

# FCC PART 15 B TEST REPORT

For

## Iconnect

No.9, Aly. 58, Ln. 112, Ruiguang Rd., Neihu Dist., Taipei City, Taiwan

FCC ID: 2AB87934

<b>Report Type:</b> Original Report	<b>Product Type:</b> Concurrent Dual-Radios 2.4GHz+5GHz MIMO AP/CPE
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<b>Report Number:</b> RDG150401005-00C	
<b>Report Date:</b> 2015-04-16	
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## **TABLE OF CONTENTS**

<b>GENERAL INFORMATION.....</b>	<b>3</b>
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT) .....	3
OBJECTIVE .....	3
RELATED SUBMITTAL(S)/GRANT(S).....	3
TEST METHODOLOGY .....	3
TEST FACILITY .....	4
<b>SYSTEM TEST CONFIGURATION.....</b>	<b>5</b>
DESCRIPTION OF TEST CONFIGURATION .....	5
EUT EXERCISE SOFTWARE .....	5
EQUIPMENT MODIFICATIONS .....	5
SUPPORT EQUIPMENT LIST AND DETAILS .....	5
SUPPORT CABLE LIST AND DETAILS .....	5
CONFIGURATION OF TEST SETUP .....	6
<b>SUMMARY OF TEST RESULTS .....</b>	<b>7</b>
<b>FCC§15.107 - CONDUCTED EMISSIONS.....</b>	<b>8</b>
MEASUREMENT UNCERTAINTY .....	8
EUT SETUP.....	8
EMI TEST RECEIVER SETUP.....	9
TEST EQUIPMENT LIST AND DETAILS.....	9
TEST PROCEDURE .....	9
CORRECTED AMPLITUDE & MARGIN CALCULATION .....	9
TEST RESULTS SUMMARY .....	10
TEST DATA .....	10
<b>FCC §15.109 - RADIATED SPURIOUS EMISSIONS .....</b>	<b>15</b>
MEASUREMENT UNCERTAINTY .....	15
EUT SETUP .....	15
EMI TEST RECEIVER SETUP.....	16
TEST PROCEDURE .....	17
TEST EQUIPMENT LIST AND DETAILS.....	17
CORRECTED AMPLITUDE & MARGIN CALCULATION .....	17
TEST RESULTS SUMMARY .....	17
TEST DATA .....	18
<b>DECLARATION LETTER.....</b>	<b>24</b>

## GENERAL INFORMATION

### Product Description for Equipment Under Test (EUT)

The *Iconnect* 's product, model number: *AP120C* (FCC ID: 2AB87934) or ("EUT") in this report is a *Concurrent Dual-Radios 2.4GHz+5GHz MIMO AP/CPE*, which was measured approximately: 19.5 cm (L) x 19.5 cm (W) x 4.7 cm (H), rated input voltage: DC 12V from adapter or DC48V from POE.

Adapter Information: Sunny

Model: SYS1308-2412-W2

Input: AC 100-240V, 50/60Hz, MAX 1.0A

Output: DC 12V, 2.0A

*Note: The series product, model AP120C, Matrix-Pro, Matrix, AP120C-AC, Matrix-Pro-AC, Matrix-AC, AP120C-ACU, AP120RC, AP120RC-AC, AP120RC-ACU are electrically identical, the difference between them is just the model name, we selected AP120C for fully testing, the details was explained in the attached declaration letter.*

*\* All measurement and test data in this report was gathered from production sample serial number: 153UAP12C0007(Assigned by Applicant).The EUT was received on 2015-04-03.*

### Objective

This test report is prepared on behalf of *Iconnect* in accordance with Part 2, Subpart J, and Part 15-Subparts A and B of the Federal Communications Commission's rules.

The objective of the manufacturer is to determine the compliance of EUT with FCC Part 15 B Class B.

### Related Submittal(s)/Grant(s)

FCC Part 15C DTS submissions with FCC ID: 2AB87934.

FCC Part 15E NII submissions with FCC ID: 2AB87934.

### Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2009, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Dongguan).

**Test Facility**

The Test site used by Bay Area Compliance Laboratories Corp. (Dongguan) to collect test data is located on the No.69 Pulongcun, Puxinhu Industrial Zone, Tangxia, Dongguan, Guangdong, China

Test site at Bay Area Compliance Laboratories Corp. (Dongguan) has been fully described in reports submitted to the Federal Communications Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 06, 2015. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2009.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 273710. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

FINAL

## SYSTEM TEST CONFIGURATION

### Description of Test Configuration

The system was configured for testing in a typical fashion (as normally used by a typical user).

### EUT Exercise Software

N/A

### Equipment Modifications

No modification was made to the EUT tested.

### Support Equipment List and Details

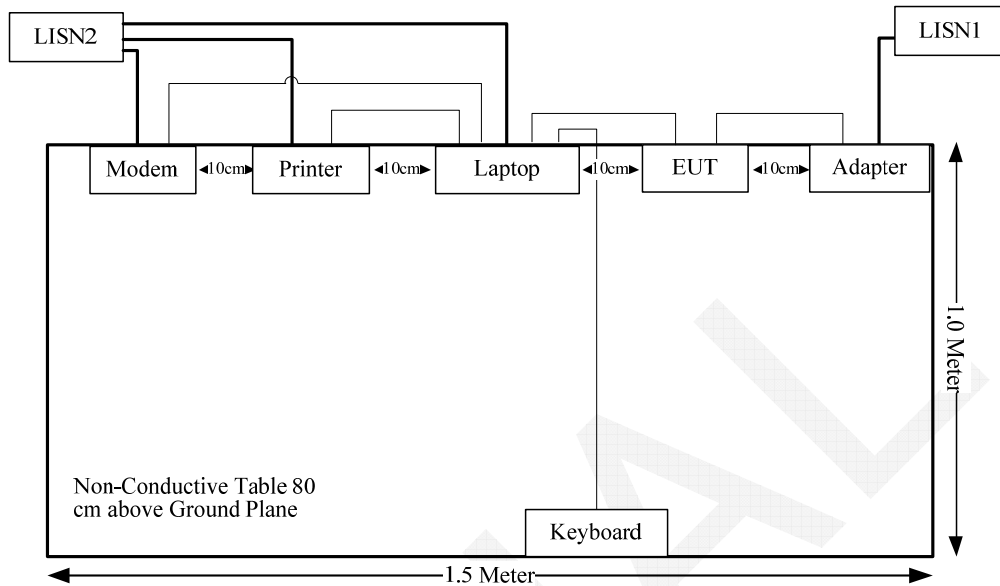
Manufacturer	Description	Model	Serial Number
DELL	Laptop	PP11L	QDS-BRCM1017
HP	Printer	C3941A	JPTVOB2337
DELL	Keyboard	L100	CNORH656658907BL05DC
SAST	Modem	AEM-2100	0293
ALFA	802.3af/at Gigabit PoE Adapter	PSE-1000GU	1411-0002460

