

MEASUREMENT AND TECHNICAL REPORT

CARDIONET
1010 2nd Avenue
San Diego, CA 92101

DATE: 21 December 2006

This Report Concerns:	Original Grant: X	Class II Change:
Equipment Type:	Gateway C3	
Deferred grant requested per 47 CFR 0.457(d)(1)(ii)?	Yes: Defer until:	No: X
Company Name agrees to notify the Commission by: of the intended date of announcement of the product so that the grant can be issued on that date.	N/A	
Transition Rules Request per 15.37?	Yes:	No: X*
(*) FCC Part 15, Paragraph(s) 15.247(a), 15.247(b), 15.247(c), 15.247(d), 15.107(a), and 15.109(a) and RSS-Gen 7.2; RSS 210, Annexes 7 and 8		
Report Prepared by:	TÜV AMERICA, INC 10040 Mesa Rim Road San Diego, CA 92121-2912 Phone: 858 678 1400 Fax: 858 546 0364	

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1.0 GENERAL INFORMATION

1.1 Product Description

Gateway C3

General Equipment Description:

EUT Description:	CardioNet C3 Ambulatory ECG Monitoring system		
EUT Name:	CardioNet C3 Gateway		
Model No.:	Gateway: 100-0023-01	Serial No.:	Engineering Prototype

EUT Specifications

Length:	5.75"	Width:	2.5"	Height:	1"	Weight:	5.9 oz
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Power Requirements

Voltage:	15V DC out	(If battery powered, make sure battery life is sufficient to complete testing.)	
# of Phases:	1 phase 100-240 VAC, 60Hz., 400mA input		
Current (Amps/phase(max)):	1.5A	Current (Amps/phase(nominal)):	1A

EUT Power Cable

Permanent	OR	x	Removable
Shielded	OR	x	Unshielded
Not Applicable		x	Length (in meters): 2

EUT Interface Ports and Cables

Interface				Shielding		Connector Type	Port Termination	Length (in meters)	Removable	Permanent
Type	Analog	Digital	Qty	Yes	No	Type	Termination			
RS-232	X		1		X			6	X	
USB		X	1	X		BRAID	Coaxial	6	X	

Gateway C3 (continued)

EUT Operating Modes to be Tested

1. Normal Operating Mode where Monitor and Sensor communicate.
2. Special Operation Mode where Monitor and Sensor can each independently transmit on low, mid & High bands.

EUT System Components

Description	Model #	Serial #	FCC ID #
C3 Gateway	100-0023-01	Engineering Prototype	QBI-1009

Support Equipment

Description	Model #	Serial #	FCC ID #
NONE			

Oscillator Frequencies

Frequency	Derived Frequency	Component # / Location	Description of Use
13 MHz	104 MHz	Y1	Main PLL frequency for PXA271
32.768 kHz	32.768 kHz	Y5	PXA RTC
32.768 kHz	32.768 kHz	Y2	Backup RTC
24.576 MHz	24.576 MHz	Y3	Audio CODEC
14.7456 MHz	14.7456 MHz	Y4	Baud Rate Generator

Power Supply

Manufacturer	Model #	Serial #	Type
FRIWO	15.1434.500-00		Switched-mode:X (Frequency) Not specified

Power Line Filters

Manufacturer	Model #	Location in EUT
SPECTRUM	FPB-1206-A601P3	L29/L30

Critical EMI Components (Capacitors, ferrites, etc.)

Description	Manufacturer	Part # or Value	Qty	Component # / Location
NONE				

EMC Critical Detail

On board shielding of digital components and RF sources.

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 DESCRIPTION	PARAGRAPH NUMBER
Band Edge	15.247(a)(1); RSS 210, Annex 7, A7.3
Bandwidth	15.247(a)(2); RSS 210, Annex 8, A8.2
RF Output Power	15.247(b); RSS 210, Annex 8, A8.4
RF Conducted Spurious Emissions	15.247(c); RSS 210, Annex 8, A8.5
Radiated Spurious Emissions – Restricted Bands (1GHz to 25GHz)	15.247(c)/ 15.209(a); RSS 210, Annex 8, A8.5
Power Spectral Density	15.247(d); RSS 210, Annex 8, A8.2
Conducted Emissions	15.107(a); RSS-Gen 7.2.2
Radiated Emissions (30 to 1000 MHz)	15.209(a); RSS-Gen 7.2

Testing was performed according to the procedures in FCC/ANSI C63.4 and CSA 108.8-M1983. Intentional radiators are rotated through three orthogonal axes to determine the attitude that maximizes the emissions. Test photos indicate worst case.

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: 858 678 1400
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.

2.0 SYSTEM TEST CONFIGURATION

2.1 Justification

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

See Test Setup Photos Exhibit

2.2 EUT Exercise Software

None

2.3 Special Accessories

None

2.4 Equipment Modifications

None

2.5 Configuration of Test System

See Test Setup Photos Exhibit

3.0 EQUIPMENT/DATA

Test Conditions:

BANDEDGE - FCC Part 15.247(a)(1)(i) and (a)(2); RSS 210 Annex 7, (2)
BANDWIDTH - FCC Part 15.247(a)(1)(i) and (a)(2); RSS 210 Annex 8, A8.2
OUTPUT POWER - FCC Part 15.247(b); RSS 210 Annex 8, A8.4
CONDUCTED SPURIOUS - FCC Part 15.247(c); RSS 210 Annex 8, A8.5
POWER SPECTRAL DENSITY - FCC Part 15.247(d); RSS 210 Annex 8, A8.2
CONDUCTED EMISSIONS - FCC Part 15.107(a); RSS-Gen, 7.2
RADIATED EMISSIONS - FCC Part 15.109(a); RSS-Gen, 7.2

The following measurements were performed at the San Diego Testing Facility:

☐ - Test not applicable

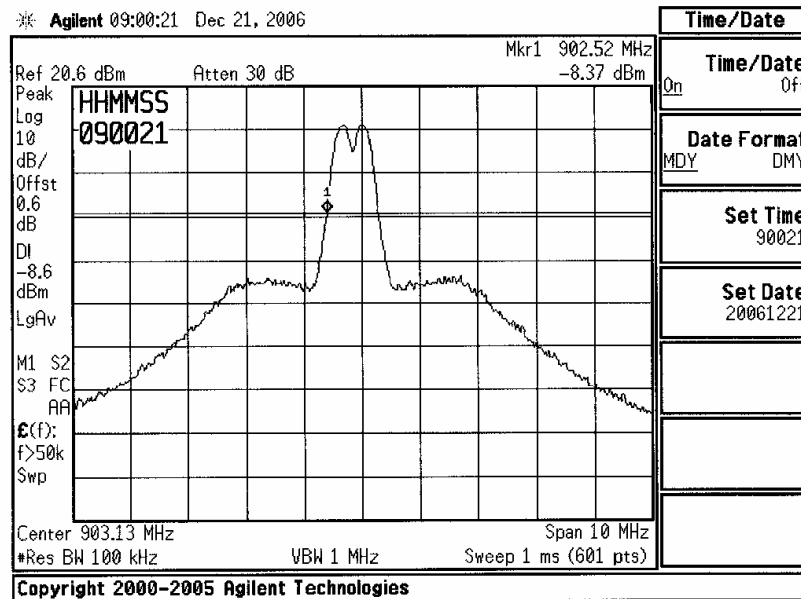
- - TR-2, Test Room
- - Roof (Small Open Area Test Site)
- - Canyon #1 (10- and 30-Meter Open Area Test Site), Carroll Canyon, San Diego

