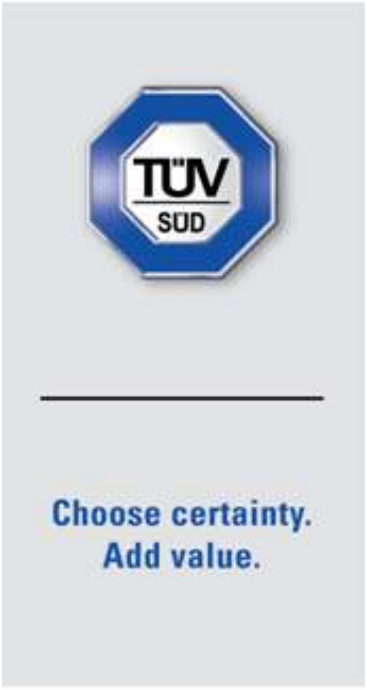

Report On

Application for Grant of Equipment Authorization of the
Inseego Corp.
M1000 Wireless Hotspot Modem

FCC CRF 47 Part 15 Subpart C §15.247
RSS-247 Issue 2: 2017

Report No. 72146272C **May 2019**

REPORT ON	Radio Testing of the Inseego Corp. M1000 Wireless Hotspot Modem
TEST REPORT NUMBER	72146272C
PREPARED FOR	Inseego Corp. 9605 Scranton Road, Suite 300 San Diego, CA 92121 USA
CONTACT PERSON	Roman Olmos Senior Regulatory Engineer (858) 812-0606 roman.olmos@inseego.com
PREPARED BY	Ferdinand S. Custodio **Name** Authorized Signatory Title: Senior EMC Test Engineer/Wireless Team Lead
APPROVED BY	Alex Chang **Name** Authorized Signatory Title: Senior EMC/RF Wireless Test Engineer
DATED	May 10, 2019

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

Revision History

72146272C Inseego Corp. M1000 Wireless Hotspot Modem					
DATE	OLD REVISION	NEW REVISION	REASON	PAGES AFFECTED	APPROVED BY
05/10/2019	Initial Release				Alex Chang

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
Inseego Corp.
M1000 Wireless Hotspot Modem

1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Inseego Corp. M1000 Wireless Hotspot Modem to the requirements of FCC CRF 47 Part 15 Subpart C §15.247: 2018 and RSS-247 Issue 2: 2017.

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	Inseego Corp.
Product Trademark/Brand	Inseego
Product Marketing Name	5G MiFi 1000
Model Number(s)	M1000
FCC ID Number	PKRISGM1000
IC Number	3229A-M1000
Serial Number(s)	FF130219B00305 and FF130219B00294
Number of Samples Tested	2
Test Specification/Issue/Date	• FCC CRF 47 Part 15 Subpart C §15.247 (October 1, 2018). • RSS-247 Issue 2: 2017 - Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices. • RSS-Gen Issue 5 April 2018 - General Requirements for Compliance of Radio Apparatus. • KDB558074 D01 DTS Meas Guidance v05r01, (February 11, 2019) Guidance For Compliance Measurements On Digital Transmission System, Frequency Hopping Spread Spectrum System, and Hybrid System Devices operating under Section 15.247 of the FCC Rules. • ANSI C63.10-2013 11.8.1: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices • SAR Test Report Number SAR.20190423. Issued by RF Exposure Lab 802 N. Twin Oaks Valley Road, Suite 105, San Marcos, CA 92069 USA
Start of Test	March 11, 2019
Finish of Test	March 17, 2019
Name of Engineer(s)	Ferdinand Custodio
Related Document(s)	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 CRF 47 Part 15 Subpart C §15.247 with cross-reference to the corresponding ISED RSS standard is shown below.

Section	FCC Part Sections(s)	ISED Sections	Test Description	Result	Comments/ Base Standard
2.1	§15.247(b)(3)	RSS-247 5.4(d)	Peak Output Power	Compliant	
2.2	§15.207(a)	RSS-Gen 8.8	Conducted Emissions	Compliant	
2.3	-	RSS-Gen 6.7	99% Emission Bandwidth	For reporting purpose only	
2.4	§15.247(a)(2)	RSS-247 5.2(a)	Minimum 6 dB RF Bandwidth	Compliant	
2.5	§15.247(d)	RSS-247 5.5	Out-of-Band Emissions - Conducted	Compliant	
2.6	§15.247(d)	RSS-247 5.5	Band-edge Compliance of RF Conducted Emissions	Compliant	
2.7	§15.247(d)	RSS-247 5.5	Spurious Radiated Emissions	Compliant	
	-	RSS-Gen 7.4	Receiver Spurious Emissions	N/A*	
2.8	§15.247(e)	RSS-247 5.2(b)	Power Spectral Density for Digitally Modulated Device	Compliant	

N/A* Not Applicable. EUT is not a stand-alone receiver.

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1.3 PRODUCT INFORMATION

1.3.1 Technical Description

The Equipment Under Test (EUT) was a Inseego Corp. M1000 Wireless Hotspot Modem. The EUT is a Wireless Hotspot Modem supporting 3G/4G/5G/WLAN Technologies. The EUT is also equipped with a USB Port and AC Wall Power Adaptor.

1.3.2 EUT General Description

EUT Description	Wireless Hotspot Modem
Product Marketing Name	5G MiFi 1000
Model Number(s)	M1000
Rated Voltage	3.8V, 4400mAh (Rechargeable Li-Ion battery pack) Input 100-240VAC, Output 5V (External AC-DC Power Adapter)
Mode Verified	802.11b, 802.11g and 802.11n in 2.4GHz band
Capability	WCDMA Band 2, 4, 5, LTE Band 2, 4, 5, 13, 66, 5G Band n261, and 802.11 a/b/g/n/ac
Primary Unit (EUT)	☐ Production ☒ Pre-Production ☐ Engineering

(Client declaration, max. antenna gain covered under this test report)

2412 MHz to 2462 MHz (Tx 0)	-0.5 dBi
2412 MHz to 2462 MHz (Tx 1)	-1.0 dBi

1.3.3 Maximum Conducted Output Power

Mode	Frequency Range (MHz)	Output Power (dBm)	Output Power (mW)	MIMO Output Power (mW)
802.11b MIMO	2412-2462	13.8	23.4	46.8
802.11g MIMO	2412-2462	13.9	24.5	49.0
802.11 n HT20 MIMO	2412-2462	14.0	25.1	50.2
802.11 n HT40 MIMO	2422-2452	13.9	24.5	49.0

1.4 EUT TEST CONFIGURATION

1.4.1 Test Configuration Description

Test Configuration	Description
A	Antenna Conducted Port Test Setup. Antenna ports (Tx 0 and Tx 1) connected directly to the TS8997 Test System.
B	Radiated Test Setup (Cabinet Spurious Emissions). Antenna port terminated with 50Ω load.
C	AC Conducted Emissions Test Setup. EUT transmitting via integral antenna. Normal configuration while in transmit mode.

1.4.2 EUT Exercise Software

The EUT is connected to the support laptop via USB running Qualcomm Radio Control Tool Version 4.0.00113. The software allows RF configuration of the EUT such as mode, modulation, channel, bandwidth, antenna designation and recommended TX power level.

1.4.3 Support Equipment and I/O cables

Manufacturer	Equipment/Cable	Description
DELL	Support Laptop	LATITUDE E6440, Inseego property No. 00455
Inseego Corp.	USB Cable	Type A to Type C USB Cable. M/N: NOV7000USB
Inseego Corp.	External AC-DC Power Adapter	Model: SSW-2783, PN: 40123126.01 Input: 100-240VAC, 50/60Hz, 0.5A Output: 5VDC, max. 2A

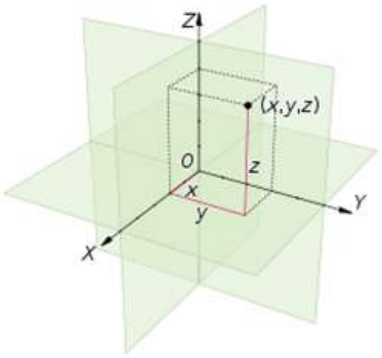
1.4.4 Worst Case Configuration

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

2.4 GHz WLAN							
Band	**Data Rate Setting**	**Mode**	**Channel Setting**	**Frequency**	**Antenna Setting**	**Tune Up (Max)**	**TX Setting**
802.11b	11 Mbps	HT20	1	2412	Tx0	14 dBm	12
			6	2437			12
			11	2462			12
			1	2412	Tx1	14 dBm	12
			6	2437			12
			11	2462			12

802.11g	24 Mbps	OFDM	1	2412	Tx0	14 dBm	8
			6	2437			8
			11	2462			8
			1	2412	Tx1	14 dBm	8
			6	2437			8
			11	2462			8
802.11n HT20	65 Mbps	MCS6	1	2412	Tx0	14 dBm	5
			6	2437			5
			11	2462			5
			1	2412	Tx1	14 dBm	5
			6	2437			5
			11	2462			5
802.11n HT40	120 Mbps	MCS5	1(5)	2422	Tx0	14 dBm	5
			4(8)	2437			5
			11(7)	2452			5
			1(5)	2422	Tx1	14 dBm	5
			4(8)	2437			5
			11(7)	2452			5

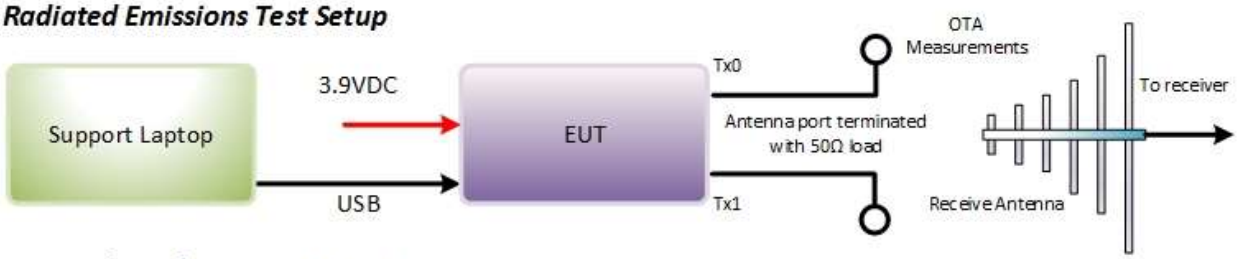
The EUT is a portable device. For radiated measurements, X, Y and Z orientations were verified during initial prescan to verify the worst axis. No major variation in emissions observed between the three (3) orientations for cabinet spurious emissions. Verifications performed using “Y” configuration (flat on the table as designed).



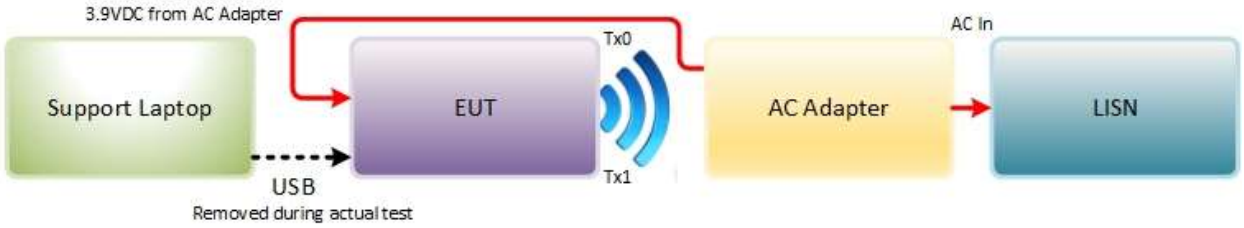
1.4.5 Simplified Test Configuration Diagram

Antenna Port Conducted Test Setup

Radiated Emissions Test Setup



AC Conducted Emissions Test Setup



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 FF130219B00305 and FF130219B00294		
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 C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

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 C63.4-2014. 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)

16936 Via Del Campo, San Diego, CA 92127-1708 (33.018644,-117.092409). Phone: (858) 678-1400 Fax: (858) 546-0364.

1.9 TEST FACILITY REGISTRATION

1.9.1 FCC – Designation 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 Designation is US1146.

1.9.2 Innovation, Science and Economic Development Canada (IC) Registration No.: 3067A-1 & 22806-1

The 10m Semi-anechoic chamber of TUV SUD America Inc. (San Diego Rancho Bernardo) has been registered by Certification and Engineering Bureau of Innovation, Science and Economic Development Canada for radio equipment testing with Registration No. 3067A-1.

The 3m Semi-anechoic chamber of TUV SUD America Inc. (San Diego Mira Mesa) has been registered by Certification and Engineering Bureau of Innovation, Science and Economic Development Canada for radio equipment testing with Registration No. 22806-1.

1.9.3 BSMI – Laboratory Code: SL2-IN-E-028R (US0102)

TUV Product Service Inc. (San Diego) is a recognized EMC testing laboratory by the BSMI under the MRA (Mutual Recognition Arrangement) with the United States. Accreditation includes CNS 13438 up to 6GHz.

1.9.4 NCC (National Communications Commission - US0102)

TUV SUD America Inc. (San Diego) is listed as a Foreign Recognized Telecommunication Equipment Testing Laboratory and is accredited to ISO/IEC 17025 (A2LA Certificate No.2955.13) which under APEC TEL MRA Phase 1 was designated as a Conformity Assessment Body competent to perform testing of equipment subject to the Technical Regulations covered under its scope of accreditation including RTTE01, PLMN01 and PLMN08 for TTE type of testing and LP002 for Low-Power RF Device type of testing.

1.9.5 VCCI – Registration No. A-0280 and A-0281

TUV SUD America Inc. (San Diego) is a VCCI registered measurement facility which includes radiated field strength measurement, radiated field strength measurement above 1GHz, mains port interference measurement and telecommunication port interference measurement.

1.9.6 RRA – Identification No. US0102

TUV SUD America Inc. (San Diego) is National Radio Research Agency (RRA) recognized laboratory under Phase I of the APEC Tel MRA.

1.9.7 OFCA – U.S. Identification No. US0102

TUV SUD America Inc. (San Diego) is recognized by Office of the Communications Authority (OFCA) under Appendix B, Phase I of the APEC Tel MRA.

SECTION 2

TEST DETAILS

Radio Testing of the
Inseego Corp.
M1000 Wireless Hotspot Modem

2.1 MAXIMUM CONDUCTED OUTPUT POWER

2.1.1 Specification Reference

FCC CFR 47 Part 15, Clause 15.247(b)(3)
RSS-247, Section 5.4(d)

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: FF130219B00305 / Test Configuration A

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

March 15, 2019/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	24.4 °C
Relative Humidity	45.3 %
ATM Pressure	98.9 kPa

2.1.7 Additional Observations

- This is a conducted test (Maximum conducted output power) using direct connection to TS8997 Test System. Path loss was programmed to the test system for both transmit chains.
- Test results presented is from SAR test report SAR.20190423, manufacturer provided a tune up procedure (14 dBm max). Power were adjusted until it correlates with SAR power levels with recommended TX settings.
- Test methodology is per FCC title 47 part 15 §15.247(a), KDB 558074 D01 DTS Meas Guidance v05 and ANSI C63.10-2013 11.8.1.
- EUT complies with the 30dBm limit.

2.1.8 Test Results

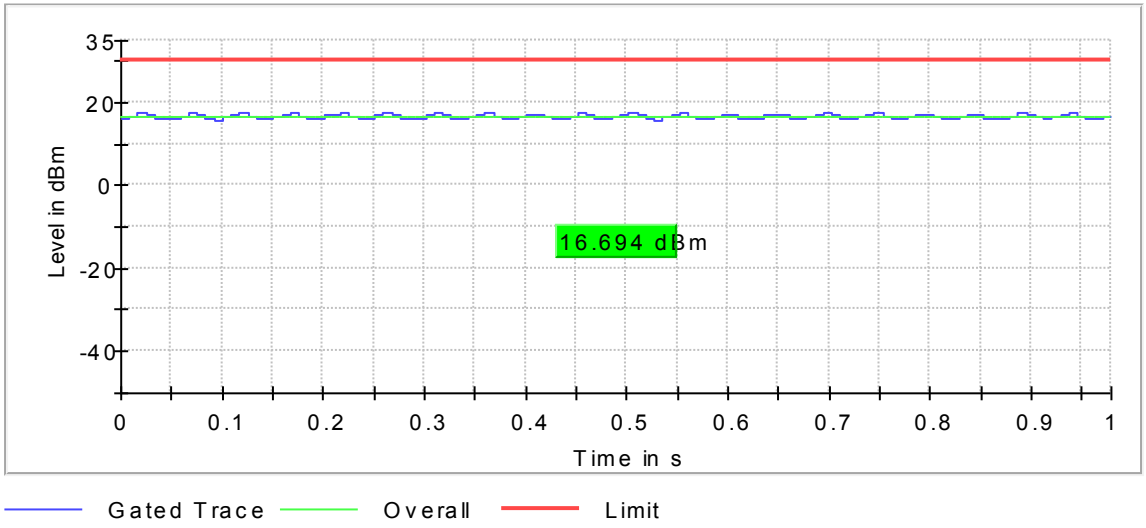
Band	Data Rate Setting	Mode	Channel Setting	Frequency (MHz)	Antenna Setting	Tune Up (Max)	Tx Setting	Measured Power (dBm)
2450 MHz b mode	1 Mbps	HT20	1	2412	Tx0	14 dBm	12	13.6
			6	2437			12	13.4
			11	2462			12	13.5
			1	2412	Tx1		12	13.5
			6	2437			12	13.3
			11	2462			12	13.6
	2 Mbps		1	2412	Tx0		12	13.6
			6	2437			12	13.4
			11	2462			12	13.6
			1	2412	Tx1		12	13.7
			6	2437			12	13.5
			11	2462			12	13.6
	5.5 Mbps		1	2412	Tx0		12	13.5
			6	2437			12	13.2
			11	2462			12	13.5
			1	2412	Tx1		12	13.4
			6	2437			12	13.1
			11	2462			12	13.4
	11 Mbps		1	2412	Tx0		12	13.6
			6	2437			12	13.5
			11	2462			12	13.6
			1	2412	Tx1		12	13.8
			6	2437			12	13.6
			11	2462			12	13.7
2450 MHz g mode	6 Mbps	OFDM	1	2412	Tx0	14 dBm	10	13.7
			6	2437			10	13.1
			11	2462			10	13.7
			1	2412	Tx1		10	13.7
			6	2437			10	13.2
			11	2462			10	13.7
	9 Mbps		1	2412	Tx0		10	13.8
			6	2437			10	13.2
			11	2462			10	13.8
			1	2412	Tx1		10	13.8
			6	2437			10	13.1
			11	2462			10	13.7
	12 Mbps		1	2412	Tx0		10	13.7
			6	2437			10	13.2
			11	2462			10	13.7
			1	2412	Tx1		10	13.7

			6	2437			8	13.1
			11	2462			8	13.6
	18 Mbps		1	2412	Tx0		8	13.9
			6	2437			8	13.5
			11	2462			8	13.9
			1	2412	Tx1		8	13.8
			6	2437			8	13.4
			11	2462			8	13.7
	24 Mbps		1	2412	Tx0	14 dBm	8	13.9
			6	2437			8	13.5
			11	2462			8	13.9
			1	2412	Tx1		8	13.8
			6	2437			8	13.6
			11	2462			8	13.8
	36 Mbps		1	2412	Tx0		5	13.1
			6	2437			5	13.7
			11	2462			5	13.5
			1	2412	Tx1		5	13.2
			6	2437			5	13.6
			11	2462			5	13.4
	48 Mbps		1	2412	Tx0		5	13.7
			6	2437			5	13.5
			11	2462			5	13.7
			1	2412	Tx1		5	13.6
			6	2437			5	13.5
			11	2462			5	13.6
	54 Mbps		1	2412	Tx0		5	13.8
			6	2437			5	13.7
			11	2462			5	13.6
			1	2412	Tx1		5	13.7
			6	2437			5	13.5
			11	2462			5	13.6
2450 MHz n mode HT20	7.2 Mbps	MCS0	1	2412	Tx0	14 dBm	10	13.7
			6	2437			10	13.1
			11	2462			10	13.7
			1	2412	Tx1		10	13.7
			6	2437			10	13.2
			11	2462			10	13.7
	14.4 Mbps	MCS1	1	2412	Tx0		10	13.8
			6	2437			10	13.2
			11	2462			10	13.8
			1	2412	Tx1		10	13.8
			6	2437			10	13.1
			11	2462			10	13.7

