



*GE Medical Systems*

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## **Technical Publications**

Direction 2291062  
Revision 2.7

# **SIGNA CONTOUR 7.66 CONFORMANCE STATEMENT**

for DICOM v3.0

## **sm - Service Manual**

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**WARNING**

- THIS SERVICE MANUAL IS AVAILABLE IN ENGLISH ONLY.
- IF A CUSTOMER'S SERVICE PROVIDER REQUIRES A LANGUAGE OTHER THAN ENGLISH, IT IS THE CUSTOMER'S RESPONSIBILITY TO PROVIDE TRANSLATION SERVICES.
- DO NOT ATTEMPT TO SERVICE THE EQUIPMENT UNLESS THE SERVICE MANUAL HAS BEEN CONSULTED AND UNDERSTOOD.
- FAILURE TO HEED THIS WARNING MAY RESULT IN INJURY TO THE SERVICE PROVIDER, OPERATOR OR PATIENT FROM ELECTRIC SHOCK, MECHANICAL OR OTHER HAZARDS.

# 1 SECTION 1 - INTRODUCTION

## 1.0 Overview

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

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

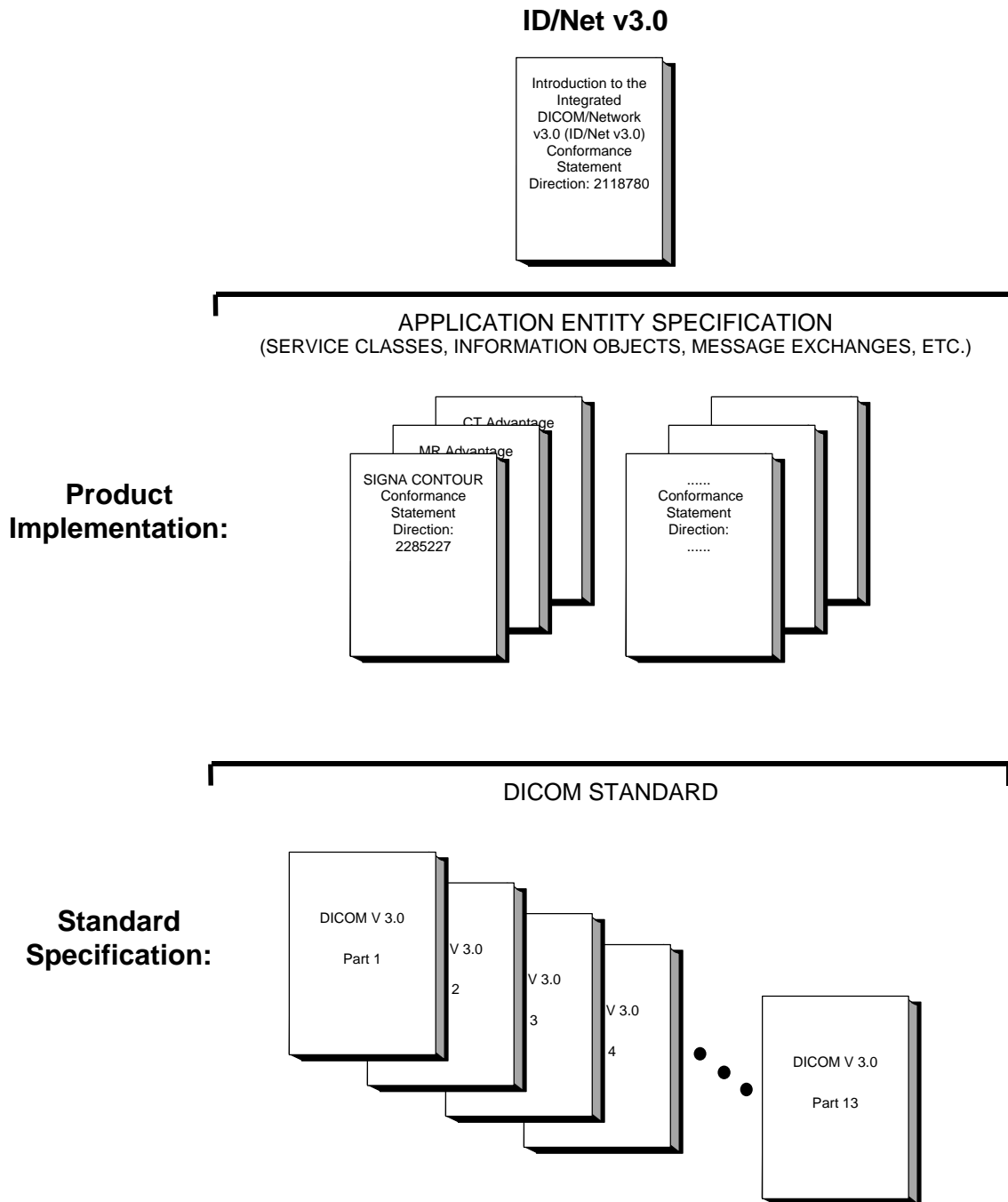
**Section 2, *Network Conformance Statement***, which specifies the GEMS equipment compliance to the DICOM requirements for the implementation of Networking features.

**Section 3, *Media Storage Conformance Statement***, which specifies the GEMS equipment compliance to the DICOM requirements for the implementation of Media Storage featuresq

**Section 4, *Print SCU Conformance Statement***, which specifies the GEMS equipment compliance to the DICOM requirements for the implementation of DICOM Print SCU.

### 1.1 Overall Conformance Statement Documentation Structure

The Documentation Structure of the GEMS Conformance Statements and their relationship with the DICOM v3.0 Conformance Statements is shown in Illustration below.





This document specifies the DICOM v3.0 implementation. It is entitled:

*SIGNA CONTOUR 7.66  
Conformance Statement for DICOM v3.0  
Direction 2291062*

This DICOM Conformance Statement documents the DICOM v3.0 Conformance Statement and Technical Specification required to interoperate with the GEMS network interface. Introductory information, which is applicable to all GEMS Conformance Statements, is described in the document:

*Introduction to the Integrated DICOM/Network v3.0 (ID/Net v3.0)  
Conformance Statement  
Direction: 2118780.*

This Introduction familiarizes the reader with DICOM terminology and general concepts. It should be read prior to reading the individual products' GEMS Conformance Statements.

The GEMS 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 v3.0 Part 8 standard.

For more information including Network Architecture and basic DICOM concepts, please refer to the Introduction.

For the convenience of software developers, there is "collector" Direction available. By ordering the collector, the Introduction described above and all of the currently published GEMS Product Conformance Statements will be received. The collector Direction is:

*ID/Net v3.0 Conformance Statements  
Direction: 2117016*

For more information regarding DICOM v3.0, copies of the Standard may be obtained by written request or phone by contacting:

NEMA Publication  
1300 North 17th Street  
Suite 1847  
Rosslyn, VA 22209  
USA  
Phone: (703) 841-3200

## 1.2 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 v3.0 Standards and with the terminology and concepts which are used in those Standards.

If readers are unfamiliar with DICOM v3.0 terminology they should first refer to the document listed below, then read the DICOM v3.0 Standard itself, prior to reading this DICOM Conformance Statement document.

*Introduction to the Integrated DICOM/Network v3.0 (ID/Net v3.0)  
Conformance Statement  
Direction: 2118780*

## 1.3 Scope and Field of Application

It is the intent of this document, in conjunction with the *Introduction to the Integrated DICOM/Network v3.0 (ID/Net v3.0) Conformance Statement, Direction: 2118780*, to provide an unambiguous specification for GEMS implementations. This specification, called a Conformance Statement, includes a DICOM v3.0 Conformance Statement and is necessary to ensure proper processing and interpretation of GEMS medical data exchanged using DICOM v3.0. The GEMS Conformance Statements are available to the public.

The reader of this DICOM Conformance Statement should be aware that different GEMS devices are capable of using different Information Object Definitions. For example, a GEMS 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 GEMS implementation. If the user encounters unspecified private data elements while parsing a GEMS Data Set, the user is well advised to ignore those data elements (per the DICOM v3.0 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 GEMS devices.

## 1.4 Important Remarks

The use of these DICOM Conformance Statements, in conjunction with the DICOM v3.0 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 v3.0 Standard. DICOM v3.0 will incorporate new features and technologies and GE may follow the evolution of the Standard. The GEMS protocol is based on DICOM v3.0 as specified in each DICOM Conformance Statement. Evolution of the Standard may require changes to devices which have implemented DICOM v3.0. **In addition, GE reserves the right to discontinue or make changes to the support of communications features (on its products) reflected on by these DICOM Conformance Statements.** The **user** should ensure that any non-GE provider, which connects with GE devices, also plans for the future evolution of the DICOM Standard. Failure to do so will likely result in the loss of function and/or connectivity as the DICOM Standard changes and GE Products are enhanced to support these changes.
- **To be informed of the evolution of the implementation described in this document, the User is advised to regularly check the GE Internet Server, accessible via anonymous ftp (GE Internet Server Address: ftp.med.ge.com, 192.88.230.11).**
- **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.

## **1.5 References**

A list of references which is applicable to all GEMS Conformance Statements is included in the *Introduction to the Integrated DICOM/Network v3.0 (ID/Net v3.0) Conformance Statement, Direction: 2118780.*

## **1.6 Definitions**

A set of definitions which is applicable to all GEMS Conformance Statements is included in the *Introduction to the Integrated DICOM/Network v3.0 (ID/Net v3.0) Conformance Statement, Direction: 2118780.*

## **1.7 Symbols and Abbreviations**

A list of symbols and abbreviations which is applicable to all GEMS Conformance Statements is included in the *Introduction to the Integrated DICOM/Network v3.0 (ID/Net v3.0) Conformance Statement, Direction: 2118780.*

## **2 SECTION 2 - NETWORK CONFORMANCE STATEMENT**

### **2.0 INTRODUCTION**

This Conformance Statement (CS) specifies the SIGNA CONTOUR compliance to DICOM v3.0. It details the DICOM Service Classes and roles which are supported by this product in it's version 7.66.

The SIGNA CONTOUR product uses DICOM services to import images for possible further analysis and/or processing. It also uses DICOM services to export images to other DICOM-compliant machines.

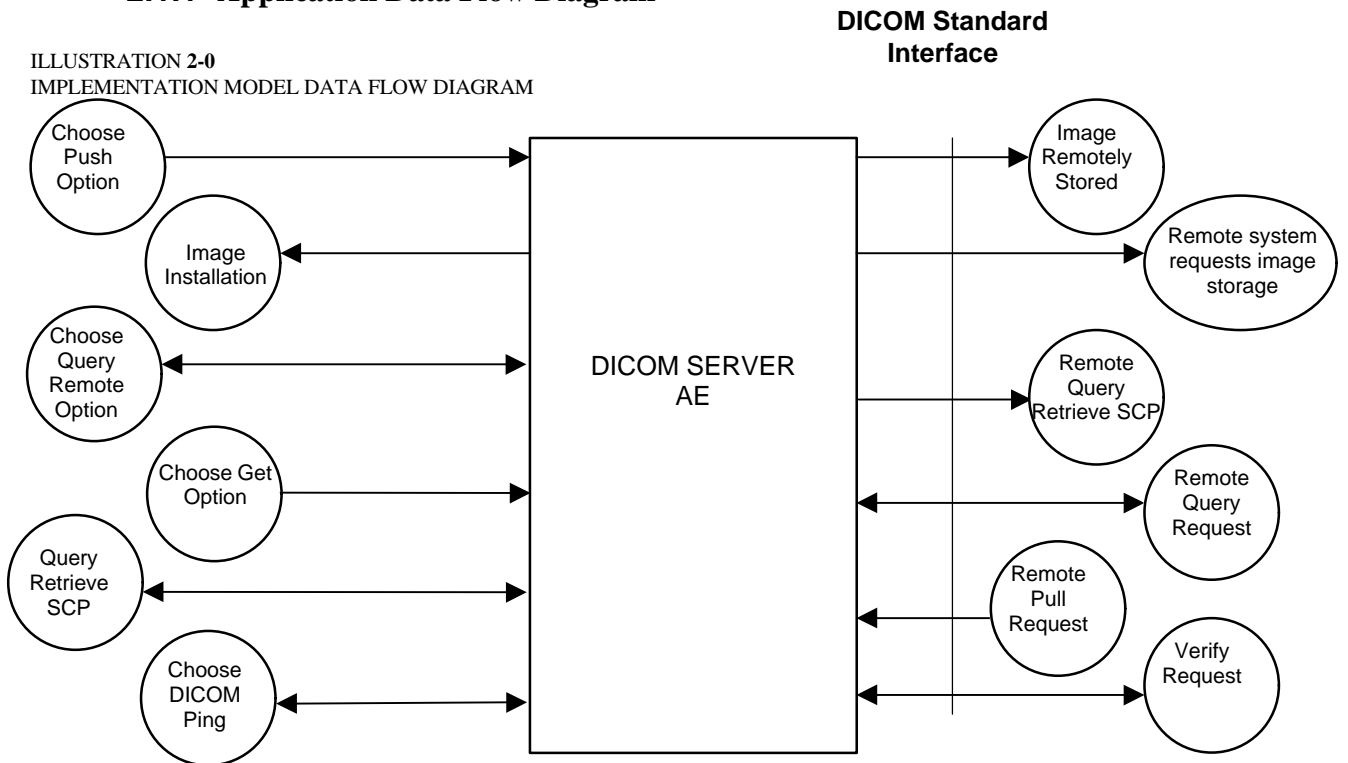
Note the format of this section follows the format of the DICOM Standard Part 2 (conformance) Annex A hence the paragraph numbering scheme. Please refer to that part of the standard while reading this section.

### **2.1 IMPLEMENTATION MODEL**

All DICOM functionality on the SIGNA CONTOUR product is handled by the DICOM Server Application Entity (AE). The DICOM Server AE is commanded to perform DICOM services through the buttons and menu selections on the main user interface panel. The DICOM Server AE is also listening to a pre-defined port for incoming connections.

### 2.1.1 Application Data Flow Diagram

ILLUSTRATION 2-0  
IMPLEMENTATION MODEL DATA FLOW DIAGRAM



There are three Real-World Activities that will cause the DICOM Server Application Entity (DICOM Server AE) to initiate a DICOM association to a remote DICOM Application Entity.

The *Choose "Push" Option* Real-World activity consists of an operator selecting one or more study, series or image in the local database manager and choosing either "Send examination", "Send series" or "Send image" from the "Network" pull down menu on the local database manager to send the image(s) to a selected destination.

Real-World Activity, *Query Remote*, causes the DICOM Server AE to initiate an association to the Remote DICOM AE and request the list of all studies. Once the DICOM Server AE receives the list of studies, it will select the first study (as determined through the local database manager list sort criterion) and request the list of series for that study. After receiving the list of series the DICOM Server AE will ask for the list of images for the first series in the list. The operator can then select any study in the study list to retrieve the list of series and images.

Real-World Activity, *Choose "Pull" Option*, will be available once the *Query Remote* activity is performed. The operator can now select one or more study (series or image) and ask the DICOM Server AE to retrieve the selected image(s) from the Remote DICOM AE by choosing either "Get Examination", "Get Series", or "Get Images".

Real-World Activity, *Choose DICOM Ping*, consists of an operator selecting DICOM Ping from the "Network" pull down menu on the local database manager to check the status of the selected remote DICOM AE.

There is no Real-World activity required for the DICOM Server AE to respond to an incoming DICOM store, query or retrieve. The DICOM Server AE is always prepared to respond to a DICOM Store, Query, or Retrieve by any remote DICOM AE.

The DICOM Server AE will perform the Real-World activity *Image Installation* after the remote AE sends an image to the SIGNA CONTOUR product.

Once a *Query* request is received, the DICOM Server AE will search the local database for all entries that match the keys requested by the Remote DICOM AE and send back the list of matches. The DICOM Server AE will also respond to an incoming retrieval request from a Remote AE by sending the image(s) to the Destination AE.

## 2.1.2 Functional Definition of AE's

DICOM Server Application Entity initiates the following operations:

- Initiate an association to a Remote AE for the purpose of sending images to the Remote AE. If the Remote AE accepts the presentation context applicable to the image(s) being sent, the DICOM Server AE will send the image(s) to the receiving Remote AE by invoking C-STORE-RQ operation for each image on the same association.
- Initiate an association with a Remote AE to query for images on the remote host. A Study-Root Study-Level C-FIND-RQ request will be sent to the Remote AE once an association has been established. After all responses are received, DICOM Server AE will issue a Series-Level C-FIND-RQ request to get the series for a study in the list. An Image-Level C-FIND-RQ will be issued for the first series in the series list.
- Send a C-MOVE-RQ request to a Remote AE for retrieve of images after successful association establishment. The DICOM Server AE's Storage SCP will receive the images over a separate association.
- Initiate an association with a Remote AE to verify it's status with a C-ECHO-RQ. The Remote AE will report it's status in a C-ECHO-RSP.

The DICOM Server AE waits for association requests from Remote AEs that wish to perform the following operations:

- *Verification*: If a C-ECHO-RQ message is received, the DICOM Server AE will send back a C-ECHO-RSP message with a status of "success".
- *Image Storage*: If a C-STORE-RQ message is received, the DICOM Server AE will receive the image and try to update the local database. If the image is stored successfully on storage media and the database updated a status of "success" will be returned in a C-STORE-RSP message.
- *Query*: If a C-FIND-RQ message is received the DICOM Server AE will search the database for the requested attributes and send back a C-FIND-RSP message containing a match and a status of "pending". After all matching records have been sent, a status of "success" will be returned in a C-FIND-RSP message. The Remote AE can terminate the query by sending a C-CANCEL-FIND-RQ message.
- *Retrieve*: If a C-MOVE-RQ message is received the DICOM Server AE will lookup its list of configured Remote AEs for the Destination AE. If the Destination AE is configured, the DICOM Server AE will open a new

association to the Destination AE and use C-STORE-RQ to send the image(s). The DICOM Server AE will send a C-MOVE-RSP message with a status of “pending” after every five images are sent. When all images are sent or if DICOM Server AE receives a C-CANCEL-MOVE-RQ a final C-MOVE-RSP will be sent back with an appropriate status.

### 2.1.3 Sequencing of Real-World Activities

Real-World Activity *Query Remote* must be performed before *Choose Pull Option* can be performed.

## 2.2 AE SPECIFICATIONS

### 2.2.1 DICOM Server AE Specification

This Application Entity provides Standard Conformance to the following DICOM v3.0 SOP Classes as an SCU:

| SOP Class Name (SCU)             | SOP Class UID               |
|----------------------------------|-----------------------------|
| Verification (Echo)              | 1.2.840.10008.1.1           |
| CT Image Information Storage     | 1.2.840.10008.5.1.4.1.1.2   |
| MR Image Information Storage     | 1.2.840.10008.5.1.4.1.1.4   |
| Secondary Capture image storage  | 1.2.840.10008.5.1.4.1.1.7   |
| Standalone Overlay storage       | 1.2.840.10008.5.1.4.1.1.8   |
| Study Root Query/Retrieve - FIND | 1.2.840.10008.5.1.4.1.2.2.1 |
| Study Root Query/Retrieve - MOVE | 1.2.840.10008.5.1.4.1.2.2.2 |

This Application Entity provides Standard Conformance to the following DICOM v3.0 SOP classes as an SCP:

| SOP Class Name (SCP)             | SOP Class UID               |
|----------------------------------|-----------------------------|
| Verification (Echo)              | 1.2.840.10008.1.1           |
| CT Information Storage           | 1.2.840.10008.5.1.4.1.1.2   |
| MR Information Storage           | 1.2.840.10008.5.1.4.1.1.4   |
| Secondary Capture image storage  | 1.2.840.10008.5.1.4.1.1.7   |
| Standalone Overlay storage       | 1.2.840.10008.5.1.4.1.1.8   |
| Study Root Query/Retrieve - FIND | 1.2.840.10008.5.1.4.1.2.2.1 |
| Study Root Query/Retrieve - MOVE | 1.2.840.10008.5.1.4.1.2.2.2 |

#### 2.2.1.1 Association Establishment Policy

##### 2.2.1.1.1 General

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



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

The Maximum Length PDU negotiation is included in all association establishment requests. The maximum length PDU for association initiated by the DICOM Server AE is:

|                           |                  |
|---------------------------|------------------|
| <b>Maximum Length PDU</b> | <b>36 Kbytes</b> |
|---------------------------|------------------|

SOP class Extended Negotiation is not supported.

The maximum number of Presentation Context Items that is supported is 60. Note that the same Abstract Syntax may be offered multiple times with different Transfer Syntaxes.

The user information items sent by this product are:  
Maximum PDU Length and,  
Implementation UID

### **2.2.1.1.2 Number of Associations**

The DICOM Server AE (SCU) will initiate only one DICOM association at a time to perform an image store to a remote host or retrieve image(s) from a Remote AE.

The DICOM Server AE (SCP) can have a maximum of four DICOM associations open simultaneously to receive and store image or respond to an echo.

### **2.2.1.1.3 Asynchronous Nature**

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

### **2.2.1.1.4 Implementation Identifying Information**

The Implementation UID allows unique identification of a set of products that share the same implementation.

The Implementation UID for this GEMS Implementation is:

|   |                             |
|---|-----------------------------|
| <b>SIGNA CONTOUR Implementation UID</b> | <b>1.2.840.113619.6.100</b> |
|---|-----------------------------|

### **2.2.1.2 Association Initiation by Real-World Activity**

This AE attempts to initiate a new association due to a "Push" operation initiated by the user. A new association is also initiated when the user performs a "Query Remote" operation or issues a retrieve operation by performing a "Get" operation at Study/Series/Image level.

**2.2.1.2.1 Push Image(s) to Remote AE**

**2.2.1.2.1.1 Associated Real-World Activity**

The operator must first select a destination by choosing “Select Remote Host” from the “Network” pull-down menu on the local database manager and then choose a hostname.

The “Push” operation will cause the DICOM server AE to initiate an Association when the operator selects one or more study, series, or images in the local database manager and then chooses either “Send examination”, “Send series”, or “Send image” from the “Network” pull-down menu on the local database manager.

**Note:** If multiple study, series, or images are chosen to be pushed, one association will be established for each of the studies, series, or images. A single association for a single series will be used for the multiple C-STORE operations necessary for the images in the series.

