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Report On

Application for Grant of Equipment Authorization of the
Novatel Wireless Inc.
MIFI8800L Wireless Hotspot Modem

FCC Part 15 Subpart E §15.407
RSS-247 Issue 2 February 2017

Report No. 72139211F **August 2018**

REPORT ON	Radio Testing of the Novatel Wireless Inc. MIFI8800L Wireless Hotspot Modem
TEST REPORT NUMBER	72139211F
PREPARED FOR	Novatel Wireless Inc. 9605 Scranton Road, Suite 300 San Diego, CA 92121 USA
CONTACT PERSON	Roman Olmos Senior Regulatory Engineer (858) 812-3400 rolmos@nvtl.com
PREPARED BY	Xiaoying Zhang **Name** Authorized Signatory Title: EMC/Wireless Test Engineer
APPROVED BY	Ferdinand S. Custodio Name Authorized Signatory Title: Senior EMC Test Engineer/Wireless Team Lead
DATED	August 27, 2018

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

Revision History

72139211F Novatel Wireless Inc. MIFI8800L Wireless Hotspot Modem					
DATE	OLD REVISION	NEW REVISION	REASON	PAGES AFFECTED	APPROVED BY
08/27/2018	Initial Release				Ferdinand Custodio

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SECTION 1

REPORT SUMMARY

Radio Testing of the
Novatel Wireless Inc.
MIFI8800L Wireless Hotspot Modem

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

1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Novatel Wireless Inc. Wireless Hotspot Modem to the requirements of the following:

- FCC Part 15 Subpart E §15.407: 2017
- RSS-247 Issue 2 February 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	Novatel Wireless Inc.
Product Trademark/Brand	Inseego
Product Marketing Name	MiFi 8800L
Model Number(s)	MIFI8800L
FCC ID Number	PKRNVWMIFI8800
IC Number	3229A-MIFI8800
Serial Number(s)	AZ280418A00067
Number of Samples Tested	1
Test Specification/Issue/Date	• FCC Part 15 Subpart E §15.407 (October 1, 2017). • RSS-247 Issue 2 February 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. • 789033 D02 General UNII Test Procedures New Rules v02r01 (Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - Part 15, Subpart E) December 14, 2017. • ANSI C63.10-2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
Start of Test	July 24, 2018
Finish of Test	August 10, 2018
Name of Engineer(s)	Xiaoying Zhang
Related Document(s)	None. Supporting documents for EUT certification are separate exhibits.

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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 ISED RSS standard is shown below.

Operation in the U-NII 1 and U-NII 3 Bands					
Section	**FCC Part Sections(s)**	**ISED Sections**	**Test Description**	**Result**	**Comments/ Base Standard**
2.1	§15.207(a)	RSS-Gen 8.8	Conducted Emissions	Compliant	-
2.2	§15.403(i)	-	26 dB Bandwidth	For reporting purpose only	
2.3		RSS-Gen 6.7	99% Emission Bandwidth	For reporting purpose only	
2.4	§15.407(e)	RSS-247 6.2.4.1	Minimum 6dB Bandwidth	Compliant	-
2.5	15.407(a)(1)(ii) and 15.407(a)(3)	RSS-247 6.2.1.1 and 6.2.4.1	Maximum Conducted Output Power	Compliant	-
2.6	15.407(a)(1)(ii) and 15.407(a)(3)	RSS-247 6.2.1.1 and 6.2.4.1	Maximum Power Spectral Density (PSD)	Compliant	-
2.7	§15.407(b)(1),(4) (i) and (7) / 15.209	RSS-247 6.2.1(2) and 6.2.4 (2)	Unwanted Emissions Measurement	Compliant	-
2.8	§15.407(b)(1),(4) (i) and (7) §15.209	RSS-247 6.2.1.2 and 6.2.4.2	Band-Edge Measurements	Compliant	-
2.9	§15.407(g)	RSS-Gen 6.11	Frequency Stability	Client Declaration	
-	-	RSS-247 6.2.2.2	Indoor Operation Only	Refer to the Label or User Manual	

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1.3 PRODUCT INFORMATION

1.3.1 Technical Description

The Equipment Under Test (EUT) was a Novatel Wireless Inc. MIFI8800L Wireless Hotspot Modem. The EUT supports LTE, WCDMA/HSPA, 802.11a, 802.11b, 802.11g and 802.11n and 802.11ac. WLAN supports both SISO and MIMO mode. Bands supported for WIFI are 2.4GHz, U-NII 1 and U-NII 3.

1.3.2 EUT General Description

EUT Description	Wireless Hotspot Modem
Product Marketing Name	MiFi 8800L
Model Number(s)	MIFI8800L
Rated Voltage	3.8V, 4500mAh (Rechargeable Li-Ion battery pack) Input 100-240VAC, Output 5V (External AC-DC Power Adapter)
Mode Verified	802.11a, 802.11n and 802.11ac in U-NII 1 and U-NII 3 bands
Capability	WCDMA Band 2, 5, LTE Band 2, 4, 5, 7, 13, 14, 46, 48, 66 and 802.11 a/b/g/n/ac
Primary Unit (EUT)	☐ Production ☒ Pre-Production ☐ Engineering

Antenna Gain

2412 MHz to 2462 MHz	0.1 dBi
5170 MHz to 5250 MHz	3.2 dBi
5735 MHz to 5835 MHz	2.9 dBi

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1.3.3 Maximum Conducted Output Power

Mode	Frequency Range (MHz)	MIMO Mode		
		Output Power (dBm)	Output Power (mW)	EIRP Output Power (mW)
802.11a (U-NII 1)	5180-5240	14.97	31.41	65.61
802.11n (U-NII 1)	5180-5240	14.94	31.19	65.16
802.11ac (U-NII 1)	5180-5240	13.62	23.01	48.08
802.11a (U-NII 3)	5745-5825	21.49	140.93	274.79
802.11n (U-NII 3)	5745-5825	20.17	103.99	202.77
802.11ac (U-NII 3)	5745-5825	20.84	121.34	236.59

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1.4 EUT TEST CONFIGURATION

1.4.1 Test Configuration Description

Test Configuration	Description
A	Power measurements using antenna conducted port test setup. Both WLAN antenna (RF0 and RF1) for SISO mode and MIMO mode are verified.
B	Antenna Conducted Port Test Setup. Antenna port (RF0 or RF1) connected directly to the Spectrum Analyser with 10dB external attenuator.
C	Radiated Test Setup (Cabinet Spurious Emissions). Antenna port terminated with 50Ω load.

1.4.1 EUT Exercise Software

The EUT is connected to the support laptop via USB. Tera Term was used to communicate with the EUT. The manufacturer provided different macros to load that configures the RF settings of the EUT. Parameters that could be updated using the macros are 802.11 mode, channel, modulation, bandwidth, TX port and TX power.

1.4.2 Support Equipment and I/O cables

Manufacturer	Equipment/Cable	Description
DELL	Support Laptop	LATITUDE E6410, S/N: 5JK9ZN1
DELL	AC/DC Adapter for the support laptop	Model: DA90PE1-00, P/N: WK890 S/N: CN-0WK890-48661-8CR-N77V-A01
Novatel Wireless	USB Cable (EUT to Support Laptop)	Type A to Type C USB Cable. M/N: NOV7000USB

1.4.3 Worst Case Configuration

Worst-case configuration used in this test report based from Maximum Conducted Output Power measurements:

Mode	Channel	Data Rate/MCS
802.11a (U-NII 1)	48 (High Channel)	9 Mbps
802.11n 20 MHz (U-NII 1)	48 (High Channel)	MCS 1
802.11ac 40 MHz (U-NII 1)	40 (Low Channel)	MCS 0
802.11a (U-NII 3)	157 (Middle Channel)	6 Mbps
802.11n 20 MHz (U-NII 3)	165 (High Channel)	MCS 0
802.11ac 20 MHz (U-NII 3)	157 (Middle Channel)	MCS 0

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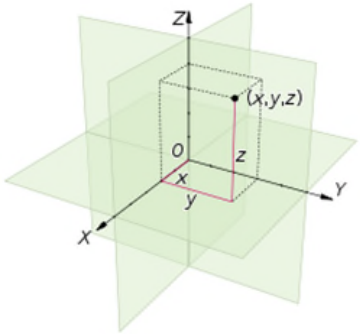
The EUT is a portable device. For radiated measurements, X, Y and Z orientations were verified during initial prescan to verify the worst axis. No major variation in emissions observed between the three (3) orientations for cabinet spurious emissions. Verifications performed using "Y" configuration.



1.4.4 Duty Cycle and Transmission Duration Used (Worst Case Configuration)

Mode	*T (µs)*	*50/T (kHz)*	Duty Cycle (x)	DCCF
UNII 1 a	954.59	52.37	0.9	0.46
UNII 1 n 20 MHz	679.34	73.6	0.862	0.64
UNII 1 n 40 MHz	654.531	76.39	0.856	0.67
UNII 1 ac 20 MHz	1335.267	37.44	0.92	0.34
UNII 1 ac 40 MHz	659.732	75.79	0.86	0.66
UNII 1 ac 80 MHz	186.437	268.19	0.638	1.95
UNII 3 a	1420.684	35.19	0.93	0.31
UNII 3 n 20 MHz	1328.066	37.65	0.92	0.34
UNII 3 n 40 MHz	658.332	75.95	0.86	0.66
UNII 3 ac 20 MHz	1335.067	37.45	0.925	0.34
UNII 3 ac 40 MHz	658.932	75.88	0.857	0.67
UNII 3 ac 80 MHz	186.437	268.19	0.639	1.94

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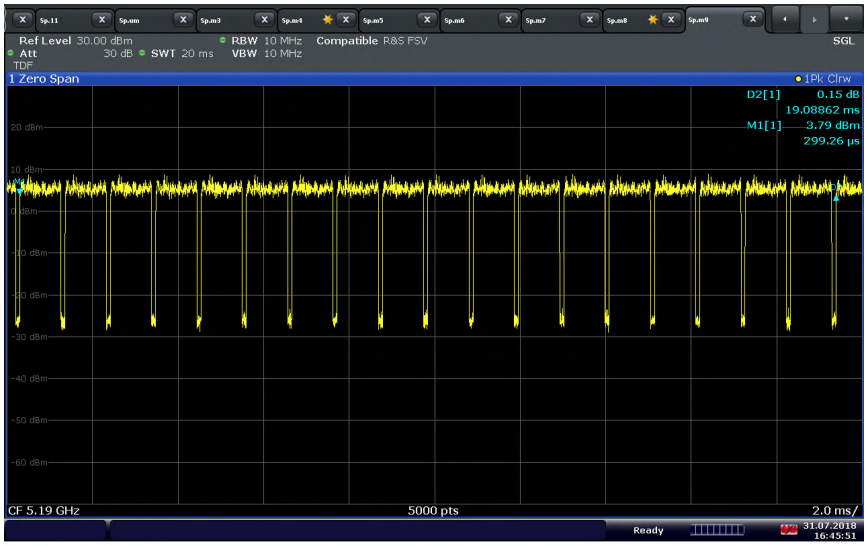

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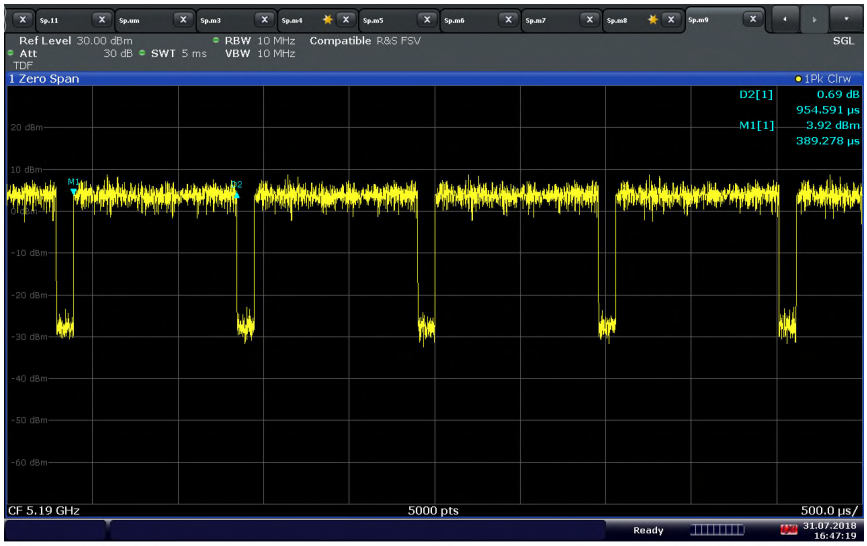
Sample Duty Cycle Calculation (802.11 a) 18 Tx /20 ms



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Sample *T* Verification (802.11 a)

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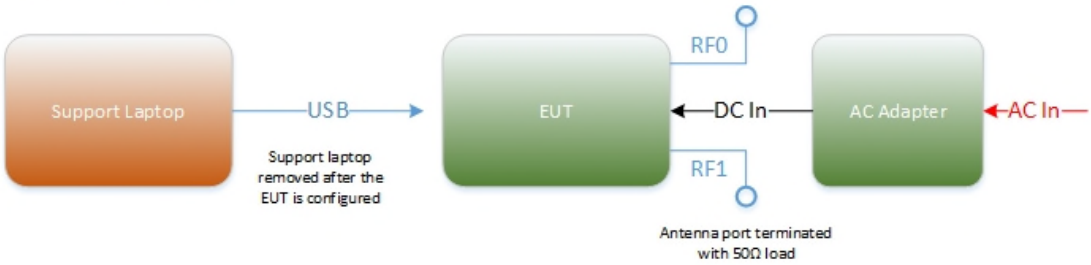
1.4.5 Simplified Test Configuration Diagram

Test Configuration A

Test Configuration B

Test Configuration C

Test Configuration D



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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 AZ280418A00067		
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.

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SECTION 2

TEST DETAILS

Radio Testing of the
Novatel Wireless Inc.
Wireless Hotspot Modem

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2.1 CONDUCTED EMISSIONS

2.1.1 Specification Reference

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

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 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.*

2.1.3 Equipment Under Test and Modification State

Serial No: AZ280418A00067/Test Configuration C

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

July 27, 2018/XYZ

2.1.5 Test Equipment Used

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

2.1.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	25.9 °C
Relative Humidity	56.1 %
ATM Pressure	98.7 kPa

2.1.7 Additional Observations

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 2.1.8 for sample computation.

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2.1.8 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**

2.1.9 Test Results

Compliant. See attached plots and tables.

