FCC 47 CFR PART 15 SUBPART E &
INDUSTRY CANADA RSS-247

TEST REPORT

For

802.11a/b/g/n/ac 2T2R + BT4.1LE USB Combo Module

Model: WCBN4502B

Trade Name: LITE-ON

Issued to

Lite-On Technology Corp.
Bldg. C, 90, Chien 1 Road, Chung Ho, New Taipei City 23585, Taiwan, R.O.C

Issued by

Compliance Certification Services Inc.
No.11, Wugong 6th Rd., Wugu Dist., New Taipei City 24891, Taiwan. (R.O.C.)
http://www.ccsrf.com
service@ccsrf.com
Issued Date: June 16, 2015

Testing Laboratory
1309

Revision History

Rev.		Issue Date		Revisions	Effect Page	Revised By
00		June 16, 2015		Initial Issue	ALL	Doris Chu

TABLE OF CONTENTS

1. TEST RESULT CERTIFICATION

Applicant:	Lite-On Technology Corp. Bldg. C, 90, Chien 1 Road, Chung Ho, New Taipei City 23585, Taiwan, R.O.C
Manufacturer:	LITE-ON TECHNOLOGY (Changzhou) CO., LTD A9 Building, No.88, Yanghu Road, Wujin Hi-Tech Industrial Development Zone, Changzhou City, Jiangsu Province, P. R. China
Equipment Under Test:	802.11a/b/g/n/ac 2T2R + BT4.1LE USB Combo Module
Trade Name:	LITE-ON
Model:	WCBN4502B
Date of Test:	June 8, 2015

APPLICABLE STANDARDS	
STANDARD	**TEST RESULT**
FCC 47 CFR Part 15 Subpart E & Industry Canada RSS-247 Issue 1	No non-compliance noted

We hereby certify that:

Compliance Certification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

The test results of this report relate only to the tested sample identified in this report.

Approved by

Miller Lee
Manager
Compliance Certification Services Inc.

Reviewed by

Angel Cheng
Section Manager
Compliance Certification Services Inc.

2. EUT DESCRIPTION

Product	802.11a/b/g/n/ac 2T2R + BT4.1LE USB Combo Module
Trade Name	LITE-ON
Model Number	WCBN4502B
Model Discrepancy	N/A
Power Supply	Powered from host device
Received Date	May 28, 2015
Frequency Range	IEEE 802.11a/ IEEE 802.11n HT 20 MHz: 5745~5825 MHz IEEE 802.11n HT 40 MHz: 5755~5795 MHz IEEE 802.11ac VHT 80 mode: 5775MHz
Transmit Power	IEEE 802.11a mode: 18.86 dBm IEEE 802.11n HT 20 MHz mode: 18.08 dBm IEEE 802.11n HT 40 MHz mode: 19.43 dBm IEEE 802.11ac VHT 80 MHz mode: 12.86 dBm
Modulation Technique & Transmit Data Rate	IEEE 802.11a: OFDM (54, 48, 36, 24, 18, 12, 9, 6 Mbps) IEEE 802.11n HT 20 MHz mode: OFDM (6.5, 7.2, 13, 14.4, 14.44, 19.5, 21.7, 26, 28.89, 28.9, 39, 43.3, 43.33 52, 57.78, 57.8, 58.5, 65.0, 72.2, 78, 86.67, 104, 115.56, 117, 130, 144.44 Mbps) IEEE 802.11n HT 40 MHz mode: OFDM (13.5, 15, 27, 30, 40.5, 45, 54, 60, 81, 90, 108, 120, 121.5, 135, 150, 162, 180, 216, 240, 243, 270, 300 Mbps) IEEE 802.11ac VHT 80 mode: OFDM (29.3, 58.5, 87.8, 117, 175.5, 234, 263.3, 292.5, 351, 390, 468, 526.5, 585, 702, 780 Mbps)
Number of Channels	IEEE 802.11a mode: 5 Channels IEEE 802.11n HT 20 MHz mode: 5 Channels IEEE 802.11n HT 40 MHz mode: 2 Channels IEEE 802.11ac VHT 80 mode: 1 Channels
Antenna Specification	1. HONGLIN / 290-10031 PIFA Antenna Ant_1: Gain: 2.4 dBi Ant_2: Gain: 2.6 dBi (Worst) 2. Walsin / RFMTA200700NNLB002 PIFA Antenna ANT0: Gain: -0.46 dBi ANT2: Gain: 1.17 dBi

3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10: 2009 and FCC CFR 47 Part 15.207, 15.209, 15.247.

The tests documented in this report were performed in accordance with IC RSS-247, IC RSS-Gen and ANSI C63.10:2013.

This submittal(s) (test report) is intended for IC Certification with Industry Canada RSS-247.

3.1 EUT CONFIGURATION

The EUT configuration for testing is installed for RF field strength measurement to meet the Commissions requirement, and is operated in a manner intended to generate the maximum emission in a continuous normal application.

3.2 EUT EXERCISE

The EUT is operated in the engineering mode to fix the Tx frequency for the purposes of measurement.

According to its specifications, the EUT must comply with the requirements of Section 15.407 under the FCC Rules Part 15 Subpart E.

3.3 GENERAL TEST PROCEDURES

Conducted Emissions

The EUT is placed on the turntable, which is positioned at 0.8 m above the ground plane. According to the requirements in ANSI C63.10: 2013 for IC, ANSI C63.10: 2009 for FCC, the conducted emission from the EUT is measured in the frequency range between 0.15 MHz and 30MHz, using the CISPR Quasi-Peak detector mode.

Radiated Emissions

The EUT is placed on the turntable, which is 1.5 m above the ground plane. The turntable is then rotated for 360 degrees to determine the proper orientation for the maximum emission level. The EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission level. And, each emission is to be maximized by changing the horizontal and vertical polarization of the receiving antenna. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in ANSI C63.10: 2013 for IC, ANSI C63.10: 2009 for FCC.

3.4 FCC PART 15.205 RESTRICTED BANDS OF OPERATIONS

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 -	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.52525	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	156.7 - 156.9	3260 - 3267	23.6 - 24.0
12.29 - 12.293	162.0125 - 167.17	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	167.72 - 173.2	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	240 - 285	3600 - 4400	([2])
13.36 - 13.41	322 - 335.4		

[1] Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

[2] Above 38.6

(b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

3.5 DESCRIPTION OF TEST MODES

The EUT (model: WCBN4502B) had been tested under operating condition.
The EUT is a 2x2 configuration spatial MIMO (2Tx & 2Rx) without beam forming function that operate in double TX chains and double RX chains. The 2x2 configuration is implemented with two outside TX & RX chains (Chain 0 and 1).

Software used to control the EUT for staying in continuous transmitting and receiving mode was programmed.

After verification, all tests were carried out with the worst case test modes as shown below except radiated spurious emission below 1GHz, which worst case was in normal link mode only.

IEEE 802.11a mode / 5745 ~ 5825MHz
Channel Low (5745MHz), Channel Mid (5785MHz) and Channel High (5825MHz) with 6Mbps data rate were chosen for full testing.

IEEE 802.11n HT 20 MHz mode / 5745 ~ 5825MHz
Channel Low(5745MHz), Channel Mid(5785MHz) and Channel High(5825MHz) with 6.5Mbps data rate were chosen for full testing.

IEEE 802.11n HT 40 MHz mode / 5755 ~ 5795MHz
Channel Low(5755MHz) and Channel High(5795MHz) with 13.5Mbps data rate were chosen for full testing.

IEEE 802.11ac VHT 80 MHz mode for 5775MHz:
Channel (5775MHz) with 6.5Mbps data rate were chosen for full testing.

The field strength of spurious emission was measured in the following position: EUT stand-up position (Z mode), lie-down position (X, Y mode). The worst emission was found in lie-down position (X axis) and the worst case was recorded.

4. INSTRUMENT CALIBRATION

4.1 MEASURING INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

4.2 MEASUREMENT EQUIPMENT USED

Equipment Used for Emissions Measurement

Remark: *Each piece of equipment is scheduled for calibration once a year and Loop Antenna is scheduled for calibration once three years.*

Conducted Emissions Test Site				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Spectrum Analyzer	Agilent	E4446A	US42510252	11/23/2015
Thermostatic/Hrgrosatic Chamber	TAICHY	MHG-150LF	930619	10/07/2015
AC Power Source	EXTECH	6205	1140845	N.C.R
DC Power Supply	ABM	8301HD	D011531	N.C.R
Power Meter	Anritsu	ML2495A	1012009	06/07/2016
Power Sensor	Anritsu	MA2411A	0917072	06/08/2016
Spectrum Analyzer	ROHDE&SCHWARZ	FSV40	101073	07/09/2015

Wugu 966 Chamber A				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Spectrum Analyzer	Agilent	E4446A	US42510268	09/18/2015
EMI Test Receiver	R&S	ESCI	100064	06/04/2016
Bilog Antenna	Sunol Sciences	JB3	A030105	08/19/2015
Horn Antenna	EMCO	3117	00055165	01/26/2016
Horn Antenna	EMCO	3116	26370	12/25/2015
Turn Table	CCS	CC-T-1F	N/A	N.C.R
Antenna Tower	CCS	CC-A-1F	N/A	N.C.R
Controller	CCS	CC-C-1F	N/A	N.C.R
Pre-Amplifier	MITEQ	1652-3000	1490939	08/09/2016
Pre-Amplifier	EMC	EMC 01265	4035	06/04/2016
Pre-Amplifier	MITEQ	AMF-6F-260400-40-8P	985646	12/25/2015
Coaxial Cable	Huber+Suhner	102	29212/2	12/25/2015
Coaxial Cable	Huber+Suhner	102	29406/2	12/25/2015
Test S/W	EZ-EMC (CCS-3A1RE)			

4.3MEASUREMENT UNCERTAINTY

PARAMETER	UNCERTAINTY
Powerline Conducted Emission	N/A
3M Semi Anechoic Chamber / 30M~200M	+/- 4.0138
3M Semi Anechoic Chamber / 200M~1000M	+/- 3.9483
3M Semi Anechoic Chamber / 1G~8G	+/- 2.5975
3M Semi Anechoic Chamber / 8G~18G	+/- 2.6112
3M Semi Anechoic Chamber / 18G~26G	+/- 2.7389
3M Semi Anechoic Chamber / 26G~40G	+/- 2.9683

***Remark**: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.*

5 FACILITIES AND ACCREDITATIONS

5.1 FACILITIES

All measurement facilities used to collect the measurement data are located at

☐ No.199, Chunghsen Road, Hsintien City, Taipei Hsien, Taiwan, R.O.C.
Tel: 886-2-2217-0894 / Fax: 886-2-2217-1029

☒ No.11, Wugong 6th Rd., Wugu Dist., New Taipei City 248, Taiwan (R.O.C.)
Tel: 886-2-2299-9720 / Fax: 886-2-2298-4045

☐ No.81-1, Lane 210, Bade 2nd Rd., Lujhu Township, Taoyuan County 33841, TAIWAN, R.O.C.
Tel: 886-3-324-0332 / Fax: 886-3-324-5235

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.10: 2013 for IC, ANSI C63.10: 2009 for FCC and CISPR Publication 22.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

5.2 LABORATORY ACCREDITATIONS AND LISTING

The test facilities used to perform radiated and conducted emissions tests are accredited by American Association for Laboratory Accreditation Program for the specific scope accreditation under Lab Code: 0824-01 to perform Electromagnetic Interference tests according to FCC Part 15 and CISPR 22 requirements. In addition, the test facilities are listed with Industry Canada, Certification and Engineering Bureau, IC 2324G-1 for 3M Semi Anechoic Chamber A, IC 2324G-2 for 3M Semi Anechoic Chamber B.

5.3 TABLE OF ACCREDITATIONS AND LISTINGS

Country	Agency	Scope of Accreditation	Logo
USA	FCC	3M Semi Anechoic Chamber (FCC MRA: TW1039) to perform FCC Part 15 measurements	FCC MRA: TW1039
Taiwan	TAF	LP0002, RTTE01, FCC Method-47 CFR Part 15 Subpart C, D, E, RSS-247, RSS-310 IDA TS SRD, AS/NZS 4268, AS/NZS 4771, TS 12.1 & 12,2, ETSI EN 300 440-1, ETSI EN 300 440-2, ETSI EN 300 328, ETSI EN 300 220-1, ETSI EN 300 220-2, ETSI EN 301 893, ETSI EN 301 489-1/3/7/17 FCC OET Bulletin 65 + Supplement C, EN 50360, EN 50361, EN 50371, RSS 102, EN 50383, EN 50385, EN 50392, IEC 62209, CNS 14958-1, CNS 14959 FCC Method –47 CFR Part 15 Subpart B IEC / EN 61000-3-2, IEC / EN 61000-3-3, IEC / EN 61000-4-2/3/4/5/6/8/11	TAF Testing Laboratory 1309
Canada	Industry Canada	3M Semi Anechoic Chamber (IC 2324G-1 / IC 2324G-2) to perform	Canada IC 2324G-1 IC 2324G-2

** No part of this report may be used to claim or imply product endorsement by A2LA or any agency of the US Government.*

6 SETUP OF EQUIPMENT UNDER TEST

6.1 SETUP CONFIGURATION OF EUT

See test photographs attached in Appendix I for the actual connections between EUT and support equipment.

6.2 SUPPORT EQUIPMENT

No.	Device Type	Brand	Model	Series No.	FCC ID	Data Cable	Power Cord
1	Notebook PC	ASUS	M5200AE	5BN0AG019631	PD9WM3B2100	N/A	AC I/P: Unshielded, 1.8m with a core DC O/P: Unshielded, 1.8m

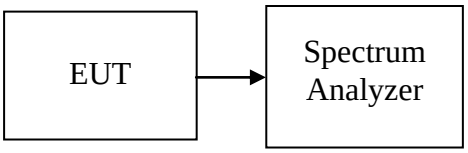
Remark:

1. *All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.*
2. *Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.*

7 RSS-247 REQUIREMENTS

7.1 99%BANDWIDTH

Test Configuration



TEST PROCEDURE

The resolution bandwidth shall be set to as close to 1% of the selected span as is possible without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical, a sampling detector shall be used since a peak or, peak hold.

TEST RESULTS

No non-compliance noted.

Test Data

Test mode: IEEE 802.11a mode / 5745 ~ 5825MHz

Channel	Frequency (MHz)	99%Bandwidth (MHz)
Low	5745	17.5619
Mid	5785	17.5236
High	5825	17.5109

Test mode: IEEE 802.11n HT 20 MHz mode / 5745 ~ 5825MHz / Chain 0

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	5745	18.4084
Mid	5785	18.3332
High	5825	18.4793

Test mode: IEEE 802.11n HT 20 MHz mode / 5745 ~ 5825MHz / Chain 1

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	5745	18.2058
Mid	5785	18.3046
High	5825	18.5403

Test mode: IEEE 802.11n HT 40 MHz mode / 5755 ~ 5815MHz / Chain 0

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	5755	36.5874
High	5795	36.7086

Test mode: IEEE 802.11n HT 40 MHz mode / 5755 ~ 5815MHz / Chain 1

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	5755	36.5724
High	5795	36.4787

Test mode: IEEE 802.11ac VHT 80 MHz mode / 5775MHz / Chain 0

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Mid	5775	75.7118

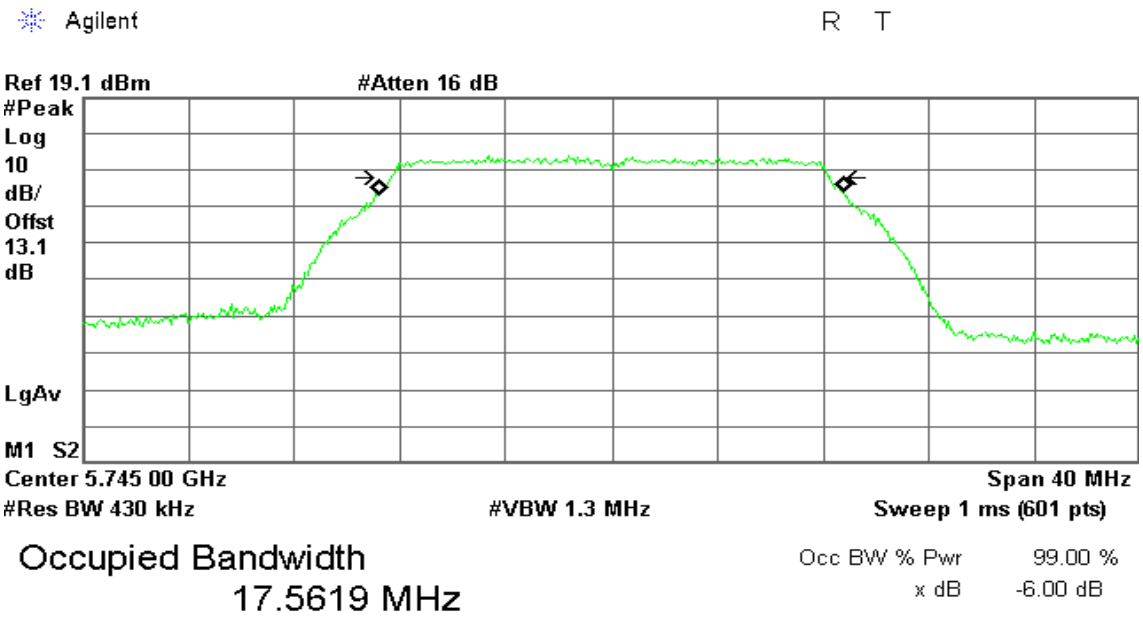
Test mode: IEEE 802.11ac VHT 80 MHz mode / 5775MHz / Chain 1

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Mid	5775	76.0635

Test Plot

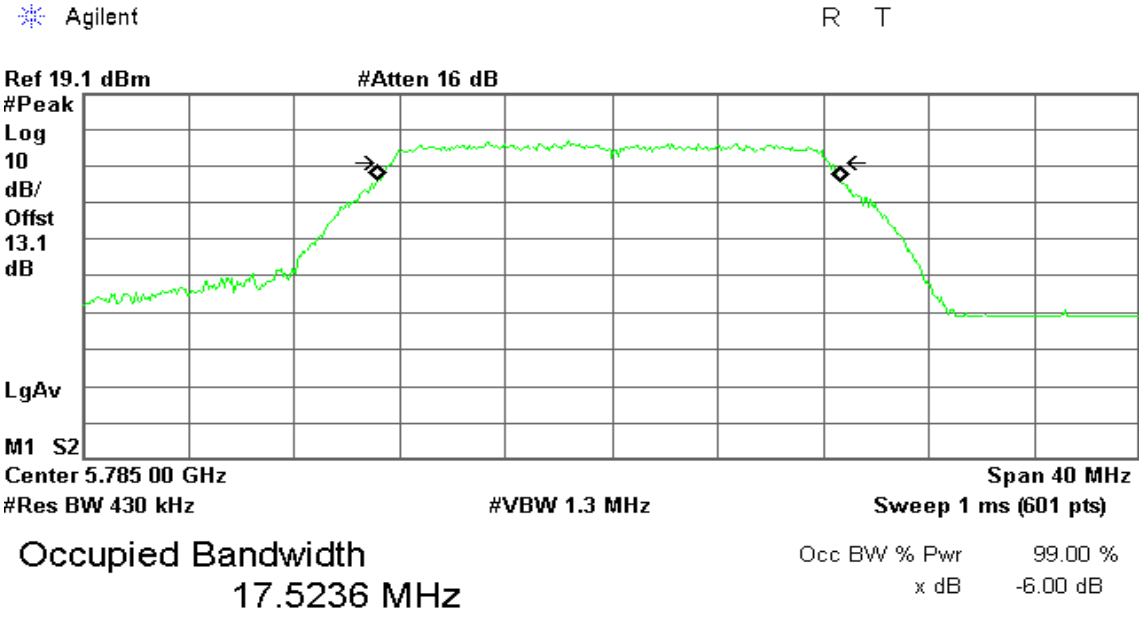
IEEE 802.11a mode / 5745 ~ 5825MHz

99% Bandwidth (CH Low)



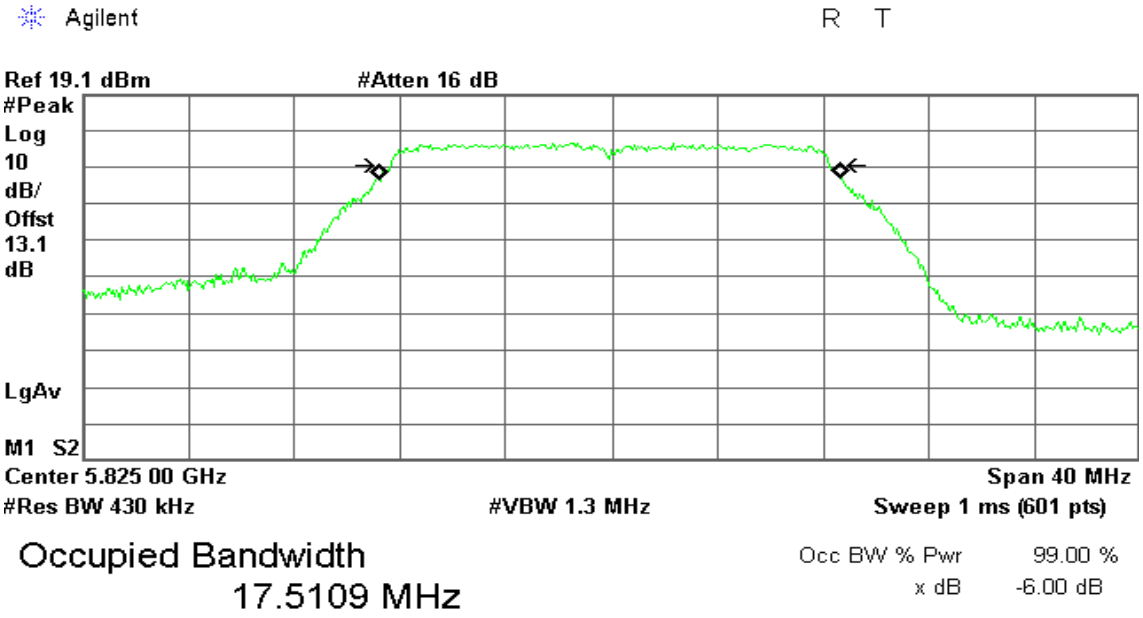
Transmit Freq Error -3.327 kHz
x dB Bandwidth 16.613 MHz

99% Bandwidth (CH Mid)



Transmit Freq Error -85.106 kHz
x dB Bandwidth 16.594 MHz

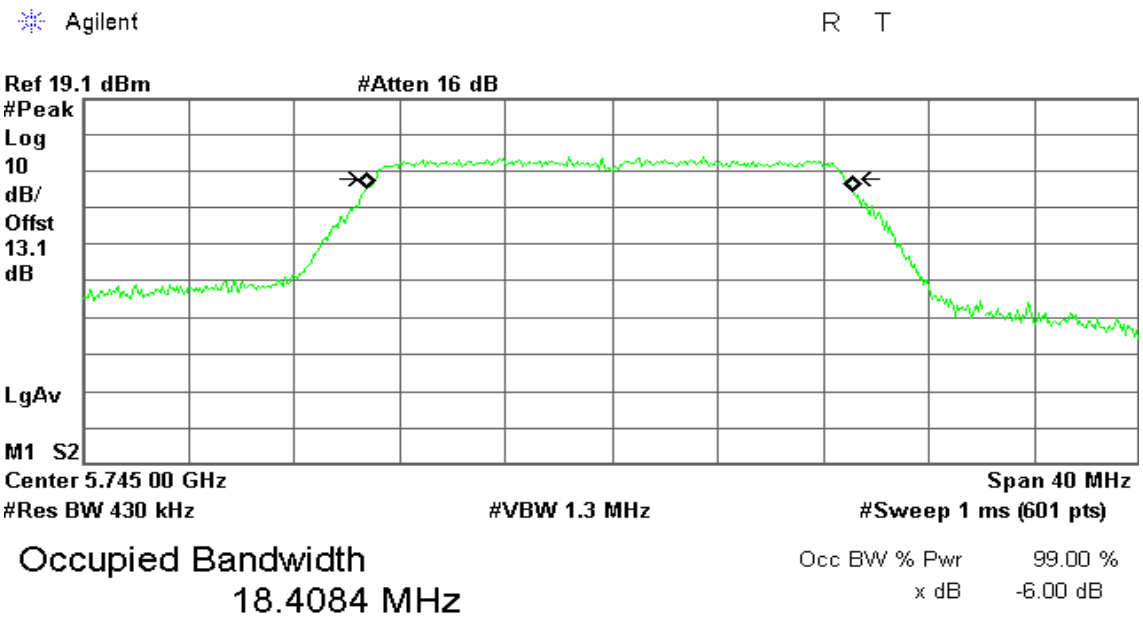
99% Bandwidth (CH High)



Transmit Freq Error	-60.730 kHz
x dB Bandwidth	16.617 MHz

Test mode: IEEE 802.11n HT 20 MHz mode / 5745 ~ 5825MHz / Chain 0

99% Bandwidth (CH Low)

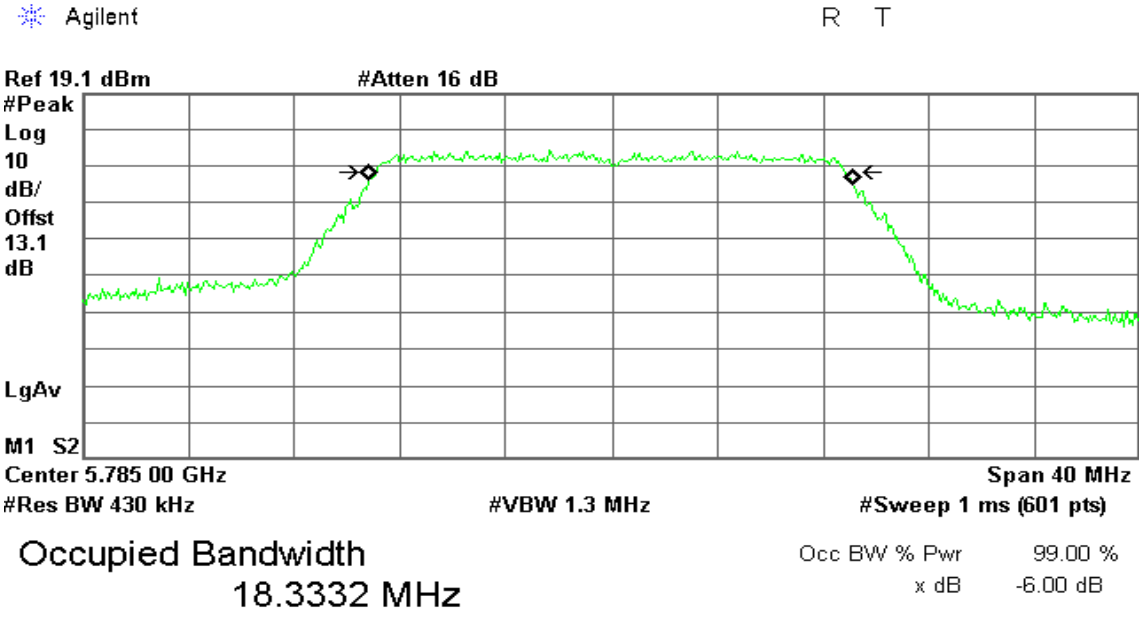


Occupied Bandwidth
18.4084 MHz

Occ BW % Pwr	99.00 %
x dB	-6.00 dB

Transmit Freq Error	-46.950 kHz
x dB Bandwidth	17.731 MHz

99% Bandwidth (CH Mid)

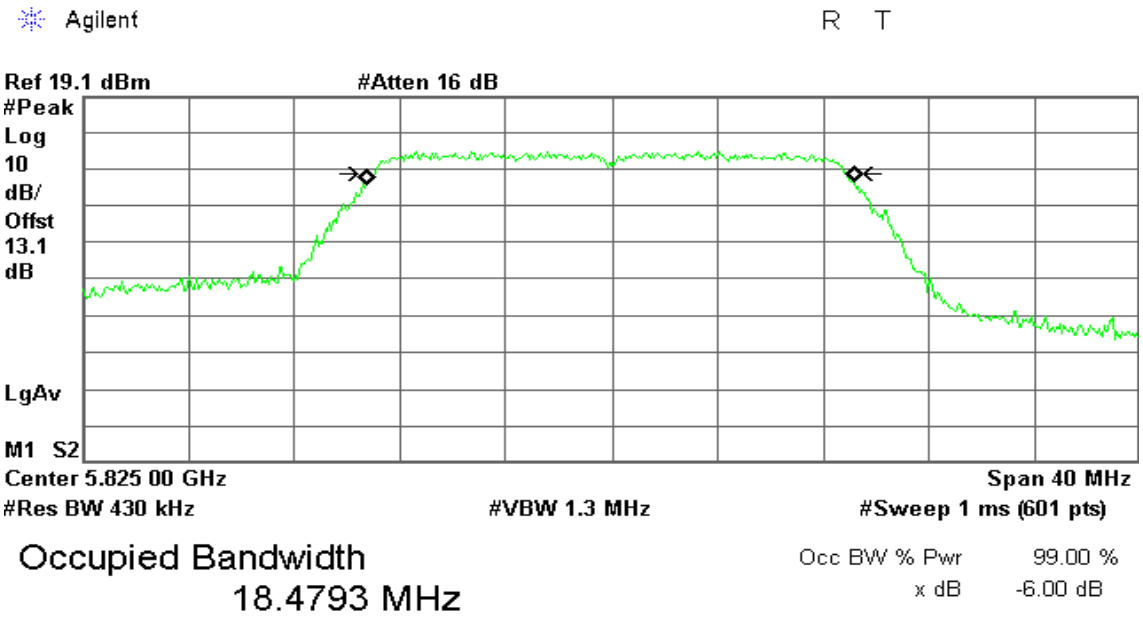


Occupied Bandwidth
18.3332 MHz

Occ BW % Pwr	99.00 %
x dB	-6.00 dB

Transmit Freq Error	-24.178 kHz
x dB Bandwidth	17.754 MHz

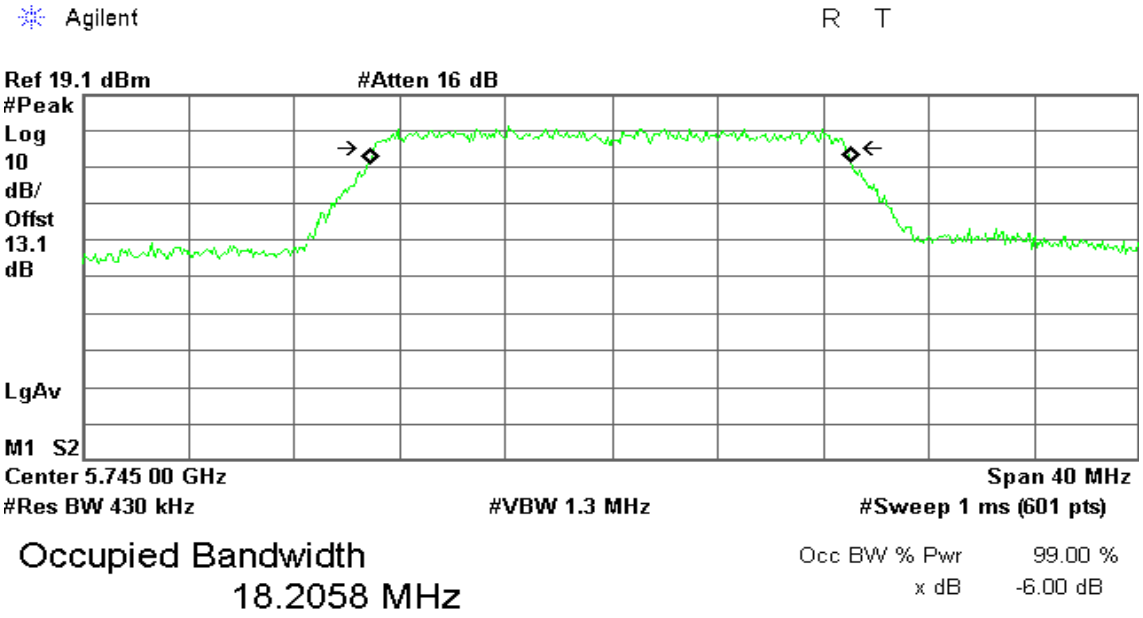
99% Bandwidth (CH High)



