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Report On

Application for Grant of Equipment Authorization of the
ViaSat Inc.

L-Band Satellite Fixed Terminal M2M FT2225 Terminal

FCC Part 15 Subpart C §15.247

IC RSS-247 Issue 1 May 2015

IC RSS-Gen Issue 4 November 2014

Report No. SD72107151B-0615

October 2015





REPORT ON Radio Testing of the
ViaSat Inc.
L-Band Satellite Fixed Terminal

TEST REPORT NUMBER SD72107151B-0615

PREPARED FOR ViaSat Inc.
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DATED October 15, 2015



Revision History

SD72107151B-0615 ViaSat Inc. L-Band Satellite Fixed Terminal M2M FT2225 Terminal					
DATE	OLD REVISION	NEW REVISION	REASON	PAGES AFFECTED	APPROVED BY
10/15/2015	Initial Release				Ferdinand Custodio

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SECTION 1

REPORT SUMMARY

Radio Testing of the
ViaSat Inc.
L-Band Satellite Fixed Terminal



1.1 INTRODUCTION

The information contained in this report is intended to show verification of the ViaSat Inc. M2M FT2225 Terminal L-Band Satellite Fixed Terminal to the requirements of FCC Part 15 Subpart C §15.247 and IC RSS-247 Issue 1 May 2015.

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	ViaSat Inc.
Model Number(s)	FT2225
FCC ID Number	2ABLPFT2225
IC Number	20546-FT2225
Serial Number(s)	C10015220004
Number of Samples Tested	1
Test Specification/Issue/Date	<ul style="list-style-type: none">• FCC Part 15 Subpart C §15.247 (October 1, 2014).• RSS-247 – Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices (Issue 1, May 2015).• RSS-Gen - General Requirements for Compliance of Radio Apparatus (Issue 4, November 2014).• 558074 D01 DTS Meas Guidance v03r03, (June 09, 2015) Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247.
Start of Test	July 31, 2015
Finish of Test	August 03, 2015
Name of Engineer(s)	Alex Chang
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 §15.247 with cross-reference to the corresponding IC RSS standard is shown below.

Section	§15.247 Spec Clause	RSS	Test Description	Result	Comments/ Base Standard
2.1	§15.247(b)(3)	RSS-247 5.4(4)	Peak Output Power	Compliant	
	§15.207(a)	RSS-Gen 7.2.4	Conducted Emissions	N/A	
2.3		RSS-Gen 4.6.1	99% Emission Bandwidth	Compliant	
2.4	§15.247(a)(2)	RSS-247 5.2(1)	Minimum 6 dB RF Bandwidth	Compliant	
2.5	§15.247(d)	RSS-247 5.5	Out-of-Band Emissions - Conducted	Compliant	
2.6	§15.247(d)	RSS-247 5.5	Band-edge Compliance of RF Conducted Emissions	Compliant	
2.7	§15.247(d)	RSS-247 5.5	Spurious Radiated Emissions	Compliant	
2.7		RSS-Gen 4.10	Receiver Spurious Emissions	Compliant	
2.8	§15.247(d)	RSS-247 5.5	Radiated Band Edge Measurements	Compliant	
2.9	§15.247(e)	RSS-247 5.2(2)	Power Spectral Density for Digitally Modulated Device	Compliant	

N/A EUT is a DC voltage operated device.



1.3 PRODUCT INFORMATION

1.3.1 Technical Description

The Equipment Under Test (EUT) was a ViaSat Inc. M2M FT2225 Terminal (L-Band Satellite Fixed Terminal) model no. FT2225. The EUT is a device intended to provide dependable, instant IP-based machine-to-machine (M2M) communications via satellite. Powered by ViaSat Managed Services (VMS), this sitcom terminal's secure two-way networking capability enables real-time data collections, monitoring and control for time-critical SCADA applications. The FT2225 incorporates Wi-Fi and Bluetooth functions. A shielded power/Ethernet CAT5e combine cable was provided and used by customer for final evaluation. The Wi-Fi 802.11 b/g modes were verified and evaluated in this test report.

1.3.2 EUT General Description

EUT Description	L-Band Satellite Fixed Terminal
Model Name	M2M FT2225 Terminal
Model Number(s)	FT2225
Rated Voltage	10 – 32VDC
Mode Verified	802.11 b/g
Capability	802.11 b/g WLAN (DTS) 2.4GHz band 20MHz BW and Bluetooth EDR
Primary Unit (EUT)	<input type="checkbox"/> Production <input checked="" type="checkbox"/> Pre-Production <input type="checkbox"/> Engineering
Antenna Type	Integral PCB trace type (multilayer chip antenna)
Manufacturer	ViaSat
Antenna Gain (measured declared by manufacturer)	-6.23 dBi (2412 MHz) -6.01 dBi (2437 MHz) -4.79 dBi (2462 MHz)

1.3.3 Maximum Conducted Output Power

Mode	Frequency Range (MHz)	Average Output Power (dBm)	Average Output Power (mW)
802.11b	2412 – 2462	19.38	86.70
802.11g	2412 – 2462	15.32	34.04

1.4 EUT TEST CONFIGURATION

1.4.1 Test Configuration Description

Test Configuration	Description
A	Antenna conducted port test configuration. A conducted test sample was provided for this setup. The integral antenna was removed to gain accessible to the coaxial connector. EUT configuration was set to WiFi mode via Ethernet connection using Tera Term application. Manufacturer provided the instructions that able to configure the EUT to change modes, channels, data rates and power level (Power parameter was set to "20 for b mode and 15 for g mode" which corresponds to the maximum power setting).
B	Radiated emissions test configuration. EUT was set on continuous transmission at 100% duty cycle modulated in low, mid or high channel for evaluation.

1.4.2 EUT Exercise Software

EUT is configured via TCP/IP (Ethernet). EUT IP address is set to 192.168.100.2. This address is used to connect to the EUT via Tera Term client application. Once connected, corresponding programming commands were issue in order to set the EUT in WiFi test mode.

1.4.3 Support Equipment and I/O cables

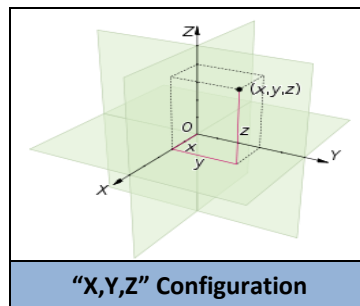
Manufacturer	Equipment/Cable	Description
Sony	Support Laptop	Model PCG-31311L
Sony	Support AC-DC Power Adapter	Model: ACDP-120E03
—	Ethernet EUT to Support Laptop	2.1 meters, shielded CAT5e cable with RJ45 connector

1.4.4 Worst Case Configuration

Worst-case configuration used in this test report as per maximum conducted output power measurements:

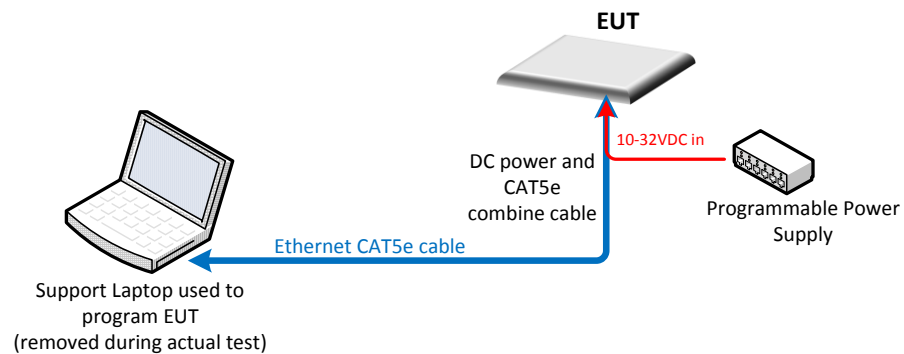
Mode	Channel	Data Rate
802.11b	11 (High Channel)	5.5Mbps
802.11g	1 (Low Channel)	6Mbps

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



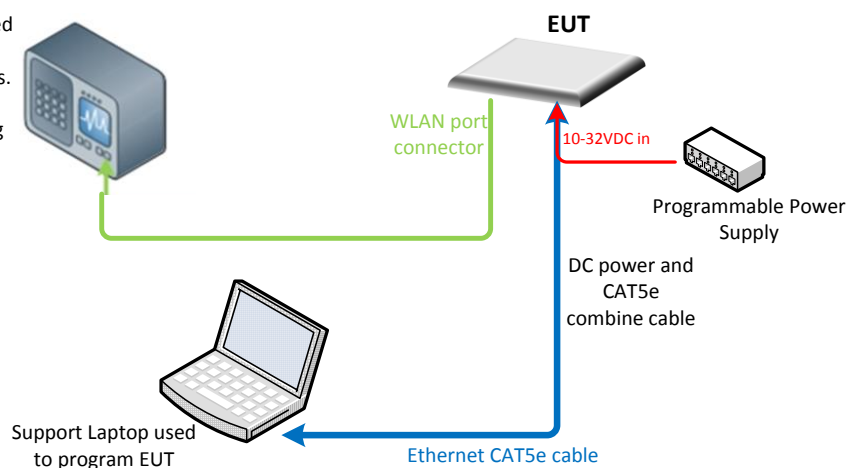
1.4.5 Simplified Test Configuration Diagram

Radiated Emission Test Setup



Conducted Port Measurement Test Setup

Antenna test port provided by the manufacturer for conducted measurements. The output is connected directly to the measuring equipment, external attenuators are used.



Not To Scale – Illustration Purpose Only
 Objects may not represent actual image of original equipment/s or set-up.



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: C10015220004		
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.: US1146

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 §2.948 of the FCC rules. The acceptance letter from the FCC is maintained in our files and the Registration is US1146.



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

The 10m Semi-anechoic chamber of TÜV SÜD 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
ViaSat Inc.
L-Band Satellite Fixed Terminal



2.1 PEAK OUTPUT POWER

2.1.1 Specification Reference

Part 15 Subpart C §15.247(b)(3)

2.1.2 Standard Applicable

(3) For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

2.1.3 Equipment Under Test and Modification State

Serial No: C10015220004 / Test Configuration A

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

July 31, 2015 / AC

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/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	24.1 °C
Relative Humidity	52.6 %
ATM Pressure	99.3 kPa

2.1.7 Additional Observations

- This is a conducted test (Maximum conducted [average] output power) using direct connection to a power meter.
- An offset of 28.8dB was added to compensate for the external attenuator and cable used from the antenna port to the power sensor and spectrum analyzer.
- Test methodology is per Clause 9.2.3.1 of KDB 558074 D01 DTS Meas Guidance v03r01 (April 09, 2013). All conditions under this Clause are satisfied.
- Both Peak and Average measurements were recorded.

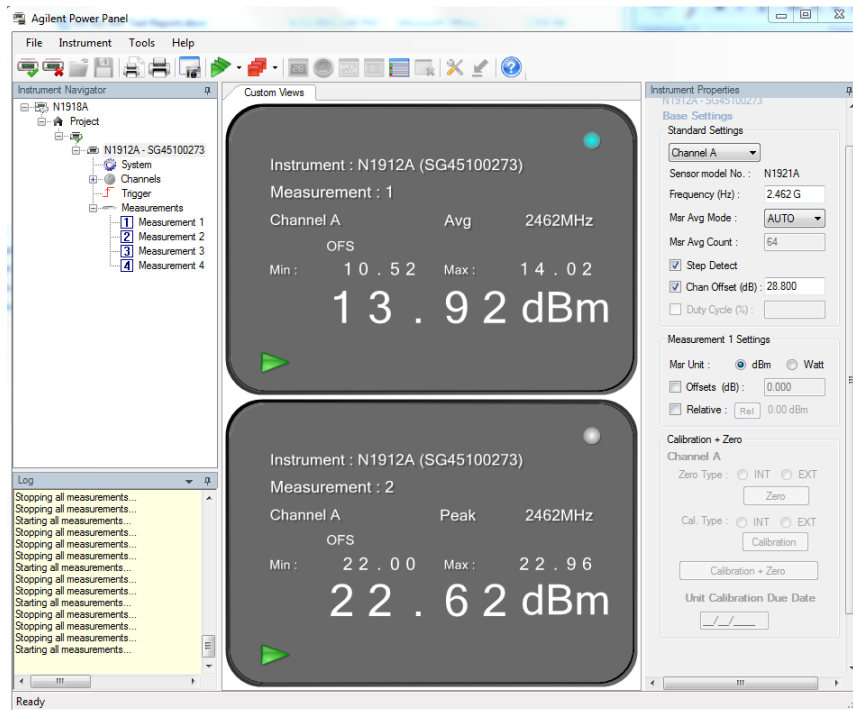
2.1.8 Test Results

WLAN Mode	Channel	Data Rates (Mbps)	Measured Average Power (dBm)	Measured Peak Power (dBm)
802.11b	1 (2412 MHz)	1	18.52	21.30
		2	18.67	21.36
		5.5	18.89	21.40
		11	18.62	21.48
	6 (2437 MHz)	1	18.26	21.08
		2	18.36	21.14
		5.5	18.59	21.09
		11	18.48	21.21
	11 (2462 MHz)	1	18.83	21.59
		2	18.90	21.66
		5.5	19.38	21.69
		11	18.94	21.59



WLAN Mode	Channel	Data Rates (Mbps)	Measured Average Power (dBm)	Measured Peak Power (dBm)
802.11g	1 (2412 MHz)	6	15.32	22.90
		9	15.25	22.92
		12	15.16	22.88
		18	15.05	22.95
		24	14.95	23.01
		36	14.64	22.89
		48	14.57	22.87
		54	14.38	22.91
	6 (2437 MHz)	6	14.87	22.52
		9	14.84	22.50
		12	14.78	22.56
		18	14.62	22.56
		24	14.73	22.72
		36	14.57	22.58
		48	14.09	22.49
		54	14.13	22.50
	11 (2462 MHz)	6	14.91	22.94
		9	14.80	22.93
		12	14.74	22.92
		18	14.65	22.81
		24	14.54	22.91
		36	14.37	22.83
		48	14.09	22.93
		54	14.02	22.96

2.1.9 Sample Test Display





2.2 99% EMISSION BANDWIDTH

2.2.1 Specification Reference

RSS-Gen Clause 4.6.1

2.2.2 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.

2.2.3 Equipment Under Test and Modification State

Serial No: C10015220004 / Test Configuration A

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

July 31, 2015 / AC

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	24.1 °C
Relative Humidity	52.6 %
ATM Pressure	99.3 kPa

2.2.7 Additional Observations

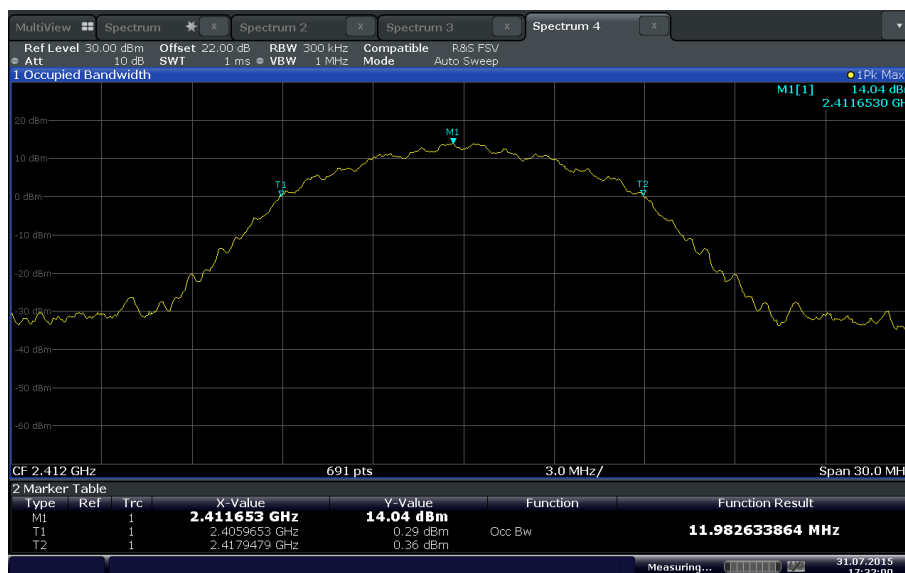
- This is a conducted test.
- An offset of 22.0dB was added to compensate for the external attenuator and cable used from the antenna port to the spectrum analyzer.
- Span is wide enough to capture the channel transmission.
- RBW is 1% of the span.
- VBW is 3X RBW.
- Sweep is auto.

- 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.

