Supplemental “Transmit Simultaneously” Test Report

Report No.:	RFBCKS-WTW-P21123397-4
FCC ID:	2AAAS-BB02
Test Model:	BB02
Received Date:	2021/12/10
Test Date:	2021/12/17 ~ 2021/12/30
Issued Date:	2022/6/30
Applicant:	Vivint. Inc.
Address:	4931 N. 300 W. Provo, UT 84604 USA
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

Table of Contents

Release Control Record 3

1 Certificate of Conformity 4

2 Summary of Test Results 5

2.1 Measurement Uncertainty 5
2.2 Modification Record 5

3 General Information 6

3.1 General Description of EUT 6
3.1.1 Test Mode Applicability and Tested Channel Detail 9
3.2 Description of Support Units 12
3.2.1 Configuration of System under Test 13

4 Test Types and Results 14

4.1 Radiated Emission and Bandedge Measurement 14
4.1.1 Limits of Radiated Emission and Bandedge Measurement 14
4.1.2 Test Instruments 15
4.1.3 Test Procedures 17
4.1.4 Deviation from Test Standard 17
4.1.5 Test Setup 18
4.1.6 EUT Operating Conditions 19
4.1.7 Test Results (Mode 1) 20
4.1.8 Test Results (Mode 2) 23
4.2 Conducted Emission Measurement 26
4.2.1 Limits of Conducted Emission Measurement 26
4.2.2 Test Instruments 26
4.2.3 Test Procedures 27
4.2.4 Deviation from Test Standard 27
4.2.5 Test Setup 27
4.2.6 EUT Operating Conditions 27
4.2.7 Test Results (Mode 1) 28
4.2.8 Test Results (Mode 2) 30
4.3 Conducted Out of Band Emission Measurement 32
4.3.1 Limits of Conducted Out of Band Emission Measurement 32
4.3.2 Test Setup 32
4.3.3 Test Instruments 32
4.3.4 Test Procedures 32
4.3.5 Deviation from Test Standard 32
4.3.6 EUT Operating Conditions 32
4.3.7 Test Results 32

5 Pictures of Test Arrangements 34

Appendix – Information of the Testing Laboratories 35

Release Control Record

Issue No.	Description	Date Issued
RFBCKS-WTW-P21123397-4	Original release.	2022/6/30

1 Certificate of Conformity

Product:	Vivint Air Tower
Brand:	Vivint, Inc.
Test Model:	BB02
Sample Status:	Engineering sample
Applicant:	Vivint. Inc.
Test Date:	2021/12/17 ~ 2021/12/30
Standards:	47 CFR FCC Part 15, Subpart C (Section 15.247) 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 : Vivian Huang , **Date:** 2022/6/30

Vivian Huang / Specialist

Approved by : , **Date:** 2022/6/30

May Chen / Manager

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C, E (SECTION 15.247, 15.407)			
FCC Clause	Test Item	Result	Remarks
15.207 15.407(b)(8)	AC Power Conducted Emission	Pass	Meet the requirement of limit. Minimum passing margin is -4.64 dB at 0.45078 MHz.
15.205 / 15.209 / 15.247(d) 15.407(b) (1/2/3/4(i/ii)/8)	Radiated Emissions and Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -3.9 dB at 63.11 MHz.

Note:
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
Conducted emissions	-	2.5 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	Vivint Air Tower
Brand	Vivint, Inc.
Test Model	BB02
Status of EUT	Engineering sample
Power Supply Rating	12Vdc from power adapter
Modulation Type	**WLAN:** CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM 256QAM for OFDM in 11ac mode and VHT20/40 in 2.4GHz 1024QAM for OFDMA in 11ax HE mode **BT-EDR:** GFSK, π/4-DQPSK, 8DPSK **BT-LE:** GFSK
Modulation Technology	**WLAN:** DSSS, OFDM, OFDMA **BT-EDR:** FHSS **BT-LE:** DTS
Transfer Rate	**WLAN:** 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 802.11ax: up to 1201.0 Mbps **BT-EDR:** up to 3 Mbps **BT-LE:** up to 2 Mbps
Operating Frequency	**WLAN:** **2.4GHz:** 2.412 ~ 2.462 GHz **5GHz:** 5.18~5.32GHz, 5.50~5.72GHz, 5.745 ~ 5.825GHz **BT-EDR&BT-LE:** 2.402 ~ 2.480 GHz
Number of Channel	**WLAN:** **2.4GHz:** 802.11b, 802.11g, 802.11n (HT20), 802.11ax (HE20): 11 802.11n (HT40), VHT40, 802.11ax (HE40): 7 **5GHz:** 802.11a, 802.11n (HT20), 802.11ac (VHT20), 802.11ax (HE20): 25 802.11n (HT40), 802.11ac (VHT40), 802.11ax (HE40): 12 802.11ac (VHT80), 802.11ax (HE80): 6 **BT-EDR:** 79 **BT-LE:** 40
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	NA
Cable Supplied	NA

Note:

1. The EUT has below radios as following table:

Radio 1	Radio 2
WLAN (2.4GHz / 5GHz Low Band / 5GHz Scanning (only RX))	WLAN (5GHz High Band / 5GHz Scanning (only RX)) & Bluetooth

2. Simultaneously transmission condition.

Condition	Technology		
1	WLAN 2.4GHz	WLAN 5GHz (Low Band)	WLAN 5GHz (High Band)
2	WLAN 5GHz (Low Band)	WLAN 5GHz (High Band)	Bluetooth
Note: The emission of the simultaneous operation has been evaluated and no non-compliance was found.			

3. The EUT must be supplied with a power adapter and the following different models could be chosen:

No	Brand	Model No.	Spec.
1	HONOTO	ADS-24FUD-12 12024EPCU	AC Input : 100-240V, 50/60Hz, 0.6A DC Output : 12V, 2A DC Output Cable : Unshielded, 1.51m
2	ZB-Power	ZB-H120020A-88	AC Input : 100-240V, 50/60Hz, 0.6A DC Output : 12V, 2.0A DC output Cable : Unshielded, 1.51m
Note: From the above adapters, the worst radiated emission test (below 1GHz) and conducted emission test was found in **Model No.: ADS-24FUD-12 12024EPCU**. Therefore only the test data of the adapter were recorded in this report.			

