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April 13, 2011

Mr. Sun Kwan Kim
S. Manager
Samsung Electronics Co., Ltd.
416 Maetan 3-Dong, Yeongtong-Gu
Suwon-Si, Gyeonggi-DO
Korea 443-742

Dear Sun:

Enclosed is the Wireless Test Report for the CY-WDCA6UR UWB Radio Module by Samsung Electronics, Co., Ltd. This report can be used to demonstrate compliance with FCC 15.519 Subpart F requirements for Ultra Wideband Devices. If you have any questions, please contact me.

Sincerely,

Jeffrey A. Lenk
President

Enclosure

Project 12273-10

**Samsung Electronics Co., Ltd.
CY-WDCA6UR UWB Radio Module**

Wireless Certification Report

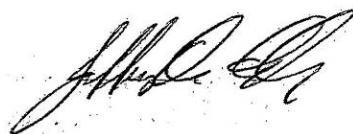
Prepared for:
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By

Professional Testing (EMI), Inc.
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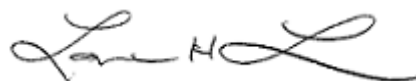
April 13, 2011

Reviewed by



Jeffrey A. Lenk
President

Written by



Layne Lueckemeyer
Product Development Engineer

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(2) This report shall not be reproduced except in full, without the written approval of Professional Testing (EMI), Inc.

(3) The significance of this report is dependent on the representative character of the test sample submitted for evaluation and the results apply only in reference to the sample tested. The manufacturer must continuously implement the changes shown herein to attain and maintain the required degree of compliance.



Applicant: Samsung Electronics Co., Ltd.
 Applicant's Address: 416 Maetan 3-Dong, Yeongtong-Gu
 Suwon-Si, Gyeonggi-DO
 Korea 443-742
 FCC ID: A3LCYWDC6UR
 Project Number: 12273-10
 Test Dates: March 9-10, 2011

The **CY-WDCA6UR UWB Radio Module by Samsung Electronics Co., Ltd.**, was tested to and found to be in compliance with FCC 47 CFR Part 15 Subpart F.

The highest emissions generated by the above equipment are listed below:

Parameter	Frequency (MHz)	Level		Limit	Margin (dB)
Radiated Spurious	76.638	27.3 dBμV/m		29.5 dBμV/m	-2.2
Output Power	3960	-42.9 dBm	.00005 mw	-41.3 dBm	-1.6
UWB Bandwidth 10 dB WiMedia Band Group 1					
Low (3432 MHz)		Mid (3960 MHz)		High (4488 MHz)	
500.3 MHz		510.5 MHz		512.2 MHz	
UWB Bandwidth 10 dB WiMedia Band Group 3					
Low (6600 MHz)		Mid (7128 MHz)		High (7656 MHz)	
507.9 MHz		507.9 MHz		508.8 MHz	
UWB Bandwidth 10 dB WiMedia Band Group 6					
Low (7656 MHz)		Mid (8184 MHz)		High (8712 MHz)	
508.8 MHz		509.6 MHz		508.8 MHz	

I, Layne Lueckemeyer, for Professional Testing (EMI), Inc., being familiar with the FCC rules and test procedures have reviewed the test setup, measured data, and this report. I believe them to be true and accurate.

Layne Lueckemeyer
 Product Development Engineer

This report has been reviewed and accepted by Samsung Electronics Co., Ltd. The undersigned is responsible for ensuring that this device will continue to comply with the FCC rules.

 Representative of Samsung Electronics Co., Ltd.

1.0 Introduction

1.1 Scope

This report describes the extent of the equipment under test (EUT) conformance to the intentional radiator requirements of the USA

Professional Testing (EMI), Inc. (PTI), follows the guidelines of NIST for all uncertainty calculations, estimates, and expressions thereof for EMC testing. The procedure of ANSI C63.4: 2009 were utilized for making all emissions measurements.

1.2 EUT Description

The CY-WDCA6UR UWB Radio Module is a complete compact UWB radio implemented in a standard PC Mini-Card format that is intended to be used with compatible Samsung monitor products to provide UWB functionality. The CY-WDCA6UR operates in the frequency band defined in the FCC rules and Regulations for UWB devices. Specifically, it operates between the frequencies of 3.168 and 8.976 GHz per the industry-defined WiMedia 1.1 specification.

1.3 EUT Operation

The EUT was tested while in a continuous transmit mode. The EUT was tuned to WiMedia Band Groups 1, 3, and 6 to perform power, UWB bandwidth, harmonic and spurious tests. The EUT continuously transmitted at maximum power. The system tested consisted of the following:

Manufacturer	Model	FCC ID
Samsung Electronics Co., Ltd.	CY-WDCA6UR UWB Radio Module	A3LCYWDCA6UR

The following rules apply to the operation of the EUT:

Guidelines	FCC Rules
	Part 15
Transmitter Characteristics	15.519
Spurious Radiated Power	15.209, 15.519(c)
Power Line Conducted	15.207
Antenna Requirement	15.203
Radiated Emissions in GPS Bands	15.519 (d)
UWB Bandwidth	15.519 (b)
Peak Emissions within a 50 MHz Bandwidth	15.519 (e)

1.4 Modifications

No modifications were made to the EUT during the performance of the test program.

1.5 Test Site

Measurements were made at the PTI semi-anechoic facility designated Site 45 (FCC 459644, IC 3036B-1) in Austin, Texas. This site is registered with the FCC under Section 2.948 and Industry Canada per RS-212 and is subsequently confirmed by laboratory accreditation (NVLAP). The test site is located at 11400 Burnet Rd., Austin, Texas, 78758, while the main office is located at 1601 N. A.W. Grimes Blvd., Suite B, Round Rock, Texas, 78665. Professional Testing (EMI), Inc. (PTI), follows the guidelines of NIST for all uncertainty calculations, estimates and expressions thereof for EMC testing. The procedure of ANSI C63.4:2009 and C63.10:2009 were utilized for making all emissions measurements.

1.6 Applicable Documents

Document	Title	Release
ANSI C63.4	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low Voltage Electrical and Electronic Equipment.	2009
ANSI C63.10	American National Standard for Testing Unlicensed Wireless Devices	2009
47 CFR	Part 15 – Radio Frequency Devices Subpart C: Intentional Radiators; Subpart F: Ultra–Wideband Operation	2007

2.0 Average Output Power

Average power measurements were made on selected fundamental transmit frequencies of the EUT for the lowest, most center, and highest sub-bands WiMedia Band Groups 1, 3, and 6.

Tests of the fundamental emissions of the EUT also determined the worse case polarization of the device. The emissions of the device were measured with the EUT in three orthogonal axes.

2.1 Test Procedure

The EUT was placed on a non-conductive table 0.8 meters above the ground plane. The table was centered on a motorized turntable that enables 360-degree rotation. For measurements of the fundamental signal, a measurement antenna was positioned at a distance of 1 meter, as measured from the closest point of the EUT. Rotating the EUT maximized the emissions.

A spectrum analyzer with average detection was used to find the maximum field strength during the variability testing. Resolution bandwidth (RBW) used was recorded. A calculation was then made to determine the average power at the antenna terminal. A diagram showing the test setup is given as Figure 2.1.1.

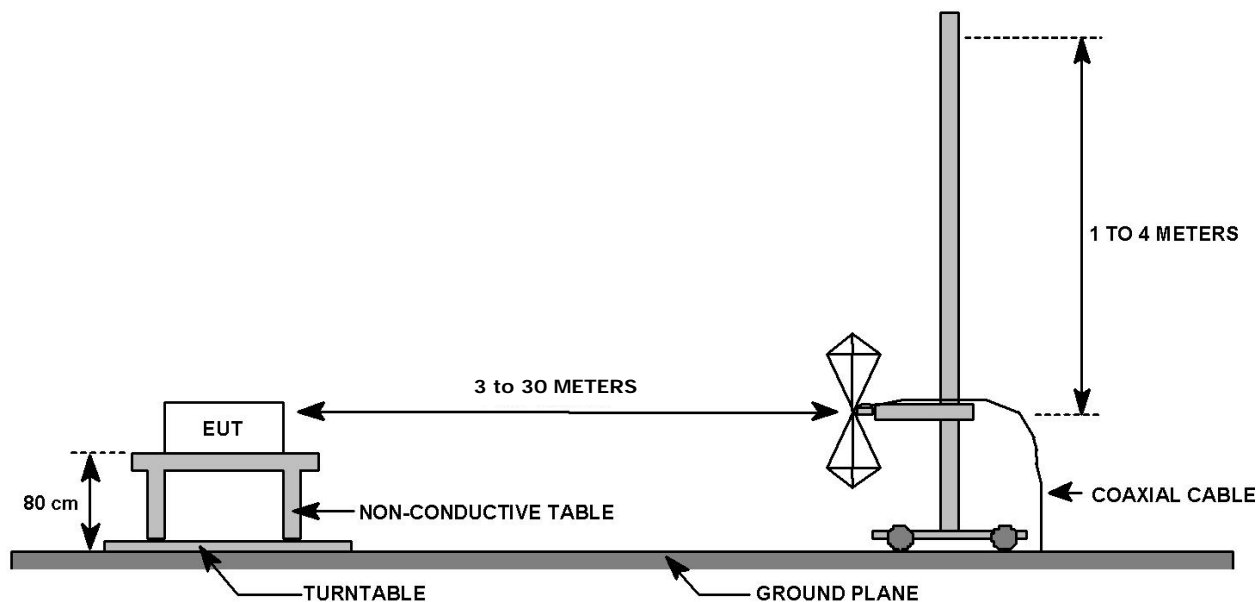


Figure 2.1.1: Radiated Emission Test Setup

2.2 Test Criteria

The maximum average output power is -41.3 dBm for devices operating in the frequency range 3100 - 10600 MHz according to FCC 15.519.

2.3 Test Results

Average power output measurements for the EUT were taken on March 10, 2011, and the EUT was found to be in compliance with applicable requirements.

Table 2.3.1: Radiated Emissions Test Equipment

Asset #	Manufacturer	Model #	Description	Calibration Due
0085	HP	85650A	Quasi-peak Adapter (high band)	July 28, 2011
0949	HP	85662A	Spectrum Analyzer Display (high band)	NCR
1841	HP	8566B	Spectrum Analyzer (high band)	June 8, 2011
0990	HP	85685A	RF Preselector (high band)	March 24, 2011
1281	HP	85650A	Quasi-peak Adapter (low band)	January 20, 2012
1834	HP	85662A	Spectrum Analyzer Display (low band)	NCR
1145	HP	8568B	Spectrum Analyzer (low band)	July 28, 2011
1035	HP	85685A	RF Preselector (low band)	April 3, 2011
1454	HP	8447D	RF Preamplifier	July 06, 2011
1497	Emco	3108	Biconical Antenna	August 4, 2011
1486	Emco	3147	Log Periodic Dipole Array Antenna	August 4, 2011
C026	none	none	Coaxial Cable (low band)	August 02, 2011
C027	none	none	Coaxial Cable (high band)	August 02, 2011

Table 2.3.2: Microwave Radiated Emissions Test Equipment

Asset #	Manufacturer	Model #	Description	Calibration Due
1780	ETS-Lindgren	3117	Ridge Guide Antenna	November 11, 2011
1529	Miteq	Antenna Mounted	Microwave Preamplifier (preamp 1)	July 16, 2011
1841	HP	8566B	Spectrum Analyzer	June 8, 2011
0949	HP	85662A	Spectrum Analyzer Display	NCR
1530	Miteq	None	Microwave Preamplifier (preamp 2)	July 16, 2011
C030	None	None	Coaxial Cable (MRE band)	March 22, 2011

Asset #	Manufacturer	Model #	Description	Calibration Due
XXXX	Pasternack	LLS	2 sections, total 12ft	Cal Before Use
0819	EMCO	3115	Ridge Guide Antenna	October 15, 2011
1594	Miteq	AFS44-00102650	Microwave Preamplifier (preamp 1)	March 2, 2011
(Rental unit)	Rohde & Schwarz	FSQ	Spectrum Analyzer	August 24, 2011
1542	A.H. Systems	SAS 572	Antenna, Horn 18-26.5GHz	NCR
1735	Pasternack	PE9850-20	Antenna, Horn 26.5-40GHz	NCR

Table 2.3.3: Average Power Output Measurement Test Results Data Sheet 1

Project #	Date	Rule	Distance	Antenna	RBW	VBW	Detector
12273-10	March 10, 2011	15.519	1 m	Horn	1 MHz	1 MHz	RMS Avg
COMMENT		Transmitting					

BG 1

Frequency Measured (MHz)	EUT Direction (Degrees)	Antenna Height (Meters)	Recorded Amplitude (dBµV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBµV/m)
3432	0	1	65.8	40.5	31.7	3.5	60.5
3960	0	1	66.4	40.9	32.9	3.5	61.8
4488	0	1	63.3	41.5	32.0	3.9	57.6

BG3

Frequency Measured (MHz)	EUT Direction (Degrees)	Antenna Height (Meters)	Recorded Amplitude (dBµV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBµV/m)
6600	0	1	63.8	43.0	35.6	4.8	61.1
7128	0	1	60.4	42.4	36.4	4.9	59.2
7656	0	1	56.4	42.1	37.2	4.7	56.2

BG 6

Frequency Measured (MHz)	EUT Direction (Degrees)	Antenna Height (Meters)	Recorded Amplitude (dBµV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBµV/m)
3432	0	1	65.8	40.5	31.7	3.5	60.5
3960	0	1	66.4	40.9	32.9	3.5	61.8
4488	0	1	63.3	41.5	32.0	3.9	57.6

Calculations

$$P = \frac{(E * d)^2}{30 * G}$$

P = Power in watts, E = measured maximum field strength in V/m, d = distance in meters, G = numeric gain of transmitting antenna

Distance = 1 meter
Gain = 0 dBi

Table 2.3.4: Average Power Output Measurement Test Results Data Sheet 2

Project #	Date	Rule	Distance	Antenna	RBW	VBW	Detector
12273-10	March 10, 2011	15.519	1 m	Horn	1 MHz	1 MHz	RMS Avg
COMMENT		Transmitting					

Calculated Result BG 3

Frequency (MHz)	Field Strength (dBμV)	E.I.R.P.		Limit (dBm)
		dBm	mW	
3432	60.5	-44.27	.000037	-41.3
3960	61.8	-42.97	.000050	-41.3
4488	57.6	-47.17	.000019	-41.3

Calculated Result BG 3

Frequency (MHz)	Field Strength (dBμV)	E.I.R.P.		Limit (dBm)
		dBm	mW	
6600	61.1	-43.67	.000043	-41.3
7128	59.2	-45.57	.000028	-41.3
7656	56.2	-48.57	.000014	-41.3

Calculated Result BG 3

Frequency (MHz)	Field Strength (dBμV)	E.I.R.P.		Limit (dBm)
		dBm	mW	
7656	59.2	-45.57	.000028	-41.3
8184	59.1	-45.67	.000027	-41.3
8712	60.6	-44.17	.000038	-41.3

3.0 UWB Bandwidth

UWB bandwidth measurements were performed on the EUT to determine compliance with FCC 15.519(b).

