Electromagnetic Compatibility Test Report

Tests Performed on a Dwyer Instruments

Probe Radio Board Module

Model PRB

Radiometrics Document RP-6951B

ACCREDITED
TESTING CERT #1495.01

Product Detail: FCC ID: Z7KWP0082011 IC ID: 9525A-WP82011 Equipment type: DTS, 2.4 GHz transmitter
Test Standards: US CFR Title 47, Chapter I, FCC Part 15 Subpart C FCC Part 15 CFR Title 47: 2009 Industry Canada RSS-210, Issue 8: 2010 as required for Category I Equipment This report concerns: Original Grant for Certification FCC Part 15.247

Tests Performed For:	*Test Facility:*
Dwyer Instrument, Inc. 102 Indiana Hwy. 212 Michigan City, IN 46361	**Radiometrics Midwest Corporation** 12 East Devonwood Romeoville, IL 60446 (815) 293-0772

Test Date(s): (Month-Day-Year)
March 23 to August 5, 2011

Document RP-6951B Revisions:

Rev.	Issue Date	Affected Sections	Revised By
0	September 12, 2011		
1	September 15, 2011	All	Joseph Strzelecki
2	October 27, 2011	Pages 1 and 4	Joseph Strzelecki

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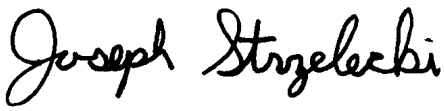
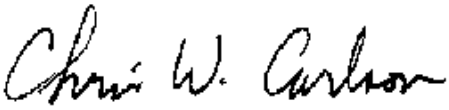
1 ADMINISTRATIVE DATA

Equipment Under Test: A Dwyer Instruments, Universal Handheld Transceiver Model: UHH Serial Number: None This will be referred to as the EUT in this Report	
Date EUT Received at Radiometrics: (Month-Day-Year) March 23, 2011	*Test Date(s): (Month-Day-Year)* March 23 to August 5, 2011
Test Report Written By: Joseph Strzelecki Senior EMC Engineer	*Test Witnessed By:* Tim Bonardi Dwyer
Radiometrics' Personnel Responsible for Test:  09/07/2011 Joseph Strzelecki Senior EMC Engineer NARTE EMC-000877-NE	*Test Report Approved By*  09/07/2011 Chris W. Carlson Director of Engineering NARTE EMC-000921-NE

2 TEST SUMMARY AND RESULTS

The EUT (Equipment Under Test) is a Probe Radio Board module Model PRB. It is installed in Universal Temperature Anemometer, Model UTA, manufactured by Dwyer Instruments. The UTA contains the module PRB. The detailed test results are presented in a separate section. The following is a summary of the test results.

Test Results

Environmental Phenomena	Frequency Range	FCC Section	RSS- Section	Test Result
RF AC Mains Conducted Emissions	0.15 - 30 MHz	15.207	GEN; 7.2.2	Pass
RF Radiated Emissions	30-25,000 MHz	15.209	GEN; 7.2.5	Pass
Time of Occupancy (Dwell Time)	2400 to 2483 MHz	15.247 a	210; A8.1 (2)	Pass
6 dB Bandwidth Test	2400 to 2483 MHz	15.247 a	210; A8.1 (4)	Pass
20 dB Bandwidth Test	2400 to 2483 MHz	15.247 a	210; A8.1 (4)	Pass
Peak Output Power	2400 to 2483 MHz	15.247 b	210; A8.1 (1)	Pass
Band-edge Compliance of RF Conducted Emissions	2400 to 2483 MHz	15.247 d	210; A8.4 (2)	Pass
Spurious Radiated Emissions	30 MHz to 25 GHz	15.247 d	210; A8.5	Pass
Power Spectral Density	2400 to 2483 MHz	15.247 e	210; A8.2 (1)	Pass

Note: The RSS-210 specification is not currently covered in Radiometrics' Scope of Accreditation. This is technically very similar to FCC, CFR 47 Part 15 which is on Radiometrics scope.

2.1 RF Exposure Compliance Requirements

Since the power output is 6 mW, the EUT meets the FCC requirement for RF exposure. Since the EUT is less than 200 mW, it is exempt from RSS-102. There are no power level adjustments and the antenna is permanently attached. The detailed calculations for RF Exposure are presented in a separate document.

3 EQUIPMENT UNDER TEST (EUT) DETAILS

3.1 EUT Description

The EUT is a Probe radio board, Model PRB. The PRB is installed in a Universal Humidity Temperature sensor, Model UHT, manufactured by Dwyer Instruments. The EUT was in good working condition during the tests, with no known defects.

3.1.1 FCC Section 15.203 & RSS-GEN Antenna Requirements

The antenna is permanently attached to the PCB via a trace on the circuit board. The antenna is internal to the EUT and it is not readily available to be modified by the end user. Therefore, it meets the 15.203 Requirements.

3.2 Related Submittals

The associated Transceiver is operated under 15.247 and RSS-210. It is subject to the FCC requirements pursuant to the Certification equipment authorization under Part 15 Subpart C, and is being submitted as FCC ID: Z7KUHH0032011.

4 TESTED SYSTEM DETAILS

4.1 Tested System Configuration

The system was configured for testing in a typical fashion. The EUT was placed on an 80-cm high, nonconductive test stand. The testing was performed in conditions as close as possible to installed conditions. Wiring was consistent with manufacturer's recommendations.

The EUT was tested as a stand-alone device. Power was supplied with a new battery.

The identification for all equipment, plus descriptions of all cables used in the tested system, are:

Tested System Configuration List

Item	Description	Type*	Manufacturer	Model Number	Serial Number
1	Probe Radio Board module	E	Dwyer Instruments	PRB	Sample A
2	Universal Handheld Transceiver	E	Dwyer Instruments	UHH	Sample A
3	UTA Wireless Probe	E	Dwyer Instruments	UTA-C	None
4	USB Charger	E	Griffin Technology	PB-BLK-2	None

* Type: E = EUT

List of System Cables

QTY	Length (m)	Cable Description	Connected to (Item #)	Shielded?
1	1.0	USB Charging cable	#1, #2 and #4	Yes

4.2 Special Accessories

No special accessories were used during the tests in order to achieve compliance.

4.3 Equipment Modifications

No modifications were made to the EUT at Radiometrics' test facility in order to comply with the standards listed in this report.

5 TEST SPECIFICATIONS AND RELATED DOCUMENTS

Document	Date	Title
FCC CFR Title 47	2009	Code of Federal Regulations Title 47, Chapter 1, Federal Communications Commission, Part 15 - Radio Frequency Devices
ANSI C63.4-2003	2003	Methods of Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
IC RSS-210 Issue 8	2010	Low Power Licence-Exempt Radiocommunication Devices (All Frequency Bands) Category I Equipment
IC RSS-Gen Issue 3	2010	General Requirements and Information for the Certification of Radiocommunication Equipment (RSS-Gen)
FCC DA 00-705	2000	Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems
FCC 558074	2005	Measurement of Digital Transmission Systems Operating under Section 15.247

The test procedures used are in accordance with the FCC DA 00-705, <or> FCC 558074, Industry Canada RSS-GEN and ANSI document C63.4-2003, "Methods of Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz". The specific procedures are described herein. Radiated testing was performed at an antenna to EUT distance of 3 meters. The antenna was raised and lowered from 1 to 4 meters.

6 RADIOMETRICS' TEST FACILITIES

The results of these tests were obtained at Radiometrics Midwest Corp. in Romeoville, Illinois, USA. Radiometrics is accredited by A2LA (American Association for Laboratory Accreditation) to conform to ISO/IEC 17025: 2005 "General Requirements for the Competence of Calibration and Testing Laboratories". Radiometrics' Lab Code is 121191 and Certification Number is 1495.01. Radiometrics' scope of accreditation includes all test methods listed herein. A copy of the accreditation can be accessed on our web site (www.radiomet.com). Radiometrics accreditation status can be verified at A2LA's web site (www.a2la2.org).

The following is a list of shielded enclosures located in Romeoville, Illinois used during the tests:

Chamber A: Is an anechoic chamber that measures 24' L X 12' W X 12' H. The walls and ceiling are fully lined with ferrite absorber tiles. The floor has a 10' x 10' section of ferrite absorber tiles located in the center. Panashield of Rowayton, Connecticut manufactured the chamber. The enclosure is NAMAS certified.

Chamber E: Is a custom made anechoic chamber that measures 52' L X 30' W X 18' H. The walls and ceiling are fully lined with RF absorber. Pro-shield of Collinsville, Oklahoma manufactured the chamber.

Test Station F: Is an area that measures 10' D X 12' W X 10' H. The floor and back wall are metal shielded. This area is used for conducted emissions measurements.

A separate ten-foot long, brass plated, steel ground rod attached via a 6 inch copper braid grounds each of the above chambers. Each enclosure is also equipped with low-pass power line filters.

The FCC has accepted these sites as test site number US1065. The FCC test site Registration Number is 732175. Details of the site characteristics are on file with the Industry Canada as site number IC3124A-1.

A complete list of the test equipment is provided herein. The calibration due dates are indicated on the equipment list. The equipment is calibrated in accordance to ANSI/NCSL Z540-1 with traceability to the National Institute of Standards and Technology (NIST).

7 DEVIATIONS AND EXCLUSIONS FROM THE TEST SPECIFICATIONS

There were no deviations or exclusions from the test specifications.

8 CERTIFICATION

Radiometrics Midwest Corporation certifies that the data contained herein was taken under conditions that meet or exceed the requirements of the test specification and the data contained herein was taken with calibrated test equipment. The results relate only to the EUT listed herein.

