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Report On

Radio Testing of the
Hothead Technologies, Inc.
Spree Fitness Device

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

Report No. SC1301417A

March 2013



America

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
Hothead Technologies, Inc.
Fitness Device

TEST REPORT NUMBER SC1301417A

PREPARED FOR Hothead Technologies, Inc.
8111 LBJ Frwy Suite 480
Dallas, TX 75251

CONTACT PERSON Lance Decker
Director of Technology
(214) 468-0000
ldecker@spreesports.com

PREPARED BY



Ferdinand S. Custodio

Name

Authorized Signatory

Title: EMC/Wireless Test Engineer



APPROVED BY

Chip R. Fleury

Name

Authorized Signatory

DATED

March 06, 2013



America

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

Revision History

SC1301417A Hothead Technologies, Inc. Spree Fitness Device					
DATE	OLD REVISION	NEW REVISION	REASON	PAGES AFFECTED	APPROVED BY
03/06/13	Initial Release				Ferdinand Custodio

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SECTION 1

REPORT SUMMARY

Radio Testing of the
Hothead Technologies, Inc.
Fitness Device

1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Hothead Technologies, Inc. Fitness Device 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	Hothead Technologies, Inc.
Model Number(s)	SPOD101
FCC ID Number	SR6-SPOD101
IC Number	10933A-SPOD101
Serial Number(s)	N/A
Number of Samples Tested	1
Test Specification/Issue/Date	• FCC Part 15 Subpart C §15.249 (October 1, 2011). • 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	March 04, 2013
Finish of Test	March 06, 2013
Name of Engineer(s)	Ferdinand S. Custodio Brian Jahmaine Whitted
Related Document(s)	None. Supporting documents for EUT certification are separate exhibits.

1.2 BRIEF SUMMARY OF RESULTS

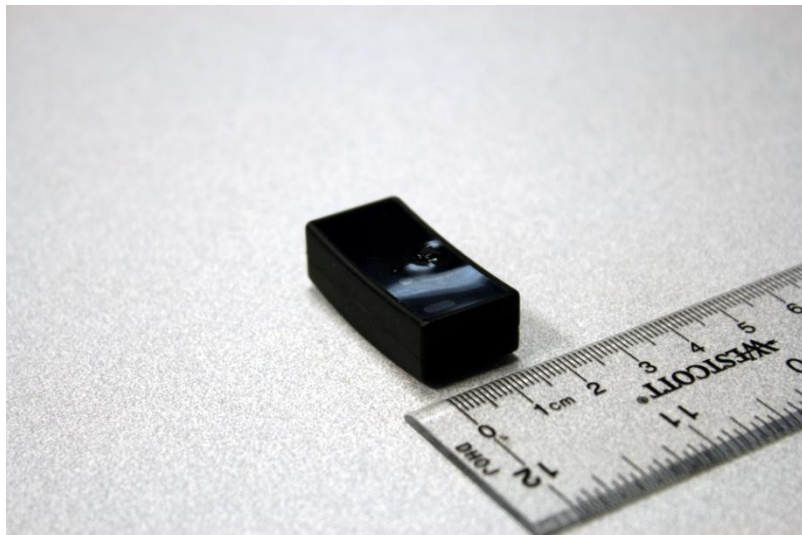
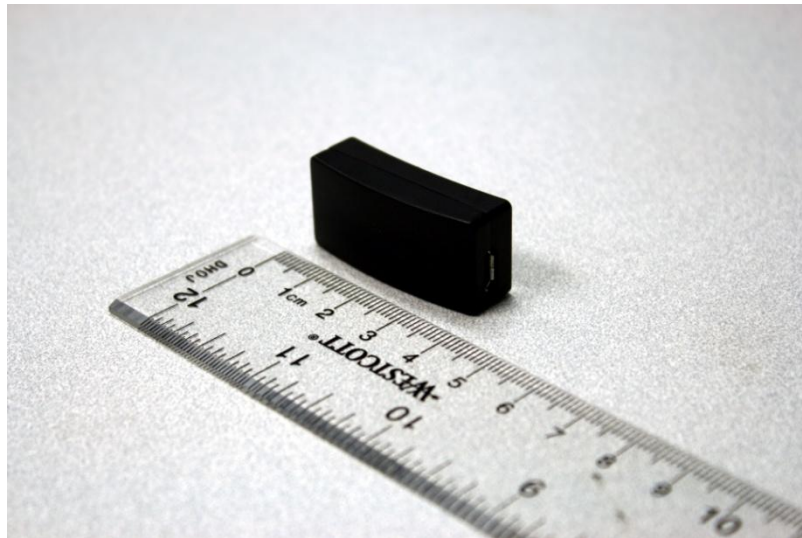
A brief summary of the tests carried out in accordance with FCC Part 15 Subpart C §15.249 with cross-reference to the corresponding IC RSS standard is shown below.

Section	Spec Clause	RSS	Test Description	Result	Comments/Base Standard
2.1	§15.207(a)	RSS-Gen 7.2.4	Conducted Emissions	Compliant	
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	

1.3 PRODUCT INFORMATION

1.3.1 Technical Description

The Equipment Under Test (EUT) was a Hothead Technologies, Inc. Fitness Device as shown in the photograph below. The EUT is worn on the head using a custom headband, the EUT then monitors heart rate, temperature and motion. It also has a presence sensor to know when it is on the head. This presence sensor acts as the on/off switch. The USB port on the EUT is for charging purposes only, no data is being transferred through this port. The EUT uses Nordic nRF8001 Single Chip Bluetooth® low energy RF module for interfacing with a portable device (i.e. iPhone5 or iPod Touch) running a custom app.



Equipment Under Test

1.3.2 EUT General Description

EUT Description	Fitness Device
Model Name	Spree
Model Number(s)	SPOD101
Rated Voltage	3.7VDC from integral Polymer Li-Ion Cell
Output Power	91.0dBμV/m @ 3 meters (377.7μW EIRP Average @ 100% Duty Cycle)
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)
Modulation Used	GFSK

1.3.3 Antenna Details

Model	N/A (information not available during time of assessment)
Manufacturer	Nordic Semiconductor
Antenna Type	PCB trace antenna
Antenna Gain (Peak)	0 dBi
EUT Antenna Connector	N/A (PCB trace antenna).
Maximum Dimensions	N/A (information not available during time of assessment)

1.4 EUT TEST CONFIGURATION

1.4.1 Test Configuration Description

Test Configuration	Description
Default	Radiated only configuration. EUT will transmit through the integral antenna.

1.4.2 EUT Exercise Software

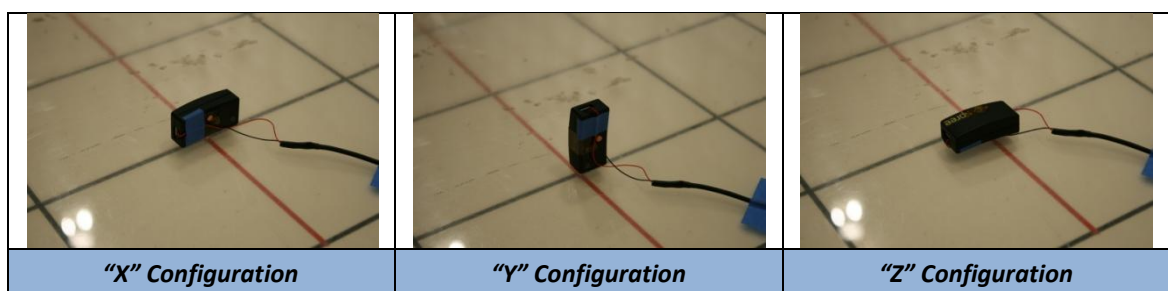
A test firmware was loaded to the EUT which enable cycling of Low, Mid and High channels @ 100% duty cycle (modulated) as well as Normal Operation and Receive modes.

1.4.3 Support Equipment and I/O cables

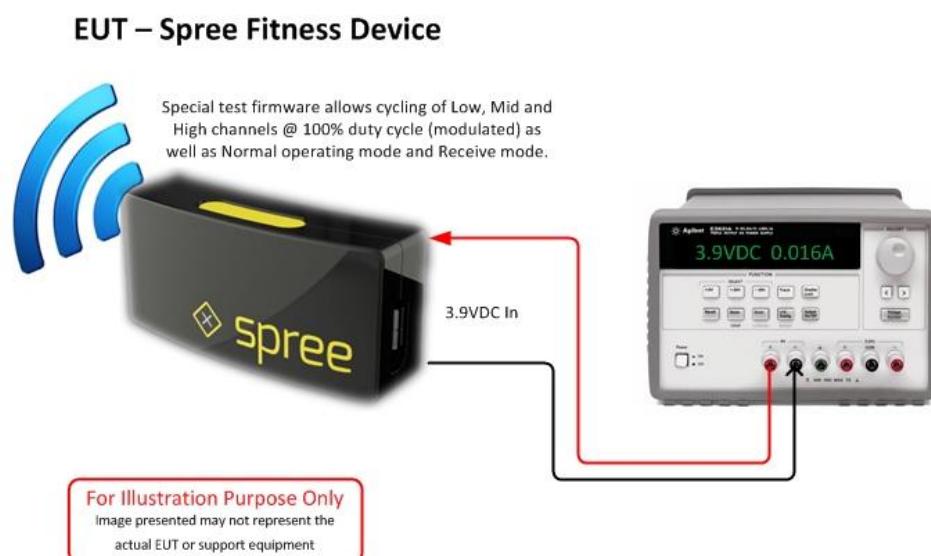
Manufacturer	Equipment/Cable	Description
Motorola	ITE Power Supply	Model: SSW-2285US 5VDC @500mA

1.4.4 Worst Case Configuration

For radiated measurements X, Y and Z orientations were verified. Worst case position is "Y".



1.4.5 Simplified Test Configuration Diagram



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

1.8.1 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.

1.8.2 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.



SECTION 2

TEST DETAILS

Radio Testing of the
Hothead Technologies, Inc.
Fitness Device

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 μ H/50 ohms line impedance stabilization network (LISN).