### Support Cable List and Details

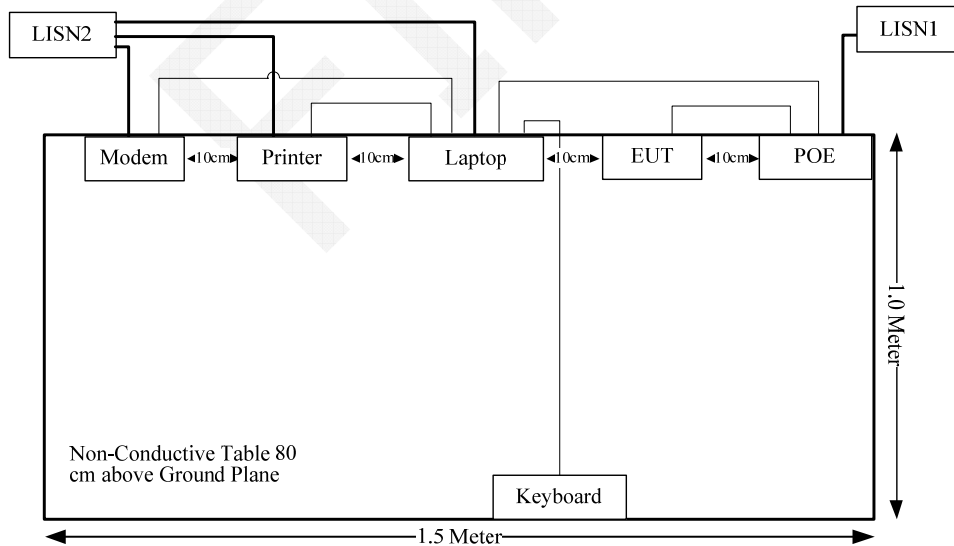
Cable Description	Shielding Type	Ferrite Core	Length (m)	From	To
Serial Cable	Yes	No	1.2	Serial Port of Laptop	Modem
Parallel Cable	Yes	No	1.2	Parallel Port of Laptop	Printer
Keyboard Cable	Yes	No	1.8	USB Port of Laptop	Keyboard
RJ45 Cable	No	No	0.8	RJ45 Port of Laptop	EUT
Adapter Cable	No	No	1.5	DC Jack of EUT	Adapter
RJ45 Cable	No	No	1.5	POE	EUT
RJ45 Cable	No	No	1.5	POE	Laptop

## Configuration of Test Setup

### Powered by Adapter:



### Powered by POE:



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Results
§15.107	Conducted Emissions	Compliance
§15.109	Radiated Emissions	Compliance

FINAL

## FCC§15.107 - CONDUCTED EMISSIONS

### Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are Receiver, cable loss, and LISN.

Compliance or non-compliance with a disturbance limit shall be determined in the following manner:

If  $U_{lab}$  is less than or equal to  $U_{cisp}$  of Table 1, then:

- compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.

If  $U_{lab}$  is greater than  $U_{cisp}$  of Table 1, then:

- compliance is deemed to occur if no measured disturbance level, increased by  $(U_{lab} - U_{cisp})$ , exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level, increased by  $(U_{lab} - U_{cisp})$ , exceeds the disturbance limit.

Based on CISPR 16-4-2: 2011, measurement uncertainty of conducted disturbance at mains port using AMN at Bay Area Compliance Laboratories Corp. (Dongguan) is 3.46 dB (150 kHz to 30 MHz).

Table 1 – Values of  $U_{cisp}$

Measurement	$U_{cisp}$
Conducted disturbance at mains port using AMN (150 kHz to 30 MHz)	3.4 dB

### EUT Setup



- Note: 1. Support units were connected to second LISN.  
 2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.



The setup of EUT is according with per ANSI C63.4-2009 measurement procedure. The specification used was with the FCC Part 15 B Class B limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The adapter was connected to a 120V/60Hz AC power source.

### EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESCS 30	830245/006	2014-10-20	2015-10-20
R&S	L.I.S.N	ESH2-Z5	892107/021	2014-06-09	2015-06-09
R&S	Two-line V-network	ENV 216	3560.6550.12	2014-12-11	2015-12-11
R&S	Test Software	EMC32	Version8.53.0	N/A	N/A

\* Statement of Traceability: Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

### Test Procedure

During the conducted emission test, the adapter was connected to the outlet of the first LISN and the other support equipments were connected to the outlet of the second LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in the Quasi-peak and average detection mode.

### Corrected Amplitude & Margin Calculation

The basic equation is as follows:

$$V_C = V_R + A_C + VDF$$

Herein,

$V_C$ : corrected voltage amplitude

$V_R$ : reading voltage amplitude

$A_C$ : attenuation caused by cable loss

VDF: voltage division factor of AMN or ISN

The “**Margin**” column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of 7dB means the emission is 7dB below the maximum limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

## Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Part 15 B Class B, with the worst margin reading of:

**3.5 dB at 0.264113 MHz** in the **Neutral** conducted mode for powered by POE.

## Test Data

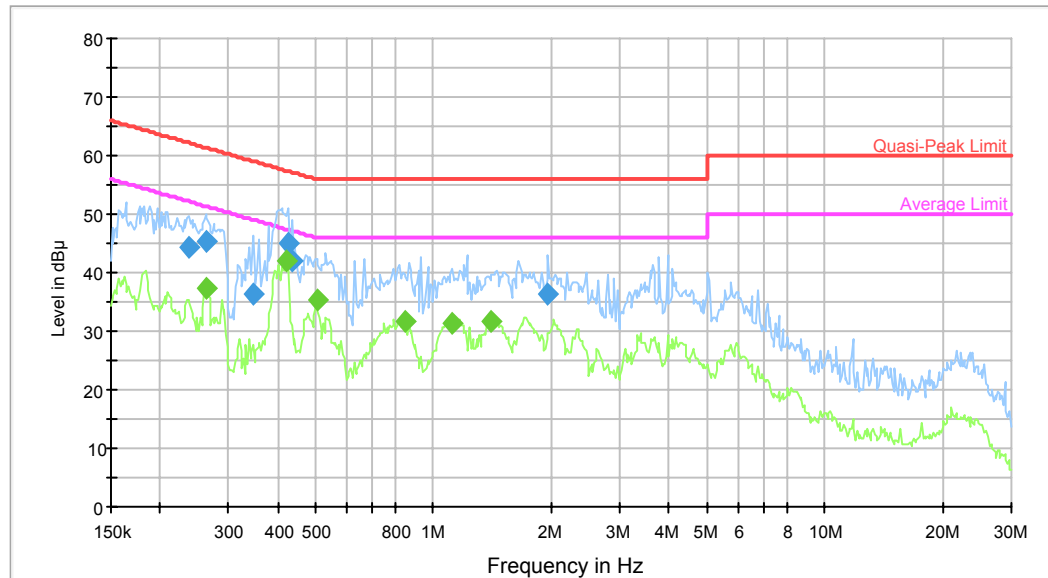
### Environmental Conditions

<b>Temperature:</b>	26.2 °C
<b>Relative Humidity:</b>	64 %
<b>ATM Pressure:</b>	100.1kPa

*The testing was performed by Allen Qiao on 2015-04-03.*

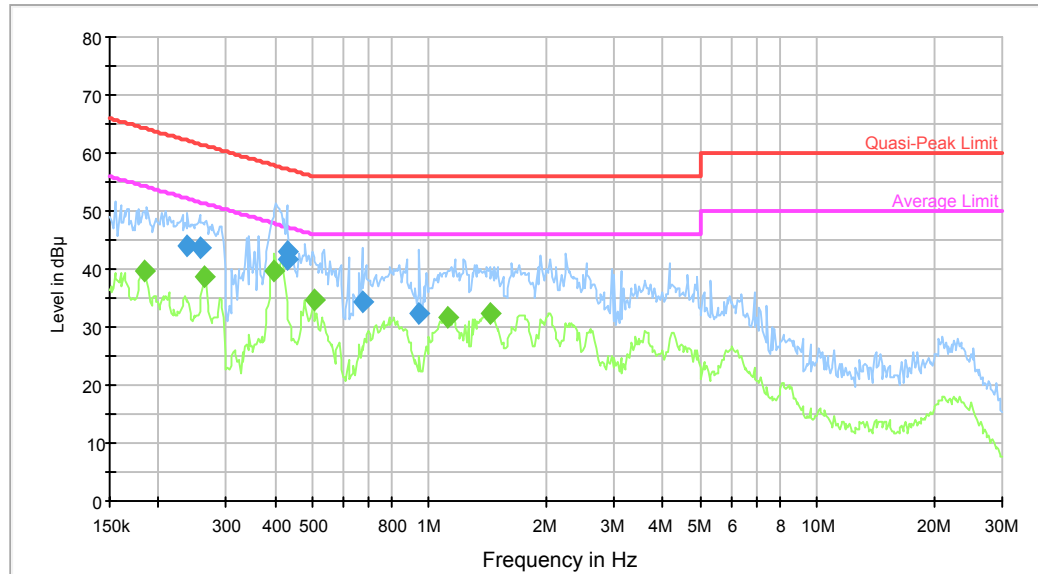
Test Mode: Powered Adapter

AC120V, 60Hz, Line:



Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.238124	44.4	9.000	L1	10.2	17.8	62.2	Compliance
0.262017	45.4	9.000	L1	10.2	16.0	61.4	Compliance
0.346296	36.5	9.000	L1	10.3	22.6	59.1	Compliance
0.426011	45.0	9.000	L1	10.2	12.3	57.3	Compliance
0.436318	42.0	9.000	L1	10.2	15.1	57.1	Compliance
1.967177	36.4	9.000	L1	10.4	19.6	56.0	Compliance

Frequency (MHz)	Average (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.264113	37.2	9.000	L1	10.2	14.1	51.3	Compliance
0.419276	41.9	9.000	L1	10.2	5.6	47.5	Compliance
0.503608	35.4	9.000	L1	10.1	10.6	46.0	Compliance
0.845331	31.5	9.000	L1	10.4	14.5	46.0	Compliance
1.117238	31.4	9.000	L1	10.4	14.6	46.0	Compliance
1.407671	31.8	9.000	L1	10.4	14.2	46.0	Compliance

