



Test report No. : 4788947466-US-R1-V0
Page : 1 of 159
Issued date : Oct. 28, 2019
FCC ID : VGYAP912C

RADIO TEST REPORT

Product : 802.11ac Ceiling-mount Access Point
Model Name : VigorAP 912C
FCC ID : VGYAP912C
Test Regulation : FCC 47 CFR Part 15 Subpart E (Section 15.407)
Received Date : Apr. 9, 2019
Test Date : Apr. 9, 2019 ~ Jul 26, 2019
Issued Date : Oct. 28, 2019

Applicant : Draytek Corporation
No.26, Fu Shing Rd., HuKou County, Hsinchu Industrial
Park,HsinChu,303,Taiwan
Issued By : Underwriters Laboratories Taiwan Co., Ltd.
Building B and Building E, No. 372-7, Sec. 4, Zhongxing
Rd., Zhudong Township, Hsinchu County, Taiwan



The results reported herein have been performed in accordance with the laboratory's terms of accreditation. This report shall not be reproduced except in full without the written approval of the Laboratory. The results in this report are responsible of the test sample(s) provided by the client only and are not to be used to indicate applicability to other similar products.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Test report No. : 4788947466-US-R1-V0
Page : 2 of 159
Issued date : Oct. 28, 2019
FCC ID : VGYAP912C

REVISION HISTORY

Original Test Report No.: 4788947466-US-R1-V0

[illegible]

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Table Of Contents

1. Attestation of Test Results	4
2. Summary of Test Results	5
3. Test Methodology and Procedures	6
4. Facilities and Accreditation	6
5. Measurement Uncertainty	7
6. Equipment under Test	8
6.1. Description of EUT	8
6.2. Channel List	10
6.3. Test Condition	11
6.4. Description Of Available Antennas	11
6.5. Test Mode Applicability and Tested Channel Detail	12
6.6. Duty cycle	14
7. Test Equipment	16
8. Description of Test Setup	18
9. Test Results	19
9.1. 6dB Bandwidth	19
9.2. 26dB Bandwidth	26
9.3. Occupied Bandwidth	33
9.4. Conducted output power	46
9.5. Power Spectral Density	52
9.6. Frequency Stability	71
9.7. Radiated Spurious Emission	74
9.8. AC Power Line Conducted Emission	123
Appendix I Radiated Band Edge and OOB Measurement	129
Appendix II Radiated Spurious Emission Measurement	147



Test report No. : 4788947466-US-R1-V0
Page : 4 of 159
Issued date : Oct. 28, 2019
FCC ID : VGYAP912C

1. Attestation of Test Results

APPLICANT: Draytek Corporation
No.26, Fu Shing Rd., HuKou County, Hsinchu Industrial
Park,HsinChu,303,Taiwan

MANUFACTURER Draytek Corporation
No.26, Fu Shing Rd., HuKou County, Hsinchu Industrial
Park,HsinChu,303,Taiwan

EUT DESCRIPTION: 802.11ac Ceiling-mount Access Point

BRAND: DrayTek

MODEL: VigorAP 912C

SAMPLE STAGE: Identical Prototype

DATE of TESTED: Apr. 9, 2019 ~ Jul 26, 2019

APPLICABLE STANDARDS	
STANDARD	Test Results
FCC 47 CFR PART 15 Subpart E (Section 15.407)	PASS

Underwriters Laboratories Taiwan Co., Ltd. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by Underwriters Laboratories Taiwan Co., Ltd. based on interpretations and/or observations of test results. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by Underwriters Laboratories Taiwan Co., Ltd. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Underwriters Laboratories Taiwan Co., Ltd. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Prepared By:

Cindy Hsin
Project Handler

Date : Oct. 28, 2019

Approved and Authorized By:

Stanley Wu
Senior Project Engineer

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan
Telephone :+886-2-7737-3000
Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



2. Summary of Test Results

Summary of Test Results		
FCC Clause	Test Items	Result
15.407(e)	6dB Bandwidth	PASS
15.403(i)	26dB Bandwidth	PASS
2.1049	Occupied Bandwidth	See Note2
15.407(a)(1/3)	Conducted Output Power	PASS
15.407(a)(1/3)	Power Spectral Density	PASS
15.407(g)	Frequency Stability	PASS
15.407(b) (1/4(i/ii)/6)	Radiated Emissions and Band Edge Measurement	PASS
15.407(b)(6)	AC Power Conducted Emission	PASS
15.203	Antenna Requirement	PASS

Note:

1. For the Radiated Band Edge and OOB test plots were recorded in Appendix I, the Radiated Emissions test plots were recorded in Appendix II.
2. The Occupied Bandwidth was reference only.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



3. Test Methodology and Procedures

The tests documented in this report were performed in accordance with 47 CFR FCC Part 2, KDB 789033 D02 General UNII Test Procedure New Rules v02r01, KDB414788 D01 Radiated Test Site v01r01, ANSI C63.10-2013 and KDB 662911 D01 Multiple Transmitter Output v02r01.

4. Facilities and Accreditation

Test Location	Underwriters Laboratories Taiwan Co., Ltd.
Address	Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan
Accreditation Certificate	Underwriters Laboratories Taiwan Co., Ltd. is accredited by TAF, Laboratory Code 3398. The full scope of accreditation can be viewed at http://accreditation.taftw.org.tw/taf/public/basic/viewApplyItems.action?unitNo=3398

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



5. Measurement Uncertainty

For statement of conformity, accuracy method (Section 8.2.4 and 8.2.5 of ISO Guide 98-4) was applied as decision rule for measurement in this test report.

The following uncertainties have been calculated to provide a confidence level of 95 % using a coverage factor $k=2$.

Test Item	Measurement Frequency Range	K	U(dB)
Conducted disturbance at mains terminals ports	0.15MHz ~ 30MHz	2	1.7
RF Conducted	9 kHz - 40GHz	2	1.0
Radiated disturbance below 30MHz	9 kHz - 30 MHz	2	2.2
Radiated disturbance below 1 GHz	30MHz ~ 1GHz	2	5.3
Radiated disturbance above 1GHz	1GHz ~ 40GHz	2	4.8

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



6. Equipment under Test

6.1. Description of EUT

Product	802.11ac Ceiling-mount Access Point	
Brand Name	DrayTek	
Model Name	VigorAP 912C	
Operating Frequency	5180 ~ 5240 MHz, 5745 ~ 5825 MHz	
Modulation	256QAM, 64QAM, 16QAM, QPSK, BPSK	
Transfer Rate	802.11a: up to 54 Mbps 802.11n: up to MCS15 802.11ac: up to MCS9	
Number of Channel	5180 ~ 5240 MHz	4 for 802.11a, 802.11n (HT20), 802.11ac (VHT20)
		2 for 802.11n (HT40), 802.11 ac (VHT40)
		1 for 802.11ac (VHT80)
	5745 ~ 5825 MHz	5 for 802.11a, 802.11n (HT20), 802.11ac (VHT20)
		2 for 802.11n (HT40), 802.11 ac (VHT40)
		1 for 802.11ac (VHT80)
Maximum Output Power	5180 ~ 5240 MHz: 24.40dBm 5745 ~ 5825 MHz: 24.19dBm	
Normal Voltage	12Vdc from adapter	

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Note:

1. The EUT incorporates a MIMO function. Physically, the EUT provides two completed transmitters and two receivers.

Modulation Mode	Tx,Rx Function
802.11a	2TX,2RX
802.11n (HT20)	2TX,2RX
802.11n (HT40)	2TX,2RX
802.11ac (VHT20)	2TX,2RX
802.11ac (VHT40)	2TX,2RX
802.11ac (VHT80)	2TX,2RX

* The modulation and bandwidth are similar for 802.11n mode for HT20 / HT40 and 802.11ac mode for VHT20 / VHT40, therefore investigated worst case to representative mode in test report.

2. The EUT contains following accessory devices

Product	Brand	Model	Description
Adapter	DEE VAN ENTERPRISE CO., LTD	DSA-12PF09-12 FUS 120100	I/P:100-240Vac,50/60Hz, 0.5A O/P: 12 Vdc, 1A O/P Cable: 1.5m, Non-shielded, w/o ferrite core
Ceiling mount bracket	Draytek Corporation	N/A	N/A
T-Rail Mounting Kits (Used for suspended ceiling)	Draytek Corporation	N/A	N/A
Fixings and Screws (for ceiling mounting)	Draytek Corporation	N/A	N/A
Screw set (for wall mounting)	Draytek Corporation	N/A	N/A
RJ-45 Cable (Ethernet)	Draytek Corporation	N/A	Length: 1.8m, Non-shielded

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

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



6.2. Channel List

FOR 5180 ~ 5240MHz

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

Channel	Frequency	Channel	Frequency
36	5180 MHz	44	5220 MHz
40	5200 MHz	48	5240 MHz

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

Channel	Frequency	Channel	Frequency
38	5190 MHz	46	5230 MHz

1 channel is provided for 802.11ac (VHT80):

Channel	Frequency
42	5210MHz

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

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



6.3. Test Condition

Test Item	Test Site No.	Environmental Condition	Input Power	Test Date	Tested by
Antenna Port Conducted Measurement	SR4	23~26°C / 62~68%RH	120Vac / 60 Hz	Apr. 09, 2019 ~ Jul. 23, 2019	Wayne Chen / Howard Kao
Radiated Spurious Emission	966-2	23~27°C / 60~69%RH	120Vac / 60 Hz	Apr. 09, 2019 ~ Jul. 26, 2019	Will Chen
AC power Line Conducted Emission	SR1	21~25°C / 58~64%RH	120Vac / 60 Hz	Jul. 12, 2019 ~ Jul. 22, 2019	Will Chen

FCC Test Firm Registration Number: 498077

6.4. Description Of Available Antennas

Antenna	Brand Name	Model Name	Antenna Type	Connector Type	Antenna Gain(dBi)
Chain(0)	LYNwave	ALX19M-222AA4-00	Embedded	IPEX	3.7
Chain(1)	LYNwave	ALX19M-222AA4-01	Embedded	IPEX	4.1

Note: The above antenna information was provided from customer and for more detailed features description, please refer the manufacturer's specification or user's manual.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



6.5. Test Mode Applicability and Tested Channel Detail

- 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).
- For below 1 GHz radiated emission and AC power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case.
- For Antenna Port Conducted Measurement, this item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.
- The fundamental of the EUT was investigated in three orthogonal axes X/Y/Z, it was determined that X axis was worst-case . Therefore, all final radiated testing was performed with the EUT in X axis.
- For 9 kHz to 30 MHz, the loop antenna is studied in three polarization parallel/vertical/ground parallel directions, and parallel polarization has been determined to be the worst case of pre-scan radiation.
- The EUT power mode has been pre-scanned for radiation and conduction in Adapter mode and PoE mode. The worst case is found in PoE mode.

CDD Mode

Test item	Mode	Frequency Band (MHz)	Modulation Technology	Available Channel	Test Channel	Data Rate
Radiated Emissions (Above 1GHz)	802.11a	5180-5240	OFDM	36 to 48	36, 44, 48	6.0
	802.11ac (VHT20)		OFDM	36 to 48	36, 44, 48	MCS0
	802.11ac (VHT40)		OFDM	38 to 46	38, 46	MCS0
	802.11ac (VHT80)		OFDM	42	42	MCS0
	802.11a	5745-5825	OFDM	149 to 165	149, 157, 165	6.0
	802.11ac (VHT20)		OFDM	149 to 165	149, 157, 165	MCS0
	802.11ac (VHT40)		OFDM	151 to 159	151, 159	MCS0
	802.11ac (VHT80)		OFDM	155	155	MCS0
Radiated Emissions (Below 1GHz)	802.11ac (VHT80)	5745-5825	OFDM	155	155	MCS0
AC Power Line Conducted Emission	802.11ac (VHT80)	5745-5825	OFDM	155	155	MCS0
Antenna Port Conducted Measurement	802.11a	5180-5240	OFDM	36 to 48	36, 44, 48	6.0
	802.11ac (VHT20)		OFDM	36 to 48	36, 44, 48	MCS0
	802.11ac (VHT40)		OFDM	38 to 46	38, 46	MCS0
	802.11ac (VHT80)		OFDM	42	42	MCS0
	802.11a	5745-5825	OFDM	149 to 165	149, 157, 165	6.0
	802.11ac (VHT20)		OFDM	149 to 165	149, 157, 165	MCS0
	802.11ac (VHT40)		OFDM	151 to 159	151, 159	MCS0
	802.11ac (VHT80)		OFDM	155	155	MCS0

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Beamforming Mode

Test item	Mode	Frequency Band (MHz)	Modulation Technology	Available Channel	Test Channel	Data Rate
Radiated Emissions (Above 1GHz)	802.11a	5180-5240	OFDM	36 to 48	36, 44, 48	6.0
	802.11ac (VHT20)		OFDM	36 to 48	36, 44, 48	MCS0 (Nss1)
	802.11ac (VHT40)		OFDM	38 to 46	38, 46	MCS0 (Nss1)
	802.11ac (VHT80)		OFDM	42	42	MCS0 (Nss1)
	802.11a	5745-5825	OFDM	149 to 165	149, 157, 165	6.0
	802.11ac (VHT20)		OFDM	149 to 165	149, 157, 165	MCS0 (Nss1)
	802.11ac (VHT40)		OFDM	151 to 159	151, 159	MCS0 (Nss1)
	802.11ac (VHT80)		OFDM	155	155	MCS0 (Nss1)
Radiated Emissions (Below 1GHz)	802.11ac (VHT20)	5180-5240	OFDM	36 to 48	44	MCS0 (Nss1)
Antenna Port Conducted Measurement	802.11a	5180-5240	OFDM	36 to 48	36, 44, 48	6.0
	802.11ac (VHT20)		OFDM	36 to 48	36, 44, 48	MCS0 (Nss1)
	802.11ac (VHT40)		OFDM	38 to 46	38, 46	MCS0 (Nss1)
	802.11ac (VHT80)		OFDM	42	42	MCS0 (Nss1)
	802.11a	5745-5825	OFDM	149 to 165	149, 157, 165	6.0
	802.11ac (VHT20)		OFDM	149 to 165	149, 157, 165	MCS0 (Nss1)
	802.11ac (VHT40)		OFDM	151 to 159	151, 159	MCS0 (Nss1)
	802.11ac (VHT80)		OFDM	155	155	MCS0 (Nss1)

Co-Location Mode

Test item	Mode	Modulation Technology	Modulation Type	Available Channel	Test Channel	Data Rate
Radiated Emissions	802.11b	DSSS	DBPSK	1 to 13	6+165	1.0
	802.11ac (VHT20)	OFDM	BPSK	36 to 48		MCS0
				149 to 165		

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



6.6. Duty cycle

CDD Mode

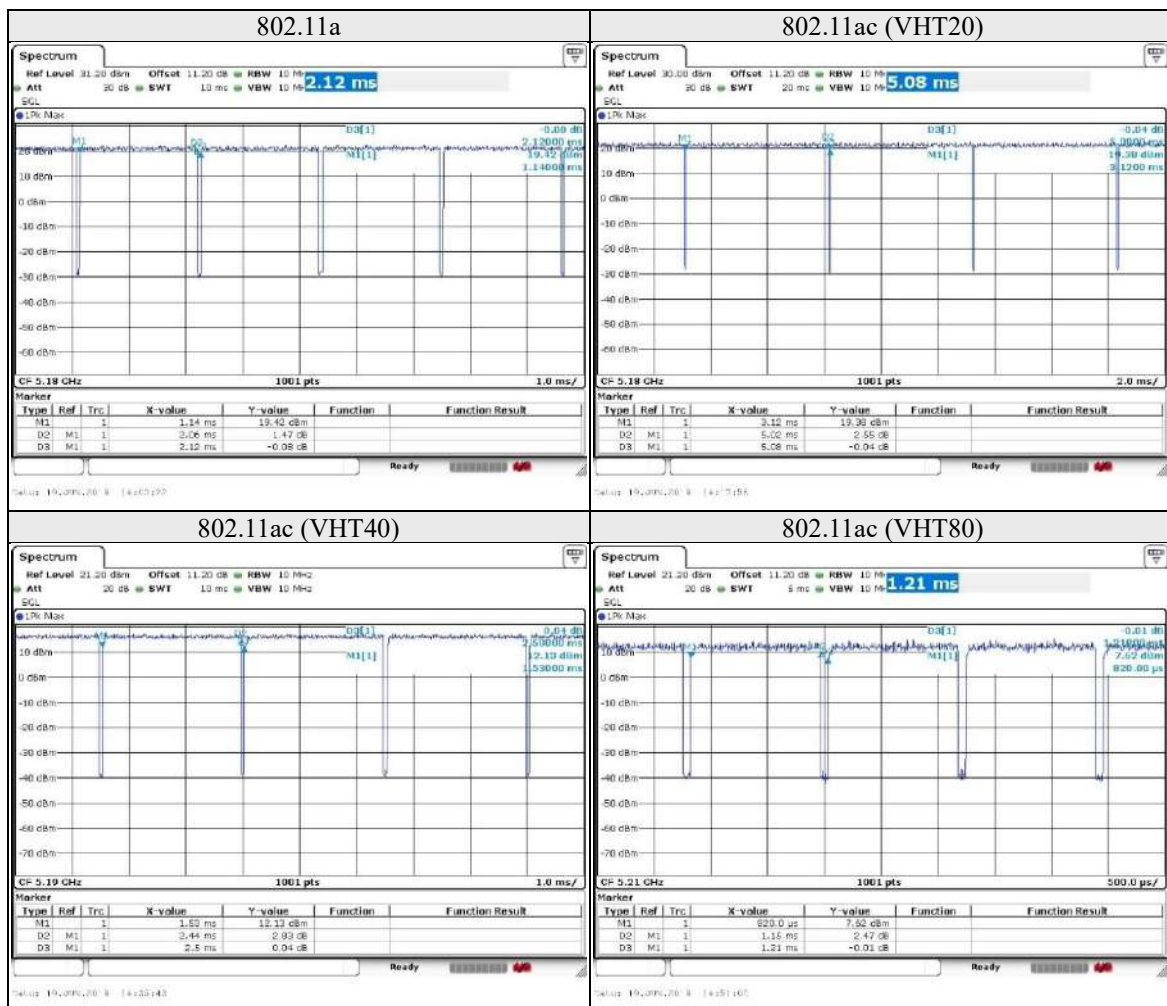
Duty cycle of test signal is < 98 %, duty factor is required.

802.11a: Duty cycle = $2.06/2.12 = 0.972$, Duty factor = $10 * \log(1/0.972) = 0.12$

802.11ac (VHT20): Duty cycle of test signal is $\geq 98 \%$, duty factor is not required.

802.11ac (VHT40): Duty cycle = $2.44/2.5 = 0.976$, Duty factor = $10 * \log(1/0.976) = 0.11$

802.11ac (VHT80): Duty cycle = $1.15/1.21 = 0.95$, Duty factor = $10 * \log(1/0.95) = 0.22$





Beamforming Mode

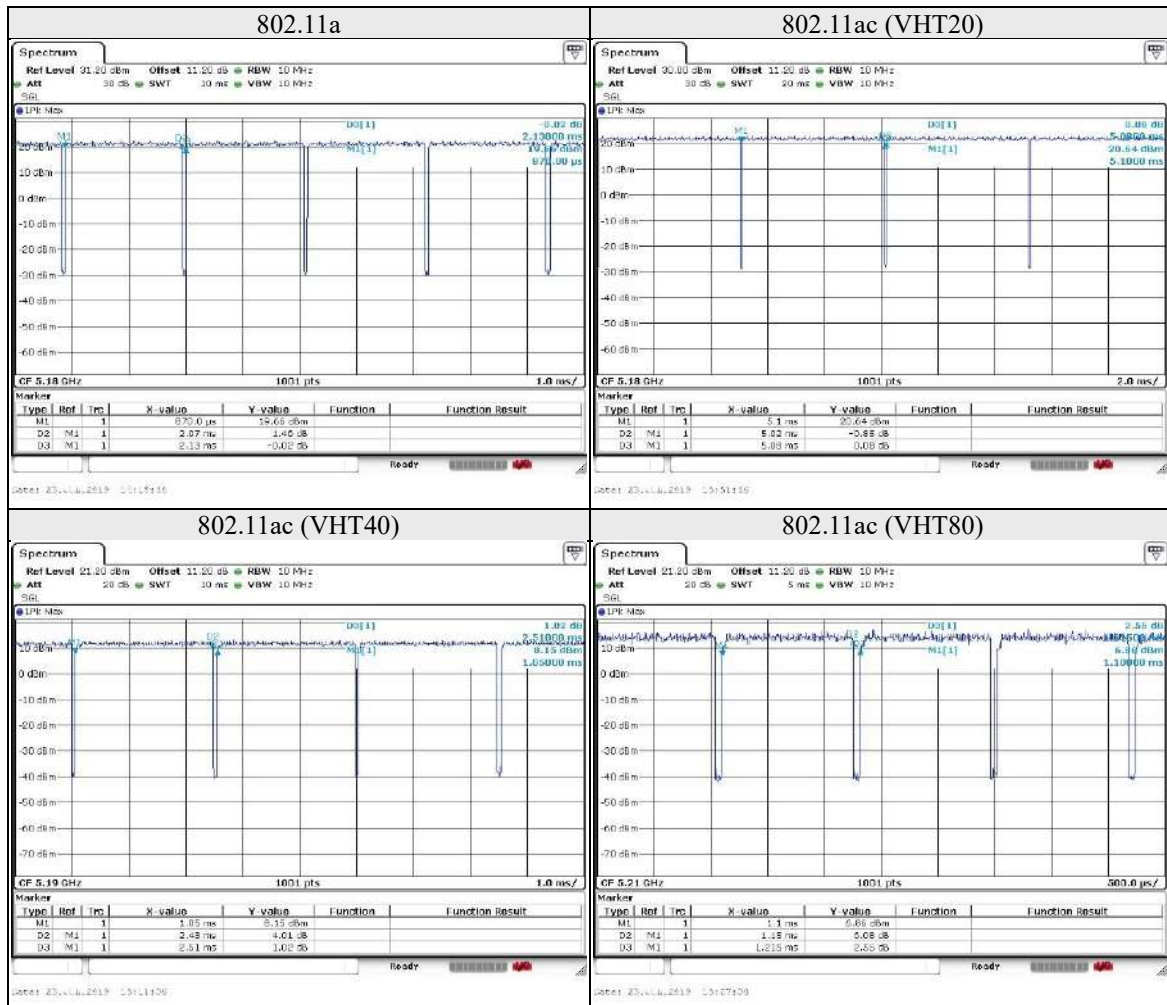
Duty cycle of test signal is < 98 %, duty factor is required.

802.11a: Duty cycle = $2.07/2.13 = 0.972$, Duty factor = $10 * \log(1/0.972) = 0.12$

802.11ac (VHT20): Duty cycle of test signal is $\geq 98 \%$, duty factor is not required.

802.11ac (VHT40): Duty cycle = $2.43/2.51 = 0.968$, Duty factor = $10 * \log(1/0.968) = 0.14$

802.11ac (VHT80): Duty cycle = $1.15/1.215 = 0.947$, Duty factor = $10 * \log(1/0.947) = 0.24$





7. Test Equipment

Test Equipment List					
Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
Radiated Spurious Emission					
Spectrum Analyzer	Keysight	N9010A	MY56070827	Nov. 8, 2018	1 year
EMI Test Receiver	Rohde & Schwarz	ESR7	101754	Nov. 8, 2018	1 year
Loop Antenna	ETS lindgren	6502	00213440	Dec. 11, 2018	1 year
Trilog-Broadband Antenna with 5dB Attenuator	Schwarzbeck & EMCI	VULB 9168 & N-6-05	774 & AT-N0538	Jan. 14, 2019	1 year
Horn Antenna (1-18 GHz)	Schwarzbeck	BBHA 9120 D	01690	Jan. 25, 2019	1 year
Horn Antenna (18-40 GHz)	Schwarzbeck	BBHA 9170	781	Jan.16, 2019	1 year
Preamplifier (30-1000 MHz)	EMCI	EMC330E	980405	Jan. 30, 2019	1 year
Preamplifier (1-18 GHz)	EMCI	EMC051835BE	980406	Jan. 29, 2019	1 year
Preamplifier (18-40GHz)	EMCI	EMC184040SE E	980426	May 8, 2019	1 year
RF Cable (9 KHz~18 GHz)	UltraPhase & EMC Instrument	A1K50-UP0358-A1K50-1500&EMC106-NM-SM-2500/7000	170111-4&170219/170102	Jan. 29, 2019	1 year
RF Cable (18 GHz~40 GHz)	UltraPhase	K1K50-UP0264-K1K50-2500/2500/600	170214-2/170214-6/170111-1	Jan. 29, 2019	1 year

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Test report No. : 4788947466-US-R1-V0
Page : 17 of 159
Issued date : Oct. 28, 2019
FCC ID : VGYAP912C

Test Equipment List					
Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
Antenna Port Conducted Measurement					
Spectrum Analyzer	Keysight	N9010A	MY56070834	Nov. 8, 2018	1 year
Spectrum Analyzer	Rohde & Schwarz	FSV40	101490	Sep. 25, 2018	1 year
Pulse Power Sensor	Anrisu	MA2411B	1531202	Dec. 17, 2018	1 year
Power Meter	Anrisu	ML2495A	1645002	Dec. 17, 2018	1 year
Temperature & Humidity Test Chamber	GIANT FORCE	GTH-150-40-CP-AR	MAA1701-010	Apr. 3, 2019	1 year
AC power Line Conducted Emission					
EMI Test Receiver	Rohde & Schwarz	ESR7	101753	Nov. 14, 2018	1 year
Two-Line V-Network	Rohde & Schwarz	ENV216	102136	Aug. 5, 2018	1 year
Impuls-Begrenzer Pulse Limiter	Rohde & Schwarz	ESH3-Z2	102219-Qt	Aug. 2, 2018	1 year
Cables	Huber+Suhner	RG 214/U	FCC-BCICF-4_RF	Jan. 29, 2019	1 year

UL Software		
Description	Name	Version
Radiated measurement	EZ_EMC	1.1.4.2
Conducted measurement	Keysight.TestSystem	1.0.0.0
AC power Line Conducted Emission	EZ_EMC	1.1.4.2

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



8. Description of Test Setup

Support Equipment

Equipment	Brand Name	Model Name	S/N	Remark
Notebook	DELL	Latitude E5470	3JFKWF2	N/A
PoE	Bullet PoE	BPI100-GH	1804240137	N/A

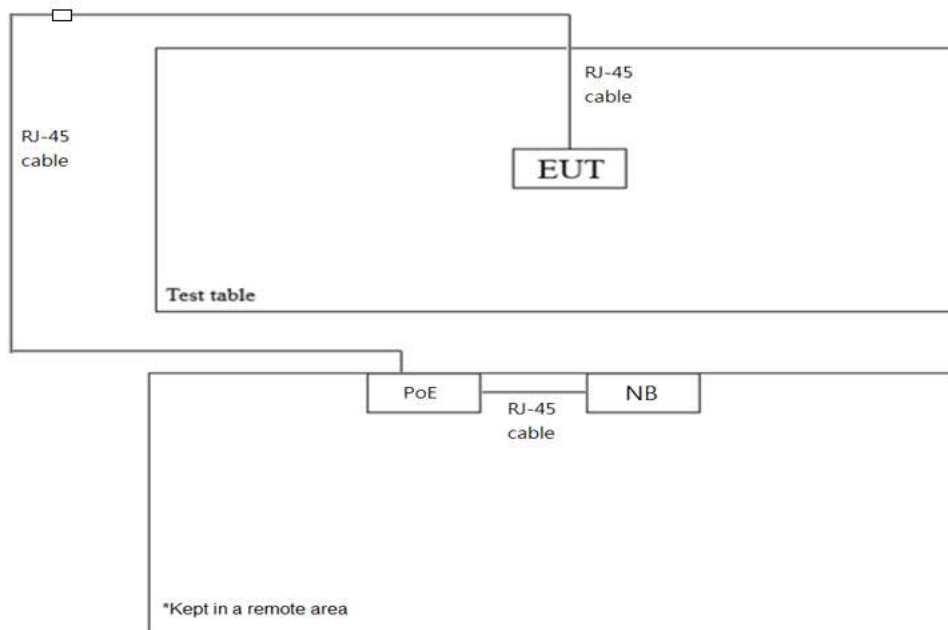
I/O Cables

Equipment	Brand Name	Model Name	S/N	Remark
RJ-45 cable	N/A	N/A	N/A	Length : 10m
RJ-45 cable	N/A	N/A	N/A	Length : 1m

Test Setup

Controlled using a bespoke application (QRCT V3.0.219.0) on a test Notebook. The application was used to enable a continuous transmission mode and to select the test channels, data rates, modulation schemes and power setting as required.

Setup Diagram for Test



Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



9. Test Results

9.1. 6dB Bandwidth

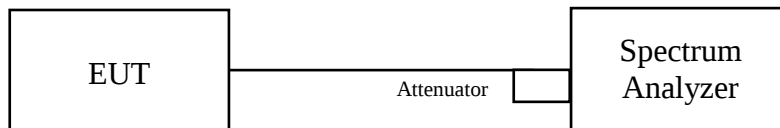
Requirements

The minimum 6 dB bandwidth shall be at least 500 kHz.

Test procedure

- Set resolution bandwidth (RBW) = 100kHz
- Set the video bandwidth (VBW) $\geq 3 \times$ RBW, Detector = Peak.
- Trace mode = max hold.
- Sweep = auto couple.
- 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

Test Setup



The loss between RF output port of the EUT and the input port of the Spectrum Analyzer has been taken into consideration.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Test Data

CDD Mode

802.11a

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
149	5745	16.284	16.324	0.5	Pass
157	5785	16.324	16.284	0.5	Pass
165	5825	16.324	16.324	0.5	Pass

802.11ac (VHT20)

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
149	5745	16.923	16.523	0.5	Pass
157	5785	16.903	16.523	0.5	Pass
165	5825	16.903	17.243	0.5	Pass

802.11ac (VHT40)

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
151	5755	35.085	35.045	0.5	Pass
159	5795	35.045	35.045	0.5	Pass

802.11ac (VHT80)

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
155	5775	75.684	75.684	0.5	Pass

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

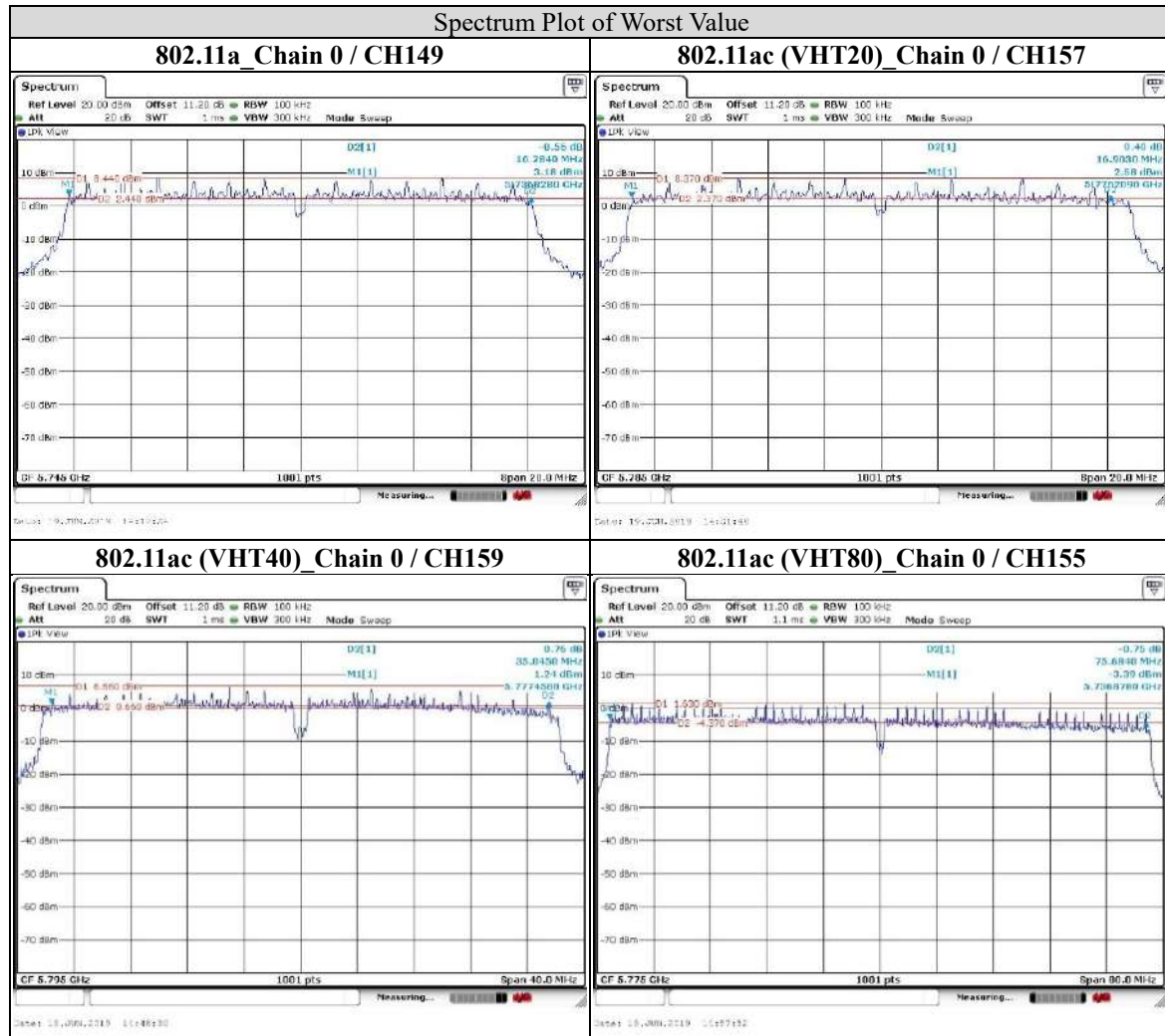
Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Test report No. : 4788947466-US-R1-V0
Page : 21 of 159
Issued date : Oct. 28, 2019
FCC ID : VGYAP912C



Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

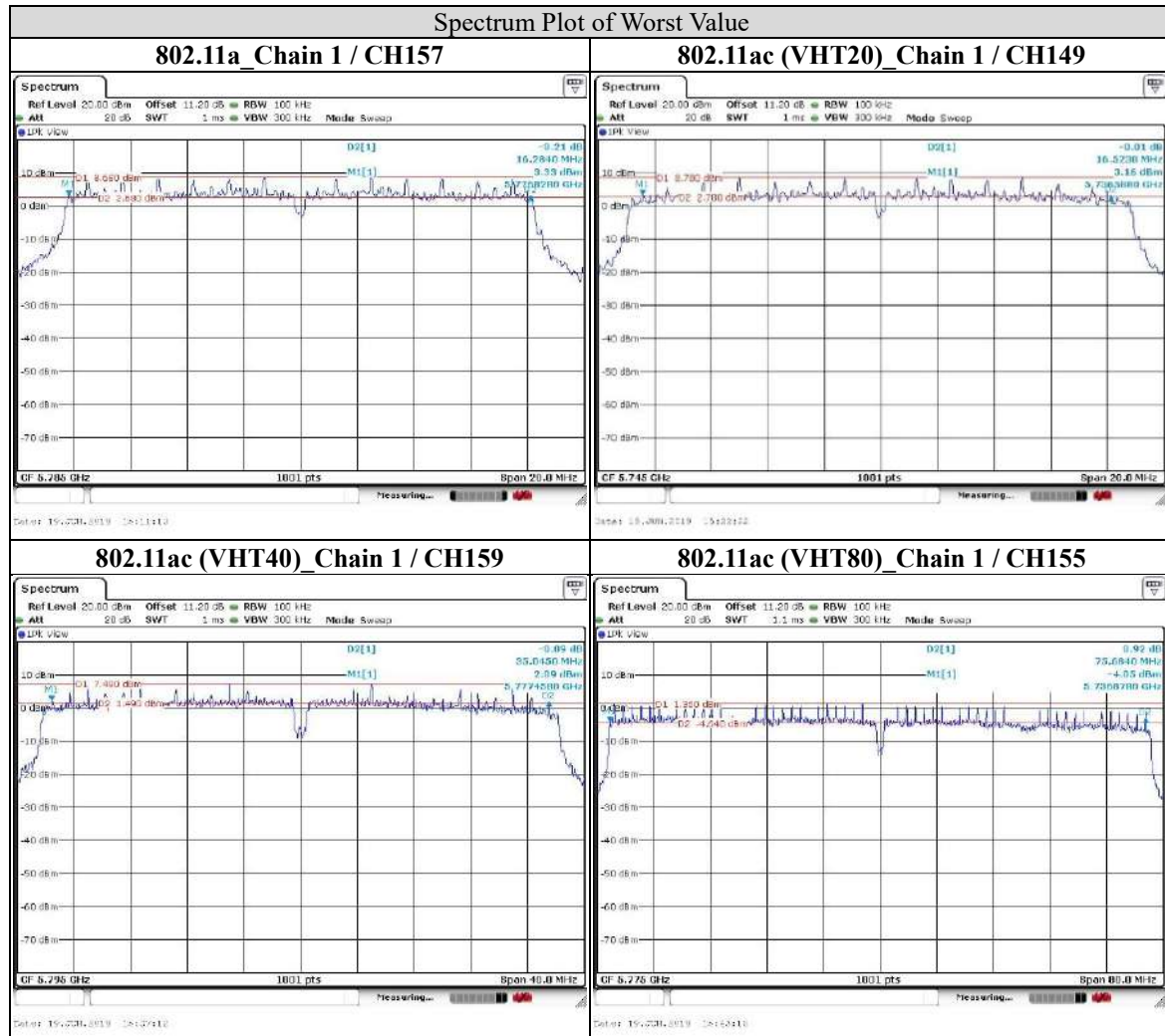
Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Test report No. : 4788947466-US-R1-V0
Page : 22 of 159
Issued date : Oct. 28, 2019
FCC ID : VGYAP912C



Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Beamforming Mode

802.11a

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
149	5745	16.304	16.304	0.5	Pass
157	5785	16.304	16.284	0.5	Pass
165	5825	16.264	16.324	0.5	Pass

802.11ac (VHT20)

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
149	5745	16.923	17.143	0.5	Pass
157	5785	17.143	17.163	0.5	Pass
165	5825	17.283	16.523	0.5	Pass

802.11ac (VHT40)

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
151	5755	35.085	35.125	0.5	Pass
159	5795	35.085	35.085	0.5	Pass

802.11ac (VHT80)

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
155	5775	75.285	75.445	0.5	Pass

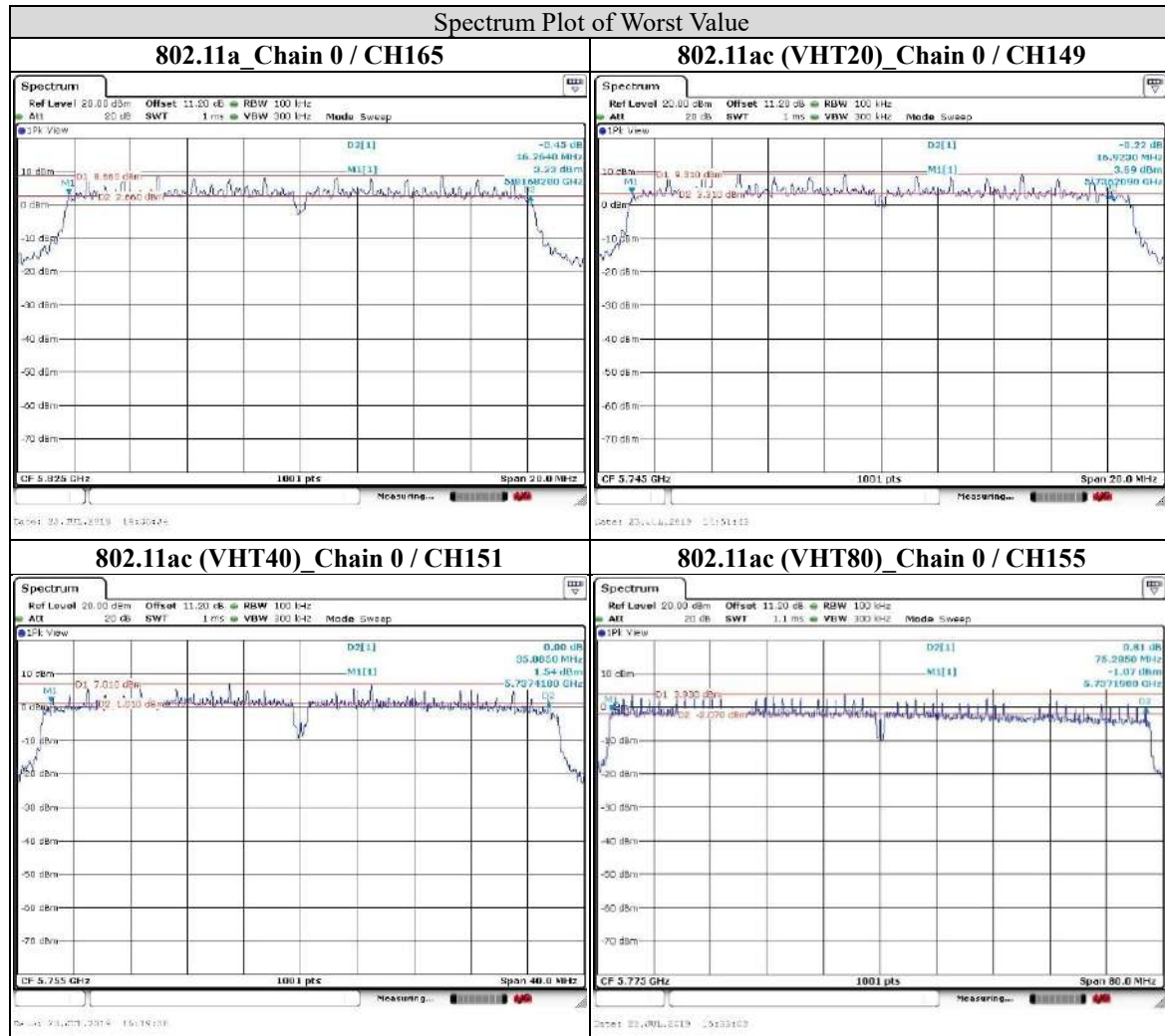
Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