9 TEST EQUIPMENT TABLE

RMC ID	Manufacturer	Description	Model No.	Serial No.	Frequency Range	Cal Period	Cal Date
AMP-05	RMC/Celeritek	Pre-amplifier	MW110G	1001	1.0-12GHz	12 Mo.	01/19/11
AMP-20	Avantek	Pre-amplifier	SF8-0652	15221	8-18GHz	12 Mo	01/18/11
AMP-22	Anritsu	Pre-amplifier	MH648A	M23969	0.1-1200MHz	12 Mo.	01/18/11
AMP-29	HP / Agilent	Amplifier	11975A	2304A00158	2-8 GHz	12 Mo.	04/05/11
ANT-13	EMCO	Horn Antenna	3115	2502	1.0-18GHz	24 Mo.	11/18/10
ANT-44	Impossible Machine	Super Log Antenna	SL-20M2G	1002	20-2000MHz	24 Mo.	11/25/09
ANT-48	RMC	Std Gain Horn	HW2020	1001	18-26 GHz	12 Mo.	04/05/11
ANT-53	EMCO	Loop Antenna	6507	1453	1 kHz-30 MHz	24 Mo	11/04/09
HPF-01	Solar	High Pass Filter	7930-100	HPF-1	0.15-30MHz	24 Mo.	10/27/09
LSN-01	Electrometrics	50 uH LISN	FCC/VDE 50/2	1001	0.01-30MHz	24 Mo.	06/01/09 06/14/11
MXR-02	HP / Agilent	Harmonic Mixer	11970K	2332A00489	18-26.5GHz	12 Mo.	04/05/11

RMC ID	Manufacturer	Description	Model No.	Serial No.	Frequency Range	Cal Period	Cal Date
PRE-01	Hewlett Packard	Preselector	85685A	2510A00143	20 Hz-2GHz	24 Mo.	01/11/10
REC-01	Hewlett Packard	Spectrum Analyzer	8566A	2106A02115, 2209A01349	30Hz-22GHz	12 Mo.	10/29/10
REC-07	Anritsu	Spectrum Analyzer	MS2601A	MT53067	0.01-2200MHz	12 Mo.	01/21/11
THM-02	Fluke	Temp/Humid Meter	971	93490471	N/A	12 Mo.	04/01/10

Note: All calibrated equipment is subject to periodic checks.

10 TEST SECTIONS

10.1 AC Conducted Emissions

The tests and limits are in accordance with FCC section 15.207 and RSS Gen section 7.2.2.

A computer-controlled analyzer was used to perform the conducted emissions measurements. The frequency range was divided into 500 subranges equally spaced on a logarithmic scale. The computer recorded the peak of each subrange. This data was then plotted on semi-log graph paper generated by the computer and plotter. Adjusting the positions of the cables and orientation of the test system then maximizes the highest emissions.

Mains Conducted emission measurements were performed using a 50 Ohm/50 uH Line Impedance Stabilization Network (LISN) as the pick-up device. Measurements were repeated on both leads within the power cord. If the EUT power cord exceeded 80 cm in length, the excess length of the power cord was made into a 30 to 40 cm bundle near the center of the cord. The LISN was placed on the floor at the base of the test platform and electrically bonded to the ground plane.

FCC Limits of Conducted Emissions at the AC Mains Ports

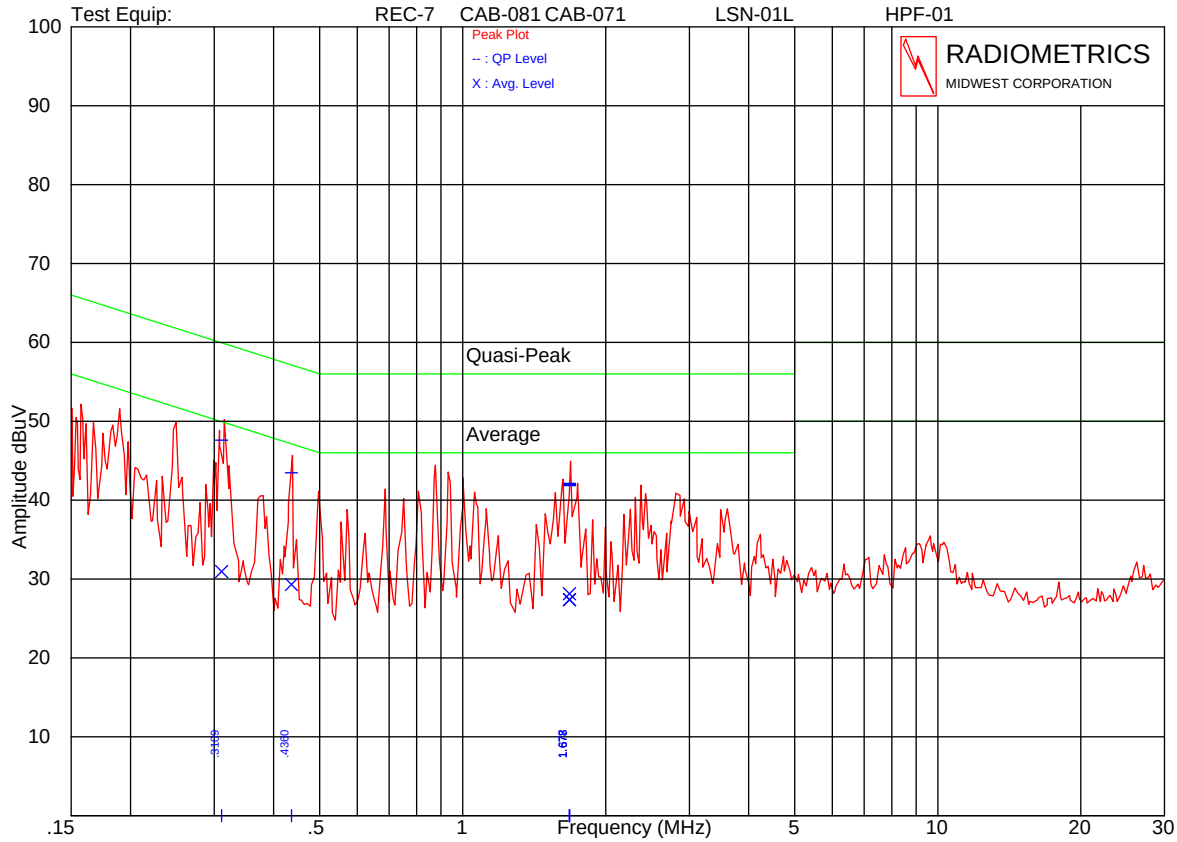
Frequency Range (MHz)	Class B Limits (dBuV)	
	Quasi-Peak	Average
0.150 - 0.50*	66 - 56	56 - 46
0.5 – 5.0	56	46
5.0 - 30	60	50
* The limit decreases linearly with the logarithm of the frequency in this range.		

The initial step in collecting conducted data is a peak detector scan and the plotting of the measurement range. Significant peaks are then marked as shown on the following table, and these signals are then measured with the quasi-peak detector. The following represents the worst case emissions from the host computer (with the EUT connected) power cord, after testing all modes of operation.

Test Date : August 5, 2011
The Amplitude is the final corrected value with cable and LISN Loss.
* QP readings are quasi-peak with a 9 kHz bandwidth and no video filter.

Judgment: Passed by at least 5 dB

Testing of the Dwyer, Model PRB, PRB Module in a Universal Temperature Amemometer



Testing of the Dwyer, Model PRB, PRB Module in a Universal Temperature Amemometer