Test Equipment Used:

Model No.	Prop. No.	Description	Manufacturer	Serial No.	Date Cal'ed
3146	6641	Antenna, Log Periodic Dipole	EMCO	106X	06/05
3115	6669	Double Ridge Antenna	EMCO	9412-4364	08/05
3110B	6644	Biconical Antenna	EMCO	9508-2134	10/05
E4440A	6814	Spectrum Analyzer	Hewlett Packard	MY42510441	02/06
8493A	--	20 dB Attenuator	Hewlett Packard	05391	Verified
VAT-20	--	20 dB Attenuator	Mini Circuits	--	Verified
LPB 2520/A	6622	Antenna, Bilog	Antenna Research	1170	07/05
ESVS 30	6732	EMI Test Receiver	Rhode & Schwarz	833825/003	11/05
3104	6663	Biconical Antenna	EMCO	3041	Verified
3115	6679	Double Ridge Guide Antenna	EMCO	2495	04/06
3146	6641	Log Periodic Dipole Antenna	EMCO	106X	Verified

Remarks: One year calibration cycle for all test equipment and sites.

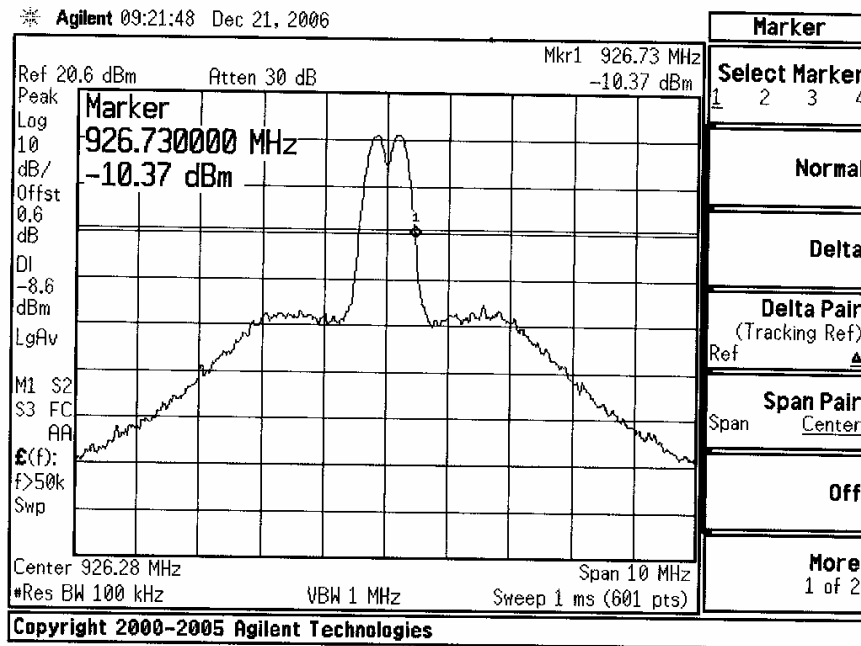
Part 15.247(a)(1), RSS 210, Annex 7 (2), Bandedge



Cardionet
Channel ϕ
reaches -20dBc point at 902.5 MHz
band edge is 902 MHz - OK

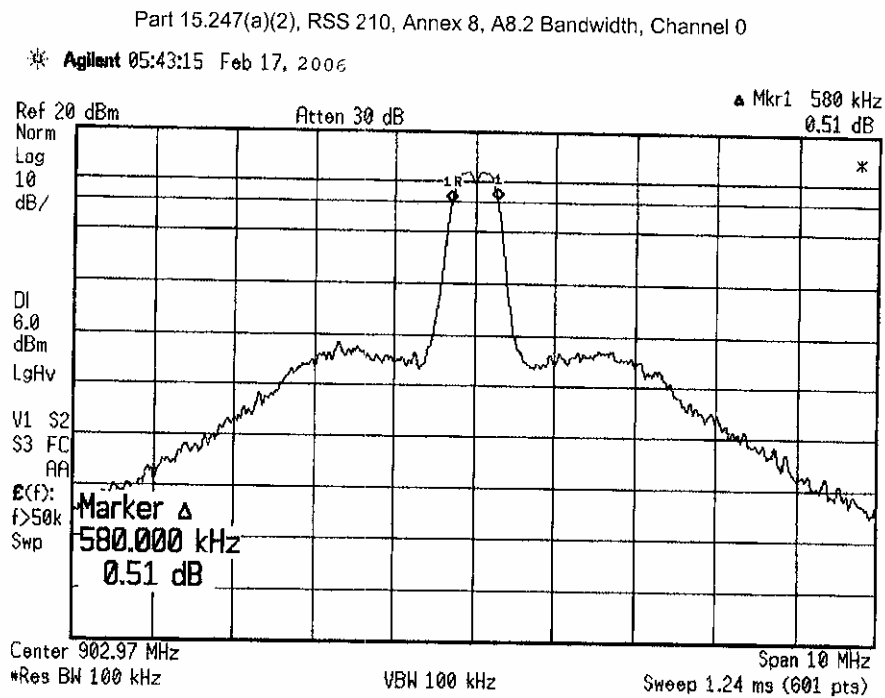
gts

Part 15.247(a)(1), RSS 210, Annex 7 (2), Bandedge



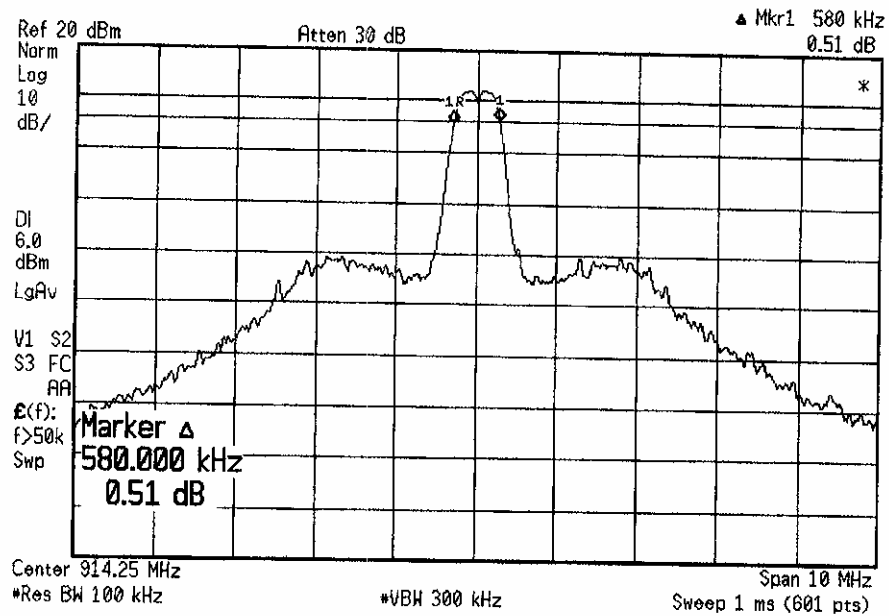
Cardionet
Highest channel
Band edge at 928 MHz
reaches -20dBc @ 926.7 MHz - OK

