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May 22, 2012

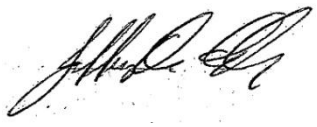
Traxxas, LLP
1100 Klein Road
Plano, TX 75074

Dear Gary:

Enclosed is the Wireless Test Report for the Drag Timing System Finish End by Traxxas. This report can be used to demonstrate compliance with FCC requirements for wireless devices in the United States.

If you have any questions, please contact me.

Sincerely,



Jeffrey A. Lenk
President

Enclosure

Project 13461-10

Traxxas, LLP
Drag Timing System Finish End

Wireless Test Report
Revision 2

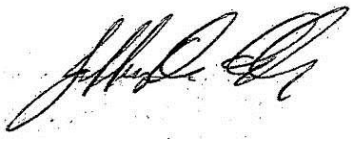
Prepared for:
Traxxas, LLP
1100 Klein Road
Plano, TX 75074

By

Professional Testing (EMI), Inc.
1601 N. A.W. Grimes Blvd., Suite B
Round Rock, Texas78665

May 22, 2012

Reviewed by



Jeffrey A. Lenk
President

Written by

Jesse Banda
EMC Engineer

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Applicant: Traxxas, LLP

Applicant's Address: 1100 Klein Road
Plano, Texas 75074

FCC ID: XVE-SA11200
Project Number: 13461-10

Test Dates: March 1, 2012 to March 4, 2012

The TraxxasDrag Timing System Finish Endwas tested to and found to be in compliance with FCC 47 CFR Part 15.

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

Parameter	Frequency (MHz)	EIRP Level	EIRP Limit	Margin (dB)	OBW 6dB
Transmitter: Fundamental	2406	16.2 dBm	28.4 dBm	-12.2	920 kHz
Transmitter: Fundamental	2426	16.1 dBm	28.4 dBm	-12.3	900 kHz
Transmitter: Fundamental	2453	15.4 dBm	28.4 dBm	-13.0	910 kHz

I, Jesse Banda, 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.

Jesse Banda

Jesse Banda
EMC Engineer

This report has been reviewed and accepted by Traxxas.The undersigned is responsible for ensuring that this devicewill continue to comply with the FCC rules.

_____

Representative of Traxxas

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 United States.

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 Drag Timing System (DTS) FinishEnd provides a complete SPI to RF antenna wireless MODEM. The module is designed to implement wireless device links in the 2.4GHz ISM frequency band.The module contains a 2.4GHz GFSK radio transceiver, packet data buffering, packet framer, DSSS baseband controller, Received Signal Strength Indication (RSSI), and SPI interface for data transfer and device configuration. In DSSS modes the baseband performs DSSS spreading/de-spreading, while in GFSK Mode (1 Mb/s – GFSK) the baseband performs Start of Frame (SOF), End of Frame (EOF), detection and CRC16 generation and checking.The EUT is powered by a 6V NiMh battery pack or 4 AA batteries. The EUT was tuned to a low, middle, and high channel to perform power, occupied bandwidth, power spectral density, and harmonic tests. The EUT was tuned to a middle channel to perform spurious tests. The EUT continuously transmitted at maximum power. The system tested consisted of the following:

Manufacturer	Traxxas, LLP
Model	Drag Timing System Finish End
FCC ID	XVE-SA11200
Power Supply	6 VDC from batteries
Frequency (GHz)	2.406 - 2.453
Modulation Type (2.4 GHz)	DSSS
Antenna Type	PCB Yagi

The following rules apply to the operation of the EUT:

Guidelines	**FCC Rules**
	Part 15
Transmitter Characteristics	15.247
Spurious Radiated Power	15.209
Power Line Conducted	15.207
Antenna Requirement	15.203

1.3 Modifications

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

1.4 Test Site

Measurements were made at the PTIsemi-anechoic facility designated Site 45 (FCC 459644, IC 3036B-1) in Austin, Texas.This site is registered with the FCCunder 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 Road, Austin, Texas, 78758, while the main office is located at 1601 N. A.W. Grimes Blvd., Suite B, Round Rock, Texas, 78665.

1.5 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 forTesting Unlicensed Wireless Devices	2009
47 CFR	Part 15 – Radio Frequency DevicesSubpart C -Intentional Radiators	
KDB Publication No. 718828	Guidance on Measurements for Digital Transmission Systems(47 CFR 15.247)	September 30,2011

1.6 Applicable Tests

Test	Rule (FCC)
Output Power	15.247(a)
Occupied Bandwidth	15.247(a)(2)
Power Spectral Density	15.247(e)
Radiated Emissions, Harmonic, Spurious, Band Edge	15.205(a), 15.209(a), 15.247(a)
Antenna Requirements	15.203

2.0 Maximum Peak Conducted Output Power

Maximum peak conductive output power measurements were made on the selected fundamental transmitting frequenciesof the EUT. Measurements were made on the low, middle, and high frequencies.

2.1 Test Procedure

The maximum peak conducted output power was measured with a spectrum analyzer connected to the output of the EUT via a short coaxial cable. The EUT was set to transmit at the appropriate frequencies while measurements were made. The analyzer was set to 1 MHz RBW and 3 MHz VBW.The analyzer was then set to MAX HOLD and a measurement was taken. A low, middle, and high frequency was measured. A diagram showing the test setup is given as Figure 2.1.1.

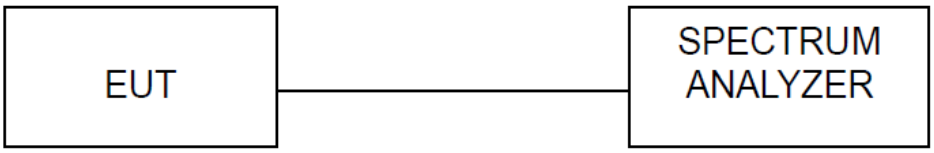


Figure 2.1.1: Conducted Emission Test Setup

2.2 Test Criteria

The maximum peak conducted output powermust not exceed 1 Wattaccording to FCC Section 15.247.

2.3 Test Equipment

Table 2.3.1: Test Equipment (Fundamental frequency)

Asset #	Manufacturer	Model #	Description	Calibration Due
C147	N/A	N/A	U.FL to SMA cable	5/26/2012
Rental	Rohde &Schwartz	FSP	Spectrum Analyzer, 9kHz - 30 GHz	12/22/2012

2.4 Test Results

Peak Power Measurements											
Channel	Frequency (MHz)	Modulation	Conducted Test Data				Ant. Factor	Corrected Antenna Port Peak Power			EIRP
			Value (dBm)	CF1 (dB)	CF2 (dB)	CF3 (dB)	Max (dB)	Value (dBm)	Limit (dBm)	Result (P/F)	Value (dBm)
1	2406	DSSS	8.55	0	0	0	1.64	8.6	28.4	PASS	16.2
2	2426	DSSS	8.44	0	0	0	1.64	8.4	28.4	PASS	16.1
3	2453	DSSS	7.74	0	0	0	1.64	7.7	28.4	PASS	15.4

Note: 7.64 dB was added to the recorded value to compensate for the antenna gain.

3.0 Occupied Bandwidth

Occupied bandwidth measurements were performed on the EUT to determine compliance with FCC 15.247.

3.1 Test Procedure

The occupied bandwidth was measured with a spectrum analyzer connected to the output of the EUT via a short coaxial cable. The EUT was set to transmit at the appropriate frequencies while measurements were made. The analyzer was set to 10 kHz RBW and 30 kHz VBW.The analyzer was then set to MAX HOLD. Markers were placed at the lower and upper points that were 6db below the peak to find the occupied bandwidth. A low, middle, and high frequency was measured. A diagram showing the test setup is given as Figure 3.1.1.

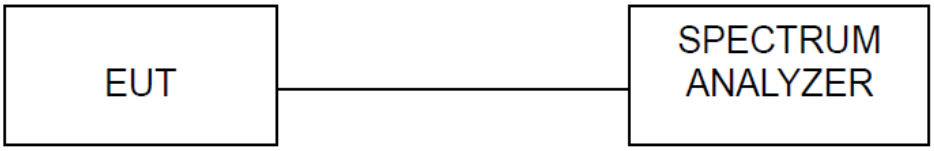


Figure 3.1.1: Conducted Emission Test Setup

3.2 Test Criteria

The minimum 6 dB occupied bandwidth for the EUT is 500 kHz in accordance with 15.247(a)(2).