**2.2.1.2.1.2 Proposed Presentation Contexts**

The following table shows the proposed presentation contexts for the DICOM Server AE after Real-World Activity “Push” Operation has been performed. The following selection method is used when choosing from multiple accepted transfer syntaxes:

1. If image is stored locally in Implicit VR the order of preference is as follows:
  - i) Implicit VR Big Endian (GE private transfer syntax, see section 2.4.3)
  - ii) Implicit VR Little Endian
2. If image is stored locally in Explicit VR or in proprietary Advantage format the order of preference is as follows:
  - i) Explicit VR Big Endian
  - ii) Implicit Big Endian (GE private transfer syntax, see section 2.4.3)
  - iii) Implicit VR Little Endian
  - iv) Explicit VR Little Endian

**Table 2.2.1.2.1.2-1 Proposed Presentation Contexts for DICOM Server AE and Real-World activity Push Image(s)**

| Presentation Context Table - Proposal |                           |  |  |      |                      |
|---------------------------------------|---------------------------|--|--|------|----------------------|
| Abstract Syntax                       |                           | Transfer Syntax  |  | Role | Extended Negotiation |
| Name                                  | UID                       | Name List  | UID List                                   |      |                      |
| CT Image Storage                      | 1.2.840.10008.5.1.4.1.1.2 | Implicit VR Little Endian<br>Implicit VR Big Endian (GE private) | 1.2.840.10008.1.2<br>1.2.840.113619.5.2    | SCU  | None                 |
| CT Image Storage                      | 1.2.840.10008.5.1.4.1.1.2 | Explicit VR Little Endian<br>Explicit VR Big Endian              | 1.2.840.10008.1.2.1<br>1.2.840.10008.1.2.2 | SCU  | None                 |
| MR Image Storage                      | 1.2.840.10008.5.1.4.1.1.4 | Implicit VR Little Endian<br>Implicit VR Big Endian (GE private) | 1.2.840.10008.1.2<br>1.2.840.113619.5.2    | SCU  | None                 |
| MR Image Storage                      | 1.2.840.10008.5.1.4.1.1.4 | Explicit VR Little   | 1.2.840.10008.1.2.1                        | SCU  | None                 |

|                                      |                                 |  |  |     |      |
|--------------------------------------|---------------------------------|--|--|-----|------|
|                                      |                                 | Endian<br>Explicit VR Big<br>Endian                                    | 1.2.840.10008.1.2.2                        |     |      |
| Secondary<br>Capture                 | 1.2.840.10008.5.1.4.1.1.7       | Implicit VR Little<br>Endian<br>Implicit VR Big<br>Endian (GE private) | 1.2.840.10008.1.2<br>1.2.840.113619.5.2    | SCU | None |
| Secondary<br>Capture                 | 1.2.840.10008.5.1.4.1.1.7       | Explicit VR Little<br>Endian<br>Explicit VR Big<br>Endian              | 1.2.840.10008.1.2.1<br>1.2.840.10008.1.2.2 | SCU | None |
| Stand-alone<br>Overlay               | 1.2.840.10008.5.1.4.1.1.8       | Implicit VR Little<br>Endian<br>Implicit VR Big<br>Endian (GE private) | 1.2.840.10008.1.2<br>1.2.840.113619.5.2    | SCU | None |
| Stand-alone<br>Overlay               | 1.2.840.10008.5.1.4.1.1.8       | Explicit VR Little<br>Endian<br>Explicit VR Big<br>Endian              | 1.2.840.10008.1.2.1<br>1.2.840.10008.1.2.2 | SCU | None |
| Study Root<br>Query/Retrieve<br>FIND | 1.2.840.10008.5.1.4.1.2.2.<br>1 | Implicit VR Little<br>Endian   | 1.2.840.10008.1.2                          | SCU | None |
| Study Root<br>Query/Retrieve<br>MOVE | 1.2.840.10008.5.1.4.1.2.2.<br>2 | Implicit VR Little<br>Endian   | 1.2.840.10008.1.2                          | SCU | None |

**Note:** Other Presentation contexts with private SOP class names may be offered when establishing an association. These are private SOP classes which may be ignored. See section 2.4.2.

**2.2.1.2.1.2.1 SOP Specific Conformance Statement for Image Storage SOP Classes**

This implementation can perform multiple C-STORE operations over a single association. A single association for a single series will be used for the multiple C-STORE operations necessary for the images in the series

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

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

Upon receiving a C-STORE confirmation containing any status that is not Success or Refused, this implementation will consider the current request to be a failure but will continue to attempt to send the remaining images in the request on the same association.

Each C-STORE operation supports an "Association Timer". This timer starts when the association request is sent and stops when the association is established or rejected. The time-out is configurable in dcs.cfg as *bi\_assoc\_tio* and defaults to 30 seconds.

Each C-STORE operation also supports an "Operation Inactivity Timer". This time-out starts once the first C-STORE request has been issued (on association) or received and is reset each time a C-STORE response has been received or when subsequent C-STORES are sent. This time-out is configurable in dcs.cfg as *bi\_store\_tio* and defaults to 90 seconds.

Each C-STORE operation also supports a "Session Timer". This timer starts when the association is established and stops when the association is ended. This time-out is configurable in dcs.cfg as *bi\_session\_tio* and defaults to 60 minutes.

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

When DICOM Server AE initiates an association to issue a C-STORE, one of the following two operations will be performed:

If the image is stored locally on the SIGNA CONTOUR in DICOM format ("Dic" appears in the "Fmt" column at the exam level of the local database manager), the image will be transmitted by the DICOM Server AE with the same elements as was originally received or created locally (for the standard elements only).

If the image is stored locally on the SIGNA CONTOUR in a non-DICOM Advantage format ("Adv" appears in the "Fmt" field at the exam level of the local database manager), the image will be translated and then transmitted by the DICOM Server AE to the identical profiles specified by the CT Advantage Conformance Statement for DICOM v3.0 (Direction 2118781) and the MR Signa Advantage Conformance Statement for DICOM v3.0 (Direction 2118782).

## 2.2.1.2.2 Query Remote AE

### 2.2.1.2.2.1 Associated Real-World Activity

The operator must first select a destination by choosing "*Selected remote host:*" from "*Network*" pull-down menu on the local database manager and then choose a hostname.

Provided that the operator had set "Custom search?" to "Off" when setting the Remote host parameters, the "*Query*" operation will cause the DICOM Server AE to initiate an association (with zero length Patient name, Patient id, Study date, Accession number, and Study id) to the selected Remote AE when the "*Receive*" entry is selected from the "*Network*" pull-down menu.

Otherwise, if the operator had set "Custom search?" to "On" when setting the Remote host parameters, the "*Query*" operation will cause a Customize search parameters menu to appear. The operator can enter values for Patient name, Patient id, Study date, Accession number, and Study id. Not entering a value means match on any value for that field. Patient name will match on any patient name that contains what the operator entered. Patient id, Study id, and Accession number will match on what the operator enters. For Study date, the operator selects a range type from the "Exam date" pull down menu, where the choices are All, Before, Between, or Exactly. Once a range type is selected, the correct number of fields appear and the operator enters dates into those fields.

Once the desired parameters are entered the operator chooses "OK" and that will cause the DICOM Server AE to initiate an association to the selected Remote AE.

Once a list of Study/Series/Image is retrieved, the operator can invoke the "*Pull*" operation by choosing "*Get Exam*" or "*Get Series*" or "*Get Image*" from the "*Network*" pull-down menu, or the operator can cause a new association with different parameters to the same Remote AE by choosing "Change search parameters" from the "Search" pull-down menu on the remote database manager.

**2.2.1.2.2.2 Proposed Presentation Contexts**

When the Real-World activity “Query” or “Pull” is initiated all presentation contexts shown in table 2.2.1.2.1.2-1 are proposed during association establishment, but only the Query/Retrieve-FIND related contexts are applicable to this activity.

**2.2.1.2.2.2.1 SOP Specific Conformance Statement for C-FIND SCU**

After the Query operation is initiated, the DICOM Server AE will perform a study-root C-FIND-RQ request at each of the three levels (Study, Series, and Image) in succession.

The Initial Study-Level request will ask for all studies in the Remote database that match the user specified Patient name, Patient id, Study date, Accession number, and Study id. Zero length data in any of those fields means match on any value. Zero length data is the default value if the user does not specify a value. The user specified Patient name will come surrounded by single asterisks (asterisk is a wild card that matched any number of characters). The Study date is a range of dates where a date is exactly 8 characters long and the format of the range is:

- “” is any date,
- “yyyymmdd-“ is any date on or before that year/month/day,
- “yyyymmdd-yyyymmdd” is any date on or between those dates,
- “yyyymmdd” is only on that date.

The C-FIND SCU will not perform any extended negotiation and so will only perform hierarchical query.

Each C-FIND SCU operation supports an “Association Timer”, “Operation Inactivity Timer” and “Session Timer” with time out values of 900 seconds, 900 seconds and 60 minutes respectively. These values are configurable in dcs.cfg.

If a “Cancel” or “Refused” status is returned from the Remote AE the association is closed and the operation terminated.

The DICOM Server AE will parse each matching C-FIND-RSP reply and ignore the entries that do not contain a valid DICOM data stream. No VR validation is performed which means that syntax errors will be ignored.

Tables 2.2.1.2.2.2.1-1 - 2.2.1.2.2.2.1-3 shows the various fields that are requested at the Study, Series, and Image levels of the C-FIND request.

**Table 2.2.1.2.2.2.1-1: Requested Study Level Keys**

| Description      | Type | Tag       | Value   |
|------------------|------|-----------|---|
| Study date       | R    | 0008,0020 | Zero length for any Study date, or “yyyymmdd-yyyymmdd” matches inclusive range of ‘from-to’ Study dates. ‘From’ or ‘To’ date can be zero length meaning that side of the range is any date. |
| Study time       | R    | 0008,0030 | Zero length   |
| Accession number | R    | 0008,0050 | Zero length for any Accession number, or Accession number matches this value  |

| Description                    | Type | Tag       | Value   |
|--------------------------------|------|-----------|---|
| Patient's name                 | R    | 0010,0010 | Zero length for any Patient name, or Patient's name matches this value  |
| Study id                       | R    | 0020,0010 | Zero length for any Study id, or Study id matches this value  |
| Study Instance UID             | U    | 0020,000D | Zero length for Study level query. Study Instance UID of study for which matches are requested at a lower level |
| Study description              | O    | 0008,1030 | Zero length   |
| Private Creator Identification | P    | 0009,0010 | GEMS_IDEN_01  |
| Suite Id                       | P    | 0009,1002 | Zero Length   |

**Table 2.2.1.2.2.1-2: Requested Series Level Keys**

| Description         | Type | Tag       | Value  |
|---------------------|------|-----------|--|
| Modality            | R    | 0008,0060 | Zero length  |
| Series number       | R    | 0020,0011 | Zero length  |
| Series Instance UID | U    | 0020,000E | Zero length for Series level query. Series instance UID of series for which matches are requested at a low level |
| Series description  | O    | 0008,103E | Zero length  |
| Manufacturer        | O    | 0008,0070 | Zero length  |
| Images in series    | O    | 0020,1002 | Zero length  |

**Table 2.2.1.2.2.1-3: Requested Image Level Keys**

| Description                    | Type | Tag       | Value        |
|--------------------------------|------|-----------|--------------|
| Image number                   | R    | 0020,0013 | Zero length  |
| Image Instance UID             | U    | 0008,0018 | Zero length  |
| Image type                     | O    | 0008,0008 | Zero length  |
| Rows                           | O    | 0028,0010 | Zero length  |
| Columns                        | O    | 0028,0011 | Zero length  |
| Image position                 | O    | 0020,0032 | Zero length  |
| Image orientation              | O    | 0020,0037 | Zero length  |
| Slice thickness                | O    | 0018,0050 | Zero length  |
| Slice spacing                  | O    | 0018,0088 | Zero length  |
| Gantry tilt                    | O    | 0018,1120 | Zero length  |
| Convolution kernel             | O    | 0018,1210 | Zero length  |
| Reconstruction diameter        | O    | 0018,1100 | Zero length  |
| Data collection diameter       | O    | 0018,0090 | Zero length  |
| Flip angle                     | O    | 0018,1314 | Zero length  |
| Echo number                    | O    | 0018,0086 | Zero length  |
| Echo time                      | O    | 0018,0081 | Zero length  |
| Inversion time                 | O    | 0018,0082 | Zero length  |
| Repetition time                | O    | 0018,0080 | Zero length  |
| Private Creator Identification | P    | 0019,0010 | GEMS_ACQU_01 |
| Dfov Rect                      | P    | 0019,101E | Zero Length  |
| Midscan Time                   | P    | 0019,1024 | Zero Length  |
| Azimuth                        | P    | 0019,1026 | Zero Length  |

| Description                         | Type | Tag       | Value         |
|-------------------------------------|------|-----------|---------------|
| Number of Echo                      | P    | 0019,107E | Zero Length   |
| Private Creator Identification      | P    | 0021,0010 | GEMS_RELTA_01 |
| Scout Anref                         | P    | 0021,104A | Zero Length   |
| Private Creator Identification      | P    | 0027,0010 | GEMS_IMAG_01  |
| Location RAS                        | P    | 0027,1040 | Zero Length   |
| Location                            | P    | 0027,1041 | Zero Length   |
| Center R Coordinate                 | P    | 0027,1042 | Zero Length   |
| Center A Coordinate                 | P    | 0027,1043 | Zero Length   |
| Table Start Location                | P    | 0027,1050 | Zero Length   |
| Table End Location                  | P    | 0027,1051 | Zero Length   |
| RAS Letter for Side of Image        | P    | 0027,1052 | Zero Length   |
| RAS Letter for Anterior/Posterior   | P    | 0027,1053 | Zero Length   |
| RAS Letter for Scout Start Location | P    | 0027,1054 | Zero Length   |
| RAS Letter for Scout End Location   | P    | 0027,1055 | Zero Length   |
| Image Dimension X                   | P    | 0027,1060 | Zero Length   |
| Image Dimension Y                   | P    | 0027,1061 | Zero Length   |

**Note:** In the above tables the type field has the following meaning:

- R - Required
- U - Unique
- O - Optional
- P - Private

### 2.2.1.2.3 Get Image(s) from Remote AE

#### 2.2.1.2.3.1 Associated Real-World Activity

The operator must first select a destination by choosing “Selected remote host:” from “Network” pull-down menu on the local database manager and then choose a hostname. The operator then has to perform the Real-World activity “Query” to get a list of Study/Series/Image. Once the list of Study/Series/Image is retrieved, the operator can invoke the “Get” operation by choosing “Get Exam” or “Get Series” or “Get Image” from the “Network” pull-down menu.

#### 2.2.1.2.3.2 Proposed Presentation Contexts

When the Real-World activity “Get” is initiated all presentation contexts shown in table 2.2.1.2.1.2-1 are proposed during association establishment, but only the Query/Retrieve-MOVE related contexts are applicable to this activity.

#### 2.2.1.2.3.2.1 SOP Specific Conformance Statement for C-MOVE SCU

When the operator starts a *Get* operation at any level (Study, Series, Image) the DICOM Server AE will initiate a C-MOVE-RQ request to the Remote AE with the DICOM Server AE as the Destination AE. The Storage SCP will handle the incoming images as described in section 2.2.1.3.1.

Each C-MOVE SCU operation supports an “Association Timer”, “Operation Inactivity Timer” and “Session Timer” with time out values of 900 seconds, 900

seconds and 60 minutes respectively. These time-outs are configurable in dcs.cfg as *bi\_assoc\_tio*, *bi\_move\_tio* and *bi\_session\_tio* respectively.

The DICOM Server AE will send a C-CANCEL-MOVE-RQ to the Remote AE if the operator “Pauses” or “Clears” the job from the local database manager Network queue.

### 2.2.1.2.4 DICOM Ping to Remote AE

#### 2.2.1.2.4.1 Associated Real-World Activity

The operator must first select a destination by choosing “Selected remote host:” from “Network” pull-down menu on the local database manager and then choose a hostname. The operator then has to perform the Real-World activity “Choose DICOM PING” to send a C-ECHO request to get the status of the Remote AE.

If the C-ECHO response is received with a success, the DICOM Server will post a pop-up to the operator indicating that the remote device is alive.

#### 2.2.1.2.4.2 Presentation Context Table

**Table 2.2.1.3.2.2-1: Acceptable Presentation Contexts for DICOM Server AE and Real-World Activity DICOM Ping**

| Presentation Context Table |                   |                           |                   |      |                      |
|----------------------------|-------------------|---------------------------|-------------------|------|----------------------|
| Abstract Syntax            |                   | Transfer Syntax           |                   | Role | Extended Negotiation |
| Name                       | UID               | Name List                 | UID List          |      |                      |
| Verification               | 1.2.840.10008.1.1 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCP  | None                 |

#### 2.2.1.2.4.2.1 SOP Specific Conformance Statement to Verification SOP Class

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

Each ECHO operation supports an “Association Timer”, “Operation Inactivity Timer” and “Session Timer” with a time out values of 300 seconds, 90 seconds and 60 minutes respectively.

Upon receiving a C-ECHO-RSP, containing a successful status, a message will be posted to the operator indicating success.



### 2.2.1.3 Association Acceptance Policy

The DICOM Server AE places no limitations on who may connect to it.

When the DICOM Server AE accepts an association for image storage, it will receive any images transmitted on that association and store the images on disk.

It will also respond to queries from Remote AEs by sending matching entries. Any Remote AE can request and receive a list of images on the local database. The Remote AE must be configured in the local database manager's list of Remote AE for it to be able to retrieve images from DICOM Server AE.

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

#### 2.2.1.3.1 Receive Image(s)

This AE is indefinitely listening for associations. No operator action is required to receive an image.

##### 2.2.1.3.1.1 Associated Real-World Activity

The Real-World Activity associated with the Receive Image(s) operation is the storage of the image on the disk drive of the SIGNA CONTOUR .

##### 2.2.1.3.1.2 Presentation Context Table

**Table 2.2.1.3.1.2-1: Acceptable Presentation Contexts for DICOM Server AE and Real-World Activity Receive Image(s)**

| Presentation Context Table |                           |                           |                     |      |                      |
|----------------------------|---------------------------|---------------------------|---------------------|------|----------------------|
| Abstract Syntax            |                           | Transfer Syntax           |                     | Role | Extended Negotiation |
| Name                       | UID                       | Name List                 | UID List            |      |                      |
| Verification               | 1.2.840.10008.1.1         | Implicit VR Little Endian | 1.2.840.10008.1.2   | SCP  | None                 |
| CT Image Storage           | 1.2.840.10008.5.1.4.1.1.2 | Implicit VR Little Endian | 1.2.840.10008.1.2   | SCP  | None                 |
| CT Image Storage           | 1.2.840.10008.5.1.4.1.1.2 | GE Implicit VR Big Endian | 1.2.840.113619.5.2  | SCP  | None                 |
| CT Image Storage           | 1.2.840.10008.5.1.4.1.1.2 | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | SCP  | None                 |
| CT Image Storage           | 1.2.840.10008.5.1.4.1.1.2 | Explicit VR Big Endian    | 1.2.840.10008.1.2.2 | SCP  | None                 |
| MR Image Storage           | 1.2.840.10008.5.1.4.1.1.4 | Implicit VR Little Endian | 1.2.840.10008.1.2   | SCP  | None                 |
| MR Image Storage           | 1.2.840.10008.5.1.4.1.1.4 | GE Implicit VR Big Endian | 1.2.840.113619.5.2  | SCP  | None                 |
| MR Image Storage           | 1.2.840.10008.5.1.4.1.1.4 | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | SCP  | None                 |
| MR Image Storage           | 1.2.840.10008.5.1.4.1.1.4 | Explicit VR Big Endian    | 1.2.840.10008.1.2.2 | SCP  | None                 |
| Secondary Capture          | 1.2.840.10008.5.1.4.1.1.7 | Implicit VR Little Endian | 1.2.840.10008.1.2   | SCP  | None                 |
| Secondary                  | 1.2.840.10008.5.1.4.1.1.7 | Implicit VR Big           | 1.2.840.113619.5.2  | SCP  | None                 |

| Capture            |                           | Endian(GE Private)                 |                     |     |      |
|--------------------|---------------------------|------------------------------------|---------------------|-----|------|
| Secondary Capture  | 1.2.840.10008.5.1.4.1.1.7 | Explicit VR Little Endian          | 1.2.840.10008.1.2.1 | SCP | None |
| Secondary Capture  | 1.2.840.10008.5.1.4.1.1.7 | Explicit VR Big Endian             | 1.2.840.10008.1.2.2 | SCP | None |
| Standalone Overlay | 1.2.840.10008.5.1.4.1.1.8 | Implicit VR Little Endian          | 1.2.840.10008.1.2   | SCP | None |
| Standalone Overlay | 1.2.840.10008.5.1.4.1.1.8 | Implicit VR Big Endian(GE Private) | 1.2.840.113619.5.2  | SCP | None |
| Standalone Overlay | 1.2.840.10008.5.1.4.1.1.8 | Explicit VR Little Endian          | 1.2.840.10008.1.2.1 | SCP | None |
| Standalone Overlay | 1.2.840.10008.5.1.4.1.1.8 | Explicit VR Big Endian             | 1.2.840.10008.1.2.2 | SCP | None |

**Note:** The SCP does not have a default acceptance policy if more than one acceptable transfer syntaxes are proposed by the SCU. It is the responsibility of the SCU to make a selection from more than one transfer syntaxes accepted. If multiple transfer syntaxes are proposed in the same presentation context, the SCP will accept the first one.

**2.2.1.3.1.2.1 SOP Specific Conformance to Storage SOP Classes**

The DICOM Server AE conforms to the SOP's of the Storage Service Class at level 1 (base). Type 3 elements will be discarded unless explicitly stated otherwise (reference Appendix A IOD Definitions). Private elements will be discarded from the image when receiving images containing non-GE private data elements.

Each C-STORE SCP operation supports an "Association Timer", "Operation Inactivity Timer" and "Session Timer" with time out values of 900 seconds, 900 seconds and 60 minutes respectively.

