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Report On

Radio Testing of the
Blast Motion, Inc.
Blast B0113 Wireless Motion Sensor

FCC Part 15 Subpart C §15.249
IC RSS-210 Issue 8 December 2010

Report No. SC1312333 **January 2014**

TÜV SÜD America Inc., 10040 Mesa Rim Road, San Diego, CA 92121
Tel: (858) 678-1400. Website: www.TUVamerica.com

REPORT ON	Radio Testing of the Blast Motion, Inc. Wireless Motion Sensor
TEST REPORT NUMBER	SC1312333
PREPARED FOR	Blast Motion, Inc. 2281 Las Palmas Drive, Suite 101 Carlsbad, CA 92011
CONTACT PERSON	Mark Winbigler Sr. Manufacturing Engineer (760) 803-2724 mwinbigler@blastmotion.com
PREPARED BY	Ferdinand S. Custodio **Name** Authorized Signatory Title: EMC/Wireless Test Engineer
APPROVED BY	Chip R. Fleury **Name** Authorized Signatory
DATED	December 31, 2013

Revision History

SC1312333 Blast Motion, Inc. Blast Wireless Motion Sensor					
DATE	OLD REVISION	NEW REVISION	REASON	PAGES AFFECTED	APPROVED BY
12/31/13	Initial Release				Chip R. Fleury

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SECTION 1

REPORT SUMMARY

Radio Testing of the
Blast Motion, Inc.
Wireless Motion Sensor

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1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Blast Motion, Inc. Wireless Motion Sensor to the requirements of FCC Part 15 Subpart C §15.249 and IC RSS-210 Issue 8 December 2010.

Objective	To perform Radio Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Manufacturer	Blast Motion, Inc.
Model Number(s)	B0113
FCC ID Number	SN2-B0113
IC Number	11003A-B0113
Serial Number(s)	N/A
Number of Samples Tested	1
Test Specification/Issue/Date	• FCC Part 15 Subpart C §15.249 (October 1, 2013). • RSS-210 - Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment (Issue 8, December 2010). • RSS-Gen - General Requirements and Information for the Certification of Radio Apparatus (Issue 3, December 2010).
Start of Test	December 30, 2013
Finish of Test	December 30, 2013
Name of Engineer(s)	Ferdinand S. Custodio
Related Document(s)	None. Supporting documents for EUT certification are separate exhibits.

1.2 BRIEF SUMMARY OF RESULTS

A brief summary of the tests carried out in accordance with FCC Part 15 Subpart C §15.249 with cross-reference to the corresponding IC RSS standard is shown below.

Section	Spec Clause	RSS	Test Description	Result	Comments/Base Standard
2.1	§15.207(a)	RSS-Gen 7.2.4	Conducted Emissions	N/A	
2.2	§15.215(c)	RSS-Gen 4.6.3	20 dB Bandwidth	Compliant	
2.3		RSS-Gen 4.6.1	99% Emission Bandwidth	Compliant	
2.4	§15.249(a)	RSS-210 A2.9(a)	Field Strength Limits for Fundamental and Harmonics	Compliant	
2.5	§15.249(d)	RSS-210 A2.9(b)	Spurious Radiated Emissions	Compliant	
2.6		RSS-Gen 4.10	Receiver Spurious Emissions	Compliant	

N/A *Not applicable, EUT is battery powered*

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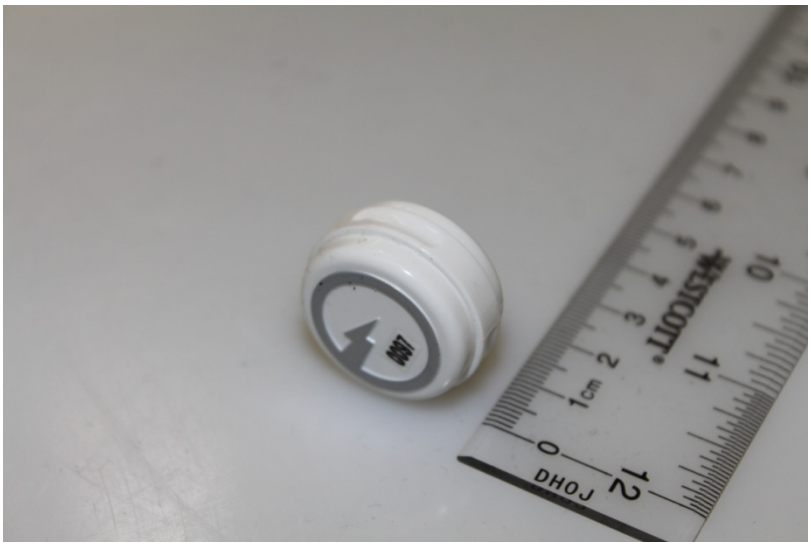
1.3 PRODUCT INFORMATION

1.3.1 Technical Description

The Equipment Under Test (EUT) was a Blast Motion, Inc. Wireless Motion Sensor as shown in the photograph below. The EUT is a compact inertial sensor capable of tracking motion in three-dimensional space. The EUT typically communicates with a custom mobile app using Bluetooth LE technology.



Equipment Under Test

1.3.2 EUT General Description

EUT Description	Wireless Motion Sensor
Model Name	Blast
Model Number(s)	B0113
Rated Voltage	2.8 – 4.2VDC (Rechargeable Lithium Ion Battery)
Output Power	75.8 dBµV/m @ 3 meters (0.0114 mW EIRP)
Frequency Range	2402MHz to 2480 MHz in the 2400 MHz to 2483.5 MHz Band
Number of Operating Frequencies	40
Channels Verified	Low Channel 2402MHz (Advertising Channel) Mid Channel 2440MHz (Data Channel) High Channel 2480MHz (Advertising Channel)
Antenna Type (used during evaluation)	Integral (Complies with Part 15.203 requirements)

1.3.3 Antenna Details

Model	BT Antenna Part No. 1001312
Manufacturer	ethertronics®
Antenna Type	Embedded Bluetooth™ Ceramic Antenna
Antenna Gain	1.72 dBi
EUT Antenna Connector	N/A (surface mount).
Maximum Dimensions	2.0 x 1.2mm

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1.4 EUT TEST CONFIGURATION

1.4.1 Test Configuration Description

Test Configurations	Description
Default	Radiated only configuration. EUT transmitting through the integral antenna. The EUT was placed over the support wireless charging pad to sustain continuous transmission @ 100% duty cycle. This is to prevent the EUT from reaching the cut-off voltage of 2.8VDC.

1.4.2 EUT Exercise Software

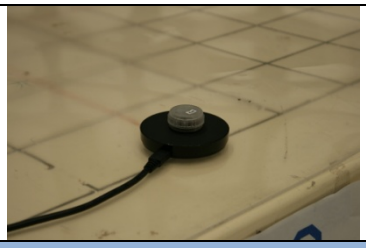
A test firmware was loaded to the EUT which enable cycling of Low, Mid and High channels @ 100% duty cycle (modulated) as well as Normal Operation and Receive modes.

1.4.3 Support Equipment and I/O cables

Manufacturer	Equipment/Cable	Description
LG	Wireless Charger	Model: WCP-300 SN: 304HYDT001690
Belkin	USB Extension	1.8 meters, shielded, Type A connector
Novatel Wireless	AC Power Supply (USB 5VDC)	Model: SSW-2423 SN: N/A

1.4.4 Worst Case Configuration

For radiated measurements X, Y and Z orientations were verified. For Z orientation, the EUT was rotated 90° from Y position. Identical result obtained between Y and Z orientations. Verification performed using Y or Z orientation.

		
"X" Configuration	***"Y" Configuration***	***"Z" Configuration***

Worst case channel used is Low Channel (Channel 37 2402 MHz). This is based from Peak Output Power test results under Section 2.4 of this test report.

1.4.5 Simplified Test Configuration Diagram

EUT placed over a support wireless charger during testing to ensure the internal battery can support the continuous transmission @ 100% duty cycle.

Support iPad Mini used to program the EUT using BT LE technology to transmit continuously @ 100% duty cycle (iPad removed during verification testing of the EUT) using custom test app.

1.5 DEVIATIONS FROM THE STANDARD

No deviations from the applicable test standards or test plan were made during testing.

1.6 MODIFICATION RECORD

Description of Modification	Modification Fitted By	Date Modification Fitted
Serial Number N/A		
N/A		

The table above details modifications made to the EUT during the test programme. The modifications incorporated during each test (if relevant) are recorded on the appropriate test pages.

1.7 TEST METHODOLOGY

All measurements contained in this report were conducted with ANSI C63.4-2009, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.
For conducted and radiated emissions the equipment under test (EUT) was configured to measure its highest possible emission level. This level was based on the maximized cable configuration from exploratory testing per ANSI C63.4-2009. The test modes were adapted according to the Operating Instructions provided by the manufacturer/client.

1.8 TEST FACILITY LOCATION

1.8.1 TÜV SÜD America Inc. (Mira Mesa)

10040 Mesa Rim Road, San Diego, CA 92121-2912 (32.901268,-117.177681). Phone: 858 678 1400 FAX: 858-546 0364

1.8.2 TÜV SÜD America Inc. (Rancho Bernardo)

Sony Electronics Inc., Building #8 16530 Via Esprillo, San Diego, CA 92127-1708 (33.018644,-117.092409). Phone: 858 942 5542 FAX: 858-546 0364

1.9 TEST FACILITY REGISTRATION

1.9.1 FCC – Registration No.: US5296

TUV SUD America Inc. (San Diego), is an accredited test facility with the site description report on file and has met all the requirements specified in §2.498 of the FCC rules. The acceptance letter from the FCC is maintained in our files and the Registration is US5296.

1.9.2 Industry Canada (IC) Registration No.: 3067A

The 10m Semi-anechoic chamber of TUV SUD America Inc. (San Diego) has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No. 3067A.

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SECTION 2

TEST DETAILS

Radio Testing of the
Blast Motion, Inc.
Wireless Motion Sensor

2.1 CONDUCTED EMISSIONS

2.1.1 Specification Reference

Part 15 Subpart C §15.207(a)

2.1.2 Standard Applicable

An intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 µH/50 ohms line impedance stabilization network (LISN).

Frequency of emission (MHz)	Conducted limit (dBµV)	
	Quasi-peak	Average
0.15–0.5	66 to 56*	56 to 46*
0.5–5	56	46
5–30	60	50

**Decreases with the logarithm of the frequency.*

2.1.3 Equipment Under Test and Modification State

Not performed. EUT is battery operated only.

