TÜV SÜD America

# TEST RESULT SUMMARY

## FCC Part 15 Subpart C Section 15.247
## Industry Canada RSS-210 Issue 8
## Industry Canada RSS-Gen Issue 3

| | |
|---|---|
| MANUFACTURER | Vaddio<br>9433 Science Center Drive<br>New Hope MN  55428 |
| DESCRIPTION OF EQUIPMENT | 2.4GHz Wireless Audio transmitter and IR LED illuminator |
| NAME OF EQUIPMENT | AutoTrak 2.0 Belt Pack Unit |
| MODEL NUMBER(S) TESTED | 998-7231-000 (Transmitter) & 998-7232-000 (Medallion) |
| SERIAL NUMBER(S) TESTED | n/a |
| TEST REPORT NUMBER | WC1111130 |
| TEST DATE(S) | 9-12 December 2011 |

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, Sections 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"* and RSS-Gen Issue 3 *"General Requirements and Information for the Certification of Radiocommunication 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 February 2012 | Tested by: | Approved by: |
| Location: | Taylors Falls MN<br>USA | Greg S Jakubowski<br>EMC Test Engineer | Joel T Schneider<br>Senior EMC Engineer |

**Not Transferable**

# EMC TEST REPORT

| | | | |
|---|---|---|---|
| Test Report No. | **WC1111130** | Date of issue: | 06 February 2012 |

Product Description  2.4GHz Wireless Audio transmitter and IR LED illuminator

Product Name  AutoTrak 2.0 Belt Pack Unit

Model No(s) Tested  998-7231-000 (Transmitter) & 998-7232-000 (Medallion)

Serial No(s) Tested  n/a

Manufacturer  Vaddio

Address  9433 Science Center Drive

New Hope MN  55428

Test Result  ■ **Positive**  ☐ **Negative**

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**REVISION RECORD**

| REVISION | TOTAL NUMBER OF PAGES | DATE | DESCRIPTION |
|---|---|---|---|
|  | 44 | 06 February 2012 | Initial Release |
|  |  |  |  |

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**TEST REPORT CONTENTS** **Page(s)**

**EMC TEST REGULATIONS:**

**The tests were performed according to the following regulations:**

- FCC Part 15 Subpart C Section 15.247 Paragraphs (a)(2), (b)(3), (d), (e)
- Industry Canada RSS-210 Issue 8, Sections  A8.2(a), A8.4(4), A8.5, A8.2(b), A9.2, A9.3
- Industry Canada RSS-Gen Issue 3 Sections 4.6.1

**ENVIRONMENTAL CONDITIONS IN THE LAB**

|  | Actual |
| --- | --- |
| Temperature: | : 15-18°C |
| Atmospheric pressure | : 100 kPa |
| Relative Humidity | : 18-25% |

**POWER SUPPLY UTILIZED**

| Power supply system | : 3.7 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.

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## Emission Bandwidth (EBW)
**FCC 15.247(a)(2), IC RSS-210 A8.2(a)**

**Test summary**
The requirements are:   ■ - MET   □ - NOT MET
Testing was performed in accordance with the test procedure of FCC KDB Publication 558074
The minimum 6 dB EBW = 1.854 MHz

**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 Tech Area, conducted measurement

**Test equipment**

| TUV ID | Model | Manufacturer | Description | Serial | Cal Due |
|---|---|---|---|---|---|
| WRLE10435 | E4440A | Agilent | Spectrum Analyzer | MY44304483 | 22-Jul-12 |

**Test limit**
500 kHz minimum

**Test data**
See following pages

6 dB Bandwidth
Low channel

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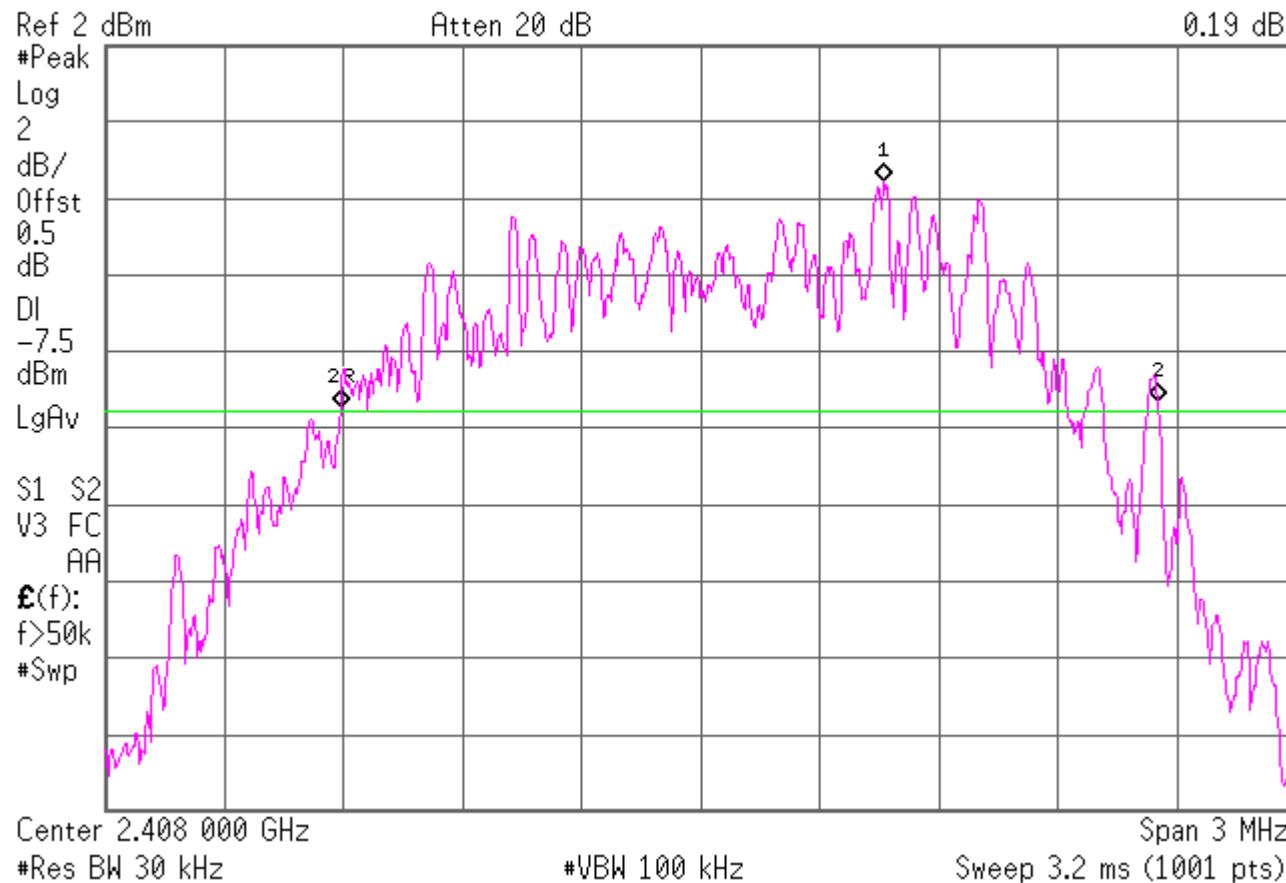
6 dB Bandwidth
Mid channel

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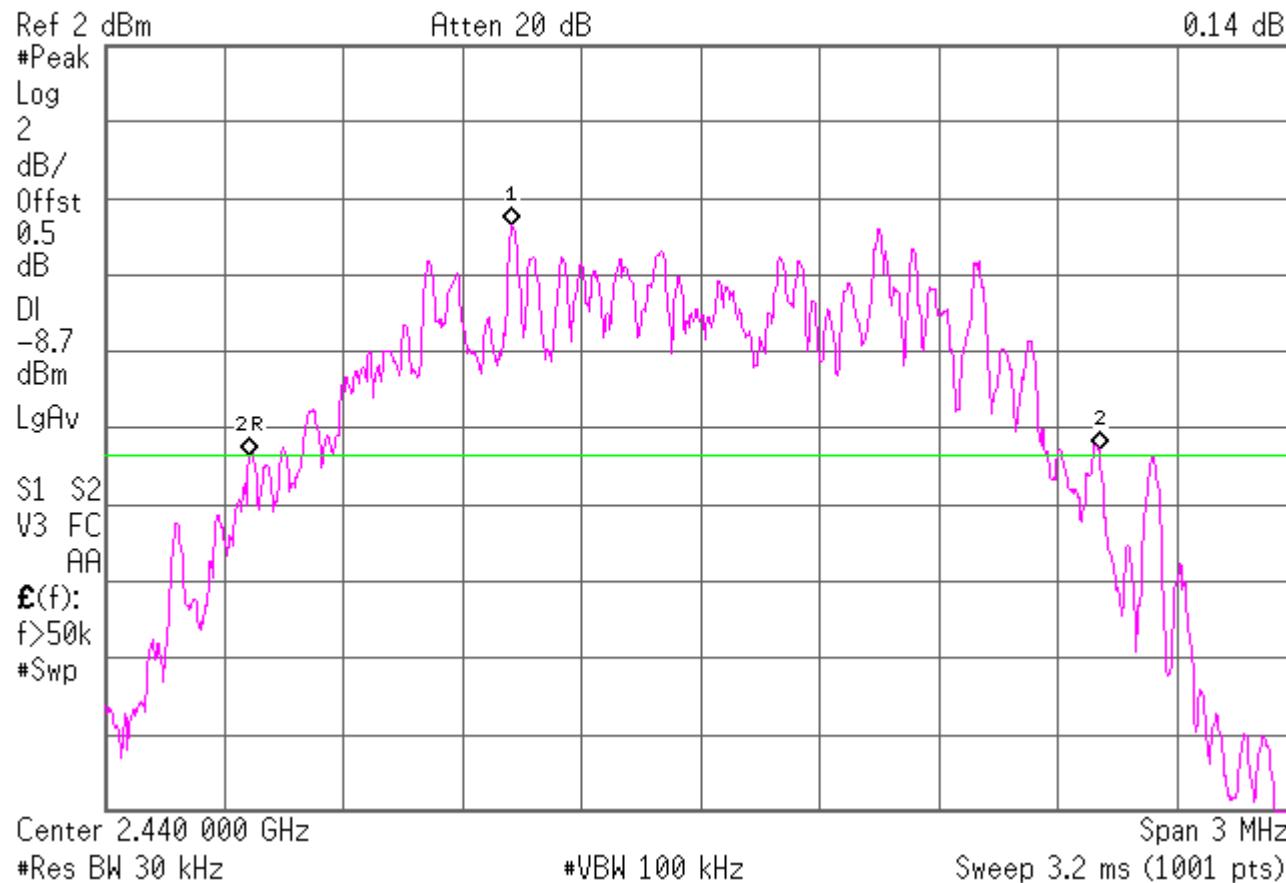
6 dB Bandwidth
High channel
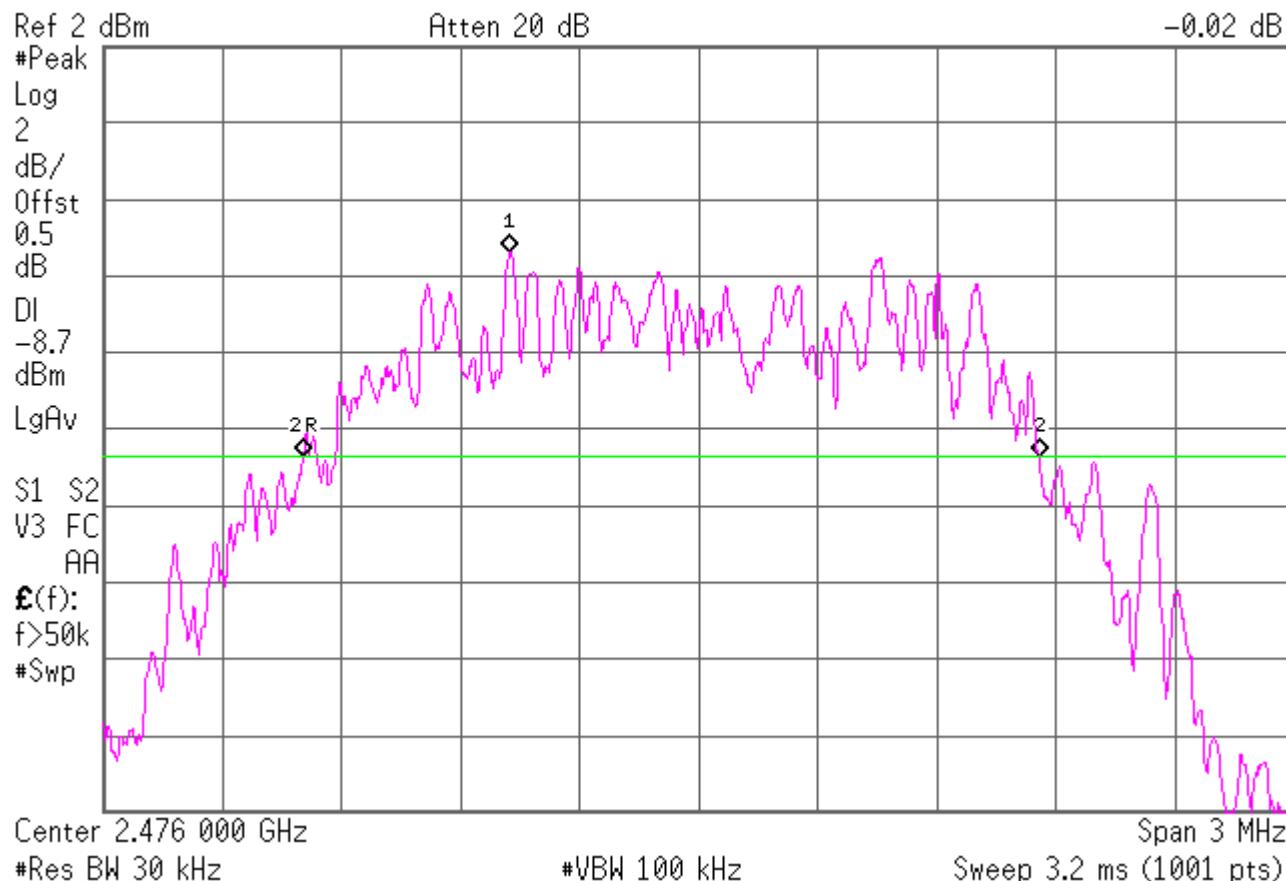
## Fundamental Emission Output Power
**FCC 15.247(b)(3), IC RSS-210 A8.4(4)**