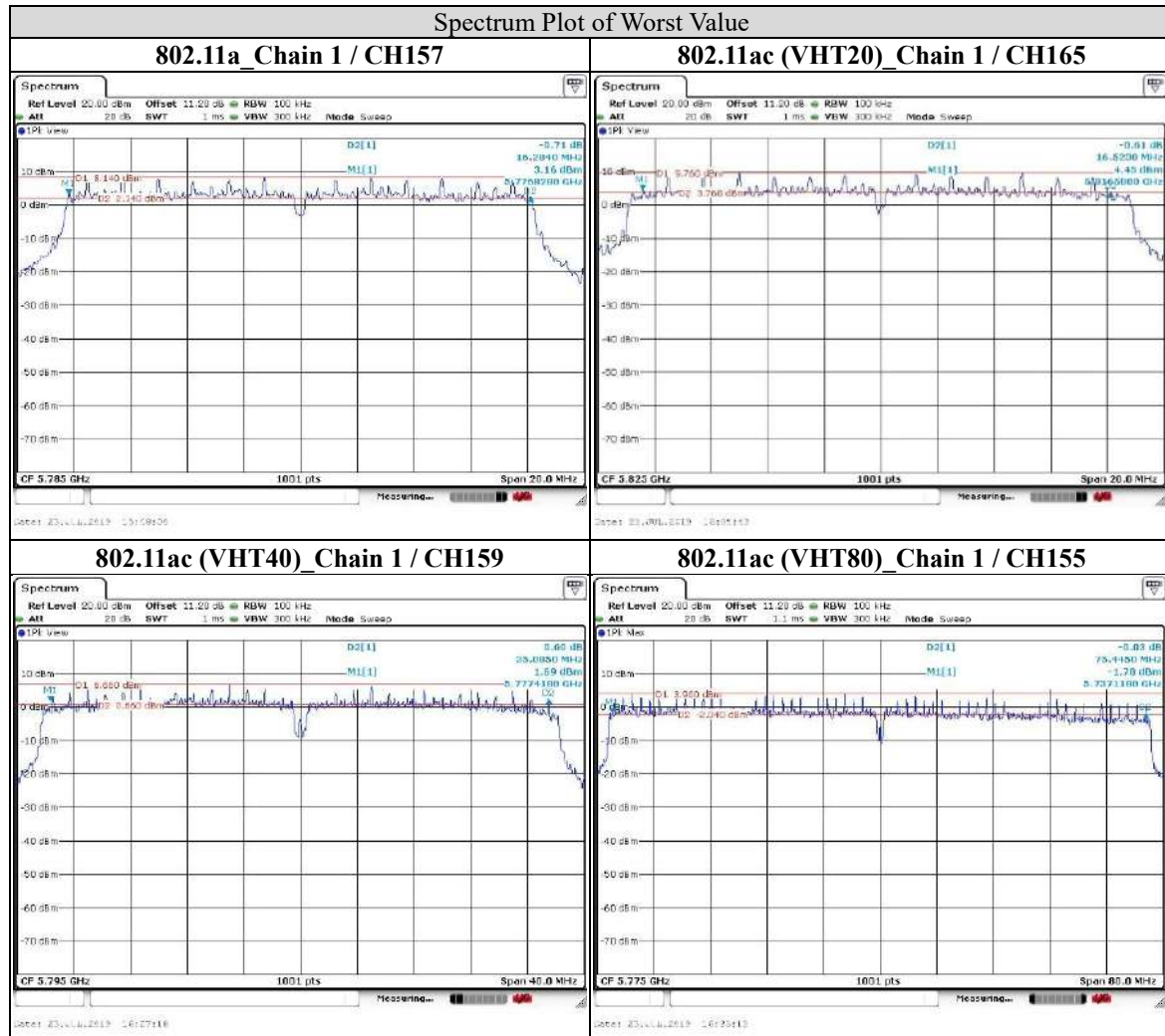
Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0878 / 3.0





Test report No. : 4788947466-US-R1-V0
Page : 25 of 159
Issued date : Oct. 28, 2019
FCC ID : VGYAP912C



Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0878 / 3.0

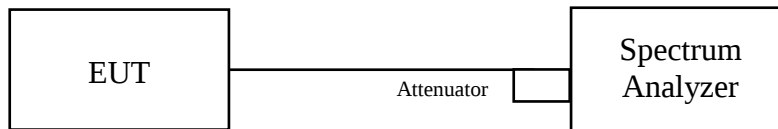


9.2. 26dB Bandwidth

Test procedure

1. Set RBW = approximately 1% of the emission bandwidth.
2. Set the VBW > RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Measure the maximum width of the emission that is 26 dB down from the peak of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

Test Setup



The loss between RF output port of the EUT and the input port of the Spectrum Analyzer has been taken into consideration.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Test Data

CDD Mode

802.11a

CHANNEL	CHANNEL FREQUENCY (MHz)	26 dB Bandwidth (MHz)		PASS / FAIL
		CHAIN 0	CHAIN 1	
36	5180	21.079	20.879	PASS
44	5220	35.115	40.01	PASS
48	5240	34.416	39.76	PASS

802.11ac (VHT20)

CHANNEL	CHANNEL FREQUENCY (MHz)	26 dB Bandwidth (MHz)		PASS / FAIL
		CHAIN 0	CHAIN 1	
36	5180	21.628	21.628	PASS
44	5220	36.414	38.561	PASS
48	5240	28.971	34.316	PASS

802.11ac (VHT40)

CHANNEL	CHANNEL FREQUENCY (MHz)	26 dB Bandwidth (MHz)		PASS / FAIL
		CHAIN 0	CHAIN 1	
38	5190	40.729	40.46	PASS
46	5230	47.113	64.106	PASS

802.11ac (VHT80)

CHANNEL	CHANNEL FREQUENCY (MHz)	26 dB Bandwidth (MHz)		PASS / FAIL
		CHAIN 0	CHAIN 1	
42	5210	83.12	83.44	PASS

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

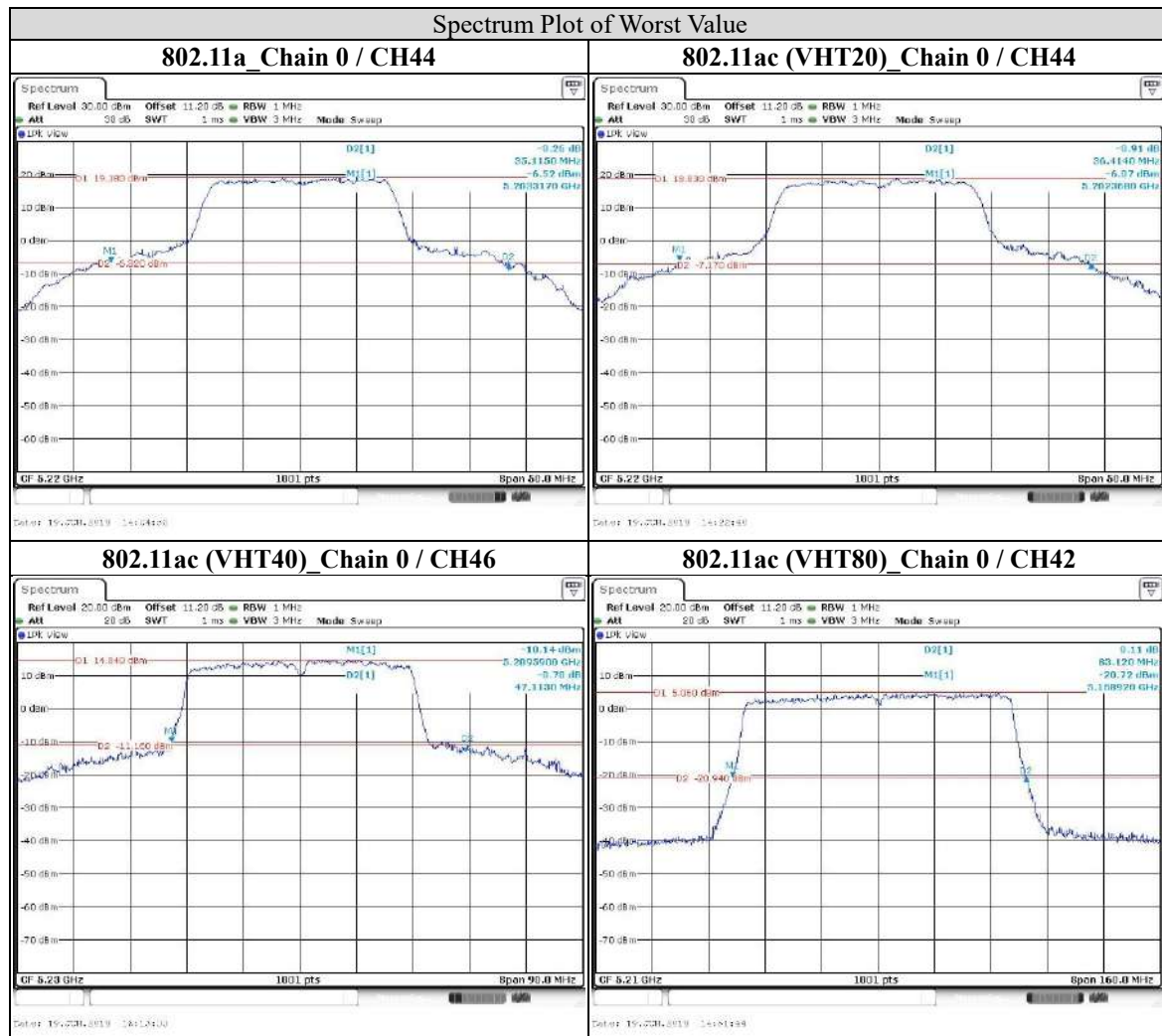
Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Test report No. : 4788947466-US-R1-V0
Page : 28 of 159
Issued date : Oct. 28, 2019
FCC ID : VGYAP912C



Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

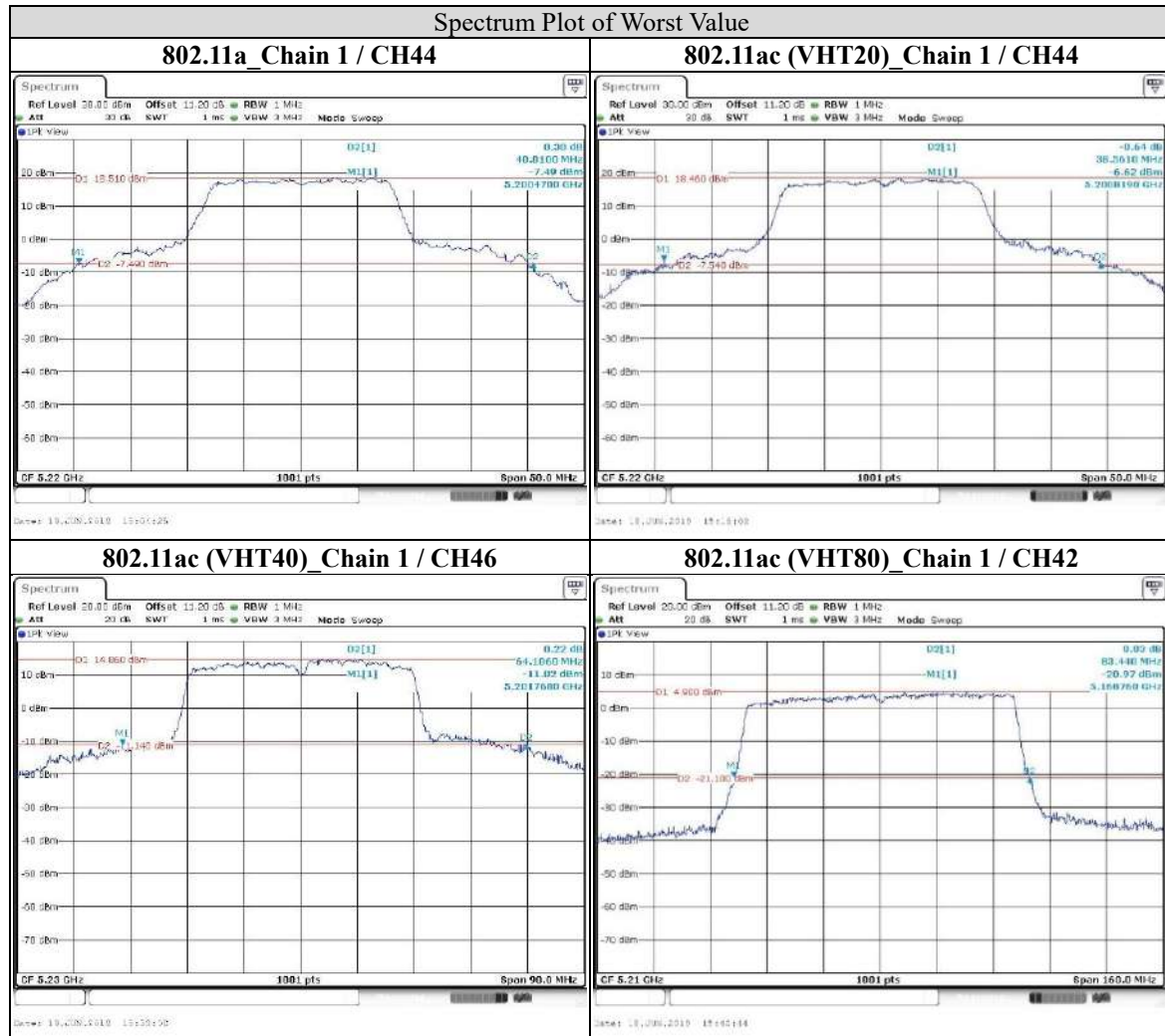
Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Test report No. : 4788947466-US-R1-V0
Page : 29 of 159
Issued date : Oct. 28, 2019
FCC ID : VGYAP912C



Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Beamforming Mode

802.11a

CHANNEL	CHANNEL FREQUENCY (MHz)	26 dB Bandwidth (MHz)		PASS / FAIL
		CHAIN 0	CHAIN 1	
36	5180	21.179	22.028	PASS
44	5220	24.076	31.768	PASS
48	5240	26.374	31.668	PASS

802.11ac (VHT20)

CHANNEL	CHANNEL FREQUENCY (MHz)	26 dB Bandwidth (MHz)		PASS / FAIL
		CHAIN 0	CHAIN 1	
36	5180	22.378	24.625	PASS
44	5220	24.226	30.12	PASS
48	5240	22.428	24.525	PASS

802.11ac (VHT40)

CHANNEL	CHANNEL FREQUENCY (MHz)	26 dB Bandwidth (MHz)		PASS / FAIL
		CHAIN 0	CHAIN 1	
38	5190	40.46	40.46	PASS
46	5230	47.383	59.88	PASS

802.11ac (VHT80)

CHANNEL	CHANNEL FREQUENCY (MHz)	26 dB Bandwidth (MHz)		PASS / FAIL
		CHAIN 0	CHAIN 1	
42	5210	83.44	83.44	PASS

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

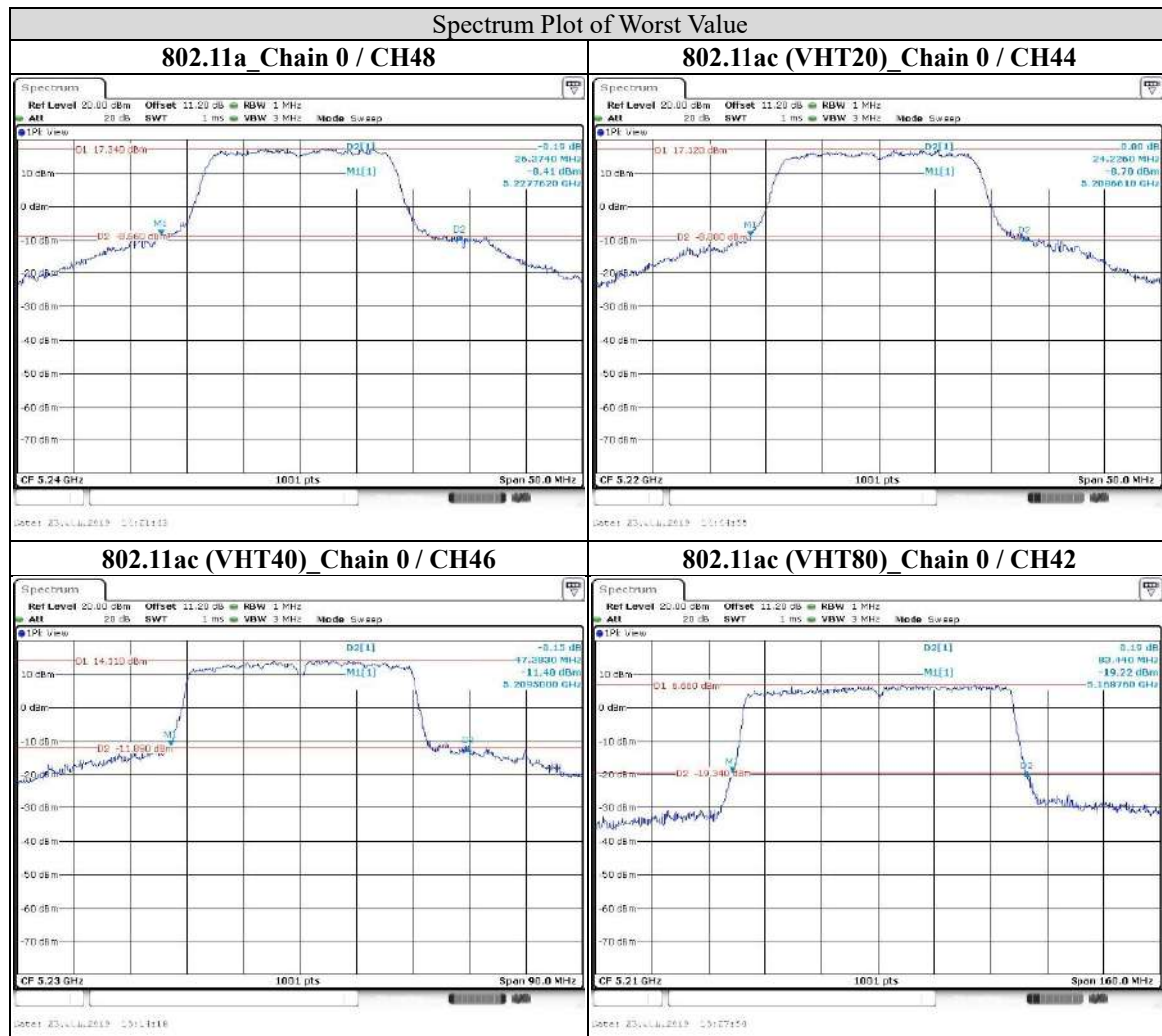
Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Test report No. : 4788947466-US-R1-V0
Page : 31 of 159
Issued date : Oct. 28, 2019
FCC ID : VGYAP912C



Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0878 / 3.0

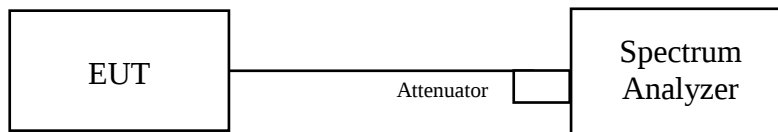


9.3. Occupied Bandwidth

Test procedure

1. Set center frequency to the nominal EUT channel center frequency.
2. Set span = 1.5 times to 5.0 times the OBW.
3. Set RBW = 1% to 5% of the OBW
4. Set VBW $\geq 3 \times$ RBW
5. Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.
6. Use the 99% power bandwidth function of the instrument (if available).
7. If the instrument does not have a 99% power bandwidth function, the trace data points are recovered and directly summed in power units. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5% of the total is reached; that frequency is recorded as the upper frequency. The 99% occupied bandwidth is the difference between these two frequencies.

Test Setup



The loss between RF output port of the EUT and the input port of the Spectrum Analyzer has been taken into consideration.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Test Data

CDD Mode

802.11a

Channel	Channel Frequency (MHz)	Occupied Bandwidth (MHz)	
		CHAIN 0	CHAIN 1
36	5180	17.133	17.283
44	5220	18.281	20.579
48	5240	18.182	19.829
149	5745	17.133	17.283
157	5785	17.183	17.333
165	5825	17.383	17.582

802.11ac (VHT20)

Channel	Channel Frequency (MHz)	Occupied Bandwidth (MHz)	
		CHAIN 0	CHAIN 1
36	5180	18.132	18.132
44	5220	19.73	20.723
48	5240	18.482	19.13
149	5745	18.182	18.082
157	5785	18.232	18.132
165	5825	18.382	18.382

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



802.11ac (VHT40)

Channel	Channel Frequency (MHz)	Occupied Bandwidth (MHz)	
		CHAIN 0	CHAIN 1
38	5190	36.064	35.964
46	5230	36.363	36.563
151	5755	37.163	36.563
159	5795	36.363	36.363

802.11ac (VHT80)

Channel	Channel Frequency (MHz)	Occupied Bandwidth (MHz)	
		CHAIN 0	CHAIN 1
42	5210	75.644	75.644
155	5775	75.644	75.764

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Test report No. : 4788947466-US-R1-V0
Page : 36 of 159
Issued date : Oct. 28, 2019
FCC ID : VGYAP912C



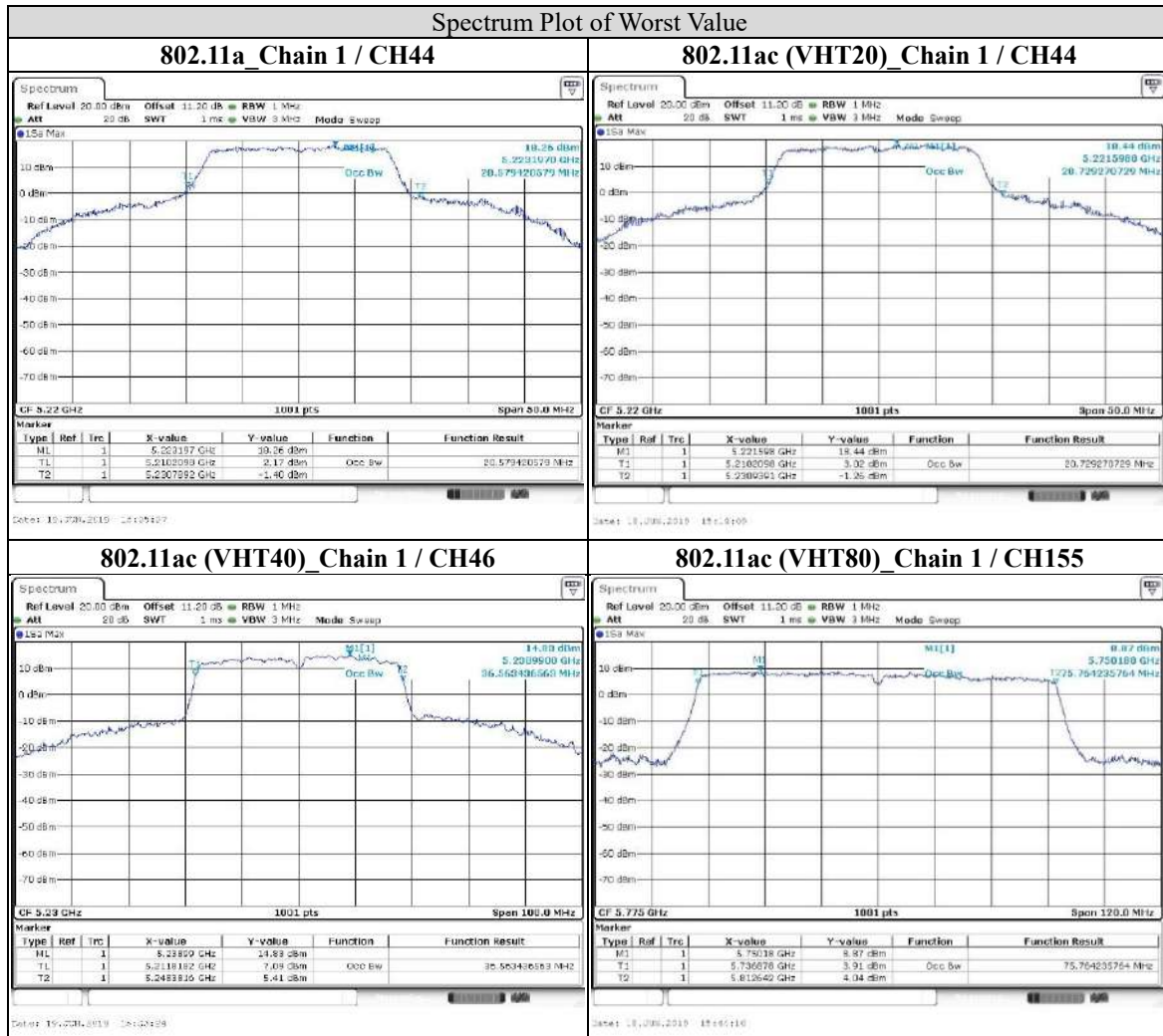


Test report No. : 4788947466-US-R1-V0
Page : 37 of 159
Issued date : Oct. 28, 2019
FCC ID : VGYAP912C





Test report No. : 4788947466-US-R1-V0
Page : 38 of 159
Issued date : Oct. 28, 2019
FCC ID : VGYAP912C



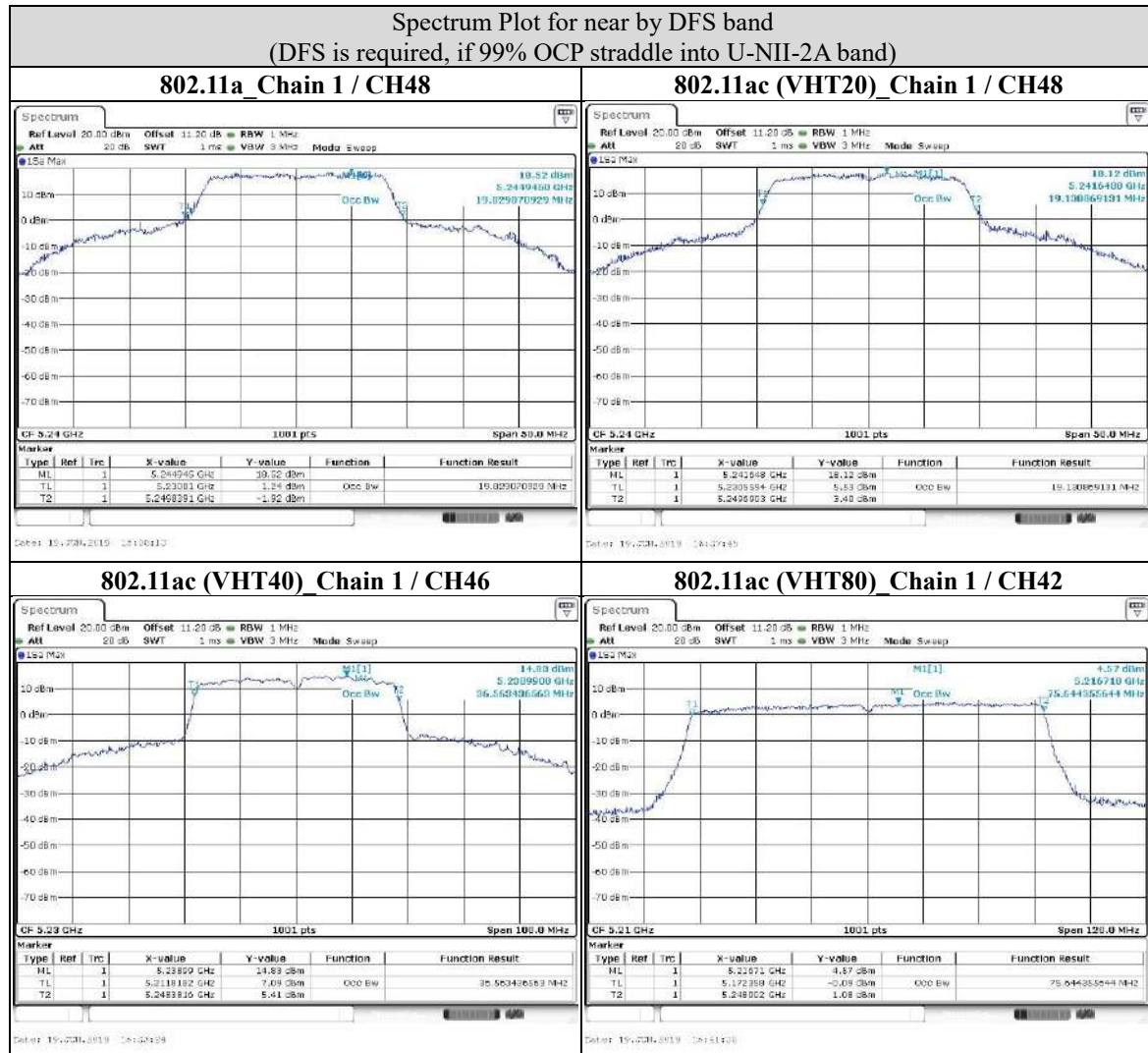
Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0878 / 3.0





Beamforming Mode

802.11a

Channel	Channel Frequency (MHz)	Occupied Bandwidth (MHz)	
		CHAIN 0	CHAIN 1
36	5180	17.183	17.382
44	5220	17.383	17.732
48	5240	17.382	17.882
149	5745	17.133	17.283
157	5785	17.233	17.333
165	5825	17.333	17.582

802.11ac (VHT20)

Channel	Channel Frequency (MHz)	Occupied Bandwidth (MHz)	
		CHAIN 0	CHAIN 1
36	5180	18.332	18.382
44	5220	18.382	18.631
48	5240	18.332	18.432
149	5745	18.482	18.332
157	5785	18.531	18.382
165	5825	18.731	18.581

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



802.11ac (VHT40)

Channel	Channel Frequency (MHz)	Occupied Bandwidth (MHz)	
		CHAIN 0	CHAIN 1
38	5190	35.964	35.964
46	5230	36.363	36.563
151	5755	36.463	36.064
159	5795	36.563	36.363

802.11ac (VHT80)

Channel	Channel Frequency (MHz)	Occupied Bandwidth (MHz)	
		CHAIN 0	CHAIN 1
42	5210	75.644	75.644
155	5775	76.363	76.124

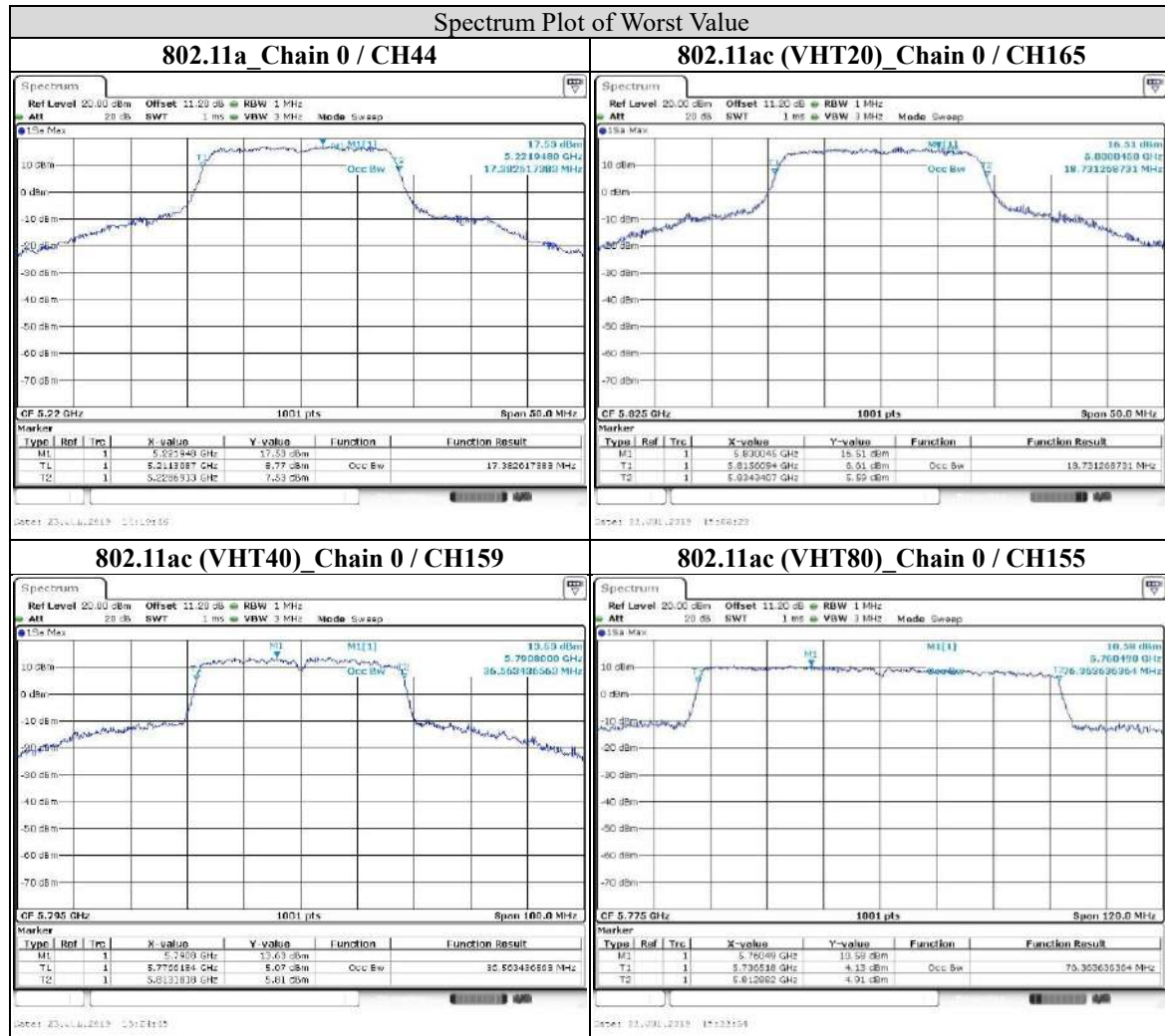
Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

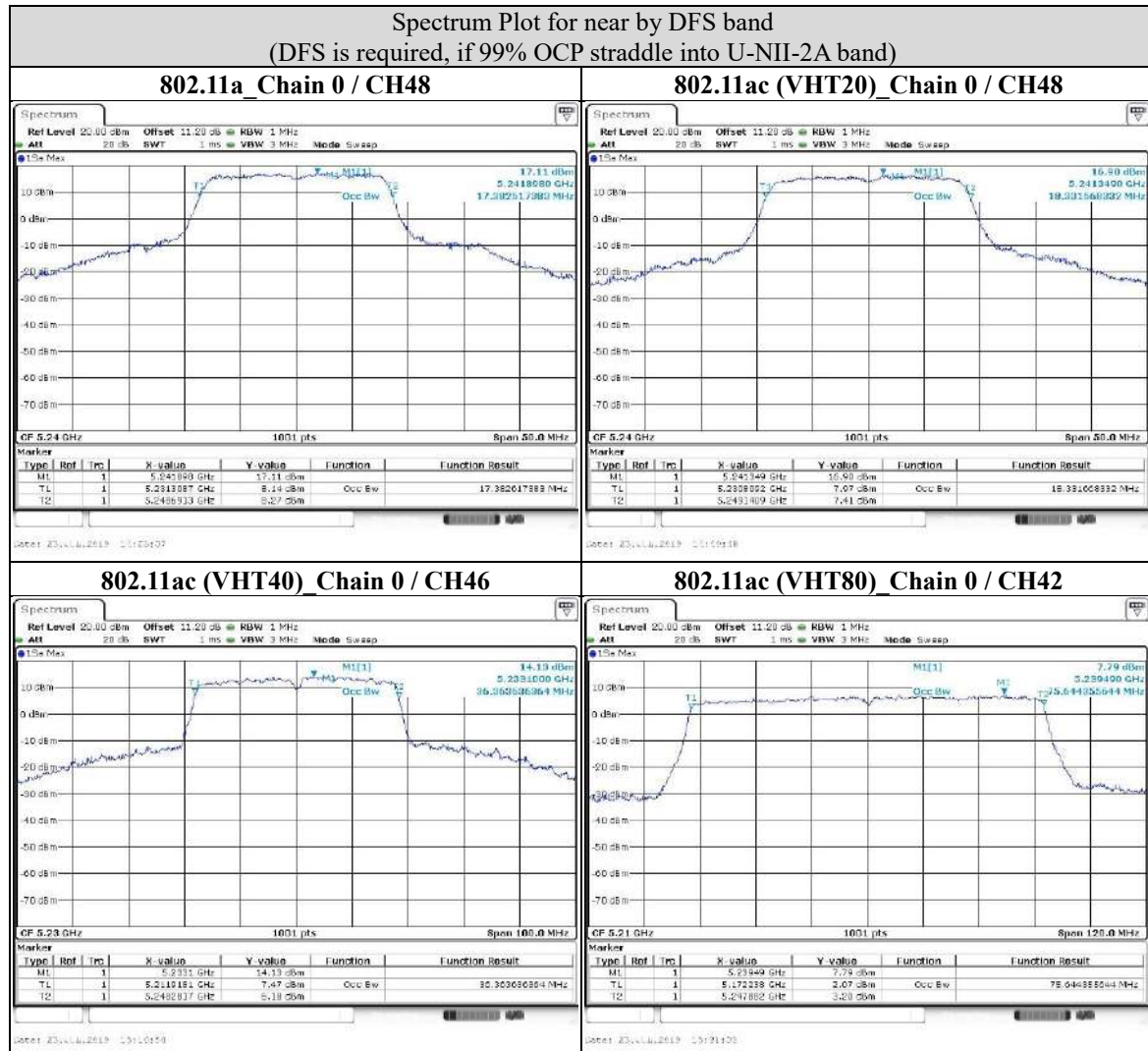
Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0





Test report No. : 4788947466-US-R1-V0
Page : 43 of 159
Issued date : Oct. 28, 2019
FCC ID : VGYAP912C





Test report No. : 4788947466-US-R1-V0
Page : 44 of 159
Issued date : Oct. 28, 2019
FCC ID : VGYAP912C



Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0878 / 3.0





9.4. Conducted output power

Requirements

Operation Band	EUT Category		Limit
U-NII-1		Outdoor Access Point	1 Watt (30 dBm) Max. e.i.r.p $\leq$ 125mW(21 dBm) at any elevation angle above 30 degrees as measured from the horizon If $G_{TX} > 6$ dBi, then $P_{Out} = 30 - (G_{TX} - 6)$
		Fixed point-to-point Access Point	1 Watt (30 dBm) If $G_{TX} > 23$ dBi, then $P_{Out} = 30 - (G_{TX} - 23)$
	√	Indoor Access Point	1 Watt (30 dBm) If $G_{TX} > 6$ dBi, then $P_{Out} = 30 - (G_{TX} - 6)$
		Client device	250mW (24 dBm) If $G_{TX} > 6$ dBi, then $P_{Out} = 24 - (G_{TX} - 6)$
U-NII-2A	---		250mW (24 dBm) or 11 dBm+10 log B* If $G_{TX} > 6$ dBi, then $P_{Out} = 24 - (G_{TX} - 6)$
U-NII-2C	---		250mW (24 dBm) or 11 dBm+10 log B* If $G_{TX} > 6$ dBi, then $P_{Out} = 24 - (G_{TX} - 6)$
U-NII-3	---		For Point-to-multipoint systems (P2M): 1 Watt (30 dBm). If $G_{TX} > 6$ dBi, then $P_{Out} = 30 - (G_{TX} - 6)$ For Point-to-point systems (P2P): 1 Watt (30 dBm)

Note:

- P_{Out} = maximum conducted output power in dBm,
- G_{TX} = the maximum transmitting antenna directional gain in dBi.
- Directional Gain = $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{Gn/20})^2 / N_{ant}]$ dBi.

Nant: Number of Transmit Antennas

G1, G2,..., Gn: Gain of Individual Antennas

- 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.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Test Procedure

Test method PM-G

For 802.11a, 802.11ac (VHT20), 802.11ac (VHT40)

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 and set the detector to AVERAGE. Duty factor is not added to measured value.

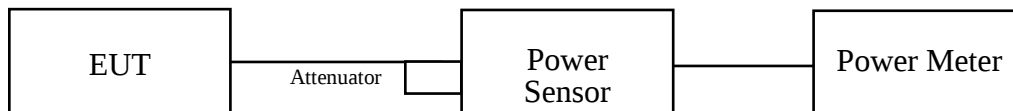
Test method SA-1

For 802.11ac (VHT80)

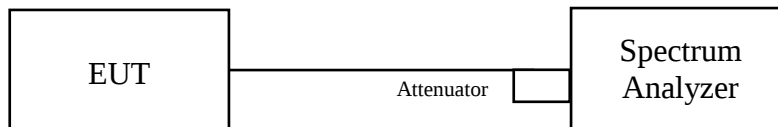
- 1) Set span to encompass the entire 26 dB EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal.
- 2) Set sweep trigger*.
- 3) Set RBW = 1 MHz.
- 4) Set VBW $\geq$ 3 MHz
- 5) Number of points in sweep $\geq$ 2 Span / RBW.
- 6) Sweep time $\leq$ (number of points in sweep) * T
- 7) Using emission bandwidth to determine the frequency span for integration the channel bandwidth.
- 8) Detector = RMS.
- 9) Trace mode = max hold.
- 10) Allow max hold to run for at least 60 seconds, or longer as needed to allow the trace to stabilize.

* If transmit duty cycle < 98%, use a video trigger with the trigger level set to enable triggering only on full power pulses. Transmitter must operate at maximum power control level for the entire duration of every sweep. If the EUT transmits continuously (i.e., with no off intervals) or at duty cycle $\geq$ 98%, and if each transmission is entirely at the maximum power control level, then the trigger shall be set to “free run.”

Test Setup



The loss between RF output port of the EUT and the input port of the Power Meter has been taken into consideration.



