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Report On

Application for Grant of Equipment Authorization of the
NantWorks
HBox Access Point for Medical Devices

FCC Part 15 Subpart E §15.407
IC RSS-210 Issue 8 December 2010

Report No. SC1311091C

January 2014



REPORT ON Radio Testing of the
NantWorks
Access Point for Medical Devices

TEST REPORT NUMBER SC1311091C

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Authorized Signatory

DATED January 10, 2014



Revision History

SC1311091C NantWorks HBox Access Point for Medical Devices					
DATE	OLD REVISION	NEW REVISION	REASON	PAGES AFFECTED	APPROVED BY
01/10/2014	Initial Release				Chip R. Fleury



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SECTION 1

REPORT SUMMARY

Radio Testing of the
NantWorks
Access Point for Medical Devices



1.1 INTRODUCTION

The information contained in this report is intended to show verification of the NantWorks Access Point for Medical Devices to the requirements of FCC Part 15 Subpart E §15.407 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	NantWorks
Model Number(s)	200-HBX-PDL
FCC ID Number	IFU1001008
IC Number	N/A (Manufacturer not seeking IC Certification at the time of verification)
Serial Number(s)	N/A (Sample #1) Conducted antenna service port testing sample, serial number not available due to temporary addition of an antenna port for testing / 34008112 (Radiated testing - Sample #2) 34008096 (Radiated testing - Sample #3)
Number of Samples Tested	3
Test Specification/Issue/Date	• FCC Part 15 Subpart E §15.407 (October 1, 2012). • RSS-210 - Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment (Issue 8, December 2010). • RSS-Gen - General Requirements and Information for the Certification of Radio Apparatus (Issue 3, December 2010). • 789033 D01 General UNII Test Procedures v01r03 (Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - Part 15, Subpart E.
Start of Test	November 26, 2013
Finish of Test	December 24, 2013
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 E §15.407 with cross-reference to the corresponding IC RSS standard is shown below.

Operation in the 5.15 to 5.25GHz band					
Section	Spec Clause	RSS	Test Description	Result	Comments/Base Standard
2.1	§15.207(a)	RSS-Gen 7.2.4	Conducted Emissions	Compliant	
2.2	§15.407(e)	RSS-210 A9.4(6)(i)	Indoor Operation Only	Client Declaration	
2.3	§15.407(a)(1)		26 dB Bandwidth	As Reported	
2.4		RSS-Gen 4.6.1	99% Emission Bandwidth	As Reported	
2.5	§15.407(a)(1)	RSS-210 A9.2(1)	Maximum Conducted Output Power	Compliant	
2.6	§15.407(a)(1)	RSS-210 A9.2(1)	Peak Power Spectral Density	Compliant	
2.7	§15.407(b)(1) / 15.209	RSS-210 A9.2(1)	Unwanted Emissions Measurement	Compliant	
2.8	§15.407(b)(1)	RSS-210 A9.2(1)	Band-Edge Measurements	Compliant	
2.9	§15.407(a)(6)		Peak Excursion Ratio	Compliant	

1.3 PRODUCT INFORMATION

1.3.1 Technical Description

The Equipment Under Test (EUT) was a NantWorks HBox Access Point for Medical Devices as shown in the photograph below. The EUT can connect to a network through Ethernet port or Wi-Fi. In normal operation, the EUT collects user data via USB, Bluetooth or Wi-Fi and upload the information back to a data server. The NFC function is for quick Bluetooth pairing by obtaining the device info when within NFC range of the EUT. Only the 802.11 "a" and "n" (U-NII) functions verified in this test report.



Equipment Under Test



1.3.2 EUT General Description

EUT Description	Access Point for Medical Devices
Model Name	HBox
Model Number(s)	200-HBX-PDL
Frequency Range	5180 MHz to 5240 MHz in the 5150 MHz to 5250 MHz Band (U-NII 1)
Number of Operating Frequencies	4
Channels Verified	Low Channel 5180 MHz (Channel 36) Mid Channel 5220 MHz (Channel 44) High Channel 5240MHz (Channel 48)
Rated Voltage	Internal 3.7VDC Li-Ion Battery (Gold Peak Industries 130801-00), AC adapter/charger is Hon-Kwang Switching Power Supply Model: HK-AB-050A400-US, output is 5.0VDC 4.0A
Mode Verified	802.11 a and n (U-NII)
Capability	802.11 a/b/g/n WLAN (DTS/U-NII), Bluetooth 2.0 + EDR, Bluetooth 4.0 and NFC
Primary Unit (EUT)	☒ Production ☐ Pre-Production ☐ Engineering
Antenna Type	PIFA type (Ant #1 and 2) – Integral, complies with Part 15.203 requirements
Antenna Gain Ant #1 (Main, WiFi +BT)	5000MHz = 2.3dBi. Ant #2 is not used for 5GHz application.
Modulation Used	OFDM

1.3.3 Maximum Conducted Output Power

Mode	Frequency Range (MHz)	Output Power (dBm)	Output Power (mW)
802.11a	5180-5240	11.77	15.03
802.11 n (ht20)	5180-5240	11.68	14.72
802.11 n (ht40)	5180-5240	5.80	3.802



1.4 EUT TEST CONFIGURATION

1.4.1 Test Configuration Description

Test Configuration	Description
A	Antenna conducted port test configuration. 802.11 a and n modes of the EUT operating in the U-NII bands does not support MIMO. The EUT is programmed using a generic JTAG debug board connected via USB. Radio commands are programmed using Tera Term SSH2 (Secure Shell) client software.
B	Radiated emissions test configuration. The EUT is programmed using PuTTY SSH2 (Secure Shell) client software. The EUT is connected to a support broadband router where the support laptop used to program the EUT is also connected. Client provided radio commands to modify modes, channel number and data rates. TX power is set to max power as a default setting.

1.4.2 EUT Exercise Software

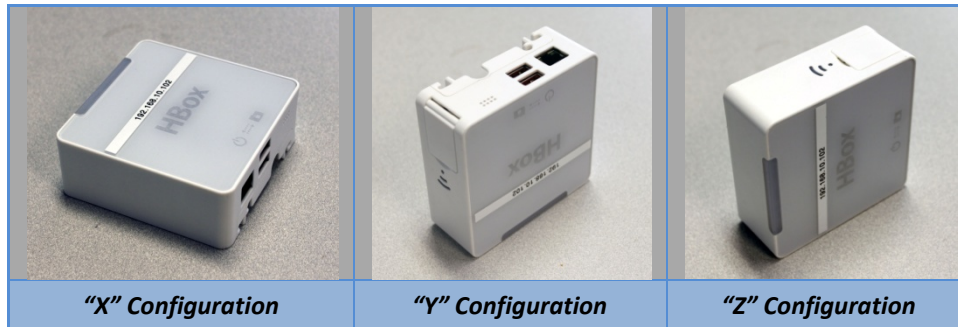
HBOX Function Tester. This is built-in within the firmware. Radio commands are executed via Ethernet or USB via a JTAG debug board using Tera Term or Putty from a support PC.

1.4.3 Support Equipment and I/O cables

Manufacturer	Equipment/Cable	Description
Sony	Personal Computer (Y Series Laptop)	Model PCG-31311L
Sony	AC Adapter	Model PCGA-AC19V9 S/N:147839091 0023259
Hon-Kwang	I.T.E. Power Supply for EUT	Model HK-AB-050A400-US 5VDC @ 4A
Trendnet	Broadband Router	Model TW100S4W1CA S/N: RA1332S400789
DVE	Switching Adapter for Broadband Router	Model DSA-6PFE-05 FUS 050100 5VDC @ 1A
Lorom	CAT5E Patch Cable (2X)	Unshielded, 1.5 meters Ethernet cables
-	Debug board	Generic JTAG (Joint Test Action Group)/IEEE 1149.1 Standard Test Access Port and
	USB cable	Shielded, 1.7m generic USB cable

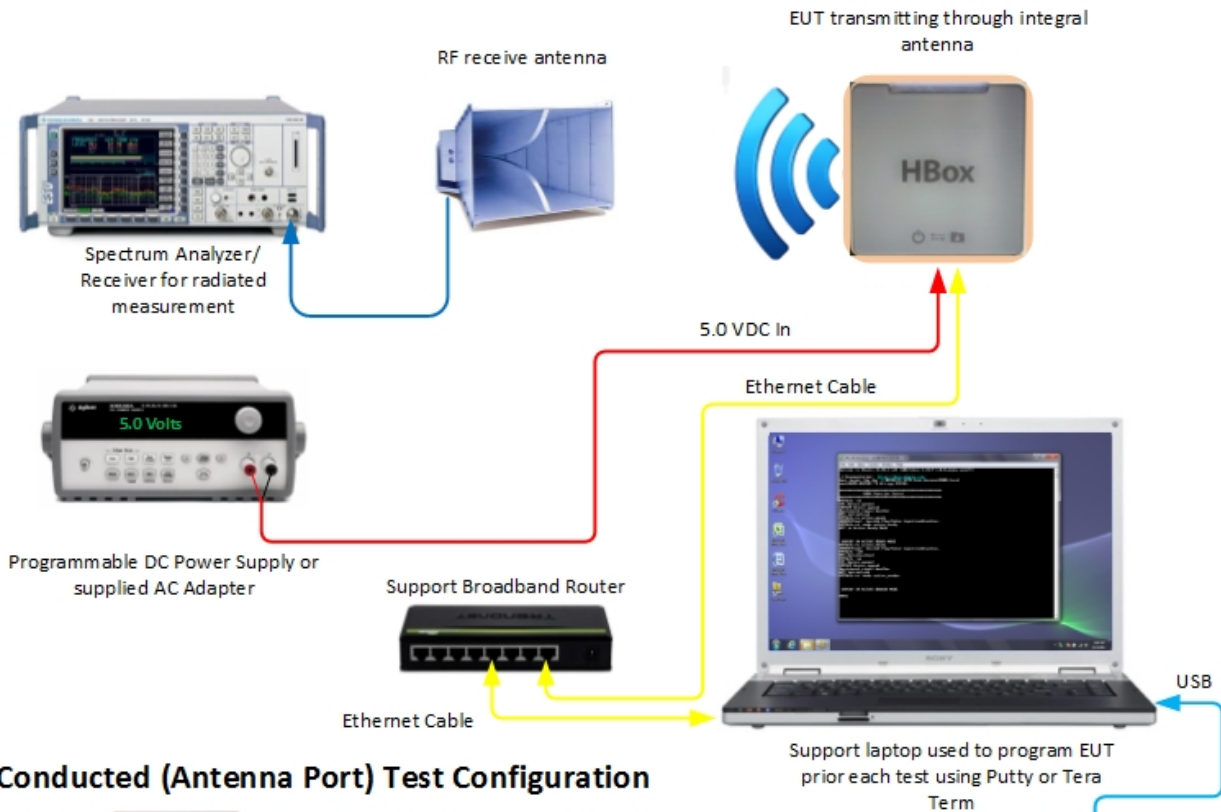
1.4.4 Worst Case Configuration

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

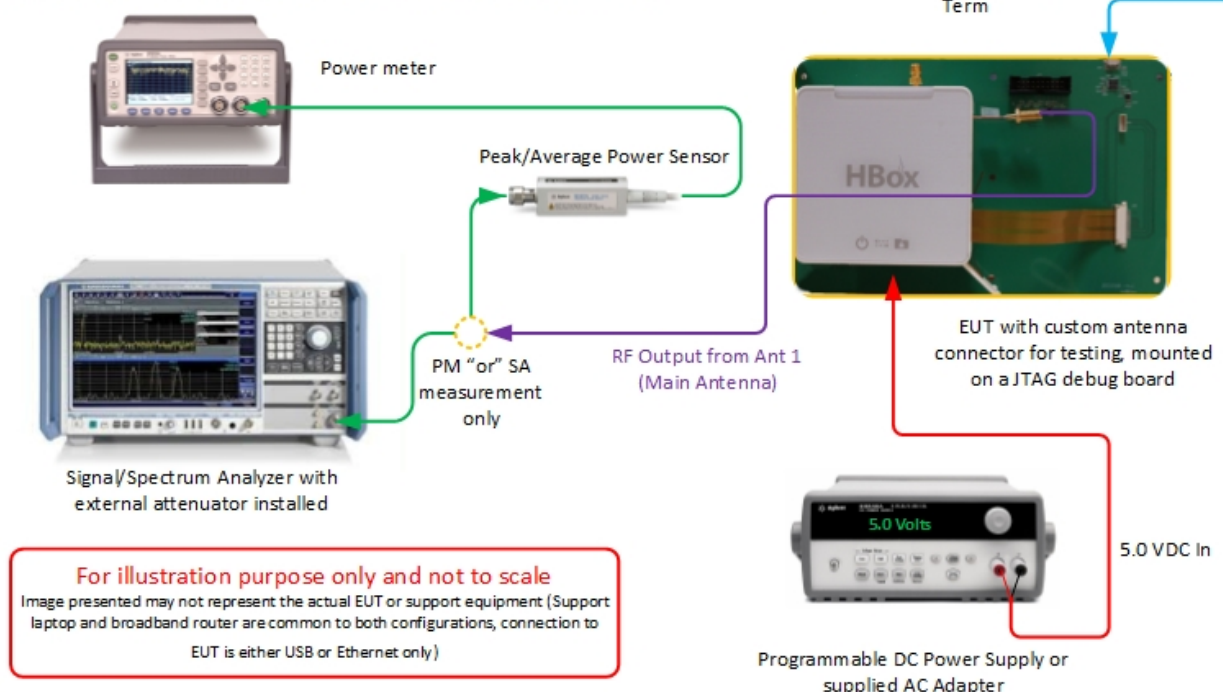


1.4.5 Simplified Test Configuration Diagram

Radiated Test Configuration



Conducted (Antenna Port) Test Configuration



1.5 DEVIATIONS FROM THE STANDARD

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

1.6 MODIFICATION RECORD

Description of Modification	Modification Fitted By	Date Modification Fitted
Serial Number N/A (Sample #1) Antenna port conducted sample/34008112 (Sample #2)/34008096 (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 and 789033 D01 General UNII Test Procedures v01r03 (Federal Communications Commission Office of Engineering and Technology Laboratory Division Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - Part 15, Subpart E.

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

1.8 TEST FACILITY

1.8.1 FCC – Registration No.: US5296

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

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

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



SECTION 2

TEST DETAILS

Radio Testing of the
NantWorks
Access Point for Medical Devices

2.1 CONDUCTED EMISSIONS

2.1.1 Specification Reference

Part 15 Subpart C §15.207(a)

2.1.2 Standard Applicable

An intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN).

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

**Decreases with the logarithm of the frequency.*

2.1.3 Equipment Under Test and Modification State

Serial No: 34008112 / Test Configuration B

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

December 13, 2013/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

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

2.1.7 Additional Observations

- The EUT was verified using AC adapter supplied by the manufacturer..
- EUT verified using input voltage of 120VAC 60Hz.
- There are no significant variations in test results between 802.11a and 802.11n. Only the worst case observed configuration is presented (802.11a mode).
- Receive mode is also presented for comparison.



- 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 2.1.8 for sample computation.

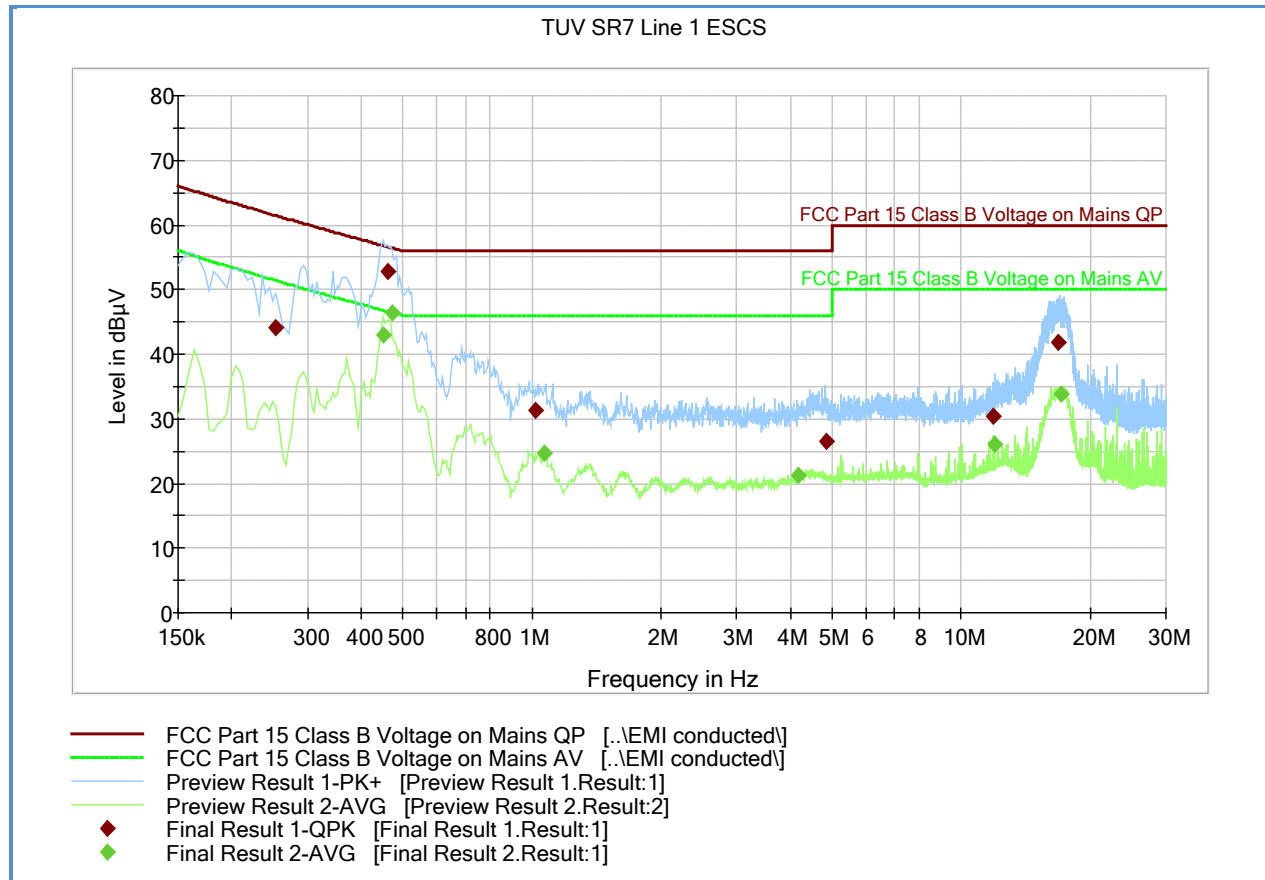
2.1.8 Sample Computation (Conducted Emission – Quasi Peak)

Measuring equipment raw measurement (db μ V) @ 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 (db μ V) @ 150kHz			26.2

2.1.9 Test Results

Compliant. See attached plots and tables.

2.1.10 FCC Conducted Emissions Line 1 – Hot (Worst Case Channel 802.11a)



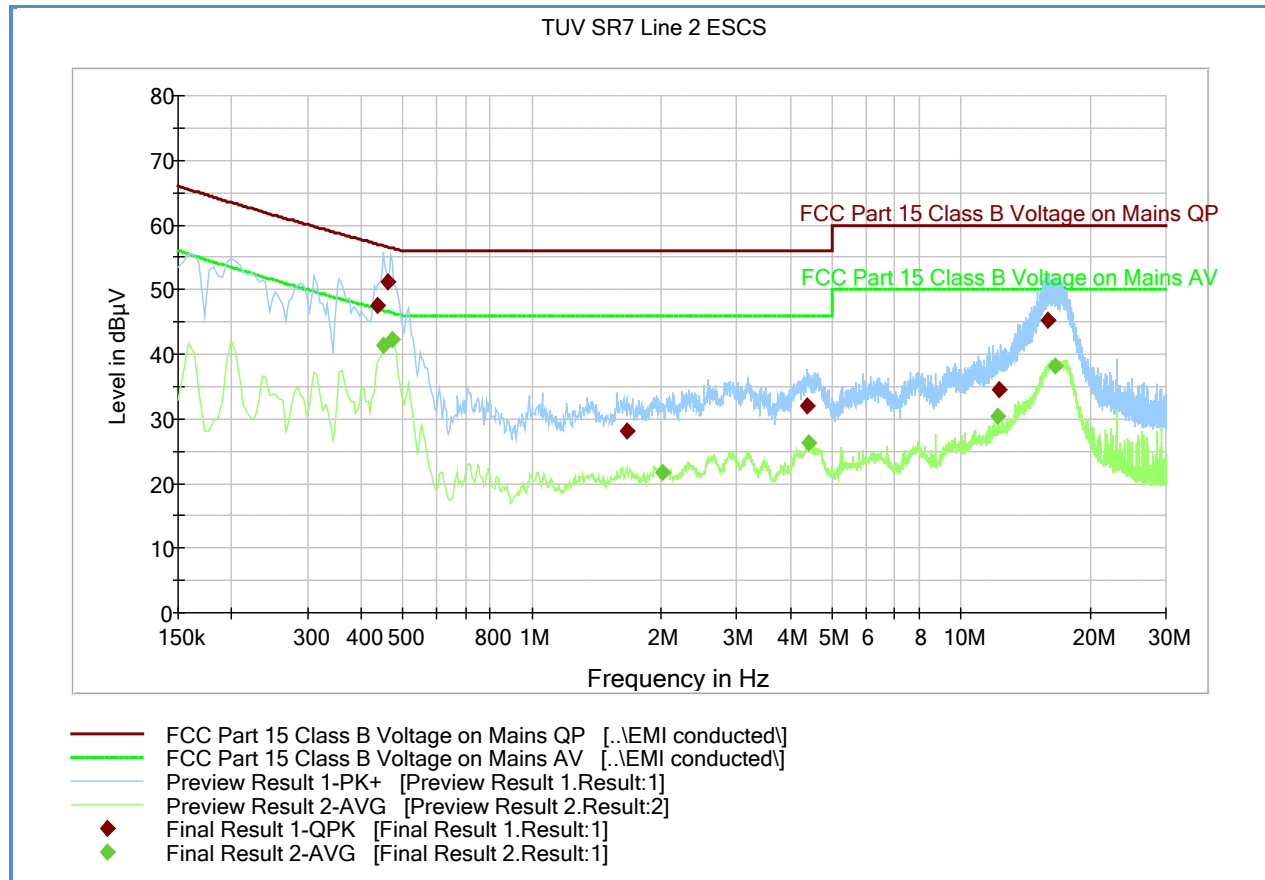
Quasi Peak

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV)
0.253500	44.0	1000.0	9.000	Off	L1	20.3	17.4	61.4
0.460500	52.7	1000.0	9.000	Off	L1	20.2	3.9	56.6
1.023000	31.4	1000.0	9.000	Off	L1	20.2	24.6	56.0
4.866000	26.6	1000.0	9.000	Off	L1	20.4	29.4	56.0
11.895000	30.5	1000.0	9.000	Off	L1	20.5	29.5	60.0
16.872000	41.7	1000.0	9.000	Off	L1	20.8	18.3	60.0

Average

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - Ave (dB)	Limit - Ave (dBµV)
0.451500	42.9	1000.0	9.000	Off	L1	20.2	3.9	46.8
0.474000	46.4	1000.0	9.000	Off	L1	20.2	0.0	46.4
1.072500	24.8	1000.0	9.000	Off	L1	20.2	21.2	46.0
4.164000	21.3	1000.0	9.000	Off	L1	20.4	24.7	46.0
11.953500	26.0	1000.0	9.000	Off	L1	20.5	24.0	50.0
17.047500	33.8	1000.0	9.000	Off	L1	20.8	16.2	50.0

