

## FCC PART 15.407



## TEST REPORT

For

### Shenzhen Crystal Video Technology Co.,LTD.

F13,F518 Idea Land,BaoYuan Road,Baoan Central Area,ShenZhen,China

**FCC ID: Y3HCC898020150202**

<b>Report Type:</b> Original Report	<b>Product Type:</b> HD wireless video transmitter
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<b>Report Number:</b>	RDG150123002-00
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## GENERAL INFORMATION

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

The *Shenzhen Crystal Video Technology Co.,LTD.*'s product, model number: *CC8980 (FCC ID: Y3HCC898020150202)* or ("EUT") in this report is a *HD wireless video transmitter*, which was measured approximately: 12.7 cm (L) x8.3cm (W) x 3.3 cm (H), rated input voltage: DC 12V from adapter.

Adapter Information: KUANTEN

Model: SSA301F120200US

Input: 100-240V,50/60Hz,0.8A

Output: 12V,2A

*\* All measurement and test data in this report was gathered from production sample serial number: 150123002 (Assigned by BACL.Dongguan). The EUT was received on 2015-01-23.*

### Objective

This type approval report is prepared on behalf of *Shenzhen Crystal Video Technology Co.,LTD.* in accordance with Part 2-Subpart J, Part 15-Subparts A, B and E of the Federal Communications Commission's rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart E, section 15.203, 15.205, 15.207, 15.209 and 15.407 rules.

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

N/A

### Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2003, 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 emissions measurement was performed and 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 02, 2012. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2003.

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.

## SYSTEM TEST CONFIGURATION

### Description of Test Configuration

The system was configured for testing in an engineering mode (which was selected by manufacturer). For 5.8GHz band, 2 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	5755	2	5795

The worst-case data rates are determined to be as follows for each mode based upon investigations by measuring the average power and PSD across all data rates bandwidths, and modulations.

### EUT Exercise Software

The software “AppCom\_4.0.4.7” was used for testing, and the commands were provided by manufacturer. The worst condition (maximum power) was setting by the software as following table:

Test Software Version	AppCom_4.0.4.7	
Test Frequency	5755MHz	5795MHz
Power Level Setting	33	72

### Equipment Modifications

No modification was made to the EUT.

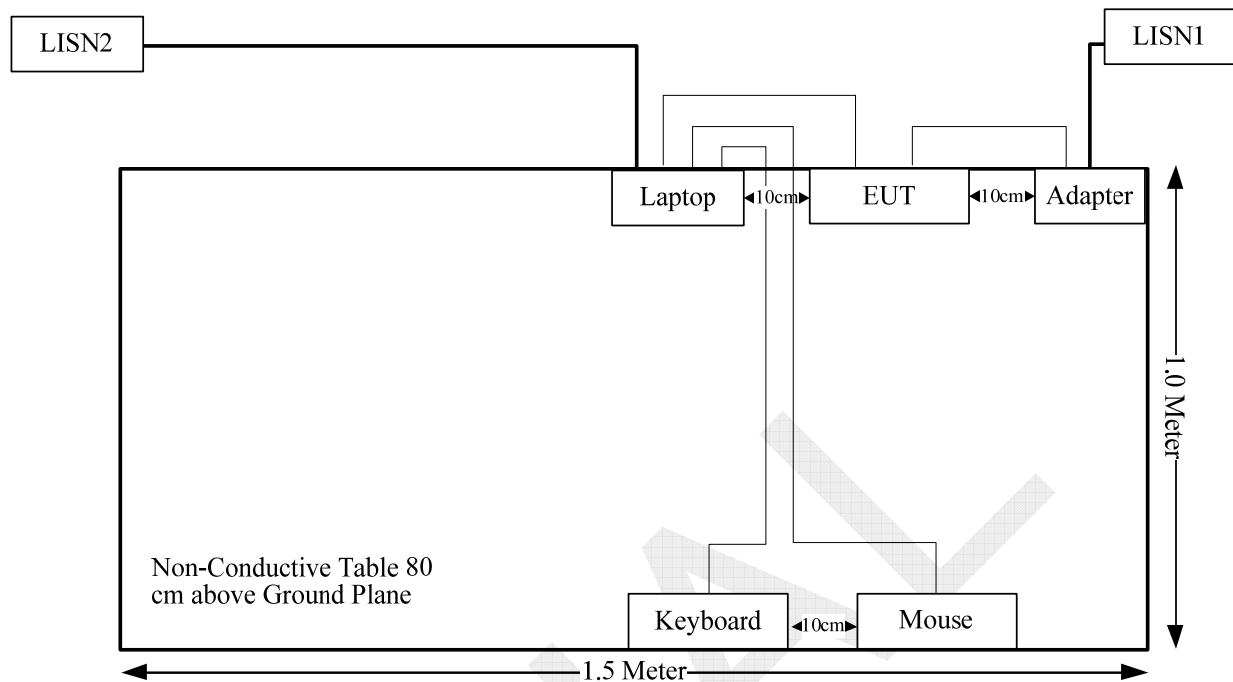
### Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
DELL	Laptop	PP11L	QDS-BRCM1017
DELL	Keyboard	L100	CNORH656658907BL05DC
DELL	Mouse	MO56UOA	F0Y02P7Y