The loss between RF output port of the EUT and the input port of the Spectrum Analyzer has been taken into consideration.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Test Data

CDD Mode

802.11a

CHAN.	FREQ. (MHz)	MAXIMUM CONDUCTED POWER (dBm)		TOTAL POWER (mW)	TOTAL POWER (dBm)	POWER LIMIT (dBm)	PASS / FAIL
		chain 0	chain 1				
36	5180	17.47	18.06	119.82	20.79	30	PASS
44	5220	20.97	21.34	261.17	24.17	30	PASS
48	5240	21.16	21.6	275.161	24.40	30	PASS
149	5745	18.61	19.12	154.269	21.88	30	PASS
157	5785	18.99	19.37	165.747	22.19	30	PASS
165	5825	19.44	19.87	184.953	22.67	30	PASS

Note:

1. Directional Gain = 4.1dBi, so the limit does not need to reduced.

802.11ac (VHT20)

CHAN.	FREQ. (MHz)	MAXIMUM CONDUCTED POWER (dBm)		TOTAL POWER (mW)	TOTAL POWER (dBm)	POWER LIMIT (dBm)	PASS / FAIL
		chain 0	chain 1				
36	5180	17.32	17.75	113.517	20.55	30	PASS
44	5220	20.87	21.19	253.702	24.04	30	PASS
48	5240	20.49	20.89	234.688	23.70	30	PASS
149	5745	18.39	18.92	147.007	21.67	30	PASS
157	5785	18.75	19.12	156.647	21.95	30	PASS
165	5825	19.22	19.72	177.316	22.49	30	PASS

Note:

1. Directional Gain = 4.1dBi, so the limit does not need to reduced.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



802.11ac (VHT40)

CHAN.	FREQ. (MHz)	MAXIMUM CONDUCTED POWER (dBm)		TOTAL POWER (mW)	TOTAL POWER (dBm)	POWER LIMIT (dBm)	PASS / FAIL
		chain 0	chain 1				
38	5190	15.18	15.79	70.892	18.51	30	PASS
46	5230	19.78	20.20	199.773	23.01	30	PASS
151	5755	21.01	21.34	262.327	24.19	30	PASS
159	5795	19.62	20.19	196.094	22.92	30	PASS

Note:

1. Directional Gain = 4.1dBi, so the limit does not need to reduced.

802.11ac (VHT80)

CHAN.	CHAN. FREQ. (MHz)	MAXIMUM CONDUCTED POWER (dBm)		TOTAL POWER (mW)	TOTAL POWER (dBm)	POWER LIMIT (dBm)	PASS / FAIL
		chain 0	chain 1				
42	5210	13.42	13.88	46.413	16.67	30	PASS
155	5775	17.39	17.72	113.984	20.57	30	PASS

Note:

1. Directional Gain = 4.1dBi, so the limit does not need to reduced.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Beamforming Mode

802.11a

CHAN.	FREQ. (MHz)	MAXIMUM CONDUCTED POWER (dBm)		TOTAL POWER (mW)	TOTAL POWER (dBm)	POWER LIMIT (dBm)	PASS / FAIL
		chain 0	chain 1				
36	5180	18.76	19.21	158.53	22.00	29.09	PASS
44	5220	20.62	20.03	216.038	23.35	29.09	PASS
48	5240	20.71	20.3	224.913	23.52	29.09	PASS
149	5745	18.61	19.12	154.269	21.88	29.09	PASS
157	5785	18.99	19.37	165.747	22.19	29.09	PASS
165	5825	19.44	19.87	184.953	22.67	29.09	PASS

Note:

1. Directional Gain = 6.91dBi, so the limit shall be reduced.

802.11ac (VHT20)

CHAN.	FREQ. (MHz)	MAXIMUM CONDUCTED POWER (dBm)		TOTAL POWER (mW)	TOTAL POWER (dBm)	POWER LIMIT (dBm)	PASS / FAIL
		chain 0	chain 1				
36	5180	19.64	19.58	182.827	22.62	29.09	PASS
44	5220	20.59	20.32	222.198	23.47	29.09	PASS
48	5240	20.23	19.93	203.84	23.09	29.09	PASS
149	5745	20.6	20.53	227.795	23.58	29.09	PASS
157	5785	20.36	20.24	214.325	23.31	29.09	PASS
165	5825	20.31	20.33	215.294	23.33	29.09	PASS

Note:

1. Directional Gain = 6.91dBi, so the limit shall be reduced.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



802.11ac (VHT40)

CHAN.	FREQ. (MHz)	MAXIMUM CONDUCTED POWER (dBm)		TOTAL POWER (mW)	TOTAL POWER (dBm)	POWER LIMIT (dBm)	PASS / FAIL
		chain 0	chain 1				
38	5190	11.69	12.16	31.201	14.94	29.09	PASS
46	5230	19.78	20.20	199.773	23.01	29.09	PASS
151	5755	20.33	20.38	217.039	23.37	29.09	PASS
159	5795	19.62	20.19	196.094	22.92	29.09	PASS

Note:

1. Directional Gain = 6.91dBi, so the limit shall be reduced.

802.11ac (VHT80)

CHAN.	CHAN. FREQ. (MHz)	MAXIMUM CONDUCTED POWER (dBm)		TOTAL POWER (mW)	TOTAL POWER (dBm)	POWER LIMIT (dBm)	PASS / FAIL
		chain 0	chain 1				
42	5210	16.47	16.15	85.571	19.32	29.09	PASS
155	5775	20.00	20.22	205.196	23.12	29.09	PASS

Note:

1. Directional Gain = 6.91dBi, so the limit shall be reduced.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



9.5. Power Spectral Density

Requirements

Operation Band	EUT Category		Limit
U-NII-1		Outdoor Access Point	17dBm/ MHz If $G_{TX} > 6$ dBi, then $PSD = 17 - (G_{TX} - 6)$
		Fixed point-to-point Access Point	17dBm/ MHz If $G_{TX} > 23$ dBi, then $PSD = 17 - (G_{TX} - 23)$
	√	Indoor Access Point	17dBm/ MHz If $G_{TX} > 6$ dBi, then $PSD = 17 - (G_{TX} - 6)$
		Client device	11dBm/ MHz If $G_{TX} > 6$ dBi, then $PSD = 11 - (G_{TX} - 6)$
U-NII-2A	---		11dBm/ MHz If $G_{TX} > 6$ dBi, then $PSD = 11 - (G_{TX} - 6)$
U-NII-2C	---		11dBm/ MHz If $G_{TX} > 6$ dBi, then $PSD = 11 - (G_{TX} - 6)$
U-NII-3	---		For Point-to-multipoint systems (P2M): 30dBm/ 500kHz. If $G_{TX} > 6$ dBi, then $PSD = 30 - (G_{TX} - 6)$ For Point-to-point systems (P2P): 30dBm/ 500kHz

Note:

1. PSD = power spectral density that he same method as used to determine the conducted output power shall be used to determine the power spectral density. And power spectral density in dBm/MHz
2. G_{TX} = the maximum transmitting antenna directional gain in dBi.
3. Directional Gain = $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{Gn/20})^2 / Nant]$ dBi.

Nant: Number of Transmit Antennas

G1, G2,..., Gn: Gain of Individual Antennas

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Test procedure

For U-NII-1 band:

Using method SA-1_with Duty cycle >98 % (802.11ac (VHT20))

1. Set span to encompass the entire emission bandwidth (EBW) of the signal.
2. Set RBW = 1 MHz, Set VBW $\geq$ 3 RBW, Detector = RMS
3. Sweep time = auto, trigger set to “free run”.
4. Trace average at least 100 traces in power averaging mode.
5. Record the max value

Using method SA-2_with Duty cycle <98 % (802.11a 、 802.11ac (VHT40) 、 802.11ac (VHT80))

1. Set span to encompass the entire emission bandwidth (EBW) of the signal.
2. Set RBW = 1 MHz, Set VBW $\geq$ 3 RBW, Detector = RMS
3. Sweep time = auto, trigger set to “free run”.
4. Trace average at least 100 traces in power averaging mode.
5. Record the max value and add 10 log (1/duty cycle)

For U-NII-3:

with Duty cycle >98 % (802.11ac (VHT20))

1. Set span to encompass the entire emission bandwidth (EBW) of the signal.
2. Set RBW = 300 kHz, Set VBW $\geq$ 1 MHz, Detector = RMS
3. Use the peak marker function to determine the maximum power level in any 300 kHz band segment within the fundamental EBW.
4. 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 $BWCF = 10\log(500 \text{ kHz}/300\text{kHz})$
5. Sweep time = auto, trigger set to “free run”.
6. Trace average at least 100 traces in power averaging mode.
7. Record the max value.

with Duty cycle <98 % (802.11a 、 802.11ac (VHT40) 、 802.11ac (VHT80))

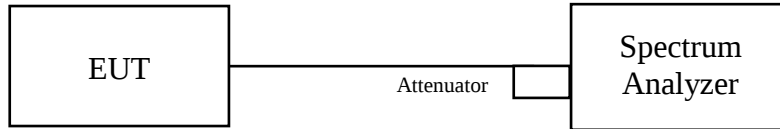
1. Set span to encompass the entire emission bandwidth (EBW) of the signal.
2. Set RBW = 300 kHz, Set VBW $\geq$ 1 MHz, Detector = RMS
3. Use the peak marker function to determine the maximum power level in any 300 kHz band segment within the fundamental EBW.
4. Scale the observed power level to an equivalent value in 500 kHz by adjusting (reducing) the measured power by a bandwidth correction factor (BWCF) where $BWCF = 10\log(500 \text{ kHz}/300\text{kHz})$
5. Sweep time = auto, trigger set to “free run”.
6. Trace average at least 100 traces in power averaging mode.
7. Record the max value and add 10 log (1/duty cycle)

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan
Telephone : +886-2-7737-3000
Facsimile (FAX) : +886-3-583-7948



Test Setup



The loss between RF output port of the EUT and the input port of the Spectrum Analyzer has been taken into consideration.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Test Data

CDD Mode

For U-NII-1 band

802.11a

CHAN.	FREQ. (MHz)	PSD (dBm)		TOTAL PSD with duty factor (dBm)	MAX. LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1			
36	5180	6.42	6.64	9.66	16.09	PASS
44	5220	9.96	9.98	13.10	16.09	PASS
48	5240	10.15	10.21	13.31	16.09	PASS

Note:

1. Method a) of power density measurement of KDB 662911 is using for calculating total power density.
Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional Gain = 6.91dBi, so the limit shall be reduced.
3. Refer to section 6.6 for duty cycle spectrum plot.

802.11ac (VHT20)

CHAN.	CHAN. FREQ. (MHz)	PSD (dBm)		TOTAL PSD (dBm)	MAX. LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1			
36	5180	6.20	6.32	9.27	16.09	PASS
44	5220	9.78	9.61	12.71	16.09	PASS
48	5240	9.17	9.22	12.21	16.09	PASS

Note:

1. Method a) of power density measurement of KDB 662911 is using for calculating total power density.
Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional Gain = 6.91dBi, so the limit shall be reduced.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



802.11ac (VHT40)

CHAN.	FREQ. (MHz)	PSD (dBm)		TOTAL PSD with duty factor (dBm)	MAX. LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1			
38	5190	1.38	1.44	4.53	16.09	PASS
46	5230	6.24	5.84	9.16	16.09	PASS

Note:

1. Method a) of power density measurement of KDB 662911 is using for calculating total power density.
Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional Gain = 6.91dBi, so the limit shall be reduced.
3. Refer to section 6.6 for duty cycle spectrum plot.

802.11ac (VHT80)

CHAN.	FREQ. (MHz)	PSD (dBm)		TOTAL PSD with duty factor (dBm)	MAX. LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1			
42	5210	-3.86	-3.55	-0.47	16.09	PASS

Note:

1. Method a) of power density measurement of KDB 662911 is using for calculating total power density.
Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional Gain = 6.91dBi, so the limit shall be reduced.
3. Refer to section 6.6 for duty cycle spectrum plot.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

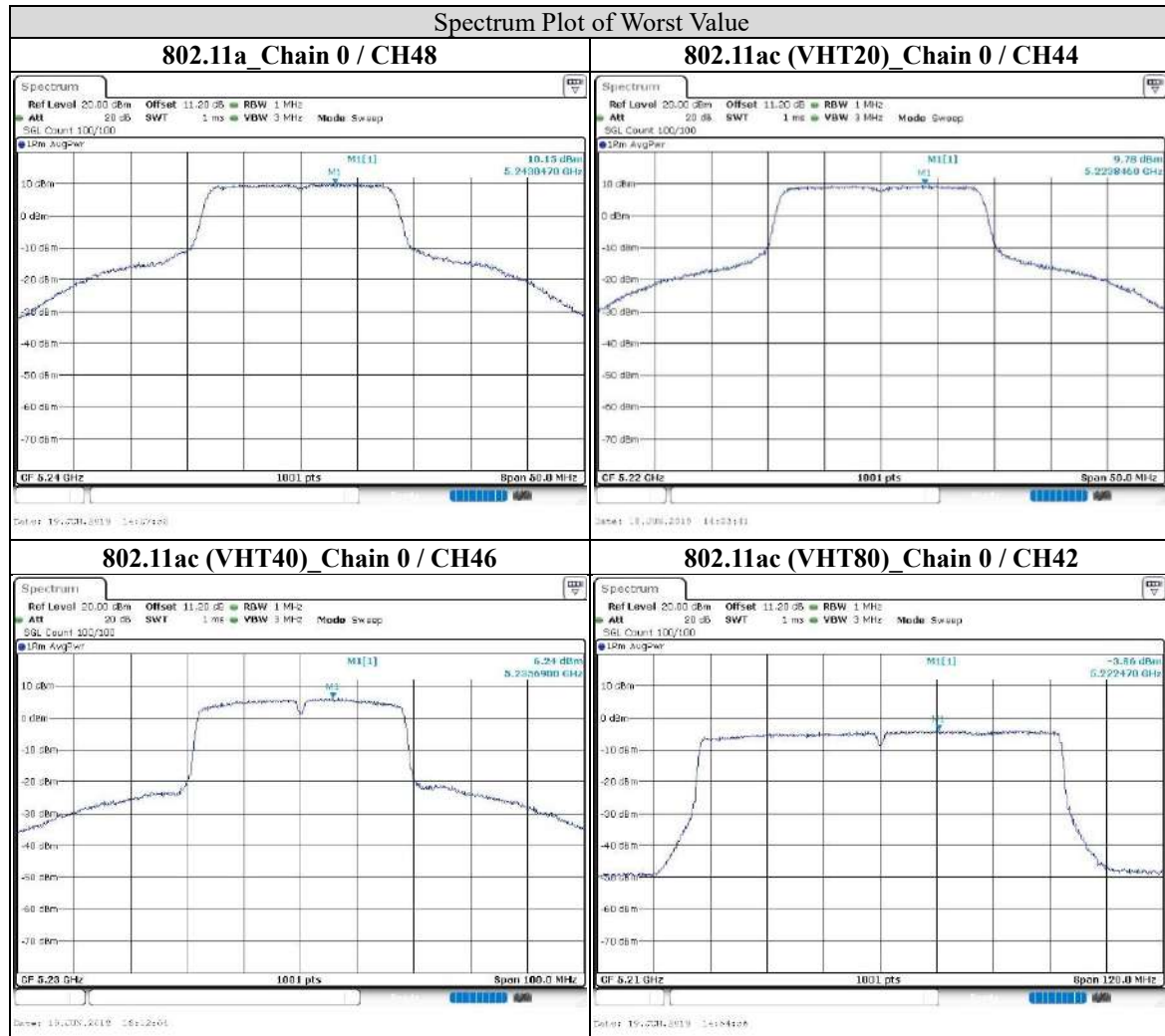
Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Test report No. : 4788947466-US-R1-V0
Page : 57 of 159
Issued date : Oct. 28, 2019
FCC ID : VGYAP912C



Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

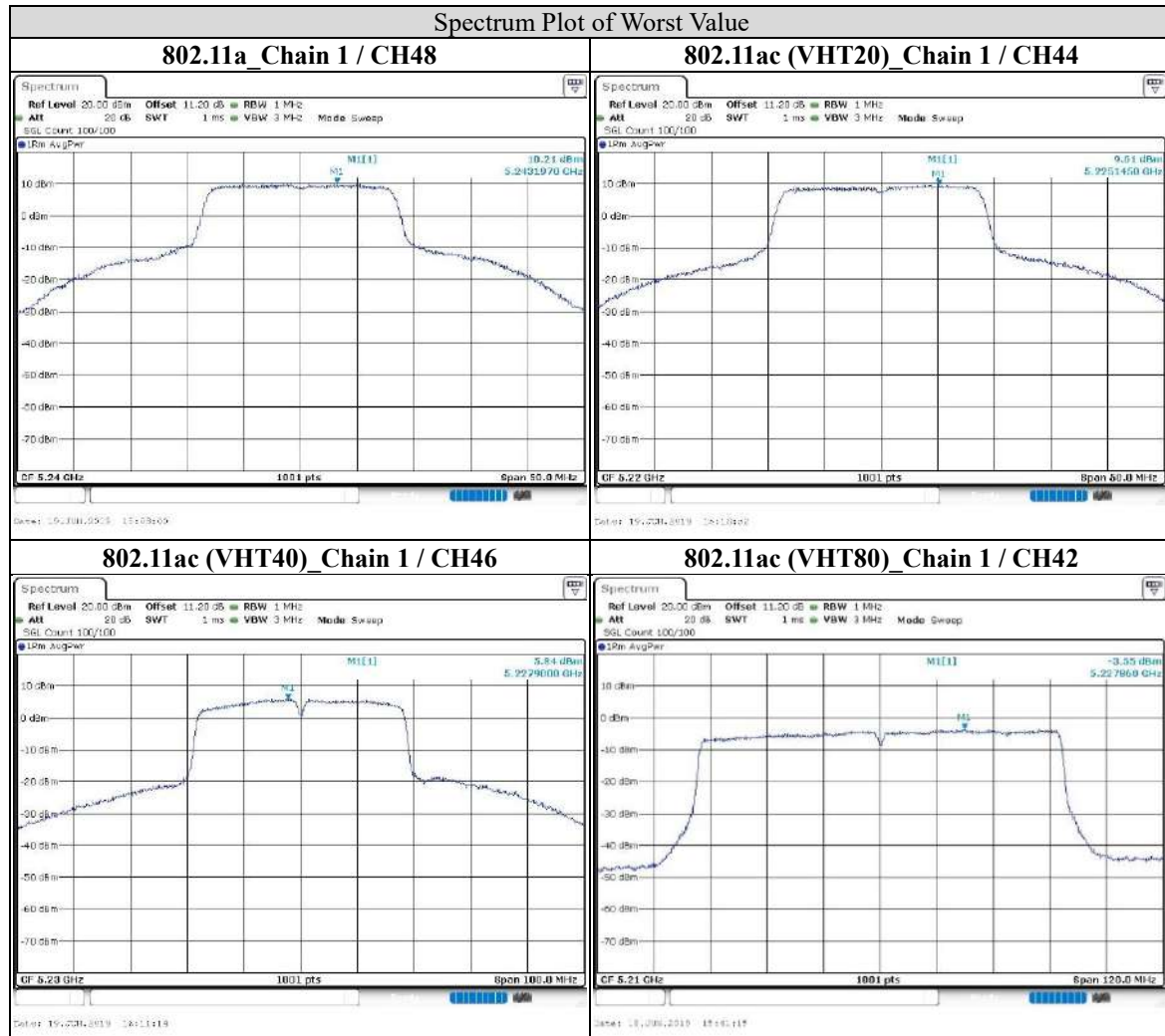
Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Test report No. : 4788947466-US-R1-V0
Page : 58 of 159
Issued date : Oct. 28, 2019
FCC ID : VGYAP912C



Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Beamforming Mode

802.11a

CHAN.	FREQ. (MHz)	PSD (dBm)		TOTAL PSD with duty factor (dBm)	MAX. LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1			
36	5180	7.04	7.42	10.37	16.09	PASS
44	5220	8.31	8.65	11.62	16.09	PASS
48	5240	8.79	8.96	12.01	16.09	PASS

Note:

1. Method a) of power density measurement of KDB 662911 is using for calculating total power density.
Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional Gain = 6.91dBi, so the limit shall be reduced.
3. Refer to section 6.6 for duty cycle spectrum plot.

802.11ac (VHT20)

CHAN.	CHAN. FREQ. (MHz)	PSD (dBm)		TOTAL PSD (dBm)	MAX. LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1			
36	5180	7.08	7.56	10.34	16.09	PASS
44	5220	7.93	8.16	11.06	16.09	PASS
48	5240	7.71	7.87	10.80	16.09	PASS

Note:

1. Method a) of power density measurement of KDB 662911 is using for calculating total power density.
Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional Gain = 6.91dBi, so the limit shall be reduced.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



802.11ac (VHT40)

CHAN.	FREQ. (MHz)	PSD (dBm)		TOTAL PSD with duty factor (dBm)	MAX. LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1			
38	5190	-3.00	-2.74	0.28	16.09	PASS
46	5230	5.25	5.63	8.60	16.09	PASS

Note:

1. Method a) of power density measurement of KDB 662911 is using for calculating total power density.
Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional Gain = 6.91dBi, so the limit shall be reduced.
3. Refer to section 6.6 for duty cycle spectrum plot.

802.11ac (VHT80)

CHAN.	FREQ. (MHz)	PSD (dBm)		TOTAL PSD with duty factor (dBm)	MAX. LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1			
42	5210	-1.76	-1.38	1.68	16.09	PASS

Note:

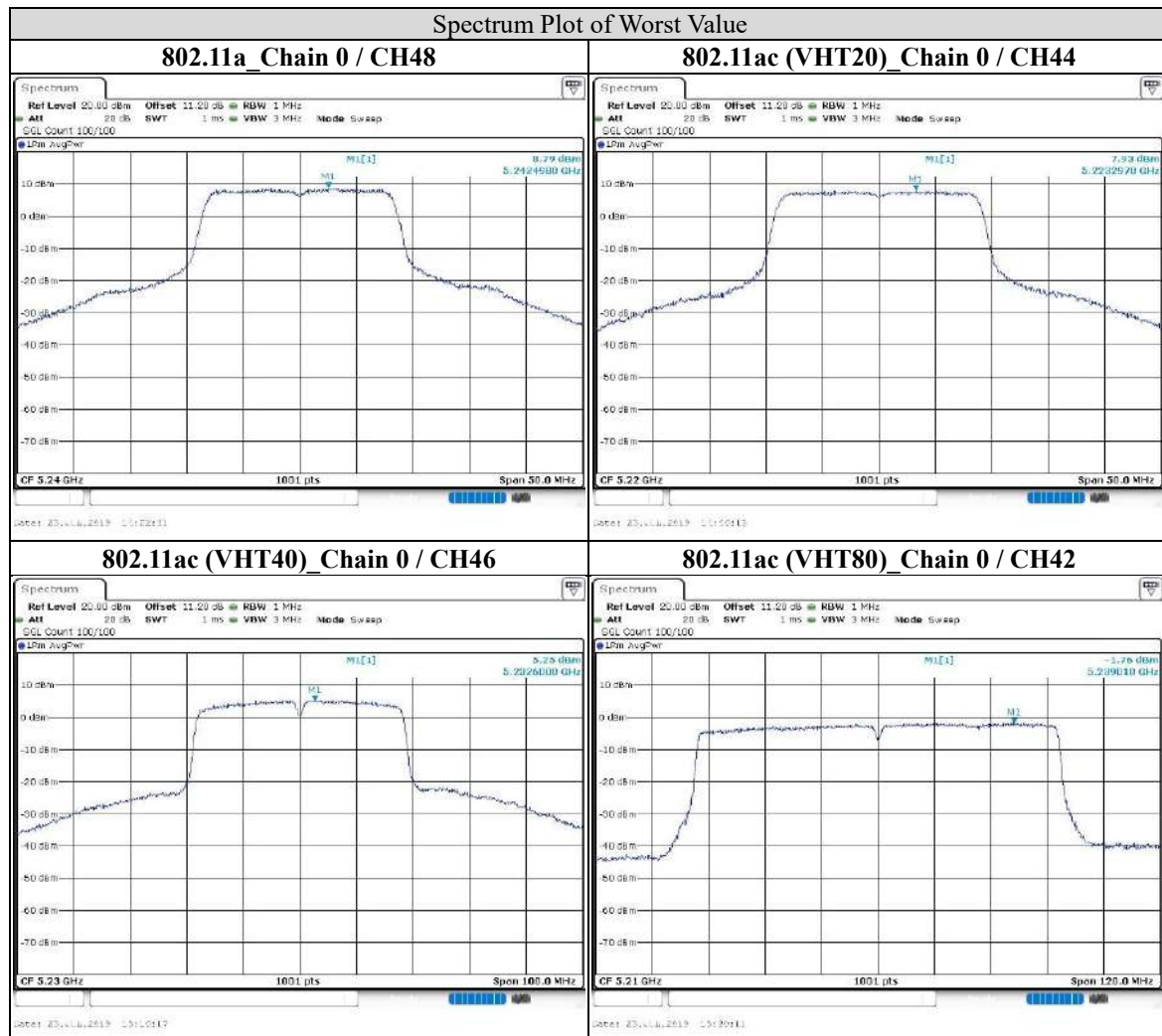
1. Method a) of power density measurement of KDB 662911 is using for calculating total power density.
Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional Gain = 6.91dBi, so the limit shall be reduced.
3. Refer to section 6.6 for duty cycle spectrum plot.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan
Telephone : +886-2-7737-3000
Facsimile (FAX) : +886-3-583-7948



Test report No. : 4788947466-US-R1-V0
Page : 61 of 159
Issued date : Oct. 28, 2019
FCC ID : VGYAP912C



Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

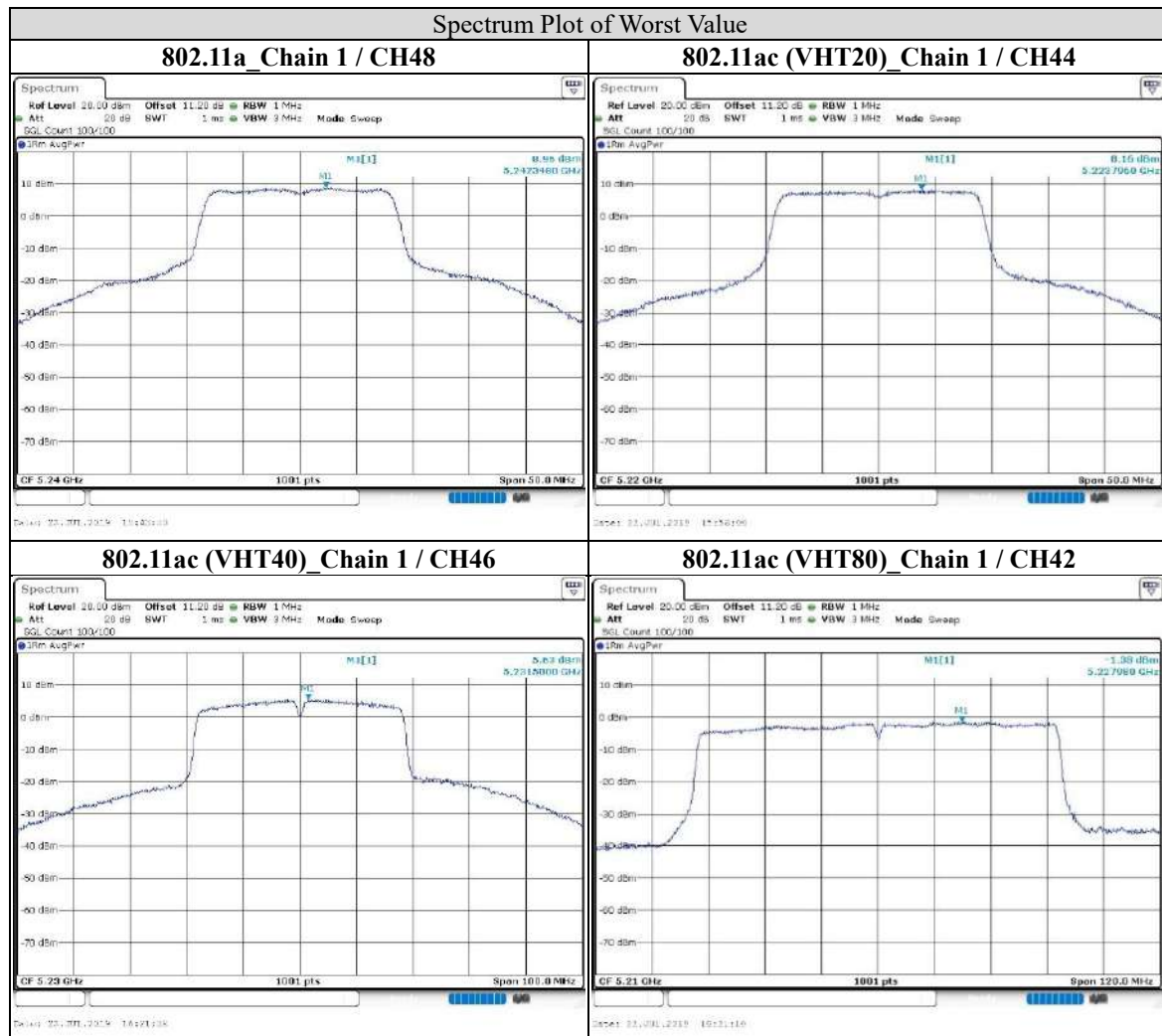
Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Test report No. : 4788947466-US-R1-V0
Page : 62 of 159
Issued date : Oct. 28, 2019
FCC ID : VGYAP912C



Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



For U-NII-3 Band

CDD Mode

802.11a

TX Chain	Channel	Frequency (MHz)	PSD w/o BWCF (dBm/300 kHz)	PSD with BWCF (dBm/500 kHz)	10 log (N=2) dB	Total PSD with Duty Factor (dBm/500 kHz)	Limit (dBm/500 kHz)	Pass / Fail
0	149	5745	2.75	4.97	3.01	8.10	29.09	Pass
	157	5785	2.83	5.05	3.01	8.18	29.09	Pass
	165	5825	3.14	5.36	3.01	8.49	29.09	Pass
1	149	5745	2.9	5.12	3.01	8.25	29.09	Pass
	157	5785	3.23	5.45	3.01	8.58	29.09	Pass
	165	5825	3.48	5.70	3.01	8.83	29.09	Pass

Note:

1. Directional Gain = 6.91dBi, so the limit shall be reduced.
2. Refer to section 6.6 for duty cycle spectrum plot.
3. 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 $BWCF = 10\log(500 \text{ kHz}/300\text{kHz})$.

802.11ac (VHT20)

TX Chain	Channel	Frequency (MHz)	PSD w/o BWCF (dBm/300 kHz)	PSD with BWCF (dBm/500 kHz)	10 log (N=2) dB	Total PSD (dBm/500 kHz)	Limit (dBm/500 kHz)	Pass / Fail
0	149	5745	2.05	4.27	3.01	7.28	29.09	Pass
	157	5785	2.44	4.66	3.01	7.67	29.09	Pass
	165	5825	2.5	4.72	3.01	7.73	29.09	Pass
1	149	5745	2.29	4.51	3.01	7.52	29.09	Pass
	157	5785	2.85	5.07	3.01	8.08	29.09	Pass
	165	5825	2.92	5.14	3.01	8.15	29.09	Pass

Note:

1. Directional Gain = 6.91dBi, so the limit shall be reduced.
2. 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 $BWCF = 10\log(500 \text{ kHz}/300\text{kHz})$.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



802.11ac (VHT40)

TX Chain	Channel	Frequency (MHz)	PSD w/o BWCF (dBm/300 kHz)	PSD with BWCF (dBm/500 kHz)	10 log (N=2) dB	Total PSD with Duty Factor (dBm/500 kHz)	Limit (dBm/500 kHz)	Pass / Fail
0	151	5755	1.99	4.21	3.01	7.33	29.09	Pass
	159	5795	0.25	2.47	3.01	5.59	29.09	Pass
1	151	5755	2.11	4.33	3.01	7.45	29.09	Pass
	159	5795	0.66	2.88	3.01	6.00	29.09	Pass

Note:

1. Directional Gain = 6.91dBi, so the limit shall be reduced.
2. Refer to section 6.6 for duty cycle spectrum plot.
3. 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 $BWCF = 10\log(500 \text{ kHz}/300\text{kHz})$.

802.11ac (VHT80)

TX Chain	Channel	Frequency (MHz)	PSD w/o BWCF (dBm/300 kHz)	PSD with BWCF (dBm/500 kHz)	10 log (N=2) dB	Total PSD with Duty Factor (dBm/500 kHz)	Limit (dBm/500 kHz)	Pass / Fail
0	155	5775	-4.98	-2.76	3.01	0.47	29.09	Pass
1	155	5775	-4.74	-2.52	3.01	0.71	29.09	Pass

Note:

1. Directional Gain = 6.91dBi, so the limit shall be reduced.
2. Refer to section 6.6 for duty cycle spectrum plot.
3. 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 $BWCF = 10\log(500 \text{ kHz}/300\text{kHz})$.

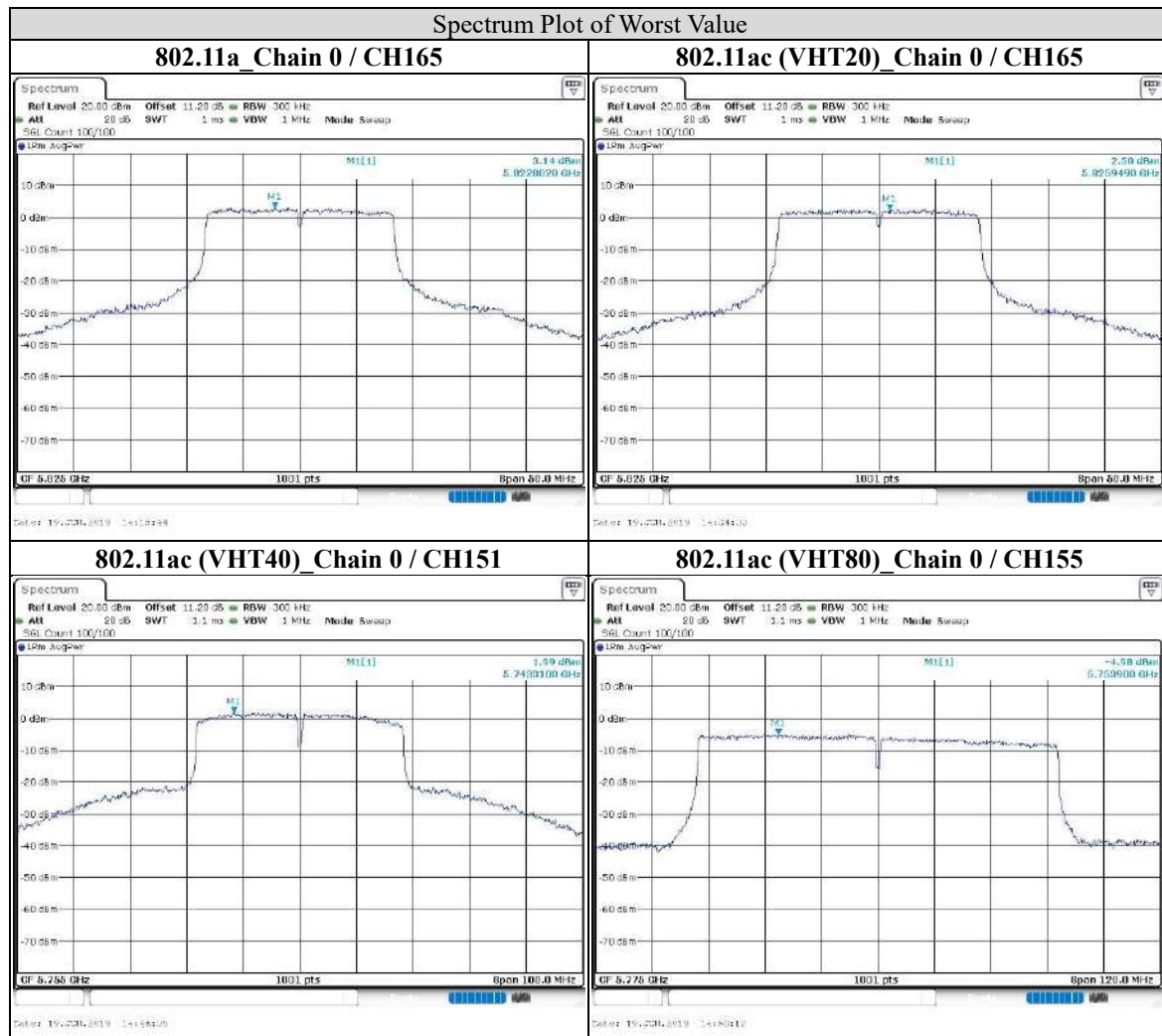
Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

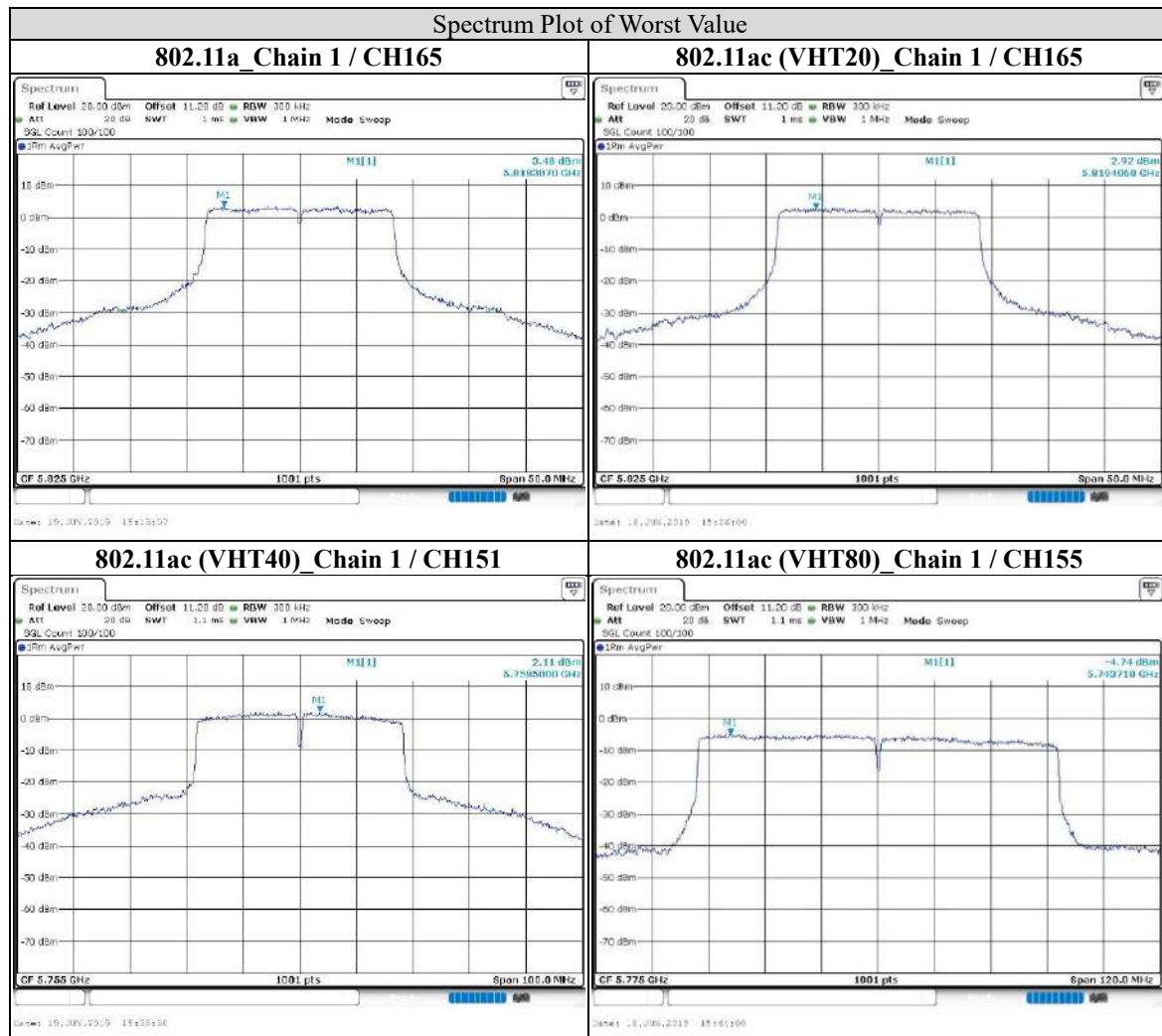
Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0878 / 3.0





Test report No. : 4788947466-US-R1-V0
Page : 66 of 159
Issued date : Oct. 28, 2019
FCC ID : VGYAP912C



Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Beamforming Mode

802.11a

TX Chain	Channel	Frequency (MHz)	PSD w/o BWCF (dBm/300 kHz)	PSD with BWCF (dBm/500 kHz)	10 log (N=2) dB	Total PSD with Duty Factor (dBm/500 kHz)	Limit (dBm/500 kHz)	Pass / Fail
0	149	5745	2.75	4.97	3.01	8.10	29.09	Pass
	157	5785	2.83	5.05	3.01	8.18	29.09	Pass
	165	5825	3.14	5.36	3.01	8.49	29.09	Pass
1	149	5745	2.9	5.12	3.01	8.25	29.09	Pass
	157	5785	3.23	5.45	3.01	8.58	29.09	Pass
	165	5825	3.48	5.70	3.01	8.83	29.09	Pass

Note:

1. Directional Gain = 6.91dBi, so the limit shall be reduced.
2. Refer to section 6.6 for duty cycle spectrum plot.
3. 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 $BWCF = 10\log(500 \text{ kHz}/300\text{kHz})$.

