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Report On

Application for Grant of Equipment Authorization of the
Lantronix, Inc.

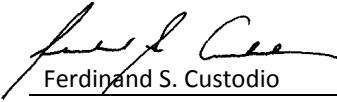
Wireless Print Solutions Adapter; xPrintServer Wi-Fi
Professional and xPrintServer Wi-Fi Essential Ethernet to
Wireless Print Server

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

Report No. SD72105305-0415E

May 2015



REPORT ON	Radio Testing of the Lantronix, Inc. Ethernet to Wireless Print Server
TEST REPORT NUMBER	SD72105305-0415E
PREPARED FOR	Lantronix, Inc. 7535 Irvine Center Drive, Suite 100 Irvine, CA
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PREPARED BY	 Ferdinand S. Custodio Name Authorized Signatory Title: EMC/Senior Wireless Test Engineer
APPROVED BY	 Chip R. Fleury Name Authorized Signatory Title: West Coast EMC Manager
DATED	July 26, 2015



Revision History

SD72105305-0415E Lantronix, Inc. Wireless Print Solutions Adapter; xPrintServer Wi-Fi Professional and xPrintServer Wi-Fi Essential Ethernet to Wireless Print Server					
DATE	OLD REVISION	NEW REVISION	REASON	PAGES AFFECTED	APPROVED BY
07/26/2015	Initial Release				Chip R. Fleury

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SECTION 1

REPORT SUMMARY

Radio Testing of the
Lantronix, Inc.
Ethernet to Wireless Print Server

1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Lantronix, Inc. Ethernet to Wireless Print Server 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	Lantronix, Inc.
Model Number(s)	WPSA-100 (Xerox); XPS2140201S (Lantronix) and XPS2140101S (Lantronix)
FCC ID Number	R68XPSWF
IC Number	3867A-XPSWF
Serial Number(s)	N/A
Number of Samples Tested	2
Test Specification/Issue/Date	• FCC Part 15 Subpart E §15.407 (October 1, 2014). • RSS-210 - Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment (Issue 8, December 2010). • RSS-Gen - General Requirements for Compliance of Radio Apparatus (Issue 4, November 2014). • 789033 D02 General UNII Test Procedures New Rules v01 (Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - Part 15, Subpart E) June 06, 2014.
Start of Test	May 18, 2015
Finish of Test	May 27, 2015
Name of Engineer(s)	Ferdinand Custodio Nikolay Shtin
Related Document(s)	• Continuous TX test instructions.rtf • Supporting documents for EUT certification are separate exhibits.



SECTION 2

TEST DETAILS

Radio Testing of the
Lantronix, Inc.
Ethernet to Wireless Print Server



2.6 MAXIMUM POWER SPECTRAL DENSITY (PSD)

2.6.1 Specification Reference

Part 15 Subpart E §15.407(a)(1)(IV) and §15.407(a)(3) and RSS-210 A9.2(1) and (4)

2.6.2 Standard Applicable

(iv) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 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.

(2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 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.

(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.

2.6.3 Test Methodology

Section II (F) PSD of 789033 D02 General UNII Test Procedures New Rules v01

2.6.4 Equipment Under Test and Modification State

Serial No: N/A / Test Configuration A

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

May 26, 2015/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

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature 25.0°C
 Relative Humidity 45.6%
 ATM Pressure 99.1 kPa

2.6.8 Additional Observations

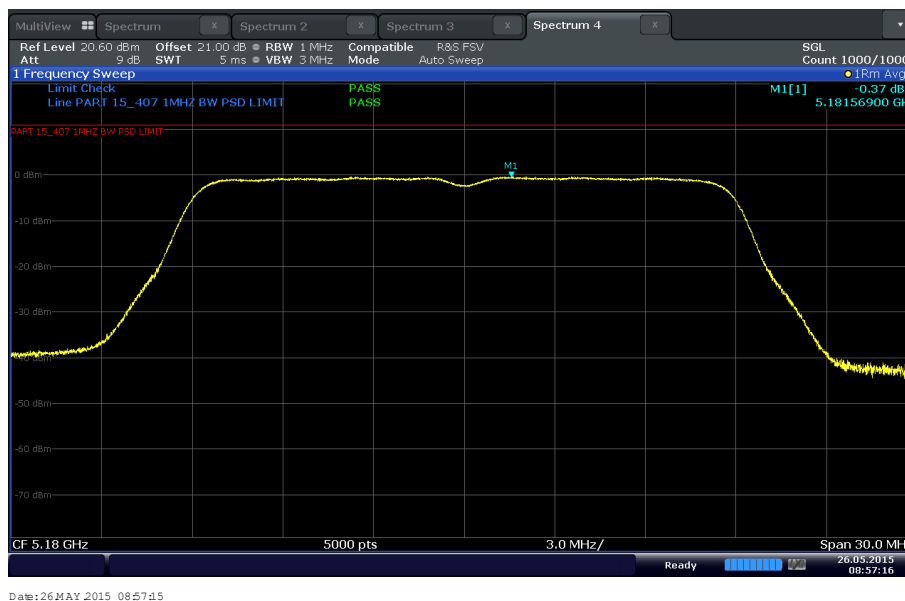
- This is a conducted test as per Section II (F) PSD of 789033 D02 General UNII Test Procedures New Rules v01.
- Method SA-2 of Section II (E) was used for SA configuration.
- An offset of 21.0dB was added to compensate for the external attenuator and cable used.
- Only the worst case channel and data rate for each mode presented.
- Duty Cycle values are from Section 2.5.5 of this test report.
- RBW for U-NII 1 is 1MHz while 500 kHz for U-NII 3.

2.6.9 Test Results

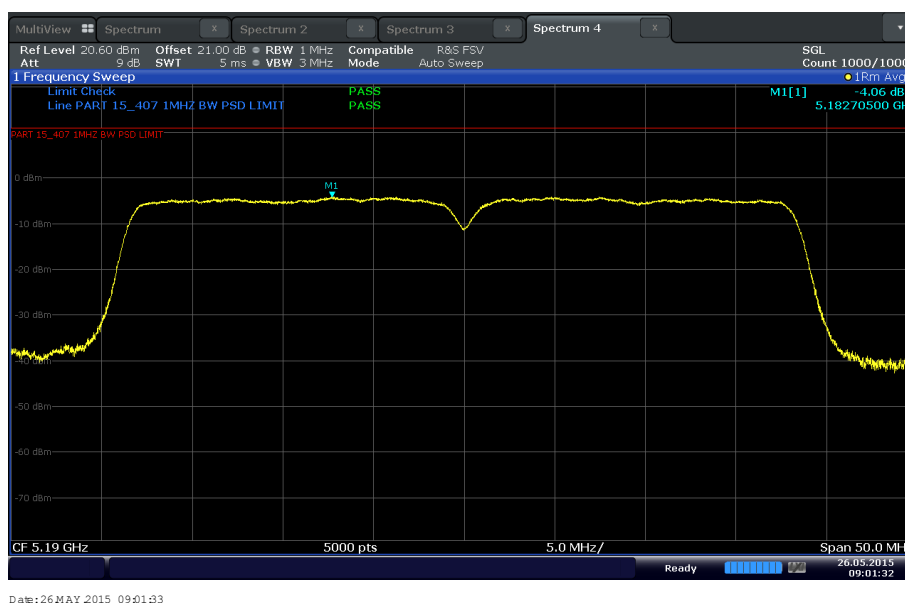
802.11n U-NII 1 (5150 MHz to 5250 MHz)						
Channel	Bandwidth (MHz)	MCS Index	Peak of the Spectrum (dBm)	Duty Cycle Correction Factor (dB)	Calculated Maximum PSD (dBm)	Limit (dBm)
36 (5180 MHz)	20	6	-0.37	1.93	1.56	11 dBm/1 MHz
38 (5190 MHz)	40	6	-4.06	3.00	-1.06	
802.11n U-NII 2A (5250 MHz to 5350 MHz)						
Channel	Bandwidth (MHz)	MCS Index	Peak of the Spectrum (dBm)	Duty Cycle Correction Factor (dB)	Calculated Maximum PSD	Limit (dBm)
52 (5260 MHz)	20	1	-0.95	0.60	-0.35	11 dBm/1 MHz
62 (5310 MHz)	40	0	-3.35	0.65	-2.70	
802.11n U-NII 2C (5470 MHz to 5725 MHz)						
Channel	Bandwidth (MHz)	MCS Index	Peak of the Spectrum (dBm)	Duty Cycle Correction Factor (dB)	Calculated Maximum PSD	Limit (dBm)
102 (5510 MHz)	40	0	-2.31	0.65	-1.66	11 dBm/1 MHz
144 (5720 MHz)	20	4	-0.21	1.53	1.32	

802.11n U-NII 3 (5725 MHz to 5850 MHz).						
Channel	Bandwidth (MHz)	MCS Index	Peak of the Spectrum (dBm)	Duty Cycle Correction Factor (dB)	Calculated Maximum PSD (dBm)	Limit (dBm)
165 (5825 MHz)	20	6	-2.34	1.93	-0.41	30 dBm/500 kHz
159 (5795 MHz)	40	2	-5.14	1.58	-3.56	
802.11ac U-NII 1(5150 MHz to 5250 MHz)						
Channel	Bandwidth (MHz)	MCS Index	Peak of the Spectrum (dBm)	Duty Cycle Correction Factor (dB)	Calculated Maximum PSD (dBm)	Limit (dBm)
36 (5180 MHz)	20	6	-0.37	1.93	1.56	11 dBm/1 MHz
38 (5190 MHz)	40	6	-4.06	3.00	-1.06	
42 (5210 MHz)	80	3	-6.74	3.00	-3.74	
802.11ac U-NII 2A (5250 MHz to 5350 MHz)						
Channel	Bandwidth (MHz)	MCS Index	Peak of the Spectrum (dBm)	Duty Cycle Correction Factor (dB)	Calculated Maximum PSD	Limit (dBm)
52 (5260 MHz)	20	1	-0.90	0.60	-0.30	11 dBm/1 MHz
58 (5290 MHz)	80	1	-7.61	2.00	-5.61	
62 (5310 MHz)	40	0	-3.43	0.65	-2.78	
802.11ac U-NII 2C (5470 MHz to 5725 MHz)						
Channel	Bandwidth (MHz)	MCS Index	Peak of the Spectrum (dBm)	Duty Cycle Correction Factor (dB)	Calculated Maximum PSD	Limit (dBm)
102 (5510 MHz)	40	0	-2.43	0.65	-1.78	11 dBm/1 MHz
106 (5530 MHz)	80	1	-6.55	2.00	-4.55	
144 (5720 MHz)	20	4	-0.35	1.53	1.18	
802.11ac U-NII 3 (5725 MHz to 5850 MHz).						
Channel	Bandwidth (MHz)	MCS Index	Peak of the Spectrum (dBm)	Duty Cycle Correction Factor (dB)	Calculated Maximum PSD (dBm)	Limit (dBm)
165 (5825 MHz)	20	8	-2.47	2.35	-0.12	30 dBm/500 kHz
159 (5795 MHz)	40	2	-5.14	1.58	-3.56	
155 (5775 MHz)	80	3	-8.87	3.00	-5.87	

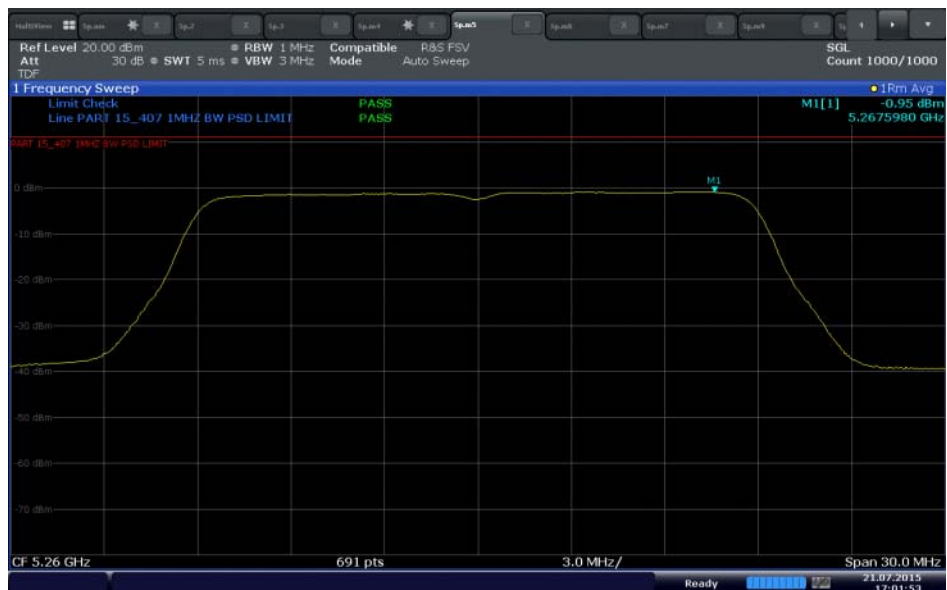
2.6.10 Test Plots



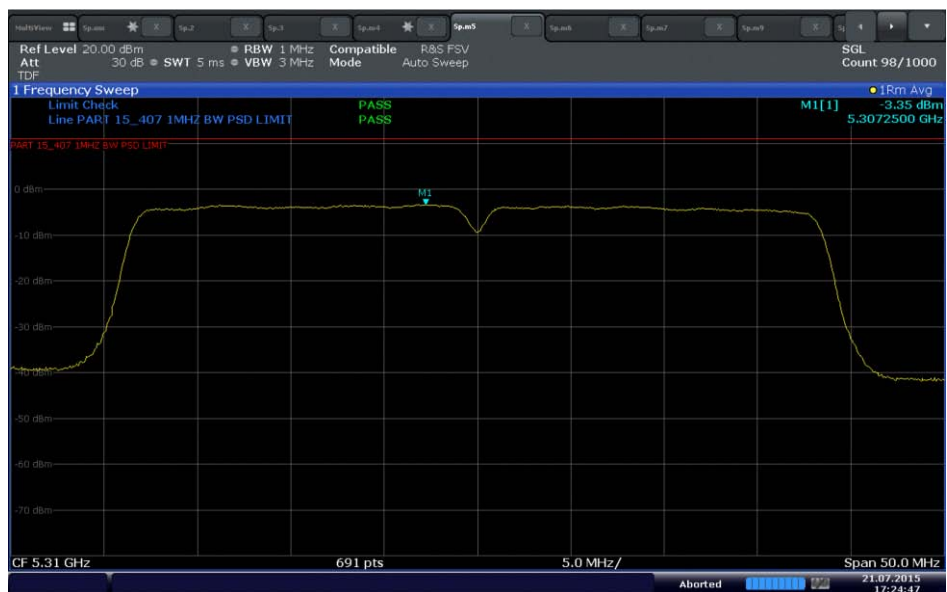
802.11n U-NII 1 20MHz BW Channel 36 (5180 MHz)



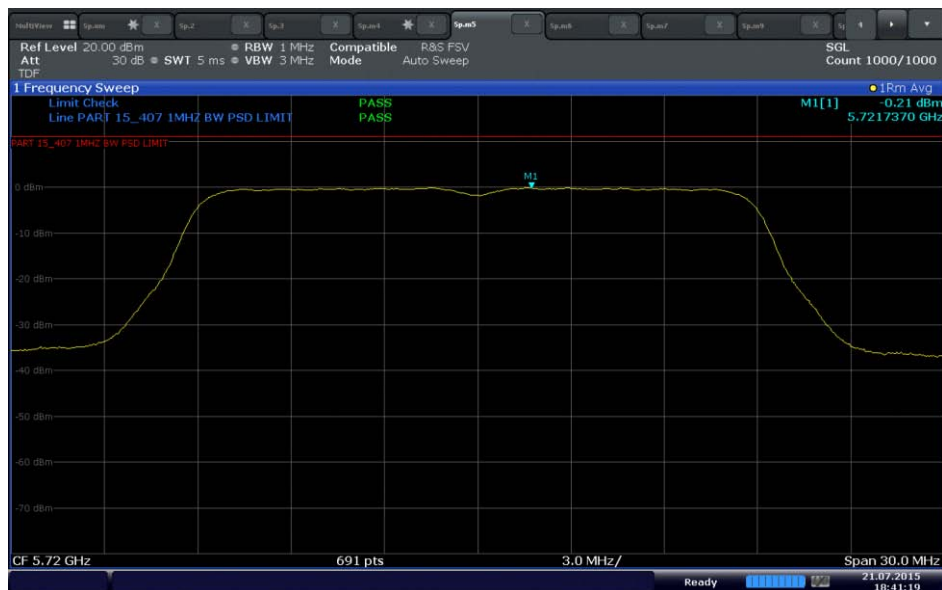
802.11n U-NII 1 40MHz BW Channel 38 (5190 MHz)



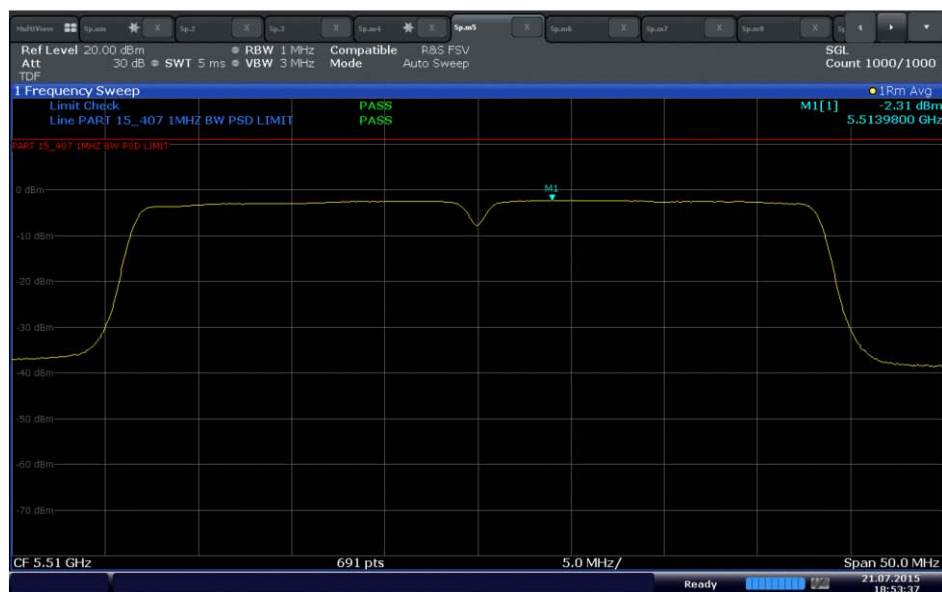
802.11n U-NII 2A 20MHz BW Channel 52 (5260 MHz)



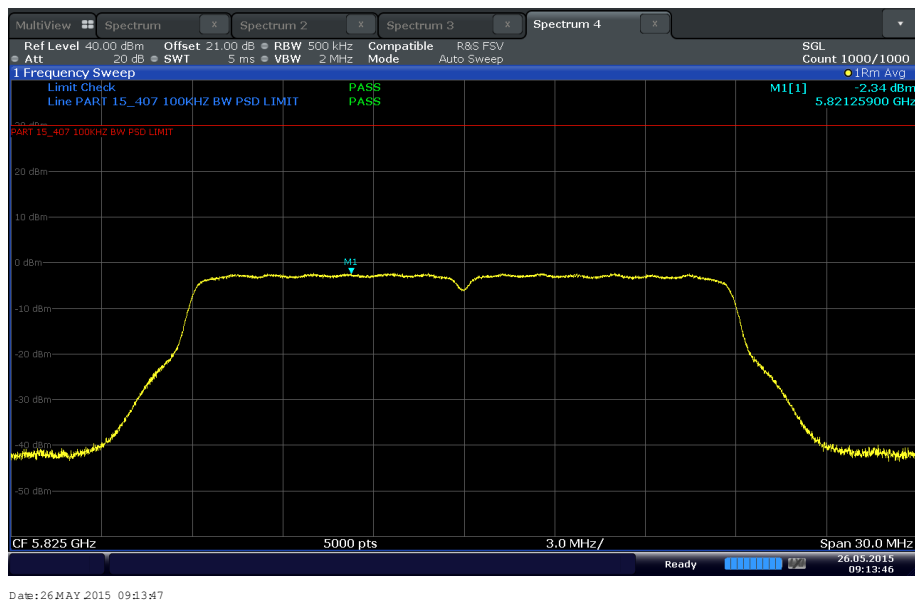
802.11n U-NII 2A 40MHz BW Channel 62 (5310 MHz)



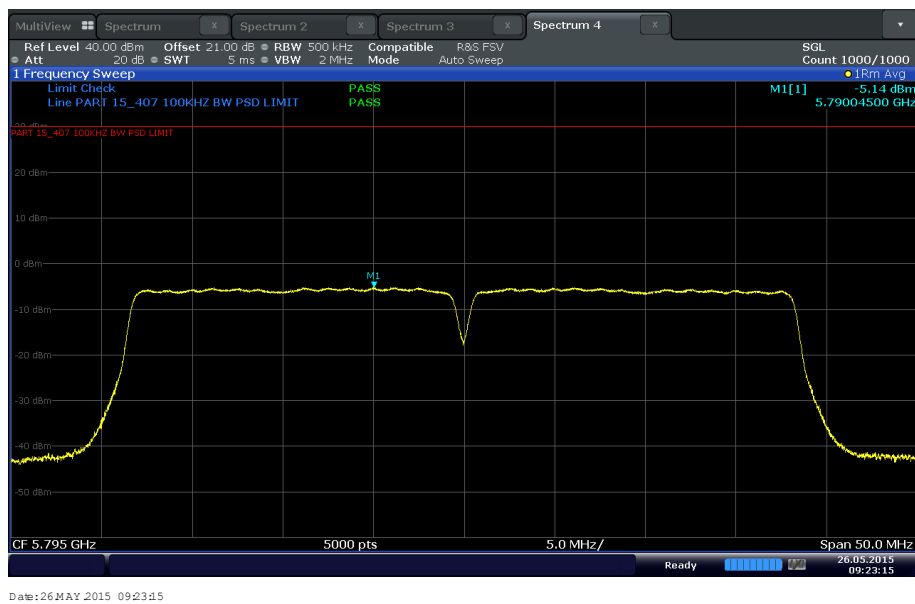
802.11n U-NII 2C 20MHz BW Channel 144 (5720 MHz)



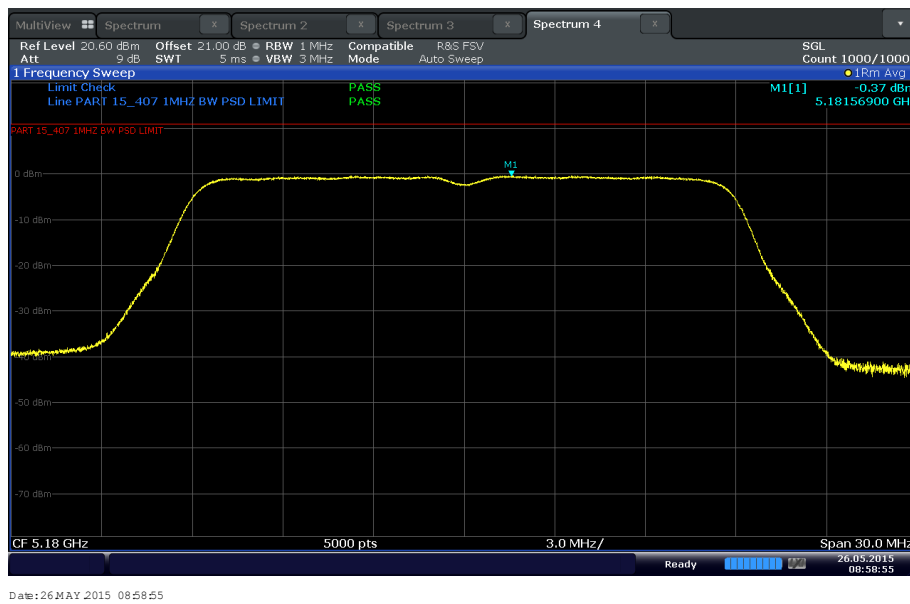
802.11n U-NII 2C 40MHz BW Channel 102 (5510 MHz)



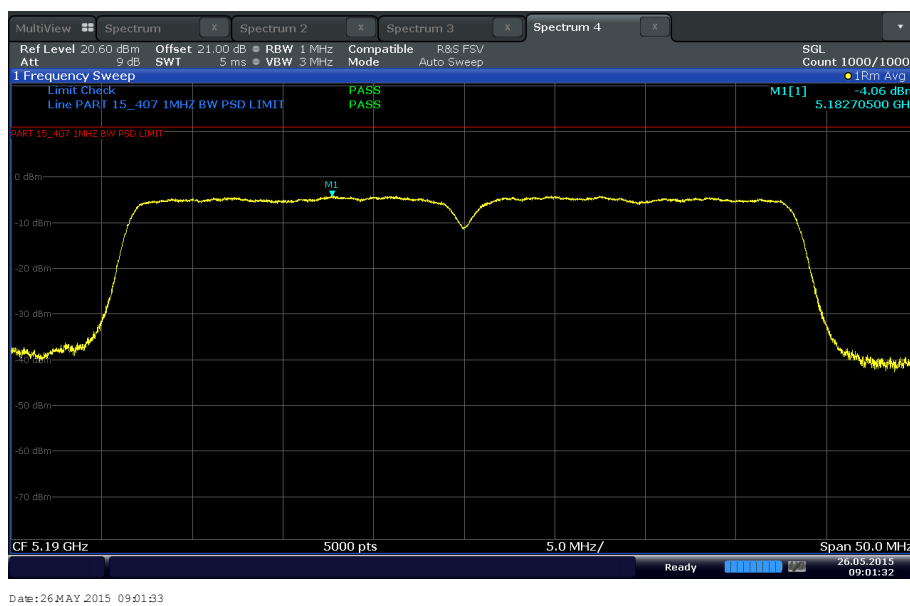
802.11n U-NII 3 20MHz BW Channel 165 (5825 MHz)



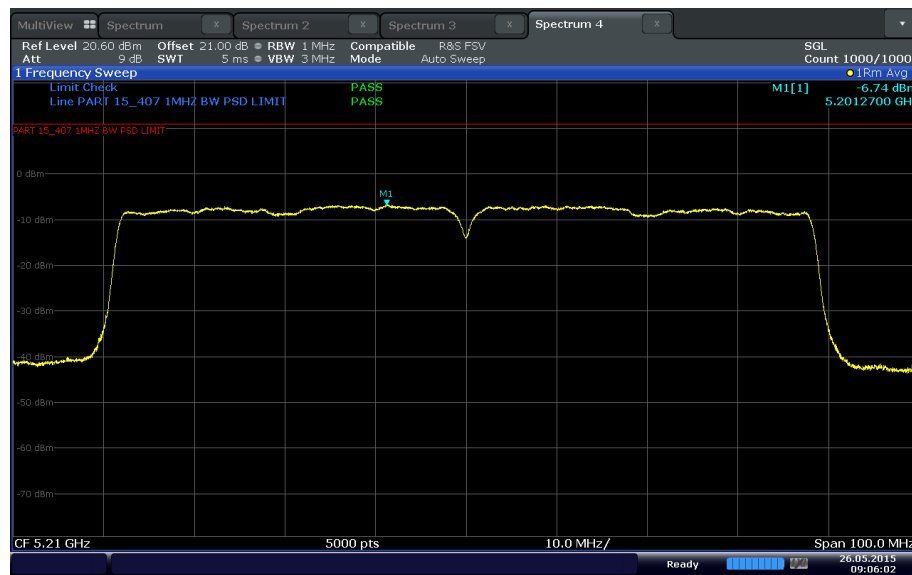
802.11n U-NII 3 40MHz BW Channel 159 (5795 MHz)



