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Report On

Application for Grant of Equipment Authorization of the
Sotera Wireless
ViSi 92-10010 Mobile Monitor

FCC Part 15 Subpart C §15.247
IC RSS-210 Issue 8 December 2010

Report No. SC1311961B

February 2014



REPORT ON	Radio Testing of the Sotera Wireless Mobile Monitor
TEST REPORT NUMBER	SC1311961B
PREPARED FOR	Sotera Wireless 9444 Waples St. #280 San Diego, CA 92121
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PREPARED BY	 Ferdinand S. Custodio Name Authorized Signatory Title: EMC/Wireless Test Engineer
APPROVED BY	 Chip R. Fleury Name Authorized Signatory
DATED	February 07, 2014



Revision History

SC1311961B Sotera Wireless ViSi Mobile Monitor					
DATE	OLD REVISION	NEW REVISION	REASON	PAGES AFFECTED	APPROVED BY
02/07/2014	Initial Release				Chip R. Fleury

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SECTION 1

REPORT SUMMARY

Radio Testing of the
Sotera Wireless
Mobile Monitor

1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Sotera Wireless ViSi Mobile Monitor to the requirements of FCC Part 15 Subpart C §15.247 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	Sotera Wireless
Model Number(s)	92-10010
FCC ID Number	ARI-VISI-MOBILE
IC Number	8810A-VISI-MOBILE
Serial Number(s)	• P41500008 (Conducted antenna port testing - Sample #1) • P41500003 (Radiated testing - Sample #2) • P41500004 (Radiated testing - Sample #3)
Number of Samples Tested	3
Test Specification/Issue/Date	• FCC Part 15 Subpart C §15.247 (October 1, 2012). • 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). • 558074 D01 DTS Meas Guidance v03r01,(April 09,2013) Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247.
Start of Test	January 20, 2014
Finish of Test	January 23, 2014
Name of Engineer(s)	Ferdinand Custodio
Related Document(s)	None. Supporting documents for EUT certification are separate exhibits.



1.2 BRIEF SUMMARY OF RESULTS

A brief summary of the tests carried out in accordance with FCC Part 15 Subpart C §15.247 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-210 A8.4 (4)	Peak Output Power	Compliant	
2.2	§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-210 A8.2(a)	Minimum 6 dB RF Bandwidth	Compliant	
2.5	§15.247(d)	RSS-210 A8.5	Out-of-Band Emissions - Conducted	Compliant	
2.6	§15.247(d)	RSS-210 A8.5	Band-edge Compliance of RF Conducted Emissions	Compliant	
2.7	§15.247(d)	RSS-210 A8.5	Spurious Radiated Emissions	Compliant	
2.7		RSS-Gen 4.10	Receiver Spurious Emissions	Compliant	
2.8	§15.247(d)	RSS-210 A8.5	Radiated Band Edge Measurements	Compliant	
2.9	§15.247(e)	RSS-210 A8.2(b)	Power Spectral Density for Digitally Modulated Device	Compliant	

N/A EUT is battery operated

1.3 PRODUCT INFORMATION

1.3.1 Technical Description

The Equipment Under Test (EUT) was a Sotera Wireless ViSi Mobile Monitor model no. 92-10010 as shown in the photograph below. The EUT is part of the Visi Mobile Monitoring System intended to be used for vital signs monitoring. The EUT uses 802.11 b, g and n technologies to connect wirelessly and transfers parameters monitored to iPads, iPhones, nurses stations, etc.



Equipment Under Test



1.3.2 EUT General Description

EUT Description	Mobile Monitor (part of ViSi Mobile Monitoring System)
Model Name	ViSi
Model Number(s)	92-10010
Rated Voltage	Internal 3.7VDC Li-Ion Battery (iTech B00693LFTR 2000mAh 7.4Wh)
Mode Verified	802.11 b/g and n
Capability	802.11 b/g/n WLAN (DTS) 2.4GHz band 20MHz BW
Primary Unit (EUT)	☒ Production ☐ Pre-Production ☐ Engineering
Antenna Type	Integral Chip type
Manufacturer	fractus
Antenna Model	P/N: FR05-S1-NO-1004
Antenna Gain	1.8 dBi

1.3.3 Maximum Conducted Output Power

Mode	Frequency Range (MHz)	Output Power (dBm)	Output Power (mW)
802.11b	2412-2462	15.83	38.28
802.11g	2412-2462	12.90	19.50
802.11 n (ht20)	2412-2462	11.78	15.07

1.4 EUT TEST CONFIGURATION

1.4.1 Test Configuration Description

Test Configuration	Description
A	Antenna conducted port test configuration. All measurements were performed on the antenna port provided by the manufacturer for testing purposes only. EUT is programmed using terminal software via a USART test fixture connected by USB.
B	Radiated emissions test configuration. EUT is programmed using terminal software via a USART test fixture connected by USB.

1.4.2 EUT Exercise Software

Test routine provided by the manufacturer built within the firmware. Radio commands are executed via USB using a universal synchronous/asynchronous receiver/transmitter (USART) interface fixture (proprietary to Sotera Wireless) and Terminal v1.91b 20140110β – by Br@y++ (terminal application).

1.4.3 Support Equipment and I/O cables

Manufacturer	Equipment/Cable	Description
Sony	Support Personal Computer (Y Series Laptop)	Model PCG-31311L
Sony	Support AC Adapter	Model PCGA-AC19V9 S/N:147839091 0023259
-	Support USART fixture	WT Connectivity Fixture V2 1-000486-00 rA S/N 003
	Support USB cable	Shielded, 1.7m generic USB cable

1.4.4 Worst Case Configuration

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

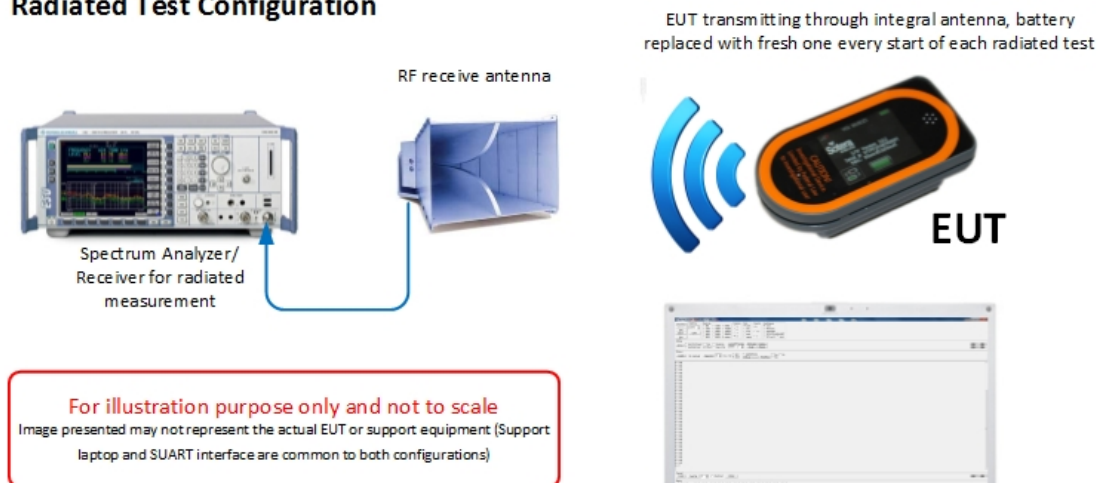
Mode	Channel	Data Rate
802.11b	1 (Low Channel)	5.5Mbps
802.11g	1 (Low Channel)	6Mbps
802.11 n (ht20)	1 (Low Channel)	6.5Mbps (mcs 0)

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

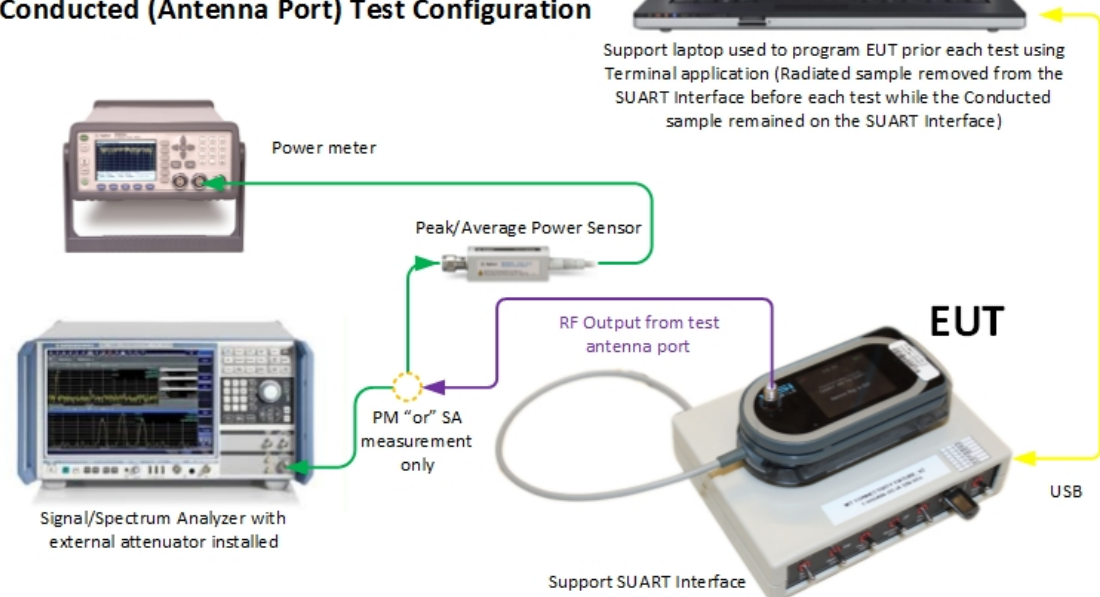


1.4.5 Simplified Test Configuration Diagram

Radiated Test Configuration



Conducted (Antenna Port) Test Configuration



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
P41500008, P41500003 and P41500004		
N/A		

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

1.7 TEST METHODOLOGY

All measurements contained in this report were conducted with ANSI C63.4-2009, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

For conducted and radiated emissions the equipment under test (EUT) was configured to measure its highest possible emission level. This level was based on the maximized cable configuration from exploratory testing per ANSI C63.4-2009. The test modes were adapted according to the Operating Instructions provided by the manufacturer/client.

1.8 TEST FACILITY LOCATION

1.8.1 TÜV SÜD America Inc. (Mira Mesa)

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

1.8.2 TÜV SÜD America Inc. (Rancho Bernardo)

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



1.9 TEST FACILITY REGISTRATION

1.9.1 FCC – Registration No.: US5296

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

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

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



SECTION 2

TEST DETAILS

Radio Testing of the
Sotera Wireless
Mobile Monitor



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: P41500008 / Test Configuration A

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

January 20,2014/FSC

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	34.6%
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 20.60dB was added to compensate for the external attenuator and cable used from the antenna port to the power sensor.
- 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.

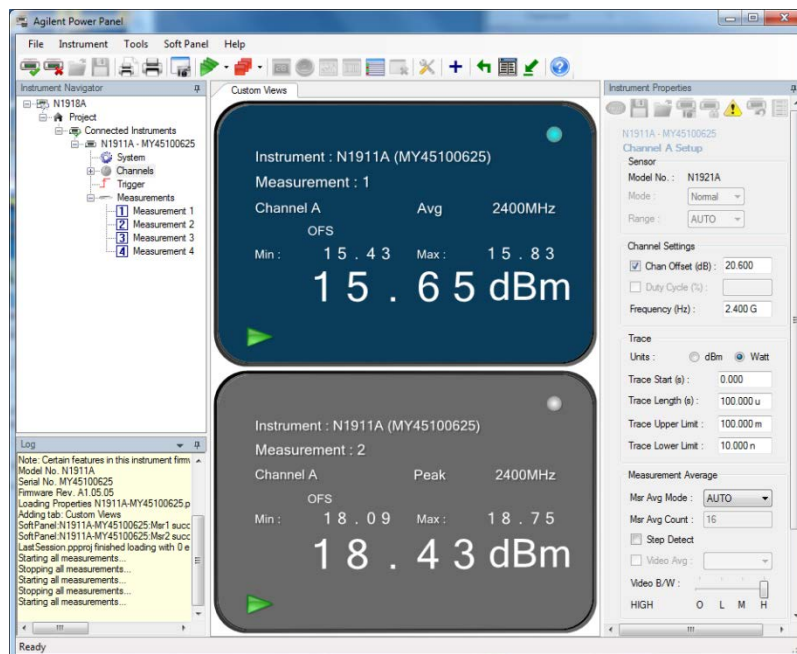
2.1.8 Test Results

WLAN Mode	Channel	Data Rates (Mbps)	Measured Average Power (dBm)	Measured Peak Power (dBm)
802.11b	1 (2412 MHz)	1	15.49	18.86
		2	15.68	18.79
		5.5	15.83	18.75
		11	15.76	18.76
	6 (2437 MHz)	1	15.13	18.25
		2	15.41	18.56
		5.5	15.55	18.42
		11	15.44	18.59
	11 (2462 MHz)	1	14.74	17.90
		2	15.09	18.17
		5.5	15.22	18.12
		11	15.11	18.20
802.11g	1 (2412 MHz)	6	12.90	23.44
		9	12.83	23.54
		12	12.73	22.83
		18	12.72	23.19
		24	12.66	22.91
		36	12.54	23.29
		48	12.28	23.06
		54	12.11	22.74
	6 (2437 MHz)	6	12.44	23.22
		9	12.59	23.22
		12	12.55	22.64
		18	12.52	22.47
		24	12.24	22.48
		36	12.03	22.68
		48	11.98	22.48

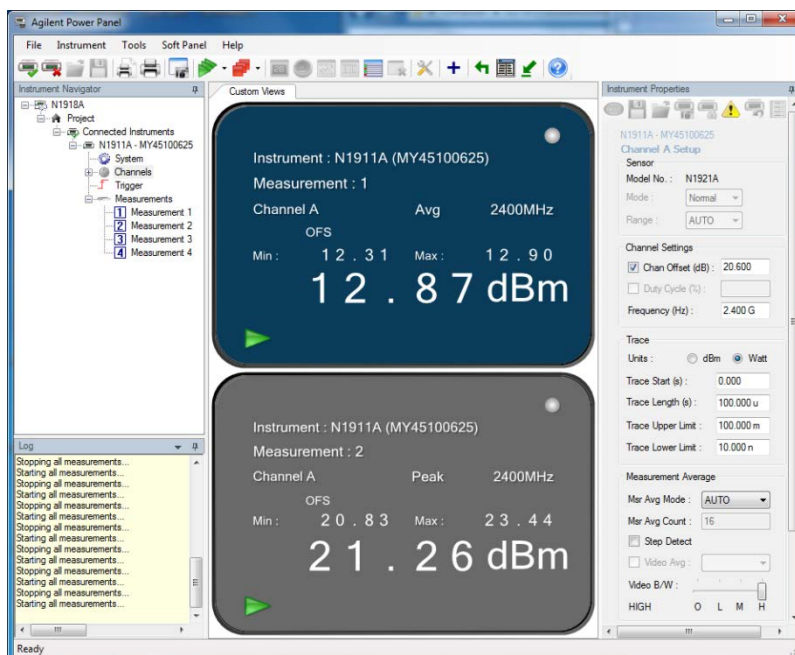
WLAN Mode	Channel	Data Rates (Mbps)	Measured Average Power (dBm)	Measured Peak Power (dBm)
802.11g	6 (2437 MHz)	54	11.86	22.30
	11 (2462 MHz)	6	12.10	22.96
		9	12.14	22.69
		12	12.06	22.10
		18	12.01	21.87
		24	12.07	21.80
		36	11.85	22.52
		48	11.58	22.02
		54	11.52	21.89
802.11n (ht20)	1 (2412 MHz)	mcs 0 (6.50 Mbps)	11.78	22.14
		mcs 1(13.0 Mbps)	11.64	22.83
		mcs 2(19.5 Mbps)	11.54	22.17
		mcs 3 (26.0 Mbps)	11.59	22.26
		mcs 4 (39.0 Mbps)	11.39	22.22
		mcs 5 (52.0 Mbps)	11.34	21.94
		mcs 6 (58.5 Mbps)	11.12	22.41
		mcs 7 (65.0 Mbps)	11.02	22.30
	6 (2437 MHz)	mcs 0 (6.50 Mbps)	11.41	21.96
		mcs 1(13.0 Mbps)	11.34	22.49
		mcs 2(19.5 Mbps)	11.28	21.72
		mcs 3 (26.0 Mbps)	11.31	21.67
		mcs 4 (39.0 Mbps)	11.25	21.73
		mcs 5 (52.0 Mbps)	10.85	21.44
		mcs 6 (58.5 Mbps)	10.82	21.98
		mcs 7 (65.0 Mbps)	10.79	21.94

WLAN Mode	Channel	Data Rates (Mbps)	Measured Average Power (dBm)	Measured Peak Power (dBm)
802.11n (ht20)	11 (2462 MHz)	mcs 0 (6.50 Mbps)	11.04	21.47
		mcs 1(13.0 Mbps)	10.94	22.08
		mcs 2(19.5 Mbps)	10.79	21.54
		mcs 3 (26.0 Mbps)	10.64	21.39
		mcs 4 (39.0 Mbps)	10.83	21.65
		mcs 5 (52.0 Mbps)	10.56	21.24
		mcs 6 (58.5 Mbps)	10.51	21.58
		mcs 7 (65.0 Mbps)	10.30	21.55

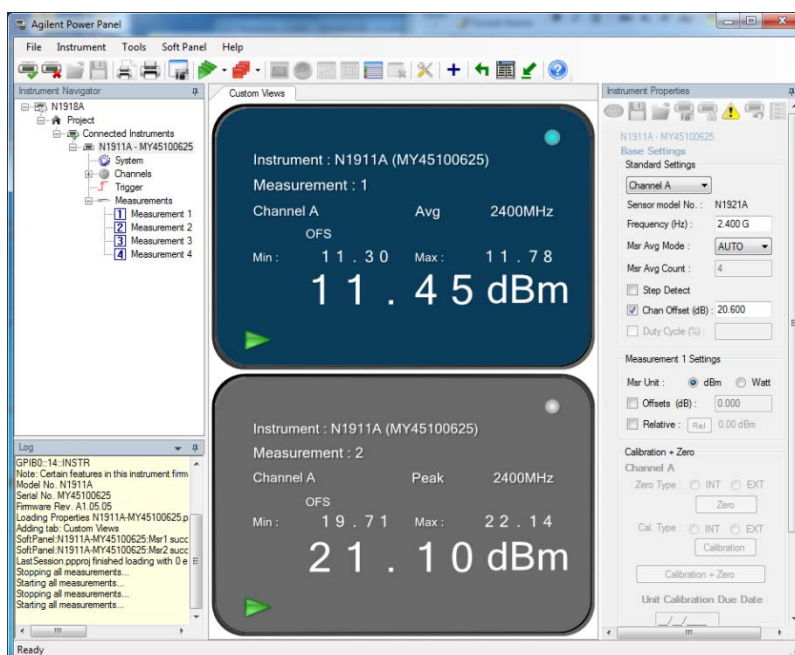
2.1.9 Sample Test Display



802.11 "b" mode. Low Channel 5.5Mbps



802.11 "g" mode. Low Channel 6Mbps



802.11 "n" mode ht20. Mid Channel 6.5Mbps

2.2 CONDUCTED EMISSIONS

2.2.1 Specification Reference

Part 15 Subpart C §15.207(a)

2.2.2 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.*

2.2.3 Equipment Under Test and Modification State

Test not performed. EUT is a battery operated device. Charger for the EUT was verified separately.



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: P41500008 / Test Configuration A

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

January 22, 2014/FSC

2.3.5 Test Equipment Used

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

2.3.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	19.4°C
Relative Humidity	19.3%
ATM Pressure	99.6 kPa

2.3.7 Additional Observations

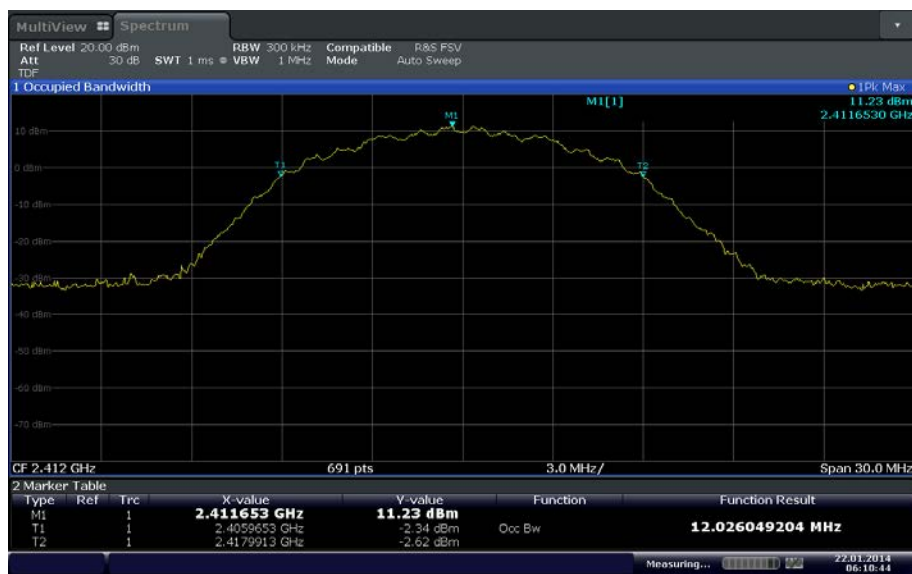
- This is a conducted test.
- A transducer factor (TDF) was added to compensate for the external attenuator and cable used.
- Span is wide enough to capture the channel transmission.
- RBW is 1% of the span.
- VBW is 3X RBW.
- Sweep is auto.