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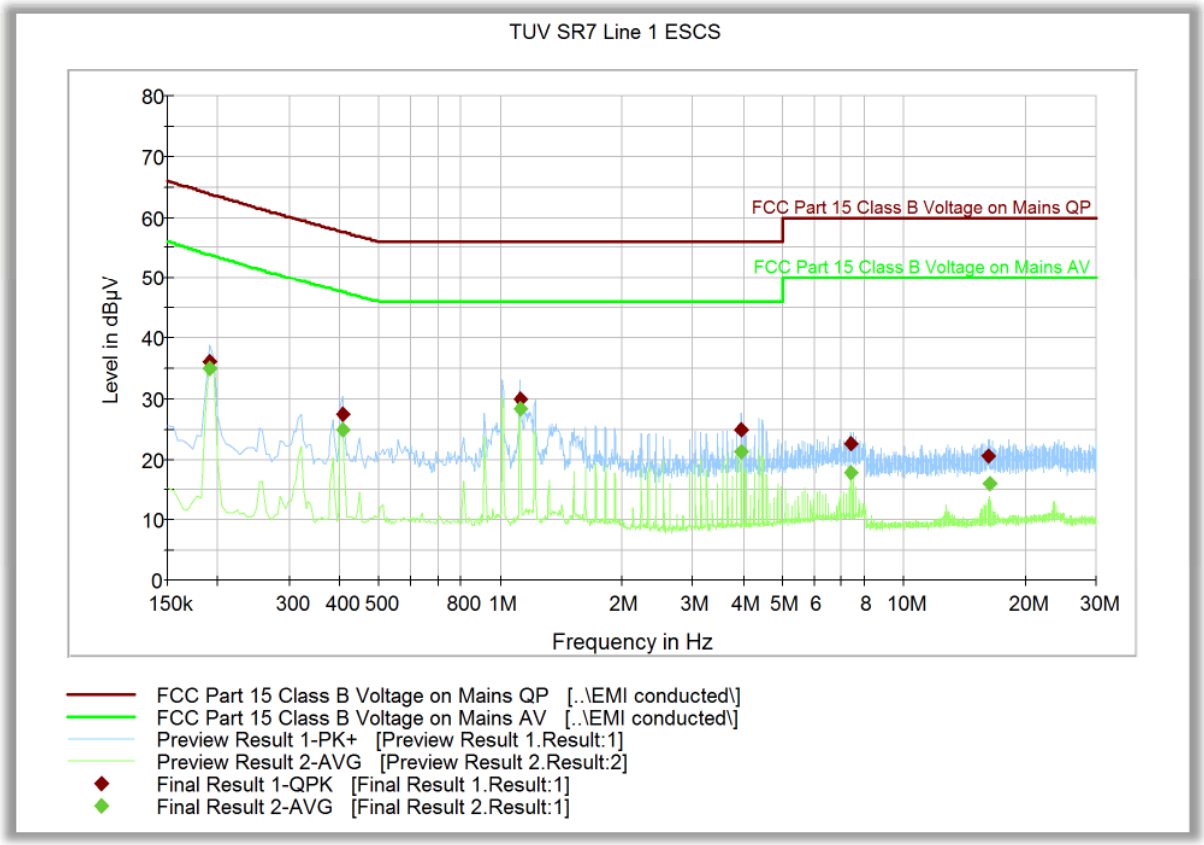
2.1.10 MIFI8800L 120VAC 60Hz (Line 1)



Quasi Peak

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV)
0.190500	36.1	1000.0	9.000	Off	L1	20.2	27.8	63.9
0.406500	27.5	1000.0	9.000	Off	L1	20.3	30.2	57.6
1.117500	29.9	1000.0	9.000	Off	L1	20.2	26.1	56.0
3.961500	25.0	1000.0	9.000	Off	L1	20.5	31.0	56.0
7.413000	22.6	1000.0	9.000	Off	L1	20.5	37.4	60.0
16.219500	20.6	1000.0	9.000	Off	L1	20.7	39.4	60.0

Average

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - Ave (dB)	Limit - Ave (dBµV)
0.190500	34.9	1000.0	9.000	Off	L1	20.2	19.0	53.9
0.406500	24.8	1000.0	9.000	Off	L1	20.3	22.8	47.6
1.117500	28.4	1000.0	9.000	Off	L1	20.2	17.6	46.0
3.961500	21.2	1000.0	9.000	Off	L1	20.5	24.8	46.0
7.413000	17.7	1000.0	9.000	Off	L1	20.5	32.3	50.0
16.251000	16.0	1000.0	9.000	Off	L1	20.7	34.0	50.0

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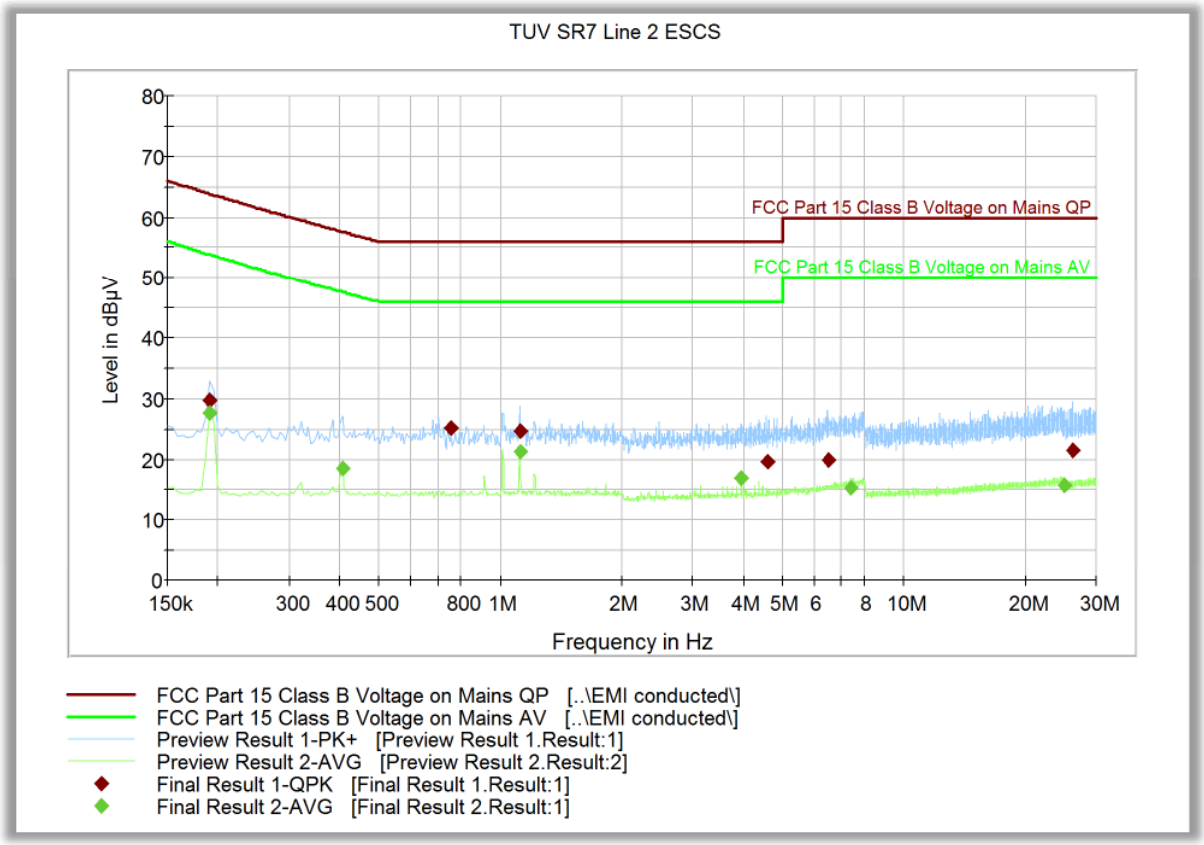
2.1.11 MIFI8800L 120VAC 60Hz (Line 2)



Quasi Peak

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV)
0.190500	29.7	1000.0	9.000	Off	N	20.2	34.2	63.9
0.757500	25.2	1000.0	9.000	Off	N	20.2	30.8	56.0
1.117500	24.8	1000.0	9.000	Off	N	20.3	31.2	56.0
4.578000	19.7	1000.0	9.000	Off	N	20.4	36.3	56.0
6.522000	19.9	1000.0	9.000	Off	N	20.6	40.1	60.0
26.196000	21.5	1000.0	9.000	Off	N	20.8	38.5	60.0

Average

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - Ave (dB)	Limit - Ave (dBµV)
0.190500	27.7	1000.0	9.000	Off	N	20.2	26.2	53.9
0.406500	18.4	1000.0	9.000	Off	N	20.3	29.2	47.6
1.117500	21.2	1000.0	9.000	Off	N	20.3	24.8	46.0
3.961500	17.0	1000.0	9.000	Off	N	20.5	29.0	46.0
7.413000	15.3	1000.0	9.000	Off	N	20.5	34.7	50.0
24.985500	15.9	1000.0	9.000	Off	N	20.7	34.1	50.0

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2.2 26 DB BANDWIDTH

2.2.1 Specification Reference

FCC CFR 47 Part 15, Clause 15.403(i)

2.2.2 Standard Applicable

(i) Emission bandwidth. For purposes of this subpart the emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum level of the modulated carrier. Determination of the emissions bandwidth is based on the use of measurement instrumentation employing a peak detector function with an instrument resolution bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement..

2.2.3 Test Methodology

Section II (C) (1) of 789033 D02 General UNII Test Procedures v02r01

2.2.4 Equipment Under Test and Modification State

Serial No: AZ280418A00067 / Test Configuration B

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

July 25 and 31, 2018/XYZ

2.2.6 Test Equipment Used

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

2.2.7 Environmental Conditions

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	25.9 - 27.7 °C
Relative Humidity	51.3 - 56.6 %
ATM Pressure	98.8 - 98.9 kPa

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2.2.8 Additional Observations

- This is a conducted test.
- Test methodology is per Section II (C) (1) of 789033 D02 General UNII Test Procedures v02r01 (December 14, 2017). All conditions under this Section were satisfied.
- Span is wide enough to capture the channel transmission.
- RBW is set approx. to 1% of anticipated EBW.
- VBW > RBW.
- Detector is peak.
- Trace is max hold.
- Sweep time is set to Auto.
- “n dB down” (26dB) marker function of the spectrum analyzer was used for this test.

2.2.9 Summary Test Results (For reporting purpose only)

26 dB Bandwidth			
WiFi Mode	**Low Channel**	**Middle Channel**	**High Channel**
802.11a U-NII 1	20.69 MHz	20.82 MHz	20.15 MHz
802.11n U-NII 1 (20 MHz)	21.16 MHz	21.42 MHz	20.86 MHz
802.11n U-NII 1 (40 MHz)	39.01 MHz	-	39.06 MHz
802.11ac U-NII 1 (20 MHz)	21.46 MHz	21.24 MHz	21.20 MHz
802.11ac U-NII 1 (40 MHz)	39.012 MHz	-	39.06 MHz
802.11ac U-NII 1 (80 MHz)	-	82.69 MHz	-
802.11a U-NII 3	23.06 MHz	22.27 MHz	21.94 MHz
802.11n U-NII 3 (20 MHz)	29.7 MHz	23.4 MHz	24.34 MHz
802.11n U-NII 3 (40 MHz)	69.41 MHz	-	58.53 MHz
802.11ac U-NII 3 (20 MHz)	23.51 MHz	22.06 MHz	22.1 MHz
802.11ac U-NII 3 (40 MHz)	63.87 MHz	-	74.74 MHz
802.11ac U-NII 3 (80 MHz)	-	148.77 MHz	-

