

Supplemental “Transmit Simultaneously” Test Report

Report No.: RFBAOZ-WTW-P23070065-2

FCC ID: RRR-BW1600A

Test Model: BW1600A

Received Date: 2023/7/12

Test Date: 2023/8/2 ~ 2023/9/12

Issued Date: 2023/9/27

Applicant: Alpha Networks Inc.

Address: No.8, Li-shing 7th Rd., Science-based Industrial Park, Hsinchu 300, Taiwan, R.O.C.

Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
Hsin Chu Laboratory

Lab Address: E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan

Test Location: E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan

**FCC Registration /
Designation Number:** 723255 / TW2022



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Release Control Record

Issue No.	Description	Date Issued
RFBAOZ-WTW-P23070065-2	Original release.	2023/9/27

1 Certificate of Conformity

Product: LTE Data and Voice (ATA) In-Home Gateway

Brand: Brightspeed

Test Model: BW1600A

Sample Status: Engineering sample

Applicant: Alpha Networks Inc.

Test Date: 2023/8/2 ~ 2023/9/12

Standards: 47 CFR FCC Part 15, Subpart C (Section 15.247)

47 CFR FCC Part 15, Subpart E (Section 15.407)

47 CFR FCC Part 27, Subpart H

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 , **Date:** 2023/9/27
Phoenix Huang / Specialist

Approved by : May Chen , **Date:** 2023/9/27
May Chen / Manager

2 Summary of Test Results

FCC Part 15, Subpart C, E (SECTION 15.247, 15.407), Part 27, Subpart H			
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 -11.16 dB at 0.37266 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 -1.3 dB at 15690.00 MHz.
2.1053 27.53(g)	Radiated Spurious Emissions	PASS	Meet the requirement of limit. Minimum passing margin is -46.70 dB at 2099.10 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:

Parameter	Specification	Uncertainty (±)
Conducted Out of Band Emissions	9 kHz ~ 40 GHz	2.5 dB
AC Power Conducted Emissions	150 kHz ~ 30 MHz	1.9 dB
Unwanted Emissions below 1 GHz	9 kHz ~ 30 MHz	3.1 dB
	30 MHz ~ 1 GHz	5.5 dB
Unwanted Emissions above 1 GHz	1 GHz ~ 18 GHz	5.0 dB
	18 GHz ~ 40 GHz	5.3 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	LTE Data and Voice (ATA) In-Home Gateway
Brand	Brightspeed
Test Model	BW1600A
Status of EUT	Engineering sample
Power Supply Rating	12 Vdc from power adapter or 5 Vdc from USB interface
Modulation Type	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM 256QAM for OFDM in 11ac mode 1024QAM for OFDMA in 11ax mode
Modulation Technology	DSSS, OFDM, OFDMA
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 802.11ax: up to 1201.0 Mbps
Operating Frequency	2.4GHz: 2.412 GHz ~ 2.462 GHz 5GHz: 5.18 GHz~ 5.24 GHz, 5.745 GHz ~ 5.825 GHz
Number of Channel	2.4GHz: 802.11b, 802.11g, 802.11n (HT20), VHT20, 802.11ax (HE20): 11 802.11n (HT40), VHT40, 802.11ax (HE40): 7 5GHz: 802.11a, 802.11n (HT20), 802.11ac (VHT20), 802.11ax (HE20): 9 802.11n (HT40), 802.11ac (VHT40), 802.11ax (HE40): 4 802.11ac (VHT80), 802.11ax: 2
Antenna Type	Refer to Note
Antenna Connector	Refer to Note

Note:

1. The EUT uses following accessories.

AC Adapter 1		
Brand	Model	Specification
MOSO	MS-V2000R120-024Q0-US	AC Input : 100-240V 50/60Hz 0.7A max. DC Output : 12V 2A DC Output Cable : 1.8 m Plug : White mouth with fork plug and groove
RJ14 Cable		
Specification		
Signal Line : 3.7 m		
RJ11 Cable		
Specification		
Signal Line : 3.66 m		
RJ45 Cable 1		
Model	Specification	
MT01-C076	Signal Line : 1.8 m	
RJ45 Cable 2		
Model	Specification	
MT01-C077	Signal Line : 1.8 m	

2. The EUT contains certified WWAN module which FCC ID: XMR202008EC25AFXD.

3. The EUT has below radios as following table:

Radios 1	Radios 2
WLAN 2.4GHz + WLAN 5GHz	WWAN(LTE + WCDMA)

4. Simultaneously transmission condition.

Condition	Technology		
1	WWAN	WLAN 2.4GHz	WLAN 5GHz

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

WLAN							
Antenna No.	Brand	Model	Antenna Net Gain (dBi)	Frequency Range (MHz)	Antenna Type	Connector Type	Cable Length (cm)
1	Quectel	Y4AXO00A1FA	3.53	2400~2500	Dipole	ipex(MHF)	5
			4.82	5150~5925			
2	Quectel	Y4AXO00A1EA	1.66	2400~2500	Dipole	ipex(MHF)	13
			4.61	5150~5925			
WWAN							
Antenna No.	Brand	Model	Antenna Net Gain (dBi)	Frequency Range (MHz)	Antenna Type		
1	Quectel	Y4AXO00A1BA	-2.38	663 to 698	PIFA		
			1.19	698~716			
			1.19	777~798			
			-1.72	824~849			
			1.89	1710~1780			
			3	1850~1910			
2	Quectel	Y4AXO00A1AA	-2.29	663 to 698	PIFA		
			0.97	698~716			
			0.97	777~798			
			0.34	824~849			
			2.48	1710~1780			
			1.8	1850~1910			

