

MEASUREMENT AND TECHNICAL REPORT

GE MEDICAL SYSTEMS - IT
15222 del Amo Avenue
Tustin, CA 92780

DATE: 25 November 2002

This Report Concerns:	Original Grant: X	Class II Change:
Equipment Type:	DT-7001 Instrument Transceiver, Model DT-7001*	
	(*) Model numbers represent per customer: DT-7000 and DT-7001. DT-7001 deemed worst case.	
Deferred grant requested per 47 CFR 0.457(d)(1)(ii)?	Yes: Defer until:	No: X
Company Name agrees to notify the Commission by:	N/A	
of the intended date of announcement of the product so that the grant can be issued on that date.		
Transition Rules Request per 15.37?	Yes:	No: X*
(*) FCC Parts 2 and 95, Paragraph(s) 2.1049, 2.1055 and 95.1115(a), 95.1115(b), 95.1115(e)		
Report Prepared by:	TÜV AMERICA, INC 10040 Mesa Rim Road San Diego, CA 92121-2912 Phone: 858 546 3999 Fax: 858 546 0364	

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1.0 GENERAL INFORMATION**1.1 Product Description****General Equipment Description -- NOTE: This information will be input into your test report as shown below.**

EUT Description: Instrument Transceiver

EUT Name: DT-7000 & DT-7001

Model No.: -- Serial No.: --

Product Options: With batteries (DT-7001) or without (DT-7000)

Configurations to be tested: DT-7001 (deemed worst case)

Power Requirements

Regulations require testing to be performed at typical power ratings in the countries of intended use. (i.e., European power is typically 230 VAC 50 Hz or 400 VAC 50 Hz, single and three phase, respectively)

Voltage: 115 (If battery powered, make sure battery life is sufficient to complete testing.)

of Phases: 1

Current (Amps/phase(max)): 2 Current (Amps/phase(nominal)): 0.5

Other: Battery back-up (internal to device) will test on wall power

Other Special Requirements

--

Typical Installation and/or Operating Environment

(ie. Hospital, Small Business, Industrial/Factory, etc.)

Hospital or other fixed healthcare facility

EUT Power Cable

☐ Permanent	OR	☒ Removable	Length (in meters):	<u>3 m</u>
☐ Shielded	OR	☒ Unshielded		
☐ Not Applicable				

EUT Interface Ports and Cables

Interface				Shielding								
Type	Analog	Digital	Qty	Yes	No	Type	Termination	Connector Type	Port Termination	Length (in meters)	Removable	Permanent
EXAMPLE:												
RS232	☐	☒	2	☒	☐	Foil over braid	Coaxial	Metallized 9-pin D-Sub	Characteristic Impedance	6	☒	☐
Data I/O	☐	☒	2	☐	☒	Drain wire is present by not totally shielded	Multi-wire	Hirose	--	1	☒	☐
Power	☒	☐	1	☐	☒	Jerome brick	--	--	--	3	☒	☐

EUT Software.

Revision Level: --

Description: SW for the digital board; SW for the RF module

EUT Operating Modes to be Tested -- list the operating modes to be used during test. It is recommended the equipment be tested while operating in a typical operation mode. FCC testing of personal computers and/or peripherals requires that a simple program generate a complete line of upper case H's. Provide a general description of all software, firmware, and PLD algorithms used in the equipment. List all code modules as described above, with the revision level used during testing. Consult with your TÜV Product Service Representative if additional assistance is required.

- Expect to test per DA00-0075. As TUV AM directs, will test in FHSS mode or will adjust to stop at a specific frequency. The unit Only operates in FHSS when installed.