**Image Reception**

If the DICOM Server AE returns one of the following status codes, then the C-STORE operation was unsuccessful and no image will be installed:

- 0110 (Processing Failure) Indicates that an internal system call has failed while processing an image.
- A711 (Out of Resources) Indicates that probably there was not enough disk space to store the image. The user should attempt recovery by removing some images from the SIGNA CONTOUR system.
- A712 (Out of Resources) Indicates that there was not enough resource (such as memory) to store the image.
- A800 (SOP Class not supported)

In the event of a successful C-STORE operation, the image has successfully been written to disk. The image will then be accessed in the same manner as any other image by the applications on the SIGNA CONTOUR system.

Images may be deleted when instructed to do so by the user. Thus the duration of the storage of the image is determined by the users of the SIGNA CONTOUR system.

**Image Installation**

If the image installation is unsuccessful, a message will appear in the Message Log informing the user of the failure and the image will be removed.

If the image installation process finds that an element is not encoded according to the DICOM standard, it will fail to install the image and the file will be removed.

### **Image Installation of GE Created MR or CT Images**

Images that were originally created on recent GE MR and CT scanners will be converted from their native Advantage Proprietary Format to DICOM format for transmission. If the images are stored as full fidelity representations and are subsequently returned to recent GE scanners, then the images will be transformed back to Advantage Proprietary Format.

There is an assumption made by such GE scanners:

The private element (0009,1001) is used as the full fidelity flag. If this flag contains the string: "GE\_GENESIS\_FF" when received by a scanner, then it is assumed that the image object was originally a GE created image object and contains all private elements that it was sent with.

If full fidelity flag is present and not all the elements are sent back as sent (ie, not full fidelity) there are 2 possible actions:

1. the translator will do its best to convert the image and will use default values where DICOM fields are missing
2. If certain critical information is not provided then the image will be stored as a screen save

It is strongly suggested that if GE private element (0009,1001) is present then all GE private elements originally associated with the image be preserved.

### **Image Installation of non-GE Created MR or CT Images**

Images received from non GE products are installed as appropriate image object without any of their private data elements. Also if some critical fields (mandatory) are missing, then the image will not be installed.

## **2.2.1.3.2 Verification Request from Remote AE**

This AE is indefinitely listening for associations. No operator action is required to respond to a *verification* message.

### **2.2.1.3.2.1 Associated Real-World Activity**

The Real-World Activity associated with the verification request is to send a C-ECHO response message with a status of "success" to the requesting AE.

### **2.2.1.3.2.2 Presentation Context Table**

**Table 2.2.1.3.2.2-1: Acceptable Presentation Contexts for DICOM Server AE and Real-World Activity**

**Verification Request**

| Presentation Context Table |                   |                           |                   |      |                      |
|----------------------------|-------------------|---------------------------|-------------------|------|----------------------|
| Abstract Syntax            |                   | Transfer Syntax           |                   | Role | Extended Negotiation |
| Name                       | UID               | Name List                 | UID List          |      |                      |
| Verification               | 1.2.840.10008.1.1 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCP  | None                 |

**2.2.1.3.2.2.1 SOP Specific Conformance to Verification SOP Class**

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

Each ECHO operation supports an “Association Timer”, “Operation Inactivity Timer” and “Session Timer” with a time out values of 900 seconds, 900 seconds and 60 minutes respectively.

**2.2.1.3.3 Query Request from Remote AE**

This AE is indefinitely listening for associations. No operator action is required to respond to a *query* request.

**2.2.1.3.3.1 Associated Real-World Activity**

The Real-World Activity associated with the query request is to search the local database for entries that match the request and send a C-FIND response message with a status of “pending” for each matching entry.

**2.2.1.3.3.2 Presentation Context Table**

**Table 2.2.1.3.1.2-1: Acceptable Presentation Contexts for DICOM Server AE and Real-World Activity Query Request**

| Presentation Context Table     |                             |                           |                   |      |                      |
|--------------------------------|-----------------------------|---------------------------|-------------------|------|----------------------|
| Abstract Syntax                |                             | Transfer Syntax           |                   | Role | Extended Negotiation |
| Name                           | UID                         | Name List                 | UID List          |      |                      |
| Study Root Query/Retrieve FIND | 1.2.840.10008.5.1.4.1.2.2.1 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCU  | None                 |

**2.2.1.3.3.2.1 SOP Specific Conformance to C-FIND SCP**

Each C-FIND SCP operation supports an “Association Timer”, “Operation Inactivity Timer” and “Session Timer” with time out values of 900 seconds, 900 seconds and 60 minutes respectively.

All Required( R) and Unique(U) study, series, and image level keys for the Study-Root Query/Retrieve information model are supported. Some optional (O) keys are also supported as described in the following tables.

**Table 2.2.1.3.3.2.1-1 Supported study level keys**

| Description                    | Type | Tag       | Usage                |
|--------------------------------|------|-----------|----------------------|
| Study date                     | R    | 0008,0020 | Matched              |
| Study time                     | R    | 0008,0030 | Matched              |
| Accession number               | R    | 0008,0050 | Matched              |
| Patient's name                 | R    | 0010,0010 | Matched <sup>1</sup> |
| Patient id                     | R    | 0010,0020 | Matched              |
| Study id                       | R    | 0020,0010 | Matched              |
| Study Instance UID             | U    | 0020,000D | Matched              |
| Study description              | O    | 0008,1030 | Returned             |
| Private Creator Identification | P    | 0009,0010 | GEMS_IDEN_01         |
| Suite Id                       | P    | 0009,1002 | Returned             |

**Table 2.2.1.3.3.2.1-2 Supported series level keys**

| Description         | Type | Tag       | Usage    |
|---------------------|------|-----------|----------|
| Modality            | R    | 0008,0060 | Matched  |
| Series number       | R    | 0020,0011 | Matched  |
| Series Instance UID | U    | 0020,000E | Matched  |
| Series description  | O    | 0008,103E | Returned |
| Manufacturer        | O    | 0008,0070 | Returned |
| Images in series    | O    | 0020,1002 | Returned |

**Table 2.2.1.3.3.2.1-3 Supported image level keys**

| Description                    | Type | Tag       | Usage        |
|--------------------------------|------|-----------|--------------|
| Image number                   | R    | 0020,0013 | Matched      |
| Image Instance UID             | U    | 0008,0018 | Matched      |
| Image type                     | O    | 0008,0008 | Returned     |
| Rows                           | O    | 0028,0010 | Returned     |
| Columns                        | O    | 0028,0011 | Returned     |
| Image position                 | O    | 0020,0032 | Returned     |
| Image orientation              | O    | 0020,0037 | Returned     |
| Slice thickness                | O    | 0018,0050 | Returned     |
| Slice spacing                  | O    | 0018,0088 | Returned     |
| Gantry tilt                    | O    | 0018,1120 | Returned     |
| Convolution kernel             | O    | 0018,1210 | Returned     |
| Reconstruction diameter        | O    | 0018,1100 | Returned     |
| Data collection diameter       | O    | 0018,0090 | Returned     |
| Flip angle                     | O    | 0018,1314 | Returned     |
| Echo number                    | O    | 0018,0086 | Returned     |
| Echo time                      | O    | 0018,0081 | Returned     |
| Inversion time                 | O    | 0018,0082 | Returned     |
| Repetition time                | O    | 0018,0080 | Returned     |
| Trigger time                   | O    | 0018,1060 | Returned     |
| Private Creator Identification | P    | 0019,0010 | GEMS_ACQU_01 |

<sup>1</sup> The local database does not store the different components of the patient's name in separate fields so it is not possible to query for studies by last name or any other component.

| Description                         | Type | Tag       | Usage         |
|-------------------------------------|------|-----------|---------------|
| Dfov Rect                           | P    | 0019,101E | Returned      |
| Midscan Time                        | P    | 0019,1024 | Returned      |
| Azimuth                             | P    | 0019,1026 | Returned      |
| Number of Echo                      | P    | 0019,107E | Returned      |
| Private Creator Identification      | P    | 0021,0010 | GEMS_RELTA_01 |
| Scout Anref                         | P    | 0021,104A | Returned      |
| Private Creator Identification      | P    | 0027,0010 | GEMS_IMAG_01  |
| Location RAS                        | P    | 0027,1040 | Returned      |
| Location                            | P    | 0027,1041 | Returned      |
| Center R Coordinate                 | P    | 0027,1042 | Returned      |
| Center A Coordinate                 | P    | 0027,1043 | Returned      |
| Table Start Location                | P    | 0027,1050 | Returned      |
| Table End Location                  | P    | 0027,1051 | Returned      |
| RAS Letter for Side of Image        | P    | 0027,1052 | Returned      |
| RAS Letter for Anterior/Posterior   | P    | 0027,1053 | Returned      |
| RAS Letter for Scout Start Location | P    | 0027,1054 | Returned      |
| RAS Letter for Scout End Location   | P    | 0027,1055 | Returned      |
| Image Dimension X                   | P    | 0027,1060 | Returned      |
| Image Dimension Y                   | P    | 0027,1061 | Returned      |

**Note:** In the above tables the type field has the following meaning:

**R** - Required    **U** - Unique    **O** - Optional    **P** - Private

Only keys with Usage type *Matched* will be matched against values in the database.

Values in keys of type *Returned* will be ignored and will be filled in with data from the database.

If an optional key is requested that does not appear in any of the tables above, that key will be ignored and no corresponding element will be returned.

If the database does not have a value corresponding to any requested optional key a zero-length element will be returned.

Except sequence matching all other matchings are supported.

Only hierarchical query is supported. Therefore, the C-FIND SCP will not perform any extended negotiation.

### 2.2.1.3.4 Retrieve Request From Remote AE

This AE is indefinitely listening for associations. No operator action is required to respond to a *retrieve* request.

#### 2.2.1.3.4.1 Associated Real-World Activity

The Real-World Activity associated with the Retrieve Request is to send all images corresponding to the C-MOVE request to the destination AE through a separate association.

### 2.2.1.3.4.2 Presentation Context Table

**Table 2.2.1.3.4.2-1: Acceptable Presentation Contexts for DICOM Server AE and Real-World Activity Retrieve Request.**

| Presentation Context Table     |                             |                           |                   |      |                      |
|--------------------------------|-----------------------------|---------------------------|-------------------|------|----------------------|
| Abstract Syntax                |                             | Transfer Syntax           |                   | Role | Extended Negotiation |
| Name                           | UID                         | Name List                 | UID List          |      |                      |
| Study Root Query/Retrieve MOVE | 1.2.840.10008.5.1.4.1.2.2.2 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCU  | None                 |

#### 2.2.1.3.4.2.1 SOP Specific Conformance to C-MOVE SCP

The DICOM Server AE provides standard conformance to the baseline Study-root C-MOVE Service Class SCP.

Each C-MOVE SCP operation supports an “Association Timer”, “Operation Inactivity Timer” and “Session Timer” with a time out values of 900 seconds, 900 seconds and 60 minutes respectively. These time-outs are configurable in dcs.cfg as *bi\_assoc\_tio*, *bi\_store\_tio* and *bi\_session\_tio* respectively

All images requested in a C-MOVE-RQ will be sent over a single association. A C-MOVE-RSP with a “pending” status will be returned to the requester every five images.

The C-MOVE SCP will invoke C-STORE requests for the following SOP classes:

| SOP Class Name                  | SOP Class UID             |
|---------------------------------|---------------------------|
| CT Image Information Storage    | 1.2.840.10008.5.1.4.1.1.2 |
| MR Image Information Storage    | 1.2.840.10008.5.1.4.1.1.4 |
| Secondary Capture image storage | 1.2.840.10008.5.1.4.1.1.7 |
| Standalone Overlay storage      | 1.2.840.10008.5.1.4.1.1.8 |

In addition to the C-MOVE response status values defined in DICOM V3.0 part 4 the following status values will be returned:

- C000 - Indicates that an error occurred while retrieving records from the local database.
- C001 - Indicates all other processing error.
- C011 - If the Destination AE returns a “Storage Full” condition this status will be returned. This status will only be sent if the Destination AE returns a status of A711 and is only applicable if the Destination AE is an SdC-based product.

#### 2.2.1.3.4.3 Presentation Context Acceptance Criteria

No criterion.

#### 2.2.1.3.4.4 Transfer Syntax Selection Policy

The SCP does not have a default acceptance policy if more than one acceptable transfer syntaxes are proposed for the same SOP class (in separate presentation contexts). It is the responsibility of the SCU to make a selection from the list of accepted presentation contexts that apply to any particular SOP class. If multiple transfer syntaxes are proposed in the same presentation context, the SCP will accept the first one.



## **2.3 COMMUNICATION PROFILES**

### **2.3.1 Supported Communication Stacks (parts 8,9)**

DICOM Upper Layer (Part 8) is supported using TCP/IP.

### **2.3.2 TCP/IP Stack**

The TCP/IP stack is inherited from a UNIX Operating System.

#### **2.3.2.1 Physical Media Support**

Ethernet v2.0, IEEE 802.3.

### **2.3.3 Point-to-Point Stack**

A 50-pin ACR-NEMA connection is not applicable to this product.

## 2.4 EXTENSIONS / SPECIALIZATIONS / PRIVATIZATIONS

### 2.4.1 Specialized Information Object Definition

Following is a list of additional private attributes defined for a standard MR IOD. For incoming third-party DICOM images the values in these elements are retained without modification.

- (0008,0008) Value 3: MR Image IOD specific specializations  
PROJECTION IMAGE  
REFORMATTED  
SCREEN SAVE  
PROC  
COMB
- Value 4 : MR Image implementation specific  
COLLAPSE  
VASCULAR  
IVI

**Note:** When converting a received DICOM IOD to Advantage format if element 8,8 does not contain any of the defined values the IOD will be converted to secondary capture IOD.

- (0018,0022) Scan Options : Defined Terms  
NONE  
VASCTOF\_GEMS  
VASCPC\_GEMS  
CINE\_GEMS  
FAST\_GEMS  
IIC\_GEMS  
GRAPH\_GEMS  
IRP\_GEMS  
DEP\_GEMS  
CL\_GEMS  
SAT\_GEMS  
NPW  
RT\_GEMS  
VB\_GEMS  
POMP\_GEMS  
VB\_GEMS  
EDR\_GEMS  
SEQ\_GEMS  
CS\_GEMS  
MP\_GEMS  
SQPIX\_GEMS  
MT\_GEMS  
EPI\_GEMS  
TRF\_GEMS  
RTR\_GEMS  
FT\_GEMS  
NF\_GEMS  
RAMP\_RL\_GEMS  
RAMP\_LR\_GEMS  
RAMP\_AP\_GEMS  
RAMP\_PA\_GEMS

RAMP\_SI\_GEMS  
 RAMP\_IS\_GEMS  
 FC\_FREQ\_AX\_GEMS  
 FC\_SLICE\_AX\_GEMS  
 SS\_GEMS  
 VASCANGIO\_GEMS  
 RESP\_GEMS  
 BC\_GEMS  
 Z1024\_GEMS  
 CC\_GEMS  
 Z512\_GEMS  
 Z2\_GEMS  
 Z4\_GEMS  
 FR\_GEMS  
 BSP\_GEMS  
 FWF\_GEMS  
 FWW\_GEMS  
 T2P\_GEMS  
 SSRF\_GEMS  
 RTBC\_GEMS  
 AN\_GEMS

**Note:** When converting a received DICOM IOD to Advantage format if element 18,22 does not contain any of the defined values the received data will be interpreted as having the value “NONE”.

**2.4.2 Private SOP Classes**

ID/Net v2.0 Private IODs are based upon the April 1993 draft version of the DICOM v3.0. ID/Net v2.0 IODs are supported for backward compatibility. The following private SOP classes are defined:

| Abstract Syntax Name   | UID                |
|--|--------------------|
| GE Private DICOM MR Image Information Object(ID/Net v2.0 compatible) | 1.2.840.113619.4.2 |
| GE Private DICOM CT Image Information Object(ID/Net v2.0 compatible) | 1.2.840.113619.4.3 |
| GE Private DICOM Display Information Object(ID/Net v2.0 compatible)  | 1.2.840.113619.4.4 |

**Note:** See the “ID/Net v2.0 Implementation Profiles” (Direction 46-269546G2) for definitions of Information Objects.

**2.4.3 Private Transfer Syntax**

The following private SOP transfer syntax is defined:

| Transfer Syntax Name   | UID                |
|------------------------|--------------------|
| Implicit VR Big Endian | 1.2.840.113619.5.2 |

This private transfer syntax is identical to the DICOM Implicit VR Little Endian syntax except for the encapsulation of the pixel data. Pixel data (element 7FE0,0010) is encoded in Big Endian format for this private transfer syntax. All other elements are encoded in Little Endian format as dictated by the DICOM standard.

The following table shows the presentation contexts that are proposed for GE private SOP classes.

| Presentation Context Table - Accepted / Proposed                      |                    |                                     |                    |      |                      |
|---|--------------------|-------------------------------------|--------------------|------|----------------------|
| Abstract Syntax   |                    | Transfer Syntax                     |                    | Role | Extended Negotiation |
| Name  | UID                | Name List                           | UID List           |      |                      |
| GE Private DICOM MR Image Information Object (ID/Net v2.0 compatible) | 1.2.840.113619.4.2 | Implicit VR Little Endian           | 1.2.840.10008.1.2  | Both | None                 |
| GE Private DICOM MR Image Information Object (ID/Net v2.0 compatible) | 1.2.840.113619.4.2 | Implicit VR Big Endian (GE Private) | 1.2.840.113619.5.2 | Both | None                 |
| GE Private DICOM CT Image Information Object (ID/Net v2.0 compatible) | 1.2.840.113619.4.3 | Implicit VR Little Endian           | 1.2.840.10008.1.2  | Both | None                 |
| GE Private DICOM CT Image Information Object (ID/Net v2.0 compatible) | 1.2.840.113619.4.3 | Implicit VR Big Endian (GE Private) | 1.2.840.113619.5.2 | Both | None                 |
| GE Private DICOM Display Information Object (ID/Net v2.0 compatible)  | 1.2.840.113619.4.4 | Implicit VR Little Endian           | 1.2.840.10008.1.2  | Both | None                 |
| GE Private DICOM Display Information Object (ID/Net v2.0 compatible)  | 1.2.840.113619.4.4 | Implicit VR Big Endian (GE Private) | 1.2.840.113619.5.2 | Both | None                 |

## 2.4.4 Private Data Elements

Refer to *Appendix B* for a complete listing of private data elements used with this implementation.

## 2.5 CONFIGURATION

### 2.5.1 AE Title/Presentation Address Mapping

The SIGNA CONTOUR system allows the user to “add”, “Remove”, or “Update” the mapping of remote AE Titles to IP Addresses and Ports. These options can be selected from the “Remote Host Selection” menu displayed by choosing “Selected remote host:” from the “Network” pull-down menu from the local database manager.

### 2.5.2 Configurable Parameters

The following fields are configurable for the DICOM Server AE:

- Local AE Title (the machine hostname)
- Local IP Address
- Local IP Netmask
- Max PDU length
- Time-outs, which are set for all hosts, are configurable in dcs.cfg:
  - note: \* denotes any SOP class (time in sec)
  - \*Association time-out - *bj\_assoc\_tio*
  - \*Inactivity time-out - *bj\_store\_tio*
  - \*Session timeout - *bj\_session\_tio*
  - \*Move operation time-out - *bj\_move\_tio*
  - \*Find time-out - *bj\_find\_tio*

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

**Note:** The local port on which the SIGNA CONTOUR system receives DICOM incoming TCP connections is port **4006**.

## 2.6 SUPPORT OF EXTENDED CHARACTER SETS

In addition to the DICOM default character set, *SIGNA CONTOUR* supports the ISO IR 100 Latin alphabet #1 supplementary set for the purpose of interchange.

### 3 MEDIA STORAGE CONFORMANCE STATEMENT

#### 3.0 Introduction

This Conformance Statement (CS) specifies the SIGNA CONTOUR compliance to DICOM v3.0 Media Interchange. It details the DICOM Media Storage Application Profiles and roles which are supported by this product in it's version 7.66.

Note the format of this section follows the format of the DICOM Standard Part 2 (conformance) Annex C hence the paragraph numbering scheme. Please refer to that part of the standard while reading this section.

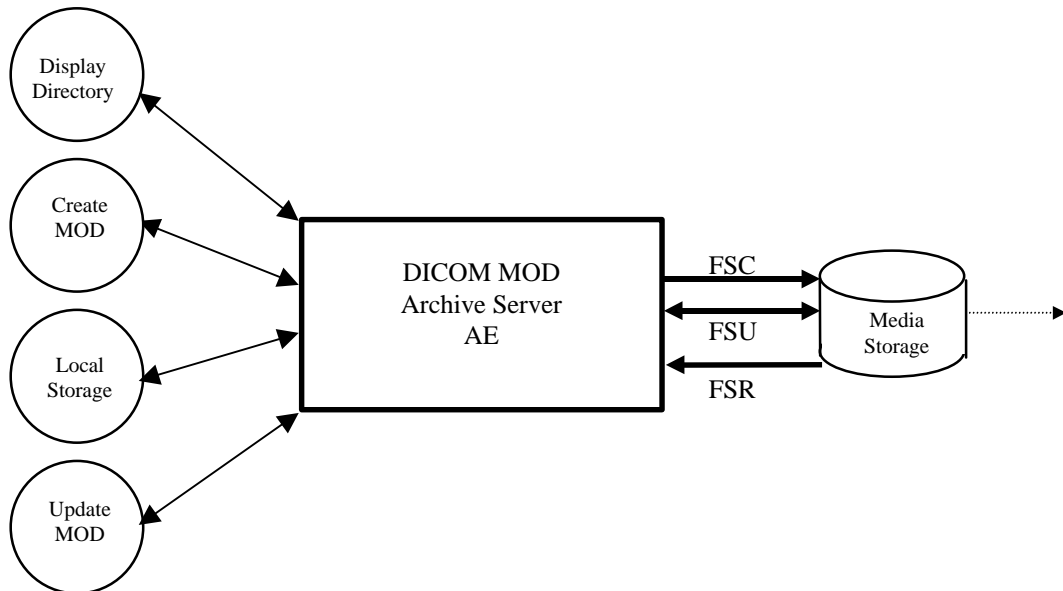
#### 3.1 Implementation Model : MOD Archive Server

All DICOM functionality on the SIGNA CONTOUR product is handled by the DICOM Server Application Entity (AE). The DICOM Server AE is commanded to perform DICOM services through the buttons and menu selections on the main user interface panel.

##### 3.1.1 Application Data Flow Diagram

The MOD Archive Server creates and/or updates the 5.25 inch (130mm) MOD media with various DICOM SOP instances. It can process CT, MR, Secondary Capture and Overlay IOD's.