**Test summary**
The requirements are:　■ - MET　□ - NOT MET
Testing was performed in accordance with the test procedure of FCC KDB Publication 558074 measurement procedure PK1
Conducted measurements were made at the antenna port
Device power was adjusted to -5 dB setting
The maximum power output measured is 6.23 dBm or 4.21 mW
The antenna gain is 0 dBi.

**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 Tech Area, conducted measurement

**Test equipment**

| TUV ID | Model | Manufacturer | Description | Serial | Cal Due |
|--------|-------|--------------|-------------|--------|---------|
| WRLE10435 | E4440A | Agilent | Spectrum Analyzer | MY44304483 | 22-Jul-12 |

**Test limit**
1 watt

**Test Data**
See following pages

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## Maximum Peak Conducted Output Power Level
### Low channel

```
※ Agilent 08:32:46 Dec 12, 2011
                                              Mkr1 2.409 251 GHz
Ref 10 dBm            Atten 20 dB                    6.23 dBm
#Peak
Log
2
dB/                                                    1
Offst                                                  ◇
0.5
dB


LgAv

S1 S2
V3 FC
   AA
£(f):
FTun
#Swp



Center 2.408 000 GHz                            Span 3 MHz
#Res BW 3 MHz          #VBW 3 MHz        Sweep 1 ms (1001 pts)
```
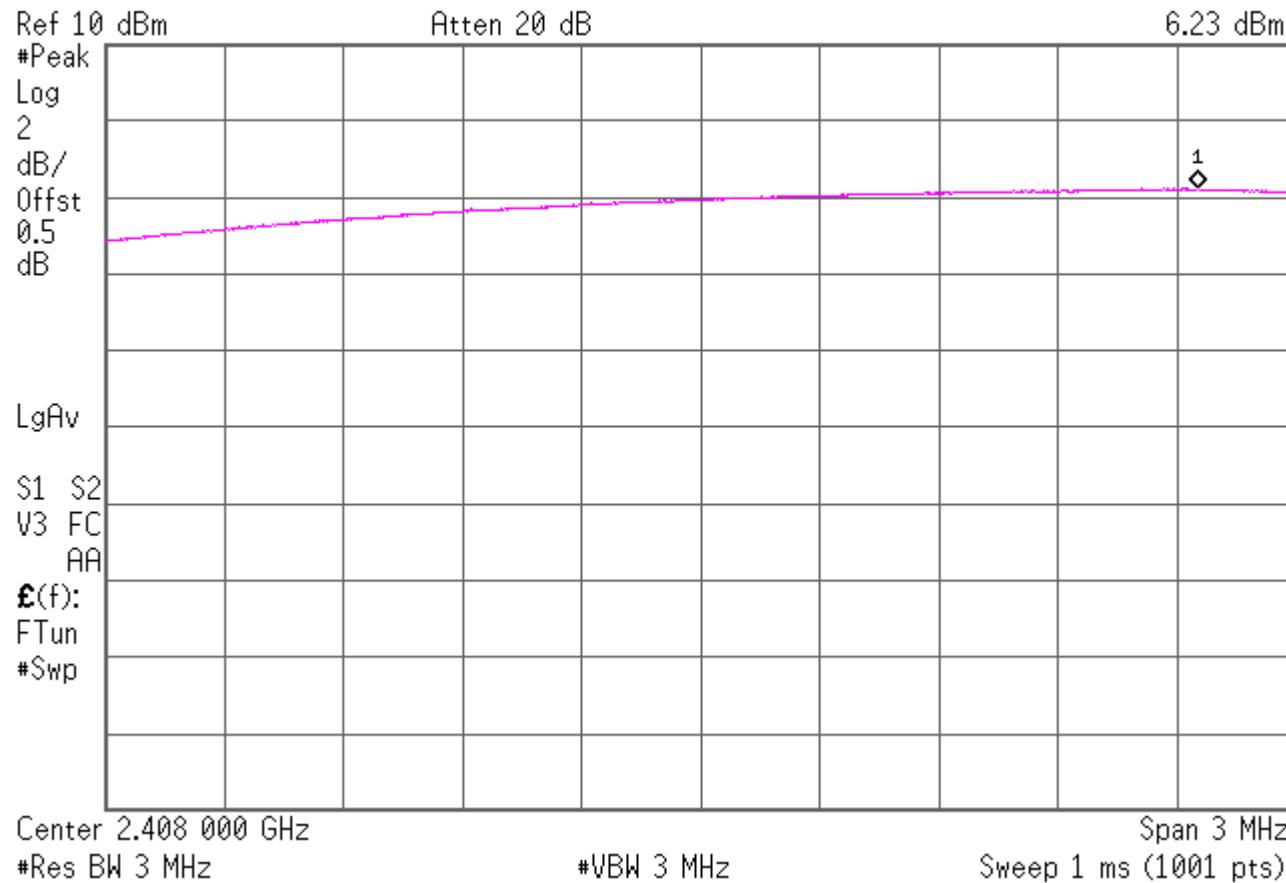
## Maximum Peak Conducted Output Power Level
### Mid channel



✷ **Agilent** 08:37:26 Dec 12, 2011

Mkr1  2.438 923 GHz

Ref 10 dBm              Atten 20 dB                              5.54 dBm

#Peak
Log
2
dB/
Offst
0.5
dB

LgAv

S1  S2
V3  FC
    AA
£(f):
FTun
#Swp

Center 2.440 000 GHz                                    Span 3 MHz
#Res BW 3 MHz              #VBW 3 MHz          Sweep 1 ms (1001 pts)
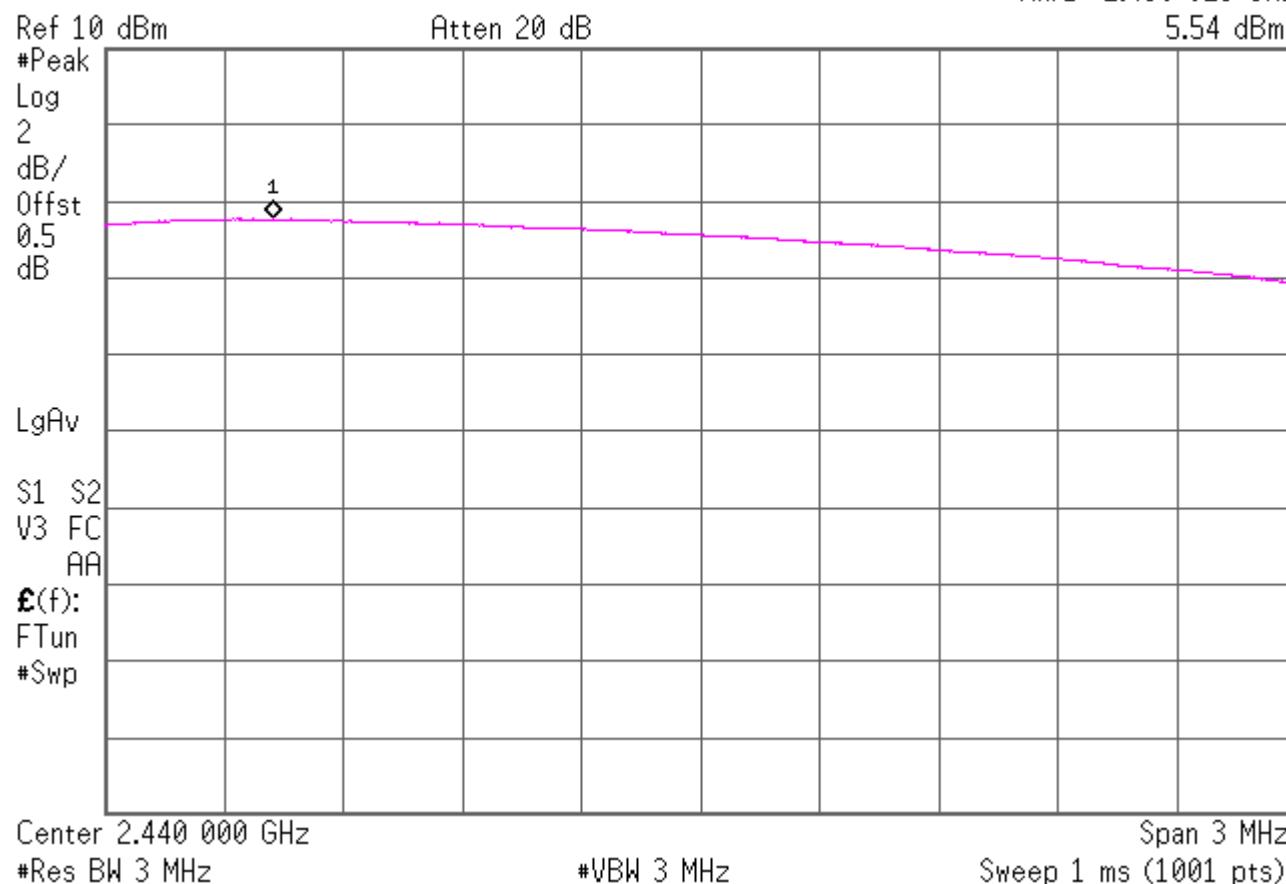
## Maximum Peak Conducted Output Power Level
### High channel