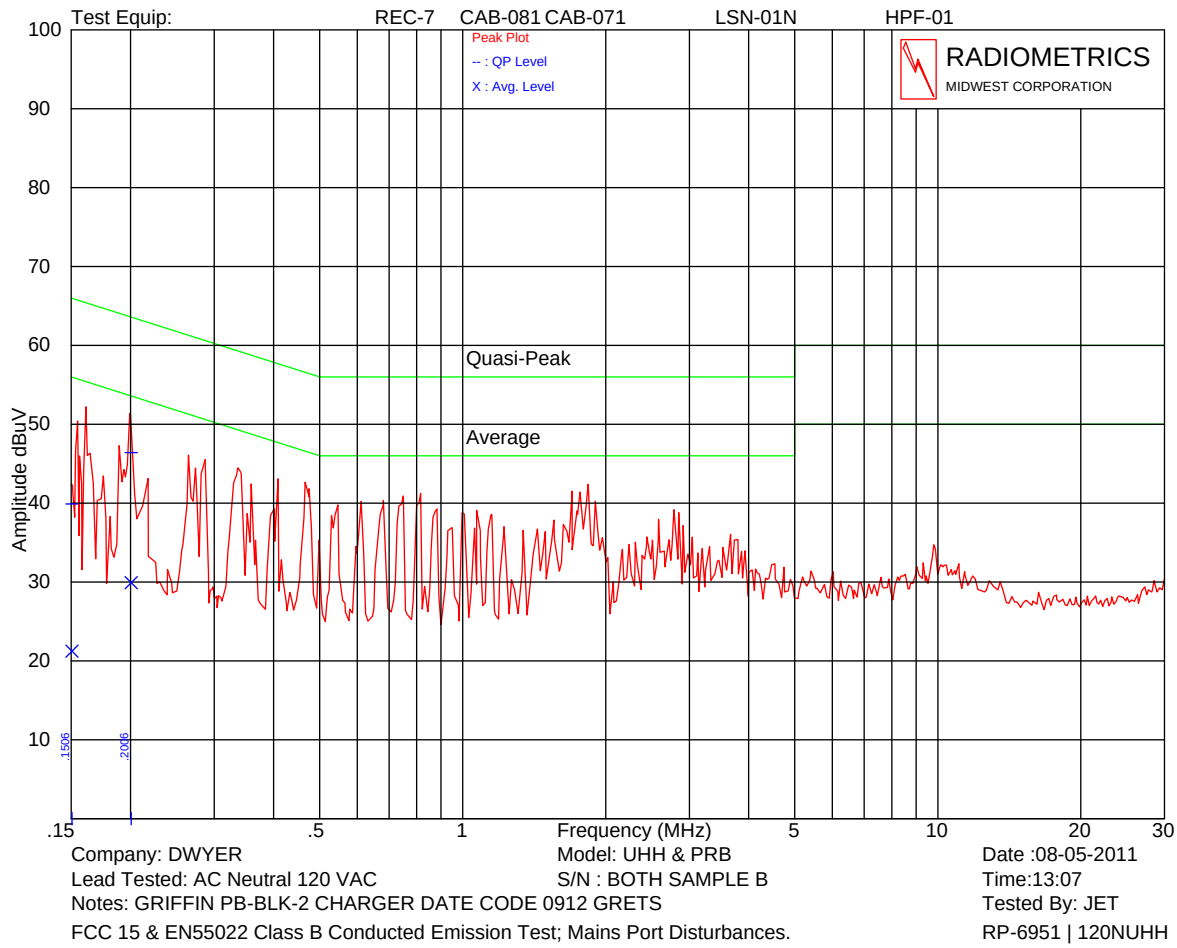
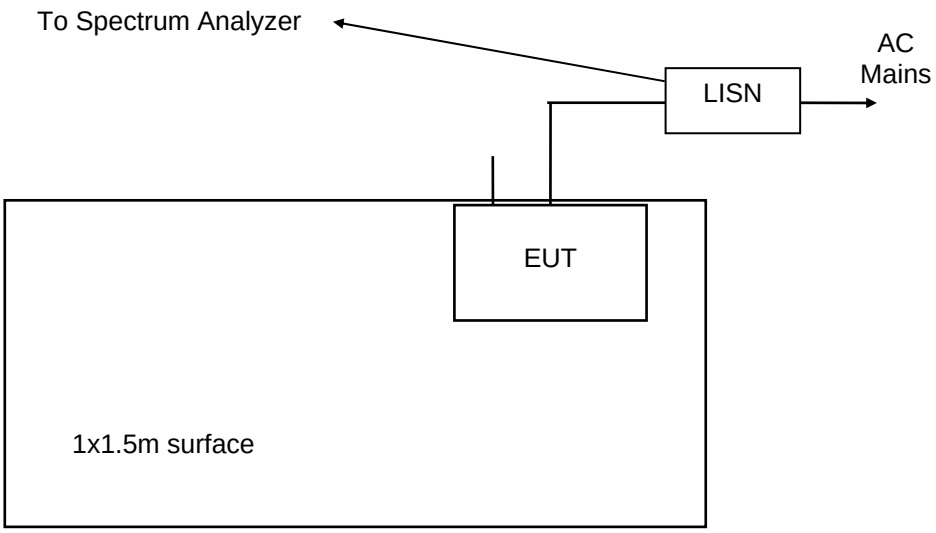


Figure 1. Conducted Emissions Test Setup



Notes:
- LISN's 80 cm from EUT chassis
- Vertical conductive plane 40 cm from rear of table top
- EUT power cord bundled

10.2 Time of Occupancy (Dwell Time)

As required by FCC section 15.35 and RSS-210 section 6.5, the Peak to Average correction factor was calculated.

The EUT transmits only accesses the probes every 500mS, and may burst up to 4 readings. Each reading is 1 mSeconds. Therefore the maximum total on time for any 100 mSec time period is 4 mSec. The peak to average factor is 20*Log(4/100) = 28 dB

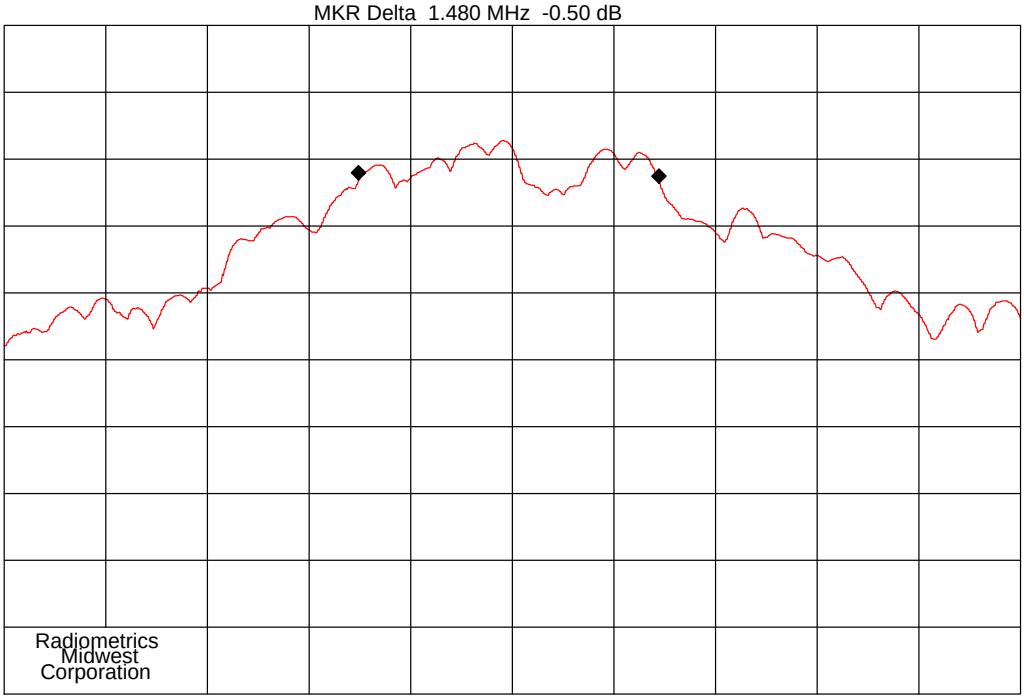
10.3 Occupied Bandwidth

The spectrum analyzer was set to the MAX HOLD mode to record the worst case of the modulation. The EUT was transmitting at its maximum data rate. The trace was allowed to stabilize.

The marker-to-peak function was set to the peak of the emission. Then the marker-delta function was used to measure 6 or 20 dB down one side of the emission. The marker-delta function was reset and then moved to the other side of the emission, until it is (as close as possible to) even with the reference marker level. The marker-delta reading at this point is the bandwidth of the emission.

Channel MHz	6 dB EBW kHz	20 dB EBW kHz
2405	1480	3135
2440	1595	3480
2480	1485	3910

MKR Delta 1.480 MHz -0.50 dB

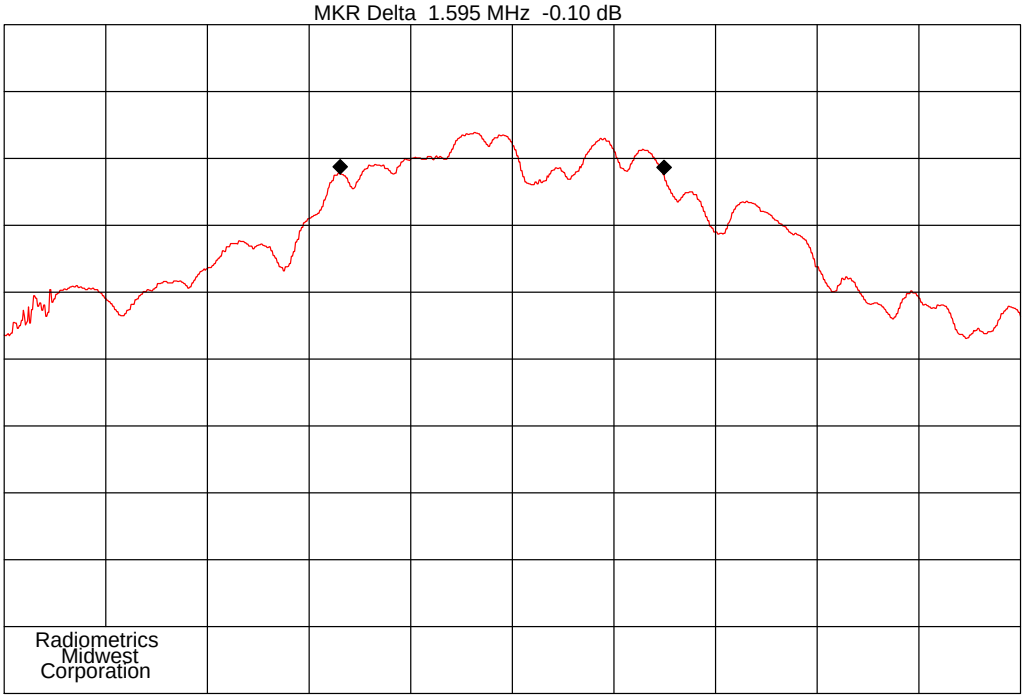


Company: Dwyer
CENTER 2.405 00 GHz
RES BW 100 kHz
10 dB/
Notes: 6 dB Bandwidth, Lowest Channel