4. The antenna information is listed as below.

Antenna No.	RF Chain No.	Model	Antenna Net Gain (dBi)	Frequency Range (GHz)	Antenna Type	Connector Type
5G1	0	WHVA1	4.5	5.15~5.35 (Scanning, RX only)	PIFA	None
5G2	1	WHVA1	4.5	5.47~5.85 (Scanning, RX only)	PIFA	None
ANT 2 (2a)	2G	48XKAB18	3.5	2.4~2.4835	Dipole	ipex(MHF)
	5GL		3.1	5.15~5.35		
ANT 2 (2b)	5GH	48XKAB18	3.6	5.47~5.85	Dipole	ipex(MHF)
ANT 3 (3a)	2G	48XKAB19	2.7	2.4~2.4835	Dipole	ipex(MHF)
	5GL		3.7	5.15~5.35		
ANT 3 (3b)	BT	48XKAB19	2.9	2.4~2.4835 (BT)	Dipole	ipex(MHF)
	5GH		3.5	5.47~5.85		

5. The EUT has below source items as following table:

Source Item	3.3V to 1.0V DC/DC converter	Package	PCB Board	E-CAP
G01(A)	AU1(RT5789BGJ8F)	SOT23	PCB A	Main Source
G01(B)	AU1(RT5789BGJ8F)	SOT23	PCB A	2nd Source
G02	AU1(RT5789BGJ8F)	SOT23	PCB B	2nd Source
G03	AU11 (JWH5276)	QFN	PCB B	2nd Source
Note: 1. PCB A(48WHVA11.SGD) and PCB B(48WHVA11.0GA) Layout different with Package, adding Colay-out for QFN. 2. From the above source Item, the worst radiated emission test (below 1GHz) was found in **G01(A)**. Therefore only the test data of the source Item were recorded in this report.				

6. The EUT incorporates a MIMO function:

Modulation Mode	2.4GHz Band	
	TX & RX Configuration	
802.11b	2TX	2RX
802.11g	2TX	2RX
802.11n (HT20)	2TX	2RX
802.11n (HT40)	2TX	2RX
VHT20	2TX	2RX
VHT40	2TX	2RX
802.11ax (HE20)	2TX	2RX
802.11ax (HE40)	2TX	2RX

Modulation Mode	5GHz Band (low band)		5GHz Band (high band)	
	TX & RX Configuration		TX & RX Configuration	
802.11a	2TX	2RX	2TX	2RX
802.11n (HT20)	2TX	2RX	2TX	2RX
802.11n (HT40)	2TX	2RX	2TX	2RX
802.11ac (VHT20)	2TX	2RX	2TX	2RX
802.11ac (VHT40)	2TX	2RX	2TX	2RX
802.11ac (VHT80)	2TX	2RX	2TX	2RX
802.11ax (HE20)	2TX	2RX	2TX	2RX
802.11ax (HE40)	2TX	2RX	2TX	2RX
802.11ax (HE80)	2TX	2RX	2TX	2RX

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

3.1.1 Test Mode Applicability and Tested Channel Detail

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

Where **RE≥1G:** Radiated Emission above 1GHz & Bandedge Measurement
RE<1G: Radiated Emission below 1GHz
PLC: Power Line Conducted Emission
OB: Conducted Out-Band Emission Measurement

Radiated Emission Test (Above 1GHz):

☒ The tested configurations represent the worst-case mode from all possible combinations by the maximum power.
☒ Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE
1	802.11g + 802.11a (Low Band) + 802.11a (High Band)	1 to 11	6	DSSS	DBPSK
		36 to 64 100 to 144 149 to 165	40	OFDM	BPSK
		36 to 64 100 to 144 149 to 165	149	OFDM	BPSK
2	802.11a (Low Band) + 802.11a (High Band) + BT-LE 2M	36 to 64 100 to 144 149 to 165	40	OFDM	BPSK
		36 to 64 100 to 144 149 to 165	149	OFDM	BPSK
		0 to 39	19	DTS	GFSK

Radiated Emission Test (Below 1GHz):

☒ The tested configurations represent the worst-case mode from all possible combinations by the maximum power.

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

EUT CONFIGURE MODE	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE
1	802.11g + 802.11a (Low Band) + 802.11a (High Band)	1 to 11	6	DSSS	DBPSK
		36 to 64 100 to 144 149 to 165	40	OFDM	BPSK
		36 to 64 100 to 144 149 to 165	149	OFDM	BPSK
2	802.11a (Low Band) + 802.11a (High Band) + BT-LE 2M	36 to 64 100 to 144 149 to 165	40	OFDM	BPSK
		36 to 64 100 to 144 149 to 165	149	OFDM	BPSK
		0 to 39	19	DTS	GFSK

Power Line Conducted Emission Test:

☒ The tested configurations represent the worst-case mode from all possible combinations by the maximum power.

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

EUT CONFIGURE MODE	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE
1	802.11g + 802.11a (Low Band) + 802.11a (High Band)	1 to 11	6	DSSS	DBPSK
		36 to 64 100 to 144 149 to 165	40	OFDM	BPSK
		36 to 64 100 to 144 149 to 165	149	OFDM	BPSK
2	802.11a (Low Band) + 802.11a (High Band) + BT-LE 2M	36 to 64 100 to 144 149 to 165	40	OFDM	BPSK
		36 to 64 100 to 144 149 to 165	149	OFDM	BPSK
		0 to 39	19	DTS	GFSK

Conducted Out-Band Emission Measurement:

☒ The tested configurations represent the worst-case mode from all possible combinations by the maximum power.