### External Cable

Cable Description	Shielding Type	Ferrite Core	Length (m)	From Port	To
HDMI Cable	yes	No	1.5	HDMI Port of Laptop	EUT
USB Cable	yes	No	1.5	USB Port of Laptop	Keyboard
USB Cable	yes	No	1.5	USB Port of Laptop	Mouse

## Block Diagram of Test Setup



**SUMMARY OF TEST RESULTS**

FCC Rules	Description of Test	Result
FCC §15.407 (f)	Maximum Permissible Exposure	Compliance
§15.203	Antenna Requirement	Compliance
§15.407(b)(6)& §15.207(a)	Conducted Emissions	Compliance
§15.205& §15.209 &§15.407(b) (1),(6),(7)	Undesirable Emission& Restricted Bands	Compliance
§15.407(b) (1),(2),(3),(4)	Out Of Band Emissions	Compliance
§15.407(a) (1)	26 dB Bandwidth	Compliance
§15.407(a)(1),	Conducted Transmitter Output Power	Compliance
§15.407 (a)(1),(5)	Power Spectral Density	Compliance

## FCC §15.407 (f) & §1.1307 & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

### Applicable Standard

According to subpart 15.407(f) and subpart §1.1307, systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

Limits for Maximum Permissible Exposure (MPE) (§1.1310, §2.1091)

(B) Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm <sup>2</sup> )	Averaging Time (minutes)
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f <sup>2</sup> )	30
30–300	27.5	0.073	0.2	30
300–1500	/	/	f/1500	30
1500–100,000	/	/	1.0	30

f = frequency in MHz; \* = Plane-wave equivalent power density;

According to §1.1310 and §2.1091 RF exposure is calculated.

### Calculated Formulary:

Predication of MPE limit at a given distance

$S = PG/4\pi R^2$  = power density (in appropriate units, e.g. mW/cm<sup>2</sup>);

P = power input to the antenna (in appropriate units, e.g., mW);

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain;

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm);

### Calculated Data:

Frequency (MHz)	Antenna Gain		Conducted Power		Evaluation Distance (cm)	Power Density (mW/cm <sup>2</sup> )	MPE Limit (mW/cm <sup>2</sup> )
	(dBi)	(numeric)	(dBm)	(mW)			
5795	2	1.58	19.47	88.51	20.00	0.02792	1.0

**Result:** The device meet FCC MPE at 20 cm distance



## **FCC §15.203 – ANTENNA REQUIREMENT**

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### **Applicable Standard**

According to § 15.203, An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

And according to FCC 47 CFR section 15.407 (a)(1),if transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### **Antenna Connector Construction**

This product used two external detachable antennas uses a unique connector, the maximum gain is 2 dBi, which fulfill the requirement of this section, please refer to the EUT photos.

**Result:** Compliance.

## FCC §15.407 (b) (6) §15.207 (a) – CONDUCTED EMISSIONS

### Applicable Standard

FCC §15.207, §15.407(b) (6)

### 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  $U_{cispr}$  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  $U_{cispr}$  of Table 1, then:

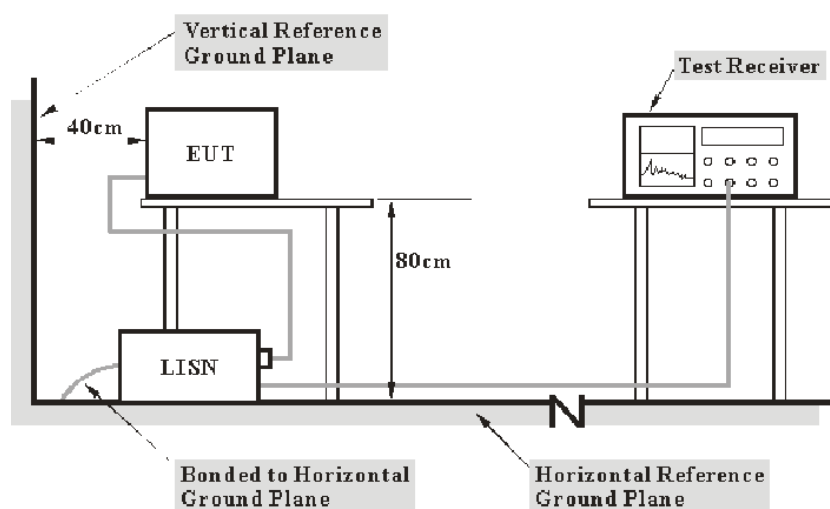
- compliance is deemed to occur if no measured disturbance level, increased by  $(U_{lab} - U_{cispr})$ , exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level, increased by  $(U_{lab} - U_{cispr})$ , exceeds the disturbance limit.

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  $U_{cispr}$

Measurement	$U_{cispr}$
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 C63.4-2003 measurement procedure. The specification used was with the FCC Part 15.207 limits.

The spacing between the peripherals was 10 cm.

