FCC TEST REPORT

For

Shenzhen Geniatech Inc., Ltd.

eyetv

Model No.: Netstream Air

Additional Model No.: Netstream Duo, Netstream 4S, Netstream 4A, Netstream 4T, Netstream A, Eyetv Netstream, eyetv T2, U6

Prepared for	:	Shenzhen Geniatech Inc., Ltd.
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Date of receipt of test sample	:	April 21, 2017
Number of tested samples	:	1
Serial number	:	Prototype
Date of Test	:	April 21, 2017~May 04, 2017
Date of Report	:	May 04, 2017

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FCC TEST REPORT
FCC CFR 47 PART 15 E(15.407): 2016

Report Reference No.	**:**	**LCS170421078AE**
Date of Issue.....	:	May 04, 2017
Testing Laboratory Name.....	**:**	**Shenzhen LCS Compliance Testing Laboratory Ltd.**
Address.....	:	1F., Xingyuan Industrial Park, Tongda Road, Bao'an Blvd., Bao'an District, Shenzhen, Guangdong, China
Testing Location/ Procedure	:	Full application of Harmonised standards ■ Partial application of Harmonised standards □ Other standard testing method □
Applicant's Name.....	**:**	**Shenzhen Geniatech Inc., Ltd.**
Address.....	:	18F, GDC Building, No 9th, Gaoxin Middle 3rd Road, Nanshan, Shenzhen, China
Test Specification		
Standard	:	FCC CFR 47 PART 15 E(15.407): 2016
Test Report Form No.	**:**	LCSEMC-1.0
TRF Originator	:	Shenzhen LCS Compliance Testing Laboratory Ltd.
Master TRF.....	:	Dated 2011-03

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EUT Description.	**:**	**eyetv**
Trade Mark.....	:	N/A
Model/ Type reference	:	Netstream Air
Ratings.....	:	DC 5.0V/2A by AC Adapter
Result	:	**Positive**

Compiled by:	**Supervised by:**	**Approved by:**
Aking Jin		Gavin Liang
Aking Jin / File administrators	Glin Lu/ Technique principal	Gavin Liang/ Manager

FCC -- TEST REPORT

Test Report No. : LCS170421078AE	May 04, 2017 Date of issue

EUT.....	: eyetv
Type / Model.....	: Netstream Air
Applicant.....	**: Shenzhen Geniatech Inc., Ltd.**
Address.....	: 18F, GDC Building, No 9th, Gaoxin Middle 3rd Road, Nanshan, Shenzhen, China
Telephone.....	: /
Fax.....	: /
Manufacturer.....	**: Shenzhen Geniatech Inc., Ltd.**
Address.....	: 18F, GDC Building, No 9th, Gaoxin Middle 3rd Road, Nanshan, Shenzhen, China
Telephone.....	: /
Fax.....	: /
Factory.....	**: Shenzhen Geniatech Inc., Ltd.**
Address.....	: 18F, GDC Building, No 9th, Gaoxin Middle 3rd Road, Nanshan, Shenzhen, China
Telephone.....	: /
Fax.....	: /

Test Result:	**Positive**

The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

Revision History

Revision	Issue Date	Revisions	Revised By
00	May 04, 2017	Initial Issue	Gavin Liang

TABLE OF CONTENTS

1. GENERAL INFORMATION 6
1.1. DESCRIPTION OF DEVICE (EUT) 6
1.2. HOST SYSTEM CONFIGURATION LIST AND DETAILS 6
1.3. EXTERNAL I/O PORT 6
1.4. DESCRIPTION OF TEST FACILITY 7
1.5. STATEMENT OF THE MEASUREMENT UNCERTAINTY 7
1.6. MEASUREMENT UNCERTAINTY 7
1.7. DESCRIPTION OF TEST MODES 7
1.8. FREQUENCY OF CHANNELS 8
2. TEST METHODOLOGY 9
2.1. EUT CONFIGURATION 9
2.2. EUT EXERCISE 9
2.3. GENERAL TEST PROCEDURES 9
3. SYSTEM TEST CONFIGURATION 10
3.1. JUSTIFICATION 10
3.2. EUT EXERCISE SOFTWARE 10
3.3. SPECIAL ACCESSORIES 10
3.4. BLOCK DIAGRAM/SCHEMATICS 10
3.5. EQUIPMENT MODIFICATIONS 10
3.6. TEST SETUP 10
4. SUMMARY OF TEST RESULTS 11
5. TEST RESULT 12
5.1. ON TIME AND DUTY CYCLE 12
5.2. MAXIMUM CONDUCTED OUTPUT POWER MEASUREMENT 14
5.3. POWER SPECTRAL DENSITY MEASUREMENT 16
5.4. 99% AND 26DB OCCUPIED BANDWIDTH MEASUREMENT 23
5.5. RADIATED EMISSIONS MEASUREMENT 30
5.6. POWER LINE CONDUCTED EMISSIONS 43
5.7 UNDESIRABLE EMISSIONS MEASUREMENT 46
5.8. ANTENNA REQUIREMENTS 61
6. LIST OF MEASURING EQUIPMENTS 62
7. TEST SETUP PHOTOGRAPHS OF EUT 63
8. EXTERIOR PHOTOGRAPHS OF THE EUT 63
9. INTERIOR PHOTOGRAPHS OF THE EUT 63

1. GENERAL INFORMATION

1.1. Description of Device (EUT)

EUT	:	eyetv
Model Number	:	Netstream Air, Netstream Duo, Netstream 4S, Netstream 4A, Netstream 4T, Netstream A, Eyetv Netstream, eyetv T2, U6
Model Declaration	:	PCB board, structure and internal of these model(s) are the same, So no additional models were tested
Test Model	:	Netstream Air
Power Supply	:	DC 5.0V/2A by AC Adapter
Frequency Range	:	IEEE 802.11b:2412-2462MHz IEEE 802.11g:2412-2462MHz IEEE 802.11n HT20:2412-2462MHz/5180-5240MHz/5745-5825MHz IEEE 802.11n HT40:2422-2452MHz/5190-5230MHz/5755-5795MHz IEEE 802.11a:5180-5240MHz/5745-5825MHz IEEE 802.11ac:5180-5240MHz/5745-5825MHz IEEE 802.11ac VHT40: 5190-5230MHz/5755-5795MHz IEEE 802.11ac VHT80: 5210MHz/5775MHz
Channel Number	:	11 Channels for WIFI 20MHz Bandwidth(802.11b/g/n-HT20) 7 Channels for WIFI 40MHz Bandwidth(802.11n-HT40) 4 Channels for 5180.00-5240.00MHz(802.11a/ac/n-HT20) 2 Channels for 5190.00-5230.00MHz(802.11ac/n-HT40) 1 Channels for 5210.00MHz(802.11ac-HT80) 5 Channels for 5745.00-5825.00MHz(802.11a/ac/n-HT20) 2 Channels for 5755.00-5795.00MHz(802.11ac/n-HT40) 1 Channels for 5775.00MHz(802.11ac-HT80)
Modulation Technology	:	IEEE 802.11b: DSSS(CCK,DQPSK,DBPSK) IEEE 802.11g: OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n: OFDM (64QAM, 16QAM,QPSK,BPSK) IEEE 802.11a: OFDM (64QAM, 16QAM,QPSK,BPSK) IEEE 802.11ac: OFDM (256QAM, 64QAM, 16QAM,QPSK,BPSK)
Data Rates	:	IEEE 802.11b: 1-11Mbps IEEE 802.11g: 6-54Mbps IEEE 802.11n: MCS0-MCS15 IEEE 802.11a: 6-54Mbps IEEE 802.11ac: MCS0-MCS15
Antenna Type And Gain	:	PIFA antenna, 2.0dBi (Max.) for 2.4G, 5.2G and 5.8G WLAN

1.2. Host System Configuration List and Details

Manufacturer	Description	Model	Serial Number	Certificate
TRANSIN	Adapter	TS-A010-050020ADH	--	VoC

1.3. External I/O Port

I/O Port Description	Quantity	Cable
DC Power Port	1	N/A
ATSC Antenna Port	1	N/A

1.4. Description of Test Facility

CNAS Registration Number. is L4595.

FCC Registration Number. is 899208.

Industry Canada Registration Number. is 9642A-1.

VCCI Registration Number. is C-4260 and R-3804.

ESMD Registration Number. is ARCB0108.

UL Registration Number. is 100571-492.

TUV SUD Registration Number. is SCN1081.

TUV RH Registration Number. is UA 50296516-001

The 3m-Semi anechoic test site fulfils CISPR 16-1-4 according to ANSI C63.4:2014 and CISPR 16-1-4:2010 SVSWR requirement for radiated emission above 1GHz.

1.5. Statement of the Measurement Uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. To CISPR 16 – 4 “Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements” and is documented in the LCS quality system acc. To DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

1.6. Measurement Uncertainty

Test Item		Frequency Range	Uncertainty	Note
Radiation Uncertainty	:	9KHz~30MHz	3.10dB	(1)
		30MHz~200MHz	2.96dB	(1)
		200MHz~1000MHz	3.10dB	(1)
		1GHz~26.5GHz	3.80dB	(1)
		26.5GHz~40GHz	3.90dB	(1)
Conduction Uncertainty	:	150kHz~30MHz	1.63dB	(1)
Power disturbance	:	30MHz~300MHz	1.60dB	(1)

(1). This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

1.7. Description of Test Modes

The EUT has been tested under operating condition.

This test was performed with EUT in X, Y, Z position and the worst case was found when EUT in X position.

Worst-case mode and channel used for 150 kHz-30 MHz power line conducted emissions was the mode and channel with the highest output power that was determined to be IEEE 802.11a mode (High Channel).

Worst-case mode and channel used for 9kHz-1000 MHz radiated emissions was the mode and channel with the highest output power, that was determined to be IEEE 802.11a mode(High Channel).

Worst-Case data rates were utilized from preliminary testing of the Chipset, worst-case data rates used during the testing are as follows:
IEEE 802.11a Mode : 6 Mbps, OFDM.
IEEE 802.11ac VHT20 Mode: MCS0
IEEE 802.11n HT20 Mode: MCS0, OFDM.
IEEE 802.11ac VHT40 Mode: MCS0, OFDM.
IEEE 802.11n HT40 Mode: MCS0, OFDM.
IEEE 802.11ac VHT80 Mode: MCS0, OFDM.

Antenna & Bandwidth

Antenna	Single (Port.1)			Two (Port.1 + Port.2)		
Bandwidth Mode	20MHz	40MHz	80MHz	20MHz	40MHz	80MHz
IEEE 802.11a	☐	☐	☐	☑	☐	☐
IEEE 802.11n	☐	☐	☐	☑	☑	☐
IEEE 802.11ac	☐	☐	☐	☑	☑	☑

1.8. Frequency of Channels

IEEE 802.11a/n-HT20/ac-VHT20

Frequency Band	Channel No.	Frequency(MHz)	Channel No.	Frequency(MHz)
5180~5240MHz	36	5180	44	5220
	40	5200	48	5240

IEEE 802.11n-HT40/ac-VHT40

Frequency Band	Channel No.	Frequency(MHz)	Channel No.	Frequency(MHz)
5190~5230MHz	38	5190	46	5230

IEEE 802.11ac-VHT80

Frequency Band	Channel No.	Frequency(MHz)	Channel No.	Frequency(MHz)
5210MHz	42	5210	--	--

The test configuration of the test software shows as below:

Test mode	Channel No.	Frequency(MHz)	Software setting value
IEEE 802.11a	36	5180	14
	44	5220	14
	48	5240	14
IEEE 802.11n-HT20	36	5180	12
	44	5220	12
	48	5240	12
IEEE 802.11ac-VHT20	36	5180	11
	44	5220	11
	48	5240	11
IEEE 802.11n-HT40	38	5190	12
	46	5230	12
IEEE 802.11ac-VHT40	38	5190	11
	46	5230	11
IEEE 802.11ac-VHT80	42	5210	11

2. TEST METHODOLOGY

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

The radiated testing was performed at an antenna-to-EUT distance of 3 meters. All radiated and conducted emissions measurement was performed at Shenzhen LCS Compliance Testing Laboratory Ltd.

2.1. EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

2.2. EUT Exercise

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements.

According to FCC's request, Test Procedure KDB 789033 D02 General UNII Test Procedures New Rules v01r04 and KDB 662911 are required to be used for this kind of FCC 15.407 UII device.

According to its specifications, the EUT must comply with the requirements of the Section 15.203, 15.205, 15.207, 15.209 and 15.407 under the FCC Rules Part 15 Subpart E

2.3. General Test Procedures

2.3.1 Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 6.2.1 of ANSI C63.10-2013 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using Quasi-peak and average detector modes.

2.3.2 Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 6.3 of ANSI C63.10-2013

3. SYSTEM TEST CONFIGURATION

3.1. Justification

The system was configured for testing in a continuous transmits condition.

3.2. EUT Exercise Software

The system was configured for testing in a continuous transmits condition and change test channels by software (realtek_8812AU) provided by application.

3.3. Special Accessories

N/A

3.4. Block Diagram/Schematics

Please refer to the related document

3.5. Equipment Modifications

Shenzhen LCS Compliance Testing Laboratory Ltd. has not done any modification on the EUT.

3.6. Test Setup

Please refer to the test setup photo.

