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Report On

Application for Grant of Equipment Authorization of the
Intersections Inc.
Voyce Band Digital Collar

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

Report No. DI1403643A November 2014

REPORT ON	Radio Testing of the Intersections Inc. Digital Collar
TEST REPORT NUMBER	DI1403643A
PREPARED FOR	Intersections Inc. 3800 Concorde Pkwy. Ste. 400 Chantilly, VA 20151
CONTACT PERSON	Paul Tupin Director, Product Management (571) 328-7943 ptupin@i4cinnovations.com
PREPARED BY	Ferdinand S. Custodio **Name** Authorized Signatory Title: EMC/Senior Wireless Test Engineer
APPROVED BY	Chip R. Fleury **Name** Authorized Signatory
DATED	November 17, 2014

Revision History

DI1403643A Intersections Inc. Voyce Band Digital Collar					
DATE	OLD REVISION	NEW REVISION	REASON	PAGES AFFECTED	APPROVED BY
11/17/2014	Initial Release				Chip R. Fleury

CONTENTS

TÜV SÜD AMERICA INC 10040 Mesa Rim Road San Diego, CA 92121-2912 Phone: 858 678 1400 FAX: 858 546 0364

SECTION 1

REPORT SUMMARY

Radio Testing of the
Intersections Inc.
Digital Collar

1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Intersections Inc**.** Voyce Band Digital Collar 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	Intersections Inc.
Model Number(s)	X-100
FCC ID Number	2ACMJ-X100
IC Number	N/A
Serial Number(s)	N/A (Sample #1) Conducted antenna service port testing sample, serial number not available. This is a board only sample / 1017 (Radiated testing - Sample #2) BVBIDIAG2B (Radiated testing - Sample #3)
Number of Samples Tested	3
Test Specification/Issue/Date	• FCC Part 15 Subpart C §15.247 (October 1, 2013). • RSS-210 - Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment (Issue 8, December 2010). • RSS-Gen - General Requirements for Compliance of Radio Apparatus (Issue 4, November 2014). • 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	May 14, 2014
Finish of Test	June 19, 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 8.8	Conducted Emissions	Compliant	
2.3		RSS-Gen 6.6	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 7.1	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	

1.3 PRODUCT INFORMATION

1.3.1 Technical Description

The Equipment Under Test (EUT) was an Intersections Inc. Voyce Band Digital Collar as shown in the photograph below. The EUT is a wearable tech for dogs. The EUT allows owners to track their dog's location, behavior and health all through an app interface. The EUT can also monitor a dog's heart and respiratory rates. The EUT utilizes UWB, 802.11 and Bluetooth radio functions. Only the 802.11 b, g, n (20MHz) and Bluetooth LE functions were verified in this test report.

Equipment Under Test

1.3.2 EUT General Description

EUT Description	Digital Collar
Model Name	Voyce Band
Model Number(s)	X-100
Rated Voltage	Internal 3.7VDC Li-Ion Polymer Battery 680 mAh (EVE Energy CO.,LTD P0470-LF (602447)), USB wall charger is Rocketfish Mobile Model: RF-AC1U2M, output is 5.0VDC 2.4A.
Mode Verified	802.11 b/g/n and BT LE
Capability	802.11 b/g/n WLAN (DTS), UWB and Bluetooth 4.0
Primary Unit (EUT)	☒ Production
	☐ Pre-Production
	☐ Engineering
Antenna Type	2.4GHz Bluetooth/Wi-Fi Embedded Antenna
Antenna Gain	0.5dBi

1.3.3 Maximum Conducted Output Power

Mode	Frequency Range (MHz)	Output Power (dBm)	Output Power (mW)
802.11b	2412-2462	18.39	69.0
802.11g	2412-2462	16.48	44.5
802.11 n (ht20)	2412-2462	16.10	40.7
Bluetooth LE	2402-2480	7.10	5.13

1.4 EUT TEST CONFIGURATION

1.4.1 Test Configuration Description

Test Configuration	Description
A	Antenna conducted port test configuration. A "board only" sample was provided for this setup. The integral antenna was removed and replaced by a short test cable with SMA connector. For Wi-Fi testing, RF configurations were controlled via USB using Tera Term. For Bluetooth LE testing, the EUT is connected to a CMW500. RF configurations were controlled using the call box.
B	Charging Mode. The EUT does not transmit when charging using the supplied docking station. This mode was used for AC conducted emissions test. A typical sealed unit sample was used for this test.
C	Radiated emissions test configuration. Identical programming procedure as Test Configuration A. A sealed sample with special USB interface board (for programming) was provided for this setup.

1.4.2 EUT Exercise Software

The sample verified for each test configuration has its own test firmware loaded provided by the manufacturer. The test firmware allows interface with the EUT using Tera Term terminal emulator application via USB connection. For Bluetooth LE verification, the firmware allows communication and control functions using a CMW500 Wideband Communication Tester.

1.4.3 Support Equipment and I/O cables

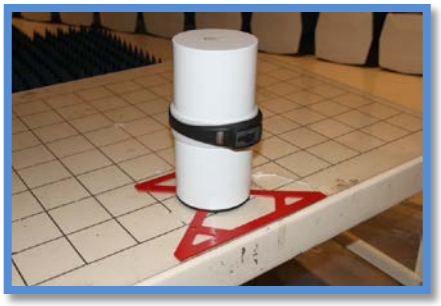
Manufacturer	Equipment/Cable	Description
HP	Support Laptop	Elitebook 8440p S/N CND1042K06
Rocketfish Mobile	USB Wall Charger	Model RF-AC1U2M
Speag	Phantom Canine Neck	Dog Neck P/N:QD DOG 001 BA S/N: 1000
I4C Innovations	USB Docking Station	S/N BVB1037C
	USB cable (2x)	Shielded, 1.0m USB cable (Type A to micro-B)

1.4.4 Worst Case Configuration

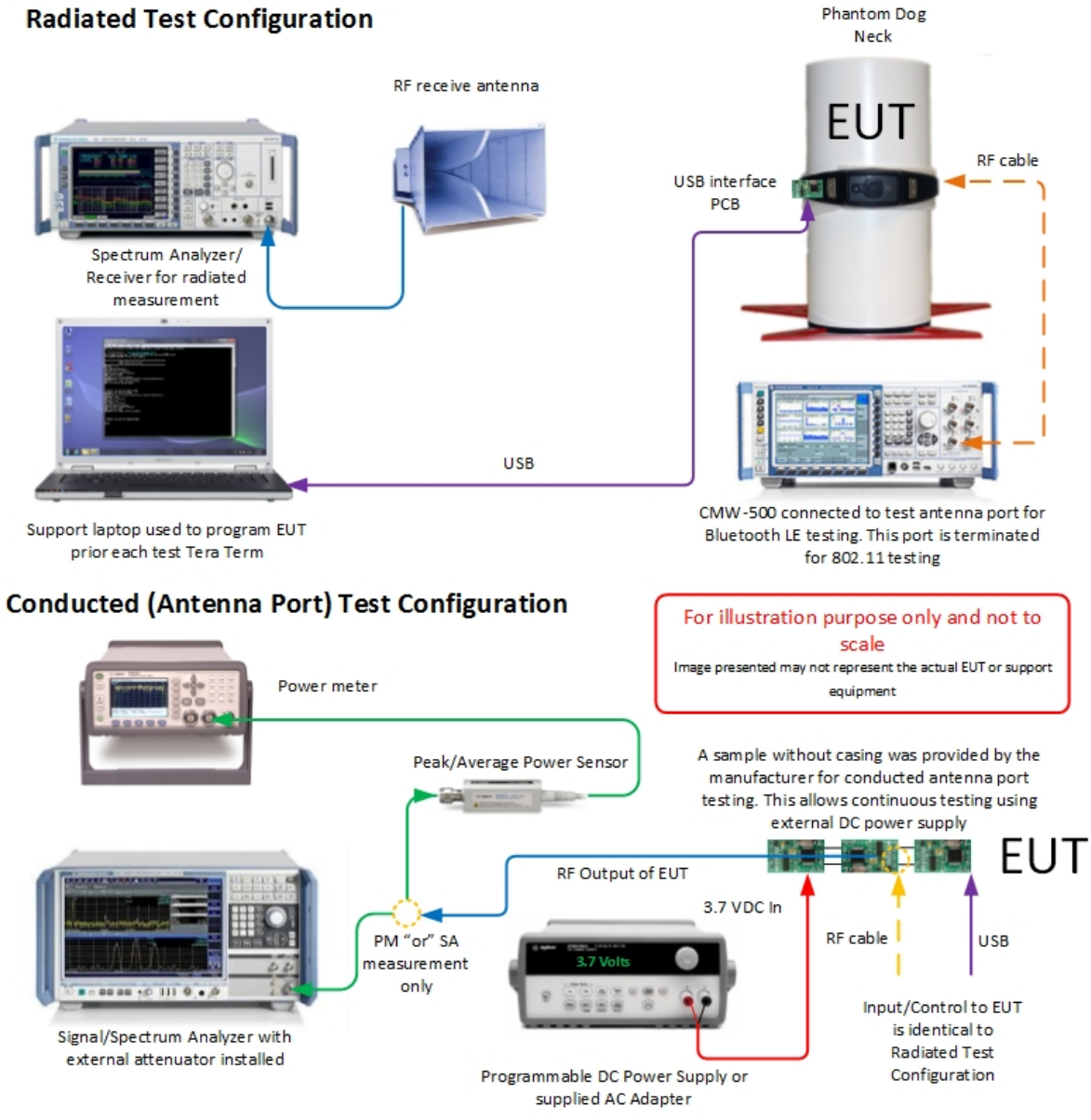
Worst-case configuration used in this test report as per maximum conducted output power measurements:

Mode	Channel	Data Rate
802.11b	1 (Low Channel)	1Mbps
802.11g	11 (High Channel)	6Mbps
802.11 n (ht20)	11 (High Channel)	58.5Mbps (mcs 6)
Bluetooth LE	37 (Low Channel)	1Mbps

EUT is a mobile device. For radiated measurements, the EUT was verified representing typical usage; the EUT was mounted on a canine phantom neck with 0.635cm separation.



1.4.5 Simplified Test Configuration Diagram



1.5 DEVIATIONS FROM THE STANDARD

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

1.6 MODIFICATION RECORD

Description of Modification	Modification Fitted By	Date Modification Fitted
Serial Number N/A (Sample #1) Antenna port conducted sample/1017 (Sample #2)/BVBIDIAG2B (Sample #3)		
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 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.

TÜV SÜD AMERICA INC 10040 Mesa Rim Road San Diego, CA 92121-2912 Phone: 858 678 1400 FAX: 858 546 0364

SECTION 2

TEST DETAILS

Radio Testing of the
Intersections Inc.
Digital Collar

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: N/A (Sample #1) / Test Configuration A

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

June 02 and 03, 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 performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	24.3°C
Relative Humidity	50.5%
ATM Pressure	98.9 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 20.9dB (27.4dB for Bluetooth with CMW500) 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 were satisfied.
- Test Program Power Settings as recommended by the manufacturer were: 18dBm for 802.11b, 15dBm for 802.11g and 15dBm for 802.11n
- 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**	**18.39**	**24.15**
		2	17.88	20.37
		5.5	17.82	20.3
		11	17.38	19.96
	6 (2437 MHz)	1	17.53	20.05
		2	17.2	19.76
		5.5	17.23	19.76
		11	17.03	19.62
	11 (2462 MHz)	1	17.83	20.43
		2	17.59	20.1
		5.5	17.06	19.58
		11	17.13	19.85
802.11g	1 (2412 MHz)	6	14.64	24.15
		9	14.58	23.52
		12	14.94	24
		18	14.82	23.52
		24	14.77	24.3
		36	14.65	23.91
		48	14.65	23.56
		54	14.49	23.72
	6 (2437 MHz)	6	15.23	24.31
		9	15.36	23.72
		12	14.7	23.77
		18	14.64	23.36
		24	14.48	23.94
		36	14.8	23.88
		48	15.12	23.69

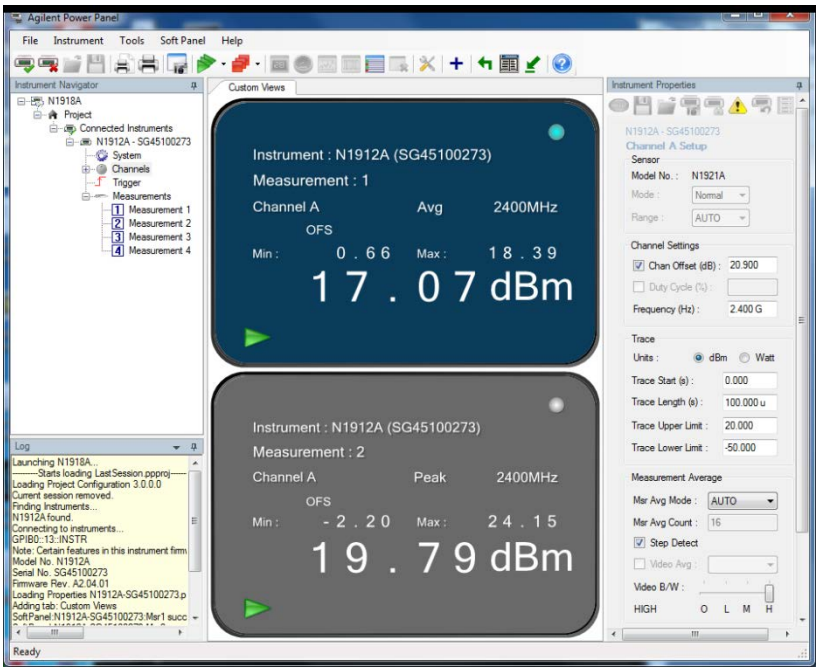
WLAN Mode	Channel	Data Rates (Mbps)	Measured Average Power (dBm)	Measured Peak Power (dBm)
802.11g	6 (2437 MHz)	54	14.69	23.68
	11 (2462 MHz)	**6**	**16.48**	**24.62**
		9	14.38	23.27
		12	14.90	23.74
		18	15.11	23.56
		24	14.88	24.06
		36	14.70	23.74
		48	15.18	23.63
		54	14.90	23.73
802.11n (20 MHz BW)	1 (2412 MHz)	mcs 0 (6.50 Mbps)	13.93	23.68
		mcs 1(13.0 Mbps)	15.94	24.64
		mcs 2(19.5 Mbps)	14.44	23.94
		mcs 3 (26.0 Mbps)	14.51	23.98
		mcs 4 (39.0 Mbps)	14.73	23.94
		mcs 5 (52.0 Mbps)	14.48	23.92
		mcs 6 (58.5 Mbps)	14.38	23.82
		mcs 7 (65.0 Mbps)	14.56	23.87
	6 (2437 MHz)	mcs 0 (6.50 Mbps)	15.94	24.45
		mcs 1(13.0 Mbps)	14.94	24.00
		mcs 2(19.5 Mbps)	14.49	23.71
		mcs 3 (26.0 Mbps)	14.81	23.87
		mcs 4 (39.0 Mbps)	14.61	23.76
		mcs 5 (52.0 Mbps)	14.90	23.97
		mcs 6 (58.5 Mbps)	14.58	23.77
		mcs 7 (65.0 Mbps)	14.54	23.69

WLAN Mode	Channel	Data Rates (Mbps)	Measured Average Power (dBm)	Measured Peak Power (dBm)
802.11n (20 MHz BW)	**11 (2462 MHz)**	mcs 0 (6.50 Mbps)	14.67	23.82
		mcs 1(13.0 Mbps)	14.79	23.93
		mcs 2(19.5 Mbps)	14.85	23.75
		mcs 3 (26.0 Mbps)	15.15	23.98
		mcs 4 (39.0 Mbps)	15.06	23.87
		mcs 5 (52.0 Mbps)	15.82	24.33
		mcs 6 (58.5 Mbps)	**16.10**	**24.40**
		mcs 7 (65.0 Mbps)	14.70	23.66

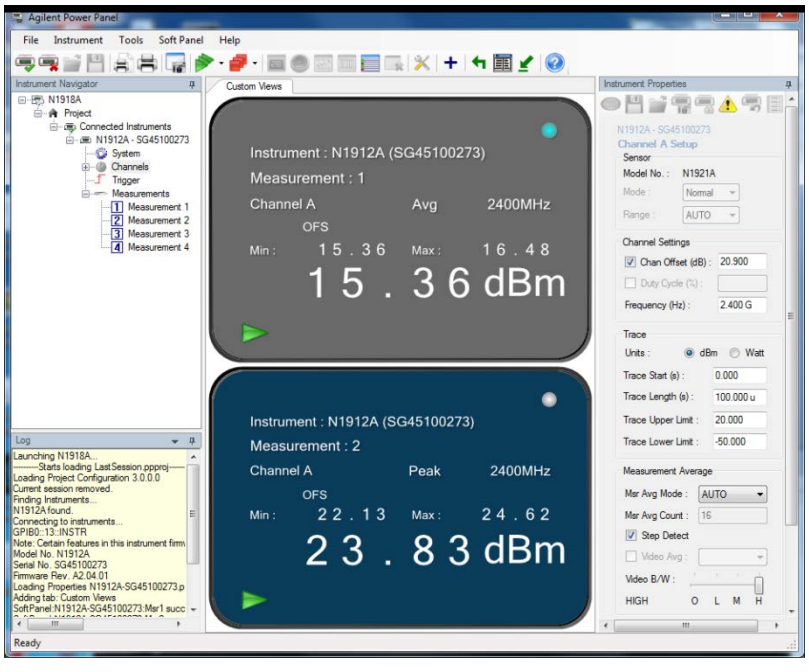
Bluetooth Low Energy (LE)	Channel	Modulation	Measured Average Power (dBm)	Calculated Average Power using 4.88dB correction factor (dBm)	Measured Peak Power (dBm)
	37 (2402 MHz)	GFSK @ 1Mbps and using PRBS9	2.22	7.10	8.84
	17 (2440 MHz)		1.74	6.62	8.23
	39 (2480 MHz)		0.53	5.41	8.24

Test Notes: 4.88dB measurement correction factor is from Section 2.1.10 of this test report. This correction factor is applied to the Average power meter measurement for EUT that can't transmit continuously (>98%) using it's duty cycle information.

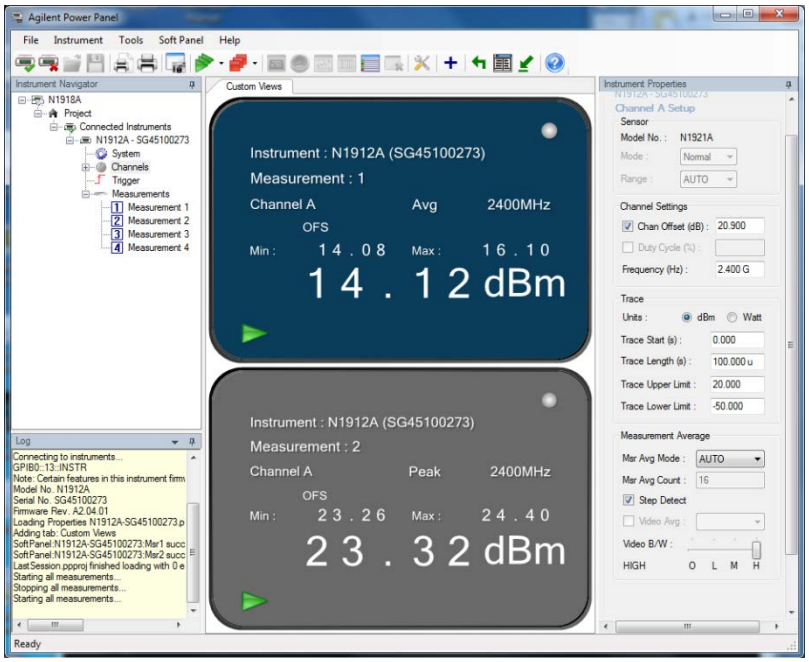
2.1.9 Sample Test Display



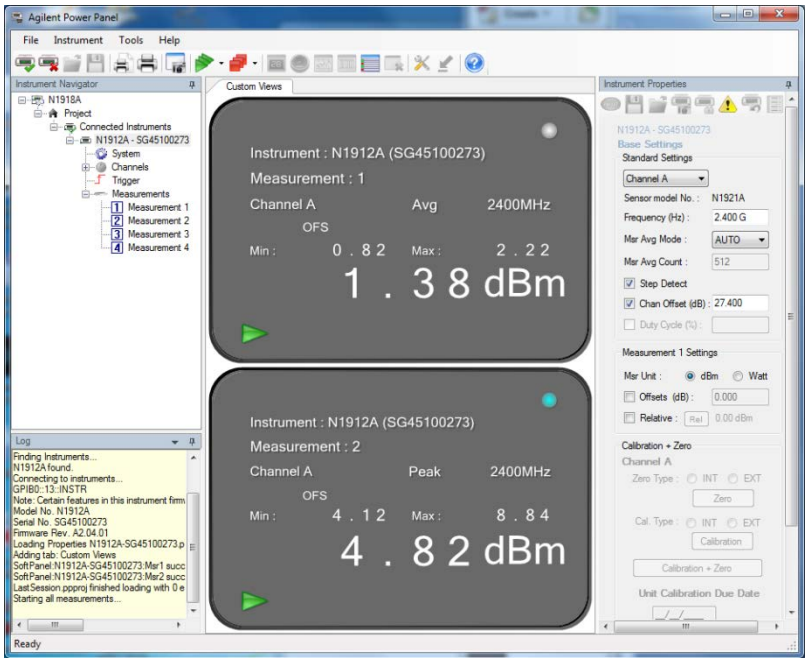
802.11 “b” mode. Low Channel 1Mbps



802.11 “g” mode. High Channel 6Mbps

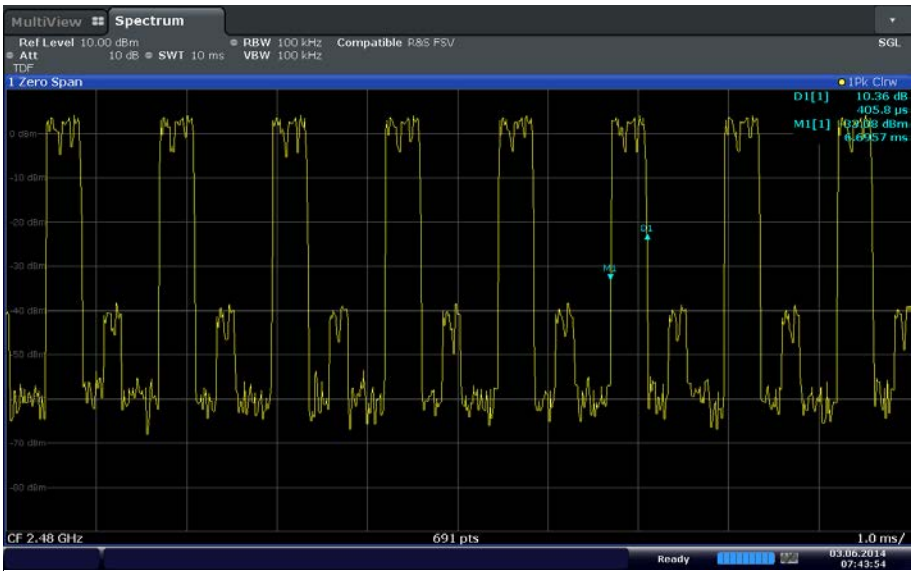


802.11 “n” mode ht20. High Channel 58.5Mbps



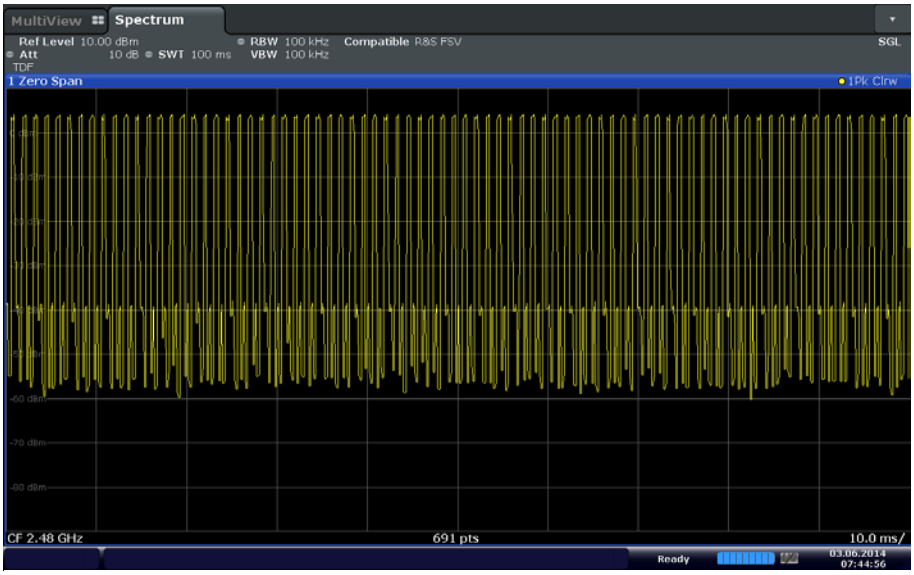
Bluetooth LE. Low Channel 1Mbps

2.1.10 Duty Cycle Measurement Correction Factor for Bluetooth LE



Date: 3.JUN.2014 07:43:54

10ms sweep plot showing 8 packets (406µs wide)



Date: 3.JUN.2014 07:44:56

100ms sweep plot showing 80 packets

Duty Cycle Measurement Factor = 10 log (1/((80x0.406)/100))
= 10 log (1/(32.48/100))
= 10 log (1/0.3248)
= **4.88** (as per Clause 9.2.3.1 (d) of KDB 558074 D01 (DTS Meas Guidance v03r01, April 09, 2013)

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 µH/50 ohms line impedance stabilization network (LISN).

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

**Decreases with the logarithm of the frequency.*

2.2.3 Equipment Under Test and Modification State

Serial No: 1017 / Test Configuration B

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

May 16, 2014/FSC

2.2.5 Test Equipment Used

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

2.2.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	24.9 °C
Relative Humidity	18.4.%
ATM Pressure	99.1 kPa

2.2.7 Additional Observations

- The EUT was verified using the supplied charging cradle.
- Verification performed while the EUT is in Charging Mode.
- 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 2.2.8 for sample computation.