The adapter was connected to a 120 VAC/60 Hz 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

### Corrected Amplitude & Margin Calculation

The basic equation is as follows:

$$V_C = V_R + A_C + VDF$$

$$C_f = A_C + VDF$$

Herein,

$V_C$  (cord. Reading): corrected voltage amplitude

$V_R$ : reading voltage amplitude

$A_C$ : attenuation caused by cable loss

VDF: voltage division factor of AMN

$C_f$ : Correction Factor

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 Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESCS 30	830245/006	2014-10-16	2015-10-16
R&S	L.I.S.N	ESH3-Z5	843331/015	N/A	N/A
R&S	Two-line V-network	ENV 216	3560.6550.12	2015-01-22	2016-01-22
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 of laptop was connected to 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.

## Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Part 15.207, with the worst margin reading of:

**18.50 dB at 0.187494 MHz in the Line conducted mode**

## Test Data

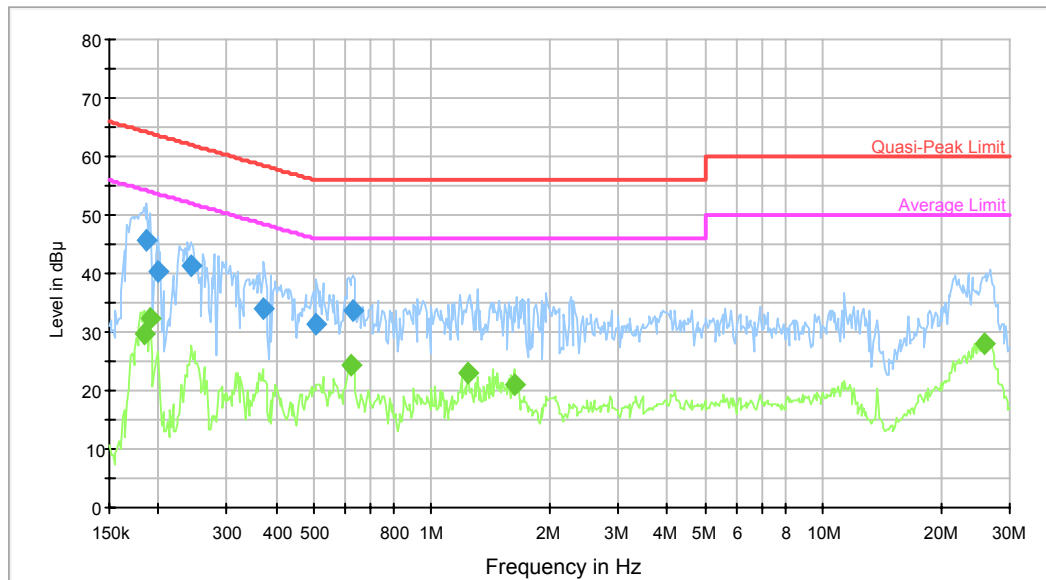
### Environmental Conditions

<b>Temperature:</b>	22.9 °C
<b>Relative Humidity:</b>	34 %
<b>ATM Pressure:</b>	101.3 kPa

*The testing was performed by Dean Liu on 205-01-24.*

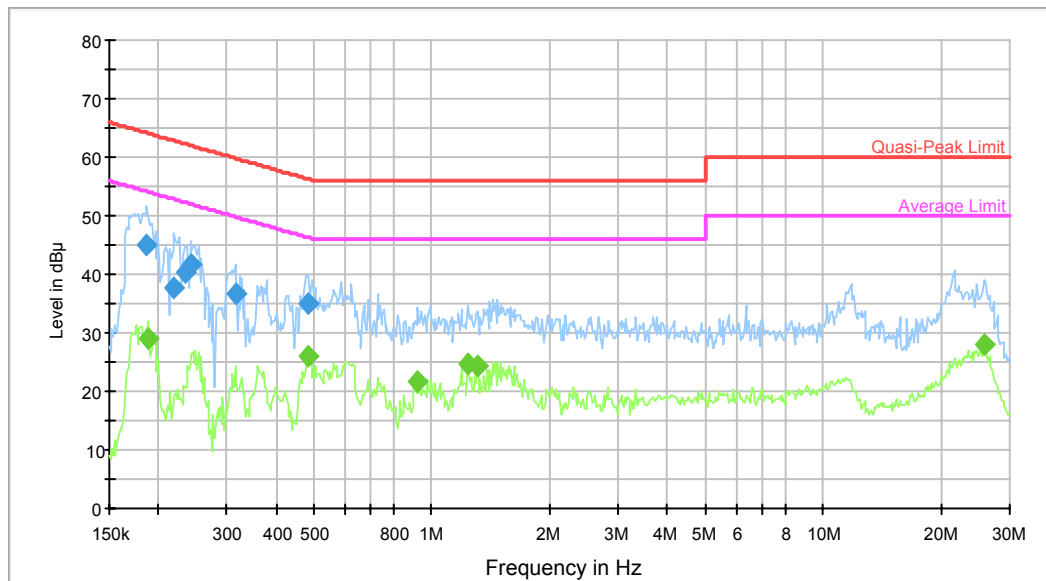
Test Mode: Transmitting

AC120 V, 60 Hz, Line:



Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.187494	45.6	9.000	L1	10.6	18.5	64.1	Compliance
0.199835	40.4	9.000	L1	10.8	23.2	63.6	Compliance
0.241949	41.2	9.000	L1	10.7	20.8	62.0	Compliance
0.372042	34.0	9.000	L1	10.7	24.5	58.5	Compliance
0.507637	31.2	9.000	L1	10.3	24.8	56.0	Compliance
0.629488	33.8	9.000	L1	10.5	22.2	56.0	Compliance