3.1 Test Procedure

The UWB bandwidth was measured with a spectrum analyzer connected to a double-ridged guide horn while the EUT was operating in continuous transmit mode at the appropriate center frequency. The analyzer center frequency was set to the EUT carrier frequency. The analyzer was set to a resolution bandwidth of 5 MHz and a video bandwidth of 10 MHz. Measurements were made at the Lower, Middle, and Upper sub-bands within WiMedia Band Groups 1, 3, and 6. Frequency characteristics for WiMedia Band Groups 1, 3, and 6 are shown in the table below. A diagram showing the test setup is given as Figure 2.1.1.

BG	Channel	Ch1	Ch0	F low	F mid	F high
N/A	N/A	0	0	-	-	-
1	1(A)	0	1	3168 MHz	3432 MHz	3696 MHz
	2(B)	1	0	3696 MHz	3960 MHz	4224 MHz
	3(C)	1	1	4224 MHz	4488 MHz	4752 MHz
2	4(A)	0	1	4752 MHz	5016 MHz	5280 MHz
	5(B)	1	0	5280 MHz	5544 MHz	5808 MHz
	6(C)	1	1	5808 MHz	6072 MHz	6336 MHz
3	7(A)	0	1	6336 MHz	6600 MHz	6864 MHz
	8(B)	1	0	6864 MHz	7128 MHz	7392 MHz
	9(C)	1	1	7392 MHz	7656 MHz	7920 MHz
6	9(A)	0	1	7392 MHz	7656 MHz	7920 MHz
	10(B)	1	0	7920 MHz	8184 MHz	8448 MHz
	11(C)	1	1	8448 MHz	8712 MHz	8976 MHz

3.2 Test Criteria

A UWB transmitter is defined as an intentional radiator that, at any point, has a fractional bandwidth equal to or greater than 0.20 or has a UWB bandwidth equal to or greater than 500 MHz, regardless of the fractional bandwidth. The UWB bandwidth is the frequency band bounded by the points that are 10 dB below the highest radiated emission, based on the complete transmission system including the antenna. The upper boundary is designated as f_H , and the lower boundary is designated as f_L . The frequency at which the highest radiated emission occurs is designated as f_M .

Center frequency — The center frequency, f_c , equals $(f_H + f_L)/2$.

Fractional bandwidth — The fractional bandwidth equals $2(f_H - f_L)/(f_H + f_L)$.

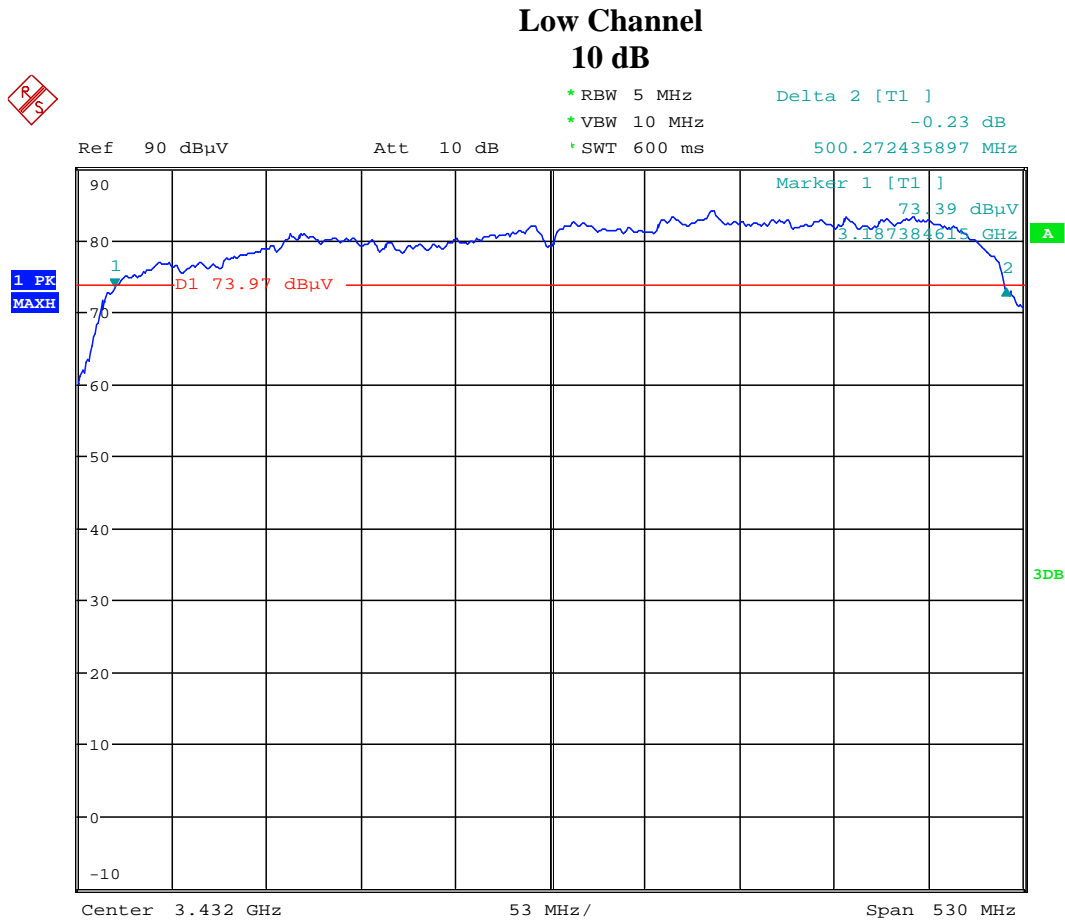
Per section 15.519(b), the UWB bandwidth of a UWB system operating under the provisions of this section must be contained between 3100 MHz and 10600 MHz.

3.3 Test Results

UWB bandwidth measurements were taken on March 10, 2011, and the EUT was found to be in compliance with applicable requirements. Test equipment used to perform this test is given in Tables 2.3.1 and 2.3.2.

Table 3.3.1: UWB Bandwidth Test Results – Low Channel

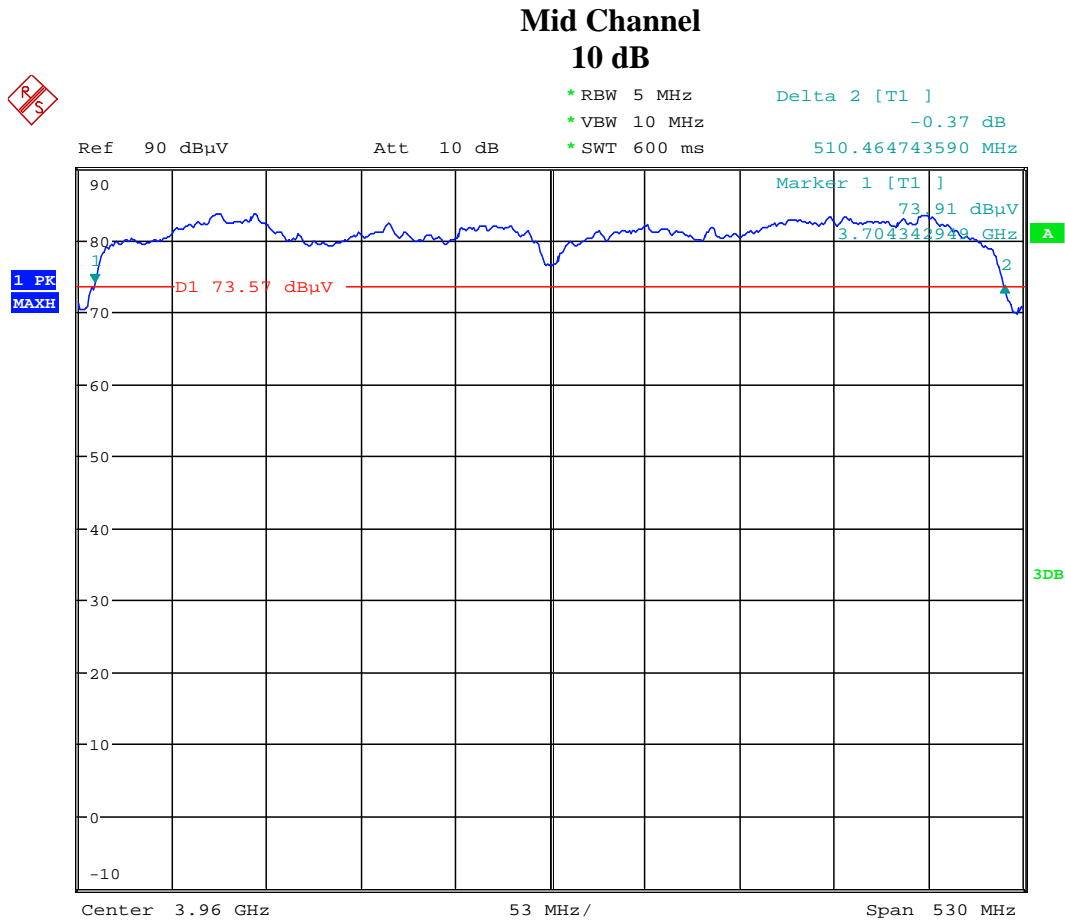
Project #	Date	Rule	Distance	Antenna	RBW	VBW	Detector
12273-10	March 10, 2011	15.519(b)	1 m	Horn	5 MHz	10 MHz	Peak
COMMENT		Transmitting Low Channel BG 1 10 dB Bandwidth – 500.272 MHz					



Result = Pass

Table 3.3.2: UWB Bandwidth Test Results – Middle Channel

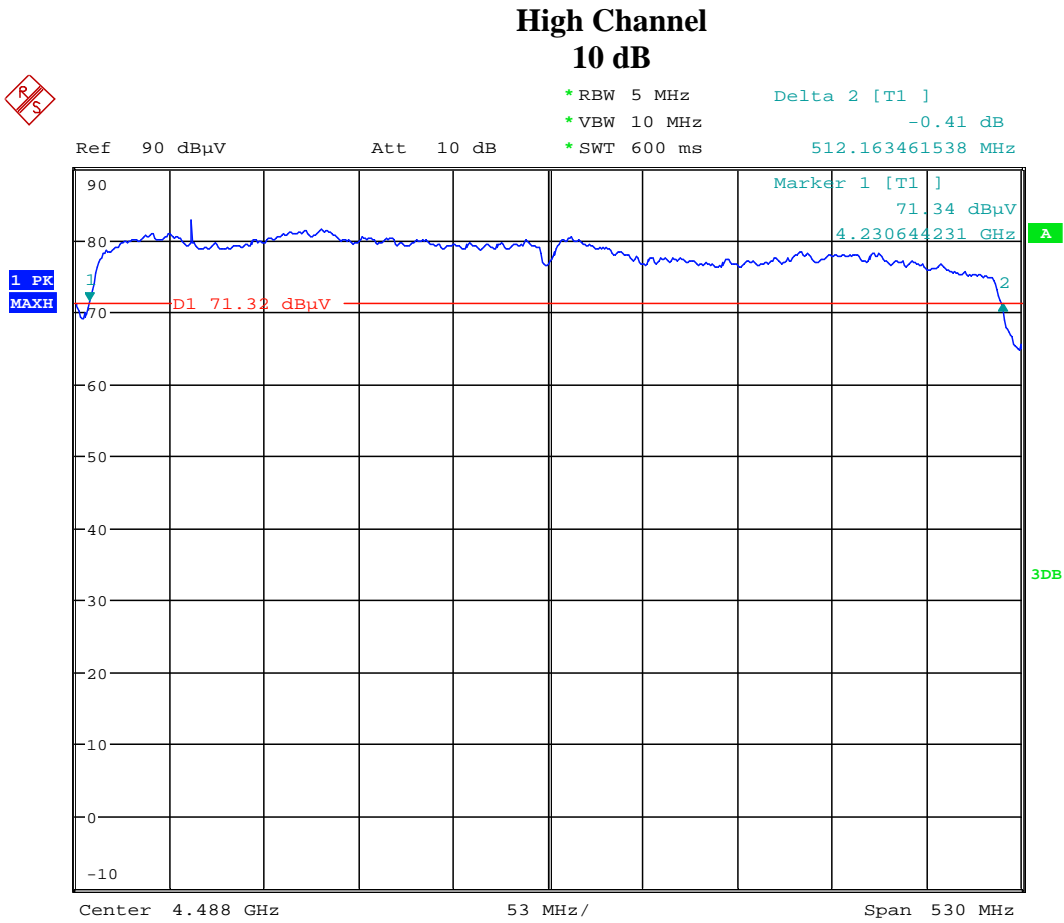
Project #	Date	Rule	Distance	Antenna	RBW	VBW	Detector
12273-10	March 10, 2011	15.519(b)	1 m	Horn	5 MHz	10 MHz	Peak
COMMENT		Transmitting Middle Channel BG 1 10 dB Bandwidth – 510.465 MHz					



Result = Pass

Table 3.3.3: UWB Bandwidth Test Results – High Channel

Project #	Date	Rule	Distance	Antenna	RBW	VBW	Detector
12273-10	March 10, 2011	15.519(b)	1 m	Horn	5 MHz	10 MHz	Peak
COMMENT		Transmitting High Channel BG 1 10 dB Bandwidth – 512.163 MHz					

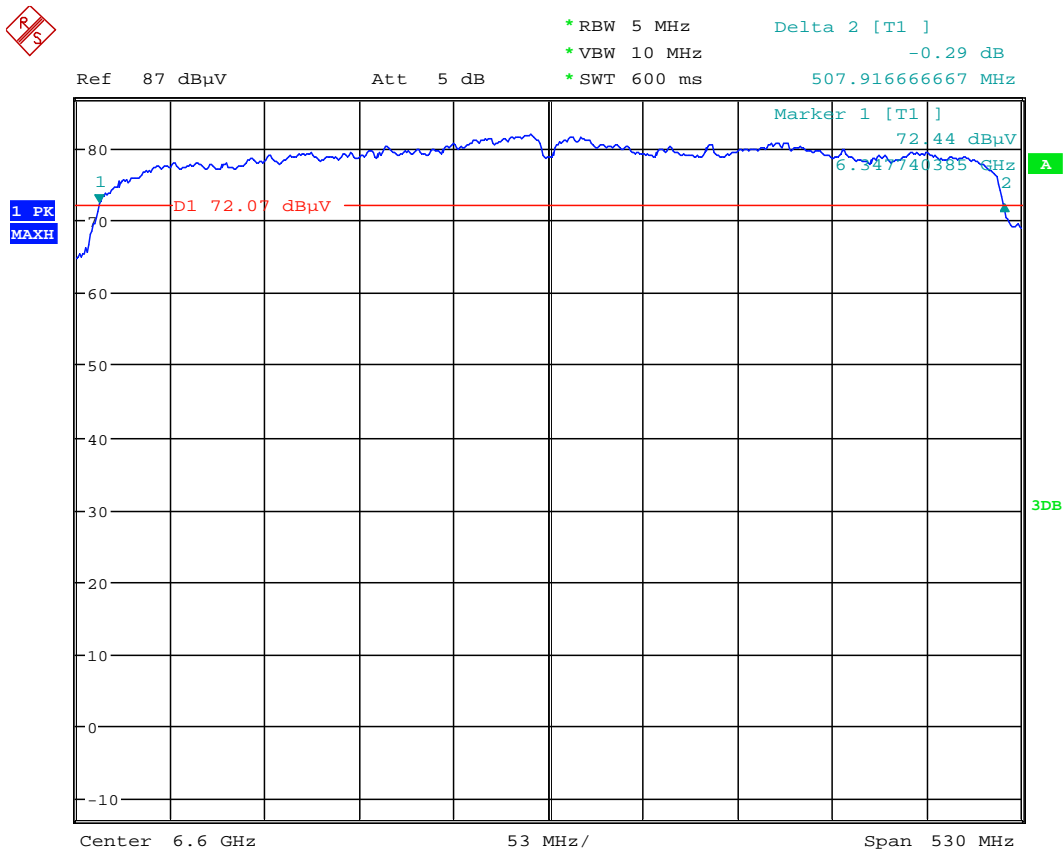


Result = Pass

Table 3.3.4: UWB Bandwidth Test Results – Low Channel

Project #	Date	Rule	Distance	Antenna	RBW	VBW	Detector
12273-10	March 10, 2011	15.519(b)	1 m	Horn	5 MHz	10 MHz	Peak
COMMENT		Transmitting Low Channel BG 3 10 dB Bandwidth – 507.917 MHz					