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2.2.10 Sample Test Plots

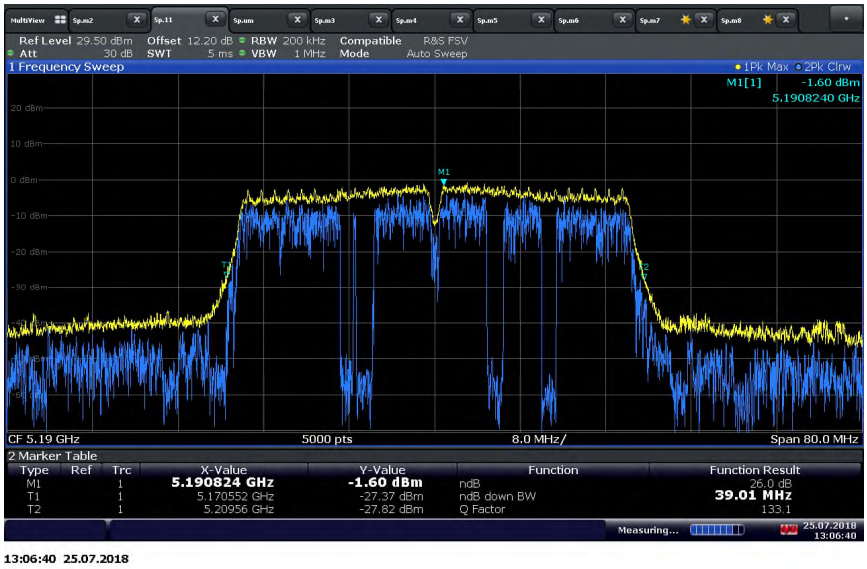
12:47:43 25.07.2018

802.11a U-NII 1 Middle Channel

13:00:06 25.07.2018

802.11n (20 MHz BW) U-NII 1 Middle Channel

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



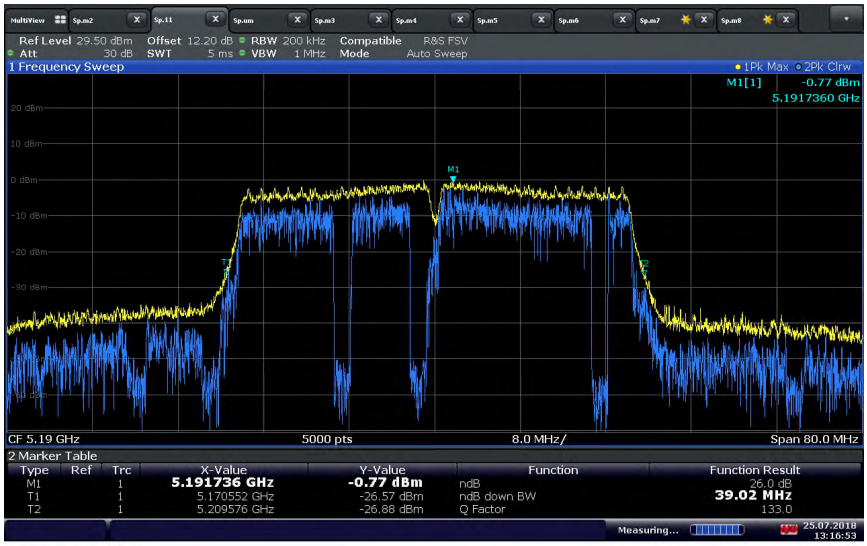
13:06:40 25.07.2018

802.11n (40 MHz BW) U-NII 1 Low Channel

13:12:50 25.07.2018

802.11ac (20 MHz BW) U-NII 1 Middle Channel

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



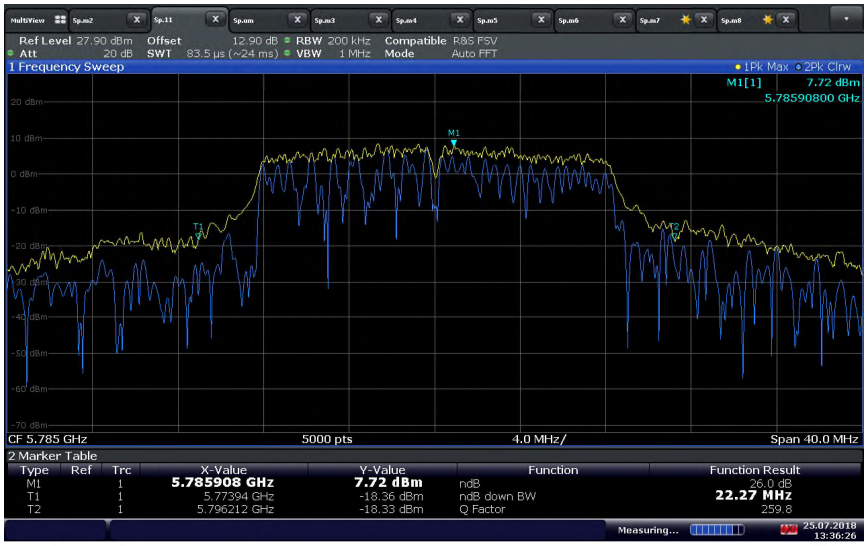
13:16:53 25.07.2018

802.11ac (40 MHz BW) U-NII 1 Low Channel

15:47:38 31.07.2018

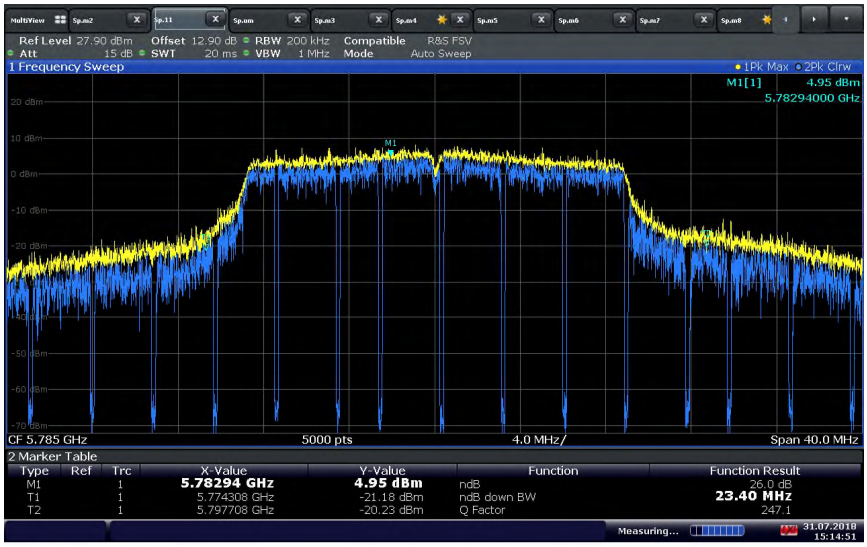
802.11ac (80 MHz BW) U-NII 1 Middle Channel

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



13:36:27 25.07.2018

802.11a U-NII 3 Middle Channel



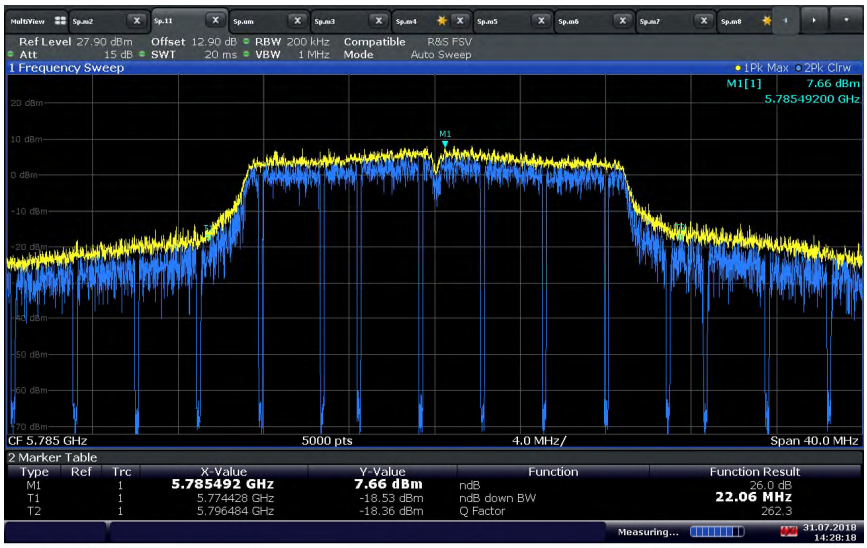
15:14:52 31.07.2018

802.11n (20 MHz BW) U-NII 3 Middle Channel

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

14:43:18 31.07.2018

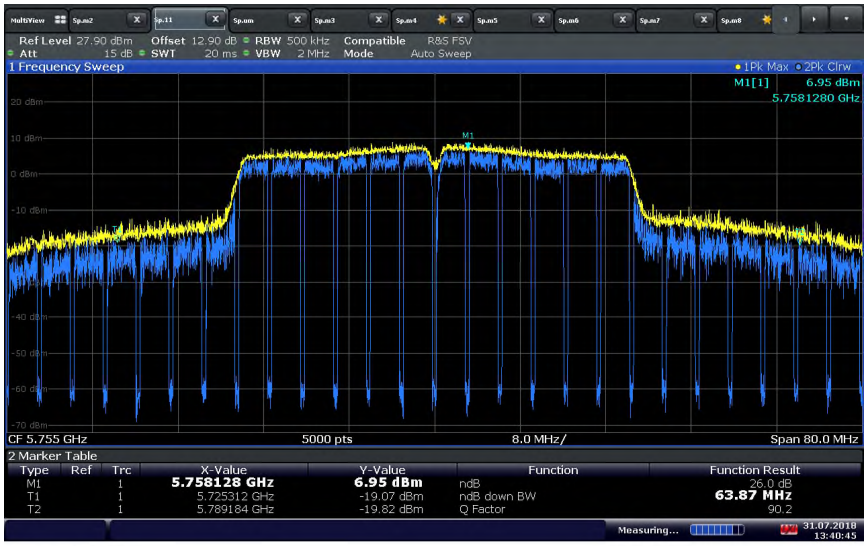
802.11n (40 MHz BW) U-NII 3 Low Channel



14:28:19 31.07.2018

802.11ac (20 MHz BW) U-NII 3 Middle Channel

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



13:40:45 31.07.2018

802.11ac (40 MHz BW) U-NII 3 Low Channel

13:18:13 31.07.2018

802.11ac (80 MHz BW) U-NII 3 Middle Channel

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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 Test Methodology

Section II (D) of 789033 D02 General UNII Test Procedures v02r01

2.3.4 Equipment Under Test and Modification State

Serial No: AZ280418A00067 / Test Configuration B

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

July 25 and 31, 2018/XYZ

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

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	25.9 - 27.7 °C
Relative Humidity	51.3 - 56.6 %
ATM Pressure	98.8 - 98.9 kPa

2.3.8 Additional Observations

- This is a conducted test.
- RBW is between 1% to 5% of the anticipated OBW.
- VBW is 3X RBW.
- Sweep is auto.
- Detector is peak.
- Span is 1.5 times to 5.0 times the OBW.
- 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.

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2.3.9 Summary Test Results (For reporting purpose only)

99% Bandwidth			
WiFi Mode	**Low Channel**	**Middle Channel**	**High Channel**
802.11a U-NII 1	16.62 MHz	16.55 MHz	16.72 MHz
802.11n U-NII 1 (20 MHz)	17.70 MHz	17.71 MHz	17.61 MHz
802.11n U-NII 1 (40 MHz)	36.0 MHz	-	36.05 MHz
802.11ac U-NII 1 (20 MHz)	17.63 MHz	17.71 MHz	17.68 MHz
802.11ac U-NII 1 (40 MHz)	36.0 MHz	-	36.304 MHz
802.11ac U-NII 1 (80 MHz)	-	75.94 MHz	-
802.11a U-NII 3	17.02 MHz	16.97 MHz	17.54 MHz
802.11n U-NII 3 (20 MHz)	18.64 MHz	18.39 MHz	18.76 MHz
802.11n U-NII 3 (40 MHz)	39.79 MHz	-	39.89 MHz
802.11ac U-NII 3 (20 MHz)	18.87 MHz	18.73 MHz	18.64 MHz
802.11ac U-NII 3 (40 MHz)	38.57 MHz	-	39.99 MHz
802.11ac U-NII 3 (80 MHz)	-	89.964 MHz	-

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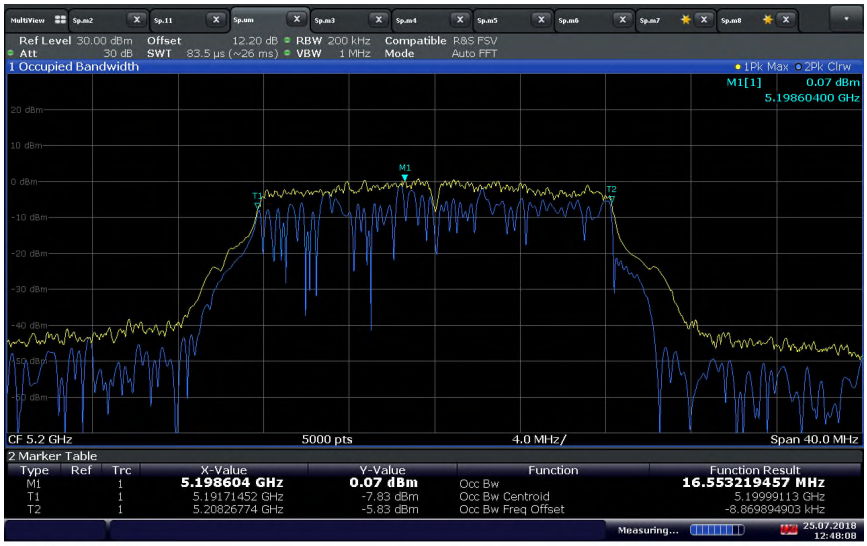
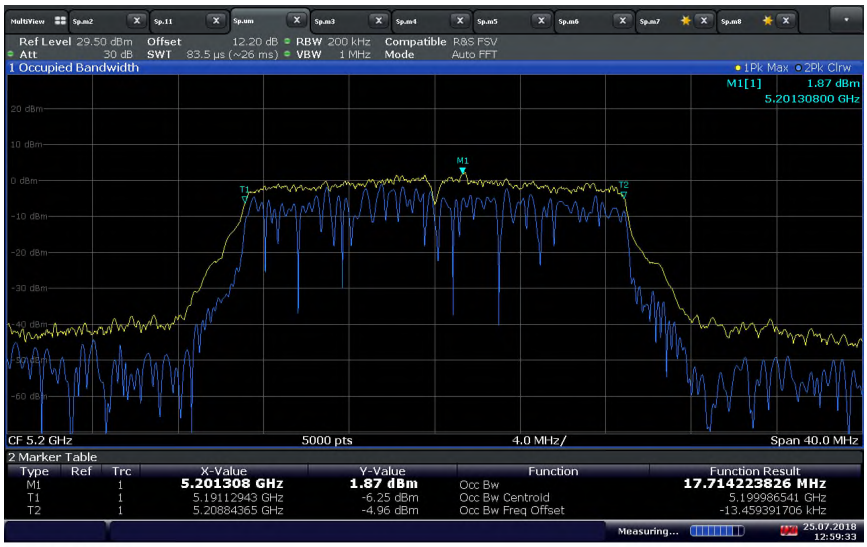
2.3.10 Test Plots