✳ **Agilent** 08:40:24  Dec 12, 2011

Mkr1  2.474 815 GHz
4.93 dBm

Ref 10 dBm                Atten 20 dB

#Peak
Log
2
dB/
Offst
0.5
dB

LgAv

S1  S2
V3  FC
     AA
£(f):
FTun
#Swp

Center 2.476 000 GHz                Span 3 MHz
#Res BW 3 MHz        #VBW 3 MHz        Sweep 1 ms (1001 pts)
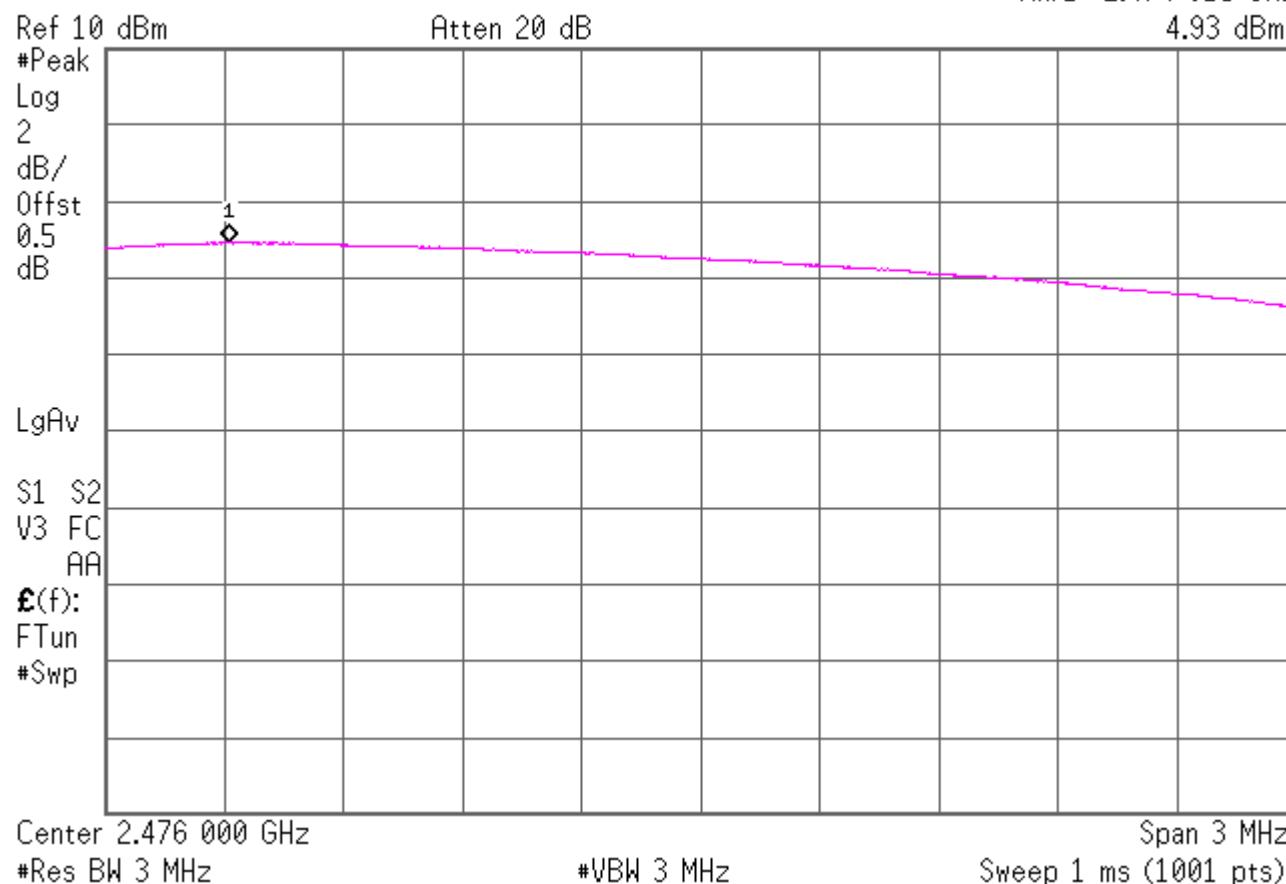
## Power spectral density
**FCC 15.247(e), IC RSS-210 A8.2(b)**

**Test summary**
The requirements are:   ■ - MET   □ - NOT MET
Testing was performed in accordance with the test procedure of FCC KDB Publication 558074 – measurement procedure PKPSD
Maximum power spectral density is -12.58 dBm / 3 kHz

**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 Tech Area, conducted measurement

**Test equipment**

| TUV ID | Model | Manufacturer | Description | Serial | Cal Due |
|--------|-------|--------------|-------------|--------|---------|
| WRLE10435 | E4440A | Agilent | Spectrum Analyzer | MY44304483 | 22-Jul-12 |

**Test limit**
No greater than 8 dBm in any 3 kHz band

**Test data**
See following pages.

## Power spectral density
## Low channel



```
✳ Agilent 13:18:08  Dec 12, 2011
Offset=0.5dB cable - 15.2dB BWCF = -14.7dB          Mkr1  2.408 230 GHz
Ref -4.7 dBm                #Atten 20 dB                      -12.58 dBm
#Peak
Log
5
dB/
Offst
-14.7
dB

LgAv

S1  S2
V3  FC
     AA
£(f):
f>50k
#Swp

Center 2.408 000 GHz                                     Span 2.5 MHz
#Res BW 100 kHz            #VBW 300 kHz        Sweep 1 ms (1001 pts)
```

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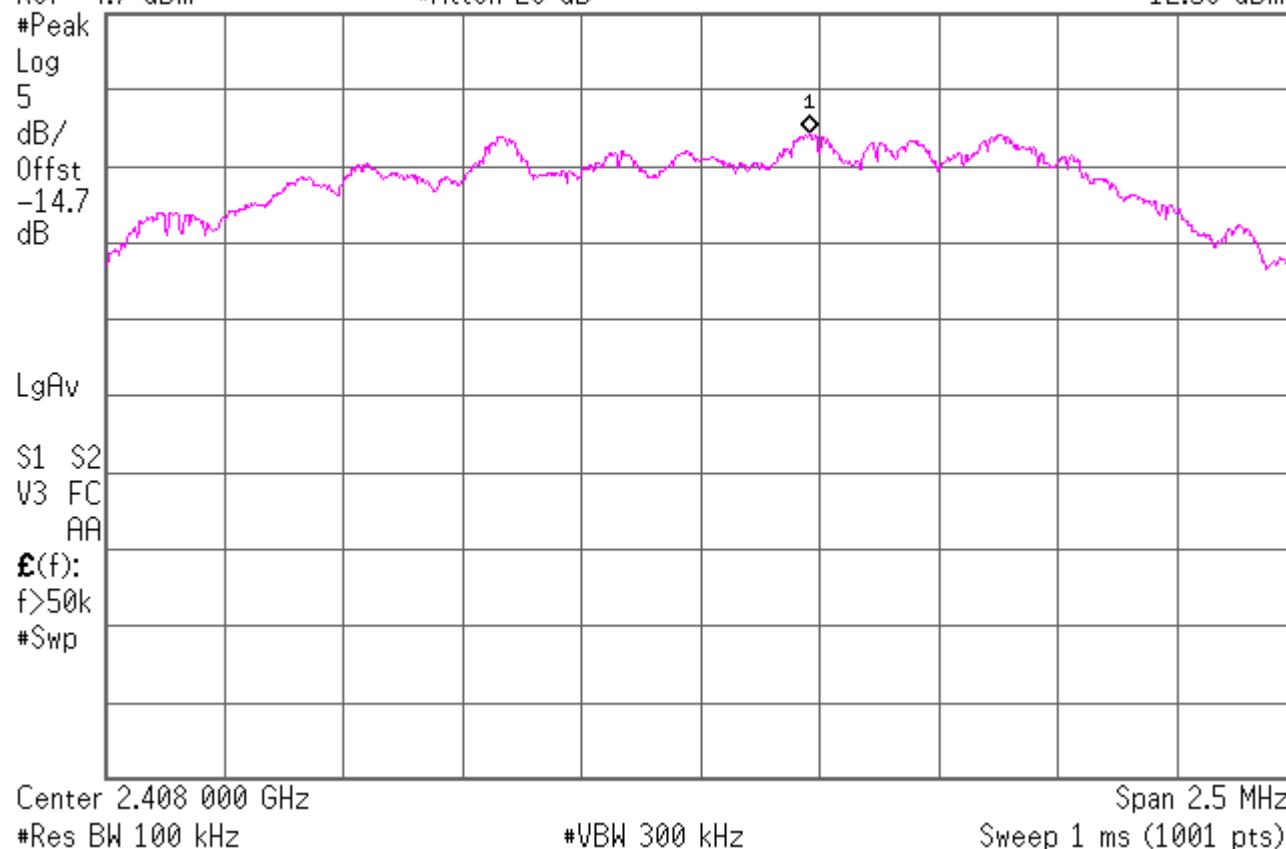
Power spectral density
Mid channel



Agilent 13:18:48 Dec 12, 2011

Offset=0.5dB cable − 15.2dB BWCF = −14.7dB          Mkr1  2.439 578 GHz

Ref −4.7 dBm                    #Atten 20 dB                              −13.13 dBm

#Peak
Log
5
dB/
Offst
−14.7
dB

LgAv

S1  S2
V3  FC
    AA
£(f):
f>50k
#Swp

Center 2.440 000 GHz                                    Span 2.5 MHz
#Res BW 100 kHz                    #VBW 300 kHz                    Sweep 1 ms (1001 pts)