- Detector is peak.
- 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 (For reporting purposes only)

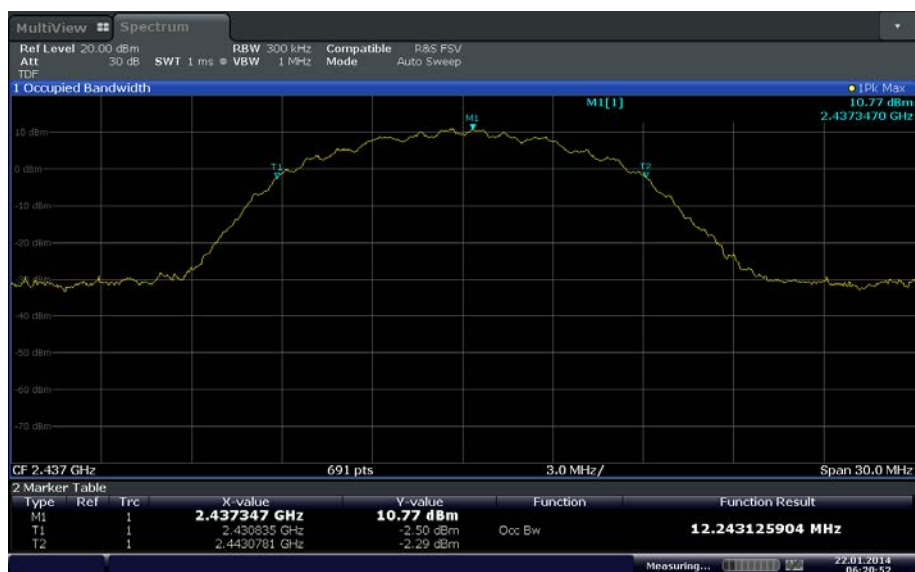
Mode	Channel	Measured 99% Bandwidth (MHz)
802.11b	1 (2412 MHz)	12.026
	6 (2437 MHz)	12.243
	11 (2462 MHz)	12.287
802.11g	1 (2412 MHz)	16.585
	6 (2437 MHz)	16.585
	11 (2462 MHz)	16.628
802.11n HT20	1 (2412 MHz)	17.496
	6 (2437 MHz)	17.496
	11 (2462 MHz)	17.540

2.3.9 Test Results Plots



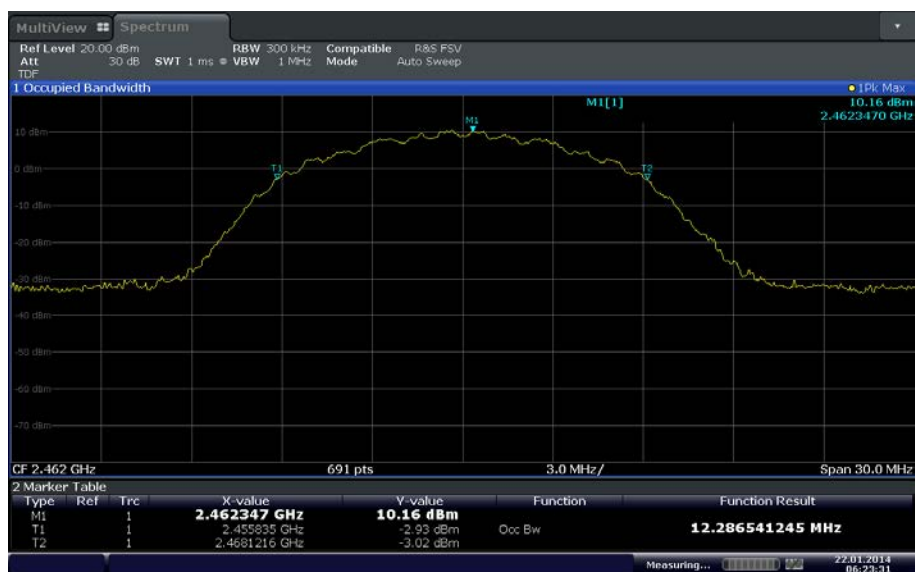
Date: 22 JAN 2014 06:10:44

802.11b Low Channel



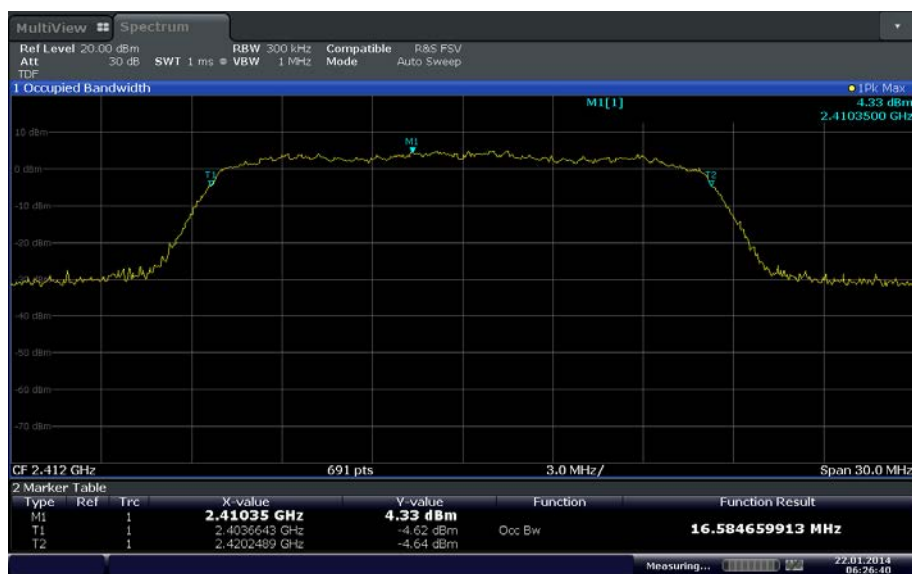
Date: 22.JAN.2014 06:20:52

802.11b Mid Channel



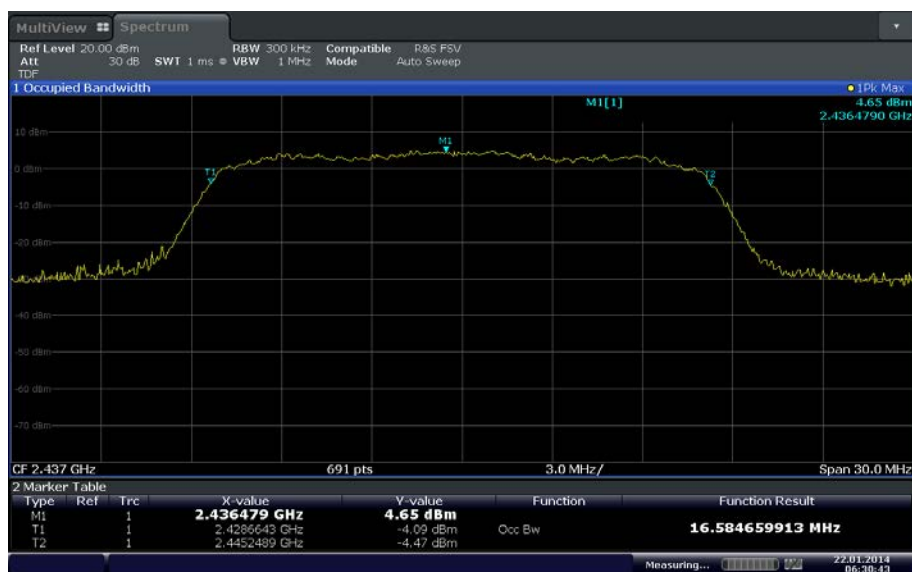
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802.11b High Channel



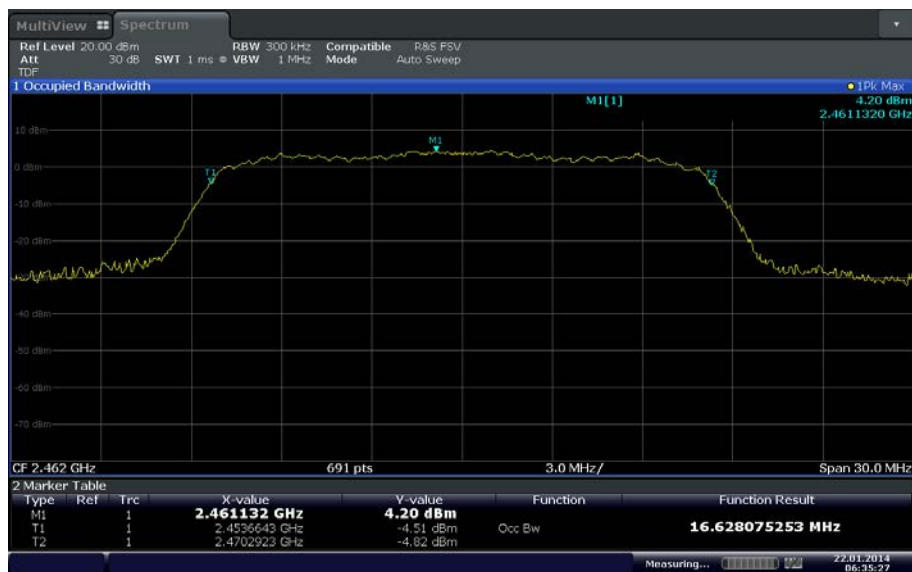
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802.11g Low Channel



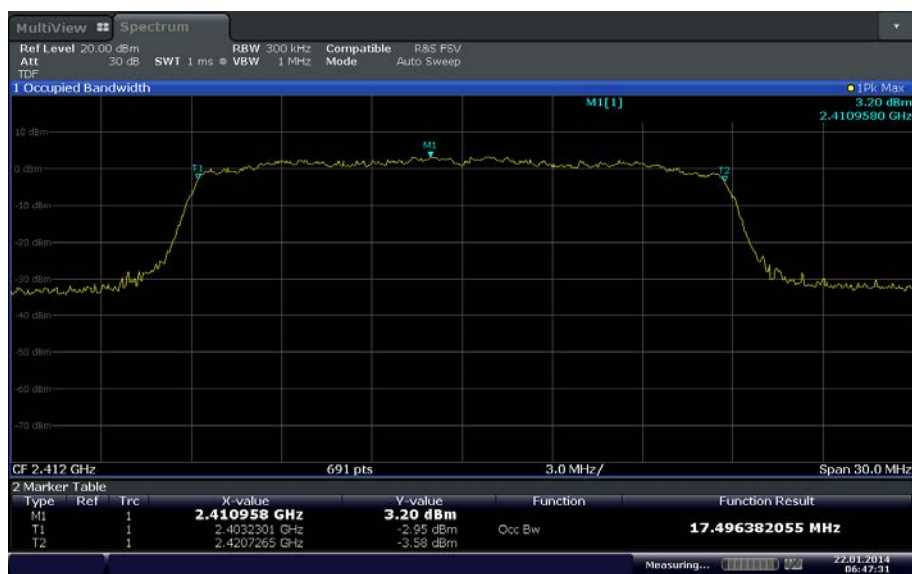
Date: 22.JAN.2014 06:30:43

802.11g Mid Channel



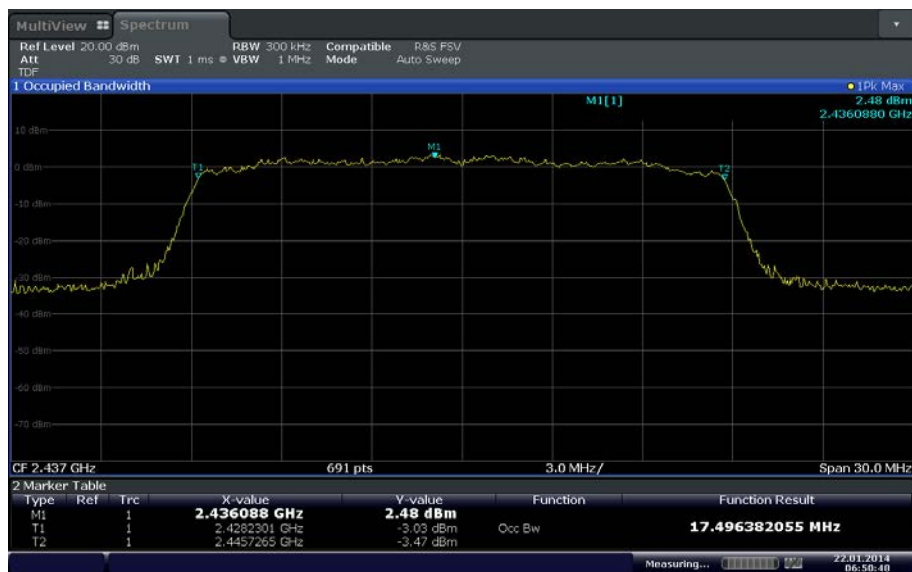
Date: 22.JAN.2014 06:35:27

802.11g High Channel



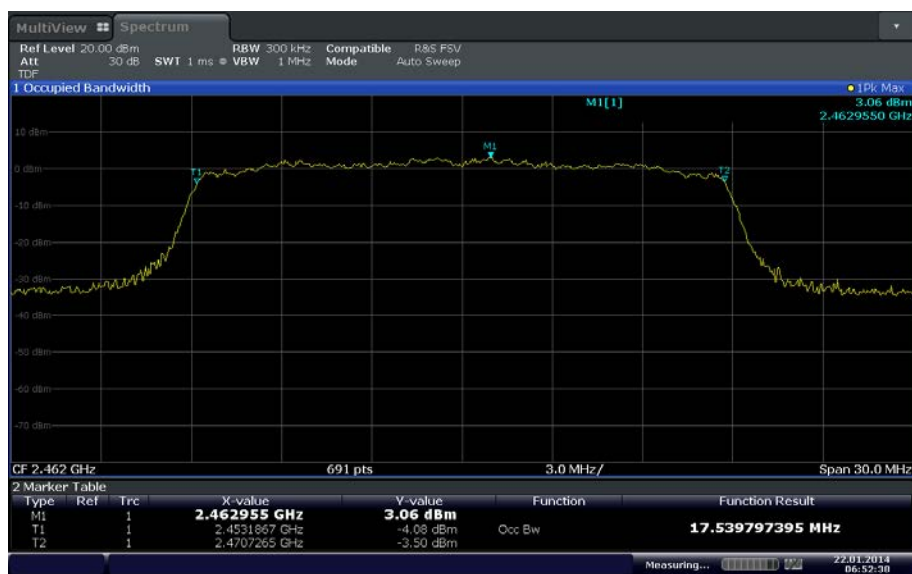
Date: 22.JAN.2014 06:47:31

802.11n HT20 Low Channel



Date: 22.JAN.2014 06:50:47

802.11n HT20 Mid Channel



Date: 22.JAN.2014 06:52:39

802.11n HT20 High Channel



2.4 MINIMUM 6 dB RF BANDWIDTH

2.4.1 Specification Reference

Part 15 Subpart C §15.247(a)(2)

2.4.2 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.

2.4.3 Equipment Under Test and Modification State

Serial No: P41500008 / Test Configuration A

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

January 22, 2014/FSC

2.4.5 Test Equipment Used

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

2.4.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	19.4°C
Relative Humidity	19.3%
ATM Pressure	99.6 kPa

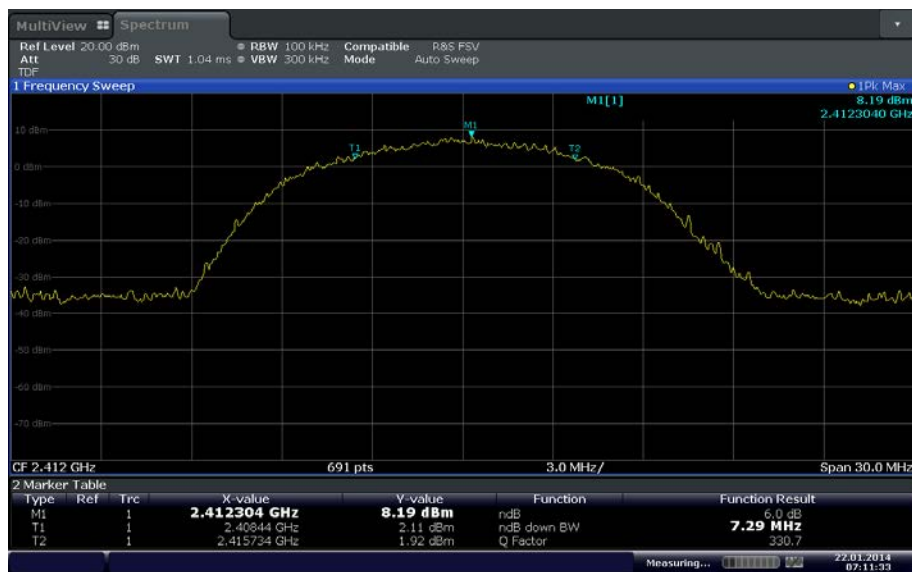
2.4.7 Additional Observations

- This is a conducted test.
- A transducer factor (TDF) was added to compensate for the external attenuator and cable used.
- 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.

2.4.8 Test Results

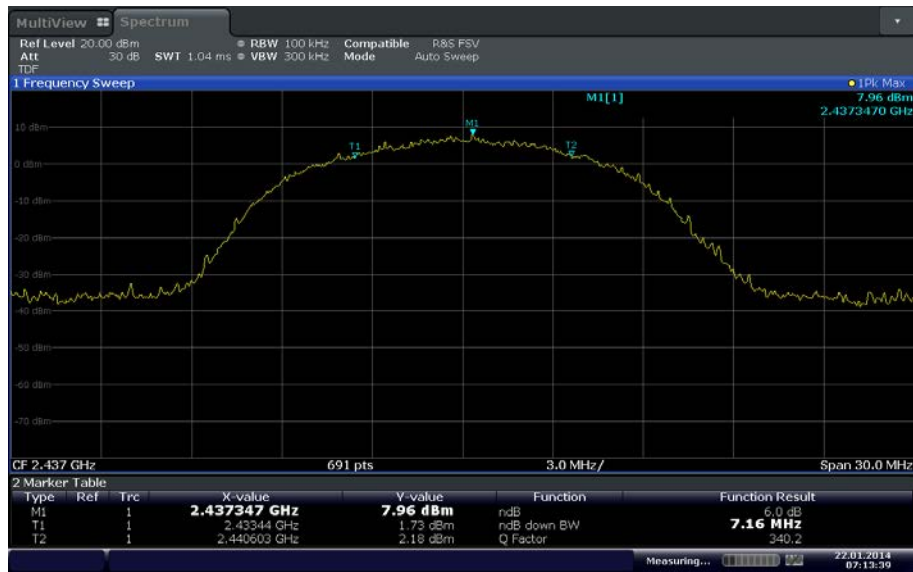
Mode	Channel	Measured Bandwidth (MHz)	Minimum Bandwidth (MHz)	Compliance
802.11b	1 (2412 MHz)	7.29	0.500	Complies
	6 (2437 MHz)	7.16	0.500	Complies
	11 (2462 MHz)	7.38	0.500	Complies
802.11g	1 (2412 MHz)	16.54	0.500	Complies
	6 (2437 MHz)	16.19	0.500	Complies
	11 (2462 MHz)	15.456	0.500	Complies
802.11n HT20	1 (2412 MHz)	17.279	0.500	Complies
	6 (2437 MHz)	17.149	0.500	Complies
	11 (2462 MHz)	16.064	0.500	Complies