2.2 20 dB BANDWIDTH

2.2.1 Specification Reference

Part 15 Subpart C §15.215(c)

2.2.2 Standard Applicable

(c) Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

2.2.3 Equipment Under Test and Modification State

Serial No: N/A / Default Test Configuration

2.2.4 Date of Test/Initial of test personnel who performed the test

December 30, 2013/FSC

2.2.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.2.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	23.0°C
Relative Humidity	20.5%
ATM Pressure	99.7 kPa

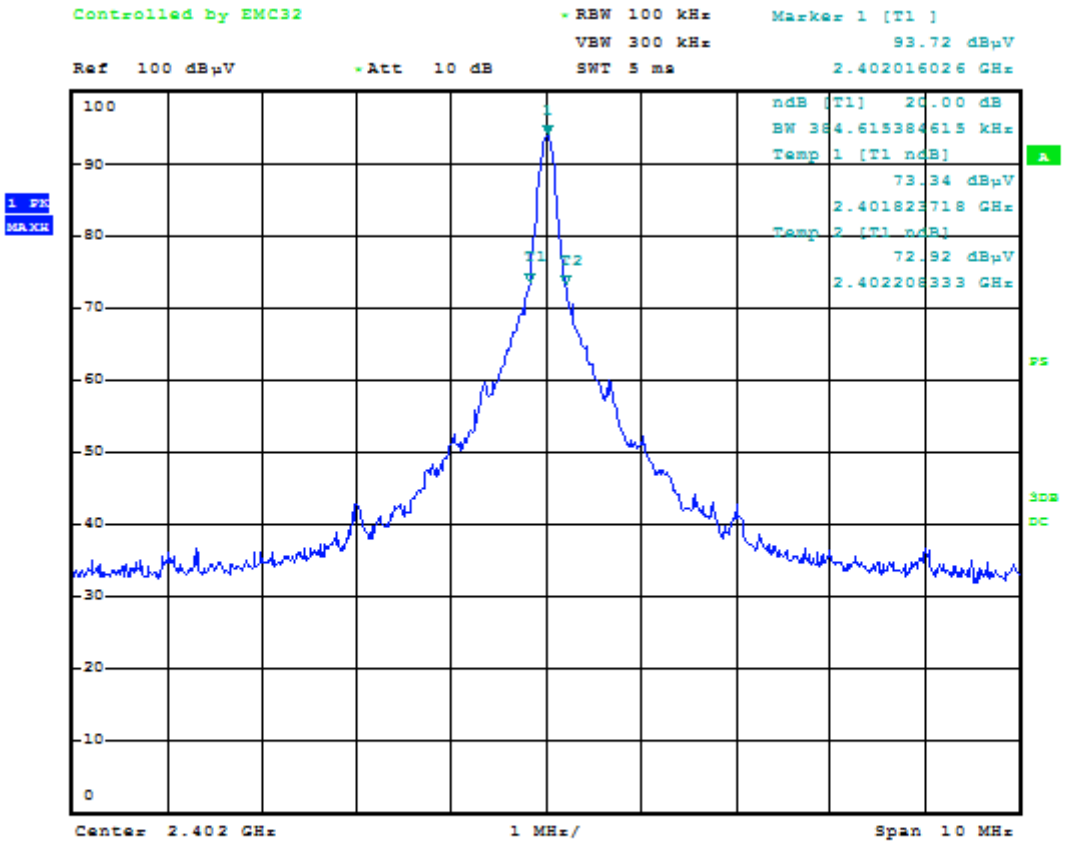
2.2.7 Additional Observations

- This is a radiated test.
- “n dB down” marker function of the Spectrum Analyzer used.
- Span is wide enough to capture the channel transmission.
- RBW is 1% of the span, VBW is 3X RBW.
- Sweep is auto.
- Detector is peak.
- Trace is max hold.

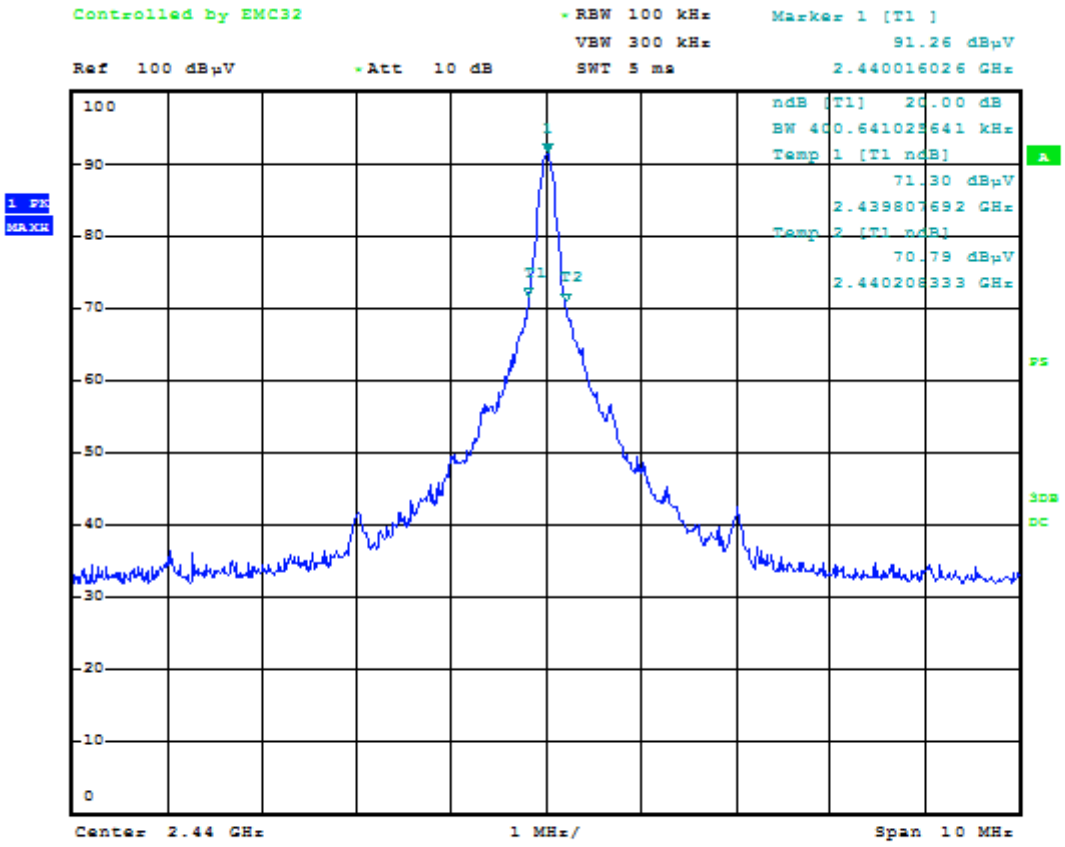
2.2.8 Test Results

Low Channel (2402 MHz)	Mid Channel (2440MHz)	High Channel (2480MHz)
384.62 kHz	400.64 kHz	384.62 kHz

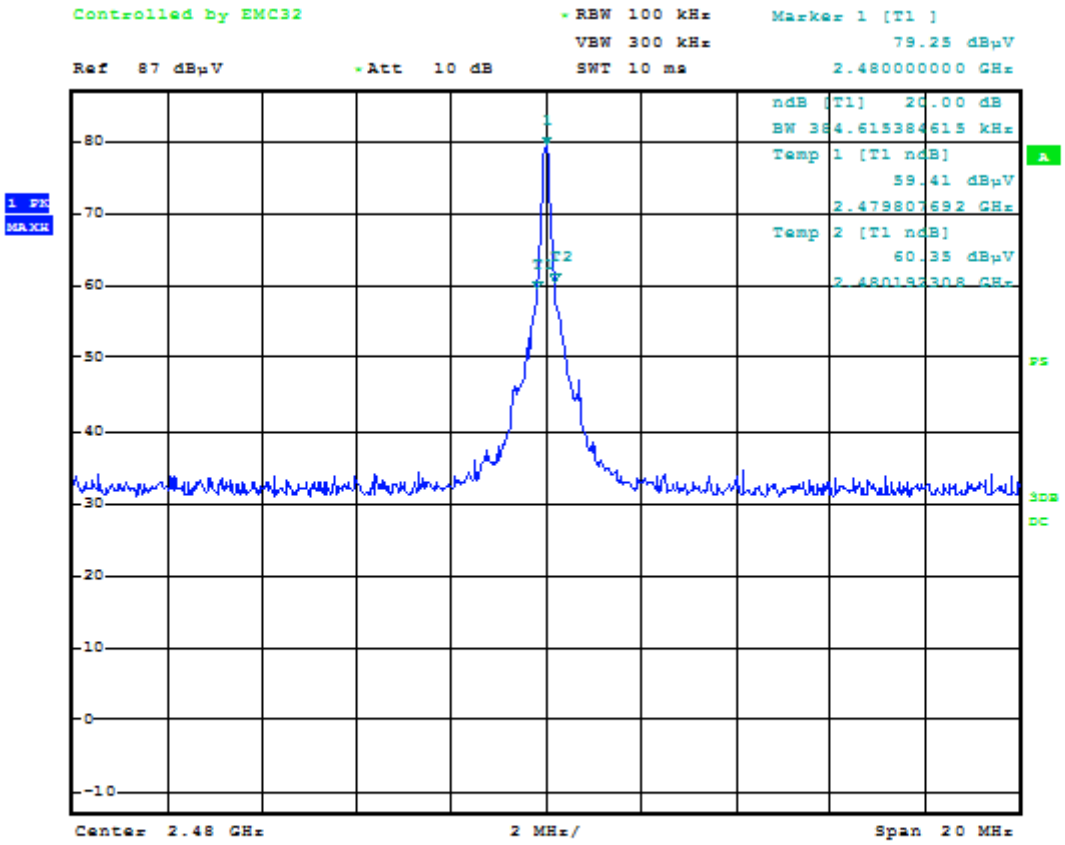
2402.00 MHz – (20dB BW/2) = 2401.806MHz (within the frequency band - **Compliant**)
2480.00MHz + (20dB BW/2) = 2480.192MHz (within the frequency band - **Compliant**)



Low Channel


Controlled by EMC32
RBW 100 kHz
VBW 300 kHz
SWT 5 ms
Marker 1 [T1]
91.26 dBµV
2.440016026 GHz
Ref 100 dBµV
Att 10 dB
ndB [T1] 20.00 dB
BW 400.641025641 kHz
Temp 1 [T1 ndB]
71.30 dBµV
2.439807692 GHz
Temp 2 [T1 ndB]
70.79 dBµV
2.440208333 GHz
1 PK
MAXH
A
PS
SDB
DC
100
90
80
70
60
50
40
30
20
10
0
T1
T2
Center 2.44 GHz
1 MHz/
Span 10 MHz
Date: 30.DEC.2013 11:42:21

Mid Channel



High Channel

2.3 99% EMISSION BANDWIDTH

2.3.1 Specification Reference

RSS-Gen Clause 4.6.1

2.3.2 Standard Applicable

When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99% emission bandwidth, as calculated or measured.
The transmitter shall be operated at its maximum carrier power measured under normal test conditions. The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts. The resolution bandwidth shall be set to as close to 1% of the selected span as is possible without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical, a sampling detector shall be used given that a peak or peak hold may produce a wider bandwidth than actual.
The trace data points are recovered and directly summed in linear terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points. This frequency is recorded. The span between the two recorded frequencies is the occupied bandwidth.