Frequency (MHz)	Average (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.184529	29.5	9.000	L1	10.5	24.8	54.3	Compliance
0.190505	32.5	9.000	L1	10.6	21.5	54.0	Compliance
0.619536	24.3	9.000	L1	10.5	21.7	46.0	Compliance
1.239175	23.0	9.000	L1	10.4	23.0	46.0	Compliance
1.624765	21.1	9.000	L1	10.4	24.9	46.0	Compliance
25.798550	28.0	9.000	L1	10.9	22.0	50.0	Compliance

**AC120 V, 60 Hz, Neutral:**

Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.187494	45.1	9.000	N	11.1	19.0	64.1	Compliance
0.219886	37.8	9.000	N	11.3	25.0	62.8	Compliance
0.234359	40.3	9.000	N	11.3	22.0	62.3	Compliance
0.241949	41.8	9.000	N	11.2	20.2	62.0	Compliance
0.314718	36.7	9.000	N	11.1	23.1	59.8	Compliance
0.483938	34.8	9.000	N	10.4	21.4	56.3	Compliance

Frequency (MHz)	Average (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.188994	28.8	9.000	N	11.1	25.2	54.1	Compliance
0.483938	26.2	9.000	N	10.4	20.1	46.3	Compliance
0.922769	21.8	9.000	N	10.5	24.2	46.0	Compliance
1.239175	24.7	9.000	N	10.5	21.3	46.0	Compliance
1.310256	24.2	9.000	N	10.5	21.8	46.0	Compliance
25.798550	28.1	9.000	N	10.9	21.9	50.0	Compliance

**FCC §15.209, §15.205 & §15.407(b) (1) (6) (7) –UNWANTED EMISSION****Applicable Standard**

FCC §15.407; §15.209; §15.205;

(b) Undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

(1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

(2) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

(3) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

(4) For transmitters operating in the 5.725-5.85 GHz band: All emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of -17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of -27 dBm/MHz.

(5) The emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.

(6) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209. Further, any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in §15.207.

(7) The provisions of §15.205 apply to intentional radiators operating under this section.

**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  $U_{cisprr}$  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  $U_{cisprr}$  of Table 1, then:

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

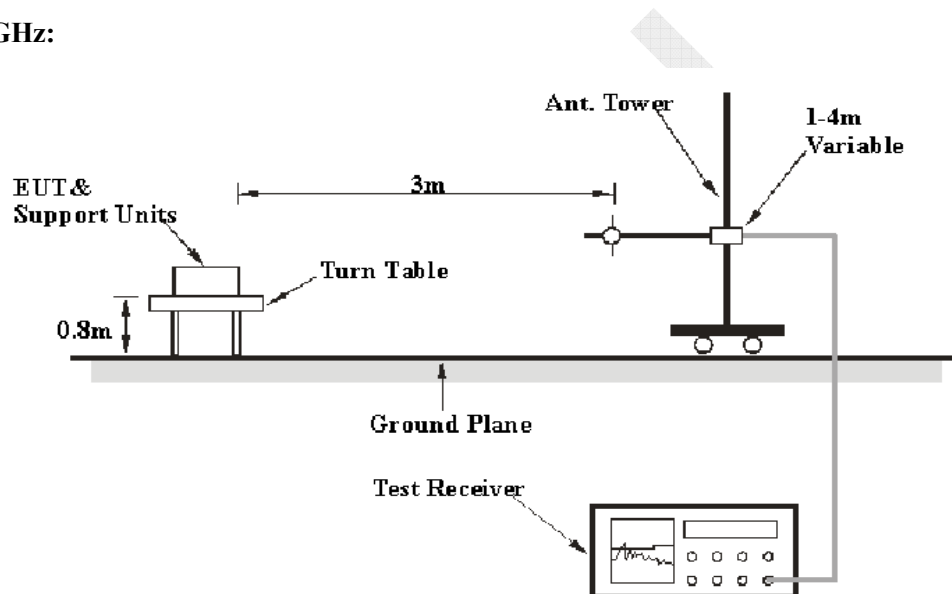
6G~18GHz: 5.23 dB

Table 1 – Values of  $U_{\text{cispr}}$

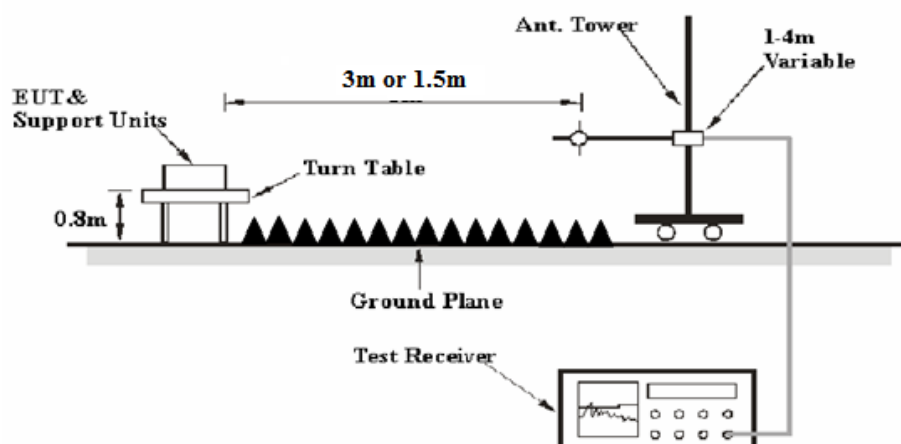
Measurement	$U_{\text{cispr}}$
Radiated disturbance (electric field strength at an OATS or in a SAC) (30 MHz to 1000 MHz)	6.3 dB
Radiated disturbance (electric field strength in a FAR) (1 GHz to 6 GHz)	5.2 dB
Radiated disturbance (electric field strength in a FAR) (6 GHz to 18 GHz)	5.5 dB