2.1.1 FCC Conducted Emissions Line 2 – Neutral (Worst Case Channel 802.11a)



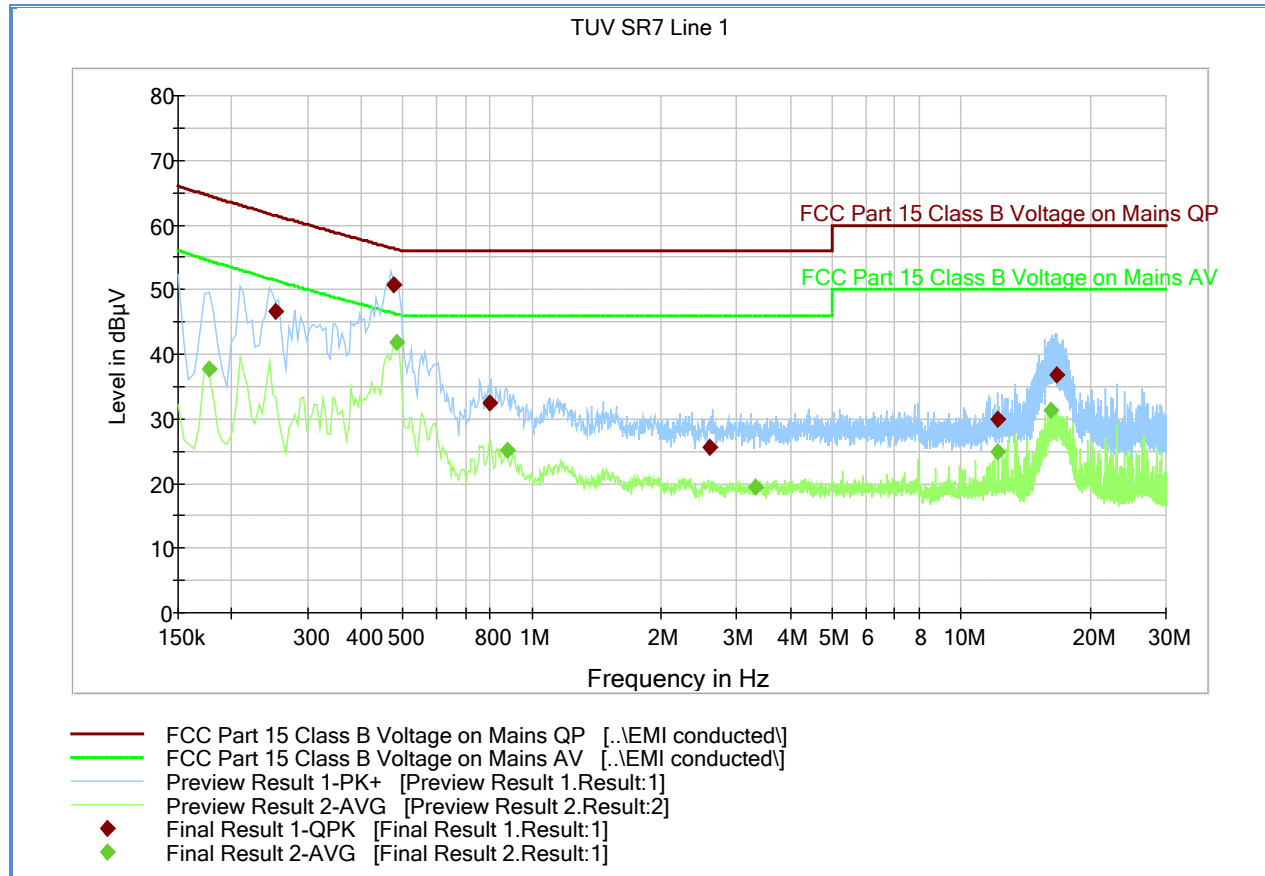
Quasi Peak

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBμV)
0.438000	47.7	1000.0	9.000	Off	N	21.1	9.4	57.0
0.460500	51.1	1000.0	9.000	Off	N	21.1	5.5	56.6
1.671000	28.1	1000.0	9.000	Off	N	21.1	27.9	56.0
4.380000	32.1	1000.0	9.000	Off	N	21.2	23.9	56.0
12.295500	34.6	1000.0	9.000	Off	N	21.3	25.4	60.0
15.922500	45.2	1000.0	9.000	Off	N	21.5	14.8	60.0

Average

Frequency (MHz)	Average (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - Ave (dB)	Limit - Ave (dBμV)
0.451500	41.4	1000.0	9.000	Off	N	21.1	5.4	46.8
0.474000	42.4	1000.0	9.000	Off	N	21.1	4.0	46.4
2.008500	21.8	1000.0	9.000	Off	N	21.1	24.2	46.0
4.411500	26.3	1000.0	9.000	Off	N	21.2	19.7	46.0
12.138000	30.4	1000.0	9.000	Off	N	21.3	19.6	50.0
16.597500	38.2	1000.0	9.000	Off	N	21.6	11.8	50.0

2.1.2 FCC Conducted Emissions Line 1 – Hot (Receive Mode)



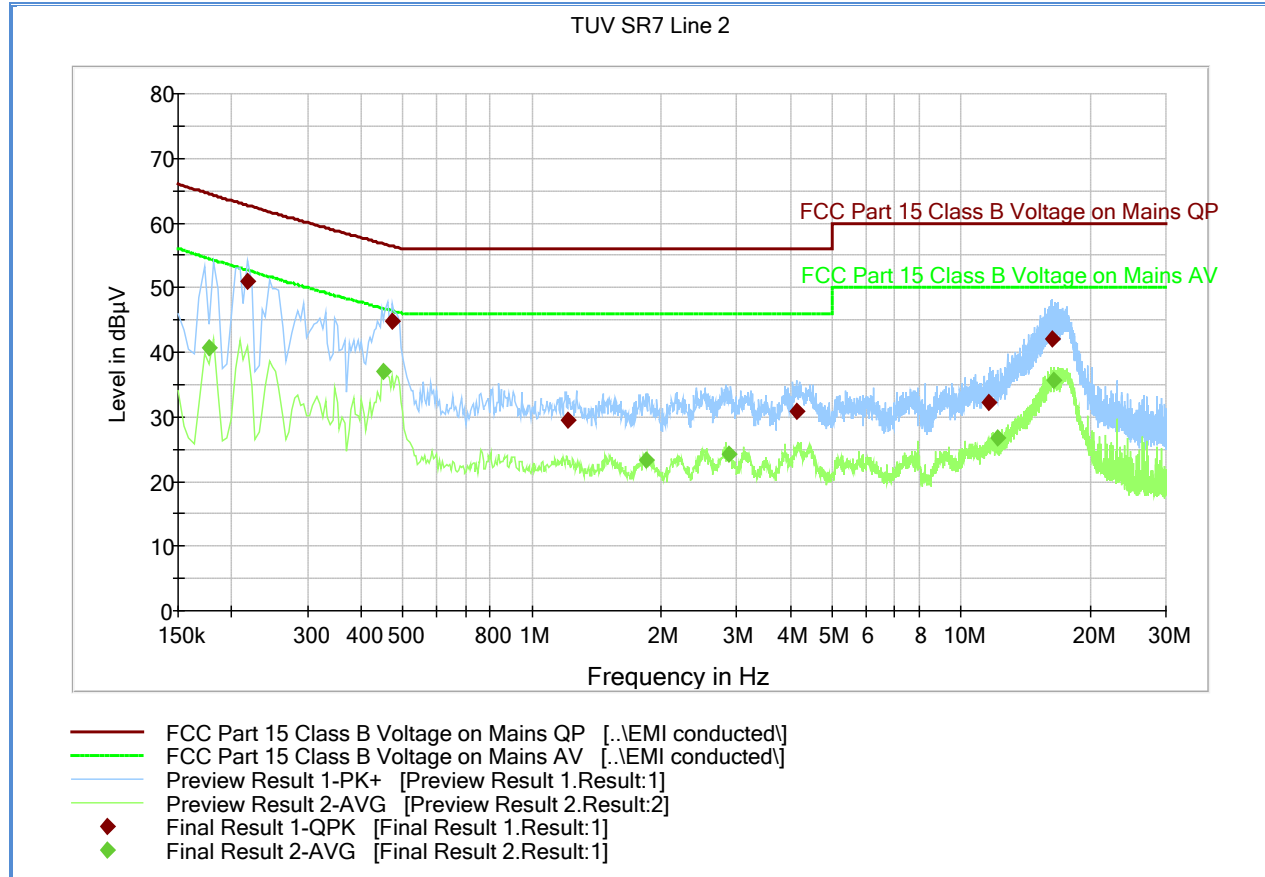
Quasi Peak

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBμV)
0.253500	46.7	1000.0	9.000	Off	L1	20.3	14.7	61.4
0.478500	50.7	1000.0	9.000	Off	L1	20.2	5.6	56.3
0.798000	32.5	1000.0	9.000	Off	L1	20.2	23.5	56.0
2.598000	25.7	1000.0	9.000	Off	L1	20.3	30.3	56.0
12.138000	30.0	1000.0	9.000	Off	L1	20.5	30.0	60.0
16.746000	36.9	1000.0	9.000	Off	L1	20.8	23.1	60.0

Average

Frequency (MHz)	Average (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - Ave (dB)	Limit - Ave (dBμV)
0.177000	37.6	1000.0	9.000	Off	L1	20.4	16.9	54.5
0.483000	41.9	1000.0	9.000	Off	L1	20.2	4.4	46.3
0.874500	25.2	1000.0	9.000	Off	L1	20.2	20.8	46.0
3.318000	19.5	1000.0	9.000	Off	L1	20.3	26.5	46.0
12.196500	25.0	1000.0	9.000	Off	L1	20.5	25.0	50.0
16.228500	31.4	1000.0	9.000	Off	L1	20.8	18.6	50.0

2.1.3 FCC Conducted Emissions Line 2 – Neutral (Receive Mode)



Quasi Peak

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV)
0.217500	50.9	1000.0	9.000	Off	N	21.1	11.9	62.7
0.474000	44.8	1000.0	9.000	Off	N	21.1	11.6	56.4
1.216500	29.5	1000.0	9.000	Off	N	21.1	26.5	56.0
4.137000	30.8	1000.0	9.000	Off	N	21.2	25.2	56.0
11.589000	32.3	1000.0	9.000	Off	N	21.3	27.7	60.0
16.309500	42.0	1000.0	9.000	Off	N	21.6	18.0	60.0

Average

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - Ave (dB)	Limit - Ave (dBµV)
0.177000	40.8	1000.0	9.000	Off	N	21.2	13.8	54.5
0.451500	37.1	1000.0	9.000	Off	N	21.1	9.7	46.8
1.851000	23.3	1000.0	9.000	Off	N	21.1	22.7	46.0
2.868000	24.3	1000.0	9.000	Off	N	21.1	21.7	46.0
12.196500	26.7	1000.0	9.000	Off	N	21.3	23.3	50.0
16.467000	35.6	1000.0	9.000	Off	N	21.6	14.4	50.0

2.2 INDOOR OPERATION ONLY

2.2.1 Specification Reference

Part 15 Subpart E §15.407(e) and RSS-210 A9.4(6)(i)

2.2.2 Standard Applicable

(e) Within the 5.15–5.25 GHz band, U-NII devices will be restricted to indoor operations to reduce any potential for harmful interference to co-channel MSS operations.

2.2.3 Manufacturer Declaration

See attached page from the user manual with a statement indicating compliance with this requirement.

Chapter 1: Regulatory Approvals

The HBox is currently designed to meet regulations for use in the United States.

Federal Communications Commission (FCC)

This device complies with part 15 of the Federal Communications Commission (FCC) Rules.

Operation is subject to the following two conditions:

1. This device may not cause harmful interference
2. This device must accept any interference received, including interference that may cause undesired operation.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.

This device is restricted to indoor use only when operating in the 5.15 to 5.25GHz frequency band (U-NII 1).



2.3 26 dB BANDWIDTH

2.3.1 Specification Reference

Part 15 Subpart E §15.407(a)(1)

2.3.2 Standard Applicable

(1) For the band 5.15–5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or 4 dBm + 10 log B, where B is the 26–dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 4 dBm in any 1–MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

2.3.3 Test Methodology

Section C of 789033 D01 General UNII Test Procedures v01r03

2.3.4 Equipment Under Test and Modification State

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

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

December 26, 2013/FSC

2.3.6 Test Equipment Used

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

2.3.7 Environmental Conditions

Ambient Temperature	24.5 °C
Relative Humidity	21.4 %
ATM Pressure	99.4 kPa

2.3.8 Additional Observations

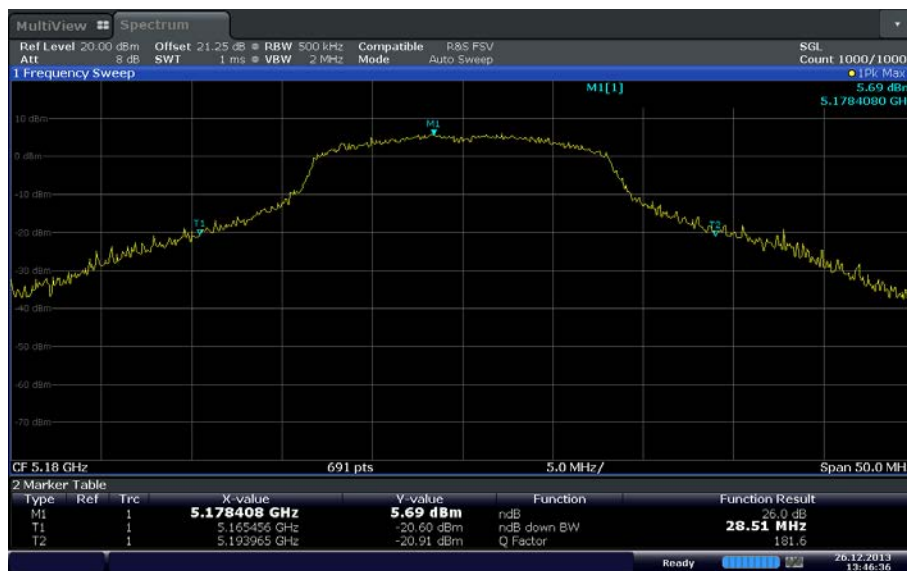
- This is a conducted test.
- Test methodology is per Section C (Emission bandwidth) of 789033 D01 General UNII Test Procedures v01r03,(April 08, 2013). All conditions under this Section were satisfied.
- Span is wide enough to capture the channel transmission.
- RBW is 1% of the span.
- VBW > RBW.
- Sweep is auto.
- Detector is peak.

- Trace is max hold.
- “n dB down” (26dB) marker function of the spectrum analyzer was used for this test.
- RBW adjusted until RBW/EBW ratio is approximately 1%.

2.3.9 Summary Test Results (as reported)

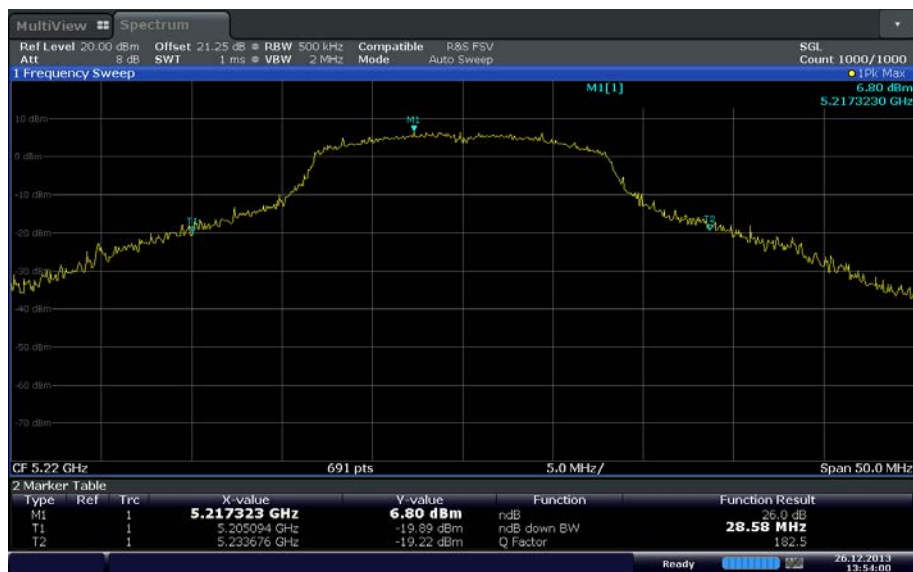
WiFi Mode	Low Channel (5180 MHz)	Mid Channel (5220 MHz)	High Channel (5240 MHz)
a	28.51 MHz	28.58 MHz	28.22MHz
n HT20	24.10 MHz	24.31 MHz	22.58 MHz
n HT40	43.85 MHz	44.28 MHz	44.14 MHz

2.3.10 Test Plots



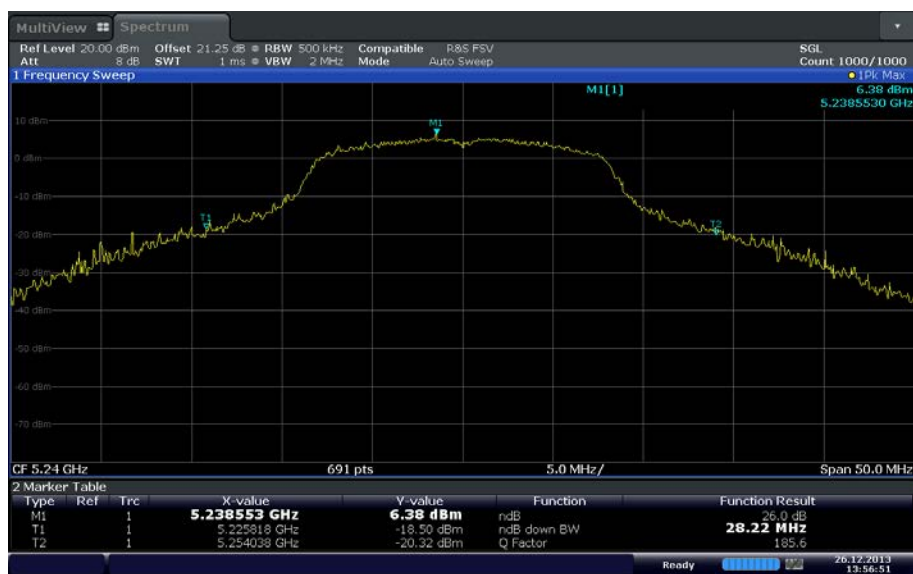
Date: 26 DEC 2013 13:46:36

802.11a Low Channel



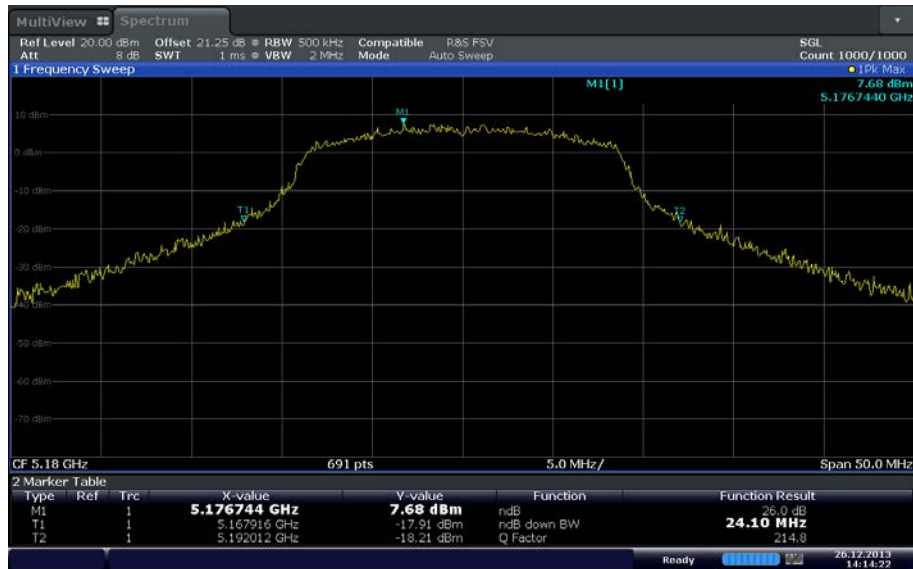
Date: 26 DEC 2013 13:54:00

802.11a Mid Channel



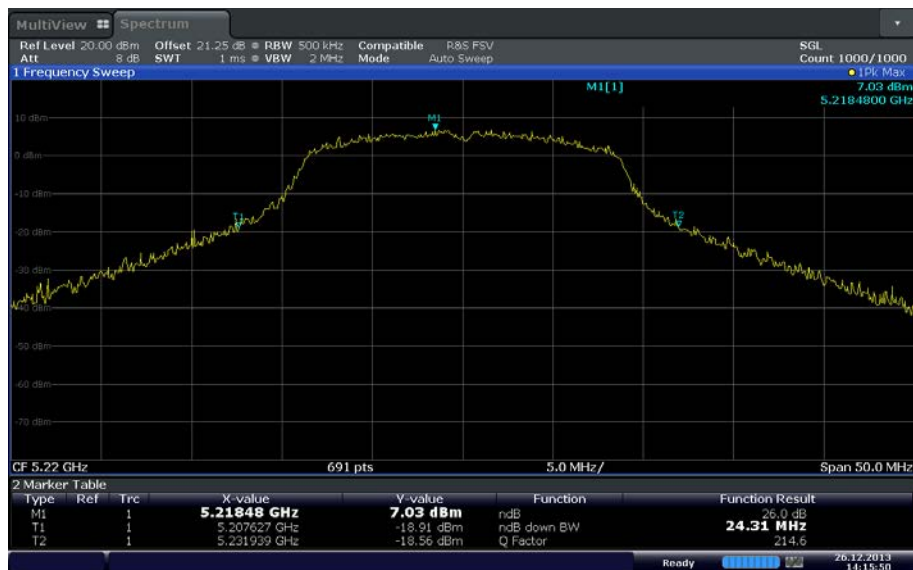
Date: 26 DEC 2013 13:56:51

802.11a High Channel



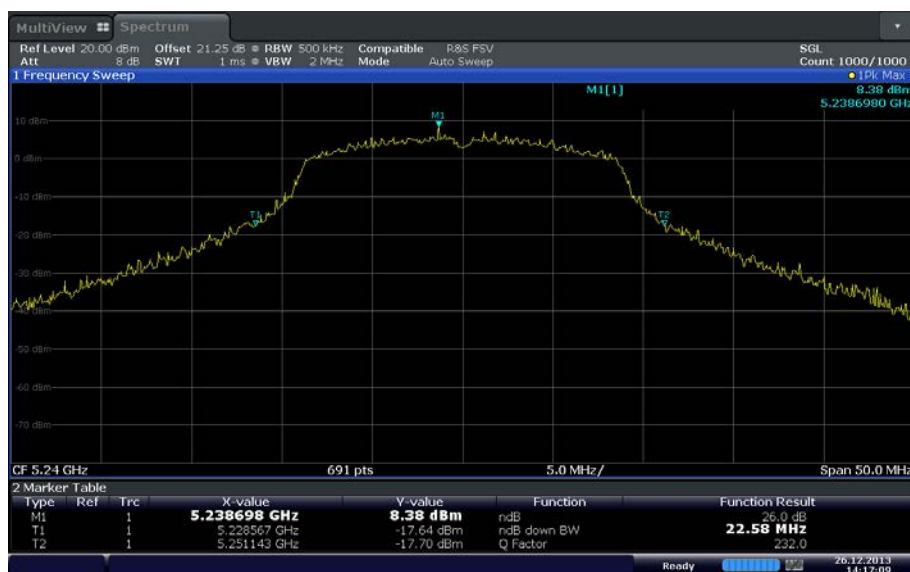
Date: 26 DEC 2013 14:14:22

802.11n HT20 Low Channel



Date: 26 DEC 2013 14:15:51

802.11n HT20 Mid Channel



Date: 26 DEC 2013 14:17:10

802.11n HT20 High Channel



Date: 26 DEC 2013 14:55:43

802.11n HT40 Low Channel



Date: 26 DEC 2013 14:58:02

802.11n HT40 Mid Channel



Date: 26 DEC 2013 14:58:37

802.11n HT40 High Channel



2.4 99% EMISSION BANDWIDTH

2.4.1 Specification Reference

RSS-Gen Section 4.6.1

2.4.2 Standard Applicable

When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99% emission bandwidth, as calculated or measured.