802.11ac U-NII 1 20MHz BW Channel 36 (5180 MHz)

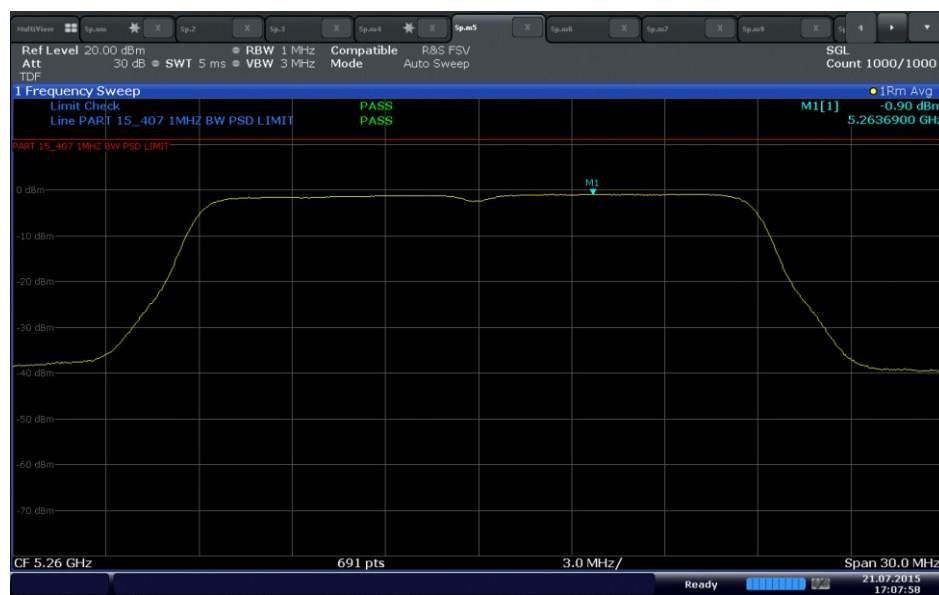


802.11ac U-NII 1 40MHz BW Channel 38 (5190 MHz)

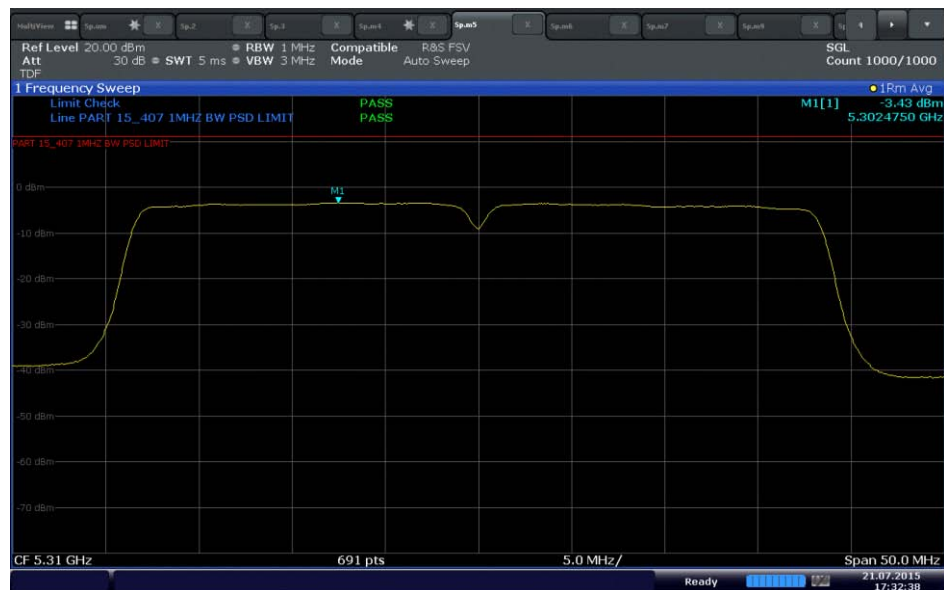


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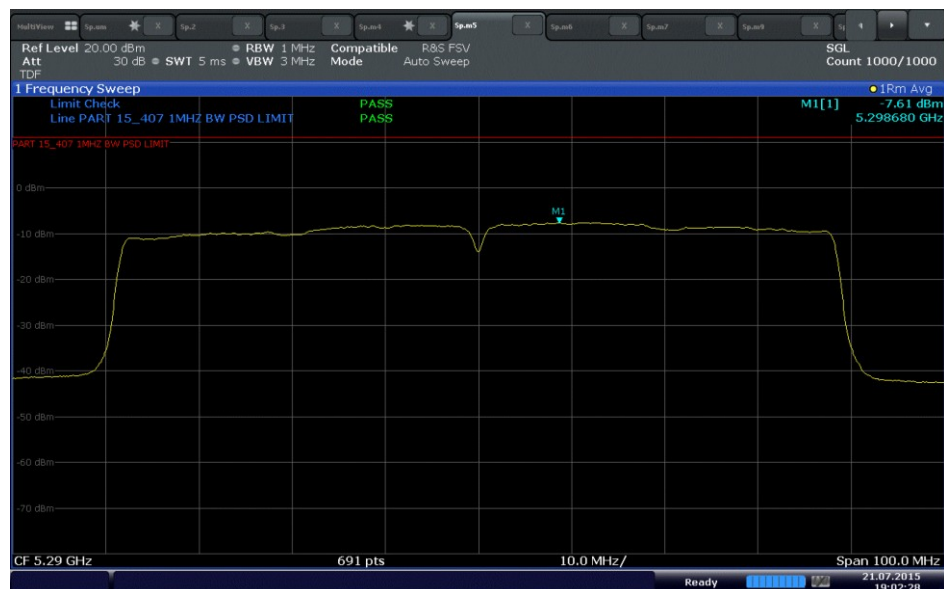
802.11ac U-NII 1 80MHz BW Channel 42 (5210 MHz)



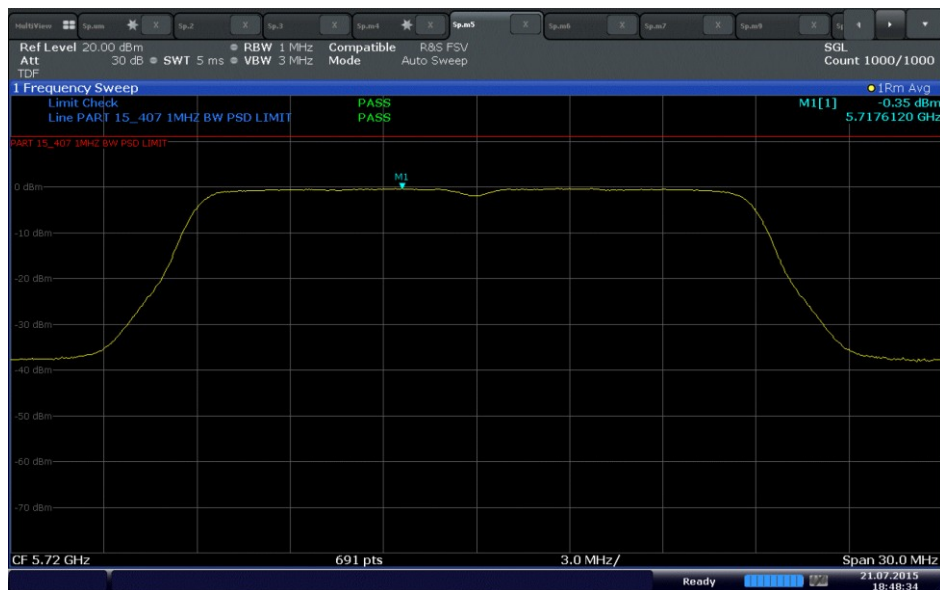
802.11ac U-NII 2A 20MHz BW Channel 52 (5260 MHz)



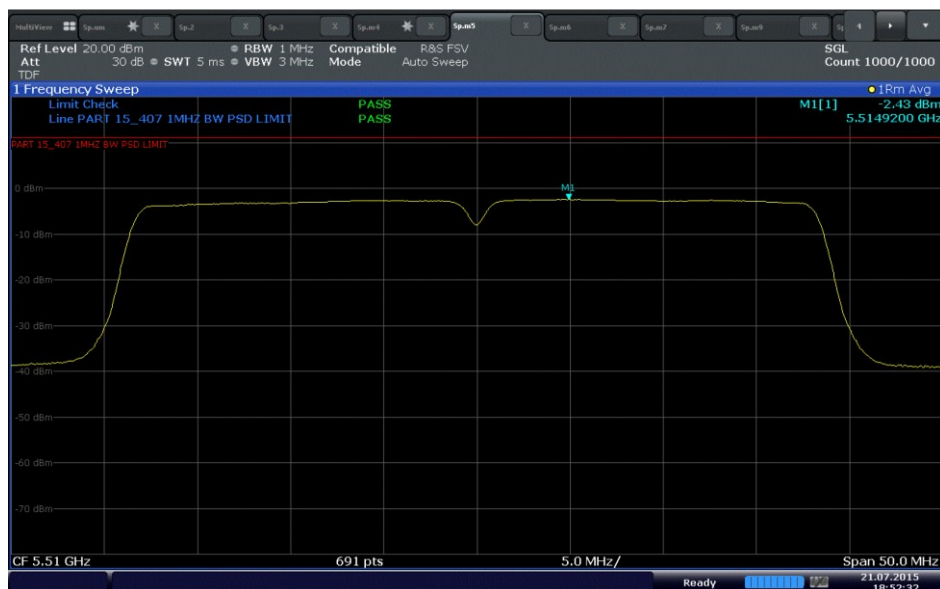
802.11ac U-NII 2A 40MHz BW Channel 62 (5310 MHz)



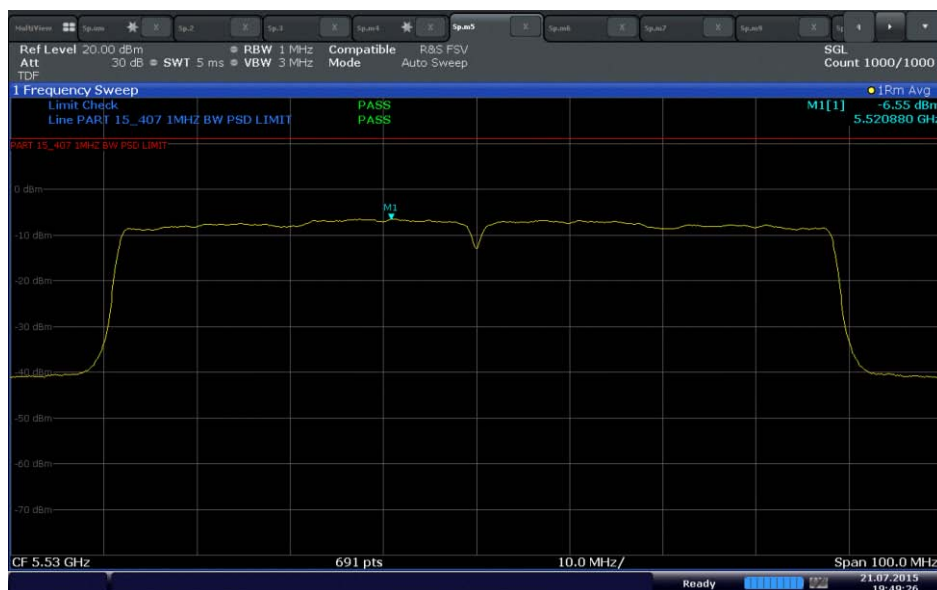
802.11ac U-NII 2A 80MHz BW Channel 58 (5290 MHz)



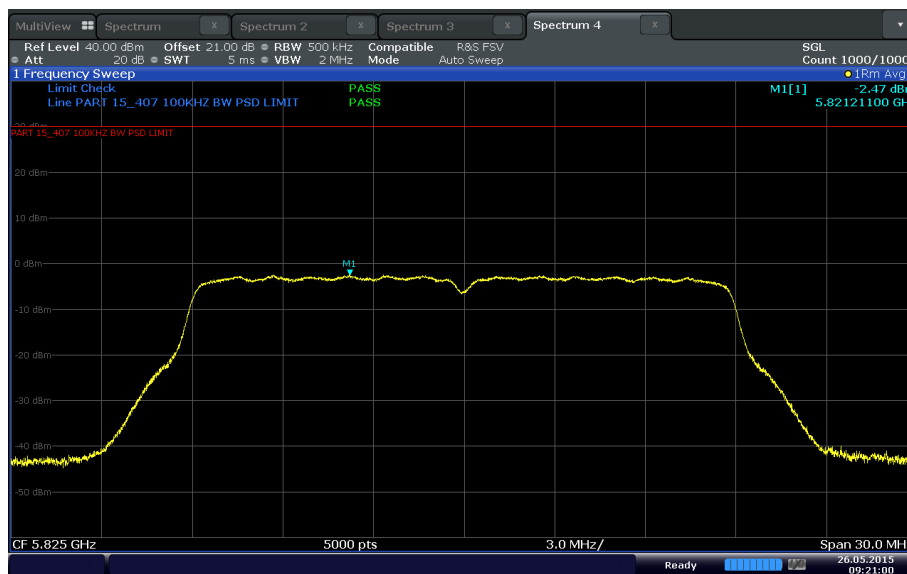
802.11ac U-NII 2C 20MHz BW Channel 144 (5720 MHz)



802.11ac U-NII 2C 40MHz BW Channel 102 (5510 MHz)

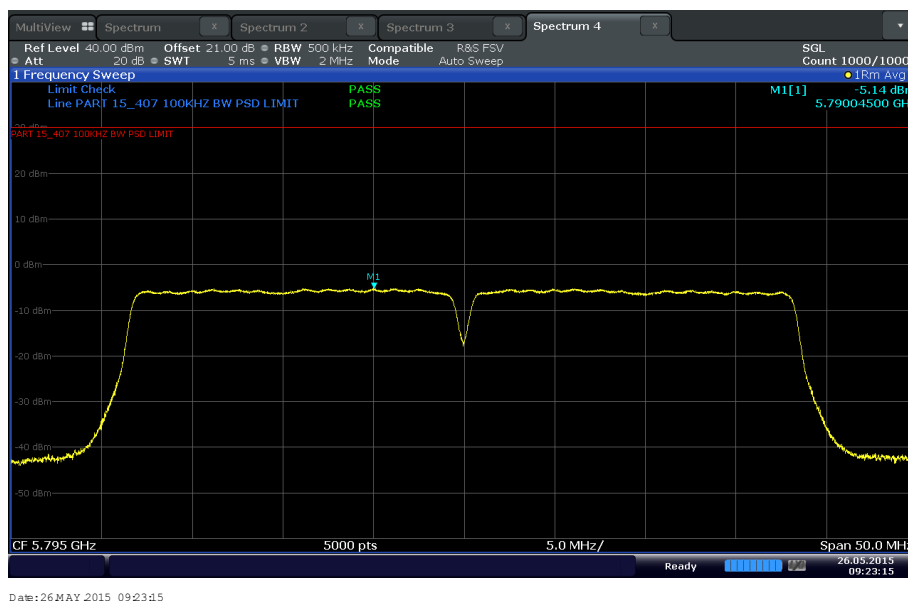


802.11ac U-NII 2C 40MHz BW Channel 106 (5530 MHz)

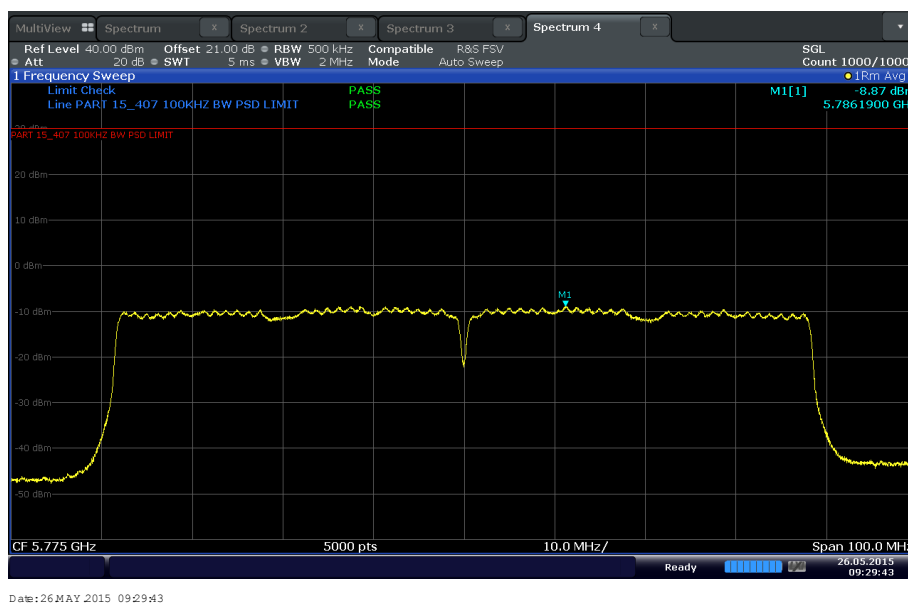


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802.11ac U-NII 3 20MHz BW Channel 165 (5825 MHz)



802.11ac U-NII 3 40MHz BW Channel 159 (5795 MHz)



802.11ac U-NII 3 80MHz BW Channel 155 (5775 MHz)



2.7 UNWANTED EMISSIONS MEASUREMENT

2.7.1 Specification Reference

Part 15 Subpart E §15.407(b)(1),(4) and (7) / 15.209 and RSS-210 A9.2(1) and (4)

2.7.2 Standard Applicable

(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: All emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of -17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of -27 dBm/MHz.

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

2.7.3 Test Methodology

Section II (G) Unwanted Emission Measurement of 789033 D02 General UNII Test Procedures New Rules v01

2.7.4 Equipment Under Test and Modification State

Serial No: N/A / Test Configuration A and B

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

May 26, 2015/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

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	25.0°C
Relative Humidity	45.6%
ATM Pressure	99.1 kPa

2.7.8 Additional Observations

- This is an antenna-port conducted measurement test plus radiated cabinet emissions measurements.
- Only the worst case data rate presented for both 802.11n and 802.11ac covering all available bandwidths.
- Sweep time is set to auto.
- An offset of 21.00dB was added to compensate for the external attenuator and cable used.
- If an Average measurement is required. The offset will be adjusted to include the duty cycle correction factor found under Section 2.5.5 of this test report. However no such emissions observed that requires further evaluation (i.e Section II (G)(6) Unwanted Emission Measurement of 789033 D02 General UNII Test Procedures New Rules v01).
- If an Average measurement is required. Trace stabilization will be adjusted by a factor of 2.9 as per duty cycle of 0.3456 (worst case, 80MHz BW MCS9).

$$\begin{aligned}\text{Trace count} &= (1/0.3456) \times 100 \\ &= 290\end{aligned}$$

- The field strength limit of 15.209 is first converted to dBm (EIRP) using the formula under Section G(2)(d)(III) of 789033 D02 General UNII Test Procedures New Rules v01. Prescans were performed against this limit. If Peak complies with the limit, no Average evaluation will be performed.
- There were no unwanted emissions observed that falls in the Restricted Bands.
- Any emissions that is not in the restricted band will be evaluated to -27dBm/MHz (U-NII 1) and -17dBm/MHz (U-NII 3) limit.
- 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.

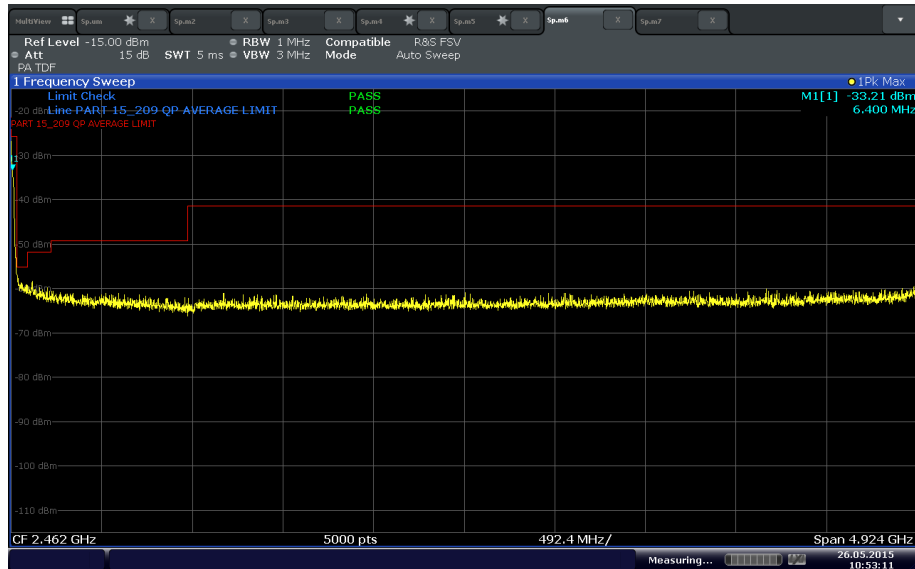
2.7.9 Sample Computation (Radiated Emission)

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

2.7.10 Test Results

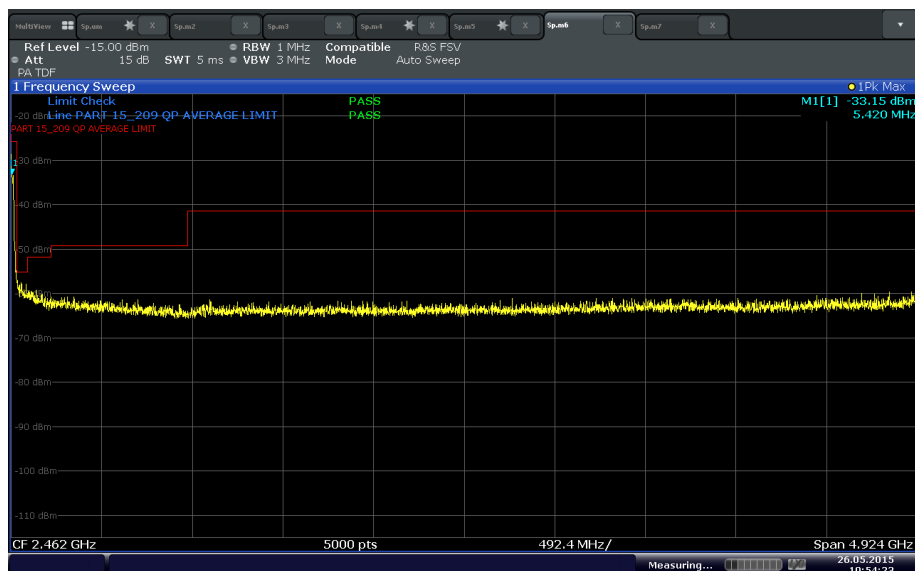
See attached plots.