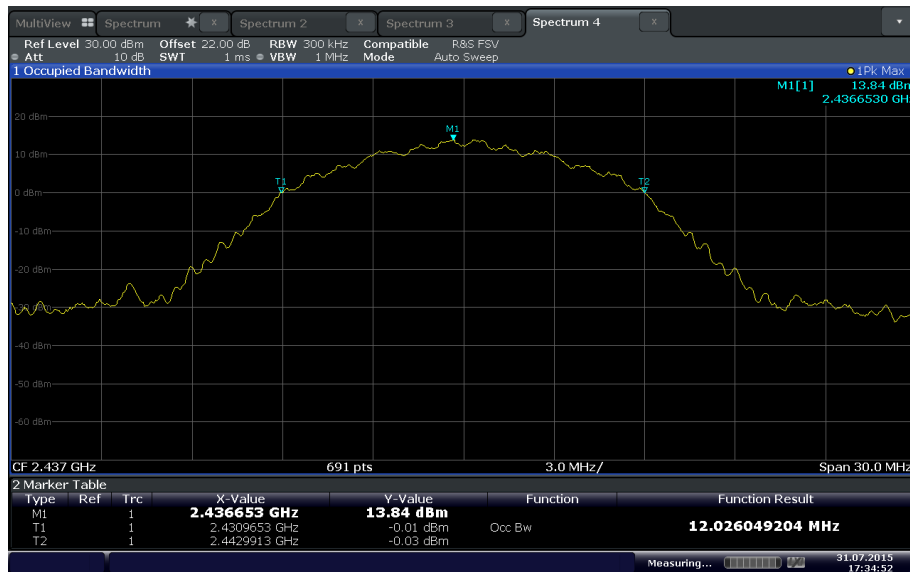
2.2.8 Test Results

Mode	Channel	Measured 99% Bandwidth (MHz)
802.11b	1 (2412 MHz)	11.983
	6 (2437 MHz)	12.026
	11 (2462 MHz)	11.983
802.11g	1 (2412 MHz)	16.758
	6 (2437 MHz)	16.758
	11 (2462 MHz)	16.671

2.2.9 Test Results Plots

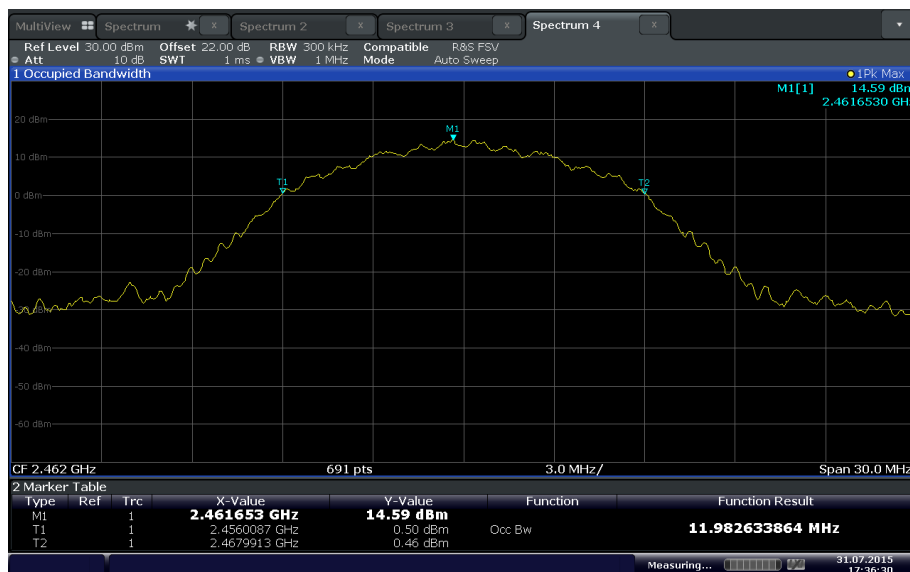


802.11b Low Channel (2412 MHz)



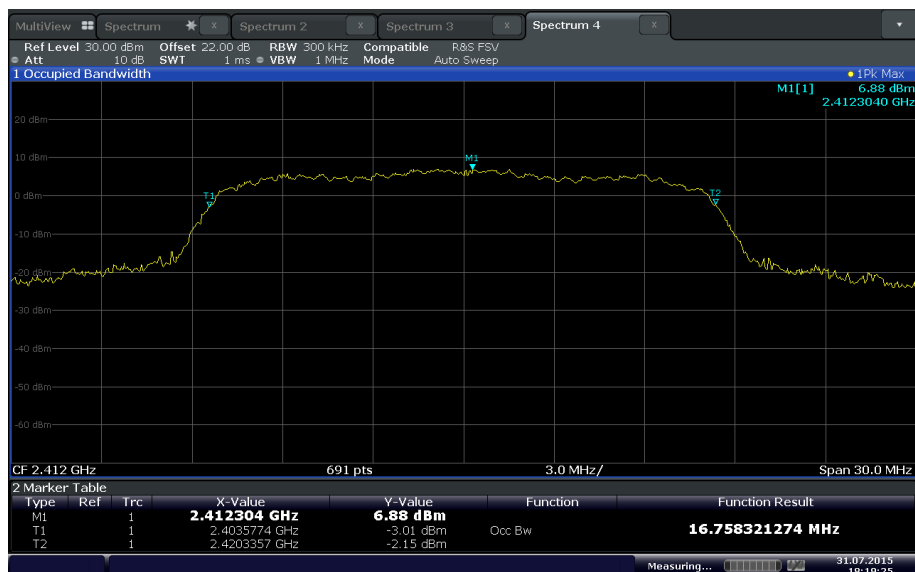
Date: 31 JUL 2015 17:34:52

802.11b Mid Channel (2437 MHz)



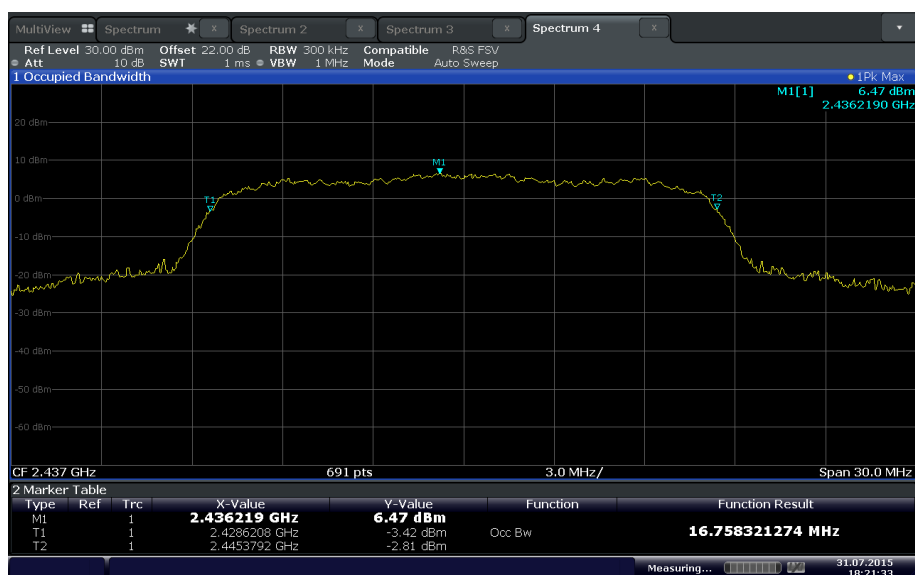
Date: 31 JUL 2015 17:36:30

802.11b High Channel (2462 MHz)



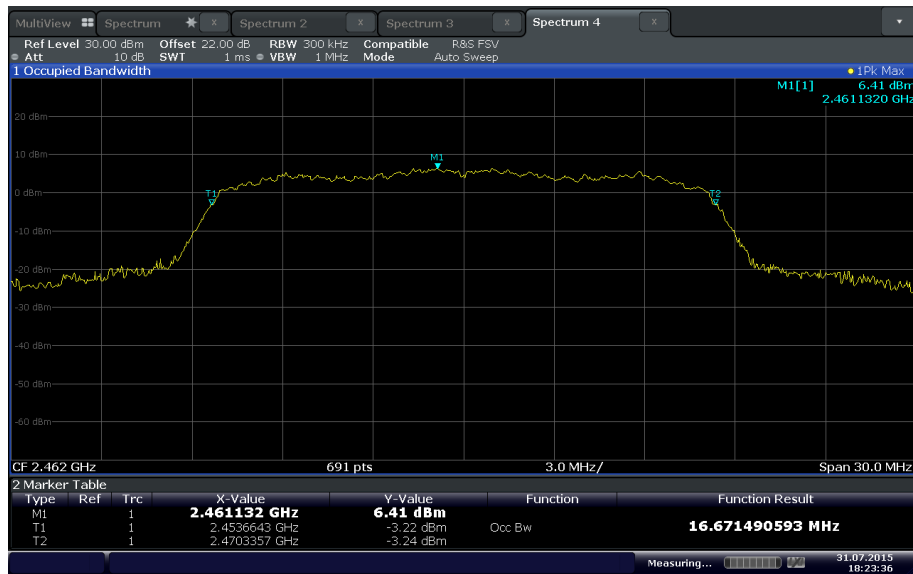
Date: 31 JUL 2015 18:19:25

802.11g Low Channel (2412 MHz)



Date: 31 JUL 2015 18:21:33

802.11g Mid Channel (2437 MHz)



Date: 31 JUL 2015 18:23:37

802.11g High Channel (2462 MHz)



2.3 MINIMUM 6 dB RF BANDWIDTH

2.3.1 Specification Reference

Part 15 Subpart C §15.247(a)(2)

2.3.2 Standard Applicable

(2) Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

2.3.3 Equipment Under Test and Modification State

Serial No: C10015220004 / Test Configuration A

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

July 31, 2015 / AC

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	24.1 °C
Relative Humidity	52.6 %
ATM Pressure	99.3 kPa

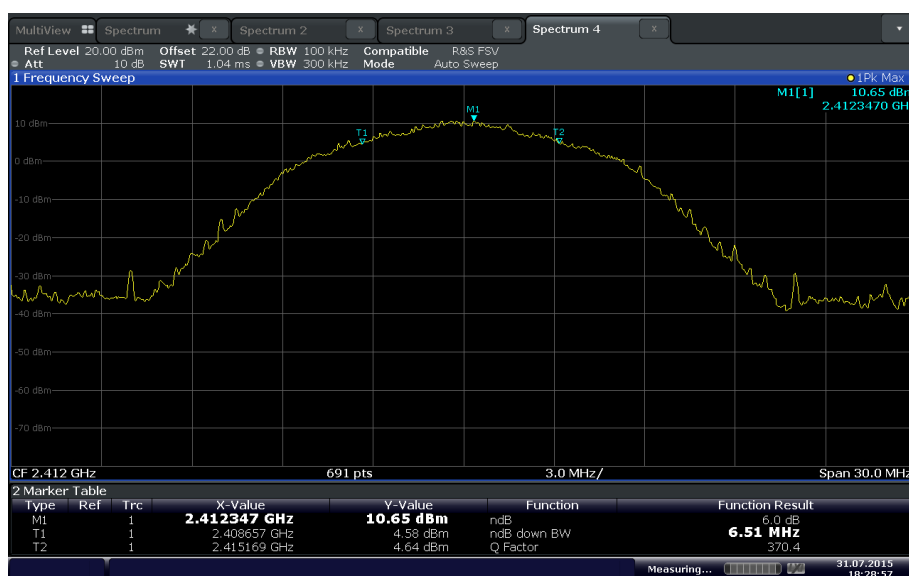
2.3.7 Additional Observations

- This is a conducted test.
- An offset of 22.0dB was added to compensate for the external attenuator and cable used from the antenna port to the spectrum analyzer.
- Span is wide enough to capture the channel transmission.
- RBW is set to 100 kHz.
- VBW is 3X RBW.
- Sweep is auto.
- Detector is peak.
- The “n” dB down marker function of the spectrum analyzer was used for this test.
- For signal modulation where “n” dB down marker function is not practical a peak measurement is performed while the trace is in max hold.
- A horizontal line is drawn 6dB below the peak measurement.
- 6dB bandwidth is where the lower and upper edge of the signal intersects the drawn line using delta marker type measurement.

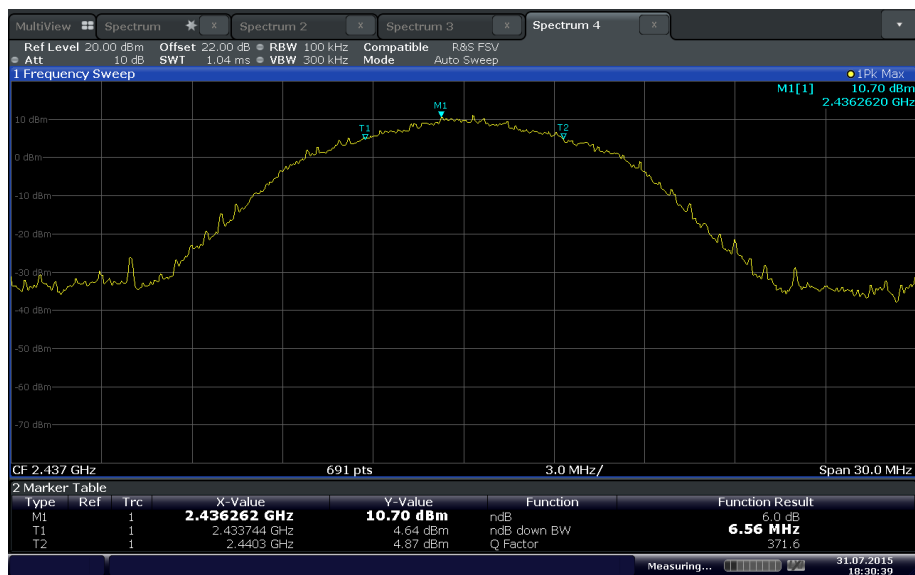
2.3.8 Test Results

Mode	Channel	Measured Bandwidth (MHz)	Minimum Bandwidth (MHz)	Compliance
802.11b	1 (2412 MHz)	6.51	0.500	Complies
	6 (2437 MHz)	6.56	0.500	Complies
	11 (2462 MHz)	6.60	0.500	Complies
802.11g	1 (2412 MHz)	13.46	0.500	Complies
	6 (2437 MHz)	13.46	0.500	Complies
	11 (2462 MHz)	13.55	0.500	Complies

2.3.9 Test Results Plots

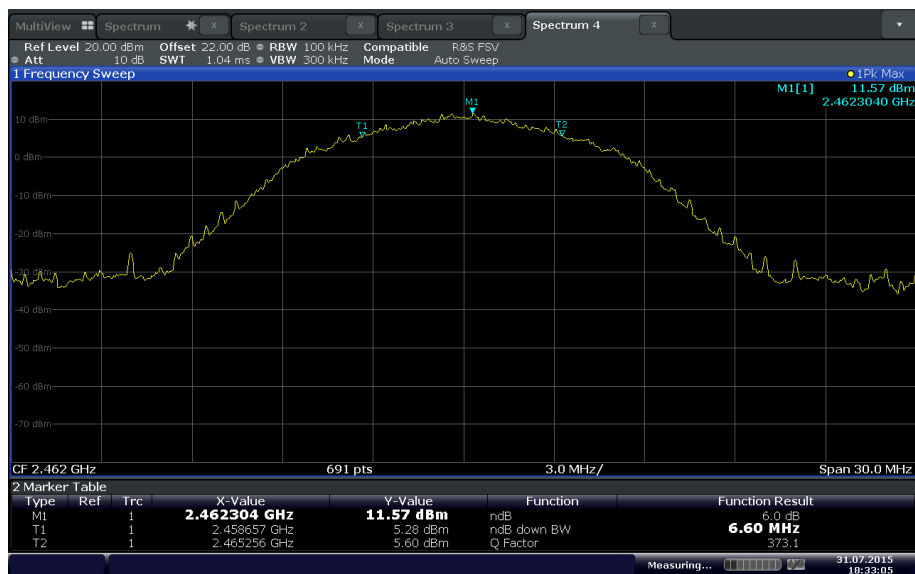


802.11b Low Channel (2412 MHz)



Date: 31 JUL 2015 18:30:39

802.11b Mid Channel (2437 MHz)



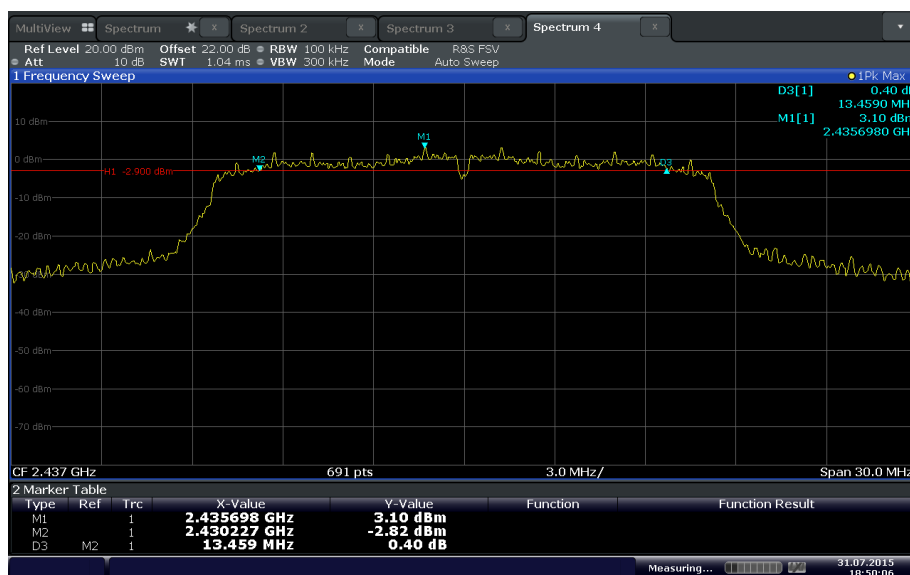
Date: 31 JUL 2015 18:33:06

802.11b High Channel (2462 MHz)



