

Supplemental “Transmit Simultaneously” Test Report

Report No.: RF161216E08C-5

FCC ID: UAY-W8997-M1216

Test Model: W8997-M1216

Received Date: June 18, 2018

Test Date: June 27 to 28, 2018

Issued Date: July 13, 2018

Applicant: Marvell Semiconductor, Inc.

Address: 5488 Marvell Lane, Santa Clara CA95054 USA

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

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Test Location: E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300,
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**FCC Registration /
Designation Number:** 723255 / TW2022



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Release Control Record

Issue No.	Description	Date Issued
RF161216E08C-5	Original release.	July 13, 2018

1 Certificate of Conformity

Product: IEEE 802.11 2X2 MU-MIMO ac/a/b/g/n Wireless LAN + Bluetooth NGFF Module

Brand: Marvell

Test Model: W8997-M1216

Sample Status: ENGINEERING SAMPLE

Applicant: Marvell Semiconductor, Inc.

Test Date: June 27 to 28, 2018

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 :



Date:

July 13, 2018

Wendy Wu / Specialist

Approved by :



Date:

July 13, 2018

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
15.205 / 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 -4.5dB at 299.03MHz.

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) (±)
Radiated Emissions up to 1 GHz	30MHz ~ 1GHz	5.33 dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	5.10 dB
	6GHz ~ 18GHz	4.85 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	IEEE 802.11 2X2 MU-MIMO ac/a/b/g/n Wireless LAN + Bluetooth NGFF Module
Brand	Marvell
Test Model	W8997-M1216
Status of EUT	ENGINEERING SAMPLE
Power Supply Rating	DC 3.3V from host equipment
Modulation Type	WLAN: CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM 256QAM for OFDM in 11ac mode BT-EDR: GFSK, $\pi/4$ -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, 5.26~5.32GHz, 5.50~5.70GHz, 5.745~5.825GHz BT-EDR: 2.402 ~ 2.480GHz BT-LE: 2.402 ~ 2.480GHz
Number of Channel	WLAN: 2.4GHz: 802.11b, 802.11g, 802.11n (HT20): 11 802.11n (HT40): 7 5GHz: 802.11a, 802.11n (HT20), 802.11ac (VHT20): 24 802.11n (HT40), 802.11ac (VHT40): 11 802.11ac (VHT80): 5 BT-EDR: 79 BT-LE: 40
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	NA
Data Cable Supplied	NA

Note:

1. This report is prepared for FCC class II permissive change. The difference compared with the Report No.: RF161216E08-5 as the following:

◆ Add new antennas as following table:

Original							
Antenna Set.	Brand	Model	Chain No.	Antenna Net. Gain(dBi)	Frequency range (MHz)	Antenna Type	Connector Type
1	MAG.LAYERS	MSA-4008-25GC1-A1	Chain 0(Aux)	2.98	2400~2500	PIFA	i-pex(MHF)
				5.16	4900~5900		
			Chain 1(Main)	2.98	2400~2500		
				5.16	4900~5900		
Newly							
Antenna Set.	Brand	Model	Chain No.	Antenna Net. Gain(dBi)	Frequency range (MHz)	Antenna Type	Connector Type
2	Bondale	G-RA0K10090176-1436B	Chain 0(Aux)	1.9	2400~2500	Dipole	RP-SMA
				3.6	4900~5800		
			Chain 1(Main)	1.9	2400~2500		
				3.6	4900~5800		
3	San Jose	UEN-201	Chain 0(Aux)	2.4	2400~2500	Dipole	RP-SMA
				4.4	4900~5800		
			Chain 1(Main)	2.4	2400~2500		
				4.4	4900~5800		

Note:

1. Antenna Set. 3 was selected for Radiated Emissions test.
2. According to above condition, only Radiated Emissions and Band Edge Measurement test items need to be performed. And all data were verified to meet the requirements.
3. There are WLAN, BT technology used for the EUT.
4. Simultaneously transmission condition.