Illustration 3-1 Specific AE Application Model



The MOD Archive Server AE has a local storage that may contain various SOP instances. These may have been obtained by original creation, network (DICOM or proprietary) or by removable media using other application entities. These instances are external to this conformance claim and the origin of SOP instances is outside the scope of this claim.

The MOD Archive Server AE can initialize Media by acting as an FSC to create a new DICOM File-set on a 2.3 GB MOD media or a 1.2GB MOD media. It initializes the DICOM File-set and writes the specified SOP instances onto the MOD. The SOP instances written will be limited to instances that match the criteria of one of the Application Profiles that is supported. When updating media, a pre-existing File-set will be updated with the selected SOP instances that match one of the supported Application Profiles

### 3.1.2 Functional Definitions of AE's

This Server has only one Application Entity: the MOD Archive Application

The MOD Archive Application can perform these functions:

- It can initialize (create DOS filesystem) a piece of media, writing a new label and DICOM File-set onto the media. ("LABEL")
- It can update a piece of media by adding new SOP instances to an already existing DICOM File-set from local storage. ("SAVE")
- It can display a directory listing of the File-set on a piece of media. (QUERY)
- It can copy SOP instance from the MOD onto local storage. ("RESTORE")

### 3.1.3 Sequencing of Real World Activities

The updating function can only be performed on a piece of media that has already had a DICOM File-set created.

The display function can only be performed on a piece of media that has already had a DICOM File-set created. With no SOP instances having been added, the directory will be displayed empty.

The copy function can only be performed with a piece of media that had been updated and had DICOM SOP instances in the File-set.

There are no other sequencing requirements.

### 3.1.4 File Meta Information for Implementation Class and Version

The File Meta-Information for this implementation is :

|   |                             |
|---|-----------------------------|
| <b>File Meta-Information Version</b>        | <b>1</b>                    |
| <b>SIGNA CONTOUR<br/>Implementation UID</b> | <b>1.2.840.113619.6.100</b> |
| <b>Implementation Version Name</b>          | <b>OFFIS_DCMTK_341</b>      |

## 3.2 AE Specifications

### 3.2.1 MOD Archive Specification

The MOD Archive provides standard conformance to DICOM Interchange Option of the Media Storage Service Class. The Application Profiles and roles are listed in Table 3.2-1.

**Table 3.2-1 : Application Profile, Activities and Roles for MOD Update**

| <b>Application Profiles Supported</b> | <b>Real World Activity</b> | <b>Role</b> | <b>SC Option</b> |
|---------------------------------------|----------------------------|-------------|------------------|
| STD-CTMR-MOD23                        | Create MOD                 | FSC         | Interchange      |
|                                       | Update MOD                 | FSU         | Interchange      |
|                                       | Display Directory          | FSR         | Interchange      |
|                                       | Copy To Local Storage      | FSR         | Interchange      |
| STD-CTMR-MOD12                        | Create MOD                 | FSC         | Interchange      |
|                                       | Update MOD                 | FSU         | Interchange      |
|                                       | Display Directory          | FSR         | Interchange      |
|                                       | Copy To Local Storage      | FSR         | Interchange      |
| PRI-CTMR-MOD12                        | Create MOD                 | FSC         | Interchange      |
|                                       | Update MOD                 | FSU         | Interchange      |
|                                       | Display Directory          | FSR         | Interchange      |
|                                       | Copy To Local Storage      | FSR         | Interchange      |

The MOD Archive Application will query the user before initializing media when a File-set is found on the media and an initialize operation has been requested.

Depending on the physical media type being 2.3 GB or 1.2 GB medis, the system will apply the correct characteristics as an FSC to meet the appropriate Application Profile.

As an FSU role, the system will produce directory sequences for each SOP instance that is added to the File-set consistent with the STD-CTMR-MOD{12,23} profile and it will make the File-set directory so that an early installed base system that only understands the PRI-CTMR-MOD12 profile will not be able to use the media. An upgrade to the installed base system will be required to learn how to be a FSU or FSR of the STD-CTMR-MOD{12,23} profile directory sequences.

**3.2.1.1 File Meta Information for the Application Entity**

Following are the values set in the File Meta Information for this AE Title :

|  |  |
|--|--|
| <b>Source Application Entity Title</b> | <b>Not used by the MOD Archive Application</b> |
| <b>Private Information Creator UID</b> | <b>Not used by the MOD Archive Application</b> |
| <b>Private Information</b>             | <b>Not used by the MOD Archive Application</b> |

**3.2.1.2 Real World Activities**

**3.2.1.2.1 Real World Activity: Create MOD Request**

The MOD Archive Application acts as an FSC using the Interchange option when requested to initialize (“LABEL”) the media. The AE will use the appropriate Application Profile depending on the physical media type that is in the optical disk drive (be it 2.3 GB or 1.2 GB media).

The MOD Archive Application will label the media and take the user provided list of SOP instances eliminating any SOP instances on that list that does not correspond to one of the Application Profiles in Table 3.2-1. These SOP instances are written to the media and a corresponding DICOMDIR is created. The determination of the potentially applicable Application Profile is dependent on the type of media and the associated software on which the AE has been invoked.



### **3.2.1.2.1.1 Application Profiles for the RWA: Create MOD**

For the list of Application Profiles that invoke this AE for the Create MOD RWA, see Table 3.2-1.

### **3.2.1.2.2 Real World Activity: Display Directory**

The MOD Archive Application acts as an FSR using the Interchange option when requested to provide a directory listing.

When an MOD update Application is requested to provide a directory listing it will read the File-set and display the DICOMDIR directory entries for those SOP instances in the File-set that correspond to the user selected Application Profile.

### **3.2.1.2.2.1 Media Storage Application Profiles for the RWA: Display Directory**

For the list of Application Profiles that invoke this AE for the MOD directory listing RWA, see Table 3.2-1. There are no extensions or specialization's.

#### **3.2.1.2.2.2 Options:**

None applicable.

### **3.2.1.2.3 Real World Activity: Copy to Local Storage**

The MOD Archive Application acts as an FSR when copying from the MOD to local storage.

The MOD Archive Application will copy any SOP Instance selected from an MOD Directory list from the MOD to the local storage upon request. The MOD Directory listing Real-World Application will filter out the SOP Instances that do not match the Application Profile.

### **3.2.1.2.3.1 Application Profiles for the RWA: Copy to Local Storage**

For the list of Application Profiles that invoke this AE for the MOD Copy to Local Storage RWA, see Table 3.2-1.

#### **3.2.1.2.3.2 Options:**

None applicable.

### **3.2.1.2.4 Real World Activity: Update MOD**

The MOD Archive Application acts as an FSU using the Interchange option when requested to update an MOD.

The MOD Archive Application will take the selected list of SOP instances and eliminate any SOP instance that does not correspond to permissible SOP instances listed in the Application Profiles Table 3.2-1. The remaining SOP instances are written to the media that is found in the MOD Archive Application disk drive. The determination of the potentially applicable Application Profile is dependent on the type of media and associated software on which the AE has been invoked.

**3.2.1.2.4.1 Application Profiles for the RWA: Update MOD Request**

For the list of Application Profiles that invoke this AE for the MOD Copy to Local Storage RWA, see Table 3.2-1.

**3.2.1.2.4.2 Options:**

None applicable.

**3.3 Standard, Augmented and Private Application Profiles**

**3.3.1 Class and Profile Identification**

The Class of Application Profiles defined here is for Computed Tomography and Magnetic Resonance Imaging Clinical applications.

The identifier for this class is CTMR-MOD.

The specific Application Profile in this class is shown in Table 3.3.1-1.

**Table 3.3.1-1 : CTMR MOD Profiles**

| <b>Application Profile</b>        | <b>Identifier</b> | <b>Description</b>   |
|-----------------------------------|-------------------|--|
| CT/MR Studies on 2.3 GB MOD media | STD-CTMR-MOD23    | It handles single frame 12 or 16 bit grayscale compressed/uncompressed images. |
| CT/MR Studies on 1.2 GB MOD media | STD-CTMR-MOD12    | It handles single frame 12 or 16 bit grayscale compressed/uncompressed images. |
| CT/MR Studies on 1.2 GB MOD media | PRI-CTMR-MOD12    | It handles single frame 12 or 16 bit grayscale compressed/uncompressed images. |

**3.3.2 Clinical Contexts**

This Application Profile facilitates the interchange of primary CT and MR images as well as processed CT and MR images as Secondary Capture and Standalone Overlay Images. Please refer to appendix A for the IOD definitions. CT, MR, SC and OV images may co-exist within the same File-set.

Typical interchanges would be between acquisition devices, archives and workstations within and between institutions.

### **3.3.2.1 Roles and Service Class Options**

This Application Profile Class uses the Media Storage Service Class defined in PS3.4 with the Interchange Option.

The Application Entity shall support one or more roles of the File-set Creator, File-set Reader and File-set Updater defined in PS3.10.

#### **3.3.2.1.1 File Set Creator**

The Application Entity acting as a File-set Creator generates a File Set under the PRI-CTMR-MOD12 Application Profile Class. Typical entities using this role would include CT or MR equipment and archive systems which generate a patient record to transfer to another institution. File Set Creator shall be able to generate the Basic Directory SOP Class in the DICOMDIR File with all types of Directory Records related to the SOP Classes stored in the File-set.

FSC for the MOD profile has no concept of finalizing the disc at the completion of most recent write session. This is a requirement of CD-R and does not apply to the MOD profiles.

#### **3.3.2.1.2 File Set Reader**

The role of File Set Reader is used by the Application Entities which receive a transferred File Set. Typical entities using this role would include display workstations and archive systems which receive a patient record transferred from another institution. File Set Readers shall be able to read all the SOP Classes defined for the specific Application Profile for which a Conformance Statement is made using all the defined Transfer Syntaxes.

#### **3.3.2.1.3 File Set Updater**

The role of File Set Updater is used by Application Entities which receive a transferred File Set and update it by the addition of information. Typical entities using this role would include analytic workstations which for instance may add to the File-set an information object containing a processed (e.g., edge-enhanced) image. File-set Updaters do not have to read the images. File-set Updaters shall be able to generate one or more of the SOP Instances defined for the specific Application Profile for which a conformance statement is made and to read and update the DICOMDIR file.

### **3.3.3 Standard Application Profiles**

The MOD Archive Server supports the standard Application Profile: CTMR-MOD as an FSC, FSR or FSU.

#### **3.3.3.1 STD-CTMR-MOD12 Class Profile**

##### **3.3.3.1.1 SOP Classes and Transfer Syntaxes**

This class of Application Profiles is based on the Media Storage Service Class with the Interchange Option. (see PS3.4).

SOP Classes and corresponding Transfer Syntaxes supported by the STD-CTMR-MOD12 Application Profiles is also specified in the Table 3.3.3.1.1-1.

**Table 3.3.3.1.1-1 : IOD's and Transfer Syntaxes for CTMR-MOD Application Profiles**

| Information Object Definition | SOP Class UID             | Transfer Syntax and UID  | FSC Req. | FSR Req. | FSU Req. |
|-------------------------------|---------------------------|--|----------|----------|----------|
| Basic Directory               | 1.2.840.10008.1.3.10      | Explicit VR Little Endian Uncompressed<br>1.2.840.10008.1.2.1      | M        | M        | M        |
| CT Image Storage              | 1.2.840.10008.5.1.4.1.1.2 | Explicit VR Big Endian Uncompressed<br>1.2.840.10008.1.2.2         | O        | M        | O        |
| CT Image Storage              | 1.2.840.10008.5.1.4.1.1.2 | JPEG Lossless Process Selection Value 14<br>1.2.840.10008.1.2.4.70 | O        | M        | O        |
| MR Image Storage              | 1.2.840.10008.5.1.4.1.1.4 | Explicit VR Big Endian Uncompressed<br>1.2.840.10008.1.2.2         | O        | M        | O        |
| MR Image Storage              | 1.2.840.10008.5.1.4.1.1.4 | JPEG Lossless Process Selection Value 14<br>1.2.840.10008.1.2.4.70 | O        | M        | O        |
| SC Image Storage              | 1.2.840.10008.5.1.4.1.1.7 | Explicit VR Big Endian Uncompressed<br>1.2.840.10008.1.2.2         | O        | M        | O        |
| SC Image Storage              | 1.2.840.10008.5.1.4.1.1.7 | JPEG Lossless Process Selection Value 14<br>1.2.840.10008.1.2.4.70 | O        | M        | O        |
| Standalone Overlay            | 1.2.840.10008.5.1.4.1.1.8 | Explicit VR Big Endian Uncompressed<br>1.2.840.10008.1.2.2         | O        | O        | O        |
| Standalone Overlay            | 1.2.840.10008.5.1.4.1.1.8 | JPEG Lossless Process Selection Value 14<br>1.2.840.10008.1.2.4.70 | O        | O        | O        |

M : Mandatory O : Optional

**NOTE:**

The MOD Archive Application chooses the JPEG Lossless compression (selection value 1) as the default transfer syntax for storing images on the media. But the transfer syntax is selectable on a per media basis at install time using a method defined by the Application.

**3.3.3.1.2 Physical Media and Media Formats**

The CT/MR Application Profiles in the STD-CTMR-MOD12 require the 130mm 1.2GB 512 Byte per Sector Magneto-Optical Rewritable physical media with the PC File System as defined in PS3.12.

**3.3.3.1.3 Logical Format**

The STD-CTMR-MOD12 Application profile media format conforms to the Logical Format specification in PS3.12. The following table 3.3.3.1.3-1 defines the specific values used for this profile.

**Table 3.3.3.1.3-1 : Boot Sector for STD-CTMR-MOD12 conformance media**

| Bytes(s)  | Big Endian               | As Stored  | Description   |
|-----------|--------------------------|------------|---|
| 00 - 02   |                          | 0xEB3C90   | Jump instruction to loader (NOPs)                         |
| 03 - 10   | 0x4D53444F53342E30       |            | “MSDOS4.0” The formatting DOS (vendor specific)           |
| 11 - 12   | 0x0200                   | 0x0002     | 512 bytes/sector  |
| 13        | 32                       | 0x20       | sectors/cluster   |
| 14-15     | 0x0001                   | 0x0100     | 1 sector in boot record                                   |
| 16        | 0x02                     | 0x02       | 2 File Allocation Tables (FAT)                            |
| 17 - 18   | 0x0200                   | 0x0002     | 512 root directory entries                                |
| 19 - 20   | 0x0000                   | 0x0000     | Flag for more than 65536 sector/disk. Use offset 32 value |
| 21        | 0xF8                     | 0xF8       | Flag for disk type; FOH if not otherwise specified        |
| 22 - 23   | 143                      | 0x8F00     | 143 sectors/FAT   |
| 24 - 25   | 31                       | 0x1F00     | 31 sectors/track  |
| 26 - 27   | 1                        | 0x0100     | 1 side (head) per disk                                    |
| 28 - 31   | 00000000                 | 0x0...0    | 0 reserved or hidden sectors                              |
| 32 - 35   | 1163306                  | 0x2AC01100 | 1163306 Total sector/disk. Varies from disk to disk       |
| 36 - 37   | 0x0080                   | 0x8000     | Physical Drive number = 80                                |
| 38        | 0x29                     | 0x29       | Extended boot record signature = 41                       |
| 39 - 42   | <i>Date Stamp</i>        |            | Volume serial number                                      |
| 43 - 53   | 0x47454D535F4449434F4D20 |            | “GEMS-DICOM”  |
| 54 - 61   | 0x0...0                  | 0x0...0    | The file system label                                     |
| 62 - 509  | -                        | -          | Don't care. Any contents acceptable                       |
| 510 - 511 | 0xAA55                   | 0x55AA     | Signature flag  |

**3.3.3.1.4 Directory Information in DICOMDIR**

Conformant Application Entities shall include in the DICOMDIR File a Basic Directory IOD containing Directory Records at the Patient and subsidiary levels appropriate to the SOP Classes in the File-set. All DICOM files in the File-set incorporating SOP Instances defined for the specific Application Profile shall be referenced by the Directory Records.

All DICOM SOP Instance files in the File-set are stored in the MSDOS file system subdirectory \GEMS and are referenced from the DICOMDIR directory records.

**Refer to Appendix C for a complete listing of all the optional modules and optional attributes used in the DICOMDIR definition. Please note that the mandatory attributes in each of the directory records as mentioned in Part 3 Addendum (Basic Directory Information Object Definition) are not listed in the appendix, but are supported by the implementation.**

**NOTE:**

The modality attribute (0008,0060) in the DICOMDIR Series records should be CT/MR for Secondary Capture and Standalone Overlay SOP Class Images. Otherwise the SIGNA CONTOUR DICOM media display browser will not list-up the series for contents rendering the retrieval to local storage impossible.

**3.3.3.1.4.1 Additional Keys**

None.

**3.3.3.1.5 Other Parameters**

This section defines other parameters common to all specific Application Profiles in the STD-CTMR-MOD12 class which need to be specified in order to ensure interoperable information interchange.

### 3.3.3.1.5.1 Image Attribute Values

The attributes listed in Table 3.3.3.1.5.1-1 used within the CT/MR/SC/Standalone Overlay Image files, shall take the values specified.

**Table 3.3.3.1.5.1-1: CTMR-MOD Required Image Attribute Values for CT and MR, SC and OV Images**

| Attribute                  | Tag         | Value       |
|----------------------------|-------------|-------------|
| Modality                   | (0008,0060) | CT/MR       |
| Photometric Interpretation | (0028,0004) | MONOCHROME2 |
| Bits Allocated             | (0028,0100) | 16          |
| Bits Stored                | (0028,0101) | 16          |

Overlay data if present shall be encoded in Overlay Data (60XX,3000).

#### 3.3.3.1.5.1.1 Attribute Value Precedence

None.

### 3.3.3.2 STD-CTMR-MOD23 Class Profile

#### 3.3.3.2.1 SOP Classes and Transfer Syntaxes

This class of Application Profiles is based on the Media Storage Service Class with the Interchange Option. (see PS3.4).

SOP Classes and corresponding Transfer Syntaxes supported by the STD-CTMR-MOD23 Application Profiles is also specified in the Table 3.3.3.1.1-1.

#### 3.3.3.2.2 Physical Media and Media Formats

The CT/MR Application Profiles in the STD-CTMR-MOD23 require the 130mm 1.2GB 512 Byte per Sector Magneto-Optical Rewritable physical media with the PC File System as defined in PS3.12.

#### 3.3.3.2.3 Logical Format

The STD-CTMR-MOD23 Application profile media format conforms to the Logical Format specification in PS3.12. The following table 3.3.3.2.3-1 defines the specific values used for this profile.

**Table 3.3.3.2.3-1 : Boot Sector for STD-CTMR-MOD23 conformance media**

| Bytes(s) | Big Endian         | As Stored | Description                                     |
|----------|--------------------|-----------|---|
| 00 - 02  |                    | 0xEB3C90  | Jump instruction to loader (NOPs)               |
| 03 - 10  | 0x4D53444F53342E30 |           | “MSDOS4.0” The formatting DOS (vendor specific) |
| 11 - 12  | 0x0200             | 0x0002    | 512 bytes/sector                                |

|           |                          |            |   |
|-----------|--------------------------|------------|---|
| 13        | 64                       | 0x40       | sectors/cluster   |
| 14-15     | 0x0001                   | 0x0100     | 1 sector in boot record                                   |
| 16        | 0x02                     | 0x02       | 2 File Allocation Tables (FAT)                            |
| 17 - 18   | 0x0200                   | 0x0002     | 512 root directory entries                                |
| 19 - 20   | 0x0000                   | 0x0000     | Flag for more than 65536 sector/disk. Use offset 32 value |
| 21        | 0xF8                     | 0xF8       | Flag for disk type; FOH if not otherwise specified        |
| 22 - 23   | 138                      | 0x8E00     | 138 sectors/FAT   |
| 24 - 25   | 62                       | 0x3E00     | 62 sectors/track  |
| 26 - 27   | 1                        | 0x0100     | 1 side (head) per disk                                    |
| 28 - 31   | 00000000                 | 0x0...0    | 0 reserved or hidden sectors                              |
| 32 - 35   | 2244896                  | 0x20412200 | 2244896 Total sector/disk. Varies from disk to disk       |
| 36 - 37   | 0x0080                   | 0x8000     | Physical Drive number = 80                                |
| 38        | 0x29                     | 0x29       | Extended boot record signature = 41                       |
| 39 - 42   | <i>Date Stamp</i>        |            | Volume serial number                                      |
| 43 - 53   | 0x47454D535F4449434F4D20 |            | "GEMS-DICOM"  |
| 54 - 61   | 0x0...0                  | 0x0...0    | The file system label                                     |
| 62 - 509  | -                        | -          | Don't care. Any contents acceptable                       |
| 510 - 511 | 0xAA55                   | 0x55AA     | Signature flag  |

### 3.3.3.2.4 Directory Information in DICOMDIR

Conformant Application Entities shall include in the DICOMDIR File a Basic Directory IOD containing Directory Records at the Patient and subsidiary levels appropriate to the SOP Classes in the File-set. All DICOM files in the File-set incorporating SOP Instances defined for the specific Application Profile shall be referenced by the Directory Records.

All DICOM SOP Instance files in the File-set are stored in the MSDOS file system subdirectory \GEMS and are referenced from the DICOMDIR directory records.

**Refer to *Appendix C* for a complete listing of all the optional modules and optional attributes used in the DICOMDIR definition. Please note that the mandatory attributes in each of the directory records as mentioned in Part 3 Addendum (Basic Directory Information Object Definition) are not listed in the appendix, but are supported by the implementation.**

**NOTE:**

The modality attribute (0008,0060) in the DICOMDIR Series records should be CT/MR for Secondary Capture and Standalone Overlay SOP Class Images. Otherwise the SIGNA CONTOUR DICOM media display browser will not list-up the series for contents rendering the retrieval to local storage impossible.

#### 3.3.3.2.4.1 Additional Keys

None.

#### 3.3.3.2.5 Other Parameters

This section defines other parameters common to all specific Application Profiles in the STD-CTMR-MOD23 class which need to be specified in order to ensure interoperable information interchange.

#### 3.3.3.2.5.1 Image Attribute Values

The attributes listed in Table 3.3.3.1.5.1-1 used within the CT/MR/SC/Standalone Overlay Image files, shall take the values specified.