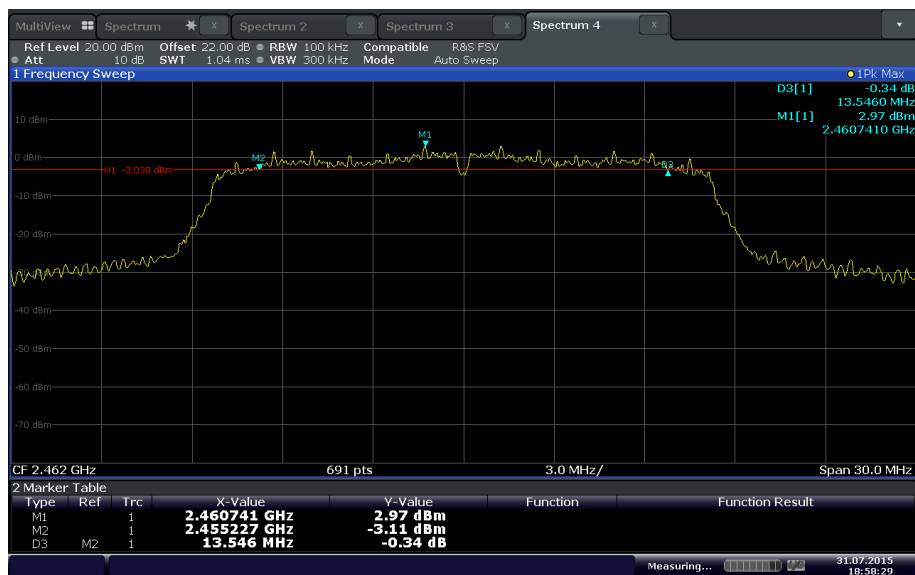
Date: 31 JUL 2015 18:45:05

802.11g Low Channel (2412 MHz)



Date: 31 JUL 2015 18:50:07

802.11g Mid Channel (2437 MHz)



Date: 31 JUL 2015 18:58:29

802.11g High Channel (2462 MHz)



2.4 OUT-OF-BAND EMISSIONS - CONDUCTED

2.4.1 Specification Reference

Part 15 Subpart C §15.247(d)

2.4.2 Standard Applicable

(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

2.4.3 Equipment Under Test and Modification State

Serial No: C10015220004 / Test Configuration A

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

August 01, 2015 / AC

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	24.5 °C
Relative Humidity	56.0 %
ATM Pressure	99.6 kPa

2.4.7 Additional Observations

- This is a conducted test.
- An offset of 22.0dB was added to compensate for the external attenuator and cable used from the antenna port to the spectrum analyzer.
- RBW is 100kHz.VBW is 3X RBW.
- Sweep is auto. Detector is RMS. Trace is max hold.
- Initial scan was performed to determine the highest level of the desired power within the band. Limit (display line) was drawn 30dB below this level.
- Spectrum was searched from 9 kHz up to 26.5GHz.

2.4.8 Test Results Plots



Date: 1 AUG 2015 10:25:05

802.11b Low Channel (2412 MHz)



Date: 1 AUG 2015 10:34:59

802.11b Mid Channel (2437 MHz)



Date: 1 AUG 2015 10:37:03

802.11b High Channel (2462 MHz)



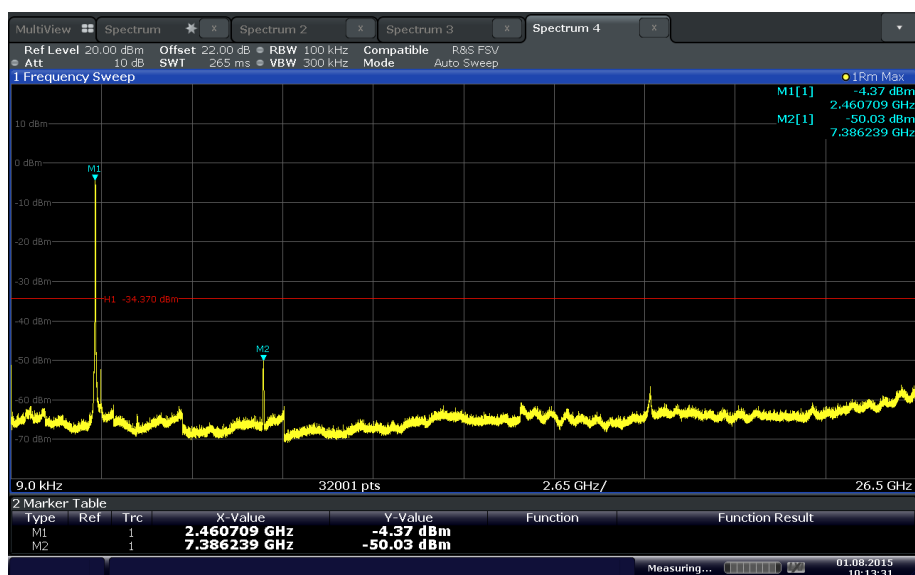
Date: 1 AUG 2015 10:21:10

802.11g Low Channel (2412 MHz)



Date: 1 AUG 2015 10:18:51

802.11g Mid Channel (2437 MHz)



Date: 1 AUG 2015 10:13:31

802.11g High Channel (2462 MHz)



2.5 BAND-EDGE COMPLIANCE OF RF CONDUCTED EMISSIONS

2.5.1 Specification Reference

Part 15 Subpart C §15.247(d)

2.5.2 Standard Applicable

(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

2.5.3 Equipment Under Test and Modification State

Serial No: C10015220004 / Test Configuration A

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

August 01, 2015 / AC

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

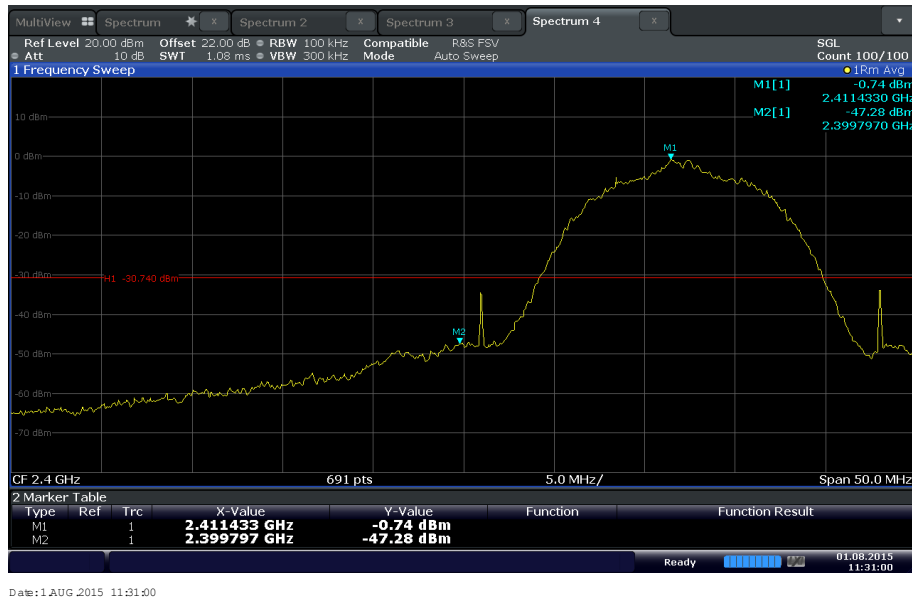
Ambient Temperature	24.5 °C
Relative Humidity	56.0 %
ATM Pressure	99.6 kPa

2.5.7 Additional Observations

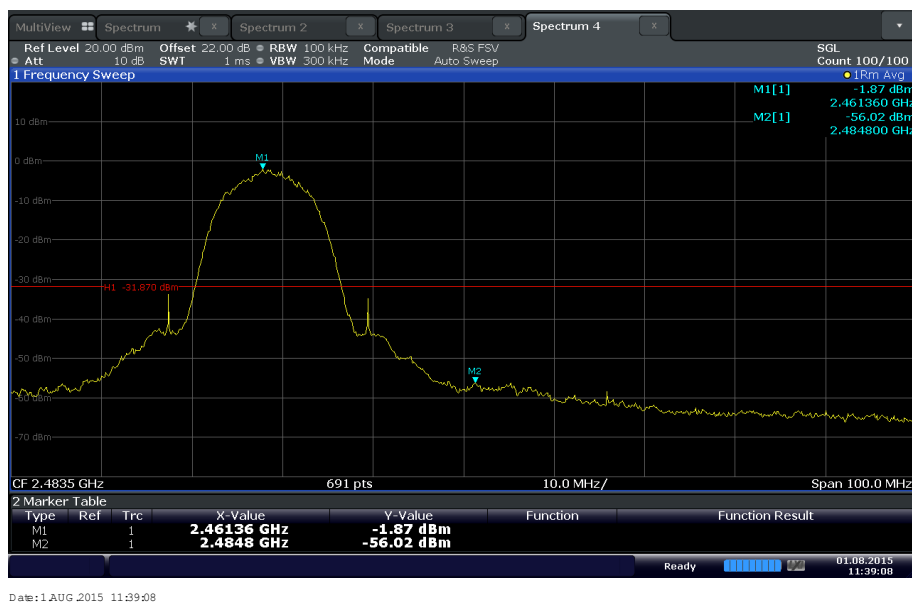
- Setup is identical to “Out-of-Band Emissions – Conducted” test (previous test).
- 2.4GHz band-edges (2400MHz and 2483.5MHz) were verified in this test.
- Test methodology is per Clause 13.2 Marker-delta method of KDB 558074 D01 DTS Meas Guidance v03r01 (April 09, 2013).
- An offset of 22.0dB was added to compensate for the external attenuator and cable used from the antenna port to the spectrum analyzer.

2.5.8 Test Results

Complies. See attached plots.



802.11b Low Channel (2412 MHz)

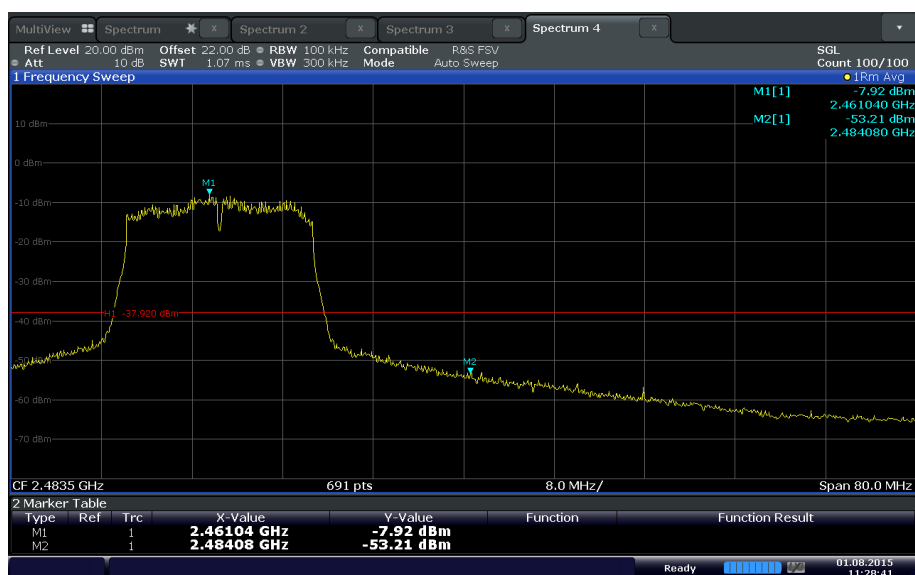


802.11b High Channel (2462 MHz)



Date: 1 AUG 2015 11:26:41

802.11g Low Channel (2412 MHz)



Date: 1 AUG 2015 11:28:41

802.11g High Channel (2462 MHz)



2.6 SPURIOUS RADIATED EMISSIONS

2.6.1 Specification Reference

Part 15 Subpart C §15.247(d)

2.6.2 Standard Applicable

(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

2.6.3 Equipment Under Test and Modification State

Serial No: C10015220004 / Test Configuration B

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

August 02 and 03, 2015 / AC

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	25.4-25.8°C
Relative Humidity	43.5-44.5%
ATM Pressure	98.7-99.0 kPa

2.6.7 Additional Observations

- This is a radiated test. The spectrum was searched from 30MHz to the 10th harmonic.
- There are no emissions found that do not comply to the restricted bands defined in FCC Part 15 Subpart C, 15.205 or Part 15.247(d).
- Only the considered worst case WLAN configuration (802.11b, High Channel, 5.5Mbps) presented for radiated emissions below 1GHz. There are no significant differences in emissions between all modes below 1GHz.



- Only noise floor measurements observed above 18GHz.
- Measurement was done using EMC32 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.

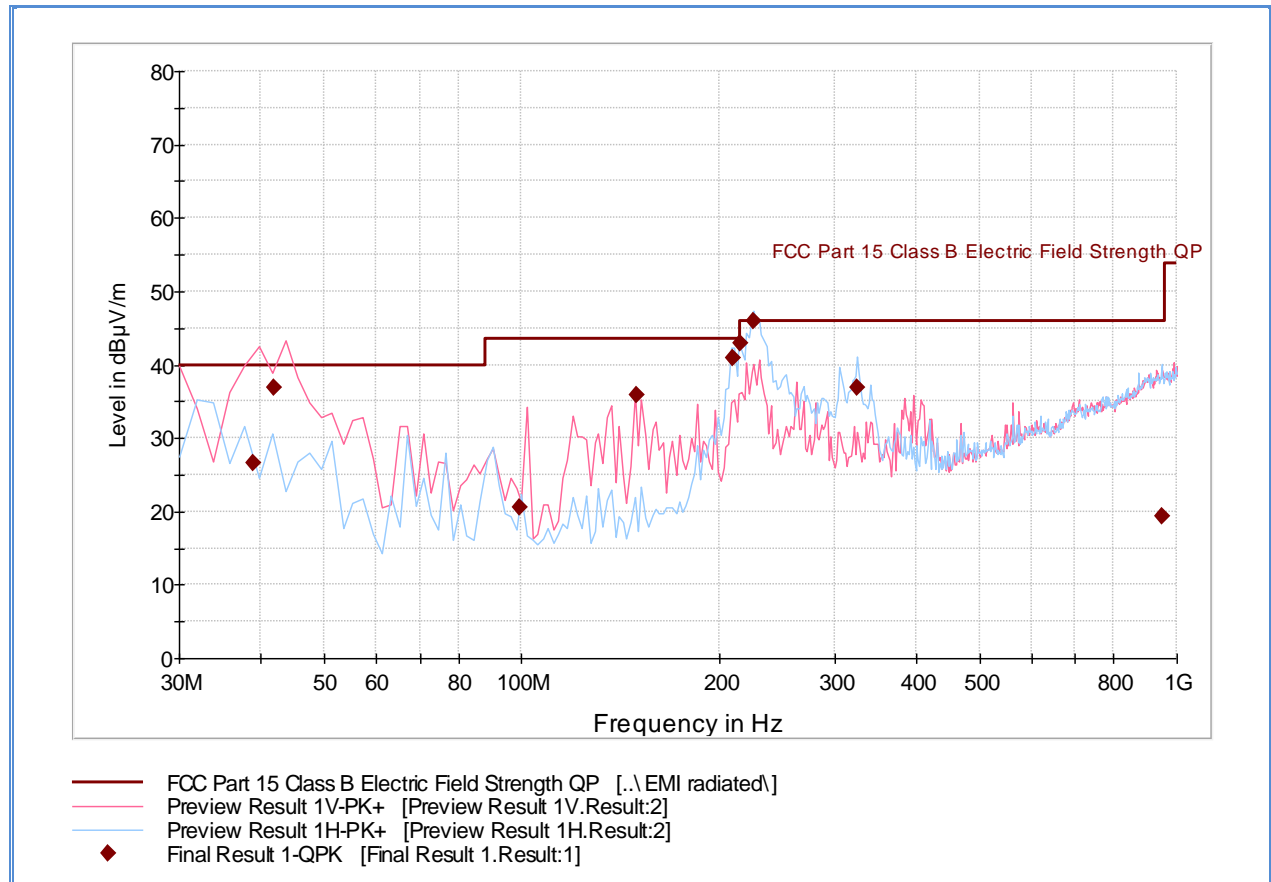
2.6.8 Sample Computation (Radiated Emission)

Measuring equipment raw measurement (dB μ V) @ 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 Quasi Peak Final Measurement (dB μ V/m) @ 30MHz			11.8

2.6.9 Test Results

See attached plots.