ITEM : PRB
REF 97.0 dBuV
VBW 300 kHz
Time: 09:58

Date : 12-17-2010
SPAN 5.00 MHz
ATTEN 0 dB
SWP 20.0 msec
File: BW61UTA

MKR Delta 1.595 MHz -0.10 dB

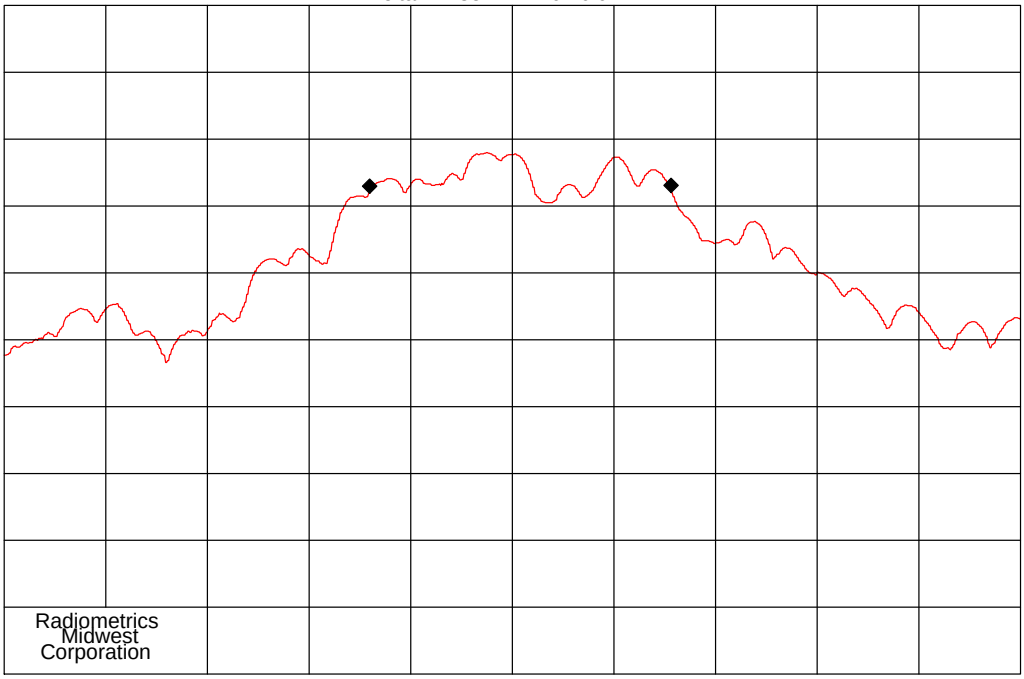


Company: Dwyer
CENTER 2.440 00 GHz
RES BW 100 kHz
10 dB/
Notes: 6 dB Bandwidth, Mid Channel

ITEM : PRB
REF 97.0 dBuV
VBW 300 kHz
Time: 11:05

Date : 12-17-2010
SPAN 5.00 MHz
ATTEN 0 dB
SWP 20.0 msec
File: BW62UTA

MKR Delta -1.485 MHz -0.10 dB

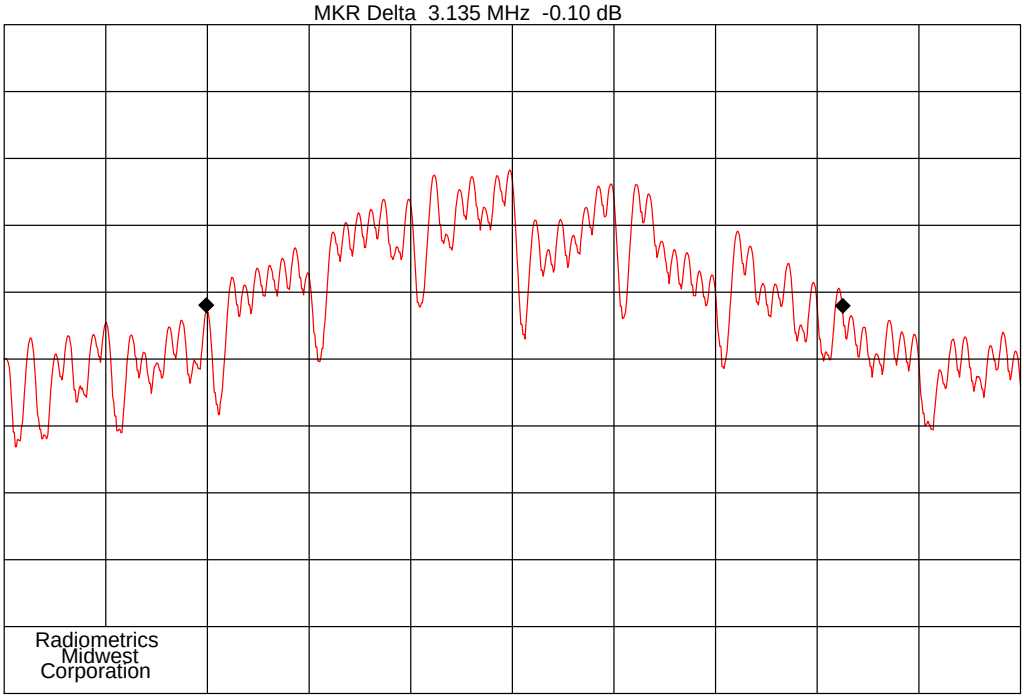


Company: Dwyer
CENTER 2.479 94 GHz
RES BW 100 kHz
10 dB/
Notes: 6 dB Bandwidth, Highest Channel

ITEM : PRB
REF 97.0 dBuV
VBW 300 kHz
Time: 09:35

Date : 12-17-2010
SPAN 5.00 MHz
ATTEN 0 dB
SWP 20.0 msec
File: BW63-UTA

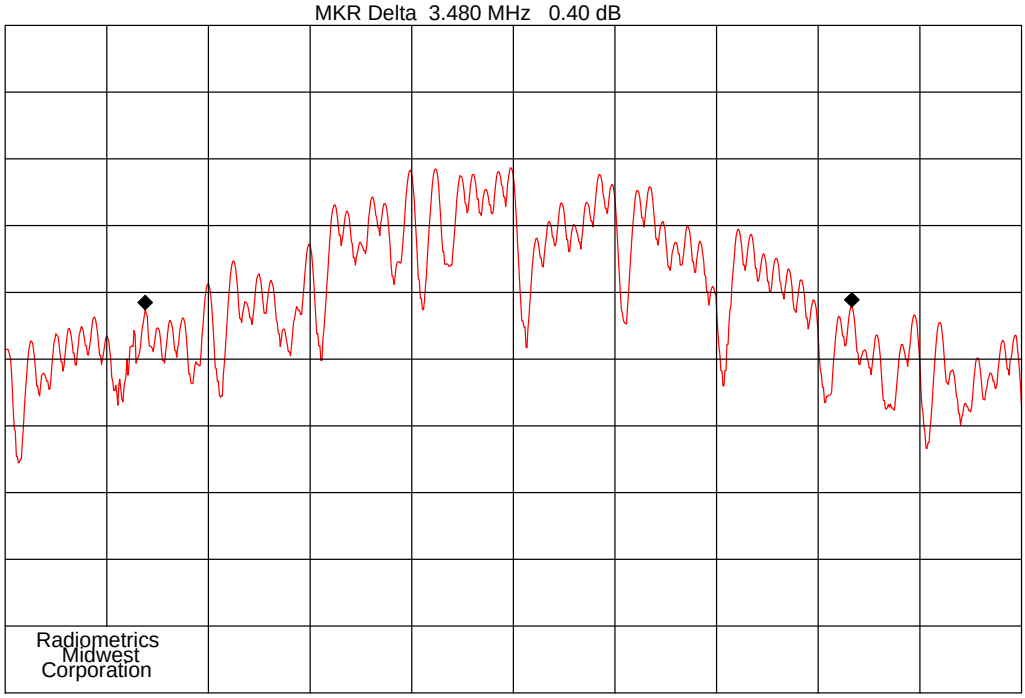
MKR Delta 3.135 MHz -0.10 dB



Company: Dwyer
CENTER 2.405 00 GHz
RES BW 30 kHz
10 dB/
Notes: 20dB Bandwidth, Lowest Channel

ITEM : PRB
REF 97.0 dBuV
VBW 100 kHz
Time: 10:00

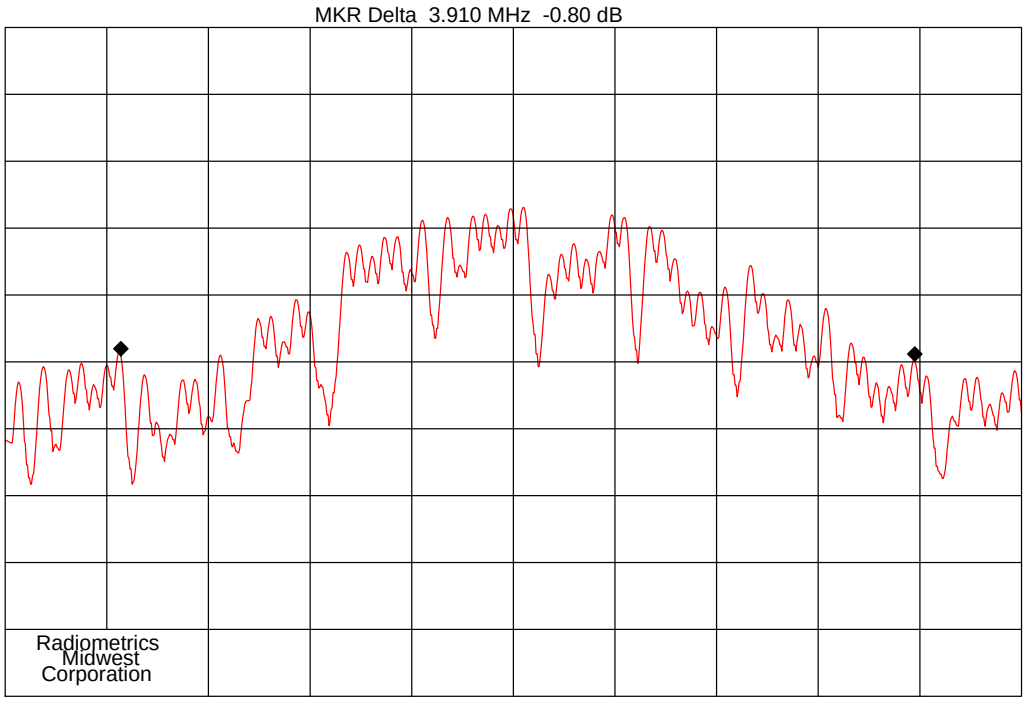
Date : 12-17-2010
SPAN 5.00 MHz
ATTEN 0 dB
SWP 20.0 msec
File: BW201UTA



Company: Dwyer
CENTER 2.440 00 GHz
RES BW 30 kHz
10 dB/
Notes: 20 dB Bandwidth, Mid Channel