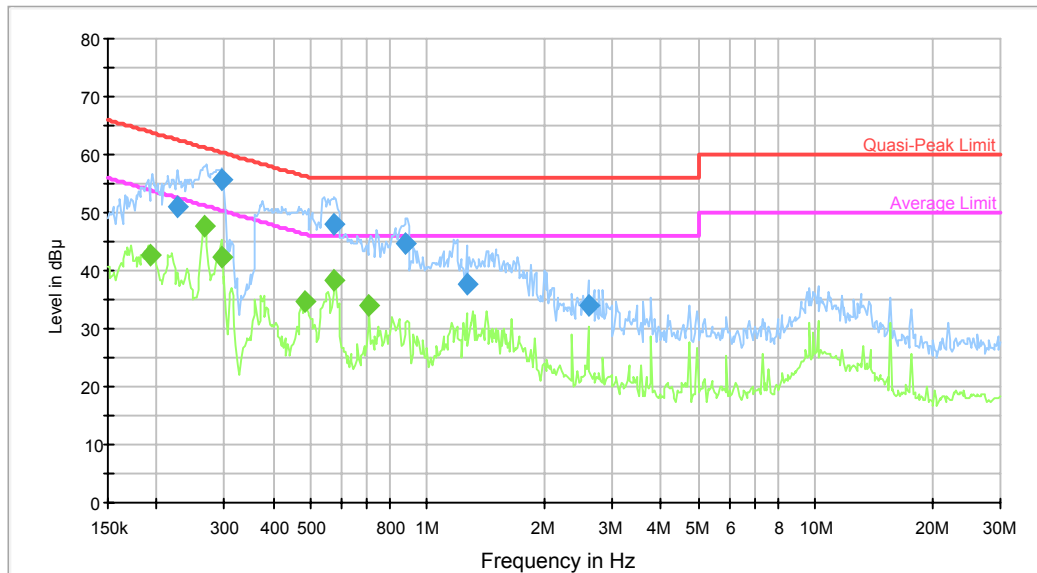
**AC120V, 60Hz, Neutral:**

Frequency (MHz)	QuasiPeak (dB $\mu$ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V)	Comment
0.238124	44.2	9.000	N	10.2	18.0	62.2	Compliance
0.255827	43.5	9.000	N	10.2	18.1	61.6	Compliance
0.429420	43.0	9.000	N	10.2	14.3	57.3	Compliance
0.432855	41.8	9.000	N	10.2	15.4	57.2	Compliance
0.670921	34.5	9.000	N	10.4	21.5	56.0	Compliance
0.945093	32.4	9.000	N	10.4	23.6	56.0	Compliance

Frequency (MHz)	Average (dB $\mu$ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V)	Comment
0.184529	39.5	9.000	N	10.2	14.8	54.3	Compliance
0.262017	38.6	9.000	N	10.2	12.8	51.4	Compliance
0.399703	39.6	9.000	N	10.2	8.3	47.9	Compliance
0.503608	34.8	9.000	N	10.1	11.2	46.0	Compliance
1.117238	31.8	9.000	N	10.4	14.2	46.0	Compliance
1.430284	32.5	9.000	N	10.4	13.5	46.0	Compliance

Test Mode: Powered by POE

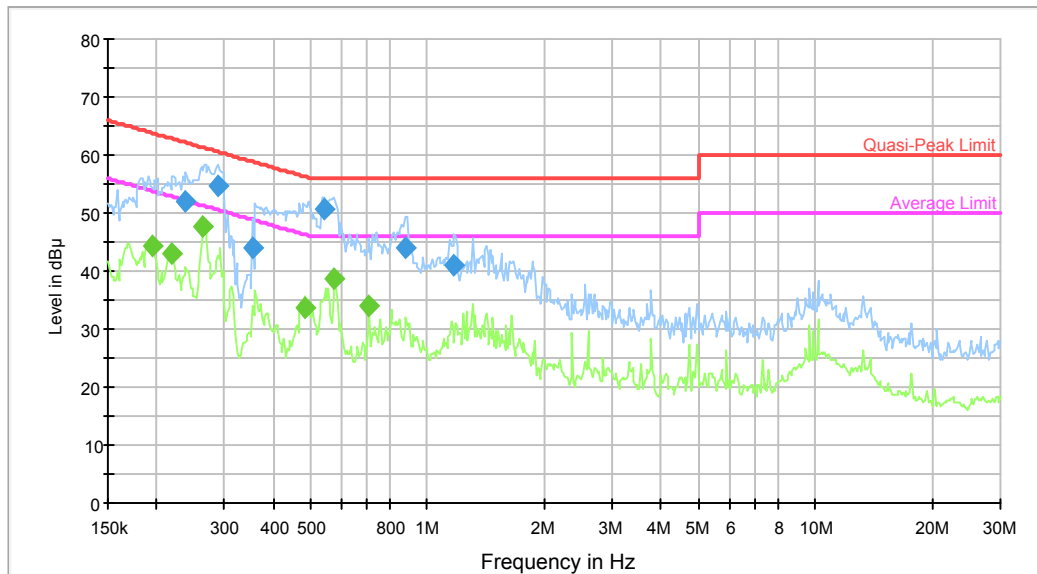
AC120V, 60Hz, Line:



Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.227007	51.1	9.000	L1	10.2	11.5	62.6	Compliance
0.295282	55.7	9.000	L1	10.3	4.7*	60.4	Compliance
0.576662	48.1	9.000	L1	10.2	7.9	56.0	Compliance
0.879690	44.7	9.000	L1	10.4	11.3	56.0	Compliance
1.259081	37.8	9.000	L1	10.4	18.2	56.0	Compliance
2.599932	34.0	9.000	L1	10.5	22.0	56.0	Compliance

Frequency (MHz)	Average (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.193566	42.8	9.000	L1	10.2	11.1	53.9	Compliance
0.266226	47.5	9.000	L1	10.2	3.7*	51.2	Compliance
0.295282	42.4	9.000	L1	10.3	8.0	50.4	Compliance
0.483938	34.7	9.000	L1	10.1	11.6	46.3	Compliance
0.576662	38.2	9.000	L1	10.2	7.8	46.0	Compliance
0.709407	34.1	9.000	L1	10.5	11.9	46.0	Compliance

\*Within measurement uncertainty!

**AC120V, 60Hz, Neutral:**

Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.238124	52.0	9.000	N	10.2	10.2	62.2	Compliance
0.288307	54.8	9.000	N	10.3	5.8	60.6	Compliance
0.354674	44.1	9.000	N	10.3	14.8	58.9	Compliance
0.541050	50.7	9.000	N	10.1	5.3	56.0	Compliance
0.872708	44.0	9.000	N	10.4	12.0	56.0	Compliance
1.171949	41.1	9.000	N	10.4	14.9	56.0	Compliance

Frequency (MHz)	Average (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.195114	44.3	9.000	N	10.2	9.5	53.8	Compliance
0.219886	43.2	9.000	N	10.2	9.7	52.8	Compliance
0.264113	47.8	9.000	N	10.2	3.5*	51.3	Compliance
0.483938	33.8	9.000	N	10.1	12.5	46.3	Compliance
0.576662	38.8	9.000	N	10.2	7.2	46.0	Compliance
0.709407	34.1	9.000	N	10.4	11.9	46.0	Compliance

\*Within measurement uncertainty!

## FCC §15.109 - RADIATED SPURIOUS EMISSIONS

### Measurement Uncertainty

Compliance or non-compliance with a disturbance limit shall be determined in the following manner:

If  $U_{lab}$  is less than or equal to  $U_{cisp}$  of Table 1, then:

- compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.

If  $U_{lab}$  is greater than  $U_{cisp}$  of Table 1, then:

- compliance is deemed to occur if no measured disturbance level, increased by  $(U_{lab} - U_{cisp})$ , exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level, increased by  $(U_{lab} - U_{cisp})$ , exceeds the disturbance limit.

