

Supplemental “Transmit Simultaneously” Test Report

Report No.: RF181212E04-4

FCC ID: NOIKBEA0Q04

Test Model: EA0Q04

Received Date: Dec. 12, 2018

Test Date: Jan. 22 to 24, 2019

Issued Date: Mar. 25, 2019

Applicant: NETRONIX, INC.

Address: No. 945, Boai St., Jubei City, Hsin-Chu, 302, 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 R.O.C.

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

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



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Release Control Record

Issue No.	Description	Date Issued
RF181212E04-4	Original release.	Mar. 25, 2019

1 Certificate of Conformity

Product: Digital Notepad

Brand: MobiScribe

Test Model: EA0Q04

Sample Status: ENGINEERING SAMPLE

Applicant: NETRONIX, INC.

Test Date: Jan. 22 to 24, 2019

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

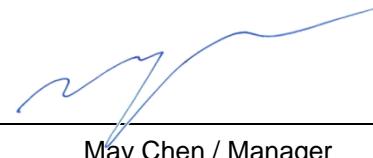
47 CFR FCC Part 15, Subpart E (Section 15.407)

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 : 
Wendy Wu / Specialist

, **Date:** Mar. 25, 2019

Approved by : 
May Chen / Manager

, **Date:** Mar. 25, 2019

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)(6)	AC Power Conducted Emission	PASS	Meet the requirement of limit. Minimum passing margin is -11.16dB at 0.48594MHz.
15.205 / 15.209 / 15.247(d) 15.407(b) (1/2/3/4(i/ii)/6)	Radiated Emissions and Band Edge Measurement	PASS	Meet the requirement of limit. Minimum passing margin is -0.2dB at 11550.00MHz.

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	1.84 dB
Radiated Emissions up to 1 GHz	30MHz ~ 1GHz	4.87 dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	5.12 dB
	6GHz ~ 18GHz	4.86 dB
	18GHz ~ 40GHz	5.24 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Digital Notepad
Brand	MobiScribe
Test Model	EA0Q04
Status of EUT	ENGINEERING SAMPLE
Power Supply Rating	DC 3.8V from battery or DC 5V from USB interface
Modulation Type	WLAN: CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM 256QAM for OFDM in 11ac mode and VHT (20/40) mode in 2.4GHz BT-EDR: GFSK, π/4-DQPSK, 8DPSK BT-LE: GFSK
Modulation Technology	WLAN: DSSS,OFDM BT-EDR: FHSS BT-LE: DTS
Transfer Rate	WLAN: 802.11b: up to 11Mbps 802.11a/g: up to 54Mbps 802.11n: up to 300Mbps 802.11ac: up to 866.7Mbps BT-EDR: Up to 3Mbps BT-LE: Up to 1Mbps
Operating Frequency	WLAN: 2.4GHz: 2.412 ~ 2.462GHz 5GHz: 5.18 ~ 5.24GHz, 5.26GHz ~ 5.32GHz, 5.50GHz ~ 5.72GHz, 5.745 ~ 5.825GHz BT-EDR: 2.402GHz ~ 2.480GHz BT-LE: 2.402GHz ~ 2.480GHz
Number of Channel	WLAN: 2.4GHz: 802.11b, 802.11g, 802.11n (HT20), VHT20: 11 802.11n (HT40), VHT40: 7 5GHz: 802.11a, 802.11n (HT20), 802.11ac (VHT20): 25 802.11n (HT40), 802.11ac (VHT40): 12 802.11ac (VHT80): 6 BT-EDR: 79 BT-LE: 40
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	NA
Data Cable Supplied	USB Cable x 1 (Shielded, 1m)

Note:

1. Simultaneously transmission condition.

Condition	Technology	
1	WLAN 2.4GHz	Bluetooth
2	WLAN 5GHz	Bluetooth

Note: The emission of the simultaneous operation has been evaluated and no non-compliance was found.

2. The EUT could be supplied with a rechargeable battery as the following table:

Brand Name	Model No.	Spec.
TCL	PR-248899G	3.8Vdc, 3035mAh 11.53Wh

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

Antenna No.	Brand	Model	Antenna Net Gain (dBi)	Frequency ange (MHz)	Antenna Type	Connector Type	Cable Length (mm)
1	Walsin	RFPCA310904EMLB301	2.96	2400~2500	PCB	i-pex(MHF)	43
			3.72	5150~5850			
2	Walsin	RFPCA310912EMLB301	1.83	2400~2500	PCB	i-pex(MHF)	128
			5.43	5150~5850			

4. The eMMC provided to the EUT, please refer to the following table:

Brand	Model	Spec.
SANDISK	SDINBDG4-8G	8G Byte

5. For conducted emissions, the EUT was pre-tested under the following modes:

Test Mode	Description
Mode A	Power from USB adapter
Mode B	Power from Laptop

From the above modes, the worst cases were found in **Mode B**. Therefore only the test data of the mode was recorded in this report.

