

FCC Test Report (Co-Located)

Report No.: RF160330C17C

FCC ID: BKMAE-WLU5000

Test Model: WLU5000-D101(RoHS)

Received Date: May 26, 2016

Test Date: Jun. 01 ~ Jun. 02, 2016

Issued Date: Jun. 17, 2016

Applicant: SEIKO EPSON CORPORATION

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

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Release Control Record

Issue No.	Description	Date Issued
RF160330C17C	Original release.	Jun. 17, 2016

1 Certificate of Conformity

Product: Wireless LAN Module

Brand: EPSON

Test Model: WLU5000-D101(RoHS)

Sample Status: DV sample

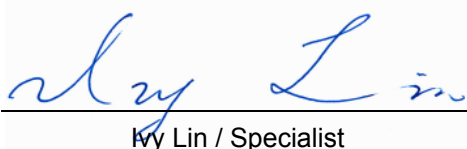
Applicant: SEIKO EPSON CORPORATION

Test Date: Jun. 01 ~ Jun. 02, 2016

Standard: 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 :



Ivy Lin / Specialist

Date:

Jun. 17, 2016

Approved by :



Ken Liu / Senior Manager

Date:

Jun. 17, 2016

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.247) 47 CFR FCC Part 15, Subpart E (Section 15.407)			
FCC Clause	Test Item	Result	Remarks
15.205 / 15.209 / 15.247(d) 15.407(b) (1/2/3/4/6)	Radiated Emissions Measurement	PASS	Meet the requirement of limit. Minimum passing margin is -3.2dB at 119.24MHz.
15.205 / 15.209 / 15.247(d) 15.407(b) (1/2/3/4/6)	Band Edge Measurement	PASS	Meet the requirement of limit. Minimum passing margin is -1.0dB at 2483.50MHz.

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	Expended Uncertainty (k=2) ($\pm$)
Radiated Emissions up to 1 GHz	30MHz ~ 200MHz	3.63 dB
	200MHz ~ 1000MHz	3.64 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	2.29 dB
	18GHz ~ 40GHz	2.29 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Wireless LAN Module
Brand	EPSON
Test Model	WLU5000-D101(RoHS)
Status of EUT	DV sample
Power Supply Rating	5Vdc from host equipment
Modulation Type	CCK, DQPSK, DBPSK for DSSS 256QAM, 64QAM, 16QAM, QPSK, BPSK for OFDM
Modulation Technology	DSSS, OFDM
Transfer Rate	802.11b: 11.0/ 5.5/ 2.0/ 1.0Mbps 802.11g: 54.0/ 48.0/ 36.0/ 24.0/ 18.0/ 12.0/ 9.0/ 6.0Mbps 802.11a: 54.0/ 48.0/ 36.0/ 24.0/ 18.0/ 12.0/ 9.0/ 6.0Mbps 802.11n: up to 300.0Mbps 802.11ac: up to 866.7Mbps
Operating Frequency	2412 ~ 2462MHz, 5180 ~ 5240MHz & 5745 ~ 5825MHz
Number of Channel	2412 ~ 2462MHz: 11 for 802.11b, 802.11g, 802.11n (HT20) 7 for 802.11n (HT40) 5180 ~ 5240MHz: 4 for 802.11a, 802.11n (HT20), 802.11ac (VHT20) 2 for 802.11n (HT40), 802.11ac (VHT40) 1 for 802.11ac (VHT80) 5745 ~ 5825MHz: 5 for 802.11a, 802.11n (HT20), 802.11ac (VHT20) 2 for 802.11n (HT40), 802.11ac (VHT40) 1 for 802.11ac (VHT80)
Output Power	2412 ~ 2462MHz: 413.146mW 5180 ~ 5240MHz: 83.954mW 5745 ~ 5825MHz: 84.055mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	N/A
Data Cable Supplied	N/A

Note:

1. The EUT (Model: WLU5000-D101(RoHS), FCC ID: BKMAE-WLU5000) with the following modules might be collocated in projector (Brand: EPSON, Model: H709A and H852A).

