FCC Test Report (WLAN)
(Spot Check)

Report No.:	RF210105C01A-1
FCC ID:	PZWBHTM70QW
Original FCC ID:	PZWBHTM70QWG
Test Model:	BHT-M70-QW
Received Date:	2021/1/5
Test Date:	2021/3/6 ~ 2021/8/20
Issued Date:	2021/09/30
Applicant:	DENSO WAVE INCORPORATED
Address:	1 Yoshiike Kusagi Agui-cho,Chita-gun Aichi 470-2297, Japan
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Hsin Chu Laboratory
Lab Address:	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan
Test Location:	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan
FCC Registration / Designation Number:	723255 / TW2022

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Release Control Record

Issue No.	Description	Date Issued
RF210105C01A-1	Original release.	2021/09/30

1 Certificate of Conformity

Product:	2D Code Handy Terminal
Brand:	DENSO
Test Model:	BHT-M70-QW
Sample Status:	Engineering sample
Applicant:	DENSO WAVE INCORPORATED
Test Date:	2021/3/6 ~ 2021/8/20
Standard:	47 CFR FCC Part 15, Subpart E (Section 15.407) ANSI C63.10: 2013

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

Prepared by : _____ , **Date:** 2021/09/30

Claire Kuan / Specialist

Approved by : _____ , **Date:** 2021/09/30

Clark Lin / Technical Manager

2 Summary of Test Results

47 CFR FCC Part 15, Subpart E (Section 15.407)			
FCC Clause	Test Item	Result	Remarks
15.407(b)(6)	AC Power Conducted Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -14.27dB at 0.64609 MHz.
15.407(b) (1/2/3/4(i/ii)/6)	Radiated Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -7.2 dB at 10600.00 MHz
15.407(a)(1/2/3)	Max Average Transmit Power	Pass	Meet the requirement of limit.
---	Occupied Bandwidth Measurement	NA	Refer to Note 1 below
15.407(a)(1/2/3)	Peak Power Spectral Density	NA	Refer to Note 1 below
15.407(e)	6dB bandwidth	NA	Refer to Note 1 below
15.407(g)	Frequency Stability	NA	Refer to Note 1 below
15.203	Antenna Requirement	Pass	Antenna connector is Spring not a standard connector.

Note:

1. AC Power Conducted Emission & Radiated Emissions & Max Average Transmit Power were performed for this addendum. The others testing data refer to original test report.
2. For U-NII-3 band compliance with rule part 15.407(b)(4)(i), the OOBE test plots were recorded in Annex A.
3. Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

2.1 Measurement Uncertainty

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

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	1.9 dB
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	3.1 dB
	30MHz ~ 1GHz	5.4 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	5.0 dB
	18GHz ~ 40GHz	5.3 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	2D Code Handy Terminal
Brand	DENSO
Test Model	BHT-M70-QW
Status of EUT	Engineering sample
Power Supply Rating	3.6 Vdc from battery; 5 Vdc from power adapter
Modulation Type	64QAM, 16QAM, QPSK, BPSK for OFDM 256QAM for OFDM in 11ac mode
Modulation Technology	OFDM
Transfer Rate	802.11a: up to 54 Mbps 802.11n: up to 300 Mbps 802.11ac: up to 866.7 Mbps
Operating Frequency	5.18~5.32GHz, 5.50~5.72GHz, 5.745 ~ 5.825GHz
Number of Channel	802.11a, 802.11n (HT20), 802.11ac (VHT20): 25 802.11n (HT40), 802.11ac (VHT40): 12 802.11ac (VHT80): 6
Output Power	5.18 ~ 5.24 GHz: 146.451 mW 5.26 ~ 5.32GHz: 146.031 mW 5.5 ~ 5.72GHz: 145.177 mW 5.745 ~ 5.825 GHz: 186.696 mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	Battery x 1 Adapter x 1 (Option) Adapter x 1 (for Cradle) QC3.0 charge single Cradle x 1 (Option_Brand: DENSO, Model: CU-M70UQ) USB Cradle with spare battery charge x 1 (Option_Brand: DENSO, Model: CU-M70U) LAN Cradle with Spare battery charge x 1 (Option_Brand: DENSO, Model: CU-M70L)
Data Cable Supplied	USB Cable x 1 (Shielded, 1.45m, Option _Brand: NIEN-YI, Model: NYS3892-0)

Note:

1. Exhibit prepared for Spot Check Verification report, the format, test items and amount of spot–check test data are decided by applicant's engineering judgment, for more details please refer to the declaration letter exhibit. (Original FCC ID: PZWBHTM70QWG, Report No.: RF210105C01-1)
2. The EUT has below radios as following table:

Radio 1	Radio 2	Radio 3
WLAN 2.4GHz	WLAN 5GHz	Bluetooth

3. WLAN and Bluetooth technology cannot transmit at same time.

4. The EUT must be supplied with a power adapter & battery and following below table:

Item	Brand	Model No.	Spec.
Battery	DENSO	BT3	DC Output: 3.6Vdc, 3050mAh, 10.98Wh
Adapter (Option)	CHANNEL WELL	2ACP0183C	AC Input: 100-240Vac~, 0.5A, 50/60Hz DC Output: 5.0Vdc / 3.0A 15.0W, 9.0Vdc / 2.0A 18.0W, 12.0Vdc / 1.5A 18.0W
For Cradle use			
Item	Brand	Model No.	Spec.
Adapter (Option)	Sunny	SYS1548-5012-T3	AC Input: 100-240Vac~1.5A MAX 50-60Hz AC Cable: Unshielded, 1.71m DC Output: +12.0Vdc / 4.16A DC Cable: Unshielded, 1.16m with one core

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

Antenna No.	RF Chain No	Brand	Model	Antenna gain (dBi)	Frequency Range (MHz)	Antenna Type	Connector Type
1 (WiFi & BT)	Chain0	HONGBO	1415-01R8C00	3.26	2400-2500 (WiFi)	PIFA	Spring
				3.21	2400-2500 (BT)		
				3.63	5150-5250		
				3.65	5250-5350		
				3.45	5470-5725		
				3.52	5725-5850		
2 (WiFi)	Chain1	HONGBO	1415-01R8C00	0.68	2400-2500	PIFA	Spring
				2.63	5150-5250		
				2.6	5250-5350		
				2.93	5470-5725		
				2.4	5725-5850		

6. In the original report, the EUT was pre-tested for conducted emission test under following test modes:

Pre-test Mode	Description
Mode A	**Adapter Mode**
Mode B	Laptop Mode
Mode C	Cradle with Type C port
Mode D	Cradle with RJ45 port
Mode E	QC3.0 charge single Cradle
From the above modes, the worst conducted emission test was found in **Mode A**. Therefore only the test data of the modes were recorded in this report.	

7. In the original report, the EUT was pre-tested for radiated emission test under following test modes:

Pre-test Mode	Description
Mode A	Battery Mode
Mode B	**Adapter Mode**
Mode C	Cradle with Type C port
Mode D	**Cradle with RJ45 port**
Mode E	QC3.0 charge single Cradle
The worst radiated emissions were found in **Mode D** for below 1GHz and found in **Mode B** for above 1GHz. Therefore only the test data of the modes were recorded in this report.	

8. The EUT incorporates a MIMO function:

MODULATION MODE	TX & RX CONFIGURATION	
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
Note: The EUT doesn't support beamforming function.		

9. The above EUT information is declared by manufacturer and for more detailed features description, please refers to the manufacturer's specifications or user's manual.
10. The above Antenna information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible.

3.2 Description of Test Modes

FOR 5180 ~ 5320MHz

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

Channel	Frequency	Channel	Frequency
36	5180 MHz	52	5260 MHz
40	5200 MHz	56	5280 MHz
44	5220 MHz	60	5300 MHz
48	5240 MHz	64	5320 MHz

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

Channel	Frequency	Channel	Frequency
38	5190 MHz	54	5270 MHz
46	5230 MHz	62	5310 MHz

2 channel is provided for 802.11ac (VHT80):

Channel	Frequency	Channel	Frequency
42	5210 MHz	58	5290 MHz

FOR 5500 ~ 5720MHz

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

Channel	Frequency	Channel	Frequency
100	5500 MHz	124	5620 MHz
104	5520 MHz	128	5640 MHz
108	5540 MHz	132	5660 MHz
112	5560 MHz	136	5680 MHz
116	5580 MHz	140	5700 MHz
120	5600 MHz	144	5720 MHz

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

Channel	Frequency	Channel	Frequency
102	5510 MHz	126	5630 MHz
110	5550 MHz	134	5670 MHz
118	5590 MHz	142	5710 MHz

3 channels are provided for 802.11ac (VHT80):

Channel	Frequency	Channel	Frequency
106	5530 MHz	138	5690 MHz
122	5610 MHz		

FOR 5745 ~ 5825MHz:

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

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

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

Channel	Frequency	Channel	Frequency
151	5755 MHz	159	5795 MHz

1 channel is provided for 802.11ac (VHT80):

Channel	Frequency
155	5775 MHz

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable To				Description
	RE≥1G	RE<1G	PLC	APCM	
-	√	√	√	√	-

Where **RE≥1G:** Radiated Emission above 1GHz **RE<1G:** Radiated Emission below 1GHz
PLC: Power Line Conducted Emission **APCM:** Antenna Port Conducted Measurement

Note: In the original test report, the EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on X-place.

