FCC Test Report

Report No.:	RF141225E12G-1 R1
FCC ID:	Q87-WRT1900ACV2
Test Model:	WRT1900ACSV2
Series Model:	WRT1900ACS V2, WRT1900ACS
Received Date:	Mar. 30, 2016
Test Date:	Mar. 30 ~ May 11, 2016
Issued Date:	Jun. 14, 2016
Applicant:	Linksys LLC
Address:	121 Theory Drive Irvine California 92617 United States
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
Lab Address:	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan R.O.C.
Test Location (1):	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan R.O.C.
Test Location (2):	No. 49, Ln. 206, Wende Rd., Shangshan Tsuen, Chiung Lin Hsiang, Hsin Chu Hsien 307, Taiwan R.O.C.

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Report Issue History Record

Issue No.	Reason for Change	Date Issued
RF141225E12-1	Original	Mar. 13, 2015
RF141225E12E-1	Added one model No.: WRT1900ACS	Aug. 10, 2015
RF141225E12F	1. Upgrade the standard to section 15.407 under new rule for U-NII-3 band. 2. Removed the original adapter “Model: MU42-1120300-A1” 3. Added one model No.: WRT1900ACSV2	May 10, 2016
RF141225E12G-1	Upgrade the standard to section 15.407 under new rule (16-24) for U-NII-3 band.	May 19, 2016
RF141225E12G-1 R1	Modified the series model from WRT1900ACV2 to WRT1900ACS V2	Jun. 14, 2016

Release Control Record

Issue No.	Description	Date Issued
RF141225E12G-1	Original release	May 19, 2016
RF141225E12G-1 R1	Modified the series model from WRT1900ACV2 to WRT1900ACS V2	Jun. 14, 2016

1 Certificate of Conformity

Product:	802.11ac Router
Brand:	Linksys
Test Model:	WRT1900ACSV2
Series Model:	WRT1900ACS V2, WRT1900ACS
Sample Status:	Engineering Sample
Applicant:	Linksys LLC
Test Date:	Mar. 30 ~ May 11, 2016
Standards:	47 CFR FCC Part 15, Subpart E (Section 15.407) ANSI C63.10:2013

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

Prepared by : _____ , **Date:** Jun. 14, 2016
Polly Chien / Specialist

Approved by : _____ , **Date:** Jun. 14, 2016
May Chen / Manager

2 Summary of Test Results

47 CFR FCC Part 15, Subpart E (Section 15.407)			
FCC Clause	Test Item	Result	Remarks
15.407(b) (1/2/3/4(i/ii)/6)	Radiated Emissions & Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -1.53B at 5654.98MHz.
15.407(a)(1/2/3)	Max Average Transmit Power	Pass	Meet the requirement of limit.
15.407(a)(1/2/3)	Peak Power Spectral Density	Pass	Meet the requirement of limit.
15.407(e)	6dB bandwidth	Pass	Meet the requirement of limit. (U-NII-3 Band only)
15.407(g)	Frequency Stability	Pass	Meet the requirement of limit.
15.203	Antenna Requirement	Pass	Antenna connector is R-SMA not a standard connector.

*For U-NII-3 band compliance with rule part 15.407(b)(4)(i), the OOBE test plots were recorded in Annex A.

2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Radiated Emissions up to 1 GHz	30MHz ~ 200MHz	5.43 dB
	200MHz ~1000MHz	3.72 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	4.00 dB
	18GHz ~ 40GHz	4.11 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	802.11ac Router
Brand	Linksys
Test Model	WRT1900ACSV2
Series Model	WRT1900ACS V2, WRT1900ACS
Model Difference	Refer to note for more details
Status of EUT	Engineering Sample
Driver version	v7.2.8.6
Power Supply Rating	12Vdc (Adapter)
Modulation Type	256QAM, 64QAM, 16QAM, QPSK, BPSK for OFDM
Modulation Technology	OFDM
Transfer Rate	802.11a: 54/ 48/ 36/ 24/ 18/ 12/ 9/ 6Mbps 802.11n: up to 600Mbps 802.11ac: up to 1733.33Mbps
Operating Frequency	5745 ~ 5825MHz
Number of Channel	802.11a, 802.11n (HT20), 802.11ac (VHT20): 5 802.11n (HT40), 802.11ac (VHT40): 2 802.11ac (VHT80): 1
Output Power	621.046mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	Adapter
Data Cable Supplied	NA

Note:

1. This report is prepared for FCC class II permissive change.
2. This is a supplementary report of Report No.: RF141225E12F. The difference between them is below information: All test data had been re-tested except for AC power conducted emission test item.
   - ◆ Upgraded the standard to section 15.407 under new rule (16-24) for U-NII-3 band.
3. The following models are electrically identical, different model names are for marketing purpose.

Brand	Model No.	Note
Linksys	WRT1900ACSV2	For marketing requirement
	WRT1900ACS V2	
	WRT1900ACS	
From the above models, model: **WRT1900ACSV2** was selected as representative model for the test and its data was recorded in this report.		

4. There are 2.4GHz and 5GHz WLAN technology used for the EUT
5. 2.4GHz and 5GHz technology can transmit at same time.

6. The EUT need to be supplied with a power adapter and following three different models could be chosen as following table:

No	Brand	Model No.	Spec.
1	CWT	2AAF036F US	Input: 100-240V, 1.2A, 50/60Hz Output: 12V, 3A DC output cable: 1.8m, unshielded
2	CWT	2ABN036F US	Input: 100-240V, 1.0A, 50/60Hz Output: 12V, 3A DC output cable: 1.8m, unshielded
3	LINKSYS	MU42-3120300-A1	Input: 100-240V, 1.5A, 50/60Hz Output: 12V, 3A DC output cable: 1.5m, unshielded
Note: For radiated emissions test, the EUT was pre-tested with above adapters, the worst case was found in adapter 3. Therefore only the test data of the adapter was recorded in this report.			

7. The antennas provided to the EUT, please refer to the following table:

Transmitter Circuit	Brand	Gain (dBi)	Cable Loss (dB)	Net Gain (dBi)	Frequency Range (GHz to GHz)	Antenna Type	Connecter Type
Chain (0)	LINKSYS	3.8	1.9	1.9	5.725 ~ 5.85	DIPOLE	R-SMA
Chain (1)	LINKSYS	3.8	2.1	1.7	5.725 ~ 5.85	DIPOLE	R-SMA
Chain (2)	LINKSYS	3.8	2.1	1.7	5.725 ~ 5.85	DIPOLE	R-SMA
Chain (3)	LINKSYS	3.8	1.6	2.2	5.725 ~ 5.85	DIPOLE	R-SMA

8. The EUT has two different Transformer types could be chosen and please refer the below table:

Type 1 (Vendor: MINGTEK)		
Vendor P/N	Vendor	Location
HN1878CG	MINGTEK	T1
HN3678CG	MINGTEK	T2, T3
Type 2 (Vendor: BOTHHAND)		
Vendor P/N	Vendor P/N	Vendor P/N
LG1P109N LF	BOTHHAND	T1
LG2P109N LF	BOTHHAND	T2, T3
From the above types, the worst radiated emission was found in **Type 1** (Vendor: MINGTEK). Therefore only the test data of the type were recorded in this report.		

9. The EUT incorporates a MIMO function with beamforming.

MODULATION MODE	DATA RATE (MCS)	TX & RX CONFIGURATION	
802.11a	6 ~ 54Mbps	4TX	4RX
802.11n (HT20) & 802.11n (HT40)	MCS 0~7	4TX	4RX
	MCS 8~15	4TX	4RX
	MCS 16~23	4TX	4RX
	MCS 24~31	4TX	4RX
802.11ac (VHT20)	MCS0~8 Nss=1	4TX	4RX
	MCS0~8 Nss=2	4TX	4RX
	MCS0~9 Nss=3	4TX	4RX
	MCS0~8 Nss=4	4TX	4RX
802.11ac (VHT40) & 802.11ac (VHT80)	MCS0~9 Nss=1	4TX	4RX
	MCS0~9 Nss=2	4TX	4RX
	MCS0~9 Nss=3	4TX	4RX
	MCS0~9 Nss=4	4TX	4RX

*The modulation and bandwidth are similar for 802.11n mode for 20MHz/40MHz and 802.11ac mode for 20MHz/40MHz, therefore investigated worst case to representative mode in test report. (Final test mode refer section 3.2.1)

10. The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.

3.2 Description of Test Modes

For 5745 ~ 5825MHz:

5 channels are provided for 802.11a, 802.11n (HT20), 802.11ac (VHT20):

Channel	Frequency	Channel	Frequency
149	5745MHz	161	5805MHz
153	5765MHz	165	5825MHz
157	5785MHz		

2 channels are provided for 802.11n (HT40), 802.11ac (VHT40):

Channel	Frequency	Channel	Frequency
151	5755MHz	159	5795MHz

1 channel is provided for 802.11ac (VHT80):

Channel	Frequency
155	5775MHz

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE≥1G	RE<1G	PLC	APCM	
-	√	√	-	√	-

Where **RE≥1G:** Radiated Emission above 1GHz & Bandedge Measurement **RE<1G:** Radiated Emission below 1GHz

PLC: Power Line Conducted Emission **APCM:** Antenna Port Conducted Measurement

Note:

1. In original report, the EUT had been pre-tested on the positioned of each 2 axis. The worst case was found when positioned on Y-plane (for below 1GHz) and X-plane (for above 1GHz).

2. "-" means no effect.