6. Detail antenna specification please refer to antenna datasheet and/or antenna measurement report.

7. The EUT incorporates a MIMO function:

2.4 GHz Band		
Modulation Mode	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
5 GHz 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
802.11ax (HE20)	2TX	2RX
802.11ax (HE40)	2TX	2RX
802.11ax (HE80)	2TX	2RX

Note:

1. All of modulation mode support beamforming function except 802.11a/b/g modulation mode.
2. The EUT support Beamforming and CDD mode, therefore both mode were investigated and the worst case scenario was identified. The worst case data were presented in test report.

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

3.1.1 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.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE
802.11b + 802.11ax (HE40) + LTE Band 12	1 to 11	11	DSSS	DBPSK
	36 to 48 149 to 165	46	OFDM	BPSK
	23017 to 23173	23017	OFDMA	QPSK

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.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE
802.11b + 802.11ax (HE40) + LTE Band 12	1 to 11	11	DSSS	DBPSK
	36 to 48 149 to 165	46	OFDM	BPSK
	23017 to 23173	23017	OFDMA	QPSK

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.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE
802.11b + 802.11ax (HE40) + LTE Band 12	1 to 11	11	DSSS	DBPSK
	36 to 48 149 to 165	46	OFDM	BPSK
	23017 to 23173	23017	OFDMA	QPSK

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.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE
802.11b + 802.11ax (HE40)	1 to 11	11	DSSS	DBPSK
	36 to 48 149 to 165	46	OFDM	BPSK

Test Condition:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE\geq1G	23deg. C, 70%RH	120Vac, 60Hz	Ryan Du
RE<1G	23deg. C, 67%RH	120Vac, 60Hz	Sampson Chen
PLC	23deg. C, 68%RH	120Vac, 60Hz	Sampson Chen
OB	25deg. C, 60%RH	120Vac, 60Hz	Katina Lu