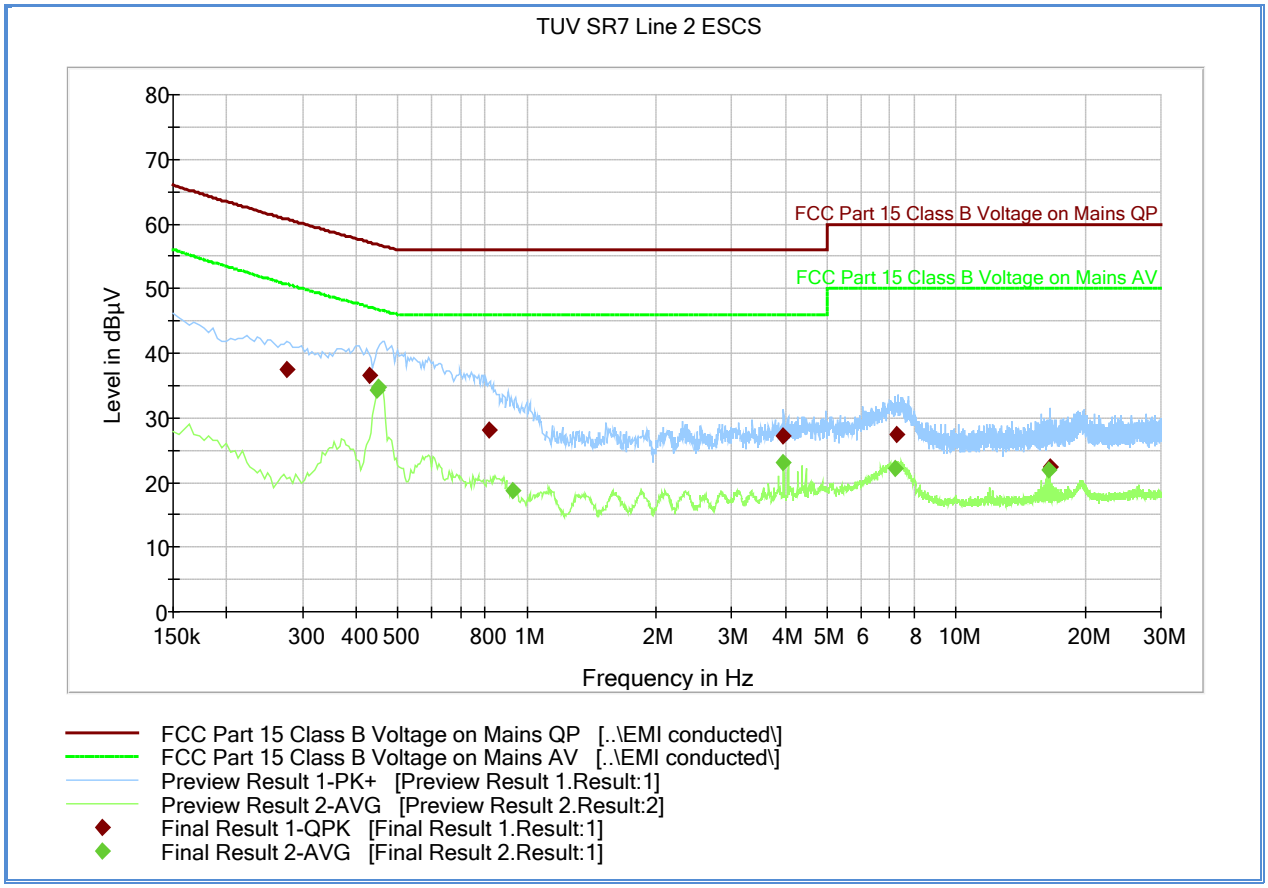
2.2.8 Sample Computation (Conducted Emission – Quasi Peak)

Measuring equipment raw measurement (dbµV) @ 150kHz			5.5
Correction Factor (dB)	Asset# 8607 (20 dB attenuator)	19.9	20.7
	Asset# 1177 (cable)	0.15	
	Asset# 1176 (cable)	0.35	
	Asset# 7567 (LISN)	0.30	
Reported QuasiPeak Final Measurement (dbµV) @ 150kHz			**26.2**

2.2.9 Test Results

Compliant. See attached plots and tables.

2.2.10 FCC Conducted Emissions Line 1 – Hot (Charging Mode)



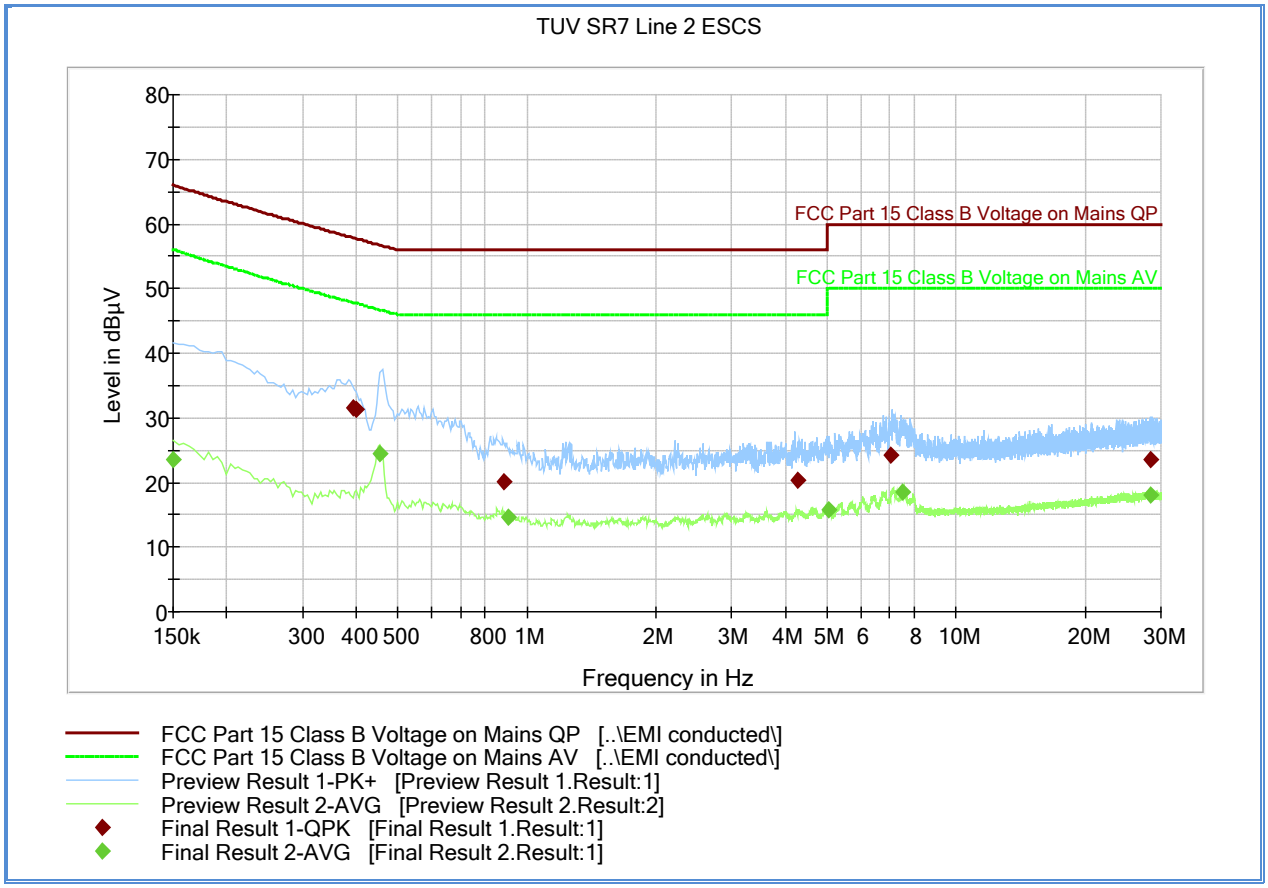
Quasi Peak

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV)
0.276000	37.4	1000.0	9.000	Off	N	20.1	23.3	60.7
0.429000	36.6	1000.0	9.000	Off	N	20.0	20.6	57.2
0.816000	28.2	1000.0	9.000	Off	N	20.1	27.8	56.0
3.961500	27.3	1000.0	9.000	Off	N	20.4	28.7	56.0
7.246500	27.3	1000.0	9.000	Off	N	20.4	32.7	60.0
16.534500	22.3	1000.0	9.000	Off	N	20.8	37.7	60.0

Average

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - Ave (dB)	Limit - Ave (dBµV)
0.447000	34.2	1000.0	9.000	Off	N	20.0	12.7	46.8
0.451500	34.6	1000.0	9.000	Off	N	20.0	12.1	46.8
0.924000	18.7	1000.0	9.000	Off	N	20.0	27.3	46.0
3.961500	23.2	1000.0	9.000	Off	N	20.4	22.8	46.0
7.237500	22.1	1000.0	9.000	Off	N	20.4	27.9	50.0
16.453500	22.0	1000.0	9.000	Off	N	20.8	28.0	50.0

2.2.1 FCC Conducted Emissions Line 2 – Neutral (Charging Mode)



Quasi Peak

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV)
0.393000	31.6	1000.0	9.000	Off	N	20.0	26.2	57.9
0.402000	31.4	1000.0	9.000	Off	N	20.1	26.3	57.7
0.883500	20.1	1000.0	9.000	Off	N	20.0	35.9	56.0
4.263000	20.3	1000.0	9.000	Off	N	20.5	35.7	56.0
7.035000	24.3	1000.0	9.000	Off	N	20.4	35.7	60.0
28.342500	23.5	1000.0	9.000	Off	N	20.8	36.5	60.0

Average

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - Ave (dB)	Limit - Ave (dBµV)
0.150000	23.5	1000.0	9.000	Off	N	20.1	32.5	56.0
0.456000	24.5	1000.0	9.000	Off	N	20.0	22.2	46.7
0.906000	14.6	1000.0	9.000	Off	N	20.0	31.4	46.0
5.059500	15.9	1000.0	9.000	Off	N	20.4	34.1	50.0
7.521000	18.5	1000.0	9.000	Off	N	20.4	31.5	50.0
28.432500	18.0	1000.0	9.000	Off	N	20.8	32.0	50.0

2.3 99% EMISSION BANDWIDTH

2.3.1 Specification Reference

RSS-Gen Clause 6.6

2.3.2 Standard Applicable

The emission bandwidth (x dB) is defined as the frequency range between two points, one above and one below the carrier frequency, at which the spectral density of the emission is attenuated x dB below the maximum in-band spectral density of the modulated signal. Spectral density (power per unit bandwidth) is to be measured with a detector of resolution bandwidth in the range of 1% to 5% of the anticipated emission bandwidth, and a video bandwidth at least 3x the resolution bandwidth.
When the occupied bandwidth limit is not stated in the applicable RSS or reference measurement method, the transmitted signal bandwidth shall be reported as the 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 (RBW) shall be in the range of 1% to 5% of the occupied bandwidth (OBW) and video bandwidth (VBW) shall be approximately 3x RBW.

Note: Video averaging is not permitted.
A peak, or peak hold, may be used in place of the sampling detector as this may produce a wider bandwidth than the actual bandwidth (worst-case measurement). Use of a peak hold may be necessary to determine the occupied bandwidth if the device is not transmitting continuously.
The trace data points are recovered and are directly summed in linear power level 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 (starting at the highest frequency, at the right side of the span, and going down in frequency). This frequency is then recorded.
The difference between the two recorded frequencies is the 99% occupied bandwidth.

2.3.3 Equipment Under Test and Modification State

Serial No: N/A (Sample #1) / Test Configuration A

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

June 03 and 04, 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	24.6 °C
Relative Humidity	48.2.%
ATM Pressure	98.9 kPa

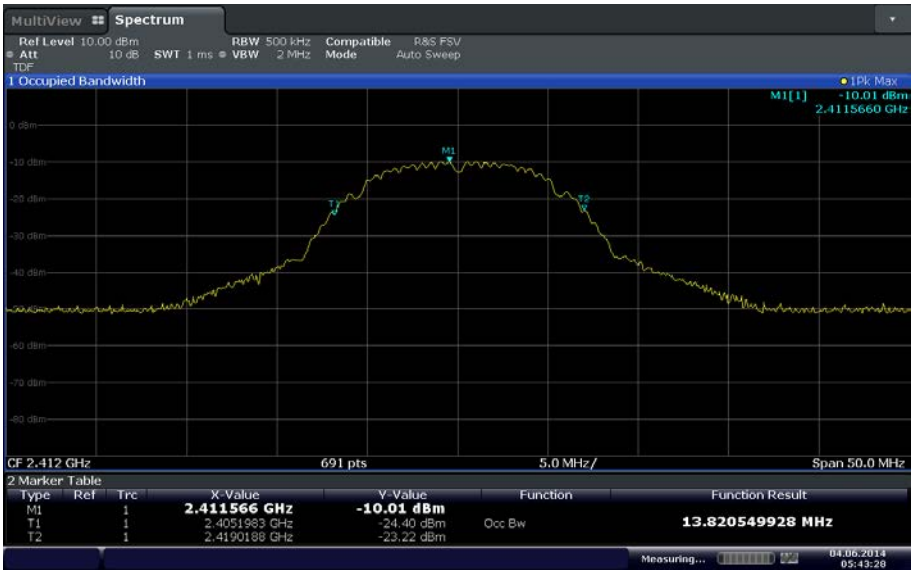
2.3.7 Additional Observations

- This is a conducted test.
- TDF (Transducer Factor) was used to compensate for the external attenuator and cable used. Separate TDF factors were used for 802.11 and Bluetooth LE measurements.
- 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)	13.821
	6 (2437 MHz)	13.821
	11 (2462 MHz)	13.821
802.11g	1 (2412 MHz)	16.932
	6 (2437 MHz)	17.004
	11 (2462 MHz)	17.004
802.11n HT20	1 (2412 MHz)	18.886
	6 (2437 MHz)	18.813
	11 (2462 MHz)	18.741
Bluetooth LE	37 (2402 MHz)	0.941
	17 (2440 MHz)	0.941
	39 (2480 MHz)	0.941

2.3.9 Test Results Plots



Date: 4.JUN.2014 05:43:28

802.11b Low Channel

Date: 4.JUN.2014 05:49:03

802.11b Mid Channel

Date: 4.JUN.2014 05:46:51

802.11b High Channel

Date: 4.JUN.2014 05:54:10

802.11g Low Channel

Date: 4.JUN.2014 05:57:45

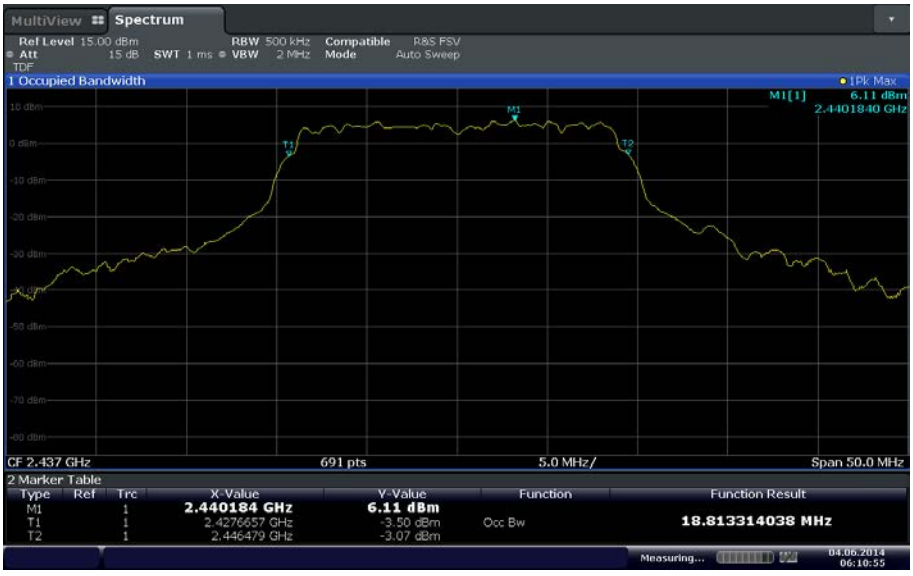
802.11g Mid Channel

Date: 4.JUN.2014 05:59:33

802.11g High Channel

Date: 4.JUN.2014 06:03:44

802.11n HT20 Low Channel

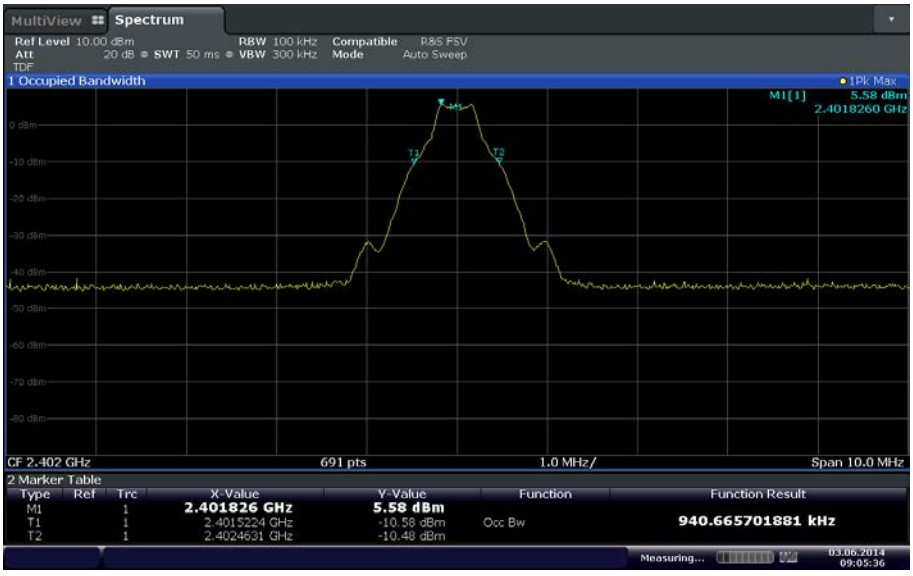


Date: 4.JUN.2014 06:10:55

802.11n HT20 Mid Channel

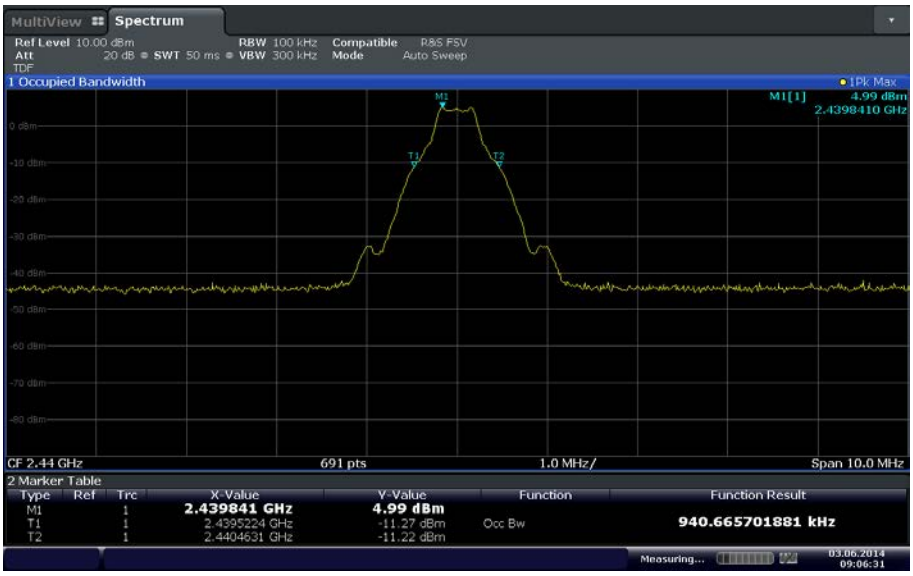
Date: 4.JUN.2014 06:08:55

802.11n HT20 High Channel



Date: 3.JUN.2014 09:05:36

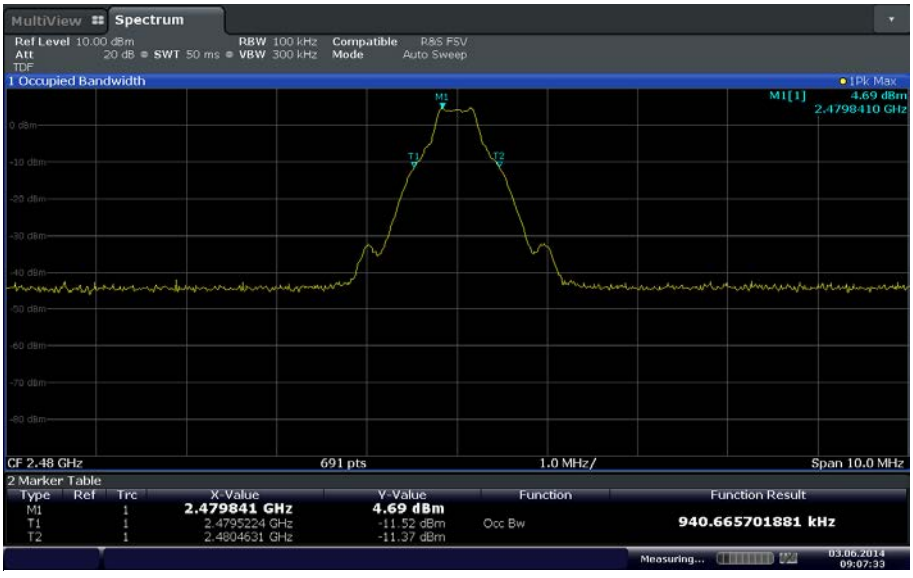
Bluetooth LE Low Channel



Date: 3.JUN.2014 09:06:31

Bluetooth LE Mid Channel

1.



Date: 3.JUN.2014 09:07:33

Bluetooth LE 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: N/A (Sample #1) / Test Configuration A

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

June 03 and 04, 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	24.6 °C
Relative Humidity	48.2.%
ATM Pressure	98.9 kPa

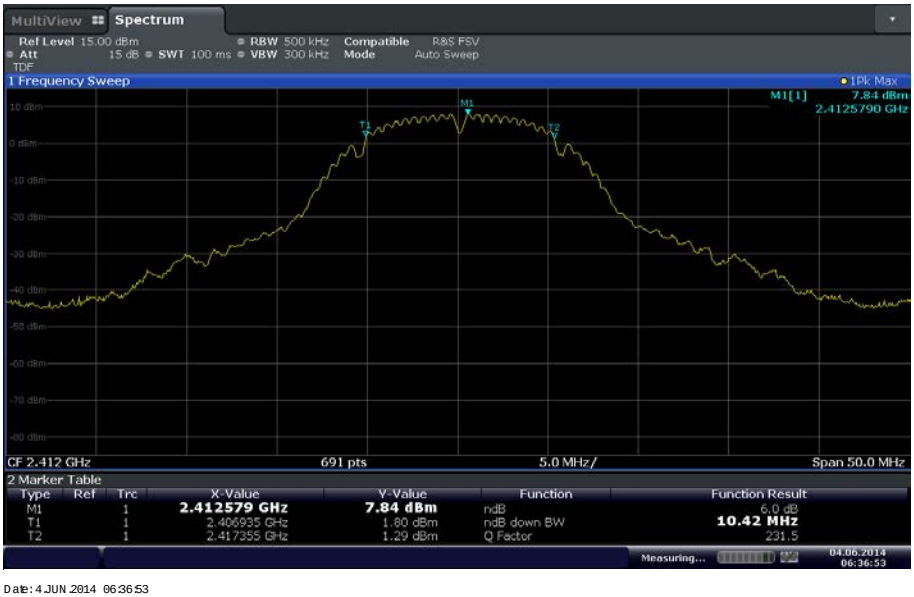
2.4.7 Additional Observations

- This is a conducted test.
- TDF (Transducer Factor) was used to compensate for the external attenuator and cable used. Separate TDF factors were used for 802.11 and Bluetooth LE measurements.
- Span is wide enough to capture the channel transmission.
- RBW is set to either 100 kHz (BT LE) or 1% of the span (802.11 b, g and n).
- 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.