The transmitter shall be operated at its maximum carrier power measured under normal test conditions. The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts. The resolution bandwidth shall be set to as close to 1% of the selected span as is possible without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical, a sampling detector shall be used given that a peak or peak hold may produce a wider bandwidth than actual.

The trace data points are recovered and directly summed in linear terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points. This frequency is recorded. The span between the two recorded frequencies is the occupied bandwidth.

2.4.3 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

December 27, 2013/FSC

2.4.5 Test Equipment Used

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

2.4.6 Environmental Conditions

Ambient Temperature	22.6°C
Relative Humidity	23.1 %
ATM Pressure	99.6 kPa

2.4.7 Additional Observations

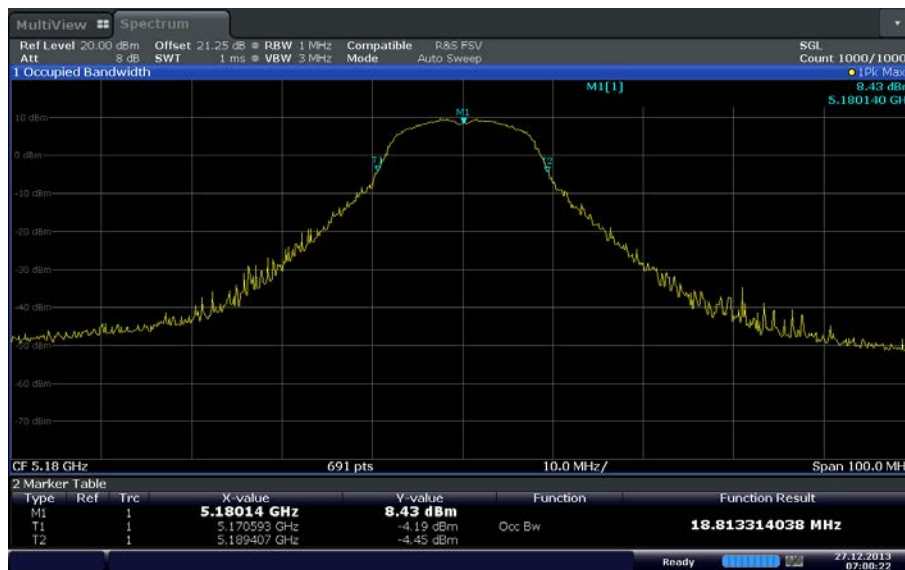
- This is a conducted test.
- An offset of 21.25dB was added to compensate for the external attenuator and cable used.
- Span is wide enough to capture the channel transmission.
- RBW is 1% of the span.
- VBW is 3X RBW.
- Sweep is auto.

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

2.4.8 Test Results (For reporting purposes only)

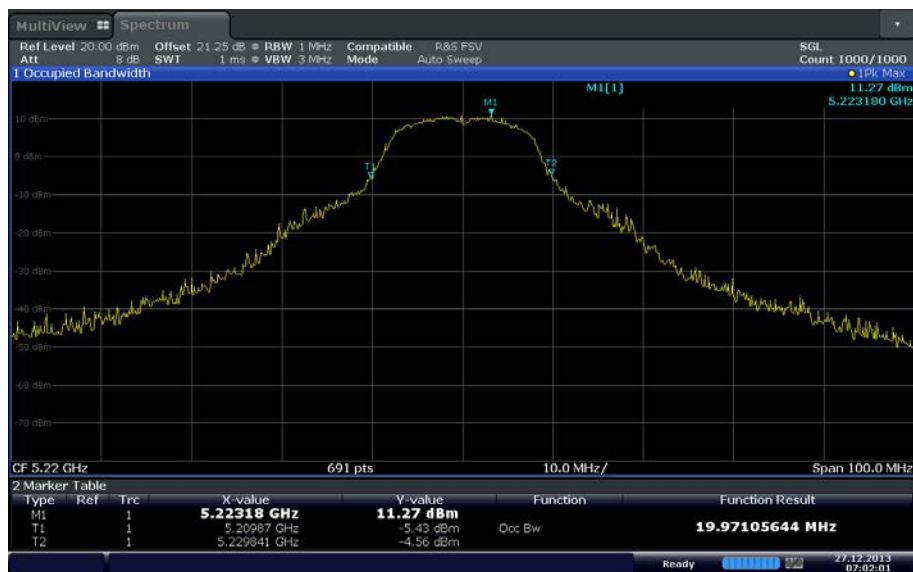
Mode	Channel	Measured 99% Bandwidth (MHz)
802.11a	36 (5180 MHz)	18.813
	44 (5220 MHz)	19.971
	48 (5240 MHz)	20.260
802.11n HT20	36 (5180 MHz)	19.537
	44 (5220 MHz)	19.537
	48 (5240 MHz)	19.247
802.11n HT40	36 (5180 MHz)	36.614
	44 (5220 MHz)	36.758
	48 (5240 MHz)	36.758

2.4.9 Test Plots



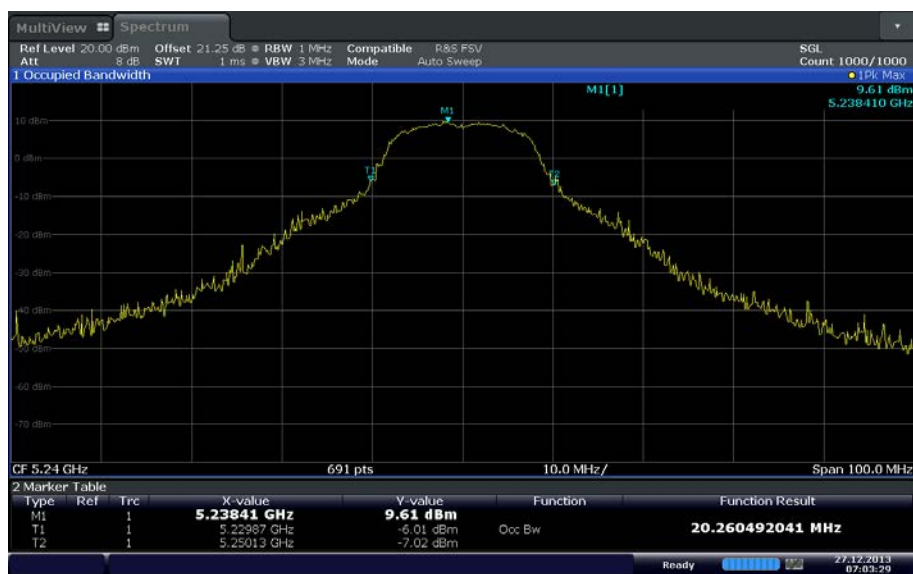
Date: 27 DEC 2013 07:00:21

802.11a Low Channel



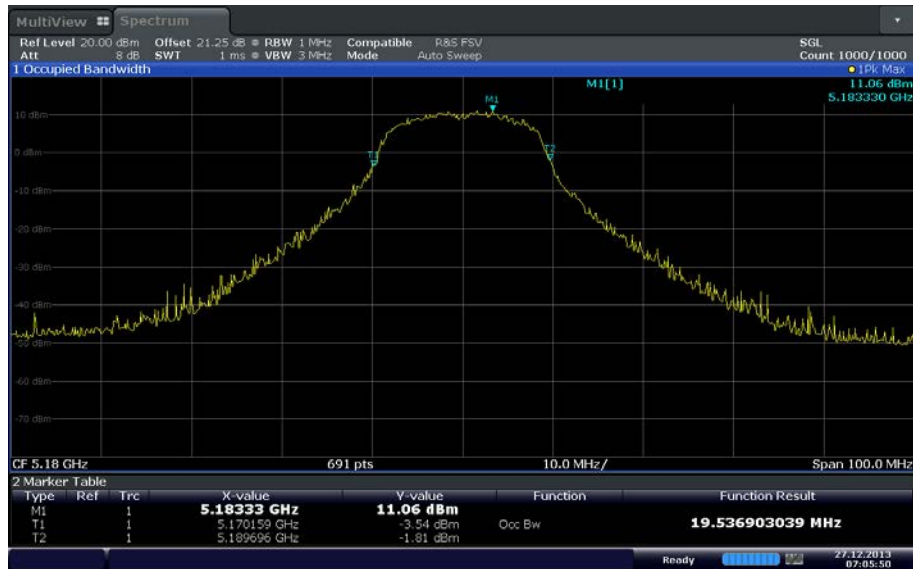
Date: 27 DEC 2013 07:02:01

802.11a Mid Channel



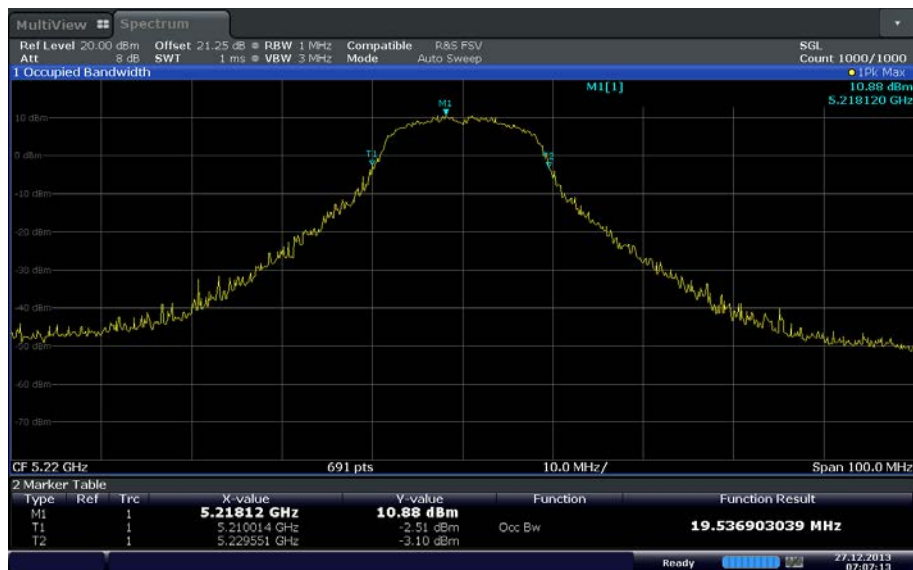
Date: 27 DEC 2013 07:03:29

802.11a High Channel



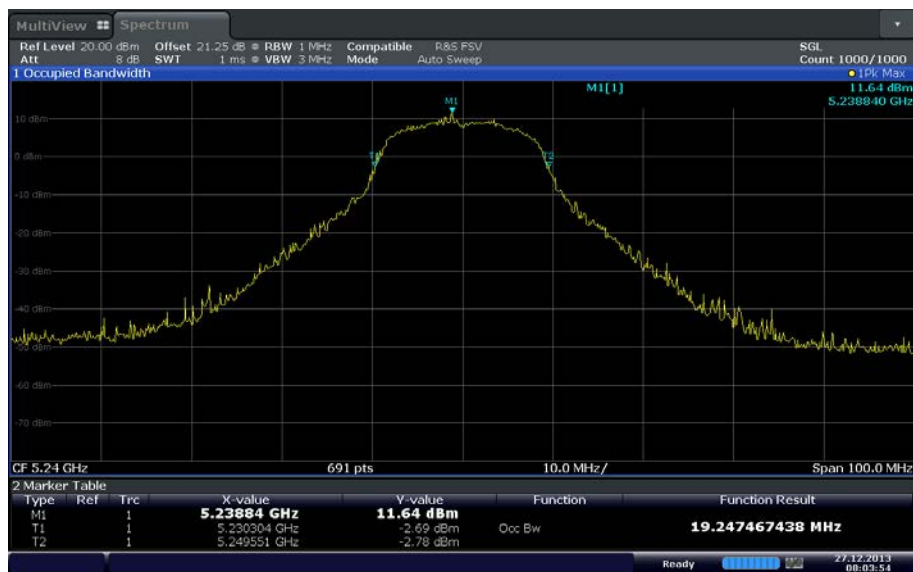
Date: 27 DEC 2013 07:05:50

802.11n HT20 Low Channel



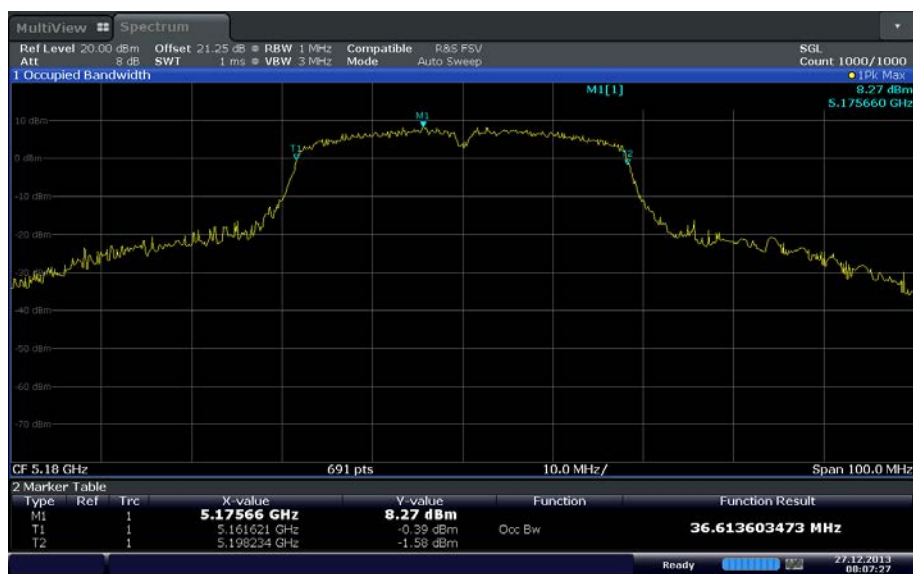
Date: 27 DEC 2013 07:07:13

802.11n HT20 Mid Channel



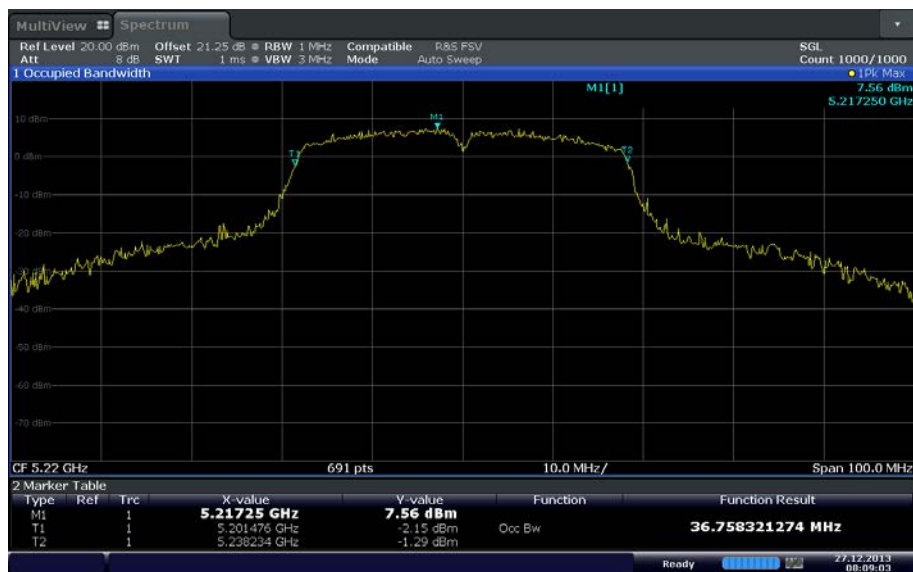
Date: 27 DEC 2013 08:03:54

802.11n HT20 High Channel



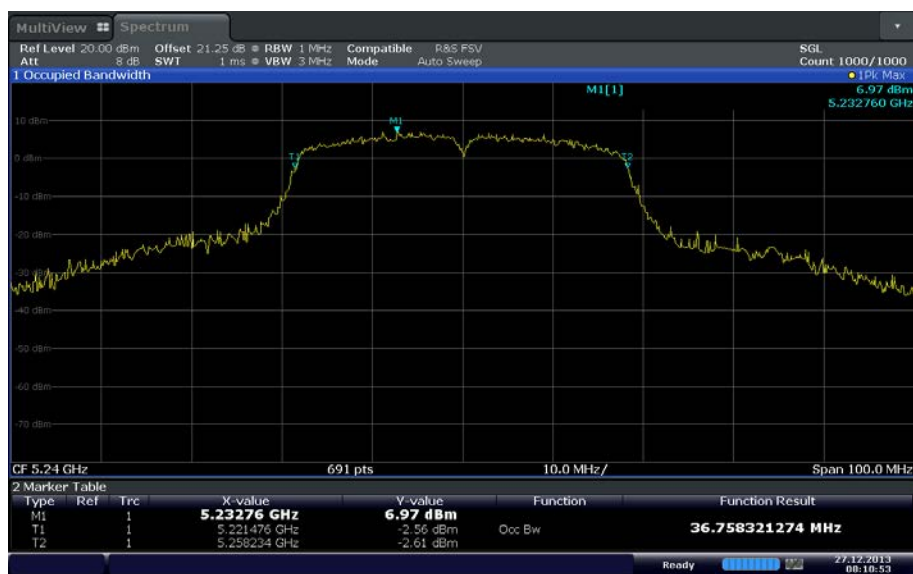
Date: 27 DEC 2013 08:02:27

802.11n HT40 Low Channel



Date: 27 DEC 2013 08:09:03

802.11n HT40 Mid Channel



Date: 27 DEC 2013 08:10:53

802.11n HT40 High Channel



2.5 MAXIMUM CONDUCTED OUTPUT POWER

2.5.1 Specification Reference

Part 15 Subpart E §15.407(a)(1) and RSS-210 A9.2(1)

2.5.2 Standard Applicable

For the band 5.15–5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or $4 \text{ dBm} + 10 \log B$, where B is the 26-dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 4 dBm in any 1-MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

The maximum e.i.r.p. shall not exceed 200 mW or $10 + 10 \log_{10} B$, dBm, whichever power is less. B is the 99% emission bandwidth in MHz. The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band

2.5.3 Test Methodology

Section E(3)(a) Method PM of 789033 D01 General UNII Test Procedures v01r03

2.5.4 Equipment Under Test and Modification State

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

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

November 26, 2013/FSC

2.5.6 Test Equipment Used

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

2.5.7 Environmental Conditions

Ambient Temperature	24.1°C
Relative Humidity	34.6%
ATM Pressure	99.3 kPa

2.5.8 Additional Observations

- This is a conducted test (Measurement using an RF average power meter) using direct connection to a power meter.
- An offset of 21.25dB was added to compensate for the external attenuator and cable used from the antenna port to the power sensor.



- Test methodology is per Section E(3)(a) Method PM of 789033 D01 General UNII Test Procedures v01r03,(April 08, 2013). All conditions under this Section were satisfied.

2.5.9 Limit Consideration

FCC Limit = 50mW or 4 dBm + 10 log (26dB BW in MHz)
 = 50mW or 4 dBm + 10 log (22.58MHz)
 = 50mW or 17.537 dBm (56.72mW)
 = since 50<56.72
 = therefore use 50mW or 17dBm limit

IC Limit = 200 mW or 10 + 10 log₁₀ (99% BW in MHz)
 = 200 mW or 10 + 10 log₁₀ (18.813MHz)
 = 200mW or 22.75 dBm (188.36mW)
 = since 200>188.36
 = therefore use 188.36mW or 22.75dBm limit

Limit used is 50mW or 17dBm which satisfy both FCC and IC requirement for this test.