Radiated Emission Test (Above 1GHz):

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	MODE	FREQ. BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
-	802.11a	5745-5825	149 to 165	149, 157, 165	OFDM	BPSK	6
-	802.11ac (VHT20)		149 to 165	149, 157, 165	OFDM	BPSK	6.5
-	802.11ac (VHT40)		151 to 159	151, 159	OFDM	BPSK	13.5
-	802.11ac (VHT80)		155	155	OFDM	BPSK	29.3

Radiated Emission Test (Below 1GHz):

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	MODE	FREQ. BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
-	802.11a	5745-5825	149 to 165	157	OFDM	BPSK	6

Antenna Port Conducted Measurement:

☒ This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

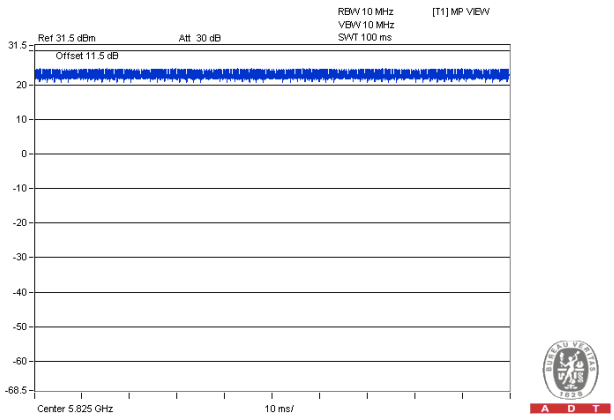
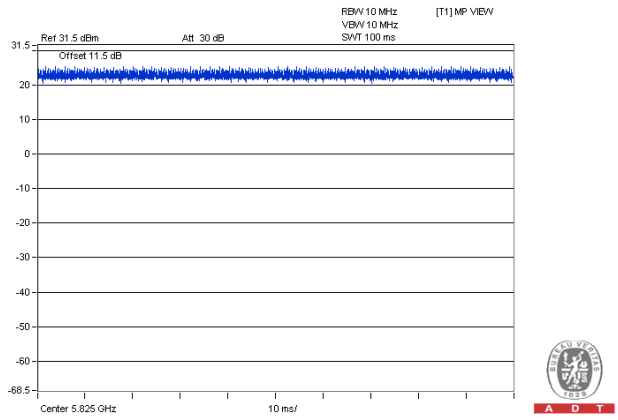
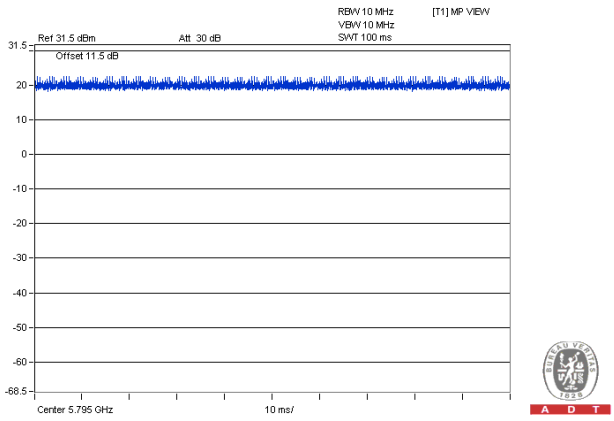
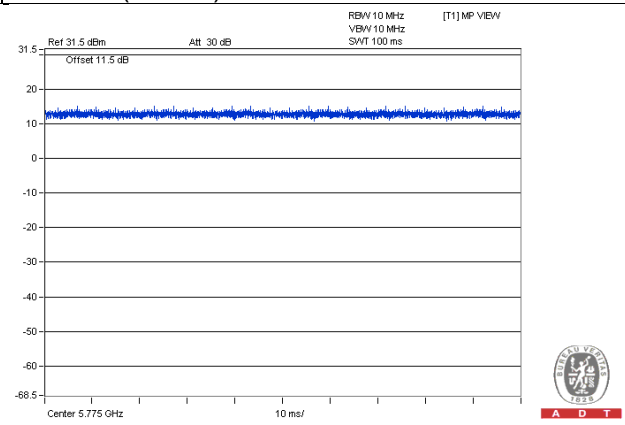
EUT CONFIGURE MODE	MODE	FREQ. BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
-	802.11a	5745-5825	149 to 165	149, 157, 165	OFDM	BPSK	6
-	802.11ac (VHT20)		149 to 165	149, 157, 165	OFDM	BPSK	6.5
-	802.11ac (VHT40)		151 to 159	151, 159	OFDM	BPSK	13.5
-	802.11ac (VHT80)		155	155	OFDM	BPSK	29.3

Test Condition:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE≥1G	26deg. C, 70%RH	120Vac, 60Hz	Andy Ho
RE<1G	23deg. C, 71%RH	120Vac, 60Hz	Weiwei Lo
APCM	26deg. C, 62%RH	120Vac, 60Hz	Anderson Chen

3.3 Duty Cycle of Test Signal

Duty cycle of test signal is 100 %, duty factor is not required.

802.11a	802.11ac (VHT20)
	
802.11ac (VHT40)	**802.11ac (VHT80)**
	

3.4 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

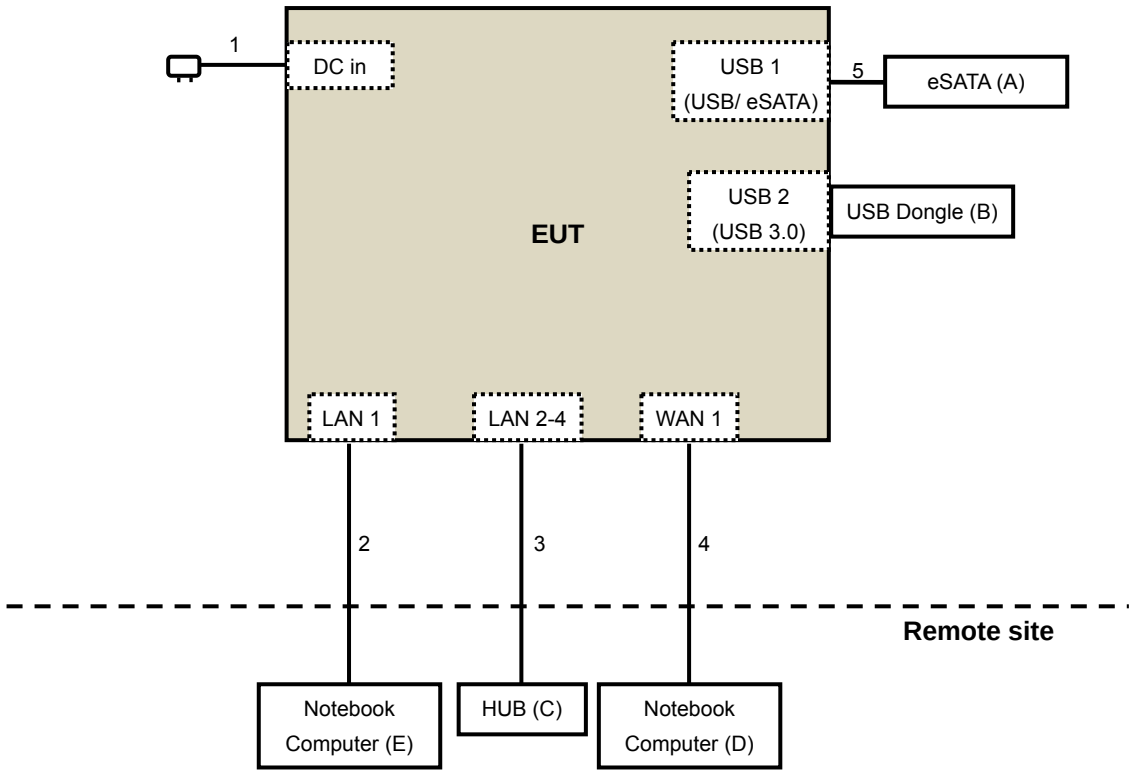
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	eSATA	VANTEC	NST-300SU-BK	02B27B0193	FCC DoC Approved	Provided by Lab
B.	USB 3.0 Dongle	Transcend	TS16GJF750K	NA	NA	Provided by Lab
C.	HUB	ZyXEL	ES-116P	S060H02000215	FCC DoC Approved	Provided by Lab
D.	Notebook Computer	DELL	PP32LA	GSLB32S	FCC DoC Approved	Provided by Lab
E.	Notebook Computer	DELL	E6440	F9LYQ32	FCC DoC Approved	Provided by Lab

Note:

1. All power cords of the above support units are non-shielded (1.8m).
2. Items C-E acted as communication partners to transfer data.

ID	Descriptions	Qty.	Length(m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	DC power cable	1	1.8	No	0	Supplied by Client
2.	RJ45 cable	1	10	No	0	Provided by Lab
3.	RJ45 cable	3	10	No	0	Provided by Lab
4.	RJ45 cable	1	10	No	0	Provided by Lab
5.	Esata cable	1	1	Yes	0	Supplied by Client

3.4.1 Configuration of System under Test



3.5 General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC Part 15, Subpart E (15.407)

KDB 789033 D02 General UNII Test Procedures New Rules v01r02
KDB 662911 D01 Multiple Transmitter Output v02r01

ANSI C63.10-2013

All test items have been performed and recorded as per the above standards.

Note: The EUT has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (DoC). The test report has been issued separately.

4 Test Types and Results

4.1 Radiated Emission and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge Measurement

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table.

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

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

LIMITS OF UNWANTED EMISSION OUT OF THE RESTRICTED BANDS

APPLICABLE TO	LIMIT	
789033 D02 General UNII Test Procedures New Rules v01r02	FIELD STRENGTH AT 3m	
	PK:74 (dBµV/m)	AV:54 (dBµV/m)
APPLICABLE TO	EIRP LIMIT	EQUIVALENT FIELD STRENGTH AT 3m
15.407(b)(1)	PK:-27 (dBm/MHz)	PK:68.2(dBµV/m)
15.407(b)(2)		
15.407(b)(3)		
15.407(b)(4)(i)	PK:-27 (dBm/MHz) *1 PK:10 (dBm/MHz) *2 PK:15.6 (dBm/MHz) *3 PK:27 (dBm/MHz) *4	PK: 68.2(dBµV/m) *1 PK:105.2 (dBµV/m) *2 PK: 110.8(dBµV/m) *3 PK:122.2 (dBµV/m) *4
15.407(b)(4)(ii)	FIELD STRENGTH at 3m / § 15.247(d),	
	PK:74 (dBµV/m)	AV:54 (dBµV/m)

*1 beyond 75 MHz or more above of the band edge.

*2 below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above.

*3 below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above.

*4 from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

NOTE: The following formula is used to convert the equipment isotropic radiated power (eirp) to field strength:

$$E = \frac{1000000\sqrt{30P}}{3}$$ µV/m, where P is the eirp (Watts).