12:48:09 25.07.2018

802.11a U-NII 1 Middle Channel



12:59:33 25.07.2018

802.11n (20 MHz BW) U-NII 1 Middle Channel

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

13:06:12 25.07.2018

802.11n (40 MHz BW) U-NII 1 Low Channel

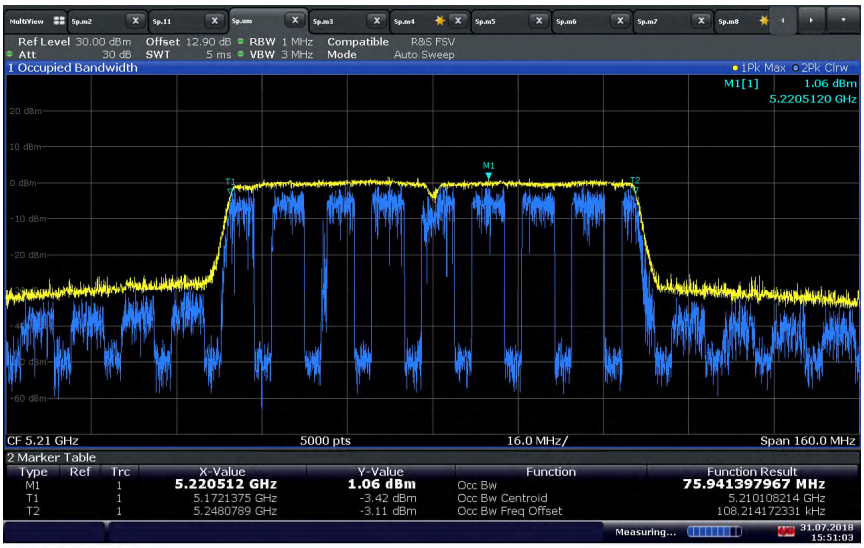
13:13:16 25.07.2018

802.11ac (20 MHz BW) U-NII 1 Middle Channel

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

13:17:23 25.07.2018

802.11ac (40 MHz BW) U-NII 1 Low Channel



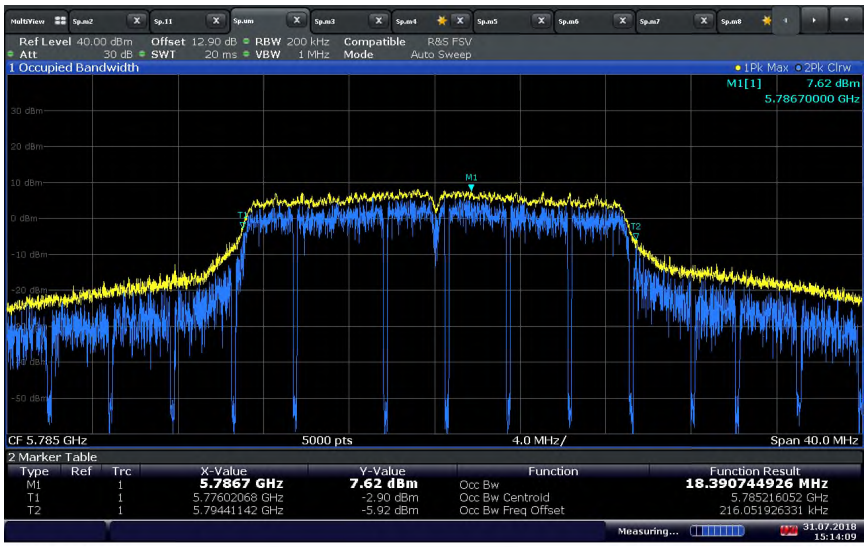
15:51:04 31.07.2018

802.11ac (80 MHz BW) U-NII 1 Middle Channel

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

13:35:20 25.07.2018

802.11a U-NII 3 Middle Channel



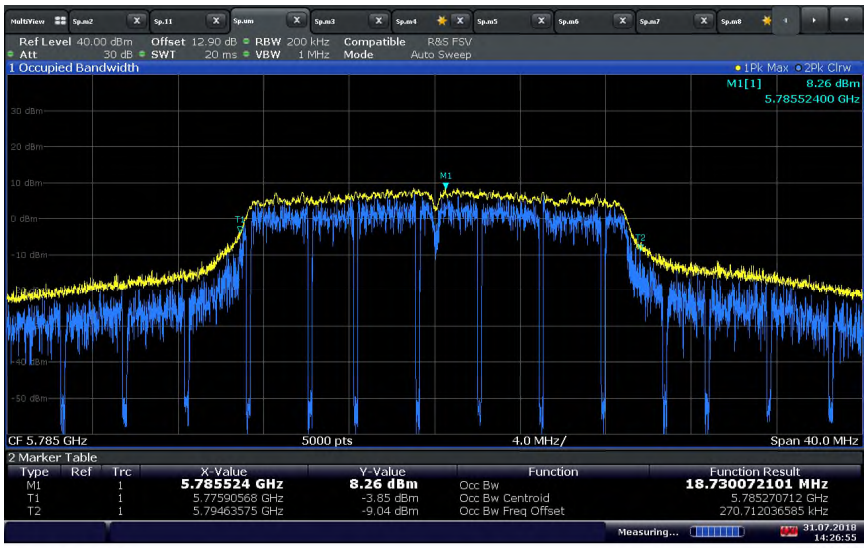
15:14:10 31.07.2018

802.11n (20 MHz BW) U-NII 3 Middle Channel

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

14:45:23 31.07.2018

802.11n (40 MHz BW) U-NII 3 Low Channel



14:26:56 31.07.2018

802.11ac (20 MHz BW) U-NII 3 Middle Channel

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

13:42:29 31.07.2018

802.11ac (40 MHz BW) U-NII 3 Low Channel

13:16:25 31.07.2018

802.11ac (80 MHz BW) U-NII 3 Middle Channel

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

2.4 MINIMUM 6DB BANDWIDTH

2.4.1 Specification Reference

FCC CFR 47 Part 15, Clause 15.407(e)
RSS-247, Section 6.2.4.1

2.4.2 Standard Applicable

FCC CFR 47 Part 15, Clause 15.407:
(e) Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

RSS-247, Section 6.2.4.1:
For equipment operating in the band 5725-5850 MHz, the minimum 6 dB bandwidth shall be at least 500 kHz.

2.4.3 Test Methodology

Section II (C) (2) of 789033 D02 General UNII Test Procedures v02r01

2.4.4 Equipment Under Test and Modification State

Serial No: AZ280418A00067 / Test Configuration B

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

July 25 and 31, 2018/XYZ

2.4.6 Test Equipment Used

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

2.4.7 Environmental Conditions

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	25.9 - 27.7 °C
Relative Humidity	51.3 - 56.6 %
ATM Pressure	98.8 - 98.9 kPa

2.4.8 Additional Observations

- This is a conducted test.
- Span is wide enough to capture the channel transmission.
- RBW is 100kHz.
- VBW is 3X RBW.
- Sweep is auto.
- Detector is Peak.
- Trace mode is Max Hold

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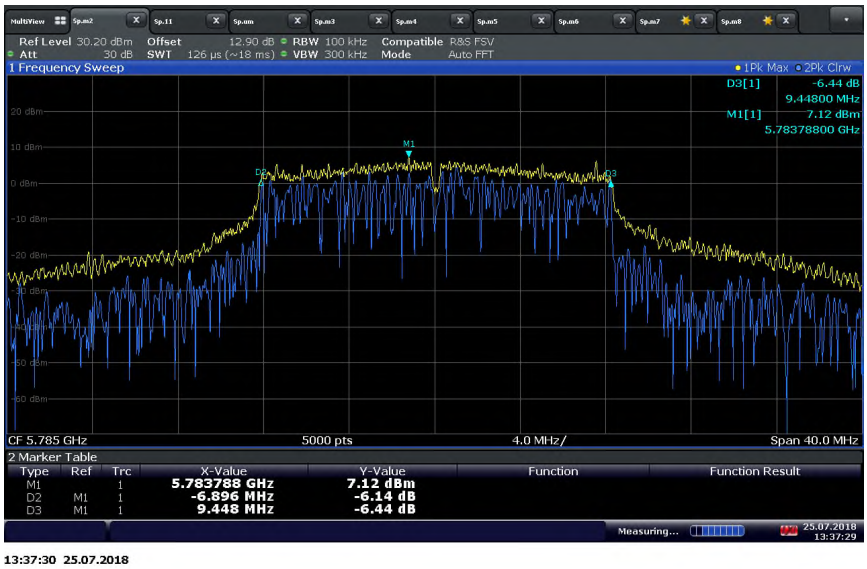
2.4.9 Summary Test Results

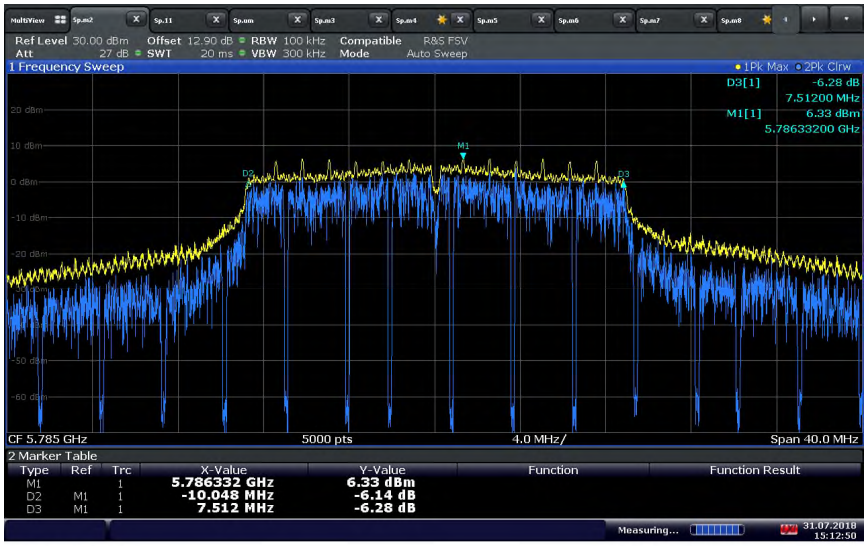
Minimum 6dB Bandwidth (>500kHz)			
WiFi Mode	**Low Channel**	**Middle Channel**	**High Channel**
802.11a U-NII 3	16.368 MHz	16.344 MHz	16.448 MHz
802.11n U-NII 3 (20 MHz)	17.552 MHz	17.56 MHz	17.568 MHz
802.11n U-NII 3 (40 MHz)	36.344 MHz	-	36.32 MHz
802.11ac U-NII 3 (20 MHz)	17.568 MHz	17.568 MHz	17.56 MHz
802.11ac U-NII 3 (40 MHz)	36.104 MHz	-	36.32 MHz
802.11ac U-NII 3 (80 MHz)	-	75.702 MHz	-

2.4.10 Sample Test Plots



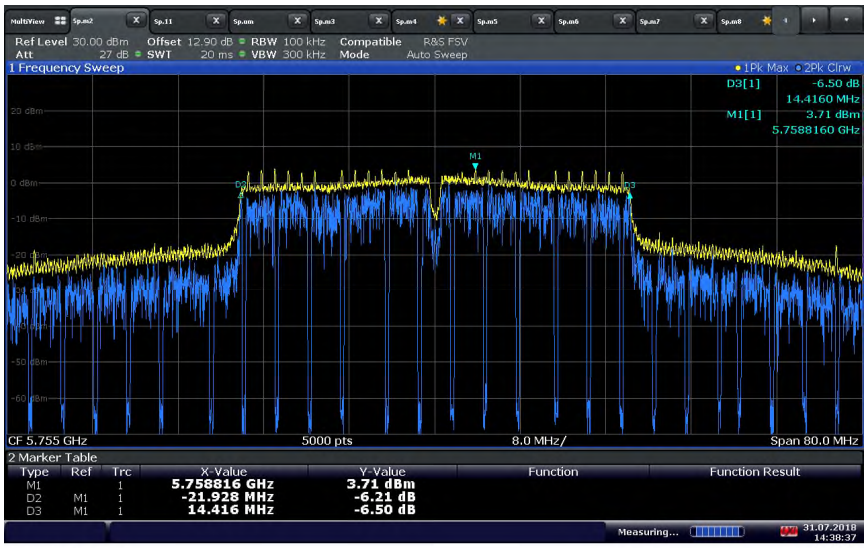
802.11a U-NII 3 Middle Channel

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



15:12:51 31.07.2018

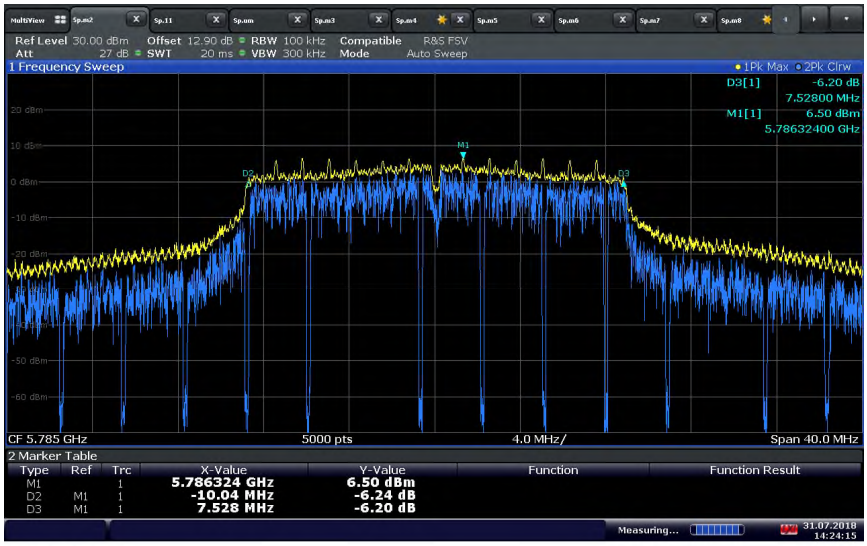
802.11n (20 MHz BW) U-NII 3 Middle Channel



14:38:38 31.07.2018

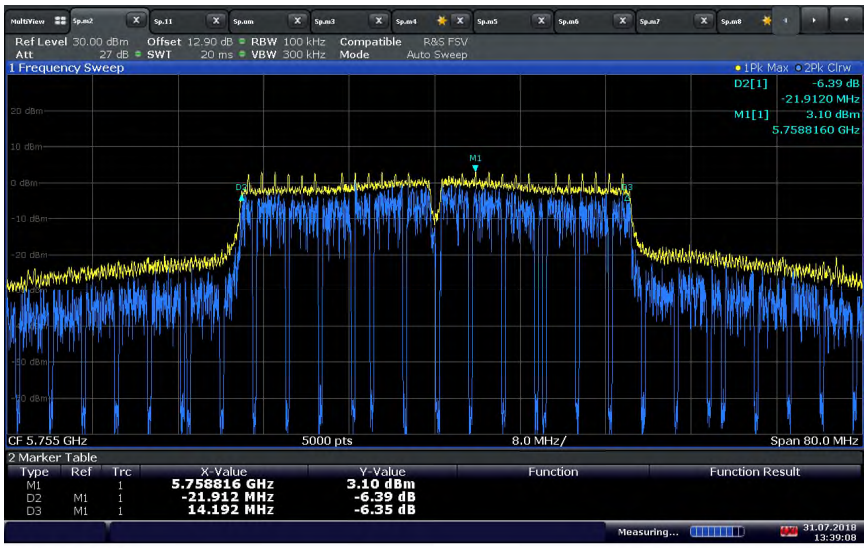
802.11n (40 MHz BW) U-NII 3 Low Channel

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



14:24:16 31.07.2018

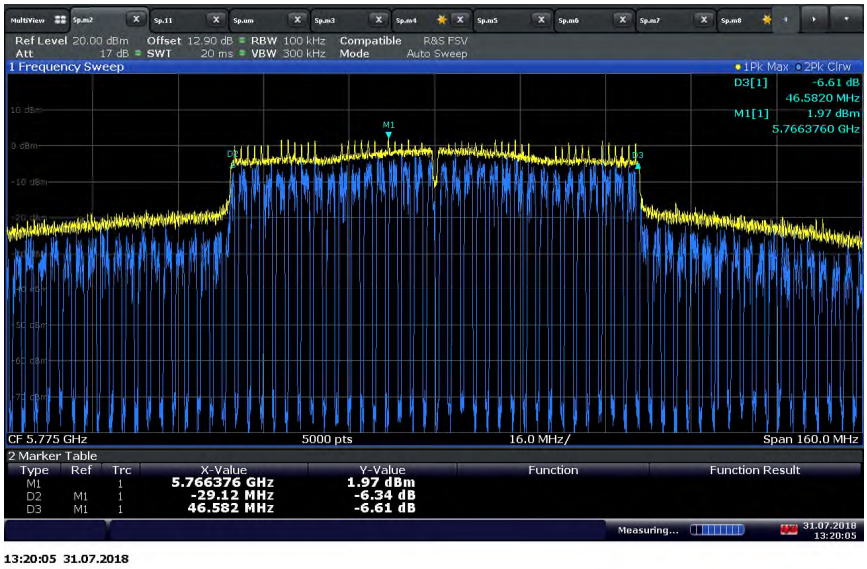
802.11ac (20 MHz BW) BW U-NII 3 Middle Channel



13:39:09 31.07.2018

802.11ac (40 MHz BW) U-NII 3 Low Channel

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



802.11ac (80 MHz BW) U-NII 3 Middle Channel

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2.5 MAXIMUM CONDUCTED OUTPUT POWER

2.5.1 Specification Reference

FCC CFR 47 Part 15, Clause 15.407(a)(1)(ii) and (a)(3)
RSS-247, Section 6.2.1.1 and 6.2.4.1

2.5.2 Standard Applicable

FCC CFR 47 Part 15, Clause 15.407 (a)(1) :
(ii) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

FCC CFR 47 Part 15, Clause 15.407 (a):
(3) For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

RSS-247, Section 6.2.1.1:
The maximum e.i.r.p. (5150 – 5250 MHz) shall not exceed 200 mW or 10 + 10 $\log_{10}$B, dBm, whichever power is less. B is the 99% emission bandwidth in megahertz. The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

RSS-247, Section 6.2.4.1:
The maximum conducted output power (5725 – 5850 MHz) shall not exceed 1 W. The power spectral density shall not exceed 30 dBm in any 500 kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications and multiple collocated transmitters transmitting the same information.