Transmit Freq Error	-36.052 kHz
x dB Bandwidth	17.839 MHz

Test mode: IEEE 802.11n HT 20 MHz mode / 5745 ~ 5825MHz / Chain 1

99% Bandwidth (CH Low)

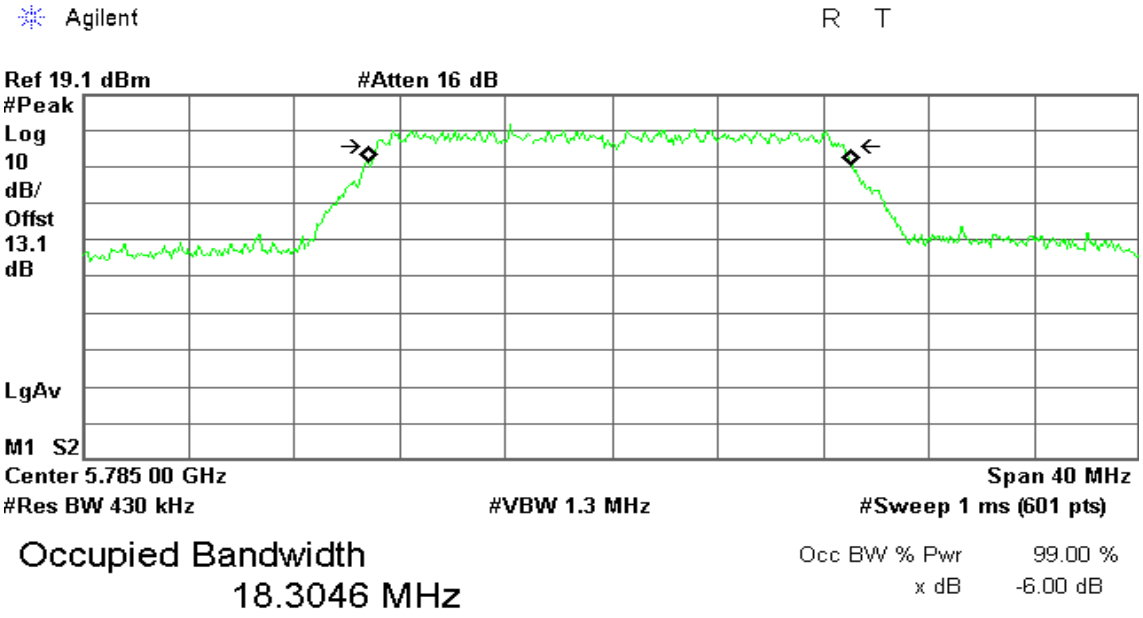


Occupied Bandwidth
18.2058 MHz

Occ BW % Pwr 99.00 %
x dB -6.00 dB

Transmit Freq Error -20.568 kHz
x dB Bandwidth 17.826 MHz

99% Bandwidth (CH Mid)

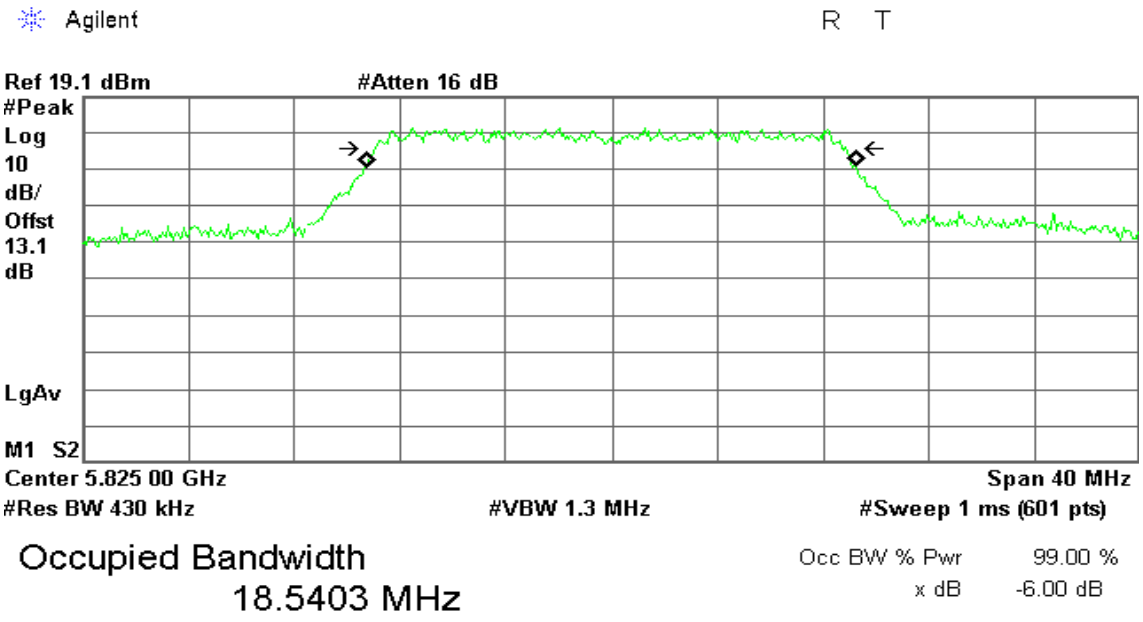


Occupied Bandwidth
18.3046 MHz

Occ BW % Pwr 99.00 %
x dB -6.00 dB

Transmit Freq Error -70.871 kHz
x dB Bandwidth 17.695 MHz

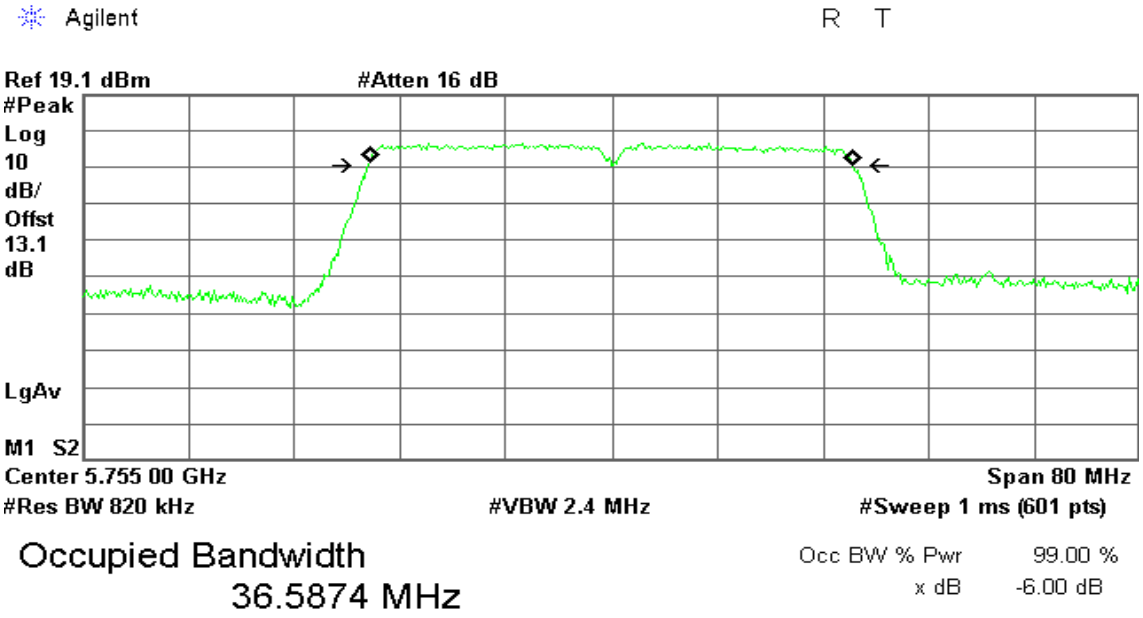
99% Bandwidth (CH High)



Transmit Freq Error	8.204 kHz
x dB Bandwidth	17.881 MHz

Test mode: IEEE 802.11n HT 40 MHz mode / 5755 ~ 5815MHz / Chain 0

99% Bandwidth (CH Low)

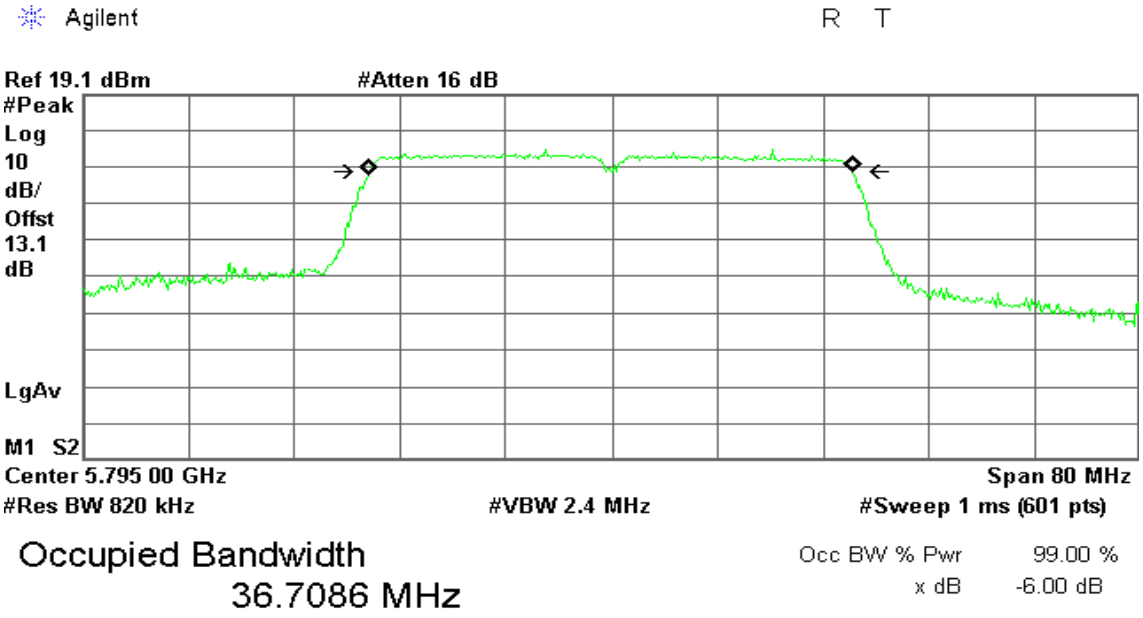


Occupied Bandwidth
36.5874 MHz

Occ BW % Pwr 99.00 %
x dB -6.00 dB

Transmit Freq Error 2.750 kHz
x dB Bandwidth 36.706 MHz

99% Bandwidth (CH High)



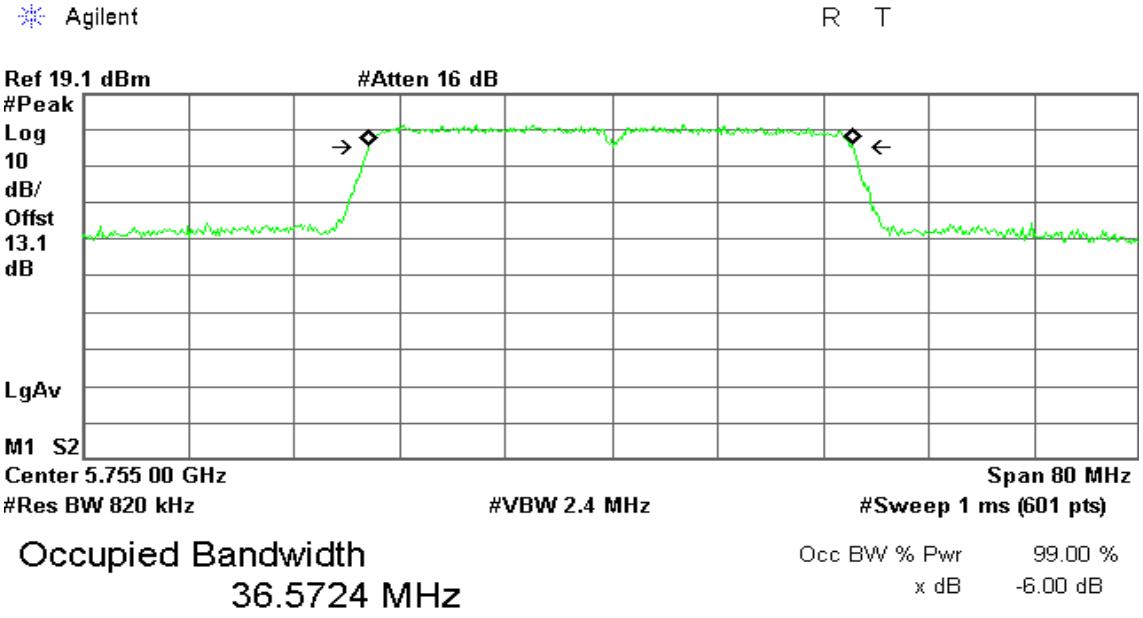
Occupied Bandwidth
36.7086 MHz

Occ BW % Pwr 99.00 %
x dB -6.00 dB

Transmit Freq Error -40.761 kHz
x dB Bandwidth 36.590 MHz

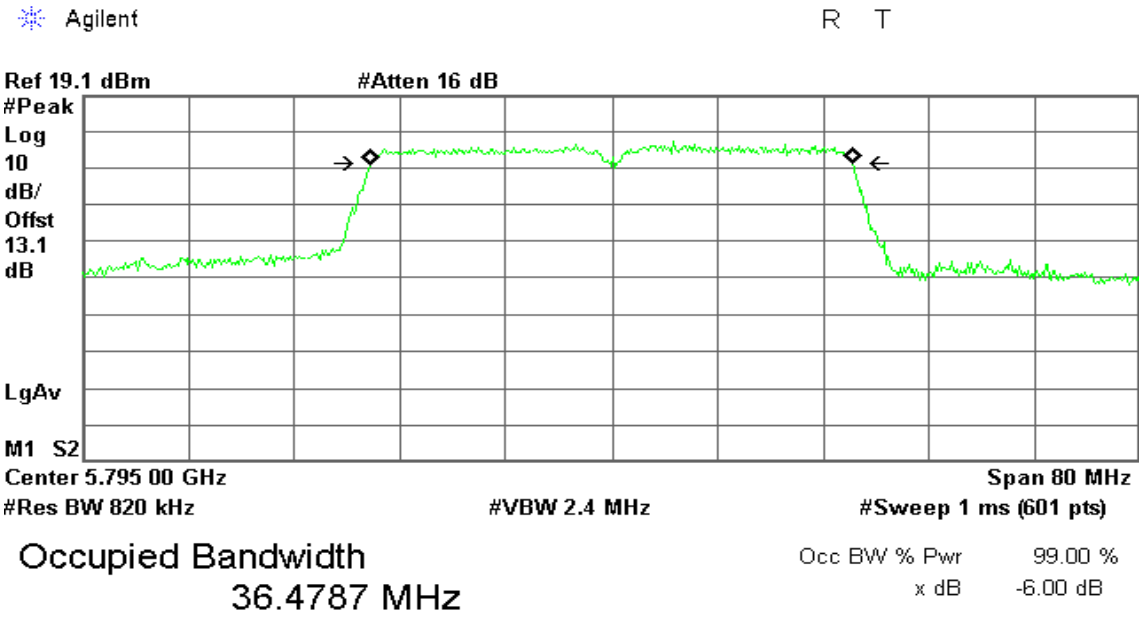
Test mode: IEEE 802.11n HT 40 MHz mode / 5755 ~ 5815MHz / Chain 1

99% Bandwidth (CH Low)



Transmit Freq Error -53.796 kHz
x dB Bandwidth 36.694 MHz

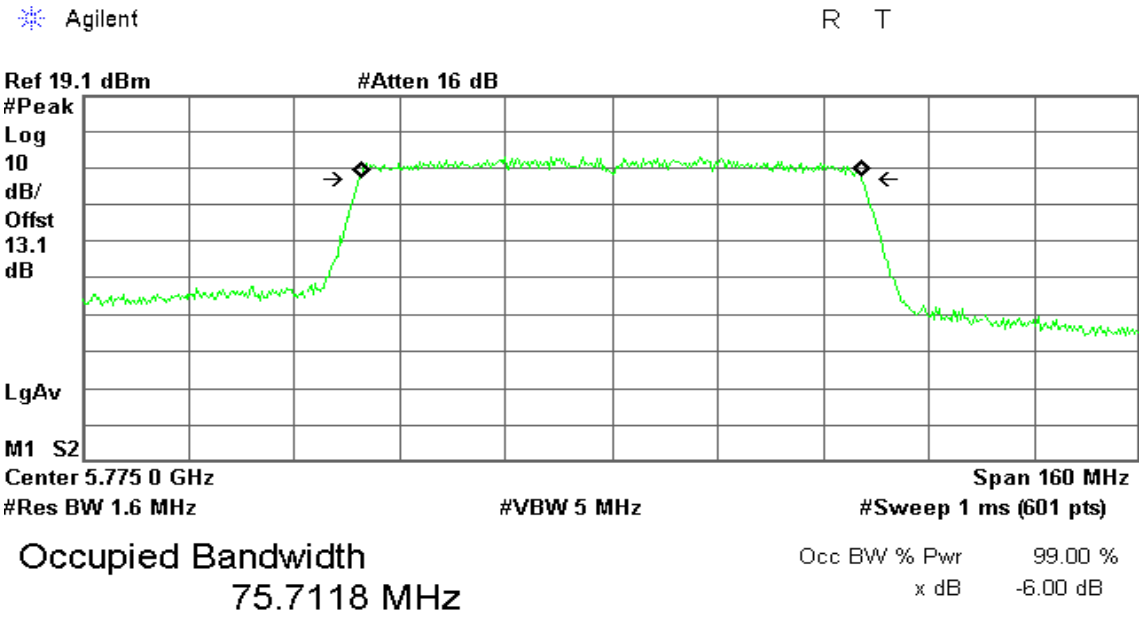
99% Bandwidth (CH High)



Transmit Freq Error -27.320 kHz
x dB Bandwidth 36.443 MHz

Test mode: IEEE 802.11ac VHT 80 MHz mode / 5775MHz / Chain 0

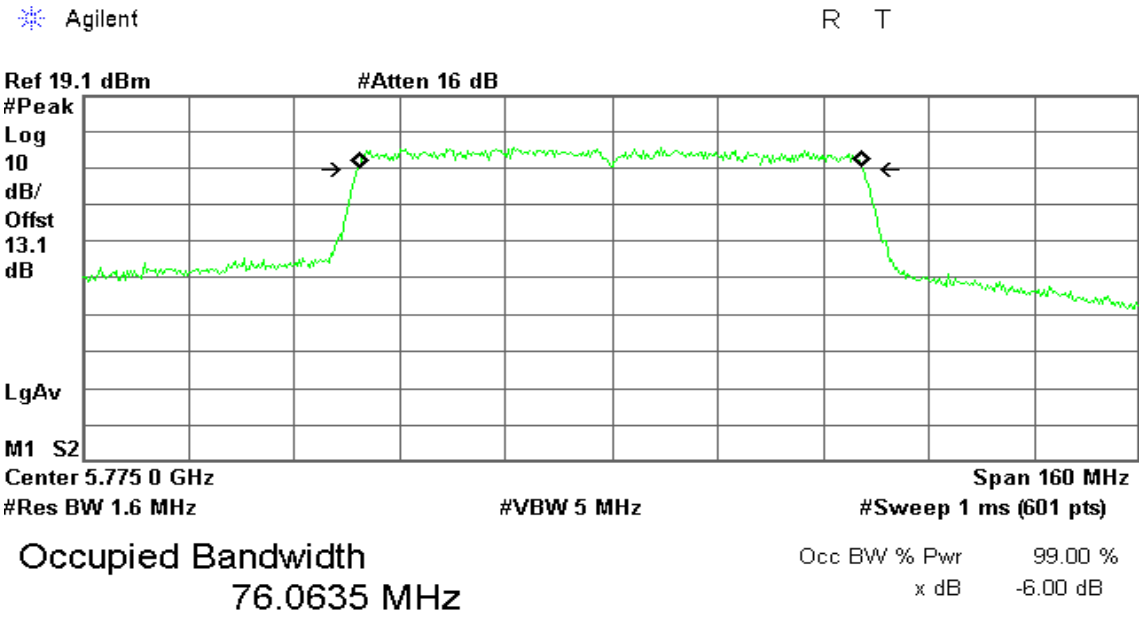
99% Bandwidth (CH Mid)



Transmit Freq Error	-112.897 kHz
x dB Bandwidth	76.097 MHz

Test mode: IEEE 802.11ac VHT 80 MHz mode / 5775MHz / Chain 1

99% Bandwidth (CH Mid)



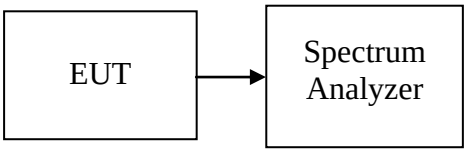
Transmit Freq Error	-143.200 kHz
x dB Bandwidth	76.669 MHz

7.2 6DB BANDWIDTH

LIMIT

According to §15.407 & RSS-247§, systems using digital modulation techniques may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz, and 5725 - 5850 MHz bands. The minimum 6dB bandwidth shall be at least 500 kHz.

Test Configuration



TEST PROCEDURE

1. Place the EUT on the table and set it in the transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW = VBW = 100kHz, Span = 50MHz, Sweep = auto.
4. Mark the peak frequency and –6dB (upper and lower) frequency.
5. Repeat until all the rest channels are investigated.

TEST RESULTS

No non-compliance noted

Test Data

Test mode: IEEE 802.11a mode

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (kHz)	Result
Low	5745	16.613	>500	PASS
Mid	5785	16.594		PASS
High	5825	16.617		PASS

Test mode: IEEE 802.11n HT 20 MHz mode / Chain 0

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (kHz)	Result
Low	5745	17.731	>500	PASS
Mid	5785	17.754		PASS
High	5825	17.839		PASS

Test mode: IEEE 802.11n HT 20 MHz mode / Chain 1

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (kHz)	Result
Low	5745	17.826	>500	PASS
Mid	5785	17.695		PASS
High	5825	17.881		PASS

Test mode: IEEE 802.11n HT 40 MHz mode / Chain 0

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (kHz)	Result
Low	5755	36.706	>500	PASS
High	5795	36.590		PASS

Test mode: IEEE 802.11n HT 40 MHz mode / Chain 1

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (kHz)	Result
Low	5755	36.694	>500	PASS
High	5795	36.443		PASS

Test mode: IEEE 802.11ac VHT 80 MHz mode / 5775MHz / Chain 0

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (kHz)	Result
Mid	5755	76.097	>500	PASS

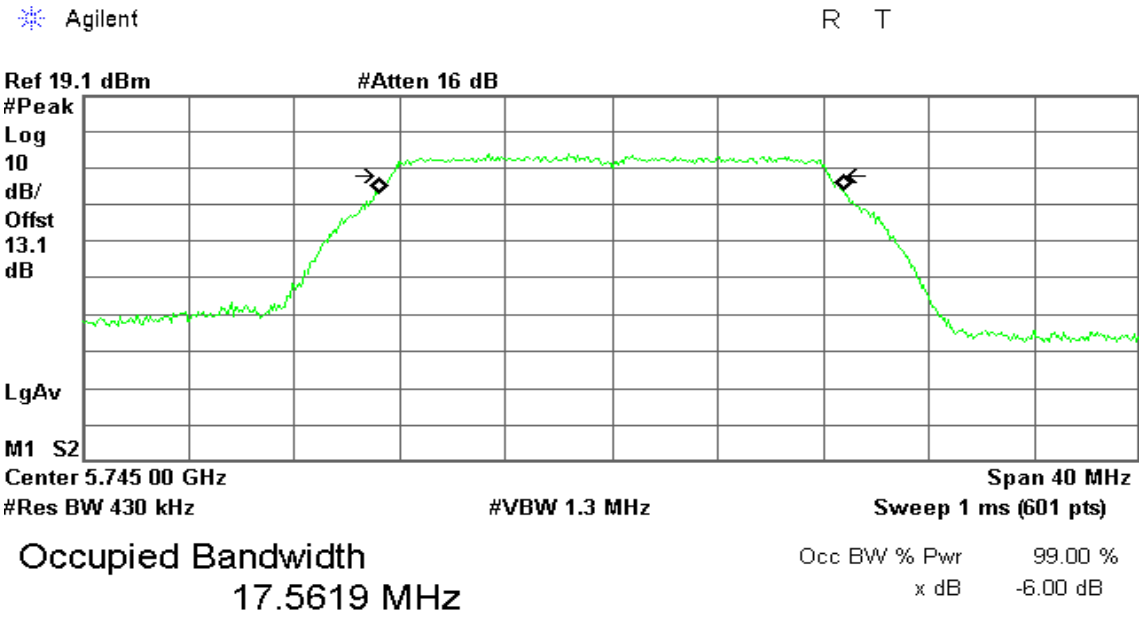
Test mode: IEEE 802.11ac VHT 80 MHz mode / 5775MHz / Chain 1

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (kHz)	Result
Mid	5755	76.669	>500	PASS

Test Plot

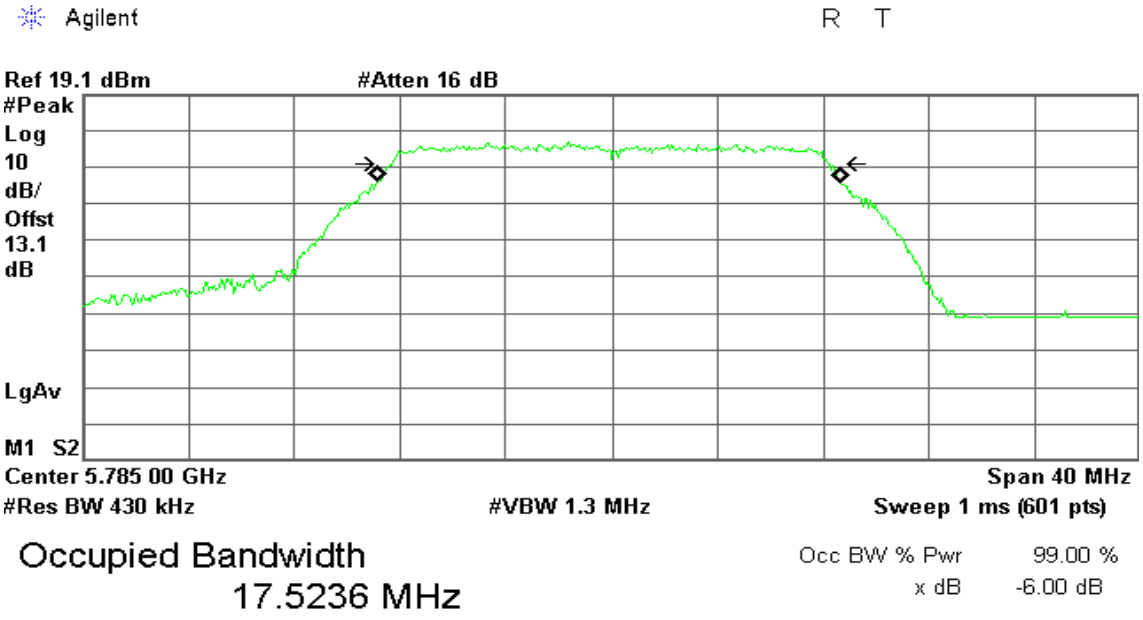
IEEE 802.11a mode / 5745 ~ 5825MHz

6dB Bandwidth (CH Low)



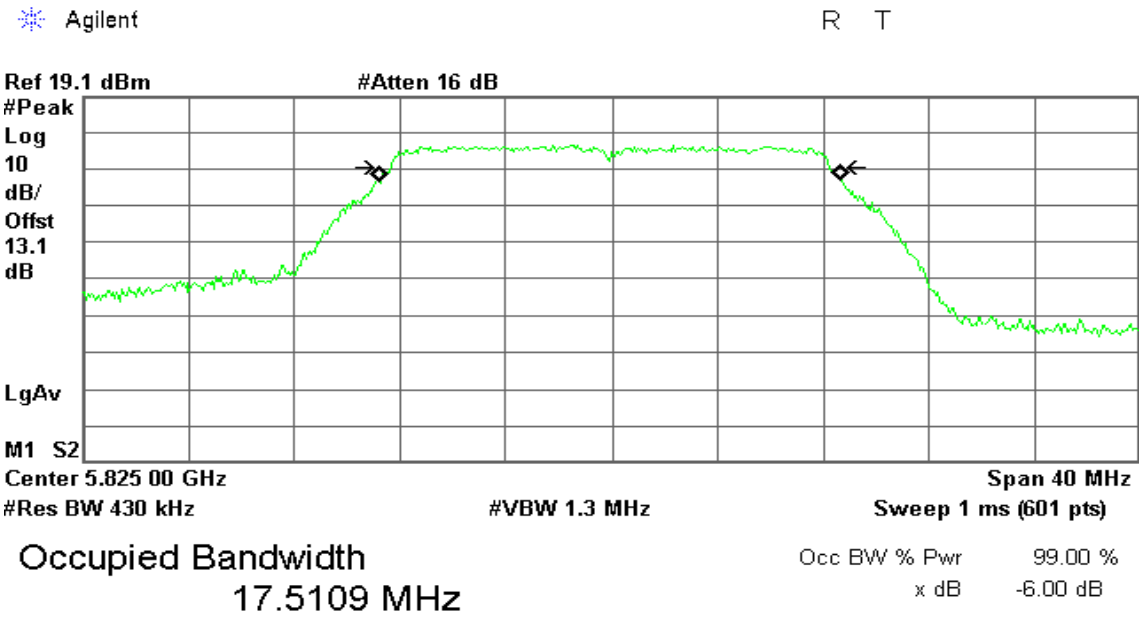
Transmit Freq Error -3.327 kHz
x dB Bandwidth 16.613 MHz

6dB Bandwidth (CH Mid)



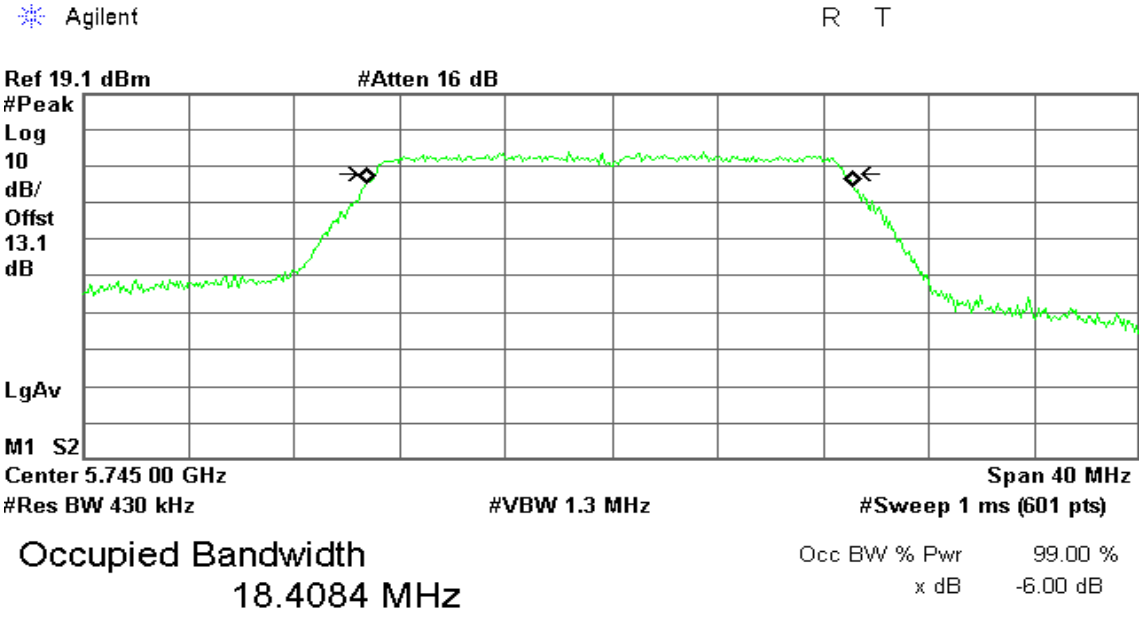
Transmit Freq Error -85.106 kHz
x dB Bandwidth 16.594 MHz

6dB Bandwidth (CH High)



IEEE 802.11n HT 20 MHz mode / 5745 ~ 5825MHz / Chain 0

6dB Bandwidth (CH Low)