4.1.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver Agilent	N9038A	MY51210202	Dec. 16, 2015	Dec. 15, 2016
Pre-Amplifier(*) EMCI	EMC001340	980142	Jan. 20, 2016	Jan. 19, 2018
Loop Antenna(*) Electro-Metrics	EM-6879	264	Dec. 16, 2014	Dec. 15, 2016
RF Cable	NA	LOOPCAB-001 LOOPCAB-002	Jan. 18, 2016	Jan. 17, 2017
Pre-Amplifier Mini-Circuits	ZFL-1000VH2B	AMP-ZFL-04	Nov. 11, 2015	Nov. 10, 2016
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-361	Jan. 07, 2016	Jan. 06, 2017
RF Cable	8D-FB	CHHCAB-001-1 CHHCAB-001-2	Oct. 04, 2015	Oct. 03, 2016
	RF-141	CHHCAB-004	Oct. 04, 2015	Oct. 03, 2016
Horn_Antenna AISI	AIH.8018	0000220091110	Jan. 18, 2016	Jan. 17, 2017
Pre-Amplifier Agilent	8449B	3008A01923	Oct. 27, 2015	Oct. 26, 2016
RF Cable	NA	131206 131213 131215 SNMY23685/4	Jan. 15, 2016	Jan. 14, 2017
Spectrum Analyzer Agilent	E4446A	MY48250254	Nov. 25, 2015	Nov. 24, 2016
Pre-Amplifier SPACEK LABS	SLKKa-48-6	9K16	Dec. 11, 2015	Dec. 10, 2016
Horn_Antenna SCHWARZBECK	BBHA 9170	9170-424	Jan. 18, 2016	Jan. 17, 2017
RF Cable	SUCOFLEX 102	36442/2 36434/2	Dec. 10, 2015	Dec. 09, 2016
Software	ADT_Radiated_V8.7.07	NA	NA	NA
Antenna Tower & Turn Table CT	NA	NA	NA	NA
Boresight Antenna Fixture	NA	NA	NA	NA
Spectrum Analyzer Agilent	E4446A	MY48250254	Nov. 25, 2015	Nov. 24, 2016
Power meter Anritsu	ML2495A	1014008	Apr. 28, 2015	Apr. 27, 2016
			May 05, 2016	May 04, 2017
Power sensor Anritsu	MA2411B	0917122	Apr. 28, 2015	Apr. 27, 2016
			May 05, 2016	May 04, 2017
Temperature & Humidity Chamber GIANTFORCE	GTH-150-40-SP-AR	MAA0812-008	Jan. 15, 2016	Jan. 14, 2017

Note:
1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The calibration interval of the loop antenna is 24 months and the calibrations are traceable to NML/ROC and NIST/USA.
3. The test was performed in 966 Chamber No. H.
4. The FCC Site Registration No. is 797305.
5. The CANADA Site Registration No. is IC 7450H-3.
6. Loop antenna was used for all emissions below 30 MHz.
7. Tested Date: Mar. 30 ~ May 09, 2016

4.1.3 Test Procedures

a. The EUT was placed on the top of a rotating table 0.8 meters (for below 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.

f. The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

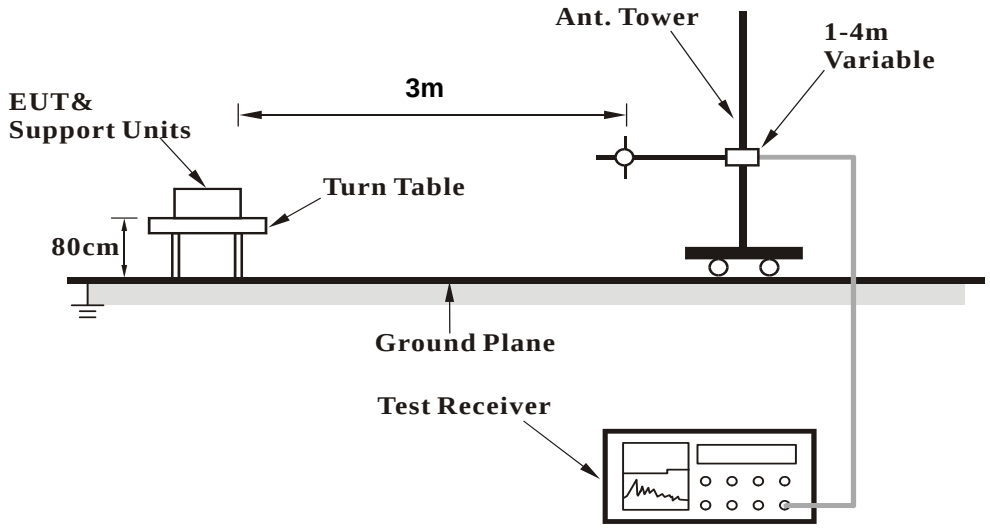
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for RMS Average (Duty cycle < 98%) for Average detection (AV) at frequency above 1GHz, then the measurement results was added to a correction factor (10 log(1/duty cycle)).
4. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz (Duty cycle ≥ 98%) for Average detection (AV) at frequency above 1GHz.
5. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

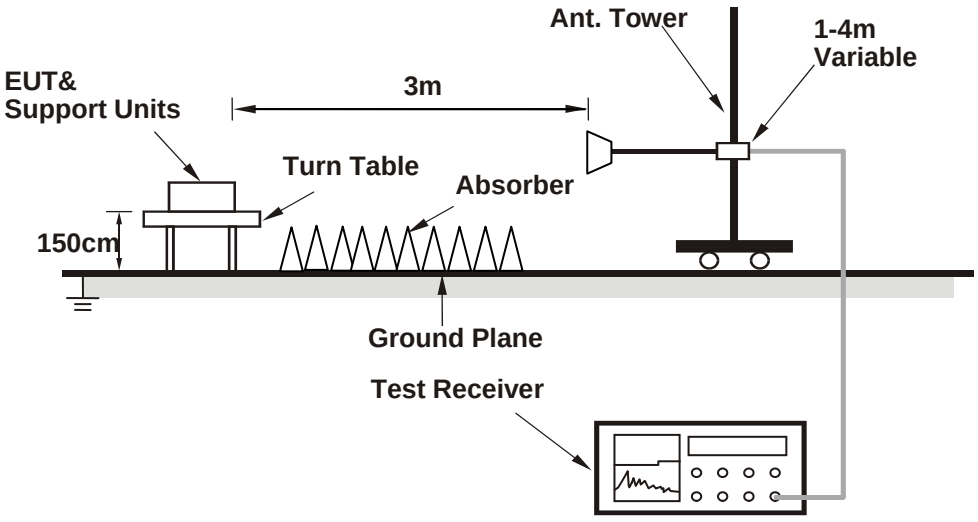
No deviation.

4.1.5 Test Set Up

<Frequency Range below 1GHz>



<Frequency Range above 1GHz>



For the actual test configuration, please refer to the attached file (Test Setup Photo)

4.1.6 EUT Operating Conditions

1. Connect the EUT with the support units D-E (Notebook Computer) which is placed in remote site.
2. The communication partner run test program “DutApiMimoApApp.exe” to enable EUT under transmission/receiving condition continuously at specific channel frequency.

4.1.7 Test Results

Above 1GHz Data

802.11a

CHANNEL	TX Channel 149	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 40GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5655.93	59.83 PK	72.61	-12.78	1.53 H	51	52.39	7.44
2	*5745.00	107.80 PK			1.53 H	51	100.09	7.71
3	*5745.00	98.80 AV			1.53 H	51	91.09	7.71
4	#5914.80	60.57 PK	75.72	-15.15	1.53 H	51	52.83	7.74
5	11490.00	57.30 PK	74.00	-16.70	1.13 H	332	44.16	13.14
6	11490.00	44.60 AV	54.00	-9.40	1.13 H	332	31.46	13.14
7	#17235.00	58.10 PK	74.00	-15.90	1.03 H	114	35.06	23.04
8	#17235.00	46.30 AV	54.00	-7.70	1.03 H	114	23.26	23.04
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5665.43	66.00 PK	79.65	-13.65	2.33 V	250	58.52	7.48
2	*5745.00	122.60 PK			2.33 V	250	114.89	7.71
3	*5745.00	113.30 AV			2.33 V	250	105.59	7.71
4	#5906.73	65.76 PK	81.68	-15.92	2.33 V	250	58.11	7.65
5	11490.00	57.70 PK	74.00	-16.30	1.19 V	330	44.56	13.14
6	11490.00	46.30 AV	54.00	-7.70	1.19 V	330	33.16	13.14
7	#17235.00	61.10 PK	74.00	-12.90	1.05 V	118	38.06	23.04
8	#17235.00	49.40 AV	54.00	-4.60	1.05 V	118	26.36	23.04

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

CHANNEL	TX Channel 157	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 40GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5785.00	108.20 PK			1.56 H	37	100.43	7.77
2	*5785.00	99.40 AV			1.56 H	37	91.63	7.77
3	11570.00	57.50 PK	74.00	-16.50	1.18 H	328	44.32	13.18
4	11570.00	44.80 AV	54.00	-9.20	1.18 H	328	31.62	13.18
5	#17355.00	58.30 PK	74.00	-15.70	1.03 H	103	35.16	23.14
6	#17355.00	46.40 AV	54.00	-7.60	1.03 H	103	23.26	23.14
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5785.00	123.00 PK			2.08 V	360	115.23	7.77
2	*5785.00	113.90 AV			2.08 V	360	106.13	7.77
3	11570.00	57.70 PK	74.00	-16.30	1.17 V	324	44.52	13.18
4	11570.00	46.00 AV	54.00	-8.00	1.17 V	324	32.82	13.18
5	#17355.00	60.90 PK	74.00	-13.10	1.03 V	111	37.76	23.14
6	#17355.00	49.30 AV	54.00	-4.70	1.03 V	111	26.16	23.14

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

CHANNEL	TX Channel 165	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 40GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5652.60	59.79 PK	70.13	-10.34	1.56 H	33	52.37	7.42
2	*5825.00	106.80 PK			1.56 H	33	99.07	7.73
3	*5825.00	98.20 AV			1.56 H	33	90.47	7.73
4	#5920.50	60.70 PK	71.52	-10.82	1.56 H	33	52.92	7.78
5	11650.00	57.20 PK	74.00	-16.80	1.13 H	316	43.96	13.24
6	11650.00	44.50 AV	54.00	-9.50	1.13 H	316	31.26	13.24
7	#17475.00	58.50 PK	74.00	-15.50	1.06 H	114	35.36	23.14
8	#17475.00	46.50 AV	54.00	-7.50	1.06 H	114	23.36	23.14
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5660.20	65.36 PK	75.77	-10.41	2.00 V	26	57.91	7.45
2	*5825.00	121.60 PK			2.00 V	26	113.87	7.73
3	*5825.00	112.70 AV			2.00 V	26	104.97	7.73
4	#5920.02	61.87 PK	71.87	-10.00	2.00 V	26	54.09	7.78
5	11650.00	57.70 PK	74.00	-16.30	1.21 V	318	44.46	13.24
6	11650.00	46.00 AV	54.00	-8.00	1.21 V	318	32.76	13.24
7	#17475.00	60.90 PK	74.00	-13.10	1.05 V	125	37.76	23.14
8	#17475.00	49.10 AV	54.00	-4.90	1.05 V	125	25.96	23.14

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

802.11ac (VHT20)

CHANNEL	TX Channel 149	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 40GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5654.98	59.41 PK	71.90	-12.49	1.59 H	19	51.99	7.42
2	*5745.00	108.20 PK			1.59 H	19	100.49	7.71
3	*5745.00	99.70 AV			1.59 H	19	91.99	7.71
4	#5912.43	58.50 PK	77.47	-18.97	1.59 H	19	50.79	7.71
5	11490.00	57.40 PK	74.00	-16.60	1.17 H	318	44.26	13.14
6	11490.00	44.90 AV	54.00	-9.10	1.17 H	318	31.76	13.14
7	#17235.00	58.10 PK	74.00	-15.90	1.10 H	122	35.06	23.04
8	#17235.00	46.20 AV	54.00	-7.80	1.10 H	122	23.16	23.04
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5689.18	75.14 PK	97.22	-22.08	2.01 V	28	67.55	7.59
2	*5745.00	123.00 PK			2.01 V	28	115.29	7.71
3	*5745.00	114.20 AV			2.01 V	28	106.49	7.71
4	#5908.62	63.85 PK	80.29	-16.44	2.01 V	28	56.17	7.68
5	11490.00	57.70 PK	74.00	-16.30	1.25 V	303	44.56	13.14
6	11490.00	45.90 AV	54.00	-8.10	1.25 V	303	32.76	13.14
7	#17235.00	60.90 PK	74.00	-13.10	1.00 V	116	37.86	23.04
8	#17235.00	49.10 AV	54.00	-4.90	1.00 V	116	26.06	23.04