3.3 Test Equipment

Table 3.3.1: Test Equipment (Fundamental frequency)

Asset #	Manufacturer	Model #	Description	Calibration Due
C147	N/A	N/A	U.FL to SMA cable	5/26/2012
Rental	Rohde &Schwartz	FSP	Spectrum Analyzer, 9kHz - 30 GHz	12/22/2012

3.4 Test Result

6dB Bandwidth Measurement Data						
Channel	Frequency (MHz)	Port	Modulation	6dB Bandwidth		
				Value (kHz)	Limit (kHz)	Result (P/F)
1	2406	1	DSSS	920	500	PASS
2	2426	1	DSSS	900	500	PASS
3	2453	1	DSSS	910	500	PASS

Table 3.4.1: Occupied Bandwidth Test Results, Channel 1

PROJECT #	DATE	RULE	METHOD	FREQUENCY	RBW	VBW	DETECTOR
13461-10	March 2, 2012	15.247	Conducted	2406MHz	10 kHz	30 kHz	Peak
COMMENT	OBW = 920 kHz						

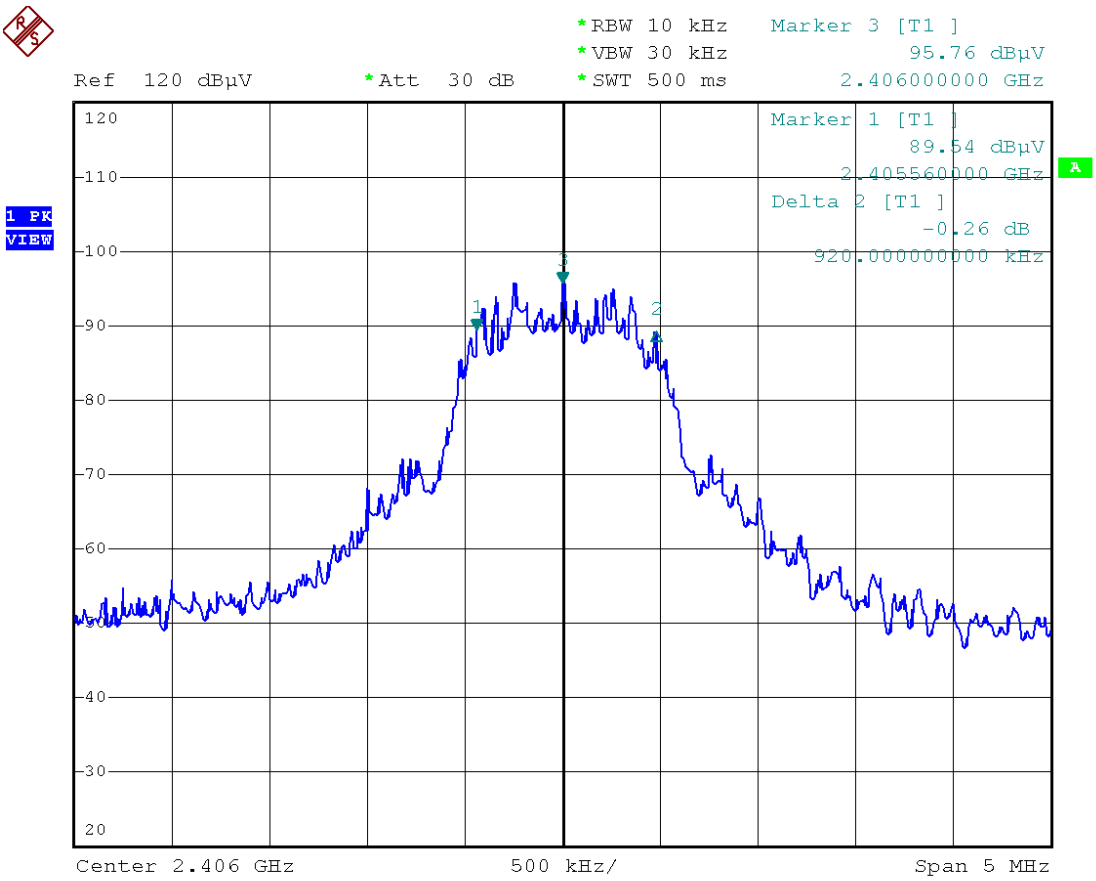


Table 3.4.2: Occupied Bandwidth Test Results, Channel 2

PROJECT #	DATE	RULE	METHOD	FREQUENCY	RBW	VBW	DETECTOR
13461-10	March 2, 2012	15.247	Conducted	2406 MHz	10 kHz	30 kHz	Peak
COMMENT	OBW = 900 kHz						

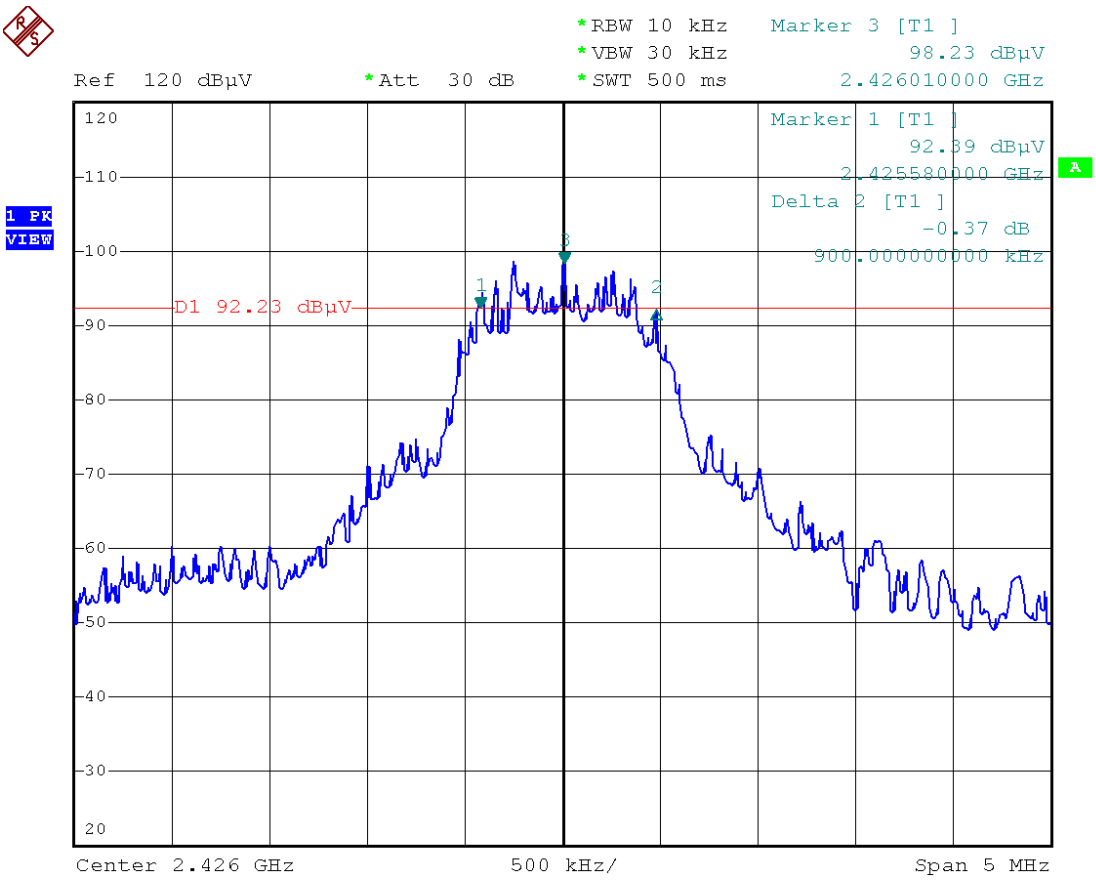
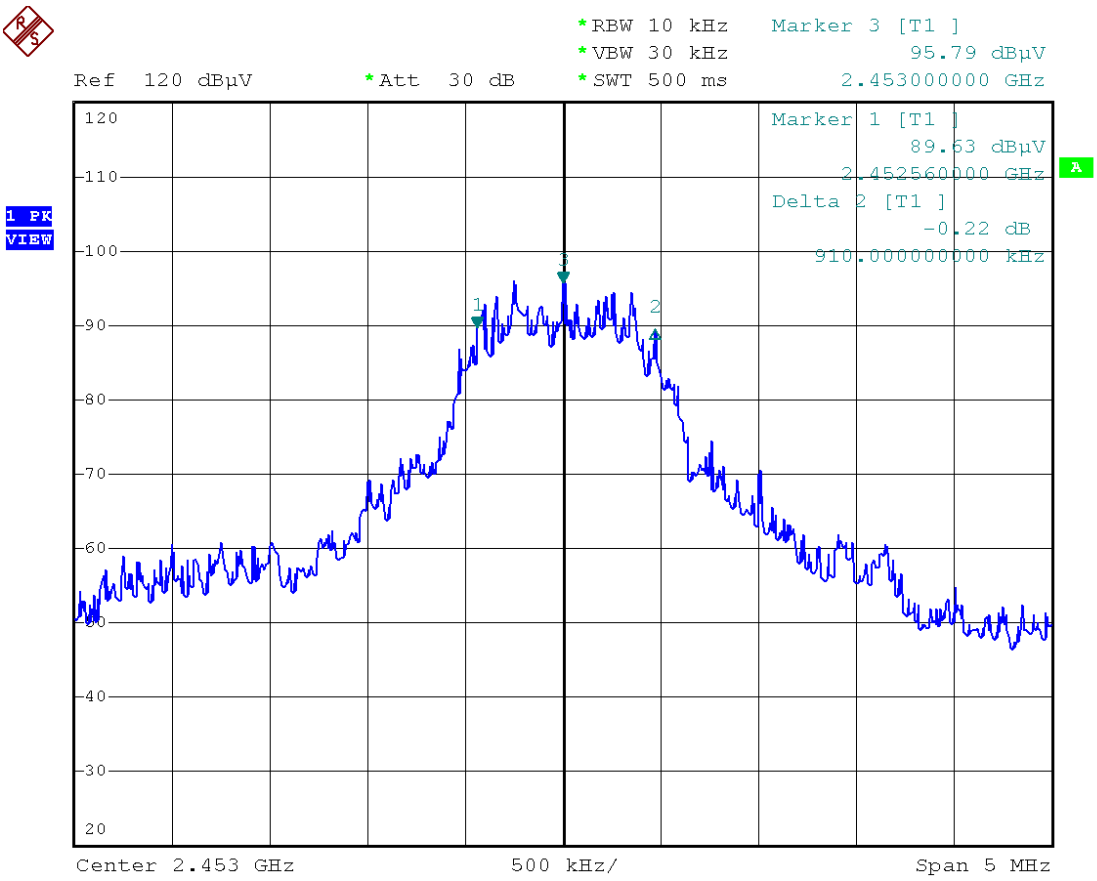