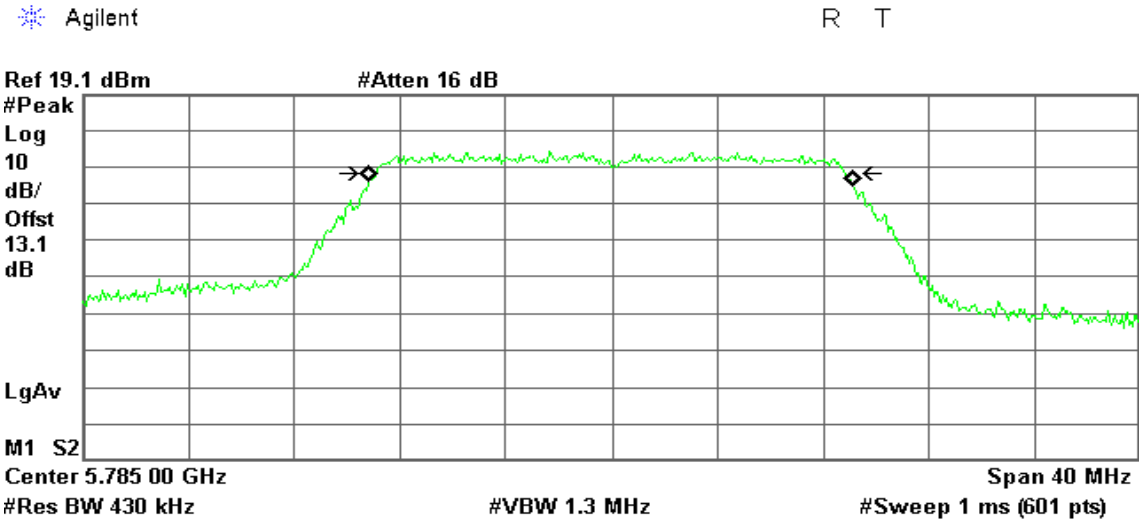


Occupied Bandwidth
18.4084 MHz

Occ BW % Pwr 99.00 %
x dB -6.00 dB

Transmit Freq Error -46.950 kHz
x dB Bandwidth 17.731 MHz

6dB Bandwidth (CH Mid)

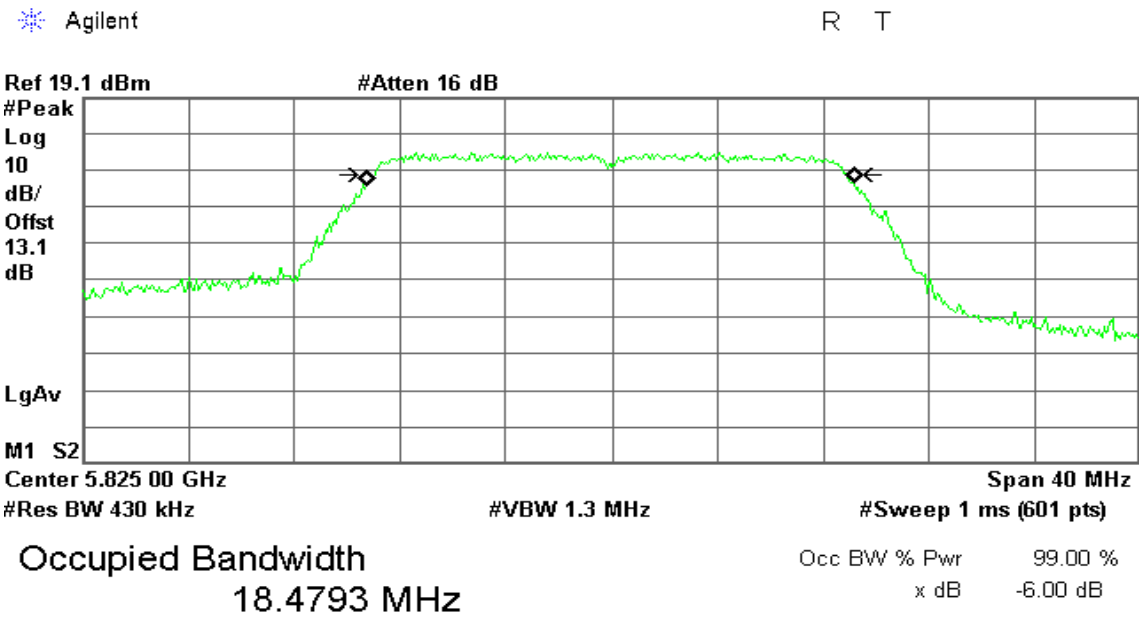


Occupied Bandwidth
18.3332 MHz

Occ BW % Pwr 99.00 %
x dB -6.00 dB

Transmit Freq Error -24.178 kHz
x dB Bandwidth 17.754 MHz

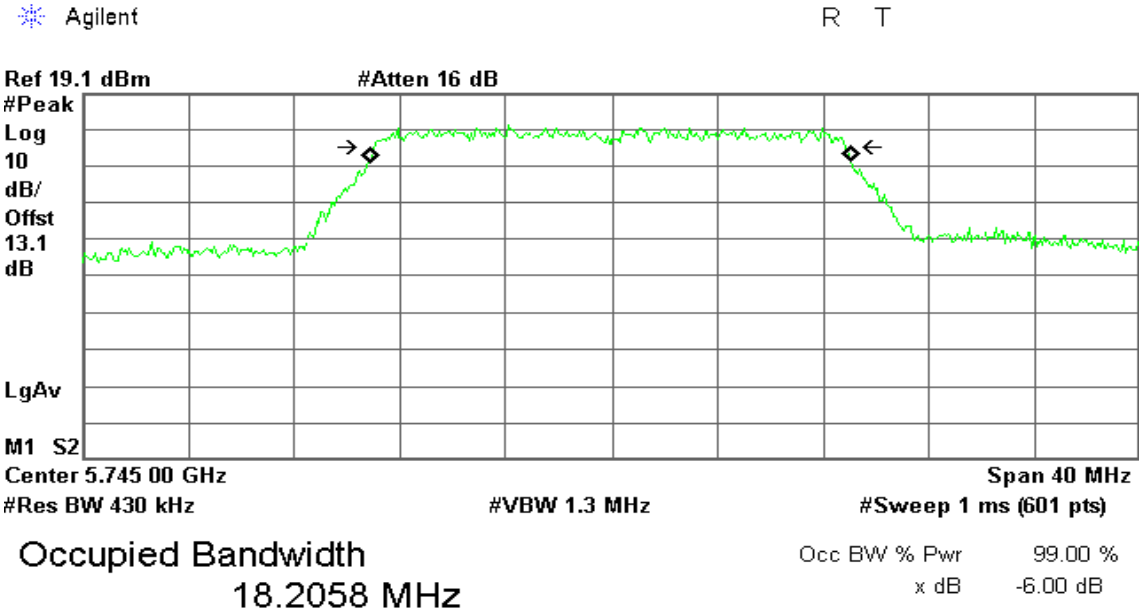
6dB Bandwidth (CH High)



Transmit Freq Error	-36.052 kHz
x dB Bandwidth	17.839 MHz

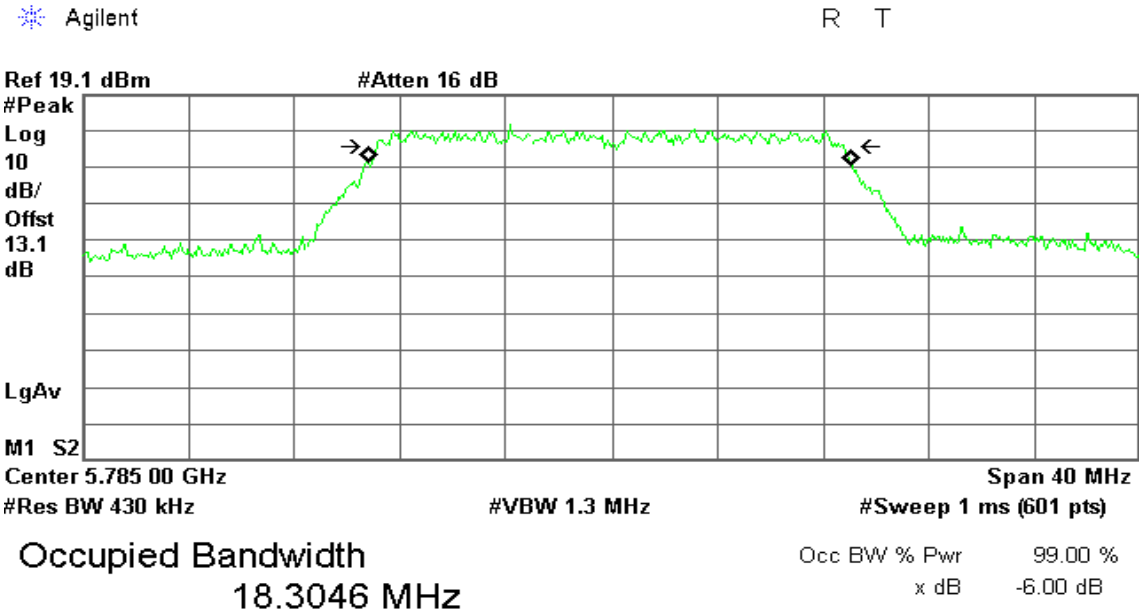
IEEE 802.11n HT 20 MHz mode / 5745 ~ 5825MHz / Chain 1

6dB Bandwidth (CH Low)



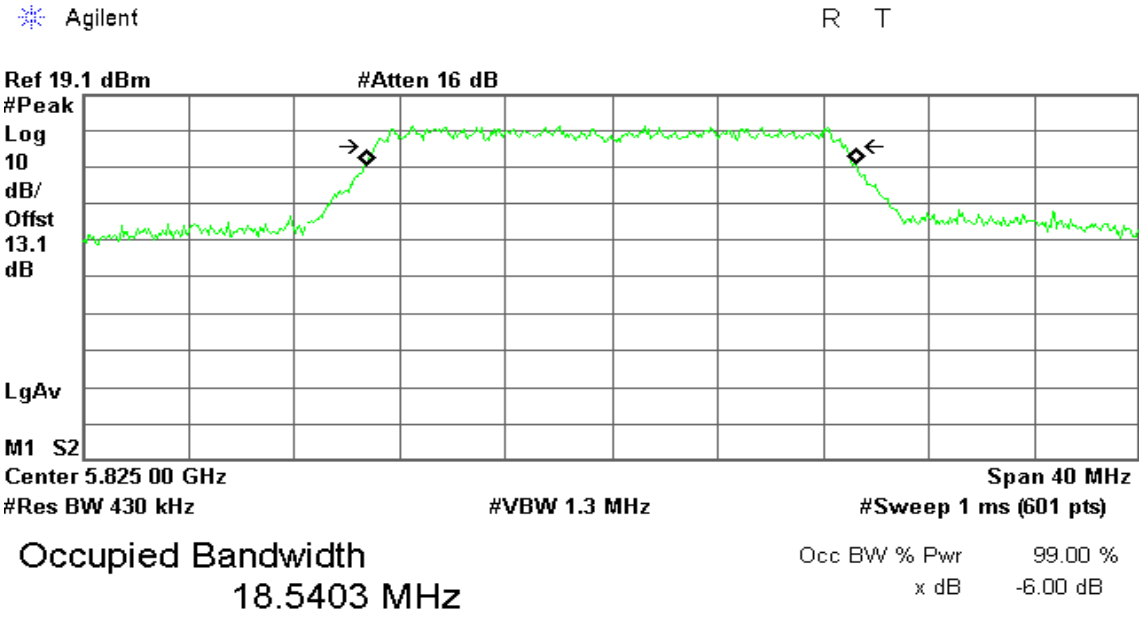
Transmit Freq Error	-20.568 kHz
x dB Bandwidth	17.826 MHz

6dB Bandwidth (CH Mid)



Transmit Freq Error	-70.871 kHz
x dB Bandwidth	17.695 MHz

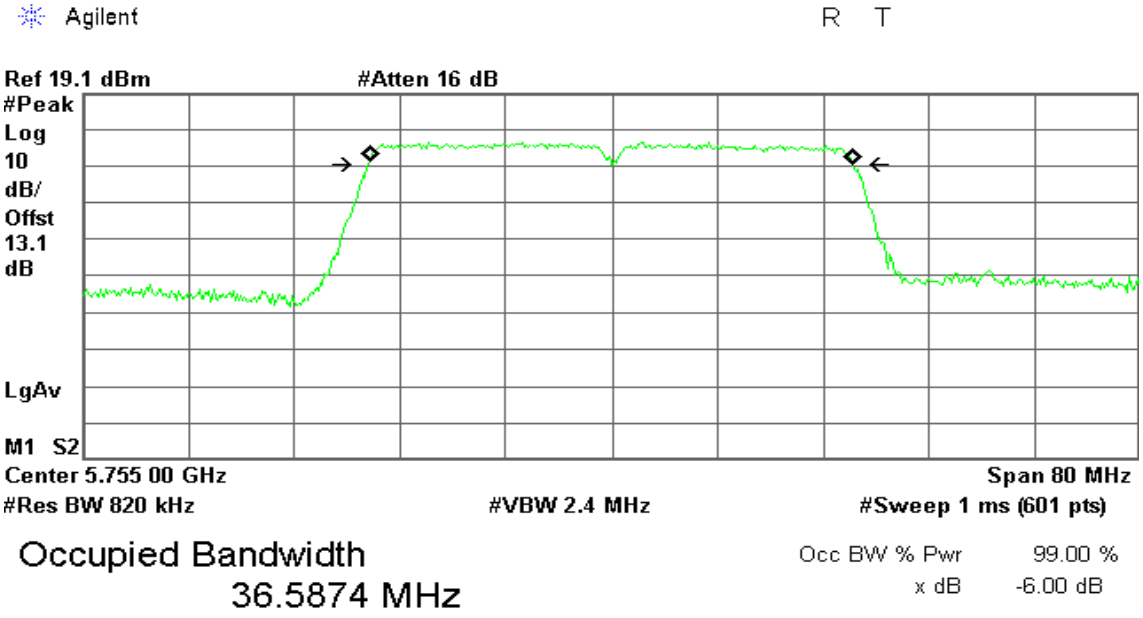
6dB Bandwidth (CH High)



Transmit Freq Error	8.204 kHz
x dB Bandwidth	17.881 MHz

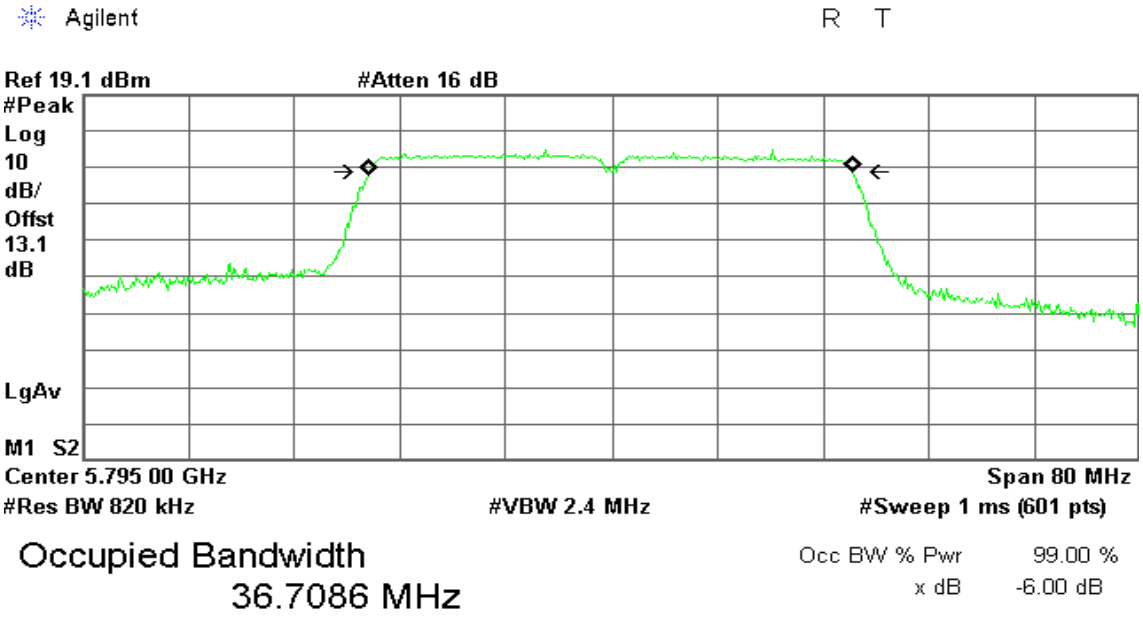
IEEE 802.11n HT 40 MHz mode / 5755 ~ 5815MHz / Chain 0

6dB Bandwidth (CH Low)



Transmit Freq Error	2.750 kHz
x dB Bandwidth	36.706 MHz

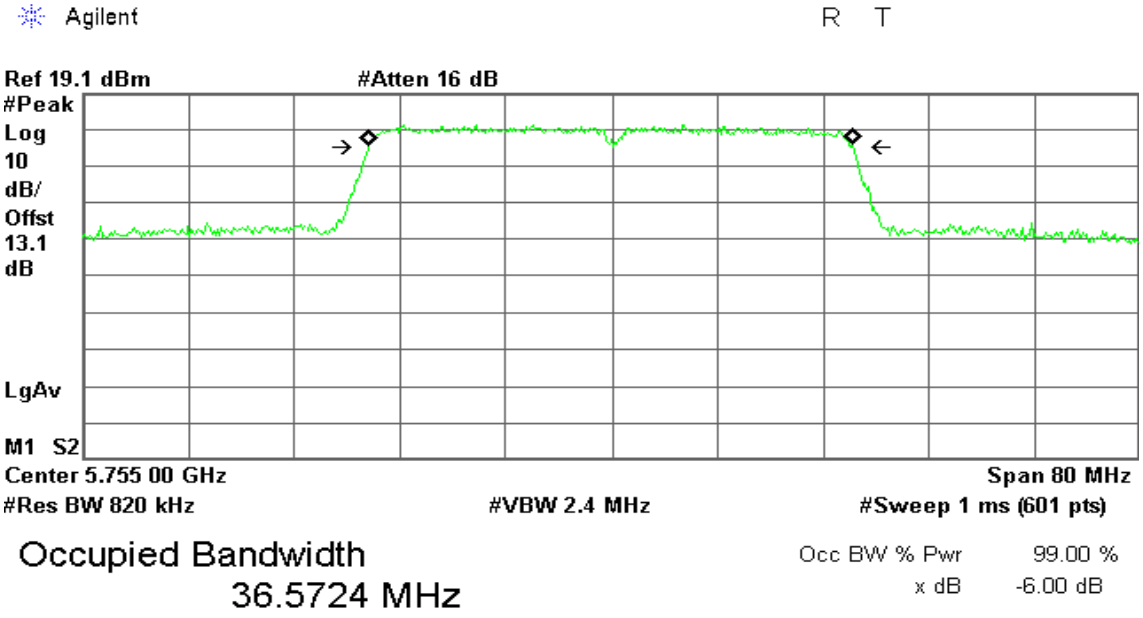
6dB Bandwidth (CH High)



Transmit Freq Error	-40.761 kHz
x dB Bandwidth	36.590 MHz

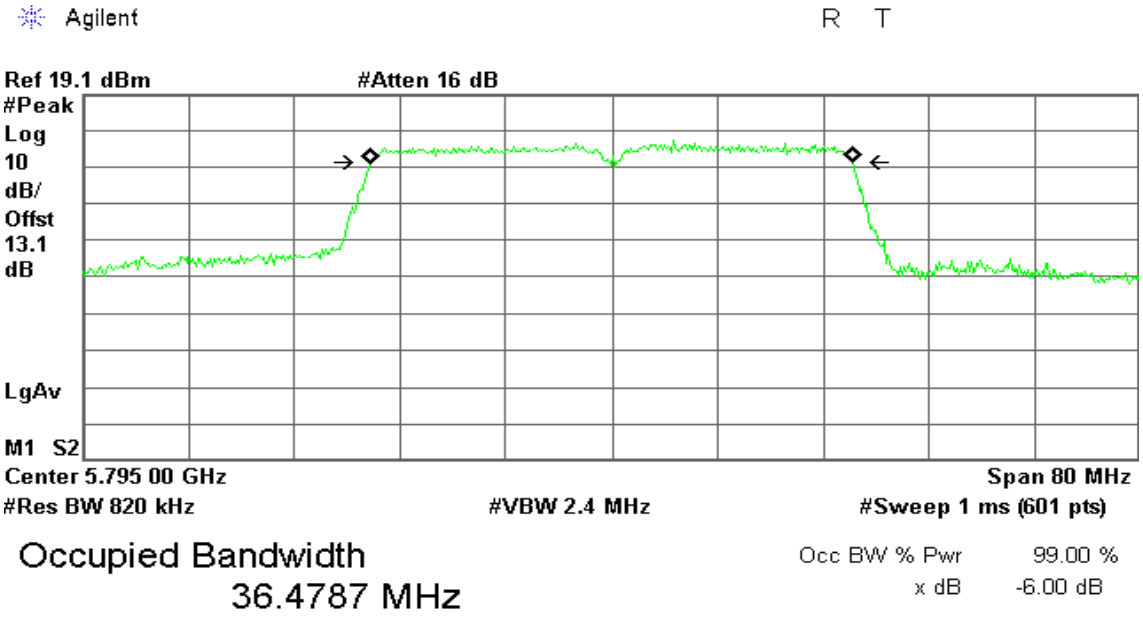
IEEE 802.11n HT 40 MHz mode / 5755 ~ 5815MHz / Chain 1

6dB Bandwidth (CH Low)



Transmit Freq Error	-53.796 kHz
x dB Bandwidth	36.694 MHz

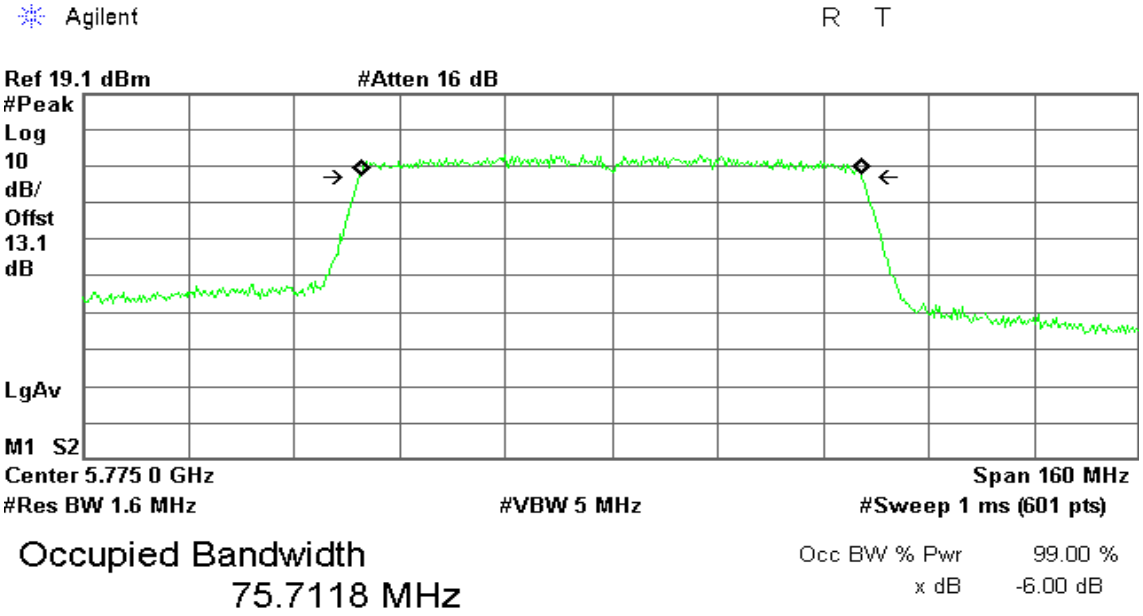
6dB Bandwidth (CH High)



Transmit Freq Error	-27.320 kHz
x dB Bandwidth	36.443 MHz

IEEE 802.11ac VHT 80 MHz mode / 5775MHz / Chain 0

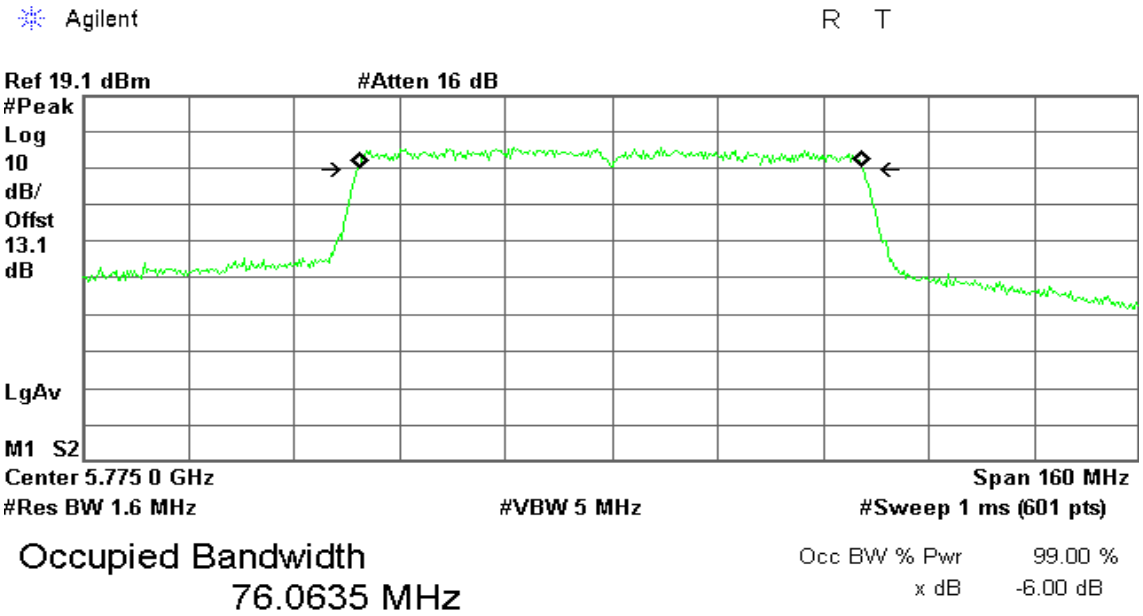
6dB Bandwidth (CH Mid)



Transmit Freq Error	-112.897 kHz
x dB Bandwidth	76.097 MHz

IEEE 802.11ac VHT 80 MHz mode / 5775MHz / Chain 1

6dB Bandwidth (CH Mid)



Transmit Freq Error	-143.200 kHz
x dB Bandwidth	76.669 MHz

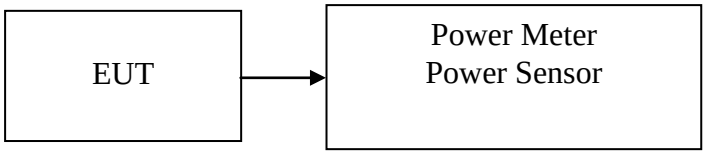
7.3MAXIMUM CONDUCTED OUTPUT POWER

LIMIT

The maximum peak output power of the intentional radiator shall not exceed the following:

1. According to §15.407, for systems using digital modulation in the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz: 1 Watt.
2. According to RSS-247 §, for systems employing digital modulation techniques operating in the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz, the maximum peak conducted output power shall not exceed 1 W.

Test Configuration



TEST PROCEDURE

The transmitter output is connected to the Power Meter. The Power Meter is set to the peak power detection.

TEST RESULTS

No non-compliance noted

Test Data

Test mode: IEEE 802.11a mode / 5745 ~ 5825MHz

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)
Low	5745	10.40	0.0110
Mid	5785	***18.86**	0.0769
High	5825	12.20	0.0166

Test mode: IEEE 802.11n HT 20 MHz mode / 5245 ~ 5825MHz

Channel	Frequency (MHz)	Chain 0 Output Power (dBm)	Chain 1 Output Power (dBm)	Output Power (dBm)	Output Power (W)
Low	5745	10.13	10.48	13.32	0.0215
Mid	5785	12.67	16.61	***18.08**	0.0643
High	5825	11.67	13.67	15.80	0.0380

Test mode: IEEE 802.11n HT 40 MHz mode / 5755 ~ 5795MHz

Channel	Frequency (MHz)	Chain 0 Output Power (dBm)	Chain 1 Output Power (dBm)	Output Power (dBm)	Output Power (W)
Low	5755	16.44	16.41	***19.43**	0.0878
High	5795	12.63	14.82	16.87	0.0487

Test mode: IEEE 802.11ac VHT 80 MHz mode / 5775MHz

Channel	Frequency (MHz)	Chain 0 Output Power (dBm)	Chain 1 Output Power (dBm)	Output Power (dBm)	Output Power (W)
Mid	5775	9.77	9.93	***12.86**	0.0193

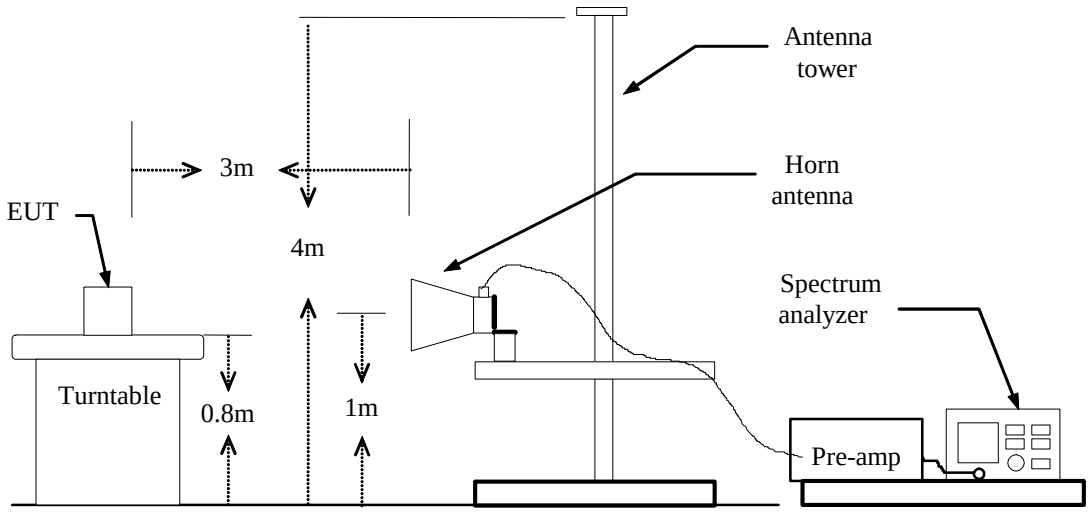
Remark: *Total Output Power (w) = Chain 0 (10^(Output Power /10)/1000)+ Chain 1 (10^(Output Power /10)/1000)*

7.4BAND EDGES MEASUREMENT

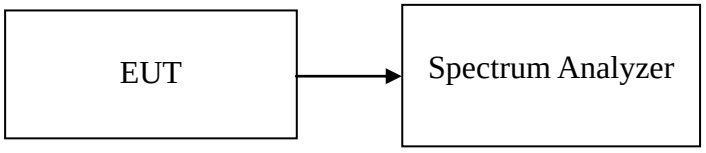
LIMIT

According to §15.407 & RSS-247 §, in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in 15.209(a) (see Section 15.205(c)).

Test Configuration



For Conducted



TEST PROCEDURE

1. The EUT is placed on a turntable, which is 1.5m above the ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.
4. Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission:
   (a) PEAK: RBW=VBW=1MHz / Sweep=AUTO
   (b) AVERAGE: RBW=1MHz,
   if duty cycle≧98%, VBW=10Hz.
   if duty cycle<98% VBW=1/T.
   IEEE 802.11b mode: = 96%, VBW= 510Hz
   IEEE 802.11g mode: = 92%, VBW= 1.1KHz
   IEEE 802.11n HT 20 MHz mode: = 84%, VBW= 2KHz
   IEEE 802.11n HT 40 MHz mode: = 73%, VBW= 15KHz
5. Repeat the procedures until all the PEAK and AVERAGE versus POLARIZATION are measured.

