

TEST RESULT SUMMARY

FCC Part 15 Subpart C Section 15.247 Industry Canada RSS-210 Issue 8

MANUFACTURER	Cyberonics Incorporated 100 Cyberonics Boulevard Houston TX 77058 USA
DESCRIPTION OF EQUIPMENT	Bluetooth LE device
NAME OF EQUIPMENT	ProGuardian Sensor
MODEL NUMBER(S) TESTED	PG1000
SERIAL NUMBER(S) TESTED	0045
TEST REPORT NUMBER	NC1400574.4
TEST DATE(S)	04-10 February 2014

TÜV SÜD America Inc, as an independent testing laboratory, declares that the equipment tested as specified above conforms to the applicable 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", and Industry Canada RSS-210 Issue 8 "Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment".

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.

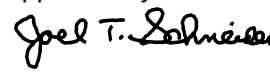
Date: 06 March 2014

Tested by:



Greg Jakubowski
Senior EMC Technician

Approved by:



Joel T Schneider
Senior EMC Engineer

Not Transferable

EMC TEST REPORT

Test Report No. NC1400574.4 Date of issue: 06 March 2014

Product Description Bluetooth LE device

Product Name ProGuardian Sensor

Model No(s) Tested PG1000

Serial No(s) Tested 0045

Manufacturer Cyberonics Incorporated

Address 100 Cyberonics Boulevard
Houston TX 77058 USA

Test Result ☒ **Positive** ☐ **Negative**

TÜV SÜD 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 SÜD America Inc shall have no liability for any deductions, inferences or generalizations drawn by the client or others from TÜV SÜD America Inc issued reports.

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TÜV SÜD 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
	81	06 March 2014	Initial Release



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EMC TEST REGULATIONS:

The tests were performed according to the following regulations:

- FCC Part 15 Subpart C Sections 15.247(a)2), (b)3), (d), (e)
- Industry Canada RSS-210 Issue 8 Sections A8.2(a)(b), A8.4(4), A8.5

ENVIRONMENTAL CONDITIONS IN THE LAB

	<u>Actual</u>
Temperature:	: 13°C
Atmospheric pressure	: 99 kPa
Relative Humidity	: 11%

POWER SUPPLY UTILIZED

Power supply system : 3 VDC

TEST EQUIPMENT

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

SIGN EXPLANATIONS

- ☐ - not applicable
- ☒ - applicable.

6 dB signal bandwidth

FCC 15.247(a)2), IC RSS-210 A8.2(a)

Test summary

The requirements are: ☒ - MET ☐ - NOT MET

Testing per 558074 D01 DTS Meas Guidance v03 – section 8.1

Test location

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

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

☐ - Wild River Shield Room 2

Test equipment

TUV ID	Model	Manufacturer	Description	Serial	Cal Date	Cal Due
WRLE03204	EM-6917B	Electro-Metrics	Biconicalog Periodic	102	30-May-13	30-May-14
OWLE02682	85650A	Hewlett-Packard	Quasi-Peak Adapter	2811A01127	19-Mar-13	19-Mar-14
WRLE03295	85662A	Hewlett-Packard	Analyzer Display	2349A06144	22-Apr-13	22-Apr-14
WRLE02689	8566B	Hewlett-Packard	Spectrum Analyzer	2416A00321	22-Apr-13	22-Apr-14
WRLE02670	8447D	Hewlett-Packard	Preamplifier	2443A03954	Code B 20-Jan-14	Code B 20-Jan-15
WRLE02075	3115	EMCO	Ridge Guide Ant. 1-18 GHz	9001-3275	12-Feb-13	12-Feb-14
WRLE10527	SL18B4020	Phase One Microwave	Preamplifier 1 – 18 GHz	0001	Code B 23-Jan-14	Code B 23-Jan-15
WRLE02003	F550B1	Acronetics	4 – 8 GHz Bandpass Filter	010	Code B 23-Jan-14	Code B 23-Jan-15
WRLE03935	F548B-1	Acronetics	1 – 2 GHz Bandpass Filter	010	Code B 23-Jan-14	Code B 23-Jan-15
WRLE10435	E4440A	Agilent	Spectrum Analyzer	MY44304483	20-Nov-13	20-Nov-14
WRLE03978	SL26-3010	Phase One Microwave	Amplifier 18-26.5 GHz	0005	Code B 21-Jan-14	Code B 21-Jan-15
OWLE03996	SAS-572	A.H. Systems	STD Gain Horn	183	Code Y	Code Y
WRLE10923	83640B	Agilent	Swept Signal Generator	3844A00471	25-Jul-13	25-Jul-14
WRLE03229	3115	Electro-Mechanics (EMCO)	Ridge Guide Antenna	2483	05-Sept-13	05-Sept-14
WRLE10863	N/A	TÜV SÜD America Inc	Test Companion Software Version 3.4.71	N/A	Code Y	Code Y

Test limit

The minimum 6 dB bandwidth shall be at least 500 kHz.

Test data

Low Channel

Agilent 13:28:10 Feb 6, 2014

 ▲ Mkr2 680 kHz

0.13 dB

Ref -42 dBm

Atten 10 dB

#Peak

Log

5

dB/

DI

-50.6

dBm

LgAv

S1 S2

Center 2.402 000 GHz

Span 2 MHz

#Res BW 100 kHz

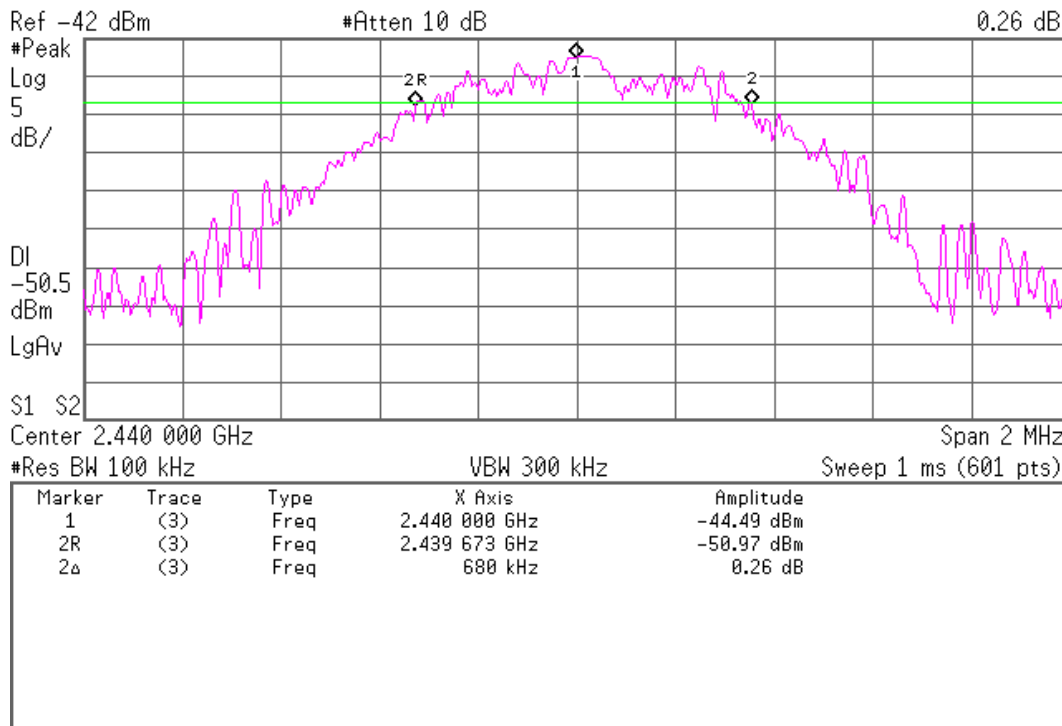
VBW 300 kHz

Sweep 1 ms (601 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(3)	Freq	2.402 000 GHz	-44.56 dBm
2R	(3)	Freq	2.401 670 GHz	-50.50 dBm
2Δ	(3)	Freq	680 kHz	0.13 dB