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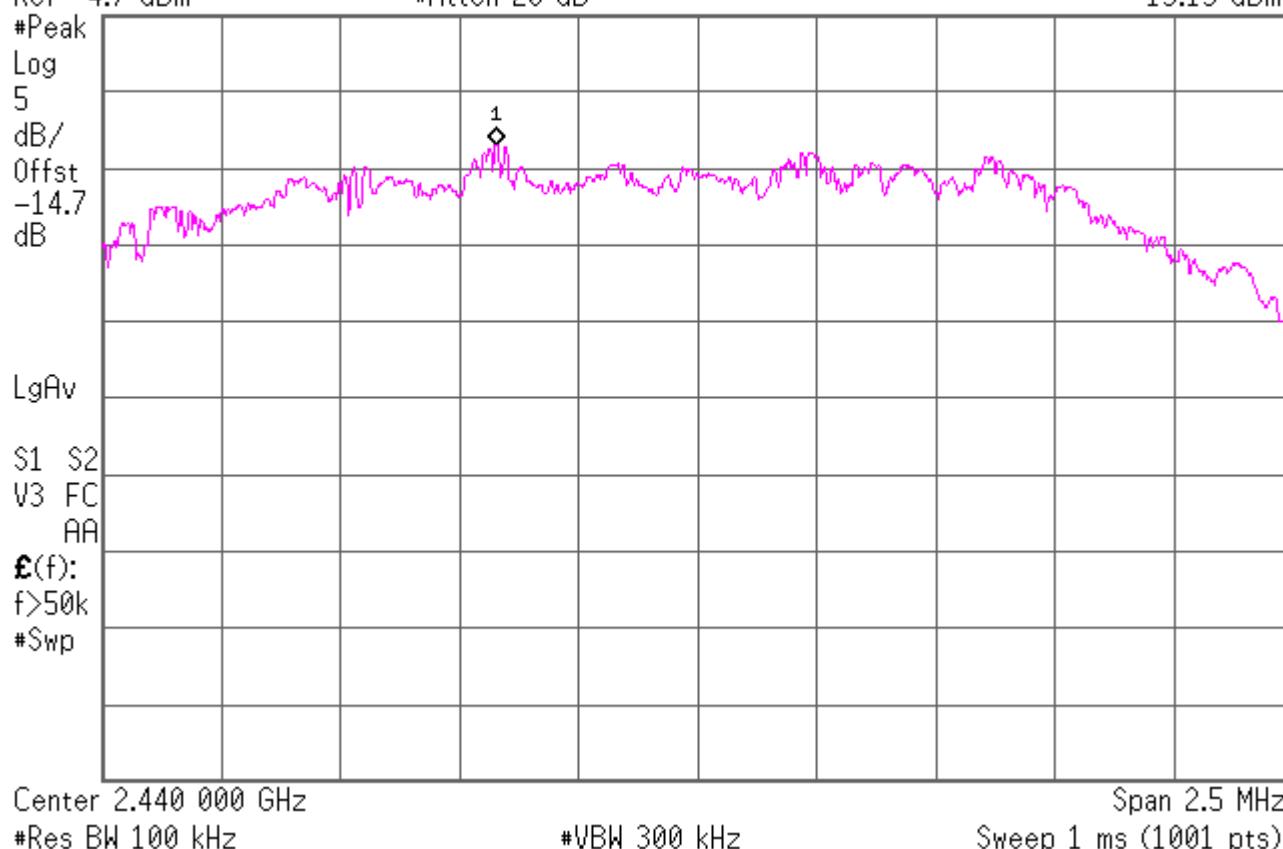
Power spectral density
High channel

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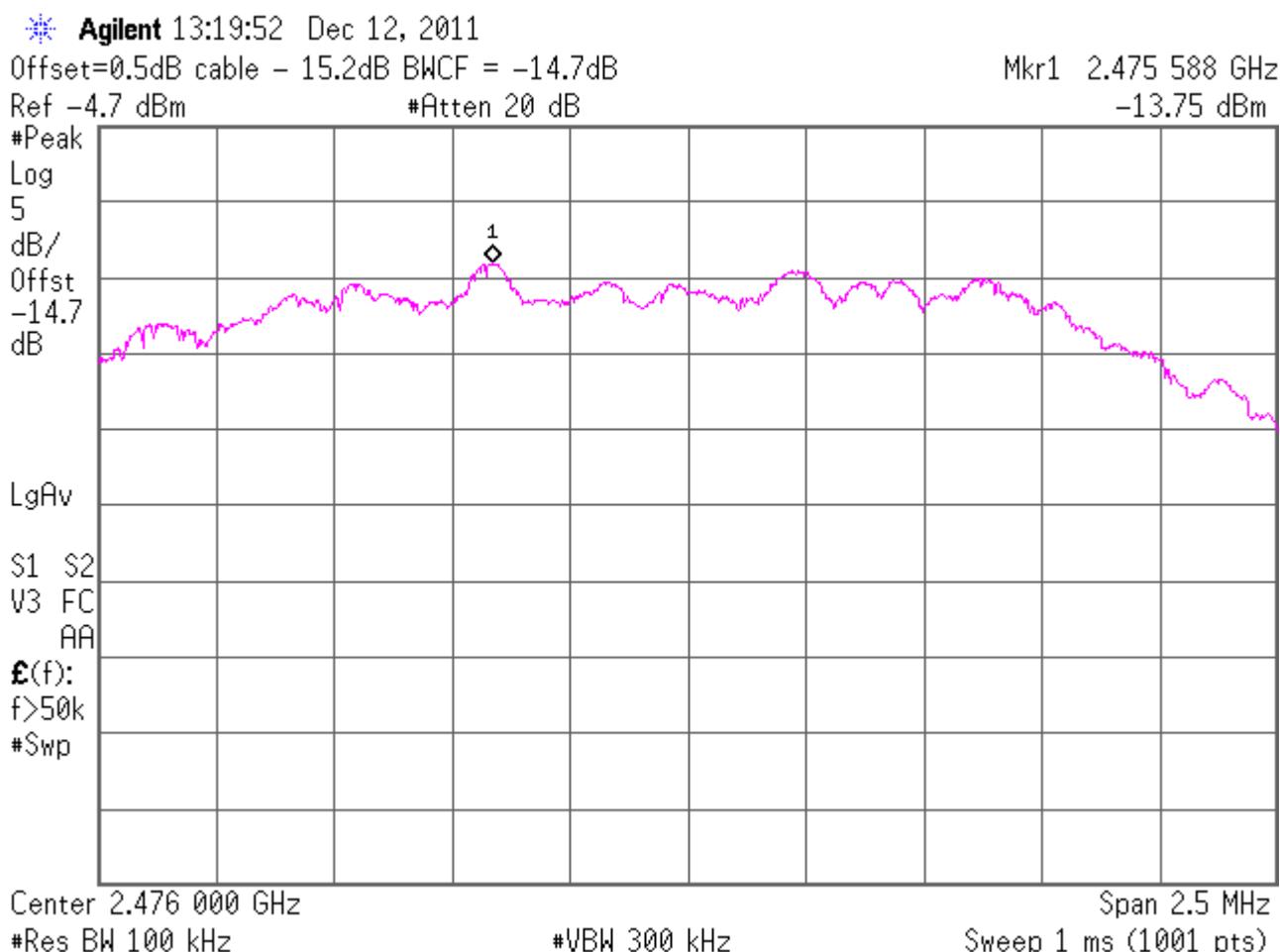
## Maximum Unwanted Emission Levels
**FCC 15.247(d), IC RSS-210 A8.5**

**Test summary**

The requirements are:  ■ - MET  □ - NOT MET
Testing was performed in accordance with FCC KDB Publication 558074

Maximum unwanted conducted emission is -35 dBc at the 2$^{nd}$ harmonic
Maximum unwanted conducted emission into a non-restricted frequency band is -52.79 dBc at 7.22 GHz
Maximum unwanted average radiated emission into a restricted frequency band above 1 GHz is 52.14 dBμV/m (405 μV/m) at 3 meters with average detector at 4.951 GHz.
Maximum unwanted peak radiated emission into a restricted frequency band above 1 GHz is 61.11 dBμV/m (1136 μV/m) at 3 meters with peak detector at 4.951 GHz.
Average measurements above 1 GHz are made using a peak detector with 1 MHz RBW and 10 Hz VBW.
Maximum unwanted QP radiated emission into a restricted frequency band below 1 GHz is 32.8 dBμV/m (43.7 μV/m) at 3 meters with QP detector at 73.719 MHz

**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 Tech Area, conducted measurement

**Test distance – radiated emissions**

■ - 0.3 meters
■ - 3 meters

**Test equipment**

| TUV ID | Model | Manufacturer | Description | Serial | Cal Due |
|--------|-------|--------------|-------------|--------|---------|
| NBLE03196 | 8566B | Hewlett-Packard | Spectrum Analyzer | 2240A01856 | 04-Jan-12 |
| NBLE03195 | 85662A | Hewlett-Packard | Analyzer Display | 2648A13518 | 04-Jan-12 |
| WRLE02680 | 85650A | Hewlett-Packard | Quasi-Peak Adapter | 2043A00343 | 06-Jul-12 |
| WRLE10527 | SL18B4020 | Phase One Microwave | Preamplifier 1 – 18 GHz | 0001 | Code B 05-Jan-13 |
| WRLE03229 | 3115 | EMCO | Ridge Guide Antenna | 2483 | 04-Aug-12 |
| WRLE03997 | EWT-14-0066 | EWT | 2.4 GHz Notch filter | E2 | Code B 12-May-12 |
| WRLE10435 | E4440A | Agilent | Spectrum Analyzer | MY44304483 | 22-Jul-12 |
| WRLE03978 | SL26-3010 | Phase One Microwave | Amplifier 18-26.5 GHz | 0005 | Code B 11-Aug-12 |
| WRLE06717 | 3116 | EMCO | Ridge Guide Ant 18-40 GHz | 2005 | 21-Jun-12 |
| WRLE02003 | F550B1 | Acronetics | 4 – 8 GHz Bandpass Filter | 010 | Code B 30-Nov-12 |
| WRLE03933 | F551B-1 | Acronetics | 8 – 12 GHz Bandpass Filter | 010 | Code B 30-Nov-12 |
| WRLE03934 | F549B-1 | Acronetics | 2 – 4 GHz Bandpass Filter | 010 | Code B 30-Nov-12 |
| WRLE03935 | F548B-1 | Acronetics | 1 – 2 GHz Bandpass Filter | 010 | Code B 30-Nov-12 |
| WRLE03995 | EM-6917B | Electro-Metrics | Biconicalog Periodic | 151 | 06-May-12 |
| WRLE02670 | 8447D | Hewlett-Packard | Preamplifier | 2443A03954 | Code B 17-Jan-12 |

Cal Code B = Calibration verification performed internally.

**Test limits;**

Conducted out of band emissions -20 dBc

Radiated emissions into restricted bands,

| Frequncy (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 |
| Above 960 | 500, QP | 54.0 |
| > 1000 | 500, AV | 54.0 |