Item	Product name	Brand	Model	FCC ID	Antenna Type	Antenna Gain (dBi)
1	WN7122BEP	EPSON	WN7122BEP	BKMAE-7122	Printed	Ant.1: 0.32 Ant. 2: 0.31
2	Bluetooth Module	EPSON	DBUB-E207	BKMAE-E207	Printed	4.8

2. All models for the projector are as below. Model: H709A is for final test.

Brand	Model	Type of Product	Lamp power	LCD resolutions	Light Output (Brightness)
EPSON	H709A	LCD Projector	200 W	1920 x 1080	2200 lm
EPSON	H852A	LCD Projector	215 W	1920 x 1080	2500 lm

3. The EUT incorporates a MIMO function. Physically, the EUT provides 2 completed transmitters and 2 receivers.

Modulation Mode	TX Function
802.11a	2TX
802.11b	2TX
802.11g	2TX
802.11n (HT20)	2TX
802.11n (HT40)	2TX
802.11ac (VHT20)	2TX
802.11ac (VHT40)	2TX
802.11ac (VHT80)	2TX

4. The following antennas were provided to the EUT.

Antenna	Brand	Model	Antenna Type	Antenna Connector	Gain (dBi)		
					2.4GHz	5.15~5.25GHz	5.725~5.850GHz
L Side Antenna	HONGBO	290-40168	PIFA	N/A	1.6	1.9	2.2
R Side Antenna	HONGBO	290-40167	PIFA	N/A	1.8	3.4	3.2

5. The 2.4 and 5GHz cannot transmit simultaneously.

3.2 Description of Test Modes

For 2.4GHz (Module Model: WLU5000-D101(RoHS) & WN7122BEP)

11 channels are provided for 802.11b, 802.11g and 802.11n (HT20):

Channel	Frequency	Channel	Frequency
1	2412MHz	7	2442MHz
2	2417MHz	8	2447MHz
3	2422MHz	9	2452MHz
4	2427MHz	10	2457MHz
5	2432MHz	11	2462MHz
6	2437MHz		

7 channels are provided for 802.11n (HT40):

Channel	Frequency	Channel	Frequency
3	2422MHz	7	2442MHz
4	2427MHz	8	2447MHz
5	2432MHz	9	2452MHz
6	2437MHz		

For 5180 ~ 5240MHz (Module Model: WLU5000-D101(RoHS))

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

Channel	Frequency	Channel	Frequency
36	5180 MHz	44	5220 MHz
40	5200 MHz	48	5240 MHz

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

Channel	Frequency	Channel	Frequency
38	5190 MHz	46	5230 MHz

1 channel is provided for 802.11ac (VHT80):

Channel	Frequency
42	5210MHz

For 5745 ~ 5825MHz (Module Model: WLU5000-D101(RoHS))

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

Channel	Frequency	Channel	Frequency
149	5745MHz	161	5805MHz
153	5765MHz	165	5825MHz
157	5785MHz		

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

Channel	Frequency	Channel	Frequency
151	5755MHz	159	5795MHz

1 channel is provided for 802.11ac (VHT80):

Channel	Frequency
155	5775MHz

For Bluetooth (Module Model: DBUB-E207)

79 channels are provided to this EUT:

Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
0	2402	20	2422	40	2442	60	2462
1	2403	21	2423	41	2443	61	2463
2	2404	22	2424	42	2444	62	2464
3	2405	23	2425	43	2445	63	2465
4	2406	24	2426	44	2446	64	2466
5	2407	25	2427	45	2447	65	2467
6	2408	26	2428	46	2448	66	2468
7	2409	27	2429	47	2449	67	2469
8	2410	28	2430	48	2450	68	2470
9	2411	29	2431	49	2451	69	2471
10	2412	30	2432	50	2452	70	2472
11	2413	31	2433	51	2453	71	2473
12	2414	32	2434	52	2454	72	2474
13	2415	33	2435	53	2455	73	2475
14	2416	34	2436	54	2456	74	2476
15	2417	35	2437	55	2457	75	2477
16	2418	36	2438	56	2458	76	2478
17	2419	37	2439	57	2459	77	2479
18	2420	38	2440	58	2460	78	2480
19	2421	39	2441	59	2461		

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT CONFIGURE MODE	APPLICABLE TO		DESCRIPTION	
	RE $\geq$ 1G	RE<1G	Co-located function	Module model
A	√	√	WLAN 2.4GHz	Module model: WLU5000-D101(RoHS)
			WLAN 2.4GHz	Module model: WN7122BEP
			Bluetooth	Module model: DBUB-E207
B	√	√	WLAN 5GHz	Module model: WLU5000-D101(RoHS)
			WLAN 2.4GHz	Module model: WN7122BEP
			Bluetooth	Module model: DBUB-E207

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

Note: The EUT had been pre-tested on the positioned of each X, Y axis. The worst case was found when positioned on **X-axis**.

