GE Heathcare

Technical Publications

Direction 5442700-100 (DOC1225688)
Revision 2

Volumetrix MI ™
DICOM CONFORMANCE STATEMENT

LIST OF REVISIONS

REV	DATE	DESCRIPTION	PAGES	APPR.
1	Jan 2013	Initial Release	All	M. Mesh
2	June 2013	Update MR section Update modules content	Sections 2.1, 7	M.Mesh

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CONFORMANCE STATEMENT OVERVIEW

Volumetrix MI is an application that uses NM, PT, CT, MR images and creates NM, PT, CT, SC and MFSC images.

Table 0.1 provides an overview of the network services supported by the **Volumetrix MI**.

Table 0.1 – APPLICATION

SOP Classes	User of Object Instances	Creator of Object Instances
Transfer		
Secondary Capture Image Storage	No	Yes
Multi-frame Grayscale Byte Secondary Capture Image Storage	No	Yes
Multi-frame True Color Secondary Capture Image Storage	No	Yes
Nuclear Medicine Image Storage	Yes	Yes
Computerized Tomography Image Storage	Yes	Yes
Positron Emission Tomography Image Storage	Yes	Yes
Magnetic Resonance Image Storage	Yes	Yes

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1. INTRODUCTION

1.1 OVERVIEW

Volumetrix MI is a one-stop shop for processing and reading non-cardiac volumetric data, including NM SPECT and hybrid SPECT-CT, PET-CT, external CT/MR (CT/MR from a separate non-hybrid Scan). For follow-up studies, two studies can be registered and viewed simultaneously, each including its reference data.

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 (Conformance Statement), which specifies the GEHC equipment compliance to the DICOM requirements for the implementation

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 (CT Image Information Object Implementation), which specifies the GEHC equipment compliance to DICOM requirements for the implementation of a CT Image Information Object

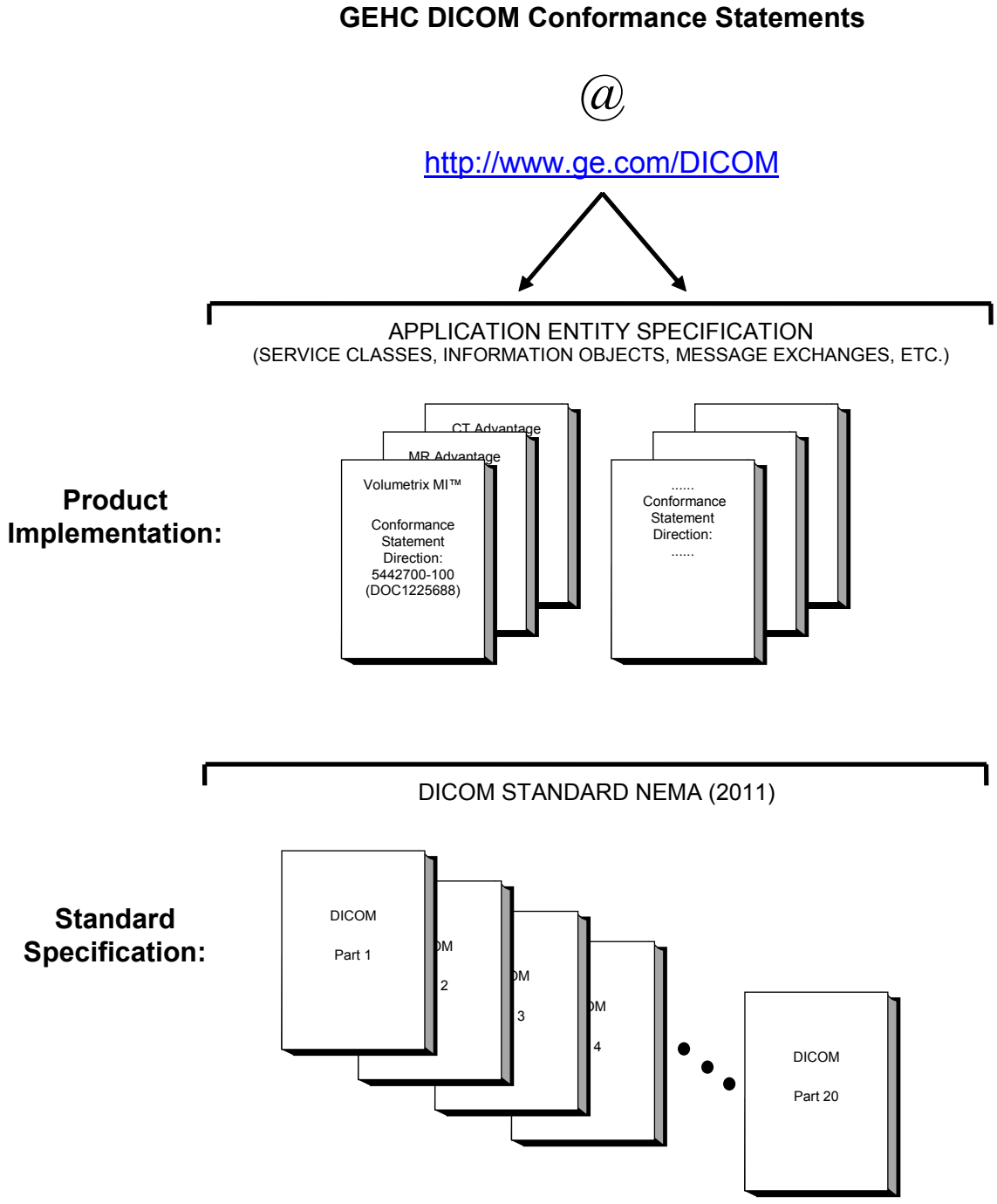
Section 5 (PET Image Information Object Implementation), which specifies the GEHC equipment compliance to DICOM requirements for the PET Image Information Object

Section 6 (Secondary Capture Image Information Object Implementation), which specifies the GEHC equipment compliance to DICOM requirements for the implementation of a Secondary Capture Information Object and Multi-Frame Secondary Capture Information Object

Section 7 (MR Image Information Object Implementation), which specifies the GEHC equipment compliance to DICOM requirements for the MR Image 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:

Volumetrix MI™
Conformance Statement for DICOM
Direction **5442700-100 (DOC1225688)**

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. Failures 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/

Xeleris 3.0 & 3.1 DICOM Conformance statement DIRECTION 5357330-1EN Rev2 .
http://www3.gehealthcare.com/en/Products/Interoperability/DICOM/Nuclear_Medicine_DICOM_Conformance_Statements#

VS5 – ADVANTAGE WORKSTATION 4.6 DICOM Conformance statement, Direction 5404296-100, Rev.2
http://www3.gehealthcare.com/en/Products/Interoperability/DICOM/Workstations_DICOM_Conformance_Statements#

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
CSE	Customer Service Engineer
CT	Computerized Tomography
DICOM	Digital Imaging and Communications in Medicine
IHE	Integrating the Healthcare Enterprise
IOD	Information Object Definition
ISO	International Organization for Standards
JPEG	Joint Photographic Experts Group
LUT	Look-up Table
MFSC	Multi-Frame Secondary Capture
MR	Magnetic Resonance Imaging
NM	Nuclear Medicine
O	Optional (Key Attribute)
PACS	Picture Archiving and Communication System
PET	Positron Emission Tomography
PDO	Protocol Data Object
R	Required (Key Attribute)
RTO	Review Template Object
SC	Secondary Capture
SOP	Service-Object Pair

SDO	Series Data Object
TCP/IP	Transmission Control Protocol/Internet Protocol
U	Unique (Key Attribute)
UI	User Interface
VM	Value Multiplicity
VR	Value Representation

1.9 TERMS DEFINITIONS

In the following conformance statement, the following terms describe the use of each of the DICOM tags.

When Volumetrix MI is loading DICOM data files, we use the following terms:

- **Ignored**: the software will ignore the value of the tag
- **Used**: the software might use at some point the value of this tag; the value could be used for computations, for display, or to regenerate the value of a secondary capture
- **Mandatory**: the software will need a valid value for this tag; this value will be used for computations and an invalid value will prevent the software to load the data.

When the application is saving some reformatted or secondary capture images, we use the following terms:

- **Removed**: the tag is removed of the module and will be absent from the data set
- **Generated**: the software will generate a value, generally by computing a new value
- **Copied**: the software will try as much as possible to duplicate the value found in the source images if the value is the same on all the source images; if the value is not consistent, the tag will be absent from the data set if "Ignored" at load or possibly regenerated if "Used" at load

2. CONFORMANCE STATEMENT

2.1 INTRODUCTION

The Volumetrix MI is a software application, designed for Xeleris Workstation. This means that networking and media storage features are inherited from this platform. The application uses NM, CT, PET and MR DICOM images to display and processing.
The images created by the application (NM, CT, PET, MR, SC and MFSC) are saved in DICOM format. These images can be loaded and displayed by other GE HEALTHCARE applications or by other non-GE applications conformant to the DICOM Standard.

The Volumetrix MI will run on Xeleris 3.0 or higher as well as stand-alone application on AW Server. For a complete description of the networking conformance, refer to the Xeleris 3.0 & 3.1 DICOM Conformance statement (see Section 1.6)
For detailed description of objects ,created by AW "Filmer" application (invoked from the Volumetrix MI), refer to the VS5 – ADVANTAGE WORKSTATION 4.6 DICOM Conformance statement (see Section 1.6)

Volumetrix MI is a one-stop shop for processing and reading non-cardiac volumetric data, including NM SPECT and hybrid SPECT-CT, PET-CT, external CT/MR (CT/MR from a separate non-hybrid scan). For follow-up studies, two studies can be registered and viewed simultaneously, each including its reference data.

The Volumetrix MI main features include:

- Complete SPECT projections processing support: Motion Detection and Correction (Licensed Option), FBP and OSEM Reconstruction and Reformat (SPECT Options), including uniformity, attenuation and scatter corrections, attenuation map creation if not provided as input (Licensed Option), and OSEM with Resolution Recovery (licensed option), as well as Multi FOV Pasting.
- Hybrid QC
- Registration: Rigid Registration (Licensed Option), automatic or user-adjusted registration for external CT, MR and/or follow-up studies.
- Advanced Volumetrix Review, such as large gallery of predefined layouts, customized layouts, Creating 3D VR Images (Licensed Option), CT Segmentation (Table Removal) (Licensed Option), NM/PET Segmentation (Licensed Option), and Collecting 3D Spots.

The Volumetrix MI requires the NM, CT, PET and/or MR images as its input. The images can be any conforming image.

The following types of input datasets are supported:

- Only STATIC, TOMO and RECON TOMO image types are supported for NM IODs:
  - ✓ NM Static Images as Uniformity Maps
  - ✓ NM planar emission projections or reconstructed SPECT transaxial slices (single or Multi-FOV)
    *Note: If the NM emission data is from a non-GE vendor, it is recommended to use reconstructed transaxial slices as i*nput.
  - ✓ NM scatter projections
- Hybrid SPECT CT (single or Multi-FOV) with or without attenuation maps
- Hybrid PET CT
- Data from external MR, including obliques
- Data from external CTs
- Data from a single exam or two exams (for follow-up purposes), each may have additional external CT/MR
- Triple Energy Window data (TEW)
- Data from external CTs for attenuation correction (licensed option)

- Saved Results of all Volumetrix MI tasks can be used as input data for reading and re-processing tasks. For example, registration of previous study to external CT, or pasting of multi FOV data. The saved results may include Tomo Spots.

SOP Class Name	SOP Class UID
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20
CT Image Storage	1.2.840.10008.5.1.4.1.1.2
PET Image Storage	1.2.840.10008.5.1.4.1.1.128
MR Image Storage	1.2.840.10008.5.1.4.1.1.4

The **Volumetrix MI** creates the following outputs:

SOP Class Name	SOP Class UID
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20
CT Image Storage	1.2.840.10008.5.1.4.1.1.2
PET Image Storage	1.2.840.10008.5.1.4.1.1.128
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7
Multi-frame Grayscale Byte Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.2
Multi-frame True Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4
MR Image Storage	1.2.840.10008.5.1.4.1.1.4

The goal of this document is to give a detailed description of:

- The DICOM NM IODs that are required for use with and saved by the Volumetrix MI (Section 3)
- The DICOM CT IODs that are required for use with and saved by the Volumetrix MI (Section 4)
- The DICOM PET IODs that are required for use with and saved by the Volumetrix MI (Section 5)
- The DICOM SC and MFSC IODs written by the application (Section 6)
- The DICOM MR IODs that are required for use with and saved by the Volumetrix MI (Section 7)

2.2 SPECIFIC CHARACTER SETS SUPPORTED

Volumetric MI Application supports input images and creates output images encoded using the following character sets:

- Latin alphabet No. 1 "ISO_IR 100" / "ISO 2022 IR 100"
- Latin alphabet No. 2 "ISO_IR 101"/ "ISO 2022 IR 101"

Input images containing Character Set attribute (0008,0005) other than mentioned above will be rejected.

3. NM INFORMATION OBJECT IMPLEMENTATION

3.1 INTRODUCTION

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

3.2 VOLUMERIX MI MAPPING OF DICOM ENTITIES

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

TABLE 3-1
MAPPING OF DICOM ENTITIES TO VOLUMETRIX MI ENTITIES

DICOM IE	Volumetrix MI 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
	Private Patient	Used	3.4.1.2
Study	General Study	Used	3.4.2.1
	Patient Study	Used	3.4.2.2
	Private Study	Used	3.4.2.3
	Standard Extended Study	Used	3.4.2.4
	Clinical Trial Study	Not Used	N/A
Series	General Series	Used	3.4.3.1
	Clinical Trial Series	Not Used	N/A
	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 RECON TOMO	3.4.4.1
Equipment	General Equipment	Used	3.4.5.1
Image	General Image	Used	3.4.6.1
	Image Pixel	Used	3.4.6.2
	NM Image Pixel	Used	3.4.6.3

Acquisition Context	Not Used	N/A
Device	Not Used	N/A
Specimen	Not Used	N/A
Multi-frame	Used	3.4.6.4
NM Multi-frame	Used	3.4.6.5
NM Image	Used	3.4.6.6
NM Isotope	Used	3.4.6.7
NM Detector	Used	3.4.6.8
NM Tomo Acquisition	Used for images where Image Type (0008,0008) Value 3 is TOMO or RECON TOMO	3.4.6.9
NM Multi-gated Acquisition	Not Used	N/A
NM Phase	Not Used	N/A
NM Reconstruction	Used for images where Image Type (0008,0008) Value 3 is RECON TOMO	3.4.6.10
Overlay Plane	Not Used	N/A
Multi-frame Overlay	Not Used	N/A
VOI LUT	Used	3.4.6.11
SOP Common	Used	3.4.6.12
Private Image	Used	3.4.6.13
Private Image Pixel	Used	3.4.6.14
Private Isotope	Used	3.4.6.15
Private Detector	Used	3.4.6.16
Private Tomo Acquisition	Used for images where Image Type (0008,0008) Value 3 is TOMO or RECON TOMO	3.4.6.17
Private SPECT Reconstruction	Used for images where Image Type (0008,0008) Value 3 is RECON TOMO	3.4.6.18
Private SPECT Backprojection	Used for images where Image Type (0008,0008) Value 3 is RECON TOMO	3.4.6.19
Private SPECT Oblique Reformat	Used for images where Image Type (0008,0008) Value 3 is RECON TOMO	3.4.6.20

Note: Only images with Image Type (0008,0008) Value 3 is STATIC, TOMO and RECON TOMO are supported

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).

Volumetrix MI 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 (ignored on read and 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	Attribute Usage
Patient's Name	(0010,0010)	2	Patient's full name.	Used/ Copied
Patient ID	(0010,0020)	2	Primary hospital identification number or code for the patient.	Mandatory/ Copied
Issuer of Patient ID	(0010,0021)	3	Not Used	Ignored / Removed
Issuer of Patient ID Qualifiers Sequence	(0010,0024)	3	Not Used	Ignored / Removed
Patient's Birth Date	(0010,0030)	2	Birth date of the patient.	Used/ Copied
Patient's Sex	(0010,0040)	2	Sex of the named patient.	Used/ Copied
Other Patient IDs	(0010,1000)	3	Other identification numbers or codes used to identify the patient.	Ignored/Copied
Other Patient Names	(0010,1001)	3	Other names used to identify the patient.	Ignored/Copied
Other Patient IDs Sequence	(0010,1002)	3	Not Used	Ignored / Removed
Ethnic Group	(0010,2160)	3	Ethnic group or race of the patient.	Ignored /Copied
Patient Comments	(0010,4000)	3	User-defined additional information about the patient.	Ignored/Copied

3.4.1.2 Private Patient Module

TABLE 3-4
PRIVATE PATIENT MODULE ATTRIBUTES

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

3.4.2 Study Entity Modules

3.4.2.1 General Study Module

TABLE 3-5
GENERAL STUDY MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description	Attribute Usage
Study Instance UID	(0020,000D)	1	Unique identifier for the Study.	Mandatory / Copied
Study Date	(0008,0020)	2	Date the Study started.	Used / Copied
Study Time	(0008,0030)	2	Time the Study started	Used / Copied
Accession Number	(0008,0050)	2	A RIS generated number that identifies the order for the Study.	Used / Copied
Referring Physician's Name	(0008,0090)	2	Name of the patient's referring physician.	Used/ Copied
Study ID	(0020,0010)	2	User or equipment generated Study identifier.	Used/ Copied
Study Description	(0008,1030)	3	Study Description.	Ignored / Copied
Name of Physician(s) Reading Study	(0008,1060)	3	Names of the physician(s) reading the Study.	Ignored / Copied

3.4.2.2 Patient Study Module

TABLE 3-6
PATIENT STUDY MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description	Attribute Usage
Admitting Diagnoses Description	(0008,1080)	3	Description of the admitting diagnosis (diagnoses)	Ignored / Removed
Patient's Age	(0010,1010)	3	Age of the Patient.	Used / Copied
Patient's Size	(0010,1020)	3	Length or size of the Patient, in meters.	Used / Copied
Patient's Weight	(0010,1030)	3	Weight of the Patient, in kilograms	Used / Copied
Occupation	(0010,2180)	3	Patient Occupation.	Ignored / Copied
Additional Patient's History	(0010,21B0)	3	Additional information about the Patient's medical history.	Ignored /Copied

3.4.2.3 Private Study Module

TABLE 3-7
PRIVATE STUDY MODULE ATTRIBUTES

Attribute Name	Tag	Private Creator ID	Attribute Description	Attribute Usage
Study Name	(0009,xx10)	GEMS_GENIE_1	Name of the Database Study Object	Ignored/Copied
Study Flags	(0009,xx11)	GEMS_GENIE_1	Defines study information.	Ignored/Copied
Study Type	(0009,xx12)	GEMS_GENIE_1	Defines type of study.	Ignored/Copied
Study Comments	(0013,xx26)	GEMS_GENIE_1	User-defined additional information about the study.	Ignored/Copied
Protocol Data SQ	(0033,xx50)	GEMS_XELPRV_01	SQ with items encoding Protocol data Object (PDO) attributes; May contain 0 or more items	Ignored/Copied
>Object Type	(0033,xx08)	GEMS_XELPRV_01	Always set to "PROTOCOL DATA"	Ignored/Copied
>Modified	(0033,xx10)	GEMS_XELPRV_01	Modified Flag; Default value is 0, not modified.	Ignored/Copied
>Name	(0033,xx11)	GEMS_XELPRV_01	Name	Ignored/Copied
>Database Object Unique ID	(0033,xx16)	GEMS_XELPRV_01	Database UID of PDO; contains value of PDO UID tag (0033, xx52) generated at time of object creation.	Ignored/Copied

>Date	(0033,xx17)	GEMS_XELPRV_01	Date	Ignored/Copied
>Time	(0033,xx18)	GEMS_XELPRV_01	Time	Ignored/Copied
>ProtocolDataFlags	(0033,xx19)	GEMS_XELPRV_01	ProtocolDataFlags	Ignored/Copied
>ProtocolName	(0033,xx1A)	GEMS_XELPRV_01	ProtocolName	Ignored/Copied
>Relevant data UID	(0033,xx1B)	GEMS_XELPRV_01	Contains value of StudyID.	Ignored/Copied
>BulkData	(0033,xx1C)	GEMS_XELPRV_01	BulkData	Ignored/Copied
>IntData	(0033,xx1D)	GEMS_XELPRV_01	IntData	Ignored/Copied
>DoubleData	(0033,xx1E)	GEMS_XELPRV_01	DoubleData	Ignored/Copied
>StringData	(0033,xx1F)	GEMS_XELPRV_01	StringData	Ignored/Copied
>BulkDataFormat	(0033,xx20)	GEMS_XELPRV_01	BulkDataFormat	Ignored/Copied
>IntDataFormat	(0033,xx21)	GEMS_XELPRV_01	IntDataFormat	Ignored/Copied
>DoubleDataFormat	(0033,xx22)	GEMS_XELPRV_01	DoubleDataFormat	Ignored/Copied
>StringDataFormat	(0033,xx23)	GEMS_XELPRV_01	StringDataFormat	Ignored/Copied
>Description	(0033,xx24)	GEMS_XELPRV_01	Description	Ignored/Copied
>Internal SOPClassUID	(0033,xx51)	GEMS_XELPRV_01	PDO Private SOP Class UID	Ignored/Copied
>Internal Instance UID	(0033,xx52)	GEMS_XELPRV_01	PDO Instance UID	Ignored/Copied
ReviewTemplatesSequence	(0033,xx60)	GEMS_XELPRV_01	SQ with items encoding Private Review Tem-plates Objects (RTO) attributes	Ignored/Copied
>Object Type	(0033,xx08)	GEMS_XELPRV_01	Private object type. Contains String "REVIEW DATA"	Ignored/Copied
>Modified	(0033,xx10)	GEMS_XELPRV_01	Modified Flag	Ignored/Copied
>Name	(0033,xx11)	GEMS_XELPRV_01	Name	Ignored/Copied
>StudyId	(0033,xx14)	GEMS_XELPRV_01	StudyId	Ignored/Copied
>Database Object Unique ID	(0033,xx16)	GEMS_XELPRV_01	Database UID of RTO contains value of RTO UID tag (0033,xx62)	Ignored/Copied
>CreationDate	(0033,xx17)	GEMS_XELPRV_01	CreationDate	Ignored/Copied
>CreationTime	(0033,xx18)	GEMS_XELPRV_01	CreationTime	Ignored/Copied
>RTName	(0033,xx28)	GEMS_XELPRV_01	RTName	Ignored/Copied
>RTSpecification	(0033,xx29)	GEMS_XELPRV_01	RTSpecification	Ignored/Copied
>Review TemplatesFlags	(0033,xx2A)	GEMS_XELPRV_01	Review TemplatesFlags	Ignored/Copied
>DataValidationSpec	(0033,xx2B)	GEMS_XELPRV_01	DataValidationSpec	Ignored/Copied
>Description	(0033,xx2C)	GEMS_XELPRV_01	Description	Ignored/Copied
>IconDescription	(0033,xx2D)	GEMS_XELPRV_01	IconDescription	Ignored/Copied
>Internal SOP Class UID	(0033,xx61)	GEMS_XELPRV_01	RTO Private SOP Class UID	Ignored/Copied
>Internal InstanceUID	(0033,xx62)	GEMS_XELPRV_01	RTO Instance UID	Ignored/Copied

3.4.2.4 Standard Extended Study Module

TABLE 3-8
STANDARD EXTENDED STUDY MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description	Attribute Usage
Study Comments	(0032,4000)	3	Comments for Study	Ignored/Copied

3.4.3 Series Entity Modules

3.4.3.1 General Series Module

TABLE 3-9
GENERAL SERIES MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description	Attribute Usage
Modality	(0008,0060)	1	Type of equipment that originally acquired the data used to create the images in this Series. Defined Terms used: NM = Nuclear Medicine (for NM IOD) OT = Other (for NM IOD) PT= Positron Emission Tomography (for PET IOD)	Mandatory/ Generated
Series Instance UID	(0020,000E)	1	Internally generated unique identifier of the Series.	Mandatory/ Generated
Series Number	(0020,0011)	2	A number that identifies this Series.	Ignored/ Generated
Series Date	(0008,0021)	3	Date the Series started.	Used/Generated (Current Date)
Series Time	(0008,0031)	3	Time the Series started.	Used/Generated (Current Time)
Laterality	(0020,0060)	2C	Laterality of (paired) body part examined.	Ignored/ Copied
Performing Physicians' Name	(0008,1050)	3	Name of the physician(s) administering this Series.	Ignored/ Copied
Protocol Name	(0018,1030)	3	User-defined description of the conditions under which the Series was performed.	Used/ Generated
Series Description	(0008,103E)	3	Description of the Series	Used/Generated (application generated on save)
Operators' Name	(0008,1070)	3	Name(s) of the operator(s) supporting the Series	Used / Copied
Referenced Performed Procedure Step Sequence	(0008,1111)	3	Uniquely identifies the Performed Procedure Step SOP Instance to which the Series is related.	Ignored /Removed
Body Part Examined	(0018,0015)	3	Text description of the part of the body examined.	Used/Copied
Request Attributes Sequence	(0040,0275)	3	Sequence that contains attributes from the Imaging Service Request.	Ignored/Removed
Comments on the Performed Procedure Step	(0040,0280)	3	User-defined comments on the Performed Procedure Step	Ignored/Removed
Performed Procedure Step ID	(0040,0253)	3	Equipment generated identifier of the protocol carried out within this step.	Ignored/Removed
Performed Procedure Step Start Date	(0040,0244)	3	The date that the protocol (SPS) acquisition actually started	Ignored/Removed
Performed Procedure Step Start Time	(0040,0245)	3	The time that the protocol (SPS) acquisition actually started	Ignored/Removed
Performed Procedure Step Description	(0040,0254)	3	The full path of the performed protocol name.	Ignored/Removed
Performed Protocol Code Sequence	(0040,0260)	3	Not Used	Ignored/Removed

3.4.3.2 Standard Extended Series Module

TABLE 3-10
STANDARD EXTENDED SERIES MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description	Attribute Usage
Patient Position	(0018,5100)	3	Patient position descriptor relative to the equipment	Used/ Copied when sent to legacy systems only, otherwise Removed

3.4.3.3 NM/PET Patient Orientation Module

TABLE 3-11
NM/PET PATIENT ORIENTATION MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description	Attribute Usage
Patient Orientation Code Sequence	(0054,0410)	2	Describes the orientation of the patient with respect to gravity.	Used/Copied
>Include Code Sequence Macro			Baseline ID 19	Used/Copied
> Patient Orientation Modifier Code Sequence	(0054,0412)	2C	Patient Orientation Modifier.	Used/Copied
>>Include 'Code Sequence Macro'			Baseline ID 20	Used/Copied
Patient Gantry Relationship Code Sequence	(0054,0414)	2	Describes the orientation of the patient with respect to the gantry.	Used/Copied
>Include Code Sequence Macro			Baseline ID 21	Used/Copied