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

EUT CONFIGURE MODE	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE
1	802.11g + 802.11a (Low Band)	1 to 11	6	DSSS	DBPSK
		36 to 64 100 to 144 149 to 165	40	OFDM	BPSK
2	802.11a (High Band) + BT-LE 2M	36 to 64 100 to 144 149 to 165	149	OFDM	BPSK
		0 to 39	19	DTS	GFSK

Test Condition:

Applicable To	Environmental Conditions	Input Power	Tested By
RE≥1G	24deg. C, 67%RH	120Vac, 60Hz	Ryan Du
RE<1G	24deg. C, 69%RH	120Vac, 60Hz	Sampson Chen
PLC	24deg. C, 66%RH	120Vac, 60Hz	Sampson Chen
OB	25deg. C, 60%RH	120Vac, 60Hz	Leon Dai

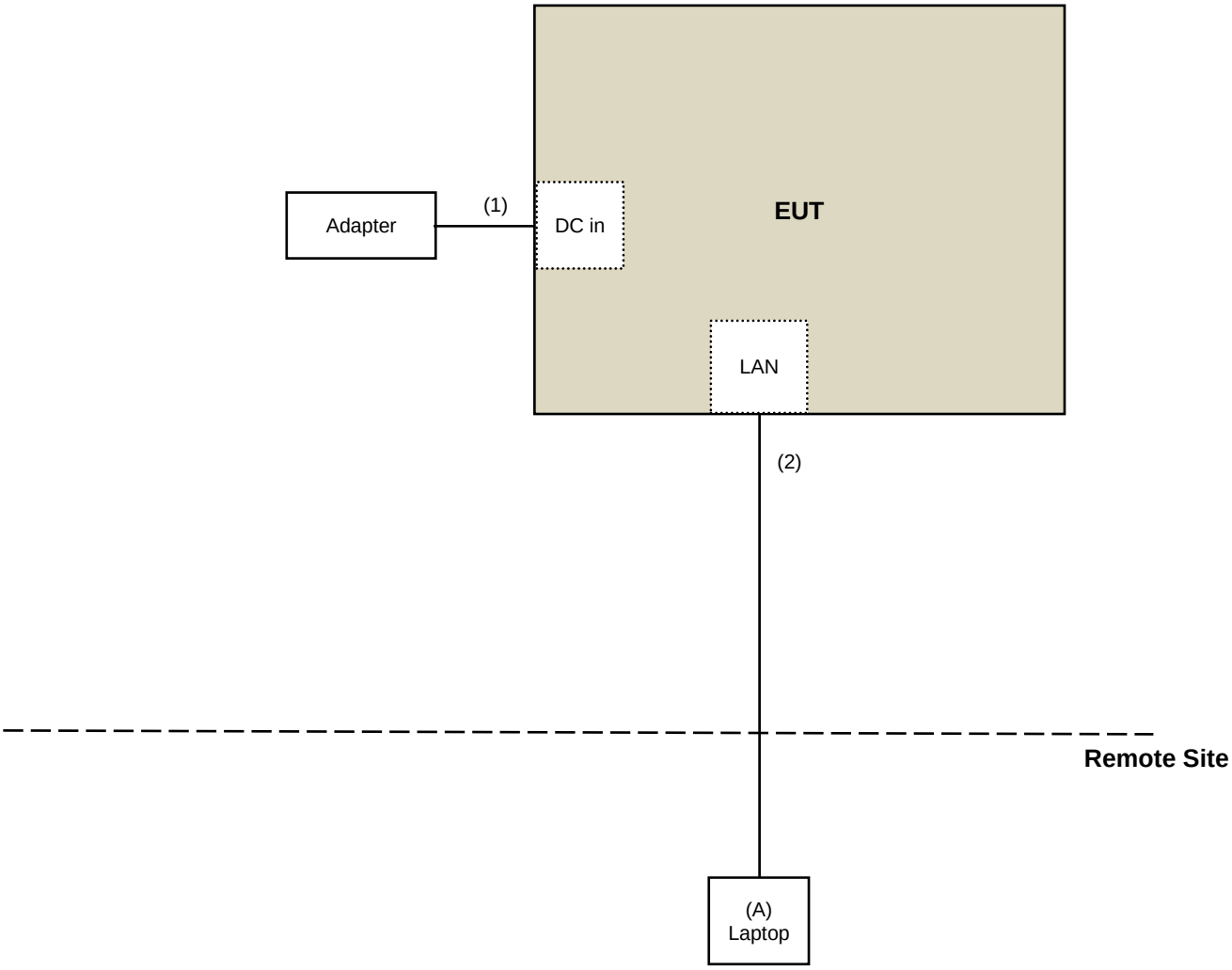
3.2 Description of Support Units

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	E5520	8Y4DMQ1	N/A	Provided by Lab

ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1	DC Cable	1	1.51	No	0	Supplied by applicant
2	RJ-45 Cable	1	10	No	0	Provided by Lab

3.2.1 Configuration of System under Test



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
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 test:

Description & Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Spectrum Analyzer KEYSIGHT	N9030B	MY57142938	2021/4/26	2022/4/25
Test Receiver KEYSIGHT	N9038A	MY59050100	2021/5/3	2022/5/2
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	2021/5/24	2022/5/23
Loop Antenna TESEQ	HLA 6121	45745	2021/7/21	2022/7/20
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	2021/10/19	2022/10/18
Trilog Broadband Antenna Schwarzbeck	VULB 9168	9168-361	2021/10/26	2022/10/25
RF Coaxial Cable COMMATE/PEWC	8D	966-3-1	2021/3/16	2022/3/15
RF Coaxial Cable COMMATE/PEWC	8D	966-3-2	2021/3/16	2022/3/15
RF Coaxial Cable COMMATE/PEWC	8D	966-3-3	2021/3/16	2022/3/15
Fixed attenuator Mini-Circuits	UNAT-5+	PAD-3m-3-01	2021/9/23	2022/9/22
Horn Antenna Schwarzbeck	BBHA9120-D	9120D-406	2021/11/14	2022/11/13
Pre_Amplifier EMCI	EMC12630SE	980384	2021/1/11	2022/1/10
RF Coaxial Cable EMCI	EMC104-SM-SM-1500	180504	2021/4/26	2022/4/25
RF Coaxial Cable EMCI	EMC104-SM-SM-2000	180601	2021/6/8	2022/6/7
RF Cable EMCI	EMC104-SM-SM-6000	210201	2021/5/13	2022/5/12
Fix tool for Boresight antenna tower BV	FBA-01	FBA_SIP01	NA	NA
Spectrum Analyzer Keysight	N9030A	MY54490679	2021/7/9	2022/7/8
Pre_Amplifier EMCI	EMC184045SE	980387	2021/1/11	2022/1/10
Horn Antenna Schwarzbeck	BBHA 9170	BBHA9170519	2021/11/14	2022/11/13
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	2021/3/10	2022/3/9