Radiated Emission Test (Above 1GHz):

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

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

Mode	FREQ. Band (MHz)	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
802.11a	5180-5240	36 to 48	40	OFDM	BPSK	6
802.11a	5260-5320	52 to 64	60	OFDM	BPSK	6
802.11ac (VHT20)	5500-5720	100 to 144	116	OFDM	BPSK	6.5
802.11ac (VHT40)	5745-5825	151 to 159	151	OFDM	BPSK	13.5

Radiated Emission Test (Below 1GHz):

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

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

Mode	FREQ. Band (MHz)	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
802.11ac (VHT40)	5180-5320 5500-5720 5745-5825	38 to 62 102 to 142 151 to 159	151	OFDM	BPSK	13.5

Power Line Conducted Emission Test:

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

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

Mode	FREQ. Band (MHz)	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
802.11ac (VHT40)	5180-5320 5500-5720 5745-5825	38 to 62 102 to 142 151 to 159	151	OFDM	BPSK	13.5

Antenna Port Conducted Measurement:

☒ This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.
☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
☒ Following channel(s) was (were) selected for the final test as listed below.

Mode	FREQ. Band (MHz)	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
802.11a	5180-5320	36 to 64	36, 40, 48, 52, 60, 64	OFDM	BPSK	6
802.11ac (VHT20)		36 to 64	36, 40, 48, 52, 60, 64	OFDM	BPSK	6.5
802.11ac (VHT40)		38 to 62	38, 46, 54, 62	OFDM	BPSK	13.5
802.11ac (VHT80)		42, 58	42, 58	OFDM	BPSK	29.3
802.11a	5500-5720	100 to 144	100, 116, 140, 144	OFDM	BPSK	6
802.11ac (VHT20)		100 to 144	100, 116, 140, 144	OFDM	BPSK	6.5
802.11ac (VHT40)		102 to 142	102, 110, 134, 142	OFDM	BPSK	13.5
802.11ac (VHT80)		106 to 138	106, 122, 138	OFDM	BPSK	29.3
802.11a	5745-5825	149 to 165	149, 157, 165	OFDM	BPSK	6
802.11ac (VHT20)		149 to 165	149, 157, 165	OFDM	BPSK	6.5
802.11ac (VHT40)		151 to 159	151, 159	OFDM	BPSK	13.5
802.11ac (VHT80)		155	155	OFDM	BPSK	29.3

Test Condition:

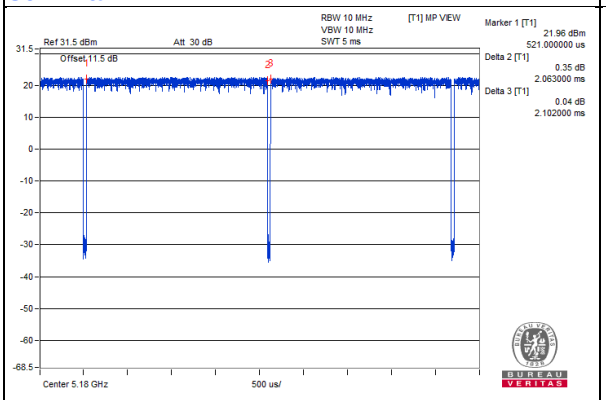
Applicable To	Environmental Conditions	Input Power	Tested By
RE≥1G	25deg. C, 66%RH	120Vac, 60Hz	Tom Yang
RE<1G	25deg. C, 68%RH	120Vac, 60Hz	Tom Yang
PLC	25deg. C, 66%RH	120Vac, 60Hz	Tom Yang
APCM	25deg. C, 60%RH	120Vac, 60Hz	Kevin Ko

3.3 Duty Cycle of Test Signal

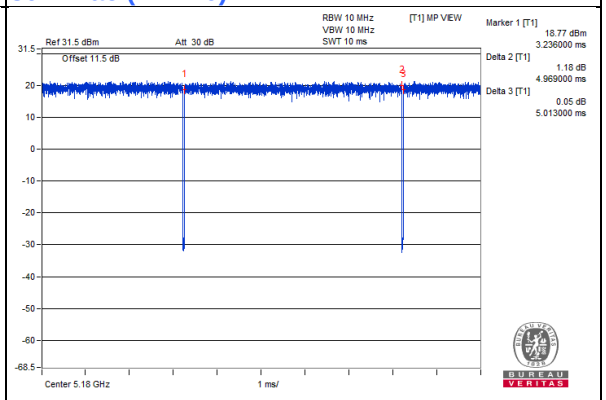
Duty cycle of test signal is ≥ 98 %, duty factor is not required.

802.11a: Duty cycle = 2.063 ms /2.102 ms=0.981
802.11ac (VHT20): Duty cycle = 4.969 ms /5.013 ms=0.991
802.11ac (VHT40): Duty cycle = 2.413 ms /2.452 ms=0.984
802.11ac (VHT80): Duty cycle = 2.237 ms /2.275 ms=0.983

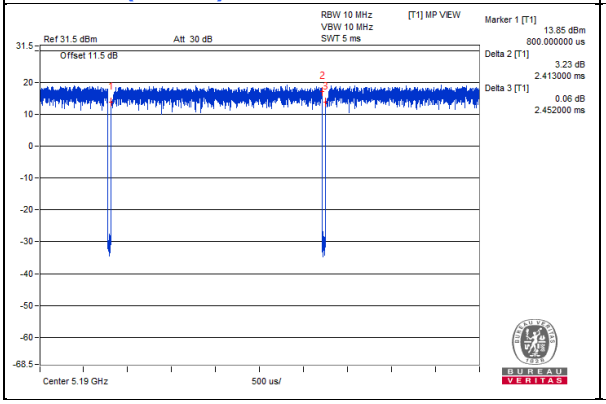
802.11a



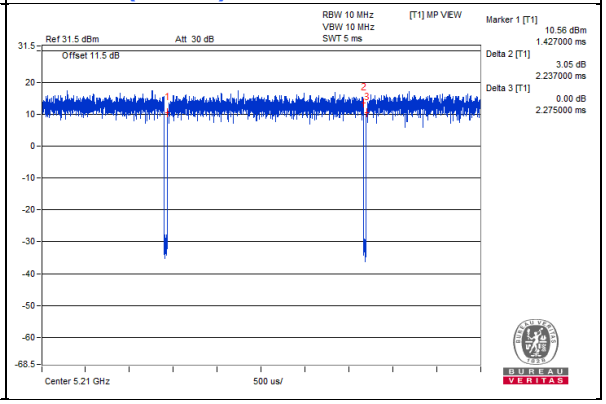
802.11ac (VHT20)



802.11ac (VHT40)



802.11ac (VHT80)



3.4 Description of Support Units

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

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Laptop	DELL	E5430	HYV4VY1	FCC DoC	Provided by Lab
B.	Cradle	Denso	CU-M70U	NA	NA	Supplied by client

Note:

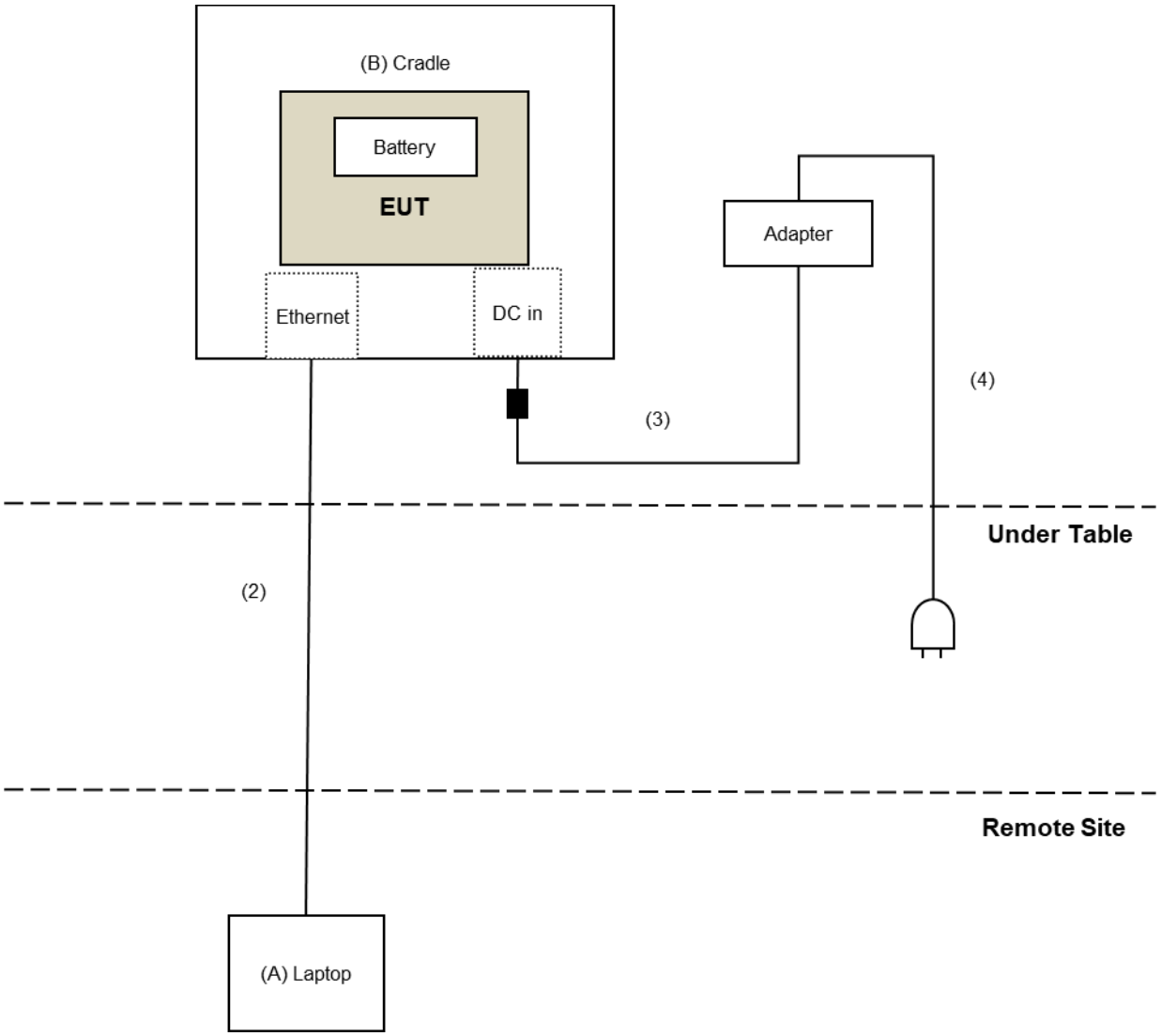
1. All power cords of the above support units are non-shielded (1.8m).

