GE Heathcare

# Technical Publications

**Direction DOC0660253**

**Revision 17**

# NM General Purpose 600/800 Series *
# DICOM CONFORMANCE STATEMENT

* Refer to Section 1 for a list of products in NM General Purpose 600/800 Series family to which this Conformance Statement applies.

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# LIST OF REVISIONS

| REV | DATE | DESCRIPTION | PAGES | APPR. |
|---|---|---|---|---|
| 1 | May 2010 | Discovery NM/CT 670 Release | All | T. Cohen |
| 2 | Mar 2011 | Discovery NM 630 Release<br>Update Private Dictionary and content of NM Images created | 1.1<br>2.1<br>2.2.1<br>2.7<br>3.3<br>3.4<br>3.5<br>4.3<br>4.4<br>4.5<br>6.1 | M. Mesh |
| 3 | Feb 2012 | Brivo NM 615 and Optima NM/CT 640 Release | Conformance statement overview<br>2.1, 2.2.1, 2.3.1, 2.3.1.2.1.2<br>3.1, 4.1, 5.1<br>Added new sections:<br>Section 8<br>Section 9 | M. Mesh |
| 4 | May 2012 | Update after external review | Conformance statement overview<br>8.1<br>8.3<br>8.5.4<br>9.7.1.4, 9.7.1.5, 9.7.1.6, 9.7.1.7 | M. Mesh |
| 5 | July 2012 | Modify list of attributes , update attributes descriptions | 3.4.1.1<br>3.4.2.1<br>3.4.2.4<br>3.4.3.1<br>3.4.3.4 | M. Mesh |

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| | | | 3.4.6.7<br>3.4.6.9<br>3.4.6.15<br>3.4.6.16<br>3.5.2<br>4.4.1.1<br>4.4.2.1<br>4.4.2.2 – removed<br>4.4.5.5<br>4.5.1<br>4.5.3<br>8.4.3.1<br>8.4.3.5<br>8.4.3.6<br>8.4.3.9<br>8.5.3<br>5.2.1.2<br>9.7.1.5.1 | |
| 6 | April 2013 | Update CT Radiation Dose report IOD attributes<br><br>MPPS Support<br><br>New Private Tag | 9.3 Table 9-2<br>9.4.1.1<br>9.4.1.2<br>9.4.1.3<br>9.4.3.3<br>9.4.3.4<br>9.4.3.5<br>9.5.1<br>9.5.2<br>9.5.3<br>Conformance Statement Overview<br>1.1<br>2.1<br>2.2.2.<br>2.2.3<br>2.2.4<br>2.3.1<br>2.3.1.2<br>2.3.1.2.5 – new<br>2.3.1.1.4<br>7<br>3.4.3.4 Table 3-11<br>3.5.2 Table 3-35 | M. Mesh |
| 7 | June 2014 | Discovery NM/CT 670-Pro product release | Conformance Statement Overview<br>1.1<br>1.6<br>2.1<br>2.2.1<br>2.3 (Note) | M.Mesh |

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|---|---|---|---|---|
| | | | 2.3.1.2.1 (Note)<br>2.3.1.2.2 (Note)<br>2.3.1.2.3 (Note)<br>2.3.1.2.4 (Note)<br>3.1<br>3.4.4.1<br>3.4.5.1<br>3.4.6.10<br>3.4.6.15<br>3.4.6.16<br>4.1<br>5.1<br>6.1<br>7.1<br>7.4.4<br>8.1 (Note) | |
| 8 | September 2014 | Optima NM/CT 640 product release | Conformance Statement Overview<br>2.2.3<br>2.2.4.4<br>2.3.1.2.2.2.1<br>2.3.1.2.5.1<br>2.3.1.2.5.2.1<br>3.4.6.7<br>3.4.6.9<br>3.4.6.10<br>9.3.2.1<br>9.3.3.1 | M. Mesh |
| 9 | August 2015 | Discovery NM/CT 670 ES product Release | Conformance statement overview<br>1.1<br>2.1<br>2.2.1<br>2.3.1.2.1 (Note)<br>3.1 (Note)<br>3.4.4.1<br>3.4.5.1<br>3.4.6.10<br>3.4.6.15<br>3.4.6.16<br>4.1 (Note)<br>5.1<br>6.1 (Note)<br>7.1<br>7.4.4<br>8.1 (Note) | M. Mesh |
| 10 | November 2015 | Discovery NM/CT 670 CZT product Release | Conformance statement overview<br>1.1<br>2.1<br>2.2.1<br>2.3.1.2.1 (Note) | M.Mesh |

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|---|---|---|---|---|
| | | | 3.1 (Note)<br>3.4.4.1<br>3.4.5.1<br>3.4.6.10<br>3.4.6.15<br>3.4.6.16<br>4.1 (Note)<br>5.1<br>6.1 (Note)<br>7.1<br>7.4.4<br>8.1 (Note) | |
| 11 | August 2016 | New release of NM 600/800 Series Software<br><br>New types of Secondary Capture<br><br>Radiopharmaceutical Radiation Dose SR | Conformance statement overview<br>2.3.1<br>2.3.1.2.1.1<br>3.4.3.4<br>3.4.5.1<br>3.4.6.6<br>4<br>10 (New) | M.Mesh |
| 12 | January 2017 | Discovery 670 DR product Release | Conformance statement overview<br>1.1<br>3.1 Note<br>4.3.5.1<br>7.1<br>10.3.2.1 | M.Mesh |
| 13 | November 2017 | 800 Series products release<br>New private Tags | Conformance statement overview<br>1.1<br>1.6<br>2.1<br>2.2.1<br>2.3<br>2.3.1<br>2.3.1.2.1<br>2.3.1.2.2<br>2.3.1.2.3<br>2.3.1.2.4<br>3.1<br>3.4.6<br>3.4.6.10<br>3.4.6.16<br>3.4.6.17<br>3.5.1<br>4.1<br>5.1<br>7.1<br>7.4.4<br>8.1<br>10.1 | M.Mesh |
| 14 | December 2017 | New release of NM 600/800 Series | Conformance Statement Overview | M.Mesh |

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|---|---|---|---|---|
| | | Software<br>New private Tags | 1.1<br>1.2<br>2.3.1<br>2.3.1.2.1.2<br>2.5.3 (New)<br>2.5.4 (New)<br>3.3<br>3.4.3.13.4.6.10<br>3.4.6.16<br>3.5.2<br>5.4<br>5.4.1.2<br>5.4.2.1<br>8.5.4<br>9.2.1<br>9.3.1.1<br>9.3.3.5<br>10.2.1<br>10.3.1.1<br>10.3.3.5<br>10.6.1.2.1 | |
| 15 | May 2018 | New release of NM 600/800 Series Software | Conformance Statement Overview<br>1.1<br>1.2<br>2.3.1<br>2.3.1.2.1.2<br>2.3.1.2.2.2<br>2.5.3<br>2.5.4<br>2.8.1<br>3.3<br>3.4.3.1<br>3.4.6.8<br>3.4.6.9<br>3.4.6.10<br>3.4.6.16<br>3.5.2<br>5.4<br>5.4.1.2<br>5.4.2.1<br>8.5.4<br>9.2.1<br>9.3.1.1<br>9.3.3.5<br>10.2.1<br>10.3.1.1<br>10.3.2.1 Table 10-6<br>10.3.3.5<br>10.6.1.2.1 | M.Mesh |
| 16 | July 2019 | New release of NM 600/800 Series Software<br>Exclude Brivo NM 615 | 2.3.1.1.2<br>2.3.1.2.2.2.1<br>2.3.1.2.4.2.1 | M. Mesh |

| | | | | |
|---|---|---|---|---|
| | | | Section 5<br>Section 7 | |
| 17 | Dec 2019 | Fix external Review comments | 3.4.2.3<br>3.5.1<br>Table 5-5<br>Table 5-10 | M. Mesh |

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# CONFORMANCE STATEMENT OVERVIEW

**Throughout this document the term "NM General Purpose 600/800 Series" refers to the following products:**

- **Discovery NM/CT 670**
- **Discovery NM/CT 670 Pro**
- **Discovery NM/CT 670 ES**
- **Discovery NM/CT 670 CZT**
- **Discovery 670 DR**
- **Discovery NM 630**
- **Optima NM/CT 640**
- **NM/CT 850**
- **NM/CT 860**
- **NM 830**
- **NM/CT 870 DR**
- **NM/CT 870 CZT**

The Discovery NM/CT 670 system is a combination of an NM camera and a BrightSpeed Elite 16 slices CT Scanner.
The Discovery NM/CT 670 Pro, Discovery NM/CT 670 CZT ,Discovery 670 DR ,NM/CT 870 DR and NM/CT 870 CZT systems are a combination of an NM camera and an Optima CT540 16 Slices CT scanner.
The Discovery NM/CT 670 ES system is a combination of an NM camera and an Optima CT540 8 slices CT scanner.
NM/CT 850 system is combination of NM Camera and CT 850 8 Slices CT Scanner.
NM/CT 860 system is combination of NM Camera and CT 860 8 Slices CT Scanner.
**Discovery NM/CT 670*** term is used when functionality described is the same for all Hybrid 600 Series configurations (Discovery NM/CT 670, Discovery NM/CT 670 Pro, Discovery NM/CT 670 ES, Discovery 670 DR and Discovery NM/CT 670 CZT).
**NM/CT 800*** term is when functionality described is the same for all Hybrid 800 Series configurations (NM/CT 850, NM/CT 860, NM/CT 870 DR and NM/CT 870 CZT).
**NM/CT 870*** term is when functionality described is the same for Hybrid800 Series configurations (NM/CT 850, NM/CT 860, NM/CT 870 DR and NM/CT 870 CZT).

Discovery NM/CT 670* and NM/CT 800* systems work in three different modes:

1. NM standalone - Generates NM images.
2. NM/CT hybrid - A single NM scan (Tomo, Gated Tomo only) partnered with the related Hybrid CT protocol with one or more CT acquisition(s), NM and CT series will be included in the same study.
3. CT standalone exams scheduled via CT UI. Generates CT images only.

The Discovery NM/CT 670* DICOM implementations allow the user to send Nuclear Medicine image data, which may be partnered with CT image data acquired through the front-end acquisition system, and Secondary Capture Objects, created as reports of several Quality Control (QC) operations on the NM camera, Radiopharmaceutical Radiation Dose Structured Reports (RRDR) and RRDR Secondary Capture Objects to another DICOM station. Note that CT images and secondary capture are sent by the CT scanner independently (See Reference A in Section 1.6).

The NM/CT 800* DICOM implementations allow the user to send Nuclear Medicine image data, which may be partnered with CT image data acquired through the front-end acquisition system, and Secondary Capture Objects, created as reports of several Quality Control (QC) operations on the NM camera, Radiopharmaceutical Radiation Dose Structured Reports (RRDR) and RRDR Secondary Capture Objects to another DICOM station. Note that CT

images, CT Dose Reports and secondary captures are sent by the CT 800* scanner independently (See Reference B in Section 1.6 ).

The Discovery NM 630 system is NM Standalone camera, which generates only NM Images, Radiopharmaceutical Radiation Dose Structured Reports (RRDR) and RRDR Secondary Capture Object Its DICOM implementation is the same as the Discovery NM/CT 670* systems working in NM standalone mode.

The NM 830 system is NM Standalone camera, which generates only NM Images, Radiopharmaceutical Radiation Dose Structured Reports (RRDR) and RRDR Secondary Capture Object. Its DICOM implementation is the same as the NM/CT 800* systems working in NM standalone mode.

The Optima NM/CT 640 system is NM/CT Hybrid camera, which generates both NM and CT images .It works in 2 modes:

1. NM standalone - Generates NM images.
2. NM/CT hybrid - A single NM scan (Tomo, Gated Tomo only) partnered with the related Hybrid CT protocol with one or more CT acquisition(s), NM and CT series will be included in the same study

The Optima NM/CT 640 DICOM implementation allows the user to send Nuclear Medicine image data and Computerized Tomography image data acquired through the front-end acquisition system, CT Radiation Dose reposts of patient exposure during Hybrid acquisition and Secondary Capture Objects, created as reports of several Quality Control (QC) operations on the, to another DICOM station.

**NM General Purpose 600/800 Series** DICOM implementations support storage commitment for the already transferred data. This guarantees the user that the acquired data is safely archived for future use.

**NM General Purpose 600/800 Series** DICOM implementations also support receiving Worklist information from a remote AE. They support receiving more than one Scheduled procedure step per study instance. Similarly, **NM General Purpose 600/800 Series** products support scheduling locally more than one protocol to be performed for a study.

**NM General Purpose 600/800 Series** DICOM implementation also provide a verification mechanism by which a remote AE can verify application-level communication **NM General Purpose 600/800 Series** DICOM Server. Also provided is a mechanism by **NM General Purpose 600/800 Series** user can verify application-level communication with a remote AE.

**NM General Purpose 600/800 Series** DICOM implementation creates and updates Modality Performed Procedure Step instances managed by a remote AE in association with image acquisition. Completion or discontinuation of the MPPS is performed as the result of an operator action.

**Note:** Modality Performed Procedure Step SOP Class is supported by Discovery NM/CT 670 system in CT Standalone mode via BrightSpeed Elite 16 slices CT Scanner, Discovery NM/CT 670 ES system in CT Standalone mode via Optima CT540 8 Slices CT scanner, by Discovery NM/CT 670 Pro, Discovery 670 DR, Discovery NM/CT 670 CZT and NM/CT 870* systems in CT Standalone mode via Optima CT540 16 slices CT scanner, by NM/CT 850 system in standalone mode by CT 850 Scanner and by NM/CT 860 system in standalone mode by CT 860 Scanner. Refer to appropriate CT Scanner DICOM Conformance Statements (Section 1.6).

Table 0.1 provides an overview of the network services supported by **NM General Purpose 600/800 Series**

Table 0.1 – NETWORK SERVICES

| SOP Classes | User of Service (SCU) | Provider of Service (SCP) |
|---|---|---|
| **Transfer** | | |
| Secondary Capture Image Storage | Yes | No |

| | | |
|---|---|---|
| Nuclear Medicine Image Storage | Yes | No |
| Computerized Tomography Image Storage | Yes (*) | No |
| X-Ray Radiation Dose SR | Yes (***) | No |
| Enhanced SR | Yes (**) | No |
| Radiopharmaceutical Radiation Dose SR | Yes | No |
| **Workflow Management** | | |
| Storage Commitment Push Model SOP Class | Yes | No |
| Modality Worklist Information Model – FIND SOP Class | Yes | No |
| Modality Performed Procedure Step SOP Class | Yes | No |

**Note:** (*)– Discovery NM/CT 670*,NM/CT 800* and Optima NM/CT 640 DICOM implementations only.
(**) – Discovery NM/CT 670* and NM/CT 800* implementations (for CT Radiation Dose SR objects created by CT Scanner) and Optima NM/CT 640 DICOM implementation (for transfer CT Radiation Dose SR Objects to systems, which do not support X-Ray Radiation Dose SR SOP Class)
(***) - Optima NM/CT 640 DICOM implementations only

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# 1. INTRODUCTION

## 1.1 OVERVIEW

**Throughout this document the term "NM General Purpose 600/800 Series" refers to the following products:**

- **Discovery NM/CT 670**
- **Discovery NM/CT 670 Pro**
- **Discovery NM/CT 670 CZT**
- **Discovery NM/CT 670 ES**
- **Discovery 670 DR**
- **Discovery NM 630**
- **Optima NM/CT 640**
- **NM/CT 850**
- **NM/CT 860**
- **NM 830**
- **NM/CT 870 DR**
- **NM/CT 870 CZT**

**Discovery NM/CT 670*** term is used when functionality described is the same for all Hybrid 600 Series configurations (Discovery NM/CT 670, Discovery NM/CT 670 Pro, Discovery NM/CT 670 ES, Discovery 670 DR and Discovery NM/CT 670 CZT).

**NM/CT 800*** term is when functionality described is the same for all Hybrid 800 Series configurations (NM/CT 850, NM/CT 860, NM/CT 870 DR and NM/CT 870 CZT).

**NM/CT 870*** term is when functionality described is the same for Hybrid800 Series configurations (NM/CT 850, NM/CT 860, NM/CT 870 DR and NM/CT 870 CZT).

The Discovery NM/CT 670 system is a combination of an NM camera and a BrightSpeed Elite 16 slices CT Scanner.
The Discovery NM/CT 670 Pro, Discovery NM/CT 670 CZT ,Discovery 670 DR ,NM/CT 870 DR and NM/CT 870 CZT systems are a combination of an NM camera and an Optima CT540 16 Slices CT scanner.
The Discovery NM/CT 670 ES system is a combination of an NM camera and an Optima CT540 8 slices CT scanner.
NM/CT 850 system is combination of NM Camera and CT 850 8 Slices CT Scanner.
NM/CT 860 system is combination of NM Camera and CT 860 8 Slices CT Scanner.

Discovery NM/CT 670* and NM/CT 800* systems work in three different modes:

1) NM standalone - Generates NM images.
2) NM/CT hybrid - A single NM scan (Tomo, Gated Tomo only) partnered with the related Hybrid CT protocol with one or more CT acquisition(s), NM and CT series will be included in the same study.
3) CT standalone exams scheduled via CT UI. Generates CT images only.

The Discovery NM/CT 670* DICOM implementations allow the user to send Nuclear Medicine image data, which may be partnered with CT image data acquired through the front-end acquisition system, and Secondary Capture Objects, created as reports of several Quality Control (QC) operations on the NM camera, Radiopharmaceutical Radiation Dose Structured Reports (RRDR) and RRDR Secondary Capture Objects to another DICOM station.

The NM/CT 800* DICOM implementations allow the user to send Nuclear Medicine image data, which may be partnered with CT image data acquired through the front-end acquisition system, and Secondary Capture Objects, created as reports of several Quality Control (QC) operations on the NM camera, Radiopharmaceutical Radiation Dose Structured Reports (RRDR) and RRDR Secondary Capture Objects to another DICOM station. Note that CT images, CT Dose Reports and secondary captures are sent by the CT 800* scanner independently Discovery NM/CT 670* and NM/CT 870* CT scanner DICOM Conformance Statement is described in a separate document (Reference A in Section 1.6 ).

NM/CT 850 and NM/CT 860 CT Scanner DICOM Conformance Statement is described in a separate document (Reference B in Section 1.6).

The Discovery NM 630 system is NM Standalone camera, which generates only NM Images, Radiopharmaceutical Radiation Dose Structured Reports (RRDR) and RRDR Secondary Capture Object Its DICOM implementation is the same as the Discovery NM/CT 670* systems working in NM standalone mode.

The NM 830 system is NM Standalone camera, which generates only NM Images, Radiopharmaceutical Radiation Dose Structured Reports (RRDR) and RRDR Secondary Capture Object. Its DICOM implementation is the same as the NM/CT 800* systems working in NM standalone mode.

The Optima NM/CT 640 system is NM/CT Hybrid camera, which generates both NM and CT images .It works in 2 modes:

1) NM standalone - Generates NM images.
2) NM/CT hybrid - A single NM scan (Tomo, Gated Tomo only) partnered with the related Hybrid CT protocol with one or more CT acquisition(s), NM and CT series will be included in the same study

The DICOM Conformance related to the NM standalone functionality as well as DICOM behavior of the NM/CT hybrid scanning is described in this document.

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 (Secondary Capture Image Information Object Implementation),** which specifies the GEHC equipment compliance to DICOM requirements for the implementation of a SC Image Information Object.

**Section 5 (Modality Worklist Information Model),** which specifies the GEHC equipment compliance to DICOM requirements for the implementation of the Modality Worklist service.

**Section 6 (Storage Commitment PUSH Model Implementation),** which specifies the GEHC equipment compliance to DICOM requirements for the implementation of the Storage Commitment service.

**Section 7 (Modality Performed Procedure Step Model Implementation),** which specifies the GEHC equipment compliance to DICOM requirements for the implementation of the Modality Performed Procedure Step service.

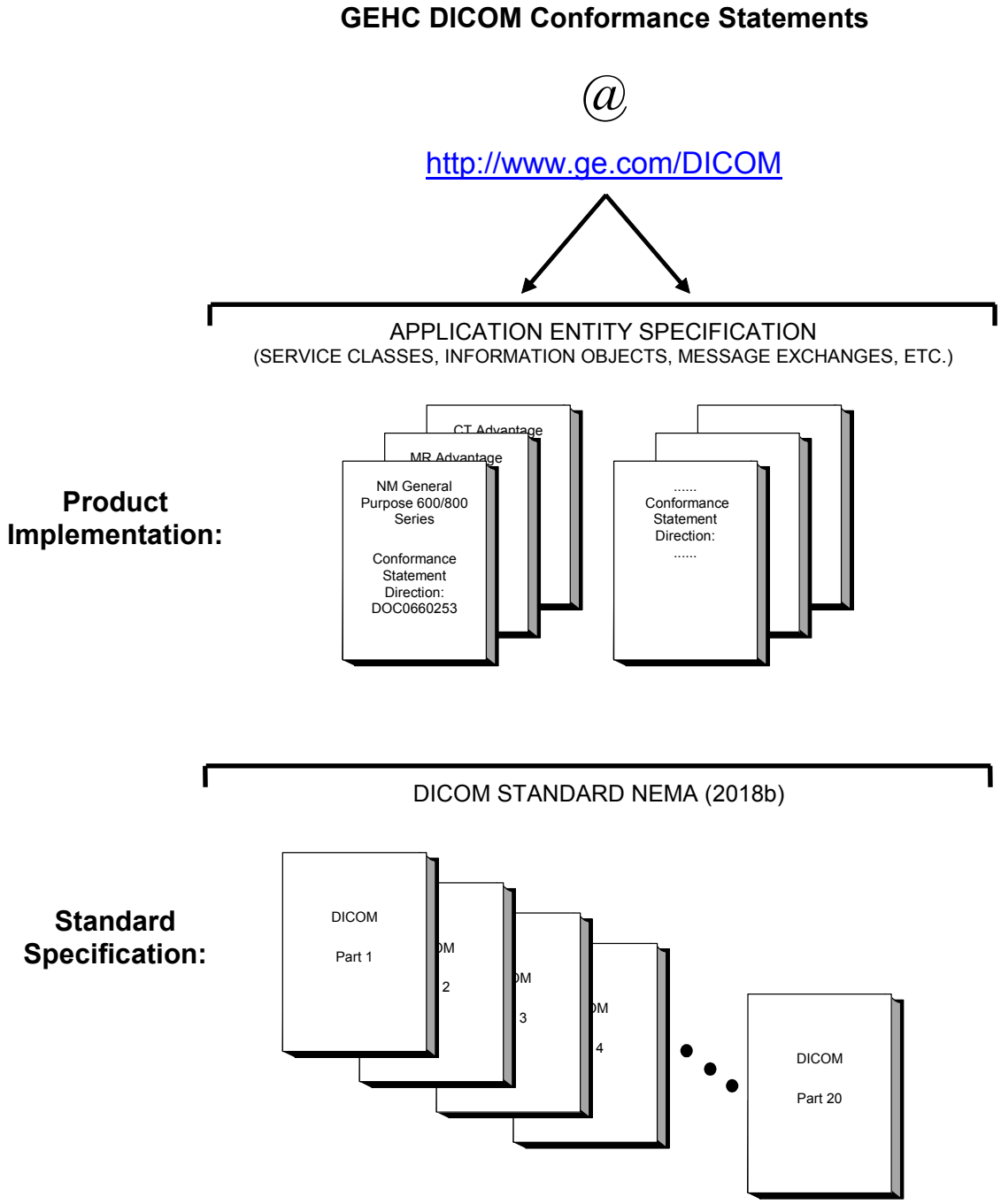
**Section 8 (CT Image Information Object Implementation),** which specifies the GEHC equipment compliance to DICOM requirements for the Optima NM/CT 640 implementation of a CT Image Information Object.

**Section 9 (CT Radiation Dose Structured Report Information Object Implementation),** which specifies the GEHC equipment compliance to DICOM requirements for the Optima NM/CT 640 implementation of a CT Radiation Dose SR Information Object.

**Section 10 (Radiopharmaceutical Radiation Dose Structured Report Information Object Implementation),** which specifies the GEHC equipment compliance to DICOM requirements for the implementation of a Radiopharmaceutical Radiation Dose SR 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:

**NM General Purpose 600/800 Series**
Conformance Statement for DICOM
Direction **DOC0660253**

This DICOM Conformance Statement documents the DICOM Conformance Statement and Technical Specification required interoperating 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. 17th 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

| | |
|---|---|
| NEMA PS3 | Digital Imaging and Communications in Medicine (DICOM) Standard, available free at http://medical.nema.org/ |
| Reference A | DOC0636565 ,"LightSpeed*, Discovery*, BrightSpeed* and Optima* Dicom Conformance Statement" |
| Reference B | DOC2074801 NM-CT 850/860 Dicom Conformance Statement |

## 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.

**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 |
| CT | Computerized Tomography |
| DHCP | Dynamic Host Configuration Protocol |
| DICOM | Digital Imaging and Communications in Medicine |
| DNS | Domain Name System |
| HIS | Hospital Information System |
| IOD | Information Object Definition |
| ISO | International Organization for Standards |
| JPEG | Joint Photographic Experts Group |
| LUT | Look-up Table |
| MWL | Modality Worklist |
| MPPS | Modality Performed Procedure Step |
| NM | Nuclear Medicine |
| O | Optional (Key Attribute) |
| OSI | Open Systems Interconnection |
| PACS | Picture Archiving and Communication System |
| PDU | Protocol Data Unit |
| PPS | Performed Procedure Step |
| R | Required (Key Attribute) |
| RIS | Radiology Information System |
| RRDR | Radiopharmaceutical Radiation Dose Report |
| SC | Secondary Capture |
| SR | Structured Report |
| SCP | Service Class Provider |
| SCU | Service Class User |
| SDO | Series Data Object |
| SOP | Service-Object Pair |
| SPS | Scheduled Procedure Step |
| TCP/IP | Transmission Control Protocol/Internet Protocol |
| U | Unique (Key Attribute) |
| UI | User Interface |
| UL | Upper Layer |
| VM | Value Multiplicity |
| VR | Value Representation |

# 2. NETWORK CONFORMANCE STATEMENT

## 2.1 INTRODUCTION

This section of the DICOM Conformance Statement specifies the NM General Purpose 600/800 Series compliance to DICOM requirements for networking features. Refer to Section 1 for detailed description of products of NM General Purpose 600/800 Series.

This section details the roles and DICOM Service Classes supported by the NM General Purpose 600/800 Series.

The Discovery NM/CT 670* and NM/CT 800* DICOM implementations allow the user to acquire, store Nuclear Medicine Image data, Radiopharmaceutical Radiation Dose Structured Reports (RRDR), RRDR Secondary Capture Objects, CT Image data, RRDR, CT Radiation Dose Reports and Secondary Capture Objects, created as reports of several Quality Control (QC) operations, and send them to another DICOM station.

The Discovery NM 630 and NM 830 DICOM implementations allow the user to acquire, store Nuclear Medicine Image data, Radiopharmaceutical Radiation Dose Structured Reports (RRDR), RRDR Secondary Capture Objects and Secondary Capture Objects, created as reports of several Quality Control (QC) operations, and send them to another DICOM station.

The Optima NM/CT 640 DICOM implementation allows the user to send acquired Nuclear Medicine image data and CT image data, Radiopharmaceutical Radiation Dose Structured Reports (RRDR), RRDR Secondary Capture Objects, CT Radiation Dose reports of patient exposure during Hybrid acquisition and Secondary Capture Objects In this situation

NM General Purpose 600/800 Series products provide the DICOM C-STORE service as a service class user (SCU).

The NM General Purpose 600/800 Series DICOM implementations support storage commitment for the already transferred data. This guarantees the user that the acquired image data are safely archived for future use. In this situation NM General Purpose 600/800 Series products provide the DICOM Storage Commitment Service as Service Class User (SCU).

The NM General Purpose 600/800 Series DICOM implementations support receiving Worklist information from a remote AE. For NM standalone exams (all products) and for hybrid exams (Discovery NM/CT 670*, NM/CT 800* and Optima NM/CT 640) DICOM implementations support receiving more than one Scheduled Procedure Step per study instance, enabling the acquisition of their matching number of protocols for this study. Similarly, NM General Purpose 600/800 Series products support scheduling locally more than one protocol to be performed for a study. Note that each Scheduled Procedure Step is performed independently.

For CT standalone exams the Discovery NM/CT 670* and NM/CT 800* DICOM implementations support scheduling a single Scheduled Procedure Step per study instance (via Worklist or by local scheduling) enabling the acquisition of a single protocol per study.

The NM General Purpose 600/800 Series DICOM implementations creates and updates Modality Performed Procedure Step (MPPS) instances managed by a remote AE in association with image acquisition. Completion or discontinuation of the MPPS is performed as the result of an operator action.

The Discovery NM/CT 670* and NM/CT 800* DICOM Implementations use two different AE titles, one for the NM Camera and one for the CT Scanner. A verification mechanism is provided, by which a remote application entity (AE) can verify application-level communication with the NM Camera DICOM Server and CT Scanner DICOM server. Also

provided is a mechanism by which a Discovery NM/CT 670* or NM/CT 800* user can verify application-level communication with a remote DICOM AE. In these situations, Discovery NM/CT 670* and NM/CT 800* provide the DICOM C-ECHO service as both a SCP and SCU, respectively, from NM and CT.

The other NM General Purpose 600/800 Series DICOM implementations provide a verification mechanism by which a remote application entity (AE) can verify application-level communication with the NM General Purpose 600/800 Series DICOM Server. Also provided is a mechanism by which a NM General Purpose 600/800 Series product user can verify application-level communication with a remote DICOM AE. In these situations, NM General Purpose 600/800 Series products provide the DICOM C-ECHO service as both a SCP and SCU, respectively.

## 2.2 IMPLEMENTATION MODEL

### 2.2.1 Overview

Two different Application Entities (AE) logically provide all DICOM functionality:

- **CT Scanner DICOM Server AE** for Discovery NM/CT 670* and NM/CT 800* CT standalone mode.
- **NM Camera AE** for all other modes of NM General Purpose 600/800 Series products The NM Camera AE is commanded to perform DICOM services through the use of the NM Camera user interface.

The both AEs also listen on pre-defined ports for incoming connections from remote DICOM AEs.

**Note:** **In this section term NM Camera AE DICOM implementation refers to DICOM implementation of all NM General Purpose 600/800 Series products, except Discovery NM/CT 670* and NM/CT 800* working in CT Standalone mode ( CT standalone exams scheduled via CT UI, CT images only are generated).**

**This section describes the only NM Camera Application Entity Implementation Model.**

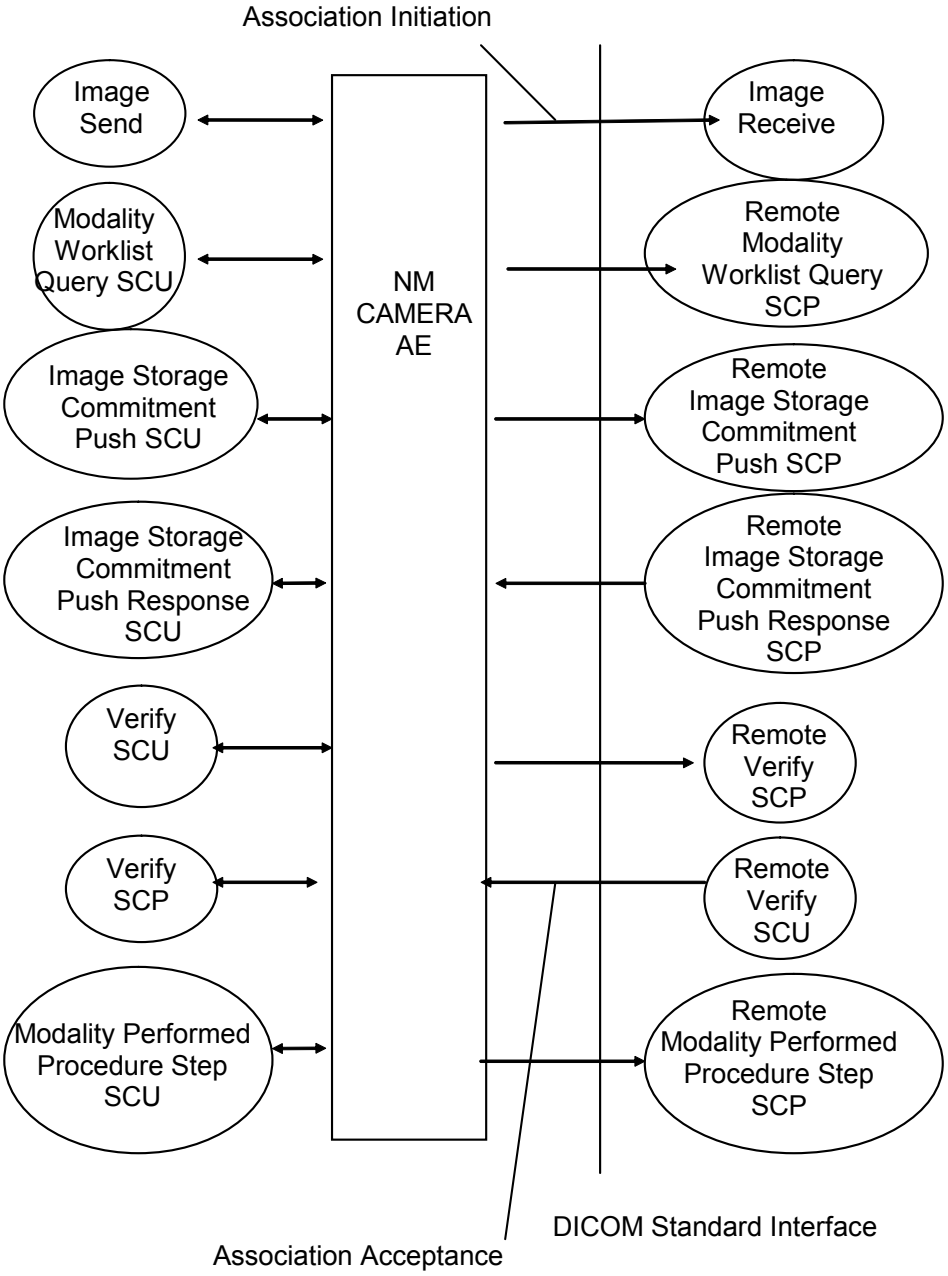
For Discovery NM/CT 670*, NM/CT 870 DR and NM/CT 870 CZT CT Scanner DICOM Server Application Entity Implementation model, refer to CT Scanner DICOM Conformance Statement (Reference A in Section 1.6).

For NM/CT 850 and NM/CT 860 CT Scanner DICOM Server Application Entity Implementation model, refer to CT Scanner DICOM Conformance Statement (Reference B in Section 1.6).