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

CHANNEL	TX Channel 157	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 40GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5785.00	107.10 PK			1.60 H	34	99.33	7.77
2	*5785.00	98.50 AV			1.60 H	34	90.73	7.77
3	11570.00	57.80 PK	74.00	-16.20	1.17 H	307	44.62	13.18
4	11570.00	45.10 AV	54.00	-8.90	1.17 H	307	31.92	13.18
5	#17355.00	58.50 PK	74.00	-15.50	1.10 H	119	35.36	23.14
6	#17355.00	46.50 AV	54.00	-7.50	1.10 H	119	23.36	23.14
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5785.00	121.90 PK			2.19 V	360	114.13	7.77
2	*5785.00	113.00 AV			2.19 V	360	105.23	7.77
3	11570.00	58.10 PK	74.00	-15.90	1.30 V	297	44.92	13.18
4	11570.00	46.30 AV	54.00	-7.70	1.30 V	297	33.12	13.18
5	#17355.00	60.60 PK	74.00	-13.40	1.03 V	129	37.46	23.14
6	#17355.00	48.90 AV	54.00	-5.10	1.03 V	129	25.76	23.14

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

CHANNEL	TX Channel 165	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 40GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5659.73	59.50 PK	75.43	-15.93	1.55 H	48	52.05	7.45
2	*5825.00	107.50 PK			1.55 H	48	99.77	7.73
3	*5825.00	99.00 AV			1.55 H	48	91.27	7.73
4	#5922.40	59.18 PK	70.12	-10.94	1.55 H	48	51.37	7.81
5	11650.00	57.70 PK	74.00	-16.30	1.16 H	292	44.46	13.24
6	11650.00	44.90 AV	54.00	-9.10	1.16 H	292	31.66	13.24
7	#17475.00	58.60 PK	74.00	-15.40	1.09 H	130	35.46	23.14
8	#17475.00	46.80 AV	54.00	-7.20	1.09 H	130	23.66	23.14
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5664.95	63.35 PK	79.30	-15.95	2.10 V	74	55.87	7.48
2	*5825.00	122.30 PK			2.10 V	74	114.57	7.73
3	*5825.00	113.50 AV			2.10 V	74	105.77	7.73
4	#5907.20	67.36 PK	81.34	-13.98	2.10 V	74	59.71	7.65
5	11650.00	58.60 PK	74.00	-15.40	1.33 V	311	45.36	13.24
6	11650.00	46.70 AV	54.00	-7.30	1.33 V	311	33.46	13.24
7	#17475.00	60.30 PK	74.00	-13.70	1.00 V	143	37.16	23.14
8	#17475.00	48.50 AV	54.00	-5.50	1.00 V	143	25.36	23.14

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

802.11ac (VHT40)

CHANNEL	TX Channel 151	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 40GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5673.02	63.68 PK	85.28	-21.60	1.58 H	52	56.17	7.51
2	*5755.00	105.20 PK			1.58 H	52	97.47	7.73
3	*5755.00	96.10 AV			1.58 H	52	88.37	7.73
4	#5924.77	59.25 PK	68.37	-9.12	1.58 H	52	51.42	7.83
5	11510.00	57.90 PK	74.00	-16.10	1.14 H	282	44.78	13.12
6	11510.00	45.30 AV	54.00	-8.70	1.14 H	282	32.18	13.12
7	#17265.00	58.60 PK	74.00	-15.40	1.10 H	129	35.50	23.10
8	#17265.00	46.60 AV	54.00	-7.40	1.10 H	129	23.50	23.10
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5660.20	73.03 PK	75.77	-2.74	2.29 V	249	65.58	7.45
2	*5755.00	120.00 PK			2.29 V	249	112.27	7.73
3	*5755.00	110.60 AV			2.29 V	249	102.87	7.73
4	#5919.55	66.58 PK	72.22	-5.64	2.29 V	249	58.81	7.77
5	11510.00	58.40 PK	74.00	-15.60	1.31 V	310	45.28	13.12
6	11510.00	46.20 AV	54.00	-7.80	1.31 V	310	33.08	13.12
7	#17265.00	60.10 PK	74.00	-13.90	1.03 V	135	37.00	23.10
8	#17265.00	48.60 AV	54.00	-5.40	1.03 V	135	25.50	23.10

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

CHANNEL	TX Channel 159	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 40GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5654.02	59.47 PK	71.19	-11.72	1.52 H	66	52.05	7.42
2	*5795.00	105.30 PK			1.52 H	66	97.51	7.79
3	*5795.00	96.00 AV			1.52 H	66	88.21	7.79
4	#5919.07	58.40 PK	72.57	-14.17	1.52 H	66	50.63	7.77
5	11590.00	58.40 PK	74.00	-15.60	1.17 H	279	45.20	13.20
6	11590.00	45.60 AV	54.00	-8.40	1.17 H	279	32.40	13.20
7	#17385.00	58.40 PK	74.00	-15.60	1.11 H	140	35.30	23.10
8	#17385.00	46.60 AV	54.00	-7.40	1.11 H	140	23.50	23.10
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5678.25	68.66 PK	89.15	-20.49	2.23 V	248	61.12	7.54
2	*5795.00	120.10 PK			2.23 V	248	112.31	7.79
3	*5795.00	110.50 AV			2.23 V	248	102.71	7.79
4	#5920.02	68.63 PK	71.87	-3.24	2.23 V	248	60.85	7.78
5	11590.00	57.80 PK	74.00	-16.20	1.33 V	310	44.60	13.20
6	11590.00	45.80 AV	54.00	-8.20	1.33 V	310	32.60	13.20
7	#17385.00	60.70 PK	74.00	-13.30	1.03 V	134	37.60	23.10
8	#17385.00	49.00 AV	54.00	-5.00	1.03 V	134	25.90	23.10

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

802.11ac (VHT80)

CHANNEL	TX Channel 155	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 40GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5673.98	60.02 PK	85.99	-25.97	1.30 H	64	52.50	7.52
2	*5775.00	101.10 PK			1.30 H	64	93.35	7.75
3	*5775.00	91.20 AV			1.30 H	64	83.45	7.75
4	#5916.23	60.65 PK	74.67	-14.02	1.30 H	64	52.90	7.75
5	11550.00	58.30 PK	74.00	-15.70	1.13 H	268	45.14	13.16
6	11550.00	45.30 AV	54.00	-8.70	1.13 H	268	32.14	13.16
7	#17325.00	59.10 PK	74.00	-14.90	1.05 H	133	35.94	23.16
8	#17325.00	47.10 AV	54.00	-6.90	1.05 H	133	23.94	23.16
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	**#5654.98**	**70.37 PK**	**71.90**	**-1.53**	**2.33 V**	**20**	**62.95**	**7.42**
2	*5775.00	114.30 PK			2.33 V	20	106.55	7.75
3	*5775.00	104.70 AV			2.33 V	20	96.95	7.75
4	#5914.80	66.58 PK	75.72	-9.14	2.33 V	20	58.84	7.74
5	11550.00	58.00 PK	74.00	-16.00	1.31 V	322	44.84	13.16
6	11550.00	45.70 AV	54.00	-8.30	1.31 V	322	32.54	13.16
7	#17325.00	60.70 PK	74.00	-13.30	1.03 V	119	37.54	23.16
8	#17325.00	48.80 AV	54.00	-5.20	1.03 V	119	25.64	23.16

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

Below 1GHz Data

802.11a

CHANNEL	TX Channel 157	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	84.44	35.25 QP	40.00	-4.75	2.00 H	164	48.73	-13.48
2	178.29	37.48 QP	43.50	-6.02	1.50 H	325	46.71	-9.23
3	264.89	34.56 QP	46.00	-11.44	1.00 H	179	42.74	-8.18
4	499.99	31.06 QP	46.00	-14.94	1.50 H	38	32.62	-1.56
5	562.51	38.91 QP	46.00	-7.09	1.50 H	1	39.42	-0.51
6	750.01	33.39 QP	46.00	-12.61	1.50 H	62	29.79	3.60
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	76.04	31.60 QP	40.00	-8.40	1.50 V	144	43.48	-11.88
2	125.01	31.58 QP	43.50	-11.92	1.00 V	97	41.17	-9.59
3	178.34	33.88 QP	43.50	-9.62	1.50 V	149	43.12	-9.24
4	499.99	32.40 QP	46.00	-13.60	1.00 V	360	33.96	-1.56
5	562.51	38.48 QP	46.00	-7.52	1.50 V	360	38.99	-0.51
6	687.49	33.78 QP	46.00	-12.22	1.50 V	360	31.78	2.00

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value

4.2 Transmit Power Measurement

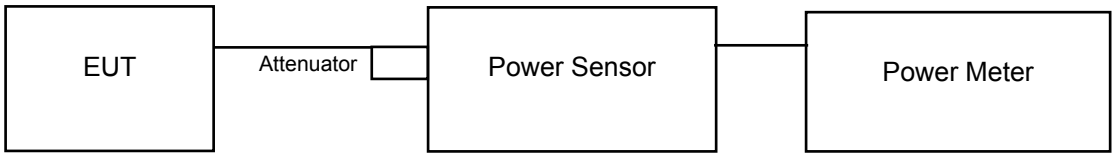
4.2.1 Limits of Transmit Power Measurement

Operation Band	EUT Category		Limit
U-NII-1		Outdoor Access Point	1 Watt (30 dBm) (Max. e.i.r.p ≦ 125mW(21 dBm) at any elevation angle above 30 degrees as measured from the horizon)
		Fixed point-to-point Access Point	1 Watt (30 dBm)
		Indoor Access Point	1 Watt (30 dBm)
		Mobile and Portable client device	250mW (24 dBm)
U-NII-2A	---		250mW (24 dBm) or 11 dBm+10 log B*
U-NII-2C	---		250mW (24 dBm) or 11 dBm+10 log B*
U-NII-3	√		1 Watt (30 dBm)

*B is the 26 dB emission bandwidth in megahertz

Per KDB 662911 Method of conducted output power measurement on IEEE 802.11 devices,
Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$;
Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any N_{ANT};
Array Gain = 5 log(N_{ANT}/N_{SS}) dB or 3 dB, whichever is less for 20-MHz channel widths with $N_{ANT} \geq 5$.
For power measurements on all other devices: Array Gain = 10 log(N_{ANT}/N_{SS}) dB.