6. For radiated emissions, the EUT was pre-tested under the following modes:

Test Mode	Description
Mode A	Power from USB adapter
Mode B	Power from Battery

From the above modes, the worst case was found in **Mode A**. Therefore only the test data of the mode was recorded in this report.

7. The EUT incorporates a MIMO function.

2.4GHz		
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
5GHz		
MODULATION MODE	TX & RX CONFIGURATION	
802.11a	2TX	2RX
802.11n (HT20)	2TX	2RX
802.11n (HT40)	2TX	2RX
802.11ac (VHT20)	2TX	2RX
802.11ac (VHT40)	2TX	2RX
802.11ac (VHT80)	2TX	2RX

Note:

1. The modulation and bandwidth are similar for 802.11n mode for 20MHz (40MHz) and 802.11ac mode for 20MHz (40MHz), therefore investigated worst case to representative mode in test report. (Final test mode refer section 3.2.1)

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 \geq 1G	RE $<$ 1G	PLC	OB	
1	✓	✓	✓	✓	WLAN 2.4GHz + Bluetooth
2	✓	✓	✓	✓	WLAN 5GHz + Bluetooth

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

RE $<$ 1G: Radiated Emission below 1GHz

PLC: Power Line Conducted Emission

OB: Conducted Out-Band Emission Measurement

NOTE:

1. The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **X-plane**.

Radiated Emission Test (Above 1GHz):

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 + BT-EDR	1 to 11	1	OFDM	BPSK
		0 to 78	39	FHSS	8DPSK
2	802.11ac (VHT80) + BT-EDR	42, 58 106 to 138 155	155	OFDM	BPSK
		0 to 78	39	FHSS	8DPSK

Radiated Emission Test (Below 1GHz):

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 + BT-EDR	1 to 11	1	OFDM	BPSK
		0 to 78	39	FHSS	8DPSK
2	802.11ac (VHT80) + BT-EDR	42, 58 106 to 138 155	155	OFDM	BPSK
		0 to 78	39	FHSS	8DPSK

Power Line Conducted Emission Test:

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 + BT-EDR	1 to 11	1	OFDM	BPSK
		0 to 78	39	FHSS	8DPSK
2	802.11ac (VHT80) + BT-EDR	42, 58 106 to 138 155	155	OFDM	BPSK
		0 to 78	39	FHSS	8DPSK

Conducted Out-Band Emission Measurement:

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 + BT-EDR	1 to 11	1	OFDM	BPSK
		0 to 78	39	FHSS	8DPSK
2	802.11ac (VHT80) + BT-EDR	42, 58 106 to 138 155	155	OFDM	BPSK
		0 to 78	39	FHSS	8DPSK

Test Condition:

Applicable To	Environmental Conditions	Input Power (System)	Tested By
RE \geq 1G	25deg. C, 65%RH	120Vac, 60Hz	Frank Chuang
RE<1G	25deg. C, 65%RH	120Vac, 60Hz	Steven Chaing
PLC	25deg. C, 68%RH	120Vac, 60Hz	Frank Chuang
OB	21deg. C, 60%RH	120Vac, 60Hz	Anderson Chen

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.	USB Adapter	ASUS	EXA1205UA	NA	NA	Provided by Lab
B.	Laptop	HP	TPN-Q186	5CD8212YYG	FCC DoC	Provided by Lab

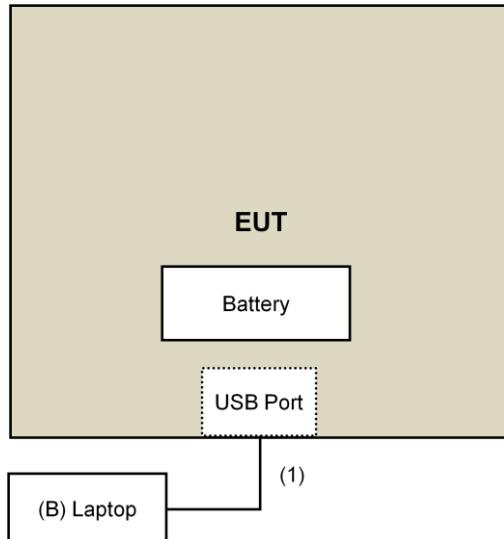
Note:

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

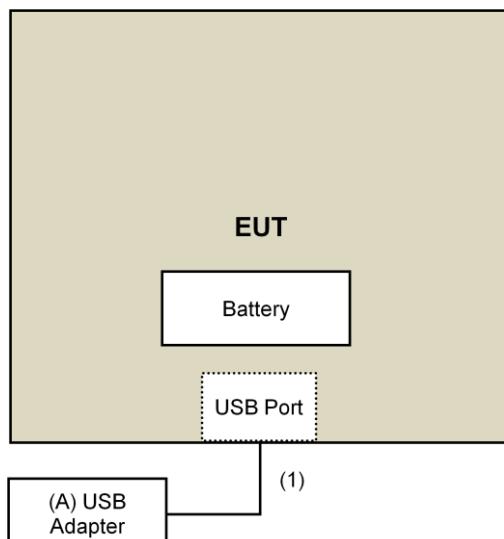
ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	Micro USB Cable	1	1	Yes	0	Supplied by client

