

FCC Test Report (WLAN) (Spot Check)

Report No.: RF180830E03I-1

FCC ID: 2APLE18300403

Original FCC ID: 2APLE18300398

Test Model: VMB5000

Received Date: June 08, 2020

Test Date: July 18 to Aug. 04, 2020

Issued Date: Aug. 14, 2020

Applicant: Arlo Technologies, Inc.

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Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
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Test Location: E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300,
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**FCC Registration /
Designation Number:** 723255 / TW2022



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Release Control Record

Issue No.	Description	Date Issued
RF180830E03I-1	Original release.	Aug. 14, 2020

1 Certificate of Conformity

Product: Arlo Gen5 Entry Hub

Brand: Arlo

Test Model: VMB5000

Sample Status: ENGINEERING SAMPLE

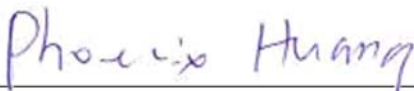
Applicant: Arlo Technologies, Inc.

Test Date: July 18 to Aug. 04, 2020

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 :


Phoenix Huang / Specialist

Date:

Aug. 14, 2020

Approved by :



Date:

Aug. 14, 2020

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 -12.21 dB at 0.47035 MHz.
15.407(b) (1/2/3/4(i/ii)/6)	Radiated Emissions & Band Edge Measurement*	Pass	Meet the requirement of limit. Minimum passing margin is -1.7 dB at 5150.00 MHz.
15.407(a)(1/2/3)	Max Average Transmit Power	Pass	Meet the requirement of limit.

Note:

1. For U-NII-3 band compliance with rule part 15.407(b)(4)(i), the OOB test plots were recorded in Annex A.
2. For U-NII-1, U-NII-2A, U-NII-2C band compliance with rule 15.407(b) of the band-edge items, the test plots were recorded in Annex B. Test Procedures refer to report 4.1.3.
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) ($\pm$)
Conducted Emissions at mains ports	150kHz ~ 30MHz	1.9 dB
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	3.1 dB
	30MHz ~ 1GHz	5.5 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	5.1 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 (WLAN)

Product	Arlo Gen5 Entry Hub
Brand	Arlo
Test Model	VMB5000
Status of EUT	ENGINEERING SAMPLE
Power Supply Rating	12Vdc from power adapter
Modulation Type	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM 256QAM for OFDM in 11ac mode only
Modulation Technology	DSSS, OFDM
Transfer Rate	802.11b: up to 11 Mbps 802.11a/g: up to 54 Mbps 802.11n: up to 300 Mbps 802.11ac: up to 866.7 Mbps
Operating Frequency	2.4GHz: 2.412 ~ 2.462 GHz 5GHz: 5.18 ~ 5.24 GHz, 5.26 ~ 5.32 GHz, 5.50 ~ 5.70 GHz, 5.745 ~ 5.825 GHz
Number of Channel	2.4GHz: 802.11b, 802.11g, 802.11n (HT20): 11 802.11n (HT40): 7 5GHz: 802.11a, 802.11n (HT20), 802.11ac (VHT20): 24 802.11n (HT40), 802.11ac (VHT40): 11 802.11ac (VHT80): 2
Output Power	2.412 ~ 2.462 GHz: 907.922 mW 5.18 ~ 5.24 GHz: 531.612 mW 5.26 ~ 5.32 GHz: 229.908 mW 5.5 ~ 5.7 GHz: 231.024 mW 5.745 ~ 5.825 GHz: 465.254 mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	Adapter x 1
Data Cable Supplied	NA

Note:

- 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: 2APLE18300398, Report No.: RF180830E03C-1, RF180830E03F-1)
- There are WLAN and Sub-GHz technology used for the EUT. The EUT has below radios as following table:

Radio 1	Radio 2
WLAN (2.4GHz+5GHz band)	Sub-GHz

3. Simultaneously transmission condition.

Condition	Technology		
1	WLAN 2.4GHz	WLAN 5GHz	Sub-GHz

4. The EUT must be supplied with a power adapter and following different models could be chosen as following table:

No.	Brand	Model No.	Spec.
1	Arlo	AD2076F10	Input: 100-120Vac, 0.56A, 50/60Hz Output: 12Vdc, 1.5A DC output cable (Unshielded, 1.8m)
2	Arlo	AD2067M20	Input: 100-240Vac, 1.0A, 50/60Hz Output: 12Vdc, 2.5A DC output cable (Unshielded, 1.8m)
3	Arlo	2ABB018F 1	Input: 100-120Vac, 0.6A, 50/60Hz Output: 12Vdc, 1.5A DC output cable (Unshielded, 1.8m)
4	Arlo	P030WM1251	Input: 100-240Vac, 1.0A, 50/60Hz Output: 12Vdc, 2.5A DC output cable (Unshielded, 1.8m)

Note: In original report, from the above models, the worst radiated emission and AC power conducted emission test was found in **Adapter 2**. Therefore only the test data of the modes were recorded in this report.

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

Sub-GHz							
Ant No.	Brand	Model	Antenna Gain (dBi)	Frequency rang (MHz)	Antenna type	Connector type	
1	NA	902P00214N0	1.5	860~930	PIFA	NA	
WLAN							
Ant No.	Brand	Model	Antenna Net Gain (dBi)	Frequency rang (GHz)	Antenna type	Connector type	Cable Length (mm)
1	NA	9 07X01052X0	2.5	2.4~2.4835	Dipole	i-pex	75
			1.8	5.15~5.25			
			2	5.25~5.35			
			2.2	5.47~5.725			
			1.6	5.725~5.85			
2	NA	9 07X00747X19	2.5	2.4~2.4835	Dipole	i-pex	90
			2.2	5.15~5.25			
			1.2	5.25~5.35			
			3.2	5.47~5.725			
			3.5	5.725~5.85			

6. The EUT incorporates a MIMO function.

2.4GHz Band		
MODULATION MODE	TX & RX CONFIGURATION	
802.11b	2TX	2RX
802.11g	2TX	2RX
802.11n (HT20)	2TX	2RX
802.11n (HT40)	2TX	2RX
5GHz Band		
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

7. 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.
8. 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 ~ 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	5210 MHz

FOR 5260 ~ 5320MHz

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

Channel	Frequency	Channel	Frequency
52	5260 MHz	60	5300 MHz
56	5280 MHz	64	5320 MHz

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

Channel	Frequency	Channel	Frequency
54	5270 MHz	62	5310 MHz

FOR 5500 ~ 5700MHz

11 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		

5 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		

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 $\geq$ 1G	RE<1G	PLC	APCM	
-	√	√	√	√	-

Where **RE $\geq$ 1G**: Radiated Emission above 1GHz

RE<1G: Radiated Emission below 1GHz

PLC: Power Line Conducted Emission

APCM: Antenna Port Conducted Measurement

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)
802.11ac (VHT20)	5180-5240	36 to 48	36, 40, 48	OFDM	BPSK	6.5
802.11ac (VHT20)	5260-5320	52 to 64	52, 60, 64	OFDM	BPSK	6.5
802.11ac (VHT40)	5500-5700	102 to 134	102, 110, 134	OFDM	BPSK	13.5
802.11ac (VHT20)	5745-5825	149 to 165	149, 157, 165	OFDM	BPSK	6.5

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 (VHT20)	5180-5320, 5500-5700, 5745-5825	36 to 64, 100 to 140, 149 to 165	40	OFDM	BPSK	6.5

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 (VHT20)	5180-5320, 5500-5700, 5745-5825	36 to 64, 100 to 140, 149 to 165	40	OFDM	BPSK	6.5

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)
802.11ac (VHT20)	5180-5240	36 to 48	36, 40, 48	OFDM	BPSK	6.5
802.11ac (VHT20)	5260-5320	52 to 64	52, 60, 64	OFDM	BPSK	6.5
802.11ac (VHT40)	5500-5700	102 to 134	102, 110, 134	OFDM	BPSK	13.5
802.11ac (VHT20)	5745-5825	149 to 165	149, 157, 165	OFDM	BPSK	6.5