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: 2021/12/17~ 2021/12/30

For other test items:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Spectrum Analyzer R&S	FSV40	101516	2021/3/8	2022/3/7
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: 2021/12/29

4.1.3 Test Procedures

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 detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

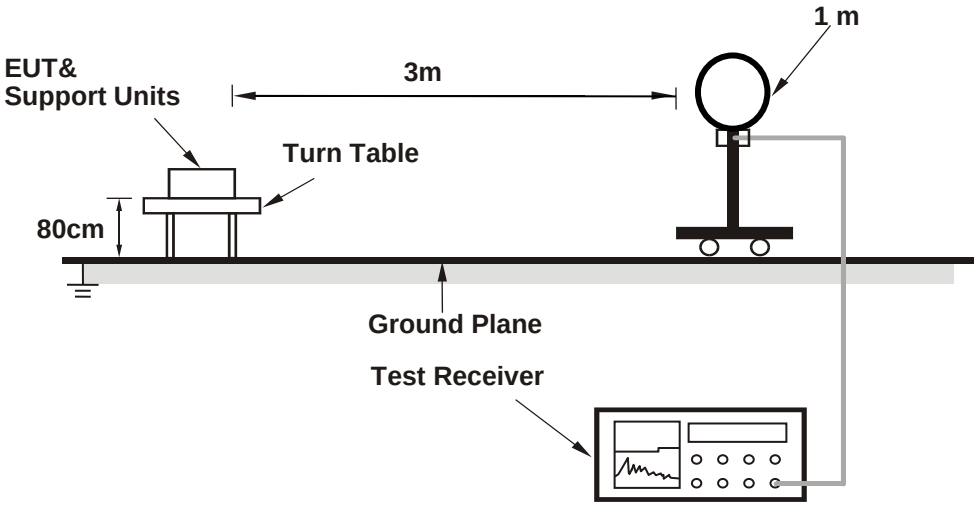
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is ≥ 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

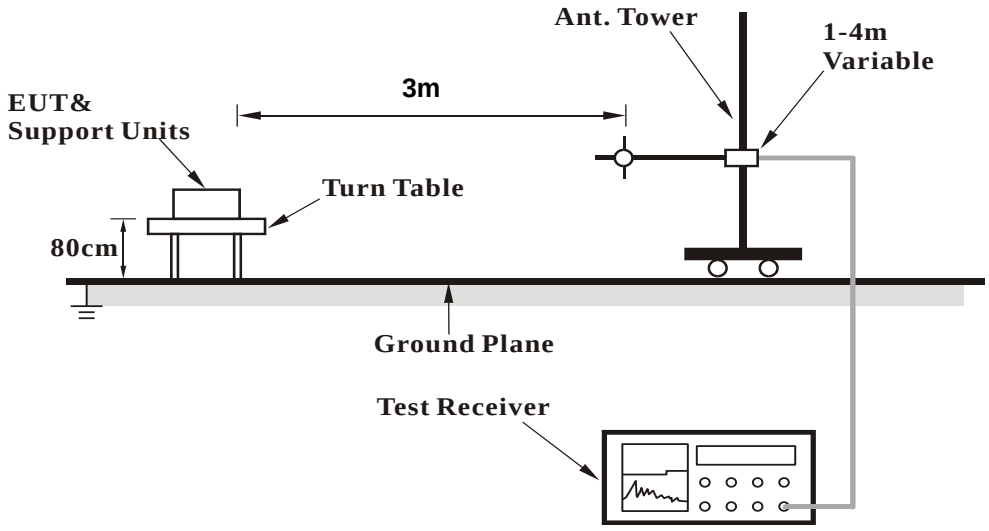
No deviation.

4.1.5 Test Setup

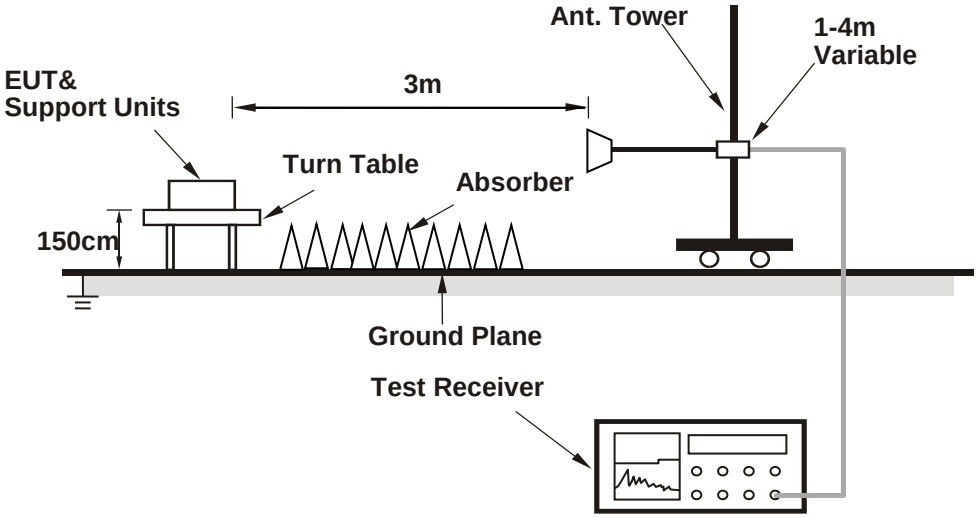
For Radiated emission below 30MHz



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 Conditions

a. Placed the EUT on the testing table.
b. Controlling software (Wi-Fi: package_UIv2.13_DLLv5.11_20191004-alpha-RSSI -DFS; BT/BLE: [2.2036.00]WCN Combo Tool for customer) has been activated to set the EUT under transmission condition continuously at specific channel frequency.