3.2.1 Configuration of System under Test

For conducted emissions test:



For other 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 (dB_uV/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	
Frequency Band	Applicable To	EIRP Limit	Equivalent Field Strength at 3m
5150~5250 MHz	15.407(b)(1)	PK:-27 (dB _m /MHz)	PK:68.2(dB _u V/m)
5250~5350 MHz	15.407(b)(2)		
5470~5725 MHz	15.407(b)(3)	PK:-27 (dB _m /MHz) PK:10 (dB _m /MHz) PK:15.6 (dB _m /MHz) PK:27 (dB _m /MHz)	PK: 68.2(dB _u V/m) PK:105.2 (dB _u V/m) PK: 110.8(dB _u V/m) PK:122.2 (dB _u V/m)
5725~5850 MHz	<input checked="" type="checkbox"/> 15.407(b)(4)(i)		
	<input type="checkbox"/> 15.407(b)(4)(ii)		
		Emission limits in section 15.247(d)	

^{*1} beyond 75 MHz or more above of the band edge.
^{*2} below the band edge increasing linearly to 10 dB_m/MHz at 25 MHz above.
^{*3} below the band edge increasing linearly to a level of 15.6 dB_m/MHz at 5 MHz above.
^{*4} from 5 MHz above or below the band edge increasing linearly to a level of 27 dB_m/MHz at the band edge.

Note:

The following formula is used to convert the equipment isotropic radiated power (eirp) to field strength:

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

4.1.2 Test Instruments

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Keysight	N9038A	MY54450088	July 05, 2018	July 04, 2019
Pre-Amplifier EMCI	EMC001340	980142	Feb. 09, 2018	Feb. 08, 2019
Loop Antenna Electro-Metrics	EM-6879	269	Sep. 07, 2018	Sep. 06, 2019
RF Cable	NA	LOOPCAB-001	Jan. 14, 2019	Jan. 13, 2020
RF Cable	NA	LOOPCAB-002	Jan. 14, 2019	Jan. 13, 2020
Pre-Amplifier Mini-Circuits	ZFL-1000VH2B	AMP-ZFL-01	Oct. 30, 2018	Oct. 29, 2019
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-406	Nov. 22, 2018	Nov. 21, 2019
RF Cable	8D	966-4-1	Mar. 21, 2018	Mar. 20, 2019
RF Cable	8D	966-4-2	Mar. 21, 2018	Mar. 20, 2019
RF Cable	8D	966-4-3	Mar. 21, 2018	Mar. 20, 2019
Fixed attenuator Mini-Circuits	UNAT-5+	PAD-3m-4-01	Sep. 27, 2018	Sep. 26, 2019
Horn_Antenna SCHWARZBECK	BBHA 9120D	9120D-783	Nov. 25, 2018	Nov. 24, 2019
Pre-Amplifier Mini-Circuits	ZVA-183-S+	AMP-ZVA-03	May 10, 2018	May 09, 2019
RF Cable	EMC104-SM-SM-1200	160923	Jan. 29, 2018	Jan. 28, 2019
RF Cable	EMC104-SM-SM-2000	150318	Jan. 29, 2018	Jan. 28, 2019
RF Cable	EMC104-SM-SM-5000	150321	Jan. 29, 2018	Jan. 28, 2019
Pre-Amplifier EMCI	EMC184045SE	980387	Jan. 29, 2018	Jan. 28, 2019
Horn_Antenna SCHWARZBECK	BBHA 9170	BBHA9170608	Nov. 25, 2018	Nov. 24, 2019
RF Cable	EMC102-KM-KM-1200	160925	Jan. 29, 2018	Jan. 28, 2019
Software	ADT_Radiated_V8.7.08	NA	NA	NA
Boresight Antenna Tower & Turn Table Max-Full	MF-7802BS	MF780208530	NA	NA
Spectrum Analyzer R&S	FSV40	100964	June 20, 2018	June 19, 2019
Power meter Anritsu	ML2495A	1014008	May 09, 2018	May 08, 2019
Power sensor Anritsu	MA2411B	0917122	May 09, 2018	May 08, 2019

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. The CANADA Site Registration No. is 20331-2
4. Loop antenna was used for all emissions below 30 MHz.
5. Tested Date: Jan. 23 to 24, 2019

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 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:

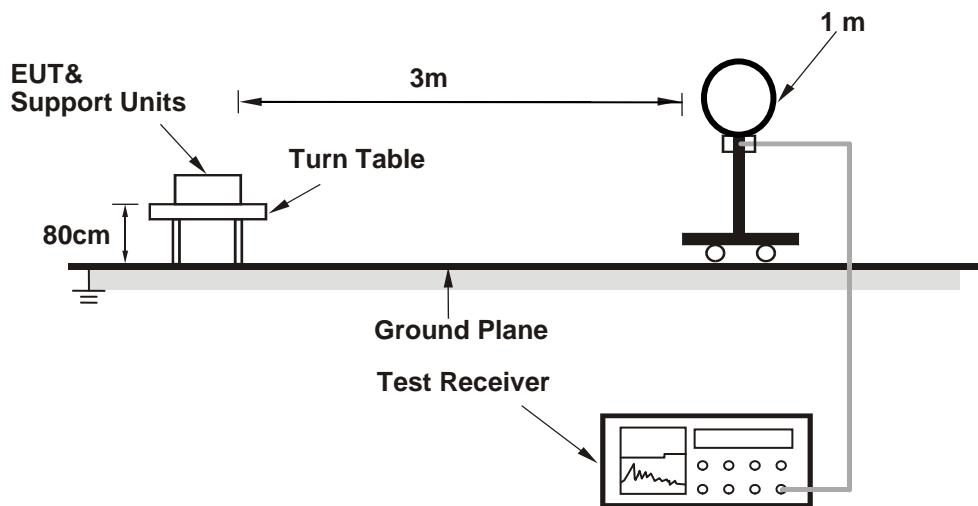
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

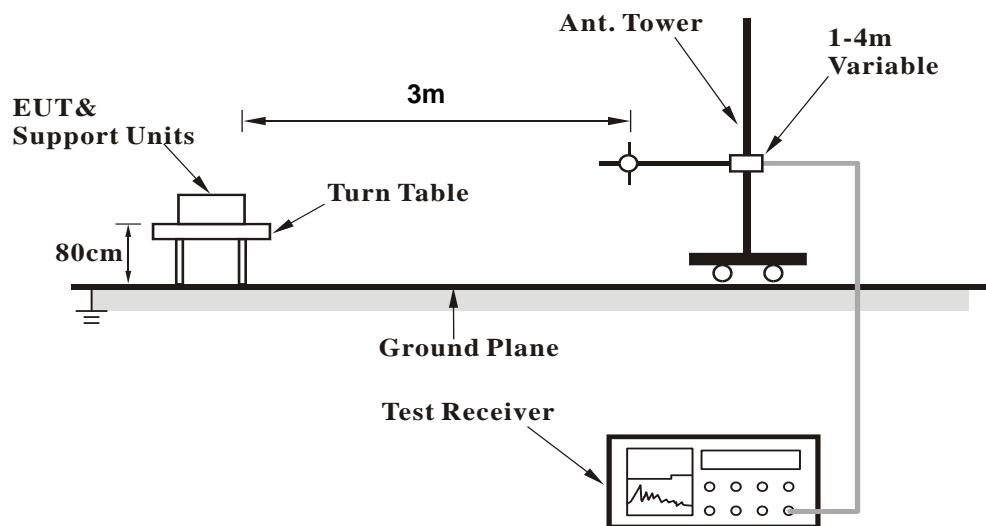
No deviation.

4.1.5 Test Setup

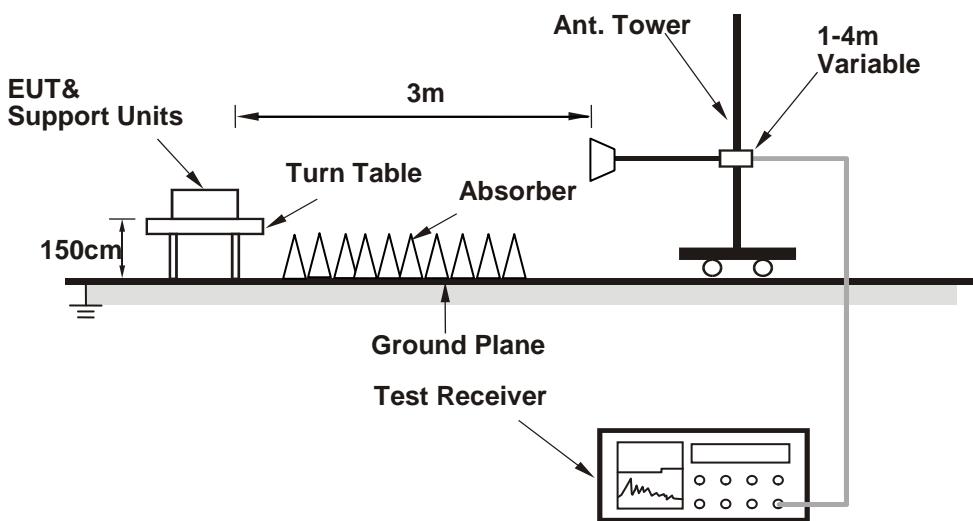
For Radiated emission below 30MHz



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 Conditions

- Placed the EUT on the testing table.
- Controlling software (Tera Term paste EA0C04_Wifi SOP_20190116.doc) has been activated to set the EUT on specific status.