4.2.2 Test Setup



4.2.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.2.4 Test Procedure

For Average Power Measurement

Method PM is used to perform output power measurement, trigger and gating function of wide band power meter is enabled to measure max output power of TX on burst. Duty factor is not added to measured value.

4.2.5 Deviation fromTest Standard

No deviation.

4.2.6 EUT Operating Conditions

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

4.2.7 Test Result

Power Output:

802.11a

Channel	Frequency (MHz)	Maximum Conducted Power (dBm)				Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
149	5745	20.71	21.19	22.24	22.76	605.576	27.82	28.10	Pass
157	5785	21.43	22.25	22.19	21.72	**621.046**	27.93	28.10	Pass
165	5825	20.65	20.64	21.86	21.79	536.493	27.30	28.10	Pass

NOTE: Directional gain = 10 log[$(10^{G1/20} + 10^{G2/20} + 10^{G3/20} + 10^{G4/20})^2$ / 4] = 7.9dBi > 6dBi , so the power limit shall be reduced to 30-(7.9-6) = 28.10dBm.

802.11ac (VHT20)

Channel	Frequency (MHz)	Maximum Conducted Power (dBm)				Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
149	5745	21.23	22.20	21.76	22.21	615.007	27.89	28.10	Pass
157	5785	20.34	21.23	21.42	21.19	511.080	27.08	28.10	Pass
165	5825	20.83	20.08	21.51	21.47	504.779	27.03	28.10	Pass

NOTE: Directional gain = 10 log[$(10^{G1/20} + 10^{G2/20} + 10^{G3/20} + 10^{G4/20})^2$ / 4] = 7.9dBi > 6dBi , so the power limit shall be reduced to 30-(7.9-6) = 28.10dBm.

802.11ac (VHT40)

Channel	Frequency (MHz)	Maximum Conducted Power (dBm)				Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
151	5755	21.24	21.22	21.56	21.37	545.786	27.37	28.10	Pass
159	5795	21.12	21.40	21.24	21.73	549.439	27.40	28.10	Pass

NOTE: Directional gain = 10 log[$(10^{G1/20} + 10^{G2/20} + 10^{G3/20} + 10^{G4/20})^2$ / 4] = 7.9dBi > 6dBi , so the power limit shall be reduced to 30-(7.9-6) = 28.10dBm.

802. 11ac (VHT80)

Channel	Frequency (MHz)	Maximum Conducted Power (dBm)				Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
155	5775	21.20	21.24	21.24	21.11	527.038	27.22	28.10	Pass

NOTE: Directional gain = 10 log[$(10^{G1/20} + 10^{G2/20} + 10^{G3/20} + 10^{G4/20})^2$ / 4] = 7.9dBi > 6dBi , so the power limit shall be reduced to 30-(7.9-6) = 28.10dBm.

Occupied Bandwidth:

802.11a

Channel	Frequency (MHz)	Occupied Bandwidth (MHz)			
		Chain 0	Chain 1	Chain 2	Chain 3
149	5745	16.68	16.68	16.68	16.68
157	5785	16.68	16.68	16.80	16.68
165	5825	16.68	16.68	16.68	16.80

802.11ac (VHT20)

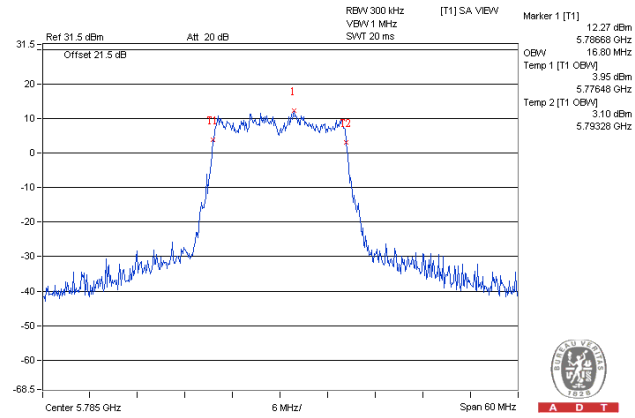
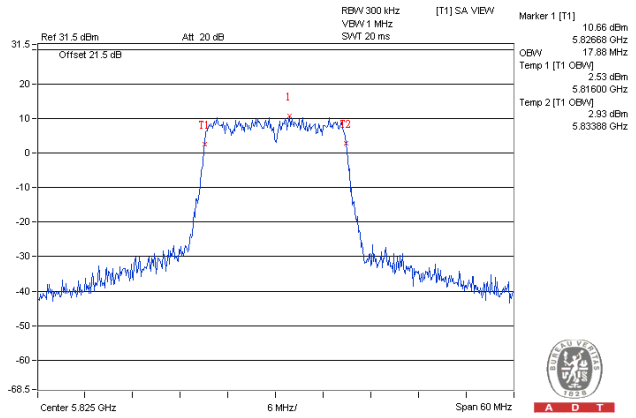
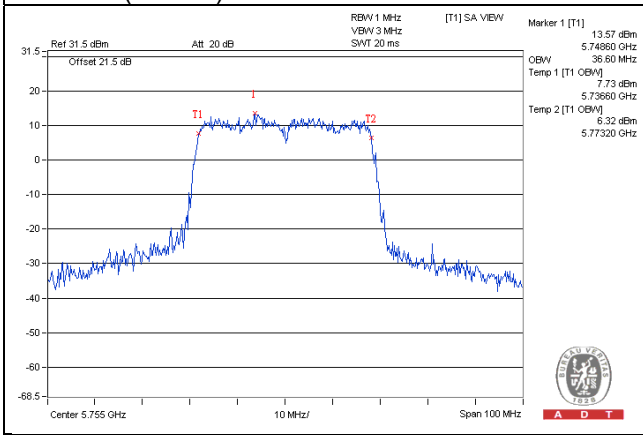
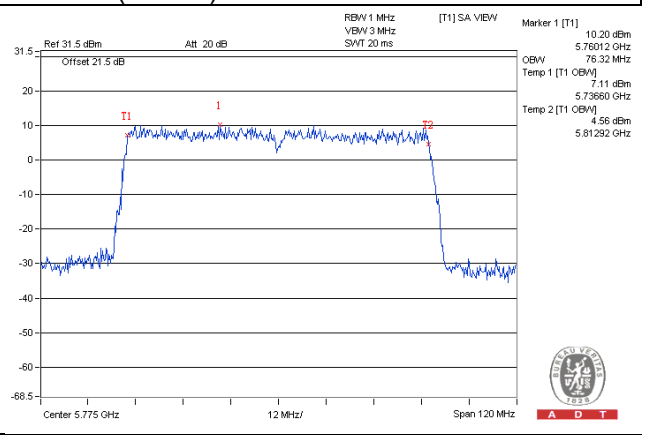
Channel	Frequency (MHz)	Occupied Bandwidth (MHz)			
		Chain 0	Chain 1	Chain 2	Chain 3
149	5745	17.76	17.64	17.76	17.76
157	5785	17.64	17.76	17.64	17.76
165	5825	17.76	17.64	17.64	17.88

802.11ac (VHT40)

Channel	Frequency (MHz)	Occupied Bandwidth (MHz)			
		Chain 0	Chain 1	Chain 2	Chain 3
151	5755	36.60	36.60	36.60	36.60
159	5795	36.60	36.60	36.60	36.60

802.11ac (VHT80)

Channel	Frequency (MHz)	Occupied Bandwidth (MHz)			
		Chain 0	Chain 1	Chain 2	Chain 3
155	5775	76.32	76.08	76.08	76.08

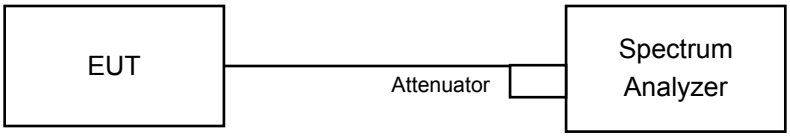
Spectrum Plot of Worst Value	
802.11a	802.11ac (VHT20)
	
802.11ac (VHT40)	802.11ac (VHT80)
	

4.3 Peak Power Spectral Density Measurement

4.3.1 Limits of Peak Power Spectral Density Measurement

Operation Band	EUT Category		Limit
U-NII-1		Outdoor Access Point	17dBm/ MHz
		Fixed point-to-point Access Point	
		Indoor Access Point	
		Mobile and Portable client device	11dBm/ MHz
U-NII-2A	---		11dBm/ MHz
U-NII-2C	---		11dBm/ MHz
U-NII-3	√		30dBm/ 500kHz

4.3.2 Test Setup



4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.4 Test Procedures

a. Set span to encompass the entire emission bandwidth (EBW) of the signal.

b. Set RBW = 300 kHz, Set VBW ≥ 1 MHz, Detector = RMS

c. Use the peak marker function to determine the maximum power level in any 300 kHz band segment within the fundamental EBW.

d. Scale the observed power level to an equivalent value in 500 kHz by adjusting (reducing) the measured power by a bandwidth correction factor (BWCF) where BWCF = 10log(500 kHz/300kHz)

e. Sweep time = auto, trigger set to “free run”.

f. Trace average at least 100 traces in power averaging mode.

g. Record the max value

4.3.5 Deviation from Test Standard

No deviation.

4.3.6 EUT Operating Conditions

Same as Item 4.2.6.

4.3.7 Test Results

802.11a

TX chain	Channel	Freq. (MHz)	PSD (dBm/300kHz)	PSD (dBm/500kHz)	10 log (N=4) dB	Total PSD (dBm/500kHz)	Limit (dBm/500kHz)	Pass / Fail
0	149	5745	-1.35	0.87	6.02	6.89	28.10	Pass
	157	5785	-0.74	1.48	6.02	7.50	28.10	Pass
	165	5825	-0.60	1.62	6.02	7.64	28.10	Pass
1	149	5745	-0.04	2.18	6.02	8.20	28.10	Pass
	157	5785	0.10	2.32	6.02	8.34	28.10	Pass
	165	5825	0.35	2.57	6.02	8.59	28.10	Pass
2	149	5745	-0.59	1.63	6.02	7.65	28.10	Pass
	157	5785	-0.14	2.08	6.02	8.10	28.10	Pass
	165	5825	-0.20	2.02	6.02	8.04	28.10	Pass
3	149	5745	-0.75	1.47	6.02	7.49	28.10	Pass
	157	5785	-0.66	1.56	6.02	7.58	28.10	Pass
	165	5825	-0.02	2.20	6.02	8.22	28.10	Pass

Note:
1. Directional gain = 10 log[$(10^{G1/20} + 10^{G2/20} + 10^{G3/20} + 10^{G4/20})^2$ / 4] = 7.9dBi > 6dBi , so the power density limit shall be reduced to 30-(7.9-6) = 28.10dBm.