2.4.9 Test Results Plots



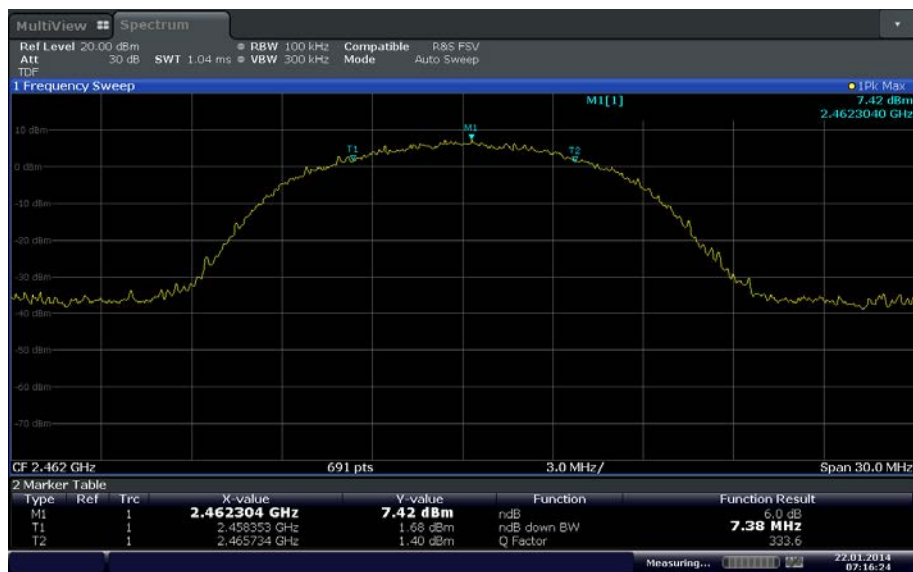
Date: 22 JAN 2014 07:11:33

802.11b Low Channel



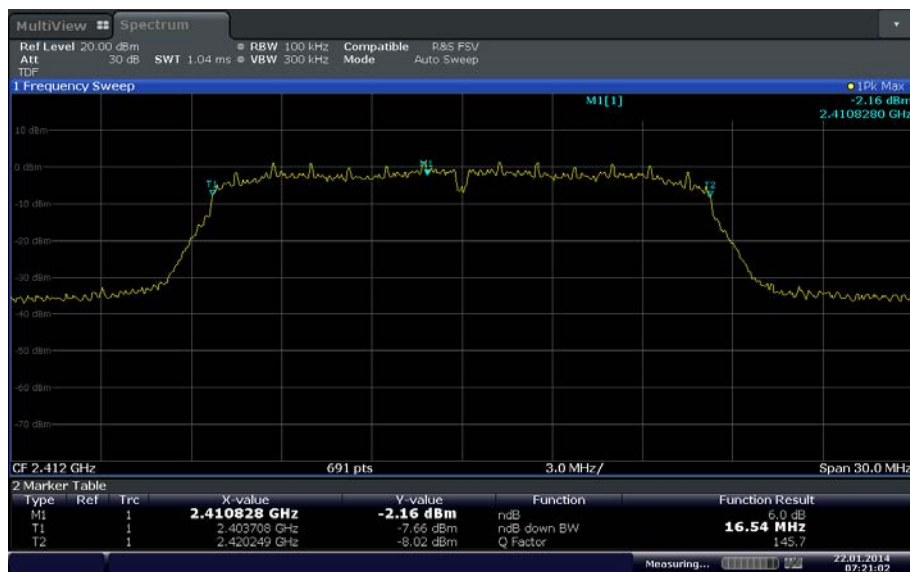
Date: 22.JAN 2014 07:13:39

802.11b Mid Channel



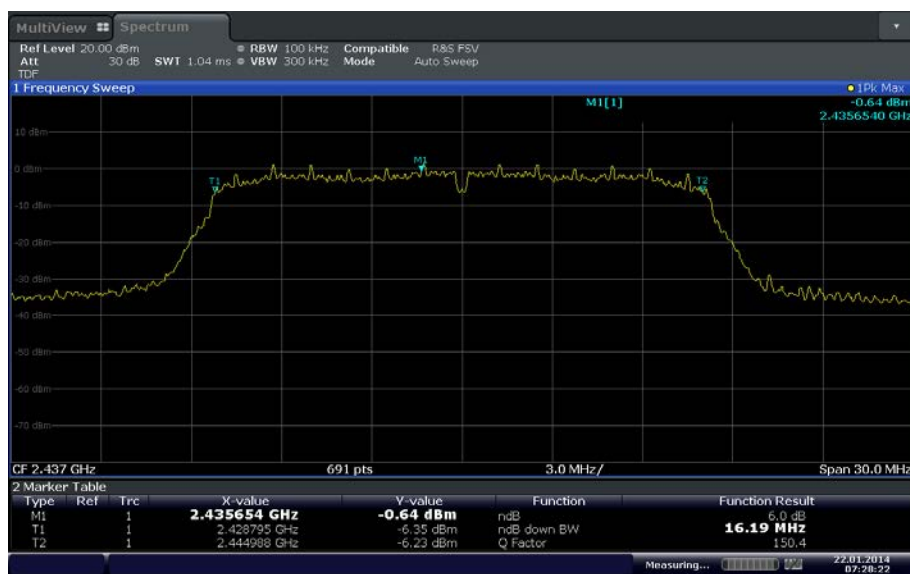
Date: 22.JAN 2014 07:16:24

802.11b High Channel



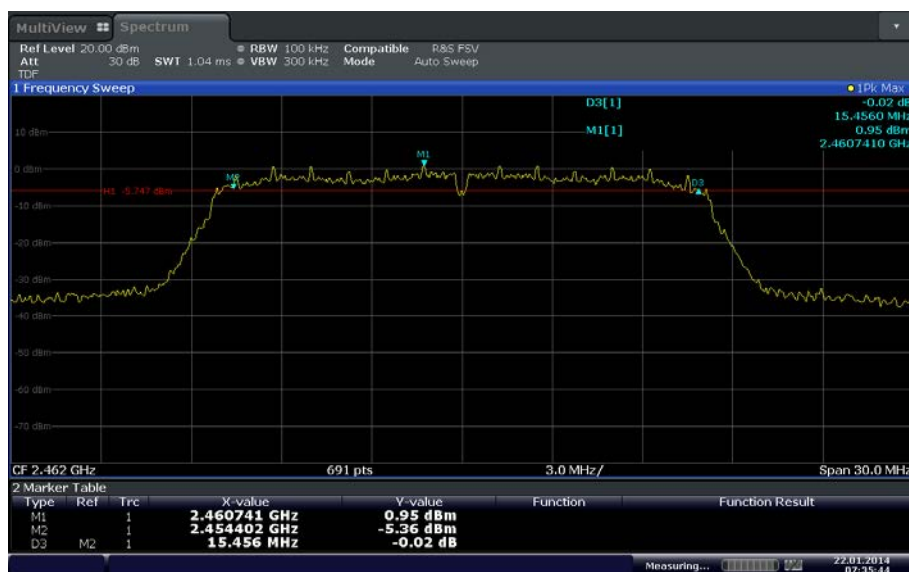
Date: 22.JAN.2014 07:21:02

802.11g Low Channel



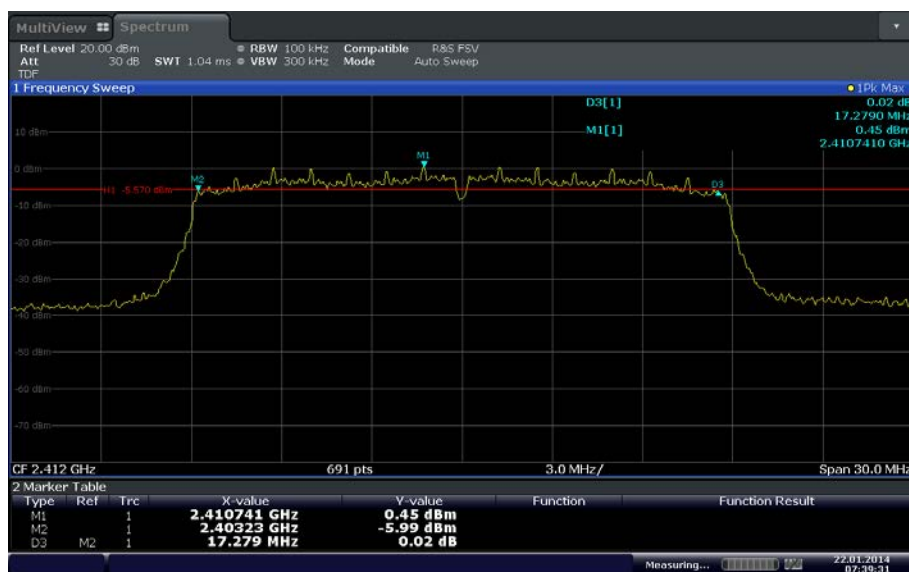
Date: 22.JAN.2014 07:28:22

802.11g Mid Channel



Date: 22.JAN.2014 07:35:44

802.11g High Channel



Date: 22.JAN.2014 07:39:31

802.11n HT20 Low Channel



Date: 22.JAN.2014 07:43:09

802.11n HT20 Mid Channel



Date: 22.JAN.2014 07:46:14

802.11n HT20 High Channel



2.5 OUT-OF-BAND EMISSIONS - CONDUCTED

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: P41500008 / Test Configuration A

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

January 22, 2014/FSC

2.5.5 Test Equipment Used

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

2.5.6 Environmental Conditions/ Test Location

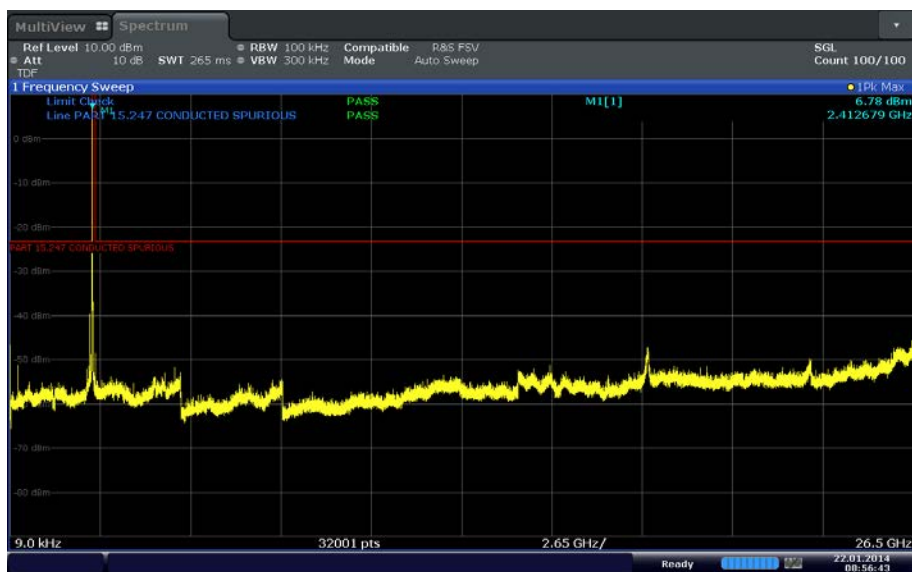
Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	19.4°C
Relative Humidity	19.3%
ATM Pressure	99.6 kPa

2.5.7 Additional Observations

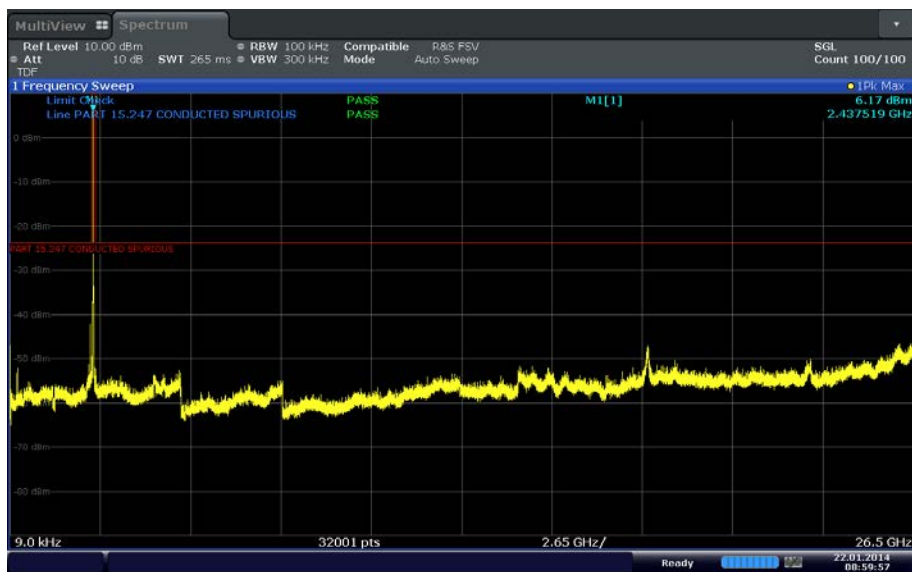
- This is a conducted test.
- A transducer factor (TDF) was added to compensate for the external attenuator and cable used.
- RBW is 100kHz.VBW is 3X RBW.
- Sweep is auto. Detector is peak. Trace is max hold.
- Initial scan was performed to determine the highest level of the desired power within the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

2.5.8 Test Results Plots



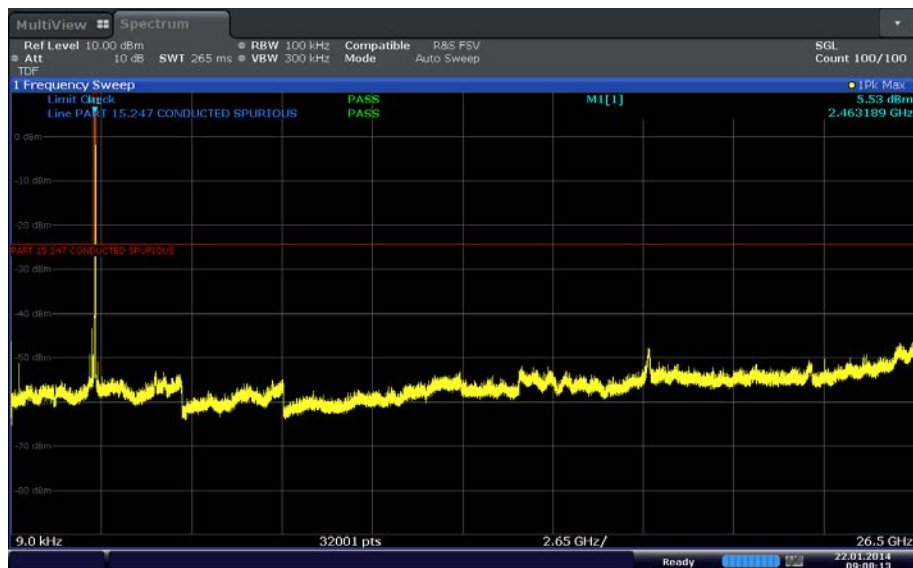
Date: 22 JAN 2014 08:56:43

802.11b Low Channel



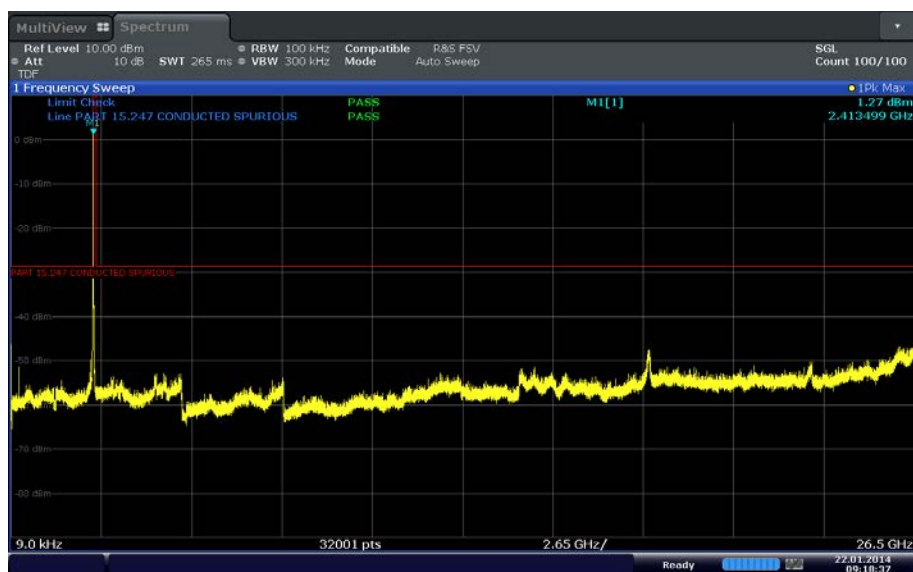
Date: 22 JAN 2014 08:59:57

802.11b Mid Channel



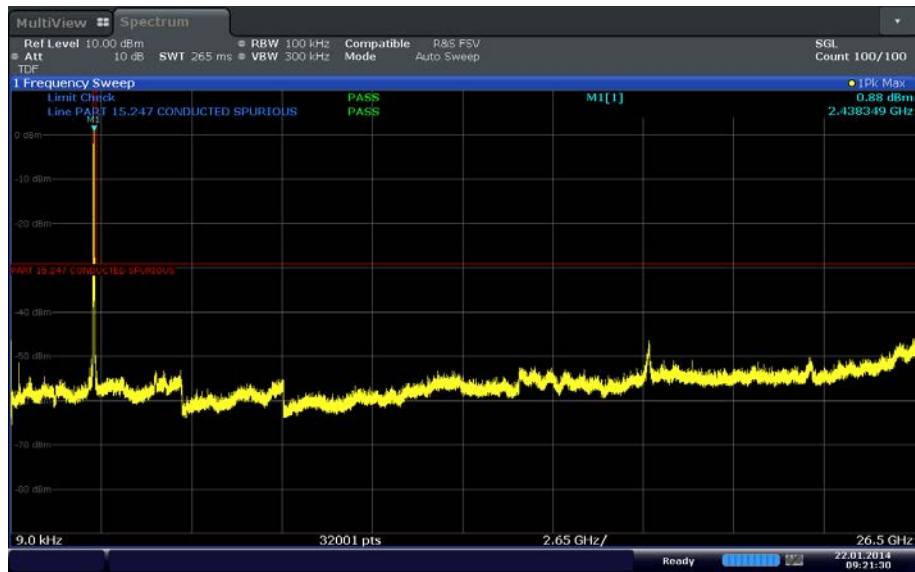
Date: 22.JAN.2014 09:08:12

802.11b High Channel



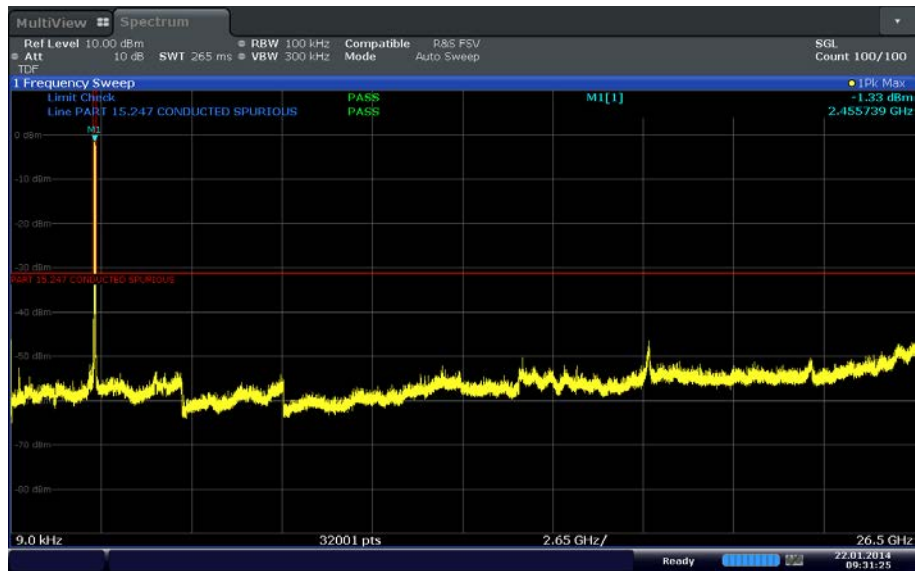
Date: 22.JAN.2014 09:16:38

802.11g Low Channel



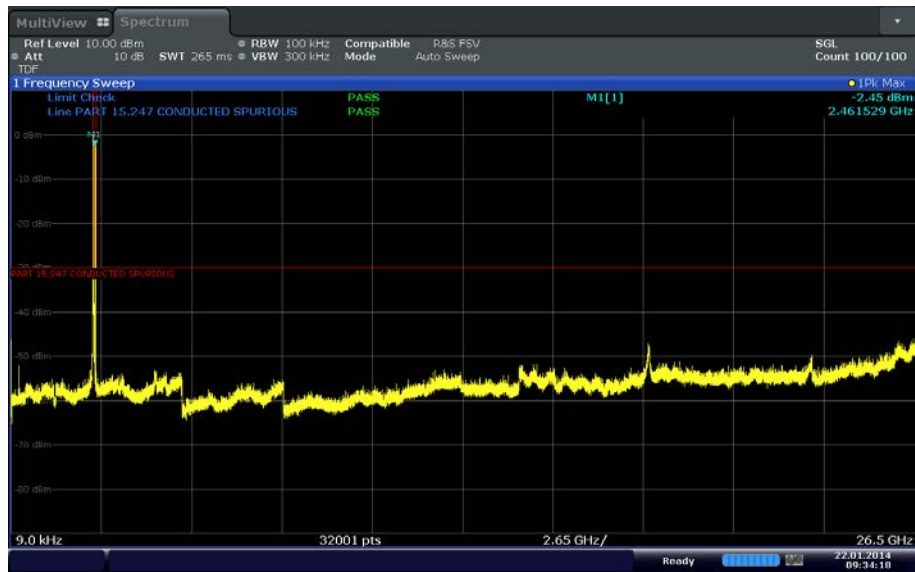
Date: 22.JAN 2014 09:21:30

802.11g Mid Channel



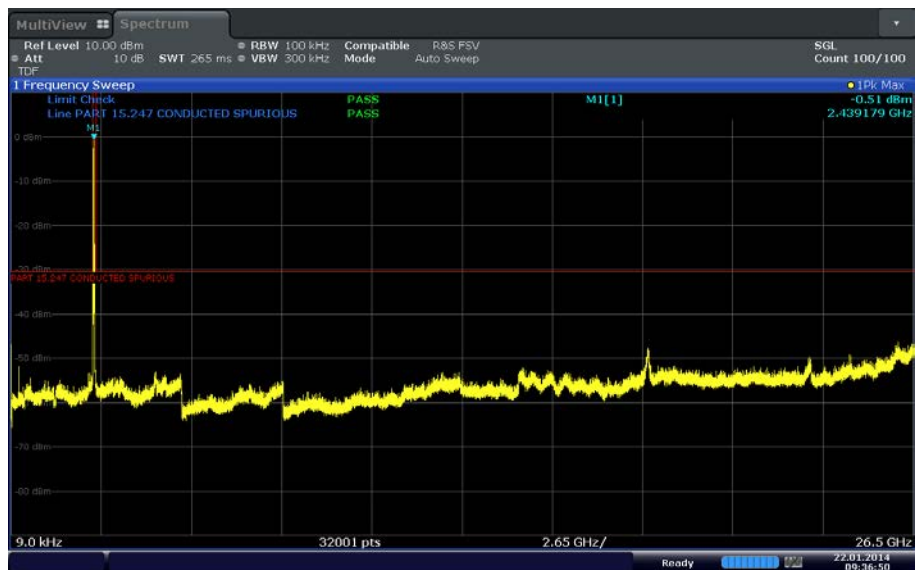
Date: 22.JAN 2014 09:31:25

802.11g High Channel



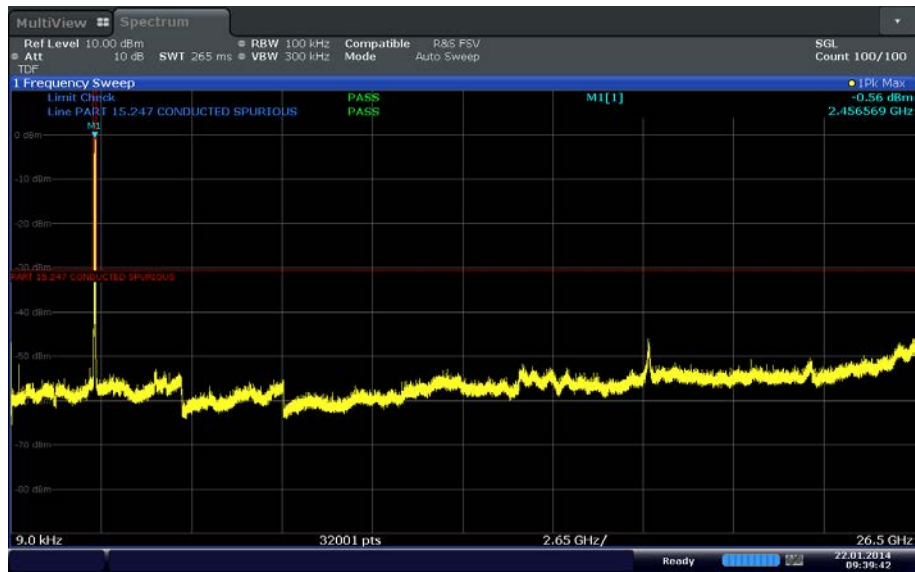
Date: 22.JAN.2014 09:34:18

802.11n HT20 Low Channel



Date: 22.JAN.2014 09:36:50

802.11n HT20 Mid Channel



Date: 22.JAN.2014 09:39:41

802.11n HT20 High Channel

2.6 BAND-EDGE COMPLIANCE OF RF CONDUCTED EMISSIONS

2.6.1 Specification Reference

Part 15 Subpart C §15.247(d)

2.6.2 Standard Applicable

See previous test.