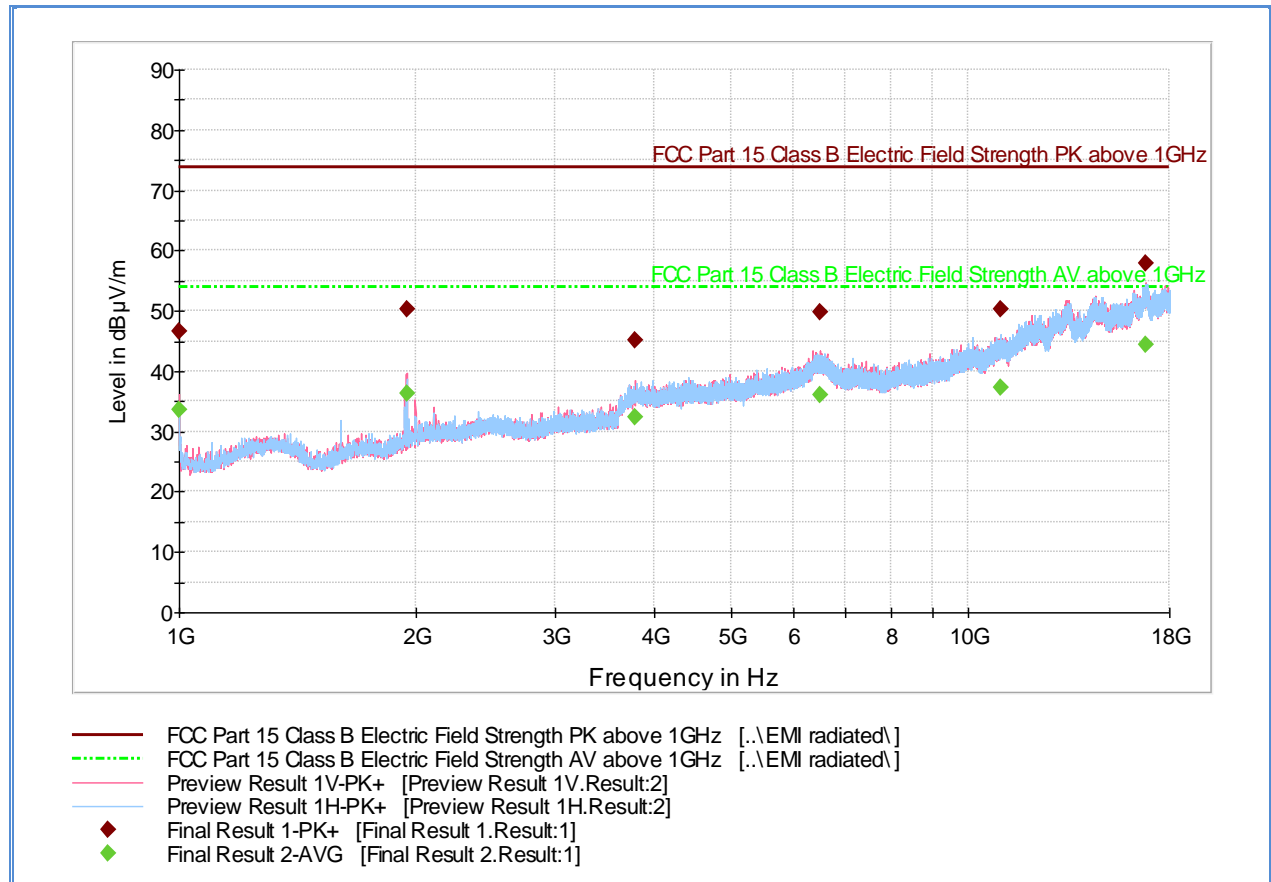
2.6.10 Test Results Below 1GHz (Receive/Standby Mode)



Quasi Peak Data

Frequency (MHz)	QuasiPeak (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)
38.879439	26.5	1000.0	120.000	250.0	V	252.0	-16.1	13.5	40.0
41.887214	36.8	1000.0	120.000	100.0	V	22.0	-17.4	3.2	40.0
99.123848	20.6	1000.0	120.000	110.0	V	342.0	-19.7	22.9	43.5
149.577154	35.9	1000.0	120.000	100.0	V	130.0	-19.0	7.6	43.5
210.021563	40.9	1000.0	120.000	150.0	H	233.0	-16.1	2.6	43.5
215.869339	42.9	1000.0	120.000	128.0	H	74.0	-15.9	0.6	43.5
225.892665	46.0	1000.0	120.000	120.0	H	77.0	-15.4	0.0	46.0
325.350942	36.8	1000.0	120.000	100.0	H	247.0	-11.7	9.2	46.0
950.635030	19.3	1000.0	120.000	150.0	H	264.0	1.6	26.7	46.0

2.6.11 Test Results Above 1GHz (Receive/Standby Mode)



Peak Data

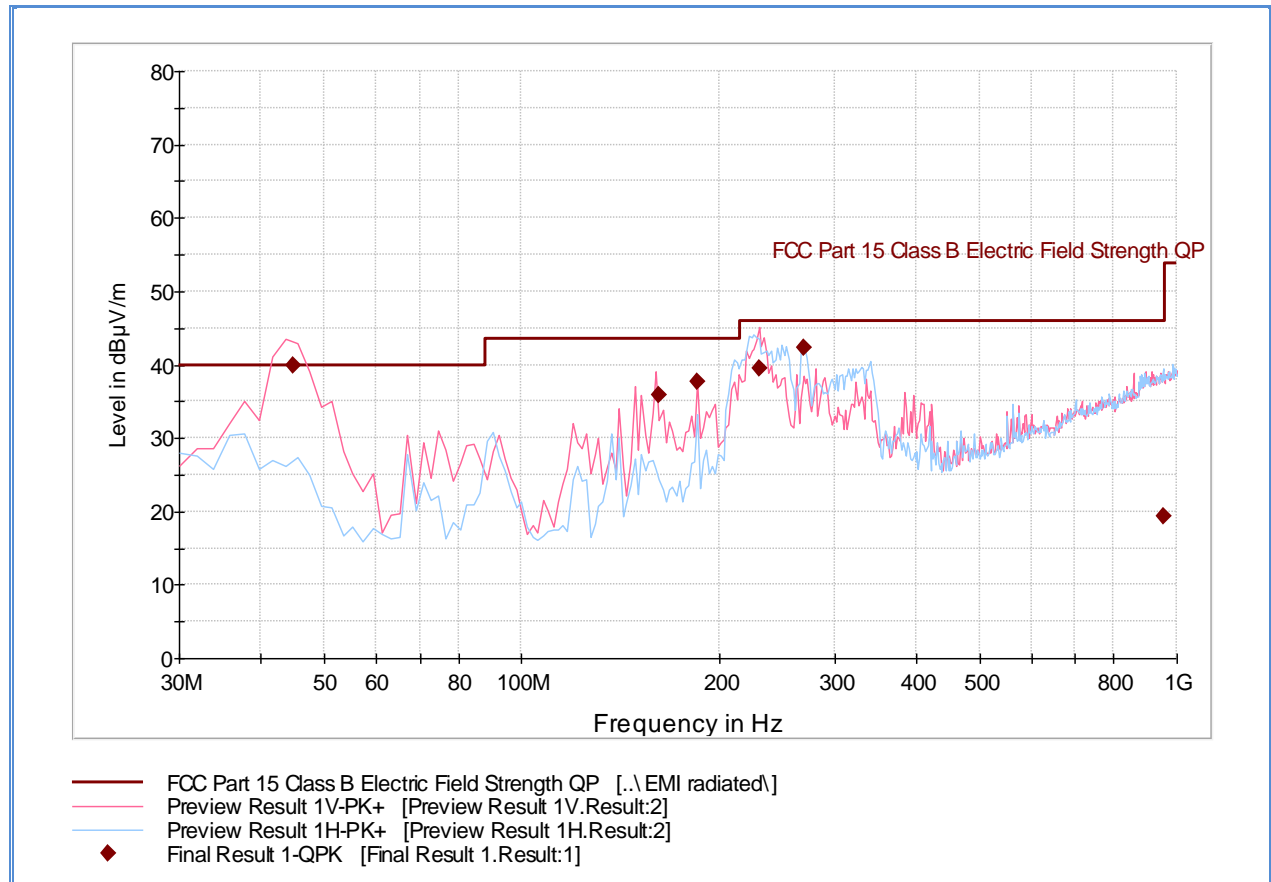
Frequency (MHz)	MaxPeak (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
1000.000000	46.7	1000.0	1000.000	200.5	V	0.0	-7.2	27.2	73.9
1941.433333	50.3	1000.0	1000.000	200.5	V	239.0	-2.3	23.6	73.9
3790.833333	45.1	1000.0	1000.000	178.6	V	69.0	4.9	28.8	73.9
6480.433333	49.7	1000.0	1000.000	120.7	V	99.0	11.1	24.2	73.9
10998.500000	50.3	1000.0	1000.000	138.7	H	0.0	14.9	23.6	73.9
16788.500000	57.8	1000.0	1000.000	324.1	V	180.0	23.8	16.1	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)
1000.000000	33.7	1000.0	1000.000	200.5	V	0.0	-7.2	20.2	53.9
1941.433333	36.2	1000.0	1000.000	200.5	V	239.0	-2.3	17.7	53.9
3790.833333	32.4	1000.0	1000.000	178.6	V	69.0	4.9	21.5	53.9
6480.433333	36.0	1000.0	1000.000	120.7	V	99.0	11.1	17.9	53.9
10998.500000	37.2	1000.0	1000.000	138.7	H	0.0	14.9	16.7	53.9
16788.500000	44.3	1000.0	1000.000	324.1	V	180.0	23.8	9.6	53.9

Test Notes: No significant emissions observed above 18GHz.

2.6.12 Test Results Below 1GHz (WLAN worst Case Configuration_802.11b_High Channel)

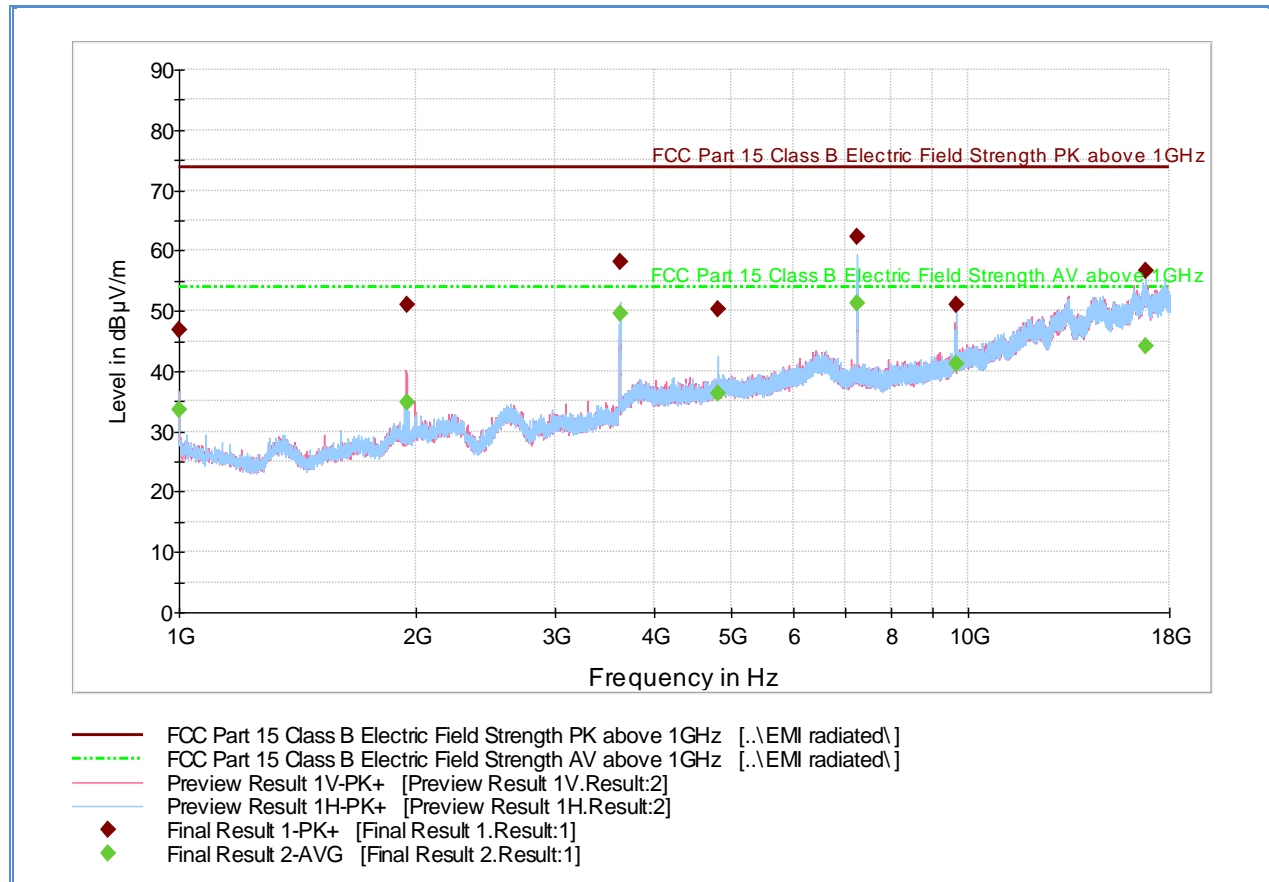


Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
44.887214	39.8	1000.0	120.000	100.0	V	84.0	-18.5	0.2	40.0
161.560481	35.8	1000.0	120.000	100.0	V	246.0	-18.2	7.7	43.5
185.471022	37.7	1000.0	120.000	100.0	V	112.0	-17.0	5.8	43.5
230.940441	39.6	1000.0	120.000	105.0	V	17.0	-15.0	6.4	46.0
269.738196	42.2	1000.0	120.000	105.0	H	65.0	-13.7	3.8	46.0
951.946693	19.3	1000.0	120.000	232.0	H	58.0	1.5	26.7	46.0

Test Notes: Only worst case channel presented for spurious emissions below 1GHz.