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	USB Cable	1	1.45	No	0	Supplied by client
2.	RJ-45 Cable	1	10	Yes	0	Provided by Lab
3.	DC Cable	1	1.16	Yes	1	Supplied by client
4.	AC Cable	1	1.71	Yes	0	Supplied by client

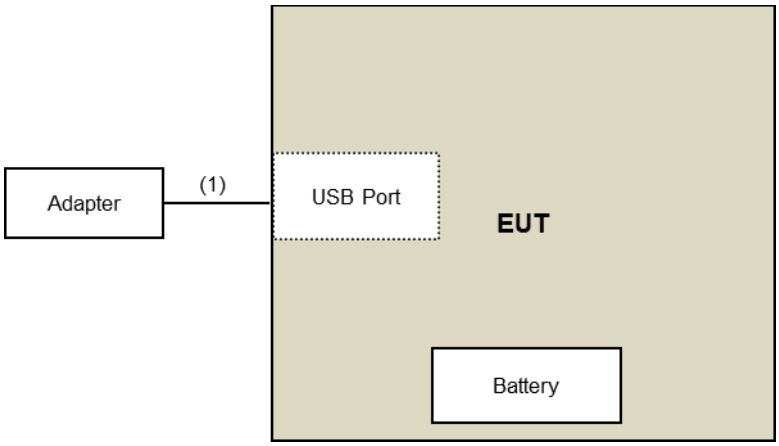
Note: The core(s) is(are) originally attached to the cable(s).

3.4.1 Configuration of System under Test

For radiated emission (below 1GHz):



For conducted emission & radiated emission (above 1GHz):



3.5 General Description of Applied Standard and References

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

Test Standard:
FCC Part 15, Subpart E (15.407)
ANSI C63.10-2013

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

References Test Guidance:
KDB 789033 D02 General UNII Test Procedure New Rules v02r01
KDB 662911 D01 Multiple Transmitter Output v02r01

All test items have been performed as a reference to the above KDB test guidance.

4 Test Types and Results

4.1 Radiated Emission and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge Measurement

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

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

NOTE:

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

Limits of unwanted emission out of the restricted bands

Applicable To		Limit	
789033 D02 General UNII Test 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:

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

4.1.2 Test Instruments

For Radiated Emission & OOBE Test:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Agilent	N9038A	MY50010156	2020/7/24	2021/7/23
Software	ADT_Radiated_V8.7.08	NA	NA	NA
Antenna Tower & Turn Table Max-Full	MF-7802	MF780208406	NA	NA
Pre_Amplifier EMCI	EMC001340	980142	2020/5/25	2021/5/24
LOOP ANTENNA Electro-Metrics	EM-6879	264	2021/3/5	2022/3/4
RF Coaxial Cable JYEBO	5D-FB	LOOPCAB-001	2021/1/7	2022/1/6
RF Coaxial Cable JYEBO	5D-FB	LOOPCAB-002	2021/1/7	2022/1/6
Pre_Amplifier Mini-Circuits	ZFL-1000VH2	QA0838008	2020/10/20	2021/10/19
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-361	2020/11/5	2021/11/4
RF Coaxial Cable COMMATE/PEWC	8D	966-3-1	2020/3/17	2021/3/16
RF Coaxial Cable COMMATE/PEWC	8D	966-3-2	2020/3/17	2021/3/16
RF Coaxial Cable COMMATE/PEWC	8D	966-3-3	2020/3/17	2021/3/16
Fixed attenuator Mini-Circuits	UNAT-5+	PAD-3m-3-01	2020/9/24	2021/9/23
Horn Antenna Schwarzbeck	BBHA9120-D	9120D-406	2020/11/22	2021/11/21
Pre_Amplifier EMCI	EMC12630SE	980384	2021/1/11	2022/1/10
RF Coaxial Cable EMCI	EMC104-SM-SM-1500	180504	2020/4/29	2021/4/28
RF Coaxial Cable EMCI	EMC104-SM-SM-2000	180601	2020/6/9	2021/6/8
RF Coaxial Cable EMCI	EMC104-SM-SM-6000	210201	2020/6/9	2021/6/8
Fix tool for Boresight antenna tower LIOW GUU	FBA-01	FBA_SIP01	NA	NA
Spectrum Analyzer Keysight	N9030A	MY54490679	2020/7/13	2021/7/12
Pre_Amplifier EMCI	EMC184045SE	980387	2021/1/11	2022/1/10
SHF-EHF Horn Schwarzbeck	BBHA 9170	BBHA9170519	2020/11/22	2021/11/21
RF Cable-Frequency range: 1-40GHz EMCI	EMC102-KM-KM-1200	160924	2021/1/11	2022/1/10
RF cable (40GHz) EMCI	EMC-KM-KM-4000	200214	2020/3/11	2021/3/10

Note:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in 966 Chamber No. 3.
3. Tested Date: 2021/3/6

For other test items:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Spectrum Analyzer R&S	FSV40	100964	2021/3/8	2022/3/7
Power meter Anritsu	ML2495A	1529002	2021/6/21	2022/6/20
Power sensor Anritsu	MA2411B	1339443	2021/5/31	2022/5/30
10dB Attenuator Woken	MDCS18N-10	MDCS18N-10-01	2021/4/13	2022/4/12
Software	ADT_RF Test Software V6.6.5.4	NA	NA	NA

NOTE: 1. The test was performed in Oven room 2.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
3. Tested Date: 2021/8/20

4.1.3 Test Procedure

For Radiated emission below 30MHz

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. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

Note:

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

For Radiated emission above 30MHz

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

f. The test-receiver system was set to peak and average 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.

Note:

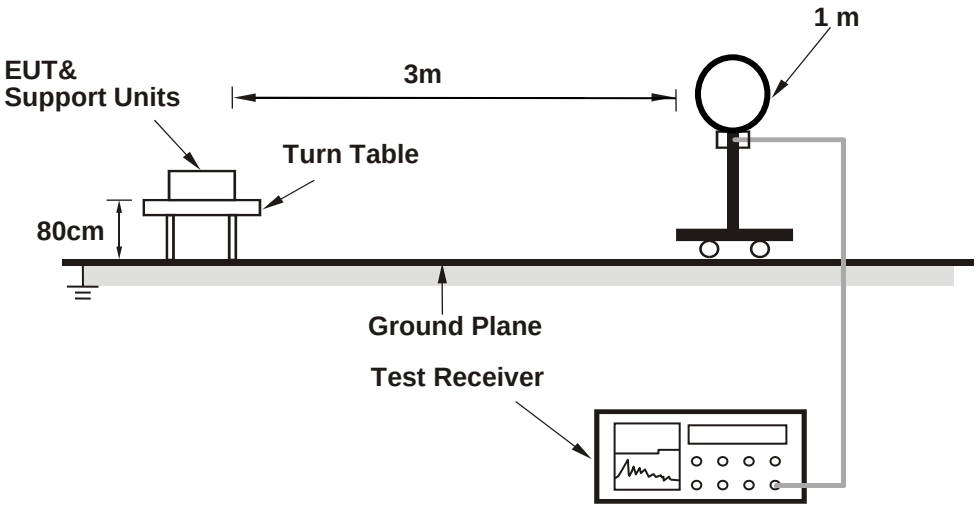
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98%) or 10Hz (Duty cycle ≥ 98%) for Average detection (AV) at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

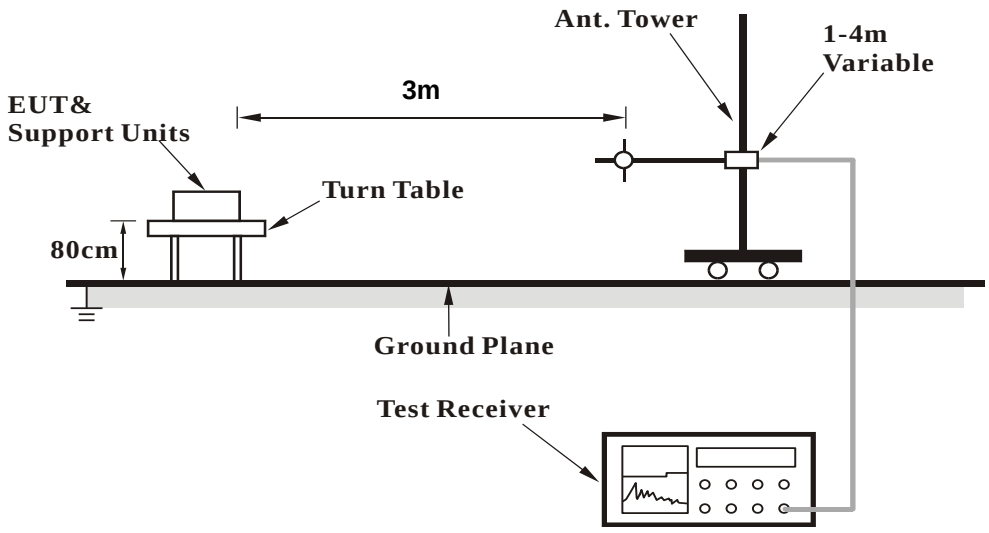
No deviation.