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	FREQ. BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	Module model
A	802.11g	2412-2462	1 to 11	6	OFDM	BPSK	WLU5000-D101(RoHS)
	802.11g	2412-2462	1 to 11	11	OFDM	BPSK	WN7122BEP
	Bluetooth	2402-2480	0, 39, 78	78	FHSS	GFSK	DBUB-E207
B	802.11a	5180-5240, 5745-5825	36 to 48, 149 to 165	48	OFDM	BPSK	WLU5000-D101(RoHS)
	802.11g	2412-2462	1 to 11	11	OFDM	BPSK	WN7122BEP
	Bluetooth	2402-2480	0, 39, 78	78	FHSS	GFSK	DBUB-E207

Radiated Emission Test (Below 1GHz):

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

EUT CONFIGURE MODE	MODE	FREQ. BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	Module model
A	802.11g	2412-2462	1 to 11	6	OFDM	BPSK	WLU5000-D101(RoHS)
	802.11g	2412-2462	1 to 11	11	OFDM	BPSK	WN7122BEP
	Bluetooth	2402-2480	0, 39, 78	78	FHSS	GFSK	DBUB-E207
B	802.11a	5180-5240, 5745-5825	36 to 48, 149 to 165	48	OFDM	BPSK	WLU5000-D101(RoHS)
	802.11g	2412-2462	1 to 11	11	OFDM	BPSK	WN7122BEP
	Bluetooth	2402-2480	0, 39, 78	78	FHSS	GFSK	DBUB-E207

Test Condition:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER (SYSTEM)	TESTED BY
RE $\geq$ 1G	22deg. C, 66%RH	120Vac, 60Hz	Tank Wu
RE<1G	21deg. C, 66%RH	120Vac, 60Hz	Tank Wu

3.3 Description of Support Units

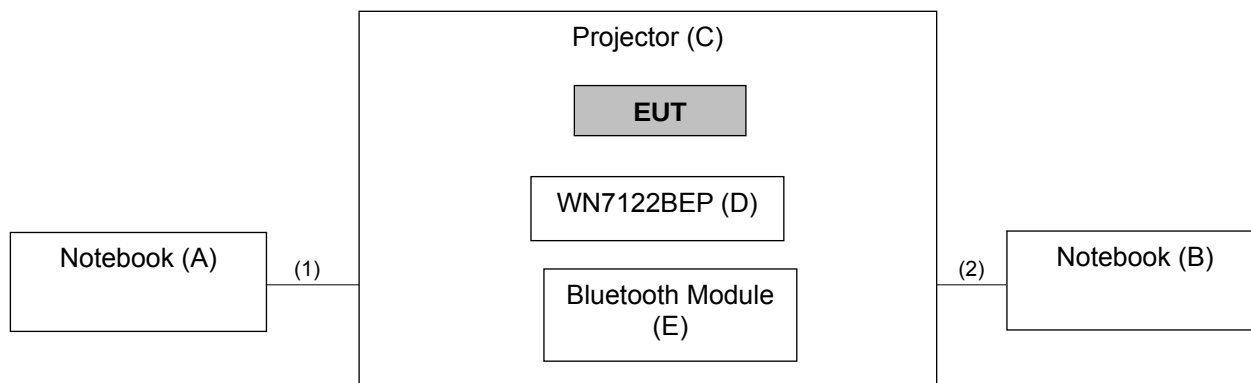
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Notebook	DELL	E5430	FKKCYW1	FCC DoC Approved	-
B.	Notebook	DELL	E5420	BPQ7MQ1	FCC DoC Approved	-
C.	Projector	EPSON	H709A	N/A	N/A	Provided by the manufacturer
D.	WN7122BEP	EPSON	WN7122BEP	N/A	BKMAE-7122	Provided by the manufacturer
E.	Bluetooth Module	EPSON	DBUB-E207	N/A	BKMAE-E207	Provided by the manufacturer

Note: 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.	USB cable	2	1.8	Y	0	-
2.	USB cable	1	1.8	Y	0	-

3.3.1 Configuration of System under Test



3.4 General Description of Applied Standard

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC Part 15, Subpart C (15.247)

FCC Part 15, Subpart E (15.407)

ANSI C63.10-2013

All test items have been performed and recorded as per the above standards.