## EUT Setup

### Below 1 GHz:



### Above 1 GHz:





The radiated emission tests were performed in the 3 meters chamber, using the setup accordance with the ANSI C63.4-2003. The specification used was the FCC 15.209, and FCC 15.407 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 spacing between the peripherals was 10 cm.

The adapter of laptop was connected to a 120 VAC/60 Hz power source

### EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 40 GHz.

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were 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	1MHz	3 MHz	/	PK
	1MHz	10 Hz	/	Ave.

### Test Procedure

During the radiated emission test, the adapter of laptop was connected to the first AC floor outlet and the other support equipments were connected to the second AC floor outlet.

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

Data was recorded in Quasi-peak detection mode for frequency range of 30 MHz-1GHz, peak and Average detection modes for frequencies above 1GHz.

According to KDB 789033 D02 General UNII Test Procedures New Rules v01, emission shall be computed as:  $E [dB\mu V/m] = EIRP[dBm] + 95.2$ , for  $d = 3$  meters.

According to C63.4, the above 1G test result shall be extrapolated to the specified distance using an extrapolation factor of 20dB/decade from 3m to 1.5m

Distance extrapolation factor =  $20 \log (\text{specific distance } [3m] / \text{test distance } [1.5m])$  dB

Extrapolation result = Corrected Amplitude (dB $\mu$ V/m) - distance extrapolation factor (6dB)

### 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 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Limit} - \text{Extrapolation result}$$

**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	2014-07-28	2017-07-27
HP	Amplifier	8447E	2434A02181	2014-09-01	2015-09-01
R&S	Spectrum Analyzer	FSEM	DE31388	2014-05-09	2015-05-09
ETS LINDGREN	Horn Antenna	3115	000 527 35	2012-09-06	2015-09-06
Mini-Circuit	Amplifier	ZVA-213-S+	054201245	2014-02-19	2015-02-19
R&S	Spectrum Analyzer	FSP 38	100478	2014-05-09	2015-05-09
Ducommun Technologies	Horn Antenna	ARH-4223-02	1007726-01 1304	2014-06-16	2017-06-15
Ducommun Technologies	Horn Antenna	ARH-2823-02	1007726-01 1302	2014-06-16	2017-06-15
Quinstar	Amplifier	QLW-18405536-JO	15964001001	2014-09-06	2015-09-06

\* **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 Results Summary**

According to the recorded data in following table, the EUT complied with the FCC Title 47, Part 15, Subpart C, Section 15.205, 15.209 and 15.407, with the worst margin reading of:

**6.23 dB at 5725 MHz** in the **Vertical** polarization mode

**Test Data****Environmental Conditions**

<b>Temperature:</b>	20.5 °C-20.3°C
<b>Relative Humidity:</b>	65 %-65%
<b>ATM Pressure:</b>	101.3 kPa-101.6 kPa

*The testing was performed by Dean Liu on 2015-01-28 and 2015-02-05.*

*Mode: Transmitting*

Test Mode: Transmitting

Frequency	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Extrapolation result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
(MHz)	Reading (dBμV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB)						
Low Channel:5755 MHz										
5755	62.34	PK	H	32.15	6.11	0.00	100.60	94.60	N/A	N/A
5755	45.22	AV	H	32.15	6.11	0.00	83.48	77.48	N/A	N/A
5755	76.64	PK	V	32.15	6.11	0.00	114.90	108.90	N/A	N/A
5755	60.44	AV	V	32.15	6.11	0.00	98.70	92.70	N/A	N/A
5725	34.72	PK	V	32.15	6.04	0.00	72.91	66.91	74.00	7.09
5725	15.58	AV	V	32.15	6.04	0.00	53.77	47.77	54.00	6.23
11510	30.24	PK	V	37.90	9.86	26.12	51.88	45.88	74.00	28.12
11510	18.27	AV	V	37.90	9.86	26.12	39.91	33.91	54.00	20.09
17265	29.31	PK	V	41.09	13.86	25.63	58.63	52.63	74.00	21.37
17265	17.12	AV	V	41.09	13.86	25.63	46.44	40.44	54.00	13.56
1334	33.64	PK	V	23.17	2.99	26.94	32.86	26.86	74.00	47.14
1334	21.56	AV	V	23.17	2.99	26.94	20.78	14.78	54.00	39.22
233.52	36.7	QP	V	12.06	1.85	21.48	29.13	29.13	46.00	16.87
High Channel:5795 MHz										
5795	66.35	PK	H	32.16	6.13	0.00	104.64	98.64	N/A	N/A
5795	49.16	AV	H	32.16	6.13	0.00	87.45	81.45	N/A	N/A
5795	79.67	PK	V	32.16	6.13	0.00	117.96	111.96	N/A	N/A
5795	64.7	AV	V	32.16	6.13	0.00	102.99	96.99	N/A	N/A
5850	32.52	PK	V	32.17	6.34	0.00	71.03	65.03	74.00	8.97
5850	14.31	AV	V	32.17	6.34	0.00	52.82	46.82	54.00	7.18
11590	30.57	PK	V	37.90	9.73	26.06	52.14	46.14	74.00	27.86
11590	18.64	AV	V	37.90	9.73	26.06	40.21	34.21	54.00	19.79
17385	29.66	PK	V	41.81	13.21	25.63	59.05	53.05	74.00	20.95
17385	17.25	AV	V	41.81	13.21	25.63	46.64	40.64	54.00	13.36
1334	34.28	PK	V	23.17	2.99	26.94	33.50	27.50	74.00	46.50
1334	21.53	AV	V	23.17	2.99	26.94	20.75	14.75	54.00	39.25
233.52	37.2	QP	V	12.06	1.85	21.48	29.63	29.63	46.00	16.37