Test Condition:

Applicable To	Environmental Conditions	Input Power	Tested By
RE $\geq$ 1G	22deg. C, 70%RH	120Vac, 60Hz	Ryan Du
RE<1G	23deg. C, 68%RH	120Vac, 60Hz	Ryan Du
PLC	25deg. C, 75%RH	120Vac, 60Hz	Sampson Chen
APCM	23deg. C, 67%RH	120Vac, 60Hz	Ryan Du

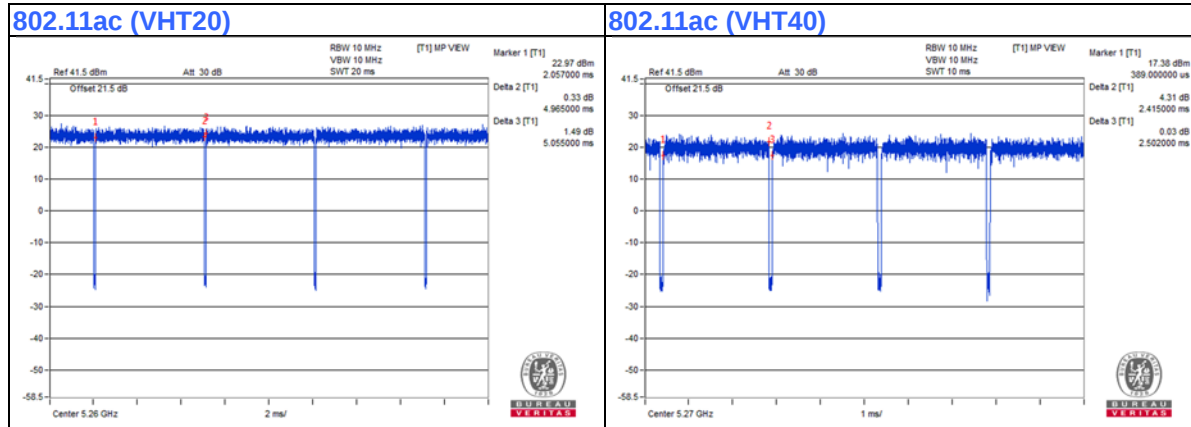
3.3 Duty Cycle of Test Signal

If duty cycle of test signal is $\geq 98\%$, duty factor is not required.

If duty cycle of test signal is $< 98\%$, duty factor shall be considered.

802.11ac (VHT20): Duty cycle = $4.965 \text{ ms} / 5.055 \text{ ms} = 0.982$

802.11ac (VHT40): Duty cycle = $2.415 \text{ ms} / 2.502 \text{ ms} = 0.965$, Duty factor = $10 * \log(1/\text{Duty cycle}) = 0.15 \text{ dB}$



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.

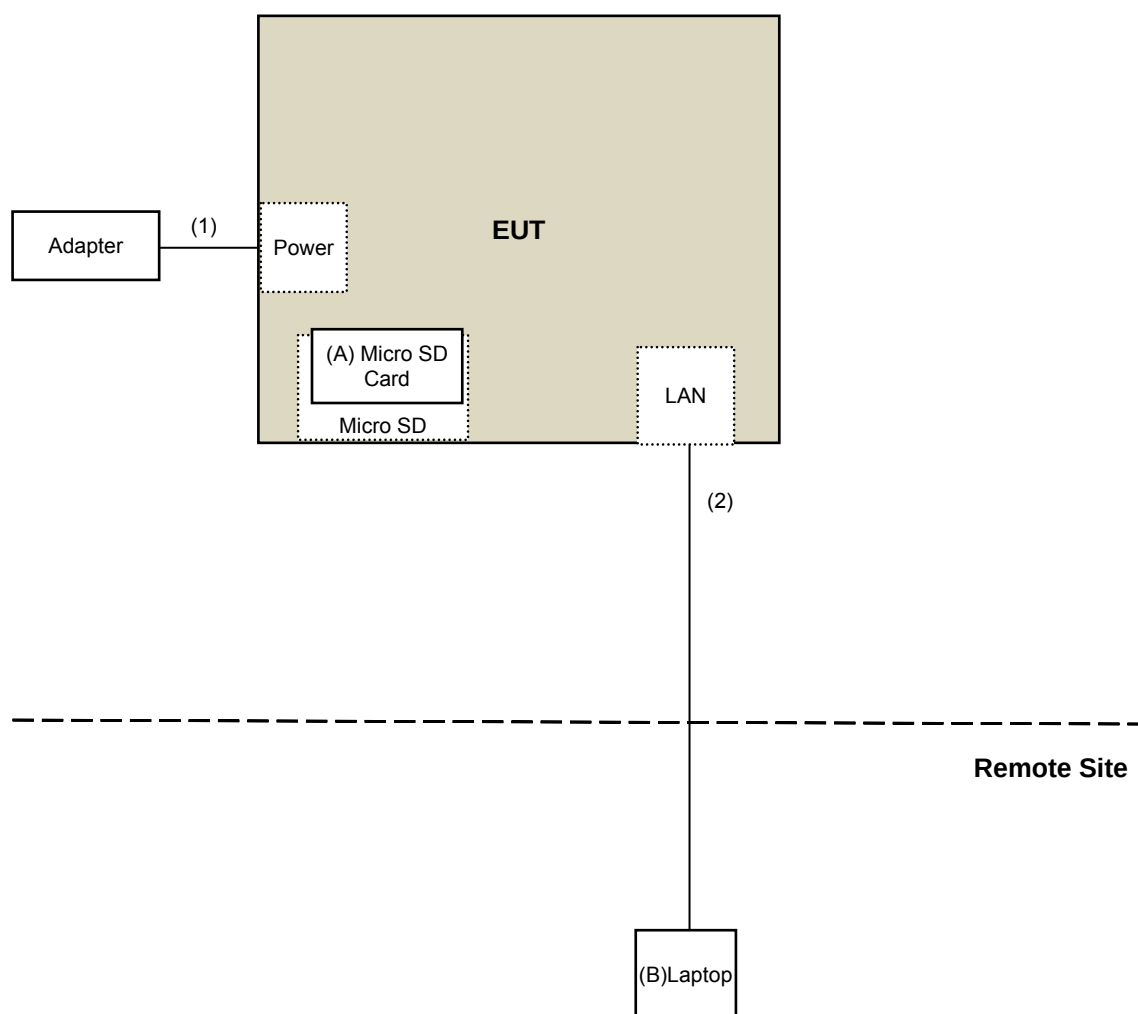
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Micro SD Card	SanDisk	8GB	NA	NA	Provided by Lab
B.	Laptop	DELL	E6420	B92T3R1	FCC DoC	Provided by Lab

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.	DC Cable	1	1.8	No	0	Supplied by client
2.	RJ-45 Cable	1	10	No	0	Provided by Lab

3.4.1 Configuration of System under Test



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:

- The lower limit shall apply at the transition frequencies.
- Emission level (dBuV/m) = 20 log Emission level (uV/m).
- 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 (dBuV/m)	AV:54 (dBuV/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(dBuV/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(dBuV/m) ^{*1} PK: 105.2 (dBuV/m) ^{*2} PK: 110.8(dBuV/m) ^{*3} PK: 122.2 (dBuV/m) ^{*4}
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(dBuV/m) ^{*1} PK:105.2 (dBuV/m) ^{*2} PK: 110.8(dBuV/m) ^{*3} PK:122.2 (dBuV/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:

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

4.1.2 Test Instruments

For Radiated Emission test:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Agilent	N9038A	MY51210202	Dec. 13, 2019	Dec. 12, 2020
Pre-Amplifier EMCI	EMC001340	980142	May 25, 2020	May 24, 2021
Loop Antenna Electro-Metrics	EM-6879	264	Feb. 18, 2020	Feb. 17, 2021
RF Cable	NA	LOOPCAB-001	Jan. 08, 2020	Jan. 07, 2021
RF Cable	NA	LOOPCAB-002	Jan. 08, 2020	Jan. 07, 2021
Pre-Amplifier Mini-Circuits	ZFL-1000VH2B	AMP-ZFL-01	Oct. 23, 2019	Oct. 22, 2020
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-406	Nov. 11, 2019	Nov. 10, 2020
RF Cable	8D	966-4-1	Mar. 18, 2020	Mar. 17, 2021
RF Cable	8D	966-4-2	Mar. 18, 2020	Mar. 17, 2021
RF Cable	8D	966-4-3	Mar. 18, 2020	Mar. 17, 2021
Fixed attenuator Mini-Circuits	UNAT-5+	PAD-3m-4-01	Sep. 26, 2019	Sep. 25, 2020
Horn_Antenna SCHWARZBECK	BBHA 9120D	9120D-783	Nov. 24, 2019	Nov. 23, 2020
Pre-Amplifier EMCI	EMC12630SE	980385	Aug. 15, 2019	Aug. 14, 2020
RF Cable	EMC104-SM-SM-1200	160923	Jan. 15, 2020	Jan. 14, 2021
RF Cable	EMC104-SM-SM-2000	180502	Apr. 29, 2020	Apr. 28, 2021
RF Cable	EMC104-SM-SM-6000	180418	Apr. 29, 2020	Apr. 28, 2021
Pre-Amplifier EMCI	EMC184045SE	980387	Jan. 15, 2020	Jan. 14, 2021
Horn_Antenna SCHWARZBECK	BBHA 9170	BBHA9170519	Nov. 24, 2019	Nov. 23, 2020
RF Cable	EMC102-KM-KM-1200	160924	Jan. 15, 2020	Jan. 14, 2021
RF Cable	EMC-KM-KM-4000	200214	Mar. 11, 2020	Mar. 10, 2021
Software	ADT_Radiated_V8.7.08	NA	NA	NA
Boresight Antenna Tower & Turn Table Max-Full	MF-7802BS	MF780208530	NA	NA

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. 4.
3. Tested Date: July 18 to Aug 01, 2020

For other test items:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Spectrum Analyzer R&S	FSV40	100964	May 29, 2020	May 28, 2021
Power meter Anritsu	ML2495A	1529002	July 22, 2020	July 21, 2021
Power sensor Anritsu	MA2411B	1339443	July 22, 2020	July 21, 2021
Fixed Attenuator Mini-Circuits	MDCS18N-10	MDCS18N-10-01	Apr. 14, 2020	Apr. 13, 2021
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: Aug. 04, 2020

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:

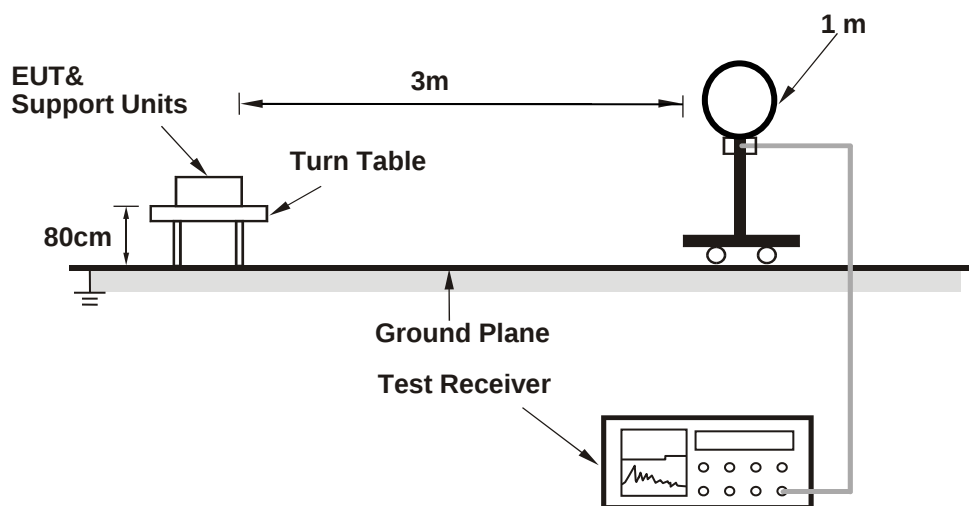
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is $\geq 1/T$ (Duty cycle $< 98\%$) or 10Hz (Duty cycle $\geq 98\%$) 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

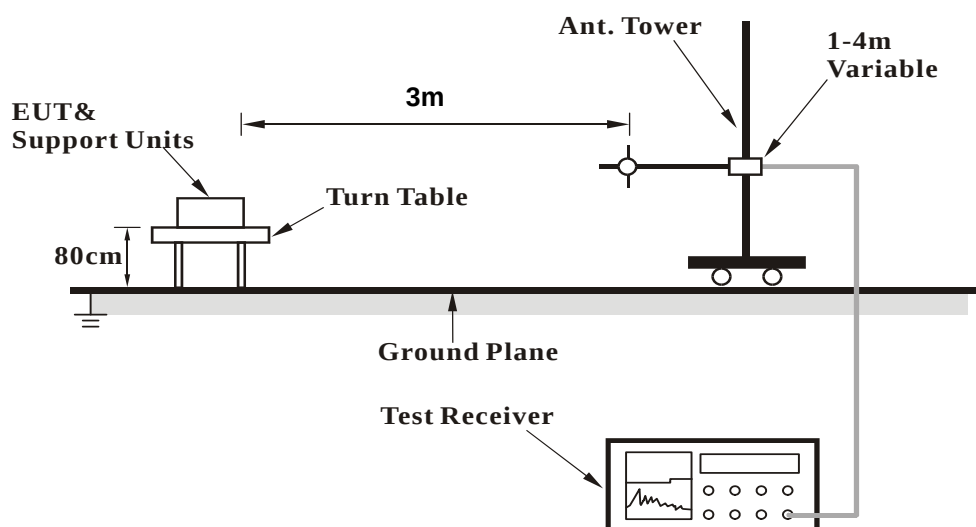
No deviation.

4.1.5 Test Setup

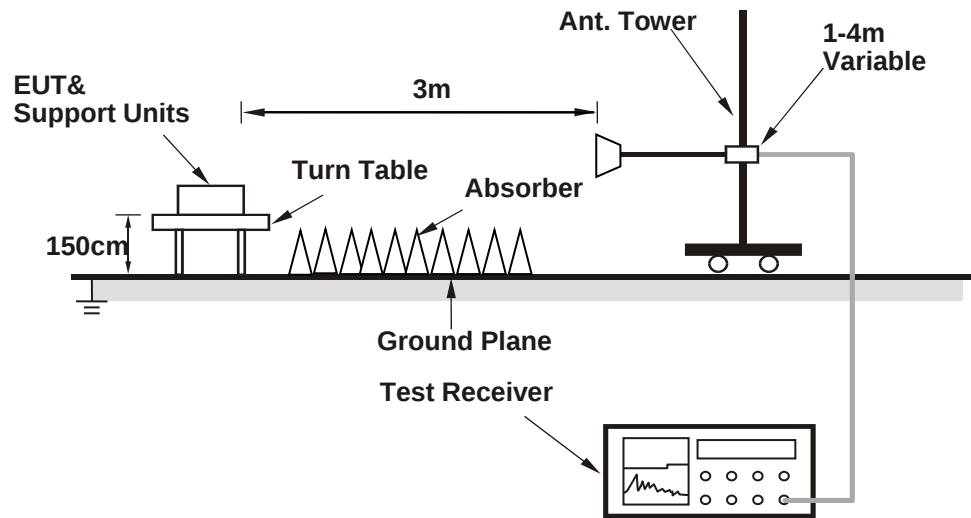
For Radiated emission below 30MHz



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

- Placed the EUT on the testing table.
- Controlling software (QDART-connectivity (1.0.40)) has been activated to set the EUT under transmission condition continuously at specific channel frequency.