NOTE: The EUT has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (DoC). The test report has been issued separately.

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 Procedures New Rules v01r02	FIELD STRENGTH AT 3m	
	PK:74 (dBμV/m)	AV:54 (dBμV/m)
APPLICABLE TO	EIRP LIMIT	EQUIVALENT FIELD STRENGTH AT 3m
15.407(b)(1)	PK:-27 (dBm/MHz)	PK:68.2(dBμV/m)
15.407(b)(2)		
15.407(b)(3)		
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)	FIELD STRENGTH at 3m / § 15.247(d),	
	PK:74 (dBμV/m)	AV:54 (dBμV/m)
^{*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:

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

4.1.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESCS30	100289	Dec. 23, 2015	Dec. 22, 2016
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100269	Apr. 19, 2016	Apr. 18, 2017
BILOG Antenna SCHWARZBECK	VULB9168	9168-148	Jan. 18, 2016	Jan. 17, 2017
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-1169	Jan. 08, 2016	Jan. 07, 2017
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Jan. 18, 2016	Jan. 17, 2017
Preamplifier Agilent	8449B	3008A01911	Aug. 09, 2015	Aug. 08, 2016
Preamplifier Agilent	8447D	2944A10638	Aug. 09, 2015	Aug. 08, 2016
RF signal cable HUBER+SUHNER	SUCOFLEX 104	CABLE-CH9-02(309222 +248780)	Aug. 09, 2015	Aug. 08, 2016
RF signal cable HUBER+SUHNER	SUCOFLEX 104	CABLE-CH9-03(274092)	Aug. 09, 2015	Aug. 08, 2016
RF signal cable Woken	8D-FB	Cable-CH9-01	Aug. 11, 2015	Aug. 10, 2016
Software BV ADT	ADT_Radiated_ V7.6.15.9.4	NA	NA	NA
Antenna Tower EMCO	2070/2080	512.835.4684	NA	NA
Turn Table EMCO	2087-2.03	NA	NA	NA
Antenna Tower & Turn BV ADT	AT100	AT93021705	NA	NA
Turn Table BV ADT	TT100	TT93021705	NA	NA
Turn Table Controller BV ADT	SC100	SC93021705	NA	NA
26GHz ~ 40GHz Amplifier	EM26400	815221	Oct. 18, 2015	Oct. 17, 2016

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 HwaYa Chamber 9.
3. The horn antenna and preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
4. The FCC Site Registration No. is 215374.
5. The IC Site Registration No. is IC 7450F-9.

4.1.3 Test Procedure

- a. The EUT was placed on the top of a rotating table 0.8 meters (for below 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:

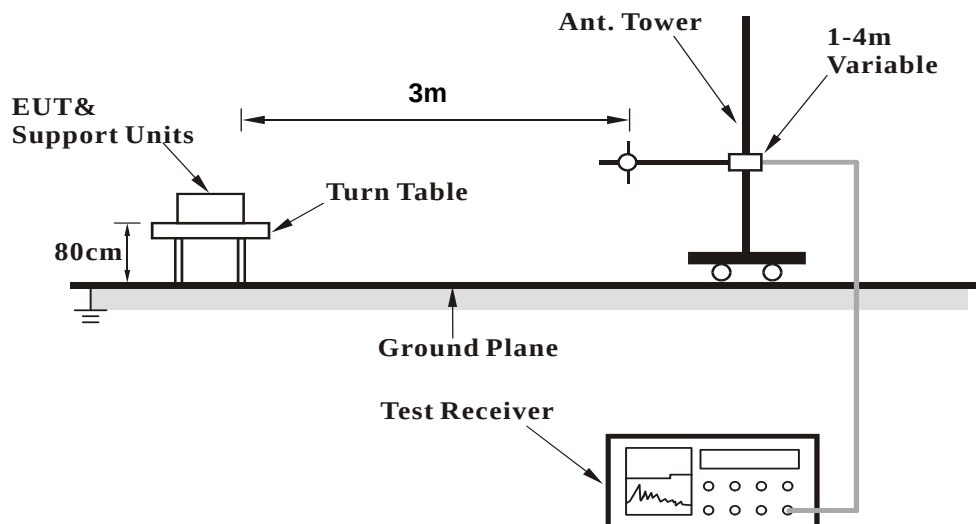
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for RMS Average (Duty cycle < 98%) for Average detection (AV) at frequency above 1GHz, then the measurement results was added to a correction factor ($10 \log(1/\text{duty cycle})$).
4. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz (Duty cycle $\geq 98\%$) for Average detection (AV) at frequency above 1GHz.
5. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