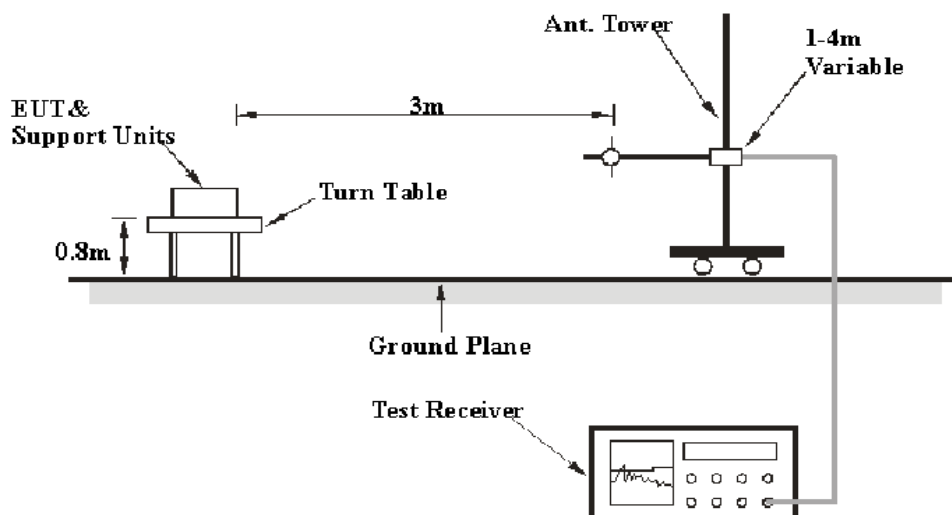
Based on CISPR 16-4-2: 2011, measurement uncertainty of radiated emission at a distance of 3m at Bay Area Compliance Laboratories Corp. (Dongguan) is: 30M~200MHz: 5.0 dB; 200M~1GHz: 6.2 dB; 1G~6GHz: 4.45 dB, 6G~18GHz: 5.23 dB

Table 1 – Values of  $U_{cisp}$

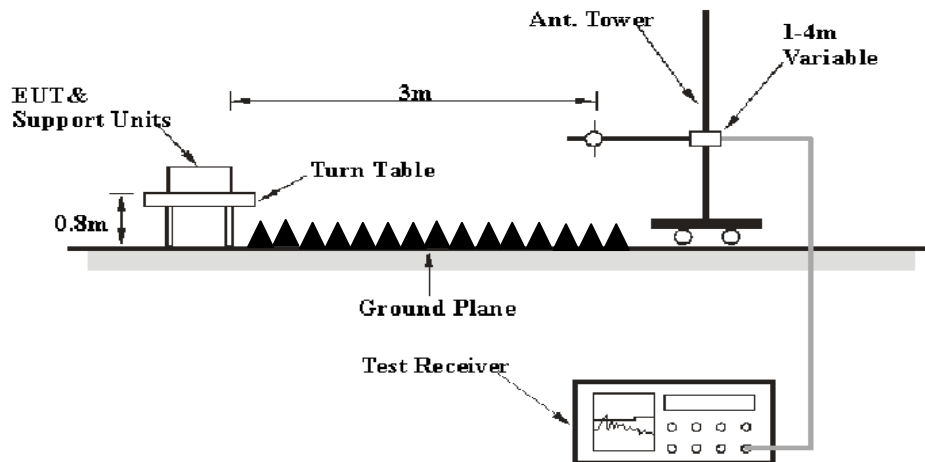
Measurement		$U_{cisp}$
Radiated disturbance (electric field strength at an OATS or in a SAC)	(30 MHz to 1000 MHz)	6.3 dB
Radiated disturbance (electric field strength in a FAR)	(1 GHz to 6 GHz)	5.2 dB
Radiated disturbance (electric field strength in a FAR)	(6 GHz to 18 GHz)	5.5 dB

### EUT Setup

Below 1GHz:



Above 1GHz:



The radiated emission tests were performed in the 3 meters chamber test site, using the setup accordance with the ANSI C63.4-2009. The specification used was the FCC Part 15.109 Class B limits.

### EMI Test Receiver Setup

The system was investigated from 30 MHz to 6 GHz.

During the radiated emission test, the EMI test receiver was set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Detector
30 MHz – 1000 MHz	120 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1 MHz	3 MHz	/	Peak
	1 MHz	10 Hz	/	Ave.



## Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

The data was recorded in the Quasi-peak detection mode for below 1 GHz, peak and average detection mode above 1 GHz.

## Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESCI	100224	2014-05-09	2015-05-09
Sunol Sciences	Antenna	JB3	A060611-3	2014-11-06	2017-11-05
HP	Amplifier	8447E	2434A02181	2014-09-01	2015-09-01
Agilent	Spectrum Analyzer	E4440A	SG43360054	2014-12-04	2015-12-04
ETS-Lindgren	Horn Antenna	3115	000 527 35	2012-09-06	2015-09-06
Mini-Circuit	Amplifier	ZVA-213-S+	054201245	2015-02-19	2016-02-19

\* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

## Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Loss and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

$$\text{Corrected Amplitude} = \text{Meter Reading} + \text{Antenna Loss} + \text{Cable Loss} - \text{Amplifier Gain}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7 dB means the emission is 7 dB below the limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

## Test Results Summary

According to the data in the following table, the EUT complied with the FCC Part 15 B Class B, with the worst margin reading of:

**5.3 dB at 62.0100 MHz in the Vertical polarization for powered by adapter.**

## Test Data

### Environmental Conditions

Temperature:	23.7 -23.6°C
Relative Humidity:	70-66 %
ATM Pressure:	100.3-101.3 kPa