2.4.8 Test Results

Mode	Channel	Measured Bandwidth (MHz)	Minimum Bandwidth (MHz)	Compliance
802.11b	1 (2412 MHz)	10.42	0.500	Complies
	6 (2437 MHz)	10.35	0.500	Complies
	11 (2462 MHz)	10.35	0.500	Complies
802.11g	1 (2412 MHz)	16.79	0.500	Complies
	6 (2437 MHz)	16.79	0.500	Complies
	11 (2462 MHz)	16.79	0.500	Complies
802.11n HT20	1 (2412 MHz)	17.66	0.500	Complies
	6 (2437 MHz)	17.66	0.500	Complies
	11 (2462 MHz)	17.66	0.500	Complies
Bluetooth LE	37 (2402 MHz)	0.507	0.500	Complies
	17 (2440 MHz)	0.507	0.500	Complies
	39 (2480 MHz)	0.507	0.500	Complies

2.4.9 Test Results Plots



Date: 4.JUN.2014 06:36:53

802.11b Low Channel

Date: 4.JUN.2014 06:38:45

802.11b Mid Channel

Date: 4.JUN.2014 06:41:25

802.11b High Channel

Date: 4.JUN.2014 06:51:05

802.11g Low Channel

Date: 4.JUN.2014 06:52:45

802.11g Mid Channel

Date: 4.JUN.2014 06:54:39

802.11g High Channel

Date: 4.JUN.2014 06:56:23

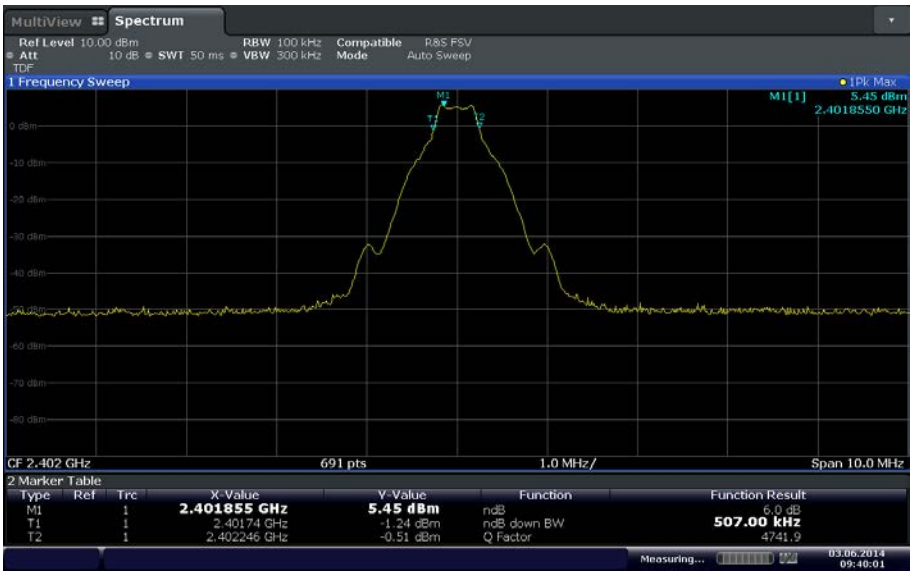
802.11n HT20 Low Channel

Date: 4.JUN.2014 06:58:23

802.11n HT20 Mid Channel

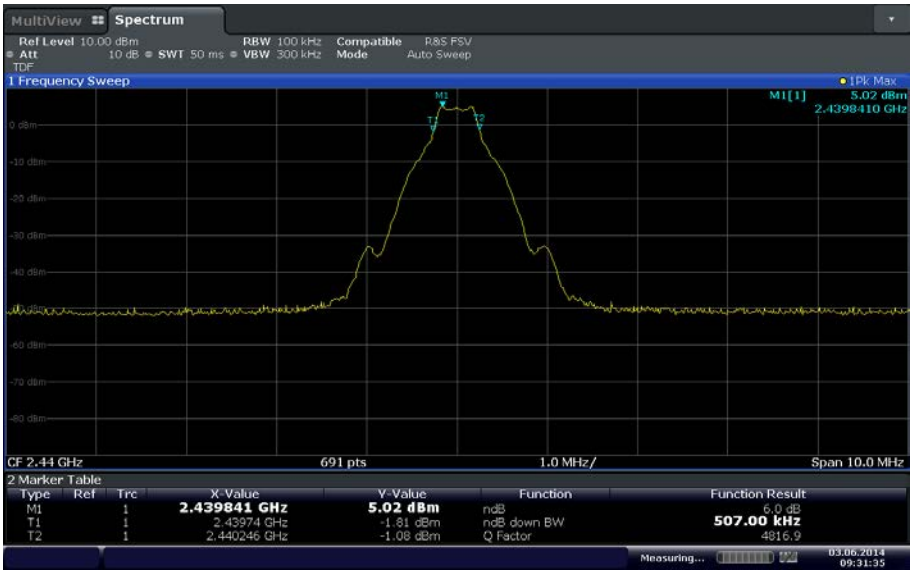
Date: 4.JUN.2014 06:59:57

802.11n HT20 High Channel



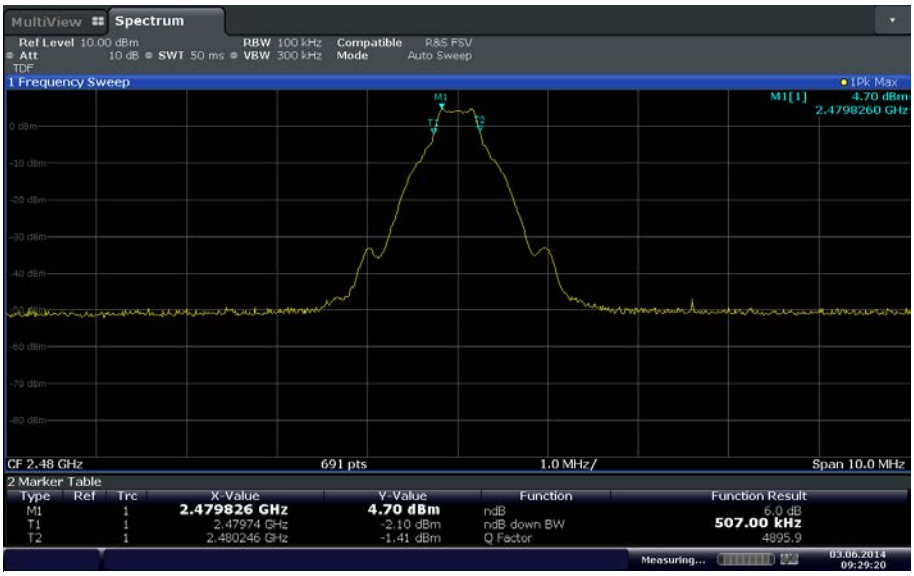
Date: 3.JUN.2014 09:40:01

Bluetooth LE Low Channel



Date: 3.JUN.2014 09:31:35

Bluetooth LE Mid Channel



Date: 3.JUN.2014 09:29:20

Bluetooth LE 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: N/A (Sample #1) / Test Configuration A

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

June 03 and 04, 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

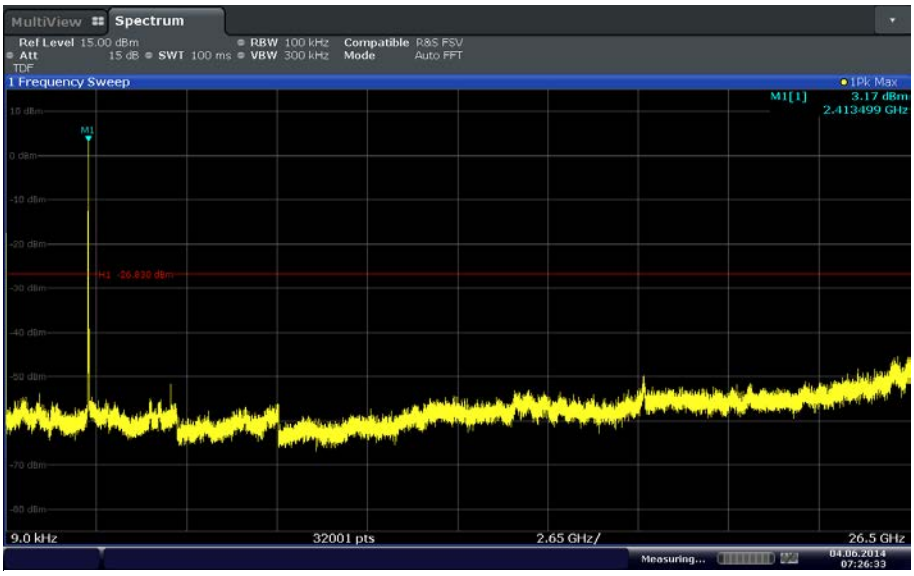
Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	24.6 °C
Relative Humidity	48.2.%
ATM Pressure	98.9 kPa

2.5.7 Additional Observations

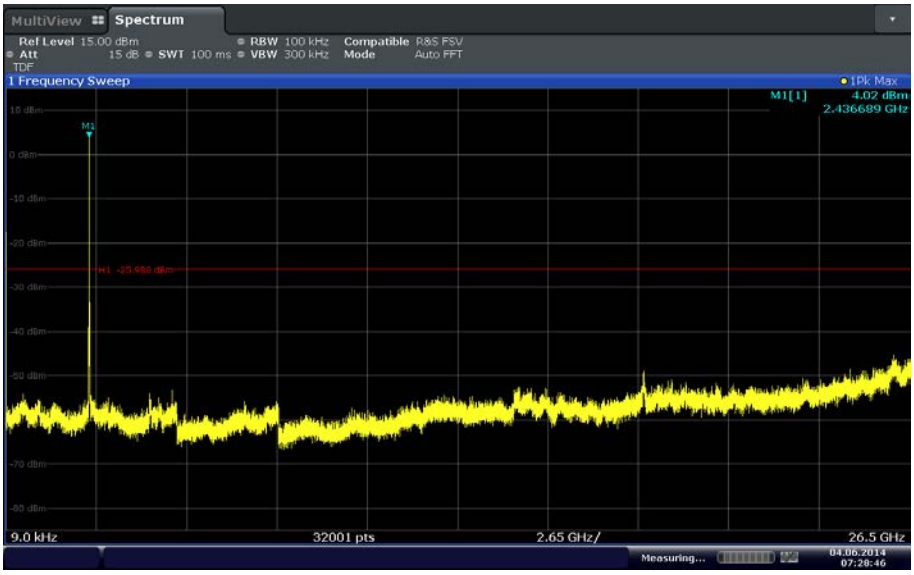
- This is a conducted test.
- TDF (Transducer Factor) was used to compensate for the external attenuator and cable used. Separate TDF factors were used for 802.11 and Bluetooth LE measurements.
- RBW is 100kHz.VBW is 3X RBW.
- Sweep is auto. Detector is peak. Trace is max hold.
- Initial scan was performed 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



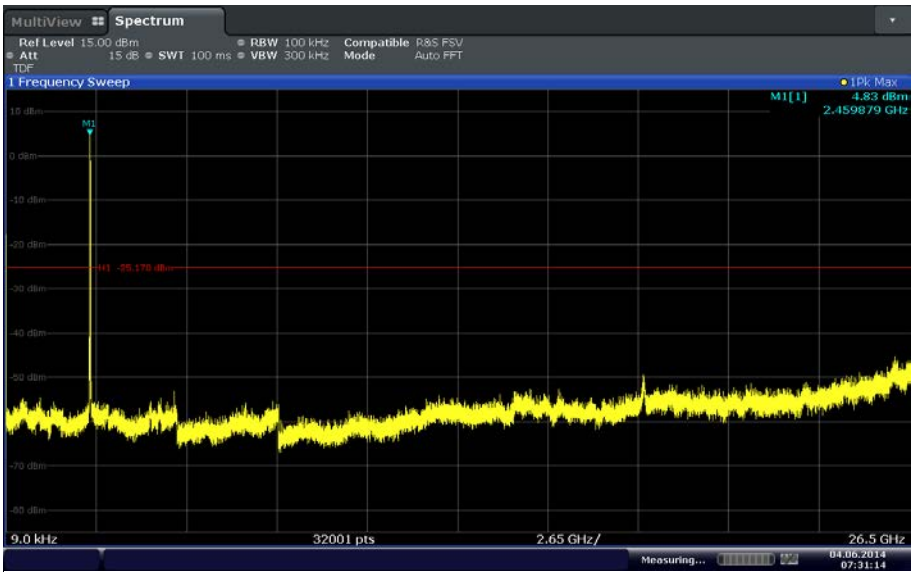
Date: 4.JUN.2014 07:26:34

802.11b Low Channel



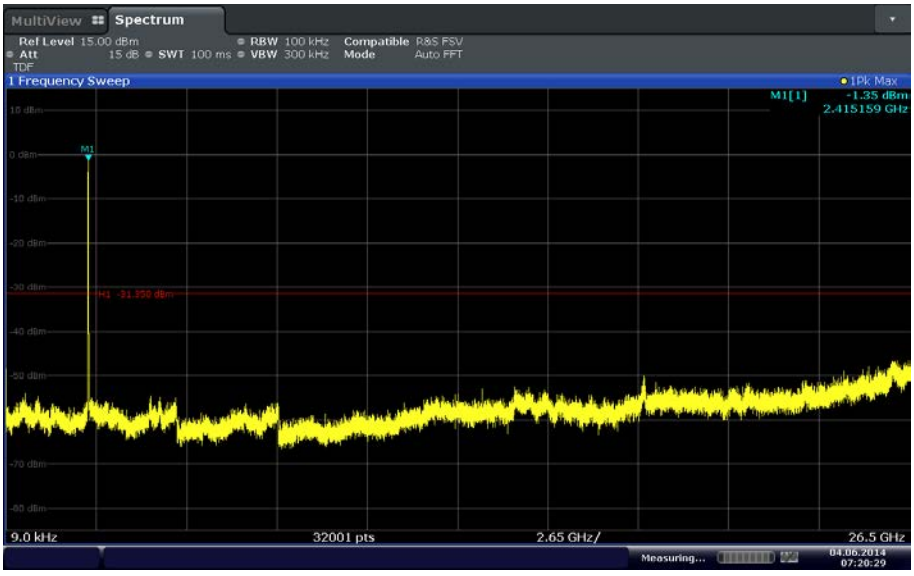
Date: 4.JUN.2014 07:28:46

802.11b Mid Channel



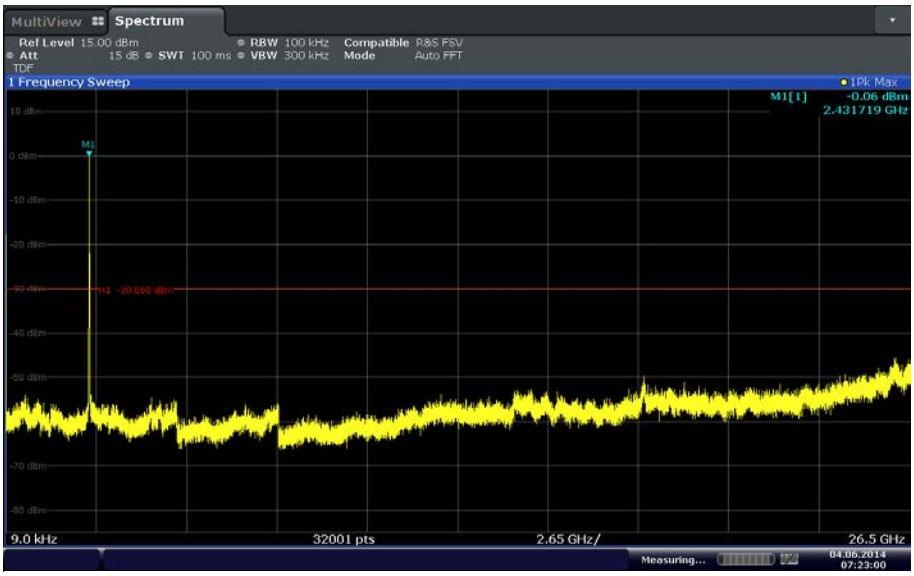
Date: 4.JUN.2014 07:31:14

802.11b High Channel



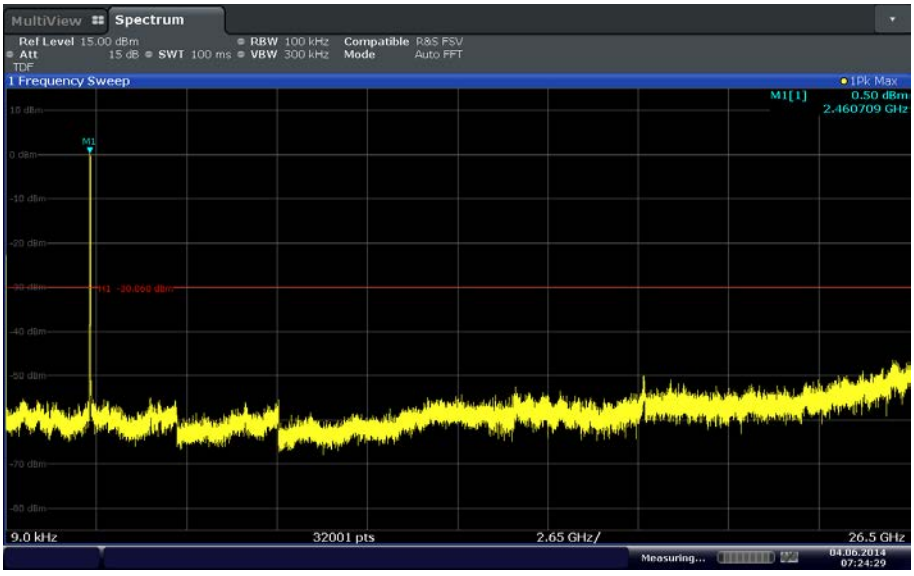
Date: 4.JUN.2014 07:20:29

802.11g Low Channel



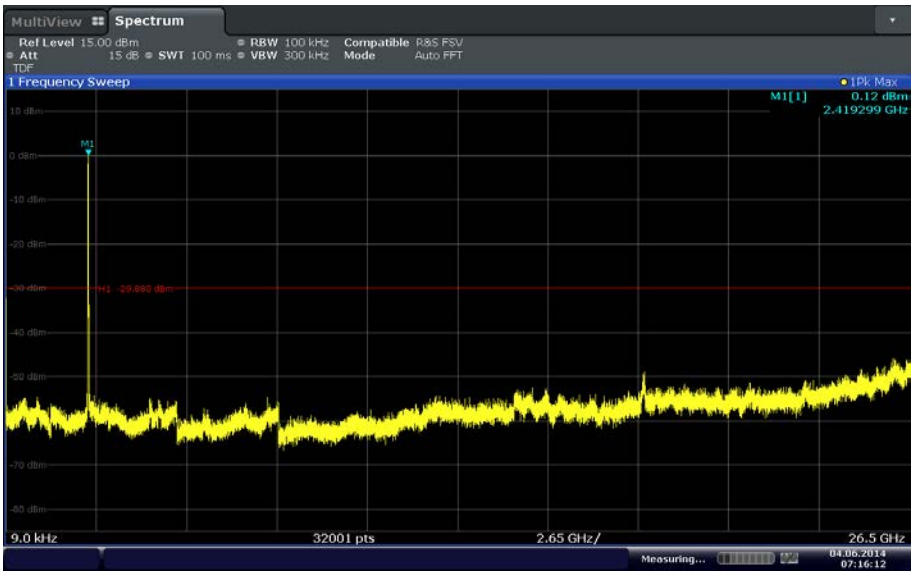
Date: 4.JUN.2014 07:23:00

802.11g Mid Channel



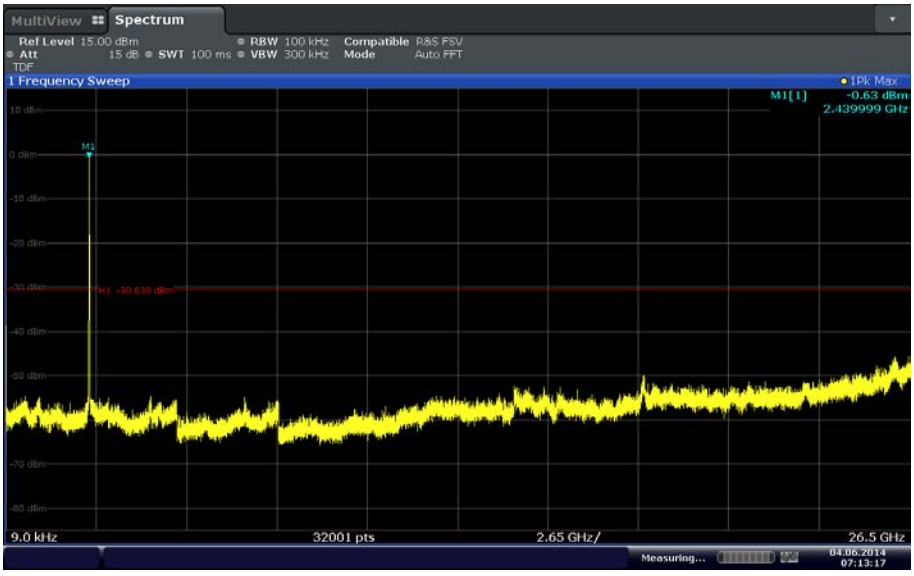
Date: 4.JUN.2014 07:24:29

802.11g High Channel



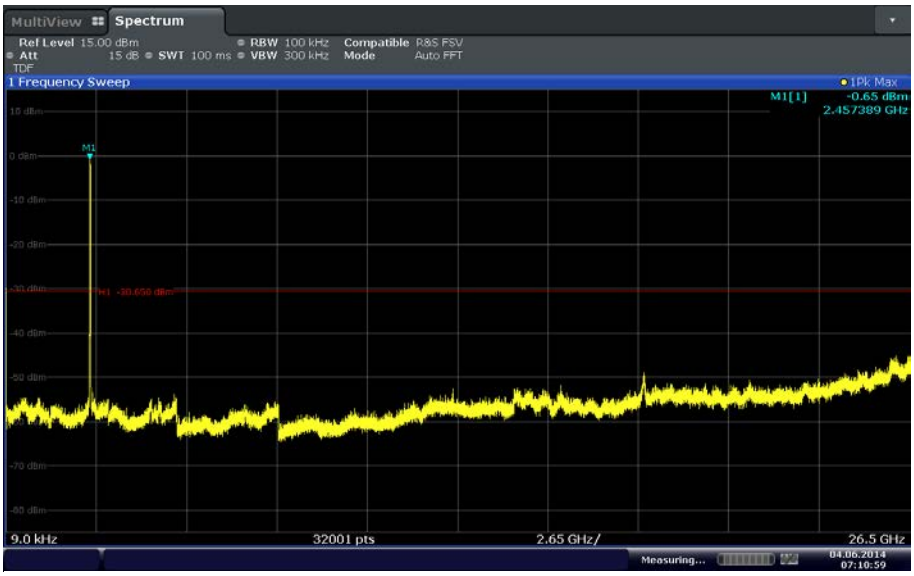
Date: 4.JUN.2014 07:16:12

802.11n HT20 Low Channel



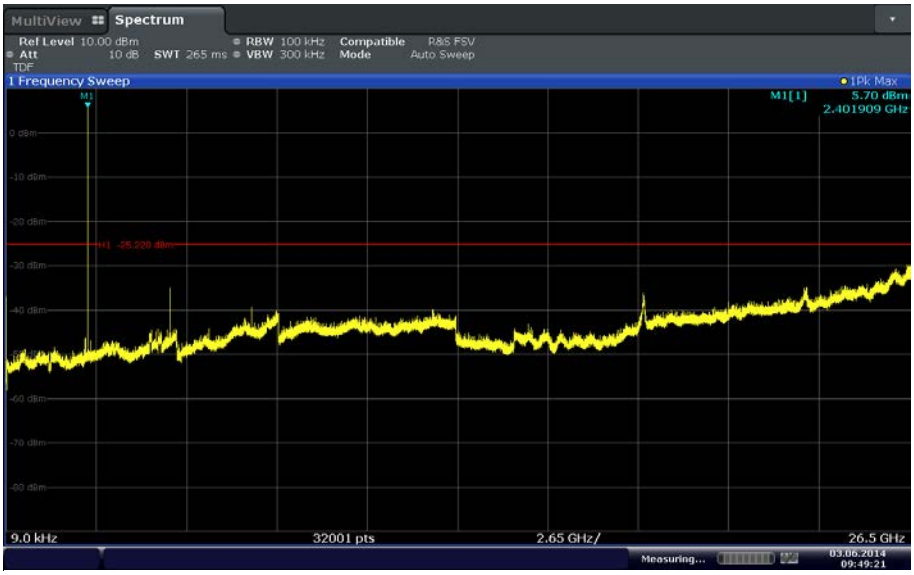
Date: 4.JUN.2014 07:13:18

802.11n HT20 Mid Channel



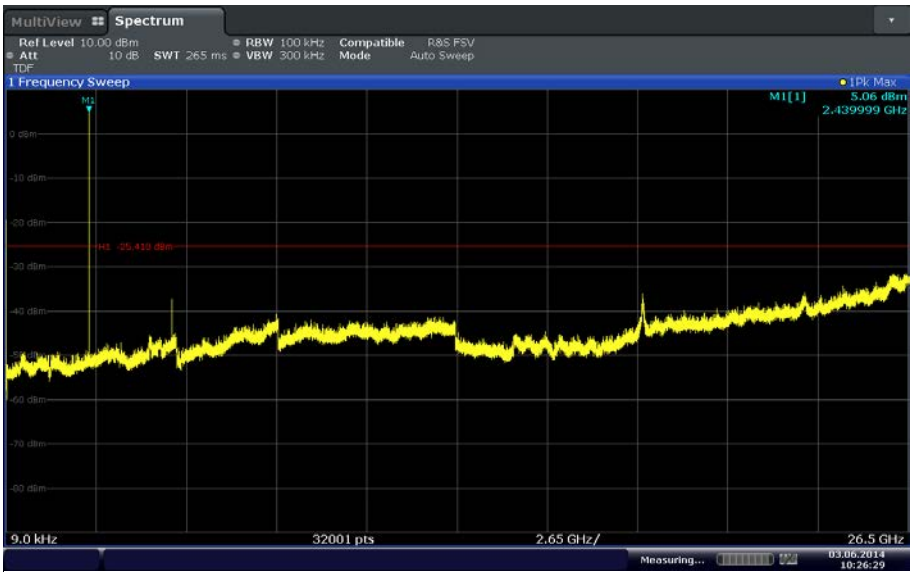
Date: 4.JUN.2014 07:11:00

802.11n HT20 High Channel



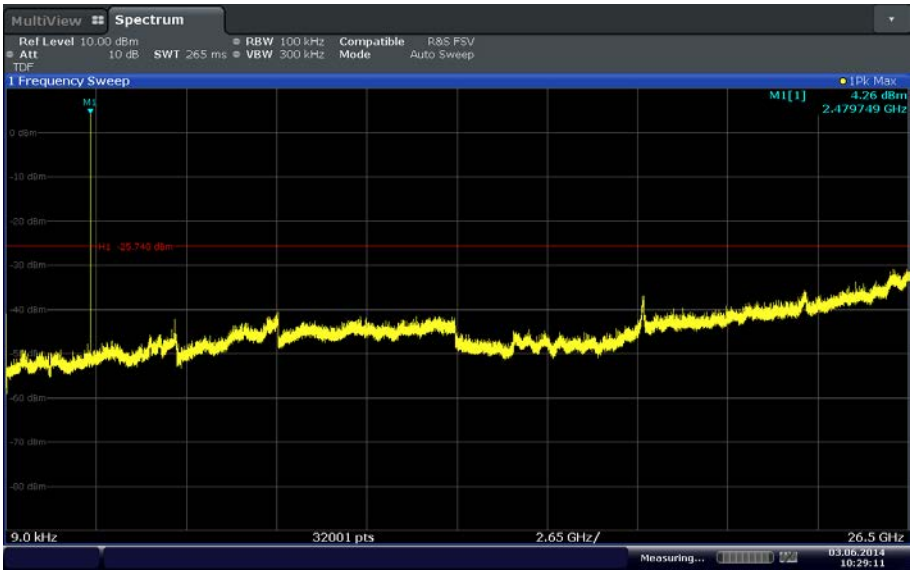
Date: 3.JUN.2014 09:49:21

Bluetooth LE Low Channel



Date: 3.JUN.2014 10:26:30

Bluetooth LE Mid Channel



Date: 3.JUN.2014 10:29:11

Bluetooth LE High Channel

TÜV SÜD AMERICA INC 10040 Mesa Rim Road San Diego, CA 92121-2912 Phone: 858 678 1400 FAX: 858 546 0364

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: N/A (Sample #1) / Test Configuration A

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

June 03 and 04, 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	24.6 °C
Relative Humidity	48.2.%
ATM Pressure	98.9 kPa

2.6.7 Additional Observations

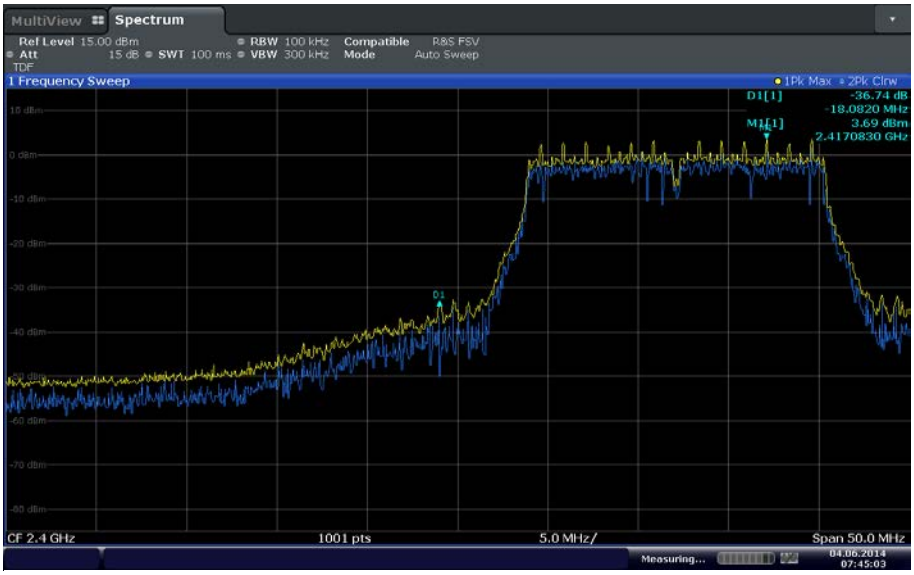
- This is a conducted test.
- TDF (Transducer Factor) was used to compensate for the external attenuator and cable used. Separate TDF factors were used for 802.11 and Bluetooth LE measurements.
- RBW is 100kHz.VBW is 3X RBW.
- Sweep is auto. Detector is peak. Trace is max hold.
- Trace was centred on the band-edge frequency.
- Span was set to encompass the band-edge frequency and the peak of the emission.
- Using Marker function, peak of the emission was determined and the delta to the band-edge frequency measured.