2.7.11 Test Plots



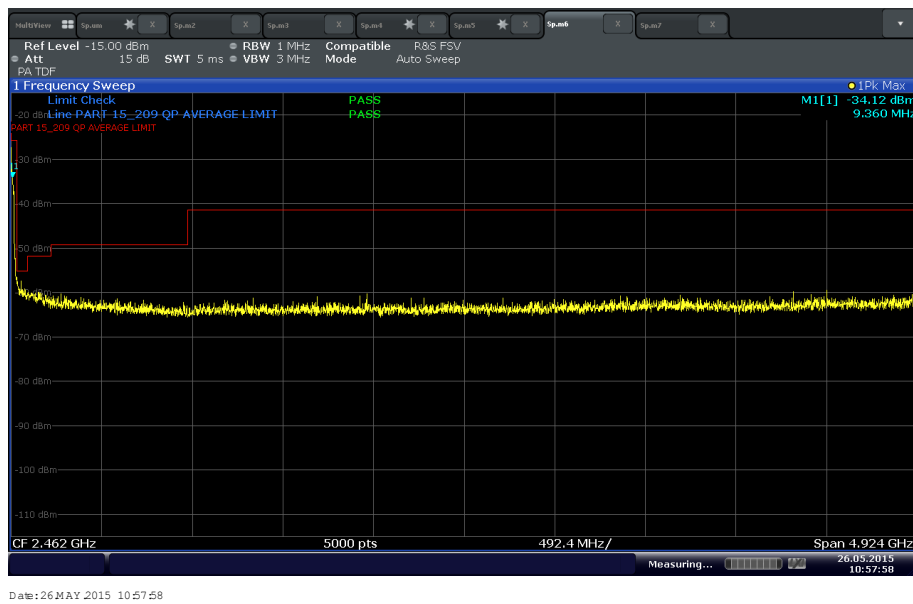
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U-NII 1 Low Channel below 1GHz (20 MHz BW)

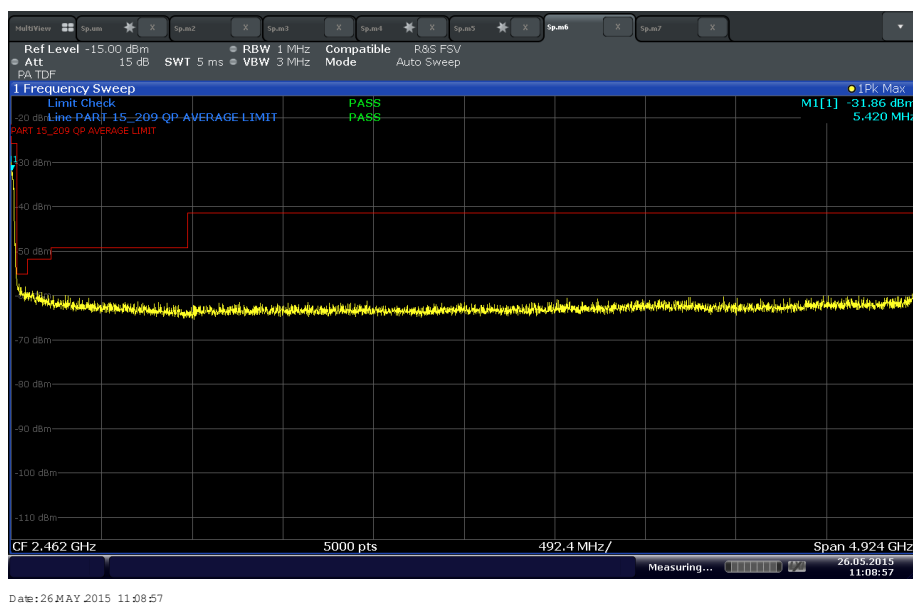


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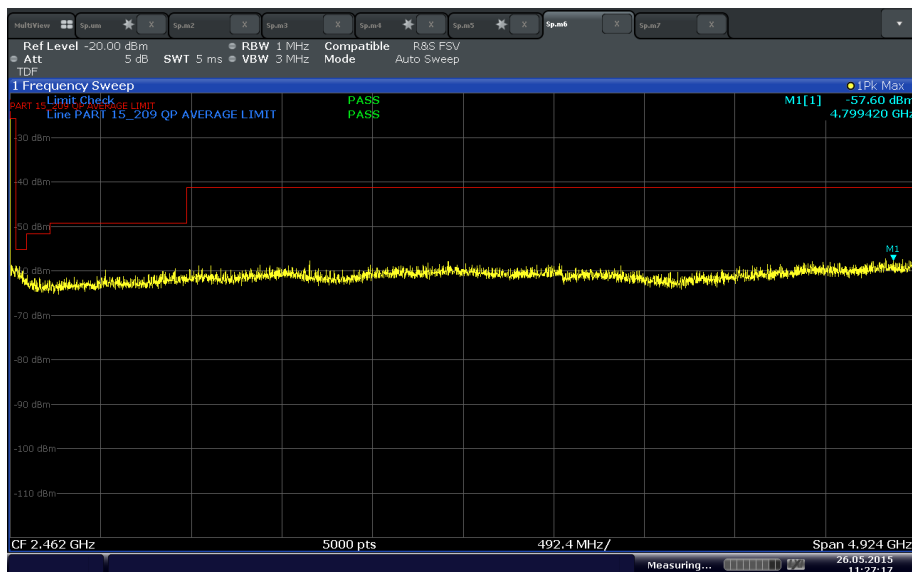
U-NII 1 Mid Channel below 1GHz (20 MHz BW)



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

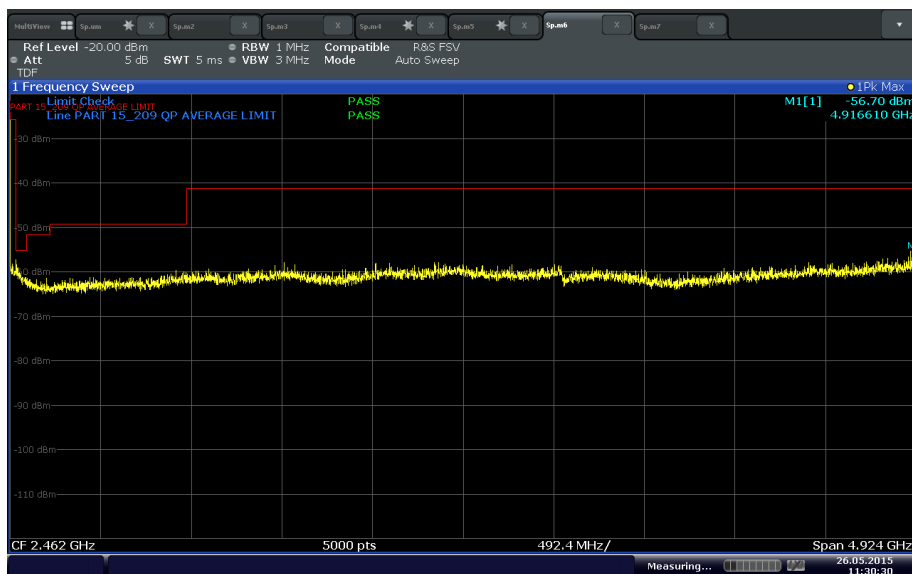


U-NII 1 Low Channel below 1GHz (40 MHz BW)



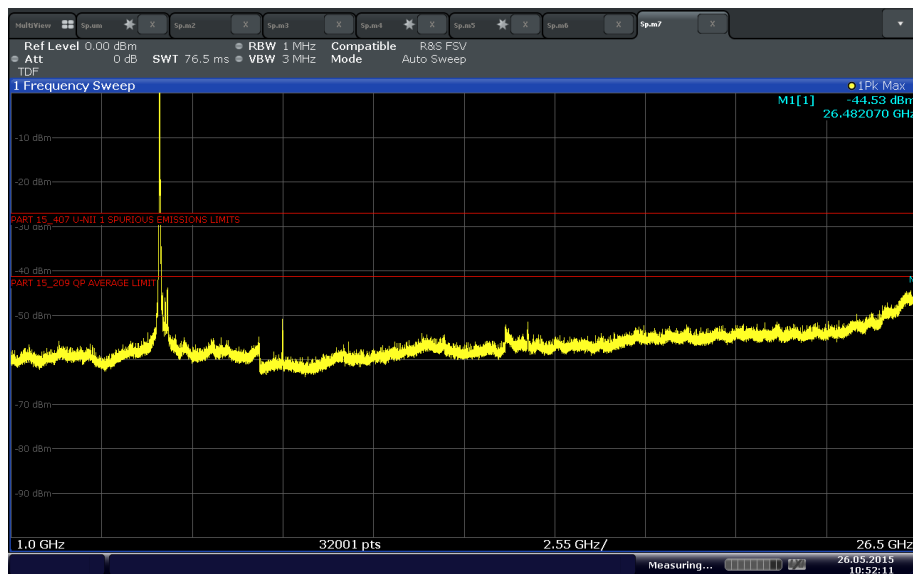
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U-NII 1 High Channel below 1GHz (40 MHz BW)

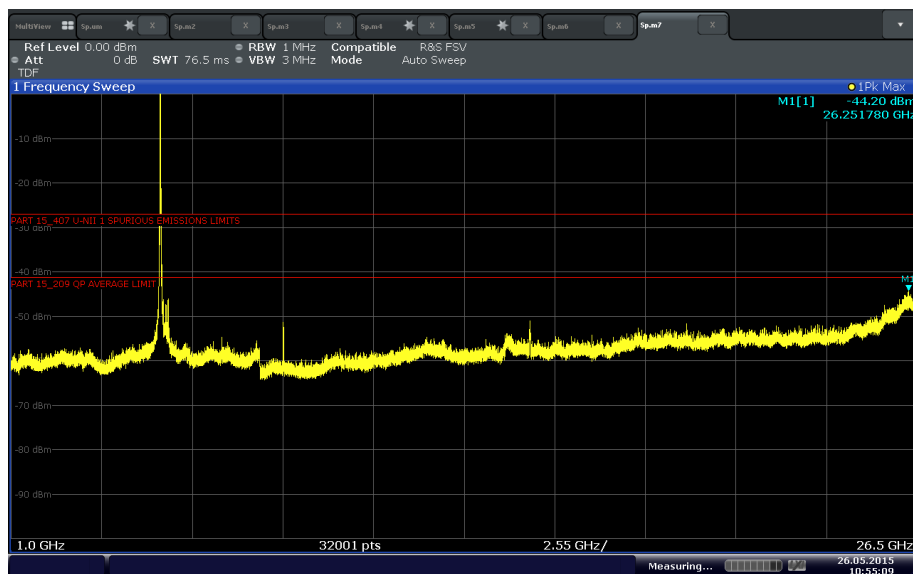


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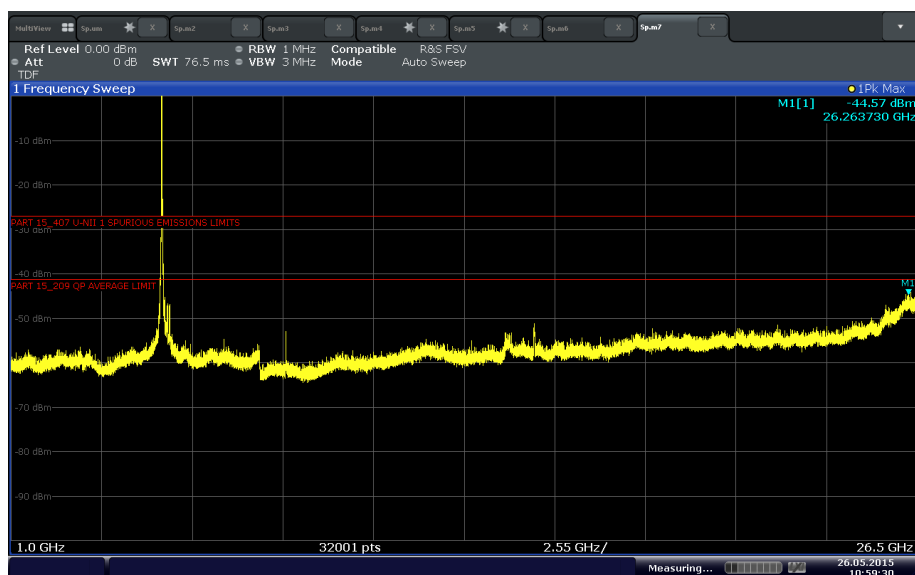
U-NII 1 Mid Channel below 1GHz (80 MHz BW)



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

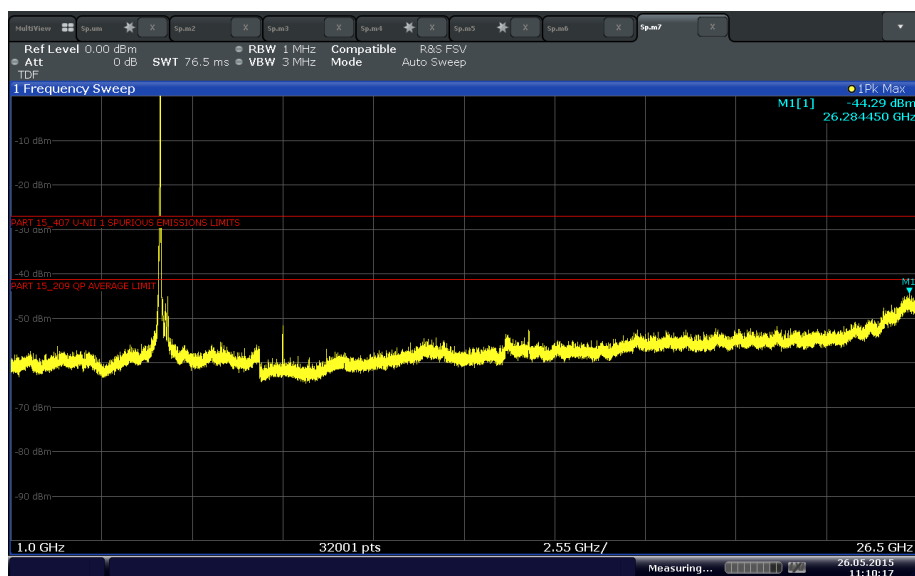


U-NII 1 Mid Channel above 1GHz (20 MHz BW)



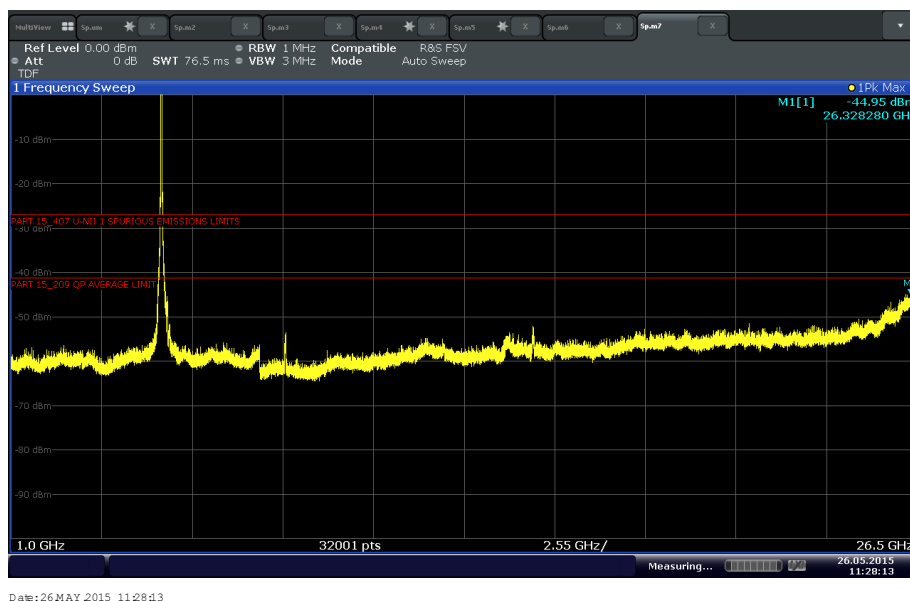
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U-NII 1 High Channel above 1GHz (20 MHz BW)

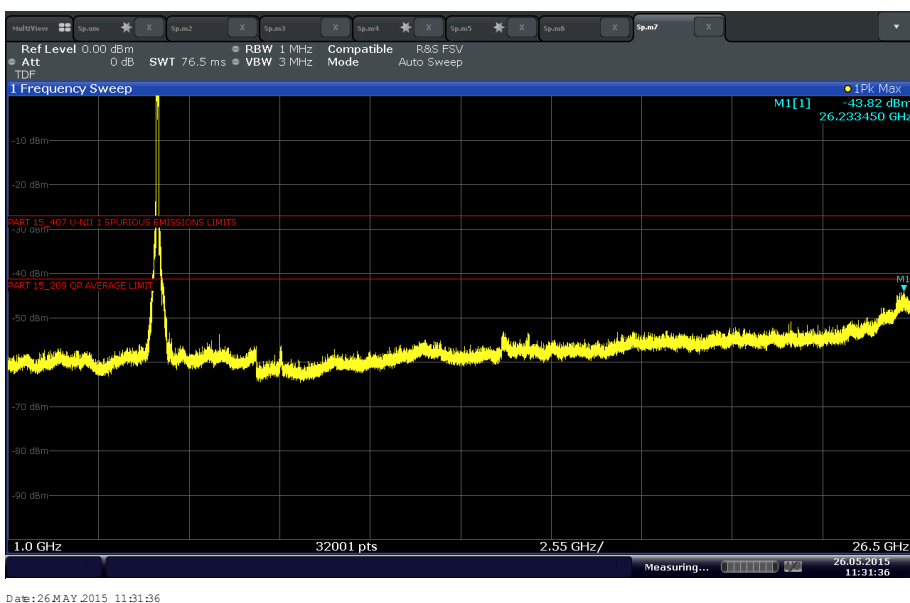


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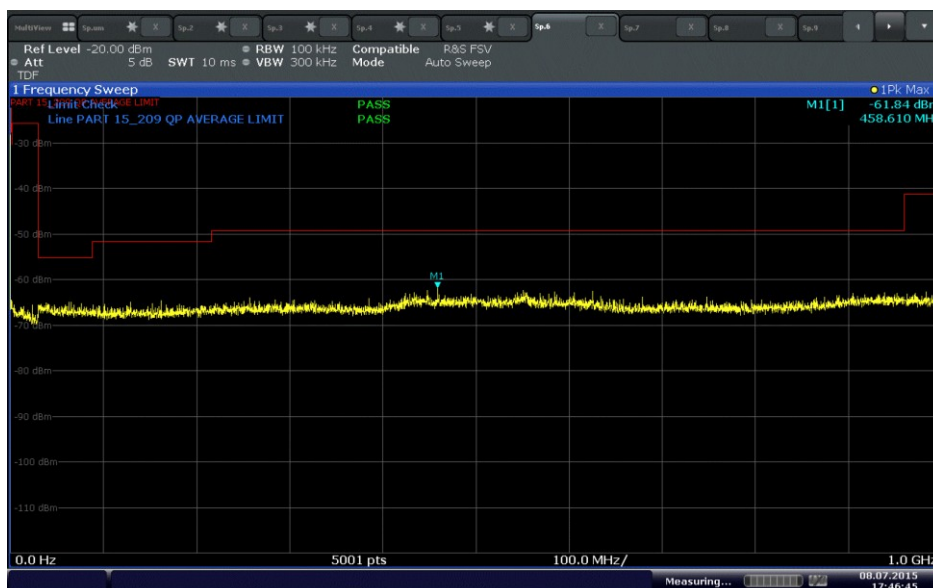
U-NII 1 Low Channel above 1GHz (40 MHz BW)



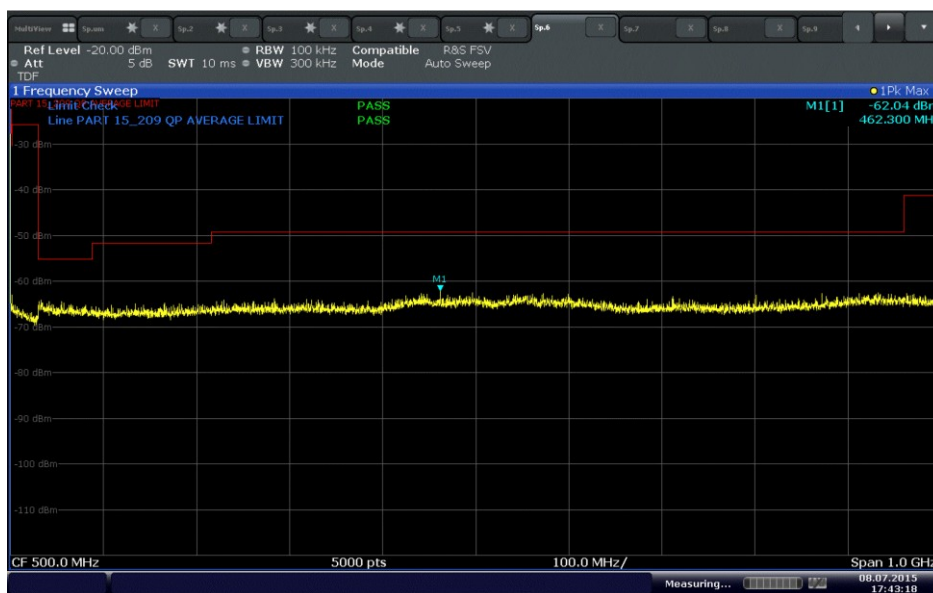
U-NII 1 High Channel above 1GHz (40 MHz BW)



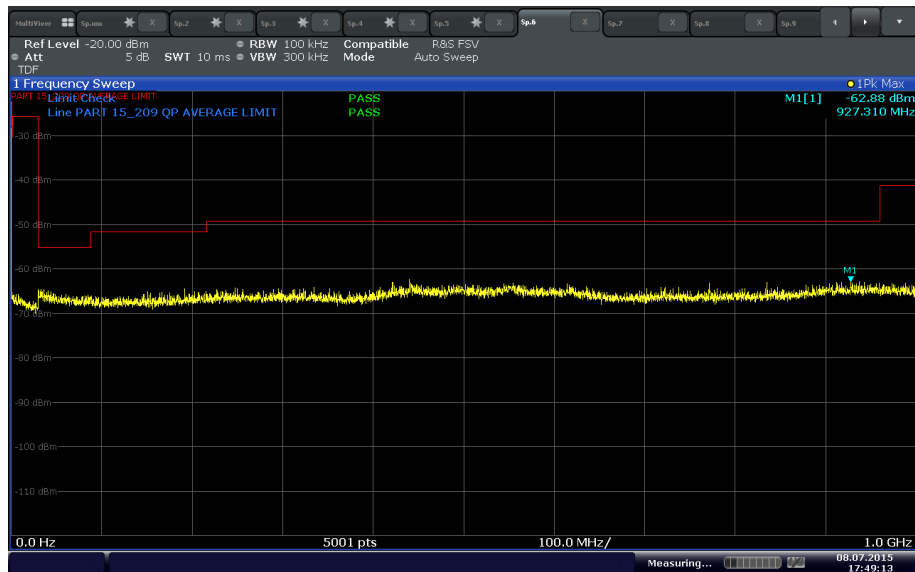
U-NII 1 Mid Channel above 1GHz (80 MHz BW)



U-NII 2A Low Channel below 1GHz (20 MHz BW)

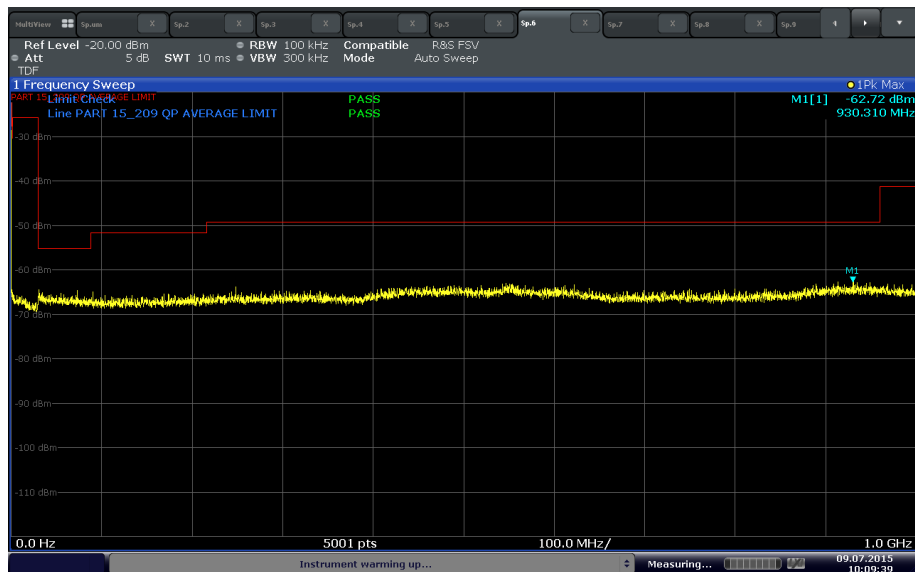


U-NII 2A Mid Channel below 1GHz (20 MHz BW)



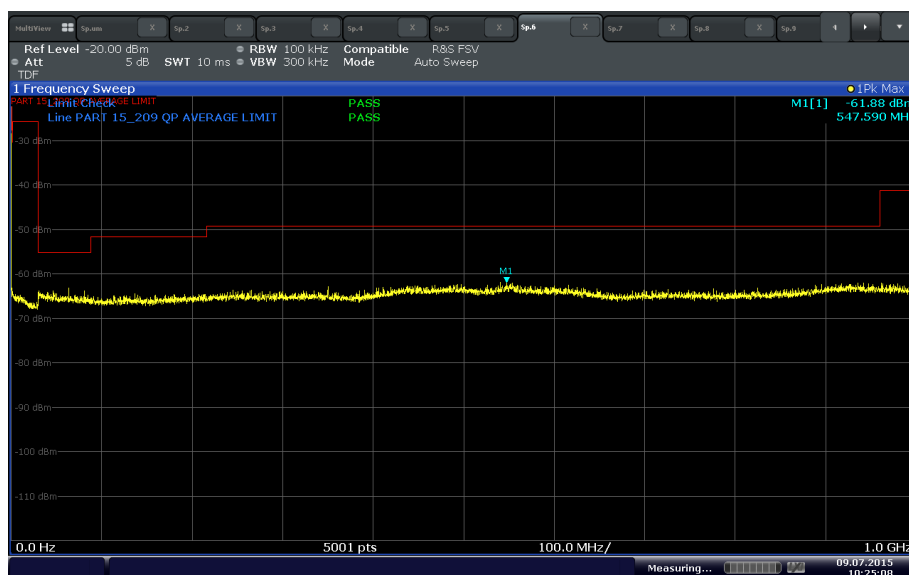
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U-NII 2A High Channel below 1GHz (20 MHz BW)

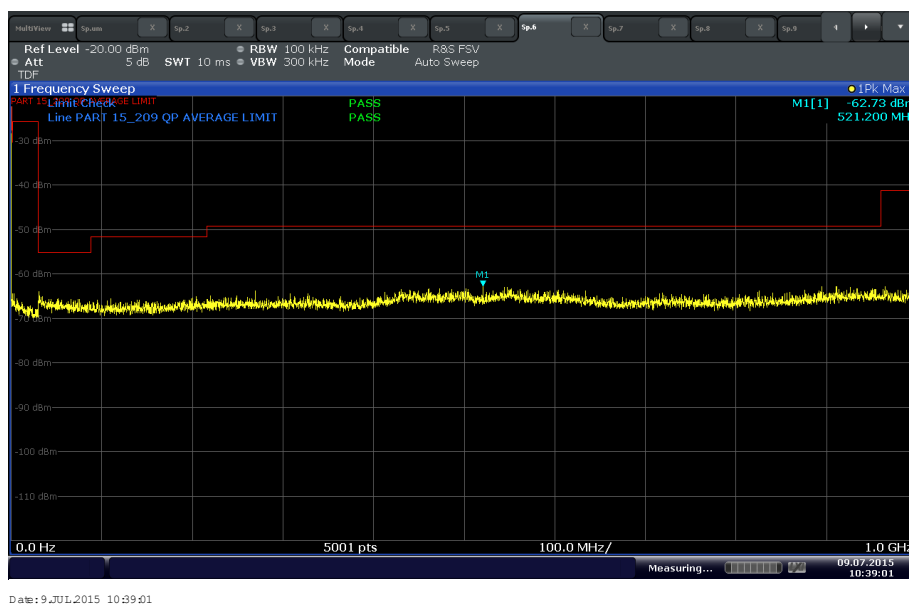


Date: 9 JUL 2015 10:09:40

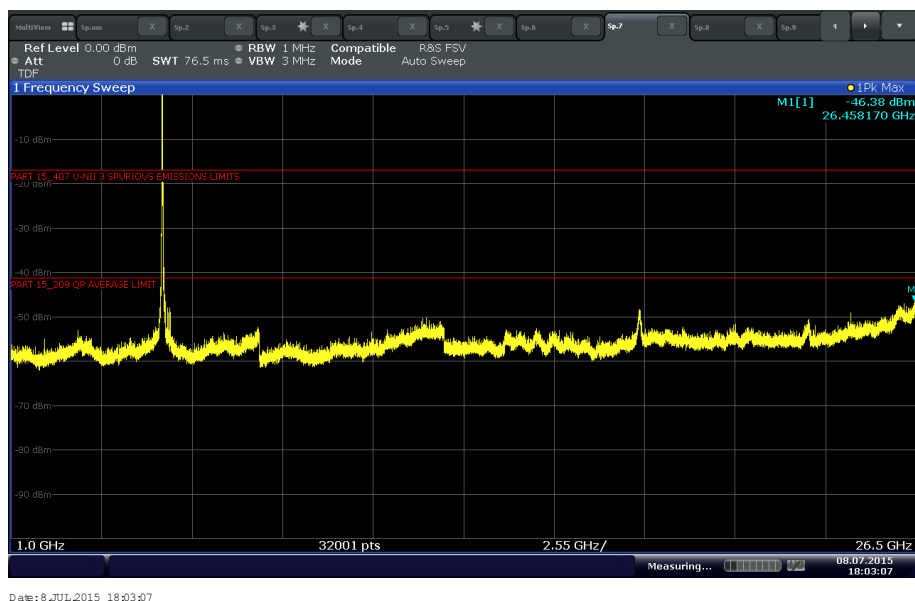
U-NII 2A Low Channel below 1GHz (40 MHz BW)