802.11ac (VHT20)

TX Chain	Channel	Frequency (MHz)	PSD w/o BWCF (dBm/300 kHz)	PSD with BWCF (dBm/500 kHz)	10 log (N=2) dB	Total PSD (dBm/500 kHz)	Limit (dBm/500 kHz)	Pass / Fail
0	149	5745	2.91	5.13	3.01	8.14	29.09	Pass
	157	5785	2.89	5.11	3.01	8.12	29.09	Pass
	165	5825	2.63	4.85	3.01	7.86	29.09	Pass
1	149	5745	3.05	5.27	3.01	8.28	29.09	Pass
	157	5785	2.73	4.95	3.01	7.96	29.09	Pass
	165	5825	3.26	5.48	3.01	8.49	29.09	Pass

Note:

1. Directional Gain = 6.91dBi, so the limit shall be reduced.
2. 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 $BWCF = 10\log(500 \text{ kHz}/300\text{kHz})$.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



802.11ac (VHT40)

TX Chain	Channel	Frequency (MHz)	PSD w/o BWCF (dBm/300 kHz)	PSD with BWCF (dBm/500 kHz)	10 log (N=2) dB	Total PSD with Duty Factor (dBm/500 kHz)	Limit (dBm/500 kHz)	Pass / Fail
0	151	5755	0.5	2.72	3.01	5.87	29.09	Pass
	159	5795	0.25	2.47	3.01	5.62	29.09	Pass
1	151	5755	0.59	2.81	3.01	5.96	29.09	Pass
	159	5795	0.66	2.88	3.01	6.03	29.09	Pass

Note:

1. Directional Gain = 6.91dBi, so the limit shall be reduced.
2. Refer to section 6.6 for duty cycle spectrum plot.
3. 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 $BWCF = 10\log(500 \text{ kHz}/300\text{kHz})$.

802.11ac (VHT80)

TX Chain	Channel	Frequency (MHz)	PSD w/o BWCF (dBm/300 kHz)	PSD with BWCF (dBm/500 kHz)	10 log (N=2) dB	Total PSD with Duty Factor (dBm/500 kHz)	Limit (dBm/500 kHz)	Pass / Fail
0	155	5775	-3.22	-1.00	3.01	2.25	29.09	Pass
1	155	5775	-2.68	-0.46	3.01	2.79	29.09	Pass

Note:

1. Directional Gain = 6.91dBi, so the limit shall be reduced.
2. Refer to section 6.6 for duty cycle spectrum plot.
3. 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 $BWCF = 10\log(500 \text{ kHz}/300\text{kHz})$.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

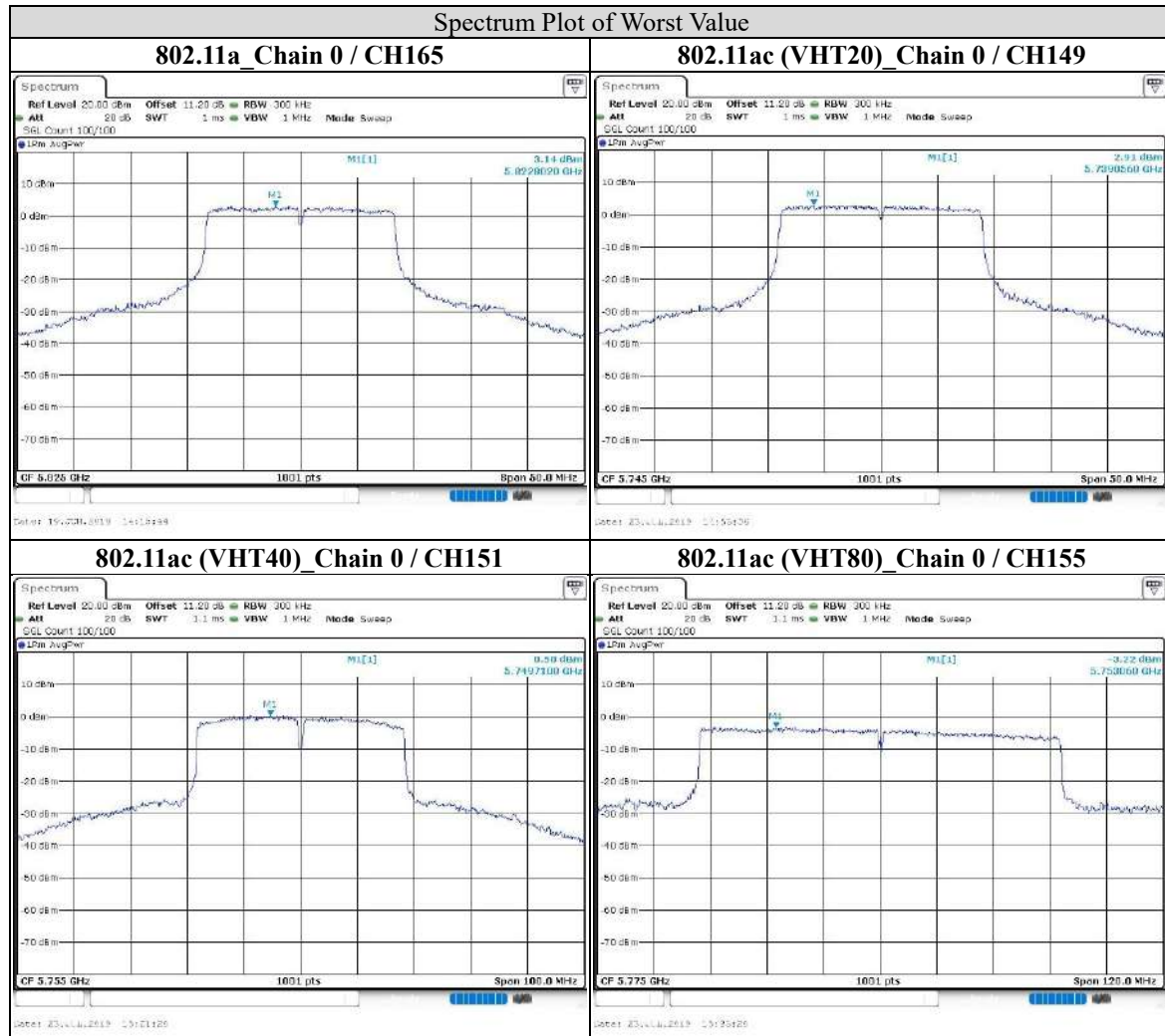
Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Test report No. : 4788947466-US-R1-V0
Page : 69 of 159
Issued date : Oct. 28, 2019
FCC ID : VGYAP912C



Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

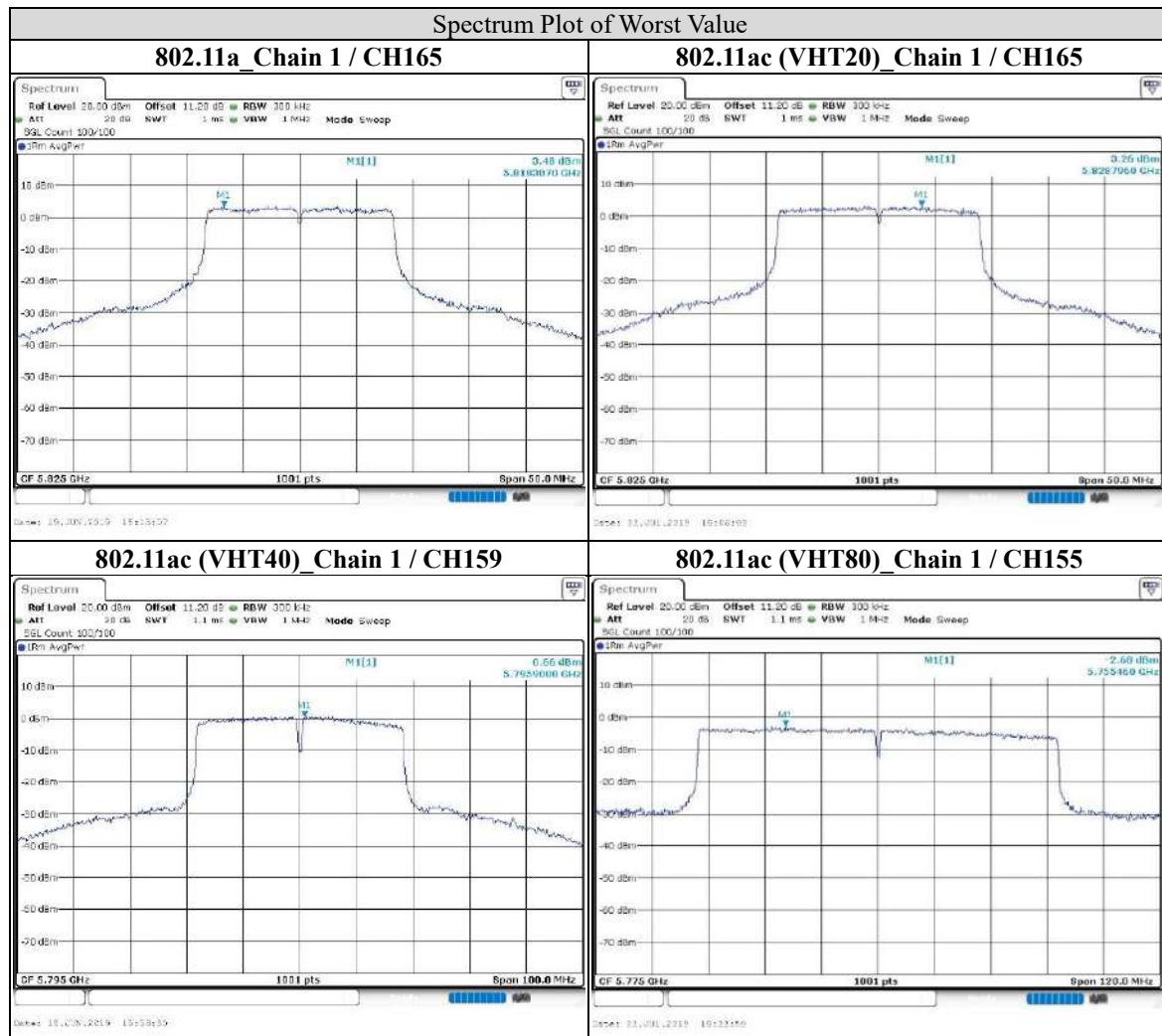
Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Test report No. : 4788947466-US-R1-V0
Page : 70 of 159
Issued date : Oct. 28, 2019
FCC ID : VGYAP912C



Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



9.6. Frequency Stability

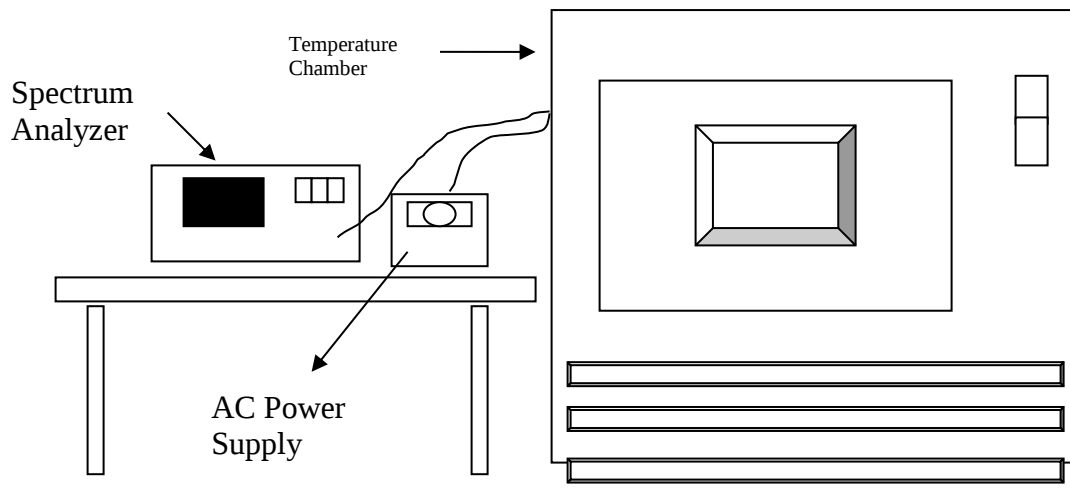
Requirements

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

Test procedure

- The EUT was placed inside the environmental test chamber and powered by nominal AC voltage.
- Turn the EUT on and couple its output to a spectrum analyzer.
- Turn the EUT off and set the chamber to the highest temperature specified.
- 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.
- Repeat step 2 and 3 with the temperature chamber set to the lowest temperature.
- 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.

Test Setup



Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Test Data

CDD Mode

Frequency Stability Versus Temp.									
Operating Frequency: 5180 MHz									
TEMP. (°C)	Power Supply (Vac)	0 Minute		2 Minute		5 Minute		10 Minute	
		Measured Frequency (MHz)	Freq. Drift (ppm)	Measured Frequency (MHz)	Freq. Drift (ppm)	Measured Frequency (MHz)	Freq. Drift (ppm)	Measured Frequency (MHz)	Freq. Drift (ppm)
50	120	5180.0099	1.91	5180.0095	1.83	5180.0115	2.22	5180.0097	1.87
40	120	5180.0077	1.49	5180.0086	1.66	5180.0085	1.64	5180.0081	1.56
30	120	5180.0069	1.33	5180.0071	1.37	5180.0082	1.58	5180.0087	1.68
20	120	5179.9871	-2.49	5179.9894	-2.05	5179.9906	-1.81	5179.988	-2.32
10	120	5179.992	-1.54	5179.9943	-1.10	5179.9935	-1.25	5179.9942	-1.12
0	120	5179.9926	-1.43	5179.995	-0.97	5179.9945	-1.06	5179.9934	-1.27
-10	120	5179.9773	-4.38	5179.9775	-4.34	5179.9765	-4.54	5179.9739	-5.04
-20	120	5180.0055	1.06	5180.0068	1.31	5180.006	1.16	5180.0096	1.85
-30	120	5179.9891	-2.10	5179.9901	-1.91	5179.9896	-2.01	5179.9895	-2.03
TEMP. (°C)	Power Supply (Vac)	0 Minute		2 Minute		5 Minute		10 Minute	
		Measured Frequency (MHz)	Freq. Drift (ppm)	Measured Frequency (MHz)	Freq. Drift (ppm)	Measured Frequency (MHz)	Freq. Drift (ppm)	Measured Frequency (MHz)	Freq. Drift (ppm)
20	102	5179.9862	-2.66	5179.9903	-1.87	5179.9903	-1.87	5179.9882	-2.28
20	138	5179.9881	-2.30	5179.9884	-2.24	5179.9906	-1.81	5179.9881	-2.30

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Beamforming Mode

Frequency Stability Versus Temp.									
Operating Frequency: 5180 MHz									
TEMP. (°C)	Power Supply (Vac)	0 Minute		2 Minute		5 Minute		10 Minute	
		Measured Frequency (MHz)	Freq. Drift (ppm)	Measured Frequency (MHz)	Freq. Drift (ppm)	Measured Frequency (MHz)	Freq. Drift (ppm)	Measured Frequency (MHz)	Freq. Drift (ppm)
50	120	5180.0065	1.25	5180.0045	0.87	5180.0027	0.52	5180.0015	0.29
40	120	5180.0006	0.12	5179.9905	-1.83	5180.0071	1.37	5179.9996	-0.08
30	120	5179.9971	-0.56	5180.0042	0.81	5180.0077	1.49	5179.9921	-1.53
20	120	5179.9834	-3.20	5179.9716	-5.48	5179.9830	-3.28	5179.9824	-3.40
10	120	5179.9743	-4.96	5179.9905	-1.83	5179.9762	-4.59	5179.9723	-5.35
0	120	5179.9940	-1.16	5179.9825	-3.38	5179.9804	-3.78	5179.9770	-4.44
-10	120	5179.9725	-5.31	5179.9685	-6.08	5179.9559	-8.51	5179.9595	-7.82
-20	120	5179.9958	-0.81	5180.0040	0.77	5180.0016	0.31	5179.9758	-4.67
-30	120	5179.9721	-5.39	5179.9766	-4.52	5179.9735	-5.12	5179.9671	-6.35
TEMP. (°C)	Power Supply (Vac)	0 Minute		2 Minute		5 Minute		10 Minute	
		Measured Frequency (MHz)	Freq. Drift (ppm)	Measured Frequency (MHz)	Freq. Drift (ppm)	Measured Frequency (MHz)	Freq. Drift (ppm)	Measured Frequency (MHz)	Freq. Drift (ppm)
20	102	5179.9843	-3.03	5179.9703	-5.73	5179.9802	-3.82	5179.9772	-4.40
20	138	5179.9826	-3.36	5179.9736	-5.10	5179.9772	-4.40	5179.9762	-4.59

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



9.7. Radiated Spurious Emission

Requirements

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

Frequency(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.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Limits of unwanted emission out of the restricted bands

Applicable To		Limit	
789033 D02 General UNII Test Procedure New Rules v02r01		Field Strength at 3m	
		PK:74 (dBμV/m)	AV:54 (dBμV/m)
Frequency Band	Applicable To	EIRP Limit	Equivalent Field Strength at 3m
5150~5250 MHz	15.407(b)(1)	PK:-27 (dBm/MHz)	PK:68.2(dBμV/m)
5250~5350 MHz	15.407(b)(2)		
5470~5725 MHz	15.407(b)(3)		
5725~5850 MHz	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}
*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:

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

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Test Procedures

[For 9 kHz ~ 30 MHz]

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. 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. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. For measurement below 30MHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

[For above 30 MHz]

- a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 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. For measurement below 1GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
- f. The test-receiver system was set to peak and average detects 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.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Note:

- The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
- 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.
- The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is $\geq 1/T$ (Duty cycle < 98%) or 10Hz (Duty cycle $\geq 98\%$) for Average detection (AV) at frequency above 1GHz.

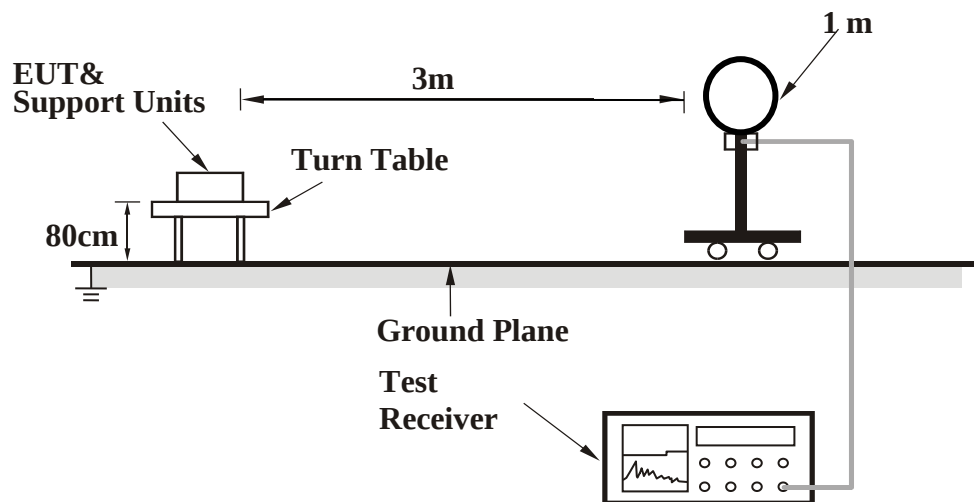
Configuration	Average	
	RBW	VBW
802.11a	1MHz	1 kHz
802.11ac (VHT20)		10 Hz
802.11ac (VHT40)		1 kHz
802.11ac (VHT80)		1 kHz

Note: Refer to section 6.6 for duty cycle.

- All modes of operation were investigated and the worst-case emissions are reported.

Test Setup

<Frequency Range 9 kHz ~ 30 MHz>



Underwriters Laboratories Taiwan Co., Ltd.

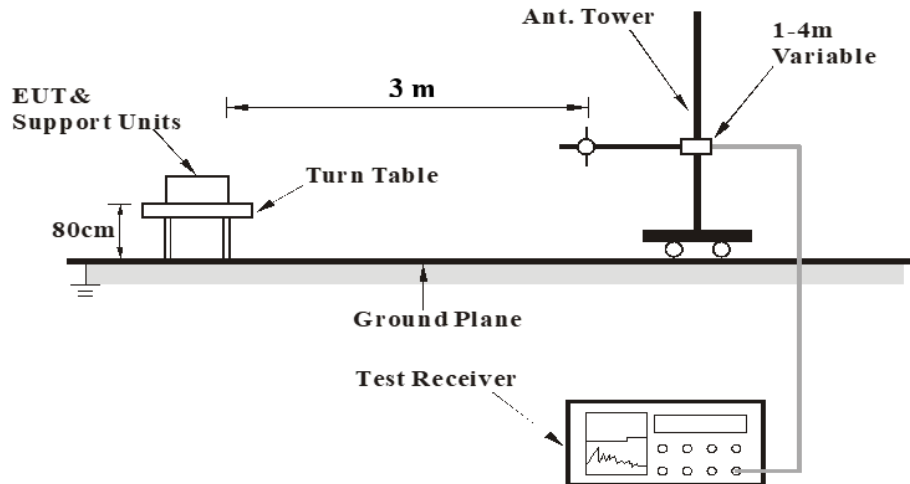
Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

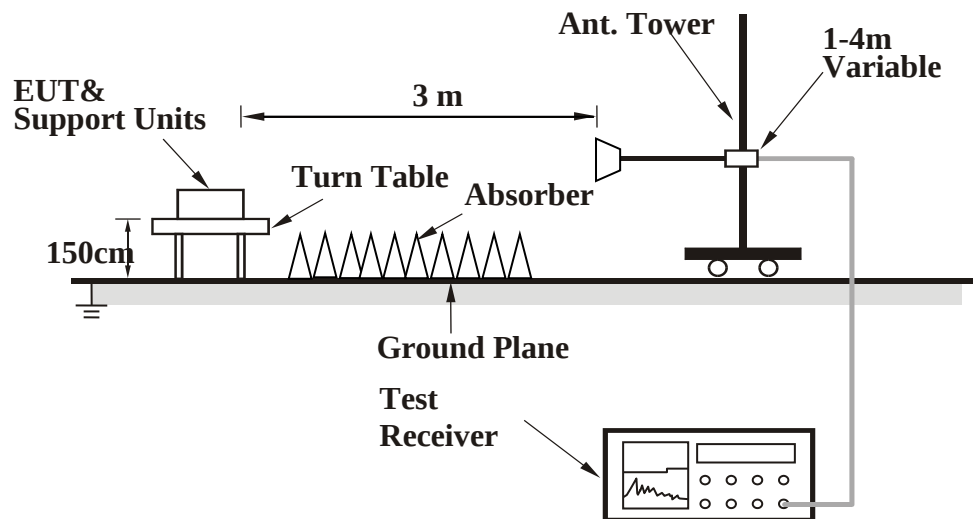
Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0878 / 3.0

<Frequency Range 30 MHz ~ 1 GHz >



<Frequency Range above 1 GHz>



For the actual test configuration, please refer to the Setup Configurations.



Test Data

CDD Mode

Above 1GHz Data

802.11a

EUT Test Condition		Measurement Detail	
Channel	Channel 36	Frequency Range	1 GHz ~ 40 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	5150.000	66.19	-2.24	63.95	74.00	-10.05	peak
@	5180.000	117.23	-2.23	115.00	-	-	peak
-	5150.000	55.29	-2.24	53.05	54.00	-0.95	AVG
@	5180.000	108.14	-2.23	105.91	-	-	AVG
#	6906.650	63.22	1.67	64.89	68.20	-3.31	peak
#	10360.000	42.80	8.87	51.67	68.20	-16.53	peak
*	15540.000	39.22	12.56	51.78	74.00	-22.22	peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	5150.000	63.41	-2.24	61.17	74.00	-12.83	peak
@	5180.000	113.22	-2.23	110.99	-	-	peak
-	5150.000	52.85	-2.24	50.61	54.00	-3.39	AVG
@	5180.000	104.28	-2.23	102.05	-	-	AVG
#	6906.650	63.84	1.67	65.51	68.20	-2.69	peak
#	10360.000	46.60	8.87	55.47	68.20	-12.73	peak
*	15540.000	38.91	12.56	51.47	74.00	-22.53	peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@" : Fundamental Frequency.
5. "#": The radiated frequency is out of the restricted band.
6. "*": The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
7. The other emission levels were very low against the limit.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Test report No. : 4788947466-US-R1-V0
Page : 80 of 159
Issued date : Oct. 28, 2019
FCC ID : VGYAP912C

EUT Test Condition		Measurement Detail	
Channel	Channel 44	Frequency Range	1 GHz ~ 40 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	5033.300	62.30	-2.50	59.80	74.00	-14.20	peak
@	5220.000	120.89	-2.33	118.56	-	-	peak
-	5147.900	50.61	-2.24	48.37	54.00	-5.63	AVG
@	5220.000	111.40	-2.33	109.07	-	-	AVG
#	6960.200	61.77	2.03	63.80	68.20	-4.40	peak
#	10440.000	46.59	9.07	55.66	68.20	-12.54	peak
*	15660.000	37.99	12.40	50.39	74.00	-23.61	peak
-	20880.000	42.12	13.81	55.93	83.54	-27.61	peak
-	20880.000	28.56	13.81	42.37	63.54	-21.17	AVG
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	5036.300	62.16	-2.48	59.68	74.00	-14.32	peak
@	5220.000	116.92	-2.33	114.59	-	-	peak
-	5103.500	50.02	-2.27	47.75	54.00	-6.25	AVG
@	5220.000	107.70	-2.33	105.37	-	-	AVG
#	6960.200	61.95	2.03	63.98	68.20	-4.22	peak
#	10440.000	51.12	9.07	60.19	68.20	-8.01	peak
*	15660.000	38.24	12.40	50.64	74.00	-23.36	peak
-	20880.000	50.67	13.81	64.48	83.54	-19.06	peak
-	20880.000	35.92	13.81	49.73	63.54	-13.81	AVG

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. "#": The radiated frequency is out of the restricted band.
6. "*": The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
7. The other emission levels were very low against the limit.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



EUT Test Condition		Measurement Detail	
Channel	Channel 48	Frequency Range	1 GHz ~ 40 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	5137.100	62.09	-2.25	59.84	74.00	-14.16	peak
@	5240.000	120.64	-2.44	118.20	-	-	peak
-	5098.400	50.05	-2.28	47.77	54.00	-6.23	AVG
@	5240.000	111.36	-2.44	108.92	-	-	AVG
#	6986.550	61.36	2.17	63.53	68.20	-4.67	peak
#	10480.000	45.32	9.03	54.35	68.20	-13.85	peak
*	15720.000	39.80	12.34	52.14	74.00	-21.86	peak
*	20960.000	35.50	13.82	49.32	83.54	-34.22	peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	5087.300	61.68	-2.30	59.38	74.00	-14.62	peak
@	5240.000	117.55	-2.44	115.11	-	-	peak
-	5108.300	49.67	-2.27	47.40	54.00	-6.60	AVG
@	5240.000	108.19	-2.44	105.75	-	-	AVG
#	6986.550	61.63	2.17	63.80	68.20	-4.40	peak
#	10480.000	52.07	9.03	61.10	68.20	-7.10	peak
-	15720.000	43.96	12.34	56.30	74.00	-17.70	peak
-	15720.000	31.92	12.34	44.26	54.00	-9.74	AVG
-	20960.000	44.18	13.82	58.00	83.54	-25.54	peak
-	20960.000	30.24	13.82	44.06	63.54	-19.48	AVG
#	26200.000	34.16	16.19	50.35	77.74	-27.39	peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. "#": The radiated frequency is out of the restricted band.
6. "*": The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
7. The other emission levels were very low against the limit.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Test report No. : 4788947466-US-R1-V0
Page : 82 of 159
Issued date : Oct. 28, 2019
FCC ID : VGYAP912C

EUT Test Condition		Measurement Detail	
Channel	Channel 149	Frequency Range	1 GHz ~ 40 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
#	5646.000	63.94	-2.07	61.87	68.20	-6.33	peak
-	5725.000	91.81	-1.76	90.05	122.20	-32.15	peak
@	5745.000	120.05	-1.62	118.43	-	-	peak
@	5745.000	110.51	-1.62	108.89	-	-	AVG
*	7659.900	47.99	3.46	51.45	74.00	-22.55	peak
*	11490.000	40.77	9.77	50.54	74.00	-23.46	peak
#	17235.000	44.20	15.75	59.95	68.20	-8.25	peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
#	5620.500	61.06	-2.09	58.97	68.20	-9.23	peak
-	5725.000	87.75	-1.76	85.99	122.20	-36.21	peak
@	5745.000	117.50	-1.62	115.88	-	-	peak
@	5745.000	107.92	-1.62	106.30	-	-	AVG
*	7659.900	49.81	3.46	53.27	74.00	-20.73	peak
-	11490.000	53.31	9.77	63.08	74.00	-10.92	peak
-	11490.000	41.74	9.77	51.51	54.00	-2.49	AVG
#	17235.000	51.54	15.75	67.29	68.20	-0.91	peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. "#": The radiated frequency is out of the restricted band.
6. "*": The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
7. The other emission levels were very low against the limit.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Test report No. : 4788947466-US-R1-V0
Page : 83 of 159
Issued date : Oct. 28, 2019
FCC ID : VGYAP912C

EUT Test Condition		Measurement Detail	
Channel	Channel 157	Frequency Range	1 GHz ~ 40 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
#	5622.000	61.12	-2.09	59.03	68.20	-9.17	peak
-	5724.500	65.06	-1.76	63.30	121.06	-57.76	peak
@	5785.000	119.91	-1.36	118.55	-	-	peak
@	5785.000	110.39	-1.36	109.03	-	-	AVG
-	5854.000	62.67	-1.22	61.45	113.08	-51.63	peak
#	5945.000	60.49	-1.16	59.33	68.20	-8.87	peak
*	7713.200	47.78	3.59	51.37	74.00	-22.63	peak
*	11570.000	41.65	9.65	51.30	74.00	-22.70	peak
#	17355.000	43.08	16.71	59.79	68.20	-8.41	peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
#	5605.500	60.40	-2.09	58.31	68.20	-9.89	peak
-	5712.000	60.64	-1.86	58.78	108.56	-49.78	peak
@	5785.000	117.36	-1.36	116.00	-	-	peak
@	5785.000	107.71	-1.36	106.35	-	-	AVG
-	5853.000	60.50	-1.23	59.27	115.36	-56.09	peak
#	5927.500	60.49	-1.17	59.32	68.20	-8.88	peak
*	7713.200	50.17	3.59	53.76	74.00	-20.24	peak
-	11570.000	50.42	9.65	60.07	74.00	-13.93	peak
-	11570.000	38.52	9.65	48.17	54.00	-5.83	AVG
#	17355.000	50.52	16.71	67.23	68.20	-0.97	peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. "#": The radiated frequency is out of the restricted band.
6. "*": The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
7. The other emission levels were very low against the limit.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Test report No. : 4788947466-US-R1-V0
Page : 84 of 159
Issued date : Oct. 28, 2019
FCC ID : VGYAP912C

EUT Test Condition		Measurement Detail	
Channel	Channel 165	Frequency Range	1 GHz ~ 40 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
@	5825.000	120.93	-1.24	119.69	-	-	peak
@	5825.000	111.35	-1.24	110.11	-	-	AVG
-	5852.000	92.78	-1.23	91.55	117.64	-26.09	peak
#	5958.500	61.08	-1.13	59.95	68.20	-8.25	peak
#	7766.500	47.38	3.75	51.13	68.20	-17.07	peak
*	11650.000	42.84	9.40	52.24	74.00	-21.76	peak
#	17475.000	41.57	17.67	59.24	68.20	-8.96	peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
@	5825.000	118.66	-1.24	117.42	-	-	peak
@	5825.000	109.13	-1.24	107.89	-	-	AVG
-	5852.500	87.67	-1.23	86.44	116.50	-30.06	peak
#	5931.000	60.31	-1.16	59.15	68.20	-9.05	peak
#	7766.500	49.53	3.75	53.28	68.20	-14.92	peak
-	11650.000	49.13	9.40	58.53	74.00	-15.47	peak
-	11650.000	37.07	9.40	46.47	54.00	-7.53	AVG
#	17475.000	49.59	17.67	67.26	68.20	-0.94	peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. "#": The radiated frequency is out of the restricted band.
6. "*": The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
7. The other emission levels were very low against the limit.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



802.11ac (VHT20)

EUT Test Condition		Measurement Detail	
Channel	Channel 36	Frequency Range	1 GHz ~ 40 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	5150.000	66.94	-2.24	64.70	74.00	-9.30	peak
@	5180.000	117.66	-2.23	115.43	-	-	peak
-	5150.000	55.32	-2.24	53.08	54.00	-0.92	AVG
@	5180.000	107.79	-2.23	105.56	-	-	AVG
#	6907.200	62.90	1.67	64.57	68.20	-3.63	peak
#	10360.000	44.35	8.87	53.22	68.20	-14.98	peak
*	15540.000	36.45	12.56	49.01	74.00	-24.99	peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	5150.000	64.02	-2.24	61.78	74.00	-12.22	peak
@	5180.000	112.97	-2.23	110.74	-	-	peak
-	5150.000	52.52	-2.24	50.28	54.00	-3.72	AVG
@	5180.000	103.28	-2.23	101.05	-	-	AVG
#	6907.200	63.93	1.67	65.60	68.20	-2.60	peak
#	10360.000	49.17	8.87	58.04	68.20	-10.16	peak
*	15540.000	36.29	12.56	48.85	74.00	-25.15	peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. "#": The radiated frequency is out of the restricted band.
6. "*": The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
7. The other emission levels were very low against the limit.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Test report No. : 4788947466-US-R1-V0
Page : 86 of 159
Issued date : Oct. 28, 2019
FCC ID : VGYAP912C

EUT Test Condition		Measurement Detail	
Channel	Channel 44	Frequency Range	1 GHz ~ 40 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	5021.000	62.84	-2.58	60.26	74.00	-13.74	peak
@	5220.000	120.10	-2.33	117.77	-	-	peak
-	5140.100	50.20	-2.25	47.95	54.00	-6.05	AVG
@	5220.000	110.51	-2.33	108.18	-	-	AVG
#	6960.500	61.69	2.03	63.72	68.20	-4.48	peak
#	10440.000	50.34	9.07	59.41	68.20	-8.79	peak
*	15660.000	35.86	12.40	48.26	74.00	-25.74	peak
-	20880.000	43.56	13.81	57.37	83.54	-26.17	peak
-	20880.000	28.14	13.81	41.95	63.54	-21.59	AVG
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	5017.100	62.33	-2.62	59.71	74.00	-14.29	peak
@	5220.000	117.12	-2.33	114.79	-	-	peak
-	5109.800	49.78	-2.27	47.51	54.00	-6.49	AVG
@	5220.000	107.49	-2.33	105.16	-	-	AVG
#	6960.500	61.84	2.03	63.87	68.20	-4.33	peak
#	10440.000	54.77	9.07	63.84	68.20	-4.36	peak
*	15660.000	35.81	12.40	48.21	74.00	-25.79	peak
-	20880.000	50.75	13.81	64.56	83.54	-18.98	peak
-	20880.000	34.45	13.81	48.26	63.54	-15.28	AVG

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. "#": The radiated frequency is out of the restricted band.
6. "*": The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
7. The other emission levels were very low against the limit.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Test report No. : 4788947466-US-R1-V0
Page : 87 of 159
Issued date : Oct. 28, 2019
FCC ID : VGYAP912C

EUT Test Condition		Measurement Detail	
Channel	Channel 48	Frequency Range	1 GHz ~ 40 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	5103.500	62.39	-2.27	60.12	74.00	-13.88	peak
@	5240.000	120.44	-2.44	118.00	-	-	peak
-	5115.500	50.10	-2.26	47.84	54.00	-6.16	AVG
@	5240.000	111.30	-2.44	108.86	-	-	AVG
#	6986.500	61.62	2.17	63.79	68.20	-4.41	peak
#	10480.000	46.93	9.03	55.96	68.20	-12.24	peak
*	15720.000	39.83	12.34	52.17	74.00	-21.83	peak
*	20960.000	38.35	13.82	52.17	83.54	-31.37	peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	5118.800	61.26	-2.26	59.00	74.00	-15.00	peak
@	5240.000	117.87	-2.44	115.43	-	-	peak
-	5144.000	49.70	-2.25	47.45	54.00	-6.55	AVG
@	5240.000	107.98	-2.44	105.54	-	-	AVG
#	6986.500	61.64	2.17	63.81	68.20	-4.39	peak
#	10480.000	53.50	9.03	62.53	68.20	-5.67	peak
-	15720.000	45.24	12.34	57.58	74.00	-16.42	peak
-	15720.000	32.64	12.34	44.98	54.00	-9.02	AVG
-	20960.000	47.13	13.82	60.95	83.54	-22.59	peak
-	20960.000	31.70	13.82	45.52	63.54	-18.02	AVG
#	26200.000	34.44	16.19	50.63	77.74	-27.11	peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. "#": The radiated frequency is out of the restricted band.
6. "*": The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
7. The other emission levels were very low against the limit.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Test report No. : 4788947466-US-R1-V0
Page : 88 of 159
Issued date : Oct. 28, 2019
FCC ID : VGYAP912C

EUT Test Condition		Measurement Detail	
Channel	Channel 149	Frequency Range	1 GHz ~ 40 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
#	5588.500	61.89	-2.09	59.80	68.20	-8.40	peak
-	5725.000	96.59	-1.76	94.83	122.20	-27.37	peak
@	5745.000	119.47	-1.62	117.85	-	-	peak
@	5745.000	109.94	-1.62	108.32	-	-	AVG
*	7659.900	48.90	3.46	52.36	74.00	-21.64	peak
*	11490.000	39.41	9.77	49.18	74.00	-24.82	peak
#	17235.000	43.82	15.75	59.57	68.20	-8.63	peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
#	5595.000	60.42	-2.09	58.33	68.20	-9.87	peak
-	5725.000	88.94	-1.76	87.18	122.20	-35.02	peak
@	5745.000	116.81	-1.62	115.19	-	-	peak
@	5745.000	107.22	-1.62	105.60	-	-	AVG
*	7659.900	49.52	3.46	52.98	74.00	-21.02	peak
-	11490.000	48.94	9.77	58.71	74.00	-15.29	peak
-	11490.000	34.86	9.77	44.63	54.00	-9.37	AVG
#	17235.000	51.46	15.75	67.21	68.20	-0.99	peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. "#": The radiated frequency is out of the restricted band.
6. "*": The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
7. The other emission levels were very low against the limit.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



EUT Test Condition		Measurement Detail	
Channel	Channel 157	Frequency Range	1 GHz ~ 40 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
#	5614.000	61.80	-2.10	59.70	68.20	-8.50	peak
-	5723.500	64.93	-1.77	63.16	118.78	-55.62	peak
@	5785.000	119.27	-1.36	117.91	-	-	peak
@	5785.000	109.71	-1.36	108.35	-	-	AVG
-	5908.500	61.20	-1.18	60.02	80.41	-20.39	peak
#	5962.500	62.73	-1.11	61.62	68.20	-6.58	peak
*	7713.200	48.75	3.59	52.34	74.00	-21.66	peak
*	11570.000	39.44	9.65	49.09	74.00	-24.91	peak
#	17355.000	44.31	16.71	61.02	68.20	-7.18	peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
#	5558.000	60.47	-2.05	58.42	68.20	-9.78	peak
-	5725.000	61.74	-1.76	59.98	122.20	-62.22	peak
@	5785.000	117.83	-1.36	116.47	-	-	peak
@	5785.000	108.29	-1.36	106.93	-	-	AVG
-	5852.000	60.30	-1.23	59.07	117.64	-58.57	peak
#	5936.500	60.91	-1.17	59.74	68.20	-8.46	peak
*	7713.200	49.62	3.59	53.21	74.00	-20.79	peak
-	11570.000	49.73	9.65	59.38	74.00	-14.62	peak
-	11570.000	35.77	9.65	45.42	54.00	-8.58	AVG
#	17355.000	50.43	16.71	67.14	68.20	-1.06	peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. "#": The radiated frequency is out of the restricted band.
6. "*": The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
7. The other emission levels were very low against the limit.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Test report No. : 4788947466-US-R1-V0
Page : 90 of 159
Issued date : Oct. 28, 2019
FCC ID : VGYAP912C

EUT Test Condition		Measurement Detail	
Channel	Channel 165	Frequency Range	1 GHz ~ 40 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
@	5825.000	120.13	-1.24	118.89	-	-	peak
@	5825.000	110.50	-1.24	109.26	-	-	AVG
-	5850.000	90.38	-1.23	89.15	122.20	-33.05	peak
#	5926.000	60.56	-1.17	59.39	68.20	-8.81	peak
#	7766.500	48.83	3.75	52.58	68.20	-15.62	peak
*	11650.000	41.70	9.40	51.10	74.00	-22.90	peak
#	17475.000	43.73	17.67	61.40	68.20	-6.80	peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
@	5825.000	118.83	-1.24	117.59	-	-	peak
@	5825.000	109.31	-1.24	108.07	-	-	AVG
-	5852.000	83.12	-1.23	81.89	117.64	-35.75	peak
#	5934.000	61.10	-1.17	59.93	68.20	-8.27	peak
#	7766.500	49.92	3.75	53.67	68.20	-14.53	peak
-	11650.000	49.83	9.40	59.23	74.00	-14.77	peak
-	11650.000	35.70	9.40	45.10	54.00	-8.90	AVG
#	17475.000	49.94	17.67	67.61	68.20	-0.59	peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. "#": The radiated frequency is out of the restricted band.
6. "*": The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
7. The other emission levels were very low against the limit.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



802.11ac (VHT40)

EUT Test Condition		Measurement Detail	
Channel	Channel 38	Frequency Range	1 GHz ~ 40 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	5150.000	69.68	-2.24	67.44	74.00	-6.56	peak
@	5190.000	113.00	-2.23	110.77	-	-	peak
-	5150.000	55.70	-2.24	53.46	54.00	-0.54	AVG
@	5190.000	103.33	-2.23	101.10	-	-	AVG
#	6920.200	61.63	1.77	63.40	68.20	-4.80	peak
#	10380.000	38.65	8.98	47.63	68.20	-20.57	peak
*	15570.000	34.05	12.46	46.51	74.00	-27.49	peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	5148.500	62.93	-2.24	60.69	74.00	-13.31	peak
@	5190.000	108.92	-2.23	106.69	-	-	peak
-	5150.000	51.58	-2.24	49.34	54.00	-4.66	AVG
@	5190.000	98.82	-2.23	96.59	-	-	AVG
#	6920.200	61.89	1.77	63.66	68.20	-4.54	peak
#	10380.000	44.54	8.98	53.52	68.20	-14.68	peak
*	15570.000	37.77	12.46	50.23	74.00	-23.77	peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. "#": The radiated frequency is out of the restricted band.
6. "*": The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
7. The other emission levels were very low against the limit.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Test report No. : 4788947466-US-R1-V0
Page : 92 of 159
Issued date : Oct. 28, 2019
FCC ID : VGYAP912C