GT2



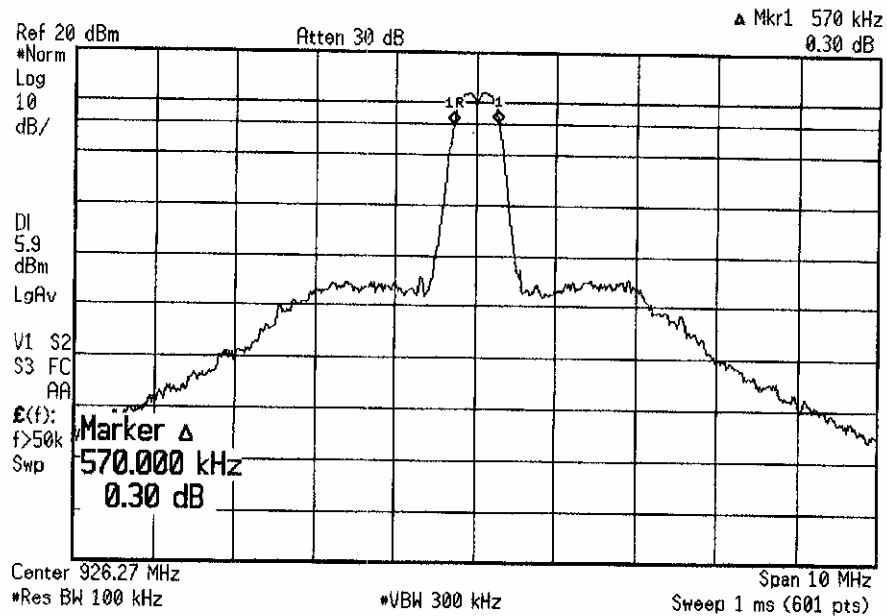
Part 15.247(a)(2), RSS 210, Annex 8, A8.2 Bandwidth, Channel 15

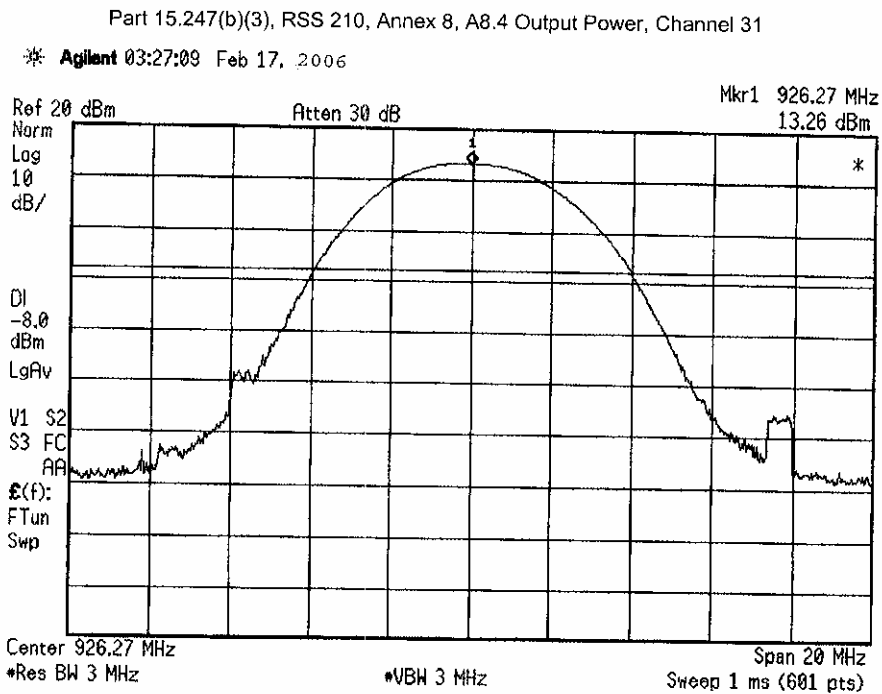
* Agilent 06:12:56 Feb 17, 2006



Part 15.247(a)(2), RSS 210, Annex 8, A8.2 Bandwidth, Channel 31

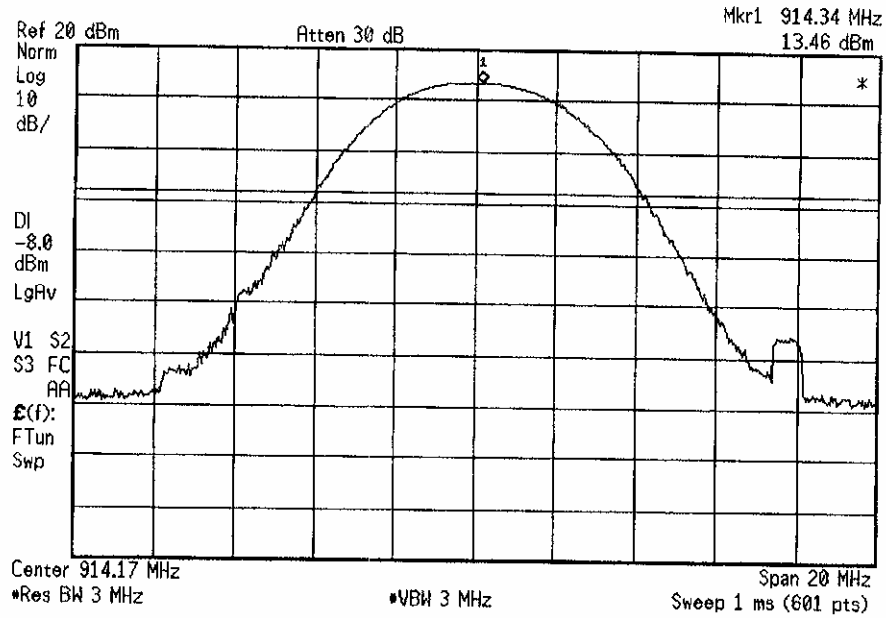
✱ Agilent 06:06:47 Feb 17, 2006





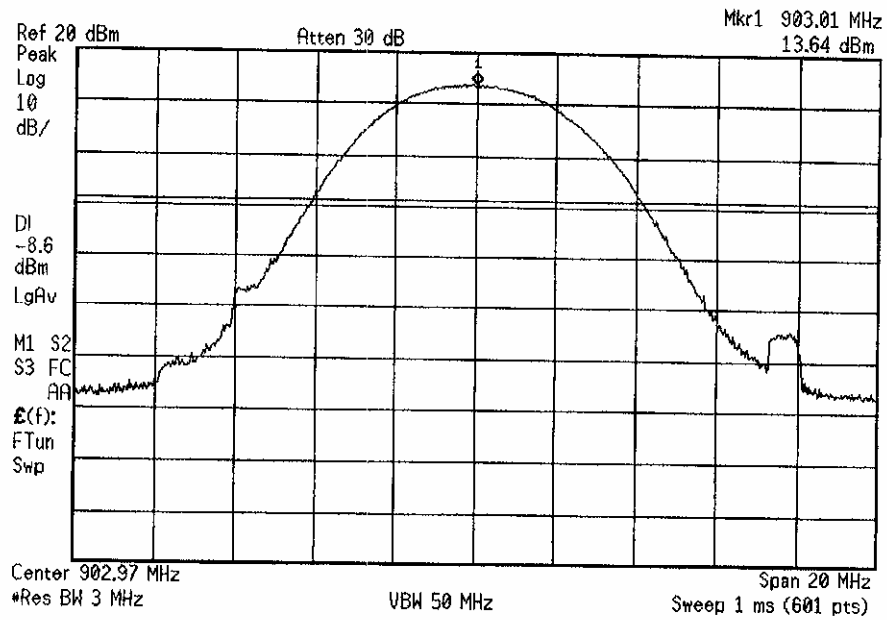
Part 15.247(b)(3), RSS 210, Annex 8, A8.4 Output Power, Channel 15