Frequency of emission (MHz)	Conducted limit (dB μ V)	
	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

Serial No: N/A / Default Test Configuration

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

March 06, 2013/BJW

2.1.5 Test Equipment Used

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

2.1.6 Environmental Conditions

Ambient Temperature	25.2°C
Relative Humidity	32.2%
ATM Pressure	99.3 kPa

2.1.7 Additional Observations

- The EUT is a battery operated device; however there is a provision to charge the EUT via USB port.
- The EUT does not transmit when in charging mode in normal operation.
- To show general compliance to the present requirement, the EUT was verified while in charging mode using the supplied AC charger.



- 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 2.1.8 for sample computation.

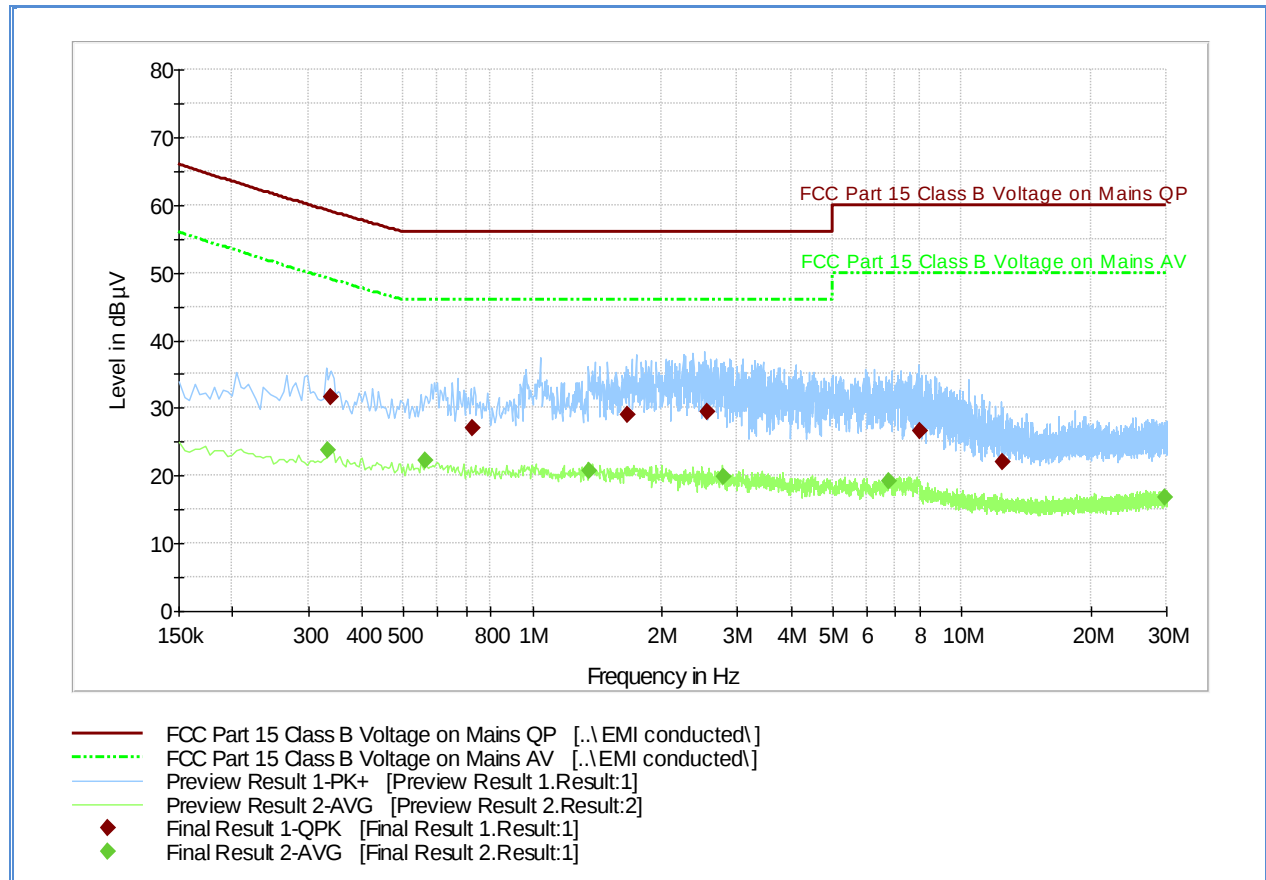
2.1.8 Sample Computation (Conducted Emission – Quasi Peak)

Measuring equipment raw measurement (dbμV) @ 150kHz			5.5
Correction Factor (dB)	Asset# 8607 (20 dB attenuator)	19.9	20.7
	Asset# 1177 (cable)	0.15	
	Asset# 1176 (cable)	0.35	
	Asset# 7568 (LISN)	0.30	
Reported QuasiPeak Final Measurement (dbμV) @ 150kHz			26.2

2.1.9 Test Results

Compliant. See attached plots and tables.

2.1.10 Line 1 (120VAC 60Hz)



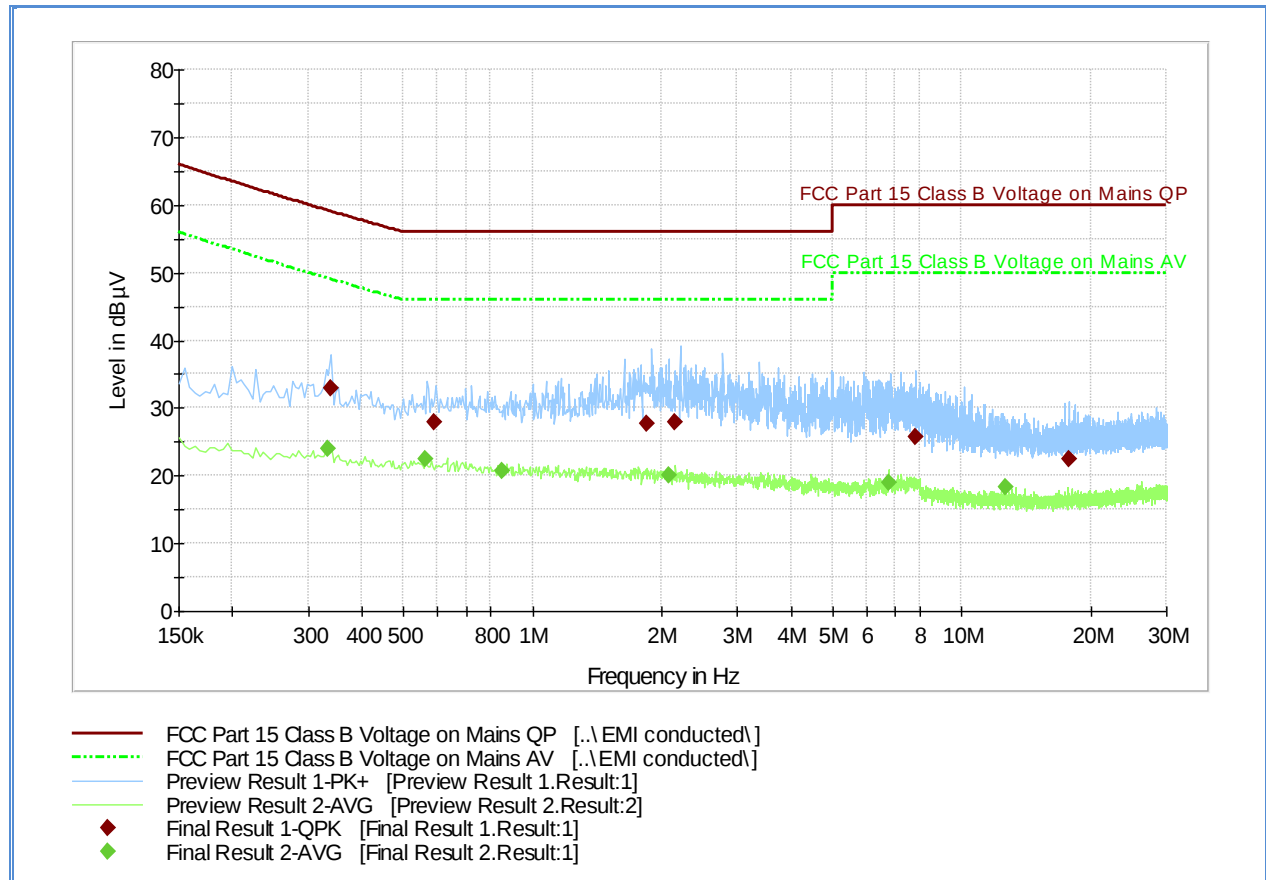
Quasi Peak

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV)
0.339000	31.6	1000.0	9.000	Off	L1	20.3	27.5	59.0
0.726000	27.1	1000.0	9.000	Off	L1	20.2	28.9	56.0
1.666500	28.9	1000.0	9.000	Off	L1	20.3	27.1	56.0
2.557500	29.4	1000.0	9.000	Off	L1	20.3	26.6	56.0
7.993500	26.6	1000.0	9.000	Off	L1	20.4	33.4	60.0
12.489000	21.9	1000.0	9.000	Off	L1	20.6	38.1	60.0

Average

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - Ave (dB)	Limit - Ave (dBµV)
0.334500	23.7	1000.0	9.000	Off	L1	20.3	25.4	49.1
0.564000	22.1	1000.0	9.000	Off	L1	20.2	23.9	46.0
1.360500	20.7	1000.0	9.000	Off	L1	20.3	25.3	46.0
2.778000	19.7	1000.0	9.000	Off	L1	20.3	26.3	46.0
6.765000	19.1	1000.0	9.000	Off	L1	20.4	30.9	50.0
29.868000	16.9	1000.0	9.000	Off	L1	21.6	33.1	50.0

2.1.11 Line 2 (120VAC 60Hz)



Quasi Peak

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV)
0.339000	33.0	1000.0	9.000	Off	N	21.1	26.1	59.0
0.591000	28.0	1000.0	9.000	Off	N	21.1	28.0	56.0
1.851000	27.8	1000.0	9.000	Off	N	21.1	28.2	56.0
2.152500	27.9	1000.0	9.000	Off	N	21.1	28.1	56.0
7.831500	25.7	1000.0	9.000	Off	N	21.2	34.3	60.0
17.794500	22.5	1000.0	9.000	Off	N	21.6	37.5	60.0