Overlay data if present shall be encoded in Overlay Data (60XX,3000).

#### **3.3.3.2.5.1.1 Attribute Value Precedence**

None.

### **3.3.4 Private Application Profiles**

The MOD Archive Server supports a private Application Profile: PRI-CTMR-MOD12 as an FSR or FSU.

#### **3.3.4.1 PRI-CTMR-MOD12 Class Profile**

##### **3.3.4.1.1 SOP Classes and Transfer Syntaxes**

This class of Application Profiles is based on the Media Storage Service Class with the Interchange Option. (see PS3.4).

SOP Classes and corresponding Transfer Syntaxes supported by the PRI-CTMR-MOD12 Application Profiles is specified in the Table 3.3.3.1.1-1.

**NOTE:**

The MOD Archive Application chooses the JPEG Lossless compression (selection value 1) as the default transfer syntax for storing images on the media. But the transfer syntax is selectable on a per media basis at install time using a method defined by the Application.

The SOP instance files in the Media File-set in the PRI-CTMR-MID12 profile uses a non-standard JPEG compression process resulting in interoperability problems when decoded using readily available industry decompression routine. See section 3.4.3 for details of the encoding problem unique to the PRI-CTMR-MOD12 profile.

##### **3.3.4.1.2 Physical Media and Media Formats**

The CT/MR Application Profiles in the PRI-CTMR-MOD12 require the 130mm 1.2GB 512 Byte per Sector Magneto-Optical Rewritable physical media with the PC File System as defined in PS3.12.

##### **3.3.4.1.3 Logical Format**

The PRI-CTMR-MOD12 Application profile media format conforms to the Logical Format specification in PS3.12. Table 3.3.3.1.3-1 defines the specific values used for this profile.

##### **3.3.4.1.4 Directory Information in DICOMDIR**



Conformant Application Entities shall include in the DICOMDIR File a Basic Directory IOD containing Directory Records at the Patient and subsidiary levels appropriate to the SOP Classes in the File-set. All DICOM files in the File-set incorporating SOP Instances defined for the specific Application Profile shall be referenced by the Directory Records.

All DICOM SOP Instance files in the File-set are stored in the MSDOS file system subdirectory \GEMS and are referenced from the DICOMDIR directory records.

**Refer to Appendix C for a complete listing of all the optional modules and optional attributes used in the DICOMDIR definition. Please note that the mandatory attributes in each of the directory records as mentioned in Part 3 Addendum (Basic Directory Information Object Definition) are not listed in the appendix, but are supported by the implementation.**

Directory records found in the PRI-CTMR-MOD12 profile do not contain the Attribute "Frame of Reference" (0020,0052). This Attribute was specified as Required after the first release of this Application Profile.

#### **3.3.4.1.4.1 Additional Keys**

None.

#### **3.3.4.1.5 Other Parameters**

This section defines other parameters common to all specific Application Profiles in the PRI-CTMR-MOD12 class which need to be specified in order to ensure interoperable information interchange. See 3.4.2 for JPEG encoding problem in the PRI-CTMR-MOD12 profile.

#### **3.3.4.1.5.1 Image Attribute Values**

The attributes listed in Table 3.3.3.1.5.1-1 used within the CT/MR/SC/Standalone Overlay Image files, shall take the values specified.

Overlay data if present shall be encoded in Overlay Data (60XX,3000).

#### **3.3.4.1.5.1.1 Attribute Value Precedence**

None.

### **3.4 Extensions, Specialization's and Privatization's of SOP Classes and Transfer Syntaxes**

#### **3.4.1 Extensions, Specialization's and Privatization's of SOP Classes**

The CT/MR SOP Class Images have definitions extended for Defined Terms and include GE specific Private Data elements. The following sections describe the details for these SOP classes.

### 3.4.1.1 SOP Specific Conformance Statement for CT SOP Class

Refer to *section 2.4* for standard extensions and *Appendix B* for private data elements.

### 3.4.1.2 SOP Specific Conformance Statement for MR SOP Class

Refer to *section 2.4* for standard extensions and *Appendix B* for private data elements.

### 3.4.2 Private Transfer Syntax Specification

The SOP instance files in the Media File-set in the PRI-CTMR-MOD12 profile uses a non-standard JPEG compression process resulting in interoperability problems when decoded using readily available industry standard JPEG decompression routines.

## 3.5 Configuration

The MOD Archive Application will have only 1.2GB drive installed.

**Table 3.5-1 : Supported Profiles for various Drive Configurations**

| <b>Disk Drive Installed</b> | <b>Profiles Supported</b> |
|-----------------------------|---------------------------|
| 1.3 GB Optical Disk Drive   | PRI-CTMR-MOD12            |
|                             | STD-CTMR-MOD12            |
| 2.6 GB Optical Disk Drive   | PRI-CTMR-MOD12            |
|                             | STD-CTMR-MOD12            |
|                             | STD-CTMR-MOD23            |

## 3.6 Support of Extended Character Sets

The MOD Archive Application will support copy of SOP instances containing the ISO IR 100 (Latin alphabet No. 1, supplementary set) and DICOM default character sets as defined in PS3.5.

## 4 PRINT SCU CONFORMANCE

### 4.0 Introduction

This Conformance Statement (CS) specifies the SIGNA CONTOUR compliance to DICOM v3.0. It details the DICOM Service Classes and roles which are supported by this product in its version 7.66.

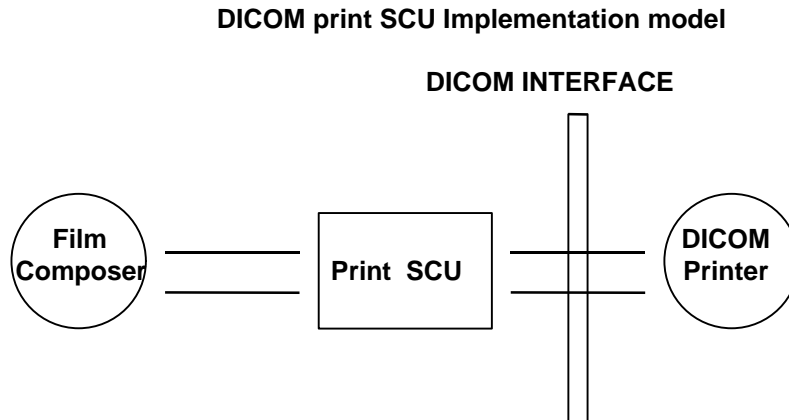
The SIGNA CONTOUR product uses DICOM services to provide the DICOM Print SCU Application Profile. The SIGNA CONTOUR product uses DICOM Print SCU to print images on DICOM Compliant Printers.

Note the format of this section follows the format of the DICOM Standard Part 2 (conformance) Annex A hence the paragraph numbering scheme. Please refer to that part of the standard while reading this section.

### 4.1 IMPLEMENTATION MODEL : PRINT SCU

The DICOM Print SCU is a DICOM print filter which provides the capability to print images to DICOM printers. The DICOM Print filter acts as an SCU of the DICOM print management SOP class.

#### 4.1.1 Application Data Flow Diagram



Film Composer is the User interface and this is used to initiate the local real world activity. User issues the print request using Film Composer. Film composer allows printer selection and it composes the preformatted film file. This film file is interpreted by SCU and it sends the appropriate messages to DICOM print SCP running on DICOM printer.

#### 4.1.2 Functional Definition of AE's

DICOM Print SCU Establishes the Association with requested printer to print the composed film. If the Remote AE accepts the presentation context applicable to the print job, the DICOM Print AE SCU will send the print job to the receiving Remote AE by using the N-CREATE and N-SET services.

**4.1.3 Sequencing of Real-World Activities**

- User has to select the DICOM printer from Film Composer Interface.
- The images to be printed shall be dragged and dropped into film composer slots from Viewing applications either manually or automatically.
- In case of manual drag and drop user has to press Print Button to print the images .
- The Print SCU will start the Print Session. The Print Session involves establishing association with printer followed by the next sequence of activities.
- The Print SCU gets the Printer status using N-GET service. If the Printer returns FAILURE status the print session will be terminated and the requester will be notified of the printer status.
- The film session is created using N-CREATE service. In case of error return the print session will be terminated. The attribute values for the Film session will be specified with the film session request.
- The film box is created using N-CREATE service. The print session will be terminated if the printer fails to create the film box. The film box attribute values will be sent in the film box create request.
- The image attributes for the images to be printed in this session will be set using the N-SET service. If the printer fails to accommodate the images in the image set to be printed the print session will be terminated.
- The film will be printed using the N-ACTION service. Only film box printing is supported. In case of error the print session will be terminated.
- Film box instance will be deleted using the N-DELETE service.
- The SCU does not wait for N-EVENT-REPORT from Printer after deleting the film box instance. The N-EVENT-REPORT received when the association is still active are handled but the data received will be ignored.
- Finally the association will be terminated and if all the above operations are successful the requester will be notified of the successful print session. This just indicates the images to be printed have been successfully sent to the printer.

**4.2 AE SPECIFICATIONS**

**4.2.1 DICOM Print SCU AE Specification**

Print SCU provides Standard Conformance to the following DICOM 3.0 SOP classes as an SCU:

| SOP CLASS name                                  | SOP CLASS UID                 |
|---|-------------------------------|
| Basic grayscale print management meta SOP class | <b>1.2.840.10008.5.1.1.9</b>  |
| Printer SOP class                               | <b>1.2.840.10008.5.1.1.16</b> |

## 4.2.2 Association Establishment Policy

### 4.2.2.1 General

The Print SCU provides options to indicate the printer AE title, Printer host name. In this product these inputs are provided by Film Composer. Depending on these inputs the Print SCU will establish the association with the desired printer.

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

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

The Maximum Length PDU negotiation is included in all association establishment requests. The maximum length PDU for association initiated by the DICOM Print SCU AE is:

|                           |                  |
|---------------------------|------------------|
| <b>Maximum Length PDU</b> | <b>10 Kbytes</b> |
|---------------------------|------------------|

### 4.2.2.2 Number of Associations

The Print SCU will initiate only one association with printer. This will not initiate any other associations while the current association is active.

### 4.2.2.3 Asynchronous Nature

The print SCU does not support asynchronous operations. All operations will be performed synchronously.

### 4.2.2.4 Implementation identifying information

The Implementation UID allows unique identification of a set of products that share the same implementation.

The Implementation UID for this GEMS Implementation is:

|   |                             |
|---|-----------------------------|
| <b>SIGNA CONTOUR Implementation UID</b> | <b>1.2.840.113619.6.100</b> |
|---|-----------------------------|

## 4.2.3 Association Establishment Policy

Print SCU initiates association with the Printer (which is running DICOM print SCP) provided as input to print SCU by film Composer.

**4.2.3.1 Real World Activity**

**4.2.3.1.1 Associated Real-World Activity - “Print”**

The Film Composer allows the user to select printers and it also allows the user to drag and drop the images (from viewer application) into the film. It also allows the user to manipulate some print parameters like film format and number of copies to print. When user presses the "Print" Button the Film composer communicates this request to Print SCU which then tries to establish the association with requested printer and sends the images for printing.

**4.2.3.1.2 Proposed Presentation Contexts**

The Proposed Presentation Context table for the Print SCU is as shown in following Table.

| Presentation Context Table                 |                        |  |                   |      |                      |
|--|------------------------|--|-------------------|------|----------------------|
| Abstract Syntax                            |                        | Transfer Syntax                                |                   | Role | Extended Negotiation |
| Name                                       | UID                    | Name   | UID               |      |                      |
| Basic Grayscale Print Management SOP Class | 1.2.840.10008.5.1.1.9  | DICOM Implicit VRLittle Endian Transfer Syntax | 1.2.840.10008.1.2 | SCU  | None                 |
| Printer SOP Class                          | 1.2.840.10008.5.1.1.16 | DICOM Implicit VRLittle Endian Transfer Syntax | 1.2.840.10008.1.2 | SCU  | None                 |

**4.2.3.1.3 SOP Specific Conformance Statement**

The Print SCU supports the following mandatory SOP classes which are defined under the Basic Grayscale Print Management Meta SOP Class.

Mandatory Print SOP Classes supported by Print SCU :

| NAME                                | UID                  |
|-------------------------------------|----------------------|
| Basic Film Session SOP Class        | 1.2.840.10008.5.1.1  |
| Basic Film Box SOP Class            | 1.2.840.10008.5.1.2  |
| Basic Grayscale Image Box SOP Class | 1.2.840.10008.5.1.4  |
| Printer SOP Class                   | 1.2.840.10008.5.1.16 |

The Print SCU does not support any optional SOP class

**4.2.3.1.3.1 Basic Film Session SOP Class**

The Print SCU supports the following DIMSE Service Elements for the Basic Film Session SOP Class.

N-CREATE - Requests the Print SCP to create an instance of Basic Film Session.

The following Attribute values are supported by the N-CREATE:

| Attribute         | DICOM Tag      | Valid Range                      | Default Value             |
|-------------------|----------------|----------------------------------|---------------------------|
| Number of Copies  | ( 2000, 0010 ) | 1-99                             | Set by user               |
| Print Priority    | ( 2000, 0020 ) | HIGH                             | HIGH                      |
| Medium Type       | ( 2000, 0030 ) | CLEAR FILM<br>BLUE FILM<br>PAPER | Set in Configuration File |
| Film Destination  | ( 2000, 0040 ) | MAGAZINE<br>PROCESSOR            | Set in Configuration File |
| Session Label     | ( 2000, 0050 ) | "Sdc_DICOM_PRINT"                | "Sdc_DICOM_PRINT"         |
| Memory Allocation | ( 2000, 0060 ) | Sent zero length                 | Sent zero length          |

If a Failure status is returned during N-CREATE operation of Film session following action will be taken by Print SCU.

0x213 "Resource Limitation" message will be sent.

All other status "Failure" message will be sent.

In all the cases the print session will be terminated.

#### 4.2.3.1.3.2 Basic Film box SOP Class

The Print SCU supports the following DIMSE Service Elements for the Basic Film Box SOP Class.

N-CREATE - Requests the Print SCP to create an instance of Film Box.

N-ACTION - Requests the Print SCP to print the Film Box onto Printer.

N-DELETE - Requests the Print SCP to delete the Film Box Instance.

The Following Attribute values for the N-CREATE are supported.

| Attribute                       | DICOM Tag      | Valid Range                            | Default Value             |
|---------------------------------|----------------|--|---------------------------|
| Image Display Format            | ( 2010, 0010 ) | STANDARD/C,R<br>Printer Dependent      | Set in User Interface     |
| Reference Film Session Sequence | ( 2010, 0500 ) |  |                           |
| Film Orientation                | ( 2010, 0040 ) | PORTRAIT                               | Set in Configuration File |
| Film Size ID                    | ( 2010, 0050 ) | Sent zero length                       | Sent zero length          |
| Magnification type              | ( 2010, 0060 ) | BILINEAR<br>CUBIC<br>REPLICATE<br>NONE | Set in Configuration File |
| Max Density                     | ( 2010, 0130 ) | 0-4095                                 | Set in Configuration File |
| Configuration Information       | ( 2010, 0150 ) | Printer Dependent                      | Set in Configuration File |
| Smoothing type                  | ( 2010, 0080 ) | Printer Dependent                      | Set in Configuration File |
| Border density                  | ( 2010, 0100 ) | BLACK<br>WHITE                         | Set in Configuration File |
| Empty image density             | ( 2010, 0110 ) | BLACK<br>WHITE                         | Set in Configuration File |

|             |                |        |                           |
|-------------|----------------|--------|---------------------------|
| Min density | ( 2010, 0120 ) | 0-4095 | Set in Configuration File |
|-------------|----------------|--------|---------------------------|

**Note:** Attributes "sent zero length" use the camera default values.

If Failure status is returned during N-CREATE operation of Film box following action will be taken by Print SCU.

0x213 "Resource Limitation" message will be sent.

0x106 "Unsupported Film Format" message will be sent.

All other status "Failure" message will be sent

In all the cases the print session will be terminated.

If Failure status is returned during N-ACTION operation of Film box following action will be taken by Print SCU.

0xC602 "Unable to Create Print Job" message will be sent.

All other status "Failure" message will be sent.

In all the cases the print session will be terminated.

If Failure status is returned during N-DELETE operation of Film box following action will be taken by Print SCU.

All the return status "Failure" message will be sent and the print session will be terminated.

#### 4.2.3.1.3.3 Basic Grayscale Image Box SOP Class

The Print SCU supports the following DIMSE Service Elements for Grayscale Image Box SOP Class.

N-SET - Requests the Printer to set the image box attributes.

The Following Attribute values are supported.

| Attribute                             | DICOM Tag      | Valid Range                   | Default Value       |
|---------------------------------------|----------------|-------------------------------|---------------------|
| Image Position                        | ( 2020, 0010 ) | Based on Image Display format | No Default Value    |
| Preformatted Grayscale Image Sequence | ( 2020, 0110 ) |                               |                     |
| >Samples per pixel                    | ( 0028, 0002 ) | 1                             | 1                   |
| >Photometric Interpretation           | ( 0028, 0004 ) | MONOCHROME2                   | MONOCHROME2         |
| >Rows                                 | ( 0028, 0010 ) | Image Dependent               | Image Dependent     |
| >Columns                              | ( 0028, 0011 ) | Image Dependent               | Image Dependent     |
| >Pixel Aspect Ratio                   | ( 0028, 0034 ) | 1/1                           | 1/1                 |
| >Bits Allocated                       | ( 0028, 0100 ) | 8                             | 8                   |
| >Bits Stored                          | ( 0028, 0101 ) | 8                             | 8                   |
| >High Bit                             | ( 0028, 0102 ) | 7                             | 7                   |
| >Pixel Representation                 | ( 0028, 0103 ) | 0(unsigned integer)           | 0(unsigned integer) |
| Polarity                              | ( 0020, 0020 ) | NORMAL                        | NORMAL              |



If Failure status is returned during N-SET operation of Image Box following action will be taken by Print SCU.  
 0xC605 "Resources temporarily not available" message will be sent.  
 All other status "Failure" message will be sent.  
 In all the cases the print session will be terminated.

#### 4.2.3.1.3.4 Printer SOP Class

N-GET DIMSE service is supported for Printer SOP Class. If an N-EVENT-REPORT DIMSE service is received when association is active, Print SCU handles the relevant states but the data received is ignored.

The Print SCU issues the request to retrieve following attributes.

If Printer returns Printer Status of FAILURE the association is terminated and the requester will be notified of the printer status. If the WARNING status is received the SCU will continue with the print session.

| Optional Attribute       | DICOM Tag      | Default Value              |
|--------------------------|----------------|----------------------------|
| *Printer Status          | ( 2110, 0010 ) | Printer shall return Value |
| *Printer Status Info     | ( 2110, 0020 ) | Printer shall return Value |
| *Printer Name            | ( 2110, 0030 ) | Printer shall return Value |
| *Manufacturer            | ( 0008, 0070 ) | Printer shall return Value |
| *Manufacturer Model Name | ( 0008, 1090 ) | Printer shall return Value |
| *Device Serial No.       | ( 1800, 1000 ) | Printer shall return Value |
| *Software Versions       | ( 1800, 1020 ) | Printer shall return Value |
| *Date Last Calibrated    | ( 1800, 1200 ) | Printer shall return Value |
| *Time Last Calibrated    | ( 1800, 1201 ) | Printer shall return Value |

The Print SCU issues the N-GET service to retrieve the printer status. The statuses are processed as follows:

- If Printer status (2110,0010) is NORMAL, the film is printed.
- If Printer status (2110,0010) is FAILURE the print job is terminated. The Printer Status Info (2110,0020) attribute is not processed.
- If Printer status (2110,0010) is WARNING one of three things will happen:
  - a) If the Printer Status Info (2110,0020) is "SUPPLY LOW" the status is displayed to the user and the print job continues.
  - b) If the Printer Status Info (2110,0020) is "RECEIVER FULL" or "SUPPLY EMPTY", or "FILM JAM" the status is displayed to the user and the print job is aborted.
  - c) For all other Printer Status Info (2110,0020) values, the status is ignored and the print job continues.

#### 4.2.4 Association Acceptance Policy

The Print SCU does not accept associations.

## **4.3 COMMUNICATION PROFILES**

### **4.3.1 Supported Communication Stacks (parts 8,9)**

DICOM Upper Layer (Part 8) is supported using TCP/IP.

### **4.3.2 TCP/IP Stack**

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

#### **4.3.2.1 API**

Not Applicable

#### **4.3.2.2 Physical Media Support**

Ethernet v2.0, IEEE 802.3.

## **4.4 Standard Extended/Specialised/Private SOPs**

None.

## **4.5 Configuration**

### **4.5.1 AE Title/Presentation Address Mapping**

The Local AE title is "Print\_SCU" .

The SIGNA CONTOUR system allows the user to "add", "Remove", or "Update" the mapping of remote DICOM Printer AE Titles to IP Addresses and Ports. These options can be selected from the "Remote Printer Selection" menu displayed by choosing "Configure" button from the Film Composer .

## 4.5.2 Configurable Parameters

The following fields are configurable for the DICOM Print SCU AE:

- Local IP Address
- Local IP Netmask
- Max PDU length
- Time-outs, which are set for all hosts, are configurable in dprint.cfg:
  - \*Association time-out           - *bi\_assoc\_tio*
  - \*Session timeout               - *bi\_session\_tio*
  - \*Create timeout                 - *bi\_ncreate\_tio*

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

## 4.6 Support of Extended Character Set

The Print SCU does not support any Extended Character Set.

## Appendix A IDO Definitions

Enclosed is a listing of only the Optional/Conditional modules/attributes used by this implementation for CT/MR/SC and Standalone Overlay IOD's.

**NOTE:**

All other modules which are mandatory and consist of only type 1 elements and attributes which are type 1 pre DICOM standard are supported by this implementation but are not explicitly listed here.