802.11ac (VHT20)

TX chain	Channel	Freq. (MHz)	PSD (dBm/300kHz)	PSD (dBm/500kHz)	10 log (N=4) dB	Total PSD (dBm/500kHz)	Limit (dBm/500kHz)	Pass / Fail
0	149	5745	-0.21	2.01	6.02	8.03	28.10	Pass
	157	5785	-1.01	1.21	6.02	7.23	28.10	Pass
	165	5825	-1.40	0.82	6.02	6.84	28.10	Pass
1	149	5745	-0.17	2.05	6.02	8.07	28.10	Pass
	157	5785	-0.68	1.54	6.02	7.56	28.10	Pass
	165	5825	-0.68	1.54	6.02	7.56	28.10	Pass
2	149	5745	-1.44	0.78	6.02	6.80	28.10	Pass
	157	5785	-1.44	0.78	6.02	6.80	28.10	Pass
	165	5825	-1.30	0.92	6.02	6.94	28.10	Pass
3	149	5745	-2.00	0.22	6.02	6.24	28.10	Pass
	157	5785	-0.80	1.42	6.02	7.44	28.10	Pass
	165	5825	-1.03	1.19	6.02	7.21	28.10	Pass

Note:
1. Directional gain = 10 log[$(10^{G1/20} + 10^{G2/20} + 10^{G3/20} + 10^{G4/20})^2$ / 4] = 7.9dBi > 6dBi , so the power density limit shall be reduced to 30-(7.9-6) = 28.10dBm.

802.11ac (VHT40)

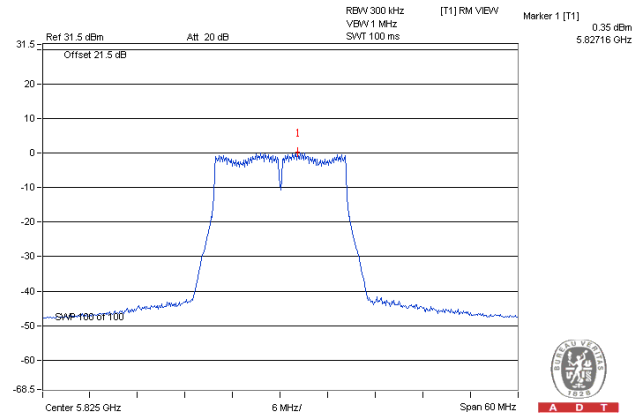
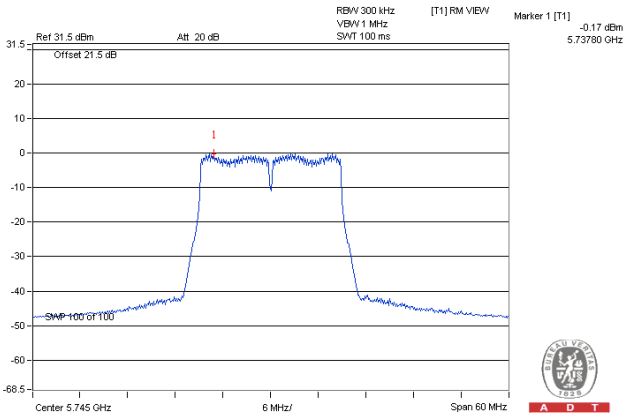
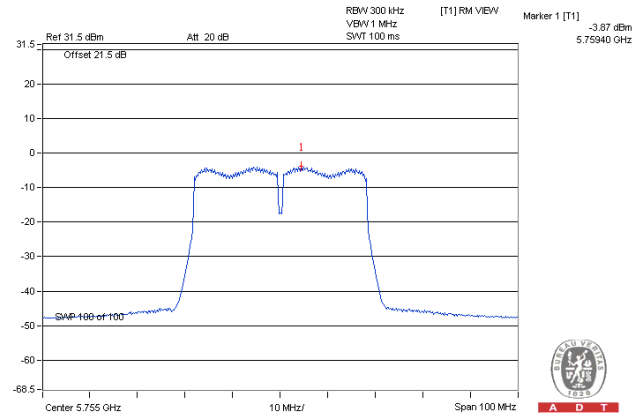
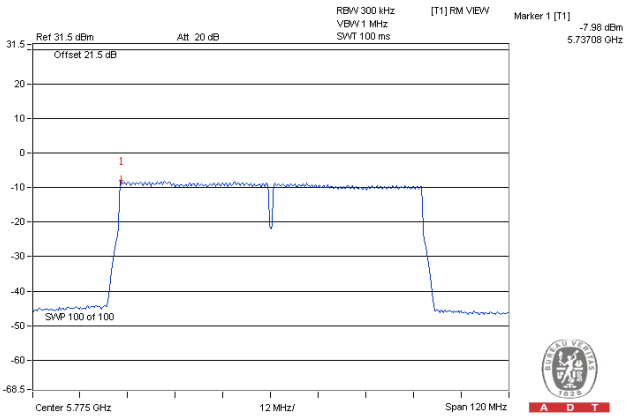
TX chain	Channel	Freq. (MHz)	PSD (dBm/300kHz)	PSD (dBm/500kHz)	10 log (N=4) dB	Total PSD (dBm/500kHz)	Limit (dBm/500kHz)	Pass / Fail
0	151	5755	-4.61	-2.39	6.02	3.63	28.10	Pass
	159	5795	-4.89	-2.67	6.02	3.35	28.10	Pass
1	151	5755	-3.87	-1.65	6.02	4.37	28.10	Pass
	159	5795	-4.48	-2.26	6.02	3.76	28.10	Pass
2	151	5755	-4.98	-2.76	6.02	3.26	28.10	Pass
	159	5795	-5.03	-2.81	6.02	3.21	28.10	Pass
3	151	5755	-4.70	-2.48	6.02	3.54	28.10	Pass
	159	5795	-4.85	-2.63	6.02	3.39	28.10	Pass

Note:
1. Directional gain = 10 log[$(10^{G1/20} + 10^{G2/20} + 10^{G3/20} + 10^{G4/20})^2$ / 4] = 7.9dBi > 6dBi , so the power density limit shall be reduced to 30-(7.9-6) = 28.10dBm.

802.11ac (VHT80)

TX chain	Channel	Freq. (MHz)	PSD (dBm/300kHz)	PSD (dBm/500kHz)	10 log (N=4) dB	Total PSD (dBm/500kHz)	Limit (dBm/500kHz)	Pass / Fail
0	155	5755	-7.98	-5.76	6.02	0.26	28.10	Pass
1	155	5755	-7.99	-5.77	6.02	0.25	28.10	Pass
2	155	5755	-8.61	-6.39	6.02	-0.37	28.10	Pass
3	155	5755	-8.58	-6.36	6.02	-0.34	28.10	Pass

Note:
1.Directional gain = 10 log[$(10^{G1/20} + 10^{G2/20} + 10^{G3/20} + 10^{G4/20})^2$ / 4] = 7.9dBi > 6dBi , so the power density limit shall be reduced to 30-(7.9-6) = 28.10dBm.

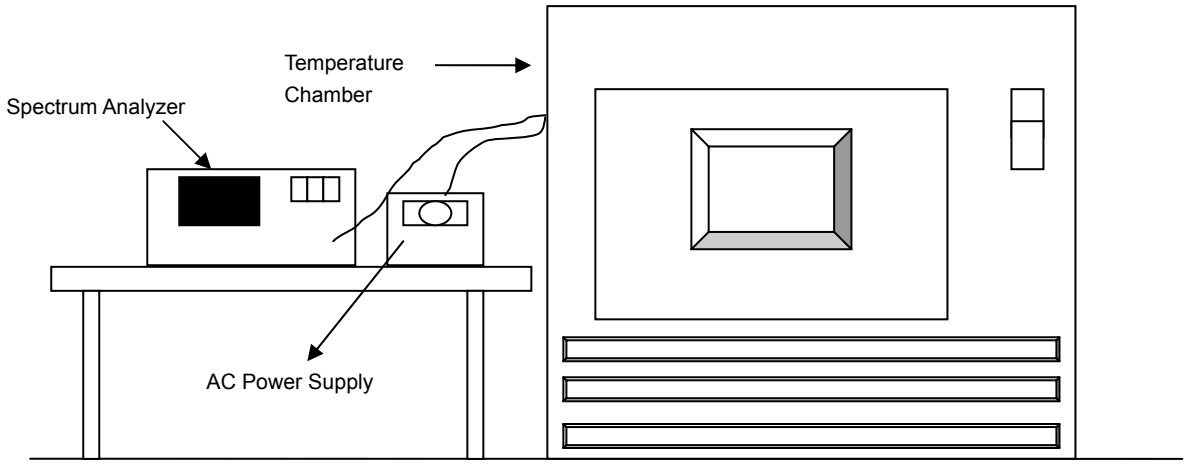
Spectrum Plot of Worst Value	
802.11a	802.11ac (VHT20)
	
802.11ac (VHT40)	802.11ac (VHT80)
	

4.4 Frequency Stability

4.4.1 Limits of Frequency Stability Measurement

The frequency of the carrier signal shall be maintained within band of operation

4.4.2 Test Setup



4.4.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.4.4 Test Procedure

a. The EUT was placed inside the environmental test chamber and powered by nominal AC voltage.

b. Turn the EUT on and couple its output to a spectrum analyzer.

c. Turn the EUT off and set the chamber to the highest temperature specified.

d. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize, turn the EUT on and measure the operating frequency after 2, 5, and 10 minutes.

e. Repeat step 2 and 3 with the temperature chamber set to the lowest temperature.

f. The test chamber was allowed to stabilize at +20 degree C for a minimum of 30 minutes. The supply voltage was then adjusted on the EUT from 85% to 115% and the frequency record.

4.4.5 Deviation from Test Standard

No deviation.

4.4.6 EUT Operating Condition

Set the EUT transmit at un-modulation mode to test frequency stability.