### 2.2.2 Application Data Flow Diagram

The network application model for the NM Camera DICOM Implementation is shown in the following Illustration:

**ILLUSTRATION 2–1**
NM CAMERA NETWORK APPLICATION MODEL AND DATA FLOW DIAGRAM



### 2.2.3 Functional Definition of AE's

The NM Camera 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 NM Camera AE will send the images via the C-STORE service.
- *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 NM Camera AE will request a storage commitment for the image(s) previously sent successfully via the N-ACTION-RQ.
- *Verify*: Initiates a DICOM association in order to send a verification message to a remote AE via a C-ECHO-RQ message.
- *Modality Work List (MWL)*: Initiates a DICOM association in order to query the work list from a remote AE. If the remote AE accepts a presentation context applicable to the modality work list request being sent, the NM Camera AE will receive appropriate MWL responses via the C-FIND service.
- *Modality Performed Procedure Step (MPPS):* Initiates a DICOM association in order to report the progress of the procedure step for each of the following operations:
    - *Start PPS*: in order to create a DICOM Modality Performed Procedure Step SOP instance in the remote AE when first image of the protocol is stored in database .If the remote AE accepts a presentation context applicable to Modality performed Procedure Step, the PPS DICOM SCU will issue a request to create the SOP instance in the remote AE via the N-CREATE service.
    - *Complete PPS*: in order to update a DICOM Modality Performed Step instance that is already created with the remote AE when all scan acquisitions are completed for the protocol or the operator marks this protocol as completed. If the remote AE accepts a presentation context applicable to Modality performed Procedure Step, the PPS DICOM SCU will issue a request to update the SOP instance in the remote AE via the N-SET service. The PPS Status is set to 'COMPLETED'.
    - *Discontinue PPS*: Initiates a DICOM association in order to update a DICOM Modality Performed Step instance that is already created with the remote AE when the operator marks this protocol discontinued. If the remote AE accepts a presentation context applicable to Modality performed Procedure Step, the PPS DICOM SCU will issue a request to update the SOP instance in the remote AE via the N-SET service. The PPS Status is set to 'DISCONTINUED'.

The NM Camera AE responds to the following functions:

- *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 NM Camera AE.

### 2.2.4 Sequencing of Real-World Activities

#### 2.2.4.1 Default Protocol Workflow

The NM Camera AE queries the remote station for the Modality Worklist; performs acquisition according to local schedules or by Worklist procedures; reports the start of procedure using MPPS ;sends images to auto-transfer destinations at the end of each scan of the protocol and then requests Storage Commitment for previously sent images, reports the progress of procedure using MPPS.

#### 2.2.4.2 Local Scheduling

The system either does not have a Modality Worklist Server AE installed or a Modality Worklist Server AE installed but no Worklist information is obtained from HIS/RIS system for the current procedure that is being performed. The information required for performing the procedure is supplied through the user interface of the system. The use of this information in MPPS SOP instances is described later in this document (see section 7).

#### 2.2.4.3 Modality Worklist (MWL)

The system has a Modality Worklist Server AE installed. Work-List information is obtained from HIS/RIS system through the use of Basic Worklist Management Service. The user or the system initiates a MWL query (as a MWL SCU) to the MWL SCP with a given set of query parameters. The MWL SCP returns responses, which match the query parameters.
Items from the returned Worklist responses are presented to the user within "To-Do List" browser.
A subset of attributes corresponding to operator selected returned Worklist responses will be included in acquired NM, CT and CT Radiation Dose SR SOP instances related to the responses (see sections 3.4, 8.4 , 9.3 accordingly).

#### 2.2.4.4 Report of Performed Procedure Step progress

The system initiates a 'Start PPS' after the first acquired image is of the protocol is installed to database.
NM Camera AE initiates a MPPS N-CREATE request to the remote AE (MPPS SCP), in-order to create a MPPS SOP instance at the remote AE. The MPPS SCP returns response indicating the success/failure of the request execution. The PPS state information is updated on the system based on the response data.
When all scans of the protocol are successfully completed, system initiates 'Complete PPS'. The remote AE returns response indicating the success/failure of the request execution. The PPS state information is updated in the system based on the response data.
The user may decide to finish the protocol even the protocol is not completed (not all scans are performed or acquisition of any scan(s) failed). In this case the system initiates 'Complete PPS' or 'Discontinue PPS' based on the choice selected by the user using the user interface provided. The remote AE returns response indicating the success/failure of the request execution. The PPS state information is updated in the system based on the response data.

#### 2.2.4.5 Send Images (Manual)

The user has to select data from Local or QC database browser on the "Data Management" panel and click on the transfer destination at the bottom the "Data Management" panel.

## 2.3 AE SPECIFICATIONS

**Note:** For Discovery NM/CT 670*, NM/CT 870* CT DICOM Server AE specifications, refer to CT Scanner DICOM Conformance Statement (Reference A in Section 1.6.)

For NM/CT 850 and NM/CT 860* CT Scanner DICOM Server Application Entity Implementation model, refer to CT Scanner DICOM Conformance Statement (Reference B in Section 1.6).

### 2.3.1 NM Camera AE Specification

The NM Camera 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 |
| Secondary Capture Image Storage | 1.2.840.10008.5.1.4.1.1.7 | Yes | No |
| Nuclear Medicine Image Storage | 1.2.840.10008.5.1.4.1.1.20 | Yes | No |
| CT Image Storage | 1.2.840.10008.5.1.4.1.1.2 | Yes (*) | No |
| X-Ray Radiation Dose SR | 1.2.840.10008.5.1.4.1.1.88.67 | Yes (*) | No |
| Enhanced SR | 1.2.840.10008.5.1.4.1.1.88.22 | Yes (**) | No |
| Radiopharmaceutical Radiation Dose SR | 1.2.840.10008.5.1.4.1.1.88.68 | Yes | No |
| Modality Worklist Information Model - FIND | 1.2.840.10008.5.1.4.31 | Yes | No |
| Modality Performed Procedure Step SOP Class | 1.2.840.10008.3.1.2.3.3 | Yes | No |
| Storage Commitment Push Model | 1.2.840.10008.1.20.1 | Yes | No |

**Note:** (*) – Optima NM/CT 640 DICOM implementations only
(**) – Optima NM/CT 640 DICOM implementations only (for transfer CT Radiation Dose SR objects to systems which do not support X-Ray Radiation Dose SR SOP Class as SCP).

#### 2.3.1.1 Association Establishment Policies

##### 2.3.1.1.1 General

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

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

The maximum length PDU receive size for the NM Camera AE is:

| Maximum Length PDU | 64234 (Not Configurable) |
|---|---|

The SOP Class Extended Negotiation is not supported.

##### 2.3.1.1.2 Number of Associations

The NM Camera AE (SCU) will initiate a single DICOM association to perform a single selected object (study/series/image ) send to a remote node. One association is opened per image both in manual send and in auto-send. Multiple Send operations can be performed. The Image Storage Commitment Request (SCU) initiates a new single association for all the images that were successfully stored on the remote AE. The NM Camera AE (SCU) will initiate a single DICOM association for each PPS message sent to remote AE. NM Camera AE can initiate a maximum of 10 simultaneous associations to remote nodes.

The NM Camera AE (SCP) can accept multiple DICOM associations opened simultaneously to service verifications. The NM Camera AE can support a maximum of 10 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:

| | |
|---|---|
| **NM Camera Implementation UID** | **1.2.840.113619.6.280** |
| **NM Camera Implementation Version Name** | **NUEVO_MC3_401** |

### 2.3.1.2 Association Initiation Policy

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

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

The NM Camera AE initiates a new association in the following cases:

- Due to an image send operation being initiated from the NM Camera user interface, or by auto send option.
- Due to a storage commitment request operation being initiated from the NM Camera user interface upon successful image transfer or by auto send option
- Due to a Verify operation initiated to determine whether the remote DICOM station is operational.
- Due to Modality Worklist request being initiated from the NM Camera user interface
- For every PPS operation initiated.

#### 2.3.1.2.1 Real-World Activity Image Send

**Note:** For hybrid scanning in Discovery NM/CT 670* and NM/CT 800* DICOM implementations selecting CT image(s) to be transferred and selecting the send destination is done from the CT scanner. For CT Image Send (Push) Real World activity description please refer to Discovery NM/CT 670* and NM//CT 870* CT Scanner DICOM Conformance Statement (Reference A in Section 1.6) and NM/CT 850 /NM/CT 860 CT Scanner DICOM Conformance Statement (Reference B in Section 1.6).

**Note:** For all other NM General Purpose 600/800 Series products sending acquired data (manually or automatically) is performed via the NM Camera Operator Console screen.

##### 2.3.1.2.1.1 Associated Real-World Activity

There are two ways to send NM data: manual and automatic. In the manual way, in order to send data, the operator must both select objects (Study/Series/ Image(s)) to be transferred from the Data Management and select a destination by pressing the destination button.
Once these selections have been made, the operator pushes the Transfer Destination button to initiate a send operation. In the automatic way, when any single acquisition (scan) has been completed (in a NM-only context as well as in the hybrid context) the data is automatically sent to the destination(s) which are predefined within system configuration; the NM Camera AE will then initiate an association with the remote AE in order to send the selected object(s) – one object per association – and will accept and interpret responses received from the remote AE.

The UI will indicate the status of the object (Study, Series, Image) being transferred. The status can be one of IN-PROGRESS, SUCCESS, or FAILURE. The associated error messages due to a failed status can be found in system log.

#### 2.3.1.2.1.2 Proposed Presentation Context Table

| Presentation Context Table – Proposed by NM Camera AE for "Image Send "Activity | | | | | |
|---|---|---|---|---|---|
| **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 |
| 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 |
| X-Ray Radiation Dose SR (*) | 1.2.840.10008.5.1.4.1.1.88.67 | 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 |
| Radiopharmaceutical Radiation Dose SR | 1.2.840.10008.5.1.4.1.1.88.68 | 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:** (*) –Optima NM/CT 640 DICOM implementation only
(**) –Optima NM/CT 640 DICOM implementation only (for transfer CT Radiation Dose SR objects to systems which do not support X-Ray Radiation Dose SR SOP Class as SCP).

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

The NM Camera AE implementation includes optional data elements in the SOP Instances as described in Sections 3, 4 and 8.

This implementation can perform a single C-STORE operation over a single association.

All the operations used by this SOP class support an **Association Timer.** This timer is started when the association request is sent, and is stopped when the respective response is received. The default time-out value is 60 seconds and is not configurable.

Each C-STORE operation also supports an **Operation Inactivity Timer**. This time-out starts once the first C-STORE

request has been issued (on association) or received and is reset each time a C-STORE response has been received or when subsequent C-STORES are sent. This time-out is 5 minutes. It is non-configurable.
If any of the two timers mentioned above expires, the connection is closed and the operation in progress is considered failed.

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

When NM Camera AE initiates an association to issue a C-STORE, the image will be transmitted by the NM Camera AE with the same elements as was created locally.

Transfer log shows one of these statuses for store request: JOB_SUCCEEDED, JOB_FAILED, JOB_IN_PROGRESS. The specific error codes can be observed in the log.

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 |
|---|---|---|---|
| Failure | A700-A7FF | Refused: Out of resources | The message " JOB FAILED: error sending image" is displayed in Transfer Log. |
| | A900-A9FF | Error: Data Set does not match SOP Class | The message " JOB FAILED: error sending image" is displayed in Transfer Log |
| | C000-CFFF | Error: Cannot Understand | The message " JOB FAILED: error sending image" is displayed in Transfer Log |
| | 0122 | SOP Class Not Supported | The message " JOB FAILED: error sending image" is displayed in Transfer Log |
| Warning | B000 | Coercion of Data Elements | The message “JOB SUCCEEDED” posted to the Transfer Log. |
| | B006 | Elements Discarded | The message “JOB SUCCEEDED” posted to the Transfer Log. |
| | B007 | Data Set does not match SOP Class | The message “JOB SUCCEEDED” posted to the Transfer Log. |
| Success | 0000 | | The message “JOB SUCCEEDED” posted to the Transfer Log. |
| * | * | Any other status code. | The message " JOB FAILED: error sending image" is displayed in Transfer Log. |

#### 2.3.1.2.2 Real-World Activity Modality Worklist Query SCU

**Note:** For NM standalone exams and NM/CT hybrid exams the Worklist query is performed via the NM Camera Operator Console screen. Worklist for CT standalone scanning is performed via CT Scanner Operator Console. For Real World activity: Worklist Query for CT standalone please refer to Discovery NM/CT 670* and NM/CT 870* CT Scanner DICOM Conformance Statement (Reference A in Section 1.6) and to NM/CT 850 and NM/CT 860 CT Scanner DICOM Conformance Statement (Reference B in Section 1.6).

#### 2.3.1.2.2.1 Associated Real-World Activity

NM Camera AE queries the remote AE for a Modality Worklist (MWL) in the following cases:

- When NM Camera application is started, MWL query is automatically performed for updating entries displayed in the NM Camera "To Do List".
- User opens "Filter..." button in NM Camera UI. MWL Filter dialog is opened, user defines relevant MWL matching keys and presses on "Query" button.
- Users requires MWL query using latest MWL matching keys defined by pressing on "Refresh" button in the NM camera UI.
- Users requires MWL query using latest MWL matching keys defined to map of the MWL Requested or Scheduled Procedures to the NM Camera acquisition protocols .

#### 2.3.1.2.2.2 Proposed Presentation Context Table

| Presentation Context Table – Proposed by NM Camera AE for Modality Worklist Query SCU Activity | | | | | |
|---|---|---|---|---|---|
| **Abstract Syntax** | | **Transfer Syntax** | | **Role** | **Extended Negotiation** |
| **Name** | **UID** | **Name List** | **UID List** | | |
| Modality Worklist Information Model - FIND | 1.2.840.10008.5.1.4.31 | Implicit VR Little Endian<br>Explicit VR Big Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.2 | SCU | None |

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

The NM Camera includes matching keys in the Modality Worklist queries as described in Section 5

If Modality Worklist query failed, the user receives a notification message.

All the operations used by this SOP class support an **Association Timer**. This timer is started when the association request is sent, and is stopped when the respective response is received. The default time-out value is 30 seconds, and is not configurable.

All the operations used by this SOP class support a **Session Timer**. This timer is started when the association is established, and stopped when association is ended. The default time-out value is 180 seconds.

If any of the two timers mentioned above expires, the connection is closed and the operation in progress is considered failed

Sending C-FIND CANCEL is not supported by the NM Camera AE.

If NM Camera AE receives a success response with no matching response, a pop-up will show saying that the Worklist query has failed.

When the C-FIND response received from the Worklist SCP does not include one of the tags defined as type 1 (e.g. Patient name, Patient ID, Study Instance UID) the NM Camera AE will show a pop-up message listing which tags are missing, the Worklist item will be rejected.

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

| Service Status | Status Code | Further Meaning | Application Behavior When Receiving Status Code |
|---|---|---|---|
| Failure | A700 | Refused: Out of resources | User receives a notification message.<br>Only locally scheduled studies or studies which acquisition is in progress are displayed in the NM Camera "To Do List" |
| | A900 | Error: Identifier does not match SOP Class | User receives a notification message.<br>Only locally scheduled studies or studies which acquisition is in progress are displayed in the NM Camera "To Do List" |
| | C000-CFFF | Error: Unable to process | User receives a notification message.<br>Only locally scheduled studies or studies which acquisition is in progress are displayed in the NM Camera "To Do List" |
| | 0122 | SOP Class Not Supported | User receives a notification message.<br>Only locally scheduled studies or studies which acquisition is in progress are displayed in the NM Camera "To Do List" |
| Cancel | FE00 | Matching terminated due to cancel | Not Applicable |
| Success | 0000 | Matching is complete - No final identifier is supplied | All accepted MWL entries, received from MWL SCP system, along with locally scheduled studies or studies which acquisition is in progress are displayed in the NM Camera "To Do" List |
| Pending | FF00 | Matches are continuing - Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys. | "MWL query is in progress" notification is displayed along with MWL query progress indicator. |
| * | FF01 | Matches are continuing - Warning that one or more Optional Keys were not supported for existence for this Identifier | "MWL query is in progress" notification is displayed along with MWL query progress indicator. |
| | * | Any other status code. | User receives a notification message.<br>Only locally scheduled studies or studies which acquisition is in progress are displayed in the NM Camera "To Do List" |

#### 2.3.1.2.3 Real-World Activity Image Storage Commitment Push SCU

**Note:** For Real World activity Image Storage Commitment Push SCU of CT Scanner AE please refer to please refer to Discovery NM/CT 670* and NM/CT 870* CT Scanner DICOM Conformance Statement (Reference A in Section 1.6) and to NM/CT 850 and NM/CT 860 CT Scanner DICOM Conformance Statement (Reference B in Section 1.6) Associated Real-World Activity.

The operator must both select objects (Study/Series/Image(s)) to be transferred from the Data Transfer panel, and select a destination from the list of previously defined destinations. Once these selections have been made, the operator pushes the "Destination" button to initiate an image send operation.

If the destination is configured as storage commitment capable or the destination is configured to use other storage commitment capable devices, the NM Camera AE initiates the following operations:

- Negotiates and establishes association with remote Storage Commitment Provider.
- Sends the selected images to the remote DICOM AE.
- Closes the association.
- If all the images are transferred without failures the following steps will be executed. If there are any failures the job will be marked as failed and the Storage Commitment request will not be sent.
- Establishes a new association for sending the commitment request for all successfully transferred images.
- Receives the response on same association or on a different association.
- Updates the archive flag information for successful instances.

The Transfer Log shows the status of the storage commitment request progress. The status can be either JOB_SUCCEEDED, JOB_FAILED, or JOB_IN_PROGRESS.

#### 2.3.1.2.3.1 Proposed Presentation Context Table

| Presentation Context Table – Proposed by NM Camera AE for Image Storage Commitment Push SCU Activity | | | | | |
|---|---|---|---|---|---|
| **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<br>Explicit VR Little Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1 | SCU | None |

##### 2.3.1.2.3.1.1 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 every group of successfully transferred image(s).

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 “Refused” status, the association is terminated. The reason for termination is recorded in the system log file.

Upon receiving a N-ACTION confirmation containing a status other than the DICOM standard 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.

The NM Camera AE uses DICOM network storage services to transfer SOP Instances which are to be committed.

The NM Camera AE may request Storage Commitment for Instances of any of the Composite SOP Classes it supports as an SCU (see Section 2.3.1).

The Storage Commitment Information Object is described in Section 6.

All the operations used by this SOP class support an **Association Timer.** This timer is started when the association request is sent, and is stopped when the respective response is received. The default time-out value is 60 seconds, and is not configurable.

All the operations used by this SOP class support a **Session Timer**. This timer is started when the association is established, and stopped when the association is ended. The default time-out value is 10 minutes and is not configurable.

If any of the two timers mentioned above expires, the connection is closed and the operation in progress is considered failed.

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 | The message " JOB FAILED: error storage commitment" is displayed in Transfer Log;<br>Storage commitment will be considered as failed; |
| | 0112 | No such SOP Instance | The message " JOB FAILED: error storage commitment" is displayed in Transfer Log;<br>Storage commitment will be considered as failed; |
| | 0110 | Processing failure | The message " JOB FAILED: error storage commitment" is displayed in Transfer Log;<br>Storage commitment will be considered as failed; |
| | 0213 | Resource limitation | The message " JOB FAILED: error storage commitment" is displayed in Transfer Log;<br>Storage commitment will be considered as failed; |
| | 0122 | Referenced SOP Class Not Supported | The message " JOB FAILED: error storage commitment" is displayed in Transfer Log;<br>Storage commitment will be considered as failed; |
| | 0131 | Duplicate Transaction UID | The message " JOB FAILED: error storage commitment" is displayed in Transfer Log;<br>Storage commitment will be considered as failed; |
| Success | 0000 | | The message " JOB IN PROGRESS: waiting for commitment" is displayed in Transfer Log.<br>The request for storage comment is considered successfully sent. A timer is started which will expire if no N-EVENT-REPORT for the Transaction UID is received within a configurable timeout period. |

| | | | |
|---|---|---|---|
| * | * | Any other status code. | The message " JOB FAILED: error storage commitment" is displayed in Transfer Log;<br>Storage commitment will be considered as failed; |

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 NM Camera has initiated is not supported. The Remote AE (SCP) must initiate a new association in order to send the new N-EVENT-REPORT (see Section 2.3.1.3.2.2.1).

#### 2.3.1.2.4 Real-World Activity Verify SCU

**Note:** For CT scanner AE Real Time Activity: Verify refer to Discovery NM/CT 670* and NM/CT 870* CT Scanner DICOM Conformance Statement (Reference A in Section 1.6) and NM/CT 850 and NM/CT 860* CT Scanner DICOM Conformance Statement (Reference B in Section 1.6).

##### 2.3.1.2.4.1 Associated Real-World Activity

Service personnel invoke the DICOM Station Configuration Utility from NM Camera UI. The user selects any of defined remote DICOM AE and presses on “Refresh status” button. The NM Camera AE initiates an association with the remote DICOM AE in order to verify communication at the application level. The success or failure of the verification process is displayed to the user.

###### 2.3.1.2.4.1.1 Proposed Presentation Context Table

| Presentation Context Table – Proposed by NM Camera AE for Verify SCU Activity | | | | | |
|---|---|---|---|---|---|
| Abstract Syntax | | Transfer Syntax | | Role | Extended Negotiation |
| Name | UID | Name List | UID List | | |
| Verification SOP Class | 1.2.840.10008.1.1 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCU | None |

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

The NM Camera AE provides standard conformance to the DICOM Verification Service Class.
All the operations used by this SOP class support an Association Timer. This timer is started when the association request is sent, and is stopped when the respective response is received. The default time-out value is 20 seconds and is not configurable.

#### 2.3.1.2.5 Real-World Activity Performed Procedure Step creation and update

##### 2.3.1.2.5.1 Associated Real-World Activity

The real-world activities are mentioned in section 2.2.4.4 describing PPS Sequencing of Real-World Activities.
Each of the real world activity results in either creating a new Performed procedure Step SOP instance at the remote SCP or updating an already created Performed Procedure Step SOP instance as per the DICOM standard.

NM Camera AE generates an association establishment request upon the following events:

- In order to issue an N-CREATE message with Performed Procedure Step status = IN-PROGRESS when the first image of the first scan in the protocol is stored in database.

- In order to send a final intermediate N-SET message with Performed Procedure Step status =COMPLETED in the following events:
  - When the acquisition of the last scan in a protocol is completed leaving no non-acquired scans in the protocol, the protocol is automatically considered completed.
  - When the operator presses the "Protocol Completed" button for a selected protocol.
  - When the operator presses the "Protocol Completed" button where a study instance is selected, the N-SET message is sent for all protocols in a study that has acquired data.
- In order to send a final N-SET message with Performed Procedure Step status = DISCONTINUED when the operator presses the "Discontinue Protocol" button for a selected protocol or for all of the protocols in a study when study is selected. The message will be set with the reason for discontinuing the protocol as selected by the operator (see Table 7-5 for list of possible discontinue reasons).

#### 2.3.1.2.5.2 Proposed Presentation Context Table

| Presentation Context Table – Proposed by NM Camera AE for Performed Procedure Step creation and update Activity | | | | | |
|---|---|---|---|---|---|
| **Abstract Syntax** | | **Transfer Syntax** | | **Role** | **Extended Negotiation** |
| **Name** | **UID** | **Name List** | **UID List** | | |
| Modality Performed Procedure Step | 1.2.840.10008.3.1.2.3.3 | 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 Modality Performed Procedure Step SOP Class

When sending a PPS message, the system looks for stations configured to act as PPS manager.
If the remote AE does not support the proposed Presentation context, an appropriate error message is logged. Only one association is opened at a time.

The NM Camera AE includes attributes in the Modality Performed Procedure Step N-CREATE and N-SET messages as described in Section 7.4.

NM Camera AE does not define any extended error codes. The standard error codes are handled. On a response with status 'Success' for the N-CREATE or N-SET request, the system updates the state and indicates the same on the user interface. On a response with status other than 'Success' the operation is deemed 'Failed'.

If the operation is 'Failed', detailed message is logged into system log-file and system automatically retries the failed operation.

If the N-CREATE operation fails, the system marks the condition to enable sending N-CREATE again upon next scan's acquisition start.

This is an update that will be reported again by sending of the final N-SET COMPLETE or DISCONTINUE message.

The PPS N-SET request can inform of completion of multiple images/SR objects over a single association.

### 2.3.1.3 Association Acceptance Policy

The NM Camera AE places no limitation on whom may connect to it. The maximum number of associations accepted in parallel is limited to 5.

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

As part of the storage commitment implementation, the NM Camera AE Server responds to N-EVENT-REPORT received

from the remote AE.

#### 2.3.1.3.1 Real-World Activity Verify SCP

##### 2.3.1.3.1.1 Associated Real-World Activity

The NM Camera 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.

##### 2.3.1.3.1.2 Accepted Presentation Context Table

| Presentation Context Table - Accepted by NM Camera AE for Verify SCP Activity | | | | | |
|---|---|---|---|---|---|
| **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 |

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

The NM Camera AE provides standard conformance to the DICOM verification service class.

#### 2.3.1.3.2 Real-World Activity Image Storage Commitment Push Response SCU

##### 2.3.1.3.2.1 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 NM Camera 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.

##### 2.3.1.3.2.2 Accepted Presentation Context Table

| Presentation Context Table - Accepted by NM Camera AE for Image Storage Commitment Push Response SCU Activity | | | | | |
|---|---|---|---|---|---|
| **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<br>Explicit VR Little Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1 | SCU | None |

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

The NM Camera AE 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 NM Camera 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 as "Archive" Icon. User shall explicitly request deleting of Instances , which are not marked as "Archived"

If the Storage Commitment Result indicates any failure status the error will be written to the **/home/ctuser/neuvo/logfiles/nwscp.log** error log.

Any retry must be manually reinitiated as a new Storage request following by Storage Commitment Request (see Section 2.3.1.2.3). The list of specific Failure Reason Codes that this AE will be able to process is described in Section 6.1.2.1

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 | 0110 | Processing failure | This status code is sent if SCANER AE failed to understand N_EVENT_RESPONSE message | None |
| Success | 0000 | | Send in case that SCANER AE successfully processed N_EVENT_RESPONSE message | None |

#### 2.3.1.3.2.3 Presentation Context Acceptance Criterion

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

#### 2.3.1.3.2.4 Transfer Syntax Selection Policies

Within each Presentation Context, the NM Camera AE will select Transfer Syntaxes according to the following priority (highest priority first):

1. Explicit VR Little Endian
2. 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.

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

### 2.4.2 Physical Media Support

Ethernet 802.3 provides the physical network layer for this product.

## 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. The extensions are defined in Sections 3.5, 4.5 , 8.5, 9.4 and 10.4.

#### 2.5.1.2 Private SOP Classes

The NM General Purpose 600/800 Series systems do not implement any Private SOP Class.

### 2.5.2 Private Transfer Syntaxes

The NM General Purpose 600/800 Series systems do not implement any Private transfer syntax.

### 2.5.3 Additional Protocols

The NM General Purpose 600/800 Series systems support DHCP Protocol.

### 2.5.4 IPv4 and IPv6 Support

The NM General Purpose 600/800 Series systems support IPv4 only.

## 2.6 CONFIGURATION

The NM General Purpose 600/800 Series systems are configured by GE Healthcare Field Service Engineers. The DICOM configuration items below are configurable or re-configurable by a Field Service Engineer but are not accessible through the implementation user interface.

### 2.6.1 AE Title/Presentation Address Mapping

The NM General Purpose 600/800 Series systems allow 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 GE Healthcare Field Service Engineers.

### 2.6.2 Configurable Parameters

The following fields are configurable for NM Camera AE (local):

- Local AE Title

**Note:** Listening Port Number (default value is 4006), PDU length and any time-outs are not configurable for NM Camera AE. The configuration of IP routers and subnet mask is available on a OS level.

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:
  - PPS provider
  - Send destination
  - Auto-send destination
  - Modality Worklist Provider
  - Storage Commit Server only
  - Storage Commitment on (AE Title of one of previously defined Storage Commitment Servers)
  - Auto-Processing destination (shall be used for Xeleris Workstations only)
  - Auto-Reconstruction destination (shall be used for Smart Console© systems only)

**Note:** All configurations must be performed by a GE Field Engineer. The DICOM configuration items are configurable or re-configurable by a Field Service Engineer but are not accessible through the NM Camera user interface.

## 2.7 SUPPORT OF EXTENDED CHARACTER SETS

The NM Camera AE supports only a single single-byte extended character set ISO_IR 100 (Latin alphabet Number 1 supplementary set.

The NM Camera user interface will allow the user to enter characters from the console keyboard that is within ASCII or the configured extended character set. The product specifies ISO_IR 100 (Latin alphabet Number 1) extended character set in Specific Character Set (0008,0005) whether any such extended characters are included in SOP Instances or not.

The product will accept, as a Modality Worklist SCU, Scheduled Procedure Step Identifiers with any value of Specific Character Set (0008,0005) defined by DICOM standard. It will map that Specific Character Set value without change into the images created pursuant to that Scheduled Procedure Step. Text attributes of the Scheduled Procedure Step Identifier, including Patient and Physician names that include extended characters will be displayed as described above. If Modality Worklist entries do not contain Specific Character Set (0008,0005) value, the NM Camera AE adds ISO_IR 100 (Latin alphabet Number 1) extended character set in Specific Character Set (0008,0005) to the images created pursuant to that Scheduled Procedure Step.

## 2.8 CODES AND CONTROLLED TERMINOLOGY

### 2.8.1 Fixed Coded Terminology

The NM Camera AE uses the fixed (non-configurable, non-extensible) coded terminology in NM Image SOP Instance as described in Section 3 and in Modality Performed Procedure attributes as described in Section 7

The NM Camera DICOM implementation is capable of supporting arbitrary coding schemes for Procedure and Protocol Codes. During installation, a service technician will establish a mapping between the site-specific codes and the Protocol Names used internally to identify acquisition protocols. A remote AE station configured to act as Worklist provider is configured to map according to one of the DICOM tags:

- (0040,0007) - Scheduled Procedure Step Description

- (0032,1060) - Requested Procedure Description
- (0040,0008) - Scheduled Protocol Code Sequence

NM Camera Implementation extends the following sets of coded terminology:

| Context Group | Default Value Set | Use |
|---|---|---|
| Radionuclides | CID 18 | Selected value from this group is used in NM Image<br>Radiopharmaceutical Information Sequence (0054,0016)<br>> Radionuclide Code Sequence (0054,0300)<br><br>(GEHC-NUC, 20001, ^166^Holmium) |
| Radiopharmaceuticals | CID 25 | Selected value from this group is used in NM Image<br>Radiopharmaceutical Information Sequence (0054,0016)<br>> Radiopharmaceutical Code Sequence (0054,0304)<br><br>(SRT,C-B10C4, Technetium^99m Ethyl cysteinate dimer)<br>(SRT,C-B1184, Strontium-89 chloride)<br>(SRT,C-B10A5, Yttrium-90 microspheres)<br>(GEHC-NUC,10001, Iodine^123^ DaTSCAN Ioflupane)<br>(GEHC-NUC,10004, Lutetium^177)<br>(GEHC-NUC,10005, Xeneisol Xe^133^)<br>(GEHC-NUC,10006, Technetium^99m TRODAT-1)<br>(GEHC-NUC,10007, Radium Ra 223 dichlorid)<br>(GEHC-NUC,10008, Lutetium^177 DOTATATE)<br>(GEHC-NUC,10009, Lutetium^177 NAAG n-acetylaspartylglutamate) |

### 2.8.2 Mapped Coded Terminology

The product does not use any mapped coded terminology

### 2.8.3 Configurable Coded Terminology

The product does not use any 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

**Note:** **In this section term NM Camera AE DICOM implementation refers to DICOM implementation of NM General Purpose 600/800 Series products except Discovery NM/CT 670* and NM/CT 800* in CT standalone mode.**

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 NM CAMERA MAPPING OF DICOM ENTITIES

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

**TABLE 3-1**
**MAPPING OF DICOM ENTITIES TO NM CAMERA ENTITIES**

| DICOM IE | NM Camera Entity |
|---|---|
| Patient | Patient |
| Study | Study |
| Series | Series |
| Image | Dataset |

## 3.3 IOD MODULE TABLE

The Nuclear Medicine 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 |
| | Clinical Trial Subject | Not Used | N/A |
| Study | General Study | Used | 3.4.2.1 |
| | Patient Study | Used | 3.4.2.2 |
| | Standard Extended Study | Used | 3.4.2.3 |
| | Private 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 |
| | Standard Extended Series | Used | 3.4.3.2 |
| | NM/PET Patient Orientation | Used | 3.4.3.3 |
| | Private Series | Used | 3.4.3.4 |
| Frame of Reference | Frame of Reference | Used for images where Image Type (0008,0008) Value 3 is TOMO or GATED 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 |
| | Specimen | Not Used | N/A |
| | Multi-frame | Used | 3.4.6.5 |
| | NM Multi-frame | Used | 3.4.6.6 |
| | NM Image | Used | 3.4.6.7 |
| | NM Isotope | Used | 3.4.6.8 |
| | NM Detector | Used | 3.4.6.9 |
| | NM Tomo-Acquisition | Used for images where Image Type (0008,0008) Value 3 is TOMO or GATED TOMO | 3.4.6.10 |
| | NM Multi-gated Acquisition | Used for images where Image Type (0008,0008) Value 3 is GATED or GATED TOMO | 3.4.6.11 |
| | NM Phase | Used for images where Image Type (0008,0008) Value 3 is DYNAMIC | 3.4.6.12 |
| | NM Reconstruction | Not Used | N/A |
| | Overlay Plane | Not Used | N/A |
| | Multi-frame Overlay | Not Used | N/A |
| | VOI LUT | Used | 3.4.6.13 |
| | SOP Common | Used | 3.4.6.14 |
| | Frame Extraction | Not Used | N/A |
| | Private Image | Used | 3.4.6.15 |
| | Private NM Image | Used | 3.4.6.16 |

| | | | |
|---|---|---|---|
| | Private Image Tomo | Used for images where Image Type (0008,0008) Value 3 is TOMO or GATED TOMO | 3.4.6.17 |
| | Private Image Multi-Gated | Used for images where Image Type (0008,0008) Value 3 is GATED or GATED TOMO | 3.4.6.18 |
| | Private Image GSPECT | Used for images where Image Type (0008,0008) Value 3 is GATED TOMO | 3.4.6.19 |

## 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). Also note that Attributes which are not present in tables are not supported.

NM Camera private attributes are defined in private modules, each of which follows 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, xxee) format, where xx represents a reserved block of element numbers within the group gggg.

Note that any element not listed in table(s) means that it is not supported (not stored in the created images).