3.4.3.4 Private Series Module

TABLE 3-12
PRIVATE SERIES MODULE ATTRIBUTES

Attribute Name	Tag	Private Creator ID	Attribute Description	Attribute Usage
Series Object Name	(0009,xx20)	GEMS_GENIE_1	Name of the Database Series Object.	Ignored/Generated
Series Flags	(0009,xx21)	GEMS_GENIE_1	Defines series information.	Ignored/Generated
User Orientation	(0009,xx22)	GEMS_GENIE_1	User specified patient orientation.	Ignored/Copied
Initiation Type	(0009,xx23)	GEMS_GENIE_1	Acquisition initiation type. The Defined Terms: 0 = started on count rate 1 = started after time delay 2 = started manually	Ignored/Removed
Initiation Delay	(0009,xx24)	GEMS_GENIE_1	Acquisition start delay time.	Ignored/Removed
Initiation Count Rate	(0009,xx25)	GEMS_GENIE_1	Acquisition start count rate	Ignored/Removed
Number Energy Sets	(0009,xx26)	GEMS_GENIE_1	Number of energy sets in this Series. Possible Value: 0,1,2,3,4	Used/Generated
Number Detectors	(0009,xx27)	GEMS_GENIE_1	Number of detectors. Possible Value: 0,1,2	Used/Generated
Number R-R Windows	(0009,xx28)	GEMS_GENIE_1	Number of R-R Interval Windows. Possible Value: 0,1	Used/Generated
Number MG Time Slots	(0009,xx29)	GEMS_GENIE_1	Number of R-R Interval time bins. Possible Value: 0,8,16	Ignored/Copied
Number View Sets	(0009,xx2A)	GEMS_GENIE_1	Number of view sets in this	Used/Generated

			Series.	
Trigger History UID	(0009,xx2B)	GEMS_GENIE_1	UID of Private Trigger Object relevant to the Series.	Ignored/Copied
Series Comments	(0009,xx2C)	GEMS_GENIE_1	User-defined additional information about the series.	Ignored /Copied
Distance Prescribed	(0009,xx2E)	GEMS_GENIE_1	User prescribed whole body scanning distance.	Ignored/Removed
Table Direction	(0009,xx2F)	GEMS_GENIE_1	Table Direction	Ignored/Removed
Series Type	(0011,xx0A)	GEMS_GENIE_1	Defines type of series. The Defined Terms are: 9 = Tomographic 12= Ortogonal Reformat 15 = Results 24= Reprojection	Used/Generated
Effective Series Duration	(0011,xx0B)	GEMS_GENIE_1	Calculated duration of series.	Used/Copied
Number Beats	(0011,xx0C)	GEMS_GENIE_1	Number of physiological triggers during acquisition.	Ignored /Removed
Series Data Sequence	(0033,xx70)	GEMS_XELPRV_01	Sequence of item contains information about processing parameters.	Ignored/Generated (application generated on save)
>Object Type	(0033,xx08)	GEMS_XELPRV_01	Object Type. Contains string "SERIES DATA "	Used/Copied
>Modified	(0033,xx10)	GEMS_XELPRV_01	Default value = 0 (Not Modified). Possible Values 0,1	Ignored/Copied
>Name	(0033,xx11)	GEMS_XELPRV_01	SDO Name	Ignored/Generated
>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.	Ignored/Generated
>Date	(0033,xx17)	GEMS_XELPRV_01	SDO Creation date	Ignored/Generated (Current Date)
>Time	(0033,xx18)	GEMS_XELPRV_01	SDO Creation time	Ignored/Generated (Current Time)
>Series Data Flags	(0033,xx19)	GEMS_XELPRV_01	SDO Flags. Default value = 0	Ignored/Generated
>Protocol Name	(0033,xx1A)	GEMS_XELPRV_01	Name of Protocol created SDO	Ignored/Generated
>Relevant Data UID	(0033,xx1B)	GEMS_XELPRV_01	UID(s) of SOP Instance(s) relative to SDO	Used/Generated
>Bulk Data	(0033,xx1C)	GEMS_XELPRV_01	SDO parameter(s) stored as binary buffer(s)	Used/Generated
>Int Data	(0033,xx1D)	GEMS_XELPRV_01	List of SDO parameters stored as integers	Used/Generated
>Double Data	(0033,xx1E)	GEMS_XELPRV_01	List of SDO parameters stored as doubles	Used/Generated
>String Data	(0033,xx1F)	GEMS_XELPRV_01	List of SDO parameters stored as list of strings	Used/Generated
>Bulk Data Format	(0033,xx20)	GEMS_XELPRV_01	Format of bulk parameters; contains information about name and size of bulk buffers	Used/Generated
>Int Data Format	(0033,xx21)	GEMS_XELPRV_01	Format of integer parameters; contains information about name and number of integers in list	Used/Generated
>Double Data Format	(0033,xx22)	GEMS_XELPRV_01	Format of double parameters; contains information about	Used/Generated

			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	Used/Generated
>Description	(0033,xx24)	GEMS_XELPRV_01	User or equipment generated SDO description	Ignored/Generated
>SDO Private SOP Class UID	(0033,xx71)	GEMS_XELPRV_01	SDO Private SOP Class UID- "1.2.840.113619.4.17"	Ignored/Generated
>SDO Instance UID	(0033,xx72)	GEMS_XELPRV_01	SDO Instance UID; Internally generated	Ignored/Generated
>Double Data SQ	(0033,xx73)	GEMS_XELPRV_01	Sequence of items to store SDO parameters as lists of doubles	Used/Removed
>>Double Data	(0033,xx1E)	GEMS_XELPRV_01	List of SDO parameters stored as doubles	Used/Removed

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

The Frame of Reference Module Attributes appear for TOMO and RECON TOMO scan types.

TABLE 3-13
FRAME OF REFERENCE MODULE ATTRIBUTES

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

3.4.5 Equipment Entity Modules

3.4.5.1 General Equipment Module

TABLE 3-14
GENERAL EQUIPMENT MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description	Attribute Usage
Manufacturer	(0008,0070)	2	Manufacturer of the equipment that produced the composite instances. Possible Values: "GE MEDICAL SYSTEMS"	Used /Generated

			"GE MEDICAL SYSTEMS, NUCLEAR" (for NM IOD) "GE MEDICAL SYSTEMS, PET " (for PET IOD) "GE MEDICAL SYSTEMS, CT" (for CT IOD) "GE MEDICAL SYSTEMS, MRI " (for MR IOD)	
Institution Name	(0008,0080)	3	Institution where the equipment that produced the composite instances is located.	Used/Copied
Institution Address	(0008,0081)	3	Mailing address of the institution where the equipment that produced the composite instances is located.	Ignored /Removed
Institutional Department Name	(0008,1040)	3	Department in the institution where the equipment that produced the composite instances is located.	Ignored /Removed
Manufacturer's Model Name	(0008,1090)	3	Manufacturer's model name of the equipment that produced the composite instances.	Used /Copied
Device Serial Number	(0018,1000)	3	Manufacturer's serial number of the equipment that produced the composite instances.	Ignored /Generated
Station Name	(0008,1010)	3	User defined name identifying the machine that produced the composite instances.	Ignored /Generated
Software Versions	(0018,1020)	3	Manufacturer's designation of software version of the equipment that produced the composite instances	Ignored /Generated
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.	Ignored /Removed
Date of Last Calibration	(0018,1200)	3	Date when the image acquisition device calibration was last changed in any way.	Ignored /Removed
Time of Last Calibration	(0018,1201)	3	Time when the image acquisition device calibration was last changed in any way.	Ignored /Removed

3.4.6 Image Entity Modules

3.4.6.1 General Image Module

TABLE 3-15
GENERAL IMAGE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description	Attribute Usage
Instance Number	(0020,0013)	2	A number that identifies this image.	Ignored/Generated
Patient Orientation	(0020,0020)	2C	Not sent for NM (not required)	Ignored/Removed
Content Date	(0008,0023)	2C	The date the image pixel data creation started.	Used/Generated (Current Date)
Content Time	(0008,0033)	2C	The time the image pixel data creation started	Used/Generated (Current Time)
Image Type	(0008,0008)	3	See 3.4.6.6.1	Used / Generated
Acquisition Date	(0008,0022)	3	The date the acquisition of data that resulted in this image started	Used/ Generated
Acquisition Time	(0008,0032)	3	The time the acquisition of data that resulted in this image started	Used/ Generated
Image Comments	(0020,4000)	3	Contains additional information about image.	Used/Copied
Quality Control Image	(0028,0300)	3	Indicates whether or not this image is a quality control or phantom image.	Ignored / Removed

3.4.6.2 Image Pixel Module

TABLE 3-16
IMAGE PIXEL MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description	Attribute Usage
Samples per Pixel	(0028,0002)	1	See 3.4.6.3 for NM Images	
Photometric Interpretation	(0028,0004)	1	See 3.4.6.3 for NM Images	
Rows	(0028,0010)	1	Number of rows in the image.	Used / Generated
Columns	(0028,0011)	1	Number of columns in the image	Used / Generated
Bits Allocated	(0028,0100)	1	See 3.4.6.3 for NM Images	
Bits Stored	(0028,0101)	1	See 3.4.6.3 for NM Images	
High Bit	(0028,0102)	1	See 3.4.6.3 for NM Images	
Pixel Representation	(0028,0103)	1	Data representation of the pixel samples.	Used / Generated
Pixel Data	(7FE0,0010)	1	A data stream of the pixel samples that comprise the Image.	Used /Generated
Planar Configuration	(0028,0006)	1C	Not Used (number of Samples per Pixel is always 1)	Ignored / Removed
Pixel Aspect Ratio	(0028,0034)	1C	Not Used	Ignored / Removed
Smallest Image Pixel Value	(0028,0106)	3	The minimum actual pixel value encountered in this image.	Used /Generated
Largest Image Pixel Value	(0028,0107)	3	The maximum actual pixel value encountered in this image.	Used /Generated

3.4.6.3 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	Attribute Usage
Samples per Pixel	(0028,0002)	1	Number of samples (planes) in this image. The value always set to 1.	Used/ Generated
Photometric Interpretation	(0028,0004)	1	Specifies the intended interpretation of the pixel data Enumerated Values supported : MONOCHROME2	Used/Generated
Bits Allocated	(0028,0100)	1	Number of bits allocated for each pixel sample. Each sample shall have the same number of bits allocated. Enumerated Values supported : 16.	Used / Generated
Bits Stored	(0028,0101)	1	Number of bits stored for each pixel sample. Value equal to Bit Allocated (0028,0100)	Used / Generated
High Bit	(0028,0102)	1	Most significant bit for pixel sample data. Value equal to Bit Stored (0028,0101) – 1	Used / Generated
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.	Used / Copied

3.4.6.4 Multi-Frame Module

TABLE 3-18
MULTI-FRAME MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description	Attribute Usage
Number of Frames	(0028,0008)	1	Number of frames in a Multi-frame Image.	Used / Generated
Frame Increment Pointer	(0028,0009)	1	See 3.4.6.5.1 for further specialization.	Used / Generated

3.4.6.5 NM Multi-frame Module

TABLE 3-19
NM MULTI-FRAME MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description	Attribute Usage
Frame Increment Pointer	(0028,0009)	1	See 3.4.6.5.1 for further specialization.	Used / Generated
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).	Used /Generated
Number of Energy Windows	(0054,0011)	1	Number of energy set windows in SOP Instance. Possible values: 1, 2, 3 or 4.	Used /Generated
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).	Used / Generated
Number of Detectors	(0054,0021)	1	Number of detectors in SOP Instance. Possible values: 1 or 2.	Used / Generated
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).	Used / Generated
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 RECON TOMO	Used / Generated
Slice Vector	(0054,0080)	1C	An array which contains the spatial slice number for each frame. Sent if the value of the Frame Increment Pointer (0028,0009) includes the Tag for Slice Vector (0054,0080)	Used / Generated
Number of Slices	(0054,0081)	1C	Number of images slices in SOP Instance. Sent if Image Type (0008,0008), Value 3 is RECON TOMO.	Used / Generated
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).	Used / Generated

3.4.6.5.1 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)	Image Types Usage
STATIC	0054H 0010H \ 0054H 0020H Sequencing is by Energy Window Vector (0054,0010), Detector Vector (0054,0020).	Used /Ignored
TOMO	0054H 0010H \ 0054H 0020H \ 0054H 0050H \ 0054H 0090H Sequencing is by Energy Window Vector (0054,0010), Detector Vector (0054,0020), Rotation Vector (0054,0050), Angular View Vector (0054,0090)	Used/Generated
RECON TOMO	0054H 0080H Sequencing is by Slice Vector (0054,0080)	Used/Generated

Note: STATIC Images are never generated; used only as input images.

3.4.6.6 NM Image Module

TABLE 3-21
NM IMAGE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description	Attribute Usage
Image Type	(0008,0008)	1	See 3.4.6.6.1 for specialization.	Used / Generated
Image ID	(0054,0400)	3	User or equipment generated Image identifier.	Used / Generated
Counts Accumulated	(0018,0070)	2	Sum of all gamma events for all frames in the image.	Used / Generated
Acquisition Termination Condition	(0018,0071)	3	Description of how the data collection was stopped. Defined Terms are used: CNTS = counts DENS = density, count limit reached within ROI MANU = manual TIME = time TRIG = physiological trigger	Used / Copied
Actual Frame Duration	(0018,1242)	1C	Elapsed time for one frame acquisition in msec. Used when the Image Type (0008,0008), Value 3, is equal to STATIC	Used/ Removed
Count Rate	(0018,1243)	3	Maximum count rate achieved during the acquisition in counts/sec	Used/ Copied
Corrected Image	(0028, 0051)	3	Corrections have been applied to the image. Defined Terms are used: UNIF = flood corrected COR = center of rotation corrected ATTN = attenuation corrected SCAT = scatter corrected NRGY = energy corrected LIN = linearity corrected CLN = count loss normalization MOTN=motion corrected	Used / Copied

3.4.6.6.1 Image Type

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

- STATIC - Identifies a Static Image (Uniformity Maps)
- TOMO - Identifies a Tomographic (SPECT) Image
- RECON TOMO - Identifies a reconstructed Tomographic Image

The following Enumerated Values of Value 4 are used:

- EMISSION - Transmission source is NOT active during image acquisition

The following values of Image Type (0008,0008) are generated:
Value 1 may have the following Enumerated Values:

- DERIVED identifies a Derived Image

Value 2 may have the following Enumerated Value:

- PRIMARY identifies a Primary Image

Value 3 may have the following Enumerated Values:

- TOMO - Identifies a Tomographic (SPECT) Image
- RECON TOMO - Identifies a reconstructed Tomographic Image

Value 4 may have the following Enumerated Value:

- EMISSION - Transmission source is NOT active during image acquisition

3.4.6.7 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	Attribute Usage
Energy Window Information Sequence	(0054,0012)	2	Sequence of Items that describe the energy window groups used. Up to 3 items are supported for this SQ.	Used /Copied
> Energy Window Name	(0054,0018)	3	A user defined name which describes this Energy Window.	Ignored/Copied
>Energy Window Range Sequence	(0054,0013)	3	Sequence describing window energy limits. May contain 1 or more items.	Used / Copied
>> Energy Window Lower Limit	(0054,0014)	3	The lower limit of the energy window in KeV.	Used / Copied
>> Energy Window Upper Limit	(0054,0015)	3	The upper limit of the energy window in KeV.	Used / Copied
Radiopharmaceutical Information Sequence	(0054,0016)	2	Information on radiopharmaceutical(s) used.	
> Radionuclide Code Sequence	(0054,0300)	2	Sequence that identifies the radionuclide.	Only first valid item is Used /Copied.
>> Include 'Code Sequence Macro'	*Baseline ID 18*			Used/Copied See **TABLE 3-21A** for full list of supported values.
> Radiopharmaceutical Route	(0018,1070)	3	Route of injection.	Ignored /Removed
> Administration Route Code Sequence	(0054,0302)	3	Not Used	Ignored /Removed
> Radiopharmaceutical Volume	(0018,1071)	3	Volume of injection in cubic cm.	Used / Copied
> Radiopharmaceutical Start Time	(0018,1072)	3	Time of start of injection.	Ignored /Removed
> Radiopharmaceutical Stop Time	(0018,1073)	3	Time of end of injection.	Ignored /Removed
> Radionuclide Total Dose	(0018,1074)	3	Total amount of radionuclide injected in MBq.	Used / Copied
> Radiopharmaceutical	(0018,0031)	3	Name of the radiopharmaceutical.	Used / Copied
> Radiopharmaceutical Code Sequence	(0054,0304)	3	Sequence that identifies the radiopharmaceutical.	Ignored /Copied
>> Include 'Code Sequence Macro'	*Baseline ID 25*			Ignored/Copied See **TABLE 3-21B** for full list of supported values.
Intervention Drug Information Sequence	(0018,0026)	3	Sequence of Items that describes the intervention drugs used..	Ignored / Removed

TABLE 3-21A
RADIONUCLIDE CODE SEQUENCE VALUES

Code Value	Coding Scheme Designator	Code Meaning
C-105A1	99SDM	^11^Carbon
C-107A1	99SDM	^13^Nitrogen
C-111A1	99SDM	^18^Fluorine
C-114A4	99SDM	^123^Iodine
C-114A6	99SDM	^125^Iodine
C-114B1	99SDM	^131^Iodine
C-122A5	99SDM	^133^Barium
C-128A2	99SDM	^68^Germanium
C-131A2	99SDM	^67^Gallium
C-138A9	99SDM	^201^Thallium
C-144A3	99SDM	^57^Cobalt
C-145A4	99SDM	^111^Indium
C-155A1	99SDM	^22^Sodium
C-159A2	99SDM	^82^Rubidium
C-163A8	99SDM	^99m^Technetium
C-172A8	99SDM	^133^Xenon
C-173A7	99SDM	^85^Krypton
C-178A8	99SDM	^153^Gadolinium

TABLE 3-21B
RADIOPHARMACEUTICAL CODE SEQUENCE VALUES (BASELINE ID 25)

Code Value	Coding Scheme Designator	Code Meaning
C-B1000	SRT	Diagnostic radioisotope
C-B1010	SRT	Therapeutic radioisotope
C-B1011	SRT	Sodium chromate Cr^51^
C-B1012	SRT	Chromium^51^ albumin
C-B1013	SRT	Chromium^51^ chloride
C-B1016	SRT	Copper^64^ versenate
C-B1017	SRT	Copper^64^ acetate
C-B1018	SRT	Copper^67^ ceruloplasmin
C-B1021	SRT	Cyanocobalamin Co^57^
C-B1022	SRT	Cyanocobalamin Co^58^
C-B1023	SRT	Cyanocobalamin Co^60^
C-B1031	SRT	Fluorodeoxyglucose F^18^
C-B1032	SRT	Sodium fluoride F^18^
C-B1037	SRT	Rubidium chloride Rb^82^
C-B103C	SRT	Ammonia N^13^
C-B1041	SRT	Gallium^67^ citrate
C-B1051	SRT	Colloidal gold Au^198^
C-B1061	SRT	Indium^111^ pentetate
C-B1062	SRT	Disodium indium^111^

C-B1063	SRT	Colloidal Indium^111^
C-B1065	SRT	Indium^111^-Fe(OH)>3<
C-B1066	SRT	Indium^111^ red cell label
C-B1067	SRT	Indium^111^ transferrin
C-B1068	SRT	Indium^113^ bleomycin
C-B1069	SRT	Indium^113^ chloride
C-B1070	SRT	Indium^113^ pentetate
C-B1071	SRT	Indium^113^ oxoquinoline WBC label
C-B1072	SRT	Indium^113^ oxoquinoline platelet label
C-B1073	SRT	Indium^113^ oxoquinoline RBC label
C-B1081	SRT	Sodium iodide I^123^
C-B1082	SRT	Fibrinogen I^123^
C-B1083	SRT	Oleic acid I^125^
C-B1084	SRT	Iodinated I^125^ albumin
C-B1085	SRT	Rose Bengal sodium I^131^
C-B1086	SRT	Sodium iodide I^131^
C-B1087	SRT	Iodocholesterol I^131^
C-B1088	SRT	Iothalamate sodium I^125^
C-B1089	SRT	Iodinated I^131^ albumin
C-B1090	SRT	Iodinated I^131^ aggregated albumin
C-B1091	SRT	Iodohippurate I^131^ sodium
C-B1092	SRT	Diiodofluorecein I^131^
C-B1093	SRT	Iodinated I^125^ oleic acid and triolein
C-B1094	SRT	Iodinated I^125^ levothyroxine
C-B1095	SRT	Iodohippurate I^123^ sodium
C-B1096	SRT	Iodinated I^125^ povidone
C-B1097	SRT	Iodinated I^125^ Rose Bengal
C-B1098	SRT	Iodinated I^125^ sealed source
C-B1099	SRT	Iodinated I^125^ sodium iodine
C-B1100	SRT	Iodinated I^125^ human serum albumin
C-B1105	SRT	Iodohippurate I^125^ sodium
C-B1108	SRT	Iofetamine I^123^ hydrochloride
C-B1109	SRT	Iodine^131^ polyvinylpyrrolidone
C-B1111	SRT	Iodinated I^131^ gamma globulin
C-B1121	SRT	Ferrous citrate Fe^59^
C-B1122	SRT	Ferrous chloride Fe^59^
C-B1123	SRT	Ferrous sulfate Fe^59^
C-B1124	SRT	Iron Fe^59^ labeled dextran
C-B1140	SRT	Chromic phosphate P^32^
C-B1142	SRT	Sodium phosphate P^32^
C-B1150	SRT	Potassium chloride K^43^
C-B1151	SRT	Potassium carbonate K^42^
C-B1152	SRT	Potassium chloride K^42^
C-B1171	SRT	Selenomethionione Se^75^

C-B1172	SRT	Selenium^75^ HCAT
C-B1175	SRT	Sodium chloride Na^24^
C-B1176	SRT	Sodium chloride Na^22^
C-B1180	SRT	Strontium chloride Sr^85^
C-B1181	SRT	Strontium chloride Sr^87^
C-B1182	SRT	Strontium nitrate Sr^85^
C-B1183	SRT	Strontium nitrate Sr^87^
C-B1200	SRT	Technetium Tc^99m^ aggregated albumin
C-B1203	SRT	Technetium Tc^99m^ microaggregated albumin
C-B1204	SRT	Technetium Tc^99m^ albumin colloid
C-B1205	SRT	Technetium Tc^99m^ albumin microspheres
C-B1206	SRT	Sodium pertechnetate Tc^99m^
C-B1207	SRT	Technetium Tc^99m^ disofenin
C-B1208	SRT	Technetium Tc^99m^ mebrofenin
C-B1209	SRT	Technetium Tc^99m^ lidofenin
C-B1210	SRT	Technetium Tc^99m^ iron ascorbate
C-B1211	SRT	Technetium Tc^99m^ stannous etidronate
C-B1212	SRT	Technetium Tc^99m^ medronate
C-B1213	SRT	Technetium Tc^99m^ oxidronate
C-B1214	SRT	Technetium Tc^99m^ pentetate
C-B1215	SRT	Technetium Tc^99m^ pyro and polyphosphates
C-B1216	SRT	Technetium Tc^99m^ serum albumin
C-B1220	SRT	Technetium Tc^99m^ sodium glucoheptonate
C-B1221	SRT	Technetium Tc^99m^ succimer
C-B1222	SRT	Technetium Tc^99m^ sulfur colloid
C-B1223	SRT	Technetium Tc^99m^ exametazine
C-B1224	SRT	Technetium Tc^99m^ tagged red cells
C-B1225	SRT	Technetium Tc^99m^ N-substituted iminodiace-tate
C-B1231	SRT	Thallous chloride Tl^201^
C-B1251	SRT	Pentetate calcium trisodium Yb^169^
C-B1300	SRT	Carbon^14^ triolein
C-B1302	SRT	Carbon^14^ D-xylose
C-B1304	SRT	Cholyl-carbon^14^ glycine
Y-X1743	99SDM	FDG -- fluorodeoxyglucose
Y-X1744	99SDM	FDOPA -- fluoroDOPA
Y-X1745	99SDM	F- -- Fluorine
Y-X1746	99SDM	NH3 -- Ammonia
Y-X1747	99SDM	H2O --water
Y-X1748	99SDM	O2 -- Oxygen
Y-X1749	99SDM	[150]CO -- carbon monoxide
Y-X1750	99SDM	[150]CO2 -- carbon dioxide
Y-X1751	99SDM	OAc -- Acetate
Y-X1752	99SDM	Palmitate
Y-X1753	99SDM	[11C]CO -- carbon monoxide

Y-X1754	99SDM	[11C]CO2 -- carbon dioxide
Y-X1755	99SDM	Rubidium cation
Y-X1756	99SDM	FluoroSpiperone
Y-X1757	99SDM	L-2-Fluorotyrosine
Y-X1758	99SDM	Misonidazole
Y-X1759	99SDM	[11C]Butanol
Y-X1760	99SDM	Deoxyglucose
Y-X1761	99SDM	Glucose
Y-X1762	99SDM	Methionine
Y-X1763	99SDM	N-MethylSpiperone
Y-X1764	99SDM	Raclopride
Y-X1765	99SDM	Thymidine
Y-X1766	99SDM	L-1-Tyrosine
Y-X1767	99SDM	[15O]Butanol
Y-X1768	99SDM	EDTA
Y-X1769	99SDM	PTSM
PHRM-MIBI	CSMC-AIM	Technetium Tc^99m^ sestamibi
PHRM-TETRO	CSMC-AIM	Technetium Tc^99m^ tetrofosmin

3.4.6.8 NM Detector Module

TABLE 3-23
NM DETECTOR MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description	Attribute Usage
Detector Information Sequence	(0054,0022)	2	Sequence of Items that describe the detectors used. 1 or 2 items are supported in the SQ.	Used / Copied
> Collimator/Grid Name	(0018,1180)	3	Label describing the collimator used	Ignored / Copied
> Collimator Type	(0018,1181)	2	Collimator type. The following values are supported: PARA = Parallel PINH = Pinhole FANB = Fan-beam CONE = Cone-beam SLNT = Slant hole ASTG = Astigmatic DIVG = Diverging NONE = No collimator UNKN = Unknown	Used / Copied
> Field of View Shape	(0018,1147)	3	Shape of FOV The following values are supported: RECTANGLE ROUND	Ignored / Copied
> Field of View Dimension(s)	(0018,1149)	3	Dimensions of the field of view in mm.	Ignored / Copied
> Focal Distance	(0018,1182)	2	Focal distance, in mm.	Ignored / Copied
> X Focus Center	(0018,1183)	3	Center of focus along a row.	Used / Copied
> Y Focus Center	(0018,1184)	3	Center of focus along a column.	Used / Copied
> Zoom Center	(0028,0032)	3	The amount of offset from (0, 0) applied to each	Used / Copied

			pixel in the image before application of the zoom factor, specified by a numeric pair (in mm).	
> Zoom Factor	(0028,0031)	3	The amount of magnification applied to each pixel in the image.	Used / Copied
> Center of Rotation Offset	(0018,1145)	3	Offset between detector center and mechanical center	Used / Copied
> Gantry/Detector Tilt	(0018,1120)	3	Angle of tilt in degrees of the detector.	Used / Copied
> Distance Source to Detector	(0018,1110)	2C	Distance in mm from transmission source to the detector face.	Ignored / Removed
> Start Angle	(0054,0200)	3	Position of the detector about the patient for the start of the acquisition, in degrees.	Ignored / Removed
> Radial Position	(0018,1142)	3	Radial distance of the detector from the center of rotation, in mm.	Ignored / Removed
> 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	Ignored / Copied
> 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.	Ignored / Copied
> View Code Sequence	(0054,0220)	3	Sequence that describes the projection of the anatomic region of interest on the image receptor.	Used / Copied
>> Include 'Code Sequence Macro'	*Baseline ID 26*			Used / Copied See **TABLE 3-22A**

TABLE 3-22A
VIEW CODE SEQUENCE VALUES (BASELINE ID 26)

Code Value	Coding Scheme Designator	Code Meaning
G-5206	SRT	Right anterior oblique
G-5207	SRT	Left anterior oblique
G-5208	SRT	Right posterior oblique
G-5209	SRT	Left posterior oblique
G-5210	SRT	Oblique axial
G-5212	SRT	Sagittal-oblique axial
G-5215	SRT	Anterior projection
G-5216	SRT	Posterior projection
G-5220	SRT	Medial-lateral
G-5221	SRT	Lateral-medial
G-5222	SRT	Right lateral projection
G-5223	SRT	Left lateral projection
G-5224	SRT	Medial-lateral oblique
G-5225	SRT	Latero-medial oblique
G-A104	SRT	Lateral
G-A117	SRT	Transverse
G-A138	SRT	Coronal
G-A145	SRT	Sagittal
G-A147	SRT	Axial

G-A186	SRT	Short Axis
G-A18A	SRT	Vertical Long Axis
G-A18B	SRT	Horizontal Long Axis

3.4.6.9 NM Tomo Acquisition Module

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

TABLE 3-24
NM TOMO ACQUISITION MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description	Attribute Usage
Rotation Information Sequence	(0054,0052)	2	Sequence of Items that describe TOMO rotational groups. May contain 0 or 1 item.	Used / Copied
> Start Angle	(0054,0200)	1	Position of the detector about the patient for the start of the acquisition, in degrees.	Used / Copied
> Angular Step	(0018,1144)	1	The angular scan arc step between views of the TOMO acquisition, in degrees	Used / Copied
> Rotation Direction	(0018,1140)	1	Direction of rotation of the detector about the patient. Enumerated Values: CW = clockwise (decreasing angle) CC = counter-clockwise (increasing angle).	Used / Copied
> Scan Arc	(0018,1143)	1	The effective angular range of the scan data in degrees.	Used / Copied
> Actual Frame Duration	(0018,1242)	1	Nominal acquisition time per angular position, in msec.	Used / Copied
> Radial Position	(0018,1142)	3	Radial distance of the detector from the center of rotation, in mm.	Used / Copied
> Distance Source to Detector	(0018,1110)	2C	Distance in mm from transmission source to the detector face.	Ignored / Removed
> Number of Frames in Rotation	(0054,0053)	1	Number of angular views in this rotation.	Used / Generated
> Table Traverse	(0018,1131)	3	Table longitudinal position at acquisition start .in mm.	Used / Copied
> Table Height	(0018,1130)	3	The distance in mm of the top of the patient table to the center of rotation.	Used / Copied
Type of Detector Motion	(0054,0202)	3	Describes the detector motion during acquisition. Enumerated Values: STEP AND SHOOT = Interrupted motion, acquire only while stationary. CONTINUOUS = Gantry motion and acquisition are simultaneous and continuous. ACQ DURING STEP = Interrupted motion, acquisition is continuous.	Ignored / Copied

3.4.6.10 NM Reconstruction Module

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

TABLE 3-25
NM RECONSTRUCTION MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description	Attribute Usage
Spacing Between Slices	(0018,0088)	2	Spacing between slices, in mm, measured from center-to-center of each slice along the	Used / Generated

			normal to the first image.	
Slice Thickness	(0018,0050)	2	Nominal slice thickness, in mm.	Used / Generated
Slice Progression Direction	(0054,0500)	3	Describes the anatomical direction that slices are progressing as the slices are considered in order (as defined by the Slice Vector (0054,0080)). Meaningful only for cardiac images.	Ignored / Removed

3.4.6.11 VOI LUT Module

TABLE 3-26
VOI LUT MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description	Attribute Usage
Window Center	(0028,1050)	1C	Window Center for display.	Used / Generated (Calculated from actually maximal and minimal pixel values.)
Window Width	(0028,1051)	1C	Window Width for display.	Used / Generated (Calculated from actually maximal and minimal pixel values.)