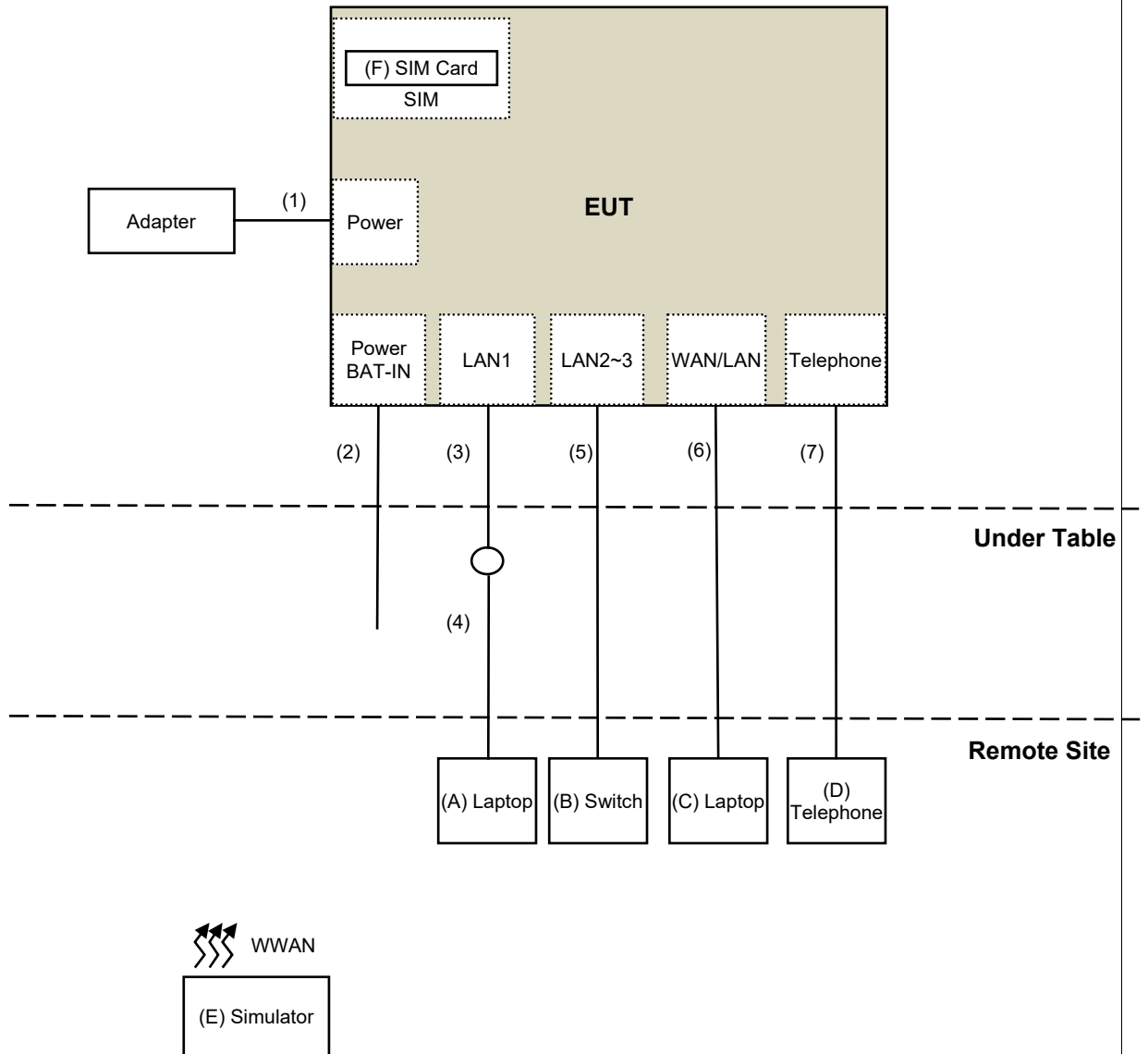
3.2 Description of Support Units

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	Lenovo	20U5S01X00 L14	PF-1ANPYA	NA	Provided by Lab
B	Switch	D-Link	DGS-1005D	DR8WC92000523	NA	Provided by Lab
C	Laptop	Lenovo	20U5S01X00 L14	PF-28LKK7	NA	Provided by Lab
D	Telephone	WONDER	WD-303	7C17KA 04011	NA	Provided by Lab
E	LTE Wireless Communication Test Set	Keysight	E7515A	MY56030229	NA	Provided by Lab
F	SIM Card	Keysight	E7515-10910	NA	NA	Provided by Lab

ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1	DC Cable	1	1.8	No	0	Supplied by applicant
2	Type C to Type C Cable	1	1	Yes	0	Provided by Lab
3	RJ45 Cable	1	1.8	No	0	Supplied by applicant
4	RJ45 Cable	1	10	No	0	Provided by Lab
5	RJ45 Cable	2	10	No	0	Provided by Lab
6	RJ45 Cable	1	10	No	0	Provided by Lab
7	RJ14 Cable	1	3.7	No	0	Supplied by applicant

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:

- 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 (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:

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

For 47 CFR FCC Part 27:

According to FCC 27.53(g) For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least $43 + 10 \log (P)$ dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

4.1.2 Test Instruments

For Radiated Emission test: (Below 1 GHz)

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Bi_Log Antenna Schwarzbeck	VULB 9168	9168-406	2022/10/21	2023/10/20
Boresight Antenna Tower & Turn Table Max-Full	MF-7802BS	MF780208530	N/A	N/A
Fixed Attenuator Mini-Circuits	UNAT-5+	PAD-ATT5-03	2022/12/28	2023/12/27
Loop Antenna Electro-Metrics	EM-6879	264	2023/2/21	2024/2/20
MXA Signal Analyzer Keysight	N9020B	MY60112408	2023/3/6	2024/3/5
MXE EMI Receiver Keysight	N9038A	MY59050100	2023/6/13	2024/6/12
Preamplifier EMCI	EMC330N	980701	2023/2/18	2024/2/17
	EMC001340	980142	2023/5/8	2024/5/7
RF Coaxial Cable JYEBAO	5D-FB	LOOPCAB-001	2022/12/19	2023/12/18
		LOOPCAB-002	2022/12/19	2023/12/18
RF Coaxial Cable PEWC	8D	966-4-1	2023/2/18	2024/2/17
		966-4-2	2023/2/18	2024/2/17
		966-4-3	2023/2/18	2024/2/17
Software	ADT_Radiated_V8.7.08	N/A	N/A	N/A

Notes:

1. The calibration interval of the all test instruments are 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: 2023/9/12

For Radiated Emission test: (Above 1 GHz)

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Antenna Tower & Turn Table Max-Full	MF-7802	MF780208406	N/A	N/A
Fix tool for Boresight antenna tower BV	FBA-01	FBA_SIP01	N/A	N/A
Horn Antenna Schwarzbeck	BBHA 9120D	9120D-406	2022/11/13	2023/11/12
	BBHA 9170	9170-739	2022/11/13	2023/11/12
MXE EMI Receiver Keysight	N9038A	MY59050100	2023/6/13	2024/6/12
Preamplifier EMCI	EMC12630SE	980384	2022/12/28	2023/12/27
	EMC184045SE	980387	2022/12/28	2023/12/27
PXA Signal Analyzer Keysight	N9030B	MY57142938	2023/4/6	2024/4/5
RF Coaxial Cable EMCI	EMC-KM-KM-4000	200214	2023/2/20	2024/2/19
	EMC102-KM-KM-1200	160924	2022/12/28	2023/12/27
	EMC104-SM-SM-1500	180504	2023/3/27	2024/3/26
	EMC104-SM-SM-2000	180601	2023/6/2	2024/6/1
	EMC104-SM-SM-6000	210201	2023/5/8	2024/5/7
Software	ADT_Radiated_V8.7.08	N/A	N/A	N/A

Notes:

1. The calibration interval of the all test instruments are 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: 2023/8/8 ~ 2023/8/9

For other test item:

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Fixed Attenuator Woken	MDCS18N-10	MDCS18N-10-01	2023/3/27	2024/3/26
MXA Signal Analyzer Keysight	N9020B	MY60112409	2023/2/18	2024/2/17
Software	ADT_RF Test Software V6.6.5.4	N/A	N/A	N/A

Notes:

1. The calibration interval of the all test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in Oven room 2.
3. Tested Date: 2023/8/2

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 $\geq 1/T$ (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.