Average

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - Ave (dB)	Limit - Ave (dBµV)
0.334500	24.0	1000.0	9.000	Off	N	21.1	25.1	49.1
0.564000	22.5	1000.0	9.000	Off	N	21.1	23.5	46.0
0.847500	20.8	1000.0	9.000	Off	N	21.1	25.2	46.0
2.076000	20.0	1000.0	9.000	Off	N	21.1	26.0	46.0
6.760500	18.9	1000.0	9.000	Off	N	21.2	31.1	50.0
12.687000	18.3	1000.0	9.000	Off	N	21.4	31.7	50.0

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

March 4, 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

Ambient Temperature	24.6°C
Relative Humidity	39.9%
ATM Pressure	99.3 kPa

2.2.7 Additional Observations

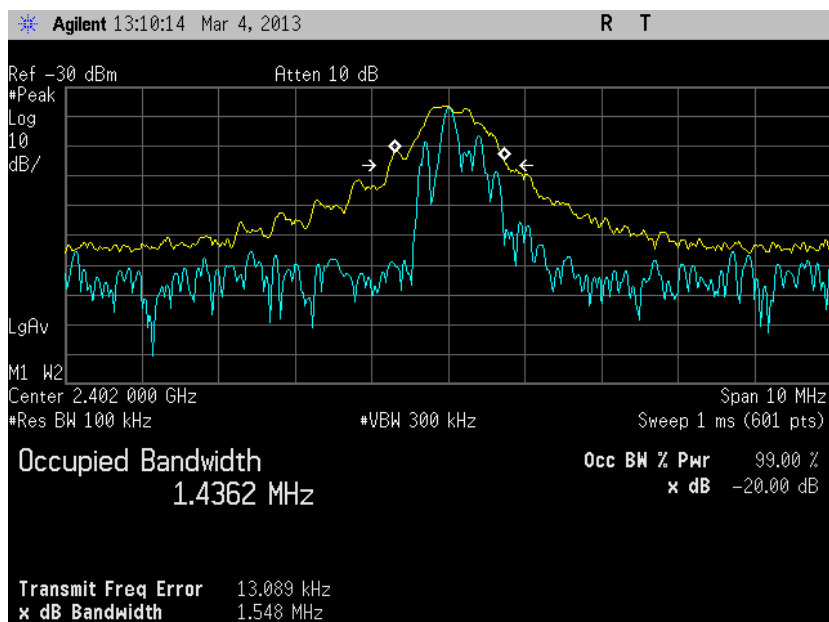
- This is a radiated test.
- OBW measurement function of the Spectrum Analyzer used (x dB function).
- Span is wide enough to capture the channel transmission.
- RBW is 1% of the span, VBW is 3X RBW.
- Sweep is auto.
- Detector is peak.
- Trace is max hold.

2.2.8 Test Results

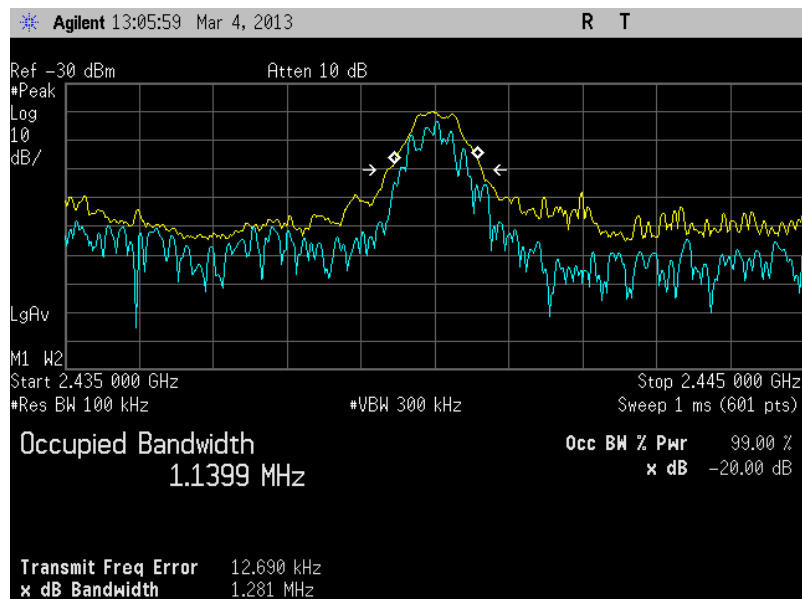
Low Channel (2402 MHz)	Mid Channel (2440MHz)	High Channel (2480MHz)
1.548 MHz	1.281 MHz	1.209 MHz

2402.00 MHz – (20dB BW/2) = 2401.226MHz (within the frequency band - **Compliant**)

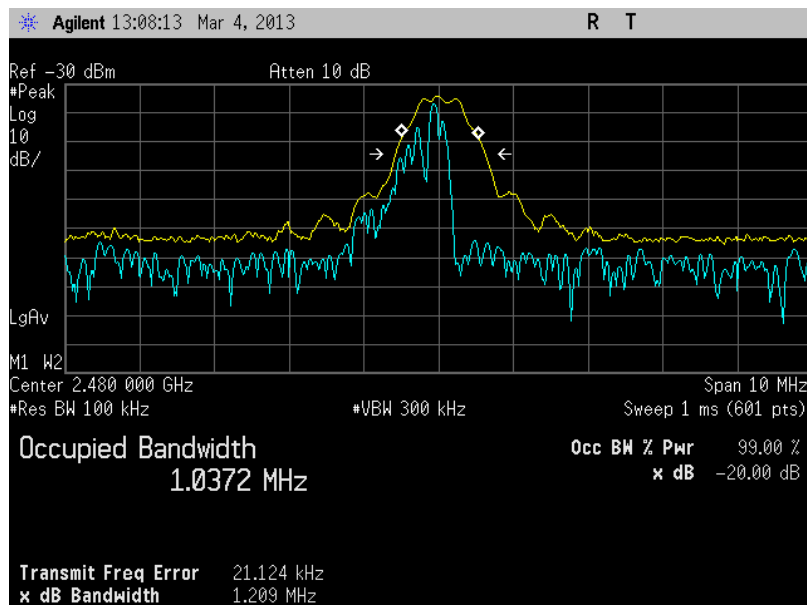
2480.00MHz + (20dB BW/2) = 2480.774MHz (within the frequency band - **Compliant**)



Low Channel



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

March 4, 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

Ambient Temperature	24.6°C
Relative Humidity	39.9%
ATM Pressure	99.3 kPa

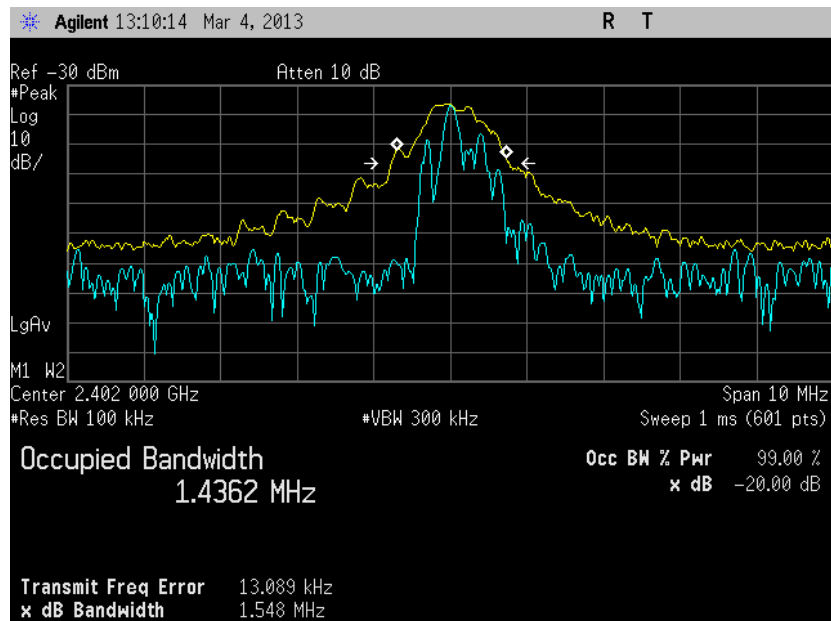
2.3.7 Additional Observations

- 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.

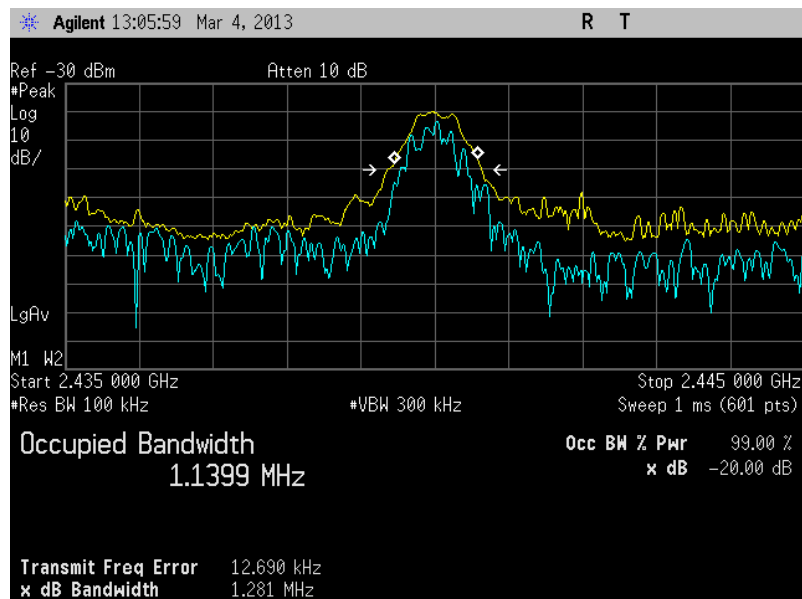
- The % Power Bandwidth setting in the spectrum analyzer was set to 99% (default).
- The Channel Bandwidth measurement function of the spectrum analyzer was used for this test.