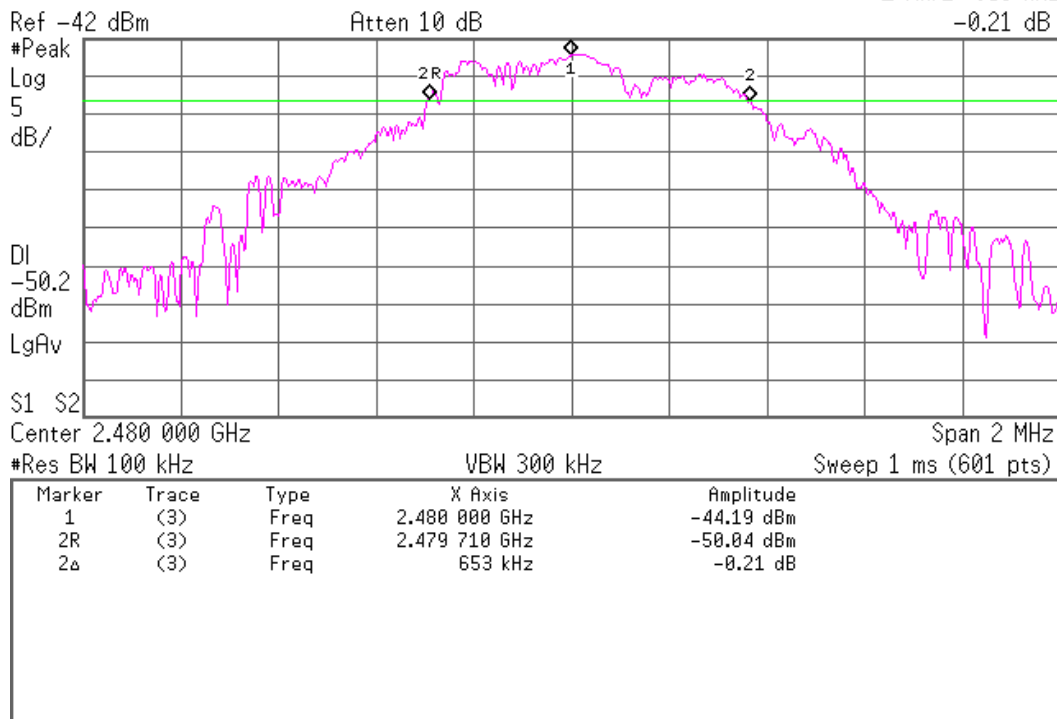
Mid Channel

* Agilent 11:51:56 Feb 6, 2014

 ▲ Mkr2 680 kHz
 0.26 dB


High Channel

* Agilent 13:33:57 Feb 6, 2014

 ▲ Mkr2 653 kHz
 -0.21 dB


Fundamental emission output power

FCC 15.247(b)(3), IC RSS-210 A8.4(4)

Test summary

The requirements are: ■ - MET □ - NOT MET

Testing per 558074 D01 DTS Meas Guidance v03 – section 3 – ANSI C63.10-2009 section 7.8.2 for integral antenna

Test location

- - Wild River Lab Large Test Site (Open Area Test Site)
- - Wild River Lab Small Test Site (Open Area Test Site)
- - Wild River Shield Room 2

Test equipment

TUV ID	Model	Manufacturer	Description	Serial	Cal Date	Cal Due
WRLE03204	EM-6917B	Electro-Metrics	Biconicalog Periodic	102	30-May-13	30-May-14
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WRLE02689	8566B	Hewlett-Packard	Spectrum Analyzer	2416A00321	22-Apr-13	22-Apr-14
WRLE02670	8447D	Hewlett-Packard	Preamplifier	2443A03954	Code B 20-Jan-14	Code B 20-Jan-15
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WRLE10527	SL18B4020	Phase One Microwave	Preamplifier 1 – 18 GHz	0001	Code B 23-Jan-14	Code B 23-Jan-15
WRLE02003	F550B1	Acronetics	4 – 8 GHz Bandpass Filter	010	Code B 23-Jan-14	Code B 23-Jan-15
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OWLE03996	SAS-572	A.H. Systems	STD Gain Horn	183	Code Y	Code Y
WRLE10923	83640B	Agilent	Swept Signal Generator	3844A00471	25-Jul-13	25-Jul-14
WRLE03229	3115	Electro-Mechanics (EMCO)	Ridge Guide Antenna	2483	05-Sept-13	05-Sept-14
WRLE10863	N/A	TÜV SÜD America Inc	Test Companion Software Version 3.4.71	N/A	Code Y	Code Y

Test limit

1 Watt or 30 dBm

Test data

$$P = (Ed)^2 / 30G$$

where

P is the power, in W = 3.69 mW (high channel, worst case)

E is the measured peak field strength, in V/m = 100.91 dBμV/m = 0.111 V/m

D is the distance at which the measurement was made, in m = 3

G is the numeric gain of the radiating element, = 1

If the gain of the radiating element is not known, then either the effective radiated power (ERP) or the effective isotropic radiated power (EIRP) may be calculated from the measured peak field strength, by using either G= 1.64 or G= 1, respectively, in Equation (5).