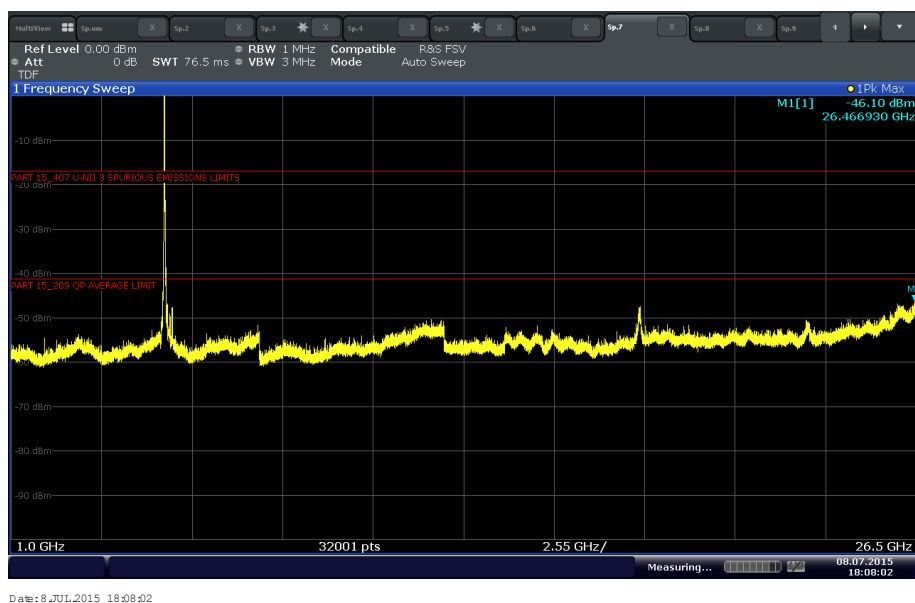
U-NII 2A High Channel below 1GHz (40 MHz BW)



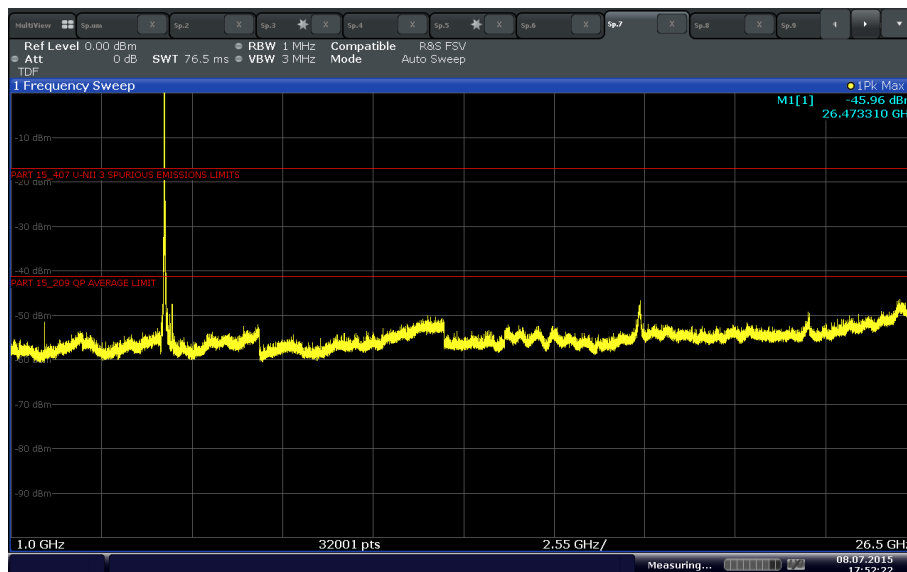
U-NII 2A Mid Channel below 1GHz (80 MHz BW)



U-NII 2A Low Channel above 1GHz (20 MHz BW)

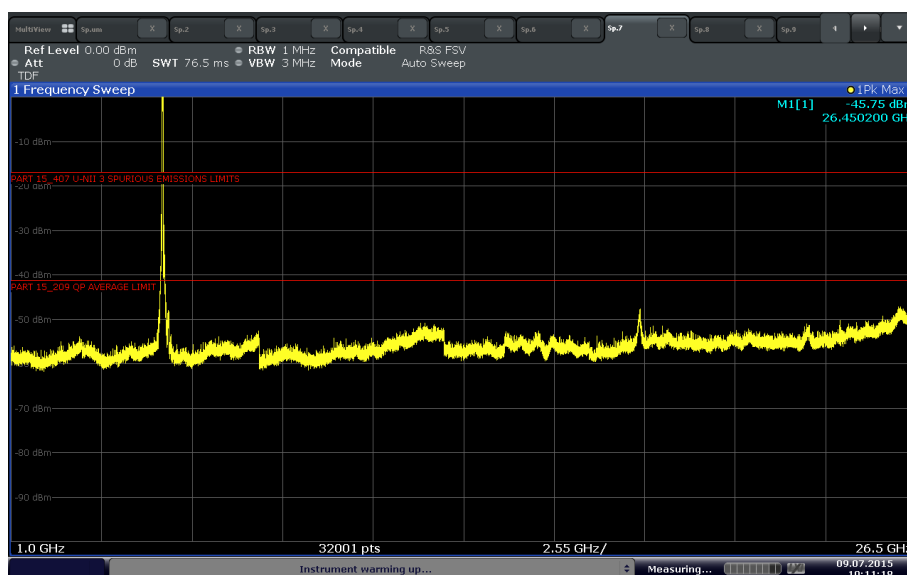


U-NII 2A Mid Channel above 1GHz (20 MHz BW)



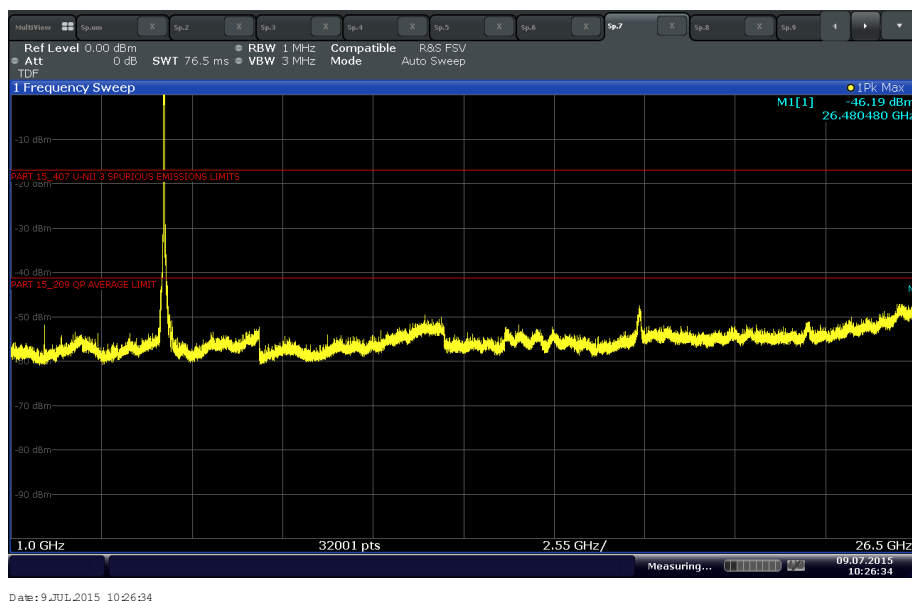
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U-NII 2A High Channel above 1GHz (20 MHz BW)

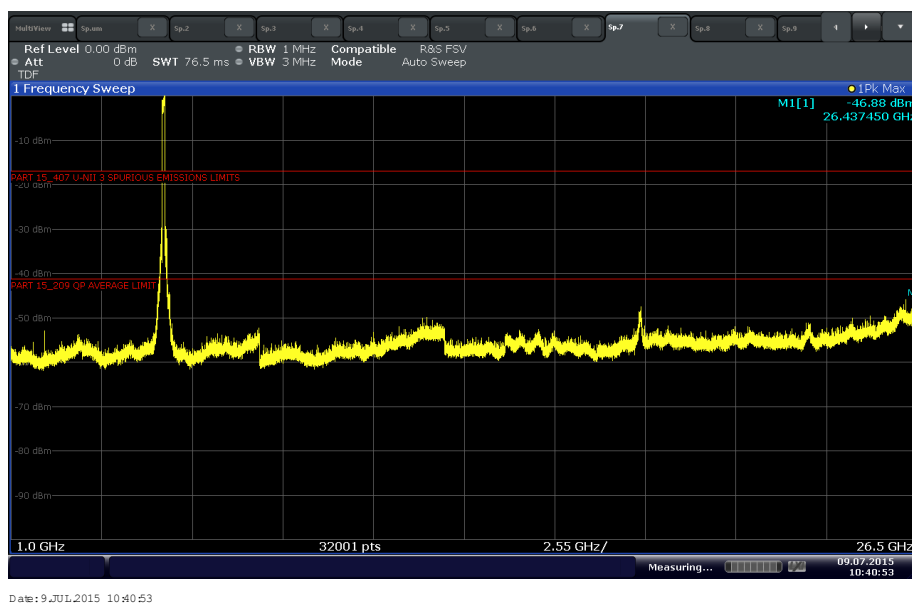


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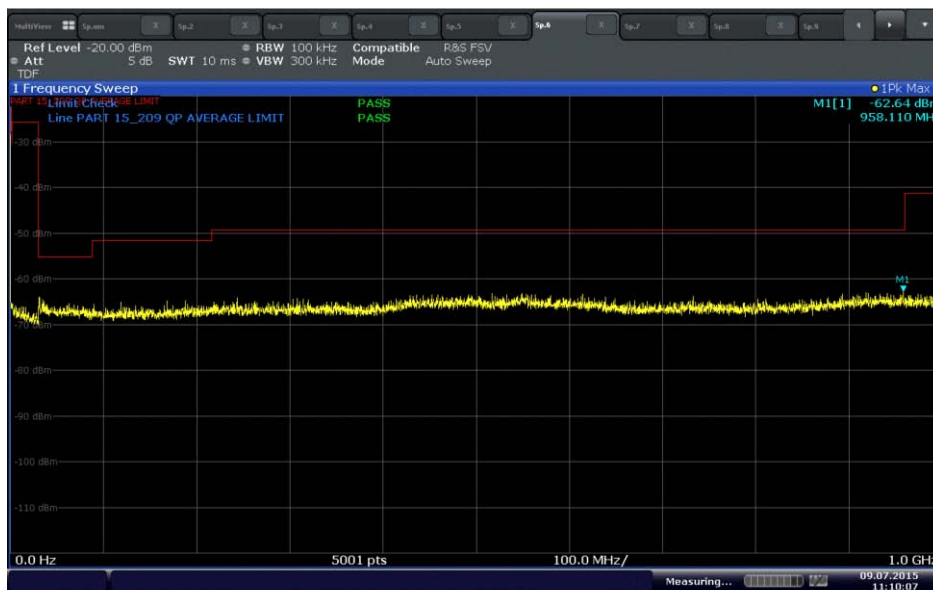
U-NII 2A Low Channel above 1GHz (40 MHz BW)



U-NII 2A High Channel above 1GHz (40 MHz BW)

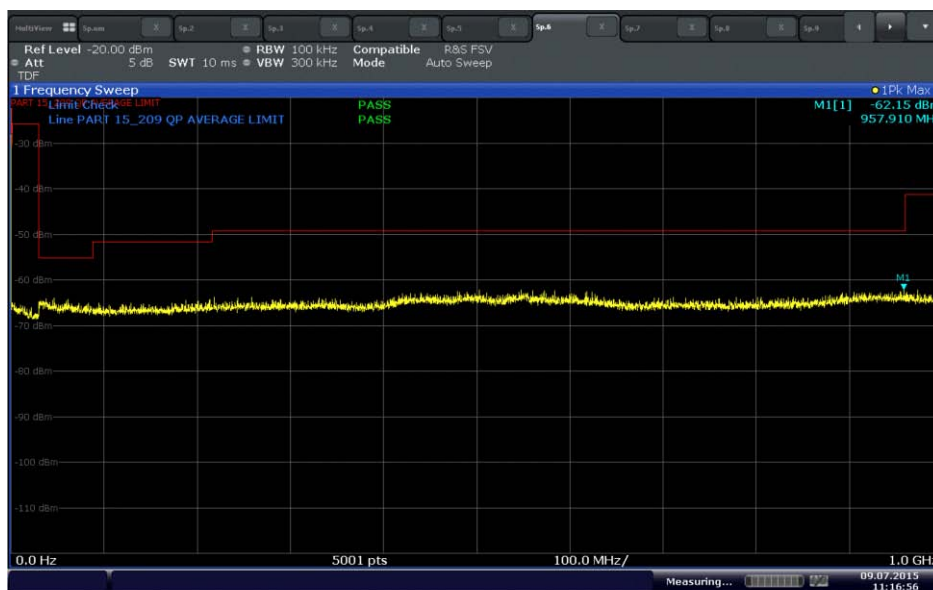


U-NII 2A Mid Channel above 1GHz (80 MHz BW)



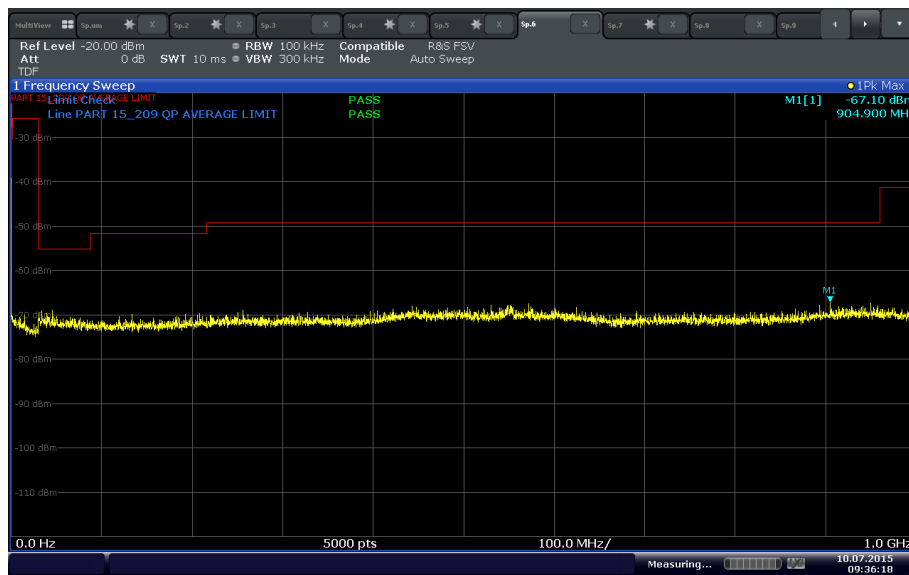
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U-NII 2C Low Channel below 1GHz (20 MHz BW)

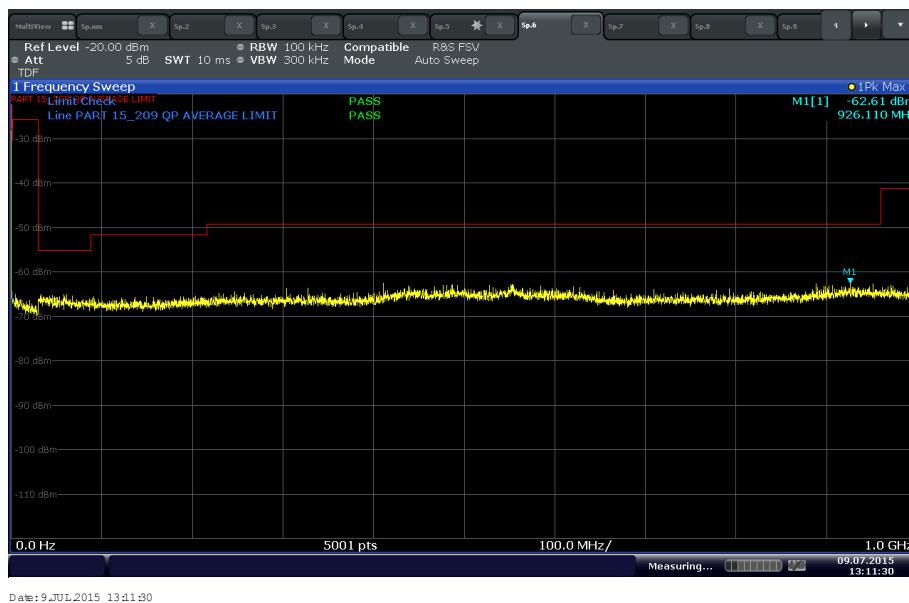


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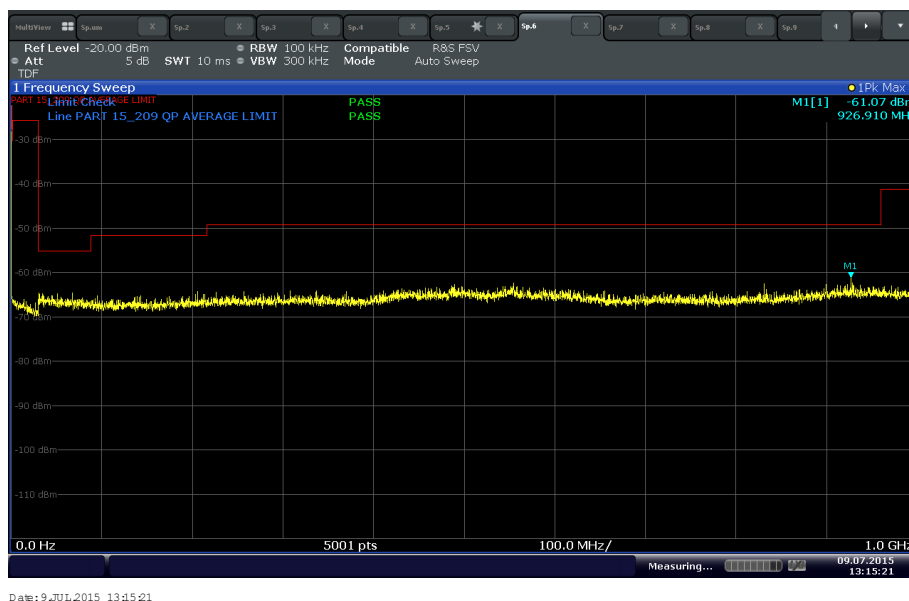
U-NII 2C Mid Channel below 1GHz (20 MHz BW)



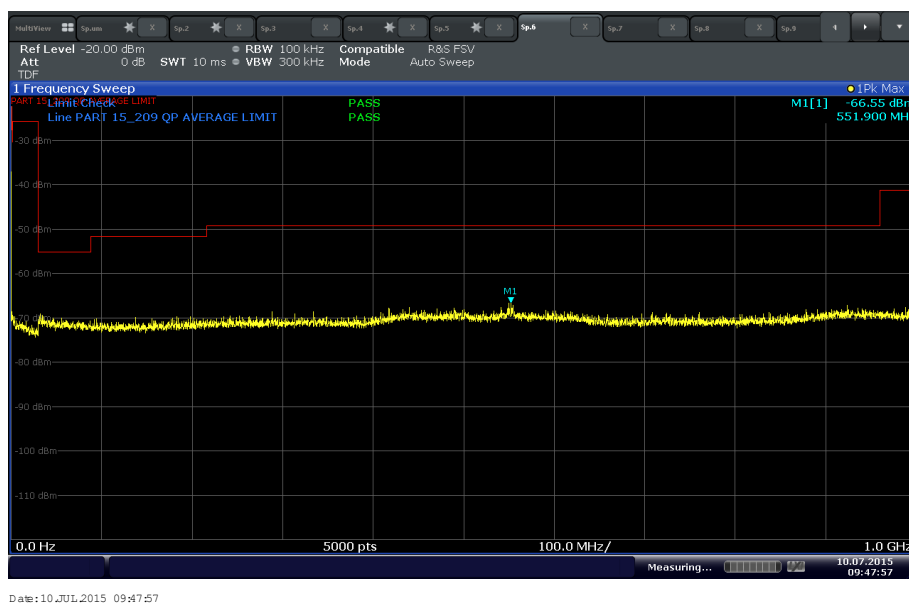
U-NII 2C High Channel below 1GHz (20 MHz BW)



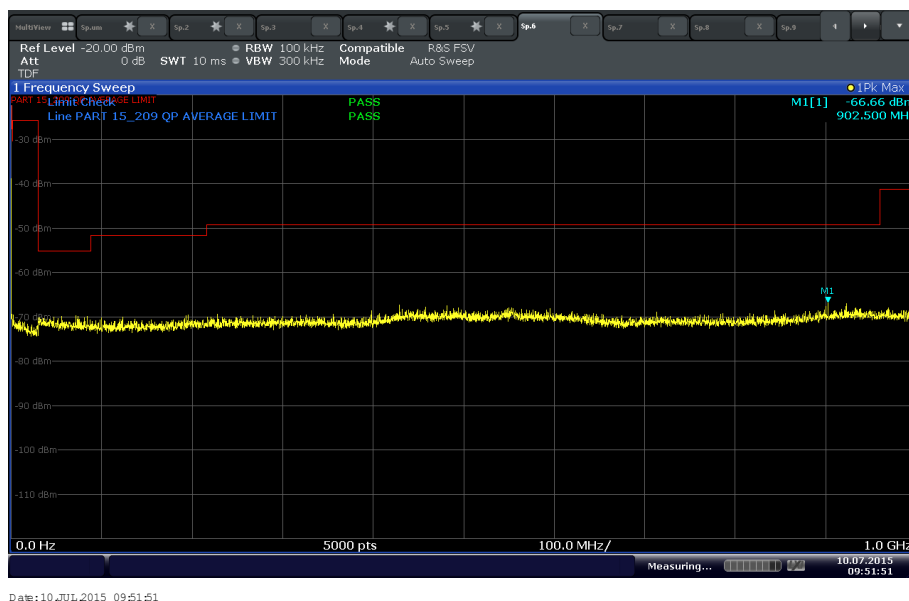
U-NII 2C Low Channel below 1GHz (40 MHz BW)



U-NII 2C Mid Channel below 1GHz (40 MHz BW)

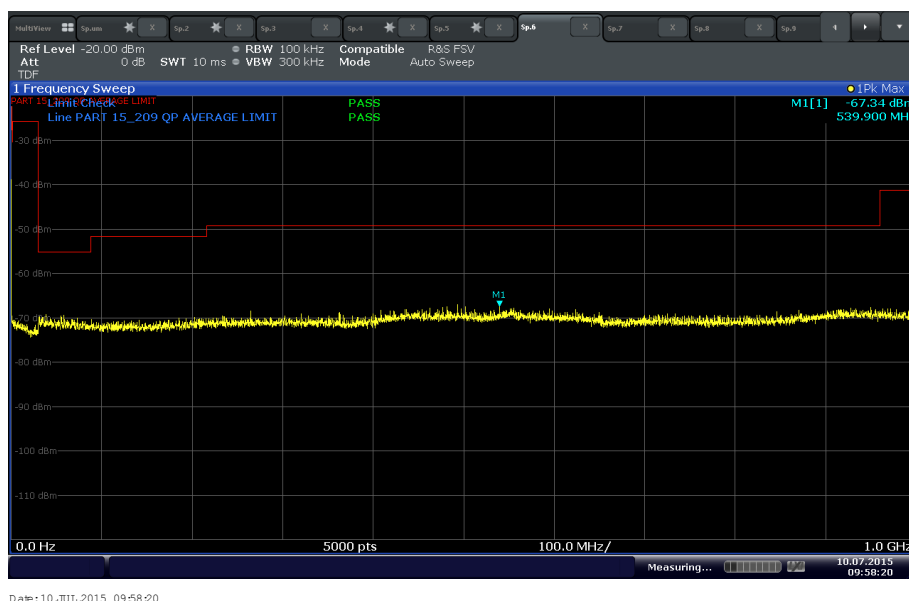


U-NII 2C High Channel below 1GHz (40 MHz BW)



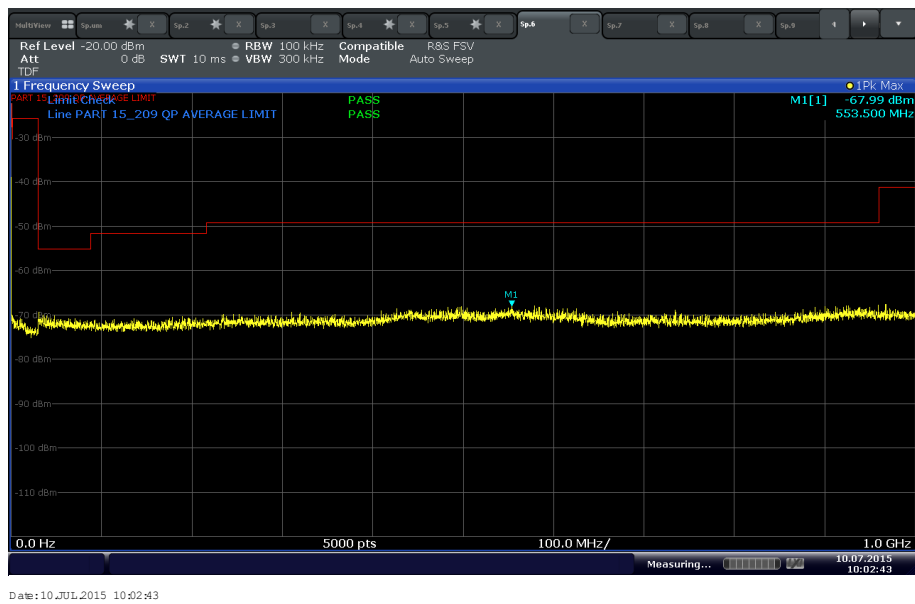
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U-NII 2C Low Channel below 1GHz (80 MHz BW)

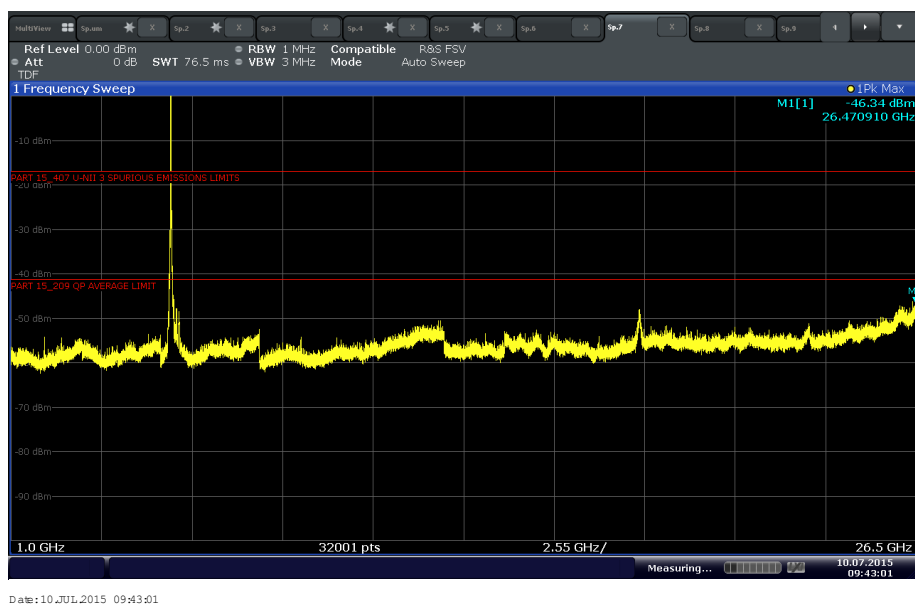


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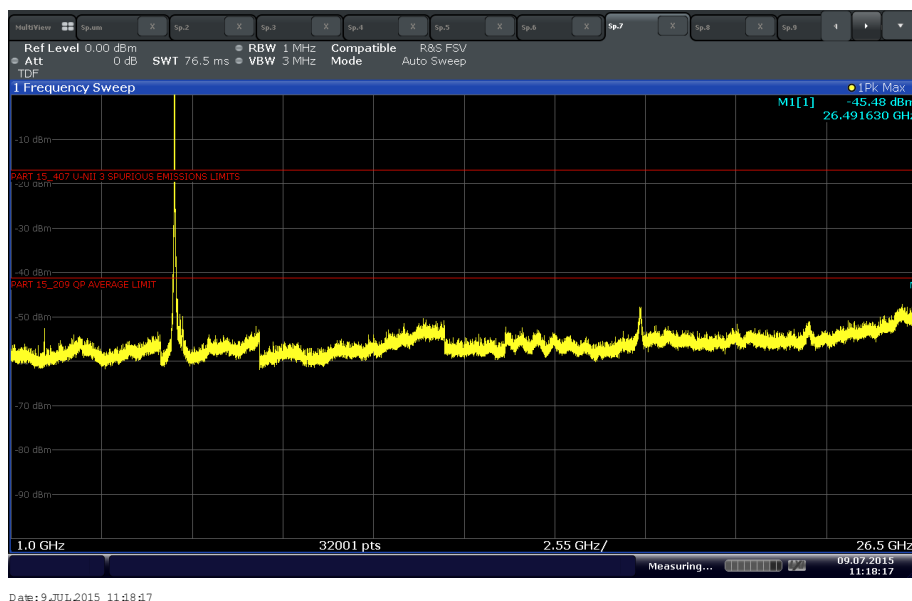
U-NII 2C Mid Channel below 1GHz (80 MHz BW)