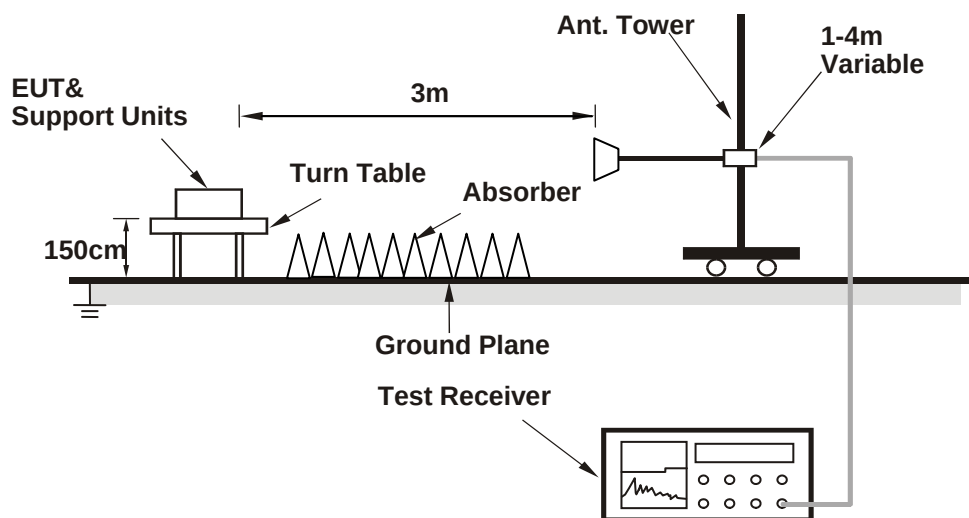
No deviation.

4.1.5 Test Setup

<Frequency Range below 1GHz>



<Frequency Range above 1GHz>



For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.1.6 EUT Operating Conditions

Set the EUT under transmission condition continuously at specific channel frequency.

4.1.7 Test Results

ABOVE 1GHz WORST-CASE DATA :

CHANNEL	802.11g CH 6 + 802.11g CH 11 + GFSK CH 78	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz	TEST MODE	A

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	*2437.00	107.3 PK			2.77 H	291	72.30	35.00
2	*2437.00	97.3 AV			2.77 H	291	62.30	35.00
3	4874.00	52.9 PK	74.0	-21.1	1.93 H	44	48.40	4.50
4	4874.00	39.5 AV	54.0	-14.5	1.93 H	44	35.00	4.50
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	*2437.00	108.2 PK			4.00 V	282	112.30	-4.10
2	*2437.00	97.8 AV			4.00 V	282	101.90	-4.10
3	4874.00	54.1 PK	74.0	-19.9	1.50 V	15	49.60	4.50
4	4874.00	41.8 AV	54.0	-12.2	1.50 V	15	37.30	4.50

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)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

CHANNEL	802.11g CH 6 + 802.11g CH 11 + GFSK CH 78	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz	TEST MODE	A

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	*2462.00	110.4 PK			1.60 H	36	75.27	35.13
2	*2462.00	101.1 AV			1.60 H	36	65.97	35.13
3	2483.50	66.2 PK	74.0	-7.8	1.50 H	47	30.98	35.22
4	2483.50	53.0 AV	54.0	-1.0	1.50 H	47	17.78	35.22
5	4924.00	49.5 PK	74.0	-24.5	1.50 H	21	44.83	4.67
6	4924.00	35.2 AV	54.0	-18.8	1.50 H	21	30.53	4.67
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	*2462.00	106.0 PK			1.30 V	114	70.80	35.20
2	*2462.00	97.1 AV			1.30 V	114	61.90	35.20
3	2483.50	63.1 PK	74.0	-10.9	1.75 V	87	27.90	35.20
4	2483.50	51.4 AV	54.0	-2.6	1.75 V	87	16.20	35.20
5	4924.00	49.2 PK	74.0	-24.8	1.50 V	176	44.50	4.70
6	4924.00	35.9 AV	54.0	-18.1	1.50 V	176	31.20	4.70

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)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * " : Fundamental frequency.