3.4.6.12 SOP Common Module

This section defines the Attributes which are required for proper functioning and identification of the associated SOP Instances.

TABLE 3-27
SOP COMMON MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description	Attribute Usage
SOP Class UID	(0008,0016)	1	Uniquely identifies the SOP Class. Always set to "1.2.840.10008.5.1.4.1.1.20"	Ignored / Generated
SOP Instance UID	(0008,0018)	1	Uniquely identifies the SOP Instance.	Mandatory / Generated
Specific Character Set	(0008,0005)	1C	Character Set that expands or replaces the Basic Graphic Set. Defined Terms used: refer to Section 2.2	Used / Generated
Instance Creation Date	(0008,0012)	3	Date of instance creation.	Ignored / Generated
Instance Creation Time	(0008,0013)	3	Time of instance creation.	Ignored / Generated
Instance Creator UID	(0008,0014)	3	The Implementation UID for this DICOM v3.0 Implementation Set to the 1.2.840.113619.6.281	Ignored / Generated
Instance Number	(0020,0013)	3	See 3.4.6.1 for more specialization	Ignored / Generated

3.4.6.13 Private Image Module

This section specifies the Attributes which identify and describe an image within a particular series. This Module contains *private* Attributes that convey information not contained in the related DICOM Standard v3.0 Module.

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TABLE 3-28
PRIVATE IMAGE MODULE ATTRIBUTES

Attribute Name	Tag	Private Creator	Attribute Description	Attribute Usage
Workstation DICOM data Identifier	(0009,xx01)	GEMS_GENIE_1		Used / Generated (Always set to "GEMS_GENIE")
DatasetUID	(0009,xx1E)	GEMS_GENIE_1	Unique Identifier of Dataset object	Ignored/ Generated

Dataset UID List	(0009,xx45)	GEMS_GENIE_1	Unique Identifier of Dataset object in List format	Ignored / Removed
Radio Nuclide Name	(0011,xx0D)	GEMS_GENIE_1	Name of radionuclide used.	Used / Copied
Database Object Name	(0011,xx10)	GEMS_GENIE_1	Name of the Database Dataset Object.	Ignored /Generated
Dataset Modified	(0011,xx11)	GEMS_GENIE_1	Dataset Modified Flag	Ignored / Generated
Dataset Name	(0011,xx12)	GEMS_GENIE_1	Dataset Name	Used /Generated
Dataset Type	(0011,xx13)	GEMS_GENIE_1	Defines type of dataset. The Defined Terms are: 0 = Static 12 = Tomographic planar 13 = Transaxial 14 = Sagittal 15 = Coronal 42 = MIP 3D	Used /Generated
Completion Time	(0011,xx14)	GEMS_GENIE_1	Completion Time	Ignored / Generated
Detector Number	(0011,xx15)	GEMS_GENIE_1	Detector number image was acquired by.	Used / Generated
Energy Number	(0011,xx16)	GEMS_GENIE_1	Energy set number.	Used / Generated
RR Interval Window Number	(0011,xx17)	GEMS_GENIE_1	R-R interval number.	Used / Generated
MG Bin Number	(0011,xx18)	GEMS_GENIE_1	Multi-gated time bin number.	Ignored / Generated (set to 0)
Radius Of Rotation	(0011,xx19)	GEMS_GENIE_1	Distance to the center of detector rotation.	Used / Copied
Detector Count Zone	(0011,xx1A)	GEMS_GENIE_1	FOV zone for count-based acquisition termination criteria. The Defined Terms are: 0 = none specified 1 = total (all) counts 2 = counts in energy set 3 = counts inside an ROI 4 = counts outside an ROI	Ignored / Generated
Image Orientation	(0011,xx1F)	GEMS_GENIE_1	Orientation of the image. The Defined Terms are: 0 = no rotation, no mirroring 1 = no rotation, mirrored	Ignored / Generated
Table Orientation	(0011,xx26)	GEMS_GENIE_1	Orientation of the table for whole body acquisition.	Ignored / Copied
ROI Top Left	(0011,xx27)	GEMS_GENIE_1	Acquisition count zone ROI, top left coordinate.	Ignored / Generated
ROI Bottom Right	(0011,xx28)	GEMS_GENIE_1	Acquisition count zone ROI, bottom right coordinate.	Ignored / Generated
View X Adjustment	(0011,xx2C)	GEMS_GENIE_1	View X Adjustment	Ignored / Generated
View Y Adjustment	(0011,xx2D)	GEMS_GENIE_1	View Y Adjustment	Ignored / Generated
Pixel Overflow Flag	(0011,xx2E)	GEMS_GENIE_1	Pixel Overflow Flag	Ignored / Generated
Pixel Overflow Level	(0011,xx2F)	GEMS_GENIE_1	Pixel Overflow Level	Ignored / Generated
Acquisition Parent UID	(0011,xx31)	GEMS_GENIE_1	Acquisition Parent UID	Used / Copied
Processing Parent UID	(0011,xx32)	GEMS_GENIE_1	Processing Parent UID	Used / Copied
Energy Correct Name	(0011,xx33)	GEMS_GENIE_1	Name of applied energy correction.	Ignored/ Copied
Spatial Correct Name	(0011,xx34)	GEMS_GENIE_1	Name of applied spatial correction.	Ignored/ Copied
Tuning Calib Name	(0011,xx35)	GEMS_GENIE_1	Name of applied tuning	Ignored/ Copied

			calibration data.	
Uniformity Correct Name	(0011,xx36)	GEMS_GENIE_1	Name of associated uniformity correction.	Used / Copied
Acquisition Specific Correct Name	(0011,xx37)	GEMS_GENIE_1	Name(s) of associated acquisition specific correction(s).	Ignored/ Copied
Dataset Flags	(0011,xx3F)	GEMS_GENIE_1	Defines dataset information.	Ignored / Generated
Period	(0011,xx55)	GEMS_GENIE_1	Period	Used / Copied
Elapsed Time	(0011,xx56)	GEMS_GENIE_1	Elapsed Time	Ignored / Copied
FOV	(0011,xx57)	GEMS_GENIE_1	FOV	Used / Copied
Digital FOV	(0013,xx10)	GEMS_GENIE_1	Digital FOV	Used / Copied
Source Translator	(0013,xx11)	GEMS_GENIE_1	Source Translator	Used / Generated (Always set to 4)
RAL Flags	(0013,xx12)	GEMS_GENIE_1	RAL Flags	Used / Copied
Xeleris Frame Sequence	(0055,xx65)	GEMS_GENIE_1	Xeleris Frame Sequence. Present for historical reasons. Always contains 0 items.	Ignored / Copied
Annotation Sequence	(0019, xx5F)	GEMS_GENIE_1	Annotations attached to image; May contain 0 or more Items	Used / Generated
>Modified	(0019, xx60)	GEMS_GENIE_1	Modified Flag	Ignored / Generated
>Name	(0019, xx61)	GEMS_GENIE_1	Name of Database Annotation Object	Used / Generated
>Aid	(0019, xx62)	GEMS_GENIE_1	Database Annotation Unique ID	Ignored / Generated
>DatabaseAnnotationMapping	(0019, xx63)	GEMS_GENIE_1		Used / Generated
>DatabaseObjectClassID	(0019, xx64)	GEMS_GENIE_1		Ignored / Generated
>DatabaseObjectUniqueID	(0019, xx65)	GEMS_GENIE_1		Ignored / Generated
>TextFgColour	(0019, xx66)	GEMS_GENIE_1	Text Foreground Color	Used / Generated
>TextBgColour	(0019, xx67)	GEMS_GENIE_1	Text Background Color	Used / Generated
>MarkerColour	(0019, xx68)	GEMS_GENIE_1		Used / Generated
>LineColour	(0019, xx69)	GEMS_GENIE_1		Used / Generated
>LineThickness	(0019, xx6A)	GEMS_GENIE_1		Used / Generated
>Font	(0019, xx6B)	GEMS_GENIE_1		Used / Generated
>TextBackingMode	(0019, xx6C)	GEMS_GENIE_1		Used / Generated
>TextJustification	(0019, xx6D)	GEMS_GENIE_1		Used / Generated
>TextShadowOffsetX	(0019, xx6E)	GEMS_GENIE_1		Used / Generated
>TextShadowOffsetY	(0019, xx6F)	GEMS_GENIE_1		Used / Generated
>GeomColour	(0019, xx70)	GEMS_GENIE_1		Used / Generated
>GeomThickness	(0019, xx71)	GEMS_GENIE_1		Used / Generated
>GeomLineStye	(0019, xx72)	GEMS_GENIE_1		Used / Generated
>GeomDashLength	(0019, xx73)	GEMS_GENIE_1		Used / Generated
>GeomFillPattern	(0019, xx74)	GEMS_GENIE_1		Used / Generated
>MarkerSize	(0019, xx75)	GEMS_GENIE_1		Used / Generated
>Interactivity	(0019, xx76)	GEMS_GENIE_1	Interactivity Flag	Used / Generated
>TextLoc	(0019, xx77)	GEMS_GENIE_1		Used / Generated
>TextString	(0019, xx78)	GEMS_GENIE_1		Used / Generated
>TextAttachMode	(0019, xx79)	GEMS_GENIE_1		Used / Generated
>TextCursorMode	(0019, xx7A)	GEMS_GENIE_1		Used / Generated
>LineCtrlSize	(0019, xx7B)	GEMS_GENIE_1		Used / Generated
>LineType	(0019, xx7C)	GEMS_GENIE_1		Used / Generated
>LineStyle	(0019, xx7D)	GEMS_GENIE_1		Used / Generated

>LineDashLength	(0019, xx7E)	GEMS_GENIE_1		Used / Generated
>LinePtCount	(0019, xx7F)	GEMS_GENIE_1		Used / Generated
>LinePts	(0019, xx80)	GEMS_GENIE_1		Used / Generated
>LineAttachMode	(0019, xx81)	GEMS_GENIE_1		Used / Generated
>MarkerType	(0019, xx82)	GEMS_GENIE_1		Used / Generated
>MarkerLoc	(0019, xx83)	GEMS_GENIE_1		Used / Generated
>MarkerAttachMode	(0019, xx84)	GEMS_GENIE_1		Used / Generated
>FrameNumber	(0019, xx86)	GEMS_GENIE_1		Used / Generated
OrigSOP Instance UID	(0033,xx07)	GEMS_GENIE_1	List of SOP UIDs of Xeleris associated datasets encapsulated into the DICOM NM Image.	Ignored / Generated
Trigger History Modified Flag	(0033,xx30)	GEMS_GENIE_1	Triggers Modification Flag	Ignored/ Removed
Database Object Name	(0033,xx31)	GEMS_GENIE_1	Name of Database Trigger History Object	Ignored/ Removed
Trigger History Software Ver-sion	(0033,xx32)	GEMS_GENIE_1	Trigger History Software Version	Ignored/ Removed
Number of Triggers	(0033,xx33)	GEMS_GENIE_1	Number of Triggers	Ignored/ Removed
Trigger Size	(0033,xx34)	GEMS_GENIE_1	Size of one Trigger data slot	Ignored/ Removed
Trigger Data Size	(0033,xx35)	GEMS_GENIE_1	Size of Trigger Data Size	Ignored/ Removed
Trigger Data	(0033,xx36)	GEMS_GENIE_1	Buffer with trigger data information	Ignored/ Removed
Trigger History Description	(0033,xx37)	GEMS_GENIE_1		Ignored/ Removed
Trigger History Flags	(0033,xx38)	GEMS_GENIE_1		Ignored/ Removed
Trigger History Private Instance UID	(0033,xx39)	GEMS_GENIE_1		Ignored/ Removed
Trigger History SOP Class UID	(0033,xx3A)	GEMS_GENIE_1	Internal SOP Class UID value	Ignored/ Removed
ROI Sequence	(0057,xx01)	GEMS_XELPRV_01	ROI created on image; may contain 0 or more items.	Used/ Generated
>PrivateSOPClassUID	(0057,xx02)	GEMS_XELPRV_01	ROI SOP Class UID	Ignored/ Generated (Set to "1.2.840.10008.5.1.4.1.1.9")
>ObjectInstanceUID	(0057,xx03)	GEMS_XELPRV_01	ROI SOP Instance UID	Used/ Generated
>Index	(0057,xx10)	GEMS_XELPRV_01	Index of ROI	Used / Generated
>Dimensions	(0057,xx11)	GEMS_XELPRV_01	ROI Dimensions. Contain value: 1	Used / Generated
>Points	(0057,xx12)	GEMS_XELPRV_01	Number of Points	Used / Generated
>Type	(0057,xx13)	GEMS_XELPRV_01	ROIType	Used / Generated
>Description	(0057,xx14)	GEMS_XELPRV_01	ROI Description	Used / Generated
>DValueRepresentation	(0057,xx15)	GEMS_XELPRV_01	DataValueRepresentation	Used / Generated (Set to 3)
>ROI Label	(0057,xx16)	GEMS_XELPRV_01	ROI Label	Used / Generated
>Data	(0057,xx17)	GEMS_XELPRV_01	List of ROI Shape points	Used / Generated
>Modified	(0057,xx41)	GEMS_XELPRV_01	Modified	Ignored/Generated
>DatabaseObjectName	(0057,xx42)	GEMS_XELPRV_01	Name of ROI Database Object	Ignored/Generated
>DatabaseObjectClass ID	(0057,xx45)	GEMS_XELPRV_01		Ignored/Generated
>DatabaseObjectUID	(0057,xx46)	GEMS_XELPRV_01	ROI Object SOP Instance UID	Ignored/Generated
>Normal Colour	(0057,xx47)	GEMS_XELPRV_01	Normal Colour	Used / Generated

>NameFont	(0057,xx48)	GEMS_XELPRV_01	NameFont	Used / Generated
>FillPattern	(0057,xx49)	GEMS_XELPRV_01	FillPattern	Used / Generated
>LineStyle	(0057,xx4A)	GEMS_XELPRV_01	LineStyle	Used / Generated
>LineDashLength	(0057,xx4B)	GEMS_XELPRV_01	LineDashLength	Used / Generated
>LineThickness	(0057,xx4C)	GEMS_XELPRV_01	LineThickness	Used / Generated
>Interactivity	(0057,xx4D)	GEMS_XELPRV_01	Interactivity Flag	Used / Generated
>Name Position	(0057,xx4E)	GEMS_XELPRV_01	Name Position	Used / Generated
>NameDisplay	(0057,xx4F)	GEMS_XELPRV_01	NameDisplayFlag	Used / Generated
>Label	(0057,xx50)	GEMS_XELPRV_01	ROI Label	Used / Generated (contains the same value as ROILabel attribute(0057,xx16))
>BpSeg	(0057,xx51)	GEMS_XELPRV_01	BpSeg	Used / Generated
>BpSegpairs	(0057,xx52)	GEMS_XELPRV_01	BpSegpairs	Used / Generated
>SeedSpace	(0057,xx53)	GEMS_XELPRV_01	SeedSpace	Used / Generated
>Seeds	(0057,xx54)	GEMS_XELPRV_01	Seeds	Used / Generated
>Shape	(0057,xx55)	GEMS_XELPRV_01	Shape	Used / Generated
>ShapeTilt	(0057,xx56)	GEMS_XELPRV_01	ShapeTilt	Used / Generated
>ShapePtsSpace	(0057,xx59)	GEMS_XELPRV_01	ShapePtsSpace	Used / Generated
>ShapeCtrlPtsCount	(0057,xx5A)	GEMS_XELPRV_01	ShapeCtrlPtsCount	Used / Generated
>Shap CtrlPts	(0057,xx5B)	GEMS_XELPRV_01	Shap CtrlPts	Used / Generated
>ShapeCPSpace	(0057,xx5C)	GEMS_XELPRV_01	ShapeCPSpace	Used / Generated
>ROIFlags	(0057,xx5D)	GEMS_XELPRV_01	ROIFlags	Ignored / Generated
>FrameNumber	(0057,xx5E)	GEMS_XELPRV_01	FrameNumber	Used / Generated
>DatasetROI Mapping	(0057,xx60)	GEMS_XELPRV_01	DatasetROI Mapping	Used / Generated

3.4.6.14 Private Image Pixel Module

This section specifies the Attributes that describe the pixel data of the image. This Module contains *private* Attributes that convey information not contained in the related DICOM Standard v3.0 Module.

TABLE 3-29
PRIVATE IMAGE PIXEL MODULE ATTRIBUTES

Attribute Name	Tag	Private Creator	Attribute Description	Attribute Usage
Picture Name	(0011,xx30)	GEMS_GENIE_1	Name of the database Picture Object	Ignored/Generated
Byte Order	(0011,xx38)	GEMS_GENIE_1	Defines pixel data byte order.	Used/Generated
Compression Type	(0011,xx39)	GEMS_GENIE_1	Compression information	Used/Generated
Picture Format	(0011,xx3A)	GEMS_GENIE_1	Xeleris IAP image format	Used/Generated
Pixel Scale	(0011,xx3B)	GEMS_GENIE_1		Ignored /Generated (Set to 1.0)
Pixel Offset	(0011,xx3C)	GEMS_GENIE_1	Set to 0.0.	Ignored /Generated (Set to 0.0)
Viewing Name	(0011,xx40)	GEMS_GENIE_1	Name of the database Viewing Object	Ignored/Generated
Orientation Angle	(0011,xx41)	GEMS_GENIE_1	Orientation Angle	Ignored/Generated
Rotation Angle	(0011,xx42)	GEMS_GENIE_1	Rotation Angle	Ignored/Generated
Window Inverse Flag	(0011,xx43)	GEMS_GENIE_1	Window Inverse Flag	Ignored/Generated
Threshold Center	(0011,xx44)	GEMS_GENIE_1		Ignored/Generated
Threshold Width	(0011,xx45)	GEMS_GENIE_1		Ignored/Generated

Interpolation Type	(0011,xx46)	GEMS_GENIE_1		Ignored/Generated
Where Name	(0011,xx50)	GEMS_GENIE_1	Name of the database Where Object	Ignored/Generated
FScalar	(0013,xx15)	GEMS_GENIE_1	Scaling Factor for Floating Point pixel data	Ignored/Generated

3.4.6.15 Private Isotope Module

This section contains Attributes that describe the isotope administered for the acquisition. This Module contains *private* Attributes that convey information not contained in the related DICOM Standard v3.0 Module.

TABLE 3-30
PRIVATE ISOTOPE MODULE ATTRIBUTES

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

3.4.6.16 Private Detector Module

This section contains Attributes that describe Nuclear Medicine Detectors used to produce an image. This Module contains *private* Attributes that convey information not contained in the related DICOM Standard v3.0 Module.

TABLE 3-31
PRIVATE DETECTOR MODULE ATTRIBUTES

Attribute Name	Tag	Private Creator	Attribute Description	Attribute Usage
Xeleris Detector Information Sequence	(0055,xx22)	GEMS_GENIE_1	Xeleris detector information.	Used / Generated
>Use FOV Mask	(0011,xx23)	GEMS_GENIE_1	Whether FOV mask used during image acquisition. The Defined Terms are: 0 = no mask used 1 = FOV mask used	Used / Copied
>FOV Mask Y Cutoff Distance	(0011,xx24)	GEMS_GENIE_1	Hexagonal FOV mask Y cutoff angle.	Used / Copied
>FOV Mask Cutoff Angle	(0011,xx25)	GEMS_GENIE_1	Hexagonal FOV mask cutoff angle.	Used / Copied
>Uniformity Mean	(0011,xx29)	GEMS_GENIE_1	Uniformity Mean value	Used / Copied
>FOV Shape	(0011,xx3E)	GEMS_GENIE_1	GEHC NM system detector type. The Defined Terms are: 1 = 400AC 6 = Optima 7 = MAXXUS	Used / Copied

			8 = Millennium MPS 9 = Millennium MPR 10 = Millennium MG 12 = Other 13 = VARICAM 14 = DST 21 = Optima V3.0 22 = MAXXUS V3.0 23 = Millennium MPS V3.0 24= Millennium MPR V3.0 25 = Millennium MG V3.0 27 = Discovery NM530c	
>Transmission Scan Time	(0013,xx18)	GEMS_GENIE_1	Attenuation correction transmission scan duration.	Ignored/Copied
>Transmission Mask Width	(0013,xx19)	GEMS_GENIE_1	Attenuation correction transmission scan mask width.	Ignored/Copied
>Copper Attenuator Thickness	(0013,xx1A)	GEMS_GENIE_1	Thickness of transmission scan copper attenuator.	Ignored/Copied
>Tomo View Offset	(0013,xx1E)	GEMS_GENIE_1	Tomo view detector offset (vector)	Used/Generated
>Start Angle	(0035,xx01)	GEMS_GENIE_1	Detector start angle	Used/Generated

3.4.6.17 Private Tomo Acquisition Module

This section contains Attributes that describe Rotation information of a tomographic acquisition image performed on the patient. This Module contains *private* Attributes that convey information not contained in the related DICOM Standard v3.0 Module. . This module is present only when the Image Type (0008,0008), Value 3, is equal to TOMO or RECON TOMO.

TABLE 3-32
PRIVATE TOMO ACQUISITION MODULE ATTRIBUTES

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

3.4.6.18 Private SPECT Reconstruction Module

This section contains Attributes that describe Nuclear Medicine reconstructed volumes. Reconstructed volumes are created by applying a transformation (reconstruction) process to the acquired TOMO frames. Define the conditions under which this module is present. This module is present only when the Image Type (0008,0008), Value 3, is equal to RECON TOMO**.** This Module contains *private* Attributes that convey information not contained in the related DICOM Standard v3.0 Module.

TABLE 3-33
PRIVATE SPECT RECONSTRUCTION MODULE ATTRIBUTES

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

3.4.6.19 Private SPECT Backprojection Module

This section contains Attributes that describe Nuclear Medicine reconstructed volumes. Reconstructed volumes are created by applying a transformation (reconstruction) process to the acquired TOMO frames. This module is present only when the Image Type (0008,0008), Value 3, is equal to RECON TOMO**.** This Module contains *private* Attributes that convey information not contained in the related DICOM Standard v3.0 Module.