2.3.3 Equipment Under Test and Modification State

Serial No: N/A / Default Test Configuration

2.3.4 Date of Test/Initial of test personnel who performed the test

December 30, 2013/FSC

2.3.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.3.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	23.0°C
Relative Humidity	20.5%
ATM Pressure	99.7 kPa

2.3.7 Additional Observations

- This is a radiated test.
- Span is wide enough to capture the channel transmission.
- RBW is 1% of the span.
- VBW is 3X RBW.
- Sweep is auto.
- Detector is peak.

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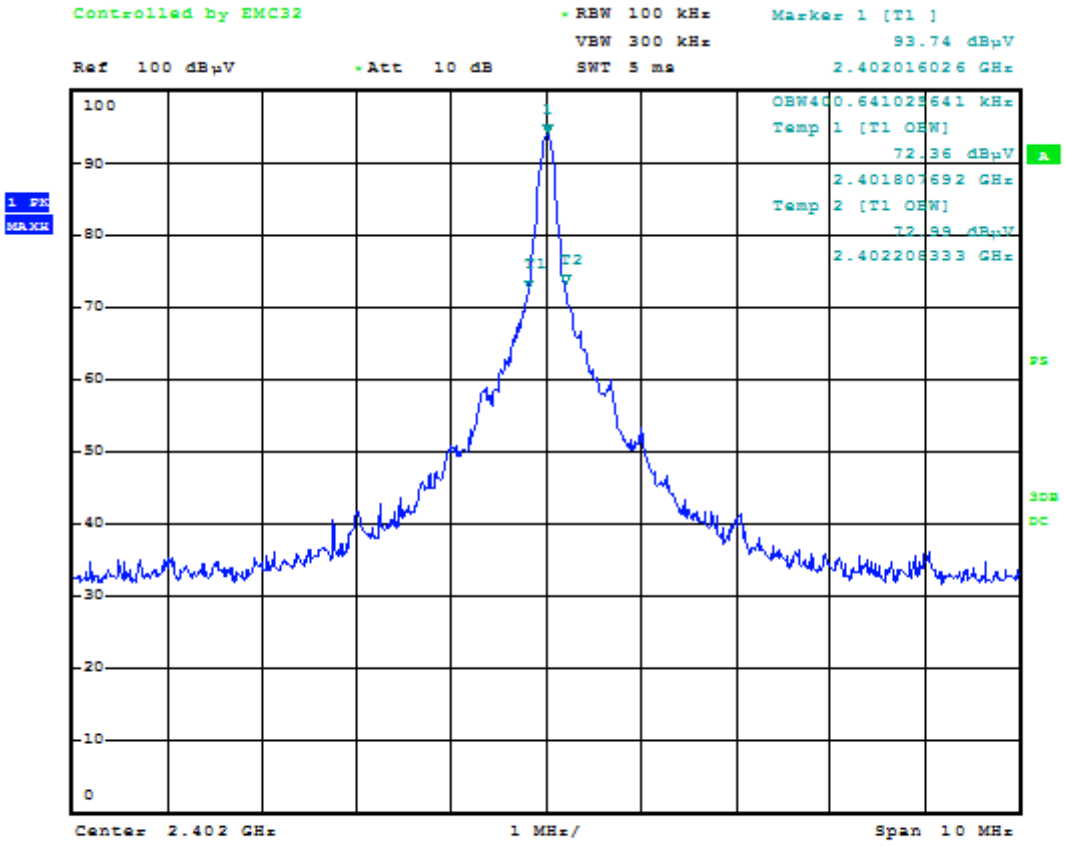
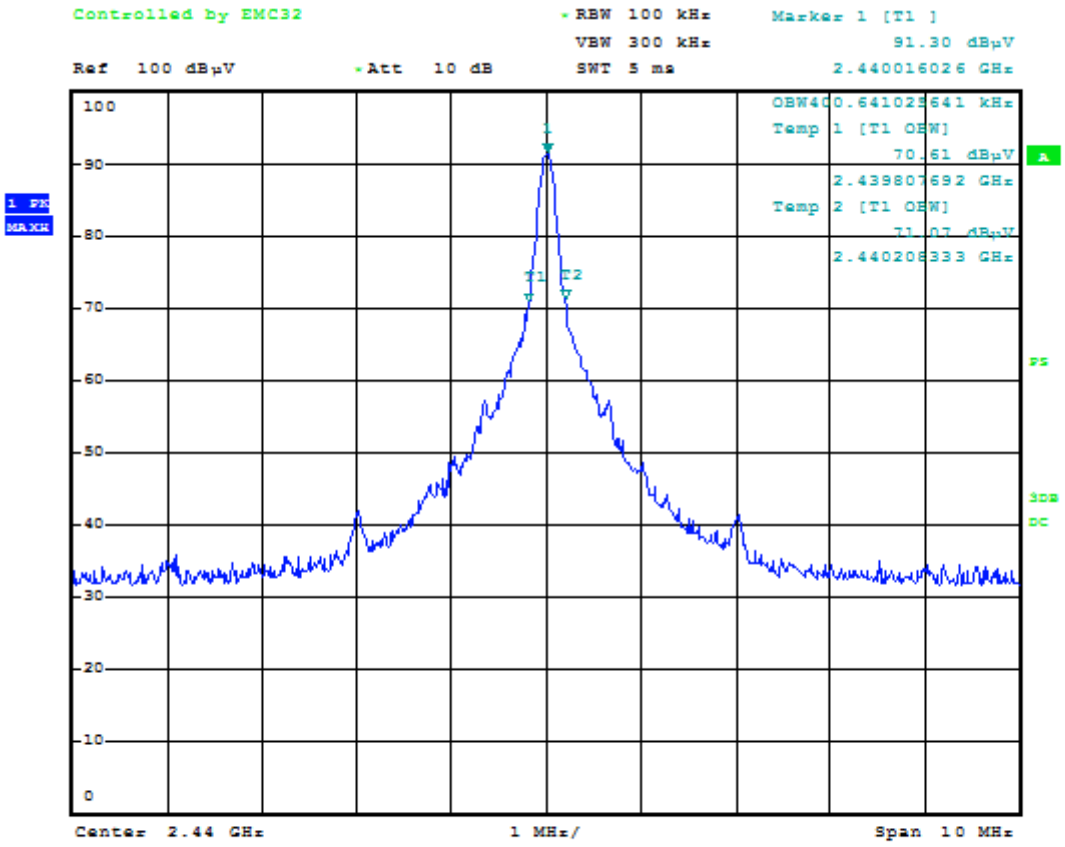
- The % Power Bandwidth setting in the spectrum analyzer was set to 99% (default).
- The Channel Bandwidth measurement function of the spectrum analyzer was used for this test.

2.3.8 Test Results

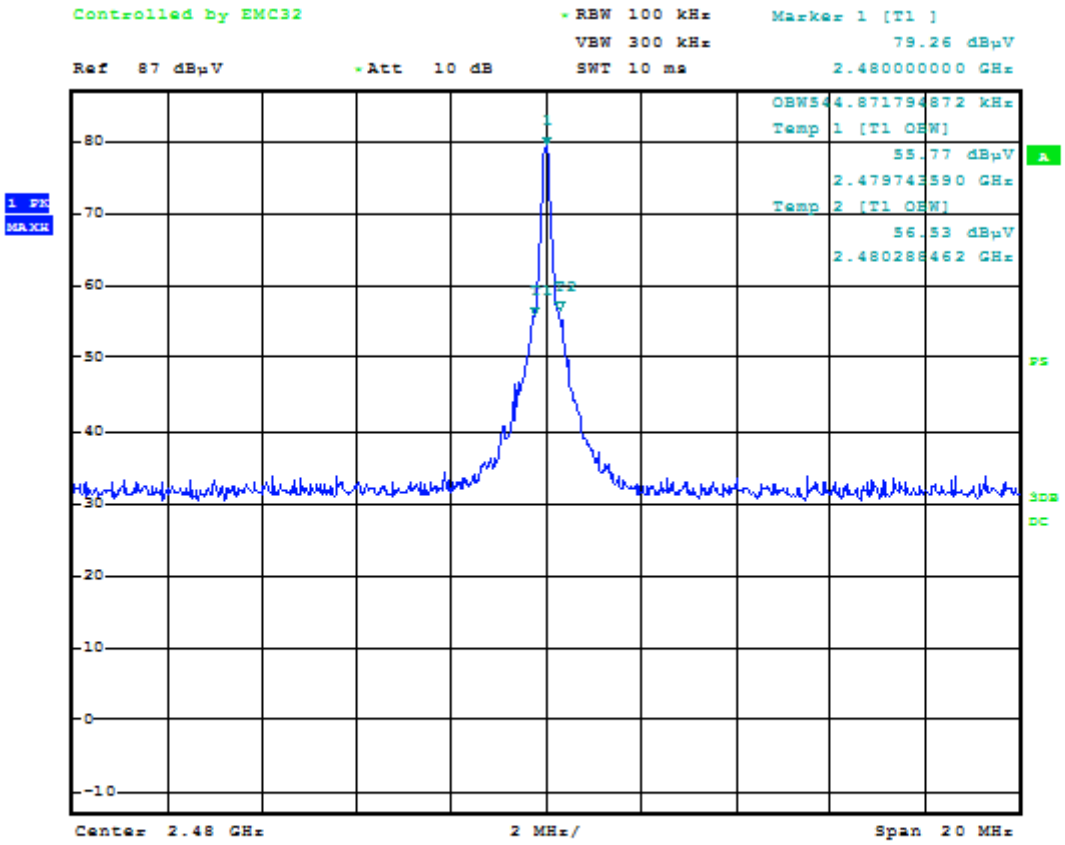
Low Channel (2402 MHz)	Mid Channel (2440MHz)	High Channel (2480MHz)
400.64 kHz	400.64 kHz	544.87 kHz



Low Channel


Controlled by EMC32
RBW 100 kHz
VBW 300 kHz
SWT 5 ms
Marker 1 [T1]
91.30 dBµV
2.440016026 GHz
Ref 100 dBµV
Att 10 dB
OBW 0.641025641 kHz
Temp 1 [T1 OBW]
70.61 dBµV
2.439807692 GHz
Temp 2 [T1 OBW]
2.440208333 GHz
1 PK
MAXH
T1 T2
100
90
80
70
60
50
40
30
20
10
0
Center 2.44 GHz
1 MHz/
Span 10 MHz
Date: 30.DEC.2013 11:41:28

