

TEST RESULT SUMMARY

FCC Part 15 Subpart C Section 15.247 Industry Canada RSS-210 Issue 7

MANUFACTURER'S NAME	Nonin Medical Incorporated
MANUFACTURER'S ADDRESS	13700 1st Avenue North Plymouth MN 55441
NAME OF EQUIPMENT	Saber Wireless RF Bluetooth Communications Module
MODEL NUMBER(S) TESTED	N/A
TEST REPORT NUMBER	WC704535 Rev A
TEST DATE(S)	26 - 27 June 2007 and 06 May 2008

According to testing performed at TÜV America Inc, the above mentioned unit is in compliance with the applicable electromagnetic compatibility (EMC) portions of the requirements defined in FCC Part 15 Subpart C Section 15.247 and Industry Canada RSS-210 Issue 7.

It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical characteristics. Any modifications necessary for compliance made during testing on the above mentioned date(s) must be implemented in all production units for compliance to be maintained.

TÜV America Inc, as an independent testing laboratory, declares that the equipment tested as specified above conforms to the applicable EMC requirements of FCC Part 15 Subpart C Section 15.247 *"Operation within the bands 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz; General requirements."* and IC RSS-210 Issue 7 *"Low-power License-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment"*.

Date: 06 May 2008

Location: Taylors Falls MN
USA



Greg Jakubowski
Senior EMC Technician

Not Transferable



Joel T. Schneider
Senior EMC Engineer

EMC TEST REPORT

Test Report File No. : **WC704535 Rev A** Date of issue: 06 May 2008

Model / Serial No(s) Tested : N/A / 13, 3, 22

Product Type : Saber Wireless RF Bluetooth Communications Module

Applicant : Nonin Medical Incorporated

Address : 13700 1st Avenue North
Plymouth MN 55441

Test Result : **Positive** **Negative**

Test Project Number
References : **WC704535 Rev A**

Total pages including
Appendices : **59**

TÜV AMERICA Inc reports apply only to the specific samples tested under stated test conditions. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. TÜV America Inc shall have no liability for any deductions, inferences or generalizations drawn by the client or others from TÜV America Inc issued reports.

This report is the confidential property of the client. As a mutual protection to our clients, the public and ourselves, extracts from the test report shall not be reproduced except in full without our written approval. This report shall not be used by the client to claim product endorsement by NVLAP, NIST, or any agency of the US government.

*TÜV AMERICA Inc and its professional staff hold government and professional organization certifications and are members of
AAMI, ACIL, AEA, ANSI, IEEE, NARTE, and VCCI.*

REVISION RECORD

REVISION	TOTAL NUMBER OF PAGES	DATE	DESCRIPTION
	49	28 October 2007	Initial Release
A	59	06 May 2008	<p>Revisions include:</p> <ul style="list-style-type: none">▪ Page 29: amended radiated spurious emission data to indicate no signals were detected in transmit or receive mode.▪ Page 20: Added conducted emissions data



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Sign Explanations:

- not applicable
- applicable

EMC TEST REGULATIONS:

The tests were performed according to the following regulations :

- EN 50081-1 / 1991
- EN 55014-2: 1997 + Amendment A1: 2001 - Category __
- EN 55024: 1998 + Amendments A1: 2001 + A2: 2003
- EN 60601-1-2: 2001
- EN 61000-6-1: 2001
- EN 61000-6-2: 2001
- EN 61326: 1997 + Amendments A1: 1998 + A2: 2001 + A3: 2003
- EN 61800-3: 1996 + Amendment A11: 2000
- ETS 300 683: 1997
- ETS 300 683: 1997
- ETSI EN 301 489-3 V1.4.1: 2002
- EN 300 220-3 V1.1.1
- EN 300 330-2 V1.1.1
- FCC Part 15 Subpart C Section 15.207
- FCC Part 15 Subpart C Section 15.209
- FCC Part 15 Subpart C Section 15.247
- FCC Part 15 Subpart C Section 15.249
- IC RSS-210 Issue 7
- IC RSS-Gen Issue 2

ENVIRONMENTAL CONDITIONS IN THE LAB

Temperature:	<u>Actual</u>
Atmospheric pressure	: 17 - 24 °C
Relative Humidity	: 98.0 - 98.8 kPa
	: 34 - 50 %

POWER SUPPLY UTILIZED

Power supply system : 60 Hz - 110 VAC - 1 Phase

Carrier Frequency Separation

FCC 15.247(a)(1), IC RSS-210 A8.1(b)

Test summary

The requirements are: - MET - NOT MET

Carrier Frequency Separation = 1.004 MHz

Test location

- Wild River Lab Large Test Site (Open Area Test Site)
- Wild River Lab Large Test Site - Tech area
- Wild River Lab Small Test Site (Open Area Test Site)

Test equipment

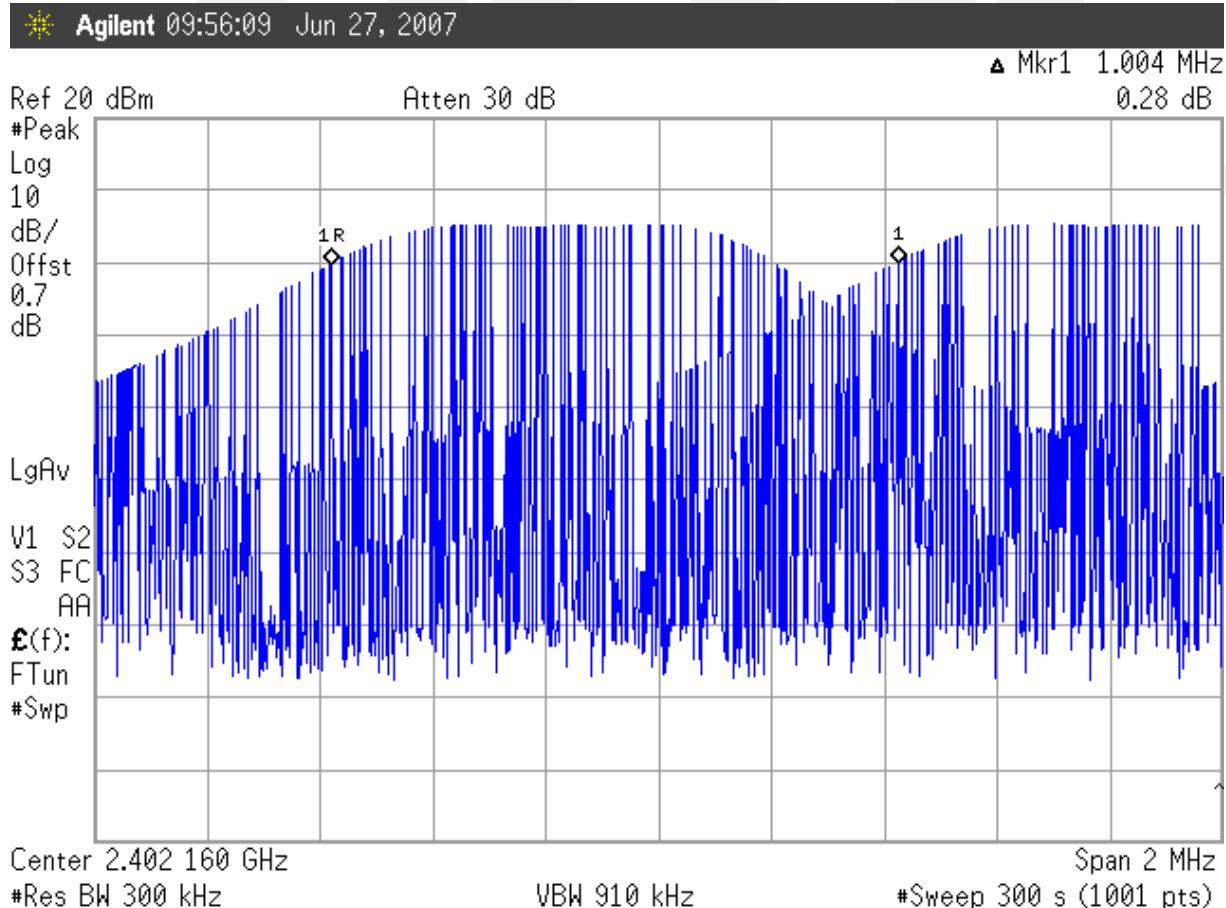
TUV ID	Model Number	Manufacturer	Description	Serial Number	Cal Due
10435	E4440A	Agilent	Spectrum Analyzer	MY42510439	27 Feb 08
3844	61697		HF cable		Code B

Cal Code B = Calibration verification performed internally.

Test Limit

780 kHz (20 dB bandwidth) minimum

Test data



Number of Hopping Frequencies

FCC 15.247(a)(1)(iii), IC RSS-210 A8.1(d)

Test summary

The requirements are: - MET - NOT MET

Number of hopping frequencies = 79

Test location

- Wild River Lab Large Test Site (Open Area Test Site)
- Wild River Lab Large Test Site - Tech area
- Wild River Lab Small Test Site (Open Area Test Site)

Test equipment

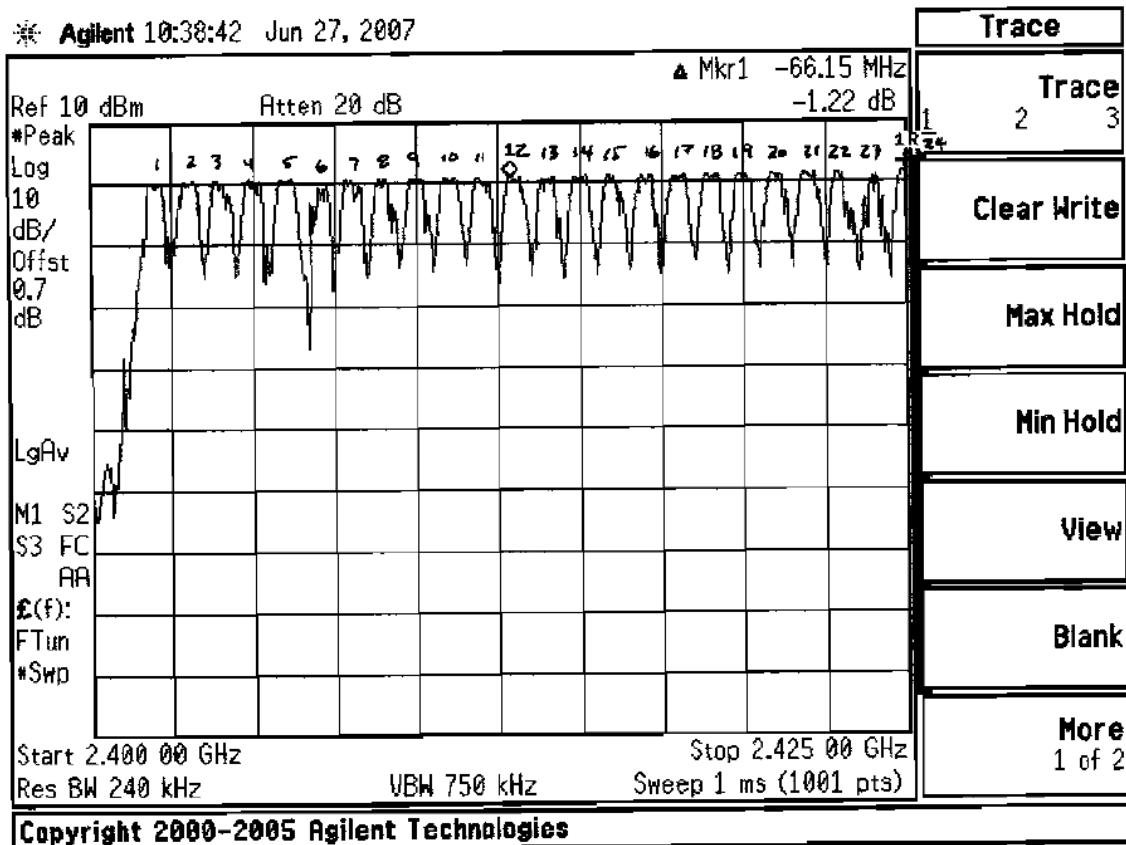
TUV ID	Model Number	Manufacturer	Description	Serial Number	Cal Due
10435	E4440A	Agilent	Spectrum Analyzer	MY42510439	27 Feb 08
3844	61697	TÜV	HF cable	N/A	Code B

Cal Code B = Calibration verification performed internally.