### A.1 CT Specific IOD Definition

#### A.1.1 CT Image IOD Modules

| Entity Name        | Module Name        | Reference                          | Usage |
|--------------------|--------------------|------------------------------------|-------|
| Patient            | Patient            | A.5.1                              | M     |
| Study              | General Study      | A.5.2                              | M     |
|                    | Patient Study      | A.5.3                              | U     |
| Series             | General Series     | A.5.4                              | M     |
| Frame of Reference | Frame of Reference | A.5.12                             | M     |
| Equipment          | General Equipment  | A.5.5                              | M     |
| Image              | General Image      | A.5.6                              | M     |
|                    | Image Plane        | A.5.7                              | M     |
|                    | Image Pixel        | Only the type 1 elements are sent. | M     |
|                    | Contrast/Bolus     | A.5.8                              | C     |
|                    | CT Image           | A.1.2                              | M     |
|                    | SOP Common         | A.5.9                              | M     |

#### A.1.2 CT Image Module

| Attribute Name              | Tag         | Type | Notes   |
|-----------------------------|-------------|------|---|
| Rescale Intercept           | (0028,1052) | 1    | -1024 or 0 sent   |
| Rescale Slope               | (0028,1053) | 1    | Value of 1 is sent  |
| KVP                         | (0018,0060) | 2    | Value always sent.  |
| Acquisition Number          | (0020,0012) | 2    | Value always sent.  |
| Date Collection Diameter    | (0018,0090) | 3    | Value always sent.  |
| Reconstruction Diameter     | (0018,1100) | 3    | Value sent for all images except scouts.  |
| Distance Source to Detector | (0018,1110) | 3    | Value always sent.  |
| Distance Source to Patient  | (0018,1111) | 3    | Value always sent.  |
| Gantry / Detector Tilt      | (0018,1120) | 3    | Value always sent.  |
| Table Height                | (0018,1130) | 3    | Value always sent.  |
| Rotation Direction          | (0018,1140) | 3    | Not sent for scout or axial   |
| Exposure Time               | (0018,1150) | 3    | Value always sent.  |
| Xray Tube Current           | (0018,1151) | 3    | Value always sent.  |
| Exposure                    | (0018,1152) | 3    | Value always sent.  |
| Filter Type                 | (0018,1160) | 3    | Sent.<br>Defined terms:<br><b>BODY FILTER</b><br><b>BOWTIE FLAT FILT</b><br><b>FLAT FILTER</b><br><b>LARGE BOWTIE FIL</b> |
| Focal Spot                  | (0018,1190) | 3    | Sent. Fixed value of 0.7 or 1.2   |
| Convolution Kernel          | (0018,1210) | 3    | Not sent for scouts.<br>Defined Terms:  |

|  |  |  |   |
|--|--|--|---|
|  |  |  | <u>SMOOTH</u><br><u>SOFT</u><br><u>STANDARD</u><br><u>DETAIL</u><br><u>BONE</u><br><u>EDGE</u><br><u>SHARP</u><br><u>LUNG</u> |
|--|--|--|---|

## A.2 MR Specific IOD Definition

### A.2.1 MR Image IOD Modules

| Entity Name        | Module Name        | Reference                          | Usage |
|--------------------|--------------------|------------------------------------|-------|
| Patient            | Patient            | A.5.1                              | M     |
| Study              | General Study      | A.5.2                              | M     |
|                    | Patient Study      | A.5.3                              | U     |
| Series             | General Series     | A.5.4                              | M     |
| Frame of Reference | Frame of Reference | A.5.12                             | M     |
| Equipment          | General Equipment  | A.5.5                              | M     |
| Image              | General Image      | A.5.6                              | M     |
|                    | Image Plane        | A.5.7                              | M     |
|                    | Image Pixel        | Only the type 1 elements are sent. | M     |
|                    | Contrast/Bolus     | A.5.8                              | C     |
|                    | MR Image           | A.2.2                              | M     |
|                    | SOP Common         | A.5.9                              | M     |

### A.2.2 MR Image Module

| Attribute Name              | Tag         | Type | Notes  |
|-----------------------------|-------------|------|--|
| Scan Options                | (0018,0022) | 2    | Always sent. (even if value is zero length)                                    |
| MR Acquisition Type         | (0018,0023) | 2    | 2D or 3D depending on acquisition type.  |
| Repetition Time             | (0018,0080) | 2C   | Sent if Scanning Sequence is <b>EP</b> and Sequence Variant is <b>not SK</b> . |
| Echo Time                   | (0018,0081) | 2    | Always Sent. (even if value is zero length)                                    |
| Inversion Time              | (0018,0082) | 2C   | Always Sent. (even if value is zero length)                                    |
| Echo Train Length           | (0018,0091) | 2    | Always Sent. (even if value is zero length)                                    |
| Trigger Time                | (0018,1060) | 2C   | Always Sent. (even if value is zero length)                                    |
| Angio Flag                  | (0018,0025) | 3    | Always sent 'Y' or 'N'   |
| Number Of Averages          | (0018,0083) | 3    | Always sent (even if value is zero length)                                     |
| Imaging Frequency           | (0018,0084) | 3    | Always sent (even if value is zero length)                                     |
| Imaged Nucleus              | (0018,0085) | 3    | Zero-length element is sent.   |
| Echo Number                 | (0018,0086) | 3    | Always sent. (even if value is zero length)                                    |
| Magnetic Field Strength     | (0018,0087) | 3    | Sent if available, else not sent   |
| Spacing Between Slices      | (0018,0088) | 3    | Always sent (even if value is zero length)                                     |
| Percent Sampling            | (0018,0093) | 3    | Always sent (even if value is zero length)                                     |
| Percent Phase Field of View | (0018,0094) | 3    | Always sent (even if value is zero length)                                     |
| Pixel Bandwidth             | (0018,0095) | 3    | Sent if available, else not sent   |
| Nominal Interval            | (0018,1062) | 3    | Sent if available, else not sent   |
| Heart Rate                  | (0018,1088) | 3    | Sent if available, else not sent   |
| Cardiac Number of Images    | (0018,1090) | 3    | Sent if available, else not sent   |
| Trigger Window              | (0018,1094) | 3    | Sent if available, else not sent   |
| Reconstruction Diameter     | (0018,1100) | 3    | Always sent. (even if value is zero length)                                    |

|                          |             |   |  |
|--------------------------|-------------|---|--|
| Receiving Coil           | (0018,1250) | 3 | Sent if available, else not sent.  |
| Transmitting Coil        | (0018,1251) | 3 | Sent if available, else not sent.  |
| Acquisition Matrix       | (0018,1310) | 3 | Sent if available, else not sent.  |
| Phase Encoding Direction | (0018,1312) | 3 | Sent if available, else not sent. Is 'ROW' or 'COL' if sent.                                     |
| Flip Angle               | (0018,1314) | 3 | Sent if available, else not sent.  |
| Variable Flip Angle Flag | (0018,1315) | 3 | Always sent. Value is 'Y' for RAMPED_x: where x is AP, IS, IR, PA, SI, or AL, else value is 'N'. |
| SAR                      | (0018,1316) | 3 | Sent if available, else not sent.  |
| Temporal Resolution      | (0020,0110) | 3 | Always sent. (even if value is zero length)  |

### A.3 SC Specific IOD Definition

#### A.3.1 SC Image IOD Modules

| Entity Name | Module Name       | Reference                                      | Usage |
|-------------|-------------------|--|-------|
| Patient     | Patient           | A.5.1  | M     |
| Study       | General Study     | A.5.2  | M     |
|             | Patient Study     | A.5.3  | U     |
| Series      | General Series    | A.5.4  | M     |
| Equipment   | General Equipment | A.5.5  | U     |
|             | SC Equipment      | A.5.13   | M     |
| Image       | General Image     | A.5.6  | M     |
|             | Image Pixel       | Only the type 1 elements are sent.             | M     |
|             | SC Image          | Not sent (consists entirely of type 3 element) | M     |
|             | Modality LUT      | Only the type 1C elements are sent.            | U     |
|             | VOI LUT           | A.5.11   | U     |
|             | SOP Common        | A.5.9  | M     |

### A.4 Standalone Overlay Specific IOD Definition

#### A.4.1 Standalone Overlay Image IOD Modules

| Entity Name | Module Name            | Reference | Usage |
|-------------|------------------------|-----------|-------|
| Patient     | Patient                | A.5.1     | M     |
| Study       | General Study          | A.5.2     | M     |
|             | Patient Study          | A.5.3     | U     |
| Series      | General Series         | A.5.4     | M     |
| Equipment   | General Equipment      | A.5.5     | M     |
| Overlay     | Overlay Identification | A.5.14    | M     |
|             | Overlay Plane          | A.5.10    | M     |
|             | SOP Common             | A.5.9     | M     |

### A.5 CT/MR/SC/Standalone Overlay IOD Common Table Definitions

#### A.5.1 Patient Module

| Attribute Name | Tag         | Type | Notes  |
|----------------|-------------|------|--|
| Patient's Name | (0010,0010) | 2    | As entered at the user interface or from worklist. Supports 5 different components delimited by "^". Supports a maximum length of 64 characters including the delimiter. Delimiters must be operator, entered from the |

|                              |             |    |  |
|------------------------------|-------------|----|--|
|                              |             |    | user interface.                                |
| Patient ID                   | (0010,0020) | 2  | As entered at user interface or from worklist. |
| Patient's Birth Date         | (0010,0030) | 2  | Always sent zero length.                       |
| Patient's Sex                | (0010,0040) | 2  | Always sent.                                   |
| Referenced Patient Sequence  | (0008,1120) | 3  | Not used. Will be discarded.                   |
| >Referenced SOP Class UID    | (0008,1150) | 1C | Not used. Will be discarded.                   |
| >Referenced SOP Instance UID | (0008,1155) | 1C | Not used. Will be discarded.                   |
| Patient's Birth Time         | (0010,0032) | 3  | Not used. Will be discarded.                   |
| Other Patient IDs            | (0010,1000) | 3  | Not used. Will be discarded.                   |
| Other Patient Names          | (0010,1001) | 3  | Not used. Will be discarded.                   |
| Ethnic Group                 | (0010,2160) | 3  | Not used. Will be discarded.                   |
| Patient Comments             | (0010,4000) | 3  | Not used. Will be discarded.                   |

**A.5.2 General Study Module**

| Attribute Name                     | Tag         | Type | Notes  |
|------------------------------------|-------------|------|--|
| Study Instance UID                 | (0020,000D) | 1    | Value from worklist is used if present and single worklist entry. Value is generated uniquely for each exam if worklist entry is not present or multiple worklists entries are satisfied with this study.. |
| Study Date                         | (0008,0020) | 2    | Generated for each exam and always sent.   |
| Study Time                         | (0008,0030) | 2    | Generated for each exam and always sent.   |
| Referring Physician's Name         | (0008,0090) | 2    | Value from user interface or modality worklist. Truncated to 33 characters.  |
| Study ID                           | (0020,0010) | 2    | Value from user interface or worklist sent.  |
| Accession Number                   | (0008,0050) | 2    | Value from user interface or worklist sent.  |
| Study Description                  | (0008,1030) | 3    | Value from user interface or worklist sent.  |
| Physician(s) of Record             | (0008,1048) | 3    | Value from user interface or worklist sent.  |
| Name of Physician(s) Reading Study | (0008,1060) | 3    | Not supported. Data will be lost.  |
| Referenced Study Sequence          | (0008,1110) | 3    | Value from the worklist  |
| >Referenced SOP Class UID          | (0008,1150) | 1C   | Value from the worklist  |
| >Referenced SOP Instance UID       | (0008,1155) | 1C   | Value from the worklist  |

**A.5.3 Patient Study Module**

| Attribute Name                  | Tag         | Type | Notes   |
|---------------------------------|-------------|------|---|
| Admitting Diagnoses Description | (0008,1080) | 3    | Not Supported. Information will be removed.                                 |
| Patient's Age                   | (0010,1010) | 3    | Calculated from Date of Birth entered at user interface.                    |
| Patient's Size                  | (0010,1020) | 3    | Not Supported. Information will be removed.                                 |
| Patient's Weight                | (0010,1030) | 3    | Value from user interface.  |
| Occupation                      | (0010,2180) | 3    | Not Supported. Information will be removed.                                 |
| Additional Patient's History    | (0010,21B0) | 3    | Value from modality worklist or user interface. Truncated to 60 characters. |

**A.5.4 General Series Module**

| Attribute Name      | Tag         | Type | Notes                                |
|---------------------|-------------|------|--------------------------------------|
| Modality            | (0008,0060) | 1    | MR/CT                                |
| Series Instance UID | (0020,000E) | 1    | Locally Generated UID                |
| Series Number       | (0020,0011) | 2    | Generated sequentially, always sent. |

|                                     |              |    |   |
|-------------------------------------|--------------|----|---|
| Laterality                          | (0020,0060)  | 2C | Always sent zero-length.  |
| Series Date                         | (0008,0021)  | 3  | Generated for each series and always sent.  |
| Series Time                         | (0008,0031)  | 3  | Generated for each series and always sent.  |
| Performing Physician's Name         | (0008,1050)  | 3  | Not Used. Discarded.  |
| Protocol Name                       | (0008,1030)  | 3  | Sent if entered at user interface. Limited to 24 characters.  |
| Series Description                  | (0008,103E)  | 3  | Value from user interface is sent.  |
| Operator's Name                     | (0008,1070)  | 3  | Value from user interface is sent. Limited to 4 characters.   |
| Referenced Study Component Sequence | (0008,1111)  | 3  | Not Used. Discarded   |
| >Referenced SOP Class UID           | (0008,1150)  | 1C | Value used for performed procedure step..   |
| >Referenced SOP Instance UID        | (0008,1155)  | 1C | Value used for performed procedure step..   |
| Body Part Examined                  | (0018, 0015) | 3  | Not Used. Will be discarded.  |
| Patient Position                    | (0018,5100)  | 2C | Sent. As selected by operator when patient is positioned:<br>Defined terms are:<br>HFP = Head-First Prone<br>HFS = Head-First Supine<br>HFDR = Head-First Decubitus Right<br>HFDL = Head-First Decubitus Left<br>FFDR = Feet-First Decubitus Right<br>FFDL = Feet-First Decubitus Left<br>FFP = Feet-First Prone<br>FFS = Feet-First Supine |
| Smallest Pixel Value in Series      | (0028,0108)  | 3  | Not Used. Will be discarded.  |
| Largest Pixel Value in Series       | (0028,0109)  | 3  | Not Used. Will be discarded.  |

**A.5.5 General Equipment Module**

| Attribute Name              | Tag         | Type | Notes   |
|-----------------------------|-------------|------|---|
| Manufacturer                | (0008,0070) | 2    | Always sent as "GE MEDICAL SYSTEMS"   |
| Institution Name            | (0008,0080) | 3    | Sent. Value is configurable. Limited to 32 characters.  |
| Institution Address         | (0008,0081) | 3    | Not Used. Discarded.  |
| Station Name                | (0008,1010) | 3    | Sent. Value is configurable. Limited to 8 characters.   |
| Institution Department Name | (0008,1040) | 3    | Not Used. Discarded.  |
| Manufacturers Model Name    | (0008,1090) | 3    |   |
| Device Serial Number        | (0018,1000) | 3    | Sent if present in image.   |
| Software Versions           | (0018,1020) | 3    | Always sent as "07" for this version - does not distinguish individual software releases.   |
| Spatial Resolution          | (0018,1050) | 3    | Sent only for MR images.  |
| Date of Last Calibration    | (0018,1200) | 3    |   |
| Time of Last Calibration    | (0018,1201) | 3    |   |
| Pixel Padding Value         | (0028,0120) | 3    | Sent. For CT images the value used may not correspond to the actual value used in the image. Older CT scanners used -32768 while newer scanners use -2000 as padding. |

**A.5.6 General Image Module**

| Attribute Name | Tag | Type | Notes |
|----------------|-----|------|-------|
|----------------|-----|------|-------|



|                              |             |    |  |
|------------------------------|-------------|----|--|
| Image Number                 | (0020,0013) | 2  | Generated sequentially, always sent.         |
| Patient Orientation          | (0020,0020) | 2C | Always sent zero length.                     |
| Image Date                   | (0008,0023) | 2C | Generated for each image, always sent.       |
| Image Time                   | (0008,0033) | 2C | Generated for each image, always sent.       |
| Image Type                   | (0008,0008) | 3  | Always sent.                                 |
| Acquisition Number           | (0020,0012) | 3  | Generated for each acquisition, always sent. |
| Acquisition Date             | (0008,0022) | 3  | Generated for each acquisition, always sent. |
| Acquisition Time             | (0008,0032) | 3  | Generated for each acquisition, always sent. |
| Referenced Image Sequence    | (0008,1140) | 3  | Not Used. Discarded.                         |
| >Referenced SOP Class UID    | (0008,1150) | 1C | Not Used. Discarded.                         |
| >Referenced SOP Instance UID | (0008,1155) | 1C | Not Used. Discarded.                         |
| Derivation Description       | (0008,2111) | 3  | Not Used. Discarded.                         |
| Source Image Sequence        | (0008,2112) | 3  | Not Used. Discarded.                         |
| Images in Acquisition        | (0020,1002) | 3  | Not Used. Discarded.                         |
| Images Comments              | (0020,4000) | 3  | Not Used. Discarded.                         |
| Lossy Image Compression      | (0028,2110) | 3  | Not Used. Discarded.                         |

**A.5.7 Image Plane Module**

| Attribute Name              | Tag         | Type | Notes              |
|-----------------------------|-------------|------|--------------------|
| Slice Thickness             | (0018,0050) | 2    | Value always sent. |
| Image Orientation (Patient) | (0020,0037) | 1    | Value always sent. |
| Image Position (Patient)    | (0020,0032) | 1    | Value always sent. |
| Image Slice Location        | (0020,1041) | 3    | Value always sent. |
| Pixel Spacing               | (0028,0030) | 1    | Value always sent. |

**A.5.8 Image Pixel Module**

| Attribute Name                              | Tag         | Type | Notes                |
|---|-------------|------|----------------------|
| Samples per Pixel                           | (0028,0002) | 1    | Value always sent.   |
| Photometric Interpretation                  | (0028,0004) | 1    | Value always sent.   |
| Rows  | (0028,0010) | 1    | Value always sent.   |
| Columns                                     | (0028,0011) | 1    | Value always sent.   |
| Bits Allocated                              | (0028,0100) | 1    | Value always sent.   |
| Bits Stored                                 | (0028,0101) | 1    | Value always sent.   |
| High Bit                                    | (0028,0102) | 1    | Value always sent.   |
| Pixel Presentation                          | (0028,0103) | 1    | Value always sent.   |
| Pixel Data                                  | (7FE0,0010) | 1    | Value always sent.   |
| Planar Configuration                        | (0028,0006) | 1C   | Not Used. Discarded. |
| Pixel Aspect Ratio                          | (0028,0034) | 1C   | Not Used. Discarded. |
| Smallest Image Pixel Value                  | (0028,0106) | 3    | Not Used. Discarded. |
| Largest Image Pixel Value                   | (0028,0107) | 3    | Not Used. Discarded. |
| Red Palette Color Lookup Table Descriptor   | (0028,1101) | 1C   | Not Used. Discarded. |
| Green Palette Color Lookup Table Descriptor | (0028,1102) | 1C   | Not Used. Discarded. |
| Blue Palette Color Lookup Table Descriptor  | (0028,1103) | 1C   | Not Used. Discarded. |
| Red Palette Color Lookup Table Data         | (0028,1201) | 1C   | Not Used. Discarded. |
| Green Palette Color Lookup Table Data       | (0028,1202) | 1C   | Not Used. Discarded. |
| Blue Palette Color Lookup Table Data        | (0028,1203) | 1C   | Not Used. Discarded. |

**A.5.9 Contrast Bolus Module**

| Attribute Name                               | Tag         | Type | Notes  |
|--|-------------|------|--|
| Contrast/Bolus Agent                         | (0018,0010) | 2    | Sent if contrast exam, as entered in user interface. |
| Contrast/Bolus Agent Sequence                | (0018,0012) | 3    | Not Used. Discarded.                                 |
| >Code Value                                  | (0008,0100) | 1C   | Not Used. Discarded.                                 |
| >Coding Scheme Designator                    | (0008,0102) | 1C   | Not Used. Discarded.                                 |
| >Code Meaning                                | (0008,0104) | 3    | Not Used. Discarded.                                 |
| Contrast/Bolus Route                         | (0018,1040) | 3    | Sent if contrast exam, as entered in user interface. |
| Contrast/Bolus Administration Route Sequence | (0018,1014) | 3    | Not Used. Discarded.                                 |
| >Additional Drug Sequence                    | (0018,002A) | 3    | Not Used. Discarded.                                 |
| Contrast/Bolus Volume                        | (0018,1041) | 3    | Not Used. Discarded.                                 |
| Contrast/Bolus Start Time                    | (0018,1042) | 3    | Not Used. Discarded.                                 |
| Contrast/Bolus Stop Time                     | (0018,1043) | 3    | Not Used. Discarded.                                 |
| Contrast/Bolus Total Dose                    | (0018,1044) | 3    | Not Used. Discarded.                                 |
| Contrast Flow Rate(s)                        | (0018,1046) | 3    | Not Used. Discarded.                                 |
| Contrast Flow Duration(s)                    | (0018,1047) | 3    | Not Used. Discarded.                                 |
| Contrast/Bolus Ingredient                    | (0018,1048) | 3    | Not Used. Discarded.                                 |
| Contrast/Bolus Ingredient Concentration      | (0018,1049) | 3    | Not Used. Discarded.                                 |

**A.5.10 SOP Common Module**

| Attribute Name         | Tag         | Type | Notes                |
|------------------------|-------------|------|----------------------|
| SOP Class UID          | (0008,0016) | 1    | Always sent          |
| SOP Instance UID       | (0008,0018) | 1    | Always sent          |
| Specific Character Set | (0008,0005) | 1C   | ISO_IR 100           |
| Instance Creation Date | (0008,0012) | 3    | Not Used. Discarded. |
| Instance Creation Time | (0008,0013) | 3    | Not Used. Discarded. |
| Instance Creation UID  | (0008,0014) | 3    | Not Used. Discarded. |