Table 3.4.3: Occupied Bandwidth Test Results, Channel 3

PROJECT #	DATE	RULE	METHOD	FREQUENCY	RBW	VBW	DETECTOR
13461-10	March 2, 2012	15.247	Conducted	2406 MHz	10 kHz	30 kHz	Peak
COMMENT	OBW = 9.10 kHz						



4.0 Power Spectral Density

Power spectral density measurements were performed on the EUT to determine compliance with FCC 15.247(e).

4.1 Test Procedure

The power spectral densitywas measured with a spectrum analyzer connected to the output of the EUT via a short coaxial cable. The EUT was set to transmit at the appropriate frequencies while measurements were made. The analyzer was set to 100 kHz RBW and 300 kHz VBW.The analyzer was then set to MAX HOLD. A marker was placed at the peak. A bandwidth correction factor was applied to the peak measurement to scale to the equivalent 3 kHz bandwith.A low, middle, and high frequency was measured. A diagram showing the test setup is given as Figure 4.1.1.

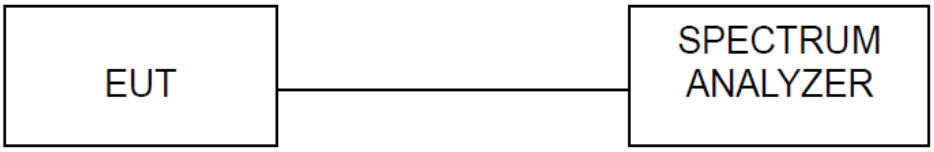


Figure 4.1.1: Conducted Emission Test Setup

4.2 Test Criteria

According to section 47 CFR, Sections 15.247(e), the maximum power spectral density is +8 dBm in any 3 kHz bandwidth.

4.3 Test Equipment

Table 3.3.1: Test Equipment (Fundamental frequency)

Asset #	Manufacturer	Model #	Description	Calibration Due
C147	N/A	N/A	U.FL to SMA cable	5/26/2012
Rental	Rohde &Schwartz	FSP	Spectrum Analyzer, 9kHz - 30 GHz	12/22/2012

4.4 Test Results

Power spectral density measurements were taken on March 2, 2012, and the EUT was found to be in compliance with applicable requirements.

PSD Measurements									
Channel	Frequency (MHz)	Port	Modulation	Conducted Test Data	RBW	Corrected Antenna Port Power Spectral Density			BWCF
				Value (dBm)	Setting (kHz)	Value (dBm)	Limit (dBm)	Result (P/F)	Value (dB)
1	2406	1	DSSS	6.27	100	-8.96	8	PASS	-15.23
2	2426	1	DSSS	6.17	100	-9.06	8	PASS	-15.23
3	2453	1	DSSS	5.08	100	-10.15	8	PASS	-15.23

Table 4.4.1: Power Spectral Density Test Results, Channel 1

PROJECT #	DATE	RULE	METHOD	FREQUENCY	RBW	VBW	DETECTOR
13461-10	March 2, 2012	15.247	Conducted	2406 MHz	100 kHz	300 kHz	Peak
COMMENT	Bandwidth correction Factor (B.W.C.F.) = 10log(3 kHz/100 kHz)						

Frequency Measured (MHz)	Recorded Amplitude (dBm / 100 kHz)	B.W.C.F. (dB)	PSD (dBm / 3 kHz)	Limit (dBm/ 3kHz)
2406	6.27	-15.23	-8.96	8

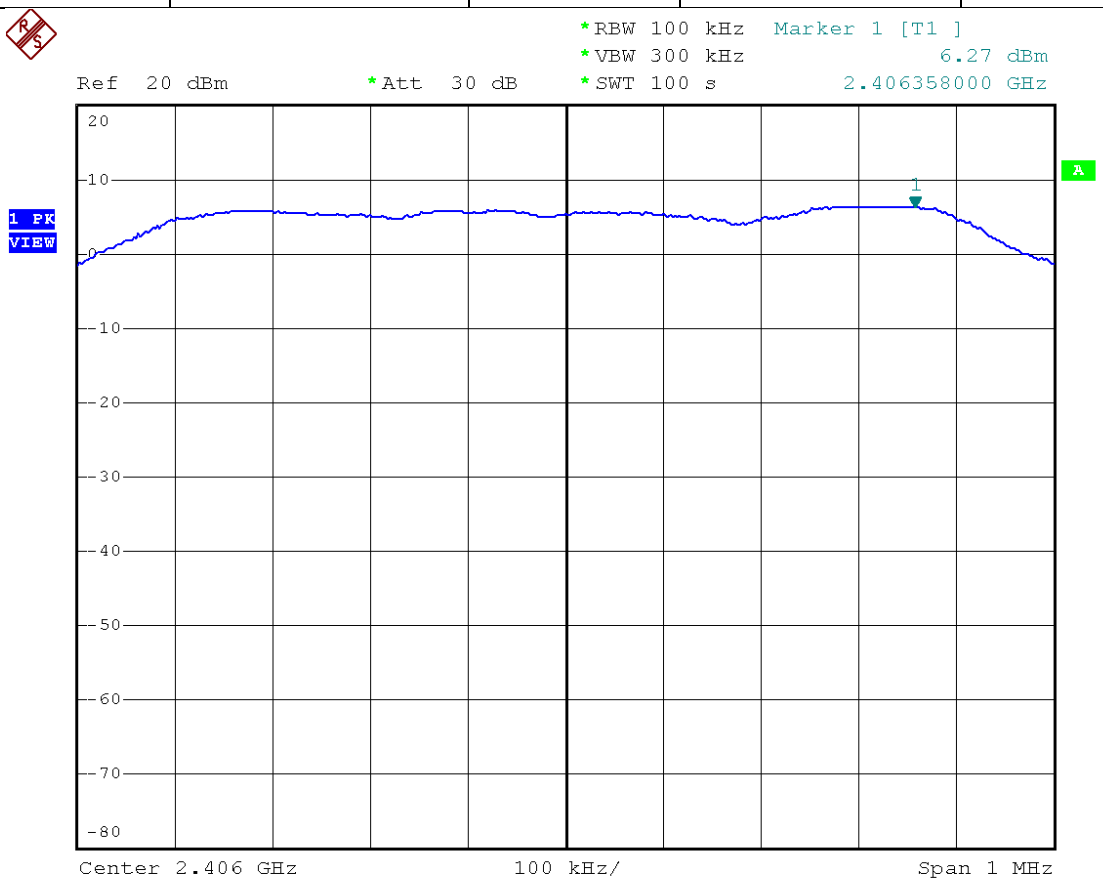


Table 4.4.2: Power Spectral Density Test Results, Channel 2

PROJECT #	DATE	RULE	METHOD	FREQUENCY	RBW	VBW	DETECTOR
13461-10	March 2, 2012	15.247	Conducted	2426 MHz	100 kHz	300 kHz	Peak
COMMENT	Bandwidth correction Factor (B.W.C.F.) = 10log(3 kHz/100 kHz)						

Frequency Measured (MHz)	Recorded Amplitude (dBm / 100 kHz)	B.W.C.F. (dB)	PSD (dBm / 3 kHz)	Limit (dBm/ 3kHz)
2426	6.17	-15.23	-9.06	8