2.3.8 Test Results

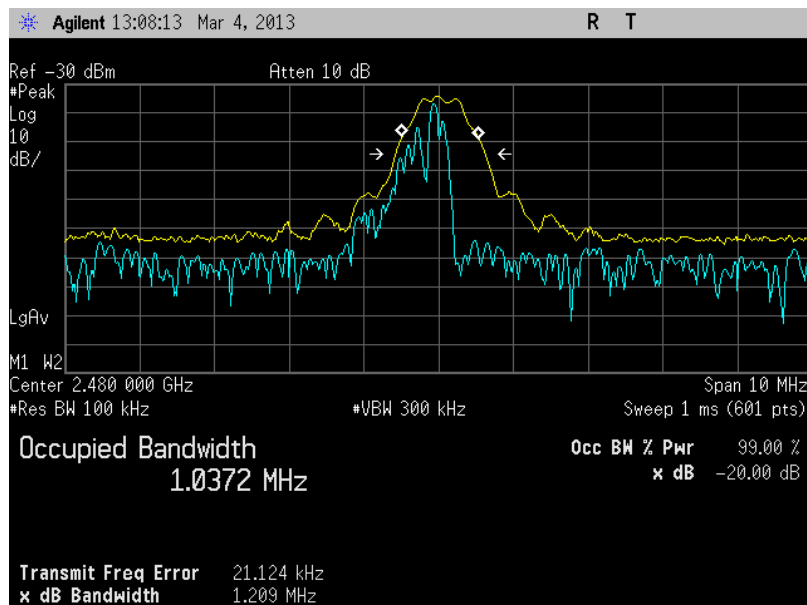
Low Channel (2402 MHz)	Mid Channel (2440MHz)	High Channel (2480MHz)
1.4362 MHz	1.1399 MHz	1.0372 MHz



Low Channel



Mid Channel



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

March 4-6, 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

Ambient Temperature	25.2°C
Relative Humidity	32.7%
ATM Pressure	99.5 kPa

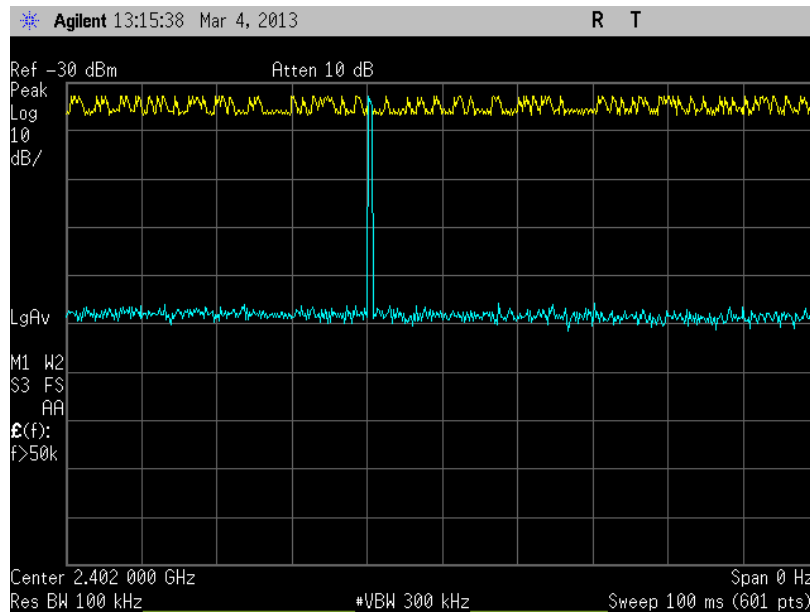
2.4.7 Additional Observations

- This is a radiated test. The spectrum was searched from 1GHz to the 10th harmonic (25GHz).
- There are no emissions observed above 10GHz.
- 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.

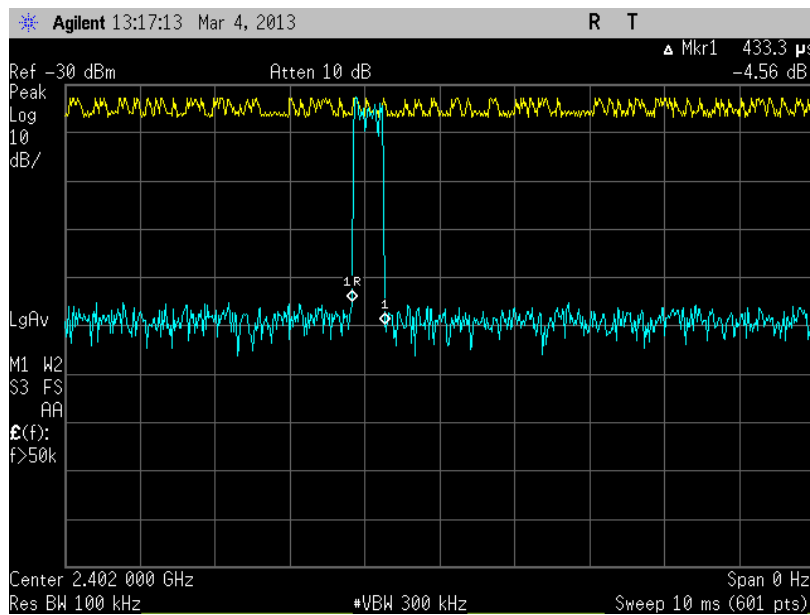
2.4.8 Sample Computation (Radiated Emission)

Measuring equipment raw measurement (db μ V) @ 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 (db μ V/m) @ 2400 MHz			53.6

2.4.9 Duty Cycle Correction Factor Calculation



100ms sweep (representative channel)



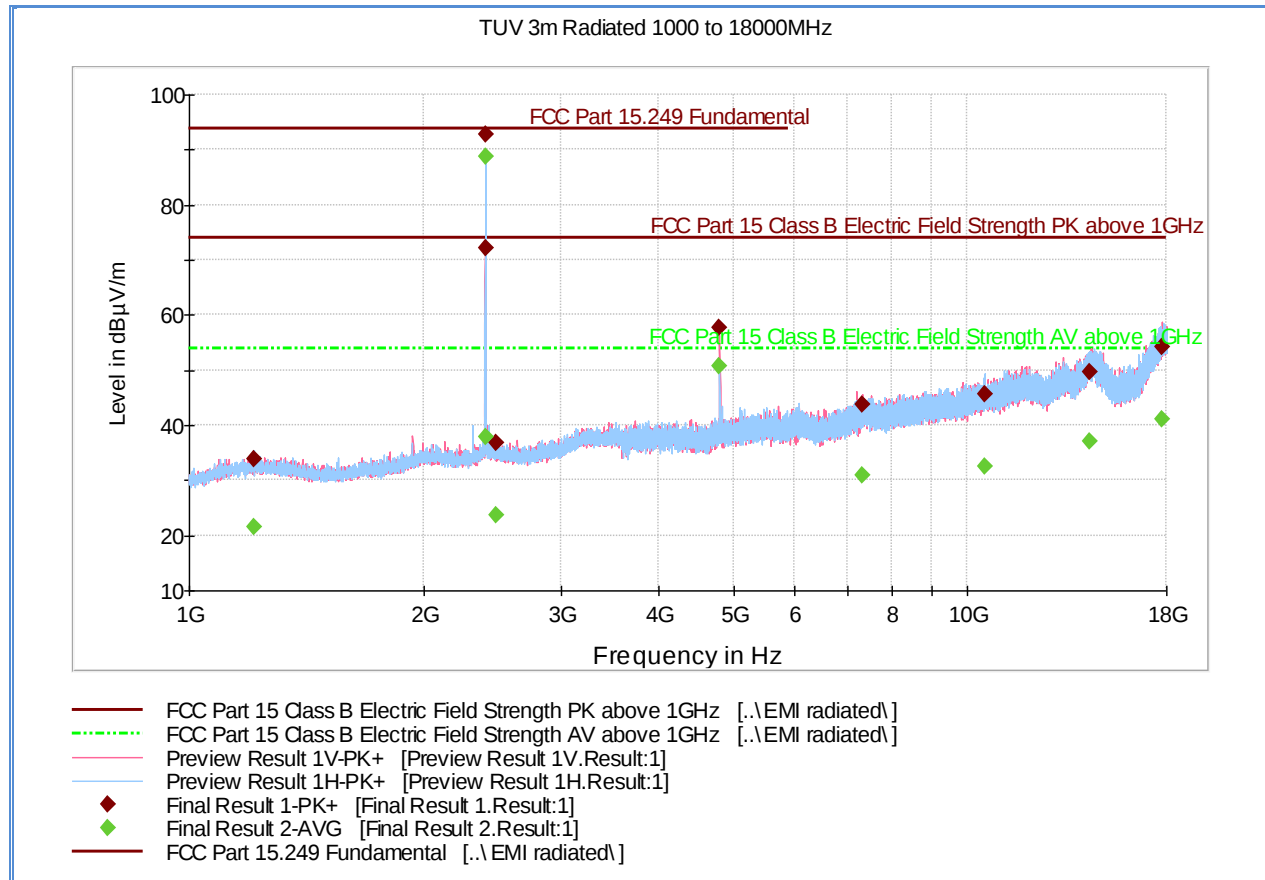
10ms sweep (representative channel)

Duty Cycle Calculation: = 0.4333 ms "On" time per 100 ms sweep
Duty Cycle Correction Factor = $20 \log(0.004333)$
 = -47.26 (Limited to -20dB)

2.4.10 Test Results

See attached plots.