For 47 CFR FCC Part 27:

- a. The field strength was measured with Spectrum Analyzer.
- b. Measurement in the semi-anechoic chamber, EUT placed on the 0.8m/1.5m height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m to find the maximum polar radiated power. The “Read Value” is the field strength value via a spectrum reading obtained corrected for antenna factor, cable loss and pre-amplifier factor.
- c. Perform a field strength measurement and then mathematically convert the measured field strength level to EIRP level.
- d. Follow ANSI 63.26 section 5.2.7 d), $EIRP \text{ Value (dBm)} = \text{Read Value (dB}\mu\text{V/m)} - \text{Correction Factor @3m}$
- e. $\text{Correction Factor (dB) @ 3m} = 20\log(D) - 104.8$; where D is the measurement distance @3 m = -95.26 dB

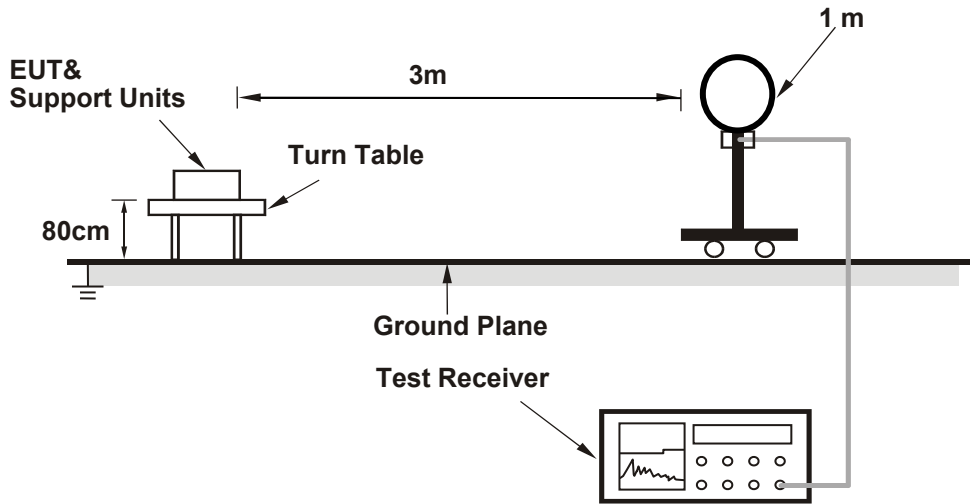
Note: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1MHz/3MHz.

4.1.4 Deviation from Test Standard

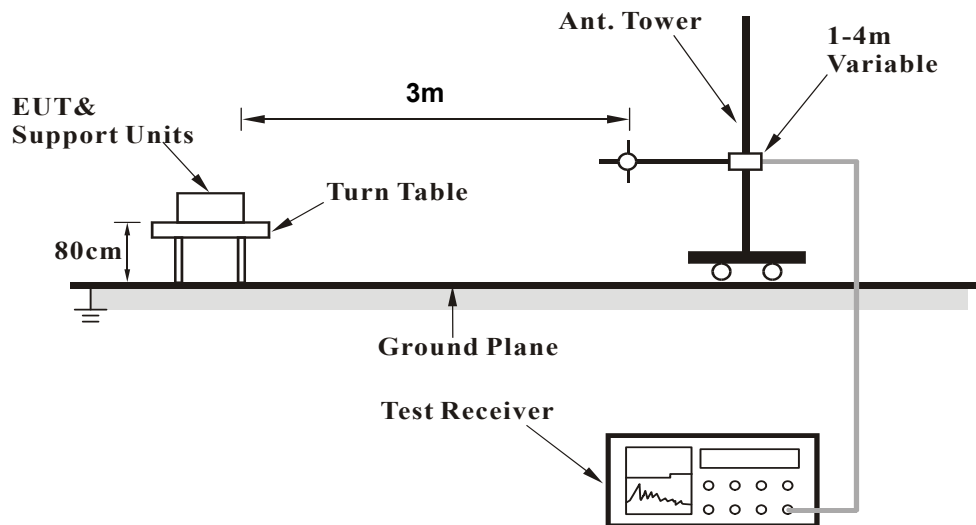
No deviation.

4.1.5 Test Setup

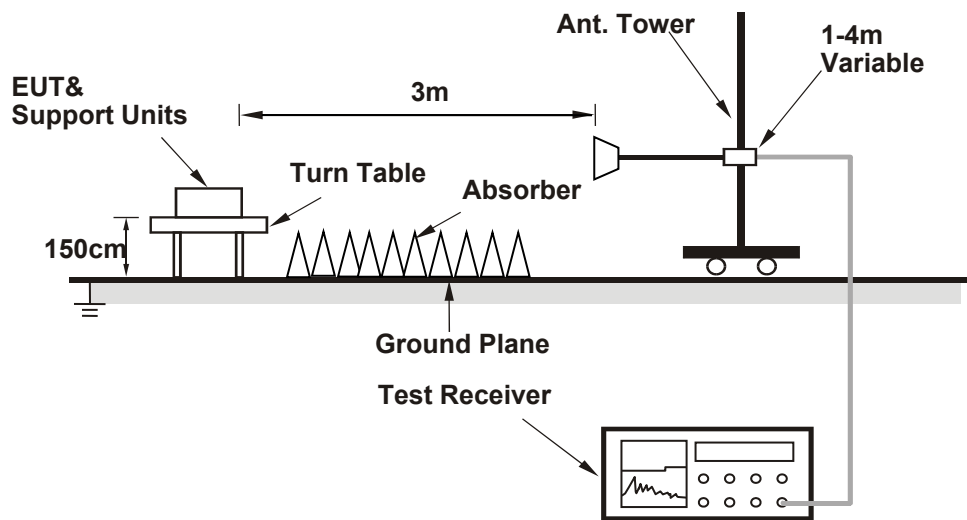
For Radiated emission below 30MHz



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

- Placed the EUT on the testing table.
- WLAN controlling software (MT7915 QA 0.0.2.17]) has been activated to set the EUT under transmission condition continuously at specific channel frequency.
- The EUT is configured by emulator to set data modulation and maximum power using WWAN technology.