**FCC§15.407(b) –CONDUCTED SPURIOUS EMISSION AT ANTENNA PORT****Applicable Standard**

FCC §15.407;

(b) Undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

(1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

(2) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

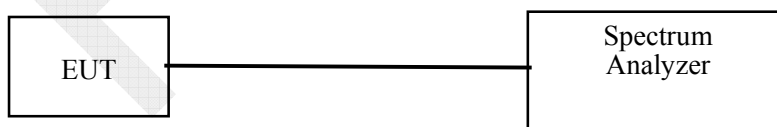
(3) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

(4) For transmitters operating in the 5.725-5.85 GHz band: All emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of -17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of -27 dBm/MHz.

(5) The emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.

**Test Procedure**

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. The Resolution bandwidth is set to 1MHz, The Video bandwidth is set to  $\geq 1$ MHz, report the peak value out of the operating band. Offset the antenna gain and cable loss.
3. Repeat above procedures until all frequencies measured were complete.

**Test Equipment List and Details**

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSEM	DE31388	2014-05-09	2015-05-09
R&S	Spectrum Analyzer	FSP 38	100478	2014-05-09	2015-05-09

\* **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 Data****Environmental Conditions**

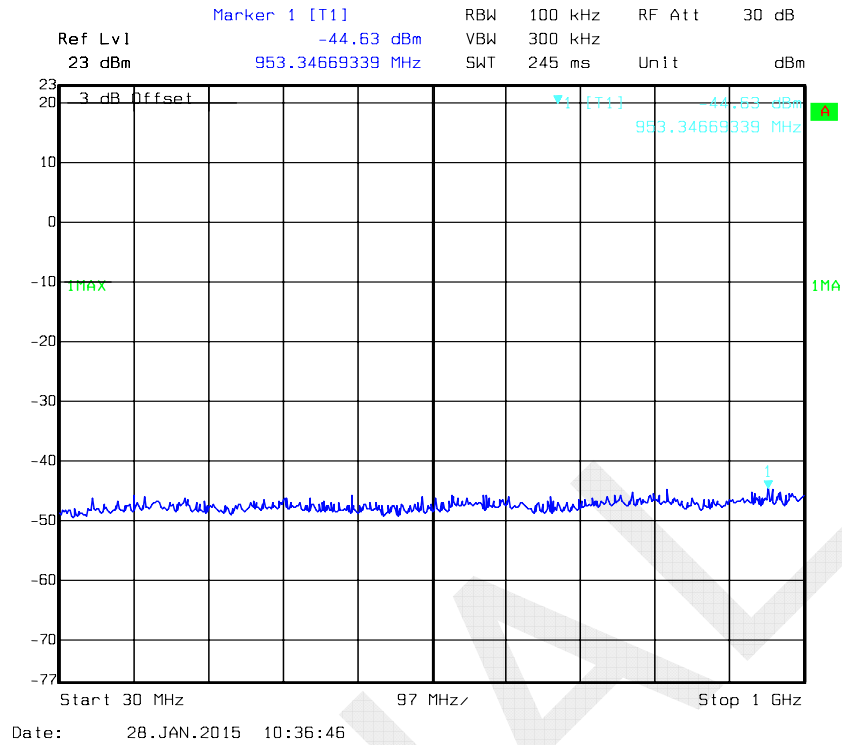
<b>Temperature:</b>	20.5 °C-20.3°C
<b>Relative Humidity:</b>	65 %-65%
<b>ATM Pressure:</b>	101.3 kPa-101.6 kPa