4.4.7 Test Results

Frequency Stability Versus Temp.									
Operating Frequency: 5745MHz									
Temp. (℃)	Power Supply (Vac)	0 Minute		2 Minute		5 Minute		10 Minute	
		Measured Frequency (MHz)	Pass / Fail	Measured Frequency (MHz)	Pass / Fail	Measured Frequency (MHz)	Pass / Fail	Measured Frequency (MHz)	Pass / Fail
50	120	5744.9893	Pass	5744.9883	Pass	5744.9898	Pass	5744.9882	Pass
40	120	5745.0073	Pass	5745.0072	Pass	5745.0115	Pass	5745.0095	Pass
30	120	5745.0284	Pass	5745.0248	Pass	5745.0251	Pass	5745.0285	Pass
20	120	5744.9833	Pass	5744.9863	Pass	5744.9878	Pass	5744.9890	Pass
10	120	5744.9788	Pass	5744.9786	Pass	5744.9808	Pass	5744.9793	Pass
0	120	5744.9989	Pass	5745.0018	Pass	5744.9993	Pass	5744.9996	Pass
-10	120	5744.9817	Pass	5744.9846	Pass	5744.9849	Pass	5744.9812	Pass
-20	120	5744.9803	Pass	5744.9796	Pass	5744.979	Pass	5744.9804	Pass
-30	120	5745.0010	Pass	5745.0009	Pass	5744.9969	Pass	5744.9971	Pass

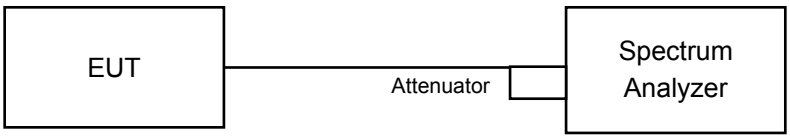
Frequency Stability Versus Voltage									
Operating Frequency: 5745MHz									
Temp. (℃)	Power Supply (Vac)	0 Minute		2 Minute		5 Minute		10 Minute	
		Measured Frequency (MHz)	Pass / Fail	Measured Frequency (MHz)	Pass / Fail	Measured Frequency (MHz)	Pass / Fail	Measured Frequency (MHz)	Pass / Fail
20	138	5744.9823	Pass	5744.9869	Pass	5744.9880	Pass	5744.9896	Pass
	120	5744.9833	Pass	5744.9863	Pass	5744.9878	Pass	5744.9890	Pass
	102	5744.9844	Pass	5744.9861	Pass	5744.9887	Pass	5744.9895	Pass

4.5 6dB Bandwidth Measurement

4.5.1 Limits of 6dB Bandwidth Measurement

The minimum of 6dB Bandwidth Measurement is 0.5MHz.

4.5.2 Test Setup



4.5.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.5.4 Test Procedure

MEASUREMENT PROCEDURE REF

a. Set resolution bandwidth (RBW) = 100kHz

b. Set the video bandwidth (VBW) ≥ 3 x RBW, Detector = Peak.

c. Trace mode = max hold.

d. Sweep = auto couple.

e. Measure the maximum width of the emission that is constrained by the frequencies associated with the two amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission

4.5.5 Deviation from Test Standard

No deviation.

4.5.6 EUT Operating Condition

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

4.5.7 Test Results

802.11a

Channel	Frequency (MHz)	6dB Bandwidth (MHz)				Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3		
149	5745	16.62	16.65	16.61	16.60	0.5	Pass
157	5785	16.61	16.60	16.56	16.57	0.5	Pass
165	5825	16.61	16.60	16.58	16.58	0.5	Pass

802.11ac (VHT20)

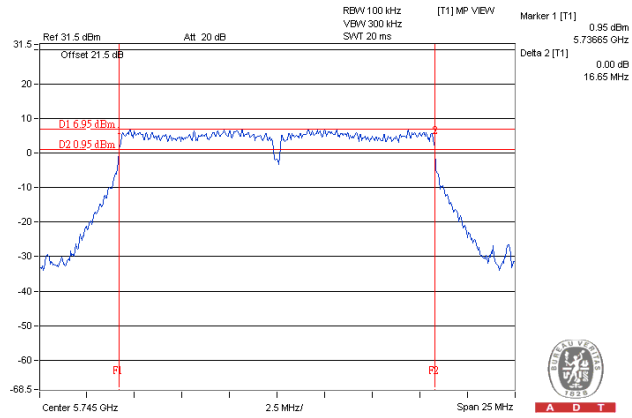
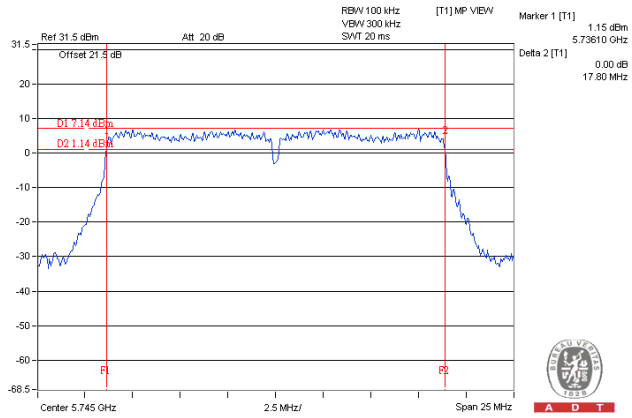
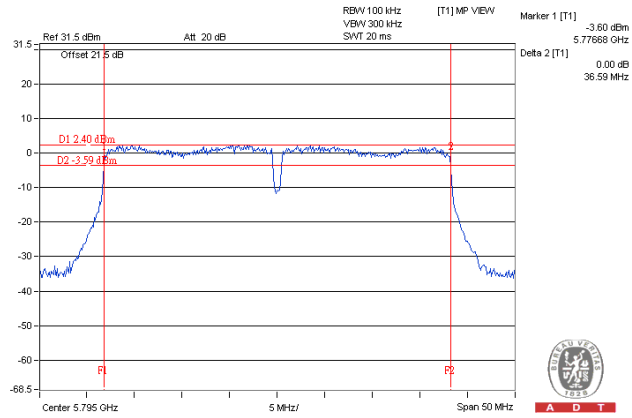
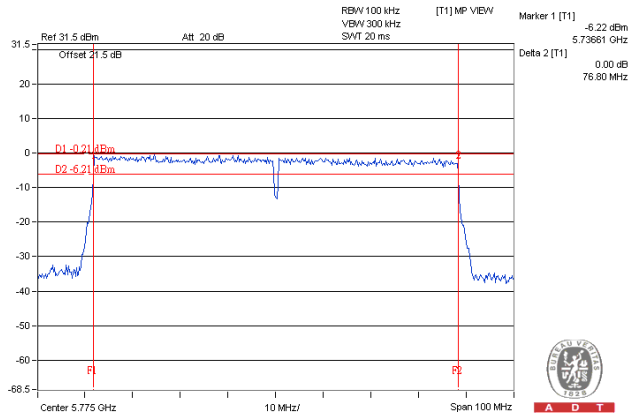
Channel	Frequency (MHz)	6dB Bandwidth (MHz)				Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3		
149	5745	17.77	17.80	17.78	17.77	0.5	Pass
157	5785	17.75	17.73	17.74	17.73	0.5	Pass
165	5825	17.74	17.71	17.73	17.73	0.5	Pass

802.11ac (VHT40)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)				Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3		
151	5755	36.58	36.54	36.57	36.57	0.5	Pass
159	5795	36.56	36.56	36.56	36.59	0.5	Pass

802.11ac (VHT80)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)				Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3		
155	5775	76.80	76.75	76.79	76.78	0.5	Pass

Spectrum Plot of Worst Value	
802.11a	802.11ac (VHT20)
	
802.11ac (VHT40)	802.11ac (VHT80)
	

5 Pictures of Test Arrangements

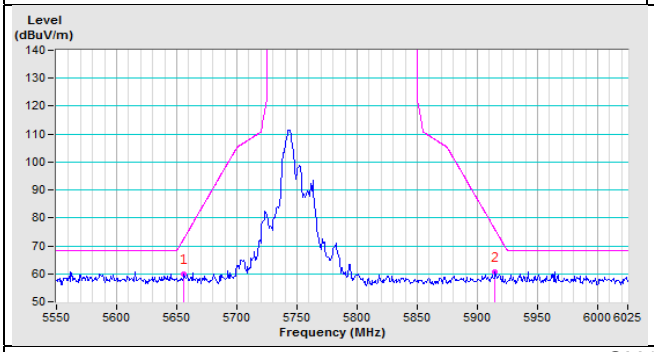
Please refer to the attached file (Test Setup Photo).

Annex A- Radiated Out of Band Emission (OOBE) Measurement (For U-NII-3 band)