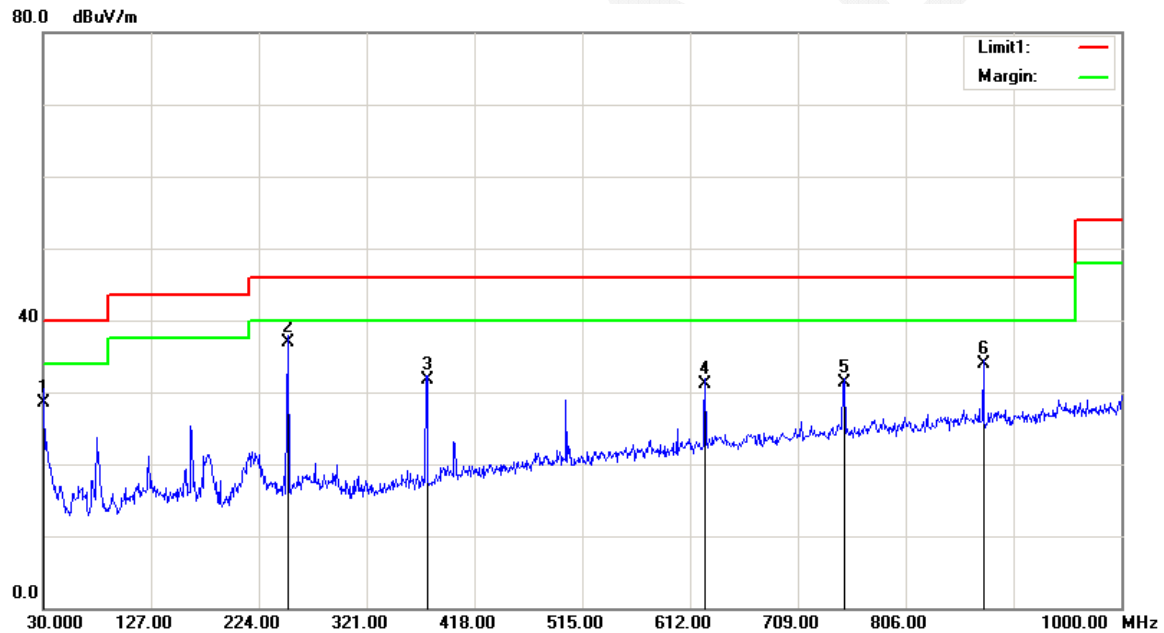
The testing was performed by Allen Qiao on 2015-04-03 and 2015-04-11.

Test Result: Compliance

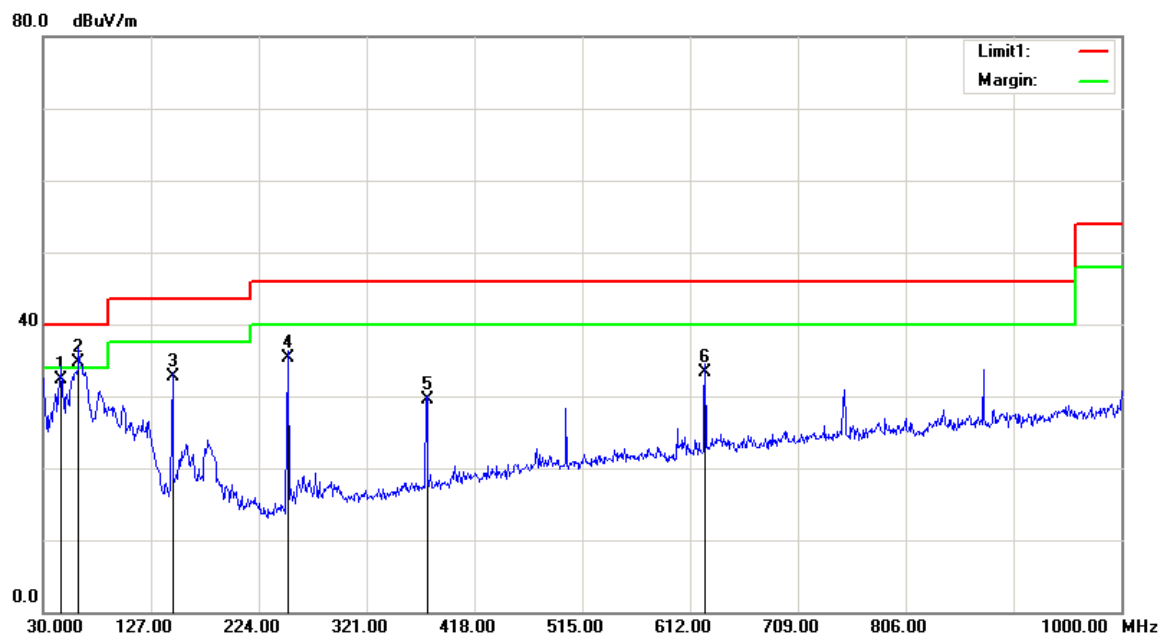
1) Below 1G:

Test Mode: Powered by Adapter

### Horizontal



Frequency (MHz)	Receiver Reading (dBμV)	Detector (PK/QP/Ave)	Correction Factor (dB/m)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
30.0000	25.22	QP	3.38	28.60	40.00	11.40
250.1900	44.96	QP	-7.96	37.00	46.00	9.00
375.3200	36.06	QP	-4.26	31.80	46.00	14.20
625.5800	31.07	QP	0.13	31.20	46.00	14.80
750.7100	29.47	QP	1.83	31.30	46.00	14.70
875.8400	30.80	QP	3.10	33.90	46.00	12.10