TABLE 3-34
PRIVATE SPECT BACKPROJECTION MODULE ATTRIBUTES

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

3.4.6.20 Private SPECT Oblique Module

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

TABLE 3-35
PRIVATE SPECT OBLIQUE MODULE ATTRIBUTES

Attribute Name	Tag	Private Creator	Attribute Description	Attribute Usage
Rfmtr Trans Ref	(0011,xx88)	GEMS_GENIE_1	Rfmtr Trans Ref	Used/ Generated
Rfmtr Trans Ref mm	(0011,xx89)	GEMS_GENIE_1	Rfmtr Trans Ref mm	Used/ Generated
Two Line Trans Ref	(0011,xx8A)	GEMS_GENIE_1	Two Line Trans Ref	Used/ Generated
Three–D Zero	(0011,xx8B)	GEMS_GENIE_1	Three–D Zero	Used/ Generated
Three–D Zero Length	(0011,xx8C)	GEMS_GENIE_1	Three–D Zero Length	Used/ Generated
Three–D Zero In	(0011,xx8D)	GEMS_GENIE_1	Three–D Zero In	Used/ Generated
Threshold	(0013,xx21)	GEMS_GENIE_1	Threshold	Used/ Generated
LinearDepth	(0013,xx22)	GEMS_GENIE_1	Linear Depth	Used/ Generated

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 3-36
STANDARD EXTENDED ATTRIBUTES

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

3.5.2 Private Group GEMS_GENIE_1

TABLE 3-37
PRIVATE GROUP GEMS_GENIE_1

Attribute Name	Tag	VR	VM	Attribute Description	Attribute Usage
Private Creator Identification	(0009,00xx)	LO	1	GEMS_GENIE_1	
Workstation DICOM data Identifier	(0009,xx01)	SH	1	Default value: "GEMS_GENIE"	Used / Generated
Study Name	(0009,xx10)	LO	1	Name of the Database Study Object	Ignored/Copied
Study Flags	(0009,xx11)	SL	1	Defines study information.	Ignored/Copied
Study Type	(0009,xx12)	SL	1	Defines type of study.	Ignored/Copied
Dataset UID	(0009,xx1E)	UI	1	Unique Identifier of Dataset object	Ignored/ Generated
Series Object Name	(0009,xx20)	LO	1	Name of the Database Series Object.	Ignored/Generated
Series Flags	(0009,xx21)	SL	1	Defines series information.	Ignored/Generated
User Orientation	(0009,xx22)	SH	1	User specified patient orientation.	Ignored/Generated

Initiation Type	(0009,xx23)	SL	1	Acquisition initiation type.	Ignored/Copied
Initiation Delay	(0009,xx24)	SL	1	Acquisition start delay time.	Ignored/Copied
Initiation Count Rate	(0009,xx25)	SL	1	Acquisition start count rate	Ignored/Copied
Number Energy Sets	(0009,xx26)	SL	1	Number of energy sets in this Series.	Used/Generated
Number Detectors	(0009,xx27)	SL	1	Number of detectors.	Used/Generated
Number R-R Windows	(0009,xx28)	SL	1	Number of R-R Interval Windows.	Used/Generated
Number MG Time Slots	(0009,xx29)	SL	1	Number of R-R Interval time bins.	Ignored/Copied
Number View Sets	(0009,xx2A)	SL	1	Number of view sets in this Series.	Used /Generated
Trigger History UID	(0009,xx2B)	LO	1	UID of Private Trigger Object relevant to the Series.	Ignored/Removed
Series Comments	(0009,xx2C)	LO	1	User-defined additional information about the series.	Ignored /Generated
Distance Prescribed	(0009,xx2E)	FD	1	User prescribed whole body scanning distance.	Ignored/Copied
Table Direction	(0009,xx2F)	SL	1	Table Direction	Ignored/Copied
Rotational Continuous Speed	(0009,xx33)	FD	1	Rotational Continuous Speed	Ignored/ Generated
Gantry Locus Type	(0009,xx35)	UL	1	Locus type of gantry motion during acquisition.	Ignored/ Generated
Patient Object Name	(0009,xx40)	PN	1	Name of the Database Patient Object	Ignored/Copied
Patient Flags	(0009,xx41)	SL	1	Defines patient information.	Ignored/Copied
Patient Creation Date	(0009,xx42)	DA	1	Date of Patient Entity creation.	Ignored/Copied
Patient Creation Time	(0009,xx43)	TM	1	Time of Patient Entity creation.	Ignored/Copied
Dataset UID List	(0009,xx45)	LT	1	Unique Identifier of Dataset object in List format	Ignored / Removed
Private Creator Identification	(0011,00xx)	LO	1	GEMS_GENIE_1	Used / Generated
Series Type	(0011,xx0A)	SL	1	Defines type of series.	Used/Generated
Effective Series Duration	(0011,xx0B)	SL	1	Calculated duration of series.	Used/Generated
Number Beats	(0011,xx0C)	SL	1-n	Number of physiological triggers during acquisition.	Ignored /Copied
Radio Nuclide Name	(0011,xx0D)	LO	1-n	Name of radionuclide used.	Used / Copied
Database Object Name	(0011,xx10)	LO	1-n	Name of the Database Dataset Object.	Ignored /Generated
Dataset Modified	(0011,xx11)	SL	1-n	Dataset Modified Flag	Ignored / Generated
Dataset Name	(0011,xx12)	LO	1-n	Dataset Name	Used /Generated
Dataset Type	(0011,xx13)	SL	1	Defines type of dataset. The Defined Terms are:	Used /Generated
Completion Time	(0011,xx14)	LO	1	Completion Time	Ignored / Generated
Detector Number	(0011,xx15)	SL	1-n	Detector number image was acquired by.	Used / Generated
Energy Number	(0011,xx16)	SL	1-n	Energy set number.	Used / Generated
RR Interval Window Number	(0011,xx17)	SL	1-n	R-R interval number.	Used / Generated
MG Bin Number	(0011,xx18)	SL	1-n	Multi-gated time bin number.	Ignored / Generated
Radius Of Rotation	(0011,xx19)	FD	1-n	Distance to the center of detector rotation.	Used / Copied
Detector Count Zone	(0011,xx1A)	SL	1-n	FOV zone for count-based acquisition termination criteria. The Defined Terms are: 0 = none specified 1 = total (all) counts	Ignored / Generated

				2 = counts in energy set 3 = counts inside an ROI 4 = counts outside an ROI	
Energy Offset	(0011,xx1C)	SL	4	Energy window offset as a percentage of the energy peak.	Ignored/Generated
Energy Range	(0011,xx1D)	SL	1		Ignored/Generated
Image Orientation	(0011,xx1F)	SL	1-n	Orientation of the image.	Ignored / Generated
Use FOV Mask	(0011,xx23)	SL	1	Whether FOV mask used during image acquisition.	Used / Copied
FOV Mask Y Cutoff Distance	(0011,xx24)	SL	1	Hexagonal FOV mask Y cutoff angle.	Used / Copied
FOV Mask Cutoff Angle	(0011,xx25)	SL	1	Hexagonal FOV mask cutoff angle.	Used / Copied
Table Orientation	(0011,xx26)	SL	1-n	Orientation of the table for whole body acquisition.	Ignored / Copied
ROI Top Left	(0011,xx27)	SL	1-n	Acquisition count zone ROI, top left coordinate.	Ignored / Generated
ROI Bottom Right	(0011,xx28)	SL	1-n	Acquisition count zone ROI, bottom right coordinate.	Ignored / Generated
Uniformity Mean	(0011,xx29)	SL	1	Uniformity Mean value	Used / Copied
View X Adjustment	(0011,xx2C)	FD	1-n	View X Adjustment	Ignored / Generated
View Y Adjustment	(0011,xx2D)	FD	1-n	View Y Adjustment	Ignored / Generated
Pixel Overflow Flag	(0011,xx2E)	SL	1-n	Pixel Overflow Flag	Ignored / Generated
Pixel Overflow Level	(0011,xx2F)	SL	1-n	Pixel Overflow Level	Ignored / Generated
Picture Name	(0011,xx30)	LO	1-n	Name of the database Picture Object	Ignored/Generated
Acquisition Parent UID	(0011,xx31)	LO	1-n	Acquisition Parent UID	Used / Copied
Processing Parent UID	(0011,xx32)	LO	1-n	Processing Parent UID	Used / Copied
Energy Correct Name	(0011,xx33)	LO	1-n	Name of applied energy correction.	Ignored/ Copied
Spatial Correct Name	(0011,xx34)	LO	1-n	Name of applied spatial correction.	Ignored/ Copied
Tuning Calib Name	(0011,xx35)	LO	1-n	Name of applied tuning calibration data.	Ignored/ Copied
Uniformity Correct Name	(0011,xx36)	LO	1-n	Name of associated uniformity correction.	Used / Copied
Acquisition Specific Correct Name	(0011,xx37)	LT	1	Name(s) of associated acquisition specific correction(s).	Ignored/ Copied
Byte Order	(0011,xx38)	SL	1-n	Defines pixel data byte order.	Used/Generated
Compression Type	(0011,xx39)	SL	1-n	Compression information	Used/Generated
Picture Format	(0011,xx3A)	SL	1-n	Xeleris IAP image format	Used/Generated
Pixel Scale	(0011,xx3B)	FD	1-n		Ignored /Generated
Pixel Offset	(0011,xx3C)	FD	1-n	Set to 0.0.	Ignored /Generated
FOV Shape	(0011,xx3E)	SL	1	GEHC NM system detector type.	Used / Copied
Dataset Flags	(0011,xx3F)	SL	1-n	Defines dataset information.	Ignored /Generated
Viewing Name	(0011,xx40)	LO	1-n	Name of the database Viewing Object	Ignored/Generated
Orientation Angle	(0011,xx41)	SL	1-n	Orientation Angle	Ignored/Generated
Rotation Angle	(0011,xx42)	FD	1-n	Rotation Angle	Ignored/Generated
Window Inverse Flag	(0011,xx43)	SL	1-n	Window Inverse Flag	Ignored/Generated
Threshold Center	(0011,xx44)	FD	1-n		Ignored/Generated
Threshold Width	(0011,xx45)	FD	1-n		Ignored/Generated

Interpolation Type	(0011,xx46)	SL	1-n		Ignored/Generated
Where Name	(0011,xx50)	LO	1-n	Name of the database Where Object	Ignored/Generated
Period	(0011,xx55)	FD	1-n	Period	Used / Copied
Elapsed Time	(0011,xx56)	FD	1-n	Elapsed Time	Ignored / Copied
FOV	(0011,xx57)	FD	1-n	FOV	Used / Copied
Image Size	(0011,xx61)	SL	1 -n	Image Size	Ignored/Generated
Linear FOV	(0011,xx62)	FD	1-n	Linear FOV	Ignored/Generated
Spatial Offset	(0011,xx63)	FD	1-n	Spatial Offset	Ignored/Generated
Spatial Orientation	(0011,xx64)	FD	1-n	Spatial Orientation	Ignored/Generated
ReferenceDatasetUID	(0011,xx65)	LO	1-n	Reference Dataset UID	Used/Generated
Starcam Reference Dataset	(0011,xx66)	LO	1-n	Starcam Reference Dataset	Ignored/Generated
Reference Frame Number	(0011,xx67)	SL	1-n	Reference Frame Number	Ignored/Generated
Cursor Length	(0011,xx68)	SL	1-n	Cursor Length	Ignored/Generated
Number of Cursors	(0011,xx69)	SL	1-n	Number of Cursors	Ignored/Generated
Cursor Coordinates	(0011,xx6A)	SL	1-n	Cursor Coordinates	Ignored/Generated
Recon Options Flag	(0011,xx6B)	SL	1-n	Recon Options Flag	Used/Generated
Motion Threshold	(0011,xx6C)	FD	1-n	Motion Threshold	Ignored/Generated
Motion Curve UID	(0011,xx6D)	UI	1-n	Motion Curve UID	Ignored/Generated
Recon Type	(0011,xx6E)	SL	1 -n	Recon Type	Used/ Generated
Pre Filter Type	(0011,xx6F)	SL	1-n	Pre Filter Type	Used/ Generated
Back Proj Filter Type	(0011,xx71)	SL	1-n	Back Proj Filter Type	Used/ Generated
Recon Arc	(0011,xx72)	SL	1-n	Recon Arc	Used/ Generated
Recon Pan AP Offset	(0011,xx73)	FD	1-n	Recon Pan AP Offset	Used/ Generated
Recon Pan LR Offset	(0011,xx74)	FD	1-n	Recon Pan LR Offset	Used/ Generated
Recon Area	(0011,xx75)	FD	1-n	Recon Area	Used/ Generated
Start View	(0011,xx76)	SL	1-n	Start View	Used/ Generated
Attenuation Type	(0011,xx77)	SL	1-n	Attenuation Type	Used/ Generated
Dual Energy Processing	(0011,xx78)	SL	1-n	Dual Energy Processing	Used/ Generated
Pre Filter Param	(0011,xx79)	SH	1-n	Pre Filter Param	Used/ Generated
Pre Filter Param 2	(0011,xx7A)	SH	1-n	Pre Filter Param 2	Used/ Generated
BackProjFilterParam	(0011,xx7B)	SH	1-n	Back Proj Filter Param	Used/ Generated
Back Proj Filter Param 2	(0011,xx7C)	SH	1-n	Back Proj Filter Param 2	Used/ Generated
Attenuation Coef	(0011,xx7D)	SH	1-n	Attenuation Coef	Used/ Generated
Ref Slice Width	(0011,xx7E)	SL	1-n	Ref Slice Width	Used/ Generated
Ref Trans Pixel Volume	(0011,xx7F)	FD	1-n	Ref Trans Pixel Volume	Used/ Generated
Attenuation Threshold	(0011,xx81)	SH	1-n	Attenuation Threshold	Used/ Generated
Interpolation Distance	(0011,xx82)	FD	1-n	Interpolation Distance	Used/ Generated
Interpolation Center X	(0011,xx83)	FD	1-n	Interpolation Center X	Used/ Generated
Interpolation Center Y	(0011,xx84)	FD	1-n	Interpolation Center Y	Used/ Generated
Quant Filter Flag	(0011,xx85)	SL	1-n	Quant Filter Flag	Used/ Generated
Head Conversion	(0011,xx86)	SL	1-n	Head Conversion	Used/ Generated
Slice Width Pixels	(0011,xx87)	SL	1-n	Slice Width Pixels	Used/ Generated
Rfmtr Trans Ref	(0011,xx88)	SL	1-n	Rfmtr Trans Ref	Used/ Generated
Rfmtr Trans Ref mm	(0011,xx89)	FD	1-n	Rfmtr Trans Ref mm	Used/ Generated
Two Line Trans Ref	(0011,xx8A)	SL	1-n	Two Line Trans Ref	Used/ Generated
Three–D Zero	(0011,xx8B)	SL	1-n	Three–D Zero	Used/ Generated
Three–D Zero Length	(0011,xx8C)	SL	1-n	Three–D Zero Length	Used/ Generated
Three–D Zero In	(0011,xx8D)	SL	1-n	Three–D Zero In	Used/ Generated
Private Creator Identification	(0013,00xx)	LO	1	GEMS_GENIE_1	Used / Generated
Digital FOV	(0013,xx10)	FD	1-n	Digital FOV	Used / Copied
Source Translator	(0013,xx11)	SL	1	Source Translator	Used / Generated
RAL Flags	(0013,xx12)	SL	1-n	RAL Flags	Used / Copied

FScalar	(0013,xx15)	FD	1-n	Scaling Factor for Floating Point pixel data	Ignored/Generated
AutoTrack Peak	(0013,xx16)	SL	1		Ignored/Generated
AutoTrack Width	(0013,xx17)	SL	1		Ignored/Generated
Transmission Scan Time	(0013,xx18)	FD	1	Attenuation correction transmission scan duration.	Ignored/Copied
Transmission Mask Width	(0013,xx19)	FD	1	Attenuation correction transmission scan mask width.	Ignored/Copied
Copper Attenuator Thickness	(0013,xx1A)	FD	1	Thickness of transmission scan copper attenuator.	Ignored/Copied
Det Ang Separation	(0013,xx1B)	FD	1	Detector Ang Separation	Ignored/ Generated
Axial Acceptance Angle	(0013,xx1C)	SL	1	Axial Acceptance Angle	Ignored/ Generated
Theta Acceptance Value	(0013,xx1D)	SL	1	Theta Acceptance Value	Ignored/ Generated
Tomo View Offset	(0013,xx1E)	FD	1-n	Tomo view detector offset (vector)	Used/Generated
Threshold	(0013,xx21)	FD	1-n	Threshold	Used/ Generated
LinearDepth	(0013,xx22)	FD	1-n	Linear Depth	Used/ Generated
UnifDateTime	(0013,xx23)	LO	1-n	Unif Date Time	Ignored/Generated
Study Comments	(0013,xx26)	LT	1	User-defined additional information about the study.	Ignored/Copied
Private Creator Identification	(0015,00xx)	LO	1	GEMS_GENIE_1	Used / Generated
Num ECT Phases	(0015,xx12)	SL	1	Number of ECT Phases	Used / Generated
Num WB Scans	(0015,xx13)	SL	1	Number of WB Scans	Ignored/ Generated
ECT Phase Num	(0015,xx14)	SL	1	ECT Phase Number	Used / Generated
WB Scan Num	(0015,xx15)	SL	1	WB Scan Number	Ignored/ Generated
Comb Head Number	(0015,xx16)	SL	1	Comb Head Number	Ignored/ Generated
Private Creator Identification	(0019,00xx)	LO	1	GEMS_GENIE_1	Used / Generated
Annotation Sequence	(0019, xx5F)	SQ	1	Annotations attached to image; May contain 0 or more Items	Used / Generated
Modified	(0019, xx60)	SL	1	Modified Flag	Ignored / Generated
Name	(0019, xx61)	LO	1	Name of Database Annotation Object	Used / Generated
Aid	(0019, xx62)	LO	1	Database Annotation Unique ID	Ignored / Generated
DatabaseAnnotationMapping	(0019, xx63)	LO	1-n		Used / Generated
DatabaseObjectClassID	(0019, xx64)	LO	1		Ignored / Generated
DatabaseObjectUniqueID	(0019, xx65)	LO	1		Ignored / Generated
TextFgColour	(0019, xx66)	LO	1	Text Foreground Color	Used / Generated
TextBgColour	(0019, xx67)	LO	1	Text Background Color	Used / Generated
MarkerColour	(0019, xx68)	LO	1		Used / Generated
LineColour	(0019, xx69)	LO	1		Used / Generated
LineThickness	(0019, xx6A)	SL	1		Used / Generated
Font	(0019, xx6B)	LT	1		Used / Generated
TextBackingMode	(0019, xx6C)	SL	1		Used / Generated
TextJustification	(0019, xx6D)	SL	1		Used / Generated
TextShadowOffsetX	(0019, xx6E)	SL	1		Used / Generated
TextShadowOffsetY	(0019, xx6F)	SL	1		Used / Generated
GeomColour	(0019, xx70)	LT	1		Used / Generated
GeomThickness	(0019, xx71)	SL	1		Used / Generated
GeomLineStye	(0019, xx72)	SL	1		Used / Generated
GeomDashLength	(0019, xx73)	SL	1		Used / Generated
GeomFillPattern	(0019, xx74)	SL	1		Used / Generated
MarkerSize	(0019, xx75)	SL	1		Used / Generated
Interactivity	(0019, xx76)	SL	1	Interactivity Flag	Used / Generated

TextLoc	(0019, xx77)	FD	1-n		Used / Generated
TextString	(0019, xx78)	LT	1		Used / Generated
TextAttachMode	(0019, xx79)	SL	1-n		Used / Generated
TextCursorMode	(0019, xx7A)	SL	1-n		Used / Generated
LineCtrlSize	(0019, xx7B)	SL	1		Used / Generated
LineType	(0019, xx7C)	SL	1-n		Used / Generated
LineStyle	(0019, xx7D)	SL	1		Used / Generated
LineDashLength	(0019, xx7E)	SL	1		Used / Generated
LinePtCount	(0019, xx7F)	SL	1-n		Used / Generated
LinePts	(0019, xx80)	FD	1-n		Used / Generated
LineAttachMode	(0019, xx81)	SL	1-n		Used / Generated
MarkerType	(0019, xx82)	SL	1-n		Used / Generated
MarkerLoc	(0019, xx83)	FD	1-n		Used / Generated
MarkerAttachMode	(0019, xx84)	SL	1-n		Used / Generated
FrameNumber	(0019, xx86)	UL	1		Used / Generated
Private Creator Identification	(0033,00xx)	LO	1	GEMS_GENIE_1	Used / Generated
OrigSOP Instance UID	(0033,xx07)	LO	1-n	List of SOP UIDs of associated datasets encapsulated into the DICOM NM Image.	Ignored / Generated
Trigger History Modified Flag	(0033,xx30)	SL	1	Name of Database Trigger History Object	Ignored/ Removed
Database Object Name	(0033,xx31)	LO	1	Trigger History Software Version	Ignored/ Removed
Trigger History Software Version	(0033,xx32)	LO	1	Number of Triggers	Ignored/ Removed
Number of Triggers	(0033,xx33)	SL	1	Size of one Trigger data slot	Ignored/ Removed
Trigger Size	(0033,xx34)	SL	1	Size of Trigger Data Size	Ignored/ Removed
Trigger Data Size	(0033,xx35)	SL	1	Buffer with trigger data information	Ignored/ Removed
Trigger Data	(0033,xx36)	OB	1		Ignored/ Removed
Trigger History Description	(0033,xx37)	LO	1		Ignored/ Removed
Trigger History Flags	(0033,xx38)	SL	1		Ignored/ Removed
Trigger History Private Instance UID	(0033,xx39)	LO	1		Ignored/ Removed
Trigger History SOP Class UID	(0033,xx3A)	LO	1	Internal SOP Class UID value	Ignored / Removed
Private Creator Identification	(0035,00xx)	LO	1	GEMS_GENIE_1	Used / Generated
Start Angle	(0035,xx01)	FD	1	Detector start angle	Used/Copied
Private Creator Identification	(0055,00xx)	LO	1	GEMS_GENIE_1	Used / Generated
Xeleris Energy Window Information Sequence	(0055,xx12)	SQ	1	The number of items in the Energy Window sequence	Ignored/Generated
Xeleris Energy Window Range Sequence	(0055,xx13)	SQ	1		Ignored/Generated
Xeleris Detector Information Sequence	(0055,xx22)	SQ	1	Xeleris detector information.	Used / Generated
Xeleris Rotation Information Sequence	(0055,xx52)	SQ	1		Used / Generated
Xeleris Frame Sequence	(0055,xx65)	SQ	1	Xeleris Frame Sequence.	Ignored / Copied

3.5.3 Private Group GEMS_XELPRV_01

TABLE 3-38
PRIVATE GROUP GEMS_XELPRV_01

Attribute Name	Tag	VR	VM	Attribute Description	Attribute Usage
Private Creator Identification	(0033,00xx)	LO	1	GEMS_XELPRV_01	Used/Generated
Object Type	(0033,xx08)	CS	1	SDO/RTO/PDO Type	Ignored/Generated
Modified	(0033,xx10)	SL	1	SDO/RTO/PDO Modification Flag	Ignored/Generated
Name	(0033,xx11)	LO	1	SDO/RTO/PDO Name	Ignored/Generated
StudyId	(0033,xx14)	LO	1	Parent RTO Study Id	Ignored/Copied
Database Object Unique ID	(0033,xx16)	LO	1	SDO/RTO/PDO Database UID	Ignored/Generated
Date	(0033,xx17)	SH	1	SDO/RTO/PDO Creation date	Ignored/Generated
Time	(0033,xx18)	SH	1	SDO/RTO/PDO Creation time	Ignored/Generated
Object Flags	(0033,xx19)	UL	1	SDO/PDO Flags.	Ignored/Generated
ProtocolName	(0033,xx1A)	LO	1	Name of Protocol created SDO/PDO	Ignored/Generated
RelevantDataUID	(0033,xx1B)	LO	1	UID(s) of SOP Instance(s) relative to SDO/Parent StudyId of RTO	Ignored/Generated
BulkData	(0033,xx1C)	OB	1	SDO/PDO parameter(s) stored as binary buffer(s)	Ignored/Generated
IntData	(0033,xx1D)	SL	1-n	List of SDO/PDO parameters stored as integers	Ignored/Generated
Double Data	(0033,xx1E)	FD	1-n	List of SDO/PDO parameters stored as doubles	Ignored/Generated
String Data	(0033,xx1F)	OB	1	List of SDO/PDO parameters stored as list of strings	Ignored/Generated
BulkDataFormat	(0033,xx20)	OB	1	Format of bulk SDO/PDO parameters	Ignored/Generated
IntDataFormat	(0033,xx21)	OB	1	Format of integer SDO/PDO parameters	Ignored/Generated
DoubleDataFormat	(0033,xx22)	OB	1	Format of double SDO/PDO parameters	Ignored/Generated
StringDataFormat	(0033,xx23)	OB	1	Format of string SDO/PDO parameters	Ignored/Generated
Description	(0033,xx24)	LT	1	User or equipment generated SDO/PDO description	Ignored/Generated
RTName	(0033,xx28)	LO	1	RTO Name	Ignored/Copied
RTSpecification	(0033,xx29)	LT	1	RTO Specification	Ignored/Copied
ReviewTemplatesFlags	(0033,xx2A)	UL	1	Review Templates Flags	Ignored/Copied
DataValidationSpec	(0033,xx2B)	LT	1	RTO Data Validation Spec	Ignored/Copied
Description	(0033,xx2C)	LT	1	RTO Description	Ignored/Copied
IconDescription	(0033,xx2D)	LT	1	RTO Icon Description	Ignored/Copied
ProtocolDataSequence	(0033,xx50)	SQ	1	SQ with items encoding Protocol Data Object (PDO) attributes	Ignored/Copied
InternalSOPClassUID	(0033,xx51)	UI	1	PDO Private SOP Class UID	Ignored/Copied
InternalInstanceUID	(0033,xx52)	UI	1	PDO Instance UID	Ignored/Copied
ReviewTemplatesSequence	(0033,xx60)	SQ	1	SQ with items encoding Review Templates Objects (RTO) attributes	Ignored/Copied
InternalSOPClassUID	(0033,xx61)	UI	1	RTO Private SOP Class UID	Ignored/Copied
InternalInstanceUID	(0033,xx62)	UI	1	RTO Instance UID	Ignored/Copied
SeriesDataSequence	(0033,xx70)	SQ	1	SQ with items encoding Series	Ignored/Generated

				Data Object (SDO) attributes	
InternalSOPClassUID	(0033,xx71)	UI	1	SDO Private SOP Class UID	Ignored/Generated
InternalInstance UID	(0033,xx72)	UI	1	SDO Instance UID	Ignored/Generated
DoubleDataSQ	(0033,xx73)	SQ	1	Sequence of items to store SDO parameters as lists of doubles	Used/Removed
Private Creator Identification	(0057,00xx)	LO	1	GEMS_XELPRV_01	Used/Generated
ROI Sequence	(0057,xx01)	SQ	1	ROI created on image	Used/ Generated
PrivateSOPClassUID	(0057,xx02)	UI	1	ROI SOP Class UID	Ignored/ Generated
ObjectInstanceUID	(0057,xx03)	UI	1	ROI SOP Instance UID	Used/ Generated
Index	(0057,xx10)	IS	1	Index of ROI	Used / Generated
Dimensions	(0057,xx11)	US	1	ROI Dimensions.	Used / Generated
Points	(0057,xx12)	US	1	Number of Points	Used / Generated
Type	(0057,xx13)	CS	1	ROIType	Used / Generated
Description	(0057,xx14)	LO	1	ROI Description	Used / Generated
DValueRepresentation	(0057,xx15)	US	1	DataValueRepresentation	Used / Generated
ROI Label	(0057,xx16)	LO	1	ROI Label	Used / Generated
Data	(0057,xx17)	OW	1	List of ROI Shape points	Used / Generated
Modified	(0057,xx41)	SL	1	Modified	Ignored/Generated
DatabaseObjectName	(0057,xx42)	LO	1	Name of ROI Database Object	Ignored/Generated
DatabaseObjectClass ID	(0057,xx45)	LO	1	Object Internal SOP Class UID	Ignored/Generated
DatabaseObjectUID	(0057,xx46)	LO	1	Object SOP Instance UID	Ignored/Generated
Normal Colour	(0057,xx47)	LO	1	Normal Colour	Used / Generated
NameFont	(0057,xx48)	LT	1	NameFont	Used / Generated
FillPattern	(0057,xx49)	SL	1	FillPattern	Used / Generated
LineStyle	(0057,xx4A)	SL	1	LineStyle	Used / Generated
LineDashLength	(0057,xx4B)	SL	1	LineDashLength	Used / Generated
LineThickness	(0057,xx4C)	SL	1	LineThickness	Used / Generated
Interactivity	(0057,xx4D)	SL	1	Interactivity Flag	Used / Generated
Name Position	(0057,xx4E)	SL	1	Name Position	Used / Generated
NameDisplay	(0057,xx4F)	SL	1	NameDisplayFlag	Used / Generated
Label	(0057,xx50)	LO	1	ROI Label	Used / Generated
BpSeg	(0057,xx51)	SL	1-n	BpSeg	Used / Generated
BpSegpairs	(0057,xx52)	US	1-n	BpSegpairs	Used / Generated
SeedSpace	(0057,xx53)	SL	1	SeedSpace	Used / Generated
Seeds	(0057,xx54)	FD	1-n	Seeds	Used / Generated
Shape	(0057,xx55)	SL	1-n	Shape	Used / Generated
ShapeTilt	(0057,xx56)	FD	1-n	ShapeTilt	Used / Generated
ShapePtsSpace	(0057,xx59)	SL	1-n	ShapePtsSpace	Used / Generated
ShapeCtrlPtsCount	(0057,xx5A)	SL	1	ShapeCtrlPtsCount	Used / Generated
ShapeCtrlPts	(0057,xx5B)	FD	1-n	ShapeCtrlPts	Used / Generated
ShapeCPSpace	(0057,xx5C)	SL	1	ShapeCPSpace	Used / Generated
ROIFlags	(0057,xx5D)	UL	1	ROIFlags	Ignored / Generated
FrameNumber	(0057,xx5E)	UL	1	FrameNumber	Used / Generated
DatasetROI Mapping	(0057,xx60)	LO	1-n	DatasetROI Mapping	Used / Generated

3.6 STANDARD EXTENDED AND PRIVATE CONTEXT GROUPS

Volumetrix MI does not support any coded terminology

4. CT INFORMATION OBJECT IMPLEMENTATION

4.1 INTRODUCTION

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

4.2 VOLUMERIX MI MAPPING OF DICOM ENTITIES

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

TABLE 4-1
MAPPING OF DICOM ENTITIES TO VOLUMETRIX MI ENTITIES

DICOM IE	Volumetrix MI Entity
Patient	Patient
Study	Study
Series	Series
Image	Dataset

4.3 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 4.5.