**A.5.11 Overlay Plane Module**

| Attribute Name         | Tag         | Type | Notes  |
|------------------------|-------------|------|--|
| Overlay Data           | (60xx,3000) | 1C   | Only for SC & Standalone Overlay IOD Definitions |
| Overlay Rows           | (60xx,0010) | 1    | Only for SC & Standalone Overlay IOD Definitions |
| Overlay Columns        | (60xx,0011) | 1    | Only for SC & Standalone Overlay IOD Definitions |
| Overlay Type           | (60xx,0040) | 1    | Only for SC & Standalone Overlay IOD Definitions |
| Origin                 | (60xx,0050) | 1    | Only for SC & Standalone Overlay IOD Definitions |
| Overlay Bits Allocated | (60xx,0100) | 1    | Only for SC & Standalone Overlay IOD Definitions |
| Bit Position           | (60xx,0102) | 1    | Only for SC & Standalone Overlay IOD Definitions |
| Overlay Description    | (60xx,0022) | 3    | Not Used. Discarded.                             |
| Overlay Subtype        | (60xx,0045) | 3    | Not Used. Discarded.                             |
| Overlay Label          | (60xx,1500) | 3    | Not Used. Discarded.                             |

|                             |             |   |                      |
|-----------------------------|-------------|---|----------------------|
| ROI Area                    | (60xx,1301) | 3 | Not Used. Discarded. |
| ROI Mean                    | (60xx,1302) | 3 | Not Used. Discarded. |
| ROI Standard Deviation      | (60xx,1303) | 3 | Not Used. Discarded. |
| Overlay Description - Gray  | (60xx,1100) | 3 | Not Used. Discarded. |
| Overlay Description - Red   | (60xx,1101) | 3 | Not Used. Discarded. |
| Overlay Description - Green | (60xx,1102) | 3 | Not Used. Discarded. |
| Overlay Description - Blue  | (60xx,1103) | 3 | Not Used. Discarded. |
| Overlays - Gray             | (60xx,1200) | 3 | Not Used. Discarded. |
| Overlays - Red              | (60xx,1201) | 3 | Not Used. Discarded. |
| Overlays - Green            | (60xx,1202) | 3 | Not Used. Discarded. |
| Overlays - Blue             | (60xx,1203) | 3 | Not Used. Discarded. |

**A.5.12 VOI LUT Module**

| Attribute Name                    | Tag         | Type | Notes  |
|-----------------------------------|-------------|------|--|
| VOI LUT Sequence                  | (0028,3010) | 3    | Not used. Discarded.   |
| >LUT Descriptor                   | (0028,3002) | 1C   | Not used. Discarded.   |
| >LUT Explanation                  | (0028,3003) | 3    | Not used. Discarded.   |
| >LUT Data                         | (0028,3006) | 1C   | Not used. Discarded.   |
| Window Center                     | (0028,1050) | 3    | Always sent for secondary capture(one value)<br>For CT and MR images value is calculated from histogram of pixel data. The middle point between maximum and minimum pixel value is used. |
| Window Width                      | (0028,1051) | 1C   | Always sent for secondary capture(one value)<br>For CT and MR images value is calculated from histogram of pixel data. The difference between maximum and minimum pixel value is used.   |
| Window Center & Width Explanation | (0028,1055) | 3    | Not used. Discarded.   |

**A.5.13 Frame of Reference Module**

| Attribute Name               | Tag         | Type | Notes                                   |
|------------------------------|-------------|------|---|
| Frame of Reference UID       | (0020,0052) | 1    | Always sent                             |
| Position Reference Indicator | (0020,1040) | 2    | Value as entered at the user interface. |

**A.5.14 SC Equipment Module**

| Attribute Name | Tag         | Type | Notes                                 |
|----------------|-------------|------|---------------------------------------|
| Modality       | (0008,0060) | 3    | Modality of original image (MR or CT) |

**A.5.15 Overlay Identification Module**

| Attribute Name | Tag         | Type | Notes   |
|----------------|-------------|------|---|
| Overlay Number | (0020,0022) | 2    | The image number of the image this overlay is for |
| Overlay Date   | (0008,0024) | 3    | Date of overlay                                   |
| Overlay Time   | (0008,0034) | 3    | Time of overlay                                   |

**A.5.16 Requested Procedure Module**

| Attribute Name         | Tag         | Type | Notes                     |
|------------------------|-------------|------|---------------------------|
| Requested Procedure ID | (0040,1001) | 1C   | Sent if present in image. |

|   |             |   |                           |
|---|-------------|---|---------------------------|
| Referenced Study Sequence               | (0008,1110) | 3 | Sent if present in image. |
| >Referenced Study Sequence Class UID    | (0008,1150) | 3 | Sent if present in image. |
| >Referenced Study Sequence Instance UID | (0008,1155) | 3 | Sent if present in image. |

**A.5.17 Scheduled Procedure Step Module**

| <b>Attribute Name</b>                         | <b>Tag</b>  | <b>Type</b> | <b>Notes</b>              |
|---|-------------|-------------|---------------------------|
| Scheduled Procedure Step Description          | (0040,0007) | 1C          | Sent if present in image. |
| Scheduled Procedure Action Item Code Sequence | (0040,0008) | 3           | MR does not use           |
| Schedule Procedure Step ID                    | (0040,0009) | 1C          | Sent if present in image. |

## Appendix B Private Data Elements

Enclosed is a listing of private data elements used in this implementation for CT/MR Image IOD definition.

### B.1 CT Image IOD Private Data Elements Definition

#### B.1.1 Private Creator Identification (GEMS\_IDEN\_01)

| Attribute Name                | Tag         | VR | VM |
|-------------------------------|-------------|----|----|
| Private Element Creator       | (0009,10xx) | LO | 1  |
| Full fidelity                 | (0009,xx01) | LO | 1  |
| Suite id                      | (0009,xx02) | SH | 1  |
| Product id                    | (0009,xx04) | SH | 1  |
| Image actual date             | (0009,xx27) | SL | 1  |
| Service id                    | (0009,xx30) | SH | 1  |
| Mobile location number        | (0009,xx31) | SH | 1  |
| Equipment UID                 | (0009,xxE3) | UI | 1  |
| Genesis Version - now         | (0009,xxE6) | SH | 1  |
| Exam Record checksum          | (0009,xxE7) | UL | 1  |
| Actual series data time stamp | (0009,xxE9) | SL | 1  |

#### B.1.2 Private Creator Identification (GEMS\_PATI\_01)

| Attribute Name          | Tag         | VR | VM |
|-------------------------|-------------|----|----|
| Private Element Creator | (0011,10xx) | LO | 1  |
| Patient Status          | (0011,xx10) | SS | 1  |

#### B.1.3 Private Creator Identification (GEMS\_ACQU\_01)

| Attribute Name                  | Tag         | VR | VM |
|---------------------------------|-------------|----|----|
| Private Element Creator         | (0019,10xx) | LO | 1  |
| Number of cells I in Detector   | (0019,xx02) | SL | 1  |
| Cell number at Theta            | (0019,xx03) | DS | 1  |
| Cell spacing                    | (0019,xx04) | DS | 1  |
| Horiz. frame of ref.            | (0019,xx0F) | DS | 1  |
| Series contrast                 | (0019,xx11) | SS | 1  |
| Start number for baseline       | (0019,xx13) | SS | 1  |
| End number for baseline         | (0019,xx14) | SS | 1  |
| Start number for enhanced scans | (0019,xx15) | SS | 1  |
| End number for enhanced scans   | (0019,xx16) | SS | 1  |
| Series plane                    | (0019,xx17) | SS | 1  |
| First scan RAS                  | (0019,xx18) | LO | 1  |
| First scan location             | (0019,xx19) | DS | 1  |
| Last scan RAS                   | (0019,xx1A) | LO | 1  |
| Last scan loc.                  | (0019,xx1B) | DS | 1  |
| Display field of view           | (0019,xx1E) | DS | 1  |
| Table speed                     | (0019,xx23) | DS | 1  |
| Mid scan time                   | (0019,xx24) | DS | 1  |
| Mid scan flag                   | (0019,xx25) | SS | 1  |

|                                    |             |    |   |
|------------------------------------|-------------|----|---|
| Degrees of azimuth                 | (0019,xx26) | SL | 1 |
| Gantry period                      | (0019,xx27) | DS | 1 |
| X-Ray On position                  | (0019,xx2A) | DS | 1 |
| X-Ray Off position                 | (0019,xx2B) | DS | 1 |
| Number of triggers                 | (0019,xx2C) | SL | 1 |
| Angle of first view                | (0019,xx2E) | DS | 1 |
| Trigger frequency                  | (0019,xx2F) | DS | 1 |
| Scan FOV type                      | (0019,xx39) | SS | 1 |
| Stat recon flag                    | (0019,xx40) | SS | 1 |
| Compute type                       | (0019,xx41) | SS | 1 |
| Segment number                     | (0019,xx42) | SS | 1 |
| Total segments requested           | (0019,xx43) | SS | 1 |
| Interscan delay                    | (0019,xx44) | DS | 1 |
| View compression factor            | (0019,xx47) | SS | 1 |
| Total no. of ref channels          | (0019,xx4A) | SS | 1 |
| Data size for scan data            | (0019,xx4B) | SL | 1 |
| Recon post proc. flag              | (0019,xx52) | SS | 1 |
| CT water number                    | (0019,xx57) | SS | 1 |
| CT bone number                     | (0019,xx58) | SS | 1 |
| Number of channels (1...512)       | (0019,xx5E) | SL | 1 |
| Increment between channels         | (0019,xx5F) | SL | 1 |
| Starting view                      | (0019,xx60) | SL | 1 |
| Number of views                    | (0019,xx61) | SL | 1 |
| Increment between views            | (0019,xx62) | SL | 1 |
| Dependant on #views processed      | (0019,xx6A) | SS | 1 |
| Field of view in detector cells    | (0019,xx6B) | SS | 1 |
| Value of back projection button    | (0019,xx70) | SS | 1 |
| Set if fat estimates were used     | (0019,xx71) | SS | 1 |
| Z chan avg. over views             | (0019,xx72) | DS | 1 |
| Avg. of left ref chans over views  | (0019,xx73) | DS | 1 |
| Max left chan over views           | (0019,xx74) | DS | 1 |
| Avg. of right ref chans over views | (0019,xx75) | DS | 1 |
| Max right chan over views          | (0019,xx76) | DS | 1 |
| Reference channel used             | (0019,xxDA) | SS | 1 |
| Back projector coefficient         | (0019,xxDB) | DS | 1 |
| Primary speed correction used      | (0019,xxDC) | SS | 1 |
| Overrange correction used          | (0019,xxDD) | SS | 1 |
| Dynamic Z alpha value              | (0019,xxDE) | DS | 1 |

**B.1.4 Private Creator Identification (GEMS\_RELA\_01)**

| <b>Attribute Name</b>          | <b>Tag</b>  | <b>VR</b> | <b>VM</b> |
|--------------------------------|-------------|-----------|-----------|
| Private Element Creator        | (0021,10xx) | LO        | 1         |
| Series from which Prescribed   | (0021,xx03) | SS        | 1         |
| Genesis Version - now          | (0021,xx05) | SH        | 1         |
| Series Record checksum         | (0021,xx07) | UL        | 1         |
| Genesis version - Now          | (0021,xx18) | SH        | 1         |
| Acqrecon record checksum       | (0021,xx19) | UL        | 1         |
| Screen Format                  | (0021,xx37) | SS        | 1         |
| Anatomical reference for scout | (0021,xx4A) | LO        | 1         |
| Tube focal spot position       | (0021,xx90) | SS        | 1         |

|                     |             |    |   |
|---------------------|-------------|----|---|
| Biopsy position     | (0021,xx91) | SS | 1 |
| Biopsy T location   | (0021,xx92) | FL | 1 |
| Biopsy ref location | (0021,xx93) | FL | 1 |

**B.1.5 Private Creator Identification (GEMS\_STDY\_01)**

| Attribute Name   | Tag         | VR | VM |
|--|-------------|----|----|
| Private Element Creator                                  | (0023,10xx) | LO | 1  |
| Start time(sec) in first axial                           | (0023,xx70) | FD | 1  |
| No. of updates to header                                 | (0023,xx74) | SL | 1  |
| Indicates if the study has complete info (DICOM/genesis) | (0023,xx7D) | SS | 1  |

**B.1.6 Private Creator Identification (GEMS\_SERS\_01)**

| Attribute Name                  | Tag         | VR | VM |
|---------------------------------|-------------|----|----|
| Private Element Creator         | (0025,10xx) | LO | 1  |
| Last pulse sequence used        | (0025,xx06) | SS | 1  |
| Images in Series                | (0025,xx07) | SL | 1  |
| Landmark Counter                | (0025,xx10) | SL | 1  |
| Number of Acquisitions          | (0025,xx11) | SS | 1  |
| Series Complete Flag            | (0025,xx17) | SL | 1  |
| Number of images archived       | (0025,xx18) | SL | 1  |
| Last image number used          | (0025,xx19) | SL | 1  |
| Primary Receiver Suite and Host | (0025,xx1A) | SH | 1  |

**B.1.7 Private Creator Identification (GEMS\_IMAG\_01)**

| Attribute Name                | Tag         | VR | VM |
|-------------------------------|-------------|----|----|
| Private Element Creator       | (0027,10xx) | LO | 1  |
| Image archive flag            | (0027,xx06) | SL | 1  |
| Scout Type                    | (0027,xx10) | SS | 1  |
| Vma mamp                      | (0027,xx1C) | SL | 1  |
| Vma phase                     | (0027,xx1D) | SS | 1  |
| Vma mod                       | (0027,xx1E) | SL | 1  |
| Vma clip                      | (0027,xx1F) | SL | 1  |
| Smart scan ON/OFF flag        | (0027,xx20) | SS | 1  |
| Foreign Image Revision        | (0027,xx30) | SH | 1  |
| Plane Type                    | (0027,xx35) | SS | 1  |
| RAS letter of image location  | (0027,xx40) | SH | 1  |
| Image location                | (0027,xx41) | FL | 1  |
| Center R coord of plane image | (0027,xx42) | FL | 1  |
| Center A coord of plane image | (0027,xx43) | FL | 1  |
| Center S coord of plane image | (0027,xx44) | FL | 1  |
| Normal R coord                | (0027,xx45) | FL | 1  |
| Normal A coord                | (0027,xx46) | FL | 1  |
| Normal S coord                | (0027,xx47) | FL | 1  |
| R Coord of Top Right Corner   | (0027,xx48) | FL | 1  |
| A Coord of Top Right Corner   | (0027,xx49) | FL | 1  |
| S Coord of Top Right Corner   | (0027,xx4A) | FL | 1  |

|                                   |             |    |   |
|-----------------------------------|-------------|----|---|
| R Coord of Bottom Right Corner    | (0027,xx4B) | FL | 1 |
| A Coord of Bottom Right Corner    | (0027,xx4C) | FL | 1 |
| S Coord of Bottom Right Corner    | (0027,xx4D) | FL | 1 |
| Table start location              | (0027,xx50) | FL | 1 |
| Table end location                | (0027,xx51) | FL | 1 |
| RAS letter for side of image      | (0027,xx52) | SH | 1 |
| RAS letter for anterior/posterior | (0027,xx53) | SH | 1 |
| RAS letter for scout starts loc.  | (0027,xx54) | SH | 1 |
| RAS letter for scout end loc.     | (0027,xx55) | SH | 1 |

**B.1.8 Private Creator Identification (GEMS\_IMPS\_01)**

| Attribute Name            | Tag         | VR | VM |
|---------------------------|-------------|----|----|
| Private Element Creator   | (0029,10xx) | LO | 1  |
| Lower range of Pixels l   | (0029,xx04) | SL | 1  |
| Lower range of Pixels l   | (0029,xx05) | DS | 1  |
| Lower range of Pixels l   | (0029,xx06) | DS | 1  |
| Lower range of Pixels l   | (0029,xx07) | SL | 1  |
| Lower range of Pixels l   | (0029,xx08) | SH | 1  |
| Lower range of Pixels l   | (0029,xx09) | SH | 1  |
| Lower range of Pixels l   | (0029,xx0A) | SS | 1  |
| Version of the hdr struct | (0029,xx26) | SS | 1  |
| Advantage comp. Overflow  | (0029,xx34) | SL | 1  |

**B.1.9 Private Creator Identification (GEMS\_PARM\_01)**

| Attribute Name                | Tag         | VR | VM |
|-------------------------------|-------------|----|----|
| Private Element Creator       | (0043,10xx) | LO | 1  |
| Window value                  | (0043,xx10) | US | 1  |
| Total input views             | (0043,xx11) | US | 1  |
| X-Ray chain                   | (0043,xx12) | SS | 3  |
| Decon kernel parameters       | (0043,xx13) | SS | 5  |
| Calibration parameters        | (0043,xx14) | SS | 3  |
| Total output views            | (0043,xx15) | SS | 3  |
| Number of overranges          | (0043,xx16) | SS | 5  |
| IBH image scale factors       | (0043,xx17) | DS | 1  |
| BBH coefficients              | (0043,xx18) | DS | 3  |
| Number of BBH chains to blend | (0043,xx19) | SS | 1  |
| Starting channel number       | (0043,xx1A) | SL | 1  |
| Ppscan parameters             | (0043,xx1B) | SS | 1  |
| GE image integrity            | (0043,xx1C) | SS | 1  |
| Level value                   | (0043,xx1D) | SS | 1  |
| Delta start time              | (0043,xx1E) | DS | 1  |
| Max overranges in a view      | (0043,xx1F) | SL | 1  |
| Avg. overranges all views     | (0043,xx20) | DS | 1  |
| Corrected after glow terms    | (0043,xx21) | SS | 1  |
| Reference channels            | (0043,xx25) | SS | 6  |
| No views ref chans blocked    | (0043,xx26) | US | 6  |
| Scan pitch ratio              | (0043,xx27) | SH | 1  |
| Unique image iden             | (0043,xx28) | OB | 1  |



|                                |             |    |   |
|--------------------------------|-------------|----|---|
| Histogram tables               | (0043,xx29) | OB | 1 |
| User defined data              | (0043,xx2A) | OB | 1 |
| Private Scan Options           | (0043,xx2B) | SS | 4 |
| RA cord of target recon center | (0043,xx31) | DS | 2 |
| Trigger on position            | (0043,xx40) | FL | 4 |
| Degree of rotation             | (0043,xx41) | FL | 4 |
| DAS trigger source             | (0043,xx42) | SL | 4 |
| DAS fpa gain                   | (0043,xx43) | SL | 4 |
| DAS output source              | (0043,xx44) | SL | 4 |
| DAS ad input                   | (0043,xx45) | SL | 4 |
| DAS cal mode                   | (0043,xx46) | SL | 4 |
| DAS cal frequency              | (0043,xx47) | SL | 4 |
| DAS reg xm                     | (0043,xx48) | SL | 4 |
| DAS auto zero                  | (0043,xx49) | SL | 4 |
| Starting channel of view       | (0043,xx4A) | SS | 4 |
| DAS xm pattern                 | (0043,xx4B) | SL | 4 |
| TGGC trigger mode              | (0043,xx4C) | SS | 4 |
| Start scan to Xray on delay    | (0043,xx4D) | FL | 4 |
| Duration of x-ray on           | (0043,xx4E) | FL | 4 |
| slop_int_10...slop_int_17      | (0043,xx60) | IS | 8 |

**B.1.10 Private Creator Identification (GEMS\_HELIOS\_01)**

| Attribute Name                                  | Tag         | VR | VM |
|---|-------------|----|----|
| Private Element Creator                         | (0045,10xx) | LO | 1  |
| Number of Macro rows in detector                | (0045,xx01) | LO | 1  |
| Macro width at ISO center                       | (0045,xx02) | FL | 1  |
| DAS Type  | (0045,xx03) | SS | 1  |
| DAS gain  | (0045,xx04) | SS | 1  |
| DAS temperature                                 | (0045,xx05) | SS | 1  |
| Table direction whether moving in or moving out | (0045,xx06) | CS | 1  |
| Z smoothing factor                              | (0045,xx07) | FL | 1  |
| View weighting mode                             | (0045,xx08) | SS | 1  |
| Sigma row number. Which rows were used          | (0045,xx09) | SS | 2  |
| minimum das value found in the scan data        | (0045,xx0A) | FL | 1  |
| Maximum offset shift value used                 | (0045,xx0B) | FL | 1  |
| Number of views shifted                         | (0045,xx0C) | SS | 1  |
| Z tracking flag                                 | (0045,xx0D) | SS | 1  |
| Mean Z error                                    | (0045,xx0E) | FL | 1  |
| Z tracking maximum error                        | (0045,xx0F) | FL | 1  |
| starting view for row 2a                        | (0045,xx10) | SS | 1  |
| Number of views in row 2a                       | (0045,xx11) | SS | 1  |
| starting view for row 1a                        | (0045,xx12) | SS | 1  |
| Sigma mode                                      | (0045,xx13) | SS | 1  |
| Number of views in row 1a                       | (0045,xx14) | SS | 1  |
| starting view for row 2b                        | (0045,xx15) | SS | 1  |
| Number of views in row 2b                       | (0045,xx16) | SS | 1  |
| starting view for row 1b                        | (0045,xx17) | SS | 1  |
| Number of views in row 1b                       | (0045,xx18) | SS | 1  |
| Air filter calibration date                     | (0045,xx19) | SS | 1  |
| Air filter calibration time                     | (0045,xx1A) | SS | 1  |

|                            |             |    |   |
|----------------------------|-------------|----|---|
| Phantom calibration date   | (0045,xx1B) | SS | 1 |
| Phantom calibration time   | (0045,xx1C) | SS | 1 |
| Z slope calibration date   | (0045,xx1D) | SS | 1 |
| Z slope calibration time   | (0045,xx1E) | SS | 1 |
| Crosstalk calibration date | (0045,xx1F) | SS | 1 |
| Crosstalk calibration time | (0045,xx20) | SS | 1 |
| Itebone option flag        | (0045,xx21) | SS | 1 |
| Peristaltic flag option    | (0045,xx22) | SS | 1 |

## B.2 MR Image IOD Private Data Elements Definition

### B.2.1 Private Creator Identification (GEMS\_IDEN\_01)

| Attribute Name                | Tag         | VR | VM |
|-------------------------------|-------------|----|----|
| Private Element Creator       | (0009,10xx) | LO | 1  |
| Full fidelity                 | (0009,xx01) | LO | 1  |
| Suite id                      | (0009,xx02) | SH | 1  |
| Product id                    | (0009,xx04) | SH | 1  |
| Image actual date             | (0009,xx27) | SL | 1  |
| Service id                    | (0009,xx30) | SH | 1  |
| Mobile location number        | (0009,xx31) | SH | 1  |
| Equipment UID                 | (0009,xxE3) | UI | 1  |
| Genesis Version - now         | (0009,xxE6) | SH | 1  |
| Exam Record checksum          | (0009,xxE7) | UL | 1  |
| Actual series data time stamp | (0009,xxE9) | SL | 1  |