2.6.8 Test Results

Complies. See attached plots.

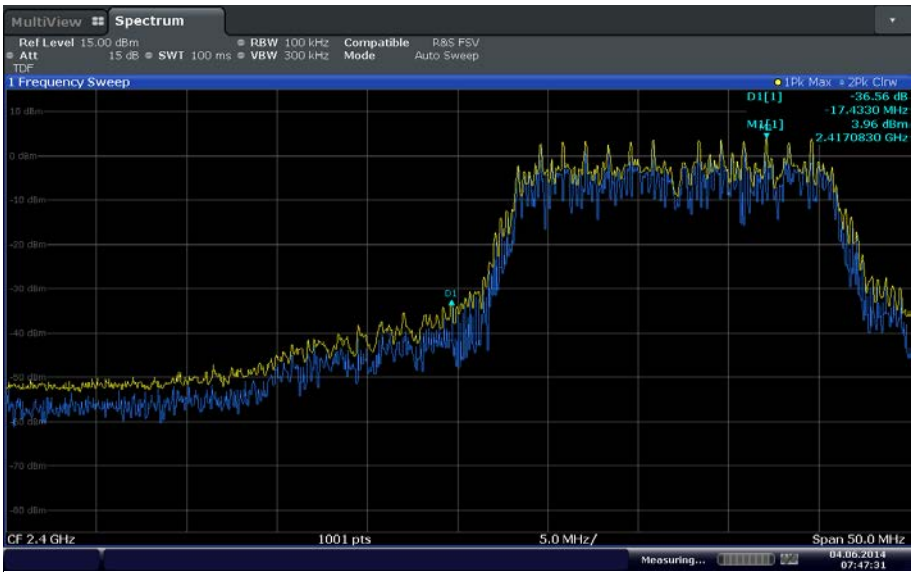
Date: 4.JUN.2014 07:41:36

802.11b Low Channel (2412 MHz)



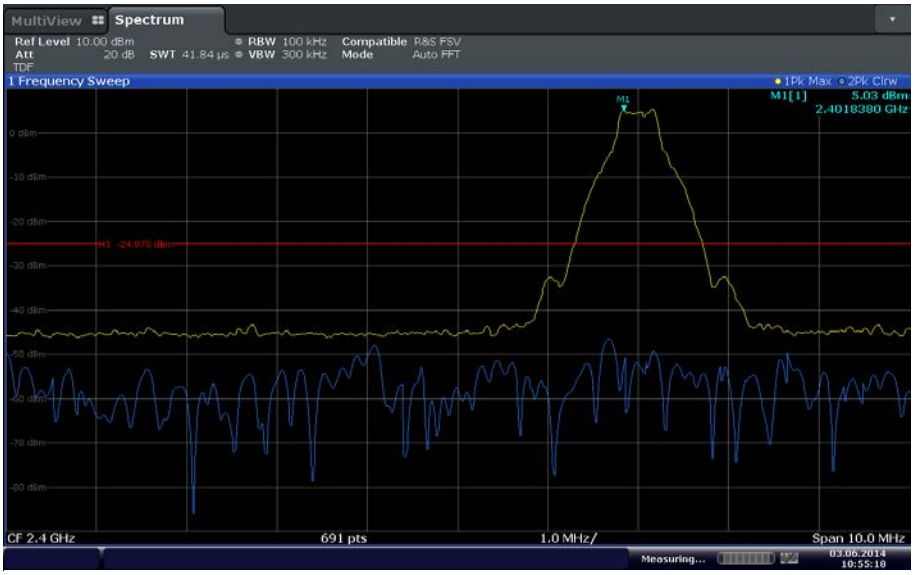
Date: 4.JUN.2014 07:45:03

802.11g Low Channel (2412 MHz)



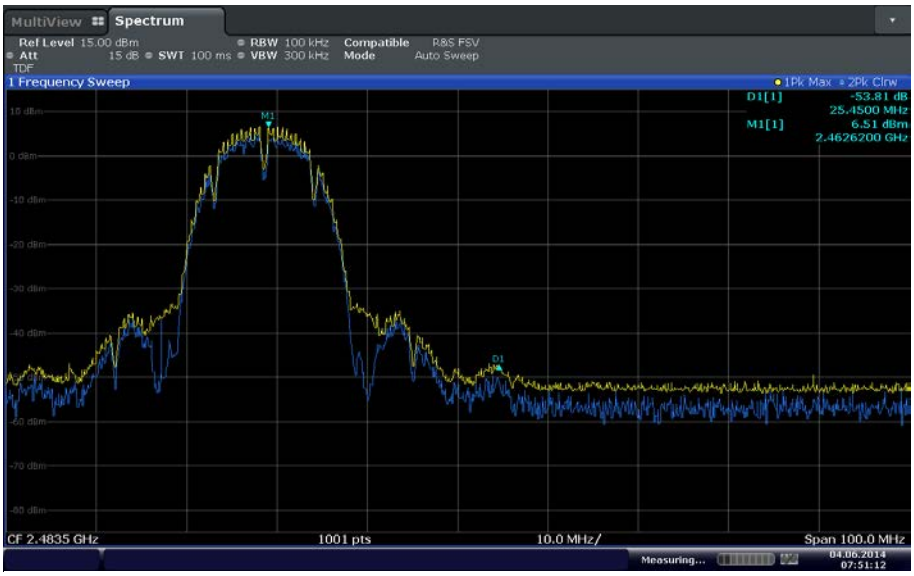
Date: 4.JUN.2014 07:47:31

802.11n HT20 Low Channel (2412 MHz)



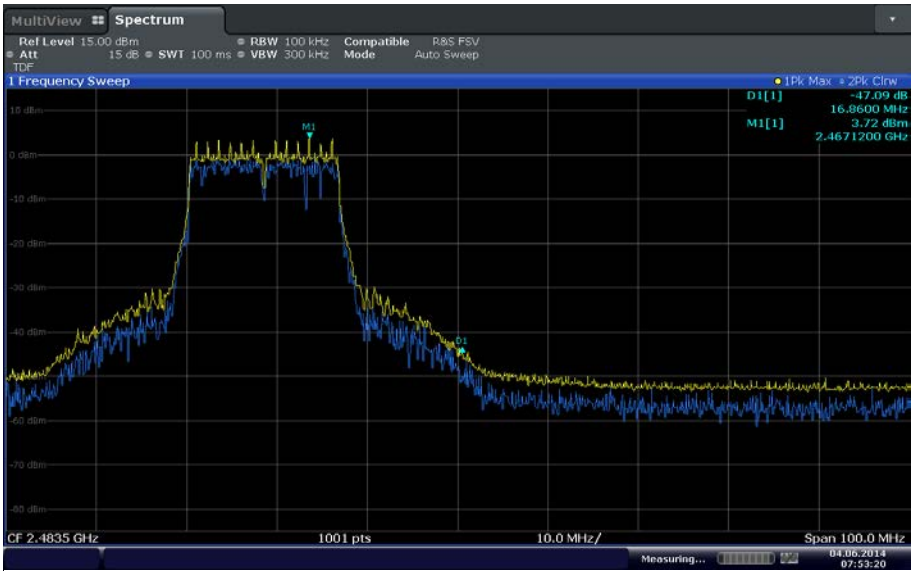
Date: 3.JUN.2014 10:55:19

Bluetooth LE Low Channel (2402 MHz)



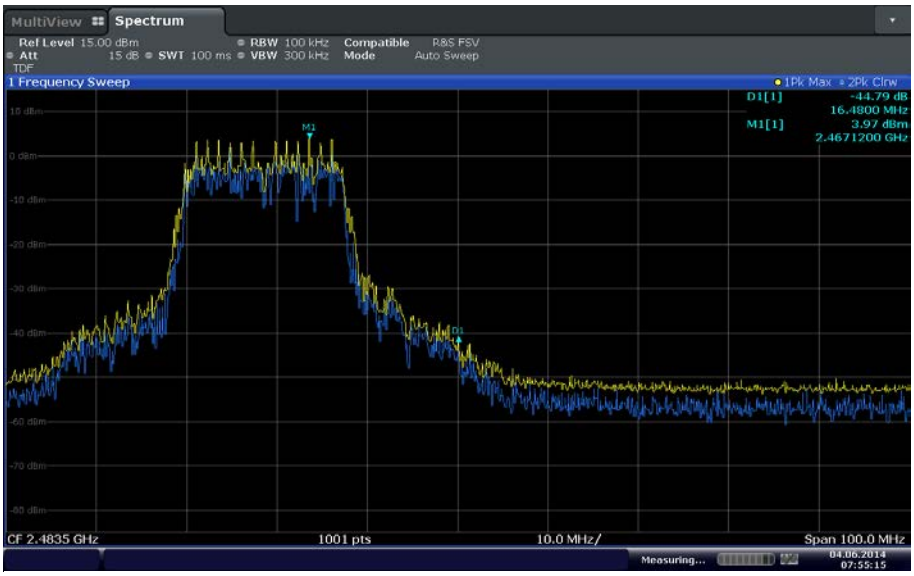
Date: 4.JUN.2014 07:51:12

802.11b High Channel (2462 MHz)



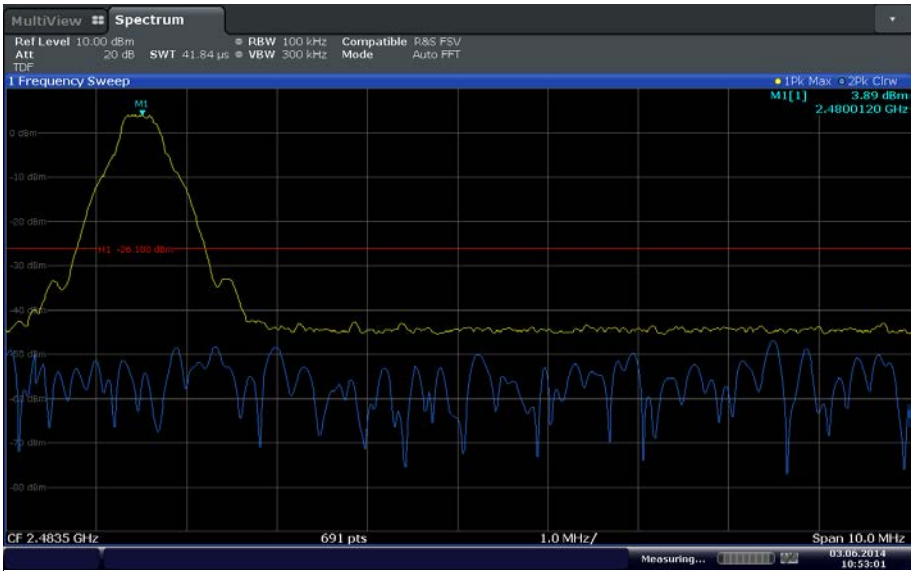
Date: 4.JUN.2014 07:53:20

802.11g High Channel (2462 MHz)



Date: 4.JUN.2014 07:55:15

802.11n HT20 High Channel (2462 MHz)



Date: 3.JUN.2014 10:53:01

Bluetooth LE High Channel (2480 MHz)

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: 1017 and BVBIDIAG2B/ Test Configuration C

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

June 05 and 06, 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 performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	24.2-24.6°C
Relative Humidity	48.2-49.5%
ATM Pressure	98.6-98.9 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, 1Mbps) 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.

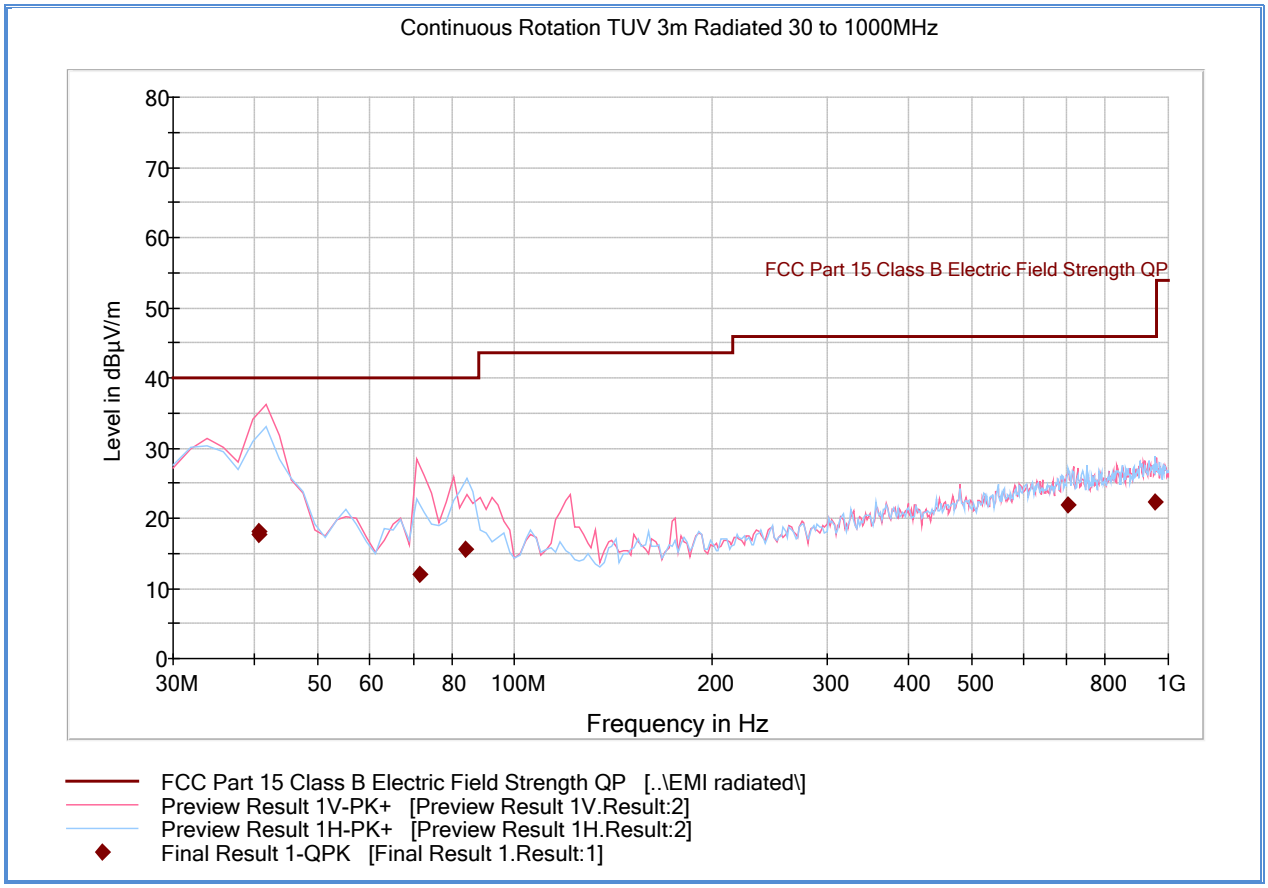
2.7.8 Sample Computation (Radiated Emission)

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

2.7.9 Test Results

See attached plots.

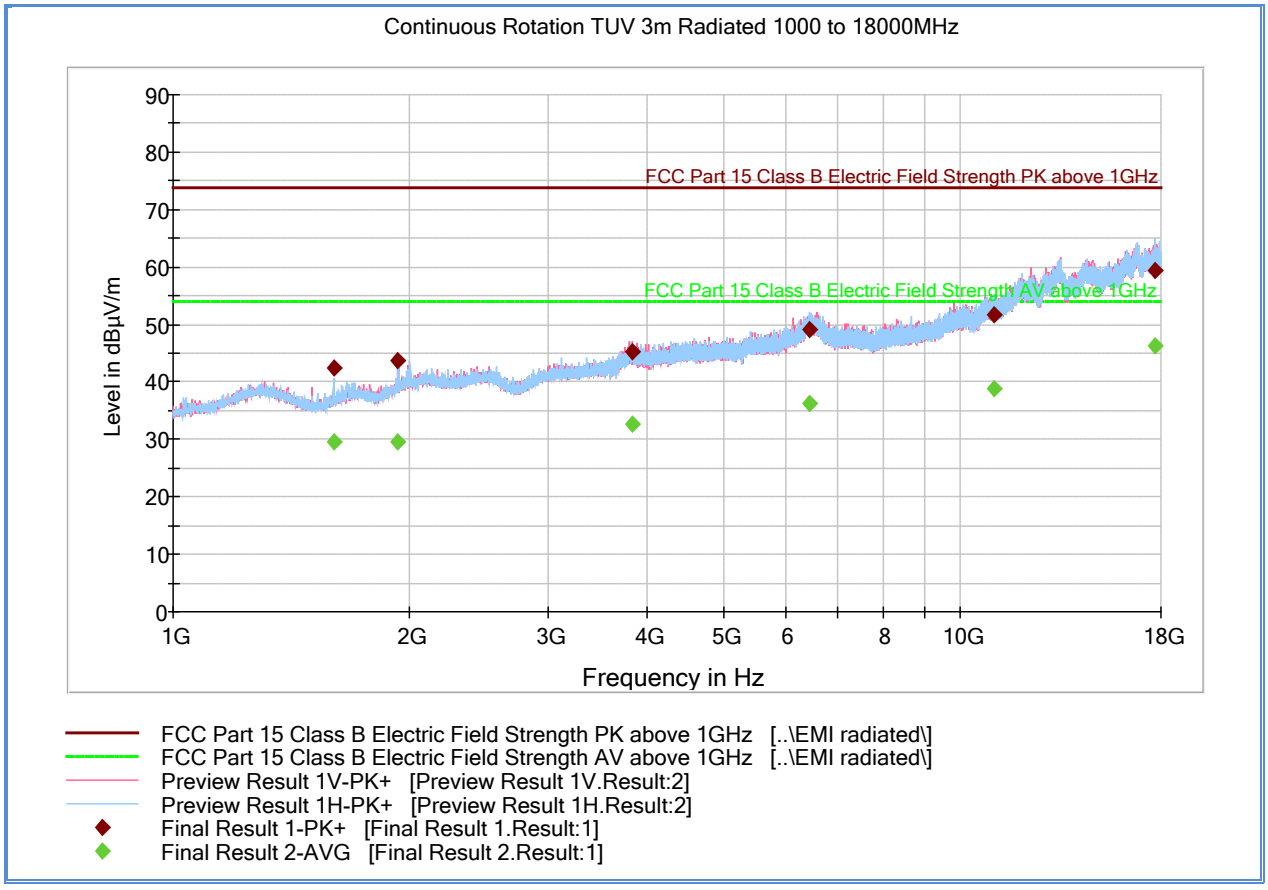
2.7.10 Test Results Below 1GHz (Receive Mode)



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)
40.607214	17.7	1000.0	120.000	100.0	V	-7.0	-16.1	22.3	40.0
40.623327	18.1	1000.0	120.000	100.0	V	-8.0	-16.1	21.9	40.0
71.421643	12.1	1000.0	120.000	100.0	V	263.0	-21.4	27.9	40.0
84.252745	15.5	1000.0	120.000	200.0	H	0.0	-20.8	24.5	40.0
701.305170	22.0	1000.0	120.000	100.0	H	308.0	-0.5	24.0	46.0
956.690581	22.4	1000.0	120.000	144.0	H	324.0	2.4	23.6	46.0

2.7.11 Test Results Above 1GHz (Receive Mode)



Peak Data

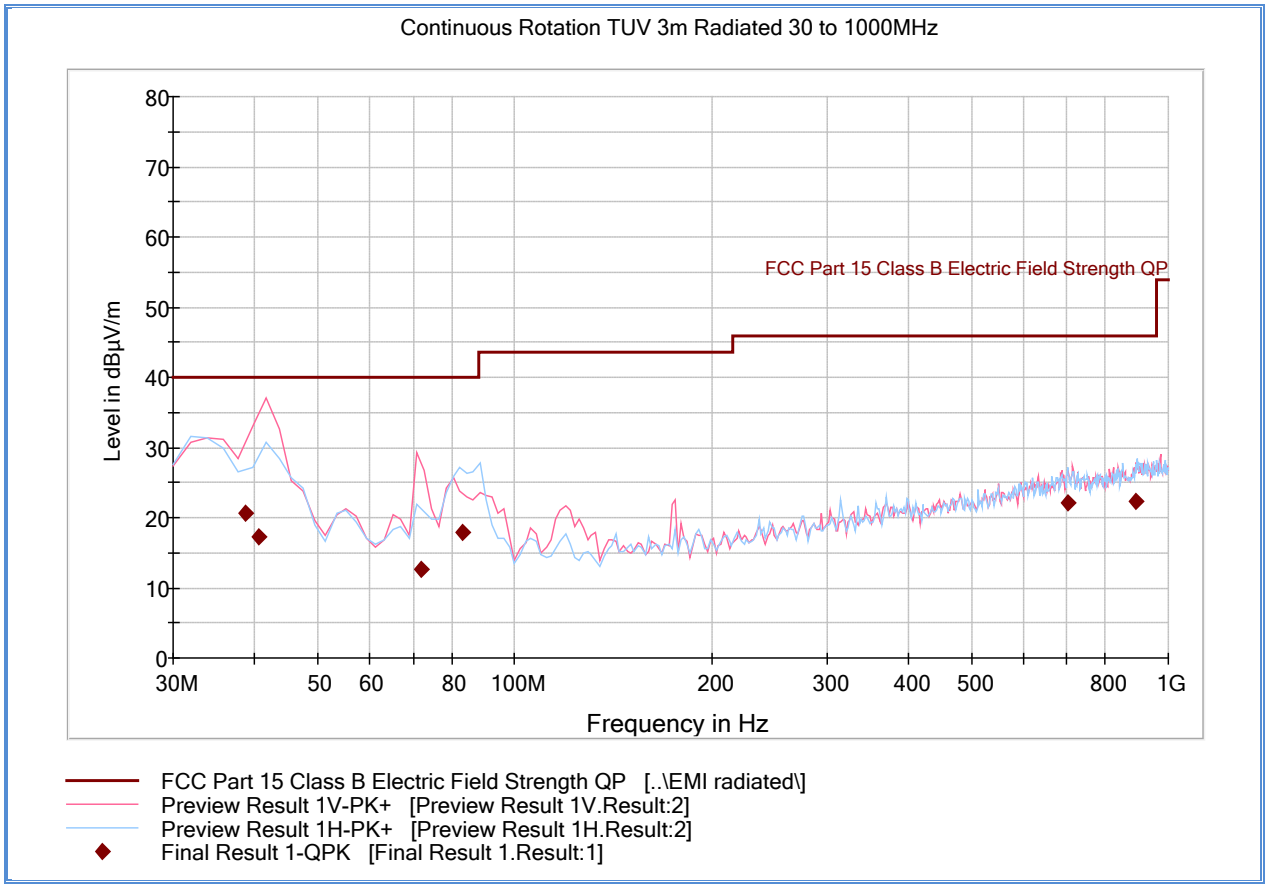
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1600.133333	42.4	1000.0	1000.000	208.5	H	304.0	-4.9	31.5	73.9
1931.966667	43.6	1000.0	1000.000	322.2	V	52.0	-1.4	30.3	73.9
3838.966667	45.3	1000.0	1000.000	278.3	V	118.0	6.0	28.6	73.9
6430.033333	49.1	1000.0	1000.000	301.2	H	82.0	12.6	24.8	73.9
11043.16666	51.7	1000.0	1000.000	155.6	H	330.0	16.8	22.2	73.9
17726.10000	59.4	1000.0	1000.000	333.1	H	221.0	25.7	14.5	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)
1600.133333	29.7	1000.0	1000.000	208.5	H	304.0	-4.9	24.2	53.9
1931.966667	29.5	1000.0	1000.000	322.2	V	52.0	-1.4	24.4	53.9
3838.966667	32.6	1000.0	1000.000	278.3	V	118.0	6.0	21.3	53.9
6430.033333	36.3	1000.0	1000.000	301.2	H	82.0	12.6	17.6	53.9
11043.16666	38.8	1000.0	1000.000	155.6	H	330.0	16.8	15.1	53.9
17726.10000	46.2	1000.0	1000.000	333.1	H	221.0	25.7	7.7	53.9

Test Notes: No significant emissions observed above 3GHz.