ITEM : PRB
REF 97.0 dBuV
VBW 100 kHz
Time: 11:07

Date : 12-17-2010
SPAN 5.00 MHz
ATTEN 0 dB
SWP 20.0 msec
File: BW202UTA



Company: Dwyer
CENTER 2.479 94 GHz
RES BW 30 kHz
10 dB/
Notes: 20 dB Bandwidth, Highest Channel

ITEM : PRB
REF 97.0 dBuV
VBW 100 kHz
Time: 09:38

Date : 12-17-2010
SPAN 5.00 MHz
ATTEN 0 dB
SWP 20.0 msec
File: BW203UTA

10.4 Peak Output Power

Since antenna conducted tests cannot be performed on the EUT, radiated tests were performed to show compliance with this requirement. The FCC procedures from power output option 2, Method #3 were used. Since the gain of the antenna is always less than 6dB, the limit is not reduced. The transmitter's peak power was calculated using the following equation:

P = (E x d)^2 / (30)

Where: E = the measured maximum peak field strength in V/m.

d = Distance in meters from which the field strength was measured. (3 meters)

P = The EUT power in watts

The Field Strength was measured using the procedures described in section 10.9, with the exception of the resolution and video bandwidths. The spectrum analyzer was set to the following settings:

Span = 3 MHz ; RBW = 3 MHz (> the 20 dB bandwidth of the emission being measured)
VBW = 3 MHz; Sweep = auto; Detector function = peak; Trace = max hold

Freq	Peak		Meas	EUT	EUT	Limit
MHz	dBuV/m	V/m	Dist	Watts	dBm	dBm
2405	95	3	0.05623	9.49E-04	-0.23	30
2440	94.3	3	0.05188	8.07E-04	-0.93	30
2480	94.8	3	0.05495	9.06E-04	-0.43	30

Overall Test result: Pass by 30.2 dB

10.5 Power Spectral Density

Since antenna conducted tests cannot be performed on the EUT, radiated tests were performed to show compliance with this requirement. The FCC procedures from PSD option 1 was used. The power spectral density was measured as follows.

The field strength was measured using the procedures described in section 10.9, with the following exceptions: The analyzer was tuned to the highest point of the maximized fundamental emission. Using this peak level, the transmitter's power spectral density was calculated using the following equation:

P = (E x d)^2 / (30 x G)

Where: E = the measured maximum peak field strength in V/m, using the bandwiths in this section.

G = The numeric gain of the transmitting antenna over an isotropic radiator.

d = Distance in meters from which the field strength was measured. (3 meters)

P = The EUT power in watts

Span = 500 kHz ; RBW = 3 kHz ; VBW = 10 kHz; Sweep = 167 Seconds
Detector function = Peak

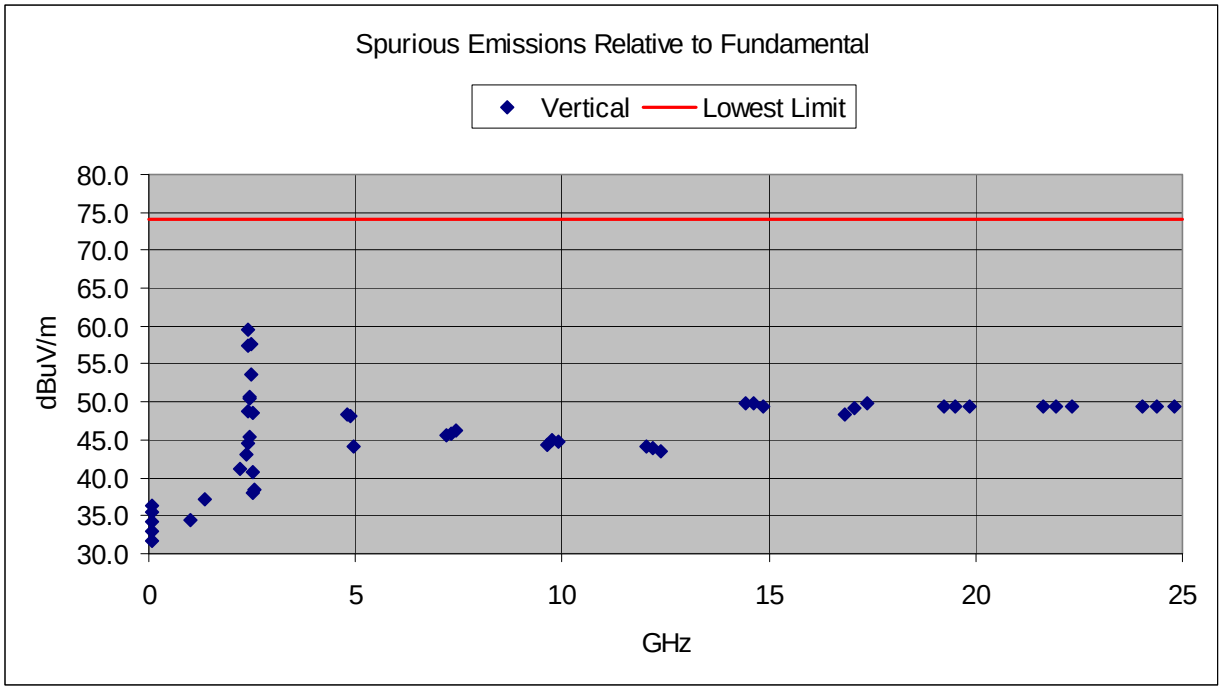
Freq	3kHz PSD Field Strength		Test Distance	3 kHz Spectral Density from EUT		Limit
MHz	dBuV/m	V/m	Meters	Watts	dBm	dBm
2405	84.4	0.0165959	3	8.26E-05	-10.83	8
2440	83	0.0141254	3	5.99E-05	-12.23	8
2480	83.5	0.0149624	3	6.72E-05	-11.73	8

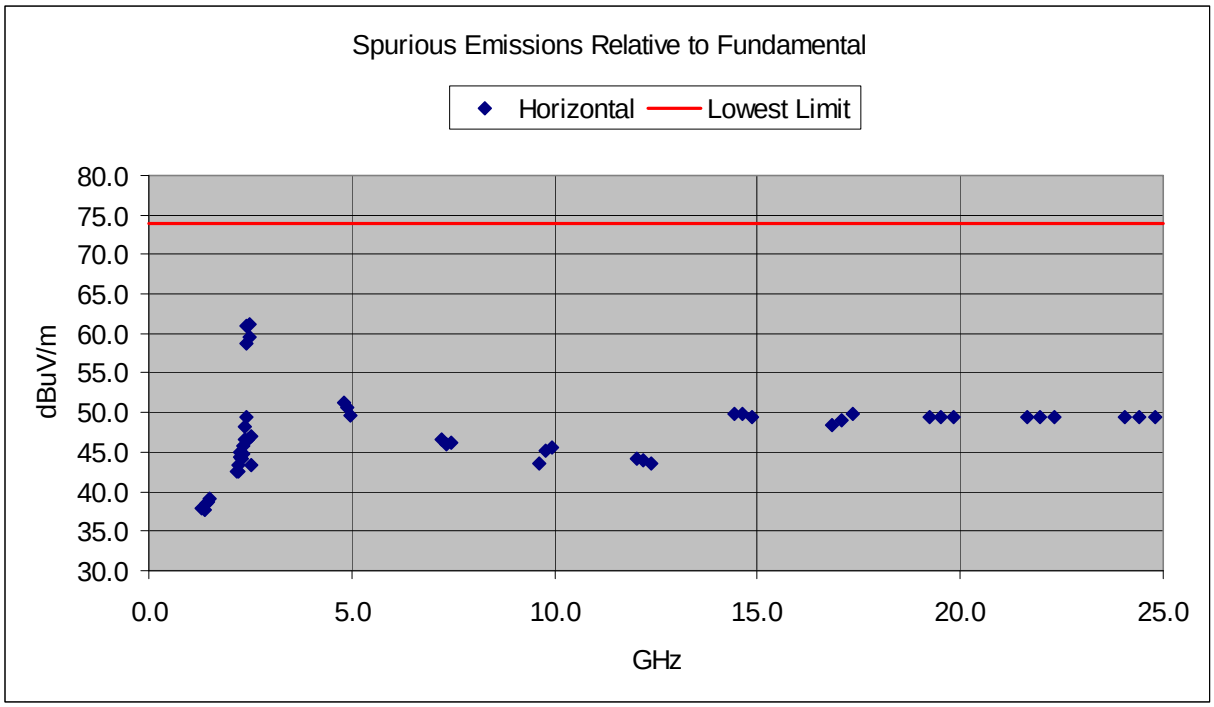
Overall Test result: Pass by 18.8 dB

10.6 Spurious RF Conducted Emissions

Since antenna conducted tests cannot be performed on the EUT at 2.4 GHz, radiated tests were performed to show compliance with this requirement.

The EUT was tested in continous mode and peak readings were made from the lowest frequency generated in the EUT up through the 10th harmonic. The limit is 20 dB lower than the peak of the lowest fundamental. The data is shown graphically.