4.1.5 Test Setup

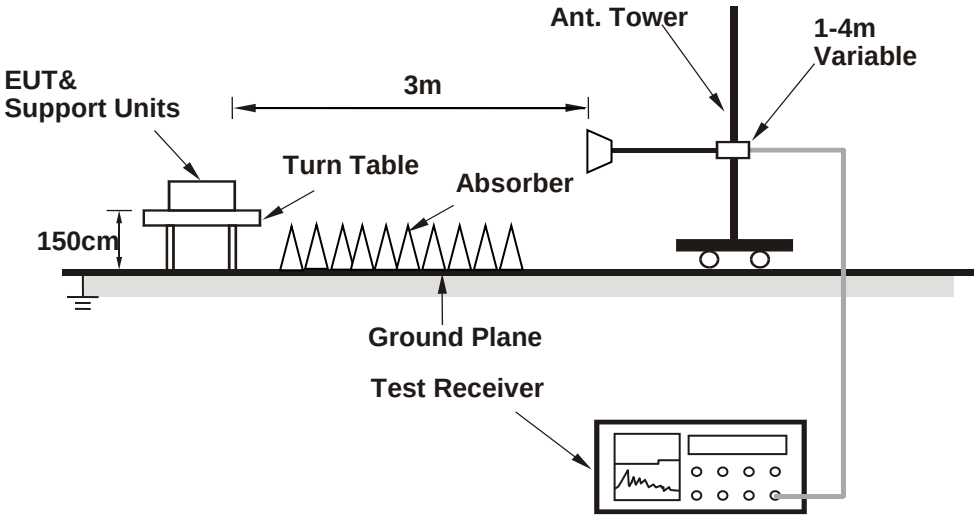
For Radiated emission below 30MHz



For Radiated emission 30MHz to 1GHz



For Radiated emission above 1GHz



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

4.1.6 EUT Operating Condition

a. Connected the EUT with the Laptop which is placed on the testing table.
b. Controlling software (QRCT4 (v4.0-00067)) has been activated to set the EUT under transmission condition continuously.

4.1.7 Test Results

Above 1GHz Data

RF Mode	TX 802.11a	**Channel**	CH 40：5200 MHz
Frequency Range	1GHz ~ 40GHz	**Detector Function**	Peak (PK) Average (AV)
Input Power	120Vac, 60Hz	**Environmental Conditions**	25 °C, 66% RH
Tested By	Tom Yang		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	**Frequency (MHz)**	**Emission Level (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Height (m)**	**Table Angle (Degree)**	**Raw Value (dBuV)**	**Correction Factor (dB/m)**
1	*5200.00	112.3 PK			1.00 H	267	107.5	4.8
2	*5200.00	103.4 AV			1.00 H	267	98.6	4.8
3	#10400.00	51.1 PK	68.2	-17.1	1.44 H	199	36.9	14.2
4	15600.00	47.0 PK	74.0	-27.0	2.09 H	121	32.0	15.0
5	15600.00	36.3 AV	54.0	-17.7	2.09 H	121	21.3	15.0
Antenna Polarity & Test Distance : Vertical at 3 m								
No	**Frequency (MHz)**	**Emission Level (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Height (m)**	**Table Angle (Degree)**	**Raw Value (dBuV)**	**Correction Factor (dB/m)**
1	*5200.00	114.0 PK			1.05 V	245	109.2	4.8
2	*5200.00	103.7 AV			1.05 V	245	98.9	4.8
3	#10400.00	58.9 PK	68.2	-9.3	1.17 V	154	44.7	14.2
4	15600.00	46.8 PK	74.0	-27.2	1.94 V	120	31.8	15.0
5	15600.00	35.7 AV	54.0	-18.3	1.94 V	120	20.7	15.0

Remarks:

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

RF Mode	TX 802.11a	Channel	CH 60：5300 MHz
Frequency Range	1GHz ~ 40GHz	Detector Function	Peak (PK) Average (AV)
Input Power	120Vac, 60Hz	Environmental Conditions	25 °C, 66% RH
Tested By	Tom Yang		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*5300.00	114.1 PK			1.15 H	244	109.3	4.8
2	*5300.00	104.2 AV			1.15 H	244	99.4	4.8
3	10600.00	51.1 PK	74.0	-22.9	1.50 H	197	36.9	14.2
4	10600.00	39.7 AV	54.0	-14.3	1.50 H	197	25.5	14.2
5	15900.00	46.7 PK	74.0	-27.3	2.14 H	106	32.2	14.5
6	15900.00	35.8 AV	54.0	-18.2	2.14 H	106	21.3	14.5
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*5300.00	113.8 PK			1.03 V	229	109.0	4.8
2	*5300.00	103.8 AV			1.03 V	229	99.0	4.8
3	10600.00	59.0 PK	74.0	-15.0	1.22 V	147	44.8	14.2
4	**10600.00**	**46.8 AV**	**54.0**	**-7.2**	**1.22 V**	**147**	**32.6**	**14.2**
5	15900.00	47.3 PK	74.0	-26.7	1.94 V	111	32.8	14.5
6	15900.00	36.1 AV	54.0	-17.9	1.94 V	111	21.6	14.5

Remarks:

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

RF Mode	TX 802.11ac (VHT20)	Channel	CH 116：5580 MHz
Frequency Range	1GHz ~ 40GHz	Detector Function	Peak (PK) Average (AV)
Input Power	120Vac, 60Hz	Environmental Conditions	25 °C, 66% RH
Tested By	Tom Yang		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*5580.00	113.7 PK			1.03 H	282	108.7	5.0
2	*5580.00	103.8 AV			1.03 H	282	98.8	5.0
3	11160.00	46.1 PK	74.0	-27.9	1.54 H	216	31.5	14.6
4	11160.00	34.7 AV	54.0	-19.3	1.54 H	216	20.1	14.6
5	#16740.00	45.7 PK	68.2	-22.5	2.21 H	107	28.4	17.3
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*5580.00	113.1 PK			1.08 V	262	108.1	5.0
2	*5580.00	103.6 AV			1.08 V	262	98.6	5.0
3	11160.00	53.3 PK	74.0	-20.7	1.38 V	156	38.7	14.6
4	11160.00	40.4 AV	54.0	-13.6	1.38 V	156	25.8	14.6
5	#16740.00	44.4 PK	68.2	-23.8	1.91 V	85	27.1	17.3

Remarks:

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

RF Mode	TX 802.11ac (VHT40)	Channel	CH 151：5755 MHz
Frequency Range	1GHz ~ 40GHz	Detector Function	Peak (PK) Average (AV)
Input Power	120Vac, 60Hz	Environmental Conditions	25 °C, 66% RH
Tested By	Tom Yang		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	#5645.90	56.9 PK	68.2	-11.3	1.04 H	273	51.9	5.0
2	*5755.00	111.4 PK			1.04 H	273	106.0	5.4
3	*5755.00	101.5 AV			1.04 H	273	96.1	5.4
4	#6010.25	52.7 PK	68.2	-15.5	1.04 H	273	46.9	5.8
5	11510.00	46.8 PK	74.0	-27.2	1.52 H	213	31.7	15.1
6	11510.00	34.9 AV	54.0	-19.1	1.52 H	213	19.8	15.1
7	#17265.00	45.6 PK	68.2	-22.6	2.22 H	99	27.0	18.6
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	#5643.66	60.0 PK	68.2	-8.2	1.02 V	255	55.0	5.0
2	*5755.00	112.0 PK			1.02 V	255	106.6	5.4
3	*5755.00	101.9 AV			1.02 V	255	96.5	5.4
4	#6009.98	52.7 PK	68.2	-15.5	1.02 V	255	46.9	5.8
5	11510.00	50.2 PK	74.0	-23.8	1.28 V	166	35.1	15.1
6	11510.00	38.4 AV	54.0	-15.6	1.28 V	166	23.3	15.1
7	#17265.00	45.3 PK	68.2	-22.9	1.91 V	88	26.7	18.6

Remarks:

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

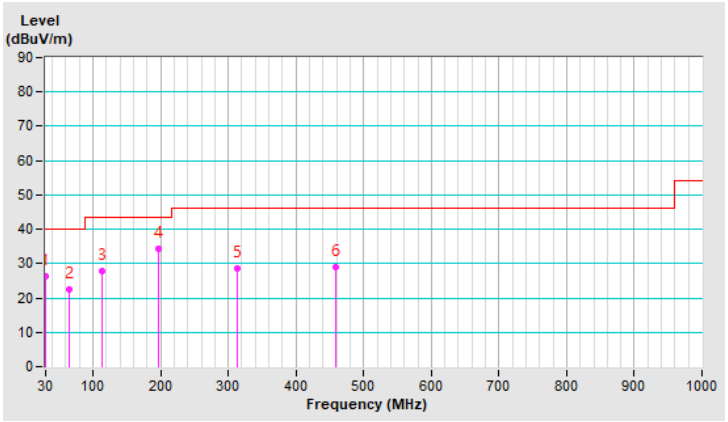
Below 1GHz Data

RF Mode	TX 802.11ac (VHT40)	Channel	CH 151：5755 MHz
Frequency Range	9kHz ~ 1GHz	Detector Function	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	30.17	26.4 QP	40.0	-13.6	1.00 H	279	35.7	-9.3
2	64.10	22.6 QP	40.0	-17.4	1.00 H	18	31.9	-9.3
3	113.27	27.7 QP	43.5	-15.8	2.00 H	78	38.0	-10.3
4	196.48	34.3 QP	43.5	-9.2	1.50 H	283	44.9	-10.6
5	313.63	28.7 QP	46.0	-17.3	1.50 H	360	34.6	-5.9
6	459.54	29.1 QP	46.0	-16.9	2.00 H	120	31.0	-1.9