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

5. The EUT incorporates a MIMO function.

2.4GHz Band			
MODULATION MODE	DATA RATE (MCS)	TX & RX CONFIGURATION	
802.11b	1 ~ 11Mbps	2TX	2RX
802.11g	6 ~ 54Mbps	2TX	2RX
802.11n (HT20)	MCS 0~7	2TX	2RX
	MCS 8~15	2TX	2RX
802.11n (HT40)	MCS 0~7	2TX	2RX
	MCS 8~15	2TX	2RX
5GHz Band			
MODULATION MODE	DATA RATE (MCS)	TX & RX CONFIGURATION	
802.11a	6 ~ 54Mbps	2TX	2RX
802.11n (HT20)	MCS 0~7	2TX	2RX
	MCS 8~15	2TX	2RX
802.11n (HT40)	MCS 0~7	2TX	2RX
	MCS 8~15	2TX	2RX
802.11ac (VHT20)	MCS0~8 Nss=1	2TX	2RX
	MCS0~8 Nss=2	2TX	2RX
802.11ac (VHT40)	MCS0~9 Nss=1	2TX	2RX
	MCS0~9 Nss=2	2TX	2RX
802.11ac (VHT80)	MCS0~9 Nss=1	2TX	2RX
	MCS0~9 Nss=2	2TX	2RX

6. 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	
1	√	√	WLAN (2.4GHz) + BT-EDR
2	√	√	WLAN (5GHz) + BT-EDR

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

Radiated Emission Test (Above 1GHz):

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

EUT CONFIGURE MODE	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE
1	802.11g + BT-EDR	1 to 11	6	OFDM	BPSK
		0 to 78	0	8DPSK	3DH5
2	802.11ac (VHT20) + BT-EDR	36 to 48 52 to 64 100 to 140 149 to 165	157	OFDM	BPSK
		0 to 78	0	8DPSK	3DH5

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	6	OFDM	BPSK
		0 to 78	0	8DPSK	3DH5
2	802.11ac (VHT20) + BT-EDR	36 to 48 52 to 64 100 to 140 149 to 165	157	OFDM	BPSK
		0 to 78	0	8DPSK	3DH5

Test Condition:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER (SYSTEM)	TESTED BY
RE $\geq$ 1G	23deg. C, 65%RH	120Vac, 60Hz	Esan Tseng
RE<1G	24deg. C, 65%RH	120Vac, 60Hz	Frank Chuang

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.