4. SUMMARY OF TEST RESULTS

Applied Standard: FCC Part 15 Subpart E		
FCC Rules	**Description of Test**	**Result**
§15.407(a)	Maximum Conducted Output Power	Compliant
§15.407(a)	Power Spectral Density	Compliant
§15.407(a)	26dB Bandwidth	Compliant
§15.407(a)	99% Occupied Bandwidth	Compliant
§15.407(b)	Radiated Emissions	Compliant
§15.407(b)	Band edge Emissions	Compliant
§15.205	Emissions at Restricted Band	Compliant
§15.407(g)	Frequency Stability	N/A
§15.207(a)	Line Conducted Emissions	Compliant
§15.203	Antenna Requirements	Compliant
§2.1091	RF Exposure	Compliant

Note: The customer declared frequency stability is better than 20ppm which ensures that the signal remains in the allocated bands under all operational conditions stated in the user manual.

5. TEST RESULT

5.1. On Time and Duty Cycle

5.1.1. Standard Applicable

None; for reporting purpose only.

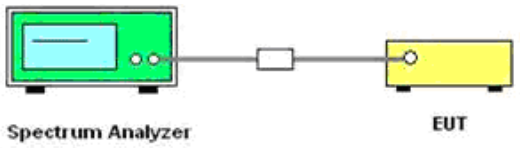
5.1.2. Measuring Instruments and Setting

Please refer to section 6 of equipment list in this report. The following table is the setting of the spectrum analyzer.

5.1.3. Test Procedures

1. Set the centre frequency of the spectrum analyzer to the transmitting frequency;
2. Set the span=0MHz, RBW=8MHz, VBW=50MHz, Sweep time=5ms;
3. Detector = peak;
4. Trace mode = Single hold.

5.1.4. Test Setup Layout



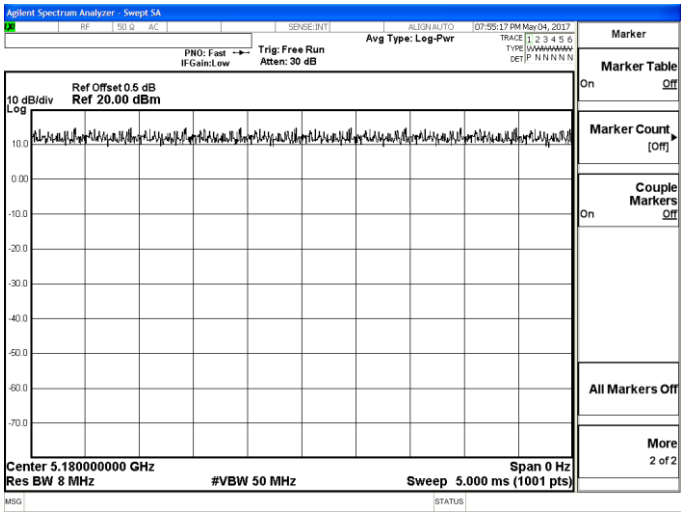
5.1.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

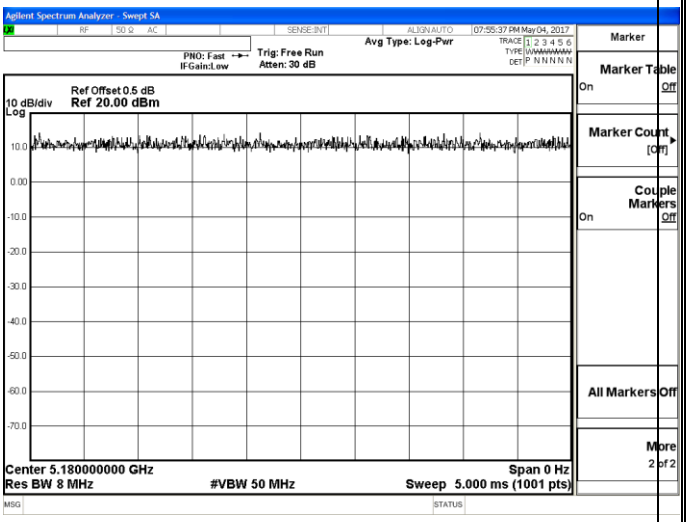
5.1.6. Test result

Mode	On Time B (ms)	Period (ms)	Duty Cycle x (Linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/B Minimum VBW(KHz)
IEEE 802.11a	5.0	5.0	1	100	0	0.01
IEEE 802.11n HT20	5.0	5.0	1	100	0	0.01
IEEE 802.11ac HT20	5.0	5.0	1	100	0	0.01
IEEE 802.11n HT40	5.0	5.0	1	100	0	0.01
IEEE 802.11ac HT40	5.0	5.0	1	100	0	0.01
IEEE 802.11ac HT80	5.0	5.0	1	100	0	0.01

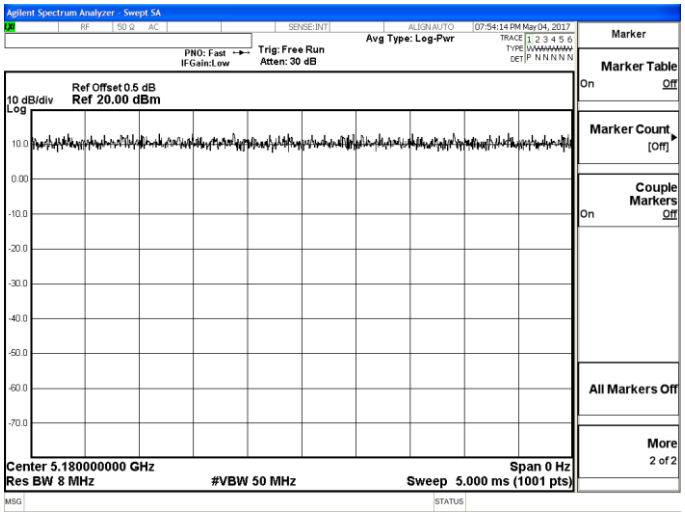
On Time and Duty Cycle



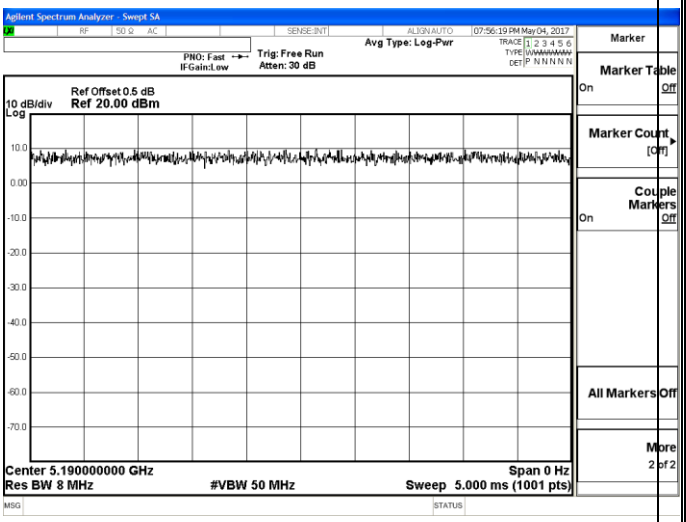
IEEE 802.11a



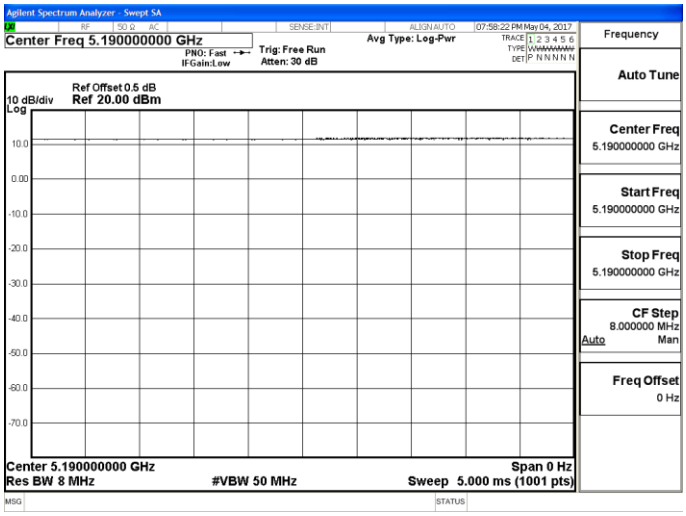
IEEE 802.11n HT20



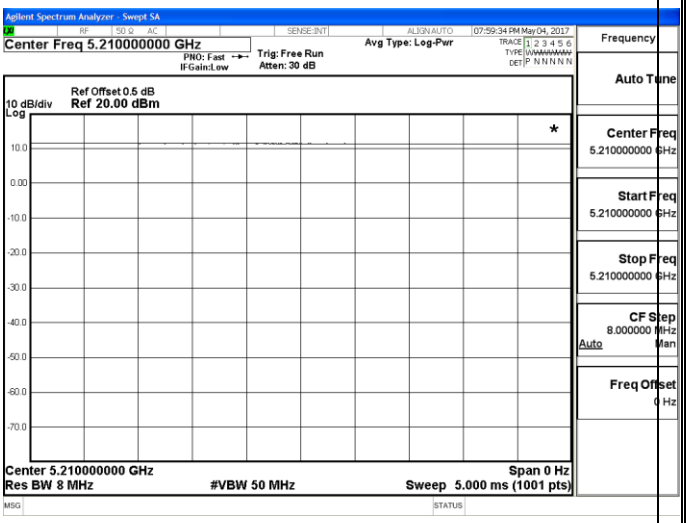
IEEE 802.11ac VHT20



IEEE 802.11n HT40



IEEE 802.11ac VHT40



IEEE 802.11ac VHT80

5.2. Maximum Conducted Output Power Measurement

5.2.1. Standard Applicable

(1) For the band 5.15-5.25 GHz.

(i) For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. 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. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

(ii) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. 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.

(iii) For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1dB reduction in maximum conducted output power is required for each 1 dB of antenna gain in excess of 23 dBi. 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.

(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. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

5.2.2. Measuring Instruments and Setting

Please refer to section 6 of equipment list in this report. The following table is the setting of the power meter.

5.2.3. Test Procedures

The transmitter output (antenna port) was connected to the power meter.

According to KDB 789033 D02 Section 3 (a) Method PM (Measurement using an RF average power meter):

(i) Measurements may be performed using a wideband RF power meter with a thermocouple detector or equivalent if all of the conditions listed below are satisfied.

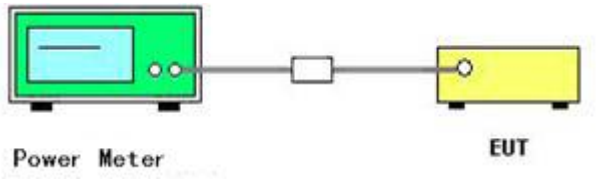
- The EUT is configured to transmit continuously or to transmit with a constant duty cycle.
- At all times when the EUT is transmitting, it must be transmitting at its maximum power control level.
- The integration period of the power meter exceeds the repetition period of the transmitted signal by at least a factor of five.

(ii) If the transmitter does not transmit continuously, measure the duty cycle, x, of the transmitter output signal as described in section II.B.

(iii) Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter.

(iv) Adjust the measurement in dBm by adding 10 log (1/x) where x is the duty cycle (e.g., 10 log (1/0.25) if the duty cycle is 25%).

5.2.4. Test Setup Layout



5.1.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

5.2.6. Test Result of Maximum Conducted Output Power

Temperature	25℃	Humidity	60%
Test Engineer	Aking Jin	Configurations	IEEE 802.11a/n/ac

Test Mode	Channel	Frequency (MHz)	Measured Conducted Average Power (dBm)			Duty Cycle factor (dB)	Report Average Power (dBm)			Limits (dBm)	Verdict
			Antenna 0	Antenna 1	Sum		Antenna 0	Antenna 1	Sum		
IEEE 802.11a	36	5180	12.63	12.78	/	0.000	12.63	12.78	/	30.00	PASS
	44	5220	12.56	12.87	/	0.000	12.56	12.87	/		
	48	5240	12.85	12.54	/	0.000	12.85	12.54	/		
IEEE 802.11n HT20	36	5180	11.87	11.90	14.90	0.000	11.87	11.90	14.90	30.00	PASS
	44	5220	11.79	11.69	14.75	0.000	11.79	11.69	14.75		
	48	5240	11.86	11.78	14.83	0.000	11.86	11.78	14.83		
IEEE 802.11ac VHT20	36	5180	10.68	10.85	13.78	0.000	10.68	10.85	13.78	30.00	PASS
	44	5220	10.82	10.87	13.86	0.000	10.82	10.87	13.86		
	48	5240	10.91	10.65	13.79	0.000	10.91	10.65	13.79		
IEEE 802.11n HT40	38	5190	10.84	10.54	13.70	0.000	10.84	10.54	13.70	30.00	PASS
	46	5230	10.65	10.84	13.76	0.000	10.65	10.84	13.76		
IEEE 802.11ac VHT40	38	5190	10.48	10.54	13.52	0.000	10.48	10.54	13.52	30.00	PASS
	46	5230	10.54	10.54	13.55	0.000	10.54	10.54	13.55		
IEEE 802.11ac VHT80	42	5210	10.62	10.54	13.59	0.000	10.62	10.54	13.59	30.00	PASS

Remark:

1. *Measured output power at difference data rate for each mode and recorded worst case for each mode.*
2. *Test results including cable loss;*
3. *Worst case data at 6Mbps at IEEE 802.11a; MCS0 at IEEE 802.11n HT20, IEEE 802.11n HT40, IEEE 802.11a VHT20, IEEE 802.11ac VHT40 and IEEE 802.11ac VHT80;*
4. *For MIMO with CCD technology device, The Directional Gain= Gain of individual transmit antennas (dBi) + Array gain;*
   Array gain = 10 log (N_{ant}), where N_{ant} is the number of transmit antennas.
5. *Directional Gain = 2.00 + 10log (2) = 5.01 dBi < 6dBi; no need reduce power limit;*
6. *Report conducted power = Measured conducted average power + Duty Cycle factor;*

5.3. Power Spectral Density Measurement

5.3.1. Standard Applicable

For 5150~5250MHz

(i) For an outdoor access point operating in the band 5.15 - 5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 MHz band.note1

(ii) For an indoor access point operating in the band 5.15 - 5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 MHz band.note1

(iii) For fixed point-to-point access points operating in the band 5.15 - 5.25 GHz, transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi.