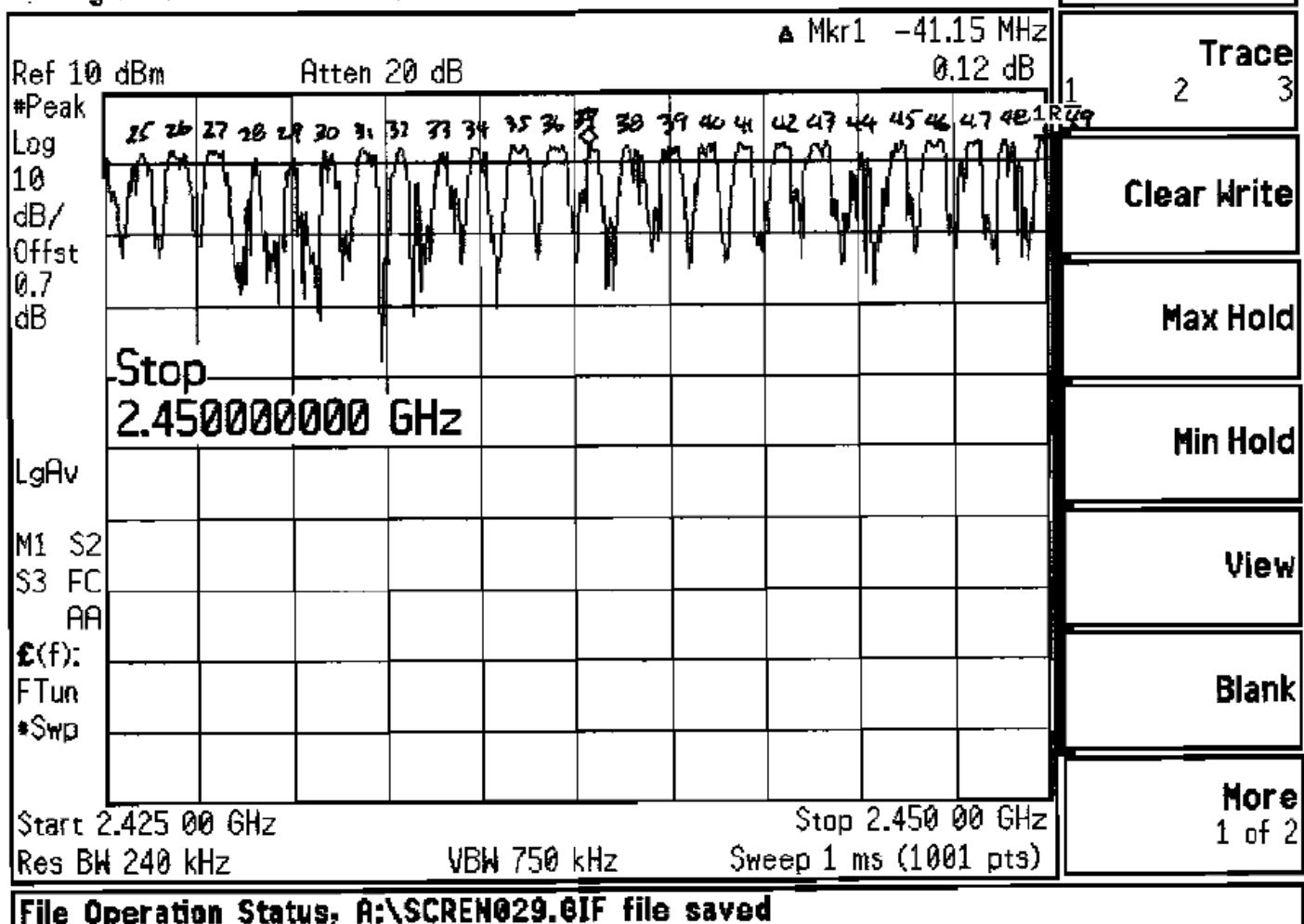
Test limit

At least 15 channels

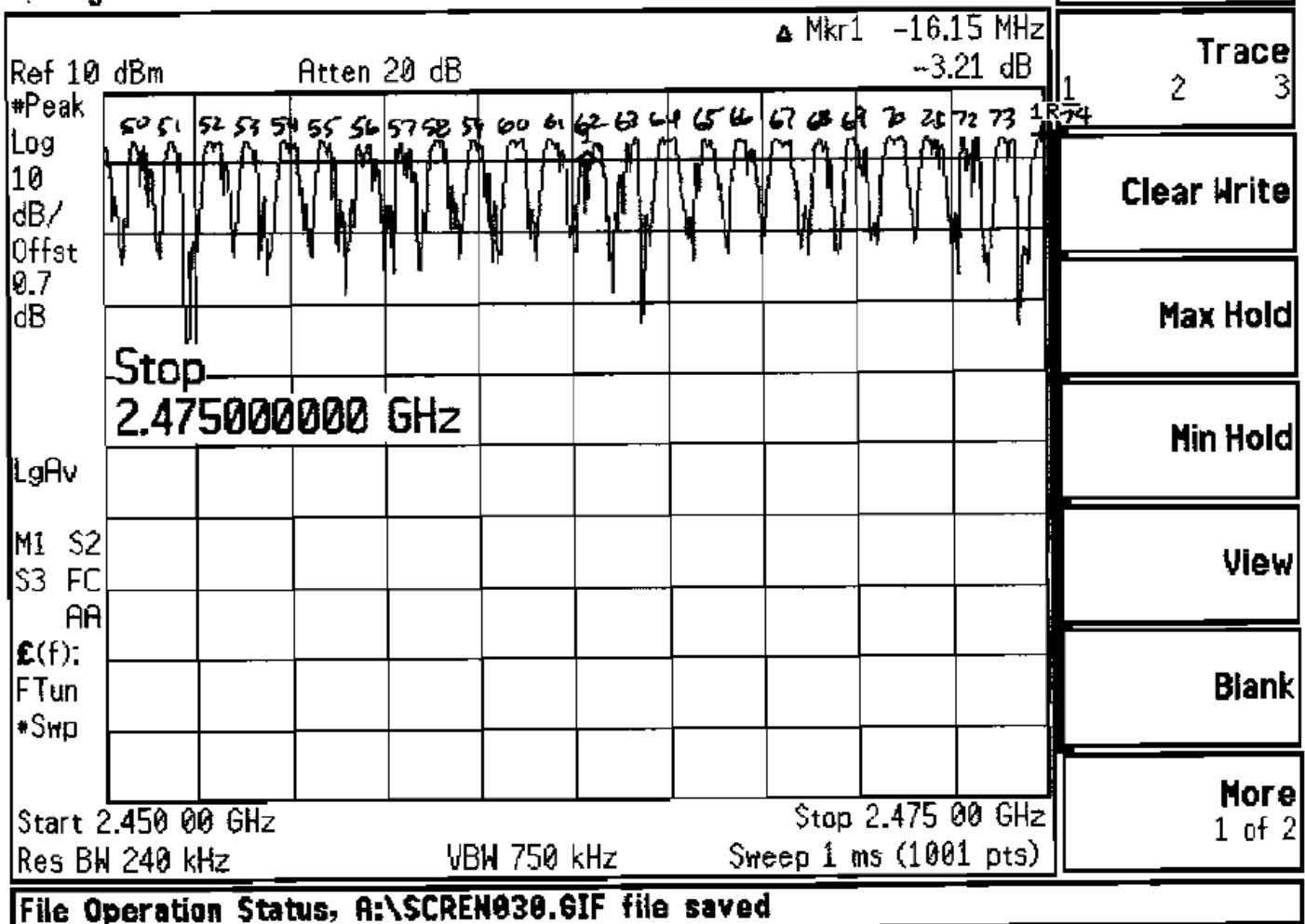
Test data



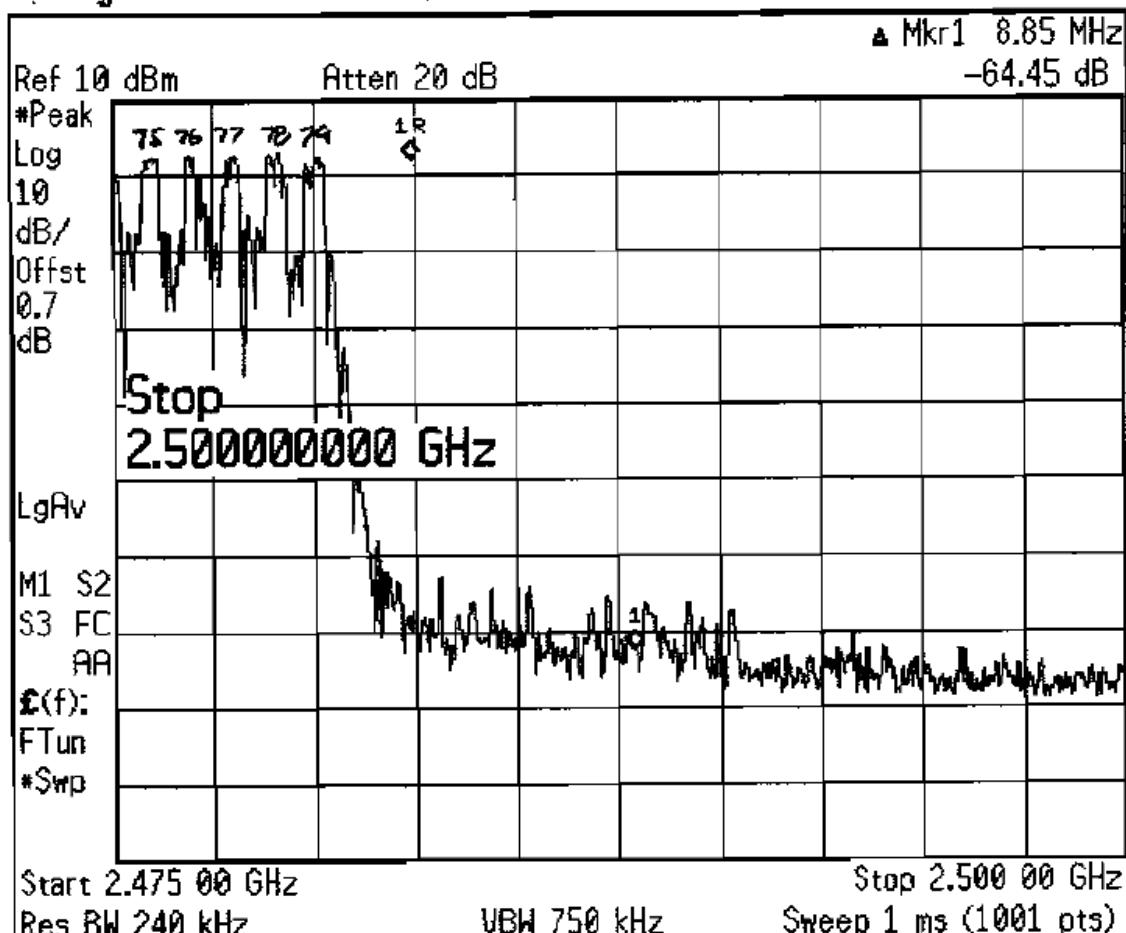
* Agilent 10:44:41 Jun 27, 2007



* Agilent 10:50:06 Jun 27, 2007



* Agilent 10:52:26 Jun 27, 2007



- Trace
- Trace 1 2 3
- Clear Write
- Max Hold
- Min Hold
- View
- Blank
- More 1 of 2

File Operation Status, A:\SCREEN031.GIF file saved

Time of Occupancy

FCC 15.247(a)(1)(iii), IC RSS-210 A8.1(d)

Test summary

The requirements are: - MET - NOT MET

Time of occupancy = 6.08 mS

Test location

- Wild River Lab Large Test Site (Open Area Test Site)
- Wild River Lab Large Test Site - Tech area
- Wild River Lab Small Test Site (Open Area Test Site)

Test equipment

TUV ID	Model Number	Manufacturer	Description	Serial Number	Cal Due
10435	E4440A	Agilent	Spectrum Analyzer	MY42510439	27 Feb 08
3844	61697	TÜV	HF cable	N/A	Code B

Cal Code B = Calibration verification performed internally.

Test limit

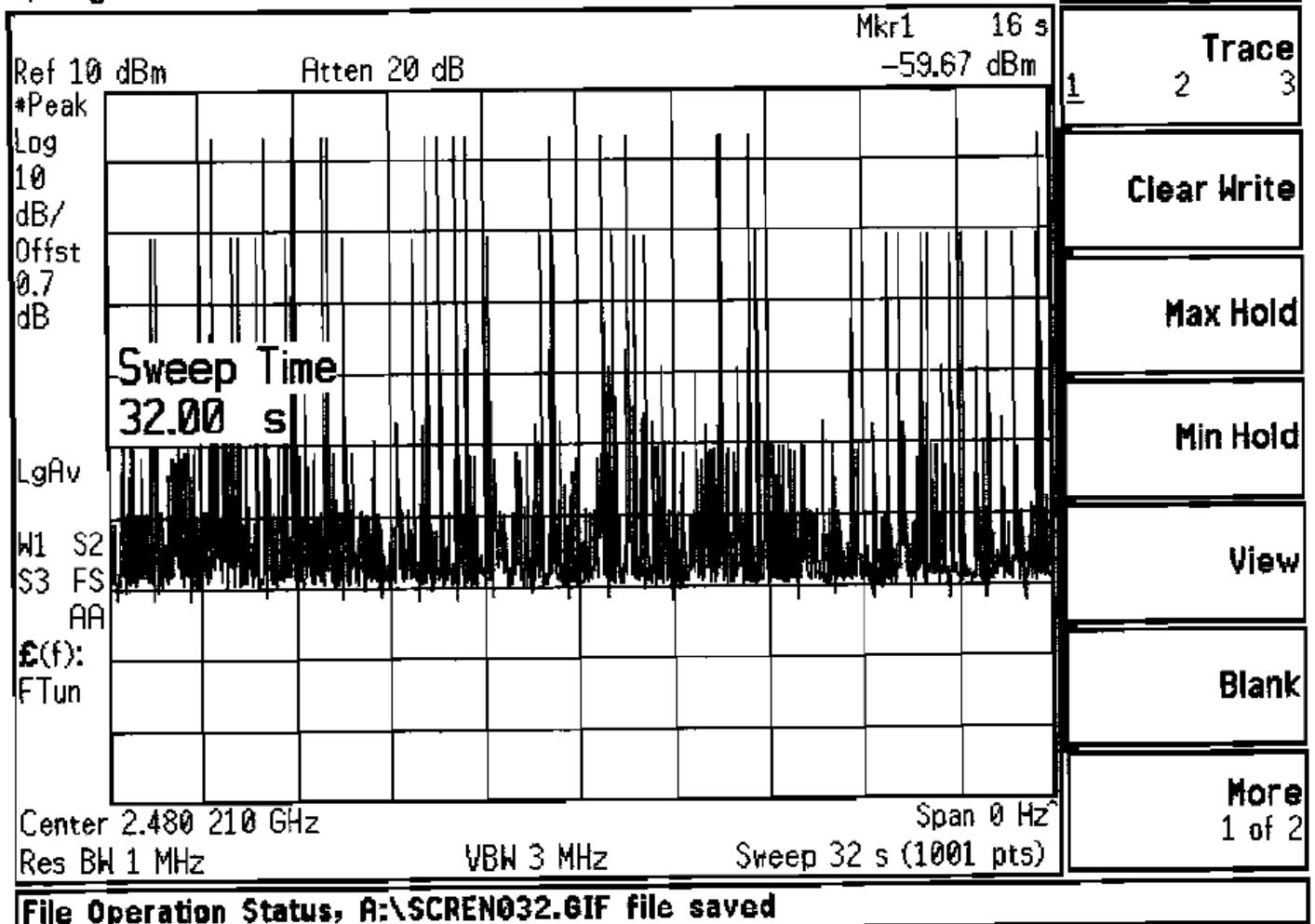
The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

Test data

See following pages

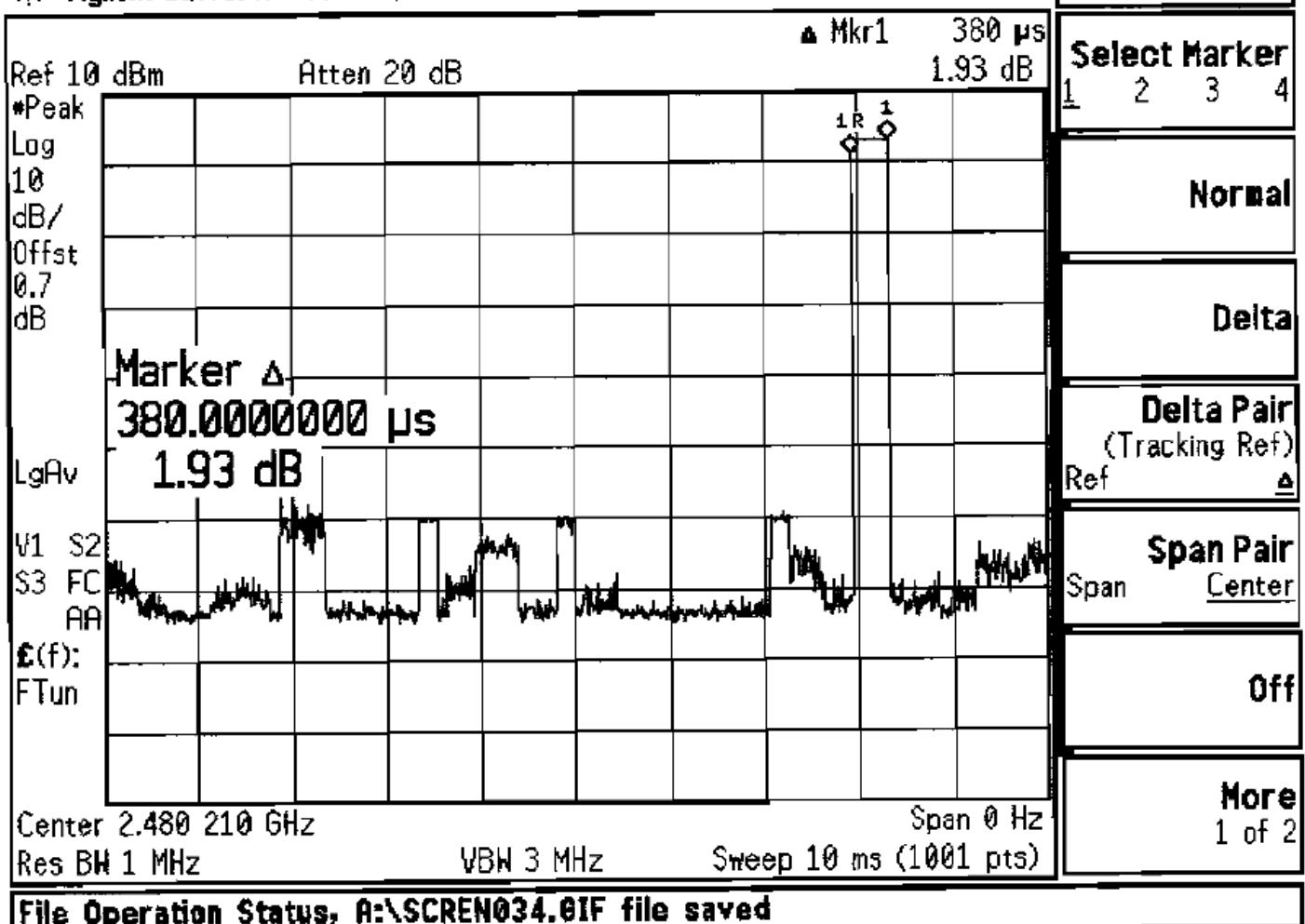
16 pulses

* Agilent 10:59:39 Jun 27, 2007



0.4 x 79 channels = 31.6 seconds
 $380 \mu\text{S} \times 16 = 6.08 \text{ mS}$
 < 400 mS in 31.6 seconds