4.1.7 Test Results (Mode 1)

Above 1GHz Data:

Frequency Range	1GHz ~ 40GHz	**Detector Function**	Peak (PK) 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	4874.00	50.9 PK	74.0	-23.1	1.09 H	297	47.2	3.7
2	4874.00	36.7 AV	54.0	-17.3	1.09 H	297	33.0	3.7
3	7311.00	58.4 PK	74.0	-15.6	1.06 H	343	48.7	9.7
4	7311.00	44.7 AV	54.0	-9.3	1.06 H	343	35.0	9.7
5	#10400.00	45.9 PK	68.2	-22.3	1.62 H	137	32.2	13.7
6	11490.00	47.8 PK	74.0	-26.2	1.54 H	173	33.0	14.8
7	11490.00	37.5 AV	54.0	-16.5	1.54 H	173	22.7	14.8
8	15600.00	55.8 PK	74.0	-18.2	1.50 H	56	41.8	14.0
9	15600.00	43.3 AV	54.0	-10.7	1.50 H	56	29.3	14.0
10	#17235.00	54.7 PK	68.2	-13.5	1.66 H	346	36.5	18.2
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	4874.00	41.3 PK	74.0	-32.7	3.31 V	324	37.6	3.7
2	4874.00	29.7 AV	54.0	-24.3	3.31 V	324	26.0	3.7
3	7311.00	55.2 PK	74.0	-18.8	2.74 V	52	45.5	9.7
4	7311.00	41.7 AV	54.0	-12.3	2.74 V	52	32.0	9.7
5	#10400.00	46.8 PK	68.2	-21.4	1.64 V	63	33.1	13.7
6	11490.00	47.5 PK	74.0	-26.5	2.48 V	294	32.7	14.8
7	11490.00	37.4 AV	54.0	-16.6	2.48 V	294	22.6	14.8
8	15600.00	56.5 PK	74.0	-17.5	1.60 V	92	42.5	14.0
9	15600.00	44.3 AV	54.0	-9.7	1.60 V	92	30.3	14.0
10	#17235.00	56.8 PK	68.2	-11.4	1.53 V	347	38.6	18.2

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

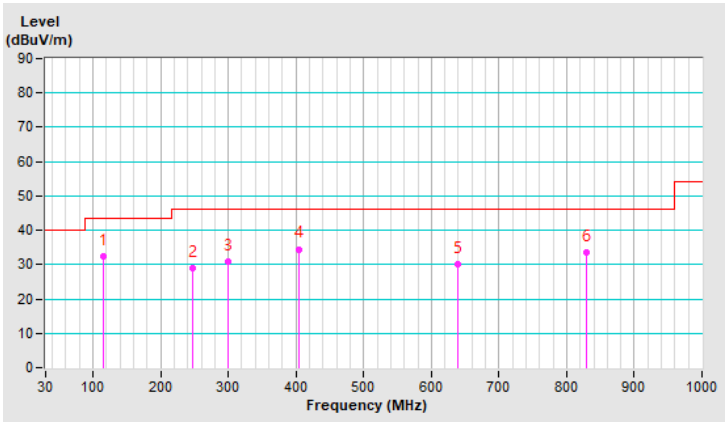
Below 1GHz Data:

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	116.23	32.5 QP	43.5	-11.0	2.00 H	247	42.5	-10.0
2	247.75	28.9 QP	46.0	-17.1	1.50 H	259	37.6	-8.7
3	299.41	31.0 QP	46.0	-15.0	1.50 H	121	37.6	-6.6
4	404.98	34.5 QP	46.0	-11.5	1.00 H	311	38.1	-3.6
5	638.46	30.2 QP	46.0	-15.8	1.00 H	84	28.1	2.1
6	828.87	33.4 QP	46.0	-12.6	2.00 H	84	27.8	5.6

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 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.

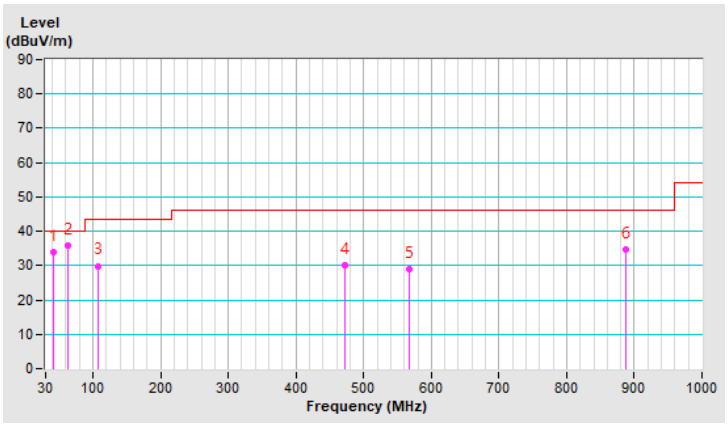


Frequency Range	9kHz ~ 1GHz	Detector Function	Quasi-Peak (QP)

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	42.47	33.8 QP	40.0	-6.2	1.50 V	277	42.0	-8.2
2	62.71	35.9 QP	40.0	-4.1	1.00 V	212	45.0	-9.1
3	108.21	29.9 QP	43.5	-13.6	1.50 V	201	40.7	-10.8
4	472.61	30.2 QP	46.0	-15.8	1.00 V	261	31.8	-1.6
5	567.97	29.1 QP	46.0	-16.9	2.00 V	17	28.6	0.5
6	887.31	34.6 QP	46.0	-11.4	2.00 V	0	28.0	6.6

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 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.