2.5.3 Test Methodology

Section II (E)(3)(a) of 789033 D02 General UNII Test Procedures v02r01

2.5.4 Equipment Under Test and Modification State

Serial No: AZ280418A00067/ Test Configuration A

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

July 24 and 25, 27, 2018 / XYZ

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

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	24.9 - 25.9 °C
Relative Humidity	55.9 - 56.6 %
ATM Pressure	98.7 - 98.9 kPa

2.5.8 Additional Observations

- This is a conducted test (Maximum conducted [average] output power) using direct connection to power meters. Both antenna ports were monitored even in SISO mode.
- Path loss was measured and added to compensate for the external attenuator and cable used.
- Only the worst case data rate/modulation for each mode presented.
- Test methodology is per Section II E (3)(a) Method PM of 789033 D02 General UNII Test Procedures v02r01 (December 14, 2017).
- The EUT transmits continuously.

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2.5.9 Test Results

WLAN Mode	Channel	Data Rates (Mbps)	Maximum Conducted Output Power (dBm)	
			Worst Case TX Chain	MIMO
802.11a U-NII 1 (5150 MHz to 5250 MHz)	36 (5180 MHz)	9	11.58	14.44
	40 (5200 MHz)	9	11.43	14.85
	48 (5240 MHz)	**9**	**11.88**	**14.97**
802.11n 20MHz BW U-NII 1 (5150 MHz to 5250 MHz)	36 (5180 MHz)	14.4 (MCS1)	11.92	14.02
	40 (5200 MHz)	14.4 (MCS1)	11.92	14.84
	48 (5240 MHz)	**14.4 (MCS1)**	**11.71**	**14.94**
802.11n 40MHz BW U-NII 1 (5150 MHz to 5250 MHz)	38 (5190 MHz) Program channel is 36	15 (MCS0)	11.72	14.56
	46 (5230 MHz) Program channel is 44	15 (MCS0)	11.95	14.67
802.11ac 20MHz BW U-NII 1 (5150 MHz to 5250 MHz)	36 (5180 MHz)	14.4 (MCS1)	11.36	13.18
	40 (5200 MHz)	14.4 (MCS1)	11.33	13.16
	48 (5240 MHz)	14.4 (MCS1)	11.9	13.3
802.11ac 40MHz BW U-NII 1 (5150 MHz to 5250 MHz)	**38 (5190 MHz) Program channel is 36**	**15 (MCS0)**	**11.98**	**13.62**
	46 (5230 MHz) Program channel is 44	15 (MCS0)	11.7	13.55
802.11ac 80MHz BW U-NII 1 (5150 MHz to 5250 MHz)	42 (5210 MHz) Program channel is 36	97.5 (MCS2)	11.52	13.3

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WLAN Mode	Channel	Data Rates (Mbps)	Maximum Conducted Output Power (dBm)	
			Worst Case TX Chain	MIMO
802.11a U-NII 3 (5725 MHz to 5850 MHz)	149 (5745 MHz)	6	19.51	21.28
	157 (5785 MHz)	**6**	**19.64**	**21.49**
	165 (5825 MHz)	6	19.56	21.32
802.11n 20MHz BW U-NII 3 (5725 MHz to 5850 MHz)	149 (5745 MHz)	7.2 (MCS0)	19.41	19.96
	157 (5785 MHz)	7.2 (MCS0)	19.46	20.15
	165 (5825 MHz)	**7.2 (MCS0)**	**19.3**	**20.17**
802.11n 40MHz BW U-NII 3 (5725 MHz to 5850 MHz)	151 (5755 MHz) Program channel is 149	15 (MCS0)	19.59	19.4
	159 (5795 MHz) Program channel is 157	15 (MCS0)	19.56	19.55
802.11ac 20MHz BW U-NII 3 (5725 MHz to 5850 MHz)	149 (5745 MHz)	7.2 (MCS0)	19.38	20.78
	157 (5785 MHz)	**7.2 (MCS0)**	**19.33**	**20.84**
	165 (5825 MHz)	7.2 (MCS0)	19.43	20.74
802.11ac 40MHz BW U-NII 3 (5725 MHz to 5850 MHz)	151 (5755 MHz) Program channel is 149	15 (MCS0)	19.55	19.16
	159 (5795 MHz) Program channel is 157	15 (MCS0)	19.55	19.4
802.11ac 80MHz BW U-NII 3 (5725 MHz to	155 (5775 MHz) Program channel is 149	97.5 (MCS2)	17.08	18.01

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2.5.10 Test Results Summary

WLAN Mode	Maximum Conducted Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	FCC Limit (dBm)	ISED Limit (dBm)
802.11a U-NII 1	14.97	3.2	18.17	30.0	22.19*
802.11n U-NII 1	14.94	3.2	18.14		23.01
802.11ac U-NII 1	13.62	3.2	16.82		23.01
802.11a U-NII 3	21.49	2.9	24.39		30.0
802.11n U-NII 3	20.17	2.9	23.07		30.0
802.11ac U-NII 3	20.84	2.9	23.74		30.0

**Alternative limit is from 10 +10log(16.55 MHz) which is less than 200mW limit*

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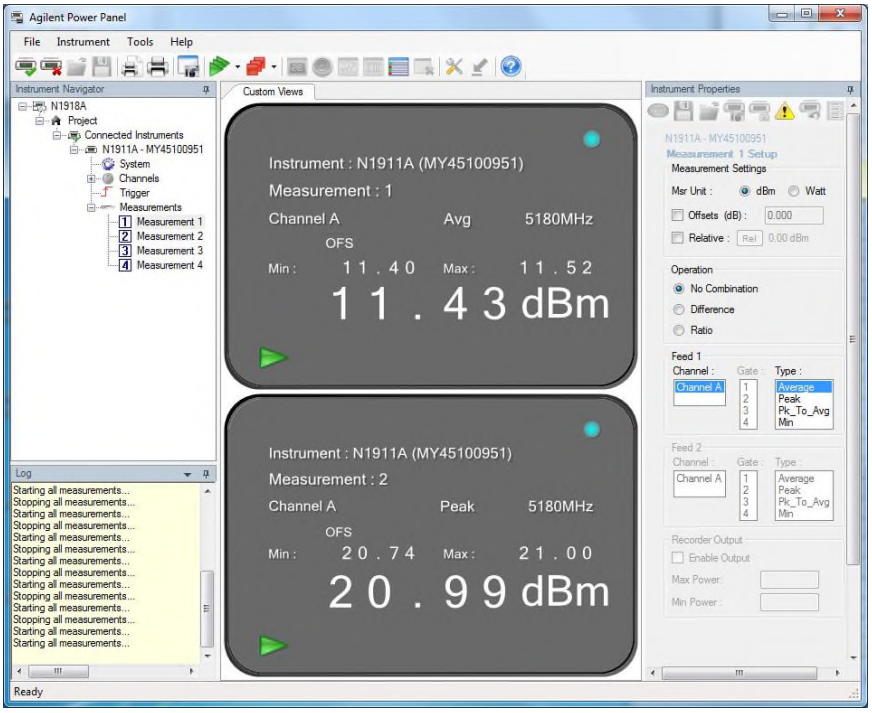
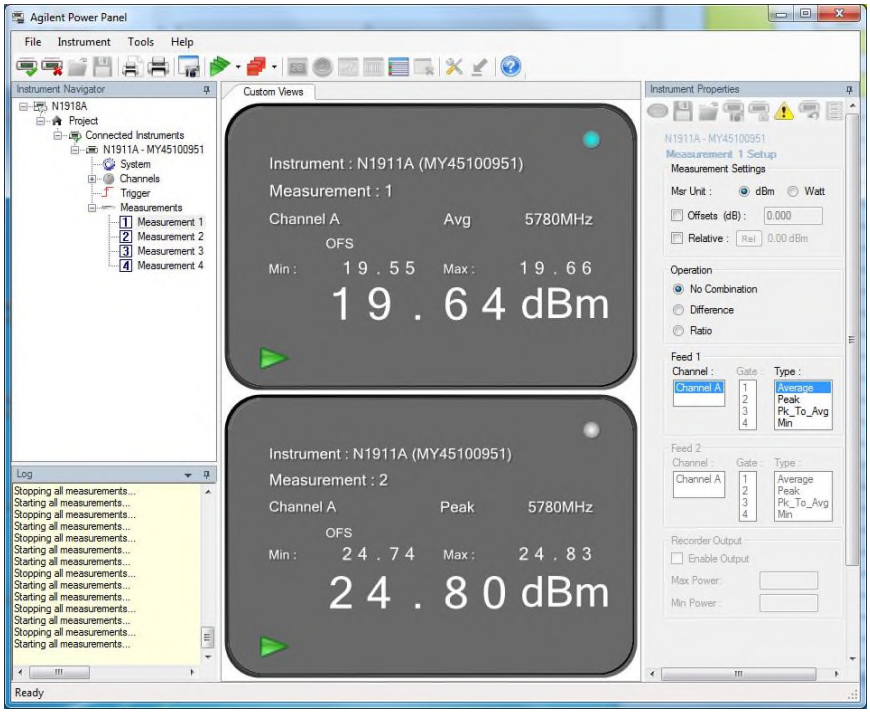
2.5.11 Sample Test Plots



802.11a Middle Channel U-NII 1 9 Mbps RF0



802.11a Middle Channel U-NII 3 6 Mbps RF0

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2.6 MAXIMUM POWER SPECTRAL DENSITY (PSD)

2.6.1 Specification Reference

FCC CFR 47 Part 15, Clause 15.407(a)(1)(ii) and (a)(3)
RSS-247, Section 6.2.1.1 and 6.2.4.1

2.6.2 Standard Applicable

FCC CFR 47 Part 15, Clause 15.407 (a)(1):
(ii) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

FCC CFR 47 Part 15, Clause 15.407 (a):
(3) For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

RSS-247, Section 6.2.1.1:
The maximum e.i.r.p. (5150 – 5250 MHz) shall not exceed 200 mW or 10 + 10 $\log_{10}$B, dBm, whichever power is less. B is the 99% emission bandwidth in megahertz. The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

RSS-247, Section 6.2.4.1:
The maximum conducted output power (5725 – 5850 MHz) shall not exceed 1 W. The power spectral density shall not exceed 30 dBm in any 500 kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications and multiple collocated transmitters transmitting the same information.

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2.6.3 Test Methodology

Section II (F) PSD of 789033 D02 General UNII Test Procedures v02r01

2.6.4 Equipment Under Test and Modification State

Serial No: AZ280418A00067 / Test Configuration B

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

July 25 and August 01, 2018/XYZ

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

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	25.9 - 27.2 °C
Relative Humidity	52.4 - 56.6 %
ATM Pressure	98.9 kPa

2.6.8 Additional Observations

- This is a conducted test as per Section II (F) PSD of 789033 D02 General UNII Test Procedures v02r01 (December 14, 2017). All conditions under this Section were satisfied.
- Path loss was measured and added to compensate for the external attenuator and cable used.
- Only the worst case data rate/modulation for each mode presented.
- RBW for U-NII 1 is 1MHz while 500 kHz for U-NII 3.
- The measurement is adjusted by adding Duty Cycle Correction Factor (DCCF) 10 log(1/x) where x is the duty cycle.

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2.6.9 Test Results

WLAN Mode	Channel	Power Spectral Density (dBm/MHz)	DCCF (dB)	Calculated Max. PSD (dBm/MHz)	Limit (dBm)
802.11a U-NII 1	36 (5180 MHz)	-0.5	0.46	0.1/3.3 EIRP	17 dBm/MHz and 10 dBm/MHz EIRP
	40 (5200 MHz)	0.53		1.13/4.33 EIRP	
	48 (5240 MHz)	0.72		1.32/4.52 EIRP	
802.11n U-NII 1 20 MHz BW	36 (5180 MHz)	0.73	0.64	1.37/44.57 EIRP	17 dBm/MHz and 10 dBm/MHz EIRP
	40 (5200 MHz)	1.14		1.78/4.98 EIRP	
	48 (5240 MHz)	1.45		2.09/5.29 EIRP	
802.11n U-NII 1 40 MHz BW	38 (5190 MHz)	-2.92	0.67	-2.25/0.95 EIRP	17 dBm/MHz and 10 dBm/MHz EIRP
	46 (5230 MHz)	-2.44		-1.77/1.43 EIRP	
802.11ac U-NII 1 20 MHz BW	36 (5180 MHz)	-0.19	0.34	0.15/3.35 EIRP	17 dBm/MHz and 10 dBm/MHz EIRP
	40 (5200 MHz)	0.42		0.76/3.96 EIRP	
	48 (5240 MHz)	0.54		0.88/4.08 EIRP	
802.11ac U-NII 1 40 MHz BW	38 (5190 MHz)	-2.23	0.66	-1.57/1.63 EIRP	17 dBm/MHz and 10 dBm/MHz EIRP
	46 (5230 MHz)	-1.84		-1.18/2.02 EIRP	
802.11ac U-NII 1 80 MHz BW	42 (5210 MHz)	-5.61	1.95	-3.66/-0.46 EIRP	17 dBm/MHz and 10 dBm/MHz EIRP

WLAN Mode	Channel	Power Spectral Density (dBm/500kHz)	DCCF (dB)	Calculated Max. PSD (dBm/500kHz)	Limit (dBm)
802.11a U-NII 3	149 (5745 MHz)	5.84	0.31	6.15	30 dBm/500 kHz
	157 (5785 MHz)	5.96		6.27	
	165 (5825 MHz)	5.95		6.26	
802.11n U-NII 3 20 MHz BW	149 (5745 MHz)	5.61	0.34	5.95	30 dBm/500 kHz
	157 (5785 MHz)	5.5		5.84	
	165 (5825 MHz)	5.6		5.94	
802.11n U-NII 3 40 MHz BW	151 (5755 MHz)	2.26	0.66	2.92	30 dBm/500 kHz
	159 (5795 MHz)	2.74		3.4	
802.11ac U-NII 3 20 MHz BW	149 (5745 MHz)	5.79	0.34	6.13	30 dBm/500 kHz
	157 (5785 MHz)	5.96		6.3	
	165 (5825 MHz)	5.92		6.26	
802.11ac U-NII 3 40 MHz BW	151 (5755 MHz)	2.01	0.67	2.68	30 dBm/500 kHz
	159 (5795 MHz)	2.7		3.37	
802.11ac U-NII 3 80 MHz BW	155 (5775 MHz)	-0.98	1.94	0.96	30 dBm/500 kHz