* Agilent 03:30:36 Feb 17, 2006



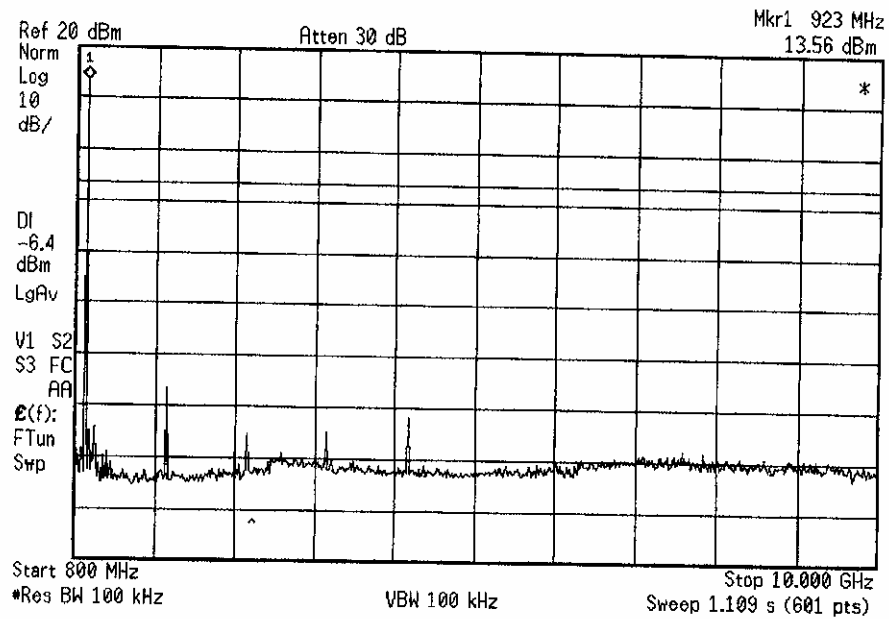
Part 15.247(b)(3), RSS 210, Annex 8, A8.4 Output Power, Channel 0

Agilent 03:44:22 Feb 17, 2006



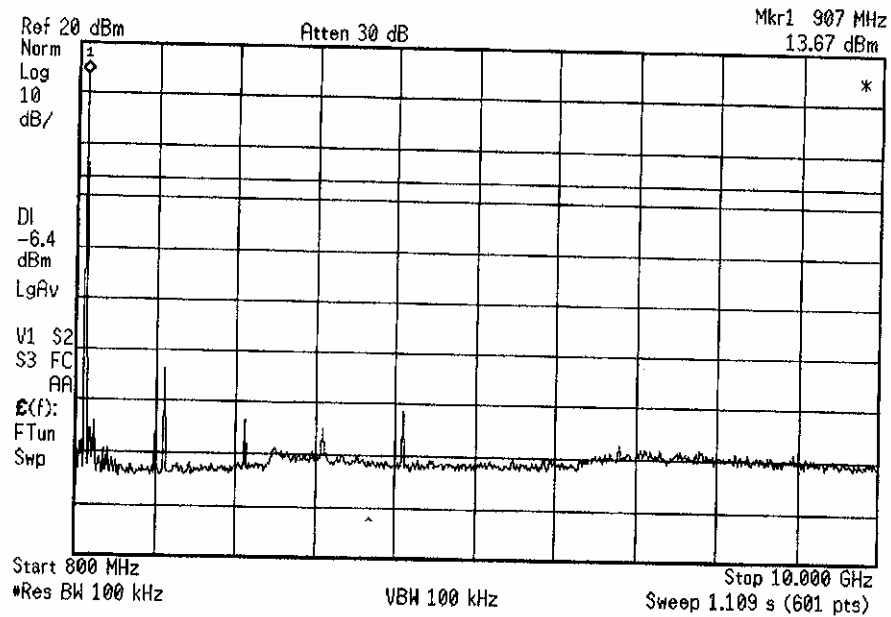
Part 15.247(c), RSS 210, Annex 8, A8.5 Conducted Spurious Emissions, Channel 31

* Agilent 03:07:05 Feb 17, 2006



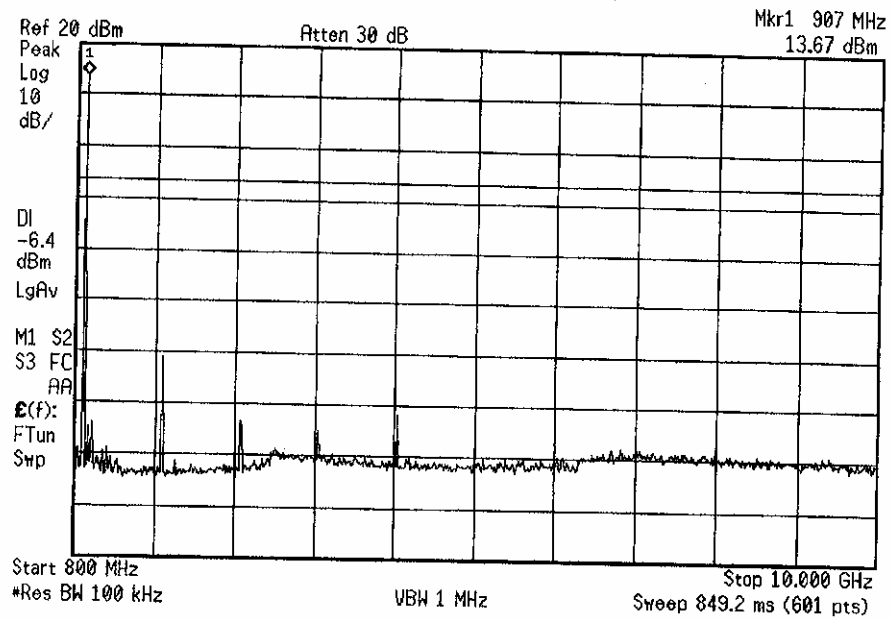
Part 15.247(c), RSS 210, Annex 8, A8.5 Conducted Spurious Emissions, Channel 15