EUT System Components -- List and describe all components which are part of the EUT. For FCC testing a minimum configuration is required. (ie. Mouse, Printer, Monitor, External Disk Drive, Motherboard, etc.)			
Description	Model #	Serial #	FCC #
DT-7001	--	--	--
Power brick	--	--	--
I/O Cable	--	--	--
Programming box and laptop to exit FHSS mode	--	--	--

Support Equipment -- List and describe all support equipment which is not part of the EUT. (i.e. peripherals, simulators, etc)			
Description	Model #	Serial #	FCC ID #
--			

Oscillator Frequencies			
Frequency	Derived Frequency	Component # / Location	Description of Use
10 MHz	9600 kbps	Oscillator on digital board	I/O communication rate
7.3728 MHz	608-614 MHz	Crystal on RF module	RF transmission

Power Supply					
Manufacturer	Model #	Serial #	Type		
Jerome	--	--	☐ Switched-mode	(Frequency)	60 Hz
			☒ Linear	☐ Other	--

Power Line Filters		
Manufacturer	Model #	Location in EUT
--		

Critical EMI Components (Capacitors, ferrites, etc.)				
Description	Manufacturer	Part # or Value	Qty	Component # / Location
ESD coating	Cybershield (alternate vendors being considered)	--	--	Inside enclosure

EMC Critical Detail -- Describe other EMC Design details used to reduce high frequency noise.
--

--

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1.2 Related Submittal Grant

None

1.3 Tested System Details

The FCC ID's for all equipment, plus descriptions of all cables used in the tested system are:

None

1.4 Test Methodology

Purpose of Test: To demonstrate compliance with the following tests.

TEST	FCC CFR 47#	PASS/FAIL
Field Strength of Fundamental	95.1115(a)	Pass
Field Strength of Out of Band Emissions	95.1115(b)	Pass
Frequency Stability vs. Voltage	95.1115(e); 2.1055	Pass
Occupied Bandwidth	2.1049	Pass

Both Conducted and Radiated testing were performed according to the procedures in FCC/ANSI C63.4 and CSA 108.8-M1983. Radiated testing was performed at an antenna-to-EUT distance of 3 meters (1 - 25 GHz).

1.5 Test Facility

The open area test site and conducted measurement data were tested by:

TÜV AMERICA, INC
10040 Mesa Rim Road
San Diego, CA 92121-2912
Phone: 858 546 3999
Fax: 858 546 0364

The Test Site Data and performance comply with ANSI C63.4 and are registered with the FCC, 7435 Oakland Mills Road, Columbia Maryland 21046. All Measurement Data is acquired according to the content of FCC Measurement Procedure and ANSI C63.4, unless supplemented with additional requirements as noted in the test report.

1.6 Part 2 Requirements

Applicant: Data Critical Corporation
15222 Del Amo Avenue
Tustin, CA 92780

Manufacturer: GE Medical Systems Information Technologies
8200 W. Tower Avenue
Milwaukee, WI 53223

R&D: GE Medical Systems Information Technologies
15222 Del Amo Avenue
Tustin, CA 92780

Note that Data Critical Corporation is an operating entity of GE Medical Systems Information Technologies.

frequency range: 608-614 MHz (frequency range tested 608.72 - 612.80)
tolerance: 50 ppm (per CCM2 Crystal.pdf for temp, per testing at TUV for voltage)
microprocessor: not applicable

Maximum power rating: 200 mV/m at 3m

EUT input power can range from 4.25 – 25 VDC. Internally, voltages are regulated to provide 3.0 VDC to the digital circuits and 4.2 VDC to the RF module.

Tune-up procedure - not applicable.

See operating description and schematics for description of the modulation system and of the modulating wavetrain.

- RF module voltage = 4.2 VDC. Overall power input to the DT-700X can range from 4.25 VDC to 25 VDC (from external power supply, medical bedside device, or internal batteries). Regardless of source, the DT-700X digital board provides a regulated 4.2 VDC to the RF module. The rest of the DT-700X digital board runs at a regulated 3.0 VDC.
- Miscellaneous technical info
 - o Frequency tolerance = 50 ppm
 - o Emissions = frequency hopping spread spectrum (FHSS)
 - o TDMA was on during all testing (frequency hopping was stopped as required by test procedures)
 - o Modulation = GFSK (Gaussian pulse shaped Frequency Shift Keying)

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2.0 SYSTEM TEST CONFIGURATION

2.1 Justification

The EUT was initially tested for FCC emissions in the following configuration:

See Block Diagram

2.2 EUT Exercise Software

None

2.3 Special Accessories

None

2.4 Equipment Modifications

None

2.5 Configuration of Test System

See Block Diagram

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**3.0 FIELD STRENGTH OF FUNDAMENTAL EQUIPMENT/DATA
OCCUPIED BANDWIDTH
FIELD STRENGTH OF OUT OF BAND EMISSIONS EQUIPMENT/DATA
FREQUENCY STABILITY VS VOLTAGE EQUIPMENT/DATA**

See following page(s).