4.1.7 Test Results (Mode 1)

Above 1GHz Data

FREQUENCY RANGE	1GHz ~ 25GHz	DETECTOR FUNCTION	Peak (PK) Average (AV)
-----------------	--------------	-------------------	---------------------------

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	4824.00	42.4 PK	74.0	-31.6	1.39 H	331	40.4	2.0
2	4824.00	32.2 AV	54.0	-21.8	1.39 H	331	30.2	2.0
3	4882.00	39.9 PK	74.0	-34.1	1.42 H	138	37.9	2.0
4	4882.00	30.3 AV	54.0	-23.7	1.42 H	138	28.3	2.0
5	7323.00	47.4 PK	74.0	-26.6	1.14 H	319	38.9	8.5
6	7323.00	38.8 AV	54.0	-15.2	1.14 H	319	30.3	8.5
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	4824.00	44.4 PK	74.0	-29.6	2.48 V	15	42.4	2.0
2	4824.00	36.5 AV	54.0	-17.5	2.48 V	15	34.5	2.0
3	4882.00	42.1 PK	74.0	-31.9	2.24 V	179	40.1	2.0
4	4882.00	32.7 AV	54.0	-21.3	2.24 V	179	30.7	2.0
5	7323.00	53.4 PK	74.0	-20.6	1.08 V	219	44.9	8.5
6	7323.00	47.1 AV	54.0	-6.9	1.08 V	219	38.6	8.5

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. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " # ": The radiated frequency is out of the restricted band.

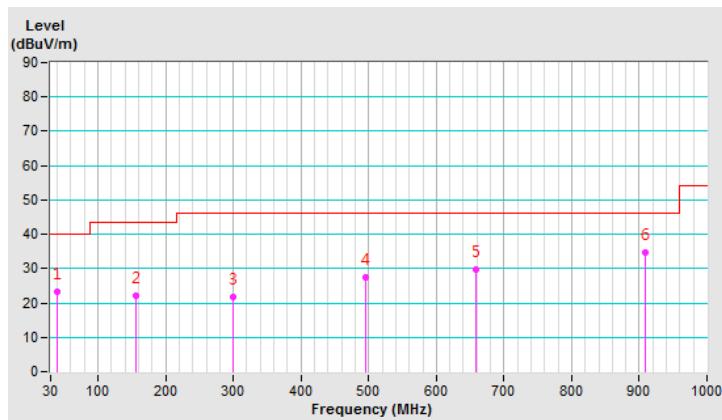
Below 1GHz Data:

FREQUENCY RANGE	9kHz ~ 1GHz	DETECTOR FUNCTION	Quasi-Peak (QP)
------------------------	-------------	--------------------------	-----------------

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	40.35	23.2 QP	40.0	-16.8	1.00 H	205	31.8	-8.6
2	156.42	22.1 QP	43.5	-21.4	1.00 H	66	29.9	-7.8
3	298.98	21.6 QP	46.0	-24.4	1.50 H	262	28.8	-7.2
4	494.73	27.4 QP	46.0	-18.6	1.00 H	49	29.4	-2.0
5	659.00	29.8 QP	46.0	-16.2	1.50 H	192	28.5	1.3
6	908.00	34.7 QP	46.0	-11.3	1.00 H	76	28.8	5.9

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 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.

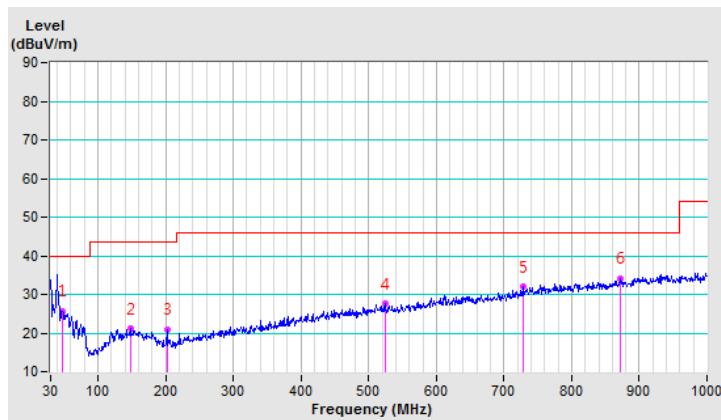


FREQUENCY RANGE		9kHz ~ 1GHz	DETECTOR FUNCTION		Quasi-Peak (QP)	
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ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	48.16	25.6 QP	40.0	-14.4	1.00 V	136	33.6	-8.0
2	147.78	21.1 QP	43.5	-22.4	1.50 V	360	29.0	-7.9
3	202.49	20.9 QP	43.5	-22.6	1.00 V	31	31.3	-10.4
4	523.83	27.5 QP	46.0	-18.5	1.00 V	116	28.9	-1.4
5	727.72	31.9 QP	46.0	-14.1	1.50 V	215	29.2	2.7
6	871.84	34.1 QP	46.0	-11.9	2.00 V	0	28.8	5.3