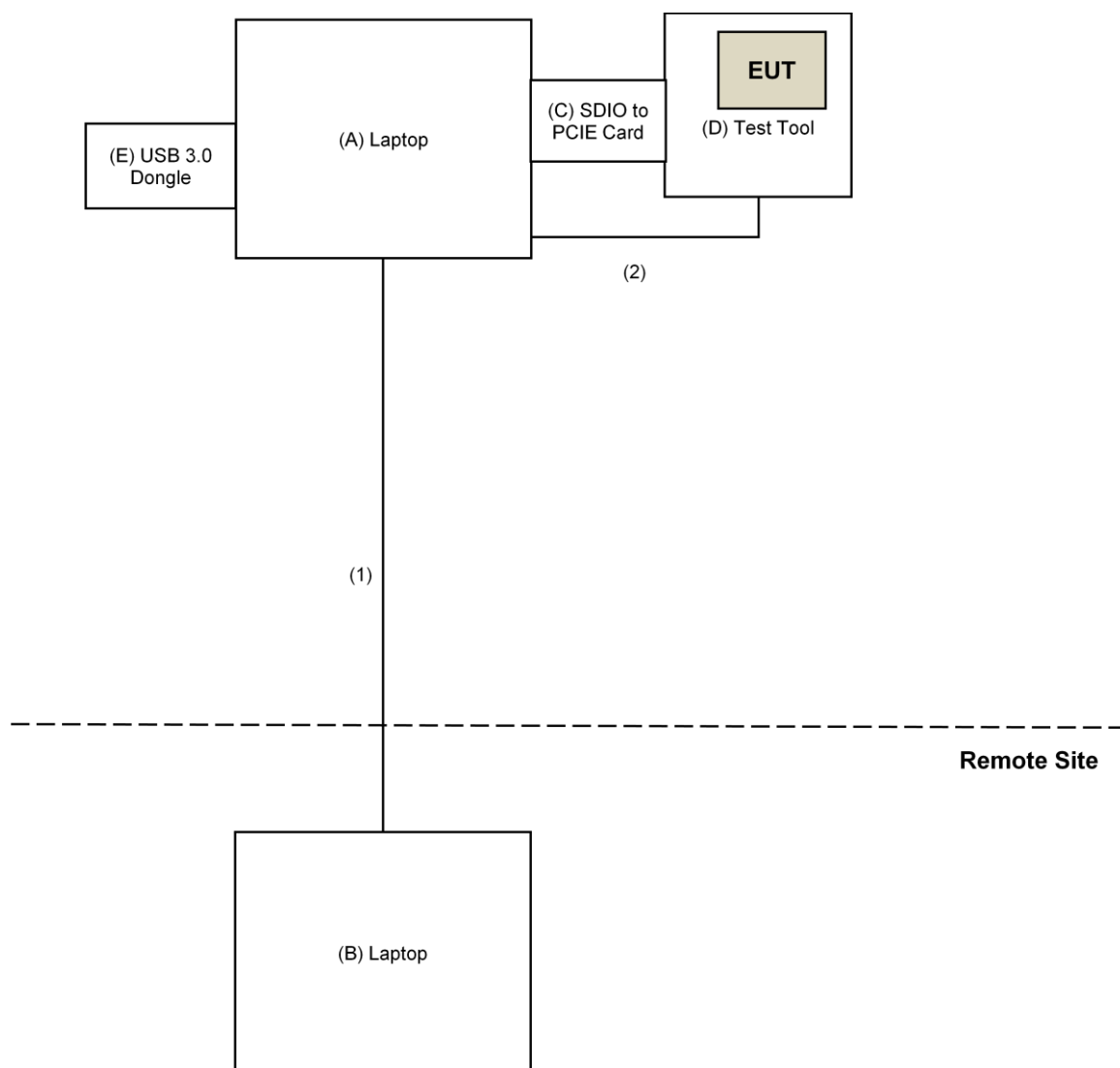
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Laptop	DELL	E6420	B92T3R1	FCC DoC	Provided by Lab
B.	Laptop	HP	Pavilion 14-ab023TU	5CD5340WXZ	NA	Provided by Lab
C.	SDIO to PCIE Card	AzureWave	NA	NA	NA	Supplied by client
D.	Test Tool	AzureWave	NA	NA	NA	Supplied by client
E.	USB 3.0 Dongle	Transcend	JF790	NA	NA	Supplied by client

Note:

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

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	RJ-45 Cable	1	10	No	0	Provided by Lab
2.	USB Cable	1	1.4	Yes	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}
	☐	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 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:

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

4.1.2 Test Instruments

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Keysight	N9038A	MY54450088	July 08, 2017	July 07, 2018
Pre-Amplifier EMCI	EMC001340	980142	Feb. 09, 2018	Feb. 08, 2019
Loop Antenna ^(*) Electro-Metrics	EM-6879	264	Dec. 16, 2016	Dec. 15, 2018
RF Cable	NA	LOOPCAB-001 LOOPCAB-002	Jan. 15, 2018	Jan. 14, 2019
Pre-Amplifier Mini-Circuits	ZFL-1000VH2B	AMP-ZFL-01	Nov. 09, 2017	Nov. 08, 2018
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-406	Nov. 29, 2017	Nov. 28, 2018
RF Cable	8D	966-4-1 966-4-2 966-4-3	Mar. 21, 2018	Mar. 20, 2019
Fixed attenuator Mini-Circuits	UNAT-5+	PAD-3m-4-01	Oct. 03, 2017	Oct. 02, 2018
Horn_Antenna SCHWARZBECK	BBHA 9120D	9120D-783	Dec. 12, 2017	Dec. 11, 2018
Pre-Amplifier EMCI	EMC12630SE	980385	Jan. 29, 2018	Jan. 28, 2019
RF Cable	EMC104-SM-SM-1200 EMC104-SM-SM-2000 EMC104-SM-SM-5000	160923 150318 150321	Jan. 29, 2018	Jan. 28, 2019
Pre-Amplifier EMCI	EMC184045SE	980387	Jan. 29, 2018	Jan. 28, 2019
Horn_Antenna SCHWARZBECK	BBHA 9170	BBHA9170608	Dec. 14, 2017	Dec. 13, 2018
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