List of measurements for run #: 3

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1	DELTA2
Find highest fundamental power of 3 orthogonal axis						
X axis = DUT lying flat, Y = DUT on edge w/ long dimension horizontal, Z = DUT on edge w/ long dimension vertical						
DUT on mid channel, 2.44 GHz, CW, max power						
Mid channel						
X axis, maximized						
1MHz RBW, 3MHz VBW						
2.44 GHz	65.65 Pk	5.83 / 28.44 / 0.0 / 0.0	99.92	H / 1.09 / 285	n/a	n/a
99.9dBuV/m@3m - 95.2dB = 4.7dBm eirp						
Y axis, maximized						
2.44 GHz	64.85 Pk	5.83 / 28.44 / 0.0 / 0.0	99.12	H / 1.05 / 243	n/a	n/a
Z axis, maximized						
2.44 GHz	60.9 Pk	5.83 / 28.44 / 0.0 / 0.0	95.17	H / 1.00 / 214	n/a	n/a
X axis						
Low channel maximized						
2.402 GHz	66.25 Pk	5.78 / 28.31 / 0.0 / 0.0	100.33	H / 1.09 / 287	n/a	n/a
100.3 - 95.2 = 5.1 dBm eirp						
High channel maximized						
2.48 GHz	66.45 Pk	5.88 / 28.58 / 0.0 / 0.0	100.91	H / 1.04 / 282	n/a	n/a
100.9 - 95.2 = 5.7 dBm eirp						

Maximum power spectral density

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

Test summary

The requirements are: ☒ - MET ☐ - NOT MET

Testing per FCC 558074 D01 DTS Meas Guidance v03 – section 10.2 – ANSI C63.10-2009 section 7.8.2 for integral antenna

Test location

- ☒ - Wild River Lab Large Test Site (Open Area Test Site)
☐ - Wild River Lab Small Test Site (Open Area Test Site)
☐ - Wild River Shield Room 2

Test equipment

TUV ID	Model	Manufacturer	Description	Serial	Cal Date	Cal Due
WRLE03204	EM-6917B	Electro-Metrics	Biconicalog Periodic	102	30-May-13	30-May-14
OWLE02682	85650A	Hewlett-Packard	Quasi-Peak Adapter	2811A01127	19-Mar-13	19-Mar-14
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WRLE02689	8566B	Hewlett-Packard	Spectrum Analyzer	2416A00321	22-Apr-13	22-Apr-14
WRLE02670	8447D	Hewlett-Packard	Preamplifier	2443A03954	Code B 20-Jan-14	Code B 20-Jan-15
WRLE02075	3115	EMCO	Ridge Guide Ant. 1-18 GHz	9001-3275	12-Feb-13	12-Feb-14
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WRLE02003	F550B1	Acronetics	4 – 8 GHz Bandpass Filter	010	Code B 23-Jan-14	Code B 23-Jan-15
WRLE03935	F548B-1	Acronetics	1 – 2 GHz Bandpass Filter	010	Code B 23-Jan-14	Code B 23-Jan-15
WRLE10435	E4440A	Agilent	Spectrum Analyzer	MY44304483	20-Nov-13	20-Nov-14
WRLE03978	SL26-3010	Phase One Microwave	Amplifier 18-26.5 GHz	0005	Code B 21-Jan-14	Code B 21-Jan-15
OWLE03996	SAS-572	A.H. Systems	STD Gain Horn	183	Code Y	Code Y
WRLE10923	83640B	Agilent	Swept Signal Generator	3844A00471	25-Jul-13	25-Jul-14
WRLE03229	3115	Electro-Mechanics (EMCO)	Ridge Guide Antenna	2483	05-Sept-13	05-Sept-14
WRLE10863	N/A	TÜV SÜD America Inc	Test Companion Software Version 3.4.71	N/A	Code Y	Code Y

Test limit

No greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

Test data

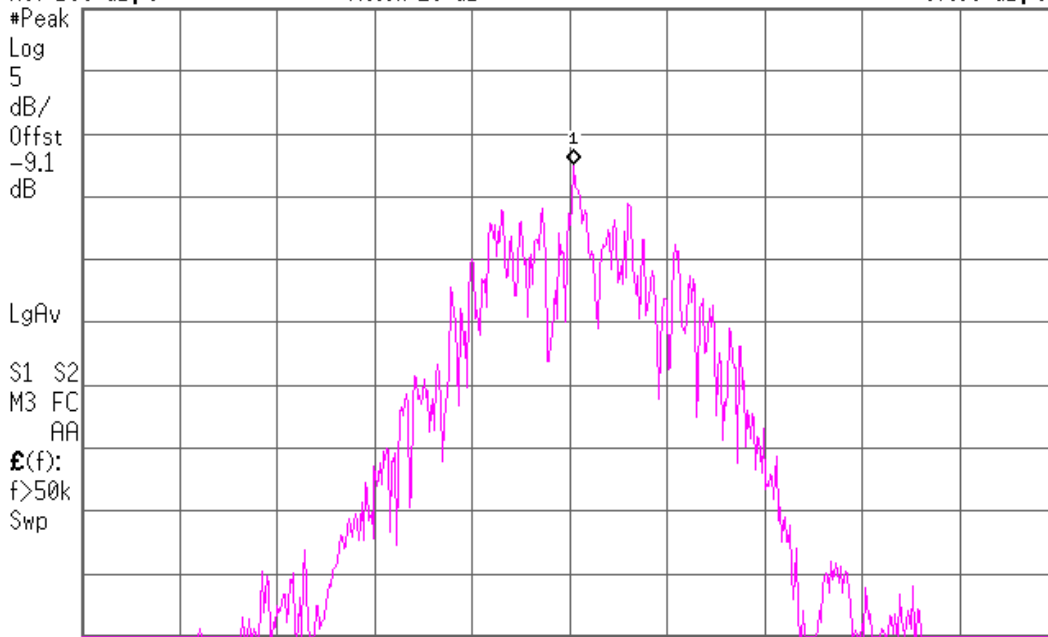
87.6 dBμV/m @ 3 meters = 0.146 mW eirp / 3 kHz, or -8.3 dBm / 3 kHz

* Agilent 09:28:12 Feb 7, 2014

Y scale = dB μ V/m@3mRef 100 dB μ V

Atten 20 dB

Mkr1 2.402 015 GHz

87.60 dB μ V

Center 2.402 000 GHz

#Res BW 3 kHz

VBW 9.1 kHz

Span 3 MHz

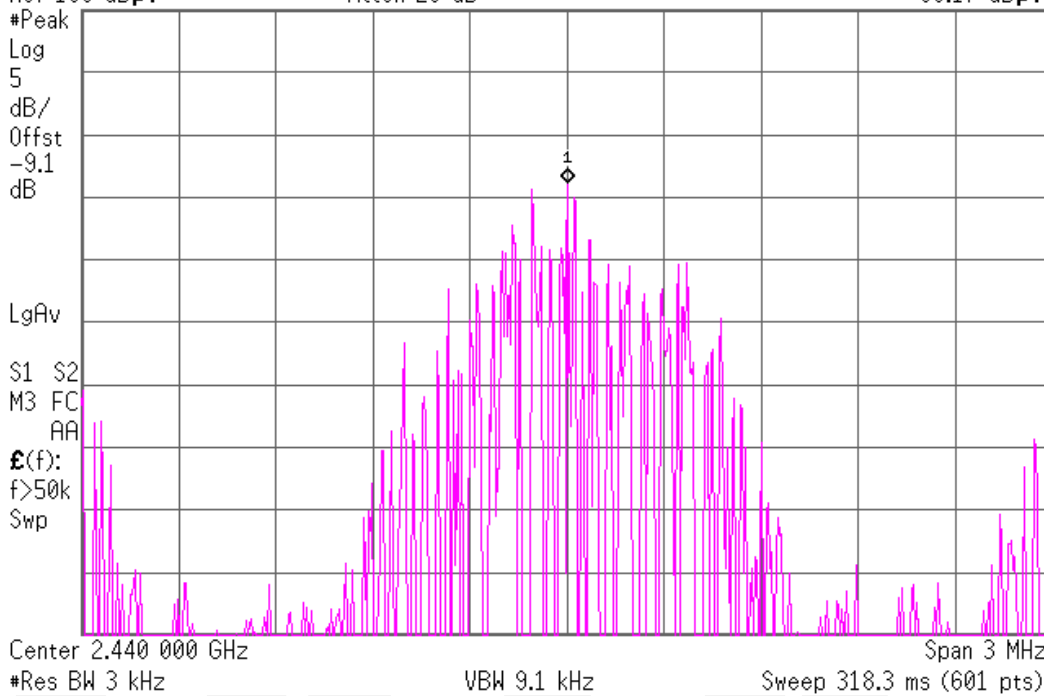
Sweep 318.3 ms (601 pts)