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

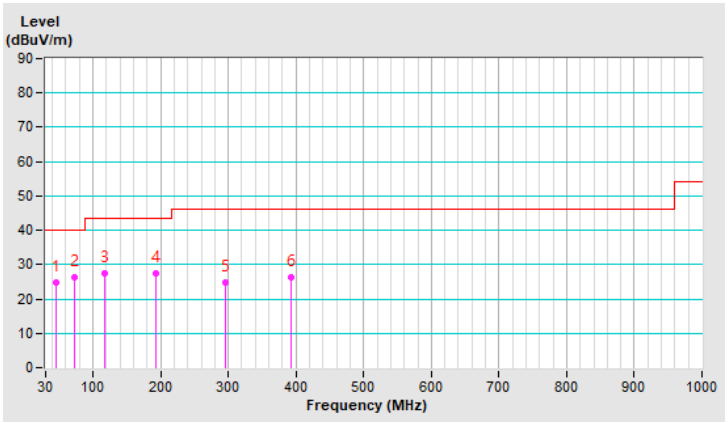


RF Mode	TX 802.11ac (VHT40)	Channel	CH 151：5755 MHz
Frequency Range	9kHz ~ 1GHz	Detector Function	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	44.84	24.6 QP	40.0	-15.4	1.00 V	211	32.8	-8.2
2	72.92	26.2 QP	40.0	-13.8	1.00 V	289	37.4	-11.2
3	117.49	27.3 QP	43.5	-16.2	1.00 V	218	37.2	-9.9
4	192.69	27.3 QP	43.5	-16.2	1.00 V	145	37.7	-10.4
5	295.56	24.9 QP	46.0	-21.1	1.50 V	218	31.7	-6.8
6	393.68	26.2 QP	46.0	-19.8	1.50 V	80	30.1	-3.9

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.



4.2 Conducted Emission Measurement

4.2.1 Limits of Conducted Emission Measurement

Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	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.

4.2.2 Test Instruments

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver R&S	ESCS 30	847124/029	2020/10/20	2021/10/19
LISN R&S	ESH3-Z5	848773/004	2020/10/27	2021/10/26
LISN R & S	ESH3-Z5	835239/001	2020/3/19	2021/3/18
50 ohms Terminator	50	3	2020/10/26	2021/10/25
RF Coaxial Cable JYEBO	5D-FB	COCCAB-001	2020/9/26	2021/9/25
Fixed attenuator STI	STI02-2200-10	005	2020/8/29	2021/8/28
Software BVADT	BVADT_Cond_ V7.3.7.4	NA	NA	NA

Note:
1. The calibration interval of the above test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in Conduction 1.
3. Tested Date: 2021/3/6

4.2.3 Test Procedure

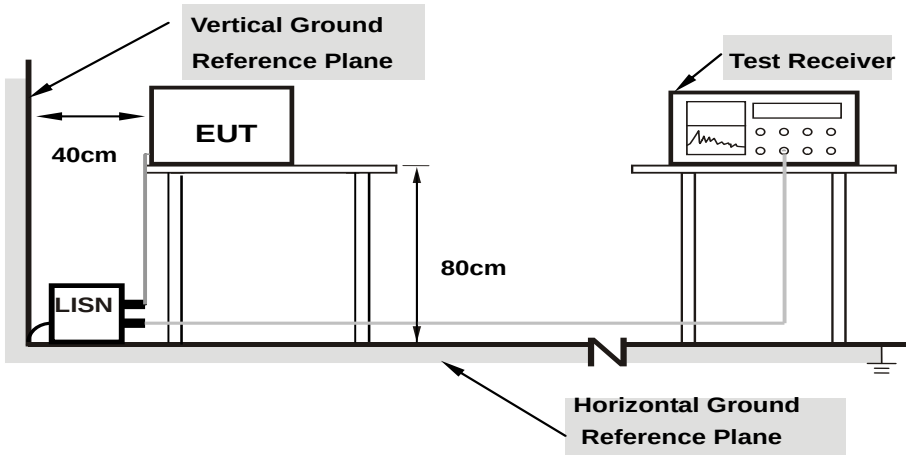
a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling 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: All modes of operation were investigated and the worst-case emissions are reported.

4.2.4 Deviation from Test Standard

No deviation.

4.2.5 Test Setup



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

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

4.2.6 EUT Operating Condition

Same as 4.1.6.

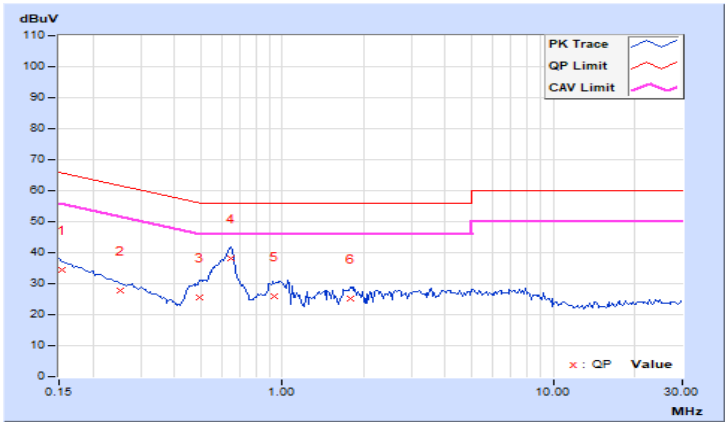
4.2.7 Test Results

RF Mode	TX 802.11ac (VHT40)	Channel	CH 151：5755 MHz
Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz

Phase Of Power : Line (L)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15391	9.96	24.62	12.46	34.58	22.42	65.79	55.79	-31.21	-33.37
2	0.25156	10.00	17.60	8.71	27.60	18.71	61.71	51.71	-34.11	-33.00
3	0.49766	10.03	15.70	10.05	25.73	20.08	56.04	46.04	-30.31	-25.96
4	**0.64609**	**10.04**	**28.11**	**21.69**	**38.15**	**31.73**	**56.00**	**46.00**	**-17.85**	**-14.27**
5	0.93516	10.06	15.74	8.75	25.80	18.81	56.00	46.00	-30.20	-27.19
6	1.78516	10.12	15.16	9.39	25.28	19.51	56.00	46.00	-30.72	-26.49

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

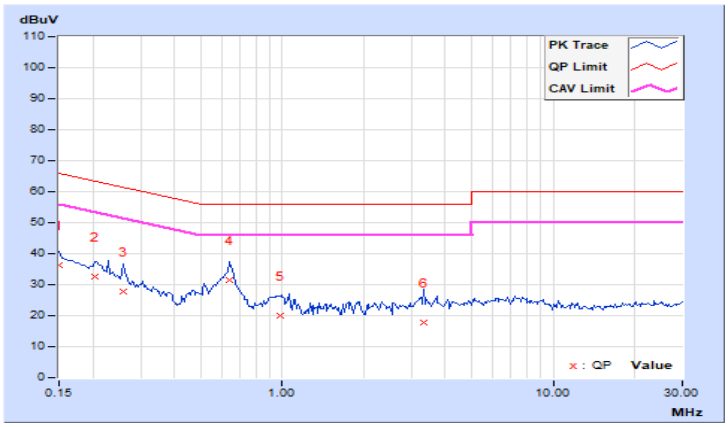


RF Mode	TX 802.11ac (VHT40)	Channel	CH 151：5755 MHz
Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz

Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	9.94	26.52	11.95	36.46	21.89	66.00	56.00	-29.54	-34.11
2	0.20469	9.98	22.61	8.15	32.59	18.13	63.42	53.42	-30.83	-35.29
3	0.25938	9.99	17.88	4.34	27.87	14.33	61.45	51.45	-33.58	-37.12
4	0.64219	10.03	21.46	13.83	31.49	23.86	56.00	46.00	-24.51	-22.14
5	0.98203	10.07	10.11	1.79	20.18	11.86	56.00	46.00	-35.82	-34.14
6	3.32813	10.21	7.39	-0.90	17.60	9.31	56.00	46.00	-38.40	-36.69

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value



4.3 Transmit Power Measurement

4.3.1 Limits of Transmit Power Measurement

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

*B is the 26 dB emission bandwidth in megahertz

Per KDB 662911 Method of conducted output power measurement on IEEE 802.11 devices,

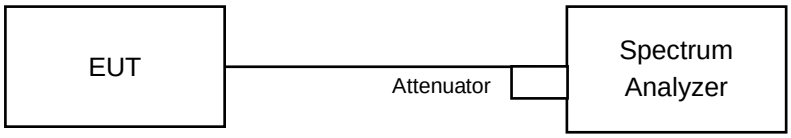
Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$;
Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any N_{ANT};
Array Gain = 5 log(N_{ANT}/N_{SS}) dB or 3 dB, whichever is less for 20-MHz channel widths with $N_{ANT} \geq 5$.

For power measurements on all other devices: Array Gain = 10 log(N_{ANT}/N_{SS}) dB.

4.3.2 Test Setup

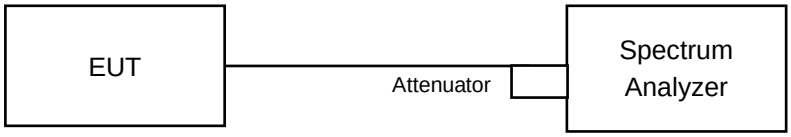
FOR POWER OUTPUT MEASUREMENT

For channel straddling 5725MHz:



For other channels:

FOR 26dB OCCUPIED BANDWIDTH



4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.4 Test Procedure

FOR POWER OUTPUT MEASUREMENT

For channel straddling 5725MHz:

Follow FCC KDB 789033 UNII test procedure:

Method SA-1

1. Set span to encompass the entire emission bandwidth (EBW) of the signal.
2. Set RBW =1MHz.
3. Set the VBW ≥ 3 x RBW.
4. Number of points in sweep ≥ 2 Span / RBW.
5. Sweep time = auto.
6. Set trigger to free run (duty cycle ≥ 98 percent)
7. Detector = RMS.
8. Trace average at least 100 traces in power averaging mode
9. Compute power by integrating the spectrum across the 26 dB EBW of the signal.