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 calibration interval of the above test instruments is 24 months and the calibrations are traceable to NML/ROC and NIST/USA.
3. The test was performed in 966 Chamber No. 4.
4. The CANADA Site Registration No. is 20331-2
5. Loop antenna was used for all emissions below 30 MHz.
6. Tested Date: June 27 to 28, 2018

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:

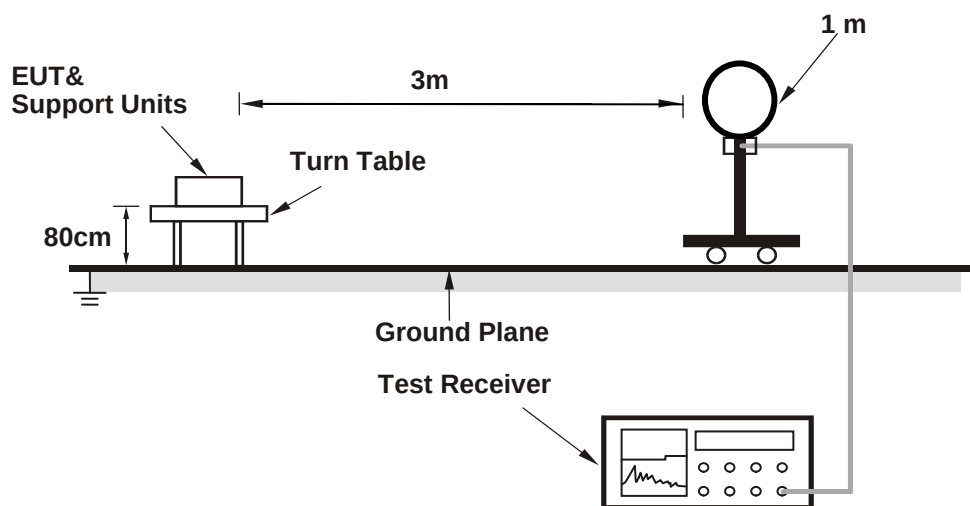
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

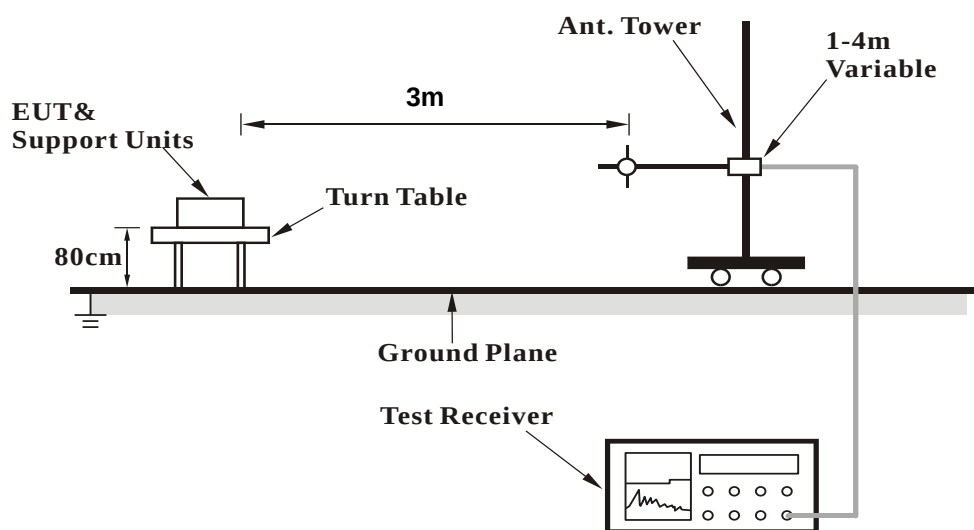
No deviation.