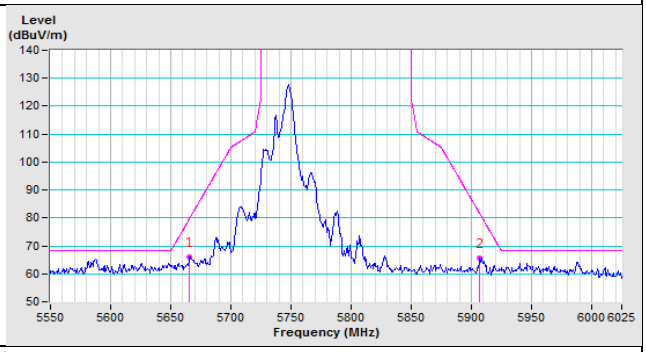
802.11a

CH149

Horizontal

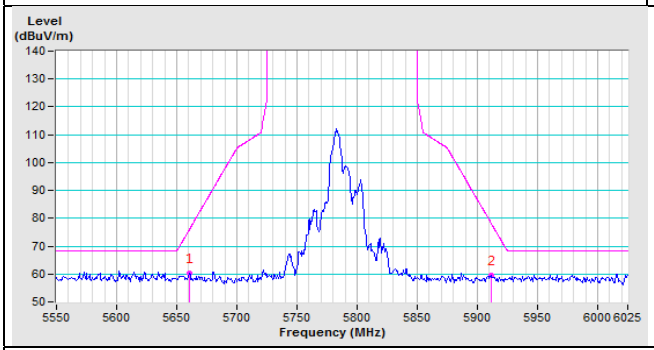


Vertical

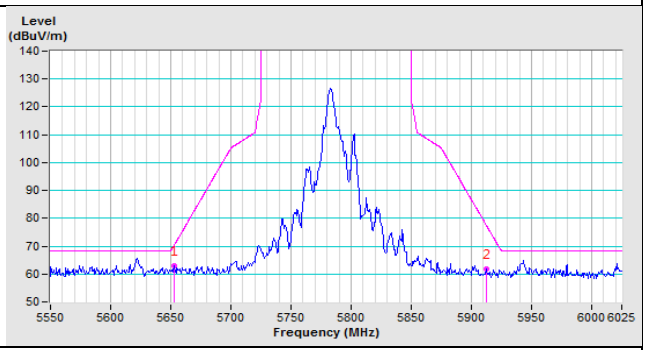


CH157

Horizontal

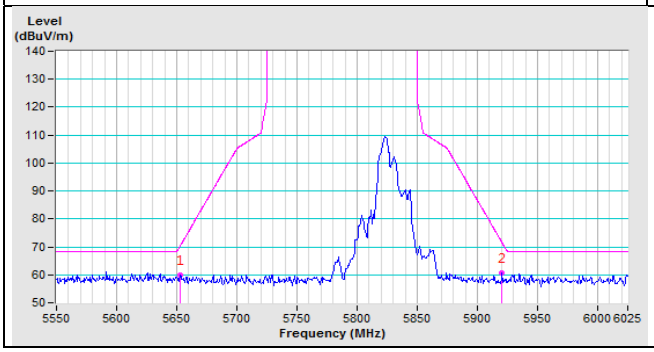


Vertical

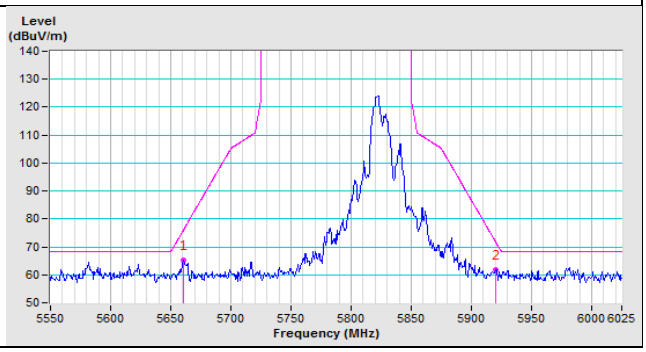


CH165

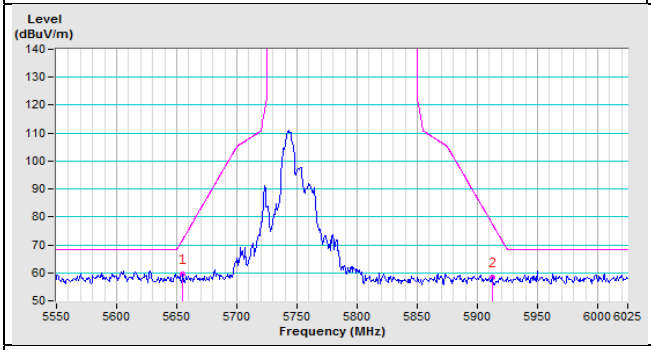
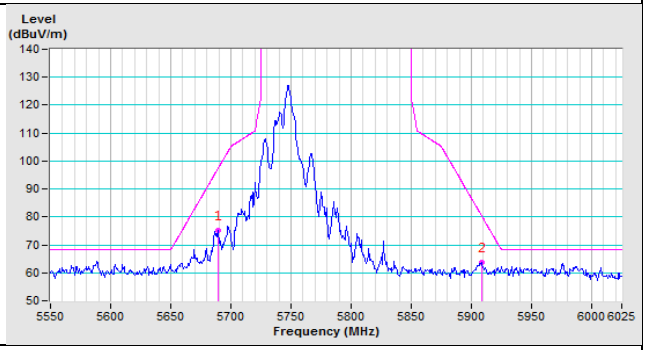
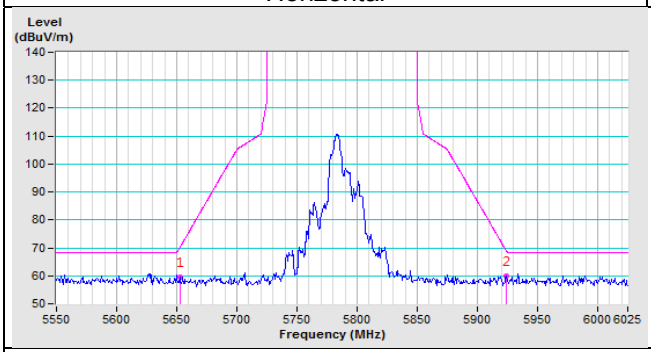
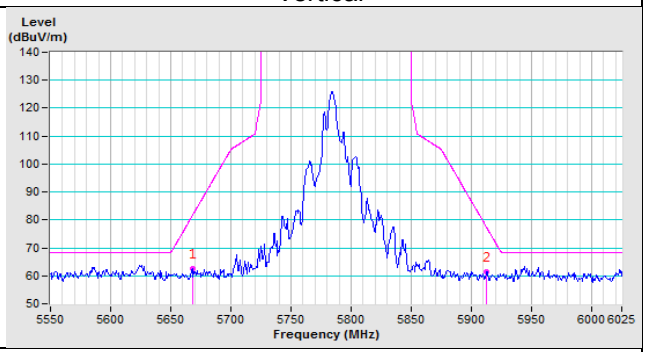
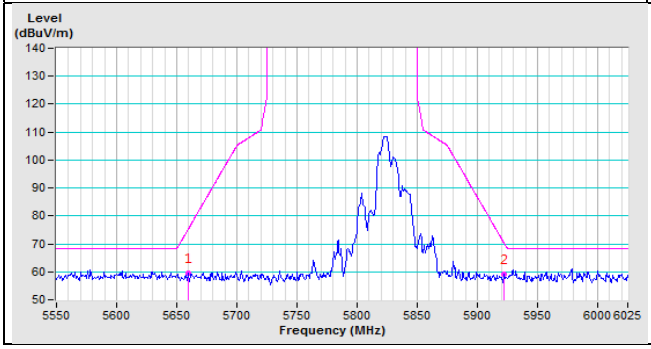
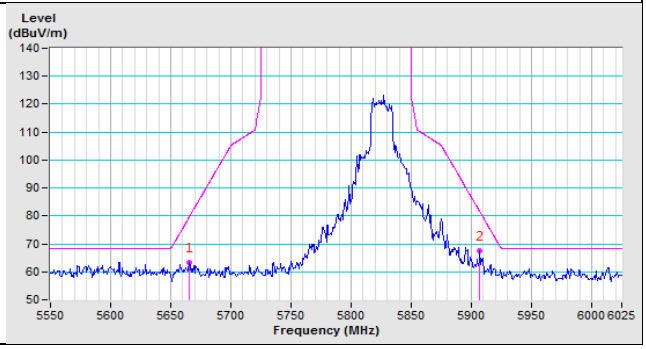
Horizontal



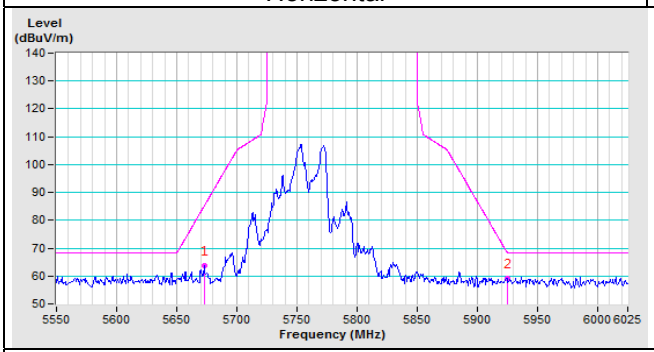
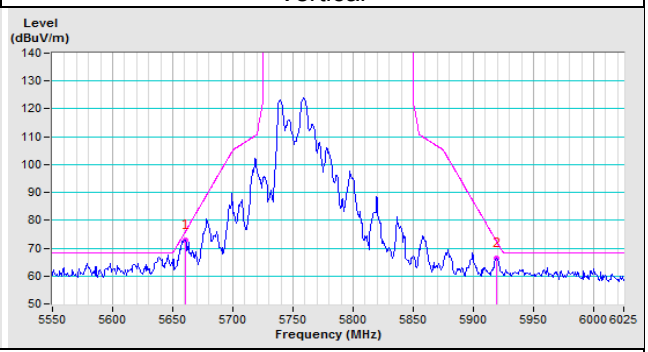
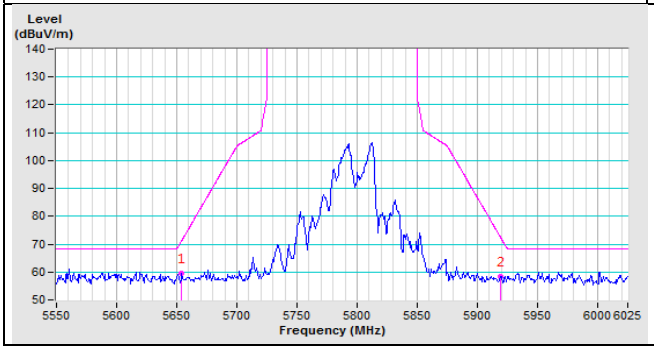
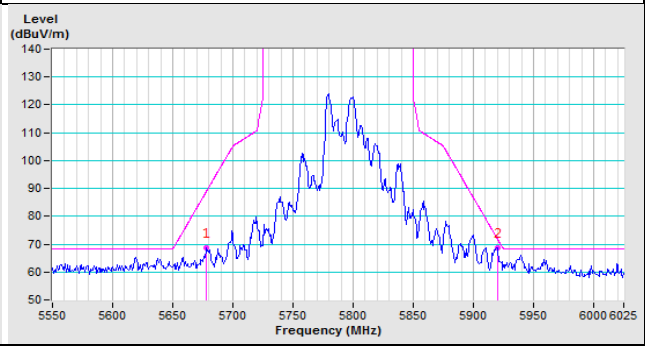
Vertical



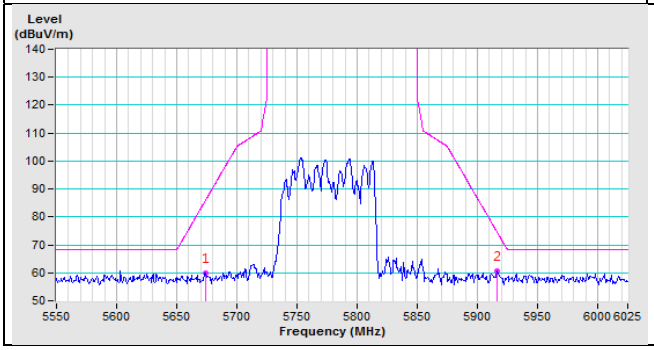
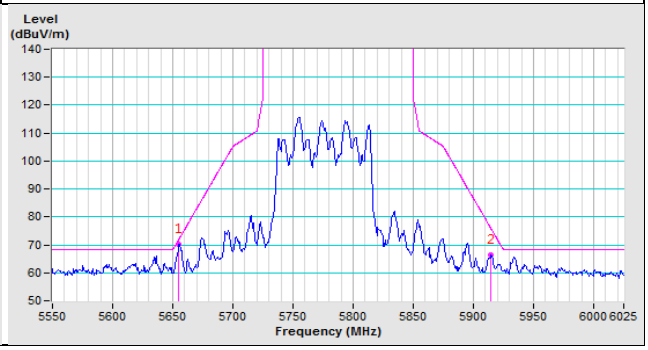
802.11ac (VHT20)

CH149	
Horizontal	Vertical
	
CH157	
Horizontal	Vertical
	
CH165	
Horizontal	Vertical
	

802.11ac (VHT40)

CH151	
Horizontal	Vertical
	
CH159	
Horizontal	Vertical
	

802.11ac (VHT80)

CH155	
Horizontal	Vertical
	

Appendix – Information on the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

Linko EMC/RF Lab
Tel: 886-2-26052180
Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab
Tel: 886-3-6668565
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Hwa Ya EMC/RF/Safety Lab
Tel: 886-3-3183232
Fax: 886-3-3270892

Email: service.adt@tw.bureauveritas.com
Web Site: www.bureauveritas-adt.com

The address and road map of all our labs can be found in our web site also.

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