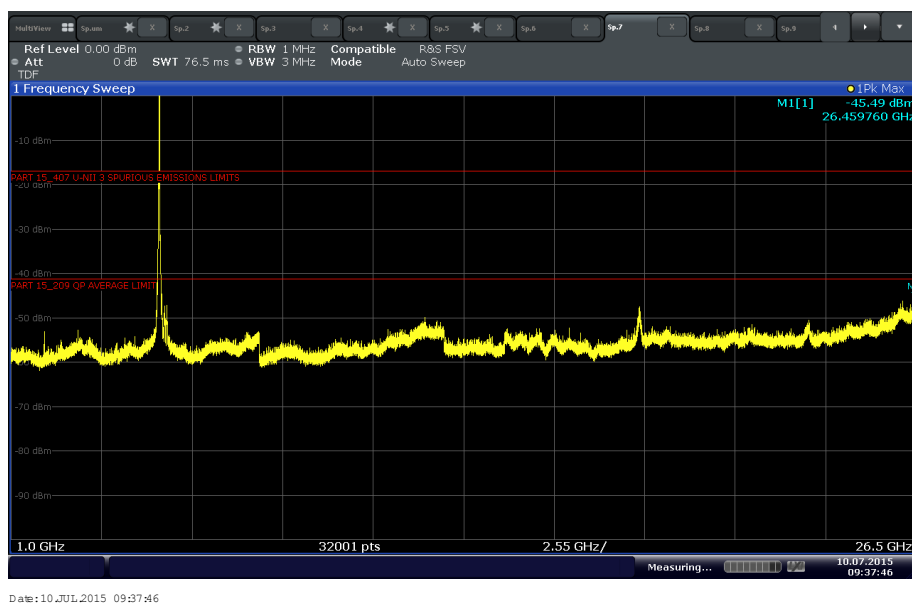
U-NII 2C High Channel below 1GHz (80 MHz BW)



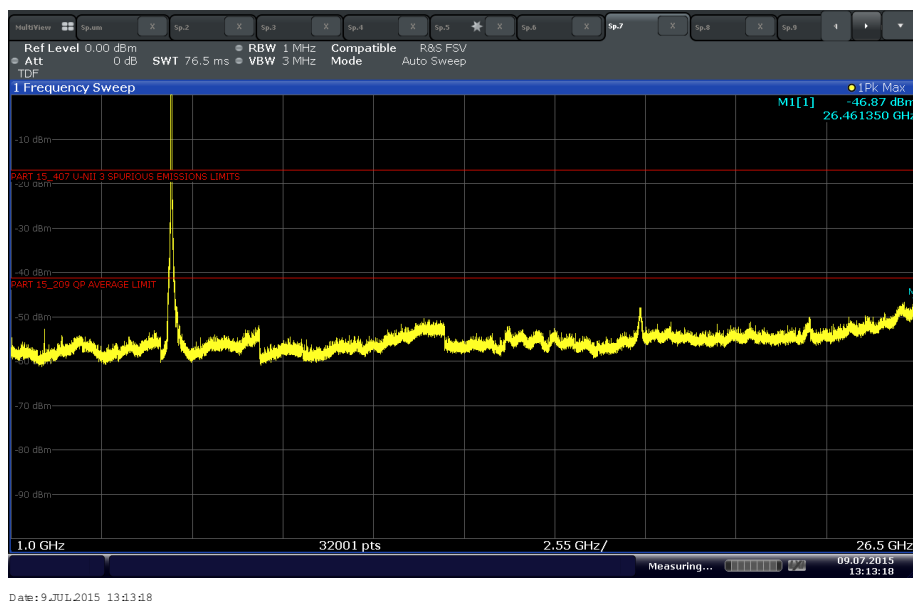
U-NII 2C Low Channel above 1GHz (20 MHz BW)



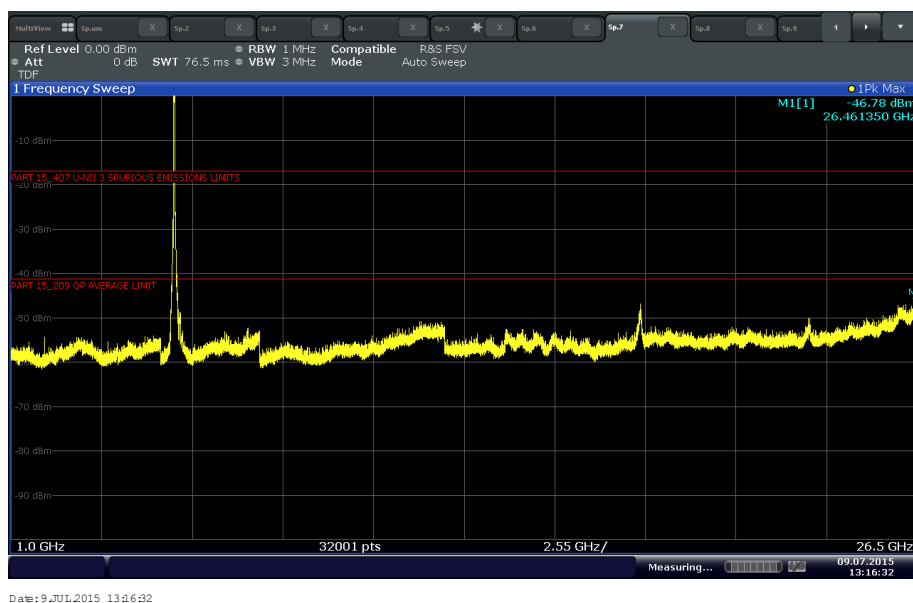
U-NII 2C Mid Channel above 1GHz (20 MHz BW)



U-NII 2C High Channel above 1GHz (20 MHz BW)



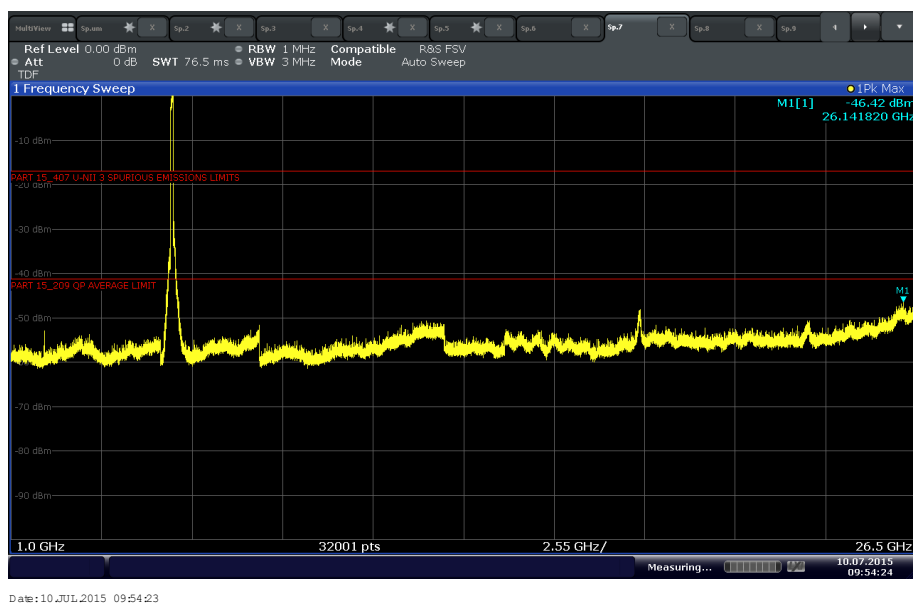
U-NII 2C Low Channel above 1GHz (40 MHz BW)



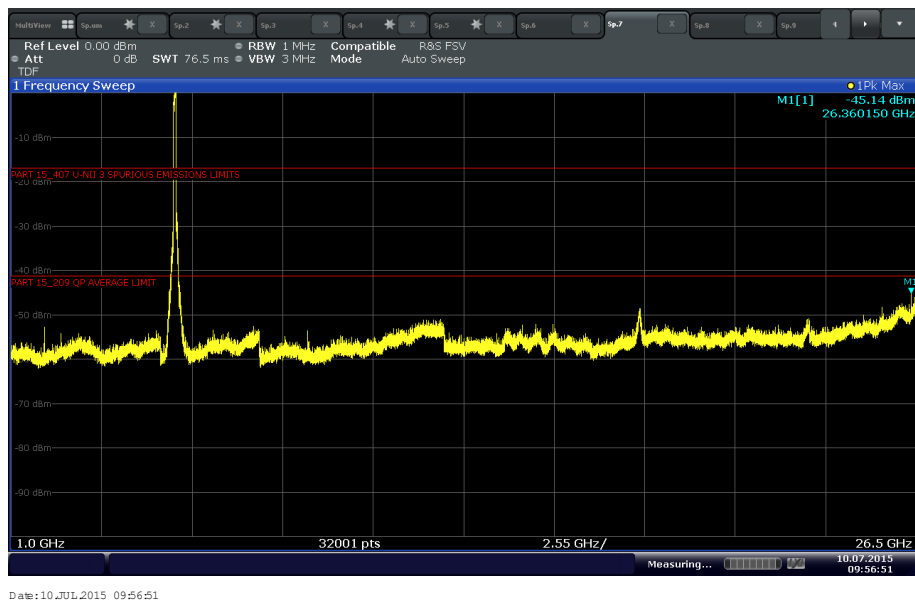
U-NII 2C Mid Channel above 1GHz (40 MHz BW)



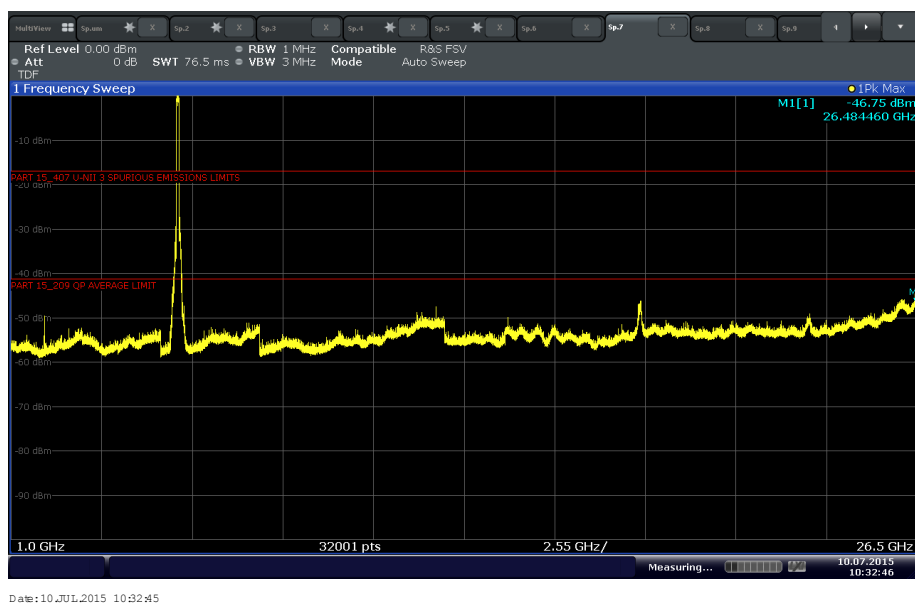
U-NII 2C High Channel above 1GHz (40 MHz BW)



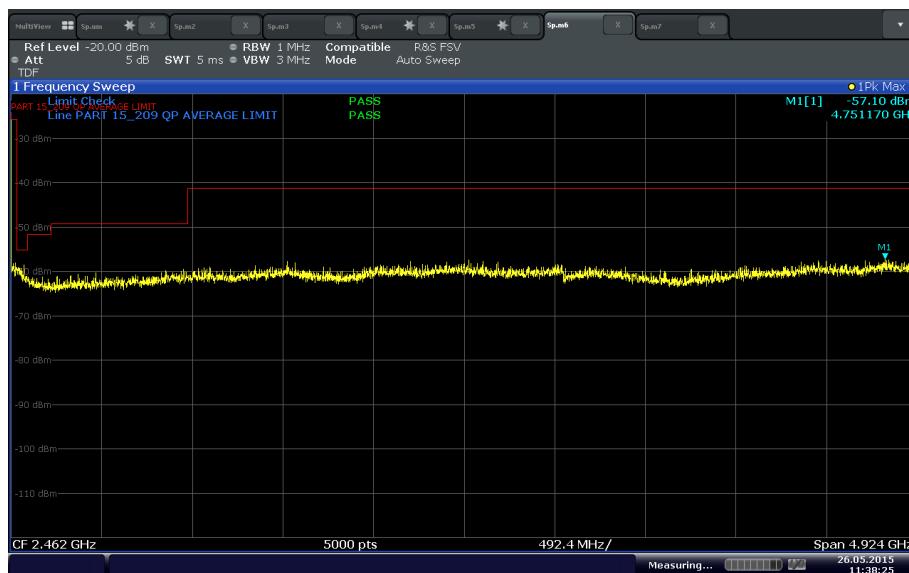
U-NII 2C Low Channel above 1GHz (80 MHz BW)



U-NII 2C Mid Channel above 1GHz (80 MHz BW)

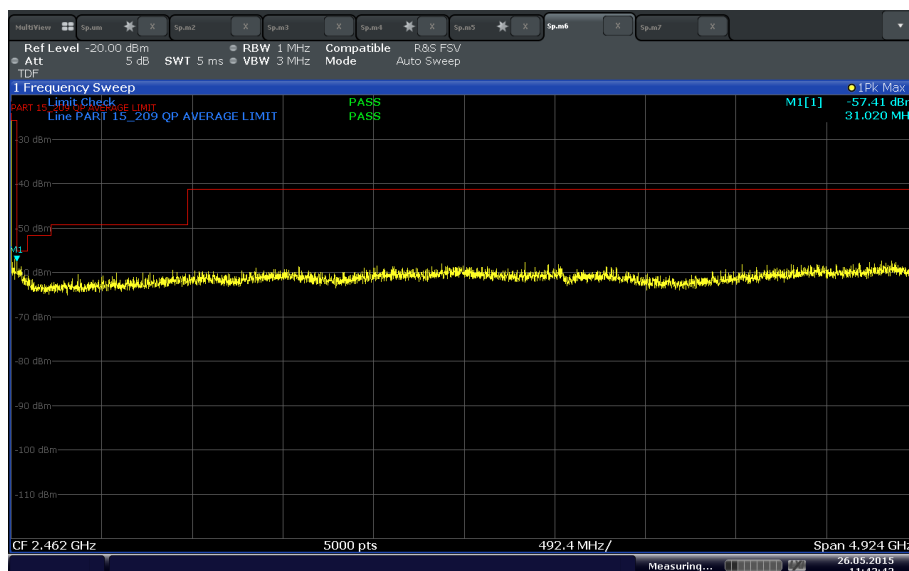


U-NII 2C High Channel above 1GHz (80 MHz BW)



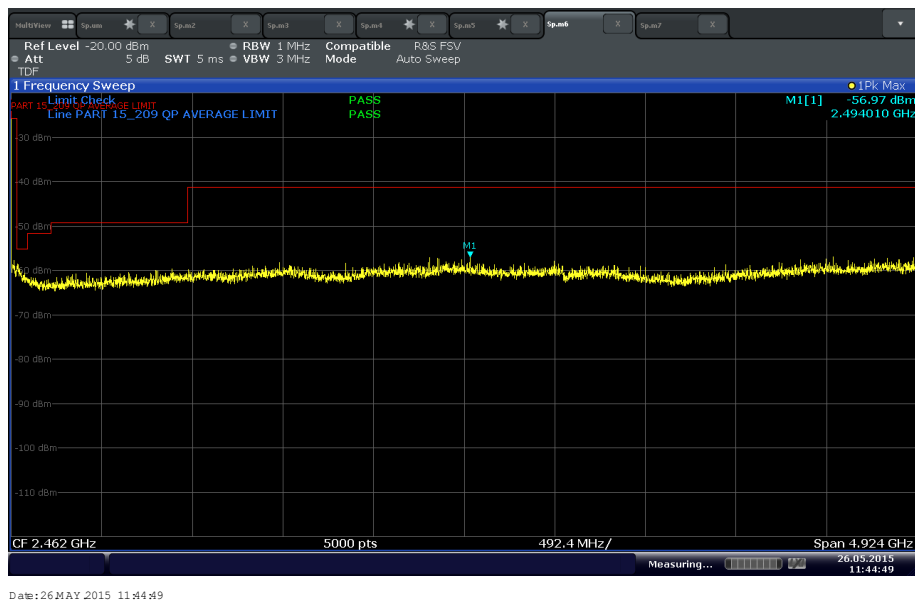
Date: 26 MAY 2015 11:38:25

U-NII 3 Low Channel below 1GHz (20 MHz BW)

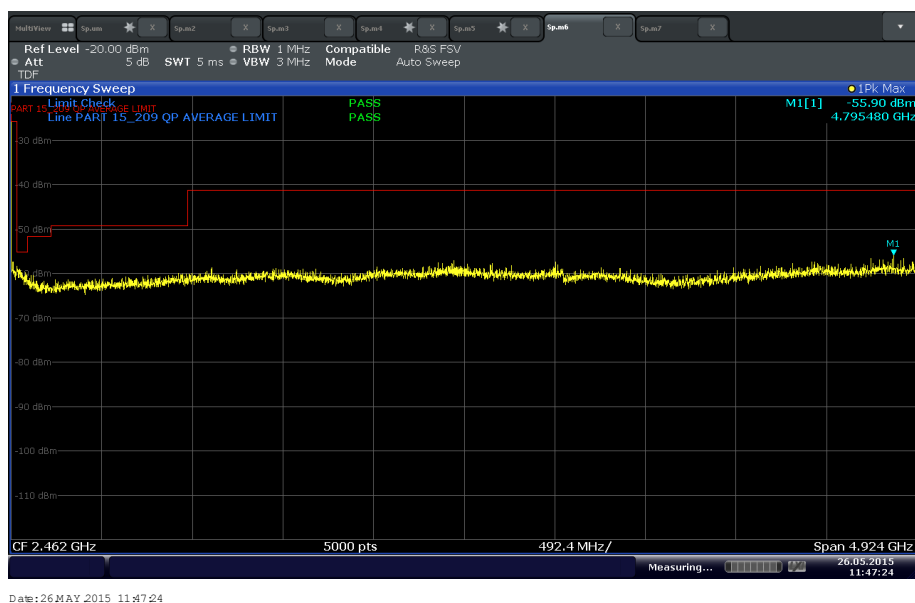


Date: 26 MAY 2015 11:42:43

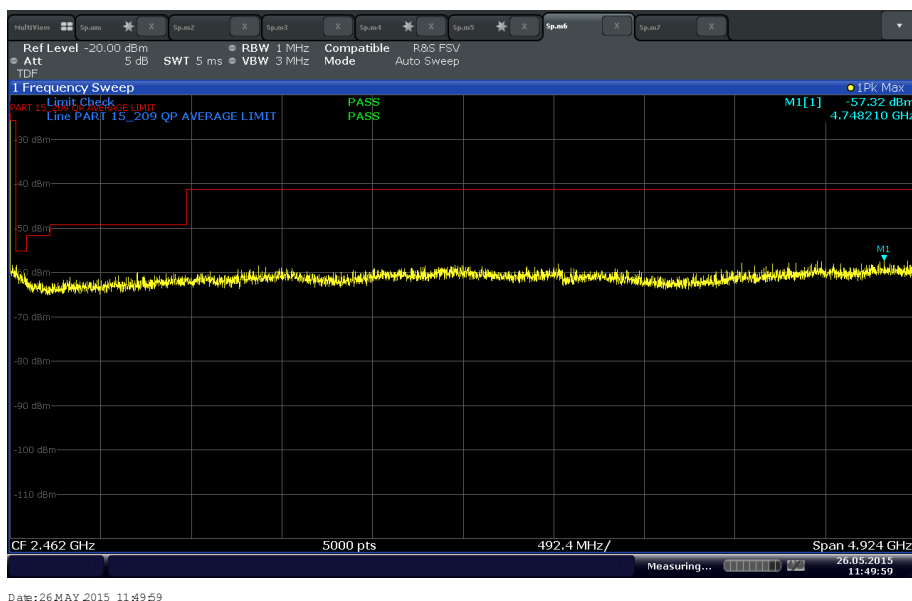
U-NII 3 Mid Channel below 1GHz (20 MHz BW)



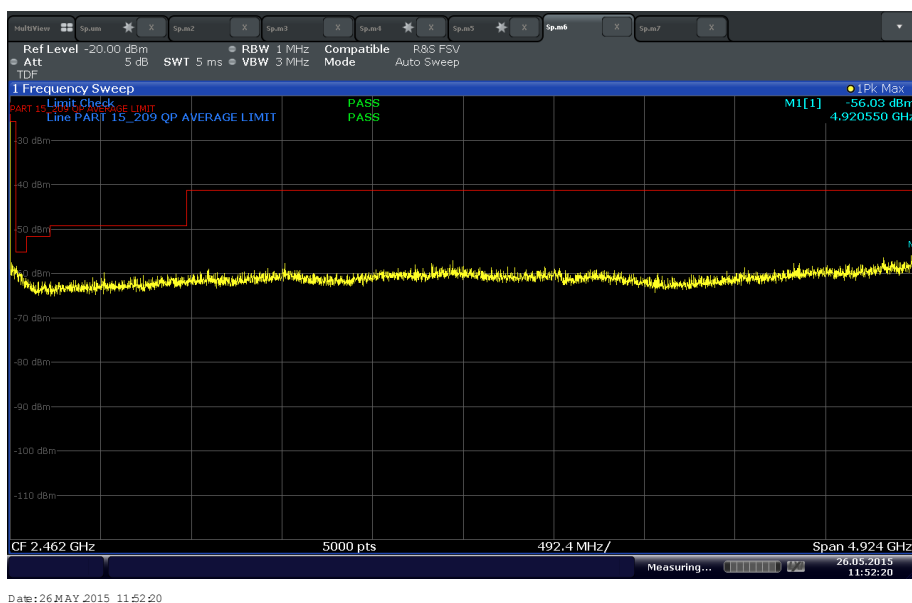
U-NII 3 High Channel below 1GHz (20 MHz BW)



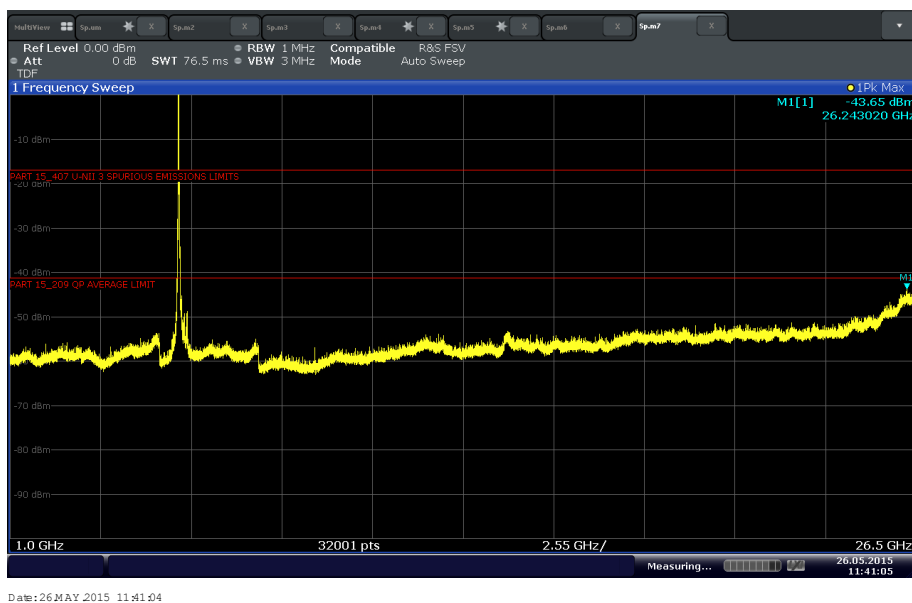
U-NII 3 Low Channel below 1GHz (40 MHz BW)



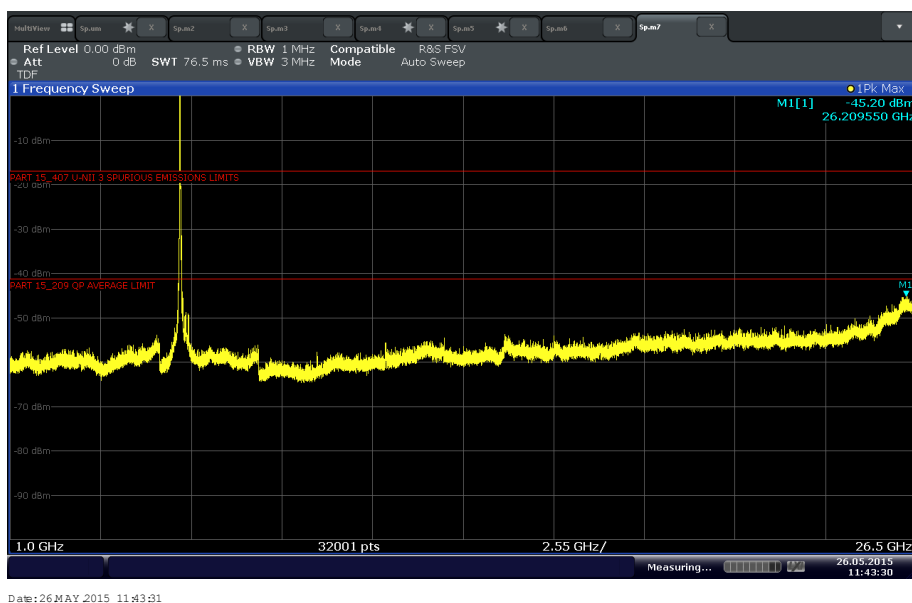
U-NII 3 High Channel below 1GHz (40 MHz BW)