For other channels:

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

FOR 26dB OCCUPIED BANDWIDTH

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%.

4.3.5 Deviation from Test Standard

No deviation.

4.3.6 EUT Operating Condition

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

4.3.7 Test Results

POWER OUTPUT

802.11a

Chan.	Chan. Freq. (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
36	5180	18.85	18.23	143.263	21.56	24	Pass
40	5200	18.88	18.40	146.451	21.66	24	Pass
48	5240	17.73	17.19	111.653	20.48	24	Pass
52	5260	18.69	18.27	141.103	21.50	24	Pass
60	5300	18.82	18.44	146.031	21.64	24	Pass
64	5320	18.32	17.81	128.315	21.08	24	Pass
100	5500	18.17	18.05	129.441	21.12	24	Pass
116	5580	18.72	18.25	141.308	21.50	24	Pass
140	5700	18.12	17.93	126.95	21.04	24	Pass
*144 (U-NII-2C Band)	5720	18.52	18.26	138.11	21.40	24	Pass
*144 (U-NII-3 Band)	5720	12.30	11.74	31.91	15.04	30	Pass
149	5745	19.02	19.03	159.783	22.04	30	Pass
157	5785	19.17	18.63	155.55	21.92	30	Pass
165	5825	18.55	18.65	144.897	21.61	30	Pass

Note: * Test was performed in accordance with Measurement follow FCC KDB 789033 UNII test procedure Method SA-1 and use spectrum analyzer test.

Note: For U-NII-2A, U-NII-2C Band output power limitation is determined based on 26dBc bandwidth

Power Limit = 11dBm + 10logB < U-NII-2A, U-NII-2C >			
Channel Number	Freq.(MHz)	Min. B(MHz)	Determined Conducted Limit (dBm)
52	5260	24.47	24.88 > 24
60	5300	24.51	24.89 > 24
64	5320	23.67	24.74 > 24
100	5500	25.35	25.03 > 24
116	5580	28.55	25.55 > 24
140	5700	27.1	25.32 > 24
144 (U-NII-2C Band)	5720	21.6	24.34 > 24

802.11ac (VHT20)

Chan.	Chan. Freq. (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
36	5180	18.38	17.92	130.809	21.17	24	Pass
40	5200	18.54	18.51	142.407	21.54	24	Pass
48	5240	17.48	17.23	108.82	20.37	24	Pass
52	5260	18.44	18.39	138.847	21.43	24	Pass
60	5300	18.66	18.58	145.562	21.63	24	Pass
64	5320	18.19	18.23	132.445	21.22	24	Pass
100	5500	18.38	17.88	130.241	21.15	24	Pass
116	5580	18.94	18.25	145.177	21.62	24	Pass
140	5700	18.72	17.85	135.427	21.32	24	Pass
*144 (U-NII-2C Band)	5720	18.70	17.41	129.212	21.11	23.98	Pass
*144 (U-NII-3 Band)	5720	12.79	11.50	33.136	15.20	30	Pass
149	5745	18.68	18.87	150.881	21.79	30	Pass
157	5785	18.84	18.59	148.837	21.73	30	Pass
165	5825	18.70	18.75	149.12	21.74	30	Pass

Note: * Test was performed in accordance with Measurement follow FCC KDB 789033 UNII test procedure Method SA-1 and use spectrum analyzer test.

Note: For U-NII-2A, U-NII-2C Band output power limitation is determined based on 26dBc bandwidth

Power Limit = 11dBm + 10logB < U-NII-2A, U-NII-2C >			
Channel Number	Freq.(MHz)	Min. B(MHz)	Determined Conducted Limit (dBm)
52	5260	25.21	25.01 > 24
60	5300	25.94	25.13 > 24
64	5320	25.5	25.06 > 24
100	5500	25.9	25.13 > 24
116	5580	28.8	25.59 > 24
140	5700	29.4	25.68 > 24
144 (U-NII-2C Band)	5720	19.88	23.98 < 24

802.11ac (VHT40)

Chan.	Chan. Freq. (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
38	5190	16.42	16.08	84.404	19.26	24	Pass
46	5230	17.41	17.08	106.131	20.26	24	Pass
54	5270	18.70	17.99	137.082	21.37	24	Pass
62	5310	15.35	14.88	65.038	18.13	24	Pass
102	5510	15.85	15.83	76.742	18.85	24	Pass
110	5550	18.51	18.24	137.638	21.39	24	Pass
134	5670	15.66	15.99	76.532	18.84	24	Pass
*142 (U-NII-2C Band)	5710	18.65	17.78	133.262	21.25	24	Pass
*142 (U-NII-3 Band)	5710	7.98	8.31	13.057	11.16	30	Pass
151	5755	20.00	19.38	186.696	22.71	30	Pass
159	5795	19.98	19.35	185.64	22.69	30	Pass

Note: * Test was performed in accordance with Measurement follow FCC KDB 789033 UNII test procedure Method SA-1 and use spectrum analyzer test.

Note: For U-NII-2A, U-NII-2C Band output power limitation is determined based on 26dBc bandwidth

Power Limit = 11dBm + 10logB < U-NII-2A, U-NII-2C >			
Channel Number	Freq.(MHz)	Min. B(MHz)	Determined Conducted Limit (dBm)
54	5270	42.94	27.32 > 24
62	5310	42.38	27.27 > 24
102	5510	42.19	27.25 > 24
110	5550	52.33	28.18 > 24
134	5670	42.24	27.25 > 24
142 (U-NII-2C Band)	5710	41.44	27.17 > 24

802.11ac (VHT80)

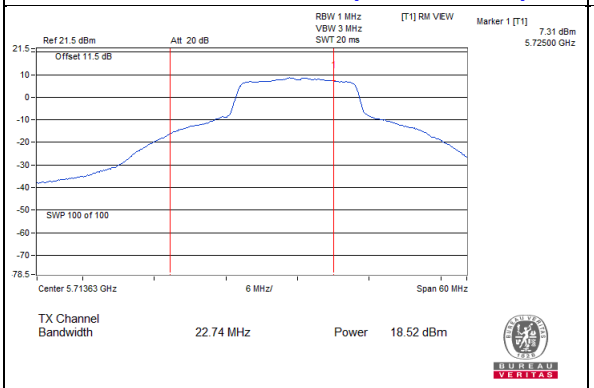
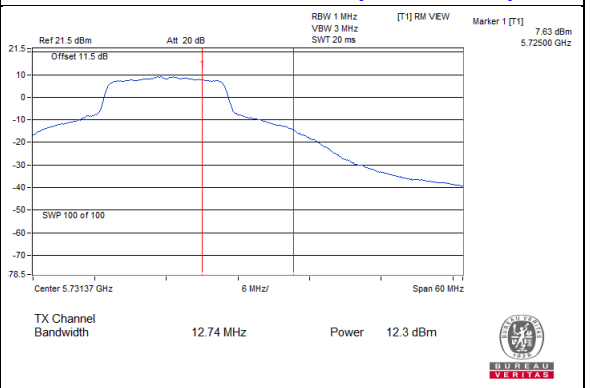
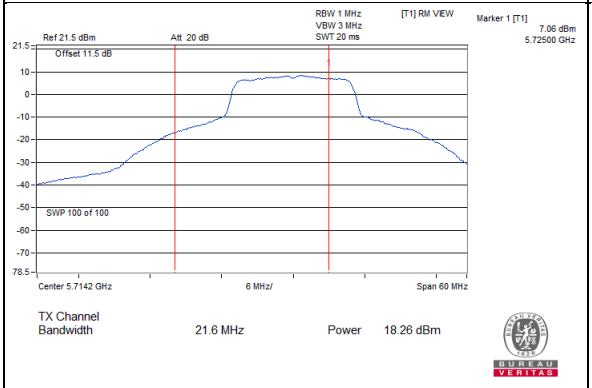
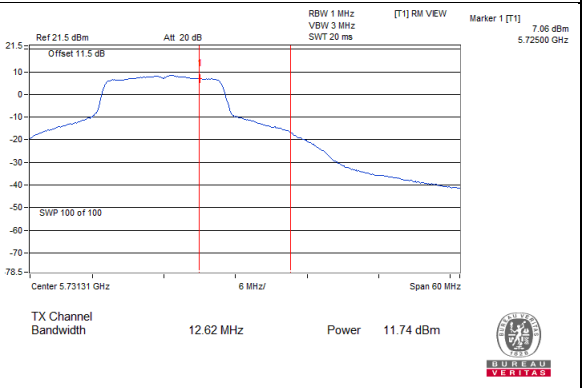
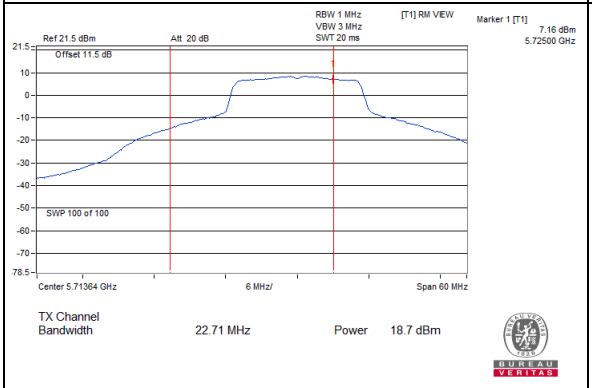
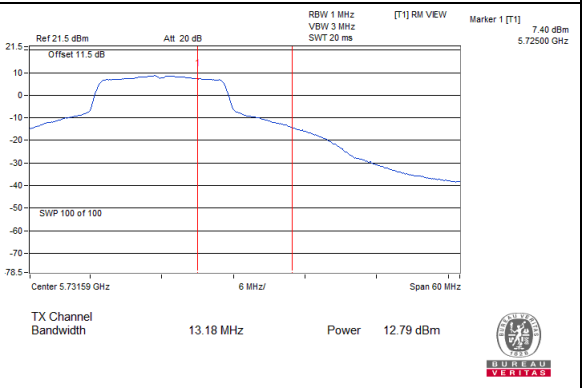
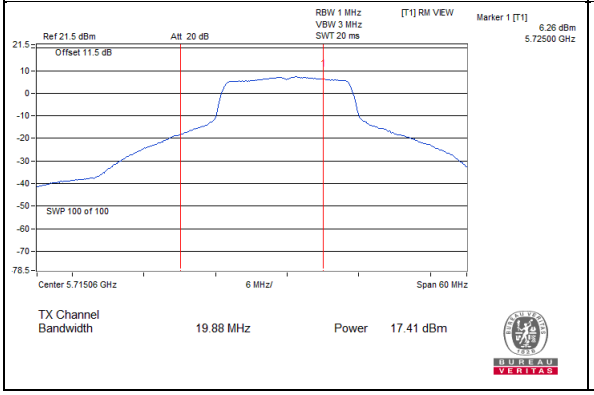
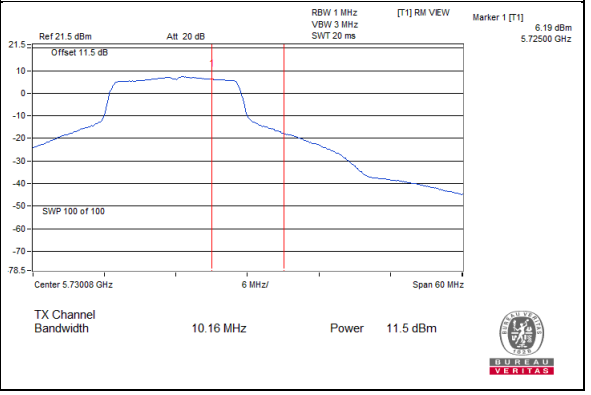
Chan.	Chan. Freq. (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
42	5210	16.02	15.62	76.47	18.83	24	Pass
58	5290	14.68	13.98	54.38	17.35	24	Pass
106	5530	15.89	15.69	75.883	18.80	24	Pass
122	5610	15.99	15.44	74.714	18.73	24	Pass
*138 (U-NII-2C Band)	5690	18.34	17.74	127.663	21.06	24	Pass
*138 (U-NII-3 Band)	5690	4.72	4.62	5.862	7.68	30	Pass
155	5775	19.12	18.98	160.726	22.06	30	Pass