Mid Channel



Date: 30.DEC.2013 14:23:36

High Channel

2.4 FIELD STRENGTH LIMITS FOR FUNDAMENTAL AND HARMONICS

2.4.1 Specification Reference

Part 15 Subpart C §15.249(a)

2.4.2 Standard Applicable

(a) The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902–928 MHz	50	500
2400–2483.5 MHz	50	500
5725–5875 MHz	50	500
24.0–24.25 GHz	250	2500

2.4.3 Equipment Under Test and Modification State

Serial No: N/A / Default Test Configuration

2.4.4 Date of Test/Initial of test personnel who performed the test

December 30, 2013/FSC

2.4.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.4.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	23.0°C
Relative Humidity	20.5%
ATM Pressure	99.7 kPa

2.4.7 Additional Observations

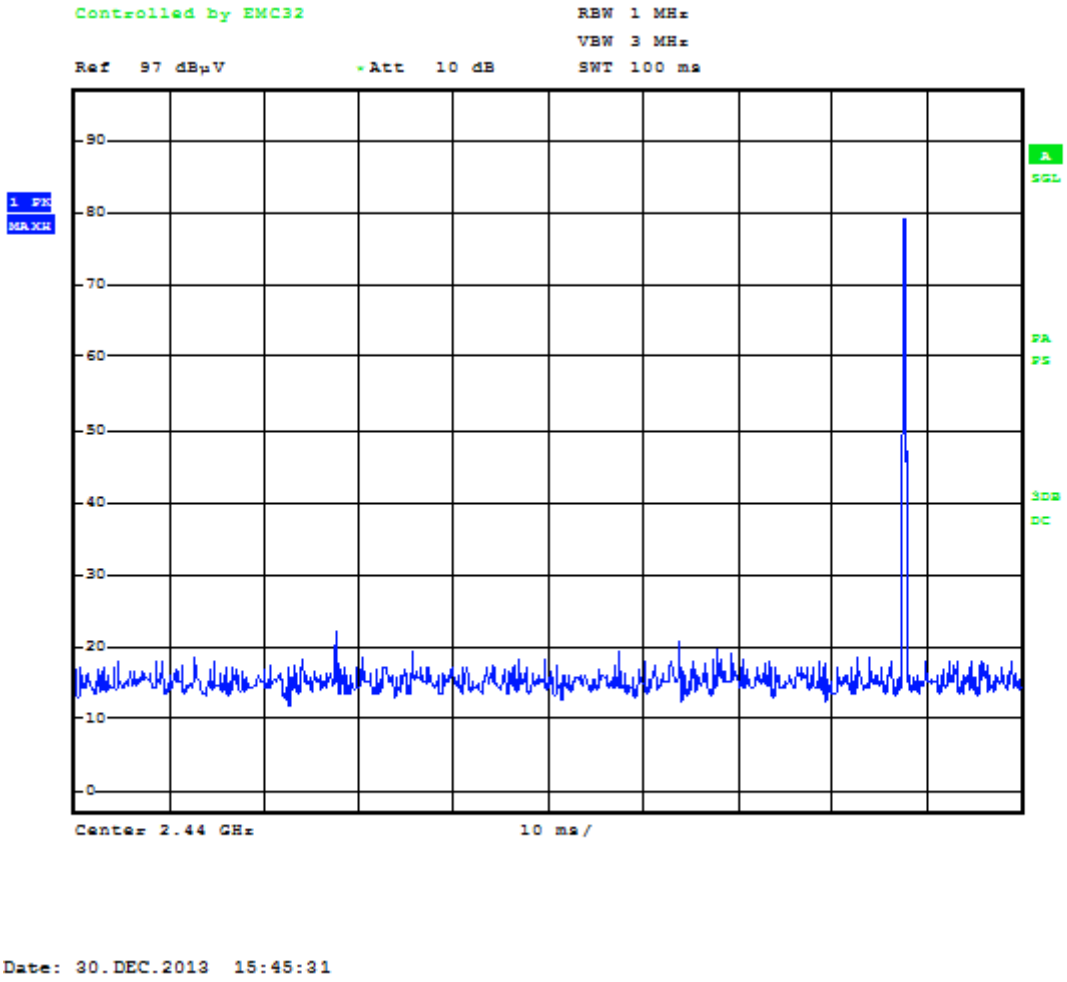
- This is a radiated test. The spectrum was searched from 1GHz to the 10th harmonic (25GHz).
- There are no emissions observed above 10GHz.
- When calculating Duty Cycle, the EUT was configured to normal operation (actual duty cycle vs. 100% duty cycle when in test mode).
- Only the fundamental measurements corrected for DCCF, all other emissions complies with the general radiated emission limits of §15.209 even at 100% duty cycle (test mode).

- Measurement was done using EMC32 V8.53 automated software. Reported level is the actual level with all the correction factors factored in. Correction Factor column is for informational purposes only. See Section 2.4.8 for sample computation.

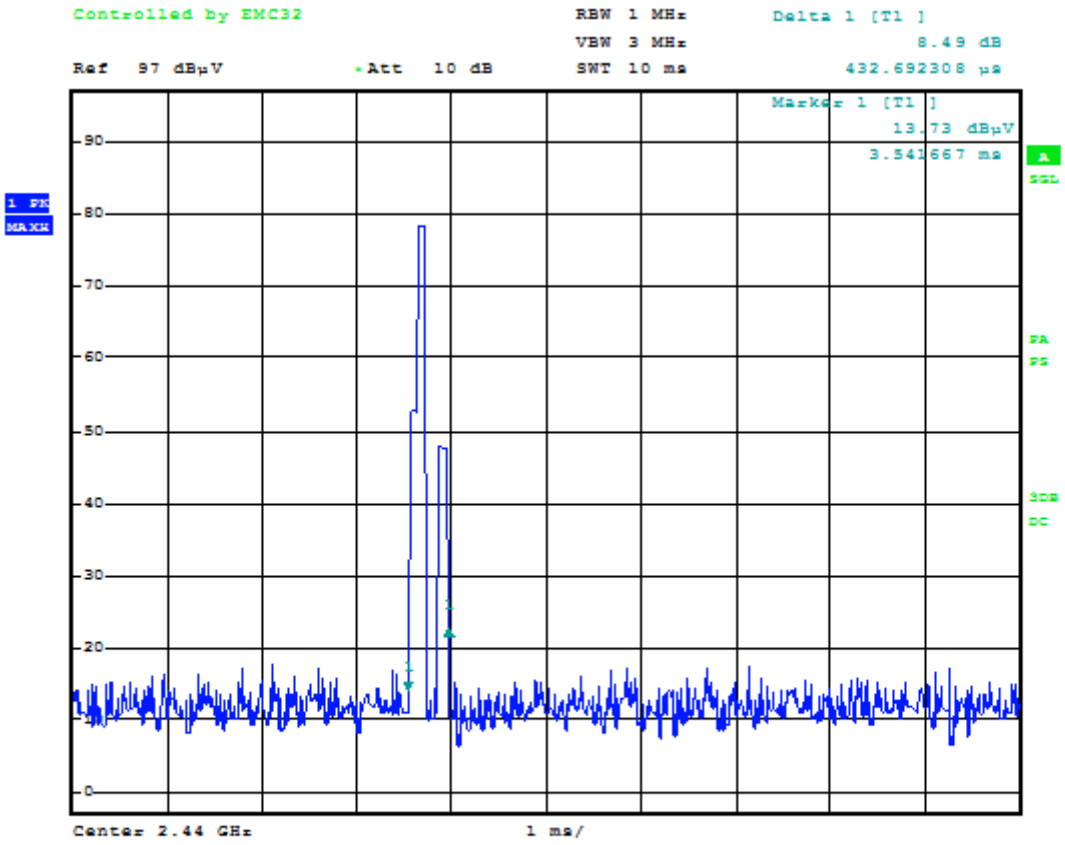
2.4.8 Sample Computation (Radiated Emission)

Measuring equipment raw measurement (dbµV) **@ 2400 MHz**			58.4
Correction Factor (dB)	Asset# 1153 (cable)	3.3	**-4.8**
	Asset# 8628 (preamplifier)	-36.4	
	Asset# 6669 (antenna)	28.3	
Reported Peak Final Measurement (dbµV/m) @ 2400 MHz			**53.6**

2.4.9 Duty Cycle Correction Factor Calculation



100ms sweep (representative channel)



10ms sweep (representative channel)

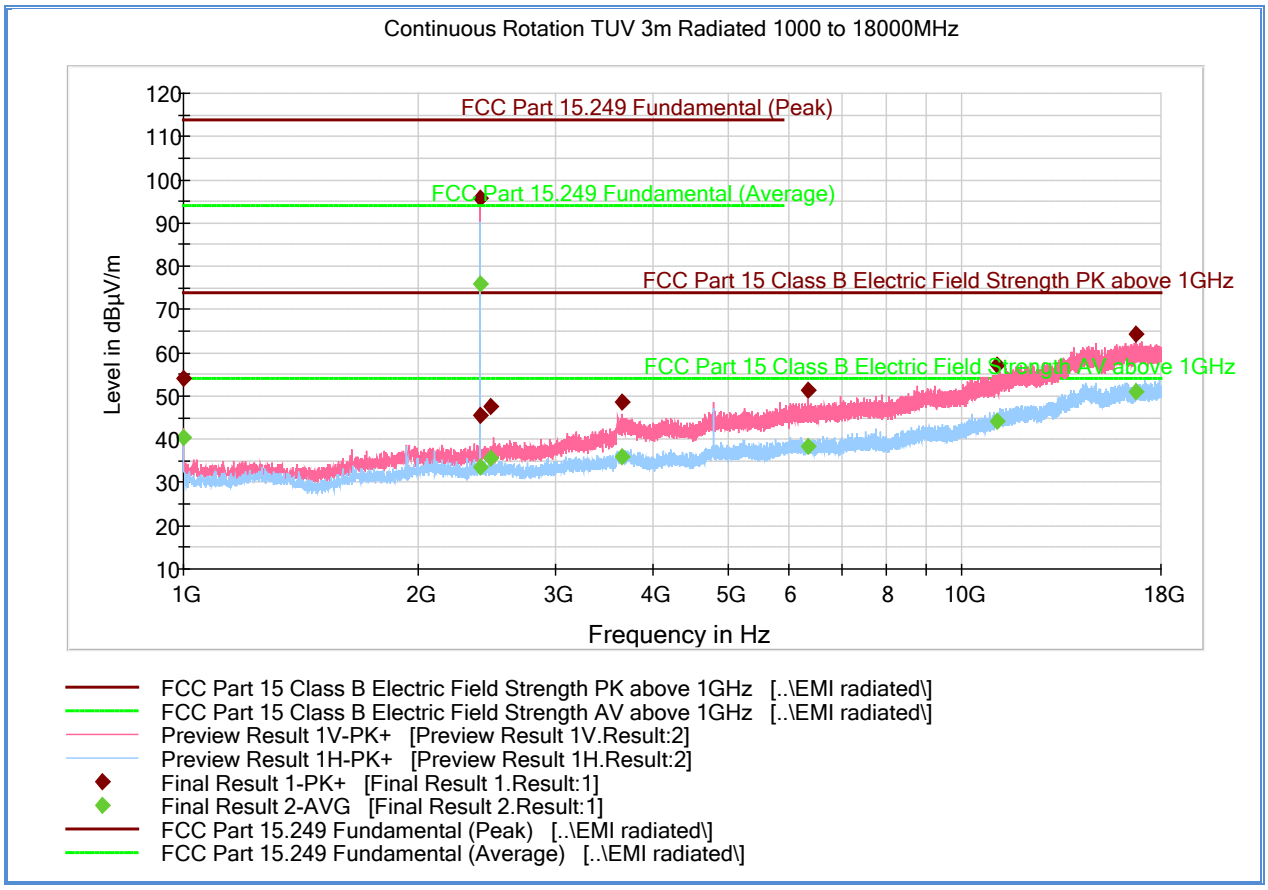
Duty Cycle Calculation: = 0.433 ms "On" time per100 ms sweep
Duty Cycle Correction Factor = 20 log (0.004333)
= **-47.26 (Limited to -20dB)**