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

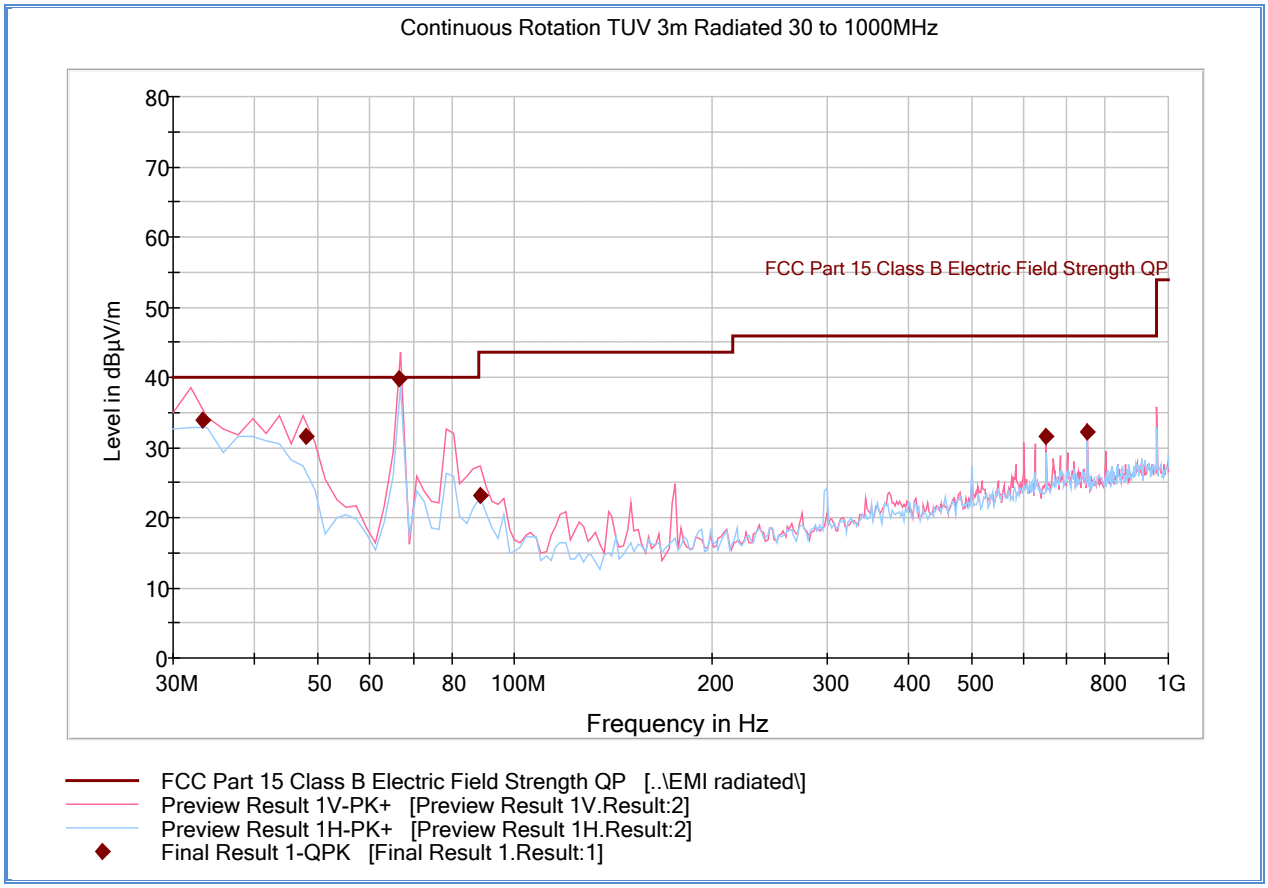


Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
38.743327	20.6	1000.0	120.000	115.0	V	15.0	-15.1	19.4	40.0
40.607214	17.2	1000.0	120.000	115.0	V	15.0	-16.1	22.8	40.0
71.741643	12.7	1000.0	120.000	100.0	V	262.0	-21.4	27.3	40.0
82.972745	17.9	1000.0	120.000	200.0	H	1.0	-20.8	22.1	40.0
700.561283	22.1	1000.0	120.000	184.0	H	254.0	-0.5	23.9	46.0
893.910060	22.3	1000.0	120.000	150.0	H	91.0	1.8	23.7	46.0

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

2.7.13 Test Results Below 1GHz (Bluetooth LE)

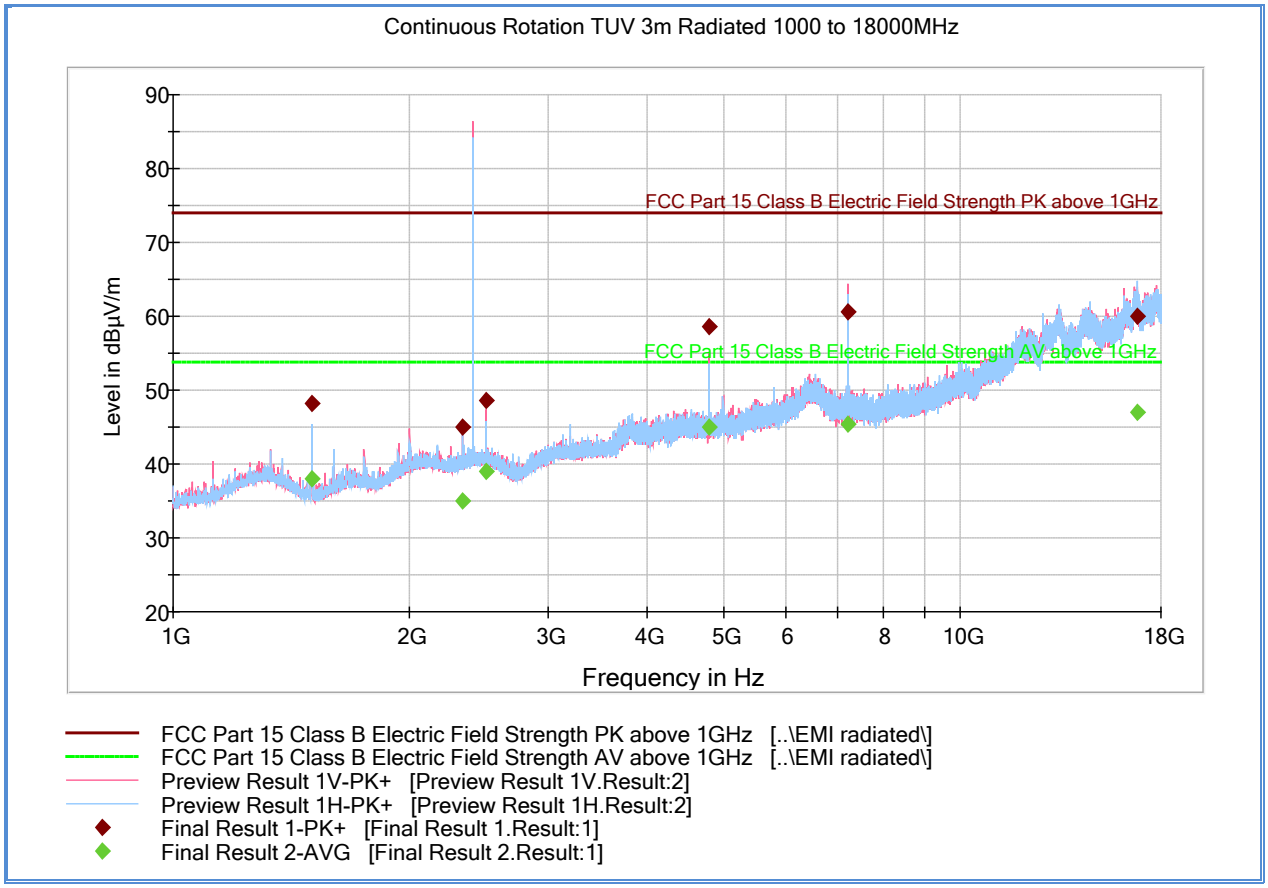


Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
33.280000	33.9	1000.0	120.000	100.0	V	57.0	-12.4	6.1	40.0
47.974990	31.5	1000.0	120.000	100.0	V	101.0	-18.3	8.5	40.0
66.533868	39.8	1000.0	120.000	100.0	V	160.0	-21.4	0.2	40.0
88.332745	23.2	1000.0	120.000	100.0	V	189.0	-20.2	20.3	43.5
649.980200	31.6	1000.0	120.000	100.0	V	108.0	-2.7	14.4	46.0
750.022365	32.2	1000.0	120.000	100.0	V	273.0	-0.8	13.8	46.0

Test Notes: Only worst case channel presented for spurious emissions below 1GHz. Emission @ 66.53MHz verified coming from support equipment.

2.7.14 Test Results Above 1GHz (Bluetooth LE Low Channel)



Peak Data

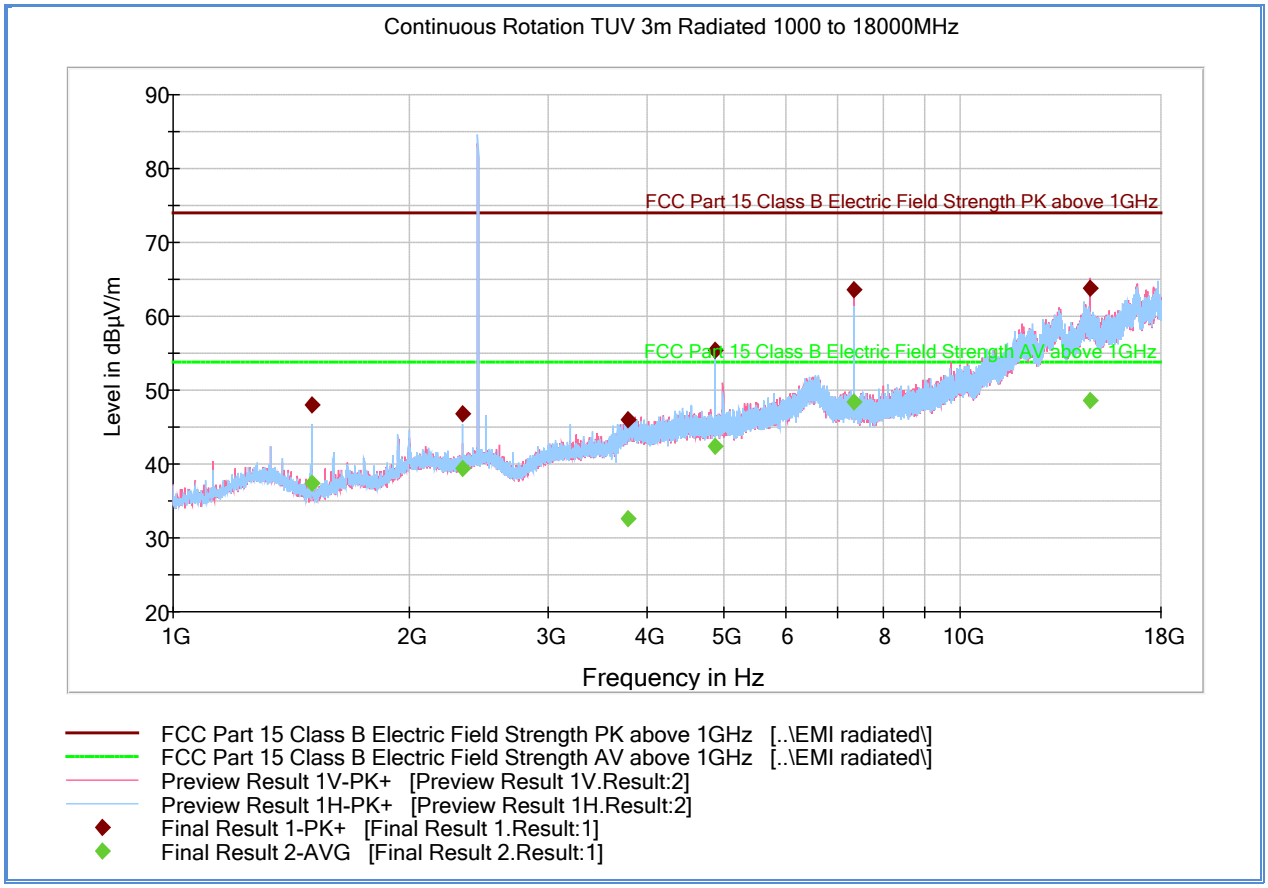
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1500.200000	48.2	1000.0	1000.000	99.7	H	184.0	-5.1	25.7	73.9
2330.933333	44.9	1000.0	1000.000	100.7	H	290.0	-0.4	29.0	73.9
2500.166667	48.6	1000.0	1000.000	113.7	V	16.0	0.2	25.3	73.9
4804.266667	58.5	1000.0	1000.000	169.6	V	325.0	6.8	15.4	73.9
7206.333333	60.7	1000.0	1000.000	206.5	V	150.0	11.3	13.2	73.9
16800.900000	60.0	1000.0	1000.000	188.5	H	309.0	25.9	13.9	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)
1500.200000	38.0	1000.0	1000.000	99.7	H	184.0	-5.1	15.9	53.9
2330.933333	35.0	1000.0	1000.000	100.7	H	290.0	-0.4	18.9	53.9
2500.166667	39.0	1000.0	1000.000	113.7	V	16.0	0.2	14.9	53.9
4804.266667	45.0	1000.0	1000.000	169.6	V	325.0	6.8	8.9	53.9
7206.333333	45.4	1000.0	1000.000	206.5	V	150.0	11.3	8.5	53.9
16800.900000	47.1	1000.0	1000.000	188.5	H	309.0	25.9	6.8	53.9

Test Notes: No significant emissions observed above 18GHz. Measurements above 18GHz were noise floor figures.

2.7.15 Test Results Above 1GHz (Bluetooth LE Mid Channel)



Peak Data

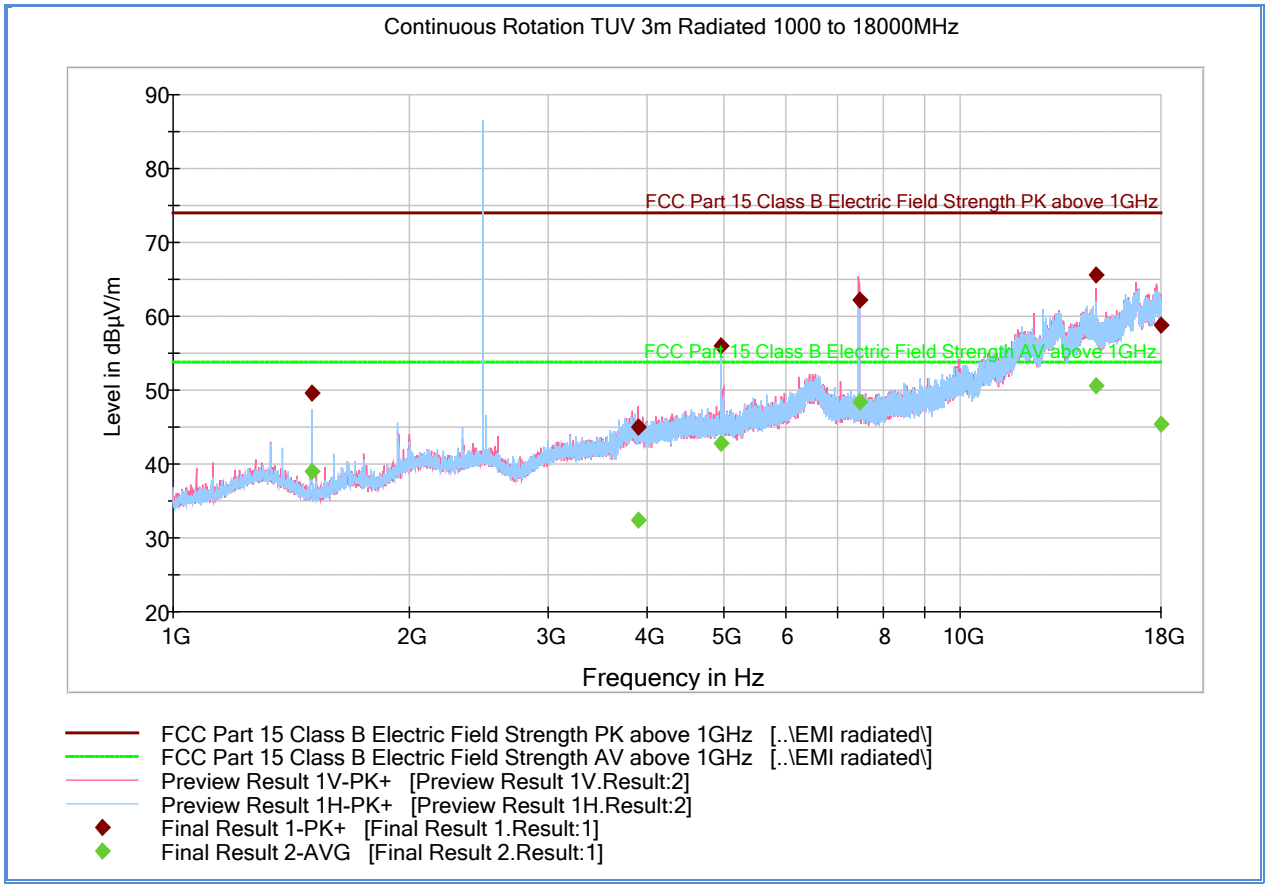
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1500.200000	48.1	1000.0	1000.000	99.7	H	188.0	-5.1	25.8	73.9
2331.133333	46.8	1000.0	1000.000	99.8	H	120.0	-0.4	27.1	73.9
3786.866667	45.9	1000.0	1000.000	356.1	H	158.0	5.8	28.0	73.9
4880.166667	55.4	1000.0	1000.000	129.7	H	234.0	7.1	18.5	73.9
7319.433333	63.6	1000.0	1000.000	128.7	V	262.0	11.1	10.3	73.9
14638.900000	63.9	1000.0	1000.000	177.6	V	51.0	22.8	10.0	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)
1500.200000	37.5	1000.0	1000.000	99.7	H	188.0	-5.1	16.4	53.9
2331.133333	39.4	1000.0	1000.000	99.8	H	120.0	-0.4	14.5	53.9
3786.866667	32.7	1000.0	1000.000	356.1	H	158.0	5.8	21.2	53.9
4880.166667	42.5	1000.0	1000.000	129.7	H	234.0	7.1	11.4	53.9
7319.433333	48.3	1000.0	1000.000	128.7	V	262.0	11.1	5.6	53.9
14638.900000	48.5	1000.0	1000.000	177.6	V	51.0	22.8	5.4	53.9

Test Notes: No significant emissions observed above 18GHz. Measurements above 18GHz were noise floor figures.

2.7.16 Test Results Above 1GHz (Bluetooth LE High Channel)



Peak Data

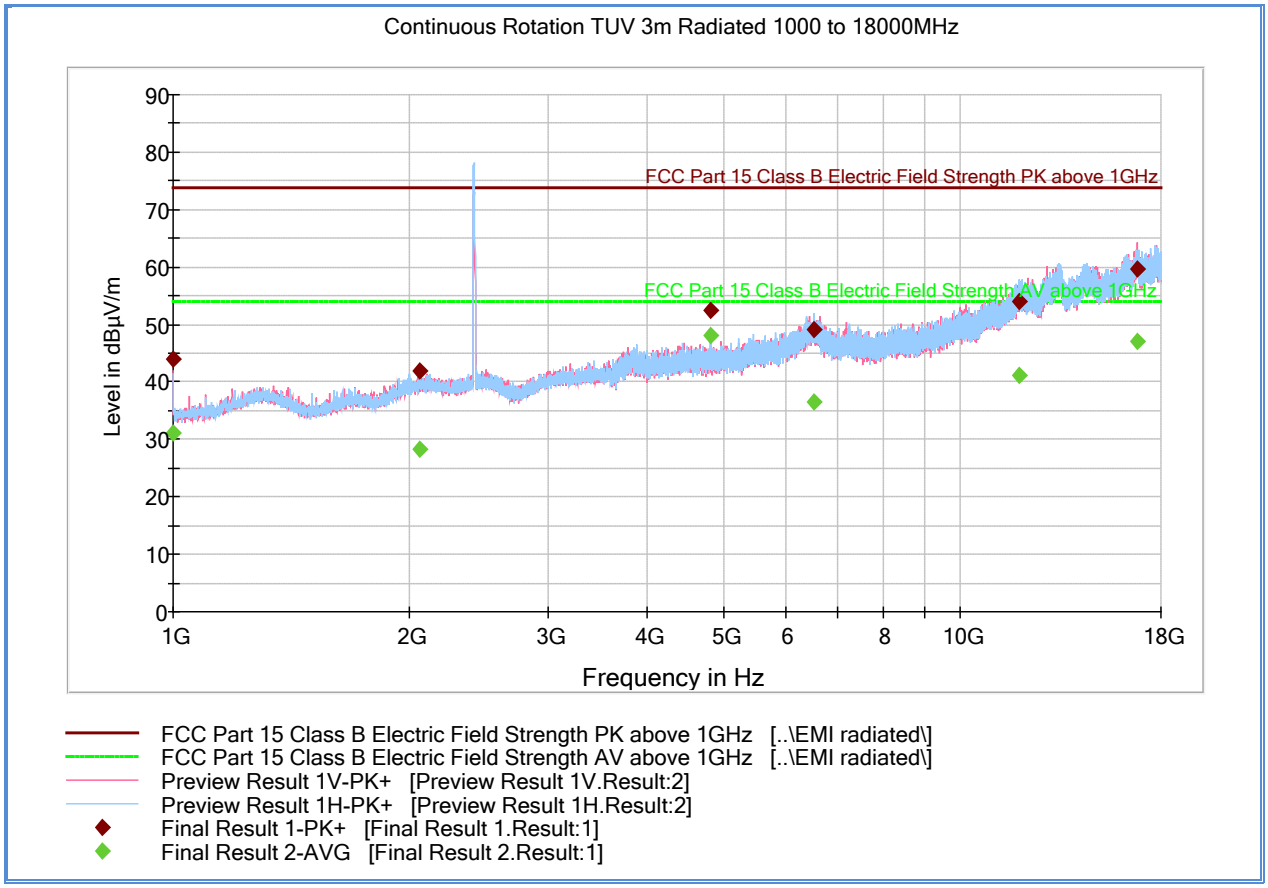
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1500.000000	49.6	1000.0	1000.000	99.7	H	183.0	-5.1	24.3	73.9
3896.466667	45.1	1000.0	1000.000	301.2	V	146.0	6.0	28.8	73.9
4959.700000	55.9	1000.0	1000.000	207.5	H	114.0	7.4	18.0	73.9
7440.000000	62.2	1000.0	1000.000	270.3	V	280.0	10.8	11.7	73.9
14879.166667	65.5	1000.0	1000.000	178.6	V	2.0	21.8	8.4	73.9
17988.633333	58.8	1000.0	1000.000	393.0	V	171.0	25.3	15.1	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)
1500.000000	39.0	1000.0	1000.000	99.7	H	183.0	-5.1	14.9	53.9
3896.466667	32.4	1000.0	1000.000	301.2	V	146.0	6.0	21.5	53.9
4959.700000	42.8	1000.0	1000.000	207.5	H	114.0	7.4	11.1	53.9
7440.000000	48.4	1000.0	1000.000	270.3	V	280.0	10.8	5.5	53.9
14879.166667	50.6	1000.0	1000.000	178.6	V	2.0	21.8	3.3	53.9
17988.633333	45.5	1000.0	1000.000	393.0	V	171.0	25.3	8.4	53.9

Test Notes: No significant emissions observed above 18GHz. Measurements above 18GHz were noise floor figures.