* Agilent 09:47:05 Feb 7, 2014

Y scale = dB μ V/m@3mRef 100 dB μ V

Atten 20 dB

Mkr1 2.440 005 GHz

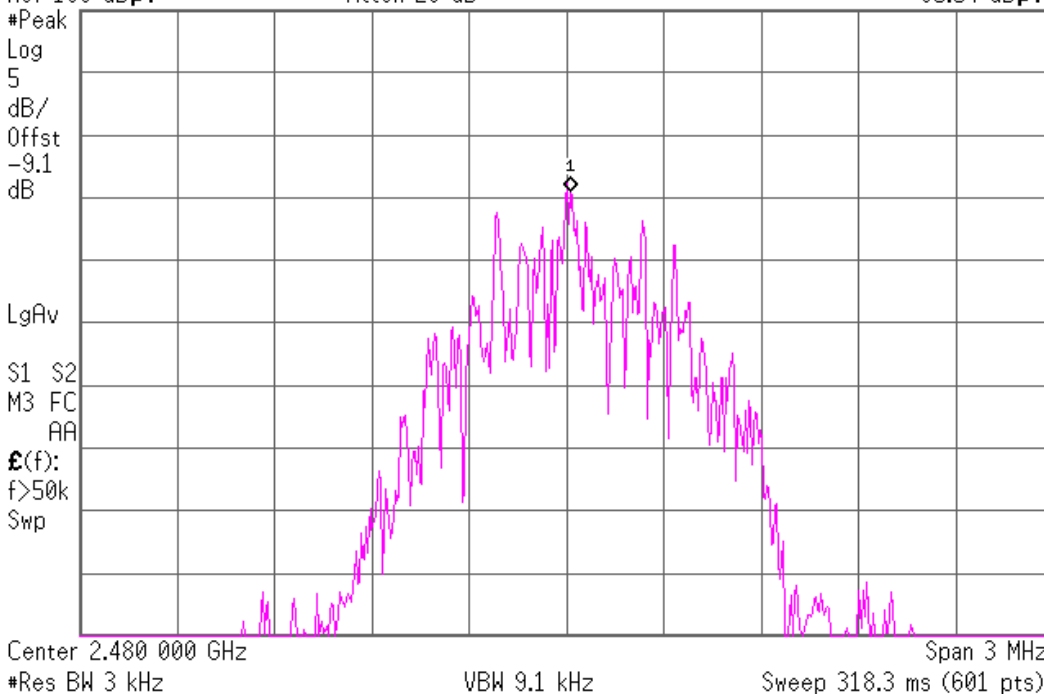
86.17 dB μ V

* Agilent 09:33:12 Feb 7, 2014

Y scale = dB μ V/m@3mRef 100 dB μ V

Atten 20 dB

Mkr1 2.480 015 GHz

85.54 dB μ V

Emissions in non-restricted frequency bands

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

Test summary

The requirements are: ■ - MET □ - NOT MET

Testing per FCC 558074 D01 DTS Meas Guidance v03 – section 11 – ANSI C63.10-2009 section 7.8.2 for integral antenna

Test location

- - Wild River Lab Large Test Site (Open Area Test Site)
- - Wild River Lab Small Test Site (Open Area Test Site)
- - Wild River Shield Room 2

Test equipment

TUV ID	Model	Manufacturer	Description	Serial	Cal Date	Cal Due
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WRLE02689	8566B	Hewlett-Packard	Spectrum Analyzer	2416A00321	22-Apr-13	22-Apr-14
WRLE02670	8447D	Hewlett-Packard	Preamplifier	2443A03954	Code B 20-Jan-14	Code B 20-Jan-15
WRLE02075	3115	EMCO	Ridge Guide Ant. 1-18 GHz	9001-3275	12-Feb-13	12-Feb-14
WRLE10527	SL18B4020	Phase One Microwave	Preamplifier 1 – 18 GHz	0001	Code B 23-Jan-14	Code B 23-Jan-15
WRLE02003	F550B1	Acronetics	4 – 8 GHz Bandpass Filter	010	Code B 23-Jan-14	Code B 23-Jan-15
WRLE03935	F548B-1	Acronetics	1 – 2 GHz Bandpass Filter	010	Code B 23-Jan-14	Code B 23-Jan-15
WRLE10435	E4440A	Agilent	Spectrum Analyzer	MY44304483	20-Nov-13	20-Nov-14
WRLE03978	SL26-3010	Phase One Microwave	Amplifier 18-26.5 GHz	0005	Code B 21-Jan-14	Code B 21-Jan-15
OWLE03996	SAS-572	A.H. Systems	STD Gain Horn	183	Code Y	Code Y
WRLE10923	83640B	Agilent	Swept Signal Generator	3844A00471	25-Jul-13	25-Jul-14
WRLE03229	3115	Electro-Mechanics (EMCO)	Ridge Guide Antenna	2483	05-Sept-13	05-Sept-14
WRLE10863	N/A	TÜV SÜD America Inc	Test Companion Software Version 3.4.71	N/A	Code Y	Code Y

Test limit

-20 dBc

Test data

See following pages – all spurious emissions meet 15.209 limit.

Emissions in restricted frequency bands

FCC 15.209(d)

Test summary

The requirements are: ■ - MET □ - NOT MET

Testing per FCC D01 DTS Meas Guidance v03, 12.1 Radiated emission measurements

Test location

- - Wild River Lab Large Test Site (Open Area Test Site)
 □ - Oakwood Lab Medium Test Site (Open Area Test Site)
 □ - Wild River Lab Large Test Site Tech Area