TABLE 4-2
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	N/A
	Private Patient	Used (same description as for NM IOD)	3.4.1.2
Study	General Study	Used (same description as for NM IOD)	3.4.2.1
	Patient Study	Used (same description as for NM IOD)	3.4.2.2
	Private Study	Used (same description as for NM IOD)	3.4.2.3
	Standard Extended Study	Used (same description as for NM IOD)	3.4.2.4
	Clinical Trial Study	Not Used	N/A
Series	General Series	Used	4.4.1.1
	Private Series	Used	4.4.1.2
	Clinical Trial Series	Not Used	N/A
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	4.4.2.1
	Image Plane	Used	4.4.2.2
	Image Pixel	Used	4.4.2.3
	Contrast/Bolus	Used for acquisitions which use contrast.	4.4.2.4
	Device	Not Used	N/A

	Standard Extended Image	Used	4.4.2.5
	CT Image	Used	4.4.2.6
	Overlay Plane	Not Used	N/A
	VOI LUT	Used	4.4.2.7
	SOP Common	Used	4.4.2.8
	Private Image	Used	4.4.2.9
	Private CT Image	Used	4.4.2.10

4.4 INFORMATION MODULE DEFINITIONS

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

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

Volumetrix MI 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.

4.4.1 Series Entity Modules

4.4.1.1 General Series Module

TABLE 4-3
GENERAL SERIES MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description	Attribute Usage
Modality	(0008,0060)	1	Type of equipment that originally acquired the data used to create the images in this Series. Defined Terms used: CT = Computed Tomography (for CT IOD) MR = Magnetic Resonance(for MR IOD)	Mandatory/ Generated
Series Instance UID	(0020,000E)	1	Internally generated unique identifier of the Series.	Mandatory/ Generated
Series Number	(0020,0011)	2	A number that identifies this Series.	Ignored/ Generated
Series Date	(0008,0021)	3	Date the Series started.	Used/Generated (Current Date)
Series Time	(0008,0031)	3	Time the Series started.	Used/Generated (Current Time)
Laterality	(0020,0060)	2C	Laterality of (paired) body part examined.	Ignored/ Copied
Performing Physicians' Name	(0008,1050)	3	Name of the physician(s) administering this Series.	Ignored/ Copied
Protocol Name	(0018,1030)	3	User-defined description of the conditions under which the Series was performed.	Used/ Generated
Series Description	(0008,103E)	3	Description of the Series	Used/Generated (application generated on save)
Operators' Name	(0008,1070)	3	Name(s) of the operator(s) supporting the Series	Used / Copied
Referenced Performed Procedure Step Sequence	(0008,1111)	3	Uniquely identifies the Performed Procedure Step SOP Instance to which the Series is related.	Ignored /Removed

Body Part Examined	(0018,0015)	3	Text description of the part of the body examined.	Used/Copied
Patient Position	(0018,5100)	3	Patient position descriptor relative to the equipment	Used/ Copied
Request Attributes Sequence	(0040,0275)	3	Sequence that contains attributes from the Imaging Service Request.	Ignored/Removed
Comments on the Performed Procedure Step	(0040,0280)	3	User-defined comments on the Performed Procedure Step	Ignored/Removed
Performed Procedure Step ID	(0040,0253)	3	Equipment generated identifier of the protocol carried out within this step.	Ignored/Removed
Performed Procedure Step Start Date	(0040,0244)	3	The date that the protocol (SPS) acquisition actually started	Ignored/Removed
Performed Procedure Step Start Time	(0040,0245)	3	The time that the protocol (SPS) acquisition actually started	Ignored/Removed
Performed Procedure Step Description	(0040,0254)	3	The full path of the performed protocol name.	Ignored/Removed
Performed Protocol Code Sequence	(0040,0260)	3	Not Used	Ignored/Removed

4.4.1.2 Private Series Module

TABLE 4-4
PRIVATE SERIES MODULE ATTRIBUTES

Attribute Name	Tag	Private Creator ID	Attribute Description	Attribute Usage
Series Type	(0011,xx0A)	GEMS_GENIE_1	Defines type of series. The Defined Terms are: 0 = Static (for MR Scout Series) 8 = Transaxial Tomo 12 = Orthogonal Reformat 13 = Oblique 3P Reformat 14 = Oblique 2L Reformat 15 = Results 24 = Reprojection (for PET IOD only)	Used/Generated
Series Flags	(0009,xx21)	GEMS_GENIE_1	Defines series information.	Ignored/Generated
Series Data Sequence	(0033,xx70)	GEMS_XELPRV_01	Sequence of item contains information about processing parameters.	Ignored/Generated (application generated on save)
>Object Type	(0033,xx08)	GEMS_XELPRV_01	Object Type. Contains string "SERIES DATA "	Ignored/Generated
>Modified	(0033,xx10)	GEMS_XELPRV_01	Default value = 0 (Not Modified)	Ignored/Generated
>Name	(0033,xx11)	GEMS_XELPRV_01	SDO Name	Ignored/Generated
>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.	Ignored/Generated
>Date	(0033,xx17)	GEMS_XELPRV_01	SDO Creation date	Ignored/Generated (Current Date)
>Time	(0033,xx18)	GEMS_XELPRV_01	SDO Creation time	Ignored/Generated (Current Time)
>Series Data Flags	(0033,xx19)	GEMS_XELPRV_01	SDO Flags. Default value = 0	Ignored/Generated
>Protocol Name	(0033,xx1A)	GEMS_XELPRV_01	Name of Protocol created SDO	Ignored/Generated
>Relevant Data UID	(0033,xx1B)	GEMS_XELPRV_01	UID(s) of SOP Instance(s)	Ignored/Generated

			relative to SDO	
>Bulk Data	(0033,xx1C)	GEMS_XELPRV_01	SDO parameter(s) stored as binary buffer(s)	Ignored/Generated
>Int Data	(0033,xx1D)	GEMS_XELPRV_01	List of SDO parameters stored as integers	Ignored/Generated
>Double Data	(0033,xx1E)	GEMS_XELPRV_01	List of SDO parameters stored as doubles	Ignored/Generated
>String Data	(0033,xx1F)	GEMS_XELPRV_01	List of SDO parameters stored as list of strings	Ignored/Generated
>Bulk Data Format	(0033,xx20)	GEMS_XELPRV_01	Format of bulk parameters; contains information about name and size of bulk buffers	Ignored/Generated
>Int Data Format	(0033,xx21)	GEMS_XELPRV_01	Format of integer parameters; contains information about name and number of integers in list	Ignored/Generated
>Double Data Format	(0033,xx22)	GEMS_XELPRV_01	Format of double parameters; contains information about name and number of doubles in list	Ignored/Generated
>String Data Format	(0033,xx23)	GEMS_XELPRV_01	Format of string parameters; contains information about name and number of strings in list	Ignored/Generated
>Description	(0033,xx24)	GEMS_XELPRV_01	User or equipment generated SDO description	Ignored/Generated
>SDO Private SOP Class UID	(0033,xx71)	GEMS_XELPRV_01	SDO Private SOP Class UID- "1.2.840.113619.4.17"	Ignored/Generated
>SDO Instance UID	(0033,xx72)	GEMS_XELPRV_01	SDO Instance UID; Internally generated	Ignored/Generated
>Double Data SQ	(0033,xx73)	GEMS_XELPRV_01	Sequence of items to store SDO parameters as lists of doubles	Ignored/Removed
>>Double Data	(0033,xx1E)	GEMS_XELPRV_01	List of SDO parameters stored as doubles	Used/removed

4.4.2 Image Entity Modules

4.4.2.1 General Image Module

TABLE 4-5
GENERAL IMAGE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description	Attribute Usage
Instance Number	(0020,0013)	2	A number that identifies this image.	Used/Generated
Patient Orientation	(0020,0020)	2C	Patient Orientation	Ignored/Copied
Content Date	(0008,0023)	2C	The date the image pixel data creation started.	Used/Generated (Current Date)
Content Time	(0008,0033)	2C	The time the image pixel data creation started	Used/Generated (Current Time)
Image Type	(0008,0008)	3	See 4.4.2.6.1	Used / Generated
Acquisition Date	(0008,0022)	3	The date the acquisition of data that resulted in this image started	Used/ Generated
Acquisition Time	(0008,0032)	3	The time the acquisition of data that resulted in this image started	Used/ Generated
Image Comments	(0020,4000)	3	Contains additional information about image.	Used/Copied

Quality Control Image	(0028,0300)	3	Indicates whether or not this image is a quality control or phantom image.	Ignored / Removed

4.4.2.2 Image Plane Module

TABLE 4-6
IMAGE PLANE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description	Attribute Usage
Pixel Spacing	(0028,0030)	1	Physical distance in the patient between the center of each pixel, specified by a numeric pair - adjacent row spacing (delimiter) adjacent column spacing in mm.	Used/Generated
Image Orientation (Patient)	(0020 ,0037)	1	The direction cosines of the first row and the first column with respect to the patient.	Used/Generated
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	Used/Generated
Slice Thickness	(0018,0050)	2	Nominal slice thickness, in mm	Used/Generated
Slice Location	(0020,1041)	3	Relative position of the image plane expressed in mm.	Used/Generated

4.4.2.3 Image Pixel Module

TABLE 4-7
IMAGE PIXEL MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description	Attribute Usage
Samples per Pixel	(0028,0002)	1	See 4.4.2.6 for CT Images	Used/Generated
Photometric Interpretation	(0028,0004)	1	See 4.4.2.6 for CT Images	Used/Generated
Rows	(0028,0010)	1	Number of rows in the image	Used/Generated
Columns	(0028,0011)	1	Number of columns in the image	Used/Generated
Bits Allocated	(0028,0100)	1	See 4.4.2.6 for CT Images	Used/Generated
Bits Stored	(0028,0101)	1	See 4.4.2.6 for CT Images	Used/Generated
High Bit	(0028,0102)	1	See 4.4.2.6 for CT Images	Used/Generated
Pixel Representation	(0028,0103)	1	Data representation of the pixel samples. Each sample shall have the same pixel representation. Enumerated Values used: 0000H = unsigned integer. 0001H = 2's complement	Used/Generated
Pixel Data	(7FE0, 0010)	1	A data stream of the pixel samples that comprise the Image.	Used/Generated
Planar Configuration	(0028,0006)	1C	Not Used (number of Samples per Pixel is always 1)	Ignored/Removed
Pixel Aspect Ratio	(0028,0034)	1C	Not Used	Ignored/Removed

4.4.2.4 Contrast/Bolus Module

TABLE 4-8
CONTRAST/BOLUS MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description	Attribute Usage
Contrast/Bolus Agent	(0018,0010)	2	Contrast or bolus agent	Ignored /Copied
Contrast/Bolus Route	(0018,1040)	3	Administration route of contrast agent	Ignored/Copied

4.4.2.5 Standard Extended Image Module

TABLE 4-9
STANDARD EXTENDED IMAGE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description	Attribute Usage
Counts Accumulated	(0018,0070)	3	Total counts in the pixel data	Ignored /Copied
Acquisition Termination Condition	(0018,0071)	3	Description of how the data collection was stopped.	Ignored /Copied
Spacing Between Slices	(0018,0088)	3	Spacing between slices, in mm. The spacing is measured from the center-to-center of each slice. Not relevant for MR IOD.	Ignored/Copied
Count Rate	(0018,1243)	3	Maximum count rate achieved during the acquisition in counts/sec	Ignored /Copied
Table Traverse	(0018,1131)	3	Table Traverse	Ignored/Copied
Smallest Image Pixel Value	(0028,0106)	3	The minimum actual pixel value encountered in this image.	Ignored/Copied
Largest Image Pixel Value	(0028,0107)	3	The maximum actual pixel value encountered in this image.	Ignored/Copied

4.4.2.6 CT Image Module

TABLE 4-10
CT IMAGE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description	Attribute Usage
Image Type	(0008,0008)	1	See 4.4.2.6.1	Used/Generated
Samples per Pixel	(0028,0002)	1	Shall be 1.	Used/Generated
Photometric Interpretation	(0028,0004)	1	Always set to MONOCHROME2	Used/Generated
Bits Allocated	(0028,0100)	1	Shall be 16.	Used/Generated
Bits Stored	(0028,0101)	1	Shall be 12 or 16.	Used/Generated
High Bit	(0028,0102)	1	Shall have only the Enumerated Value of one less than the value sent in Bits Stored.	Used/Generated
Rescale Intercept	(0028,1052)	1	The value **b** in relationship between stored values (SV) and the output units. Output units = m*SV+b	Used/ Copied
Rescale Slope	(0028,1053)	1	The value **m** in the equation specified in Rescale Intercept (0028,1052).	Used/ Copied
Rescale Type	(0028,1054)	1C	Specifies the output units of Rescale Slope (0028,1053) and Rescale Intercept (0028,1052). Required if the Rescale Type is not HU (Hounsfield Units).	Ignored/Removed
KVP	(0018,0060)	2	Peak kilo voltage output of the x-ray generator used.	Used/ Copied
Acquisition Number	(0020,0012)	2	A number identifying the single continuous gathering of data over a period of time which resulted in this image.	Used/ Copied
Scan Options	(0018,0022)	3	Parameters of scanning sequence.	Used/Copied

Data Collection Diameter	(0018,0090)	3	The diameter in mm of the region over which data were collected. See 4.4.2.6.2	Used/Copied
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 4.4.2.6.2	Ignored/Removed
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 4.4.2.6.2	Used/Copied
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 4.4.2.6.2	Ignored/Removed
Distance Source to Detector	(0018,1110)	3	Distance in mm from source to detector center. See 4.4.2.6.2	Ignored/Removed
Distance Source to Patient	(0018,1111)	3	Distance in mm from source to iso-center (center of field of view). See 4.4.2.6.2	Ignored/Removed
Gantry/Detector Tilt	(0018,1120)	3	Nominal angle of tilt in degrees of the scanning gantry.	Ignored/Copied
Table Height	(0018,1130)	3	The distance in mm of the top of the patient table to the center of rotation.	Used/Copied
Rotation Direction	(0018,1140)	3	Direction of rotation of the source when relevant, about nearest principal axis of equipment.	Ignored/Removed
Exposure Time	(0018,1150)	3	Time of x-ray exposure in msec.	Ignored/Removed
X-ray Tube Current	(0018,1151)	3	X-Ray Tube Current in mA.	Used/Copied
Exposure	(0018,1152)	3	The exposure expressed in mAs, for example calculated from Exposure Time and X-Ray Tube Current.	Ignored/Removed
Filter Type	(0018,1160)	3	Label for the type of filter inserted into the x-ray beam.	Ignored/Removed
Generator Power	(0018,1170)	3	Power in kW to the x-ray generator.	Ignored/Removed
Focal Spot	(0018,1190)	3	Size of the focal spot in mm.	Ignored/Removed
Convolution Kernel	(0018,1210)	3	A label describing the convolution kernel or algorithm used to reconstruct the data.	Used/Copied
Revolution Time	(0018,9305)	3	The time in seconds of a complete revolution of the source around the gantry orbit.	Used/Copied
Single Collimation Width	(0018,9306)	3	The width of a single row of acquired data (in mm).	Used/Copied
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.	Used/Copied
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.	Used/Copied
Table Feed per Rotation	(0018,9310)	3	Motion of the table (in mm) during a complete revolution of the source around the gantry orbit.	Used/Copied
Spiral Pitch Factor	(0018,9311)	3	Ratio of the Table Feed per Rotation (0018,9310) to the Total Collimation Width (0018,9307).	Used/Copied
Exposure Modulation Type	(0018,9323)	3	A label describing the type of exposure modulation used for the purpose of limiting the dose.	Ignored/Removed

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. Sent, if Image Type (0008,0008) Value 3 is AXIAL. Sent as "0" if Exposure Modulation Type is "NONE"	Ignored/Removed
CTDIvol	(0018,9345)	3	Computed Tomography Dose Index (CTDIvol), in mGy. It describes the average dose for this image for the selected CT conditions of operation.	Used/Copied
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.	Ignored/Removed

4.4.2.6.1 Image Type

The following Enumerated Values of Value 1 are used:
- ORIGINAL identifies an Original Image
- DERIVED identifies a Derived Image

The following Enumerated Values of Value 2 are used:
- PRIMARY identifies a Primary Image

The following Defined Terms of Value 3 are used:
- AXIAL identifies a CT Axial Image
- LOCALIZER identifies a CT Localizer Image

The following Enumerated Values of Value 1 are created:
- 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

4.4.2.6.2 Relationships Between CT Geometric Attributes

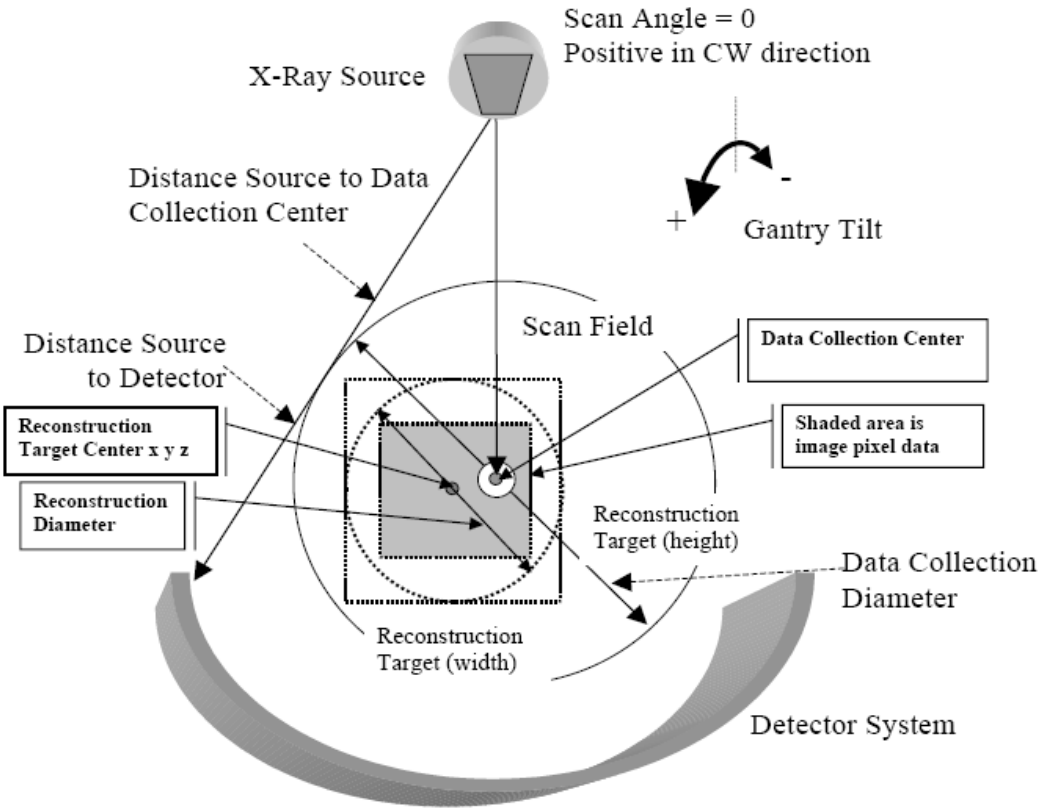

Figure C.8-19: Geometry of CT Acquisition System

4.4.2.7 VOI LUT module

TABLE 4-11
VOI LUT MODULE ATTRIBUTES

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

4.4.2.8 SOP Common Module

TABLE 4-12
SOP COMMON MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description	Attribute Usage
SOP Class UID	(0008,0016)	1	Uniquely identifies the SOP Class. "1.2.840.10008.5.1.4.1.1.2"	Used / Generated
SOP Instance UID	(0008,0018)	1	Uniquely identifies the SOP Instance.	Mandatory /

				Generated
Specific Character Set	(0008,0005)	1C	Character Set that expands or replaces the Basic Graphic Set. Defined Terms used: Refer to Section 2.2	Used / Generated
Instance Creation Date	(0008,0012)	3	Date of instance creation.	Ignored / Generated
Instance Creation Time	(0008,0013)	3	Time of instance creation.	Ignored / Generated
Instance Creator UID	(0008,0014)	3	The Implementation UID for this DICOM v3.0 Implementation Set to the 1.2.840.113619.6.281	Ignored / Generated
Instance Number	(0020,0013)	3	See 4.4.2.1 for more specialization	Ignored / Generated

4.4.2.9 Private Image Module

TABLE 4-13
PRIVATE IMAGE MODULE ATTRIBUTES

Attribute Name	Tag	Private Creator	Attribute Description	Attribute Usage
Workstation DICOM data Identifier	(0009,xx01)	GEMS_GENIE_1	Always set to "GEMS_GENIE"	Used / Generated
Dataset Type	(0011,xx13)	GEMS_GENIE_1	Defines type of dataset. The Defined Terms are: 13 = Transaxial 14 = Coronal 15 = Sagittal 28 = Oblique	Used /Generated
Dataset UID	(0009,xx1E)	GEMS_GENIE_1	Unique Identifier of Dataset object	Used/ Generated
Imageset UID	(0009,xx46)	GEMS_GENIE_1	Unique Identifier of CT/PET/MR Imageset	Used / Generated
Dataset Name	(0011,xx12)	GEMS_GENIE_1	Dataset Name	Used /Generated
Acquisition Parent UID	(0011,xx31)	GEMS_GENIE_1	Acquisition Parent UID	Used / Copied
Processing Parent UID	(0011,xx32)	GEMS_GENIE_1	Processing Parent UID	Used / Copied

4.4.2.10 Private CT Image Module

TABLE 4-14
PRIVATE CT IMAGE MODULE ATTRIBUTES

Attribute Name	Tag	Private Creator	Attribute Description	Attribute Usage
Table Feed	(0019,xx23)	GEMS_ACQU_01		Used / Copied
Mid Scan Time	(0019,xx24)	GEMS_ACQU_01		Used / Copied
Gantry Period	(0019,xx27)	GEMS_ACQU_01		Used / Copied
GE Noise Index *10	(0027,xx1F)	GEMS_IMAG_01		Used / Copied
Smart Scan ON/OFF Flag	(0027,xx20)	GEMS_IMAG_01		Used / Copied
Center R coord of plain image	(0027,xx42)	GEMS_IMAG_01		Used / Copied
Center A coord of plain image	(0027,xx43)	GEMS_IMAG_01		Used / Copied
Center S coord of plain image	(0027,xx44)	GEMS_IMAG_01		Used / Copied
CTAC Group Number	(0031,xx01)	GEHC_HYBRID_01		Used / Copied
Acq Parent UID	(0031,xx02)	GEHC_HYBRID_01		Used / Copied

Predessesor Table height	(0031,xx03)	GEHC_HYBRID_01		Used / Copied
Scan Pitch Ratio	(0043,xx27)	GEMS_PARM_01		Used / Copied
Num CT Detectors	(0045,xx01)	GEMS_HELIOS_01		Used / Copied
Cardiac Recon Algorithm	(0045,xx30)	GEMS_HELIOS_01		Used / Copied
PctRpeakDelay	(0045,xx33)	GEMS_HELIOS_01	CT Phase Location	Used / Copied
IterativeReconAnnotation	(0053,xx40)	GEHC_CT_ADVAPP_001		Used / Copied

4.5 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.

4.5.1 Standard Attributes

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

TABLE 4-15
STANDARD EXTENDED ATTRIBUTES

Information Entity Name	Attribute Name	Tag	Use
Study	Study Comments	(0032,4000)	User-defined Study notes
Image	Counts Accumulated	(0018,0070)	Total counts in the pixel data
	Acquisition Termination Condition	(0018,0071)	Description of how the data collection was stopped.
	Spacing Between Slices	(0018,0088)	Spacing between slices, in mm. The spacing is measured from the center-to-center of each slice.
	Count Rate	(0018,1243)	Maximum count rate achieved during the acquisition in counts/sec
	Table Traverse	(0018,1131)	Table Traverse
	Smallest Image Pixel Value	(0028,0106)	The minimum actual pixel value encountered in this image.
	Largest Image Pixel Value	(0028,0107)	The maximum actual pixel value encountered in this image.

4.5.2 Private Group GEMS_GENIE_1

TABLE 4-16
PRIVATE GROUP GEMS_GENIE_1

Attribute Name	Tag	VR	VM	Attribute Description	Attribute Usage
Private Creator Identification	(0009,00xx)	LO	1	GEMS_GENIE_1	Used / Generated
Workstation DICOM data Identifier	(0009,xx01)	SH	1	Default value: "GEMS_GENIE"	Used / Generated
Dataset UID	(0009,xx1E)	UI	1	Unique Identifier of Dataset object	Used/ Generated
Imageset UID	(0009,xx46)	UI	1	Unique Identifier of CT/PET/MR Imageset	Used / Generated
Series Flags	(0009,xx21)	SL	1	Defines series information.	Ignored/Generated
Private Creator Identification	(0011,00xx)	LO	1	GEMS_GENIE_1	Used / Generated
Series Type	(0011,xx0A)	SL	1	Defines type of series.	Used/Generated
Dataset Name	(0011,xx12)	LO	1-n	Dataset Name	Used /Generated
Dataset Type	(0011,xx13)	SL	1		Used /Generated
Acquisition Parent UID	(0011,xx31)	LO	1-n	Acquisition Parent UID	Used / Copied
Processing Parent UID	(0011,xx32)	LO	1-n	Processing Parent UID	Used / Copied
Private Creator Identification	(0033,00xx)	LO	1	GEMS_GENIE_1	Used / Generated
OrigSOP Instance UID	(0033,xx07)	LO	1-n	List of SOP UIDs of associated datasets encapsulated into the	Ignored / Generated

				DICOM NM Image.	