4.1.8 Test Results (Mode 2)

Above 1GHz Data:

Frequency Range	1GHz ~ 40GHz	**Detector Function**	Peak (PK) 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	4880.00	42.9 PK	74.0	-31.1	1.43 H	45	39.3	3.6
2	4880.00	32.5 AV	54.0	-21.5	1.43 H	45	28.9	3.6
3	7320.00	43.8 PK	74.0	-30.2	3.89 H	12	34.1	9.7
4	7320.00	31.9 AV	54.0	-22.1	3.89 H	12	22.2	9.7
5	#10400.00	45.9 PK	68.2	-22.3	1.60 H	150	32.2	13.7
6	11490.00	47.1 PK	74.0	-26.9	1.51 H	182	32.3	14.8
7	11490.00	37.1 AV	54.0	-16.9	1.51 H	182	22.3	14.8
8	15600.00	55.5 PK	74.0	-18.5	1.45 H	67	41.5	14.0
9	15600.00	42.9 AV	54.0	-11.1	1.45 H	67	28.9	14.0
10	#17235.00	54.5 PK	68.2	-13.7	1.65 H	331	36.3	18.2
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	4880.00	40.7 PK	74.0	-33.3	3.84 V	324	37.1	3.6
2	4880.00	30.0 AV	54.0	-24.0	3.84 V	324	26.4	3.6
3	7320.00	42.6 PK	74.0	-31.4	3.91 V	37	32.9	9.7
4	7320.00	30.7 AV	54.0	-23.3	3.91 V	37	21.0	9.7
5	#10400.00	46.5 PK	68.2	-21.7	1.65 V	52	32.8	13.7
6	11490.00	47.6 PK	74.0	-26.4	2.47 V	287	32.8	14.8
7	11490.00	37.5 AV	54.0	-16.5	2.47 V	287	22.7	14.8
8	15600.00	57.2 PK	74.0	-16.8	1.64 V	99	43.2	14.0
9	15600.00	44.8 AV	54.0	-9.2	1.64 V	99	30.8	14.0
10	#17235.00	56.2 PK	68.2	-12.0	1.56 V	352	38.0	18.2

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

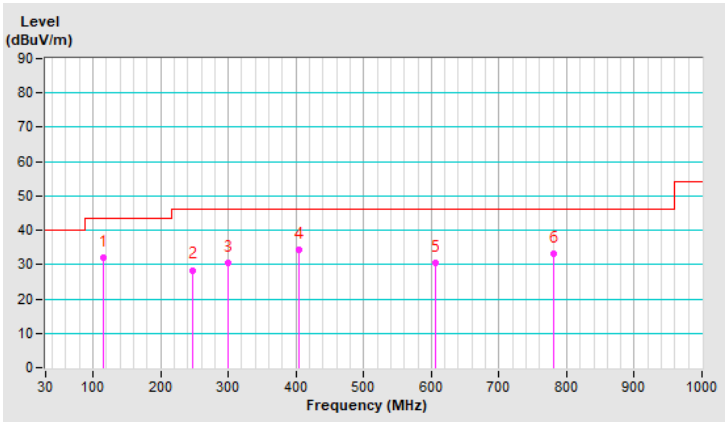
Below 1GHz Data:

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	116.11	32.1 QP	43.5	-11.4	3.00 H	282	42.1	-10.0
2	247.84	28.4 QP	46.0	-17.6	1.00 H	263	37.1	-8.7
3	299.51	30.5 QP	46.0	-15.5	1.00 H	156	37.1	-6.6
4	405.29	34.2 QP	46.0	-11.8	1.00 H	330	37.8	-3.6
5	606.03	30.5 QP	46.0	-15.5	1.50 H	137	28.7	1.8
6	781.46	33.2 QP	46.0	-12.8	2.00 H	315	28.0	5.2

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.

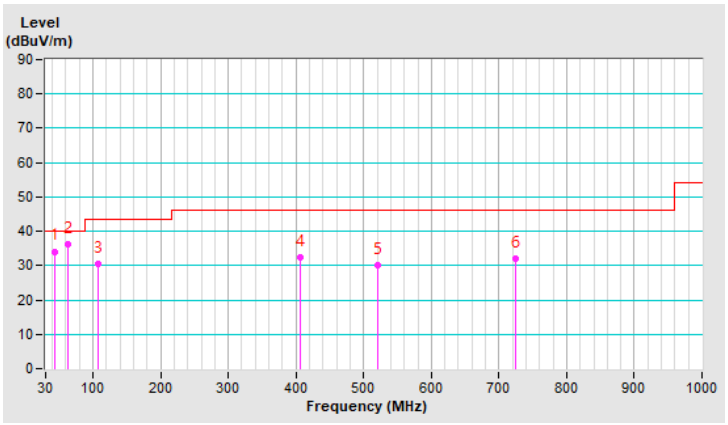


Frequency Range	9kHz ~ 1GHz	Detector Function	Quasi-Peak (QP)

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	43.01	34.1 QP	40.0	-5.9	1.00 V	197	42.2	-8.1
2	**63.11**	**36.1 QP**	**40.0**	**-3.9**	**1.00 V**	**223**	**45.3**	**-9.2**
3	108.01	30.5 QP	43.5	-13.0	1.00 V	179	41.3	-10.8
4	405.85	32.5 QP	46.0	-13.5	1.50 V	317	36.1	-3.6
5	520.67	30.2 QP	46.0	-15.8	1.00 V	233	30.5	-0.3
6	723.67	32.1 QP	46.0	-13.9	3.00 V	347	28.5	3.6

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 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	2021/10/13	2022/10/12
LISN R&S	ESH3-Z5	848773/004	2021/10/29	2022/10/28
LISN R & S	ESH3-Z5	835239/001	2021/3/26	2022/3/25
50 ohms Terminator	50	3	2021/10/27	2022/10/26
RF Coaxial Cable JYEBO	5D-FB	COCCAB-001	2021/9/25	2022/9/24
Fixed attenuator STI	STI02-2200-10	005	2021/8/27	2022/8/26
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: 2021/12/30

4.2.3 Test Procedures

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

b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

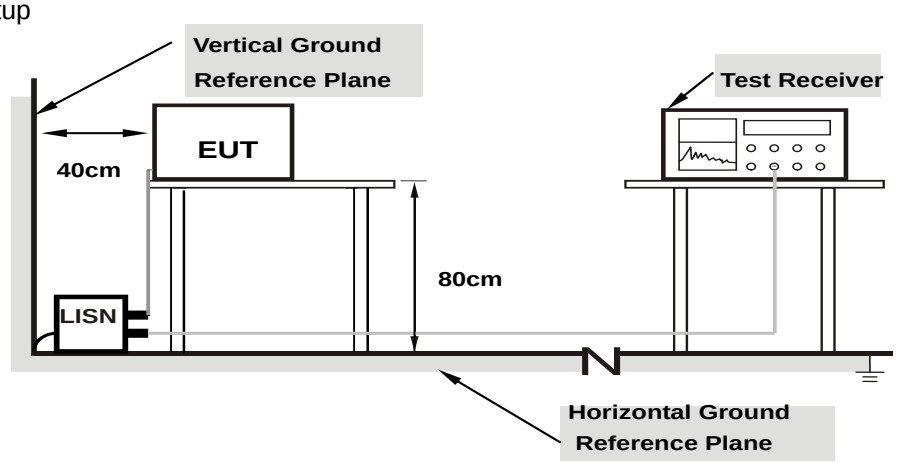
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

Note: The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.