(iv) For mobile and portable client devices in the 5.15 - 5.25 GHz band, the maximum power spectral density shall not exceed 11 dBm in any 1 MHz band. note1

Note1: If transmitting antennas of directional gain greater than 6 dBi are used, the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

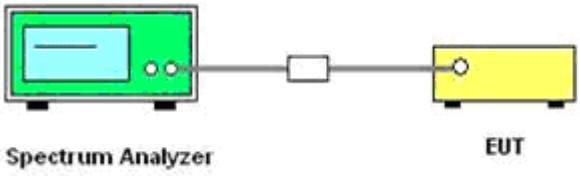
5.3.2. Measuring Instruments and Setting

Please refer to section 6 of equipment list in this report. The following table is the setting of Spectrum Analyzer.

5.3.3. Test Procedures

1. The transmitter was connected directly to a Spectrum Analyzer through a directional couple.
2. The power was monitored at the coupler port with a Spectrum Analyzer. The power level was set to the maximum level.
3. Set the RBW = 1MHz.
4. Set the VBW ≥ 3MHz
5. Span=Encompass the entire emissions bandwidth (EBW) of the signal (or, alternatively, the entire 99% occupied bandwidth) of the signal.
6. Number of points in sweep ≥ 2 × span / RBW. (This ensures that bin-to-bin spacing is ≤ RBW/2, so that narrowband signals are not lost between frequency bins.)
7. Manually set sweep time ≥ 10 × (number of points in sweep) × (total on/off period of the transmitted signal).
8. Set detector = power averaging (rms).
9. Sweep time = auto couple.
10. Trace mode = max hold.
11. Allow trace to fully stabilize.
12. Compute power by integrating the spectrum across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal using the instrument's band power measurement function with band limits set equal to the EBW (or occupied bandwidth) band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at 1 MHz intervals extending across the EBW (or, alternatively, levels (in power units) at 1 MHz intervals extending across the EBW (or, alternatively,
13. Add 10 log (1/x), where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times (because the measurement represents an average over both the on and off times of the transmission). For example, add 10 log (1/0.25) = 6 dB if the duty cycle is 25%.
14. Use the peak marker function to determine the maximum power level in any 1MHz band segment within the fundamental EBW.

5.3.4. Test Setup Layout



5.3.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

5.3.6. Test Result of Power Spectral Density

Temperature	25℃	Humidity	60%
Test Engineer	Aking Jin	Configurations	IEEE 802.11a/n/ac

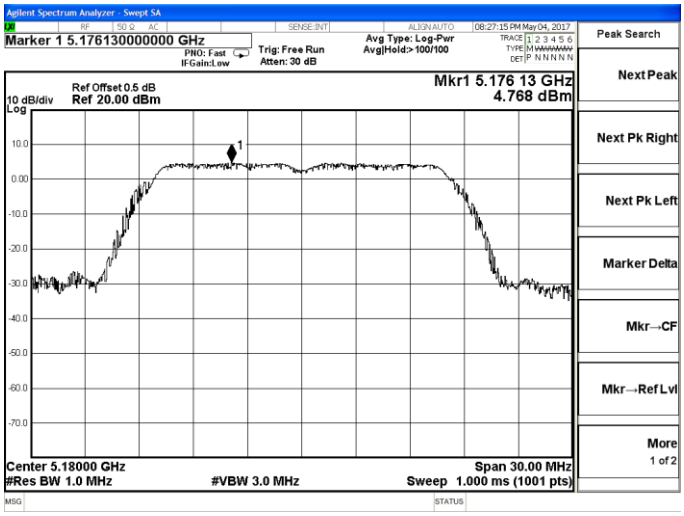
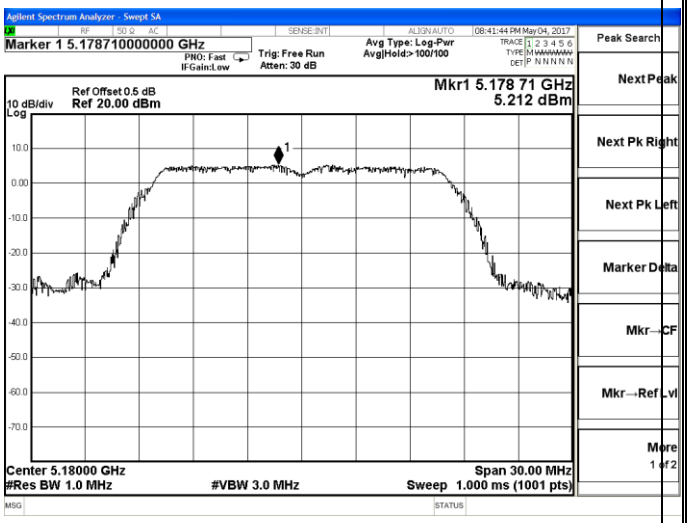
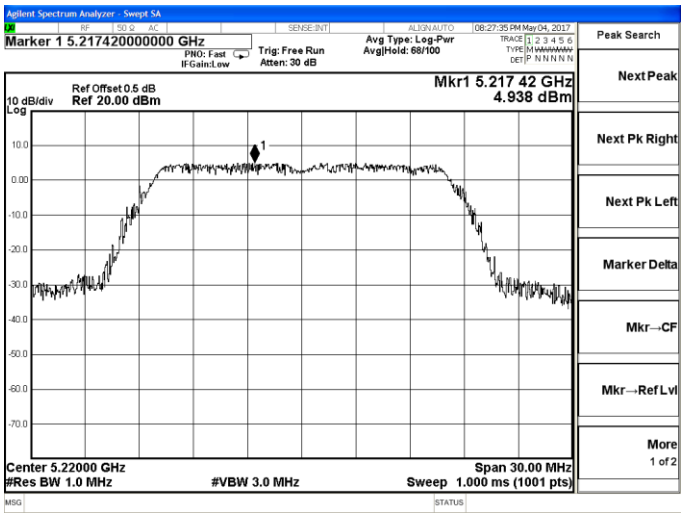
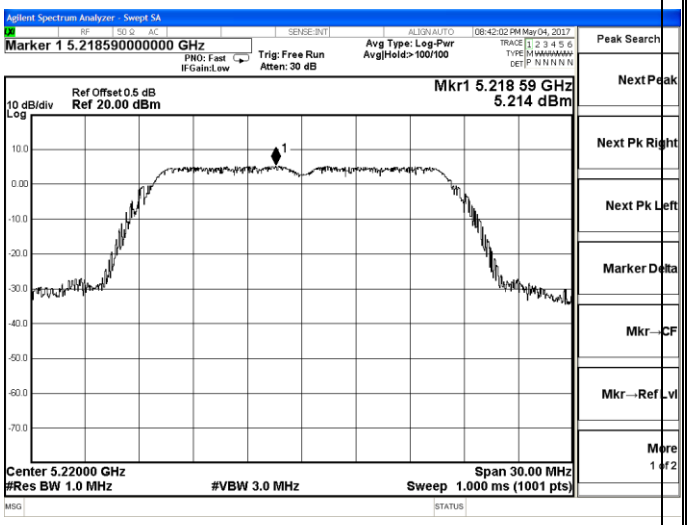
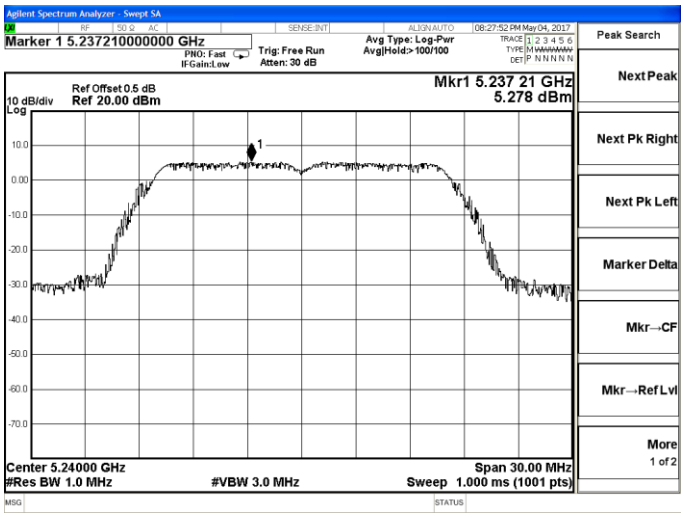
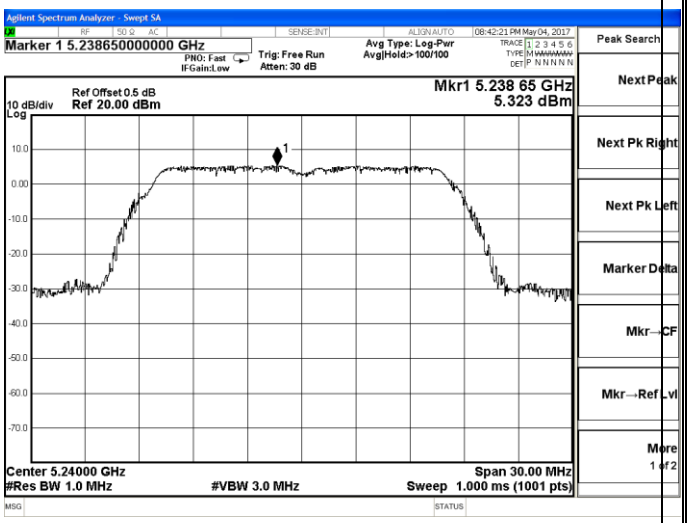
Test Mode	Channel	Frequency (MHz)	Measured Conducted PSD (dBm)			Array Gain (dB)	Duty Cycle factor (dB)	Report Conducted PSD (dBm)			PSD Limits (dBm)	Verdict
			Antenna 0	Antenna 1	Sum			Antenna 0	Antenna 1	Sum		
IEEE 802.11a	36	5180	4.768	5.212	/	0	0	4.768	5.212	/	17.00	PASS
	44	5220	4.938	5.214	/	0	0	4.938	5.214	/		
	48	5240	5.278	5.323	/	0	0	5.278	5.323	/		
IEEE 802.11n HT20	36	5180	3.542	3.800	6.68	3.010	0	3.542	3.800	6.68	17.00	PASS
	44	5220	3.720	3.849	6.80	3.010	0	3.720	3.849	6.80		
	48	5240	3.823	3.910	6.88	3.010	0	3.823	3.910	6.88		
IEEE 802.11ac VHT20	36	5180	2.718	2.852	5.80	3.010	0	2.718	2.852	5.80	17.00	PASS
	44	5220	2.695	2.762	5.74	3.010	0	2.695	2.762	5.74		
	48	5240	2.980	2.971	5.99	3.010	0	2.980	2.971	5.99		
IEEE 802.11n HT40	38	5190	0.781	1.324	4.07	3.010	0	0.781	1.324	4.07	17.00	PASS
	46	5230	1.028	1.297	4.17	3.010	0	1.028	1.297	4.17		
IEEE 802.11ac VHT40	38	5190	-0.131	-0.179	2.86	3.010	0	-0.131	-0.179	2.86	17.00	PASS
	46	5230	-0.331	0.062	2.88	3.010	0	-0.331	0.062	2.88		
IEEE 802.11ac VHT80	42	5210	-1.641	-1.745	1.32	3.010	0	-1.641	-1.745	1.32	17.00	PASS

Remark:

1. *Measured power spectrum density at difference data rate for each mode and recorded worst case for each mode.*
2. *Test results including cable loss;*
3. *Worst case data at 6Mbps at IEEE 802.11a; MCS0 at IEEE 802.11n HT20, IEEE 802.11n HT40, IEEE 802.11a VHT20, IEEE 802.11ac VHT40 and IEEE 802.11ac VHT80;*
4. *For MIMO with CCD technology device, The Directional Gain= Gain of individual transmit antennas (dBi) + Array gain;*
   Array gain = 10 log (N_{ant}), where N_{ant} is the number of transmit antennas.
5. *Directional Gain = 2.00 + 10log (2) = 5.01 dBi < 6dBi; no need reduce power spectrum density limit;*
6. *Report conducted PSD = Measured conducted average power + Duty Cycle factor;*
7. *Please refer to following test plots;*