Sample Calculation for Low Channel (95.8dBµV/m Peak @ 3 meters):
= 95.8dBµV/m – 20dB
=75.8 dBµV/m Average @ 3 meters

2.4.10 Test Results

See attached plots.

2.4.11 Test Results for Low Channel (Fundamental, Harmonics, Band Edges and above 1GHz Spurious Emissions)



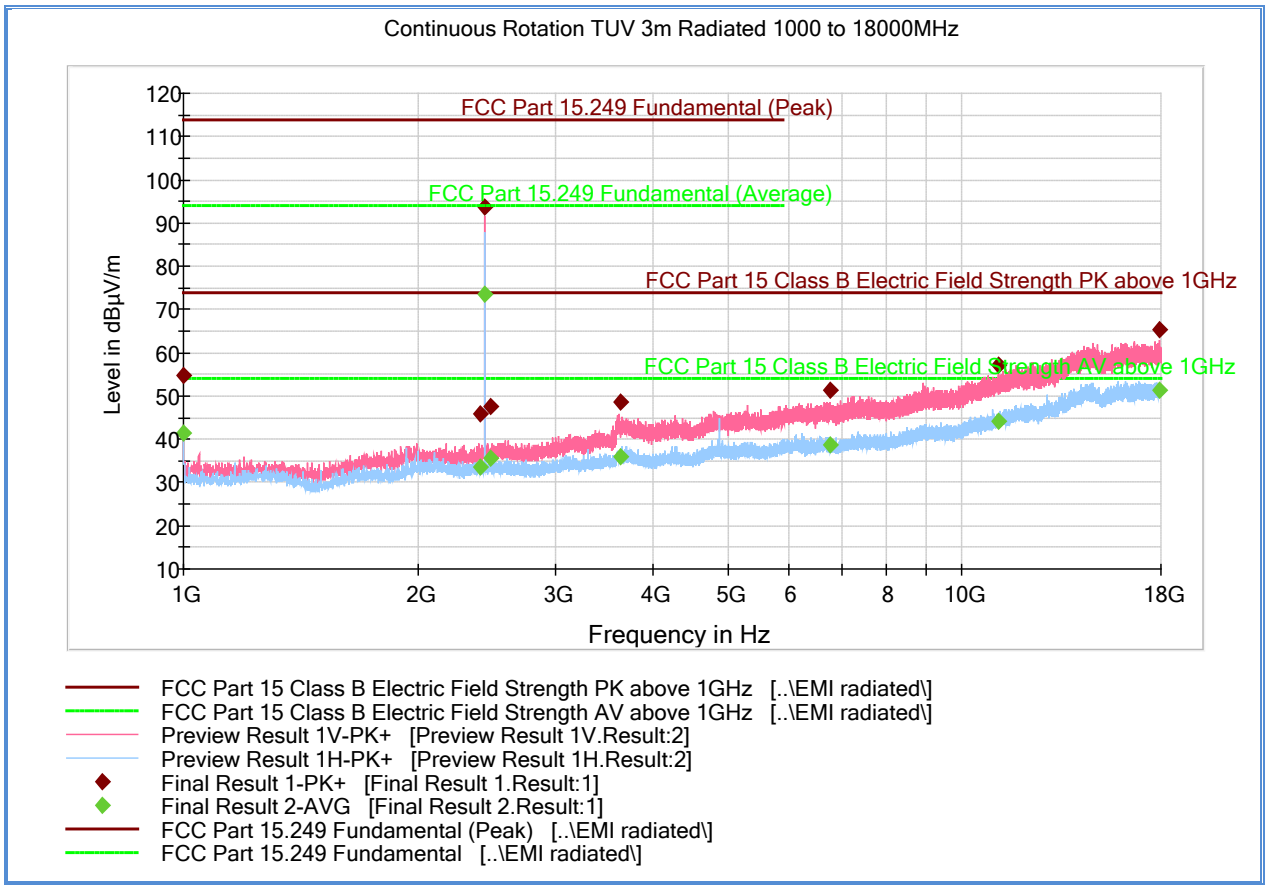
Peak Data

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.00000	54.1	1000.0	1000.000	271.3	V	224.0	-1.0	19.9	73.9
2400.00000	45.7	1000.0	1000.000	100.0	V	296.0	2.4	28.2	73.9
2402.13333	95.8	1000.0	1000.000	198.4	V	286.0	2.4	18.2	114.0
2483.50000	47.6	1000.0	1000.000	400.0	H	25.0	2.6	26.3	73.9
3663.56666	48.6	1000.0	1000.000	124.6	V	145.0	5.7	25.3	73.9
6353.30000	51.4	1000.0	1000.000	300.6	V	106.0	10.1	22.5	73.9
11068.9000	57.0	1000.0	1000.000	101.6	V	178.0	16.5	16.9	73.9
16704.0666	64.3	1000.0	1000.000	207.4	V	195.0	23.4	9.6	73.9

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.00000	40.5	1000.0	1000.000	271.3	V	224.0	-1.0	13.4	53.9
2400.00000	33.7	1000.0	1000.000	100.0	V	296.0	2.4	20.2	53.9
2402.13333	75.8	1000.0	1000.000	198.4	V	286.0	2.4	18.2	94.0
2483.50000	35.6	1000.0	1000.000	400.0	H	25.0	2.6	18.3	53.9
3663.56666	35.9	1000.0	1000.000	124.6	V	145.0	5.7	18.0	53.9
6353.30000	38.3	1000.0	1000.000	300.6	V	106.0	10.1	15.6	53.9
11068.9000	44.1	1000.0	1000.000	101.6	V	178.0	16.5	9.8	53.9
16704.0666	50.9	1000.0	1000.000	207.4	V	195.0	23.4	3.0	53.9

2.4.12 Test Results for Mid Channel (Fundamental, Harmonics, Band Edges and above 1GHz Spurious Emissions)



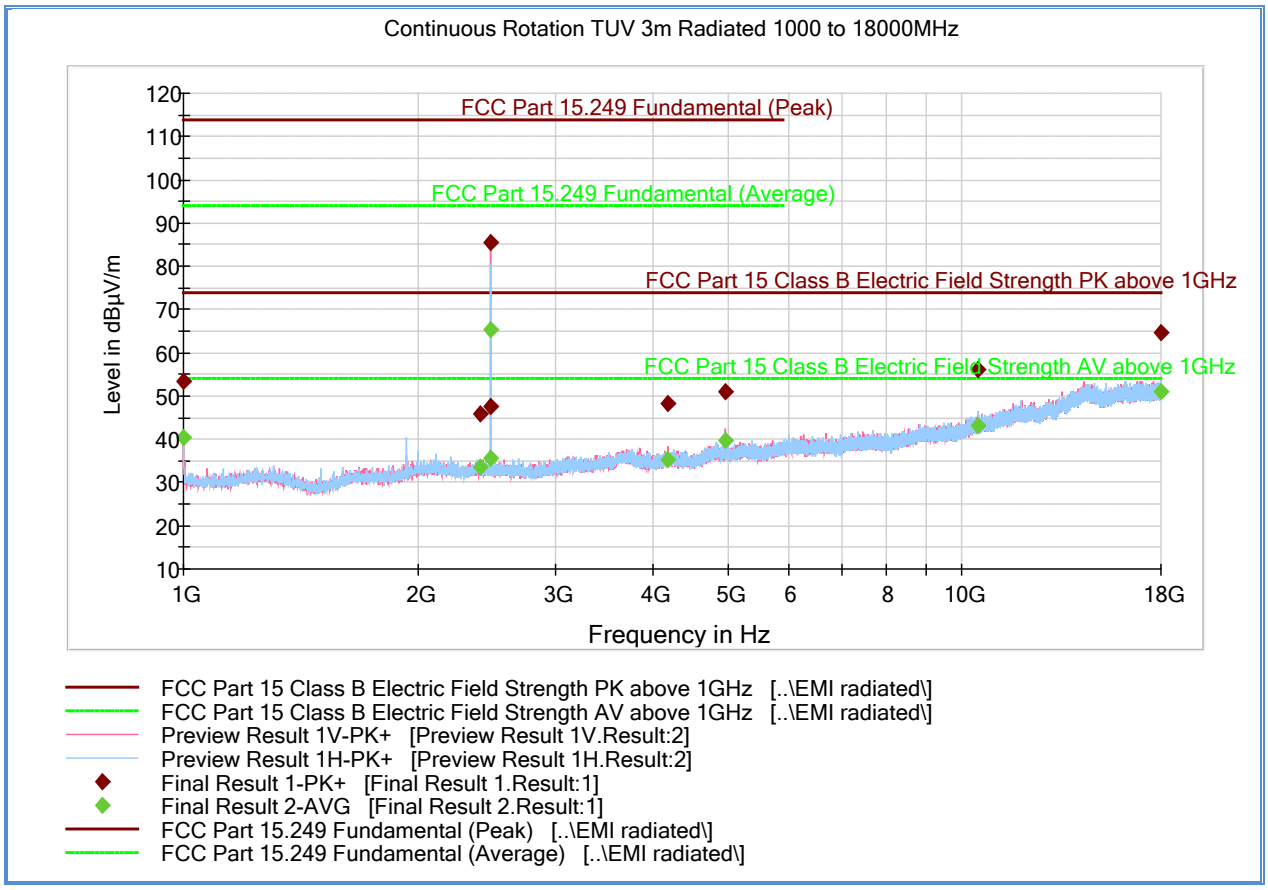
Peak Data

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.00000	54.9	1000.0	1000.000	175.5	H	211.0	-1.0	19.0	73.9
2400.00000	45.7	1000.0	1000.000	100.0	V	296.0	2.4	28.2	73.9
2440.10000	93.6	1000.0	1000.000	196.5	V	124.0	2.4	20.4	114.0
2483.50000	47.6	1000.0	1000.000	400.0	H	25.0	2.6	26.3	73.9
3633.90000	48.7	1000.0	1000.000	239.3	V	-3.0	5.7	25.2	73.9
6770.93333	51.3	1000.0	1000.000	288.2	V	135.0	10.5	22.6	73.9
11113.7000	57.2	1000.0	1000.000	196.5	V	20.0	16.6	16.7	73.9
17904.0333	65.2	1000.0	1000.000	101.6	V	9.0	23.7	8.7	73.9