Note: * Test was performed in accordance with Measurement follow FCC KDB 789033 UNII test procedure Method SA-1 and use spectrum analyzer test.

Note: For U-NII-2A, U-NII-2C Band output power limitation is determined based on 26dBc bandwidth

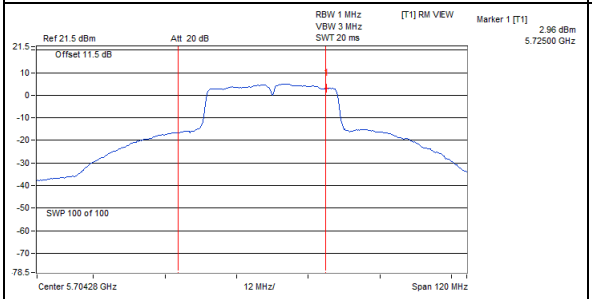
Power Limit = 11dBm + 10logB < U-NII-2A, U-NII-2C >			
Channel Number	Freq.(MHz)	Min. B(MHz)	Determined Conducted Limit (dBm)
58	5290	84.42	30.26 > 24
106	5530	84.66	30.27 > 24
122	5610	84.15	30.25 > 24
138 (U-NII-2C Band)	5690	84.08	30.24 > 24

For channel straddling 5725MHz of Power

Spectrum Plot Value of Power	
802.11a_Chain 0 / CH144 (U-NII-2C Band)	**802.11a_Chain 0 / CH144 (U-NII-3 Band)**
 TX Channel Bandwidth 22.74 MHz Power 18.52 dBm	 TX Channel Bandwidth 12.74 MHz Power 12.3 dBm
802.11a_Chain 1 / CH144 (U-NII-2C Band)	**802.11a_Chain 1 / CH144 (U-NII-3 Band)**
 TX Channel Bandwidth 21.6 MHz Power 18.26 dBm	 TX Channel Bandwidth 12.62 MHz Power 11.74 dBm
802.11ac (VHT20)_Chain 0 / CH144 (U-NII-2C Band)	**802.11ac (VHT20)_Chain 0 / CH144 (U-NII-3 Band)**
 TX Channel Bandwidth 22.71 MHz Power 18.7 dBm	 TX Channel Bandwidth 13.18 MHz Power 12.79 dBm
802.11ac (VHT20)_Chain 1 / CH144 (U-NII-2C Band)	**802.11ac (VHT20)_Chain 1 / CH144 (U-NII-3 Band)**
 TX Channel Bandwidth 19.88 MHz Power 17.41 dBm	 TX Channel Bandwidth 10.16 MHz Power 11.5 dBm

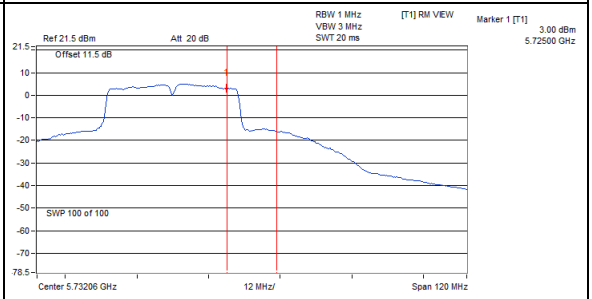
Spectrum Plot Value of Power

802.11ac (VHT40)_Chain 0 / CH142 (U-NII-2C Band)



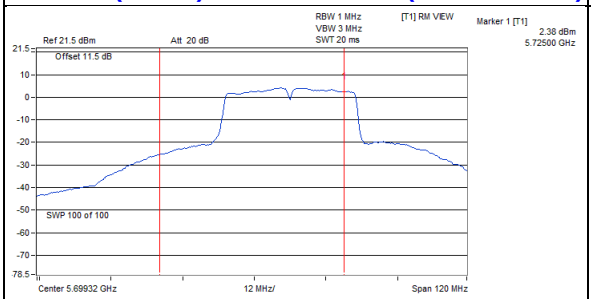
TX Channel Bandwidth 41.44 MHz Power 18.65 dBm

802.11ac (VHT40)_Chain 0 / CH142 (U-NII-3 Band)



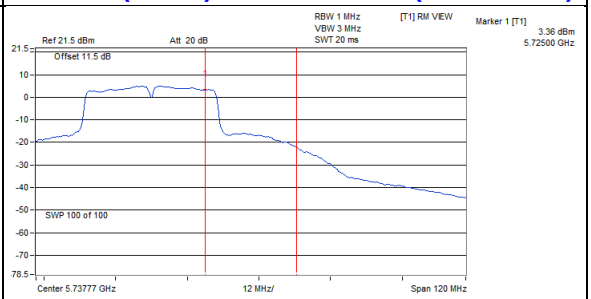
TX Channel Bandwidth 14.12 MHz Power 7.98 dBm

802.11ac (VHT40)_Chain 1 / CH142 (U-NII-2C Band)



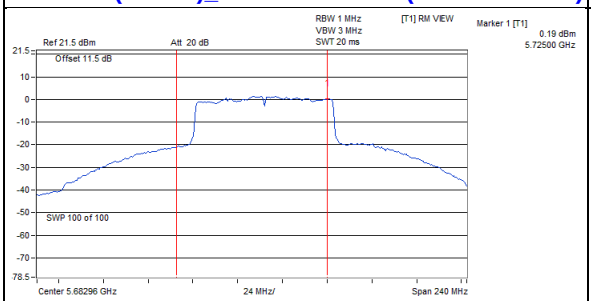
TX Channel Bandwidth 51.36 MHz Power 17.78 dBm

802.11ac (VHT40)_Chain 1 / CH142 (U-NII-3 Band)



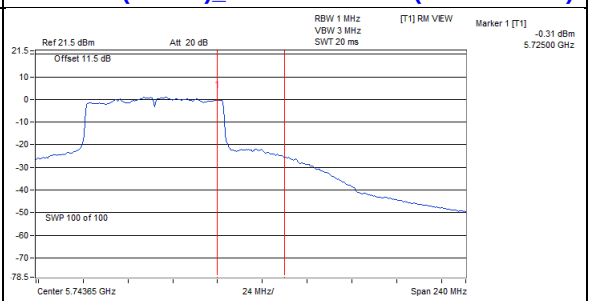
TX Channel Bandwidth 25.55 MHz Power 8.31 dBm

802.11ac (VHT80)_Chain 0 / CH138 (U-NII-2C Band)



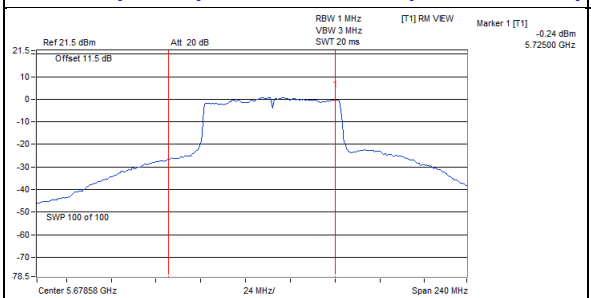
TX Channel Bandwidth 84.08 MHz Power 18.34 dBm

802.11ac (VHT80)_Chain 0 / CH138 (U-NII-3 Band)