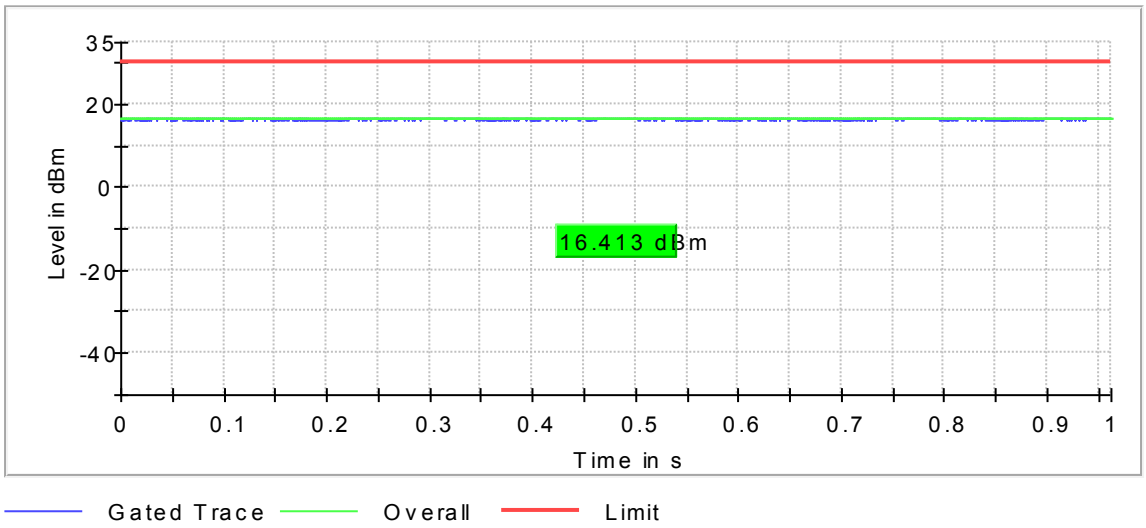
	21.7 Mbps	MCS2	1	2412	Tx0		10	13.7
			6	2437			10	13.2
			11	2462			10	13.7
			1	2412	Tx1		10	13.7
			6	2437			8	13.1
			11	2462			8	13.6
	28.9 Mbps	MCS3	1	2412	Tx0		8	13.9
			6	2437			8	13.5
			11	2462			8	13.9
			1	2412	Tx1		8	13.8
			6	2437			8	13.4
			11	2462			8	13.7
	43.3 Mbps	MCS4	1	2412	Tx0	14 dBm	8	13.9
			6	2437			8	13.5
			11	2462			8	13.9
			1	2412	Tx1		8	13.8
			6	2437			8	13.6
			11	2462			8	13.8
	57.8 Mbps	MCS5	1	2412	Tx0		5	13.1
			6	2437			5	13.7
			11	2462			5	13.5
			1	2412	Tx1		5	13.2
			6	2437			5	13.6
			11	2462			5	13.4
	65.0 Mbps	MCS6	1	2412	Tx0		5	13.7
			6	2437			5	13.5
			11	2462			5	13.7
			1	2412	Tx1		5	13.6
			6	2437			5	13.5
			11	2462			5	13.6
	72.2 Mbps	MCS7	1	2412	Tx0		5	13.8
			6	2437			5	13.7
			11	2462			5	13.6
			1	2412	Tx1		5	13.7
			6	2437			5	13.5
			11	2462			5	13.6
2450 MHz n mode HT40	15.0 Mbps	MCS0	1(5)	2422	Tx0	14 dBm	8	13.7
			4(8)	2437			8	13.8
			11(7)	2452			8	13.8
			1(5)	2422	Tx1		8	13.7
			4(8)	2437			8	13.8
			11(7)	2452			8	13.8
	30.0 Mbps	MCS1	1(5)	2422	Tx0		8	13.9
			4(8)	2437			8	13.8

			11(7)	2452			8	13.7
			1(5)	2422	Tx1		8	13.7
			4(8)	2437			8	13.6
			11(7)	2452			8	13.8
	45.0 Mbps	MCS2	1(5)	2422	Tx0		5	13.7
			4(8)	2437			5	13.6
			11(7)	2452			5	13.7
			1(5)	2422	Tx1		5	13.8
			4(8)	2437			5	13.8
			11(7)	2452			5	13.6
	60.0 Mbps	MCS3	1(5)	2422	Tx0		5	13.8
			4(8)	2437			5	13.8
			11(7)	2452			5	13.7
			1(5)	2422	Tx1		5	13.7
			4(8)	2437			5	13.9
			11(7)	2452			5	13.7
	90.0 Mbps	MCS4	1(5)	2422	Tx0	14 dBm	5	13.8
			4(8)	2437			5	13.8
			11(7)	2452			5	13.7
			1(5)	2422	Tx1		5	13.7
			4(8)	2437			5	13.6
			11(7)	2452			5	13.8
	120.0 Mbps	MCS5	1(5)	2422	Tx0		5	13.7
			4(8)	2437			5	13.8
			11(7)	2452			5	13.8
			1(5)	2422	Tx1		5	13.8
			4(8)	2437			5	13.9
			11(7)	2452			5	13.8
	135.0 Mbps	MCS6	1(5)	2422	Tx0		5	13.9
			4(8)	2437			5	13.7
			11(7)	2452			5	13.8
			1(5)	2422	Tx1		5	13.8
			4(8)	2437			5	13.7
			11(7)	2452			5	13.8
	150.0 Mbps	MCS7	1(5)	2422	Tx0		5	13.6
			4(8)	2437			5	13.7
			11(7)	2452			5	13.7
			1(5)	2422	Tx1		5	13.7
			4(8)	2437			5	13.7
			11(7)	2452			5	13.6

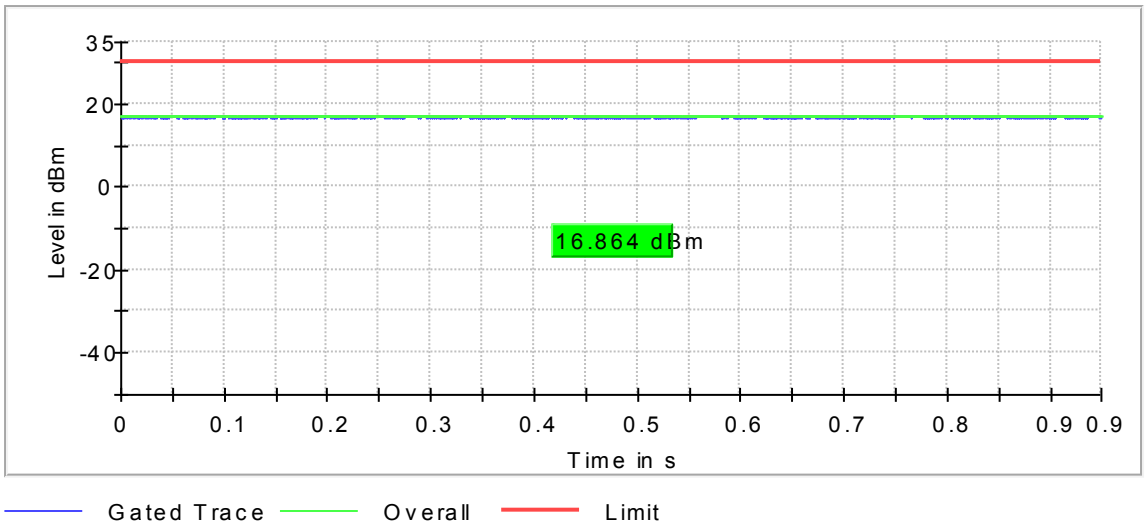
2.1.9 Sample Test Plots



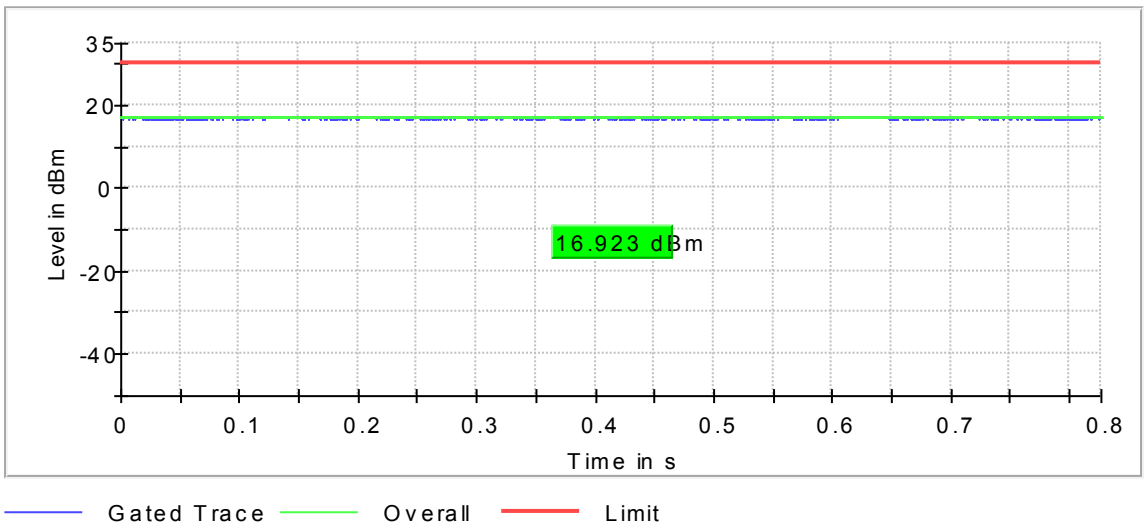
802.11b MIMO



802.11g MIMO



802.11n HT20 MIMO



802.11n HT40 MIMO

2.2 CONDUCTED EMISSIONS

2.2.1 Specification Reference

FCC CFR 47 Part 15, Clause 15.207(a)
RSS-Gen, Section 8.8

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: FF130219B00294/Test Configuration C

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

March 19, 2019 / FSC

2.2.5 Test Equipment Used

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

2.2.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	23.0 °C
Relative Humidity	46.5 %
ATM Pressure	99.0 kPa

2.2.7 Additional Observations

- Only worst-case mode presented.
- Measurement was done using EMC32 V8.53 automated software. Reported level is the actual level with all the correction factors factored in. Correction Factor column is for informational purposes only. See Section 2.2.8 for sample computation.

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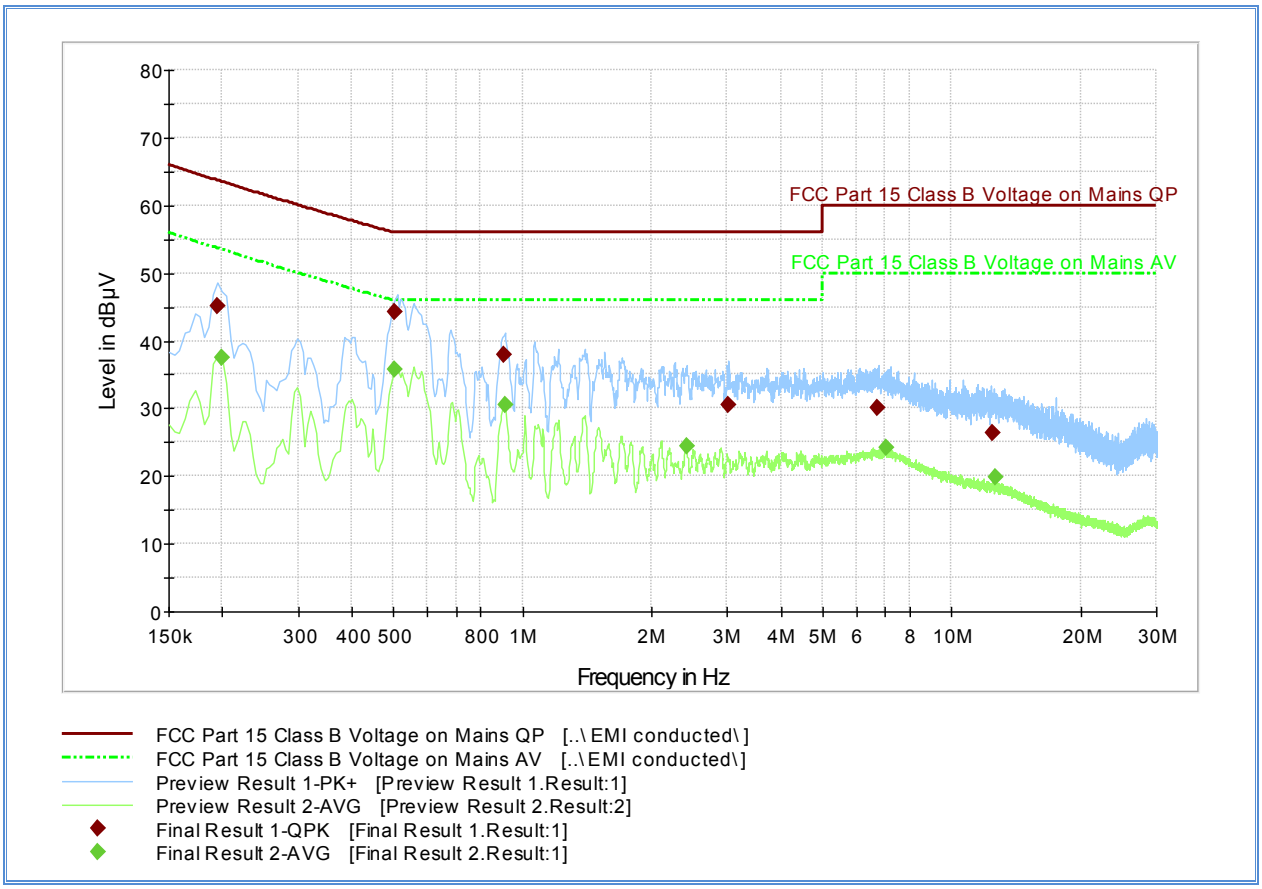
2.2.8 Sample Computation (Conducted Emission – Quasi Peak)

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# 7568 (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 M1000 120VAC 60Hz (Line 1)



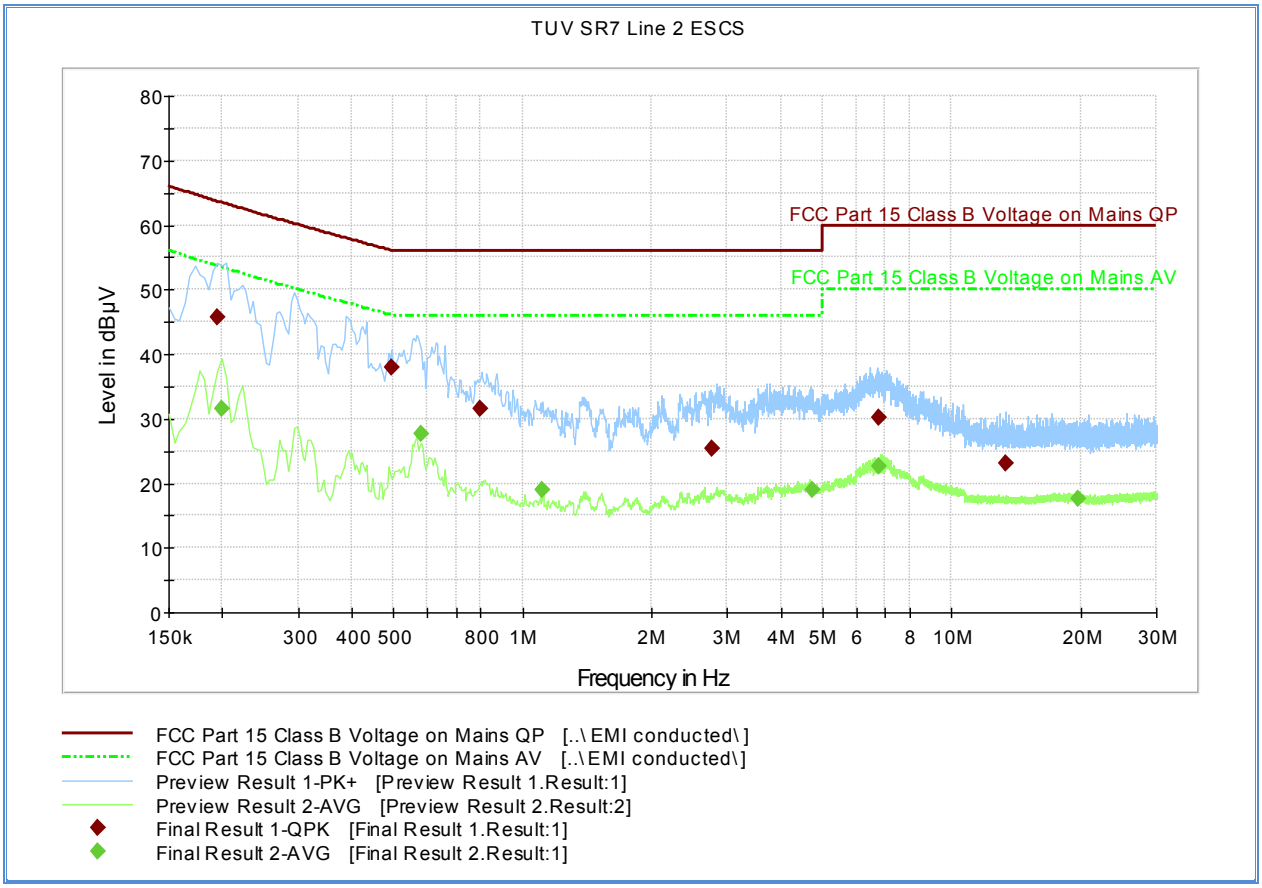
Quasi Peak

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV)
0.195000	45.2	1000.0	9.000	Off	L1	20.2	18.5	63.7
0.505500	44.2	1000.0	9.000	Off	L1	20.1	11.8	56.0
0.906000	37.9	1000.0	9.000	Off	L1	20.2	18.1	56.0
3.012000	30.6	1000.0	9.000	Off	L1	20.4	25.4	56.0
6.733500	30.2	1000.0	9.000	Off	L1	20.5	29.8	60.0
12.439500	26.5	1000.0	9.000	Off	L1	20.7	33.5	60.0

Average

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - Ave (dB)	Limit - Ave (dBµV)
0.199500	37.5	1000.0	9.000	Off	L1	20.2	15.9	53.5
0.505500	35.7	1000.0	9.000	Off	L1	20.1	10.3	46.0
0.910500	30.6	1000.0	9.000	Off	L1	20.2	15.4	46.0
2.409000	24.3	1000.0	9.000	Off	L1	20.4	21.7	46.0
7.035000	24.1	1000.0	9.000	Off	L1	20.5	25.9	50.0
12.691500	19.9	1000.0	9.000	Off	L1	20.7	30.1	50.0

2.2.11 M1000 120VAC 60Hz (Line 2)



Quasi Peak

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV)
0.195000	45.7	1000.0	9.000	Off	N	20.2	17.9	63.7
0.496500	37.9	1000.0	9.000	Off	N	20.0	18.2	56.1
0.798000	31.6	1000.0	9.000	Off	N	20.1	24.4	56.0
2.755500	25.4	1000.0	9.000	Off	N	20.5	30.6	56.0
6.778500	30.2	1000.0	9.000	Off	N	20.6	29.8	60.0
13.407000	23.0	1000.0	9.000	Off	N	20.7	37.0	60.0

Average

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - Ave (dB)	Limit - Ave (dBµV)
0.199500	31.6	1000.0	9.000	Off	N	20.2	21.9	53.5
0.582000	27.7	1000.0	9.000	Off	N	20.1	18.3	46.0
1.113000	19.0	1000.0	9.000	Off	N	20.1	27.0	46.0
4.749000	19.1	1000.0	9.000	Off	N	20.4	26.9	46.0
6.783000	22.6	1000.0	9.000	Off	N	20.6	27.4	50.0
19.765500	17.7	1000.0	9.000	Off	N	20.8	32.3	50.0

2.3 99% EMISSION BANDWIDTH

2.3.1 Specification Reference

RSS-Gen, Section 6.7

2.3.2 Standard Applicable

The occupied bandwidth or the "99% emission bandwidth" is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained. The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSSs.