Report No. SC205752-03

Test Conditions: Part 95.1115

Report No. SC205752

Photos taken? ☒ Yes Nov. 12, 2002

GE Medical Systems IT
Model DT-7001
sn K22Y0009GP w/ RF Module 201990 in CS33 case

Test Equipment Used:

Model Number	Prop. #	Description	Manufacturer	Serial No.	Cal. Due Dates
For Part 95.1115(a) Field Strength of Fundamental					
For Part 95.1115(b) Field Strength of Out of Band Emissions > 1000 MHz					
For Part 2.1049 Occupied Bandwidth					
☒ Roof, 3-meter open site					
☒ hp8566B	407	Spectrum Analyzer	Hewlett Packard	2311A02209	11/13/02
☒ 85650A	408	Quasipeak Adapter	Hewlett Packard	2811A01325	n.c.r.
☒ 3115	251	Antenna, Horn	Electro Mechanics Co	2595	10/20/02
☒ 3146	243/6641	Antenna, Log Per.	Electro Mechanics Co	106X	4/11/03
☒ PreAmp 2-20 GHZ	719	PreAmp	TUV PS	na	n.c.r.
☒ Cable 1	732	30' cable	United Microwave Products	na	n.c.r.
☒ Cable 2	6788	3' cable	United Microwave Products	na	n.c.r.
☒ FF 6548-2	777	900 MHz High Pass Filter	Sage	006	n.c.r.
to verify cable losses:					
☒ 437B	572	Power Meter	Hewlett Packard	3125O19308	4/26/03
☒ 8482A	574	Power Sensor	Hewlett Packard	3318A27679	4/11/03
☒ 8350B	6706	Sweep Signal Generator	Hewlett Packard	2749A09420	n.c.r.
For Part 95.1115(b) Field Strength of Out of Band Emissions < 1000 MHz					
☒ Canyon 2, 3- meter OATS					
☒ LPB 2520 A	6722/739	Antenna, Bilog	Antenna Research	1170	5/3/03
☒ ESVS30	466	EMC Receiver	Rhode & Schwartz	833825/003	3/30/03
For Part 2.1055 Frequency Stability Vs. Voltage					
☒ SR 2, Shielded Room, 12' x 24' x 10', Metal Chamber					
☒ hp8568B	187	Spectrum Analyzer	Hewlett Packard	2304A92500	3/28/03
☒ Variac	6006	Variable Transformer	Technopower	n/a	n.c.r.
☒ 34401A	776	Digital Multimeter	Hewlett Packard	U536086974	11/26/02
☒ 7405	6437	Antenna, Probe Kit	EMC Test Systems	9812-4261	n.c.r.

Remarks: _____

GE Medical Systems IT
Model DT-7001
sn K22Y0009GP w/ RF Module 201990 in CS33 case

CFR 47, Part 2, Paragraphs 2.1049 and 2.1055
CFR 47 Part 95 Section H

95.1115 General Technical Requirements

95.1115 (a)(1) Quasipeak 608-614 MHz 200 mV/m @ 3 meters
 $200 \text{ mV/m} = .2 \text{ V/m} = 106 \text{ dBuV/m}$
 Measured:
 608.72 MHz **103.4** dBuV/m
 612.80 MHz **105.3** dBuV/m
 see data sheet

95.1115(b) (1) Out of band emissions < 960 MHz < 200 uV/m Quasipeak @ 3 meters
 $200 \text{ uV/m} = 46.02 \text{ dBuV/m}$
 Maximum Measured: @ 614 MHz 43.0 dBuV/m
 see data sheet

95.1115(b) (2) Out of band emissions > 960 MHz < 500 uV/m average RBW 1MHz @ 3 meters
 $500 \text{ uV/m} = 53.98 \text{ dBuV/m}$
 Maximum Measured: @ 3226.1 MHz 40.76 dBuV/m
 see data sheet

95.1115(c) Emission types: any but not video or voice.
 TDMA

95.1115(d) (2) Channel use -- 1.5 MHz:
 See operating description exhibit.