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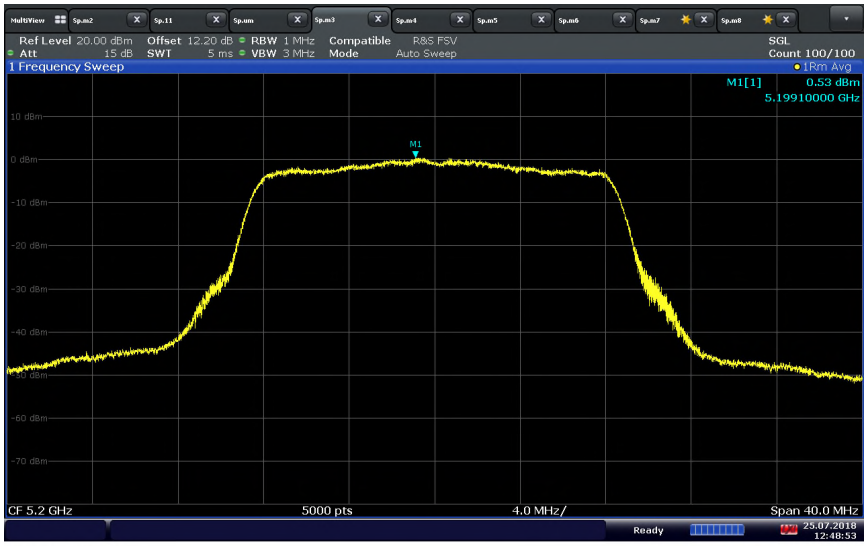
2.6.10 Sample Test Plots



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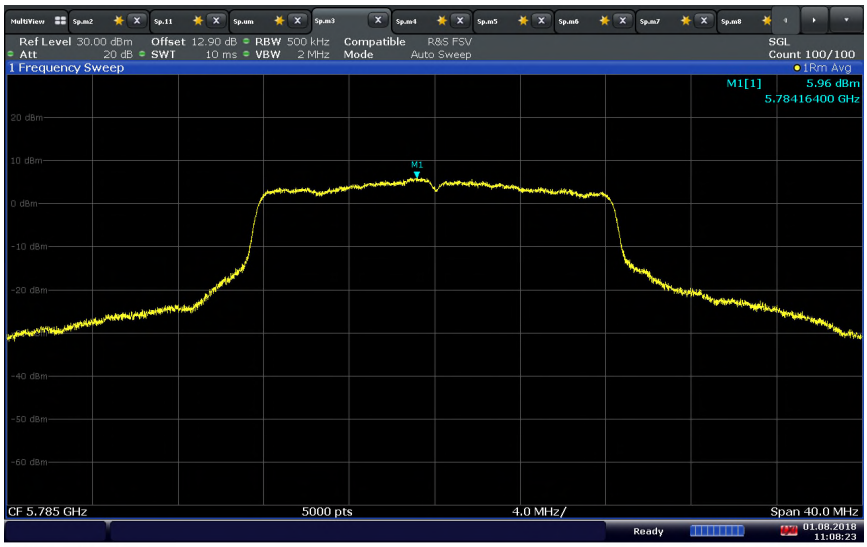
802.11a U-NII 1 Middle Channel



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802.11a U-NII 3 Middle Channel

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2.7 UNWANTED EMISSIONS MEASUREMENT

2.7.1 Specification Reference

FCC CFR 47 Part 15, Clause 15.407(b)(1), (4)(i) and (7)
FCC CFR 47 Part 15, Clause 15.209
RSS-247, Section 6.2.1.2 and 6.2.4.2

2.7.2 Standard Applicable

FCC CFR 47 Part 15, Clause 15.407:
(b) Undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:
(1) 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 e.i.r.p. of −27 dBm/MHz.

(4) For transmitters operating in the 5.725-5.85 GHz band
(i) All emissions shall be limited to a level of −27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

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

RSS-247, Section 6.2.1.2:
For transmitters with operating frequencies in the band 5150-5250 MHz, all emissions outside the band 5150-5350 MHz shall not exceed -27 dBm/MHz e.i.r.p. Any unwanted emissions that fall into the band 5250-5350 MHz shall be attenuated below the channel power by at least 26 dB, when measured using a resolution bandwidth between 1 and 5% of the occupied bandwidth (i.e. 99% bandwidth), above 5250 MHz. The 26 dB bandwidth may fall into the 5250-5350 MHz band; however, if the occupied bandwidth also falls within the 5250-5350 MHz band, the transmission is considered as intentional and the devices shall comply with all requirements in the band 5250-5350 MHz including implementing dynamic frequency selection (DFS) and TPC, on the portion of the emission that resides in the 5250-5350 MHz band.

RSS-247, Section 6.2.4.2:
Devices operating in the band 5725-5850 MHz shall have e.i.r.p. of unwanted emissions comply with the following:

a) 27 dBm/MHz at frequencies from the band edges decreasing linearly to 15.6 dBm/MHz at 5 MHz above or below the band edges;
b) 15.6 dBm/MHz at 5 MHz above or below the band edges decreasing linearly to 10 dBm/MHz at 25 MHz above or below the band edges;
c) 10 dBm/MHz at 25 MHz above or below the band edges decreasing linearly to -27 dBm/MHz at 75 MHz above or below the band edges; and
d) -27 dBm/MHz at frequencies more than 75 MHz above or below the band edges.

2.7.3 Test Methodology

Section II (G) Unwanted Emission Measurement of 789033 D02 General UNII Test Procedures v02r01

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2.7.4 Equipment Under Test and Modification State

Serial No: AZ280418A00067 / Test Configuration B and C

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

July 27, 28 and August 01, 2018/XYZ

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

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	25.9 - 27.2 °C
Relative Humidity	52.4 - 57.0 %
ATM Pressure	98.7 - 98.9 kPa

2.7.8 Additional Observations

- This is an antenna-port conducted measurement test plus radiated cabinet spurious emissions measurements.
- For conducted measurement, only the worst case data rate/modulation presented.
- Sweep time is set to auto.
- Transducer Factor (TDF) was added to compensate for the external attenuator and cable used.
- Antenna gain was added and additional 3dB offset was added for MIMO mode (verification performed on worst case antenna port).
- When measuring conducted cabinet spurious emissions, the field strength limit of 15.209 is first converted to dBm (EIRP) using the formula under Section G(2)d)(ii) of 789033 D02 General UNII Test Procedures v02r01 for below 1GHz measurements, otherwise §15.407 limits applies. If Peak complies with the limit, no Average evaluation will be performed (above 1GHz measurements).
- Only worst case configuration (channel, data rate or MCS and BW) used for radiated cabinet spurious emissions test.
- Radiated 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 2.7.9 for sample computation.

2.7.9 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**

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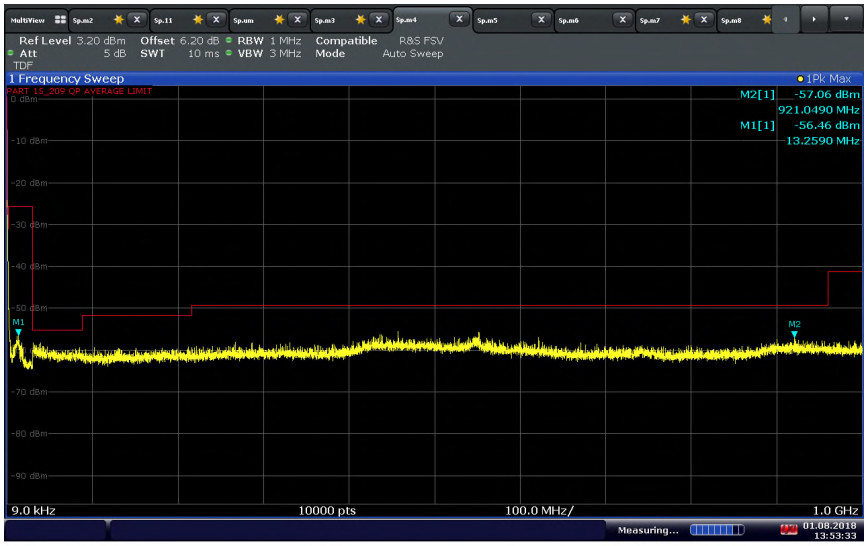
2.7.10 Test Plots



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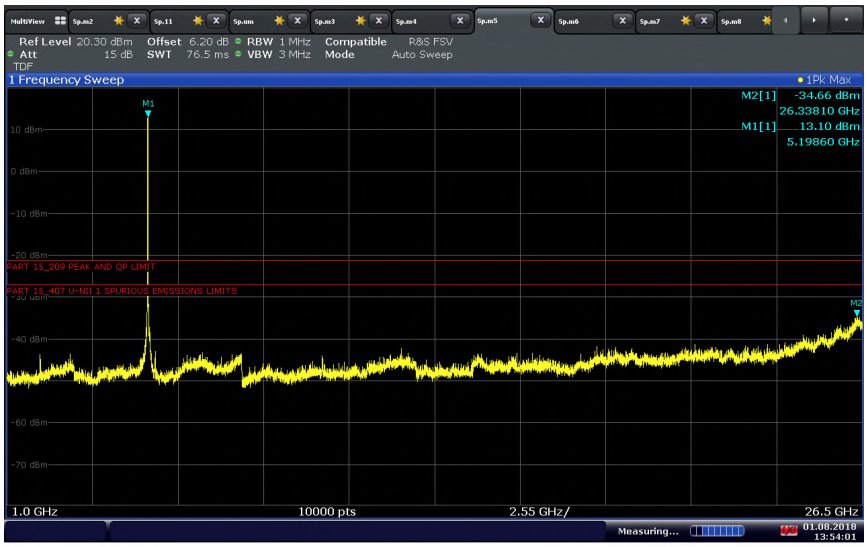
802.11 a U-NII 1 Low Channel below 1GHz



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802.11a U-NII 1 Low Channel above 1GHz

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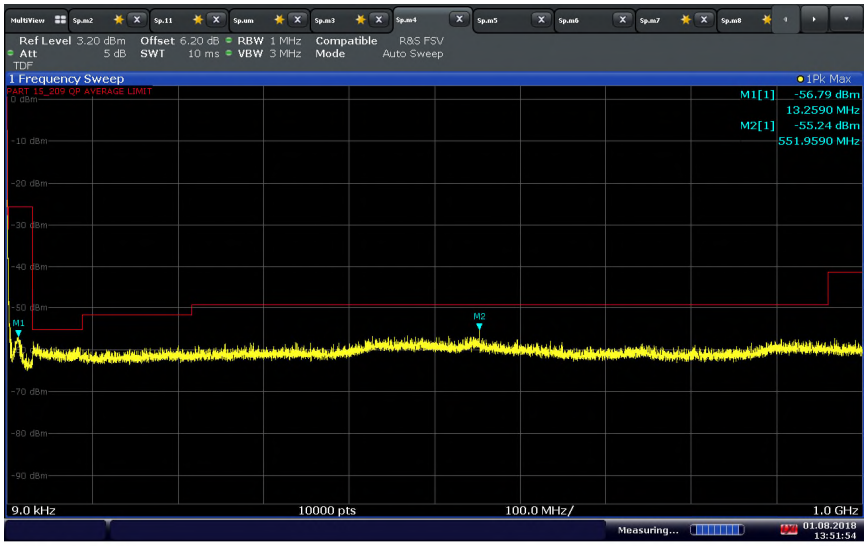

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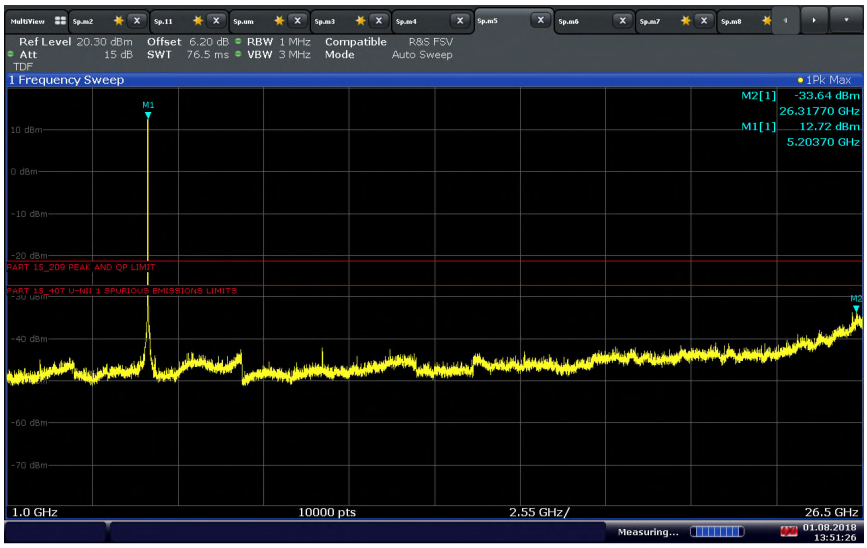
802.11 a U-NII 1 Middle Channel below 1GHz



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802.11a U-NII 1 Middle Channel above 1GHz

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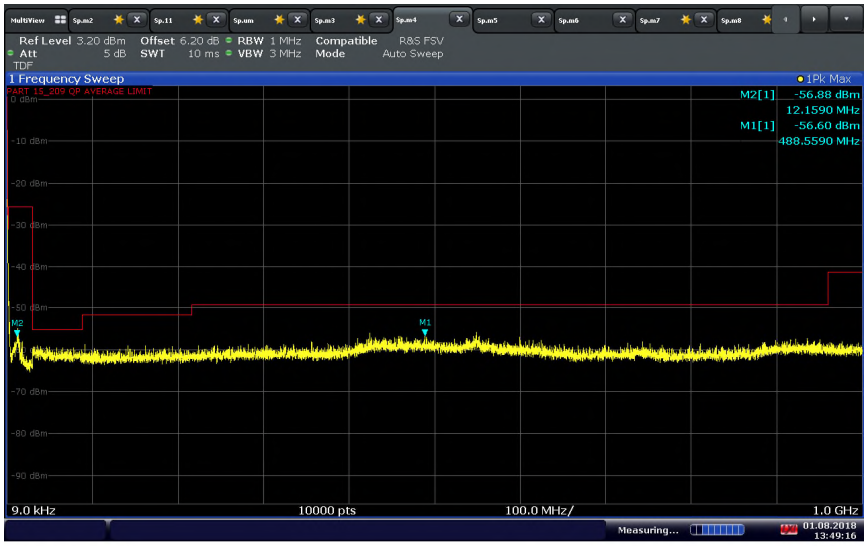