2.3.3 Equipment Under Test and Modification State

Serial No: FF130219B00305 / Test Configuration A

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

March 12, 2019 / 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	22.8 °C
Relative Humidity	45.4 %
ATM Pressure	99.4 kPa

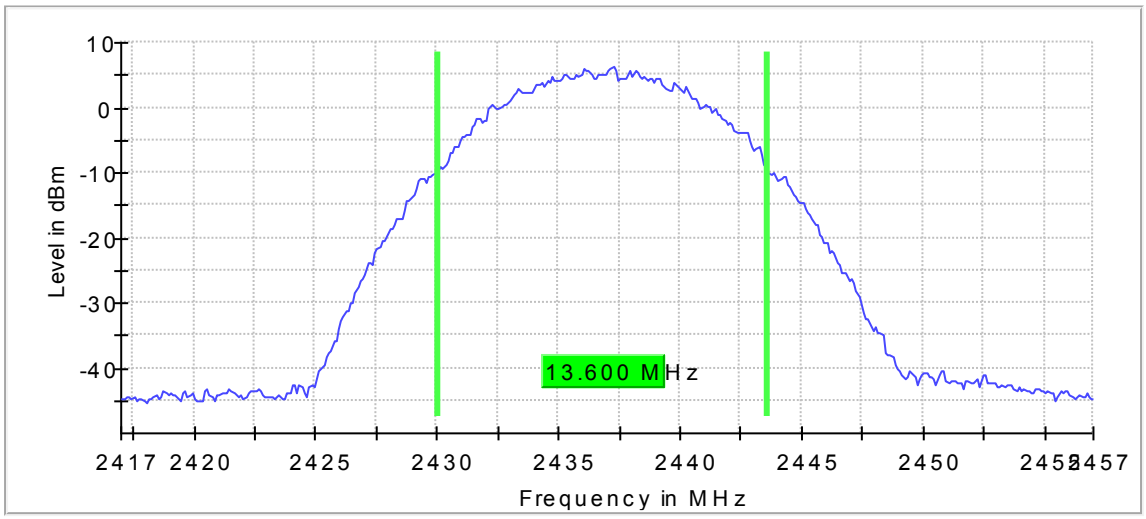
2.3.7 Additional Observations

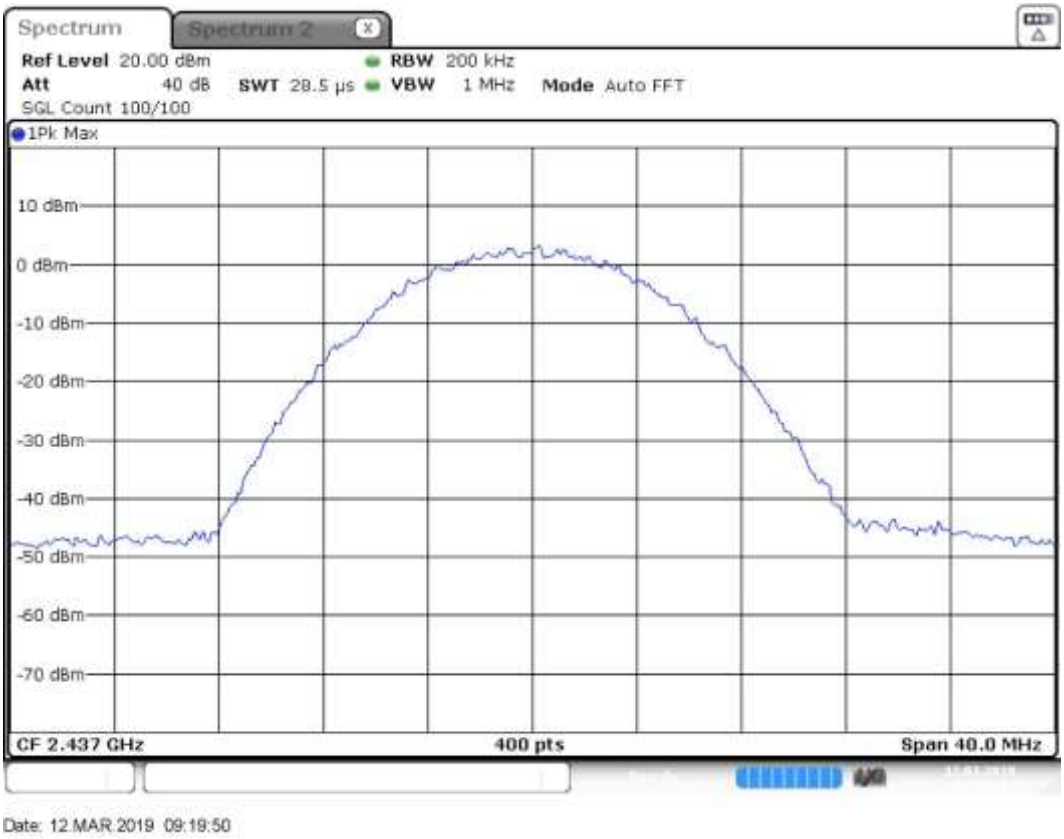
- This is a conducted test using the TS8997 Test System.
- Test methodology is per FCC title 47 part 15 §15.247(a), KDB 558074 D01 DTS Meas Guidance v04 and ANSI C63.10-2013.
- Only the worst antenna chain presented.

2.3.8 Test Results (For reporting purposes only)

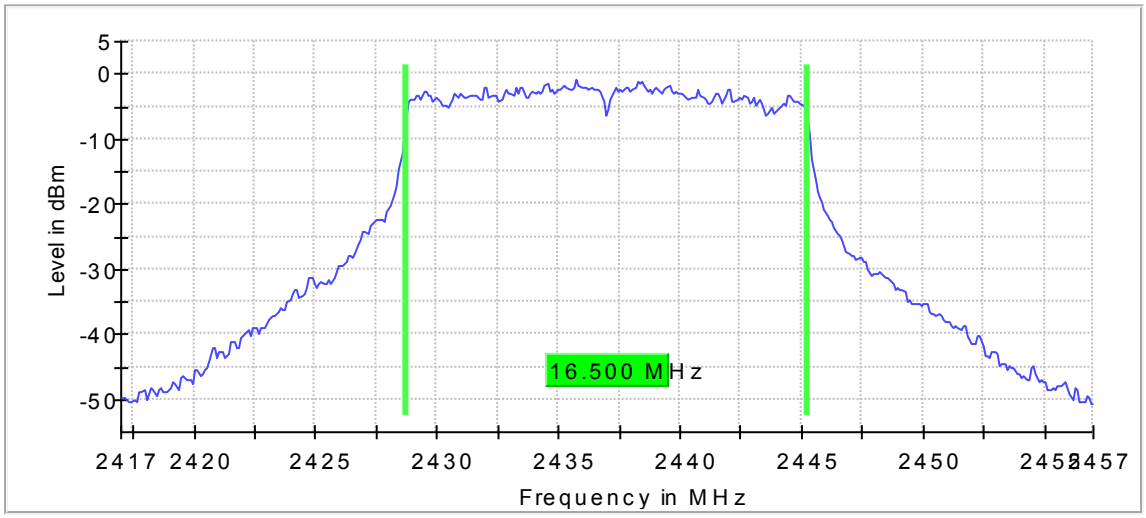
Mode	Channel	Measured 99% Bandwidth (MHz)
802.11b	1 (2412 MHz)	13.20
	6 (2437 MHz)	13.60
	11 (2462 MHz)	13.50
802.11g	1 (2412 MHz)	16.50
	6 (2437 MHz)	16.50
	11 (2462 MHz)	16.50
802.11n 20MHz BW	1 (2412 MHz)	17.80
	6 (2437 MHz)	17.90
	11 (2462 MHz)	17.90
802.11n 40MHz BW	3 (2422 MHz)	36.50
	6 (2437 MHz)	36.75
	9 (2452 MHz)	36.50

2.3.9 Sample Test Results Plots

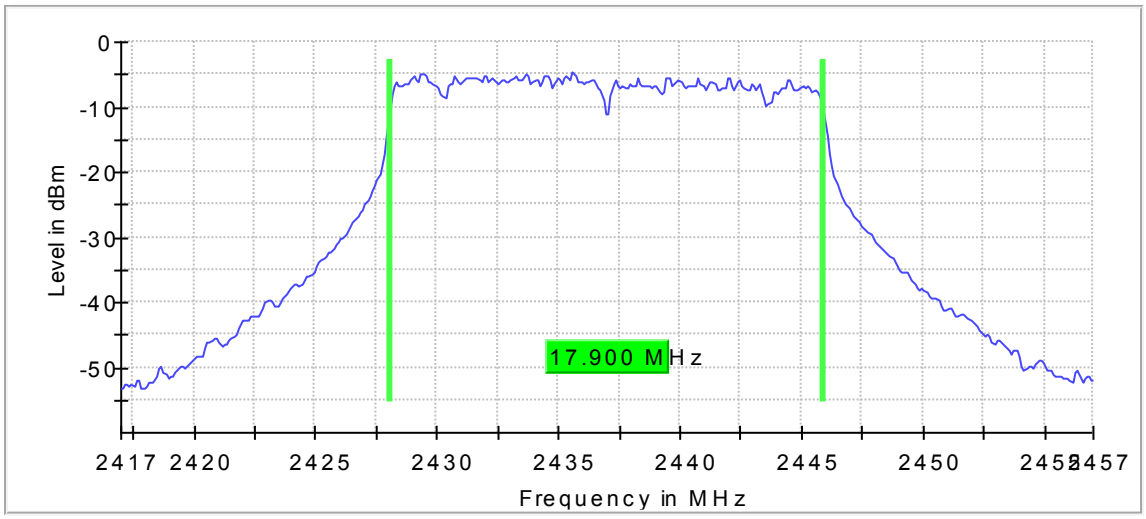


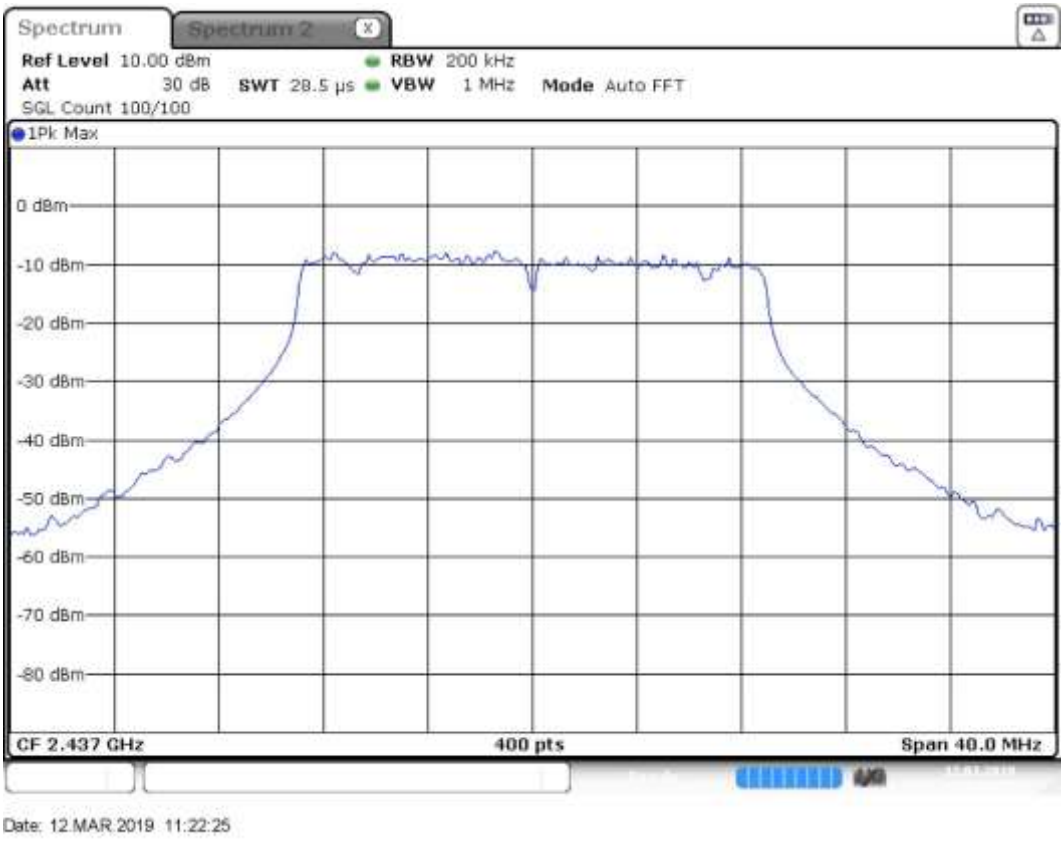


802.11b Middle Channel

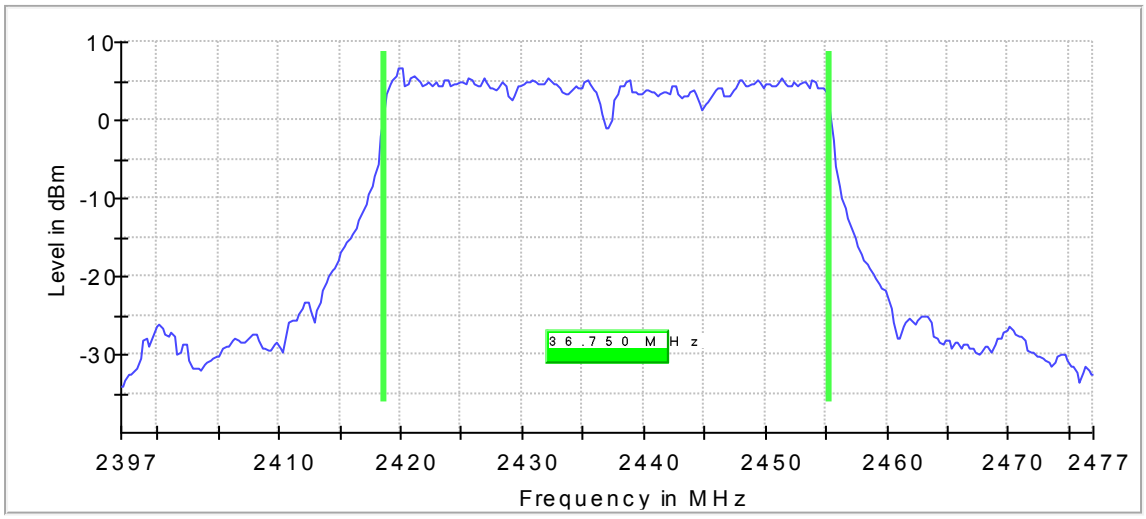


802.11g Middle Channel





802.11n Middle Channel (20 MHz BW)



802.11n Middle Channel (40 MHz BW)

2.4 MINIMUM 6 DB RF BANDWIDTH

2.4.1 Specification Reference

FCC CFR 47 Part 15, Clause 15.247(a)(2)
RSS-247, Section 5.2(a)

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.

2.4.1 Equipment Under Test and Modification State

Serial No: FF130219B00305 / Test Configuration A

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

March 12, 2019 / FSC

2.4.3 Test Equipment Used

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

2.4.4 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	22.8 °C
Relative Humidity	45.4 %
ATM Pressure	99.4 kPa

2.4.5 Additional Observations

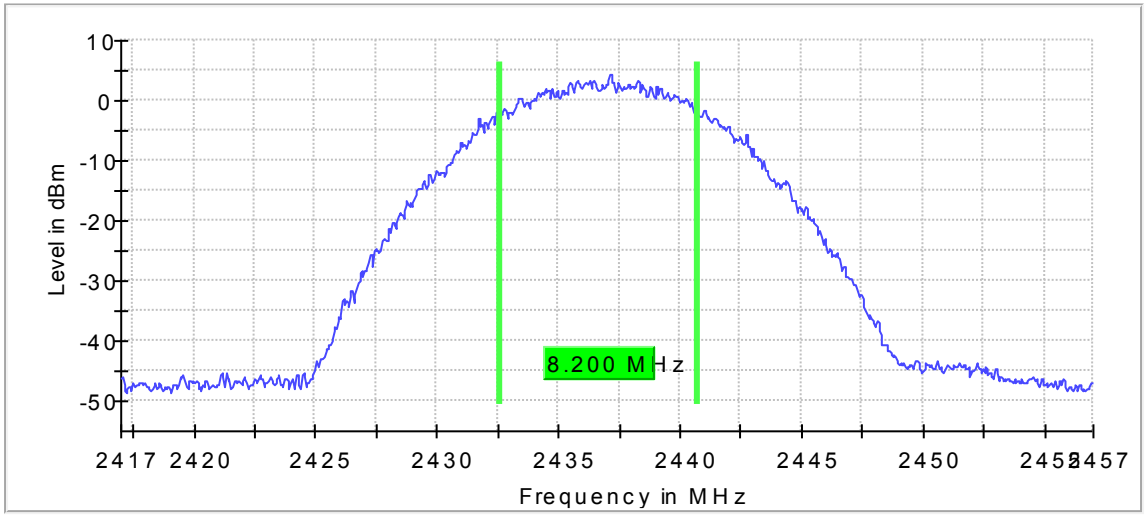
- This is a conducted test using the TS8997 Test System.
- Test methodology is per FCC title 47 part 15 §15.247(a), KDB 558074 D01 DTS Meas Guidance v04 and ANSI C63.10-2013.
- Only the worst antenna chain presented.

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

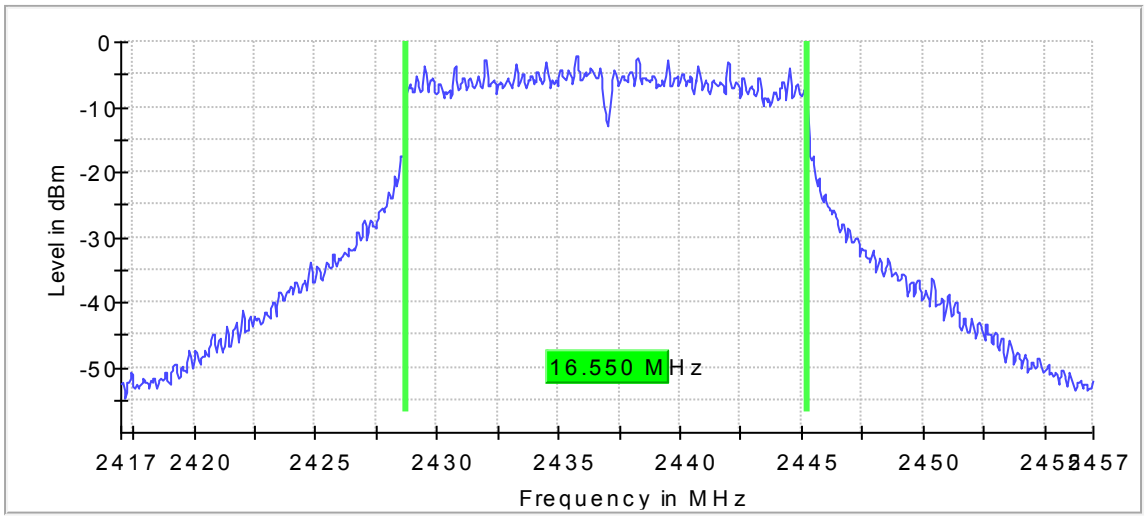
2.4.6 Test Results

Mode	Channel	Measured Bandwidth (MHz)	Minimum Bandwidth (MHz)	Compliance
802.11b	1 (2412 MHz)	7.6	0.500	Complies
	6 (2437 MHz)	8.2	0.500	Complies
	11 (2462 MHz)	8.4	0.500	Complies
802.11g	1 (2412 MHz)	16.15	0.500	Complies
	6 (2437 MHz)	16.55	0.500	Complies
	11 (2462 MHz)	15.85	0.500	Complies
802.11n 20MHz BW	1 (2412 MHz)	17.75	0.500	Complies
	6 (2437 MHz)	17.80	0.500	Complies
	11 (2462 MHz)	17.75	0.500	Complies
802.11n 20MHz BW	3 (2422 MHz)	36.45	0.500	Complies
	6 (2437 MHz)	36.55	0.500	Complies
	9 (2452 MHz)	36.15	0.500	Complies