* Agilent 11:05:47 Jun 27, 2007



20 dB Bandwidth

FCC 15.247(a), IC RSS-210 A8.1

Test summary

The requirements are: - MET - NOT MET

The 20 dB bandwidth = 780 kHz

Test location

- Wild River Lab Large Test Site (Open Area Test Site)
- Wild River Lab Large Test Site - Tech area
- Wild River Lab Small Test Site (Open Area Test Site)

Test equipment

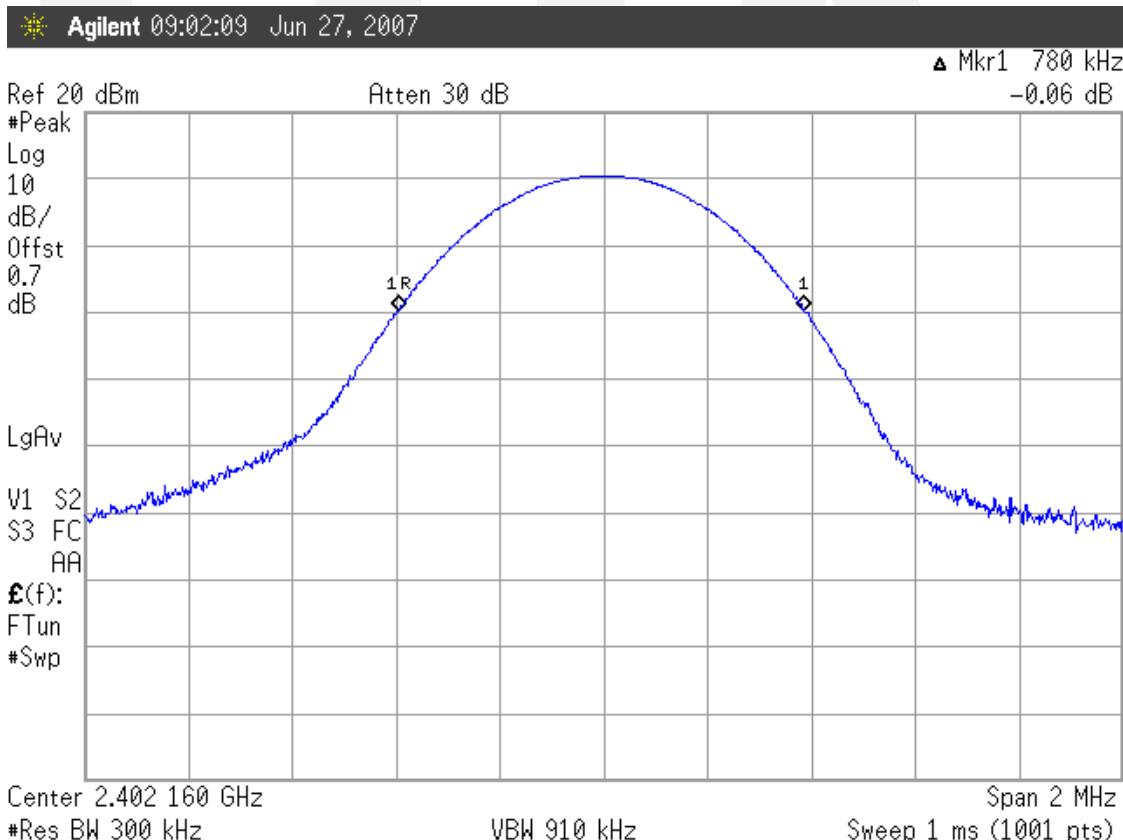
TUV ID	Model Number	Manufacturer	Description	Serial Number	Cal Due
10435	E4440A	Agilent	Spectrum Analyzer	MY42510439	27 Feb 08
3844	61697	TÜV	HF cable	N/A	Code B

Cal Code B = Calibration verification performed internally.

Test limit

No limit specified

Test data



Maximum peak output power

FCC 15.247(b)(1), IC RSS-210 A8.4 (2)

Test summary

The requirements are: - MET - NOT MET

Maximum conducted peak output power is 13.89 dBm, or 24.5 milliwatts.

Test location

- Wild River Lab Large Test Site (Open Area Test Site)

- Wild River Lab Large Test Site - Tech area

- Wild River Lab Small Test Site (Open Area Test Site)

Test equipment

TUV ID	Model Number	Manufacturer	Description	Serial Number	Cal Due
10435	E4440A	Agilent	Spectrum Analyzer	MY42510439	27 Feb 08
3844	61697	TUV	HF cable	N/A	Code B

Cal Code B = Calibration verification performed internally.

Test limit

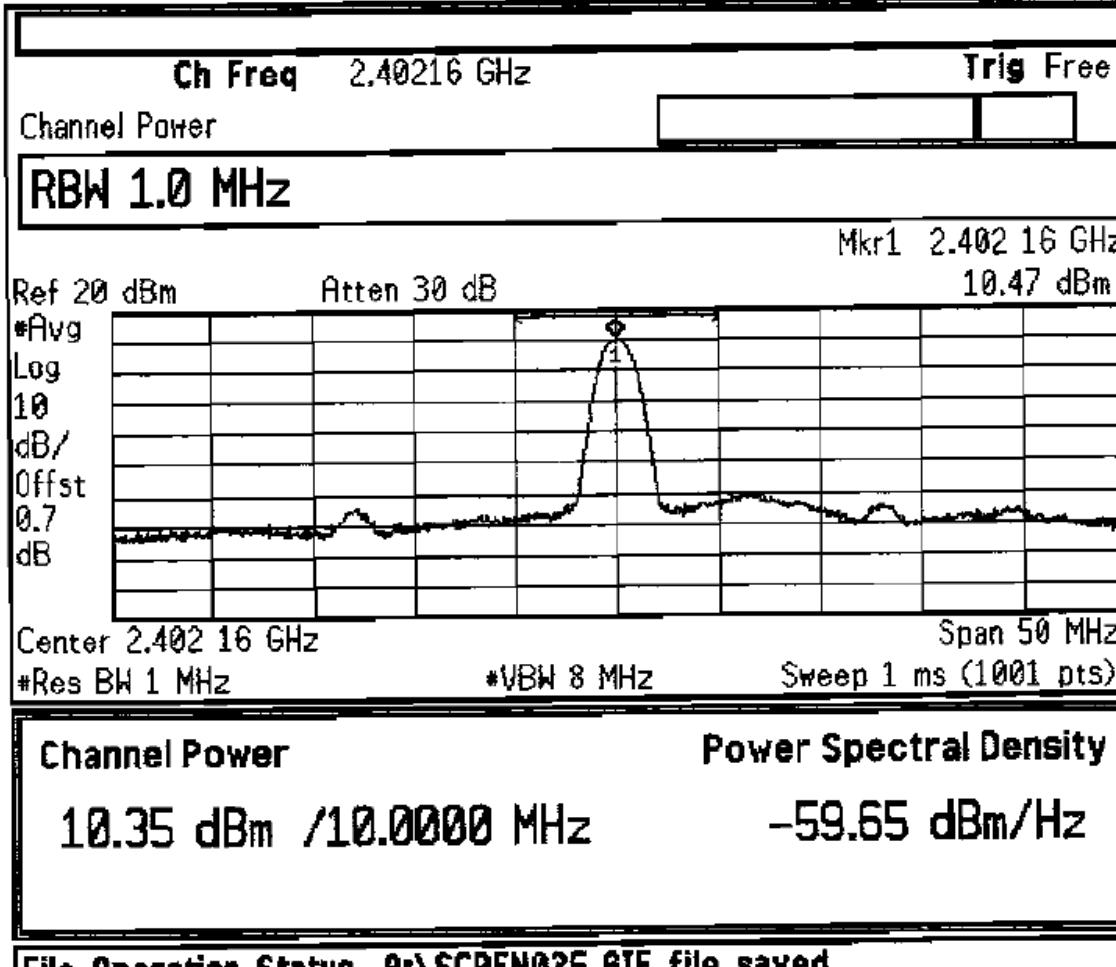
1 watt

Test data

See following pages

Channel 0

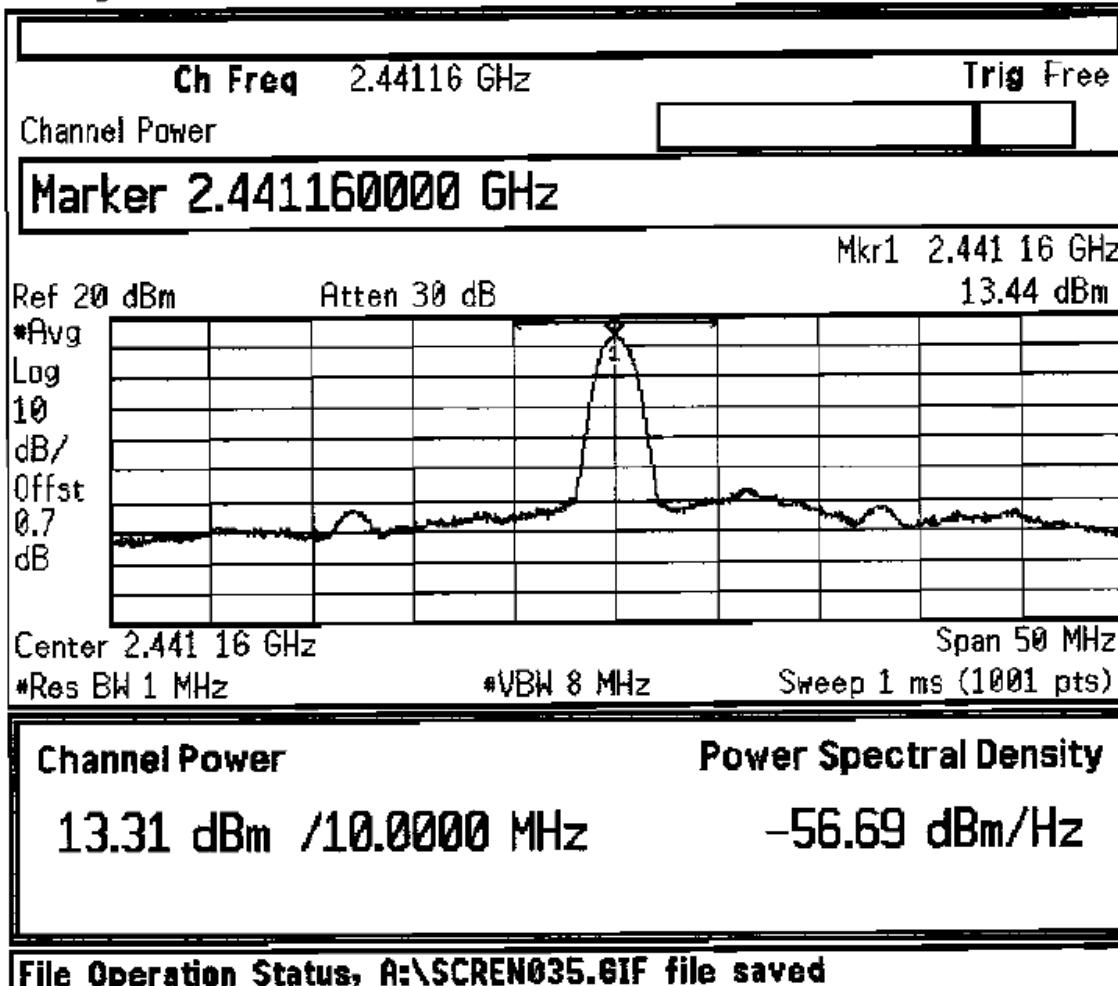
Agilent 11:17:37 Jun 27, 2007



BW/Avg
Res BW 1.0 MHz
Auto Man
Video BW
8.0 MHz
Auto Man
VBW/RBW
3.00000
Auto Man
Average
10
On Off
Avg/VBW Type
Pwr (RMS)
Auto Man
Span/RBW
106
Auto Man

Channel 39

* Agilent 11:23:36 Jun 27, 2007



Peak Search

Next Peak

Next Pk Right

Next Pk Left

Min Search

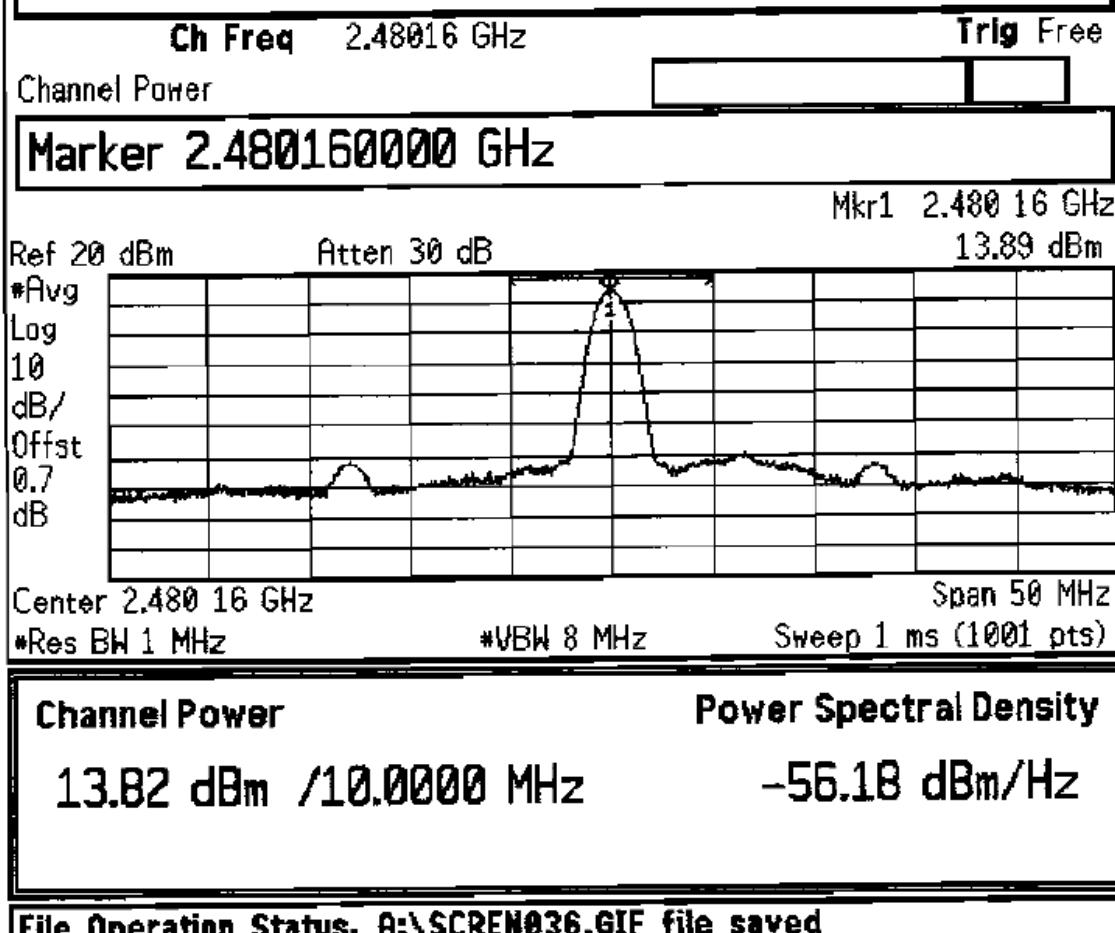
Pk-Pk Search

Mkr → CF

More
1 of 2

Channel 78

Agilent 11:27:55 Jun 27, 2007



Peak Search

Next Peak

Next Pk Right

Next Pk Left

Min Search

Pk-Pk Search

Mkr → CF

More

1 of 2

File Operation Status, A:\SCREEN036.GIF file saved

100kHz Bandwidth of Band Edges Measurement

FCC 15.247(d), RSS-210 A8.5

Test summary

The requirements are: - MET - NOT MET

Test location

- Wild River Lab Large Test Site (Open Area Test Site)
- Wild River Lab Large Test Site - Tech area
- Wild River Lab Small Test Site (Open Area Test Site)

Test equipment

TUV ID	Model Number	Manufacturer	Description	Serial Number	Cal Due
10435	E4440A	Agilent	Spectrum Analyzer	MY42510439	27 Feb 08
3844	61697	TÜV	HF cable	N/A	Code B

Cal Code B = Calibration verification performed internally.