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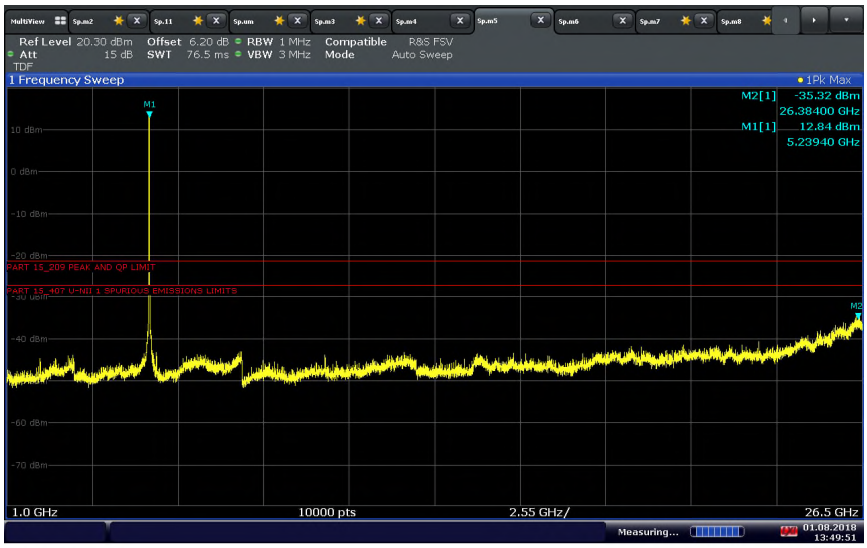
802.11 a U-NII 1 High Channel below 1GHz



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802.11a U-NII 1 High Channel above 1GHz

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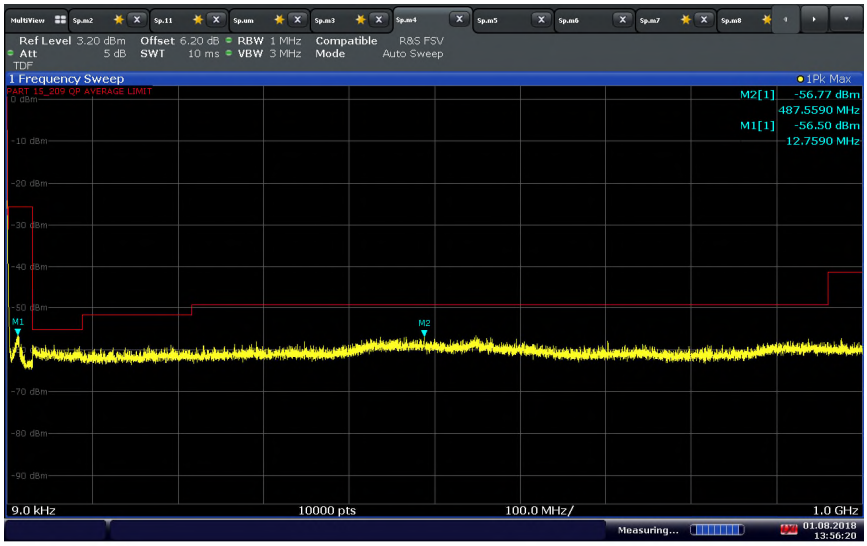

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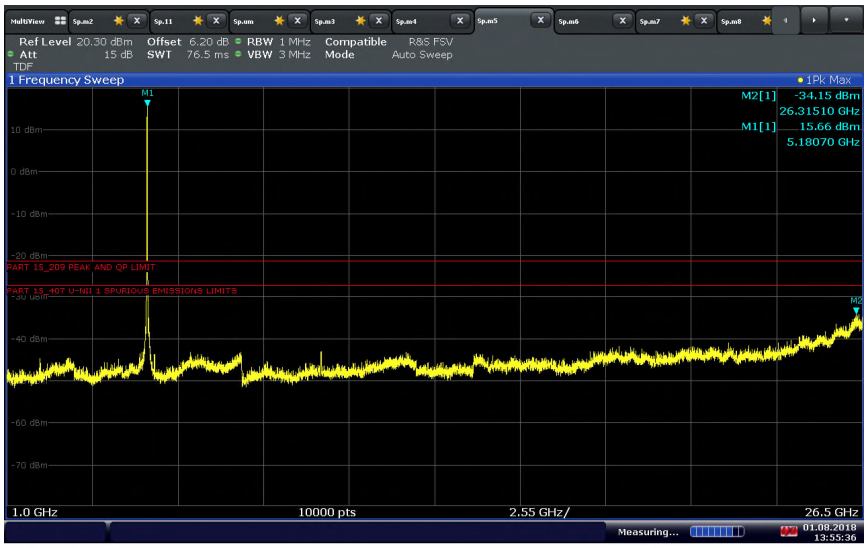
802.11 n (20 MHz) U-NII 1 Low Channel below 1GHz



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802.11 n (20 MHz) U-NII 1 Low Channel above 1GHz

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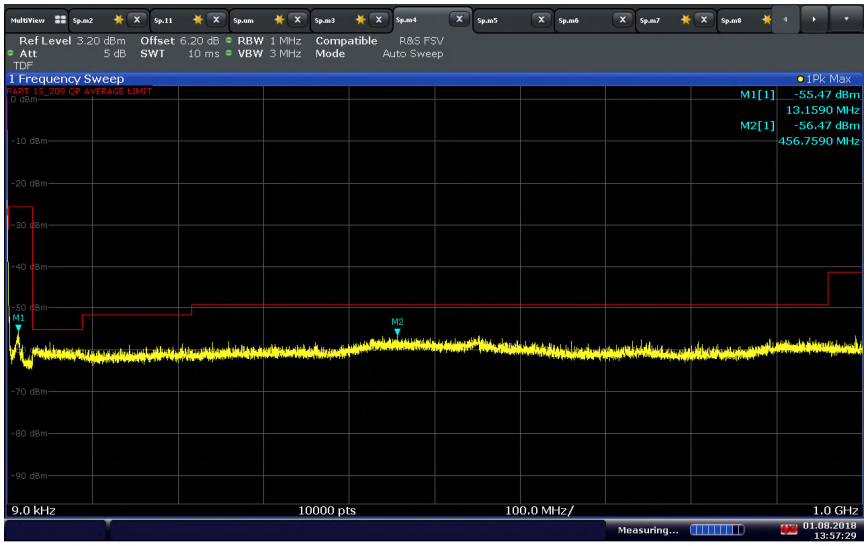

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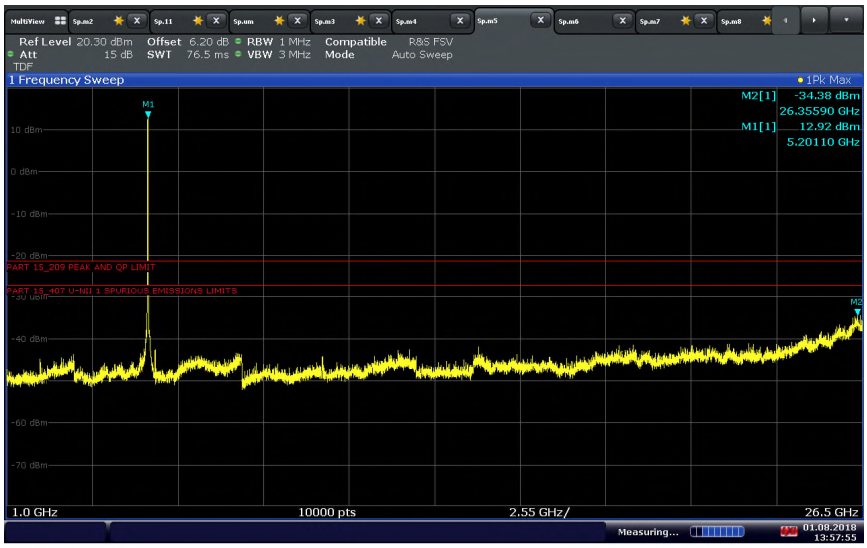
802.11 n (20 MHz) U-NII 1 Middle Channel below 1GHz



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802.11 n (20 MHz) U-NII 1 Middle Channel above 1GHz

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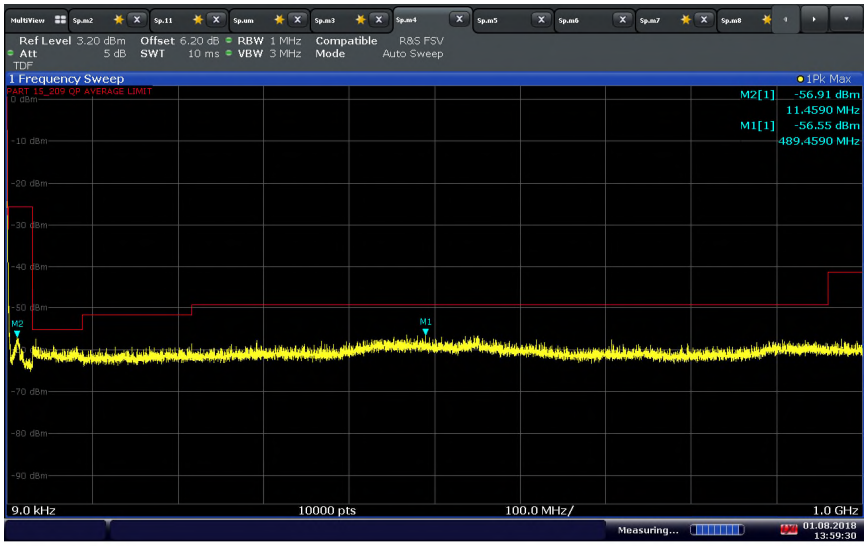

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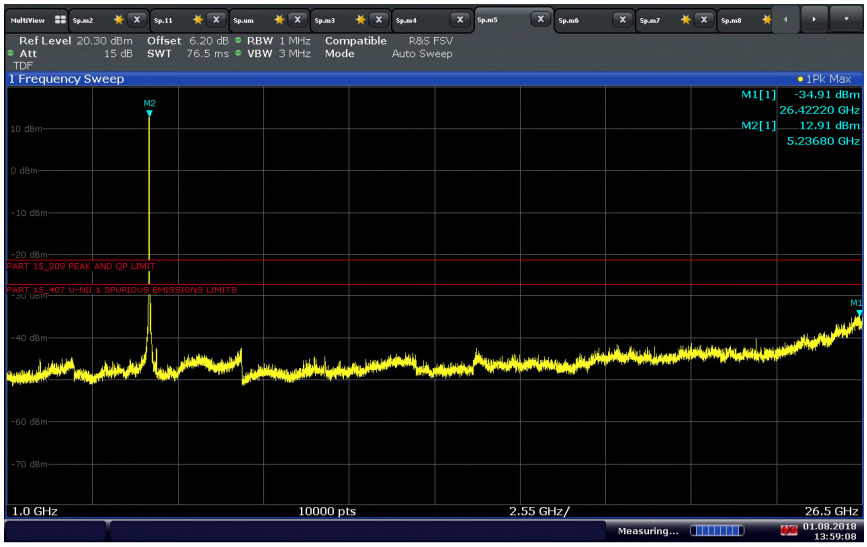
802.11 n (20 MHz) U-NII 1 High Channel below 1GHz



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802.11 n (20 MHz) U-NII 1 High Channel above 1GHz

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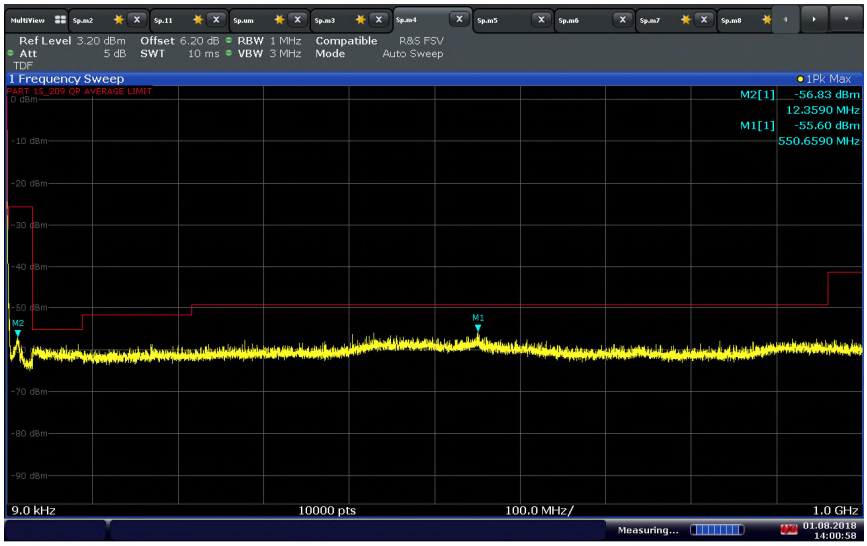

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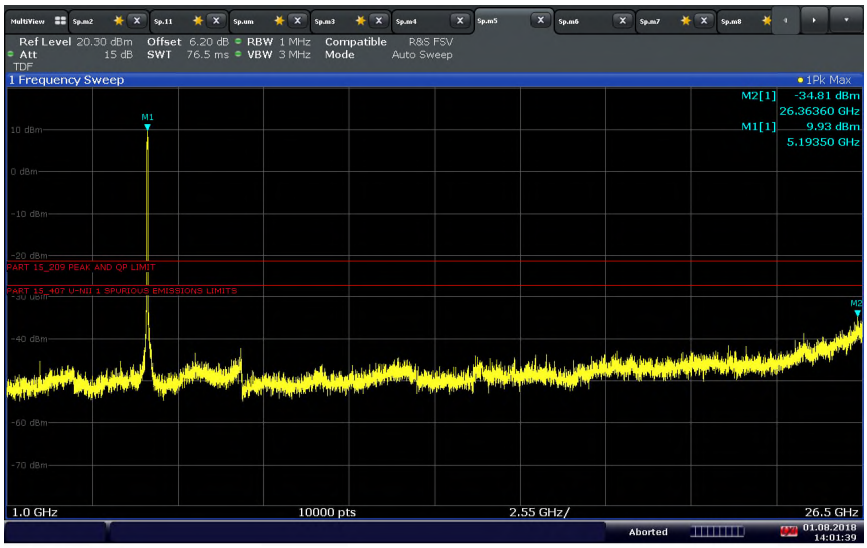
802.11 n (40 MHz) U-NII 1 Low Channel below 1GHz



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802.11 n (40 MHz) U-NII 1 Low Channel above 1GHz

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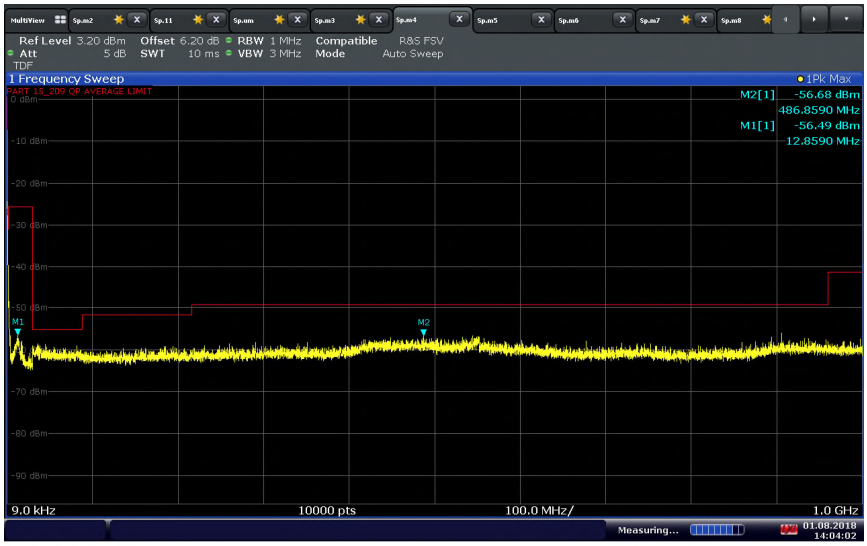