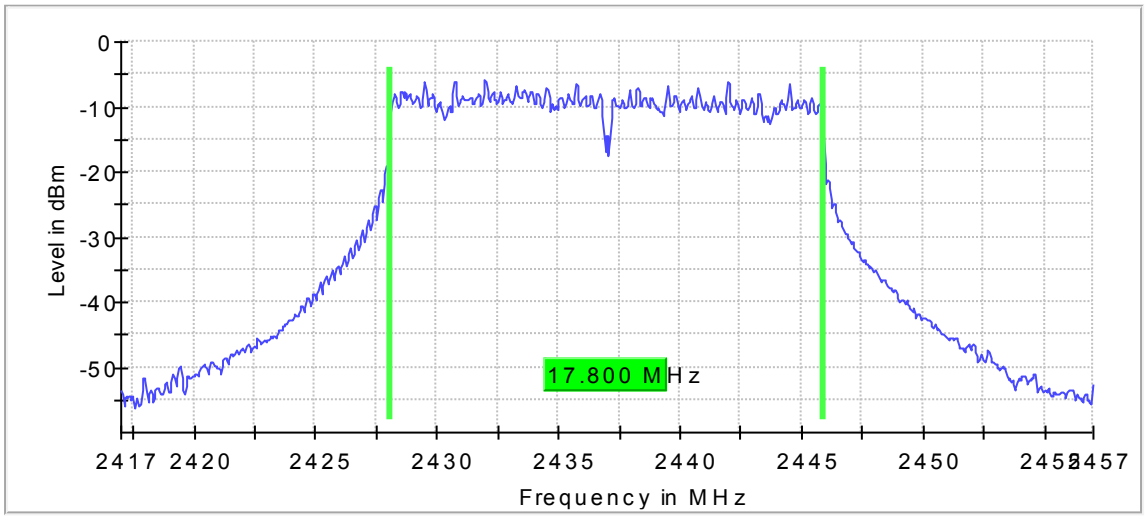
2.4.7 Sample Test Results Plots



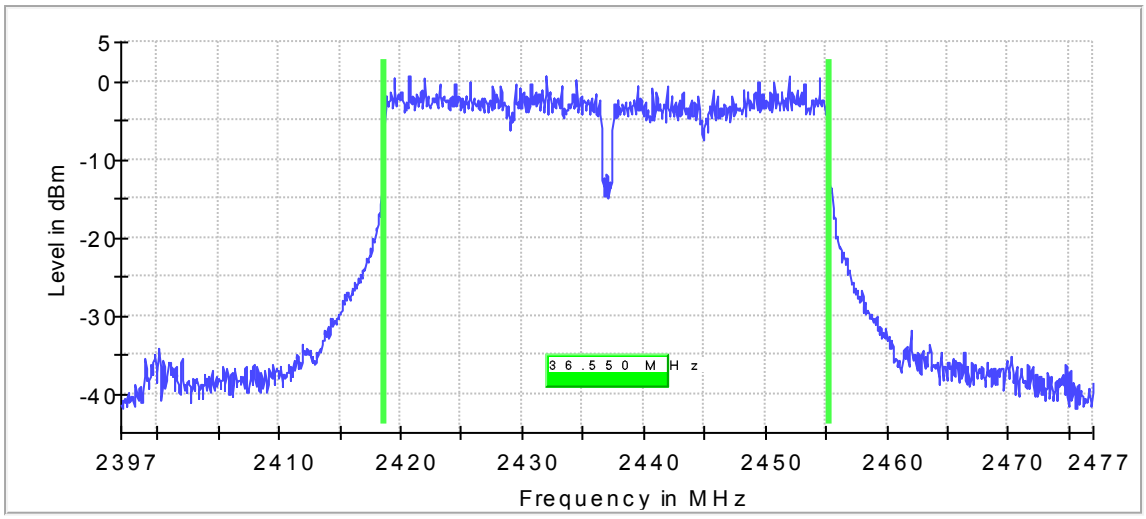
802.11b Middle Channel



802.11g Middle Channel



802.11n Middle Channel (20 MHz BW)



802.11n Middle Channel (40 MHz BW)

2.5 OUT-OF-BAND EMISSIONS - CONDUCTED

2.5.1 Specification Reference

FCC CFR 47 Part 15, Clause 15.247(d)
RSS-247, Section 5.5

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)).

2.5.1 Equipment Under Test and Modification State

Serial No: FF130219B00305 / Test Configuration A

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

March 12, 2019 / FSC

2.5.3 Test Equipment Used

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

2.5.4 Environmental Conditions/ Test Location

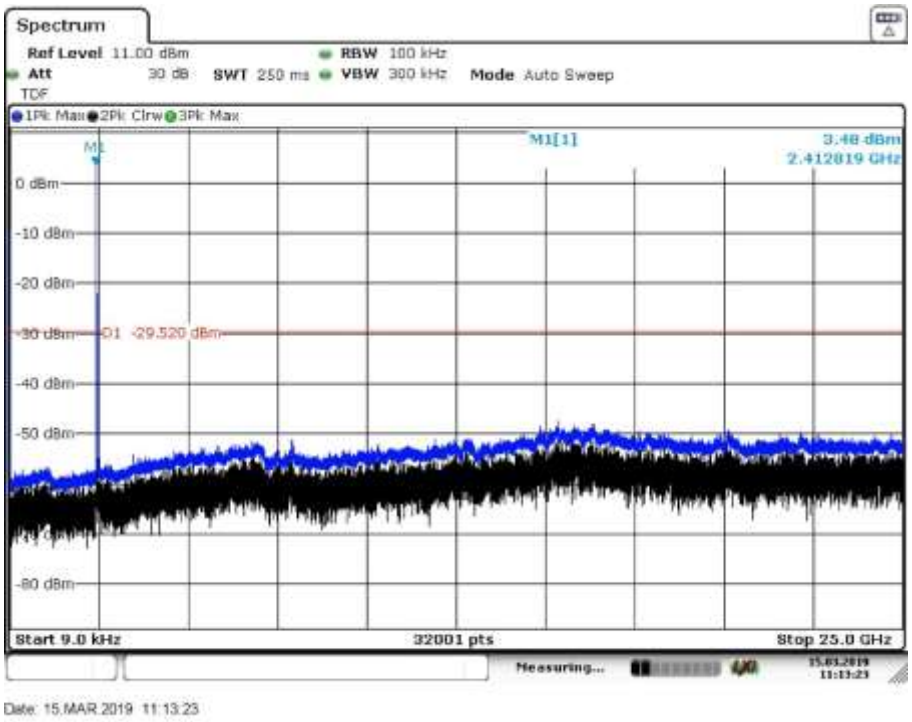
Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	22.8 °C
Relative Humidity	45.4 %
ATM Pressure	99.4 kPa

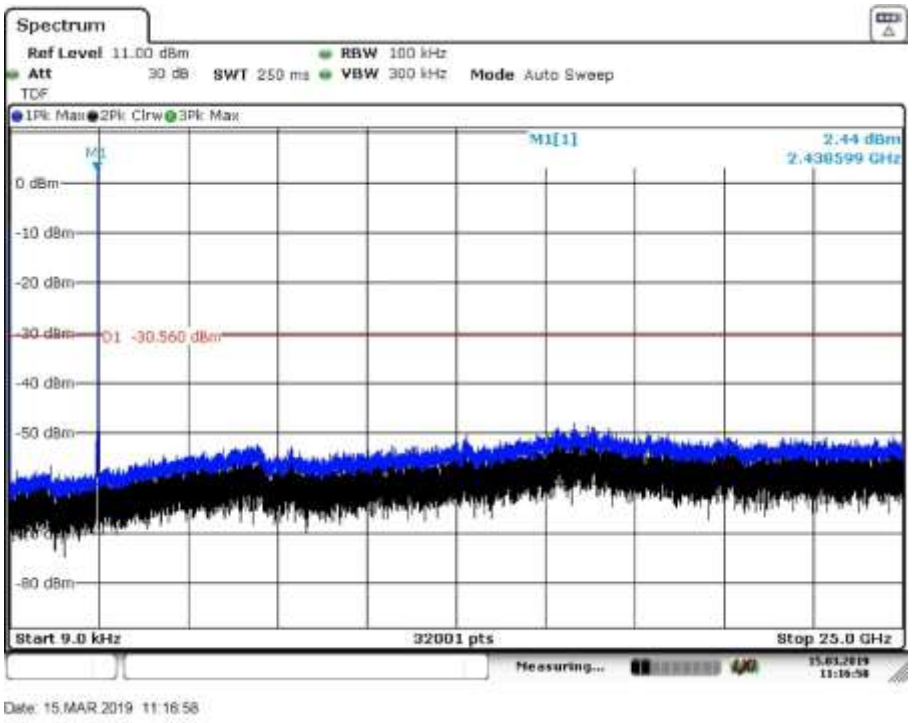
2.5.5 Additional Observations

- This is a conducted test. Spectrum was searched from 9 kHz up to 25GHz.
- TDF (Transducer Factor) was used 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 33dB below this level (worst case and to cover MIMO mode).
- Test performed on the worst-case antenna port. Only the worst transmit chain presented.