Test limit

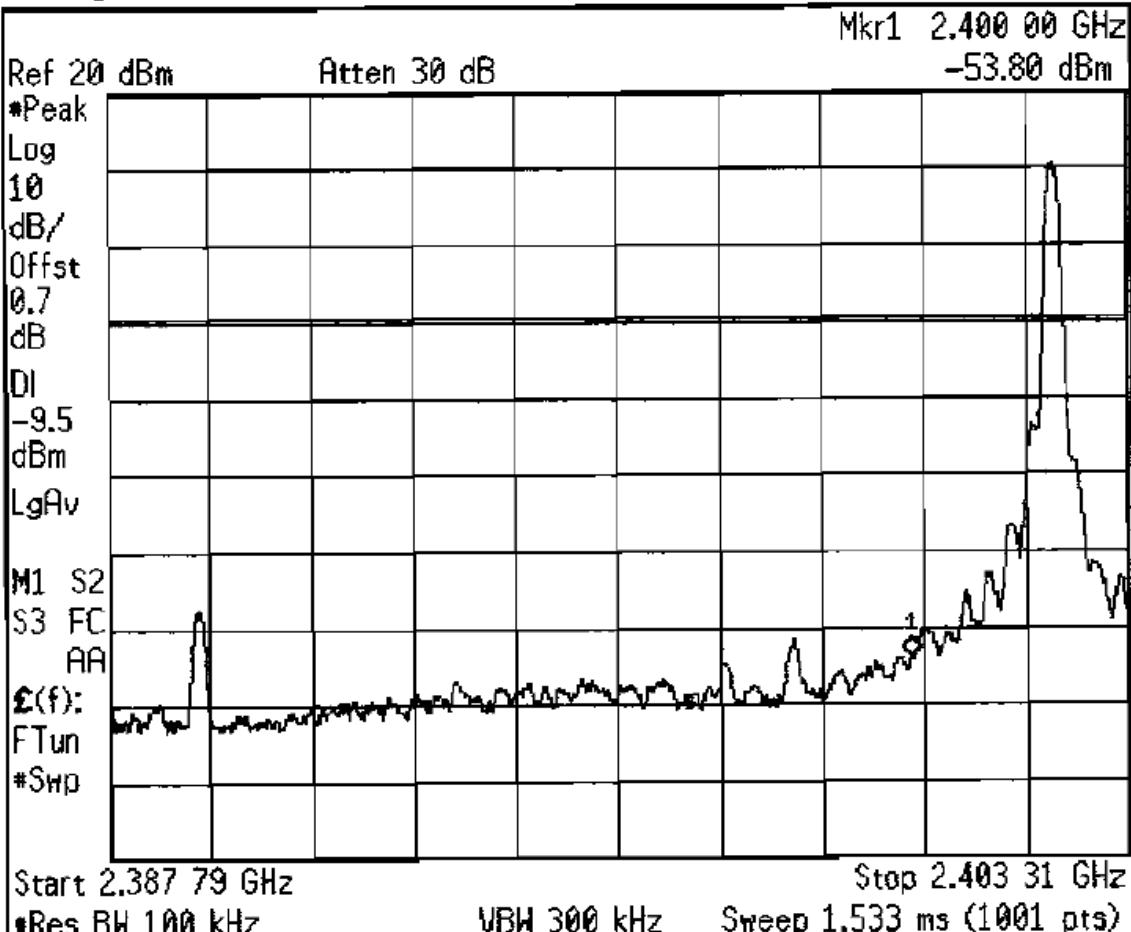
RF power at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power

Test data

See following pages.

Channel 0

* Agilent 12:07:54 Jun 27, 2007

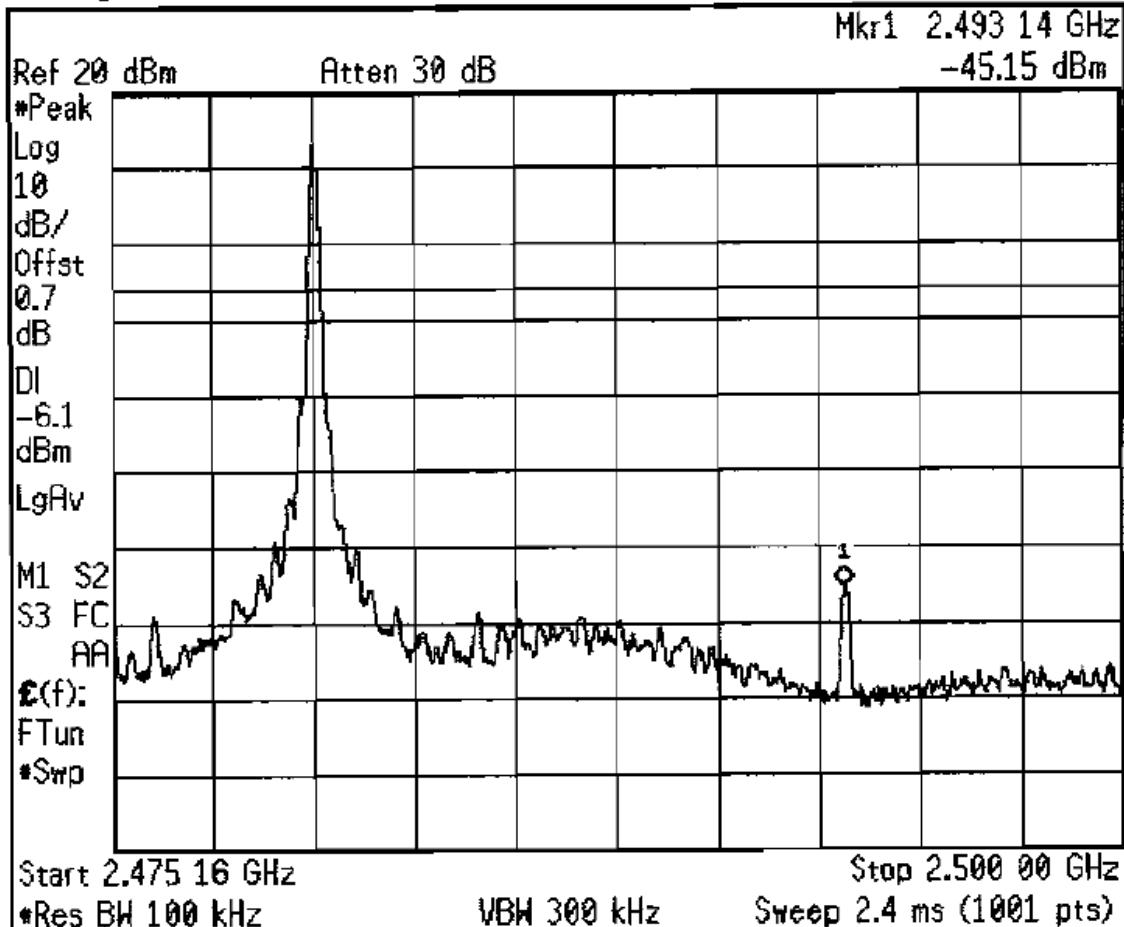


Title
Change Title>
Clear Title
-20 dBc

File Operation Status, A:\SCREEN041.GIF file saved

Channel 79

* Agilent 11:48:06 Jun 27, 2007



Title	
Change Title	
Clear Title	
-20 dBc	

Printer not responding

Spurious emissions - Conducted FCC 15.247(d), IC RSS-210 A8.5

Test summary

The requirements are: - MET - NOT MET
Minimum margin of compliance is > 20 dB

Test location

- Wild River Lab Large Test Site (Open Area Test Site)
- Wild River Lab Large Test Site - Tech area
- Wild River Lab Small Test Site (Open Area Test Site)

Test equipment

TUV ID	Model Number	Manufacturer	Description	Serial Number	Cal Due
10435	E4440A	Agilent	Spectrum Analyzer	MY42510439	27 Feb 08
3844	61697	TÜV	HF cable	N/A	Code B

Cal Code B = Calibration verification performed internally.

Test limit

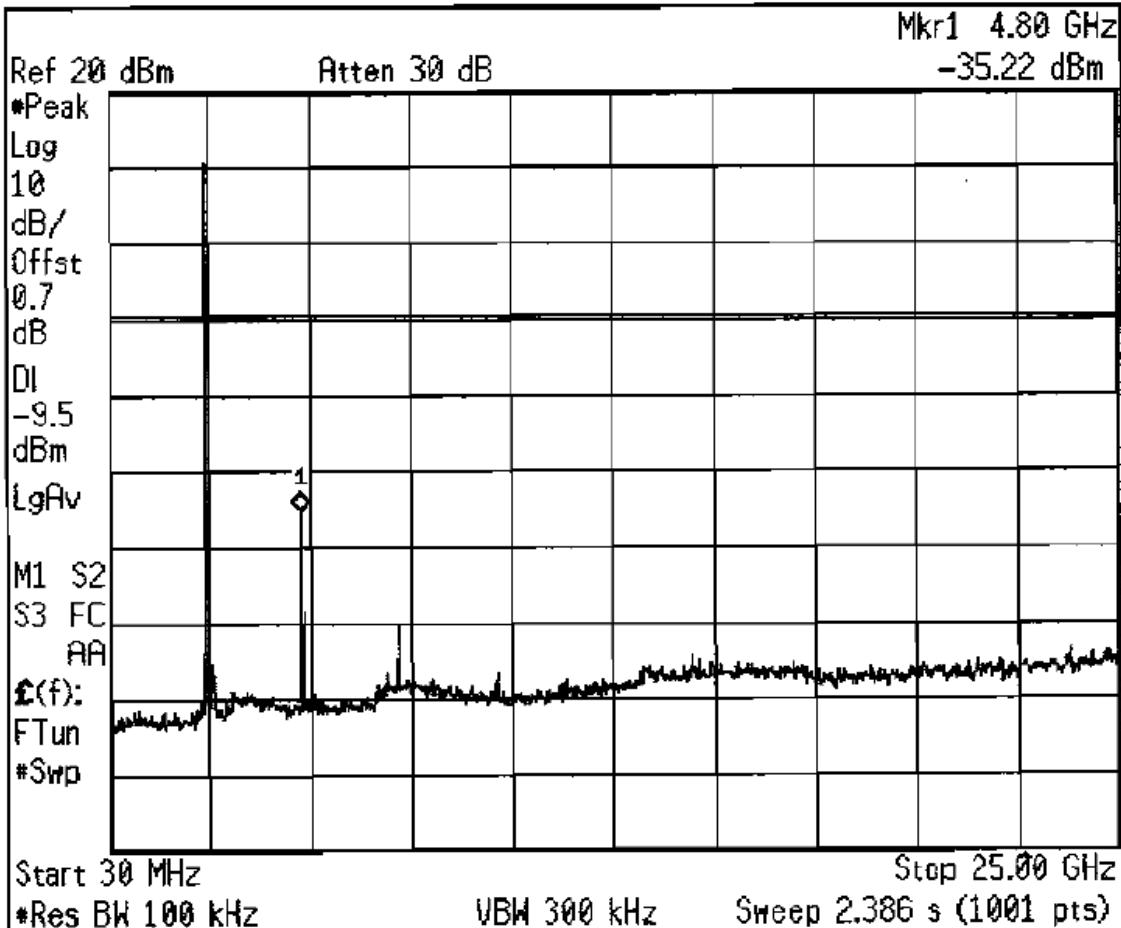
-20 dBc

Test data

See following pages.

