

GE Signa MR Series

Introduction

Private elements for GE modalities are defined in GE conformance statements found here: http://www.gehealthcare.com/usen/interoperability/dicom/products/ultrasound_dicom.html. The link is for US sites; other regions will find a different link for conformance statements appropriate for those devices.

The GE Signa MR series has a number of different software versions and product names that have been released. We have reviewed conformance statements that correspond to software releases encountered when accepting images for the Cancer Imaging Archive (<http://www.cancerimagingarchive.net>). This document describes the private elements are listed in these conformance statements.

Observations on GE Private Elements

After reading several conformance statements for different software releases in the Signa series, a clear pattern emerged. We did not confirm this with GE.

1. The Signa MR scanners use private elements in these groups with these private creator values:
 - a. 0009 GEMS_IDEN_01
 - b. 0011 GEMS_PATI_01
 - c. 0019 GEMS_ACQU_01
 - d. 0021 GEMS_RELA_01
 - e. 0023 GEMS_STDY_01
 - f. 0025 GEMS_SERS_01
 - g. 0027 GEMS_IMAG_01
 - h. 0029 GEMS_IMPS_01
 - i. 0043 GEMS_PARM_01
 - j. 2001 BrainWave: 1.2.840.113819.3
 - k. 7001 GEMS_MR_RAW_01
 - l. 0051 GEMS_FUNCTOOL_01
2. From the GE website, we start with “Signa EXCITE 3T/1.5T (11.0) 2388702DRS Rev. 0”
3. The software versions that follow this version use the same structure. The private groups and private creator values are the same. The newer software versions use the same private elements with these changes:
 - a. A new software version may define and document a private element that was not defined in a previous software version.

- b. A new software version may re-use an existing private element but give it a name which better defines the intention/interpretation of the element.
- c. One software version (or several in succession) may define a private element as either a placeholder or with the term “user data”. This does not tell the reader what to expect in that element. A later software release will properly define the element.

The interpretation of this is that it seems to be safe to use one set of definitions in our implementation of software that catalogs private elements from GE Signa modalities. Earlier software versions will not contain private elements that are first used in later software version and will not cause issues when de-identifying private elements. If there are any questions about the content of a private element as defined in a conformance statement, we can configure our software to review the element value before deciding to include or exclude the element.

False Start

We had started this analysis with the belief that each DICOM header would contain enough data to identify the modality model and software version. That would allow software to automatically determine exactly which conformance statement was appropriate and to use the exact profiles for that software version. We have since found that images from some sites do not contain the software version and/or model number. Some images are even lacking the manufacturer name. Whether this is intentional by a site to further obscure the data or just the configuration of the scanner, the net result is the same. We use the private creator data defined in the GE conformance statements as the basis for analyzing the private elements.

Scanner/Software Versions

Link Name / GE website	Model	Software Version	Document
Signa EXCITE 3T/1.5T (11.0) 2388702DRS Rev. 0	Signa Excite	11.0	2388702DRS Rev. 0
Signa EXCITE 1.5T (11.1) DOC0394474 Rev. 1	Signa Excite	11.1	DOC0394474 Rev. 1
Signa EXCITE HD Ovation(12.0) 5124914 Rev. 2	Signa Excite HD Ovation	12.0	5124914 Rev. 2
Signa HDx 3.0T/1.5T (14.0) DOC0225604 Rev. 2	Signa HDx	14.0	DOC0225604 Rev. 2

GEMS_IDEN_01

In the table of private elements in this section and following:

*: Element is listed in the document

X1: Element is listed with a note: No longer supported

				EXCITE 3T/1.5T (11.0)	EXCITE 1.5T (11.1)	Signa EXCITE HD Ovation(12.0)	Signa HDx 3.0T/1.5T (14.0)
Description	Tag	VR	VM				
GEHC Private Creator ID	0x00090010	LO	1	X 1	X 1	X 1	X 1
Full fidelity	0x00091001	LO	1	*	*	*	*
Suite id	0x00091002	SH	1	*	*	*	*
Product ID	0x00091004	SH	1	*	*	*	*
Image Actual Date	0x00091027	SL	1	*	*	*	*
Service id	0x00091030	SH	1	*	*	*	*
Mobile location number	0x00091031	SH	1	*	*	*	*
Equipment UID	0x000910e3	UI	1	*	*	*	*
Genesis Version - now	0x000910e6	SH	1	X 1	X 1	X 1	X 1
Exam Record Checksum	0x000910e7	UL	1	X 1	X 1	X 1	X 1
Actual series data time stamp	0x000910e9	SL	1	*	*	*	*