4.1.7 Test Results

Above 1GHz Data:

802.11ac (VHT20)

Channel	TX Channel 36	Detector Function	Peak (PK)
Frequency Range	1GHz ~ 40GHz		Average (AV)

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	5150.00	56.7 PK	74.0	-17.3	1.76 H	334	53.7	3.0
2	5150.00	43.9 AV	54.0	-10.1	1.76 H	334	40.9	3.0
3	*5180.00	103.7 PK			1.76 H	334	100.7	3.0
4	*5180.00	93.6 AV			1.76 H	334	90.6	3.0
5	#10360.00	52.6 PK	68.2	-15.6	1.59 H	277	39.4	13.2
6	15540.00	55.4 PK	74.0	-18.6	1.76 H	187	41.8	13.6
7	15540.00	41.6 AV	54.0	-12.4	1.76 H	187	28.0	13.6
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	5147.46	61.3 PK	74.0	-12.7	1.97 V	96	58.3	3.0
2	5147.46	48.2 AV	54.0	-5.8	1.97 V	96	45.2	3.0
3	*5180.00	114.4 PK			1.97 V	96	111.4	3.0
4	*5180.00	104.6 AV			1.97 V	96	101.6	3.0
5	#10360.00	50.4 PK	68.2	-17.8	1.87 V	111	37.2	13.2
6	15540.00	56.3 PK	74.0	-17.7	1.67 V	227	42.7	13.6
7	15540.00	42.7 AV	54.0	-11.3	1.67 V	227	29.1	13.6

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.

Channel	TX Channel 40	Detector Function	Peak (PK)
Frequency Range	1GHz ~ 40GHz		Average (AV)

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	5150.00	60.6 PK	74.0	-13.4	1.67 H	321	57.6	3.0
2	5150.00	45.6 AV	54.0	-8.4	1.67 H	321	42.6	3.0
3	*5200.00	108.5 PK			1.67 H	321	105.6	2.9
4	*5200.00	97.4 AV			1.67 H	321	94.5	2.9
5	#10400.00	52.4 PK	68.2	-15.8	1.54 H	284	39.1	13.3
6	15600.00	55.5 PK	74.0	-18.5	1.71 H	185	41.6	13.9
7	15600.00	41.7 AV	54.0	-12.3	1.71 H	185	27.8	13.9

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	5150.00	70.7 PK	74.0	-3.3	1.85 V	93	67.7	3.0
2	5150.00	52.3 AV	54.0	-1.7	1.85 V	93	49.3	3.0
3	*5200.00	118.1 PK			1.85 V	93	115.2	2.9
4	*5200.00	108.2 AV			1.85 V	93	105.3	2.9
5	#10400.00	50.2 PK	68.2	-18.0	1.90 V	97	36.9	13.3
6	15600.00	55.8 PK	74.0	-18.2	1.67 V	233	41.9	13.9
7	15600.00	42.5 AV	54.0	-11.5	1.67 V	233	28.6	13.9

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.
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

Channel	TX Channel 48	Detector Function	Peak (PK)
Frequency Range	1GHz ~ 40GHz		Average (AV)

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	5039.97	48.6 PK	74.0	-25.4	1.59 H	333	45.4	3.2
2	5039.97	37.9 AV	54.0	-16.1	1.59 H	333	34.7	3.2
3	*5240.00	107.9 PK			1.59 H	333	105.0	2.9
4	*5240.00	97.1 AV			1.59 H	333	94.2	2.9
5	#10480.00	52.4 PK	68.2	-15.8	1.64 H	261	38.9	13.5
6	15720.00	55.1 PK	74.0	-18.9	1.80 H	199	41.7	13.4
7	15720.00	41.2 AV	54.0	-12.8	1.80 H	199	27.8	13.4

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	5039.89	50.0 PK	74.0	-24.0	1.90 V	89	46.8	3.2
2	5039.89	41.3 AV	54.0	-12.7	1.90 V	89	38.1	3.2
3	*5240.00	117.8 PK			1.90 V	89	114.9	2.9
4	*5240.00	108.0 AV			1.90 V	89	105.1	2.9
5	#10480.00	50.4 PK	68.2	-17.8	1.83 V	99	36.9	13.5
6	15720.00	56.6 PK	74.0	-17.4	1.65 V	230	43.2	13.4
7	15720.00	43.0 AV	54.0	-11.0	1.65 V	230	29.6	13.4

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.

Channel	TX Channel 52	Detector Function	Peak (PK)
Frequency Range	1GHz ~ 40GHz		Average (AV)

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	5040.00	49.1 PK	74.0	-24.9	2.22 H	352	45.9	3.2
2	5040.00	38.2 AV	54.0	-15.8	2.22 H	352	35.0	3.2
3	*5260.00	109.1 PK			2.22 H	352	106.3	2.8
4	*5260.00	99.2 AV			2.22 H	352	96.4	2.8
5	#10520.00	52.2 PK	68.2	-16.0	1.53 H	271	38.6	13.6
6	15780.00	55.7 PK	74.0	-18.3	1.78 H	171	42.6	13.1
7	15780.00	42.0 AV	54.0	-12.0	1.78 H	171	28.9	13.1

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	5040.00	49.9 PK	74.0	-24.1	1.91 V	95	46.7	3.2
2	5040.00	41.5 AV	54.0	-12.5	1.91 V	95	38.3	3.2
3	*5260.00	115.9 PK			1.91 V	95	113.1	2.8
4	*5260.00	106.2 AV			1.91 V	95	103.4	2.8
5	#10520.00	50.3 PK	68.2	-17.9	1.87 V	115	36.7	13.6
6	15780.00	55.7 PK	74.0	-18.3	1.72 V	243	42.6	13.1
7	15780.00	42.3 AV	54.0	-11.7	1.72 V	243	29.2	13.1

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.

Channel	TX Channel 60	Detector Function	Peak (PK)
Frequency Range	1GHz ~ 40GHz		Average (AV)

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	109.4 PK			2.16 H	351	106.5	2.9
2	*5300.00	99.6 AV			2.16 H	351	96.7	2.9
3	10600.00	52.8 PK	74.0	-21.2	1.60 H	264	39.6	13.2
4	10600.00	40.5 AV	54.0	-13.5	1.60 H	264	27.3	13.2
5	15900.00	55.2 PK	74.0	-18.8	1.70 H	195	42.1	13.1
6	15900.00	41.4 AV	54.0	-12.6	1.70 H	195	28.3	13.1
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	115.8 PK			1.90 V	110	112.9	2.9
2	*5300.00	106.1 AV			1.90 V	110	103.2	2.9
3	10600.00	49.9 PK	74.0	-24.1	1.86 V	104	36.7	13.2
4	10600.00	36.9 AV	54.0	-17.1	1.86 V	104	23.7	13.2
5	15900.00	56.4 PK	74.0	-17.6	1.63 V	235	43.3	13.1
6	15900.00	42.5 AV	54.0	-11.5	1.63 V	235	29.4	13.1

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.

Channel	TX Channel 64	Detector Function	Peak (PK)
Frequency Range	1GHz ~ 40GHz		Average (AV)

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	*5320.00	109.5 PK			2.24 H	355	106.6	2.9
2	*5320.00	99.4 AV			2.24 H	355	96.5	2.9
3	5350.00	60.7 PK	74.0	-13.3	2.24 H	355	57.7	3.0
4	5350.00	47.9 AV	54.0	-6.1	2.24 H	355	44.9	3.0
5	10640.00	52.2 PK	74.0	-21.8	1.64 H	284	38.9	13.3
6	10640.00	40.1 AV	54.0	-13.9	1.64 H	284	26.8	13.3
7	15960.00	55.6 PK	74.0	-18.4	1.78 H	203	42.2	13.4
8	15960.00	41.8 AV	54.0	-12.2	1.78 H	203	28.4	13.4
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	*5320.00	116.8 PK			1.89 V	101	113.9	2.9
2	*5320.00	106.6 AV			1.89 V	101	103.7	2.9
3	5350.00	61.2 PK	74.0	-12.8	1.89 V	101	58.2	3.0
4	5350.00	49.2 AV	54.0	-4.8	1.89 V	101	46.2	3.0
5	10640.00	50.6 PK	74.0	-23.4	1.92 V	126	37.3	13.3
6	10640.00	37.4 AV	54.0	-16.6	1.92 V	126	24.1	13.3
7	15960.00	56.5 PK	74.0	-17.5	1.71 V	240	43.1	13.4
8	15960.00	43.1 AV	54.0	-10.9	1.71 V	240	29.7	13.4

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.