For Conducted

Conducted RF measurements of the transmitter output were made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

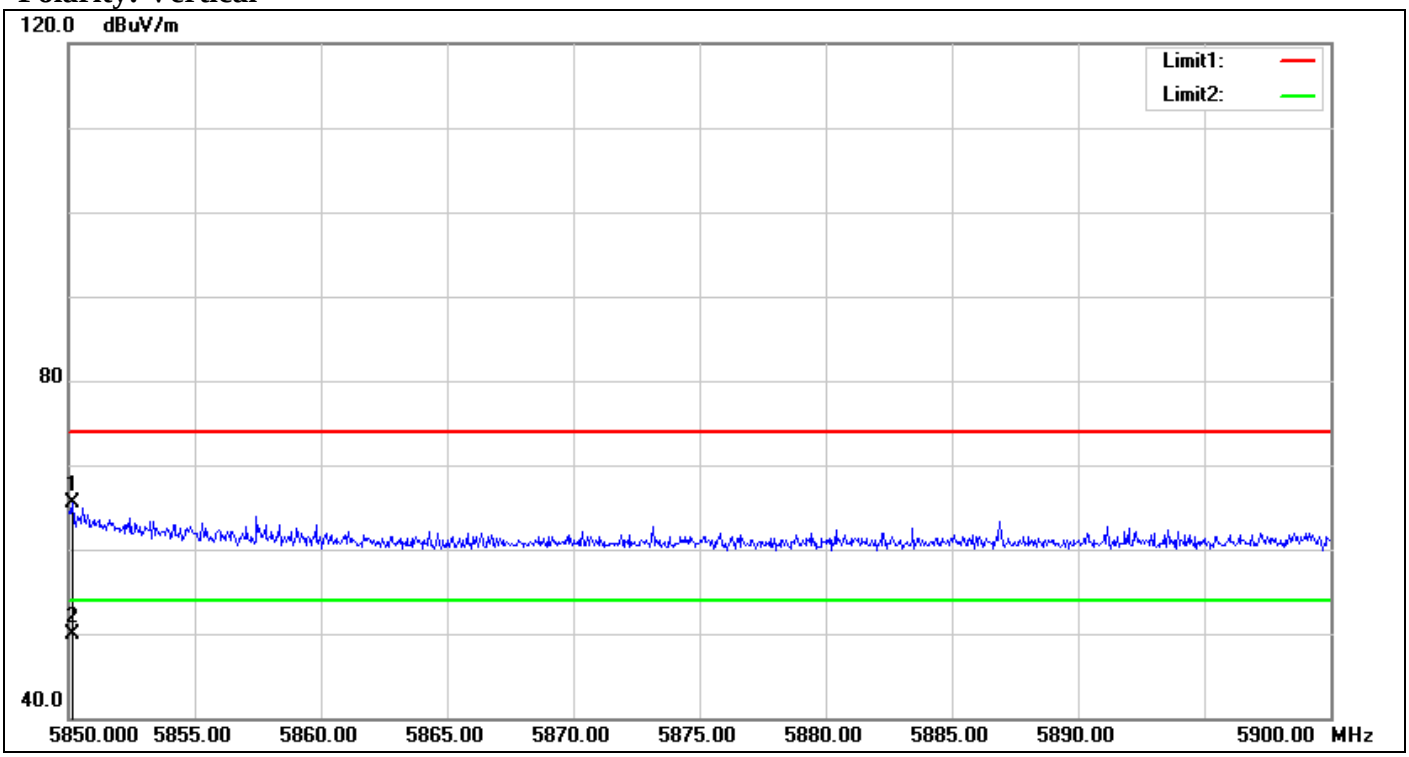
The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 100 kHz.

TEST RESULTS

Refer to attach spectrum analyzer data chart.

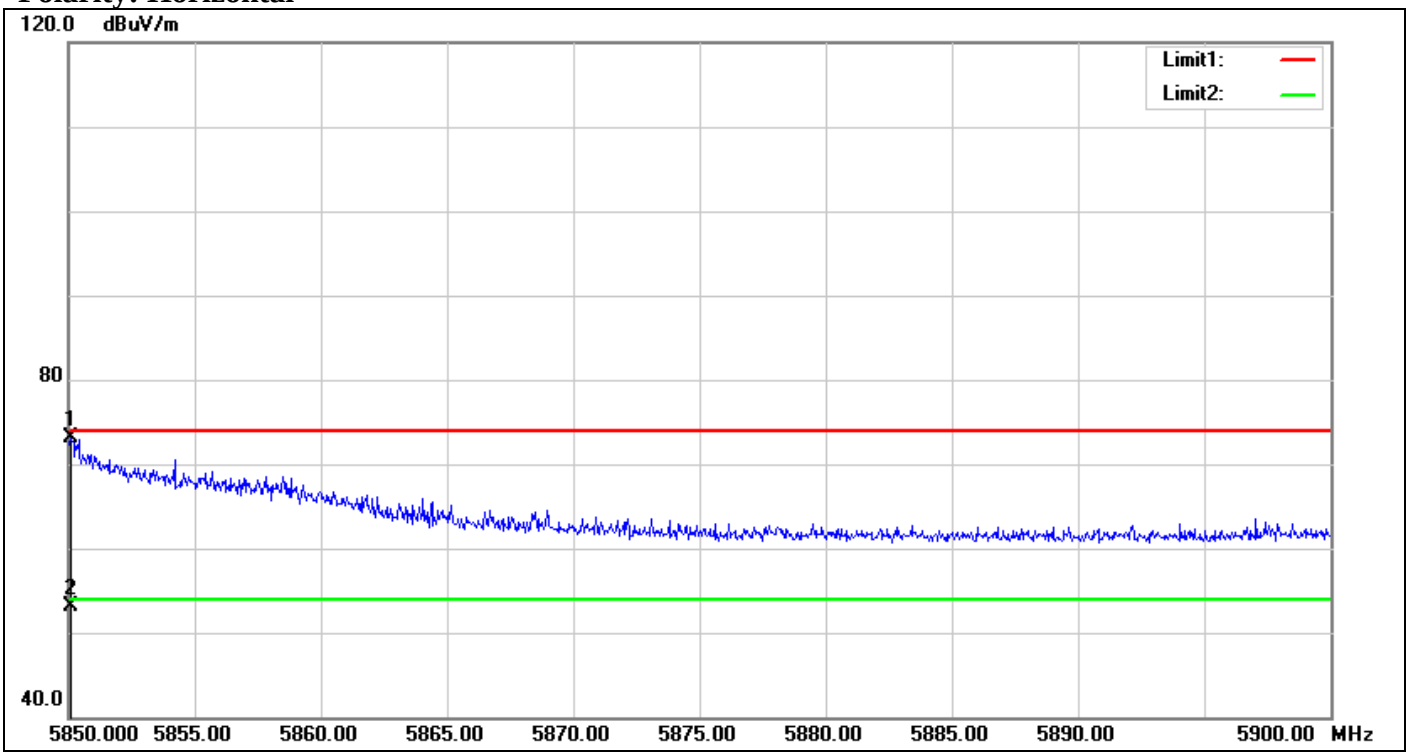
Band Edges (IEEE 802.11a mode / CH 5825 MHz)

Polarity: Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
1	5850.150	58.76	6.74	65.50	74.00	-8.50	100	134	peak
2	5850.150	43.23	6.74	49.97	54.00	-4.03	100	134	AVG

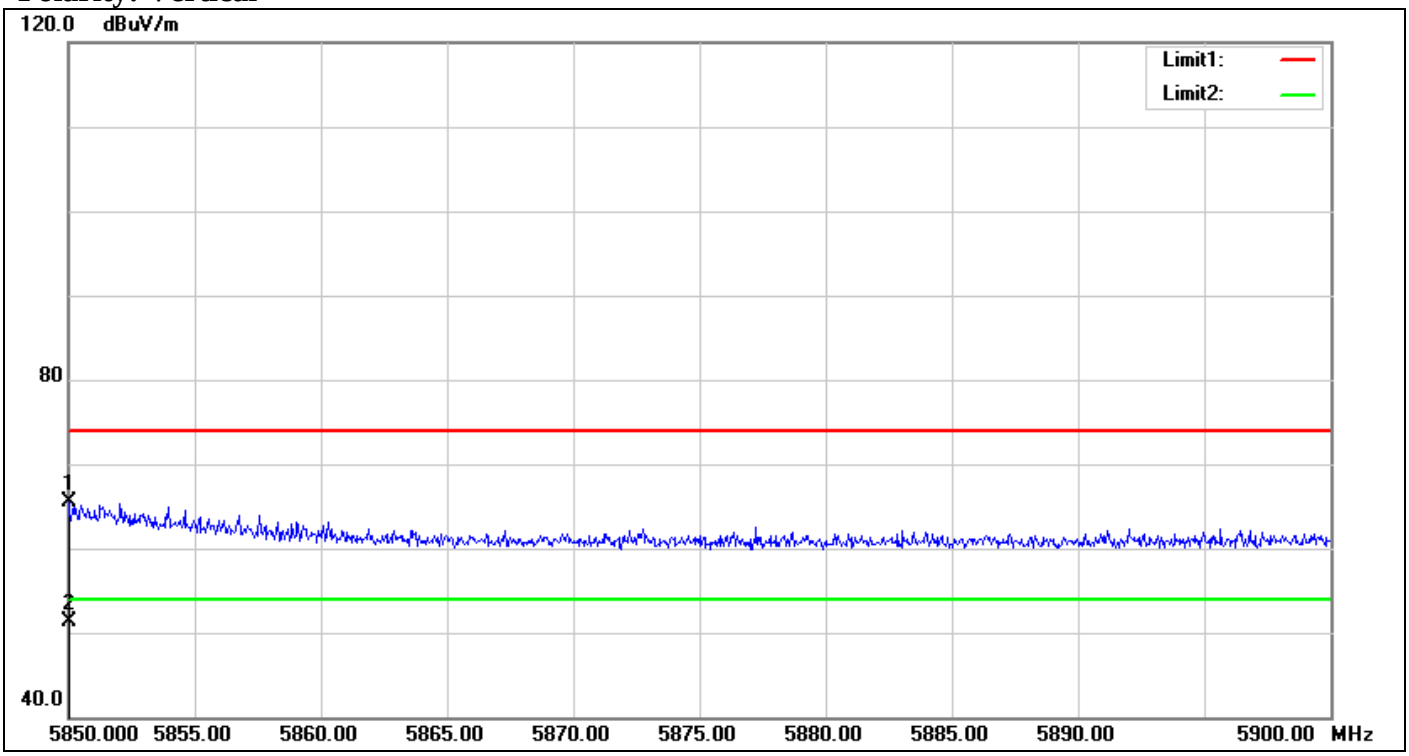
Polarity: Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
1	5850.100	66.45	6.74	73.19	74.00	-0.81	100	24	peak
2	5850.100	46.38	6.74	53.12	54.00	-0.88	100	24	AVG

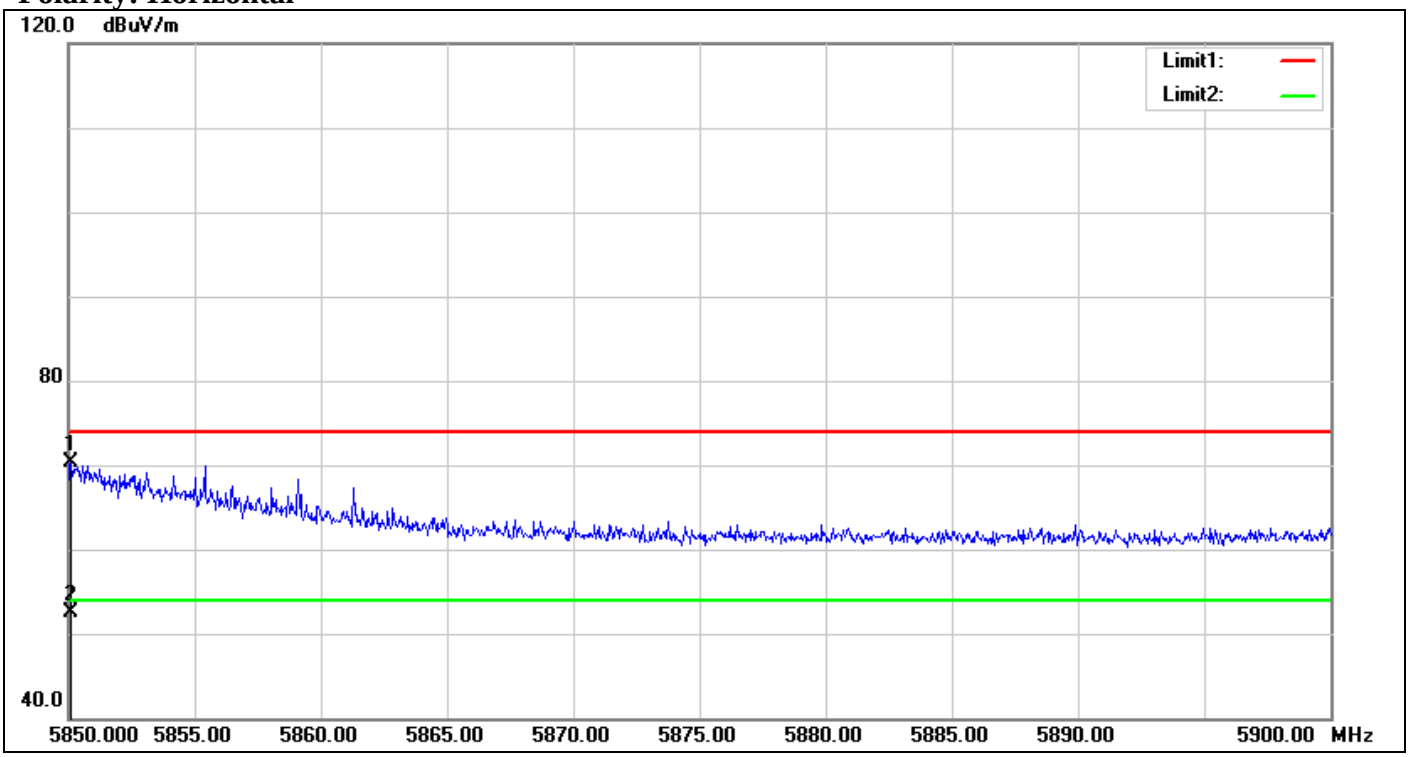
Band Edges (IEEE 802.11n HT 20 MHz Channel mode / CH 5825 MHz)

Polarity: Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
1	5850.000	58.83	6.74	65.57	74.00	-8.43	100	299	peak
2	5850.000	44.48	6.74	51.22	54.00	-2.78	100	299	AVG

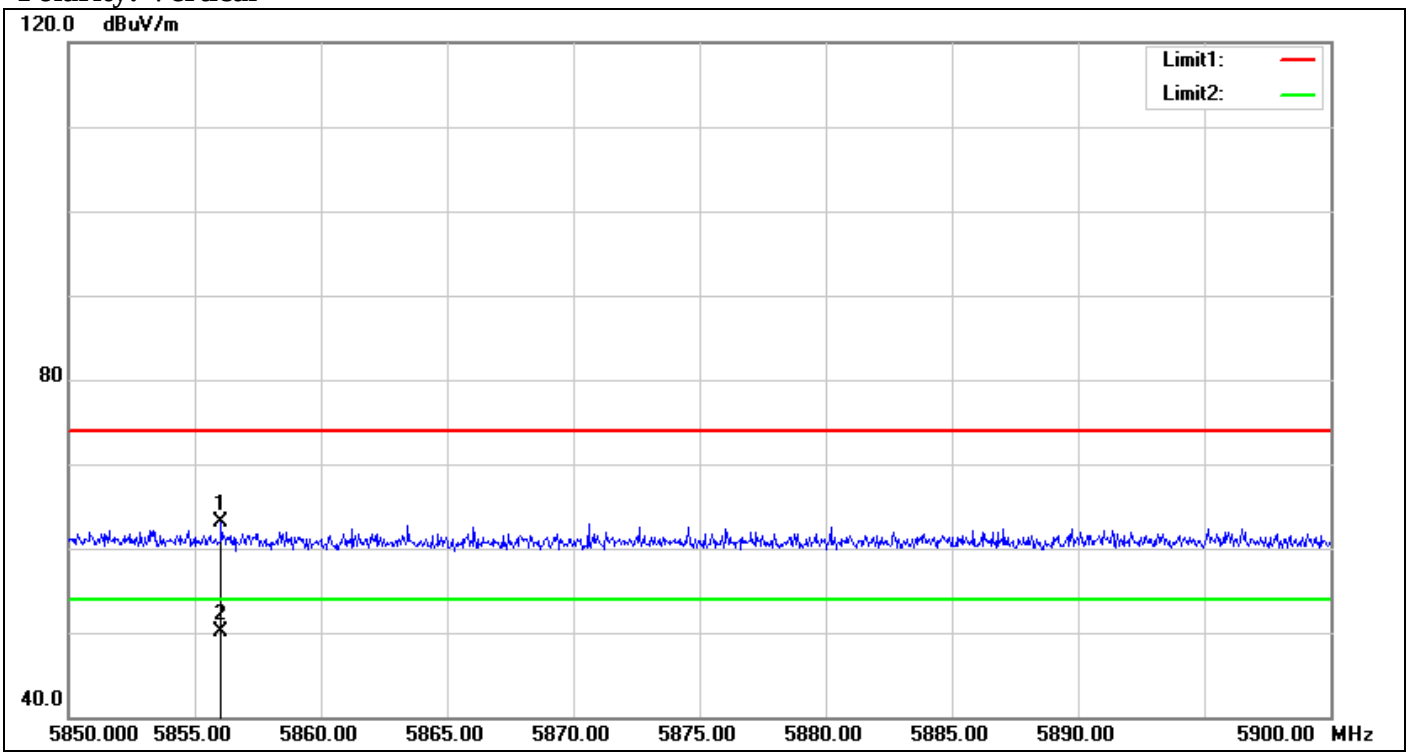
Polarity: Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
1	5850.100	63.52	6.74	70.26	74.00	-3.74	100	126	peak
2	5850.100	45.81	6.74	52.55	54.00	-1.45	100	126	AVG

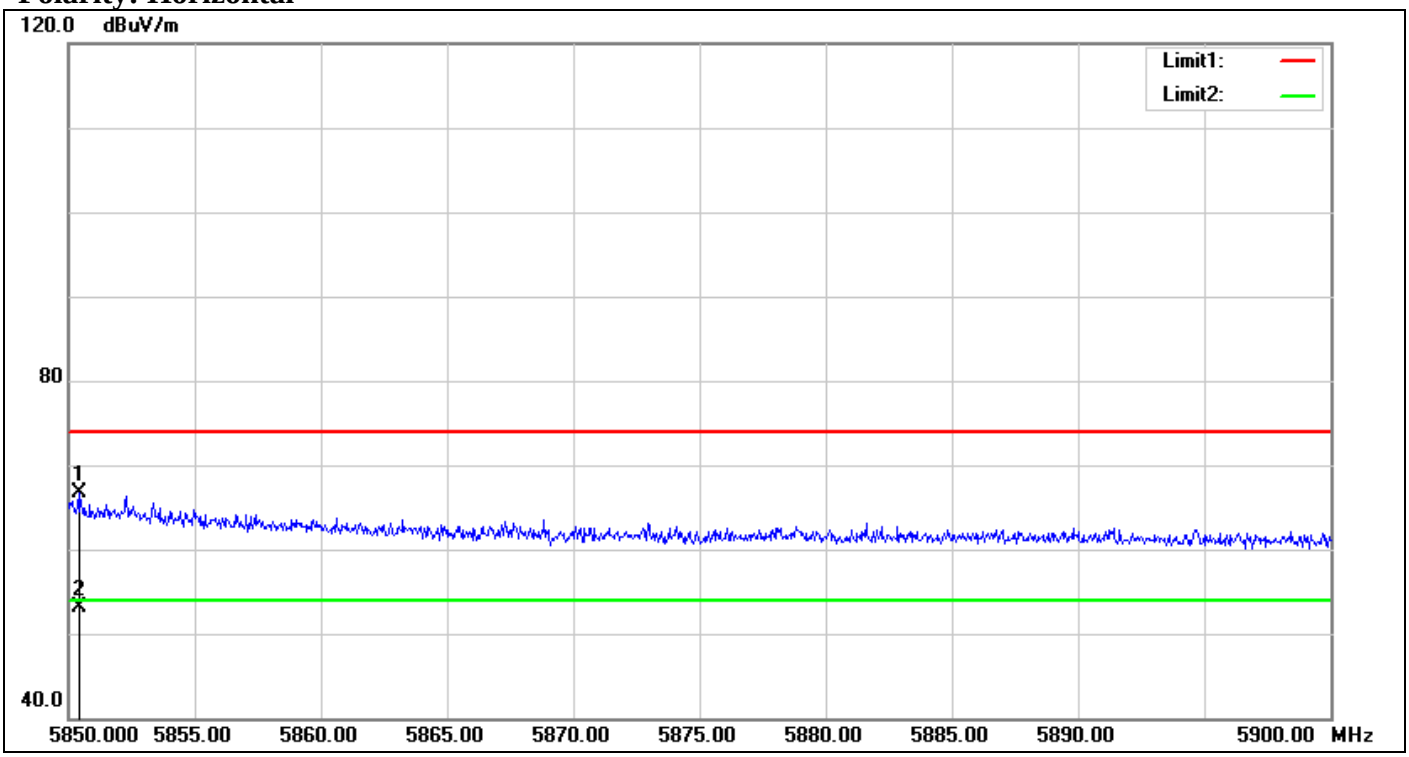
Band Edges (IEEE 802.11n HT 40 MHz mode / CH 5795 MHz)

Polarity: Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
1	5856.050	56.40	6.77	63.17	74.00	-10.83	100	351	peak
2	5856.050	43.36	6.77	50.13	54.00	-3.87	100	351	AVG

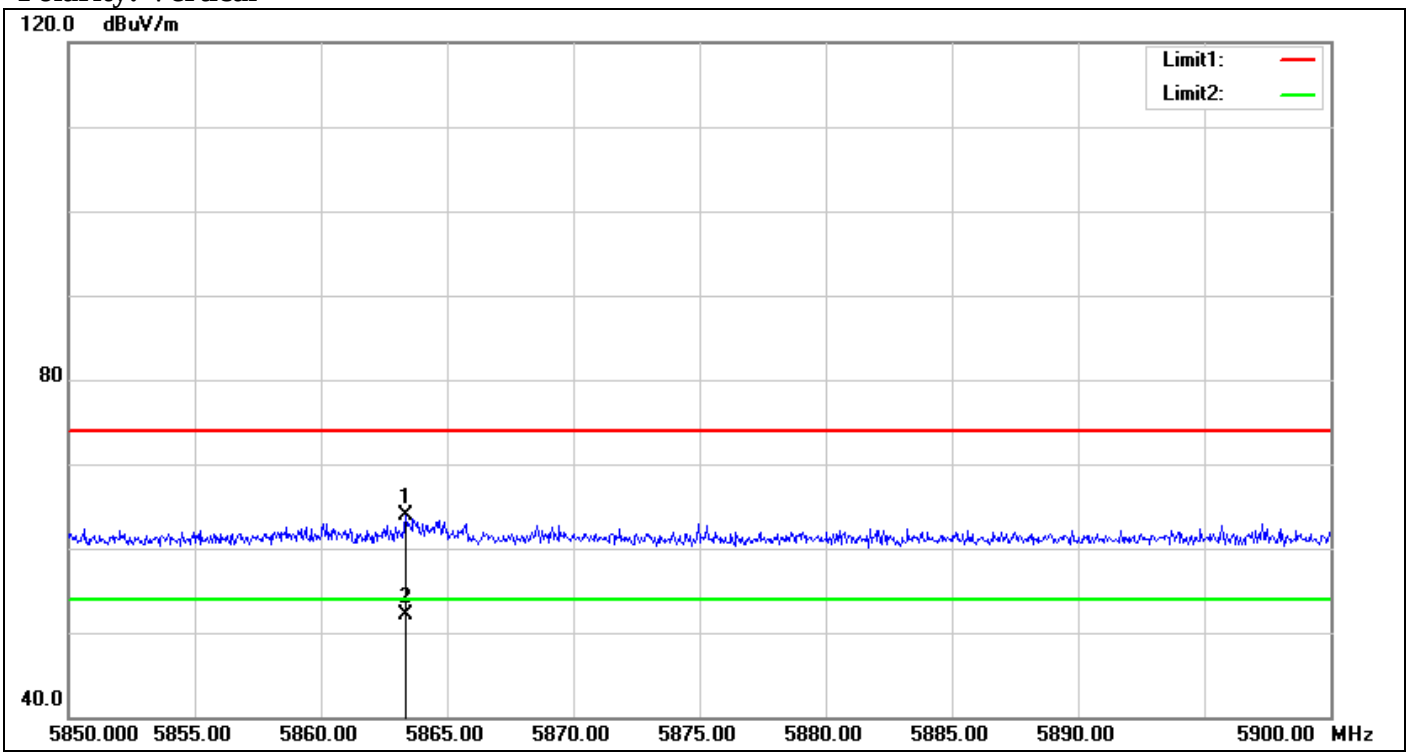
Polarity: Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
1	5850.400	59.89	6.74	66.63	74.00	-7.37	100	78	peak
2	5850.400	46.37	6.74	53.11	54.00	-0.89	100	78	AVG

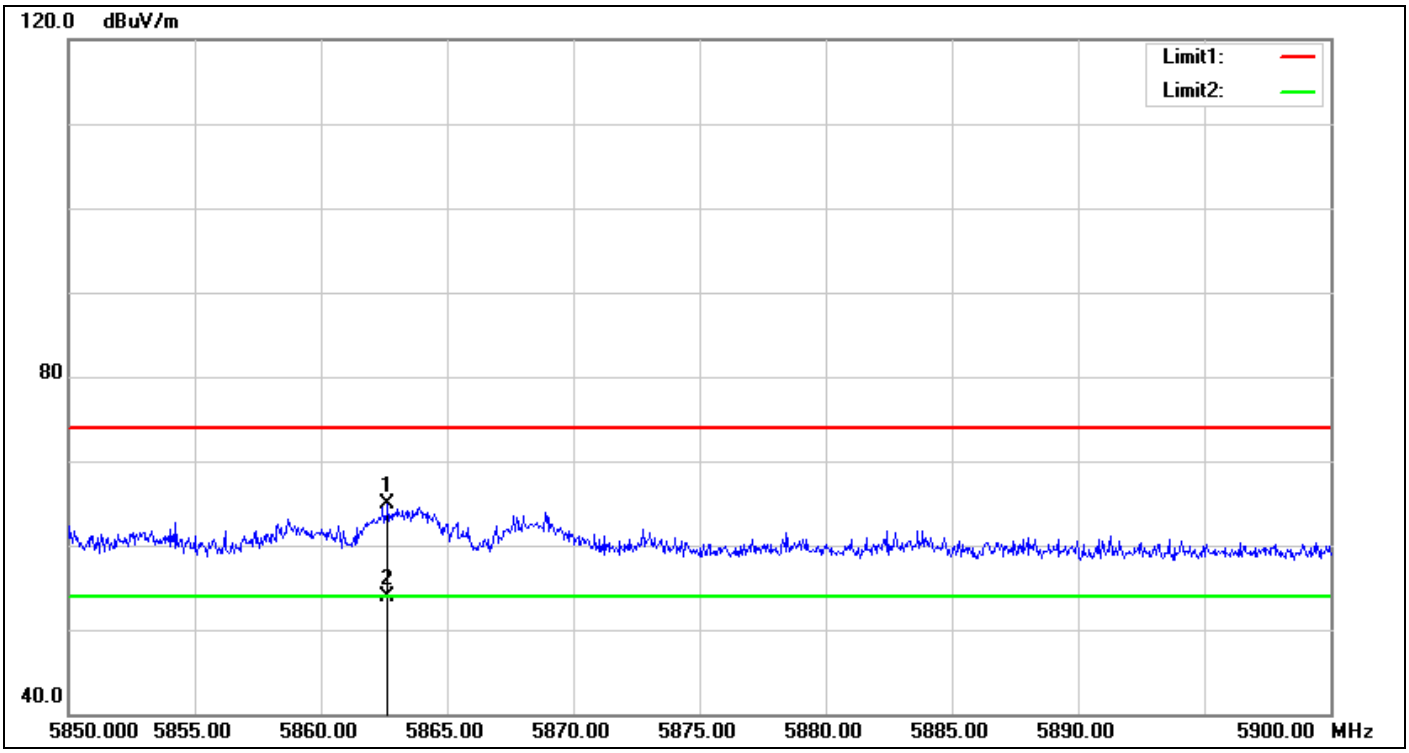
Band Edges (IEEE 802.11ac VHT 80 MHz mode / CH 5775 MHz)

Polarity: Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
1	5863.350	57.16	6.80	63.96	74.00	-10.04	100	185	peak
2	5863.350	45.29	6.80	52.09	54.00	-1.91	100	185	AVG

Polarity: Horizontal



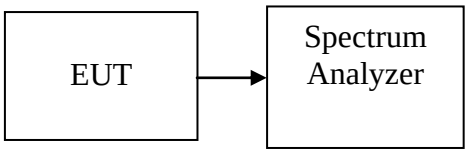
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
1	5862.650	58.04	6.79	64.83	74.00	-9.17	100	318	peak
2	5862.650	47.06	6.79	53.85	54.00	-0.15	100	318	AVG

7.5PEAK POWER SPECTRAL DENSITY

LIMIT

1. According to §15.407 & RSS-247 §, for digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 30 dBm in any 500 kHz band during any time interval of continuous transmission.

Test Configuration



TEST PROCEDURE

1. Place the EUT on the table and set it in transmitting mode.
   Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
2. Set the spectrum analyzer as RBW = 3kHz, VBW = 10kHz, Span = 300kHz, Sweep=100s
3. Record the max. reading.
4. Repeat the above procedure until the measurements for all frequencies are completed.