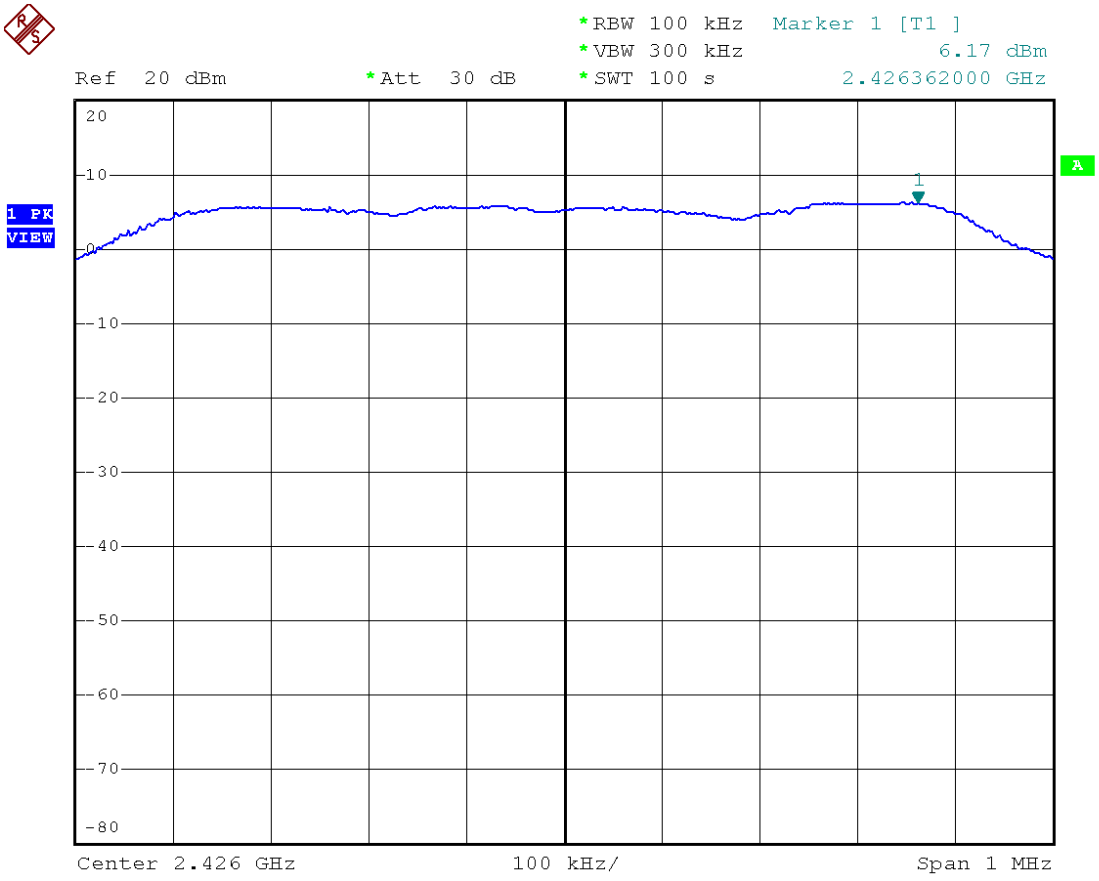
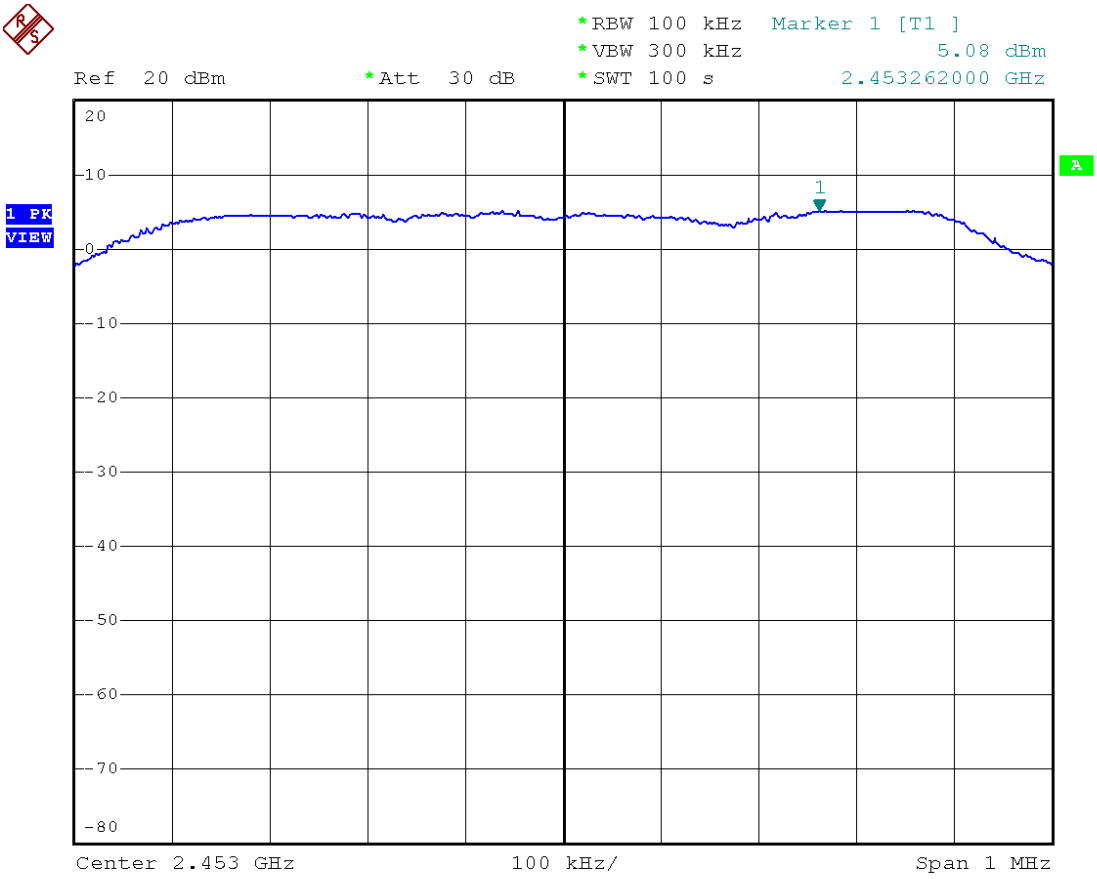


Table 4.4.3: Power Spectral Density Test Results, Channel 3

PROJECT #	DATE	RULE	METHOD	FREQUENCY	RBW	VBW	DETECTOR
13461-10	March 2, 2012	15.247	Conducted	2453 MHz	100 kHz	300 kHz	Peak
COMMENT	Bandwidth correction Factor (B.W.C.F.) = 10log(3 kHz/100 kHz)						

Frequency Measured (MHz)	Recorded Amplitude (dBm / 100 kHz)	B.W.C.F. (dB)	PSD (dBm / 3 kHz)	Limit (dBm / 3 kHz)
2453	5.08	-15.23	-10.15	8



5.0 Maximum Unwanted Emissions

Maximum unwanted emissions measurements were performed on the EUT to determine compliance to FCC section 15.247.

5.1 Test Procedure

The maximum unwanted emission was measured with a spectrum analyzer connected to the output of the EUT via a short coaxial cable. The EUT was set to transmit at the appropriate frequencies while measurements were made. The analyzer was set to 100 kHz RBW and 300 kHz VBW.The analyzer was then set to MAX HOLD and the peak value was recorded as the PDS level. The span was then set to 30 MHz to 25 GHz in MAX HOLD. A reference line was installed on the screen to indicate the recorded PSD lever. Another reference line was installed 20 dB below the recorded PSD level and a measurement was taken.A low, middle, and high frequency was measured. A diagram showing the test setup is given as Figure 5.1.1.

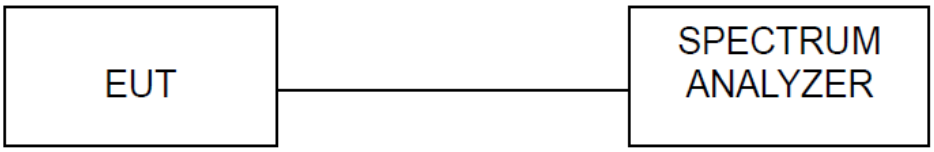


Figure 5.1.1: Conducted Emission Test Setup

5.2 Test Criteria

According to section 47 CFR, Sections 15.247(d), the maximum emission outside the authorized frequency shall be attenuated by at least 20 dB from the recorded PSD level. Additionally, 15.247(d) states that any frequency in a restricted band, as defined in 15.205(a) , must be below the radiated emission limits in 15.209(a).