Test equipment

TUV ID	Model	Manufacturer	Description	Serial	Cal Date	Cal Due
WRLE03204	EM-6917B	Electro-Metrics	Biconicalog Periodic	102	30-May-13	30-May-14
OWLE02682	85650A	Hewlett-Packard	Quasi-Peak Adapter	2811A01127	19-Mar-13	19-Mar-14
WRLE03295	85662A	Hewlett-Packard	Analyzer Display	2349A06144	22-Apr-13	22-Apr-14
WRLE02689	8566B	Hewlett-Packard	Spectrum Analyzer	2416A00321	22-Apr-13	22-Apr-14
WRLE02670	8447D	Hewlett-Packard	Preamplifier	2443A03954	Code B 20-Jan-14	Code B 20-Jan-15
WRLE02075	3115	EMCO	Ridge Guide Ant. 1-18 GHz	9001-3275	12-Feb-13	12-Feb-14
WRLE10527	SL18B4020	Phase One Microwave	Preamplifier 1 – 18 GHz	0001	Code B 23-Jan-14	Code B 23-Jan-15
WRLE02003	F550B1	Acronetics	4 – 8 GHz Bandpass Filter	010	Code B 23-Jan-14	Code B 23-Jan-15
WRLE03935	F548B-1	Acronetics	1 – 2 GHz Bandpass Filter	010	Code B 23-Jan-14	Code B 23-Jan-15
WRLE10435	E4440A	Agilent	Spectrum Analyzer	MY44304483	20-Nov-13	20-Nov-14
WRLE03978	SL26-3010	Phase One Microwave	Amplifier 18-26.5 GHz	0005	Code B 21-Jan-14	Code B 21-Jan-15
OWLE03996	SAS-572	A.H. Systems	STD Gain Horn	183	Code Y	Code Y
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WRLE03229	3115	Electro-Mechanics (EMCO)	Ridge Guide Antenna	2483	05-Sept-13	05-Sept-14
WRLE10863	N/A	TÜV SÜD America Inc	Test Companion Software Version 3.4.71	N/A	Code Y	Code Y

Test limit (in restricted bands)

Frequency (MHz)	Field strength (μV/meter)	Field strength (dBμV/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	54.0
	5000 – PK	74.0

Test data

30-1000 MHz

Measurement summary for limit1: FCC 15.247 <1GHz 3m (Qp)

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 FCC 15.247 <1GHz restr.bands 3m
370.08 MHz	40.18 Qp	2.17 / 21.28 / 27.24 / 0.0	36.39	H / 1.00 / 335	-9.61
386.796 MHz	40.05 Qp	2.23 / 21.17 / 27.29 / 0.0	36.16	H / 1.00 / 335	-9.84
265.458 MHz	32.6 Qp	1.84 / 18.49 / 27.25 / 0.0	25.67	V / 1.00 / 0	-20.33



1-25 GHz

Measurement summary for limit2: FCC 15.247 >1GHz 3m (Pk)

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	LIMIT (dBuV/m) PK
4.96 GHz	65.8 Pk	9.02 / 33.12 / 43.52 / 0.47	64.89	H / 1.02 / 89	74
4.88 GHz	65.8 Pk	8.94 / 32.97 / 43.61 / 0.45	64.55	H / 1.07 / 82	74
4.804 GHz	65.55 Pk	8.86 / 32.86 / 43.69 / 0.43	64.02	H / 1.07 / 80	74
1.24 GHz	50.8 Pk	4.08 / 25.6 / 41.69 / 0.58	39.37	H / 1.00 / 104	74

Measurement summary for limit2: FCC 15.247 >1GHz 3m (Av)

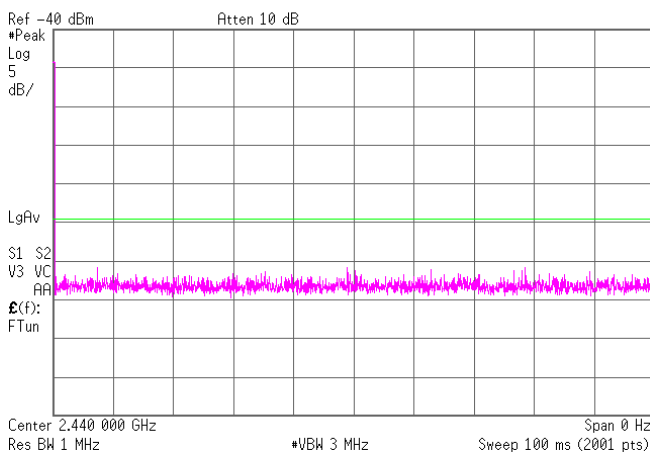
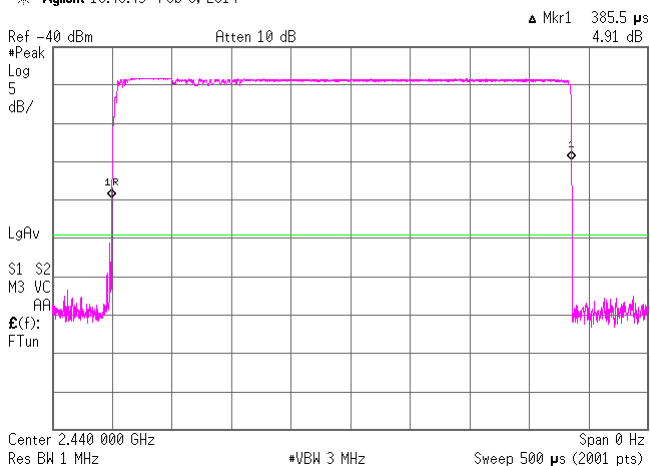
FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	FINAL (dBuV/m) Pk reading – duty cycle factor	LIMIT (dBuV/m) AVE
4.96 GHz	65.8 Pk	9.02 / 33.12 / 43.52 / 0.47	64.89	H / 1.02 / 89	16.59	54
4.88 GHz	65.8 Pk	8.94 / 32.97 / 43.61 / 0.45	64.55	H / 1.07 / 82	16.25	54
4.804 GHz	65.55 Pk	8.86 / 32.86 / 43.69 / 0.43	64.02	H / 1.07 / 80	15.72	54
1.24 GHz	50.8 Pk	4.08 / 25.6 / 41.69 / 0.58	39.37	H / 1.00 / 104	-8.93	54