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 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)
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ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	4882.00	40.1 PK	74.0	-33.9	1.47 H	139	38.1	2.0
2	4882.00	30.7 AV	54.0	-23.3	1.47 H	139	28.7	2.0
3	7323.00	48.3 PK	74.0	-25.7	1.19 H	350	39.8	8.5
4	7323.00	39.4 AV	54.0	-14.6	1.19 H	350	30.9	8.5
5	11550.00	61.3 PK	74.0	-12.7	1.06 H	295	47.7	13.6
6	11550.00	47.3 AV	54.0	-6.7	1.06 H	295	33.7	13.6
7	17325.00	51.3 PK	68.2	-16.9	3.49 H	15	33.9	17.4
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	4882.00	41.8 PK	74.0	-32.2	2.21 V	179	39.8	2.0
2	4882.00	32.4 AV	54.0	-21.6	2.21 V	179	30.4	2.0
3	7323.00	53.5 PK	74.0	-20.5	1.08 V	229	45.0	8.5
4	7323.00	47.3 AV	54.0	-6.7	1.08 V	229	38.8	8.5
5	11550.00	63.5 PK	74.0	-10.5	1.17 V	351	49.9	13.6
6	11550.00	53.8 AV	54.0	-0.2	1.17 V	351	40.2	13.6
7	17325.00	58.0 PK	68.2	-10.2	1.42 V	187	40.6	17.4

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. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " # ": The radiated frequency is out of the restricted band.

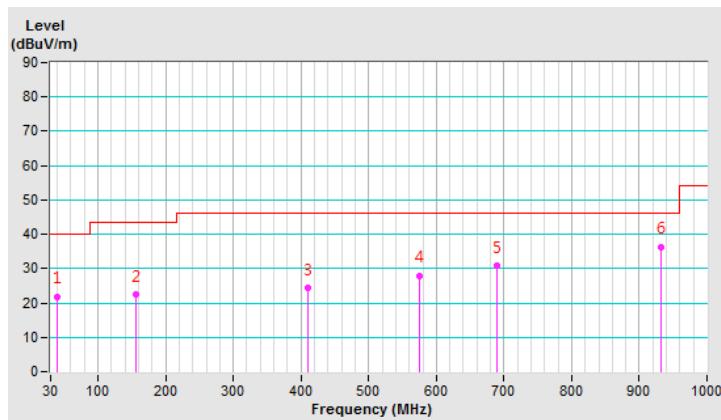
Below 1GHz Data:

FREQUENCY RANGE	9kHz ~ 1GHz	DETECTOR FUNCTION	Quasi-Peak (QP)
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ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	39.92	21.9 QP	40.0	-18.1	1.00 H	236	30.6	-8.7
2	155.57	22.4 QP	43.5	-21.1	1.50 H	263	30.2	-7.8
3	409.83	24.4 QP	46.0	-21.6	1.50 H	344	28.5	-4.1
4	574.82	28.0 QP	46.0	-18.0	1.00 H	150	28.3	-0.3
5	690.28	30.9 QP	46.0	-15.1	1.50 H	3	29.1	1.8
6	932.85	36.4 QP	46.0	-9.6	1.00 H	229	30.1	6.3

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 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.

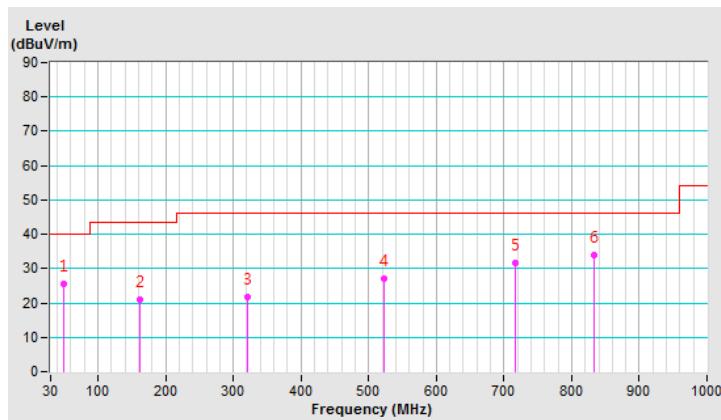


FREQUENCY RANGE		9kHz ~ 1GHz	DETECTOR FUNCTION		Quasi-Peak (QP)	
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ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	48.84	25.4 QP	40.0	-14.6	1.00 V	360	33.5	-8.1
2	162.65	20.9 QP	43.5	-22.6	1.00 V	2	28.9	-8.0
3	320.22	21.6 QP	46.0	-24.4	1.50 V	107	28.1	-6.5
4	523.17	27.1 QP	46.0	-18.9	1.00 V	76	28.5	-1.4
5	717.54	31.5 QP	46.0	-14.5	1.50 V	291	29.2	2.3
6	833.77	33.9 QP	46.0	-12.1	1.00 V	360	29.2	4.7