* Agilent 03:10:04 Feb 17, 2006



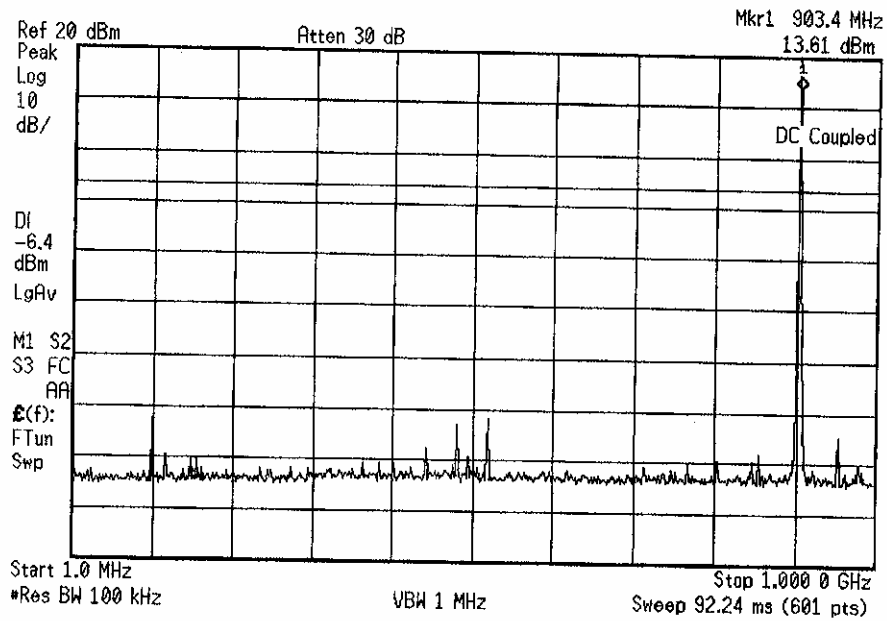
Part 15.247(c), RSS 210, Annex 8, A8.5 Conducted Spurious Emissions, Channel 0

* Agilent 03:11:46 Feb 17, 2006



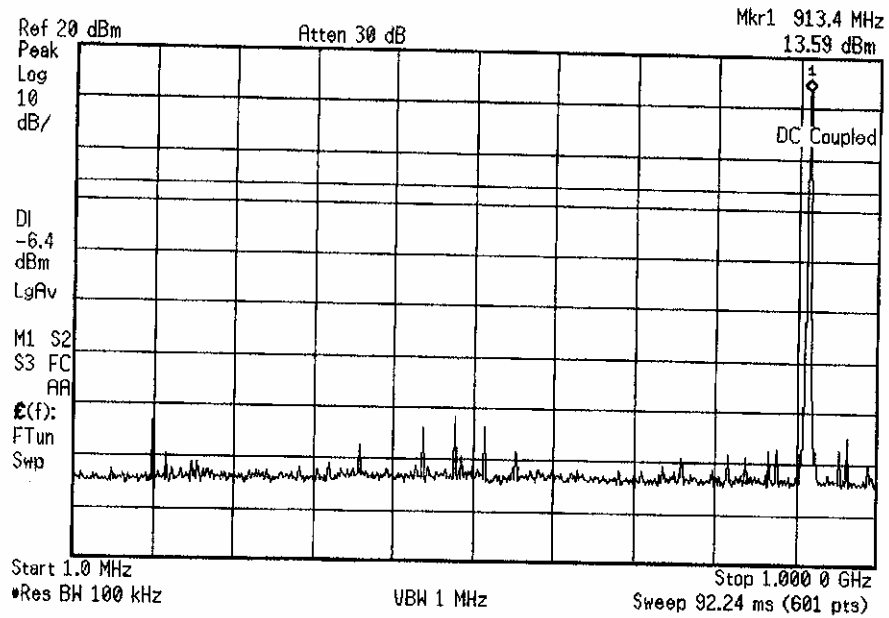
Part 15.247(c), RSS 210, Annex 8, A8.5 Conducted Spurious Emissions, Channel 0

Agilent 03:14:24 Feb 17, 2006



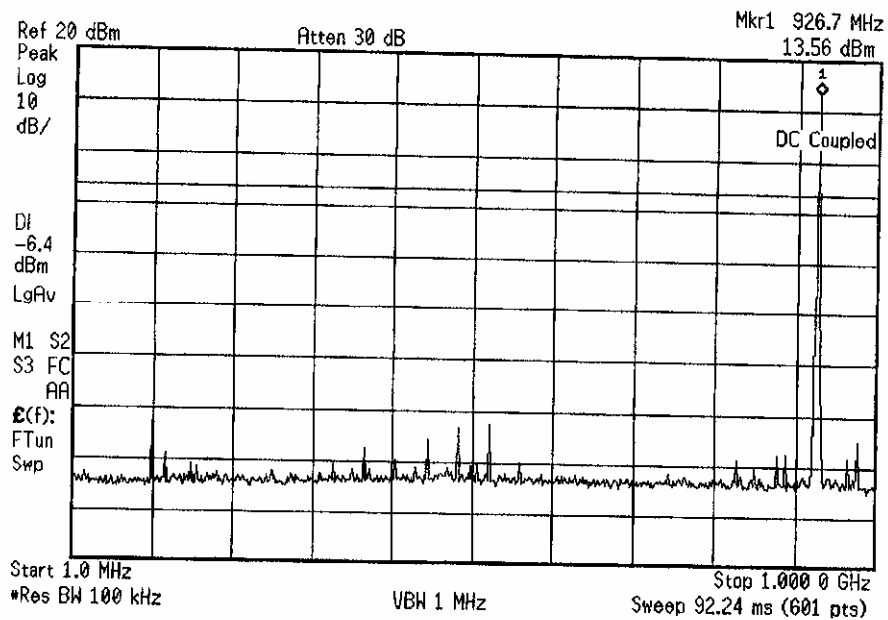
Part 15.247(c), RSS 210, Annex 8, A8.5 Conducted Spurious Emissions, Channel 15