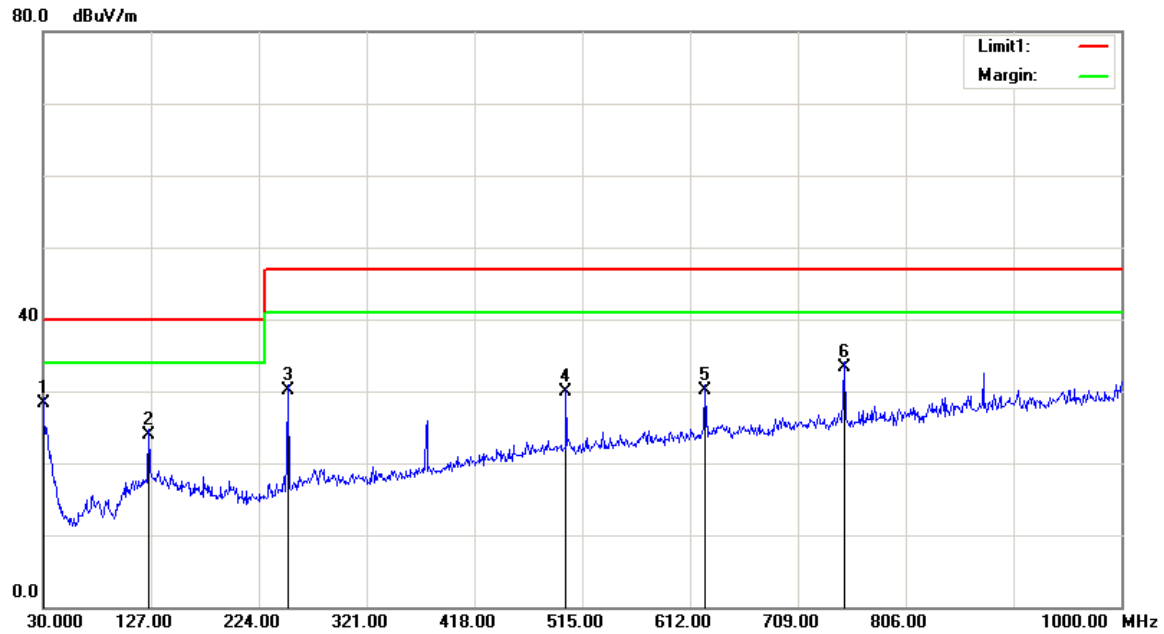
**Vertical**

Frequency (MHz)	Receiver Reading (dBμV)	Detector (PK/QP/Ave)	Correction Factor (dB/m)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
46.4900	42.96	QP	-10.66	32.30	40.00	7.70
62.0100	47.23	QP	-12.53	34.70	40.00	5.30*
146.4000	39.83	QP	-7.13	32.70	43.50	10.80
250.1900	43.36	QP	-7.96	35.40	46.00	10.60
375.3200	33.76	QP	-4.26	29.50	46.00	16.50
625.5800	33.27	QP	0.13	33.40	46.00	12.60

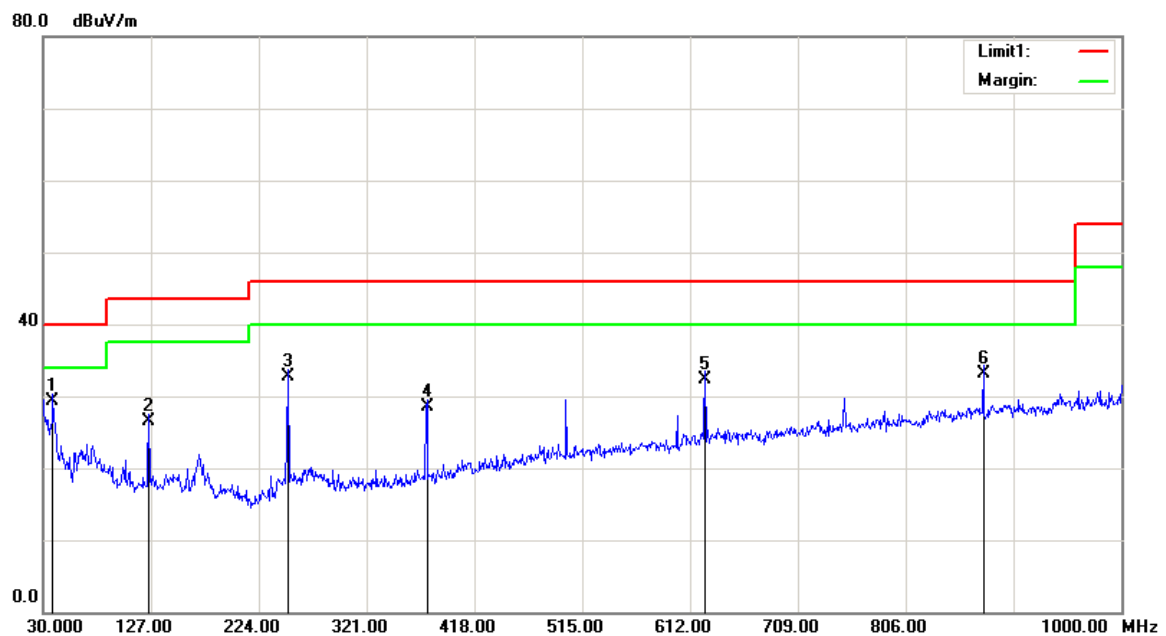
\*Within measurement uncertainty!

Test Mode: Powered by POE

### Horizontal



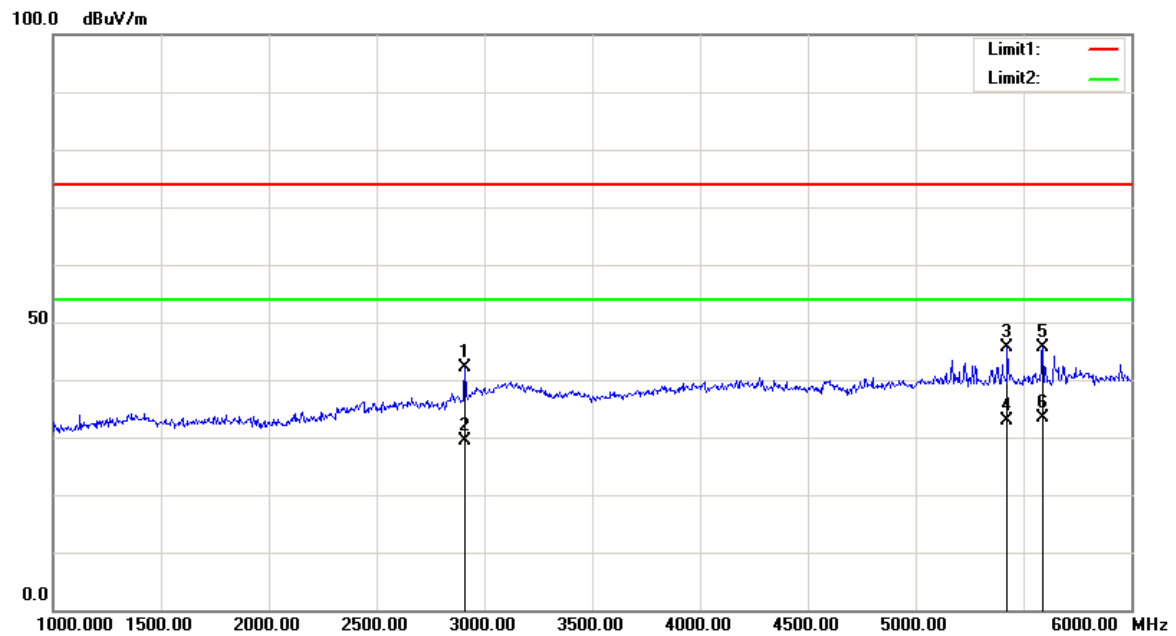
Frequency (MHz)	Receiver Reading (dBμV)	Detector (PK/QP/Ave)	Correction Factor (dB/m)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
30.0000	25.02	QP	3.38	28.40	40.00	11.60
125.0600	29.48	QP	-5.58	23.90	40.00	16.10
250.1900	38.06	QP	-7.96	30.10	47.00	16.90
500.4500	31.60	QP	-1.60	30.00	47.00	17.00
625.5800	30.07	QP	0.13	30.20	47.00	16.80
750.7100	31.47	QP	1.83	33.30	47.00	13.70