Per customer, Duty cycle (per 100mS) ranges from 0.12 - 0.376%

Measured 386µs/100 ms duty cycle

20log*00386 = -48.3dB

Agilent 10:46:43 Feb 6, 2014



Radiated band edge

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

Test equipment

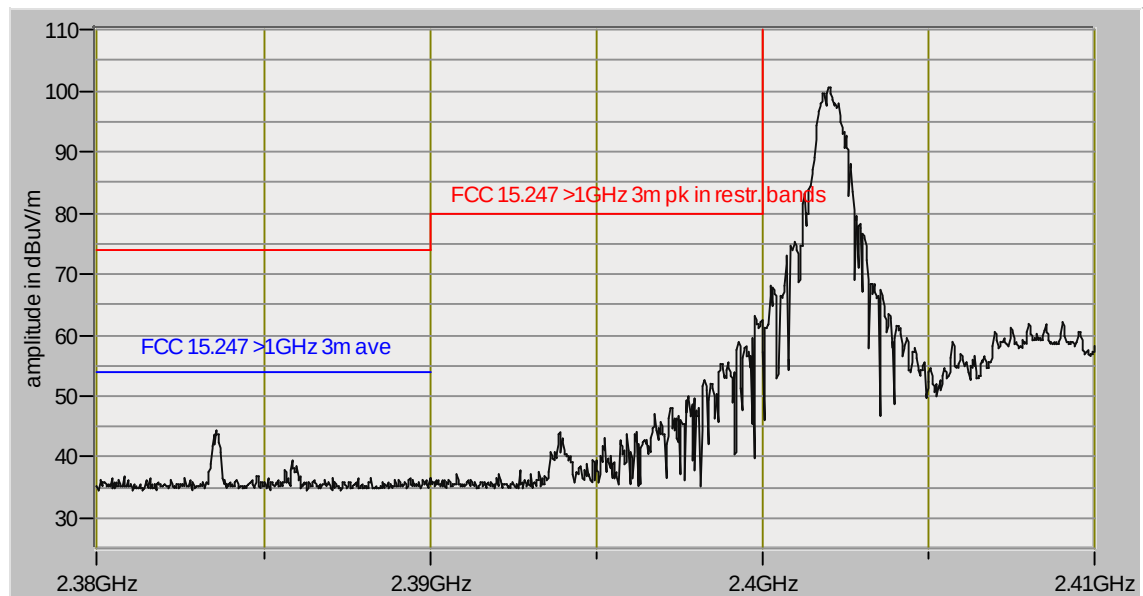
TUV ID	Model	Manufacturer	Description	Serial	Cal Date	Cal Due
WRLE03204	EM-6917B	Electro-Metrics	Biconicalog Periodic	102	30-May-13	30-May-14
OWLE02682	85650A	Hewlett-Packard	Quasi-Peak Adapter	2811A01127	19-Mar-13	19-Mar-14
WRLE03295	85662A	Hewlett-Packard	Analyzer Display	2349A06144	22-Apr-13	22-Apr-14
WRLE02689	8566B	Hewlett-Packard	Spectrum Analyzer	2416A00321	22-Apr-13	22-Apr-14
WRLE02670	8447D	Hewlett-Packard	Preamplifier	2443A03954	Code B 20-Jan-14	Code B 20-Jan-15
WRLE02075	3115	EMCO	Ridge Guide Ant. 1-18 GHz	9001-3275	12-Feb-13	12-Feb-14
WRLE10527	SL18B4020	Phase One Microwave	Preamplifier 1 – 18 GHz	0001	Code B 23-Jan-14	Code B 23-Jan-15
WRLE02003	F550B1	Acronetics	4 – 8 GHz Bandpass Filter	010	Code B 23-Jan-14	Code B 23-Jan-15
WRLE03935	F548B-1	Acronetics	1 – 2 GHz Bandpass Filter	010	Code B 23-Jan-14	Code B 23-Jan-15
WRLE10435	E4440A	Agilent	Spectrum Analyzer	MY44304483	20-Nov-13	20-Nov-14
WRLE03978	SL26-3010	Phase One Microwave	Amplifier 18-26.5 GHz	0005	Code B 21-Jan-14	Code B 21-Jan-15
OWLE03996	SAS-572	A.H. Systems	STD Gain Horn	183	Code Y	Code Y
WRLE10923	83640B	Agilent	Swept Signal Generator	3844A00471	25-Jul-13	25-Jul-14
WRLE03229	3115	Electro-Mechanics (EMCO)	Ridge Guide Antenna	2483	05-Sept-13	05-Sept-14
WRLE10863	N/A	TÜV SÜD America Inc	Test Companion Software Version 3.4.71	N/A	Code Y	Code Y

Test limit

Frequency (GHz)	Field strength (μV/meter)	Field strength (dBμV/meter)
2.39 & 2.4835	500 – AV 5000 – PK	54.0 74.0

Test data

Peak level, band edge -20 dBc

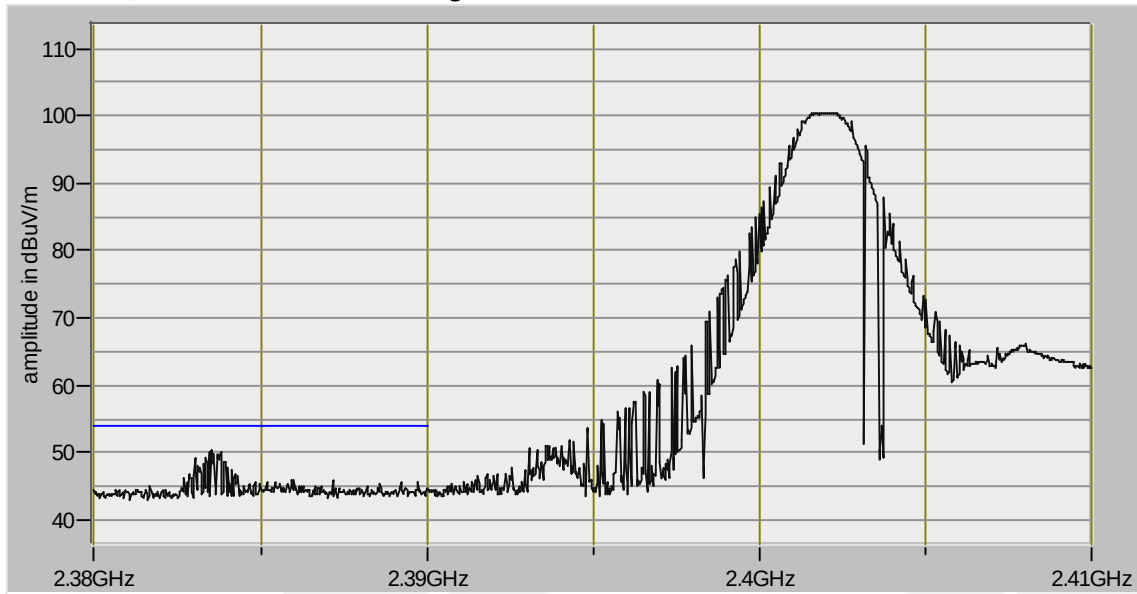


100 kHz RBW

300 kHz VBW

emc

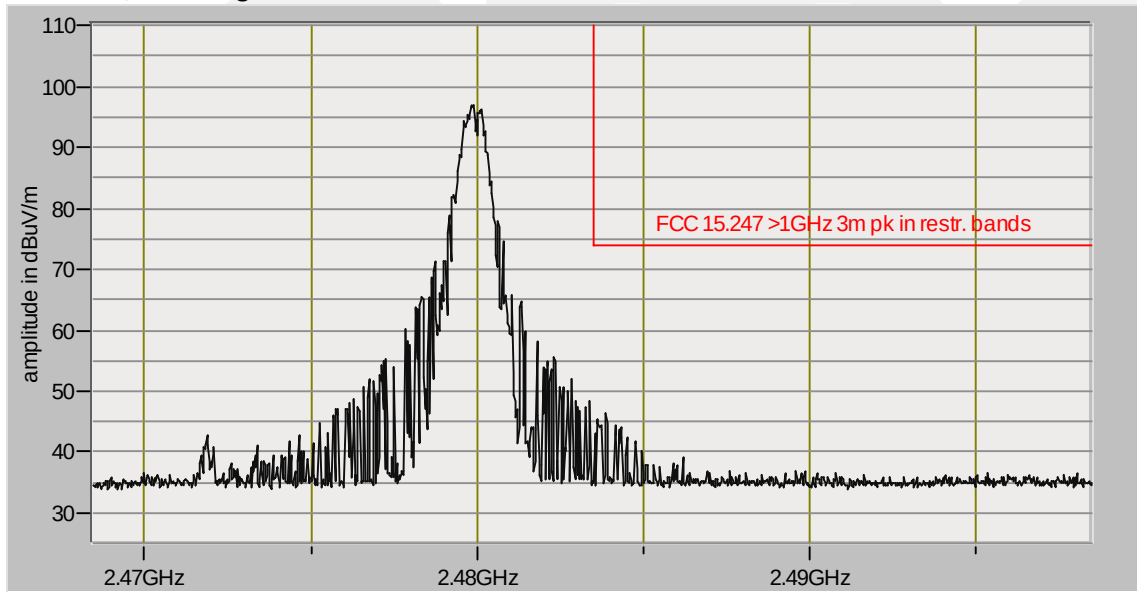
Peak level / Restricted band vs. average limit