* Agilent 03:15:40 Feb 17, 2006



Part 15.247(c), RSS 210, Annex 8, A8.5 Conducted Spurious Emissions, Channel 31

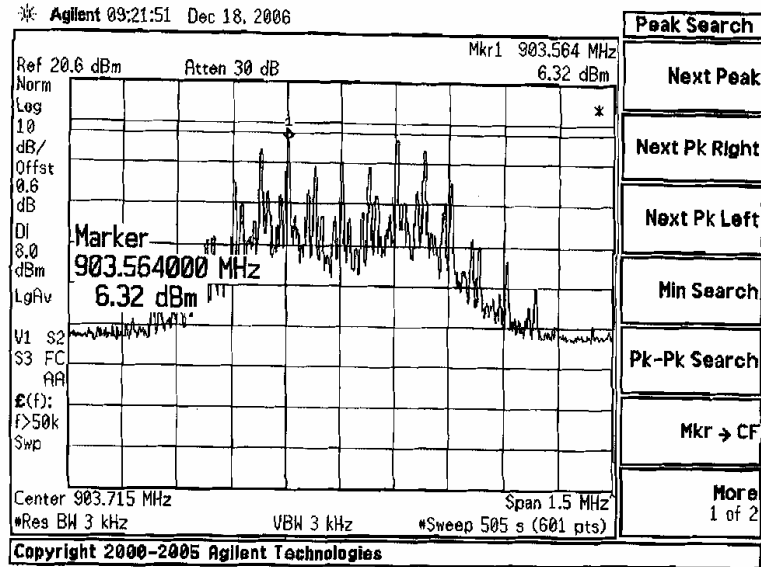
* Agilent 03:16:52 Feb 17, 2006



REPORT NO: SC000647	TESTER: Jim Owen	SPEC: FCC Part 15 para 15.209(a) / 15.247(e)
CUSTOMER: CardioNet	TEST DIST: 3 Meters	
TEST SITE: Gateway	TEST SITE: Roof	
TEST MODE: Transmit	BICONICAL: 6663	
DATE: 2-Mar-06	LOG: 6641	
NOTES:	OTHER: 6679	
above 1GHz: RBW & VBW 1 MHz for PK; RBW 1MHz and VBW 10Hz for AVG below 1GHz: RBW & VBW 100 kHz for PK; RBW 100kHz and VBW 10Hz for AVG CF = Antenna Factor + Cable Loss - Preamplifier Gain + Preselector Loss		

FREQ (MHz)	VERTICAL (dBuV)		HORIZONTAL (dBuV)		CF (dBm)	MAX LEVEL (dBuV/m)		SPEC LIMIT (dBuV/m)		MARGIN (dB)		EUT Rotation	Antenna Height	Notes
	pk	av	pk	av		pk	av	pk	av	pk	av			
902.96	71.1	70.7	63.3	62.8	23.5852	94.69	94.3	66	46	28.69	48.3	67	1	Ch. 0
1806	none				-8.058	#####	-8.1	74	54	#####	62.1			
2709	none				-3.8148	#####	-3.8	74	54	#####	-57.8			
914.25	71.3	70.9	63.7	63.3	23.5288	94.83	94.4	66	46	28.83	48.4	67	1	ch. 15
1829	none				-7.897	#####	-7.9	74	54	#####	61.9			
2743	none				-3.7196	#####	-3.7	74	54	#####	-57.7			
928.275	71.2	70.8	64	63.6	23.5	94.7	94.3	66	46	28.7	48.3	64	1	ch. 31
1852	none				-7.736	#####	-7.7	74	54	#####				
2779	none				-3.6188	#####	-3.6	74	54	#####	-57.6			
902	32	29.5	24.5	21.8	23.59	55.59	53.1	66	46	-10.4	7.09	67	1	Band Edge
928	31.1	28.8	23.5	21.5	23.5	54.6	52.3	66	46	-11.4	6.3	62	1	Band Edge