EUT Test Condition		Measurement Detail	
Channel	Channel 46	Frequency Range	1 GHz ~ 40 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	5147.600	65.99	-2.24	63.75	74.00	-10.25	peak
@	5230.000	116.72	-2.38	114.34	-	-	peak
-	5149.400	55.20	-2.24	52.96	54.00	-1.04	AVG
@	5230.000	107.47	-2.38	105.09	-	-	AVG
#	6973.500	62.46	2.10	64.56	68.20	-3.64	peak
#	10460.000	43.06	9.04	52.10	68.20	-16.10	peak
*	15690.000	34.91	12.42	47.33	74.00	-26.67	peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	5149.100	63.35	-2.24	61.11	74.00	-12.89	peak
@	5230.000	113.69	-2.38	111.31	-	-	peak
-	5149.400	50.81	-2.24	48.57	54.00	-5.43	AVG
@	5230.000	103.98	-2.38	101.60	-	-	AVG
#	6973.500	62.67	2.10	64.77	68.20	-3.43	peak
#	10460.000	48.87	9.04	57.91	68.20	-10.29	peak
*	15690.000	37.89	12.42	50.31	74.00	-23.69	peak
*	20920.000	36.30	13.82	50.12	83.54	-33.42	peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. "#": The radiated frequency is out of the restricted band.
6. "*": The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
7. The other emission levels were very low against the limit.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Test report No. : 4788947466-US-R1-V0
Page : 93 of 159
Issued date : Oct. 28, 2019
FCC ID : VGYAP912C

EUT Test Condition		Measurement Detail	
Channel	Channel 151	Frequency Range	1 GHz ~ 40 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
#	5642.500	69.63	-2.07	67.56	68.20	-0.64	peak
-	5725.000	100.41	-1.76	98.65	122.20	-23.55	peak
@	5755.000	117.80	-1.57	116.23	-	-	peak
@	5755.000	108.14	-1.57	106.57	-	-	AVG
*	7672.900	48.74	3.49	52.23	74.00	-21.77	peak
*	11510.000	40.14	9.76	49.90	74.00	-24.10	peak
#	17265.000	44.36	15.98	60.34	68.20	-7.86	peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
#	5642.500	62.88	-2.07	60.81	68.20	-7.39	peak
-	5721.500	95.56	-1.79	93.77	114.22	-20.45	peak
@	5755.000	115.76	-1.57	114.19	-	-	peak
@	5755.000	106.07	-1.57	104.50	-	-	AVG
*	7674.200	50.04	3.49	53.53	74.00	-20.47	peak
-	11510.000	47.83	9.76	57.59	74.00	-16.41	peak
-	11510.000	35.59	9.76	45.35	54.00	-8.65	AVG
#	17265.000	50.86	15.98	66.84	68.20	-1.36	peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. "#": The radiated frequency is out of the restricted band.
6. "*": The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
7. The other emission levels were very low against the limit.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Test report No. : 4788947466-US-R1-V0
Page : 94 of 159
Issued date : Oct. 28, 2019
FCC ID : VGYAP912C

EUT Test Condition		Measurement Detail	
Channel	Channel 159	Frequency Range	1 GHz ~ 40 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
#	5648.000	61.71	-2.06	59.65	68.20	-8.55	peak
-	5725.000	78.34	-1.76	76.58	122.20	-45.62	peak
@	5795.000	117.92	-1.29	116.63	-	-	peak
@	5795.000	108.33	-1.29	107.04	-	-	AVG
-	5853.500	83.83	-1.22	82.61	114.22	-31.61	peak
#	5930.000	68.46	-1.16	67.30	68.20	-0.90	peak
*	7727.500	47.45	3.62	51.07	74.00	-22.93	peak
*	11590.000	39.88	9.61	49.49	74.00	-24.51	peak
#	17385.000	44.33	16.95	61.28	68.20	-6.92	peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
#	5644.000	61.33	-2.07	59.26	68.20	-8.94	peak
-	5724.000	77.06	-1.77	75.29	119.92	-44.63	peak
@	5795.000	116.44	-1.29	115.15	-	-	peak
@	5795.000	106.60	-1.29	105.31	-	-	AVG
-	5851.500	79.63	-1.23	78.40	118.78	-40.38	peak
#	5925.500	62.62	-1.17	61.45	68.20	-6.75	peak
*	7727.500	49.18	3.62	52.80	74.00	-21.20	peak
-	11590.000	48.13	9.61	57.74	74.00	-16.26	peak
-	11590.000	36.03	9.61	45.64	54.00	-8.36	AVG
#	17385.000	50.27	16.95	67.22	68.20	-0.98	peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. "#": The radiated frequency is out of the restricted band.
6. "*": The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
7. The other emission levels were very low against the limit.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Test report No. : 4788947466-US-R1-V0
Page : 95 of 159
Issued date : Oct. 28, 2019
FCC ID : VGYAP912C

802.11ac (VHT80)

EUT Test Condition		Measurement Detail	
Channel	Channel 42	Frequency Range	1 GHz ~ 40 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	5140.400	67.71	-2.25	65.46	74.00	-8.54	peak
@	5210.000	108.01	-2.28	105.73	-	-	peak
-	5150.000	55.35	-2.24	53.11	54.00	-0.89	AVG
@	5210.000	98.24	-2.28	95.96	-	-	AVG
#	6946.200	63.16	1.96	65.12	68.20	-3.08	peak
#	10420.000	37.20	9.08	46.28	68.20	-21.92	peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	5081.000	62.41	-2.32	60.09	74.00	-13.91	peak
@	5210.000	103.77	-2.28	101.49	-	-	peak
-	5141.000	50.13	-2.25	47.88	54.00	-6.12	AVG
@	5210.000	94.29	-2.28	92.01	-	-	AVG
#	6946.200	63.72	1.96	65.68	68.20	-2.52	peak
#	10420.000	37.47	9.08	46.55	68.20	-21.65	peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. "#": The radiated frequency is out of the restricted band.
6. The other emission levels were very low against the limit.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Test report No. : 4788947466-US-R1-V0
Page : 96 of 159
Issued date : Oct. 28, 2019
FCC ID : VGYAP912C

EUT Test Condition		Measurement Detail	
Channel	Channel 155	Frequency Range	1 GHz ~ 40 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
#	5645.500	69.75	-2.07	67.68	68.20	-0.52	peak
-	5684.000	84.11	-1.97	82.14	93.36	-11.22	peak
@	5775.000	111.45	-1.43	110.02	-	-	peak
@	5775.000	101.61	-1.43	100.18	-	-	AVG
*	7700.200	48.85	3.56	52.41	74.00	-21.59	peak
*	11550.000	36.65	9.68	46.33	74.00	-27.67	peak
#	17325.000	37.19	16.47	53.66	68.20	-14.54	peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
#	5638.000	65.32	-2.07	63.25	68.20	-4.95	peak
-	5653.500	69.53	-2.05	67.48	70.79	-3.31	peak
@	5775.000	108.66	-1.43	107.23	-	-	peak
@	5775.000	98.88	-1.43	97.45	-	-	AVG
*	7700.200	49.13	3.56	52.69	74.00	-21.31	peak
*	11550.000	43.64	9.68	53.32	74.00	-20.68	peak
#	17325.000	42.86	16.47	59.33	68.20	-8.87	peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. "#": The radiated frequency is out of the restricted band.
6. "*": The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
7. The other emission levels were very low against the limit.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Beamforming Mode

Above 1GHz Data

802.11a

EUT Test Condition		Measurement Detail	
Channel	Channel 36	Frequency Range	1 GHz ~ 40 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	5150.000	72.39	-2.24	70.15	74.00	-3.85	peak
@	5180.000	118.83	-2.23	116.60	-	-	peak
-	5150.000	55.30	-2.24	53.06	54.00	-0.94	AVG
@	5180.000	108.04	-2.23	105.81	-	-	AVG
#	6907.200	65.75	1.67	67.42	68.20	-0.78	peak
#	10360.000	38.63	8.87	47.50	68.20	-20.70	peak
*	15540.000	34.42	12.56	46.98	74.00	-27.02	peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	5149.100	65.68	-2.24	63.44	74.00	-10.56	peak
@	5180.000	115.51	-2.23	113.28	-	-	peak
-	5150.000	51.86	-2.24	49.62	54.00	-4.38	AVG
@	5180.000	104.89	-2.23	102.66	-	-	AVG
#	6907.200	66.00	1.67	67.67	68.20	-0.53	peak
#	10360.000	40.80	8.87	49.67	68.20	-18.53	peak
*	15540.000	35.03	12.56	47.59	74.00	-26.41	peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. "#": The radiated frequency is out of the restricted band.
6. "*": The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
7. The other emission levels were very low against the limit.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Test report No. : 4788947466-US-R1-V0
Page : 98 of 159
Issued date : Oct. 28, 2019
FCC ID : VGYAP912C

EUT Test Condition		Measurement Detail	
Channel	Channel 44	Frequency Range	1 GHz ~ 40 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	5068.700	69.25	-2.34	66.91	74.00	-7.09	peak
@	5220.000	119.60	-2.33	117.27	-	-	peak
-	5148.200	50.72	-2.24	48.48	54.00	-5.52	AVG
@	5220.000	109.51	-2.33	107.18	-	-	AVG
#	6960.500	65.37	2.03	67.40	68.20	-0.8	peak
#	10440.000	37.82	9.07	46.89	68.20	-21.31	peak
*	15660.000	34.11	12.40	46.51	74.00	-27.49	peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	5066.000	62.32	-2.35	59.97	74.00	-14.03	peak
@	5220.000	116.43	-2.33	114.10	-	-	peak
-	5123.900	50.99	-2.25	48.74	54.00	-5.26	AVG
@	5220.000	106.39	-2.33	104.06	-	-	AVG
#	6960.500	65.85	2.03	67.88	68.20	-0.32	peak
#	10440.000	42.74	9.07	51.81	68.20	-16.39	peak
*	15660.000	34.63	12.40	47.03	74.00	-26.97	peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. "#": The radiated frequency is out of the restricted band.
6. "*": The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
7. The other emission levels were very low against the limit.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Test report No. : 4788947466-US-R1-V0
Page : 99 of 159
Issued date : Oct. 28, 2019
FCC ID : VGYAP912C

EUT Test Condition		Measurement Detail	
Channel	Channel 48	Frequency Range	1 GHz ~ 40 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	5090.600	68.63	-2.29	66.34	74.00	-7.66	peak
@	5240.000	119.81	-2.44	117.37	-	-	peak
-	5099.300	51.30	-2.27	49.03	54.00	-4.97	AVG
@	5240.000	109.78	-2.44	107.34	-	-	AVG
#	6986.500	65.43	2.17	67.60	68.20	-0.60	peak
#	10480.000	37.92	9.03	46.95	68.20	-21.25	peak
*	15720.000	33.78	12.34	46.12	74.00	-27.88	peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	5094.800	62.59	-2.28	60.31	74.00	-13.69	peak
@	5240.000	115.43	-2.44	112.99	-	-	peak
-	5129.300	50.96	-2.26	48.70	54.00	-5.30	AVG
@	5240.000	106.56	-2.44	104.12	-	-	AVG
#	6986.500	65.52	2.17	67.69	68.20	-0.51	peak
#	10480.000	42.05	9.03	51.08	68.20	-17.12	peak
*	15720.000	34.95	12.34	47.29	74.00	-26.71	peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. "#": The radiated frequency is out of the restricted band.
6. "*": The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
7. The other emission levels were very low against the limit.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Test report No. : 4788947466-US-R1-V0
Page : 100 of 159
Issued date : Oct. 28, 2019
FCC ID : VGYAP912C

EUT Test Condition		Measurement Detail	
Channel	Channel 149	Frequency Range	1 GHz ~ 40 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
#	5588.000	69.57	-2.09	67.48	68.20	-0.72	peak
-	5725.000	83.19	-1.76	81.43	122.20	-40.77	peak
@	5745.000	116.32	-1.62	114.70	-	-	peak
@	5745.000	108.26	-1.62	106.64	-	-	AVG
-	7659.900	51.04	3.46	54.50	74.00	-19.50	peak
-	7659.900	49.25	3.46	52.71	54.00	-1.29	AVG
*	11490.000	40.99	9.77	50.76	74.00	-23.24	peak
#	17235.000	37.34	15.75	53.09	68.20	-15.11	peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
#	5594.500	67.81	-2.09	65.72	68.20	-2.48	peak
-	5724.500	78.04	-1.76	76.28	121.06	-44.78	peak
@	5745.000	114.92	-1.62	113.30	-	-	peak
@	5745.000	106.78	-1.62	105.16	-	-	AVG
-	7659.900	51.74	3.46	55.20	74.00	-18.80	peak
-	7659.900	49.77	3.46	53.23	54.00	-0.77	AVG
-	11490.000	49.06	9.77	58.83	74.00	-15.17	peak
-	11490.000	36.42	9.77	46.19	54.00	-7.81	AVG
#	17235.000	39.78	15.75	55.53	68.20	-12.67	peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. "#": The radiated frequency is out of the restricted band.
6. "*": The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
7. The other emission levels were very low against the limit.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Test report No. : 4788947466-US-R1-V0
Page : 101 of 159
Issued date : Oct. 28, 2019
FCC ID : VGYAP912C

EUT Test Condition		Measurement Detail	
Channel	Channel 157	Frequency Range	1 GHz ~ 40 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
#	5631.000	69.72	-2.08	67.64	68.20	-0.56	peak
-	5717.500	60.14	-1.82	58.32	110.10	-51.78	peak
@	5785.000	116.29	-1.36	114.93	-	-	peak
@	5785.000	108.14	-1.36	106.78	-	-	AVG
-	5901.500	61.62	-1.19	60.43	85.59	-25.16	peak
#	5932.500	64.66	-1.17	63.49	68.20	-4.71	peak
-	7713.200	50.69	3.59	54.28	74.00	-19.72	peak
-	7713.200	49.01	3.59	52.60	54.00	-1.40	AVG
*	11570.000	41.45	9.65	51.10	74.00	-22.90	peak
#	17355.000	36.06	16.71	52.77	68.20	-15.43	peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
#	5637.000	67.32	-2.07	65.25	68.20	-2.95	peak
-	5695.000	61.01	-1.94	59.07	101.50	-42.43	peak
@	5785.000	114.93	-1.36	113.57	-	-	peak
@	5785.000	106.81	-1.36	105.45	-	-	AVG
-	5890.500	60.83	-1.20	59.63	93.73	-34.10	peak
#	5937.000	63.98	-1.17	62.81	68.20	-5.39	peak
-	7713.200	51.73	3.59	55.32	74.00	-18.68	peak
-	7713.200	49.65	3.59	53.24	54.00	-0.76	AVG
-	11570.000	49.94	9.65	59.59	74.00	-14.41	peak
-	11570.000	37.13	9.65	46.78	54.00	-7.22	AVG
#	17355.000	38.63	16.71	55.34	68.20	-12.86	peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. "#": The radiated frequency is out of the restricted band.
6. "*": The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
7. The other emission levels were very low against the limit.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Test report No. : 4788947466-US-R1-V0
Page : 102 of 159
Issued date : Oct. 28, 2019
FCC ID : VGYAP912C

EUT Test Condition		Measurement Detail	
Channel	Channel 165	Frequency Range	1 GHz ~ 40 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
@	5825.000	117.61	-1.24	116.37	-	-	peak
@	5825.000	109.42	-1.24	108.18	-	-	AVG
-	5850.000	74.79	-1.23	73.56	122.20	-48.64	peak
#	5974.500	65.57	-1.08	64.49	68.20	-3.71	peak
-	7766.500	50.91	3.75	54.66	74.00	-19.34	peak
-	7766.500	49.05	3.75	52.80	54.00	-1.20	AVG
*	11650.000	42.00	9.40	51.40	74.00	-22.60	peak
#	17475.000	37.85	17.67	55.52	68.20	-12.68	peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
@	5825.000	115.67	-1.24	114.43	-	-	peak
@	5825.000	107.52	-1.24	106.28	-	-	AVG
-	5850.000	71.99	-1.23	70.76	122.20	-51.44	peak
#	5973.500	63.09	-1.08	62.01	68.20	-6.19	peak
-	7766.500	51.67	3.75	55.42	74.00	-18.58	peak
-	7766.500	49.51	3.75	53.26	54.00	-0.74	AVG
-	11650.000	50.60	9.40	60.00	74.00	-14.00	peak
-	11650.000	38.01	9.40	47.41	54.00	-6.59	AVG
#	17475.000	39.87	17.67	57.54	68.20	-10.66	peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. "#": The radiated frequency is out of the restricted band.
6. "*": The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
7. The other emission levels were very low against the limit.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Test report No. : 4788947466-US-R1-V0
Page : 103 of 159
Issued date : Oct. 28, 2019
FCC ID : VGYAP912C

802.11ac (VHT20)

EUT Test Condition		Measurement Detail	
Channel	Channel 36	Frequency Range	1 GHz ~ 40 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	5150.000	69.28	-2.24	67.04	74.00	-6.96	peak
@	5180.000	116.32	-2.23	114.09	-	-	peak
-	5150.000	55.38	-2.24	53.14	54.00	-0.86	AVG
@	5180.000	108.23	-2.23	106.00	-	-	AVG
#	6907.200	66.22	1.67	67.89	68.20	-0.31	peak
#	10360.000	37.20	8.87	46.07	68.20	-22.13	peak
*	15540.000	33.85	12.56	46.41	74.00	-27.59	peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	5150.000	62.36	-2.24	60.12	74.00	-13.88	peak
@	5180.000	114.36	-2.23	112.13	-	-	peak
-	5148.200	52.40	-2.24	50.16	54.00	-3.84	AVG
@	5180.000	105.77	-2.23	103.54	-	-	AVG
#	6907.200	66.15	1.67	67.82	68.20	-0.38	peak
#	10360.000	39.12	8.87	47.99	68.20	-20.21	peak
*	15540.000	34.45	12.56	47.01	74.00	-26.99	peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. "#": The radiated frequency is out of the restricted band.
6. "*": The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
7. The other emission levels were very low against the limit.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Test report No. : 4788947466-US-R1-V0
Page : 104 of 159
Issued date : Oct. 28, 2019
FCC ID : VGYAP912C

EUT Test Condition		Measurement Detail	
Channel	Channel 44	Frequency Range	1 GHz ~ 40 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	5145.500	63.08	-2.24	60.84	74.00	-13.16	peak
@	5220.000	117.27	-2.33	114.94	-	-	peak
-	5140.400	50.68	-2.25	48.43	54.00	-5.57	AVG
@	5220.000	109.78	-2.33	107.45	-	-	AVG
#	6960.500	65.91	2.03	67.94	68.20	-0.26	peak
#	10440.000	37.51	9.07	46.58	68.20	-21.62	peak
*	15660.000	33.73	12.40	46.13	74.00	-27.87	peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	5095.400	62.32	-2.28	60.04	74.00	-13.96	peak
@	5220.000	114.20	-2.33	111.87	-	-	peak
-	5104.700	50.38	-2.27	48.11	54.00	-5.89	AVG
@	5220.000	106.38	-2.33	104.05	-	-	AVG
#	6960.500	65.42	2.03	67.45	68.20	-0.75	peak
#	10440.000	38.75	9.07	47.82	68.20	-20.38	peak
*	15660.000	34.62	12.40	47.02	74.00	-26.98	peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. "#": The radiated frequency is out of the restricted band.
6. "*": The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
7. The other emission levels were very low against the limit.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Test report No. : 4788947466-US-R1-V0
Page : 105 of 159
Issued date : Oct. 28, 2019
FCC ID : VGYAP912C

EUT Test Condition		Measurement Detail	
Channel	Channel 48	Frequency Range	1 GHz ~ 40 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	5096.900	62.17	-2.28	59.89	74.00	-14.11	peak
@	5240.000	117.80	-2.44	115.36	-	-	peak
-	5117.300	50.74	-2.26	48.48	54.00	-5.52	AVG
@	5240.000	110.12	-2.44	107.68	-	-	AVG
#	6986.500	65.60	2.17	67.77	68.20	-0.43	peak
#	10480.000	38.36	9.03	47.39	68.20	-20.81	peak
*	15720.000	34.52	12.34	46.86	74.00	-27.14	peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	5107.700	62.82	-2.27	60.55	74.00	-13.45	peak
@	5240.000	114.56	-2.44	112.12	-	-	peak
-	5105.300	50.42	-2.27	48.15	54.00	-5.85	AVG
@	5240.000	106.39	-2.44	103.95	-	-	AVG
#	6986.500	65.63	2.17	67.80	68.20	-0.40	peak
#	10480.000	38.74	9.03	47.77	68.20	-20.43	peak
*	15720.000	35.53	12.34	47.87	74.00	-26.13	peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. "#": The radiated frequency is out of the restricted band.
6. "*": The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
7. The other emission levels were very low against the limit.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Test report No. : 4788947466-US-R1-V0
Page : 106 of 159
Issued date : Oct. 28, 2019
FCC ID : VGYAP912C

EUT Test Condition		Measurement Detail	
Channel	Channel 149	Frequency Range	1 GHz ~ 40 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
#	5601.500	67.03	-2.10	64.93	68.20	-3.27	peak
-	5725.000	80.14	-1.76	78.38	122.20	-43.82	peak
@	5745.000	116.98	-1.62	115.36	-	-	peak
@	5745.000	108.79	-1.62	107.17	-	-	AVG
-	7659.900	51.18	3.46	54.64	74.00	-19.36	peak
-	7659.900	49.20	3.46	52.66	54.00	-1.34	AVG
*	11490.000	37.09	9.77	46.86	74.00	-27.14	peak
#	17235.000	33.38	15.75	49.13	68.20	-19.07	peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
#	5598.000	63.11	-2.10	61.01	68.20	-7.19	peak
-	5723.500	72.97	-1.77	71.20	118.78	-47.58	peak
@	5745.000	114.86	-1.62	113.24	-	-	peak
@	5745.000	106.81	-1.62	105.19	-	-	AVG
-	7659.900	51.61	3.46	55.07	74.00	-18.93	peak
-	7659.900	49.76	3.46	53.22	54.00	-0.78	AVG
*	11490.000	42.79	9.77	52.56	74.00	-21.44	peak
#	17235.000	38.13	15.75	53.88	68.20	-14.32	peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. "#": The radiated frequency is out of the restricted band.
6. "*": The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
7. The other emission levels were very low against the limit.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Test report No. : 4788947466-US-R1-V0
Page : 107 of 159
Issued date : Oct. 28, 2019
FCC ID : VGYAP912C

EUT Test Condition		Measurement Detail	
Channel	Channel 157	Frequency Range	1 GHz ~ 40 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
#	5590.500	64.93	-2.09	62.84	68.20	-5.36	peak
-	5711.000	62.20	-1.86	60.34	108.28	-47.94	peak
@	5785.000	116.20	-1.36	114.84	-	-	peak
@	5785.000	108.26	-1.36	106.90	-	-	AVG
-	5873.500	60.45	-1.21	59.24	105.62	-46.38	peak
#	5939.500	60.71	-1.17	59.54	68.20	-8.66	peak
-	7713.200	50.90	3.59	54.49	74.00	-19.51	peak
-	7713.200	48.89	3.59	52.48	54.00	-1.52	AVG
*	11570.000	36.98	9.65	46.63	74.00	-27.37	peak
#	17355.000	33.08	16.71	49.79	68.20	-18.41	peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
#	5636.500	64.47	-2.07	62.40	68.20	-5.80	peak
-	5690.000	61.24	-1.96	59.28	97.80	-38.52	peak
@	5785.000	114.51	-1.36	113.15	-	-	peak
@	5785.000	106.39	-1.36	105.03	-	-	AVG
-	5917.000	60.88	-1.18	59.70	74.12	-14.42	peak
#	5954.000	60.76	-1.14	59.62	68.20	-8.58	peak
-	7713.200	51.54	3.59	55.13	74.00	-18.87	peak
-	7713.200	49.60	3.59	53.19	54.00	-0.81	AVG
*	11570.000	41.72	9.65	51.37	74.00	-22.63	peak
#	17355.000	36.91	16.71	53.62	68.20	-14.58	peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. "#": The radiated frequency is out of the restricted band.
6. "*": The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
7. The other emission levels were very low against the limit.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



EUT Test Condition		Measurement Detail	
Channel	Channel 165	Frequency Range	1 GHz ~ 40 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
@	5825.000	116.40	-1.24	115.16	-	-	peak
@	5825.000	108.33	-1.24	107.09	-	-	AVG
-	5850.000	74.43	-1.23	73.20	122.20	-49.00	peak
#	5981.000	63.05	-1.08	61.97	68.20	-6.23	peak
-	7766.500	51.18	3.75	54.93	74.00	-19.07	peak
-	7766.500	49.21	3.75	52.96	54.00	-1.04	AVG
*	11650.000	39.52	9.40	48.92	74.00	-25.08	peak
#	17475.000	35.21	17.67	52.88	68.20	-15.32	peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
@	5825.000	114.42	-1.24	113.18	-	-	peak
@	5825.000	106.33	-1.24	105.09	-	-	AVG
-	5850.000	73.03	-1.23	71.80	122.20	-50.40	peak
#	5944.500	60.24	-1.16	59.08	68.20	-9.12	peak
-	7766.500	51.70	3.75	55.45	74.00	-18.55	peak
-	7766.500	49.63	3.75	53.38	54.00	-0.62	AVG
*	11650.000	43.00	9.40	52.40	74.00	-21.60	peak
#	17475.000	39.40	17.67	57.07	68.20	-11.13	peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. "#": The radiated frequency is out of the restricted band.
6. "*": The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
7. The other emission levels were very low against the limit.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Test report No. : 4788947466-US-R1-V0
Page : 109 of 159
Issued date : Oct. 28, 2019
FCC ID : VGYAP912C

802.11ac (VHT40)

EUT Test Condition		Measurement Detail	
Channel	Channel 38	Frequency Range	1 GHz ~ 40 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	5150.000	71.35	-2.24	69.11	74.00	-4.89	peak
@	5190.000	111.77	-2.23	109.54	-	-	peak
-	5150.000	55.72	-2.24	53.48	54.00	-0.52	AVG
@	5190.000	104.01	-2.23	101.78	-	-	AVG
#	6920.200	65.75	1.77	67.52	68.20	-0.68	peak
#	10380.000	37.29	8.98	46.27	68.20	-21.93	peak
*	15570.000	33.71	12.46	46.17	74.00	-27.83	peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	5088.500	63.21	-2.29	60.92	74.00	-13.08	peak
@	5190.000	107.76	-2.23	105.53	-	-	peak
-	5150.000	50.96	-2.24	48.72	54.00	-5.28	AVG
@	5190.000	99.47	-2.23	97.24	-	-	AVG
#	6920.200	65.95	1.77	67.72	68.20	-0.48	peak
#	10380.000	39.34	8.98	48.32	68.20	-19.88	peak
*	15570.000	34.90	12.46	47.36	74.00	-26.64	peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. "#": The radiated frequency is out of the restricted band.
6. "*": The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
7. The other emission levels were very low against the limit.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Test report No. : 4788947466-US-R1-V0
Page : 110 of 159
Issued date : Oct. 28, 2019
FCC ID : VGYAP912C

EUT Test Condition		Measurement Detail	
Channel	Channel 46	Frequency Range	1 GHz ~ 40 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	5150.000	62.86	-2.24	60.62	74.00	-13.38	peak
@	5230.000	118.00	-2.38	115.62	-	-	peak
-	5150.000	51.31	-2.24	49.07	54.00	-4.93	AVG
@	5230.000	110.30	-2.38	107.92	-	-	AVG
#	6973.500	65.62	2.10	67.72	68.20	-0.48	peak
#	10460.000	37.27	9.04	46.31	68.20	-21.89	peak
*	15690.000	34.27	12.42	46.69	74.00	-27.31	peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	5050.400	62.37	-2.40	59.97	74.00	-14.03	peak
@	5230.000	113.97	-2.38	111.59	-	-	peak
-	5106.500	50.88	-2.27	48.61	54.00	-5.39	AVG
@	5230.000	106.13	-2.38	103.75	-	-	AVG
#	6973.500	65.55	2.10	67.65	68.20	-0.55	peak
#	10460.000	38.14	9.04	47.18	68.20	-21.02	peak
*	15690.000	34.79	12.42	47.21	74.00	-26.79	peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. "#": The radiated frequency is out of the restricted band.
6. "*": The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
7. The other emission levels were very low against the limit.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Test report No. : 4788947466-US-R1-V0
Page : 111 of 159
Issued date : Oct. 28, 2019
FCC ID : VGYAP912C

EUT Test Condition		Measurement Detail	
Channel	Channel 151	Frequency Range	1 GHz ~ 40 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
#	5607.500	64.60	-2.09	62.51	68.20	-5.69	peak
-	5723.000	87.64	-1.77	85.87	117.64	-31.77	peak
@	5755.000	117.12	-1.57	115.55	-	-	peak
@	5755.000	109.14	-1.57	107.57	-	-	AVG
-	7672.900	51.57	3.49	55.06	74.00	-18.94	peak
-	7672.900	49.75	3.49	53.24	54.00	-0.76	AVG
*	11510.000	39.18	9.76	48.94	74.00	-25.06	peak
#	17265.000	34.67	15.98	50.65	68.20	-17.55	peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
#	5616.500	65.17	-2.09	63.08	68.20	-5.12	peak
-	5720.000	81.07	-1.80	79.27	110.80	-31.53	peak
@	5755.000	115.10	-1.57	113.53	-	-	peak
@	5755.000	106.94	-1.57	105.37	-	-	AVG
-	7674.200	51.14	3.49	54.63	74.00	-19.37	peak
-	7674.200	49.11	3.49	52.60	54.00	-1.40	AVG
*	11510.000	42.11	9.76	51.87	74.00	-22.13	peak
#	17265.000	36.87	15.98	52.85	68.20	-15.35	peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. "#": The radiated frequency is out of the restricted band.
6. "*": The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
7. The other emission levels were very low against the limit.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Test report No. : 4788947466-US-R1-V0
Page : 112 of 159
Issued date : Oct. 28, 2019
FCC ID : VGYAP912C

EUT Test Condition		Measurement Detail	
Channel	Channel 159	Frequency Range	1 GHz ~ 40 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
#	5642.500	66.72	-2.07	64.65	68.20	-3.55	peak
-	5653.000	66.77	-2.05	64.72	70.42	-5.70	peak
@	5795.000	116.67	-1.29	115.38	-	-	peak
@	5795.000	108.59	-1.29	107.30	-	-	AVG
-	5852.500	71.04	-1.23	69.81	116.50	-46.69	peak
#	5941.500	61.86	-1.16	60.70	68.20	-7.50	peak
-	7727.500	51.61	3.62	55.23	74.00	-18.77	peak
-	7727.500	49.81	3.62	53.43	54.00	-0.57	AVG
*	11590.000	37.87	9.61	47.48	74.00	-26.52	peak
#	17385.000	33.27	16.95	50.22	68.20	-17.98	peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
#	5633.500	62.68	-2.08	60.60	68.20	-7.60	peak
-	5658.500	64.33	-2.03	62.30	74.49	-12.19	peak
@	5795.000	113.96	-1.29	112.67	-	-	peak
@	5795.000	105.81	-1.29	104.52	-	-	AVG
-	5852.500	64.29	-1.23	63.06	116.50	-53.44	peak
#	5981.000	61.28	-1.08	60.20	68.20	-8.00	peak
-	7726.200	51.17	3.62	54.79	74.00	-19.21	peak
-	7726.200	49.06	3.62	52.68	54.00	-1.32	AVG
*	11590.000	42.10	9.61	51.71	74.00	-22.29	peak
#	17385.000	36.37	16.95	53.32	68.20	-14.88	peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. " # ": The radiated frequency is out of the restricted band.
6. " * ": The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
7. The other emission levels were very low against the limit.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Test report No. : 4788947466-US-R1-V0
Page : 113 of 159
Issued date : Oct. 28, 2019
FCC ID : VGYAP912C

802.11ac (VHT80)

EUT Test Condition		Measurement Detail	
Channel	Channel 42	Frequency Range	1 GHz ~ 40 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	5133.200	72.59	-2.26	70.33	74.00	-3.67	peak
@	5210.000	113.43	-2.28	111.15	-	-	peak
-	5133.500	55.12	-2.26	52.86	54.00	-1.14	AVG
@	5210.000	105.30	-2.28	103.02	-	-	AVG
#	6946.200	65.91	1.96	67.87	68.20	-0.33	peak
#	10420.000	37.01	9.08	46.09	68.20	-22.11	peak
*	15630.000	33.93	12.37	46.30	74.00	-27.70	peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	5148.800	67.10	-2.24	64.86	74.00	-9.14	peak
@	5210.000	109.87	-2.28	107.59	-	-	peak
-	5147.300	51.67	-2.24	49.43	54.00	-4.57	AVG
@	5210.000	102.47	-2.28	100.19	-	-	AVG
#	6947.500	65.78	1.96	67.74	68.20	-0.46	peak
#	10420.000	39.23	9.08	48.31	68.20	-19.89	peak
*	15630.000	35.13	12.37	47.50	74.00	-26.50	peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. "#": The radiated frequency is out of the restricted band.
6. "*": The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
7. The other emission levels were very low against the limit.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Test report No. : 4788947466-US-R1-V0
Page : 114 of 159
Issued date : Oct. 28, 2019
FCC ID : VGYAP912C

EUT Test Condition		Measurement Detail	
Channel	Channel 155	Frequency Range	1 GHz ~ 40 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
#	5625.500	69.13	-2.08	67.05	68.20	-1.15	peak
-	5654.000	70.67	-2.05	68.62	71.16	-2.54	peak
@	5775.000	113.53	-1.43	112.10	-	-	peak
@	5775.000	105.65	-1.43	104.22	-	-	AVG
-	7700.200	51.08	3.56	54.64	74.00	-19.36	peak
-	7700.200	49.09	3.56	52.65	54.00	-1.35	AVG
*	11550.000	37.18	9.68	46.86	74.00	-27.14	peak
#	17325.000	33.21	16.47	49.68	68.20	-18.52	peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
#	5625.000	65.52	-2.09	63.43	68.20	-4.77	peak
-	5654.500	68.15	-2.05	66.10	71.53	-5.43	peak
@	5775.000	111.40	-1.43	109.97	-	-	peak
@	5775.000	103.46	-1.43	102.03	-	-	AVG
-	7700.200	51.79	3.56	55.35	74.00	-18.65	peak
-	7700.200	49.79	3.56	53.35	54.00	-0.65	AVG
*	11550.000	40.83	9.68	50.51	74.00	-23.49	peak
#	17325.000	36.10	16.47	52.57	68.20	-15.63	peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. "#": The radiated frequency is out of the restricted band.
6. "*": The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
7. The other emission levels were very low against the limit.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Co-Location Mode

802.11b + 802.11ac (VHT20)

EUT Test Condition		Measurement Detail	
Channel	Channel 6+ Channel 165	Frequency Range	1 GHz ~ 40 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
*	4874.000	54.25	-3.02	51.23	74.00	-22.77	peak
*	7311.000	48.04	3.59	51.63	74.00	-22.37	peak
*	7767.800	46.95	3.75	50.70	74.00	-23.30	peak
*	9748.000	40.19	8.22	48.41	74.00	-25.59	peak
*	11650.000	41.36	9.40	50.76	74.00	-23.24	peak
*	12185.000	39.45	9.71	49.16	74.00	-24.84	peak
-	17475.000	41.10	17.67	58.77	74.00	-15.23	peak
-	17475.000	27.86	17.67	45.53	54.00	-8.47	AVG
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
*	4874.000	53.81	-3.02	50.79	74.00	-23.21	peak
*	7311.000	50.33	3.59	53.92	74.00	-20.08	peak
*	7766.500	47.55	3.75	51.30	74.00	-22.70	peak
*	9748.000	45.29	8.22	53.51	74.00	-20.49	peak
-	11650.000	49.98	9.40	59.38	74.00	-14.62	peak
-	11650.000	35.78	9.40	45.18	54.00	-8.82	AVG
*	12185.000	42.69	9.71	52.40	74.00	-21.60	peak
-	17475.000	47.57	17.67	65.24	74.00	-8.76	peak
-	17475.000	35.68	17.67	53.35	54.00	-0.65	AVG

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. " * ": The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
5. The other emission levels were very low against the limit.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



9 kHz ~ 30 MHz Data

The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

No non-compliance noted:

KDB 414788 D01 OATS and Chamber Correlation Justification

- Base on FCC 15.31 (f) (2): measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field.

- OATs and chamber correlation testing had been performed and chamber measured test results is the worst case test result.

Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30m open area test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



30 MHz ~ 1 GHz Data

CDD Mode

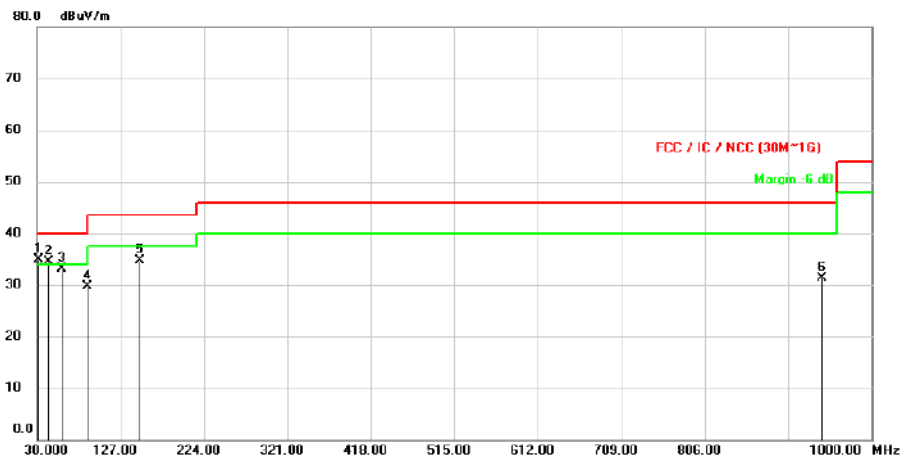
802.11ac (VHT80)

EUT Test Condition		Measurement Detail	
Channel	Channel 155	Frequency Range	30 MHz ~ 1 GHz

Horizontal



Vertical



Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Test report No. : 4788947466-US-R1-V0
Page : 118 of 159
Issued date : Oct. 28, 2019
FCC ID : VGYAP912C

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	90.3340	48.86	-21.24	27.62	43.50	-15.88	peak
-	107.9880	42.78	-18.74	24.04	43.50	-19.46	peak
-	148.5016	51.49	-15.33	36.16	43.50	-7.34	peak
-	222.7713	43.06	-17.45	25.61	46.00	-20.39	peak
-	297.0087	36.72	-14.14	22.58	46.00	-23.42	peak
-	863.8443	34.00	-3.10	30.90	46.00	-15.10	peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	32.1340	51.45	-16.49	34.96	40.00	-5.04	peak
-	43.4507	49.71	-15.27	34.44	40.00	-5.56	peak
-	58.8737	48.56	-15.55	33.01	40.00	-6.99	peak
-	89.1053	50.88	-21.20	29.68	43.50	-13.82	peak
-	148.5016	50.01	-15.33	34.68	43.50	-8.82	peak
-	942.0910	33.01	-1.71	31.30	46.00	-14.70	peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
5. The other emission levels were very low against the limit.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0

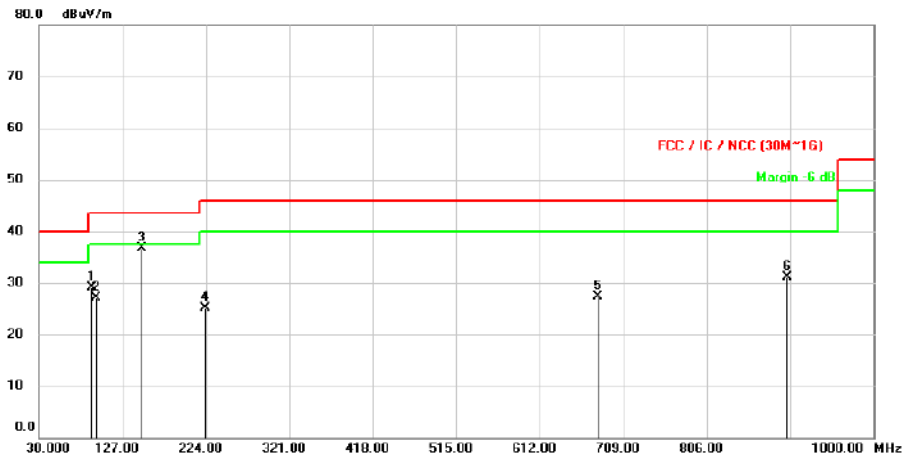


Beamforming Mode

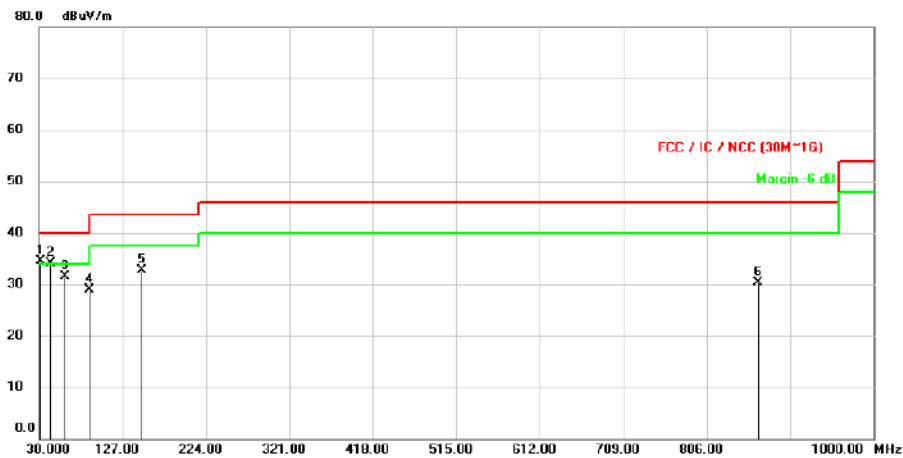
802.11ac (VHT20)

EUT Test Condition		Measurement Detail	
Channel	Channel 44	Frequency Range	30 MHz ~ 1 GHz

Horizontal



Vertical



Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Test report No. : 4788947466-US-R1-V0
Page : 120 of 159
Issued date : Oct. 28, 2019
FCC ID : VGYAP912C

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	90.3017	50.42	-21.24	29.18	43.50	-14.32	peak
-	96.6390	47.84	-20.71	27.13	43.50	-16.37	peak
-	148.5016	52.01	-15.33	36.68	43.50	-6.82	peak
-	222.7713	42.47	-17.45	25.02	46.00	-20.98	peak
-	680.2880	33.05	-5.71	27.34	46.00	-18.66	peak
-	899.9930	33.69	-2.57	31.12	46.00	-14.88	peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	31.7137	50.99	-16.50	34.49	40.00	-5.51	peak
-	43.0303	49.47	-15.30	34.17	40.00	-5.83	peak
-	59.4880	47.02	-15.61	31.41	40.00	-8.59	peak
-	89.1053	50.15	-21.20	28.95	43.50	-14.55	peak
-	148.5016	47.95	-15.33	32.62	43.50	-10.88	peak
-	866.6250	33.47	-3.08	30.39	46.00	-15.61	peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
5. The other emission levels were very low against the limit.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0

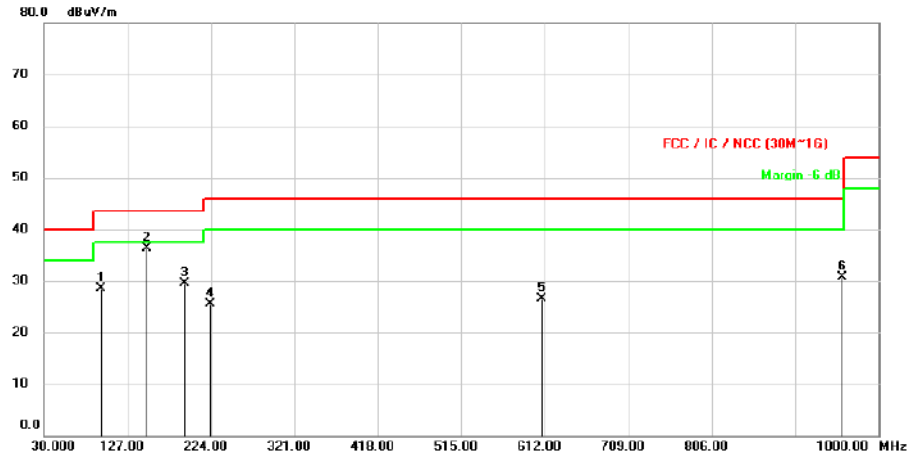


Co-Location Mode

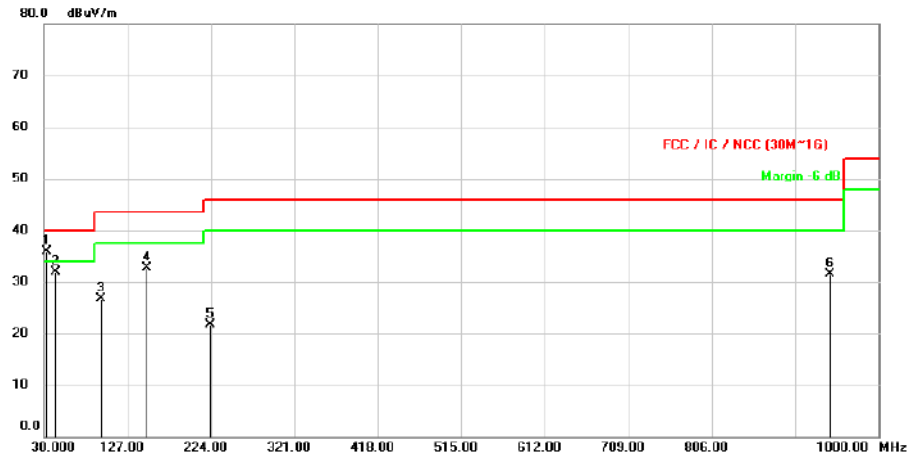
802.11b + 802.11ac (VHT20)

EUT Test Condition		Measurement Detail	
Channel	Channel 6+ Channel 165	Frequency Range	30 MHz ~ 1 GHz

Horizontal



Vertical



Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Test report No. : 4788947466-US-R1-V0
Page : 122 of 159
Issued date : Oct. 28, 2019
FCC ID : VGYAP912C

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	96.6713	49.15	-20.71	28.44	43.50	-15.06	peak
-	148.5510	51.61	-15.33	36.28	43.50	-7.22	peak
-	193.3781	46.79	-17.32	29.47	43.50	-14.03	peak
-	222.7802	42.93	-17.45	25.48	46.00	-20.52	peak
-	609.3486	33.18	-6.75	26.43	46.00	-19.57	peak
-	957.5461	32.29	-1.57	30.72	46.00	-15.28	peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	32.9423	52.35	-16.46	35.89	40.00	-4.11	peak
-	43.7415	47.13	-15.25	31.88	40.00	-8.12	peak
-	96.7035	47.31	-20.70	26.61	43.50	-16.89	peak
-	148.5014	47.99	-15.33	32.66	43.50	-10.84	peak
-	222.7711	39.06	-17.45	21.61	46.00	-24.39	peak
-	944.0307	33.13	-1.69	31.44	46.00	-14.56	peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
5. The other emission levels were very low against the limit.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



9.8. AC Power Line Conducted Emission

Requirements

Frequency (MHz)	Conducted limit (dB μ V)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30	60	50

Note:

1. The lower limit shall apply at the transition frequencies.
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

Test Procedures

- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

NOTE:

1. The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.
2. All modes of operation were investigated and the worst-case emissions are reported

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

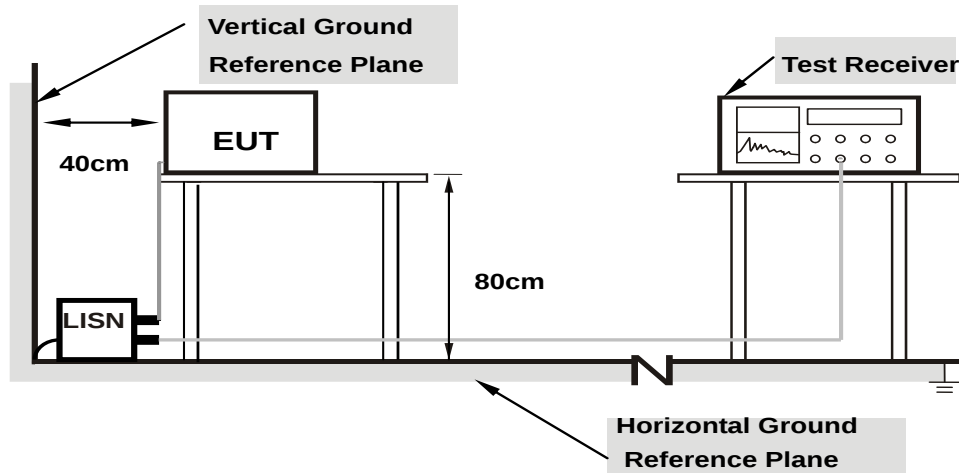
Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Test Setup



Note: 1.Support units were connected to second LISN.

For the actual test configuration, please refer to the Setup Configurations.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0

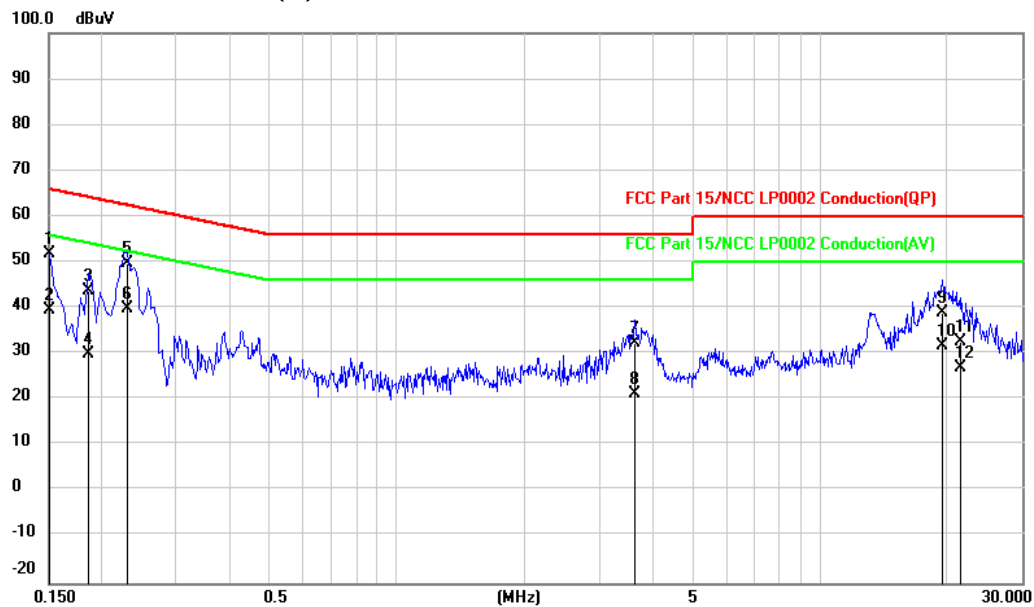


Test Data

802.11ac (VHT80)

EUT Test Condition		Measurement Detail	
Channel	Channel 155	Frequency Range	150 kHz ~ 30 MHz

Phase of Power : Line (L)



Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Test report No. : 4788947466-US-R1-V0
Page : 126 of 159
Issued date : Oct. 28, 2019
FCC ID : VGYAP912C

No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	dB	(dBuV)	(dBuV)	(dB)	
1	0.1510	32.10	19.69	51.79	65.94	-14.15	QP
2	0.1510	19.72	19.69	39.41	55.94	-16.53	AVG
3	0.1860	24.10	19.68	43.78	64.21	-20.43	QP
4	0.1860	10.36	19.68	30.04	54.21	-24.17	AVG
5	0.2300	30.06	19.68	49.74	62.45	-12.71	QP
6	0.2300	20.09	19.68	39.77	52.45	-12.68	AVG
7	3.6540	12.76	19.73	32.49	56.00	-23.51	QP
8	3.6540	1.66	19.73	21.39	46.00	-24.61	AVG
9	19.4300	19.09	19.86	38.95	60.00	-21.05	QP
10	19.4300	12.01	19.86	31.87	50.00	-18.13	AVG
11	21.5220	12.70	19.86	32.56	60.00	-27.44	QP
12	21.5220	6.99	19.86	26.85	50.00	-23.15	AVG

Remarks:

1. Result value (dBuV) = Reading value (dBuV) + Correction Factor (dB)
2. Margin(dB) = Result value (dBuV) - Limit value (dBuV)
3. Correction Factor(dB) = Insertion loss(dB) + Cable loss(dB)
4. The other emission levels were very low against the limit.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

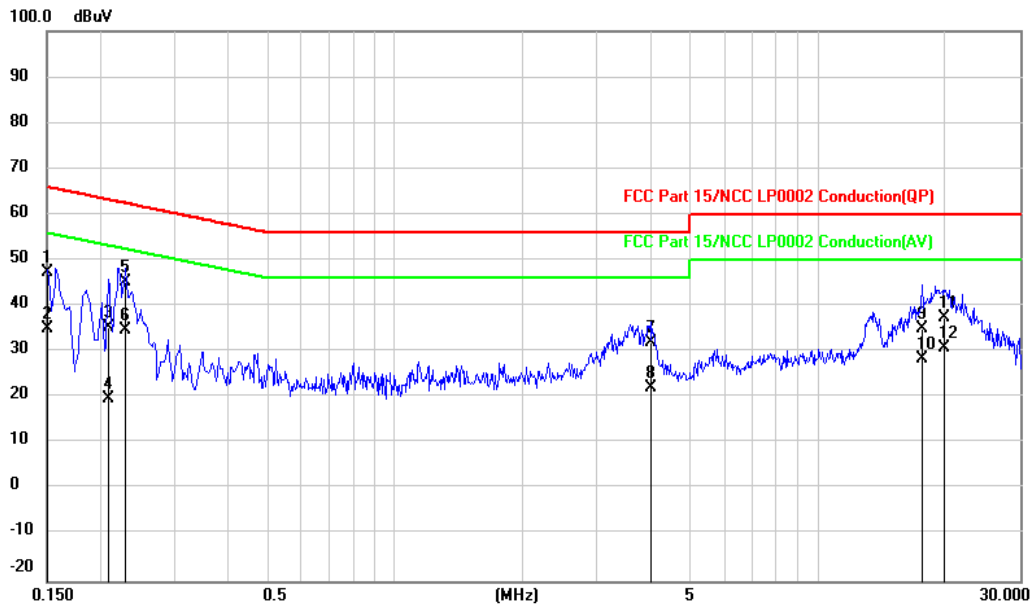
Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Phase of Power : Neutral (N)



Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Test report No. : 4788947466-US-R1-V0
Page : 128 of 159
Issued date : Oct. 28, 2019
FCC ID : VGYAP912C

No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	dB	(dBuV)	(dBuV)	(dB)	
1	0.1501	27.62	19.68	47.30	65.99	-18.69	QP
2	0.1501	15.37	19.68	35.05	55.99	-20.94	AVG
3	0.2100	15.54	19.68	35.22	63.21	-27.99	QP
4	0.2100	0.21	19.68	19.89	53.21	-33.32	AVG
5	0.2300	25.68	19.68	45.36	62.45	-17.09	QP
6	0.2300	15.00	19.68	34.68	52.45	-17.77	AVG
7	4.0140	12.38	19.74	32.12	56.00	-23.88	QP
8	4.0140	2.43	19.74	22.17	46.00	-23.83	AVG
9	17.6220	15.26	19.93	35.19	60.00	-24.81	QP
10	17.6220	8.45	19.93	28.38	50.00	-21.62	AVG
11	19.9140	17.63	19.95	37.58	60.00	-22.42	QP
12	19.9140	10.93	19.95	30.88	50.00	-19.12	AVG

Remarks:

1. Result value (dBuV) = Reading value (dBuV) + Correction Factor (dB)
2. Margin(dB) = Result value (dBuV) - Limit value (dBuV)
3. Correction Factor(dB) = Insertion loss(dB) + Cable loss(dB)
4. The other emission levels were very low against the limit.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0878 / 3.0

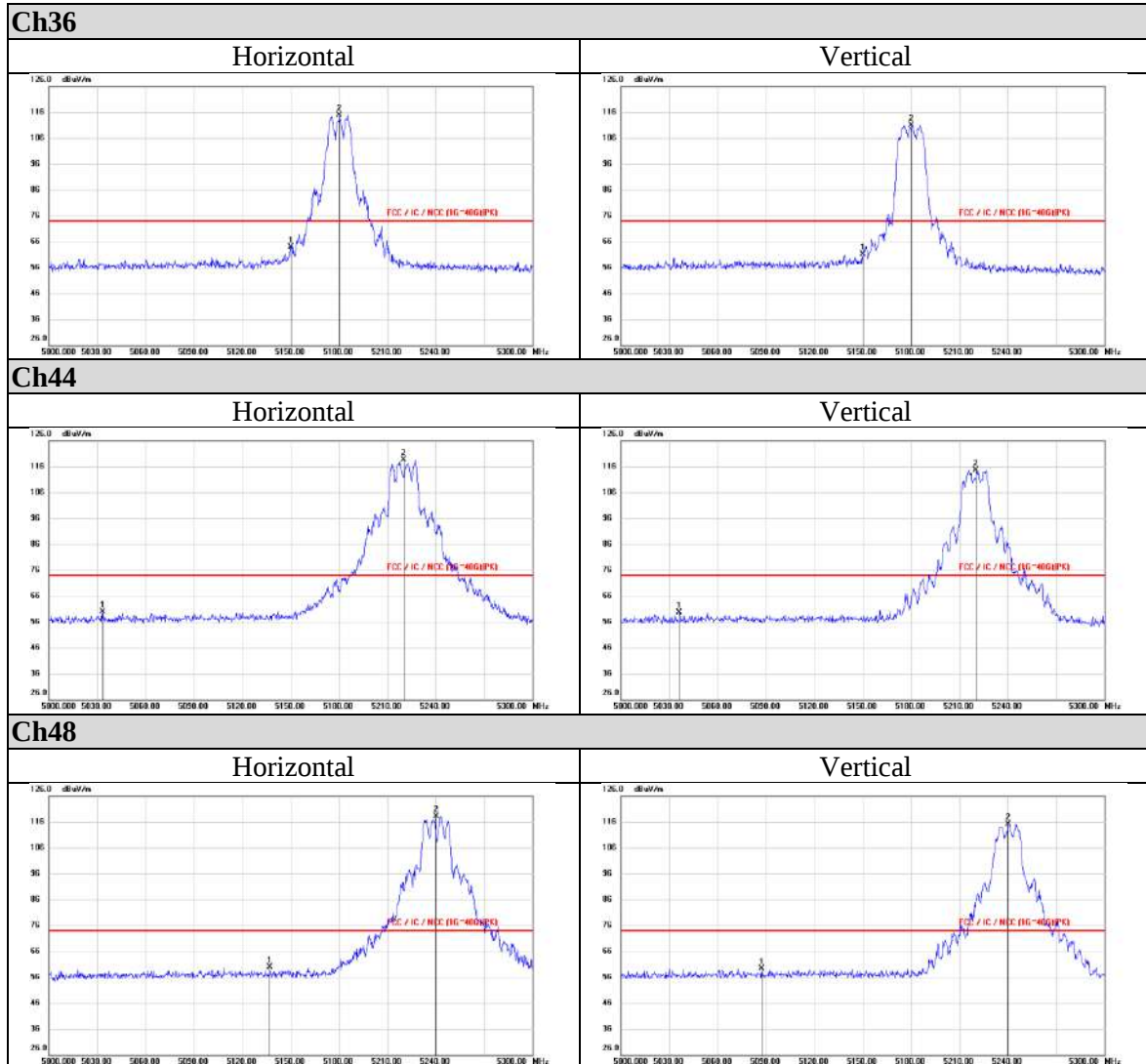


Appendix I Radiated Band Edge and OOB Measurement

CDD Mode

802.11a

Peak



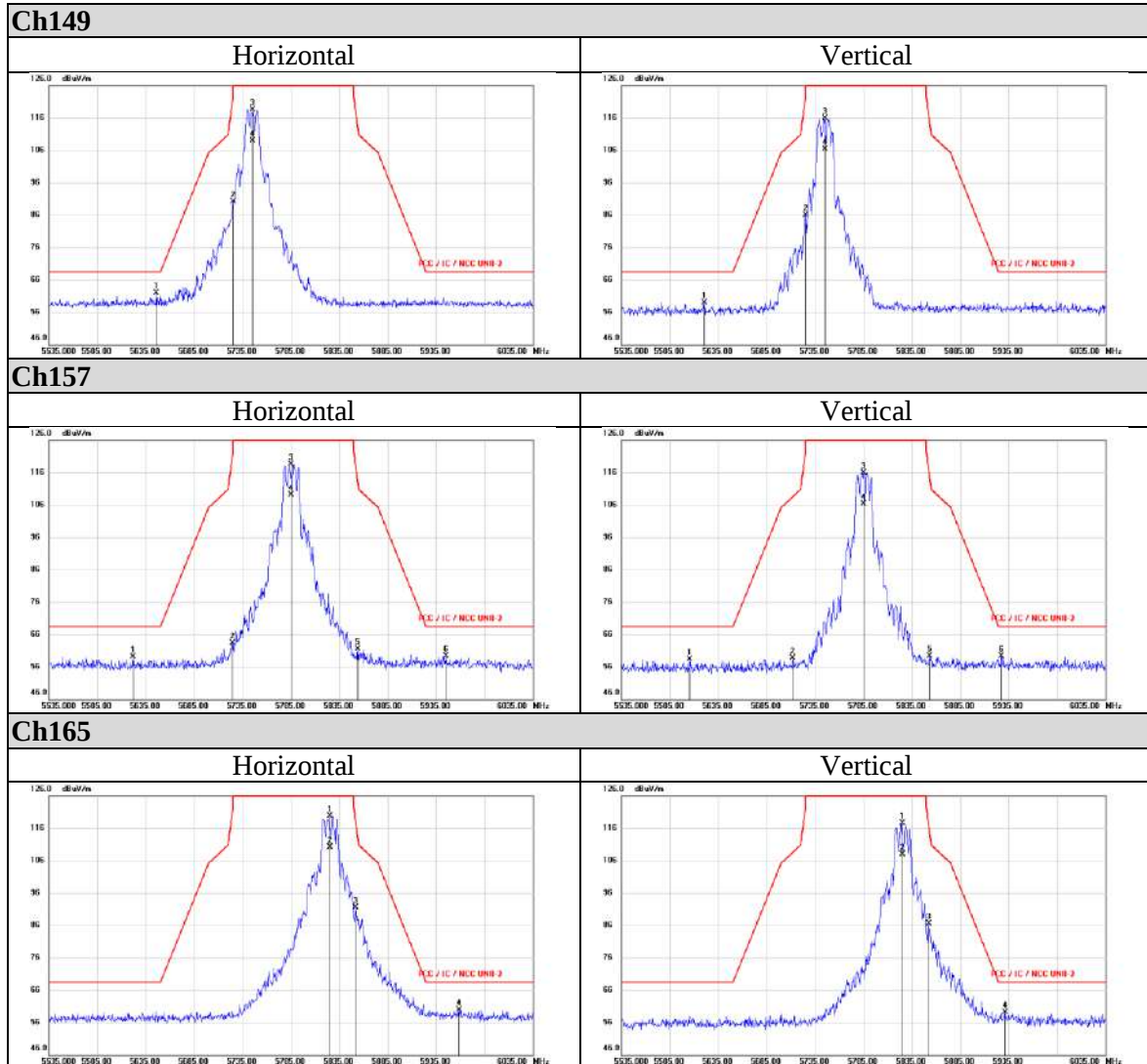
Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

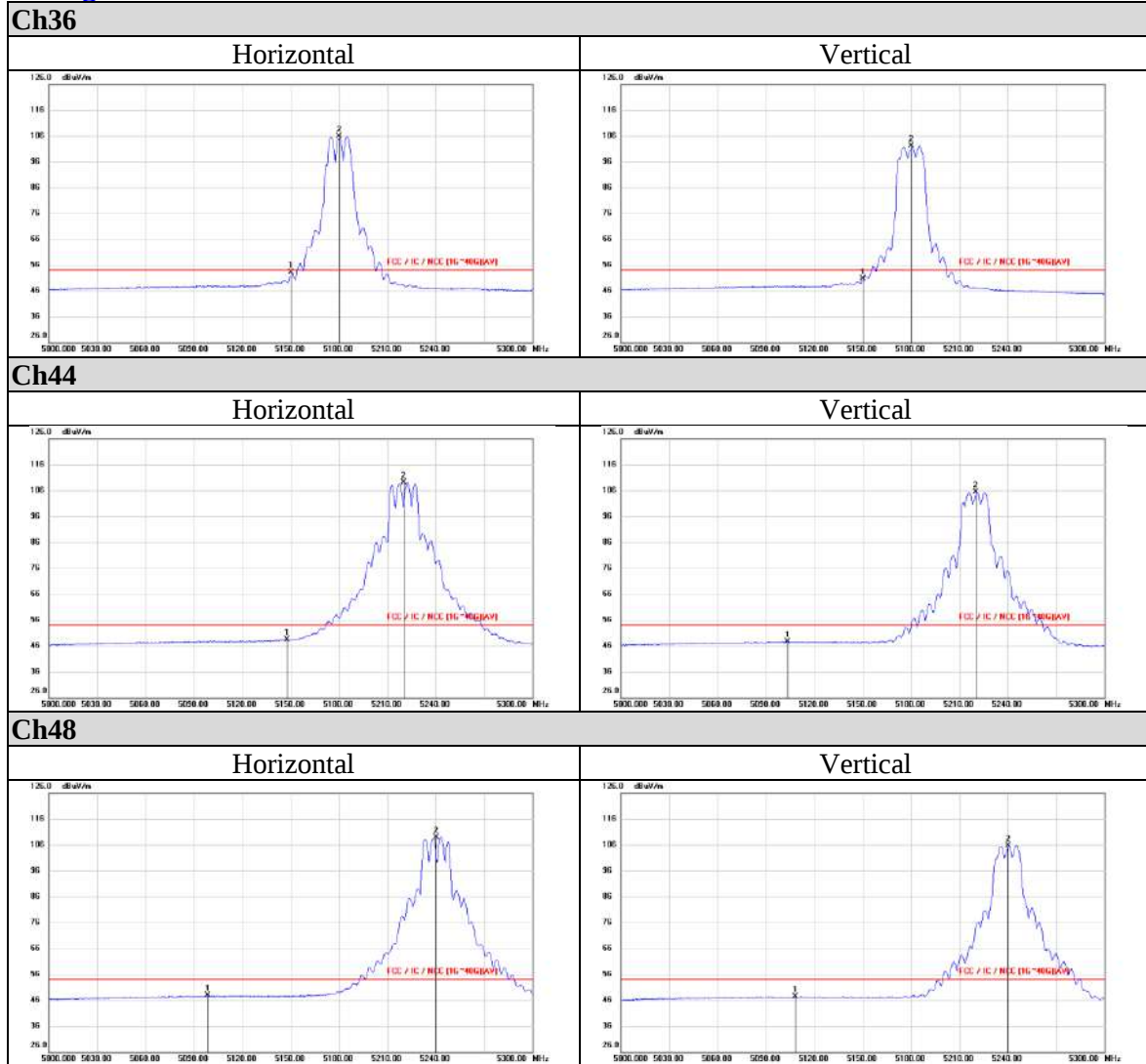
Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0878 / 3.0





Average



Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

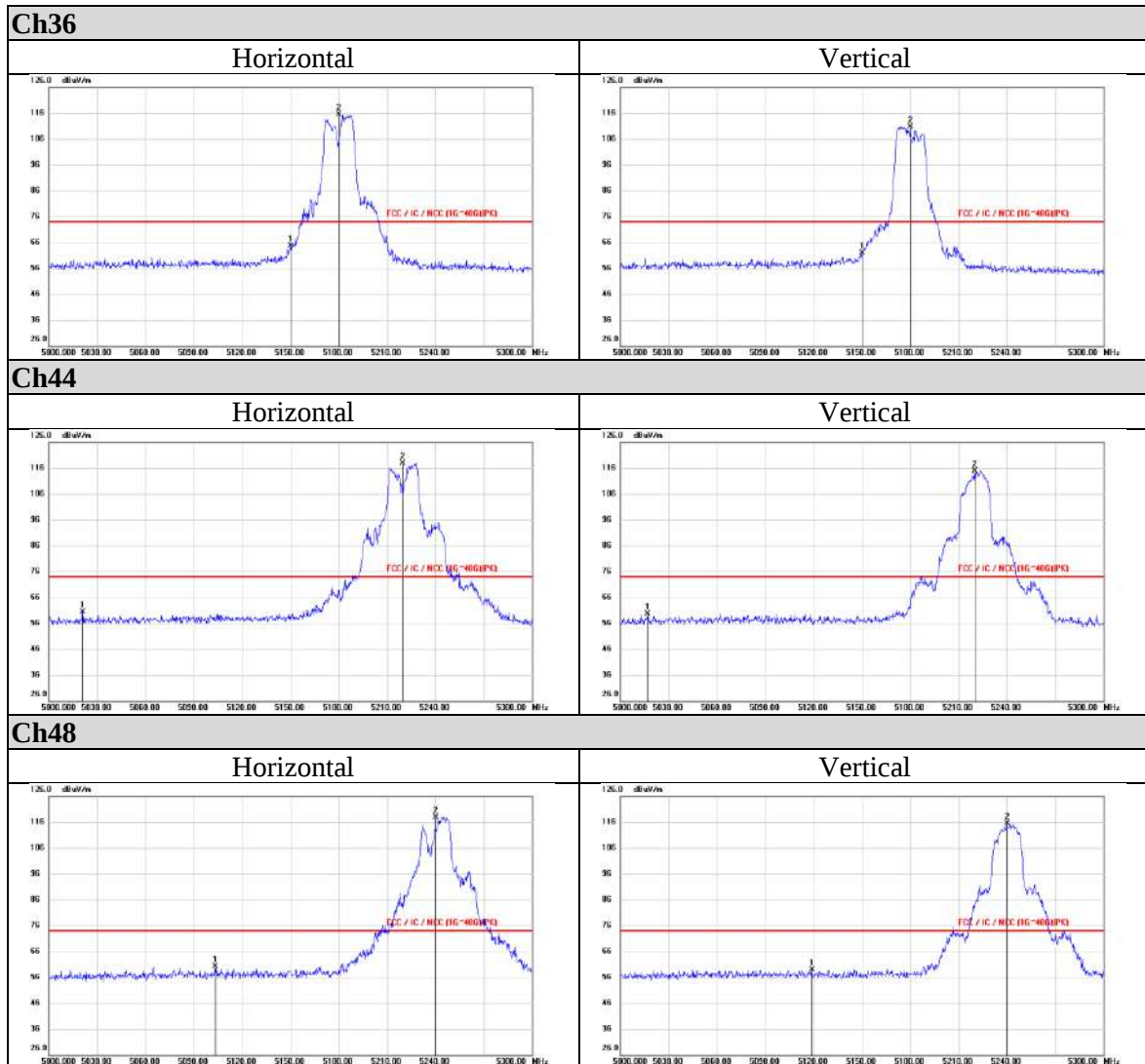
Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



802.11ac (VHT20)

Peak



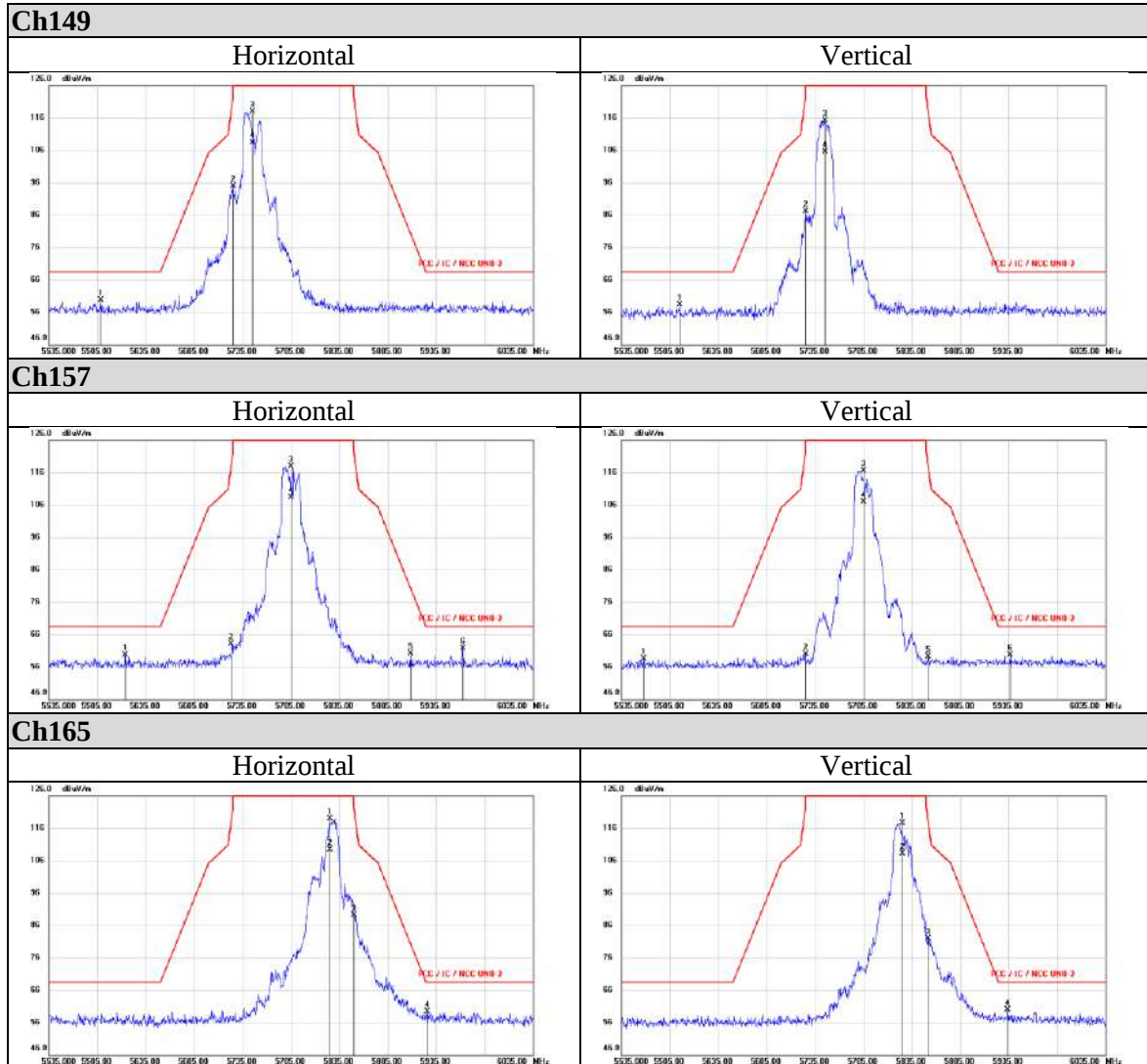
Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

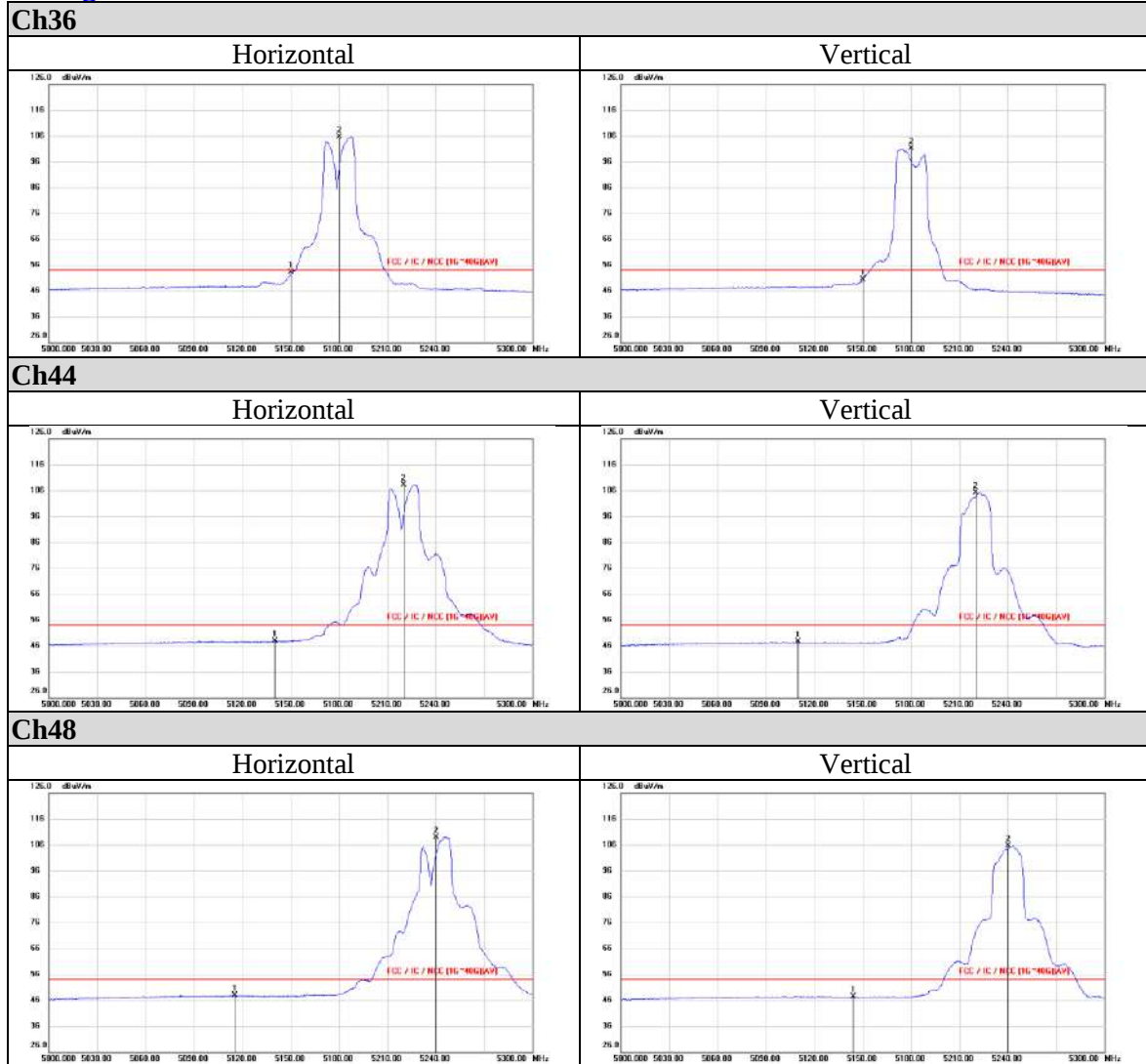
Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0878 / 3.0





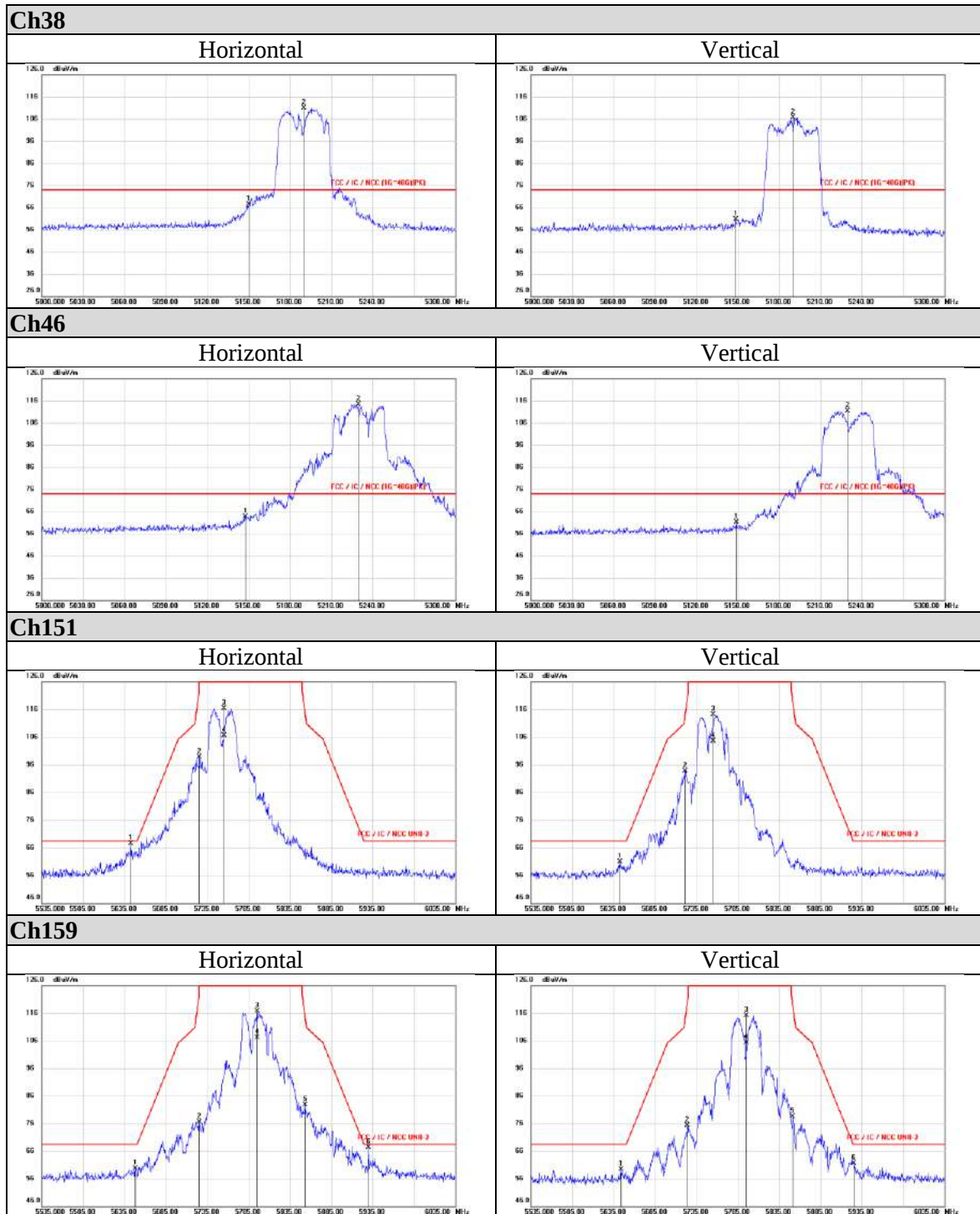
Average





802.11ac (VHT40)