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



Peak Data

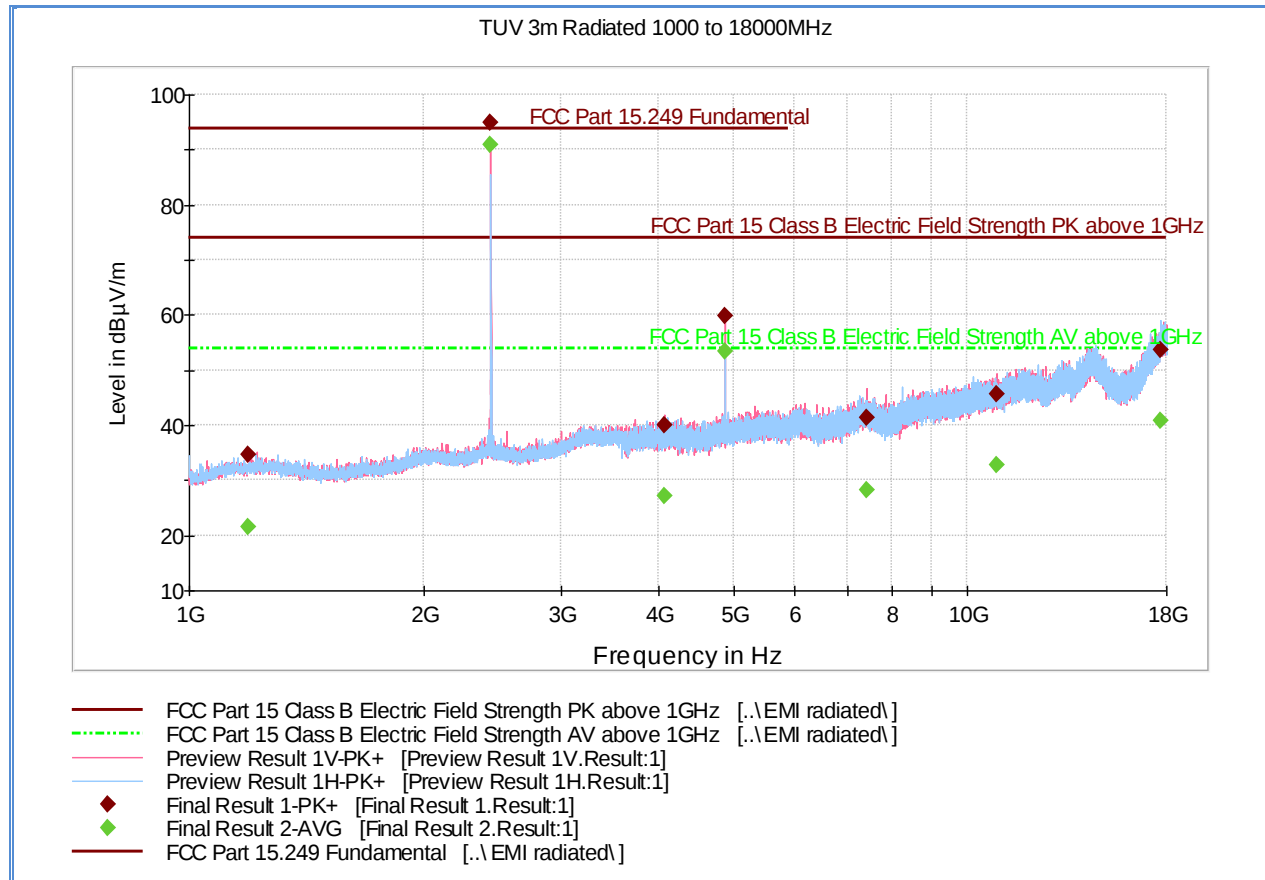
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1209.97333	33.9	1000.0	1000.000	231.0	H	285.0	-9.7	40.0	73.9
2400.00000	72.1	1000.0	1000.000	100.0	V	296.0	-4.8	1.8	73.9
2401.99333	92.7	1000.0	1000.000	100.0	V	288.0	-4.8	Fundamental	
2483.50000	36.7	1000.0	1000.000	400.0	H	25.0	-4.7	37.2	73.9
4804.00666	57.6	1000.0	1000.000	100.0	V	321.0	1.9	16.3	73.9
7333.49333	43.8	1000.0	1000.000	400.0	V	246.0	7.6	30.1	73.9
10522.2066	45.6	1000.0	1000.000	185.0	H	308.0	10.7	28.3	73.9
14366.8066	49.7	1000.0	1000.000	390.0	V	326.0	16.8	24.2	73.9
17779.7933	54.1	1000.0	1000.000	170.0	V	285.0	21.0	19.8	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)
1209.97333	21.6	1000.0	1000.000	231.0	H	285.0	-9.7	32.3	53.9
2400.00000	37.8	1000.0	1000.000	100.0	V	296.0	-4.8	16.1	53.9
2401.99333	88.7	1000.0	1000.000	100.0	V	288.0	-4.8	5.3	94.0
2483.50000	23.8	1000.0	1000.000	400.0	H	25.0	-4.7	30.1	53.9
4804.00666	50.8	1000.0	1000.000	100.0	V	321.0	1.9	3.1	53.9
7333.49333	31.0	1000.0	1000.000	400.0	V	246.0	7.6	22.9	53.9
10522.2066	32.4	1000.0	1000.000	185.0	H	308.0	10.7	21.5	53.9
14366.8066	37.2	1000.0	1000.000	390.0	V	326.0	16.8	16.7	53.9
17779.7933	41.1	1000.0	1000.000	170.0	V	285.0	21.0	12.8	53.9

Test Notes: Data presented is 100% duty cycle. Since Average results complies @ 100% duty cycle (worst case), applying the Duty Cycle Correction factor is not required. Since DCCF is -20dB, margin with Peak results will be identical with Average level (calculated).

2.4.12 Test Results for Mid Channel (Fundamental, Harmonics and Spurious Emissions)



Peak Data

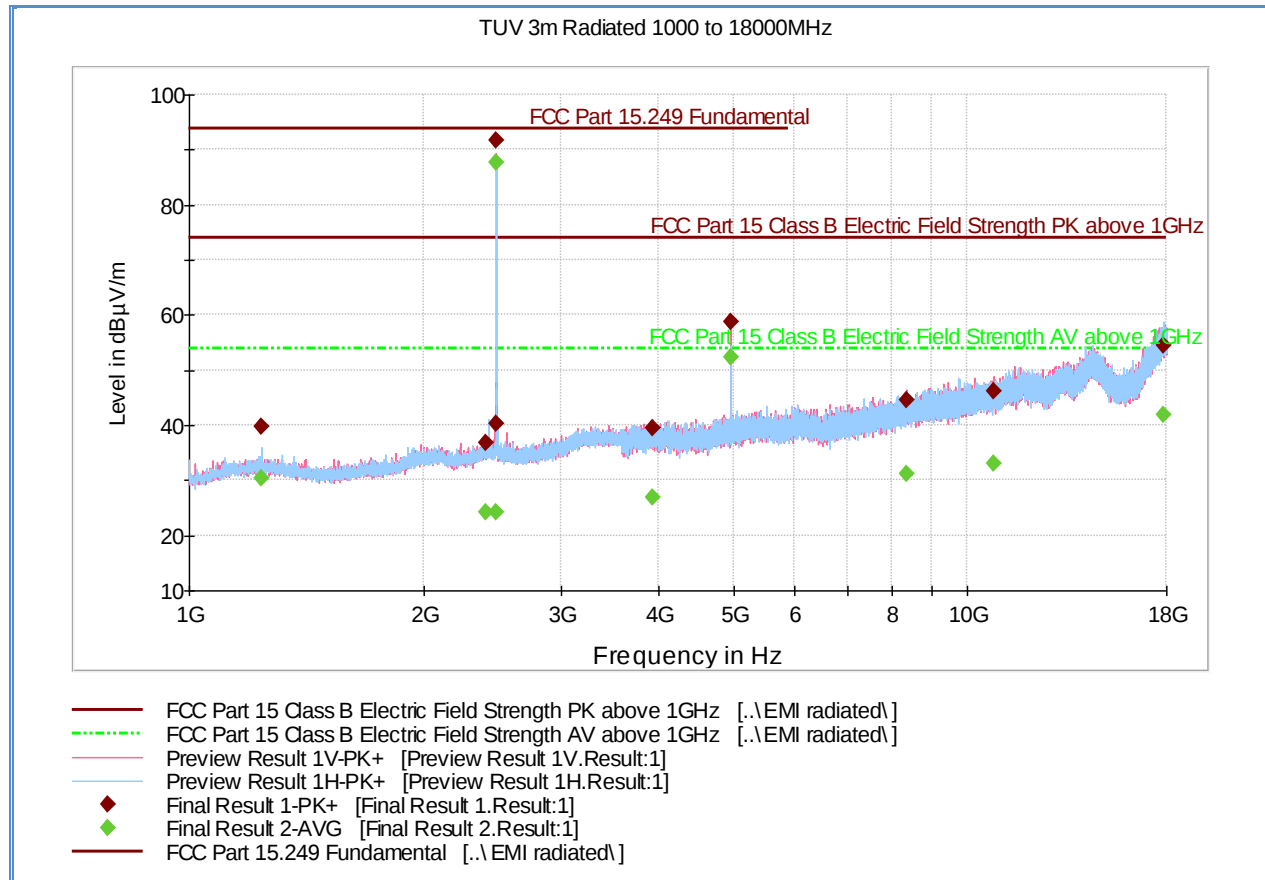
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1192.94000	34.7	1000.0	1000.000	400.0	V	0.0	-9.8	39.2	73.9
2440.00000	94.9	1000.0	1000.000	100.0	V	291.0	-4.7	Fundamental	
4080.62000	40.1	1000.0	1000.000	294.0	V	111.0	1.0	33.8	73.9
4880.02000	59.8	1000.0	1000.000	100.0	V	357.0	1.9	14.1	73.9
7415.53333	41.4	1000.0	1000.000	378.0	V	45.0	7.6	32.5	73.9
10887.8266	45.5	1000.0	1000.000	400.0	V	246.0	11.3	28.4	73.9
17679.9266	53.6	1000.0	1000.000	367.0	H	111.0	20.5	20.3	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)
1192.94000	21.6	1000.0	1000.000	400.0	V	0.0	-9.8	32.3	53.9
2440.00000	91.0	1000.0	1000.000	100.0	V	291.0	-4.7	3.0	94.0
4080.62000	27.0	1000.0	1000.000	294.0	V	111.0	1.0	26.9	53.9
4880.02000	53.3	1000.0	1000.000	100.0	V	357.0	1.9	0.6	53.9
7415.53333	28.2	1000.0	1000.000	378.0	V	45.0	7.6	25.7	53.9
10887.8266	32.8	1000.0	1000.000	400.0	V	246.0	11.3	21.1	53.9
17679.9266	40.7	1000.0	1000.000	367.0	H	111.0	20.5	13.2	53.9

Test Notes: Data presented is 100% duty cycle. Since Average results complies @ 100% duty cycle (worst case), applying the Duty Cycle Correction factor is not required. Since DCCF is -20dB, margin with Peak results will be identical with Average level (calculated).