4.1.7 Test Results

Above 1GHz Data:

Frequency Range	1 GHz ~ 40 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=10 Hz, DET=Peak
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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	4924.00	50.1 PK	74.0	-23.9	3.51 H	102	48.3	1.8
2	4924.00	48.7 AV	54.0	-5.3	3.51 H	102	46.9	1.8
3	7386.00	49.8 PK	74.0	-24.2	1.57 H	40	42.2	7.6
4	7386.00	42.9 AV	54.0	-11.1	1.57 H	40	35.3	7.6
5	10460.00	62.7 PK	68.2	-5.5	1.66 H	199	51.3	11.4
6	15690.00	68.1 PK	74.0	-5.9	1.55 H	176	57.1	11.0
7	15690.00	52.7 AV	54.0	-1.3	1.55 H	176	41.7	11.0

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	4924.00	49.4 PK	74.0	-24.6	2.75 V	92	47.6	1.8
2	4924.00	46.8 AV	54.0	-7.2	2.75 V	92	45.0	1.8
3	7386.00	52.7 PK	74.0	-21.3	3.24 V	190	45.1	7.6
4	7386.00	47.7 AV	54.0	-6.3	3.24 V	190	40.1	7.6
5	10460.00	60.0 PK	68.2	-8.2	1.59 V	340	48.6	11.4
6	15690.00	63.2 PK	74.0	-10.8	4.00 V	203	52.2	11.0
7	15690.00	49.3 AV	54.0	-4.7	4.00 V	203	38.3	11.0

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.

Mode	TX channel 23017	Frequency Range	Above 1000 MHz
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Antenna Polarity & Test Distance : Horizontal at 3 m

No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1399.40	-60.84	-13.00	-47.84	2.05 H	157	39.44	-100.28
2	2099.10	-59.70	-13.00	-46.70	2.31 H	56	38.57	-98.27

Antenna Polarity & Test Distance : Vertical at 3 m

No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1399.40	-60.31	-13.00	-47.31	1.55 V	230	39.97	-100.28
2	2099.10	-60.07	-13.00	-47.07	2.05 V	137	38.20	-98.27

Remarks:

1. $EIRP(dBm) = Raw\ Value(dBuV) + Correction\ Factor(dB/m)$
2. $Correction\ Factor(dB/m) = Antenna\ Factor(dB/m) + Cable\ Factor(dB) - Pre-Amplifier\ Factor(dB) + 20\log(D) - 104.8$
3. Margin value = EIRP – Limit value
4. The other EIRP levels were very low against the limit.

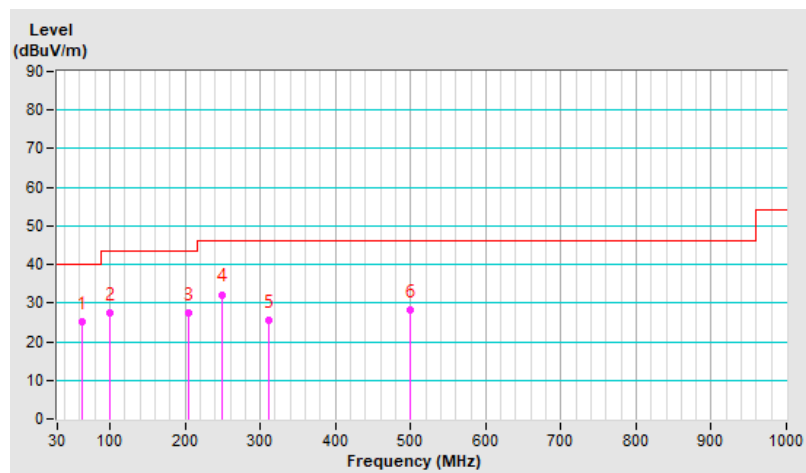
Below 1GHz Data:

Frequency Range	30 MHz ~ 1 GHz	Detector Function & Bandwidth	QP: RB=120kHz, DET=Quasi-Peak
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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	63.25	25.0 QP	40.0	-15.0	1.00 H	140	39.0	-14.0
2	99.95	27.6 QP	43.5	-15.9	1.50 H	300	45.0	-17.4
3	204.27	27.5 QP	43.5	-16.0	1.50 H	107	43.8	-16.3
4	250.18	32.2 QP	46.0	-13.8	1.50 H	64	46.4	-14.2
5	311.00	25.5 QP	46.0	-20.5	1.50 H	255	37.7	-12.2
6	499.83	28.3 QP	46.0	-17.7	1.00 H	350	35.9	-7.6

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 30 MHz ~ 1 GHz.
5. The frequency range 9 kHz ~ 30 MHz: all emissions are more than 20 dB below the limit, therefore do not be recorded in this report.