Channel	TX Channel 149	Detector Function	Peak (PK)
Frequency Range	1GHz ~ 40GHz		Average (AV)

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	#5626.57	50.1 PK	68.2	-18.1	1.28 H	3	46.7	3.4
2	*5745.00	105.8 PK			1.28 H	3	102.0	3.8
3	*5745.00	94.8 AV			1.28 H	3	91.0	3.8
4	#5984.91	50.4 PK	68.2	-17.8	1.28 H	3	46.3	4.1
5	11490.00	52.9 PK	74.0	-21.1	1.62 H	271	38.9	14.0
6	11490.00	40.5 AV	54.0	-13.5	1.62 H	271	26.5	14.0
7	#17235.00	54.9 PK	68.2	-13.3	1.75 H	196	38.4	16.5

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	#5592.42	49.7 PK	68.2	-18.5	2.49 V	177	46.3	3.4
2	*5745.00	118.4 PK			2.49 V	177	114.6	3.8
3	*5745.00	108.2 AV			2.49 V	177	104.4	3.8
4	#5937.57	52.5 PK	68.2	-15.7	2.49 V	177	48.5	4.0
5	11490.00	50.3 PK	74.0	-23.7	1.92 V	107	36.3	14.0
6	11490.00	37.3 AV	54.0	-16.7	1.92 V	107	23.3	14.0
7	#17235.00	56.0 PK	68.2	-12.2	1.61 V	226	39.5	16.5

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.
6. " # ": The radiated frequency is out of the restricted band.

Channel	TX Channel 157	Detector Function	Peak (PK)
Frequency Range	1GHz ~ 40GHz		Average (AV)

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	#5596.82	49.7 PK	68.2	-18.5	1.28 H	4	46.3	3.4
2	*5785.00	106.1 PK			1.28 H	4	102.2	3.9
3	*5785.00	95.4 AV			1.28 H	4	91.5	3.9
4	#5961.75	49.8 PK	68.2	-18.4	1.28 H	4	45.7	4.1
5	11570.00	52.7 PK	74.0	-21.3	1.63 H	266	39.1	13.6
6	11570.00	40.6 AV	54.0	-13.4	1.63 H	266	27.0	13.6
7	#17355.00	56.0 PK	68.2	-12.2	1.77 H	176	39.0	17.0

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	#5624.70	51.0 PK	68.2	-17.2	2.50 V	175	47.6	3.4
2	*5785.00	119.2 PK			2.50 V	175	115.3	3.9
3	*5785.00	108.3 AV			2.50 V	175	104.4	3.9
4	#5930.51	51.0 PK	68.2	-17.2	2.50 V	175	47.0	4.0
5	11570.00	50.4 PK	74.0	-23.6	1.83 V	100	36.8	13.6
6	11570.00	37.0 AV	54.0	-17.0	1.83 V	100	23.4	13.6
7	#17355.00	56.6 PK	68.2	-11.6	1.71 V	233	39.6	17.0

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.

Channel	TX Channel 165	Detector Function	Peak (PK)
Frequency Range	1GHz ~ 40GHz		Average (AV)

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	#5607.76	50.2 PK	68.2	-18.0	1.36 H	2	46.8	3.4
2	*5825.00	104.9 PK			1.36 H	2	100.8	4.1
3	*5825.00	95.3 AV			1.36 H	2	91.2	4.1
4	#6006.47	50.8 PK	68.2	-17.4	1.36 H	2	46.7	4.1
5	11650.00	52.6 PK	74.0	-21.4	1.60 H	265	39.1	13.5
6	11650.00	40.7 AV	54.0	-13.3	1.60 H	265	27.2	13.5
7	#17475.00	55.3 PK	68.2	-12.9	1.73 H	184	36.7	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	#5614.55	50.1 PK	68.2	-18.1	1.94 V	176	46.7	3.4
2	*5825.00	118.3 PK			1.94 V	176	114.2	4.1
3	*5825.00	107.9 AV			1.94 V	176	103.8	4.1
4	#5925.39	51.7 PK	68.2	-16.5	1.94 V	176	47.8	3.9
5	11650.00	51.0 PK	74.0	-23.0	1.82 V	114	37.5	13.5
6	11650.00	37.7 AV	54.0	-16.3	1.82 V	114	24.2	13.5
7	#17475.00	56.8 PK	68.2	-11.4	1.69 V	214	38.2	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.

802.11ac (VHT40)

Channel	TX Channel 102	Detector Function	Peak (PK)
Frequency Range	1GHz ~ 40GHz		Average (AV)

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	5460.00	50.0 PK	74.0	-24.0	2.27 H	355	46.8	3.2
2	5460.00	39.4 AV	54.0	-14.6	2.27 H	355	36.2	3.2
3	#5468.79	51.1 PK	68.2	-17.1	2.27 H	355	47.9	3.2
4	*5510.00	100.0 PK			2.27 H	355	96.8	3.2
5	*5510.00	90.3 AV			2.27 H	355	87.1	3.2
6	11020.00	52.0 PK	74.0	-22.0	1.63 H	277	38.2	13.8
7	11020.00	40.3 AV	54.0	-13.7	1.63 H	277	26.5	13.8
8	#16530.00	56.0 PK	68.2	-12.2	1.75 H	188	40.3	15.7
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	5460.00	62.5 PK	74.0	-11.5	1.82 V	277	59.3	3.2
2	5460.00	48.6 AV	54.0	-5.4	1.82 V	277	45.4	3.2
3	#5460.39	62.8 PK	68.2	-5.4	1.82 V	277	59.6	3.2
4	*5510.00	110.4 PK			1.82 V	277	107.2	3.2
5	*5510.00	100.6 AV			1.82 V	277	97.4	3.2
6	11020.00	50.1 PK	74.0	-23.9	1.84 V	116	36.3	13.8
7	11020.00	37.2 AV	54.0	-16.8	1.84 V	116	23.4	13.8
8	#16530.00	56.6 PK	68.2	-11.6	1.66 V	238	40.9	15.7

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.

Channel	TX Channel 110	Detector Function	Peak (PK)
Frequency Range	1GHz ~ 40GHz		Average (AV)

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	*5550.00	104.5 PK			2.29 H	340	101.2	3.3
2	*5550.00	94.1 AV			2.29 H	340	90.8	3.3
3	11100.00	52.6 PK	74.0	-21.4	1.59 H	266	39.3	13.3
4	11100.00	40.4 AV	54.0	-13.6	1.59 H	266	27.1	13.3
5	#16650.00	55.5 PK	68.2	-12.7	1.75 H	172	38.9	16.6
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	*5550.00	114.7 PK			1.86 V	266	111.4	3.3
2	*5550.00	104.3 AV			1.86 V	266	101.0	3.3
3	11100.00	50.4 PK	74.0	-23.6	1.88 V	101	37.1	13.3
4	11100.00	37.5 AV	54.0	-16.5	1.88 V	101	24.2	13.3
5	#16650.00	56.2 PK	68.2	-12.0	1.71 V	235	39.6	16.6

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.