**Low Channel
10 dB**

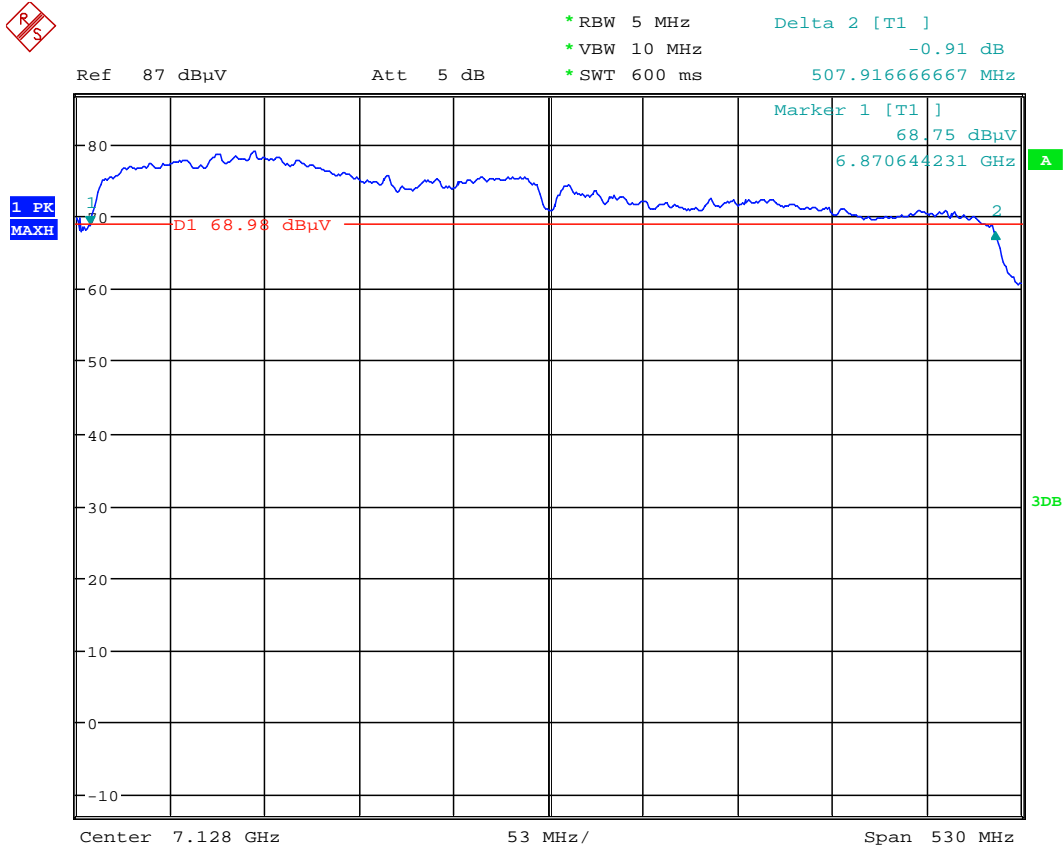


Result = Pass

Table 3.3.5: UWB Bandwidth Test Results – Middle Channel

Project #	Date	Rule	Distance	Antenna	RBW	VBW	Detector
12273-10	March 10, 2011	15.519(b)	1 m	Horn	5 MHz	10 MHz	Peak
COMMENT		Transmitting Mid Channel BG 3 10 dB Bandwidth – 507.917 MHz					

**Mid Channel
10 dB**

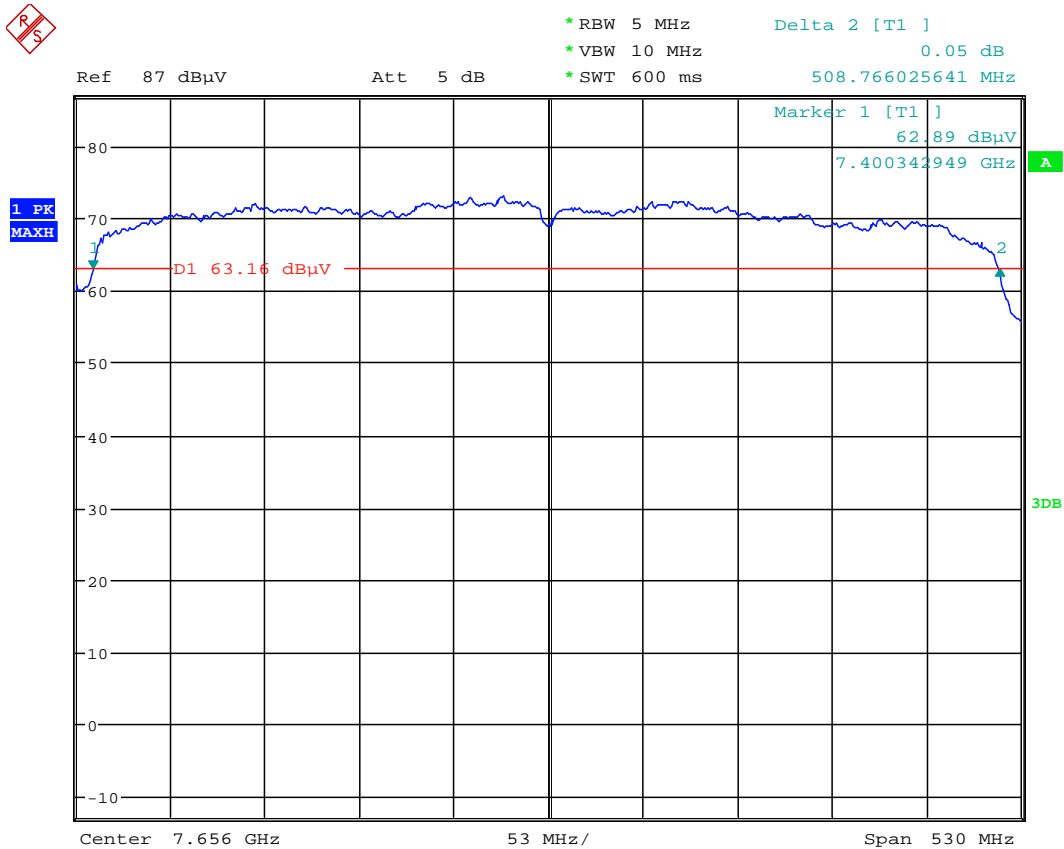


Result = Pass

Table 3.3.6: UWB Bandwidth Test Results – High Channel

Project #	Date	Rule	Distance	Antenna	RBW	VBW	Detector
12273-10	March 10, 2011	15.519(b)	1 m	Horn	5 MHz	10 MHz	Peak
COMMENT		Transmitting High Channel BG 3 10 dB Bandwidth – 508.766 MHz					

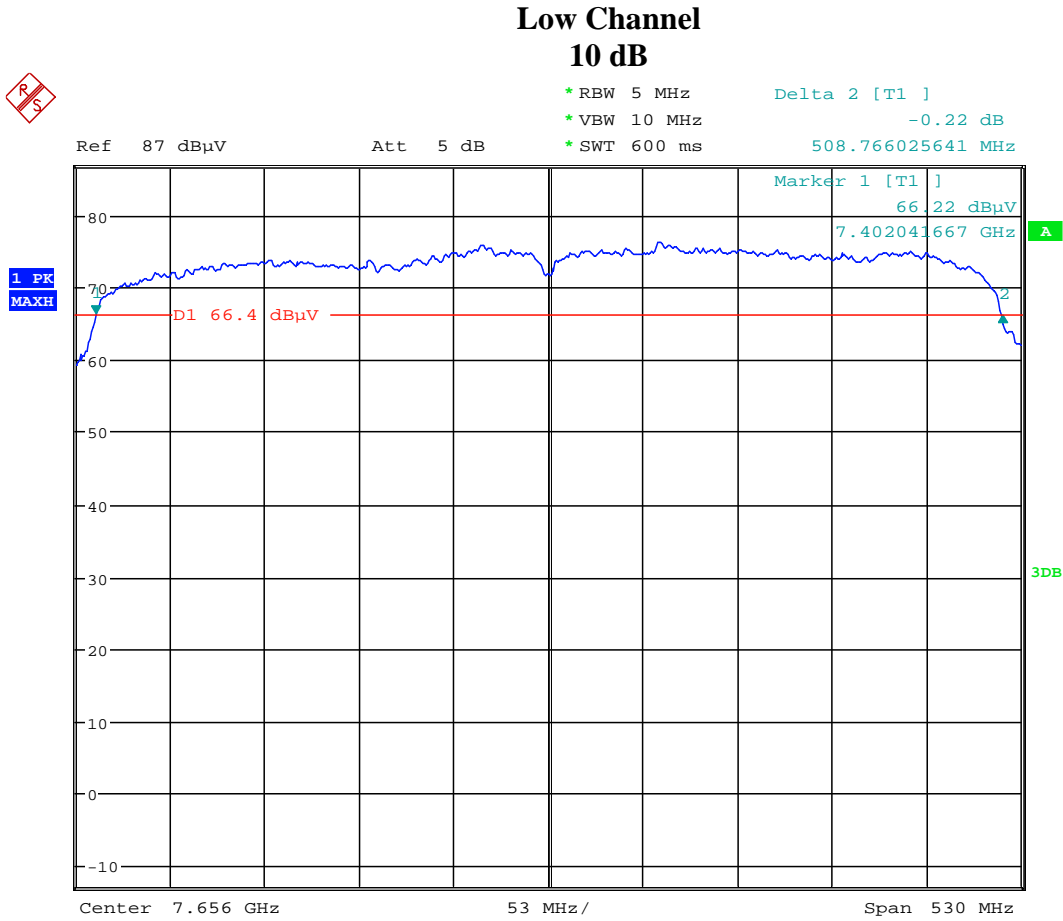
**High Channel
10 dB**



Result = Pass

Table 3.3.7: UWB Bandwidth Test Results – Low Channel

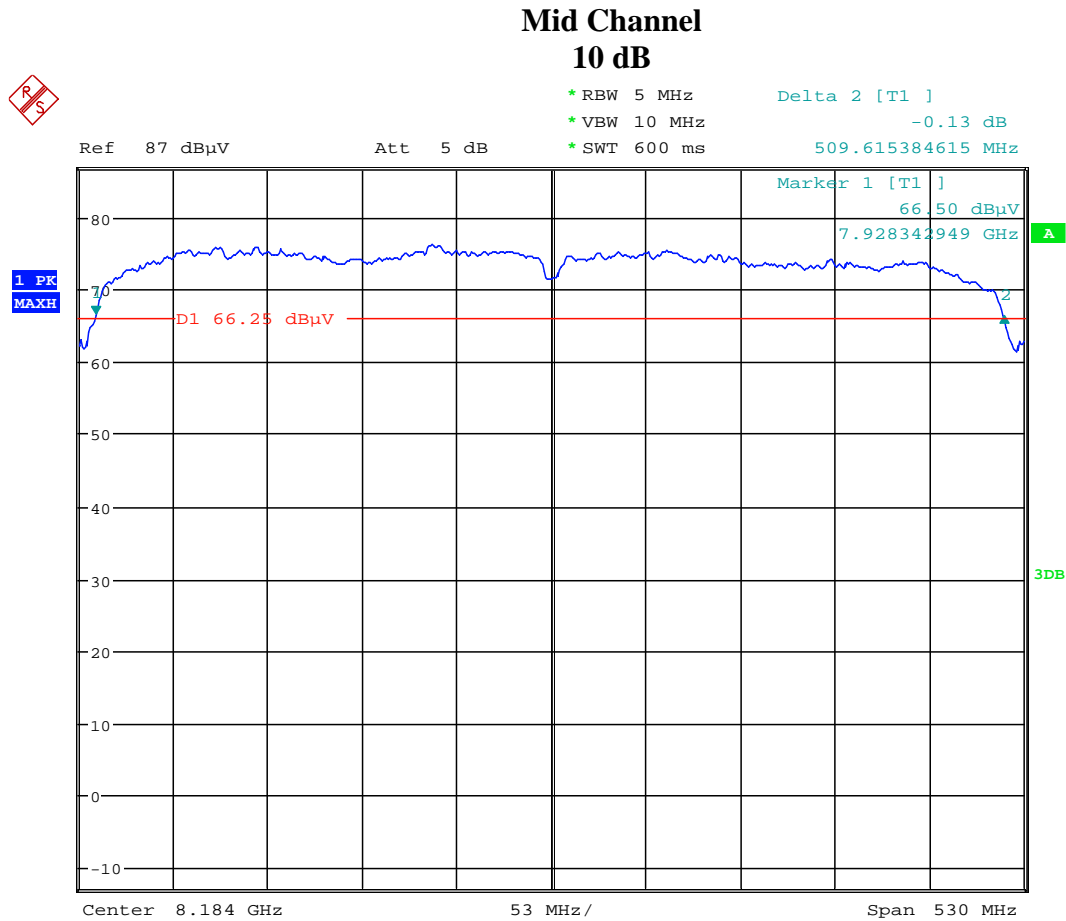
Project #	Date	Rule	Distance	Antenna	RBW	VBW	Detector
12273-10	March 10, 2011	15.519(b)	1 m	Horn	5 MHz	10 MHz	Peak
COMMENT		Transmitting Low Channel BG 6 10 dB Bandwidth – 508.766 MHz					