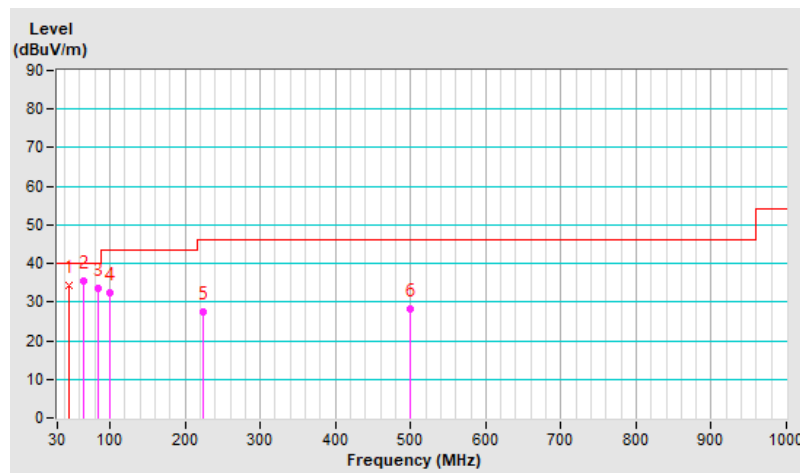


Frequency Range	30 MHz ~ 1 GHz	Detector Function & Bandwidth	QP: RB=120kHz, DET=Quasi-Peak
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Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	44.97	34.3 QP	40.0	-5.7	1.00 V	254	47.5	-13.2
2	65.25	35.5 QP	40.0	-4.5	1.00 V	341	50.0	-14.5
3	84.95	33.7 QP	40.0	-6.3	1.50 V	241	52.5	-18.8
4	100.35	32.5 QP	43.5	-11.0	1.50 V	341	49.8	-17.3
5	224.58	27.4 QP	46.0	-18.6	1.00 V	351	44.0	-16.6
6	500.00	28.2 QP	46.0	-17.8	1.50 V	314	35.8	-7.6

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 30 MHz ~ 1 GHz.
5. The frequency range 9 kHz ~ 30 MHz: all emissions are more than 20 dB below the limit, therefore do not be recorded in this report.

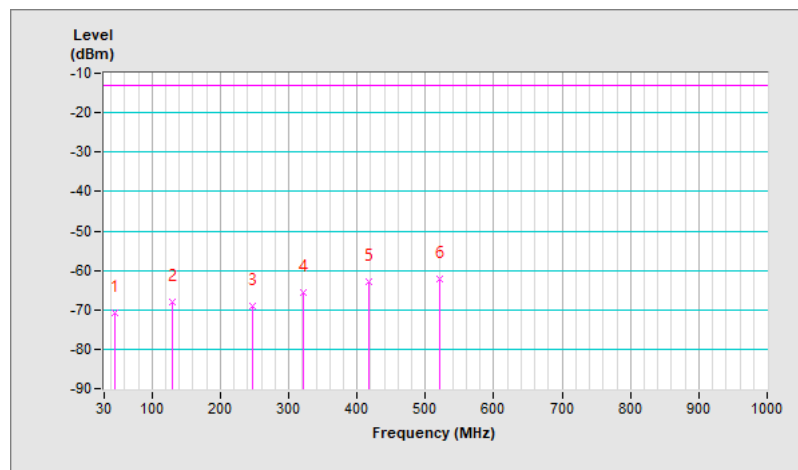


Mode	TX channel 23017	Frequency Range	Above 1000 MHz
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Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	44.70	-70.74	-13.00	-57.74	1.30 H	37	37.65	-108.39
2	130.47	-68.09	-13.00	-55.09	2.47 H	67	41.26	-109.35
3	247.30	-69.14	-13.00	-56.14	2.30 H	239	40.43	-109.57
4	322.36	-65.65	-13.00	-52.65	3.21 H	40	41.37	-107.02
5	417.78	-62.86	-13.00	-49.86	1.55 H	80	41.85	-104.71
6	521.69	-62.20	-13.00	-49.20	1.69 H	67	40.19	-102.39

Remarks:

1. $EIRP(dBm) = Raw\ Value(dBuV) + Correction\ Factor(dB/m)$
2. $Correction\ Factor(dB/m) = Antenna\ Factor(dB/m) + Cable\ Factor(dB) - Pre-Amplifier\ Factor(dB) + 20\log(D) - 104.8$
3. $Margin\ value = EIRP - Limit\ value$
4. The other EIRP levels were very low against the limit of frequency range 30 MHz ~ 1 GHz.
5. The frequency range 9 kHz ~ 30 MHz: all emissions are more than 20 dB below the limit, therefore do not be recorded in this report.