5.3 Test Equipment

Table 3.3.1: Test Equipment (Fundamental frequency)

Asset #	Manufacturer	Model #	Description	Calibration Due
C147	N/A	N/A	U.FL to SMA cable	5/26/2012
Rental	Rohde &Schwartz	FSP	Spectrum Analyzer, 9kHz - 30 GHz	12/22/2012

5.4 Test Results

Table 5.4.1: Maximum Unwanted Emission into Non-Restricting Bands, Channel 1

PROJECT #	DATE	RULE	METHOD	FREQUENCY	RBW	VBW	DETECTOR
13461-10	March 3, 2012	15.247	Conducted	2406 MHz	100 kHz	300 kHz	Peak
COMMENT							

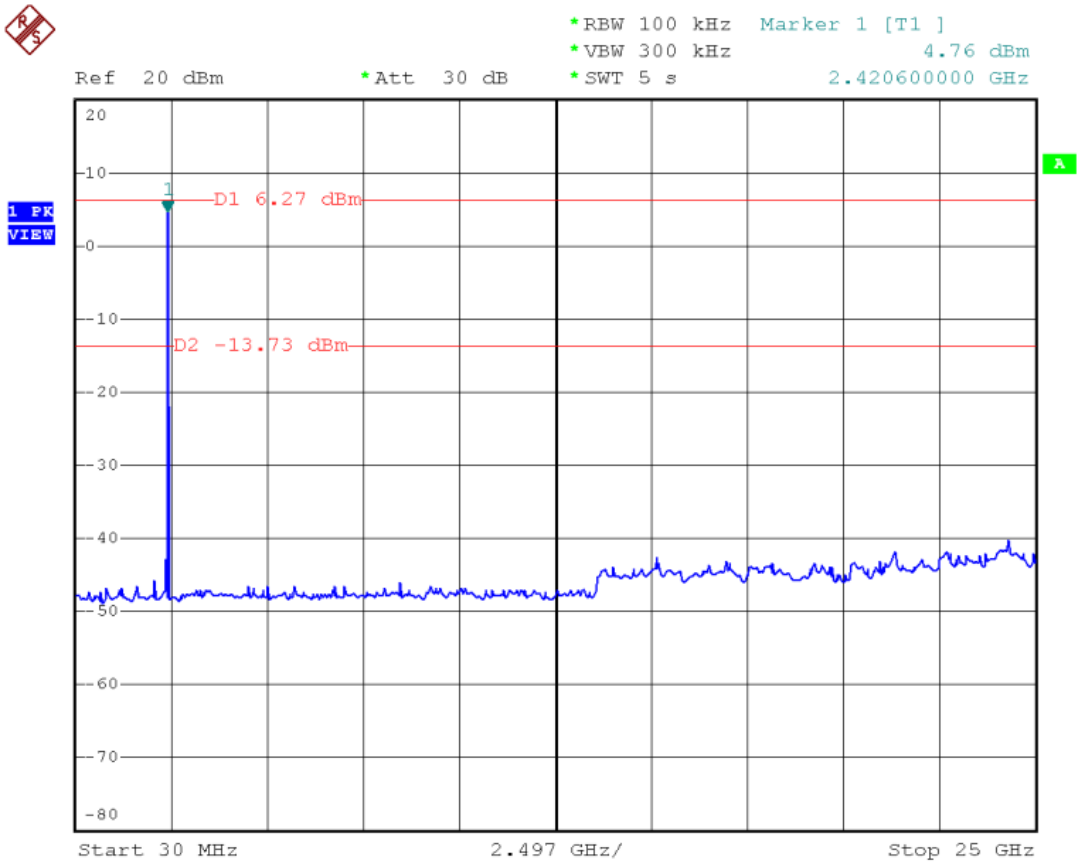


Table 5.4.2: Maximum Unwanted Emission into Non-Restricting Bands,Channel 2

PROJECT #	DATE	RULE	METHOD	FREQUENCY	RBW	VBW	DETECTOR
13461-10	March 3, 2012	15.247	Conducted	2424 MHz	100 kHz	300 kHz	Peak
COMMENT							

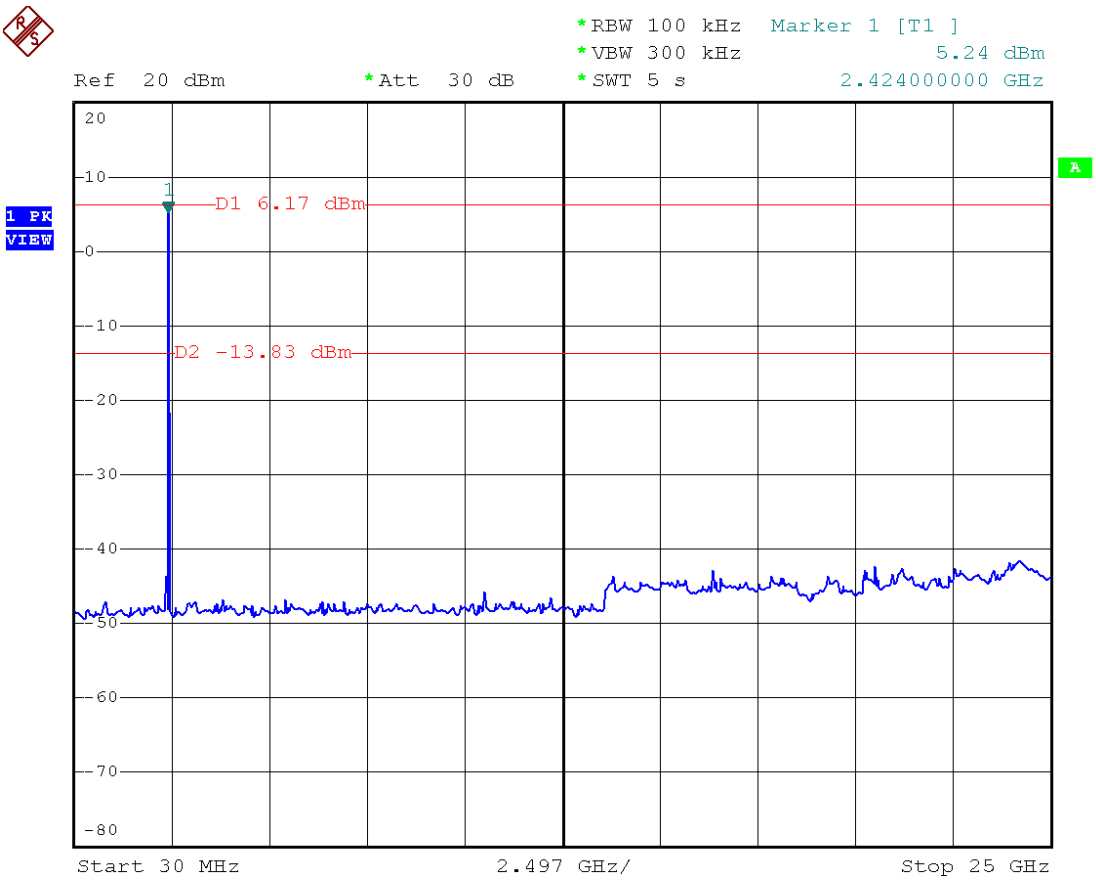


Table 5.4.3: Maximum Unwanted Emission into Non-Restricting Bands, Channel 3

PROJECT #	DATE	RULE	METHOD	FREQUENCY	RBW	VBW	DETECTOR
13461-10	March 3, 2012	15.247	Conducted	2456 MHz	100 kHz	300 kHz	Peak
COMMENT							

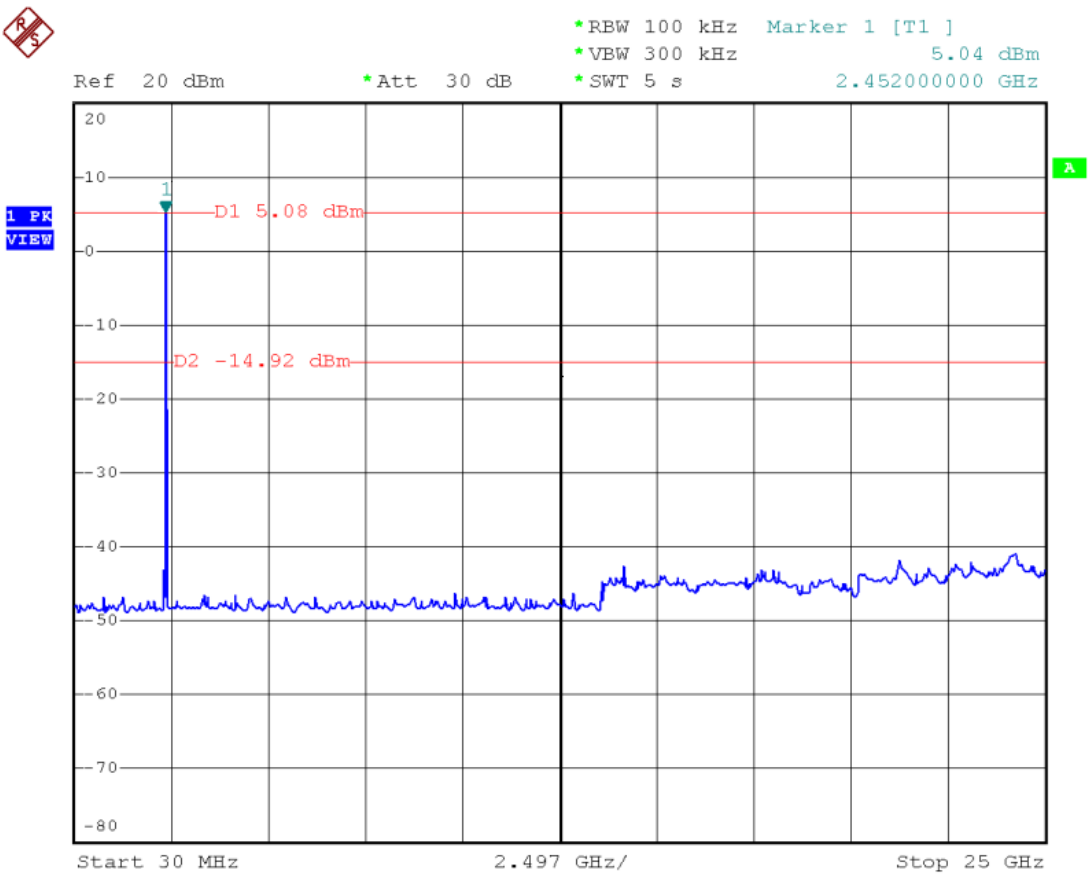


Table 5.4.5 Maximum Unwanted Emission in Restricting Bands

Frequency Measured (MHz)	Recorded Amplitude (dBm)	Antenna Gain (dB)	EIRP (dBm)	EIRP Limit (dBm)	Detector	Results
2390	-29.3	7.64	-21.66	-41.2	Peak	Pass
2390	-63.5	7.64	-55.86	-21.2	Average	Pass

Note: There were no other signals to investigate

6.0 Radiated Spurious Emission

Radiated spurious/harmonic emissions measurements were performed on the EUT to determine compliance to FCC sections 15.209.