Peak



Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

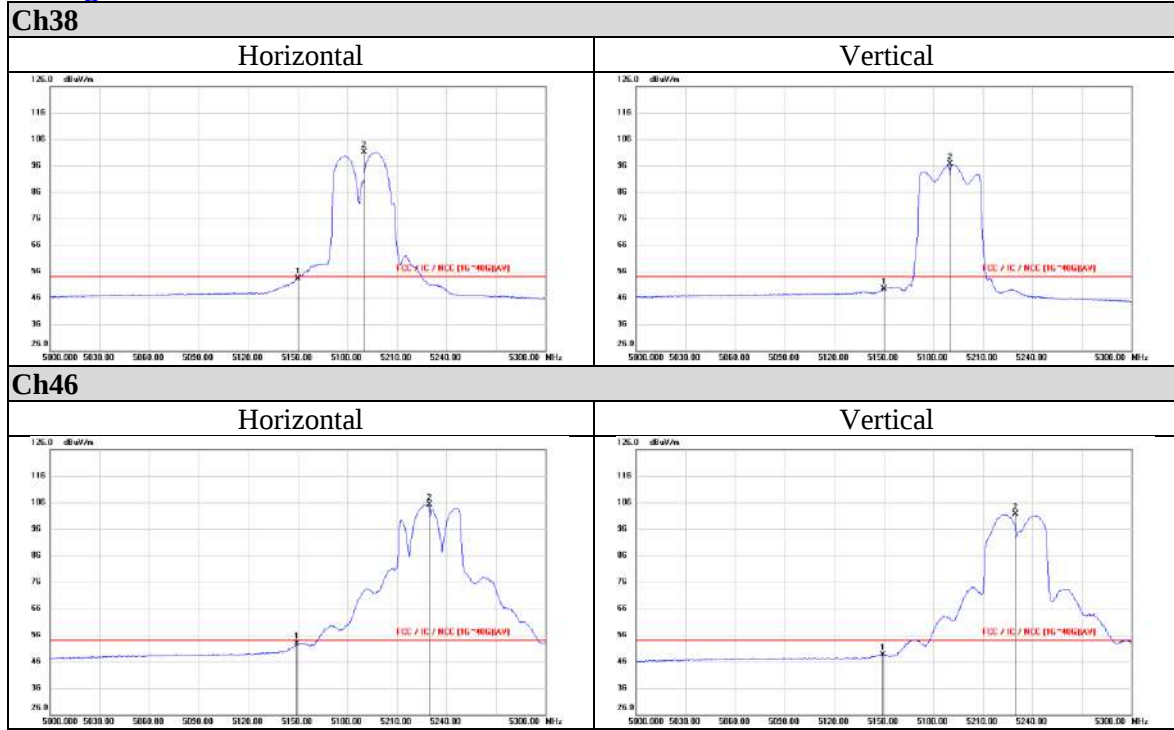
Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Average



Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

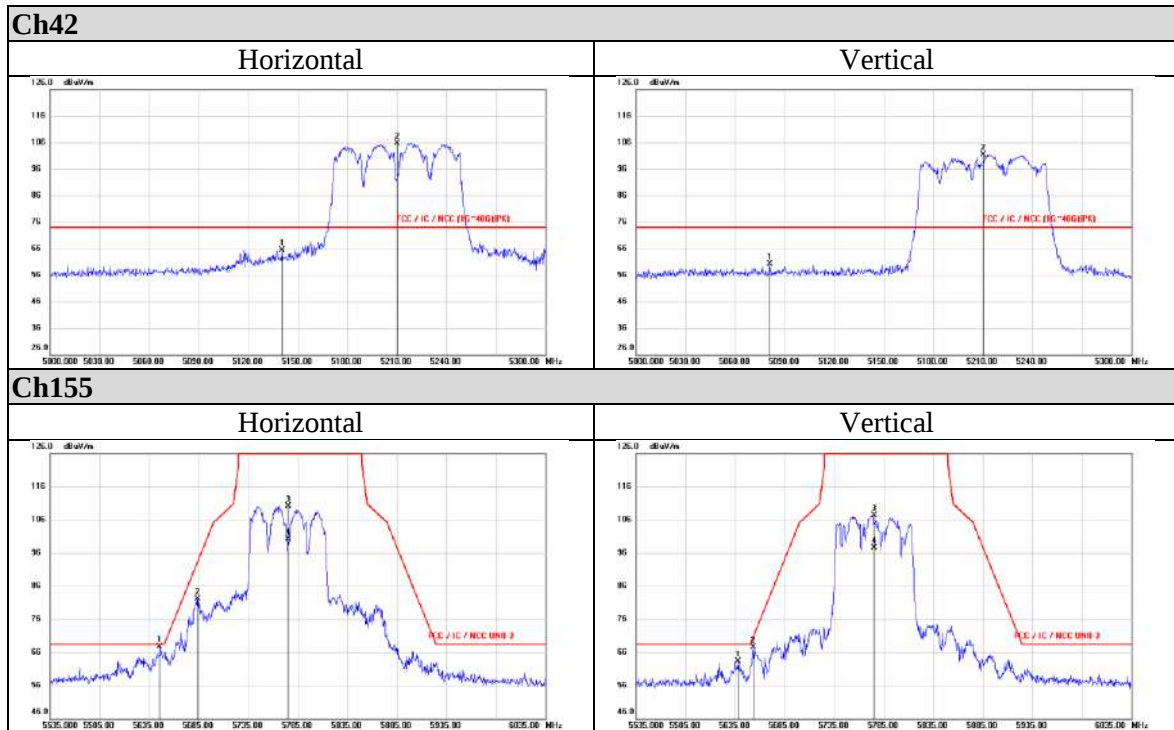
Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0878 / 3.0

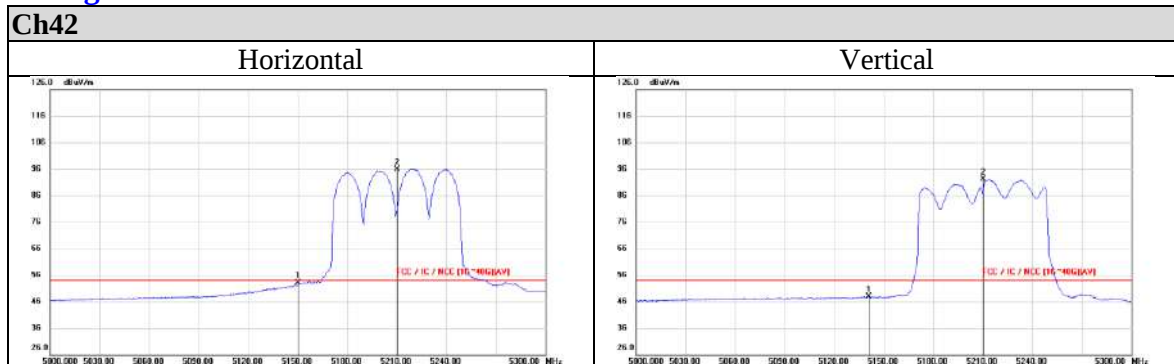


802.11ac (VHT80)

Peak



Average

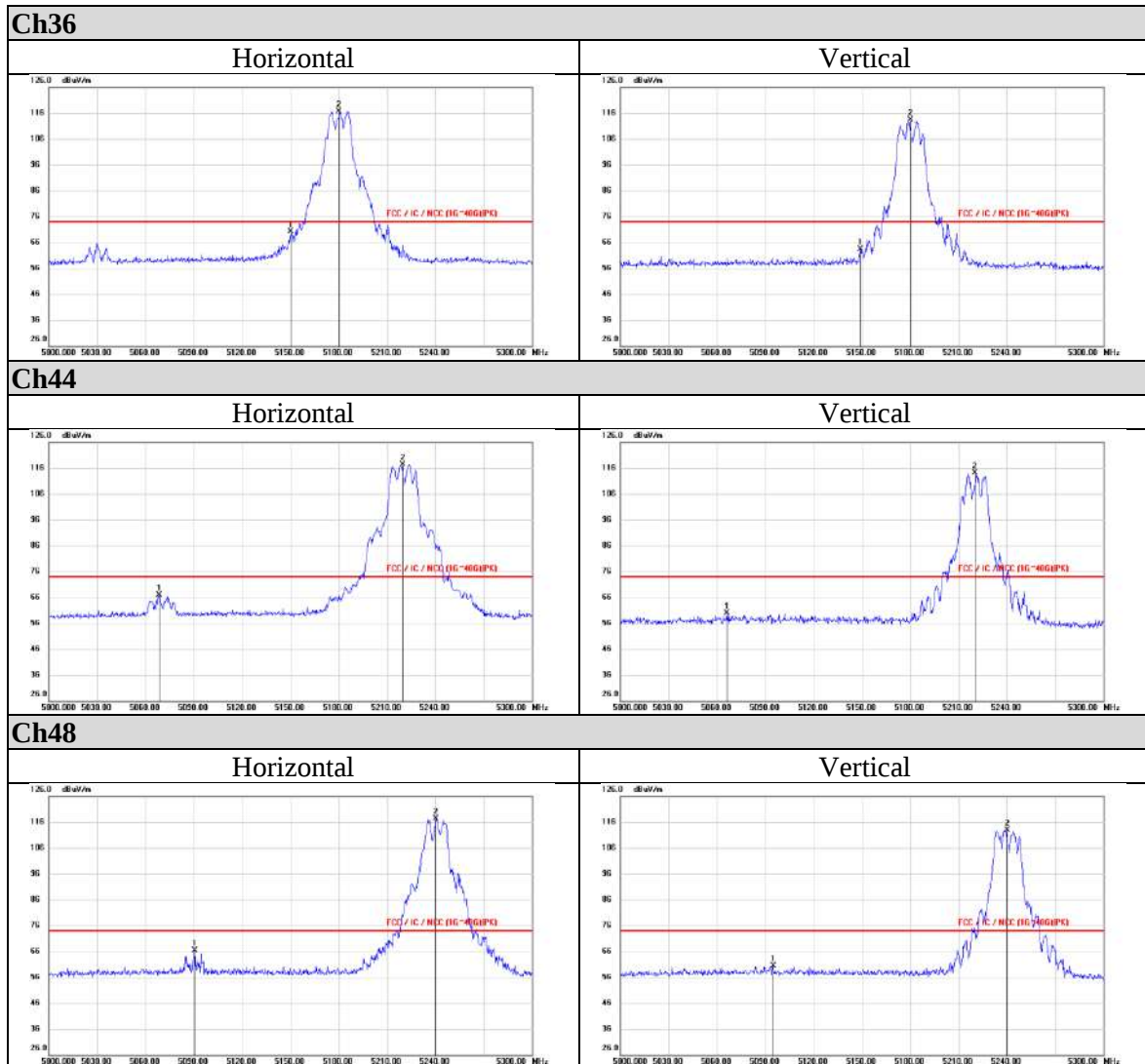




Beamforming Mode

802.11a

Peak



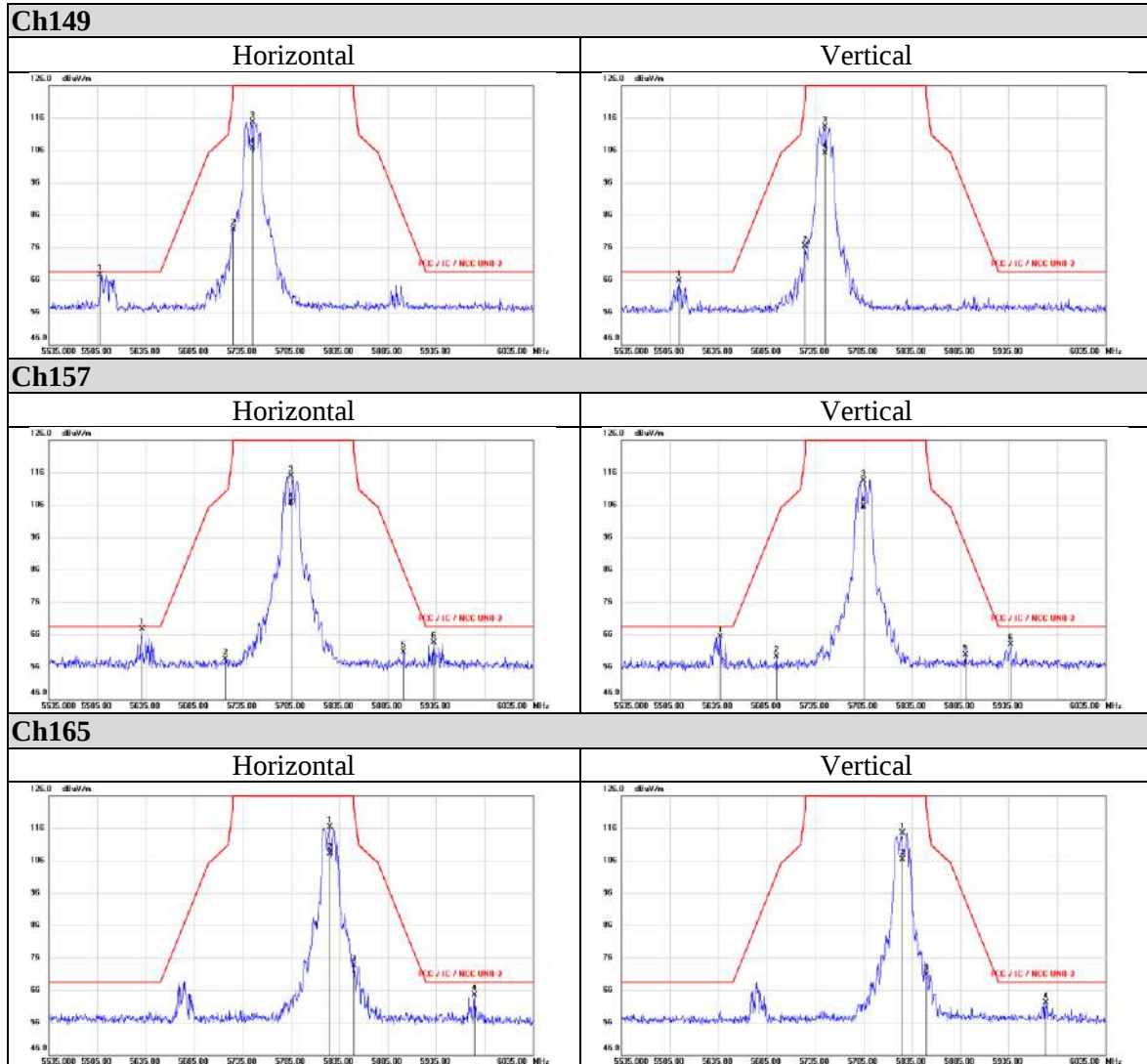
Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

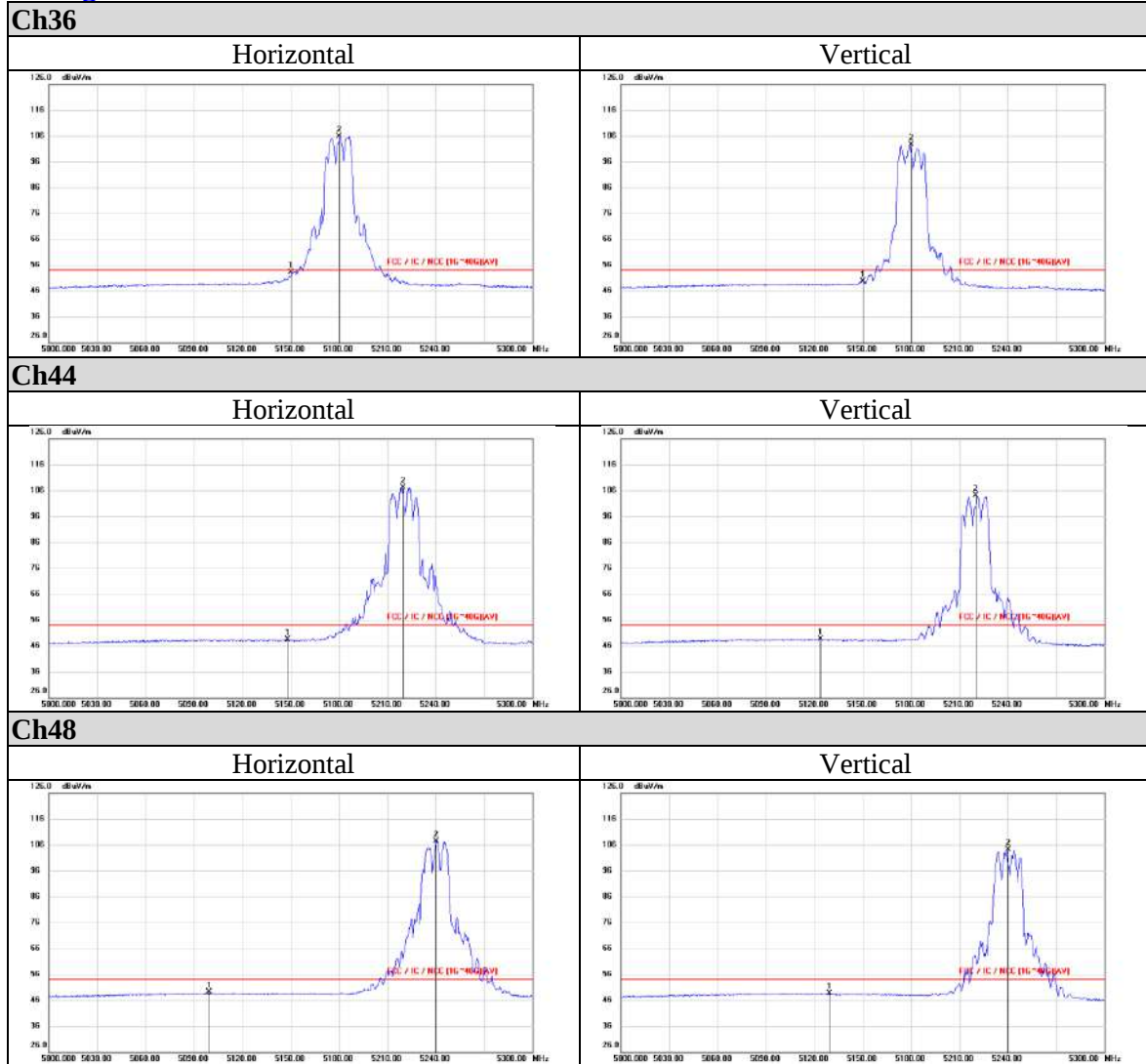
Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0878 / 3.0





Average



Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

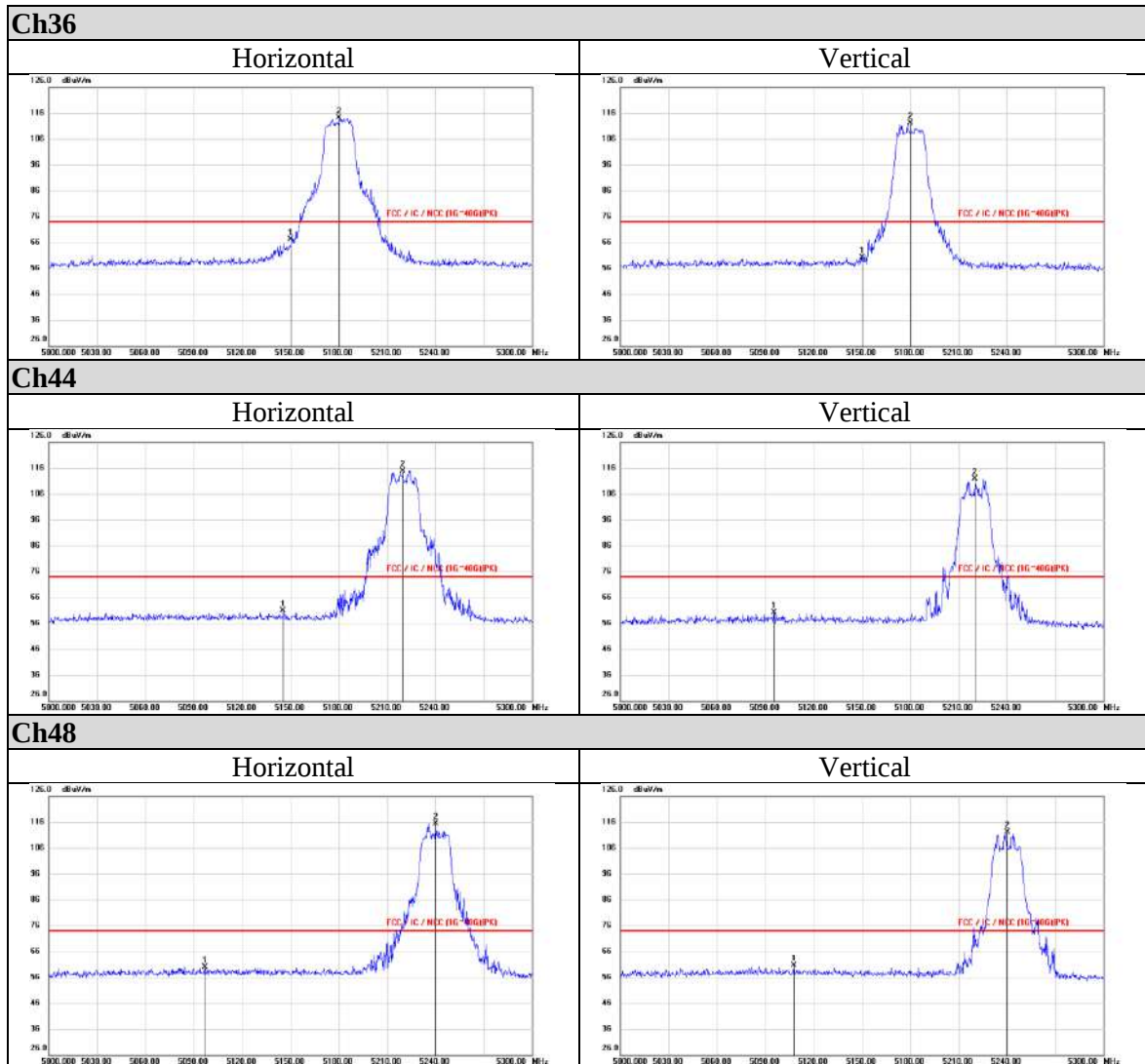
Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



802.11ac (VHT20)

Peak



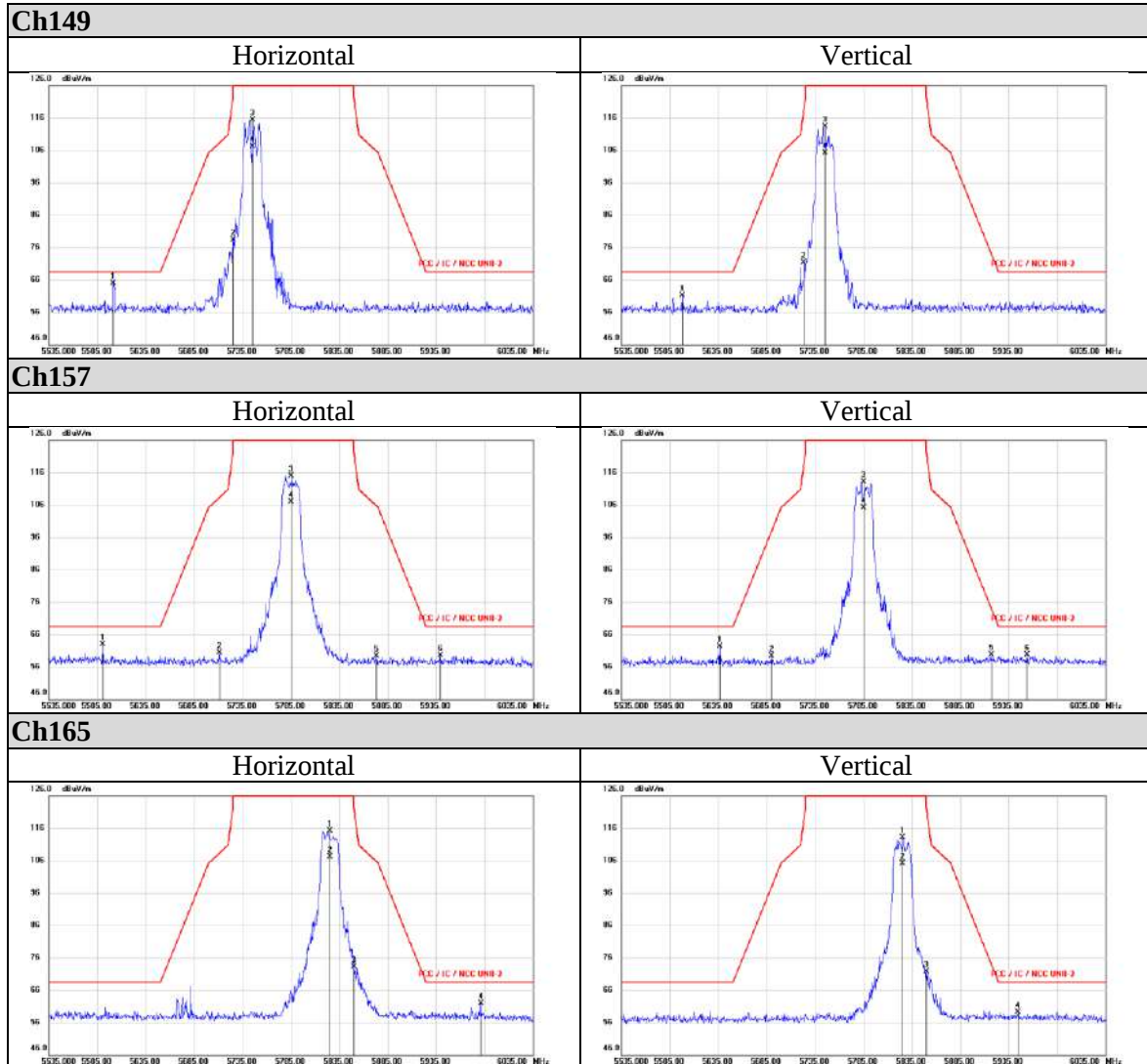
Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

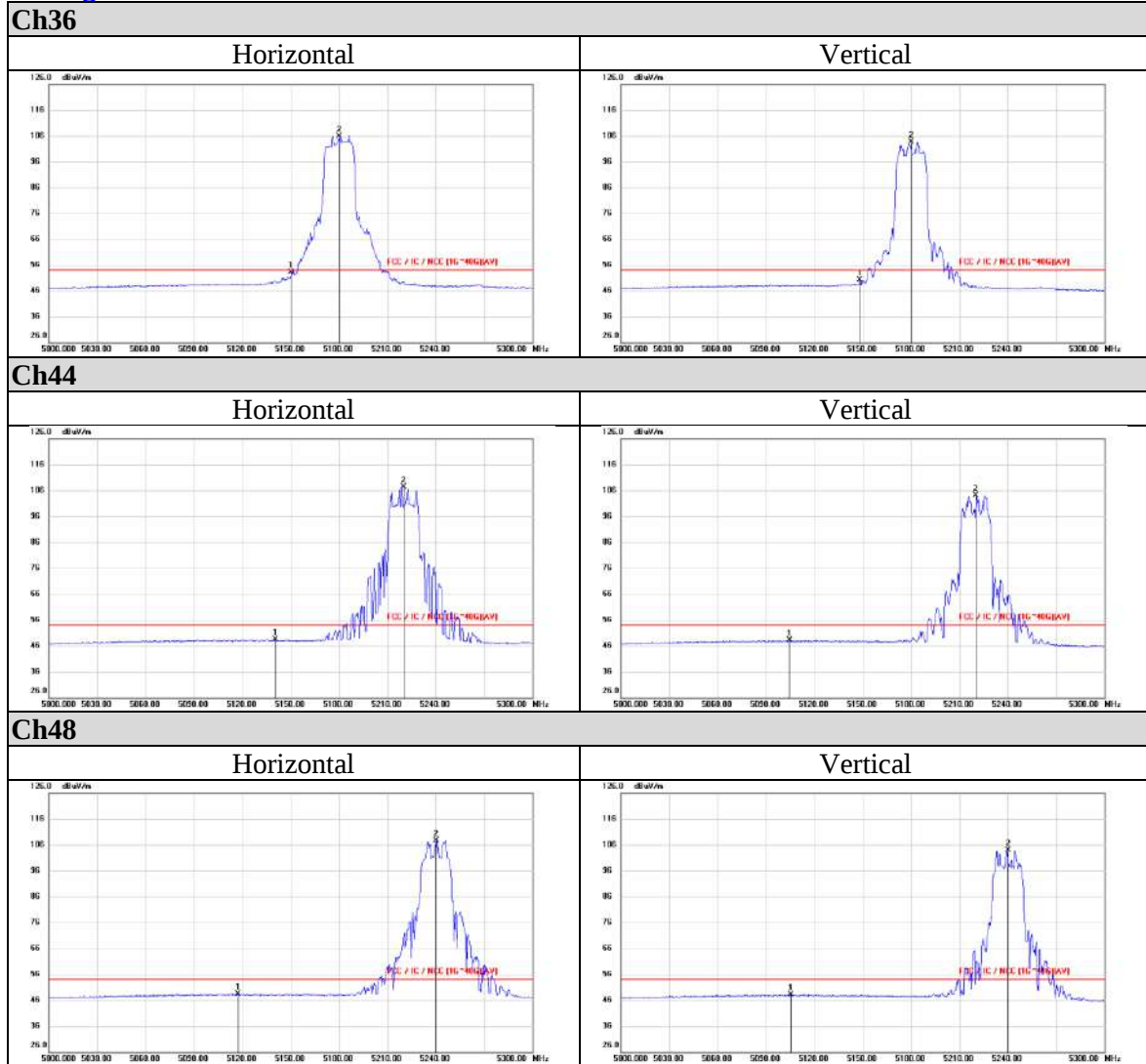
Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0878 / 3.0





Average



Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

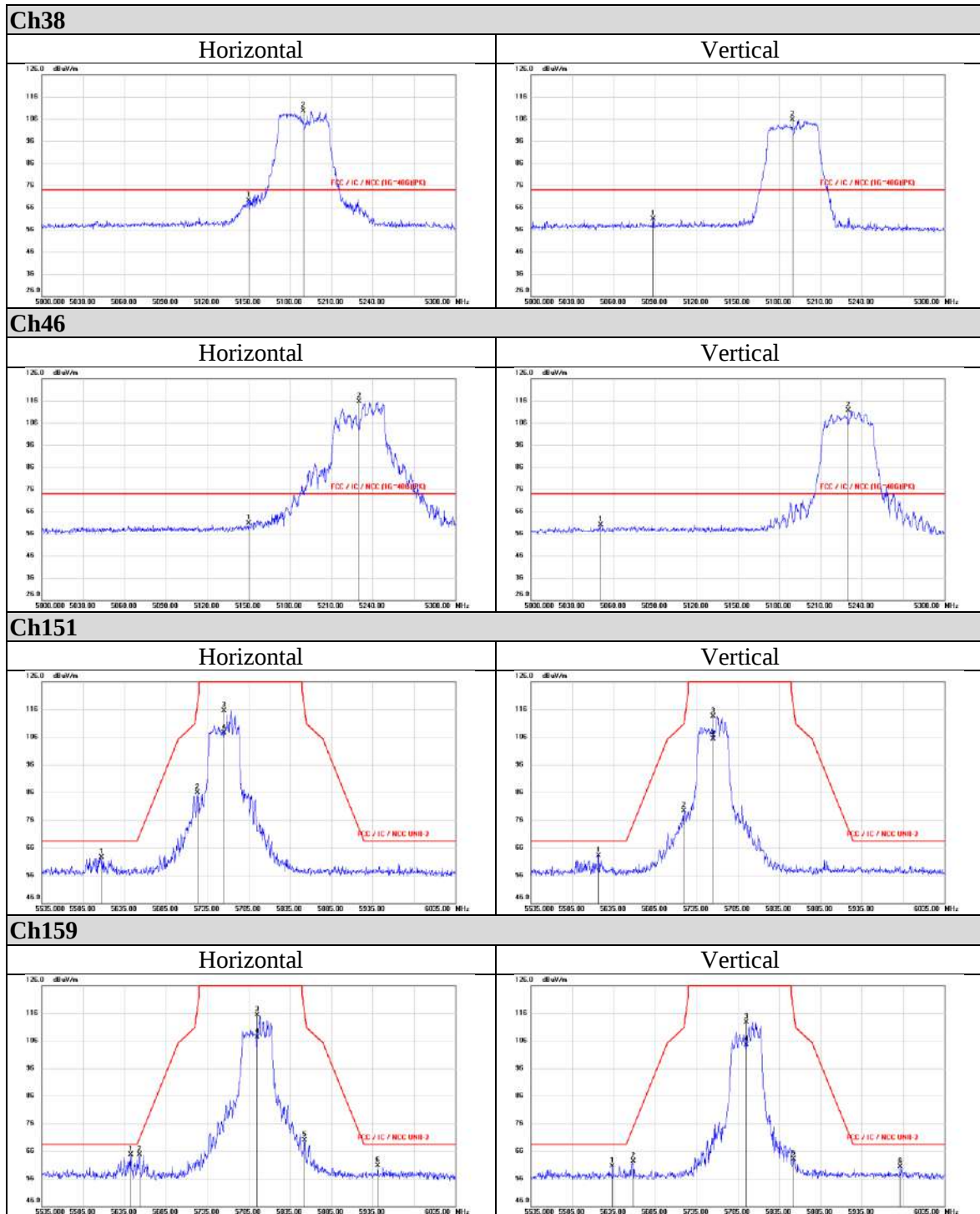
Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



802.11ac (VHT40)

Peak



Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

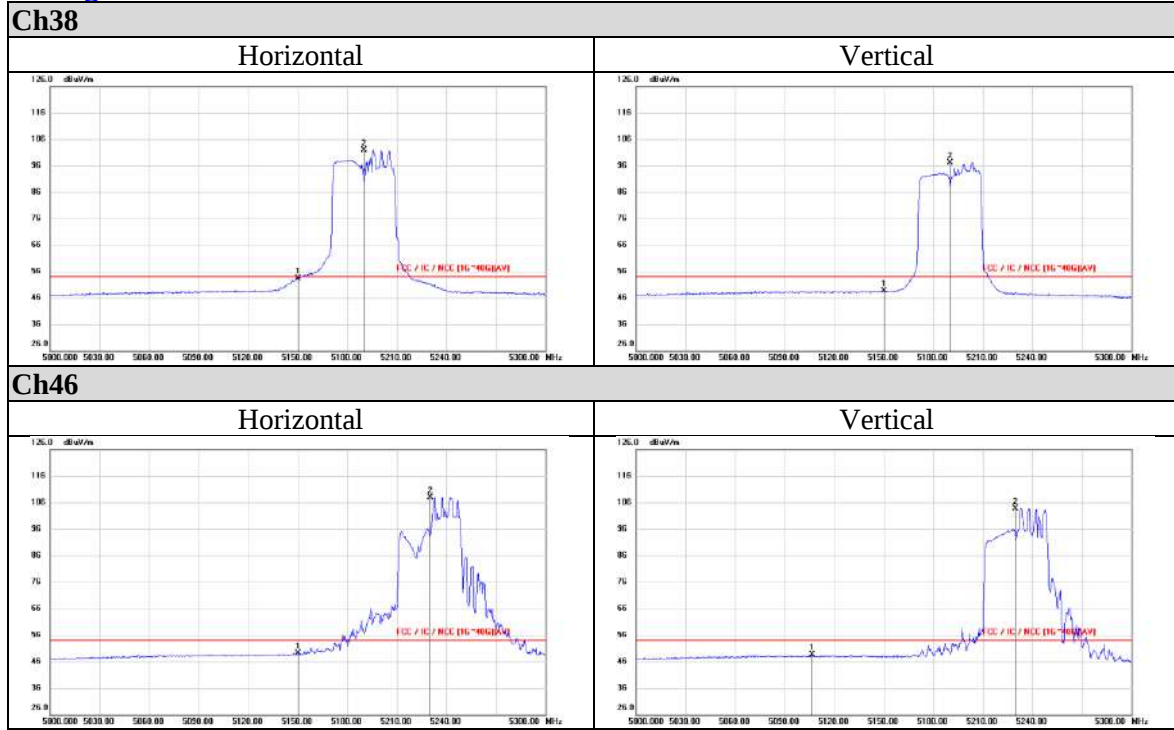
Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Average



Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

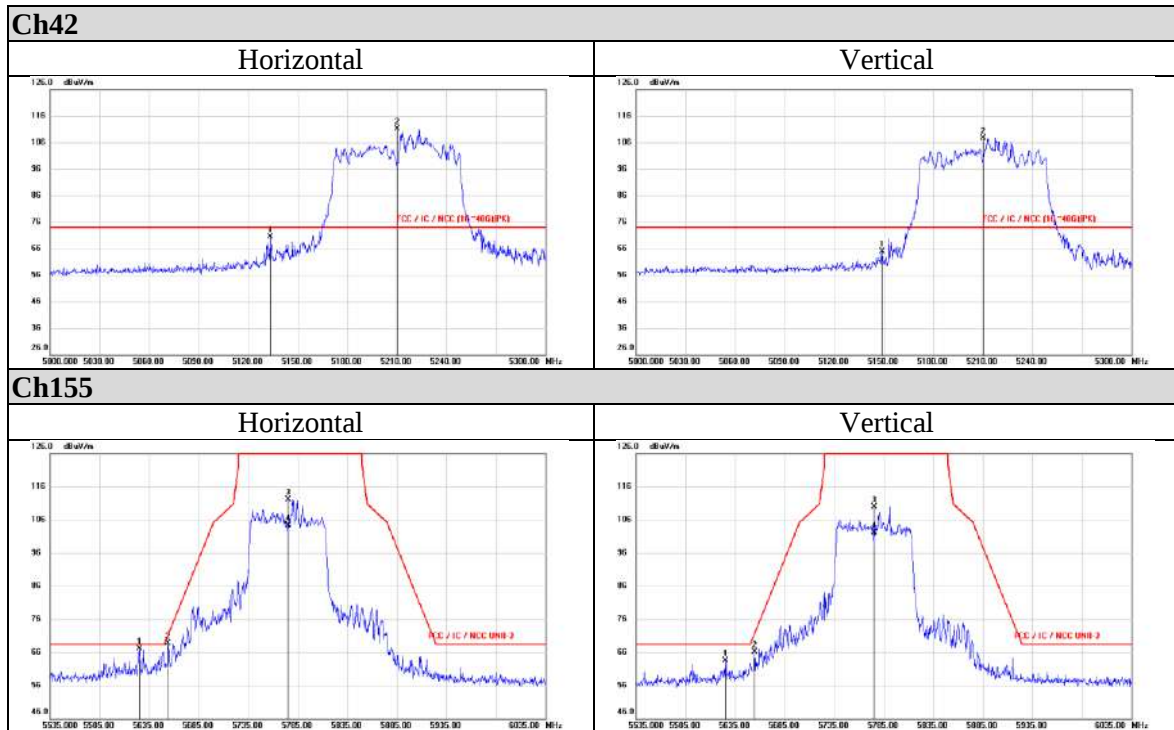
Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0878 / 3.0

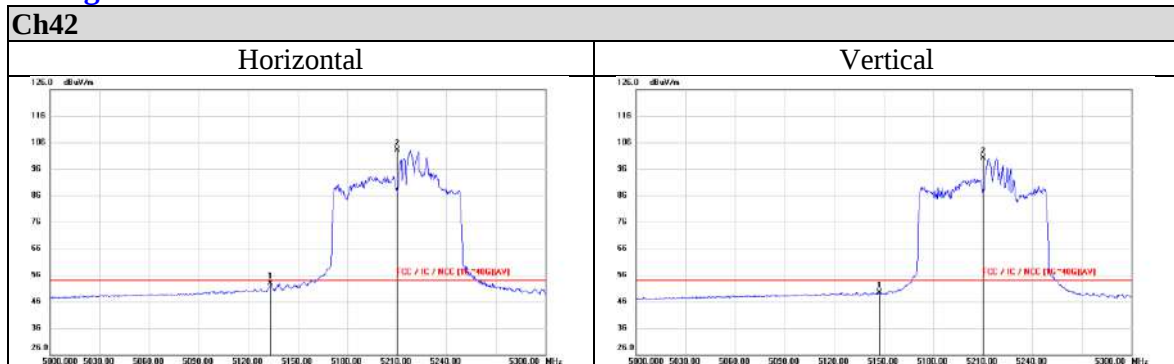


802.11ac (VHT80)