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.00000	41.4	1000.0	1000.000	175.5	H	211.0	-1.0	12.5	53.9
2400.00000	33.7	1000.0	1000.000	100.0	V	296.0	2.4	20.2	53.9
2440.10000	73.6	1000.0	1000.000	196.5	V	124.0	2.4	20.4	94.0
2483.50000	35.6	1000.0	1000.000	400.0	H	25.0	2.6	18.3	53.9
3633.90000	36.0	1000.0	1000.000	239.3	V	-3.0	5.7	17.9	53.9
6770.93333	38.8	1000.0	1000.000	288.2	V	135.0	10.5	15.1	53.9
11113.7000	44.2	1000.0	1000.000	196.5	V	20.0	16.6	9.7	53.9
17904.0333	51.5	1000.0	1000.000	101.6	V	9.0	23.7	2.4	53.9

2.4.13 Test Results for High Channel (Fundamental, Harmonics, Band Edges and above 1GHz Spurious Emissions)



Peak Data

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.00000	53.5	1000.0	1000.000	272.2	V	41.0	-1.0	20.4	73.9
2400.00000	45.7	1000.0	1000.000	100.0	V	296.0	2.4	28.2	73.9
2479.96666	85.4	1000.0	1000.000	114.6	V	148.0	2.4	28.6	114.0
2483.50000	47.6	1000.0	1000.000	400.0	H	25.0	2.6	26.3	73.9
4194.50000	48.3	1000.0	1000.000	271.2	V	241.0	5.7	25.6	73.9
4960.06666	50.9	1000.0	1000.000	125.6	V	61.0	7.9	23.0	73.9
10482.6000	56.2	1000.0	1000.000	410.7	H	-10.0	15.4	17.7	73.9
17975.6666	64.5	1000.0	1000.000	170.5	H	96.0	23.9	9.4	73.9

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.00000	40.5	1000.0	1000.000	272.2	V	41.0	-1.0	13.4	53.9
2400.00000	33.7	1000.0	1000.000	100.0	V	296.0	2.4	20.2	53.9
2479.96666	65.4	1000.0	1000.000	114.6	V	148.0	2.4	28.6	94.0
2483.50000	35.6	1000.0	1000.000	400.0	H	25.0	2.6	18.3	53.9
4194.50000	35.3	1000.0	1000.000	271.2	V	241.0	5.7	18.6	53.9
4960.06666	39.6	1000.0	1000.000	125.6	V	61.0	7.9	14.3	53.9
10482.6000	43.1	1000.0	1000.000	410.7	H	-10.0	15.4	10.8	53.9
17975.6666	51.1	1000.0	1000.000	170.5	H	96.0	23.9	2.8	53.9

2.5 SPURIOUS RADIATED EMISSIONS

2.5.1 Specification Reference

Part 15 Subpart C §15.249(d)

2.5.2 Standard Applicable

(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

2.5.3 Equipment Under Test and Modification State

Serial No: N/A / Default Test Configuration

2.5.4 Date of Test/Initial of test personnel who performed the test

December 30, 2013/FSC

2.5.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.5.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	23.0°C
Relative Humidity	20.5%
ATM Pressure	99.7 kPa

2.5.7 Additional Observations

- This is a radiated test. The spectrum was searched from 30MHz to the 10th harmonic (25GHz). There are no significant emissions observed beyond 18GHz.
- No significant emission difference between the three channels observed below 1GHz. Data presented is from worst configuration based from fundamental/harmonics verification ("Y" axis configuration).
- Above 1GHz measurement results are identical to test results presented under Section 2.4.11 up to Section 2.4.13 of this test report. No other significant spurious emissions observed other than harmonics of the fundamental frequency.
- Measurement was done using EMC32 V8.53 automated software. Reported level is the actual level with all the correction factors factored in. Correction Factor column is for informational purposes only. See Section 2.5.1 for sample computation.

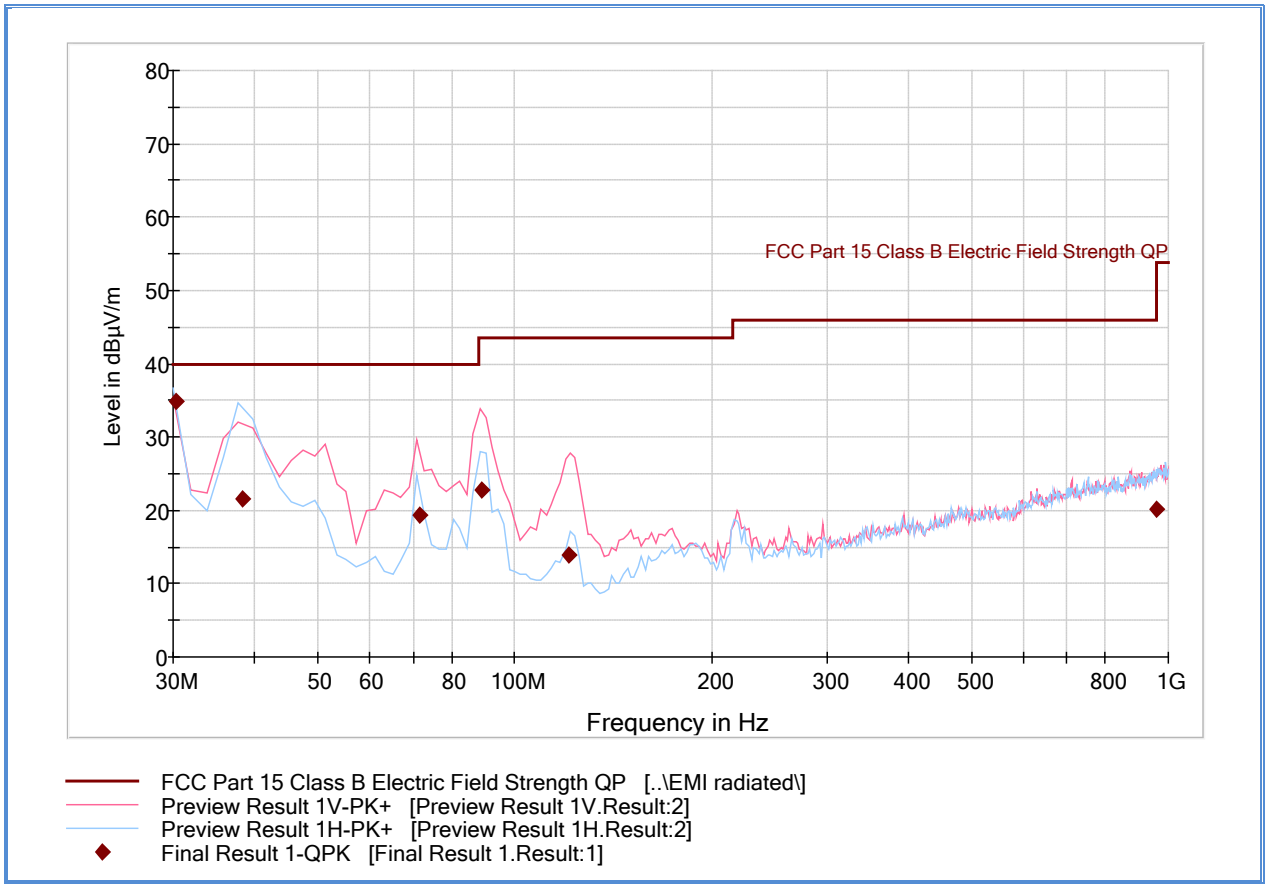
2.5.1 Sample Computation (Radiated Emission)

Measuring equipment raw measurement (dbµV) @ 30 MHz			24.4
Correction Factor (dB)	Asset# 1066 (cable)	0.3	-12.6
	Asset# 1172 (cable)	0.3	
	Asset# 1016 (preamplifier)	-30.7	
	Asset# 1175(cable)	0.3	
	Asset# 1002 (antenna)	17.2	
Reported QuasiPeak Final Measurement (dbµV/m) @ 30MHz			**11.8**

2.5.2 Test Results

See attached plots.

2.5.3 Test Results Below 1GHz (Low Channel – Worst Case Configuration))



Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
30.240000	34.9	1000.0	120.000	139.0	H	0.0	-10.8	5.1	40.0
38.295551	21.6	1000.0	120.000	371.0	H	127.0	-15.2	18.4	40.0
71.381643	19.4	1000.0	120.000	200.0	V	50.0	-21.3	20.6	40.0
89.052745	22.9	1000.0	120.000	400.0	V	343.0	-19.9	20.6	43.5
120.826613	13.9	1000.0	120.000	200.0	V	349.0	-19.1	29.6	43.5
959.818357	20.2	1000.0	120.000	115.0	H	133.0	3.0	25.8	46.0

2.6 RECEIVER SPURIOUS EMISSIONS

2.6.1 Specification Reference

RSS-Gen 6.0

2.6.2 Standard Applicable

Receivers shall comply with the limits of spurious emissions set out in this section, measured over the frequency range determined in accordance with Section 4.10 of RSS-Gen.

Table 2: Radiated Limits of Receiver Spurious Emissions

Frequency (MHz)	Field Strength (microvolts/m at 3 metres)*
30-88	100
88-216	150
216-960	200
Above 960	500

*Measurements for compliance with limits in the above table may be performed at distances other than 3 metres, in accordance with Section 7.2.7 of RSS-Gen.