Result = Pass

Table 3.3.8: UWB Bandwidth Test Results – Middle Channel

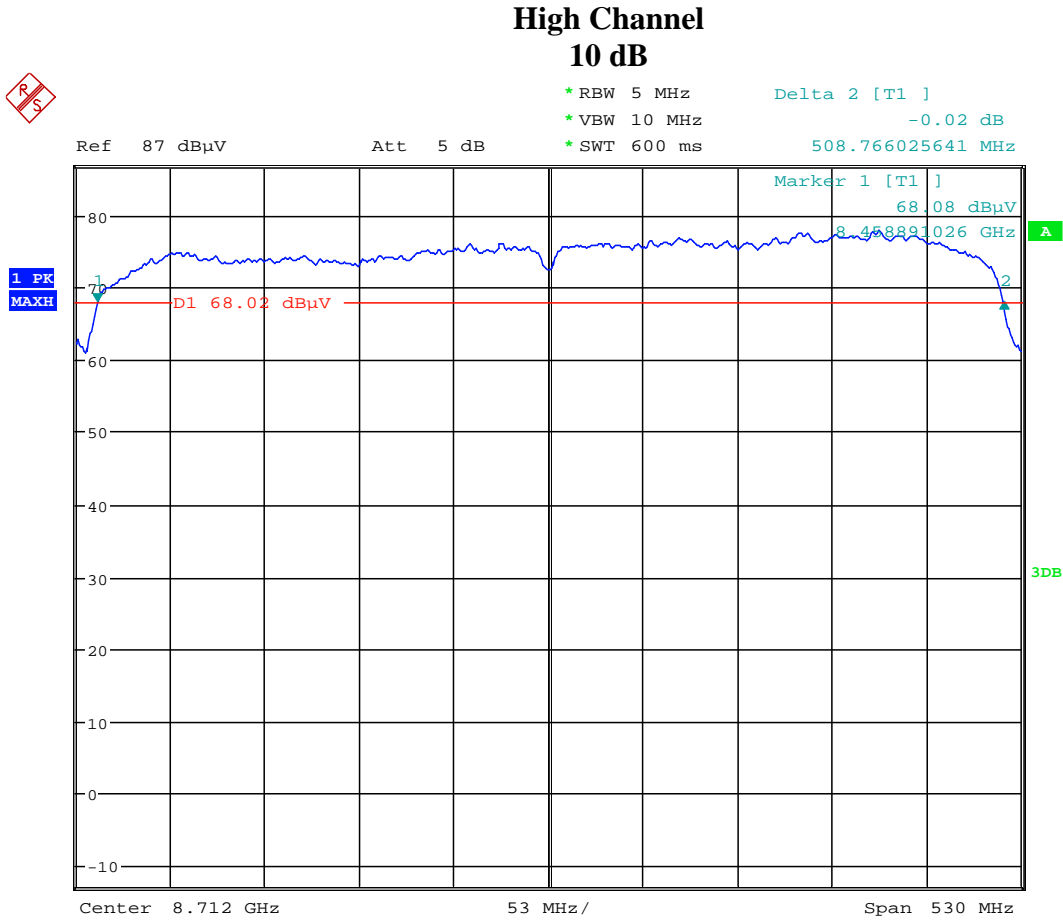
Project #	Date	Rule	Distance	Antenna	RBW	VBW	Detector
12273-10	March 10, 2011	15.519(b)	1 m	Horn	5 MHz	10 MHz	Peak
COMMENT		Transmitting Mid Channel BG 6 10 dB Bandwidth – 509.615 MHz					



Result = Pass

Table 3.3.9: UWB Bandwidth Test Results – High Channel

Project #	Date	Rule	Distance	Antenna	RBW	VBW	Detector
12273-10	March 10, 2011	15.519(b)	1 m	Horn	5 MHz	10 MHz	Peak
COMMENT		Transmitting High Channel BG 6 10 dB Bandwidth – 508.766 MHz					



Result = Pass

4.0 Spurious Radiated Emissions

Spurious radiated emissions measurements were performed on the EUT to determine compliance with FCC 15.209 and 15.519(c).

4.1 Test Procedure

The EUT was placed on a non-conductive table 0.8 meters above the ground plane. The table was centered on a rotating turntable at a distance of 10 meters from the measurement antenna.

For spurious emissions below 1 GHz, quasi-peak detection was used with a resolution bandwidth of 120 kHz. All measurements below 1 GHz were normalized to 3 meters using a 20 dB/decade distance extrapolation. The emissions were maximized by rotating the EUT and raising and lowering the measurement antenna from 1 to 4 meters.

Spurious/harmonic emissions above 1 GHz peak were measured with average and peak detection with a resolution bandwidth of 1 MHz and measured at a distance of 1 meter. Average detection was used to determine compliance of the EUT if the peak did not meet the average limit. Non-harmonic emissions must satisfy the average limit and the peak limit (20 dB above average). A diagram showing the test setup is given as Figure 2.1.1.

Note: Spurious/harmonic emissions above 1 GHz were investigated up to 40 GHz, with no discrepancies observed.

4.2 Test Criteria

The radiated limits of FCC 15.209 are shown below. The limits specified are at 3 meters. The limits are quasi-peak for emissions below 1 GHz and average for emissions above 1 GHz. Also, above 1 GHz, the peak limit is 20 dB above the average limit.

Frequency MHz	Test Distance (Meters)	Field Strength	
		($\mu\text{V/m}$)	($\text{dB}\mu\text{V/m}$)
30 to 88	3	100	40.0
88 to 216	3	150	43.5
216 to 960	3	200	46.0
Above 960	3	500	54.0

The radiated limits of RSS-220 are shown below. The limits specified are at 3 meters.

Frequency MHz	Test Distance (Meters)	Field Strength	
		($\mu\text{V/m}$)	($\text{dB}\mu\text{V/m}$)
960 to 1610	3	-75.3	19.9
1610 to 4750	3	-70.0	25.2
4750 to 10600	3	-41.3	53.9
Above 10600	3	-61.3	33.9

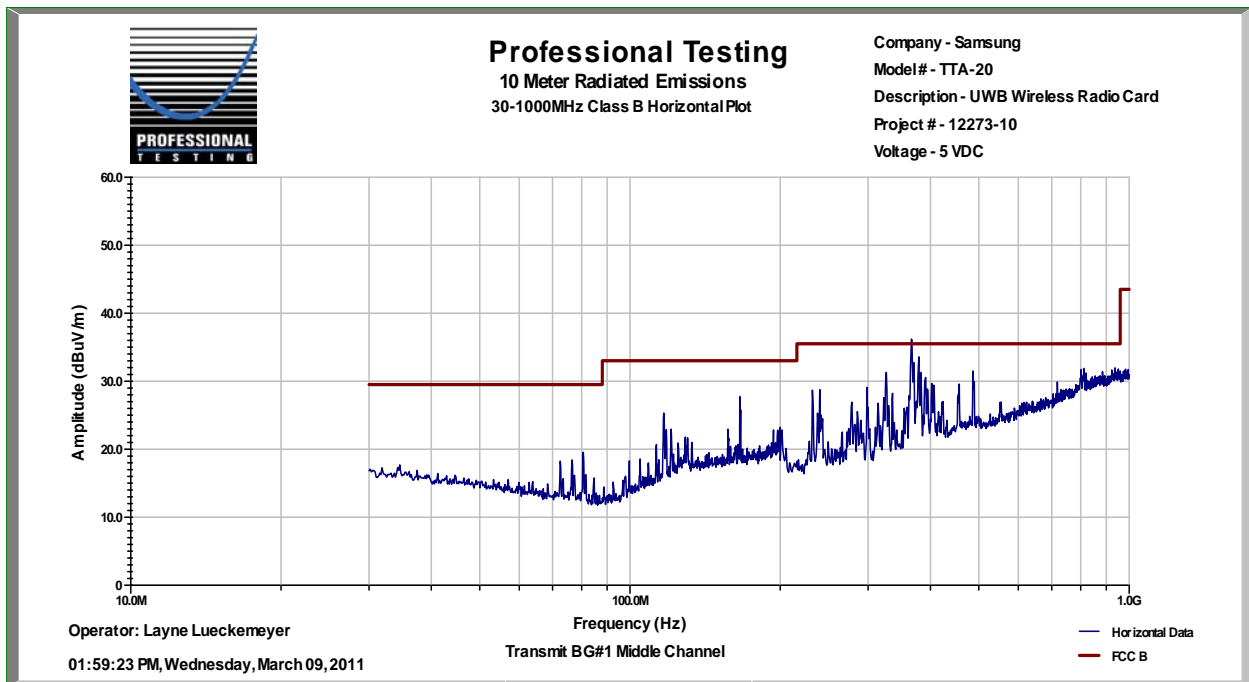
4.3 Test Results

Spurious radiated emissions measurements were taken on March 9-10, 2011; the EUT was found to be in compliance with applicable requirements. Test equipment used to perform these tests is given in Tables 2.3.1 and 2.3.2.

Table 4.3.1: Spurious Emissions Test Results, 30 to 960 MHz, Horizontal Polarization

Project #	Date	Rule	Distance	Antenna	RBW	VBW	Detector
12273-10	March 9, 2011	FCC B	10 m	Bicon Log	CISPR 120 kHz	1 MHz	Quasi-Peak
COMMENT		Transmitting UWB BG 1					

Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBμV)	Corrected Level (dBμV/m)	Limit Level (dBμV/m)	Margin (dB)
76.638	10	179	4	QP	31.4	15.5	29.5	-14.0
116.853	10	74	4	QP	33.8	20.9	33.1	-12.2
240.047	10	259	3.2	QP	43.7	28.4	35.6	-7.2
325.8	10	134	2.6	QP	40.4	27.8	35.6	-7.8
366.01	10	287	2	QP	42.9	31.6	35.6	-4.0
490.02	10	344	1.4	QP	34.7	26.9	35.6	-8.7



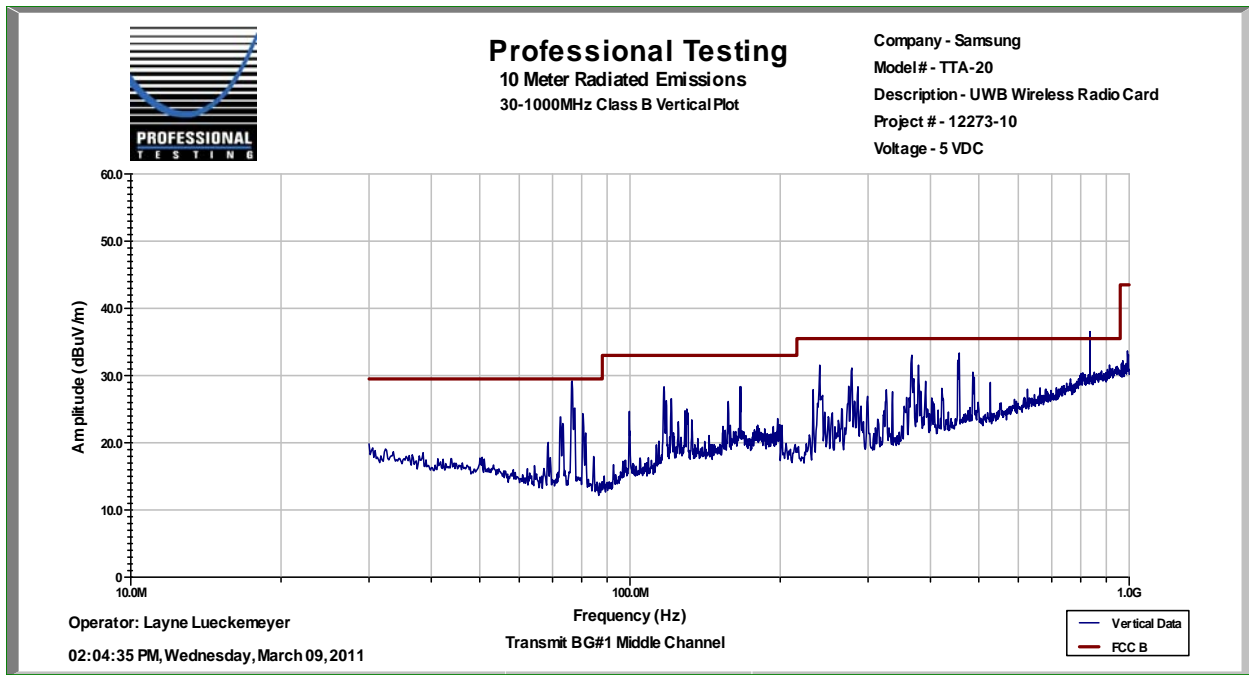
Result = Pass

NOTE: Pre-scans were performed from 30 MHz to 960 MHz in BG3 and BG6 and were shown to be typical of the results in BG1.

Table 4.3.2 Spurious Emissions Test Results, 30 to 960 MHz, Vertical Polarization

Project #	Date	Rule	Distance	Antenna	RBW	VBW	Detector
12273-10	March 9, 2011	FCC B	10 m	Bicon Log	CISPR 120 kHz	1 MHz	Quasi-Peak
COMMENT		Transmitting UWB BG 1					

Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBμV)	Corrected Level (dBμV/m)	Limit Level (dBμV/m)	Margin (dB)
76.638	10	81	1.6	QP	43.2	27.3	29.5	-2.2
99.7	10	95	1.6	QP	26.7	11.5	33.1	-21.6
116.853	10	116	1	QP	39.6	26.7	33.1	-6.4
240.047	10	170	1	QP	46.5	31.2	35.6	-4.4
366.01	10	349	1	QP	40.7	29.4	35.6	-6.2
835.2	10	1	1	QP	24.4	22.9	35.6	-12.7



Result = Pass

NOTE: Pre-scans were performed from 30 MHz to 960 MHz in BG3 and BG6 and were shown to be typical of the results in BG1.

Table 4.3.3: Spurious/Harmonic Emissions Test Results, 1 to 40 GHz, Horizontal and Vertical Polarizations – Low Channel

Project #	Date	Rule	Distance	Antenna	RBW	VBW	Detector
12273-10	March 10, 2011	FCC B	1 m	Horn	1 MHz	1 MHz	Peak
COMMENT		Transmitting Low Channel BG 1 Investigated up to 40 GHz. Harmonics from 26.5 to 40 GHz were measured at a distance of 0.3 meters to improve the measurement system’s noise floor. The limit was converted to account for the 0.3 meter distance.					