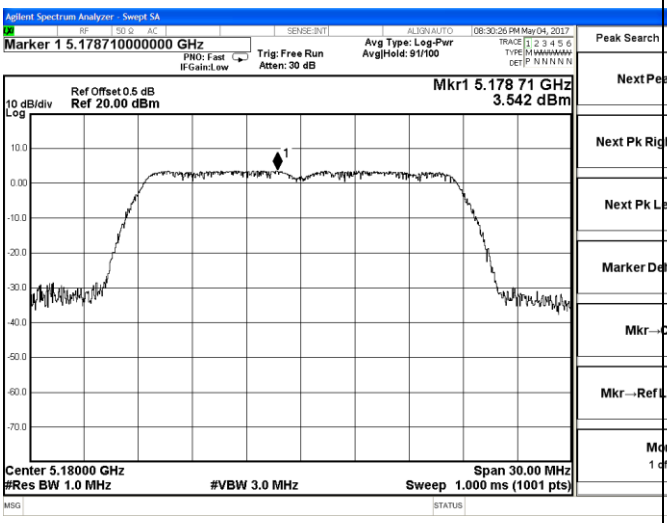
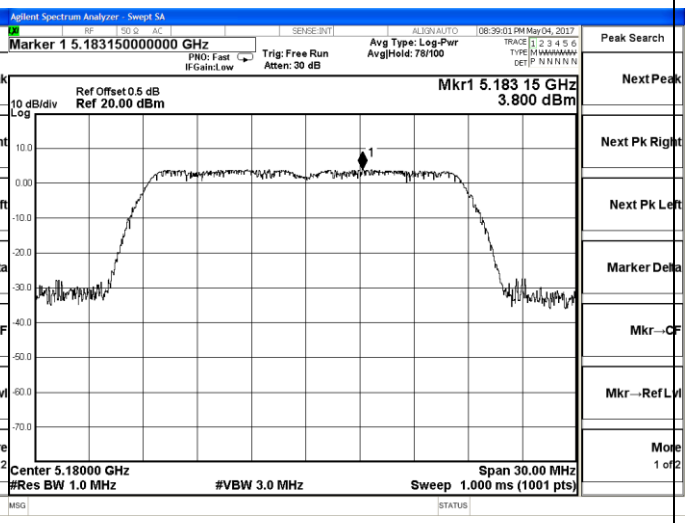
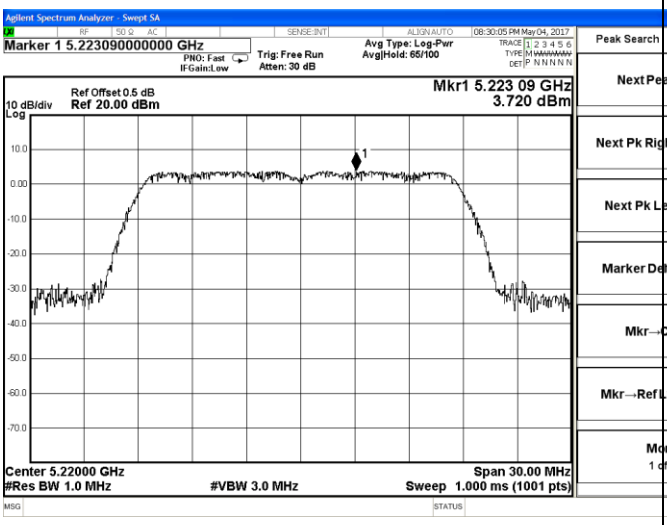
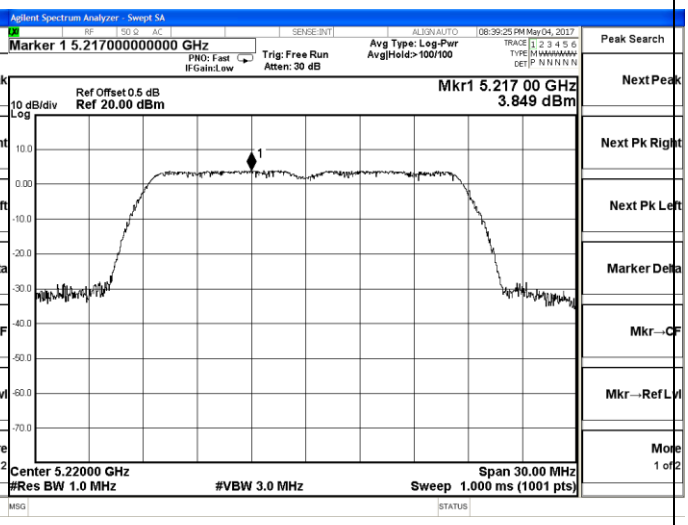
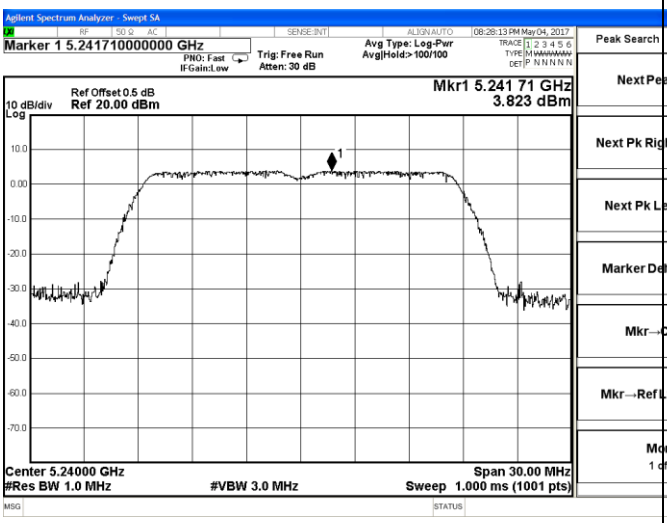
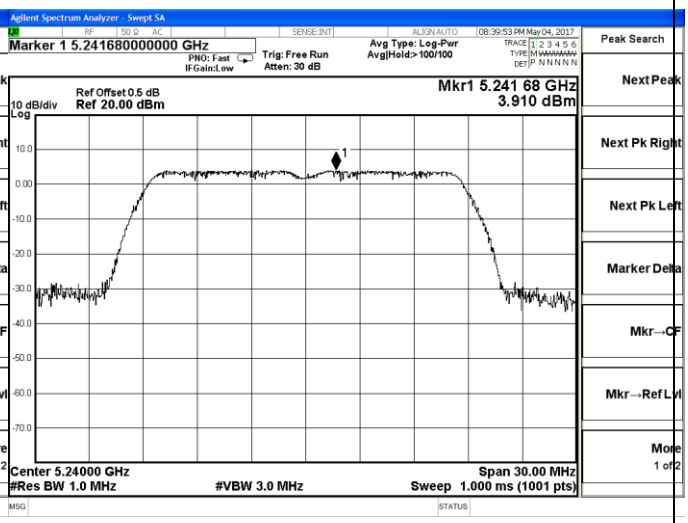
Power Spectrum Density

IEEE 802.11a

Antenna Chain 0	Antenna Chain 1
	
Channel 36 / 5180 MHz	Channel 36 / 5180 MHz
	
Channel 44 / 5220 MHz	Channel 44 / 5220 MHz
	
Channel 48 / 5240 MHz	Channel 48 / 5240 MHz

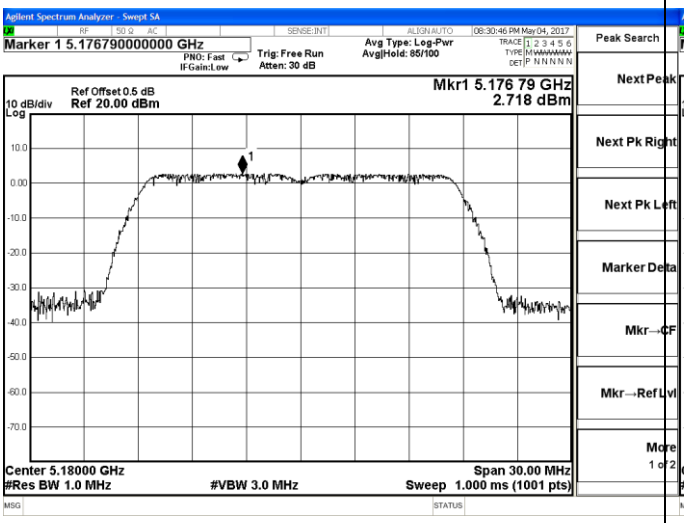
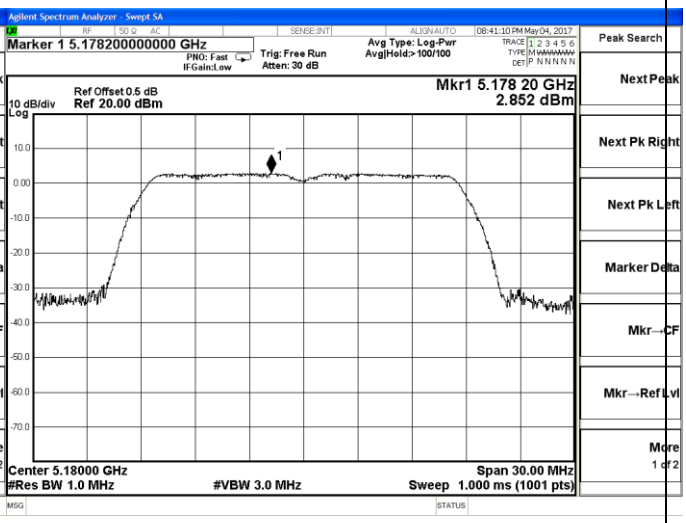
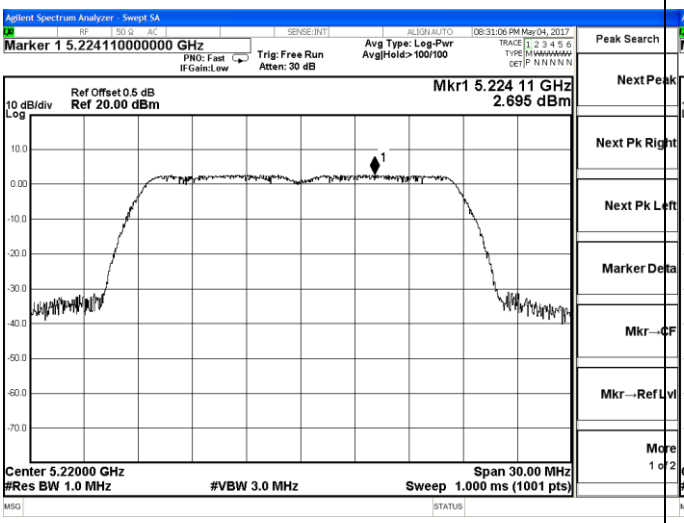
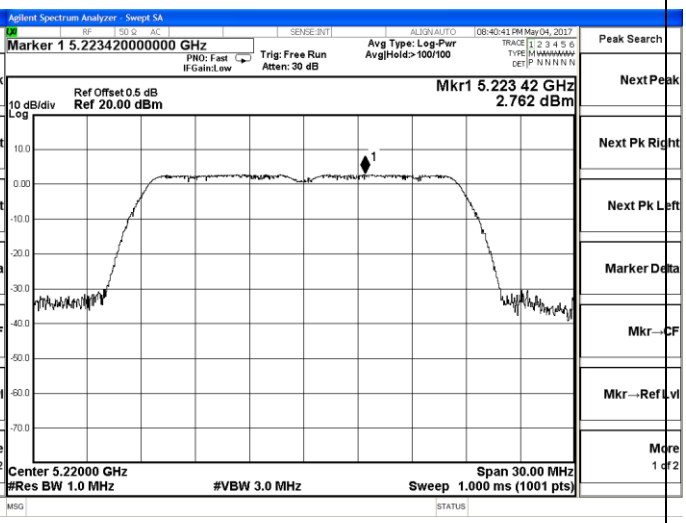
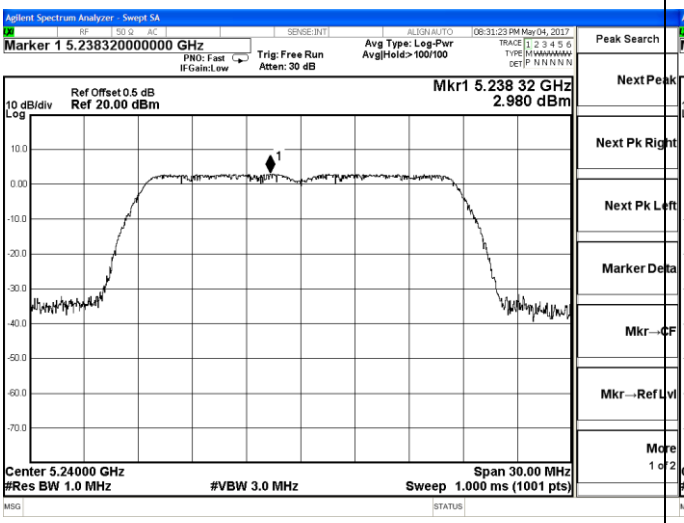
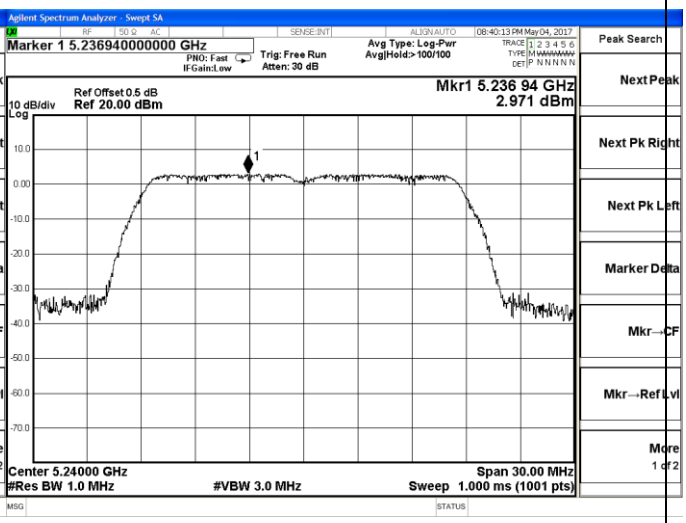
Power Spectrum Density