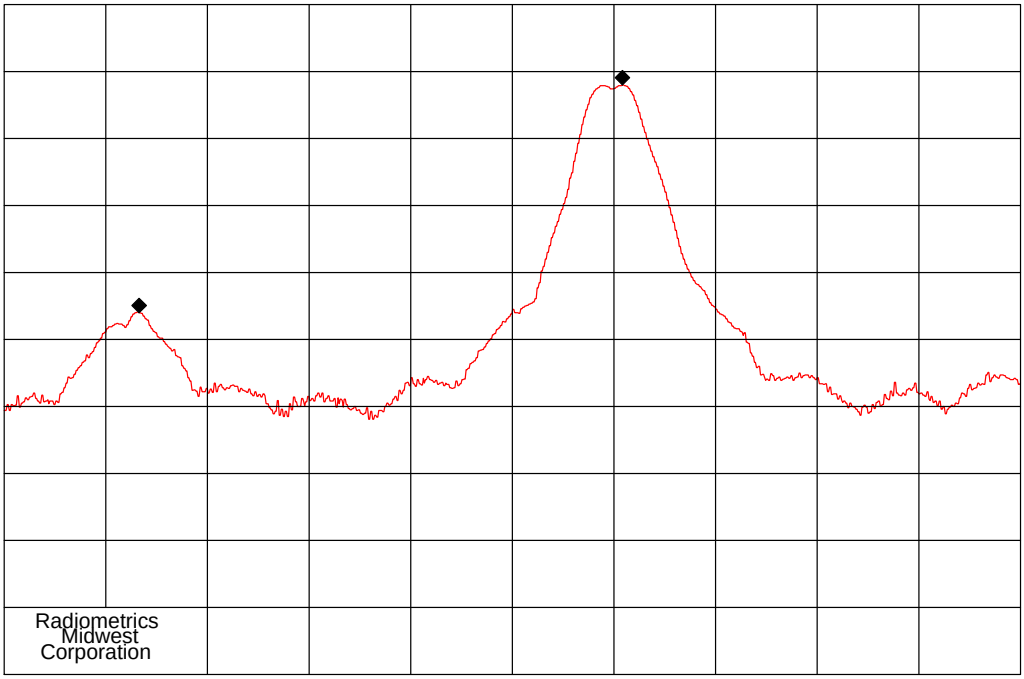




10.7 Band-edge Compliance of RF Conducted Emissions

The spectrum analyzer was set to the MAX HOLD mode to record the worst case of the modulation at the band-edge, with the EUT set to the lowest frequency. The trace was allowed to stabilize.

MKR Delta 23.80 MHz 34.00 dB

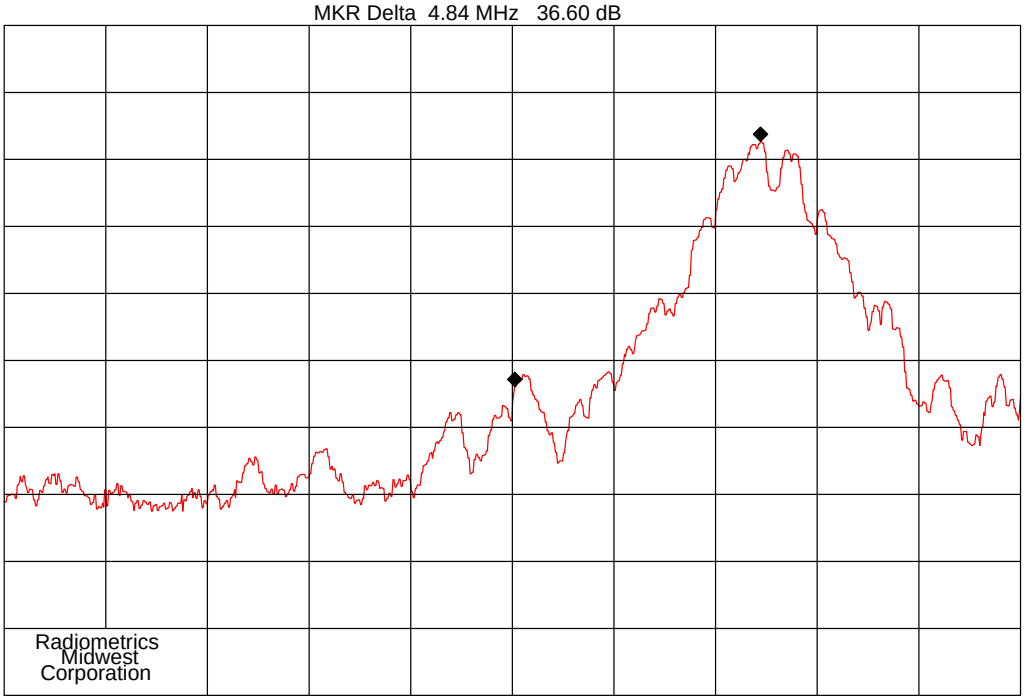


Company: Dwyer
CENTER 2.400 0 GHz
RES BW 1 MHz
10 dB/
Notes: Lower Band Edge (extended), Lowest Channel

ITEM : PRB
REF 97.0 dBuV
VBW 3 MHz
Time: 09:57

Date : 12-17-2010
SPAN 50.0 MHz
ATTEN 0 dB
SWP 20.0 msec
File: BEL2UTA

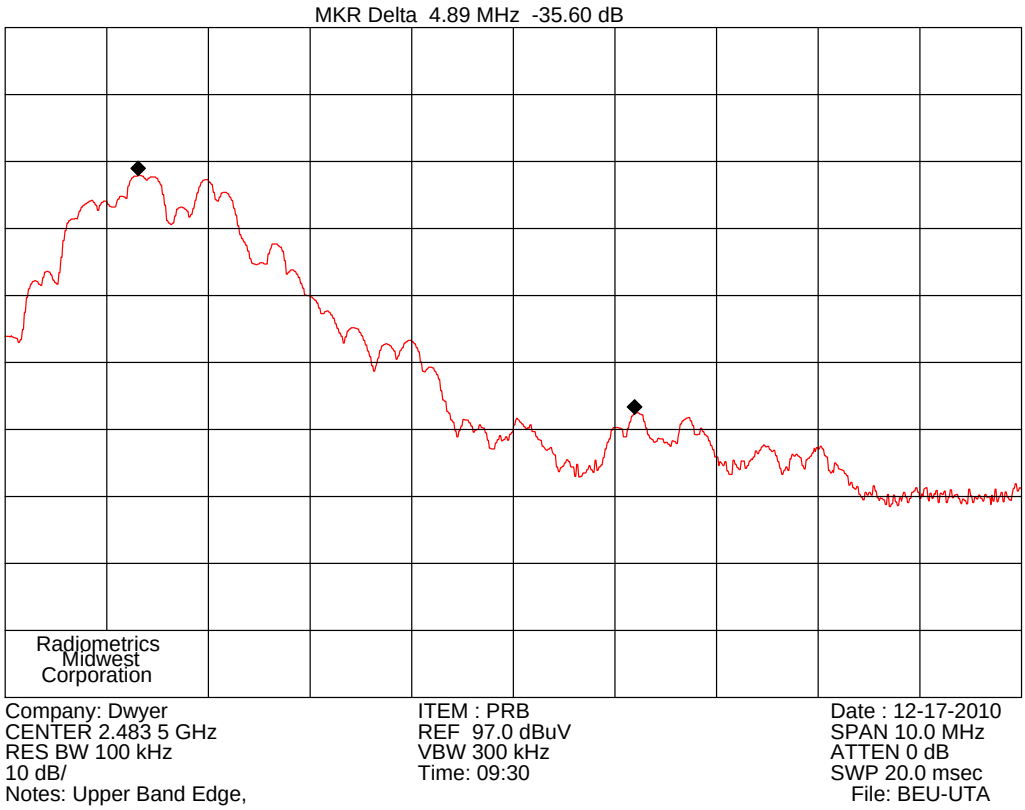
MKR Delta 4.84 MHz 36.60 dB



Company: Dwyer
CENTER 2.400 0 GHz
RES BW 100 kHz
10 dB/
Notes: Lower Band Edge, Lowest Channel

ITEM : PRB
REF 97.0 dBuV
VBW 300 kHz
Time: 09:54

Date : 12-17-2010
SPAN 20.0 MHz
ATTEN 0 dB
SWP 20.0 msec
File: BEL-UTA



	Band Edge Delta Readings in dB	
Channel	Band Edge	Minimum Allowed dB
2405 Lower Band edge	34.0	20
2480 Upper Band edge	35.6	20

10.8 Spurious Radiated Emissions (Restricted Band)

Radiated emission measurements were performed with linearly polarized broadband antennas. The results obtained with these antennas can be correlated with results obtained with a tuned dipole antenna. The radiated emission measurements were performed with a spectrum analyzer. The bandwidth used from 150 kHz to 30 MHz is 9 or 10 kHz and the bandwidth from 30 MHz to 1000 MHz is 100 or 120 kHz. Above 1 GHz, a 1 MHz bandwidth is used. A 10 dB linearity check is performed prior to start of testing in order to determine if an overload condition exists.

From 30 to 1000 MHz, an Anritsu spectrum analyzer was used. For tests from 1 to 25 GHz, an HP 8566 spectrum analyzer was used. For tests from 1 to 10 GHz, a high pass filter was used to reduce the fundamental emission. A harmonic mixer was used from 18 to 25 GHz. Figure 4 herein lists the details of the test equipment used during radiated emissions tests.

The was device was rotated through three orthogonal axis as per 13.1.4.1 of ANSI C63.4 during the prescans and during final radiated tests.

Final radiated emissions measurements were performed inside of an anechoic chamber at a test distance of 3 meters. The anechoic chamber is designated as Chamber E. This Chamber meets the Site Attenuation requirements of ANSI C63.4 and CISPR 16-1. Chamber E is located at 12 East Devonwood Ave. Romeoville, Illinois EMI test lab.

The entire frequency range from 30 to 25,000 MHz was slowly scanned with particular attention paid to those frequency ranges which appeared high. Measurements were performed using two antenna polarizations, (vertical and horizontal). The worst case emissions were recorded. All measurements may be performed using either the peak, average or quasi-peak detector functions. If the peak detector data exceeds or is marginally close to the limits, the measurements are repeated using a quasi-peak detector or average function as required by the specification for final determination of compliance.

The detected emission levels were maximized by rotating the EUT, adjusting the positions of all cables, and by scanning the measurement antenna from 1 to 4 meters above the ground.