Horizontal

Frequency (GHz)	EUT Direction (degrees)	Antenna Elevation (Meters)	Recorded Level (dBµV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBµV /m)	Limit (dBµV /m)	Margin (dB)	Detector Function
6.864	Noise	Floor	37.6	43.1	36.7	4.6	35.8	63.4	-27.6	Peak
10.296	Noise	Floor	34.8	38.4	38.8	6.6	41.8	63.4	-21.6	Peak
13.728	Noise	Floor	38.3	39.5	41.5	6.8	47.1	53.4	-6.3	Peak
17.16	Noise	Floor	36.5	41.4	43.8	8.4	47.3	53.4	-6.1	Peak
20.592	Noise	Floor	33.1	43.9	37.1	9.0	35.3	53.4	-18.1	Peak

Vertical

Frequency (GHz)	EUT Direction (degrees)	Antenna Elevation (Meters)	Recorded Level (dBµV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBµV /m)	Limit (dBµV /m)	Margin (dB)	Detector Function
6.864	Noise	Floor	37.6	43.1	36.7	4.6	35.8	63.4	-27.6	Peak
10.296	Noise	Floor	34.8	38.4	38.8	6.6	41.8	63.4	-21.6	Peak
13.728	Noise	Floor	38.3	39.5	41.5	6.8	47.1	53.4	-6.3	Peak
17.16	Noise	Floor	36.5	41.4	43.8	8.4	47.3	53.4	-6.1	Peak
20.592	Noise	Floor	33.1	43.9	37.1	9.0	35.3	53.4	-18.1	Peak

Result = Pass

Table 4.3.4: Spurious/Harmonic Emissions Test Results, 1 to 40 GHz, Horizontal and Vertical Polarizations – Mid Channel

Project #	Date	Rule	Distance	Antenna	RBW	VBW	Detector
12273-10	March 10, 2011	FCC B	1 m	Horn	1 MHz	1 MHz	Peak
COMMENT		Transmitting Mid Channel BG 1 Investigated up to 40 GHz. Harmonics from 26.5 to 40 GHz were measured at a distance of 0.3 meters to improve the measurement system’s noise floor. The limit was converted to account for the 0.3 meter distance.					

Horizontal

Frequency (GHz)	EUT Direction (degrees)	Antenna Elevation (Meters)	Recorded Level (dBµV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector Function
7.92	Noise	Floor	36.2	42.1	37.0	4.9	35.9	63.4	-27.5	Peak
11.88	Noise	Floor	36.7	37.1	40.2	6.1	45.9	53.4	-7.5	Peak
15.84	Noise	Floor	38.3	39.6	38.0	7.4	44.2	53.4	-9.2	Peak
19.8	Noise	Floor	34.3	43.7	36.5	8.2	35.4	53.4	-18.0	Peak
23.76	Noise	Floor	32.6	41.8	37.1	10.8	38.8	53.4	-14.6	Peak

Vertical

Frequency (GHz)	EUT Direction (degrees)	Antenna Elevation (Meters)	Recorded Level (dBµV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector Function
7.92	Noise	Floor	36.2	42.1	37.0	4.9	35.9	63.4	-27.5	Peak
11.88	Noise	Floor	36.7	37.1	40.2	6.1	45.9	53.4	-7.5	Peak
15.84	Noise	Floor	38.3	39.6	38.0	7.4	44.2	53.4	-9.2	Peak
19.8	Noise	Floor	34.3	43.7	36.5	8.2	35.4	53.4	-18.0	Peak
23.76	Noise	Floor	32.6	41.8	37.1	10.8	38.8	53.4	-14.6	Peak

Result = Pass

Table 4.3.5: Spurious/Harmonic Emissions Test Results, 1 to 40 GHz, Horizontal and Vertical Polarizations – High Channel

Project #	Date	Rule	Distance	Antenna	RBW	VBW	Detector
12273-10	March 10, 2011	FCC B	1 m	Horn	1 MHz	1 MHz	Peak
COMMENT		Transmitting High Channel BG 1 Investigated up to 40 GHz. Harmonics from 26.5 to 40 GHz were measured at a distance of 0.3 meters to improve the measurement system’s noise floor. The limit was converted to account for the 0.3 meter distance.					

Horizontal

Frequency (GHz)	EUT Direction (degrees)	Antenna Elevation (Meters)	Recorded Level (dBµV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector Function
8.976	noise	floor	34.9	40.5	37.6	4.9	36.9	63.4	-26.5	Peak
13.464	noise	floor	38.1	38.6	41.4	7.0	47.9	53.4	-5.5	Peak
17.952	noise	floor	35.6	42.7	46.8	9.0	48.7	53.4	-4.7	Peak
22.44	noise	floor	32	40.5	37.1	9.4	38.0	53.4	-15.4	Peak
26.928	noise	floor	40.4	41.3	37	9.0	45.1	62.9	-17.8	Peak

Vertical

Frequency (GHz)	EUT Direction (degrees)	Antenna Elevation (Meters)	Recorded Level (dBµV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector Function
8.976	noise	floor	34.9	40.5	37.6	4.9	36.9	63.4	-26.5	Peak
13.464	noise	floor	38.1	38.6	41.4	7.0	47.9	53.4	-5.5	Peak
17.952	noise	floor	35.6	42.7	46.8	9.0	48.7	53.4	-4.7	Peak
22.44	noise	floor	32	40.5	37.1	9.4	38.0	53.4	-15.4	Peak
26.928	noise	floor	40.4	41.3	37	9.0	45.1	62.9	-17.8	Peak

Result = Pass

Table 4.3.6: Spurious/Harmonic Emissions Test Results, 1 to 40 GHz, Horizontal and Vertical Polarizations – Low Channel

Project #	Date	Rule	Distance	Antenna	RBW	VBW	Detector
12273-10	March 10, 2011	FCC B	1 m	Horn	1 MHz	1 MHz	Peak
COMMENT		Transmitting Low Channel BG 3 Investigated up to 40 GHz. Harmonics from 26.5 to 40 GHz were measured at a distance of 0.3 meters to improve the measurement system's noise floor. The limit was converted to account for the 0.3 meter distance.					

Horizontal Polarization

Frequency Measured (MHz)	EUT Direction (Degrees)	Antenna Height (Meters)	Recorded Level (dBµV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBµV/m)	Limit Level (dBµV/m)	Margin (dB)	Detector Function
13.2	Noise	Floor	38.6	39.0	40.7	7.1	47.4	53.4	-6.0	Peak
19.8	Noise	Floor	35.1	43.7	36.5	8.2	36.2	53.4	-17.2	Peak
26.4	Noise	Floor	35.9	41.3	37.1	9.4	41.1	53.4	-12.3	Peak
33	Noise	Floor	37.6	41.3	37.1	9.4	42.8	62.9	-20.1	Peak
39.6	Noise	Floor	47.8	41.3	37.1	9.4	53	62.9	-9.9	Peak

Vertical Polarization

Frequency Measured (MHz)	EUT Direction (Degrees)	Antenna Height (Meters)	Recorded Level (dBµV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBµV/m)	Limit Level (dBµV/m)	Margin (dB)	Detector Function
13.2	Noise	Floor	38.6	39.0	40.7	7.1	47.4	53.4	-6.0	Peak
19.8	Noise	Floor	35.1	43.7	36.5	8.2	36.2	53.4	-17.2	Peak
26.4	Noise	Floor	35.9	41.3	37.1	9.4	41.1	53.4	-12.3	Peak
33	Noise	Floor	37.6	41.3	37.1	9.4	42.8	62.9	-20.1	Peak
39.6	Noise	Floor	47.8	41.3	37.1	9.4	53	62.9	-9.9	Peak

Result = Pass

Table 4.3.7: Spurious/Harmonic Emissions Test Results, 1 to 40 GHz, Horizontal and Vertical Polarizations – Middle Channel

Project #	Date	Rule	Distance	Antenna	RBW	VBW	Detector
12273-10	March 10, 2011	FCC B	1 m	Horn	1 MHz	1 MHz	Peak
COMMENT		Transmitting Mid Channel BG 3 Investigated up to 40 GHz. Harmonics from 26.5 to 40 GHz were measured at a distance of 0.3 meters to improve the measurement system’s noise floor. The limit was converted to account for the 0.3 meter distance.					

Horizontal Polarization

Frequency Measured (MHz)	EUT Direction (Degrees)	Antenna Height (Meters)	Recorded Level (dBµV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBµV/m)	Limit Level (dBµV/m)	Margin (dB)	Detector Function
14.256	Noise	Floor	38.1	39.5	42.4	6.2	47.2	53.4	-6.2	Peak
21.384	Noise	Floor	33.5	43.1	36.9	9.9	37.2	53.4	-16.2	Peak
28.512	Noise	Floor	39.1	41.3	37.1	9.4	44.3	62.9	-18.6	Peak
35.64	Noise	Floor	41.4	41.3	37.1	9.4	46.6	62.9	-18.3	Peak

Vertical Polarization

Frequency Measured (MHz)	EUT Direction (Degrees)	Antenna Height (Meters)	Recorded Level (dBµV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBµV/m)	Limit Level (dBµV/m)	Margin (dB)	Detector Function
14.256	Noise	Floor	38.1	39.5	42.4	6.2	47.2	53.4	-6.2	Peak
21.384	Noise	Floor	33.5	43.1	36.9	9.9	37.2	53.4	-16.2	Peak
28.512	Noise	Floor	39.1	41.3	37.1	9.4	44.3	62.9	-18.6	Peak
35.64	Noise	Floor	41.4	41.3	37.1	9.4	46.6	62.9	-18.3	Peak

Result = Pass

Table 4.3.8: Spurious/Harmonic Emissions Test Results, 1 to 40 GHz, Horizontal and Vertical Polarizations – High Channel

Project #	Date	Rule	Distance	Antenna	RBW	VBW	Detector
12273-10	March 10, 2011	FCC B	1 m	Horn	1 MHz	1 MHz	Peak
COMMENT		Transmitting High Channel BG 3 Investigated up to 40 GHz. Harmonics from 26.5 to 40 GHz were measured at a distance of 0.3 meters to improve the measurement system’s noise floor. The limit was converted to account for the 0.3 meter distance.					

Horizontal Polarization

Frequency Measured (MHz)	EUT Direction (Degrees)	Antenna Height (Meters)	Recorded Level (dBµV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBµV/m)	Limit Level (dBµV/m)	Margin (dB)	Detector Function
15.312	Noise	Floor	37.8	39.6	39.3	7.3	44.8	53.4	-8.6	Peak
22.968	Noise	Floor	33.9	40.7	37.0	10.1	40.4	53.4	-13.0	Peak
30.624	Noise	Floor	39.3	41.3	37.1	9.4	44.5	62.9	-18.4	Peak
38.28	Noise	Floor	45.6	41.3	37.1	9.4	50.8	62.9	-12.1	Peak

Vertical Polarization

Frequency Measured (MHz)	EUT Direction (Degrees)	Antenna Height (Meters)	Recorded Level (dBµV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBµV/m)	Limit Level (dBµV/m)	Margin (dB)	Detector Function
15.312	Noise	Floor	37.8	39.6	39.3	7.3	44.8	53.4	-8.6	Peak
22.968	Noise	Floor	33.9	40.7	37.0	10.1	40.4	53.4	-13.0	Peak
30.624	Noise	Floor	39.3	41.3	37.1	9.4	44.5	62.9	-18.4	Peak
38.28	Noise	Floor	45.6	41.3	37.1	9.4	50.8	62.9	-12.1	Peak

Result = Pass

Table 4.3.9: Spurious/Harmonic Emissions Test Results, 1 to 40 GHz, Horizontal and Vertical Polarizations – Low Channel

Project #	Date	Rule	Distance	Antenna	RBW	VBW	Detector
12273-10	March 10, 2011	FCC B	1 m	Horn	1 MHz	1 MHz	Peak
COMMENT		Transmitting Low Channel BG 6 Investigated up to 40 GHz. Harmonics from 26.5 to 40 GHz were measured at a distance of 0.3 meters to improve the measurement system's noise floor. The limit was converted to account for the 0.3 meter distance.					

Horizontal

Frequency (GHz)	EUT Direction (degrees)	Antenna Elevation (Meters)	Recorded Level (dBµV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector Function
15.312	Noise	Floor	37.6	39.6	39.3	7.3	44.6	53.4	-8.8	Peak
22.968	Noise	Floor	33.9	40.6	37.0	10.1	40.4	62.9	-22.5	Peak
30.624	Noise	Floor	38.5	41.3	37.1	9.4	43.7	62.9	-19.2	Peak
38.28	Noise	Floor	47.1	41.3	37.1	9.4	52.3	62.9	-10.6	Peak

Vertical

Frequency (GHz)	EUT Direction (degrees)	Antenna Elevation (Meters)	Recorded Level (dBµV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector Function
15.312	Noise	Floor	37.6	39.6	39.3	7.3	44.6	53.4	-8.8	Peak
22.968	Noise	Floor	33.9	40.6	37.0	10.1	40.4	62.9	-22.5	Peak
30.624	Noise	Floor	38.5	41.3	37.1	9.4	43.7	62.9	-19.2	Peak
38.28	Noise	Floor	47.1	41.3	37.1	9.4	52.3	62.9	-10.6	Peak

Result = Pass

Table 4.3.10: Spurious/Harmonic Emissions Test Results, 1 to 40 GHz, Horizontal and Vertical Polarizations – Mid Channel

Project #	Date	Rule	Distance	Antenna	RBW	VBW	Detector
12273-10	March 10, 2011	FCC B	1 m	Horn	1 MHz	1 MHz	Peak
COMMENT		Transmitting Mid Channel BG 6 Investigated up to 40 GHz. Harmonics from 26.5 to 40 GHz were measured at a distance of 0.3 meters to improve the measurement system's noise floor. The limit was converted to account for the 0.3 meter distance.					

Horizontal

Frequency (GHz)	EUT Direction (degrees)	Antenna Elevation (Meters)	Recorded Level (dBµV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBµV /m)	Limit (dBµV /m)	Margin (dB)	Detector Function
16.368	Noise	Floor	35.4	40.2	38.8	8.0	41.9	53.4	-11.5	Peak
24.552	Noise	Floor	34.9	42.1	37.2	9.8	39.8	53.4	-13.6	Peak
32.736	Noise	Floor	39.3	41.3	37.1	9.4	44.5	62.9	-18.4	Peak

Vertical

Frequency (GHz)	EUT Direction (degrees)	Antenna Elevation (Meters)	Recorded Level (dBµV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBµV /m)	Limit (dBµV /m)	Margin (dB)	Detector Function
16.368	Noise	Floor	35.4	40.2	38.8	8.0	41.9	53.4	-11.5	Peak
24.552	Noise	Floor	34.9	42.1	37.2	9.8	39.8	53.4	-13.6	Peak
32.736	Noise	Floor	39.3	41.3	37.1	9.4	44.5	62.9	-18.4	Peak

Result = Pass

Table 4.3.11: Spurious/Harmonic Emissions Test Results, 1 to 40 GHz, Horizontal and Vertical Polarizations – High Channel

Project #	Date	Rule	Distance	Antenna	RBW	VBW	Detector
12273-10	March 10, 2011	FCC B	1 m	Horn	1 MHz	1 MHz	Peak
COMMENT		Transmitting High Channel BG 6 Investigated up to 40 GHz. Harmonics from 26.5 to 40 GHz were measured at a distance of 0.3 meters to improve the measurement system's noise floor. The limit was converted to account for the 0.3 meter distance.					