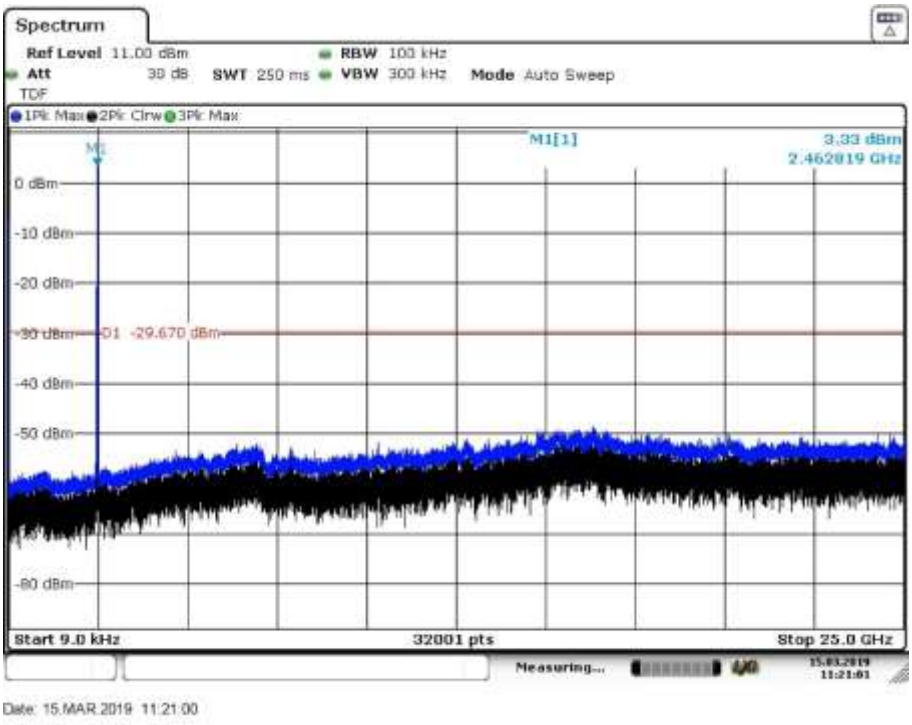
2.5.6 Test Results Plots



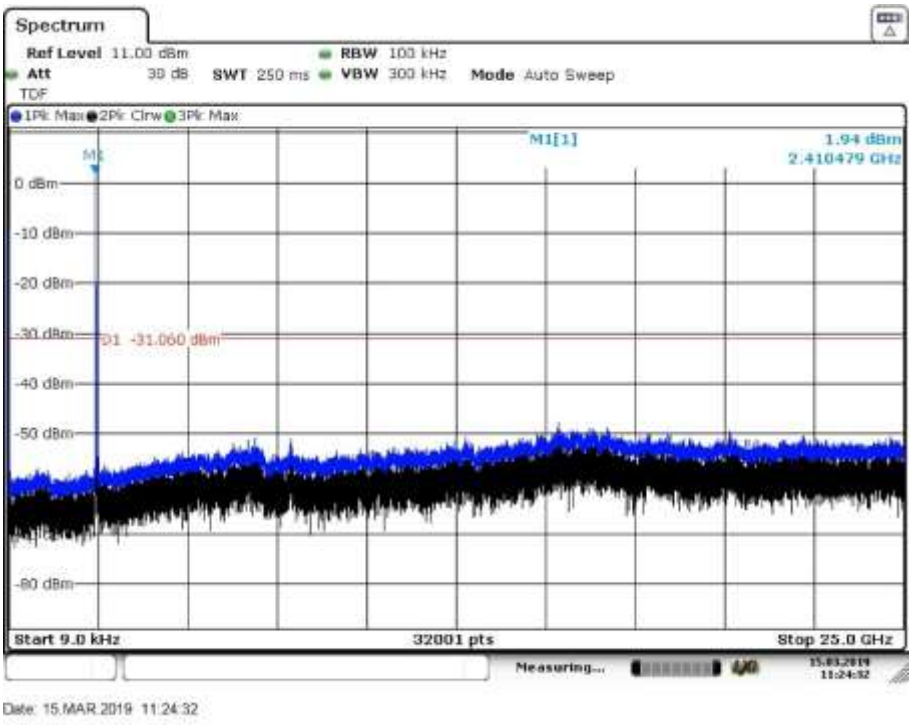
802.11b Low Channel



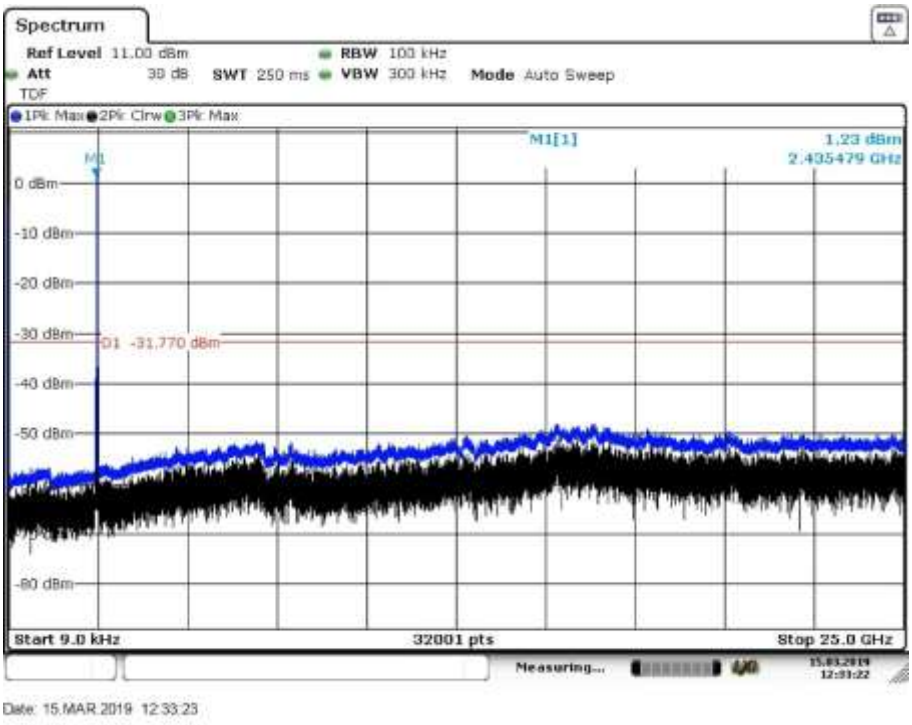
802.11b Middle Channel



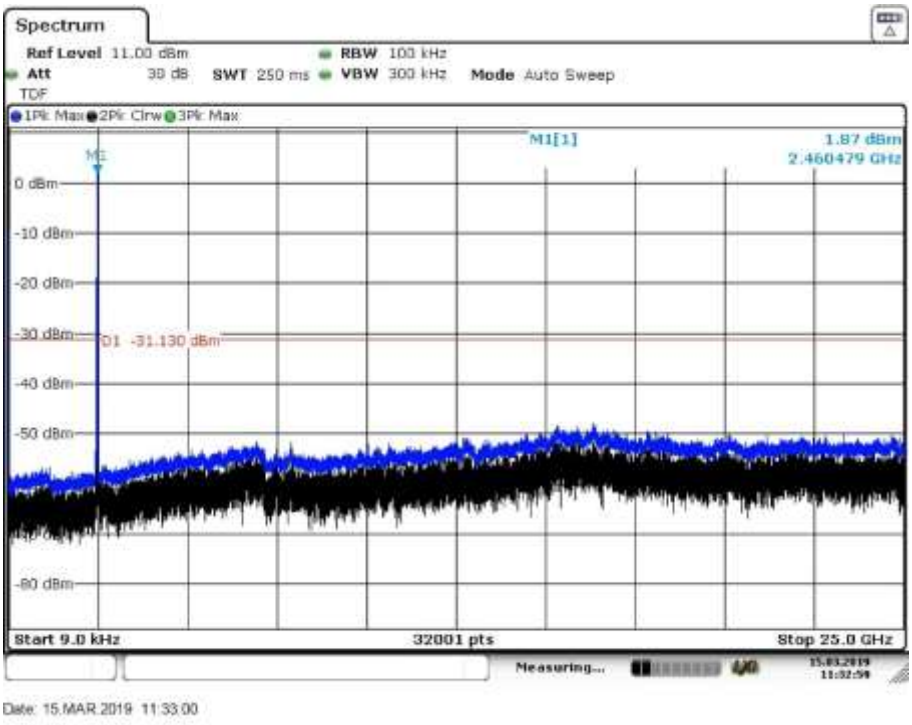
802.11b High Channel



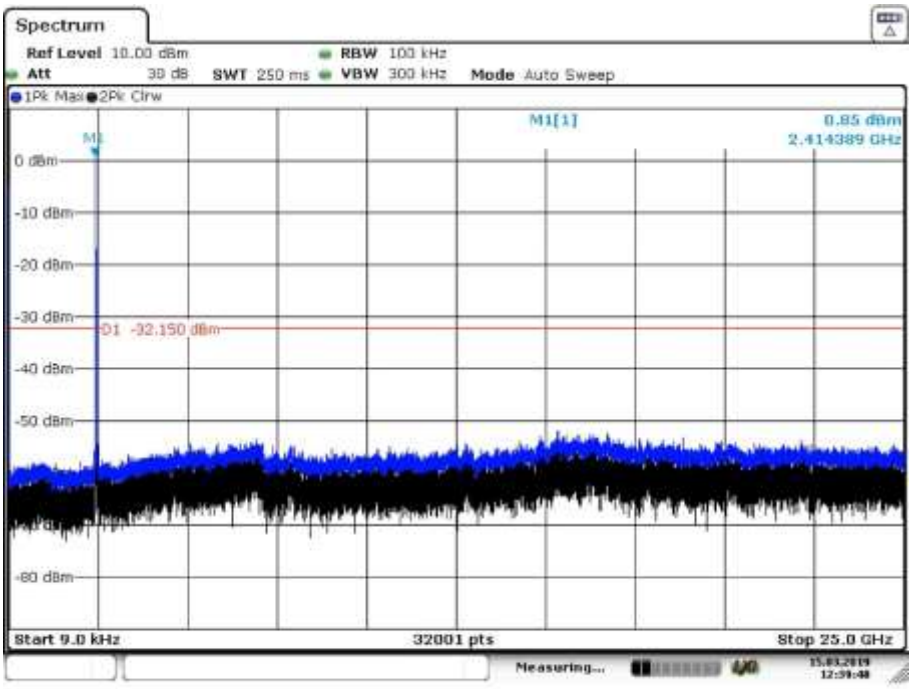
802.11g Low Channel



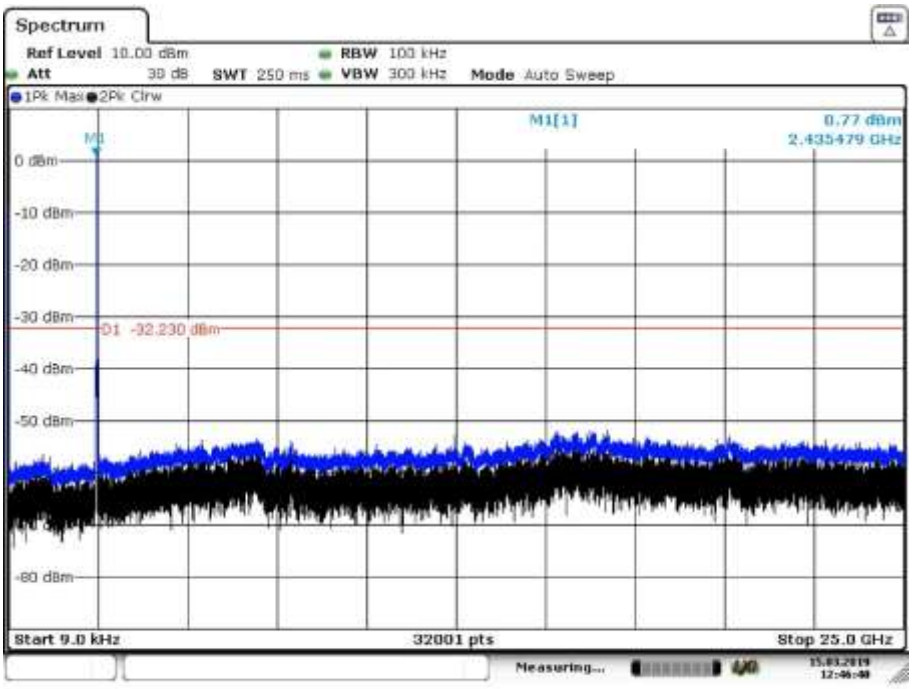
802.11g Middle Channel



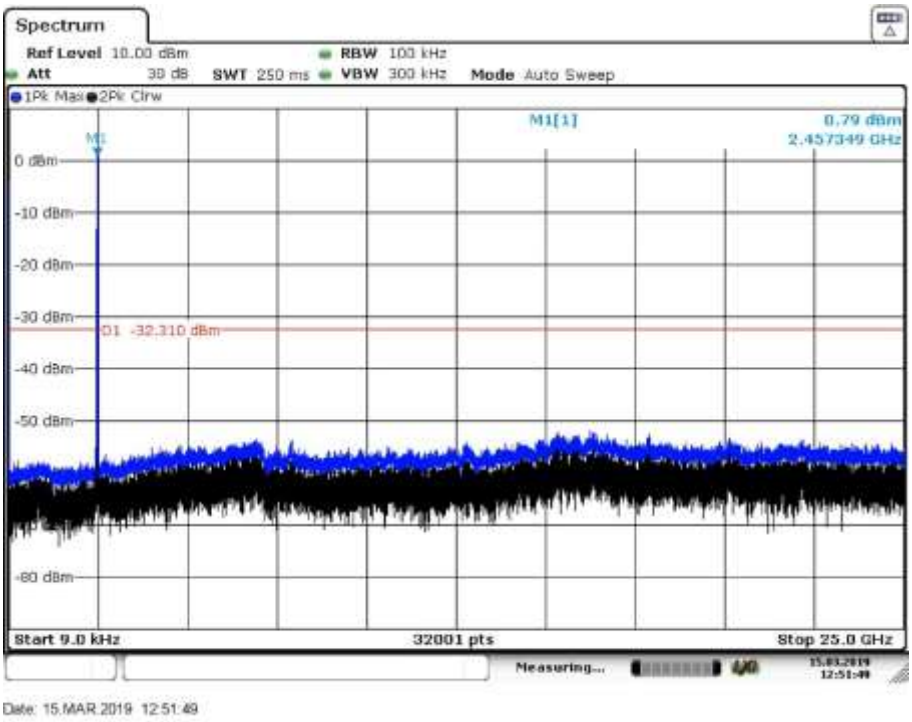
802.11g High Channel



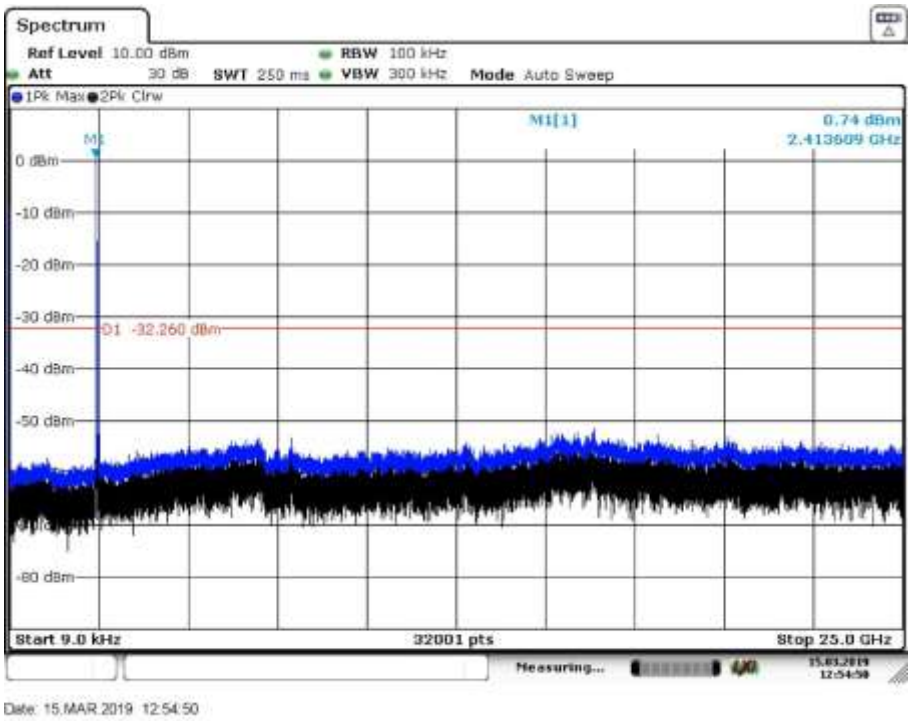
802.11n Low Channel (20MHz BW)



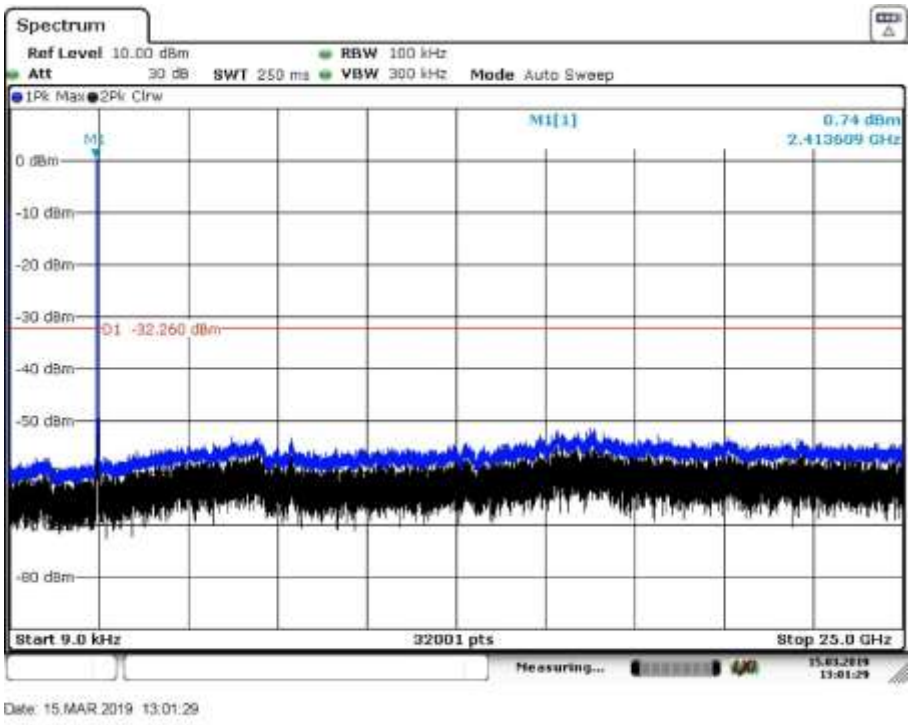
802.11n Middle Channel (20MHz BW)



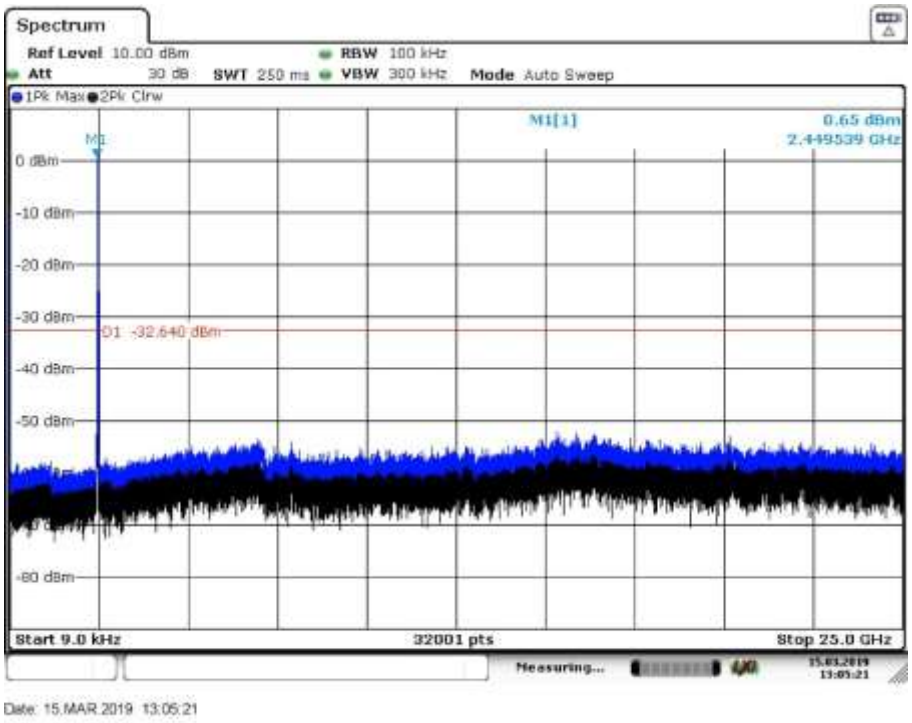
802.11n High Channel (20MHz BW)



802.11n Low Channel (40MHz BW)



802.11n Middle Channel (40MHz BW)



802.11n High Channel (40MHz BW)

2.6 BAND-EDGE COMPLIANCE OF RF CONDUCTED EMISSIONS

2.6.1 Specification Reference

FCC CFR 47 Part 15, Clause 15.247(d)
RSS-247, Section 5.5

2.6.2 Standard Applicable

See previous test.

2.6.3 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.

2.6.1 Equipment Under Test and Modification State

Serial No: FF130219B00305 / Test Configuration A

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

March 12, 2019 / FSC

2.6.3 Test Equipment Used

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

2.6.4 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

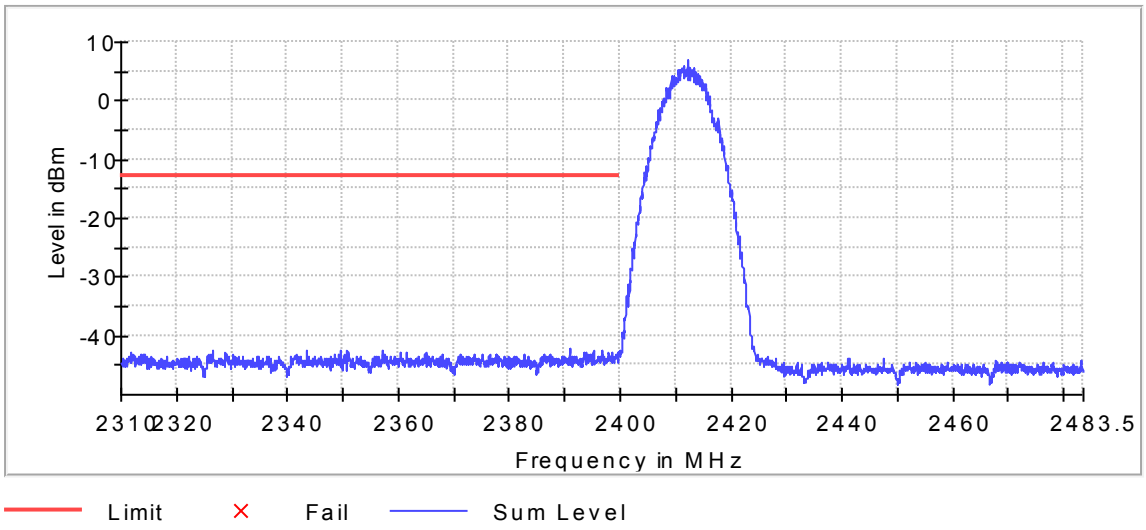
Ambient Temperature	22.8 °C
Relative Humidity	45.4 %
ATM Pressure	99.4 kPa

2.6.5 Additional Observations

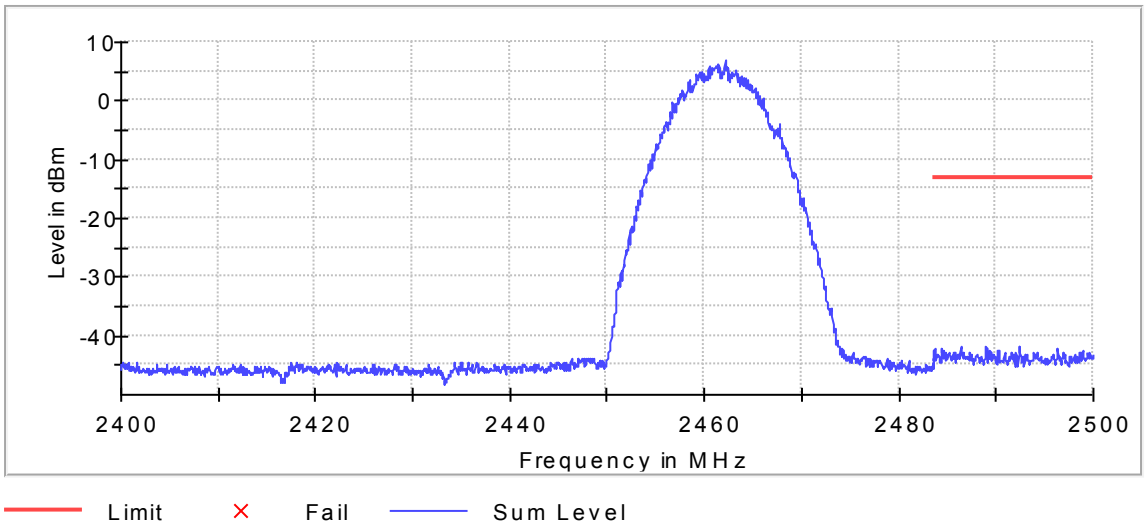
- This is a conducted test using the TS8997 Test System.
- Test methodology is per FCC title 47 part 15 §15.247(a), KDB 558074 D01 DTS Meas Guidance v04 and ANSI C63.10-2013.
- Only the worst high band edge calculation presented. This is to show compliance of the EUT with Part 15.205 limits.

2.6.6 Test Results

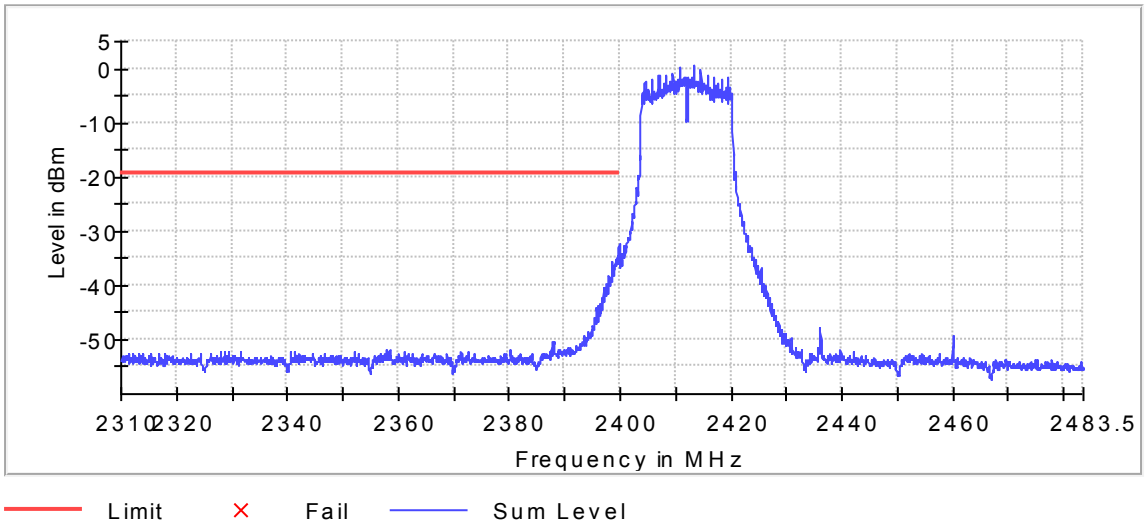
Complies. See attached plots.



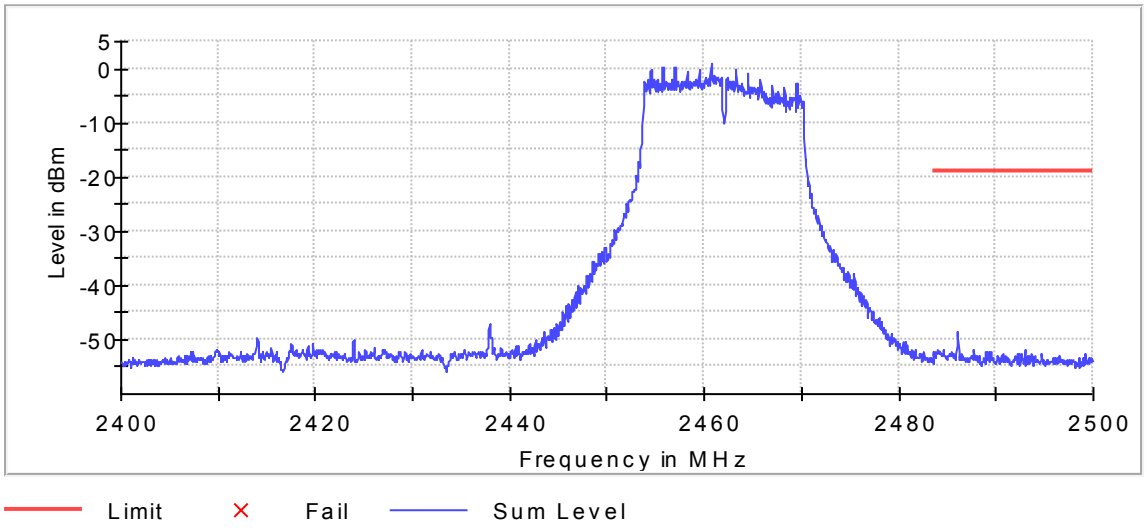
802.11b Low Channel (2412 MHz)



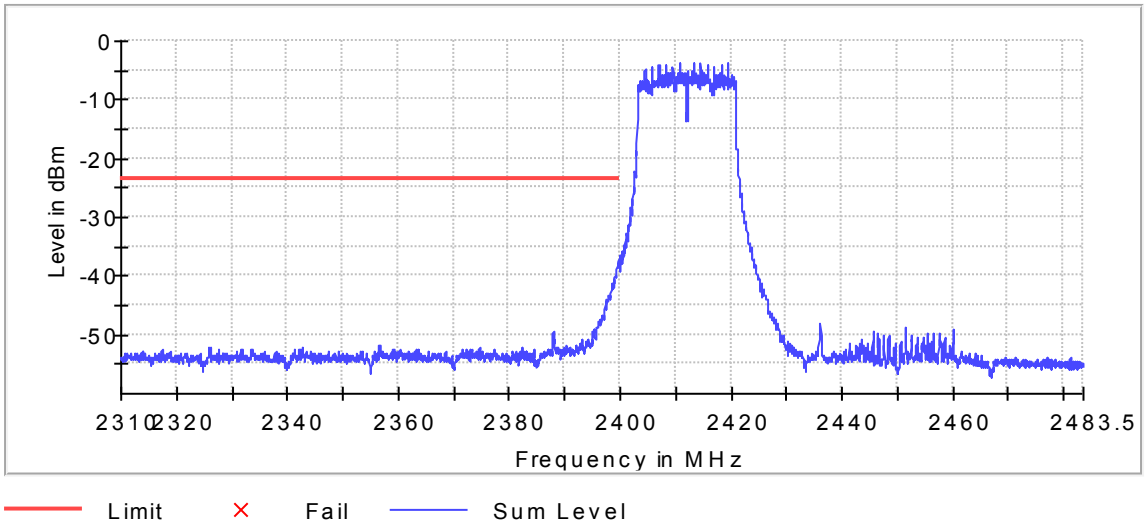
802.11b High Channel (2462 MHz Peak)