95.1115(e) Frequency Stability vs. Voltage
 Stable within bands assigned under all of the manufacturer's specifications
 Manufacturer's limit = **50 ppm**

	Endpoint	Deviation
External Vdc source	4.25 V	6.1 ppm
	25.01 V	8.5 ppm
Internal Vdc source -- 3 Lithium Cells in series	2.81 V	3.1 ppm
(low battery alarm)	3.50 V	5.4 ppm
	4.20 V	5.9 ppm
External 120 Vac source -- power brick	Vac - 15% = 102.1 Vac	6.6 ppm
	Vac + 15% = 138.0 Vac	23.0 ppm

Tested 11-13-02 in SR2 by A. Laudani
 Spectrum Analyzer hp8568AB (Span = 50 kHz, Mode = Frequency Counter)
 1 minute sample Maximum and Minimum recorded.

95.1115(e) Frequency Stability vs. Frequency
 Stable within bands assigned under all of the manufacturer's specifications
 Manufacturer's limit = 50 ppm
 See end of test report - data supplied by customer.

REPORT No: SC205752

SPEC: FCC Part 95.1115(a)(1)

CUSTOMER: GE Medical Systems IT

TEST DIST: 3 Meters

E U T: Model DT-7001
sn K22Y0009GP w/ RF Module 201990 in CS33 case

TEST SITE: 3

EUT MODE: Transmit

BICONICAL: none

DATE: Nov. 11, 2002 TESTED BY: A. Laudani

LOG PERIODIC: 243

NOTES: Quasi-Peak with 120 kHz measurement bandwidth

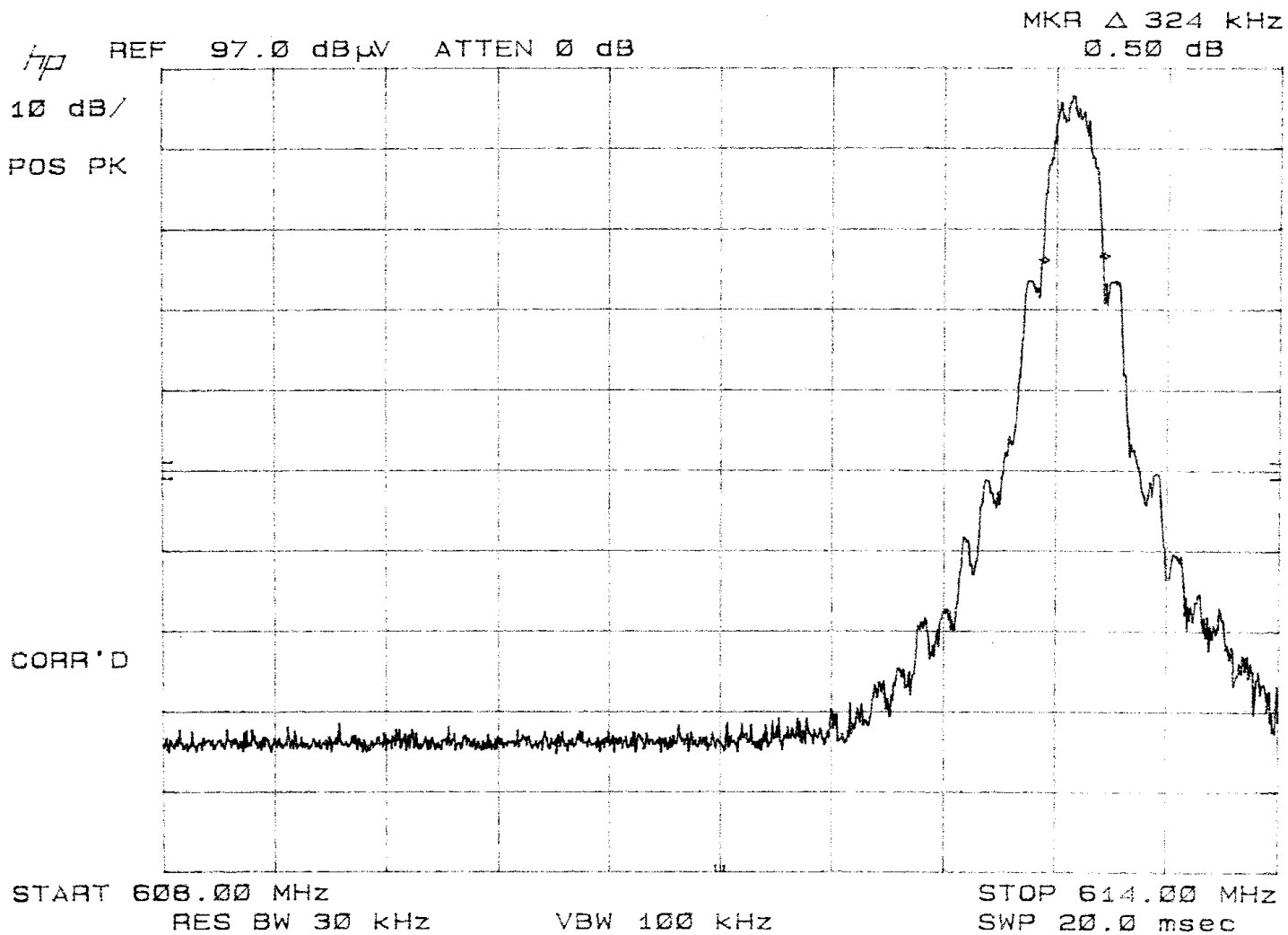
CF = antenna factor + cable loss

EUT programmed power = 76

[illegible]

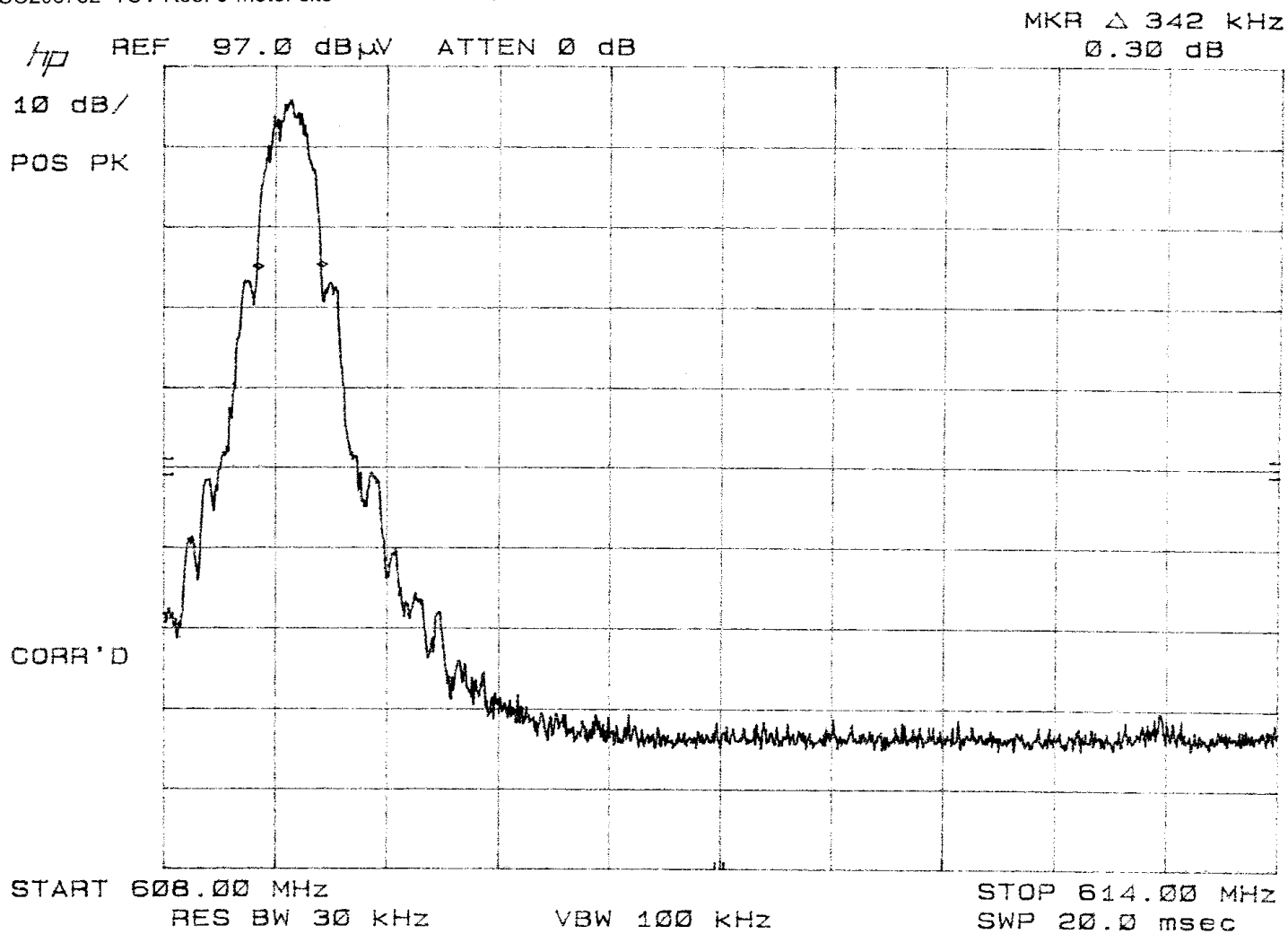
GE Medical Systems IT Model DT-7001 sn K22Y0009GP w/ RF Module 201990 in CS33 case
 FCC Part 2.1049 Occupied Bandwidth
 SC205752 TUV Roof 3-meter site