2.4.13 Test Results for High Channel (Fundamental, Harmonics, Band Edges and 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)
1240.00000	39.8	1000.0	1000.000	100.0	H	110.0	-9.5	34.1	73.9
2400.00000	36.8	1000.0	1000.000	334.0	V	266.0	-4.8	37.1	73.9
2479.99333	91.6	1000.0	1000.000	121.0	V	286.0	-4.7	Fundamental	
2483.50000	40.2	1000.0	1000.000	254.0	V	295.0	-4.7	33.7	73.9
3940.85333	39.4	1000.0	1000.000	100.0	H	295.0	1.1	34.5	73.9
4960.00000	58.7	1000.0	1000.000	100.0	V	4.0	2.0	15.2	73.9
8361.95333	44.7	1000.0	1000.000	320.0	V	337.0	7.8	29.2	73.9
10787.3200	46.1	1000.0	1000.000	160.0	V	89.0	11.1	27.8	73.9
17879.8466	54.3	1000.0	1000.000	208.0	H	155.0	21.3	19.6	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)
1240.00000	30.3	1000.0	1000.000	100.0	H	110.0	-9.5	23.6	53.9
2400.00000	24.1	1000.0	1000.000	334.0	V	266.0	-4.8	29.8	53.9
2479.99333	87.7	1000.0	1000.000	121.0	V	286.0	-4.7	6.3	94.0
2483.50000	24.3	1000.0	1000.000	254.0	V	295.0	-4.7	29.6	53.9
3940.85333	26.8	1000.0	1000.000	100.0	H	295.0	1.1	27.1	53.9
4960.00000	52.2	1000.0	1000.000	100.0	V	4.0	2.0	1.7	53.9
8361.95333	31.2	1000.0	1000.000	320.0	V	337.0	7.8	22.7	53.9
10787.3200	33.1	1000.0	1000.000	160.0	V	89.0	11.1	20.8	53.9
17879.8466	41.8	1000.0	1000.000	208.0	H	155.0	21.3	12.1	53.9

Test Notes: Data presented is 100% duty cycle. Since Average results complies @ 100% duty cycle (worst case), applying the Duty Cycle Correction factor is not required. Since DCCF is -20dB, margin with Peak results will be identical with Average level (calculated).



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

March 4-6, 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

Ambient Temperature	25.2°C
Relative Humidity	32.7%
ATM Pressure	99.5 kPa

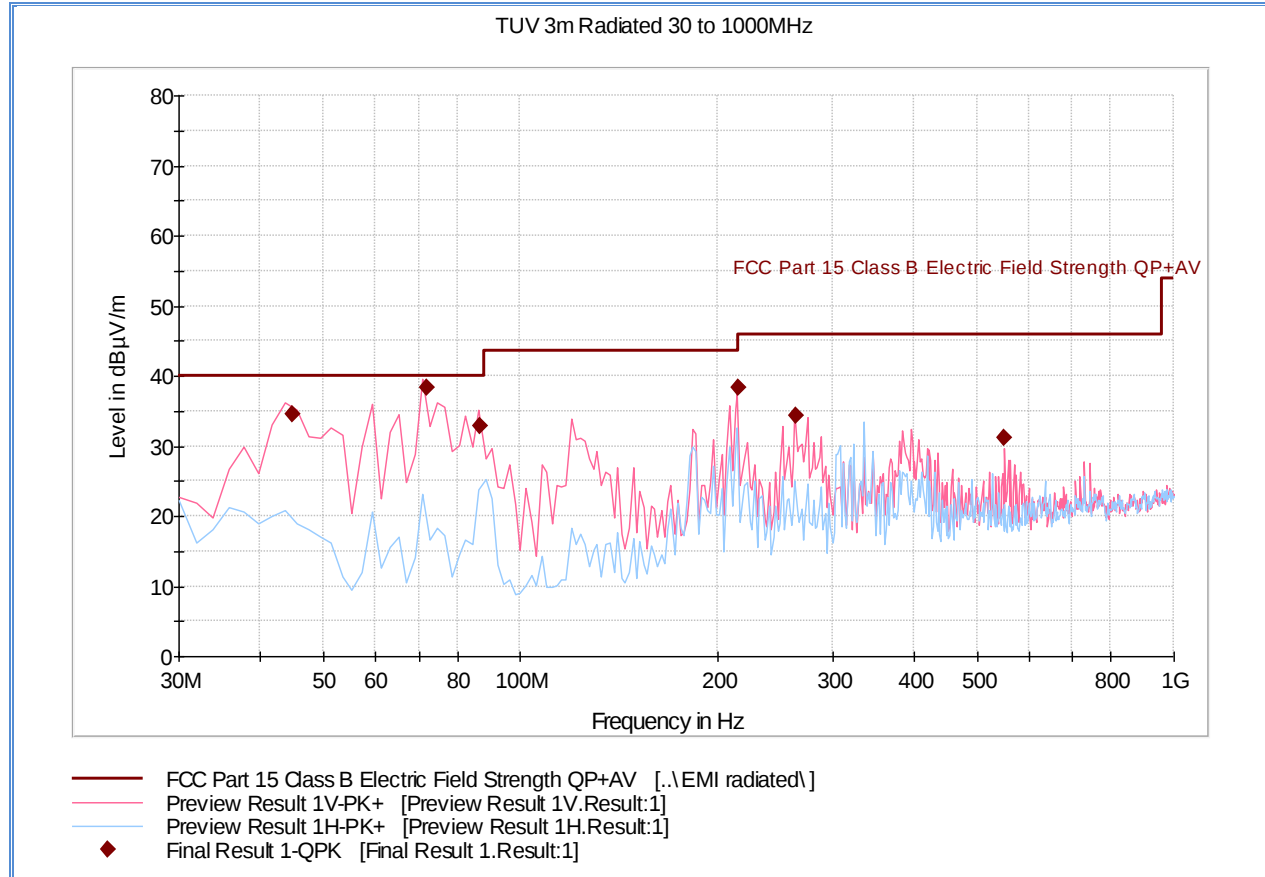
2.5.7 Additional Observations

- This is a radiated test. The spectrum was searched from 30MHz to the 10th harmonic (25GHz). There are no 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 ("V" 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 2.5.8 for sample computation.

2.5.8 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

2.5.9 Test Results Below 1GHz (Mid 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)
44.887214	34.6	1000.0	120.000	100.0	V	300.0	-18.9	5.4	40.0
71.941643	38.4	1000.0	120.000	118.0	V	144.0	-21.9	1.6	40.0
86.732745	32.8	1000.0	120.000	103.0	V	29.0	-21.1	7.2	40.0
215.829339	38.3	1000.0	120.000	100.0	V	293.0	-15.3	5.2	43.5
263.826533	34.3	1000.0	120.000	100.0	V	299.0	-13.3	11.7	46.0
550.401924	31.2	1000.0	120.000	100.0	V	261.0	-5.9	14.8	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

March 4-6, 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

Ambient Temperature	25.2°C
Relative Humidity	32.7%
ATM Pressure	99.5 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.

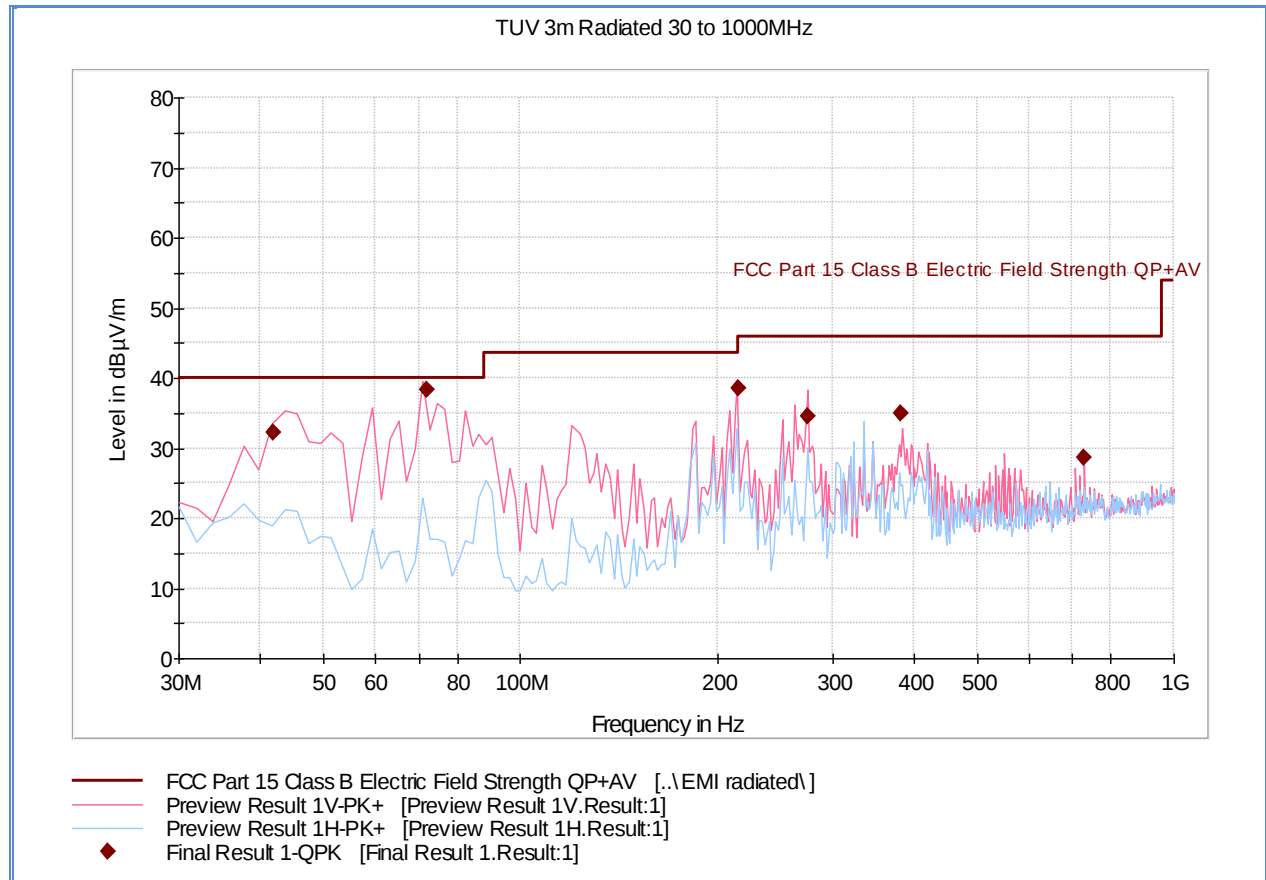


- Measurement was done using EMC32 V8.53 automated software. Reported level is the actual level with all the correction factors factored in. Correction Factor column is for informational purposes only. See Section 2.6.8 for sample computation.