1 MHz RBW

3 MHz VBW

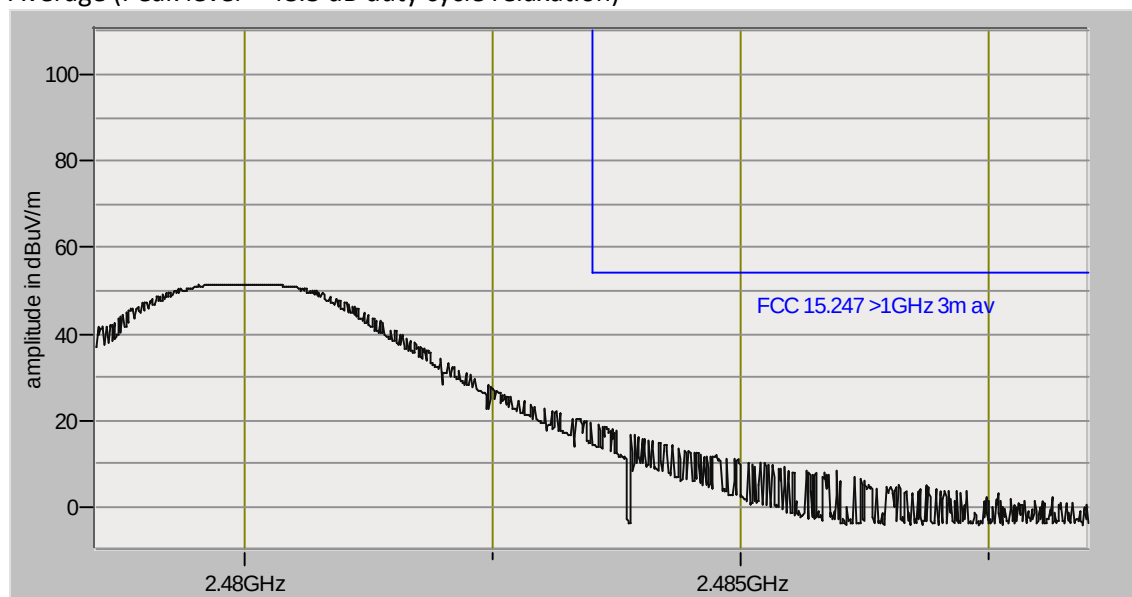
Peak level, band edge -20 dBc



100 kHz RBW

300 kHz VBW

Average (Peak level – 48.3 dB duty cycle relaxation)



1 MHz RBW

3 MHz VBW

99% bandwidth

RSS Gen Section 4.6.1

Test summaryThe requirements are: ☒ - MET ☐ - NOT MET

Tested per "A Discussion on the Measurement of Occupied Bandwidth by Brian Kasper"

Test location

- ☒ - Wild River Lab Large Test Site (Open Area Test Site)
☐ - Wild River Lab Small Test Site (Open Area Test Site)
☐ - Wild River Shield Room 2

Test equipment

TUV ID	Model	Manufacturer	Description	Serial	Cal Date	Cal Due
WRLE02075	3115	EMCO	Ridge Guide Ant. 1-18 GHz	9001-3275	12-Feb-13	12-Feb-14
WRLE10527	SL18B4020	Phase One Microwave	Preamplifier 1 – 18 GHz	0001	Code B 23-Jan-14	Code B 23-Jan-15
WRLE10435	E4440A	Agilent	Spectrum Analyzer	MY44304483	20-Nov-13	20-Nov-14