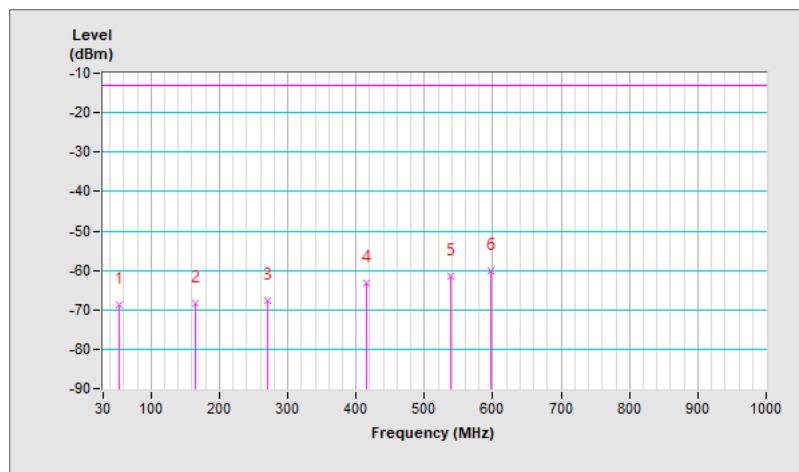


Mode	TX channel 23017	Frequency Range	Below 1000 MHz
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Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	52.87	-68.57	-13.00	-55.57	2.34 V	57	39.77	-108.34
2	165.48	-68.31	-13.00	-55.31	1.23 V	147	40.31	-108.62
3	269.74	-67.58	-13.00	-54.58	2.07 V	24	41.09	-108.67
4	415.70	-63.14	-13.00	-50.14	1.31 V	57	41.68	-104.82
5	537.92	-61.40	-13.00	-48.40	1.29 V	47	40.76	-102.16
6	596.65	-60.01	-13.00	-47.01	2.11 V	67	40.83	-100.84

Remarks:

1. $EIRP(dBm) = Raw\ Value(dBuV) + Correction\ Factor(dB/m)$
2. $Correction\ Factor(dB/m) = Antenna\ Factor(dB/m) + Cable\ Factor(dB) - Pre-Amplifier\ Factor(dB) + 20\log(D) - 104.8$
3. $Margin\ value = EIRP - Limit\ value$
4. The other EIRP levels were very low against the limit of frequency range 30 MHz ~ 1 GHz.
5. The frequency range 9 kHz ~ 30 MHz: all emissions are more than 20 dB below the limit, therefore do not be recorded in this 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
50 ohm terminal resistance	N/A	EMC-01	2022/9/27	2023/9/26
EMI Test Receiver R&S	ESCS 30	847124/029	2022/10/14	2023/10/13
Fixed Attenuator STI	STI02-2200-10	005	2023/7/1	2024/6/30
LISN R&S	ESH3-Z5	848773/004	2022/10/18	2023/10/17
RF Coaxial Cable JYEBAO	5D-FB	COCCAB-001	2023/7/1	2024/6/30
Software BVADT	BVADT_Cond_V7.3.7.4	N/A	N/A	N/A

Notes:

1. The calibration interval of the all 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: 2023/9/12

4.2.3 Test Procedures

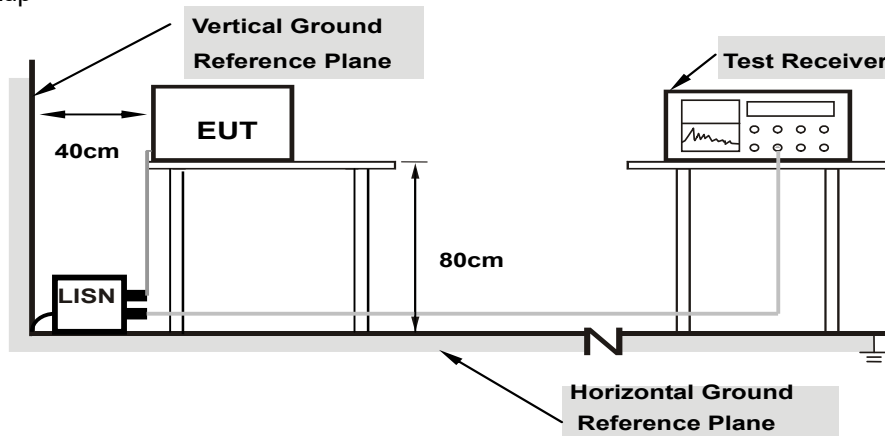
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance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

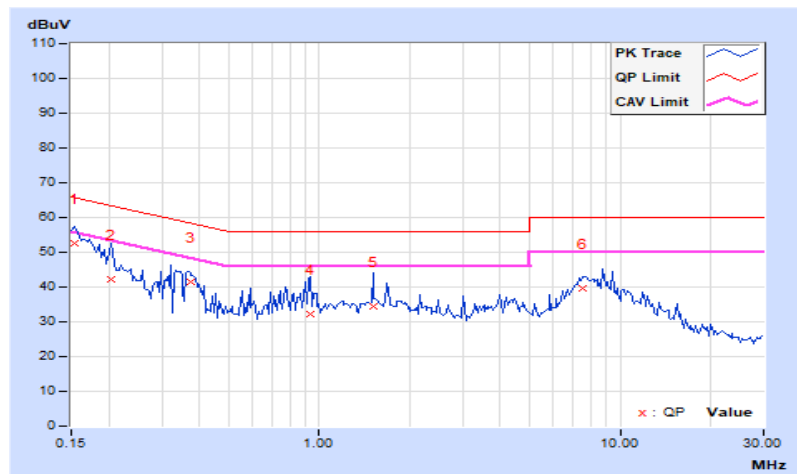
4.2.7 Test Results

Frequency Range	150 kHz ~ 30 MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9 kHz
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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	0.15391	9.95	42.66	29.26	52.61	39.21	65.79	55.79	-13.18	-16.58
2	0.20469	9.95	32.34	22.14	42.29	32.09	63.42	53.42	-21.13	-21.33
3	0.37266	9.96	31.42	26.22	41.38	36.18	58.44	48.44	-17.06	-12.26
4	0.93906	10.00	22.28	18.55	32.28	28.55	56.00	46.00	-23.72	-17.45
5	1.51172	10.02	24.26	17.20	34.28	27.22	56.00	46.00	-21.72	-18.78
6	7.54297	10.48	29.03	23.98	39.51	34.46	60.00	50.00	-20.49	-15.54