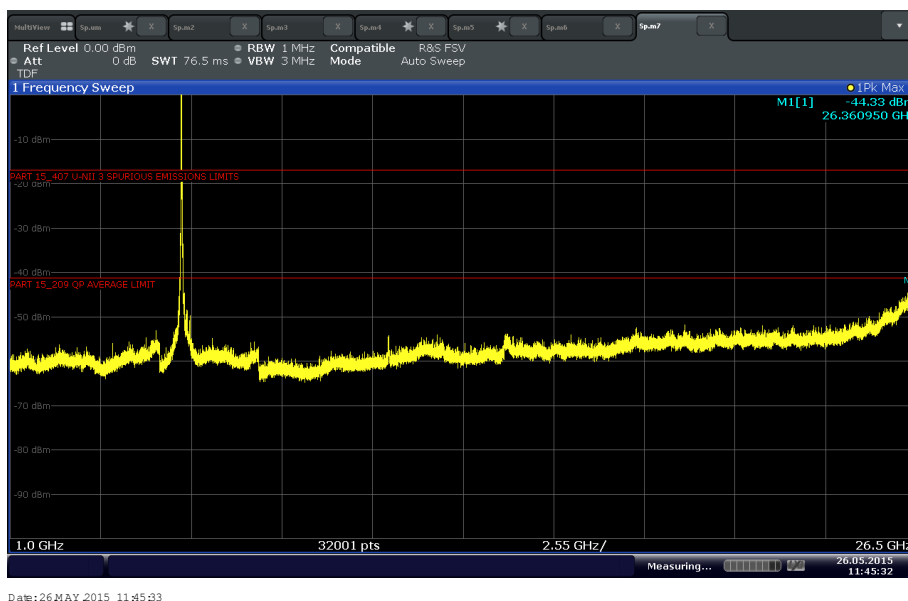
U-NII 3 Mid Channel below 1GHz (80 MHz BW)



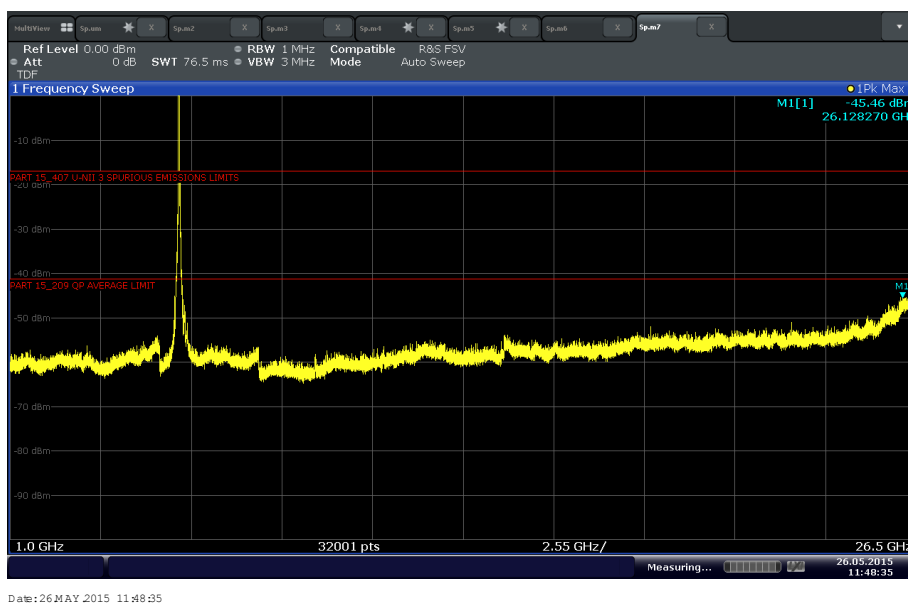
U-NII 3 Low Channel above 1GHz (20 MHz BW)



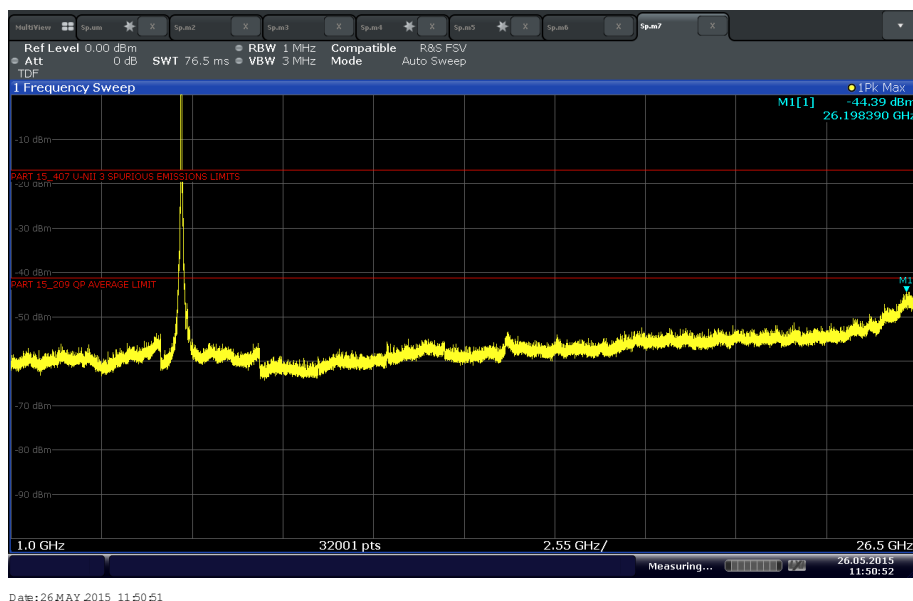
U-NII 3 Mid Channel above 1GHz (20 MHz BW)



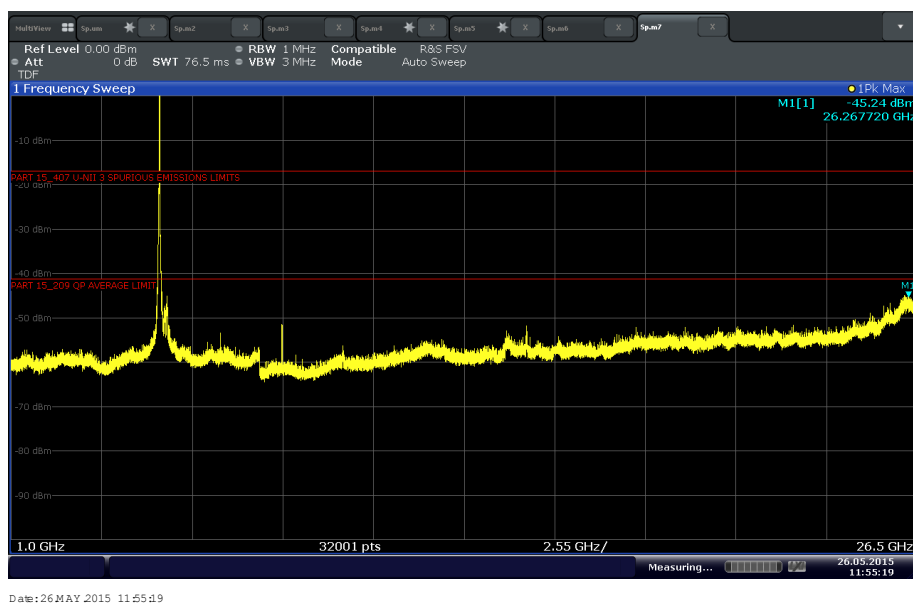
U-NII 3 High Channel above 1GHz (20 MHz BW)



U-NII 3 Low Channel above 1GHz (40 MHz BW)

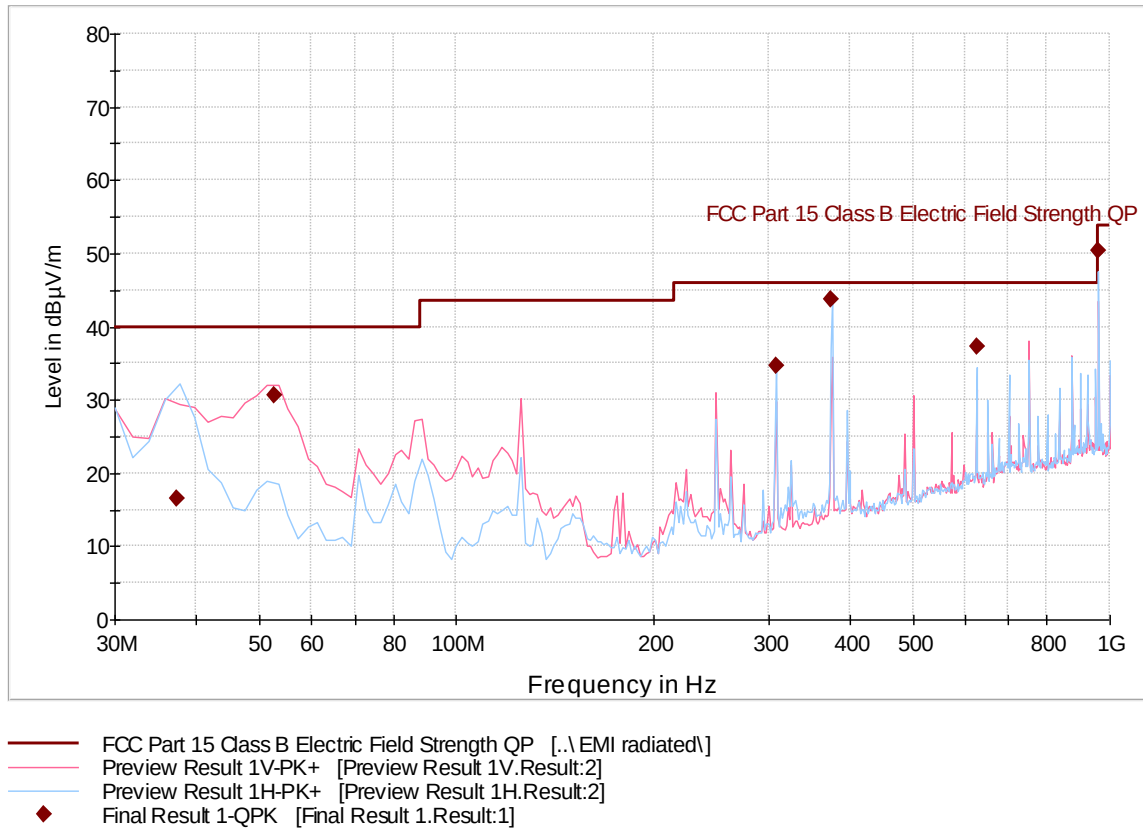


U-NII 3 High Channel above 1GHz (40 MHz BW)



U-NII 3 Mid Channel above 1GHz (80 MHz BW)

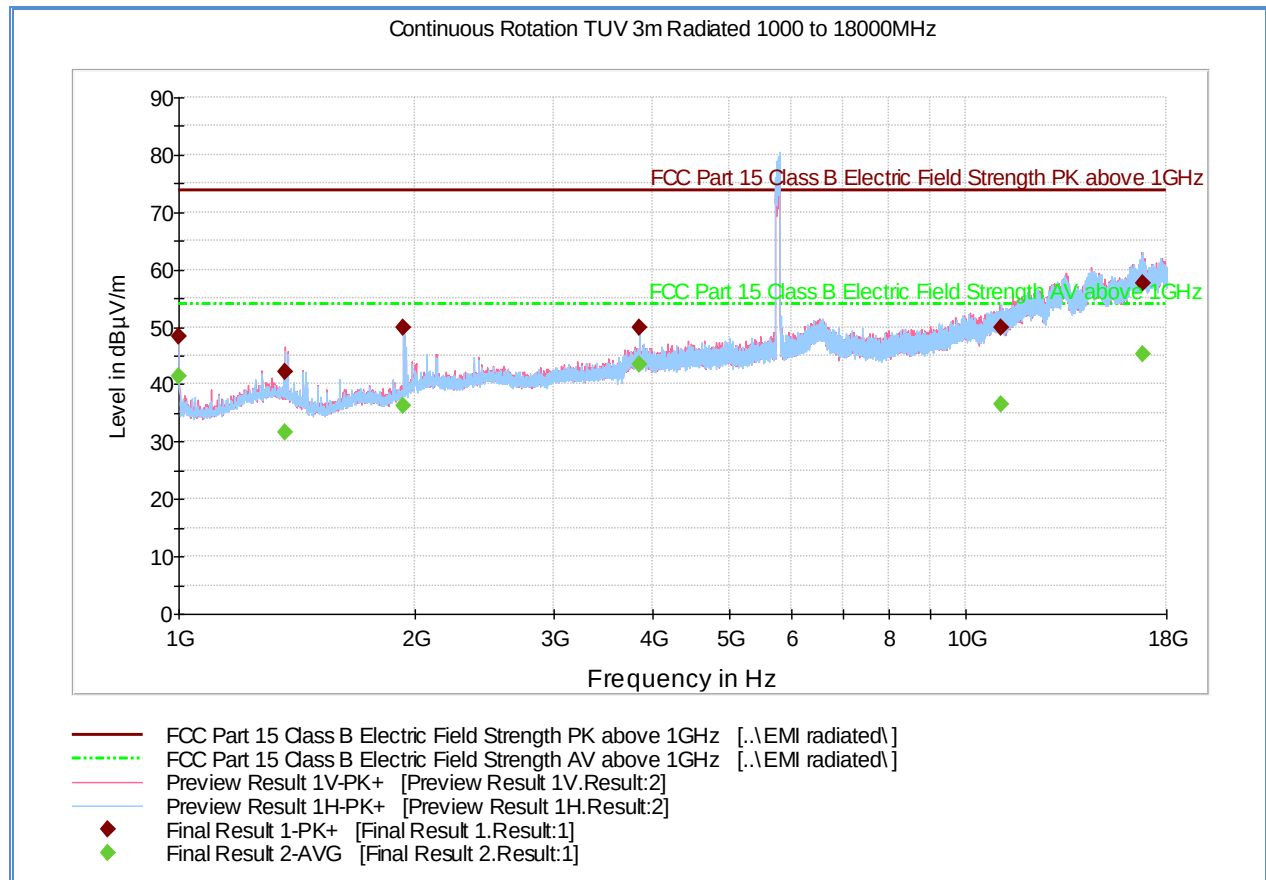
2.7.12 Test Results Below 1GHz (Representative Cabinet Spurious Emissions)



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)
37.255551	16.5	1000.0	120.000	300.0	H	11.0	-15.3	23.5	40.0
52.582766	30.7	1000.0	120.000	100.0	V	26.0	-20.4	9.3	40.0
308.015952	34.7	1000.0	120.000	116.0	H	19.0	-12.2	11.3	46.0
375.012024	43.7	1000.0	120.000	100.0	H	51.0	-9.6	2.3	46.0
624.989659	37.3	1000.0	120.000	128.0	H	99.0	-3.5	8.7	46.0
960.002244	50.4	1000.0	120.000	141.0	H	170.0	1.4	3.5	53.9

2.7.13 Test Results Above 1GHz (Representative Cabinet Spurious Emissions)



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	48.4	1000.0	1000.000	240.4	H	44.0	-7.2	25.5	73.9
1363.633333	42.1	1000.0	1000.000	182.6	V	231.0	-5.3	31.8	73.9
1932.566667	49.9	1000.0	1000.000	402.0	H	96.0	-2.3	24.0	73.9
3849.966667	49.8	1000.0	1000.000	191.5	V	146.0	4.8	24.1	73.9
11105.56666	49.8	1000.0	1000.000	355.1	H	344.0	14.5	24.1	73.9
16774.43333	57.5	1000.0	1000.000	402.0	H	69.0	23.7	16.4	73.9

Average Data (direct measurement using a Receiver)

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.000000	41.5	1000.0	1000.000	240.4	H	44.0	-7.2	12.4	53.9
1363.633333	31.6	1000.0	1000.000	182.6	V	231.0	-5.3	22.3	53.9
1932.566667	36.2	1000.0	1000.000	402.0	H	96.0	-2.3	17.7	53.9
3849.966667	43.4	1000.0	1000.000	191.5	V	146.0	4.8	10.5	53.9
11105.56666	36.5	1000.0	1000.000	355.1	H	344.0	14.5	17.4	53.9
16774.43333	45.2	1000.0	1000.000	402.0	H	69.0	23.7	8.7	53.9



Average Data with Duty Cycle Correction Factor

This section of the procedure was not performed. There was no significant spurious emission observed other than the fundamental.

Frequency (MHz)	Average (dBμV/m)	Duty Cycle Correction Factor (dB)	Calculated Average (dBμV/m)	Margin (dB)	Limit (dBμV/m)
-	-	-	-	-	53.9

Test Notes: Measurement was performed with a 5.0GHz notch filter. No significant emissions observed above 18GHz. Only the worst case configuration presented.

2.8 BAND-EDGE MEASUREMENTS

2.8.1 Specification Reference

Part 15 Subpart E §15.407(b)(1),(4) and (7) / 15.209 and RSS-210 A9.2(1) and (4)

2.8.2 Standard Applicable

(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.
- (2) For transmitters operating in the 5.25-5.35 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz.
- (3) For transmitters operating in the 5.47-5.725 GHz band: all emissions outside of the 5.47-5.725 GHz band shall not exceed an EIRP of -27 dBm/MHz.
- (4) For transmitters operating in the 5.725-5.85 GHz band: All emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of -17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of -27 dBm/MHz.

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

2.8.3 Test Methodology

Section II (G)(3)(d)(ii) Band Edge Measurement of 789033 D02 General UNII Test Procedures New Rules v01

2.8.4 Equipment Under Test and Modification State

Serial No: N/A / Test Configuration A and B

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

May 26, 2015 and July 09, 2015/FSC and NS

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

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature 25.0°C
Relative Humidity 45.6%
ATM Pressure 99.1 kPa

2.8.8 Additional Observations

- This is a conducted test using Integration Method as per Section II (G)(3)(d)(ii) Band Edge Measurement of 789033 D02 General UNII Test Procedures New Rules v01.
- RBW=100 kHz
- VBW=300 kHz
- Sweep time=Auto
- Trace Mode=max hold (Peak); trace averaging (Average)
- Detector is Peak for Peak measurements and RMS for Average measurements.
- Trace stabilization was adjusted by a factor of 2.9 as per duty cycle of 0.3456 (worst case, 80MHz BW MCS9).

$$\begin{aligned}\text{Trace count} &= (1/0.3456) \times 100 \\ &= 290\end{aligned}$$

- Sweep time is set to auto.
- An offset of 21.00dB was added to compensate for the external attenuator and cable used.
- For Average measurements, the corresponding duty cycle correction factor will be added to the calculation.
- Integration performed across 1MHz bandwidth.
- Only the worst case bandwidth and data rate presented.

2.8.9 Test Results



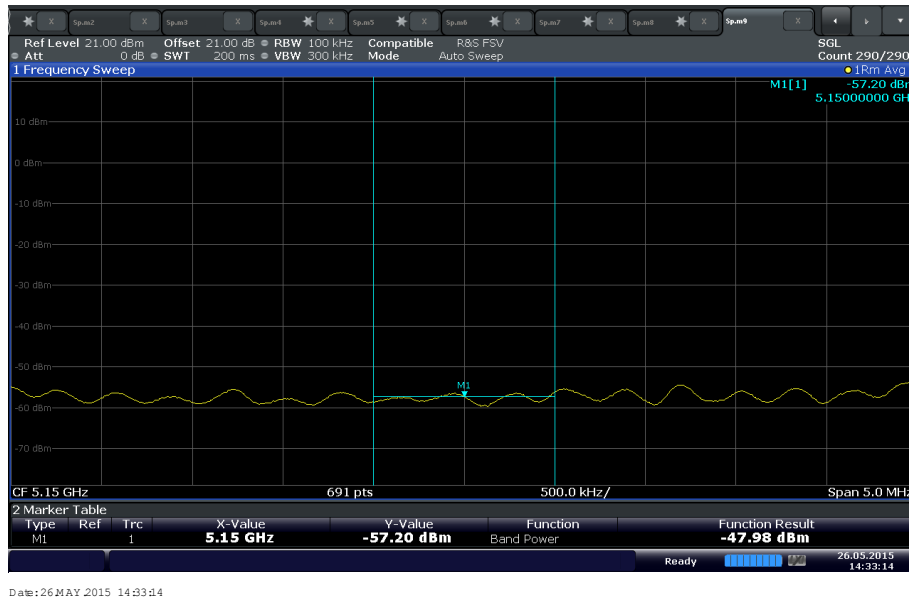
Date: 26 MAY 2015 13:42:52

U-NII 1 Lower Band Edge (Peak Measurement)

Lower band edge calculation:

- 5150 MHz (in the restricted band)
- Use the following formula as per Section Section G(2)(III) of 789033 D02 General UNII Test Procedures New Rules v01:

$$\begin{aligned}
 E(\text{dB}\mu\text{V}/\text{m}) &= \text{EIRP (dBm)} + 95.2 \\
 &= (-29.27 \text{ dBm} + 3.2 \text{ dBi antenna gain}) + 95.2 \\
 &= \mathbf{69.13 \text{ dB}\mu\text{V}/\text{m} @ 3 \text{ meters}} \text{ (Complies with } 74 \text{ dB}\mu\text{V}/\text{m} \text{ limit)}
 \end{aligned}$$

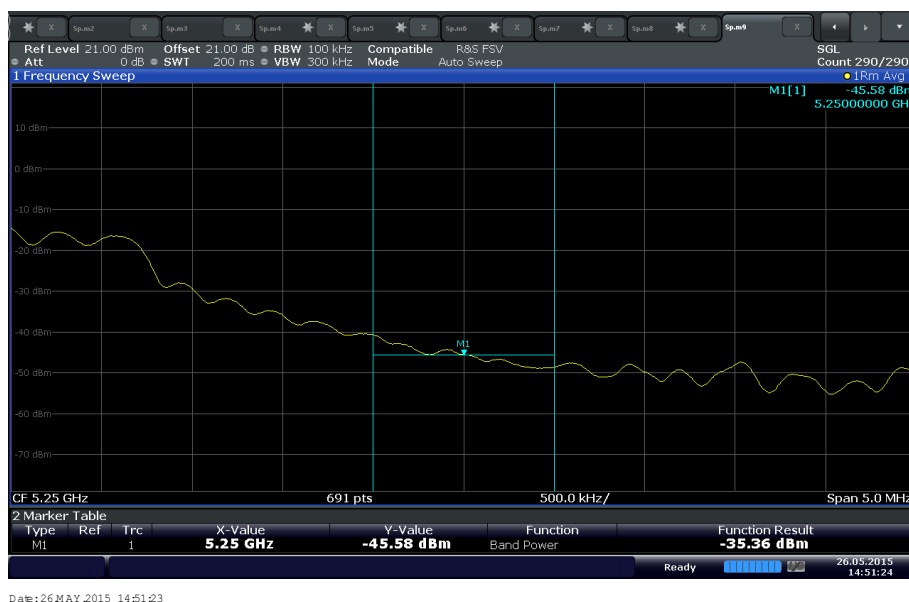


U-NII 1 Lower Band Edge (Average Measurement)

Lower band edge calculation:

- 5150 MHz (in the restricted band)
- Use the following formula as per Section Section G(2)(III) of 789033 D02 General UNII Test Procedures New Rules v01:

$$\begin{aligned}
 E(\text{dB}\mu\text{V}/\text{m}) &= \text{EIRP (dBm)} + 95.2 + \text{Duty Cycle Correction Factor} \\
 &= (-47.98 \text{ dBm} + 3.2 \text{ dBi antenna gain}) + 95.2 + 3 \text{ dB (DCCF for 40MHz MCS6)} \\
 &= \mathbf{53.42 \text{ dB}\mu\text{V}/\text{m} @ 3 \text{ meters}} \text{ (Complies with } 54 \text{ dB}\mu\text{V}/\text{m} \text{ limit)}
 \end{aligned}$$



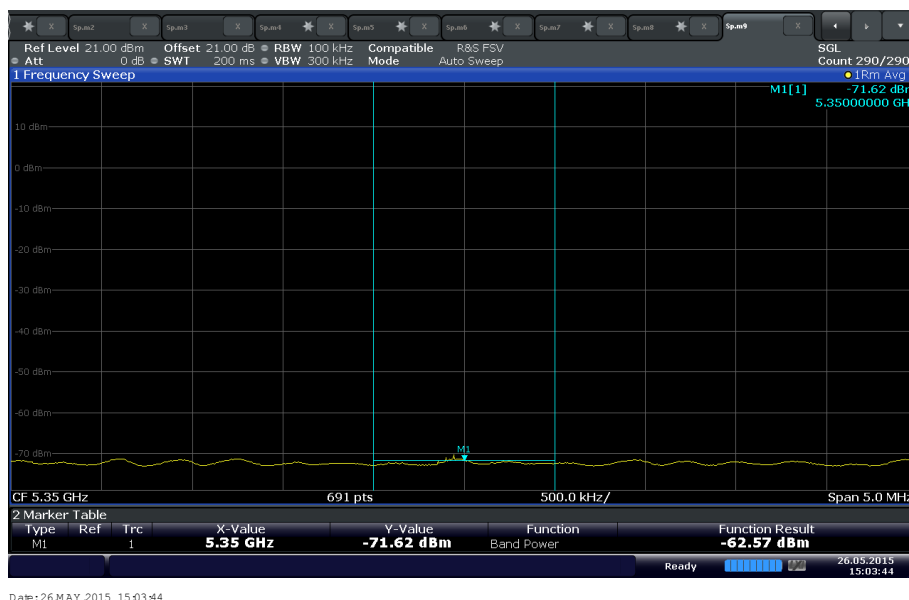
U-NII 1 Upper Band Edge (Average Measurement) @ 5250 MHz

Upper band edge calculation (5250 MHz):

- 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)

Calculation @ 5250 MHz:

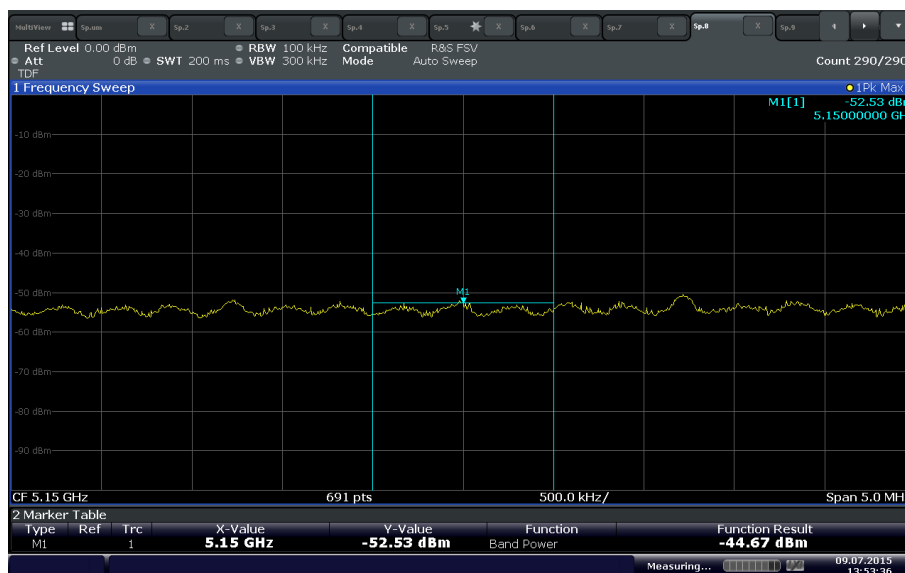
$$\begin{aligned}
 \text{Integrated average measurement @ 5250 MHz} &= -35.36 \text{ dBm} \\
 \text{EIRP @ 5250 MHz} &= -35.36 + 3.2 \text{ dBi (antenna gain)} + 3 \text{ dB (DCCF)} \\
 &= -29.16 \text{ dBm. Complies with -27 dBm/MHz limit.}
 \end{aligned}$$