4.5.3 Private Group GEMS_ACQU_01

TABLE 4-17
PRIVATE GROUP GEMS_ACQU_01

Attribute Name	Tag	VR	VM	Attribute Description	Attribute Usage
Private Creator Identification	(0019,00xx)	LO	1	GEMS_ACQU_01	Used / Generated
Table Feed	(0019,xx23)	DS	1		Used / Copied
Mid Scan Time	(0019,xx24)	DS	1		Used / Copied
Gantry Period	(0019,xx27)	DS	1		Used / Copied

4.5.4 Private Group GEMS_IMAG_01

TABLE 4-18
PRIVATE GROUP GEMS_IMAG_01

Attribute Name	Tag	VR	VM	Attribute Description	Attribute Usage
Private Creator Identification	(0027,00xx)	LO	1	GEMS_IMAG_01	Used / Generated
GE Noise Index *10	(0027,xx1F)	SL	1		Used / Copied
Smart Scan ON/OFF Flag	(0027,xx20)	SS	1		Used / Copied
Center R coord of plain image	(0027,xx42)	FL	1		Used / Copied
Center A coord of plain image	(0027,xx43)	FL	1		Used / Copied
Center S coord of plain image	(0027,xx44)	FL	1		Used / Copied

4.5.5 Private Group GEHC_HYBRID_01

TABLE 4-19
PRIVATE GROUP GEHC_HYBRID_01

Attribute Name	Tag	VR	VM	Attribute Description	Attribute Usage
Private Creator Identification	(0031,00xx)	LO	1	GEHC_HYBRID_01	Used / Generated
CTAC Group Number	(0031,xx01)	IS	1		Used / Copied
Acq Parent UID	(0031,xx02)	UI	1		Used / Copied
Predessesor Table height	(0031,xx03)	DS	1		Used / Copied

4.5.6 Private Group GEMS_PARM_01

TABLE 4-20
PRIVATE GROUP GEMS_PARM_01

Attribute Name	Tag	VR	VM	Attribute Description	Attribute Usage
Private Creator Identification	(0043,00xx)	LO	1	GEMS_PARM_01	Used / Generated
Scan Pitch Ratio	(0043,xx27)	SH	1		Used / Copied

4.5.7 Private Group GEMS_HELIOS_01

TABLE 4-21
PRIVATE GROUP GEMS_HELIOS_01

Attribute Name	Tag	VR	VM	Attribute Description	Attribute Usage
Private Creator Identification	(0045,00xx)	LO	1	GEMS_HELIOS_01	Used / Generated
Num CT Detectors	(0045,xx01)	SS	1		Used / Copied
Cardiac Recon Algorithm	(0045,xx30)	CS	1		Used / Copied
PctRpeakDelay	(0045,xx33)	CS	1	CT Phase Location	Used / Copied

4.5.8 Private Group GEHC_CT_ADVAPP_001

TABLE 4-22
PRIVATE GROUP GEHC_CT_ADVAPP_001

Attribute Name	Tag	VR	VM	Attribute Description	Attribute Usage
Private Creator Identification	(0053,00xx)	LO	1	GEHC_CT_ADVAPP_001	Used / Generated
IterativeReconAnnotation	(0053,xx40)	SH	1		Used / Copied

4.5.9 Private Group GEMS_XELPRV_01

TABLE 4-23
PRIVATE GROUP GEMS_XELPRV_01

Attribute Name	Tag	VR	VM	Attribute Description	Attribute Usage
Private Creator Identification	(0033,00xx)	LO	1	GEMS_XELPRV_01	Used/Generated
Object Type	(0033,xx08)	CS	1	SDO/RTO/PDO Type	Ignored/Generated
Modified	(0033,xx10)	SL	1	SDO/RTO/PDO Modification Flag	Ignored/Generated
Name	(0033,xx11)	LO	1	SDO/RTO/PDO Name	Ignored/Generated
StudyId	(0033,xx14)	LO	1	Parent RTO Study Id	Ignored/Copied
Database Object Unique ID	(0033,xx16)	LO	1	SDO/RTO/PDO Database UID	Ignored/Generated
Date	(0033,xx17)	SH	1	SDO/RTO/PDO Creation date	Ignored/Generated
Time	(0033,xx18)	SH	1	SDO/RTO/PDO Creation time	Ignored/Generated
Object Flags	(0033,xx19)	UL	1	SDO/PDO Flags.	Ignored/Generated
ProtocolName	(0033,xx1A)	LO	1	Name of Protocol created SDO/PDO	Ignored/Generated
RelevantDataUID	(0033,xx1B)	LO	1	UID(s) of SOP Instance(s) relative to SDO/Parent StudyId of RTO	Ignored/Generated
BulkData	(0033,xx1C)	OB	1	SDO/PDO parameter(s) stored as binary buffer(s)	Ignored/Generated
IntData	(0033,xx1D)	SL	1-n	List of SDO/PDO parameters stored as integers	Ignored/Generated
Double Data	(0033,xx1E)	FD	1-n	List of SDO/PDO parameters stored as doubles	Ignored/Generated
String Data	(0033,xx1F)	OB	1	List of SDO/PDO parameters stored as list of strings	Ignored/Generated
BulkDataFormat	(0033,xx20)	OB	1	Format of bulk SDO/PDO parameters	Ignored/Generated
IntDataFormat	(0033,xx21)	OB	1	Format of integer SDO/PDO parameters	Ignored/Generated
DoubleDataFormat	(0033,xx22)	OB	1	Format of double SDO/PDO parameters	Ignored/Generated
StringDataFormat	(0033,xx23)	OB	1	Format of string SDO/PDO parameters	Ignored/Generated
Description	(0033,xx24)	LT	1	User or equipment generated SDO/PDO description	Ignored/Generated
RTName	(0033,xx28)	LO	1	RTO Name	Ignored/Copied
RTSpecification	(0033,xx29)	LT	1	RTO Specification	Ignored/Copied
ReviewTemplatesFlags	(0033,xx2A)	UL	1	Review Templates Flags	Ignored/Copied
DataValidationSpec	(0033,xx2B)	LT	1	RTO Data Validation Spec	Ignored/Copied
Description	(0033,xx2C)	LT	1	RTO Description	Ignored/Copied
IconDescription	(0033,xx2D)	LT	1	RTO Icon Description	Ignored/Copied
ProtocolDataSequence	(0033,xx50)	SQ	1	SQ with items encoding Protocol Data Object (PDO) attributes	Ignored/Copied
InternalSOPClassUID	(0033,xx51)	UI	1	PDO Private SOP Class UID	Ignored/Copied

InternalInstanceUID	(0033,xx52)	UI	1	PDO Instance UID	Ignored/Copied
ReviewTemplatesSequence	(0033,xx60)	SQ	1	SQ with items encoding Review Templates Objects (RTO) attributes	Ignored/Copied
InternalSOPClassUID	(0033,xx61)	UI	1	RTO Private SOP Class UID	Ignored/Copied
InternalInstanceUID	(0033,xx62)	UI	1	RTO Instance UID	Ignored/Copied
SeriesDataSequence	(0033,xx70)	SQ	1	SQ with items encoding Series Data Object (SDO) attributes	Ignored/Generated
InternalSOPClassUID	(0033,xx71)	UI	1	SDO Private SOP Class UID	Ignored/Generated
InternalInstance UID	(0033,xx72)	UI	1	SDO Instance UID	Ignored/Generated
DoubleDataSQ	(0033,xx73)	SQ	1	Sequence of items to store SDO parameters as lists of doubles	Used/Removed

4.6 STANDARD EXTENDED AND PRIVATE CONTEXT GROUPS

Volumetrix MI does not support any coded terminology

5. PET INFORMATION OBJECT IMPLEMENTATION

5.1 INTRODUCTION

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

5.2 VOLUMERIX MI MAPPING OF DICOM ENTITIES

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

TABLE 5-1
MAPPING OF DICOM ENTITIES TO VOLUMETRIX MI ENTITIES

DICOM IE	Volumetrix MI Entity
Patient	Patient
Study	Study
Series	Series
Image	Dataset

5.3 IOD MODULE TABLE

The Positron Emission 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 5.5

TABLE 5-2
PET IMAGE IOD MODULES

Entity Name	Module Name	Usage	Reference
Patient	Patient	Used (same description as for NM IOD)	3.4.1.1
	Clinical Trial Subject	Not Used	N/A
	Private Patient	Used (same description as for NM IOD)	3.4.1.2
Study	General Study	Used (same description as for NM IOD)	3.4.2.1
	Patient Study	Used (same description as for NM IOD)	3.4.2.2
	Private Study	Used (same description as for NM IOD)	3.4.2.3
	Standard Extended Study	Used (same description as for NM IOD)	3.4.2.4
	Clinical Trial Study	Not Used	N/A
Series	General Series	Used (same description as for NM IOD)	3.4.3.1
	Clinical Trial Series	Not Used	N/A
	Standard Extended Series	Used	5.4.1.1
	Private Series	Used (same description as for CT IOD)	4.4.1.2
	PET Series	Used	5.4.1.2
	PET Isotope	Used	5.4.1.3
	PET Multi-gated Acquisition	Not Used	N/A
	NM/PET Patient Orientation	Used (same description as for NM IOD)	3.4.3.3
Frame of Reference	Frame of Reference	Used	5.4.2.1
Equipment	General Equipment	Used (same description as for NM IOD)	3.4.5.1

Image	General Image	Used	5.4.3.1
	Image Plane	Used	5.4.3.2
	Image Pixel	Used	5.4.3.3
	Standard Extended Image	Used	5.4.3.4
	Device	Not Used	N/A
	PET Image	Used	5.4.3.5
	Overlay Plane	Not Used	N/A
	VOI LUT	Used (same description as for CT IOD)	4.4.2.7
	Acquisition Context	Not Used	N/A
	SOP Common	Used	5.4.3.6
	Private Image	Used	5.4.3.7
	Private PET Image	Used	5.4.3.8

5.4 INFORMATION MODULE DEFINITIONS

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

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

Volumetrix MI 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.

5.4.1 Series Entity Modules

5.4.1.1 Standard Extended Series Module

TABLE 5-3
STANDARD EXTENDED SERIES MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description	Attribute Usage
Patient Position	(0018,5100)	3	Patient position descriptor relative to the equipment	Used/ Copied

5.4.1.2 PET Series Module

TABLE 5-4
PET SERIES MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description	Attribute Usage
Series Date	(0008,0021)	1	Date the Series started.	Used/Generated (Current Date)
Series Time	(0008,0031)	1	Time the Series started.	Used/Generated (Current Time)
Units	(0054,1001)	1	Pixel value units. Defined Terms: CNTS, NONE, CM2, PCNT, CPS, BQML, MGMINML, UMOLMINML, MLMING, MLG,	Used / Copied

			1CM, UMOLML, PROPCNTS, PROPCPS, MLMINML, MLML, GML, STDDEV	
Counts Source	(0054,1002)	1	The primary source of counts. Enumerated Values: EMISSION TRANSMISSION	Used / Copied
Series Type	(0054,1000)	1	A multi-valued indicator of the type of Series. See 5.4.1.2.1for specialization.	Mandatory / Generated
Reprojection Method	(0054,1004)	2C	Method for projecting volumetric data onto planar projection. Required if Series Type (0054,1000), Value 2 is REPROJECTION. Defined Terms: SUM MAX PIXEL	Used / Copied
Number of R-R Intervals	(0054,0061)	1C	The maximum number of R-R Intervals that may exist in this Series. Not Used (creation of data with Series Type = GATED is not supported)	Ignored / Removed
Number of Time Slots	(0054,0071)	1C	The maximum number of Time Slots that may exist in this Series. Not Used (creation of data with Series Type = GATED is not supported)	Ignored / Removed
Number of Time Slices	(0054,0101)	1C	The maximum number of Time Slices that may exist in this Series. Not Used (creation of data with Series Type = DYNAMIC is not supported)	Ignored / Removed
Number of Slices	(0054,0081)	1	The maximum number of Slices that may exist in this Series.	Used/ Generated
Corrected Image	(0028,0051)	2	One or more values that indicate which, if any, corrections have been applied to the images in this series.	Used / Copied
Randoms Correction Method	(0054,1100)	3	Type of randoms correction processing.	Used / Copied
Attenuation Correction Method	(0054,1101)	3	A textual description of the attenuation correction processing.	Used / Copied
Scatter Correction Method	(0054,1105)	3	A textual description of the scatter correction processing.	Used/Copied
Decay Correction	(0054,1102)	1	The real-world event to which images in this Series were decay corrected.	Used/ Copied
Reconstruction Diameter	(0018,1100)	3	Diameter, in mm, of the region within which the data was used in creating the reconstruction of the image.	Used / Copied
Convolution Kernel	(0018,1210)	3	Textual description of the convolution kernel(s) used to reconstruct the data	Used/ Copied
Reconstruction Method	(0054,1103)	3	Textual description of reconstruction Processing.	Used/ Copied
Acquisition Start Condition	(0018,0073)	3	Description of how the data collection was started	Used/ Copied
Acquisition Start Condition Data	(0018,0074)	3	Count density, change in count density, or physiological triggers causing data collection to start.	Used/ Copied

Acquisition Termination Condition	(0018,0071)	3	Description of how the data collection for the series was stopped.	Used/ Copied
Acquisition Termination Condition Data	(0018,0075)	3	Number of counts, count density, change in count density, or physiological triggers causing the termination.	Used/ Copied
Field of View Shape	(0018,1147)	3	Shape of the field of view of the PET camera.	Used/ Copied
Field of View Dimensions	(0018,1149)	3	Dimensions of the field of view, in mm. Transverse detector diameter followed by axial width.	Used/ Copied
Gantry/Detector Tilt	(0018,1120)	3	Angle of tilt in degrees of the gantry.	Used/ Copied
Type of Detector Motion	(0054,0202)	3	Describes the detector motion during acquisition.	Used/ Copied
Collimator Type	(0018,1181)	2	Collimator Type	Used/Copied
Axial Mash	(0054,1201)	3	Number of adjacent axial lines of response mashed together.	Used/Copied
Transverse Mash	(0054,1202)	3	Number of adjacent transverse lines of response mashed together.	Used/Copied
Coincidence Window Width	(0054,1210)	3	The width of the coincidence timing window, in nsec.	Used/Copied

5.4.1.2.1 Series Type

The following values of Series Type (0054,1000) are used:
Value 1 Enumerated Values:
- STATIC
- DYNAMIC
- WHOLE BODY

Value 2 Enumerated Values:
- IMAGE
- REPROJECTION

The following values of Series Type (0054,1000) are generated:
Value 1 Enumerated Values:
- STATIC
- WHOLE BODY

Value 2 Enumerated Values:
- IMAGE
- REPROJECTION

5.4.1.3 PET Isotope Module

TABLE 5-5
PET ISOTOPE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description	Attribute Usage
Radiopharmaceutical Information Sequence	(0054,0016)	2	Information on radiopharmaceutical(s) used.	Used/Copied Only 1st valid item is used /All items from input image are copied to output image(s) created by Volumertix MI
> Radionuclide Code Sequence	(0054,0300)	2	Sequence that identifies the radionuclide. May contain 0 or 1	Used /Copied

			item.	
>> Include 'Code Sequence Macro'	*Baseline Context ID is 4020*			Ignored /Copied
> Radiopharmaceutical Route	(0018,1070)	3	Route of injection.	Ignored /Removed
> Administration Route Code Sequence	(0054,0302)	3	Not Used	Ignored /Removed
> Radiopharmaceutical Volume	(0018,1071)	3	Volume of injection in cubic cm.	Used / Copied
> Radiopharmaceutical Start Time	(0018,1072)	3	Time of start of injection.	Ignored /Removed
> Radiopharmaceutical Stop Time	(0018,1073)	3	Time of end of injection.	Ignored /Removed
> Radionuclide Total Dose	(0018,1074)	3	The radiopharmaceutical dose administered to the patient measured in Becquerels (Bq) at the Radiopharmaceutical Start Time (0018,1072).	Used / Copied
> Radiopharmaceutical	(0018,0031)	3	Name of the radiopharmaceutical.	Used / Copied
> Radiopharmaceutical Code Sequence	(0054,0304)	3	Sequence that identifies the radiopharmaceutical. May contain 0 or 1 item	Ignored/Copied
>> Include 'Code Sequence Macro'	*Baseline Context ID is 4021*			Ignored/Copied
Intervention Drug Information Sequence	(0018,0026)	3	Sequence of Items that describes the intervention drugs used..	Ignored / Removed

5.4.2 Frame Of Reference Entity Modules

5.4.2.1 Frame Of Reference Module

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

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

TABLE 5-6
FRAME OF REFERENCE MODULE ATTRIBUTES

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

5.4.3 Image Entity Modules

5.4.3.1 General Image Module

TABLE 5-7
GENERAL IMAGE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description	Attribute Usage
Instance Number	(0020,0013)	2	A number that identifies this image.	Used/Generated

Patient Orientation	(0020,0020)	2C	Patient Orientation	Ignored/R
Content Date	(0008,0023)	2C	The date the image pixel data creation started.	Used/Generated (Current Date)
Content Time	(0008,0033)	2C	The time the image pixel data creation started	Used/Generated (Current Time)
Image Type	(0008,0008)	3	See 5.4.3.5 for PET Images	
Acquisition Date	(0008,0022)	3	See 5.4.3.5 for PET Images	
Acquisition Time	(0008,0032)	3	See 5.4.3.5 for PET Images	
Image Comments	(0020,4000)	3	Contains additional information about image.	Used/Copied

5.4.3.2 Image Plane Module

TABLE 5-8
IMAGE PLANE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description	Attribute Usage
Pixel Spacing	(0028,0030)	1	Physical distance in the patient between the center of each pixel, specified by a numeric pair - adjacent row spacing (delimiter) adjacent column spacing in mm.	Used/Generated
Image Orientation (Patient)	(0020 ,0037)	1	The direction cosines of the first row and the first column with respect to the patient.	Used/Generated
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	Used/Generated
Slice Thickness	(0018,0050)	2	Nominal slice thickness, in mm	Used/Generated
Slice Location	(0020,1041)	3	Relative position of the image plane expressed in mm.	Ignored/Generated

5.4.3.3 Image Pixel Module

TABLE 5-9
IMAGE PIXEL MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description	Attribute Usage
Samples per Pixel	(0028,0002)	1	See 5.4.3.5 for PET Images	
Photometric Interpretation	(0028,0004)	1	See 5.4.3.5 for PET Images	
Rows	(0028,0010)	1	Number of rows in the image	Used/Generated
Columns	(0028,0011)	1	Number of columns in the image	Used/Generated
Bits Allocated	(0028,0100)	1	See 5.4.3.5 for PET Images	
Bits Stored	(0028,0101)	1	See 5.4.3.5 for PET Images	
High Bit	(0028,0102)	1	See 5.4.3.5 for PET Images	
Pixel Representation	(0028,0103)	1	Data representation of the pixel samples. Each sample shall have the same pixel representation. Enumerated Values used: 0000H = unsigned integer. 0001H = 2's complement	Used/Generated
Pixel Data	(7FE0, 0010)	1	A data stream of the pixel samples that comprise the Image.	Used/Generated
Planar Configuration	(0028,0006)	1C	Not Used (number of Samples per Pixel is always 1)	Ignored/Removed
Pixel Aspect Ratio	(0028,0034)	1C	Not Used	Ignored/Removed
Smallest Image Pixel Value	(0028,0106)	3	The minimum actual pixel value encountered in this image.	Ignored/Generated
Largest Image Pixel Value	(0028,0107)	3	The maximum actual pixel value encountered in this image.	Ignored/Generated

5.4.3.4 Standard Extended Image Module

TABLE 5-10
STANDARD EXTENDED IMAGE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description	Attribute Usage
Image ID	(0054,0400)	3	User or equipment generated Image identifier.	Used / Generated
Spacing Between Slices	(0018,0088)	3	Spacing between slices, in mm. The spacing is measured from the center-to-center of each slice. Not relevant for MR IOD.	Ignored/Copied
Table Height	(0018,1130)	3	The distance in mm of the top of the patient table to the center of rotation.	Used / Copied

5.4.3.5 PET Image Module

TABLE 5-11
PET IMAGE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description	Attribute Usage
Image Type	(0008,0008)	1	See 5.4.3.5.1	Used/Generated
Samples per Pixel	(0028,0002)	1	Always set be 1.	Used/Generated
Photometric Interpretation	(0028,0004)	1	Always set to MONOCHROME2	Used/Generated
Bits Allocated	(0028,0100)	1	Shall be 16.	Used/Generated
Bits Stored	(0028,0101)	1	Shall be 16.	Used/Generated
High Bit	(0028,0102)	1	Shall have only the Enumerated Value of one less than the value sent in Bits Stored.	Used/Generated
Rescale Intercept	(0028,1052)	1	The value b in relationship between stored values (SV) and pixel value units (U) defined in Units (0054,1001): U = m*SV+b. Always set to 0.	Used/ Generated
Rescale Slope	(0028,1053)	1	The value **m** in the equation specified in Rescale Intercept (0028,1052).	Used/ Generated
Frame Reference Time	(0054,1300)	1	The time that the pixel values in the image occurred.	Used/Copied
Trigger Time	(0018,1060)	1C	Time interval, in msec, from the start of the trigger to the Not Used (creation of data with Series Type = GATED is not supported)	Ignored /Removed
Frame Time	(0018,1063)	1C	Nominal duration per individual frame, in msec. Not Used (creation of data with Series Type = GATED is not supported)	Ignored /Removed
Low R-R Value	(0018,1081)	1C	R-R interval lower limit for beat rejection, in msec. Not Used (creation of data with Series Type = GATED is not supported)	Ignored /Removed
High R-R Value	(0018,1082)	1C	R-R interval upper limit for beat rejection, in msec. Not Used (creation of data with Series Type = GATED is not supported)	Ignored /Removed
Lossy Image Compression	(0028,2110)	1C	Specifies whether an Image has undergone lossy compression.	Ignored /Removed
Image Index	(0054,1330)	1	An index identifying the position of this image within a PET Series.	Mandatory / Generated
Acquisition Date	(0008,0022)	2	The date the acquisition of data that resulted in this image started	Used/ Generated

Acquisition Time	(0008,0032)	2	The time the acquisition of data that resulted in this image started	Used/ Generated
Actual Frame Duration	(0018,1242)	2	Elapsed time of the data acquisition for this image, in msec.	Used/ Copied
Slice Sensitivity Factor	(0054,1320)	3	The slice-to-slice sensitivity correction factor that was used to correct this image.	Used/Copied
Decay Factor	(0054,1321)	1C	The decay factor that was used to scale image. Required if Decay Correction (0054,1102) is other than NONE.	Used/Copied
Dose Calibration Factor	(0054,1322)	3	Factor that was used to scale this image from counts/sec to Bq/ml using a dose calibrator.	Used/Copied

5.4.3.5.1 Image Type

The following values of Image Type (0008,0008) are used:
Value 1 Enumerated Values:
- ORIGINAL identifies an Original Image
- DERIVED identifies a Derived Image

Value 2 Enumerated Values:
- PRIMARY identifies a Primary Image

The following values of Image Type (0008,0008) are generated:
Value 1 Enumerated Values:
- DERIVED identifies a Derived Image

Value 2 Enumerated:
- PRIMARY identifies a Primary Image

5.4.3.6 SOP Common Module

TABLE 5-12
SOP COMMON MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description	Attribute Usage
SOP Class UID	(0008,0016)	1	Uniquely identifies the SOP Class. "1.2.840.10008.5.1.4.1.1.128"	Used / Generated
SOP Instance UID	(0008,0018)	1	Uniquely identifies the SOP Instance.	Used / Generated
Specific Character Set	(0008,0005)	1C	Character Set that expands or replaces the Basic Graphic Set. Defined Terms used: refer to Section 2.2	Used / Generated
Instance Creation Date	(0008,0012)	3	Date of instance creation.	Ignored / Generated
Instance Creation Time	(0008,0013)	3	Time of instance creation.	Ignored / Generated
Instance Creator UID	(0008,0014)	3	The Implementation UID for this DICOM v3.0 Implementation Set to the 1.2.840.113619.6.281	Ignored / Generated
Instance Number	(0020,0013)	3	See 5.4.3.1 for more specialization	

5.4.3.7 Private Image Module

TABLE 5-13
PRIVATE IMAGE MODULE ATTRIBUTES

Attribute Name	Tag	Private Creator	Attribute Description	Attribute Usage
Workstation DICOM data	(0009,xx01)	GEMS_GENIE_1	Always set to	Used / Generated

Identifier			"GEMS_GENIE"	
Dataset UID	(0009,xx1E)	GEMS_GENIE_1	Unique Identifier of Dataset object	Ignored/ Generated
Imageset UID	(0009,xx46)	GEMS_GENIE_1	Unique Identifier of CT/PET/MR Imageset	Used / Generated
Dataset Name	(0011,xx12)	GEMS_GENIE_1	Dataset Name	Used /Generated
Dataset Type	(0011,xx13)	GEMS_GENIE_1	Defines type of dataset. The Defined Terms are: 13 = Transaxial 14 = Coronal 15 = Sagittal 28 = Oblique 44= MIP_3D 45 = SUM Reprojection	Used /Generated
Processing Parent UID	(0011,xx32)	GEMS_GENIE_1	Processing Parent UID	Used / Generated
Source Translator	(0013,xx11)	GEMS_GENIE_1	Source Translator	Used/ Removed
Annotation Sequence	(0019, xx5F)	GEMS_GENIE_1	Annotations attached to image; May contain 0 or more Items	Used / Removed
>Modified	(0019, xx60)	GEMS_GENIE_1	Modified Flag	Ignored / Removed
>Name	(0019, xx61)	GEMS_GENIE_1	Name of Database Annotation Object	Used / Removed
>Aid	(0019, xx62)	GEMS_GENIE_1	Database Annotation Unique ID	Ignored / Removed
>DatabaseAnnotationMapping	(0019, xx63)	GEMS_GENIE_1		Used / Removed
>DatabaseObjectClassID	(0019, xx64)	GEMS_GENIE_1		Ignored / Removed
>DatabaseObjectUniqueID	(0019, xx65)	GEMS_GENIE_1		Ignored / Removed
>TextFgColour	(0019, xx66)	GEMS_GENIE_1	Text Foreground Color	Used / Removed
>TextBgColour	(0019, xx67)	GEMS_GENIE_1	Text Background Color	Used / Removed
>MarkerColour	(0019, xx68)	GEMS_GENIE_1		Used / Removed
>LineColour	(0019, xx69)	GEMS_GENIE_1		Used / Removed
>LineThickness	(0019, xx6A)	GEMS_GENIE_1		Used / Removed
>Font	(0019, xx6B)	GEMS_GENIE_1		Used / Removed
>TextBackingMode	(0019, xx6C)	GEMS_GENIE_1		Used / Removed
>TextJustification	(0019, xx6D)	GEMS_GENIE_1		Used / Removed
>TextShadowOffsetX	(0019, xx6E)	GEMS_GENIE_1		Used / Removed
>TextShadowOffsetY	(0019, xx6F)	GEMS_GENIE_1		Used / Removed
>GeomColour	(0019, xx70)	GEMS_GENIE_1		Used / Removed
>GeomThickness	(0019, xx71)	GEMS_GENIE_1		Used / Removed
>GeomLineStye	(0019, xx72)	GEMS_GENIE_1		Used / Removed
>GeomDashLength	(0019, xx73)	GEMS_GENIE_1		Used / Removed
>GeomFillPattern	(0019, xx74)	GEMS_GENIE_1		Used / Removed
>MarkerSize	(0019, xx75)	GEMS_GENIE_1		Used / Removed
>Interactivity	(0019, xx76)	GEMS_GENIE_1	Interactivity Flag	Used / Removed
>TextLoc	(0019, xx77)	GEMS_GENIE_1		Used / Removed
>TextString	(0019, xx78)	GEMS_GENIE_1		Used / Removed
>TextAttachMode	(0019, xx79)	GEMS_GENIE_1		Used / Removed