2.5.10 Summary Test Results (Maximum Conducted Power)

802.11 a				
Channel	Frequency (MHz)	Data Rate (Mbps)	Average Power (dBm)	Margin from 17dBm limit (dB)
36	5180	6	9.18	-7.82
44	5200	36	11.77	-5.23
48	5240	6	9.00	-8.00
802.11 n HT20				
Channel	Frequency (MHz)	Data Rate (Mbps)	Average Power (dBm)	Margin from 17dBm limit (dB)
36	5180	mcs 0 (6.50 Mbps)	9.62	-7.38
44	5200	mcs 4 (39.0 Mbps)	11.68	-5.32
48	5240	mcs 0 (6.50 Mbps)	9.45	-7.55
802.11 n HT40				
Channel	Frequency (MHz)	Data Rate (Mbps)	Average Power (dBm)	Margin from 17dBm limit (dB)
36	5180	mcs 0 (6.50 Mbps)	5.30	-11.70
44	5200	mcs 0 (6.50 Mbps)	5.65	-11.35
48	5240	mcs 7 (65.0 Mbps)	5.80	-11.20

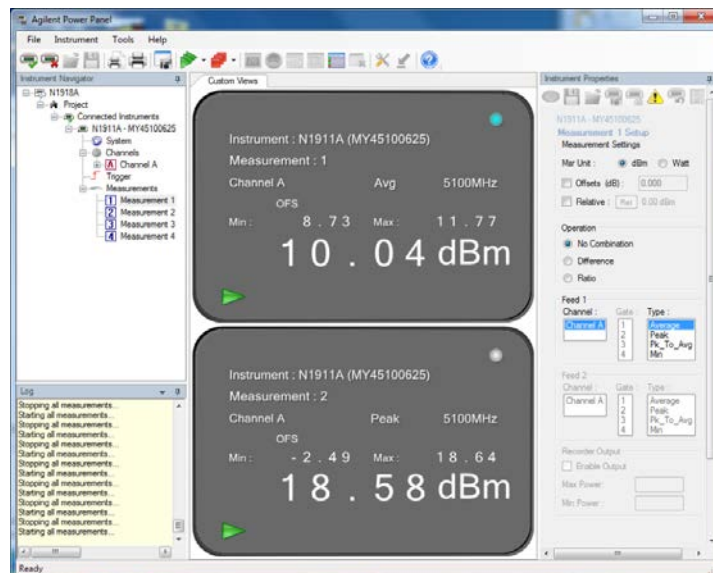
2.5.11 Test Results

WLAN Mode	Channel	Data Rates (Mbps)	Measured Average Power (dBm)	Measured Peak Power (dBm)
802.11a (5180MHz to 5240MHz)	36 (5180 MHz)	6	9.18	16.76
		9	9.06	16.55
		12	8.92	16.63
		18	8.57	16.65
		24	8.89	18.95
		36	8.68	19.24
		48	8.92	19.20
		54	7.63	18.98
	44 (5220 MHz)	6	10.43	15.93
		9	9.98	15.90
		12	10.07	16.01
		18	9.19	16.09
		24	9.20	16.10
		36	11.77	18.64
		48	11.00	18.80
		54	11.11	18.83
	48 (5240 MHz)	6	9.00	18.56
		9	8.10	15.50
		12	8.18	15.53
		18	7.69	15.52
		24	8.16	17.99
		36	7.70	18.04
		48	7.32	18.19
		54	7.06	18.30
802.11n (ht20 5180MHz to 5240MHz)	36 (5180 MHz)	mcs 0 (6.50 Mbps)	9.62	18.58
		mcs 1(13.0 Mbps)	9.44	16.63
		mcs 2(19.5 Mbps)	9.01	16.81

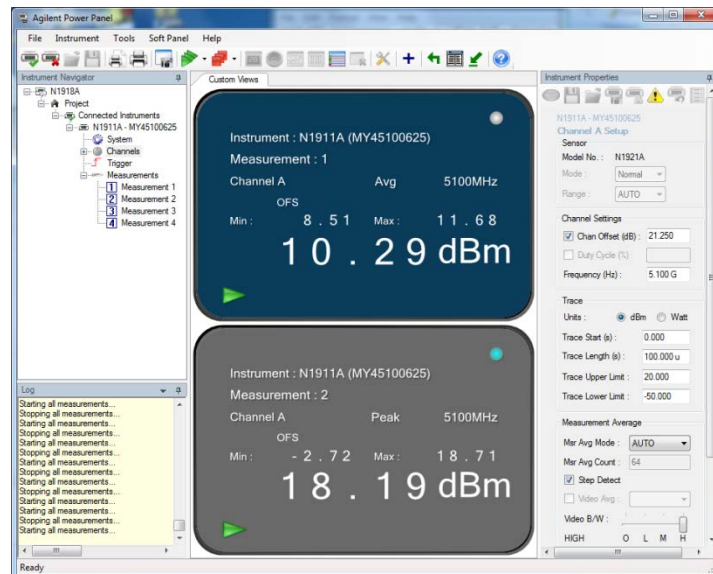
802.11n (ht20 5180MHz to 5240MHz)	36 (5180 MHz)	mcs 3 (26.0 Mbps)	8.46	16.56
		mcs 4 (39.0 Mbps)	8.28	19.30
		mcs 5 (52.0 Mbps)	8.57	19.02
		mcs 6 (58.5 Mbps)	7.32	19.21
		mcs 7 (65.0 Mbps)	7.38	19.28
	44 (5220 MHz)	mcs 0 (6.50 Mbps)	10.29	15.85
		mcs 1(13.0 Mbps)	9.90	16.14
		mcs 2(19.5 Mbps)	9.88	15.71
		mcs 3 (26.0 Mbps)	8.85	15.94
		mcs 4 (39.0 Mbps)	11.68	18.71
		mcs 5 (52.0 Mbps)	11.16	18.76
		mcs 6 (58.5 Mbps)	11.04	18.72
		mcs 7 (65.0 Mbps)	9.79	18.69
	48 (5240 MHz)	mcs 0 (6.50 Mbps)	9.45	17.57
		mcs 1(13.0 Mbps)	9.05	17.79
		mcs 2(19.5 Mbps)	8.95	18.00
		mcs 3 (26.0 Mbps)	7.54	15.47
		mcs 4 (39.0 Mbps)	7.15	15.16
		mcs 5 (52.0 Mbps)	7.87	18.20
		mcs 6 (58.5 Mbps)	7.41	18.23
		mcs 7 (65.0 Mbps)	6.69	18.14
802.11n (ht40 5180MHz to 5240MHz)	36 (5180 MHz)	mcs 0 (6.50 Mbps)	5.30	16.65
		mcs 1(13.0 Mbps)	4.28	17.34
		mcs 2(19.5 Mbps)	3.78	16.85
		mcs 3 (26.0 Mbps)	3.54	17.40
		mcs 4 (39.0 Mbps)	2.56	17.17
		mcs 5 (52.0 Mbps)	1.53	16.49
		mcs 6 (58.5 Mbps)	5.12	16.94
		mcs 7 (65.0 Mbps)	5.17	18.95
802.11n (ht40)	44 (5220 MHz)	mcs 0 (6.50 Mbps)	5.65	16.35

5180MHz to 5240MHz)		mcs 1(13.0 Mbps)	5.28	17.92
		mcs 2(19.5 Mbps)	5.01	17.01
		mcs 3 (26.0 Mbps)	4.90	17.37
		mcs 4 (39.0 Mbps)	3.97	17.36
		mcs 5 (52.0 Mbps)	1.43	15.42
		mcs 6 (58.5 Mbps)	4.52	16.75
		mcs 7 (65.0 Mbps)	5.29	18.81
	48 (5240 MHz)	mcs 0 (6.50 Mbps)	5.56	18.35
		mcs 1(13.0 Mbps)	3.18	14.77
		mcs 2(19.5 Mbps)	2.64	14.51
		mcs 3 (26.0 Mbps)	2.51	14.49
		mcs 4 (39.0 Mbps)	1.12	14.38
		mcs 5 (52.0 Mbps)	1.07	14.57
		mcs 6 (58.5 Mbps)	3.67	15.85
		mcs 7 (65.0 Mbps)	5.80	18.76

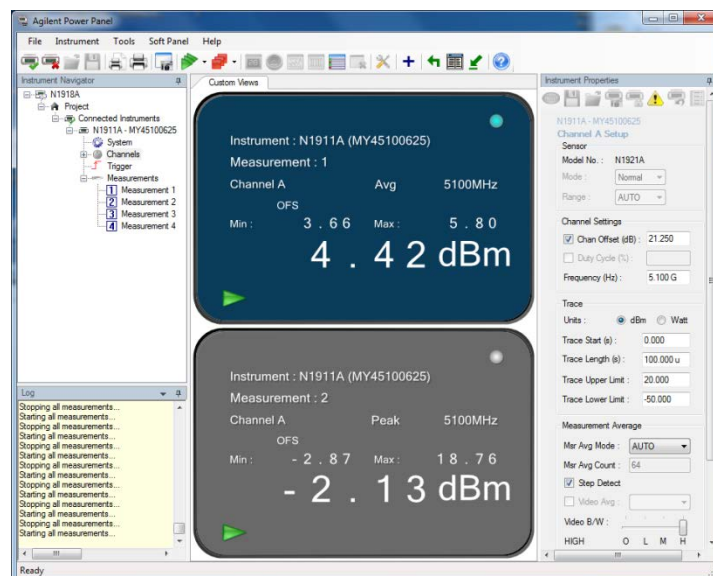
2.5.12 Sample Test Display



802.11a Worst Case Channel



802.11n HT20 Worst Case Channel



802.11n HT40 Worst Case Channel



2.6 PEAK POWER SPECTRAL DENSITY

2.6.1 Specification Reference

Part 15 Subpart E §15.407(a)(1) and RSS-210 A9.2(1)

2.6.2 Standard Applicable

For the band 5.15–5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or 4 dBm + 10 log B, where B is the 26-dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 4 dBm in any 1-MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

The maximum e.i.r.p. shall not exceed 200 mW or 10 + 10 log₁₀ B, dBm, whichever power is less. B is the 99% emission bandwidth in MHz. The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

2.6.3 Test Methodology

Section F of 789033 D01 General UNII Test Procedures v01r03

2.6.4 Equipment Under Test and Modification State

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

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

December 27, 2013/FSC

2.6.6 Test Equipment Used

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

2.6.7 Environmental Conditions

Ambient Temperature	22.6°C
Relative Humidity	23.1 %
ATM Pressure	99.6 kPa

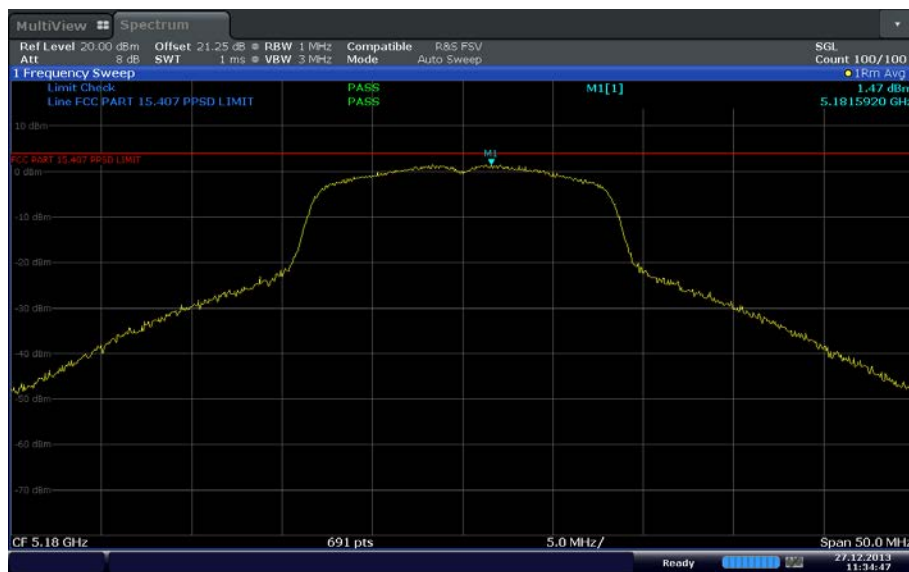
2.6.8 Additional Observations

- This is a conducted test as per Section F (PPSD) of 789033 D01 General UNII Test Procedures v01r03.
- Method used is SA-1 (trace averaging with the EUT transmitting at full power throughout each sweep). Duty cycle of the EUT verified @ 100%.

2.6.9 Test Results

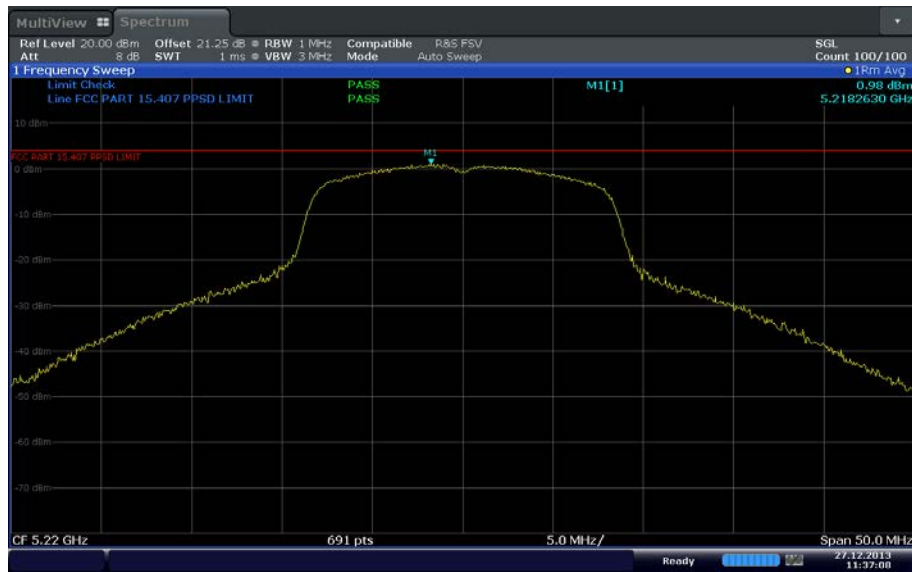
Mode	Channel	PPSD (dBm)	Limit (dBm)	Margin (dB)
802.11a	36 (5180 MHz)	1.47	4	-2.53
	44 (5220 MHz)	0.98	4	-3.02
	48 (5240 MHz)	0.82	4	-3.18
802.11n HT20	36 (5180 MHz)	0.25	4	-3.75
	44 (5220 MHz)	0.05	4	-3.95
	48 (5240 MHz)	-0.69	4	-4.69
802.11n HT40	36 (5180 MHz)	-4.83	4	-8.83
	44 (5220 MHz)	-5.67	4	-9.67
	48 (5240 MHz)	-6.68	4	-10.68

2.6.10 Test Plots



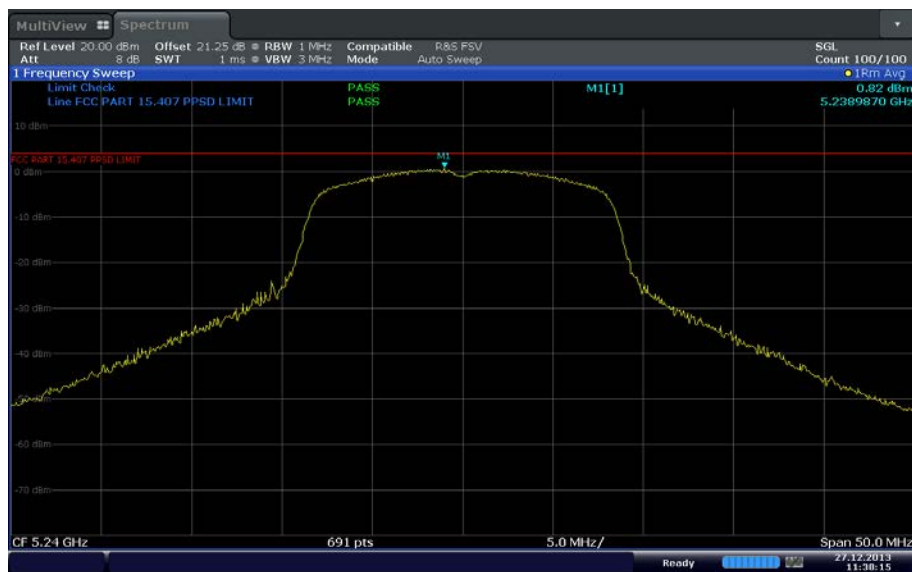
Date: 27 DEC 2013 11:34:47

802.11a Low Channel



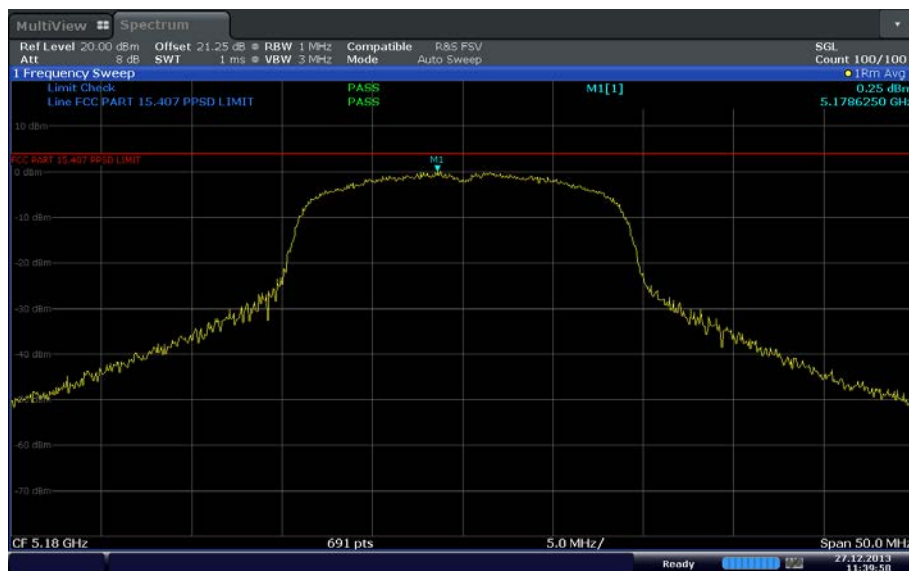
Date: 27 DEC 2013 11:37:00

802.11a Mid Channel



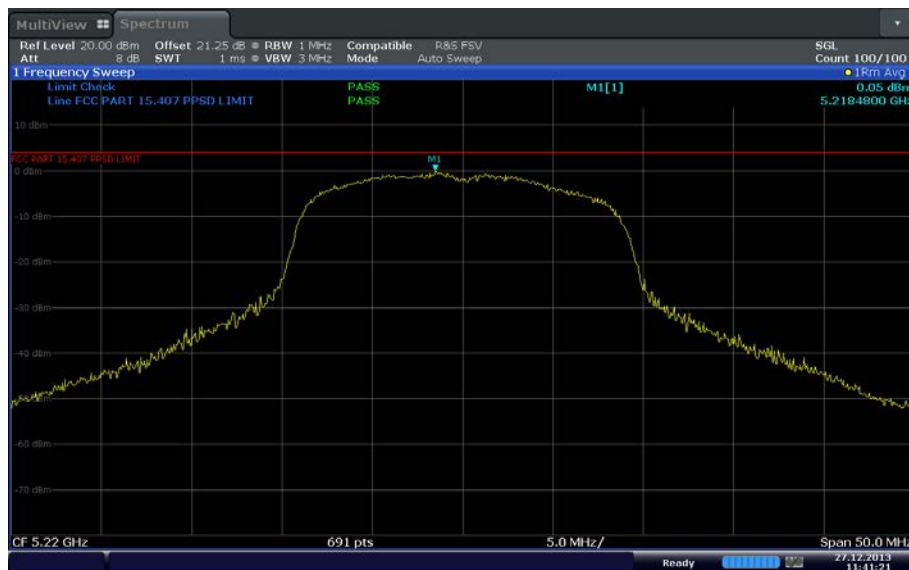
Date: 27 DEC 2013 11:38:15

802.11a High Channel



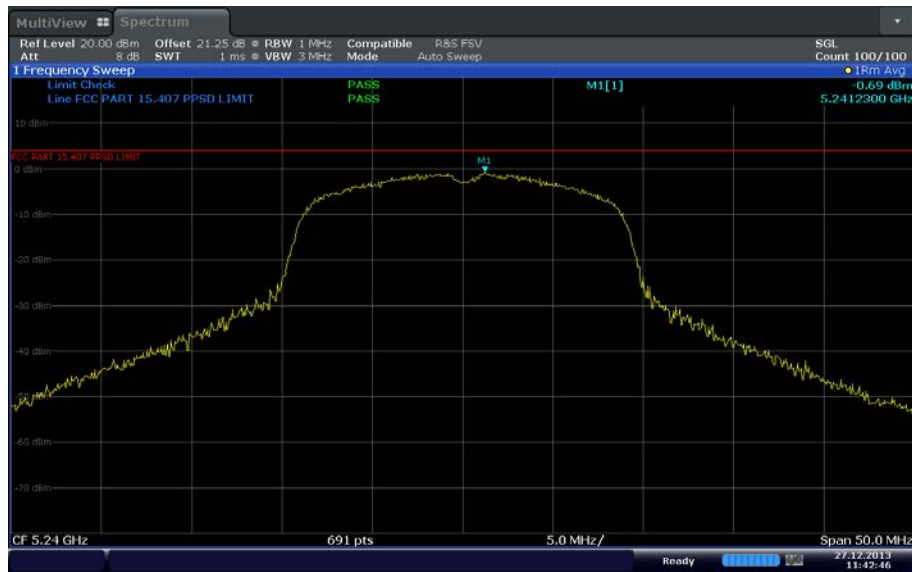
Date: 27 DEC 2013 11:39:59

802.11n HT20 Low Channel



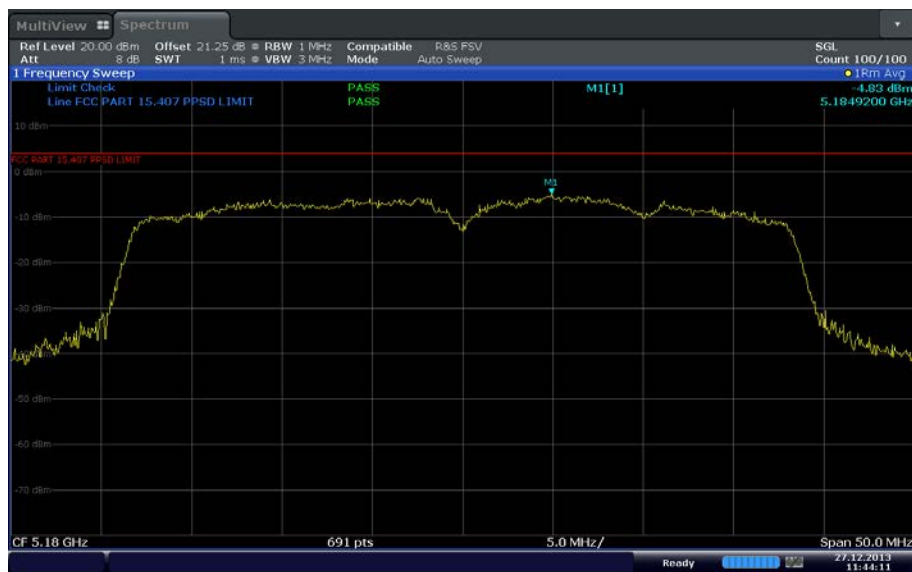
Date: 27 DEC 2013 11:41:20

802.11n HT20 Mid Channel



Date: 27 DEC 2013 11:42:45

802.11n HT20 High Channel



Date: 27 DEC 2013 11:44:11

802.11n HT40 Low Channel



Date: 27 DEC 2013 11:45:47

802.11n HT40 Mid Channel



Date: 27 DEC 2013 11:47:22

802.11n HT40 High Channel



2.7 UNWANTED EMISSIONS MEASUREMENT (RADIATED)

2.7.1 Specification Reference

Part 15 Subpart E §15.407(b)(1) and (7) and RSS-210 A9.2(1)

2.7.2 Standard Applicable

For transmitters operating in the 5.15–5.25 GHz band: all emissions outside of the 5.15–5.35 GHz band shall not exceed an EIRP of –27 dBm/MHz.

The provisions of §15.205 apply to intentional radiators operating under this section.

Emissions outside the band 5150-5250 MHz shall not exceed -27 dBm/MHz e.i.r.p.

2.7.3 Test Methodology

Section H of 789033 D01 General UNII Test Procedures v01r03

2.7.4 Equipment Under Test and Modification State

Serial No: 34008112 / Test Configuration B

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

December 5 to 24, 2013/FSC

2.7.6 Test Equipment Used

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

2.7.7 Environmental Conditions

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

2.7.8 Additional Observations

- Since the EUT has integral antenna, test method chosen for unwanted emission measurement is radiated.
- For any emissions falling outside the restricted band, the limit of -27dBm/MHz was converted to field strength using the formula under Section H(2)(d)(i) of 789033 D01 General UNII Test Procedures v01r03:

$E(\text{dB}\mu\text{V}/\text{m}) = 95.2 - \text{EIRP (dBm)} @ 3 \text{ meters using } 1\text{MHz RBW}$
 $= 95.2 - 27 \text{ dBm}$
 $= 68.2 \text{ dB}\mu\text{V}/\text{m}$



- Only the considered worst case WLAN configuration presented for radiated emissions below 1GHz. There are no significant differences in emissions between the three modes below 1GHz.
- 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 2.9.9 for sample computation.