2.6.8 Sample Computation (Radiated Emission)

Measuring equipment raw measurement (db μ V) @ 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 (db μ V/m) @ 2400 MHz			53.6

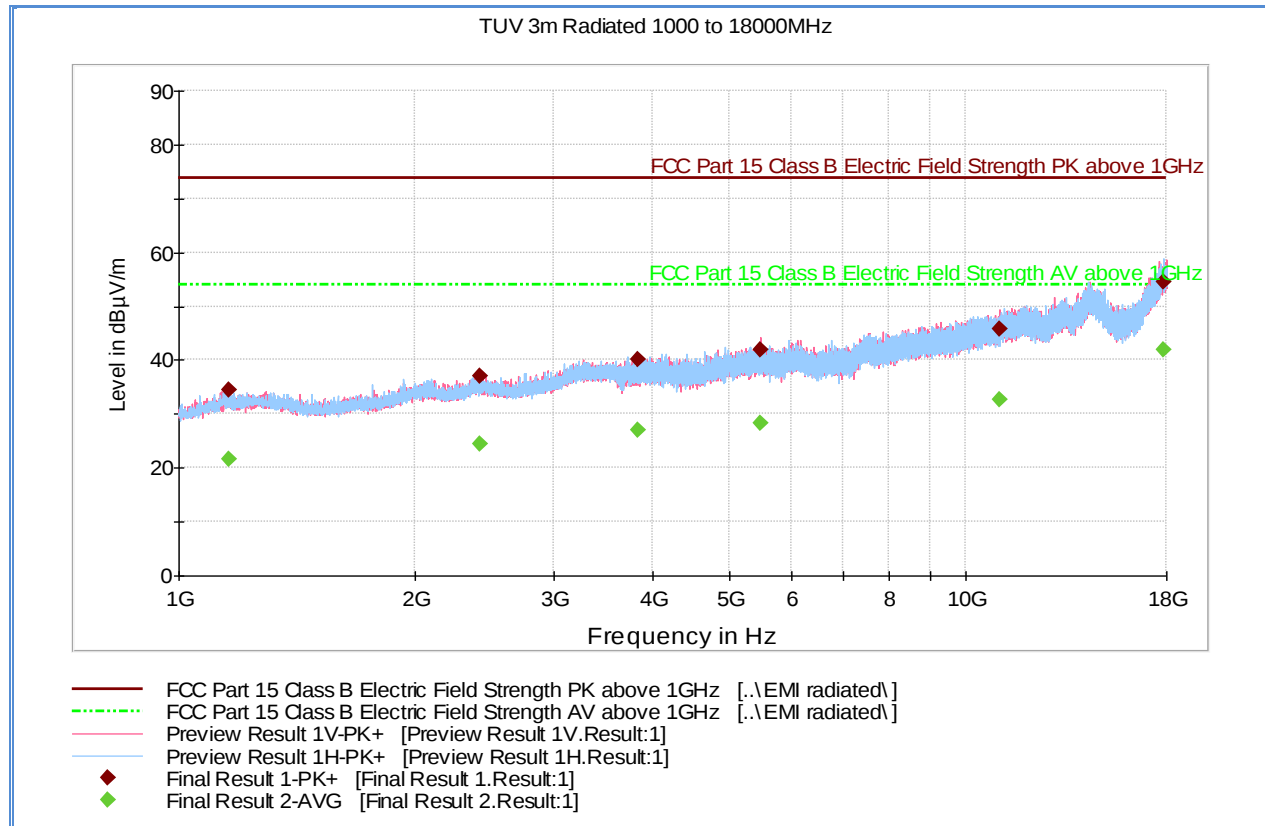
2.6.9 Test Results Below 1GHz (Receive Mode)



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)
41.863327	32.1	1000.0	120.000	100.0	V	8.0	-17.9	7.9	40.0
71.781643	38.3	1000.0	120.000	147.0	V	166.0	-21.9	1.7	40.0
215.829339	38.6	1000.0	120.000	100.0	V	299.0	-15.3	4.9	43.5
275.809860	34.5	1000.0	120.000	100.0	V	52.0	-12.5	11.5	46.0
382.907575	35.0	1000.0	120.000	100.0	V	286.0	-8.7	11.0	46.0
729.879599	28.7	1000.0	120.000	100.0	V	110.0	-1.9	17.3	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)
1160.46666	34.4	1000.0	1000.000	308.0	H	285.0	-10.0	39.5	73.9
2414.33333	37.0	1000.0	1000.000	319.0	V	199.0	-4.8	36.9	73.9
3830.23333	40.2	1000.0	1000.000	100.0	V	331.0	0.9	33.7	73.9
5482.60000	41.9	1000.0	1000.000	146.0	V	334.0	4.1	32.0	73.9
11063.1733	45.9	1000.0	1000.000	343.0	V	287.0	11.6	28.0	73.9
17883.2066	54.5	1000.0	1000.000	400.0	H	131.0	21.3	19.4	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)
1160.46666	21.5	1000.0	1000.000	308.0	H	285.0	-10.0	32.4	53.9
2414.33333	24.3	1000.0	1000.000	319.0	V	199.0	-4.8	29.6	53.9
3830.23333	27.0	1000.0	1000.000	100.0	V	331.0	0.9	26.9	53.9
5482.60000	28.3	1000.0	1000.000	146.0	V	334.0	4.1	25.6	53.9
11063.1733	32.7	1000.0	1000.000	343.0	V	287.0	11.6	21.2	53.9
17883.2066	41.8	1000.0	1000.000	400.0	H	131.0	21.3	12.1	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
Conducted Emissions						
1024	EMI Test Receiver	ESCS 30	847793/001	Rhode & Schwarz	02/29/12	03/29/13*
7568	LISN	FCC-LISN-50-25-2-10	120305	Fischer Custom Comm.	05/24/12	05/24/13
8607	20dB Attenuator	CAT-20	N/A	MCL HAT-20	08/21/12	08/21/13
8609	20dB Attenuator	CAT-20	N/A	MCL HAT-20	08/21/12	08/21/13
Radiated Test Setup						
1033	Bilog Antenna	3142C	00044556	EMCO	05/23/12	05/23/13
1051	Double-ridged waveguide horn antenna	3115	9408-4329	EMCO	05/24/12	05/24/13
8628	Pre-amplifier	QLJ 01182835-JO	8986002	QuinStar Technologies Inc.	08/17/12	08/17/13
1153	High-frequency cable	SucoFlex 100 SX	N/A	Suhner	08/17/12	08/17/13
8543	High-frequency cable	Micropore 19057793	N/A	United Microwave Products	08/17/12	08/17/13
1040	EMI Test Receiver	ESIB40	100292	Rhode & Schwarz	08/10/12	08/10/13
1049	EMI Test Receiver	ESU	100133	Rhode & Schwarz	06/13/12	06/13/13
1016	Pre-amplifier	PAM-0202	187	PAM	08/17/12	08/17/13
1150	Horn antenna	RA42-K-F-4B-C	012054-004	CMT	Verified by 1003 and 1049	
1151	Pre-amplifier	TS-PR26	100026	Rhode & Schwarz	Verified by 1003 and 1049	
Miscellaneous						
6452	Multimeter	3478A	2911A52177	Hewlett Packard	07/16/12	07/16/13
1003	Signal Generator	SMR-40	1104.0002.40	Rhode & Schwarz	11/12/12	11/12/13
7539	DC Power Supply	6434B	1140A01866	Hewlett Packard	Verified by 6452	
7560	Barometer/Temperature /Humidity Transmitter	iBTHX-W	1240476	Omega	07/12/12	07/12/13
	Test Software	EMC32	V8.53	Rhode & Schwarz	N/A	

*On 1 month extended calibration when used. Received in-tolerance from latest calibration, updated calibration due date is 03/11/14.