U-NII 1 Upper Band Edge (Average Measurement) @ 5350 MHz

Upper band edge calculation (5350 MHz):

- Limit is -27dBm EIRP
- Calculation @ 5350 MHz:
 Integrated average measurement @ 5250 MHz = -62.57 dBm
 EIRP @ 5250 MHz = -62.57 + 3.2dBi (antenna gain) + 3 dB (DCCF)
 = -59.37dBm EIRP
 Margin of compliance = -32.37 dB



Date: 9 JUL 2015 13:53:37

U-NII 2A Lower Band Edge 80 MHz BW (Peak Measurement)

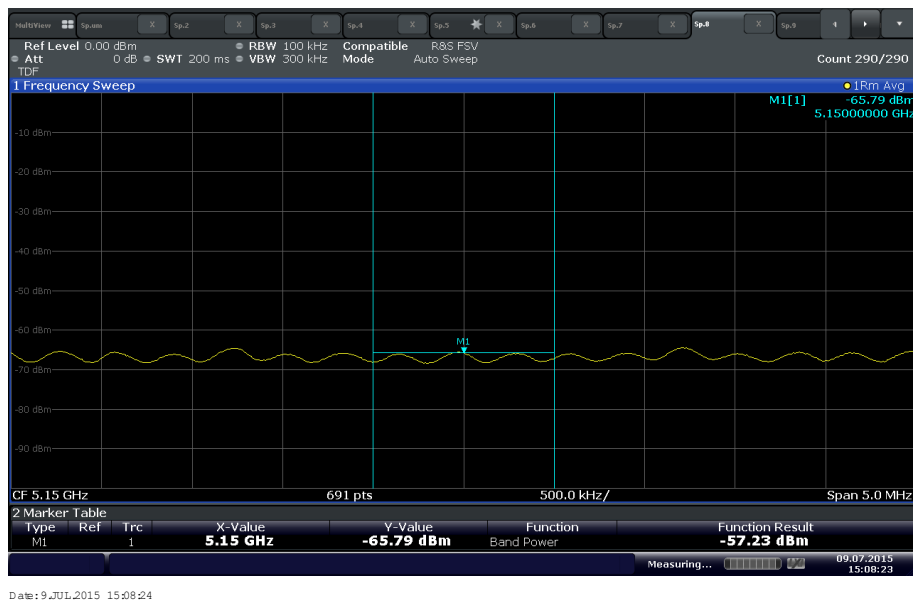
Lower band edge calculation:

- 5150 MHz (in the restricted band)
- Use the following formula as per Section G(2)(III) of 789033 D02 General UNII Test Procedures New Rules v01:

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

$$= (-44.67 \text{ dBm} + 3.2 \text{ dBi antenna gain}) + 95.2$$

$$= 53.73 \text{ dB}\mu\text{V}/\text{m} @ 3 \text{ meters (Complies with 74 dB}\mu\text{V}/\text{m limit)}$$

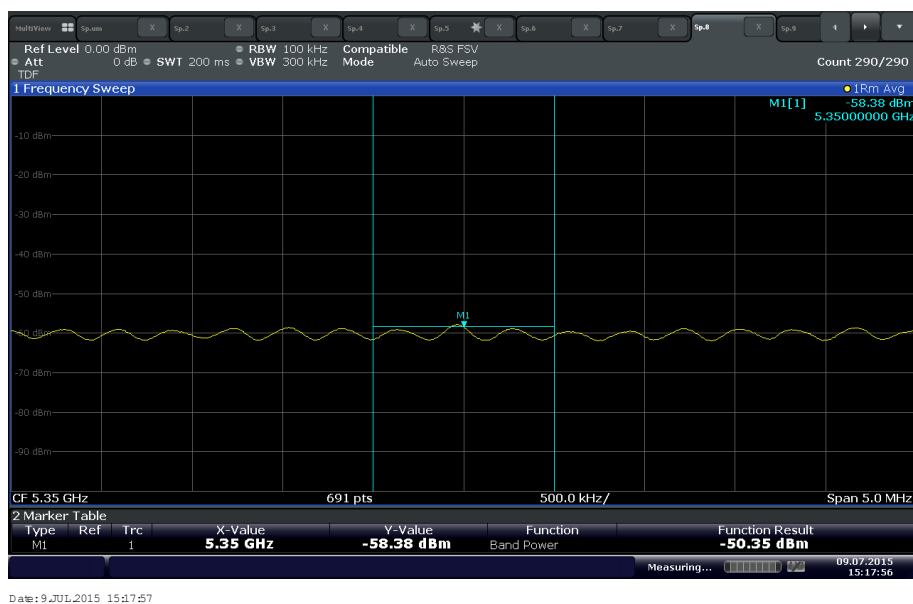


U-NII 2A Lower Band Edge 80 MHz BW (Average Measurement)

Lower band edge calculation:

- 5150 MHz (in the restricted band)
- Use the following formula as per Section G(2)(III) of 789033 D02 General UNII Test Procedures New Rules v01:

$$\begin{aligned}
 E(\text{dB}\mu\text{V/m}) &= \text{EIRP (dBm)} + 95.2 + \text{Duty Cycle Correction Factor} \\
 &= (-57.23 \text{ dBm} + 3.2 \text{ dBi antenna gain}) + 95.2 + 1.08 \text{ dB (DCCF for 80MHz MCS1)} \\
 &= 42.25 \text{ dB}\mu\text{V/m @ 3 meters (Complies with 54 dB}\mu\text{V/m limit)}
 \end{aligned}$$

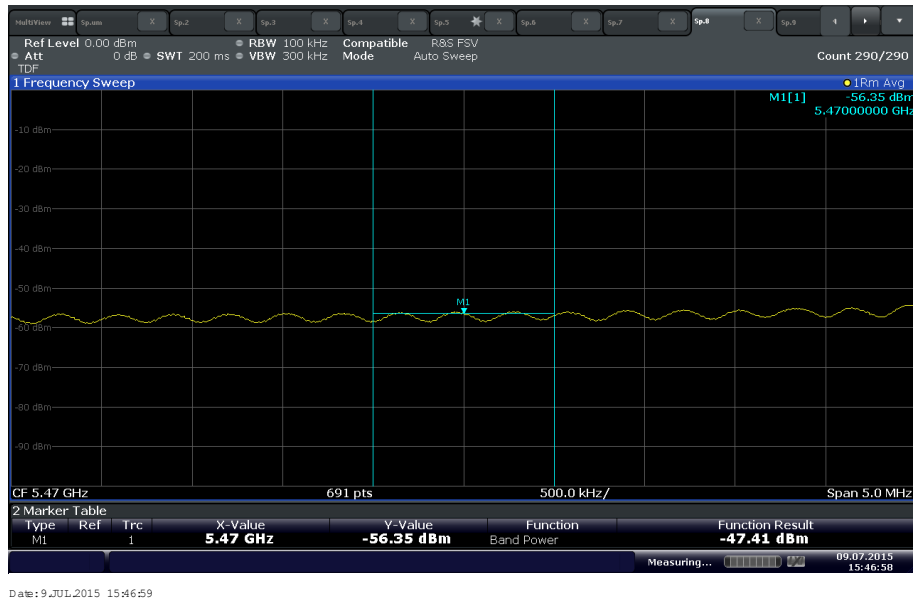


U-NII 2A Upper Band Edge 80 MHz BW (Average Measurement) @ 5350 MHz

Upper band edge calculation (5350 MHz):

- Limit is -27dBm EIRP
- Calculation @ 5350 MHz:

Integrated average measurement @ 5350 MHz	= -50.35 dBm
EIRP @ 5350 MHz	= -50.35 + 3.2dBi (antenna gain) + 1.08 dB (DCCF for 80MHz MCS1)
	= -46.07 dBm EIRP
Margin of compliance	= -19.07 dB

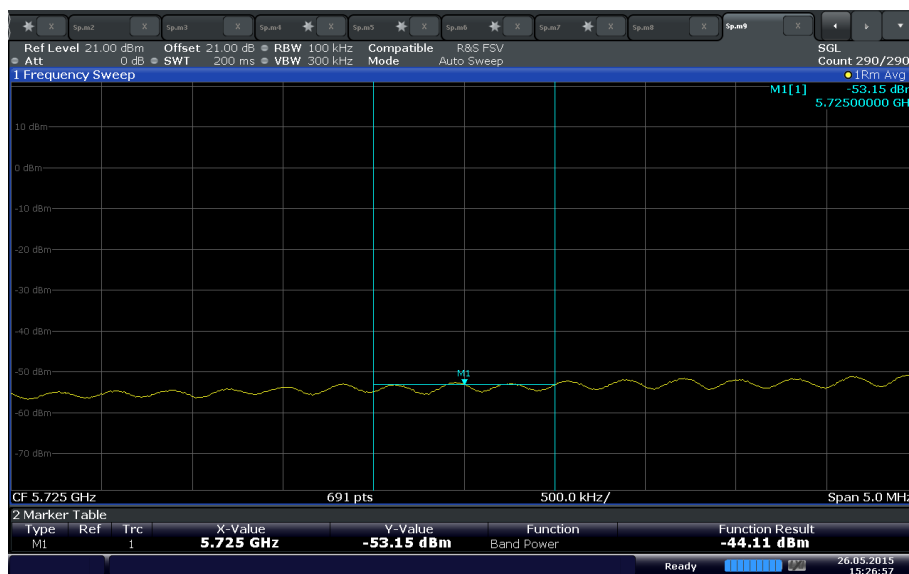


U-NII 2C Lower Band Edge 40 MHz BW (Average Measurement) @ 5470 MHz

Lower band edge calculation (5470 MHz):

- Limit is -27dBm EIRP
- Calculation @ 5470 MHz:

Integrated average measurement @ 5350 MHz	= -47.41 dBm
EIRP @ 5350 MHz	= -47.41 + 3.2dBi (antenna gain) + 0.65 dB (DCCF for 40MHz MCS0)
	= -43.56 dBm EIRP
Margin of compliance	= -16.56 dB



Date: 26 MAY 2015 15:26:57

U-NII 3 Lower Band Edge (Average Measurement) @ 5725 MHz

Lower band edge calculation:

- 5725 MHz (not in the restricted bands)
- Limit is -17dBm EIRP
- Calculation @ 5725 MHz:
 Integrated average measurement @ 5250 MHz = -44.11dBm
 EIRP @ 5250 MHz = -44.11 + 3.2dBi (antenna gain) + 1.93 dB (DCCF)
 = -38.98 dBm EIRP
 Margin of compliance = -21.98 dB



Date: 29 OCT 2014 17:02:04

U-NII 3 Upper Band Edge (Average Measurement) @ 5850 MHz



Upper band edge calculation:

- 5850 MHz (not in the restricted bands)
- Limit is -17dBm EIRP
- Calculation @ 5850 MHz:
 - Integrated average measurement @ 5250 MHz = -46.29 dBm
 - EIRP @ 5250 MHz = -46.29 + 3.2dBi (antenna gain) + 1.93 dB (DCCF)
 - = -41.16 dBm EIRP
 - Margin of compliance = -24.16 dB**



2.9 FREQUENCY STABILITY

2.9.1 Specification Reference

Part 15 Subpart E §15.407(g) and RSS-Gen 6.11

2.9.2 Standard Applicable

(g) Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the users manual.

With the transmitter installed in an environmental test chamber, the unmodulated carrier frequency shall be measured under the conditions specified below. A sufficient stabilization period at each temperature shall be used prior to each frequency measurement. The following temperatures and supply voltage ranges apply, unless specified otherwise in the applicable RSS:

- (a) at the temperatures of -30°C (-22°F), +20°C (+68°F) and +50°C (+122°F), and at the manufacturer's rated supply voltage; and
- (b) at the temperature of +20°C (+68°F) and at ±15% of the manufacturer's rated supply voltage.

If the frequency stability limits are only met within a temperature range that is smaller than the -30°C to +50°C range specified in (a), the frequency stability requirement will be deemed to be met if the transmitter is automatically prevented from operating outside this smaller temperature range and if the published operating characteristics for the equipment are revised to reflect this restricted temperature range.

In addition, if an unmodulated carrier is not available, the measurement method shall be described in the test report.

2.9.3 Test Methodology

Part 2 Subpart J §2.1055

2.9.4 Equipment Under Test and Modification State

Serial No: N/A / Test Configuration A and B

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

May 27, 2015 and July 17, 2015/FSC and NS

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

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature 25.3°C
Relative Humidity 44.7%
ATM Pressure 99.4 kPa

2.9.8 Additional Observations

- This is a conducted test.
- The EUT is sold with an AC adapter; therefore voltage variation was performed on the AC side. Nominal voltage is 120VAC.
- Unmodulated carrier is not available at the time of verification; frequency stability was verified by monitoring the 26 dB bandwidth edge closer to the band edge, ensuring it stays within the band.
- Only the worst bandwidth (40 MHz) at the band edge presented.
- High channel with worst case data rate next to U-NII-2A band was used for U-NII-1 band.
- Low channel with worst case data rate next to U-NII-2C band was used for U-NII-3 band.

2.9.9 Test Results Summary

5150-5250 MHz band (U-NII 1)			
Voltage (%)	Power (AC)	Temp (°C)	26dB BW edge within the frequency band
100	120	-30	Yes. EUT Complies
100		-20	Yes. EUT Complies
100		-10	Yes. EUT Complies
100		0	Yes. EUT Complies
100		+10	Yes. EUT Complies
100		+20	Yes. EUT Complies
100		+30	Yes. EUT Complies
100		+40	Yes. EUT Complies
100		+50	Yes. EUT Complies
115	138	+20	Yes. EUT Complies
85	102	+20	Yes. EUT Complies

5250-5350 MHz band (U-NII 2A)			
Voltage (%)	Power (AC)	Temp (°C)	26dB BW edge within the frequency band
100	120	-30	Yes. EUT Complies
100		-20	Yes. EUT Complies
100		-10	Yes. EUT Complies
100		0	Yes. EUT Complies
100		+10	Yes. EUT Complies



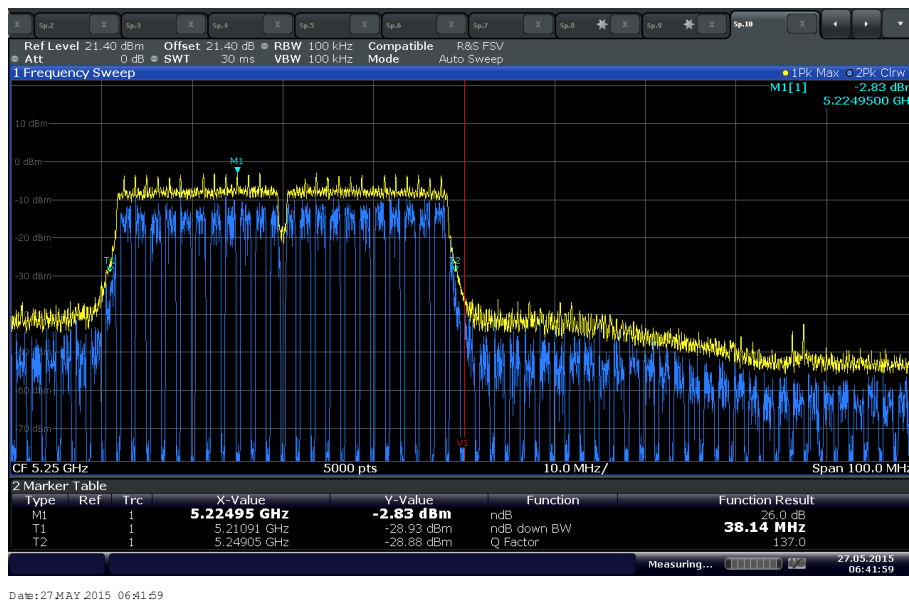
America

100		+20	Yes. EUT Complies
100		+30	Yes. EUT Complies
100		+40	Yes. EUT Complies
100		+50	Yes. EUT Complies
115	138	+20	Yes. EUT Complies
85	102	+20	Yes. EUT Complies

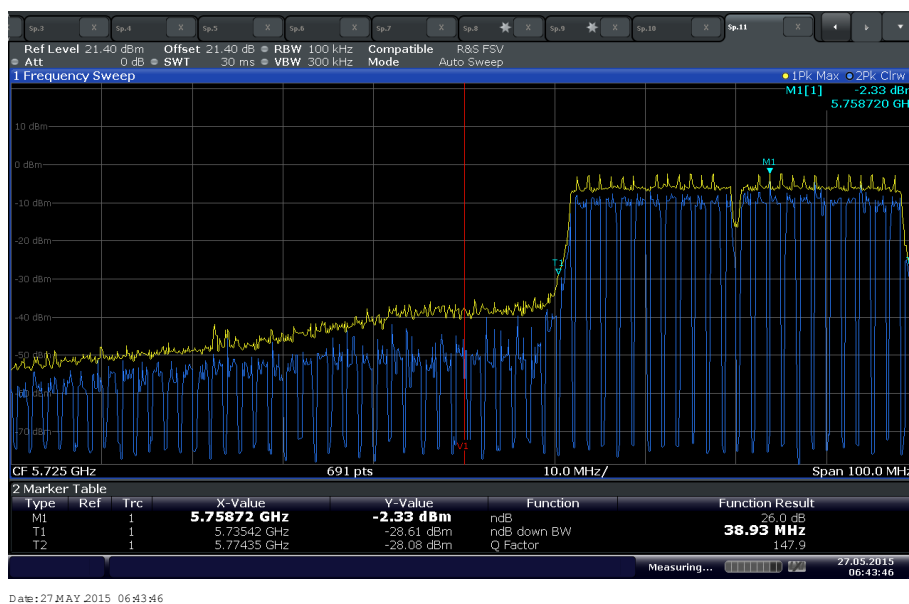
5470-5725 MHz band (U-NII 2C)			
Voltage (%)	Power (AC)	Temp (°C)	26dB BW edge within the frequency band
100	120	-30	Yes. EUT Complies
100		-20	Yes. EUT Complies
100		-10	Yes. EUT Complies
100		0	Yes. EUT Complies
100		+10	Yes. EUT Complies
100		+20	Yes. EUT Complies
100		+30	Yes. EUT Complies
100		+40	Yes. EUT Complies
100		+50	Yes. EUT Complies
115	138	+20	Yes. EUT Complies
85	102	+20	Yes. EUT Complies

5725-5850 MHz band (U-NII 3)			
Voltage (%)	Power (AC)	Temp (°C)	26dB BW edge within the frequency band
100	120	-30	Yes. EUT Complies
100		-20	Yes. EUT Complies
100		-10	Yes. EUT Complies
100		0	Yes. EUT Complies
100		+10	Yes. EUT Complies
100	120	+20	Yes. EUT Complies
100		+30	Yes. EUT Complies
100		+40	Yes. EUT Complies
100		+50	Yes. EUT Complies
115	138	+20	Yes. EUT Complies
85	102	+20	Yes. EUT Complies

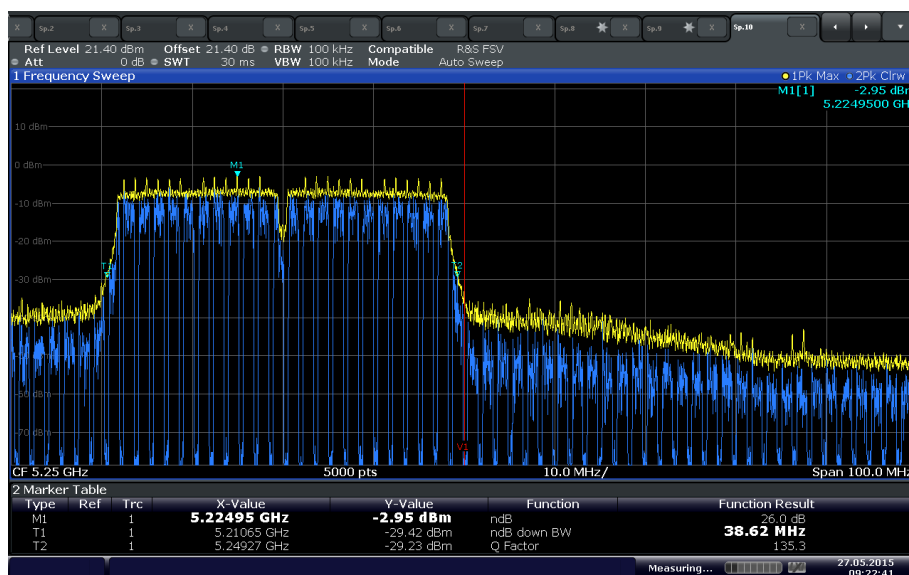
2.9.10 Sample Test Plots



U-NII 1 Worst Case Channel @ 20°C and extreme voltage (102VAC)

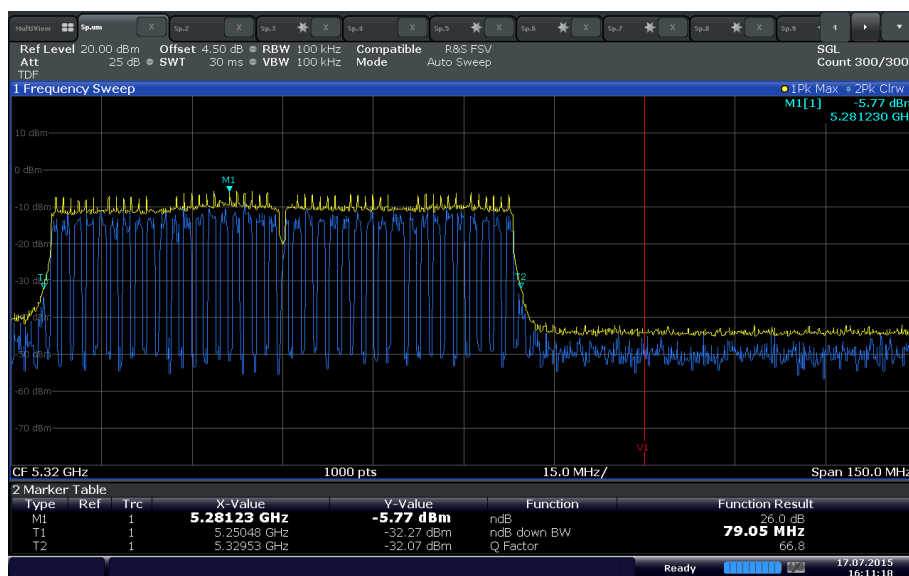


U-NII 3 Worst Case Channel @ 20°C and extreme voltage (138VAC)



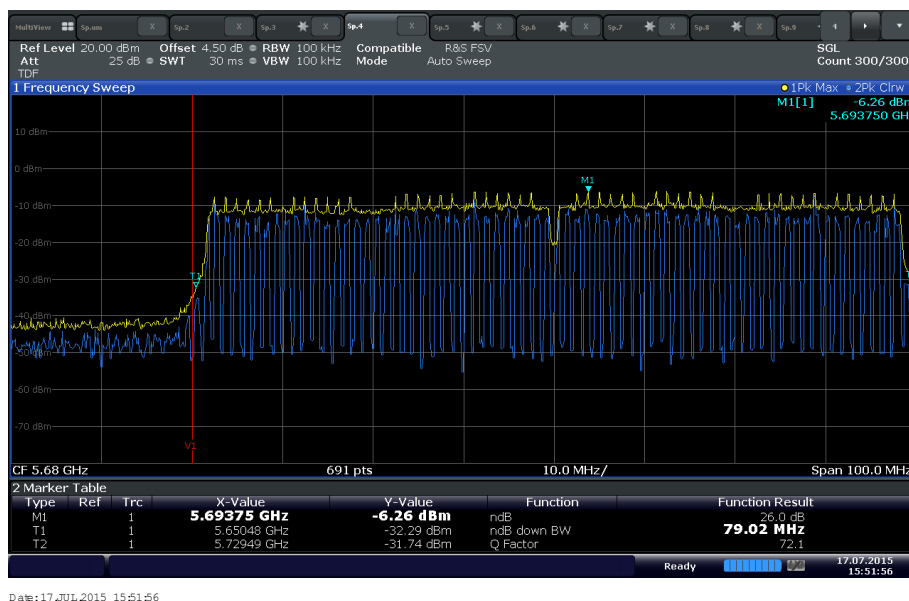
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U-NII 1 Worst Case Channel @ 50°C and nominal voltage (120VAC)



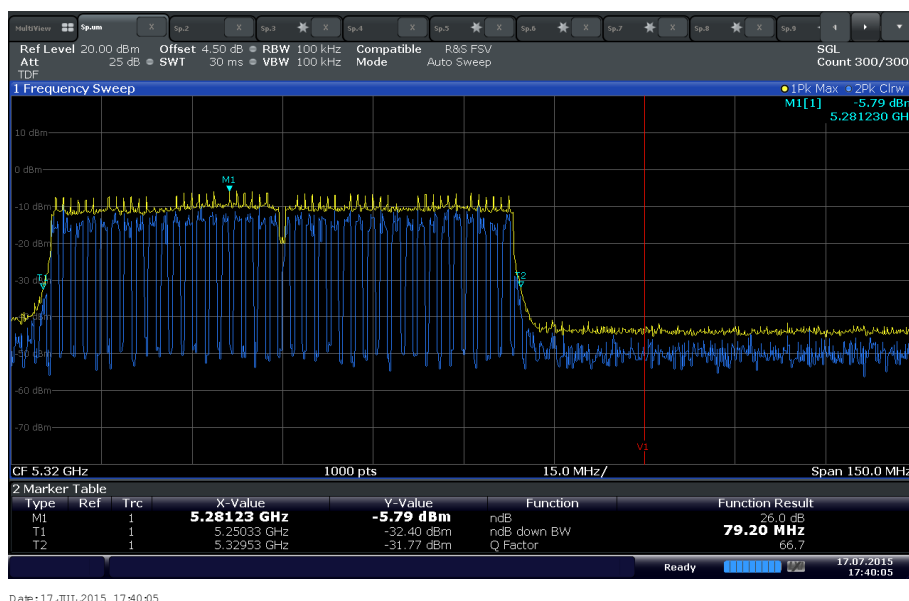
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U-NII 2A Worst Case Channel @ 20°C and extreme voltage (102VAC)