2.6.3 Equipment Under Test and Modification State

Serial No: N/A / Default Test Configuration

2.6.4 Date of Test/Initial of test personnel who performed the test

December 30, 2013/FSC

2.6.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.6.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	23.0°C
Relative Humidity	20.5%
ATM Pressure	99.7 kPa

2.6.7 Additional Observations

- This is a radiated test. The spectrum was searched from 30MHz to the 3rd harmonic (up to 18GHz performed).
- EUT in RX (Receive) mode configuration.
- Limit used is from FCC §15.209 which is identical to RSS-Gen limits.

- Measurement was done using EMC32 V8.53 automated software. Reported level is the actual level with all the correction factors factored in. Correction Factor column is for informational purposes only. See Section 2.6.8 for sample computation.

2.6.8 Sample Computation (Radiated Emission)

Measuring equipment raw measurement (dbµV) **@ 2400 MHz**			58.4
Correction Factor (dB)	Asset# 1153 (cable)	3.3	**-4.8**
	Asset# 8628 (preamplifier)	-36.4	
	Asset# 7575 (antenna)	28.3	
Reported Peak Final Measurement (dbµV/m) @ 2400 MHz			**53.6**

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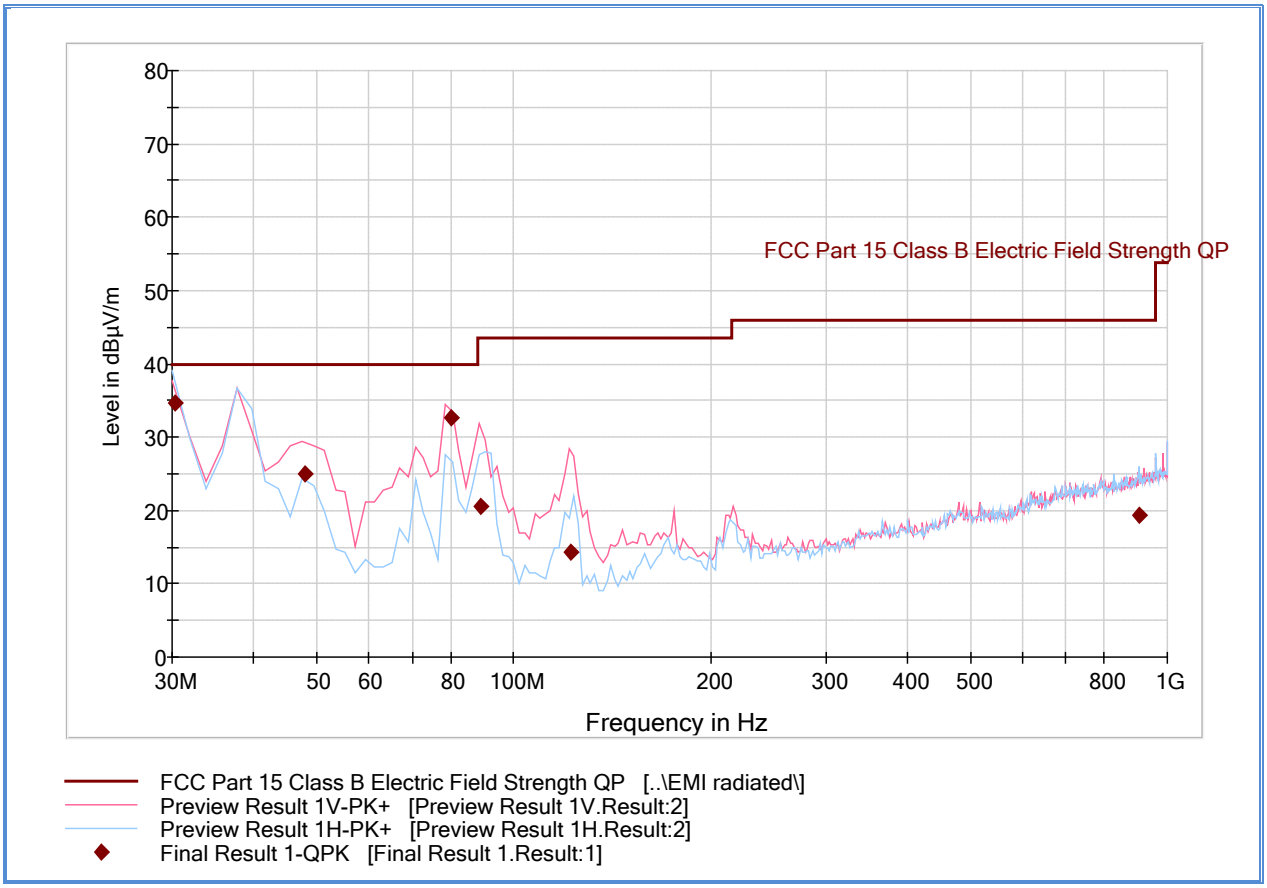
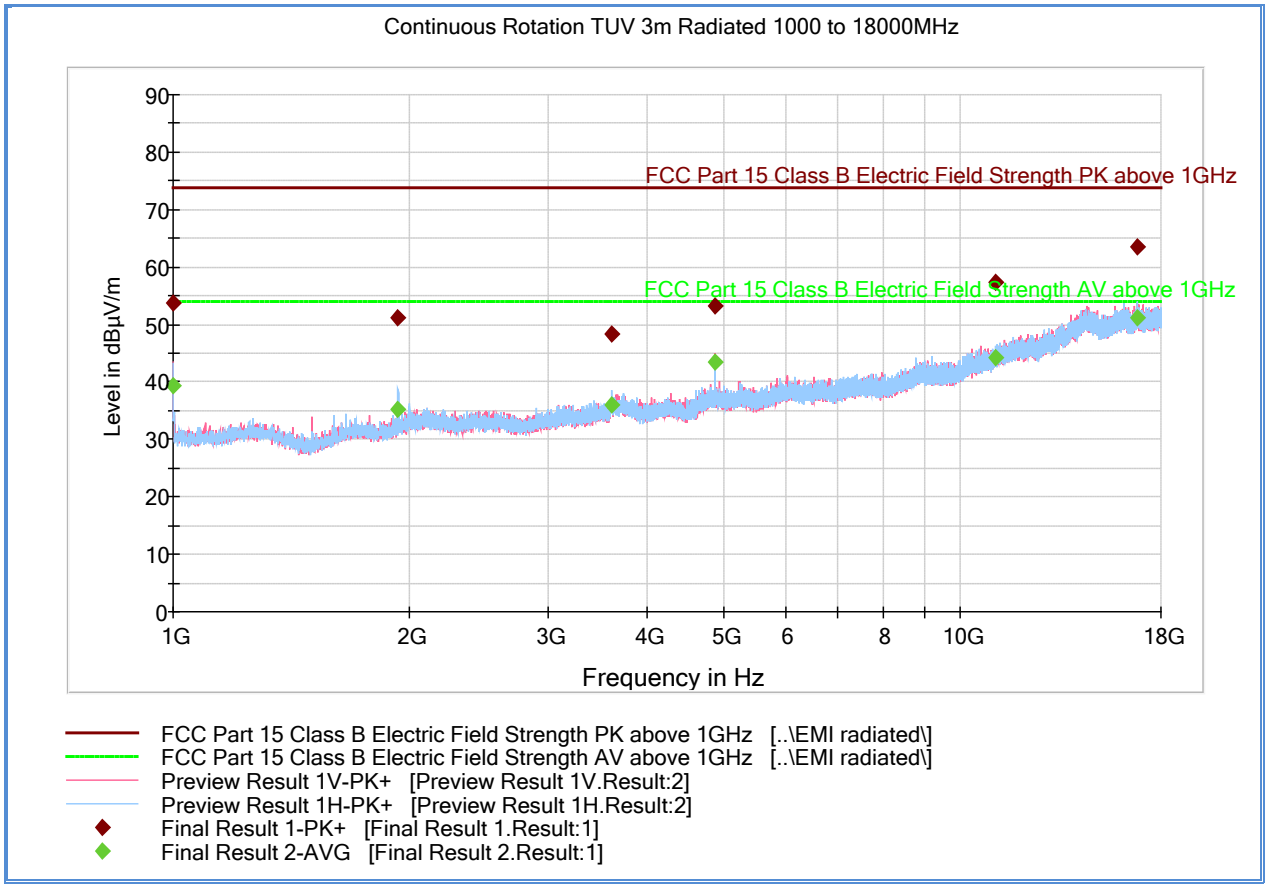
2.6.9 Test Results Below 1GHz (Receive Mode)



Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
30.320000	34.6	1000.0	120.000	127.0	H	114.0	-10.8	5.4	40.0
48.014990	25.1	1000.0	120.000	100.0	V	219.0	-18.7	14.9	40.0
79.997194	32.6	1000.0	120.000	378.0	V	287.0	-20.9	7.4	40.0
88.916633	20.6	1000.0	120.000	400.0	V	11.0	-19.9	22.9	43.5
121.986613	14.2	1000.0	120.000	105.0	V	-12.0	-19.2	29.3	43.5
903.869499	19.4	1000.0	120.000	109.0	H	336.0	2.1	26.6	46.0

2.6.10 Test Results Above 1GHz (Receive Mode)



Peak Data

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.40000	53.7	1000.0	1000.000	271.2	V	200.0	-1.1	20.2	73.9
1932.36666	51.2	1000.0	1000.000	103.6	H	119.0	1.8	22.7	73.9
3605.36666	48.5	1000.0	1000.000	333.1	H	299.0	5.7	25.4	73.9
4881.86666	53.1	1000.0	1000.000	125.6	V	24.0	7.8	20.8	73.9
11107.0333	57.3	1000.0	1000.000	226.4	H	73.0	16.6	16.6	73.9
16763.7666	63.6	1000.0	1000.000	99.6	H	355.0	23.4	10.3	73.9

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.40000	39.5	1000.0	1000.000	271.2	V	200.0	-1.1	14.4	53.9
1932.36666	35.1	1000.0	1000.000	103.6	H	119.0	1.8	18.8	53.9
3605.36666	35.9	1000.0	1000.000	333.1	H	299.0	5.7	18.0	53.9
4881.86666	43.4	1000.0	1000.000	125.6	V	24.0	7.8	10.5	53.9
11107.0333	44.2	1000.0	1000.000	226.4	H	73.0	16.6	9.7	53.9
16763.7666	51.1	1000.0	1000.000	99.6	H	355.0	23.4	2.8	53.9

SECTION 3

TEST EQUIPMENT USED

3.1 TEST EQUIPMENT USED

List of absolute measuring and other principal items of test equipment.