Conducted spurious, channel 0

* Agilent 12:02:49 Jun 27, 2007

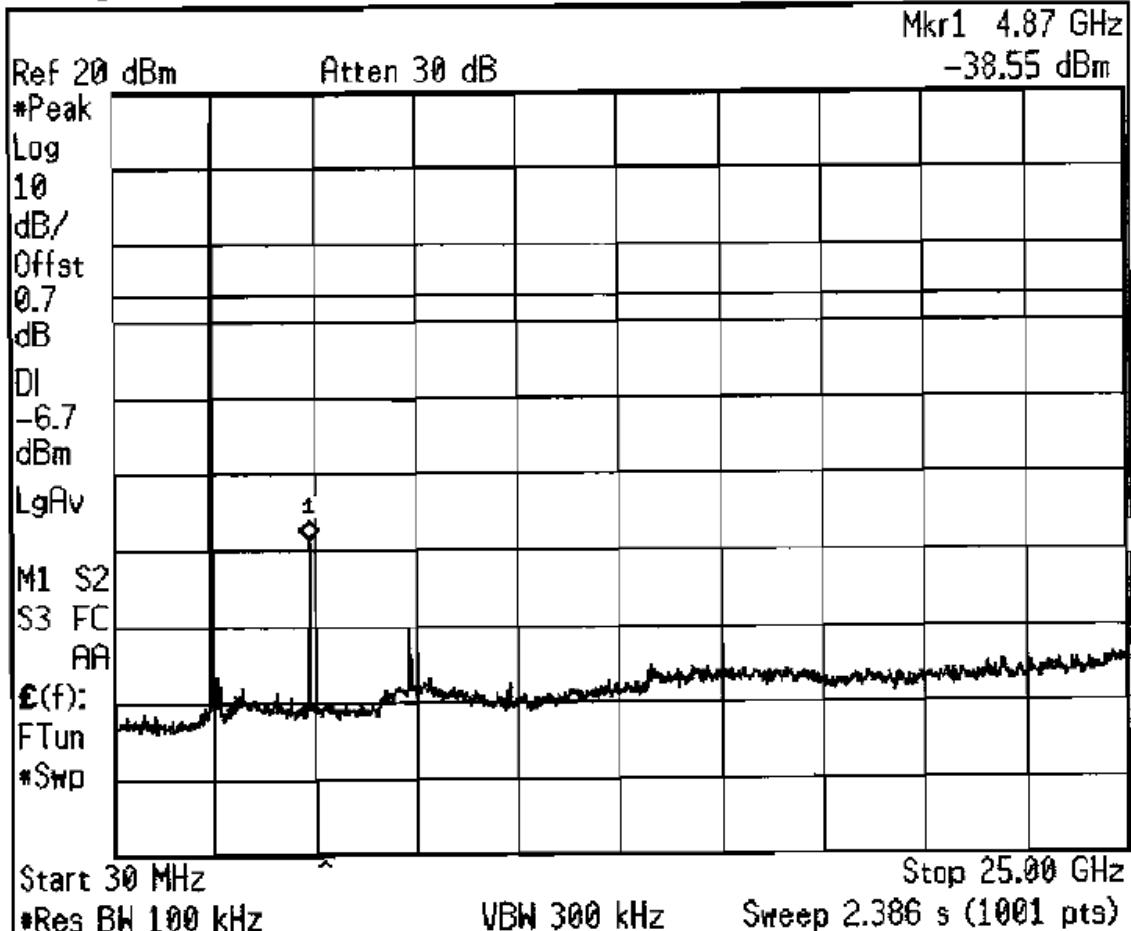


Title
Change Title
Clear Title
-20 dBc

File Operation Status, A:\SCREEN041.GIF file saved

Conducted spurious, channel 39

Agilent 11:55:57 Jun 27, 2007



Title

Change Title

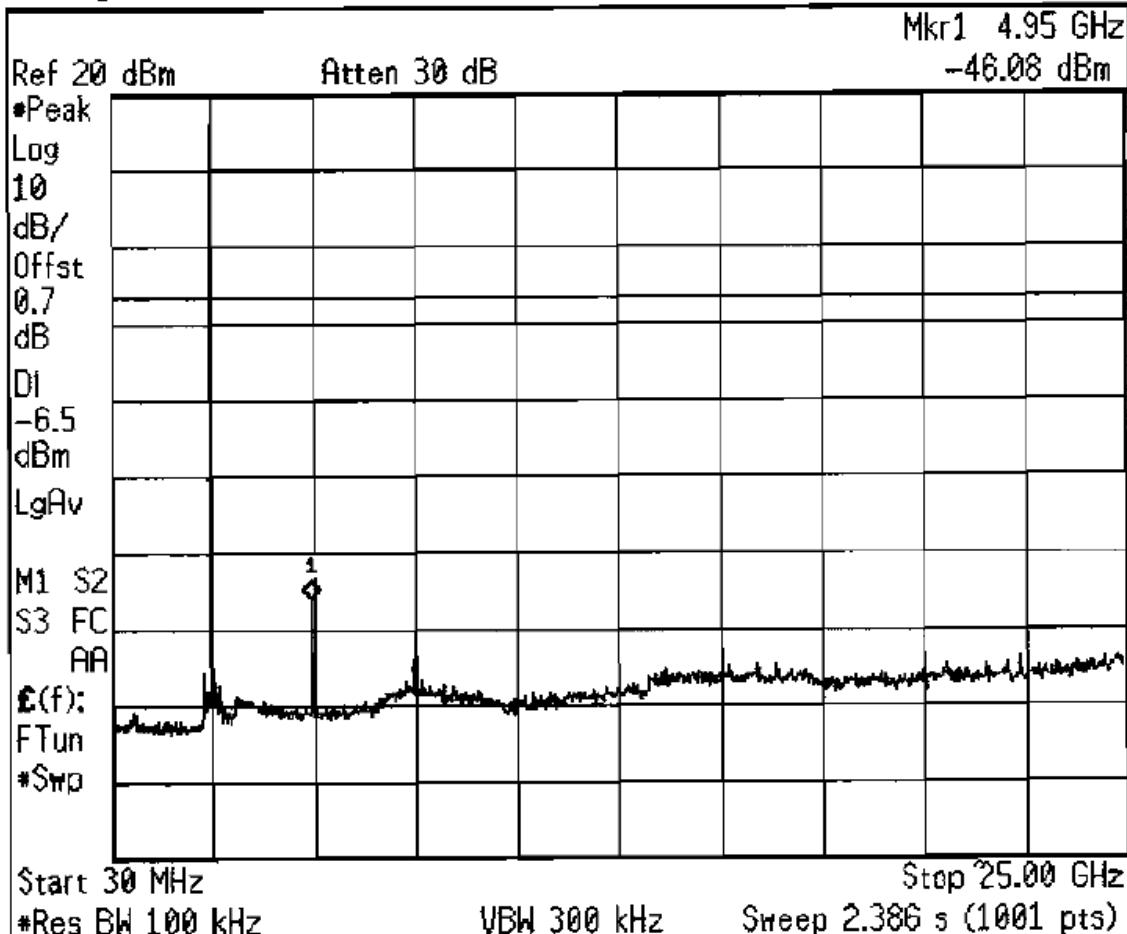
Clear Title

-20 dBc

Printer not responding

Conducted spurious, channel 78

* Agilent 11:35:22 Jun 27, 2007



Title
Change Title
Clear Title
-20 dBc

File Operation Status, A:\SCREEN037.GIF file saved

Spurious emissions - Radiated in restricted bands

FCC 15.209(d), IC RSS-210 A8.5

Test summary

The requirements are: - MET - NOT MET

No significant emissions detected

Minimum margin of compliance is > 10 dB below the limit

Test location

- Wild River Lab Large Test Site (Open Area Test Site)
- Wild River Lab Large Test Site - Tech area
- Wild River Lab Small Test Site (Open Area Test Site)

Test distance

- 3 meters
- 10 meters

Test equipment

TUV ID	Model	Manufacturer	Description	Serial	Cal Due
3294	8566B	Hewlett-Packard	Spectrum Analyzer	2349A03098	16-May-08
3295	85662A	Hewlett-Packard	Analyzer Display	2349A06144	16-May-08
2681	85650A	Hewlett-Packard	Quasi-Peak Adapter	2430A00562	23-Mar-08
3202	EM-6917B	Electro-Metrics	Biconicalog Periodic	101	10-May-08
2075	3115	EMCO	Ridge Guide Ant. 1-18 GHz	9001-3275	12-Jan-08
3958	SL18B4020	Phase One Microwave	Preamplifier 1 – 18 GHz	0002	Code B
3847	ZHL-1042J	Mini-Circuits	Preamplifier 10 - 3000 MHz	0607	Code B
3371	E4440A	Agilent	Spectrum Analyzer	MY43362222	29-Nov-07
6717	3116	EMCO	Ridge Guide Ant 18-40 GHz	2005	10-Oct-08
3978	SL26-3010	Phase One Microwave	Amplifier 18-26.5 GHz	0005	26-Mar-08
3997	EWT-14-0066	EWT	2.4 GHz Notch filter	E2	Code B

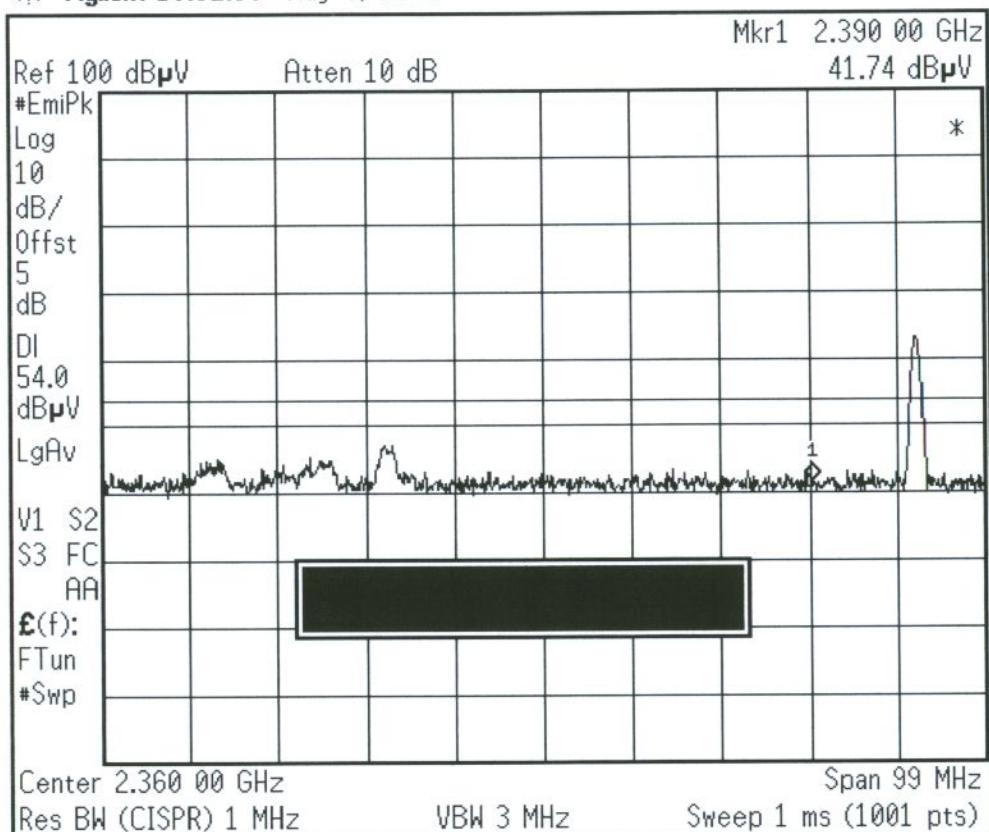
Cal Code B = Calibration verification performed internally.

Test limit (in restricted bands)

Frequency (MHz)	Field strength (μ V/meter)	Field strength (dB μ V/meter)
30 - 88	100 – QP	40.0
88 - 216	150 – QP	43.5
216 - 960	200 – QP	46.0
960-1000	500 – QP	54.0
>1000	500 – AV 5000 – PK	54.0 74.0

Test data

See following pages.



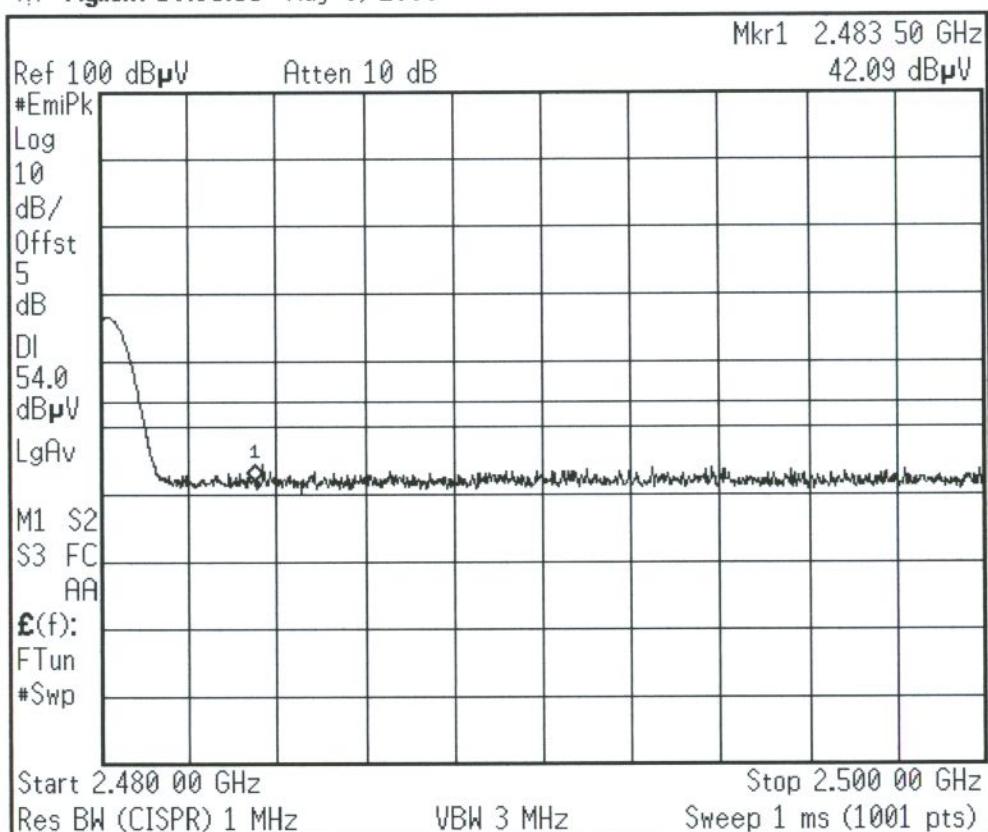
Title
Change Title
Clear Title

Copyright 2000-2005 Agilent Technologies

Restricted band edge measurement

Radiated emission on lowest channel

(peak meets average limit)



Title
Change Title
Clear Title

Restricted band edge measurement

Radiated emission on highest channel

(peak meets average limit)

RADIATED EMISSIONS



Test Report #: WC704535 Run 1

Test Area: LTS

EUT Model #: Saber with flex antenna

Date: 6/26/2007

EUT Serial #:

EUT Power: Battery

Temperature: 23.0 °C

Test Method: FCC B

Air Pressure: 98.0 kPa

Customer: Nonin Medical Inc.

Rel. Humidity: 62.0 %

EUT Description: Saber

Notes:

Data File Name: 4535.dat | Page: 1 of 2

List of measurements for run #: 1

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 FCC-B <1GHz 3m	DELTA2 FCC B >1GHz 3m
EUT is frequency hopping						
No significant emissions detected with vertical antenna 30 to 1000 MHz						
No significant emissions detected with horizontal antenna 30 to 1000 MHz						
No significant emissions detected with vertical or horizontal antenna 1 to 2.3 GHz						
no significant emissions detected from the receiver within 10 dB of the limit						

Tested by: Tom K. Swanson

Thomas K. Swanson

Printed

Signature

Reviewed by: S. L. Rupp

Susan L Rupp

Printed

Signature

RADIATED EMISSIONS



Test Report #: WC704535 Run 1 Test Area: LTS

EUT Model #: Saber with flex antenna Date: 6/26/2007

EUT Serial #: EUT Power: Battery Temperature: 23.0 °C

Test Method: FCC B Air Pressure: 98.0 kPa

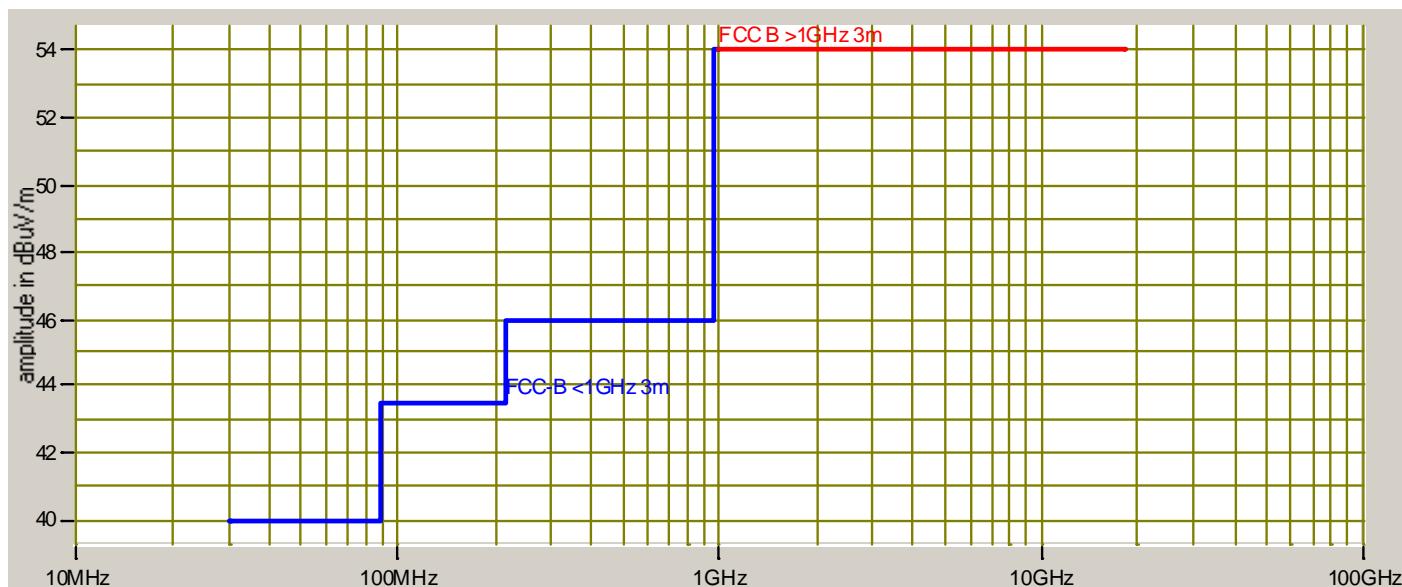
Customer: Nonin Medical Inc. Rel. Humidity: 62.0 %

EUT Description: Saber

Notes:

Data File Name: 4535.dat Page: 2 of 2

Graph:



Tested by: Tom K. Swanson

Thomas K. Swanson

Printed

Signature

Reviewed by: S. L. Rupp

Susan L Rupp

Printed

Signature

RADIATED EMISSIONS



Test Report #: WC704535 Run 2

Test Area: LTS

EUT Model #: Saber with flex antenna

Date: 6/27/2007

EUT Serial #:

EUT Power: Battery

Temperature: 24.0 °C

Test Method: FCC B

Air Pressure: 99.0 kPa

Customer: Nonin Medical Inc.