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 Conditions

Same as 4.1.6.

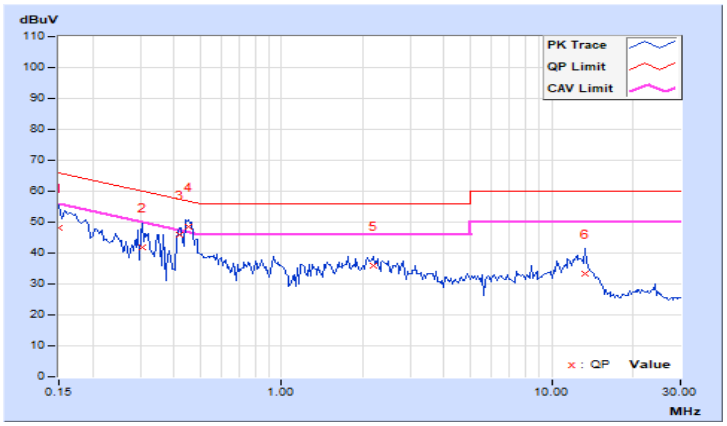
4.2.7 Test Results (Mode 1)

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	0.15000	10.07	38.17	24.59	48.24	34.66	66.00	56.00	-17.76	-21.34
2	0.30625	10.10	31.66	18.41	41.76	28.51	60.07	50.07	-18.31	-21.56
3	0.41953	10.11	35.74	30.73	45.85	40.84	57.46	47.46	-11.61	-6.62
4	**0.45078**	**10.11**	**38.44**	**32.11**	**48.55**	**42.22**	**56.86**	**46.86**	**-8.31**	**-4.64**
5	2.18359	10.22	25.78	17.87	36.00	28.09	56.00	46.00	-20.00	-17.91
6	13.36328	11.05	22.23	15.30	33.28	26.35	60.00	50.00	-26.72	-23.65

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

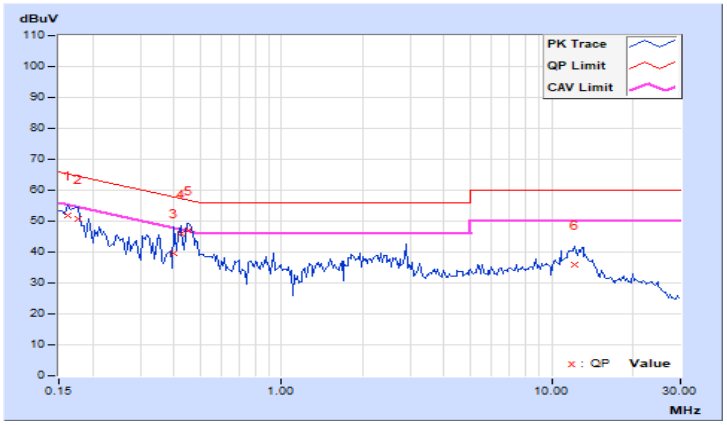


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz

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	0.16172	10.06	41.96	23.25	52.02	33.31	65.38	55.38	-13.36	-22.07
2	0.17734	10.07	40.76	22.53	50.83	32.60	64.61	54.61	-13.78	-22.01
3	0.40000	10.10	29.36	11.42	39.46	21.52	57.85	47.85	-18.39	-26.33
4	0.42344	10.10	35.88	28.63	45.98	38.73	57.38	47.38	-11.40	-8.65
5	0.45078	10.10	36.93	30.70	47.03	40.80	56.86	46.86	-9.83	-6.06
6	12.13672	10.81	25.18	18.15	35.99	28.96	60.00	50.00	-24.01	-21.04

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



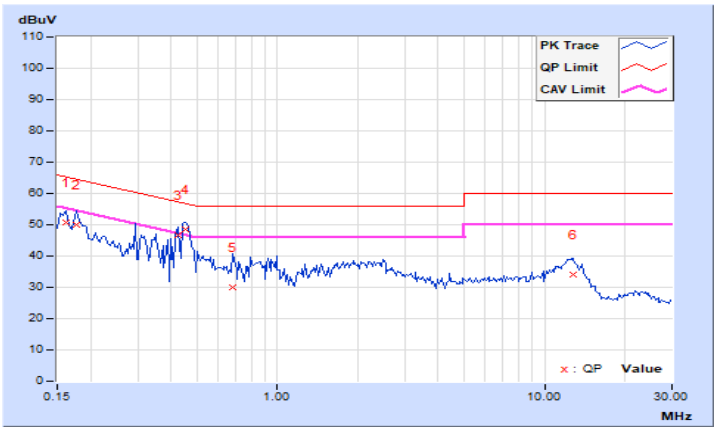
4.2.8 Test Results (Mode 2)

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	0.16172	10.07	40.53	27.66	50.60	37.73	65.38	55.38	-14.78	-17.65
2	0.17734	10.08	39.93	26.86	50.01	36.94	64.61	54.61	-14.60	-17.67
3	0.42344	10.11	36.46	29.47	46.57	39.58	57.38	47.38	-10.81	-7.80
4	0.45469	10.11	38.45	31.51	48.56	41.62	56.79	46.79	-8.23	-5.17
5	0.68125	10.13	20.02	11.31	30.15	21.44	56.00	46.00	-25.85	-24.56
6	12.88281	11.01	23.11	17.01	34.12	28.02	60.00	50.00	-25.88	-21.98