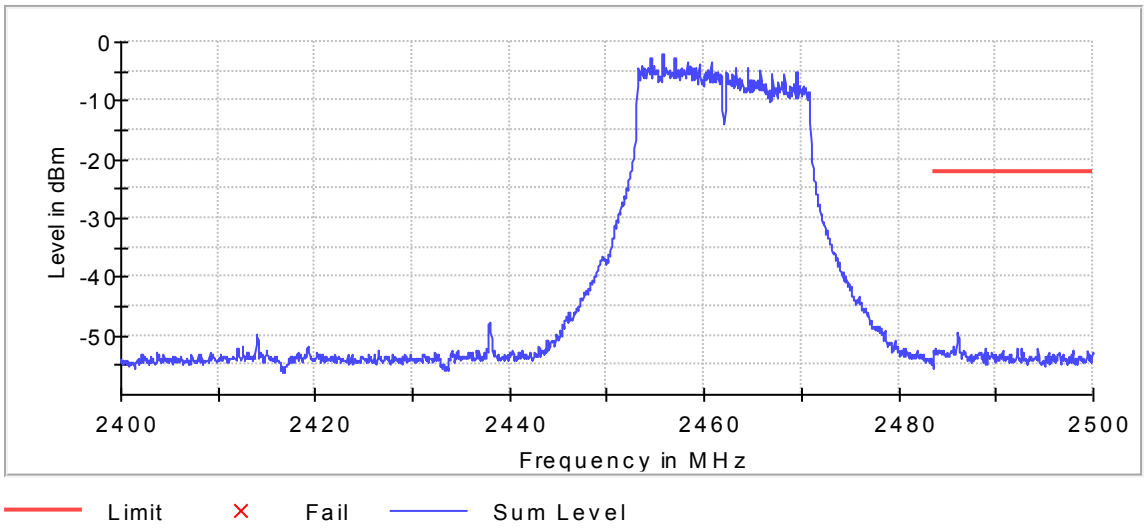
802.11g Low Channel (2412 MHz)



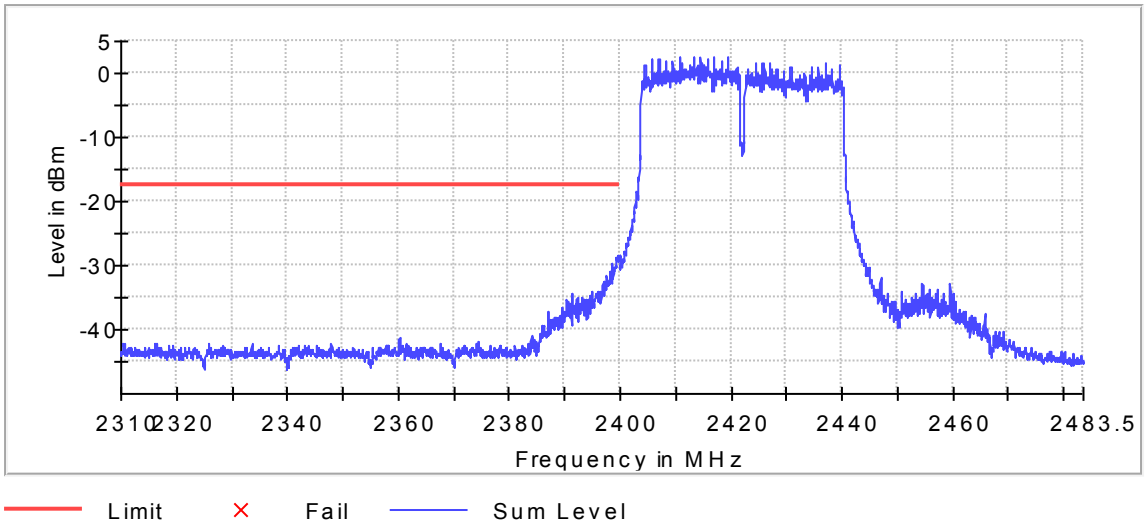
802.11g High Channel (2462 MHz Peak)



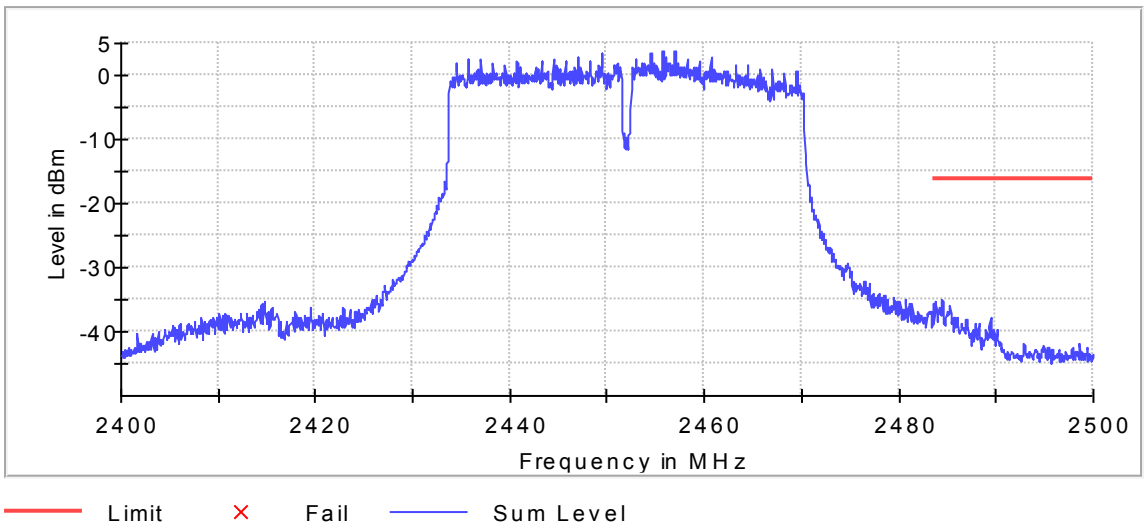
802.11n 20MHz BW Low Channel (2412 MHz)



802.11n 20MHz BW High Channel (2462 MHz Peak)



802.11n 40MHz BW Low Channel (2422 MHz)



802.11n 40MHz BW High Channel (2452 MHz Peak)

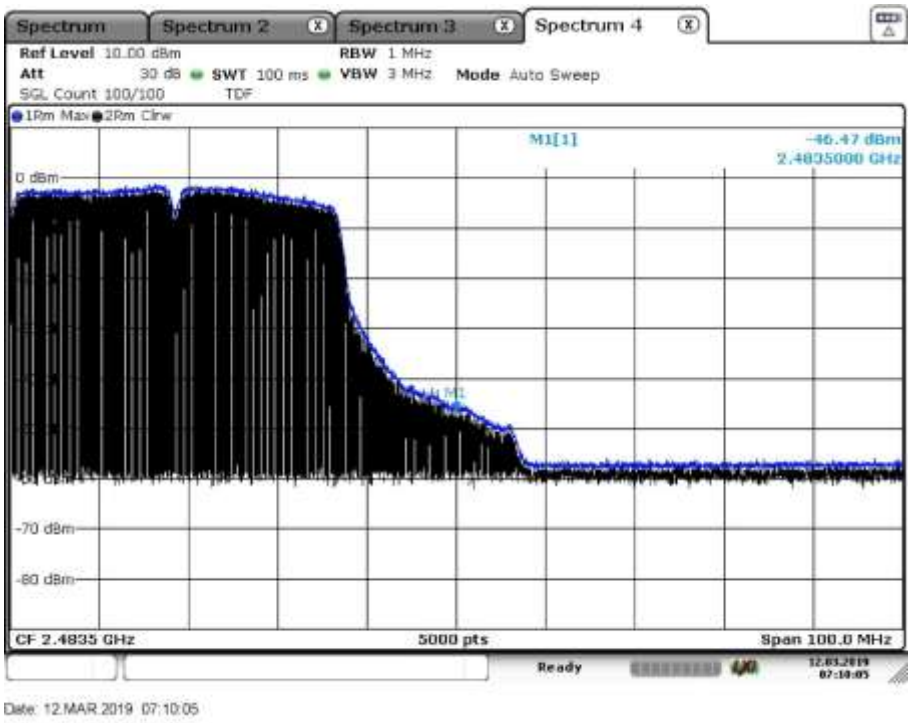
2.6.7 High Band Edge Restricted Band Calculation (Worst Case Mode 802.11n 40MHz BW)

Measured Peak = -35.6 dBm @ 2483.5 MHz, since antenna gain is -0.5 dBi then EIRP is -35.1 dBm. Electric field strength in dBµV/m is then calculated using the formula:

$$E = EIRP - 20\log D + 104.8$$

Where: E = electric field strength in dBµV/m
EIRP = equivalent isotropic radiated power in dBm
D = specific measurement distance in meters

E is therefore = (-35.6 + (-0.5 dbi)) dBm – (20log 3 meters) + 104.8 + 3dB (MIMO)
= 62.16 dBµV/m @ 3 meters
= 62.16 dBµV/m + (10log 1MHz/1kHz for RBW correction)
= 72.16 dBµV/m (complies with 74 dBµV/m Peak limits)



802.11n 40MHz High Channel (2452 MHz Average)

E is therefore = (-46.47 + (-0.5 dbi)) dBm – (20log 3 meters) + 104.8 + 3dB (MIMO)
= 51.29 dBµV/m @ 3 meters (complies with 54 dBµV/m Average limits)

2.7 SPURIOUS RADIATED EMISSIONS

2.7.1 Specification Reference

FCC 47 CFR Part 15, Clause 15.247(d)
RSS-247, Section 5.5

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: FF130219B00294 / Test Configuration B

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

March 16, 2019 / 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	25.4 °C
Relative Humidity	46.5 %
ATM Pressure	98.9 kPa

2.7.7 Additional Observations

- This is a radiated test. The spectrum was searched from 30MHz to the 10th harmonic.
- Test Methodology is per ANSI C63.10-2013.
- 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 worst-case channel and data rate/MCS presented.
- 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.

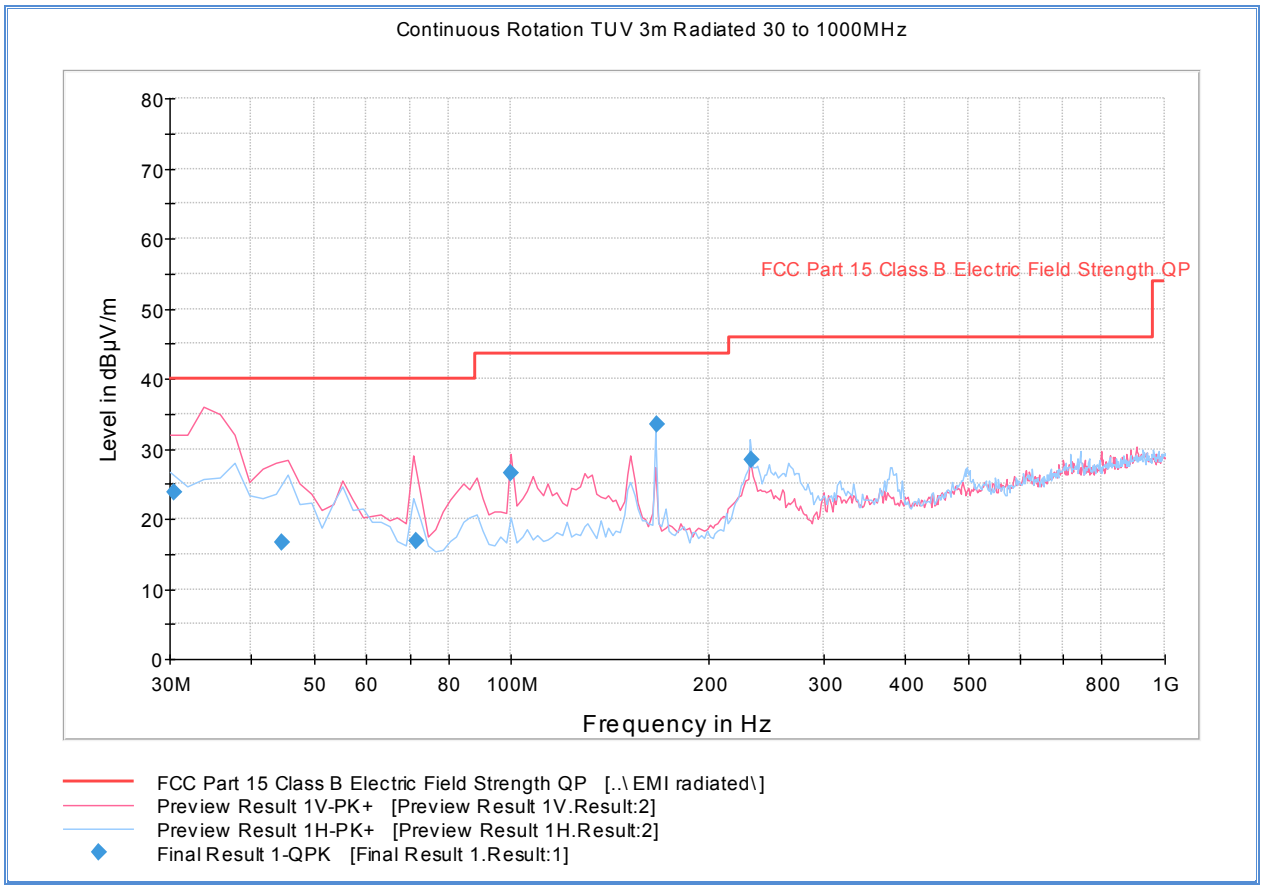
2.7.8 Sample Computation (Radiated Emission)

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 (Worst Case Configuration – 802.11b MIMO)

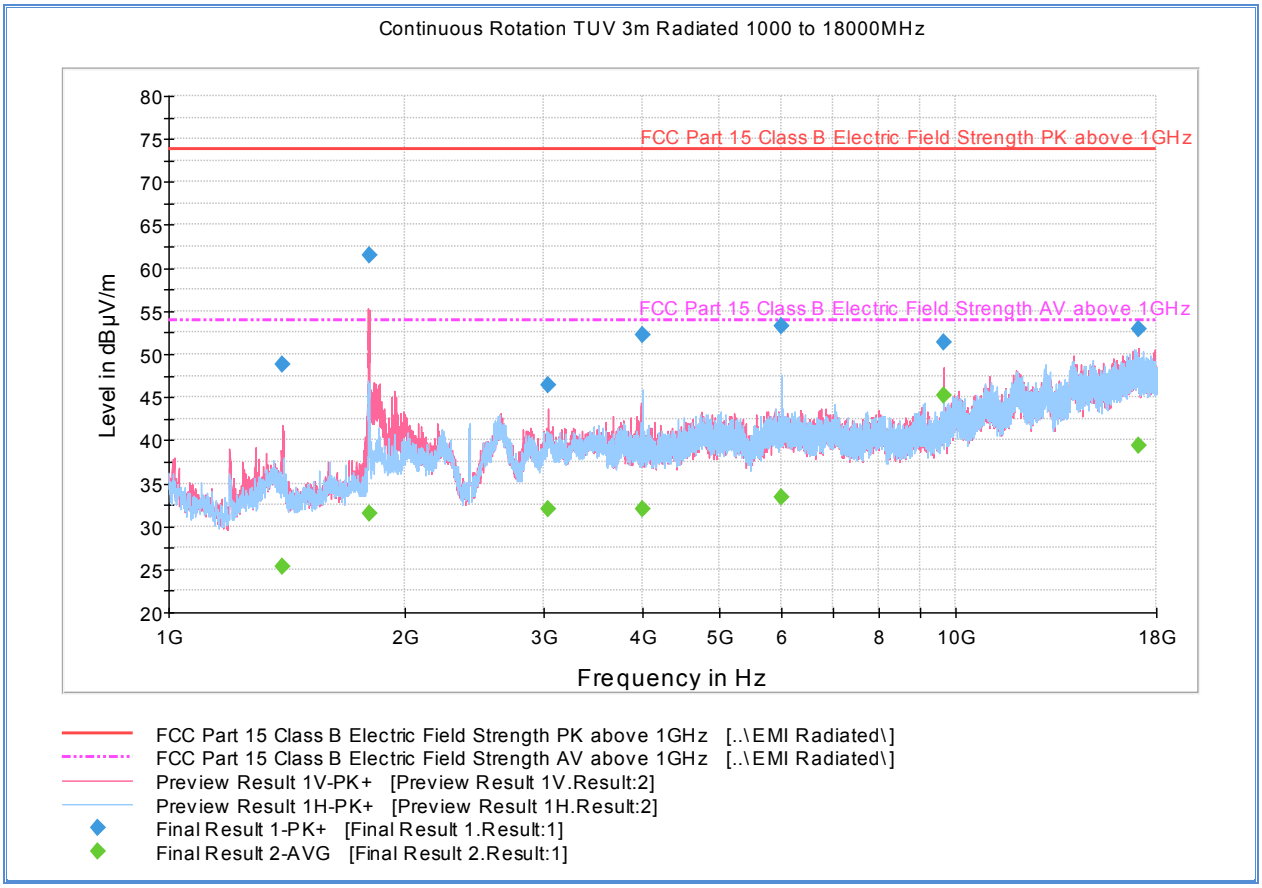


Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
30.487776	23.7	1000.0	120.000	127.0	V	329.0	-7.9	16.3	40.0
44.631102	16.7	1000.0	120.000	135.0	V	15.0	-13.3	23.3	40.0
71.501643	16.7	1000.0	120.000	100.0	V	-2.0	-17.0	23.3	40.0
99.979960	26.6	1000.0	120.000	105.0	V	165.0	-13.2	16.9	43.5
166.592144	33.6	1000.0	120.000	105.0	H	227.0	-11.8	9.9	43.5
233.204329	28.3	1000.0	120.000	121.0	H	329.0	-9.2	17.7	46.0

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

2.7.11 Test Results Above 1GHz (Worst Case Configuration – 802.11b MIMO)



Peak Data

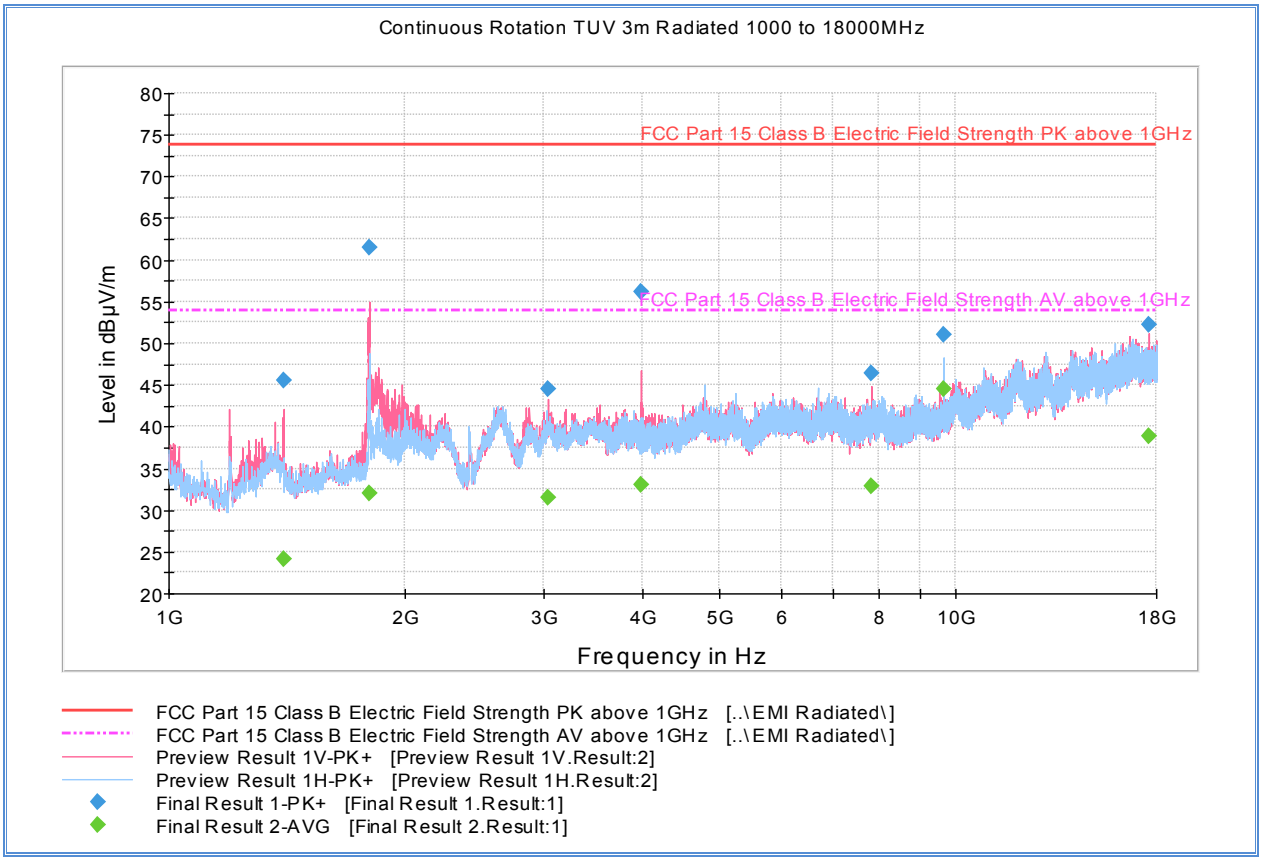
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1396.233333	48.8	1000.0	1000.000	152.2	V	161.0	-5.7	25.1	73.9
1795.833333	61.4	1000.0	1000.000	208.5	V	161.0	-3.4	12.5	73.9
3040.000000	46.3	1000.0	1000.000	103.7	V	357.0	0.9	27.6	73.9
3998.833333	52.3	1000.0	1000.000	198.5	H	283.0	2.5	21.6	73.9
6000.300000	53.3	1000.0	1000.000	142.7	H	136.0	5.7	20.6	73.9
9648.100000	51.4	1000.0	1000.000	147.7	V	81.0	8.8	22.5	73.9
17073.866667	53.0	1000.0	1000.000	128.7	V	169.0	17.6	20.9	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)
1396.233333	25.3	1000.0	1000.000	152.2	V	161.0	-5.7	28.6	53.9
1795.833333	31.5	1000.0	1000.000	208.5	V	161.0	-3.4	22.4	53.9
3040.000000	32.1	1000.0	1000.000	103.7	V	357.0	0.9	21.8	53.9
3998.833333	32.0	1000.0	1000.000	198.5	H	283.0	2.5	21.9	53.9
6000.300000	33.4	1000.0	1000.000	142.7	H	136.0	5.7	20.5	53.9
9648.100000	45.2	1000.0	1000.000	147.7	V	81.0	8.8	8.7	53.9
17073.866667	39.4	1000.0	1000.000	128.7	V	169.0	17.6	14.5	53.9

Test Notes: No significant emissions observed above 18GHz. Measurements above 18GHz were noise floor figures. 2.4GHz notch filter used for this test.