IEEE 802.11n HT20

Antenna Chain 0	Antenna Chain 1
	
Channel 36 / 5180 MHz	Channel 36 / 5180 MHz
	
Channel 44 / 5220 MHz	Channel 44 / 5220 MHz
	
Channel 48 / 5240 MHz	Channel 48 / 5240 MHz

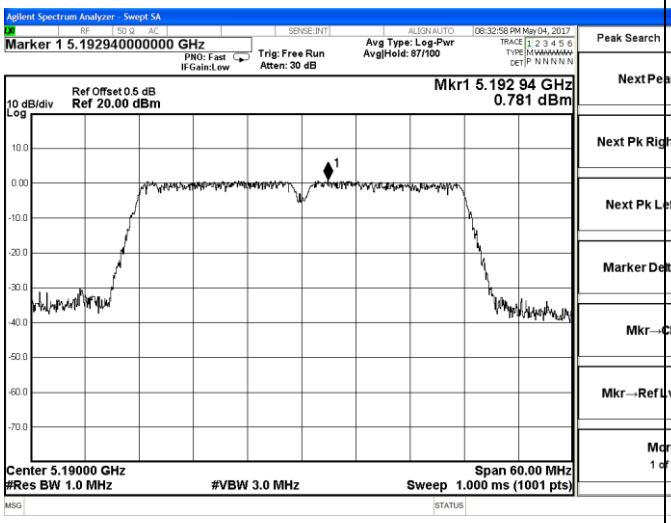
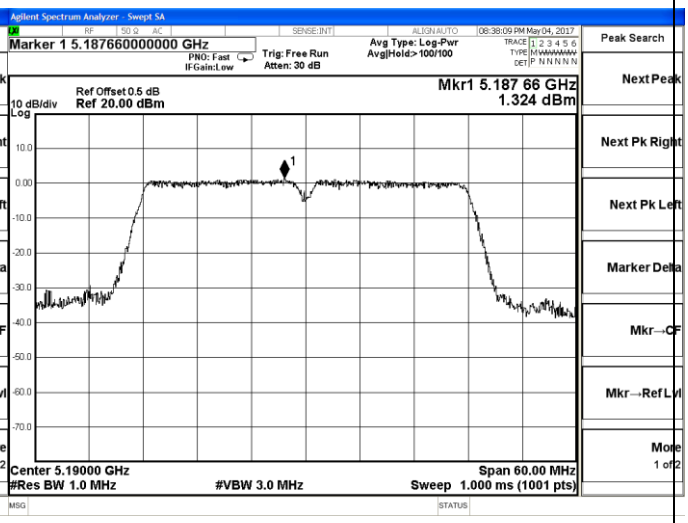
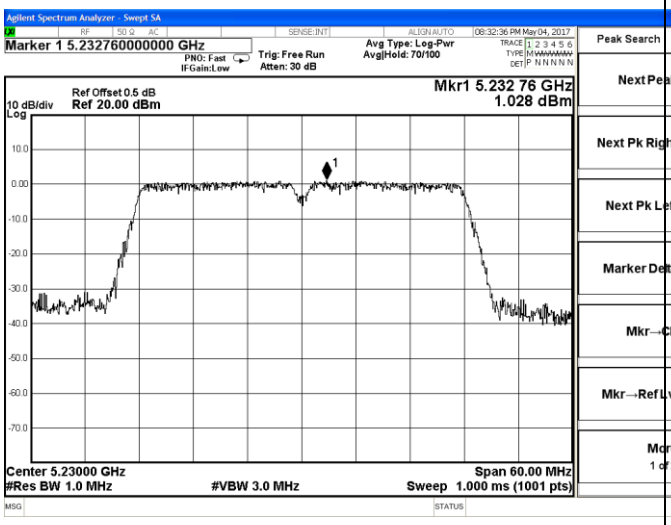
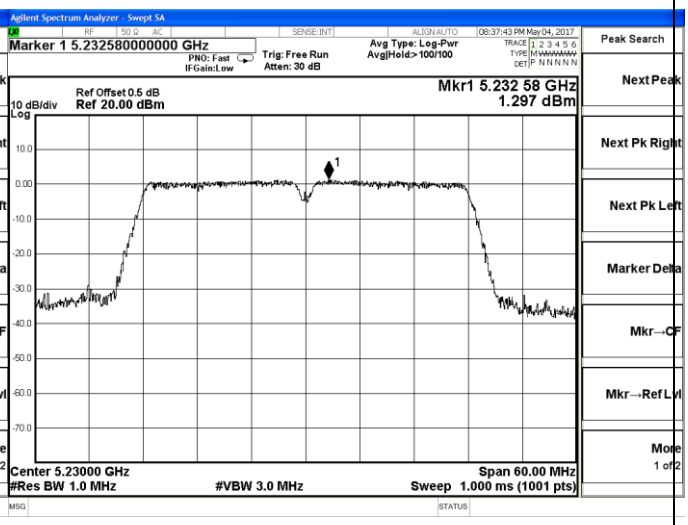
Power Spectrum Density

IEEE 802.11ac VHT20

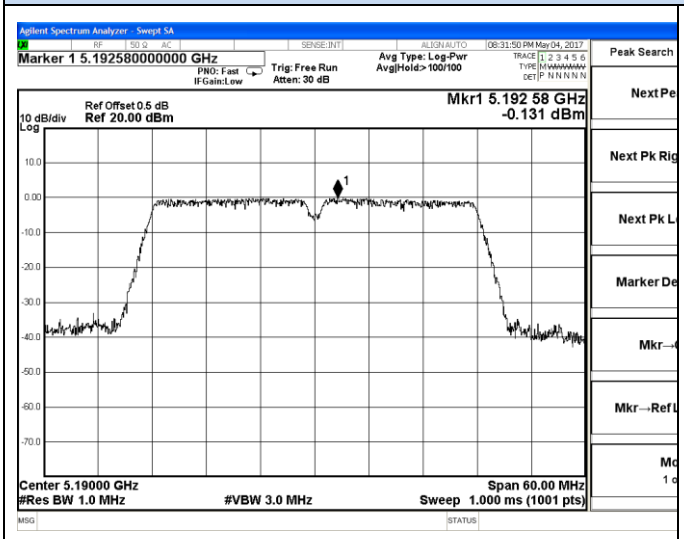
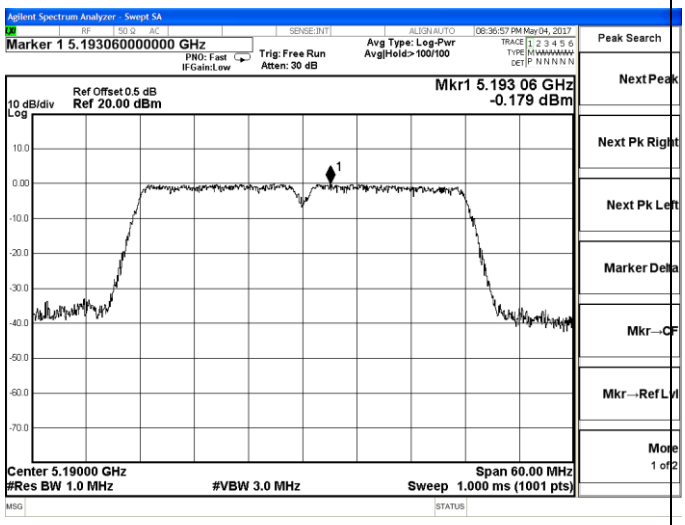
Antenna Chain 0	Antenna Chain 1
	
Channel 36 / 5180 MHz	Channel 36 / 5180 MHz
	
Channel 44 / 5220 MHz	Channel 44 / 5220 MHz
	
Channel 48 / 5240 MHz	Channel 48 / 5240 MHz

Power Spectrum Density

IEEE 802.11n HT40

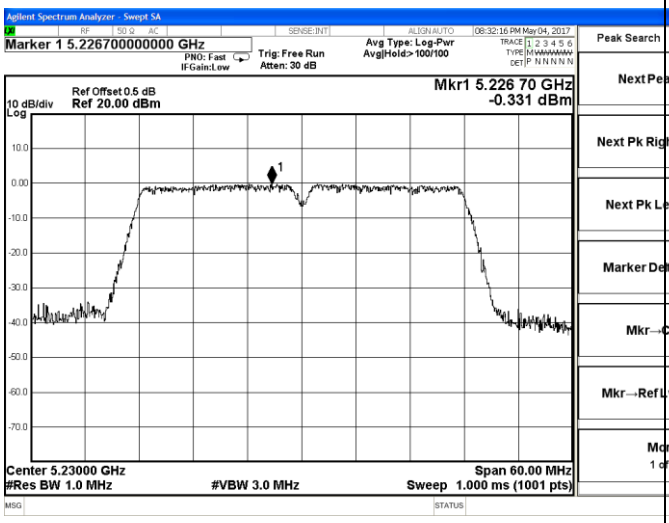
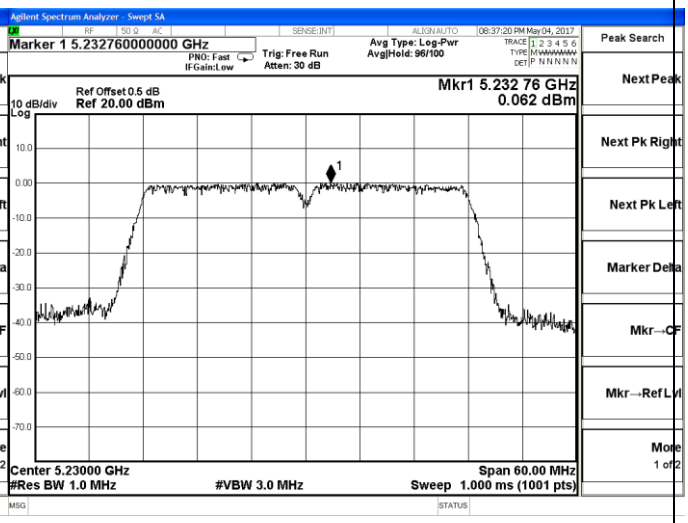
Antenna Chain 0	Antenna Chain 1
	
Channel 38 / 5190 MHz	Channel 38 / 5190 MHz
	
Channel 46 / 5230 MHz	Channel 46 / 5230 MHz

IEEE 802.11ac VHT40

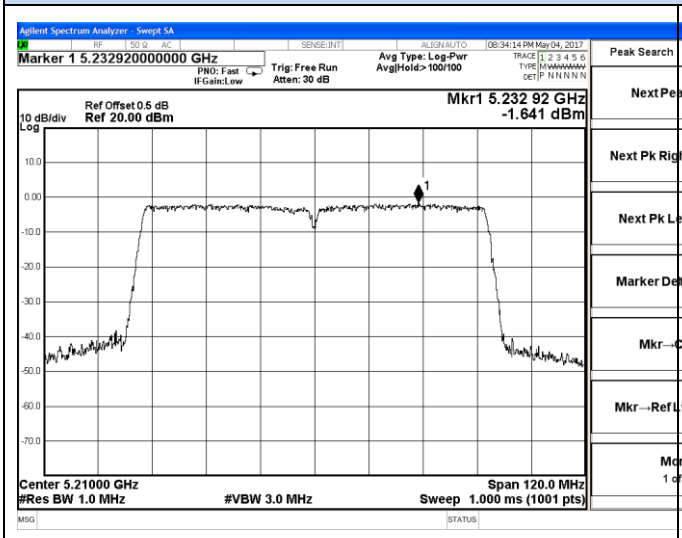
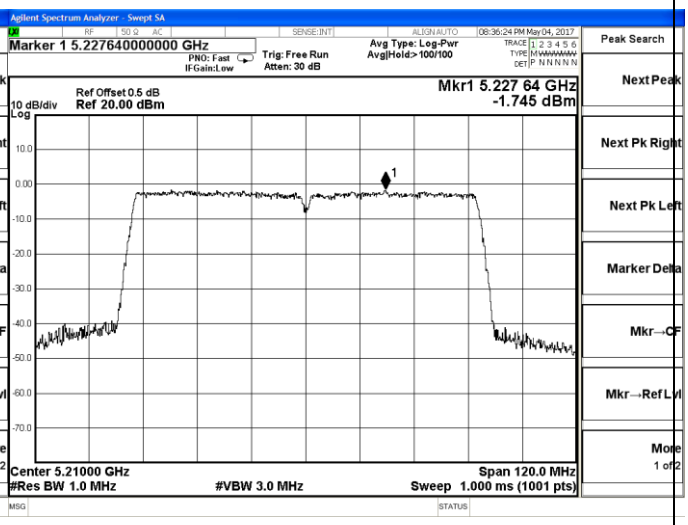
	
Channel 38 / 5190 MHz	Channel 38 / 5190 MHz

Power Spectrum Density

IEEE 802.11ac VHT40

Antenna Chain 0	Antenna Chain 1
	
Channel 46 / 5230 MHz	Channel 46 / 5230 MHz

IEEE 802.11ac VHT80

	
Channel 48 / 5210 MHz	Channel 48 / 5210 MHz

5.4. 99% and 26dB Occupied Bandwidth Measurement

5.4.1. Standard Applicable

No restriction limits. But resolution bandwidth within band edge measurement is 1% of the 99% occupied bandwidth.