2.6.3 Equipment Under Test and Modification State

Serial No: P41500008 / Test Configuration A

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

January 22, 2014/FSC

2.6.5 Test Equipment Used

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

2.6.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

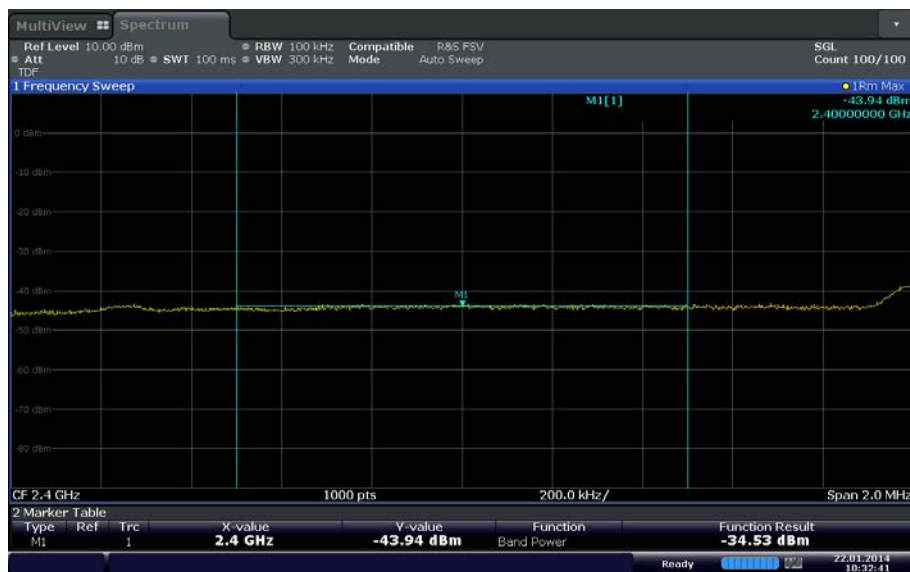
Ambient Temperature	19.4°C
Relative Humidity	19.3%
ATM Pressure	99.6 kPa

2.6.7 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 13.3.2 of KDB 558074 (D01 DTS Meas Guidance v03r01, April 09, 2013); trace averaging with continuous EUT transmission at full power.
- Limits are from Section 2.5 of this test report. These are 30dBc from the highest level of the desired power within the band.

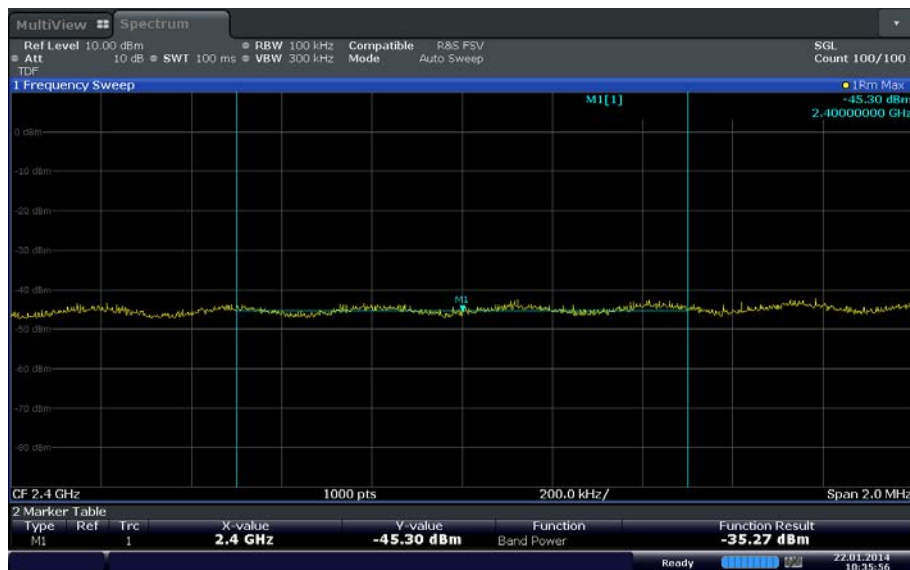
2.6.8 Test Results

Complies. See attached plots.



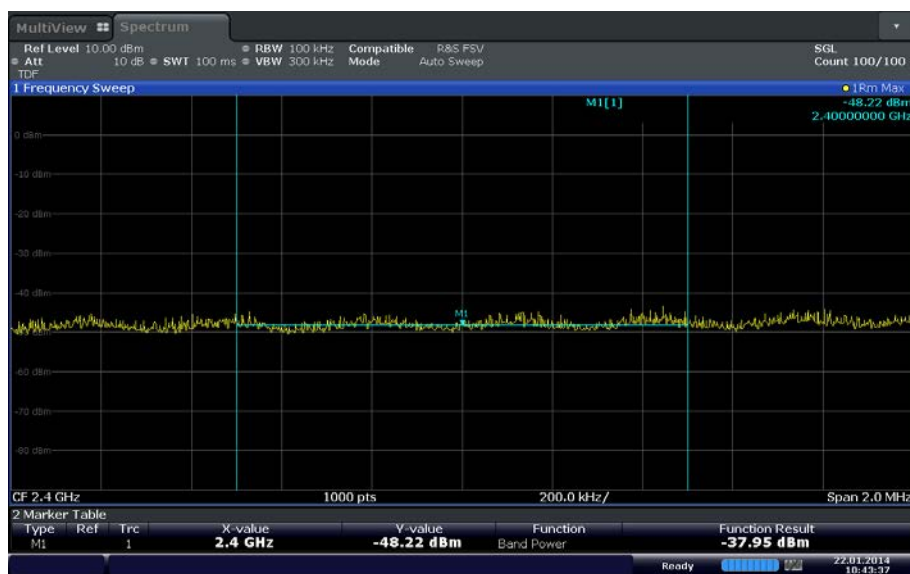
Date: 22.JAN.2014 10:32:41

802.11b Low Channel (2412 MHz). Limit is -23.22 dBm. Margin is -11.31 dB.



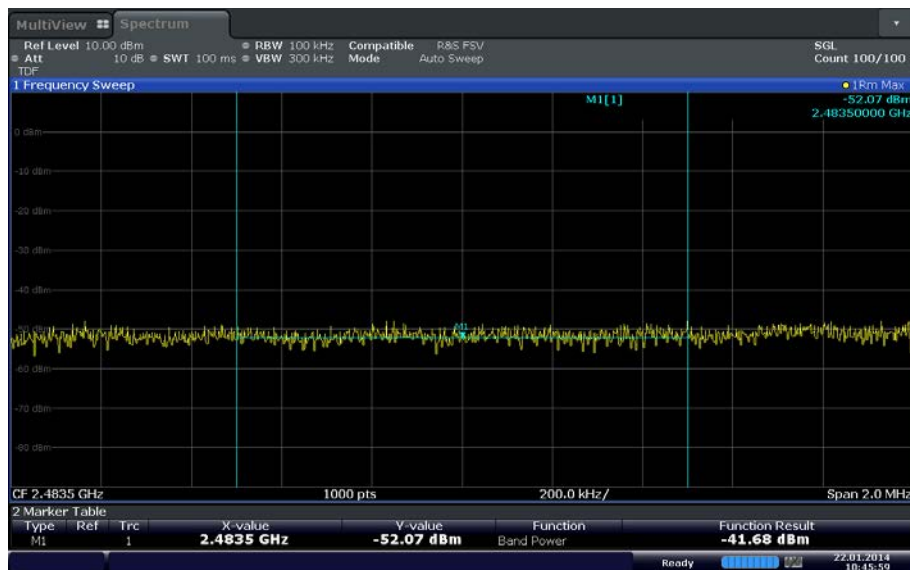
Date: 22.JAN.2014 10:35:57

802.11g Low Channel (2412 MHz). Limit is -28.73dBm. Margin is -6.54 dB.



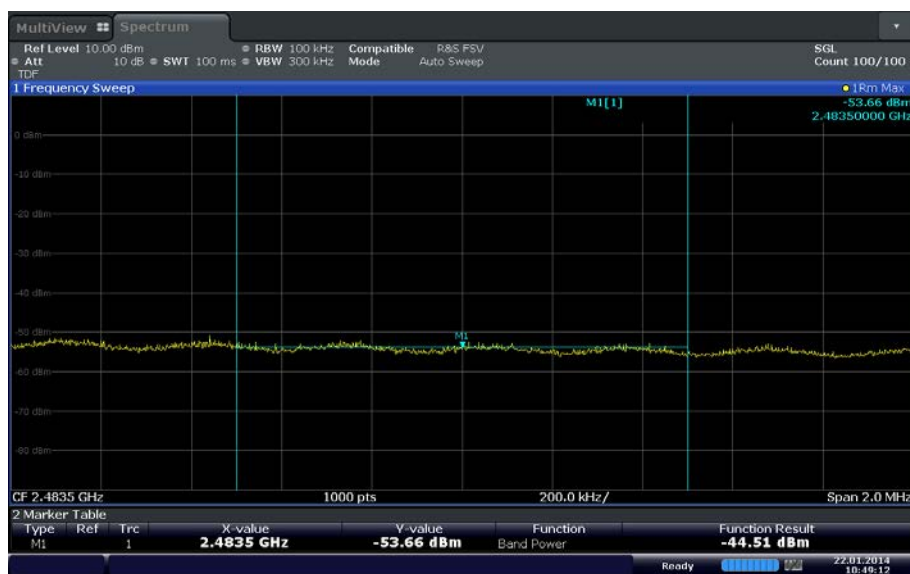
Date: 22.JAN.2014 10:43:36

802.11n HT20 Low Channel (2412 MHz). Limit is -32.45 dBm. Margin is -5.5 dB.



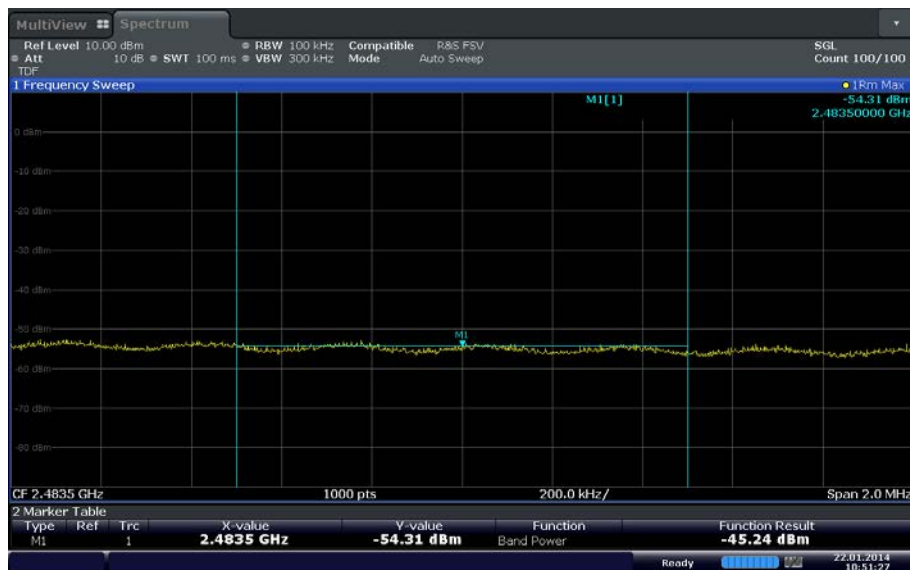
Date: 22.JAN.2014 10:45:59

802.11b High Channel (2462 MHz). Limit is -24.47 dBm. Margin is -17.21 dB.



Date: 22.JAN.2014 10:49:12

802.11g High Channel (2462 MHz). Limit is -31.33 dBm. Margin is -13.18 dB.



Date: 22.JAN.2014 10:51:27

802.11n HT20 High Channel (2462 MHz). Limit is -30.56 dBm. Margin is -14.68dB.



2.7 SPURIOUS RADIATED EMISSIONS

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: P41500003 and P41500004/ Test Configuration B

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

January 21, 22 and 24, 2014/FSC

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

2.7.7 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, Low 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 2.7.8 for sample computation.

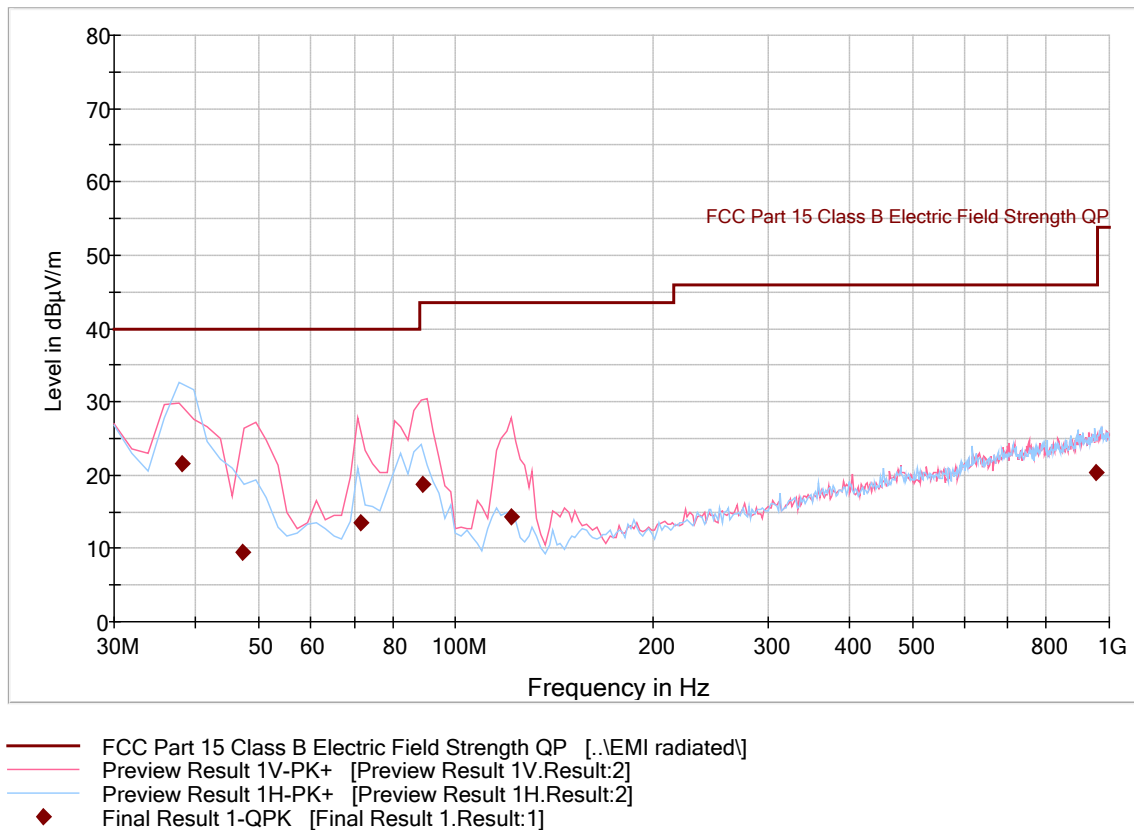
2.7.8 Sample Computation (Radiated Emission)

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 QuasiPeak Final Measurement (db μ V/m) @ 30MHz			11.8

2.7.9 Test Results

See attached plots.

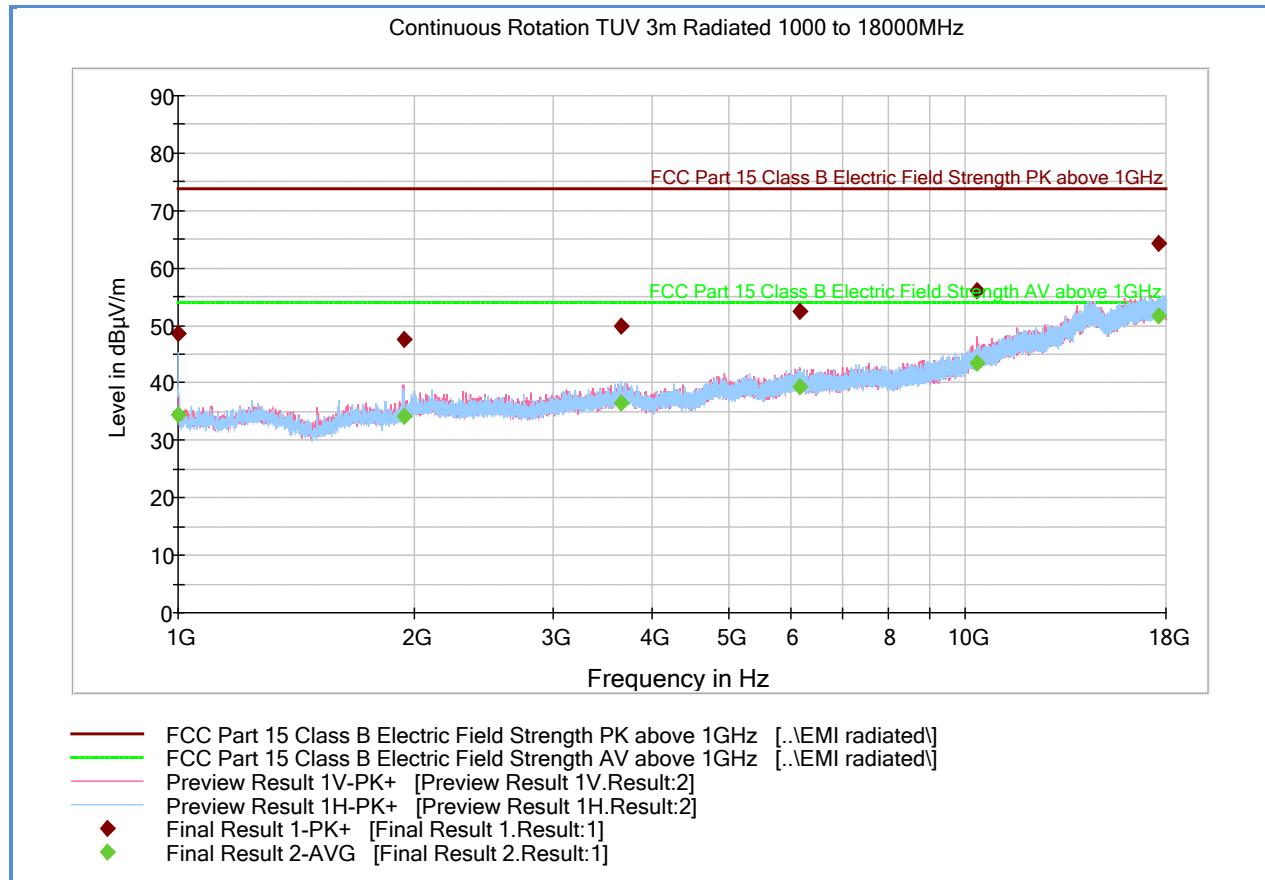
2.7.10 Test Results Below 1GHz (Receive Mode)