TEST RESULTS

No non-compliance noted

Test Data

Test mode: IEEE 802.11a mode/ 5745 ~ 5825MHz

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin	Result
Low	5745	-1.30	30.00	-31.3	PASS
Mid	5785	-1.58		-31.58	PASS
High	5825	-1.08		-31.08	PASS

Test mode: IEEE 802.11n HT 20 MHz mode / 5745 ~ 5825MHz

Channel	Frequency (MHz)	Chain 0 PPSD (dBm)	Chain 1 PPSD (dBm)	PPSD (dBm)	Limit (dBm)	Margin	Result
Low	5745	-5.33	-4.69	-1.99	30.00	-31.99	PASS
Mid	5785	-3.63	0.15	1.67		-28.33	PASS
High	5825	-2.91	1.29	2.69		-27.31	PASS

Test mode: IEEE 802.11n HT 40 MHz mode / 5755 ~ 5795MHz

Channel	Frequency (MHz)	Chain 0 PPSD (dBm)	Chain 1 PPSD (dBm)	PPSD (dBm)	Limit (dBm)	Margin	Result
Low	5755	-6.09	-1.51	-0.21	30.00	-30.21	PASS
High	5795	-6.47	-3.34	-1.62		-31.62	PASS

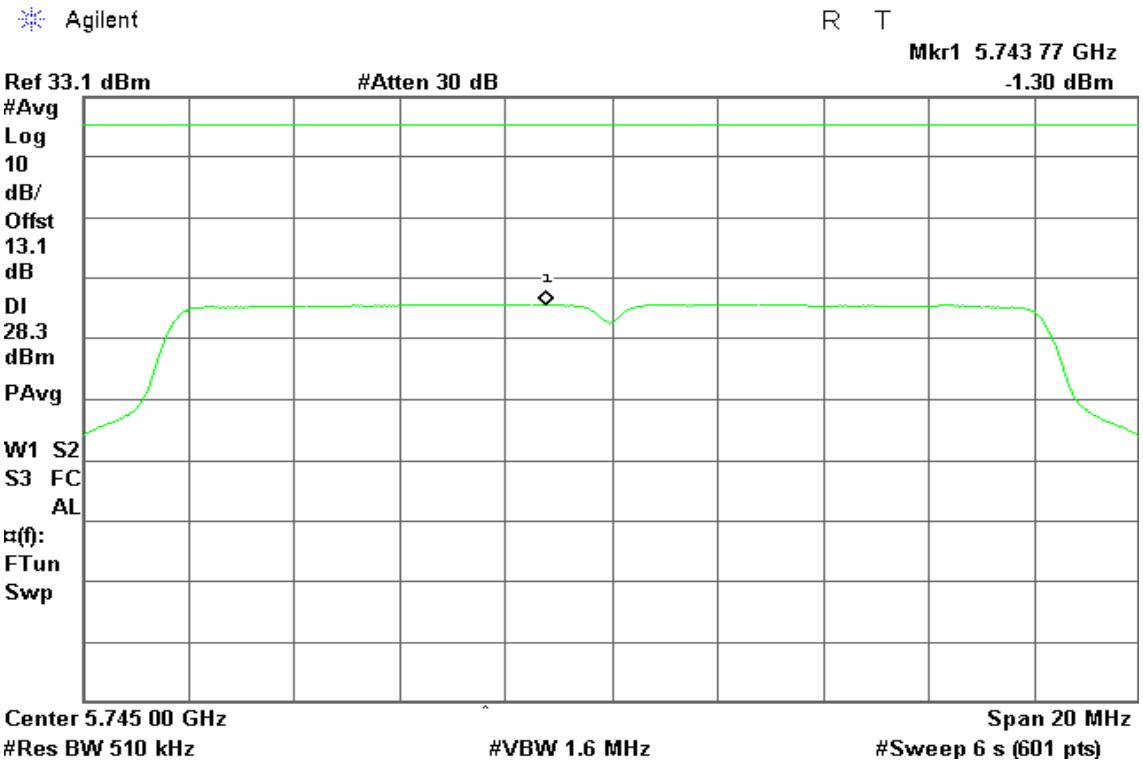
Test mode: IEEE 802.11ac VHT 80 MHz mode / 5775MHz

Channel	Frequency (MHz)	Chain 0 PPSD (dBm)	Chain 1 PPSD (dBm)	PPSD (dBm)	Limit (dBm)	Margin	Result
Mid	5775	-10.85	-10.45	-7.64	30.00	-37.64	PASS

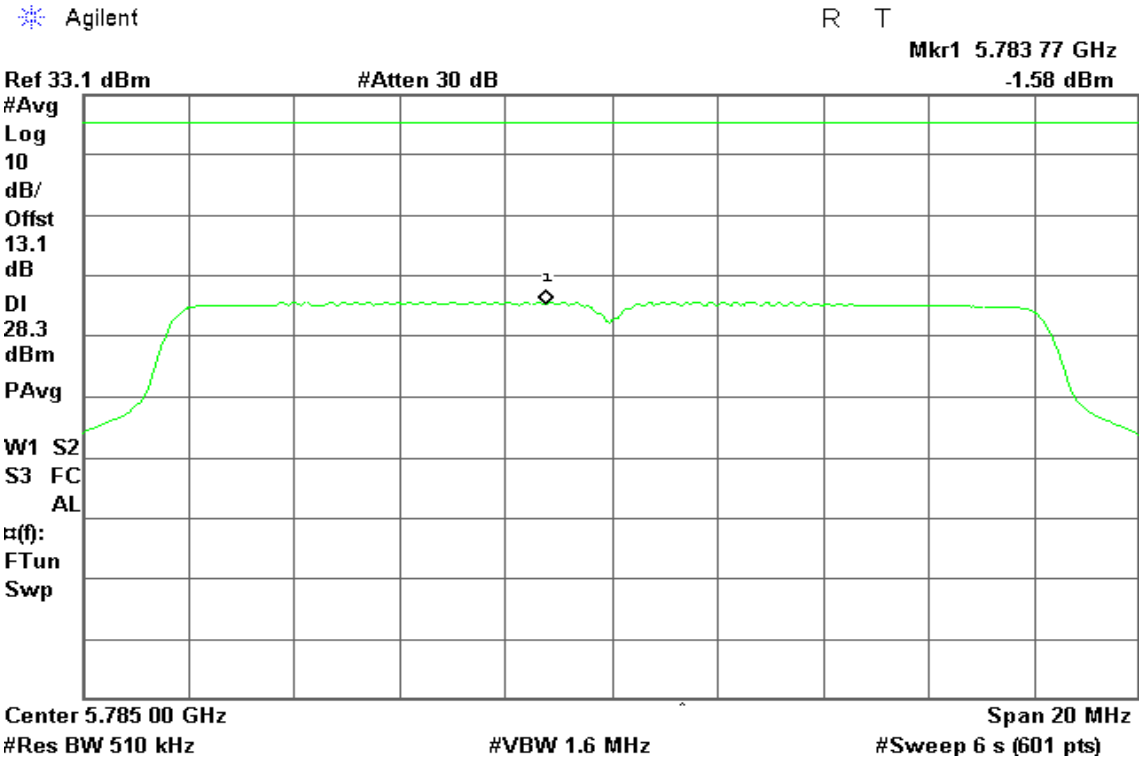
Test Plot

IEEE 802.11a MHz mode / 5745 ~ 5825MHz

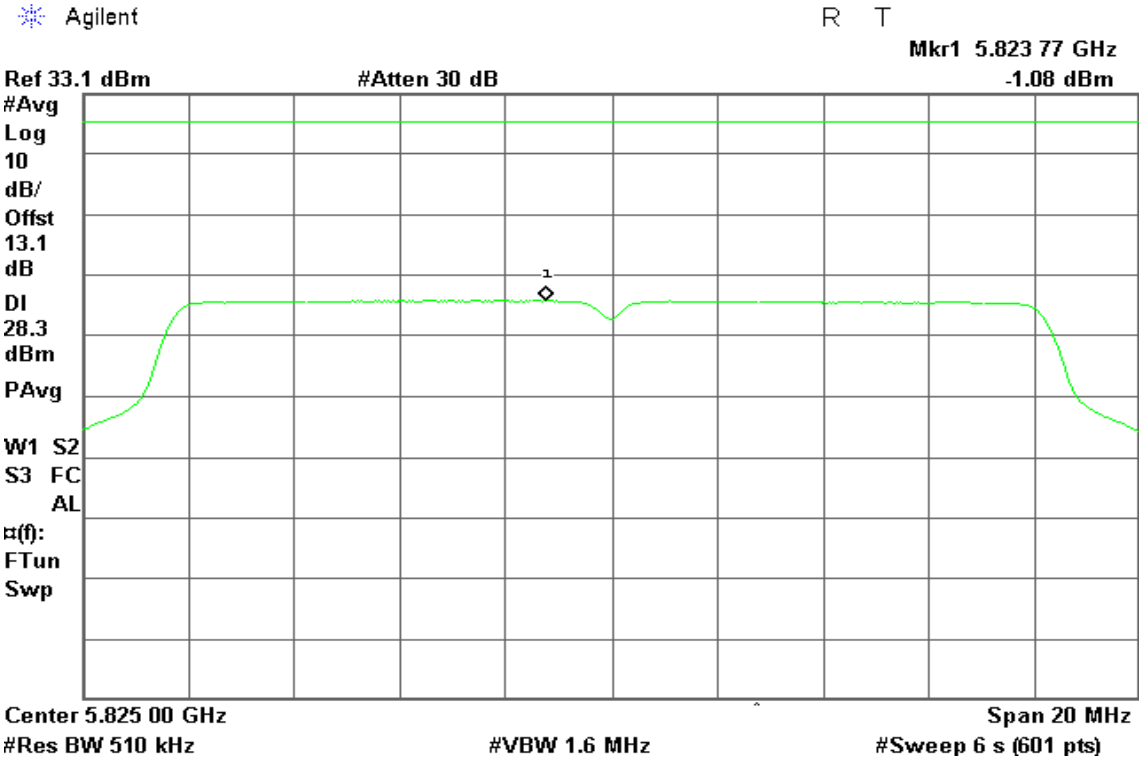
PPSD (CH Low)



PPSD (CH Mid)

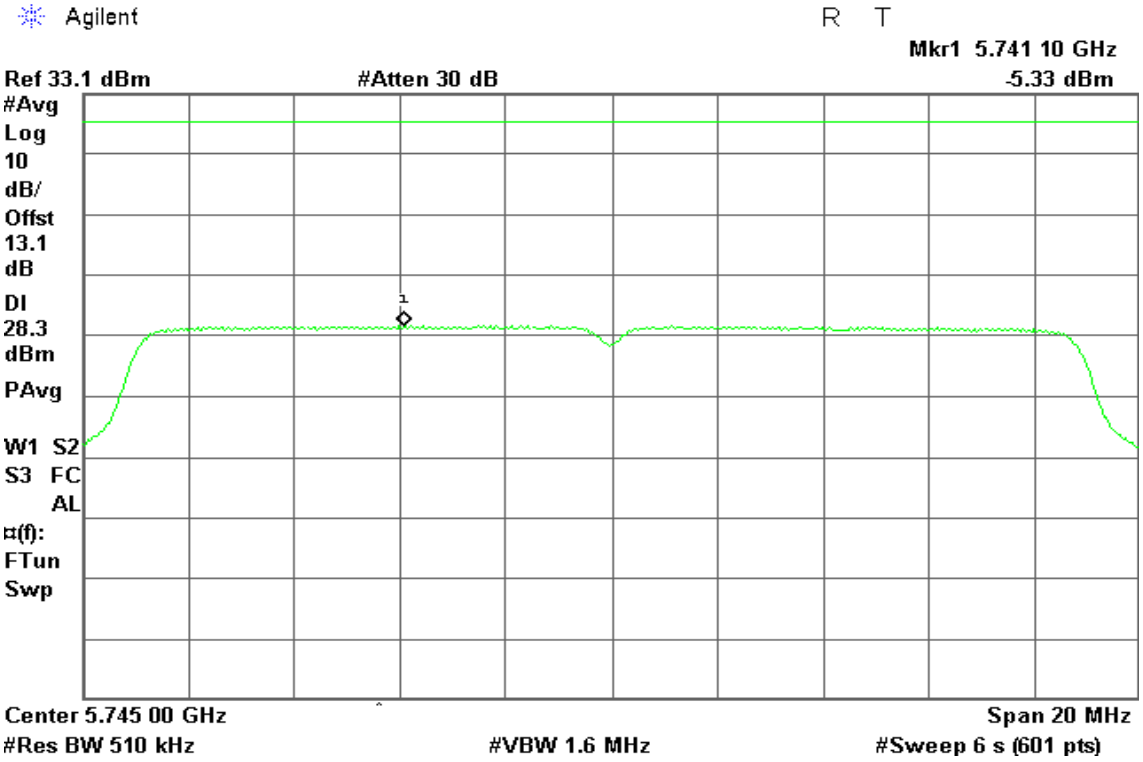


PPSD (CH High)

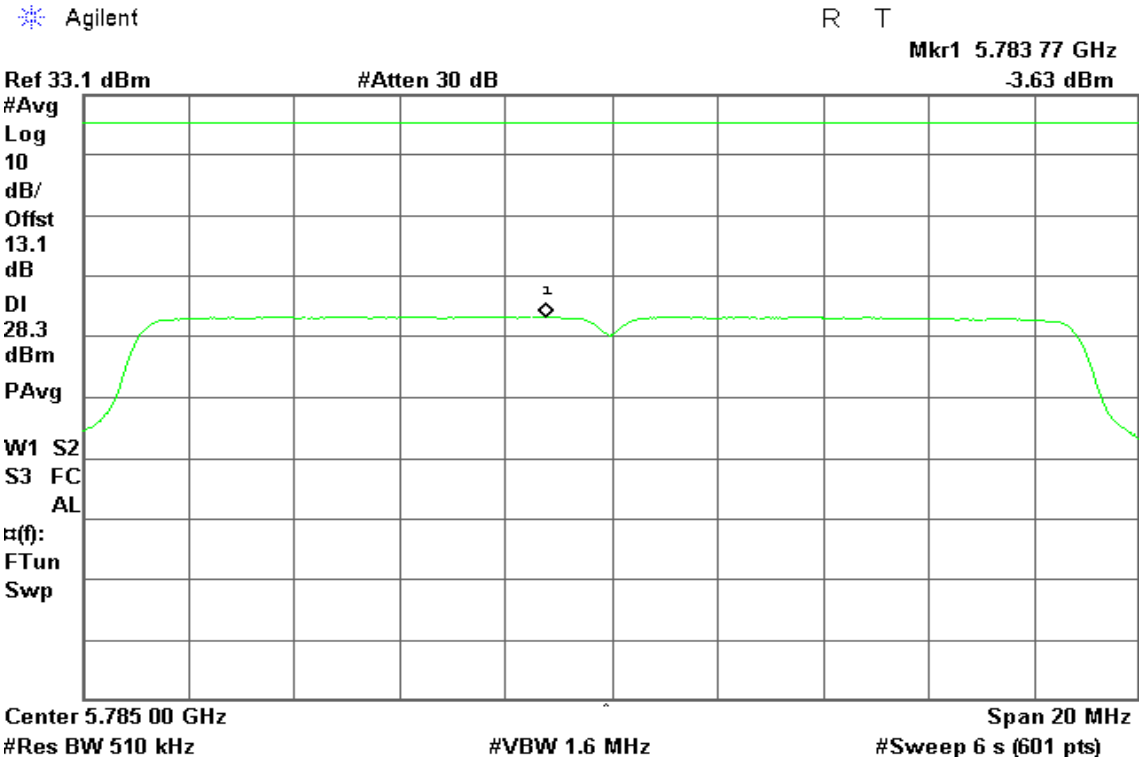

Agilent
R T
Mkr1 5.823 77 GHz
Ref 33.1 dBm
#Atten 30 dB
-1.08 dBm
#Avg
Log
10
dB/
Offst
13.1
dB
Dl
28.3
dBm
PAvg
W1 S2
S3 FC
AL
¤(f):
FTun
Swp
Center 5.825 00 GHz
Span 20 MHz
#Res BW 510 kHz
#VBW 1.6 MHz
#Sweep 6 s (601 pts)

IEEE 802.11n HT 20 MHz mode / 5745 ~ 5825MHz / Chain 0

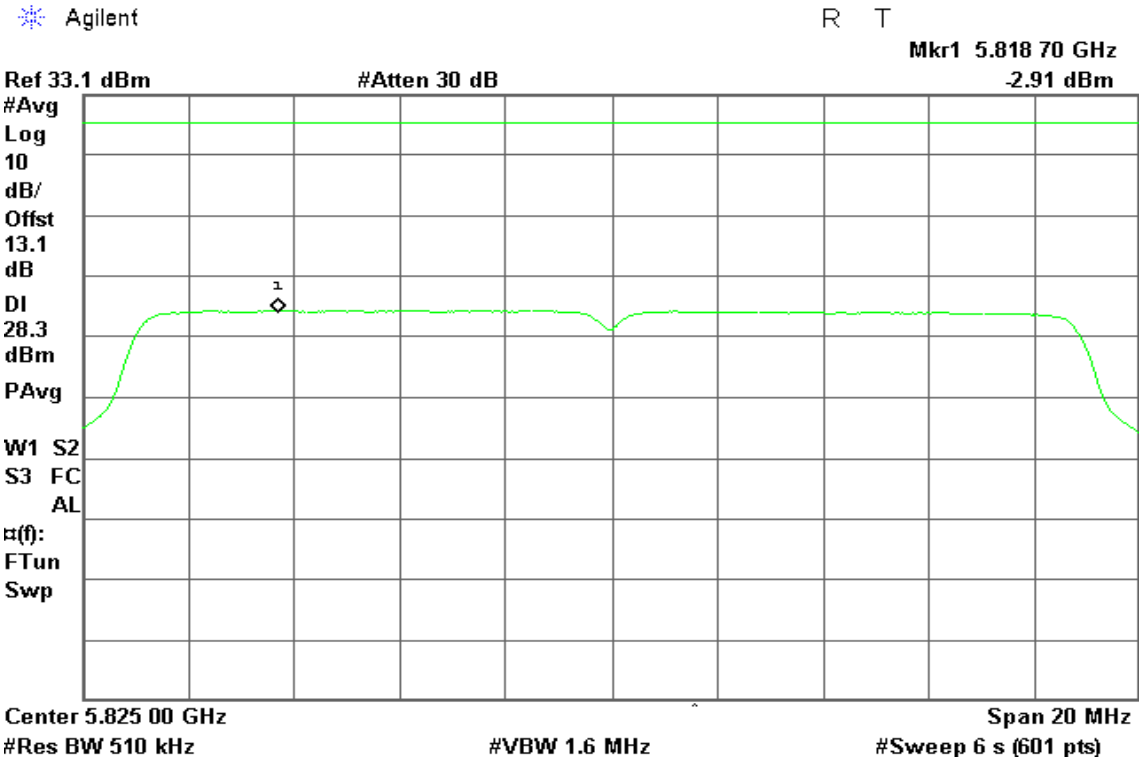
PPSD (CH Low)



PPSD (CH Mid)

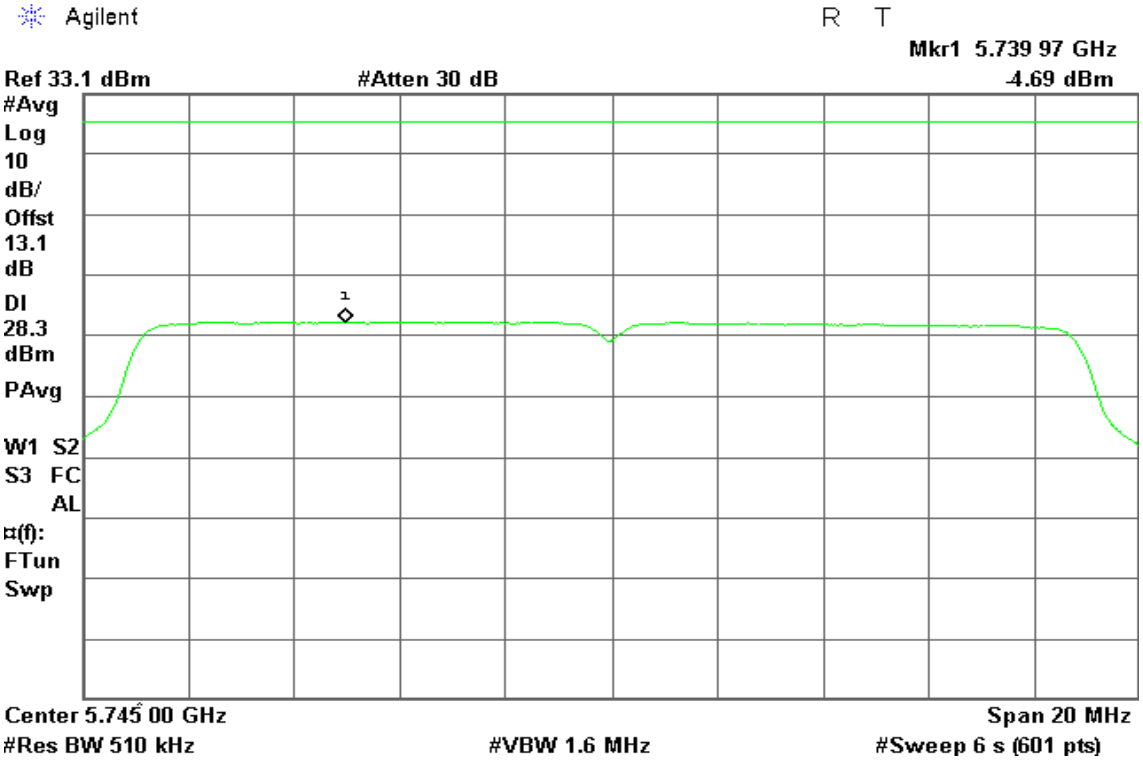


PPSD (CH High)

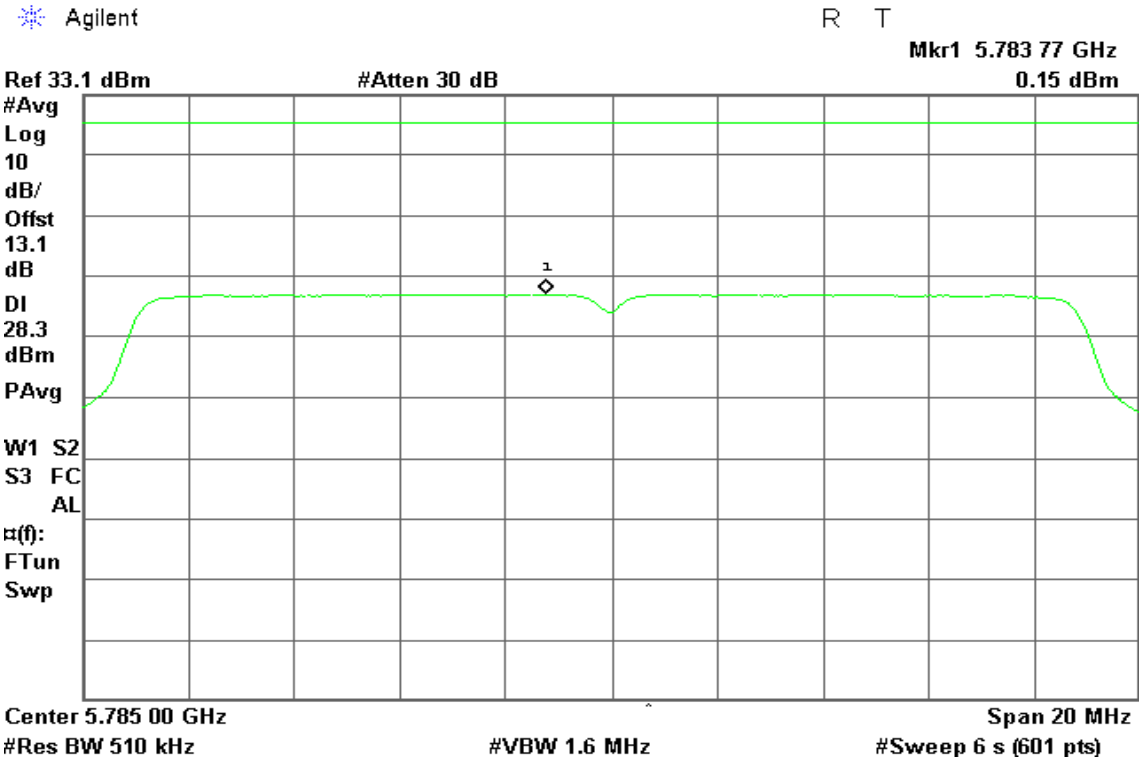

Agilent
R T
Mkr1 5.818 70 GHz
Ref 33.1 dBm
#Atten 30 dB
-2.91 dBm
#Avg
Log
10
dB/
Offst
13.1
dB
Dl
28.3
dBm
PAvg
W1 S2
S3 FC
AL
¤(f):
FTun
Swp
Center 5.825 00 GHz
Span 20 MHz
#Res BW 510 kHz
#VBW 1.6 MHz
#Sweep 6 s (601 pts)

IEEE 802.11n HT 20 MHz mode / 5745 ~ 5825MHz / Chain 1

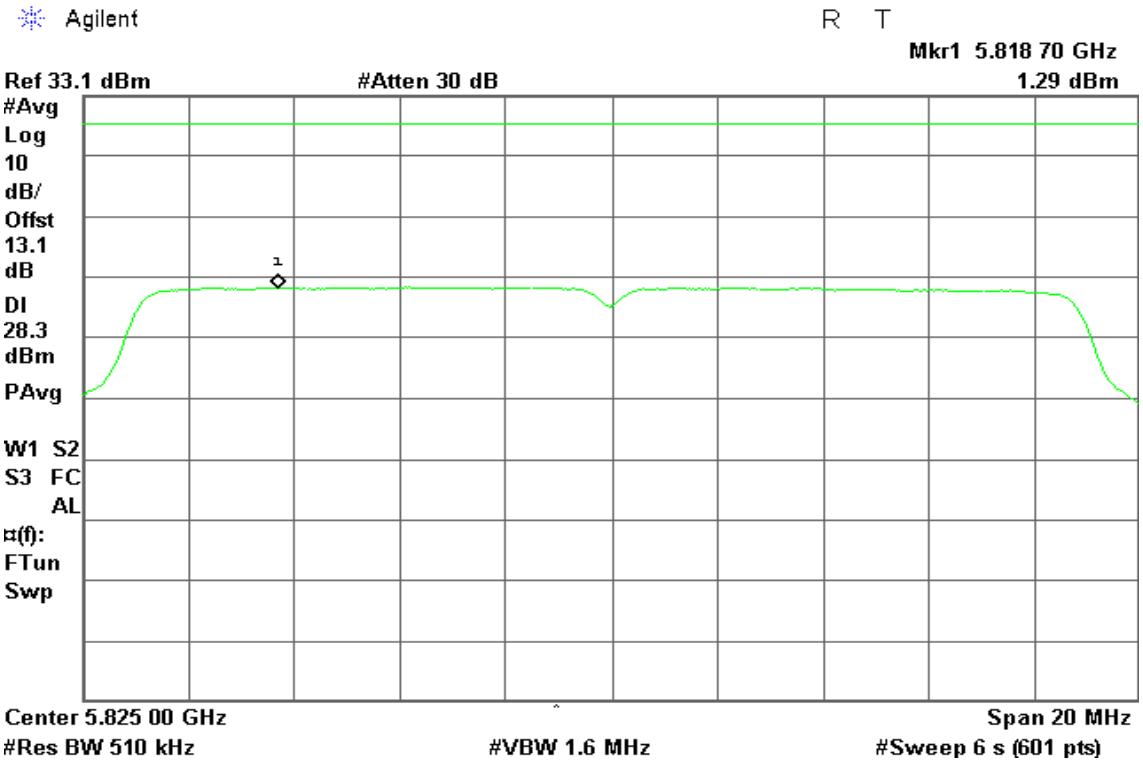
PPSD (CH Low)



PPSD (CH Mid)

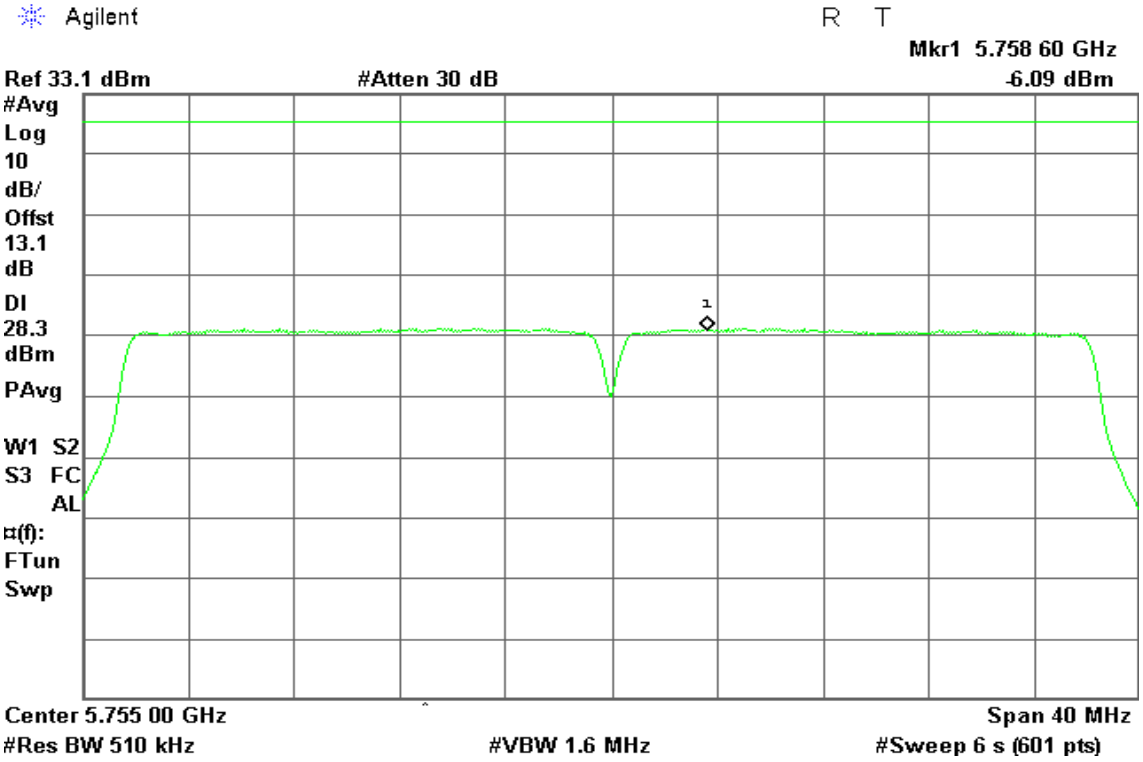


PPSD (CH High)

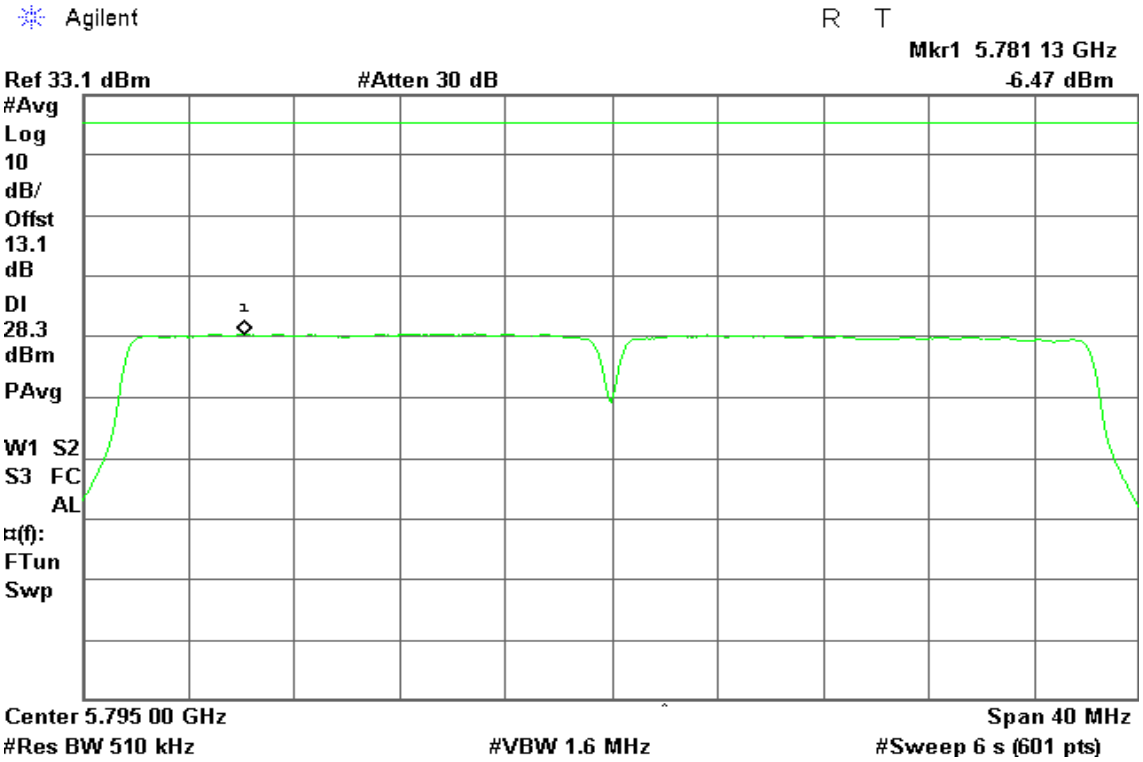

Agilent
R T
Mkr1 5.818 70 GHz
Ref 33.1 dBm
#Atten 30 dB
1.29 dBm
#Avg
Log
10
dB/
Offst
13.1
dB
Dl
28.3
dBm
PAvg
W1 S2
S3 FC
AL
¤(f):
FTun
Swp
Center 5.825 00 GHz
Span 20 MHz
#Res BW 510 kHz
#VBW 1.6 MHz
#Sweep 6 s (601 pts)

IEEE 802.11n HT 40 MHz mode / 5755 ~ 5795MHz / Chain 0

PPSD (CH Low)

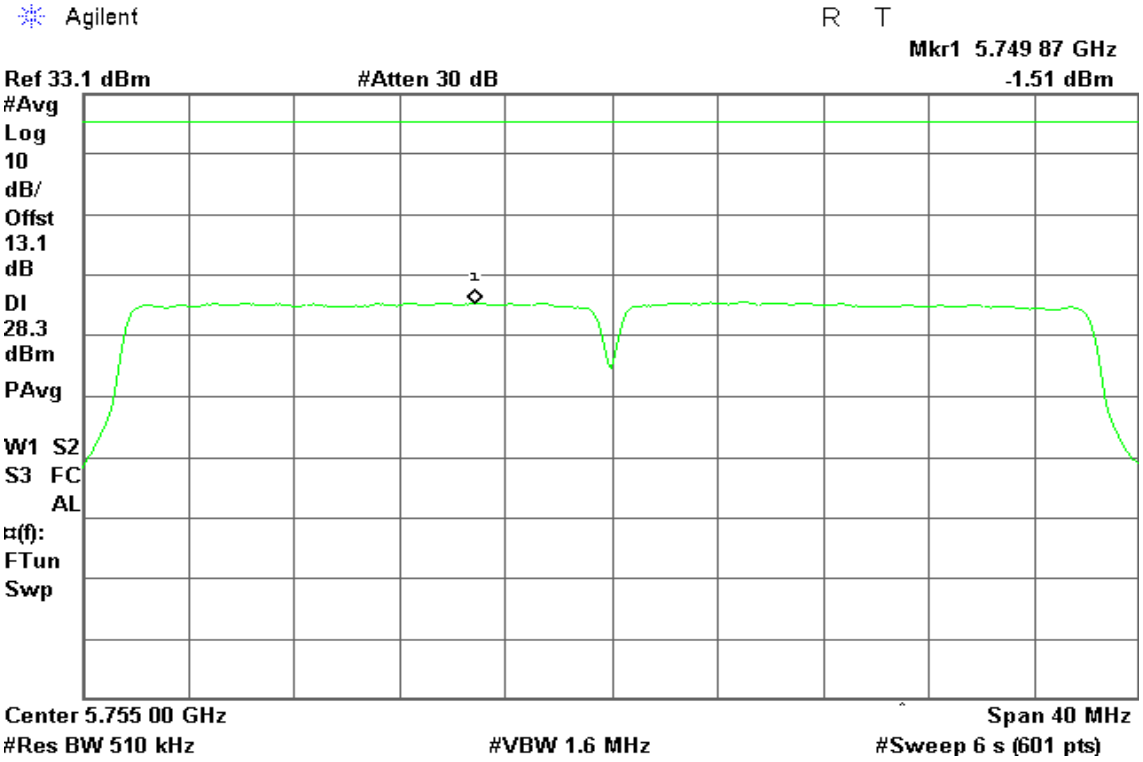


PPSD (CH High)