5.4.2. Measuring Instruments and Setting

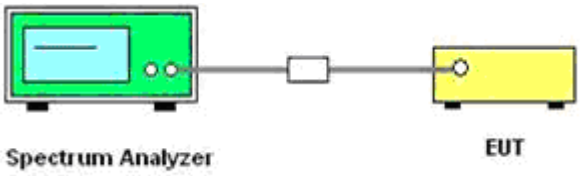
Please refer to section 6 of equipment list in this report. The following table is the setting of the Spectrum Analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span	> 26dB Bandwidth
Detector	Peak
Trace	Max Hold
Sweep Time	100ms

5.4.3. Test Procedures

1. The transmitter output (antenna port) was connected to the spectrum analyzer in peak hold mode.
2. The resolution bandwidth of 300 KHz and the video bandwidth of 1000 KHz were used.
3. Measured the spectrum width with power higher than 26dB below carrier.

5.4.4. Test Setup Layout



5.4.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

5.4.6. Test Result of 99% and 26dB Occupied Bandwidth

Temperature	25℃	Humidity	60%
Test Engineer	Aking Jin	Configurations	IEEE 802.11a/n/ac

Test Mode	Channel	Frequency (MHz)	26dB Bandwidth (MHz)		99% Bandwidth (MHz)		Limits (MHz)	Verdict
			Antenna 0	Antenna 1	Antenna 0	Antenna 1		
IEEE 802.11a	36	5180	19.95	19.80	16.950	16.950	No Limit	PASS
	44	5220	19.76	19.96	16.944	16.949		
	48	5240	20.04	19.86	16.859	16.952		
IEEE 802.11n HT20	36	5180	19.87	19.99	17.799	17.788	No Limit	PASS
	44	5220	19.95	19.93	17.812	17.813		
	48	5240	20.04	19.99	17.801	17.808		
IEEE 802.11ac VHT20	36	5180	20.07	19.94	17.805	17.803	No Limit	PASS
	44	5220	19.98	19.95	17.808	17.771		
	48	5240	19.97	19.82	17.783	17.811		
IEEE 802.11n HT40	38	5190	39.97	39.59	36.171	36.230	No Limit	PASS
	46	5230	40.18	39.90	36.193	36.211		
IEEE 802.11ac VHT40	38	5190	39.96	40.27	36.206	36.215	No Limit	PASS
	46	5230	40.17	39.92	36.171	36.194		
IEEE 802.11ac VHT80	42	5210	89.70	81.02	75.752	75.796	No Limit	PASS

Remark:

1. *Measured 99% and 26dB bandwidth at difference data rate for each mode and recorded worst case for each mode.*
2. *Test results including cable loss;*
3. *Worst case data at 6Mbps at IEEE 802.11a; MCS0 at IEEE 802.11n HT20, IEEE 802.11n HT40, IEEE 802.11a VHT20, IEEE 802.11ac VHT40 and IEEE 802.11ac VHT80;*
4. *Please refer to following test plots;*

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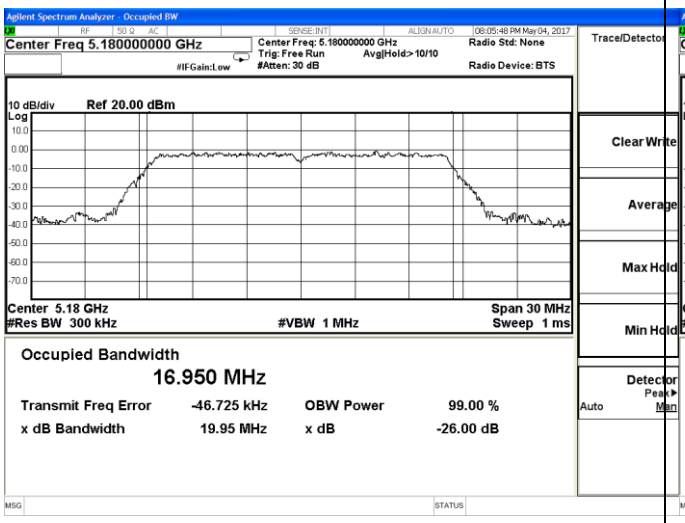
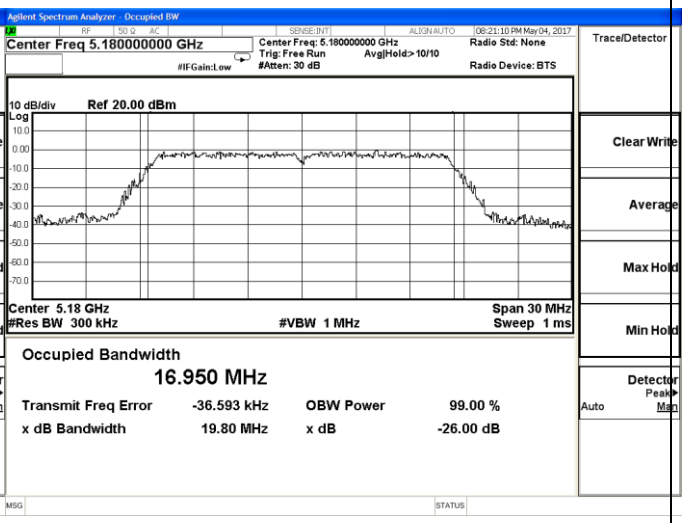
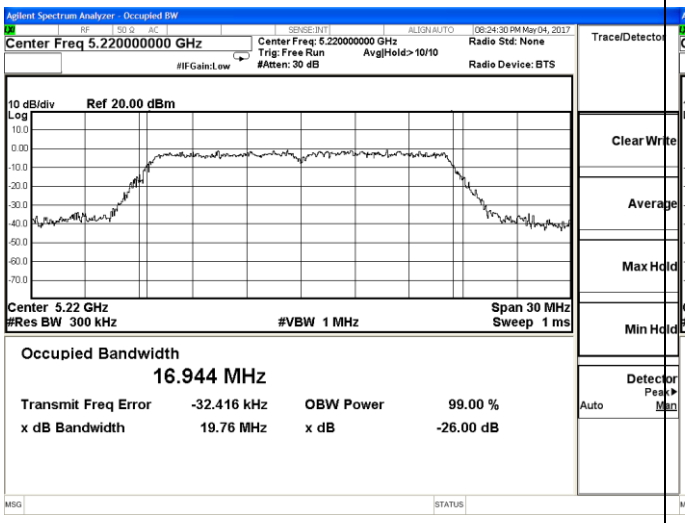
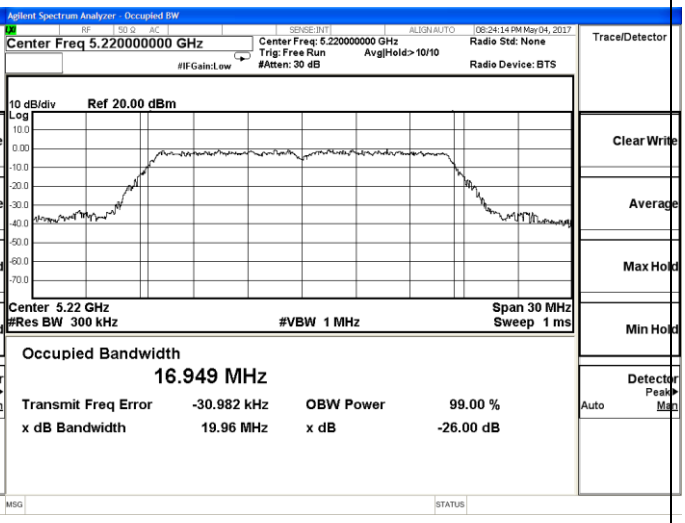
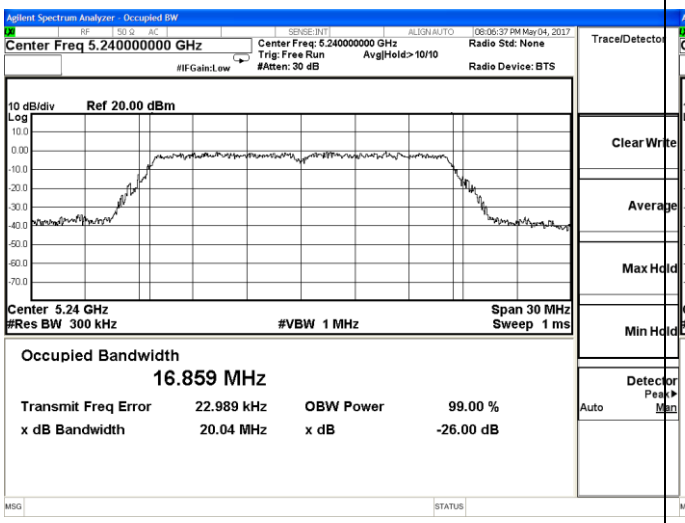
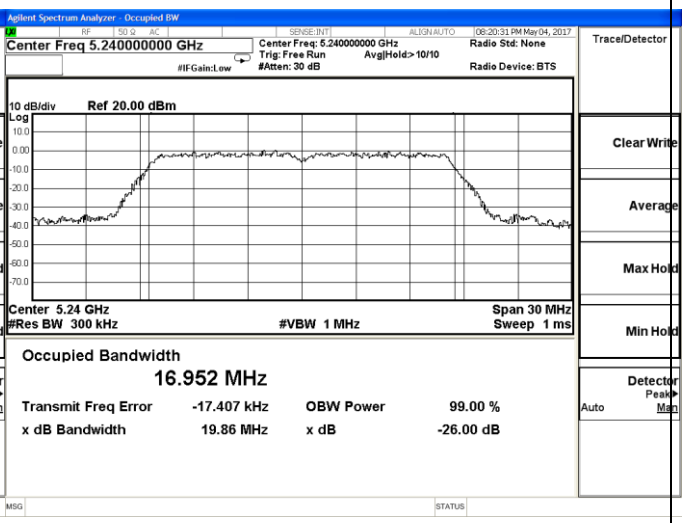
99% and 26dB Occupied Bandwidth