### 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. (*) Compound from user Last Name and First Name for locally scheduled protocols(**) (***) |
| 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 received either from MWL or from user input. |

| | | | |
|---|---|---|---|
| Patient's Sex | (0010,0040) | 2 | Sex of the named patient. (*) (**)(***)<br>Enumerated Values:<br>M = male<br>F = female<br>O = other<br>Sent as ZERO LENGTH value if value is not received either from MWL or from user input. |
| Other Patient IDs | (0010,1000) | 3 | Not Used |
| Other Patient IDs Sequence | (0010,1002) | 3 | Not Used |

***Note 1 :*** *(*) - Attributes copied from the Worklist if the study source was actually copied from a Worklist query result.*

***Note 2 :*** *(**) - Attributes copied from the user input for Locally scheduled Protocols*

***Note 3 :*** *(***) - Cannot be modified by user if meaningful value is received from MWL*

### 3.4.2 Study Entity Modules

#### 3.4.2.1 General Study Module

**TABLE 3-4**
**GENERAL STUDY MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | Attribute Description |
|---|---|---|---|
| Study Instance UID | (0020,000D) | 1 | Unique identifier for the Study.(*)(***)<br>Generated by the system for Locally Scheduled protocols |
| Study Date | (0008,0020) | 2 | Date the Study started.<br>Set to start date of the first protocol in the study. |
| Study Time | (0008,0030) | 2 | Time the Study started.<br>Set to start time of the first protocol in the study. |
| 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 received either from MWL or from user input.<br>User can modify value received from MWL |
| Referring Physician's Name | (0008,0090) | 2 | Name of the patient's referring physician (*) (**)<br>Only Last and First Names received from MWL are displayed in UI<br>Sent as ZERO LENGTH value if value is not received either from MWL or from user input.<br>User can modify value received from MWL |

| | | | |
|---|---|---|---|
| Study ID | (0020,0010) | 2 | User or equipment generated Study identifier.<br>Automatically assigned to the short name of the first Protocol in the study (**)<br>May be updated by user<br>Always sent as non-empty value. |
| Study Description | (0008,1030) | 3 | Study Description. (*) (**)<br>Automatically assigned to the short name of the first Protocol in the study for the Locally Scheduled Protocols.<br>Copied from Requested Procedure Description (0032,1060) of the first SPS in the study when read from Worklist<br>Sent as ZERO LENGTH value if value is not received neither from MWL nor from user input<br>User can modify value received from MWL |
| Name of Physician(s) Reading Study | (0008,1060) | 3 | Names of the physician(s) reading the Study. (**)<br>First Name and/or Last Name are copied from user input if entered, otherwise sent as ZERO LENGTH. |
| Procedure Code Sequence. | (0008,1032) | 3 | Procedure Code Sequence.(*) Mapped without change from Modality Worklist Requested Procedure Code Sequence (0032,1064).<br>May present in locally protocols appended to study with already scheduled MWL protocol. |
| > Include 'Code Sequence Macro' | | | |
| Referenced Study Sequence | (0008,1110) | 3 | Referenced Study Sequence.(*)<br>Only a single item is permitted in this sequence, if sent.<br>Copied from 1st valid item of Referenced Study Sequence sent in Worklist. If no valid items exist, not sent.<br>May present in locally protocols appended to study with already scheduled MWL protocol. |
| >Include 'SOP Instance Reference Macro' | | | |

***Note 1 : (*)*** *- Attributes copied from the Worklist if the study source was actually copied from a Worklist query result.*

***Note 2 : (**)*** *- Attributes copied from the user input for Locally scheduled Protocols*

***Note 3 : (***)*** *- Cannot be modified by user if received from MWL*

#### 3.4.2.2 Patient Study Module

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

| Attribute Name | Tag | Type | Attribute Description |
|---|---|---|---|
| Admitting Diagnoses Description | (0008,1080) | 3 | Description of the admitting diagnosis (diagnoses) (**)<br>Sent as ZERO LENGTH value if value is not received from user input for locally scheduled protocols |
| Patient's Age | (0010,1010) | 3 | Age of the Patient<br>Calculated from Patient Birth Date if Patient Birth Date is not empty. Not sent is Patient Birth Date is not defined.<br>Cannot be updated if Patient Birth Date is entered from MWL. |
| Patient's Size | (0010,1020) | 3 | Length or size of the Patient, in meters. (*) (**)<br>Sent as ZERO LENGTH value if value is not received either from MWL or from user input.<br>User can modify value received from MWL |
| Patient's Weight | (0010,1030) | 3 | Weight of the Patient, in kilograms.(*) (**)<br>Sent as ZERO LENGTH value if value is not received either from MWL or from user input.<br>User can modify value received from MWL |

***Note 1 :*** *(*) - Attributes copied from the Worklist if the study source was actually copied from a Worklist query result.*

***Note 2 :*** *(**) - Attributes copied from the user input for Locally scheduled Protocols*

#### 3.4.2.3 Standard Extended Study Module

**TABLE 3-6**
**STANDARD EXTENDED STUDY MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | Attribute Description |
|---|---|---|---|
| Requested Procedure Comments | (0040,1400) | 3 | Study notes<br>Sent as ZERO LENGTH value if value is not received from user input or MWL request |
| Allergies | (0010,2110) | 3 | Description of prior reaction to contrast agents, or other patient allergies or adverse reactions (*) (**)<br>Sent as ZERO LENGTH value if value is not received either from MWL or from user input.<br>User can modify value received from MWL |

| | | | |
|---|---|---|---|
| Pregnancy Status | (0010,21C0) | 3 | Describes pregnancy state of patient. (*)(**)<br>Enumerated Values:<br>0001 = not pregnant<br>0002 = possibly pregnant<br>0003 = definitely pregnant<br>0004 = unknown<br>Sent as "unknown" if value is not received either from MWL or from user input and if tag (0010,1040) - Patient's Sex – is other than "F" (Female)<br>User can modify value received from MWL if tag (0010,1040) - Patient's Sex – is "F" (Female) only |

***Note 1 : (****) – Attributes copied from the Worklist if the study source was actually copied from a Worklist query result.*

***Note 2 : (*****) – Attributes copied from the user input for Locally scheduled Protocols*

#### 3.4.2.4 Private Study Module

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

| Attribute Name | Tag | Private Creator ID | Attribute Description |
|---|---|---|---|
| Auto-Processing Application | (0009,xx1E) | QUASAR_INTERNAL_USE | Auto-Processing Application Description. Not sent if Auto-processing is not defined for protocol. |
| Acquisitions Count | (0009,xx1F) | QUASAR_INTERNAL_USE | Number of acquisitions per study.<br>Not sent if information is not provided by protocol |
| Completed Acquisitions Count | (0009,xx20) | QUASAR_INTERNAL_USE | Number of completed acquisitions per study.<br>Not sent if information is not provided by protocol |
| Acquisition flag | (0009,xx42) | QUASAR_INTERNAL_USE | Used for indicating if the study is acquired.<br>Always sent.<br>Default Value "acquired" |
| Patient Unique Key | (0009,xx39) | QUASAR_INTERNAL_USE | Patient unique key. Always sent with non-empty value. |

### 3.4.3 Series Entity Modules

#### 3.4.3.1 General Series Module

**TABLE 3-8**
**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>CT = Computed Tomography<br>SR = Structured Report |
| Series Instance UID | (0020,000E) | 1 | Internally generated unique identifier of the Series. |
| Series Number | (0020,0011) | 2 | A number that identifies this Series.<br>Internally generated |
| Laterality | (0020,0060) | 2C | Laterality of (paired) body part examined. Copied from the user input.<br>Not sent if value is not received from user input.<br>Enumerated Values:<br>R = right<br>L = left |
| Performing Physicians' Name | (0008,1050) | 3 | Name of the physician(s) administering this Series. (*) (**)<br>Sent as empty string if no user input provided. |
| Protocol Name | (0018,1030) | 3 | User-defined description of the conditions under which the Series was performed.<br>The full path of the performed protocol name. E.g. Factory&Service&Static<br>Always sent with non-empty value. |
| Series Description | (0008,103E) | 3 | Description of the Series<br>Defined by the acquired Scan name.<br>Always sent. |
| Operators' Name | (0008,1070) | 3 | Name(s) of the operator(s) supporting the Series Copied from user input.<br>Sent as empty string if no user input provided. |
| Referenced Performed Procedure Step Sequence | (0008,1111) | 3 | Uniquely identifies the Performed Procedure Step SOP Instance to which the Series is related. The sequence has exactly 1 item. Sequence is added to all image(s) created by system.<br>Always sent. |
| >Referenced SOP Class UID | (0008,1150) | 1 | Set to "1.2.840.10008.3.1.2.3.3" |

| | | | |
|---|---|---|---|
| >Referenced SOP Instance UID | (0008,1155) | 1 | Uniquely identifies the referenced SOP Instance. Internally generated. |
| Body Part Examined | (0018,0015) | 3 | Text description of the part of the body examined.<br>Sent as empty string if no user input provided.<br>Defined Terms used on this system:<br>ABDOMEN<br>ANKLE<br>ARM<br>BREAST<br>CHEST<br>CLAVICLE<br>COCCYX<br>CSPINE<br>ELBOW<br>EXTREMITY<br>FOOT<br>HAND<br>HEAD<br>HEART<br>HIP<br>JAW<br>KNEE<br>LEG<br>LSPINE<br>NECK<br>PELVIS<br>SHOULDER<br>SKULL<br>SSPINE<br>TSPINE<br>WHOLEBODY<br>NECKCHESTABDPELV |
| Patient Position | (0018,5100) | 2C | Patient position descriptor relative to the<br>Equipment.<br>For NM Images sent in Standard Extended Series Module 3.4.3.2<br>Sent for CT Images.<br>The Defined Terms used are:<br>HFP = Head First-Prone<br>HFS = Head First-Supine<br>FFP = Feet First-Prone<br>FFS = Feet First-Supine<br>Attribute is copied from the user input. |
| Request Attributes Sequence | (0040,0275) | 3 | Sequence that contains attributes from the Imaging Service Request. The sequence has exactly 1 item. Used when Series as created as result of MWL request or protocol, appended to MWL request, not sent otherwise. |

| | | | |
|---|---|---|---|
| >Requested Procedure ID | (0040,1001) | 1C | Identifier that identifies the Requested Procedure in the Imaging Service Request.(*) |
| >Accession Number | (0008,0050) | 3 | A RIS generated number that identifies the order for the Study(*)<br>May be updated by user manually. |
| >Study Instance UID | (0020,000D) | 3 | Unique identifier for the Study. (*) (***) |
| >Referenced Study Sequence | (0008,1110) | 3 | Uniquely identifies the Study SOP Instances associated with this SOP Instance. The sequence has exactly 1 item. (*) (***) |
| *>> Include 'SOP Instance Reference Macro'* | | | |
| >Requested Procedure Description | (0032,1060) | 3 | Institution-generated administrative description or classification of Requested Procedure. (*)(***) |
| >Requested Procedure Code Sequence | (0032,1064) | 3 | Not Used |
| >Scheduled Procedure Step ID | (0040,0009) | 1C | Identifier that identifies the Scheduled Procedure Step. (*) (***) |
| >Scheduled Procedure Step Description | (0040,0007) | 3 | Institution-generated description or classification of the Scheduled Procedure Step to be performed. (*) (***) |
| >Scheduled Protocol Code Sequence | (0040,0008) | 3 | Sequence describing the Scheduled Protocol following a specific coding scheme. (*) (***)<br>The sequence has exactly 1 item.<br>If MWL request contains more than 1 item, only the first valid item is copied. |
| >>Include 'Code Sequence Macro' | | | |
| Comments on the Performed Procedure Step | (0040,0280) | 3 | User-defined comments on the Performed Procedure Step (**).<br>Sent as empty string if no user input provided. |
| Performed Procedure Step ID | (0040,0253) | 3 | Equipment generated identifier of the protocol carried out within this step. The PPS ID is unique within a study. For MWL scheduled protocols set with "W_" + <SPS ID>. For locally scheduled protocols set with "L_" + numbered id starting from 1 (L_1, L_2).<br>Sent as empty string for QC protocols.<br>Always sent. |
| Performed Procedure Step Start Date | (0040,0244) | 3 | The date that the protocol (SPS) acquisition actually started (doesn't matter if the protocol originated from MWL or was locally scheduled). A locally scheduled protocol is an SPS that is created/added in the camera.<br>Always sent. |

| | | | |
|---|---|---|---|
| Performed Procedure Step Start Time | (0040,0245) | 3 | The time that the protocol (SPS) acquisition actually started (doesn't matter if the protocol originated from MWL or was locally scheduled). A locally scheduled protocol is an SPS that is created/added in the camera.<br>Always sent |
| Performed Procedure Step Description | (0040,0254) | 3 | The full path of the performed protocol name. E.g. Factory&Cardiology&One Day<br>Always sent |
| Performed Protocol Code Sequence | (0040,0260) | 3 | Not Used<br>Assisted protocol setting is not supported |

***Note 1 :*** *(*) – Attributes copied from the Worklist if the study source was actually copied from a Worklist query result (if available).*

***Note 2 :*** *(**) – Attributes copied from the user input for Locally scheduled Protocols*

***Note 3 :*** *(***) – Cannot be modified by user if received from MWL*

#### 3.4.3.2 Standard Extended Series Module

**TABLE 3-9**
**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 user input.<br>Not sent, if another Patient Position is used for acquisition. |

#### 3.4.3.3 NM/PET Patient Orientation Module

**TABLE 3-10**
**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.<br>Contains 1 items if Patient Position is one of the following:<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>Otherwise contain 0 items. |
| >Include Code Sequence Macro | | | Always (F-10450,99SDM, ”recumbent”) is sent |
| > 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. Contains exactly 1item, if sent |
| >>Include ‘Code Sequence Macro’ | | | The following codes are supported:<br>(F-10310, 99SDM,”prone”)<br>(F-10340, 99SDM,”supine”)<br>(F-10317, 99SDM,”right lateral decubitus”)<br>(F-10319, 99SDM,”left lateral decubitus”) |
| Patient Gantry Relationship Code Sequence | (0054,0414) | 2 | Describes the orientation of the patient with respect to the gantry. Contains 1 item if Patient Position is one of the following:<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>Otherwise contain 0 items. |
| >Include Code Sequence Macro | | | The following codes are supported:<br>(F-10470, 99SDM,”headfirst”)<br>(F-10480, 99SDM,”feet-first”) |

#### 3.4.3.4 Private Series Module

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

| Attribute Name | Tag | Private Creator ID | Attribute Description |
|---|---|---|---|
| Sequence Type | (0009,xx13) | QUASAR_INTERNAL_USE | Acquired Sequence Type.<br>Always sent as non-empty value |
| Sequence Name | (0009,xx14) | QUASAR_INTERNAL_USE | Acquired Sequence Name.<br>Always sent as non-empty value |
| Administrations Plan | (0009, xx25) | QUASAR_INTERNAL_USE | List of Scan Planned Administrations |
| Protocol Scheduled Date | (0009,xx40) | QUASAR_INTERNAL_USE | Protocol Scheduled Date (*).<br>Taken from the SPS Start date of the first SPS in the study – Tag (0040,0002).<br>For QC scans – sent as ZERO Length<br>Always sent |
| Protocol Scheduled Time | (0009,xx41) | QUASAR_INTERNAL_USE | Protocol Scheduled Time (*)<br>Taken from the SPS Start time of the first SPS in the study – Tag (0040,0003).<br>For QC scans – sent as ZERO Length.<br>Always sent |
| Matched protocol | (0009,xx43) | QUASAR_INTERNAL_USE | For Worklist items. The originally matched protocol vs. protocol name which is the protocol actually acquired.<br>Sent if originally matched protocol is modified by user, otherwise not sent<br>Not sent for locally scheduled protocols. |
| Private SPS ID | (0009,xx44) | QUASAR_INTERNAL_USE | Defines protocols that were appended to the original MWL protocol.<br>Contains SPS ID of original MWL Protocol.<br>Sent empty for images of locally scheduled protocols and appended to originally locally scheduled protocols. |
| Pre-Medication | (0009,xx45) | QUASAR_INTERNAL_USE | Keeps the Pre-Medication as appears in the "To-Do" list (*) (**)<br>Sent as empty string if not received from user input. |
| Anatomic Reference | (0009,xx48) | QUASAR_INTERNAL_USE | Keeps the anatomic reference for the specific scan (*). Not sent if not received from user input. |

| | | | |
|---|---|---|---|
| Acquisition Mode | (0009,xx59) | QUASAR_INTERNAL_USE | Acquisition mode.<br>Possible Values:<br>NORMAL_ACQ = 0<br>GATED_ACQ = 1<br>TOMO_ACQ = 2<br>ENERGY_ACQ = 3<br>WB_CONT_ACQ = 4<br>DYNAMIC_TOMO_ACQ = 5<br>TOMO_ACQ_DURING_STEP_ACQ = 6<br>GATED_TOMO_ACQ_DURING_STEP_ACQ = 7 |
| Series Data Sequence | (0033,xx70) | GEMS_XELPRV_01 | Sequence of item contains information about acquisition parameters. May contain from 1 or more items. Each item describes specific parameters set.<br>Sent for NM data only |
| >Object Type | (0033,xx08) | GEMS_XELPRV_01 | Object Type. Contains string “SERIES DATA “ |
| >Modified Flag | (0033,xx10) | GEMS_XELPRV_01 | Default value = 0 (Not Modified) |
| >Name | (0033,xx11) | GEMS_XELPRV_01 | SDO Name |
| >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 |
| >Series Data Flags | (0033,xx19) | GEMS_XELPRV_01 | SDO Flags. Default value = 0 |
| >Protocol Name | (0033,xx1A) | GEMS_XELPRV_01 | Name of Protocol created SDO |
| >Relevant Data UID | (0033,xx1B) | GEMS_XELPRV_01 | UID(s) of SOP Instance(s) relative to SDO |
| >Bulk Data | (0033,xx1C) | GEMS_XELPRV_01 | SDO parameter(s) stored as binary buffer(s) |
| >Int Data | (0033,xx1D) | GEMS_XELPRV_01 | List of SDO parameters stored as integers |
| >Double Data | (0033,xx1E) | GEMS_XELPRV_01 | List of SDO parameters stored as doubles |
| >String Data | (0033,xx1F) | GEMS_XELPRV_01 | List of SDO parameters stored as list of strings |
| >Bulk Data Format | (0033,xx20) | GEMS_XELPRV_01 | Format of bulk parameters; contains information about name and size of bulk buffers |
| >Int Data Format | (0033,xx21) | GEMS_XELPRV_01 | Format of integer parameters; contains information about name and number of integers in list |
| >Double Data Format | (0033,xx22) | GEMS_XELPRV_01 | Format of double parameters; contains information about name and number of doubles in list |
| >String Data Format | (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 |
| >SDO Private SOP Class UID | (0033,xx71) | GEMS_XELPRV_01 | SDO Private SOP Class UID- “1.2.840.113619.4.17” |
| >SDO Instance UID | (0033,xx72) | GEMS_XELPRV_01 | SDO Instance UID; Internally generated |

***Note 1 : (*)*** *– Attributes copied from the Worklist if the study source was actually copied from a Worklist query result (if available).*

***Note 2 : (**)*** *– Attributes copied from the user input for Locally scheduled Protocols*

### 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.

A hybrid CT/NM scan is composed of a single NM scan partnered with one or more CT 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 NM imaging and optimal CT imaging impose changing the table height during the hybrid scan. In this case, the imaging space of both modalities remains the same, but the NM and CT 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.

With this approach the handling of Frame Of Reference UID is done as follows:

1. In all combinations, images acquired with the same landmark and same table height will have the same Frame of Reference UID value. The generated images are “inherently” aligned.

2. Discovery NM/CT 670* and Optima NM/CT 640 uses a private tag named “Acquisition Parent UID”:

a. In CT images (Discovery NM/CT 670* and Optima NM/CT 640 implementation), it is (0031, xx02) Private Creator “GEHC_HYBRID_01”.

b. In NM images (Discovery NM/CT 670* and Optima NM/CT 640 implementations) and CT Images (Optima NM/CT 640 implementation), it is (0011,xx31) Private Creator “GEMS_GENIE_1”.

All the images (NM projections and CT slices obtained by on-the-fly reconstruction or retrospective reconstruction) resulting from scans defined as part of a single hybrid procedure and using the same landmark shall have the same Acquisition Parent UID value. Hence, when the operator sets a new CT landmark, overriding the landmark set on NM persistence or during a previous CT scan belonging to the same hybrid procedure, a new value is assigned to the Acquisition Parent UID attribute. The Acquisition Parent UID attribute allows Xeleris workstation, or other Image Displayer implementations, to check that CT and NM series were acquired as part of the same hybrid procedure and are using the same landmark.

3. When NM is acquired first, and the CT series is acquired at a different table height than used by NM, but with same landmark, then the CT series will get a different Frame Of Reference UID value than that used by NM, but the same Acquisition Parent UID value as NM. This shows that the imaged body in no longer aligned between the two modalities, although they have been acquired by a single hybrid scan (using the same imaging space). In this case, image registration must be applied in order to register the two modalities. The information stored by each modality in Table Height (0018,1130) can be used in this registration process.

4. When CT is acquired first, and the NM series is acquired at a different table height than used by CT, but with same landmark, the NM series will get the same Frame Of Reference UID value than that used by CT, the same Acquisition Parent UID value as CT and the image position of the NM will be modified to compensate for the table height differences existing between the two modalities. Therefore, in this case, the imaged body in

aligned between the two modalities and the same Frame Of Reference UID value shows it.

5. CT images acquired with a different landmark than the NM scan or than previous CT series of the same hybrid scan will get a Frame of Reference UID value different of the NM scan or of the previous CT series, showing that the images are not spatially related. The Acquisition Parent UID value of these images will be also changed, as indicated above at 2. In this way, Xeleris (and potentially other image displayers) will be informed that these images are not spatially aligned and image registration must be applied in order to achieve it.

Note that for CT standalone exams (Discovery NM/CT 670* implementations), the same Frame of Reference UID (0020,0052) value does not imply imaged body alignment, but just image space alignment. This attribute must be used in conjunction with the Table Height (0018,1130) to determine if two imaged bodies are spatially aligned. See CT Scanner DICOM Conformance Statement. (Reference A in Section 1.6).

The Frame of Reference Module Attributes appear for TOMO and GATED TOMO scan types. They are no available for STATIC, WHOLE BODY, GATED and DYNAMIC scans.

**TABLE 3-12**
**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. See explanation above |
| Position Reference Indicator | (0020,1040) | 2 | Sent as ZERO LENGTH value if it is not received from user input. |

### 3.4.5 Equipment Entity Modules

#### 3.4.5.1 General Equipment Module

**TABLE 3-13**
**GENERAL EQUIPMENT MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | Attribute Description |
|---|---|---|---|
| Manufacturer | (0008,0070) | 2 | Manufacturer of the equipment that produced the composite instances.<br>Default Value "GE MEDICAL SYSTEMS"<br>Always sent |
| Institution Name | (0008,0080) | 3 | Institution where the equipment that produced the composite instances is located.<br>Always taken from system configuration.<br>Sent as empty string if it is not received from user input.<br>Always sent. |
| Institution Address | (0008,0081) | 3 | Mailing address of the institution where the equipment that produced the composite instances is located.<br>Always taken from system configuration<br>Sent as empty string if it is not received from user input.<br>Always sent. |

| | | | |
|---|---|---|---|
| Institutional Department Name | (0008,1040) | 3 | Department in the institution where the equipment that produced the composite instances is located.<br>Always taken from system configuration<br>Sent as empty string if it is not received from user input.<br>Always sent. |
| Manufacturer's Model Name | (0008,1090) | 3 | Manufacturer's model name of the equipment that produced the composite instances.<br>Set to "Tandem_Discovery_670" for Discovery NM/CT 670 implementation<br>Set to "Tandem_Discovery_670_ES" for Discovery NM/CT 670 ES implementation<br>Set to "Tandem_Discovery_670_Pro" for Discovery NM/CT 670 Pro and Discovery 670 DR implementations.<br>Set to "Tandem_Apollo" for Discovery NM/CT 670 CZT implementation<br>Set to "Tandem_Discovery_630" for Discovery NM 630 implementation<br>Set to "Tandem_Optima_640" for Optima NM/CT 640 implementation<br>Set to "Tandem_830" for NM 830 implementation<br>Set to "Tandem_850" for NM/CT 850 implementation<br>Set to "Tandem_860" for NM/CT 860 implementation<br>Set to "Tandem_870_DR" for NM/CT 870DR implementation<br>Set to "Tandem_870_CZT" for NM/CT 870CZT implementation<br>Always sent |
| Device Serial Number | (0018,1000) | 3 | Manufacturer's serial number of the equipment that produced the composite instances.<br>Always taken from system configuration<br>Sent as empty string if it is not received from user input.<br>Always sent |
| Station Name | (0008,1010) | 3 | User defined name identifying the machine that produced the composite instances.<br>Camera name taken from configuration is used<br>Sent as empty string if it is not received from user input.<br>Always sent |
| Software Versions | (0018,1020) | 3 | Manufacturer's designation of software version of the equipment that produced the composite instances<br>Software/Hardware versions of current release<br>e.g. "1.003.317.1\HARDWARE_VERSION_1"<br>Always sent as non-empty value. |

| | | | |
|---|---|---|---|
| Spatial Resolution | (0018,1050) | 3 | The inherent limiting resolution in mm of the acquisition equipment for high contrast objects for the data gathering and reconstruction technique chosen.<br>Always taken from system configuration. Default value is 5.<br>Always sent |
| Date of Last Calibration | (0018,1200) | 3 | Date when the image acquisition device calibration was last changed in any way.<br>Always taken from system configuration<br>Always Sent |
| Time of Last Calibration | (0018,1201) | 3 | Time when the image acquisition device calibration was last changed in any way.<br>Always taken from system configuration<br>Always Sent |

### 3.4.6 Image Entity Modules

#### 3.4.6.1 General Image Module

**TABLE 3-14**
**GENERAL IMAGE MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | Attribute Description |
|---|---|---|---|
| Instance Number | (0020,0013) | 2 | A number that identifies this image. Sent as ZERO Length value. |
| Patient Orientation | (0020,0020) | 2C | Not sent for NM (not required ) |
| Content Date | (0008,0023) | 2C | The date the image pixel data creation started.<br>Always sent if image is part of a series in which the images are temporally related.<br>May be sent otherwise. |
| Content Time | (0008,0033) | 2C | The time the image pixel data creation started.<br>Always sent if image is part of a series in which the images are temporally related.<br>May be sent otherwise. |
| Image Type | (0008,0008) | 3 | See 3.4.6.7.1 |
| Acquisition Date | (0008,0022) | 3 | The date the acquisition of data that resulted in this image started<br>Always sent with non-empty value |
| Acquisition Time | (0008,0032) | 3 | The time the acquisition of data that resulted in this image started<br>Always sent with non-empty value |
| Image Comments | (0020,4000) | 3 | Contains additional information about image.<br>Always sent with non-empty value |

| | | | |
|---|---|---|---|
| Quality Control Image | (0028,0300) | 3 | Indicates whether or not this image is a quality control or phantom image. Enumerated Values:<br>YES<br>NO<br>Always sent |

### 3.4.6.2 Image Pixel Module

**TABLE 3-15**
**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. |
| 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

This section specifies Attributes for the description of the conditions present during data acquisition.

**TABLE 3-16**
**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>The Acquisition context sequence contains 0 items when acquisition context in scan is left "UNKNOWN", otherwise contains 1 item. |

| | | | |
|---|---|---|---|
| >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:<br>• (F-01604 ,SRT ,"Resting State")<br>• (F-05019 ,SRT, "Cardiac Stress State")<br>• (109092 ,DCM ,"Reinjection State")<br>• (109093 ,DCM ,"Redistribution State")<br>• (109094 ,DCM ,"Delayed Redistribution State") |

#### 3.4.6.4 NM Image Pixel Module

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

**TABLE 3-17**
**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>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 Multi-Frame Module

**TABLE 3-18**
**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 3.4.6.6.1 for further specialization. |

### 3.4.6.6 NM Multi-frame Module

**TABLE 3-19**
**NM MULTI-FRAME MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | Attribute Description |
|---|---|---|---|
| Frame Increment Pointer | (0028,0009) | 1 | See 3.4.6.6.1 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 to 16 |
| 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 and 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). |
| 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). |

#### 3.4.6.6.1 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 3-20.

**TABLE 3-20**
**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). |

### 3.4.6.7 NM Image Module

**TABLE 3-21**
**NM IMAGE MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | Attribute Description |
|---|---|---|---|
| Image Type | (0008,0008) | 1 | See 3.4.6.7.1 for specialization. |
| Image ID | (0054,0400) | 3 | User or equipment generated Image identifier. Taken from Scan name |
| 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, count limit reached within ROI<br>MANU = manual<br>TIME = time<br>TRIG = physiological trigger<br>Always sent as non-empty value |
| 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<br>Always sent as non-empty value |
| Corrected Image | (0028, 0051) | 3 | Corrections have been applied to the image.<br>Defined Terms are used:<br>UNIF = flood corrected<br>COR = center of rotation corrected<br>ATTN = attenuation corrected<br>SCAT = scatter corrected<br>NRGY = energy corrected<br>LIN = linearity corrected<br>CLN = count loss normalization<br>BADP = bad Pixels correction (for Discovery NM/CT 670 CZT only)<br>Always sent |

| | | | |
|---|---|---|---|
| Table Height | (0018,1130) | 3 | The height of the patient table in mm.<br>Not sent when the Image Type (0008,0008), Value 3, is equal to TOMO or GATED TOMO.<br>Otherwise sent as non-empty value |
| Table Traverse | (0018,1131) | 3 | Location of the patient table in mm. Not sent when the Image Type (0008,0008), Value 3, is equal to TOMO or GATED TOMO.<br>Otherwise sent as non-empty value |
| 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 - for Continues Acquisition.<br>MSP= multiple static frames collected into a whole body frame – for Step And Shoot acquisition. |
| 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. |

***Note1**: (*) – Attribute value is taken from user input*

#### 3.4.6.7.1 Image Type

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

- STATIC - Identifies a Static Image
- DYNAMIC - Identifies a Dynamic Image

- GATED - Identifies a Multi-Gated Image
- WHOLE BODY - Identifies a Whole Body Image
- TOMO - Identifies a Tomographic (SPECT) Image
- GATED TOMO - Identifies a Multi-gated Tomographic Image

The following Enumerated Values of Value 4 are created:

- EMISSION - Transmission source is NOT active during image acquisition

### 3.4.6.8 NM Isotope Module

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

**TABLE 3-22**
**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. Contain from 1 to 4 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. Contains from 1 to 16 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 contain from 0 to 3 items |
| > Radionuclide Code Sequence | (0054,0300) | 2 | Sequence that identifies the radionuclide. Contains 1 item for all other DICOM implementations. |
| >> *Include 'Code Sequence Macro'* | | | Baseline CID is 18"Isotopes in Radiopharmaceuticals".<br>Extended values are used (see 2.8.1)<br>The Coding Scheme Designator (0008,0102) has value "99SDM" |
| > Radiopharmaceutical Route | (0018,1070) | 3 | Route of injection. (*) |
| > Administration Route Code Sequence | (0054,0302) | 3 | Sequence that identifies the administration route for the radiopharmaceutical.<br>Contains 1 item for all other DICOM implementations, if Radiopharmaceutical Route(0018,1070) is sent with non-empty value.<br>Code Meaning (0008,0104) is sent. |
| >> *Include 'Code Sequence Macro'* | | | Baseline CID 11 "Route of Administration" |
| > 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 | Not used |
| > Radionuclide Total Dose | (0018,1074) | 3 | Total amount of radionuclide injected in MBq (*) |
| > Radiopharmaceutical Administration Event UID | (0008,3012) | 3 | Unique identification of the administration of the radiopharmaceutical to the patient. |
| > Radiopharmaceutical | (0018,0031) | 3 | Name of the radiopharmaceutical. (*). |

| | | | |
|---|---|---|---|
| > Radiopharmaceutical Code Sequence | (0054,0304) | 3 | Sequence that identifies the radiopharmaceutical.<br>Contains 1 item for all other DICOM implementations, if Radiopharmaceutical (0018,0031) is sent with non-empty value. |
| *>> Include 'Code Sequence Macro'* | | | Baseline CID 25 "Radiopharmaceuticals".<br>Extended values are used (see 2.8.1)<br>Code Meaning (0008,0104) is sent. |
| Intervention Drug Information Sequence | (0018,0026) | 3 | Sequence of Items that describes the intervention drugs used. May contain from 1 to 3 Items. Not sent if no user input exists. |
| >Intervention Drug Name | (0018,0034) | 3 | Name of intervention drug. (*) |
| >Intervention Drug Code Sequence | (0018,0029) | 3 | Not Used |
| >Administration Route Code Sequence | (0054,0302) | 3 | Not Used |
| >Intervention Drug Start Time | (0018,0035) | 3 | Time of administration of the intervention drug, using the same time base as for the Acquisition Start Time (0008,0032). (*) |
| >Intervention Drug Stop Time | (0018,0027) | 3 | Time of completion of administration of the intervention drug, using the same time base as for the Acquisition Start Time (0008,0032). (*) |
| >Intervention Drug Dose | (0018,0028) | 3 | Intervention drug dose, in mg. (*) |

***Note1**: (*) – Attribute value is taken from user input if it's not empty, otherwise is not sent*

### 3.4.6.9 NM Detector Module

**TABLE 3-23**
**NM DETECTOR MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | Attribute Description |
|---|---|---|---|
| Detector Information Sequence | (0054,0022) | 2 | Sequence of Items that describe the detectors used. Contains 1 or 2 Items. |
| > Collimator/Grid Name | (0018,1180) | 3 | Label describing the collimator used, e.g. LEGP<br>LEHR, etc.<br>Always sent as non-empty value. |
| > Collimator Type | (0018,1181) | 2 | Collimator type. Defined Terms:<br>PARA = Parallel (default)<br>NONE = No collimator<br>UNKN = Unknown<br>Always sent as non-empty value |
| > Focal Distance | (0018,1182) | 2 | Focal distance, in mm. Default value is 0. |

| | | | |
|---|---|---|---|
| > 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).(*)<br>Always sent as non-empty value |
| > Zoom Factor | (0028,0031) | 3 | The amount of magnification applied to each pixel in the image.(*)<br>Typical Range 1.0 to 4.0<br>Always sent as non-empty value |
| > Distance Source to Detector | (0018,1110) | 2C | Not sent |
| > Start Angle | (0054,0200) | 3 | Position of the detector about the patient for the start of the acquisition, in degrees. (*)<br>Sent if Image Type (0008,0008), Value 3, is other than TOMO, GATED TOMO.<br>If Image Type (0008,0008), Value 3, is WHOLE BODY, sent when Whole Body Technique (0018,1301) is "MSP". |
| > Radial Position | (0018,1142) | 3 | Not Sent |
| > Image Orientation (Patient) | (0020,0037) | 2 | 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) | 2 | 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. Sent when Image Type (0008,0008) value3 contains WHOLE BODY, otherwise is not sent. |
| >>Include 'Code Sequence Macro' | | | CID 26 Nuclear Medicine Projections is supported<br>The following values are used:<br>(SRT, G-5215, Anterior projection)<br>(SRT, G-5216, Posterior projection) |

***Note1**: (*) – Attribute value is taken from user input*

#### 3.4.6.10 NM Tomo Acquisition Module

This module is present when the Image Type (0008,0008) Value 3, is equal to TOMO or GATED TOMO.