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

3.2.3 Conducted Emissions Measurement

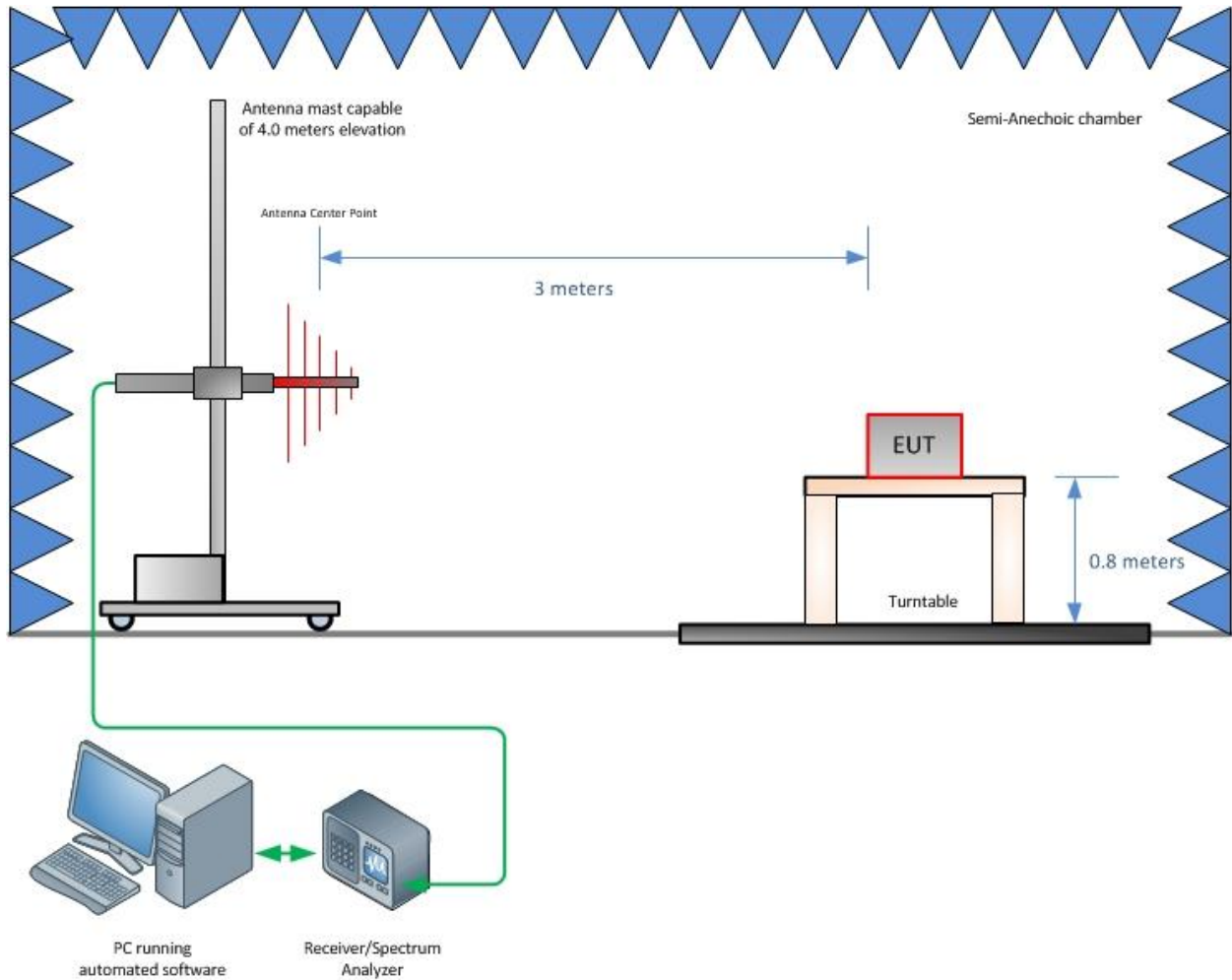
Contribution		Probability Distribution Type	Probability Distribution x_i	Standard Uncertainty $u(x_i)$	$[u(x_i)]^2$
1	Receiver/Spectrum Analyzer	Rectangular	0.36	0.21	0.04
2	Cables	Rectangular	0.50	0.29	0.08
3	LISN	Rectangular	0.66	0.38	0.15
	Attenuator	Rectangular	0.30	0.17	0.03
Combined Uncertainty (u_c):					0.80
Coverage Factor (k):					2
Expanded Uncertainty:					1.59



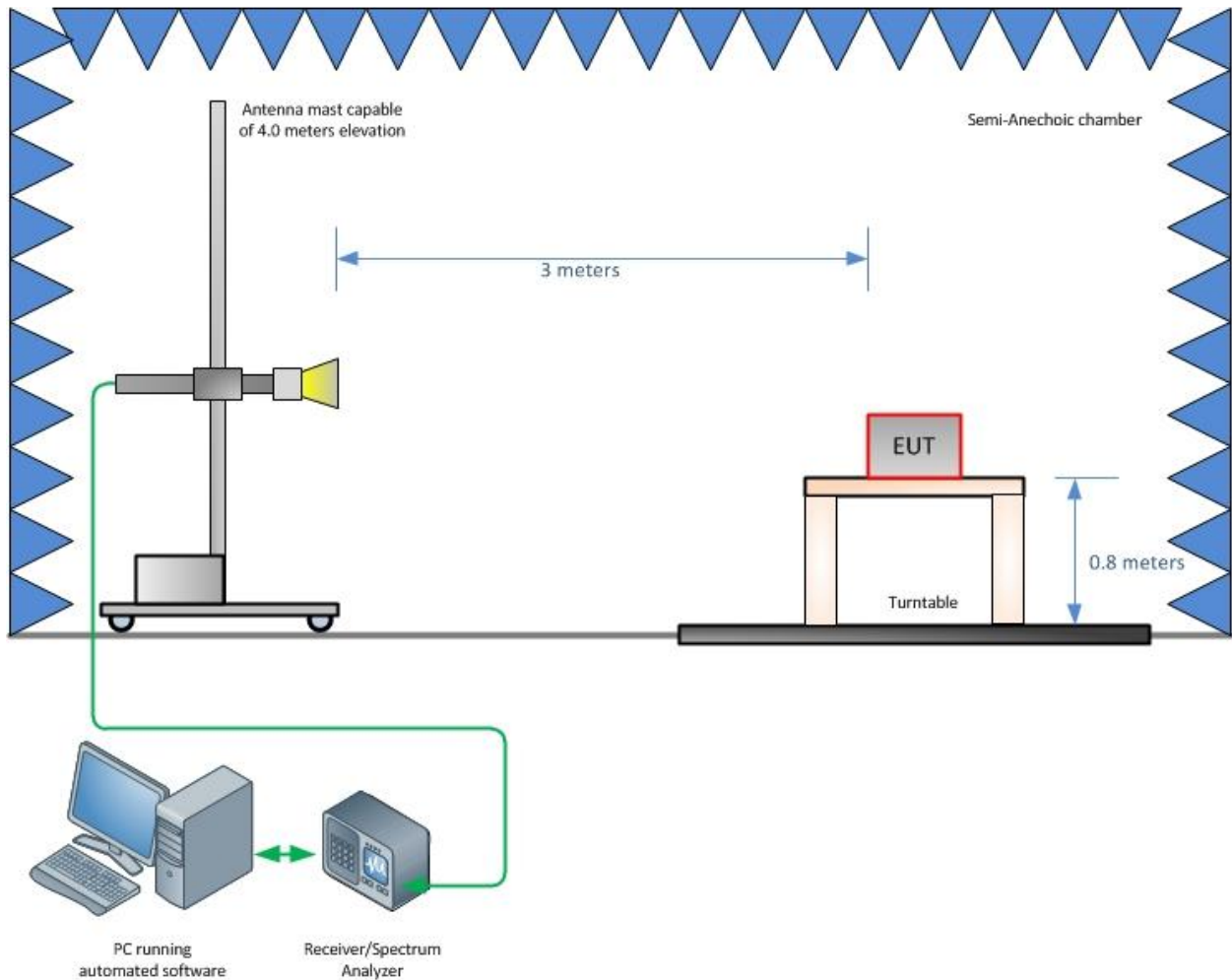
SECTION 4

DIAGRAM OF TEST SETUP

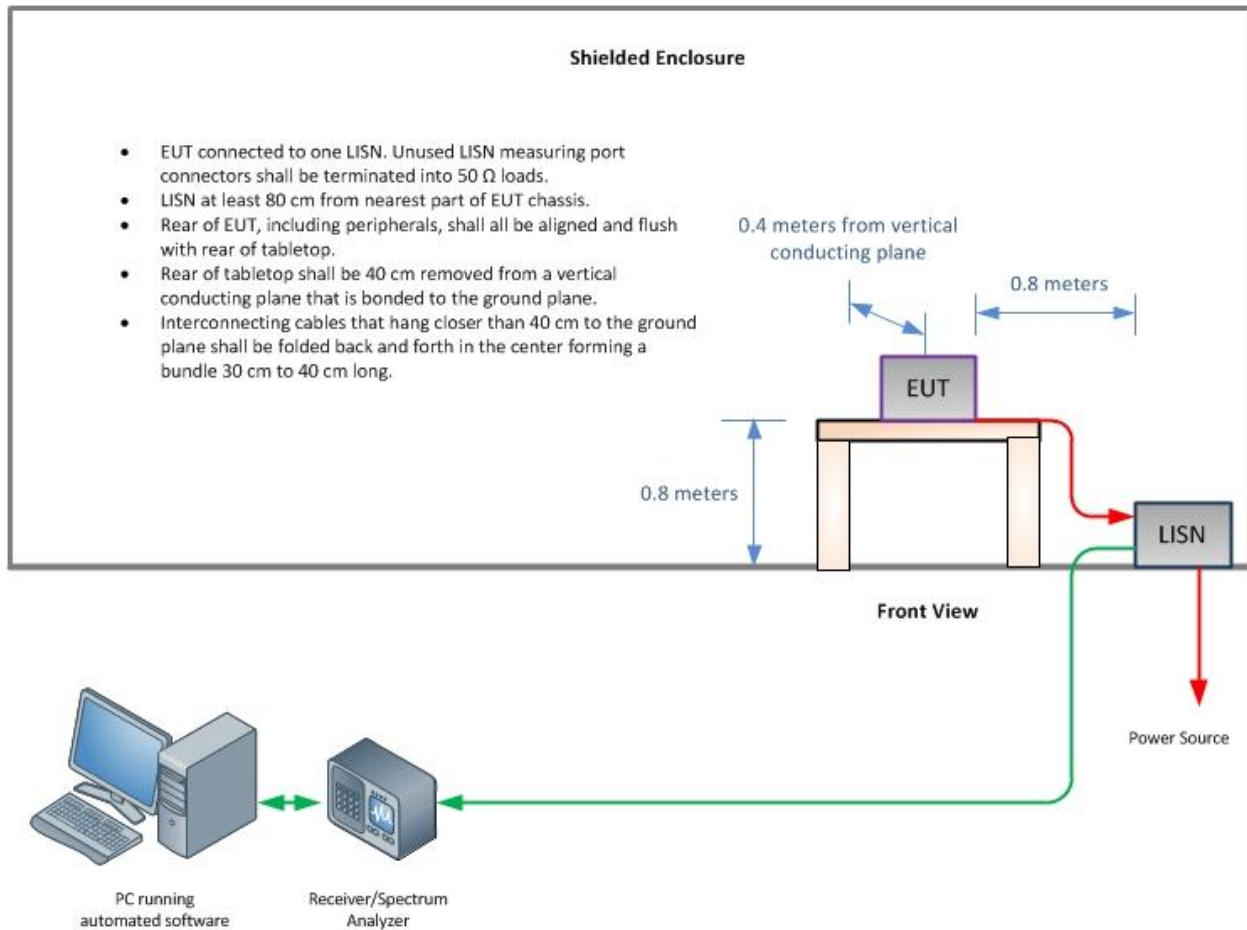
4.1 RADIATED EMISSION TEST SETUP (BELOW 1GHZ)



4.2 RADIATED EMISSION TEST SETUP (ABOVE 1GHZ)



4.3 CONDUCTED EMISSION TEST SETUP





SECTION 5

ACCREDITATION, DISCLAIMERS AND COPYRIGHT

5.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

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