2.6.13 Test Results Above 1GHz (802.11b Low Channel)



Peak Data

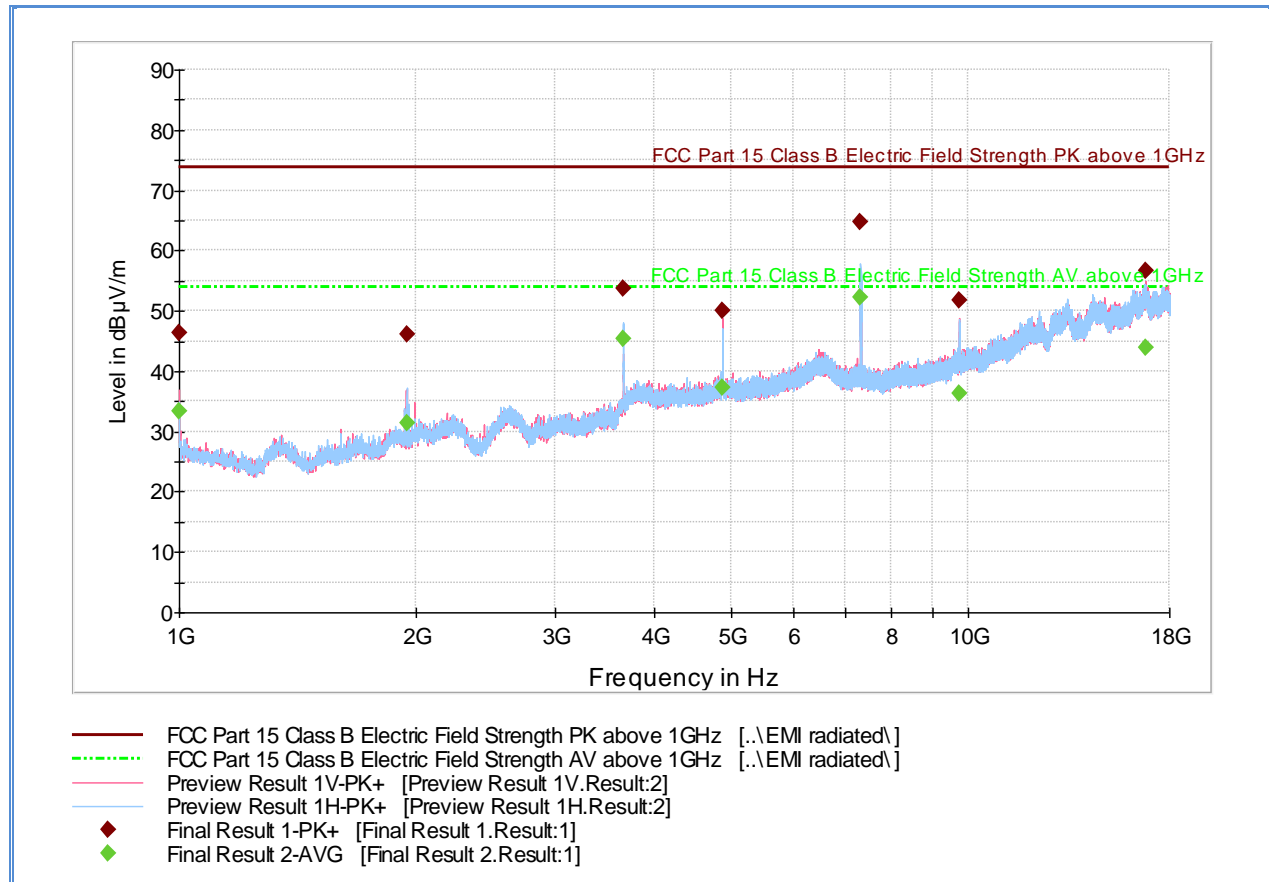
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.000000	46.8	1000.0	1000.000	202.5	V	179.0	-7.2	27.1	73.9
1941.066667	51.0	1000.0	1000.000	215.5	V	18.0	-2.3	22.9	73.9
3618.033333	58.1	1000.0	1000.000	124.7	H	288.0	2.6	15.8	73.9
4824.466667	50.4	1000.0	1000.000	131.7	H	336.0	5.7	23.5	73.9
7234.433333	62.3	1000.0	1000.000	148.7	H	344.0	9.6	11.6	73.9
9659.033333	51.1	1000.0	1000.000	331.2	H	330.0	11.9	22.8	73.9
16775.833333	56.8	1000.0	1000.000	395.1	H	149.0	23.7	17.2	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)
1000.000000	33.5	1000.0	1000.000	202.5	V	179.0	-7.2	20.4	53.9
1941.066667	34.7	1000.0	1000.000	215.5	V	18.0	-2.3	19.2	53.9
3618.033333	49.6	1000.0	1000.000	124.7	H	288.0	2.6	4.3	53.9
4824.466667	36.2	1000.0	1000.000	131.7	H	336.0	5.7	17.7	53.9
7234.433333	51.2	1000.0	1000.000	148.7	H	344.0	9.6	2.7	53.9
9659.033333	41.2	1000.0	1000.000	331.2	H	330.0	11.9	12.7	53.9
16775.833333	44.2	1000.0	1000.000	395.1	H	149.0	23.7	9.7	53.9

Test Notes: Measurement was performed with a 2.4GHz notch filter. No significant emissions observed above 10GHz. Measurements above 10GHz are noise floor figures.

2.6.14 Test Results Above 1GHz (802.11b Mid Channel)



Peak Data

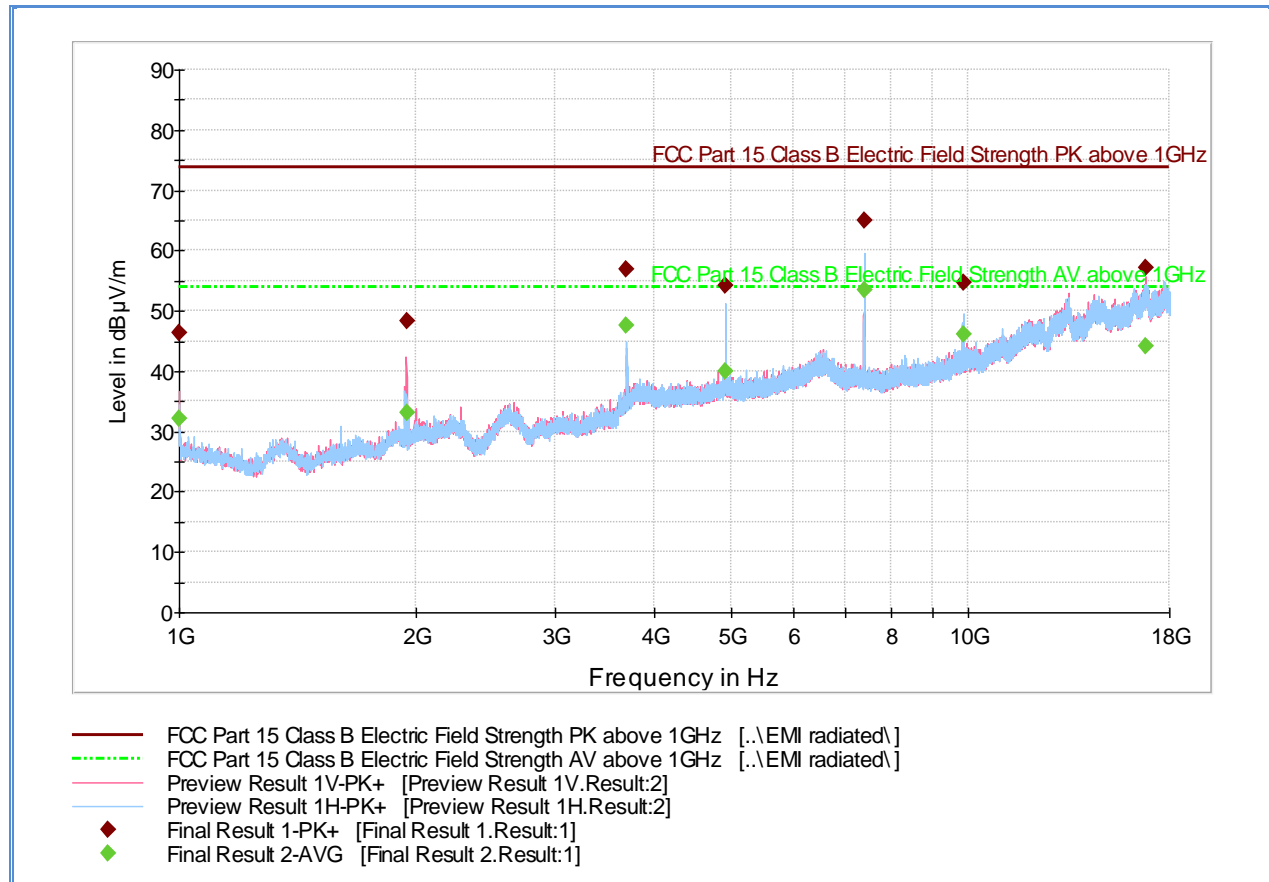
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.000000	46.4	1000.0	1000.000	206.5	V	-3.0	-7.2	27.5	73.9
1941.433333	46.0	1000.0	1000.000	139.7	H	2.0	-2.3	27.9	73.9
3654.500000	53.6	1000.0	1000.000	139.7	H	293.0	3.0	20.3	73.9
4873.533333	49.9	1000.0	1000.000	117.7	V	285.0	6.0	24.0	73.9
7311.900000	64.7	1000.0	1000.000	102.8	H	352.0	9.6	9.2	73.9
9747.600000	51.8	1000.0	1000.000	334.2	V	291.0	12.0	22.1	73.9
16830.266667	56.6	1000.0	1000.000	103.7	V	-9.0	23.5	17.3	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)
1000.000000	33.3	1000.0	1000.000	206.5	V	-3.0	-7.2	20.6	53.9
1941.433333	31.3	1000.0	1000.000	139.7	H	2.0	-2.3	22.6	53.9
3654.500000	45.5	1000.0	1000.000	139.7	H	293.0	3.0	8.4	53.9
4873.533333	37.2	1000.0	1000.000	117.7	V	285.0	6.0	16.7	53.9
7311.900000	52.2	1000.0	1000.000	102.8	H	352.0	9.6	1.7	53.9
9747.600000	36.3	1000.0	1000.000	334.2	V	291.0	12.0	17.6	53.9
16830.266667	43.8	1000.0	1000.000	103.7	V	-9.0	23.5	10.1	53.9

Test Notes: Measurement was performed with a 2.4GHz notch filter. No significant emissions observed above 10GHz. Measurements above 10GHz are noise floor figures.

2.6.15 Test Results Above 1GHz (802.11b High Channel)



Peak Data

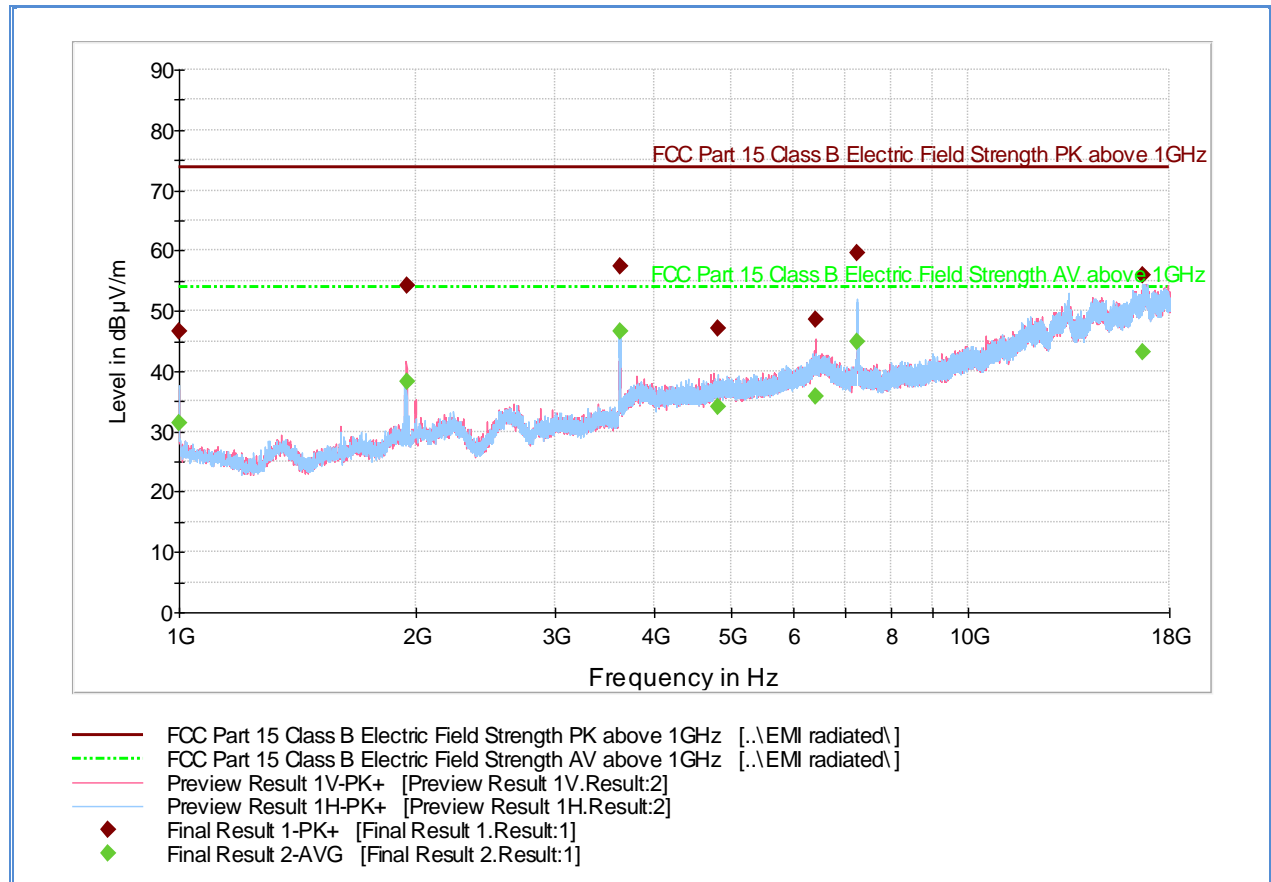
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.400000	46.5	1000.0	1000.000	201.5	V	210.0	-7.2	27.4	73.9
1941.466667	48.3	1000.0	1000.000	215.5	V	-20.0	-2.3	25.6	73.9
3693.166667	56.8	1000.0	1000.000	117.7	H	292.0	3.6	17.1	73.9
4923.800000	54.2	1000.0	1000.000	103.7	H	337.0	6.3	19.7	73.9
7387.133333	64.9	1000.0	1000.000	102.8	H	-10.0	9.3	9.0	73.9
9859.066667	54.6	1000.0	1000.000	201.5	H	305.0	12.1	19.3	73.9
16799.633333	57.1	1000.0	1000.000	300.6	V	211.0	23.9	16.8	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)
1000.400000	32.0	1000.0	1000.000	201.5	V	210.0	-7.2	21.9	53.9
1941.466667	33.0	1000.0	1000.000	215.5	V	-20.0	-2.3	20.9	53.9
3693.166667	47.5	1000.0	1000.000	117.7	H	292.0	3.6	6.4	53.9
4923.800000	39.9	1000.0	1000.000	103.7	H	337.0	6.3	14.0	53.9
7387.133333	53.5	1000.0	1000.000	102.8	H	-10.0	9.3	0.4	53.9
9859.066667	46.1	1000.0	1000.000	201.5	H	305.0	12.1	7.8	53.9
16799.633333	44.3	1000.0	1000.000	300.6	V	211.0	23.9	9.6	53.9

Test Notes: Measurement was performed with a 2.4GHz notch filter. No significant emissions observed above 10GHz. Measurements above 10GHz are noise floor figures.

2.6.16 Test Results Above 1GHz (802.11g Low Channel)



Peak Data

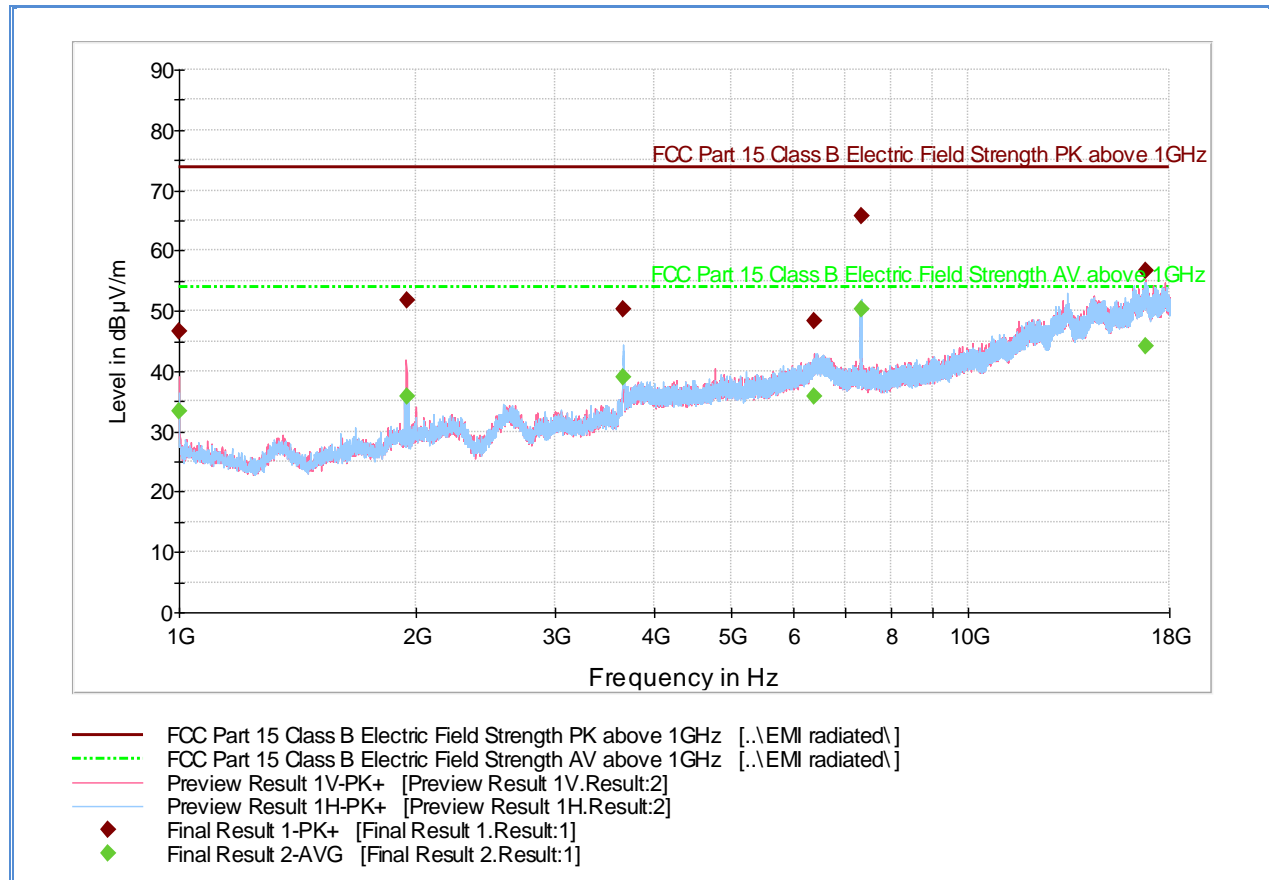
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.500000	46.6	1000.0	1000.000	300.2	H	337.0	-7.2	27.3	73.9
1941.066667	54.2	1000.0	1000.000	207.5	V	-20.0	-2.3	19.7	73.9
3619.266667	57.3	1000.0	1000.000	139.7	H	292.0	2.6	16.6	73.9
4824.666667	47.2	1000.0	1000.000	267.3	H	333.0	5.7	26.7	73.9
6399.033333	48.5	1000.0	1000.000	173.6	V	340.0	11.2	25.4	73.9
7237.166667	59.7	1000.0	1000.000	190.6	H	-20.0	9.6	14.2	73.9
16677.400000	55.9	1000.0	1000.000	182.6	H	345.0	23.1	18.0	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)
1000.500000	31.5	1000.0	1000.000	300.2	H	337.0	-7.2	22.4	53.9
1941.066667	38.2	1000.0	1000.000	207.5	V	-20.0	-2.3	15.7	53.9
3619.266667	46.5	1000.0	1000.000	139.7	H	292.0	2.6	7.4	53.9
4824.666667	34.1	1000.0	1000.000	267.3	H	333.0	5.7	19.8	53.9
6399.033333	35.8	1000.0	1000.000	173.6	V	340.0	11.2	18.1	53.9
7237.166667	44.9	1000.0	1000.000	190.6	H	-20.0	9.6	9.0	53.9
16677.400000	43.1	1000.0	1000.000	182.6	H	345.0	23.1	10.8	53.9

Test Notes: Measurement was performed with a 2.4GHz notch filter. No significant emissions observed above 8GHz. Measurements above 8GHz are noise floor figures.