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)
38.175551	21.5	1000.0	120.000	388.0	H	207.0	-15.1	18.5	40.0
47.278878	9.5	1000.0	120.000	150.0	V	281.0	-18.4	30.5	40.0
71.341643	13.5	1000.0	120.000	300.0	V	212.0	-21.3	26.5	40.0
89.052745	18.8	1000.0	120.000	400.0	V	11.0	-19.9	24.7	43.5
121.866613	14.2	1000.0	120.000	100.0	V	117.0	-19.2	29.3	43.5
954.402806	20.4	1000.0	120.000	166.0	H	276.0	2.9	25.6	46.0

2.7.11 Test Results Above 1GHz (Receive Mode)



Peak Data

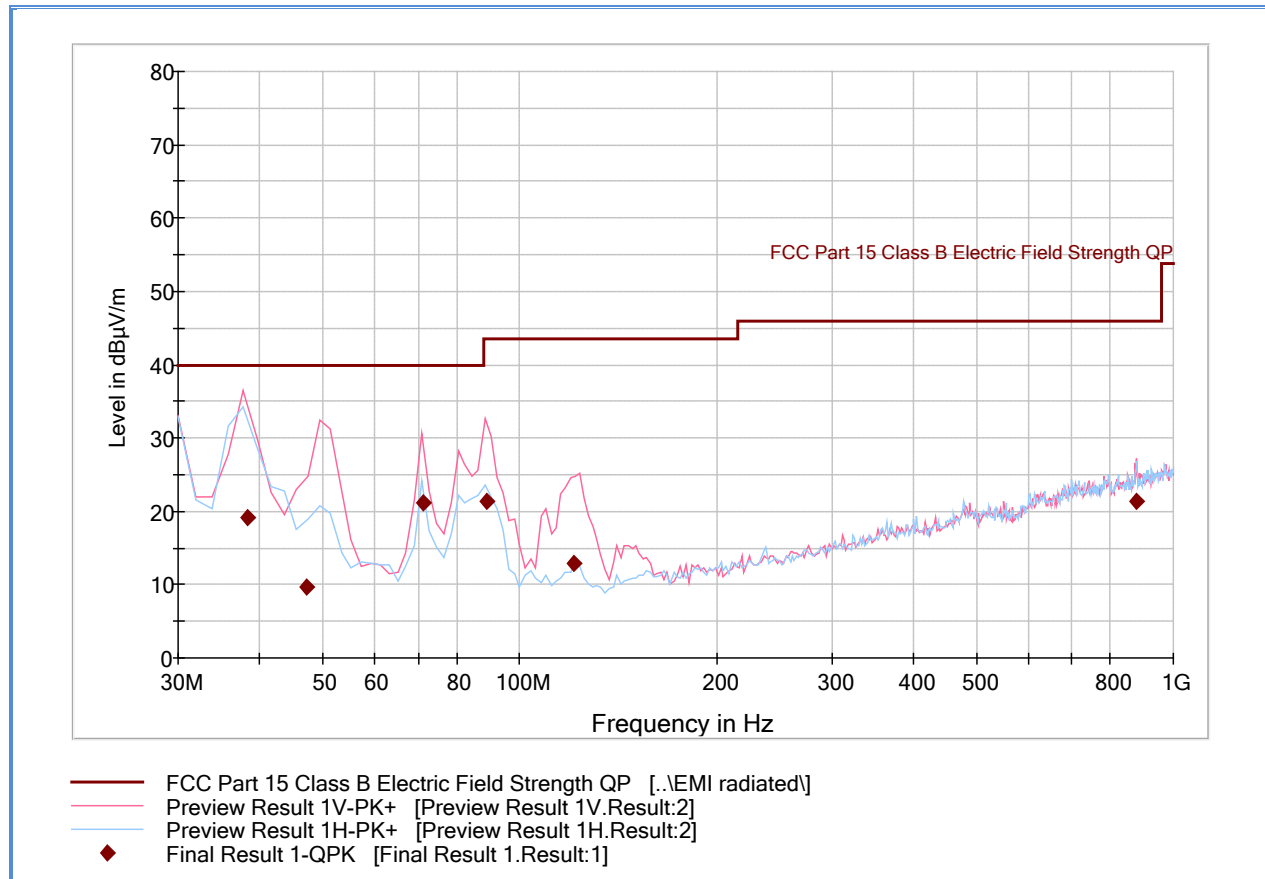
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.400000	48.5	1000.0	1000.000	276.3	H	330.0	-1.1	25.4	73.9
1932.966667	47.6	1000.0	1000.000	99.6	V	105.0	1.8	26.3	73.9
3649.133333	49.8	1000.0	1000.000	216.4	H	93.0	5.7	24.1	73.9
6176.866667	52.5	1000.0	1000.000	200.4	V	290.0	10.4	21.4	73.9
10376.066666	56.1	1000.0	1000.000	382.1	V	242.0	15.2	17.8	73.9
17615.766666	64.4	1000.0	1000.000	123.6	H	296.0	23.4	9.5	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	34.5	1000.0	1000.000	276.3	H	330.0	-1.1	19.4	53.9
1932.966667	34.2	1000.0	1000.000	99.6	V	105.0	1.8	19.7	53.9
3649.133333	36.5	1000.0	1000.000	216.4	H	93.0	5.7	17.4	53.9
6176.866667	39.2	1000.0	1000.000	200.4	V	290.0	10.4	14.7	53.9
10376.066666	43.4	1000.0	1000.000	382.1	V	242.0	15.2	10.5	53.9
17615.766666	51.6	1000.0	1000.000	123.6	H	296.0	23.4	2.3	53.9

Test Notes: No significant emissions observed above 18GHz.

2.7.12 Test Results Below 1GHz (WLAN worst Case Configuration)

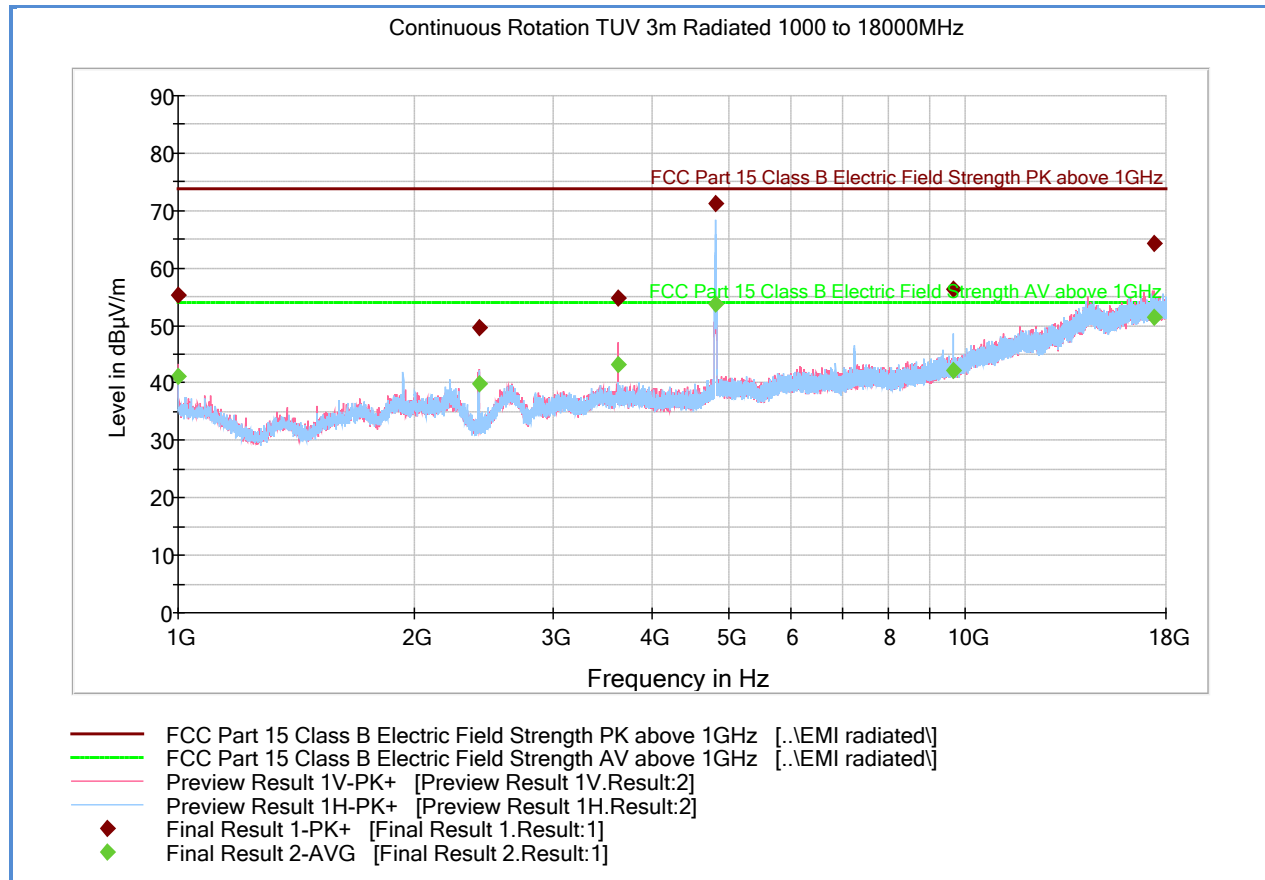


Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
38.295551	19.1	1000.0	120.000	146.0	V	275.0	-15.2	20.9	40.0
47.158878	9.6	1000.0	120.000	150.0	V	276.0	-18.4	30.4	40.0
71.301643	21.2	1000.0	120.000	100.0	V	-15.0	-21.3	18.8	40.0
88.876633	21.4	1000.0	120.000	400.0	V	343.0	-19.9	22.1	43.5
120.906613	12.9	1000.0	120.000	100.0	V	-8.0	-19.1	30.6	43.5
878.198958	21.3	1000.0	120.000	203.0	V	343.0	1.4	24.7	46.0

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

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



Peak Data

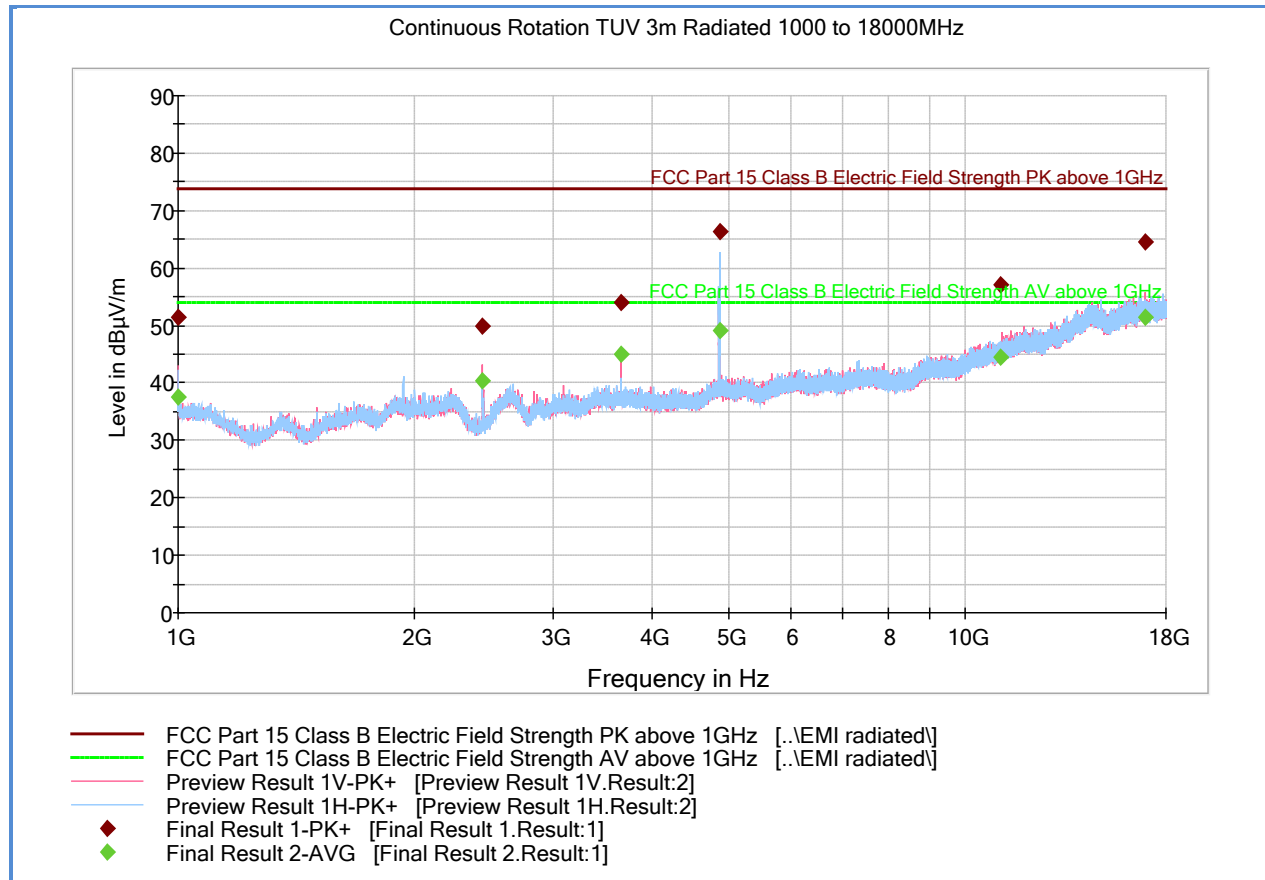
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.400000	55.3	1000.0	1000.000	177.5	V	16.0	-1.1	18.6	73.9
2410.800000	49.6	1000.0	1000.000	114.6	V	334.0	2.4	24.3	73.9
3616.833333	54.8	1000.0	1000.000	99.6	V	115.0	5.8	19.1	73.9
4822.533333	71.3	1000.0	1000.000	288.2	H	39.0	7.8	2.6	73.9
9646.166667	56.4	1000.0	1000.000	200.4	H	133.0	13.5	17.5	73.9
17352.533333	64.3	1000.0	1000.000	125.6	V	338.0	23.2	9.6	73.9

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.400000	41.2	1000.0	1000.000	177.5	V	16.0	-1.1	12.8	53.9
2410.800000	39.7	1000.0	1000.000	114.6	V	334.0	2.4	14.2	53.9
3616.833333	43.1	1000.0	1000.000	99.6	V	115.0	5.8	10.8	53.9
4822.533333	53.7	1000.0	1000.000	288.2	H	39.0	7.8	0.2	53.9
9646.166667	42.2	1000.0	1000.000	200.4	H	133.0	13.5	11.7	53.9
17352.533333	51.5	1000.0	1000.000	125.6	V	338.0	23.2	2.4	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.

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



Peak Data

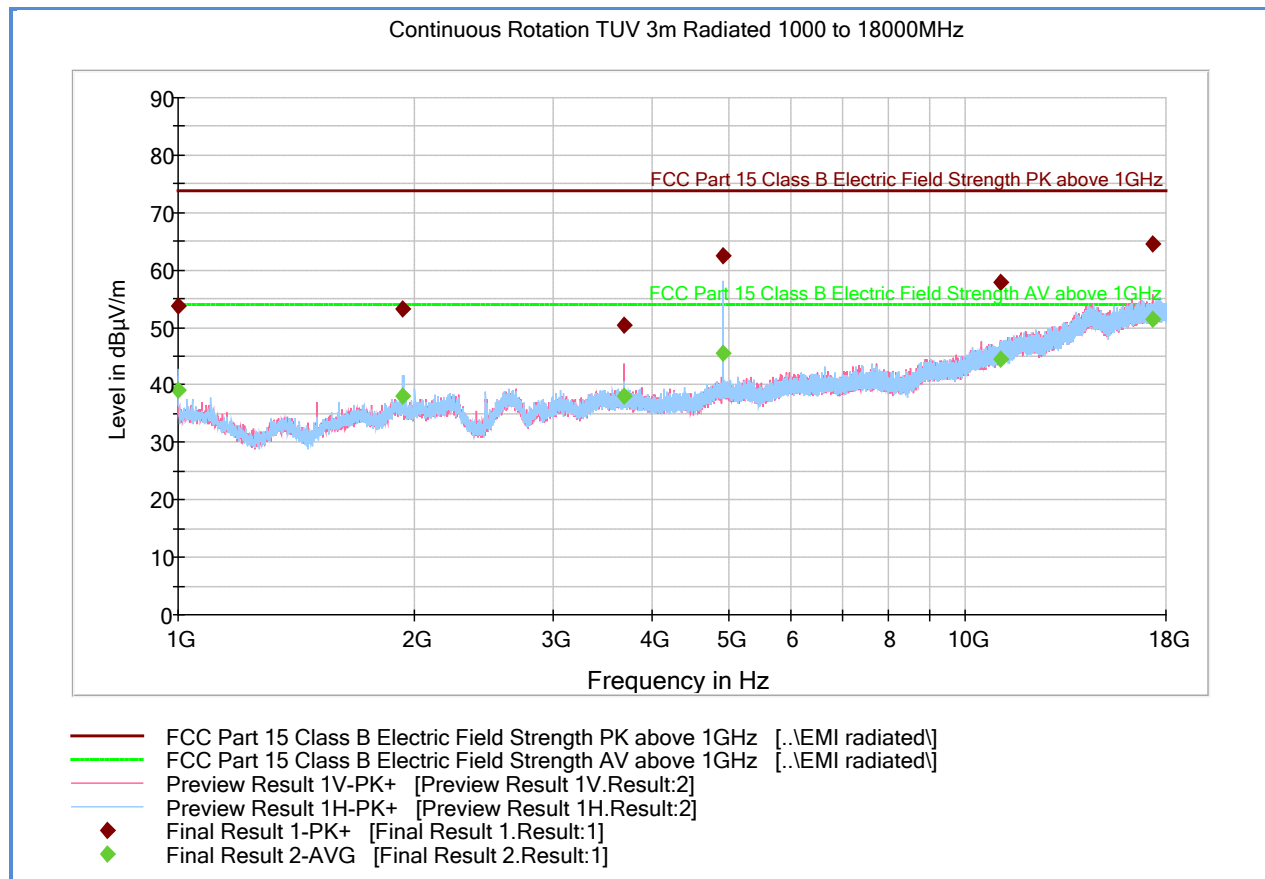
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.400000	51.5	1000.0	1000.000	272.2	V	351.0	-1.1	22.4	73.9
2436.866667	50.0	1000.0	1000.000	150.5	V	105.0	2.4	23.9	73.9
3655.600000	53.9	1000.0	1000.000	99.6	V	111.0	5.7	20.0	73.9
4873.933333	66.2	1000.0	1000.000	239.3	H	267.0	7.8	7.7	73.9
11075.533333	57.2	1000.0	1000.000	207.4	H	-16.0	16.5	16.7	73.9
16908.966667	64.5	1000.0	1000.000	282.2	V	310.0	23.4	9.4	73.9

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.400000	37.6	1000.0	1000.000	272.2	V	351.0	-1.1	16.3	53.9
2436.866667	40.3	1000.0	1000.000	150.5	V	105.0	2.4	13.6	53.9
3655.600000	45.0	1000.0	1000.000	99.6	V	111.0	5.7	8.9	53.9
4873.933333	49.2	1000.0	1000.000	239.3	H	267.0	7.8	4.7	53.9
11075.533333	44.5	1000.0	1000.000	207.4	H	-16.0	16.5	9.4	53.9
16908.966667	51.5	1000.0	1000.000	282.2	V	310.0	23.4	2.4	53.9

Test Notes: Measurement was performed with a 2.4GHz notch filter. No significant emissions observed above 6GHz. Measurements above 6GHz are noise floor figures.