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, 3, or 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 10 meter distance 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 from 1 GHz to 18 GHz were measured with average and peak detection with a resolution bandwidth of 1 MHz and measured at a distance of 3 meter.

Spurious/harmonic emissions above 18 GHz 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 7.1.1.

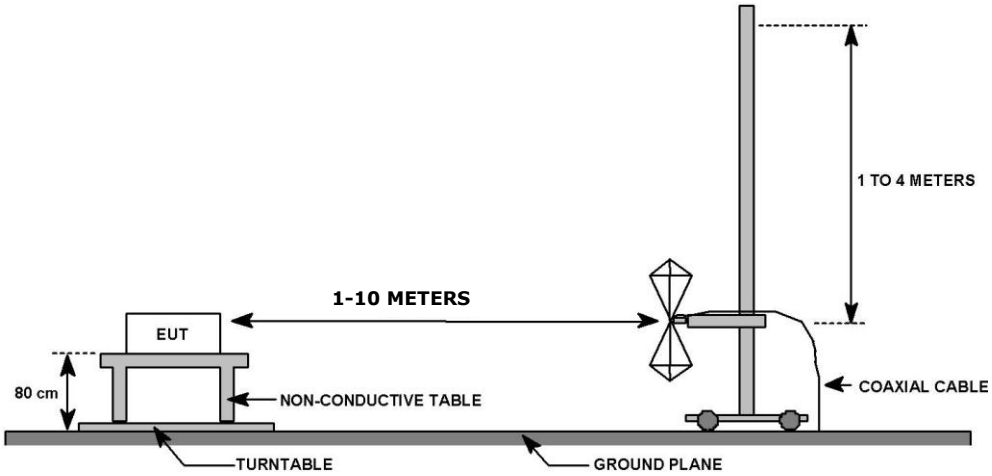


Figure 6.1.1: Radiated Emission Test Setup

6.2 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	Specification Test Distance (Meters)	Field Strength (dBuV/m)	Alternative Test Distance (Meters)	Field Strength (dBuV/m)
30 to 88	3	40.0	10	29.5
88 to 216	3	43.5	10	33.1
216 to 960	3	46.0	10	35.6
Above 960	3	54.0	3 or 1	54.0 or 63.5

6.3 Test Equipment

Table 6.3.1: Radiated Emissions Test Equipment (frequency < 1 GHz)

Asset #	Manufacturer	Model #	Description	Calibration Due
1509A	Braden	N/A	TDK 10M Chamber, NSA < 1 GHz	8/7/2012
0586	HP	8447D	Preamp, 0.1-1300MHz, 26dB	12/21/2012
1930	Agilent	E4440A-239	Spectrum Analyzer, 3 Hz - 26.5 GHz	5/19/2012
1926	ETS-Lindgren	3142D	Antenna, Biconilog, 26 MHz - 6 GHz	5/4/2012
C027	N/A	RG214	Cable Coax, N-N, 25m	5/26/2012

Table 6.3.2: Microwave Radiated Emissions Test Equipment (1GHz ≤ frequency < 18GHz)

Asset #	Manufacturer	Model #	Description	Calibration Due
1594	Miteq	AFS44-00102650	Amplifier, 1-26.5GHz, 42dB	4/17/2012
C030	N/A	RG214	Cable Coax, N-N, 30m	5/26/2012
1780	ETS-Lindgren	3117	Antenna, Double Ridged Guide Horn, 1 - 18 GHz	1/19/2013
1930	Agilent	E4440A-239	Spectrum Analyzer, 3 Hz - 26.5 GHz	5/19/2012

Table 6.3.3: Microwave Radiated Emissions Test Equipment (18GHz ≤ frequency <25GHz)

Asset #	Manufacturer	Model #	Description	Calibration Due
1974	Agilent	83017A	Microwave Preamplifier	9/20/2012
Rental	Rohde & Schwarz	FSP	Spectrum Analyzer, 9 kHz – 30 GHz	12/21/2012
1542	A.H. Systems	SAS 572	Antenna, Horn 18-26.5GHz	NCR

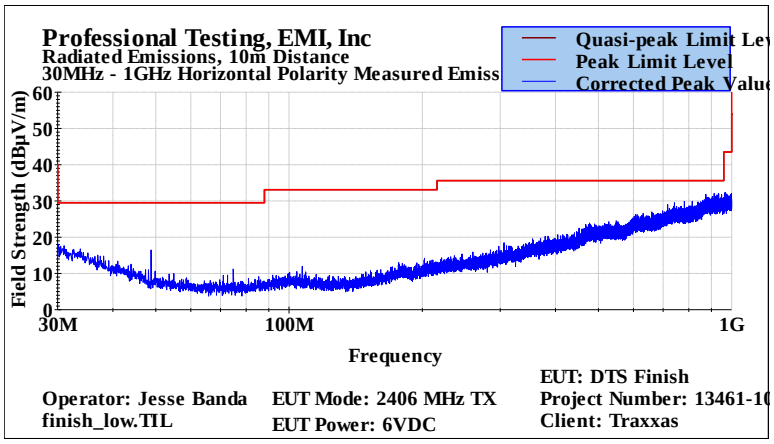
6.4 Test Results

Out of band spurious emissions measurements were taken on March 2, 2012 and April 6, 2012 and the EUT was found to be in compliance with applicable requirements.

Table 6.4.1: Out of Band Spurious Emissions Test Results, 30 MHz to 1 GHz, Low Channel

FREQUENCY	DATE	CLASS	DISTANCE	ANTENNA	RBW	VBW	DETECTOR
2406 MHz	April 6, 2012	FCC B	10 m	Biconilog	CISPR 120 kHz	1 MHz	Quasi Peak
COMMENT							

Frequency Measured (MHz)	Antenna	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBµV)	Corrected Level (dBµV/m)	Limit Level (dBµV/m)	Margin (dB)
49	HORZ	Noise	Floor	Quasi-peak	23.9	8.3	29.5	-21.2
74.8	HORZ	Noise	Floor	Quasi-peak	23.4	6.2	29.5	-23.3
970	HORZ	Noise	Floor	Quasi-peak	24.8	31.6	43.5	-11.9
46	VERT	Noise	Floor	Quasi-peak	23.6	9.1	29.5	-20.4
96.7	VERT	Noise	Floor	Quasi-peak	24.6	8.9	33.1	-24.2
970	VERT	Noise	Floor	Quasi-peak	24.7	31.5	43.5	-12.0



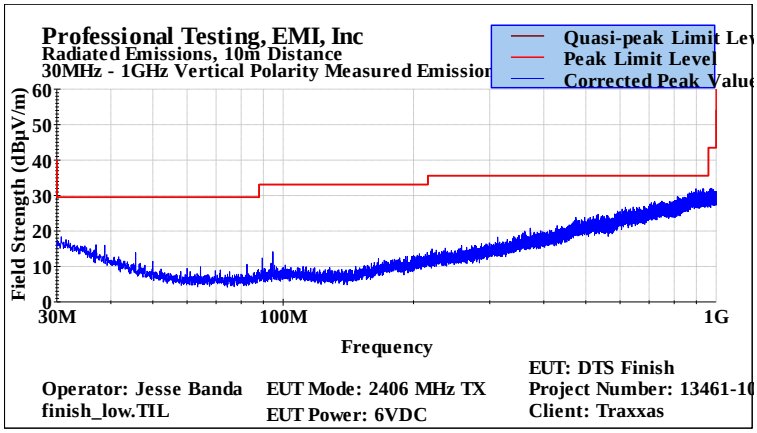


Table 6.4.2: Out of Band Spurious Emissions Test Results, 1 GHz to 25 GHz, Low Channel

FREQUENCY	DATE	CLASS	DISTANCE	ANTENNA	RBW	VBW	DETECTOR
2406 MHz	April 6, 2012	FCC B	1-3 m	Horn	1 MHz	1 MHz	Average
COMMENT	Since the EUT passed the average limit in peak mode, there were no average measurements taken.						