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 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. 24, 2018	Oct. 23, 2019
Line-Impedance Stabilization Network (for EUT) R&S	ESH3-Z5	848773/004	Oct. 22, 2018	Oct. 21, 2019
Line-Impedance Stabilization Network (for Peripheral) R&S	ENV216	100072	June 04, 2018	June 03, 2019
50 ohms Terminator	N/A	3	Oct. 22, 2018	Oct. 21, 2019
RF Cable	5D-FB	COCCAB-001	Sep. 28, 2018	Sep. 27, 2019
Fixed attenuator EMCI	STI02-2200-10	003	Mar. 16, 2018	Mar. 15, 2019
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: Jan. 22, 2019

4.2.3 Test Procedures

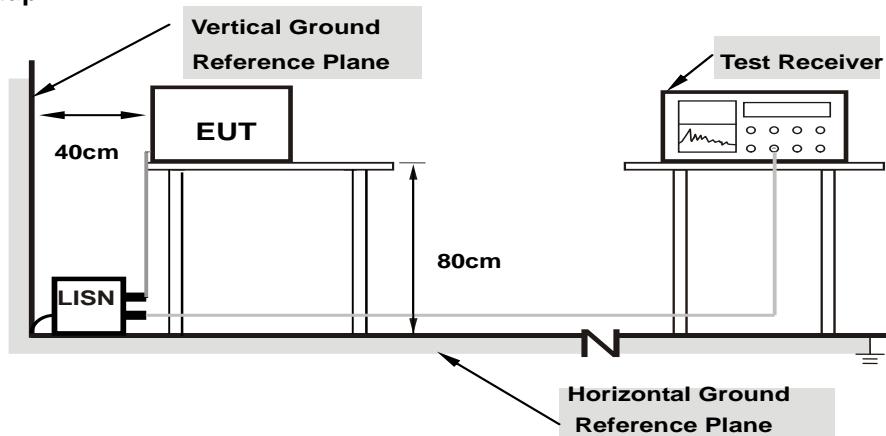
- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling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



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)

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	0.15391	10.02	39.53	28.12	49.55	38.14	65.79	55.79	-16.24	-17.65
2	0.19687	10.04	31.44	15.08	41.48	25.12	63.74	53.74	-22.26	-28.62
3	0.48594	10.08	30.30	25.00	40.38	35.08	56.24	46.24	-15.86	-11.16
4	3.04688	10.21	19.81	10.81	30.02	21.02	56.00	46.00	-25.98	-24.98
5	7.57813	10.42	19.26	13.47	29.68	23.89	60.00	50.00	-30.32	-26.11
6	23.08203	11.12	15.78	9.34	26.90	20.46	60.00	50.00	-33.10	-29.54

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

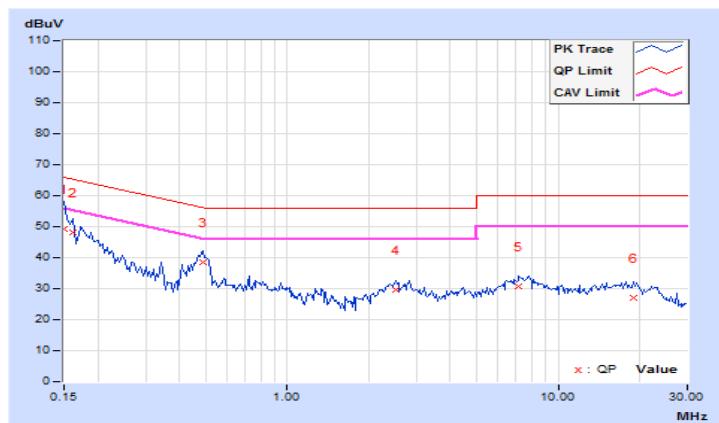


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
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Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	9.93	39.49	26.64	49.42	36.57	66.00	56.00	-16.58	-19.43
2	0.16172	9.93	38.17	24.95	48.10	34.88	65.38	55.38	-17.28	-20.50
3	0.48984	9.96	28.49	23.18	38.45	33.14	56.17	46.17	-17.72	-13.03
4	2.50781	10.06	19.43	14.26	29.49	24.32	56.00	46.00	-26.51	-21.68
5	7.17578	10.26	20.49	14.72	30.75	24.98	60.00	50.00	-29.25	-25.02
6	18.87500	10.81	16.29	10.23	27.10	21.04	60.00	50.00	-32.90	-28.96

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)