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



Peak Data

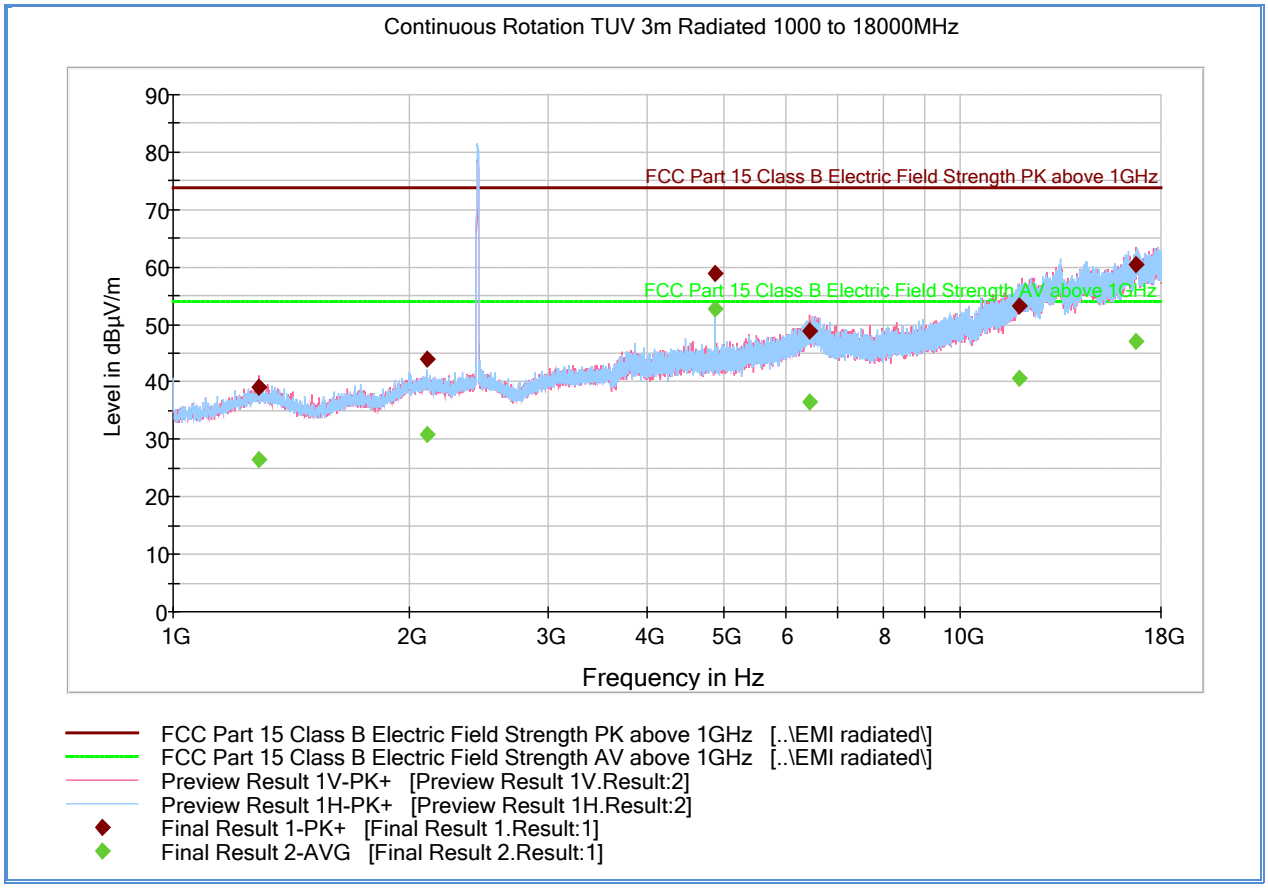
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.000000	44.0	1000.0	1000.000	181.6	V	10.0	-7.0	29.9	73.9
2057.433333	42.0	1000.0	1000.000	202.3	H	231.0	-1.0	31.9	73.9
4824.066667	52.5	1000.0	1000.000	345.1	V	-3.0	6.9	21.4	73.9
6517.066667	49.1	1000.0	1000.000	207.5	H	20.0	12.8	24.8	73.9
11899.833333	54.1	1000.0	1000.000	300.6	H	4.0	19.7	19.8	73.9
16771.300000	59.8	1000.0	1000.000	378.1	V	-9.0	25.9	14.1	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	31.0	1000.0	1000.000	181.6	V	10.0	-7.0	22.9	53.9
2057.433333	28.4	1000.0	1000.000	202.3	H	231.0	-1.0	25.5	53.9
4824.066667	48.0	1000.0	1000.000	345.1	V	-3.0	6.9	5.9	53.9
6517.066667	36.4	1000.0	1000.000	207.5	H	20.0	12.8	17.5	53.9
11899.833333	41.1	1000.0	1000.000	300.6	H	4.0	19.7	12.8	53.9
16771.300000	47.1	1000.0	1000.000	378.1	V	-9.0	25.9	6.8	53.9

Test Notes: No significant emissions observed above 18GHz. Measurements above 18GHz were noise floor figures.

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



Peak Data

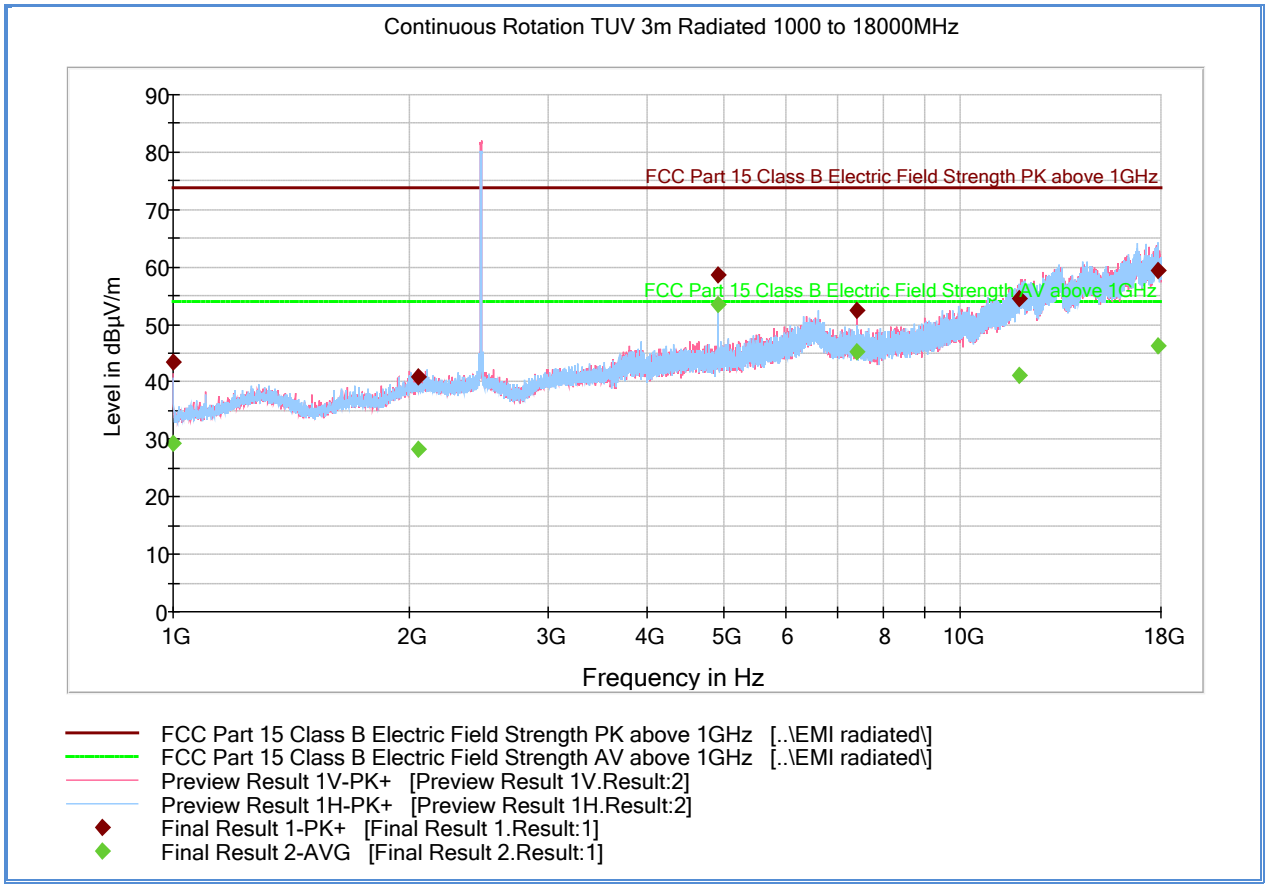
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1284.300000	39.1	1000.0	1000.000	139.7	V	99.0	-5.1	34.8	73.9
2099.700000	43.9	1000.0	1000.000	245.3	H	254.0	-1.0	30.0	73.9
4874.100000	58.8	1000.0	1000.000	255.3	H	238.0	7.1	15.1	73.9
6430.566667	49.0	1000.0	1000.000	151.6	V	273.0	12.6	24.9	73.9
11868.233333	53.3	1000.0	1000.000	207.4	V	253.0	19.4	20.6	73.9
16760.133333	60.4	1000.0	1000.000	99.7	V	41.0	25.9	13.5	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)
1284.300000	26.6	1000.0	1000.000	139.7	V	99.0	-5.1	27.3	53.9
2099.700000	30.8	1000.0	1000.000	245.3	H	254.0	-1.0	23.1	53.9
4874.100000	52.7	1000.0	1000.000	255.3	H	238.0	7.1	1.2	53.9
6430.566667	36.6	1000.0	1000.000	151.6	V	273.0	12.6	17.3	53.9
11868.233333	40.7	1000.0	1000.000	207.4	V	253.0	19.4	13.2	53.9
16760.133333	47.1	1000.0	1000.000	99.7	V	41.0	25.9	6.8	53.9

Test Notes: No significant emissions observed above 18GHz. Measurements above 18GHz were noise floor figures.

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



Peak Data

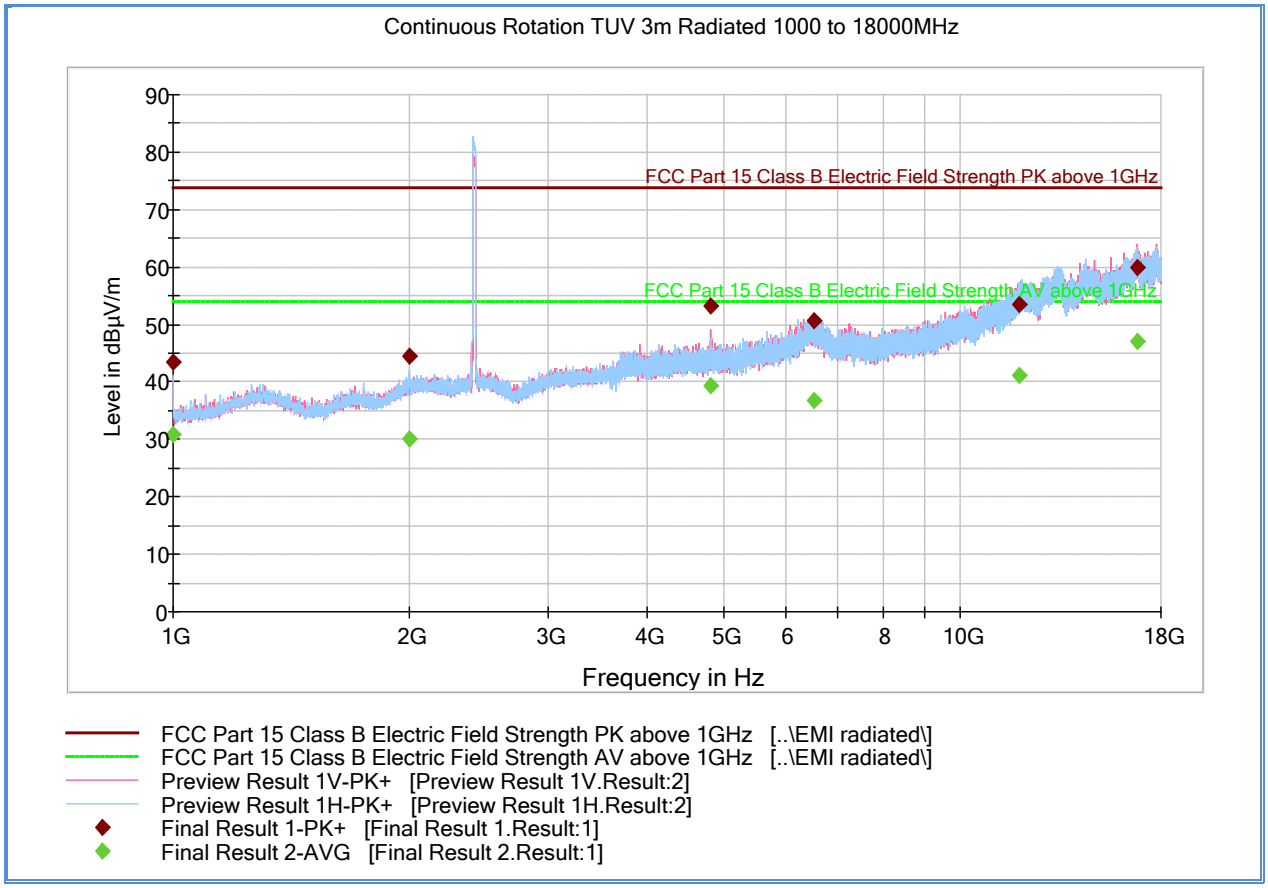
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.400000	43.4	1000.0	1000.000	189.5	V	16.0	-7.0	30.5	73.9
2045.866667	40.8	1000.0	1000.000	139.7	H	109.0	-1.0	33.1	73.9
4924.366667	58.5	1000.0	1000.000	250.3	H	238.0	7.3	15.4	73.9
7385.566667	52.3	1000.0	1000.000	155.6	V	10.0	10.9	21.6	73.9
11868.500000	54.4	1000.0	1000.000	153.6	H	339.0	19.4	19.5	73.9
17815.100000	59.5	1000.0	1000.000	146.6	H	323.0	25.8	14.4	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	29.3	1000.0	1000.000	189.5	V	16.0	-7.0	24.6	53.9
2045.866667	28.2	1000.0	1000.000	139.7	H	109.0	-1.0	25.7	53.9
4924.366667	53.4	1000.0	1000.000	250.3	H	238.0	7.3	0.5	53.9
7385.566667	45.3	1000.0	1000.000	155.6	V	10.0	10.9	8.6	53.9
11868.500000	41.0	1000.0	1000.000	153.6	H	339.0	19.4	12.9	53.9
17815.100000	46.4	1000.0	1000.000	146.6	H	323.0	25.8	7.5	53.9

Test Notes: No significant emissions observed above 18GHz. Measurements above 18GHz were noise floor figures.

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



Peak Data

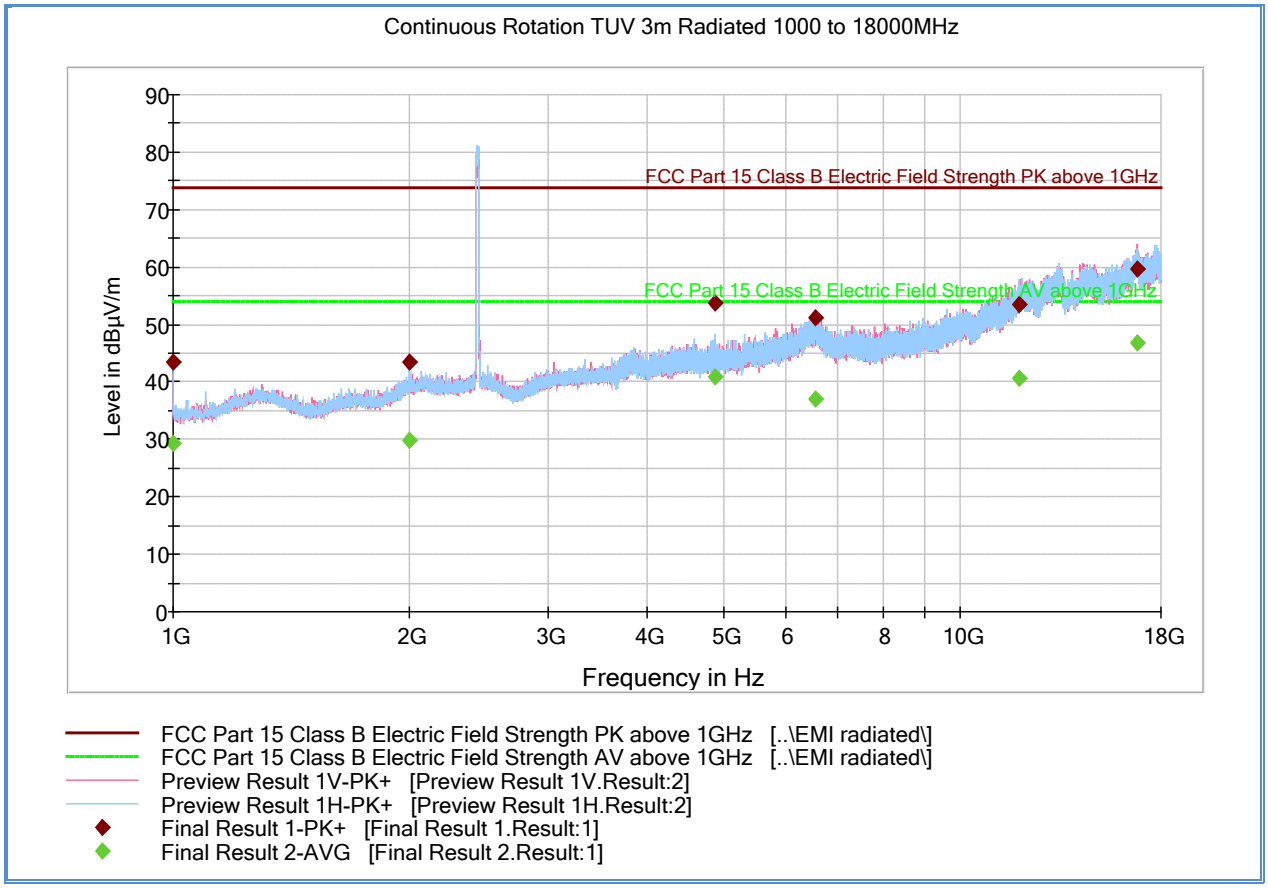
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.000000	43.4	1000.0	1000.000	99.7	H	327.0	-7.0	30.5	73.9
1999.433333	44.5	1000.0	1000.000	219.4	H	229.0	-1.0	29.4	73.9
4820.700000	53.1	1000.0	1000.000	347.1	V	-3.0	6.9	20.8	73.9
6508.133333	50.7	1000.0	1000.000	99.7	V	344.0	12.7	23.2	73.9
11905.366667	53.5	1000.0	1000.000	179.5	H	-20.0	19.7	20.4	73.9
16800.033333	59.8	1000.0	1000.000	202.4	V	1.0	25.9	14.1	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	30.9	1000.0	1000.000	99.7	H	327.0	-7.0	23.0	53.9
1999.433333	30.0	1000.0	1000.000	219.4	H	229.0	-1.0	23.9	53.9
4820.700000	39.4	1000.0	1000.000	347.1	V	-3.0	6.9	14.5	53.9
6508.133333	36.9	1000.0	1000.000	99.7	V	344.0	12.7	17.0	53.9
11905.366667	41.2	1000.0	1000.000	179.5	H	-20.0	19.7	12.7	53.9
16800.033333	47.0	1000.0	1000.000	202.4	V	1.0	25.9	6.9	53.9

Test Notes: No significant emissions observed above 18GHz. Measurements above 18GHz were noise floor figures.

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



Peak Data

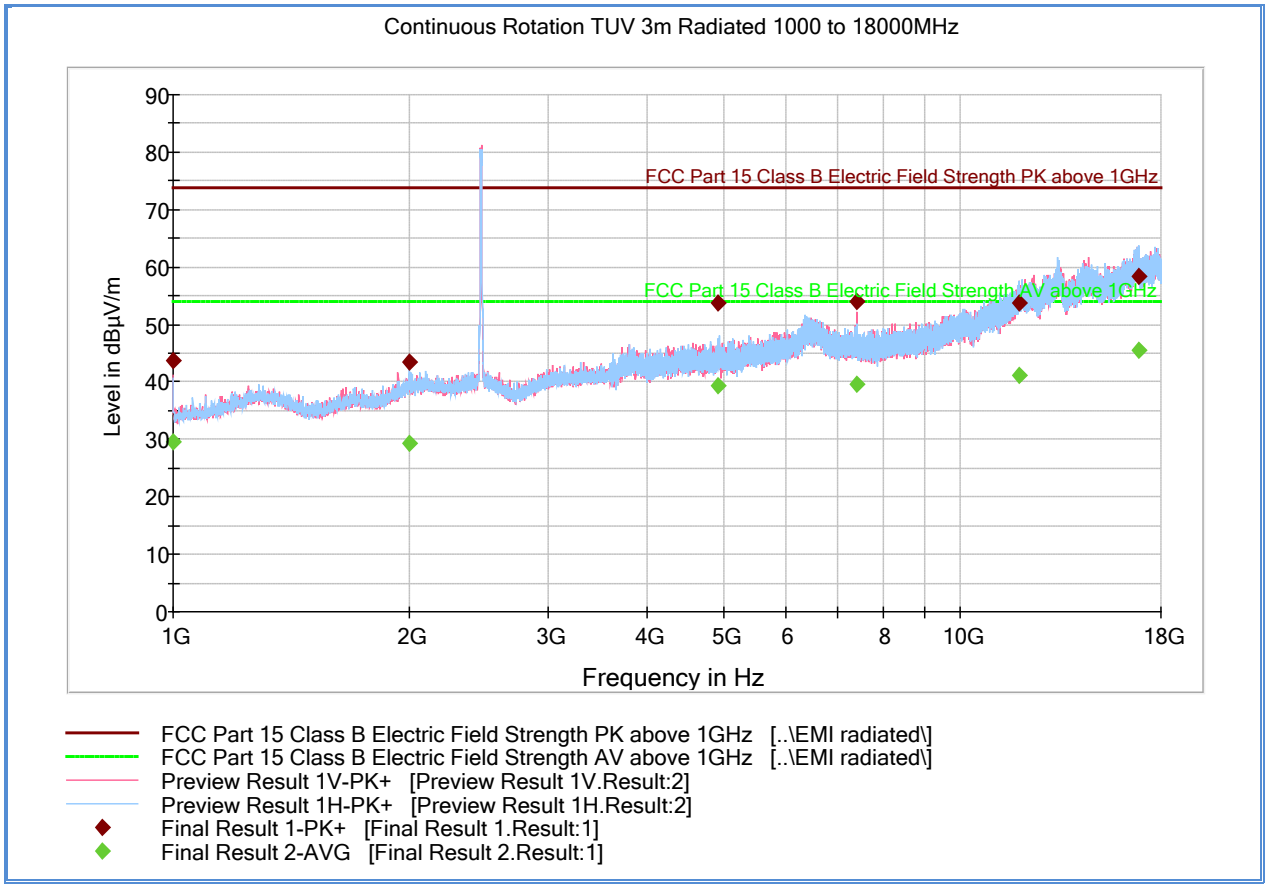
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.400000	43.6	1000.0	1000.000	99.7	H	29.0	-7.0	30.3	73.9
1999.266667	43.3	1000.0	1000.000	291.2	H	20.0	-1.0	30.6	73.9
4878.133333	53.6	1000.0	1000.000	256.3	H	238.0	7.1	20.3	73.9
6548.933333	51.1	1000.0	1000.000	171.6	V	123.0	12.8	22.8	73.9
11864.100000	53.5	1000.0	1000.000	219.4	H	10.0	19.3	20.4	73.9
16812.800000	59.7	1000.0	1000.000	99.7	V	16.0	25.7	14.2	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)
1000.400000	29.2	1000.0	1000.000	99.7	H	29.0	-7.0	24.7	53.9
1999.266667	29.8	1000.0	1000.000	291.2	H	20.0	-1.0	24.1	53.9
4878.133333	40.9	1000.0	1000.000	256.3	H	238.0	7.1	13.0	53.9
6548.933333	37.1	1000.0	1000.000	171.6	V	123.0	12.8	16.8	53.9
11864.100000	40.6	1000.0	1000.000	219.4	H	10.0	19.3	13.3	53.9
16812.800000	46.7	1000.0	1000.000	99.7	V	16.0	25.7	7.2	53.9

Test Notes: No significant emissions observed above 18GHz. Measurements above 18GHz were noise floor figures.

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



Peak Data

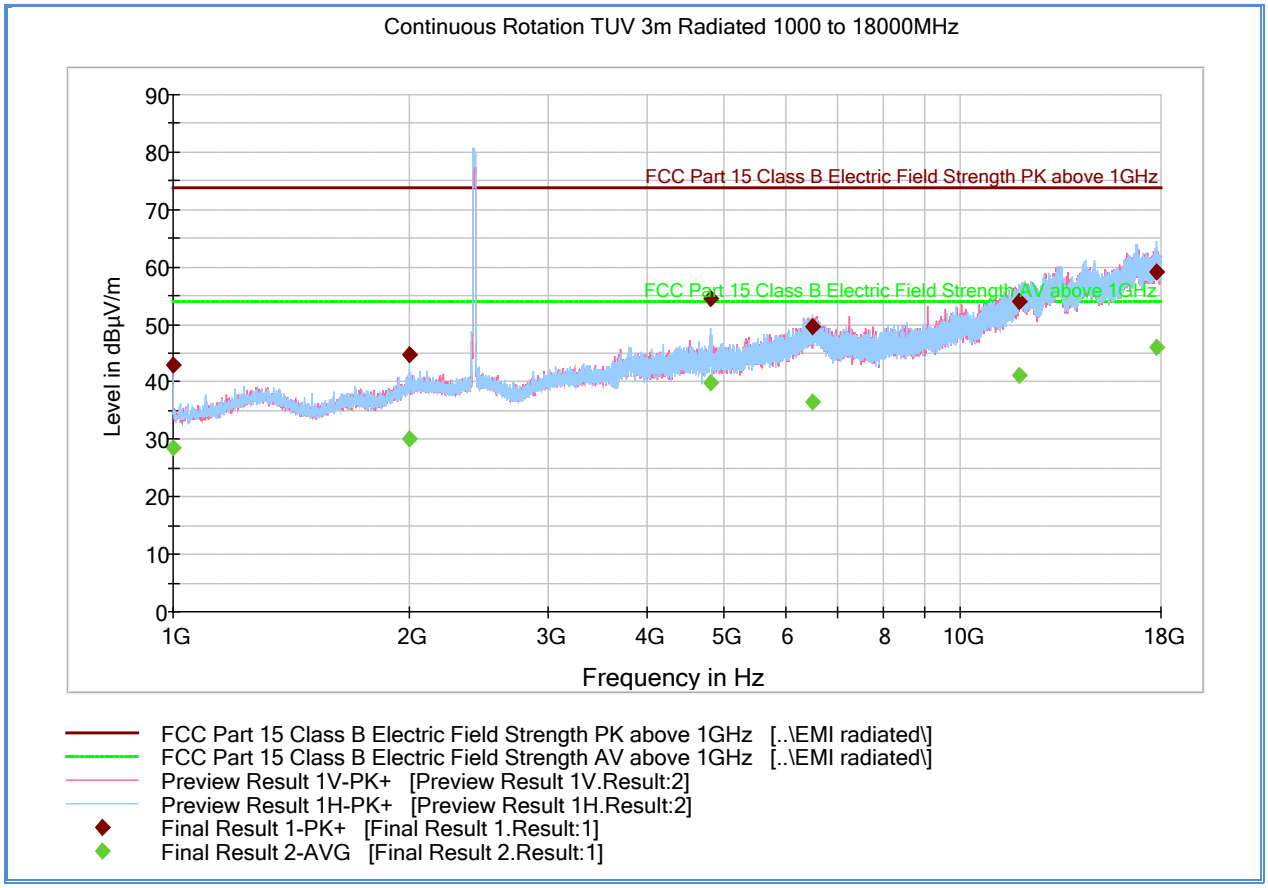
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.400000	43.8	1000.0	1000.000	180.5	V	16.0	-7.0	30.1	73.9
1998.833333	43.6	1000.0	1000.000	227.4	H	20.0	-1.0	30.3	73.9
4935.066667	53.8	1000.0	1000.000	246.3	H	244.0	7.3	20.1	73.9
7382.766667	54.1	1000.0	1000.000	154.6	V	10.0	10.9	19.8	73.9
11901.200000	53.7	1000.0	1000.000	357.1	H	20.0	19.7	20.2	73.9
16867.033333	58.5	1000.0	1000.000	202.3	H	320.0	24.8	15.4	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	29.6	1000.0	1000.000	180.5	V	16.0	-7.0	24.3	53.9
1998.833333	29.3	1000.0	1000.000	227.4	H	20.0	-1.0	24.6	53.9
4935.066667	39.3	1000.0	1000.000	246.3	H	244.0	7.3	14.6	53.9
7382.766667	39.6	1000.0	1000.000	154.6	V	10.0	10.9	14.3	53.9
11901.200000	41.2	1000.0	1000.000	357.1	H	20.0	19.7	12.7	53.9
16867.033333	45.6	1000.0	1000.000	202.3	H	320.0	24.8	8.3	53.9

Test Notes: No significant emissions observed above 18GHz. Measurements above 18GHz were noise floor figures.