**TABLE 3-24**
**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. (*) The value is always positive. |
| > 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 list – one value per angular view. |
| > Distance Source to Detector | (0018,1110) | 2C | Not sent |
| > 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.<br>Always sent. |
| > Table Height | (0018,1130) | 3 | The distance in mm of the top of the patient table to the center of rotation.<br>Sent as non-empty value in Discovery NM/CT 670* and Optima NM/CT 640 implementations.<br>In a hybrid scan it is expressed relative to CT iso center, and in non-hybrid scan it is expressed as in normal NM only – measured from floor and up. |
| Type of Detector Motion | (0054,0202) | 3 | Describes the detector motion during acquisition.(*) Enumerated Values:<br>STEP AND SHOOT = Interrupted motion, acquire only while stationary.<br>CONTINUOUS = Gantry motion and acquisition are simultaneous and continuous.<br>ACQ DURING STEP= Interrupted motion, acquire while both stationary and motion<br>Always sent as non-empty value |

***Note1**: (*) – Attribute value is taken from user input.*

#### 3.4.6.11 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 or GATED TOMO

**TABLE 3-25**
**NM MULTI-GATED ACQUISITION MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | Attribute Description |
|---|---|---|---|
| Beat Rejection Flag | (0018,1080) | 3 | Heart beat duration sorting has been applied. Enumerated Values:<br>Y = yes<br>N = no<br>Always sent. |
| PVC Rejection | (0018,1085) | 3 | Description of type of arrhythmic beat rejection criteria used. Always sent as "Reject beats out of pvc window" |
| Skip Beats | (0018,1086) | 3 | Number of beats skipped after a detected arrhythmia<br>Always sent. |
| Heart Rate | (0018,1088) | 3 | Average number of heart beats per minute for the collection period for these frames<br>Always sent. |
| 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>Contains only 1 item if presents |
| > Cardiac Framing Type | (0018,1064) | 3 | Description of type of framing performed.<br>Always sent. |
| > Data Information Sequence | (0054,0063) | 2 | Sequence of Items that describe gating criteria. Contains only 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<br>Always sent. |
| >> High R-R Value | (0018,1082) | 3 | R-R interval upper limit for beat rejection, in msec<br>Always sent. |
| >> 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.<br>Always sent. |
| >> 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.<br>Always sent. |

| | | | |
|---|---|---|---|
| >> 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 | Not Used |

### 3.4.6.12 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. New phase may be defined by user from Scan setup. Default number of phases is 1.

**TABLE 3-26**
**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>Contains 1 to 5 items, if presents. |
| > Phase Delay | (0054,0036) | 1 | Time paused between the last frame of the previous phase and the first frame of this phase, in msec. (*) Set to 0 for 1st phase. |
| > 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. (*) |

***Note1:*** *(*) – Attribute value is taken from user input*

### 3.4.6.13 VOI LUT Module

**TABLE 3-27**
**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. |

### 3.4.6.14 SOP Common Module

**TABLE 3-28**
**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. Internally generated. |
| Specific Character Set | (0008,0005) | 1C | Character Set that expands or replaces the Basic Graphic Set.<br>Defined Terms include for locally created images:<br>ISO_IR 100 = Latin Alphabet No. 1<br>For images created from MWL, the value is copied from value provided in MWL, if not empty, otherwise ISO_IR 100 is used. Always included into image |
| Instance Number | (0020,0013) | 3 | See 3.4.6.1 for more specialization |

### 3.4.6.15 Private Image Module

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

| Attribute Name | Tag | Private Creator ID | Attribute Description |
|---|---|---|---|
| Origin | (0009,xx12) | QUASAR_INTERNAL_USE | The origin of the image. "isworklist" if scheduled in MWL, "regular" if locally scheduled. |
| Image Type | (0009,xx1B) | QUASAR_INTERNAL_USE | Image type string as passed in the scan request |
| Stop Reason | (0009,xx1D) | QUASAR_INTERNAL_USE | Defines condition that image was installed to database |
| Send List Mode flag | (0009, xx24) | QUASAR_INTERNAL_USE | Defined if list mode data shall be sent to list mode data destination station<br>Taken from user input for Discovery NM/CT 670 CZT implementation.<br>Send as 0 for all other implementations. |
| Imageset Objects Count | (0037,xx90) | QUASAR_INTERNAL_USE | For Multi-Frame images (NM) - equal to value of tag (0028,0008) - Number of Frames.<br>For CT Images contains number of DICOM objects in Imageset |

| | | | |
|---|---|---|---|
| CT Isocenter Distance From Floor | (0037,xx92) | QUASAR_INTERNAL_USE | Distance of CT Isocenter from floor, in mm.<br>Shared by all images created by same Hybrid scan.<br>Used for Optima NM/CT 640 implementation.<br>Default value: 1040 mm |
| Source Translator | (0013,xx11) | GEMS_GENIE_1 | Internal code of product DICOM implementation. Enumerated Value = 11. |
| Dataset Name | (0011,xx12) | GEMS_GENIE_1 | List of dataset names |
| Acquisition Parent UID | (0011,xx31) | GEMS_GENIE_1 | Shared by all images created by same Hybrid scan.<br>In Discovery NM/CT 670* and Optima NM/CT 640 implementations is also used for correct registration.<br>For more details about NM/CT registration refer to Frame Of Reference, Section 3.4.4.1<br>Not sent for QC Images, may be sent otherwise. |
| Bed Position | (0027,xx11) | APEX_PRIVATE | Linear position of table in cm |

### 3.4.6.16 Private NM Image Module

**TABLE 3-30**
**PRIVATE NM IMAGE MODULE ATTRIBUTES**

| Attribute Name | Tag | Private Creator ID | Attribute Description |
|---|---|---|---|
| Rate Vector | (0009,xx01) | QUASAR_INTERNAL_USE | Rate for each frame |
| Count Vector | (0009,xx02) | QUASAR_INTERNAL_USE | Counts accumulated for each frame |
| Time Vector | (0009,xx03) | QUASAR_INTERNAL_USE | Time for each frame.<br>For TOMO and GATED TOMO images with type of detector Motion = ACQ DURING STEP contains values of M-View time (M-Time) calculated as Raw Time normalized according to scan motion acquisition time (C-Time) vs M-Time |
| Camera Shape | (0009,xx08) | QUASAR_INTERNAL_USE | Camera Shape L-mode flag<br>Possible Values :<br>1-L mode<br>0-Other |

| | | | |
|---|---|---|---|
| Whole Body Spots | (0009,xx10) | QUASAR_INTERNAL_USE | Defines if WB Spots are created. Sent in images created by WB Scans.<br>Possible values:<br>0 –in WHOLE BODY image created by WB Scan<br>1 – SPOTS images created by WB Scan |
| Scan Administration Plan | (0009,xx25) | QUASAR_INTERNAL_USE | List of Administration Events from Scan Administration Plan |
| WB From | (0009,xx61) | QUASAR_INTERNAL_USE | Bed position in mm where WHOLE BODY image is started. Sent when Image Type (0008,0008) value3 contains WHOLE BODY, otherwise is not sent. |
| WB To | (0009,xx62) | QUASAR_INTERNAL_USE | Bed position in mm where WHOLE BODY image is ended. Sent when Image Type (0008,0008) value3 contains WHOLE BODY, otherwise is not sent. |
| WB Image Start YOffset | (0009,xx66) | QUASAR_INTERNAL_USE | YOffset in pixels from beginning of WHOLEBODY Image, referenced to WB From (0009,xx61).<br>Sent when Image Type (0008,0008) value3 contains WHOLE BODY, otherwise is not sent. |
| WB Image End YOffset | (0009,xx67) | QUASAR_INTERNAL_USE | YOffset in pixels from beginning of WHOLEBODY Image, referenced to WB To (0009,xx62).<br>Sent when Image Type (0008,0008) value3 contains WHOLE BODY, otherwise is not sent. |
| Yoffset | (0037,xx71) | QUASAR_INTERNAL_USE | CT to NM Y difference<br>In 800 Series*, Discovery NM/CT 670* and Optima NM/CT 640 implementations is also used for correct registration.<br>For more details about NM/CT registration refer to Section 3.4.4.1.<br>In Discovery NM 630 implementation is always sent as 0. |
| Image Position Corrections Flag | (0037,xx72) | QUASAR_INTERNAL_USE | Defined if additional image position corrections shall be performed.<br>Always sent as “false”. |

| | | | |
|---|---|---|---|
| NM Bed Position | (0037,xx73) | QUASAR_INTERNAL_USE | 1) In 800 Series*,Discovery NM/CT 670* implementations for Hybrid NM/CT Scans contains distance from NM FOV center to the position on bed where landmark was set (mm).<br>2) In Optima NM/CT 640 implementation contains distance from NM FOV center to registration origin.<br>3) In 800 Series*, Discovery NM/CT 670* and Optima NM/CT 640 implementations also used for correct registration For more details about NM/CT registration refer to Section 3.4.4.1.)<br>4) For other scan types in 800 Series*, Discovery NM/CT 670* and Optima NM/CT 640 implementations contains linear bed position (in mm).<br>5) In Discovery NM 630 implementation contains linear bed position (in mm) |
| Xoffset | (0037,xx78) | QUASAR_INTERNAL_USE | CT to NM X difference<br>In 800 Series*, Discovery NM/CT 670* and Optima NM/CT 640 implementations is also used for correct registration.<br>For more details about NM/CT registration refer to Section 3.4.4.1.<br>In Discovery NM 630 implementation is always sent as 0. |
| Collimator SQ | (0037,xx10) | QUASAR_INTERNAL_USE | Contains information of collimators parameters. May contain 0 or 1 item. |
| >Hole Diameter | (0037,xx1B) | QUASAR_INTERNAL_USE | Collimator hole diameter |
| >Hole Length | (0037,xx30) | QUASAR_INTERNAL_USE | Collimator hole length |
| >Collimator Thickness | (0037,xx40) | QUASAR_INTERNAL_USE | Collimator thickness |
| >Septal Thickness | (0037,xx50) | QUASAR_INTERNAL_USE | Collimator septal thickness |
| >Intrinsic Resolution | (0037,xx60) | QUASAR_INTERNAL_USE | Collimator intrinsic resolution |
| >Blurring Slope | (0037,xx70) | QUASAR_INTERNAL_USE | Collimator blurring slope |
| Radio Nuclide Name | (0011,xx0D) | GEMS_GENIE_1 | Name of radionuclide used<br>Contain name of Energy Session, selected for acquisition |
| Detector Number | (0011,xx15) | GEMS_GENIE_1 | Detector number image was acquired by.<br>Sent when image is acquired using one detector only. |

### 3.4.6.17 Private Image Tomo Module

**TABLE 3-31**
**PRIVATE IMAGE TOMO MODULE ATTRIBUTES**

| Attribute Name | Tag | Private Creator ID | Attribute Description |
|---|---|---|---|
| Angle Vector | (0009,xx07) | QUASAR_INTERNAL_USE | Angle for each TOMO frame. For each frame is tells what is the angle of the detector |
| Raw Time Vector | (0009,xx1A) | QUASAR_INTERNAL_USE | Raw time vector |
| M-View Normalization Factors Vectors | (0009,xx63) | QUASAR_INTERNAL_USE | Vector of normalization factors per M-View (M-View is a projection acquired during detector motion). Calculated as M-View Time (0009, xx03) vs. C-Time (0009,xx63). Send only for images where Type of Detector Motion (0054,0202) is ACQ DURING STEP, otherwise is not sent |
| C-Time | (0009,xx64) | QUASAR_INTERNAL_USE | Scan motion acquisition time in msec. Calculated as average of acquisition during motion time(M-Time) of all steps except the first step.<br>Send for images where Type of Detector Motion (0054,0202) is ACQ DURING STEP |
| S&S Time | (0009,xx65) | QUASAR_INTERNAL_USE | The duration of acquiring step without motion in msec. Calculated as average of time vector (0009, xx03). Send for images where Type of Detector Motion (0054,0202) is ACQ DURING STEP |
| Send Joined Flag | (0009,xx23) | QUASAR_INTERNAL_USE | Defines if image shall be joined on send. Set to 1 – for TOMO and GATED TOMO images. For other image types is not sent. |

### 3.4.6.18 Private Image Multi-Gated Module

**TABLE 3-32**
**PRIVATE IMAGE MULTI-GATED MODULE ATTRIBUTES**

| Attribute Name | Tag | Private Creator ID | Attribute Description |
|---|---|---|---|
| Triggers Modification Flag | (0033,xx30) | GEMS_GENIE_1 | Triggers Modification Flag |
| 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 |
| Starting Heart Rate | (0009,xx37) | GEMS_GENIE_1 | Heart rate at start of acquisition. |

### 3.4.6.19 Private Image GSPECT Module

**TABLE 3-33**
**PRIVATE IMAGE GSPECT MODULE ATTRIBUTES**

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

| | | | |
|---|---|---|---|
| Average RR Time Vector | (0009,xx15) | QUASAR_INTERNAL_USE | Average r-r time vector |
| Low Limit Vector | (0009,xx16) | QUASAR_INTERNAL_USE | Low window limit vector |
| High Limit Vector | (0009,xx17) | QUASAR_INTERNAL_USE | High window limit vector |
| Begin Index Vector | (0009,xx18) | QUASAR_INTERNAL_USE | Begin index vector: link to heart beat vector |
| End Index Vector | (0009,xx19) | QUASAR_INTERNAL_USE | End index vector: link to heart beat vector |
| Perfusion SOP Instance UID | (0009,xx47) | QUASAR_INTERNAL_USE | Summed image UID |

## 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 3-34**
**STANDARD EXTENDED ATTRIBUTES**

| Information Entity Name | Attribute Name | Tag | Use |
|---|---|---|---|
| Study | Allergies | (0010,2110) | Description of prior reaction to contrast agents, or other patient allergies or adverse reactions. |
| | Pregnancy Status | (0010,21C0) | Describes pregnancy state of patient<br>Enumerated Values:<br>0001 = not pregnant<br>0002 = possibly pregnant<br>0003 = definitely pregnant<br>0004 = unknown |
| | Requested Procedure Comments | (0040,1400) | Study notes |
| Series | Patient Position | (0018,5100) | Patient position descriptor relative to the Equipment. |

### 3.5.2 Private Group QUASAR_INTERNAL_USE

**TABLE 3-35**
**PRIVATE GROUP QUASAR_INTERNAL_USE**

| Attribute Name | Tag | VR | VM | Attribute Description and Use |
|---|---|---|---|---|
| Private Creator Identification | (0009,00xx) | LO | 1 | QUASAR_INTERNAL_USE |
| Rate Vector | (0009,xx01) | UL | 1-n | Rate for each frame |
| Count Vector | (0009,xx02) | UL | 1-n | Counts accumulated for each frame |
| Time Vector | (0009,xx03) | UL | 1-n | Time for each frame |
| Angle Vector | (0009,xx07) | UL | 1-n | Angle for each TOMO frame. |

| | | | | |
|---|---|---|---|---|
| Camera Shape | (0009,xx08) | US | 1 | Camera Shape |
| Whole Body Spots | (0009,xx10) | US | 1 | Defines if WB Spots are created. Sent in images created by WB Scans. |
| Origin | (0009,xx12) | LO | 1 | The origin of the image. |
| Sequence Type | (0009,xx13) | ST | 1 | Acquired Sequence Type |
| Sequence Name | (0009,xx14) | ST | 1 | Acquired Sequence Name |
| Average RR Time Vector | (0009,xx15) | UL | 1-n | Average r-r time vector |
| Low Limit Vector | (0009,xx16) | UL | 1-n | Low window limit vector |
| High Limit Vector | (0009,xx17) | UL | 1-n | High window limit vector |
| Begin Index Vector | (0009,xx18) | UL | 1-n | begin index vector: link to heart beat vector |
| End Index Vector | (0009,xx19) | UL | 1-n | end index vector: link to heart beat vector |
| Raw Time Vector | (0009,xx1A) | UL | 1-n | Raw time vector |
| Image Type | (0009,xx1B) | LO | 1 | Image type string as passed in the scan request |
| Stop Reason | (0009,xx1D) | US | 1 | Defines condition that image was installed to db |
| Auto-Processing Application | (0009,xx1E) | ST | 1 | Auto-Processing Application Description |
| Acquisitions Count | (0009,xx1F) | US | 1 | Number of acquisitions per study |
| Completed Acquisitions Count | (0009,xx20) | US | 1 | Number of completed acquisitions per study |
| Send Joined Flag | (0009,xx23) | US | 1 | Defines if image shall be joined on send. Sent for TOMO and GATED TOMO images only |
| Send List Mode Flag | (0009,xx24) | US | 1 | Defines if list mode data of acquired scan is sent to list mode data destination station |
| Administrations Plan | (0009,xx25) | LO | 1..n | List of scan planned administrations' names. |
| Patient Unique Key | (0009,xx39) | UI | 1 | Patient unique key |
| Protocol Scheduled Date | (0009,xx40) | DA | 1 | Protocol Scheduled Date |
| Protocol Scheduled Time | (0009,xx41) | TM | 1 | Protocol Scheduled Time |
| Acquisition flag | (0009,xx42) | LO | 1 | Used for indicating if the study is acquired |
| Matched protocol | (0009,xx43) | LO | 1 | The originally matched protocol vs. protocol name which is the protocol actually acquired |
| Private SPS ID | (0009,xx44) | SH | 1 | Defines protocols that were appended to the original MWL protocol. Contains SPS ID of original MWL Protocol. |
| Pre-Medication | (0009,xx45) | LO | 1 | Keeps the Pre-Medication as appears in the "To Do" list |
| Perfusion SOP Instance UID | (0009,xx47) | UI | 1 | Summed image UID .Sent for GATED TOMO images only |
| Anatomic Reference | (0009,xx48) | LO | 1 | Keeps the anatomic reference for the specific scan |
| Acquisition Mode | (0009,xx59) | IS | 1 | Acquisition Mode. |

| | | | | |
|---|---|---|---|---|
| WB From | (0009,xx61) | DS | 1 | Bed position in mm where WHOLEBODY image is started. Sent for WHOLEBODY images only. |
| WB To | (0009,xx62) | DS | 1 | Bed position in mm where WHOLEBODY image is ended. Sent for WHOLEBODY images only. |
| M-View Normalization Factors Vectors | (0009,xx63) | UL | 1..n | Vector of normalization factors per M-View<br>Sent for TOMO and GATED TOMO images only. |
| C-Time | (0009,xx64) | UL | 1 | Scan motion acquisition time.<br>Sent for TOMO and GATED TOMO images only. |
| S&S Time | (0009,xx65) | UL | 1 | The duration of acquiring step without motion.<br>Sent for TOMO and GATED TOMO images only. |
| WB Image Start YOffset | (0009,xx66) | UL | 1 | YOffset in pixels from beginning of WHOLEBODY Image, referenced to WB From (0009,xx61).<br>Sent for WHOLEBODY images only. |
| WB Image End YOffset | (0009,xx67) | UL | 1 | YOffset in pixels from beginning of WHOLEBODY Image, referenced to WB To (0009,xx62).<br>Sent for WHOLEBODY images only. |
| Private Creator Identification | (0037,00xx) | LO | 1 | QUASAR_INTERNAL_USE |
| Collimator SQ | (0037,xx10) | SQ | 1 | Contains information of collimators parameters. |
| Hole Diameter | (0037,xx1B) | LO | 1 | Collimator hole diameter |
| Hole Length | (0037,xx30) | LO | 1 | Collimator hole length |
| Collimator Thickness | (0037,xx40) | LO | 1 | Collimator thickness |
| Septal Thickness | (0037,xx50) | LO | 1 | Collimator Septal thickness |
| Intrinsic Resolution | (0037,xx60) | LO | 1 | Collimator intrinsic resolution |
| Blurring Slope | (0037,xx70) | LO | 1 | Collimator blurring slope |
| Yoffset | (0037,xx71) | FD | 1 | CT to NM Y difference |
| Image Position Corrections Flag | (0037,xx72) | SH | 1 | Defined if image position corrections are performed. |

| | | | | |
|---|---|---|---|---|
| NM Bed Position | (0037,xx73) | FD | 1 | According to implementation and scan types contains either<br>- Distance from NM FOV center to the position on bed where landmark was set .<br>or<br>- Distance from NM FOV center to the registration origin<br>or<br>- Linear bed position |
| Xoffset | (0037,xx78) | FD | 1 | CT to NM X difference |
| Imageset Objects Count | (0037,xx90) | IS | 1 | Number of DICOM objects in Imageset for CT/ number of frames for NM. |
| CT Isocenter Distance from Floor | (0037,xx92) | DS | 1 | Distance of CT Isocenter Distance Floor, in mm |

### 3.5.3 Private Group GEMS_GENIE_1

**TABLE 3-36**
**PRIVATE GROUP GEMS_GENIE_1**

| Attribute Name | Tag | VR | VM | Attribute Description and Use |
|---|---|---|---|---|
| Private Creator Identification | (0009,00xx) | LO | 1 | GEMS_GENIE_1 |
| Starting Heart Rate | (0009,xx37) | SL | 1 | Heart rate at start of acquisition. |
| Private Creator Identification | (0011,00xx) | LO | 1 | GEMS_GENIE_1 |
| Radio Nuclide Name | (0011,xx0D) | LO | 1 | Name of radionuclide used. |
| Dataset Name | (0011,xx12) | LO | 1-n | List of Dataset names. |
| Detector Number | (0011,xx15) | SL | 1-n | Sent when image is acquired using one detector only. |
| Acquisition Parent UID | (0011,xx31) | LO | 1-n | Shared by all images created by same scan |
| Private Creator Identification | (0013,00xx) | LO | 1 | GEMS_GENIE_1 |
| Source Translator | (0013,xx11) | SL | 1 | Internal code of product DICOM implementation.<br>Enumerated Value = 11. |
| Private Creator Identification | (0033,00xx) | LO | 1 | GEMS_GENIE_1 |
| Triggers Modification Flag | (0033,xx30) | SL | 1 | Triggers Modification Flag |
| 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 |

### 3.5.4 Private Group GEMS_XELPRV_01

**TABLE 3-37**
**PRIVATE GROUP GEMS_XELPRV_01**

| Attribute Name | Tag | VR | VM | Attribute Description and Use |
|---|---|---|---|---|
| Private Creator Identification | (0033,00xx) | LO | 1 | GEMS_XELPRV_01 |
| Object Type | (0033,xx08) | CS | 1 | Object Type. Contains string "SERIES DATA " |
| Modified Flag | (0033,xx10) | SL | 1 | Default value = 0 (Not Modified) |
| Name | (0033,xx11) | LO | 1 | SDO Name |
| Database Object Unique ID | (0033,xx16) | LO | 1 | Database UID of SDO; contains value of SDO UID tag (0033,xx72) generated at time of object creation |
| Date | (0033,xx17) | SH | 1 | SDO Creation date |
| Time | (0033,xx18) | SH | 1 | SDO Creation time |
| SeriesDataFlags | (0033,xx19) | UL | 1 | SDO Flags. Default value = 0 |
| ProtocolName | (0033,xx1A) | LO | 1 | Name of Protocol created SDO |
| RelevantDataUID | (0033,xx1B) | LO | 1 | UID(s) of SOP Instance(s) relative to SDO |
| BulkData | (0033,xx1C) | OB | 1 | SDO parameter(s) stored as binary buffer(s) |
| IntData | (0033,xx1D) | SL | 1-n | List of SDO parameters stored as integers |
| Double Data | (0033,xx1E) | FD | 1-n | List of SDO parameters stored as doubles |
| String Data | (0033,xx1F) | OB | 1 | List of SDO parameters stored as list of strings |
| BulkDataFormat | (0033,xx20) | OB | 1 | Format of bulk parameters; contains information about name and size of bulk buffers |
| IntDataFormat | (0033,xx21) | OB | 1 | Format of integer parameters; contains information about name and number of integers in list |
| DoubleDataFormat | (0033,xx22) | OB | 1 | Format of double parameters; contains information about name and number of doubles in list |
| StringDataFormat | (0033,xx23) | OB | 1 | Format of string parameters; contains information about name and number of strings in list |
| Description | (0033,xx24) | LT | 1 | User or equipment generated SDO description |
| Series Data Sequence | (0033,xx70) | SQ | 1 | Sequence of item contains information about acquisition parameters. May contain from 1 to n Items. Each Items describes specific parameters set. |
| SDO Private SOP Class UID | (0033,xx71) | UI | 1 | SDO Private SOP Class UID- "1.2.840.113619.4.17" |
| SDO Instance UID | (0033,xx72) | UI | 1 | SDO Instance UID; Internally generated |

### 3.5.5 Private Group APEX_PRIVATE

**TABLE 3-38**
**PRIVATE GROUP APEX_PRIVATE**

| Attribute Name | Tag | VR | VM | Attribute Description and Use |
|---|---|---|---|---|
| Private Creator Identification | (0027,00xx) | LO | 1 | APEX_PRIVATE |
| Bed Position | (0027,xx11) | DS | 1 | Linear position of table. |

# 4. SECONDARY CAPTURE INFORMATION OBJECT IMPLEMENTATION

## 4.1 INTRODUCTION

**Note:** **In this section term NM Camera AE DICOM implementation refers to DICOM implementation of NM General Purpose 600/800 Series products except Discovery NM/CT 670*and NM/CT 800* in CT standalone mode if not specially mentioned.**

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 **NM General Purpose 600/800 Series** systems, are sent as DICOM Secondary Capture images in the following cases:

- As reports of several Quality Control Operations (Daily QC, Weekly QC, etc.), referred as term “QC SC” further in this section.
- As summary reports, complimentary for CT Radiation Dose SR (in Optima NM/CT 640 Implementation only). Refer to Section 9 for more details. This type of SC object is referred as term “CT Dose SR SC” further in this section.
- As summary reports, complimentary Radiopharmaceutical Radiation Dose Structure Reports. Refer to Section 10 for more details. This type of SC object is referred as term “RRDR SC” further in this section.

Only single frame Secondary Capture Image IOD is supported.

## 4.2 NM CAMERA MAPPING OF DICOM ENTITIES

NM Camera AE maps DICOM Information Entities to local Information Entities in the product’s database and user interface.

**TABLE 4-1**
**MAPPING OF DICOM ENTITIES TO NM CAMERA ENTITIES**

| DICOM IE | NM Camera Entity |
|---|---|
| Patient | Patient |
| Study | Exam |
| Series | Series |
| Image | Image |

### 4.3 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 4.5.

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

| Entity Name | Module Name | Usage | Reference |
|---|---|---|---|
| Patient | Patient | Used for QC SC | 4.4.1.1 |
| | | For CT Dose SR SC and RRDR SC (same description as for NM IOD) | 3.4.1.1 |
| | Clinical Trial Subject | Not Used | N/A |
| Study | General Study | Used for QC SC | 4.4.2.1 |
| | | For CT Dose SR SC and RRDR SC (same description as for NM IOD) | 3.4.2.1 |
| | Patient Study | Used for CT Dose SR SC and RRDR SC (same description as for NM IOD) | 3.4.2.2 |
| | Standard Extended Study | Used for CT Dose SR SC and RRDR SC (same description as for NM IOD) | 3.4.2.3 |
| | Private Study | Used for CT Dose SR SC (same description as for NM IOD) | 3.4.2.4 |
| | Clinical Trial Study | Not Used | N/A |
| Series | General Series | Used | 4.4.3.1 |
| | Private SC Series | Used for CT Dose SR SC and RRDR SC | 4.4.3.2 |
| | Clinical Trial Series | Not Used | N/A |
| Equipment | General Equipment | Used (same description as for NM IOD) | 3.4.5.1 |
| | SC Equipment | Used | 4.4.4.1 |
| Image | General Image | Used | 4.4.5.1 |
| | Image Pixel | Used | 4.4.5.2 |
| | Device | Not Used | N/A |
| | Specimen | Not Used | N/A |
| | SC Image | Used | 4.4.5.3 |
| | Overlay Plane | Not Used | N/A |
| | Modality LUT | Not Used | N/A |
| | VOI LUT | Not Used | N/A |
| | SOP Common | Used | 4.4.5.4 |
| | Standard Extended Image | Used | 4.4.5.5 |
| | Private SC Image | Used | 4.4.5.5 |

## 4.4 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.

### 4.4.1 Patient Entity Modules

#### 4.4.1.1 Patient Module

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

| Attribute Name | Tag | Type | Attribute Description |
|---|---|---|---|
| Patient's Name | (0010,0010) | 2 | For CT Dose SR SC and RRDR SC: Patient's full name. (*) Compound from user Last Name and First Name for locally scheduled protocols(**) (***)<br>For QC SC: name of user that performed the QC protocol. For example, "Service^^^^ " |
| Patient ID | (0010,0020) | 2 | For CT Dose SR SC and RRDR SC: primary hospital identification number or code for the patient. (*) (**) (***)<br>For QC SC: set to Camera Name from system configuration |
| 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 | For CT Dose SR SC and RRDR SC: Birth date of the patient. (*) (**) (***)<br>For QC SC: execution date of the QC Test<br>Sent as ZERO LENGTH value if value is not received either from MWL or from user input. |
| Patient's Sex | (0010,0040) | 2 | For CT Dose SR SC and RRDR SC: Sex of the named patient. (*) (**)(***)<br>Enumerated Values:<br>M = male<br>F = female<br>O = other<br>Sent as ZERO LENGTH value if value is not received either from MWL or from user input.<br>For QC SC: always sent as empty string |

| | | | |
|---|---|---|---|
| Other Patient IDs | (0010,1000) | 3 | Not Used |
| Other Patient IDs Sequence | (0010,1002) | 3 | Not Used |

***Note 1 :*** *(*) - Attributes copied from the Worklist if the study source was actually copied from a Worklist query result.*

***Note 2 :*** *(**) - Attributes copied from the user input for Locally scheduled Protocols*

***Note 3 :*** *(***) - Cannot be modified by user if meaningful value is received from MWL*

### 4.4.2 Study Entity Modules

#### 4.4.2.1 General Study Module

**TABLE 4-4**
**GENERAL STUDY MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | Attribute Description |
|---|---|---|---|
| Study Instance UID | (0020,000D) | 1 | Unique identifier for the Study. Internally generated by the system. |
| Study Date | (0008,0020) | 2 | Date the Study started. |
| Study Time | (0008,0030) | 2 | Time the Study started |
| Referring Physician's Name | (0008,0090) | 2 | Name of the patient's referring physician. Sent as empty string. |
| Study ID | (0020,0010) | 2 | Equipment generated Study identifier. Automatically assigned to default Value "QC-protocol" |
| Accession Number | (0008,0050) | 2 | Accession Number. Sent as an empty string |
| Study Description | (0008,1030) | 3 | Study Description. Automatically assigned to the description of the QC test performed. For example, "NM Daily QC", "Uniformity Test", "COR Test" etc.<br>Always sent as non-empty value |

### 4.4.3 Series Entity Modules

#### 4.4.3.1 General Series Module

**TABLE 4-5**
**GENERAL SERIES MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | Attribute Description |
|---|---|---|---|
| Modality | (0008,0060) | 1 | SC Images created by NM General Purpose 600/800 Series products generally have this attribute set to the value found in the original image.<br>Defined Terms:<br>• NM = Nuclear Medicine (QC SC and RRDR SC)<br>• CT= Computerized Tomography (CT Dose SR SC) |

| | | | |
|---|---|---|---|
| Series Instance UID | (0020,000E) | 1 | Internally generated unique identifier of the Series. |
| Series Number | (0020,0011) | 2 | A number that identifies this Series.<br>For QC SC : set as ZERO LENGTH value for<br>For CT Dose SR SC :Set as random integer value<br>For RRDR SC: Internally generated using default Base Value = 500<br>Calculated as <Base Value>+<N+1>, where <N> is number of RRDR SC objects already exists in Study |
| Protocol name | (0018,1030) | 3 | User-defined description of the conditions under which the Series was performed.<br>For CT Dose SC: contains acquisition protocol Name<br>For RRDR SC: always sent as "Exposure Monitoring" |
| Series Date | (0008,0021) | 3 | Date the Series started<br>Always sent |
| Series Time | (0008,0031) | 3 | Time the Series started.<br>Always sent |
| Series Description | (0008,103E) | 3 | Description of the Series. Always sent as non-empty value.<br>For QC SC: defined by the name of QC report.<br>For CT Dose SR SC : Composed from parent CT Series Name and Scan Type followed by suffix "Dose Secondary Capture"<br>For RRDR SC: Composed from Administration Event name followed by suffix " Secondary Capture" |

#### 4.4.3.2 Private SC Series

**TABLE 4-6**
**PRIVATE SC SERIES MODULE ATTRIBUTES**

| Attribute Name | Tag | Private Creator ID | Attribute Description |
|---|---|---|---|
| Origin | (0009,xx12) | QUASAR_INTERNAL_USE | The origin of the image.<br>For CT Dose SR: Acquisition protocol name<br>For RRDR SC: Always sent as "exposure monitoring" |
| Send List Mode flag | (0009, xx24) | QUASAR_INTERNAL_USE | Defined if list mode data shall be sent to list mode data destination station<br>Always sent as 0. |

| | | | |
|---|---|---|---|
| Sequence Type | (0009,xx13) | QUASAR_INTERNAL_USE | Type of sequence created the object<br>Always send as "secondary capture" |
| Sequence Name | (0009,xx14) | QUASAR_INTERNAL_USE | Name of Sequence created the object.<br>Always sent as non-empty value |
| Pre-Medication | (0009,xx45) | QUASAR_INTERNAL_USE | Keeps the Pre-Medication as appears in the "To-Do" list<br>Sent as empty string if not received from user input. |

### 4.4.4 Equipment Entity Modules

#### 4.4.4.1 SC Equipment Module

**TABLE 4-7**
**SC EQUIPMENT MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | Use |
|---|---|---|---|
| Conversion Type | (0008,0064) | 1 | Specify Defined Terms used:<br>SI = Scanned Image |
| Modality | (0008,0060) | 3 | SC Images created by NM General Purpose 600/800 Series products generally have this attribute set to the value found in the original image.<br>Always sent.<br>Defined Terms:<br>• NM = Nuclear Medicine (QC SC and RRDR SC)<br>• CT= Computerized Tomography (CT Dose SR SC) |

### 4.4.5 Image Entity Modules

#### 4.4.5.1 General Image Module

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

| Attribute Name | Tag | Type | Attribute Description |
|---|---|---|---|
| Instance Number | (0020,0013) | 2 | A number that identifies this image.<br>Sent as ZERO Length value |
| Content Date | (0008,0023) | 2C | The date the SC Image pixel data creation started |
| Content Time | (0008,0033) | 2C | The time the SC image pixel data creation started |

| | | | |
|---|---|---|---|
| Quality Control Image | (0028,0300) | 3 | Indicates that this image is a quality control image.<br>Enumerated Values:<br>YES - for QC SC<br>NO - for CT Dose SC and RRDR SC |
| Derivation Description | (0008,2111) | 3 | A text description of how this image was derived.<br>For QC SC: not sent<br>For CT Dose SC: Always set to "X-Ray Radiation Dose Report"<br>For RRDR SC: Always set to "Administration Secondary Capture" |
| Image Type | (0008,0008) | 3 | The following Enumerated Value of Value 1 is supported:<br>• DERIVED - identifies a Derived Image<br>The following Enumerated Value of Value 2 is supported:<br>• SECONDARY - identifies a Secondary Image |

#### 4.4.5.2 Image Pixel Module

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

| Attribute Name | Tag | Type | Attribute Description |
|---|---|---|---|
| Samples per Pixel | (0028,0002) | 1 | Number of samples (planes) in this image.<br>Possible values:<br>1 , if Photometric Interpretation (0028,0004) equals "MONOCHROME2"<br>3, if Photometric Interpretation (0028,0004) equals "RGB" |
| Photometric Interpretation | (0028,0004) | 1 | Specifies the intended interpretation of the pixel data<br>Defined Terms supported:<br>• MONOCHROME2<br>• RGB (for QC SC) |
| Rows | (0028,0010) | 1 | Number of rows in the image.<br>Possible values:<br>QC SC: 878, 934<br>CT Dose SC and RRDR SC: 300 |
| Columns | (0028,0011) | 1 | Number of columns in the image<br>Possible values:<br>QC SC: 1004<br>CT Dose SC: 520<br>RRDR SC: 620 |

| | | | |
|---|---|---|---|
| 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>QC SC: 8<br>CT Dose SC and RRDR SC: 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 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 | Sent for QC SC only<br>Enumerated Values:<br>0000H = color-by-pixel |

#### 4.4.5.3 SC Image Module

**TABLE 4-10**
**SC IMAGE MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | Use |
|---|---|---|---|
| Pixel Spacing | (0028,0030) | 1C | Not sent. Secondary Capture images created by product are not calibrated images, contain screen captures of QC result tables and Dose report information |

#### 4.4.5.4 SOP Common Module

**TABLE 4-11**
**SOP COMMON MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | Attribute Description |
|---|---|---|---|
| SOP Class UID | (0008,0016) | 1 | Uniquely identifies the SOP Class. Always set to "1.2.840.10008.5.1.4.1.1.7" |
| SOP Instance UID | (0008,0018) | 1 | Uniquely identifies the SOP Instance. Internally generated. |
| Specific Character Set | (0008,0005) | 1C | Character Set that expands or replaces the Basic Graphic Set.<br>Defined Terms include for locally created images:<br>ISO_IR 100 = Latin Alphabet No. 1<br>Always sent. |
| Instance Number | (0020,0013) | 3 | Sent as empty String |

#### 4.4.5.5 Standard Extended Image Module

TABLE 4-12
IMAGE STANDARD EXTENDED ATTRIBUTES

| Attribute Name | Tag | Use |
|---|---|---|
| Counts Accumulated | (0018,0070) | Always sent as "1" |

#### 4.4.5.6 Private SC Image Module

TABLE 4-13
PRIVATE SC MODULE ATTRIBUTES

| Attribute Name | Tag | Private Creator ID | Attribute Description |
|---|---|---|---|
| Sequence Name | (0009,xx14) | "QUASAR_INTERNAL_USE" | Acquired Sequence Type |
| Patient Unique Key | (0009,xx39) | "QUASAR_INTERNAL_USE" | Patient unique key |
| Dataset Name | (0011,xx12) | "GEMS_GENIE_1" | List of Dataset names |

### 4.5 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.

#### 4.5.1 Standard Extended Attributes

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

TABLE 4-14
STANDARD EXTENDED ATTRIBUTES

| Information Entity Name | Attribute Name | Tag | Use |
|---|---|---|---|
| Image | Counts Accumulated | (0018,0070) | |

#### 4.5.2 Private Group QUASAR_INTERNAL_USE

Private Group QUASAR_INTERNAL_USE is modeled as part of the Image Information Entity.