Rel. Humidity: 58.0 %

EUT Description: Saber

Notes:

Data File Name: 4535.dat

Page: 1 of 1

List of measurements for run #: 2

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 FCC B >1GHz 3m	DELTA2 FCC B >1G 3 M
Begin spurious scan 2.3 - 25.0 GHz						
High channel						
No significant emissions detected						
Low channel						
No significant emissions detected						
Mid channel						
No significant emissions detected						
End spurious scan 2.3 - 25 GHz						

Tested by: Greg Jakubowski

Printed

Signature

Reviewed
by: S. L. Rupp

Printed

Signature

RADIATED EMISSIONS



Test Report #: WC704535 Run 3

Test Area: LTS

EUT Model #: Saber with PCB antenna

Date: 6/27/2007

EUT Serial #:

EUT Power: Battery

Temperature: 24.0 °C

Test Method: FCC B

Air Pressure: 99.0 kPa

Customer: Nonin Medical Inc.

Rel. Humidity: 58.0 %

EUT Description: Saber with PCB antenna

Notes:

Data File Name: 4535.dat

Page: 1 of 1

List of measurements for run #: 3

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 FCC-B <1GHz 3m	DELTA2 FCC B >1GHz 3m
EUT is frequency hopping						
Begin scan 1-2.3 GHz						
No significant emissions detected						
0 - 360 degrees, vertical & horizontal, 1 - 4 meters high						
Begin scan 30 - 1000 MHz						
No significant emissions detected						
End spurious scan 30 - 1000 MHz						

Tested by: Greg Jakubowski

Printed

Signature

Reviewed
by: S. L. Rupp

Printed

Signature

RADIATED EMISSIONS



Test Report #: WC704535 Run 4

Test Area: LTS

EUT Model #: Saber with PCB antenna

Date: 6/27/2007

EUT Serial #:

EUT Power: Battery

Temperature: 24.0 °C

Test Method: FCC B

Air Pressure: 99.0 kPa

Customer: Nonin Medical Inc.

Rel. Humidity: 58.0 %

EUT Description: Saber with PCB antenna

Notes:

Data File Name: 4535.dat

Page: 1 of 2

List of measurements for run #: 4

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 FCC B >1GHz 3m	DELTA2 FCC B >1G 3 M
Begin spurious scan 2.3 - 25.0 GHz						
Low channel						
No significant emissions detected						
High channel						
No significant emissions detected						
Mid Channel						
No significant emissions detected						
End of scan						

Tested by: Greg Jakubowski

Printed

Signature

Reviewed
by: S. L. Rupp

Printed

Signature

RADIATED EMISSIONS



Test Report #: WC704535 Run 4

Test Area: LTS

EUT Model #: Saber with PCB antenna

Date: 6/27/2007

EUT Serial #: _____

EUT Power: Battery

Temperature: 24.0 °C

Test Method: FCC B

Air Pressure: 99.0 kPa

Customer: Nonin Medical Inc.

Rel. Humidity: 58.0 %

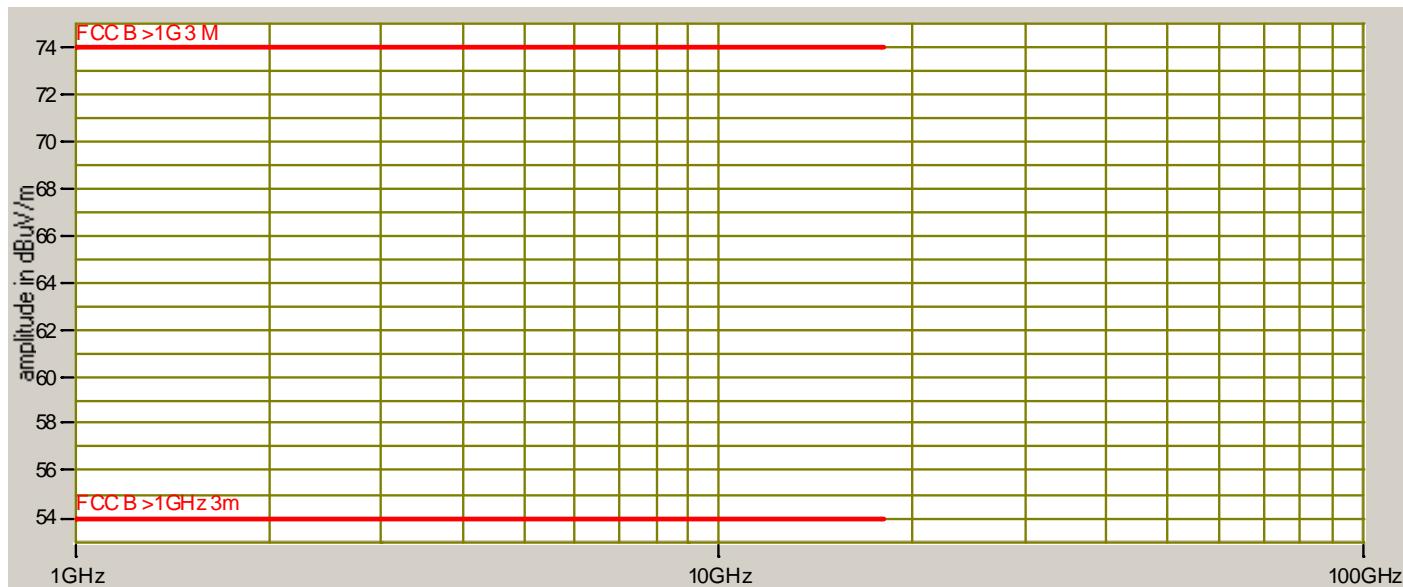
EUT Description: Saber with PCB antenna

Notes: _____

Data File Name: 4535.dat

Page: 2 of 2

Graph:



Tested by: Greg Jakubowski

A handwritten signature of "Greg Jakubowski".

Printed

Signature

Reviewed by: S. L. Rupp

A handwritten signature of "S. L. Rupp".

Printed

Signature

Emissions Test Conditions: CONDUCTED EMISSIONS (Interference Voltage)

The **CONDUCTED EMISSIONS (INTERFERENCE VOLTAGE)** measurements were performed at the following test location:

- Test not applicable

- Wild River Lab Large Test Site (Open Area Test Site)
- Wild River Lab Small Test Site (Open Area Test Site)
- Wild River Shield Room 1 - Anechoic ferrite-lined shielded room (7.3m x 3.7m x 3.7m) or (24' x 12' x 12')
- Wild River Shield Room 2 - Shielded room (3.7m x 3.5m x 2.4m) or (12' x 11.5' x 8')
- Oakwood Lab (Open Area Test Site)
- New Brighton Lab Shielded Room

Test equipment used :

TUV ID	Model Number	Manufacturer	Description	Serial Number	Cal Due
■ - 2417	3825/2	Electro-Mechanics (EMCO)	50 Ω LISN	8812-1439	Code B
■ - 2075	3115	EMCO	Ridge Guide Ant. 1-18 GHz	9001-3275	16-Jan-09
■ - 2534	ESHS-20	Rhode & Schwarz	EMI Receiver	837055/003	14-Feb-06
■ - 3847	ZHL-1042J	Mini-Circuits	Preamplifier 10 - 3000 MHz	0607	Code B

Cal Code B = Calibration verification performed internally. Cal Code Y = Calibration not required when used with other calibrated equipment.

Test Results - Conducted emissions 150 kHz - 30 MHz

The requirements are

- N/A

- MET

- NOT MET

Minimum margin of compliance

19 dB

at 2.0 MHz

Maximum margin of non-compliance

dB

at MHz

Remarks: _____

CONDUCTED EMISSIONS



Test Report #: WC704535 Run 1

Test Area: LTS

EUT Model #: Saber wireless bluetooth module

Date: 5/6/2008

EUT Serial #:

EUT Power: 60 Hz 110 VAC

Temperature: 17.0 °C

Test Method: FCC 15.207

Air Pressure: 98.0 kPa

Customer: Nonin Medical Inc

Rel. Humidity: 34.0 %

EUT Description: installed in 7800 display unit

Notes:

Data File Name: 4535ce.dat

Page: 1 of 5

List of measurements for run #: 1

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV)	EUT Lead	DELTA1 FCC B Qp	DELTA2 FCC B Avg
150.0 kHz	32.71 Qp	0.12 / 0.2 / 0.0 / 0.0	33.03	L1	-32.97	n/a
188.26 kHz	40.31 Qp	0.13 / 0.15 / 0.0 / 0.0	40.59	L1	-23.53	n/a
251.02 kHz	30.44 Qp	0.14 / 0.1 / 0.0 / 0.0	30.68	L1	-31.04	n/a
315.05 kHz	29.61 Qp	0.16 / 0.1 / 0.0 / 0.0	29.87	L1	-29.97	n/a
503.82 kHz	29.82 Qp	0.2 / 0.12 / 0.0 / 0.0	30.13	L1	-25.87	n/a
754.92 kHz	31.73 Qp	0.22 / 0.2 / 0.0 / 0.0	32.15	L1	-23.85	n/a
1.01 MHz	30.84 Qp	0.25 / 0.2 / 0.0 / 0.0	31.29	L1	-24.71	n/a
1.52 MHz	30.44 Qp	0.3 / 0.1 / 0.0 / 0.0	30.84	L1	-25.16	n/a
2.01 MHz	26.97 Qp	0.34 / 0.1 / 0.0 / 0.0	27.41	L1	-28.59	n/a
3.01 MHz	31.95 Qp	0.42 / 0.1 / 0.0 / 0.0	32.47	L1	-23.53	n/a
4.01 MHz	34.18 Qp	0.49 / 0.1 / 0.0 / 0.0	34.77	L1	-21.23	n/a
6.01 MHz	32.31 Qp	0.59 / 0.1 / 0.0 / 0.0	33.0	L1	-27.0	n/a
8.01 MHz	29.12 Qp	0.68 / 0.2 / 0.0 / 0.0	30.01	L1	-29.99	n/a
12.01 MHz	30.08 Qp	0.83 / 0.4 / 0.0 / 0.0	31.31	L1	-28.69	n/a
16.01 MHz	32.2 Qp	0.95 / 0.6 / 0.0 / 0.0	33.75	L1	-26.25	n/a
24.0 MHz	25.21 Qp	1.17 / 1.0 / 0.0 / 0.0	27.38	L1	-32.62	n/a
150.0 kHz	11.85 Av	0.12 / 0.2 / 0.0 / 0.0	12.17	L1	n/a	-43.83
188.26 kHz	24.46 Av	0.13 / 0.15 / 0.0 / 0.0	24.74	L1	n/a	-29.38
251.02 kHz	20.75 Av	0.14 / 0.1 / 0.0 / 0.0	20.99	L1	n/a	-30.73
315.05 kHz	24.2 Av	0.16 / 0.1 / 0.0 / 0.0	24.46	L1	n/a	-25.38
503.82 kHz	23.28 Av	0.2 / 0.12 / 0.0 / 0.0	23.59	L1	n/a	-22.41
754.92 kHz	23.98 Av	0.22 / 0.2 / 0.0 / 0.0	24.4	L1	n/a	-21.6
1.01 MHz	24.46 Av	0.25 / 0.2 / 0.0 / 0.0	24.91	L1	n/a	-21.09
1.52 MHz	23.13 Av	0.3 / 0.1 / 0.0 / 0.0	23.53	L1	n/a	-22.47
2.01 MHz	19.25 Av	0.34 / 0.1 / 0.0 / 0.0	19.69	L1	n/a	-26.31
3.01 MHz	17.26 Av	0.42 / 0.1 / 0.0 / 0.0	17.78	L1	n/a	-28.22
4.01 MHz	17.5 Av	0.49 / 0.1 / 0.0 / 0.0	18.09	L1	n/a	-27.91
6.01 MHz	19.56 Av	0.59 / 0.1 / 0.0 / 0.0	20.25	L1	n/a	-29.75

Tested by: J. T. Schneider

J. T. Schneider

Printed

Signature

Reviewed by: Greg S Jakubowski

G. Jakubowski

Printed

Signature

CONDUCTED EMISSIONS



Test Report #: WC704535 Run 1

Test Area: LTS

EUT Model #: Saber wireless bluetooth module

Date: 5/6/2008

EUT Serial #: _____

EUT Power: 60 Hz 110 VAC

Temperature: 17.0 °C

Test Method: FCC 15.207

Air Pressure: 98.0 kPa

Customer: Nonin Medical Inc

Rel. Humidity: 34.0 %

EUT Description: installed in 7800 display unit

Notes: _____

Data File Name: 4535ce.dat

Page: 2 of 5

List of measurements for run #: 1

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV)	EUT Lead	DELTA1 FCC B Qp	DELTA2 FCC B Avg
8.01 MHz	18.69 Av	0.68 / 0.2 / 0.0 / 0.0	19.58	L1	n/a	-30.42
12.01 MHz	17.4 Av	0.83 / 0.4 / 0.0 / 0.0	18.63	L1	n/a	-31.37
16.01 MHz	18.18 Av	0.95 / 0.6 / 0.0 / 0.0	19.73	L1	n/a	-30.27
24.0 MHz	16.33 Av	1.17 / 1.0 / 0.0 / 0.0	18.5	L1	n/a	-31.5
150.0 kHz	33.24 Qp	0.12 / 0.2 / 0.0 / 0.0	33.56	N	-32.44	n/a
315.05 kHz	30.64 Qp	0.16 / 0.1 / 0.0 / 0.0	30.9	N	-28.94	n/a
1.01 MHz	31.86 Qp	0.25 / 0.2 / 0.0 / 0.0	32.31	N	-23.69	n/a
1.52 MHz	31.57 Qp	0.3 / 0.1 / 0.0 / 0.0	31.97	N	-24.03	n/a
2.01 MHz	32.06 Qp	0.34 / 0.1 / 0.0 / 0.0	32.5	N	-23.5	n/a
150.0 kHz	12.08 Av	0.12 / 0.2 / 0.0 / 0.0	12.4	N	n/a	-43.6
315.05 kHz	26.02 Av	0.16 / 0.1 / 0.0 / 0.0	26.28	N	n/a	-23.56
1.01 MHz	24.29 Av	0.25 / 0.2 / 0.0 / 0.0	24.74	N	n/a	-21.26
1.52 MHz	24.46 Av	0.3 / 0.1 / 0.0 / 0.0	24.86	N	n/a	-21.14
2.01 MHz	26.43 Av	0.34 / 0.1 / 0.0 / 0.0	26.87	N	n/a	-19.13