4.1.5 Test Setup

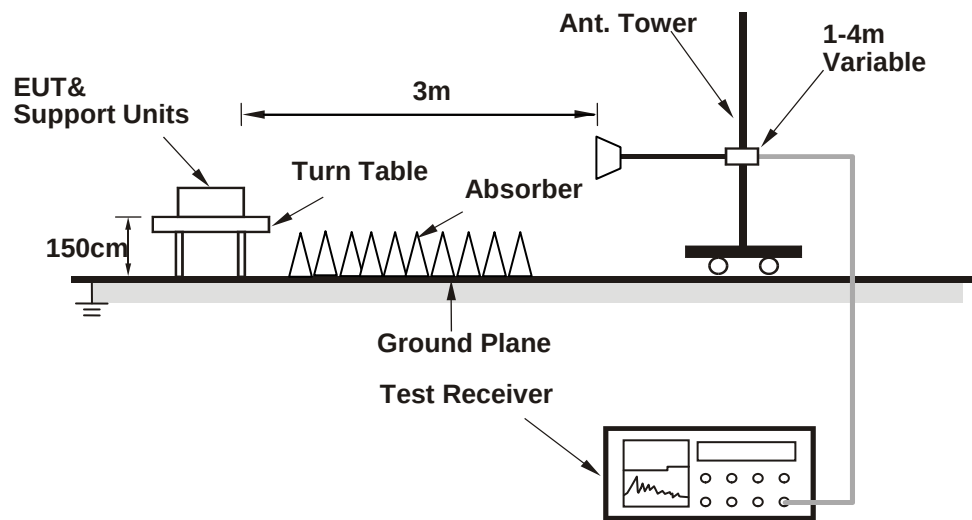
For Radiated emission below 30MHz



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

- a. Connected the EUT with the Laptop Computer which is placed on remote site.
- b. Controlling software (DUT labtool (1.0.0.109)) 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	4804.00	41.2 PK	74.0	-32.8	2.48 H	78	39.4	1.8
2	4804.00	10.1 AV	54.0	-43.9	2.48 H	78	8.3	1.8
3	4874.00	44.5 PK	74.0	-29.5	1.00 H	360	42.5	2.0
4	4874.00	32.6 AV	54.0	-21.4	1.00 H	360	30.6	2.0
5	7311.00	50.5 PK	74.0	-23.5	2.52 H	156	42.1	8.4
6	7311.00	36.9 AV	54.0	-17.1	2.52 H	156	28.5	8.4
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	4804.00	40.5 PK	74.0	-33.5	1.82 V	191	38.7	1.8
2	4804.00	10.4 AV	54.0	-43.6	1.82 V	191	8.6	1.8
3	4874.00	52.9 PK	74.0	-21.1	1.81 V	325	50.9	2.0
4	4874.00	39.2 AV	54.0	-14.8	1.81 V	325	37.2	2.0
5	7311.00	57.1 PK	74.0	-16.9	3.27 V	27	48.7	8.4
6	7311.00	44.3 AV	54.0	-9.7	3.27 V	27	35.9	8.4

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

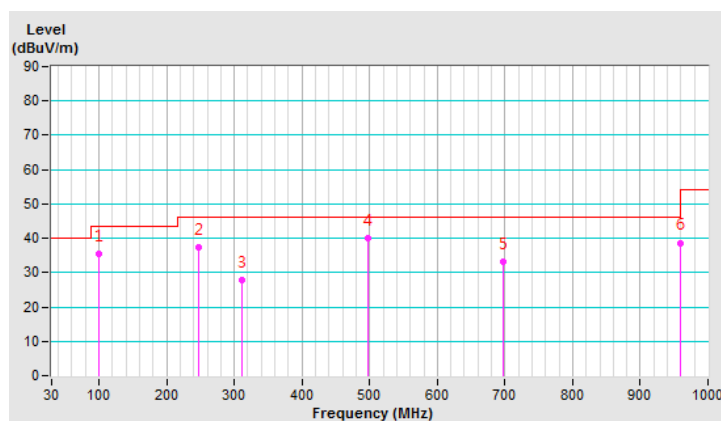
Below 1GHz Data:

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	99.82	35.5 QP	43.5	-8.0	1.50 H	309	52.8	-17.3
2	247.74	37.5 QP	46.0	-8.5	1.00 H	347	51.4	-13.9
3	310.78	27.8 QP	46.0	-18.2	1.50 H	240	39.5	-11.7
4	498.13	39.9 QP	46.0	-6.1	1.00 H	215	46.8	-6.9
5	696.59	33.3 QP	46.0	-12.7	1.50 H	48	36.5	-3.2
6	959.61	38.7 QP	46.0	-7.3	2.00 H	55	37.6	1.1

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. The emission levels were very low against the limit of frequency range 9kHz ~ 30MHz.

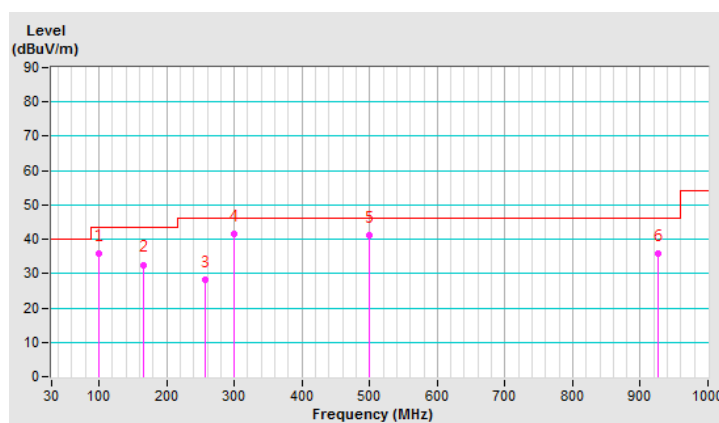


FREQUENCY RANGE	9kHz ~ 1GHz	DETECTOR FUNCTION	Quasi-Peak (QP)
------------------------	-------------	--------------------------	-----------------

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	99.85	35.9 QP	43.5	-7.6	1.50 V	95	53.2	-17.3
2	166.41	32.6 QP	43.5	-10.9	1.50 V	360	45.6	-13.0
3	256.40	28.1 QP	46.0	-17.9	1.00 V	136	41.8	-13.7
4	298.94	41.4 QP	46.0	-4.6	1.00 V	23	53.6	-12.2
5	499.86	41.0 QP	46.0	-5.0	2.00 V	160	47.9	-6.9
6	926.32	35.9 QP	46.0	-10.1	1.00 V	250	35.0	0.9

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. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. The emission levels were very low against the limit of frequency range 9kHz ~ 30MHz.



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	4804.00	41.3 PK	74.0	-32.7	2.49 H	90	39.5	1.8
2	4804.00	10.2 AV	54.0	-43.8	2.49 H	90	8.4	1.8
3	11570.00	50.7 PK	74.0	-23.3	1.08 H	351	37.3	13.4
4	11570.00	38.6 AV	54.0	-15.4	1.08 H	351	25.2	13.4
5	17355.00	51.1 PK	74.0	-22.9	2.08 H	235	33.8	17.3
6	17355.00	38.5 AV	54.0	-15.5	2.08 H	235	21.2	17.3
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	4804.00	40.2 PK	74.0	-33.8	1.80 V	182	38.4	1.8
2	4804.00	10.1 AV	54.0	-43.9	1.80 V	182	8.3	1.8
3	11570.00	53.6 PK	74.0	-20.4	2.19 V	307	40.2	13.4
4	11570.00	41.2 AV	54.0	-12.8	2.19 V	307	27.8	13.4
5	17355.00	51.9 PK	74.0	-22.1	1.27 V	264	34.6	17.3
6	17355.00	39.6 AV	54.0	-14.4	1.27 V	264	22.3	17.3