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



Peak Data

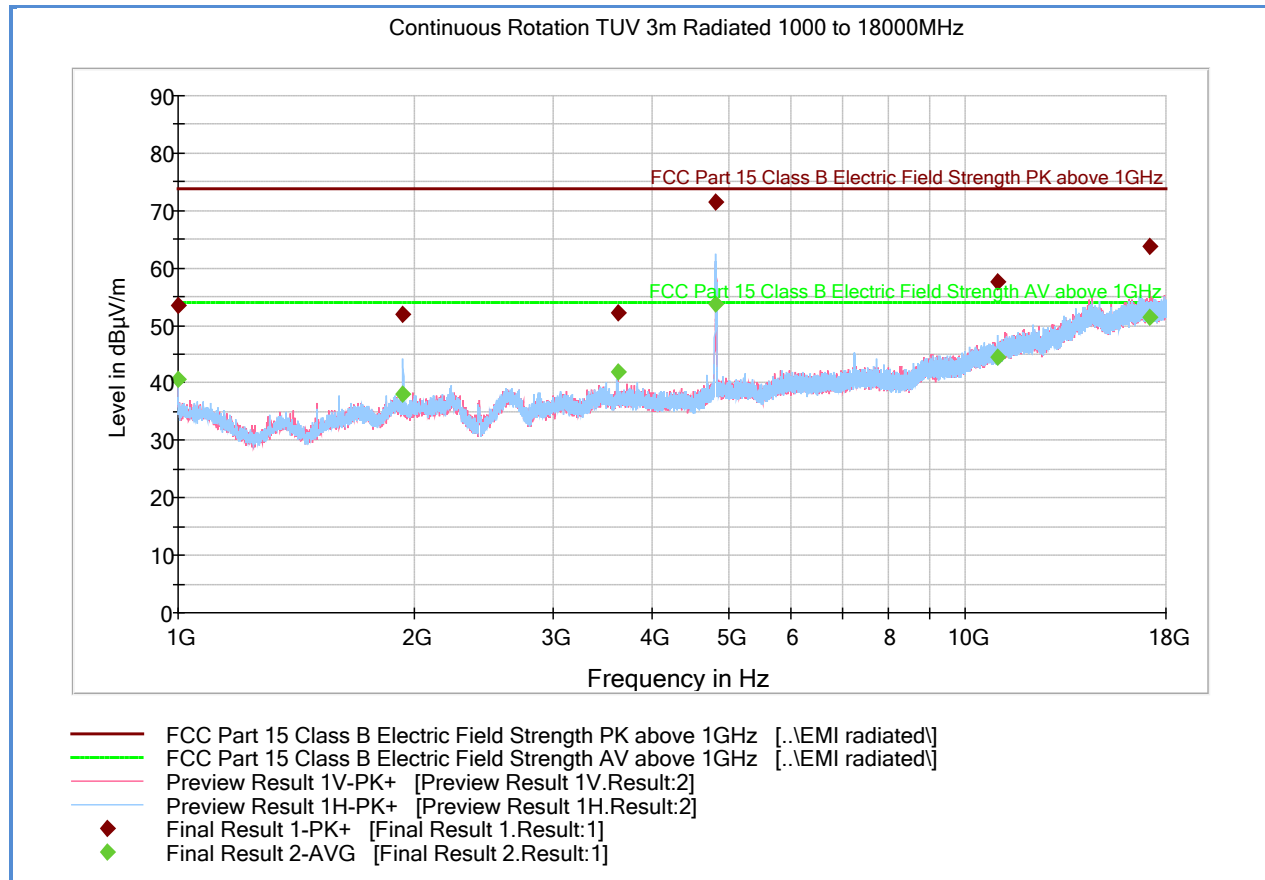
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.500000	53.7	1000.0	1000.000	167.5	H	267.0	-1.1	20.2	73.9
1932.533333	53.3	1000.0	1000.000	102.6	H	135.0	1.8	20.6	73.9
3693.600000	50.3	1000.0	1000.000	167.5	V	320.0	5.8	23.6	73.9
4923.966667	62.5	1000.0	1000.000	177.5	H	-9.0	7.8	11.4	73.9
11097.400000	57.9	1000.0	1000.000	293.2	V	286.0	16.6	16.0	73.9
17300.166667	64.6	1000.0	1000.000	294.2	V	349.0	23.1	9.3	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)
1000.500000	39.2	1000.0	1000.000	167.5	H	267.0	-1.1	14.7	53.9
1932.533333	38.0	1000.0	1000.000	102.6	H	135.0	1.8	15.9	53.9
3693.600000	38.0	1000.0	1000.000	167.5	V	320.0	5.8	15.9	53.9
4923.966667	45.5	1000.0	1000.000	177.5	H	-9.0	7.8	8.4	53.9
11097.400000	44.5	1000.0	1000.000	293.2	V	286.0	16.6	9.4	53.9
17300.166667	51.5	1000.0	1000.000	294.2	V	349.0	23.1	2.4	53.9

Test Notes: Measurement was performed with a 2.4GHz notch filter. No significant emissions observed above 6GHz. Measurements above 6GHz are noise floor figures.

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



Peak Data

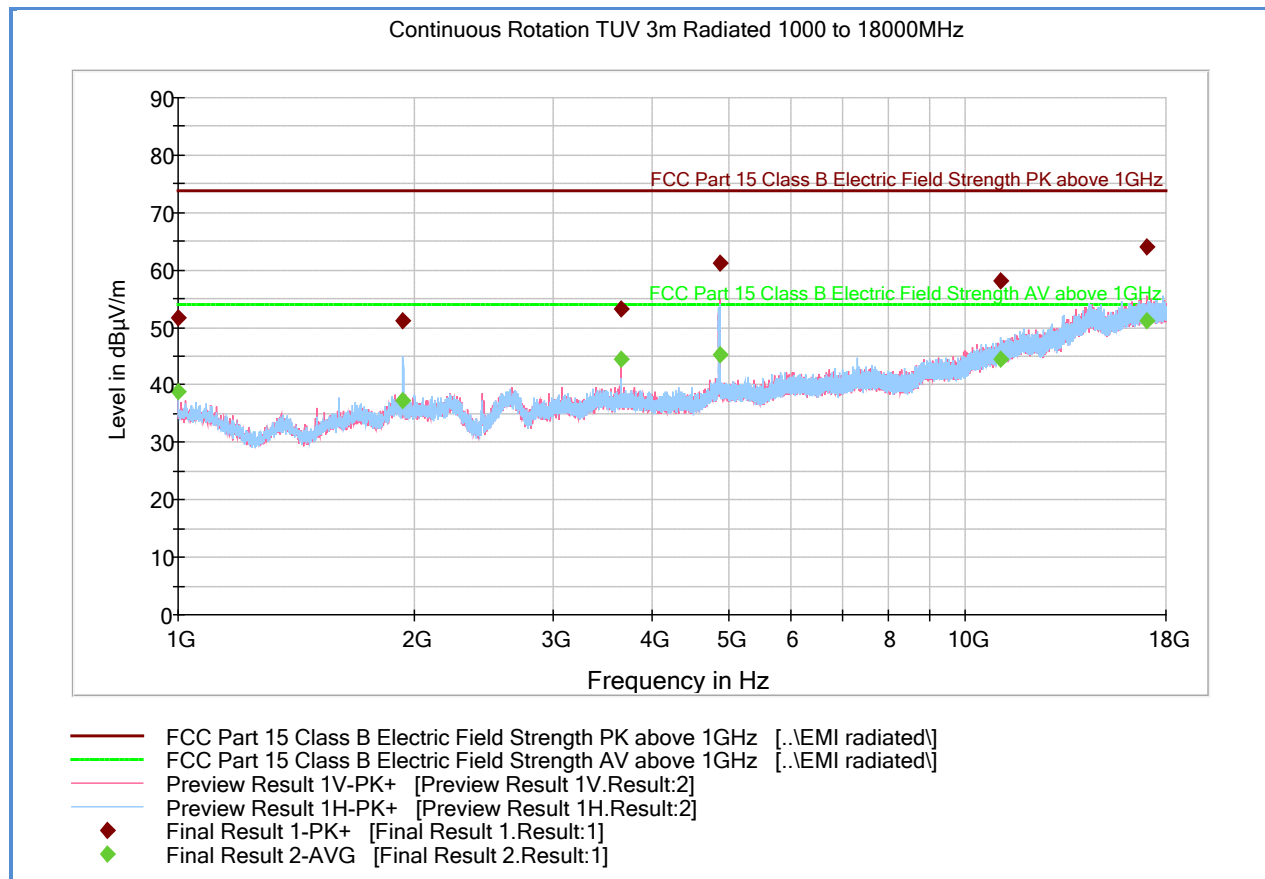
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.000000	53.5	1000.0	1000.000	177.5	H	-16.0	-1.0	20.4	73.9
1932.400000	52.0	1000.0	1000.000	103.6	H	309.0	1.8	21.9	73.9
3618.400000	52.2	1000.0	1000.000	99.6	V	311.0	5.8	21.7	73.9
4818.966667	71.6	1000.0	1000.000	396.0	H	279.0	7.8	2.3	73.9
11018.533333	57.6	1000.0	1000.000	300.6	H	331.0	16.4	16.3	73.9
17174.166667	63.7	1000.0	1000.000	202.4	V	118.0	23.2	10.2	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	40.6	1000.0	1000.000	177.5	H	-16.0	-1.0	13.3	53.9
1932.400000	38.0	1000.0	1000.000	103.6	H	309.0	1.8	15.9	53.9
3618.400000	41.9	1000.0	1000.000	99.6	V	311.0	5.8	12.0	53.9
4818.966667	53.9	1000.0	1000.000	396.0	H	279.0	7.8	0.0	53.9
11018.533333	44.4	1000.0	1000.000	300.6	H	331.0	16.4	9.5	53.9
17174.166667	51.5	1000.0	1000.000	202.4	V	118.0	23.2	2.4	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.

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



Peak Data

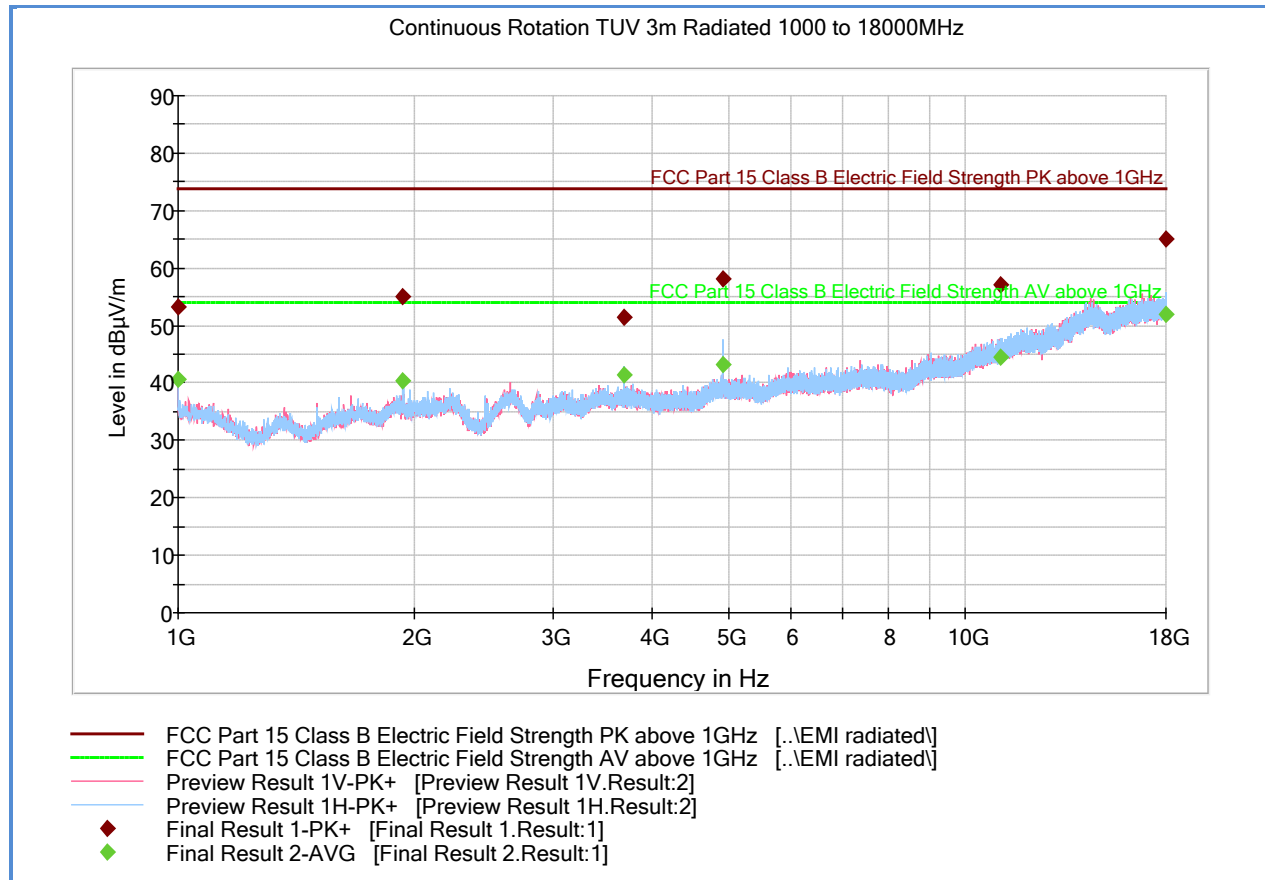
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.000000	51.8	1000.0	1000.000	251.3	V	-16.0	-1.0	22.1	73.9
1932.366667	51.2	1000.0	1000.000	114.6	H	221.0	1.8	22.7	73.9
3655.600000	53.4	1000.0	1000.000	99.6	V	112.0	5.7	20.5	73.9
4873.133333	61.3	1000.0	1000.000	141.5	V	145.0	7.8	12.6	73.9
11080.233333	58.0	1000.0	1000.000	169.5	H	132.0	16.5	15.9	73.9
17051.066667	64.1	1000.0	1000.000	249.3	V	20.0	23.4	9.8	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)
1000.000000	38.9	1000.0	1000.000	251.3	V	-16.0	-1.0	15.0	53.9
1932.366667	37.3	1000.0	1000.000	114.6	H	221.0	1.8	16.6	53.9
3655.600000	44.5	1000.0	1000.000	99.6	V	112.0	5.7	9.4	53.9
4873.133333	45.2	1000.0	1000.000	141.5	V	145.0	7.8	8.7	53.9
11080.233333	44.5	1000.0	1000.000	169.5	H	132.0	16.5	9.4	53.9
17051.066667	51.3	1000.0	1000.000	249.3	V	20.0	23.4	2.6	53.9

Test Notes: Measurement was performed with a 2.4GHz notch filter. No significant emissions observed above 6GHz. Measurements above 6GHz are noise floor figures.

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



Peak Data

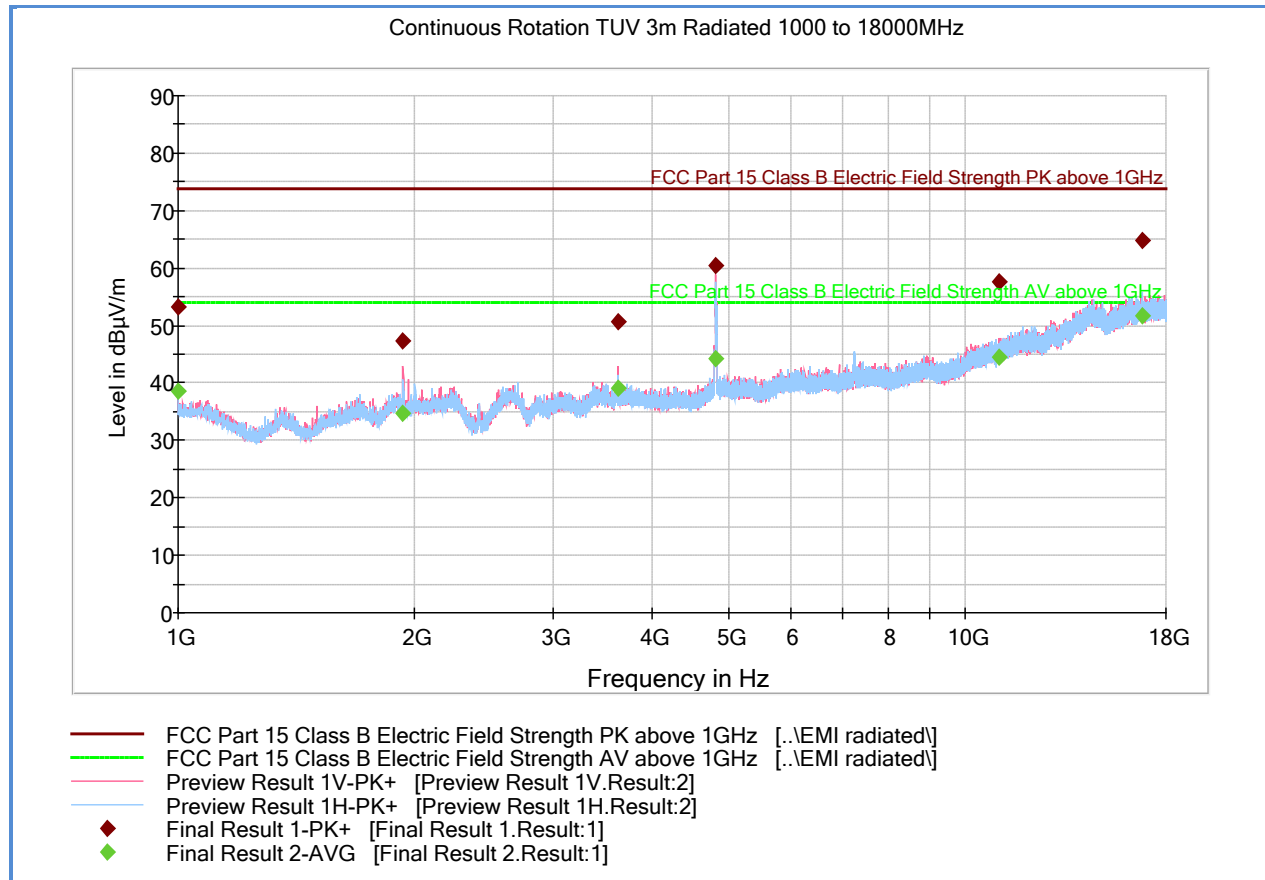
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.000000	53.3	1000.0	1000.000	177.5	H	20.0	-1.0	20.6	73.9
1932.133333	54.9	1000.0	1000.000	99.6	H	293.0	1.8	19.0	73.9
3693.000000	51.3	1000.0	1000.000	103.6	H	286.0	5.8	22.6	73.9
4922.333333	58.0	1000.0	1000.000	250.3	H	322.0	7.8	15.9	73.9
11100.833333	57.1	1000.0	1000.000	356.1	H	-20.0	16.6	16.8	73.9
17993.000000	65.0	1000.0	1000.000	405.0	H	351.0	23.9	8.9	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)
1000.000000	40.6	1000.0	1000.000	177.5	H	20.0	-1.0	13.3	53.9
1932.133333	40.3	1000.0	1000.000	99.6	H	293.0	1.8	13.6	53.9
3693.000000	41.3	1000.0	1000.000	103.6	H	286.0	5.8	12.6	53.9
4922.333333	43.2	1000.0	1000.000	250.3	H	322.0	7.8	10.7	53.9
11100.833333	44.5	1000.0	1000.000	356.1	H	-20.0	16.6	9.4	53.9
17993.000000	51.9	1000.0	1000.000	405.0	H	351.0	23.9	2.0	53.9

Test Notes: Measurement was performed with a 2.4GHz notch filter. No significant emissions observed above 6GHz. Measurements above 6GHz are noise floor figures.

2.7.19 Test Results Above 1GHz (802.11n HT20 2.4GHz Low Channel)



Peak Data

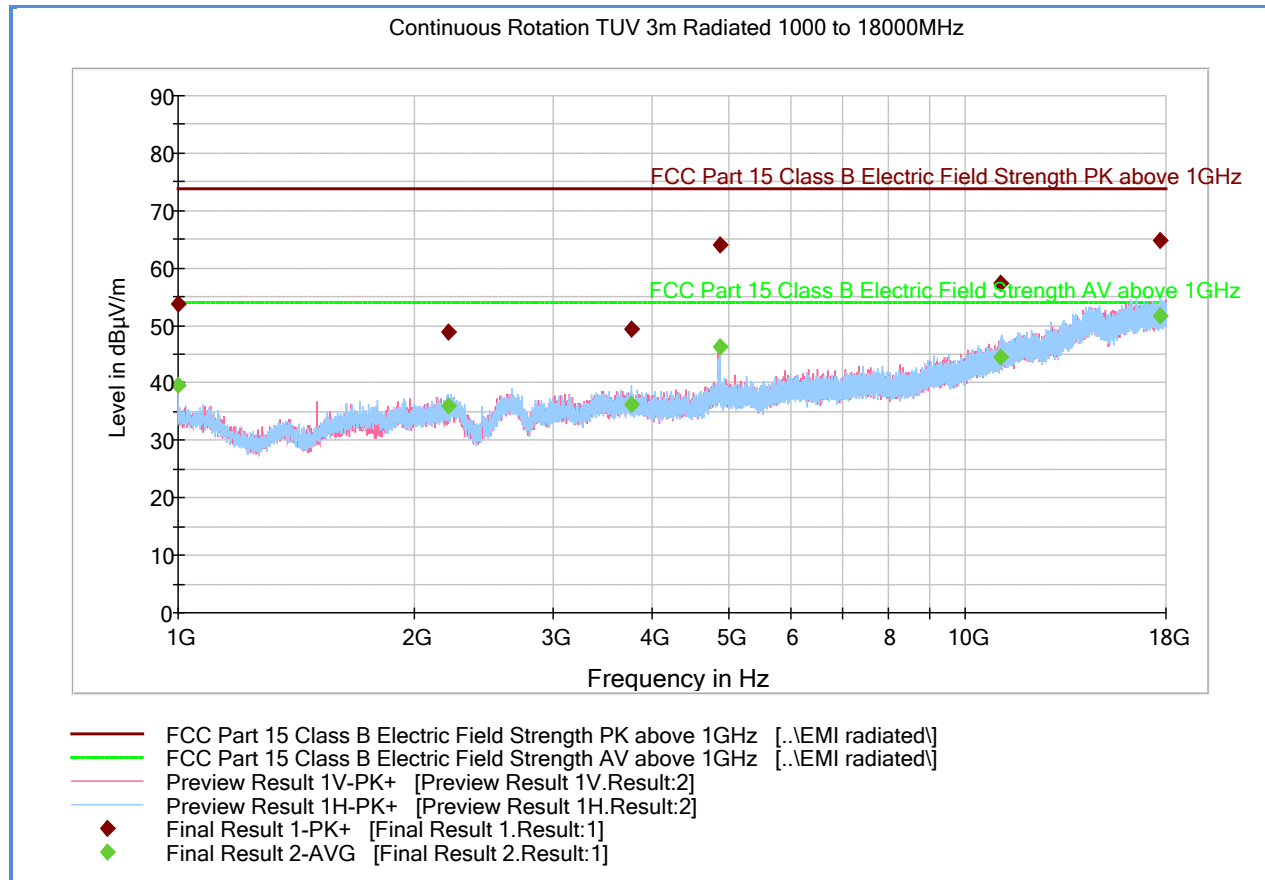
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.400000	53.1	1000.0	1000.000	176.5	V	64.0	-1.1	20.8	73.9
1931.966667	47.2	1000.0	1000.000	184.5	V	156.0	1.8	26.7	73.9
3618.200000	50.5	1000.0	1000.000	102.6	V	56.0	5.8	23.4	73.9
4819.300000	60.4	1000.0	1000.000	148.6	V	24.0	7.8	13.5	73.9
11034.200000	57.6	1000.0	1000.000	187.5	V	23.0	16.4	16.3	73.9
16792.233333	64.9	1000.0	1000.000	401.7	H	319.0	23.4	9.0	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)
1000.400000	38.6	1000.0	1000.000	176.5	V	64.0	-1.1	15.3	53.9
1931.966667	34.8	1000.0	1000.000	184.5	V	156.0	1.8	19.1	53.9
3618.200000	39.0	1000.0	1000.000	102.6	V	56.0	5.8	14.9	53.9
4819.300000	44.2	1000.0	1000.000	148.6	V	24.0	7.8	9.7	53.9
11034.200000	44.5	1000.0	1000.000	187.5	V	23.0	16.4	9.4	53.9
16792.233333	51.8	1000.0	1000.000	401.7	H	319.0	23.4	2.1	53.9

Test Notes: Measurement was performed with a 2.4GHz notch filter. No significant emissions observed above 6GHz. Measurements above 6GHz are noise floor figures.