>TextCursorMode	(0019, xx7A)	GEMS_GENIE_1		Used / Removed
>LineCtrlSize	(0019, xx7B)	GEMS_GENIE_1		Used / Removed
>LineType	(0019, xx7C)	GEMS_GENIE_1		Used / Removed
>LineStyle	(0019, xx7D)	GEMS_GENIE_1		Used / Removed
>LineDashLength	(0019, xx7E)	GEMS_GENIE_1		Used / Removed
>LinePtCount	(0019, xx7F)	GEMS_GENIE_1		Used / Removed
>LinePts	(0019, xx80)	GEMS_GENIE_1		Used / Removed
>LineAttachMode	(0019, xx81)	GEMS_GENIE_1		Used / Removed
>MarkerType	(0019, xx82)	GEMS_GENIE_1		Used / Removed
>MarkerLoc	(0019, xx83)	GEMS_GENIE_1		Used / Removed
>MarkerAttachMode	(0019, xx84)	GEMS_GENIE_1		Used / Removed
>FrameNumber	(0019, xx86)	GEMS_GENIE_1		Used / Removed
ROI Sequence	(0057,xx01)	GEMS_XELPRV_01	ROI created on image; may contain 0 or more items.	Used/ Removed
>PrivateSOPClassUID	(0057,xx02)	GEMS_XELPRV_01	ROI SOP Class UID	Ignored/ Removed
>ObjectInstanceUID	(0057,xx03)	GEMS_XELPRV_01	ROI SOP Instance UID	Used / Removed
>Index	(0057,xx10)	GEMS_XELPRV_01	Index of ROI	Used / Removed
>Dimensions	(0057,xx11)	GEMS_XELPRV_01	ROI Dimensions. Contain value: 1	Used / Removed
>Points	(0057,xx12)	GEMS_XELPRV_01	Number of Points	Used / Removed
>Type	(0057,xx13)	GEMS_XELPRV_01	ROIType	Used / Removed
>Description	(0057,xx14)	GEMS_XELPRV_01	ROI Description	Used / Removed
>DValueRepresentation	(0057,xx15)	GEMS_XELPRV_01	DataValueRepresentation	Used / Removed (Set to 3)
>ROI Label	(0057,xx16)	GEMS_XELPRV_01	ROI Label	Used / Removed
>Data	(0057,xx17)	GEMS_XELPRV_01	List of ROI Shape points	Used / Removed
>Modified	(0057,xx41)	GEMS_XELPRV_01	Modified	Ignored/Removed
>DatabaseObjectName	(0057,xx42)	GEMS_XELPRV_01	Name of ROI Database Object	Ignored/Removed
>DatabaseObjectClass ID	(0057,xx45)	GEMS_XELPRV_01		Ignored/Removed
>DatabaseObjectUID	(0057,xx46)	GEMS_XELPRV_01	ROI Object SOP Instance UID	Ignored/Removed
>Normal Colour	(0057,xx47)	GEMS_XELPRV_01	Normal Colour	Used / Removed
>NameFont	(0057,xx48)	GEMS_XELPRV_01	NameFont	Used / Removed
>FillPattern	(0057,xx49)	GEMS_XELPRV_01	FillPattern	Used / Removed
>LineStyle	(0057,xx4A)	GEMS_XELPRV_01	LineStyle	Used / Removed
>LineDashLength	(0057,xx4B)	GEMS_XELPRV_01	LineDashLength	Used / Removed
>LineThickness	(0057,xx4C)	GEMS_XELPRV_01	LineThickness	Used / Removed
>Interactivity	(0057,xx4D)	GEMS_XELPRV_01	Interactivity Flag	Used / Removed
>Name Position	(0057,xx4E)	GEMS_XELPRV_01	Name Position	Used / Removed
>NameDisplay	(0057,xx4F)	GEMS_XELPRV_01	NameDisplayFlag	Used / Removed
>Label	(0057,xx50)	GEMS_XELPRV_01	ROI Label Contains the same value as ROILabel attribute(0057,xx16)	Used / Removed
>BpSeg	(0057,xx51)	GEMS_XELPRV_01	BpSeg	Used / Removed
>BpSegpairs	(0057,xx52)	GEMS_XELPRV_01	BpSegpairs	Used / Removed

>SeedSpace	(0057,xx53)	GEMS_XELPRV_01	SeedSpace	Used / Removed
>Seeds	(0057,xx54)	GEMS_XELPRV_01	Seeds	Used / Removed
>Shape	(0057,xx55)	GEMS_XELPRV_01	Shape	Used / Removed
>ShapeTilt	(0057,xx56)	GEMS_XELPRV_01	ShapeTilt	Used / Removed
>ShapePtsSpace	(0057,xx59)	GEMS_XELPRV_01	ShapePtsSpace	Used / Removed
>ShapeCtrlPtsCount	(0057,xx5A)	GEMS_XELPRV_01	ShapeCtrlPtsCount	Used / Removed
>Shap CtrlPts	(0057,xx5B)	GEMS_XELPRV_01	Shap CtrlPts	Used / Removed
>ShapeCPSpace	(0057,xx5C)	GEMS_XELPRV_01	ShapeCPSpace	Used / Removed
>ROIFlags	(0057,xx5D)	GEMS_XELPRV_01	ROIFlags	Ignored / Removed
>FrameNumber	(0057,xx5E)	GEMS_XELPRV_01	FrameNumber	Used / Removed
>DatasetROI Mapping	(0057,xx60)	GEMS_XELPRV_01	DatasetROI Mapping	Used / Removed

5.4.3.8 Private PET Image Module

TABLE 5-14
PRIVATE PET IMAGE MODULE ATTRIBUTES

Attribute Name	Tag	Private Creator	Attribute Description	Attribute Usage
RadioPharmaceticalTotal Dose	(0009,xx38)	GEMS_PETD_01		Used / Copied
MeasuredDateTime	(0009,xx39)	GEMS_PETD_01		Used / Copied
AdminDateTime	(0009,xx3B)	GEMS_PETD_01		Used / Copied
PostInjectionActivity	(0009,xx3C)	GEMS_PETD_01		Used / Copied
PostInjectionDateTime	(0009,xx3D)	GEMS_PETD_01		Used / Copied
Reference coordinates	(0009,xx7F)	GEMS_PETD_01		Used / Copied
Recon left	(0009,xx91)	GEMS_PETD_01		Used / Copied
Recon posterior	(0009,xx92)	GEMS_PETD_01		Used / Copied

5.5 STANDARD EXTENDED AND PRIVATE DATA ATTRIBUTES

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

5.5.1 Standard Attributes

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

TABLE 5-15
STANDARD EXTENDED ATTRIBUTES

Information Entity Name	Attribute Name	Tag	Use
Series	Patient Position	(0018,5100)	Patient position descriptor relative to the equipment
Image	Image ID	(0054,0400)	User or equipment generated Image identifier.
	Table Height	(0018,1130)	The distance in mm of the top of the patient table to the center of rotation.

5.5.2 Private Group GEMS_GENIE_1

TABLE 5-16
PRIVATE GROUP GEMS_GENIE_1

Attribute Name	Tag	VR	VM	Attribute Description	Attribute Usage
Private Creator Identification	(0009,00xx)	LO	1	GEMS_GENIE_1	Used / Generated
Workstation DICOM data Identifier	(0009,xx01)	SH	1	Default value: "GEMS_GENIE"	Used / Generated
Dataset UID	(0009,xx1E)	UI	1	Unique Identifier of Dataset object	Used/ Generated
Imageset UID	(0009,xx46)	UI	1	Unique Identifier of CT/PET/MR Imageset	Used / Generated
Private Creator Identification	(0011,00xx)	LO	1	GEMS_GENIE_1	Used / Generated
Dataset Name	(0011,xx12)	LO	1-n	Dataset Name	Used /Generated
Dataset Type	(0011,xx13)	SL	1		Used /Generated
Processing Parent UID	(0011,xx32)	LO	1-n	Processing Parent UID	Used / Copied
Private Creator Identification	(0013,00xx)	LO	1	GEMS_GENIE_1	Used / Generated
Source Translator	(0013,xx11)	SL	1		Used /Removed
Private Creator Identification	(0019,00xx)	LO	1	GEMS_GENIE_1	Used / Generated
Annotation Sequence	(0019, xx5F)	SQ	1	Annotations attached to image; May contain 0 or more Items	Used / Removed
Modified	(0019, xx60)	SL	1	Modified Flag	Ignored / Removed
Name	(0019, xx61)	LO	1	Name of Database Annotation Object	Used / Removed
Aid	(0019, xx62)	LO	1	Database Annotation Unique ID	Ignored / Removed
DatabaseAnnotationMapping	(0019, xx63)	LO	1-n		Used / Removed
DatabaseObjectClassID	(0019, xx64)	LO	1		Ignored / Removed
DatabaseObjectUniqueID	(0019, xx65)	LO	1		Ignored / Removed
TextFgColour	(0019, xx66)	LO	1	Text Foreground Color	Used / Removed
TextBgColour	(0019, xx67)	LO	1	Text Background Color	Used / Removed
MarkerColour	(0019, xx68)	LO	1		Used / Removed
LineColour	(0019, xx69)	LO	1		Used / Removed
LineThickness	(0019, xx6A)	SL	1		Used / Removed
Font	(0019, xx6B)	LT	1		Used / Removed
TextBackingMode	(0019, xx6C)	SL	1		Used / Removed
TextJustification	(0019, xx6D)	SL	1		Used / Removed
TextShadowOffsetX	(0019, xx6E)	SL	1		Used / Removed
TextShadowOffsetY	(0019, xx6F)	SL	1		Used / Removed
GeomColour	(0019, xx70)	LT	1		Used / Removed
GeomThickness	(0019, xx71)	SL	1		Used / Removed
GeomLineStye	(0019, xx72)	SL	1		Used / Removed
GeomDashLength	(0019, xx73)	SL	1		Used / Removed

GeomFillPattern	(0019, xx74)	SL	1		Used / Removed
MarkerSize	(0019, xx75)	SL	1		Used / Removed
Interactivity	(0019, xx76)	SL	1	Interactivity Flag	Used / Removed
TextLoc	(0019, xx77)	FD	1-n		Used / Removed
TextString	(0019, xx78)	LT	1		Used / Removed
TextAttachMode	(0019, xx79)	SL	1-n		Used / Removed
TextCursorMode	(0019, xx7A)	SL	1-n		Used / Removed
LineCtrlSize	(0019, xx7B)	SL	1		Used / Removed
LineType	(0019, xx7C)	SL	1-n		Used / Removed
LineStyle	(0019, xx7D)	SL	1		Used / Removed
LineDashLength	(0019, xx7E)	SL	1		Used / Removed
LinePtCount	(0019, xx7F)	SL	1-n		Used / Removed
LinePts	(0019, xx80)	FD	1-n		Used / Removed
LineAttachMode	(0019, xx81)	SL	1-n		Used / Removed
MarkerType	(0019, xx82)	SL	1-n		Used / Removed
MarkerLoc	(0019, xx83)	FD	1-n		Used / Removed
MarkerAttachMode	(0019, xx84)	SL	1-n		Used / Removed
FrameNumber	(0019, xx86)	UL	1		Used / Removed

5.5.3 Private Group GEMS_XELPRV_01

TABLE 5-17
PRIVATE GROUP GEMS_XELPRV_01

Attribute Name	Tag	VR	VM	Attribute Description	Attribute Usage
Private Creator Identification	(0057,00xx)	LO	1	GEMS_XELPRV_01	Used/Removed
ROI Sequence	(0057,xx01)	SQ	1	ROI created on image	Used/ Removed
PrivateSOPClassUID	(0057,xx02)	UI	1	ROI SOP Class UID	Ignored/ Removed
ObjectInstanceUID	(0057,xx03)	UI	1	ROI SOP Instance UID	Used/ Removed
Index	(0057,xx10)	IS	1	Index of ROI	Used / Removed
Dimensions	(0057,xx11)	US	1	ROI Dimensions.	Used / Removed
Points	(0057,xx12)	US	1	Number of Points	Used / Removed
Type	(0057,xx13)	CS	1	ROIType	Used / Removed
Description	(0057,xx14)	LO	1	ROI Description	Used / Removed
DValueRepresentation	(0057,xx15)	US	1	DataValueRepresentation	Used / Removed
ROI Label	(0057,xx16)	LO	1	ROI Label	Used / Removed
Data	(0057,xx17)	OW	1	List of ROI Shape points	Used / Removed
Modified	(0057,xx41)	SL	1	Modified	Ignored/Removed
DatabaseObjectName	(0057,xx42)	LO	1	Name of ROI Database Object	Ignored/Removed
DatabaseObjectClass ID	(0057,xx45)	LO	1	Object Internal SOP Class UID	Ignored/Removed
DatabaseObjectUID	(0057,xx46)	LO	1	Object SOP Instance UID	Ignored/Removed
Normal Colour	(0057,xx47)	LO	1	Normal Colour	Used / Removed
NameFont	(0057,xx48)	LT	1	NameFont	Used / Removed
FillPattern	(0057,xx49)	SL	1	FillPattern	Used / Removed
LineStyle	(0057,xx4A)	SL	1	LineStyle	Used / Removed
LineDashLength	(0057,xx4B)	SL	1	LineDashLength	Used / Removed
LineThickness	(0057,xx4C)	SL	1	LineThickness	Used / Removed
Interactivity	(0057,xx4D)	SL	1	Interactivity Flag	Used / Removed
Name Position	(0057,xx4E)	SL	1	Name Position	Used / Removed
NameDisplay	(0057,xx4F)	SL	1	NameDisplayFlag	Used / Removed
Label	(0057,xx50)	LO	1	ROI Label	Used / Removed
BpSeg	(0057,xx51)	SL	1-n	BpSeg	Used / Removed
BpSegpairs	(0057,xx52)	US	1-n	BpSegpairs	Used / Removed
SeedSpace	(0057,xx53)	SL	1	SeedSpace	Used / Removed

Seeds	(0057,xx54)	FD	1-n	Seeds	Used / Removed
Shape	(0057,xx55)	SL	1-n	Shape	Used / Removed
ShapeTilt	(0057,xx56)	FD	1-n	ShapeTilt	Used / Removed
ShapePtsSpace	(0057,xx59)	SL	1-n	ShapePtsSpace	Used / Removed
ShapeCtrlPtsCount	(0057,xx5A)	SL	1	ShapeCtrlPtsCount	Used / Removed
Shap CtrlPts	(0057,xx5B)	FD	1-n	Shap CtrlPts	Used / Removed
ShapeCPSpace	(0057,xx5C)	SL	1	ShapeCPSpace	Used / Removed
ROIFlags	(0057,xx5D)	UL	1	ROIFlags	Ignored / Removed
FrameNumber	(0057,xx5E)	UL	1	FrameNumber	Used / Removed
DatasetROI Mapping	(0057,xx60)	LO	1-n	DatasetROI Mapping	Used / Removed

5.5.4 Private Group GEMS_PETD_01

TABLE 5-18
PRIVATE GROUP GEMS_PETD_01

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

5.6 STANDARD EXTENDED AND PRIVATE CONTEXT GROUPS

Volumetrix MI does not support any coded terminology

6. SECONDARY CAPTURE INFORMATION OBJECT IMPLEMENTATION

6.1 INTRODUCTION

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

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

The creation of the following secondary captures IODs is supported:

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

6.2 VOLUMETRIX MI MAPPING OF DICOM ENTITIES

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

TABLE 6-1
MAPPING OF DICOM ENTITIES TO VOLUMETRIX MI ENTITIES

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

6.3 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 6.5.

TABLE 6-2
SC IMAGE IOD MODULES

Entity Name	Module Name	Usage	Reference
Patient	Patient	Used (same definition as NM IOD)	3.4.1.1
	Clinical Trial Subject	Not Used	N/A
	Private Patient	Used (same definition as NM IOD)	3.4.1.2
Study	General Study	Used (same definition as NM IOD)	3.4.2.1
	Patient Study	Used (same definition as NM IOD)	3.4.2.2
	Private Study	Used (same definition as NM IOD)	3.4.2.3
	Standard Extended Study	Used (same definition as NM IOD)	3.4.2.4
	Clinical Trial Study	Not Used	N/A
Series	General Series	Used	6.4.1.1.1
	Clinical Trial Series	Not Used	N/A
	Standard Extended Series	Used (for SC IOD only)	6.4.1.2
	Private Series	Used	6.4.1.3
Equipment	General Equipment	Used	6.4.2.1
	SC Equipment	Used	6.4.2.2
Image	General Image	Used	6.4.3.1
	Image Pixel	Used	6.4.3.2
	Device	Not Used	N/A
	Specimen	Not Used	N/A
	SC Image	Used	6.4.3.3
	Overlay Plane	Not Used	N/A
	Modality LUT	Not Used	N/A
	VOI LUT	Not Used	N/A
	SOP Common	Used	6.4.3.4
	Cine	Used (for MFSC IOD only)	6.4.3.5
	Multi-Frame	Used (for MFSC IOD only)	6.4.3.6
	SC Multi-Frame Image	Used (for MFSC IOD only)	6.4.3.7
	SC Multi-Frame Vector	Used (for MFSC IOD only)	6.4.3.8
	Private Image	Used	6.4.3.9
	Private Image Pixel	Used (for SC IOD only)	6.4.3.10

6.4 INFORMATION MODULE DEFINITIONS

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

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

supported.

6.4.1 Series Entity Modules

6.4.1.1.1 General Series Module

TABLE 6-3
GENERAL SERIES MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Modality	(0008,0060)	1	For specification, see SC Equipment Module (Section 6.4.2.2)
Series Instance UID	(0020,000E)	1	Unique identifier of the Series.
Series Number	(0020,0011)	2	Series Number
Laterality	(0020,0060)	2C	Laterality. Always set to ZERO-LENGTH value.
Series Date	(0008,0021)	3	Date the Series started.
Series Time	(0008,0031)	3	Time the Series started.
Protocol Name	(0018,1030)	3	User-defined description of the conditions under which the Series was performed.
Series Description	(0008,103E)	3	Description of the Series.
Performing Physicians' Name	(0008,1050)	3	Name of the physician(s) administering this Series.
Operators' Name	(0008,1070)	3	Name(s) of the operator(s) supporting the Series.
Body Part Examined	(0018,0015)	3	Body Part Examined

6.4.1.2 Standard Extended Series Module

TABLE 6-4
STANDARD EXTENDED SERIES MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Patient Position	(0018,5100)	3	Patient position descriptor relative to the equipment. Always set to ZERO_LENGTH Value.

6.4.1.3 Private Series Module

TABLE 6-5
PRIVATE SERIES MODULE ATTRIBUTES

Attribute Name	Tag	Private Creator ID	Attribute Description
Series Object Name	(0009,xx20)	GEMS_GENIE_1	Name of the Database Series Object. For SC IOD only
Series Flags	(0009,xx21)	GEMS_GENIE_1	Defines series information For SC IOD only.
Series Type	(0011,xx0A)	GEMS_GENIE_1	Defines type of series. The Defined Terms are: 0 = SC Series 25 = MFSC Series 15= Results
Series Data Sequence	(0033,xx70)	GEMS_XELPRV_01	Sequence of item contains information about processing parameters.
>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
>Double Data SQ	(0033,xx73)	GEMS_XELPRV_01	Sequence of items to store SDO parameters as lists of doubles
>>Double Data	(0033,xx1E)	GEMS_XELPRV_01	List of SDO parameters stored as doubles

6.4.2 Equipment Entity Modules

6.4.2.1 General Equipment Module

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

TABLE 6-6
GENERAL EQUIPMENT MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Manufacturer	(0008,0070)	2	Manufacturer of the equipment that produced the SC instances. Values used : "GE MEDICAL SYSTEMS, NUCLEAR" " GE MEDICAL SYSTEMS, CT" " GE MEDICAL SYSTEMS, PET" " GE MEDICAL SYSTEMS, MRI"
Institution Name	(0008,0080)	3	Institution where the equipment that produced the composite instances is located.
Station Name	(0008,1010)	3	User defined name identifying the machine that produced the composite instances.
Manufacturer's Model Name	(0008,1090)	3	Manufacturer’s model name of the equipment that produced the composite instances.

Device Serial Number	(0018,1000)	3	Manufacturer's serial number of the equipment that produced the composite instances.
Software Version(s)	(0018,1020)	3	Manufacturer's designation of software version of the equipment that produced the composite instances.

6.4.2.2 SC Equipment Module

TABLE 6-7
SC EQUIPMENT MODULE ATTRIBUTES

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

6.4.3 Image Entity Modules

6.4.3.1 General Image Module

TABLE 6-8
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	Patient direction of the rows and columns of the image. Always sent as ZERO LENGTH.
Content Date	(0008,0023)	2C	The date the image pixel data creation started. Send for MFSC IOD only.
Content Time	(0008,0033)	2C	The time the image pixel data creation started. Send for MFSC IOD only.
Acquisition Date	(0008,0022)	3	The date the creation of data that resulted in this image started.
Acquisition Time	(0008,0032)	3	The time the creation of data that resulted in this image started.
Derivation Description	(0008,2111)	3	A text description of how this image was derived. Composed of two parts separated by "$$". First part is specific description generated by user and the second part is a description of the nature of the results and/or processing that generated the secondary capture object.
Burned In Annotation	(0028, 0301)	3	Indicates whether or not image contains sufficient burned in annotation to identify the patient and date the image was acquired. Enumerated Values : YES

			NO or MFSC images - see 6.4.3.7
Image Comments	(0020,4000)	3	User-defined comments about the image.
Image Type	(0008,0008)	3	See 6.4.3.1.1

6.4.3.1.1 Image Type

The following Enumerated Value of Value 1 is created:

– DERIVED identifies a Derived Image

The following Enumerated Value of Value 2 is created:

– SECONDARY identifies a Secondary Image

6.4.3.2 Image Pixel Module

TABLE 6-9
IMAGE PIXEL MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Samples per Pixel	(0028,0002)	1	Number of samples (planes) in this image. Set to 1 if Photometric Interpretation (0028,0004) is MONOCHROME2 Set to 3 if Photometric Interpretation (0028,0004) is RGB
Photometric Interpretation	(0028,0004)	1	Specifies the intended interpretation of the pixel data Defined Terms supported: • MONOCHROME2 - used for Single frame secondary Capture Image IOD and Multi-frame Grayscale Byte Secondary Capture Image IOD • RGB - used for Single frame secondary Capture Image IOD and Multi-frame True Color Secondary Capture Image IOD
Rows	(0028,0010)	1	Number of rows in the image.
Columns	(0028,0011)	1	Number of columns in the image.
Bits Allocated	(0028,0100)	1	Number of bits allocated for each pixel sample. Each sample shall have the same number of bits allocated. Enumerated Values supported : 8
Bits Stored	(0028,0101)	1	Number of bits stored for each pixel sample. Value equal to Bit Allocated (0028,0100)
High Bit	(0028,0102)	1	Most significant bit for pixel sample data. 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: 0000H = unsigned integer.
Pixel Data	(7FE0,0010)	1	A data stream of the pixel samples that comprise the Image.
Planar Configuration	(0028,0006)	1C	Indicates whether the pixel data are sent color-by-plane or color-by-pixel. For RGB data. Enumerated Values: 0000H = color-by-pixel
Smallest Image Pixel Value	(0028,0106)	3	The minimum actual pixel value encountered in this image. Always set to 0.
Largest Image Pixel Value	(0028,0107)	3	The maximum actual pixel value encountered in this image. Always set to 255.

6.4.3.3 SC Image Module

TABLE 6-10
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.
Date of Secondary Capture	(0018,1012)	3	The date the Secondary Capture Image was captured.
Time of Secondary Capture	(0018,1014)	3	The time the Secondary Capture Image was captured.

6.4.3.4 SOP Common Module

TABLE 6-11
SOP COMMON MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
SOP Class UID	(0008,0016)	1	Uniquely identifies the SOP Class. Possible values: "1.2.840.10008.5.1.4.1.1.7" "1.2.840.10008.5.1.4.1.1.7.2" "1.2.840.10008.5.1.4.1.1.7.4"
SOP Instance UID	(0008,0018)	1	Uniquely identifies the SOP Instance. Internally generated.
Specific Character Set	(0008,0005)	1C	Character Set that expands or replaces the Basic Graphic Set. Defined Terms used: refer to Section 2.2
Instance Creation Date	(0008,0012)	3	Date the SOP Instance was created.
Instance Creation Time	(0008,0013)	3	Time the SOP Instance was created.
Instance Creator UID	(0008,0014)	3	The Implementation UID for this DICOM v3.0 Implementation Set to the 1.2.840.113619.6.281
Instance Number	(0020,0013)	3	A number that identifies this Composite object instance

6.4.3.5 Cine Module

TABLE 6-12
CINE MODULE ATTRIBUTES

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

6.4.3.6 Multi-Frame Module

TABLE 6-13
MULTI-FRAME MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Number of Frames	(0028,0008)	1	Number of frames in a Multi-frame Image.
Frame Increment Pointer	(0028,0009)	1	Contains the Data Element Tags of one or more frame index vectors. See 6.4.3.8 for specialization

6.4.3.7 SC Multi-Frame Image Module

TABLE 6-14
SC MULTI-FRAME IMAGE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Burned in Annotation	(0028,0301)	1	Indicates whether or not image contains sufficient burned in annotation to identify the patient and date the image was acquired. Enumerated Values : YES NO
Presentation LUT Shape	(2050,0020)	1C	Specifies an identity transformation for the Presentation LUT, such that the output of all grayscale transformations defined in the IOD containing this Module are defined to be P-Values. Required if Photometric Interpretation (0028,0004) is MONOCHROME2, and BitsStored (0028,0101) is greater than 1. Enumerated Value: IDENTITY - output is in P-Values.
Rescale Intercept	(0028,1052)	1C	The value b in the relationship between stored values (SV) in Pixel Data (7FE0,0010) and the output units specified in Rescale Type (0028,1054). Output units = m*SV + b. Enumerated Value: 0 Required if Photometric Interpretation (0028,0004) is MONOCHROME2, and BitsStored (0028,0101) is greater than 1.
Rescale Slope	(0028,1053)	1C	The value m in the equation specified in Rescale Intercept (0028,1052). Enumerated Value: 1. Required if Photometric Interpretation (0028,0004) is MONOCHROME2, and BitsStored (0028,0101) is greater than 1.
Rescale Type	(0028,1054)	1C	Specifies the output units of Rescale Slope (0028,1053) and Rescale Intercept (0028,1052). Enumerated Value: US = Unspecified. Required if Photometric Interpretation (0028,0004) is MONOCHROME2, and BitsStored (0028,0101) is greater than 1.
Frame Increment Pointer	(0028,0009)	1C	Contains the Data Element Tag of the attribute which is used as the frame increment in Multi-frame pixel data - Frame Time (0018, 1063).