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	0.15391	10.02	39.67	28.60	49.69	38.62	65.79	55.79	-16.10	-17.17
2	0.17734	10.03	35.26	21.93	45.29	31.96	64.61	54.61	-19.32	-22.65
3	0.36094	10.06	17.51	9.40	27.57	19.46	58.71	48.71	-31.14	-29.25
4	0.48594	10.08	30.54	24.75	40.62	34.83	56.24	46.24	-15.62	-11.41
5	2.96484	10.20	20.15	12.17	30.35	22.37	56.00	46.00	-25.65	-23.63
6	17.94141	10.96	16.40	12.32	27.36	23.28	60.00	50.00	-32.64	-26.72

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

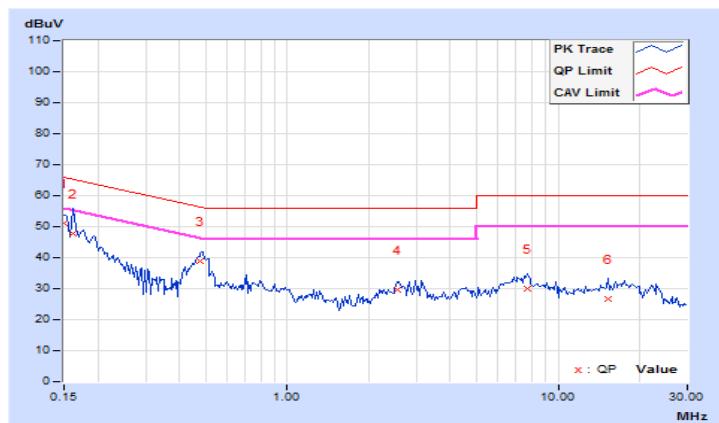


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
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Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	9.93	41.05	26.60	50.98	36.53	66.00	56.00	-15.02	-19.47
2	0.16172	9.93	38.03	23.92	47.96	33.85	65.38	55.38	-17.42	-21.53
3	0.47813	9.96	28.82	23.16	38.78	33.12	56.37	46.37	-17.59	-13.25
4	2.53516	10.06	19.61	14.14	29.67	24.20	56.00	46.00	-26.33	-21.80
5	7.70313	10.28	19.62	14.57	29.90	24.85	60.00	50.00	-30.10	-25.15
6	15.33594	10.64	16.18	10.54	26.82	21.18	60.00	50.00	-33.18	-28.82

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

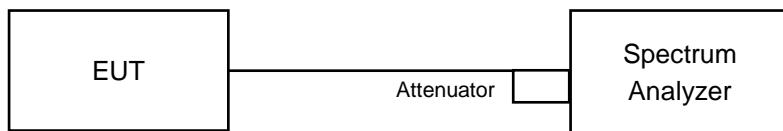


4.3 Conducted Out of Band Emission Measurement

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 \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

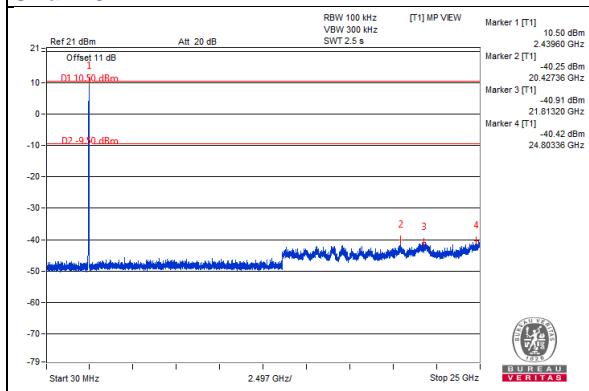
The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

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 20dB offset below D1. It shows compliance with the requirement.

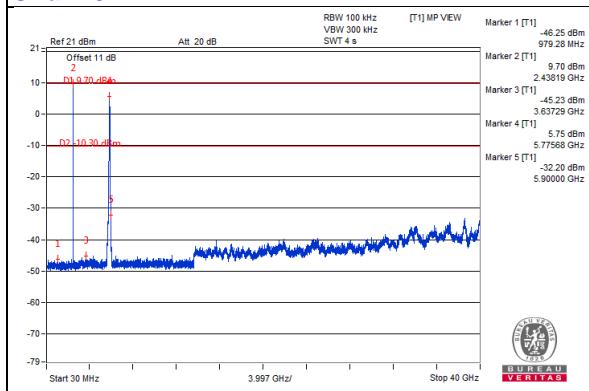
2.4GHz_802.11g CH1 + 8DPSK CH 39

Chain 0



5GHz_802.11ac (VHT80) CH155 + 8DPSK CH 39

Chain 0



5 Pictures of Test Arrangements

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

Appendix – Information on 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:

Linko EMC/RF Lab

Tel: 886-2-26052180
Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab

Tel: 886-3-6668565
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Hwa Ya EMC/RF/Safety Lab

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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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