2.7.20 Test Results Above 1GHz (802.11n HT20 2.4GHz Mid Channel)



Peak Data

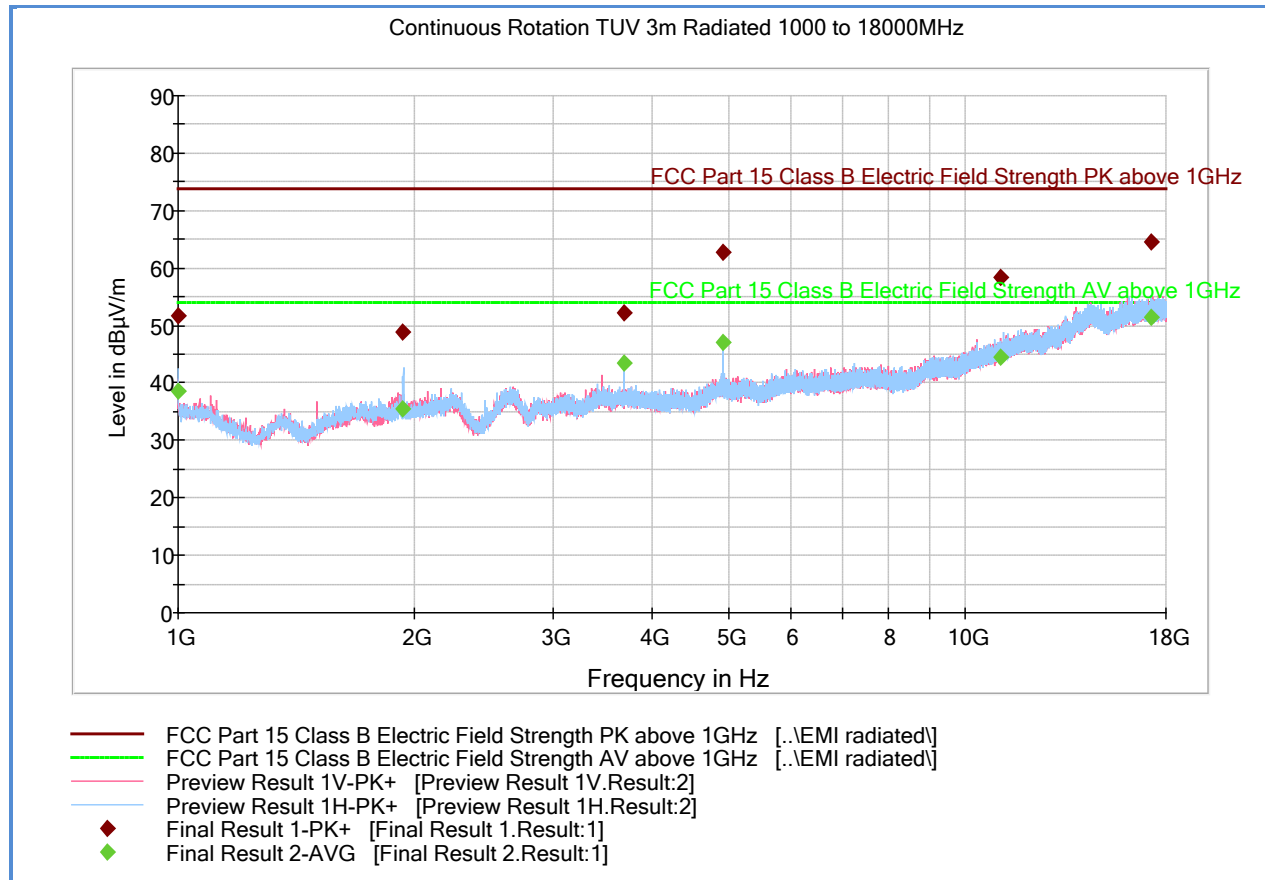
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.400000	53.7	1000.0	1000.000	175.5	H	16.0	-1.1	20.2	73.9
2207.400000	48.9	1000.0	1000.000	99.6	H	357.0	2.2	25.0	73.9
3767.433333	49.3	1000.0	1000.000	239.3	H	16.0	5.8	24.6	73.9
4875.666667	63.9	1000.0	1000.000	197.4	H	16.0	7.8	10.0	73.9
11071.166667	57.3	1000.0	1000.000	401.7	H	0.0	16.5	16.6	73.9
17694.233333	64.8	1000.0	1000.000	100.6	H	357.0	23.4	9.1	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)
1000.400000	39.6	1000.0	1000.000	175.5	H	16.0	-1.1	14.3	53.9
2207.400000	35.9	1000.0	1000.000	99.6	H	357.0	2.2	18.0	53.9
3767.433333	36.3	1000.0	1000.000	239.3	H	16.0	5.8	17.6	53.9
4875.666667	46.2	1000.0	1000.000	197.4	H	16.0	7.8	7.7	53.9
11071.166667	44.5	1000.0	1000.000	401.7	H	0.0	16.5	9.4	53.9
17694.233333	51.7	1000.0	1000.000	100.6	H	357.0	23.4	2.2	53.9

Test Notes: Measurement was performed with a 2.4GHz notch filter. No significant emissions observed above 6GHz. Measurements above 6GHz are noise floor figures.

2.7.21 Test Results Above 1GHz (802.11n HT20 2.4GHz 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	51.6	1000.0	1000.000	300.6	H	265.0	-1.0	22.3	73.9
1932.533333	48.8	1000.0	1000.000	104.6	H	137.0	1.8	25.1	73.9
3693.200000	52.1	1000.0	1000.000	99.6	V	121.0	5.8	21.8	73.9
4925.700000	62.8	1000.0	1000.000	103.6	H	120.0	7.9	11.1	73.9
11087.466667	58.3	1000.0	1000.000	100.6	V	349.0	16.5	15.6	73.9
17246.166667	64.5	1000.0	1000.000	289.2	H	-15.0	23.1	9.4	73.9

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.000000	38.6	1000.0	1000.000	300.6	H	265.0	-1.0	15.3	53.9
1932.533333	35.4	1000.0	1000.000	104.6	H	137.0	1.8	18.5	53.9
3693.200000	43.6	1000.0	1000.000	99.6	V	121.0	5.8	10.3	53.9
4925.700000	47.0	1000.0	1000.000	103.6	H	120.0	7.9	6.9	53.9
11087.466667	44.5	1000.0	1000.000	100.6	V	349.0	16.5	9.4	53.9
17246.166667	51.5	1000.0	1000.000	289.2	H	-15.0	23.1	2.4	53.9

Test Notes: Measurement was performed with a 2.4GHz notch filter. No significant emissions observed above 6GHz. Measurements above 6GHz are noise floor figures.



2.8 RADIATED BAND EDGE MEASUREMENTS AND IMMEDIATE RESTRICTED BANDS

2.8.1 Specification Reference

Part 15 Subpart C §15.247(d)

2.8.2 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)).

2.8.3 Equipment Under Test and Modification State

Serial No: P41500003 / Test Configuration B

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

January 21 and 22, 2014/FSC

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

2.8.7 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.
- Only worst-case WiFi mode presented (802.11 n HT20 2.4GHz and 802.11 b).



- 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 2.8.8 for sample computation.

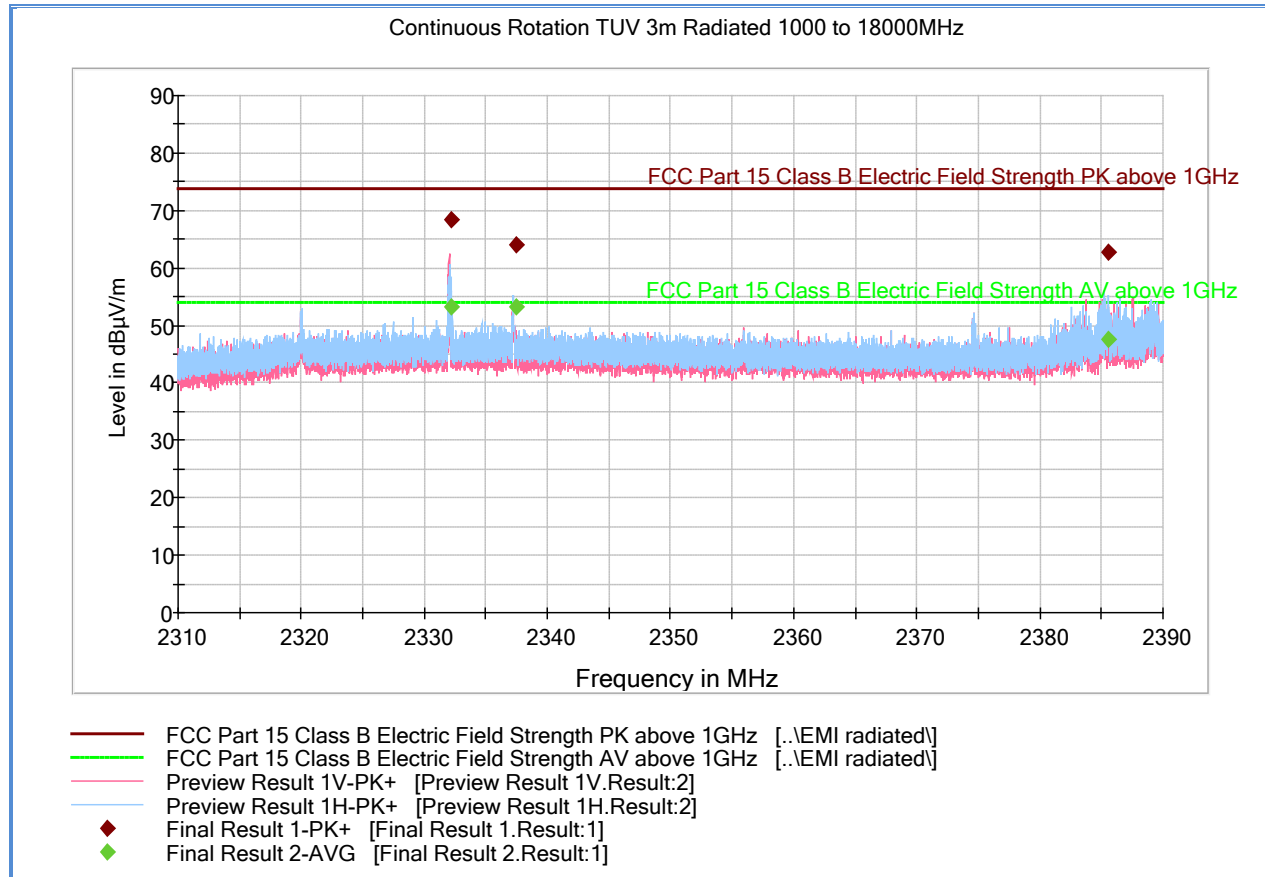
2.8.8 Sample Computation (Radiated Emission)

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 (dbμV/m) @ 2400 MHz			53.5

2.8.9 Test Results

See attached plots.

2.8.10 Test Results Restricted Band 2310MHz to 2490MHz (802.11 b Low Channel)



Peak Data

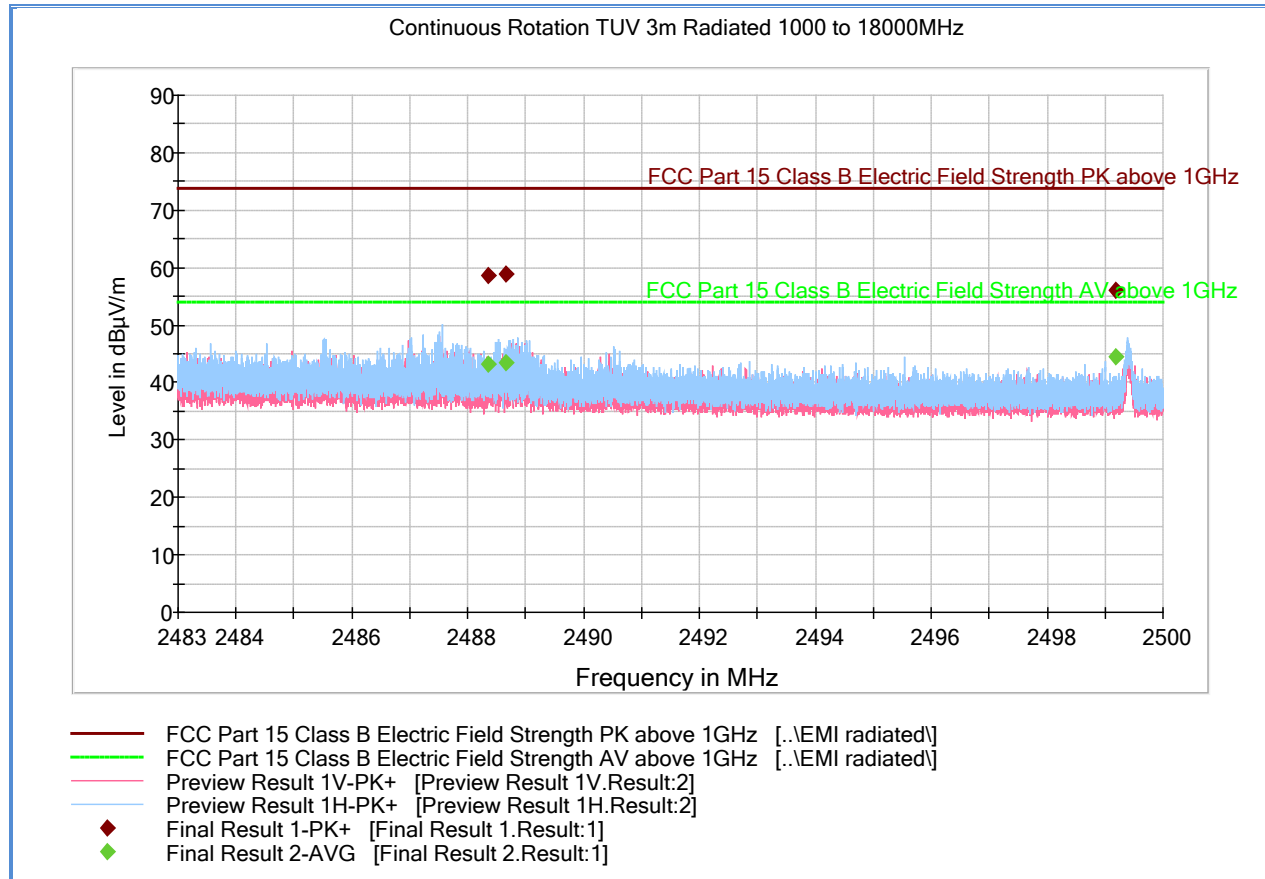
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
2332.213333	68.3	1000.0	1000.000	247.3	V	304.0	2.3	5.6	73.9
2337.408000	64.1	1000.0	1000.000	102.6	H	238.0	2.3	9.8	73.9
2385.597333	62.7	1000.0	1000.000	114.6	H	258.0	2.4	11.2	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)
2332.213333	53.3	1000.0	1000.000	247.3	V	304.0	2.3	0.6	53.9
2337.408000	53.2	1000.0	1000.000	102.6	H	238.0	2.3	0.7	53.9
2385.597333	47.7	1000.0	1000.000	114.6	H	258.0	2.4	6.2	53.9

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

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



Peak Data

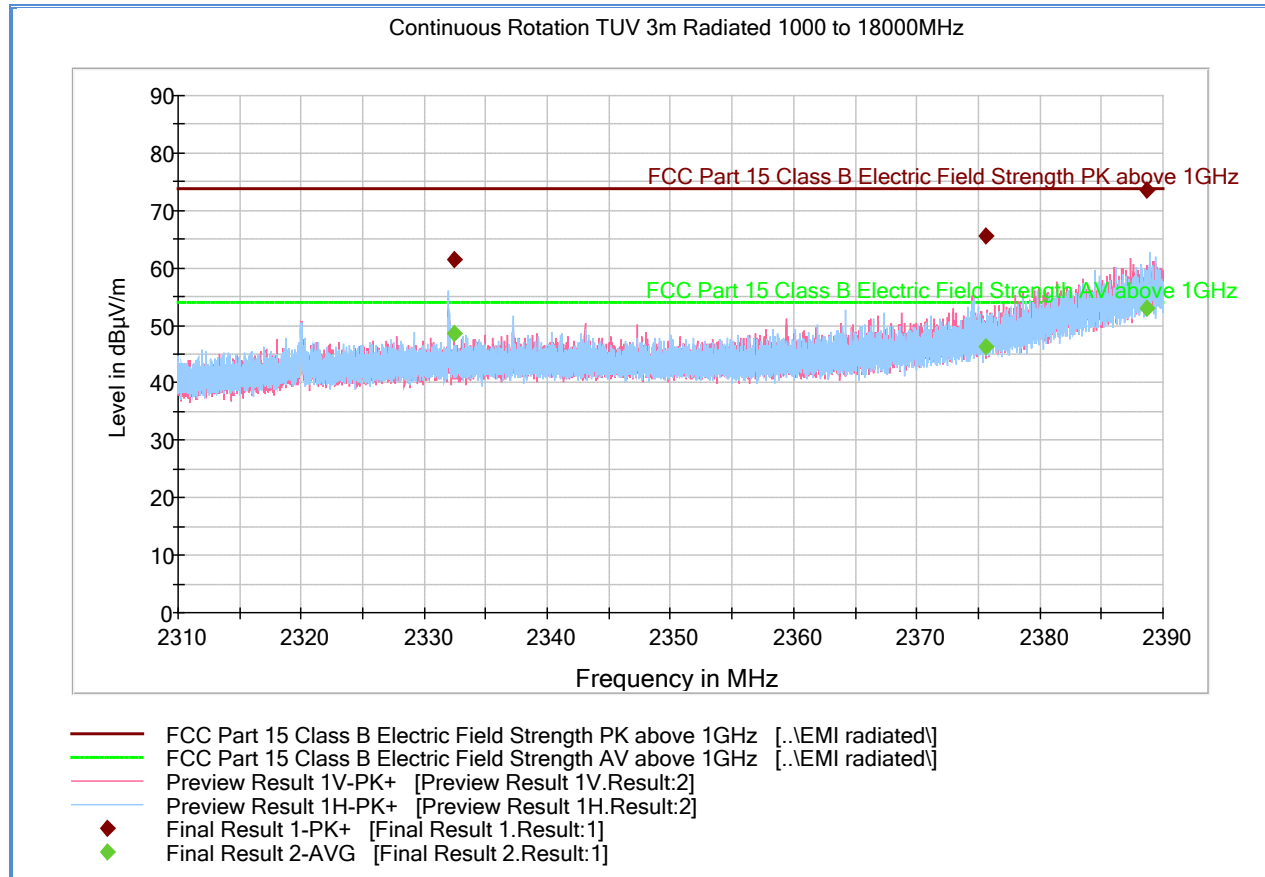
Frequency (MHz)	MaxPeak (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
2488.352600	58.6	1000.0	1000.000	100.6	H	246.0	2.4	15.3	73.9
2488.653667	58.9	1000.0	1000.000	101.6	H	264.0	2.4	15.0	73.9
2499.195367	55.9	1000.0	1000.000	99.6	H	265.0	2.4	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)
2488.352600	43.3	1000.0	1000.000	100.6	H	246.0	2.4	10.6	53.9
2488.653667	43.4	1000.0	1000.000	101.6	H	264.0	2.4	10.5	53.9
2499.195367	44.6	1000.0	1000.000	99.6	H	265.0	2.4	9.3	53.9