Channel	TX Channel 134	Detector Function	Peak (PK)
Frequency Range	1GHz ~ 40GHz		Average (AV)

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	*5670.00	101.3 PK			2.26 H	357	97.7	3.6
2	*5670.00	91.7 AV			2.26 H	357	88.1	3.6
3	#5725.00	58.7 PK	68.2	-9.5	2.26 H	357	54.9	3.8
4	11340.00	52.6 PK	74.0	-21.4	1.59 H	267	38.5	14.1
5	11340.00	40.4 AV	54.0	-13.6	1.59 H	267	26.3	14.1
6	#17010.00	54.6 PK	68.2	-13.6	1.67 H	172	36.8	17.8

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	*5670.00	112.3 PK			1.84 V	278	108.7	3.6
2	*5670.00	102.7 AV			1.84 V	278	99.1	3.6
3	#5725.00	64.3 PK	68.2	-3.9	1.84 V	278	60.5	3.8
4	11340.00	49.7 PK	74.0	-24.3	1.90 V	120	35.6	14.1
5	11340.00	36.7 AV	54.0	-17.3	1.90 V	120	22.6	14.1
6	#17010.00	55.7 PK	68.2	-12.5	1.66 V	215	37.9	17.8

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:

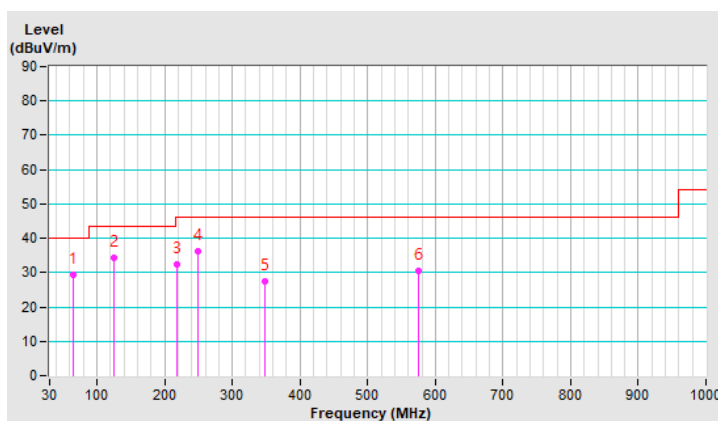
802.11ac (VHT20)

Channel	TX Channel 40	Detector Function	Quasi-Peak (QP)
Frequency Range	9kHz ~ 1GHz		

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	64.43	29.5 QP	40.0	-10.5	2.00 H	134	38.5	-9.0
2	125.00	34.2 QP	43.5	-9.3	3.00 H	135	43.4	-9.2
3	217.81	32.4 QP	46.0	-13.6	1.50 H	141	43.1	-10.7
4	250.01	36.1 QP	46.0	-9.9	1.00 H	164	44.6	-8.5
5	347.73	27.4 QP	46.0	-18.6	1.50 H	214	32.8	-5.4
6	574.54	30.5 QP	46.0	-15.5	1.50 H	245	30.0	0.5

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 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.

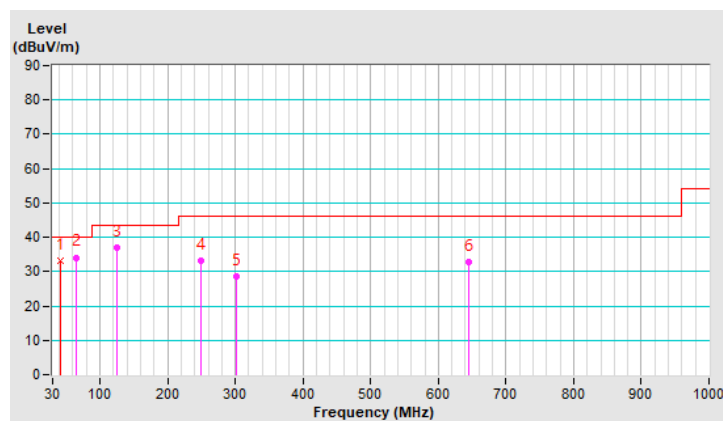


Channel	TX Channel 40	Detector Function	Quasi-Peak (QP)
Frequency Range	9kHz ~ 1GHz		

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	41.57	33.1 QP	40.0	-6.9	1.00 V	141	41.4	-8.3
2	65.34	34.1 QP	40.0	-5.9	1.00 V	187	43.4	-9.3
3	125.00	37.0 QP	43.5	-6.5	1.00 V	154	46.2	-9.2
4	250.02	33.2 QP	46.0	-12.8	1.50 V	184	41.7	-8.5
5	302.15	28.5 QP	46.0	-17.5	1.00 V	289	34.9	-6.4
6	644.11	32.7 QP	46.0	-13.3	1.50 V	221	30.4	2.3

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 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	Oct. 23, 2019	Oct. 22, 2020
Line-Impedance Stabilization Network (for EUT) R&S	ESH3-Z5	848773/004	Oct. 23, 2019	Oct. 22, 2020
Line-Impedance Stabilization Network (for Peripheral) R&S	ESH3-Z5	835239/001	Mar. 19, 2020	Mar. 18, 2021
50 ohms Terminator	50	3	Oct. 23, 2019	Oct. 22, 2020
RF Cable	5D-FB	COCCAB-001	Sep. 27, 2019	Sep. 26, 2020
Fixed attenuator EMCI	STI02-2200-10	005	Aug. 30, 2019	Aug. 29, 2020
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: July 20, 2020

4.2.3 Test Procedure

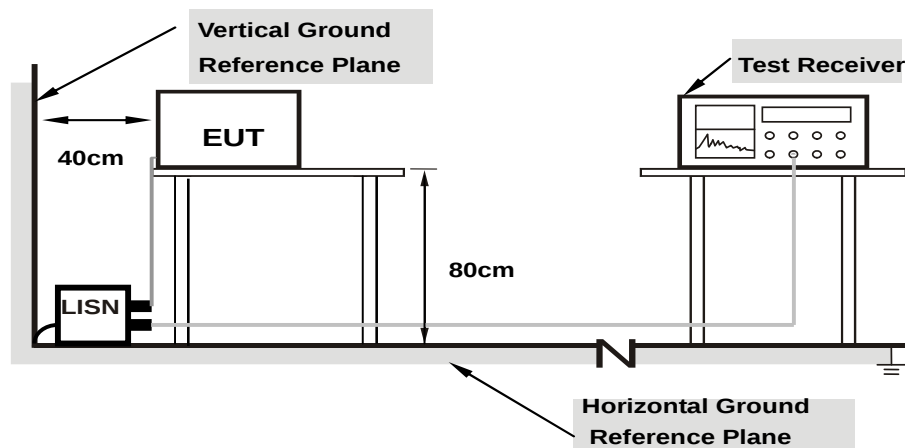
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- 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.

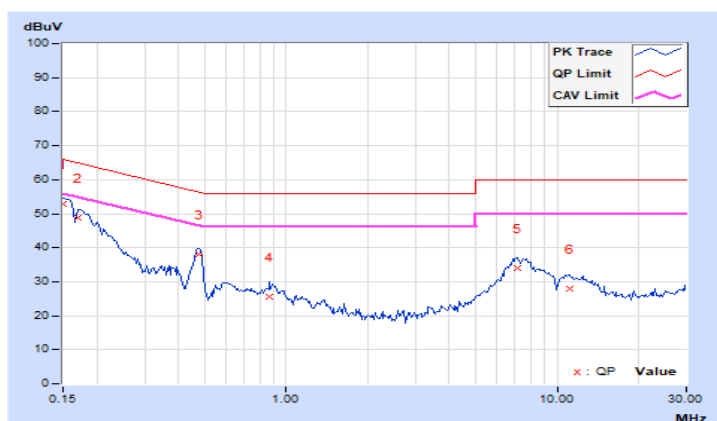
4.2.7 Test Results

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
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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	0.15016	9.98	42.82	26.24	52.80	36.22	65.99	55.99	-13.19	-19.77
2	0.16977	9.98	38.84	21.38	48.82	31.36	64.97	54.97	-16.15	-23.61
3	0.47415	10.01	28.11	20.83	38.12	30.84	56.44	46.44	-18.32	-15.60
4	0.86878	10.04	15.57	11.61	25.61	21.65	56.00	46.00	-30.39	-24.35
5	7.09771	10.48	23.38	17.58	33.86	28.06	60.00	50.00	-26.14	-21.94
6	11.20324	10.76	17.15	10.17	27.91	20.93	60.00	50.00	-32.09	-29.07