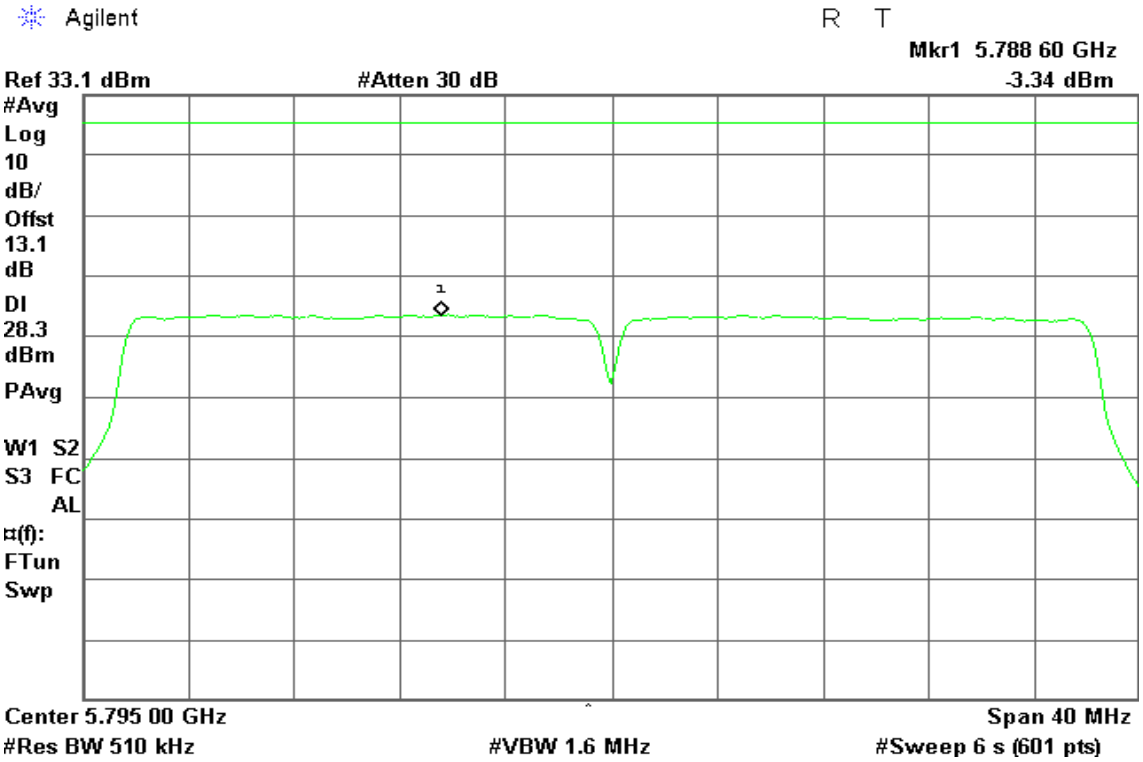


IEEE 802.11n HT 40 MHz mode / 5755 ~ 5795MHz / Chain 1

PPSD (CH Low)

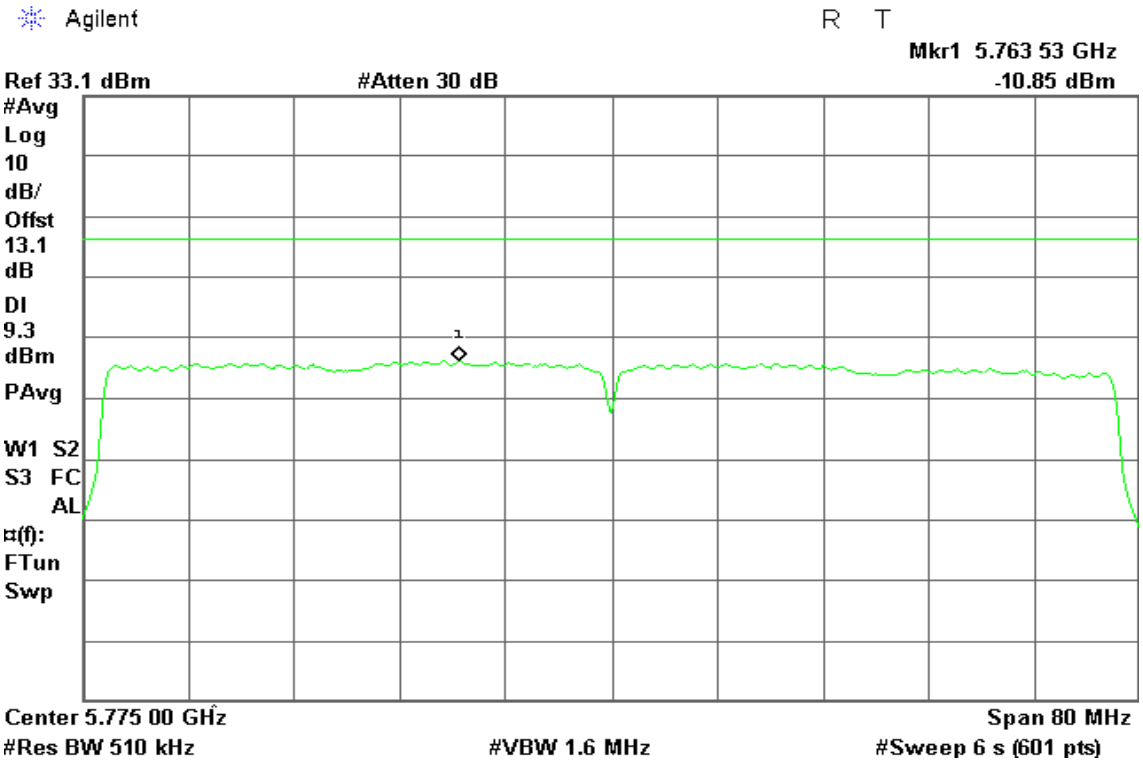


PPSD (CH High)



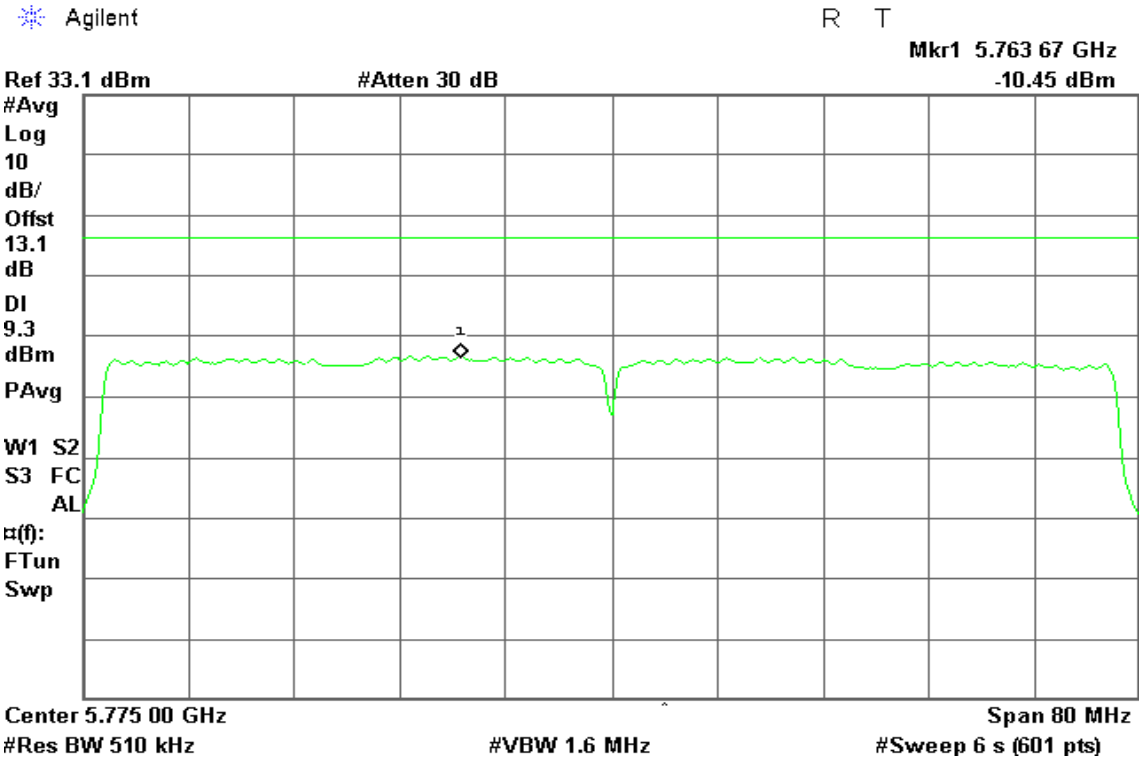
IEEE 802.11ac VHT 80 MHz mode / 5775MHz / Chain 0

PPSD (CH Mid)



IEEE 802.11ac VHT 80 MHz mode / 5775MHz / Chain 1

PPSD (CH Mid)



7.6 RADIATED EMISSIONS

LIMIT

All spurious emissions shall comply with the limits of §15.209(a) and RSS-Gen Table 2 & Table 5.

RSS-Gen Table 2 & Table 5: General Field Strength Limits for Transmitters and Receivers at Frequencies Above 30 MHz (Note)

Frequency (MHz)	Field Strength microvolts/m at 3 metres (watts, e.i.r.p.)	
	Transmitters	Receivers
30-88	100 (3 nW)	100 (3 nW)
88-216	150 (6.8 nW)	150 (6.8 nW)
216-960	200 (12 nW)	200 (12 nW)
Above 960	500 (75 nW)	500 (75 nW)

Note: *Measurements for compliance with limits in the above table may be performed at distances other than 3 metres, in accordance with Section 7.2.7.
Transmitting devices are not permitted in Table 1 bands or, unless stated otherwise, in TV bands (54-72 MHz, 76-88 MHz, 174-216 MHz, 470-608 MHz and 614-806 MHz).

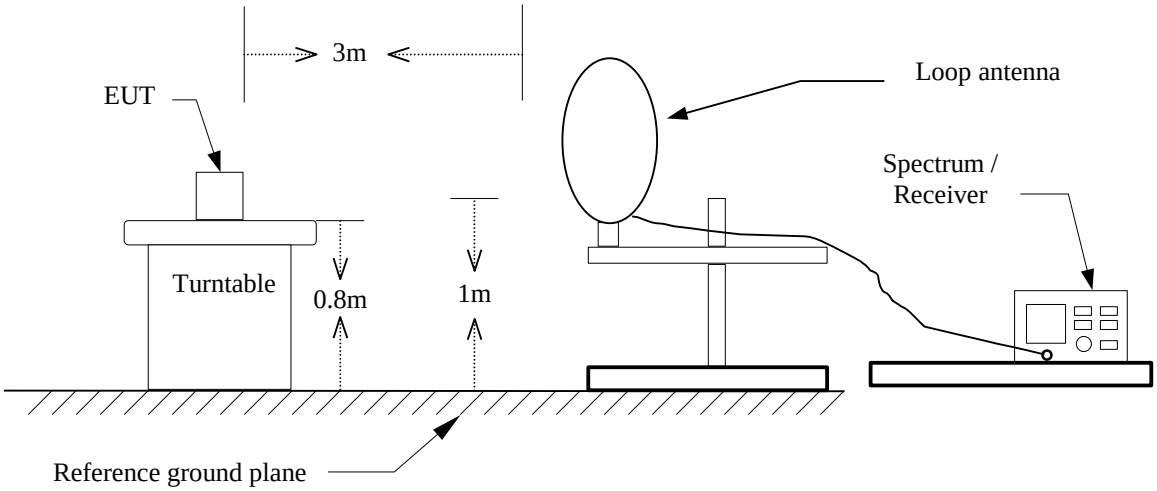
RSS-Gen Table 6: General Field Strength Limits for Transmitters at Frequencies Below 30 MHz (Transmit)

Frequency	Field Strength (microvolts/m)	Magnetic H-Field (microamperes/m)	Measurement Distance (metres)
9-490 kHz	2,400/F (F in kHz)	2,400/377F (F in kHz)	3000
490-1,705 kHz	24,000/F (F in kHz)	24,000/377F (F in kHz)	30
1.705-30 MHz	30	N/A	30

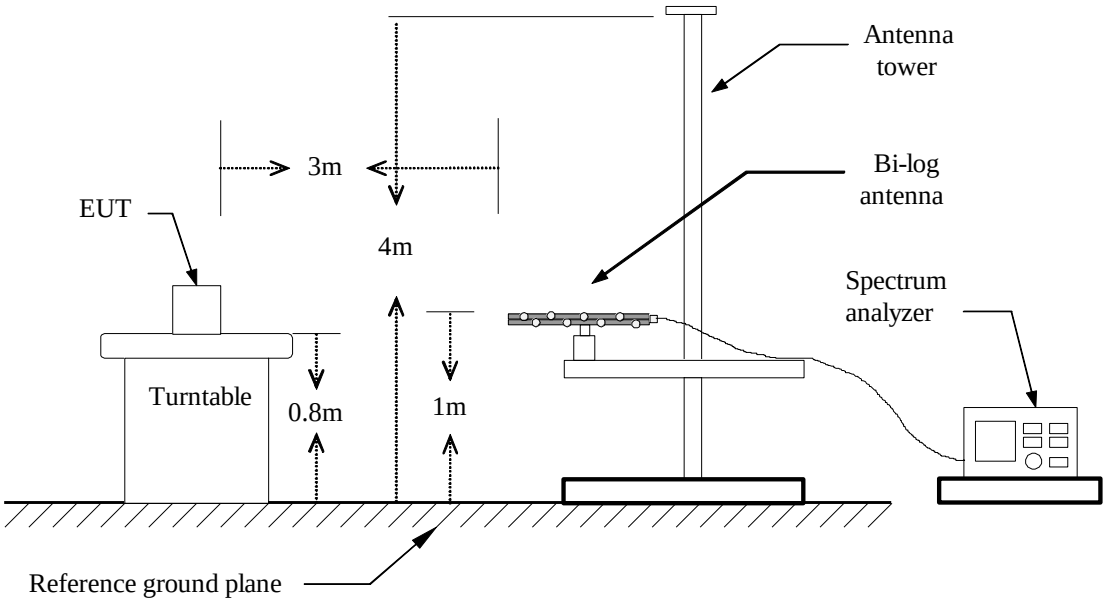
Note: The emission limits for the bands 9-90 kHz and 110-490 kHz are based on measurements employing an average detector.

Test Configuration

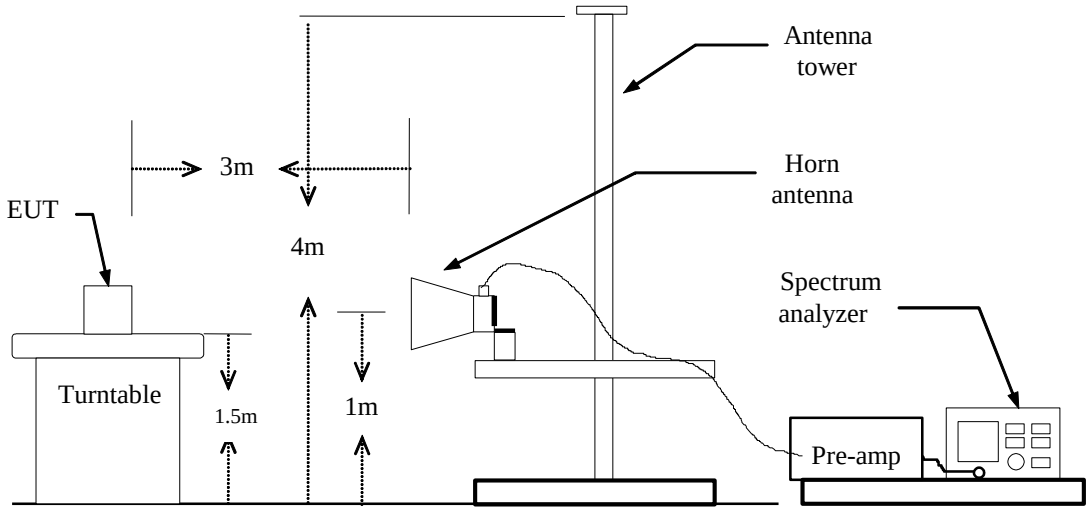
9kHz ~ 30MHz



30MHz ~ 1GHz



Above 1 GHz


Antenna
tower
3m
Horn
antenna
EUT
4m
Spectrum
analyzer
Turntable
1.5m
1m
Pre-amp

TEST PROCEDURE

1. The EUT is placed on a turntable, which is 1.5m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Set the spectrum analyzer in the following setting as:

   Below 1GHz:

   RBW=100kHz / VBW=300kHz / Sweep=AUTO

   Above 1GHz:

   (a) PEAK: RBW=VBW=1MHz / Sweep=AUTO
   (b) AVERAGE: RBW=1MHz,
   if duty cycle≧98%, VBW=10Hz.
   if duty cycle<98% VBW=1/T.
   IEEE 802.11b mode: = 96%, VBW= 510Hz
   IEEE 802.11g mode: = 92%, VBW= 1.1KHz
   IEEE 802.11n HT 20 MHz mode: = 84%, VBW= 2KHz
   IEEE 802.11n HT 40 MHz mode: = 73%, VBW= 15KHz

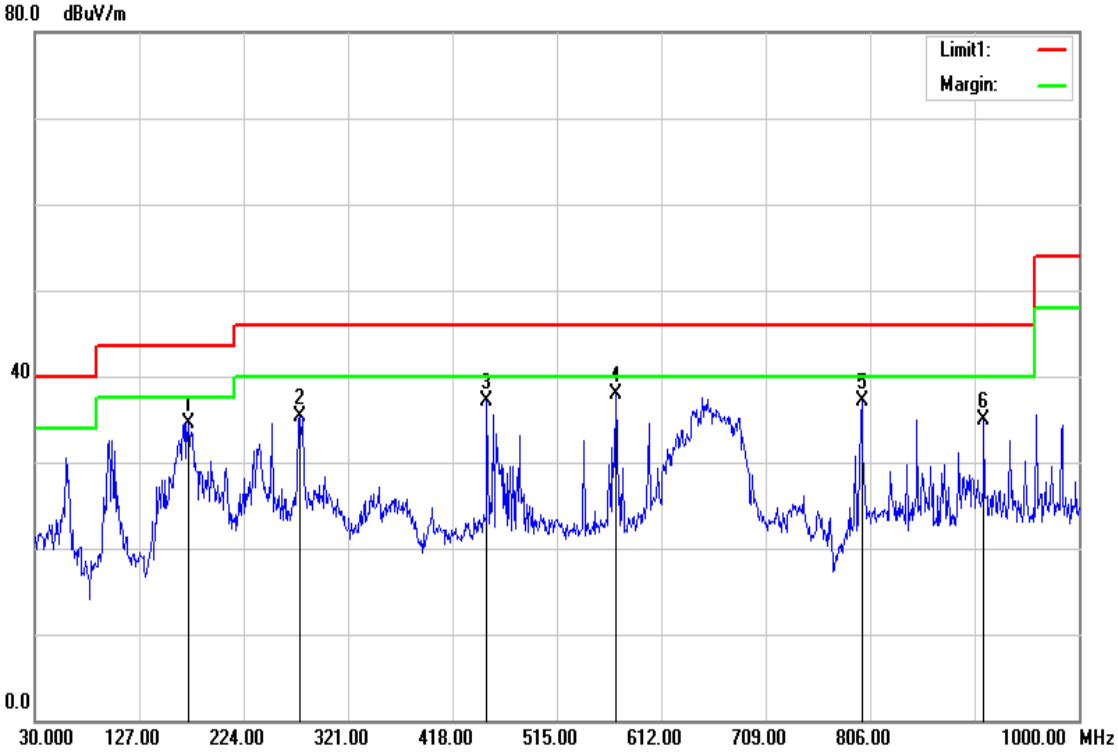
7. Repeat above procedures until the measurements for all frequencies are complete.

Below 1 GHz

Operation Mode: Normal Link **Test Date:** June 6, 2015

Temperature: 27℃ **Tested by:** David Shu

Humidity: 53% RH **Polarity:** Ver.



Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Pol. (H/V)
172.5900	51.48	-16.98	34.50	43.50	-9.00	Peak	V
276.3800	50.05	-14.68	35.37	46.00	-10.63	Peak	V
450.0100	47.20	-10.19	37.01	46.00	-8.99	Peak	V
570.2900	46.14	-8.19	37.95	46.00	-8.05	Peak	V
798.2400	41.61	-4.51	37.10	46.00	-8.90	Peak	V
911.7300	38.00	-3.00	35.00	46.00	-11.00	Peak	V

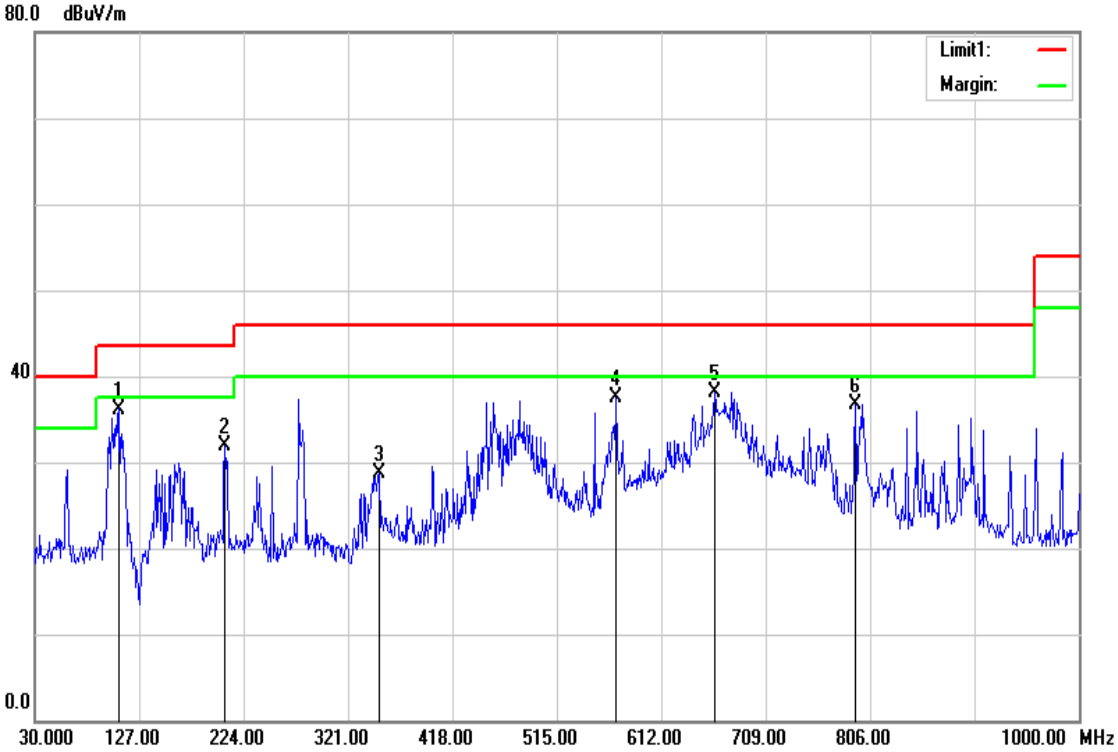
Remark:

1. *No emission found between lowest internal used/generated frequency to 30MHz (9kHz~30MHz).*
2. *Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using peak/quasi-peak detector mode.*
3. *Quasi-peak test would be performed if the peak result were greater than the quasi-peak limit or as required by the applicant.*
4. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
5. *Margin (dB) = Remark result (dBuV/m) – Quasi-peak limit (dBuV/m).*

Operation Mode: Normal Link **Test Date:** June 6, 2015

Temperature: 27℃ **Tested by:** David Shu

Humidity: 53% RH **Polarity:** Hor.



Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Pol. (H/V)
108.5700	53.72	-17.52	36.20	43.50	-7.30	peak	H
206.5400	47.87	-16.01	31.86	43.50	-11.64	peak	H
350.1000	41.60	-12.89	28.71	46.00	-17.29	peak	H
570.2900	45.70	-8.19	37.51	46.00	-8.49	peak	H
661.4700	44.55	-6.46	38.09	46.00	-7.91	peak	H
792.4200	41.36	-4.56	36.80	46.00	-9.20	peak	H

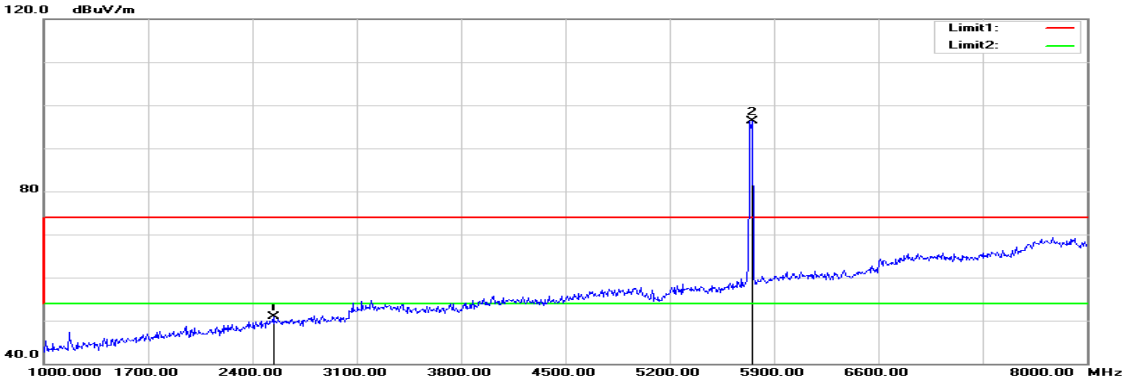
Remark:

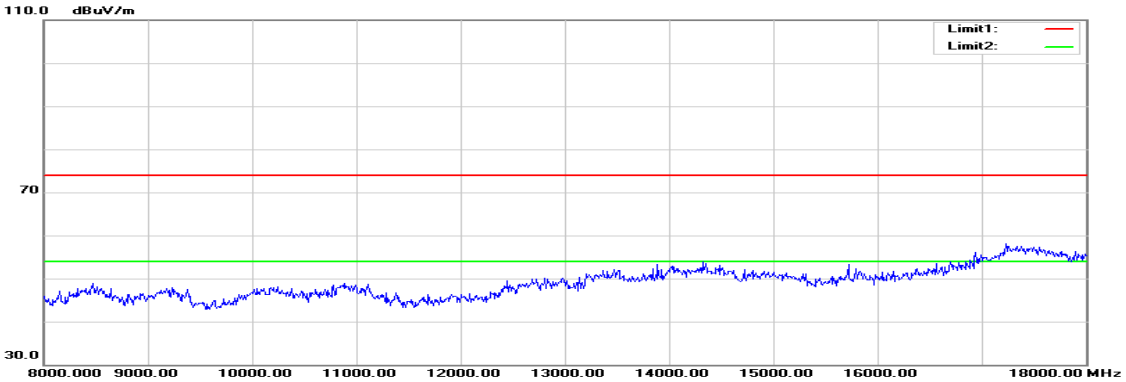
1. *No emission found between lowest internal used/generated frequency to 30MHz (9kHz~30MHz).*
2. *Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using peak/quasi-peak detector mode.*
3. *Quasi-peak test would be performed if the peak result were greater than the quasi-peak limit or as required by the applicant.*
4. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
5. *Margin (dB) = Remark result (dBuV/m) – Quasi-peak limit (dBuV/m).*

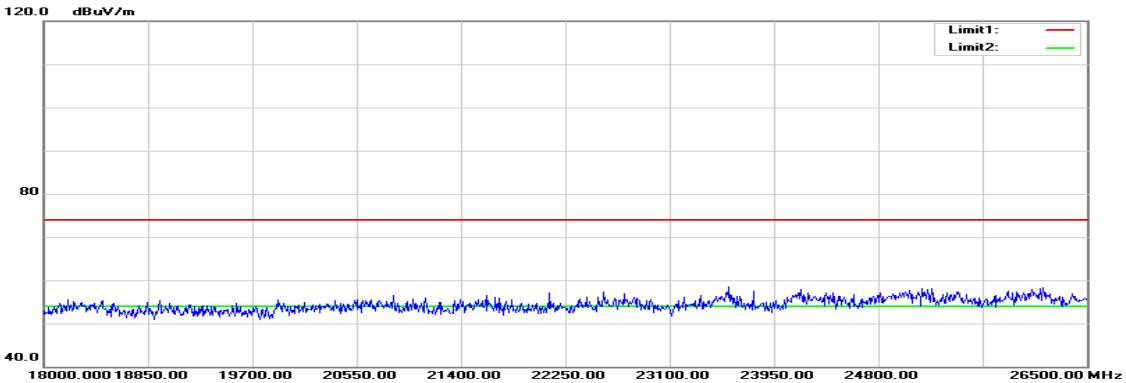
Above 1 GHz

TX / IEEE 802.11a mode / CH Low

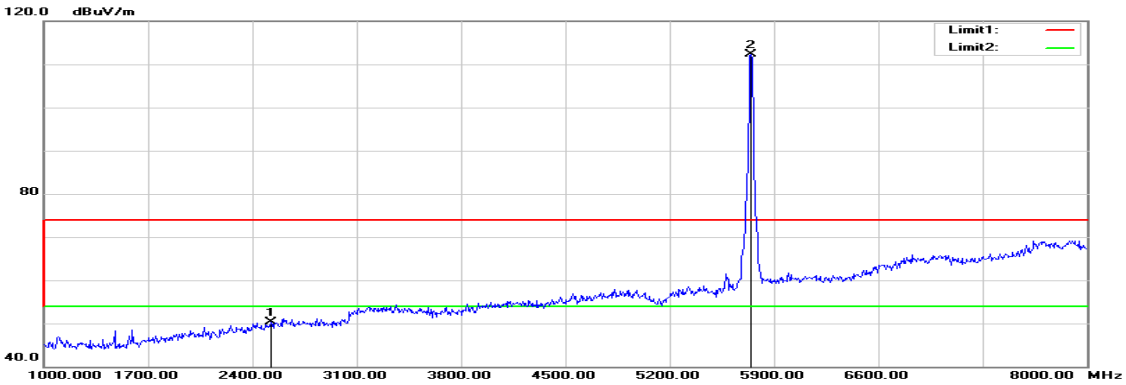
Polarity: Vertical

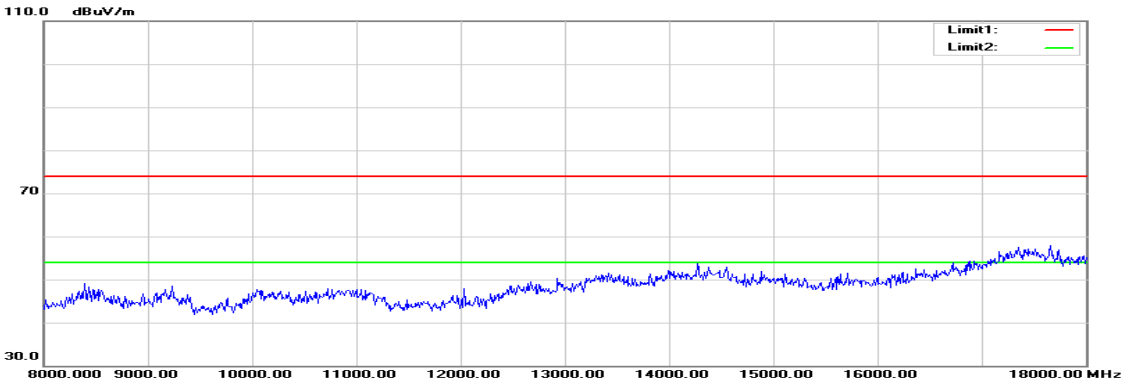


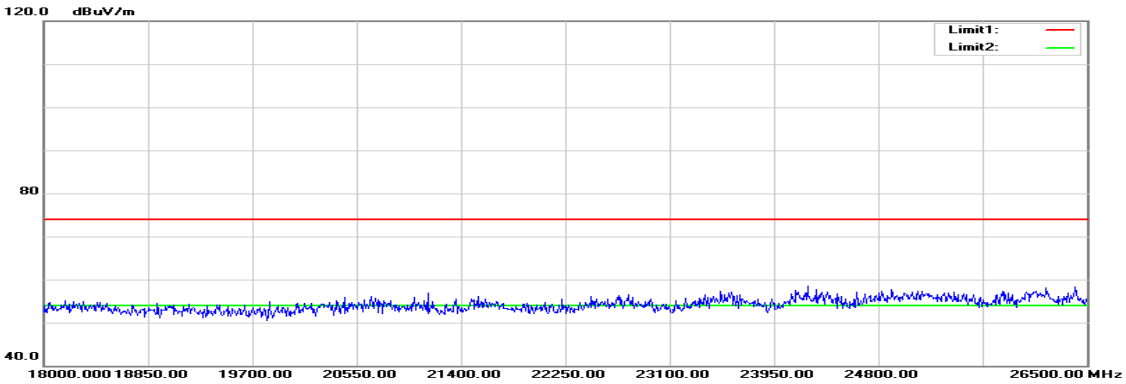




Polarity: Horizontal







Operation Mode: TX / IEEE 802.11a mode / CH Low **Test Date:** June 8, 2015

Temperature: 27°C **Tested by:** David Shu

Humidity: 53% RH **Polarity:** Ver. / Hor.