TABLE 4-15
PRIVATE GROUP QUASAR_INTERNAL_USE

| Attribute Name | Tag | VR | VM | Attribute Description and Use |
|---|---|---|---|---|
| Private Creator Identification | (0009,00xx) | LO | 1 | QUASAR_INTERNAL_USE |
| Origin | (0009,xx12) | LO | 1 | The origin of the image. |
| Sequence Type | (0009,xx13) | ST | 1 | Acquired Sequence Type |
| Sequence Name | (0009,xx14) | ST | 1 | Acquired Sequence Name |
| Send List Mode Flag | (0009,xx24) | US | 1 | Defines if list mode data of acquired scan is sent to list mode data destination station |
| Patient Unique Key | (0009,xx39) | UI | 1 | Patient unique key |

| | | | | |
|---|---|---|---|---|
| Pre-Medication | (0009,xx45) | LO | 1 | Keeps the Pre-Medication as appears in the “To Do” list |

### 4.5.3 Private Group GEMS_GENIE_1

Private Group GEMS_GENIE_1 is modeled as part of the Image Information Entity.

**TABLE 4-16**
**PRIVATE GROUP GEMS_GENIE_1**

| Attribute Name | Tag | VR | VM | Attribute Description and Use |
|---|---|---|---|---|
| Private Creator Identification | (0011,00xx) | LO | 1 | GEMS_GENIE_1 |
| Dataset Name | (0011,xx12) | LO | 1-n | List of Dataset names. |

## 4.6 STANDARD EXTENDED AND PRIVATE CONTEXT GROUPS

NM Camera AE does not support any coded terminology.

# 5. MODALITY WORKLIST QUERY IMPLEMENTATION

## 5.1 INTRODUCTION

The Discovery NM/CT 670* and NM/CT 800* implementations (for NM standalone exams and NM/CT hybrid exams) , Discovery NM 630, NM 870 and Optima NM/CT 640 implementations map DICOM Information Entities to local Information Entities in the product's database and user interface.

In the Discovery NM/CT 670*and NM/CT 800* implementations for CT standalone exams, Worklist query is performed via the CT scanner console. For Modality Worklist Information Model Definition, refer to appropriate CT Scanner DICOM Conformance Statements (Section 1.6 )

**Note: In this section term NM Camera AE DICOM implementation refers to DICOM implementation of NM General Purpose 600/800 Series products except Discovery NM/CT 670* and NM/CT 800*in CT standalone mode.**

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

## 5.2 NM CAMERA MAPPING OF DICOM ENTITIES

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

**TABLE 5-1**
**MAPPING OF DICOM ENTITIES TO NM CAMERA ENTITIES**

| DICOM | NM Camera Entity |
|---|---|
| Scheduled Procedure Step | Protocol |
| Requested Procedure | Study |
| Imaging Service Request | Study |
| Visit | Study |
| Patient | Patient |

Matching Requested Procedure Step to NM Camera protocol is done according to predefined configuration.
The configuration contains the following tags

- (0040,0007) – Scheduled Procedure Step Description
- (0032,1060) – Requested Procedure Description
- (0040,0008) – Scheduled Protocol Code Sequence - Code Meaning

The default configuration is (0040,0007) – Scheduled Procedure Step Description
If Scheduled Protocol Code Sequence - tag (0040,0008) - is selected for mapping, the protocol will be mapped according to the value of Code Meaning - tag (0008,0104).

## 5.3 WORKLIST QUERY MODULE TABLE

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

**TABLE 5-2**
**MODALITY WORKLIST INFORMATION MODEL MODULES**

| Entity Name | Module Name | Reference |
|---|---|---|
| Scheduled Procedure Step | SOP Common | 5.4.1.1 |
| | Scheduled Procedure Step | 5.4.1.2 |
| Requested Procedure | Requested Procedure | 5.4.2.1 |
| Imaging Service Request | Imaging Service Request | 5.4.3.1 |
| Visit | Visit Identification | 5.4.4.1 |
| | Visit Status | 5.4.4.2 |
| | Visit Relationship | 5.4.4.3 |
| | Visit Admission | 5.4.4.4 |
| Patient | Patient Relationship | Not Used |
| | Patient Identification | 5.4.5.1 |
| | Patient Demographic | 5.4.5.2 |
| | Patient Medical | 5.4.5.3 |

## 5.4 WORKLIST QUERY MODULE DEFINITIONS

Please refer to DICOM Standard PS 3.3. (Information Object Definitions) for a description of each of the query key attributes contained within the Modality Worklist Information Model.
Note that in all tables below information in "**Mapped into Instance/MPPS"** column is referenced to NM images and CT Images only if not explicitly specified. .

### 5.4.1 Common Scheduled Procedure Step Entity Modules

#### 5.4.1.1 SOP Common Module

**TABLE 5-3**
**SOP COMMON MODULE ATTRIBUTES**

| Attribute Name | Tag | Expected Matching Key Type | Expected Returned Key Type | Mapped into Instance/ MPPS | Note |
|---|---|---|---|---|---|
| Specific Character Set | (0008,0005) | O | 1C | Yes /Yes | See 5.4.1.1.1 |

##### 5.4.1.1.1 Specific Character Set

The NM Scanner AE will use any Specific Character Set value returned in a Scheduled Procedure Step Identifier in the images created pursuant to that Scheduled Procedure Step. Text attributes, including Patient and Physician names, that include non-ASCII characters will be displayed as described in Section 2.7
For MPPS created from MWL request, the value is copied from value provided in MWL if not empty, otherwise ISO_IR 100 is used.

#### 5.4.1.2 Scheduled Procedure Step Module

**TABLE 5-4**
**SCHEDULED PROCEDURE STEP MODULE ATTRIBUTES**

| Attribute Name | Tag | Expected Matching Key Type | Expected Returned Key Type | Mapped into Instance / MPPS | Note |
|---|---|---|---|---|---|
| Scheduled Procedure Step Sequence | (0040,0100) | R | 1 | No / No | Only one item is supported |
| >Scheduled Station AE Title | (0040,0001) | R | 1 | No / No | Single Value matching is used. |

| | | | | | |
|---|---|---|---|---|---|
| >Scheduled Procedure Step Start Date | (0040,0002) | R | 1 | Yes / No | Specified as range of date of the form: from Date - To Date.<br>SPS Start Date is mapped into private attribute "Protocol Scheduled Date" in the image – Tag (0009,xx40), QUASAR_INTERNAL_USE<br>Cannot be modified in UI if received from MWL |
| >Scheduled Procedure Step Start Time | (0040,0003) | R | 1 | Yes / No | Matching is not supported.<br>SPS Start Time is mapped into private attribute "Protocol Scheduled Time" in the image - tag (0009,xx41), QUASAR_INTERNAL_USE<br>Cannot be modified in UI if received from MWL. |
| >Modality | (0008,0060) | R | 1 | No / No | Single value matching is allowed.<br>Possible Values: NM, CT |
| >Scheduled Performing Physician's Name | (0040,0006) | R | 2 | Yes / No | Wildcard matching is allowed by Last Name and First Name separately.<br>User may enter matching values for Last Name and/or First Name separately in UI.<br>The value sent in MWL request is created according to the following template :<br>< Last Name>^< First Name><br>Mapped to Performing Physicians' Name tag (0008, 1050) for NM , CT and CT Dose SR IODs. |
| >Scheduled Procedure Step Description | (0040,0007) | O | 1C | Yes / Yes | Always included in the MWL request.<br>May be used for Protocol Mapping. |
| >Scheduled Protocol Code Sequence | (0040,0008) | O | 1C | Yes / Yes | Always included in the MWL request.<br>MPPS: Copied from the first valid item of MWL request. |
| >>Code Value | (0008,0100) | O | 1 | Yes / Yes | Requested explicitly<br>MPPS: Copied from the first valid item of MWL request |
| >>Coding Scheme Designator | (0008,0102) | O | 1 | Yes/ Yes | Requested explicitly<br>MPPS: Copied from the first valid item of MWL request |
| >>Coding Scheme Version | (0008,0103) | O | 3 | Yes/Yes | Requested explicitly<br>MPPS: Copied from the first valid item of MWL request |
| >>Code Meaning | (0008,0104) | O | 3 | Yes/ Yes | Requested explicitly . Returned non-empty value may be used for Protocol Mapping<br>If Protocol Mapping is configured to use this tag, it's never displayed for mapped protocols.<br>MPPS: Copied from the first valid item of MWL request |
| >Scheduled Procedure Step ID | (0040,0009) | O | 1 | Yes / Yes | Always included in the MWL request. |

| | | | | | |
|---|---|---|---|---|---|
| >Scheduled Station Name | (0040,0010) | O | 2 | No / No | User may add this tag to MWL request |
| > Scheduled Procedure Step Location | (0040,0011) | O | 2 | No / No | User may add this tag to MWL request |
| >Pre-Medication | (0040,0012) | O | 2C* | Yes / No | Included in the MWL request by default. User may remove this tag from MWL request (not recommended). Mapped into private attribute Pre-Medication – tag (0009,xx45) "QUASAR_INTERNAL_USE" |
| >Requested Contrast Agent | (0032,1070) | O | 2C | No / No | Included in the MWL request by default. User may remove this tag from MWL request (not recommended). |
| >Scheduled Procedure Step Status | (0040,0020) | O | 3 | No / No | Included in the MWL request by default. User may remove this tag from MWL request (not recommended). |

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

### 5.4.2 Common Requested Procedure Entity Modules

#### 5.4.2.1 Requested Procedure Module

**TABLE 5-5**
**REQUESTED PROCEDURE MODULE ATTRIBUTES**

| Attribute Name | Tag | Expected Matching Key Type | Expected Returned Key Type | Mapped into Instance / MPPS | Note |
|---|---|---|---|---|---|
| Requested Procedure ID | (0040,1001) | O | 1 | Yes / Yes | Always included in the MWL request. Single value matching is allowed. |
| Requested Procedure Description | (0032,1060) | O | 1C * | Yes / Yes | Always included in the MWL request. Matching is not supported . May be used for Protocol Mapping. Mapped to Study Description tag (0008,1030), if belongs to first Protocol in the Study |
| Requested Procedure Code Sequence | (0032,1064) | O | 1C | Yes /Yes | Always included in the MWL request Copied to Procedure Code Sequence (0008,1032) when stored to instance |
| >Code Value | (0008,0100) | O | 1 | Yes / Yes | Copied to Procedure Code Sequence (0008,1032) when stored to instance |
| >Coding Scheme Designator | (0008,0102) | O | 1 | Yes /Yes | Copied to Procedure Code Sequence (0008,1032) when stored to instance |
| >Coding Scheme Version | (0008,0103) | O | 3 | Yes / Yes | Copied to Procedure Code Sequence (0008,1032) when stored to instance |
| >Code Meaning | (0008,0104) | O | 3 | Yes / Yes | Copied to Procedure Code Sequence (0008,1032) when stored to instance |
| Study Date | (0008,0020) | O | 3 | No/No | Not included in the MWL request by default. User may add this tag to MWL request |

| | | | | | |
|---|---|---|---|---|---|
| Study Time | (0008,0030) | O | 3 | No/No | Not included in the MWL request by default.<br>User may add this tag to MWL request |
| Study Instance UID | (0020,000D) | O | 1 | Yes / Yes | Always included in the MWL request. |
| Referenced Study Sequence | (0008,1110) | O | 2 | Yes / Yes | Included in the MWL request by default.<br>User may remove this tag from MWL request (not recommended). |
| >Referenced SOP Class UID | (0008,1150) | O | 1 | Yes / Yes | Requested explicitly |
| >Referenced SOP Instance UID | (0008,1155) | O | 1 | Yes / Yes | Requested explicitly |
| Requested Procedure Comments | (0040,1400) | O | 3* | Yes/No | Not included in the MWL request by default.<br>User may add this tag to MWL request |
| Names of Intended Recipients of Results | (0040,1010) | O | 3 | No/No | Included in the MWL request by default.<br>User may remove this tag from MWL request (not recommended). |

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

### 5.4.3 Common Imaging Service Request Entity Modules

#### 5.4.3.1 Imaging Service Request Module

**TABLE 5-6**
**IMAGING SERVICE REQUEST MODULE ATTRIBUTES**

| Attribute Name | Tag | Expected Matching Key Type | Expected Returned Key Type | Mapped into Instance / MPPS | Note |
|---|---|---|---|---|---|
| Accession Number | (0008,0050) | O | 2* | Yes / Yes | Always included in the MWL request.<br>Single Value and Wild Card matching may be requested for this data element |
| Requesting Physician | (0032,1032) | O | 2 | No / No | Included in the MWL request by default.<br>User may remove this tag from MWL request (not recommended). |
| Referring Physician's Name | (0008,0090) | O | 2* | Yes / No | Included in the MWL request by default.<br>User may remove this tag from MWL request (not recommended).<br>Only First Name and Last Name are displayed on screen and stored in image;<br>User can modify value arrived from MWL. |
| Imaging Service Request Comments | (0040,2400) | O | 3 | No/No | Included in the MWL request by default.<br>User may remove this tag from MWL request (not recommended). |
| Requesting Service | (0032,1033) | O | 3 | No/No | Included in the MWL request by default.<br>User may remove this tag from MWL request (not recommended). |
| Issuer of Accession Number Sequence | (0008,0051) | O | 3 | No/No | Not included in the MWL request by default.<br>User may add this tag to MWL request |
| >Local Namespace Entity ID | (0040,0031) | O | 3 | No/No | Requested explicitly if Sequence is sent |

| | | | | | |
|---|---|---|---|---|---|
| >Universal Entity ID | (0040,0032) | O | 3 | No/No | Requested explicitly if Sequence is sent |
| >Universal Entity ID Type | (0040,0033) | O | 1C | No/No | Requested explicitly if Sequence is sent |
| Placer Order Number / Imaging Service Request | (0040,2016) | O | 3 | No / No | Not included in the MWL request by default.<br>User may add this tag to MWL request |
| Filler Order Number / Imaging Service Request | (0040,2017) | O | 3 | No / No | Not included in the MWL request by default.<br>User may add this tag to MWL request |

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

### 5.4.4 Common Visit Entity Modules

#### 5.4.4.1 Visit Identification Module

**TABLE 5-7**
**VISIT IDENTIFICATION MODULE ATTRIBUTES**

| Attribute Name | Tag | Expected Matching Key Type | Expected Returned Key Type | Mapped into Instance / MPPS | Note |
|---|---|---|---|---|---|
| Institution Name | (0008,0080) | O | 3 | No / No | User may add this tag to MWL request<br>Value from MWL response is not stored in the image – used value from System configuration instead. |
| Institution Address | (0008,0081) | O | 3 | No/No | User may add this tag to MWL request<br>Value from MWL response is not stored in the image – used value from System configuration instead. |
| Institution Code Sequence | (0008,0082) | O | 3 | No/No | Not included in the MWL request by default.<br>User may add this tag to MWL request |
| >Code Value | (0008,0100) | O | 1 | No/No | Requested explicitly if Sequence is sent |
| >Coding Scheme Designator | (0008,0102) | O | 1 | No/No | Requested explicitly if Sequence is sent |
| >Coding Scheme Version | (0008,0103) | O | 3 | No/No | Requested explicitly if Sequence is sent |
| >Code Meaning | (0008,0104) | O | 3 | No/No | Requested explicitly if Sequence is sent |
| Admission ID | (0038,0010) | O | 2 | No / No | Included in the MWL request by default.<br>User may remove this tag from MWL request (not recommended) |
| Issuer Of Admission ID | (0038,0011) | O | 2 | No / No | Included in the MWL request by default.<br>User may remove this tag from MWL request (not recommended) |
| Issuer Of Admission ID Sequence | (0038,0014) | O | 3 | No/No | Not included in the MWL request by default.<br>User may add this tag to MWL request |
| >Local Namespace Entity ID | (0040,0031) | O | 3 | No/No | Requested explicitly if Sequence is sent |
| >Universal Entity ID | (0040,0032) | O | 3 | No/No | Requested explicitly if Sequence is sent |

| | | | | | |
|---|---|---|---|---|---|
| >Universal Entity ID Type | (0040,0033) | O | 1C | No/No | Requested explicitly if Sequence is sent |

#### 5.4.4.2 Visit Status Module

**TABLE 5-8**
**VISIT STATUS MODULE ATTRIBUTES**

| Attribute Name | Tag | Expected Matching Key Type | Expected Returned Key Type | Mapped into Instance | Note |
|---|---|---|---|---|---|
| Current Patient Location | (0038,0300) | O | 2 | No / No | Included in the MWL request by default. User may remove this tag from MWL request (not recommended) |
| Visit Status ID | (0038,0008) | O | 3 | No/No | Not included in the MWL request by default. User may add this tag to MWL request. |
| Patient's Institution Residence | (0038,0400) | O | 3 | No/No | Not included in the MWL request by default. User may add this tag to MWL request. |
| Visit Comments | (0038,4000) | O | 3 | No/No | Not included in the MWL request by default. User may add this tag to MWL request. |

#### 5.4.4.3 Visit Relationship Module

**TABLE 5-9**
**VISIT RELATIONSHIP MODULE ATTRIBUTES**

| Attribute Name | Tag | Expected Matching Key Type | Expected Returned Key Type | Mapped into Instance / MPPS | Note |
|---|---|---|---|---|---|
| Referenced Patient Sequence | (0008,1120) | O | 2 | No / Yes | Not included in the MWL request by default. User may add this tag to MWL request.MPPS: Always included to N-CREATE message as empty sequence |
| >Referenced SOP Class UID | (0008,1150) | O | 3 | No/ No | Requested explicitly if Sequence is sent |
| >Referenced SOP Instance UID | (0008,1155) | O | 3 | No/ No | Requested explicitly if Sequence is sent |

#### 5.4.4.4 Visit Admission Module

**TABLE 5-10**
**VISIT ADMISSION MODULE ATTRIBUTES**

| Attribute Name | Tag | Expected Matching Key Type | Expected Returned Key Type | Mapped into Instance/ MPPS | Note |
|---|---|---|---|---|---|
| Admitting Diagnoses Description | (0008,1080) | O | 3* | Yes/No | Included in the MWL request by default. User may remove this tag from MWL request User can modify value arrived from MWL. |

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

### 5.4.5 Common Patient Entity Modules

#### 5.4.5.1 Patient Identification Module

**TABLE 5-11**
**PATIENT IDENTIFICATION MODULE ATTRIBUTES**

| Attribute Name | Tag | Expected Matching Key Type | Expected Returned Key Type | Mapped into Instance / MPPS | Note |
|---|---|---|---|---|---|
| Patient's Name | (0010,0010) | R | 1 * | Yes / Yes | Single Value or Wild Card matching is allowed Last name and First Name separately;<br>Only First Name and Last Name are displayed on screen and stored into image.<br>User cannot modify value received from MWL |
| Patient ID | (0010,0020) | R | 1 * | Yes / Yes | Only Single Value matching is allowed for this data element.<br>User cannot modify value received from MWL |
| Issuer of Patient ID | (0010,0021) | O | 3 | No / No | Included in the MWL request by default.<br>User may remove this tag from MWL request (not recommended) |
| Issuer of Patient ID Qualifiers Sequence | (0010,0024) | O | 3 | No / No | Not included in the MWL request by default.<br>User may add this tag to MWL |
| >Universal Entity ID | (0040,0032) | O | 3 | No/No | Requested explicitly if Sequence is sent |
| >Universal Entity ID Type | (0040,0033) | O | 1C | No/No | Requested explicitly if Sequence is sent |
| Other Patient IDs | (0010,1000) | O | 3 | No / No | Not included in the MWL request by default.<br>User may add this tag to MWL |
| Other Patient IDs Sequence | (0010,1002) | O | 3 | No / No | Not included in the MWL request by default.<br>User may add this tag to MWL |
| >Patient ID | (0010,0010) | O | 3 | No / No | Requested explicitly if Sequence is sent |
| > Issuer of Patient ID | (0010,0021) | O | 3 | No / No | Requested explicitly if Sequence is sent |
| > Issuer of Patient ID Qualifiers Sequence | (0010,0024) | O | 3 | No / No | Requested explicitly if Sequence is sent |
| >Type of Patient ID | (0010,0022) | O | 3 | No / No | Requested explicitly if Sequence is sent |

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

#### 5.4.5.2 Patient Demographic Module

**TABLE 5-12**
**PATIENT DEMOGRAPHIC MODULE ATTRIBUTES**

| Attribute Name | Tag | Expected Matching Key Type | Expected Returned Key Type | Mapped into Instance/ MPPS | Note |
|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| Patients Birth Date | (0010,0030) | O | 2 * | Yes / Yes | Always included in the MWL request<br>User cannot modify value received from MWL |
| Patient's Sex | (0010,0040) | O | 2 * | Yes / Yes | Always included in the MWL request<br>User cannot modify non-empty value received from MWL |
| Patient's Weight | (0010,1030) | O | 2* | Yes / No | Included in the MWL request by default.<br>User may remove this tag from MWL request (not recommended)<br>User can modify value received from MWL |
| Patient's Size | (0010,1020) | O | 2* | Yes / No | Included in the MWL request by default.<br>User may remove this tag from MWL request (not recommended)<br>User can modify value received from MWL |
| Patient's Age | (0010,1010) | O | 3 | No / No | Included in the MWL request by default.<br>User may remove this tag from MWL request (not recommended)<br>Value calculated from Patient Birth Date is displayed on screen stored into image. |
| Patient's Address | (0010,1040) | O | 3 | No / No | Not included in the MWL request by default.<br>User may add this tag to MWL |
| Patient's Telephone Numbers | (0010,2154) | O | 3 | No / No | Included in the MWL request by default.<br>User may remove this tag from MWL request (not recommended) |
| Patient Comments | (0010,4000) | O | 3 | No / No | Included in the MWL request by default.<br>User may remove this tag from MWL request (not recommended) |
| Confidentiality Constraint on Patient Data Description | (0040,3001) | O | 3 | No / No | Included in the MWL request by default.<br>User may remove this tag from MWL request (not recommended) |

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

#### 5.4.5.3 Patient Medical Module

**TABLE 5-13**
**PATIENT MEDICAL MODULE ATTRIBUTES**

| Attribute Name | Tag | Expected Matching Key Type | Expected Returned Key Type | Mapped into Instance / MPPS | Note |
|---|---|---|---|---|---|
| Patient State | (0038,0500) | O | 2 | No / No | Included in the MWL request by default.<br>User may remove this tag from MWL request (not recommended) |
| Pregnancy Status | (0010,21C0) | O | 2* | Yes / No | Included in the MWL request by default.<br>User may remove this tag from MWL request (not recommended) |
| Medical Alerts | (0010,2000) | O | 2 | No / No | Included in the MWL request by default.<br>User may remove this tag from MWL request (not recommended) |

| | | | | | |
|---|---|---|---|---|---|
| Contrast Allergies | (0010,2110) | O | 2* | Yes / No | Included in the MWL request by default. User may remove this tag from MWL request (not recommended) |
| Special Needs | (0038,0050) | O | 2 | No / No | Included in the MWL request by default. User may remove this tag from MWL request (not recommended) |
| Additional Patient History | (0010,21B0) | O | 3 | No / No | Included in the MWL request by default. User may remove this tag from MWL request (not recommended) |

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

# 6. STORAGE COMMITMENT PUSH MODEL IMPLEMENTATION

## 6.1 STORAGE COMMITMENT PUSH MODEL INFORMATION OBJECT DEFINITION

**Note:** **In this section term NM Camera AE DICOM implementation refers to DICOM implementation of NM General Purpose 600/800 Series products except Discovery NM/CT 670* and NM/CT 800*in CT standalone mode.**

This section describes NM Camera AE Storage Commitment Push Model Implementation.

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.

Note that requesting storage commitment for CT data is performed via the CT scanner console. Refer to appropriate CT Scanner DICOM Conformance Statements (Section 1.6).

### 6.1.1 STORAGE COMMITMENT MODULE FOR N-ACTION

**TABLE 6-1**
**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:<br>1.2.840.10008.5.1.4.1.1.20 Nuclear Medicine Image Storage SOP Class UID.<br>1.2.840.10008.5.1.4.1.1.7 - Secondary Capture Image Storage SOP Class UID |
| >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 |

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

**TABLE 6-2**
**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 6.1.2.1 for the list of processed values. |

#### 6.1.2.1 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:

| Failure Reason | Meaning | Application Behavior When Receiving Reason Code |
|---|---|---|
| 0110H | Processing failure | Transfer failure is logged (*) |
| 0112H | No such object instance | Transfer failure is logged (*) |
| 0213H | Resource limitation | Transfer failure is logged (*) |
| 0122H | Referenced SOP Class not supported | Transfer failure is logged (*) |
| 0119H | Class / Instance conflict | Transfer failure is logged (*) |
| 0131H | Duplicate transaction UID | Transfer failure is logged (*) |
| * | Other Failure Reason code values. | Transfer failure is logged (*) |

***Note:*** (*) - In all failure reasons an Appropriate error message is logged in **/home/ctuser/neuvo/logfiles/nwscp.log**. If the error message contains failed sop instance uid's those will logged in the log file. The image/series/studies will not be marked as archived in the Data Management Panel.

# 7. MODALITY PERFORMED PROCEDURE STEP IMPLEMENTATION

## 7.1 INTRODUCTION

**Note:** **In this section term NM Camera AE DICOM implementation refers to DICOM implementation of NM General Purpose 600/800 Series products except Discovery NM/CT 670* and NM/CT 800* in CT standalone mode.**

This section specifies the use of the DICOM Modality Performed Procedure Step information to be communicated to the Hospital/Radiology information system.

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

Note that Modality Performed Procedure Step SOP Class is supported by Discovery NM/CT 670 system in CT Standalone mode via BrightSpeed Elite 16 slices CT Scanner, Discovery NM/CT 670 ES system in CT Standalone mode via Optima CT540 8 Slices CT scanner, by Discovery NM/CT 670 Pro, Discovery 670 DR, Discovery NM/CT 670 CZT and NM/CT 870* systems in CT Standalone mode via Optima CT540 16 slices CT scanner, by NM/CT 850 system in standalone mode by CT 850 Scanner and by NM/CT 860 system in standalone mode by CT 860 Scanner. Refer to appropriate CT Scanner DICOM Conformance Statements (Section 1.6).

## 7.2 RELATIONSHIP BETWEEN SCHEDULED AND PERFORMED PROCEDURE STEPS

The NM Camera AE supports the following cases:

- Simple Case - one-to-one relationship between Scheduled Procedure Step and PPS
- Append Case - one -to-multiple relationship between Scheduled Procedure Step and PPS
- Unscheduled Case (Acquisition without MWL Data) - zero-to-one relationship between Scheduled Procedure Step and PPS
- Abandoned Case – one-to-zero relationship between Scheduled Procedure Step and PPS

Group case ( multiple-to-one relationship) is not supported.