### B.2.2 Private Creator Identification (GEMS\_PATI\_01)

| Attribute Name          | Tag         | VR | VM |
|-------------------------|-------------|----|----|
| Private Element Creator | (0011,10xx) | LO | 1  |
| Patient Status          | (0011,xx10) | SS | 1  |

### B.2.3 Private Creator Identification (GEMS\_ACQU\_01)

| Attribute Name          | Tag         | VR | VM |
|-------------------------|-------------|----|----|
| Private Element Creator | (0019,10xx) | LO | 1  |
| Horiz. Frame of ref.    | (0019,xx0F) | DS | 1  |
| Series contrast         | (0019,xx11) | SS | 1  |
| Last pseq               | (0019,xx12) | SS | 1  |
| Series plane            | (0019,xx17) | SS | 1  |
| First scan ras          | (0019,xx18) | LO | 1  |
| First scan location     | (0019,xx19) | DS | 1  |
| Last scan ras           | (0019,xx1A) | LO | 1  |
| Last scan loc.          | (0019,xx1B) | DS | 1  |
| Display field of view   | (0019,xx1E) | DS | 1  |
| Acquisition Duration    | (0019,xx5A) | FL | 1  |

|                             |             |    |   |
|-----------------------------|-------------|----|---|
| Second echo                 | (0019,xx7D) | DS | 1 |
| Number of echoes            | (0019,xx7E) | SS | 1 |
| Table delta                 | (0019,xx7F) | DS | 1 |
| Contiguous                  | (0019,xx81) | SS | 1 |
| Peak SAR                    | (0019,xx84) | DS | 1 |
| Monitor SAR                 | (0019,xx85) | SS | 1 |
| Cardiac repetition time     | (0019,xx87) | DS | 1 |
| Images per cardiac cycle    | (0019,xx88) | SS | 1 |
| Actual receive gain analog  | (0019,xx8A) | SS | 1 |
| Actual receive gain digital | (0019,xx8B) | SS | 1 |
| Delay after trigger         | (0019,xx8D) | DS | 1 |
| Swappf                      | (0019,xx8F) | SS | 1 |
| Pause Interval              | (0019,xx90) | SS | 1 |
| Pulse Time                  | (0019,xx91) | DS | 1 |
| Slice offset on freq. axis  | (0019,xx92) | SL | 1 |
| Center Frequency            | (0019,xx93) | DS | 1 |
| Transmit Gain               | (0019,xx94) | SS | 1 |
| Analog receiver gain        | (0019,xx95) | SS | 1 |
| Digital receiver gain       | (0019,xx96) | SS | 1 |
| Bitmap defining CVs         | (0019,xx97) | SL | 1 |
| Center freq. Method         | (0019,xx98) | SS | 1 |
| Pulse seq. Mode             | (0019,xx9B) | SS | 1 |
| Pulse seq. Name             | (0019,xx9C) | LO | 1 |
| Pulse seq. Date             | (0019,xx9D) | DT | 1 |
| Internal pulse seq. Name    | (0019,xx9E) | LO | 1 |
| Transmitting coil           | (0019,xx9F) | SS | 1 |
| Surface Coil Type           | (0019,xxA0) | SS | 1 |
| Extremity Coil flag         | (0019,xxA1) | SS | 1 |
| Raw data run number         | (0019,xxA2) | SL | 1 |
| Calibrated Field strength   | (0019,xxA3) | UL | 1 |
| SAT fat/water/bone          | (0019,xxA4) | SS | 1 |
| Receive bandwidth           | (0019,xxA5) | DS | 1 |
| User data                   | (0019,xxA7) | DS | 1 |
| User data                   | (0019,xxA8) | DS | 1 |
| User data                   | (0019,xxA9) | DS | 1 |
| User data                   | (0019,xxAA) | DS | 1 |
| User data                   | (0019,xxAB) | DS | 1 |
| User data                   | (0019,xxAC) | DS | 1 |
| User data                   | (0019,xxAD) | DS | 1 |
| User data                   | (0019,xxAE) | DS | 1 |
| User data                   | (0019,xxAF) | DS | 1 |
| User data                   | (0019,xxB0) | DS | 1 |
| User data                   | (0019,xxB1) | DS | 1 |
| User data                   | (0019,xxB2) | DS | 1 |
| User data                   | (0019,xxB3) | DS | 1 |
| User data                   | (0019,xxB4) | DS | 1 |
| User data                   | (0019,xxB5) | DS | 1 |
| User data                   | (0019,xxB6) | DS | 1 |
| User data                   | (0019,xxB7) | DS | 1 |
| User data                   | (0019,xxB8) | DS | 1 |
| User data                   | (0019,xxB9) | DS | 1 |
| User data                   | (0019,xxBA) | DS | 1 |

|                        |             |    |   |
|------------------------|-------------|----|---|
| User data              | (0019,xxBB) | DS | 1 |
| User data              | (0019,xxBC) | DS | 1 |
| User data              | (0019,xxBD) | DS | 1 |
| Projection angle       | (0019,xxBE) | DS | 1 |
| Saturation planes      | (0019,xxC0) | SS | 1 |
| Surface coil intensity | (0019,xxC1) | SS | 1 |
| SAT location R         | (0019,xxC2) | SS | 1 |
| SAT location L         | (0019,xxC3) | SS | 1 |
| SAT location A         | (0019,xxC4) | SS | 1 |
| SAT location P         | (0019,xxC5) | SS | 1 |
| SAT location H         | (0019,xxC6) | SS | 1 |
| SAT location F         | (0019,xxC7) | SS | 1 |
| SAT thickness R/L      | (0019,xxC8) | SS | 1 |
| SAT thickness A/P      | (0019,xxC9) | SS | 1 |
| SAT thickness H/F      | (0019,xxCA) | SS | 1 |
| Prescribed flow axis   | (0019,xxCB) | SS | 1 |
| Velocity encoding      | (0019,xxCC) | SS | 1 |
| Thickness disclaimer   | (0019,xxCD) | SS | 1 |
| Prescan type           | (0019,xxCE) | SS | 1 |
| Prescan status         | (0019,xxCF) | SS | 1 |
| Raw data type          | (0019,xxD0) | SH | 1 |
| Projection Algorithm   | (0019,xxD2) | SS | 1 |
| Projection algorithm   | (0019,xxD3) | SH | 1 |
| Fractional echo        | (0019,xxD5) | SS | 1 |
| Prep pulse             | (0019,xxD6) | SS | 1 |
| Cardiac phases         | (0019,xxD7) | SS | 1 |
| Variable echoflag      | (0019,xxD8) | SS | 1 |
| Concatenated SAT       | (0019,xxD9) | DS | 1 |
| User data              | (0019,xxDF) | DS | 1 |
| User data              | (0019,xxE0) | DS | 1 |
| Velocity Encode Scale  | (0019,xxE2) | DS | 1 |
| Fast phases            | (0019,xxF2) | SS | 1 |
| Transmission gain      | (0019,xxF9) | DS | 1 |

**B.2.4 Private Creator Identification (GEMS\_RELA\_01)**

| Attribute Name               | Tag         | VR | VM |
|------------------------------|-------------|----|----|
| Private Element Creator      | (0021,10xx) | LO | 1  |
| Series from which Prescribed | (0021,xx03) | SS | 1  |
| Genesis Version - now        | (0021,xx05) | SH | 1  |
| Series Record checksum       | (0021,xx07) | UL | 1  |
| Genesis version - Now        | (0021,xx18) | SH | 1  |
| Acq recon record checksum    | (0021,xx19) | UL | 1  |
| Table start location         | (0021,xx20) | DS | 1  |
| Series from which prescribed | (0021,xx35) | SS | 1  |
| Image from which prescribed  | (0021,xx36) | SS | 1  |
| Screen Format                | (0021,xx37) | SS | 1  |
| Locations in acquisition     | (0021,xx4F) | SS | 1  |
| Graphically prescribed       | (0021,xx50) | SS | 1  |
| Rotation from source x rot   | (0021,xx51) | DS | 1  |
| Rotation from source y rot   | (0021,xx52) | DS | 1  |

|                            |             |    |   |
|----------------------------|-------------|----|---|
| Rotation from source z rot | (0021,xx53) | DS | 1 |
| Image position             | (0021,xx54) | SH | 3 |
| Image orientation          | (0021,xx55) | SH | 6 |
| Integer slop               | (0021,xx56) | SL | 1 |
| Integer slop               | (0021,xx57) | SL | 1 |
| Integer slop               | (0021,xx58) | SL | 1 |
| Integer slop               | (0021,xx59) | SL | 1 |
| Integer slop               | (0021,xx5A) | SL | 1 |
| Float slop                 | (0021,xx5B) | DS | 1 |
| Float slop                 | (0021,xx5C) | DS | 1 |
| Float slop                 | (0021,xx5D) | DS | 1 |
| Float slop                 | (0021,xx5E) | DS | 1 |
| Float slop                 | (0021,xx5F) | DS | 1 |
| Auto window/level alpha    | (0021,xx81) | DS | 1 |
| Auto window/level beta     | (0021,xx82) | DS | 1 |
| Auto window/level window   | (0021,xx83) | DS | 1 |
| To window/level level      | (0021,xx84) | DS | 1 |

**B.2.5 Private Creator Identification (GEMS\_STDY\_01)**

| Attribute Name                                       | Tag         | VR | VM |
|--|-------------|----|----|
| Private Element Creator                              | (0023,10xx) | LO | 1  |
| Number of series in Study                            | (0023,xx01) | SL | 1  |
| Number of unachieved Series                          | (0023,xx02) | SL | 1  |
| Reference image field                                | (0023,xx10) | SS | 1  |
| Summary image  | (0023,xx50) | SS | 1  |
| Start time(sec) in first axial                       | (0023,xx70) | FD | 1  |
| No. of updates to header                             | (0023,xx74) | SL | 1  |
| Indicates if study has complete info (DICOM/genesis) | (0023,xx7D) | SS | 1  |

**B.2.6 Private Creator Identification (GEMS\_SERS\_01)**

| Attribute Name                     | Tag         | VR | VM |
|------------------------------------|-------------|----|----|
| Private Element Creator            | (0025,10xx) | LO | 1  |
| Last pulse sequence used           | (0025,xx06) | SS | 1  |
| Images in Series                   | (0025,xx07) | SL | 1  |
| Landmark Counter                   | (0025,xx10) | SL | 1  |
| Number of Acquisitions             | (0025,xx11) | SS | 1  |
| Indicates no. of updates to header | (0025,xx14) | SL | 1  |
| Series Complete Flag               | (0025,xx17) | SL | 1  |
| Number of images archived          | (0025,xx18) | SL | 1  |
| Last image number used             | (0025,xx19) | SL | 1  |
| Primary Receiver Suite and Host    | (0025,xx1A) | SH | 1  |

**B.2.7 Private Creator Identification (GEMS\_IMAG\_01)**

| Attribute Name          | Tag         | VR | VM |
|-------------------------|-------------|----|----|
| Private Element Creator | (0027,10xx) | LO | 1  |

|                                |             |    |   |
|--------------------------------|-------------|----|---|
| Image archive flag             | (0027,xx06) | SL | 1 |
| Scout Type                     | (0027,xx10) | SS | 1 |
| Foreign Image Revision         | (0027,xx30) | SH | 1 |
| Imaging Mode                   | (0027,xx31) | SS | 1 |
| Pulse Sequence                 | (0027,xx32) | SS | 1 |
| Imaging Options                | (0027,xx33) | SL | 1 |
| Plane Type                     | (0027,xx35) | SS | 1 |
| Oblique Plane                  | (0027,xx36) | SL | 1 |
| RAS letter of image location   | (0027,xx40) | SH | 1 |
| Image location                 | (0027,xx41) | FL | 1 |
| Center R coord of plane image  | (0027,xx42) | FL | 1 |
| Center A coord of plane image  | (0027,xx43) | FL | 1 |
| Center S coord of plane image  | (0027,xx44) | FL | 1 |
| Normal R coord                 | (0027,xx45) | FL | 1 |
| Normal A coord                 | (0027,xx46) | FL | 1 |
| Normal S coord                 | (0027,xx47) | FL | 1 |
| R Coord of Top Right Corner    | (0027,xx48) | FL | 1 |
| A Coord of Top Right Corner    | (0027,xx49) | FL | 1 |
| S Coord of Top Right Corner    | (0027,xx4A) | FL | 1 |
| R Coord of Bottom Right Corner | (0027,xx4B) | FL | 1 |
| A Coord of Bottom Right Corner | (0027,xx4C) | FL | 1 |
| S Coord of Bottom Right Corner | (0027,xx4D) | FL | 1 |
| Image dimension - X            | (0027,xx60) | FL | 1 |
| Image dimension - Y            | (0027,xx61) | FL | 1 |
| Number of Excitations          | (0027,xx62) | FL | 1 |

**B.2.8 Private Creator Identification (GEMS\_IMPS\_01)**

| Attribute Name            | Tag         | VR | VM |
|---------------------------|-------------|----|----|
| Private Element Creator   | (0029,10xx) | LO | 1  |
| Lower range of Pixels1    | (0029,xx15) | SL | 1  |
| Upper range of Pixels1    | (0029,xx16) | SL | 1  |
| Lower range of Pixels2    | (0029,xx17) | SL | 1  |
| Upper range of Pixels2    | (0029,xx18) | SL | 1  |
| Len of tot hdr in bytes   | (0029,xx1A) | SL | 1  |
| Version of the hdr struct | (0029,xx26) | SS | 1  |
| Advantage comp. Overflow  | (0029,xx34) | SL | 1  |
| Advantage comp. Underflow | (0029,xx35) | SL | 1  |

**B.2.9 Private Creator Identification (GEMS\_PARM\_01)**

| Attribute Name                  | Tag         | VR | VM |
|---------------------------------|-------------|----|----|
| Private Element Creator         | (0043,10xx) | LO | 1  |
| Bitmap of prescan options       | (0043,xx01) | SS | 1  |
| Gradient offset in X            | (0043,xx02) | SS | 1  |
| Gradient offset in Y            | (0043,xx03) | SS | 1  |
| Gradient offset in Z            | (0043,xx04) | SS | 1  |
| Image is original or unoriginal | (0043,xx05) | SS | 1  |
| Number of EPI shots             | (0043,xx06) | SS | 1  |
| Views per segment               | (0043,xx07) | SS | 1  |

|  |             |    |    |
|--|-------------|----|----|
| Respiratory rate, bpm  | (0043,xx08) | SS | 1  |
| Respiratory trigger point  | (0043,xx09) | SS | 1  |
| Type of receiver used  | (0043,xx0A) | SS | 1  |
| Peak rate of change of gradient field  | (0043,xx0B) | DS | 1  |
| Limits in units of percent   | (0043,xx0C) | DS | 1  |
| PSD estimated limit  | (0043,xx0D) | DS | 1  |
| PSD estimated limit in tesla per second  | (0043,xx0E) | DS | 1  |
| Saravghead   | (0043,xx0F) | DS | 1  |
| Window value   | (0043,xx10) | US | 1  |
| GE image integrity   | (0043,xx1C) | SS | 1  |
| Level value  | (0043,xx1D) | SS | 1  |
| Unique image iden  | (0043,xx28) | OB | 1  |
| Histogram tables   | (0043,xx29) | OB | 1  |
| User defined data  | (0043,xx2A) | OB | 1  |
| Private Scan Options   | (0043,xx2B) | SS | 4  |
| Effective echo spacing   | (0043,xx2C) | SS | 1  |
| String slop field 1  | (0043,xx2D) | SH | 1  |
| String slop field 2  | (0043,xx2E) | SH | 1  |
| Raw data type  | (0043,xx2F) | SS | 1  |
| Raw data type  | (0043,xx30) | SS | 1  |
| RA cord of target recon center   | (0043,xx31) | DS | 2  |
| Raw data type  | (0043,xx32) | SS | 1  |
| Neg_scanspacing  | (0043,xx33) | FL | 1  |
| Offset Frequency   | (0043,xx34) | IS | 1  |
| User_usage_tag   | (0043,xx35) | UL | 1  |
| User_fill_map_MSW  | (0043,xx36) | UL | 1  |
| User_fill_map_LSW  | (0043,xx37) | UL | 1  |
| User25...User48  | (0043,xx38) | FL | 24 |
| Slop_int_6... slop_int_9   | (0043,xx39) | IS | 4  |
| Slop_int_10... slop_int_17<br>Slop_int_11:reserved field<br>Slop_int_15:Current Station #<br>Slop_int_16:Total # of Stations | (0043,xx60) | IS | 8  |
| Study Instance UID   | (0043,xx61) | UI | 1  |
| Study ID   | (0043,xx62) | SH | 1  |
| Scanner Table Entry  | (0043,xx6f) | DS | 3  |

## Appendix C DICOMDIR Directory Information

### C.1 DICOMDIR Directory Information

Enclosed here is a listing of only the optional (conditional) modules and optional attributes used by this implementation in the DICOMDIR definition. All standard attributes as defined in Part 3 Addendum (Basic Directory Information Object) are supported by this implementation but not listed here.

#### C.1.1 Basic Directory IOD Definition

| Module                | Reference                | Usage | Notes |
|-----------------------|--------------------------|-------|-------|
| Directory Information | B.X.3.2.1 (DICOM PS3.10) | U     |       |

#### C.1.2 Directory Information Module

| Attribute Name                                    | Tag         | Type | Notes                                |
|---|-------------|------|--------------------------------------|
| Offset of the Next Directory Record               | (0004,1400) | 1C   |                                      |
| Record In-use Flag                                | (0004,1410) | 1C   |                                      |
| Offset of Referenced Lower-Level Directory Entity | (0004,1420) | 1C   |                                      |
| Directory Record Type                             | (0004,1430) | 1C   | PATIENT, STUDY, SERIES and IMAGE     |
| Referenced File ID                                | (0004,1500) | 1C   | Only found in IMAGE Directory Record |
| Referenced SOP Class UID in file                  | (0004,1510) | 1C   | Only found in IMAGE Directory Record |
| Referenced SOP Instance UID in File               | (0004,1511) | 1C   | Only found in IMAGE Directory Record |
| Referenced Transfer Syntax UID in File            | (0004,1512) | 1C   | Only found in IMAGE Directory Record |

#### C.1.3 Directory Record Selection Keys

As indicated in table C.1.2, the PRI-CTMR-MOD12 application profile will have only the Patient, Study, Series and Image directory record types. Given below are the lists of attributes supported under each of these directories.

##### C.1.3.1 Patient Keys

| Attribute Name         | Tag         | Type | Notes      |
|------------------------|-------------|------|------------|
| Specific Character Set | (0008,0005) | 1C   | ISO_IR 100 |
| Patient's Name         | (0010,0010) | 2    |            |
| Patient ID             | (0010,0020) | 1    |            |

##### C.1.3.2 Study Keys

| Attribute Name         | Tag         | Type | Notes      |
|------------------------|-------------|------|------------|
| Specific Character Set | (0008,0005) | 1C   | ISO_IR 100 |
| Study Date             | (0008,0020) | 1    |            |
| Study Time             | (0008,0030) | 1    |            |
| Accession Number       | (0008,0050) | 2    |            |
| Study Description      | (0008,1030) | 2    |            |
| Study Instance UID     | (0020,000D) | 1C   |            |
| Study ID               | (0020,0010) | 1    |            |



**C.1.3.3 Series Keys**

| Attribute Name         | Tag         | Type | Notes      |
|------------------------|-------------|------|------------|
| Specific Character Set | (0008,0005) | 1C   | ISO_IR 100 |
| Image Type             | (0008,0008) | 3    |            |
| Modality               | (0008,0060) | 1    |            |
| Manufacturer's Id      | (0008,0070) | 3    |            |
| Series Description     | (0008,103E) | 3    |            |
| Manuf. Model Name      | (0008,1090) | 3    |            |
| Series Instance UID    | (0020,000E) | 1    |            |
| Series Number          | (0020,0011) | 1    |            |

**C.1.3.4 Image Keys**

| Attribute Name              | Tag         | Type | Notes                      |
|-----------------------------|-------------|------|----------------------------|
| Specific Character Set      | (0008,0005) | 1C   | ISO_IR 100                 |
| SOP Instance UID            | (0008,0018) | 3    | Redundant to (0004,1511)   |
| Referenced Image Sequence   | (0008,1140) | 1C   | Not included               |
| Sequence Variant            | (0018,0021) | 3    |                            |
| Slice Thickness             | (0018,0050) | 3    |                            |
| Repetition Time             | (0018,0080) | 3    |                            |
| Echo Time                   | (0018,0081) | 3    |                            |
| Inversion Time              | (0018,0082) | 3    |                            |
| Number of Averages          | (0018,0083) | 3    |                            |
| Echo Number                 | (0018,0086) | 3    | MRI profile only           |
| Spacing Between Slices      | (0018,0088) | 3    |                            |
| Data Collection Diameter    | (0018,0090) | 3    |                            |
| Contrast/Bolus Route        | (0018,1040) | 3    |                            |
| Trigger Time                | (0018,1060) | 3    |                            |
| Reconstruction Diameter     | (0018,1100) | 3    |                            |
| Gantry/Detector Tilt        | (0018,1120) | 3    |                            |
| Convolution Kernel          | (0018,1210) | 3    |                            |
| Flip Angle                  | (0018,1314) | 3    |                            |
| Image Number                | (0020,0013) | 1    |                            |
| Image Position (Patient)    | (0020,0032) | 1C   |                            |
| Image Orientation (Patient) | (0020,0037) | 1C   |                            |
| Frame of Reference UID      | (0020,0052) | 1C   | Absent from PRI-CTMR-MOD12 |
| Slice Location              | (0020,1041) | 3    |                            |
| Samples Per Pixel           | (0028,0002) | R    |                            |
| Photometric Interpretation  | (0028,0004) | R    | Absent from all profiles   |
| Rows                        | (0028,0010) | 1    |                            |
| Columns                     | (0028,0011) | 1    |                            |
| Pixel Spacing               | (0028,0030) | 1C   |                            |
| Bits Allocated              | (0028,0100) | R    |                            |
| Bits Stored                 | (0028,0101) | R    | MRI - Absent from profiles |
| High Bit                    | (0028,0102) | R    | MRI - Absent from profiles |