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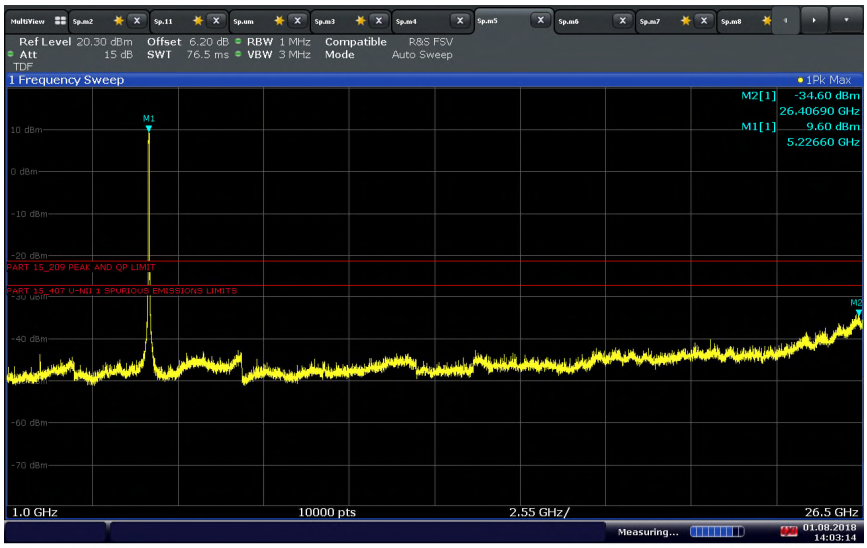
802.11 n (40 MHz) U-NII 1 High Channel below 1GHz



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802.11 n (40 MHz) U-NII 1 High Channel above 1GHz

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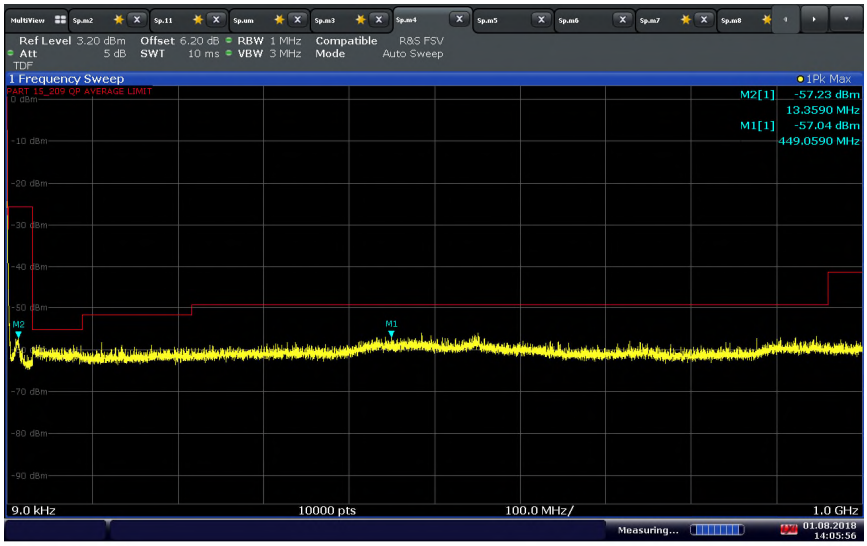
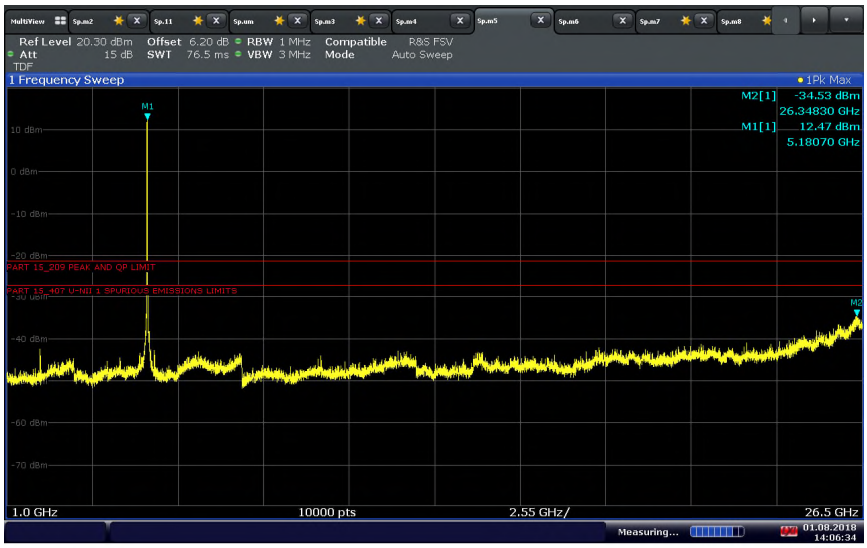


14:05:57 01.08.2018

802.11 ac (20 MHz) U-NII 1 Low Channel below 1GHz



14:06:34 01.08.2018

802.11 ac (20 MHz) U-NII 1 Low Channel above 1GHz

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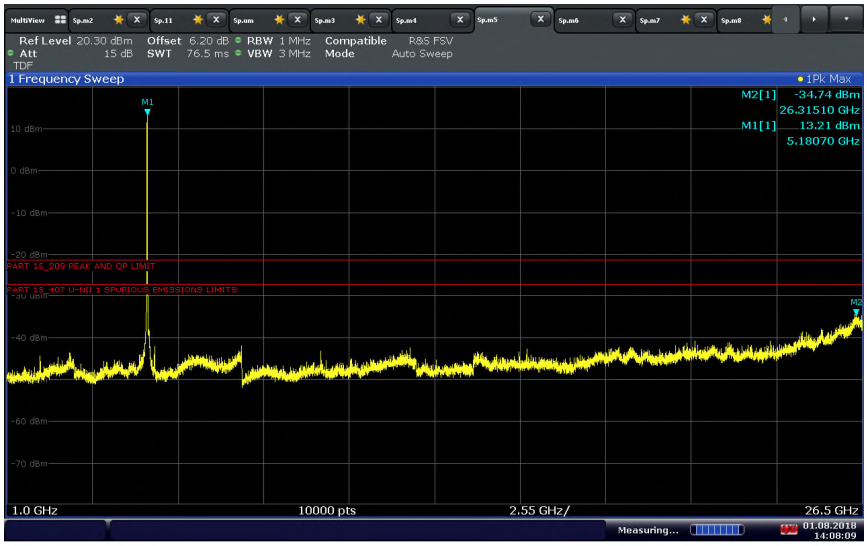

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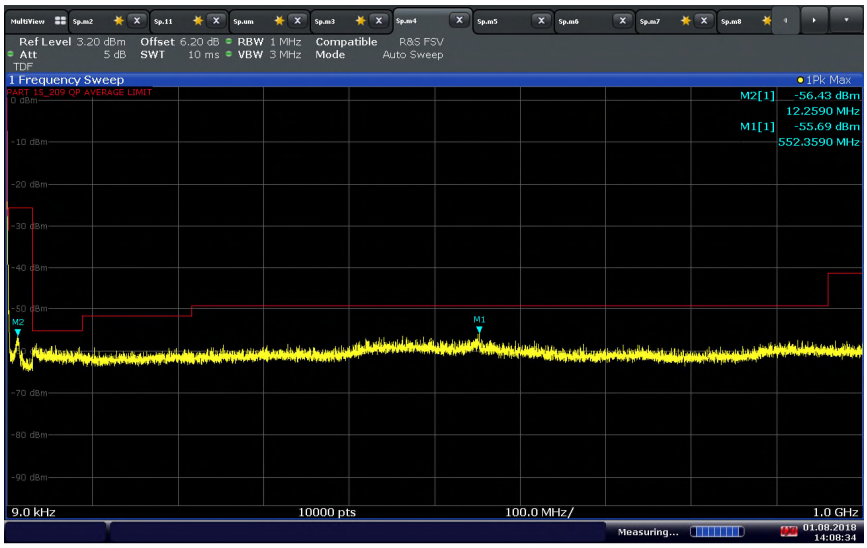
802.11 ac (20 MHz) U-NII 1 Middle Channel below 1GHz



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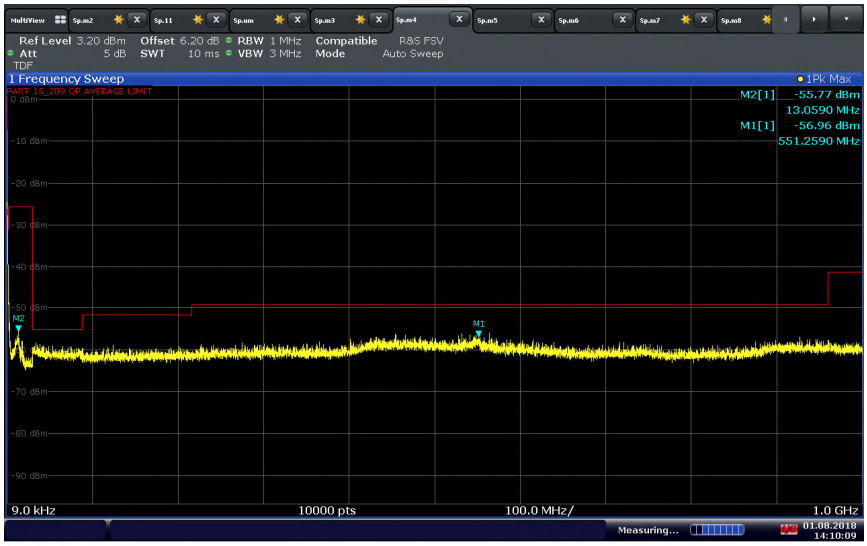
802.11 ac (20 MHz) U-NII 1 Middle Channel above 1GHz

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



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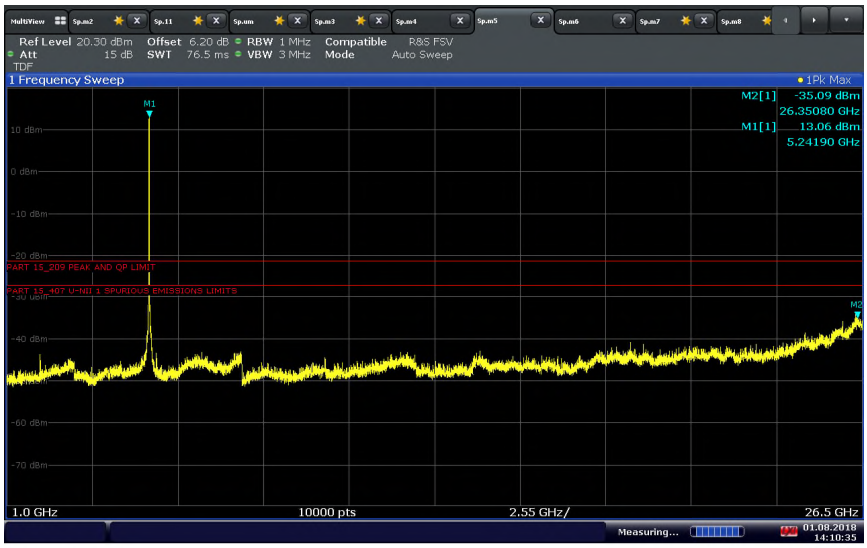
802.11 ac (20 MHz) U-NII 1 High Channel below 1GHz



14:10:36 01.08.2018

802.11 ac (20 MHz) U-NII 1 High Channel above 1GHz

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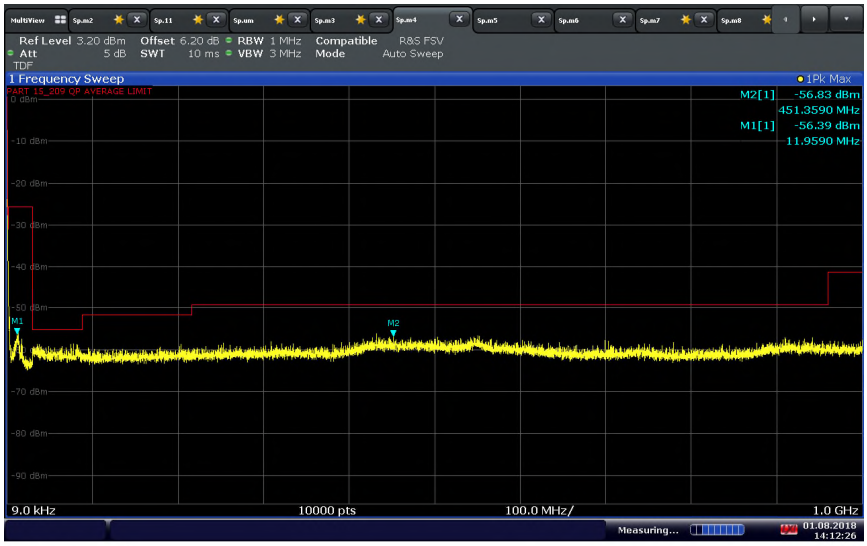
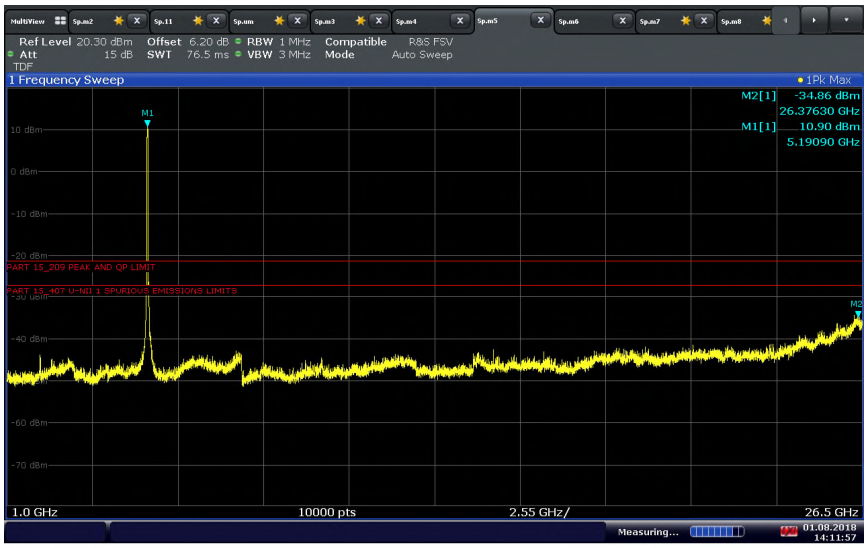


14:12:26 01.08.2018

802.11 ac (40 MHz) U-NII 1 Low Channel below 1GHz



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802.11 ac (40 MHz) U-NII 1 Low Channel above 1GHz

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