2.6.17 Test Results Above 1GHz (802.11g Mid Channel)



Peak Data

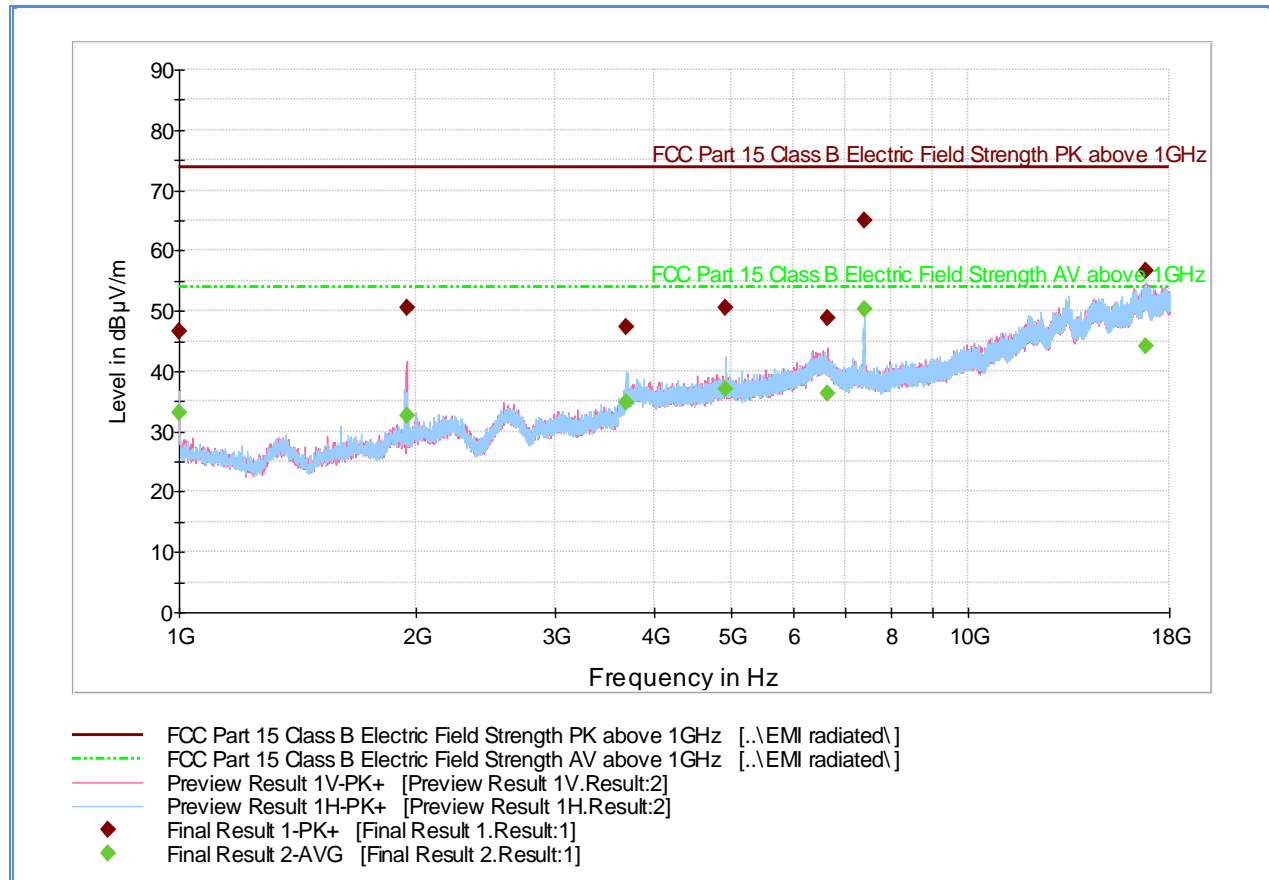
Frequency (MHz)	MaxPeak (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
1000.000000	46.7	1000.0	1000.000	206.5	V	205.0	-7.2	27.2	73.9
1941.666667	51.8	1000.0	1000.000	216.4	V	286.0	-2.3	22.1	73.9
3655.066667	50.3	1000.0	1000.000	124.7	H	288.0	3.0	23.6	73.9
6390.133333	48.4	1000.0	1000.000	103.7	V	343.0	11.1	25.5	73.9
7312.866667	65.7	1000.0	1000.000	102.7	H	-3.0	9.6	8.2	73.9
16791.700000	56.7	1000.0	1000.000	300.6	V	20.0	23.8	17.2	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)
1000.000000	33.3	1000.0	1000.000	206.5	V	205.0	-7.2	20.6	53.9
1941.666667	35.8	1000.0	1000.000	216.4	V	286.0	-2.3	18.1	53.9
3655.066667	39.0	1000.0	1000.000	124.7	H	288.0	3.0	14.9	53.9
6390.133333	35.9	1000.0	1000.000	103.7	V	343.0	11.1	18.0	53.9
7312.866667	50.4	1000.0	1000.000	102.7	H	-3.0	9.6	3.5	53.9
16791.700000	44.1	1000.0	1000.000	300.6	V	20.0	23.8	9.8	53.9

Test Notes: Measurement was performed with a 2.4GHz notch filter. No significant emissions observed above 8GHz. Measurements above 8GHz are noise floor figures.

2.6.18 Test Results Above 1GHz (802.11g High Channel)



Peak Data

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.000000	46.5	1000.0	1000.000	310.2	H	206.0	-7.2	27.4	73.9
1941.033333	50.5	1000.0	1000.000	200.5	V	210.0	-2.3	23.4	73.9
3693.966667	47.3	1000.0	1000.000	141.7	H	292.0	3.6	26.6	73.9
4921.466667	50.5	1000.0	1000.000	124.7	H	267.0	6.3	23.4	73.9
6629.466667	48.9	1000.0	1000.000	130.7	V	132.0	10.9	25.0	73.9
7390.300000	65.0	1000.0	1000.000	102.7	H	-9.0	9.3	8.9	73.9
16807.000000	56.7	1000.0	1000.000	300.6	V	38.0	23.8	17.2	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)
1000.000000	33.0	1000.0	1000.000	310.2	H	206.0	-7.2	20.9	53.9
1941.033333	32.7	1000.0	1000.000	200.5	V	210.0	-2.3	21.2	53.9
3693.966667	34.9	1000.0	1000.000	141.7	H	292.0	3.6	19.0	53.9
4921.466667	37.1	1000.0	1000.000	124.7	H	267.0	6.3	16.8	53.9
6629.466667	36.2	1000.0	1000.000	130.7	V	132.0	10.9	17.7	53.9
7390.300000	50.3	1000.0	1000.000	102.7	H	-9.0	9.3	3.6	53.9
16807.000000	44.1	1000.0	1000.000	300.6	V	38.0	23.8	9.8	53.9

Test Notes: Measurement was performed with a 2.4GHz notch filter. No significant emissions observed above 8GHz. Measurements above 8GHz are noise floor figures.



2.7 RADIATED BAND EDGE MEASUREMENTS AND IMMEDIATE RESTRICTED BANDS

2.7.1 Specification Reference

Part 15 Subpart C §15.247(d)

2.7.2 Standard Applicable

(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

2.7.3 Equipment Under Test and Modification State

Serial No: C10015220004 / Test Configuration B

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

August 02, 2015 / AC

2.7.5 Test Equipment Used

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

2.7.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	25.4 °C
Relative Humidity	43.5 %
ATM Pressure	98.7 kPa

2.7.7 Additional Observations

- This is a radiated test. The spectrum was searched from 2310MHz to 2390MHz for lower immediate restricted band and 2483.5MHz to 2500MHz for the upper immediate restricted band.
- There are no emissions found that do not comply with the restricted bands defined in FCC Part 15 Subpart C, 15.205.
- Verification were done with b and g mode in Low and High channels.



- Measurement was done using EMC32 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 2.7.8 for sample computation.

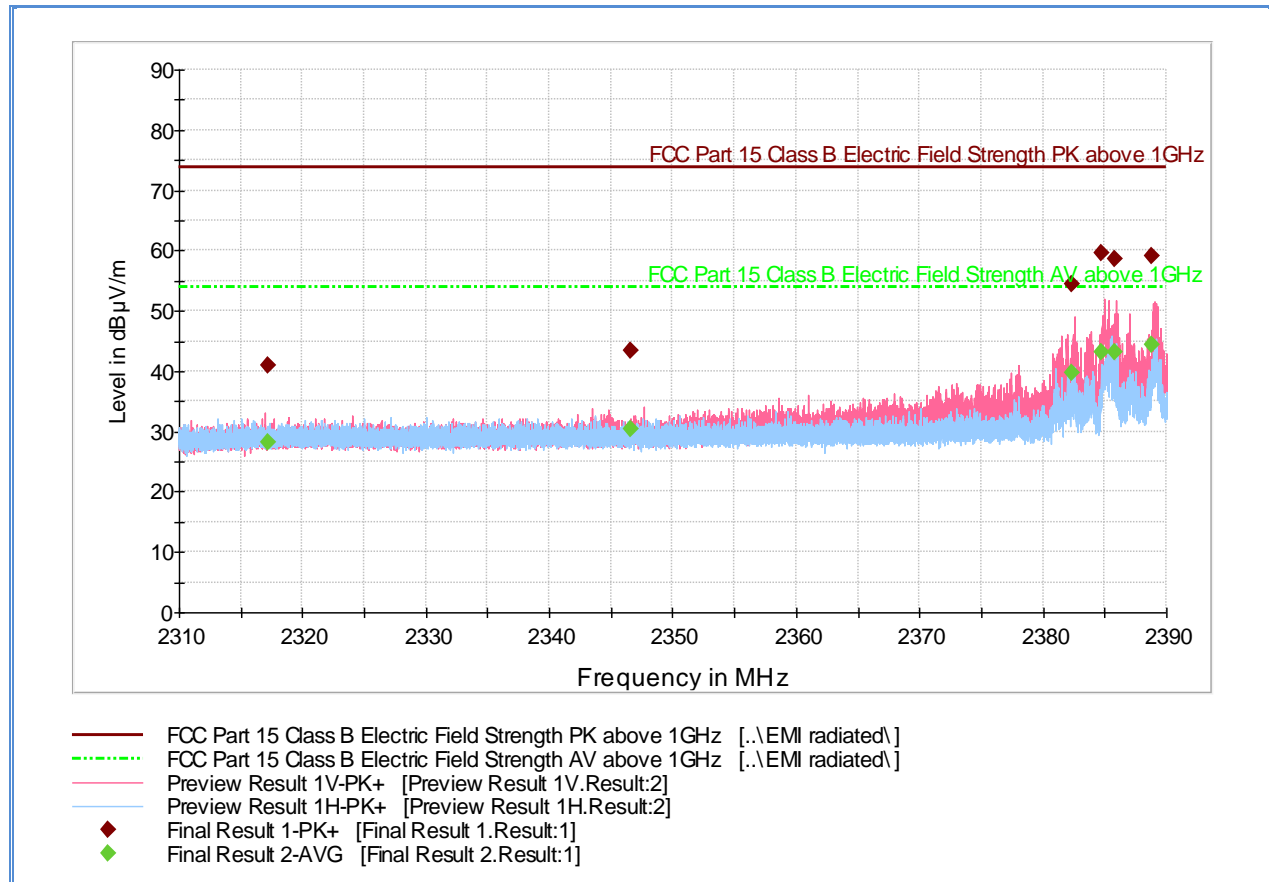
2.7.8 Sample Computation (Radiated Emission)

Measuring equipment raw measurement (dB μ V) @ 2400 MHz			53.9
Correction Factor (dB)	Asset# 1153 (cable)	3.4	-0.4
	Asset# 8628(preamplifier)	-36.5	
	Asset#7575 (antenna)	32.7	
Reported Max Peak Final Measurement (dB μ V/m) @ 2400 MHz			53.5

2.7.9 Test Results

Compliant. See attached plots.

2.7.10 Test Results Restricted Band 2310MHz to 2390MHz (802.11b Low Channel)



Peak Data

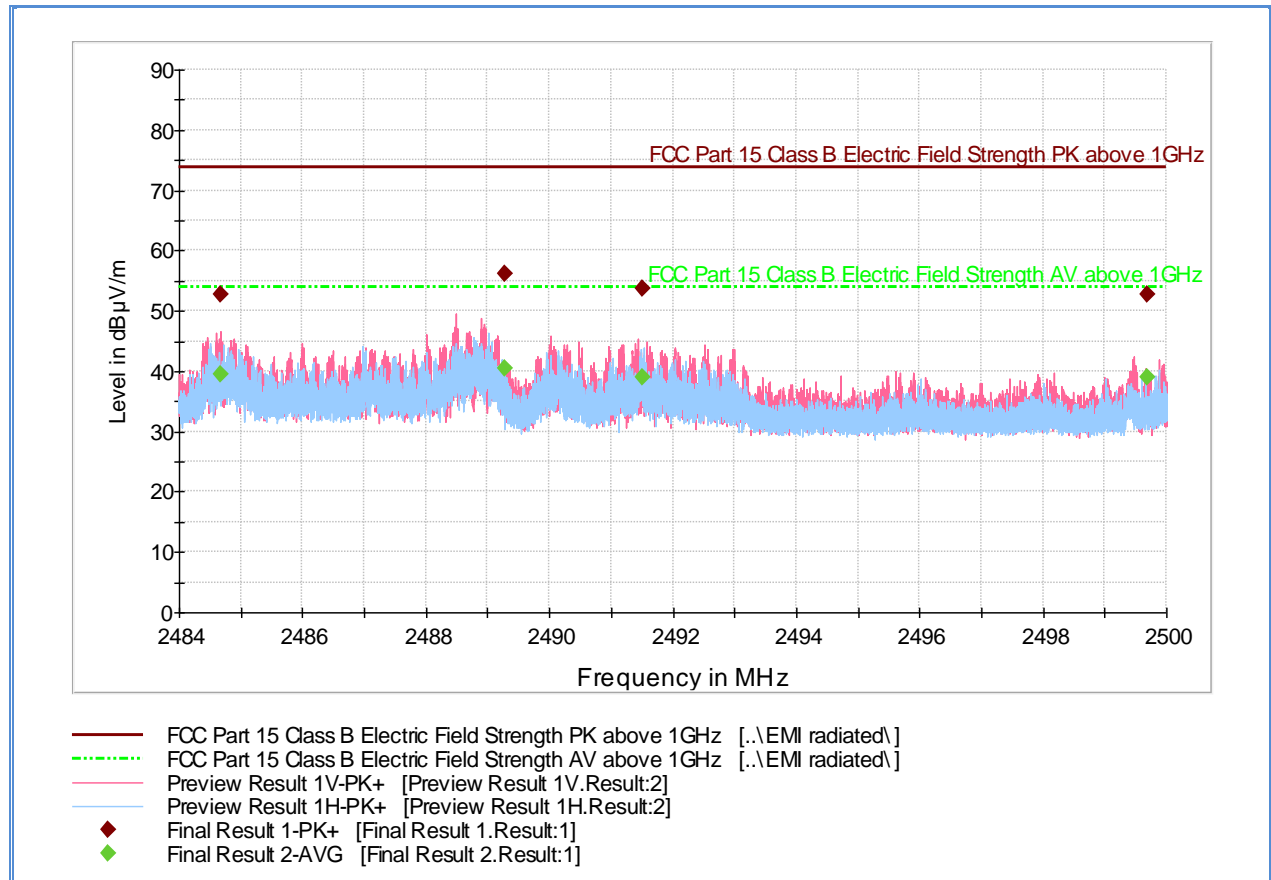
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
2317.210667	41.0	1000.0	1000.000	390.1	V	112.0	-0.8	32.9	73.9
2346.629333	43.3	1000.0	1000.000	171.6	V	259.0	-0.8	30.6	73.9
2382.306667	54.5	1000.0	1000.000	199.5	V	261.0	-0.7	19.4	73.9
2384.757333	59.5	1000.0	1000.000	163.6	V	283.0	-0.6	14.4	73.9
2385.778667	58.7	1000.0	1000.000	163.6	V	287.0	-0.6	15.2	73.9
2388.858667	59.0	1000.0	1000.000	163.6	V	286.0	-0.6	14.9	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)
2317.210667	28.1	1000.0	1000.000	390.1	V	112.0	-0.8	25.8	53.9
2346.629333	30.4	1000.0	1000.000	171.6	V	259.0	-0.8	23.5	53.9
2382.306667	39.8	1000.0	1000.000	199.5	V	261.0	-0.7	14.1	53.9
2384.757333	43.1	1000.0	1000.000	163.6	V	283.0	-0.6	10.8	53.9
2385.778667	43.1	1000.0	1000.000	163.6	V	287.0	-0.6	10.8	53.9
2388.858667	44.5	1000.0	1000.000	163.6	V	286.0	-0.6	9.4	53.9

Test Notes: 2.4GHz notch filter removed for this test.