CHANNEL	802.11g CH 6 + 802.11g CH 11 + GFSK CH 78	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz	TEST MODE	A

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	*2480.00	102.7 PK			1.47 H	136	67.50	35.20
2	*2480.00	72.6 AV			1.47 H	136	37.40	35.20
3	2483.50	51.7 PK	74.0	-22.3	1.47 H	136	54.20	-2.50
4	2483.50	21.6 AV	54.0	-32.4	1.47 H	136	24.10	-2.50
5	4960.00	50.3 PK	74.0	-23.7	1.50 H	213	45.50	4.80
6	4960.00	20.2 AV	54.0	-33.8	1.50 H	213	15.40	4.80
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	*2480.00	104.0 PK			1.46 V	202	68.80	35.20
2	*2480.00	73.9 AV			1.46 V	202	38.70	35.20
3	2483.50	47.1 PK	74.0	-26.9	1.46 V	202	49.60	-2.50
4	2483.50	17.0 AV	54.0	-37.0	1.46 V	202	19.50	-2.50
5	4960.00	51.4 PK	74.0	-22.6	1.51 V	105	46.60	4.80
6	4960.00	21.3 AV	54.0	-32.7	1.51 V	105	16.50	4.80

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)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * " : Fundamental frequency.

CHANNEL	802.11a CH 48 + 802.11g CH 11 + GFSK CH 78	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz	TEST MODE	B

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	*5240.00	108.3 PK			4.00 H	54	66.00	42.30
2	*5240.00	97.8 AV			4.00 H	54	55.50	42.30
3	5350.00	57.7 PK	74.0	-16.3	1.50 H	130	52.90	4.80
4	5350.00	46.4 AV	54.0	-7.6	1.50 H	130	41.60	4.80
5	#10480.00	59.1 PK	74.0	-14.9	1.50 H	189	42.90	16.20
6	#10480.00	46.3 AV	54.0	-7.7	1.50 H	189	30.10	16.20
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	*5240.00	113.6 PK			4.00 V	289	71.30	42.30
2	*5240.00	102.8 AV			4.00 V	289	60.50	42.30
3	5350.00	57.9 PK	74.0	-16.1	1.50 V	113	53.10	4.80
4	5350.00	46.7 AV	54.0	-7.3	1.50 V	113	41.90	4.80
5	#10480.00	58.8 PK	74.0	-15.2	1.50 V	178	42.60	16.20
6	#10480.00	46.0 AV	54.0	-8.0	1.50 V	178	29.80	16.20

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)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * " : Fundamental frequency.

CHANNEL	802.11a CH 48 + 802.11g CH 11 + GFSK CH 78	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz	TEST MODE	B

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	*2462.00	110.2 PK			1.50 H	51	75.00	35.20
2	*2462.00	101.6 AV			1.50 H	51	66.40	35.20
3	2483.50	65.5 PK	74.0	-8.5	1.51 H	54	30.30	35.20
4	2483.50	52.5 AV	54.0	-1.5	1.51 H	54	17.30	35.20
5	#3304.00	57.1 PK	74.0	-16.9	1.70 H	116	56.40	0.70
6	#3304.00	35.4 AV	54.0	-18.6	1.70 H	116	34.70	0.70
7	4924.00	48.0 PK	74.0	-26.0	1.51 H	156	43.30	4.70
8	4924.00	35.2 AV	54.0	-18.8	1.51 H	156	30.50	4.70

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	*2462.00	105.8 PK			1.50 V	89	70.60	35.20
2	*2462.00	97.1 AV			1.50 V	89	61.90	35.20
3	2483.50	62.3 PK	74.0	-11.7	1.65 V	89	27.10	35.20
4	2483.50	50.2 AV	54.0	-3.8	1.65 V	89	15.00	35.20
5	#3307.00	50.8 PK	74.0	-23.2	3.79 V	181	50.10	0.70
6	#3307.00	46.9 AV	54.0	-7.1	3.79 V	181	46.20	0.70
7	4924.00	50.1 PK	74.0	-23.9	1.30 V	22	45.40	4.70
8	4924.00	36.5 AV	54.0	-17.5	1.30 V	22	31.80	4.70