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

2.8.12 Test Results Restricted Band 2310MHz to 2490MHz (Low Channel Worst Case WiFi Mode)



Peak Data

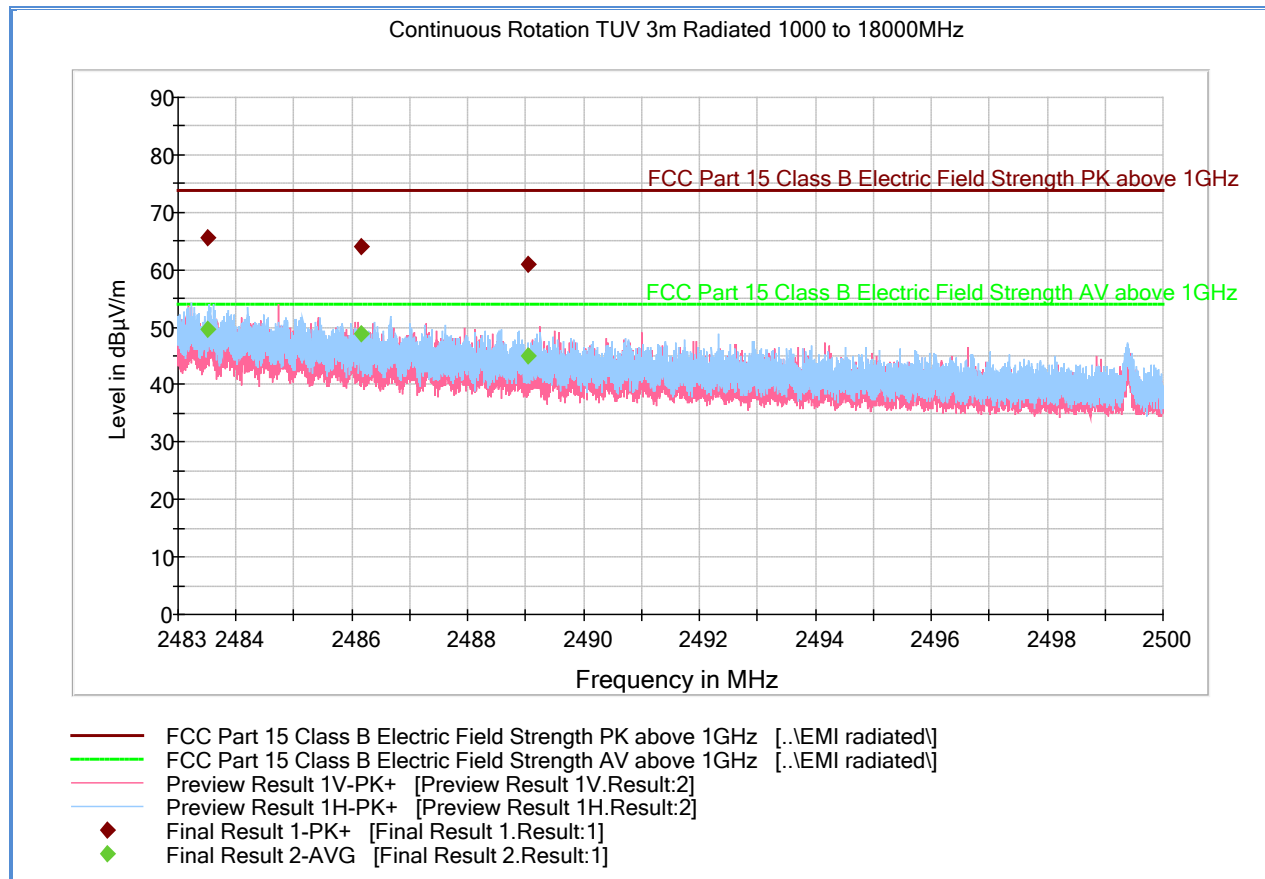
Frequency (MHz)	MaxPeak (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
2332.402667	61.5	1000.0	1000.000	114.6	H	164.0	2.3	12.4	73.9
2375.570667	65.5	1000.0	1000.000	148.6	V	154.0	2.4	8.4	73.9
2388.709333	73.6	1000.0	1000.000	142.6	H	164.0	2.4	0.3	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)
2332.402667	48.5	1000.0	1000.000	114.6	H	164.0	2.3	5.4	53.9
2375.570667	46.4	1000.0	1000.000	148.6	V	154.0	2.4	7.5	53.9
2388.709333	53.1	1000.0	1000.000	142.6	H	164.0	2.4	0.8	53.9

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

2.8.13 Test Results Restricted Band 2483.5MHz to 2500MHz (High Channel Worst Case WiFi 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)
2483.500000	65.6	1000.0	1000.000	99.6	H	232.0	2.4	8.3	73.9
2486.157833	64.1	1000.0	1000.000	101.6	H	232.0	2.4	9.8	73.9
2489.037867	60.9	1000.0	1000.000	100.6	V	323.0	2.4	13.0	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)
2483.500000	49.7	1000.0	1000.000	99.6	H	232.0	2.4	4.2	53.9
2486.157833	48.9	1000.0	1000.000	101.6	H	232.0	2.4	5.0	53.9
2489.037867	45.1	1000.0	1000.000	100.6	V	323.0	2.4	8.8	53.9

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



2.9 POWER SPECTRAL DENSITY

2.9.1 Specification Reference

Part 15 Subpart C §15.247(e)

2.9.2 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.

2.9.3 Equipment Under Test and Modification State

Serial No: P41500008 / Test Configuration A

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

January 23, 2014/FSC

2.9.5 Test Equipment Used

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

2.9.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	17.9°C
Relative Humidity	30.0.%
ATM Pressure	99.8 kPa

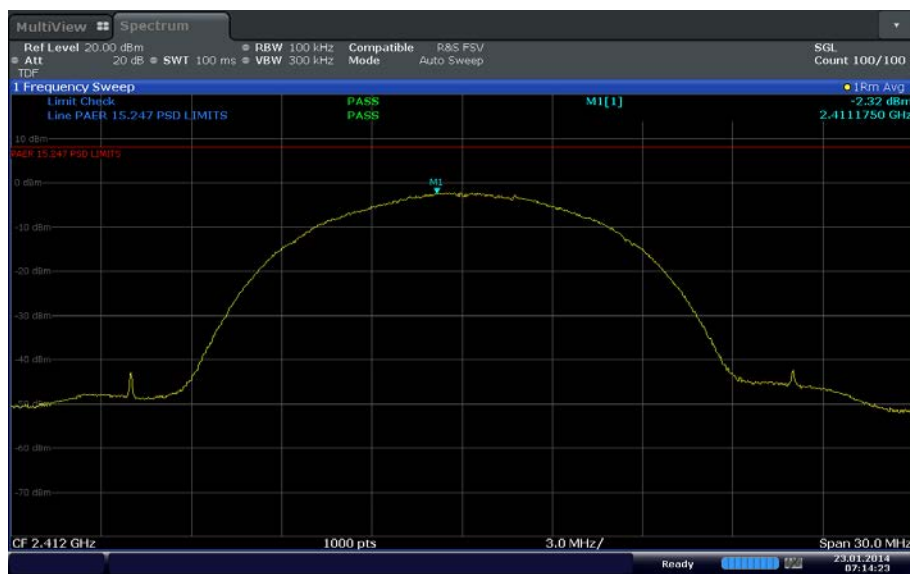
2.9.7 Additional Observations

- This is a conducted test.
- Test procedure is per Section 10.3 of KDB 558074 (April 09, 2013).
- A transducer factor (TDF) was added to compensate for the external attenuator and cable used.
- Detector is RMS power averaging.
- Trace averaging mode over 100 traces.
- Sweep time is Auto Couple.
- EUT complies with 100 kHz RBW.

2.9.8 Test Results Summary

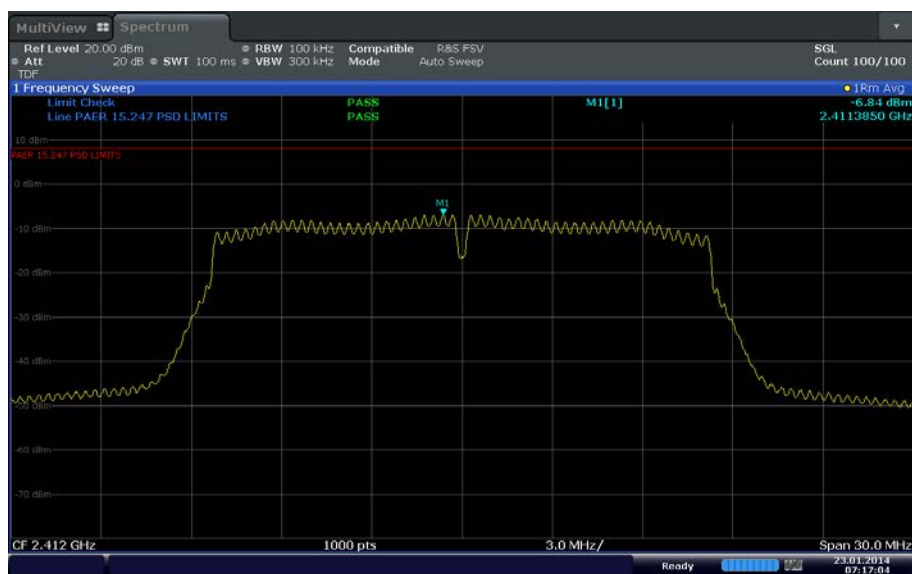
Mode	Channel	Marker Reading using 100 kHz RBW (dBm)	PSD Limit (dBm)	Margin (dB)	Compliance
802.11b	1 (2412 MHz)	-2.32	8	10.32	Complies
	6 (2437 MHz)	-2.67	8	10.67	Complies
	11 (2462 MHz)	-3.07	8	11.07	Complies
802.11g	1 (2412 MHz)	-6.84	8	14.84	Complies
	6 (2437 MHz)	-7.33	8	15.33	Complies
	11 (2462 MHz)	-7.64	8	15.64	Complies
802.11n HT20	1 (2412 MHz)	-8.25	8	16.25	Complies
	6 (2437 MHz)	-8.76	8	16.76	Complies
	11 (2462 MHz)	-9.19	8	17.19	Complies

2.9.9 Test Results Plots



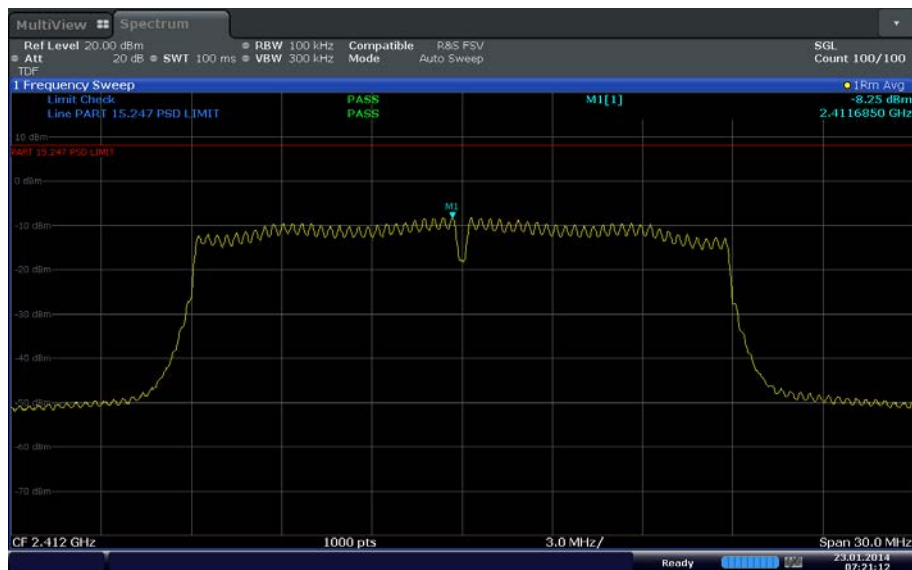
Date: 23 JAN 2014 07:14:23

802.11b Worst Case Channel



Date: 23 JAN 2014 07:17:04

802.11g Worst Case Channel



Date: 23 JAN 2014 07:21:12

802.11n HT20 Worst Case Channel



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						
7569	Series Power Meter	N1911A P-	MY45100625	Agilent	04/15/13	04/15/14
7570	50MHz-18GHz Wideband Power Sensor	N1921A	MY45240588	Agilent	05/06/13	05/06/14
7582	Signal/Spectrum Analyzer	FSW26	101614	Rhode & Schwarz	11/19/13	11/19/14
1189	Signal Generator	8648C	3623A03059	Hewlett Packard	08/06/13	08/06/14
8825	20dB Attenuator	46-20-34	BK5773	Weinschel Corp.	Verified by 1189 and 7582	
Radiated Test Setup						
1033	Bilog Antenna	3142C	00044556	EMCO	06/25/13	06/25/14
7575	Double-ridged waveguide horn antenna	3117	00155511	EMCO	03/25/13	03/25/14
8628	Pre-amplifier	QLJ 01182835-JO	8986002	QuinStar Technologies Inc.	09/03/13	09/03/14
1150	Horn antenna	3160-09	012054-004	ETS	04/26/13	04/26/15
1151	Pre-amplifier	TS-PR26	100026	Rhode & Schwarz	05/02/13	05/02/14
1051	Double-ridged waveguide horn antenna	3115	9408-4329	EMCO	06/11/13	06/11/14
8760	Pre-amplifier	ZKL-2	1001	Mini-Circuits	09/03/13	09/03/14
1153	High-frequency cable	SucoFlex 100 SX	N/A	Suhner	09/03/13	09/03/14
8543	High-frequency cable	Micropore 19057793	N/A	United Microwave Products	09/03/13	09/03/14
1040	EMI Test Receiver	ESIB40	100292	Rhode & Schwarz	07/31/13	07/31/14
1049	EMI Test Receiver	ESU	100133	Rhode & Schwarz	07/24/13	07/24/14
6815	2.4GHz Band Notch Filter	BRM50702	008	Micro-Tronics	Verified by 1189 and 7582	
1016	Pre-amplifier	PAM-0202	187	PAM	10/08/13	10/08/14
Miscellaneous						
6452	Multimeter	3478A	2911A52177	Hewlett Packard	08/02/13	08/02/14
7554	Barometer/Temperature /Humidity Transmitter	iBTHX-W	0400706	Omega	04/17/13	04/17/14
1123	DC Power Supply	E3631A	N/A	Hewlett Packard	Verified by 6452	
	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

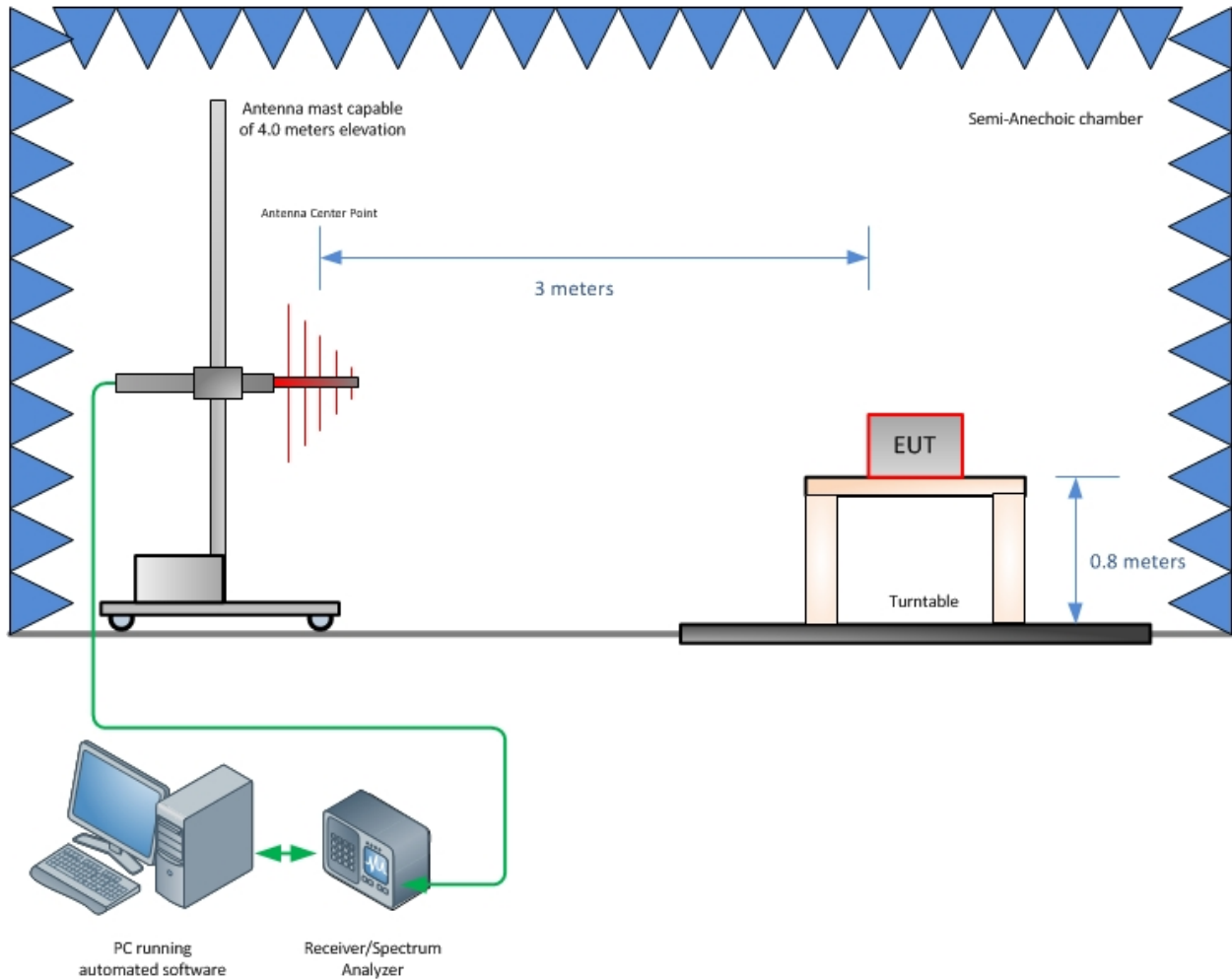
Contribution		Probability Distribution Type	Probability Distribution x_i	Standard Uncertainty $u(x_i)$	$[u(x_i)]^2$
1	Receiver/Spectrum Analyzer	Rectangular	0.57	0.33	0.11
2	Cables	Rectangular	0.50	0.29	0.08
3	EUT Setup	Rectangular	1.00	0.58	0.33
Combined Uncertainty (u_c):					0.72
Coverage Factor (k):					2
Expanded Uncertainty:					1.45



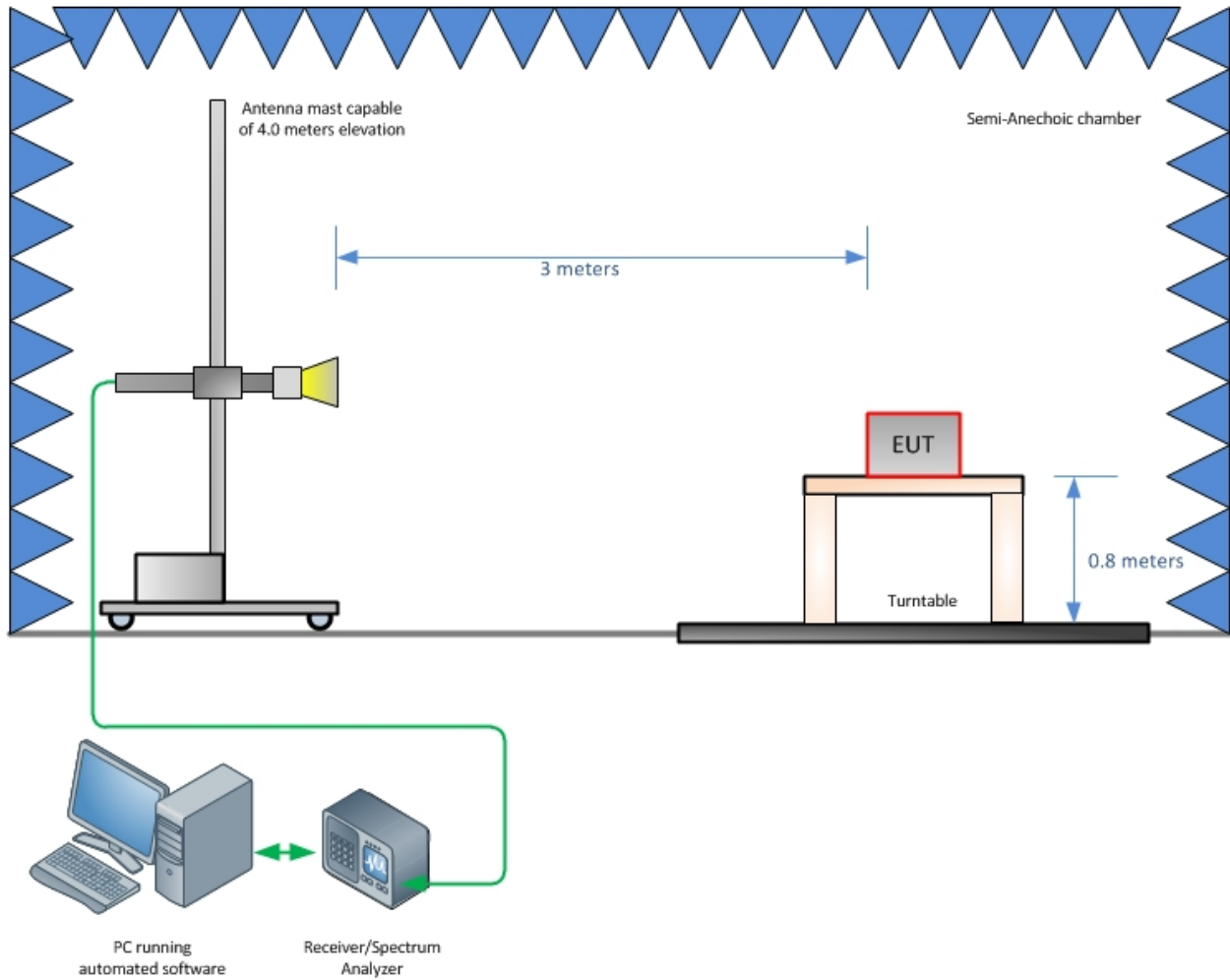
SECTION 4

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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