2.7.11 Test Results Restricted Band 2483.5MHz to 2500MHz (802.11b High Channel)



Peak Data

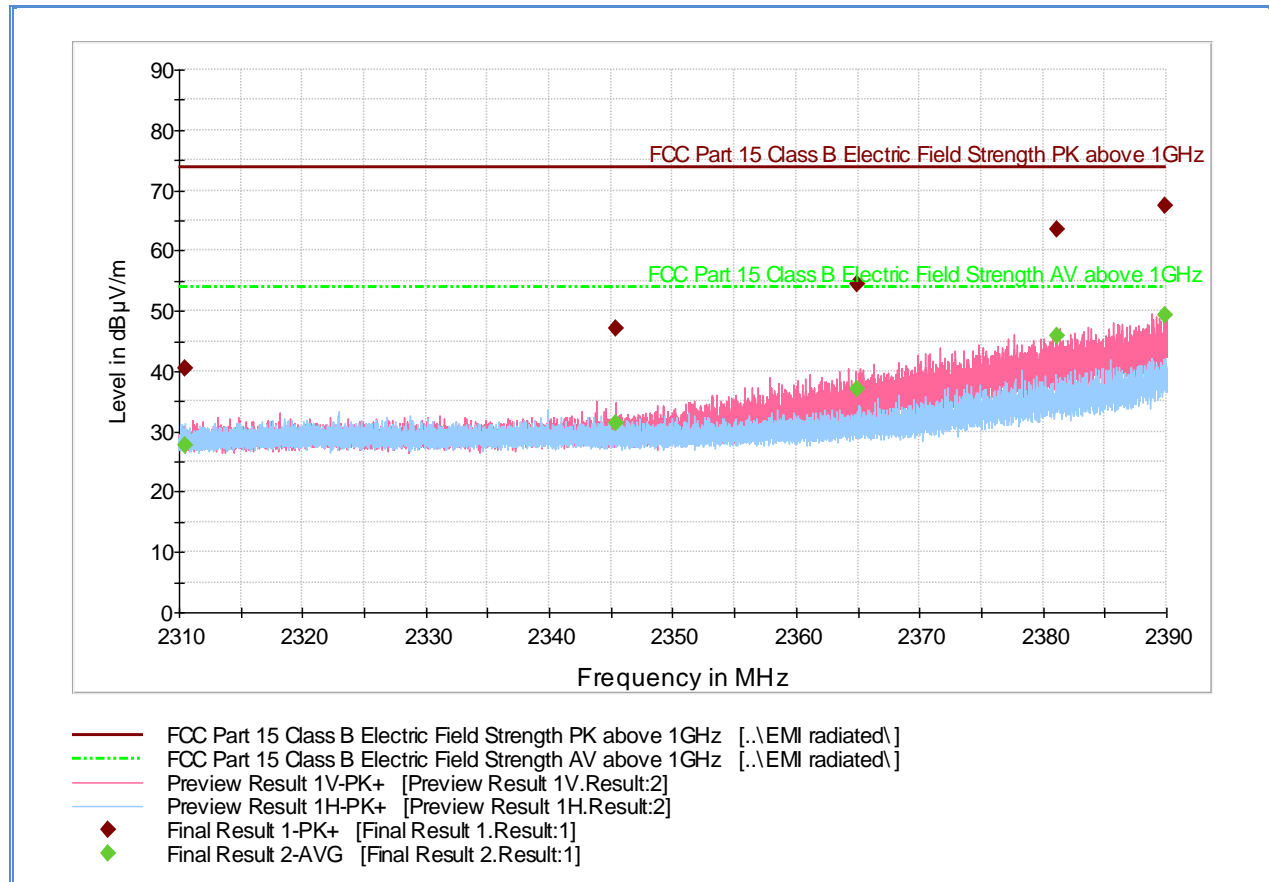
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
2484.665000	52.8	1000.0	1000.000	164.6	V	265.0	-0.1	21.1	73.9
2489.283200	56.1	1000.0	1000.000	130.7	V	261.0	-0.1	17.8	73.9
2491.508800	53.7	1000.0	1000.000	131.7	V	265.0	-0.1	20.3	73.9
2499.681067	52.7	1000.0	1000.000	156.6	V	258.0	-0.1	21.2	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)
2484.665600	39.4	1000.0	1000.000	164.6	V	265.0	-0.1	14.5	53.9
2489.283200	40.5	1000.0	1000.000	130.7	V	261.0	-0.1	13.4	53.9
2491.508800	39.1	1000.0	1000.000	131.7	V	265.0	-0.1	14.8	53.9
2499.681067	39.1	1000.0	1000.000	156.6	V	258.0	-0.1	14.8	53.9

Test Notes: 2.4GHz notch filter removed for this test.

2.7.12 Test Results Restricted Band 2310MHz to 2390MHz (802.11g Low Channel)



Peak Data

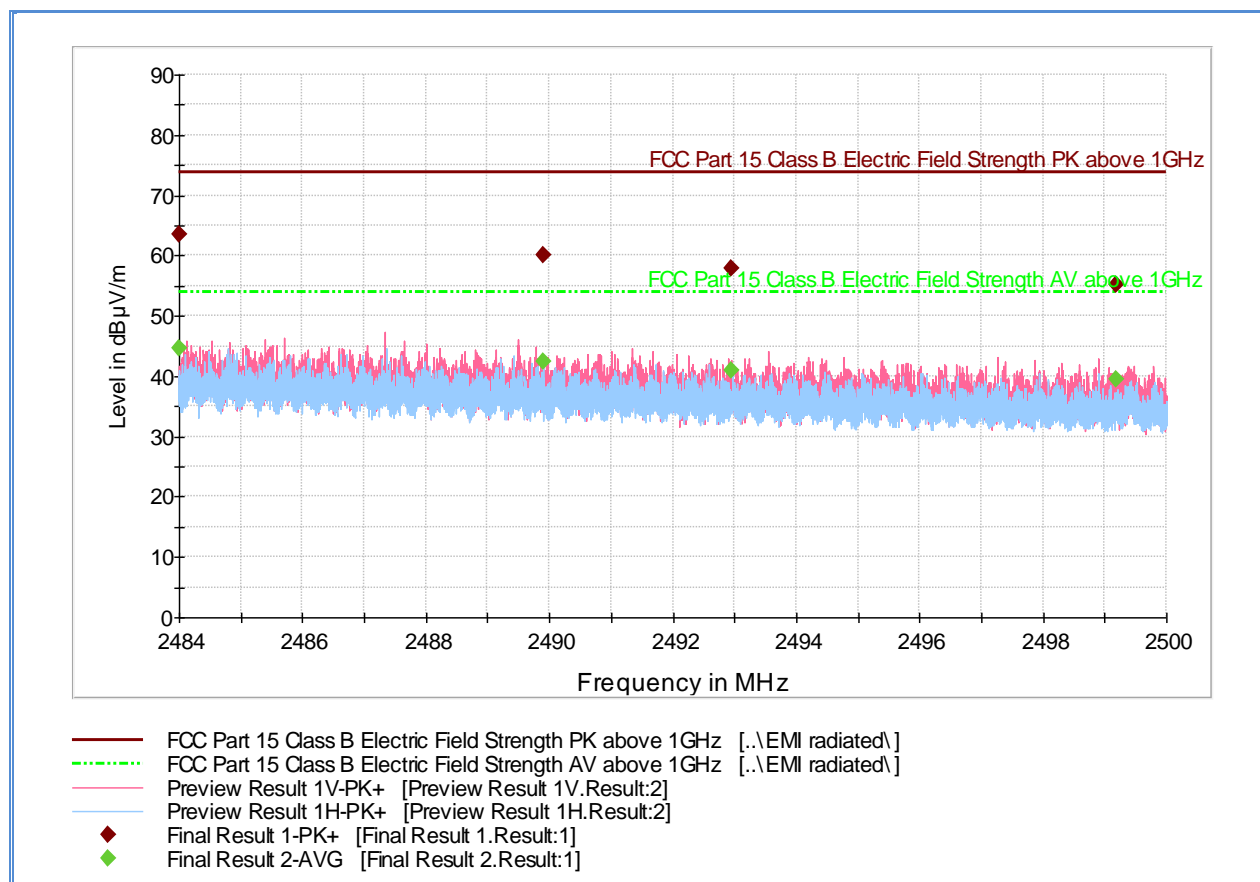
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
2310.482667	40.5	1000.0	1000.000	379.1	V	155.0	-0.8	33.4	73.9
2345.330667	47.1	1000.0	1000.000	206.5	V	262.0	-0.8	26.8	73.9
2364.986667	54.4	1000.0	1000.000	171.6	V	265.0	-0.7	19.5	73.9
2381.162667	63.4	1000.0	1000.000	163.6	V	284.0	-0.7	10.5	73.9
2389.856000	67.3	1000.0	1000.000	163.6	V	262.0	-0.6	6.6	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)
2310.482667	27.8	1000.0	1000.000	379.1	V	155.0	-0.8	26.1	53.9
2345.330667	31.4	1000.0	1000.000	206.5	V	262.0	-0.8	22.5	53.9
2364.986667	37.1	1000.0	1000.000	171.6	V	265.0	-0.7	16.8	53.9
2381.162667	45.9	1000.0	1000.000	163.6	V	284.0	-0.7	8.0	53.9
2389.856000	49.2	1000.0	1000.000	163.6	V	262.0	-0.6	4.7	53.9

Test Notes: 2.4GHz notch filter removed for this test.

2.7.13 Test Results Restricted Band 2483.5MHz to 2500MHz (802.11g High Channel)



Peak Data

Frequency (MHz)	MaxPeak (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
2484.000000	63.6	1000.0	1000.000	159.6	V	267.0	-0.1	10.3	73.9
2489.889600	60.0	1000.0	1000.000	160.6	V	248.0	-0.1	13.9	73.9
2492.948800	57.9	1000.0	1000.000	135.7	V	263.0	-0.1	16.0	73.9
2499.195200	55.2	1000.0	1000.000	156.6	V	286.0	-0.1	18.7	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)
2484.000000	44.6	1000.0	1000.000	159.6	V	267.0	-0.1	9.3	53.9
2489.889600	42.3	1000.0	1000.000	160.6	V	248.0	-0.1	11.6	53.9
2492.948800	41.0	1000.0	1000.000	135.7	V	263.0	-0.1	12.9	53.9
2499.195200	39.5	1000.0	1000.000	156.6	V	286.0	-0.1	14.4	53.9

Test Notes: 2.4GHz notch filter removed for this test.



2.8 POWER SPECTRAL DENSITY

2.8.1 Specification Reference

Part 15 Subpart C §15.247(e)

2.8.2 Standard Applicable

(e) For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

2.8.3 Equipment Under Test and Modification State

Serial No: C10015220004 / Test Configuration A

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

August 01, 2015 / AC

2.8.5 Test Equipment Used

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

2.8.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	24.5 °C
Relative Humidity	56.0.%
ATM Pressure	99.6 kPa

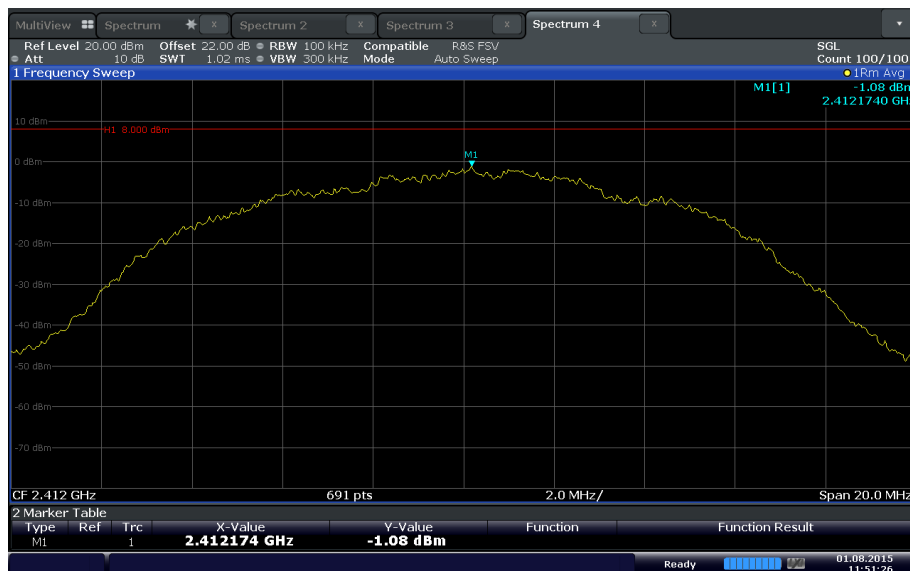
2.8.7 Additional Observations

- This is a conducted test.
- Test procedure is per Section 10.3 of KDB 558074 D01 DTS Meas Guidance v03r01 (April 09, 2013).
- An offset of 22.0dB was added to compensate for the external attenuator and cable used from the antenna port to the spectrum analyzer.
- Detector is RMS power averaging.
- Trace averaging mode over 100 traces.
- Sweep time is Auto Couple.
- EUT complies with 100 kHz RBW.