REMARKS:

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

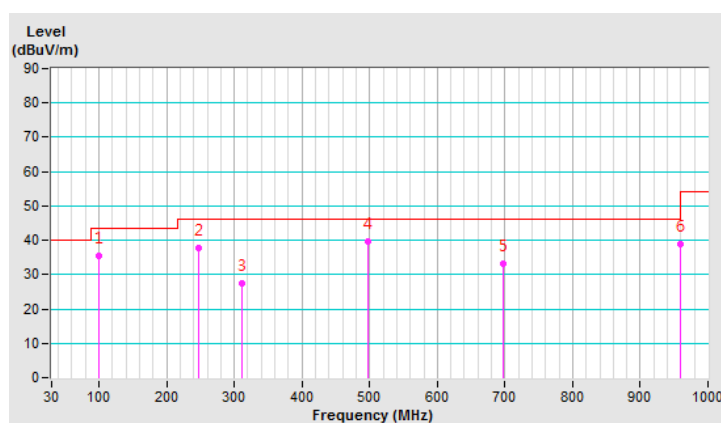
Below 1GHz Data:

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	99.75	35.4 QP	43.5	-8.1	2.50 H	239	52.7	-17.3
2	247.73	37.7 QP	46.0	-8.3	1.00 H	327	51.6	-13.9
3	310.98	27.6 QP	46.0	-18.4	1.50 H	210	39.3	-11.7
4	497.93	39.8 QP	46.0	-6.2	2.00 H	115	46.7	-6.9
5	696.61	33.2 QP	46.0	-12.8	1.00 H	6	36.4	-3.2
6	959.80	38.9 QP	46.0	-7.1	1.00 H	55	37.8	1.1

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. The emission levels were very low against the limit of frequency range 9kHz ~ 30MHz.

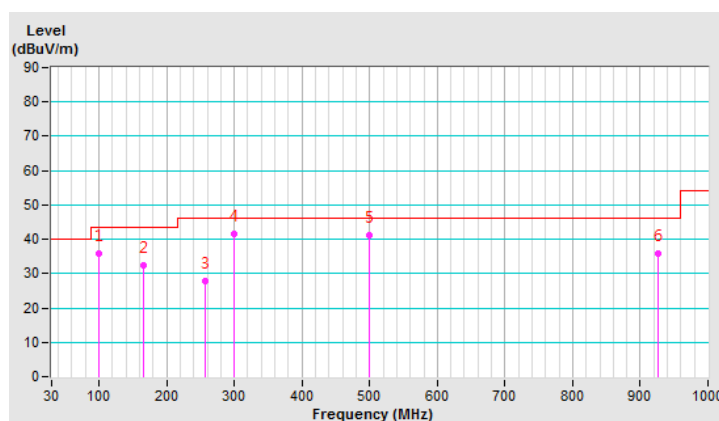


FREQUENCY RANGE	9kHz ~ 1GHz	DETECTOR FUNCTION	Quasi-Peak (QP)
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ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	99.95	35.8 QP	43.5	-7.7	1.00 V	145	53.1	-17.3
2	166.50	32.3 QP	43.5	-11.2	1.00 V	280	45.3	-13.0
3	256.51	27.8 QP	46.0	-18.2	1.00 V	66	41.5	-13.7
4	299.03	41.5 QP	46.0	-4.5	1.00 V	19	53.6	-12.1
5	499.95	41.2 QP	46.0	-4.8	2.00 V	210	48.1	-6.9
6	926.60	35.7 QP	46.0	-10.3	1.00 V	252	34.8	0.9

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. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. The emission levels were very low against the limit of frequency range 9kHz ~ 30MHz.



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 accredited and approved according to ISO/IEC 17025.

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

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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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