Nov. 11, 2002
 TECH/ENGR: AAL *AAL*



GE Medical Systems IT Model DT-7001 sn K22Y0009GP w/ RF Module 201990 in CS33 case
FCC Part 2.1049 Occupied Bandwidth
SC205752 TUV Roof 3-meter site

Nov. 11, 2002
TECH/ENGR: AAL *AAL*



REPORT No: SC205752

SPEC: FCC Part 15 para 95.1115(b)

CUSTOMER: GE Medical Systems IT

TEST DIST: 3 Meters

E U T: Model DT-7001
sn K22Y0009GP w/ RF Module 201990 in CS33 case

TEST SITE: 2

EUT MODE: Transmit

BICONICAL: 739

DATE: Nov. 11, 2002 TESTED BY: A. Laudani *AKY*

LOG PERIODIC: 739

NOTES: Quasi-Peak with 120 KHz measurement bandwidth. RCVR: 6723

EUT Programmed Power = 76

EUT powered by 120 Vac

Temperature:	26	Relative Humidity:	45%
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EUT MARGIN

-3.0 dB at 614 MHz

ver 1.9

[illegible]

Report No. SC205752-03

REPORT No: SC205752 TESTER: Alan Laudani *AL* SPEC: FCC Part 95.1115(b)(2)

CUSTOMER: GE Medical Systems IT TEST DIST: 3 Meters

E U T: Model DT-7001 TEST SITE: Roof
sn K22Y0009GP w/ RF Module 201990 in CS33 case