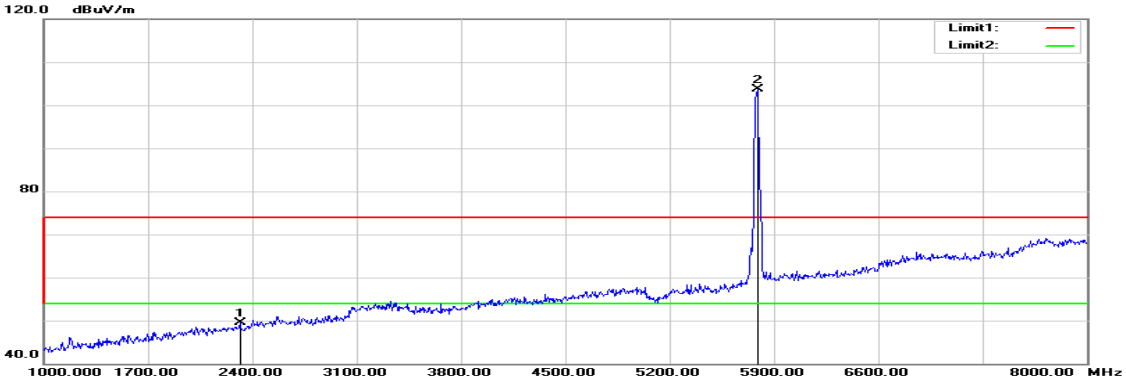
Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Pol. (H/V)
2540.000	53.94	-3.04	50.90	74.00	-23.10	peak	V
N/A							
2526.000	53.28	-3.07	50.21	74.00	-23.79	peak	H
N/A							

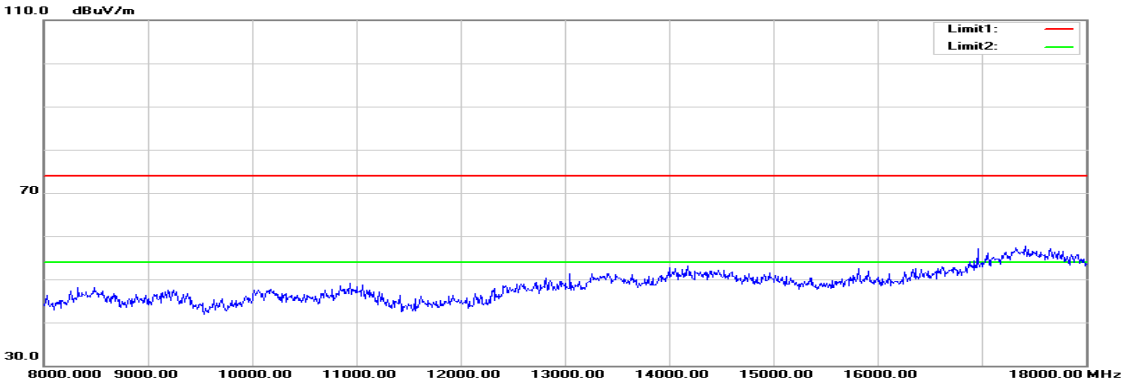
Remark:

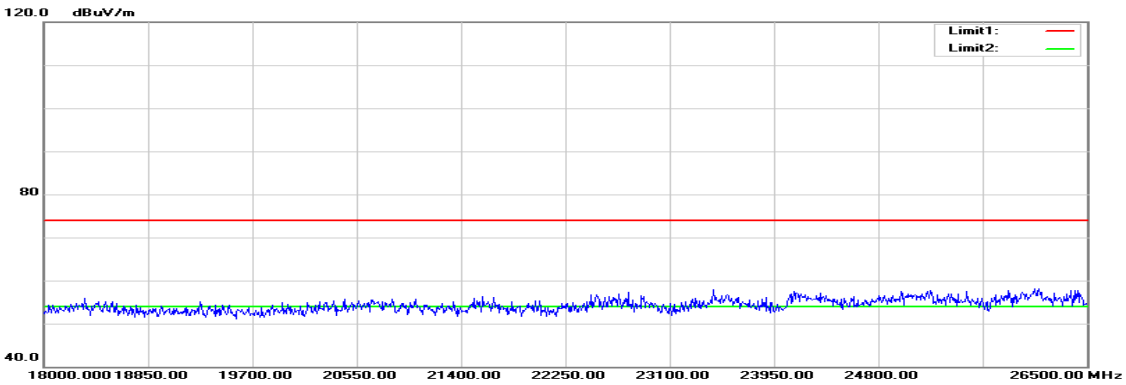
1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average limit.*
4. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*
5. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
6. *Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).*

TX / IEEE 802.11a mode / CH Mid

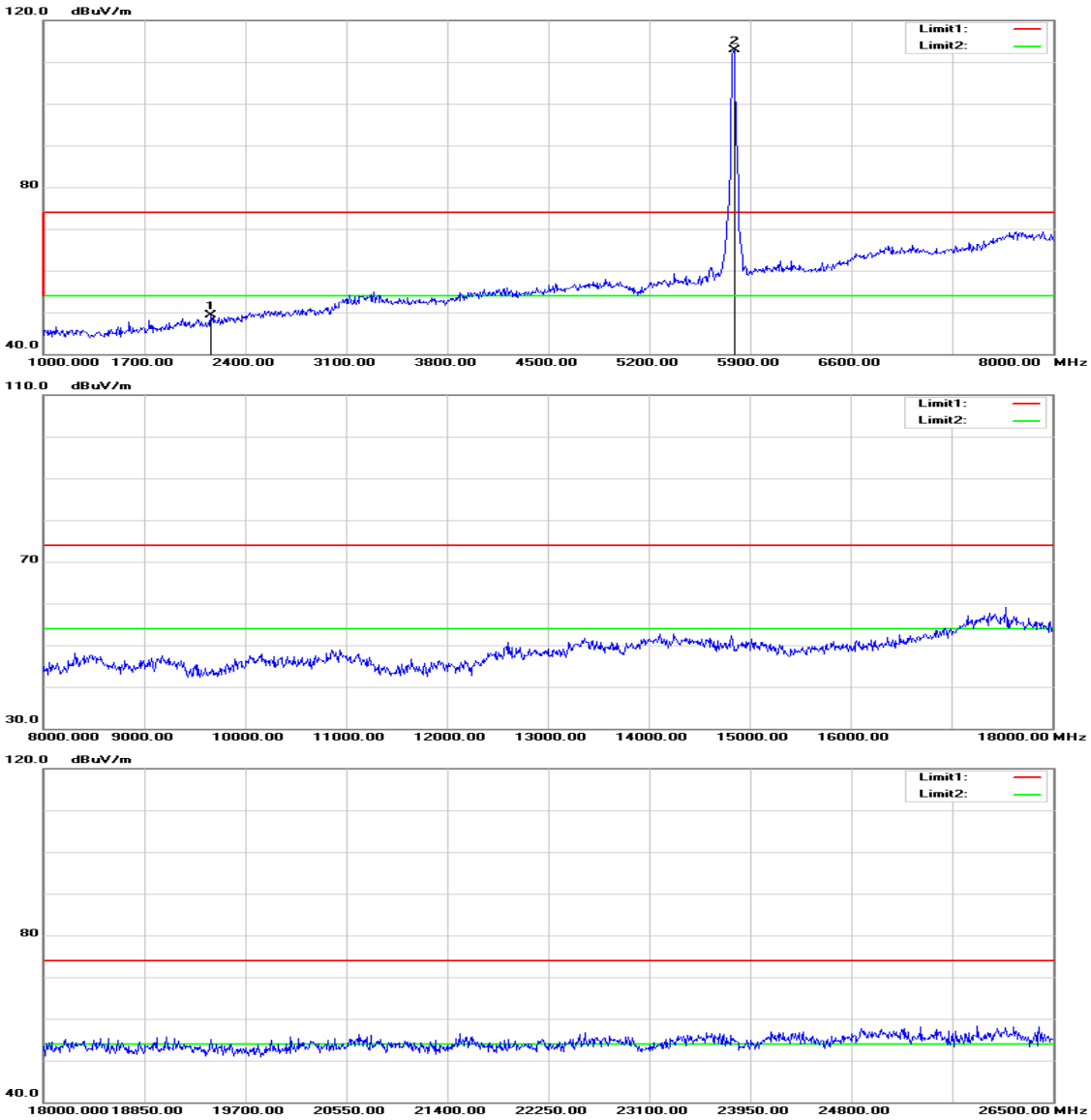
Polarity: Vertical







Polarity: Horizontal



Operation Mode: TX / IEEE 802.11a mode / CH Mid **Test Date:** June 8, 2015

Temperature: 27°C **Tested by:** David Shu

Humidity: 53% RH **Polarity:** Ver. / Hor.

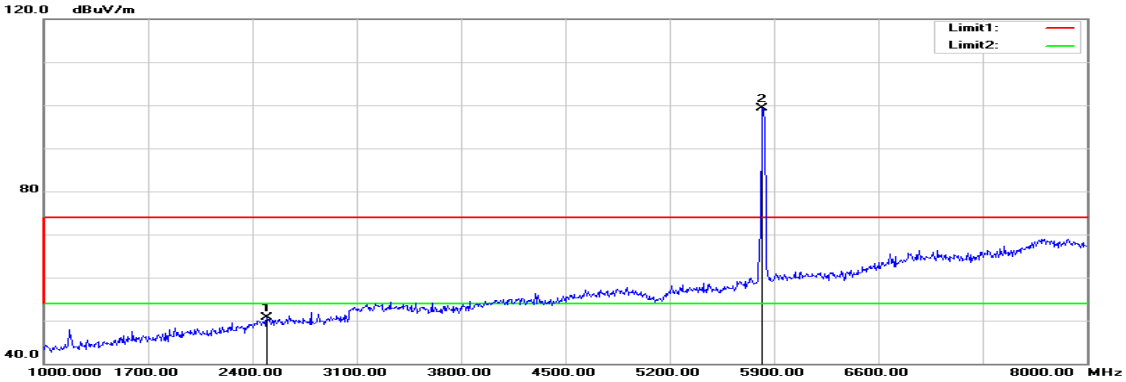
Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Pol. (H/V)
2316.000	53.83	-4.26	49.57	74.00	-24.43	peak	V
N/A							
2162.000	53.91	-4.64	49.27	74.00	-24.73	peak	H
N/A							

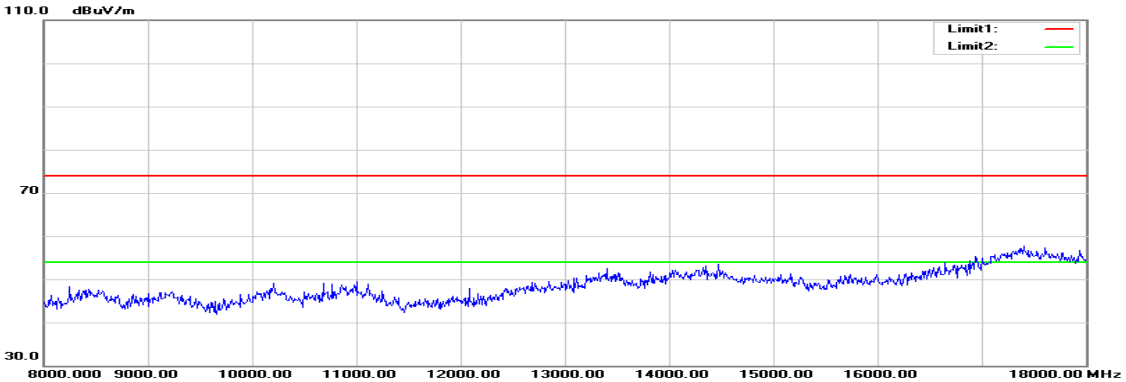
Remark:

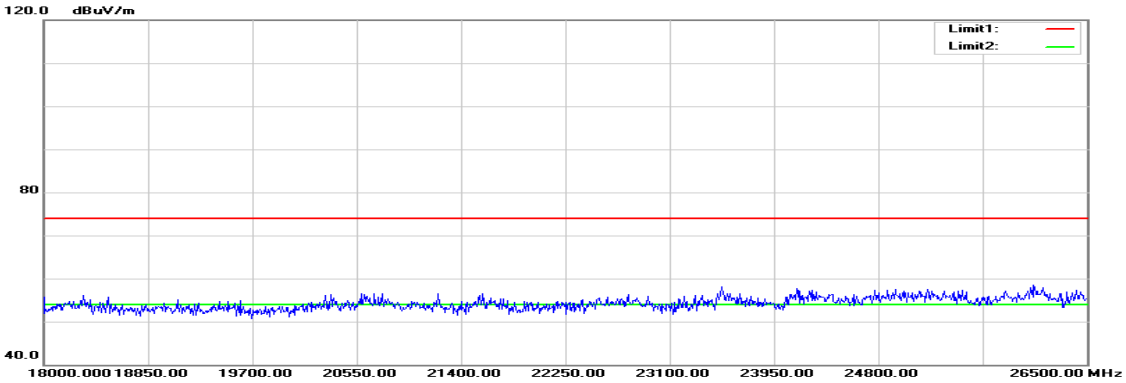
1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average limit.*
4. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*
5. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
6. *Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).*

TX / IEEE 802.11a mode / CH High

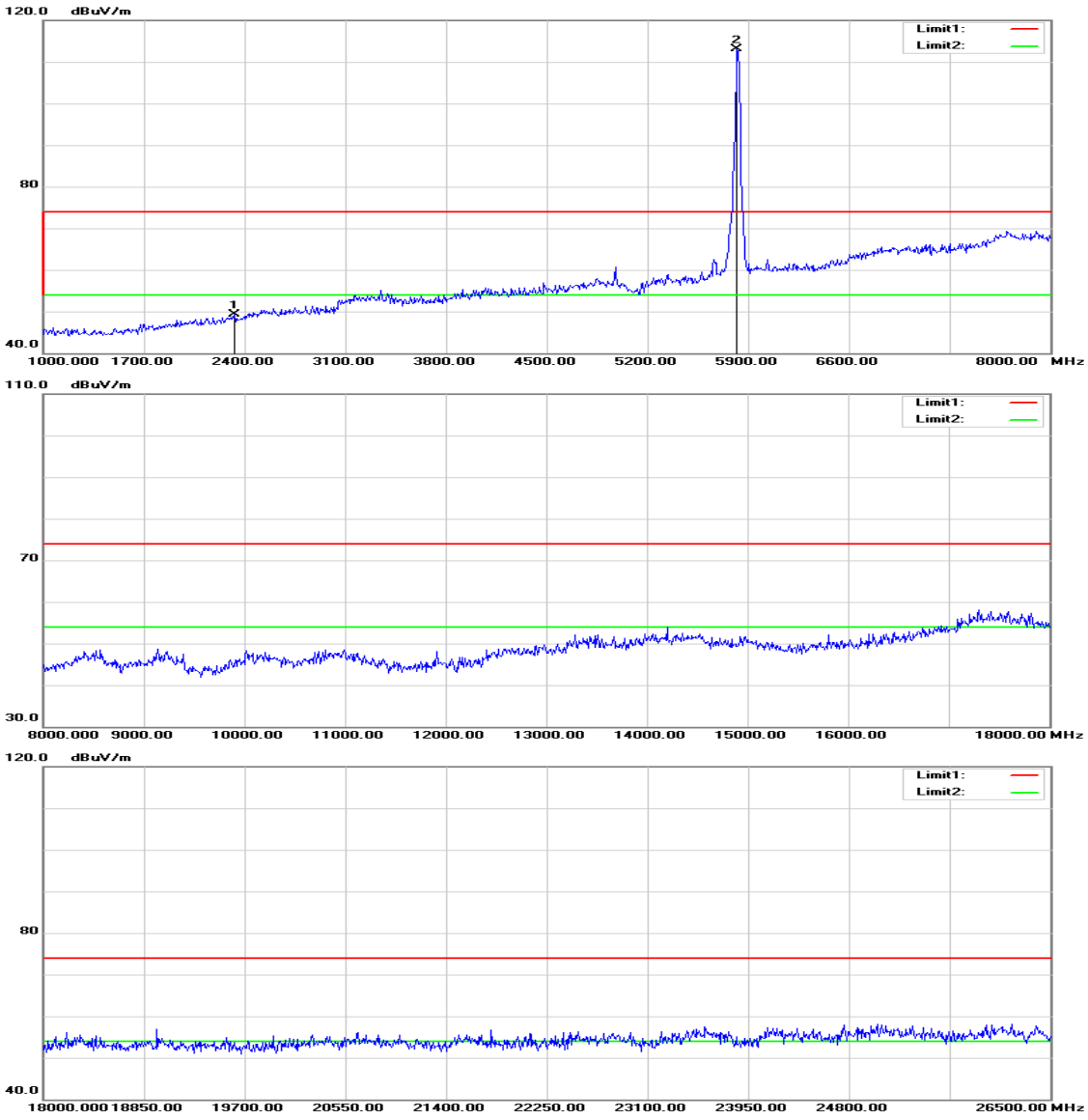
Polarity: Vertical







Polarity: Horizontal



Operation Mode: TX / IEEE 802.11a mode / CH High **Test Date:** June 8, 2015

Temperature: 27°C **Tested by:** David Shu

Humidity: 53% RH **Polarity:** Ver. / Hor.

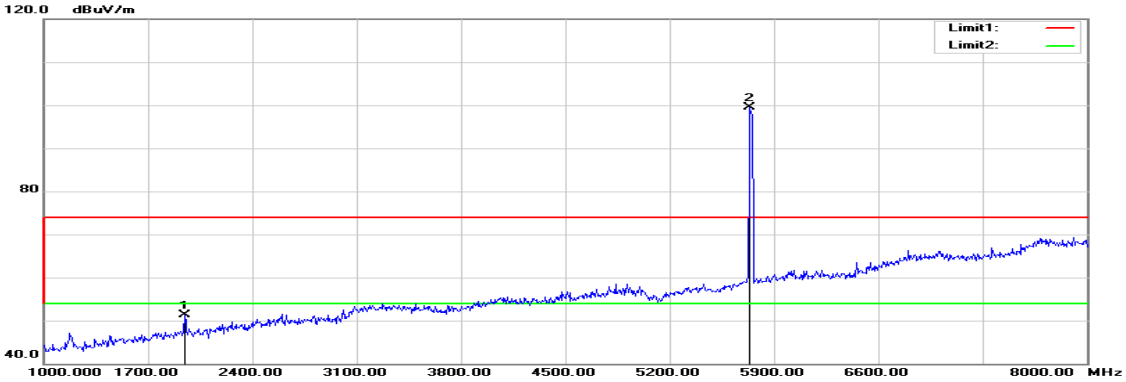
Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Pol. (H/V)
2498.000	53.89	-3.14	50.75	74.00	-23.25	peak	V
N/A							
2330.000	53.45	-4.22	49.23	74.00	-24.77	peak	H
N/A							

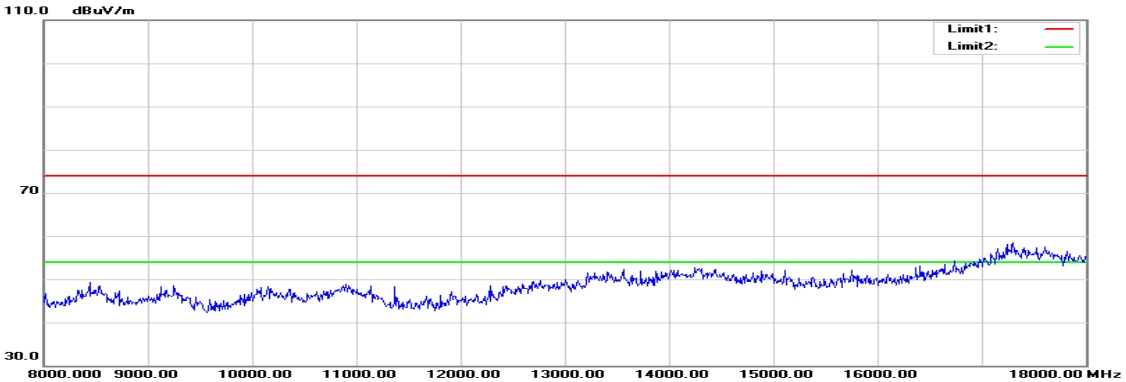
Remark:

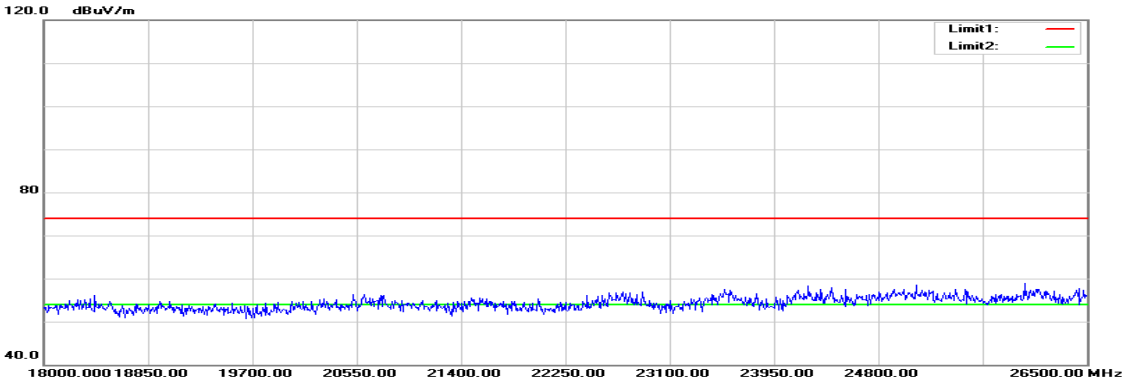
1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average limit.*
4. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*
5. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
6. *Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).*

TX / IEEE 802.11n HT 20 MHz mode / CH Low

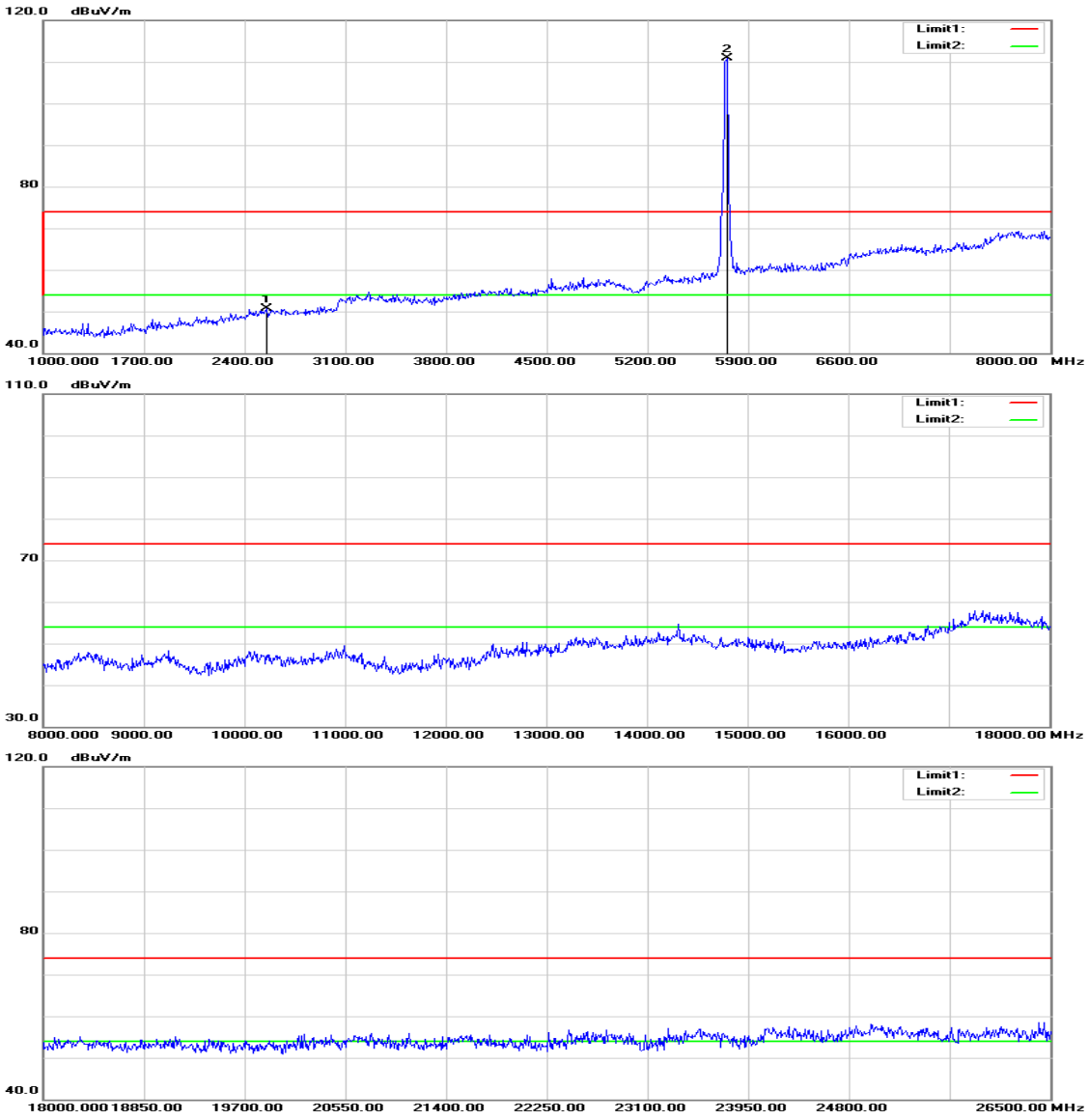
Polarity: Vertical







Polarity: Horizontal



Operation Mode: TX / IEEE 802.11n HT 20 MHz mode / CH Low **Test Date:** June 8, 2015

Temperature: 27°C **Tested by:** David Shu

Humidity: 53% RH **Polarity:** Ver. / Hor.

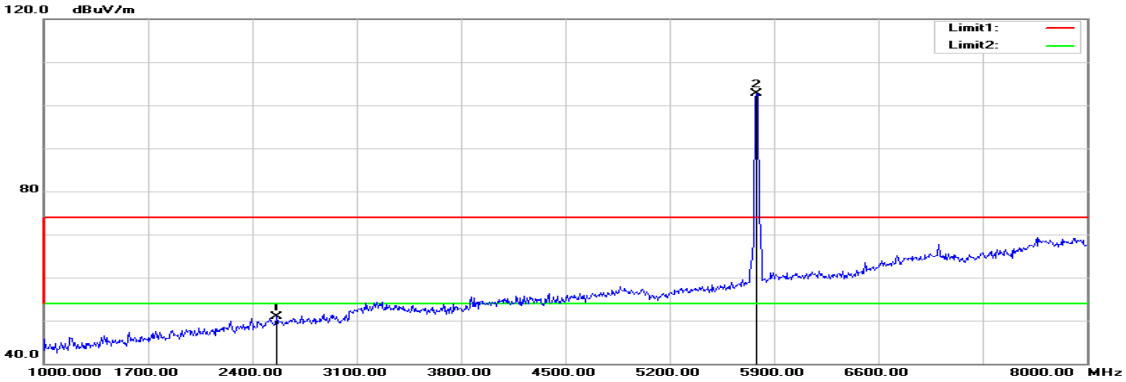
Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Pol. (H/V)
1945.000	56.41	-5.17	51.24	74.00	-22.76	peak	V
N/A							
2554.000	53.78	-3.01	50.77	74.00	-23.23	peak	H
N/A							

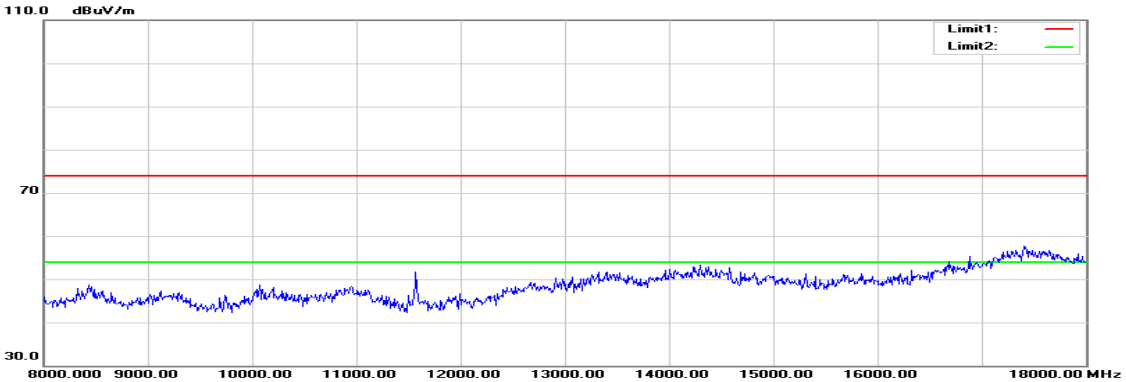
Remark:

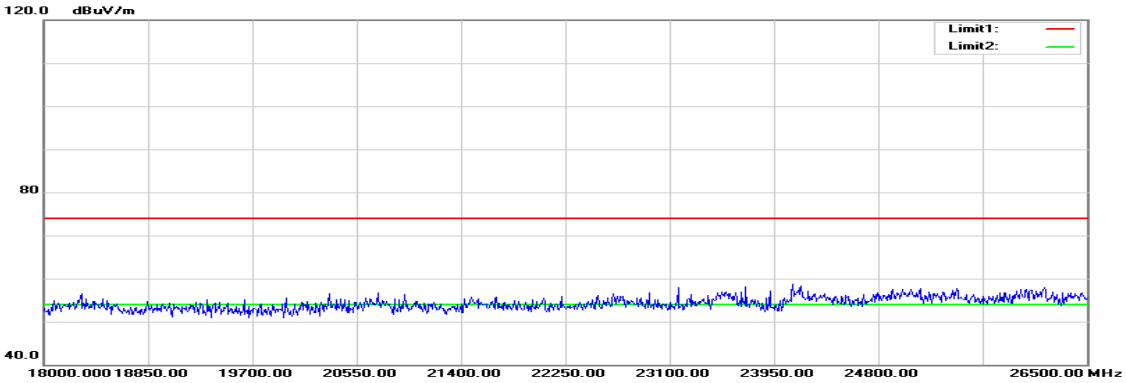
1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average limit or as required by the applicant.*
4. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*
5. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
6. *Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).*

TX / IEEE 802.11n HT 20 MHz mode / CH Mid

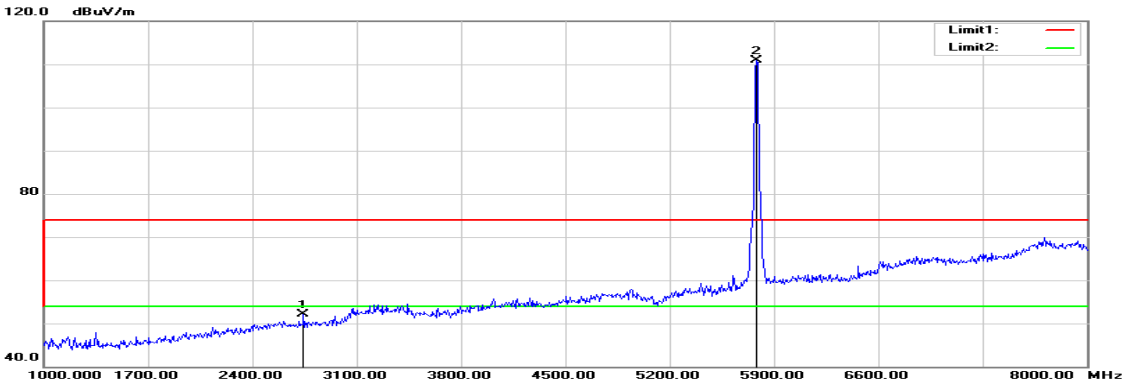
Polarity: Vertical

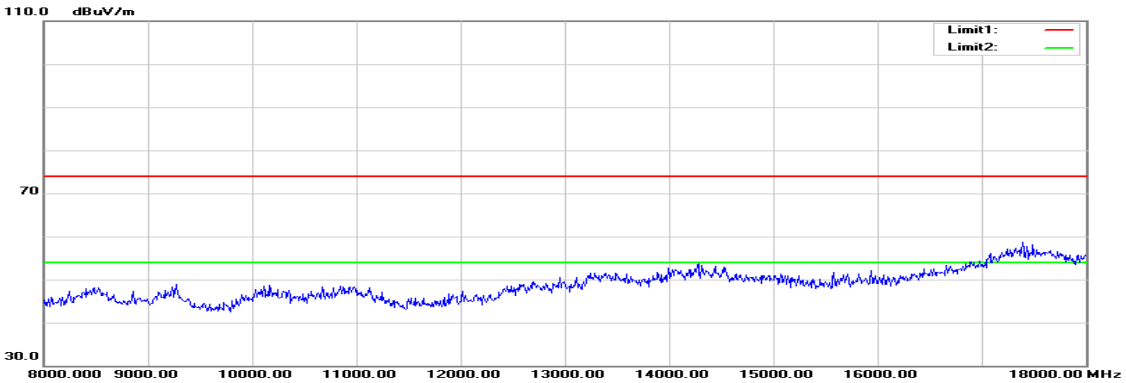


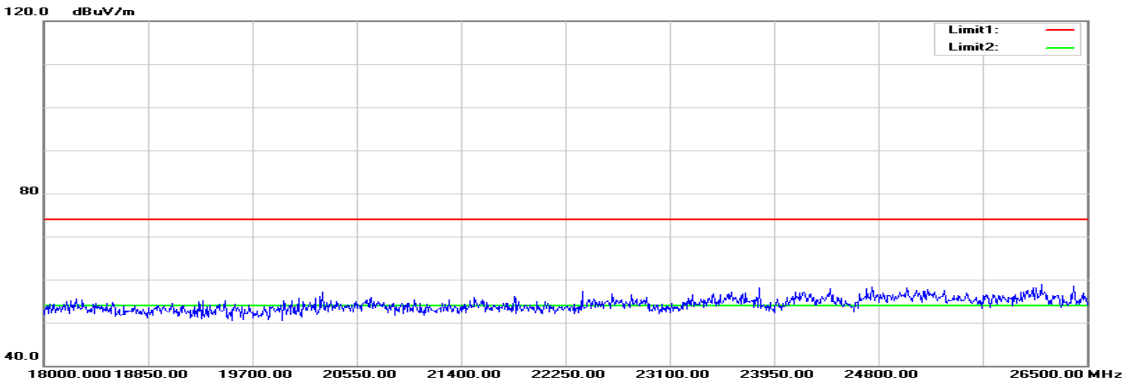




Polarity: Horizontal







Operation Mode: TX / IEEE 802.11n HT 20 MHz mode / CH Mid **Test Date:** June 8, 2015

Temperature: 27°C **Tested by:** David Shu

Humidity: 53% RH **Polarity:** Ver. / Hor.