Horizontal

Frequency (GHz)	EUT Direction (degrees)	Antenna Elevation (Meters)	Recorded Level (dBµV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector Function
17.424	Noise	Floor	35.1	41.5	44.6	8.7	46.8	53.4	-6.6	Peak
26.136	Noise	Floor	36.4	40.7	37.4	9.3	42.3	53.4	-11.1	Peak
34.848	Noise	Floor	42.7	41.3	37.1	9.4	47.9	62.9	-15	Peak

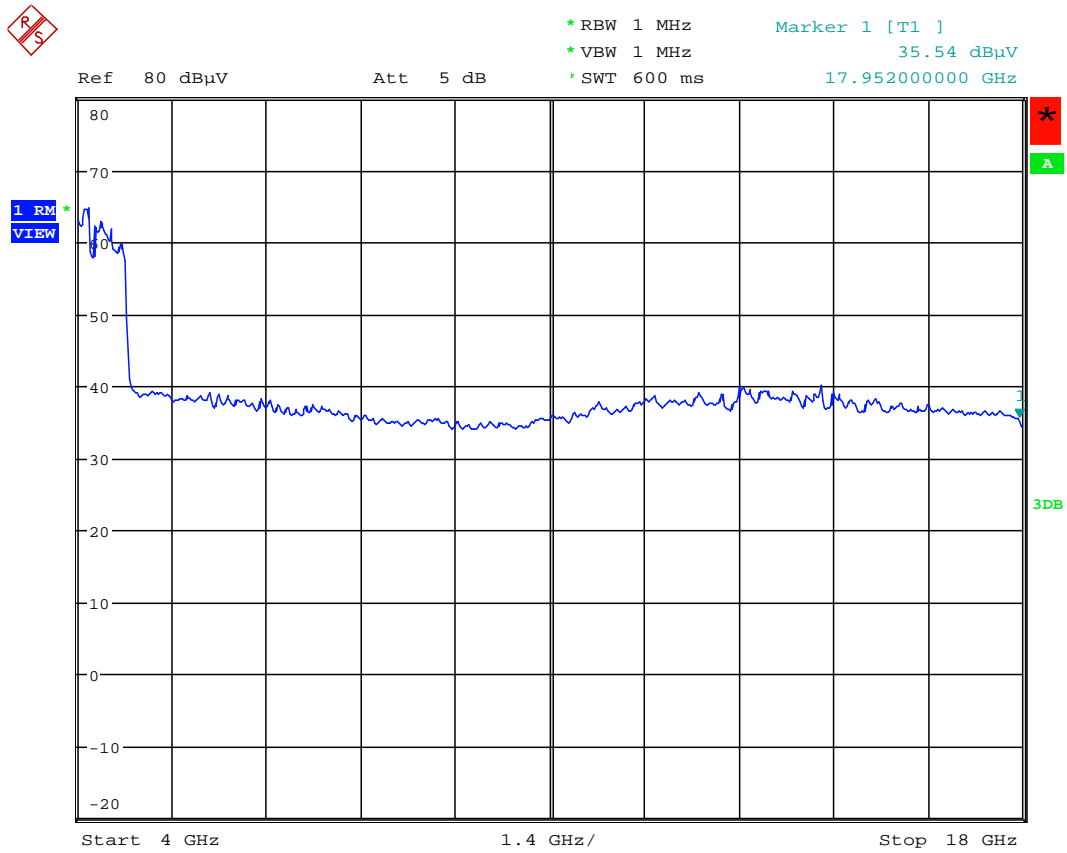
Vertical

Frequency (GHz)	EUT Direction (degrees)	Antenna Elevation (Meters)	Recorded Level (dBµV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector Function
17.424	Noise	Floor	35.1	41.5	44.6	8.7	46.8	53.4	-6.6	Peak
26.136	Noise	Floor	36.4	40.7	37.4	9.3	42.3	53.4	-11.1	Peak
34.848	Noise	Floor	42.7	41.3	37.1	9.4	47.9	62.9	-15	Peak

Result = Pass

Table 4.3.12: Spurious/Harmonic Emissions Test Results, 1 to 40 GHz, Plots – Sheet 1

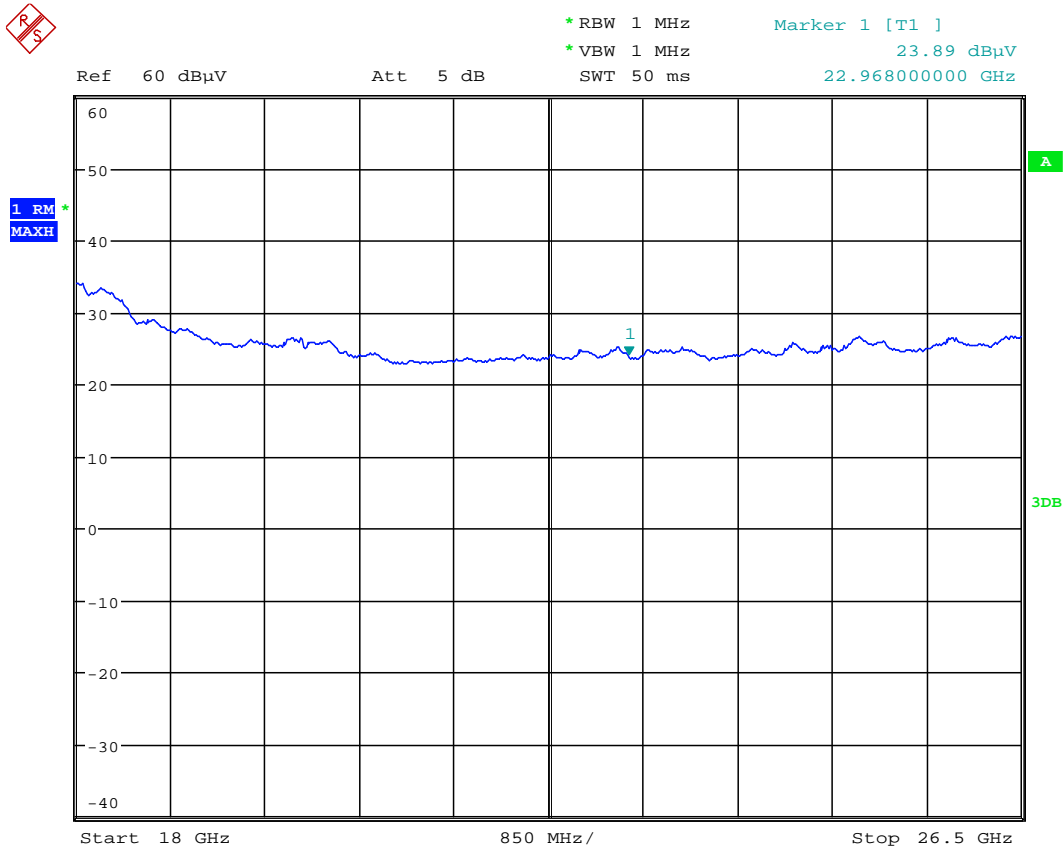
Project #	Date	Rule	Distance	Antenna	RBW	VBW	Detector
12273-10	March 10, 2011	FCC B	1 m	Horn	1 MHz	1 MHz	Peak
COMMENT		4 to 18 GHz					



Result = Pass

Table 4.3.13: Spurious/Harmonic Emissions Test Results, 1 to 40 GHz, Plots – Sheet 2

Project #	Date	Rule	Distance	Antenna	RBW	VBW	Detector
12273-10	March 10, 2011	FCC B	1 m	Horn	1 MHz	1 MHz	Peak
COMMENT		18 to 26.5 GHz					



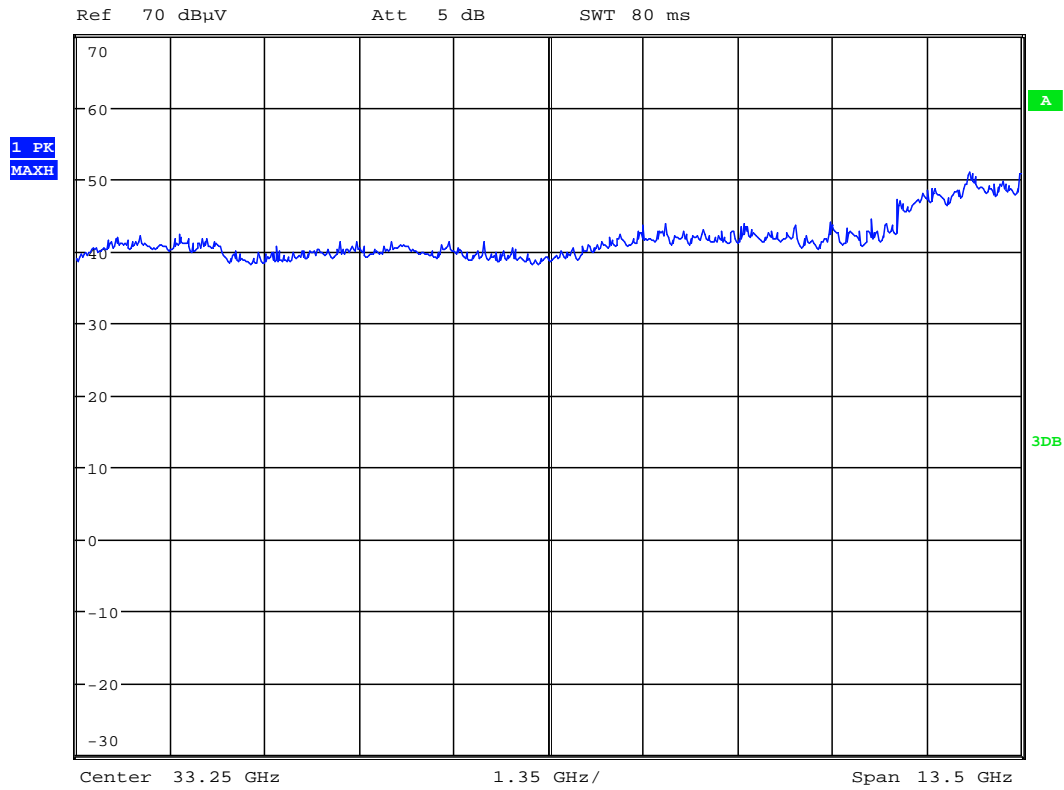
Result = Pass

Table 4.3.14: Spurious/Harmonic Emissions Test Results, 1 to 40 GHz, Plots – Sheet 3

Project #	Date	Rule	Distance	Antenna	RBW	VBW	Detector
12273-10	March 10, 2011	FCC B	1 m	Horn	1 MHz	1 MHz	Peak
COMMENT		26.5 to 40 GHz					



* RBW 1 MHz
 * VBW 1 MHz
 SWT 80 ms



Result = Pass

5.0 Radiated Emissions in GPS Bands

Radiated emissions measurements were performed on the EUT to determine compliance with FCC 15.519(d)

5.1 Test Procedure

The EUT was placed on a non-conductive table 0.8 meters above the ground plane. The table was centered on a rotating turntable at a distance of 3 meters from the measurement antenna.

The measurements made over the frequency range of 1164 MHz to 1240 MHz, and from 1559 MHz to 1610 MHz were maximized using a spectrum analyzer with RMS detector capabilities. A RBW of 1 kHz and VBW of 1 kHz with a suitable averaging time were used for these measurements. A diagram showing the test setup is given as Figure 2.1.1.

5.2 Test Criteria

In addition to the radiated emission limits specified in the table below, UWB transmitters operating under the provisions this section shall not exceed the following average limits when measured using a resolution bandwidth of no less than 1 kHz.

Frequency MHz	Test Distance (Meters)	Field Strength	
		($\mu\text{V/m}$)	(dB $\mu\text{V/m}$)
1164 to 1240	3	-85.3	9.9
1559 to 1610	3	-85.3	9.9

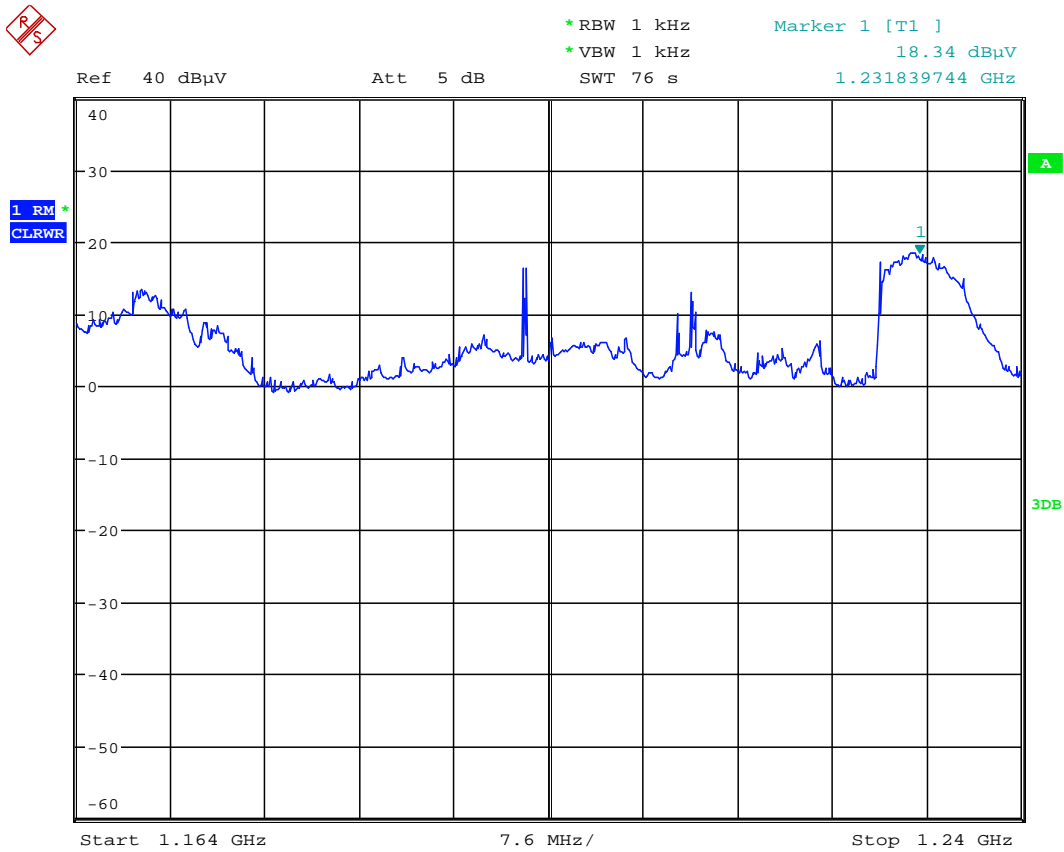
5.3 Test Results

Radiated emissions in GPS bands measurements were taken on March 10, 2011, and the EUT was found to be in compliance with applicable requirements. Test equipment used to perform these tests is given in Tables 2.3.1 and 2.3.2.