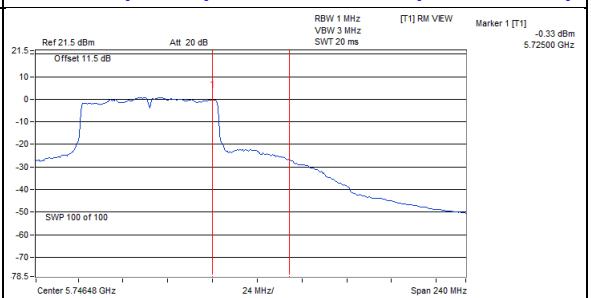
TX Channel Bandwidth 37.3 MHz Power 4.72 dBm

802.11ac (VHT80)_Chain 1 / CH138 (U-NII-2C Band)



TX Channel Bandwidth 92.84 MHz Power 17.74 dBm

802.11ac (VHT80)_Chain 1 / CH138 (U-NII-3 Band)



TX Channel Bandwidth 42.96 MHz Power 4.62 dBm

26dB OCCUPIED BANDWIDTH

802.11a

Channel	Frequency (MHz)	26dB Bandwidth (MHz)	
		Chain0	Chain1
36	5180	24.17	23.76
40	5200	23.71	22.9
48	5240	25.48	23.53
52	5260	41.51	24.47
60	5300	43.93	24.51
64	5320	41.62	23.67
100	5500	28.55	25.35
116	5580	36.21	28.55
140	5700	27.1	31.63
144 (U-NII-2C Band)	5720	22.74	21.6
144 (U-NII-3 Band)	5720	12.74	12.62
149	5745	25.59	24.29
157	5785	25.82	24.97
165	5825	26.15	25.35

802.11ac (VHT20)

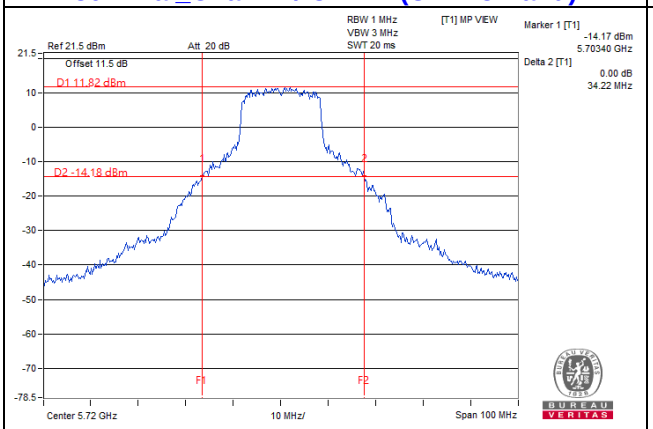
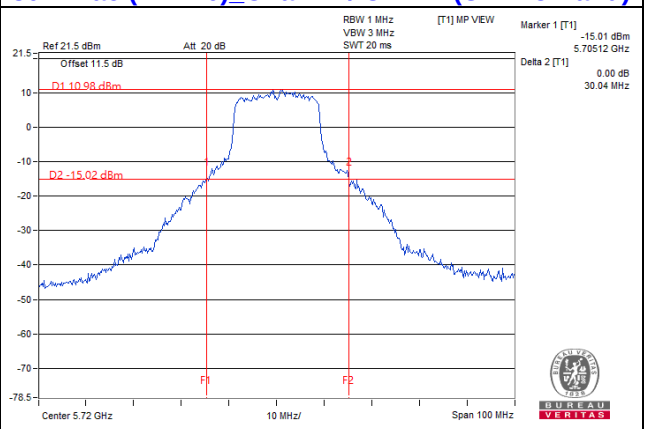
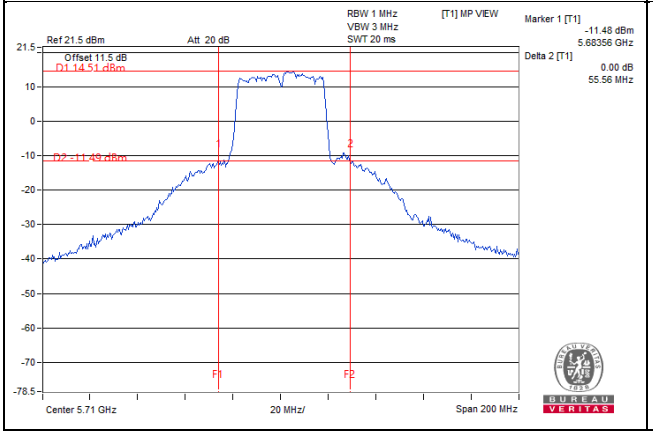
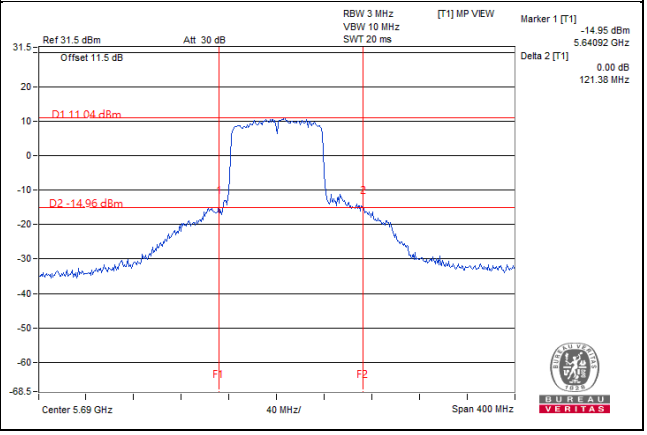
Channel	Frequency (MHz)	26dB Bandwidth (MHz)	
		Chain0	Chain1
36	5180	24.93	24.59
40	5200	25.2	24.73
48	5240	26.5	25.26
52	5260	46.88	25.21
60	5300	46.02	25.94
64	5320	43.8	25.5
100	5500	28.93	25.9
116	5580	36.41	28.8
140	5700	29.4	29.54
144 (U-NII-2C Band)	5720	22.71	19.88
144 (U-NII-3 Band)	5720	13.18	10.16
149	5745	26.06	25.77
157	5785	26.55	26.28
165	5825	26.65	26.12

802.11ac (VHT40)

Channel	Frequency (MHz)	26dB Bandwidth (MHz)	
		Chain0	Chain1
38	5190	42.74	42.46
46	5230	46.06	42.6
54	5270	93.84	42.94
62	5310	42.42	42.38
102	5510	42.19	42.39
110	5550	91.04	52.33
134	5670	42.24	42.37
142 (U-NII-2C Band)	5710	41.44	51.36
142 (U-NII-3 Band)	5710	14.12	25.55
151	5755	42.69	42.62
159	5795	42.46	42.36

802.11ac (VHT80)

Channel	Frequency (MHz)	26dB Bandwidth (MHz)	
		Chain0	Chain1
42	5210	85.01	84.04
58	5290	84.47	84.42
106	5530	84.83	84.66
122	5610	85.03	84.15
138 (U-NII-2C Band)	5690	84.08	92.84
138 (U-NII-3 Band)	5690	37.3	42.96
155	5775	84.73	85.78

Spectrum Plot of Worst Value	
802.11a _Chain 1 / CH144 (U-NII-3 Band)	**802.11ac (VHT20)_Chain 1 / CH144 (U-NII-3 Band)**
	
802.11ac (VHT40)_Chain 0 / CH142 (U-NII-3 Band)	**802.11ac (VHT80)_Chain 0 / CH138 (U-NII-3 Band)**
	

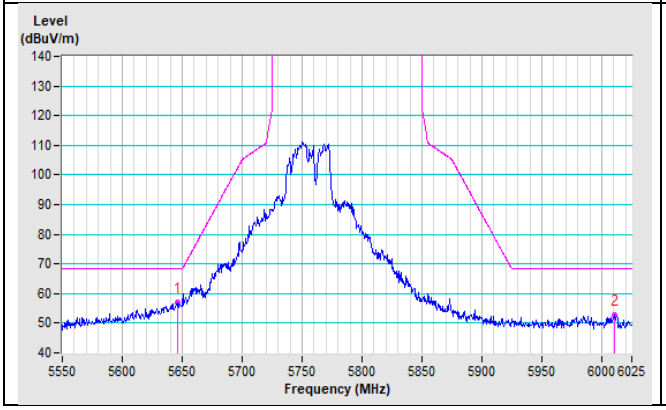
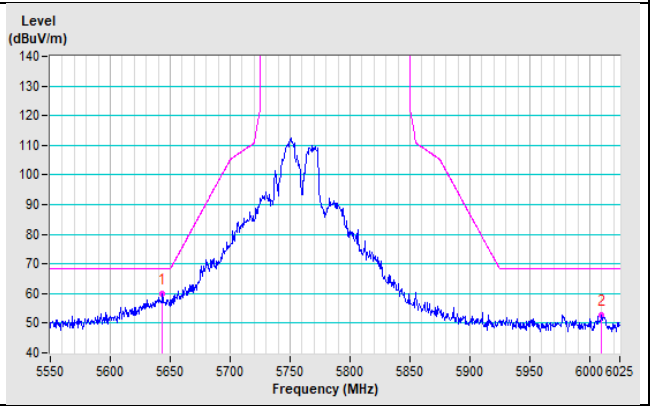
Note:

For CH144 (U-NII-3) = Delta 2 - (5725MHz - Marker 1)
For CH142 (U-NII-3) = Delta 2 - (5725MHz - Marker 1)
For CH138 (U-NII-3) = Delta 2 - (5725MHz - Marker 1)

5 Pictures of Test Arrangements

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

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

802.11ac (VHT40) CH 151：5755 MHz	
Horizontal	Vertical
	

Appendix – Information of the Testing Laboratories

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

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

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

Hsin Chu EMC/RF/Telecom Lab
Tel: 886-3-6668565
Fax: 886-3-6668323

Hwa Ya EMC/RF/Safety Lab
Tel: 886-3-3183232
Fax: 886-3-3270892

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

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

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