Peak



Average

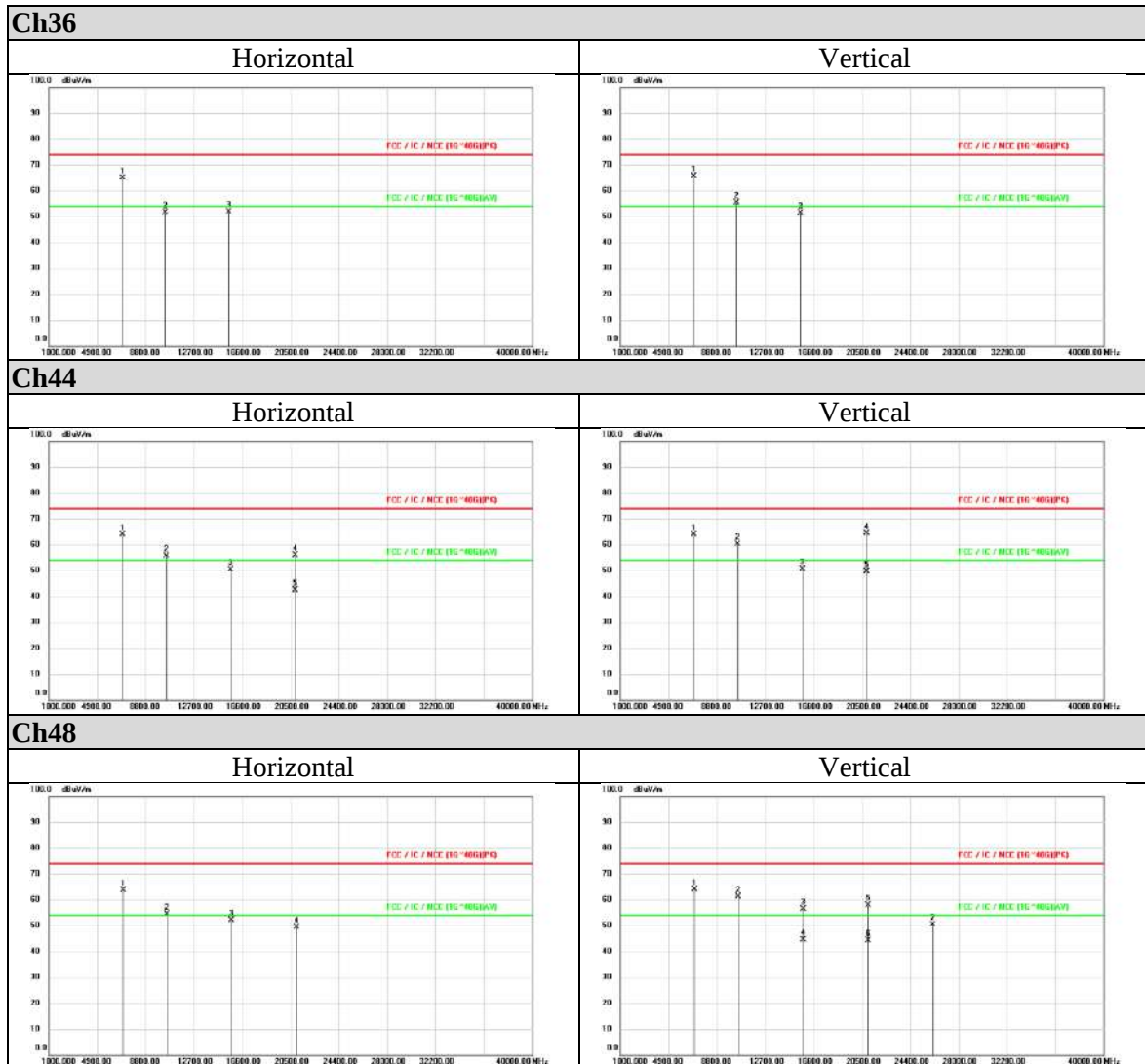




Appendix II Radiated Spurious Emission Measurement

CDD Mode

802.11a



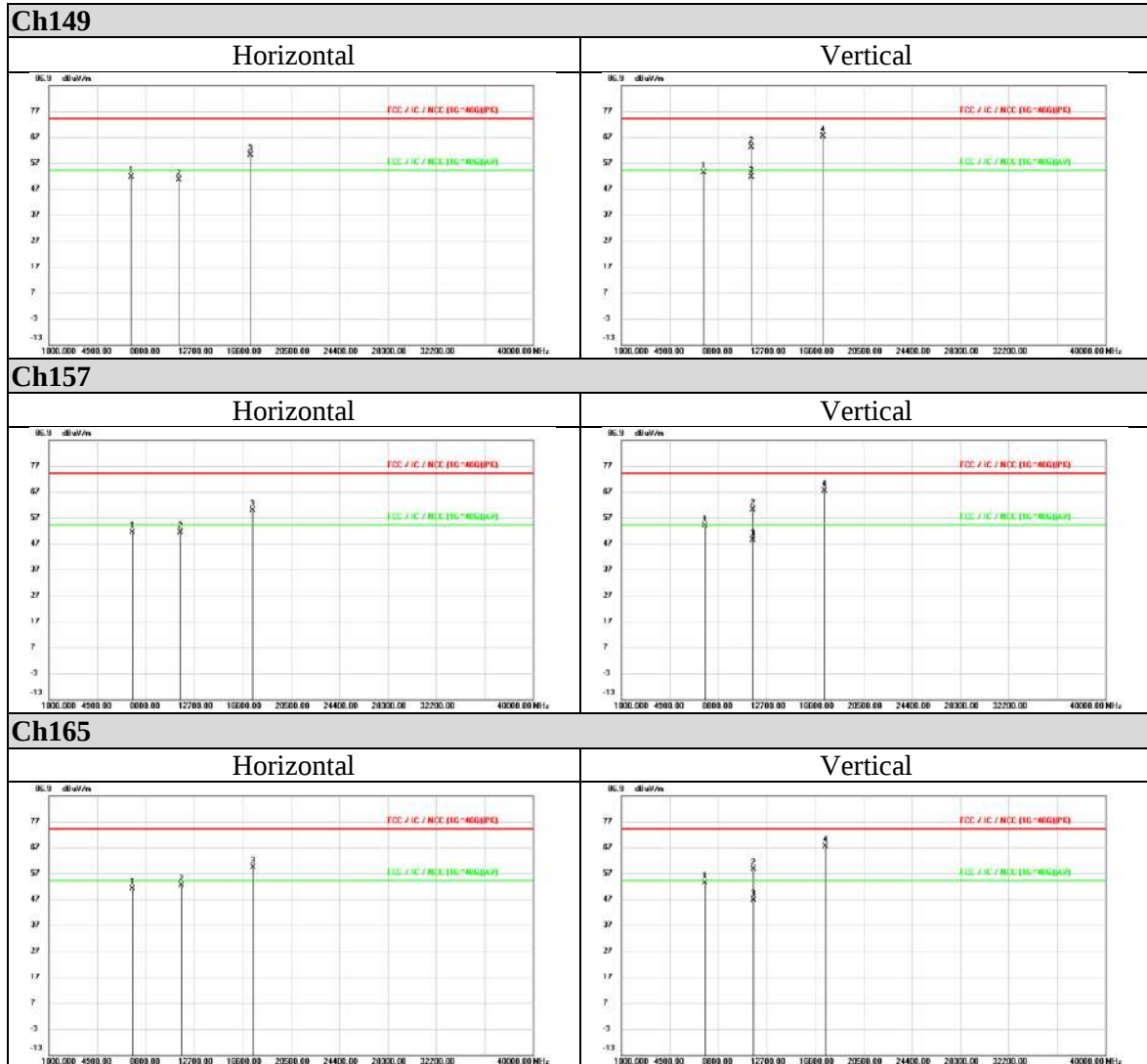
Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

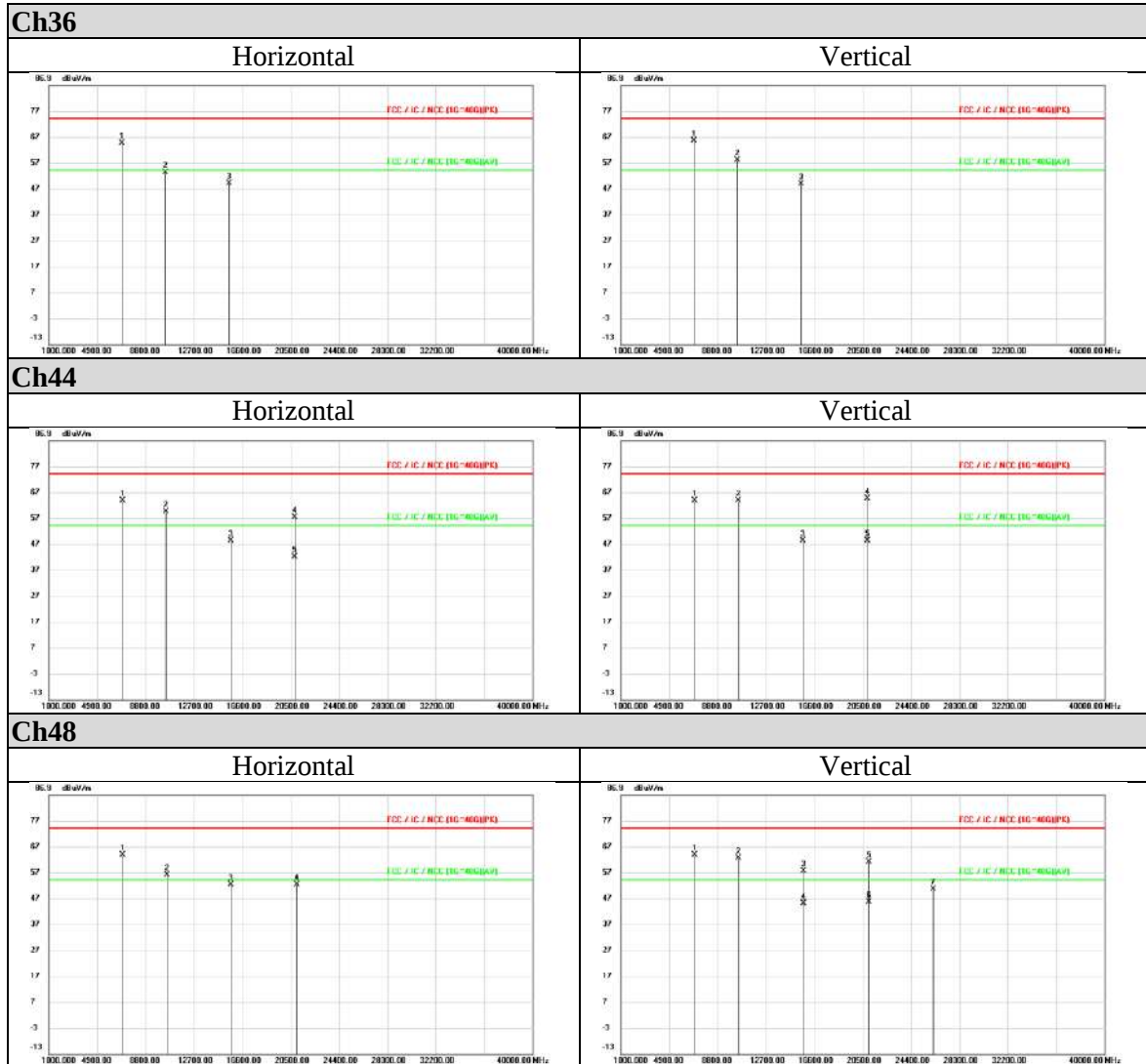
Facsimile (FAX) : +886-3-583-7948

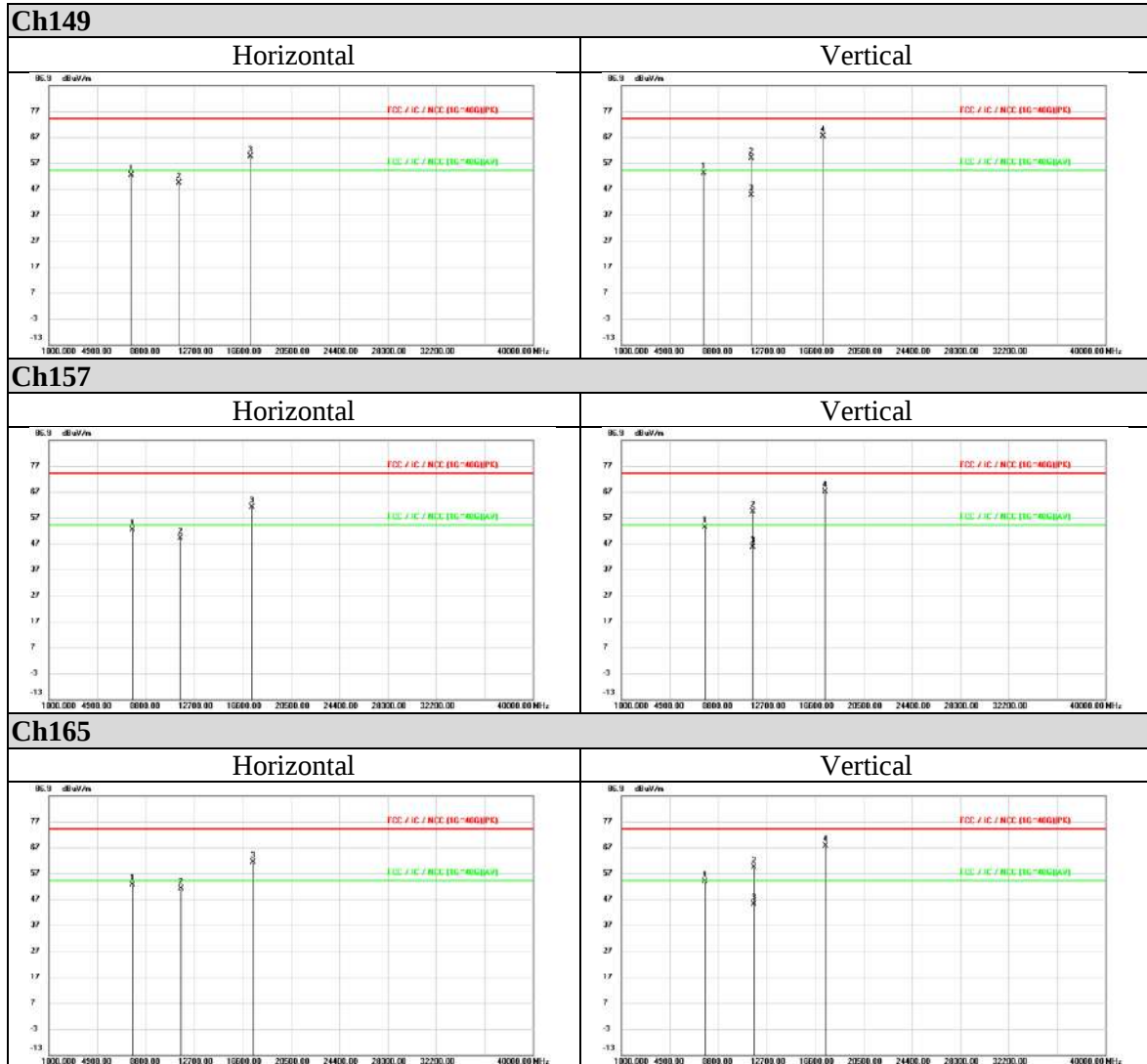
Doc No: 17-EM-F0878 / 3.0





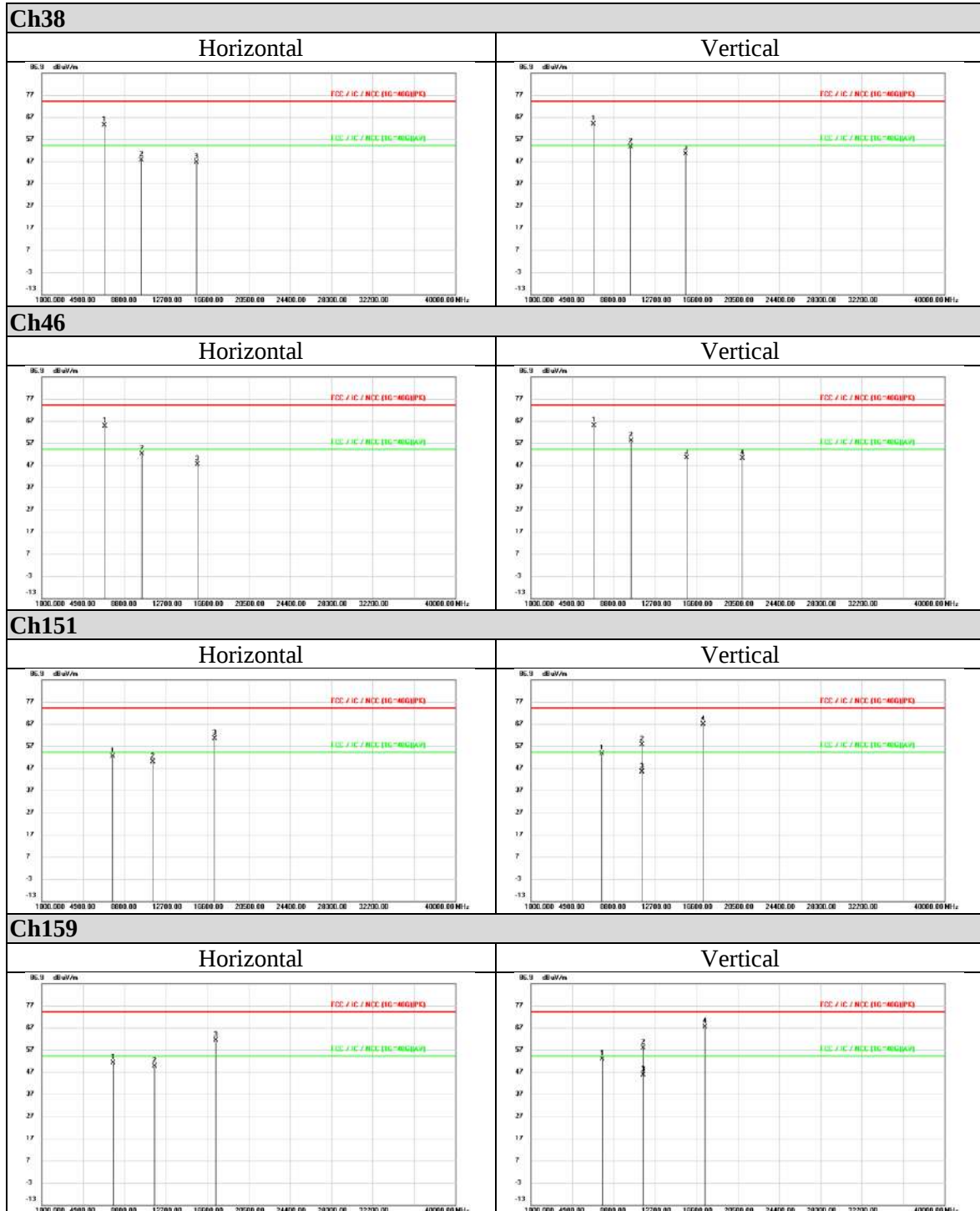
802.11ac (VHT20)





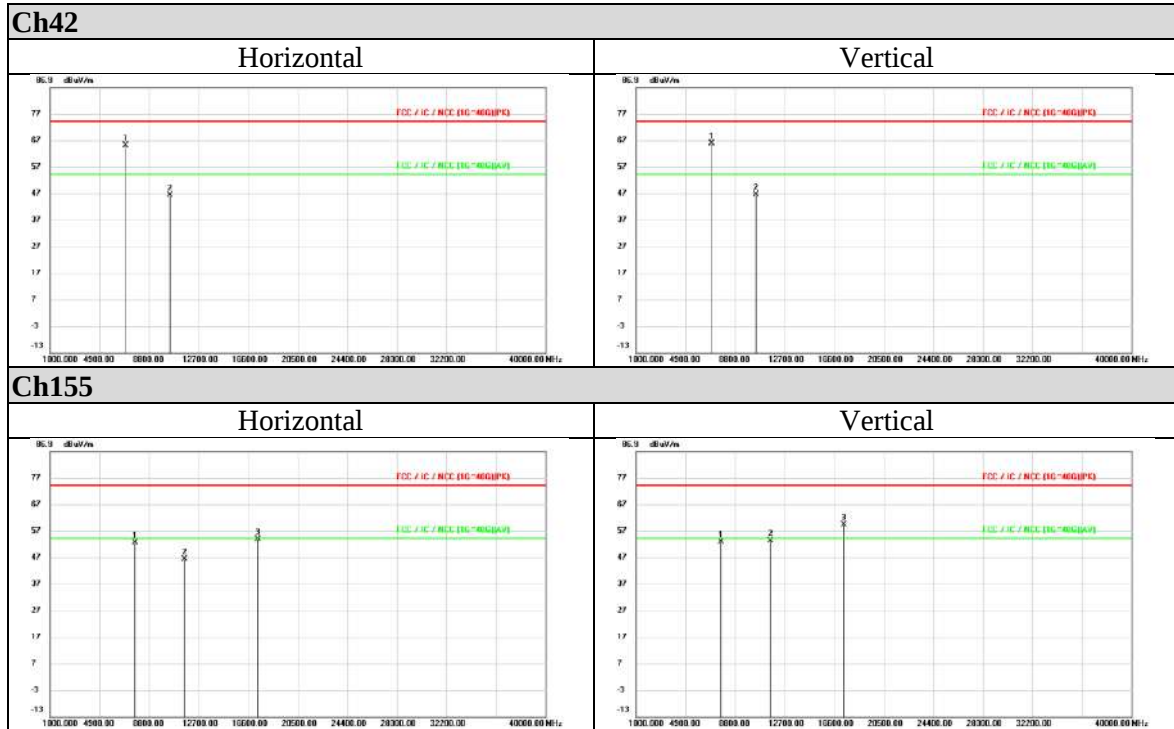


802.11ac (VHT40)





802.11ac (VHT80)



Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

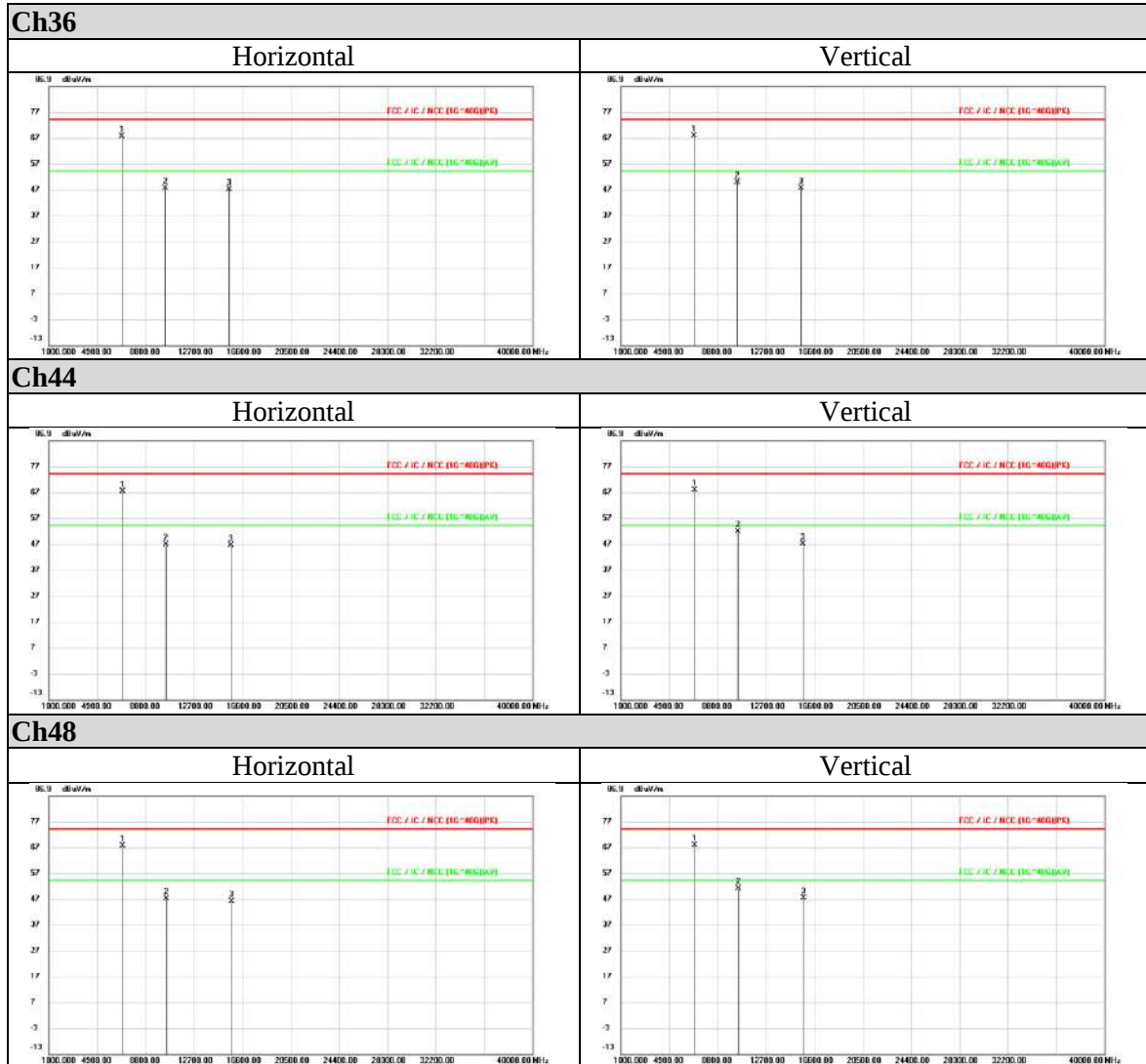
Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Beamforming Mode

802.11a



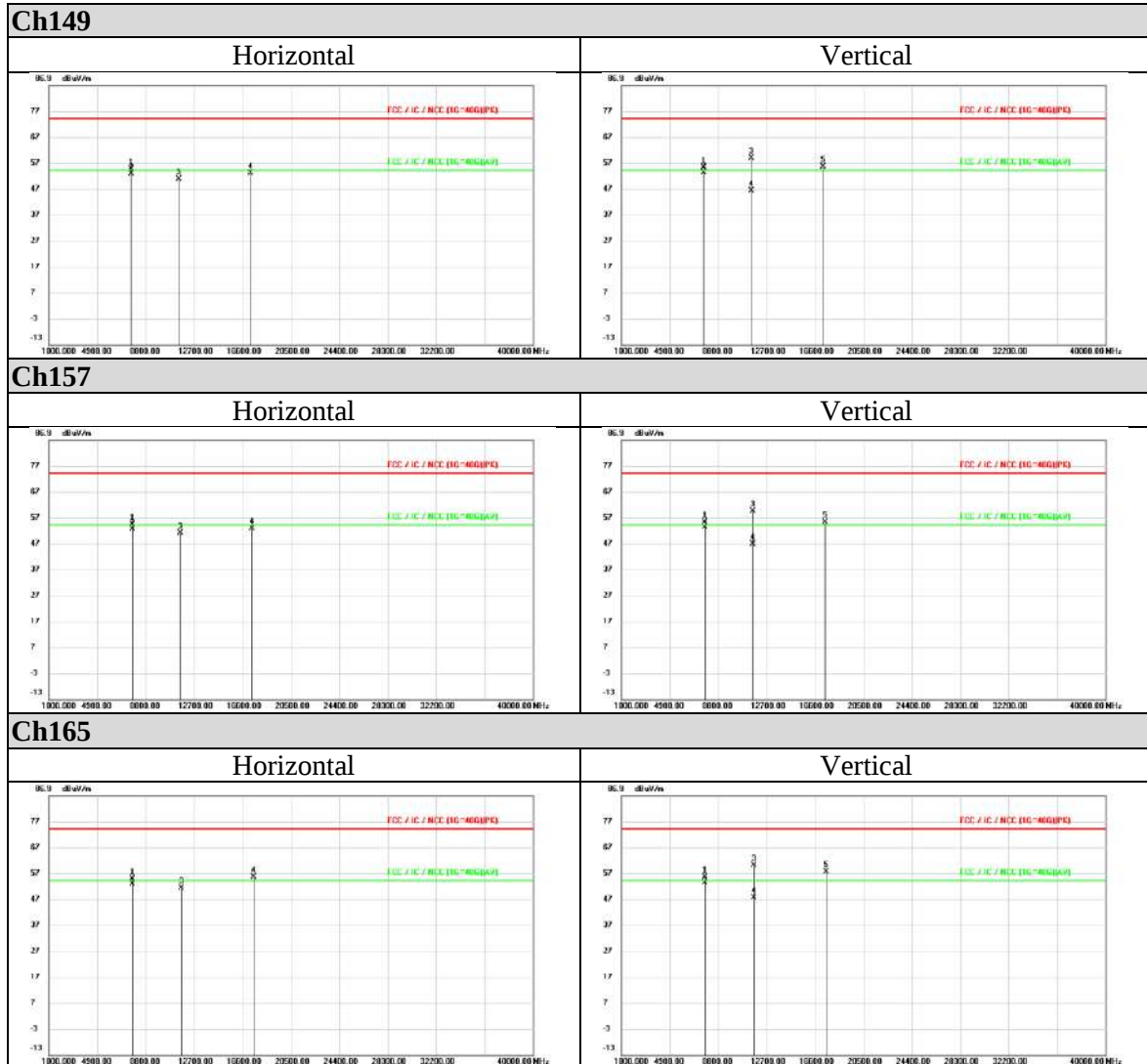
Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

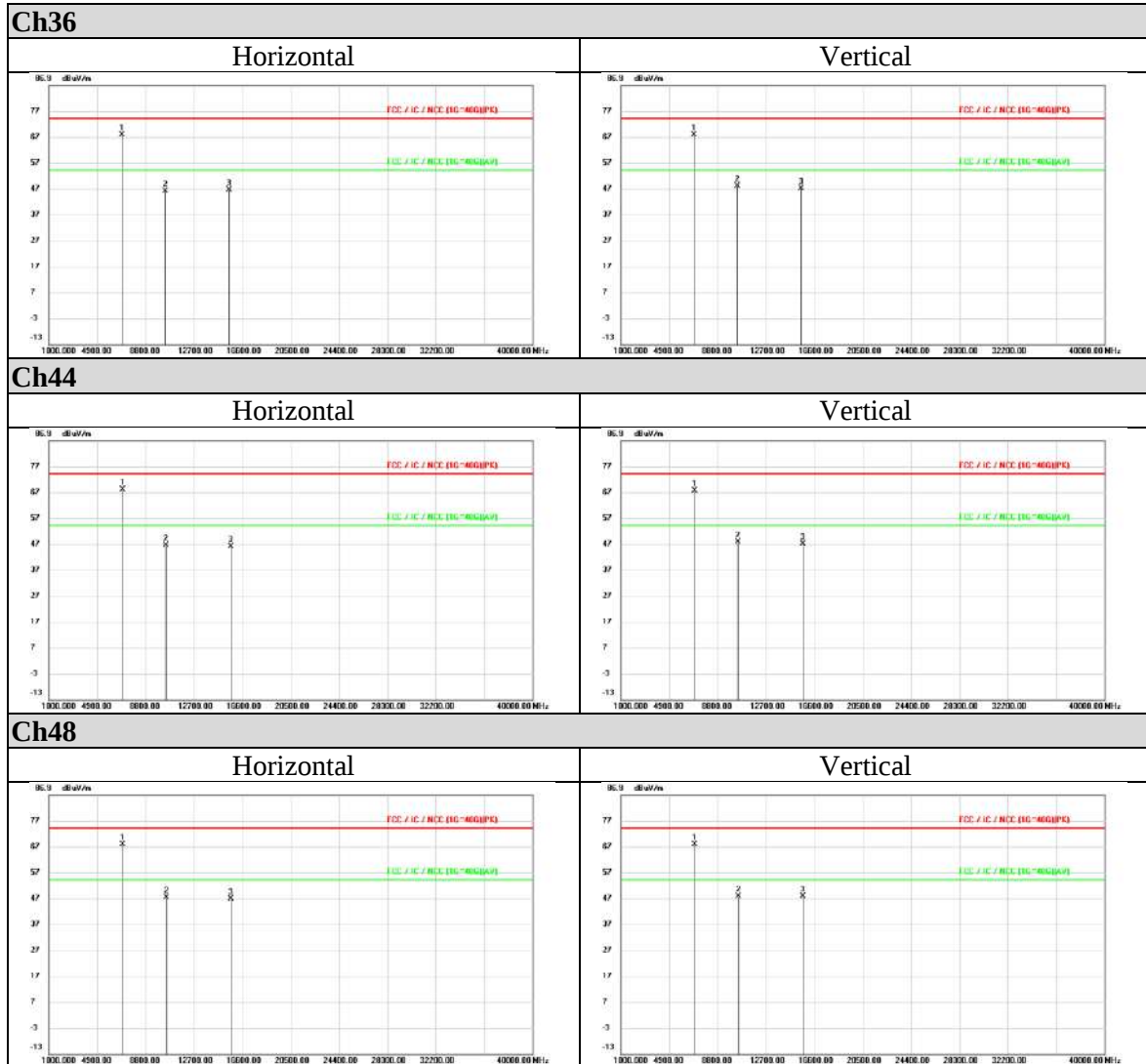
Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0878 / 3.0





802.11ac (VHT20)



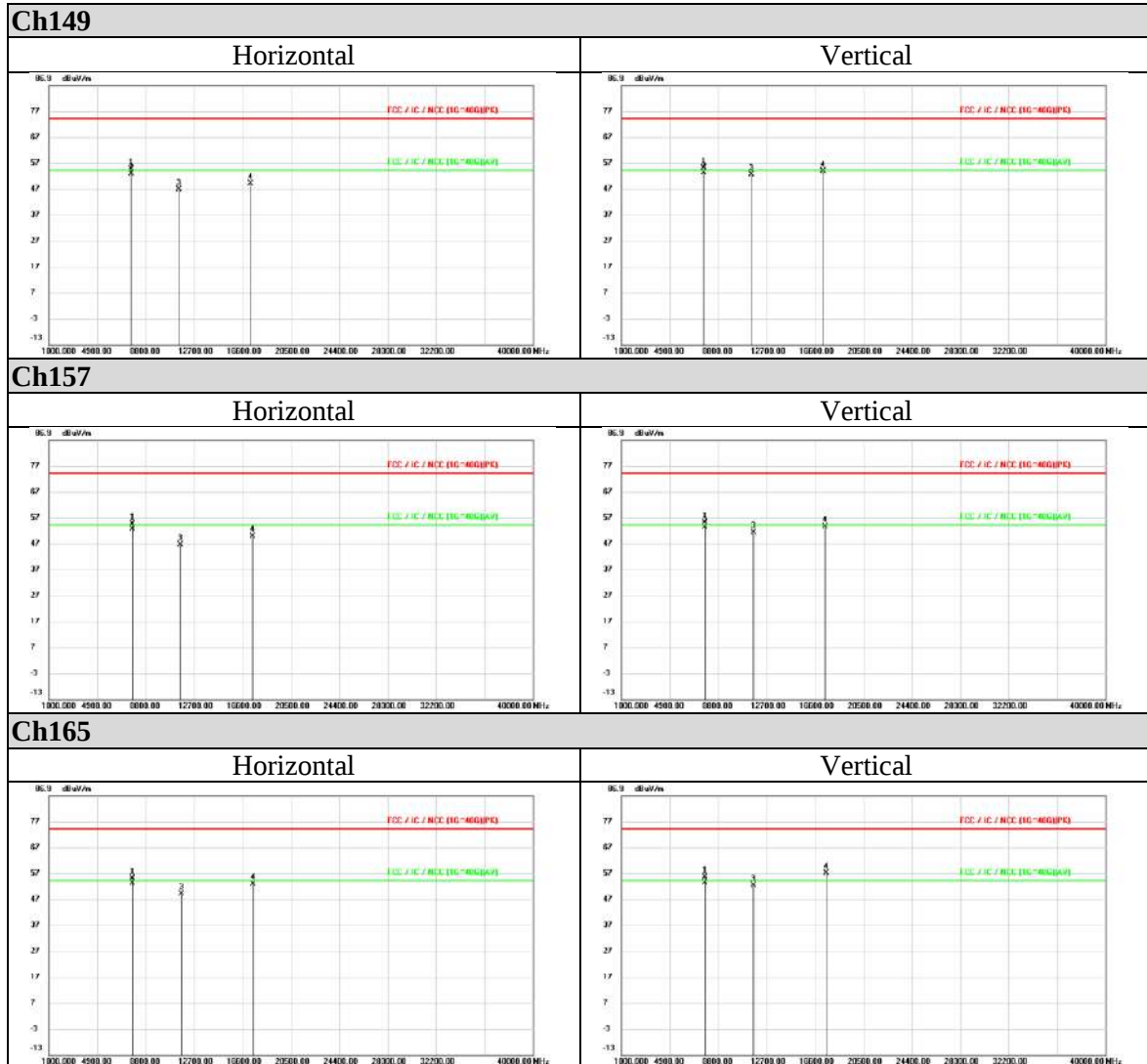
Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

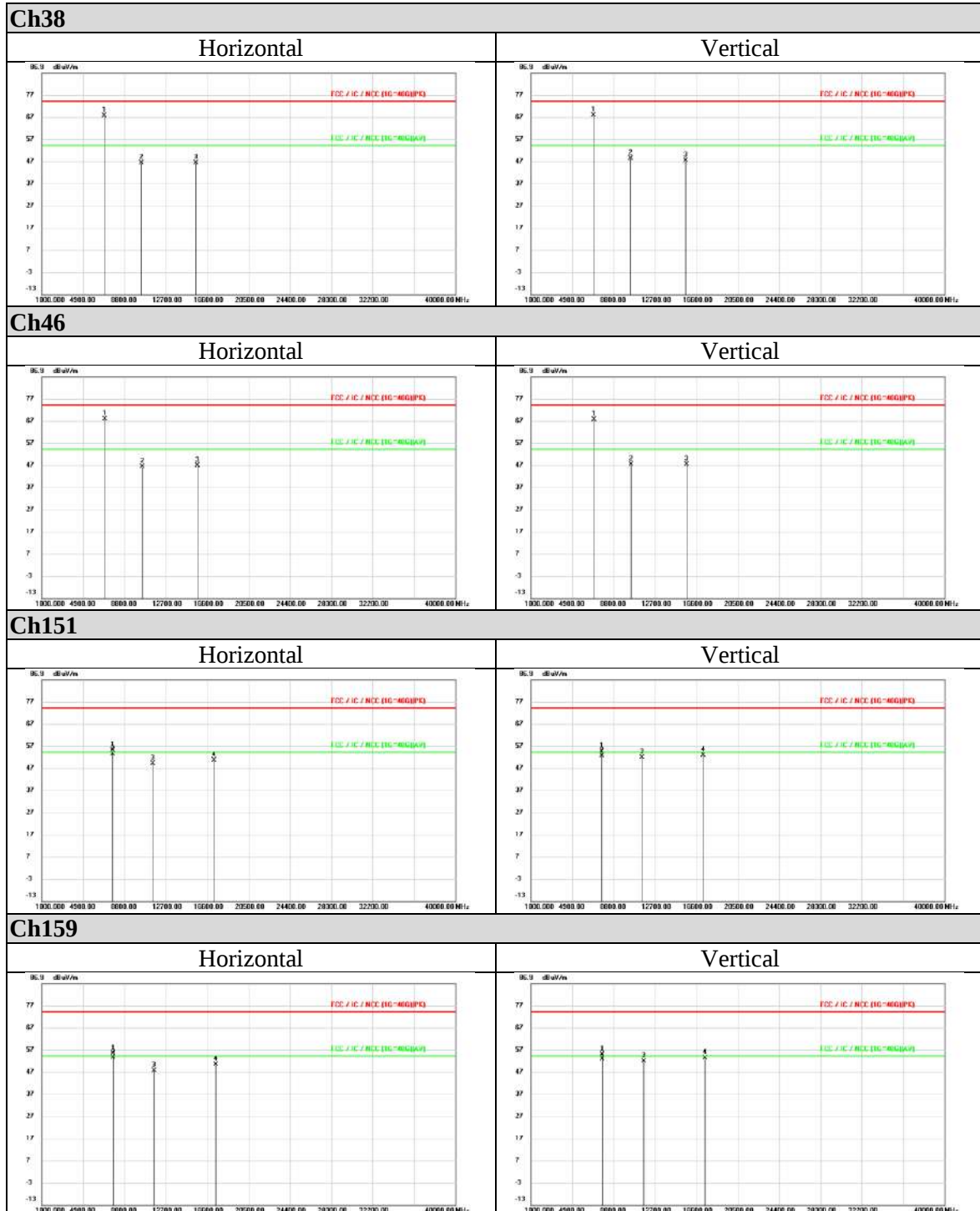
Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0878 / 3.0





802.11ac (VHT40)



Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

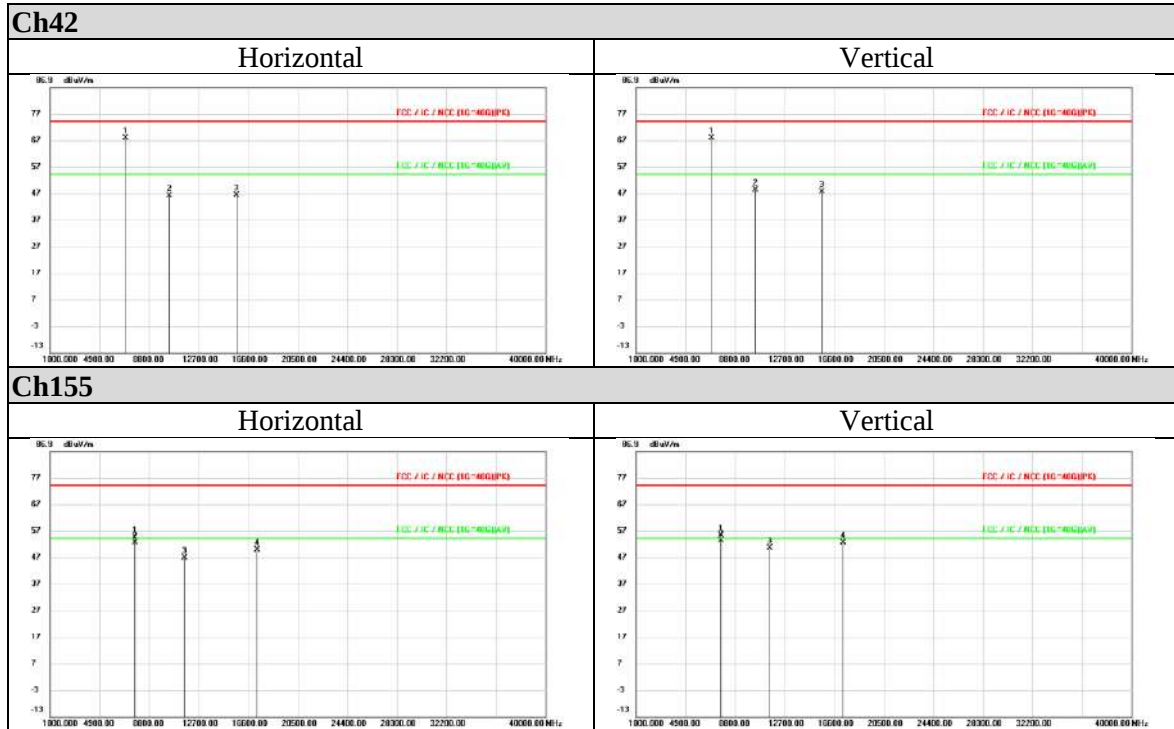
Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



802.11ac (VHT80)



Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

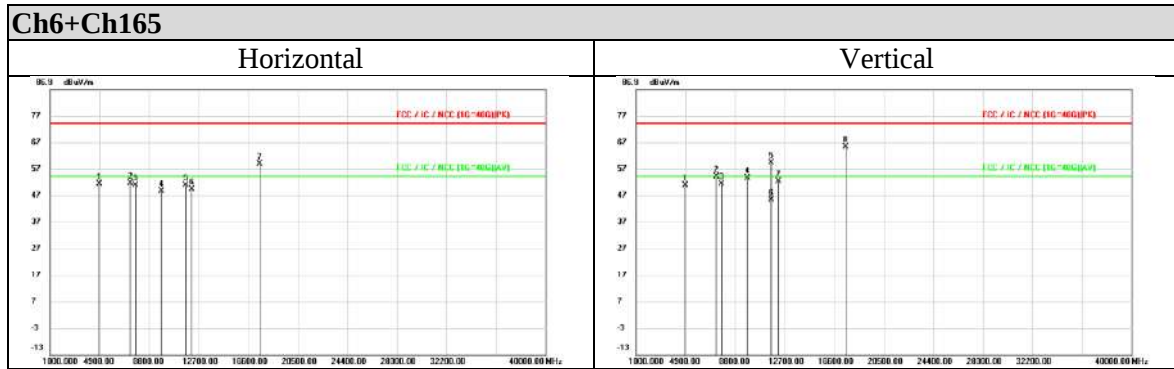
Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0878 / 3.0



Co-Location Mode

802.11b + 802.11ac (VHT20)



Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0878 / 3.0