| | 5000, PK | 74.0 |
|---|---|---|

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**Test data**

Unwanted conducted emissions into non-restricted frequency bands

Reference Level
Low channel
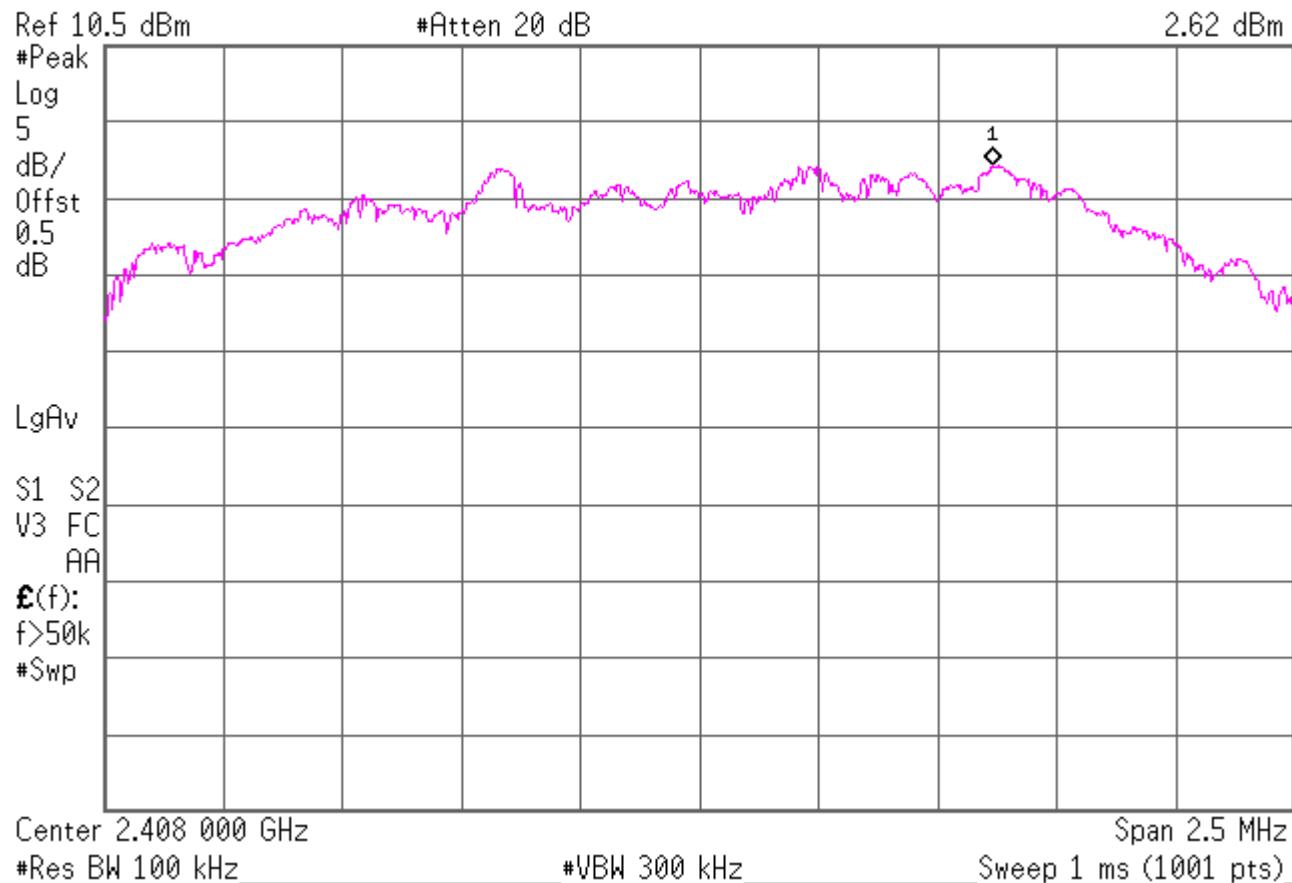
## Unwanted Emissions
## Low channel

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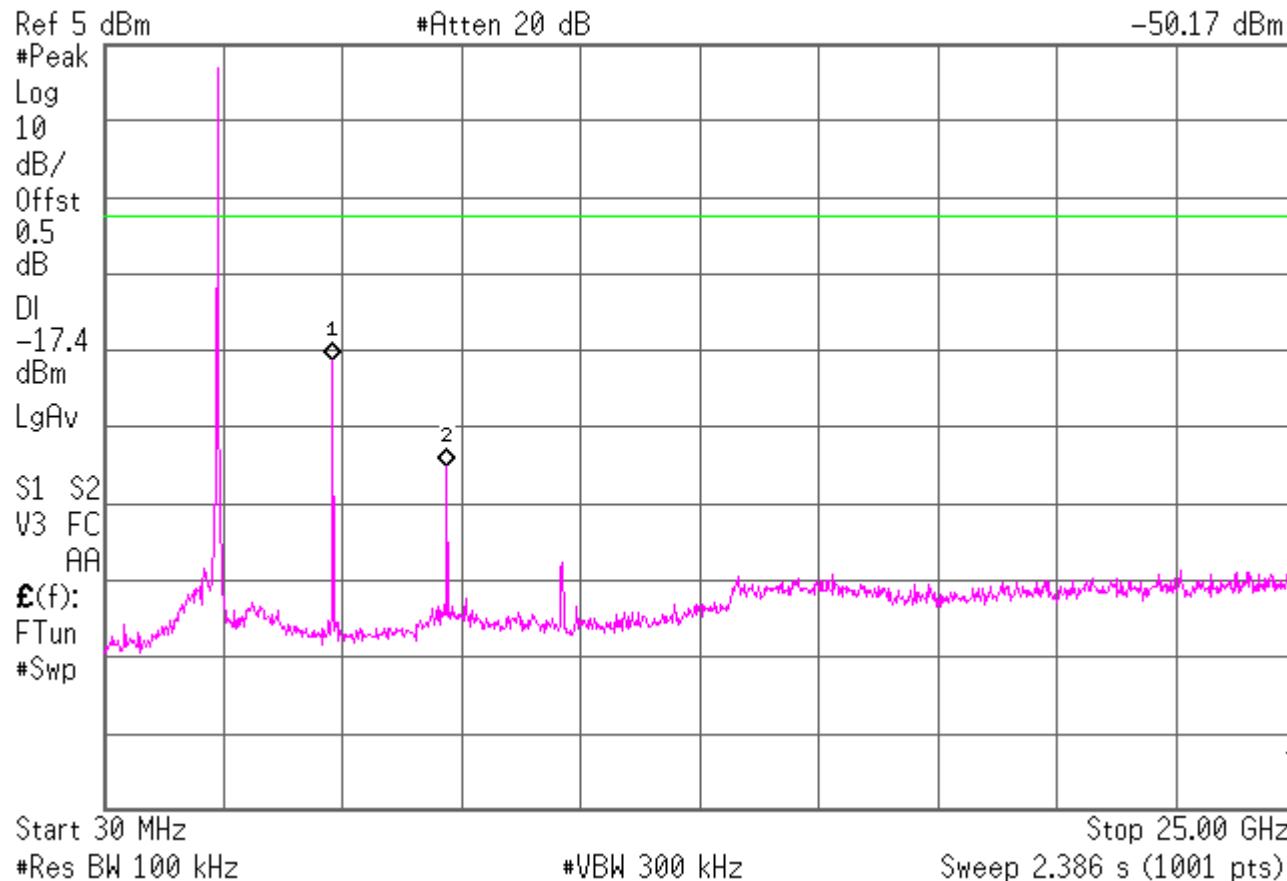
Reference Level
Mid channel

✳ **Agilent** 13:30:46  Dec 12, 2011

Mkr1  2.439 588 GHz
2.04 dBm

Ref 10.5 dBm                    #Atten 20 dB

#Peak
Log
5
dB/
Offst
0.5
dB

LgAv

S1  S2
V3  FC
      AA
£(f):
f>50k
#Swp

Center 2.440 000 GHz                              Span 2.5 MHz
#Res BW 100 kHz_____#VBW 300 kHz_____Sweep 1 ms (1001 pts)_
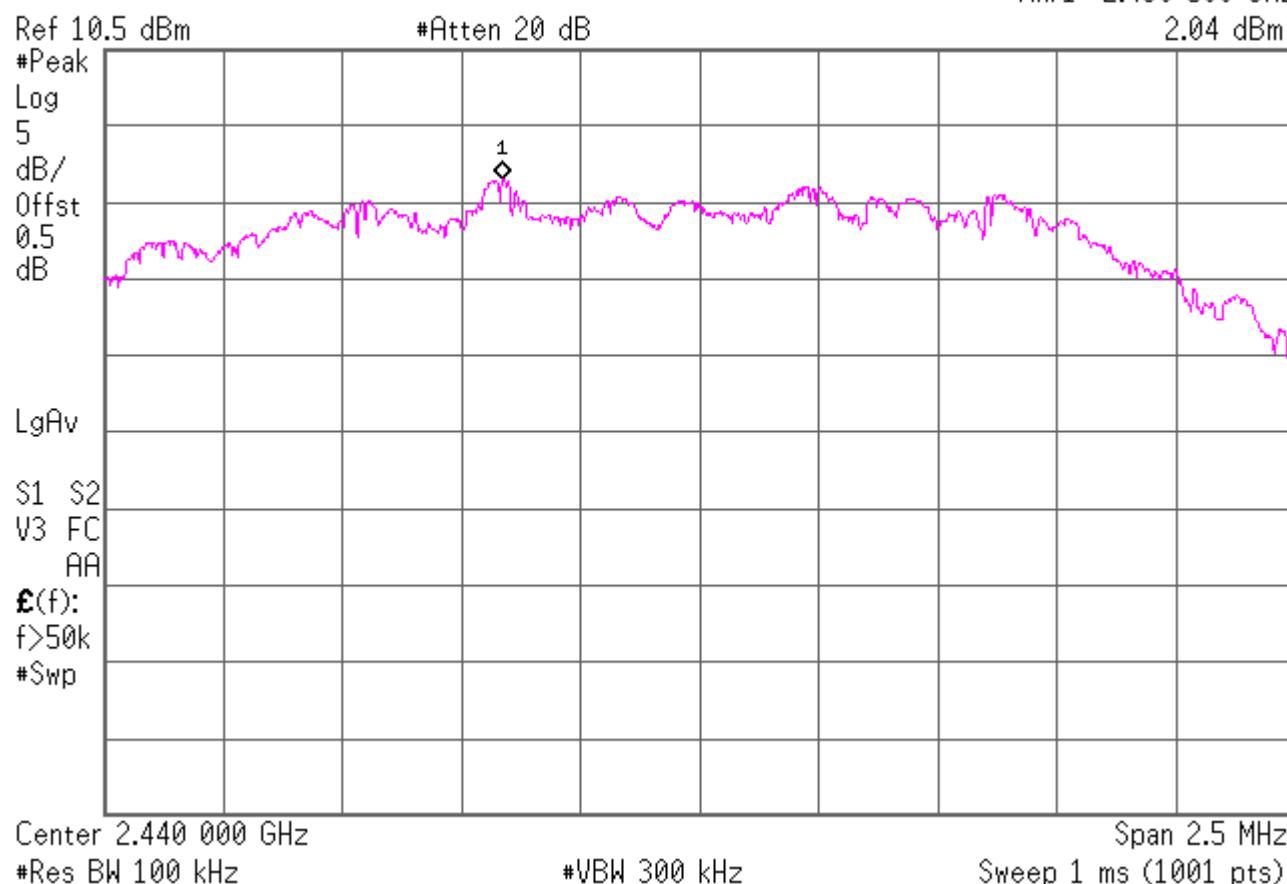
Unwanted Emissions
Mid channel