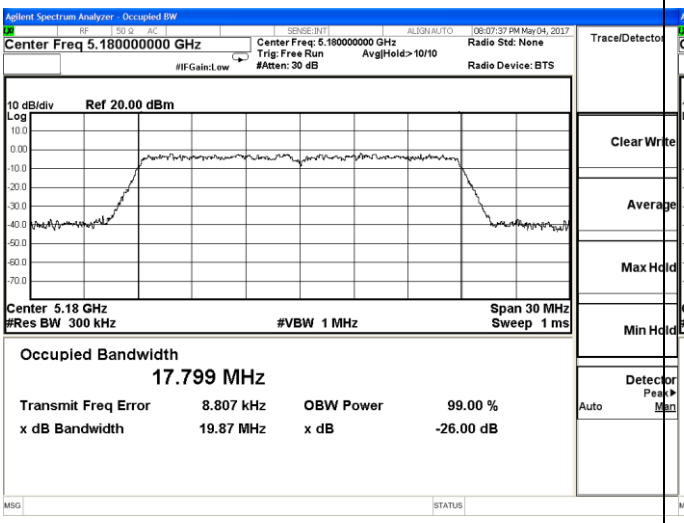
IEEE 802.11a

Antenna Chain 0	Antenna Chain 1
	
Channel 36 / 5180 MHz	Channel 36 / 5180 MHz
	
Channel 44 / 5220 MHz	Channel 44 / 5220 MHz
	
Channel 48 / 5240 MHz	Channel 48 / 5240 MHz

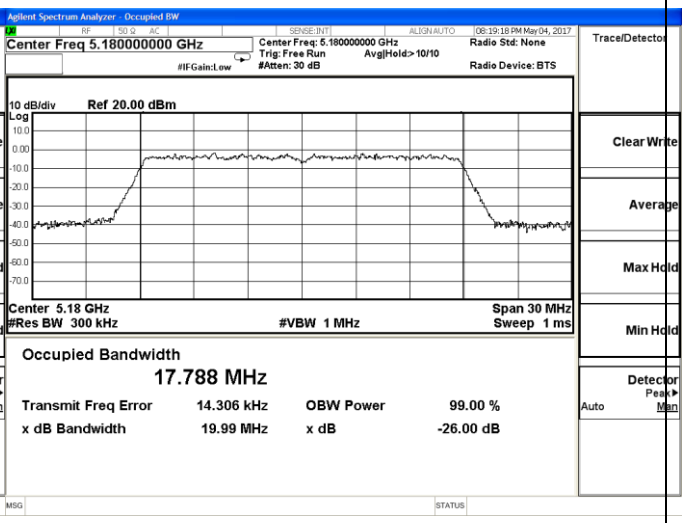
99% and 26dB Occupied Bandwidth

IEEE 802.11n HT20

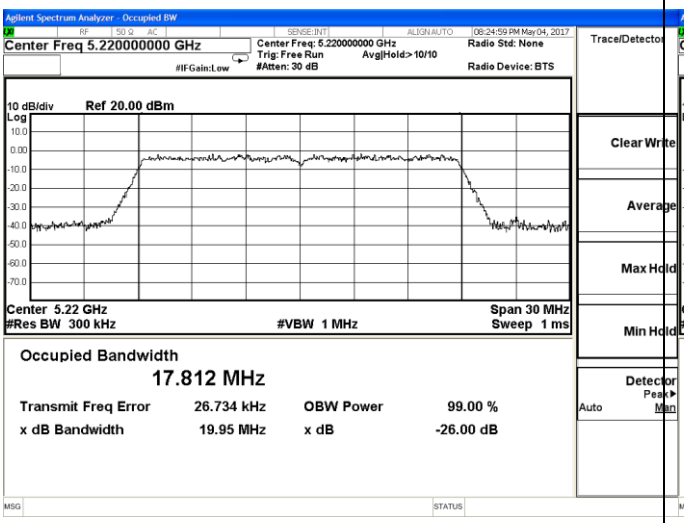
Antenna Chain 0



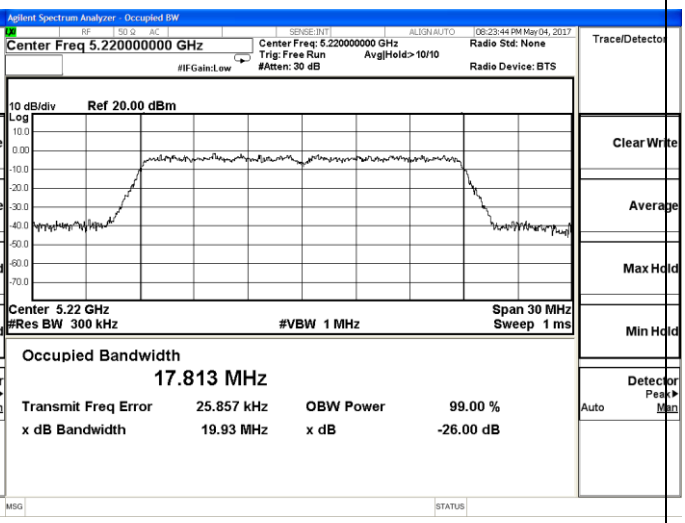
Antenna Chain 1



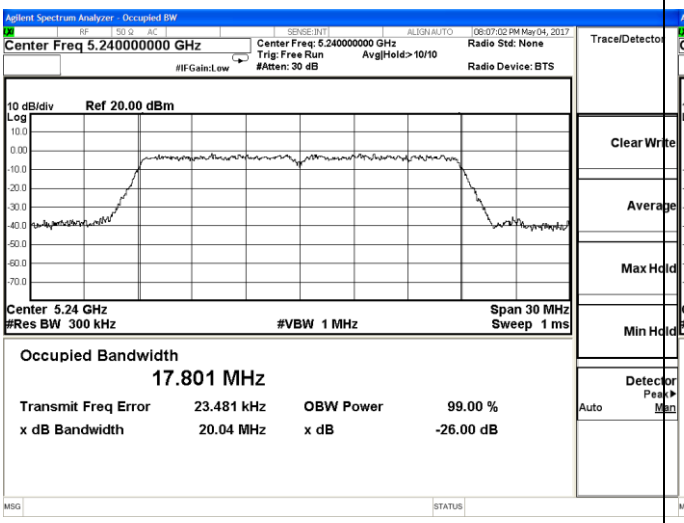
Channel 36 / 5180 MHz



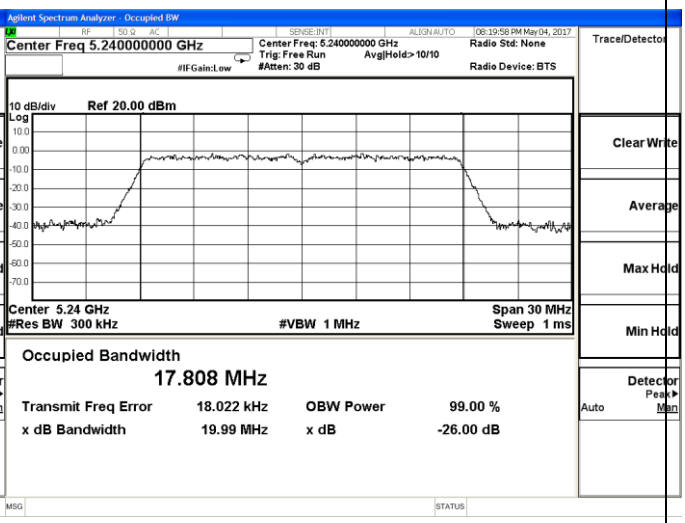
Channel 36 / 5180 MHz



Channel 44 / 5220 MHz



Channel 44 / 5220 MHz

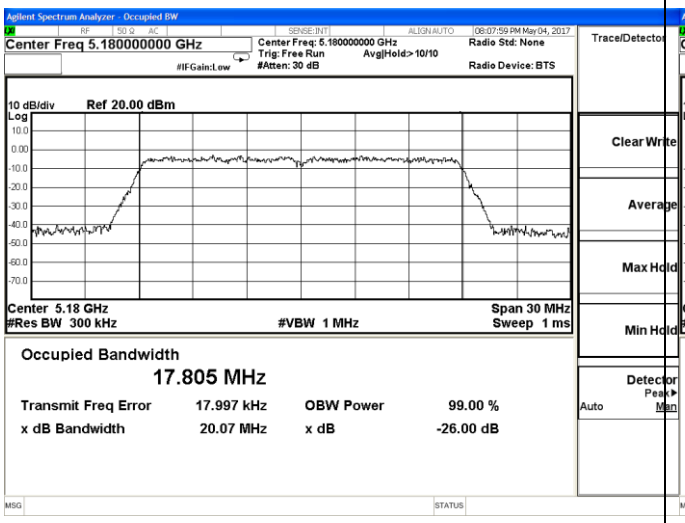
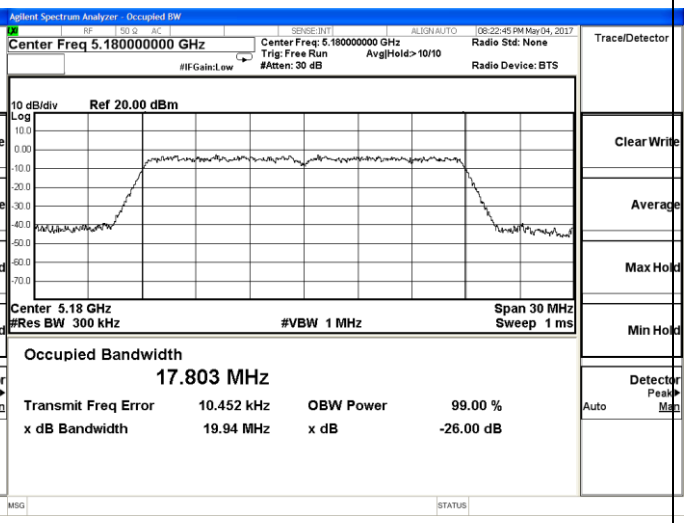
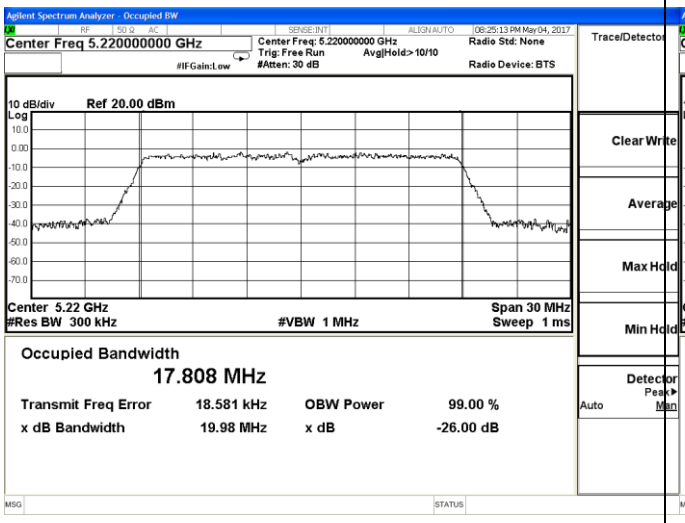
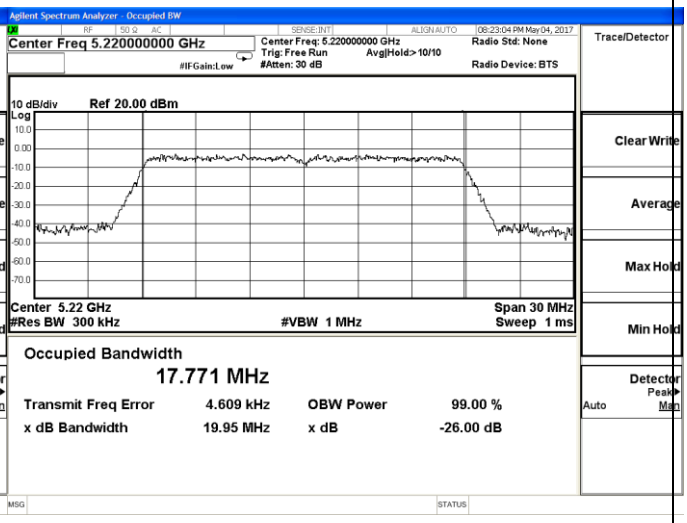
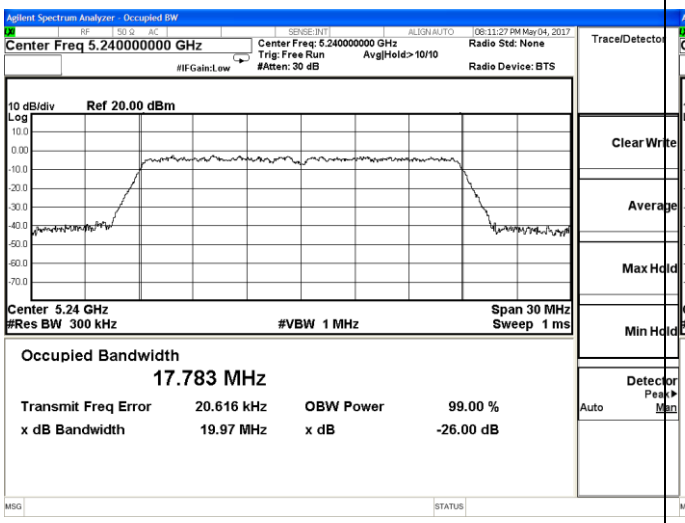
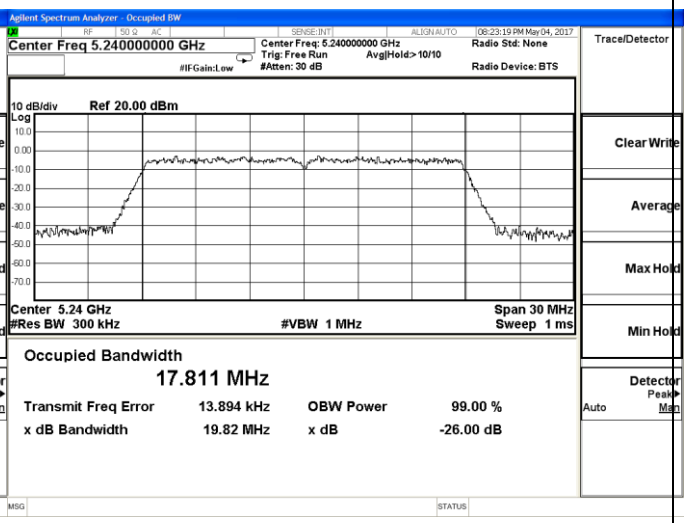