2.8.8 Test Results Summary

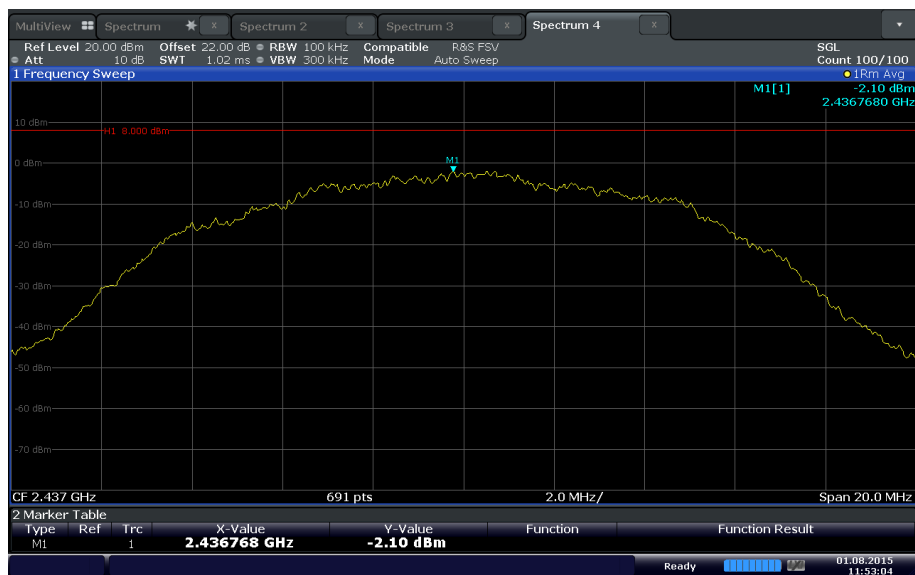
Mode	Channel	Marker Reading using 100 kHz RBW (dBm)	PSD Limit (dBm)	Margin (dB)	Compliance
802.11b	1 (2412 MHz)	-1.08	8	9.08	Complies
	6 (2437 MHz)	-2.10	8	10.10	Complies
	11 (2462 MHz)	-1.57	8	9.57	Complies
802.11g	1 (2412 MHz)	-7.08	8	15.08	Complies
	6 (2437 MHz)	-7.70	8	15.70	Complies
	11 (2462 MHz)	-8.60	8	16.60	Complies

2.8.9 Test Results Plots



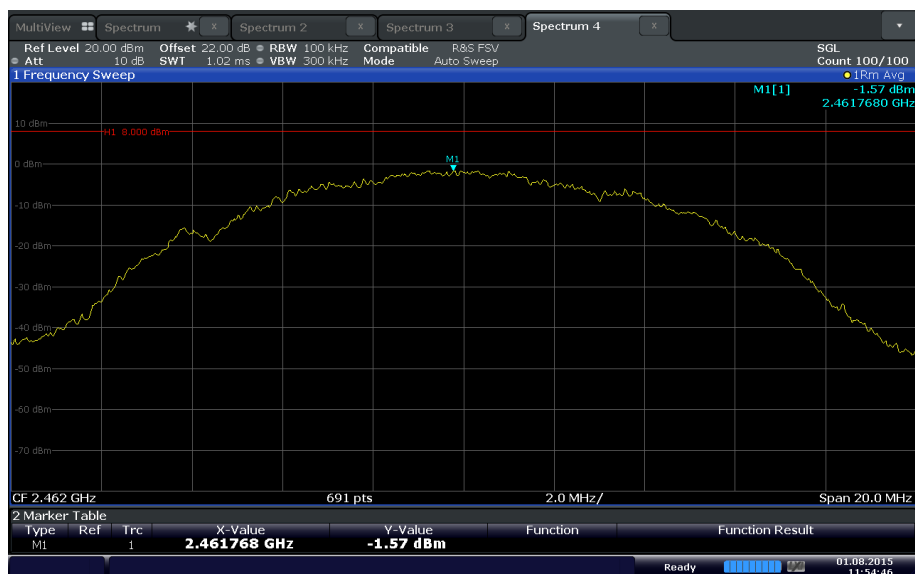
Date: 1 AUG 2015 11:51:25

802.11b Low Channel (2412 MHz)



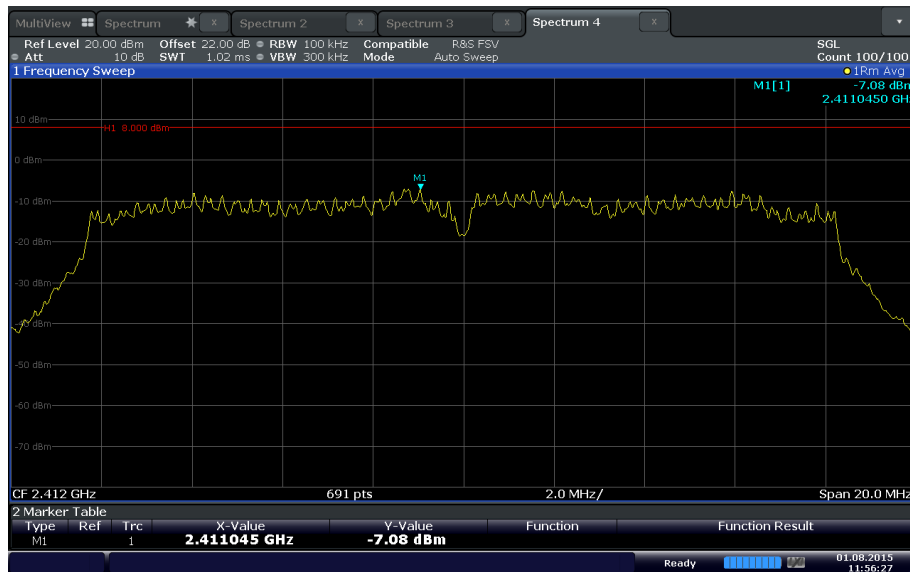
Date: 1 AUG 2015 11:53:04

802.11b Mid Channel (2437 MHz)



Date: 1 AUG 2015 11:54:47

802.11b High Channel (2462 MHz)



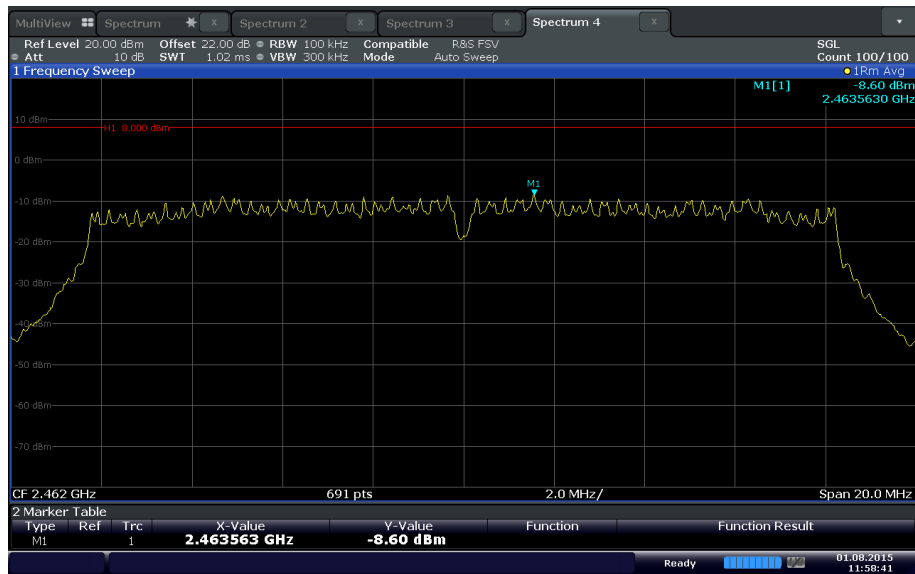
Date: 1 AUG 2015 11:56:27

802.11g Low Channel (2412 MHz)



Date: 1 AUG 2015 11:57:24

802.11g Mid Channel (2437 MHz)



Date: 1 AUG 2015 11:58:40

802.11g High Channel (2462 MHz)



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
Antenna Conducted Port Setup						
7604	P-Series Power Meter	N1912A	SG45100273	Agilent	05/27/15	05/27/16
7605	50MHz-18GHz Wideband Power Sensor	N1921A	MY51100054	Agilent	04/10/15	04/10/16
7582	Signal/Spectrum Analyzer	FSW26	101614	Rhode & Schwarz	12/22/14	12/22/15
1189	Signal Generator	8648C	3623A03059	Hewlett Packard	10/14/14	10/14/15
7608	Vector Signal Generator	SMBV100A	259021	Rhode & Schwarz	07/29/15	07/29/16
8825	20dB Attenuator	46-20-34	BK5773	Weinschel Corp.	Verified by 7582 and 7608	
Radiated Test Setup						
7575	Double-ridged waveguide horn antenna	3117	00155511	EMCO	04/27/15	04/27/16
8628	Pre-amplifier	QLJ 01182835-JO	8986002	QuinStar Technologies Inc.	03/20/15	03/20/16
1002	Bilog Antenna	3142C	00058717	ETS-Lindgren	01/30/14	01/30/16
1040	EMI Test Receiver	ESIB40	100292	Rhode & Schwarz	08/29/14	08/29/15
1049	EMI Test Receiver	ESU	100133	Rhode & Schwarz	03/11/15	03/11/16
6815	2.4GHz Band Notch Filter	BRM50702	008	Micro-Tronics	Verified by 1049	
1016	Pre-amplifier	PAM-0202	187	PAM	12/10/14	12/10/15
Miscellaneous						
6792	Multimeter	3478A	2911A70964	Hewlett Packard	08/14/15	08/14/16
11312	Mini Environmental Quality Meter	850027	CF099-56010-340	Sper Scientific	04/09/15	04/09/16
1123	DC Power Supply	E3631A	N/A	Hewlett Packard	Verified by 6792	
	Test Software	EMC32	V8.53	Rhode & Schwarz	N/A	

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	3.89	2.25	5.04
6	EUT Setup	Rectangular	1.00	0.58	0.33
Combined Uncertainty (u_c):					2.41
Coverage Factor (k):					2
Expanded Uncertainty:					4.82

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	3.89	2.25	5.04
6	EUT Setup	Rectangular	1.00	0.58	0.33
Combined Uncertainty (u_c):					2.40
Coverage Factor (k):					2
Expanded Uncertainty:					4.81

3.2.3 Conducted Antenna Port Measurement

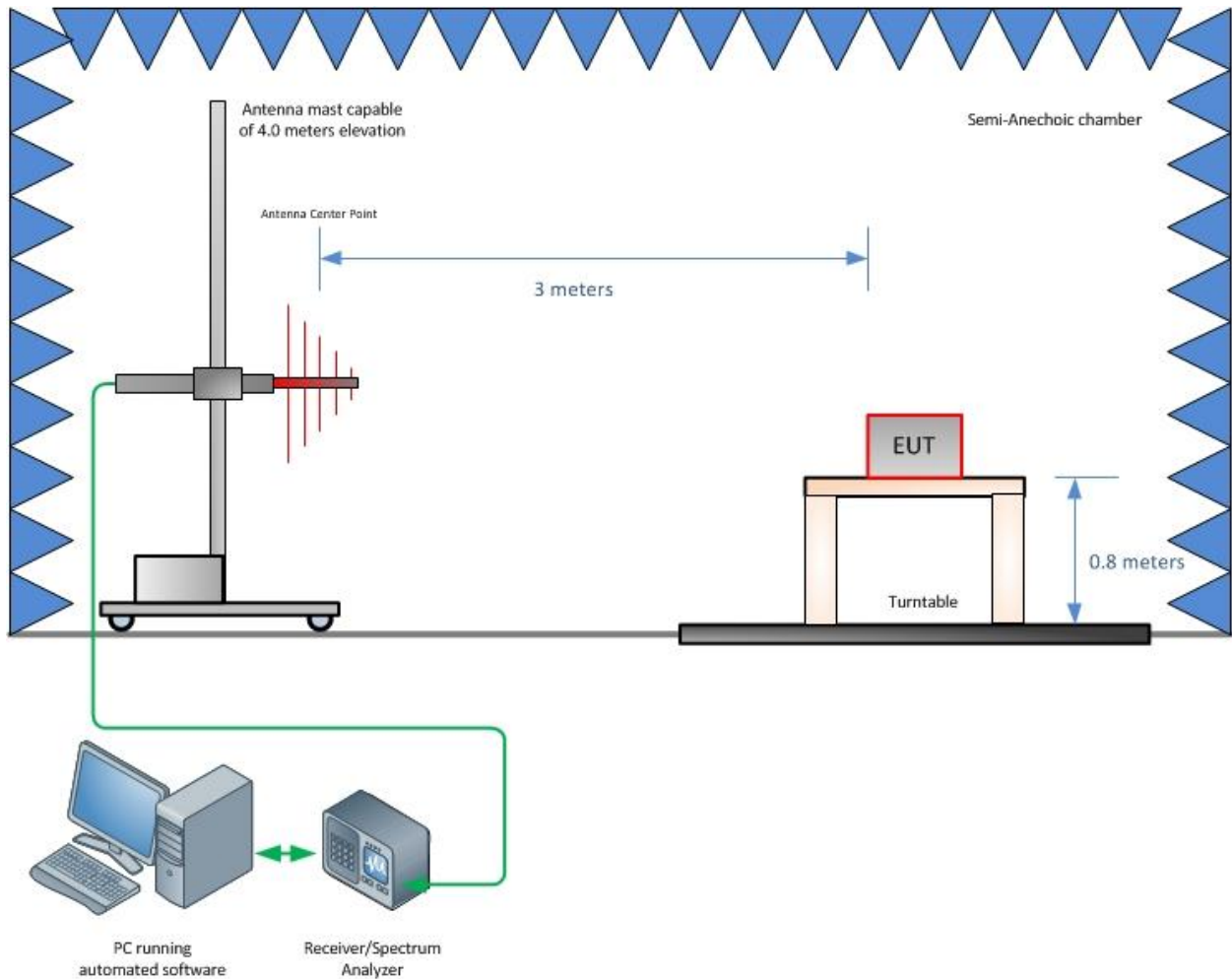
Contribution		Probability Distribution Type	Probability Distribution x_i	Standard Uncertainty $u(x_i)$	$[u(x_i)]^2$
1	Receiver/Spectrum Analyzer	Rectangular	0.34	0.20	0.04
2	Cables	Rectangular	1.00	0.58	0.33
3	EUT Setup	Rectangular	0.50	0.29	0.08
Combined Uncertainty (u_c):					0.67
Coverage Factor (k):					1.96
Expanded Uncertainty:					1.32



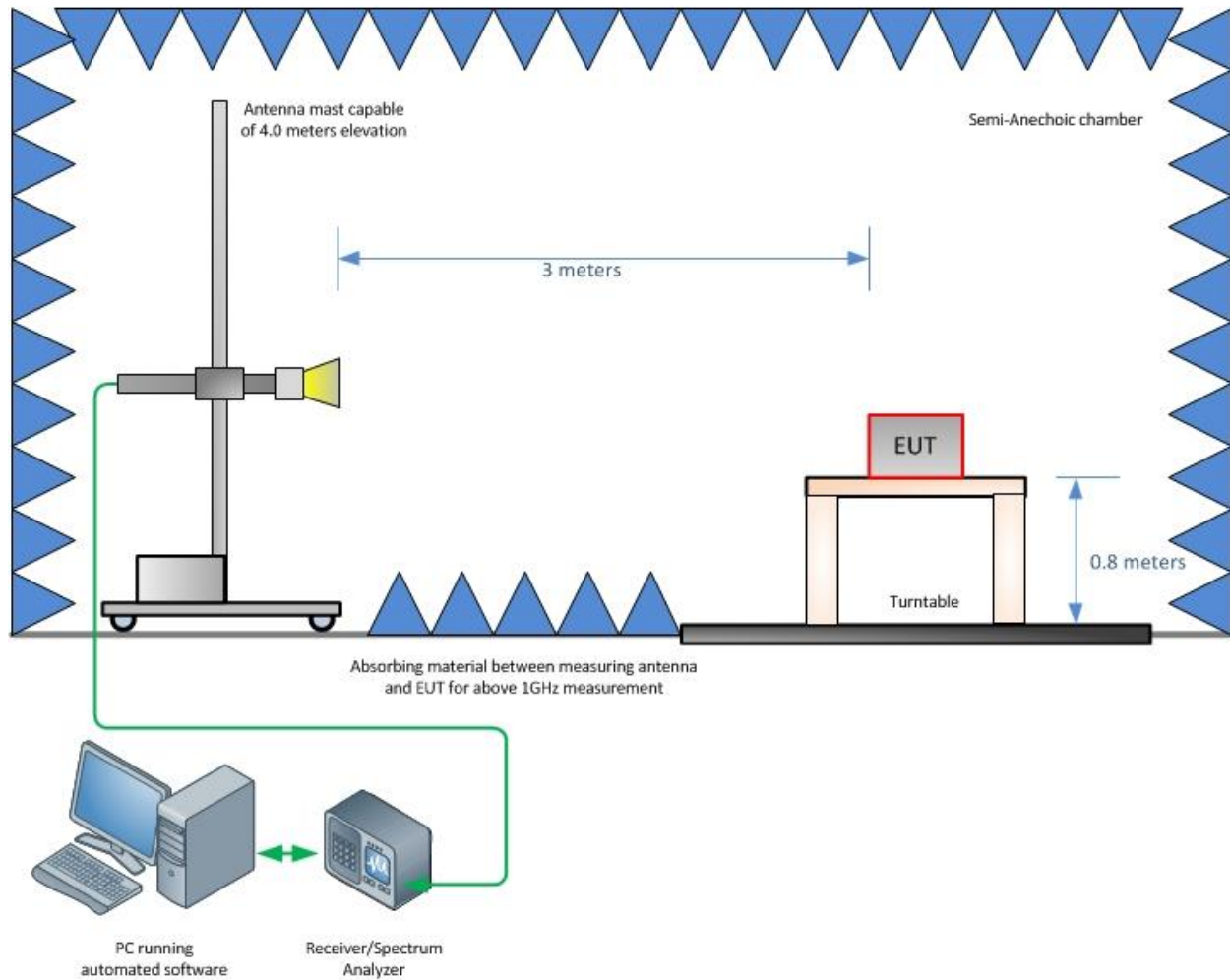
SECTION 4

DIAGRAM OF TEST SETUP

4.1 TEST SETUP DIAGRAM



Radiated Emission Test Setup (Below 1GHz)



Radiated Emission Test Setup (Above 1GHz)



SECTION 5

ACCREDITATION, DISCLAIMERS AND COPYRIGHT



5.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

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