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

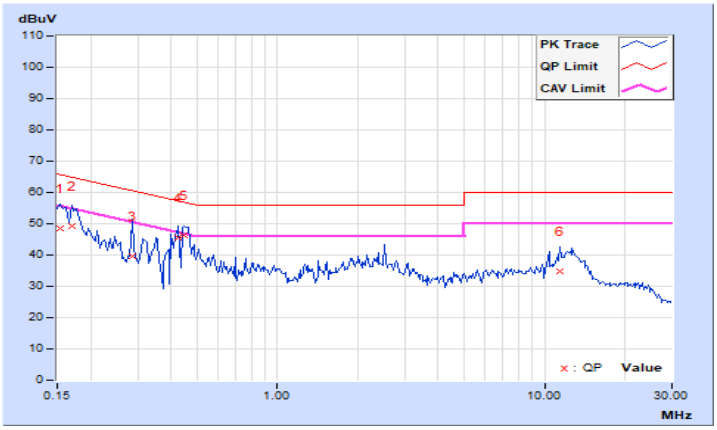


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz

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	0.15391	10.05	38.50	21.03	48.55	31.08	65.79	55.79	-17.24	-24.71
2	0.16953	10.06	39.16	22.89	49.22	32.95	64.98	54.98	-15.76	-22.03
3	0.28672	10.09	29.46	19.18	39.55	29.27	60.62	50.62	-21.07	-21.35
4	0.42734	10.10	35.35	23.93	45.45	34.03	57.30	47.30	-11.85	-13.27
5	0.44688	10.10	36.27	28.40	46.37	38.50	56.93	46.93	-10.56	-8.43
6	11.48438	10.77	23.96	17.20	34.73	27.97	60.00	50.00	-25.27	-22.03

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

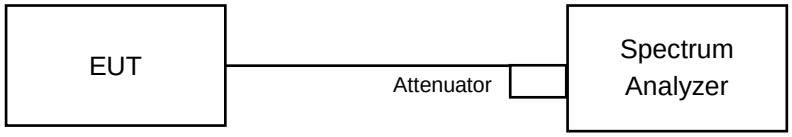


4.3 Conducted Out of Band Emission Measurement

4.3.1 Limits of Conducted Out of Band Emission Measurement

Below 20dB of the highest emission level of operating band (in 100kHz Resolution Bandwidth).

4.3.2 Test Setup



4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.4 Test Procedures

MEASUREMENT PROCEDURE REF

1. Set the RBW = 100 kHz.
2. Set the VBW ≥ 300 kHz.
3. Detector = peak.
4. Sweep time = auto couple.
5. Trace mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

MEASUREMENT PROCEDURE OOBE

1. Set RBW = 100 kHz.
2. Set VBW ≥ 300 kHz.
3. Detector = peak.
4. Sweep = auto couple.
5. Trace Mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum amplitude level.

4.3.5 Deviation from Test Standard

No deviation.

4.3.6 EUT Operating Conditions

The software provided by client to enable the EUT under transmission condition continuously at specific channel frequencies individually.

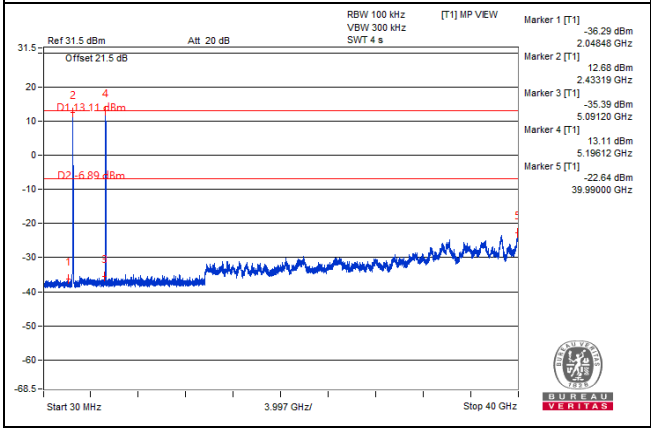
4.3.7 Test Results

The spectrum plots are attached on the following pages. D1 line indicates the highest level, and D2 line indicates the 20dB offset below D1. It shows compliance with the requirement.

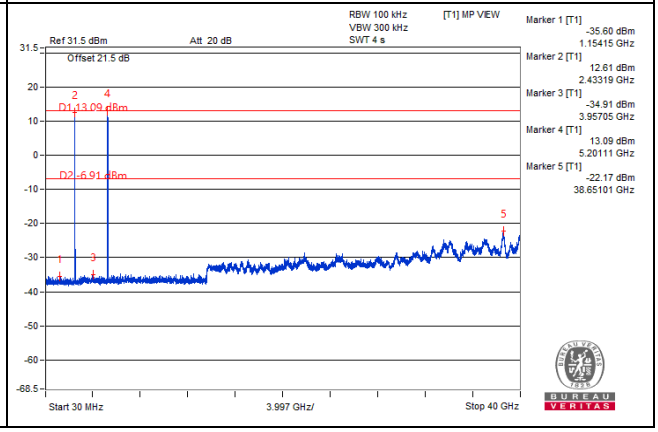
Mode 1

2.4GHz_802.11g CH6 + 5GHz_802.11a CH40 (Low Band)

Chain 0

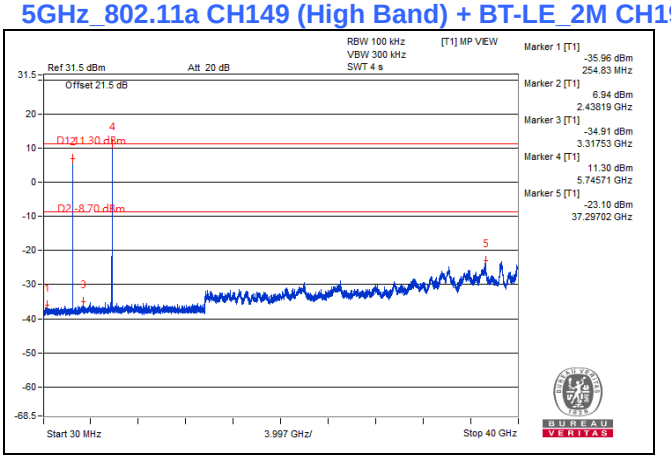


Chain 1



Mode 2

5GHz_802.11a CH149 (High Band) + BT-LE_2M CH19



5 Pictures of Test Arrangements

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

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

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