Channel 48 / 5240 MHz

Channel 48 / 5240 MHz

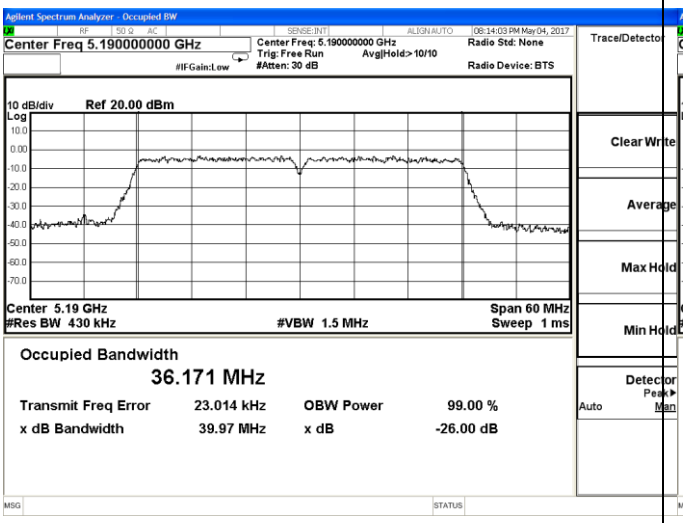
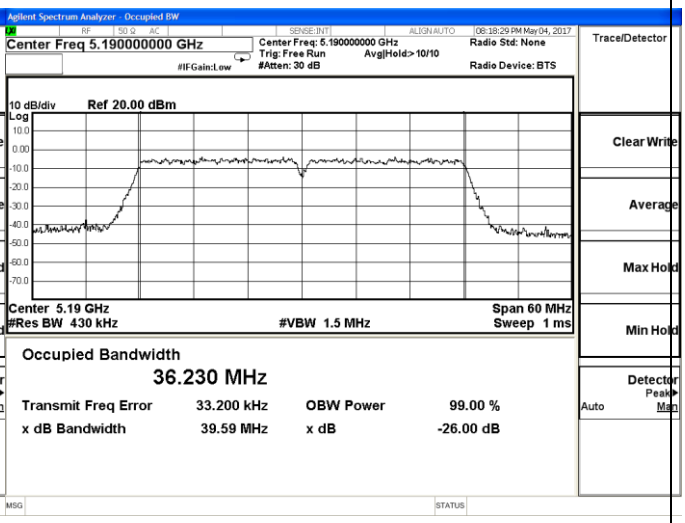
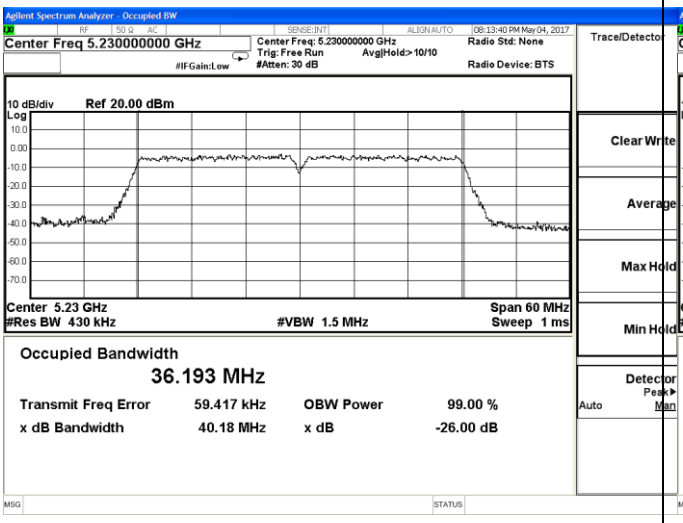
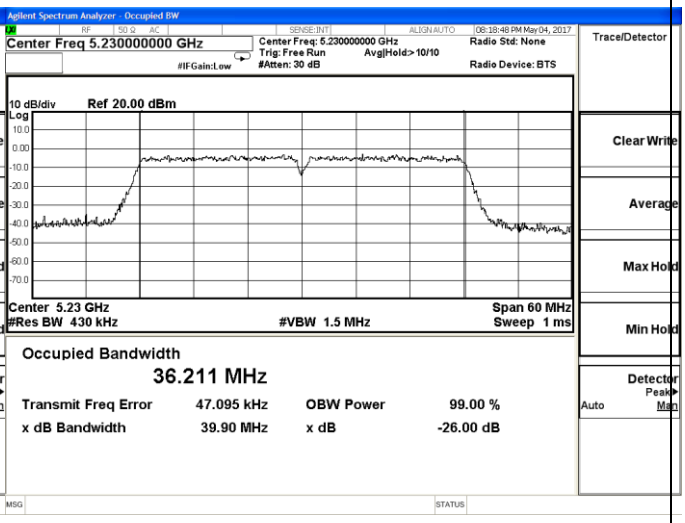
99% and 26dB Occupied Bandwidth

IEEE 802.11ac VHT20

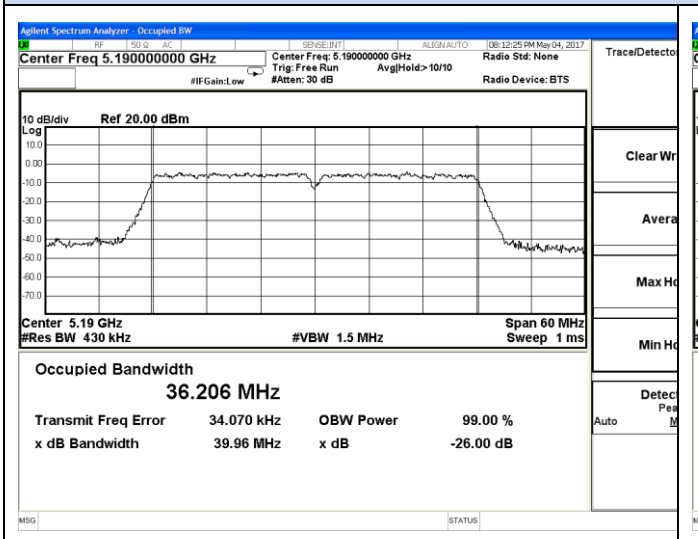
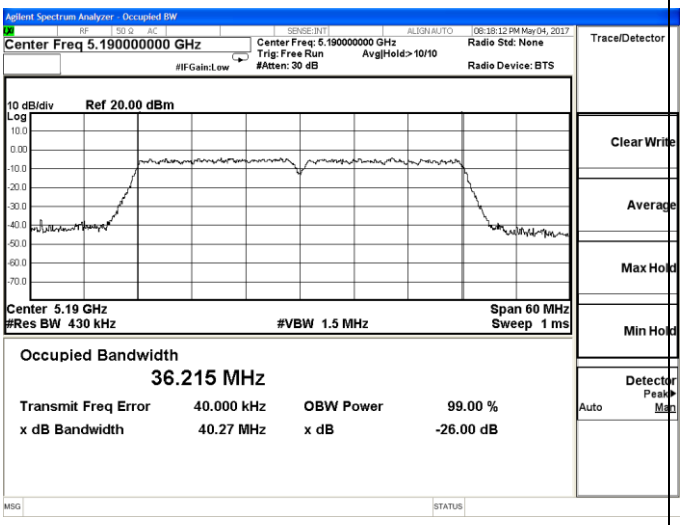
Antenna Chain 0	Antenna Chain 1
	
Channel 36 / 5180 MHz	Channel 36 / 5180 MHz
	
Channel 44 / 5220 MHz	Channel 44 / 5220 MHz
	
Channel 48 / 5240 MHz	Channel 48 / 5240 MHz

99% and 26dB Occupied Bandwidth

IEEE 802.11n HT40

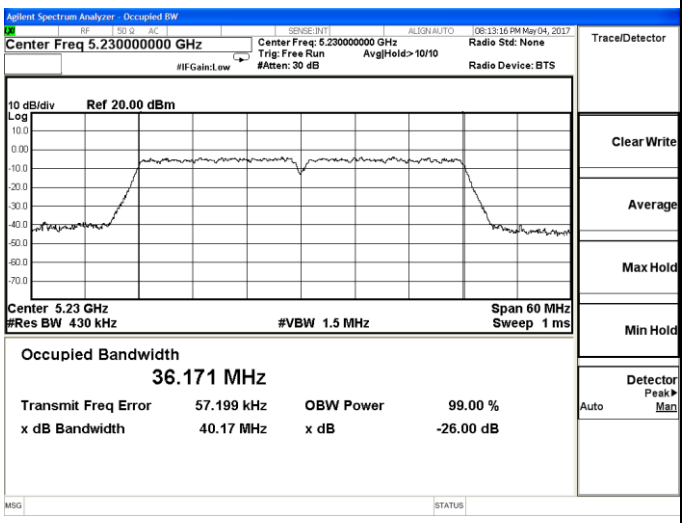
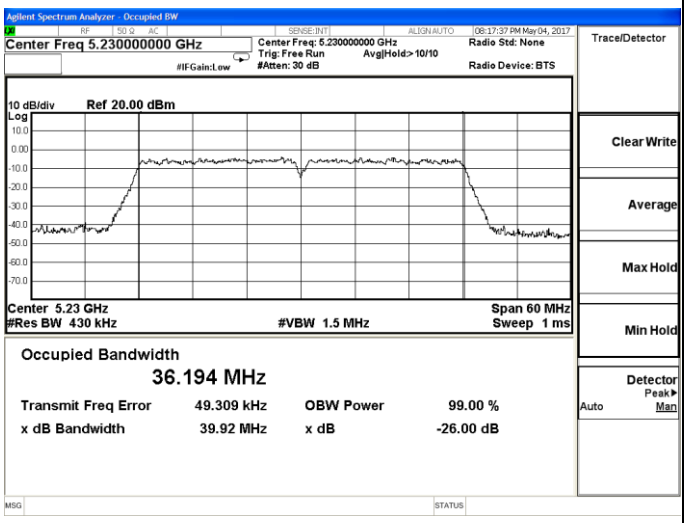
Antenna Chain 0	Antenna Chain 1
	
Channel 38 / 5190 MHz	Channel 38 / 5190 MHz
	
Channel 46 / 5230 MHz	Channel 46 / 5230 MHz

IEEE 802.11ac VHT40

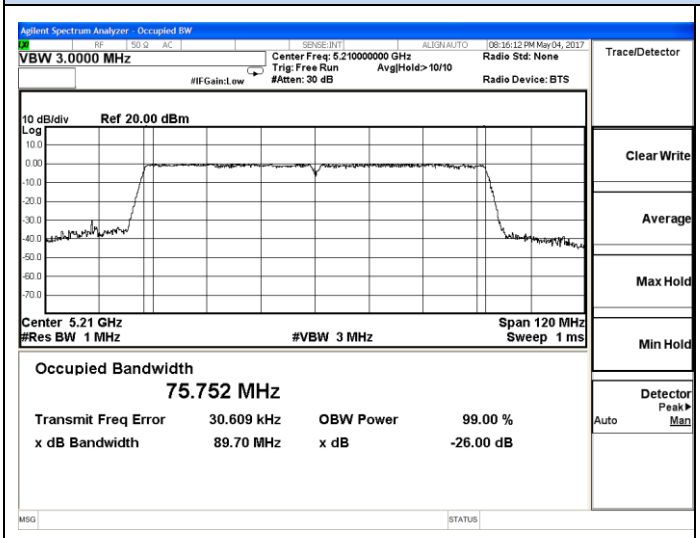
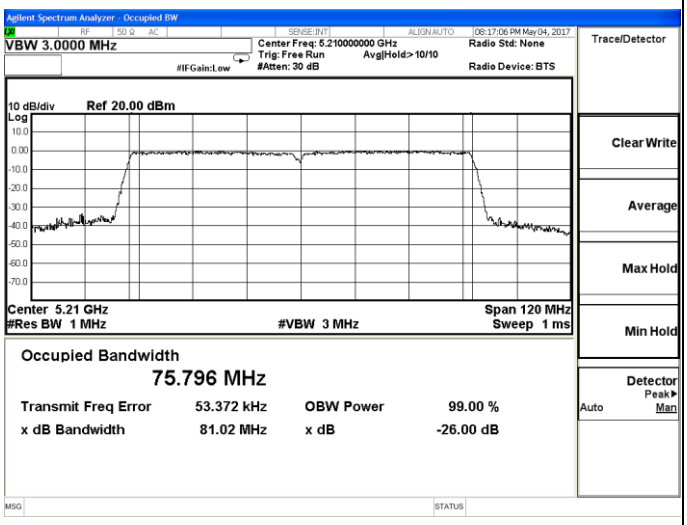
	
Channel 38 / 5190 MHz	Channel 38 / 5190 MHz

99% and 26dB Occupied Bandwidth

IEEE 802.11ac VHT40

Antenna Chain 0	Antenna Chain 1
	
Channel 46 / 5230 MHz	Channel 46 / 5230 MHz

IEEE 802.11ac VHT80

	
Channel 42 / 5210 MHz	Channel 42 / 5210 MHz

5.5. Radiated Emissions Measurement

5.5.1. Standard Applicable

15.205 (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	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293.	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	(\2\)
13.36-13.41			

\1\ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.
\2\ Above 38.6

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 (68.2dBuV/m at 3m).

In addition, In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

5.5.2. Measuring Instruments and Setting

Please refer to section 6 of equipment list in this report. The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (Emission in restricted band)	1MHz / 1MHz for Peak, 1 MHz / 1/B kHz for Average
RB / VB (Emission in non-restricted band)	1MHz / 1MHz for Peak, 1 MHz / 1/B kHz for Average

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB/VB 200Hz/1KHz for QP/AVG
Start ~ Stop Frequency	150kHz~30MHz / RB/VB 9kHz/30KHz for QP/AVG
Start ~ Stop Frequency	30MHz~1000MHz / RB/VB 120kHz/1MHz for QP

5.5.3. Test Procedures

1) **Sequence of testing 9 kHz to 30 MHz**

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 0.8 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions.

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna height is 1.5 meter.

--- At each turntable position the analyzer sweeps with peak detection to find the maximum of all emissions

Final measurement:

--- Identified emissions during the premeasurement the software maximizes by rotating the turntable position (0° to 360°) and by rotating the elevation axes (0° to 360°).

--- The final measurement will be done in the position (turntable and elevation) causing the highest emissions with QPK detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

2) **Sequence of testing 30 MHz to 1 GHz**

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna is polarized vertical and horizontal.

--- The antenna height changes from 1 to 3 meter.

--- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

Final measurement:

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (± 45°) and antenna movement between 1 and 4 meter.

--- The final measurement will be done with QP detector with an EMI receiver.

--- The final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

3) **Sequence of testing 1 GHz to 18 GHz**

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna is polarized vertical and horizontal.

--- The antenna height scan range is 1 meter to 2.5 meter.

--- At each turntable position and antenna polarization the analyzer sweeps with peak detection to find the maximum of all emissions.

Final measurement:

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (± 45°) and antenna movement between 1 and 4 meter. This procedure is repeated for both antenna polarizations.

--- The final measurement will be done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and Average detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

4) **Sequence of testing above 18 GHz**

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 1 meter.

--- The EUT was set into operation.

Premeasurement:

--- The antenna is moved spherical over the EUT in different polarizations of the antenna.

Final measurement:

--- The final measurement will be performed at the position and antenna orientation for all detected emissions that were found during the premeasurements with Peak and Average detector.

--- The final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.