Test limit

For information only

Test data

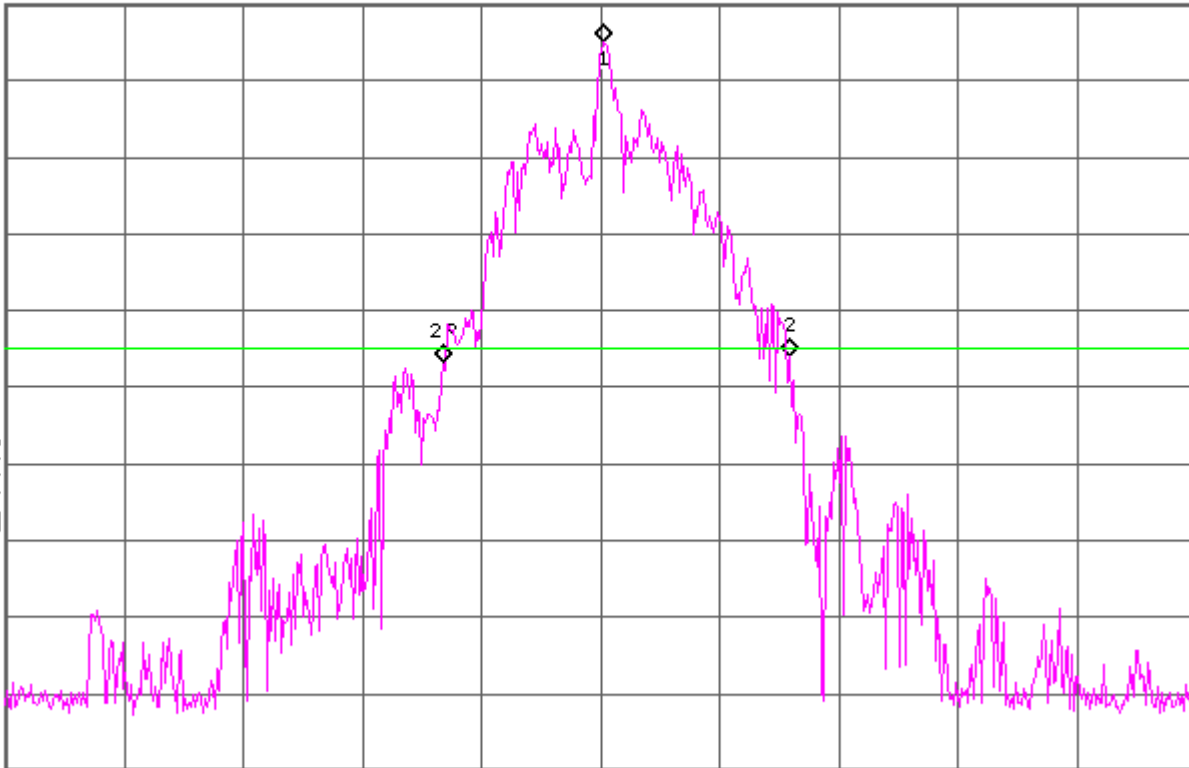
See following pages

Agilent 13:57:49 Feb 6, 2014

▲ Mkr2 1.160 MHz
0.41 dB

Ref -42 dBm

Atten 10 dB

#Samp
Log
5
dB/DI
-64.5
dBm
LgAvS1 S2
M3 FC
AA
£(f):
f>50k
Swp

Center 2.402 000 GHz

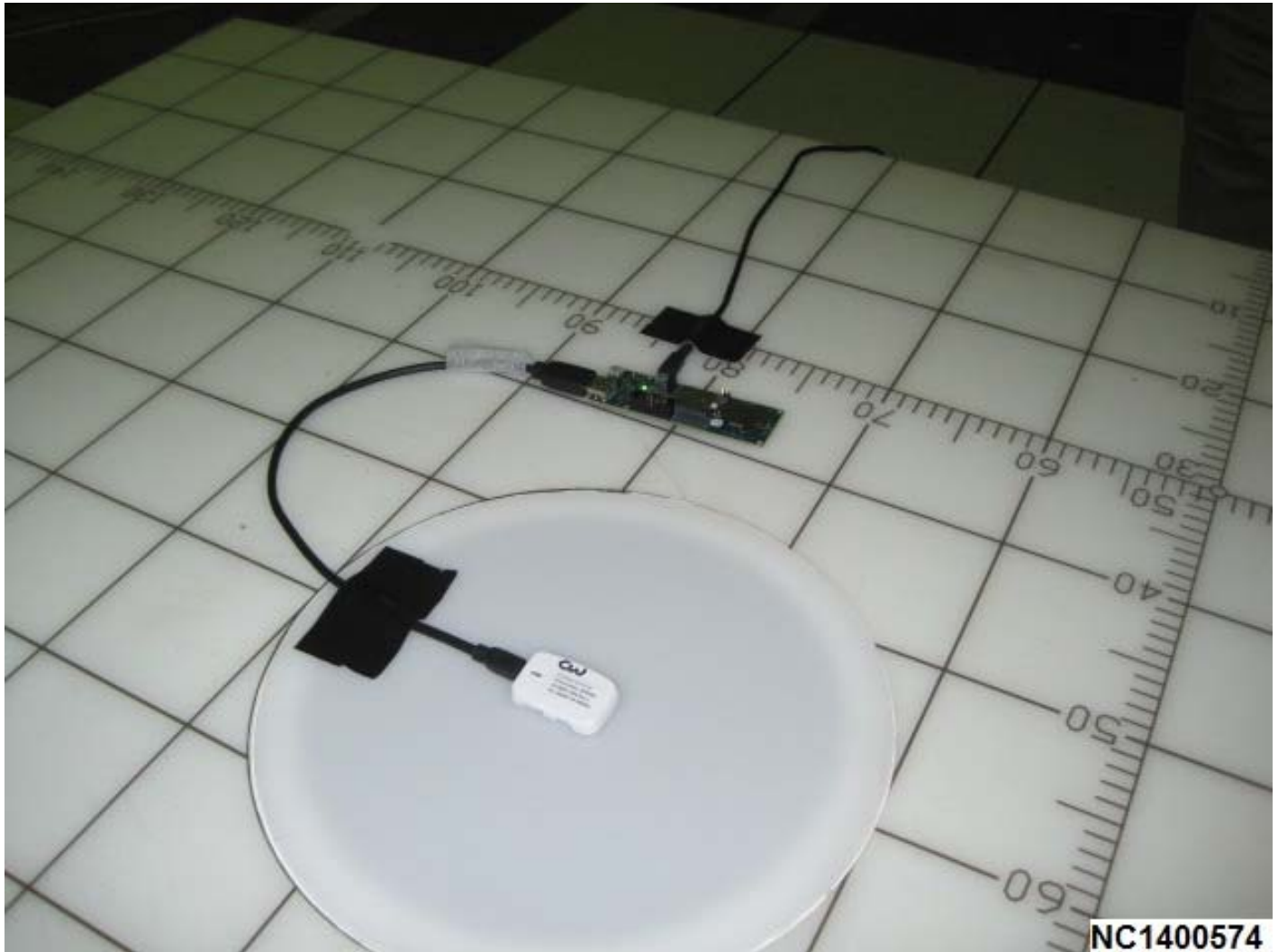
Span 4 MHz

#Res BW 39 kHz

VBW 120 kHz

Sweep 7.96 ms (601 pts)

Test-setup photo(s):
Radiated measurements



Equipment Under Test (EUT) Test Operation Mode:

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

- ☐ - Standby
- ☐ - Test program (H - Pattern)
- ☐ - Test program (color bar)
- ☐ - Test program (customer specific)
- ☐ - Practice operation
- ☐ - Normal Operating Mode
- ☒ - Fundamental set on low, mid & high channels. Continuous on. Maximum power.

Configuration of the device under test:

- ☒ - See Constructional Data Form and Block Diagram in Appendix A
- ☐ - See Product Information Form in Appendix B

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

EUT Received Date:	04 February 2014
Condition of EUT:	Normal
Testing Start Date:	04 February 2014
Testing End Date:	10 February 2014

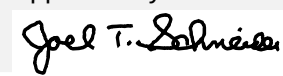
TÜV SÜD AMERICA INC

Tested by:



Greg Jakubowski
Senior EMC Technician

Approved by:



Joel T Schneider
Senior EMC Engineer

Appendix A

Constructional Data Form



Appendix B

Measurement Protocol



MEASUREMENT PROTOCOL

GENERAL INFORMATION

Test Methodology

Emission testing is performed according to the procedures in ANSI C63.4-2009 and FCC D01 DTS Meas Guidance v03.

Measurement Uncertainty

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

Final measurement levels are determined by connecting the antenna port of the DUT to a spectrum analyzer input via coaxial adapters, high frequency coax, and attenuators as necessary. The loss created by the interconnect apparatus is offset by settings within the analyzer. Specific analyzer settings are determined by the procedures throughout this report.

Radiated Emissions

The spectrum analyzer uses a quasi-peak detector for frequencies up to and including 1 GHz. For measurements above 1 GHz, peak and average detectors are used. The bandwidths used are equal to or greater than 100 Hz from 9 kHz to 150 kHz, 9 kHz from 150 kHz to 30 MHz, 100 kHz from 30 MHz to 1000 MHz, and 1 MHz from 1 GHz to 40 GHz. Video bandwidths are at least three times greater than the IF bandwidth. Average measurements above 1 GHz are also achieved using a peak detector with 1 MHz RBW and 10 Hz VBW.

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. 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) (dB/m) (dB)	FINAL (dB μ V/m)	POL/HGT/AZ (m) (deg)	DELTA1
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.