Horizontal Polarization

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)
4812	3	Noise	Floor	Average	73.4	29.0	54.0	-24.9
7218	3	Noise	Floor	Average	73.7	32.7	54.0	-21.3
9624	3	Noise	Floor	Average	73.7	38.0	54.0	-15.9
12030	3	Noise	Floor	Average	74.2	43.7	54.0	-10.3
14436	3	Noise	Floor	Average	74.6	44.0	54.0	-9.9
16842	3	Noise	Floor	Average	75	46.7	54.0	-7.3
19248	1	Noise	Floor	Average	43.9	49.6	63.5	-13.9
21654	1	Noise	Floor	Average	46.7	52.5	63.5	-11.0
24060	1	Noise	Floor	Average	47.1	55.1	63.5	-8.4

Vertical Polarization

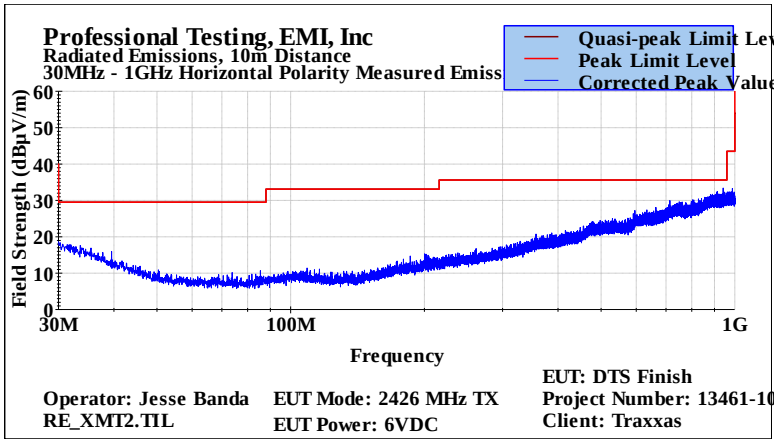
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBµV)	Corrected Level (dBµV/m)	Limit Level (dBµV/m)	Margin (dB)
4812	3	Noise	Floor	Average	73.4	29.0	54.0	-24.9
7218	3	Noise	Floor	Average	73.5	32.5	54.0	-21.5
9624	3	Noise	Floor	Average	73.6	37.9	54.0	-16.0
12030	3	Noise	Floor	Average	74.2	43.7	54.0	-10.3
14436	3	Noise	Floor	Average	74.6	44.0	54.0	-9.9
16842	3	Noise	Floor	Average	75.1	46.8	54.0	-7.2
19248	1	Noise	Floor	Average	43.9	49.6	63.5	-13.9
21654	1	Noise	Floor	Average	46.6	52.4	63.5	-11.1
24060	1	Noise	Floor	Average	47.1	55.1	63.5	-8.4

Result = Pass

Table 6.4.3: Out of Band Spurious Emissions Test Results, 30 MHz to 1 GHz, Mid Channel

FREQUENCY	DATE	CLASS	DISTANCE	ANTENNA	RBW	VBW	DETECTOR
2426 MHz	March 2, 2012	FCC B	10 m	Biconilog	CISPR 120 kHz	1 MHz	Quasi Peak
COMMENT							

Frequency Measured (MHz)	Antenna	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBµV)	Corrected Level (dBµV/m)	Limit Level (dBµV/m)	Margin (dB)
60	HORZ	Noise	Floor	Quasi-peak	24	6.9	29.5	-22.6
400	HORZ	Noise	Floor	Quasi-peak	24.5	18.7	35.6	-16.9
970	HORZ	Noise	Floor	Quasi-peak	24.9	31.7	43.5	-11.8
60	VERT	Noise	Floor	Quasi-peak	26.9	9.8	29.5	-19.7
95	VERT	Noise	Floor	Quasi-peak	23.4	7.5	33.1	-25.6
970	VERT	Noise	Floor	Quasi-peak	24.9	31.7	43.5	-11.8



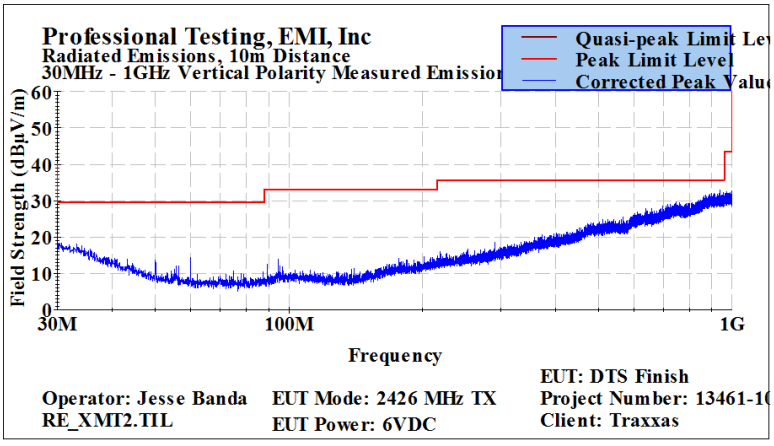


Table 6.4.4: Out of Band Spurious Emissions Test Results, 1 GHz to 25 GHz, Mid Channel

FREQUENCY	DATE	CLASS	DISTANCE	ANTENNA	RBW	VBW	DETECTOR
2426 MHz	March 2, 2012	FCC B	1-3 m	Horn	1 MHz	1 MHz	Average
COMMENT	Since the EUT passed the average limit in peak mode, there were no average measurements taken.						

Horizontal Polarization

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)
4852	3	Noise	Floor	Peak	73.4	29.0	54.0	-24.9
7278	3	Noise	Floor	Peak	73.7	32.8	54.0	-21.2
9704	3	Noise	Floor	Peak	73.7	38.4	54.0	-15.6
12130	3	Noise	Floor	Peak	74.2	43.3	54.0	-10.6
14556	3	Noise	Floor	Peak	74.6	44.3	54.0	-9.7
16982	3	Noise	Floor	Peak	75	46.5	54.0	-7.4
19408	1	Noise	Floor	Peak	43.9	48.7	63.5	-14.8
21834	1	Noise	Floor	Peak	46.7	52.5	63.5	-11.0
24260	1	Noise	Floor	Peak	47.1	55.7	63.5	-7.8

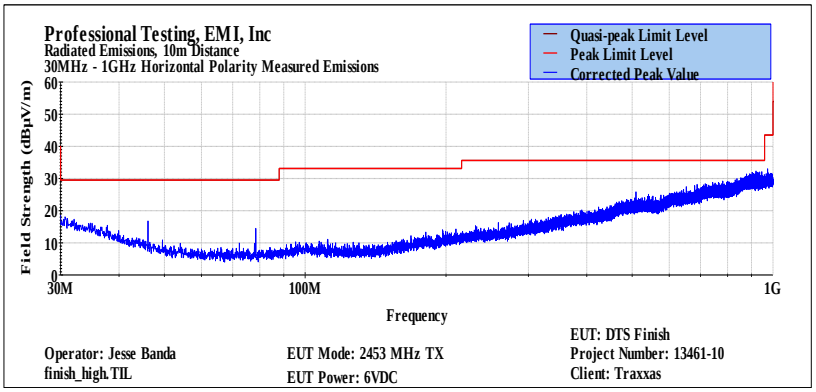
Vertical Polarization

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)
4852	3	Noise	Floor	Peak	73.4	29.0	54.0	-24.9
7278	3	Noise	Floor	Peak	73.5	32.6	54.0	-21.4
9704	3	Noise	Floor	Peak	73.6	38.3	54.0	-15.7
12130	3	Noise	Floor	Peak	74.2	43.3	54.0	-10.6
14556	3	Noise	Floor	Peak	74.6	44.3	54.0	-9.7
16982	3	Noise	Floor	Peak	75.1	46.6	54.0	-7.3
19408	1	Noise	Floor	Peak	43.9	48.7	63.5	-14.8
21834	1	Noise	Floor	Peak	46.6	52.4	63.5	-11.1
24260	1	Noise	Floor	Peak	47.1	55.7	63.5	-7.8

Table 6.4.5: Out of Band Spurious Emissions Test Results, 30 MHz to 1 GHz, High Channel

FREQUENCY	DATE	CLASS	DISTANCE	ANTENNA	RBW	VBW	DETECTOR
2453 MHz	April 6, 2012	FCC B	10 m	Biconilog	CISPR 120 kHz	1 MHz	Quasi Peak
COMMENT							

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)
46	HORZ	Noise	Floor	Quasi-peak	23.8	9.3	29.5	-20.2
79	HORZ	Noise	Floor	Quasi-peak	23.5	6.2	29.5	-23.3
970	HORZ	Noise	Floor	Quasi-peak	23.7	30.5	43.5	-13.0
90	VERT	Noise	Floor	Quasi-peak	23.8	7.4	33.1	-25.7
96	VERT	Noise	Floor	Quasi-peak	24.2	8.4	33.1	-24.7
970	VERT	Noise	Floor	Quasi-peak	23.6	30.4	43.5	-13.1



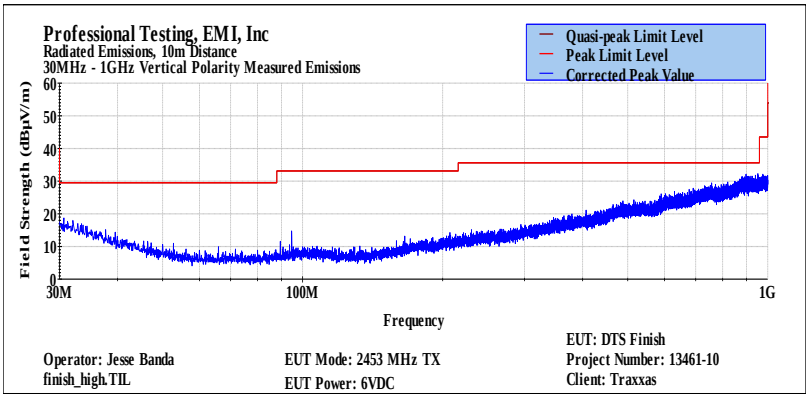


Table 6.4.6: Out of Band Spurious Emissions Test Results, 1 GHz to 25 GHz, High Channel

FREQUENCY	DATE	CLASS	DISTANCE	ANTENNA	RBW	VBW	DETECTOR
2453 MHz	April 6, 2012	FCC B	1-3 m	Horn	1 MHz	1 MHz	Average
COMMENT	Since the EUT passed the average limit in peak mode, there were no average measurements taken.						