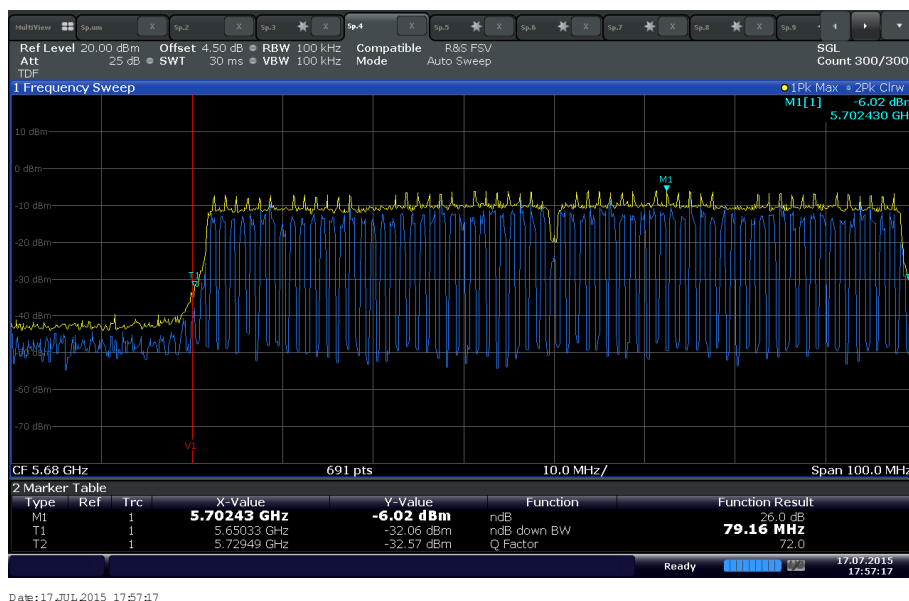
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U-NII 2C Worst Case Channel @ 20°C and extreme voltage (138VAC)

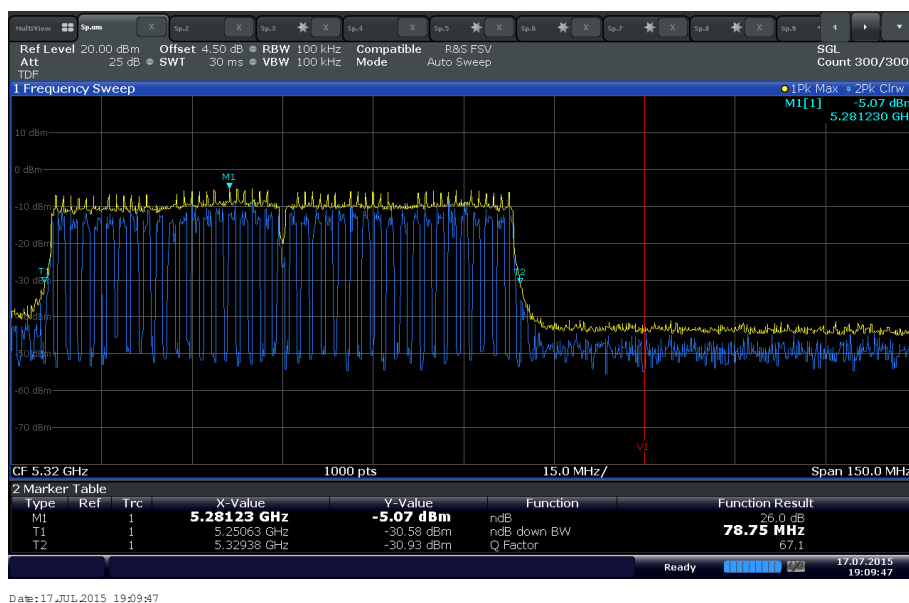


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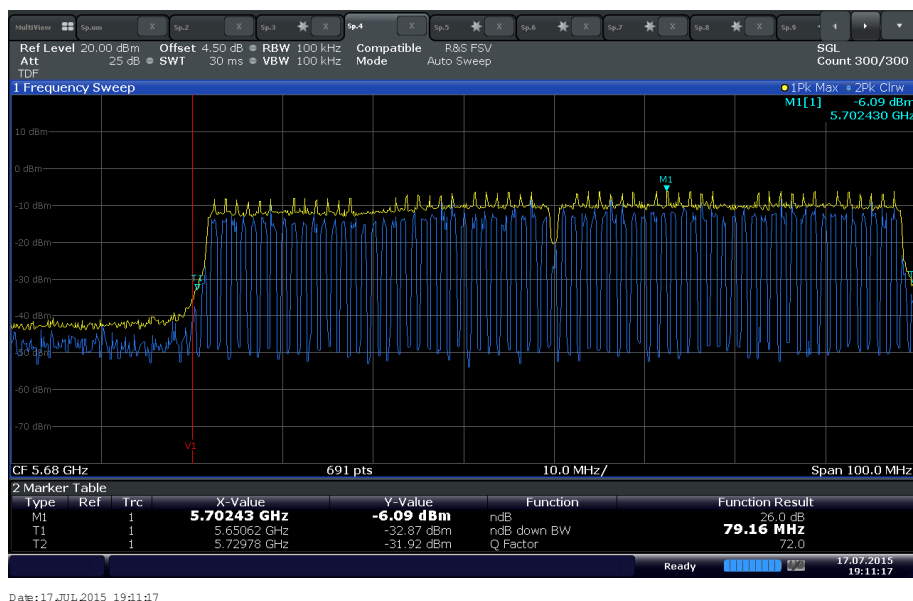
U-NII 2A Worst Case Channel @ +50°C and nominal voltage (120VAC)



U-NII 2C Worst Case Channel @ +50°C and nominal voltage (120VAC)

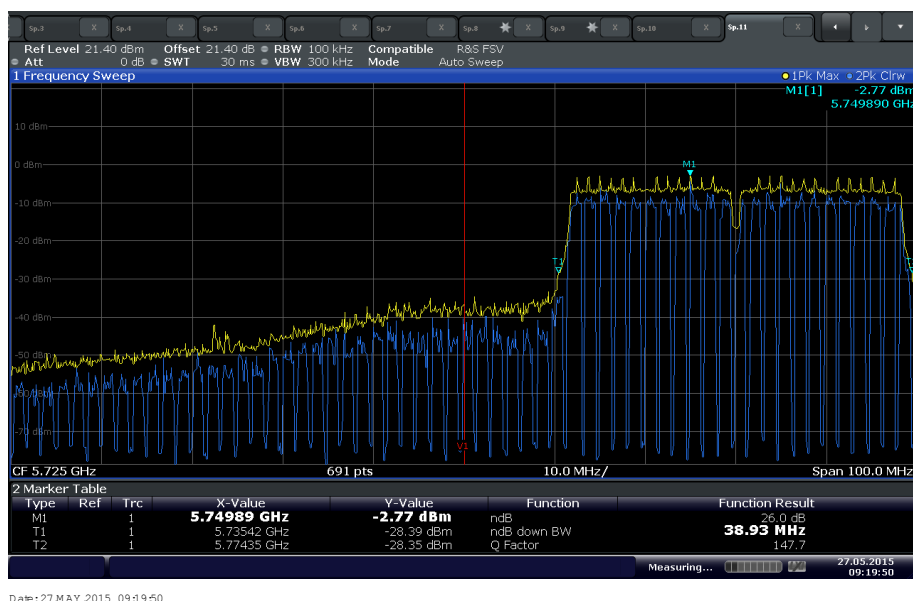


U-NII 2A Worst Case Channel @ -30°C and nominal voltage (120VAC)



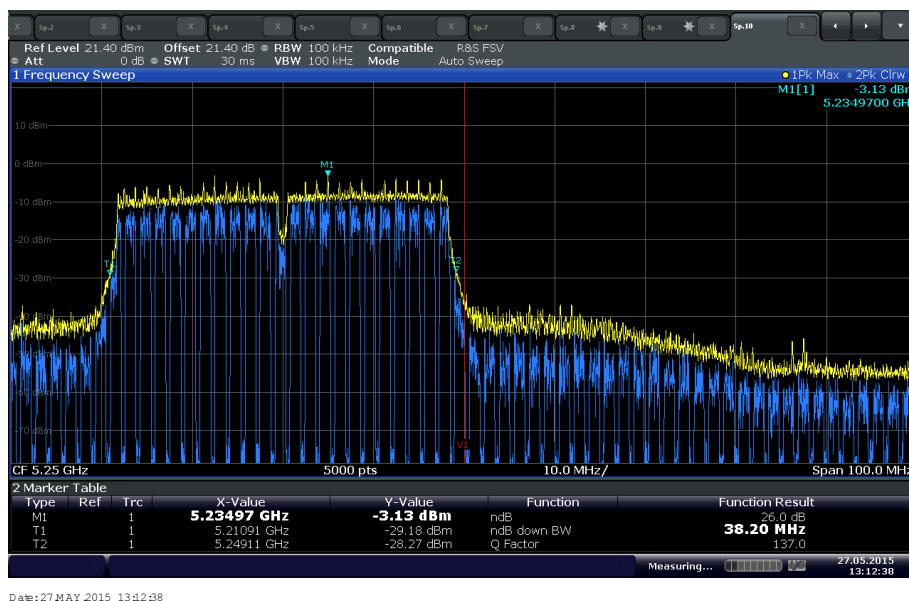
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U-NII 2C Worst Case Channel @ -30°C and nominal voltage (120VAC)



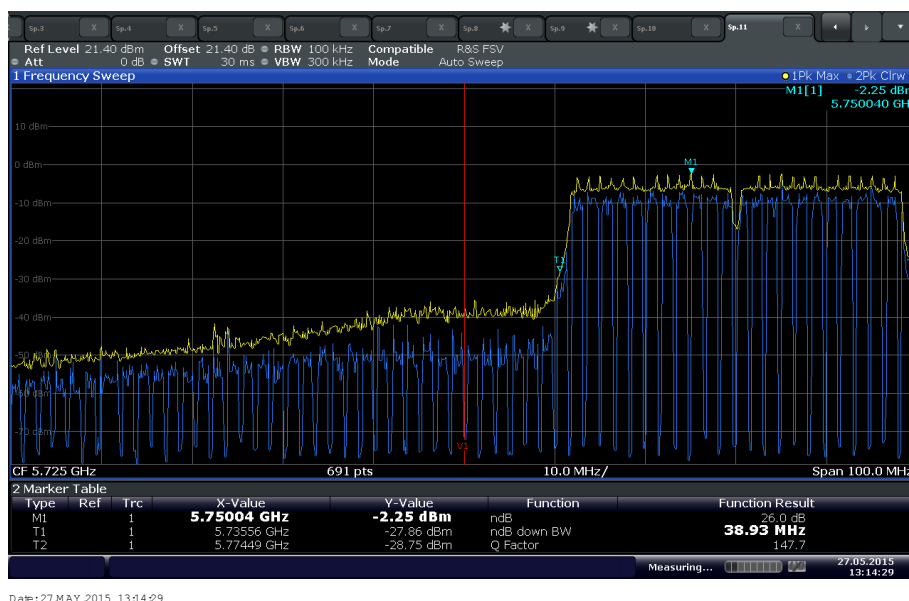
Date: 27 MAY 2015 09:19:50

U-NII 3 Worst Case Channel @ 50°C and nominal voltage (120VAC)



Date: 27 MAY 2015 13:12:38

U-NII 1 Worst Case Channel @ -30°C and nominal voltage (120VAC)



Date: 27 MAY 2015 13:14:29

U-NII 1 Worst Case Channel @ -30°C and nominal voltage (120VAC)

2.10 INDOOR OPERATION ONLY

2.10.1 Specification Reference

RSS-210 A9.4(6)(i)

2.10.2 Standard Applicable

The user manual for local area network devices shall contain instructions related to the restrictions mentioned in the above sections, namely that the device for operation in the band 5150–5250 MHz is only for indoor use to reduce the potential for harmful interference to co-channel mobile satellite systems.

2.10.3 Manufacturer Declaration

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

Notice to Users in the Canada

The Wireless Print Adapter does not exceed the Class B limits for radio-emissions.
CAN ICES-3 (B)/NMB-3(B)

This device complies with Industry Canada's licence-exempt RSSs. Operation is subject to the following two conditions:

- (1) This device may not cause interference; and
- (2) This device must accept any interference, including interference that may cause undesired operation of the device.

As a License-Exempt Local Area Network (LE-LAN) device, there are operational restrictions:

- (1) the device for operation in the band 5150-5250 MHz is only for indoor use to reduce the potential for harmful interference to co-channel mobile satellite systems;
- (2) the maximum antenna gain permitted for devices in the bands 5250-5350 MHz and 5470-5725 MHz shall comply with the e.i.r.p. limit; and
- (3) the maximum antenna gain permitted for devices in the band 5725-5825 MHz shall comply with the e.i.r.p. limits specified for point-to-point and non point-to-point operation as appropriate.

Be advised that high-power radars are allocated as primary users (i.e. priority users) of the bands 5250-5350 MHz and 5650-5850 MHz and that these radars could cause interference and/or damage to LE-LAN devices.



SECTION 3

TEST EQUIPMENT USED



3.1 TEST EQUIPMENT USED

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

ID Number (SDGE/SDRB)	Test Equipment	Type	Serial Number	Manufacturer	Cal Date	Cal Due Date
Antenna Conducted Port Setup						
7569	Series Power Meter	N1911A P-	MY45100625	Agilent	04/22/14	05/22/15
7570	50MHz-18GHz Wideband Power Sensor	N1921A	MY45240588	Agilent	04/09/14	05/09/15
7611	Signal/Spectrum Analyzer	FSW26	102017	Rhode & Schwarz	03/25/15	03/25/16
1003	Signal Generator	SMR-40	1104.0002.40	Rhode & Schwarz	04/29/15	04/29/16
7579	Temperature Chamber	115	151617	TestQuity	07/21/14	07/21/15
8825	20dB Attenuator	46-20-34	BK5773	Weinschel Corp.	Verified by 1003 and 7611	
Radiated Test Setup						
1002	Bilog Antenna	3142C	00058717	ETS-Lindgren	01/30/14	01/30/16
1040	EMI Test Receiver	ESIB40	100292	Rhode & Schwarz	08/29/14	08/29/15
1016	Pre-amplifier	PAM-0202	187	PAM	12/10/14	12/10/15
1051	Double-ridged waveguide horn antenna	3115	9408-4329	EMCO	02/28/14	02/28/16
1049	EMI Test Receiver	ESU	100133	Rhode & Schwarz	03/11/15	03/11/16
8628	Pre-amplifier	QLJ 01182835-JO	8986002	QuinStar Technologies Inc.	03/20/15	03/20/16
1150	Horn antenna	3160-09	012054-004	ETS	04/26/13	05/26/15
1151	Pre-amplifier	TS-PR26	100026	Rhode & Schwarz	05/02/13	06/02/15
1153	High-frequency cable	SucoFlex 100 SX	N/A	Suhner	Verified by 1003 and 7611	
8543	High-frequency cable	Micropore 19057793	N/A	United Microwave Products	Verified by 1003 and 7611	
6815	2.4GHz Band Notch Filter	BRM50702	008	Micro-Tronics	Verified by 1003 and 7611	
Conducted Emissions						
1024	EMI Test Receiver	ESCS 30	847793/001	Rhode & Schwarz	04/10/15	04/10/16
7567	LISN	FCC-LISN-50-25-2-10	120304	Fischer Custom Comm.	07/01/14	07/01/15
8822	20dB Attenuator	34-20-34	N/A	MCE / Weinschel	02/20/15	02/20/16
8824	20dB Attenuator	34-20-34	N/A	MCE / Weinschel	02/20/15	02/20/16
Miscellaneous						
6792	Multimeter	3478A	2911A70964	Hewlett Packard	08/12/14	08/12/15
11312	Mini Environmental Quality Meter	850027	CF099-56010-340	Sper Scientific	04/09/15	04/09/16
	Test Software	EMC32	V8.53	Rhode & Schwarz	N/A	

3.2 MEASUREMENT UNCERTAINTY

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

3.2.1 Radiated Emission Measurements (Below 1GHz)

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

3.2.2 Radiated Emission Measurements (Above 1GHz)

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

3.2.3 Conducted Antenna Port Measurement

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

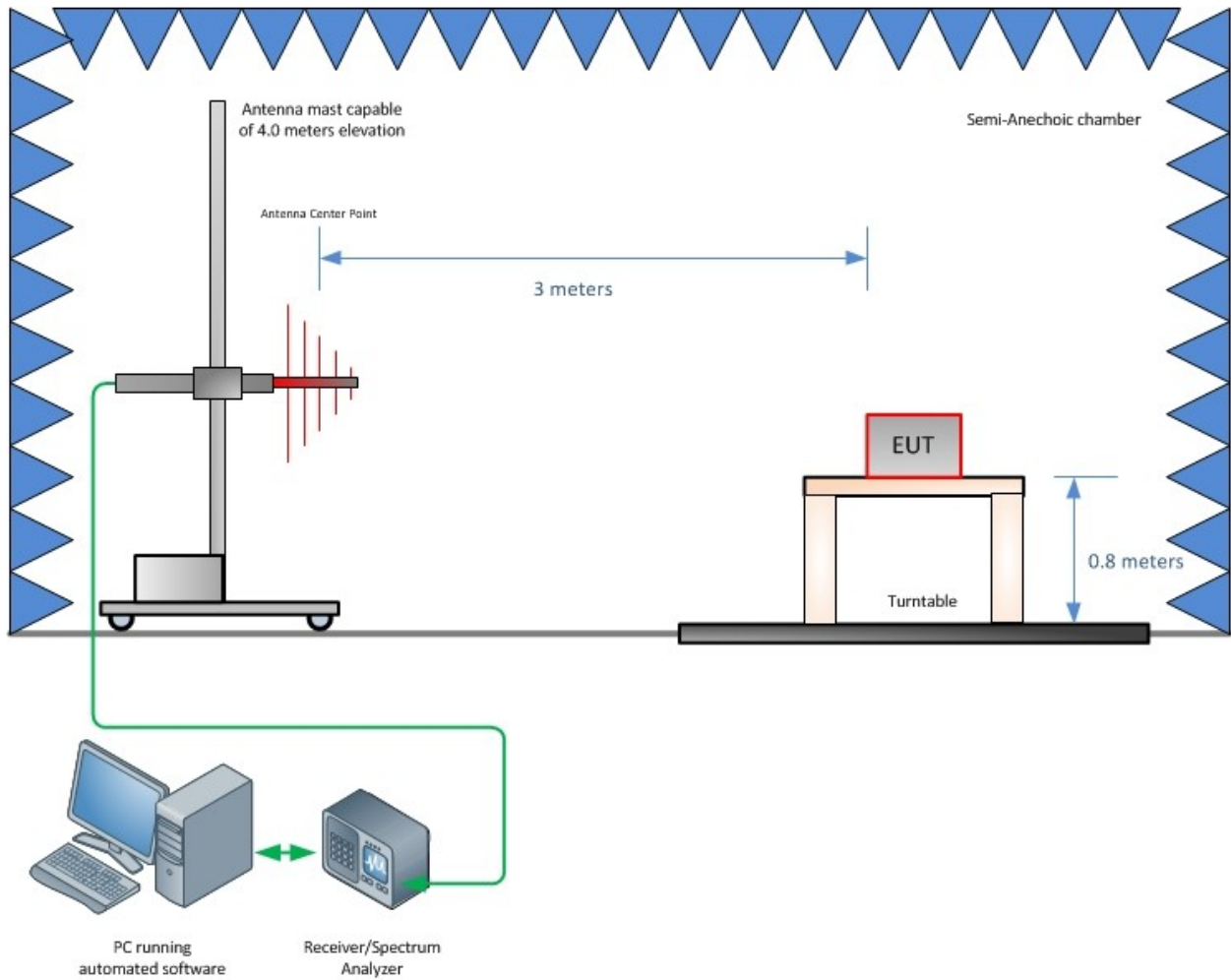
3.2.1 AC Conducted Measurements

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

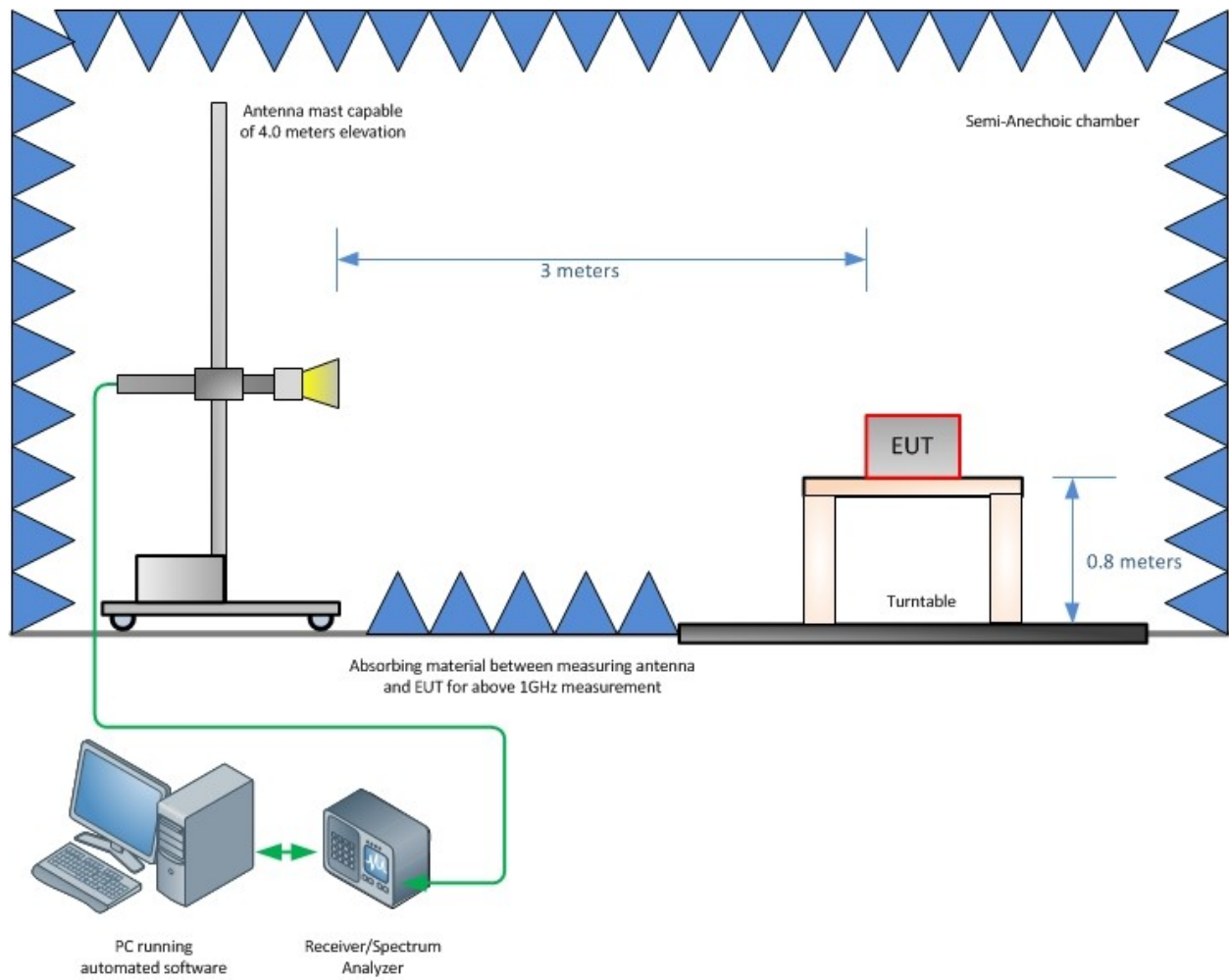
SECTION 4

DIAGRAM OF TEST SETUP

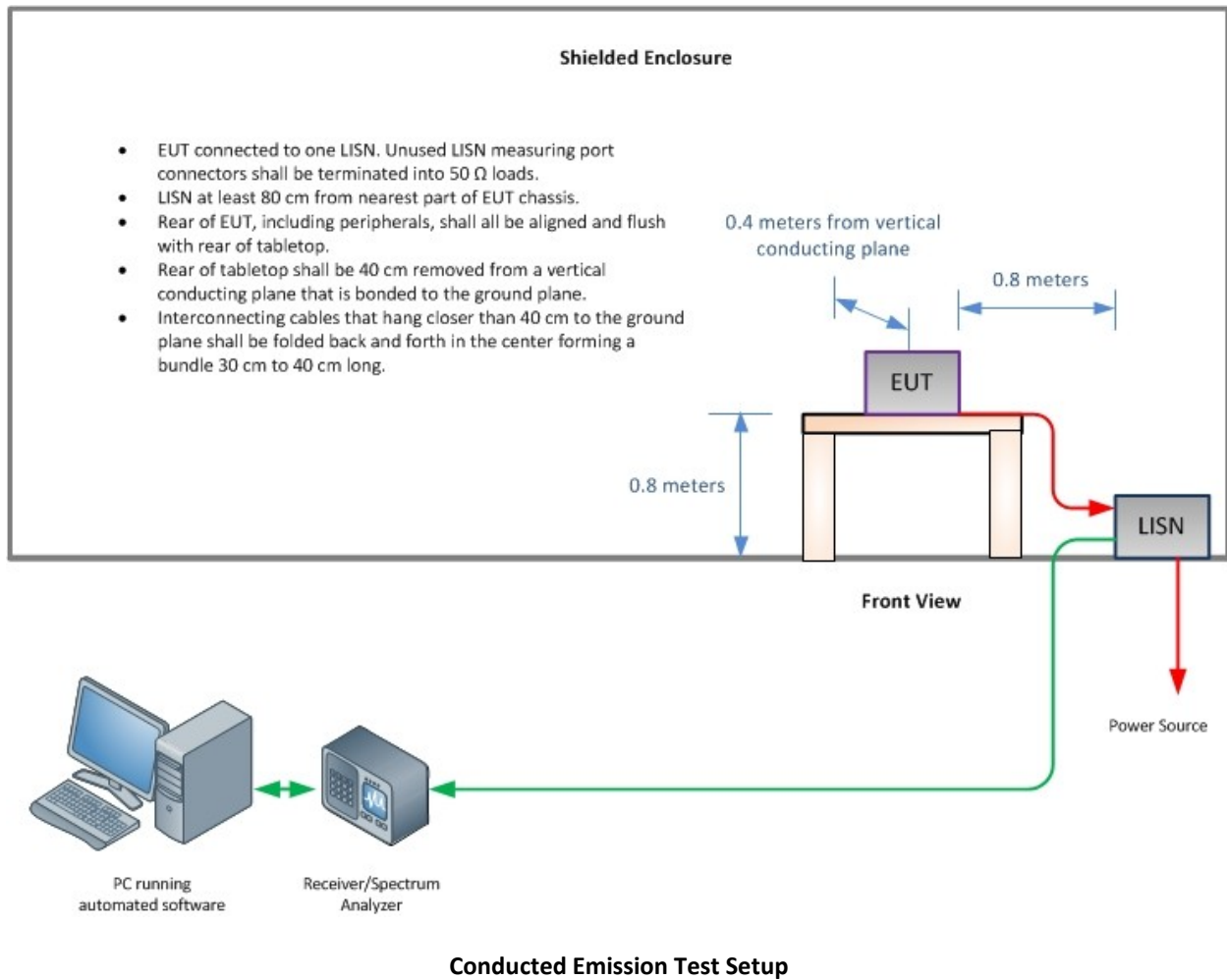
4.1 TEST SETUP DIAGRAM



Radiated Emission Test Setup (Below 1GHz)



Radiated Emission Test Setup (Above 1GHz)





SECTION 5

ACCREDITATION, DISCLAIMERS AND COPYRIGHT



5.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

TÜV SÜD America Inc.'s reports apply only to the specific sample tested under stated test conditions. It is the manufacturer's responsibility to assure the continued compliance of production units of this model. TÜV SÜD America, Inc. shall have no liability for any deductions, inferences or generalizations drawn by the client or others from TÜV SÜD America, Inc.'s issued reports.

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