EUT MODE: Transmit BICONICAL: N/A

DATE: Nov. 11, 2002 LOG: N/A

NOTES: OTHER: 251

above 1GHz: RBW & VBW 1 MHz for Pk; RBW 1MHz and VBW 10Hz for AVG

CF = Antenna Factor + Cable Loss - Preamplifier Gain

v.beta1a

FREQ (MHz)	VERTICAL (dBuV)		HORIZONTAL (dBuV)		CF (dB/m)	MAX LEVEL (dBuV/m)		SPEC LIMIT (dBuV/m)		MARGIN (dB)		EUT Rotation	Antenna Height
	pk	av	pk	av		pk	av	pk	av	pk	av		
608.72	92.9		88.6										
1217.44	55.2	26.3	54.3	27.4	-12.3475	42.85	15.1	74	54	-31.1	-38.9	131	1.5
1826.16	47.5	34.8	36.3	26.4	-7.91688	39.58	26.9	74	54	-34.4	-27.1		
2434.88	36.3	22.9	38.1	22.9	-4.61258	33.49	18.3	74	54	-40.5	-35.7		
3043.6	34.4	23	38.4	22.9	-2.43432	35.97	20.6	74	54	-38	-33.4		
3652.32	34.5	23.2	35	23.5	-0.2735	34.73	23.2	74	54	-39.3	-30.8		
4261.04	35.2	24	36.7	24.6	0.12571	36.83	24.7	74	54	-37.2	-29.3		
4869.76	37.1	24.5	36.1	24.6	0.48742	37.59	25.1	74	54	-36.4	-28.9		
5478.48	31.6	22.6	33	22.8	4.34075	37.34	27.1	74	54	-36.7	-26.9		
613	95.5		84.9										
1226	63.2	26.7	53	25.9	-12.2824	50.92	14.4	74	54	-23.1	-39.6	130	1.1
1839	46.3	30.6	37.5	26	-7.827	38.47	22.8	74	54	-35.5	-31.2		
2452	43.5	27.9	41.8	26.7	-4.5304	38.97	23.4	74	54	-35	-30.6		
3065	34.2	23.5	34.2	23.6	-2.353	31.85	21.2	74	54	-42.2	-32.8		
3678	36	24.8	35	24.1	-0.2016	35.8	24.6	74	54	-38.2	-29.4		
4291	35.7	24.2	35.2	24.4	0.0598	35.76	24.5	74	54	-38.2	-29.5		
4904	35.5	24.5	35.6	24.5	0.5696	36.17	25.1	74	54	-37.8	-28.9		
5517	35.2	23.3	36.1	23.5	4.5442	40.64	28	74	54	-33.4	-26		
6130	33.8	23.4	35.6	23.5	5.722	41.32	29.2	74	54	-32.7	-24.8		
Spurious with 608.9 MHz TX													
3226.1	42.2	37.4	36.5	28	-1.74082	40.46	35.7	74	54	-33.5	-18.3	273	1
5376.7	37.1	26.4	34.9	24.5	3.58758	40.69	30	74	54	-33.3	-24	352	1.1
Spurious with 613 MHz TX													
No Other Emissions Found													

Report No. SC205752-03

FREQUENCY STABILITY

SHEET 1 OF 1

TEST REPORT # SC205752

TEST AREA SR2



DATE Nov. 13, 2002

EUT MODEL# DT-7001

TEMPERATURE 22 °C

SPECIFICATION(S):

EUT SERIAL# K22Y0009GP

HUMIDITY 35 %

FCC Part 95.1115(e) Part 2.1055

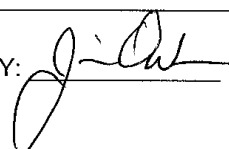
EUT DESCRIPTION Instrument Transceiver

AIR PRESSURE 100.6 kPa

TEST LEVEL		Frequency PPM	Voltage VOLTS	COMPLIES		REMARKS
FREQUENCY MINIMUM (MHz)	FREQUENCY MAXIMUM (MHz)			YES	NO	
608.6815	608.6852	6.1	4.25	√		External Vdc endpoint
608.6770	608.6822	8.5	25.01	√		External Vdc endpoint
608.6828	608.6847	3.1	2.81	√		Battery endpoint
608.6824	608.6857	5.4	3.50	√		Low Battery alarm
608.6821	608.6857	5.9	4.20	√		Battery endpoint
608.6801	608.6841	6.6	102.1	√		120 Vac - 15%
608.6786	608.6800	23.0	138.0	√		120 Vac + 15%

NOTES: Span = 50 kHz, Maximum / Minimum frequency recorded within one minute.
Limit = 50 ppm = 30,434 Hz.

TESTED BY: A. Laudani 

REVIEWED BY: 

Report No. SC205752-03

4.0 ATTESTATION STATEMENT

GENERAL REMARKS:

SUMMARY:

All tests were performed per CFR 47, Part(s) 2 and 95, Paragraphs 2.1049, 2.1055 and 95.1115(a), 95.1115(b), 95.1115(e)

■ - Performed

The Equipment Under Test

■ - **Fulfills** the requirements of CFR 47, Part(s) 2 and 95, Paragraphs 2.1049, 2.1055 and 95.1115(a), 95.1115(b), 95.1115(e)

- TÜV AMERICA, INC. -

Responsible Engineer:



Jim Owen
(EMC Chief Engineer)