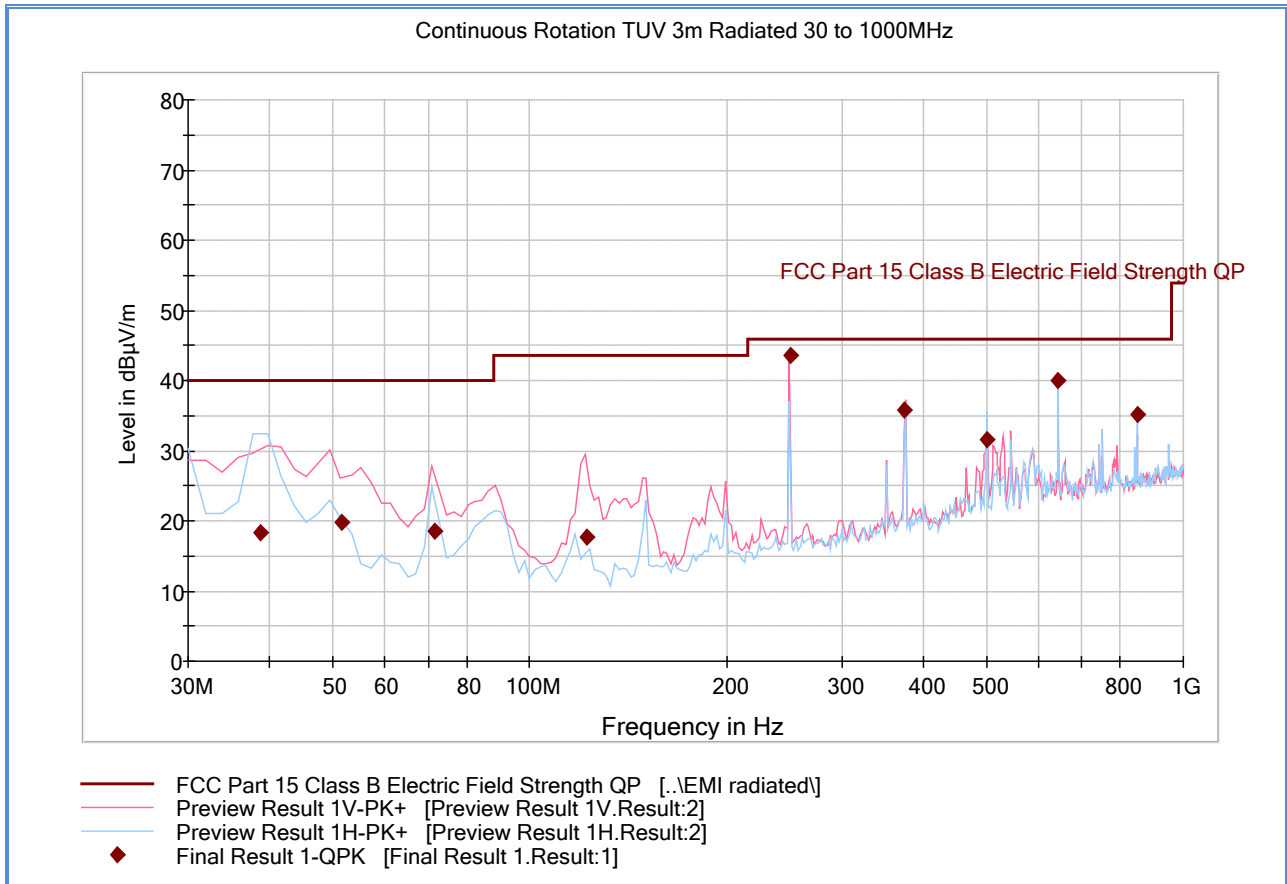
2.7.9 Sample Computation (Radiated Emission)

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

2.7.10 Test Results

See attached plots.

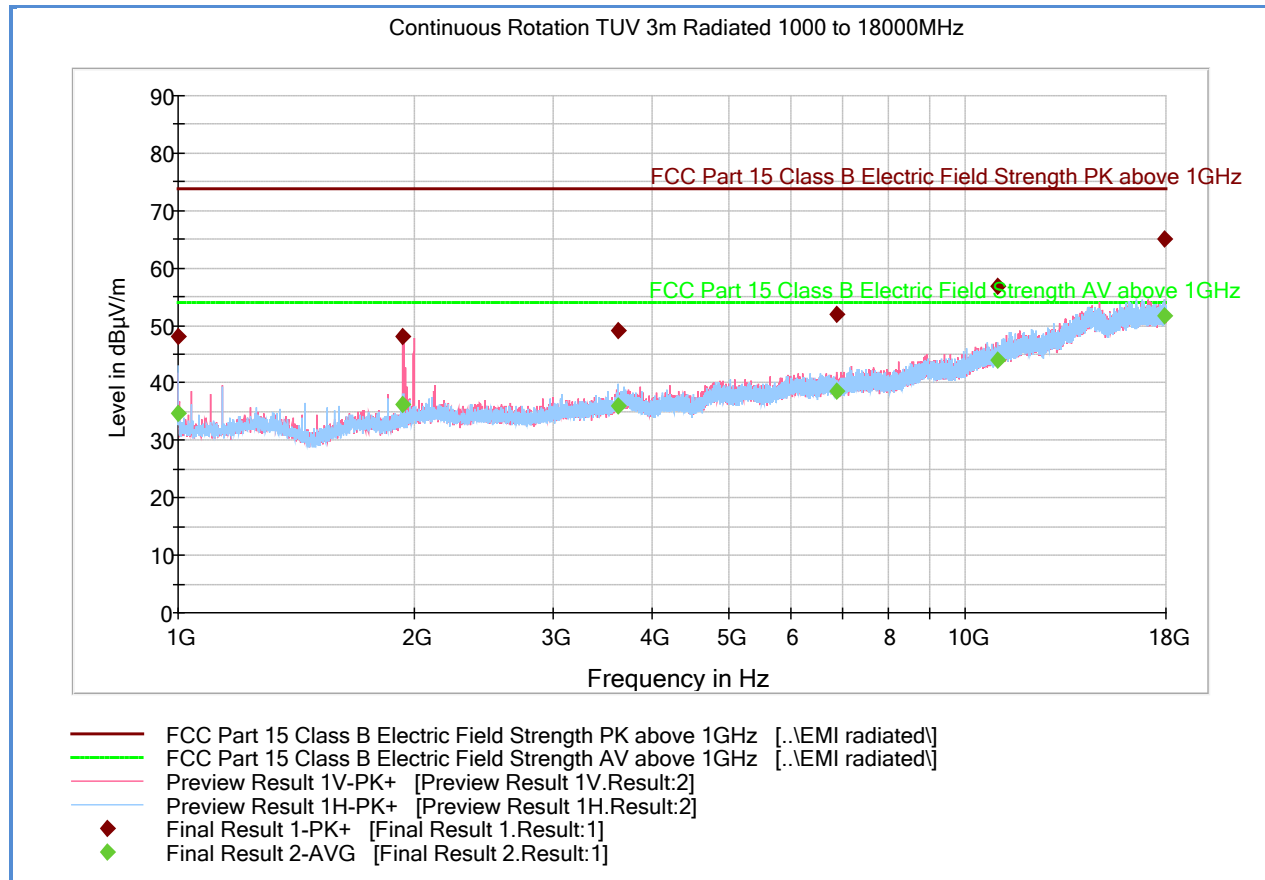
2.7.11 Test Results Below 1GHz (Receive Mode)



Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
38.775551	18.4	1000.0	120.000	283.0	H	342.0	-15.5	21.6	40.0
51.438878	19.8	1000.0	120.000	109.0	V	285.0	-19.4	20.2	40.0
71.581643	18.4	1000.0	120.000	100.0	V	307.0	-21.3	21.6	40.0
122.322725	17.6	1000.0	120.000	106.0	V	-12.0	-19.2	25.9	43.5
250.099319	43.5	1000.0	120.000	100.0	V	46.0	-12.6	2.5	46.0
374.812024	35.8	1000.0	120.000	145.0	V	9.0	-7.9	10.2	46.0
499.940842	31.6	1000.0	120.000	105.0	H	284.0	-5.1	14.4	46.0
643.468537	40.0	1000.0	120.000	105.0	H	213.0	-2.1	6.0	46.0
849.960641	35.1	1000.0	120.000	100.0	H	235.0	1.1	10.9	46.0

2.7.12 Test Results Above 1GHz (Receive Mode)



Peak Data

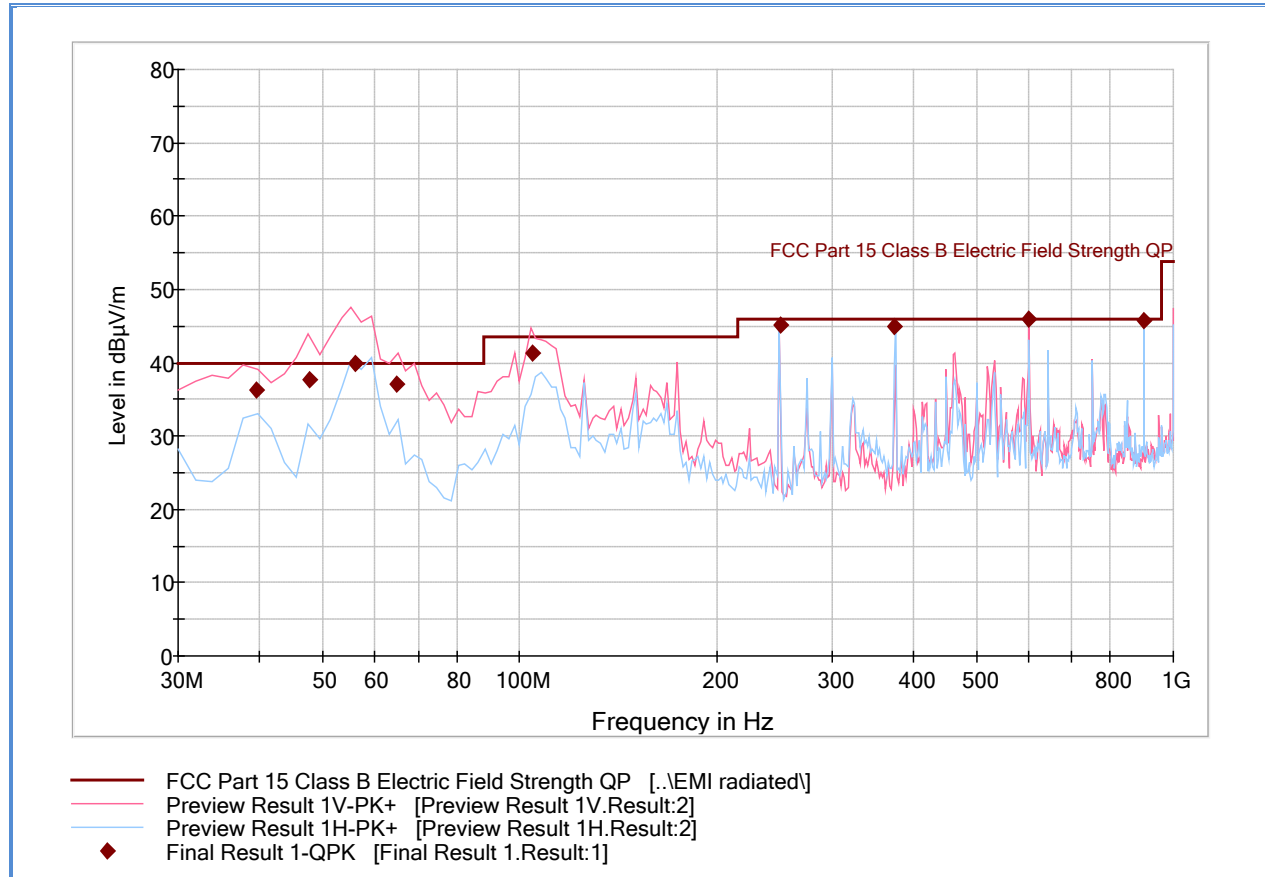
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.000000	48.2	1000.0	1000.000	300.6	H	87.0	-1.0	25.7	73.9
1932.566667	48.2	1000.0	1000.000	257.3	V	178.0	1.8	25.7	73.9
3624.066667	49.2	1000.0	1000.000	260.3	H	-10.0	5.7	24.7	73.9
6866.733333	51.9	1000.0	1000.000	202.4	V	243.0	10.5	22.0	73.9
10998.63333	56.9	1000.0	1000.000	201.4	H	293.0	16.3	17.0	73.9
17902.66666	64.9	1000.0	1000.000	259.3	V	122.0	23.7	9.0	73.9

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.000000	34.7	1000.0	1000.000	300.6	H	87.0	-1.0	19.2	53.9
1932.566667	36.3	1000.0	1000.000	257.3	V	178.0	1.8	17.6	53.9
3624.066667	35.9	1000.0	1000.000	260.3	H	-10.0	5.7	18.0	53.9
6866.733333	38.6	1000.0	1000.000	202.4	V	243.0	10.5	15.3	53.9
10998.63333	44.0	1000.0	1000.000	201.4	H	293.0	16.3	9.9	53.9
17902.66666	51.6	1000.0	1000.000	259.3	V	122.0	23.7	2.3	53.9

Test Notes: No significant emissions observed above 18GHz.

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

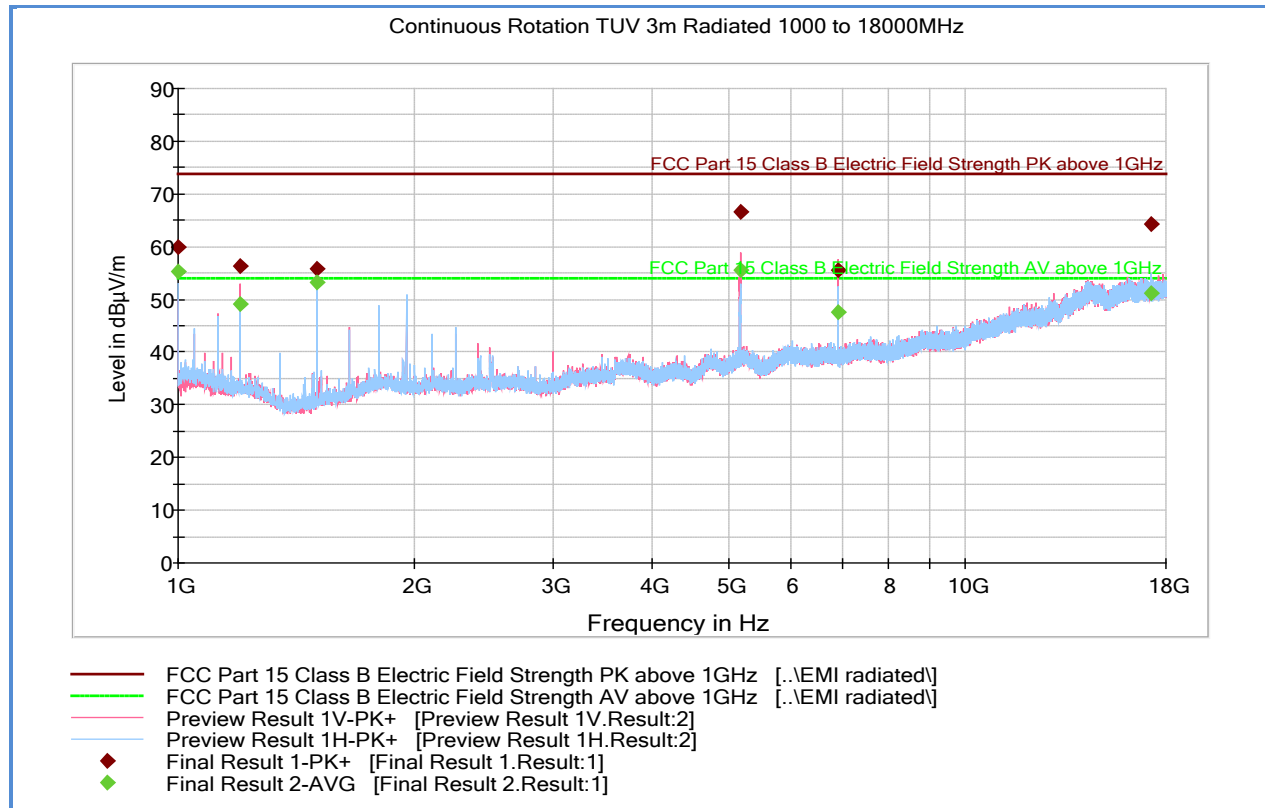


Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
39.535551	36.3	1000.0	120.000	100.0	V	193.0	-15.8	3.7	40.0
47.774990	37.6	1000.0	120.000	100.0	V	284.0	-18.6	2.4	40.0
55.870541	39.8	1000.0	120.000	100.0	V	86.0	-20.2	0.2	40.0
64.789980	37.0	1000.0	120.000	100.0	V	193.0	-21.2	3.0	40.0
104.707735	41.4	1000.0	120.000	100.0	V	3.0	-18.6	2.1	43.5
249.979319	45.2	1000.0	120.000	100.0	V	39.0	-12.6	0.8	46.0
374.972024	45.0	1000.0	120.000	105.0	H	211.0	-7.9	1.0	46.0
600.023006	46.0	1000.0	120.000	100.0	V	177.0	-2.8	0.0	46.0
900.021723	45.8	1000.0	120.000	100.0	H	170.0	2.0	0.2	46.0

Test Notes: Only worst case channel presented for spurious emissions below 1GHz. There are no emissions observed that doesn't comply with the 68.2 dBµV/m calculated limit for non-restricted bands.

2.7.14 Test Results Above 1GHz (802.11a Low Channel)



Peak Data

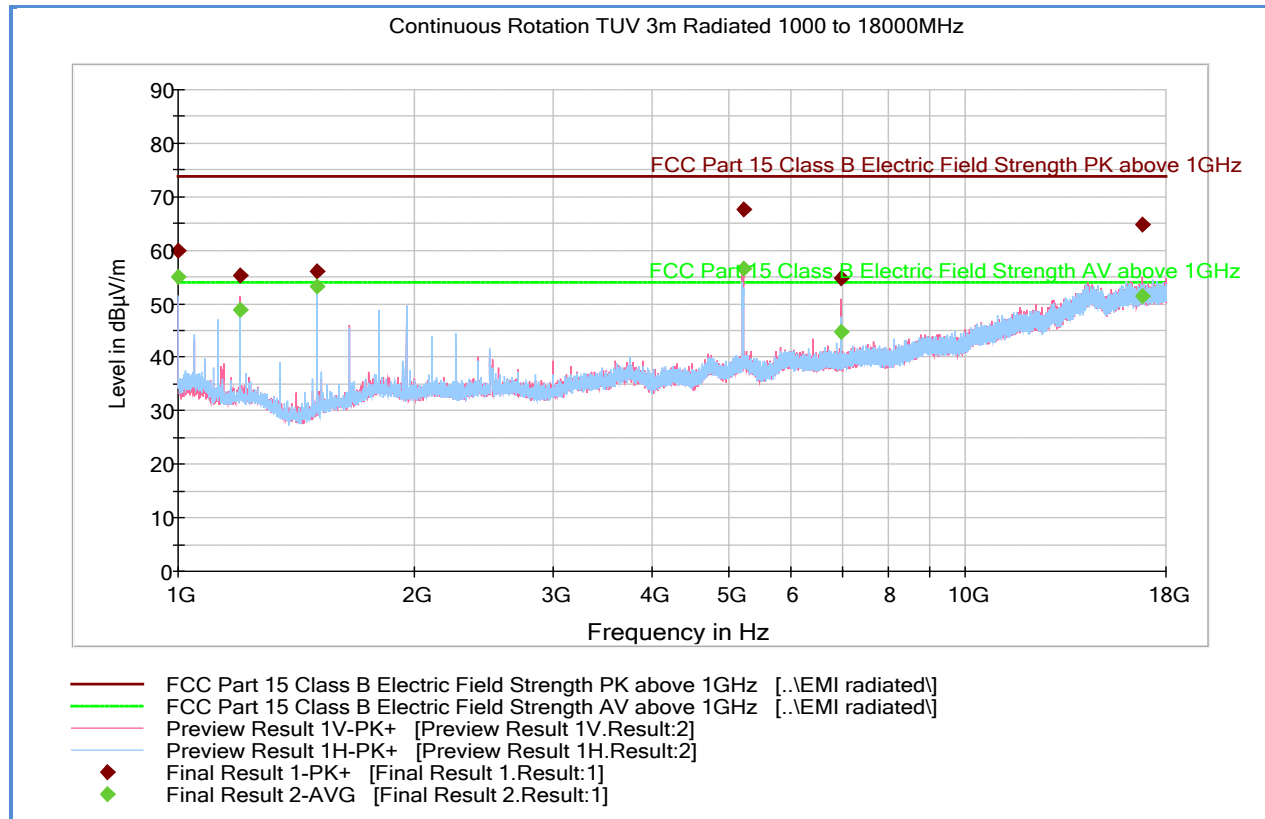
Frequency (MHz)	MaxPeak (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
1000.000000	59.8	1000.0	1000.000	99.6	H	54.0	-1.0	14.1	73.9
1199.833333	56.4	1000.0	1000.000	99.6	V	39.0	-1.5	17.5	73.9
1500.000000	55.8	1000.0	1000.000	99.6	H	179.0	-1.9	18.1	73.9
5181.233333	66.7	1000.0	1000.000	225.4	V	184.0	8.6	7.2	73.9
6906.566667	55.5	1000.0	1000.000	115.6	V	50.0	10.4	18.4	73.9
17224.433333	64.2	1000.0	1000.000	344.1	H	92.0	23.1	9.7	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)
1000.000000	55.2	1000.0	1000.000	99.6	H	54.0	-1.0	-1.3	53.9
1199.833333	49.1	1000.0	1000.000	99.6	V	39.0	-1.5	4.8	53.9
1500.000000	53.3	1000.0	1000.000	99.6	H	179.0	-1.9	0.6	53.9
5181.233333	55.6	1000.0	1000.000	225.4	V	184.0	8.6	-1.7	53.9
6906.566667	47.5	1000.0	1000.000	115.6	V	50.0	10.4	6.4	53.9
17224.433333	51.1	1000.0	1000.000	344.1	H	92.0	23.1	2.8	53.9

Test Notes: Measurement was performed with a 5.0GHz notch filter. No significant emissions observed above 8GHz. Measurements above 8GHz are noise floor figures. There are no emissions observed that doesn't comply with the 68.2 dBμV/m calculated limit for non-restricted bands. 1GHz is verified coming from the support broadband router which is required to act as DHCP server. Emission between 5.15 to 5.25GHz is the fundamental frequency.