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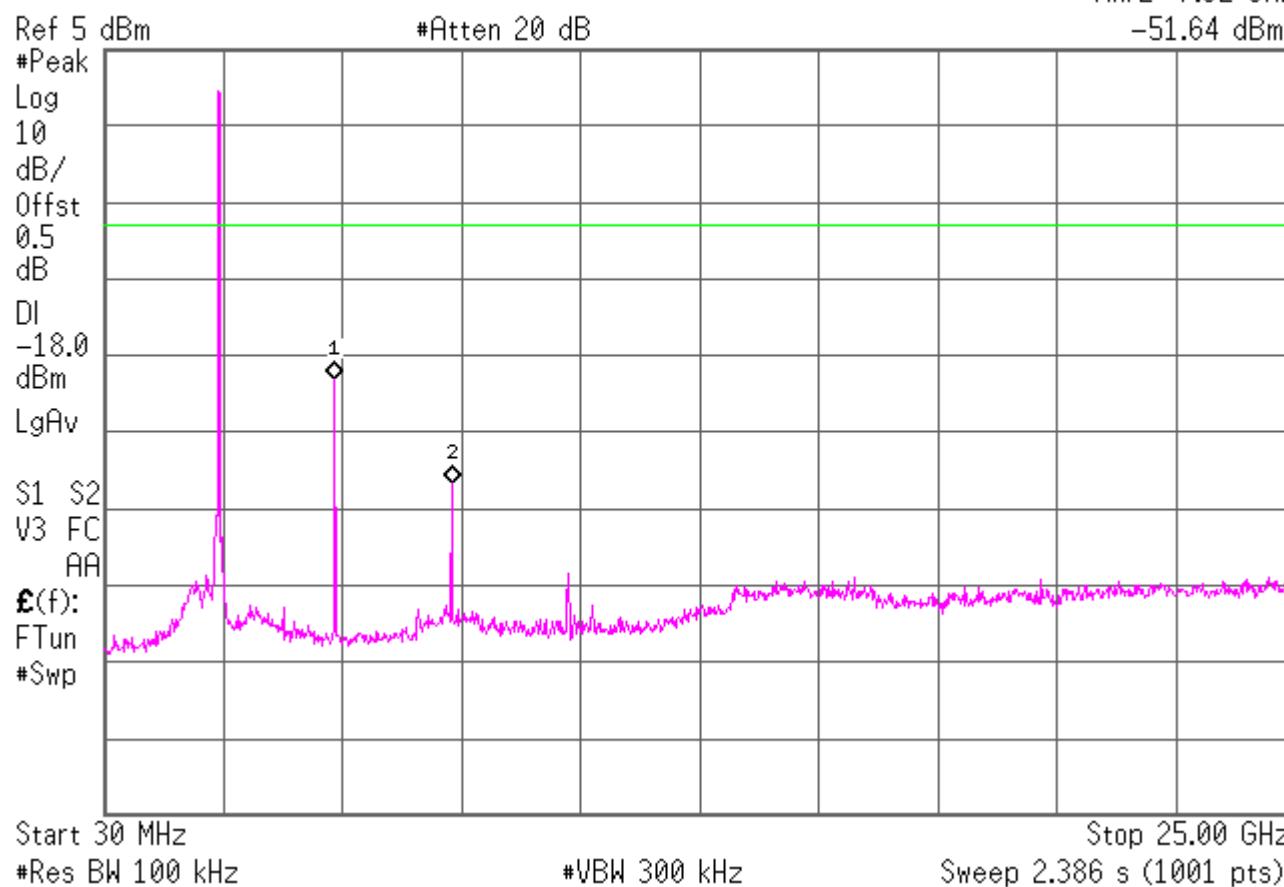
## Reference Level
## High channel

✳ **Agilent** 13:30:10  Dec 12, 2011
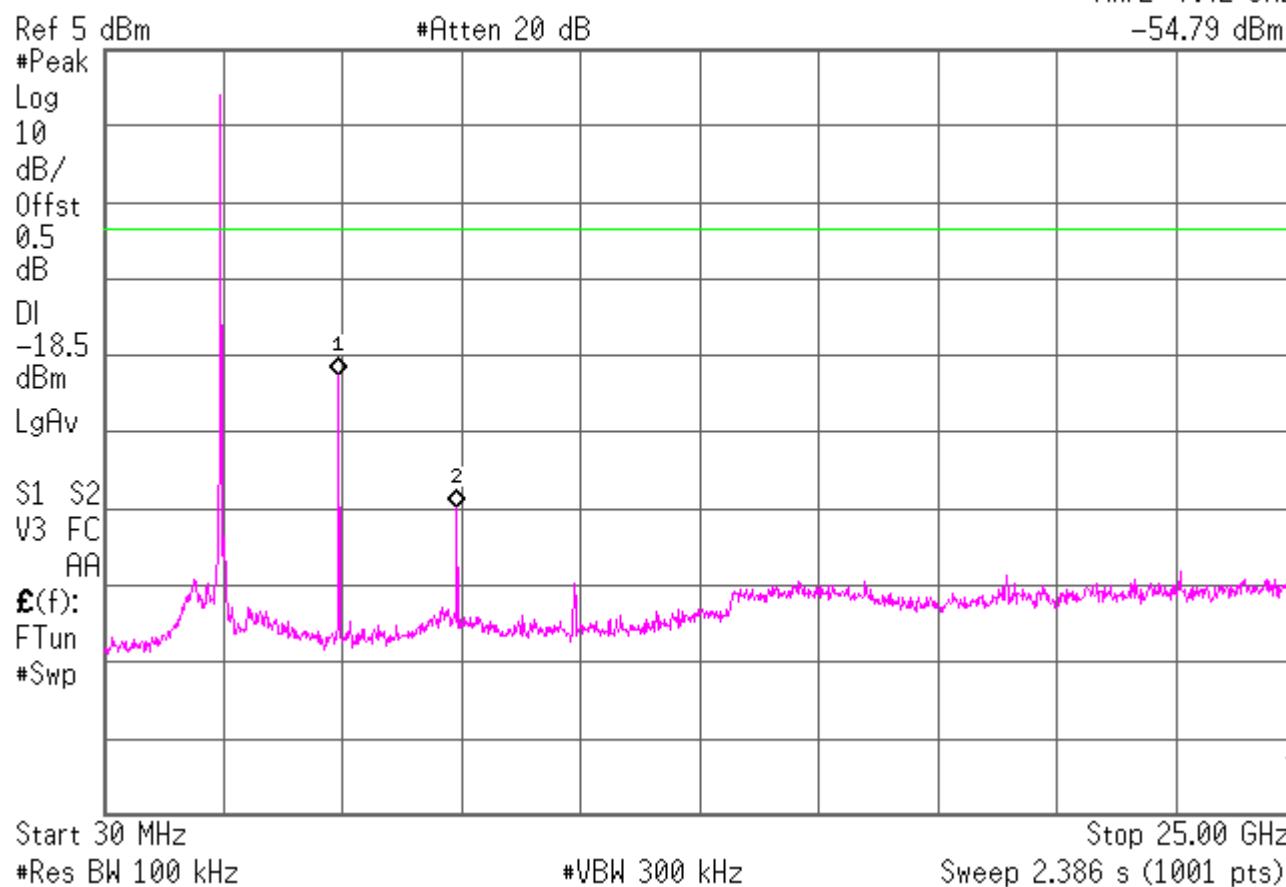
Mkr1  2.475 585 GHz
1.45 dBm

Ref 10.5 dBm                    #Atten 20 dB

#Peak
Log
5
dB/
Offst
0.5
dB

LgAv

S1  S2
V3  FC
    AA
£(f):
f>50k
#Swp

Center 2.476 000 GHz                          Span 2.5 MHz
#Res BW 100 kHz_____#VBW 300 kHz_____Sweep 1 ms (1001 pts)_

Unwanted Emissions
High channel

**Low channel conducted band-edge measurement**



| Marker | Trace | Type | X Axis | Amplitude |
|--------|-------|------|--------------|-------------|
| 1 | (3) | Freq | 2.408 20 GHz | 2.89 dBm |
| 2 | (3) | Freq | 2.405 85 GHz | -18.61 dBm |
| 3 | (3) | Freq | 2.400 00 GHz | -54.55 dBm |
| 4 | (3) | Freq | 2.390 00 GHz | -58.69 dBm |

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## High channel conducted band-edge measurement
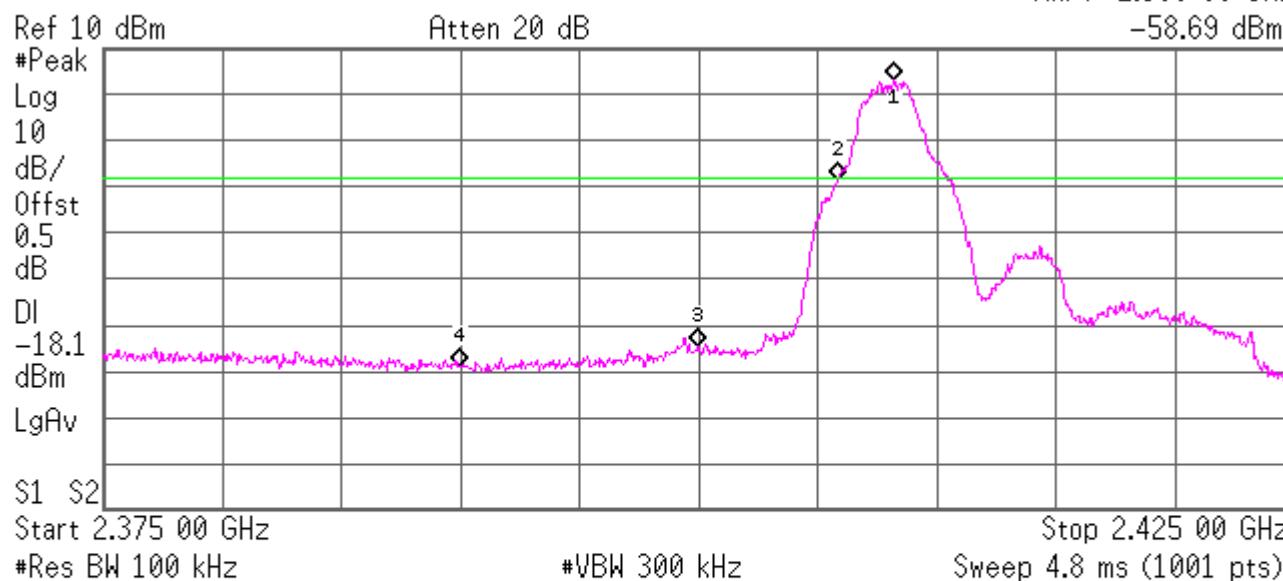


| Marker | Trace | Type | X Axis | Amplitude |
|--------|-------|------|--------------|-------------|
| 1 | (3) | Freq | 2.476 30 GHz | 0.77 dBm |
| 2 | (3) | Freq | 2.477 90 GHz | -17.95 dBm |
| 3 | (3) | Freq | 2.483 50 GHz | -59.51 dBm |
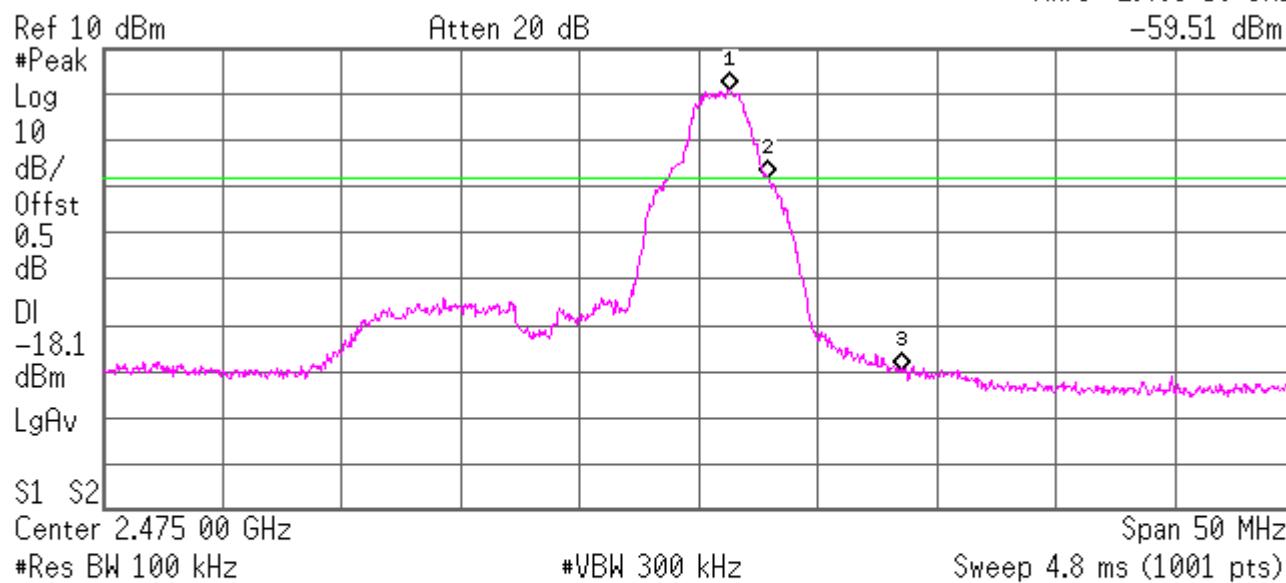
Unwanted radiated emissions into restricted frequency bands