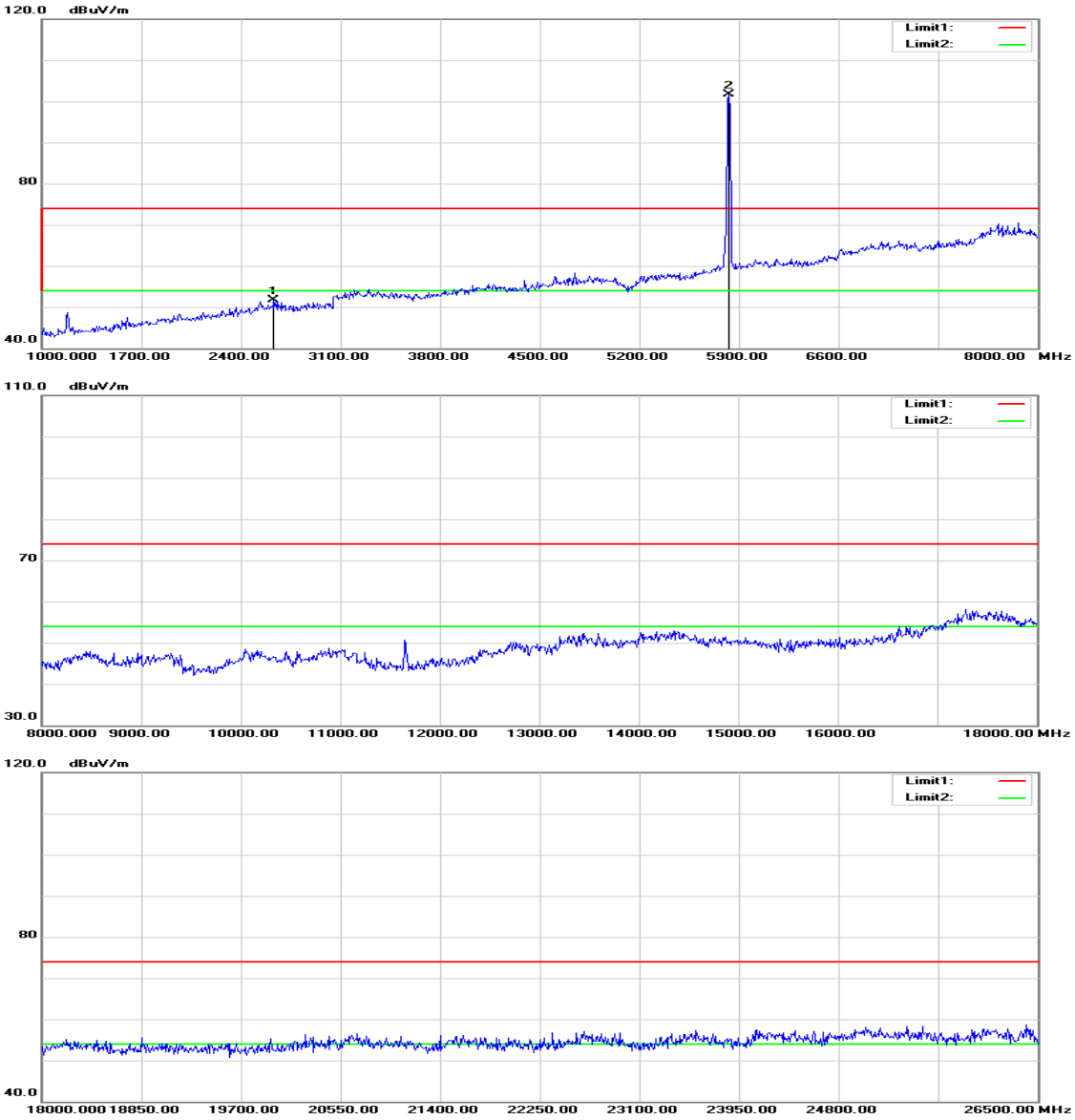
Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Pol. (H/V)
2561.000	53.89	-3.00	50.89	74.00	-23.11	peak	V
N/A							
2743.000	54.73	-2.63	52.10	74.00	-21.90	peak	H
N/A							

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average limit or as required by the applicant.*
4. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*
5. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
6. *Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).*

TX / IEEE 802.11n HT 20 MHz mode / CH High

Polarity: Vertical



Polarity: Horizontal

Operation Mode: TX / IEEE 802.11n HT 20 MHz mode / CH High **Test Date:** June 8, 2015

Temperature: 27°C **Tested by:** David Shu

Humidity: 53% RH **Polarity:** Ver. / Hor.

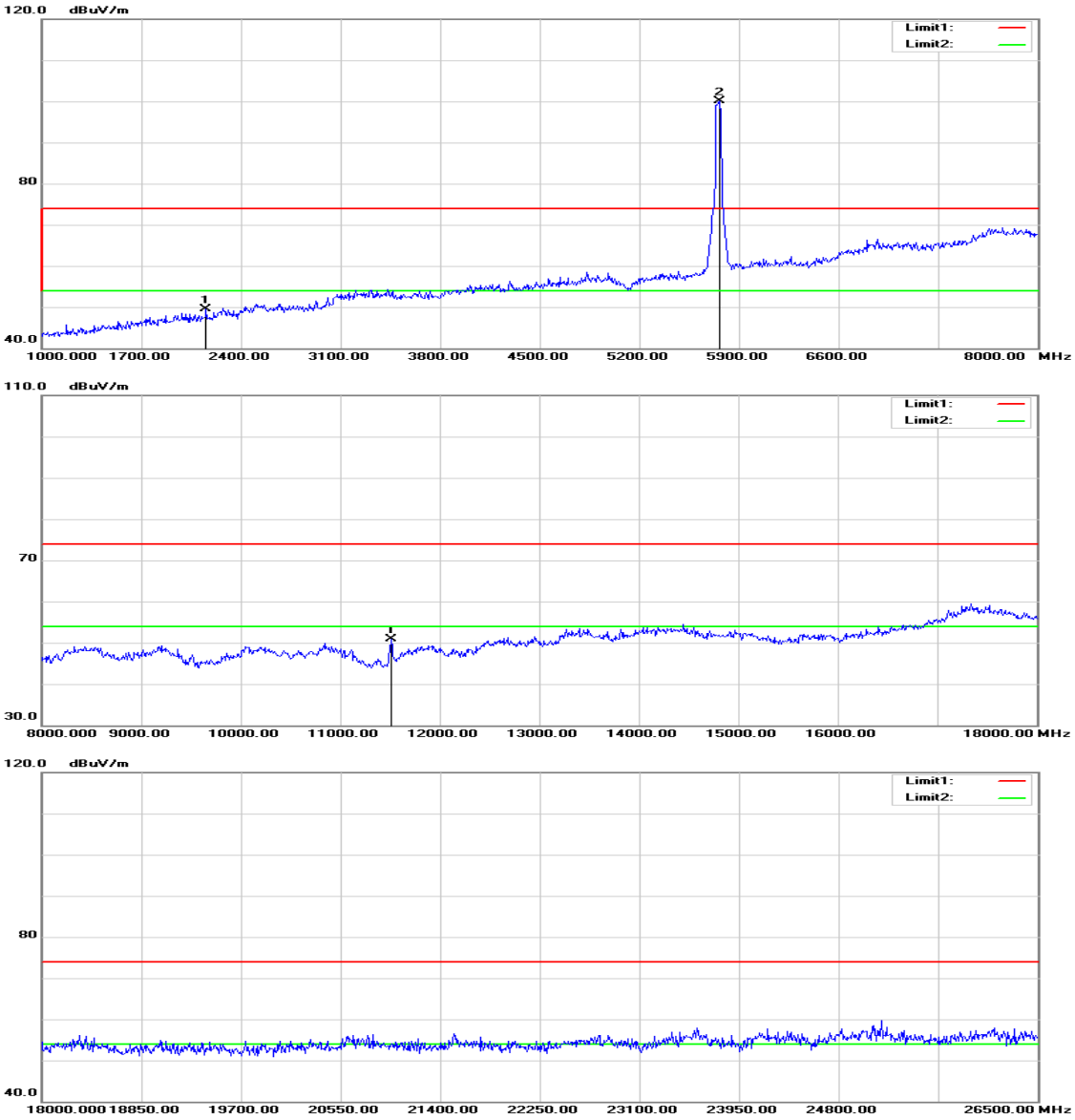
Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Pol. (H/V)
2631.000	54.56	-2.86	51.70	74.00	-22.30	peak	V
N/A							
2610.000	53.99	-2.90	51.09	74.00	-22.91	peak	H
N/A							

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average limit or as required by the applicant.*
4. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*
5. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
6. *Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).*

TX / IEEE 802.11n HT 40 MHz mode / CH Low

Polarity: Vertical



Polarity: Horizontal

Operation Mode:	TX / IEEE 802.11n HT 40 MHz mode / CH Low	**Test Date:**	June 8, 2015
Temperature:	27°C	**Tested by:**	David Shu
Humidity:	53% RH	**Polarity:**	Ver. / Hor.

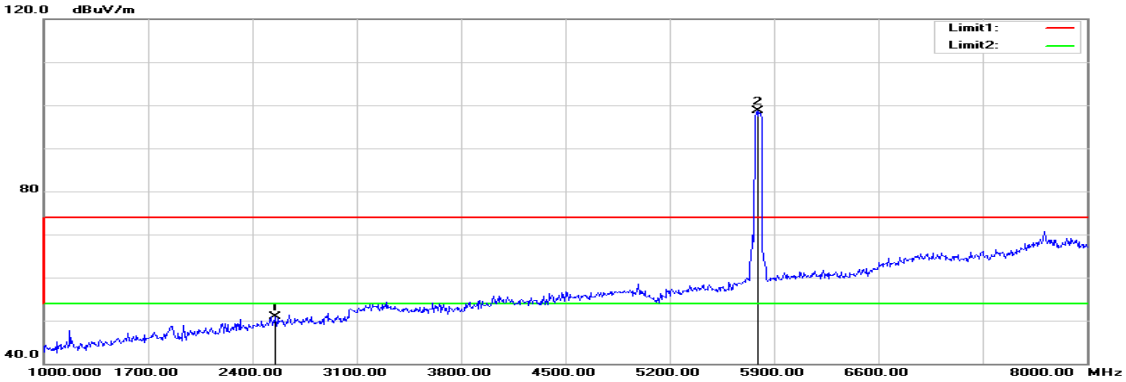
Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Pol. (H/V)
2155.000	54.15	-4.68	49.47	74.00	-24.53	peak	V
11510.000	34.04	16.79	50.83	74.00	-23.17	peak	V
N/A							
2680.000	54.21	-2.76	51.45	74.00	-22.55	peak	H
N/A							

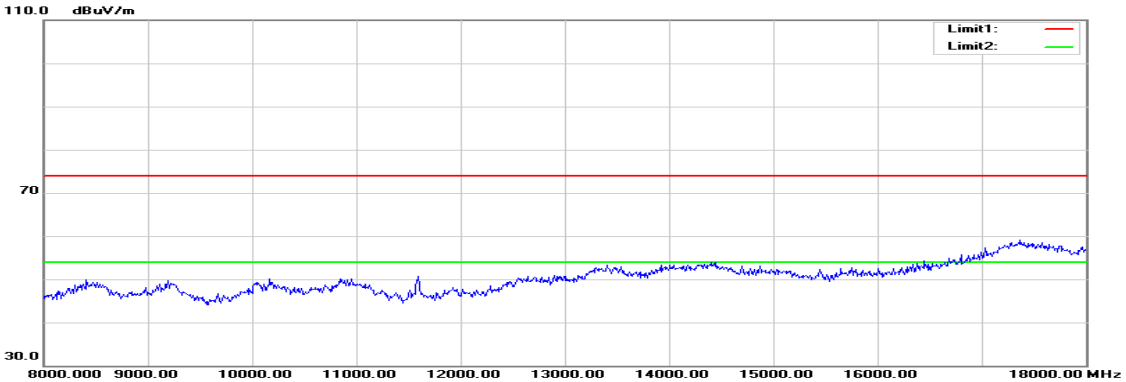
Remark:

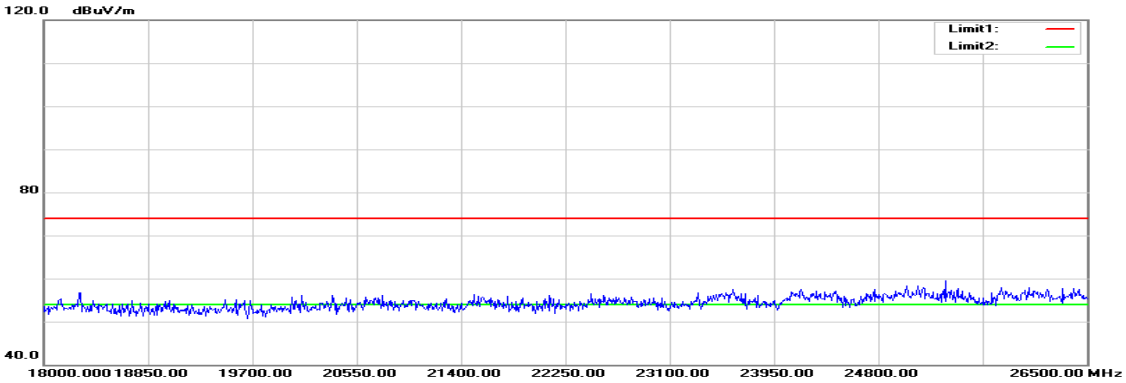
1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average limit or as required by the applicant.*
4. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*
5. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
6. *Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).*

TX / IEEE 802.11n HT 40 MHz mode / CH High

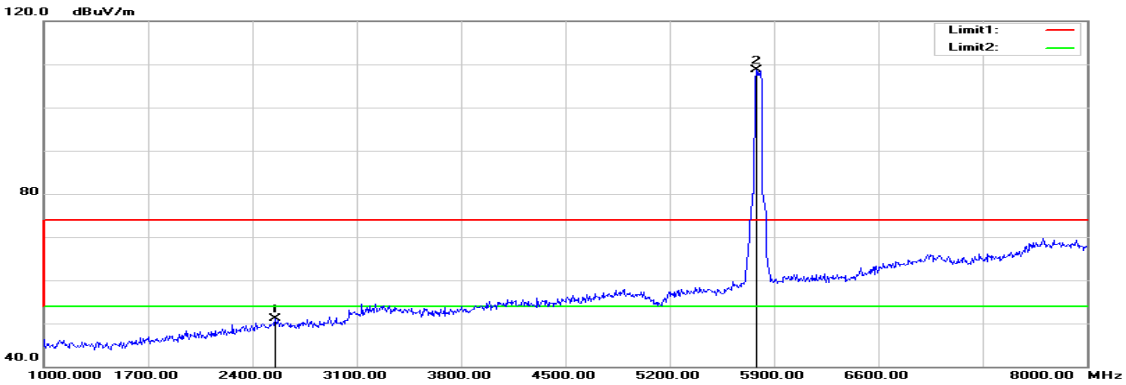
Polarity: Vertical

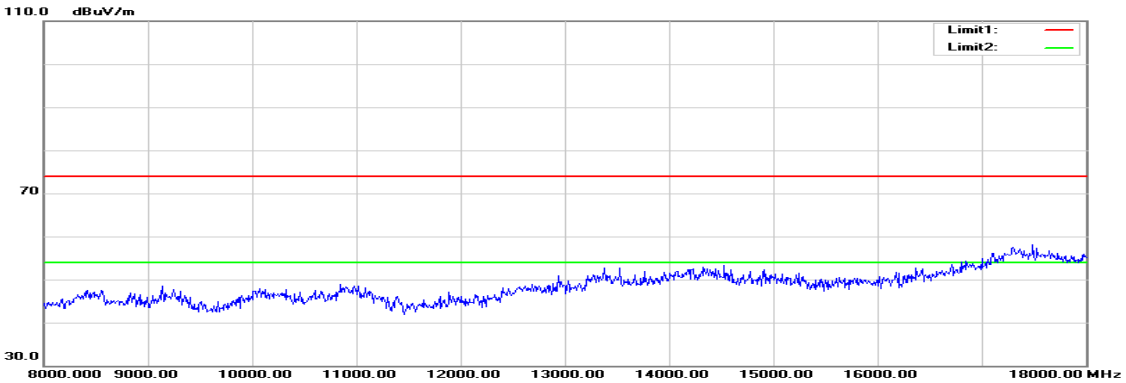


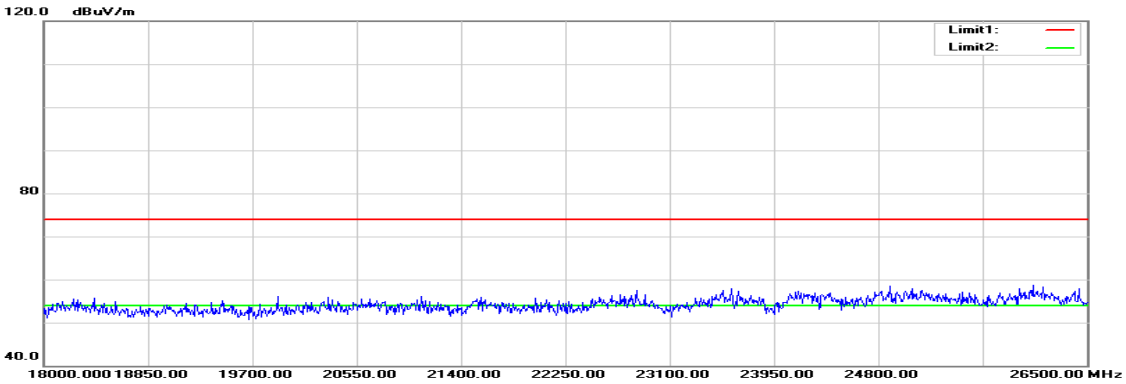




Polarity: Horizontal







Operation Mode:	TX / IEEE 802.11n HT 40 MHz mode / CH High	**Test Date:**	June 8, 2015
Temperature:	27°C	**Tested by:**	David Shu
Humidity:	53% RH	**Polarity:**	Ver. / Hor.

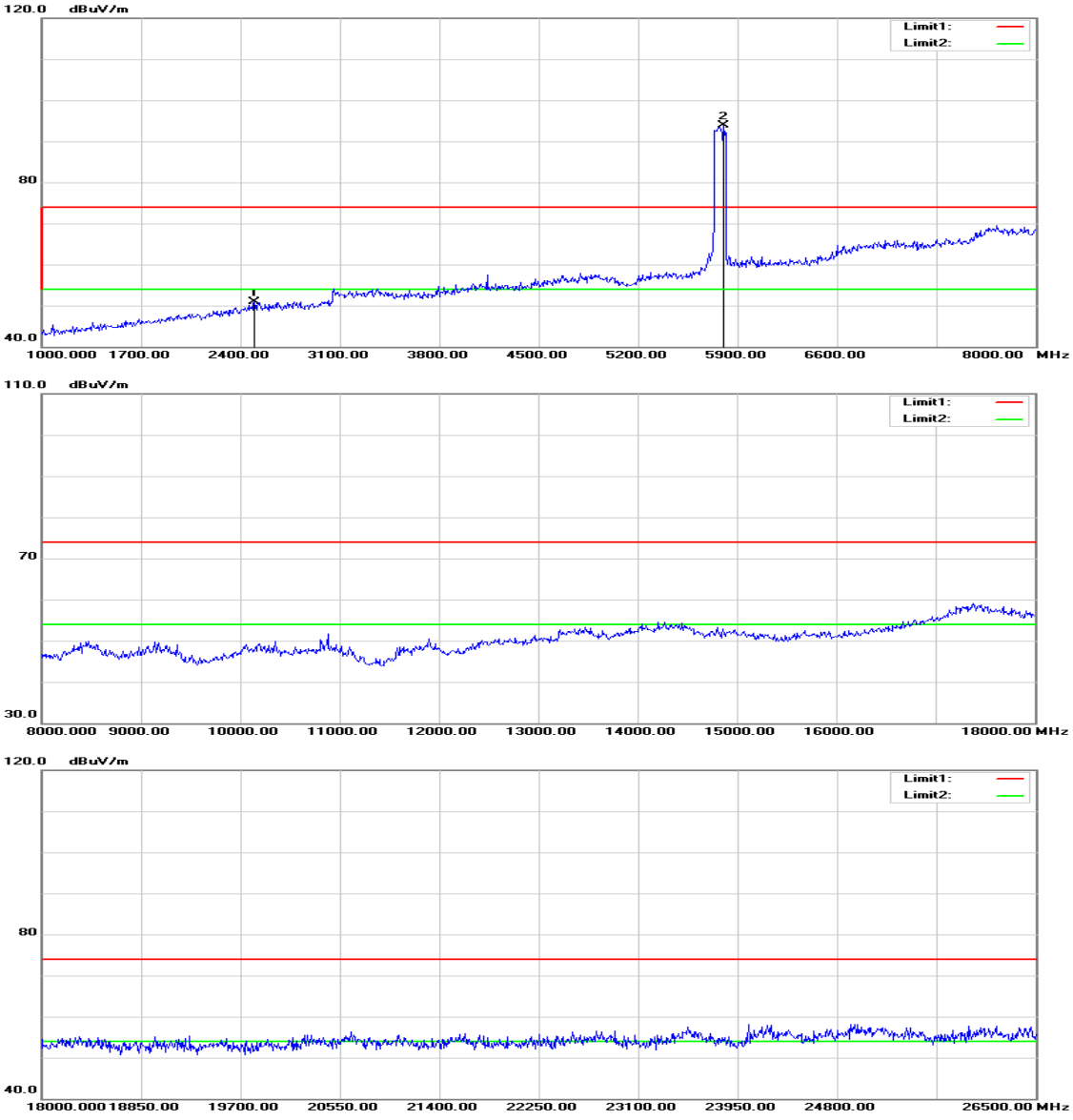
Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Pol. (H/V)
2554.000	53.95	-3.01	50.94	74.00	-23.06	peak	V
N/A							
2554.000	54.06	-3.01	51.05	74.00	-22.95	peak	H
N/A							

Remark:

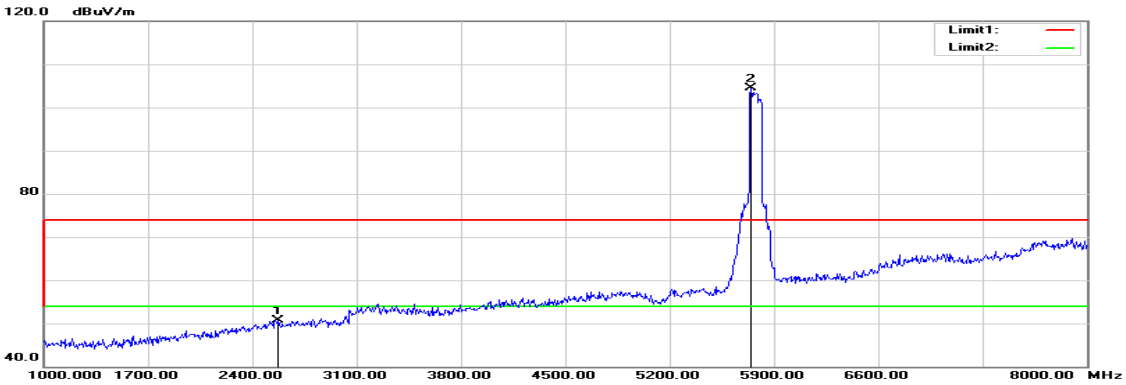
1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average limit or as required by the applicant.*
4. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*
5. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
6. *Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).*

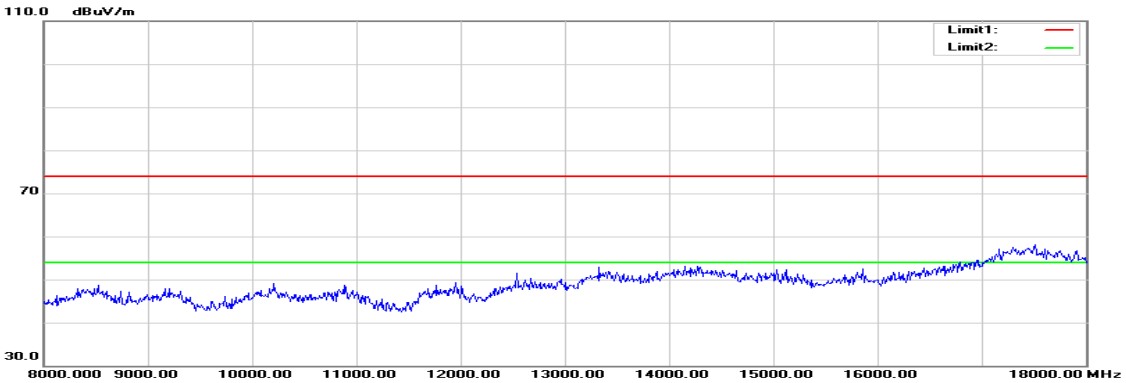
Tx / IEEE 802.11ac VHT 80 MHz mode / CH Mid

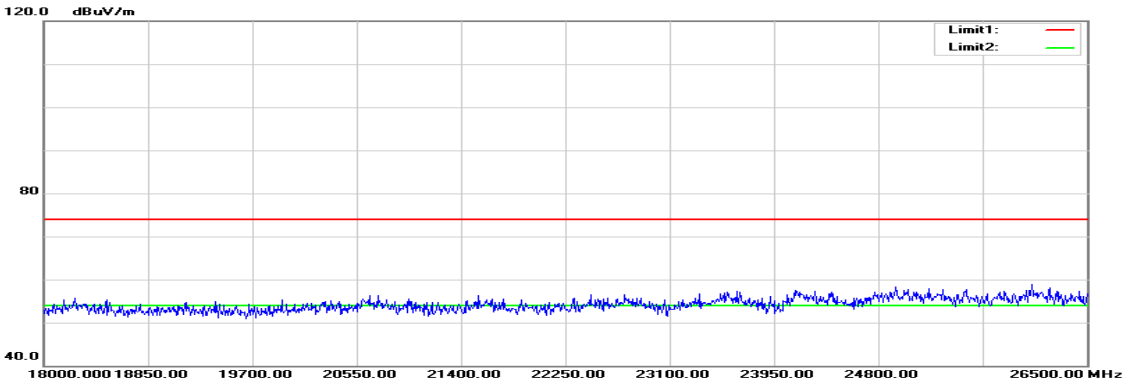
Polarity: Vertical



Polarity: Horizontal







Operation Mode:	Tx / IEEE 802.11ac VHT 80 MHz mode / CH Mid	**Test Date:**	June 8, 2015
Temperature:	27℃	**Tested by:**	David Shu
Humidity:	53% RH	**Polarity:**	Ver. / Hor.

Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Pol. (H/V)
2498.000	54.07	-3.14	50.93	74.00	-23.07	peak	V
N/A							
2575.000	53.72	-2.97	50.75	74.00	-23.25	peak	H
N/A							

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average limit or as required by the applicant.*
4. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*
5. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
6. *Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).*

7.7POWERLINE CONDUCTED EMISSIONS

LIMIT

According to §15.207(a) & RSS-Gen §7.2.4, except when the requirements applicable to a given device state otherwise, for any licence-exempt radiocommunication device equipped to operate from the public utility AC power supply, either directly or indirectly, the radio frequency voltage that is conducted back onto the AC power lines in the frequency range of 0.15 MHz to 30 MHz shall not exceed the limits shown in Table 2. The tighter limit applies at the frequency range boundaries.
The conducted emissions shall be measured with a 50 ohm/50 microhenry line impedance stabilization network.

RSS-Gen Table 2 – AC Power Lines Conducted Emission Limits

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

**Decreases with the logarithm of the frequency*

Test Configuration

See test photographs attached in Appendix 1 for the actual connections between EUT and support equipment.

TEST PROCEDURE

1. The EUT was placed on a table, which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

TEST RESULTS

The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. Significant peaks are then marked as shown on the following data page, and these signals are then quasi-peaked.

Test Data

Not applicable, because EUT not connect to AC Main Source direct.