10.8.1 Radiated Emissions Field Strength Sample Calculation

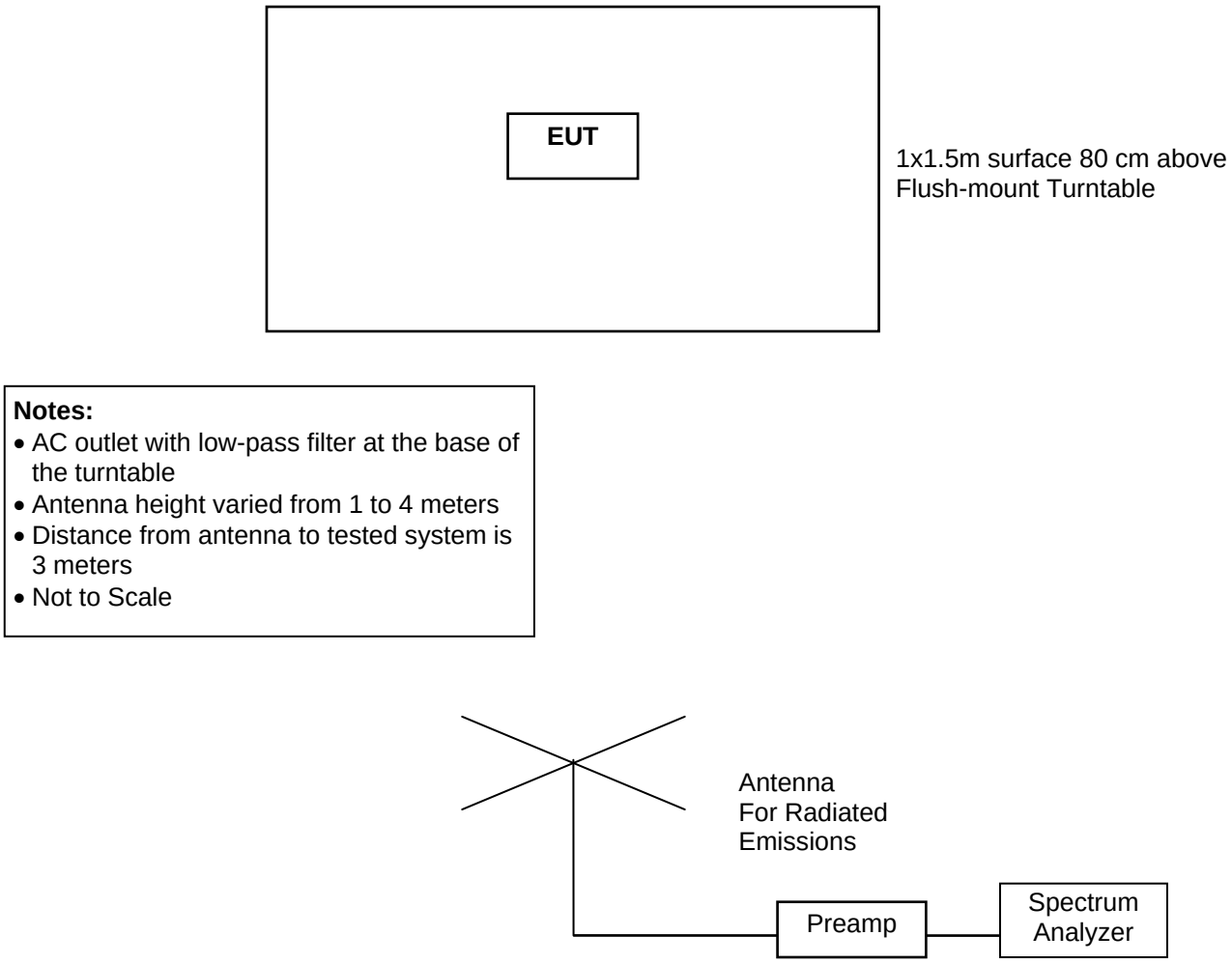
The field strength is calculated by adding the Antenna Factor and Cable Loss, and by subtracting the Amplifier Gain from the measured reading. The basic equation is as follows:

FS = RA + AF + CF - AG

Where: FS = Field Strength
RA = Receiver Amplitude
AF = Antenna Factor
CF = Cable Attenuation Factor
AG = Amplifier Gain
PKA = Peak to Average Factor (This is zero for non-average measurements)

The Peak to average factor is used when average measurements are required. It is calculated by the highest duty cycle in percent over any 100mS transmission. The factor in dB is 20 * Log(Duty cycle/100).

Figure 2. Drawing of Radiated Emissions Setup



10.8.2 Spurious Radiated Emissions Test Results (Restricted Band)

The following spectrum analyzer settings were used.

Span = wide enough to fully capture the emission being measured
RBW = 1 MHz for f ≥ 1 GHz, 100 kHz for f < 1 GHz
VBW ≥ RBW
Sweep = auto
Detector function = peak
Trace = max hold

A Video Bandwidth of 10 Hz was used for Average measurements above 1 GHz.

Testing of the Dwyer, Model PRB, PRB Module in a Universal Temperature Amemometer

Manufacturer	Dwyer	Specification	FCC Part 15 Subpart C & RSS-210
Model	PRB in a UTA	Test Date	March 23, 2011
Serial Number	None	Test Distance	3 Meters
Abbreviations	Pol = Antenna Polarization; V = Vertical; H = Horizontal; BC = Biconical (ANT-3); LP = Log-Periodic (ANT-6); HN = Horn (ANT-13) P = peak; Q = QP		
Notes	Corr. Factors = Cable Loss – Preamp Gain – Duty Cycle Factor + HP Filter Loss		
Configuration	Continuously transmitting		

Freq. MHz	Meter Reading dBuV	Dect. Type	Antenna Factor dB	Antenna Pol/ ID#	Corr. Factors dB	Field Strength dBuV/m EUT	Field Strength dBuV/m Limit	Margin Under Limit dB
34.4	29.7	P	16.0	H/44	-24.9	20.8	40.0	19.2
48.4	30.7	P	14.2	H/44	-24.4	20.5	40.0	19.5
70.4	31.2	P	7.5	H/44	-24.0	14.7	40.0	25.3
80.0	32.0	P	6.8	H/44	-23.8	15.0	40.0	25.0
100.8	37.3	P	9.9	H/44	-23.5	23.7	43.5	19.8
120.4	32.9	P	14.4	H/44	-23.4	23.9	43.5	19.6
154.4	32.3	P	10.2	H/44	-23.4	19.1	43.5	24.4
223.2	31.2	P	11.6	H/44	-23.4	19.4	46.0	26.6
246.3	42.0	P	12.5	H/44	-23.3	31.2	46.0	14.8
256.4	34.1	P	12.9	H/44	-23.3	23.7	46.0	22.3
525.0	29.7	P	17.8	H/44	-20.9	26.6	46.0	19.4
620.0	29.7	P	18.4	H/44	-20.0	28.1	46.0	17.9
797.0	32.4	P	20.2	H/44	-18.7	33.9	46.0	12.1
820.0	31.7	P	21.5	H/44	-18.7	34.5	46.0	11.5
845.0	32.0	P	21.8	H/44	-18.7	35.1	46.0	10.9
772.0	31.7	P	21.0	H/44	-18.8	33.9	46.0	12.1
820.0	32.5	P	21.5	H/44	-18.7	35.3	46.0	10.7
32.8	32.6	P	16.2	V/44	-24.8	24.0	40.0	16.0
47.2	36.5	P	14.4	V/44	-24.5	26.4	40.0	13.6
68.4	32.2	P	8.0	V/44	-24.0	16.2	40.0	23.8
81.2	32.8	P	6.9	V/44	-23.8	15.9	40.0	24.1
168.4	33.4	P	9.6	V/44	-23.4	19.6	43.5	23.9
195.6	29.3	P	9.7	V/44	-23.5	15.5	43.5	28.0
246.3	35.8	P	12.5	V/44	-23.3	25.0	46.0	21.0
270.4	30.1	P	12.9	V/44	-23.2	19.8	46.0	26.2
409.8	30.0	P	16.3	V/44	-21.6	24.7	46.0	21.3
527.0	28.6	P	17.8	V/44	-20.9	25.5	46.0	20.5
665.0	27.8	P	19.9	V/44	-19.5	28.2	46.0	17.8
729.0	27.9	P	19.7	V/44	-19.1	28.5	46.0	17.5
932.0	28.3	P	21.7	V/44	-18.5	31.5	46.0	14.5

Testing of the Dwyer, Model PRB, PRB Module in a Universal Temperature Amemometer

Readings Above 1 GHz:

Test Date	3-23-2011	Specification	FCC Part 15.247 & RSS-210

Freq. MHz	Reading dBuV	Detector Function	Polarity	Factor dB	Field Strength		Margin Under Limit dB
					EUT	Limit	
1160.0	39.4	P	H	-3.5	35.9	54.0	18.1
1312.5	41.1	P	H	-3.3	37.8	54.0	16.2
1397.0	40.3	P	H	-3.5	36.8	54.0	17.2
1432.0	41.6	P	H	-3.6	38.0	54.0	16.0
1445.0	41.9	P	H	-3.6	38.3	54.0	15.7
1480.0	42.0	P	H	-3.5	38.5	54.0	15.5
2165.0	42.3	P	H	-1.2	41.1	54.0	12.9
2191.5	44.5	P	H	-1.2	43.3	54.0	10.7
2200.0	43.7	P	H	-1.2	42.5	54.0	11.5
2240.5	46.0	P	H	-1.2	44.8	54.0	9.2
2248.0	44.2	P	H	-1.1	43.1	54.0	10.9
2287.0	44.2	P	H	-0.9	43.3	54.0	10.7
2295.0	43.9	P	H	-0.9	43.0	54.0	11.0
2320.0	44.2	P	H	-0.8	43.4	54.0	10.6
2344.0	46.0	P	H	-0.5	45.5	54.0	8.5
2367.5	45.9	P	H	-0.4	45.5	54.0	8.5
2380.5	47.3	P	H	-0.3	47.0	54.0	7.0
2391.5	49.4	P	H	-0.3	49.1	54.0	4.9
2455.0	45.9	P	H	0.2	46.1	54.0	7.9
2507.0	46.2	P	H	-0.3	45.9	54.0	8.1
2513.0	42.3	P	H	-0.3	42.0	54.0	12.0
2559.5	40.6	P	H	0.5	41.1	54.0	12.9
1355.0	39.9	P	V	-3.3	36.6	54.0	17.4
2213.5	41.5	P	V	-1.2	40.3	54.0	13.7
2380.5	48.3	P	V	-0.3	48.0	54.0	6.0
2427.5	49.5	P	V	0.0	49.5	54.0	4.5
2503.0	40.1	P	V	-0.3	39.8	54.0	14.2
2524.5	37.3	P	V	0.0	37.3	54.0	16.7
2547.5	37.5	P	V	0.4	37.9	54.0	16.1