## 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 15.209 <1GHz 3m |
|---|---|---|---|---|---|
| 73.719 MHz | 51.66 Qp | 0.83 / 8.13 / 27.82 / 0.0 | 32.8 | V / 1.00 / 178 | -7.2 |
| 76.808 MHz | 38.8 Qp | 0.84 / 7.57 / 27.78 / 0.0 | 19.44 | V / 1.00 / 180 | -20.56 |

## Measurement summary for limit1: FCC 15.247 >1GHz 3m av (Av)

| FREQ | LEVEL (dBuV) | CABLE / ANT / PREAMP / ATTEN (dB) | FINAL (dBuV / m) | POL / HGT / AZ (m)(DEG) | DELTA1 FCC 15.247 >1GHz 3m av |
|---|---|---|---|---|---|
| 4.951 GHz | 54.53 Av | 7.08 / 33.27 / 43.22 / 0.47 | 52.14 | V / 1.05 / 0 | -1.86 |
| 4.817 GHz | 55.01 Av | 6.98 / 33.03 / 43.33 / 0.44 | 52.13 | V / 1.07 / 355 | -1.87 |
| 4.88 GHz | 54.58 Av | 7.03 / 33.14 / 43.25 / 0.45 | 51.95 | V / 1.07 / 350 | -2.05 |
| 4.874 GHz | 51.01 Av | 7.02 / 33.13 / 43.26 / 0.45 | 48.36 | H / 1.22 / 345 | -5.64 |

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

| FREQ | LEVEL (dBuV) | CABLE / ANT / PREAMP / ATTEN (dB) | FINAL (dBuV / m) | POL / HGT / AZ (m)(DEG) | DELTA2 FCC 15.247 >1GHz 3m pk |
|---|---|---|---|---|---|
| 4.951 GHz | 63.5 Pk | 7.08 / 33.27 / 43.22 / 0.47 | 61.11 | V / 1.05 / 0 | -12.89 |
| 4.88 GHz | 63.4 Pk | 7.03 / 33.14 / 43.25 / 0.45 | 60.77 | V / 1.07 / 350 | -13.23 |
| 4.817 GHz | 62.95 Pk | 6.98 / 33.03 / 43.33 / 0.44 | 60.07 | V / 1.07 / 355 | -13.93 |
| 2.44 GHz | 117.55 Pk | 4.88 / 28.31 / 44.06 / 0.0 | 106.68 | H / 1.02 / 344 | -18.52 |
| 4.874 GHz | 54.0 Pk | 7.02 / 33.13 / 43.26 / 0.45 | 51.35 | H / 1.22 / 345 | -22.65 |

| |
|---|
| No other significant spurious/harmonic emissions detected from 1 to 18 GHz |
| Low, mid, or high channels |
| |
| Begin scan 18 - 25 GHz, 0.3m distance, all sides, vertical and horizontal, low, mid, & high channels |
| No significant emissions detected |

## Radiated band edge
### Peak detector trace vs. peak and average limits

#### High channel
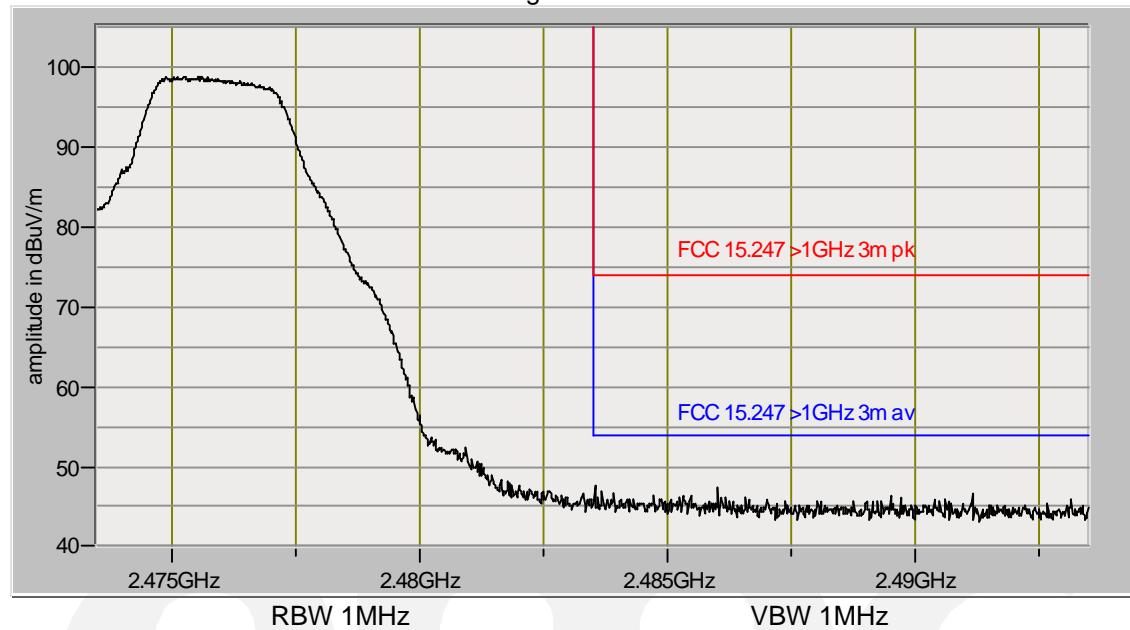


#### Low channel
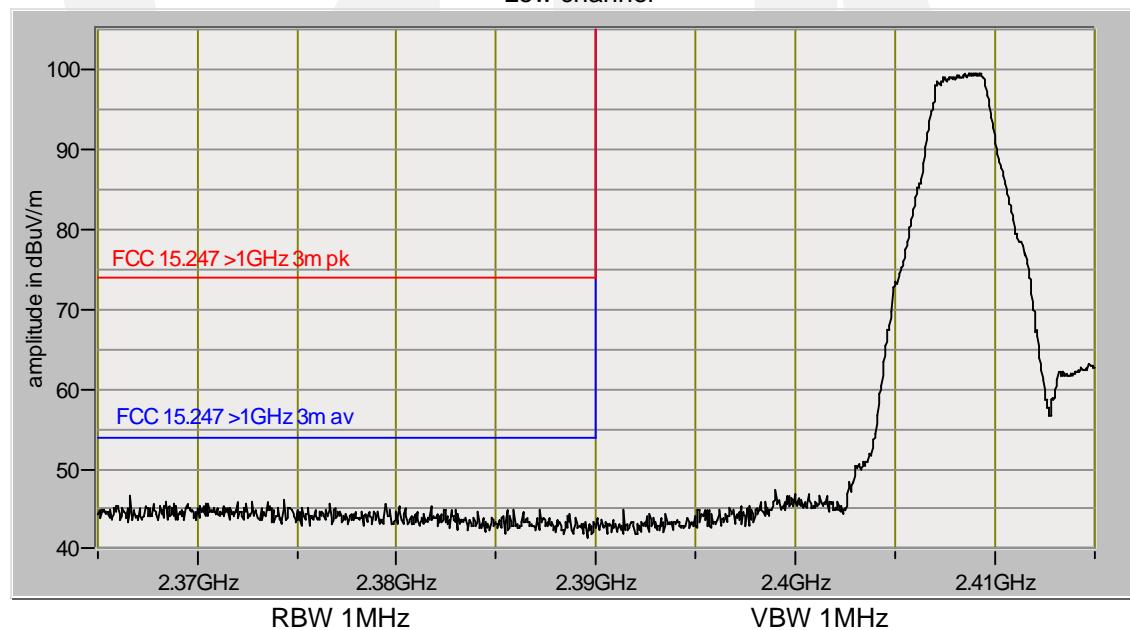
## 99% Bandwidth
**IC RSS-GEN 4.6**

**Test summary**
The requirements are: ■ - MET    □ - NOT MET
Test was performed in accordance with the article "The Measurement of Occupied Bandwidth" by Industry Canada's certification bureau
99% Occupied bandwidth is 2.59 MHz.

**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 Tech Area, conducted measurement

**Test equipment**

| TUV ID | Model | Manufacturer | Description | Serial | Cal Due |
|---|---|---|---|---|---|
| WRLE10435 | E4440A | Agilent | Spectrum Analyzer | MY44304483 | 22-Jul-12 |

**Test limit**
Not applicable

**Test data**
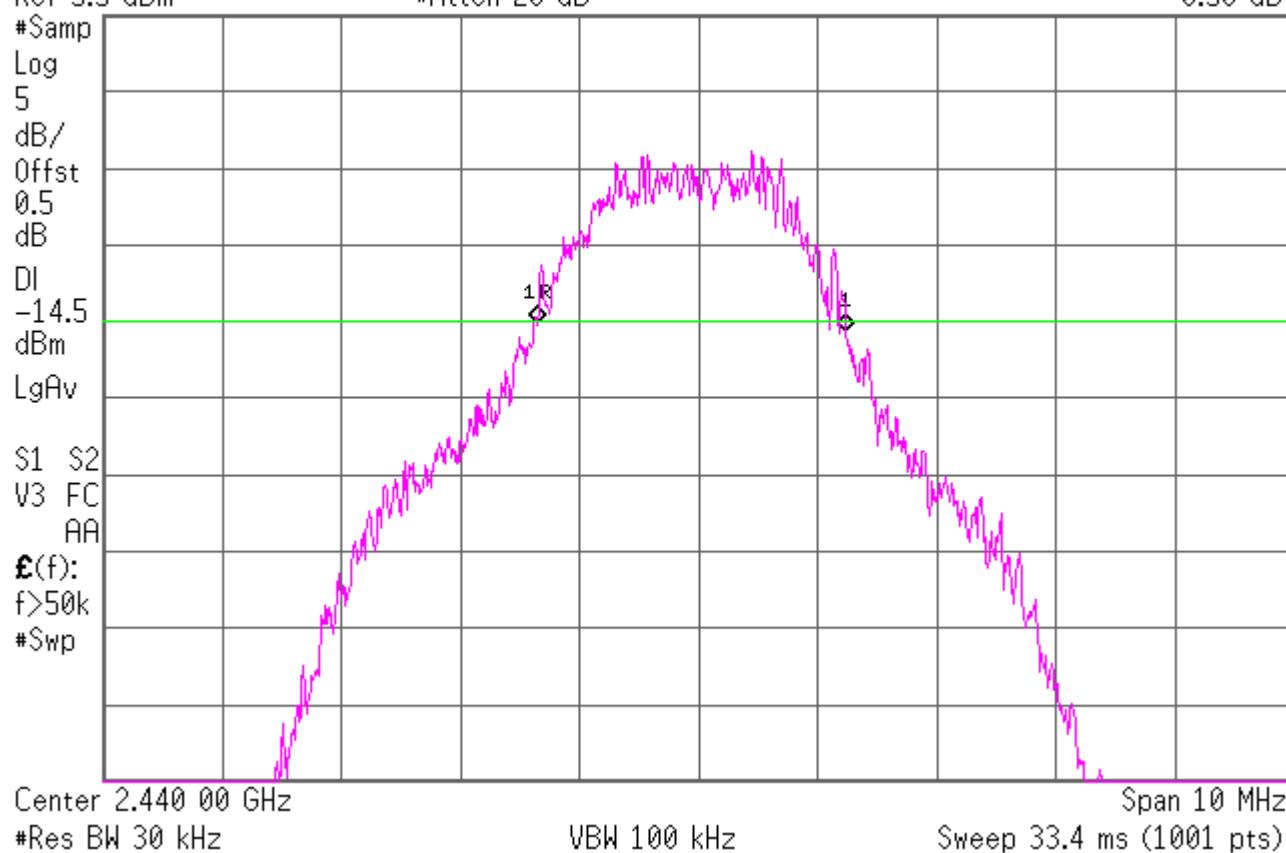
PAGES 31 – 33 REMOVED – SEE TEST SET-UPS EXHIBIT

**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

■ - See Software and/or Operating Modes in Appendix A.
Transmitter testing. Power output adjusted to the -5 dB setting. Medallion lanyard connected to Belt Pack.
Frequency, modulation, and power adjusted via DIP switch settings as necessary.