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

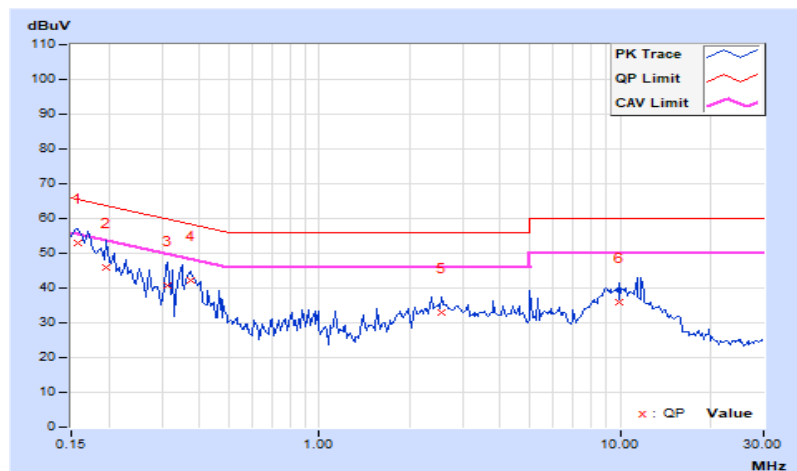


Frequency Range	150 kHz ~ 30 MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9 kHz
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Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15781	10.00	43.08	29.02	53.08	39.02	65.58	55.58	-12.50	-16.56
2	0.19687	10.00	36.00	23.25	46.00	33.25	63.74	53.74	-17.74	-20.49
3	0.31406	10.01	30.82	28.62	40.83	38.63	59.86	49.86	-19.03	-11.23
4	0.37266	10.01	32.31	27.27	42.32	37.28	58.44	48.44	-16.12	-11.16
5	2.54297	10.14	23.00	16.46	33.14	26.60	56.00	46.00	-22.86	-19.40
6	9.95313	10.65	25.21	20.32	35.86	30.97	60.00	50.00	-24.14	-19.03

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

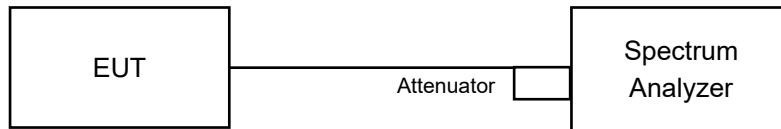


4.3 Conducted Out of Band Emission Measurement

4.3.1 Limits of Conducted Out of Band Emission Measurement

Below 30dB 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 \geq 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 OOB

1. Set RBW = 100 kHz.
2. Set VBW \geq 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

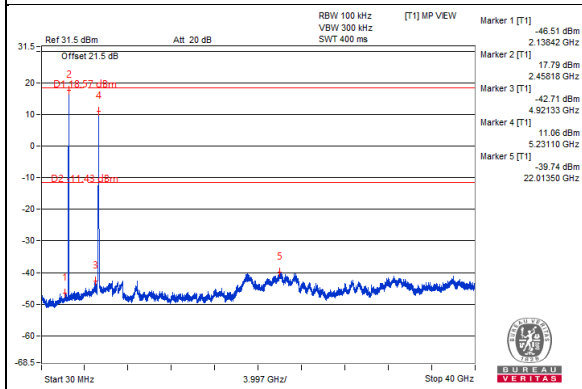
The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

4.3.7 Test Results

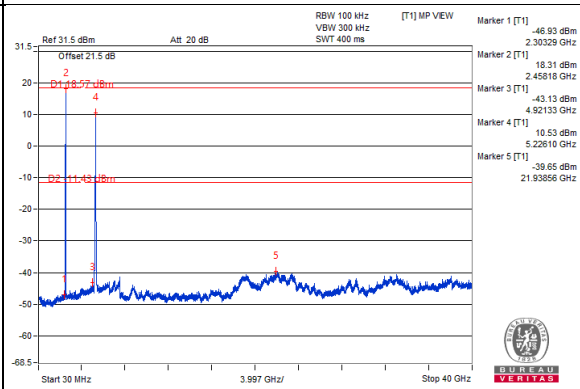
The spectrum plots are attached on the following pages. D1 line indicates the highest level, and D2 line indicates the 30dB offset below D1. It shows compliance with the requirement.

2.4GHz_802.11b CH11 + 5GHz_802.11ax (HE40) CH46

Chain 0



Chain 1



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:

Lin Kou EMC/RF Lab

Tel: 886-2-26052180

Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab

Tel: 886-3-6668565

Fax: 886-3-6668323

Hwa Ya EMC/RF/Safety Lab

Tel: 886-3-3183232

Fax: 886-3-3270892

Email: service.adt@tw.bureauveritas.com

Web Site: www.bureauveritas-adt.com

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

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