2.7.15 Test Results Above 1GHz (802.11a Mid Channel)



Peak Data

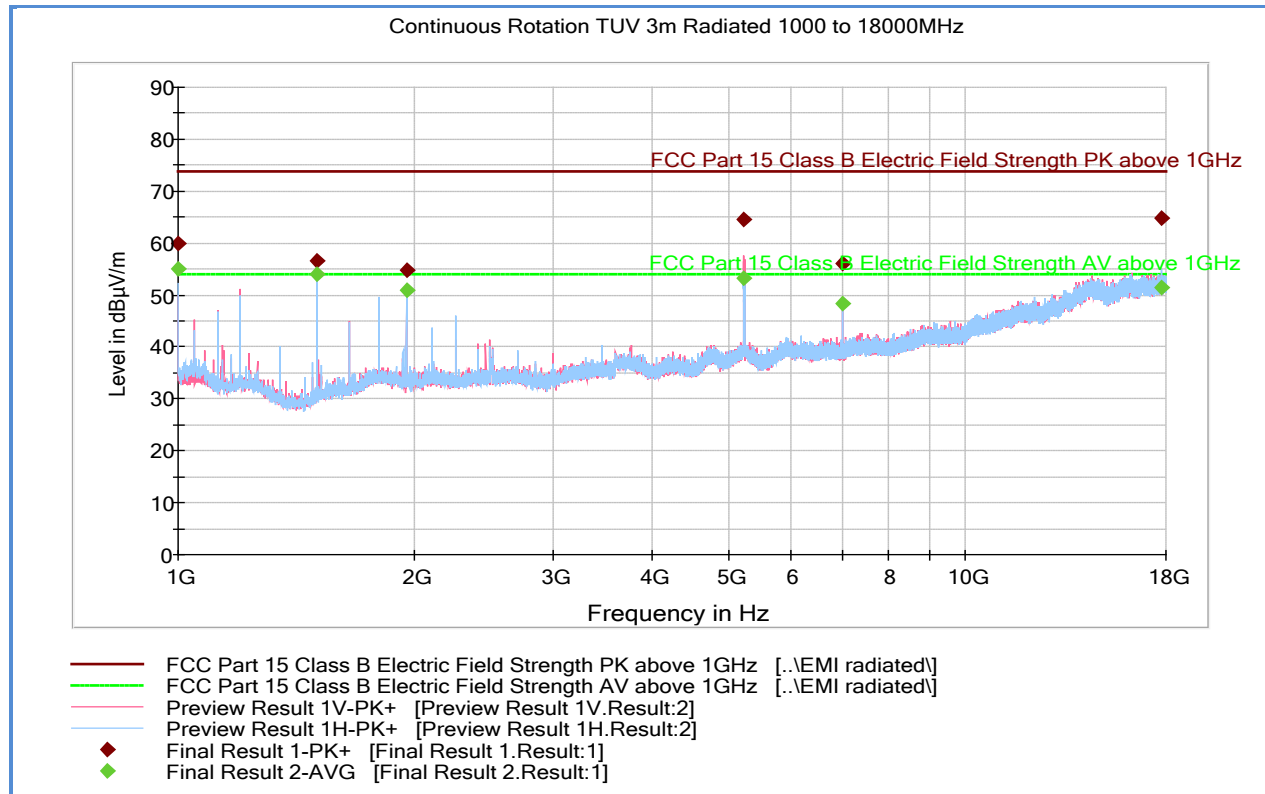
Frequency (MHz)	MaxPeak (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
1000.000000	59.8	1000.0	1000.000	101.6	H	52.0	-1.0	14.1	73.9
1199.833333	55.2	1000.0	1000.000	99.6	V	166.0	-1.5	18.7	73.9
1500.000000	56.0	1000.0	1000.000	99.6	H	202.0	-1.9	17.9	73.9
5222.633333	67.5	1000.0	1000.000	115.6	V	340.0	8.7	6.4	73.9
6960.000000	54.7	1000.0	1000.000	100.6	V	55.0	10.4	19.2	73.9
16819.833333	64.9	1000.0	1000.000	406.7	V	92.0	23.4	9.0	73.9

Average Data

Frequency (MHz)	Average (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
1000.000000	55.0	1000.0	1000.000	101.6	H	52.0	-1.0	-1.1	53.9
1199.833333	48.8	1000.0	1000.000	99.6	V	166.0	-1.5	5.1	53.9
1500.000000	53.3	1000.0	1000.000	99.6	H	202.0	-1.9	0.6	53.9
5222.633333	56.6	1000.0	1000.000	115.6	V	340.0	8.7	-2.7	53.9
6960.000000	44.7	1000.0	1000.000	100.6	V	55.0	10.4	9.2	53.9
16819.833333	51.4	1000.0	1000.000	406.7	V	92.0	23.4	2.5	53.9

Test Notes: Measurement was performed with a 5.0GHz notch filter. No significant emissions observed above 8GHz. Measurements above 8GHz are noise floor figures. There are no emissions observed that doesn't comply with the 68.2 dBμV/m calculated limit for non-restricted bands. 1GHz is verified coming from the support broadband router which is required to act as DHCP server. Emission between 5.15 to 5.25GHz is the fundamental frequency.

2.7.16 Test Results Above 1GHz (802.11a High Channel)



Peak Data

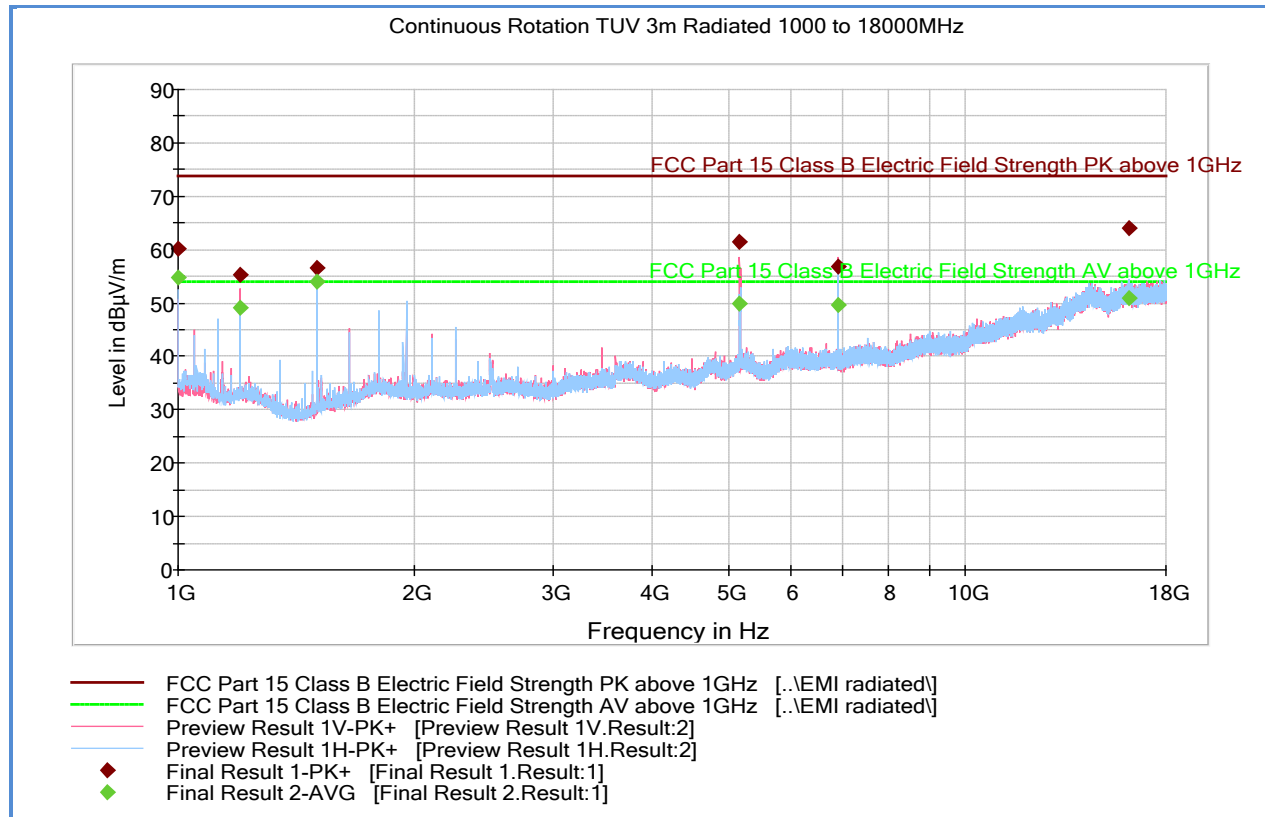
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.000000	59.8	1000.0	1000.000	99.6	H	49.0	-1.0	14.1	73.9
1500.000000	56.5	1000.0	1000.000	99.6	H	179.0	-1.9	17.4	73.9
1949.933333	54.7	1000.0	1000.000	100.6	H	223.0	1.9	19.2	73.9
5237.933333	64.7	1000.0	1000.000	131.6	V	75.0	8.8	9.2	73.9
6986.633333	56.1	1000.0	1000.000	229.3	H	284.0	10.5	17.8	73.9
17769.600000	64.7	1000.0	1000.000	247.3	H	87.0	23.5	9.2	73.9

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.000000	55.0	1000.0	1000.000	99.6	H	49.0	-1.0	-1.1	53.9
1500.000000	54.1	1000.0	1000.000	99.6	H	179.0	-1.9	-0.2	53.9
1949.933333	50.9	1000.0	1000.000	100.6	H	223.0	1.9	3.0	53.9
5237.933333	53.2	1000.0	1000.000	131.6	V	75.0	8.8	0.7	53.9
6986.633333	48.2	1000.0	1000.000	229.3	H	284.0	10.5	5.7	53.9
17769.600000	51.4	1000.0	1000.000	247.3	H	87.0	23.5	2.5	53.9

Test Notes: Measurement was performed with a 5.0GHz notch filter. No significant emissions observed above 8GHz. Measurements above 8GHz are noise floor figures. There are no emissions observed that doesn't comply with the 68.2 dBµV/m calculated limit for non-restricted bands. 1GHz is verified coming from the support broadband router which is required to act as DHCP server. Emission between 5.15 to 5.25GHz is the fundamental frequency.

2.7.17 Test Results Above 1GHz (802.11n HT20 5GHz Low Channel)



Peak Data

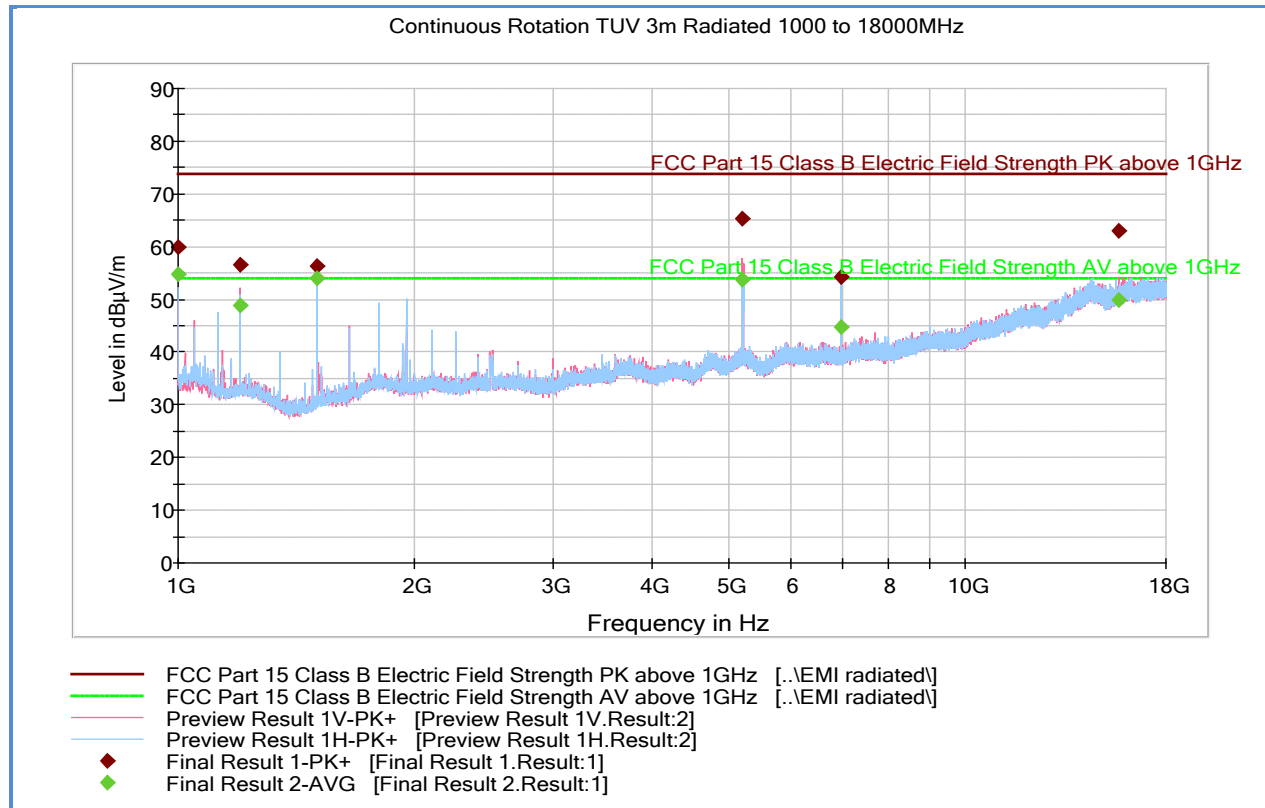
Frequency (MHz)	MaxPeak (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
1000.000000	60.2	1000.0	1000.000	101.6	H	49.0	-1.0	13.7	73.9
1199.833333	55.4	1000.0	1000.000	99.6	V	166.0	-1.5	18.5	73.9
1500.000000	56.6	1000.0	1000.000	99.6	H	179.0	-1.9	17.3	73.9
5175.233333	61.5	1000.0	1000.000	131.6	V	75.0	8.5	12.4	73.9
6906.566667	56.8	1000.0	1000.000	115.6	V	50.0	10.4	17.1	73.9
16157.733333	63.9	1000.0	1000.000	195.4	H	93.0	22.9	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)
1000.000000	54.8	1000.0	1000.000	101.6	H	49.0	-1.0	-0.9	53.9
1199.833333	49.0	1000.0	1000.000	99.6	V	166.0	-1.5	4.9	53.9
1500.000000	54.1	1000.0	1000.000	99.6	H	179.0	-1.9	-0.2	53.9
5175.233333	50.0	1000.0	1000.000	131.6	V	75.0	8.5	3.9	53.9
6906.566667	49.7	1000.0	1000.000	115.6	V	50.0	10.4	4.2	53.9
16157.733333	50.9	1000.0	1000.000	195.4	H	93.0	22.9	3.0	53.9

Test Notes: Measurement was performed with a 5.0GHz notch filter. No significant emissions observed above 8GHz. Measurements above 8GHz are noise floor figures. There are no emissions observed that doesn't comply with the 68.2 dBμV/m calculated limit for non-restricted bands. 1GHz and 1.5 GHz were verified coming from the support broadband router which is required to act as DHCP server. Emission between 5.15 to 5.25GHz is the fundamental frequency.

2.7.18 Test Results Above 1GHz (802.11n HT20 5GHz Mid Channel)



Peak Data

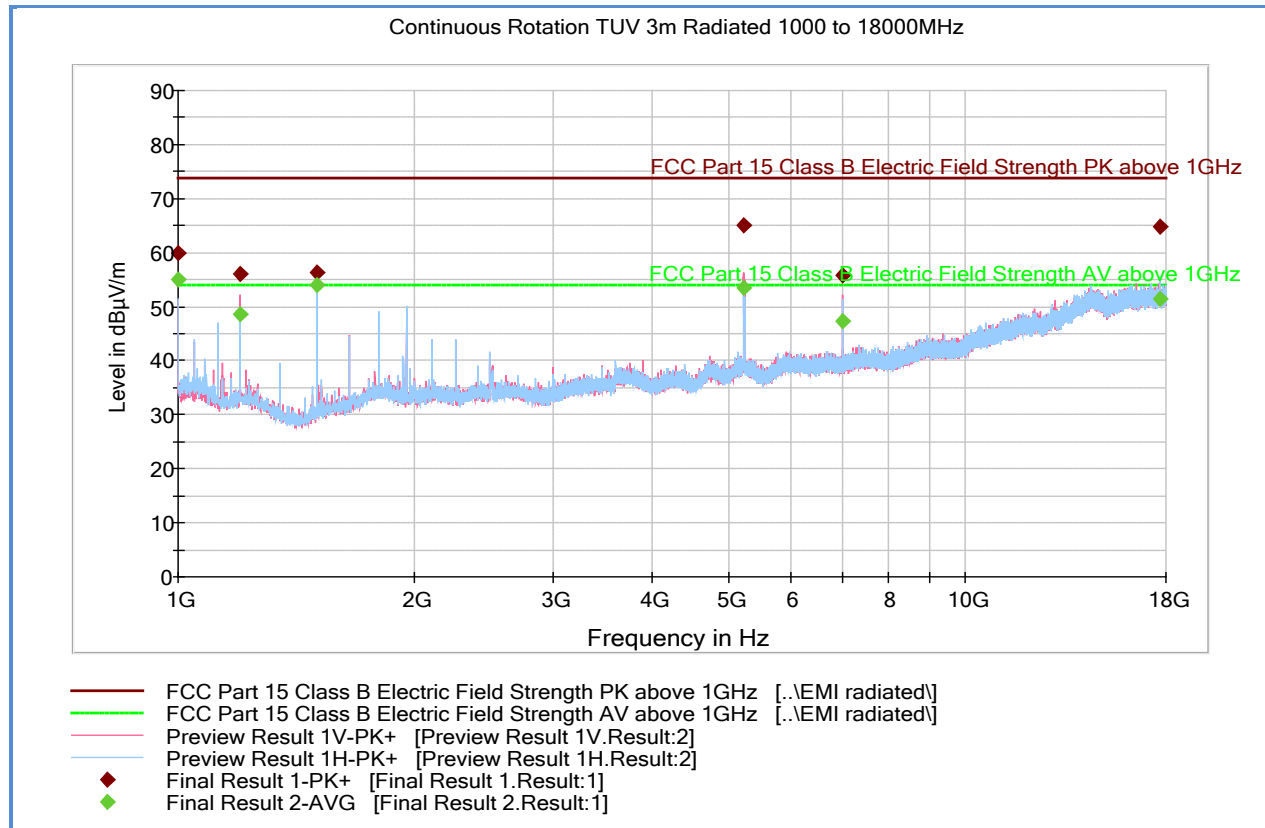
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.000000	60.0	1000.0	1000.000	101.6	H	48.0	-1.0	13.9	73.9
1199.833333	56.5	1000.0	1000.000	99.6	V	31.0	-1.5	17.4	73.9
1500.000000	56.2	1000.0	1000.000	99.6	H	179.0	-1.9	17.7	73.9
5218.633333	65.4	1000.0	1000.000	131.6	V	75.0	8.7	8.5	73.9
6960.000000	54.1	1000.0	1000.000	115.6	V	56.0	10.4	19.8	73.9
15659.500000	63.0	1000.0	1000.000	177.5	V	20.0	22.3	10.9	73.9

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.000000	54.8	1000.0	1000.000	101.6	H	48.0	-1.0	-0.9	53.9
1199.833333	49.0	1000.0	1000.000	99.6	V	31.0	-1.5	4.9	53.9
1500.000000	54.0	1000.0	1000.000	99.6	H	179.0	-1.9	-0.1	53.9
5218.633333	53.7	1000.0	1000.000	131.6	V	75.0	8.7	0.2	53.9
6960.000000	44.7	1000.0	1000.000	115.6	V	56.0	10.4	9.2	53.9
15659.500000	49.9	1000.0	1000.000	177.5	V	20.0	22.3	4.0	53.9

Test Notes: Measurement was performed with a 5.0GHz notch filter. No significant emissions observed above 8GHz. Measurements above 8GHz are noise floor figures. There are no emissions observed that doesn't comply with the 68.2 dBµV/m calculated limit for non-restricted bands. 1GHz is verified coming from the support broadband router which is required to act as DHCP server. Emission between 5.15 to 5.25GHz is the fundamental frequency.

2.7.19 Test Results Above 1GHz (802.11n HT20 5GHz High Channel)



Peak Data

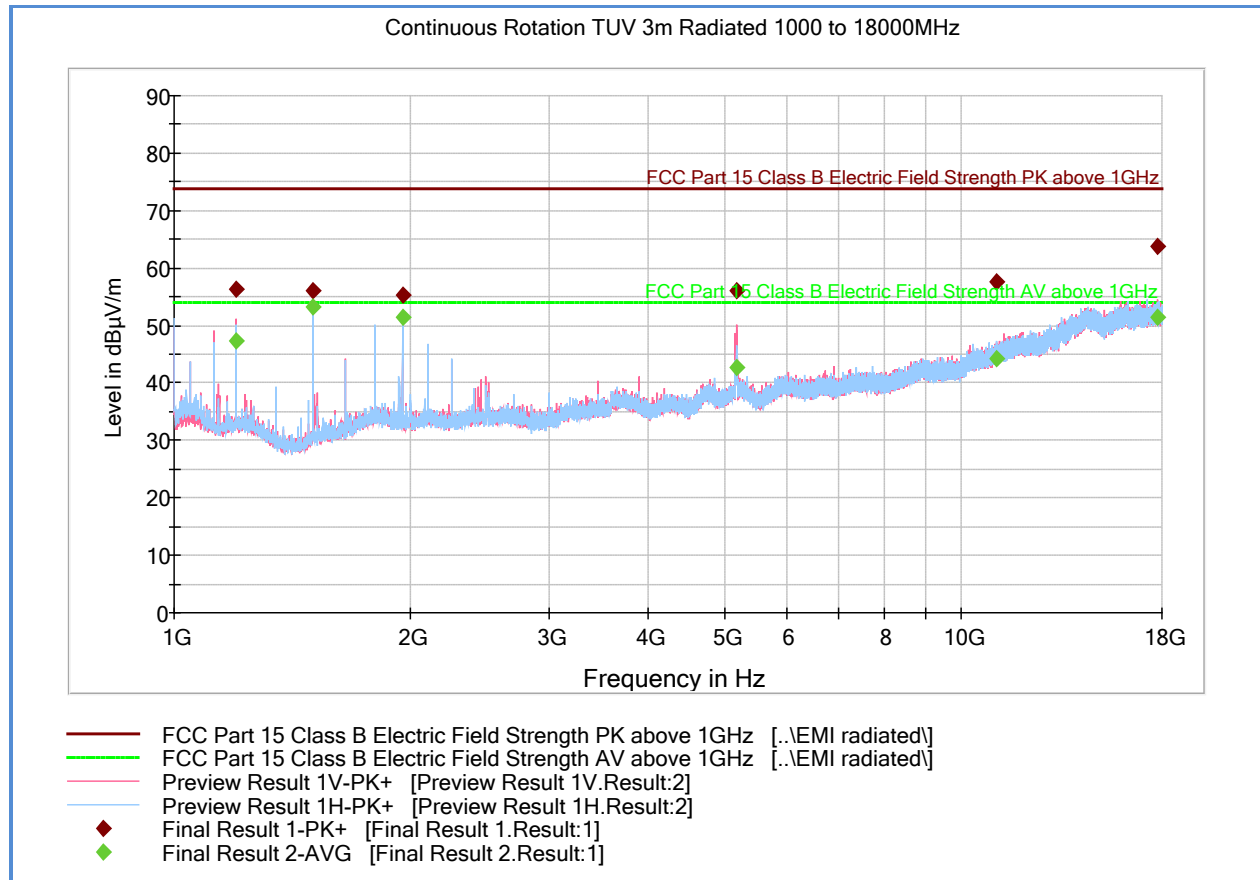
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.000000	59.8	1000.0	1000.000	101.6	H	53.0	-1.0	14.1	73.9
1199.833333	56.2	1000.0	1000.000	100.6	V	40.0	-1.5	17.7	73.9
1500.000000	56.3	1000.0	1000.000	99.6	H	179.0	-1.9	17.6	73.9
5241.866667	65.0	1000.0	1000.000	131.6	V	76.0	8.8	8.9	73.9
6986.633333	55.9	1000.0	1000.000	116.6	V	51.0	10.5	18.0	73.9
17703.866667	64.8	1000.0	1000.000	114.6	H	71.0	23.4	9.1	73.9

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.000000	54.9	1000.0	1000.000	101.6	H	53.0	-1.0	-1.0	53.9
1199.833333	48.7	1000.0	1000.000	100.6	V	40.0	-1.5	5.2	53.9
1500.000000	54.0	1000.0	1000.000	99.6	H	179.0	-1.9	-0.1	53.9
5241.866667	53.4	1000.0	1000.000	131.6	V	76.0	8.8	0.5	53.9
6986.633333	47.3	1000.0	1000.000	116.6	V	51.0	10.5	6.6	53.9
17703.866667	51.3	1000.0	1000.000	114.6	H	71.0	23.4	2.6	53.9

Test Notes: Measurement was performed with a 5.0GHz notch filter. No significant emissions observed above 8GHz. Measurements above 8GHz are noise floor figures. There are no emissions observed that doesn't comply with the 68.2 dBµV/m calculated limit for non-restricted bands. 1GHz is verified coming from the support broadband router which is required to act as DHCP server. Emission between 5.15 to 5.25GHz is the fundamental frequency.