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



Peak Data

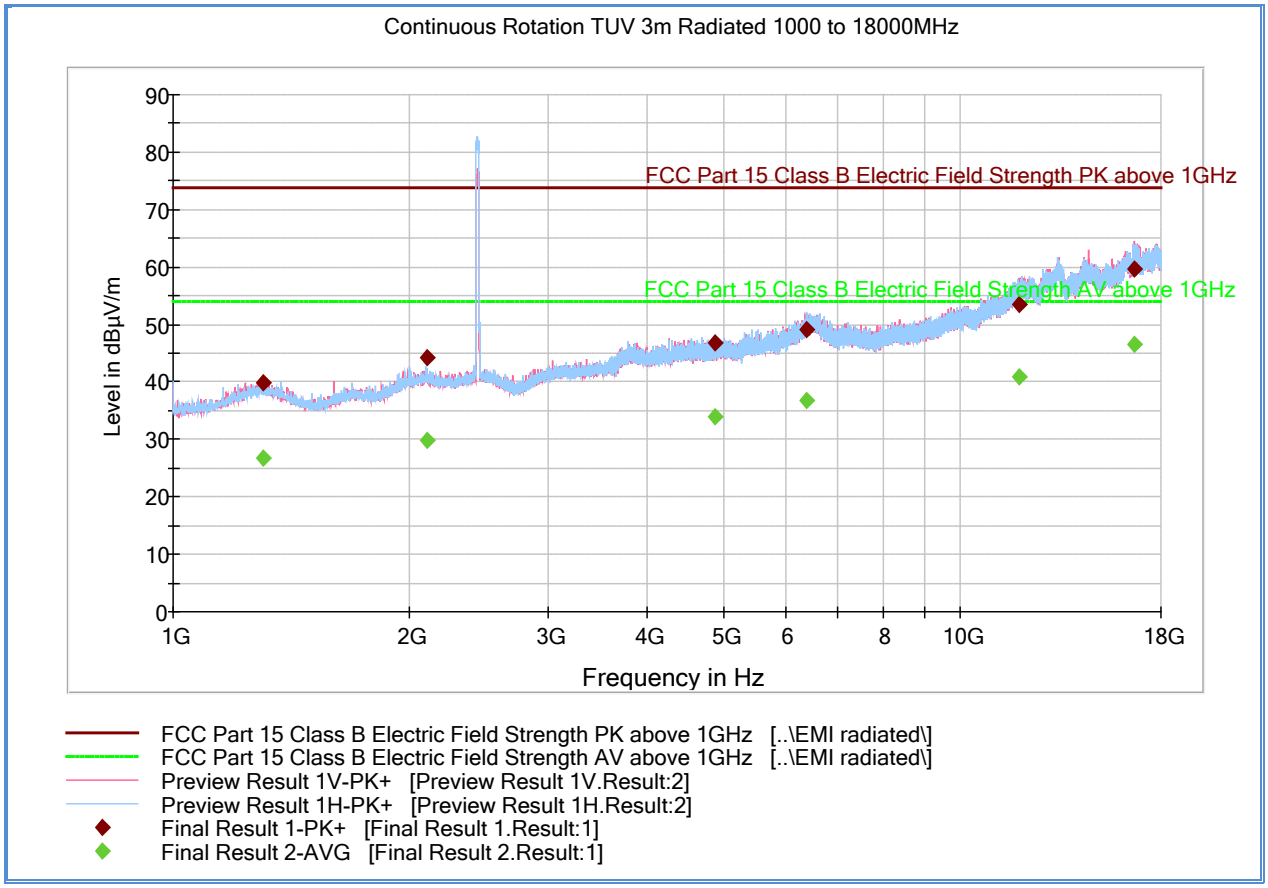
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.500000	43.1	1000.0	1000.000	99.7	H	31.0	-7.0	30.8	73.9
1999.433333	44.7	1000.0	1000.000	290.2	H	41.0	-1.0	29.2	73.9
4828.766667	54.5	1000.0	1000.000	172.5	H	238.0	6.9	19.4	73.9
6481.766667	49.5	1000.0	1000.000	229.4	H	234.0	12.7	24.4	73.9
11887.966667	53.9	1000.0	1000.000	239.3	H	352.0	19.5	20.0	73.9
17734.766667	59.3	1000.0	1000.000	189.5	H	1.0	25.7	14.6	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)
1000.500000	28.5	1000.0	1000.000	99.7	H	31.0	-7.0	25.4	53.9
1999.433333	30.2	1000.0	1000.000	290.2	H	41.0	-1.0	23.7	53.9
4828.766667	39.8	1000.0	1000.000	172.5	H	238.0	6.9	14.1	53.9
6481.766667	36.6	1000.0	1000.000	229.4	H	234.0	12.7	17.3	53.9
11887.966667	41.2	1000.0	1000.000	239.3	H	352.0	19.5	12.7	53.9
17734.766667	46.1	1000.0	1000.000	189.5	H	1.0	25.7	7.8	53.9

Test Notes: No significant emissions observed above 18GHz. Measurements above 18GHz were noise floor figures.

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



Peak Data

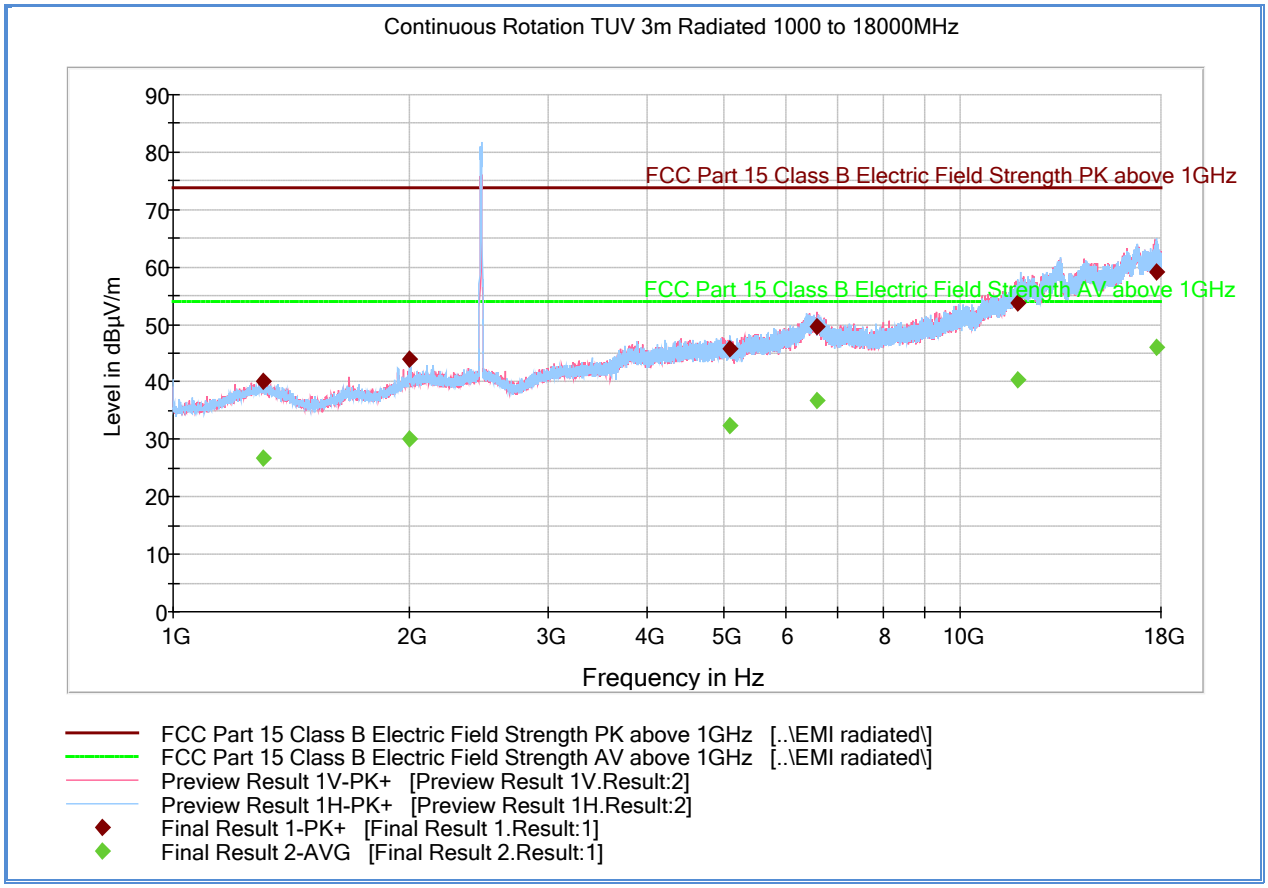
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1302.966667	39.8	1000.0	1000.000	300.6	V	146.0	-5.0	34.1	73.9
2098.633333	44.2	1000.0	1000.000	279.3	H	344.0	-1.0	29.7	73.9
4881.900000	46.7	1000.0	1000.000	253.3	H	-8.0	7.1	27.2	73.9
6390.333333	49.2	1000.0	1000.000	152.6	H	160.0	12.7	24.7	73.9
11886.633333	53.5	1000.0	1000.000	265.3	V	147.0	19.5	20.4	73.9
16687.166667	59.6	1000.0	1000.000	172.6	V	219.0	25.6	14.3	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)
1302.966667	26.8	1000.0	1000.000	300.6	V	146.0	-5.0	27.1	53.9
2098.633333	29.8	1000.0	1000.000	279.3	H	344.0	-1.0	24.1	53.9
4881.900000	33.9	1000.0	1000.000	253.3	H	-8.0	7.1	20.0	53.9
6390.333333	36.7	1000.0	1000.000	152.6	H	160.0	12.7	17.2	53.9
11886.633333	40.8	1000.0	1000.000	265.3	V	147.0	19.5	13.1	53.9
16687.166667	46.6	1000.0	1000.000	172.6	V	219.0	25.6	7.3	53.9

Test Notes: No significant emissions observed above 18GHz. Measurements above 18GHz were noise floor figures.

2.7.25 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)
1304.100000	40.1	1000.0	1000.000	402.7	H	261.0	-5.0	33.8	73.9
1999.566667	44.1	1000.0	1000.000	301.2	H	127.0	-1.0	29.8	73.9
5105.700000	45.7	1000.0	1000.000	188.5	H	-2.0	7.8	28.2	73.9
6571.866667	49.5	1000.0	1000.000	136.7	V	62.0	12.8	24.4	73.9
11857.933333	53.6	1000.0	1000.000	215.5	H	161.0	19.3	20.3	73.9
17733.900000	59.1	1000.0	1000.000	189.5	H	350.0	25.7	14.8	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)
1304.100000	26.7	1000.0	1000.000	402.7	H	261.0	-5.0	27.2	53.9
1999.566667	30.0	1000.0	1000.000	301.2	H	127.0	-1.0	23.9	53.9
5105.700000	32.5	1000.0	1000.000	188.5	H	-2.0	7.8	21.4	53.9
6571.866667	36.9	1000.0	1000.000	136.7	V	62.0	12.8	17.0	53.9
11857.933333	40.4	1000.0	1000.000	215.5	H	161.0	19.3	13.5	53.9
17733.900000	46.1	1000.0	1000.000	189.5	H	350.0	25.7	7.8	53.9

Test Notes: No significant emissions observed above 18GHz. Measurements above 18GHz were 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: 1017 and BVBIDIAG2B/ Test Configuration C

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

June 05, 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	24.6 °C
Relative Humidity	48.2.%
ATM Pressure	98.9 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) in terms of band-edge compliance.

- 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.

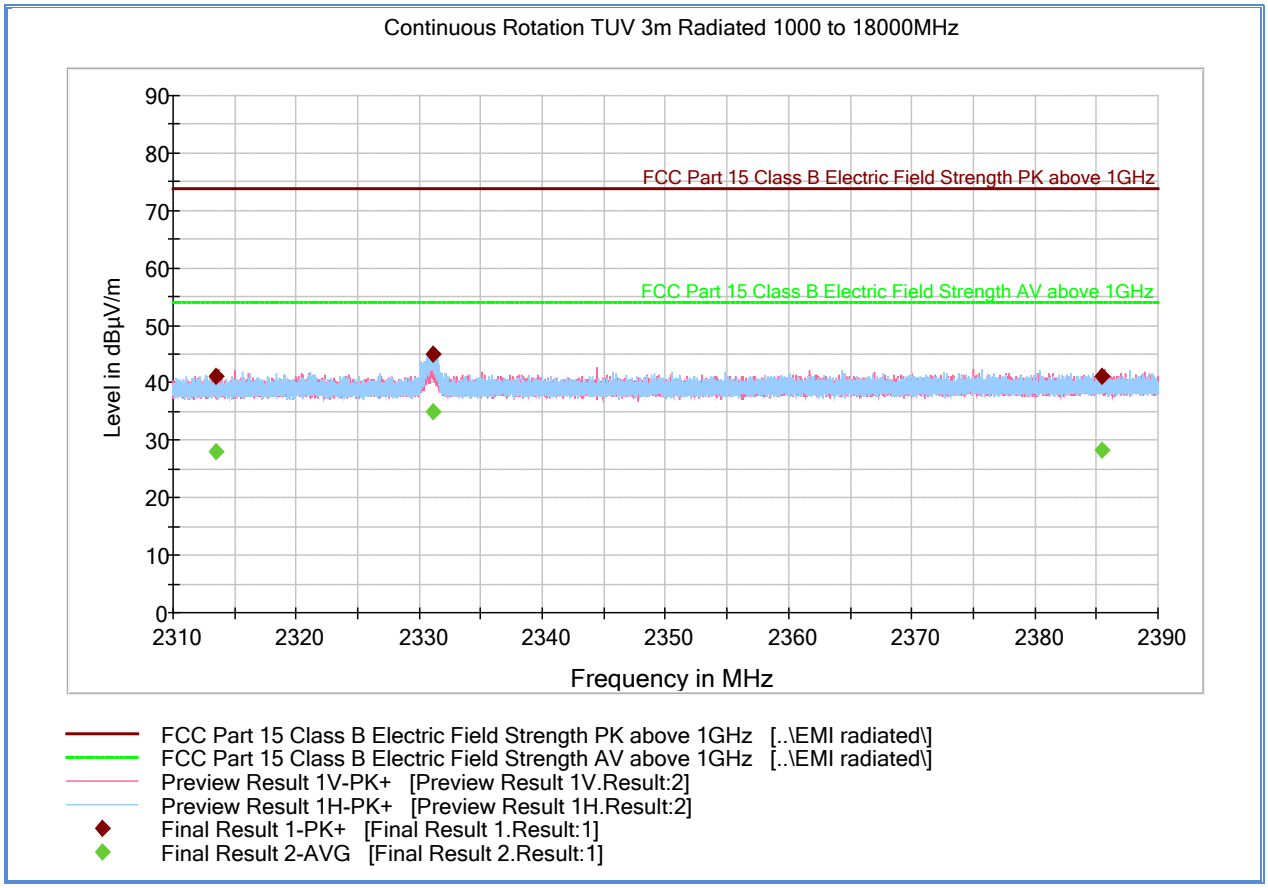
2.8.8 Sample Computation (Radiated Emission)

Measuring equipment raw measurement (dbµV) @ 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 (Bluetooth LE Low Channel)



Peak Data

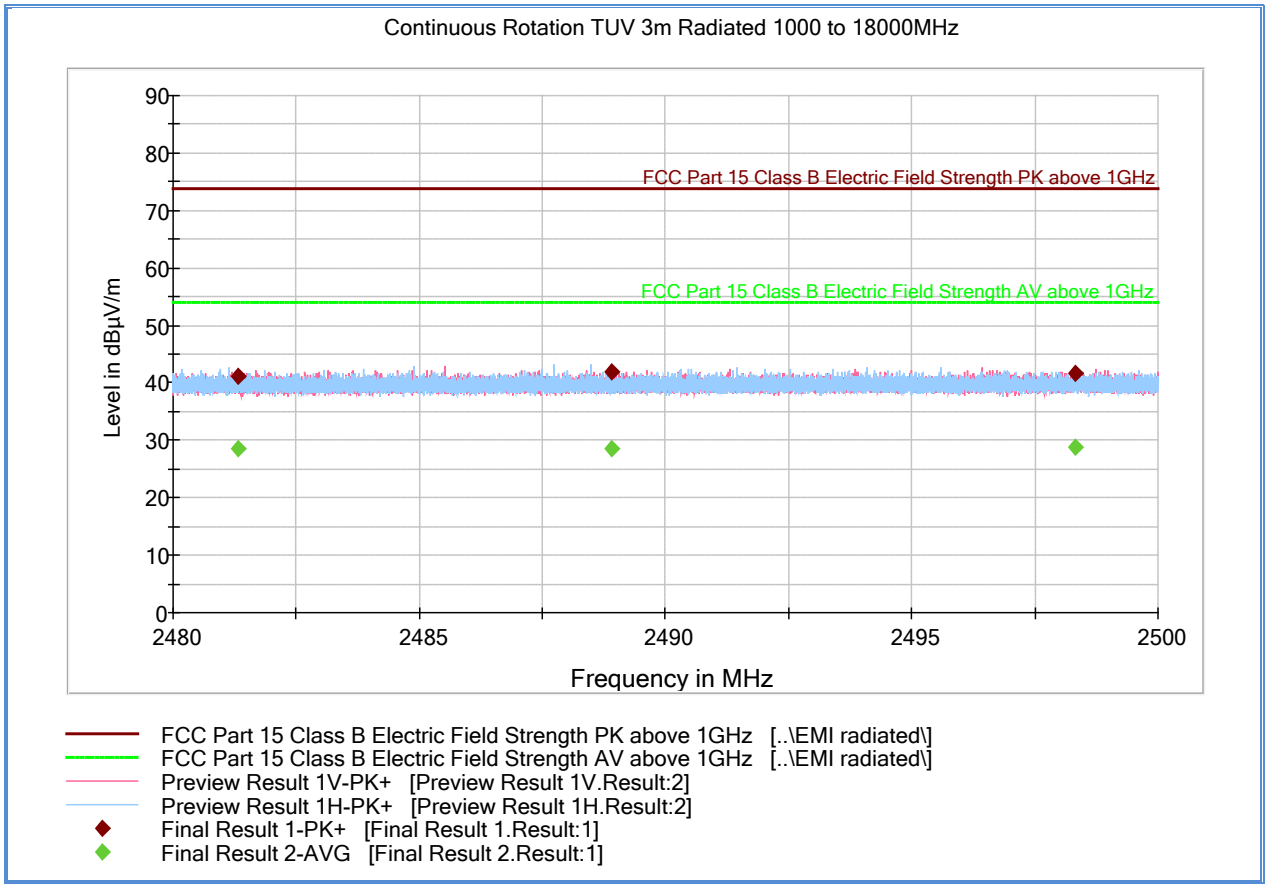
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
2313.466667	41.2	1000.0	1000.000	322.2	V	65.0	-0.5	32.7	73.9
2331.138667	45.0	1000.0	1000.000	99.7	H	290.0	-0.4	28.9	73.9
2385.469333	41.1	1000.0	1000.000	101.7	V	92.0	-0.2	32.8	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)
2313.466667	28.1	1000.0	1000.000	322.2	V	65.0	-0.5	25.8	53.9
2331.138667	35.0	1000.0	1000.000	99.7	H	290.0	-0.4	18.9	53.9
2385.469333	28.4	1000.0	1000.000	101.7	V	92.0	-0.2	25.5	53.9

Test Notes:

2.8.11 Test Results Restricted Band 2483.5MHz to 2500MHz (Bluetooth LE High Channel)



Peak Data

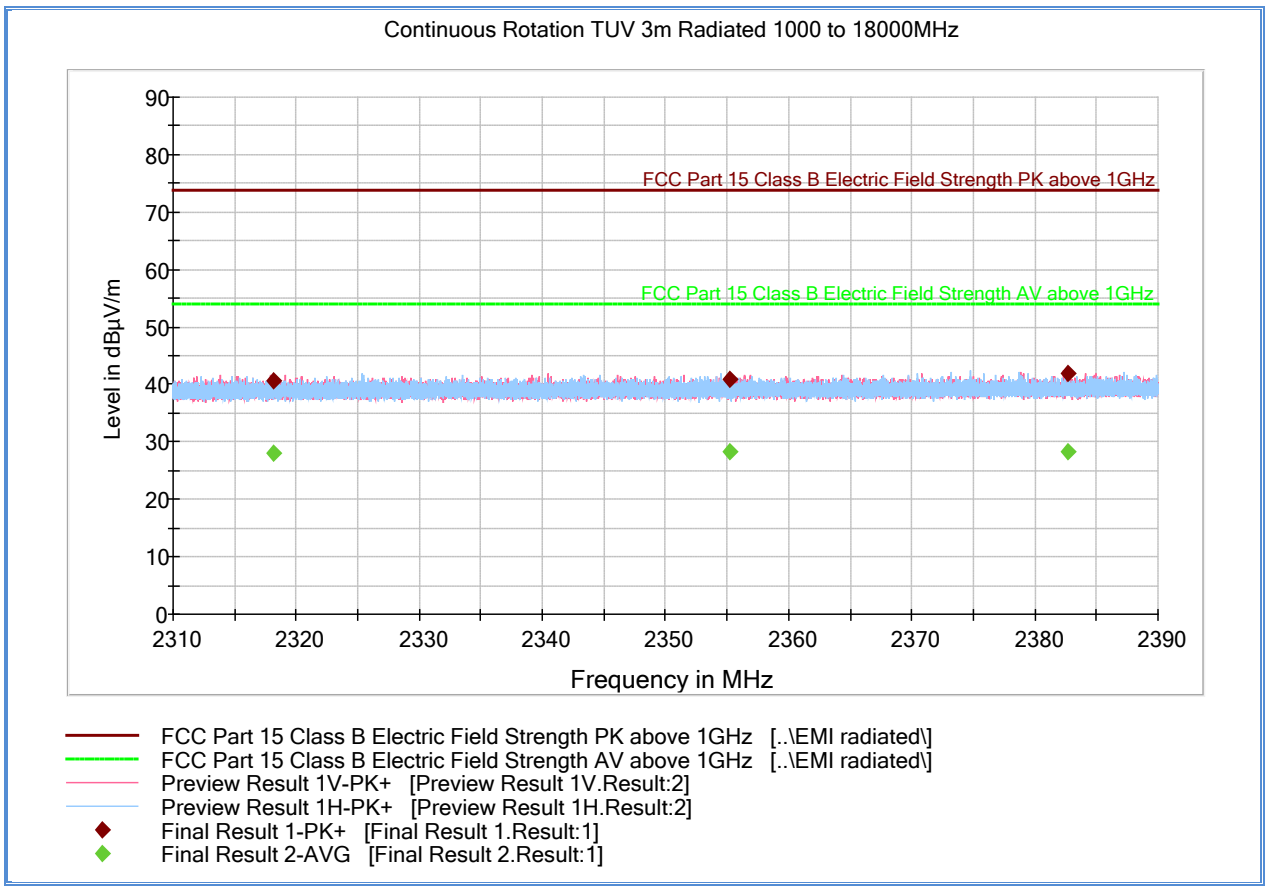
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
2481.327333	41.2	1000.0	1000.000	407.3	H	59.0	0.1	32.7	73.9
2488.896000	41.9	1000.0	1000.000	112.7	H	320.0	0.2	32.0	73.9
2498.330667	41.6	1000.0	1000.000	101.7	H	23.0	0.2	32.3	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)
2481.327333	28.6	1000.0	1000.000	407.3	H	59.0	0.1	25.3	53.9
2488.896000	28.6	1000.0	1000.000	112.7	H	320.0	0.2	25.3	53.9
2498.330667	28.7	1000.0	1000.000	101.7	H	23.0	0.2	25.2	53.9

Test Notes:

2.8.12 Test Results Restricted Band 2310MHz to 2390MHz (Low Channel Worst Case WiFi Mode)



Peak Data

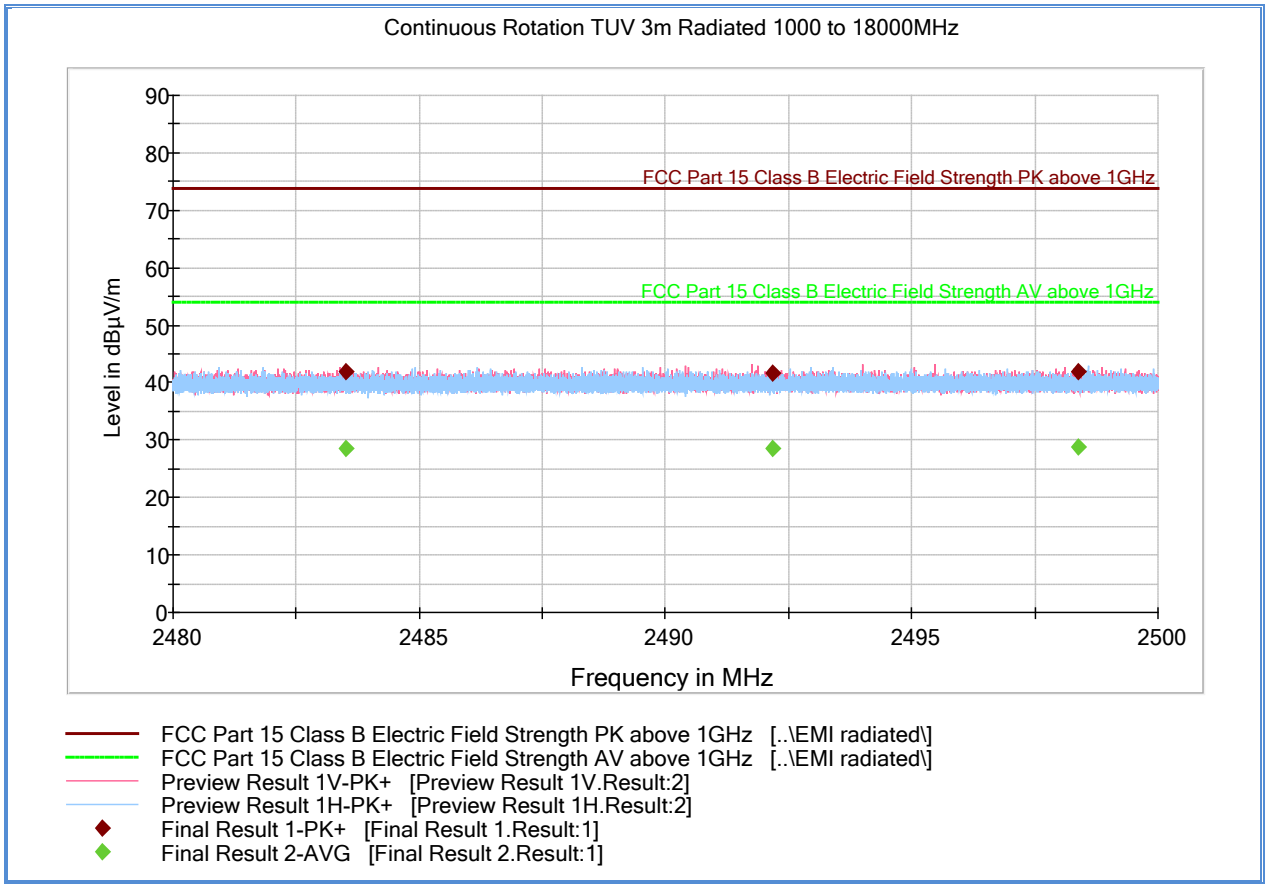
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
2318.149333	40.7	1000.0	1000.000	226.4	V	331.0	-0.5	33.2	73.9
2355.264000	40.9	1000.0	1000.000	226.4	H	109.0	-0.4	33.0	73.9
2382.674667	42.0	1000.0	1000.000	378.1	V	68.0	-0.3	31.9	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)
2318.149333	28.0	1000.0	1000.000	226.4	V	331.0	-0.5	25.9	53.9
2355.264000	28.2	1000.0	1000.000	226.4	H	109.0	-0.4	25.7	53.9
2382.674667	28.3	1000.0	1000.000	378.1	V	68.0	-0.3	25.6	53.9

Test Notes:

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)
2483.515333	41.9	1000.0	1000.000	120.7	H	263.0	0.1	32.0	73.9
2492.160000	41.7	1000.0	1000.000	355.1	V	107.0	0.2	32.2	73.9
2498.376000	41.8	1000.0	1000.000	227.4	H	114.0	0.2	32.1	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)
2483.515333	28.6	1000.0	1000.000	120.7	H	263.0	0.1	25.3	53.9
2492.160000	28.6	1000.0	1000.000	355.1	V	107.0	0.2	25.3	53.9
2498.376000	28.7	1000.0	1000.000	227.4	H	114.0	0.2	25.2	53.9

Test Notes:

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: N/A (Sample #1) / Test Configuration A

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

June 03 and 04, 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	24.6 °C
Relative Humidity	48.2.%
ATM Pressure	98.9 kPa

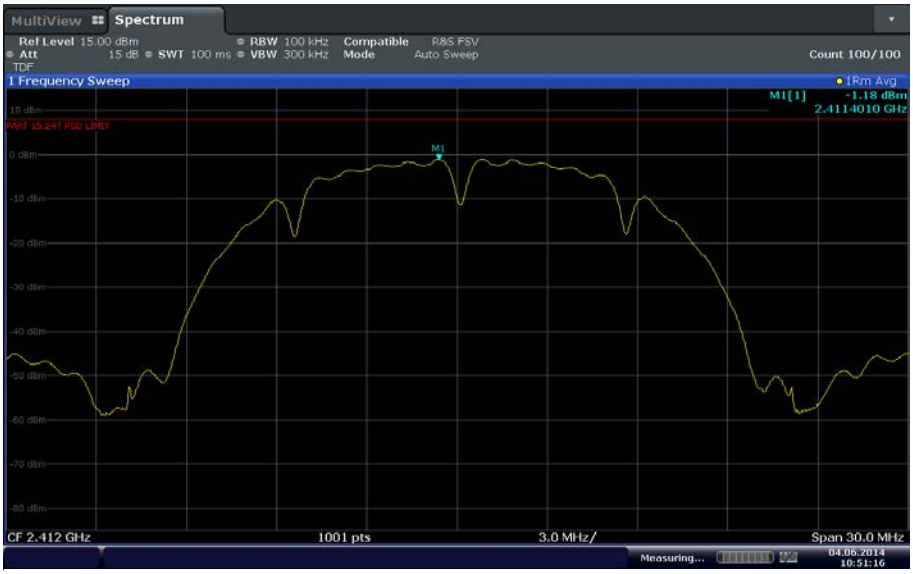
2.9.7 Additional Observations

- This is a conducted test.
- Test procedure is per Section 10.3 of KDB 558074 (April 09, 2013). For Bluetooth LE, Section 10.5 applies.
- TDF (Transducer Factor) was used to compensate for the external attenuator and cable used. Additional of 4.88dB offset was applied for Bluetooth LE to compensate for Duty Cycle.
- 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

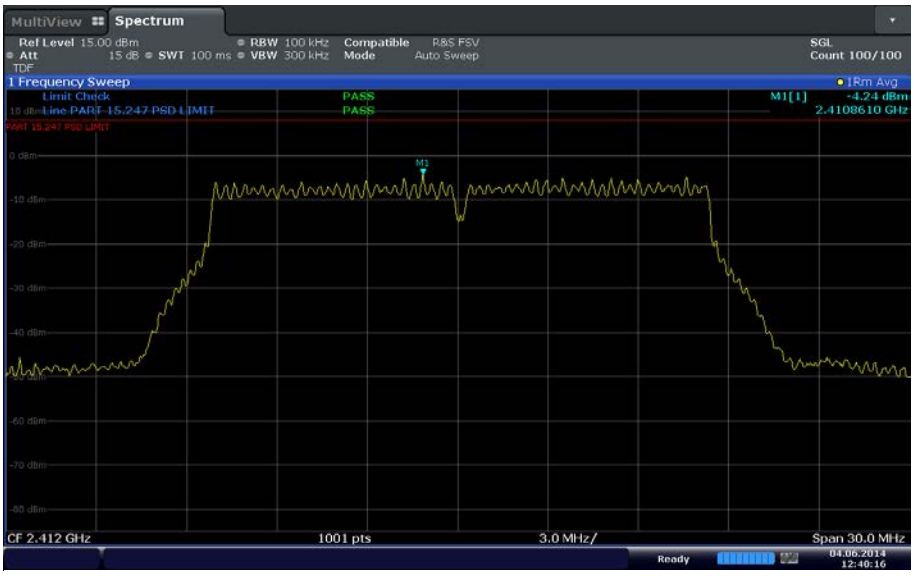
Mode	Channel	Marker Reading using 100 kHz RBW (dBm)	PSD Limit (dBm)	Margin (dB)	Compliance
802.11b	1 (2412 MHz)	-1.18	8	9.18	Complies
	6 (2437 MHz)	-1.20	8	9.20	Complies
	11 (2462 MHz)	-3.94	8	11.94	Complies
802.11g	1 (2412 MHz)	-4.24	8	12.24	Complies
	6 (2437 MHz)	-4.44	8	12.44	Complies
	11 (2462 MHz)	-4.79	8	12.79	Complies
802.11n HT20	1 (2412 MHz)	-0.71	8	8.71	Complies
	6 (2437 MHz)	-1.19	8	9.19	Complies
	11 (2462 MHz)	-1.15	8	9.15	Complies
Bluetooth LE	37 (2402 MHz)	-5.88	8	13.88	Complies
	17 (2440 MHz)	-7.00	8	15.00	Complies
	39 (2480 MHz)	-6.79	8	14.79	Complies

2.9.9 Test Results Plots



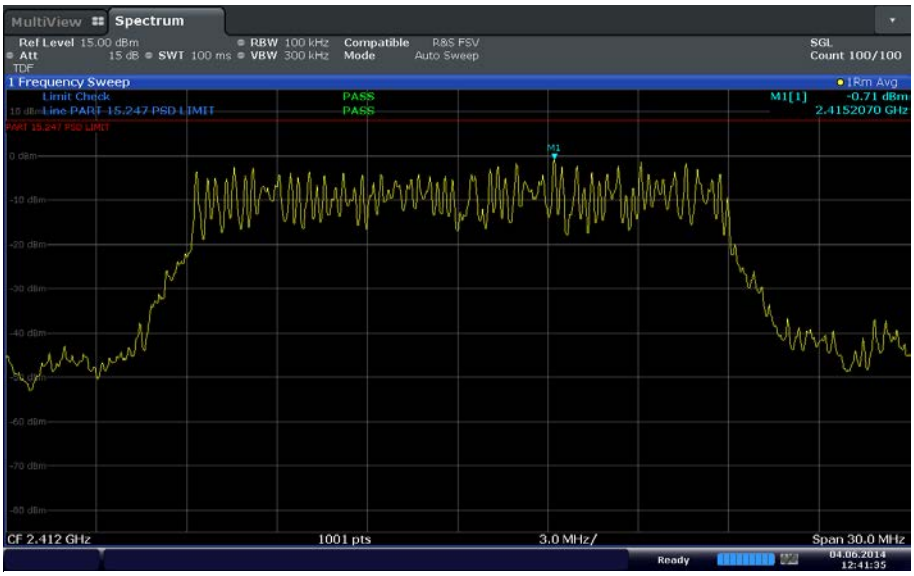
Date: 4.JUN.2014 10:51:17

802.11b Worst Case Channel



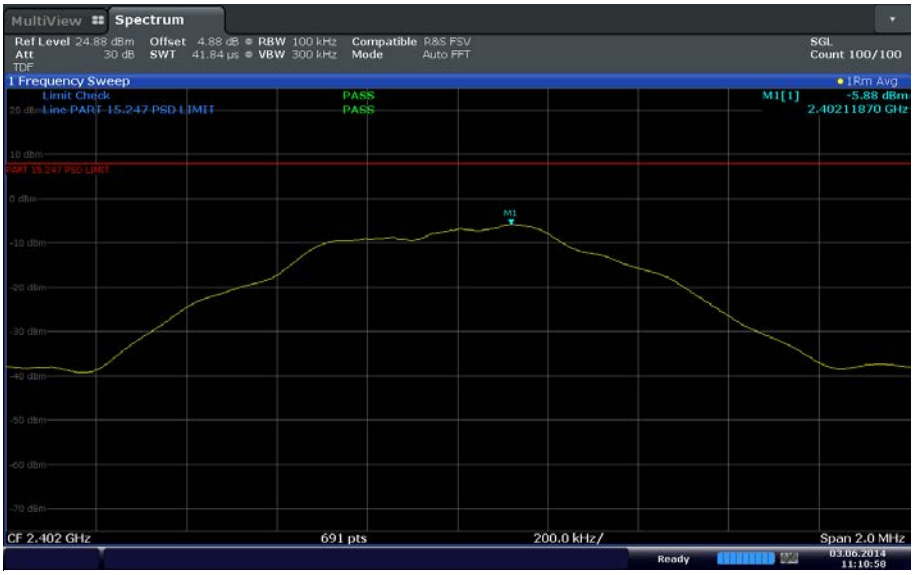
Date: 4.JUN.2014 12:40:16

802.11g Worst Case Channel



Date: 4.JUN.2014 12:41:36

802.11n HT20 Worst Case Channel



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Bluetooth LE 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	04/22/14	04/22/15
7570	50MHz-18GHz Wideband Power Sensor	N1921A	MY45240588	Agilent	04/09/14	04/09/15
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
7562	Wideband Radio Communication Tester	CMW 500	1201.0002k50/ 103829	Rhode & Schwarz	10/09/13	10/09/15
8825	20dB Attenuator	46-20-34	BK5773	Weinschel Corp.	Verified by 1189 and 7582	
Radiated Test Setup						
1002	Bilog Antenna	3142C	00058717	ETS-Lindgren	01/30/14	01/30/16
7575	Double-ridged waveguide horn antenna	3117	00155511	EMCO	04/08/14	04/08/15
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	05/02/15
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	03/17/14	03/17/15
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
7562	Wideband Radio Communication Tester	CMW 500	1201.0002k50/ 103829	Rhode & Schwarz	10/09/13	10/09/15
Conducted Emissions						
1024	EMI Test Receiver	ESCS 30	847793/001	Rhode & Schwarz	04/05/14	04/05/15
7567	LISN	FCC-LISN-50-25-2-10	120304	Fischer Custom Comm.	06/11/13	06/11/14
8822	20dB Attenuator	34-20-34	N/A	MCE / Weinschel	01/30/14	01/30/15
8824	20dB Attenuator	34-20-34	N/A	MCE / Weinschel	01/30/14	01/30/15
Miscellaneous						
6452	Multimeter	3478A	2911A52177	Hewlett Packard	08/02/13	08/02/14
7560	Barometer/Temperature/Humidity Transmitter	iBTHX-W	1240476	Omega	11/19/12	11/19/14
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

3.2.1 AC Conducted Measurements

	Contribution	Probability Distribution Type	Probability Distribution x_i	Standard Uncertainty $u(x_i)$	$[u(x_i)]^2$
1	Receiver/Spectrum Analyzer	Rectangular	0.36	0.21	0.04
2	Cables	Rectangular	0.50	0.29	0.08
3	LISN	Rectangular	0.66	0.38	0.15
4	Attenuator	Rectangular	0.30	0.17	0.03
5	EUT Setup	Rectangular	1.00	0.58	0.33
				Combined Uncertainty (u_c):	0.80
				Coverage Factor (k):	2
				Expanded Uncertainty:	1.59

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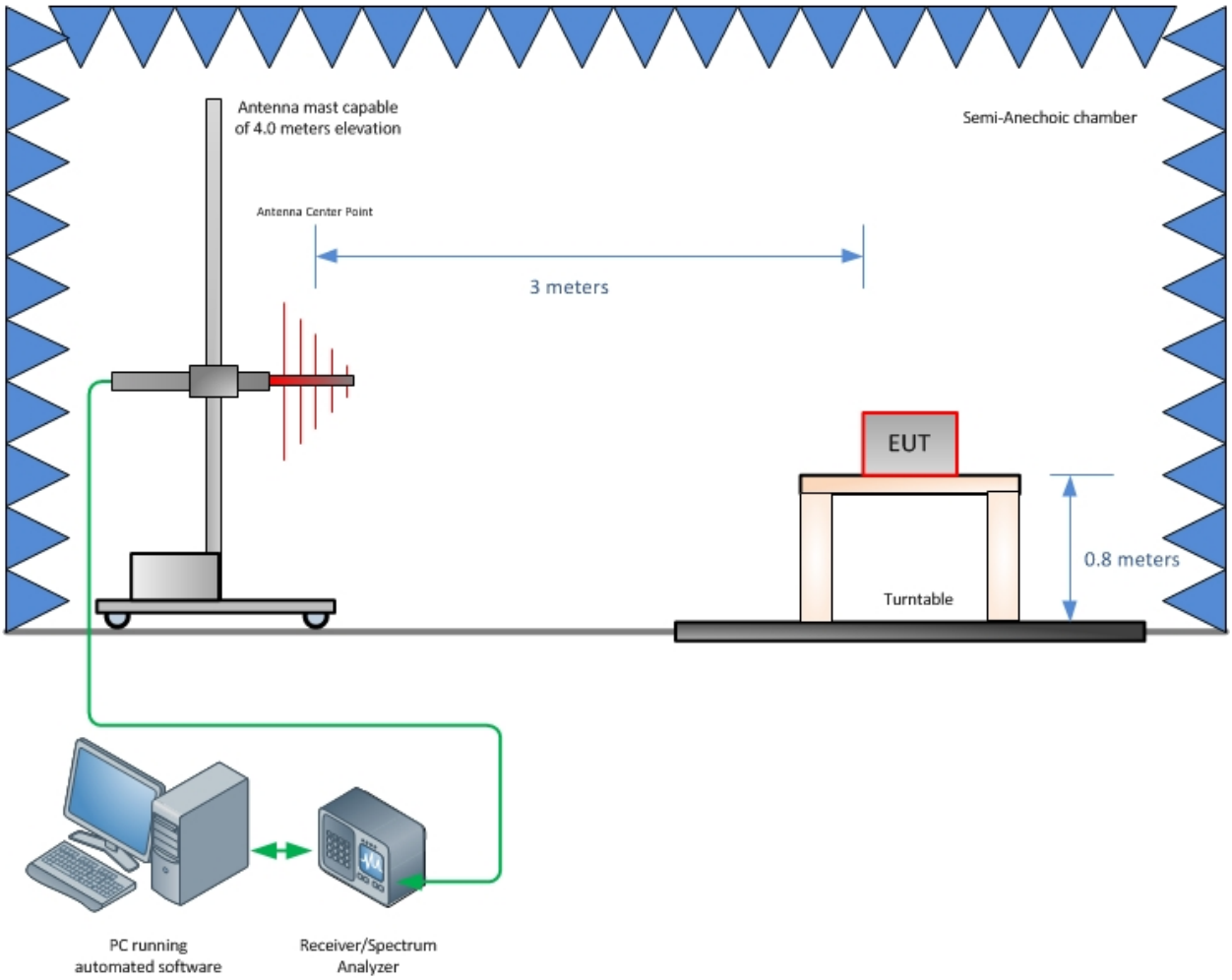
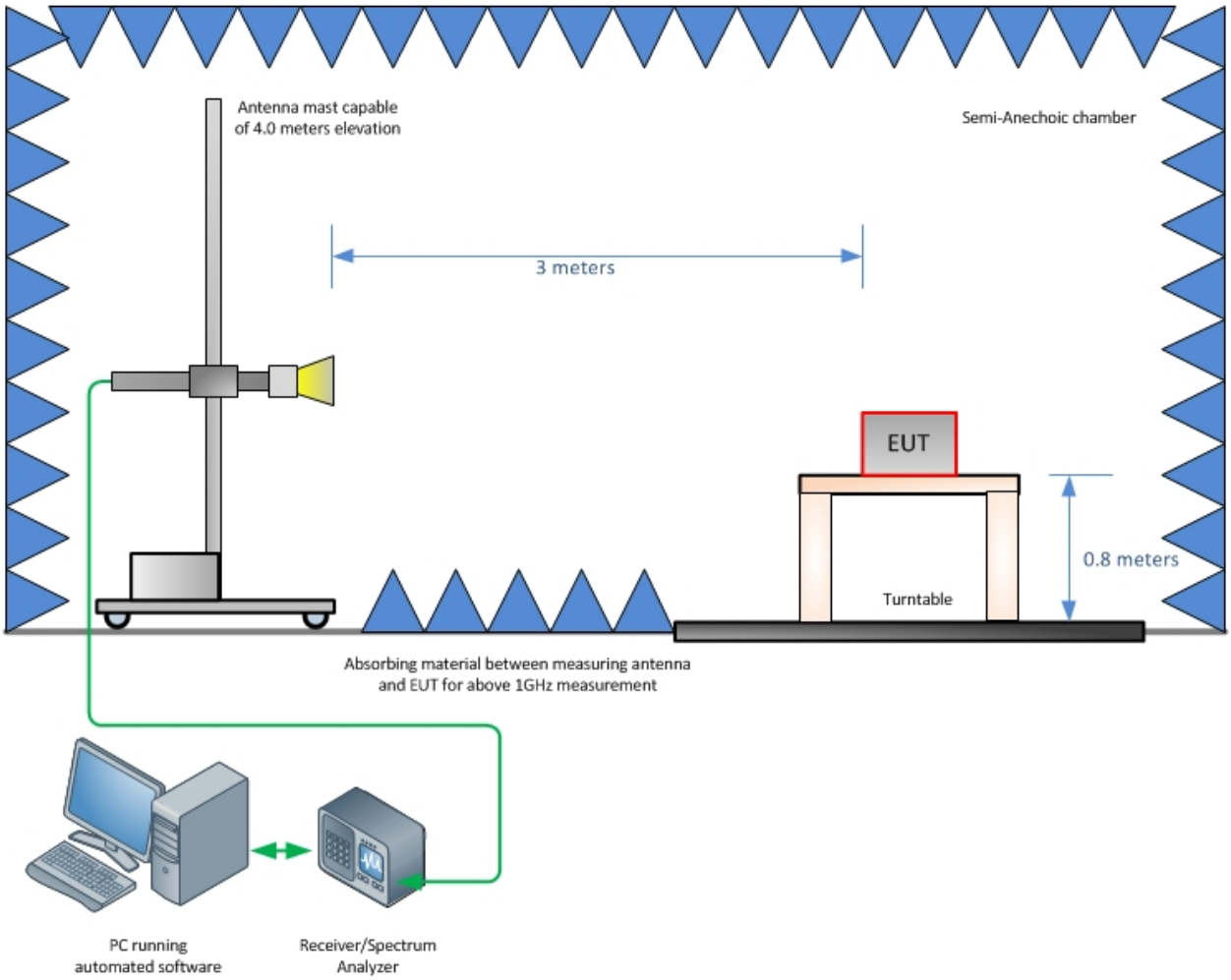
SECTION 4

DIAGRAM OF TEST SETUP

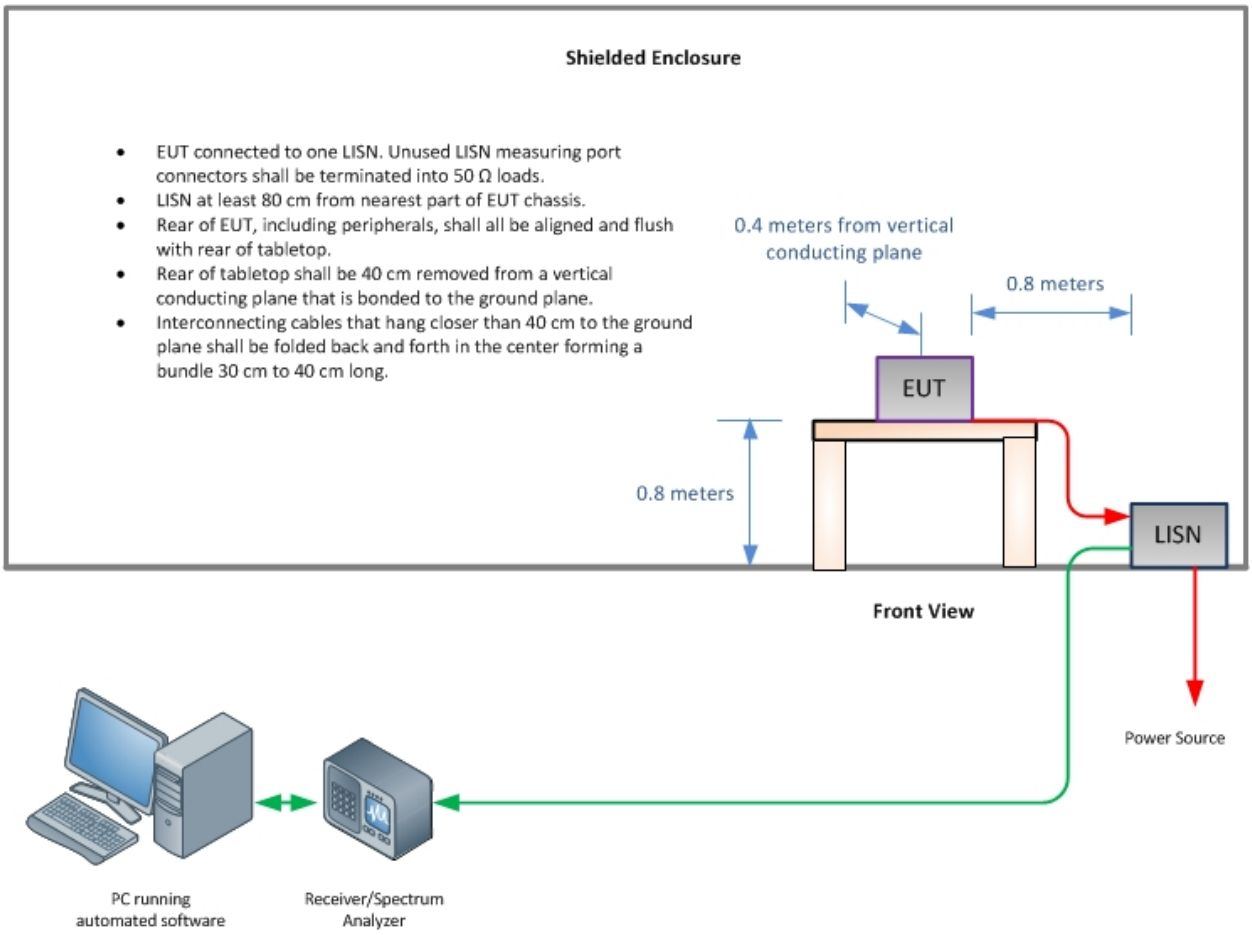
4.1 TEST SETUP DIAGRAM



Radiated Emission Test Setup (Below 1GHz)



Radiated Emission Test Setup (Above 1GHz)



Conducted Emission Test Setup

SECTION 5

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