Tested by: J. T. Schneider

Printed

J. T. Schneider

Signature

Reviewed by: Greg S Jakubowski

Printed

G. Jakubowski

Signature

CONDUCTED EMISSIONS



Test Report #: WC704535 Run 1

Test Area: LTS

EUT Model #: Saber wireless bluetooth module

Date: 5/6/2008

EUT Serial #:

EUT Power: 60 Hz 110 VAC

Temperature: 17.0 °C

Test Method: FCC 15.207

Air Pressure: 98.0 kPa

Customer: Nonin Medical Inc

Rel. Humidity: 34.0 %

EUT Description: installed in 7800 display unit

Notes:

Data File Name: 4535ce.dat

Page: 3 of 5

Measurement summary for limit1: FCC B Qp (Qp)

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV)	EUT Lead	DELTA1 FCC B Qp
4.01 MHz	34.18 Qp	0.49 / 0.1 / 0.0 / 0.0	34.77	L1	-21.23
2.01 MHz	32.06 Qp	0.34 / 0.1 / 0.0 / 0.0	32.5	N	-23.5
188.26 kHz	40.31 Qp	0.13 / 0.15 / 0.0 / 0.0	40.59	L1	-23.53
3.01 MHz	31.95 Qp	0.42 / 0.1 / 0.0 / 0.0	32.47	L1	-23.53
1.01 MHz	31.86 Qp	0.25 / 0.2 / 0.0 / 0.0	32.31	N	-23.69
754.92 kHz	31.73 Qp	0.22 / 0.2 / 0.0 / 0.0	32.15	L1	-23.85
1.52 MHz	31.57 Qp	0.3 / 0.1 / 0.0 / 0.0	31.97	N	-24.03
503.82 kHz	29.82 Qp	0.2 / 0.12 / 0.0 / 0.0	30.13	L1	-25.87
16.01 MHz	32.2 Qp	0.95 / 0.6 / 0.0 / 0.0	33.75	L1	-26.25
6.01 MHz	32.31 Qp	0.59 / 0.1 / 0.0 / 0.0	33.0	L1	-27.0
12.01 MHz	30.08 Qp	0.83 / 0.4 / 0.0 / 0.0	31.31	L1	-28.69
315.05 kHz	30.64 Qp	0.16 / 0.1 / 0.0 / 0.0	30.9	N	-28.94
8.01 MHz	29.12 Qp	0.68 / 0.2 / 0.0 / 0.0	30.01	L1	-29.99
251.02 kHz	30.44 Qp	0.14 / 0.1 / 0.0 / 0.0	30.68	L1	-31.04
150.0 kHz	33.24 Qp	0.12 / 0.2 / 0.0 / 0.0	33.56	N	-32.44
24.0 MHz	25.21 Qp	1.17 / 1.0 / 0.0 / 0.0	27.38	L1	-32.62

Tested by: J. T. Schneider

Printed

J. T. Schneider

Signature

Reviewed by: Greg S Jakubowski

Printed

G. Jakubowski

Signature

CONDUCTED EMISSIONS



Test Report #: WC704535 Run 1

Test Area: LTS

EUT Model #: Saber wireless bluetooth module

Date: 5/6/2008

EUT Serial #:

EUT Power: 60 Hz 110 VAC

Temperature: 17.0 °C

Test Method: FCC 15.207

Air Pressure: 98.0 kPa

Customer: Nonin Medical Inc

Rel. Humidity: 34.0 %

EUT Description: installed in 7800 display unit

Notes:

Data File Name: 4535ce.dat

Page: 4 of 5

Measurement summary for limit2: FCC B Avg (Av)					
FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV)	EUT Lead	DELTA2 FCC B Avg
2.01 MHz	26.43 Av	0.34 / 0.1 / 0.0 / 0.0	26.87	N	-19.13
1.01 MHz	24.46 Av	0.25 / 0.2 / 0.0 / 0.0	24.91	L1	-21.09
1.52 MHz	24.46 Av	0.3 / 0.1 / 0.0 / 0.0	24.86	N	-21.14
754.92 kHz	23.98 Av	0.22 / 0.2 / 0.0 / 0.0	24.4	L1	-21.6
503.82 kHz	23.28 Av	0.2 / 0.12 / 0.0 / 0.0	23.59	L1	-22.41
315.05 kHz	26.02 Av	0.16 / 0.1 / 0.0 / 0.0	26.28	N	-23.56
4.01 MHz	17.5 Av	0.49 / 0.1 / 0.0 / 0.0	18.09	L1	-27.91
3.01 MHz	17.26 Av	0.42 / 0.1 / 0.0 / 0.0	17.78	L1	-28.22
188.26 kHz	24.46 Av	0.13 / 0.15 / 0.0 / 0.0	24.74	L1	-29.38
6.01 MHz	19.56 Av	0.59 / 0.1 / 0.0 / 0.0	20.25	L1	-29.75
16.01 MHz	18.18 Av	0.95 / 0.6 / 0.0 / 0.0	19.73	L1	-30.27
8.01 MHz	18.69 Av	0.68 / 0.2 / 0.0 / 0.0	19.58	L1	-30.42
251.02 kHz	20.75 Av	0.14 / 0.1 / 0.0 / 0.0	20.99	L1	-30.73
12.01 MHz	17.4 Av	0.83 / 0.4 / 0.0 / 0.0	18.63	L1	-31.37
24.0 MHz	16.33 Av	1.17 / 1.0 / 0.0 / 0.0	18.5	L1	-31.5
150.0 kHz	12.08 Av	0.12 / 0.2 / 0.0 / 0.0	12.4	N	-43.6

Tested by: J. T. Schneider

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J. T. Schneider

Signature

Reviewed by: Greg S Jakubowski

Printed

G. Jakubowski

Signature

CONDUCTED EMISSIONS



Test Report #: WC704535 Run 1

Test Area: LTS

EUT Model #: Saber wireless bluetooth module

Date: 5/6/2008

EUT Serial #:

EUT Power: 60 Hz 110 VAC

Temperature: 17.0 °C

Test Method: FCC 15.207

Air Pressure: 98.0 kPa

Customer: Nonin Medical Inc

Rel. Humidity: 34.0 %

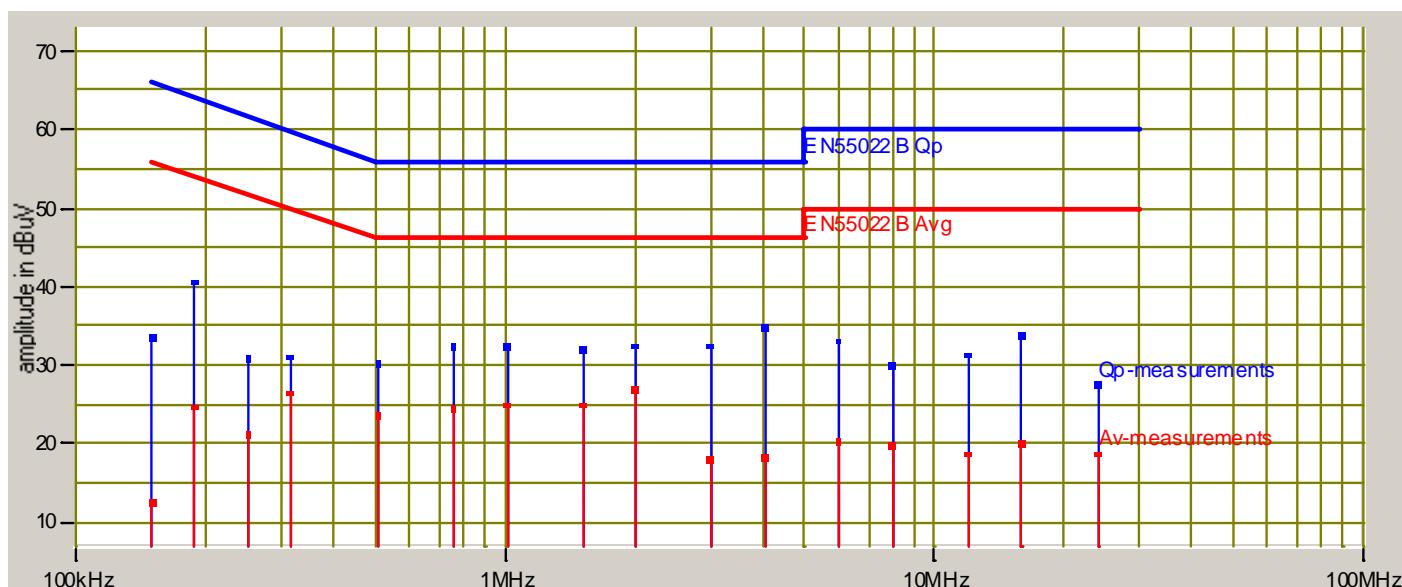
EUT Description: installed in 7800 display unit

Notes:

Data File Name: 4535ce.dat

Page: 5 of 5

Graph:



Tested by: J. T. Schneider

Printed

J. T. Schneider

Signature

Reviewed by: Greg S Jakubowski

Printed

G. Jakubowski

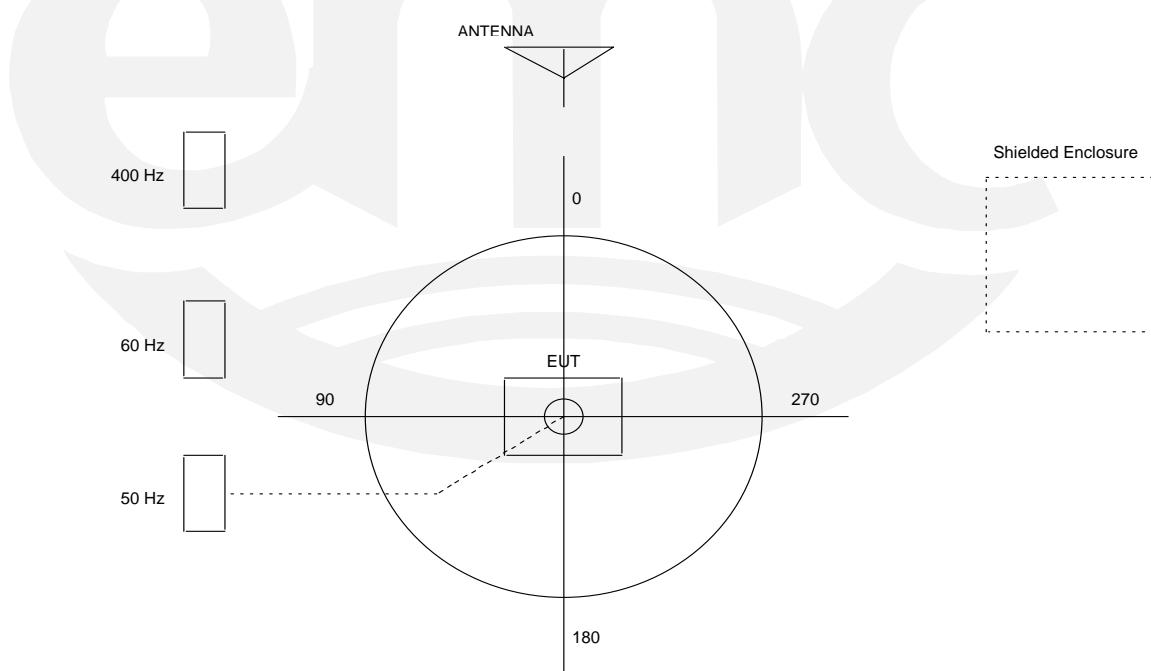
Signature

TEST SETUP FOR EMISSIONS TESTING

WILD RIVER LAB Large Test Site

Notes:

1. Items shown in dotted lines are located on the floor below the test area. It is 5 meters vertically from the ground floor to the test area.
2. 50 Hz, 60 Hz, and 400 Hz are power panels for alternating current.
3. The antenna may be positioned horizontally 3, 10 or 30 meters from the center of the turntable.
4. The circle is a 6.7 meter diameter turntable.
5. A ground plane is in the plane of this sheet.
6. The test sample is shown in the azimuthal position representing zero degrees.



Test-setup photo(s):
Radiated emissions



Test-setup photo(s):
Radiated emissions



Test-setup photo(s):
Radiated emissions



Test-setup photo(s):
Radiated emissions



Test-setup photo(s):
Radiated emissions, 18 - 26 GHz



AC Power Line Conducted Emissions



Equipment Under Test (EUT) Test Operation Mode:

The device under test was operated under the following conditions during immunity testing:

- Standby
- Test program (H - Pattern)
- Test program (color bar)
- Test program (customer specific)
- Practice operation
- Normal operating mode
- Transmit frequency locked at low, mid or high channel as needed
- Both unmodulated & modulated as needed

Configuration of the device under test:

- See Appendix A and test setup photo(s)
- See Product Information Form(s) in Appendix B

DEVIATIONS FROM STANDARD:

None.

GENERAL REMARKS:

None

Modifications required to pass:

- None
- As indicated on the data sheet(s)

Test Specification Deviations: Additions to or Exclusions from:

- None
- As indicated in the Test Plan

SUMMARY:

The requirements according to the technical regulations are

- met and the device under test does fulfill the general approval requirements.
- **not** met and the device under test does **not** fulfill the general approval requirements..