2.7.12 Test Results Above 1GHz (Worst Case Configuration – 802.11g MIMO)



Peak Data

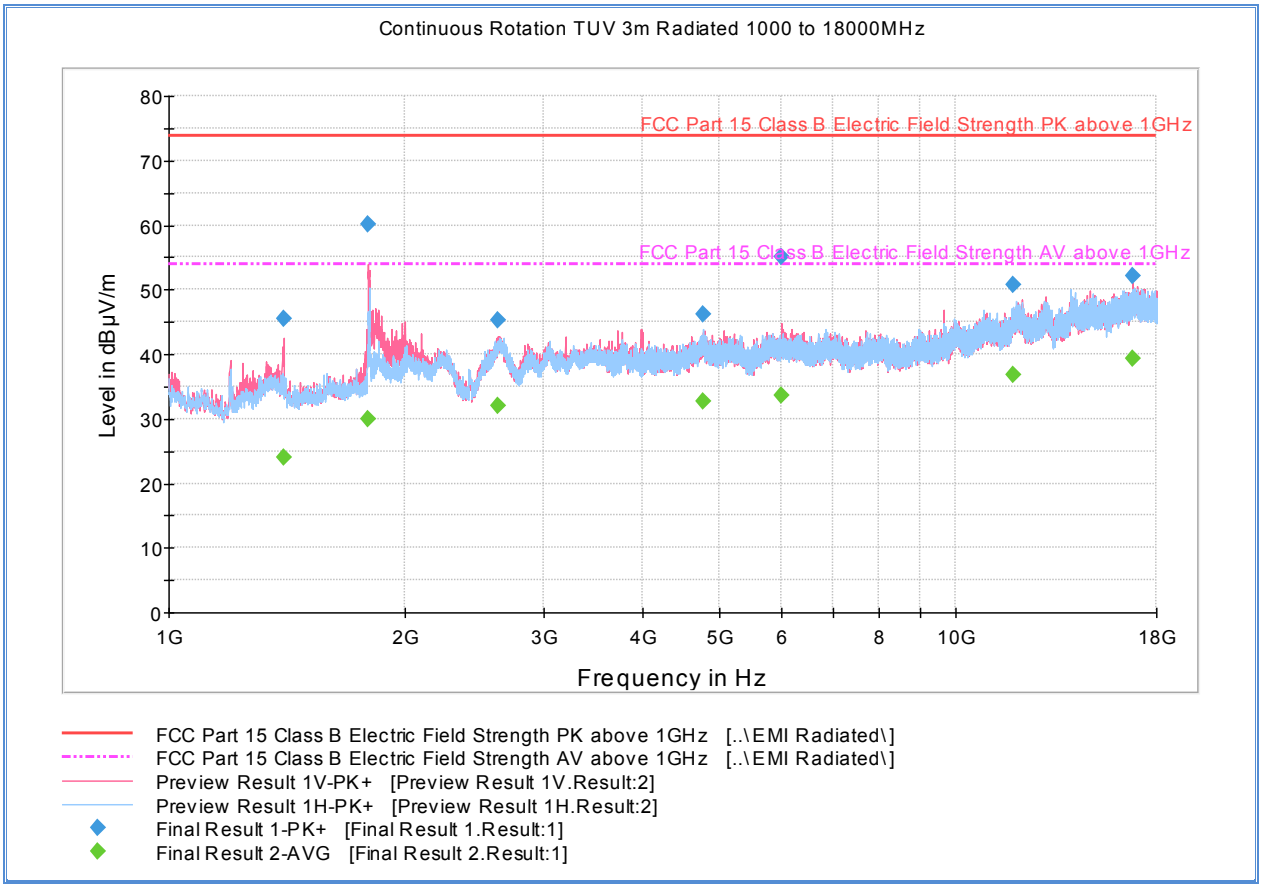
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1399.300000	45.5	1000.0	1000.000	127.7	V	227.0	-5.7	28.4	73.9
1797.333333	61.4	1000.0	1000.000	191.5	V	164.0	-3.4	12.5	73.9
3041.533333	44.4	1000.0	1000.000	198.5	V	158.0	0.9	29.5	73.9
3984.766667	56.1	1000.0	1000.000	231.4	V	191.0	2.4	17.8	73.9
7825.500000	46.4	1000.0	1000.000	120.7	V	343.0	7.1	27.5	73.9
9648.100000	51.0	1000.0	1000.000	191.5	H	171.0	8.8	22.9	73.9
17631.700000	52.3	1000.0	1000.000	139.7	V	342.0	17.9	21.6	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)
1399.300000	24.1	1000.0	1000.000	127.7	V	227.0	-5.7	29.8	53.9
1797.333333	31.9	1000.0	1000.000	191.5	V	164.0	-3.4	22.0	53.9
3041.533333	31.5	1000.0	1000.000	198.5	V	158.0	0.9	22.4	53.9
3984.766667	33.1	1000.0	1000.000	231.4	V	191.0	2.4	20.8	53.9
7825.500000	32.9	1000.0	1000.000	120.7	V	343.0	7.1	21.0	53.9
9648.100000	44.6	1000.0	1000.000	191.5	H	171.0	8.8	9.3	53.9
17631.700000	38.9	1000.0	1000.000	139.7	V	342.0	17.9	15.0	53.9

Test Notes: No significant emissions observed above 18GHz. Measurements above 18GHz were noise floor figures. 2.4GHz notch filter used for this test.

2.7.13 Test Results Above 1GHz (Worst Case Configuration – 802.11n MIMO)



Peak Data

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1398.333333	45.6	1000.0	1000.000	152.2	V	227.0	-5.7	28.3	73.9
1792.200000	60.0	1000.0	1000.000	200.5	V	163.0	-3.5	13.9	73.9
2617.866667	45.2	1000.0	1000.000	250.5	V	107.0	-0.3	28.7	73.9
4781.000000	46.1	1000.0	1000.000	173.6	H	188.0	3.7	27.8	73.9
6000.866667	55.0	1000.0	1000.000	152.2	V	301.0	5.7	18.9	73.9
11824.866667	50.7	1000.0	1000.000	127.7	H	16.0	13.3	23.2	73.9
16828.666667	52.2	1000.0	1000.000	103.7	V	233.0	17.9	21.7	73.9

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1398.333333	24.1	1000.0	1000.000	152.2	V	227.0	-5.7	29.8	53.9
1792.200000	30.0	1000.0	1000.000	200.5	V	163.0	-3.5	23.9	53.9
2617.866667	32.0	1000.0	1000.000	250.5	V	107.0	-0.3	21.9	53.9
4781.000000	32.6	1000.0	1000.000	173.6	H	188.0	3.7	21.3	53.9
6000.866667	33.5	1000.0	1000.000	152.2	V	301.0	5.7	20.4	53.9
11824.866667	36.8	1000.0	1000.000	127.7	H	16.0	13.3	17.1	53.9
16828.666667	39.2	1000.0	1000.000	103.7	V	233.0	17.9	14.7	53.9

Test Notes: No significant emissions observed above 18GHz. Measurements above 18GHz were noise floor figures. 2.4GHz notch filter used for this test.

2.8 POWER SPECTRAL DENSITY

2.8.1 Specification Reference

FCC CFR 47 Part 15, Clause 15.247(e)
RSS-247, Section 5.2(b)

2.8.2 Standard Applicable

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

2.8.1 Equipment Under Test and Modification State

Serial No: FF130219B00305 / Test Configuration A

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

March 12, 2019 / FSC

2.8.3 Test Equipment Used

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

2.8.4 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	22.8 °C
Relative Humidity	45.4 %
ATM Pressure	99.4 kPa

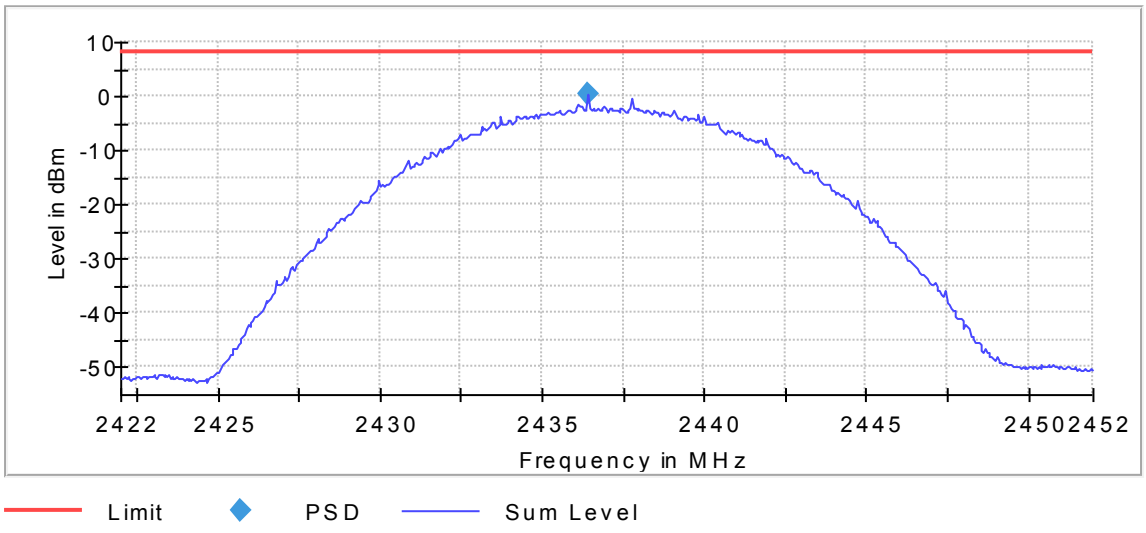
2.8.5 Additional Observations

- This is a conducted test using the TS8997 Test System.
- Test methodology is per FCC title 47 part 15 §15.247(a), KDB 558074 D01 DTS Meas Guidance v04 and ANSI C63.10-2013.
- Only the worst channel presented.

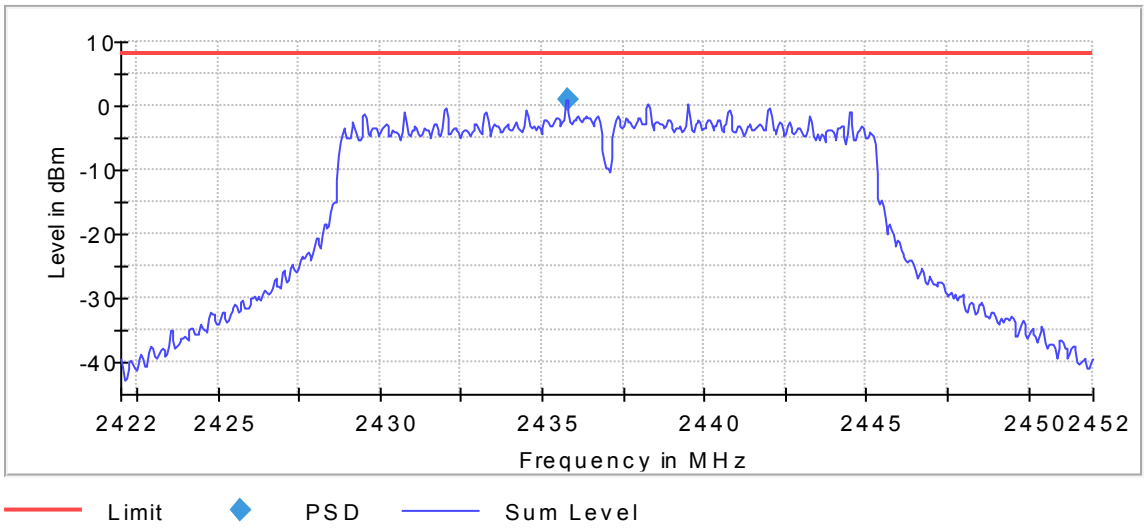
2.8.6 Test Results Summary

Mode	Channel	Marker Reading (dBm)/100 kHz	PSD Limit (dBm)	Margin (dB)	Compliance
802.11b	1 (2412 MHz)	7.629	8	0.371	Complies
	6 (2437 MHz)	7.432	8	0.568	Complies
	11 (2462 MHz)	7.694	8	0.306	Complies
802.11g	1 (2412 MHz)	1.263	8	6.737	Complies
	6 (2437 MHz)	0.829	8	7.171	Complies
	11 (2462 MHz)	1.624	8	6.376	Complies
802.11n 20MHz BW	1 (2412 MHz)	-2.811	8	10.811	Complies
	6 (2437 MHz)	-3.270	8	11.27	Complies
	11 (2462 MHz)	-1.437	8	9.437	Complies
802.11n 40MHz BW	3 (2422 MHz)	3.739	8	4.261	Complies
	6 (2437 MHz)	3.571	8	4.429	Complies
	9 (2452 MHz)	4.625	8	3.375	Complies

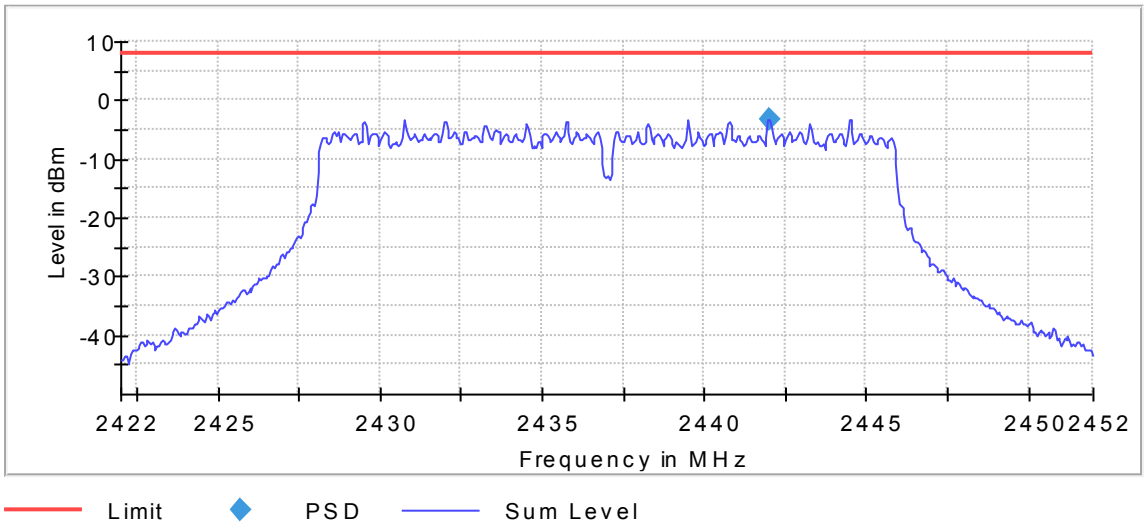
2.8.7 Sample Test Results Plots



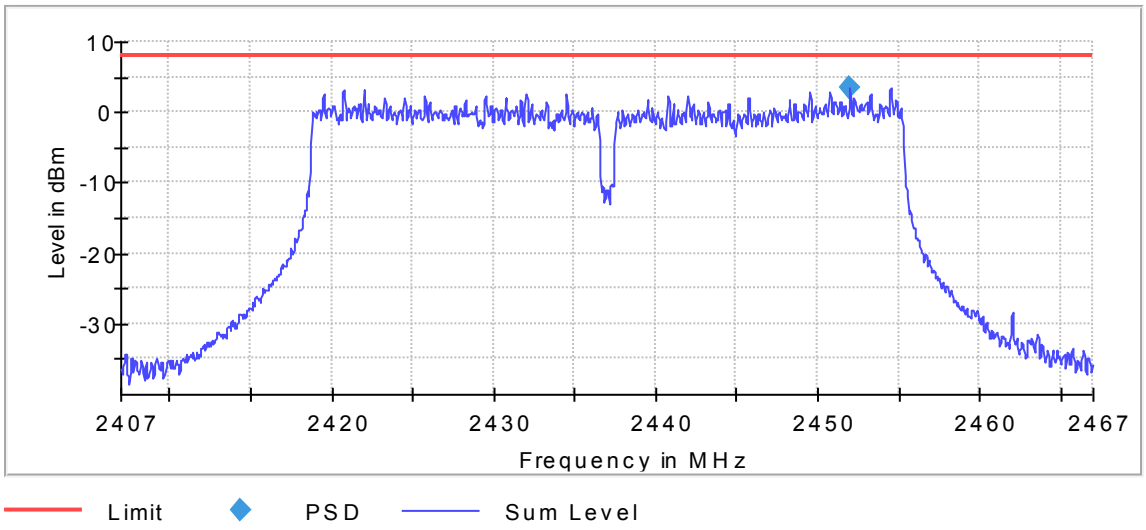
802.11b Middle Channel



802.11g Middle Channel



802.11n 20MHz BW Middle Channel



802.11n 40MHz BW Middle 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						
7643	Signal/Spectrum Analyzer	FSV30	1321.3008K30/ 103166	Rhode & Schwarz	04/11/18	04/11/19
7655	Vector Signal Generator	SMBV100A	260734	Rhode & Schwarz	11/19/18	11/19/19
7654	Signal Generator	SMB 100A	175750	Rhode & Schwarz	11/16/18	11/16/19
7656	OSP with B157	OSP120	101310	Rhode & Schwarz	01/23/19	01/23/20
8825	20dB Attenuator	46-20-34	BK5773	Weinschel Corp.	Verified by 7643 and 7654	
8832	20dB Attenuator	34-20-34	BP4150	MCE/Weinschel	Verified by 7643 and 7654	
AC Conducted Emissions Test Setup						
1024	EMI Test Receiver	ESCS30	847793/0001	Rhode & Schwarz	09/19/18	09/19/19
7567	LISN	FCC-LISN-50-25-2-10	120304	Fischer Custom Comm.	01/02/19	01/02/20
8822	20dB Attenuator	34-20-34	N/A	MCE / Weinschel	Verified by 7643 and 7655	
8824	20dB Attenuator	34-20-34	N/A	MCE / Weinschel	Verified by 7643 and 7655	
Radiated Test Setup						
1002	Bilog Antenna	3142C	00058717	ETS-Lindgren	11/20/17	11/20/19
8628	Pre-amplifier	QLJ 01182835-JO	8986002	QuinStar Technologies Inc.	03/07/19	03/07/20
1193	Pre-Amplifier	PAM-0202	185	PAM	04/11/18	04/11/19
1003	Signal Generator	SMR-40	1104.0002.40	Rhode & Schwarz	06/08/18	06/08/19
1040	EMI Test Receiver	ESIB40	100292	Rhode & Schwarz	10/15/18	10/15/19
1049	EMI Test Receiver	ESU40	100133	Rhode & Schwarz	07/13/18	07/13/19
7575	Double-ridged waveguide horn antenna	3117	00155511	EMCO	06/16/18	06/16/20
7631	Double-ridged waveguide horn antenna	3117	00205418	ETS-Lindgren	08/20/18	08/20/20
7611	Signal/Spectrum Analyzer	FSW26	102017	Rhode & Schwarz	05/09/18	05/09/19
7608	Vector Signal Generator	SMBV100A	259021	Rhode & Schwarz	09/19/17	09/19/19
7618	Horn antenna	3160-09	012054-004	ETS	08/18/17	08/18/19
n/a	Pre-amplifier (18-40 GHz)	SLKKa-30-6	15G27	Spacek Labs	Verified by 7611 and 1003	
1153	High-frequency cable	SucoFlex 100 SX	N/A	Suhner	Verified by 7611 and 1003	
8816	2.4GHz High Pass Filter	HPM50110	072	Micro-Tronics	Verified by 7611 and 1003	