Horizontal Polarization

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)
4906	3	Noise	Floor	Peak	73.5	29.1	54.0	-24.8
7359	3	Noise	Floor	Peak	73.7	32.9	54.0	-21.0
9812	3	Noise	Floor	Peak	73.9	38.7	54.0	-15.2
12265	3	Noise	Floor	Peak	74.2	42.9	54.0	-11.1
14718	3	Noise	Floor	Peak	74.8	45.1	54.0	-8.8
17171	3	Noise	Floor	Peak	75	46.7	54.0	-7.3
19624	1	Noise	Floor	Peak	43.8	49.3	63.5	-14.2
22077	1	Noise	Floor	Peak	46.8	53.4	63.5	-10.1
24530	1	Noise	Floor	Peak	47.3	56.3	63.5	-7.2

Vertical Polarization

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)
4906	3	Noise	Floor	Peak	73.4	29.0	54.0	-24.9
7359	3	Noise	Floor	Peak	73.7	32.9	54.0	-21.0
9812	3	Noise	Floor	Peak	73.8	38.6	54.0	-15.3
12265	3	Noise	Floor	Peak	74.2	42.9	54.0	-11.1
14718	3	Noise	Floor	Peak	74.8	45.1	54.0	-8.8
17171	3	Noise	Floor	Peak	74.9	46.6	54.0	-7.4
19624	1	Noise	Floor	Peak	43.8	49.3	63.5	-14.2
22077	1	Noise	Floor	Peak	46.9	53.5	63.5	-10.0
24530	1	Noise	Floor	Peak	47.3	56.3	63.5	-7.2

7.0 Band Edge Emissions

Band edge emission measurements were performed onthe EUTto determine compliance to FCC 15.247(d).

7.1 Test Procedure

Band Edge was measured with a spectrum analyzer connected to the output of the EUT via a short coaxial cable. The EUT was set to transmit at the appropriate frequencies while measurements were made. The analyzer was set to 100 kHz RBW and 300 kHz VBW.The analyzer was then set to MAX HOLD and the peak value was recorded as the PDS level. The span was then set to show the band edge of the transmitting signal with the edge of the authorized frequency band as defines in FCC 15.247. A reference line was installed on the screen to indicate the recorded PSD level. Another reference line was installed 20 dB below the recorded PSD level and a measurement was taken.A low and high frequency was measured. A diagram showing the test setup is given as Figure 6.1.1.

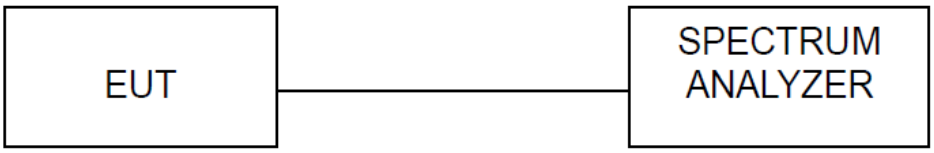


Figure 6.1.1: Conducted Emission Test Setup

7.2 Test Criteria

According to section 47 CFR, Sections 15.247(d), the maximum emission outside the authorized frequency shall be attenuated by at least 20 dB from the recorded PSD level.

7.3 Test Equipment

Table 6.3.1: Microwave Radiated Emissions Test Equipment (1GHz ≤ frequency < 18GHz)

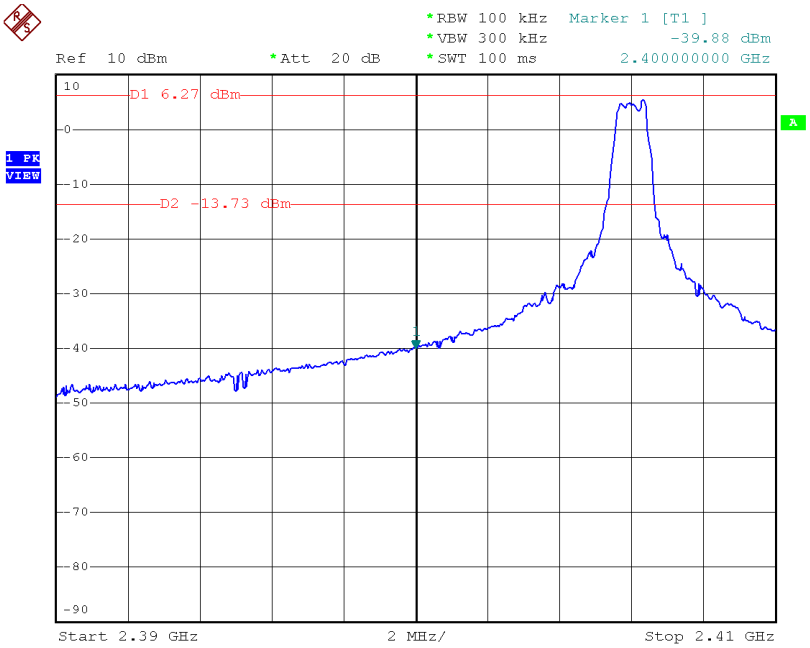
Asset #	Manufacturer	Model #	Description	Calibration Due
C030	N/A	RG214	Cable Coax, N-N, 30m	5/26/2012
0819	ETS-Lindgren	3117	Antenna, Double Ridged Guide Horn, 1 - 18 GHz	11/15/2012
Rental	Rohde & Schwarz	E4440A-239	Spectrum Analyzer, 3 Hz - 26.5 GHz	12/22/2012

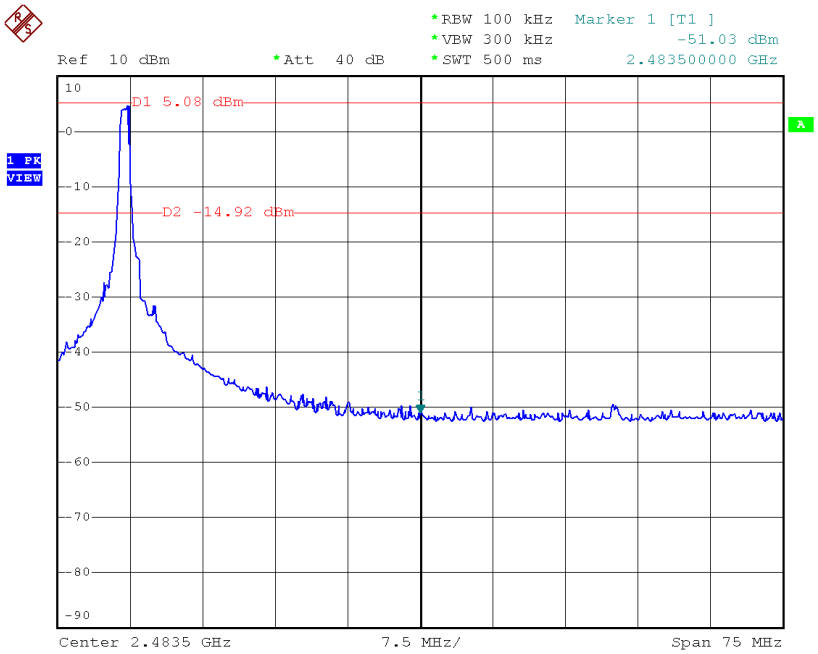
7.4 Test Results

Band edge spurious emissions measurements were taken on March 1, 2012, and the EUT was found to be in compliance with applicable requirements.

Table 6.4.1 Band Edge Spurious Emission Test Results Data Sheet

Frequency Measured (MHz)	Recorded Amplitude (dBm)	Peak in-band PSD level (dBm)	20 dBc Level (dBm)	Margin (dB)	Result
2400	-39.88	6.27	-13.73	-26.15	Pass
2483.5	-51.03	5.08	-14.92	-36.11	Pass





8.0 Antenna Requirements

An antenna evaluation was performed on the EUTtodetermine compliance with FCC sections 15.203, 15.249(b) and RSS-210.

8.1 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.

8.2 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.

8.3 Evaluation Results

The Drag Timing System FinishEnd met the criteria of this rule by virtue of having an internal antenna inaccessible to the user. Therefore, the EUT is compliant.

End of Report

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