2.7.20 Test Results Above 1GHz (802.11n HT40 5GHz Low Channel)



Peak Data

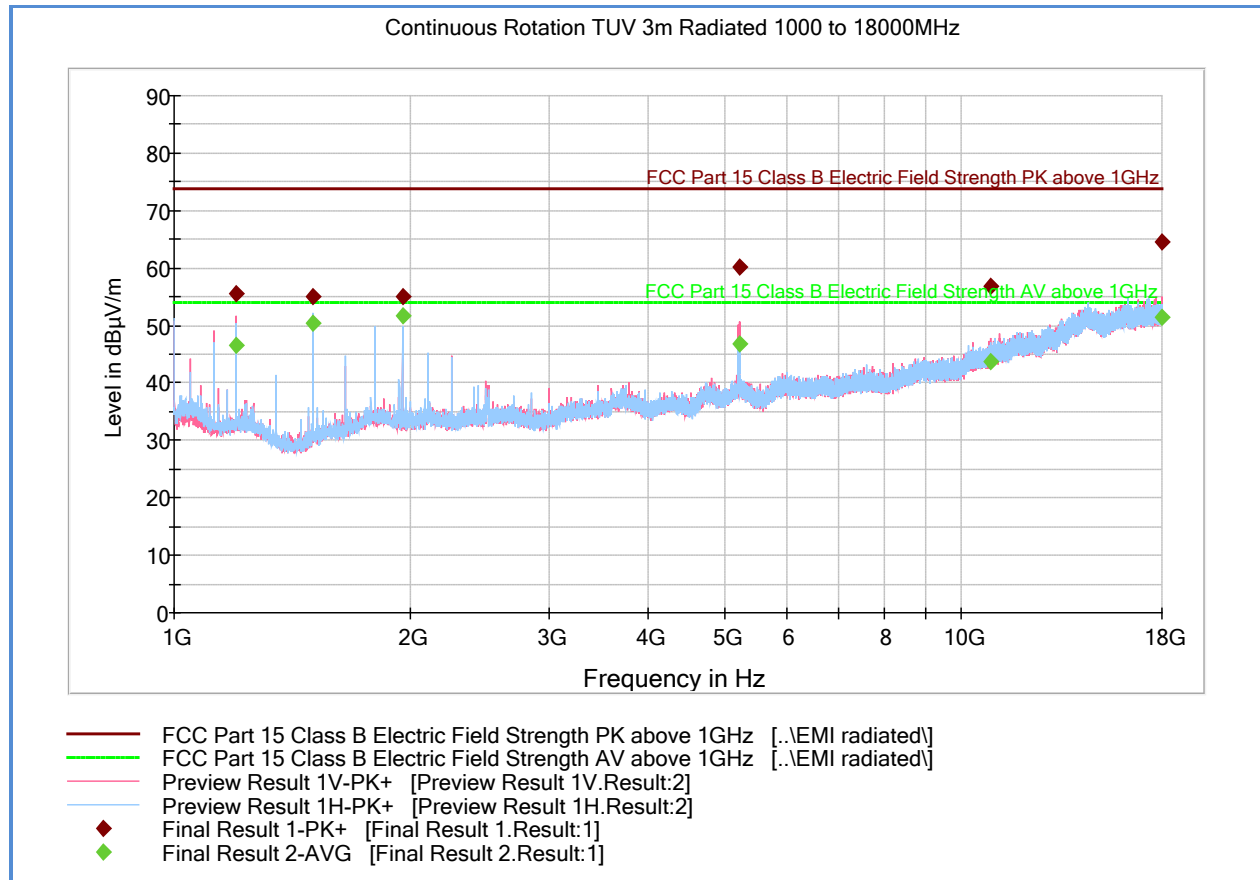
Frequency (MHz)	MaxPeak (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
1199.833333	56.3	1000.0	1000.000	202.4	V	0.0	-1.5	17.6	73.9
1500.000000	56.0	1000.0	1000.000	158.5	H	202.0	-1.9	17.9	73.9
1950.133333	55.4	1000.0	1000.000	103.6	H	214.0	1.9	18.5	73.9
5191.266667	56.0	1000.0	1000.000	228.3	V	202.0	8.6	17.9	73.9
11072.500000	57.5	1000.0	1000.000	391.0	H	113.0	16.5	16.4	73.9
17806.400000	63.8	1000.0	1000.000	357.1	V	20.0	23.5	10.1	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)
1199.833333	47.3	1000.0	1000.000	202.4	V	0.0	-1.5	6.6	53.9
1500.000000	53.3	1000.0	1000.000	158.5	H	202.0	-1.9	0.6	53.9
1950.133333	51.4	1000.0	1000.000	103.6	H	214.0	1.9	2.5	53.9
5191.266667	42.6	1000.0	1000.000	228.3	V	202.0	8.6	11.3	53.9
11072.500000	44.2	1000.0	1000.000	391.0	H	113.0	16.5	9.7	53.9
17806.400000	51.4	1000.0	1000.000	357.1	V	20.0	23.5	2.5	53.9

Test Notes: Measurement was performed with a 5.0GHz notch filter. No significant emissions observed above 8GHz. Measurements above 8GHz are noise floor figures. There are no emissions observed that doesn't comply with the 68.2 dBμV/m calculated limit for non-restricted bands.

2.7.21 Test Results Above 1GHz (802.11n HT40 5GHz Mid Channel)



Peak Data

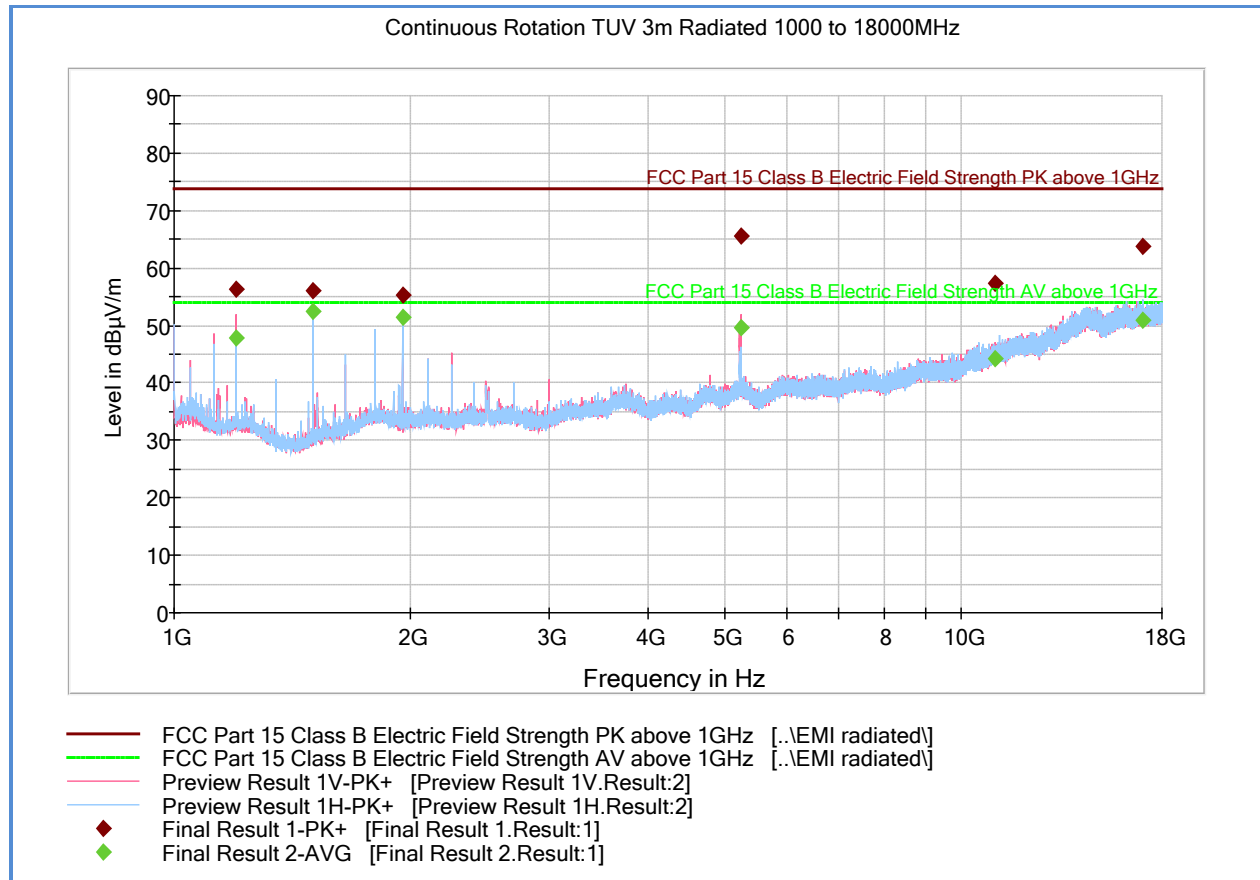
Frequency (MHz)	MaxPeak (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
1199.833333	55.5	1000.0	1000.000	124.6	V	1.0	-1.5	18.4	73.9
1499.800000	55.1	1000.0	1000.000	99.6	H	1.0	-1.9	18.8	73.9
1950.133333	55.1	1000.0	1000.000	102.6	H	213.0	1.9	18.8	73.9
5223.733333	60.2	1000.0	1000.000	220.3	V	229.0	8.7	13.7	73.9
10904.200000	56.7	1000.0	1000.000	200.4	V	338.0	16.1	17.2	73.9
17965.066667	64.7	1000.0	1000.000	202.4	V	67.0	23.8	9.2	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)
1199.833333	46.4	1000.0	1000.000	124.6	V	1.0	-1.5	7.5	53.9
1499.800000	50.4	1000.0	1000.000	99.6	H	1.0	-1.9	3.5	53.9
1950.133333	51.6	1000.0	1000.000	102.6	H	213.0	1.9	2.3	53.9
5223.733333	46.9	1000.0	1000.000	220.3	V	229.0	8.7	7.0	53.9
10904.200000	43.8	1000.0	1000.000	200.4	V	338.0	16.1	10.1	53.9
17965.066667	51.4	1000.0	1000.000	202.4	V	67.0	23.8	2.5	53.9

Test Notes: Measurement was performed with a 5.0GHz notch filter. No significant emissions observed above 8GHz. Measurements above 8GHz are noise floor figures. There are no emissions observed that doesn't comply with the 68.2 dBμV/m calculated limit for non-restricted bands.

2.7.22 Test Results Above 1GHz (802.11n HT40 5GHz 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)
1199.833333	56.3	1000.0	1000.000	101.6	V	1.0	-1.5	17.6	73.9
1500.000000	56.0	1000.0	1000.000	99.6	H	16.0	-1.9	17.9	73.9
1949.933333	55.2	1000.0	1000.000	103.6	H	213.0	1.9	18.7	73.9
5249.266667	65.6	1000.0	1000.000	168.5	V	88.0	8.8	8.4	73.9
11047.933333	57.3	1000.0	1000.000	317.1	V	286.0	16.4	16.6	73.9
17028.166667	63.7	1000.0	1000.000	179.5	H	219.0	23.4	10.2	73.9

Average Data

Frequency (MHz)	Average (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
1199.833333	47.8	1000.0	1000.000	101.6	V	1.0	-1.5	6.1	53.9
1500.000000	52.5	1000.0	1000.000	99.6	H	16.0	-1.9	1.4	53.9
1949.933333	51.4	1000.0	1000.000	103.6	H	213.0	1.9	2.5	53.9
5249.266667	49.6	1000.0	1000.000	168.5	V	88.0	8.8	4.3	53.9
11047.933333	44.2	1000.0	1000.000	317.1	V	286.0	16.4	9.7	53.9
17028.166667	51.0	1000.0	1000.000	179.5	H	219.0	23.4	2.9	53.9

Test Notes: Measurement was performed with a 5.0GHz notch filter. No significant emissions observed above 8GHz. Measurements above 8GHz are noise floor figures. There are no emissions observed that doesn't comply with the 68.2 dBμV/m calculated limit for non-restricted bands.



2.8 BAND-EDGE MEASUREMENTS (CONDUCTED)

2.8.1 Specification Reference

Part 15 Subpart E §15.407(b)(1) and (7) and RSS-210 A9.2(1)

2.8.2 Standard Applicable

For transmitters operating in the 5.15–5.25 GHz band: all emissions outside of the 5.15–5.35 GHz band shall not exceed an EIRP of –27 dBm/MHz.

The provisions of §15.205 apply to intentional radiators operating under this section.

Emissions outside the band 5150-5250 MHz shall not exceed -27 dBm/MHz e.i.r.p.

2.8.3 Test Methodology

Section H of 789033 D01 General UNII Test Procedures v01r03

2.8.4 Equipment Under Test and Modification State

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

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

December 30, 2013 and January 02, 2014/FSC

2.8.6 Test Equipment Used

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

2.8.7 Environmental Conditions

Ambient Temperature	22.9°C
Relative Humidity	26.8%
ATM Pressure	99.4 kPa

2.8.8 Additional Observations

- This is a conducted test using Integration Method as per Section H(3)(d)(ii) of 789033 D01 General UNII Test Procedures v01r03
- RBW=100 kHz
- VBW≥100 kHz
- Detector = Peak
- Sweep time=Auto
- Trace Mode=max hold

- For Average measurement, procedure under Section H(6) applies except RBW and VBW settings.
- Detector = RMS (power averaging)
- 100 trace averages performed (since EUT transmission is continuous or 100% duty cycle)
- Integration performed across 1MHz bandwidth.

2.8.9 Test Results



802.11a Low Channel

Lower band edge calculation:

- 5150 MHz (in the restricted band)
- Use the following formula as per Section H(2)(d)(i) of 789033 D01 General UNII Test Procedures v01r03:

$$\begin{aligned}
 E(\text{dB}\mu\text{V}/\text{m}) &= \text{EIRP (dBm)} + 95.2 \\
 &= (-47.63 \text{ dBm} + 2.3 \text{ dBi antenna gain}) + 95.2 \\
 &= 49.87 \text{ dB}\mu\text{V}/\text{m} @ 3 \text{ meters}
 \end{aligned}$$
- Since 49.87 dBμV/m (Peak) is less than than the 54 dBμV/m Average limit of §15.209, then average measurement is not required.



Date: 30 DEC 2013 11:19:10

802.11n HT20 Low Channel

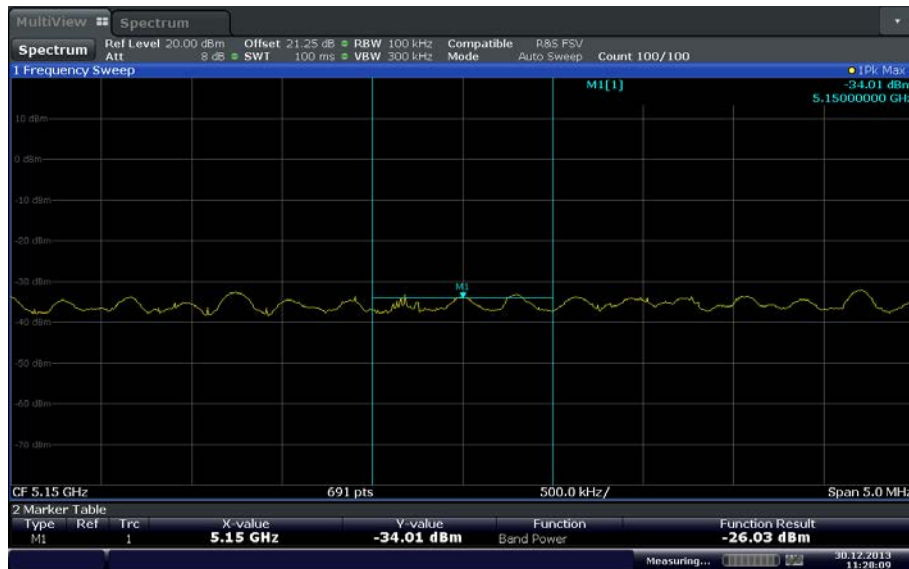
Lower band edge calculation:

- 5150 MHz (in the restricted band)
- Use the following formula as per Section H(2)(d)(i) of 789033 D01 General UNII Test Procedures v01r03:

$$E(\text{dB}\mu\text{V/m}) = \text{EIRP (dBm)} + 95.2$$

$$= (-50.44 \text{ dBm} + 2.3\text{dBi antenna gain}) + 95.2$$

$$= 47.06 \text{ dB}\mu\text{V/m @ 3 meters}$$
- Since 47.06 dBμV/m (Peak) is less than than the 54 dBμV/m Average limit of §15.209, then average measurement is not required.



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802.11n HT40 Low Channel (Peak)



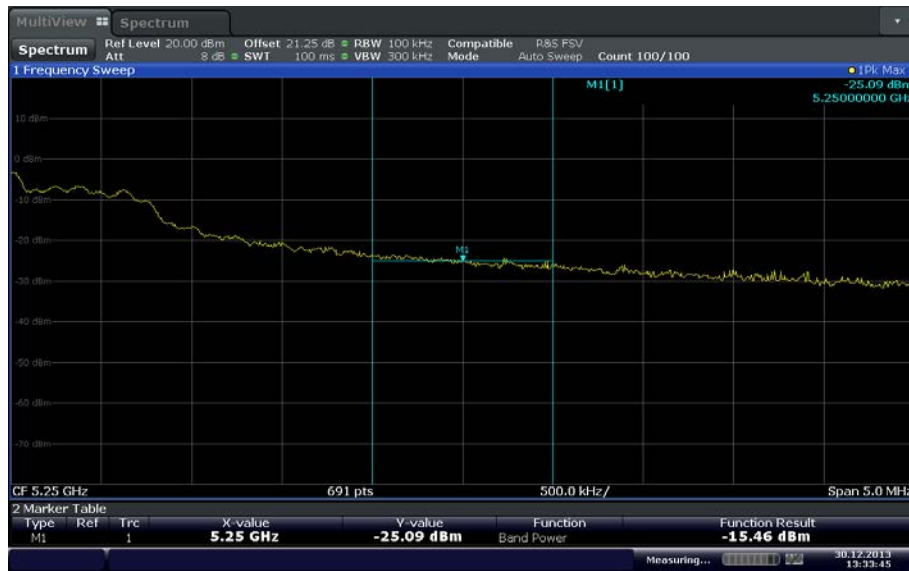
Date: 30 DEC 2013 11:46:40

802.11n HT40 Low Channel (Average)

Lower band edge calculation:

- 5150 MHz (in the restricted band)
- Use the following formula as per Section H(2)(d)(i) of 789033 D01 General UNII Test Procedures v01r03:

$$\begin{aligned}
 \text{E(dB}\mu\text{V/m)} &= \text{EIRP (dBm)} + 95.2 \text{ Calculating for Peak} \\
 &= (-34.01 \text{ dBm} + 2.3 \text{ dBi antenna gain}) + 95.2 \\
 &= 63.49 \text{ dB}\mu\text{V/m @ 3 meters (Peak, complies with 74 dB}\mu\text{V/m limit)} \\
 &= \text{EIRP (dBm)} + 95.2 \text{ Calculating for Average} \\
 &= (-52.19 \text{ dBm} + 2.3 \text{ dBi antenna gain}) + 95.2 \\
 &= 45.31 \text{ dB}\mu\text{V/m @ 3 meters (Average, complies with 54 dB}\mu\text{V/m limit)}
 \end{aligned}$$



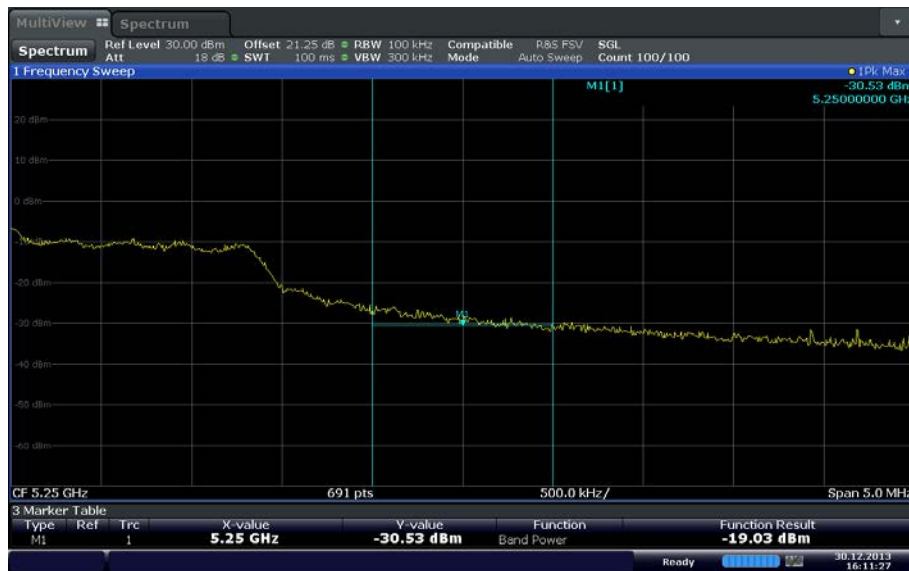
Date: 30 DEC 2013 13:33:45

802.11a High Channel

Upper band edge calculation:

- 5250 MHz (not in the restricted bands and falls within U NII-2A band, out-of-band limits typically applies to 5.35GHz or upper edge of U NII-2A, data presented is considered worst case scenario)
- Limit is -27dBm EIRP
- Calculation @ 5250 MHz:

Integrated peak measurement @ 5250 MHz	= -29.48 dBm
EIRP @ 5250 MHz	= -29.48 + 2.3 dBi (antenna gain)
	= -27.18 dBm
Margin of compliance	= -0.18 dB



Date: 30 DEC 2013 16:11:28

802.11n HT20 High Channel

Upper band edge calculation:

- 5250 MHz (not in the restricted bands and falls within U NII-2A band, out-of-band limits typically applies to 5.35GHz or upper edge of U NII-2A, data presented is considered worst case scenario)
- Limit is -27dBm EIRP
- Calculation @ 5250 MHz:

Integrated peak measurement @ 5250 MHz	= -30.53 dBm
EIRP @ 5250 MHz	= -30.53 + 2.3 dBi (antenna gain)
	= -28.23 dBm
Margin of compliance	= -1.23 dB



Date: 2 JAN 2014 09:12:09

802.11n HT40 Mid Channel

Upper band edge calculation:

This is a relative measurement. Verification performed at Mid channel (Channel 44). Actual High channel is (48,-1), wherein the primary channel is 48 (20MHz) and the secondary channel is 44 (20MHz). Bonding of two (2) 20 MHz channels to obtain 40MHz is not supported by the test software at the time of verification. In addition, the EUT worst case Modulation and Coding Scheme (MCS) between HT20 and HT40 are not identical. Relative measurement was performed to demonstrate HT40 worst case configuration complies with the requirement. For this test, 5240MHz (actual) = 5250MHz (relative).