6.4.3.8 SC Multi-Frame Vector Module

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

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

6.4.3.9 Private Image Module

TABLE 6-15
PRIVATE IMAGE MODULE ATTRIBUTES

Attribute Name	Tag	Private Creator	Attribute Description
Workstation DICOM data Identifier	(0009,xx01)	GEMS_GENIE_1	Always "GEMS_GENIE"
DatasetUID	(0009,xx1E)	GEMS_GENIE_1	Unique Identifier of Dataset object. For SC IOD only
Database Object Name	(0011,xx10)	GEMS_GENIE_1	Name of the Database Dataset Object.

			For SC IOD only
Dataset Modified	(0011,xx11)	GEMS_GENIE_1	Dataset Modified Flag . For SC IOD only.
Dataset Name	(0011,xx12)	GEMS_GENIE_1	Dataset Name. For SC IOD only
Dataset Type	(0011,xx13)	GEMS_GENIE_1	Defines type of dataset. The Defined Terms are: 6 = Grayscale SC 30 = RGB SC For SC IOD only
Dataset Flags	(0011,xx3F)	GEMS_GENIE_1	Defines dataset information. For SC IOD only
FOV	(0011,xx57)	GEMS_GENIE_1	FOV . For SC IOD only
Source Translator	(0013,xx11)	GEMS_GENIE_1	Source Translator . (Always set to 4)
Annotation Sequence	(0019, xx5F)	GEMS_GENIE_1	Annotations attached to image; May contain 0 or more Items
>Modified	(0019, xx60)	GEMS_GENIE_1	Modified Flag
>Name	(0019, xx61)	GEMS_GENIE_1	Name of Database Annotation Object
>Aid	(0019, xx62)	GEMS_GENIE_1	Database Annotation Unique ID
>DatabaseAnnotationMapping	(0019, xx63)	GEMS_GENIE_1	
>DatabaseObjectClassID	(0019, xx64)	GEMS_GENIE_1	
>DatabaseObjectUniqueID	(0019, xx65)	GEMS_GENIE_1	
>TextFgColour	(0019, xx66)	GEMS_GENIE_1	Text Foreground Color
>TextBgColour	(0019, xx67)	GEMS_GENIE_1	Text Background Color
>MarkerColour	(0019, xx68)	GEMS_GENIE_1	
>LineColour	(0019, xx69)	GEMS_GENIE_1	
>LineThickness	(0019, xx6A)	GEMS_GENIE_1	
>Font	(0019, xx6B)	GEMS_GENIE_1	
>TextBackingMode	(0019, xx6C)	GEMS_GENIE_1	
>TextJustification	(0019, xx6D)	GEMS_GENIE_1	
>TextShadowOffsetX	(0019, xx6E)	GEMS_GENIE_1	
>TextShadowOffsetY	(0019, xx6F)	GEMS_GENIE_1	
>GeomColour	(0019, xx70)	GEMS_GENIE_1	
>GeomThickness	(0019, xx71)	GEMS_GENIE_1	
>GeomLineStye	(0019, xx72)	GEMS_GENIE_1	
>GeomDashLength	(0019, xx73)	GEMS_GENIE_1	
>GeomFillPattern	(0019, xx74)	GEMS_GENIE_1	
>MarkerSize	(0019, xx75)	GEMS_GENIE_1	
>Interactivity	(0019, xx76)	GEMS_GENIE_1	Interactivity Flag
>TextLoc	(0019, xx77)	GEMS_GENIE_1	
>TextString	(0019, xx78)	GEMS_GENIE_1	
>TextAttachMode	(0019, xx79)	GEMS_GENIE_1	
>TextCursorMode	(0019, xx7A)	GEMS_GENIE_1	
>LineCtrlSize	(0019, xx7B)	GEMS_GENIE_1	
>LineType	(0019, xx7C)	GEMS_GENIE_1	
>LineStyle	(0019, xx7D)	GEMS_GENIE_1	
>LineDashLength	(0019, xx7E)	GEMS_GENIE_1	
>LinePtCount	(0019, xx7F)	GEMS_GENIE_1	
>LinePts	(0019, xx80)	GEMS_GENIE_1	
>LineAttachMode	(0019, xx81)	GEMS_GENIE_1	
>MarkerType	(0019, xx82)	GEMS_GENIE_1	
>MarkerLoc	(0019, xx83)	GEMS_GENIE_1	

>MarkerAttachMode	(0019, xx84)	GEMS_GENIE_1	
>FrameNumber	(0019, xx86)	GEMS_GENIE_1	
OrigSOP Instance UID	(0033,xx07)	GEMS_GENIE_1	List of SOP UIDs of associated datasets encapsulated into the DICOM SC Image.
ROI Sequence	(0057,xx01)	GEMS_XELPRV_01	ROI created on image; may contain 0 or more items.
>PrivateSOPClassUID	(0057,xx02)	GEMS_XELPRV_01	ROI SOP Class UID
>ObjectInstanceUID	(0057,xx03)	GEMS_XELPRV_01	ROI SOP Instance UID
>Index	(0057,xx10)	GEMS_XELPRV_01	Index of ROI
>Dimensions	(0057,xx11)	GEMS_XELPRV_01	ROI Dimensions. Contain value: 1
>Points	(0057,xx12)	GEMS_XELPRV_01	Number of Points
>Type	(0057,xx13)	GEMS_XELPRV_01	ROIType
>Description	(0057,xx14)	GEMS_XELPRV_01	ROI Description
>DValueRepresentation	(0057,xx15)	GEMS_XELPRV_01	DataValueRepresentation
>ROI Label	(0057,xx16)	GEMS_XELPRV_01	ROI Label
>Data	(0057,xx17)	GEMS_XELPRV_01	List of ROI Shape points
>Modified	(0057,xx41)	GEMS_XELPRV_01	Modified
>DatabaseObjectName	(0057,xx42)	GEMS_XELPRV_01	Name of ROI Database Object
>DatabaseObjectClass ID	(0057,xx45)	GEMS_XELPRV_01	
>DatabaseObjectUID	(0057,xx46)	GEMS_XELPRV_01	ROI Object SOP Instance UID
>Normal Colour	(0057,xx47)	GEMS_XELPRV_01	Normal Colour
>NameFont	(0057,xx48)	GEMS_XELPRV_01	NameFont
>FillPattern	(0057,xx49)	GEMS_XELPRV_01	FillPattern
>LineStyle	(0057,xx4A)	GEMS_XELPRV_01	LineStyle
>LineDashLength	(0057,xx4B)	GEMS_XELPRV_01	LineDashLength
>LineThickness	(0057,xx4C)	GEMS_XELPRV_01	LineThickness
>Interactivity	(0057,xx4D)	GEMS_XELPRV_01	Interactivity Flag
>Name Position	(0057,xx4E)	GEMS_XELPRV_01	Name Position
>NameDisplay	(0057,xx4F)	GEMS_XELPRV_01	NameDisplayFlag
>Label	(0057,xx50)	GEMS_XELPRV_01	ROI Label
>BpSeg	(0057,xx51)	GEMS_XELPRV_01	BpSeg
>BpSegpairs	(0057,xx52)	GEMS_XELPRV_01	BpSegpairs
>SeedSpace	(0057,xx53)	GEMS_XELPRV_01	SeedSpace
>Seeds	(0057,xx54)	GEMS_XELPRV_01	Seeds
>Shape	(0057,xx55)	GEMS_XELPRV_01	Shape
>ShapeTilt	(0057,xx56)	GEMS_XELPRV_01	ShapeTilt
>ShapePtsSpace	(0057,xx59)	GEMS_XELPRV_01	ShapePtsSpace
>ShapeCtrlPtsCount	(0057,xx5A)	GEMS_XELPRV_01	ShapeCtrlPtsCount
>Shap CtrlPts	(0057,xx5B)	GEMS_XELPRV_01	Shap CtrlPts
>ShapeCPSpace	(0057,xx5C)	GEMS_XELPRV_01	ShapeCPSpace
>ROIFlags	(0057,xx5D)	GEMS_XELPRV_01	ROIFlags
>FrameNumber	(0057,xx5E)	GEMS_XELPRV_01	FrameNumber
>DatasetROI Mapping	(0057,xx60)	GEMS_XELPRV_01	DatasetROI Mapping

6.4.3.10 Private Image Pixel Module

TABLE 6-16
PRIVATE IMAGE PIXEL MODULE ATTRIBUTES

Attribute Name	Tag	Private Creator	Attribute Description
Threshold Center	(0011,xx44)	GEMS_GENIE_1	Default Value: 2048.0
Threshold Width	(0011,xx45)	GEMS_GENIE_1	Default Value: 4096.0
Interpolation Type	(0011,xx46)	GEMS_GENIE_1	Default value: 2

6.5 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.

6.5.1 Standard Extended Attributes

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

TABLE 6-17
STANDARD EXTENDED ATTRIBUTES

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

6.5.2 Private Group GEMS_GENIE_1

TABLE 6-18
PRIVATE GROUP GEMS_GENIE_1

Attribute Name	Tag	VR	VM	Attribute Description
Private Creator Identification	(0009,00xx)	LO	1	GEMS_GENIE_1
Workstation DICOM data Identifier	(0009,xx01)	SH	1	Default value: "GEMS_GENIE"
DatasetUID	(0009,xx1E)	UI	1	Unique Identifier of Dataset object
Series Object Name	(0009,xx20)	LO	1	Name of the Database Series Object.
Series Flags	(0009,xx21)	SL	1	Defines series information.
Private Creator Identification	(0011,00xx)	LO	1	GEMS_GENIE_1
Series Type	(0011,xx0A)	SL	1	Defines type of series.
Database Object Name	(0011,xx10)	LO	1-n	Name of the Database Dataset Object.
Dataset Modified	(0011,xx11)	SL	1-n	Dataset Modified Flag
Dataset Name	(0011,xx12)	LO	1-n	Dataset Name
Dataset Type	(0011,xx13)	SL	1	Defines type of dataset. The Defined Terms are: 6 = Grayscale SC 30 = RGB SC For SC IOD only
Dataset Flags	(0011,xx3F)	SL	1-n	Defines dataset information.
Threshold Center	(0011,xx44)	FD	1-n	
Threshold Width	(0011,xx45)	FD	1-n	
Interpolation Type	(0011,xx46)	SL	1-n	
FOV	(0011,xx57)	FD	1-n	FOV
Private Creator Identification	(0013,00xx)	LO	1	GEMS_GENIE_1
Source Translator	(0013,xx11)	SL	1	Source Translator
Private Creator Identification	(0019,00xx)	LO	1	GEMS_GENIE_1
Annotation Sequence	(0019, xx5F)	SQ	1	Annotations attached to image; May contain 0 or more Items
Modified	(0019, xx60)	SL	1	Modified Flag
Name	(0019, xx61)	LO	1	Name of Database Annotation Object
Aid	(0019, xx62)	LO	1	Database Annotation Unique ID
DatabaseAnnotationMapping	(0019, xx63)	LO	1-n	
DatabaseObjectClassID	(0019, xx64)	LO	1	
DatabaseObjectUniqueID	(0019, xx65)	LO	1	
TextFgColour	(0019, xx66)	LO	1	Text Foreground Color
TextBgColour	(0019, xx67)	LO	1	Text Background Color
MarkerColour	(0019, xx68)	LO	1	

LineColour	(0019, xx69)	LO	1	
LineThickness	(0019, xx6A)	SL	1	
Font	(0019, xx6B)	LT	1	
TextBackingMode	(0019, xx6C)	SL	1	
TextJustification	(0019, xx6D)	SL	1	
TextShadowOffsetX	(0019, xx6E)	SL	1	
TextShadowOffsetY	(0019, xx6F)	SL	1	
GeomColour	(0019, xx70)	LT	1	
GeomThickness	(0019, xx71)	SL	1	
GeomLineStye	(0019, xx72)	SL	1	
GeomDashLength	(0019, xx73)	SL	1	
GeomFillPattern	(0019, xx74)	SL	1	
MarkerSize	(0019, xx75)	SL	1	
Interactivity	(0019, xx76)	SL	1	Interactivity Flag
TextLoc	(0019, xx77)	FD	1-n	
TextString	(0019, xx78)	LT	1	
TextAttachMode	(0019, xx79)	SL	1-n	
TextCursorMode	(0019, xx7A)	SL	1-n	
LineCtrlSize	(0019, xx7B)	SL	1	
LineType	(0019, xx7C)	SL	1-n	
LineStyle	(0019, xx7D)	SL	1	
LineDashLength	(0019, xx7E)	SL	1	
LinePtCount	(0019, xx7F)	SL	1-n	
LinePts	(0019, xx80)	FD	1-n	
LineAttachMode	(0019, xx81)	SL	1-n	
MarkerType	(0019, xx82)	SL	1-n	
MarkerLoc	(0019, xx83)	FD	1-n	
MarkerAttachMode	(0019, xx84)	SL	1-n	
FrameNumber	(0019, xx86)	UL	1	
Private Creator Identification	(0033,00xx)	LO	1	GEMS_GENIE_1
OrigSOP Instance UID	(0033,xx07)	LO	1-n	List of SOP UIDs of associated datasets encapsulated into the DICOM NM Image.

6.5.3 Private Group GEMS_XELPRV_01

TABLE 6-19
PRIVATE GROUP GEMS_XELPRV_01

Attribute Name	Tag	VR	VM	Attribute Description
Private Creator Identification	(0033,00xx)	LO	1	GEMS_XELPRV_01
Object Type	(0033,xx08)	CS	1	SDO Type
Modified Flag	(0033,xx10)	SL	1	SDO Modification Flag
Name	(0033,xx11)	LO	1	SDO Name
Database Object Unique ID	(0033,xx16)	LO	1	SDO Database UID
Date	(0033,xx17)	SH	1	SDO Creation date
Time	(0033,xx18)	SH	1	SDO Creation time
Object Flags	(0033,xx19)	UL	1	SDO Flags.
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 SDO parameters
IntDataFormat	(0033,xx21)	OB	1	Format of integer SDO parameters
DoubleDataFormat	(0033,xx22)	OB	1	Format of double SDO parameters
StringDataFormat	(0033,xx23)	OB	1	Format of string SDO parameters
Description	(0033,xx24)	LT	1	User or equipment generated SDO description
SeriesDataSequence	(0033,xx70)	SQ	1	SQ with items encoding Series Data Object (SDO) attributes
InternalSOPClassUID	(0033,xx71)	UI	1	SDO Private SOP Class UID
InternalInstance UID	(0033,xx72)	UI	1	SDO Instance UID
DoubleDataSQ	(0033,xx73)	SQ	1	Sequence of items to store SDO parameters as lists of doubles
Private Creator Identification	(0057,00xx)	LO	1	GEMS_XELPRV_01
ROI Sequence	(0057,xx01)	SQ	1	ROI created on image
PrivateSOPClassUID	(0057,xx02)	UI	1	ROI SOP Class UID
ObjectInstanceUID	(0057,xx03)	UI	1	ROI SOP Instance UID
Index	(0057,xx10)	IS	1	Index of ROI
Dimensions	(0057,xx11)	US	1	ROI Dimensions.
Points	(0057,xx12)	US	1	Number of Points
Type	(0057,xx13)	CS	1	ROIType
Description	(0057,xx14)	LO	1	ROI Description
DValueRepresentation	(0057,xx15)	US	1	DataValueRepresentation
ROI Label	(0057,xx16)	LO	1	ROI Label
Data	(0057,xx17)	OW	1	List of ROI Shape points
Modified	(0057,xx41)	SL	1	Modified
DatabaseObjectName	(0057,xx42)	LO	1	Name of ROI Database Object
DatabaseObjectClass ID	(0057,xx45)	LO	1	Object Internal SOP Class UID
DatabaseObjectUID	(0057,xx46)	LO	1	Object SOP Instance UID
Normal Colour	(0057,xx47)	LO	1	Normal Colour
NameFont	(0057,xx48)	LT	1	NameFont
FillPattern	(0057,xx49)	SL	1	FillPattern
LineStyle	(0057,xx4A)	SL	1	LineStyle
LineDashLength	(0057,xx4B)	SL	1	LineDashLength
LineThickness	(0057,xx4C)	SL	1	LineThickness
Interactivity	(0057,xx4D)	SL	1	Interactivity Flag
Name Position	(0057,xx4E)	SL	1	Name Position
NameDisplay	(0057,xx4F)	SL	1	NameDisplayFlag
Label	(0057,xx50)	LO	1	ROI Label
BpSeg	(0057,xx51)	SL	1-n	BpSeg
BpSegpairs	(0057,xx52)	US	1-n	BpSegpairs
SeedSpace	(0057,xx53)	SL	1	SeedSpace
Seeds	(0057,xx54)	FD	1-n	Seeds
Shape	(0057,xx55)	SL	1-n	Shape
ShapeTilt	(0057,xx56)	FD	1-n	ShapeTilt
ShapePtsSpace	(0057,xx59)	SL	1-n	ShapePtsSpace
ShapeCtrlPtsCount	(0057,xx5A)	SL	1	ShapeCtrlPtsCount
Shap CtrlPts	(0057,xx5B)	FD	1-n	Shap CtrlPts
ShapeCPSpace	(0057,xx5C)	SL	1	ShapeCPSpace
ROIFlags	(0057,xx5D)	UL	1	ROIFlags
FrameNumber	(0057,xx5E)	UL	1	FrameNumber
DatasetROI Mapping	(0057,xx60)	LO	1-n	DatasetROI Mapping

6.6 STANDARD EXTENDED AND PRIVATE CONTEXT GROUPS

Volumetrix MI does not support any coded terminology.

7. MR INFORMATION OBJECT IMPLEMENTATION

7.1 INTRODUCTION

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

7.2 VOLUMERIX MI MAPPING OF DICOM ENTITIES

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

TABLE 5-1
MAPPING OF DICOM ENTITIES TO VOLUMETRIX MI ENTITIES

DICOM IE	Volumetrix MI Entity
Patient	Patient
Study	Study
Series	Series
Image	Dataset

7.3 IOD MODULE TABLE

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

TABLE 7-2
MR IMAGE IOD MODULES

Entity Name	Module Name	Usage	Reference
Patient	Patient	Used (same description as for NM IOD)	3.4.1.1
	Private Patient	Used (same description as for NM IOD)	3.4.1.2
	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
	Private Study	Used (same description as for NM IOD)	3.4.2.3
	Standard Extended Study	Used (same description as for NM IOD)	3.4.2.4
	Clinical Trial Study	Not Used	N/A
Series	General Series	Used (same description as for CT IOD)	4.4.1.1
	Clinical Trial Series	Not Used	N/A
	Private Series	Used (same description as for CT IOD)	4.4.1.2
Frame of Reference	Frame of Reference	Used	7.4.1.1
Equipment	General Equipment	Used (same description as for NM IOD)	3.4.5.1
Image	General Image	Used	7.4.2.1

	Image Plane	Used (same description as for CT IOD)	4.4.2.2
	Image Pixel	Used (same description as for CT IOD)	4.4.2.3
	Contrast/Bolus	Used (same description as for CT IOD)	4.4.2.4
	Standard Extended Image	Used	7.4.2.3
	Device	Not Used	N/A
	MR Image	Used	7.4.2.2
	Private Image	Used (same description as for CT IOD)	4.4.2.9
	Overlay Plane	Not Used	N/A
	VOI LUT	Used (same description as for CT IOD)	4.4.2.7
	SOP Common	Used	7.4.2.4

7.4 INFORMATION MODULE DEFINITIONS

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

The following modules are included to convey Enumerated Values, Defined Terms, and Optional Attributes expected. Type 1 & Type 2 Attributes are also included for completeness and to define what the expected values when loading such instance are. 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 presented in tables are not supported.

7.4.1 Frame Of Reference Entity Modules

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

TABLE 7-3
FRAME OF REFERENCE MODULE ATTRIBUTES

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

7.4.2 Image Entity Modules

7.4.2.1 General Image Module

TABLE 7-4
GENERAL IMAGE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description	Attribute Usage
Instance Number	(0020,0013)	2	A number that identifies this image.	Used/Generated
Patient Orientation	(0020,0020)	2C	Patient Orientation	Used/Copied
Content Date	(0008,0023)	2C	The date the image pixel data creation started.	Used/Generated
Content Time	(0008,0033)	2C	The time the image pixel data creation started	Used/Generated
Image Type	(0008,0008)	3	See 7.4.2.2 for classification.	
Acquisition Date	(0008,0022)	3	The date the acquisition of data that resulted in this image started	Used/Generated
Acquisition Time	(0008,0032)	3	The time the acquisition of data that resulted in this image started	Used/Generated
Acquisition Number	(0020, 0012)	3	A number identifying the single continuous gathering of data over a period of time which resulted in this image.	Ignored/ Copied
Image Comments	(0020,4000)	3	Contains additional information about image.	Ignored/Copied
Quality Control Image	(0028,0300)	3	Indicates whether or not this image is a quality control or phantom image.	Ignored/Removed

7.4.2.2 MR Image Module

TABLE 7-5
MR IMAGE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description	Attribute Usage
Image Type	(0008,0008)	1	See 7.4.2.2.1.	Used/Generated
Samples per Pixel	(0028,0002)	1	Shall be 1.	Used/Generated
Photometric Interpretation	(0028,0004)	1	Enumerated Values are supported: MONOCHROME1 MONOCHROME2	Used/Copied
Bits Allocated	(0028,0100)	1	Shall be 16.	Used/Generated
Scanning Sequence	(0018,0020)	1	Enumerated Values are used: SE = Spin Echo IR = Inversion Recovery GR = Gradient Recalled EP = Echo Planar RM = Research Mode	Used/Copied
Sequence Variant	(0018,0021)	1	See 7.4.2.2.2.	Used/Copied
Scan Options	(0018,0022)	2	See 7.4.2.2.3.	Used/Copied
MR Acquisition Type	(0018,0023)	2	Enumerated Values are used: 2D = frequency x phase 3D = frequency x phase x phase	Used/Copied
Repetition Time	(0018,0080)	2C	Required except when Scanning Sequence (0018,0020) is EP and Sequence Variant (0018,0021) is not SK.	Ignored/Copied
Echo Time	(0018,0081)	2		Ignored/Copied
Echo Train Length	(0018,0091)	2		Ignored/Copied
Inversion Time	(0018,0082)	2C	Required if Scanning Sequence (0018,0020) has values of IR.	Ignored/Copied

Trigger Time	(0018,1060)	2C	Required for Scan Options (0018,0022) which include heart gating (e.g. CG, PPG, etc.)	Ignored/Copied
Sequence Name	(0018,0024)	3		Used/Copied
Number of Averages	(0018,0083)	3		Used/Copied
Imaging Frequency	(0018,0084)	3		Used/Copied
Echo Number	(0018,0086)	3		Ignored/Copied
Spacing Between Slices	(0018,0088)	3		Used/Copied
Reconstruction Diameter	(0018,1100)	3		Used/Copied
Receive Coil Name	(0018,1250)	3		Ignored/Copied
Transmit Coil Name	(0018,1251)	3		Ignored/Copied
Flip Angle	(0018,1314)	3		Used/Copied
Temporal Position Identifier	(0020,0100)	3		Used/Copied
Number of Temporal Positions	(0020,0105)	3		Used/Copied
Temporal Resolution	(0020,0110)	3		Used/Copied

7.4.2.2.1 Image Type

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

Enumerated Values of Value 1:

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

Enumerated Values of Value 2:

- PRIMARY identifies a Primary Image

Enumerated Values of Value 3:

All values present in input images are supported (ignored by input image reader).

The following Enumerated Values of Value 1 are created:
- DERIVED identifies a Derived Image

The following Enumerated Values of Value 2 are created:
- PRIMARY identifies a Primary Image

The Defined Terms of Value 3 are copied from input images.

7.4.2.2.2 Sequence Variant

Standard Defined Terms are used:

- SK segmented k-space
- MTC magnetization transfer contrast
- SS steady state
- TRSS time reversed steady state
- SP spoiled
- MP MAG prepared
- OSP oversampling phase
- NONE no sequence variant

GEMS Defined Terms are supported:

- VASCTOF_GEMS
- VB_GEMS

7.4.2.2.3 Scan Options

Standard Defined Terms are used:

– PER	Phase Encode Reordering
– RG	Respiratory Gating
– CG	Cardiac Gating
– PPG	Peripheral Pulse Gating
– FC	Flow Compensation
– PFF	Partial Fourier -Frequency
– PFP	Partial Fourier - Phase
– SP	Spatial Presaturation
– FS	Fat Saturation

7.4.2.3 Standard Extended Image Module

TABLE 7-6
STANDARD EXTENDED IMAGE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description	Attribute Usage
Counts Accumulated	(0018,0070)	3	Total counts in the pixel data	Ignored /Copied
Acquisition Termination Condition	(0018,0071)	3	Description of how the data collection was stopped.	Ignored /Copied
Count Rate	(0018,1243)	3	Maximum count rate achieved during the acquisition in counts/sec	Ignored /Copied
Table Height	(0018,1130)	3	Table Height	Ignored/Copied
Table Traverse	(0018,1131)	3	Table Traverse	Ignored/Copied
Smallest Image Pixel Value	(0028,0106)	3	The minimum actual pixel value encountered in this image.	Ignored/Copied
Largest Image Pixel Value	(0028,0107)	3	The maximum actual pixel value encountered in this image.	Ignored/Copied

7.4.2.4 SOP Common Module

TABLE 7-7
SOP COMMON MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description	Attribute Usage
SOP Class UID	(0008,0016)	1	Uniquely identifies the SOP Class. "1.2.840.10008.5.1.4.1.1.4"	Used/Generated
SOP Instance UID	(0008,0018)	1	Uniquely identifies the SOP Instance.	Mandatory/Generated
Specific Character Set	(0008,0005)	1C	Character Set that expands or replaces the Basic Graphic Set.	Used/Generated
Instance Creation Date	(0008,0012)	3	Date of instance creation.	Used/Generated
Instance Creation Time	(0008,0013)	3	Time of instance creation.	Used/Generated
Instance Creator UID	(0008,0014)	3	The Implementation UID for this DICOM v3.0 Implementation	Ignored/Generated
Instance Number	(0020,0013)	3	See 7.4.2.1 for more specialization	Used/Generated

7.5 STANDARD EXTENDED AND PRIVATE DATA ATTRIBUTES

Volumetrix MI supports the Standard and Private Attributes defined in the following sections in Standard Extended MR SOP Instances as Type 3 data elements.

7.5.1 Standard Attributes

Volumetrix MI supports the following standard attributes, not specified in the MR IOD, in SOP Instances as Type 3 data elements.

TABLE 7-8
STANDARD EXTENDED ATTRIBUTES

Information Entity Name	Attribute Name	Tag	Use
Study	Study Comments	(0032,4000)	User-defined Study notes
Image	Counts Accumulated	(0018,0070)	Total counts in the pixel data
	Acquisition Termination Condition	(0018,0071)	Description of how the data collection was stopped.
	Table Height	(0018,1130)	Table Height
	Count Rate	(0018,1243)	Maximum count rate achieved during the acquisition in counts/sec
	Table Traverse	(0018,1131)	Table Traverse
	Smallest Image Pixel Value	(0028,0106)	The minimum actual pixel value encountered in this image.
	Largest Image Pixel Value	(0028,0107)	The maximum actual pixel value encountered in this image.

7.6 STANDARD EXTENDED AND PRIVATE CONTEXT GROUPS

Volumetrix MI does not support any coded terminology.