Miscellaneous						
6708	Multimeter	34401A	US36086974	Hewlett Packard	07/18/18	07/18/19
7579	Temperature Chamber	115	151617	TestQuity	08/24/18	08/24/19
7554	Barometer/Temperature/Humidity Transmitter	iServer	400706	Omega	05/25/18	05/25/19
-	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 Conducted Antenna Port Measurement

	Input Quantity (Contribution) X_i	Value	Prob. Dist.	Divisor	$u_i(x)$	$u_i(x)^2$
1	Receiver reading	0.10 dB	Normal, k=1	1.000	0.10	0.01
2	Cable attenuation	1.00 dB	Normal, k=2	2.000	0.50	0.25
3	Receiver sinewave accuracy	0.08 dB	Normal, k=2	2.000	0.04	0.00
4	Receiver pulse amplitude	0.00 dB	Rectangular	1.732	0.00	0.00
5	Receiver pulse repetition rate	0.00 dB	Rectangular	1.732	0.00	0.00
6	Noise floor proximity	0.00 dB	Rectangular	1.732	0.00	0.00
7	Frequency interpolation	0.10 dB	Rectangular	1.732	0.06	0.00
8	Mismatch	0.07 dB	U-shaped	1.414	0.05	0.00
	Combined standard uncertainty		Normal	0.52	dB	
	Expanded uncertainty		Normal, k=2	**1.03**	**dB**	

3.2.2 Radiated Emission Measurements (Below 1GHz)

	Input Quantity (Contribution) X_i	Value	Prob. Dist.	Divisor	$u_i(x)$	$u_i(x)^2$
1	Receiver reading	0.10 dB	Normal, k=1	1.000	0.10	0.01
2	Attenuation: antenna-receiver	0.20 dB	Normal, k=2	2.000	0.10	0.01
3	Antenna factor AF	0.75 dB	Normal, k=2	2.000	0.38	0.14
4	Receiver sinewave accuracy	0.45 dB	Normal, k=2	2.000	0.23	0.05
5	Receiver pulse amplitude	1.50 dB	Rectangular	1.732	0.87	0.75
6	Receiver pulse repetition rate	1.50 dB	Rectangular	1.732	0.87	0.75
7	Noise floor proximity	0.50 dB	Rectangular	1.732	0.29	0.08
8	Mismatch: antenna-receiver	0.95 dB	U-shaped	1.414	0.67	0.45
9	AF frequency interpolation	0.30 dB	Rectangular	1.732	0.17	0.03
10	AF height deviations	0.10 dB	Rectangular	1.732	0.06	0.00
11	Directivity difference at 3 m	3.12 dB	Rectangular	1.732	1.80	3.24
12	Phase center location at 3 m	1.00 dB	Rectangular	1.732	0.58	0.33
13	Cross-polarisation	0.90 dB	Rectangular	1.732	0.52	0.27
14	Balance	0.00 dB	Rectangular	1.732	0.00	0.00
15	Site imperfections	3.76 dB	Triangular	2.449	1.54	2.36
16	Separation distance at 3 m	0.30 dB	Rectangular	1.732	0.17	0.03
17	Effect of setup table material	0.77 dB	Rectangular	1.732	0.44	0.20
18	Table height at 3 m	0.10 dB	Normal, k=2	2.000	0.05	0.00
19	Near-field effects	0.00 dB	Triangular	2.449	0.00	0.00
20	Effect of ambient noise on OATS	0.00 dB				0.00
	Combined standard uncertainty		Normal	2.95	dB	
	Expanded uncertainty		Normal, k=2	**5.90**	**dB**	

3.2.3 Radiated Emission Measurements (Above 1GHz)

	Input Quantity (Contribution) X_i	Value	Prob. Dist.	Divisor	$u_i(x)$	$u_i(x)^2$
1	Receiver reading	0.10 dB	Normal, k=1	1.000	0.10	0.01
2	Attenuation: antenna-receiver	0.20 dB	Normal, k=2	2.000	0.10	0.01
3	Antenna factor AF	0.75 dB	Normal, k=2	2.000	0.38	0.14
4	Receiver sinewave accuracy	0.45 dB	Normal, k=2	2.000	0.23	0.05
5	Receiver pulse amplitude	1.50 dB	Rectangular	1.732	0.87	0.75
6	Receiver pulse repetition rate	1.50 dB	Rectangular	1.732	0.87	0.75
7	Noise floor proximity	0.50 dB	Rectangular	1.732	0.29	0.08
8	Mismatch: antenna-receiver	0.95 dB	U-shaped	1.414	0.67	0.45
9	AF frequency interpolation	0.30 dB	Rectangular	1.732	0.17	0.03
10	AF height deviations	0.10 dB	Rectangular	1.732	0.06	0.00
11	Directivity difference at 3 m	3.12 dB	Rectangular	1.732	1.80	3.24
12	Phase center location at 3 m	1.00 dB	Rectangular	1.732	0.58	0.33
13	Cross-polarisation	0.90 dB	Rectangular	1.732	0.52	0.27
14	Balance	0.00 dB	Rectangular	1.732	0.00	0.00
15	Site imperfections	3.25 dB	Triangular	2.449	1.33	1.76
16	Separation distance at 3 m	0.30 dB	Rectangular	1.732	0.17	0.03
17	Effect of setup table material	0.77 dB	Rectangular	1.732	0.44	0.20
18	Table height at 3 m	0.10 dB	Normal, k=2	2.000	0.05	0.00
19	Near-field effects	0.00 dB	Triangular	2.449	0.00	0.00
20	Effect of ambient noise on OATS	0.00 dB				0.00
	Combined standard uncertainty		Normal		2.85 dB	
	Expanded uncertainty		Normal, k=2		**5.70 dB**	

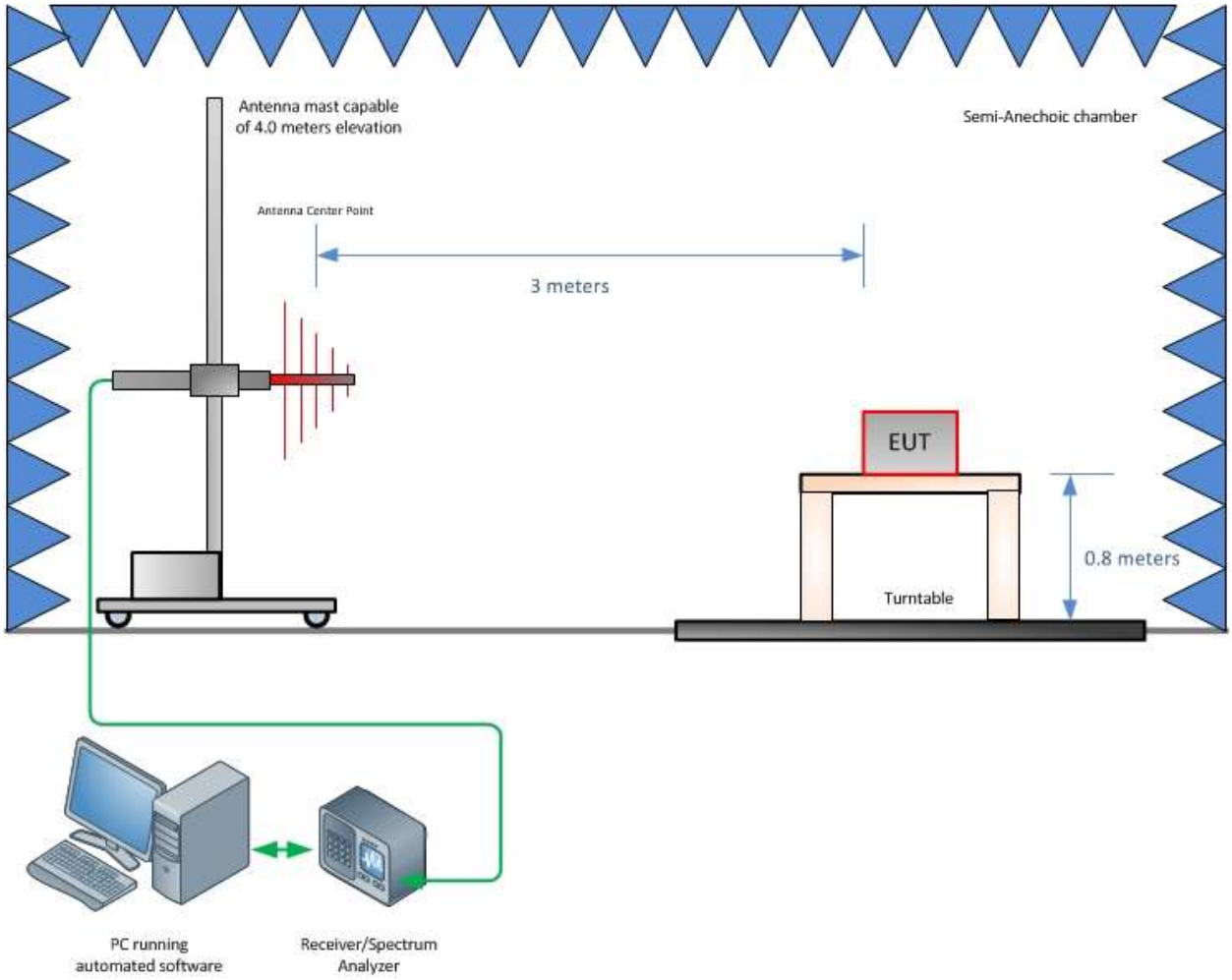
3.2.4 Conducted Measurements

	Input Quantity (Contribution) X_i	Value	Prob. Dist.	Divisor	$u_i(x)$	$u_i(x)^2$
1	Receiver reading	0.10 dB	Normal, k=1	1.000	0.10	0.01
2	LISN-receiver attenuation	0.10 dB	Normal, k=2	2.000	0.05	0.00
3	LISN voltage division factor	0.30 dB	Normal, k=2	2.000	0.15	0.02
4	Receiver sinewave accuracy	0.36 dB	Normal, k=2	2.000	0.18	0.03
5	Receiver pulse amplitude	1.50 dB	Rectangular	1.732	0.87	0.75
6	Receiver pulse repetition rate	1.50 dB	Rectangular	1.732	0.87	0.75
7	Noise floor proximity	0.00 dB	Rectangular	1.732	0.00	0.00
8	AMN VDF frequency interpolation	0.10 dB	Rectangular	1.732	0.06	0.00
9	Mismatch	0.07 dB	U-shaped	1.414	0.05	0.00
10	LISN impedance	2.65 dB	Triangular	2.449	1.08	1.17
11	Effect of mains disturbance	0.00 dB			0.00	0.00
12	Effect of the environment					
	Combined standard uncertainty		Normal		1.66 dB	
	Expanded uncertainty		**Normal, k=2**		**3.31 dB**	

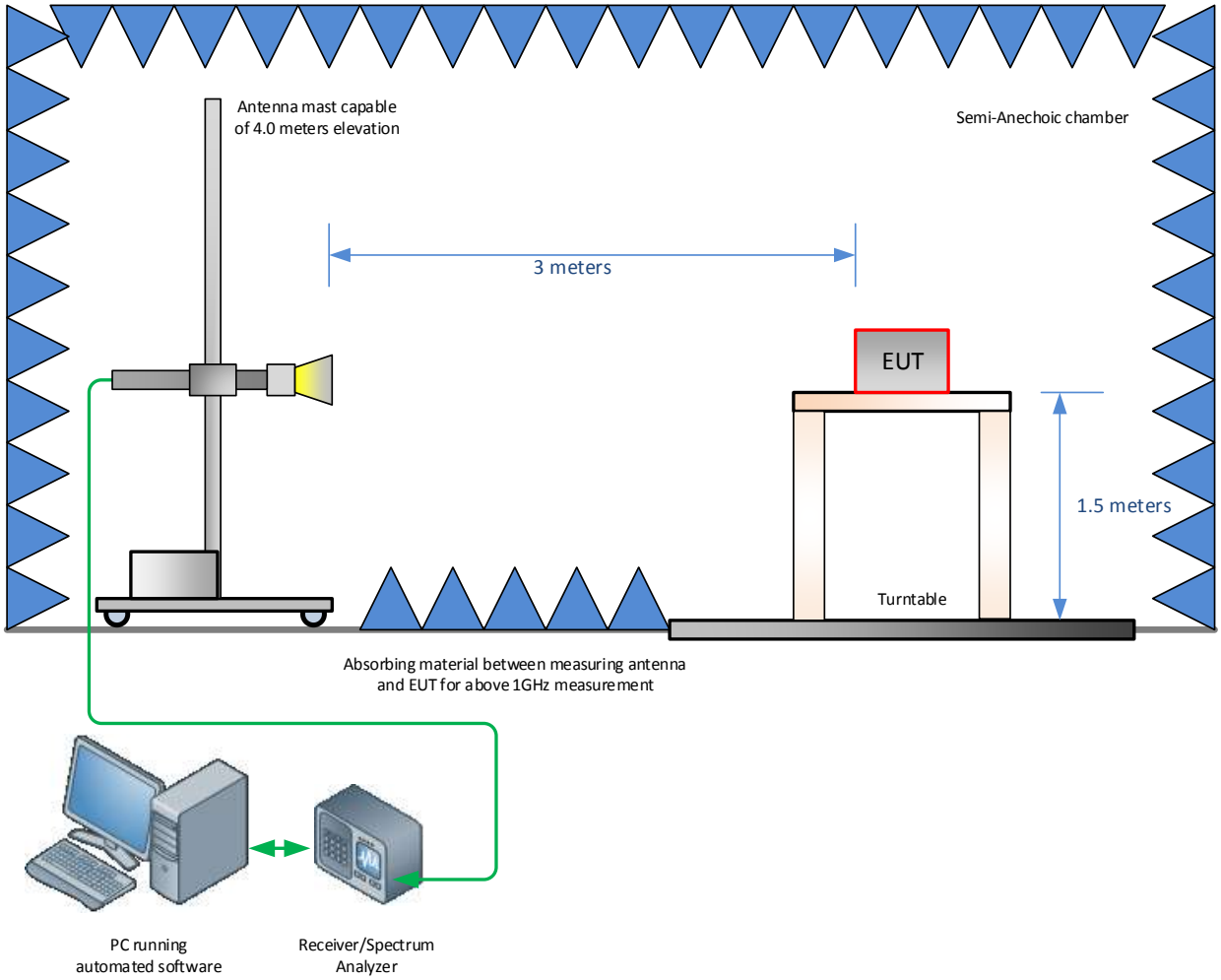
SECTION 4

DIAGRAM OF TEST SETUP

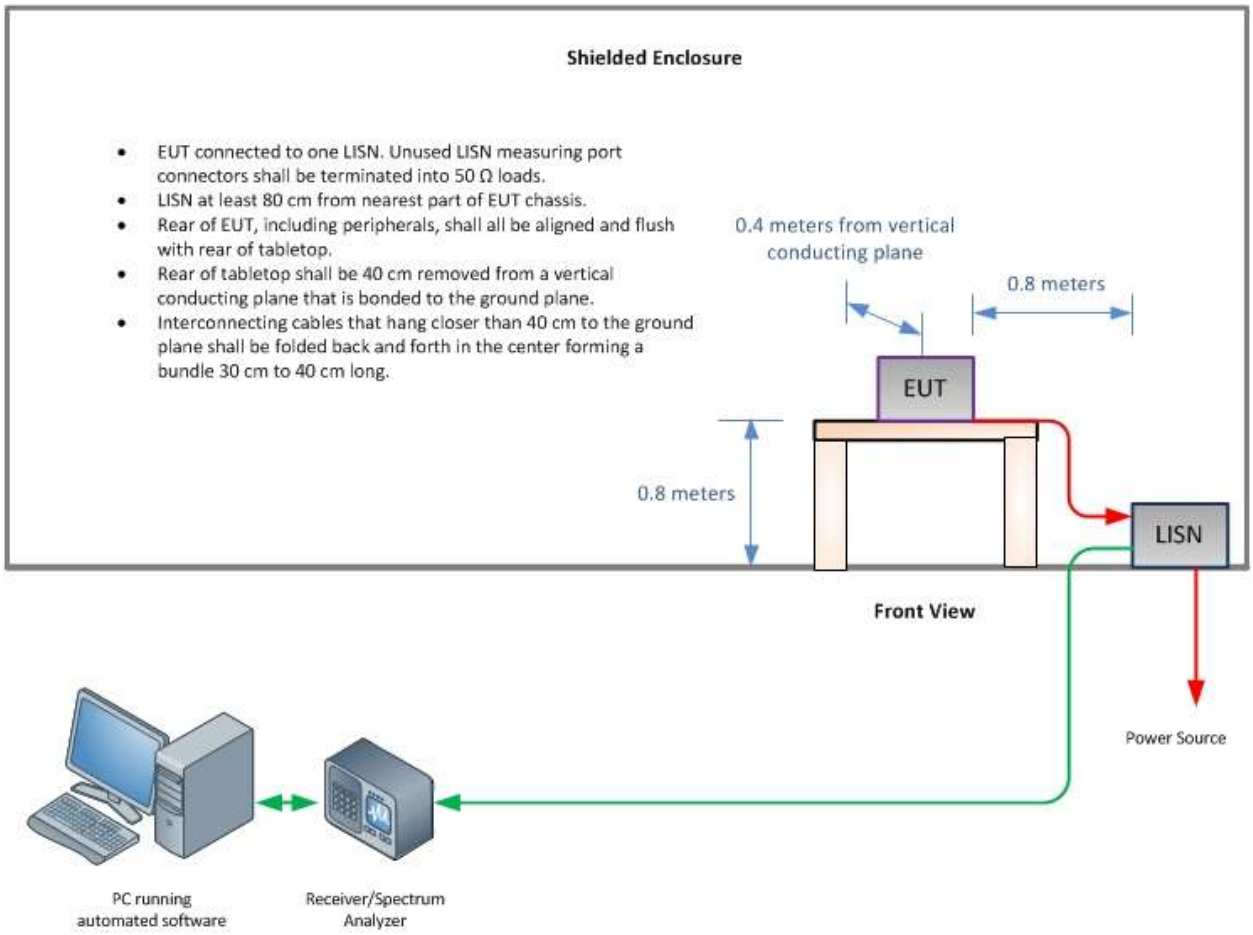
4.1 TEST SETUP DIAGRAM



Radiated Emission Test Setup (Below 1GHz)



Radiated Emission Test Setup (Above 1GHz)



Conducted Emission Test Setup

SECTION 5

ACCREDITATION, DISCLAIMERS AND COPYRIGHT

5.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

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