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)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

CHANNEL	802.11a CH 48 + 802.11g CH 11 + GFSK CH 78	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz	TEST MODE	B

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	*2480.00	103.4 PK			1.50 H	185	68.20	35.20
2	*2480.00	73.3 AV			1.50 H	185	38.10	35.20
3	2483.50	45.3 PK	74.0	-28.7	1.50 H	185	47.80	-2.50
4	2483.50	15.2 AV	54.0	-38.8	1.50 H	185	17.70	-2.50
5	4960.00	49.5 PK	74.0	-24.5	1.62 H	206	44.70	4.80
6	4960.00	40.1 AV	54.0	-13.9	1.62 H	206	35.30	4.80
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	*2480.00	103.7 PK			2.68 V	111	68.50	35.20
2	*2480.00	73.6 AV			2.68 V	111	38.40	35.20
3	2483.50	43.5 PK	74.0	-30.5	2.68 V	111	46.00	-2.50
4	2483.50	13.4 AV	54.0	-40.6	2.68 V	111	15.90	-2.50
5	4960.00	50.6 PK	74.0	-23.4	2.71 V	120	45.80	4.80
6	4960.00	20.5 AV	54.0	-33.5	2.71 V	120	15.70	4.80

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)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * " : Fundamental frequency.

BELOW 1GHz WORST-CASE DATA:

CHANNEL	802.11g CH 6 + 802.11g CH 11 + GFSK CH 78	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz	TEST MODE	A

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	119.24	40.3 QP	43.5	-3.2	1.99 H	86	56.70	-16.40
2	229.08	40.4 QP	46.0	-5.6	1.49 H	80	56.80	-16.40
3	308.62	36.2 QP	46.0	-9.8	1.00 H	149	48.40	-12.20
4	359.99	40.6 QP	46.0	-5.4	1.00 H	286	51.80	-11.20
5	480.08	33.9 QP	46.0	-12.1	1.50 H	126	42.80	-8.90
6	600.36	41.2 QP	46.0	-4.8	1.24 H	16	47.50	-6.30
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	177.44	36.8 QP	43.5	-6.7	2.00 V	310	51.50	-14.70
2	311.30	38.4 QP	46.0	-7.6	1.00 V	138	50.50	-12.10
3	359.80	40.9 QP	46.0	-5.1	1.00 V	190	52.10	-11.20
4	520.82	30.9 QP	46.0	-15.1	1.24 V	15	39.10	-8.20
5	600.36	38.2 QP	46.0	-7.8	1.00 V	289	44.50	-6.30
6	840.92	39.2 QP	46.0	-6.8	1.00 V	9	41.20	-2.00

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)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value

CHANNEL	802.11a CH 48 + 802.11g CH 11 + GFSK CH 78	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz	TEST MODE	B

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	119.24	40.3 QP	43.5	-3.2	1.99 H	86	56.70	-16.40
2	229.08	40.4 QP	46.0	-5.6	1.49 H	80	56.80	-16.40
3	308.62	36.2 QP	46.0	-9.8	1.00 H	149	48.40	-12.20
4	359.99	40.6 QP	46.0	-5.4	1.00 H	286	51.80	-11.20
5	480.08	33.9 QP	46.0	-12.1	1.50 H	126	42.80	-8.90
6	600.36	41.2 QP	46.0	-4.8	1.24 H	16	47.50	-6.30
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	177.44	36.8 QP	43.5	-6.7	2.00 V	310	51.50	-14.70
2	311.30	38.4 QP	46.0	-7.6	1.00 V	138	50.50	-12.10
3	359.80	40.9 QP	46.0	-5.1	1.00 V	190	52.10	-11.20
4	520.82	30.9 QP	46.0	-15.1	1.24 V	15	39.10	-8.20
5	600.36	38.2 QP	46.0	-7.8	1.00 V	289	44.50	-6.30
6	840.92	39.2 QP	46.0	-6.8	1.00 V	9	41.20	-2.00

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)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value

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

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