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

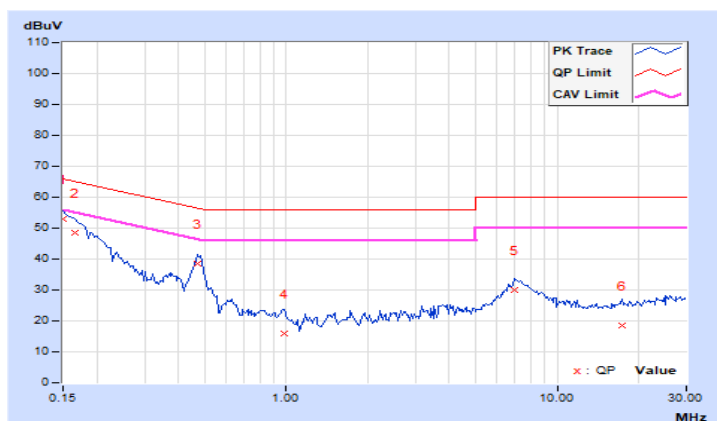


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
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Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBUV)		Emission Level (dBUV)		Limit (dBUV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15022	9.99	43.08	25.87	53.07	35.86	65.99	55.99	-12.92	-20.13
2	0.16561	9.99	38.57	20.22	48.56	30.21	65.18	55.18	-16.62	-24.97
3	0.47035	10.04	28.51	24.26	38.55	34.30	56.51	46.51	-17.96	-12.21
4	0.97822	10.09	5.95	1.68	16.04	11.77	56.00	46.00	-39.96	-34.23
5	6.95719	10.43	19.68	14.47	30.11	24.90	60.00	50.00	-29.89	-25.10
6	17.32432	10.99	7.37	1.97	18.36	12.96	60.00	50.00	-41.64	-37.04

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 $\leq$ 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,

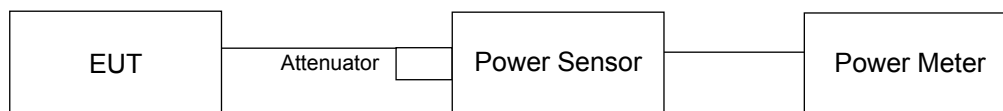
Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$;

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



4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.4 Test Procedure

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

4.3.5 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

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	19.91	20.25	203.874	23.09	30.00	PASS
40	5200	24.32	24.17	531.612	27.26	30.00	PASS
48	5240	22.64	22.32	354.262	25.49	30.00	PASS
52	5260	20.62	20.42	225.499	23.53	24.00	PASS
60	5300	20.65	20.56	229.908	23.62	24.00	PASS
64	5320	20.62	20.44	226.008	23.54	24.00	PASS
149	5745	23.27	24.03	465.254	26.68	30.00	PASS
157	5785	22.96	23.57	425.207	26.29	30.00	PASS
165	5825	23.66	22.93	428.61	26.32	30.00	PASS

802.11ac (VHT40)

Chan.	Chan. Freq. (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
102	5510	16.56	17.37	99.866	19.99	24.00	PASS
110	5550	20.52	20.73	231.024	23.64	24.00	PASS
134	5670	18.75	18.56	146.769	21.67	24.00	PASS

5 Pictures of Test Arrangements

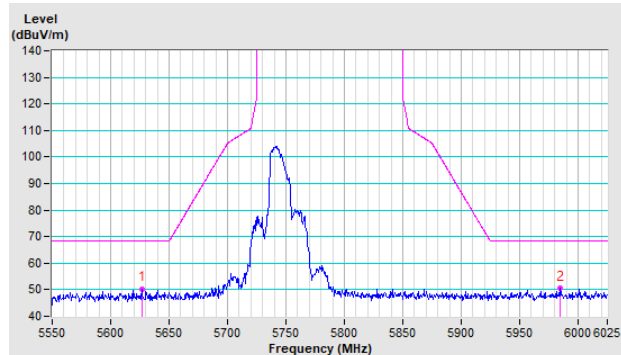
Please refer to the attached file (Test Setup Photo).

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

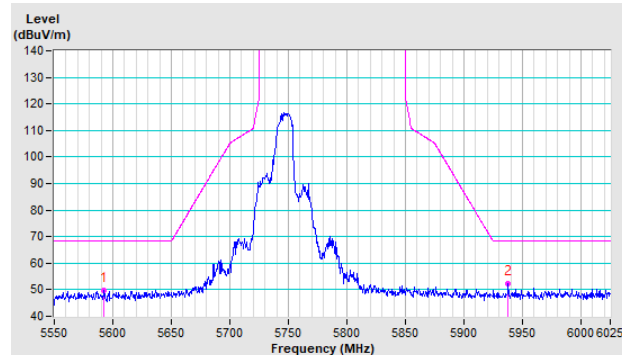
802.11ac (VHT20)