## 7.3 MODALITY PERFORMED PROCEDURE STEP MODULE TABLE

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

**TABLE 7-1**
**MODALITY PERFORMED PROCEDURE STEP MODULES**

| Module Name | Reference |
|---|---|
| SOP Common | 7.4.1 |
| Performed Procedure Step Relationship | 7.4.2 |
| Performed Procedure Step Information | 7.4.3 |
| Image Acquisition Results | 7.4.4 |
| Radiation Dose | Not Used |
| Billing and Material Management Codes | Not Used |

## 7.4 MODALITY PERFORMED PROCEDURE STEP MODULE DEFINITIONS

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

### 7.4.1 SOP Common Module

**TABLE 7-2**
**SOP COMMON MODULE ATTRIBUTES**

| Attribute Name | Tag | Type for SCU N-CREATE | Type for SCU N-SET | Usage in MPPS Instance |
|---|---|---|---|---|
| Specific Character Set | (0008,0005) | 1C | 1C | Character Set that expands or replaces the Basic Graphic Set.<br>Defined Terms used for MPPS of acquisition without MWL Data:<br>ISO_IR 100 = Latin Alphabet No. 1<br>For MPPS created from MWL request, the value is copied from value provided in MWL if not empty, otherwise ISO_IR 100 is used.<br>Always sent. |

### 7.4.2 Performed Procedure Step Relationship Module

**TABLE 7-3**
**PERFORMED PROCEDURE STEP RELATIONSHIP MODULE ATTRIBUTES**

| Attribute Name | Tag | Type for SCU - N-CREATE | |
|---|---|---|---|
| | | Acquisition without MWL Entry | Acquisition with MWL Entry |
| Scheduled Step Attributes Sequence | (0040,0270) | 1, contains only 1 item | 1, contains only 1 item |
| >Study Instance UID | (0020,000D) | 1, Locally generated UID | 1, copied from MWL |
| >Referenced Study Sequence | (0008,1110) | 2, Always sent as empty SQ | 2, copied from MWL |
| >>Referenced SOP Class UID | (0008,1150) | N/A | 1, copied from MWL |
| >>Referenced SOP Instance UID | (0008,1155) | N/A | 1, copied from MWL. |
| >Accession Number | (0008,0050) | 2, copied from value, manually entered in UI or sent as empty if no input is provided | 2, copied from MWL |
| >Issuer of Accession Number Sequence | (0008,0051) | 3, Not sent | 3, Not sent |
| >Placer Order Number/Imaging Service Request | (0040,2016) | 3, Not sent | 3, Not sent |
| >Order Placer Identifier Sequence | (0040,0026) | 3, Not sent | 3, Not sent |

| | | | |
|---|---|---|---|
| >Filler Order Number/Imaging Service Request | (0040,2017) | 3, Not sent | 3, Not sent |
| >Order Filler Identifier Sequence | (0040,0027) | 3, Not sent | 3, Not sent |
| >Requested Procedure ID | (0040,1001) | 2, Sent as empty string | 2, copied from MWL |
| >Requested Procedure Code Sequence | (0032,1064) | 3, Not sent | 3, filled from first valid item from MWL request or sent empty if no valid items exist in MWL. |
| >>Code Value | (0008,0100) | N/A | 1, filled from first valid item from MWL request, not sent if no valid items exist in MWL |
| >>Coding Scheme Designator | (0008,0102) | N/A | 1, filled from first valid item from MWL request, not sent if no valid items exist in MWL |
| >>Coding Scheme Version | (0008,0103) | N/A | 1, filled from first valid item from MWL request, not sent if no valid items exist in MWL |
| >>Code Meaning | (0008,0104) | N/A | 1, filled from first valid item from MWL request, not sent if no valid items exist in MWL. If value is missing in MWL request, filled by Code Value. (0008,0100) |
| >Requested Procedure Description | (0032,1060) | 2, Sent as empty string | 2, copied from MWL request |
| >Scheduled Procedure Step ID | (0040,0009) | 2, Sent as empty string | 2, copied from MWL request |
| >Scheduled Procedure Step Description | (0040,0007) | 2, Sent as empty string | 2, copied from MWL request |
| >Scheduled Protocol Code Sequence | (0040,0008) | 2, Sent as empty SQ | 2, filled from first valid item from MWL request, contains only 1 item |
| >>Code Value | (0008,0100) | N/A | 1, filled from first valid item from MWL request |
| >>Coding Scheme Designator | (0008,0102) | N/A | 1, filled from first valid item from MWL request |
| >>Coding Scheme Version | (0008,0103) | N/A | 3, filled from first valid item from MWL request, |
| >>Code Meaning | (0008,0104) | N/A | 3, filled from first valid item from MWL request. If value is missing in MWL request, filled by Code Value (0008,0100). |
| Patient's Name | (0010,0010) | 2, copied from value, manually entered in UI.<br>Always sent as non-empty value | 2, copied from MWL request.<br>Always sent as non-empty value, because MWL requests with missing Patient's Name are rejected by Product. |

| | | | |
|---|---|---|---|
| Patient ID | (0010,0020) | 2, copied from value, manually entered in UI.<br>Always sent as non-empty value | 2, copied from MWL request.<br>Always sent as non-empty value, because MWL requests with missing Patient ID are rejected by Product. |
| Issuer of Patient ID | (0010,0021) | 3, Not sent | 3, Not sent |
| Issuer of Patient ID Qualifiers Sequence | (0010,0024) | 3, Not sent | 3, Not sent |
| Patient's Birth Date | (0010,0030) | 2, copied from value, manually entered in UI or sent as empty if no input is provided | 2, copied from MWL request |
| Patient's Sex | (0010,0040) | 2, copied from value, manually entered in UI or sent as empty if no input is provided. | 2, copied from MWL request |
| Referenced Patient Sequence | (0008,1120) | 2, Always sent as empty SQ | 2, copied from MWL request or sent as empty SQ if no valid items present in this SQ in MWL request. |
| >Referenced SOP Class UID | (0008,1150) | N/A | 1, copied from MWL request or not sent if no valid items present in this SQ in MWL request. |
| >Referenced SOP Instance UID | (0008,1155) | N/A | 1, copied from MWL request or not sent if no valid items present in this SQ in MWL request. |
| Admission ID | (0038,0010) | 3, Not sent | 3, Not sent |
| Issuer of Admission ID | (0038,0011) | 3, Not sent | 3, Not sent |
| Issuer of Admission ID Sequence | (0032,0014) | 3, Not sent | 3, Not sent |
| Service Episode ID | (0038,0060) | 3, Not sent | 3, Not sent |
| Issuer of Service Episode ID | (0038,0061) | 3, Not sent | 3,Not sent |
| Service Episode Description | (0038,0062) | 3, Not sent | 3, Not sent |
| Issuer of Service Episode ID Sequence | (0038,0064) | 3, Not sent | 3, Not sent |

### 7.4.3 Performed Procedure Step Information Module

**TABLE 7-4**
**PERFORMED PROCEDURE STEP INFORMATION MODULE ATTRIBUTES**

| Attribute Name | Tag | Type for SCU N-CREATE | Type for SCU N-SET | Usage in MPPS Instance |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| Performed Procedure Step ID | (0040,0253) | 1 | - | Equipment generated identifier of the protocol carried out within this step. The PPS ID is unique within a study. For MWL scheduled protocols set with "W_" + <SPS ID>. For locally scheduled protocols set with "L_" + numbered id starting from 1 (L_1, L_2). |
| Performed Station AE Title | (0040,0241) | 1 | - | Local AE Title , taken from DICOM configuration. |
| Performed Station Name | (0040,0242) | 2 | - | User defined name identifying the machine that produced the composite instances<br>"Camera name" value taken from system configuration is used<br>Sent as empty string if it is not received from user input. |
| Performed Location | (0040,0243) | 2 | - | Address of the institution where the equipment that produced the composite instances is located.<br>"Institution Address" value taken from system configuration is used<br>Sent as empty string if it is not received from user input. |
| Performed Procedure Step Start Date | (0040,0244) | 1 | - | The date that the protocol (SPS) acquisition actually started (doesn't matter if the protocol originated from MWL or was locally scheduled) |
| Performed Procedure Step Start Time | (0040,0245) | 1 | - | The time that the protocol (SPS) acquisition actually started (doesn't matter if the protocol originated from MWL or was locally scheduled). |
| Performed Procedure Step Status | (0040,0252) | 1 | 3 | "COMPLETED" when operator presses "Protocol Completed" or when all the scans in the protocol are completed and session is closed.<br>"DISCONTINUED" when operator marks protocol as Discontinued. |
| Performed Procedure Step Description | (0040,0254) | 2 | 3 | The full path of the performed protocol name. E.g. Factory&Cardiology&One Day<br>Always sent as non-empty value |
| Performed Procedure Type Description | (0040,0255) | 2 | 3 | N-CREATE: Always sent as empty string<br>N-SET: Not sent |

| | | | | |
|---|---|---|---|---|
| Procedure Code Sequence | (0008,1032) | 2 | 3 | N-CREATE: Copied without change from Modality Worklist Requested Procedure Code Sequence (0032,1064) for Acquisition with MWL Entry in Simple or Appended Cases if the protocol originally matched from MWL was not changed. Otherwise sent as empty SQ.<br>N-SET: Copied from Images if presents, otherwise sent as empty SQ. |
| >Include 'Code Sequence Macro' | | | | |
| Performed Procedure Step End Date | (0040,0250) | 2 | 3 | N-CREATE: sent as empty<br>N-SET: Date when user chooses Complete or Discontinue action. |
| Performed Procedure Step End Time | (0040,0251) | 2 | 3 | N-CREATE: sent as empty<br>N-SET: Time when user chooses Complete or Discontinue action. |
| Comments on the Performed Procedure Step | (0040,0280) | 3 | 3 | User-defined comments on the Performed Procedure Step.<br>N-CREATE: Sent as empty string if no user input provided.<br>N-SET: not sent |
| Performed Procedure Step Discontinuation Reason Code Sequence | (0040,0281) | 3 | 3 | N-CREATE: sent as empty SQ<br>N-SET: if final state is DISCONTINUED, contains only 1 item with reason selected by patient from UI (see<br>Table 7-5 for list of supported reasons). Otherwise, sent as empty SQ. |

**TABLE 7-5**
**PERFORMED PROCEDURE DISCONTINUE REASONS**

| **Code Value (0008,0100)** | **Coding Scheme Designator (0008,0102)** | **Code Meaning (0008,0104) (Reason description )** |
|---|---|---|
| 110500 | DCM | Doctor cancelled procedure |
| 110511 | DCM | Nursing unit cancel |
| 110502 | DCM | Incorrect procedure ordered |
| 110509 | DCM | Change of procedure for correct charging |
| 110510 | DCM | Duplicate order |
| 110514 | DCM | Incorrect worklist entry selected |
| 110503 | DCM | Patient allergic to media/contrast |
| 110505 | DCM | Patient refused to continue procedure |
| 110515 | DCM | Patient condition prevented continuing |

| | | |
|---|---|---|
| 110506 | DCM | Patient taken for treatment or surgery |
| 110507 | DCM | Patient did not arrive |
| 110508 | DCM | Patient pregnant |
| 110504 | DCM | Patient died |
| 110501 | DCM | Equipment failure |
| 110516 | DCM | Equipment change |
| 110513 | DCM | Discontinued for unspecified reason |

### 7.4.4 Image Acquisition Results Module

**TABLE 7-6**
**IMAGE ACQUISITION RESULTS MODULE ATTRIBUTES**

| Attribute Name | Tag | Type for SCU N-CREATE | Type for SCU N-SET | Usage in MPPS Instance |
|---|---|---|---|---|
| Modality | (0008,0060) | 1 | - | For acquisitions with MWL: copied from MWL request<br>For unscheduled case: set to default value = NM |
| Study ID | (0020,0010) | 2 | - | User or equipment generated Study identifier.<br>Copied from Study Name entry of Study Info UI.<br>Always sent as non-empty value. |
| Performed Protocol Code Sequence | (0040,0260) | 2 | 3 | N-CREATE: Sent as empty SQ (Assisted Protocol Settings option is not supported)<br>N-SET : not sent |
| Performed Series Sequence | (0040,0340) | 2 | 3 | N-CREATE: sent as empty SQ<br>N-SET: always sent, may contain 1 or more items, one item for each series reported. |
| >Performing Physician's Name | (0008,1050) | 2 | 2 | Name of the physician(s) administering this Series.<br>Copied from Protocol Info UI. Sent as empty string if no user input provided. |
| >Protocol Name | (0018,1030) | 1 | 1 | User-defined description of the conditions under which the Series was performed.<br>The full path of the performed protocol name. E.g. Factory&Service&Static |
| >Operator's Name | (0008,1070) | 2 | 2 | Name(s) of the operator(s) supporting the Series Copied from user input.<br>Sent as empty string if no user input provided. |
| >Series Instance UID | (0020,000E) | 1 | 1 | Copied from image created |
| >Series Description | (0008,103E) | 2 | 2 | Copied from Image created |

| | | | | |
|---|---|---|---|---|
| >Retrieve AE Title | (0008,0054) | 2 | 2 | Always sent as empty string |
| > Archive Requested | (0040,A494) | 3 | 3 | Not Sent |
| >Referenced Image Sequence | (0008,1140) | 2 | 2 | May contain 1 or more items: one item for each image created within the series |
| >>Referenced SOP Class UID | (0008,1150) | 1 | 1 | May contain the following SOP Class UIDs:<br>Nuclear Medicine Image Storage - 1.2.840.10008.5.1.4.1.1.20<br>For Discovery NM/CT 670*, NM/CT 800* and Optima NM/CT 640 implementations may also contain:<br>CT Image Storage - 1.2.840.10008.5.1.4.1.1.2<br>Secondary Capture Image Storage – 1.2.840.10008.5.1.4.1.1.7 |
| >>Referenced SOP Instance UID | (0008,1155) | 1 | 1 | SOP Instance UID of image object created by PPS |
| >Referenced Non-Image Composite SOP Instance Sequence | (0040,0220) | 2 | 2 | For Discovery NM 630 and NM 830 implementations : always sent as empty SQ.<br>For Discovery NM/CT 670*,Optima NM/CT 640 and NM/CT 800* implementations:<br>• For Hybrid acquisitions may contain 1-n items, created for each CT Radiation Dose SR and for each CT Radiation Dose Secondary Capture.<br>• For non-hybrid acquisitions send as empty SQ. |
| >>Referenced SOP Class UID | (0008,1150) | 1 | 1 | Possible values:<br>1.2.840.10008.5.1.4.1.1.88.67 – X-Ray Radiation Dose SR SOP Class (for Optima NM/CT 640 implementation )<br>1.2.840.10008.5.1.4.1.1.88.22 – Enhanced SR SOP Class (For Discovery 670*,NM/CT 800* and Optima NM/CT 640 implementations)<br>1.2.840.10008.5.1.4.1.1.7 - Secondary Capture Image Storage SOP Class |
| >>Referenced SOP Instance UID | (0008,1155) | 1 | 1 | SOP Instance UID of Dose SR /Dose Secondary Capture object created by PPS. |

## 7.5 STANDARD EXTENDED AND PRIVATE DATA ATTRIBUTES

The Product does not support any of the Standard Extended and Private Attributes.

## 7.6 STANDARD EXTENDED AND PRIVATE CONTEXT GROUPS

The Product does not support any Standard Extended, Private, and Configurable Context Groups.

# 8. CT INFORMATION OBJECT IMPLEMENTATION

## 8.1 INTRODUCTION

This section specifies the use of the DICOM CT Image IOD to represent the information included in CT Images produced by Optima NM/CT 640 implementation. Corresponding attributes are conveyed using the module construct.

**Note:** **In this section term NM Camera AE DICOM implementation refers to Optima NM/CT 640 DICOM implementation.**

**For description of CT Images created by Discovery NM/CT 670*and NM/CT 870*implementations, refer to CT Scanner DICOM Conformance Statement (Reference A in Section 1.6).**

**For description of CT Images created by NM/CT 850 and NM/CT 860 implementations, refer to CT Scanner DICOM Conformance Statement (Reference B in Section 1.6).**

## 8.2 NM CAMERA MAPPING OF DICOM ENTITIES

NM Camera AE maps DICOM Information Entities to local Information Entities in the product's database and user interface.

**TABLE 8-1**
**MAPPING OF DICOM ENTITIES TO NM CAMERA ENTITIES**

| DICOM IE | NM Camera Entity |
|---|---|
| Patient | Patient |
| Study | Study |
| Series | Series |
| Image | Image |

## 8.3 IOD MODULE TABLE

The Computed Tomography Information Object Definition comprises the modules of the following table, plus Standard Extended and Private attributes. Standard Extended and Private attributes are described in Section 8.5.

**TABLE 8-2**
**CT 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 | NA |
| 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 |
| | Standard Extended Study | Used (same description as for NM IOD) | 3.4.2.3 |
| | Private Study | Used (same description as for NM IOD) | 3.4.2.4 |

| | | | |
|---|---|---|---|
| | Clinical Trial Study | Not Used | NA |
| Series | General Series | Used (same description as for NM IOD) | 3.4.3.1 |
| | Private Series | Used (same description as for NM IOD) | 3.4.3.4 |
| | Private CT Series | Used | 8.4.1.1 |
| | Clinical Trial Series | Not Used | NA |
| Frame of Reference | Frame of Reference | Used (same description as for NM IOD) | 3.4.4.1 |
| Equipment | General Equipment | Used (same description as for NM IOD) | 3.4.5.1 |
| Image | General Image | Used | 8.4.3.1 |
| | Image Plane | Used | 8.4.3.2 |
| | Image Pixel | Used | 8.4.3.3 |
| | Contrast/Bolus | Used for acquisitions which use contrast. | 8.4.3.4 |
| | Device | Not Used | NA |
| | Standard Extended Image | Used | 8.4.3.5 |
| | Private Image | Used(same description as for NM IOD) | 3.4.6.15 |
| | CT Image | Used | 8.4.3.6 |
| | Private CT Image | Used | 8.4.3.9 |
| | Overlay Plane | Not Used | NA |
| | VOI LUT | Used | 8.4.3.7 |
| | SOP Common | Used | 8.4.3.8 |

## 8.4 INFORMATION MODULE DEFINITIONS

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

The following modules are included to convey Enumerated Values, Defined Terms, and Optional Attributes supported. Type 1 & Type 2 Attributes are also included for completeness and to define what 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.

### 8.4.1 Series Entity Modules

#### 8.4.1.1 Private CT Series Module

**TABLE 8-3**
**PRIVATE CT SERIES MODULE ATTRIBUTES**

| Attribute Name | Tag | Private Creator ID | Attribute Description |
|---|---|---|---|
| Imagesets in Acquisition | (0037,xx91) | QUASAR_INTERNAL_USE | Number of Imagesets created by specific scan and stored within the Series. |

### 8.4.2 Frame Of Reference Entity Modules

#### 8.4.2.1 Frame Of Reference Module

**TABLE 8-4**
**FRAME OF REFERENCE MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | Attribute Description |
|---|---|---|---|
| Frame of Reference UID | (0020,0052) | 1 | See 3.4.4.1 for further explanation. |
| Position Reference Indicator | (0020,1040) | 2 | See 3.4.4.1 for further explanation. |

### 8.4.3 Image Entity Modules

#### 8.4.3.1 General Image Module

**TABLE 8-5**
**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 |
| 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 8.4.3.6.1 |
| 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 |
| Images in Acquisition | (0020,1002) | 3 | Number of images expected to be created by scan.<br>Always sent. |
| Quality Control Image | (0028,0300) | 3 | Indicates whether or not this image is a quality control or phantom image. Enumerated Values:<br>YES<br>NO<br>Always sent. |

#### 8.4.3.2 Image Plane Module

**TABLE 8-6**
**IMAGE PLANE MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | Attribute Description |
|---|---|---|---|
| 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 (*).<br>Possible values: 2.5, 5 or 10 mm<br>Always sent. |
| Slice Location | (0020,1041) | 3 | Relative position of the image plane expressed in mm.<br>Explains the relationship of this value to the table and gantry (i.e. define the implementation specific reference point), and to the values in Image Orientation (Patient) (0020,0037) and Image Position (Patient) (0020,0032).<br>Z is relative to reference point (=Landmark), which for the time being is the zero coordinate on pallet. Currently is equal to Z value of Image Position.<br>Always sent. |

***Note 1 : (*) -*** *Attributes copied from the user input*

#### 8.4.3.3 Image Pixel Module

**TABLE 8-7**
**IMAGE PIXEL MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | Attribute Description |
|---|---|---|---|
| Samples per Pixel | (0028,0002) | 1 | See 8.4.3.5 for CT Images |
| Photometric Interpretation | (0028,0004) | 1 | See 8.4.3.5 for CT 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 8.4.3.5 for CT Images |
| Bits Stored | (0028,0101) | 1 | See 8.4.3.5 for CT Images |
| High Bit | (0028,0102) | 1 | See 8.4.3.5 for CT 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 |

***Note 1 : (*) -*** *Attributes copied from the user input*

#### 8.4.3.4 Contrast/Bolus Module

**TABLE 8-8**
**CONTRAST/BOLUS MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | Attribute Description |
|---|---|---|---|
| Contrast/Bolus Agent | (0018,0010) | 2 | Contrast or bolus agent (*)<br>Sent as empty string if no user input is provided. |
| Contrast/Bolus Route | (0018,1040) | 3 | Administration route of contrast agent (*)<br>Sent as empty string if no user input is provided.<br>Possible values:<br>• ORAL<br>• IV<br>• ORAL and IV |

***Note 1 : (*) -*** *Attributes copied from the user input*

#### 8.4.3.5 Standard Extended Image Module

**TABLE 8-9**
**STANDARD EXTENDED IMAGE MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | Attribute Description |
|---|---|---|---|
| Counts Accumulated | (0018,0070) | 3 | Total counts in the pixel data |
| Spacing Between Slices | (0018,0088) | 3 | Spacing between slices, in mm. The spacing is measured from the center-to-center of each slice. (*)<br>Sent, if Image Type (0008,0008) Value 3 is AXIAL. |
| Table Traverse | (0018,1131) | 3 | Table Traverse (*) |

***Note 1 : (*) -*** *Attributes copied from the user input*

#### 8.4.3.6 CT Image Module

**TABLE 8-10**
**CT IMAGE MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | Use |
|---|---|---|---|
| Image Type | (0008,0008) | 1 | See 8.4.3.6.1 |
| Samples per Pixel | (0028,0002) | 1 | Shall be 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 b in relationship between stored values (SV) and the output units.<br>Output units = m*SV+b<br>If Image Type (0008,0008) Value 1 is ORIGINAL and Value 3 is not LOCALIZER, output units shall be Hounsfield Units (HU).<br>If Image Type (0008,0008) Value 3 is AXIAL , sent as -1000<br>If Image Type (0008,0008) Value 3 is LOCALIZER, sent as 0 |
| Rescale Slope | (0028,1053) | 1 | m in the equation specified in Rescale Intercept (0028,1052).<br>Always sent as 1 |
| Rescale Type | (0028,1054) | 1C | Specifies the output units of Rescale Slope (0028,1053) and Rescale Intercept (0028,1052).<br>If Image Type (0008,0008) Value 3 is AXIAL , sent as HU<br>If Image Type (0008,0008) Value 3 is LOCALIZER, sent as US |
| KVP | (0018,0060) | 2 | Peak kilo voltage output of the x-ray generator used. (*)<br>Possible Values: 120,140 |
| Acquisition Number | (0020,0012) | 2 | A number identifying the single continuous gathering of data over a period of time which resulted in this image. |
| Scan Options | (0018,0022) | 3 | Parameters of scanning sequence.<br>Defined Terms:<br>HELICAL SCAN<br>AXIAL SCAN<br>STATIC SCAN<br>SCOUT SCAN<br>Always sent as non-empty value. |
| Data Collection Diameter | (0018,0090) | 3 | The diameter in mm of the region over which data were collected. See 8.4.3.6.2<br>Sent If Image Type (0008,0008) Value 3 is AXIAL.<br>Default value = 500 |

| | | | |
|---|---|---|---|
| Data Collection Center (Patient) | (0018,9313) | 3 | The x, y, and z coordinates (in the patient coordinate system) in mm of the center of the region in which data were collected. See 8.4.3.6.2<br>Sent, if Image Type (0008,0008) Value 3 is AXIAL.<br>The following values are used:<br>x is 0,<br>y is 0<br>z defines Table Coordinate of Center. |
| Reconstruction Diameter | (0018,1100) | 3 | Diameter in mm of the region from within which data were used in creating the reconstruction of the image. See 8.4.3.6.2<br>Sent, if Image Type (0008,0008) Value 3 is AXIAL. (*)<br>Default Value is 500. |
| Reconstruction Target Center (Patient) | (0018,9318) | 3 | The x, y, and z coordinates (in the patient coordinate system) of the reconstruction center target point as used for reconstruction in mm. See 8.4.3.6.2<br>Sent, if Image Type (0008,0008) Value 3 is AXIAL.<br>The following values are used:<br>x defines A/P OFF CENTER, default value is 0<br>y defines R/L OFF CENTER, default value is 0<br>z defines Table Coordinate of Center, equal to the Z value of (0018,9313) - Data Collection Center (Patient) . |
| Distance Source to Detector | (0018,1110) | 3 | Distance in mm from source to detector<br>center. See 8.4.3.6.2<br>Always sent<br>Possible Value: 949 mm |
| Distance Source to Patient | (0018,1111) | 3 | Distance in mm from source to iso-center (center of field of view). See 8.4.3.6.2<br>Always sent<br>Possible Value: 541 mm |
| Gantry/Detector Tilt | (0018,1120) | 3 | Nominal angle of tilt in degrees of the scanning gantry.<br>Sent, if Image Type (0008,0008) Value 3 is AXIAL.<br>The value used: 0. |
| Table Height | (0018,1130) | 3 | The distance in mm of the top of the patient table to the center of rotation;(*).<br>Always sent. |

| | | | |
|---|---|---|---|
| Rotation Direction | (0018,1140) | 3 | Direction of rotation of the source when relevant, about nearest principal axis of equipment.<br>Enumerated Values:<br>CW = clockwise<br>Sent, if Image Type (0008,0008) Value 3 is AXIAL. |
| Exposure Time | (0018,1150) | 3 | Time of x-ray exposure in msec.<br>Always sent . |
| X-ray Tube Current | (0018,1151) | 3 | X-Ray Tube Current in mA.(*)<br>Always sent.<br>May vary per slice, if Image Type (0008,0008) Value 3 is AXIAL and Exposure Modulation Type (0018,9323) is AUTO_MA |
| Exposure | (0018,1152) | 3 | The exposure expressed in mAs, for example calculated from Exposure Time and X-Ray Tube Current.<br>Always sent.<br>Calculated as<br>X-Ray Tube Current *(Exposure Time/1000)<br>May vary per slice, if Image Type (0008,0008) Value 3 is AXIAL and Exposure Modulation Type is AUTO_MA |
| Filter Type | (0018,1160) | 3 | Label for the type of filter inserted into the x-ray beam.<br>Always sent.<br>Possible value : BOWTIE |
| Generator Power | (0018,1170) | 3 | Power in kW to the x-ray generator.<br>Always sent.<br>Calculated as :<br>(KVP* Tube Current/1000) |
| Focal Spot | (0018,1190) | 3 | Size of the focal spot in mm.<br>Always sent as pair :<br>Focal Spot width \Focal Spot length<br>Possible values:<br>Focal Spot width: 0.6 mm<br>Focal Spot length: 0.8 mm |

| | | | |
|---|---|---|---|
| Convolution Kernel | (0018,1210) | 3 | A label describing the convolution kernel or algorithm used to reconstruct the data. (*)<br>Always sent, if Image Type (0008,0008) Value 3 is AXIAL.<br>Possible values:<br>• Standard<br>• Bone<br>• Smooth<br>• Detailed |
| Revolution Time | (0018,9305) | 3 | The time in seconds of a complete revolution of the source around the gantry orbit.<br>Sent, if Image Type (0008,0008) Value 3 is AXIAL.(*)<br>Possible values: 1or 2 sec |
| Single Collimation Width | (0018,9306) | 3 | The width of a single row of acquired data (in mm).<br>Always sent.<br>Possible value: 2.5 mm |
| Total Collimation Width | (0018,9307) | 3 | The width of the total collimation (in mm) over the area of active x-ray detection. Note: This will be equal the number of effective detector rows multiplied by single collimation width.<br>Always sent.<br>Possible value: 10 mm |
| Table Speed | (0018,9309) | 3 | The distance in mm that the table moves in one second during the gathering of data that resulted in this image.<br>Sent if Image Type (0008,0008) Value 3 is AXIAL and Scan Options (0018,0022) is HELICAL SCAN or Image Type (0008,0008) Value 3 is LOCALIZER<br>If Image Type (0008,0008) Value 3 is LOCALIZER, possible value is 100 mm/sec |
| Table Feed per Rotation | (0018,9310) | 3 | Motion of the table (in mm) during a complete revolution of the source around the gantry orbit.<br>Sent, if Image Type (0008,0008) Value 3 is AXIAL and Scan Options (0018,0022) is HELICAL SCAN.<br>Calculated as :<br>Spiral Pitch Factor*Total Collimator Width |

| | | | |
|---|---|---|---|
| Spiral Pitch Factor | (0018,9311) | 3 | Ratio of the Table Feed per Rotation (0018,9310) to the Total Collimation Width (0018,9307).<br>Sent, if Image Type (0008,0008) Value 3 is AXIAL and Scan Options (0018,0022) is HELICAL SCAN. (*)<br>Possible values: 0.75 1.25, 1.75 |
| Exposure Modulation Type | (0018,9323) | 3 | A label describing the type of exposure modulation used for the purpose of limiting the dose.<br>Defined Terms:<br>NONE<br>AUTO_MA<br>Sent, if Image Type (0008,0008) Value 3 is AXIAL.(*) |
| Estimated Dose Saving | (0018,9324) | 3 | A percent value of dose saving due to the use of Exposure Modulation Type (0018,9323). A negative percent value of dose savings reflects an increase of exposure.<br>Sent, if Image Type (0008,0008) Value 3 is AXIAL.<br>Sent as 0 if Exposure Modulation Type is NONE |
| CTDIvol | (0018,9345) | 3 | Computed Tomography Dose Index<br>(CTDIvol), in mGy. It describes the average dose for this image for the selected CT conditions of operation.<br>Sent, if Image Type (0008,0008) Value 3 is AXIAL.<br>May vary per slice, if Exposure Modulation Type is AUTO_MA |
| CTDI Phantom Type Code Sequence | (0018,9346) | 3 | The type of phantom used for CTDI Measurement. Only a single Item shall be permitted in this Sequence.<br>Sent, if Image Type (0008,0008) Value 3 is AXIAL. |
| >*Include Code Sequence Macro* | DCID (4052) Phantom Devices is supported<br>The following values are used:<br>(DCM, 113690,IEC Head Dosimetry Phantom)<br>(DCM, 113691, IEC Body Dosimetry Phantom) | | |

***Note 1 : (*) -*** *Attributes copied from the user input*

#### 8.4.3.6.1 Image Type

The following Enumerated Values of Value 1 are created:

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

The following Enumerated Values of Value 2 are created:

- PRIMARY identifies a Primary Image

The following Defined Terms of Value 3 are created:

- AXIAL identifies a CT Axial Image
- LOCALIZER identifies a CT Localizer Image

#### 8.4.3.6.2 Relationships Between CT Geometric Attributes

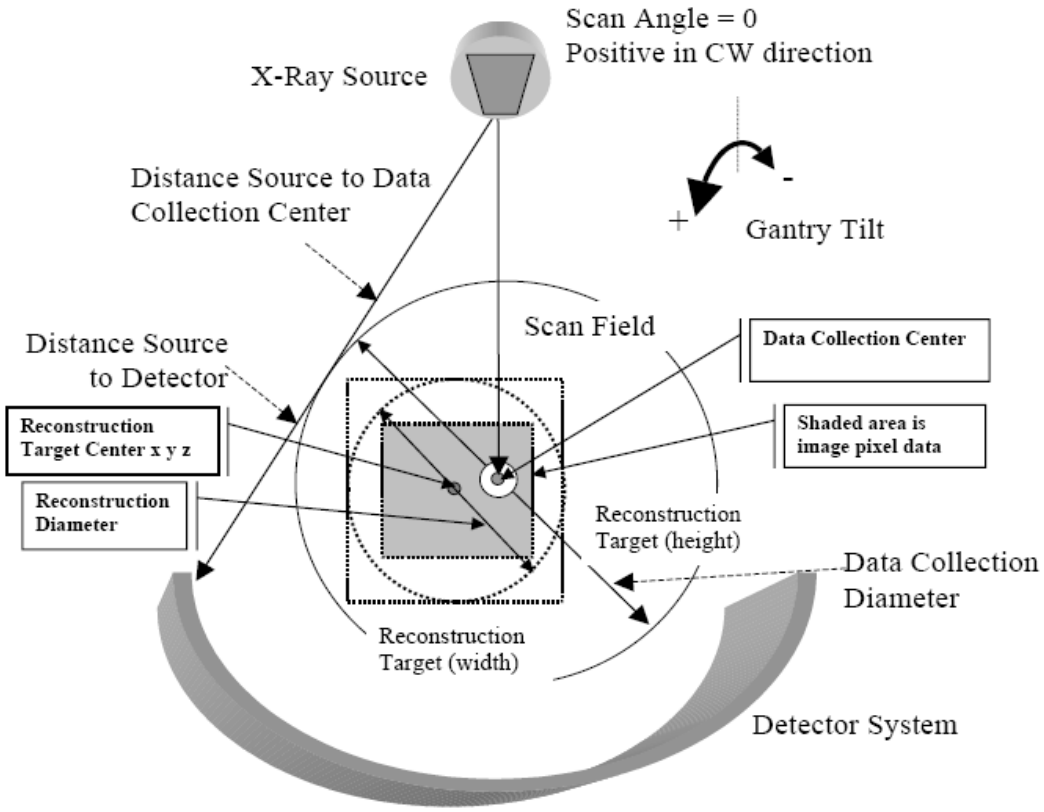



Figure C.8-19: Geometry of CT Acquisition System

### 8.4.3.7 VOI LUT module

TABLE 8-11
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.(*)<br>Sent as 40, if Image Type (0008,0008) Value 3 is AXIAL<br>Sent as 440, if Image Type (0008,0008) Value 3 is LOCALIZER<br>Always sent<br>Derived from protocol defined preset values. |
| Window Width | (0028,1051) | 1C | Window Width for display. Only single value is present.(*)<br>Sent as 400, if Image Type (0008,0008) Value 3 is AXIAL<br>Sent as 1100, if Image Type (0008,0008) Value 3 is LOCALIZER<br>Always sent<br>Derived from protocol defined preset values. |

***Note 1 : (*) -*** *Attributes copied from the user input*

#### 8.4.3.8 SOP Common Module

**TABLE 8-12**
**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 1.2.840.10008.5.1.4.1.1.2 |
| SOP Instance UID | (0008,0018) | 1 | Uniquely identifies the SOP Instance. Internally generated. |
| Specific Character Set | (0008,0005) | 1C | Character Set that expands or replaces the Basic Graphic Set.<br>Defined Terms include for locally created images:<br>ISO_IR 100 = Latin Alphabet No. 1<br>For images created from MWL, the value is copied from value provided in MWL, if not empty, otherwise ISO_IR 100 is used. Always included into image |
| Instance Number | (0020,0013) | 3 | See 3.4.6.1 for more specialization |

#### 8.4.3.9 Private CT Image Module

**TABLE 8-13**
**PRIVATE CT IMAGE MODULE ATTRIBUTES**

| Attribute Name | Tag | Private Creator ID | Attribute Description |
|---|---|---|---|
| ImagesetSOPInstanceUID | (0009,xx46) | GEMS_GENIE_1 | UID of CT Imageset. Shared for CT slices dedicated to be joined in one dataset on Xeleris database |

| | | | |
|---|---|---|---|
| Dataset UID | (0009,xx1E) | GEMS_GENIE_1 | UID of Dataset object in Xeleris WS database.<br>Always equal to value of (0009,xx46) ImagesetSOPInstanceUID |
| ACGroup | (0037,xx80) | QUASAR_INTERNAL_USE | Defines AC CT ImageSet(s)<br>Contains Number of AC Group (1,2,etc) for AC ImageSet, for all other Imagesets contains -1<br>Sent, if Image Type (0008,0008) Value 3 is AXIAL. |
| ScanDirection | (0037,xx81) | QUASAR_INTERNAL_USE | Scan direction.<br>Possible values:<br>TO_HEAD<br>TO_FEET |
| ScanRange | (0037,xx82) | QUASAR_INTERNAL_USE | Range exposed to X-ray, in mm<br>Always sent |
| BreathingTime | (0037,xx83) | QUASAR_INTERNAL_USE | Breathing Time in seconds (*)<br>Value -1 means that Breathing Time is not defined for the scan.<br>Always sent |
| BreathholdTime | (0037,xx84) | QUASAR_INTERNAL_USE | Breathhold Time in seconds (*).<br>Value -1 means that Breathhold Time is not defined for the scan<br>Always Sent |
| BreathHoldFlag | (0037,xx85) | QUASAR_INTERNAL_USE | Defines, if Imageset is acquired during breathhold time (*).<br>Possible Values:<br>TRUE, FALSE<br>Always sent |
| Acquisition Parent UID (CT) | (0031, xx02) | GEHC_HYBRID_01 | Shared by all images created by same Hybrid scan. Equal to Acquisition Parent UID (0011,xx31) GEMS_GENIE_1 tag value if it exists.<br>Also used for correct registration.<br>For more details about NM/CT registration refer to Frame Of Reference, Section 3.4.4.1 |

Note 1 : (*) - Attributes copied from the user input

## 8.5 STANDARD EXTENDED AND PRIVATE DATA ATTRIBUTES

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

### 8.5.1 Standard Attributes

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

**TABLE 8-14**
**STANDARD EXTENDED ATTRIBUTES**

| Information Entity Name | Attribute Name | Tag | Use |
|---|---|---|---|
| Study | Allergies | (0010,2110) | Description of prior reaction to contrast agents, or other patient allergies or adverse reactions. |
| | Pregnancy Status | (0010,21C0) | Describes pregnancy state of patient Enumerated Values:<br>0001 = not pregnant<br>0002 = possibly pregnant<br>0003 = definitely pregnant<br>0004 = unknown |
| | Requested Procedure Comments | (0040,1400) | Study notes |
| Image | Counts Accumulated | (0018,0070) | Total counts in pixel data |
| | Spacing Between Slices | (0018,0088) | Spacing between slices, in mm. The spacing is measured from the center-to-center of each slice. |
| | Table Traverse | (0018,1131) | Table Traverse |

### 8.5.2 Private Group GEMS_GENIE_1

**TABLE 8-15**
**PRIVATE GROUP PRIVATE GROUP GEMS_GENIE_1**

| Attribute Name | Tag | VR | VM | Attribute Description and Use |
|---|---|---|---|---|
| Private Creator Identification | (0009,00xx) | LO | 1 | GEMS_GENIE_1 |
| Imageset SOP Instance UID | (0009,xx46) | UI | 1 | UID of CT ImageSet. Shared for CT slices dedicated to be joined in one dataset on Xeleris database |
| Dataset UID | (0009,xx1E) | UI | 1 | UID of Dataset object in Xeleris WS database. |

### 8.5.3 Private Group QUASAR_INTERNAL_USE

**TABLE 8-16**
**PRIVATE GROUP QUASAR_INTERNAL_USE**

| Attribute Name | Tag | VR | VM | Attribute Description and Use |
|---|---|---|---|---|
| Private Creator Identification | (0037,00xx) | LO | 1 | QUASAR_INTERNAL_USE |
| AC Group | (0037,xx80) | IS | 1 | Defines AC CT ImageSet(s) |
| Scan Direction | (0037,xx81) | CS | 1 | Scan direction. |
| Scan Range | (0037,xx82) | DS | 1 | Range exposed to X-ray, in mm |
| Breathing Time | (0037,xx83) | IS | 1 | Breathing Time in seconds |
| Breathhold Time | (0037,xx84) | IS | 1 | Breathhold Time in seconds. |
| BreathHoldFlag | (0037,xx85) | CS | 1 | Defines, if Imageset is acquired during breathhold time |
| Imagesets in Acquisition | (0037,xx91) | IS | 1 | Number of Imagesets created by specific scan and stored within the Series. |

### 8.5.4 Private Group GEHC_HYBRID_01

**TABLE 8-17**
**PRIVATE GROUP GEHC_HYBRID_01**

| Attribute Name | Tag | VR | VM | Attribute Description and Use |
|---|---|---|---|---|
| Acquisition Parent UID (CT) | (0031, xx02) | UI | 1 | Shared by all images created by same Hybrid scan. Equal to Acquisition Parent UID (0011,xx31) GEMS_GENIE_1 tag value if it exists.<br>Used for correct registration. |

# 9. CT RADIATION DOSE STRUCTURED REPORT INFORMATION OBJECT IMPLEMENTATION

## 9.1 INTRODUCTION

This section specifies the use of the DICOM CT Radiation Dose SR IOD to represent results produced by Optima NM/CT 640 DICOM implementation. Corresponding attributes are conveyed using the module construct.