Responsible Engineer:



Alan Laudani
(EMC Engineer)



GE Medical Systems
Information Technologies

*GE Medical Systems Information Technologies
Mobile Care and Wireless Center of Excellence
15222 Del Amo Avenue, Tustin, CA 92780*

Tel: (714) 546-0147 FAX (714) 546-0084

Frequency Stability with Temperature for DT-700X

Document Number: 2011272-019

Rev	Date	Author	Change
A	12-6-2002	C. Ruther	Initial Release

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1 Purpose

This report details the stability of the frequency output of the DT-700X over the range of operation. As the RF module in the DT-700X is used in several PatientNet devices, this report also applies to the ambulatory transceivers and access points.

2 Test Set-up

2.1 EUT

As the DT-7000 and DT-7001 use the same RF module, testing need only be done on one sample. Testing was performed on:

Model Number – DT-7001
Serial Number – K22Y0013GP
Main Board – 0013 rev. 6F (artwork 4E)
RF Module – 201866
RF Firmware – revision 5.2
Enclosure – CS33

The unit was set using HyperTerminal running on a standard laptop computer. To ensure repeatability the following parameters were used for testing:

KM1 – modulation off (facilitates measurements)
PW6 – packet width of 6 as required in FCC test protocol
WQ76 – power set as required to meet FCC limits
KB1 – EUT acting as base (constant transmission)

2.2 Other Equipment

Device Type	Manufacturer	Model	Serial No.
Spectrum Analyzer	Anritsu	MS2711A	202089
Temperature Chamber	Cincinnati Sub-Zero	ZH-16-2-H/AC	ZI9532255
Temperature Monitor	Honeywell	DR4200	8924Y836649000004

3 Test Set-up and Results

The PatientNet Operators' Manual (10001001 rev. B) limits the operating temperature to +5 to +40 C. The chamber was set to a temperature to ensure the full range of operating temperatures is addressed. To ensure that entire EUT was at the set temperature, the EUT was allowed to rest in the chamber at temperature for at least 30 minutes. As the main concern is to ensure that the operating frequency range is not exceeded (608-614 MHz per 47 CFR 95H, WMTS requirements), only the frequency edges were measured.

At high resolution, the transmission peak has about a 1 kHz width. To ensure worst case values are reported, the edge of the peak closest to the FCC limit (608 MHz on the low side and 614 MHz on the high side) was measured as the center frequency (f_{center}). The -20dB point ($f_{20\text{dB}}$) was also measured on the side of the band closest to the FCC limit.

The frequency settings selected for review are the band edges, WC0 for low and WC1F for high. These settings correspond to 608.6656 MHz and 612.8980 MHz, respectively.

Time	Temp (C)	Freq setting	f_{center} (MHz)	$f_{20\text{dB}}$ (MHz)	Comment
8:05	24	WC0 (608.7)	608.672 530	608.656 010	--
8:10	24	WC1F (612.9)	612.904 880	612.913 150	highest frequency overall
12 :00	3	--	--	--	chamber at temp
13:00	3	WC0 (608.7)	608.665 610	608.647 590	--
13:20	49.5	--	--	--	chamber at temp
14:30	52.5	WC0 (608.7)	608.660 370	608.665 110	lowest frequency overall
14:50	52.5	WC1F (612.9)	612.902 626	612.907 886	--
15:10	5	--	--	--	chamber at temp
16:10	3	WC1F (612.9)	612.897 360	612.906 390	--

Data Summary:

Minimum value (closest to 608 MHz) = 608.660 370

Maximum value (closest to 614 MHz) = 612.904 880

Maximum frequency change = 750 Hz (0.1 ppm)*

* specification sheet for crystal indicates it should be accurate to at least 50 ppm (30,650Hz at 612.9 MHz) from -10°C to $+60^{\circ}\text{C}$

4 Conclusion

Over the range of allowed operating temperatures, the EUT RF output ranges from 608.660 - 612.905 MHz. This is well within the 47 CFR 95H limits for WMTS of 608 – 614 MHz. Further, the EUT operates within the 50 ppm variation expected based on the specification of the crystal used in the EUT's RF module.

The EUT will operate within 47 CFR 95H limits for WMTS.