Table 5.3.1: Radiated Emissions in GPS Bands Test Results, 1164 to 1240 MHz

Project #	Date	Rule	Distance	Antenna	RBW	VBW	Detector
12273-10	March 10, 2011	15.519(d)	1 m	Horn	1 kHz	1 kHz	RMS
COMMENT		Transmitting BG 1 1164 MHz to 1240 MHz					

Frequency Measured (MHz)	EUT Direction (Degrees)	Antenna Height (Meters)	Recorded Level (dBμV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBμV/m)	Limit Level (dBμV/m)	Margin (dB)
1.231	0	1	18.3	31.4	24.2	2.4	13.6	19.4	-5.8



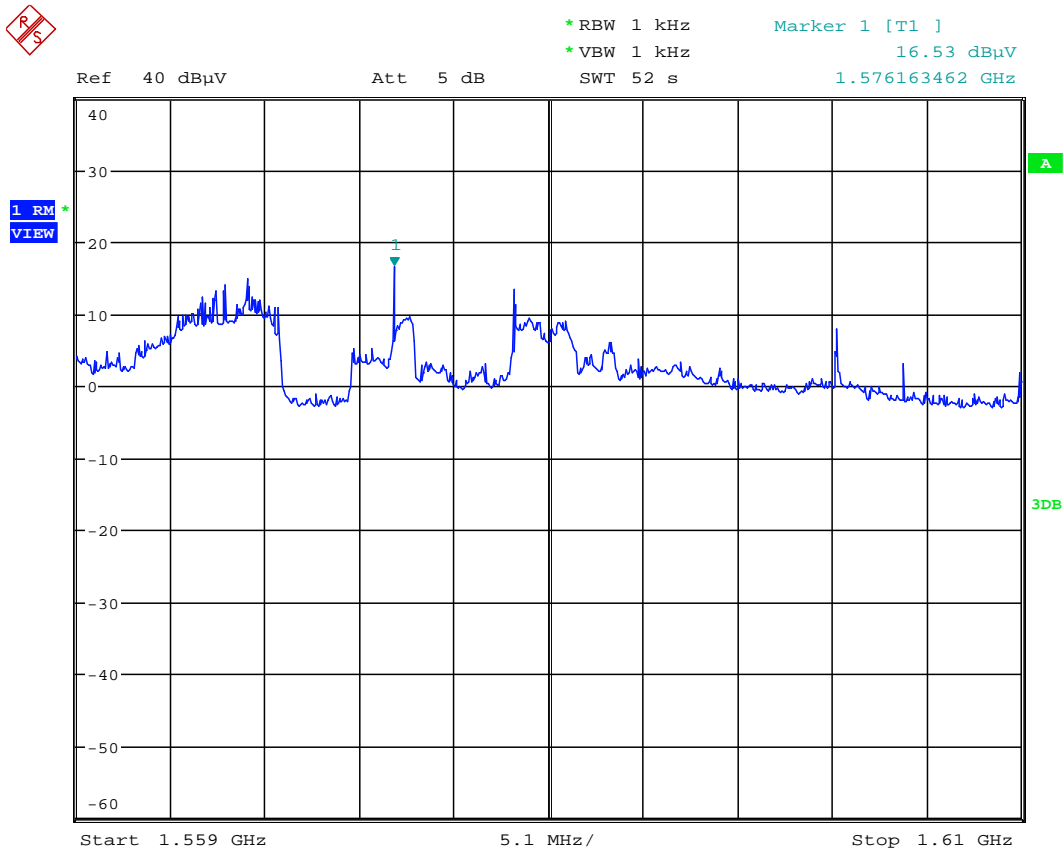
Result = Pass

Note: All digital emissions from the transmitter radiating from the antenna port meet the limits of FCC 15.519(d)

Table 5.3.2: Radiated Emissions in GPS Bands Test Results, 1559 to 1610 MHz

Project #	Date	Rule	Distance	Antenna	RBW	VBW	Detector	
12273-10	March 10, 2011	15.519(d)	1 m	Horn	1 kHz	1 kHz	RMS	
COMMENT		Transmitting BG 1 1559 MHz to 1610 MHz						

Frequency Measured (MHz)	EUT Direction (Degrees)	Antenna Height (Meters)	Recorded Level (dBμV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBμV/m)	Limit Level (dBμV/m)	Margin (dB)
1.576	0	1	16.5	31.1	24.7	2.7	12.9	19.4	-6.5



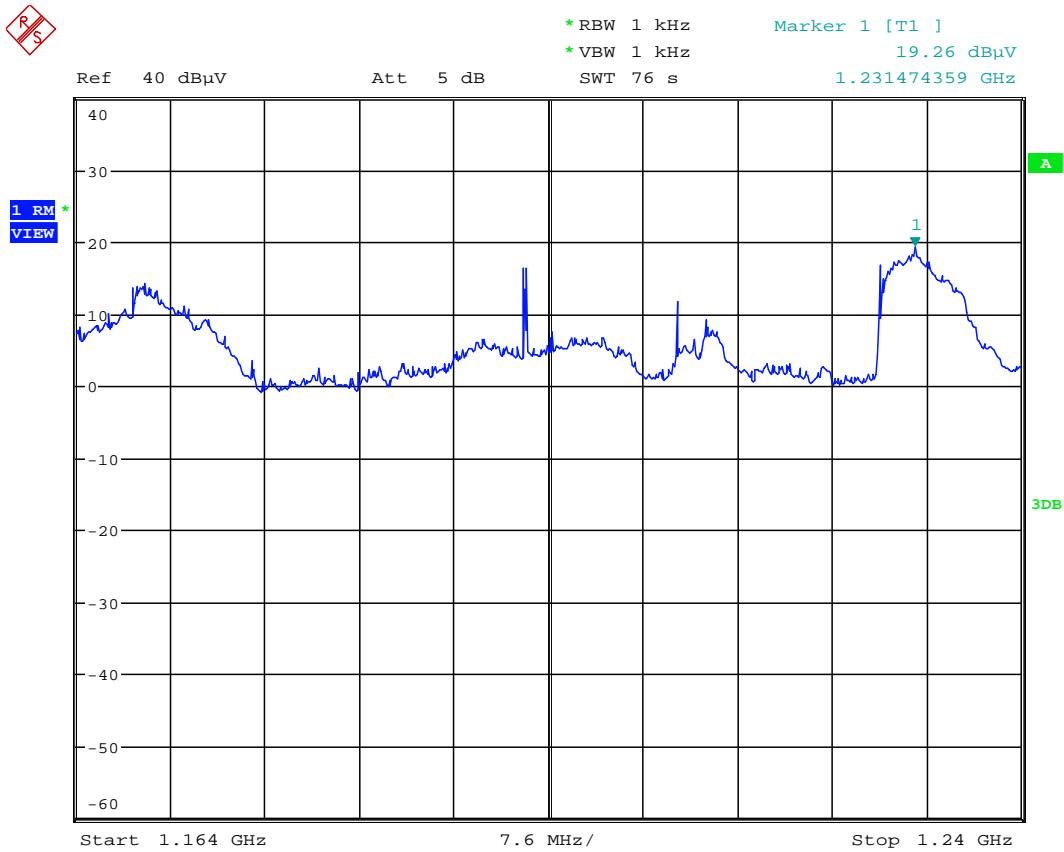
Result = Pass

Note: All digital emissions from the transmitter radiating from the antenna port meet the limits of FCC 15.519(d).

Table 5.3.3: Radiated Emissions in GPS Bands Test Results, 1164 to 1240 MHz

Project #	Date	Rule	Distance	Antenna	RBW	VBW	Detector
12273-10	March 10, 2011	15.519(d)	1 m	Horn	1 kHz	1 kHz	RMS
COMMENT		Transmitting BG 3 1164 MHz to 1240 MHz					

Frequency Measured (MHz)	EUT Direction (Degrees)	Antenna Height (Meters)	Recorded Level (dBμV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBμV/m)	Limit Level (dBμV/m)	Margin (dB)
1.231	0	1	19.3	31.4	24.2	2.4	14.6	19.4	-4.8



Ref: 15.519(d) 15.519(d) 15.519(d)

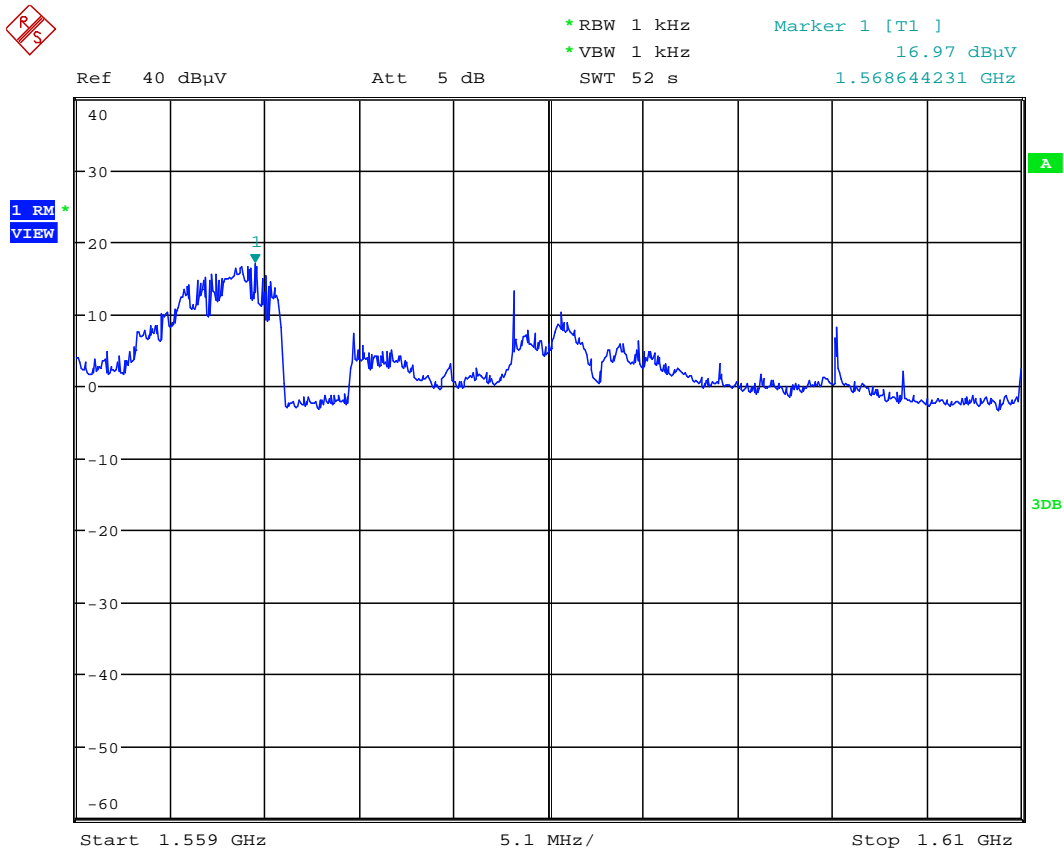
Result = Pass

Note: All digital emissions from the transmitter radiating from the antenna port meet the limits of FCC 15.519(d)

Table 5.3.4: Radiated Emissions in GPS Bands Test Results, 1559 to 1610 MHz

Project #	Date	Rule	Distance	Antenna	RBW	VBW	Detector
12273-10	March 10, 2011	15.519(d)	1 m	Horn	1 kHz	1 kHz	RMS
COMMENT		Transmitting BG 3 1559 MHz to 1610 MHz					

Frequency Measured (MHz)	EUT Direction (Degrees)	Antenna Height (Meters)	Recorded Level (dBμV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBμV/m)	Limit Level (dBμV/m)	Margin (dB)
1.568	0	1	16.9	31.1	24.7	2.7	13.2	19.4	-6.2



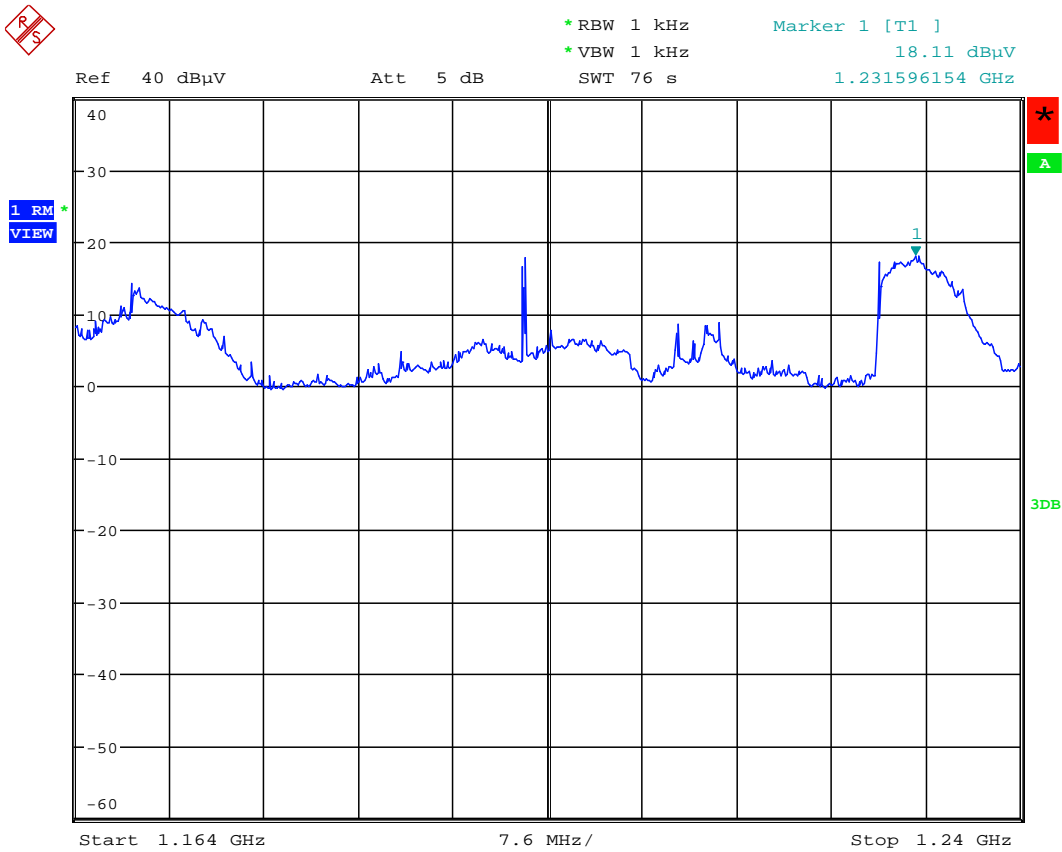
Result = Pass

Note: All digital emissions from the transmitter radiating from the antenna port meet the limits of FCC 15.519(d).