**Note:** **In this section term NM Camera AE DICOM implementation refers to Optima NM/CT 640 DICOM implementation.**

## 9.2 NM CAMERA MAPPING OF DICOM ENTITIES

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

**TABLE 9-1**
**MAPPING OF DICOM ENTITIES TO NM CAMERA ENTITIES**

| DICOM IE | NM Camera Entity |
|---|---|
| Patient | Patient |
| Study | Study |
| Series | Series |
| Document | Report |

### 9.2.1 IOD Module Table

The CT Radiation Dose Structured Report Information Object Definitions comprise the modules of the following tables plus Standard Extended and Private Attributes. Standard Extended and Private Attributes are described in Section 9.4

The contents of the SR Document Content are constrained by the supported template, as identified in Section 9.3.3.2.1.1. Standard, Standard Extended and Private Templates are further described in Section 9.6.

**TABLE 9-2**
**STRUCTURE REPORT 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 |
| 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 |
| | Standard Extended Study | Used (same description as for NM IOD) | 3.4.2.3 |
| | Private Study | Used (same description as for NM IOD) | 3.4.2.4 |

| | | | |
|---|---|---|---|
| | Clinical Trial Study | Not Used | N/A |
| Series | SR Document Series | Used | 9.3.1.1 |
| | Standard Extended Series | Used | 9.3.1.2 |
| | Private Series | Used | 9.3.1.3 |
| | Clinical Trial Series | Not Used | N/A |
| Frame Of Reference | Synchronization | Not Used | N/A |
| Equipment | General Equipment | Used (same description as for NM IOD) | 3.4.5.1 |
| | Enhanced General Equipment | Used | 9.3.2.1 |
| Document | SR Document General | Used | 9.3.3.1 |
| | SR Document Content | Used | 9.3.3.2 |
| | Standard Extended SR Document | Used | 9.3.3.3 |
| | Private SR Document | Used | 9.3.3.4 |
| | SOP Common | Used | 9.3.3.5 |

## 9.3 INFORMATION MODULE DEFINITIONS

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

The following modules are included to convey Enumerated Values, Defined Terms, and Optional Attributes supported. 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 which are not presented in tables are not supported.

### 9.3.1 Series Entity Modules

#### 9.3.1.1 SR Document Series Module

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

| Attribute Name | Tag | Type | Use |
|---|---|---|---|
| Modality | (0008,0060) | 1 | Defined Terms used for data created on this system:<br>Value = SR |
| Series Instance UID | (0020,000E) | 1 | Internally generated unique identifier of the Series. |
| Series Number | (0020,0011) | 1 | A number that identifies this Series.<br>Internally generated<br>Default Value = 1 |

| | | | |
|---|---|---|---|
| Series Description | (0008,103E) | 3 | Description of the Series. Always sent.<br>Default value CT Radiation Dose Report |
| Series Date | (0008,0021) | 3 | Date the Series started |
| Series Time | (0008,0031) | 3 | Time the Series started. |
| Referenced Performed Procedure Step Sequence | (0008,1111) | 2 | Uniquely identifies the Performed Procedure Step SOP Instance to which the Series is related. The sequence has exactly 1 item. Sequence is added to all image(s) created by system. |
| >Referenced SOP Class UID | (0008,1150) | 1 | Set to 1.2.840.10008.3.1.2.3.3 |
| >Referenced SOP Instance UID | (0008,1155) | 1 | Uniquely identifies the referenced SOP Instance. Internally generated. |

#### 9.3.1.2 Standard Extended Series Module

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

| Attribute Name | Tag | Type | Attribute Description |
|---|---|---|---|
| Performing Physicians' Name | (0008,1050) | 3 | Name of the physician(s) administering this Series. (*)(**)<br>Sent as empty string if no user input provided. |
| Protocol Name | (0018,1030) | 3 | User-defined description of the conditions under which the Series was performed.<br>The full path of the performed protocol name. E.g. Factory&Service&Static<br>Always sent with non-empty value. |
| Request Attributes Sequence | (0040,0275) | 3 | Sequence that contains attributes from the Imaging Service Request. The sequence has exactly 1 item. Used when Series as created as result of MWL request, not sent otherwise. |
| >Requested Procedure ID | (0040,1001) | 3 | Identifier that identifies the Requested Procedure in the Imaging Service Request.(*) |
| >Accession Number | (0008,0050) | 3 | A RIS generated number that identifies the order for the Study(*)<br>May be updated by user manually. |
| >Study Instance UID | (0020,000D) | 3 | Unique identifier for the Study. (*) (***) |
| >Referenced Study Sequence | (0008,1110) | 3 | Uniquely identifies the Study SOP Instances associated with this SOP Instance. The sequence has exactly 1 item. (*) (***) |
| *>> Include 'SOP Instance Reference Macro'* | | | |
| >Requested Procedure Description | (0032,1060) | 3 | Institution-generated administrative description or classification of Requested Procedure. (*)(***) |
| >Scheduled Procedure Step ID | (0040,0009) | 3 | Identifier that identifies the Scheduled Procedure Step. (*) (***) |

| | | | |
|---|---|---|---|
| >Scheduled Procedure Step Description | (0040,0007) | 3 | Institution-generated description or classification of the Scheduled Procedure Step to be performed. (*) (***) |
| >Scheduled Protocol Code Sequence | (0040,0008) | 3 | Sequence describing the Scheduled Protocol following a specific coding scheme. (*) (***)<br>The sequence has exactly 1 item.<br>If MWL request contains more than 1 item, only the first valid item is copied. |
| >>Include 'Code Sequence Macro' | | | |
| Performed Procedure Step ID | (0040,0253) | 3 | Equipment generated identifier of the protocol carried out within this step. The PPS ID is unique within a study. For MWL scheduled protocols set with W_ + <SPS ID>. For locally scheduled protocols set with L_ + numbered id starting from 1 (L_1, L_2).<br>Sent as empty string for QC protocols.<br>Always sent. |
| Performed Procedure Step Start Date | (0040,0244) | 3 | The date that the protocol (SPS) acquisition actually started (doesn't matter if the protocol originated from MWL or was locally scheduled). A locally scheduled protocol is an SPS that is created/added in the camera.<br>Always sent. |
| Performed Procedure Step Start Time | (0040,0245) | 3 | The time that the protocol (SPS) acquisition actually started (doesn't matter if the protocol originated from MWL or was locally scheduled). A locally scheduled protocol is an SPS that is created/added in the camera.<br>Always sent |
| Performed Procedure Step Description | (0040,0254) | 3 | The full path of the performed protocol name. E.g. Factory&Cardiology&One Day<br>Always sent |

***Note 1 : (*)*** *– Attributes copied from the Worklist if the study source was actually copied from a Worklist query result (if available).*

***Note 2 : (**)*** *– Attributes copied from the user input for Locally scheduled Protocols*

***Note 3 : (***)*** *– Cannot be modified by user if received from MWL*

#### 9.3.1.3 Private Series Module

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

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

| | | | |
|---|---|---|---|
| Protocol Scheduled Date | (0009,xx40) | QUASAR_INTERNAL_USE | Protocol Scheduled Date (*).<br>Taken from the SPS Start date of the first SPS in the study – Tag (0040,0002).<br>For QC scans – sent as ZERO Length<br>Always sent |
| Protocol Scheduled Time | (0009,xx41) | QUASAR_INTERNAL_USE | Protocol Scheduled Time (*)<br>Taken from the SPS Start time of the first SPS in the study – Tag (0040,0003).<br>For QC scans – sent as ZERO Length.<br>Always sent |
| Matched protocol | (0009,xx43) | QUASAR_INTERNAL_USE | For Worklist items. The originally matched protocol vs. protocol name which is the protocol actually acquired.<br>Not sent for locally scheduled protocols. |
| Private SPS ID | (0009,xx44) | QUASAR_INTERNAL_USE | Defines protocols that were appended to the original MWL protocol.<br>Contains SPS ID of original MWL Protocol.<br>Sent empty for images of locally scheduled protocols and appended to originally locally scheduled protocols. |
| Pre-Medication | (0009,xx45) | QUASAR_INTERNAL_USE | Keeps the Pre-Medication as appears in the To-Do list (*) (**)<br>Sent as empty string if not received from user input. |

***Note 1 : (****) – Attributes copied from the Worklist if the study source was actually copied from a Worklist query result (if available).*

***Note 2 : (****) – Attributes copied from the user input for Locally scheduled Protocols*

### 9.3.2 Equipment Entity Modules

#### 9.3.2.1 Enhanced General Equipment Module

**TABLE 9-6**
**ENHANCED GENERAL EQUIPMENT MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | Attribute Description |
|---|---|---|---|
| Manufacturer | (0008,0070) | 1 | Manufacturer of the equipment that produced the composite instances.<br>Default Value GE MEDICAL SYSTEMS |
| Manufacturer's Model Name | (0008,1090) | 1 | Manufacturer's model name of the equipment that produced the composite instances.<br>Set to Tandem_Optima_640 for Optima NM/CT 640 implementation |
| Device Serial Number | (0018,1000) | 1 | Manufacturer's serial number of the equipment that produced the composite instances.<br>Always taken from system configuration. |

| | | | |
|---|---|---|---|
| Software Versions | (0018,1020) | 1 | Manufacturer's designation of software version of the equipment that produced the composite instances<br>Contains Software/Hardware versions of current release e.g. 1.003.429.0\HARDWARE_VERSION_1 |

### 9.3.3 Document Entity Modules

#### 9.3.3.1 SR Document General Module

**TABLE 9-7**
**SR DOCUMENT GENERAL MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | Use |
|---|---|---|---|
| Instance Number | (0020,0013) | 1 | A number that identifies this document.<br>Default Value = 1 |
| Completion Flag | (0040,A491) | 1 | Enumerated Value used:<br>COMPLETE = Complete content. |
| Verification Flag | (0040,A493) | 1 | Enumerated Values:<br>UNVERIFIED = Not attested to. |
| Completion Flag Description | (0040,A492) | 3 | Explanation of the value sent in Completion Flag (0040,A491). |
| Content Date | (0008,0023) | 1 | The date of the document creation. |
| Content Time | (0008,0033) | 1 | The time of the document creation. |
| Verifying Observer Sequence | (0040,A073) | 1C | Not sent. |
| Referenced Request Sequence | (0040,A370) | 1C | Not sent |
| Performed Procedure Code Sequence | (0040,A372) | 2 | A Sequence that conveys the codes of the performed procedures pertaining to this SOP Instance. Always contains 0 Items. |
| Current Requested Procedure Evidence Sequence | (0040,A375) | 1C | Not Sent |
| Pertinent Other Evidence Sequence | (0040,A385) | 1C | Not Sent |
| Referenced Instance Sequence | (0008,114A) | 1C | Not Sent |

#### 9.3.3.2 SR Document Content Module

**TABLE 9-8**
**SR DOCUMENT CONTENT MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | Use |
|---|---|---|---|
| Value Type | (0040,A040) | 1 | The type of the value encoded in this Content Item.<br>Defined Term used:<br>CONTAINER |

| | | | |
|---|---|---|---|
| Concept Name Code Sequence | (0040,A043) | 1C | Code describing the concept represented by this Content Item.<br>Only a single Item is included in this sequence. |
| *>Include 'Code Sequence Macro'* | | | EV (113701, DCM,X-Ray Radiation Dose Report) |
| Continuity of Content | (0040,A050) | 1 | Enumerated Value used:<br>SEPARATE |
| Content Template Sequence | (0040,A504) | 1 | Template that describes the content of this Content Item and its subsidiary Content Items.<br>Only a single Item is included in this sequence |
| >Mapping Resource | (0008,0105) | 1 | Mapping Resource that defines the template. Defined Terms:<br>DCMR = DICOM Content Mapping Resource |
| >Template Identifier | (0040,DB00) | 1 | 10011 - CT Radiation Dose (9.3.3.2.1.1) |
| Observation DateTime | (0040,A032) | 1 | The date and time on which this Content Item was completed. Always sent. |
| Content Sequence | (0040,A730) | 1 | Provides the hierarchical structuring of the Content Tree by recursively nesting Content Items. A parent (or source) Content Item has an explicit relationship to each child (or target) Content Item, conveyed by the Relationship Type (0040,A010) attribute.<br>One or more Items may be included in this sequence. |
| > Relationship Type | (0040,A010) | 1 | Defined Term used:<br>CONTAINS<br>HAS CONCEPT MOD<br>HAS OBS CONTEXT |
| *> Insert SR Document Content Module* | | | Recursive inclusion to create document content tree.<br>See section 9.3.3.2.1 for the list of supported templates. |

#### 9.3.3.2.1 SR Document Content Descriptions

##### 9.3.3.2.1.1 Content Template

The product supports the following root Templates for SR SOP Instances created by the product.

**TABLE 9-9**
**SR ROOT TEMPLATES**

| SOP Class | Template ID | Template Name | Use |
|---|---|---|---|
| X-Ray Radiation Dose SR | 10011 | CT Radiation Dose | Create |

Refer to section 9.6 for a detailed description of the supported templates.

#### 9.3.3.3 Standard Extended SR Document Module

**TABLE 9-10**
**STANDARD EXTENDED DOSE SR MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | Attribute Description |
|---|---|---|---|
| Acquisition Date | (0008,0022) | 3 | The date of the irradiation event that resulted in this Dose SR started |
| Acquisition Time | (0008,0032) | 3 | The time of the irradiation event that resulted in this Dose SR started |
| Quality Control Image | (0028,0300) | 3 | Indicates whether or not this Dose report is created by a quality control procedure or not.<br>Enumerated Values:<br>YES<br>NO |

#### 9.3.3.4 Private SR Document Module

**TABLE 9-11**
**PRIVATE SR DOCUMENT MODULE ATTRIBUTES**

| Attribute Name | Tag | Private Creator ID | Attribute Description |
|---|---|---|---|
| Origin | (0009,xx12) | QUASAR_INTERNAL_USE | The origin of the image.”isworklist” if scheduled in MWL,” regular” if locally scheduled. |
| Image Type | (0009,xx1B) | QUASAR_INTERNAL_USE | Image type string as passed in the scan request<br>Always sent as “ct dose report” |
| Dataset Name | (0011,xx12) | GEMS_GENIE_1 | List of dataset names<br>Always sent as “X-Ray Radiation Dose Report” |
| Document XML | (0041,xx01) | QUASAR_INTERNAL_USE | XML representation of SR document used for DICOM object creation |

#### 9.3.3.5 SOP Common Module

**TABLE 9-12**
**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 1.2.840.10008.5.1.4.1.1.88.67 |
| SOP Instance UID | (0008,0018) | 1 | Uniquely identifies the SOP Instance. Internally generated. |
| Specific Character Set | (0008,0005) | 1C | Character Set that expands or replaces the Basic Graphic Set.<br>Defined Terms include for locally created images:<br>ISO_IR 100 = Latin Alphabet No. 1<br>For images created from MWL, the value is copied from value provided in MWL, if not empty, otherwise ISO_IR 100 is used. Always included into image |
| Instance Number | (0020,0013) | 3 | See 9.3.3.1 for more specialization |

## 9.4 STANDARD EXTENDED AND PRIVATE DATA ATTRIBUTES

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

### 9.4.1 Standard Attributes

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

**TABLE 9-13**
**STANDARD EXTENDED ATTRIBUTES**

| Information Entity Name | Attribute Name | Tag | Use |
|---|---|---|---|
| Study | Allergies | (0010,2110) | Description of prior reaction to contrast agents, or other patient allergies or adverse reactions. |
| | Pregnancy Status | (0010,21C0) | Describes pregnancy state of patient |
| | Requested Procedure Comments | (0040,1400) | Study notes |
| Series | Performing Physicians' Name | (0008,1050) | Name of the physician(s) administering this Series. |
| | Protocol Name | (0018,1030) | User-defined description of the conditions under which the Series was performed. |
| | Request Attributes Sequence | (0040,0275) | Sequence that contains attributes from the Imaging Service Request. |
| | Performed Procedure Step ID | (0040,0253) | Equipment generated identifier of the protocol carried out within this step. |
| | Performed Procedure Step Start Date | (0040,0244) | The date that the protocol (SPS) acquisition actually started (doesn't matter if the protocol originated from MWL or was locally scheduled). |
| | Performed Procedure Step Start Time | (0040,0245) | The time that the protocol (SPS) acquisition actually started (doesn't matter if the protocol originated from MWL or was locally scheduled). |
| | Performed Procedure Step Description | (0040,0254) | The full path of the performed protocol name. |
| SR Document | Acquisition Date | (0008,0022) | The date the acquisition of data that resulted in this image started |
| | Acquisition Time | (0008,0032) | The time the acquisition of data that resulted in this image started |
| | Counts Accumulated | (0018,0070) | Used as flag to display Dose SR in application Patient List |
| | Quality Control Image | (0028,0300) | Indicates whether or not this Dose report is created by a quality control procedure or not. |

### 9.4.2 Private Group QUASAR_INTERNAL_USE

Private Group QUASAR_INTERNAL_USE is modeled as part of the Document Information Entity.

**TABLE 9-14**
**PRIVATE GROUP QUASAR_INTERNAL_USE**

| Attribute Name | Tag | VR | VM | Attribute Description and Use |
|---|---|---|---|---|
| Private Creator Identification | (0009,0010) | LO | 1 | QUASAR_INTERNAL_USE |
| Origin | (0009,xx12) | LO | 1 | The origin of the image. |
| Image Type | (0009,xx1B) | LO | 1 | Image type string as passed in the scan request |
| Protocol Scheduled Date | (0009,xx40) | DA | 1 | Protocol Scheduled Date |
| Protocol Scheduled Time | (0009,xx41) | TM | 1 | Protocol Scheduled Time |
| Matched protocol | (0009,xx43) | LO | 1 | The originally matched protocol vs. protocol name which is the protocol actually acquired |
| Private SPS ID | (0009,xx44) | SH | 1 | Defines protocols that were appended to the original MWL protocol. Contains SPS ID of original MWL Protocol. |
| Pre-Medication | (0009,xx45) | LO | 1 | Keeps the Pre-Medication as appears in the To Do list |
| Private Creator Identification | (0041,0010) | LO | 1 | QUASAR_INTERNAL_USE |
| Document XML | (0041,xx01) | UT | 1 | XML representation of SR document used for DICOM object creation |

### 9.4.3 Private Group GEMS_GENIE_1

Private Group GEMS_GENIE_1 is modeled as part of the Document Information Entity.

**TABLE 9-15**
**PRIVATE GROUP GEMS_GENIE_1**

| Attribute Name | Tag | VR | VM | Attribute Description and Use |
|---|---|---|---|---|
| Private Creator Identification | (0011,0010) | LO | 1 | GEMS_GENIE_1 |
| Dataset Name | (0011,xx12) | LO | 1-n | List of Dataset names. |

## 9.5 STANDARD EXTENDED AND PRIVATE CONTEXT GROUPS

The Product does not support any Standard Extended, Private, and Configurable Context Groups

## 9.6 STANDARD, STANDARD EXTENDED AND PRIVATE TEMPLATES

The Product supports the Standard defined in the following sections. The product does not support any Standard Extended and Private Templates.

### 9.6.1 Standard Templates

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

#### 9.6.1.1 Template ID 10011 CT Radiation Dose

This template defines a container (the root) with subsidiary content items, each of which corresponds to a single CT X-Ray irradiation event entry.

There is a defined recording observer (the system or person responsible for recording the log, generally the system). Accumulated values shall be kept for a single CT scan, which is logical part of study workflow. Multiple CT Radiation Dose objects may be created for one Study.

**TID 10011**
**CT RADIATION DOSE**
**Type: Extensible Order: Significant**

| | NL | Rel with Parent | VT | Concept Name | VM | Req Type | Condition | Value Set Constraint |
|---|---|---|---|---|---|---|---|---|
| 1 | | | CONTAINER | EV (113701, DCM, X-Ray Radiation Dose Report) | 1 | M | | Always contains 1 item<br>(continuous type SEPARATE) |
| 2 | > | HAS CONCEPT MOD | CODE | EV (121058, DCM, Procedure reported) | 1 | M | | Possible values:<br>EV (P5-08000,SRT, Computed Tomography X-Ray) |
| 3 | >> | HAS CONCEPT MOD | CODE | EV (G-C0E8, SRT, Has Intent) | 1 | M | | DCID (3629) Procedure Intent<br>Possible values:<br>EV(R-408C3,SRT,Diagnostic Intent) |
| 4 | > | | INCLUDE | DTID (1002) Observer Context | 1-n | M | | See 9.6.1.2 |
| 5 | > | HAS OBS CONTEXT | DATETIME | EV (113809, DCM, Start of X-Ray Irradiation) | 1 | M | | Start, Date Time of the first CT Irradiation Event of the accumulation |
| 6 | > | HAS OBS CONTEXT | DATETIME | EV (113810, DCM, End of X-Ray Irradiation) | 1 | M | | End, Date Time of the last CT Irradiation Event of the accumulation |
| 7 | > | HAS OBS CONTEXT | CODE | EV (113705, DCM, Scope of Accumulation) | 1 | M | | DCID (10000) Scope of Accumulation<br>Possible values:<br>EV (113015,DCM,Series) |
| 8 | >> | HAS PROPERTIES | UIDREF | EV (112002,DCM,Series Instance UID) | 1 | M | | Series UID of CT Series created during acquisition. |
| 9 | > | CONTAINS | INCLUDE | DTID (10012) CT Accumulated Dose Data | 1 | M | | See 9.6.1.4 |
| 10 | > | CONTAINS | INCLUDE | DTID (10013) CT Irradiation Event Data | 1-n | M | | See 9.6.1.5<br>May include 1 or more templates. |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 12 | > | CONTAINS | CODE | EV (113854, DCM, Source of Dose Information) | 1-n | M | | The primary source of information from which this dose object was constructed.<br>DCID (10021) Source of CT Dose Information<br>Possible values:<br>EV(113856, DCM, Automated Data Collection)<br>EV(113867, DCM, Computed From Image Attributes) .<br>This value is used in the following case: If CT server failed during acquisition, application do not receive specific event with parameters needed to complete Dose SR. In this case automatic recovery process is started, CT reconstruction server creates CT projections from CT raw data stored on disk before crash and CT Dose report parameters are calculated from CT images created and stored in database. |
| 13 | > | CONTAINS | INCLUDE | DTID (1020) Person Participant | 1 | U | | Not Used |

#### 9.6.1.2 TID 1002 Observer Context

Describes the observer (device) that created the Content Items to which this context applies.

**TID 1002**
**OBSERVER CONTEXT**
**Type: Non-Extensible Order: Significant**

| | NL | Rel with Parent | VT | Concept Name | VM | Req Type | Condition | Value Set Constraint |
|---|---|---|---|---|---|---|---|---|
| 1 | | HAS OBS CONTEXT | CODE | EV (121005,DCM, Observer Type) | 1 | M | | DCID (270) Observer Type<br>Possible values:<br>(121007,DCM, Device) |
| *2* | | HAS OBS CONTEXT | INCLUDE | DTID (1003) Person observer identifying attributes | 1 | MC | IFF Row 1 value = (121006,DCM, Person) or Row 1 is absent | Not Used |
| 3 | | HAS OBS CONTEXT | INCLUDE | DTID (1004) Device observer identifying attributes | 1 | M | | Always used.<br>See 9.6.1.3 |

#### 9.6.1.3 TID 1004 Device Observer Identifying Attributes

This template (derived from the DICOM General Equipment Module of PS3.3) contains identifying (and optionally descriptive) attributes of devices that are observers.

**TID 1004**
**DEVICE OBSERVER IDENTIFYING ATTRIBUTES**
**Type: Extensible Order: Significant**

| | NL | Rel with Parent | VT | Concept Name | VM | Req Type | Condition | Value Set Constraint |
|---|---|---|---|---|---|---|---|---|
| 1 | | | UIDREF | EV (121012,DCM, Device Observer UID) | 1 | M | | Implementation UID of Device |
| 2 | | | TEXT | EV (121013,DCM, Device Observer Name) | 1 | U | | Value of Station Name (0008,1010) in General Equipment Module |
| 3 | | | TEXT | EV (121014,DCM, Device Observer Manufacturer) | 1 | U | | Value of Manufacturer (0008,0070) in General Equipment Module |
| 4 | | | TEXT | EV (121015,DCM, Device Observer Model Name) | 1 | U | | Value of Manufacturer's Model Name (0008,1090) in General Equipment Module |
| 5 | | | TEXT | EV (121016,DCM, Device Observer Serial Number) | 1 | U | | Value of Device Serial Number (0018,1000) in General Equipment Module |
| 6 | | | TEXT | EV (121017,DCM, Device Observer Physical Location during observation) | 1 | U | | Not Used |
| 7 | | | CODE | EV (113876, DCM, Device Role in Procedure) | 1-n | U | | The device performing the observations has other roles, e.g., as the irradiating device in a dose report, this may be recorded here, if not implicit.<br>BCID (7445) Device Participating Roles<br>(113859,DCM, Irradiating Device); only one Code is defined |

### 9.6.1.4 TID 10012 CT Accumulated Dose Data

This general template provides detailed information on CT X-Ray dose value accumulations over the scope of accumulation specified for the report (Single CT Scan identified with the single Irradiation Event).

**TID 10012**
**CT ACCUMULATED DOSE DATA**
**Type: Extensible Order: Significant**

| | NL | Rel with Parent | VT | Concept Name | VM | Req Type | Condition | Value Set Constraint |
|---|---|---|---|---|---|---|---|---|
| 1 | | | CONTAINER | EV (113811, DCM, CT Accumulated Dose Data) | 1 | M | | Contains 2 items |
| 2 | > | CONTAINS | NUM | EV (113812, DCM, Total Number of Irradiation Events) | 1 | M | | Units = EV ({events} UCUM, events)<br>May be 1 or more |
| 3 | > | CONTAINS | NUM | EV (113813, DCM, CT Dose Length Product Total) | 1 | M | | Units = EV (mGy.cm, UCUM, mGy.cm |

### 9.6.1.5 TID 10013 CT Irradiation Event Data

This template conveys the dose and equipment parameters of a single irradiation event.

**TID 10013**
**CT IRRADIATION EVENT DATA**
**Type: Extensible Order: Significant**

| | NL | Rel with Parent | VT | Concept Name | VM | Req Type | Condition | Value Set Constraint |
|---|---|---|---|---|---|---|---|---|
| 1 | | | CONTAINER | EV (113819, DCM, CT Acquisition) | 1 | M | | Contains 5 items |
| 2 | > | CONTAINS | TEXT | EV (125203, DCM, Acquisition Protocol) | 1 | U | | |
| 3 | > | CONTAINS | CODE | EV (123014 , DCM, Target Region) | 1 | M | | DCID (4031) Common Anatomic Regions<br>See 9.6.1.5.1 for possible values |
| 4 | > | CONTAINS | CODE | EV (113820, DCM, CT Acquisition Type) | 1 | M | | DCID (10013) CT Acquisition Types<br>Possible values :<br>EV (P5-08001, SRT, Spiral Acquisition)<br>EV (113804, DCM, Sequenced Acquisition)<br>EV (113805, DCM, Constant Angle Acquisition) |
| 6 | > | CONTAINS | UIDREF | EV (113769, DCM, Irradiation Event UID) | 1 | M | | Generated Internally. |
| 7 | > | CONTAINS | CONTAINER | EV (113822, DCM, CT Acquisition Parameters) | 1 | M | | Contains 7 items |
| 8 | >> | CONTAINS | NUM | EV (113824, DCM, Exposure Time) | 1 | M | | Units = EV (s, UCUM, s) |
| 9 | >> | CONTAINS | INCLUDE | DTID (10014) Scanning Length | 1 | M | | TID 10014 (included 1 item from Template)<br>See 9.6.1.6 |
| 10 | >> | CONTAINS | NUM | EV (113826, DCM, Nominal Single Collimation Width) | 1 | M | | Units = EV (mm, UCUM, mm)<br>Possible value:<br>2.5 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 11 | >> | CONTAINS | NUM | EV (113827, DCM, Nominal Total Collimation Width) | 1 | M | | Units = EV (mm, UCUM, mm)<br>Possible value:<br>10.0 |
| 12 | >> | CONTAINS | NUM | EV (113828, DCM, Pitch Factor) | 1 | MC | IF row 4 equals (P5-08001, SRT, Spiral Acquisition) or equals (113804, DCM, Sequenced Acquisition) | Units = EV ({ratio}, UCUM, ratio)<br>Possible values:<br>0.75,1.25, 1.75 |
| 13 | >> | CONTAINS | NUM | EV (113823, DCM, Number of X-Ray Sources) | 1 | M | | Units = EV ({X-Ray sources}, UCUM, X-Ray sources)<br>Value = 1 always. |
| 14 | >> | CONTAINS | CONTAINER | EV (113831, DCM, CT X-Ray Source Parameters) | 1-n | M | | Only 1 container is added<br>Contains 5 items |
| 15 | >>> | CONTAINS | TEXT | EV (113832, DCM, Identification of the X-Ray Source) | 1 | M | | Always sent as Optima NM/CT 640 Tube |
| 16 | >>> | CONTAINS | NUM | EV (113733, DCM, KVP) | 1 | M | | Units = EV (kV, UCUM, kV) |
| 17 | >>> | CONTAINS | NUM | EV (113833, DCM, Maximum X-Ray Tube Current) | 1 | M | | Units = EV (mA, UCUM, mA) |
| 18 | >>> | CONTAINS | NUM | EV (113734, DCM, X-Ray Tube Current | 1 | M | | Units = EV (mA, UCUM, mA) |
| 19 | >>> | CONTAINS | NUM | EV (113834, DCM, Exposure Time per Rotation) | 1 | MC | IF row 4 does not equal (113805, DCM, Constant Angle Acquisition) | Units = EV (s, UCUM, s) |
| 21 | > | CONTAINS | CONTAINER | EV (113839, DCM, Effective Dose) | 1 | MC | IF row 4 does not equal (113805, DCM, Constant Angle Acquisition) | Contains 3 items + 2items (containers) from DTID (10015) CT Dose Check Details |
| 22 | >> | CONTAINS | NUM | EV (113830, DCM, Mean CTDIvol) | 1 | M | | Units = EV (mGy, UCUM, mGy) |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 23 | >> | CONTAINS | CODE | EV (113835, DCM, CTDIw Phantom Type) | 1 | M | | DCID (4052) Phantom Devices<br>Possible values:<br>EV(113690,DCM, IEC Head Dosimetry Phantom)<br>EV(113691,DCM, IEC Body Dosimetry Phantom) |
| 26 | >> | CONTAINS | NUM | EV (113838, DCM, DLP) | 1 | M | | Units = EV (mGy.cm, UCUM, mGy.cm) |
| 30 | >> | CONTAINS | INCLUDE | DTID (10015) CT Dose Check Details | 1 | M | | See 9.6.1.7 |

#### 9.6.1.5.1 CID 4031 Common Anatomic Regions

**Context ID 4031**
**Common Anatomic Regions**

**Type: Extensible Version: 20091021**

| Coding Scheme Designator (0008,0102) | Code Value (0008,0100) | Code Meaning (0008,0104) |
|---|---|---|
| SRT | T-D4000 | Abdomen |
| SRT | R-FAB57 | Abdomen and Pelvis |
| SRT | T-15750 | Ankle joint |
| SRT | T-D8200 | Arm |
| SRT | T-04000 | Breast |
| SRT | T-11501 | Cervical spine |
| SRT | T-D3000 | Chest |
| SRT | R-FAB55 | Chest and Abdomen |
| SRT | R-FAB56 | Chest, Abdomen and Pelvis |
| SRT | T-12310 | Clavicle |
| SRT | T-11BF0 | Coccyx |
| SRT | T-D8300 | Elbow |
| SRT | T-D0010 | Entire body |
| SRT | T-D0300 | Extremity |
| SRT | T-D9700 | Foot |
| SRT | T-D8700 | Hand |
| SRT | T-D1100 | Head |
| SRT | T-32000 | Heart |
| SRT | T-15710 | Hip joint |
| SRT | T-D1213 | Jaw region |
| SRT | T-D9200 | Knee |
| SRT | T-D9400 | Leg |

| | | |
|---|---|---|
| SRT | T-11502 | Lumbar spine |
| SRT | T-D1600 | Neck |
| SRT | R-FAB52 | Neck and Chest |
| SRT | R-FAB53 | Neck, Chest and Abdomen |
| SRT | R-FAB54 | Neck, Chest, Abdomen and Pelvis |
| SRT | T-D6000 | Pelvis |
| SRT | R-FAB58 | Pelvis and lower extremities |
| SRT | T-D2220 | Shoulder |
| SRT | T-11100 | Skull |
| SRT | T-11AD0 | Sacrum |
| SRT | T-11502 | Thoracic spine |
| DCM | 114010 | Value Unknown |

#### 9.6.1.6 TID 10014 Scanning Length

**TID 10014**
**Scanning Length**
**Type: Extensible Order: Significant**

| | NL | Rel with Parent | VT | Concept Name | VM | Req Type | Item Type | Condition | Value Set Constraint |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | | NUM | EV (113825, DCM, Scanning Length) | 1 | M | | | Units = EV (mm, UCUM, mm) |

#### 9.6.1.7 TID 10015 CT Dose Check Details

This template records details related to the use of the NEMA Dose Check Standard (NEMA XR-25-2010).