GEMS_PATI_01

GEHC Private Creator ID	0x00110010	LO	1
Patient Status	0x00111010	SS	1

GEMS_ACQU_01

				EXCITE 3T/1.5T (11.0)
GEHC Private Creator ID	0x00190010	LO	1	*
Horiz. Frame of ref.	0x0019100f	DS	1	*
Series Contrast	0x00191011	SS	1	*
Last pseq	0x00191012	SS	1	*
Series plane	0x00191017	SS	1	*
First scan ras	0x00191018	LO	1	*
First scan location	0x00191019	DS	1	*
Last scan ras	0x0019101a	LO	1	*
Last scan loc	0x0019101b	DS	1	*
Display field of view	0x0019101e	DS	1	*
Acquisition Duration	0x0019105a	FL	1	*
Second echo	0x0019107d	DS	1	*
Number of echoes	0x0019107e	SS	1	*
Table delta	0x0019107f	DS	1	*
Contiguous	0x00191081	SS	1	*
Peak SAR	0x00191084	DS	1	*
Monitor SAR	0x00191085	SS	1	*
Cardiac repetition time	0x00191087	DS	1	*
Images per cardiac cycle	0x00191088	SS	1	*
Actual receive gain analog	0x0019108a	SS	1	*
Actual receive gain digital	0x0019108b	SS	1	*
Delay after trigger	0x0019108d	DS	1	*
Swappf	0x0019108f	SS	1	*
Pause Interval	0x00191090	SS	1	*
Pause Time	0x00191091	DS	1	*
Slice offset on freq axis	0x00191092	SL	1	*
Center Frequency	0x00191093	DS	1	*
Transmit Gain	0x00191094	SS	1	*

Analog receiver gain	0x00191095	SS	1	*
Digital receiver gain	0x00191096	SS	1	*
Bitmap defining CVs	0x00191097	SL	1	*
Center freq. Method	0x00191098	SS	1	*
Pulse Sequence Mode	0x0019109b	SS	1	*
Pulse Sequence Name	0x0019109c	LO	1	*
Pulse Sequence Date	0x0019109d	DT	1	*
Internal Pulse Sequence Name	0x0019109e	LO	1	*
Transmitting Coil Type	0x0019109f	SS	1	*
Surface Coil Type	0x001910a0	SS	1	*
Extremity Coil flag	0x001910a1	SS	1	*
Raw data run number	0x001910a2	SL	1	*
Calibrated Field Strength	0x001910a3	UL	1	*
SAT fat/water/bone	0x001910a4	SS	1	*
Receive bandwidth	0x001910a5	DS	1	X 1
User data 0	0x001910a7	DS	1	*
User data 1	0x001910a8	DS	1	*
User data 2	0x001910a9	DS	1	*
User data 3	0x001910aa	DS	1	*
User data 4	0x001910ab	DS	1	*
User data 5	0x001910ac	DS	1	*
user data 6	0x001910ad	DS	1	*
User data 7	0x001910ae	DS	1	*
User data 8	0x001910af	DS	1	*
User data 9	0x001910b0	DS	1	*
User data 10	0x001910b1	DS	1	*
User data 11	0x001910b2	DS	1	*
User data 12	0x001910b3	DS	1	*
User data 13	0x001910b4	DS	1	*
User data 14	0x001910b5	DS	1	*
User data 15	0x001910b6	DS	1	*
User data 16	0x001910b7	DS	1	*
User data 17	0x001910b8	DS	1	*
User data 18	0x001910b9	DS	1	*
User data 19	0x001910ba	DS	1	*
User data 20	0x001910bb	DS	1	*
User data 21	0x001910bc	DS	1	*
User data 22	0x001910bd	DS	1	*
Projection angle	0x001910be	DS	1	*
Saturation planes	0x001910c0	SS	1	*
Surface coil intensity	0x001910c1	SS	1	X 1

SAT location R	0x001910c2	SS	1	*
SAT location L	0x001910c3	SS	1	*
SAT location A	0x001910c4	SS	1	*
SAT location P	0x001910c5	SS	1	*
SAT location H	0x001910c6	SS	1	*
SAT location F	0x001910c7	SS	1	*
SAT thickness R/L	0x001910c8	SS	1	*
SAT thickness A/P	0x001910c9	SS	1	*
SAT thickness H/F	0x001910ca	SS	1	*
Prescribed flow axis	0x001910cb	SS	1	*
Velocity encoding	0x001910cc	SS	1	*
Thickness disclaimer	0x001910cd	SS	1	*
Prescan type	0x001910ce	SS	1	*
Prescan status	0x001910cf	SS	1	*
Raw data type	0x001910d0	SH	1	*
Projection Algorithm	0x001910d2	SS	1	X 1
Projection algorithm	0x001910d3	SH	1	*
Fractional echo	0x001910d5	SS	1	*
Prep pulse	0x001910d6	SS	1	*
Cardiac phase number	0x001910d7	SS	1	*
Variable echoflag	0x001910d8	SS	1	*
Concatenated SAT	0x001910d9	DS	1	*
User data 23	0x001910df	DS	1	*
User data 24	0x001910e0	DS	1	*
Velocity Encode Scale	0x001910e2	DS	1	*
Fast phases	0x001910f2	SS	1	*
Transmit gain	0x001910f9	DS	1	*