low channel power spectral density



Cardionet

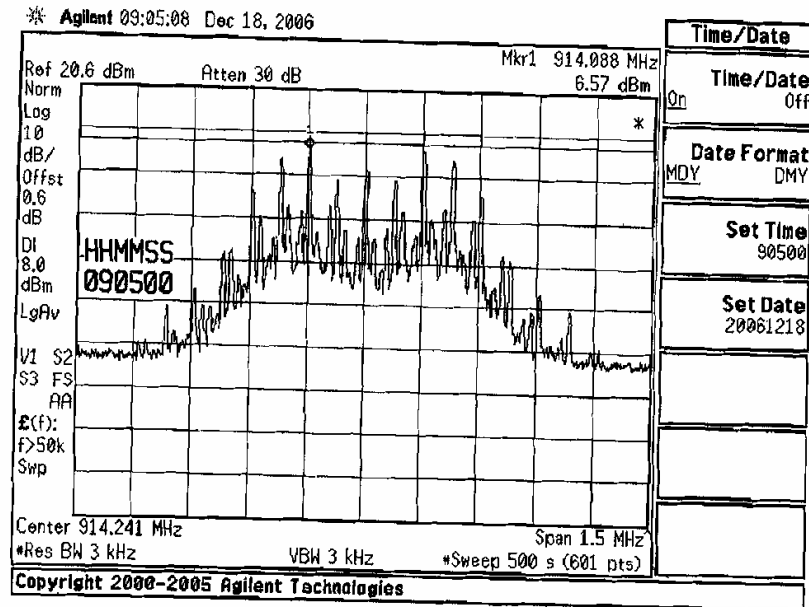
low-channel - highest power

Power spectral density

<8 dBm - OK

gts

mid channel power spectral density



Cardionet

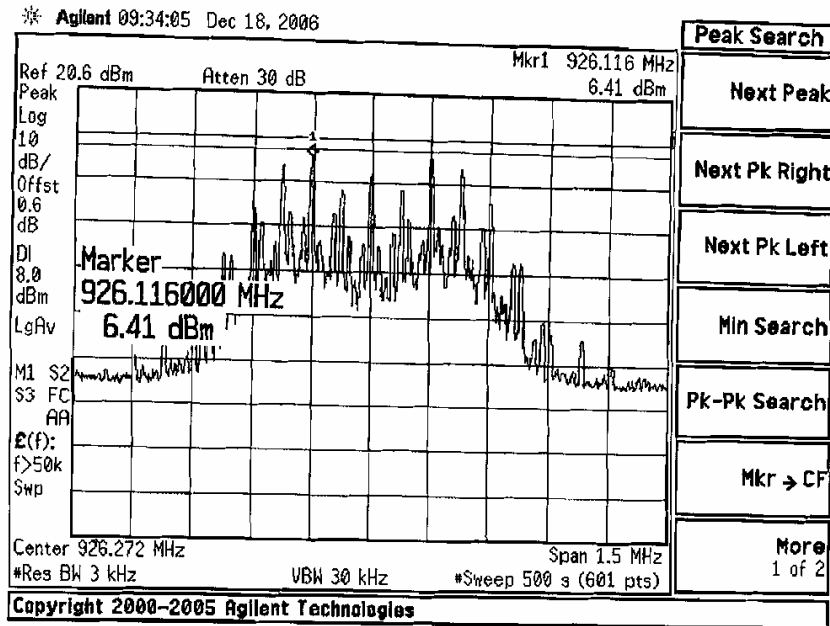
Mid-channel - highest power

Power spectral density

<8 dBm - OK

GT2

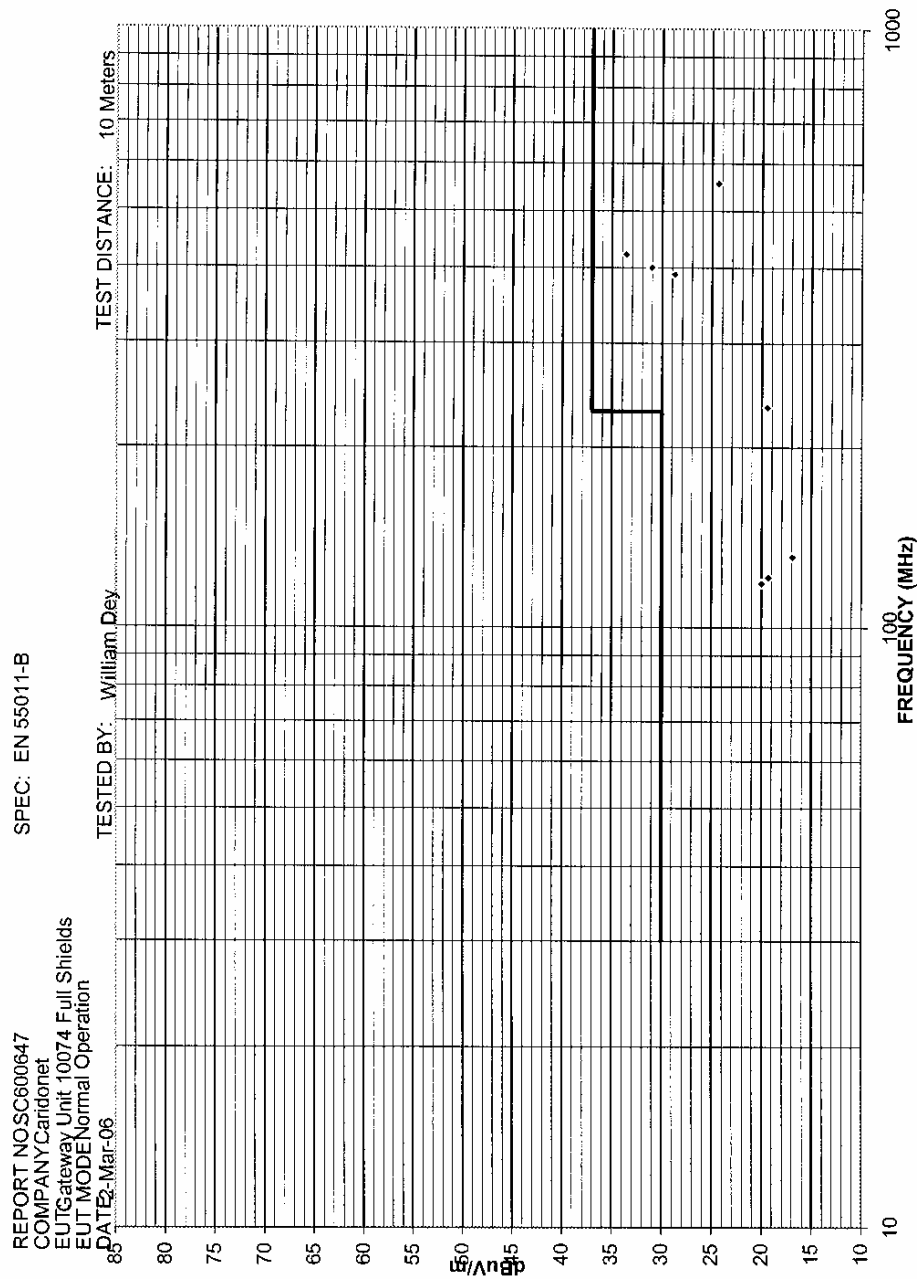
high channel power spectral density



Cardionet
High channel - highest power
Power spectral density
<8 dBm - OK
JTS



Part 15.109(a); RSS-Gen 7.2, Radiated Emissions



Part 15.109(a); RSS-Gen 7.2, Radiated Emissions

RCVR: 6723

TÜV AMERICA INC 10040 Mesa Rim Road San Diego, CA 92121-2912 Phone 858 678 1400 FAX 858 546 0364

Part 15.107(a); RSS-Gen 7.2.2, Conducted Emissions

TUV America
Conducted Emissions

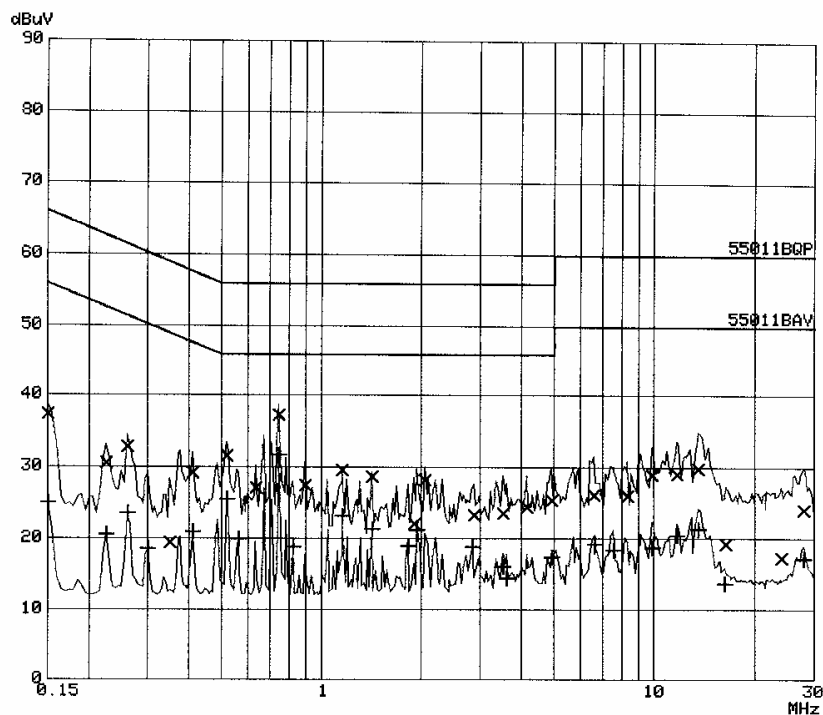
EUT: Gateway C3
 Manuf: CardioNet
 Op Cond: Normal
 Operator: Chuck Rickard
 Test Spec: EN55011 Class B
 Comment: 115vac 60Hz Line 1
 SC600647
 Date: 15. Feb 06 11:06

Scan Settings (2 Ranges)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150k	1M	5k	10k	PK+AV	100ms	AUTO	LN OFF	60dB
1M	30M	5k	10k	PK+AV	2ms	AUTO	LN OFF	60dB

Transducer No.	Start	Stop	Name
6	10k	30M	20dBLISN

Final Measurement: x QP / + AV
 Meas Time: 1 s
 Subranges: 25
 Acc Margin: 35dB



Part 15.107(a); RSS-Gen 7.2.2, Conducted Emissions

TUV America
Conducted Emissions

EUT: Gateway C3
 Manuf: CardioNet
 Op Cond: Normal
 Operator: Chuck Rickard
 Test Spec: EN55011 Class B
 Comment: 115vac 60Hz Line 1
 SC600647
 Date: 15. Feb 06 11:06

Final Measurement Results:

Frequency MHz	QP Level dBuV	QP Limit dBuV
0.15000	37.4	66.0
0.22500	30.6	62.7
0.26000	32.9	61.4
0.35000	19.4	59.0
0.41000	29.3	57.7
0.52000	31.5	56.0
0.63500	27.1	56.0
0.74500	37.3	56.0
0.89500	27.5	56.0
1.15500	29.6	56.0
1.41500	28.7	56.0
1.90500	22.1	56.0
2.05000	28.2	56.0
2.87000	23.2	56.0
3.51000	23.5	56.0
4.14500	24.4	56.0
4.93000	25.4	56.0
6.60000	26.1	60.0
8.30500	26.0	60.0
9.87000	29.0	60.0
11.70000	29.1	60.0
13.56500	29.8	60.0
16.39000	19.2	60.0
24.08000	17.2	60.0
27.96000	24.0	60.0