**TID 10015**
**CT DOSE CHECK DETAILS**
**Type: Extensible Order: Significant**

| | NL | Rel with Parent | VT | Concept Name | VM | Req Type | Condition | Value Set Constraint |
|---|---|---|---|---|---|---|---|---|
| 1 | | | CONTAINER | EV (113900, DCM, Dose Check Alert Details) | 1 | MC | Always sent, Dose Check Alerts are implemented by product | Contains up to 7 Items |
| 2 | > | CONTAINS | CODE | EV (113901, DCM, DLP Alert Value Configured) | 1 | M | | DCID (230) Yes-No<br>Possible values:<br>EV(R-0038D, SRT,Yes)<br>EV(R-00339, SRT,No)<br>Value Yes is sent for Dose Reports created by clinical scans, No – for utilities (no patients are scanned) |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 3 | > | CONTAINS | CODE | EV (113902, DCM, CTDIvol Alert Value Configured) | 1 | M | | DCID (230) Yes-No<br>EV(R-0038D, SRT,Yes)<br>EV(R-00339, SRT,No)<br>Value Yes is sent for Dose Reports created by clinical scans, No – for utilities (no patients are scanned) |
| 4 | > | CONTAINS | NUM | EV (113903, DCM, DLP Alert Value) | 1 | MC | IFF value of Row 2 is (R-0038D,SRT, Yes) | Units = EV (mGy.cm, UCUM, mGy.cm) |
| 5 | > | CONTAINS | NUM | EV (113904, DCM, CTDIvol Alert Value) | 1 | MC | IFF value of Row 3 is (R-0038D,SRT, Yes) | Units = EV (mGy, UCUM, mGy) |
| 6 | > | CONTAINS | NUM | EV(113905, DCM, Accumulated DLP Forward Estimate) | 1 | MC | IF Accumulated DLP Forward Estimate (Row 6) exceeds DLP Alert Value (Row 4) | Units = EV (mGy.cm, UCUM, mGy.cm) |
| 7 | > | CONTAINS | NUM | EV (113906, DCM, Accumulated CTDIvol Forward Estimate) | 1 | MC | IF Accumulated CTDIvol Forward Estimate (Row 7) exceeds CTDIvol Alert Value (Row 5) | Units = EV (mGy, UCUM, mGy) |
| 9 | > | CONTAINS | INCLUDE | DTID (1020) Person Participant | 1 | MC | IF Accumulated DLP Forward Estimate (Row 6) exceeds DLP Alert Value (Row 4) or Accumulated CTDIvol Forward Estimate (Row 7) exceeds CTDIvol Alert Value (Row 5) | $PersonProcedureRole = EV (113850, DCM, Irradiation Authorizing)<br>See 9.6.1.7.1 |
| 10 | | | CONTAINER | EV (113908, DCM, Dose Check Notification Details) | 1 | MC | Always sent, Dose Check Alerts are implemented by product | Contains up to 7 Items |
| 11 | > | CONTAINS | CODE | EV (113909, DCM, DLP Notification Value Configured) | 1 | M | | DCID (230) Yes-No<br>EV(R-0038D, SRT,Yes)<br>EV(R-00339, SRT,No)<br>Value Yes is sent for Dose Reports created by clinical scans, No – for utilities (no patients are scanned) |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 12 | > | CONTAINS | CODE | EV (113910, DCM, CTDIvol Notification Value Configured) | 1 | M | | DCID (230) Yes-No<br>EV(R-0038D, SRT,Yes)<br>EV(R-00339, SRT,No)<br>Value Yes is sent for Dose Reports created by clinical scans, No – for utilities (no patients are scanned) |
| 13 | > | CONTAINS | NUM | EV (113911, DCM, DLP Notification Value) | 1 | MC | IFF value of Row 11 is (R-0038D, SRT, Yes) | Units = EV (mGy.cm, UCUM, mGy.cm) |
| 14 | > | CONTAINS | NUM | EV (113912, DCM, CTDIvol Notification Value) | 1 | MC | IFF value of Row 12 is (R-0038D, SRT, Yes) | Units = EV (mGy, UCUM, mGy) |
| 15 | > | CONTAINS | NUM | EV (113913, DCM, DLP Forward Estimate) | 1 | MC | IF DLP Forward Estimate (Row 15) exceeds DLP Notification Value (Row 13) | Units = EV (mGy.cm, UCUM, mGy.cm) |
| 16 | > | CONTAINS | NUM | EV (113914, DCM, CTDIvol Forward Estimate) | 1 | MC | IF CTDIvol Forward Estimate (Row 16) exceeds CTDIvol Notification Value (Row 14) | Units = EV (mGy, UCUM, mGy) |
| 18 | > | CONTAINS | INCLUDE | DTID (1020) Person Participant | 1 | UC | IFF DLP Forward Estimate (Row 15) exceeds DLP Notification Value (Row 13) or CTDIvol Forward Estimate (Row 16) exceeds CTDIvol Notification Value (Row 14) | $PersonProcedureRole = EV (113850, DCM, Irradiation Authorizing)<br>See 9.6.1.7.1 |

#### 9.6.1.7.1 TID 1020 Person Participant

This template describes a person participating in an activity as other than an observer or subject. E.g. for a dose report documenting an irradiating procedure, participants include the person administering the irradiation and the person authorizing the irradiation.

This Template is included with specific contextual parameters from a parent Template.

**TID 1020 Parameters**

| Parameter Name | Parameter Usage |
|---|---|
| $PersonProcedureRole | Coded term or Context Group for the Concept Name that describes the nature of the person's participation in this procedure. |

**TID 1020**
**PERSON PARTICIPANT**
**Type: Extensible Order: Significant**

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

### 9.6.2 Standard Extended Templates

The Product does not support any extensions or restrictions to standard templates for SOP Instances created by this product.

### 9.6.3 Private Templates

The Product does not support any private templates for SOP Instances created by this product.

# 10. RADIOPHARMACEUTICAL RADIATION DOSE STRUCTURED REPORT INFORMATION OBJECT IMPLEMENTATION

## 10.1 INTRODUCTION

This section specifies the use of the DICOM Radiopharmaceutical Radiation Dose SR IOD to represent results produced by all products. Corresponding attributes are conveyed using the module construct.

**Note:** **In this section term NM Camera AE DICOM implementation refers to Discovery NM/CT 670*,NM/CT 800*, Discovery NM 630 and Optima NM/CT 640 DICOM implementations.**

## 10.2 NM CAMERA MAPPING OF DICOM ENTITIES

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

**TABLE 10-1**
**MAPPING OF DICOM ENTITIES TO NM CAMERA ENTITIES**

| DICOM IE | NM Camera Entity |
|---|---|
| Patient | Patient |
| Study | Study |
| Series | Series |
| Document | Report |

### 10.2.1 IOD Module Table

The Radiopharmaceutical Radiation Dose Structured Report Information Object Definitions comprise the modules of the following tables plus Standard Extended and Private Attributes. Standard Extended and Private Attributes are described in Section 10.4

The contents of the SR Document Content are constrained by the supported template, as identified in Section 10.3.3.2.1.1. Standard, Standard Extended and Private Templates are further described in Section10.6.1.

**TABLE 10-2**
**STRUCTURE REPORT 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 |
| 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 |
| | Standard Extended Study | Used (same description as for NM IOD) | 3.4.2.3 |
| | Private Study | Used (same description as for NM IOD) | 3.4.2.4 |

| | | | |
|---|---|---|---|
| | Clinical Trial Study | Not Used | NA |
| Series | SR Document Series | Used | 10.3.1.1 |
| | Standard Extended Series | Used | 10.3.1.2 |
| | Private Series | Used | 10.3.1.3 |
| | Clinical Trial Series | Not Used | N/A |
| Frame Of Reference | Synchronization | Not Used | N/A |
| Equipment | General Equipment | Used (same description as for NM IOD) | 3.4.5.1 |
| | Enhanced General Equipment | Used | 10.3.2.1 |
| Document | SR Document General | Used | 10.3.3.1 |
| | SR Document Content | Used | 10.3.3.2 |
| | Standard Extended SR Document | Used | 10.3.3.3 |
| | Private SR Document | Used | 10.3.3.4 |
| | SOP Common | Used | 10.3.3.5 |

## 10.3 INFORMATION MODULE DEFINITIONS

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

The following modules are included to convey Enumerated Values, Defined Terms, and Optional Attributes supported. 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 which are not presented in tables are not supported.

### 10.3.1 Series Entity Modules

#### 10.3.1.1 SR Document Series Module

**TABLE 10-3**
**SR DOCUMENT SERIES MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | Use |
|---|---|---|---|
| Modality | (0008,0060) | 1 | Defined Terms used for data created on this system:<br>Value = SR |
| Series Instance UID | (0020,000E) | 1 | Internally generated unique identifier of the Series. |
| Series Number | (0020,0011) | 1 | A number that identifies this Series.<br>Internally generated using default base value = 600<br>Calculated as <Base Value>+<N+1>, where <N> is number of RRDR objects already exists in Study |

| | | | |
|---|---|---|---|
| Series Description | (0008,103E) | 3 | Description of the Series. Always sent.<br>Composed from " <Administration Event name> followed by suffix " Dose Report" |
| Series Date | (0008,0021) | 3 | Date the Series is created |
| Series Time | (0008,0031) | 3 | Time the Series is created |
| Referenced Performed Procedure Step Sequence | (0008,1111) | 2 | Uniquely identifies the Administration to which the Series is related. The sequence has exactly 1 item. Sequence is added to all DICOM objects created by system. |
| >Referenced SOP Class UID | (0008,1150) | 1 | Set to 1.2.840.10008.3.1.2.3.3 |
| >Referenced SOP Instance UID | (0008,1155) | 1 | Uniquely identifies the referenced Administration.<br>Internally Generated. |

#### 10.3.1.2 Standard Extended Series Module

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

| Attribute Name | Tag | Type | Attribute Description |
|---|---|---|---|
| Protocol Name | (0018,1030) | 3 | User-defined description of the conditions under which the Series was performed.<br>Always sent as "Exposure Monitoring" |

#### 10.3.1.3 Private Series Module

**TABLE 10-5**
**PRIVATE SERIES MODULE ATTRIBUTES**

| Attribute Name | Tag | Private Creator ID | Attribute Description |
|---|---|---|---|
| Pre-Medication | (0009,xx45) | QUASAR_INTERNAL_USE | Keeps the Pre-Medication as appears in the "To-Do" list<br>Sent as empty string if not received from user input. |
| Origin | (0009,xx12) | QUASAR_INTERNAL_USE | The origin of the image.<br>Always sent as "exposure monitoring" |
| Send List Mode flag | (0009, xx24) | QUASAR_INTERNAL_USE | Defined if list mode data shall be sent to list mode data destination station<br>Always sent as 0. |
| Sequence Type | (0009,xx13) | QUASAR_INTERNAL_USE | Type of sequence created the object<br>Always send as "dose report" |

### 10.3.2 Equipment Entity Modules

#### 10.3.2.1 Enhanced General Equipment Module

**TABLE 10-6**
**ENHANCED GENERAL EQUIPMENT MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | Attribute Description |
|---|---|---|---|
| Manufacturer | (0008,0070) | 1 | Manufacturer of the equipment that produced the composite instances.<br>Default Value GE MEDICAL SYSTEMS |
| Manufacturer's Model Name | (0008,1090) | 1 | Manufacturer's model name of the equipment that produced the composite instances.<br>Set to "Tandem_Discovery_670" for Discovery NM/CT 670 implementation<br>Set to "Tandem_Discovery_670_ES" for Discovery NM/CT 670 ES implementation<br>Set to "Tandem_Discovery_670_Pro" for Discovery NM/CT 670 Pro and Discovery 670 DR implementations<br>Set to "Tandem_Apollo" for Discovery NM/CT 670 CZT implementation<br>Set to "Tandem_Discovery_630" for Discovery NM 630 implementation<br>Set to "Tandem_Optima_640" for Optima NM/CT 640 implementation<br>Set to "Tandem_830" for NM 830 implementation<br>Set to "Tandem_850" for NM/CT 850 implementation<br>Set to "Tandem_860" for NM/CT 860 implementation<br>Set to "Tandem_870_DR" for NM/CT 870DR implementation<br>Set to "Tandem_870_CZT" for NM/CT 870CZT implementation<br>Always sent |
| Device Serial Number | (0018,1000) | 1 | Manufacturer's serial number of the equipment that produced the composite instances.<br>Always taken from system configuration. |
| Software Versions | (0018,1020) | 1 | Manufacturer's designation of software version of the equipment that produced the composite instances<br>Contains Software/Hardware versions of current release e.g. 1.003.608.0\HARDWARE_VERSION_1 |

### 10.3.3 Document Entity Modules

#### 10.3.3.1 SR Document General Module

**TABLE 10-7**
**SR DOCUMENT GENERAL MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | Use |
|---|---|---|---|
| Instance Number | (0020,0013) | 1 | A number that identifies this document.<br>Default Value = 1 |
| Completion Flag | (0040,A491) | 1 | Enumerated Value used:<br>PARTIAL = partial content |

| | | | |
|---|---|---|---|
| Verification Flag | (0040,A493) | 1 | Enumerated Values:<br>UNVERIFIED = Not attested to. |
| Completion Flag Description | (0040,A492) | 3 | Explanation of the value sent in Completion Flag (0040, A491).<br>Contains information about Administration Date, Time and Delivered Dose in Mbq and mci |
| Content Date | (0008,0023) | 1 | The date of the document creation. |
| Content Time | (0008,0033) | 1 | The time of the document creation. |
| Verifying Observer Sequence | (0040,A073) | 1C | Not sent. |
| Referenced Request Sequence | (0040,A370) | 1C | Not sent |
| Performed Procedure Code Sequence | (0040,A372) | 2 | A Sequence that conveys the codes of the performed procedures pertaining to this SOP Instance. Always contains 0 Items. |
| Current Requested Procedure Evidence Sequence | (0040,A375) | 1C | Not Sent |
| Pertinent Other Evidence Sequence | (0040,A385) | 1C | Not Sent |
| Referenced Instance Sequence | (0008,114A) | 1C | Not Sent |

#### 10.3.3.2 SR Document Content Module

**TABLE 10-8**
**SR DOCUMENT CONTENT MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | Use |
|---|---|---|---|
| Value Type | (0040,A040) | 1 | The type of the value encoded in this Content Item.<br>Defined Term used:<br>CONTAINER |
| Concept Name Code Sequence | (0040,A043) | 1C | Code describing the concept represented by this Content Item.<br>Only a single Item is included in this sequence. |
| *>Include 'Code Sequence Macro'* | | | EV (113500, DCM, Radiopharmaceutical Radiation Dose Report) |
| Continuity of Content | (0040,A050) | 1 | Enumerated Value used:<br>SEPARATE |
| Content Template Sequence | (0040,A504) | 1 | Template that describes the content of this Content Item and its subsidiary Content Items.<br>Only a single Item is included in this sequence |
| >Mapping Resource | (0008,0105) | 1 | Mapping Resource that defines the template. Defined Terms:<br>DCMR = DICOM Content Mapping Resource |
| >Template Identifier | (0040, DB00) | 1 | 10021 – Radiopharmaceutical Radiation Dose |
| Observation DateTime | (0040,A032) | 1C | Observation date time is set to Pre-Injection Date Time if defined, otherwise set to Post-Injection Date Time if defined, otherwise set to Administration date time.<br>Always sent. |

| | | | |
|---|---|---|---|
| Content Sequence | (0040,A730) | 1 | Provides the hierarchical structuring of the Content Tree by recursively nesting Content Items. A parent (or source) Content Item has an explicit relationship to each child (or target) Content Item, conveyed by the Relationship Type (0040,A010) attribute.<br>One or more Items may be included in this sequence. |
| > Relationship Type | (0040,A010) | 1 | Defined Term used:<br>CONTAINS<br>HAS CONCEPT MOD<br>HAS OBS CONTEXT<br>HAS PROPERTIES |
| *> Insert SR Document Content Module* | | | Recursive inclusion to create document content tree.<br>See section 10.3.3.2.1for the list of supported templates. |

#### 10.3.3.2.1 SR Document Content Descriptions

##### 10.3.3.2.1.1 Content Template

The product supports the following root Templates for Radiopharmaceutical Radiation Dose SR SOP Instances created by the product.

| SOP Class | Template ID | Template Name | Use |
|---|---|---|---|
| Radiopharmaceutical Radiation Dose SR | 10021 | Radiopharmaceutical Radiation Dose | Create |

Refer to section 10.6 for a detailed description of the supported templates.

#### 10.3.3.3 Standard Extended SR Document Module

**TABLE 10-9**
**STANDARD EXTENDED DOSE SR MODULE ATTRIBUTES**

| Attribute Name | Tag | Use |
|---|---|---|
| Counts Accumulated | (0018,0070) | Always sent as "1" |

#### 10.3.3.4 Private SR Document Module

**TABLE 10-10**
**PRIVATE SR DOCUMENT MODULE ATTRIBUTES**

| Attribute Name | Tag | Private Creator ID | Attribute Description |
|---|---|---|---|
| Dataset Name | (0011,xx12) | GEMS_GENIE_1 | List of dataset names<br>Always sent as "Radiopharmaceutical Radiation Dose Report" |

#### 10.3.3.5 SOP Common Module

**TABLE 10-11**
**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 1.2.840.10008.5.1.4.1.1.88.68 |
| SOP Instance UID | (0008,0018) | 1 | Uniquely identifies the SOP Instance. Internally generated. |
| Specific Character Set | (0008,0005) | 1C | Character Set that expands or replaces the Basic Graphic Set.<br>Defined Terms include for locally created images:<br>ISO_IR 100 = Latin Alphabet No. 1<br>For images created from MWL, the value is copied from value provided in MWL, if not empty, otherwise ISO_IR 100 is used. Always included into image. |
| Instance Number | (0020,0013) | 3 | See 10.3.3.1for more specialization |

## 10.4 STANDARD EXTENDED AND PRIVATE DATA ATTRIBUTES

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

### 10.4.1 Standard Attributes

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

**TABLE 10-12**
**STANDARD EXTENDED ATTRIBUTES**

| Information Entity Name | Attribute Name | Tag | Use |
|---|---|---|---|
| Study | Allergies | (0010,2110) | Description of prior reaction to contrast agents, or other patient allergies or adverse reactions. |
| | Pregnancy Status | (0010,21C0) | Describes pregnancy state of patient |
| | Requested Procedure Comments | (0040,1400) | Requested Procedure (Study) notes |
| Series | Protocol Name | (0018,1030) | Always sent as “Exposure Monitoring” |
| SR Document | Counts Accumulated | (0018,0070) | Used as flag to display Dose SR in application Patient List |

### 10.4.2 Private Group QUASAR_INTERNAL_USE

Private Group QUASAR_INTERNAL_USE is modeled as part of the Document Information Entity.

**TABLE 10-13**
**PRIVATE GROUP QUASAR_INTERNAL_USE**

| Attribute Name | Tag | VR | VM | Attribute Description and Use |
|---|---|---|---|---|
| Private Creator Identification | (0009,0010) | LO | 1 | QUASAR_INTERNAL_USE |
| Origin | (0009,xx12) | LO | 1 | The origin of the image. |
| Sequence Type | (0009,xx13) | ST | 1 | Type of sequence created the object |
| Send List Mode flag | (0009, xx24) | US | 1 | Defined if list mode data shall be sent to list mode data destination station |
| Pre-Medication | (0009,xx45) | LO | 1 | Keeps the Pre-Medication as appears in the To Do list |

### 10.4.3 Private Group GEMS_GENIE_1

Private Group GEMS_GENIE_1 is modeled as part of the Document Information Entity.

**TABLE 10-14**
**PRIVATE GROUP GEMS_GENIE_1**

| Attribute Name | Tag | VR | VM | Attribute Description and Use |
|---|---|---|---|---|
| Private Creator Identification | (0011,0010) | LO | 1 | GEMS_GENIE_1 |
| Dataset Name | (0011,xx12) | LO | 1-n | List of Dataset names. |

## 10.5 STANDARD EXTENDED AND PRIVATE CONTEXT GROUPS

The Product does not support any Standard Extended, Private, and Configurable Context Groups

## 10.6 STANDARD, STANDARD EXTENDED AND PRIVATE TEMPLATES

The Product supports the Standard defined in the following sections. The product does not support any Standard Extended and Private Templates.

### 10.6.1 Standard Templates

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

#### 10.6.1.1 TID 10021 Radiopharmaceutical Radiation Dose

This template defines a container (the root) with subsidiary content items, each of which corresponds to a single Radiopharmaceutical administration event entry.

Multiple Radiopharmaceutical Radiation Dose objects may be created for one Study.

**TID 10021**
**RADIOPHARMACEUTICAL RADIATION DOSE**
**Type: Extensible Order: Significant**

| | NL | Rel with Parent | VT | Concept Name | VM | Req Type | Condition | Value Set Constraint |
|---|---|---|---|---|---|---|---|---|
| 1 | | | CONTAINER | EV (113500, DCM, "Radiopharmaceutical Radiation Dose Report") | 1 | M | | Root node |
| 2 | > | HAS CONCEPT MOD | CODE | EV (G-C2D0, SRT, "Associated Procedure") | 1 | M | | DCID 3108 “NM/PET Procedures”<br>Possible Values: see 10.6.1.1.1 |
| 3 | >> | HAS CONCEPT MOD | CODE | EV (G-C0E8, SRT, "Has Intent") | 1 | M | | DCID 3629 “Procedure Intent”<br>Possible Values:<br>EV (R-408C3, SRT, “Diagnostic Intent” ) |
| 4 | > | CONTAINS | INCLUDE | DTID 10022 “Radiopharmaceutical Administration Event Data” | 1 | M | | See 10.6.1.2 |
| 5 | > | CONTAINS | INCLUDE | DTID 10024 “Radiopharmaceutical Administration Patient Characteristics” | 1 | U | | See 10.6.1.3 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 6 | > | CONTAINS | TEXT | EV (121106, DCM, "Comment") | 1 | U | | |

#### 10.6.1.1.1 CID 3108 “NM/PET Procedures”

**NM/PET PROCEDURES**
**Type: Extensible Version: 20160314**

| Coding Scheme Designator | Code Value | Code Meaning |
|---|---|---|
| SRT | P5-D30F8 | Nuclear medicine cardiovascular study |
| SRT | P5-D6000 | Radioisotope study of endocrine system |
| SRT | P5-D6500 | Radioisotope study of hematopoietic system |
| SRT | P5-D5000 | Radioisotope study of gastrointestinal system |
| SRT | P5-D0063 | Radionuclide study for localization of inflammatory disease |
| SRT | P5-D1000 | Radioisotope study of musculoskeletal system |
| SRT | P5-D90F8 | Nuclear medicine diagnostic procedure on nervous system |
| SRT | P5-D0040 | Radionuclide localization of tumor |
| SRT | P5-D2000 | Radioisotope study of respiratory system |
| SRT | P5-D7000 | Radioisotope study of genitourinary system |

### 10.6.1.2 TID 10022 Radiopharmaceutical Administration Event Data

**TID 10022**
**RADIOPHARMACEUTICAL ADMINIDTRATION EVENT DATA**
**Type: Extensible Order: Significant**

| NL | Rel | VT | Concept Name | VM | Req Type | Condition | Value Set Constraint | |
|---|---|---|---|---|---|---|---|---|
| 1 | | | CONTAINER | EV (113502, DCM, "Radiopharmaceutical Administration") | 1 | M | | |
| 2 | > | CONTAINS | CODE | EV (F-61FDB, SRT, "Radiopharmaceutical agent") | 1 | M | | DCID 25 “Radiopharmaceuticals” Possible values: see 10.6.1.2.1 |
| 3 | >> | HAS PROPERTIES | CODE | EV (C-10072, SRT, "Radionuclide") | 1 | M | | DCID 18 “Isotopes in Radiopharmaceuticals” |
| 4 | >> | HAS PROPERTIES | NUM | EV (R-42806, SRT, "Radionuclide Half Life") | 1 | M | | UNITS = EV (s, UCUM, "seconds") |
| 5 | > | CONTAINS | UIDREF | EV (113503, DCM, "Radiopharmaceutical Administration Event UID") | 1 | M | | |
| 6 | > | CONTAINS | DATETIME | EV (123003, DCM, "Radiopharmaceutical Start DateTime") | 1 | M | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 7 | > | CONTAINS | NUM | EV (113507, DCM, "Administered activity") | 1 | M | | UNITS = EV (MBq, UCUM, "MBq") |
| 9 | > | CONTAINS | NUM | EV (113508, DCM, "Pre-Administration Measured Activity") | 1 | U | | UNITS = EV (MBq, UCUM, "MBq") |
| 10 | > | CONTAINS | NUM | EV (113509, DCM, "Post-Administration Measured Activity") | 1 | U | | UNITS = EV (MBq, UCUM, "MBq") |
| 11 | > | CONTAINS | CODE | EV (G-C340, SRT, "Route of administration") | 1 | M | | BCID 11 “Route of Administration” Possible values: see 10.6.1.2.2 |
| 21 | >> | HAS PROPERTIES | CODE | EV (G-C581, SRT, "Site of") | 1 | MC | IF Row 20 equals (G-D101, SRT, "Intravenous route") or (G-D103, SRT, "Intramuscular route"); | DCID 3746 “Percutaneous Entry Site” Possible values: see 10.6.1.2.3 |
| 22 | >>> | HAS CONCEPT MOD | CODE | EV (G-C171, SRT, "Laterality") | 1 | MC | IF Row 21 has laterality | DCID 244 “Laterality” Possible values: see 10.6.1.2.4 |
| 23 | > | HAS OBS CONTEXT | INCLUDE | DTID 1020 “Person Participant” | 1-n | M | | $PersonProcedureRole = EV (113851, DCM, "Irradiation Administering") |

#### 10.6.1.2.1 CID 25 “Radiopharmaceuticals”

**RADIOPHARMACEUTICALS**
**Type: Extensible Version: 20160314**

| Coding Scheme Designator | Code Value | Code Meaning |
|---|---|---|
| SRT | C-B1041 | Gallium^67^ citrate |
| SRT | C-145AB | Indium^111 Capromab Pendetide |
| SRT | C-145AA | Indium^111 Pentetreotide |
| SRT | C-B1061 | Indium^111^ pentetate |
| SRT | C-B1135 | Indium^111^oxyquinoline |
| SRT | C-B110E | Iodine^123 3-Iodobenzylguanidine MIBG |
| SRT | C-B1108 | Iofetamine I^123^ hydrochloride |
| SRT | C-B1081 | Sodium iodide I^123^ |
| SRT | C-B1086 | Sodium iodide I^131^ |
| SRT | C-173A5 | Krypton^81m |
| SRT | C-B1206 | Sodium pertechnetate Tc^99m^ |
| SRT | C-B1223 | Technetium Tc^99m^ exametazine |
| SRT | C-B1203 | Technetium Tc^99m^ microaggregated albumin |

| Coding Scheme Designator | Code Value | Code Meaning |
|---|---|---|
| SRT | C-B1225 | Technetium Tc^99m^ N-substituted iminodiacetate |
| SRT | C-163B0 | Technetium Tc^99m^ pentetate |
| SRT | C-163AB | Technetium Tc^99m^ sestamibi |
| SRT | C-B1215 | Technetium Tc^99m^ pyro and polyphosphates |
| SRT | C-B1224 | Technetium Tc^99m^ tagged red cells |
| SRT | C-B1222 | Technetium Tc^99m^ sulfur colloid |
| SRT | C-163AD | Technetium Tc^99m^Tetrofosmin |
| SRT | C-163B8 | Technetium^99m Mercaptoacetyl triglycine MAG3 |
| SRT | C-163BD | Technetium^99m Dimercaptosuccinic Acid DMSA |
| SRT | C-B1231 | Thallous chloride Tl^201^ |
| SRT | C-B1218 | Technetium Tc^99m^ medronate |
| GEHC-NUC | 10001 | Iodine^123^ DaTSCAN Ioflupane |
| GEHC-NUC | 10003 | Technetium^99m Ethyl cysteinate dimer |
| GEHC-NUC | 10004 | Lutetium^177 |
| GEHC-NUC | 10005 | Xeneisol Xe^133^ |
| GEHC-NUC | 10006 | Technetium^99m TRODAT-1 |

#### 10.6.1.2.2 CID 11 "Route of Administration"

**ROUTE OF ADMINISTRATION**
**Type: Extensible Version: 20160314**

| Coding Scheme Designator | Code Value | Code Meaning |
|---|---|---|
| SRT | G-D101 | Intravenous route |
| SRT | G-D102 | Intra-arterial route |
| SRT | G-D103 | Intramuscular route |
| SRT | G-D104 | Subcutaneous route |
| SRT | G-D106 | Intraperitoneal route |
| SRT | G-D107 | Intramedullary route |
| SRT | G-D108 | Intrathecal route |
| SRT | G-D109 | Intra-articular route |
| NCIt | C38244 | Intraepithelial route |
| SRT | G-D112 | Topical route |
| SRT | G-D140 | Oral route |
| NCIt | C38306 | Transluminal route |
| SRT | G-D144 | Intraluminal route |
| NCIt | C38213 | Extraluminal route |
| SRT | R-40B32 | By inhalation |
| SRT | G-D160 | Per rectum |
| SRT | G-D164 | Vaginal route |

| Coding Scheme Designator | Code Value | Code Meaning |
|---|---|---|
| SRT | R-F2C86 | Intraventricular route - cardiac |
| DCM | 127070 | Retro-orbital route |
| SRT | G-D172 | Nasal route |
| SRT | G-D17D | Intradermal route |
| SRT | R-F2CD4 | Intratumor route |

#### 10.6.1.2.3 CID 3746 "Percutaneous Entry Site"

**PERCUTANEOUS ENTRY SITE**
**Type: Extensible Version: 20110609**

| Coding Scheme Designator | Code Value | Code Meaning |
|---|---|---|
| SRT | G-D067 | Via femoral artery |
| SRT | G-D1E4 | Via radial artery |
| SRT | G-D05F | Via brachial artery |
| SRT | G-D054 | Via artery |
| SRT | G-D0C6 | Via arm vein |
| SRT | G-D071 | Via femoral vein |
| SRT | G-D052 | Via vein |

#### 10.6.1.2.4 DCID 244 "Laterality"

**LATERALITY**
**Type: Non-Extensible Version: 20030108**

| Coding Scheme Designator | Code Value | Code Meaning |
|---|---|---|
| SRT | G-A100 | Right |
| SRT | G-A101 | Left |

#### 10.6.1.2.5 TID 1020 Person Participant

This template describes a person participating in an activity as other than an observer or subject. E.g. for a dose report documenting an irradiating procedure, participants include the person administering the irradiation and the person authorizing the irradiation.

This Template is included with specific contextual parameters from a parent Template.

**TID 1020 Parameters**

| Parameter Name | Parameter Usage |
|---|---|
| $PersonProcedureRole | Coded term or Context Group for the Concept Name that describes the nature of the person's participation in this procedure. |

**TID 1020**
**PERSON PARTICIPANT**
**Type: Extensible Order: Significant**

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

#### 10.6.1.3 TID 10024 Radiopharmaceutical Administration Patient Characteristics

**TID 10024**
**RADIOPHARMACEUTICAL ADMINISTRATION PATIENT CHARACTERISTICS**
**Type: Extensible Order: Significant**

| | NL | Rel | VT | Concept Name | VM | Req Type | Condition | Value Set Constraint |
|---|---|---|---|---|---|---|---|---|
| 1 | | | CONTAINER | EV (121118, DCM, "Patient Characteristics") | | | | |
| 2 | > | CONTAINS | CODE | EV (121032, DCM, "Subject Sex") | 1 | U | | DCID 7455 “Sex” Possible values: see 10.6.1.3.1 |
| 3 | > | CONTAINS | NUM | EV (8302-2, LN, "Patient Height") | 1 | U | | UNITS = EV (cm, UCUM, "cm") |
| 4 | > | CONTAINS | NUM | EV (29463-7, LN, "Patient Weight") | 1 | U | | UNITS = EV (kg, UCUM, "kg"). |
| 5 | > | CONTAINS | NUM | EV (F-01860, SRT, "Body Mass Index") | 1 | U | | UNITS = EV (kg/m2, UCUM, "kg/m^2") |
| 6 | >> | INFERRED FROM | CODE | EV (121420, DCM, "Equation") | 1 | U | Sent only if Row 5 is sent (2 digits) | DT (122265, DCM, "BMI = Wt/Ht^2") |

##### 10.6.1.3.1 DCID 7455 “Sex”

**SEX**
**Type: Non-Extensible Version: 20040112**

| Coding Scheme Designator | Code Value | Code Meaning | Patient's Sex (0010,0040) Equivalent |
|---|---|---|---|
| DCM | M | Male | M |
| DCM | F | Female | F |
| DCM | 121103 | Undetermined sex | O |

### 10.6.2 Standard Extended Templates

The Product does not support any extensions or restrictions to standard templates for SOP Instances created by this product.

### 10.6.3 Private Templates

The Product does not support any private templates for SOP Instances created by this product.