Except for harmonics shown below, No other spurious emissions were detected from 1 to 25 GHz.
Judgment: Passed by 4.5 dB. Note that the peak readings passed the Average limits

Fundamental, Harmonic and Band edge emissions

		Spectrum Analyzer Readings									EUT	Peak	Ave	Peak	Ave	Margin
hrm	Tx	Peak			Ave	Peak			Ave	Corr.	Emission	Tot. FS		Limit		Under
		Vertical Polarization				Horizontal Polarization					Freq					
#	Freq	X	Y	Z	Max	X	Y	Z	Max	Fact.	MHz	dBuV/m		dBuV/m		Limit
1	2405	85.2	80.4	91.2	63.2	93.5	94.7	83.9	66.7	-0.1	2412	94.6	66.6	125	94	27.4
be	2405	51.5	46.7	57.5	29.5	59.8	61.0	50.2	33.0	-0.1	2400	60.9	32.9	74	54	13.1
2	2405	36.2	35.3	42.3	14.3	42.0	45.2	36.1	17.2	6.0	4810	51.2	23.2	74	54	22.8
3	2405	37.0	37.0	37.0	9.0	37.0	38.1	37.0	10.1	8.6	7215	46.7	18.7	74	54	27.3
4	2405	35.9	36.5	36.8	8.8	36.0	36.0	36.0	8.0	7.5	9620	44.3	16.3	74	54	29.7
1	2440	84.2	85.6	89.5	61.5	86.1	93.9	80.4	65.9	0.1	2440	94.0	66.0	125	94	28.0
2	2440	40.2	40.5	42.3	14.3	42.6	44.7	40.1	16.7	5.9	4880	50.6	22.6	74	54	23.4
3	2440	37.0	37.0	37.0	9.0	37.0	37.0	37.0	9.0	8.9	7320	45.9	17.9	74	54	28.1
4	2440	35.9	37.1	37.2	9.2	36.2	35.8	37.4	9.4	7.7	9760	45.1	17.1	74	54	28.9
1	2480	81.0	87.2	88.3	60.3	93.3	94.1	78.7	66.1	0.2	2480	94.3	66.3	125	94	27.7
BE	2474	48.0	55.8	57.4	29.4	60.9	59.9	46.9	32.9	0.2	2484	61.1	33.1	74	54	12.9
2	2474	37.2	38.2	37.7	10.2	37.5	43.8	37.9	15.8	5.9	4960	49.7	21.7	74	54	24.3
3	2474	37.0	37.0	37.0	9.0	37.0	37.0	37.0	9.0	9.2	7440	46.2	18.2	74	54	27.8
4	2474	36.0	36.8	36.1	8.8	37.5	36.4	35.5	9.5	8.0	9920	45.5	17.5	74	54	28.5
Column numbers (see below for explanations)																
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17

Judgment: Passed by 12.9 dB
No other emissions were detected from 10 to 25 GHz.

Column #1. hrm = Harmonic; BE = Band Edge emissions
Column #2. Frequency of Transmitter.
Column #3. Uncorrected readings from the spectrum analyzer with First Axis Rotation.
Column #4. Uncorrected readings from the spectrum analyzer with Second Axis Rotation.
Column #5. Uncorrected readings from the spectrum analyzer with Third Axis Rotation.
Column #6. Average Reading based on peak reading reduced by the Duty cylce correction
Column #7. Uncorrected readings from the spectrum analyzer with First Axis Rotation.
Column #8. Uncorrected readings from the spectrum analyzer with Second Axis Rotation.
Column #9. Uncorrected readings from the spectrum analyzer with Third Axis Rotation.
Column #10. Average Reading based on peak reading reduced by the Duty cylce correction
Column #11. Corr. Factors = Cable Loss – Preamp Gain + Antenna Factor
Column #12. Frequency of Tested Emission
Column #13. Highest peak field strength at listed frequency.
Column #14. Highest Average field strength at listed frequency.
Column #15. Peak Limit.
Column #16. Average Limit.
Column #17. The margin (last column) is the worst case margin under the peak or average limits for that row.

10.9 Unintentional Emissions (Receive Mode)

Manufacturer	Dwyer Instruments	Specification	FCC Part 15.247 & RSS-210
Model	PRB	Test Date	3/23/2010
Serial Number	none	Test Distance	3 Meters
Abbreviations	Pol = Antenna Polarization; V = Vertical; H = Horizontal; P = peak; Q = QP		
Notes	Corr. Factors = Cable Loss – Preamp Gain – Duty Cycle Factor + HP Filter Loss		
Configuration	Tested with Panasonic Toughbook; Charging (Griffin Charger)		

Freq. MHz	Meter Reading dBuV	Dect. Type	Antenna Factor dB	Antenna Pol/ ID#	Corr. Factors dB	Field Strength dBuV/m EUT	Field Strength dBuV/m Limit	Margin Under Limit dB
66.4	42.9	P	8.5	H/44	-24.1	27.3	40.0	12.7
81.2	34.7	P	6.9	H/44	-23.8	17.8	40.0	22.2
98.4	40.7	P	9.2	H/44	-23.6	26.3	43.5	17.2
138.0	40.0	P	11.7	H/44	-23.5	28.2	43.5	15.3
152.4	43.9	P	10.1	H/44	-23.4	30.6	43.5	12.9
166.4	45.2	P	9.8	H/44	-23.4	31.6	43.5	11.9
194.8	44.5	P	9.7	H/44	-23.5	30.7	43.5	12.8
198.4	52.4	P	9.6	H/44	-23.5	38.5	43.5	5.0
199.5	51.3	Q	9.6	H/44	-23.5	37.4	43.5	6.1
229.6	44.1	P	11.6	H/44	-23.3	32.4	46.0	13.6
240.2	52.7	Q	12.2	H/44	-23.3	41.6	46.0	4.4
277.1	47.5	P	13.1	H/44	-23.0	37.6	46.0	8.4
323.6	47.3	P	13.5	H/44	-22.5	38.3	46.0	7.7
369.0	45.3	P	15.0	H/44	-22.0	38.3	46.0	7.7
414.3	41.5	P	16.6	H/44	-21.5	36.6	46.0	9.4
460.2	45.0	Q	16.8	H/44	-21.0	40.8	46.0	5.2
559.0	41.9	P	18.7	H/44	-20.6	40.0	46.0	6.0
646.0	37.0	P	18.8	H/44	-19.6	36.2	46.0	9.8
696.0	38.4	P	19.7	H/44	-19.3	38.8	46.0	7.2
783.0	37.8	P	20.5	H/44	-18.8	39.5	46.0	6.5
875.0	36.8	P	21.3	H/44	-18.8	39.3	46.0	6.7
967.0	33.1	P	22.1	H/44	-18.1	37.1	54.0	16.9
66.8	47.2	P	8.4	V/44	-24.0	31.6	40.0	8.4
92.4	48.3	P	8.2	V/44	-23.5	33.0	43.5	10.5
98.4	48.7	P	9.2	V/44	-23.6	34.3	43.5	9.2
105.6	47.5	P	12.1	V/44	-23.5	36.1	43.5	7.4
138.0	45.5	P	11.7	V/44	-23.5	33.7	43.5	9.8
150.0	50.2	P	10.0	V/44	-23.3	36.9	43.5	6.6
165.9	50.7	Q	9.8	V/44	-23.4	37.1	43.5	6.4
166.5	51.4	Q	9.8	V/44	-23.4	37.8	43.5	5.7
167.9	48.8	Q	9.7	V/44	-23.4	35.1	43.5	8.4
168.7	48.9	Q	9.6	V/44	-23.4	35.1	43.5	8.4
168.8	51.3	P	9.6	V/44	-23.4	37.5	43.5	6.0
183.6	50.3	P	9.3	V/44	-23.4	36.2	43.5	7.3
196.0	45.1	P	9.7	V/44	-23.5	31.3	43.5	12.2
206.4	42.9	P	10.0	V/44	-23.4	29.5	43.5	14.0
240.2	45.2	P	12.2	V/44	-23.3	34.1	46.0	11.9

Freq. MHz	Meter Reading dBuV	Dect. Type	Antenna		Corr. Factors dB	Field Strength dBuV/m		Margin Under Limit dB
			Factor dB	Pol/ ID#		EUT	Limit	
460.2	43.0	P	16.8	V/44	-21.0	38.8	46.0	7.2
507.0	37.7	P	17.2	V/44	-20.9	34.0	46.0	12.0
553.0	37.3	P	18.0	V/44	-20.6	34.7	46.0	11.3
599.0	37.1	P	18.8	V/44	-20.3	35.6	46.0	10.4
691.0	37.7	P	19.8	V/44	-19.3	38.2	46.0	7.8
872.0	35.9	P	21.2	V/44	-18.8	38.3	46.0	7.7

Judgment: Pass by 4.4 dB