- 5250 MHz (not in the restricted bands and falls within U NII-2A band, out-of-band limits typically applies to 5.35GHz or upper edge of U NII-2A, data presented is considered worst case scenario)
- Limit is -27dBm EIRP
- Calculation @ 5240 MHz (5250 MHz):

Relative integrated peak measurement @ 5250 MHz	= -29.51 dBm
EIRP @ 5250 MHz	= -29.51 + 2.3 dBi (antenna gain)
	= -27.21 dBm
Margin of compliance	= -0.21 dB



2.9 PEAK EXCURSION RATIO

2.9.1 Specification Reference

Part 15 Subpart E §15.407(a)(6)

2.9.2 Standard Applicable

The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the maximum conducted output power shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

2.9.3 Test Methodology

Section G of 789033 D01 General UNII Test Procedures v01r03

2.9.4 Equipment Under Test and Modification State

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

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

December 30, 2013/FSC

2.9.6 Test Equipment Used

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

2.9.7 Environmental Conditions

Ambient Temperature	23.9°C
Relative Humidity	25.1%
ATM Pressure	99.7 kPa

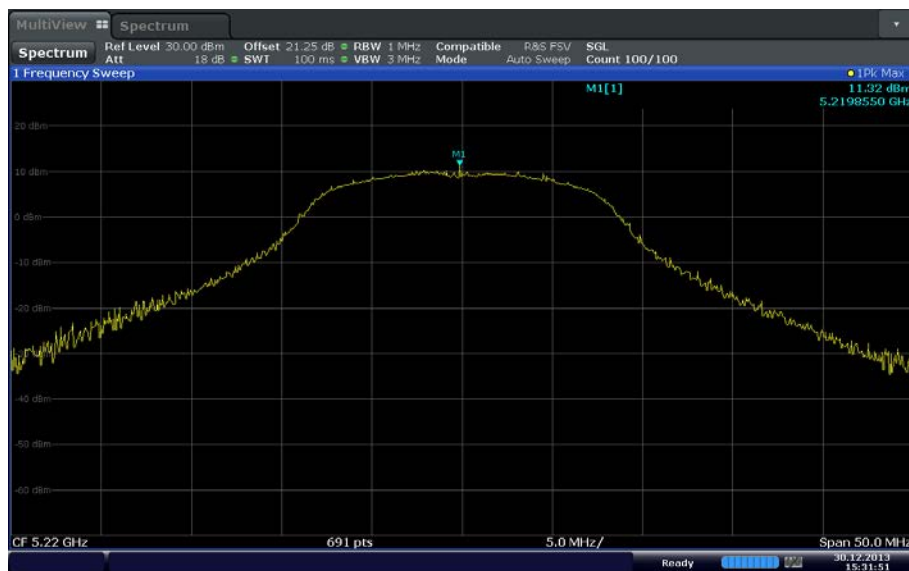
2.9.8 Additional Observations

- This is a conducted test as per Section Section G of 789033 D01 General UNII Test Procedures v01r03.
- The ratio of the peak-max-hold spectrum with PPSD measurement was verified not to exceed 13 dB
- PPSD measurement is from Section 2.6 of this test report.
- Only the mid channel verified as allowed in demonstrating compliance with this requirement.
- RBW=1 MHz, VBW≥3 MHz
- Detector = Peak
- Trace Mode=max hold
- Sweeps allowed to continue until the trace stabilizes

2.9.9 Test Results

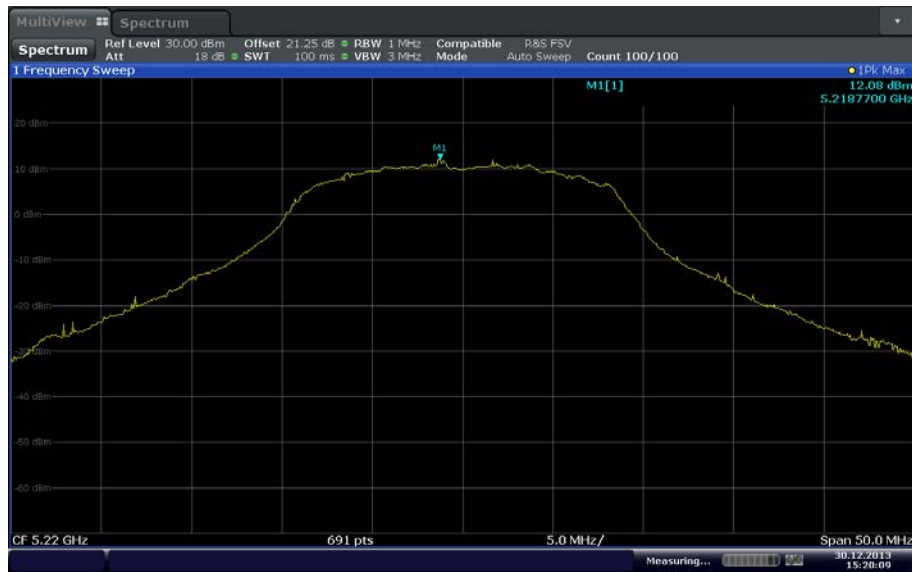
Mode	Frequency (MHz)	PPSD (dBm)	Peak Max Hold (dBm)	Ratio (dB)	Limit (dB)
802.11 a	5220	0.98	11.32	10.34	13
802.11 n HT20	5220	0.05	12.08	12.03	13
802.11 n HT40	5220	-5.67	7.28	12.95	13

2.9.10 Test Plots



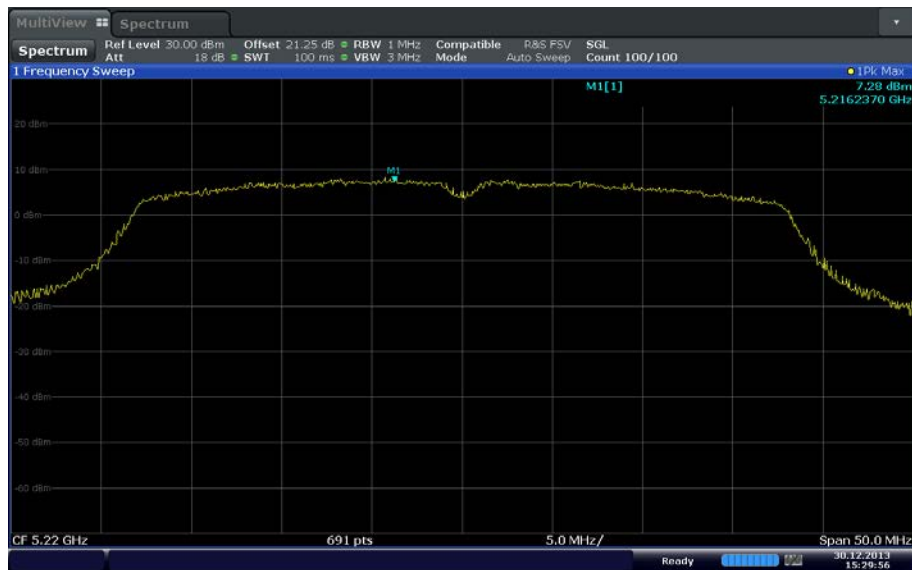
Date: 30 DEC 2013 15:31:50

802.11a Mid Channel



Date: 30 DEC 2013 15:20:09

802.11n HT20 Mid Channel



Date: 30 DEC 2013 15:29:56

802.11n HT40 Mid Channel



SECTION 3

TEST EQUIPMENT USED



3.1 TEST EQUIPMENT USED

List of absolute measuring and other principal items of test equipment.

ID Number (SDGE/SDRB)	Test Equipment	Type	Serial Number	Manufacturer	Cal Date	Cal Due Date
Antenna Conducted Port Setup						
7569	Series Power Meter	N1911A P-	MY45100625	Agilent	04/15/13	04/15/14
7570	50MHz-18GHz Wideband Power Sensor	N1921A	MY45240588	Agilent	05/06/13	05/06/14
7582	Signal/Spectrum Analyzer	FSW26	101614	Rhode & Schwarz	11/19/13	11/19/14
1189	Signal Generator	8648C	3623A03059	Hewlett Packard	08/06/13	08/06/14
-	20dB Attenuator	46-20-34	BK5773	Weinschel Corp.	Verified by 1189 and 7582	
Radiated Test Setup						
1002	Bilog Antenna	3142C	00058717	ETS-Lindgren	01/21/13	01/21/14
7575	Double-ridged waveguide horn antenna	3117	00155511	EMCO	03/25/13	03/25/14
8628	Pre-amplifier	QLJ 01182835-JO	8986002	QuinStar Technologies Inc.	09/03/13	09/03/14
1150	Horn antenna	3160-09	012054-004	ETS	04/26/13	04/26/15
1151	Pre-amplifier	TS-PR26	100026	Rhode & Schwarz	05/02/13	05/02/14
1051	Double-ridged waveguide horn antenna	3115	9408-4329	EMCO	06/11/13	06/11/14
8760	Pre-amplifier	ZKL-2	1001	Mini-Circuits	09/03/13	09/03/14
1153	High-frequency cable	SucoFlex 100 SX	N/A	Suhner	09/03/13	09/03/14
8543	High-frequency cable	Micropore 19057793	N/A	United Microwave Products	09/03/13	09/03/14
1040	EMI Test Receiver	ESIB40	100292	Rhode & Schwarz	07/31/13	07/31/14
1049	EMI Test Receiver	ESU	100133	Rhode & Schwarz	07/24/13	07/24/14
-	5.0GHz Band Notch Filter	BRM50716	015	Micro-Tronics	Verified by 1189 and 7582	
1016	Pre-amplifier	PAM-0202	187	PAM	10/08/13	10/08/14
Conducted Emissions						
1024	EMI Test Receiver	ESCS 30	847793/001	Rhode & Schwarz	03/11/13	03/11/14
7567	LISN	FCC-LISN-50-25-2-10	120304	Fischer Custom Comm.	06/11/13	06/11/14
7568	LISN	FCC-LISN-50-25-2-10	120305	Fischer Custom Comm.	07/10/13	07/10/14
8789	20dB Attenuator	HAT-20	YUU29001245	Mini Circuits	03/01/13	03/01/14
8792	20dB Attenuator	HAT-20	YUU29001245	Mini Circuits	03/01/13	03/01/14
Miscellaneous						
6452	Multimeter	3478A	2911A52177	Hewlett Packard	08/02/13	08/02/14
7554	Barometer/Temperature /Humidity Transmitter	iBTHX-W	0400706	Omega	04/17/13	04/17/14
1123	DC Power Supply	E3631A	N/A	Hewlett Packard	Verified by 6452	
	Test Software	EMC32	V8.53	Rhode & Schwarz	N/A	

3.2 MEASUREMENT UNCERTAINTY

For a 95% confidence level, the measurement uncertainties for defined systems are:

3.2.1 Radiated Emission Measurements (Below 1GHz)

Contribution		Probability Distribution Type	Probability Distribution x_i	Standard Uncertainty $u(x_i)$	$[u(x_i)]^2$
1	Receiver/Spectrum Analyzer	Rectangular	0.45	0.26	0.07
2	Cables	Rectangular	0.50	0.29	0.08
3	Preamp	Rectangular	0.50	0.29	0.08
4	Antenna	Rectangular	0.75	0.43	0.19
5	Site	Rectangular	3.89	2.25	5.04
6	EUT Setup	Rectangular	1.00	0.58	0.33
Combined Uncertainty (u_c):					2.41
Coverage Factor (k):					2
Expanded Uncertainty:					4.82

3.2.2 Radiated Emission Measurements (Above 1GHz)

Contribution		Probability Distribution Type	Probability Distribution x_i	Standard Uncertainty $u(x_i)$	$[u(x_i)]^2$
1	Receiver/Spectrum Analyzer	Rectangular	0.57	0.33	0.11
2	Cables	Rectangular	0.70	0.40	0.16
3	Preamp	Rectangular	0.50	0.29	0.08
4	Antenna	Rectangular	0.37	0.21	0.05
5	Site	Rectangular	3.89	2.25	5.04
6	EUT Setup	Rectangular	1.00	0.58	0.33
Combined Uncertainty (u_c):					2.40
Coverage Factor (k):					2
Expanded Uncertainty:					4.81

3.2.3 Conducted Antenna Port Measurement

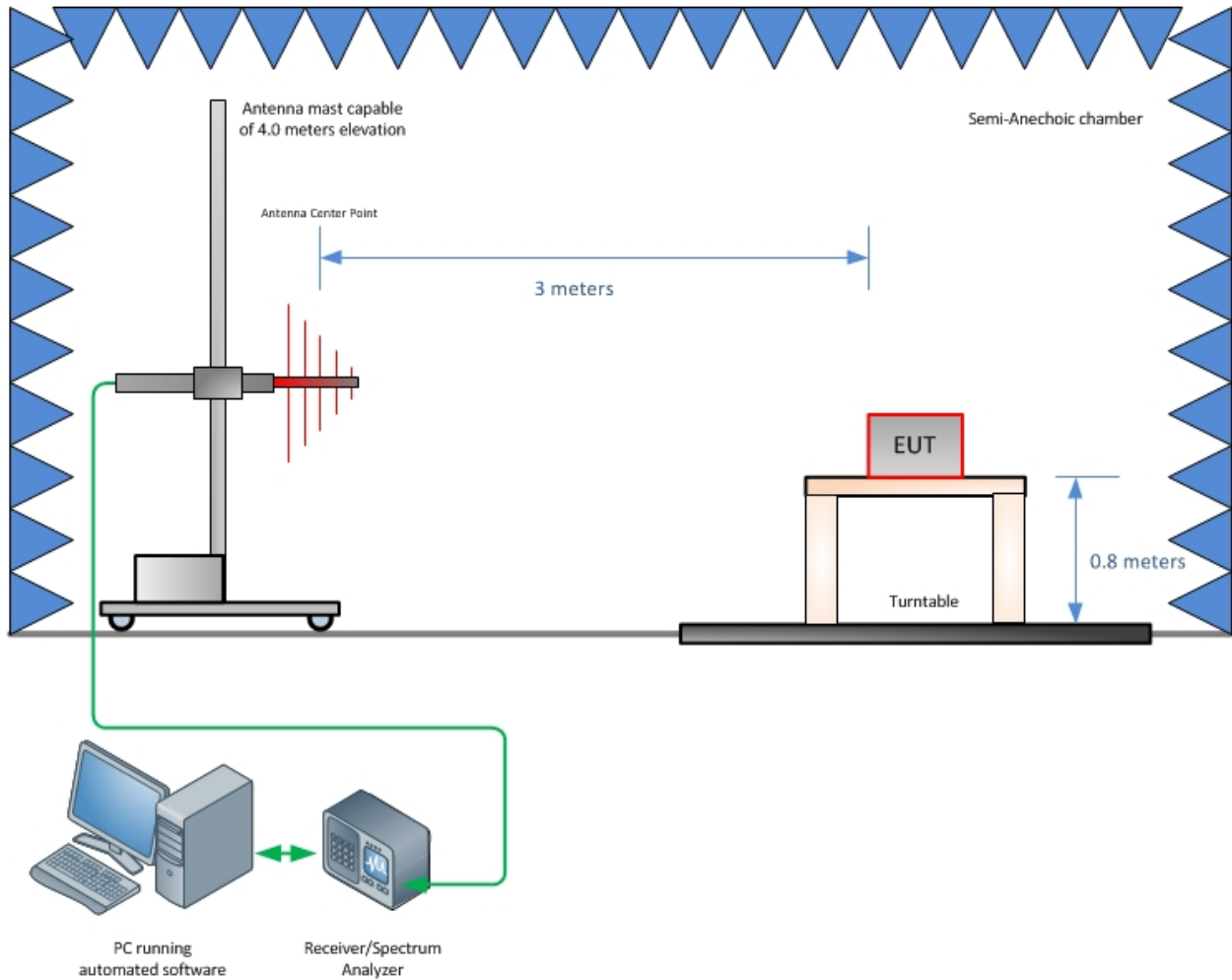
Contribution		Probability Distribution Type	Probability Distribution x_i	Standard Uncertainty $u(x_i)$	$[u(x_i)]^2$
1	Receiver/Spectrum Analyzer	Rectangular	0.57	0.33	0.11
2	Cables	Rectangular	0.50	0.29	0.08
3	EUT Setup	Rectangular	1.00	0.58	0.33
Combined Uncertainty (u_c):					0.72
Coverage Factor (k):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



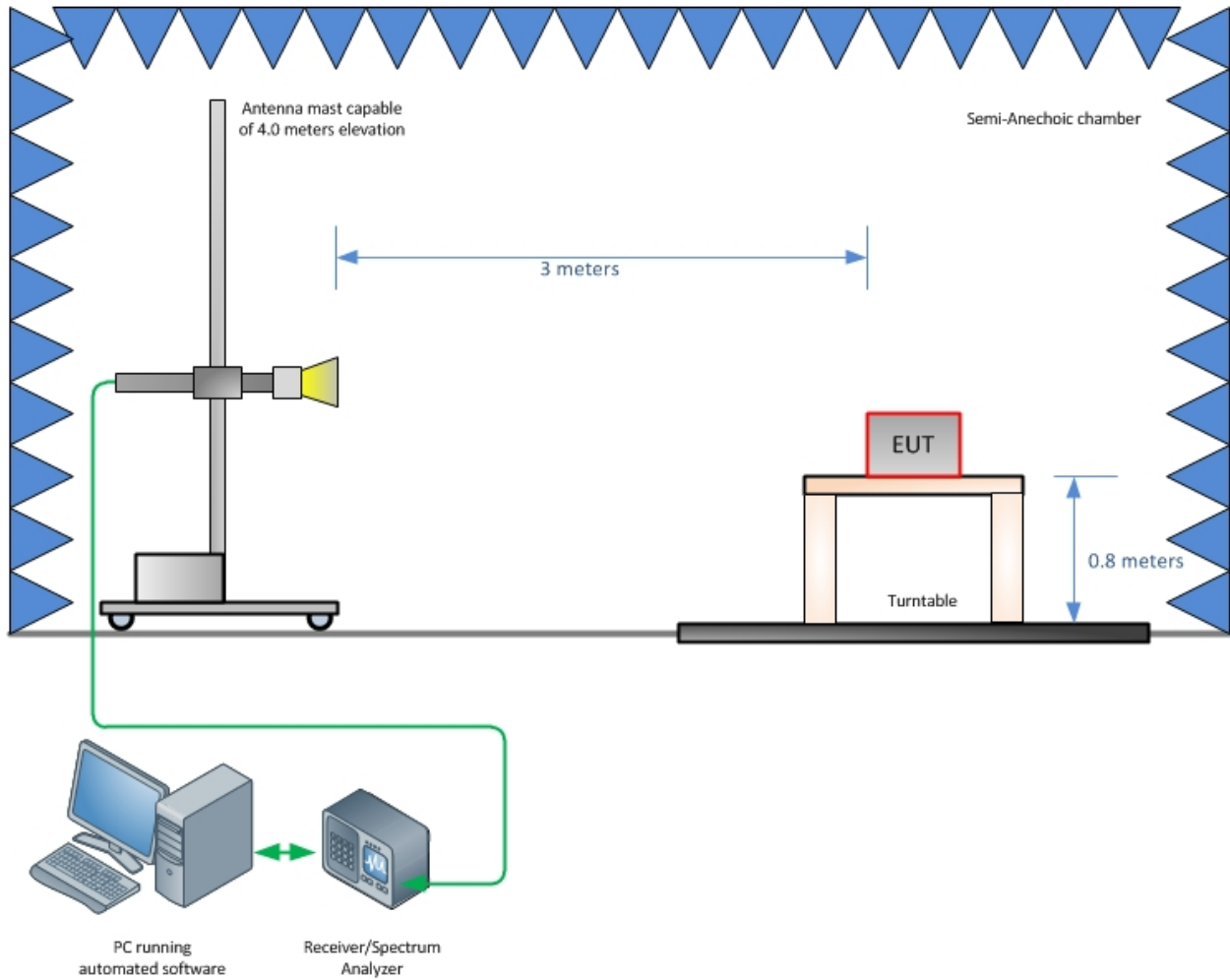
SECTION 4

DIAGRAM OF TEST SETUP

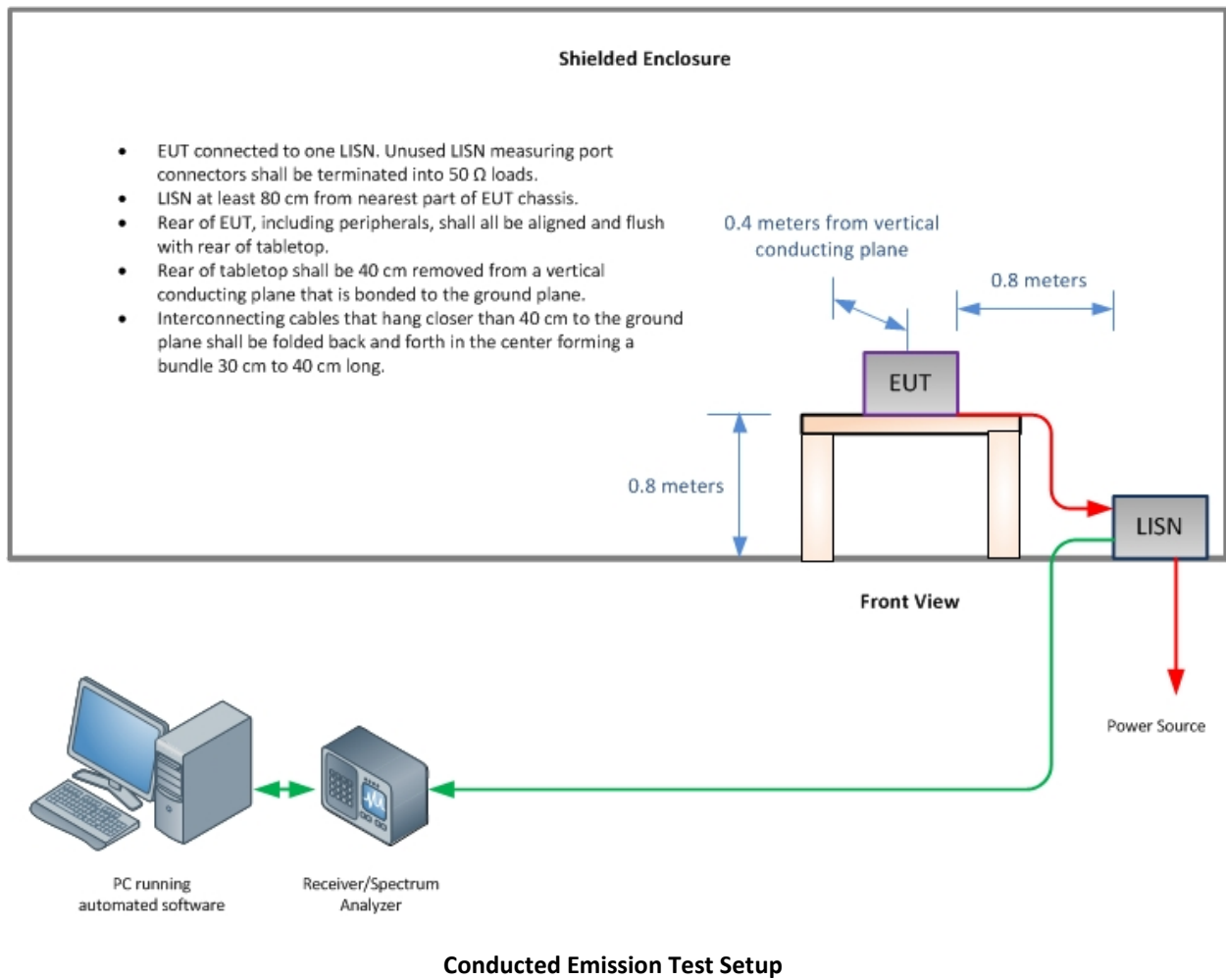
4.1 TEST SETUP DIAGRAM



Radiated Emission Test Setup (Below 1GHz)



Radiated Emission Test Setup (Above 1GHz)





SECTION 5

ACCREDITATION, DISCLAIMERS AND COPYRIGHT



5.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

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