Table 5.3.5: Radiated Emissions in GPS Bands Test Results, 1164 to 1240 MHz

Project #	Date	Rule	Distance	Antenna	RBW	VBW	Detector
12273-10	March 10, 2011	15.519(d)	1 m	Horn	1 kHz	1 kHz	RMS
COMMENT		Transmitting BG 6 1164 MHz to 1240 MHz					

Frequency Measured (MHz)	EUT Direction (Degrees)	Antenna Height (Meters)	Recorded Level (dBμV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBμV/m)	Limit Level (dBμV/m)	Margin (dB)
1.231	0	1	18.1	31.4	24.2	2.4	13.4	19.4	-6.0



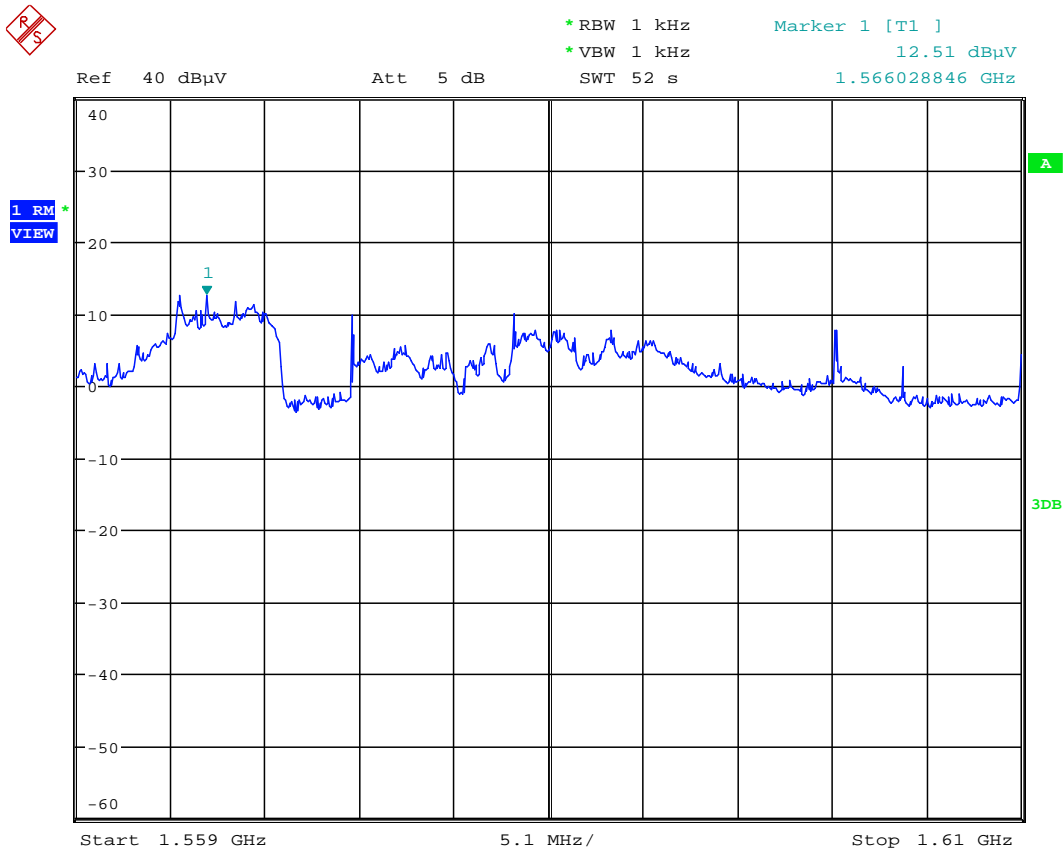
Result = Pass

Note: All digital emissions from the transmitter radiating from the antenna port meet the limits of FCC 15.519(d)

Table 5.3.6: Radiated Emissions in GPS Bands Test Results, 1559 to 1610 MHz

Project #	Date	Rule	Distance	Antenna	RBW	VBW	Detector
12273-10	March 10, 2011	15.519(d)	1 m	Horn	1 kHz	1 kHz	RMS
COMMENT		Transmitting BG 6 1559 MHz to 1610 MHz					

Frequency Measured (MHz)	EUT Direction (Degrees)	Antenna Height (Meters)	Recorded Level (dBμV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBμV/m)	Limit Level (dBμV/m)	Margin (dB)
1.576	0	1	16.5	31.1	24.7	2.7	12.9	19.4	-6.5



Result = Pass

Note: All digital emissions from the transmitter radiating from the antenna port meet the limits of FCC 15.519(d).

6.0 Peak Emissions FM Within 50 MHz Bandwidth

The EUT was evaluated to determine compliance with FCC 15.519(e) following the procedures described in FCC Section 15.521.

6.1 Test Procedure

The EUT was placed on a non-conductive table 0.8 meters above the ground plane. The table was centered on a rotating turntable at a distance of 1 meter from the measurement antenna.

The measurements made over the intentionally radiating frequency range of the EUT, from 3100 MHz to 10600 MHz, were maximized using a spectrum analyzer with peak detector capabilities. A spectrum analyzer was used for the final measurement utilizing a peak detector at the frequency with the largest amplitude. The spectrum analyzer did not support the prescribed resolution bandwidth of 50 MHz. However, when a peak measurement is required, it is acceptable to use a resolution bandwidth other than the 50 MHz specified in 47 CFR Part 15, Subpart F. The resolution bandwidth for the measurement was set to 1 MHz. The measurement was centered on the frequency at which the highest radiated emission occurred, f_m . The video bandwidth was 1 MHz.

Because a resolution bandwidth other than 50 MHz was used, the peak EIRP limit required adjustment by the resolution bandwidth ratio of $20 \log (RBW/50)$ dB, where RBW is the resolution bandwidth used for the measurement expressed in MHz. A diagram showing the test setup is given as Figure 2.1.1.

6.2 Test Criteria

There is a limit on the peak level of the emissions contained within a 50 MHz bandwidth centered on the frequency at which the highest radiated emission occurs, f_m . That limit is 0 dBm EIRP. The EUT was evaluated to determine compliance with FCC 15.519(e) following the procedures described in FCC Section 15.521.

6.3 Test Results

Peak emissions FM within 50 MHz measurements were taken on March 10, 2011, and the EUT was found to be in compliance with applicable requirements. Test equipment used to perform these tests is given in Tables 2.3.1 and 2.3.2.

Table 6.3.1: Peak Emissions FM Within 50 MHz Test Results – Low Channel

Project #	Date	Rule	Distance	Antenna	RBW	VBW	Detector
12273-10	March 10, 2011	15.519(e)	1 m	Horn	1 MHz	3 MHz	Peak
COMMENT		Transmitting Low Channel BG 1 Note: If a resolution bandwidth other than 50 MHz is employed, the peak EIRP limit shall be $20 \log(\text{RBW}/50)\text{dBm}$, where RBW is the resolution bandwidth in megahertz that is employed. $20 \log(1/50) = -33.9\text{dBm}$.					

Frequency Measured (MHz)	EUT Direction (Degrees)	Antenna Height (Meters)	Recorded Level (dBµV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBµV/m)	Limit Level (dBµV/m)	Margin (dB)	Detector Function
3.516	0	1	75.3	40.5	31.7	3.5	70.0	70.7	-0.7	Peak

Result = Pass

Table 6.3.2: Peak Emissions FM Within 50 MHz Test Results – Middle Channel

Project #	Date	Rule	Distance	Antenna	RBW	VBW	Detector
12273-10	March 10, 2011	15.519(e)	1 m	Horn	1 MHz	3 MHz	Peak
COMMENT		Transmitting Mid Channel BG 1 Note: If a resolution bandwidth other than 50 MHz is employed, the peak EIRP limit shall be $20 \log(\text{RBW}/50)\text{dBm}$, where RBW is the resolution bandwidth in megahertz that is employed. $20 \log(1/50) = -33.9\text{dBm}$.					

Frequency Measured (MHz)	EUT Direction (Degrees)	Antenna Height (Meters)	Recorded Level (dBµV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBµV/m)	Limit Level (dBµV/m)	Margin (dB)	Detector Function
3.77	0	1	75.4	40.7	32.1	3.3	70.1	70.7	-0.6	Peak

Result = Pass

Table 6.3.3: Peak Emissions FM Within 50 MHz Test Results – High Channel

Project #	Date	Rule	Distance	Antenna	RBW	VBW	Detector
12273-10	March 10, 2011	15.519(e)	1 m	Horn	1 MHz	3 MHz	Peak
COMMENT		Transmitting High Channel BG 1 Note: If a resolution bandwidth other than 50 MHz is employed, the peak EIRP limit shall be $20 \log(\text{RBW}/50)\text{dBm}$, where RBW is the resolution bandwidth in megahertz that is employed. $20 \log(1/50) = -33.9\text{dBm}$.					

Frequency Measured (MHz)	EUT Direction (Degrees)	Antenna Height (Meters)	Recorded Level (dBµV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBµV/m)	Limit Level (dBµV/m)	Margin (dB)	Detector Function
4.305	0	1	72.8	41.2	32.5	3.8	67.9	70.7	-2.8	Peak

Result = Pass

Table 6.3.4: Peak Emissions FM Within 50 MHz Test Results – Low Channel

Project #	Date	Rule	Distance	Antenna	RBW	VBW	Detector
12273-10	March 10, 2011	15.519(e)	1 m	Horn	1 MHz	3 MHz	Peak
COMMENT		Transmitting Low Channel BG 3 Note: If a resolution bandwidth other than 50 MHz is employed, the peak EIRP limit shall be $20 \log(\text{RBW}/50)\text{dBm}$, where RBW is the resolution bandwidth in megahertz that is employed. $20 \log(1/50) = -33.9\text{dBm}$.					

Frequency Measured (MHz)	EUT Direction (Degrees)	Antenna Height (Meters)	Recorded Level (dBµV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBµV/m)	Limit Level (dBµV/m)	Margin (dB)	Detector Function
6.577	0	1	71.5	43.0	35.6	4.8	68.8	70.7	-1.9	Peak

Result = Pass

Table 6.3.5: Peak Emissions FM Within 50 MHz Test Results – Middle Channel

Project #	Date	Rule	Distance	Antenna	RBW	VBW	Detector
12273-10	March 10, 2011	15.519(e)	1 m	Horn	1 MHz	3 MHz	Peak
COMMENT		Transmitting Mid Channel BG 3 Note: If a resolution bandwidth other than 50 MHz is employed, the peak EIRP limit shall be $20 \log(\text{RBW}/50)\text{dBm}$, where RBW is the resolution bandwidth in megahertz that is employed. $20 \log(1/50) = -33.9\text{dBm}$.					

Frequency Measured (MHz)	EUT Direction (Degrees)	Antenna Height (Meters)	Recorded Level (dBµV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBµV/m)	Limit Level (dBµV/m)	Margin (dB)	Detector Function
6.953	0	1	69.3	43.1	36.7	4.6	67.5	70.7	-3.2	Peak

Result = Pass

Table 6.3.6: Peak Emissions FM Within 50 MHz Test Results – High Channel

Project #	Date	Rule	Distance	Antenna	RBW	VBW	Detector
12273-10	March 10, 2011	15.519(e)	1 m	Horn	1 MHz	3 MHz	Peak
COMMENT		Transmitting High Channel BG 3 Note: If a resolution bandwidth other than 50 MHz is employed, the peak EIRP limit shall be $20 \log(\text{RBW}/50)\text{dBm}$, where RBW is the resolution bandwidth in megahertz that is employed. $20 \log(1/50) = -33.9\text{dBm}$.					

Frequency Measured (MHz)	EUT Direction (Degrees)	Antenna Height (Meters)	Recorded Level (dBµV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBµV/m)	Limit Level (dBµV/m)	Margin (dB)	Detector Function
7.625	0	1	64.9	42.1	37.2	4.7	64.7	70.7	-6.0	Peak

Result = Pass

Table 6.3.7: Peak Emissions FM Within 50 MHz Test Results – Low Channel

Project #	Date	Rule	Distance	Antenna	RBW	VBW	Detector
12273-10	March 10, 2011	15.519(e)	1 m	Horn	1 MHz	3 MHz	Peak
COMMENT		Transmitting Low Channel BG 6 Note: If a resolution bandwidth other than 50 MHz is employed, the peak EIRP limit shall be $20 \log(\text{RBW}/50)\text{dBm}$, where RBW is the resolution bandwidth in megahertz that is employed. $20 \log(1/50) = -33.9\text{dBm}$.					

Frequency Measured (MHz)	EUT Direction (Degrees)	Antenna Height (Meters)	Recorded Level (dBµV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBµV/m)	Limit Level (dBµV/m)	Margin (dB)	Detector Function
7.741	0	1	68.3	42.1	37.2	4.7	68.1	70.7	-2.6	Peak

Result = Pass

Table 6.3.8: Peak Emissions FM Within 50 MHz Test Results – Middle Channel

Project #	Date	Rule	Distance	Antenna	RBW	VBW	Detector
12273-10	March 10, 2011	15.519(e)	1 m	Horn	1 MHz	3 MHz	Peak
COMMENT		Transmitting Mid Channel BG 6 Note: If a resolution bandwidth other than 50 MHz is employed, the peak EIRP limit shall be $20 \log(\text{RBW}/50)\text{dBm}$, where RBW is the resolution bandwidth in megahertz that is employed. $20 \log(1/50) = -33.9\text{dBm}$.					

Frequency Measured (MHz)	EUT Direction (Degrees)	Antenna Height (Meters)	Recorded Level (dBµV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBµV/m)	Limit Level (dBµV/m)	Margin (dB)	Detector Function
7.996	0	1	67.2	41.9	37.4	4.7	67.4	70.7	-3.3	Peak

Result = Pass

Table 6.3.9: Peak Emissions FM Within 50 MHz Test Results – High Channel

Project #	Date	Rule	Distance	Antenna	RBW	VBW	Detector
12273-10	March 10, 2011	15.519(e)	1 m	Horn	1 MHz	3 MHz	Peak
COMMENT		Transmitting High Channel BG 6 Note: If a resolution bandwidth other than 50 MHz is employed, the peak EIRP limit shall be $20 \log(\text{RBW}/50)\text{dBm}$, where RBW is the resolution bandwidth in megahertz that is employed. $20 \log(1/50) = -33.9\text{dBm}$.					

Frequency Measured (MHz)	EUT Direction (Degrees)	Antenna Height (Meters)	Recorded Level (dBµV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBµV/m)	Limit Level (dBµV/m)	Margin (dB)	Detector Function
8.507	0	1	68.1	41.5	37.2	5.3	69.1	70.7	-1.6	Peak

Result = Pass

7.0 Antenna Requirements

An antenna evaluation was performed on the EUT to determine compliance with FCC sections 15.203 and 15.247(b).

7.1 Evaluation Procedure

The design of the EUT antenna was evaluated for conformance to engineering requirements for gain and to prevent substitution of unapproved antennae. Gain of the antenna was assessed by reviewing the antenna manufacturer's data sheet.

7.2 Evaluation Criteria

The antenna design must meet at least one of the following criteria:

- a) Antenna is permanently attached to the unit.
- b) Antenna must use a unique type of connector to attach to the EUT.
- c) Unit must be professionally installed. Installer shall be responsible for verifying that the correct antenna is employed with the unit.

Section 15.247(b)(4)(i) states that if the transmitting antenna has a directional gain greater than 6 dBi the power shall be reduced the amount in dB that the directional gain is greater than 6 dBi.

7.3 Evaluation Results

The CY-WDCA6UR UWB Radio Module met the criteria of this rule. Therefore, the EUT is compliant.

End of Report

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