EUT Received Date: 26 June 2007

Condition of EUT: Normal

Testing Start Date: 26 June 2007

Testing End Date: 06 May 2008

TÜV AMERICA INC



Greg Jakubowski
Senior EMC Technician



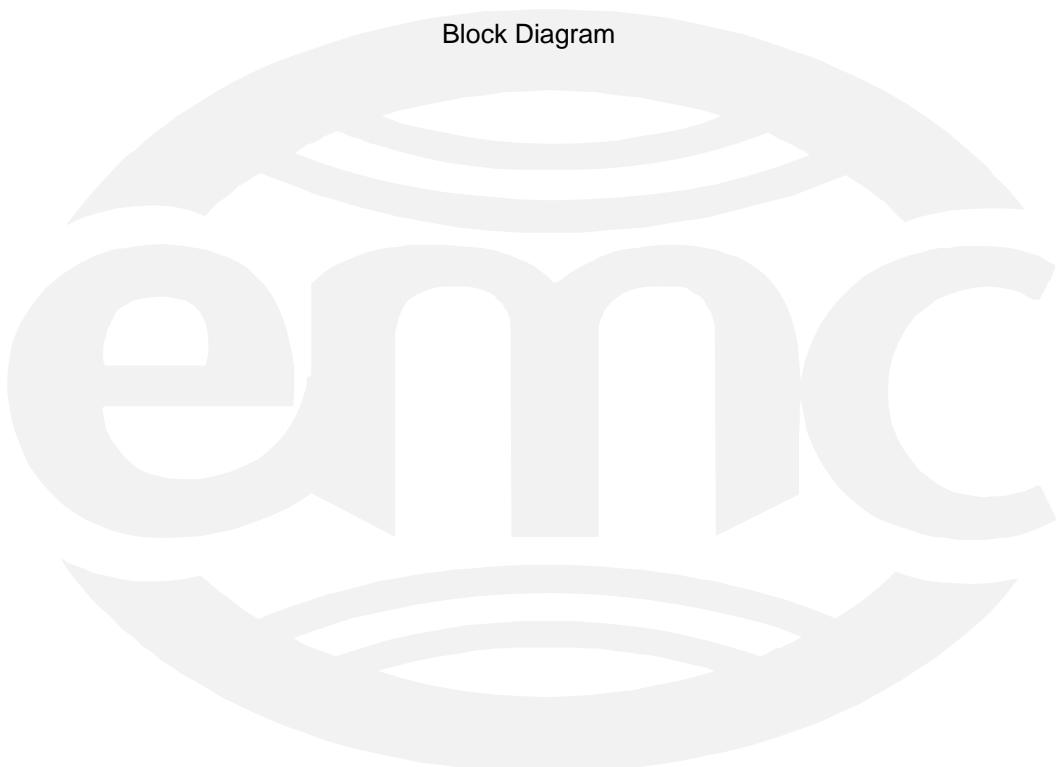
Susan L Rupp
EMC Technical Writer

Appendix A

Constructional Data Form

and

Block Diagram



Form



EMC Test Plan and Constructional Data Form

PLEASE COMPLETE THIS DOCUMENT IN FULL, ENTERING N/A IF THE FIELD IS NOT APPLICABLE. IF TESTING RESULTS IN MODIFICATIONS TO THE EQUIPMENT, PLEASE SUBMIT A REVISED TP/CDF INDICATING THOSE MODIFICATIONS.
NOTE: This information will be input into your test report as shown below. Press the F1 key at any time to get HELP for the current field selected.

Company: Nonin Medical, Inc.
Address: 13700 1st Ave N
Plymouth, MN 55441

Contact: Harold Rudnick Position: Sr Quality Engineer
Phone: 763 553 9968 Fax: 763 553 7807
E-mail Address: harold.rudnick@nonin.com

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

EUT Description: Wireless RF Bluetooth communications module
EUT Name: (project name) Saber
Model No.: N/A Serial No.: 13, 3, 22
Product Options: (1)PCB antenna, (2)flex film antenna evaluated
Configurations to be tested: Transmitter power measurements and temperature testing performed with coaxial cable bypassing the microstrip (PWB) antenna

Equipment Modification (If applicable, indicate modifications since EUT was last tested. If modifications are made during this testing, submit revised TP/CDF after testing is complete.)

Modifications since last test: _____
Modifications made during test: _____

Test Objective(s): Please indicate the tests to be performed, entering the applicable standard(s) where noted.

<input type="checkbox"/> EMC Directive 2004/108/EC (EMC) Std: _____	<input checked="" type="checkbox"/> FCC: Class A <input type="checkbox"/> B Part B,C
<input type="checkbox"/> Machinery Directive 89/392/EEC (EMC) Std: _____	<input type="checkbox"/> VCCI: Class A <input type="checkbox"/> B
<input type="checkbox"/> Medical Device Directive 93/42/EEC (EMC) Std: _____	<input type="checkbox"/> BSMI: Class A <input type="checkbox"/> B <input checked="" type="checkbox"/> Canada: Class A <input type="checkbox"/> B <input type="checkbox"/> Australia: Class A <input type="checkbox"/> B
	R&TTE Directive 1999/5/EC, IEC <input checked="" type="checkbox"/> Other: 60601-1
<input type="checkbox"/> Vehicle Directive: <input type="checkbox"/> 2001/3/EC (EMC) <input type="checkbox"/> Other Vehicle Std: _____	<input type="checkbox"/> 2004/104/EC (EMC)
<input type="checkbox"/> FDA Reviewers Guidance for Premarket Notification Submissions (EMC)	

Third Party Certification, if applicable (*Signature on Page 6 Required)

<input type="checkbox"/> Attestation of Conformity (AoC)* <input checked="" type="checkbox"/> Certificate of Conformity (CoC)* Protection Class (N/A for vehicles)	<input type="checkbox"/> EMC Certification (used with Octagon Mark)* <input type="checkbox"/> Compliance Document* <input type="checkbox"/> Class I <input type="checkbox"/> Class II <input type="checkbox"/> Class III (Press F1 when field is selected to show additional information on Protection Class.)
--	---

Form



EMC Test Plan and Constructional Data Form

FCC / TCB Certification
 E-Mark Certification

Industry Canada / FCB Certification
 Taiwan Certification

Attendance

Test will be: Attended by the customer Unattended by the customer

Failure - Complete this section if testing will not be attended by the customer.

If a failure occurs, TÜV America should:

Call contact listed above, if not available then stop testing. (After hrs phone): _____
 Continue testing to complete test series.
 Continue testing to define corrective action.
 Stop testing.

EUT Specifications and Requirements

Length: 2" Width: 1" Height: 0.5" Weight: 2 oz.

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: 9VDC (If battery powered, make sure battery life is sufficient to complete testing.)

of Phases: _____

Current (Amps/phase(max)): _____ Current (Amps/phase(nominal)): _____

Other _____

Other Special Requirements

Typical Installation and/or Operating Environment

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

EUT Power Cable

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

EMC Test Plan and Constructional Data Form

Type	EUT Interface Ports and Cables				Termination	Connector Type	Port Termination	Length tested (in meters)	Removable	Permanent						
	Analog	Digital	During Test													
			Active	Passive												
EXAMPLE: RS232	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Foil over braid	Coaxial	Metallized 9-pin D-Sub	Characteristic Impedance	6	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
Power/3.3V logic port	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	1	<input type="checkbox"/>	<input checked="" type="checkbox"/>			header pin field	characteristic impedance	0	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>		
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>		
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>		
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>		
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>		
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>		
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>		
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>		
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>		
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>		
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>		
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>		



EMC Test Plan and Constructional Data Form

EUT Software.

Revision Level: v0.9

Description: First formal software from Cybercom, most tests performed and documented

Equipment Under Test (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.

1. Frequency restricted - software designates all but one channel at a time as unusable, restricting operation to a singel channel; necessary to measure frequency stability, power output due to lack of Bluetooth test set
2. Frequency hopping - normal operating mode per Bluetooth specification; for all measurements not requiring single channel operation
- 3.

Equipment Under Test (EUT) System Components -- List and describe all components which are part of the EUT. For FCC & Taiwan testing a minimum configuration is required. (ie. Mouse, Printer, Monitor, External Disk Drive, Motherboard, etc)

Description	Model #	Serial #	FCC ID #
Bluetooth module, PCB antenna	Saber	13	
Bluetooth module, flex antenna	Saber	3	
Bluetooth module, coax. connector	Saber	22	

Form



EMC Test Plan and Constructional Data Form

Support Equipment -- List and describe all support equipment which is not part of the EUT. (i.e. peripherals, simulators, etc)
This information is required for FCC & Taiwan testing.

Description	Model #	Serial #	FCC ID #
Simulator	OEM3	RD3850	

Oscillator Frequencies

Manufacturer	Frequency	Derived Frequency	Component # / Location	Description of Use
NXP	14.756MHz	59MHz	LPC2138	Nonin Command Interface/Upper level Stack
ST	32.768kHz	26MHz, 13MHz	STLC2500C	Lower level baseband
Linear Technology	1.229MHz		LTC3530	Power Supply

Power Supply

Manufacturer	Model #	Serial #	Type
Linear Technology	LTC3530		<input checked="" type="checkbox"/> Switched-mode: (Frequency) 1.229MHz <input type="checkbox"/> Linear <input type="checkbox"/> Other: _____
			<input type="checkbox"/> Switched-mode: (Frequency) _____ <input type="checkbox"/> Linear <input type="checkbox"/> Other: _____

Power Line Filters

Manufacturer	Model #	Location in EUT



EMC Test Plan and Constructional Data Form

Critical EMI Components (Capacitors, ferrites, etc.)

Description	Manufacturer	Part # or Value	Qty	Component #/Location

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

(PLEASE INSERT "ELECTRONIC SIGNATURE" BELOW IF POSSIBLE)

Authorization Signatures (Signature Required for Certifications checked on pg 1)

Harold Rudnick, Sr. Quality Engineer

22 August 2007

Customer authorization to perform tests
according to this test plan.

Date

Harold Rudnick

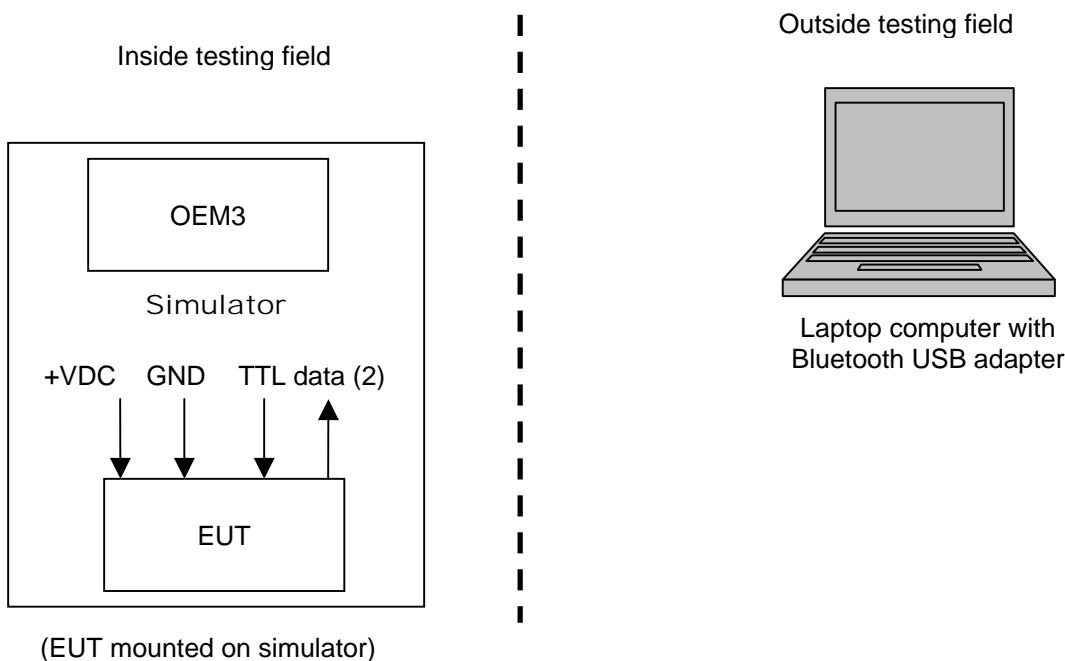
22 August 2007

Test Plan/CDF Prepared By (please print)

Date

EMC Block Diagram Form

System Configuration Block Diagram -- Provide a line drawing identifying the EUT, simulators, support equipment, I/O cables, power cables, and any other pertinent components to be used during testing. Use a dashed line to separate the equipment in the testing field versus equipment outside testing field.



Authorization Signatures

Harold Rudnick, Sr. Quality Engineer

22 August 2007

Customer authorization to perform tests
according to this test plan.

Date

Harold Rudnick

22 August 2007

Test Plan/CDF Prepared By (please print)

Date

Appendix B

Measurement Protocol



MEASUREMENT PROTOCOL

GENERAL INFORMATION

Test Methodology

Emissions testing is performed according to the procedures in ANSI C63.4-2003.

Measurement Uncertainty

The test system for conducted emissions is defined as the LISN, tuned receiver or spectrum analyzer, and coaxial cable. The test system has a measurement uncertainty of ± 1.8 dB. The test system for radiated emissions is defined as the antenna, the pre-amplifier, the spectrum analyzer and the coaxial cable. The test system has a measurement uncertainty of ± 4.8 dB. The equipment comprising the test systems is calibrated on an annual basis.

Justification

The Equipment Under Test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions. A cable is connected to each available port and either terminated with a peripheral into its characteristic impedance or left unterminated. When appropriate, the cables are manually manipulated with respect to each other to obtain maximum emissions from the unit.

Conducted Emissions

The final level, in dB μ V, equals the EMI receiver level plus the cable loss and LISN factor.

Radiated Emissions

The final level, in dB μ V/m, equals the reading from the spectrum analyzer (Level dB μ V), adding the antenna correction factor and cable loss factor (Factor dB) to it, and subtracting the preamp gain (and duty cycle correction factor, if applicable). This result then has the limit subtracted from it to provide the Delta, which gives the tabular data as shown in the data sheets in Attachment A. Intentional radiators are rotated through 3 orthogonal axes to determine the test position yielding the maximum emission levels.

Example:

FREQ (MHz)	LEVEL (dB μ V)	CABLE/ANT/PREAMP (dB)	FINAL (dB μ V/m)	POL/HGT/AZ (m)	DELTA1 (deg)
60.80	42.5Qp +	1.2 + 10.9 - 25.5 =	29.1	V 1.0 0.0	-10.9

Test Equipment

All measurement instrumentation is traceable to the National Institute of Standards and Technology and is calibrated according to internal procedure.

DETAILS OF TEST PROCEDURES

Conducted Emissions

Conducted emissions on the 50 Hz and/or 60 Hz power interface of the EUT are measured in the frequency range of 150 kHz to 30 MHz. The measurements are performed using a receiver, which has CISPR characteristic bandwidth and quasi-peak detection, and a Line Impedance Stabilization Network (LISN), with 50 Ω/50 μH (CISPR 16) characteristics. Table top equipment is placed on a non-conducting table 80 centimeters above the floor and is positioned 40 centimeters from the vertical ground plane (wall) of the screen room. In some cases, a pre-scan using a spectrum analyzer is initially performed on the units comprising the system under test to locate the highest emissions. If the minimum passing margin appears to be less than 20 dB with a peak mode measurement, the emissions are re-measured using a tuned receiver or spectrum analyzer with quasi-peak and average detection and recorded on the data sheets.

Radiated Emissions

Radiated emissions in the frequency range of 10kHz to 30 MHz, including the fundamental transmit signal, are measured using a receiver capable of quasi-peak and average measurements and a magnetic loop antenna. The transmitter is rotated through 3 orthogonal axes in order to determine the maximum emission levels. If the signal cannot be measured at the specified limit distance, measurements are recorded at multiple distances nearer to the device and the final level mathematically extrapolated. Radiated emissions from the EUT are measured in the frequency range of 30 to 1000 MHz using a spectrum analyzer and appropriate broadband linearly polarized antennas. Measurements between 30 MHz and 1000 MHz are made with 120 kHz/6 dB bandwidth and quasi-peak detection and measurements above 1000 MHz are made with a 1 MHz/6 dB bandwidth and peak detection. Table top equipment is placed on a 1.0 X 1.5 meter non-conducting table 80 centimeters above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. Interface cables that are closer than 40 centimeters to the ground plane are bundled in the center in a serpentine fashion so they are at least 40 centimeters from the ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screen room located outside the test area. The antenna is positioned 3, 10 or 30 meters horizontally from the EUT. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 meters, measurement scans are made with both horizontal and vertical antenna polarizations and the EUT are rotated 360 degrees.