**Vertical**

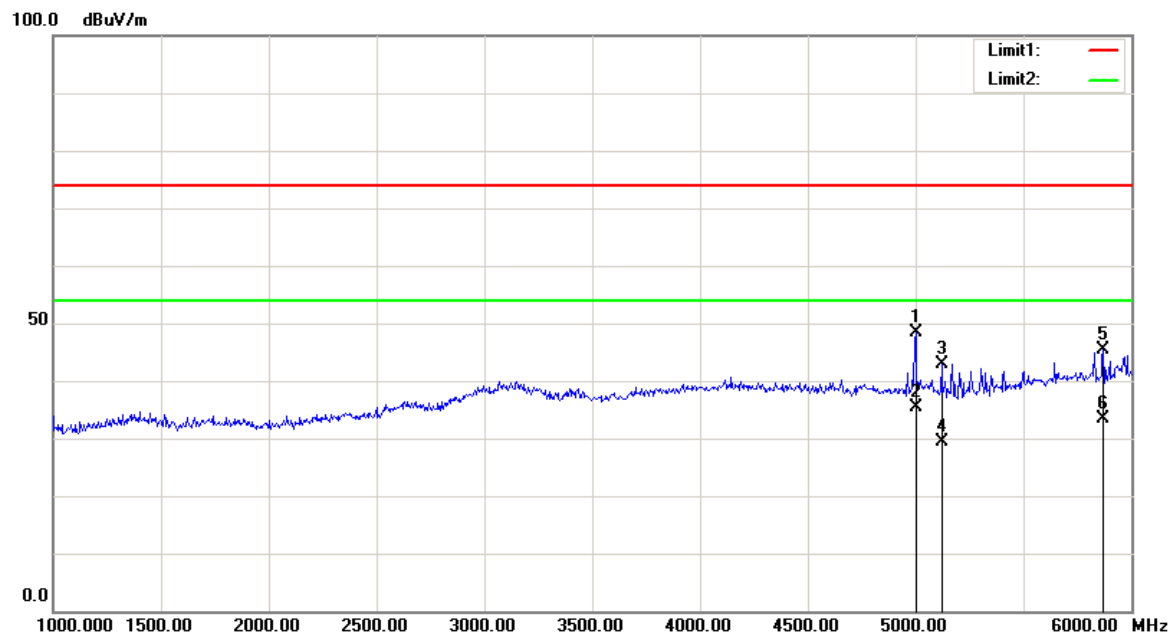
Frequency (MHz)	Receiver Reading (dBμV)	Detector (PK/QP/Ave)	Correction Factor (dB/m)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
38.7300	34.67	QP	-5.37	29.30	40.00	10.70
125.0600	32.18	QP	-5.58	26.60	43.50	16.90
250.1900	40.66	QP	-7.96	32.70	46.00	13.30
375.3200	32.86	QP	-4.26	28.60	46.00	17.40
625.5800	32.27	QP	0.13	32.40	46.00	13.60
875.8400	30.10	QP	3.10	33.20	46.00	12.80

Above 1G: (worst case)-Powered by adapter

### Horizontal



Frequency (MHz)	Receiver Reading (dBμV)	Detector (PK/QP/Ave)	Correction Factor (dB/m)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2912.500	36.55	peak	5.52	42.07	74.00	31.93
2912.500	23.84	AVG	5.52	29.36	54.00	24.64
5427.500	35.06	peak	10.51	45.57	74.00	28.43
5427.500	22.35	AVG	10.51	32.86	54.00	21.14
5590.000	34.66	peak	10.99	45.65	74.00	28.35
5590.000	22.33	AVG	10.99	33.32	54.00	20.68

**Vertical**

Frequency (MHz)	Receiver Reading (dBμV)	Detector (PK/QP/Ave)	Correction Factor (dB/m)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
5000.000	39.47	peak	8.87	48.34	74.00	25.66
5000.000	26.41	AVG	8.87	35.28	54.00	18.72
5120.000	33.24	peak	9.58	42.82	74.00	31.18
5120.000	19.75	AVG	9.58	29.33	54.00	24.67
5870.000	33.87	peak	11.42	45.29	74.00	28.71
5870.000	21.89	AVG	11.42	33.31	54.00	20.69

## DECLARATION LETTER

### Declaration of Alteration

To Whom It May Concern,

We, Iconnect, hereby declare that there are some differences between our Multiple Models and testing products. Details as below:

(This is for your reference only.)

(This is for your reference only.)

Products Description	Name	Concurrent Dual-Radios 2.4GHz+5GHz MIMO AP/CPE		
	Brand	ALFA		
	Manufacturer	Iconnect		
	Project No.	RDG150401005		
Differences Description				
Testing Products	Multiple Models		Differences Items	Details
AP120C	Matrix-Pro,Matrix,AP120C-AC, Matrix-Pro-AC,Matrix-AC, AP120C-ACU,AP120RC, AP120RC-AC,AP120RC-ACU		Model name	They are the same product, and just have the different model name.

Notes: Testing products-the products tested by BACL

Multiple Model- have the same or similar appearance, structure, PCB, Material and function to the testing products, and only are different for little parameters.

Besides the differences in the table above, we declare the products are identical  
We guarantee all the information provided above is true, and notice that we'll bear all the consequences caused by any false information or concealing

Best Regards,

Signature:

Print Name: Johnson Wang

Title: Manager