**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)
■ Transmitter output power adjusted to -5 dB setting.

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: | 09 December 2011 |
| Condition of EUT: | Normal |
| Testing Start Date: | 09 December 2011 |
| Testing End Date: | 12 December 2011 |

TÜV SÜD AMERICA INC

Tested by:

Greg S Jakubowski
EMC Test Engineer

Approved by:
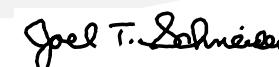
Joel T Schneider
Senior EMC Engineer

# Appendix A

Constructional Data Form

**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: | Vaddio |
| Address: | 9433 Science Center Drive |
| | |
| | New Hope,   MN   55428 |

| | | | |
|---|---|---|---|
| Contact: | Tim Wall | Position: | Engineer |
| Phone: | 763-971-4443 | Fax: | 763-971-4464 |
| E-mail Address: | twall@vaddio.com | | |

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

| | |
|---|---|
| EUT Description | 2.4GHz Wireless Audio transmitter and IR LED illuminator |
| EUT Name | AutoTrak 2.0 Belt Pack Unit |
| Model No.: | 998-7231-000 (Transmitter, North America & International)   Serial No.:<br>998-7232-000 (Medallion, North America & International) |

| | |
|---|---|
| Product Options: | none |
| Configurations to be tested: | normal |

**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.*

☐ EMC Directive 2004/108/EC (EMC)   ☐ FCC:   Class ☐ A ☐ B  Part _____
  Std:   test to quote # CG442222241060   ☐ VCCI:   Class ☐ A ☐ B
☐ Machinery Directive 89/392/EEC (EMC)   ☐ BSMI:   Class ☐ A ☐ B  (Separate Report)
  Std:   ☐ Canada:   Class ☐ A ☐ B
☐ Medical Device Directive 93/42/EEC (EMC)   ☐ Australia:   Class ☐ A ☐ B
  Std:   ☐ Other:
☐ Vehicle Directive:  ☐ 2001/3/EC (EMC)   ☐ 2004/104/EC (EMC)
  ☐ Other Vehicle Std:
☐ FDA Reviewers Guidance for Premarket
   Notification Submissions (EMC)

---

**Form**

## EMC Test Plan and Constructional Data Form

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

☐ Attestation of Conformity (AoC)*      ☐ EMC Certification (used with Octagon Mark)*
☐ Certificate of Conformity (CoC)*      ☐ Compliance Document*
   Protection Class   (N/A for vehicles)      ☐ Class I      ☐ Class II      ☐ Class III
   (Press **F1** when field is selected to show additional information on Protection Class.)
☐ FCC / TCB Certification      ☐ Industry Canada / FCB Certification
☐ E-Mark 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 SÜD 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: 4"      Width: 1"      Height: 3"      Weight: 1lbs

| 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:          3.7Vdc          (If battery powered, make sure battery life is sufficient to complete testing.)

# of Phases: _____

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

Other _____

| Other Special Requirements |
|---|

| Typical Installation and/or Operating Environment |
|---|

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

| EUT Power Cable |
|---|

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

---

**Form**

# EMC Test Plan and Constructional Data Form

## EUT Interface Ports and Cables

| Type | Analog | Digital | Active | Passive | Qty | Yes | No | Shielding Type | Termination | Connector Type | Port Termination | Length tested (in meters) | Removable | Permanent |
|------|--------|---------|--------|---------|-----|-----|-----|---------|-------------|----------------|------------------|---------------------------|-----------|-----------|
| *EXAMPLE:* *RS232* | ☐ | ☒ | ☒ | ☐ | *2* | ☒ | ☐ | *Foil over braid* | *Coaxial* | *Metallized 9-pin D-Sub* | *Characteristic Impedance* | *6* | ☒ | ☐ |
| unbalanced audio | ☒ | ☐ | ☒ | ☐ | 1 | ☒ | ☐ | braid | coax | mini-xlr | medallion mic | .914 | ☒ | ☐ |
| | ☐ | ☐ | ☐ | ☐ | | ☐ | ☐ | | | | | | ☐ | ☐ |
| | ☐ | ☐ | ☐ | ☐ | | ☐ | ☐ | | | | | | ☐ | ☐ |
| | ☐ | ☐ | ☐ | ☐ | | ☐ | ☐ | | | | | | ☐ | ☐ |
| | ☐ | ☐ | ☐ | ☐ | | ☐ | ☐ | | | | | | ☐ | ☐ |
| | ☐ | ☐ | ☐ | ☐ | | ☐ | ☐ | | | | | | ☐ | ☐ |
| | ☐ | ☐ | ☐ | ☐ | | ☐ | ☐ | | | | | | ☐ | ☐ |
| | ☐ | ☐ | ☐ | ☐ | | ☐ | ☐ | | | | | | ☐ | ☐ |
| | ☐ | ☐ | ☐ | ☐ | | ☐ | ☐ | | | | | | ☐ | ☐ |
| | ☐ | ☐ | ☐ | ☐ | | ☐ | ☐ | | | | | | ☐ | ☐ |
| | ☐ | ☐ | ☐ | ☐ | | ☐ | ☐ | | | | | | ☐ | ☐ |
| | ☐ | ☐ | ☐ | ☐ | | ☐ | ☐ | | | | | | ☐ | ☐ |

**Form**

## EMC Test Plan and Constructional Data Form

| **EUT Software**. |
| --- |

Revision Level:    v1.0.0

Description:        EMC Test firmware to produce required modes of operation.

**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.    Transmitter testing.  Medallion lanyard connected to Belt Pack.  Frequency, modulation, and power may be changed via DIP switch settings.

   2.

   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 # |
| --- | --- | --- | --- |
| 2.4GHz Wireless Audio transmitter | 998-7231-000 | | |
| Microphone Medallion and IR LED Lanyard | 998-7232-000 | | |

**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 # |
|---|---|---|---|
| | | | |

## Oscillator Frequencies

| Manufacturer | Frequency | Derived Frequency | Component # / Location | Description of Use |
|---|---|---|---|---|
| Abracon | 24MHz | 24MHz | X1 | uController clock |
| TXC | 48MHz | various | X2 | radio frequency synthesizer clock |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

## Power Supply

| Manufacturer | Model # | Serial # | Type |
|---|---|---|---|
| | | | ☐ Switched-mode: (Frequency) _____ <br> ☐ Linear   ☐ Other: _____ |
| | | | ☐ Switched-mode: (Frequency) _____ <br> ☐ Linear   ☐ Other: _____ |

## Power Line Filters

| Manufacturer | Model # | Location in EUT |
|---|---|---|
| | | |
| | | |

---

**Form**

## 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 ENTER NAMES BELOW (INSERT ELECTRONIC SIGNATURE IF POSSIBLE)

**Authorization (Signature Required if  a Third Party Certification is checked on pg 1)**

Tim Wall        12-8-11

Customer authorization to perform tests  Date
according to this test plan.

Tim Wall        12-8-11

Test Plan/CDF Prepared By (please print)  Date

**Form**

## 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.

IR LED Lanyard

Medallion Mc

### Belt Pack setup

① 3' mini-XLR to permanent attachment.
Internal audio coax shielded.

①

Belt Pack

Power: Lithium Ion, Internal
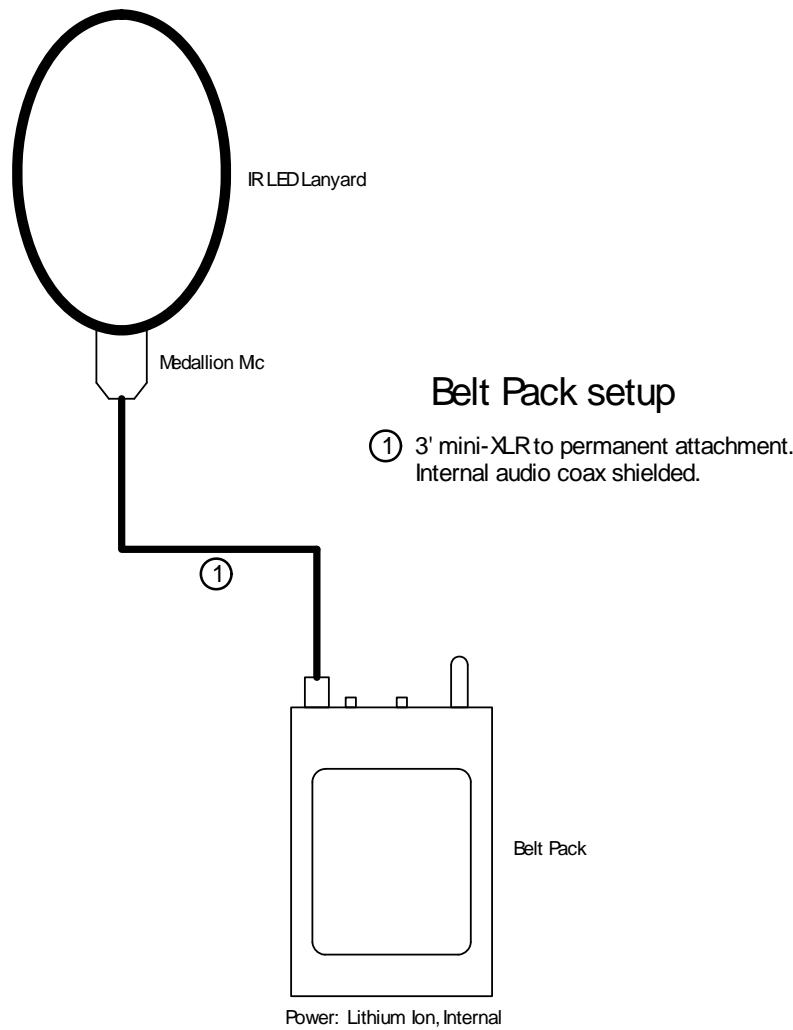
### Authorization Signatures

| Tim Wall | 12-8-11 |
|---|---|
| Customer authorization to perform tests according to this test plan. | Date |
| Tim Wall | 12-8-11 |
| Test Plan/CDF Prepared By (please print) | Date |

---

FILE: EMCU_F09.04E, REVISION 7, Effective: 14 February 2008 Page 1 of 1

# Appendix B

Measurement Protocol

# MEASUREMENT PROTOCOL
## GENERAL INFORMATION

### Test Methodology
Emission testing is performed according to the procedures in ANSI C63.4-2003, FCC KDB Publication 558074, the article "The Measurement of Occupied Bandwidth" by Industry Canada's certification bureau, & FCC Public Notice DA 02-2138.

### Measurement Uncertainty
The test system for conducted emissions – AC lines 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
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 dBμV/m, equals the reading from the spectrum analyzer (Level dBμV), 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 (dBuV) | CABLE/ANT/PREAMP (dB) (dB/m) (dB) | FINAL (dBuV/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.