Frequency MHz	AV Level dBuV	AV Limit dBuV
0.15000	25.0	56.0
0.22500	20.6	52.7
0.26000	23.6	51.4
0.30000	18.6	50.2
0.41000	20.9	47.7
0.52000	25.5	46.0
0.56000	20.0	46.0
0.74500	31.8	46.0
0.82000	18.8	46.0
1.15500	23.2	46.0
1.41500	21.3	46.0
1.82500	19.0	46.0
1.94000	21.2	46.0

Part 15.107(a); RSS-Gen 7.2.2, Conducted Emissions

Date:	15. Feb 06	11:06
2.84000	18.9	46.0
3.51000	16.0	46.0
3.61500	14.4	46.0
4.93000	17.3	46.0
6.62000	19.2	50.0
7.55500	18.4	50.0
9.86000	18.7	50.0
11.71000	20.5	50.0
13.54500	21.3	50.0
16.26000	13.6	50.0
27.94500	17.1	50.0

* limit exceeded

Part 15.107(a); RSS-Gen 7.2.2, Conducted Emissions

TUV America
Conducted Emissions

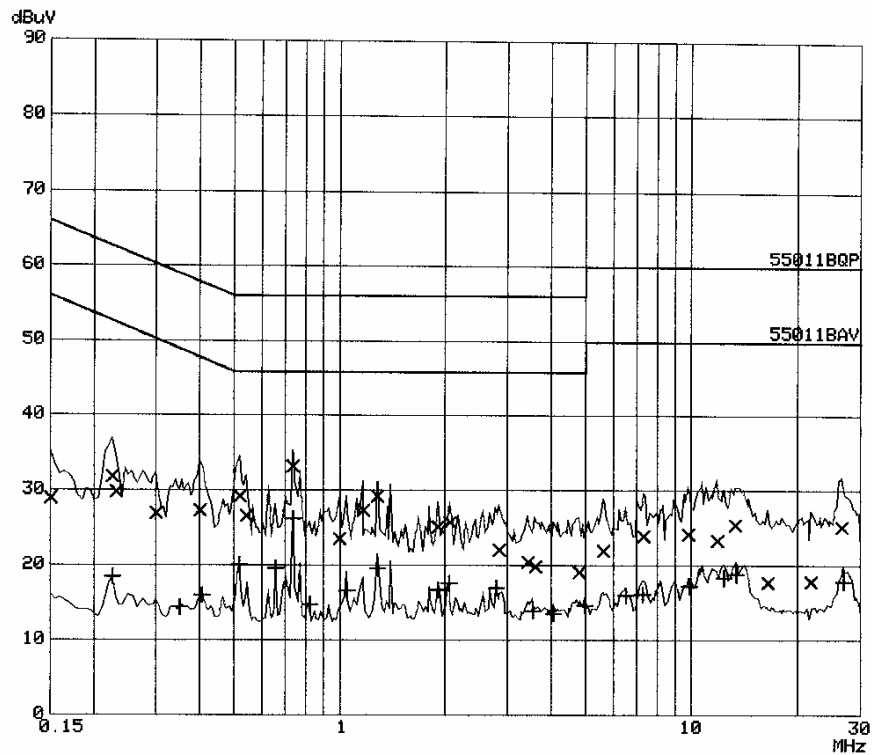
EUT: Gateway C3
 Manuf: CardioNet
 Op Cond: Normal
 Operator: Chuck Rickard
 Test Spec: EN55011 Class B
 Comment: 115vac 60Hz Line 2
 SC600647
 Date: 15. Feb 06 10:55

Scan Settings (2 Ranges)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150k	1M	5k	10k	PK+AV	100ms	AUTO	LN OFF	60dB
1M	30M	5k	10k	PK+AV	2ms	AUTO	LN OFF	60dB

Transducer No.	Start	Stop	Name
6	10k	30M	20dBLISN

Final Measurement: x QP / + AV
 Meas Time: 1 s
 Subranges: 25
 Acc Margin: 35dB



Part 15.107(a); RSS-Gen 7.2.2, Conducted Emissions

TUV America
Conducted Emissions

EUT: Gateway C3
 Manuf: CardioNet
 Op Cond: Normal
 Operator: Chuck Rickard
 Test Spec: EN55011 Class B
 Comment: 115vac 60Hz Line 2
 SC600647
 Date: 15. Feb 06 10:55

Final Measurement Results:

Frequency MHz	QP Level dBuV	QP Limit dBuV
0.15000	29.0	66.0
0.22500	31.9	62.7
0.23000	29.8	62.4
0.30000	27.0	60.2
0.40000	27.4	57.8
0.52000	29.2	56.0
0.54000	26.7	56.0
0.73500	33.1	56.0
0.99500	23.5	56.0
1.16500	27.4	56.0
1.28000	29.2	56.0
1.90000	25.2	56.0
2.05500	25.7	56.0
2.84000	22.0	56.0
3.44000	20.5	56.0
3.61500	19.9	56.0
4.80000	19.0	56.0
5.61500	21.9	60.0
7.30000	23.9	60.0
9.79500	24.2	60.0
11.84500	23.3	60.0
13.29500	25.4	60.0
16.46500	17.7	60.0
21.72000	17.8	60.0
26.70000	25.1	60.0

Frequency MHz	AV Level dBuV	AV Limit dBuV
0.22500	18.4	52.7
0.35000	14.4	49.0
0.40500	16.0	47.8
0.51500	20.0	46.0
0.65500	19.6	46.0
0.73500	26.2	46.0
0.82000	14.7	46.0
1.04500	16.7	46.0
1.28000	19.6	46.0
1.90500	16.7	46.0
2.05000	17.7	46.0
2.78500	17.0	46.0
3.55000	13.9	46.0

Part 15.107(a), RSS-Gen 7.2.2, Conducted Emissions

Date:	15. Feb 06	10:55
4.06000	13.5	46.0
4.97000	14.7	46.0
6.52000	15.9	50.0
7.28000	16.1	50.0
9.88500	17.2	50.0
12.36500	18.3	50.0
13.37500	18.8	50.0
26.95500	17.9	50.0

* limit exceeded

4.0 ATTESTATION STATEMENT

GENERAL REMARKS:

NOTES: 1) Antenna gain is less than 6 dBi.
2) Radiated Emissions - Intentional radiators are rotated through three orthogonal axes to determine the attitude that maximizes the emissions. Test photos indicate worst case.

SUMMARY:

All tests were performed per CFR 47, Part(s) 15.247(a), 15.247(b), 15.247(c), 15.247(d), 15.107(a), 15.207(a), and 15.209(a)

■ - Performed

The Equipment Under Test

■ - **Fulfills** the requirements of CFR 47, Part(s) 15.247(a), 15.247(b), 15.247(c), 15.247(d), 15.107(a), 15.207(a), and 15.209(a)

Testing Start Date: 15 February 2006

Testing End Date: 16 March 2006

- TÜV AMERICA, INC. -

Reviewing Engineer:



Chuck Rickard
(EMC Engineer)

Test Engineer:



David Gray
(EMC Engineer)