CH 149 5745 MHz

Horizontal

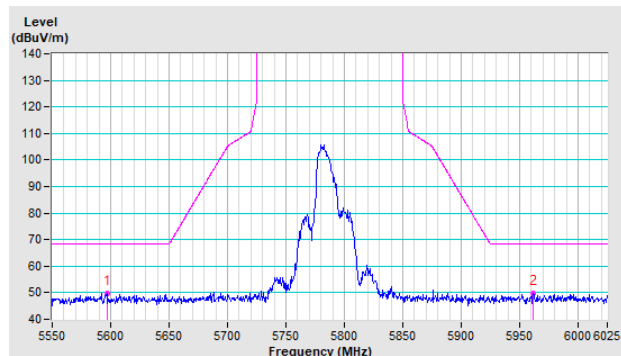


Vertical

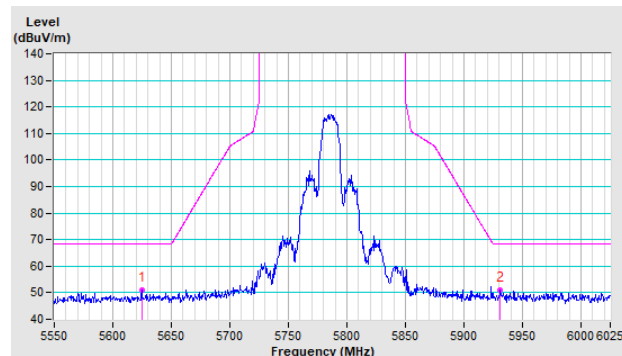


CH 157 5785 MHz

Horizontal

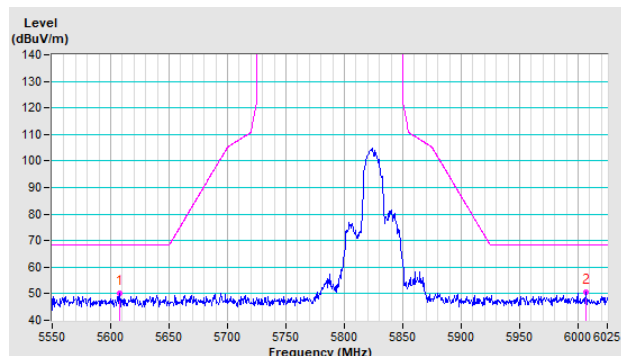


Vertical

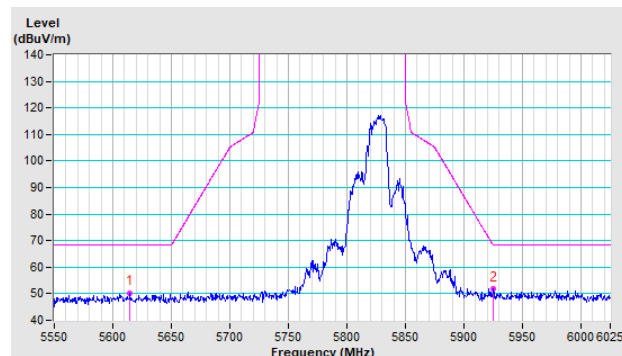


CH 165 5825 MHz

Horizontal

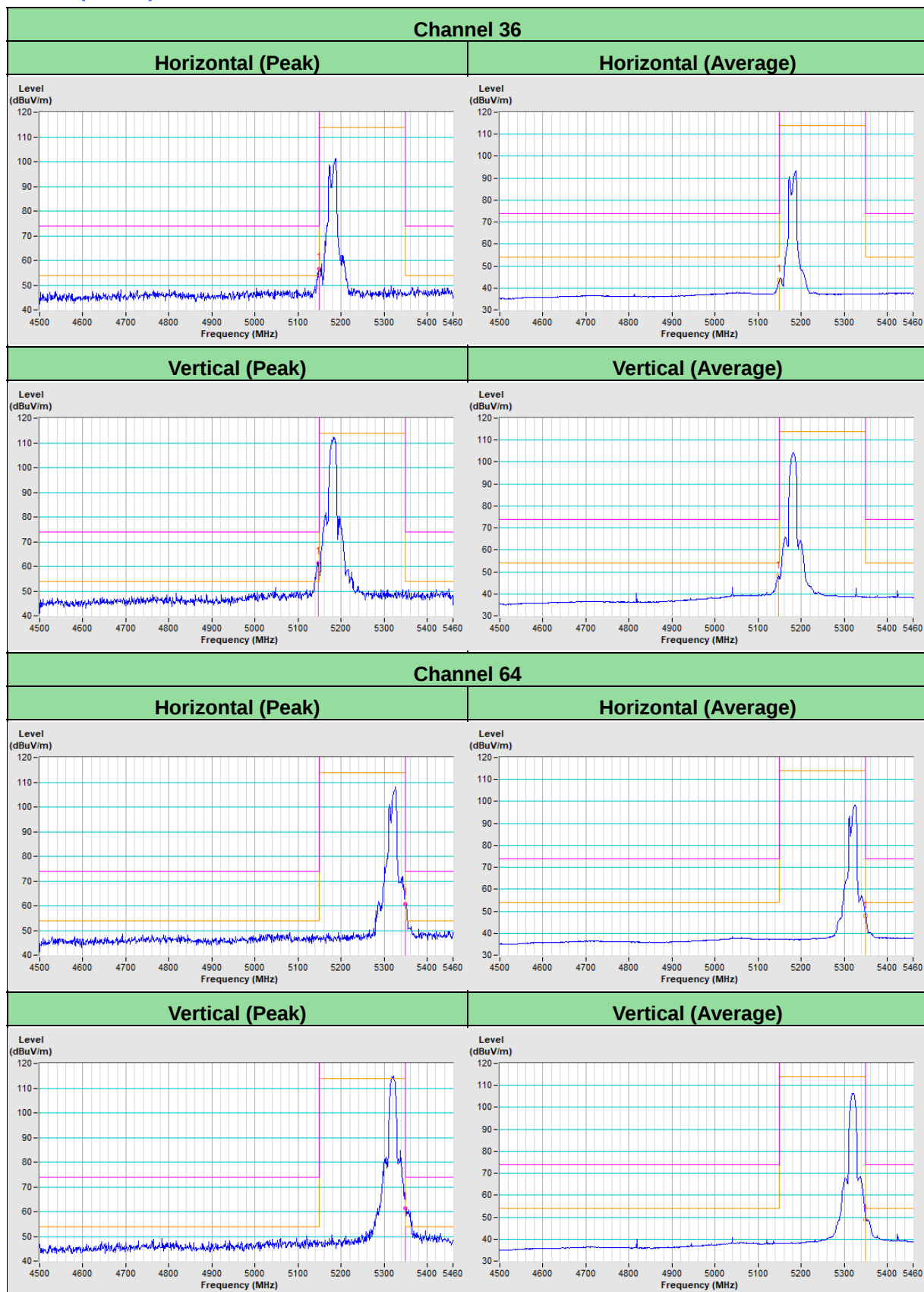


Vertical

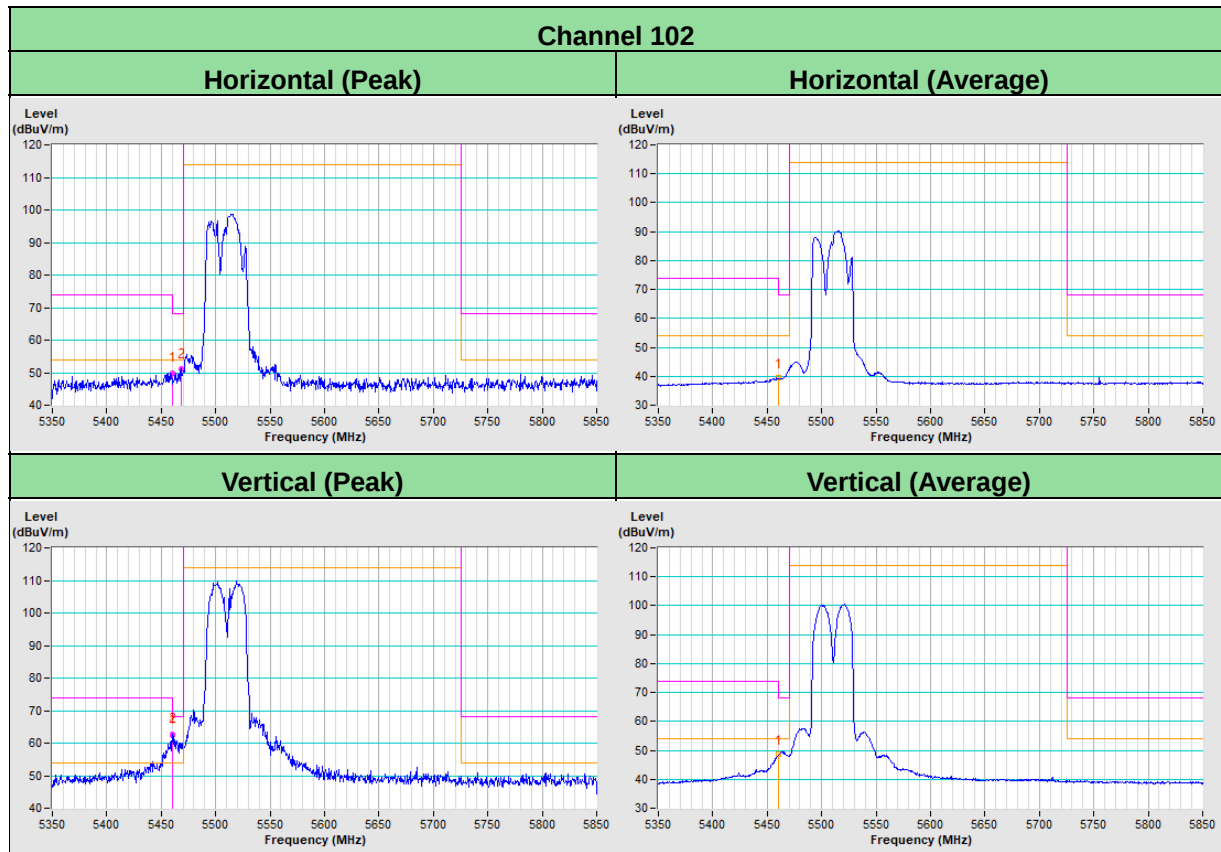


Annex B - Band-Edge Measurement (For U-NII-1, U-NII-2A, U-NII-2C band)

802.11ac (VHT20)



802.11ac (VHT40)



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:

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Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab

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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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