ID Number (SDGE/SDRB)	Test Equipment	Type	Serial Number	Manufacturer	Cal Date	Cal Due Date
Radiated Test Setup						
1002	Bilog Antenna	3142C	00058717	ETS-Lindgren	01/21/13	01/21/14
7575	Double-ridged waveguide horn antenna	3117	00155511	EMCO	03/25/13	03/25/14
8628	Pre-amplifier	QLJ 01182835-JO	8986002	QuinStar Technologies Inc.	09/03/13	09/03/14
1150	Horn antenna	3160-09	012054-004	ETS	04/26/13	04/26/15
1151	Pre-amplifier	TS-PR26	100026	Rhode & Schwarz	05/02/13	05/02/14
1153	High-frequency cable	SucoFlex 100 SX	N/A	Suhner	09/03/13	09/03/14
1040	EMI Test Receiver	ESIB40	100292	Rhode & Schwarz	07/31/13	07/31/14
1049	EMI Test Receiver	ESU	100133	Rhode & Schwarz	07/24/13	07/24/14
6815	2.4GHz Band Notch Filter	BRM50702	008	Micro-Tronics	Verified by 1189 and 7582	
1016	Pre-amplifier	PAM-0202	187	PAM	10/08/13	10/08/14
Miscellaneous						
6452	Multimeter	3478A	2911A52177	Hewlett Packard	08/02/13	08/02/14
7554	Barometer/Temperature /Humidity Transmitter	iBTHX-W	0400706	Omega	04/17/13	04/17/14
	Test Software	EMC32	V8.53	Rhode & Schwarz	N/A	

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3.2 MEASUREMENT UNCERTAINTY

For a 95% confidence level, the measurement uncertainties for defined systems are:

3.2.1 Radiated Emission Measurements (Below 1GHz)

	Contribution	Probability Distribution Type	Probability Distribution x_i	Standard Uncertainty $u(x_i)$	$[u(x_i)]^2$
1	Receiver/Spectrum Analyzer	Rectangular	0.45	0.26	0.07
2	Cables	Rectangular	0.50	0.29	0.08
3	Preamp	Rectangular	0.50	0.29	0.08
4	Antenna	Rectangular	0.75	0.43	0.19
5	Site	Rectangular	3.55	2.05	4.20
6	EUT Setup	Rectangular	1.00	0.58	0.33
				Combined Uncertainty (u_c):	2.23
				Coverage Factor (k):	2
				Expanded Uncertainty:	4.45

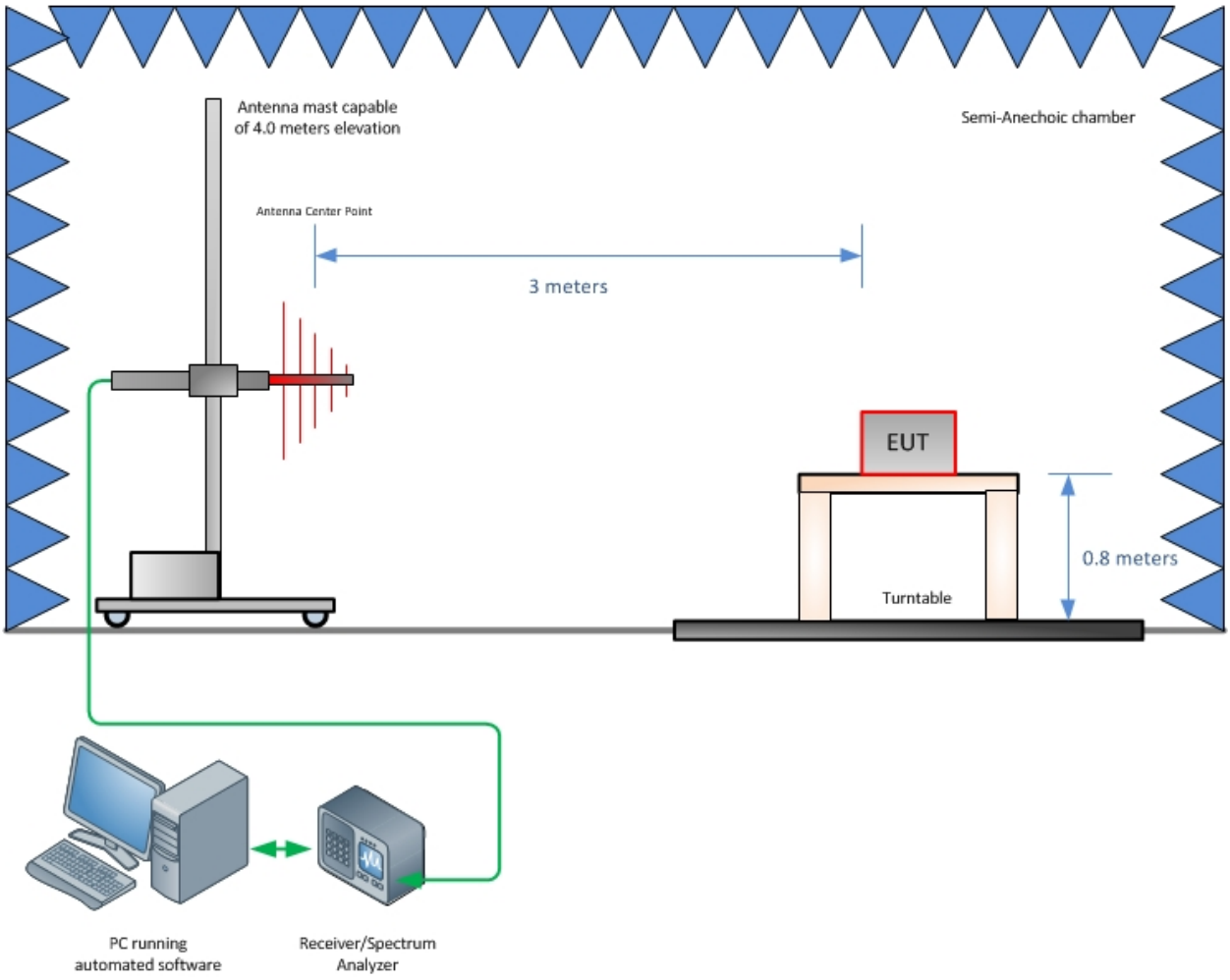
3.2.2 Radiated Emission Measurements (Above 1GHz)

	Contribution	Probability Distribution Type	Probability Distribution x_i	Standard Uncertainty $u(x_i)$	$[u(x_i)]^2$
1	Receiver/Spectrum Analyzer	Rectangular	0.57	0.33	0.11
2	Cables	Rectangular	0.70	0.40	0.16
3	Preamp	Rectangular	0.50	0.29	0.08
4	Antenna	Rectangular	0.37	0.21	0.05
5	Site	Rectangular	3.55	2.05	4.20
6	EUT Setup	Rectangular	1.00	0.58	0.33
				Combined Uncertainty (u_c):	2.22
				Coverage Factor (k):	2
				Expanded Uncertainty:	4.44

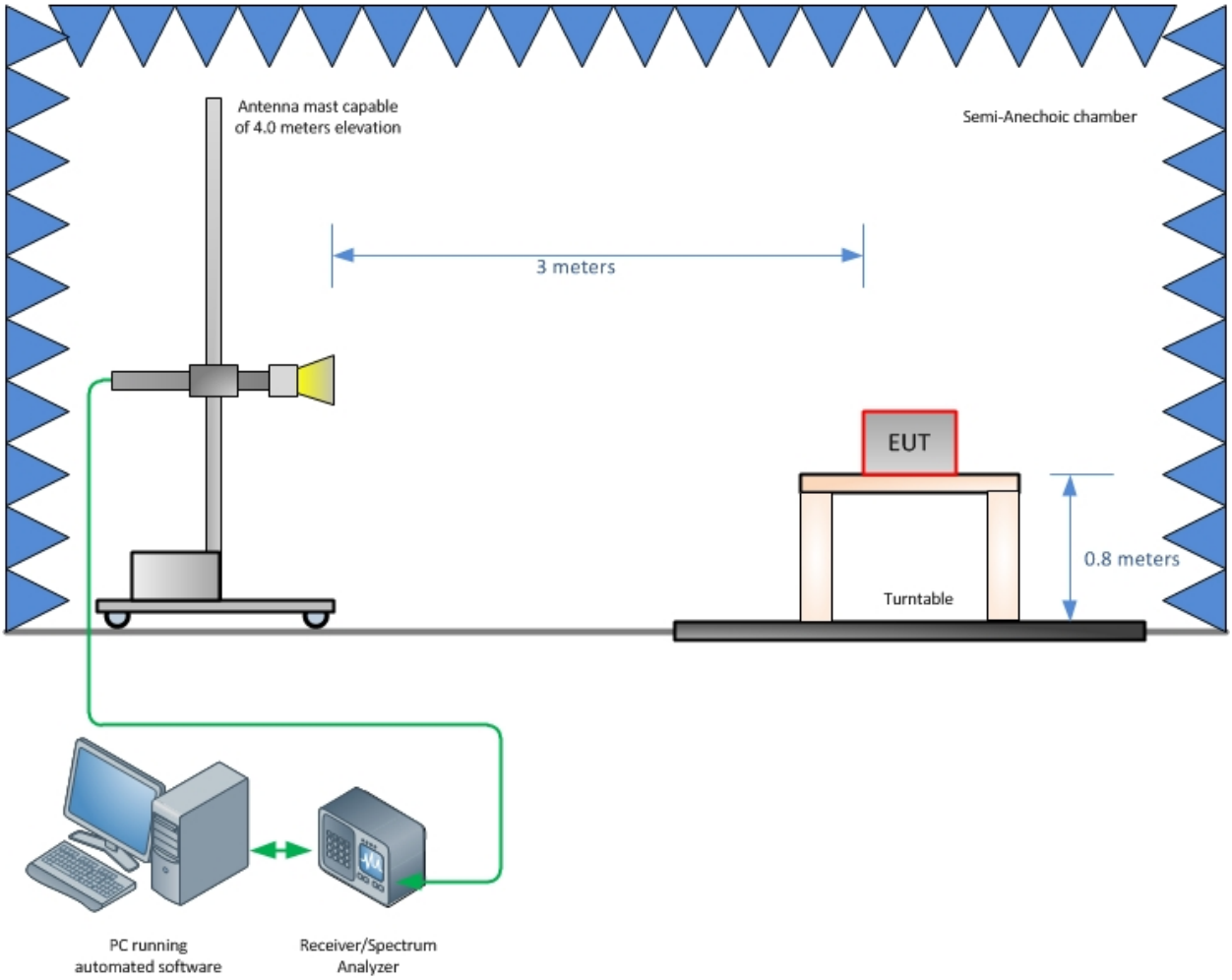
SECTION 4

DIAGRAM OF TEST SETUP

4.1 RADIATED EMISSION TEST SETUP (BELOW 1GHZ)



4.2 RADIATED EMISSION TEST SETUP (ABOVE 1GHZ)



SECTION 5

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