*The testing was performed by Dean Liu on 2015-01-28 and 2015-02-05.*

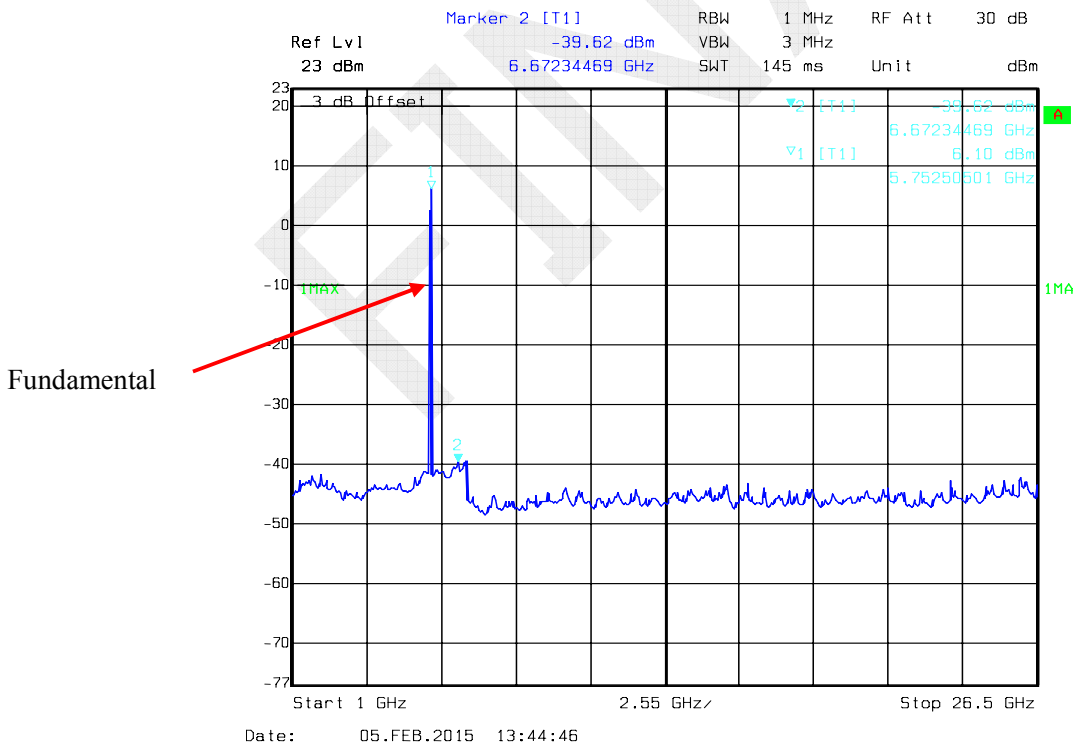
**Test Result:** Compliance,

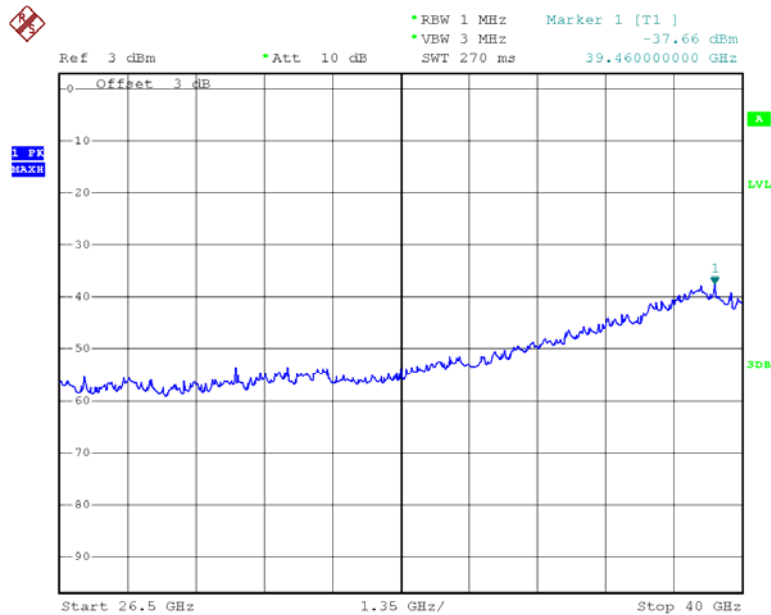
Note: All the Spurious emissions at each antenna was under limit 3dBc, so the total emissions combined under the limit.

### Low Channel 30MHz-1GHz (Antenna 0)

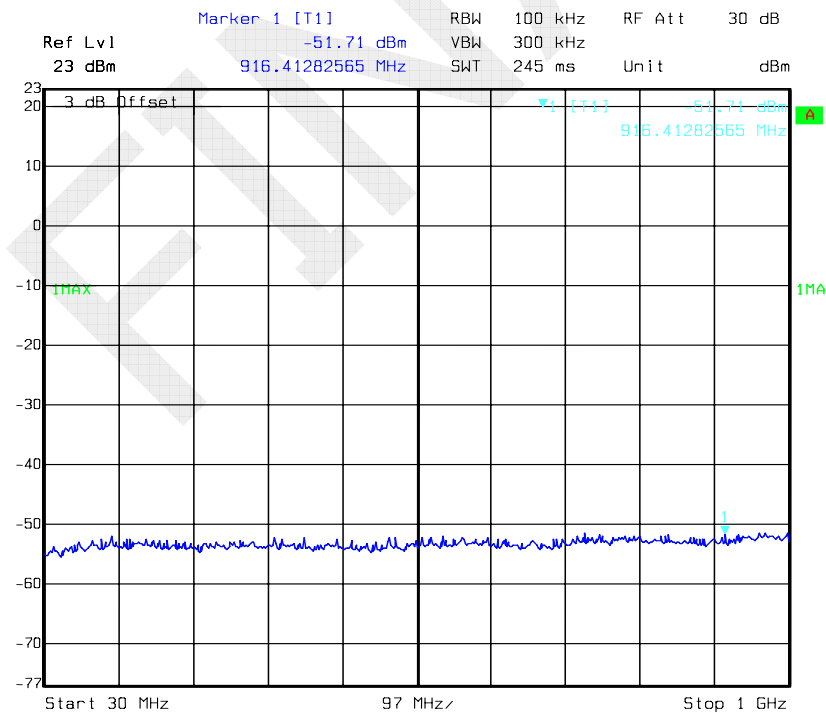


### Low Channel 1GHz-26.5GHz (Antenna 0)



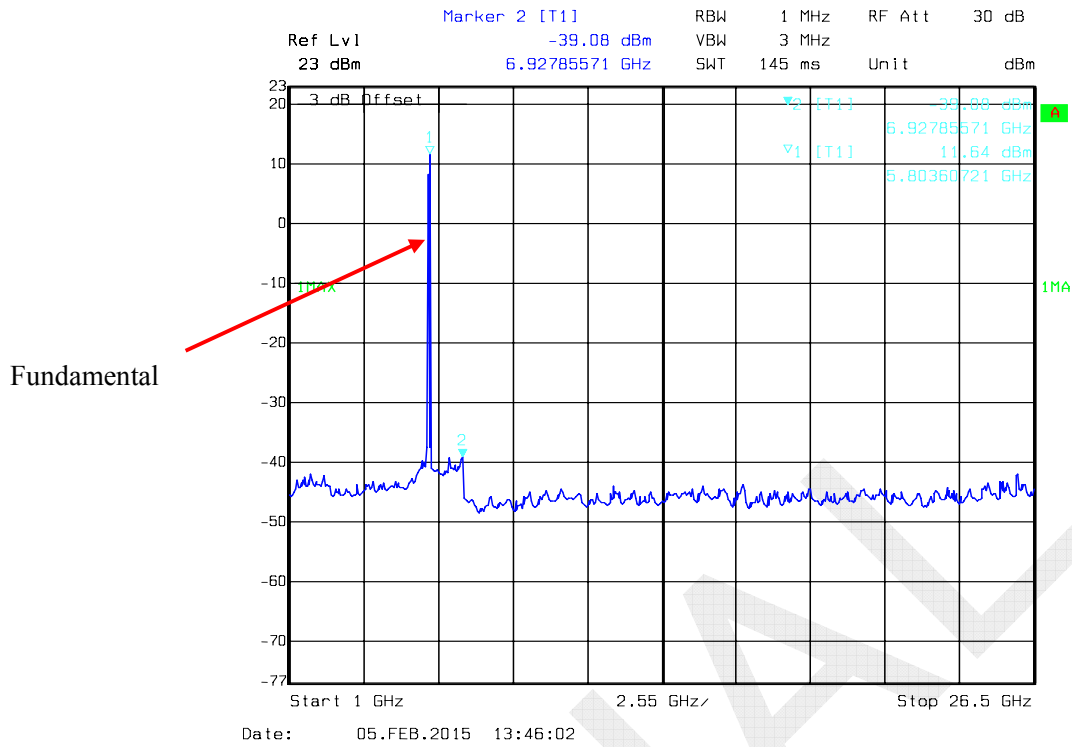
**Low Channel 26.5GHz-40GHz (Antenna 0)**

Date: 5.FEB.2015 14:01:53

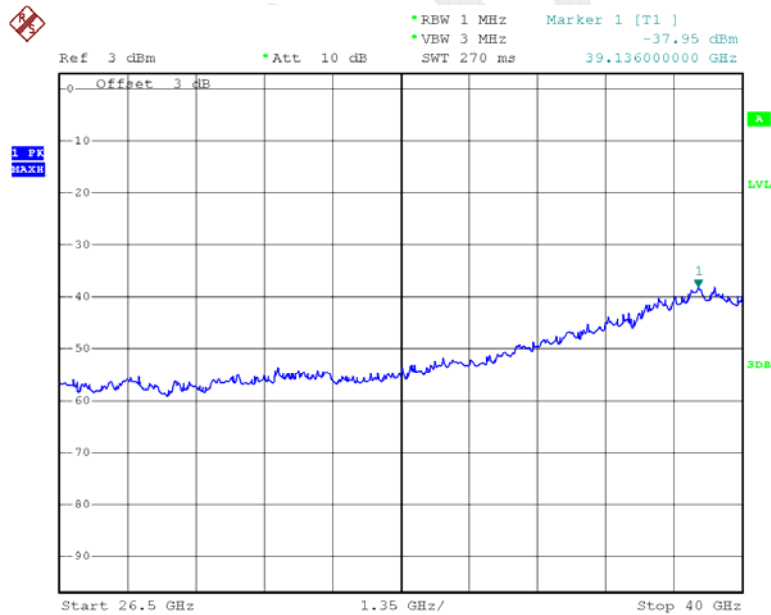
**High Channel 30MHz-1GHz (Antenna 0)**

Date: 28.JAN.2015 10:44:26

### High Channel 1GHz-26.5GHz (Antenna 0)



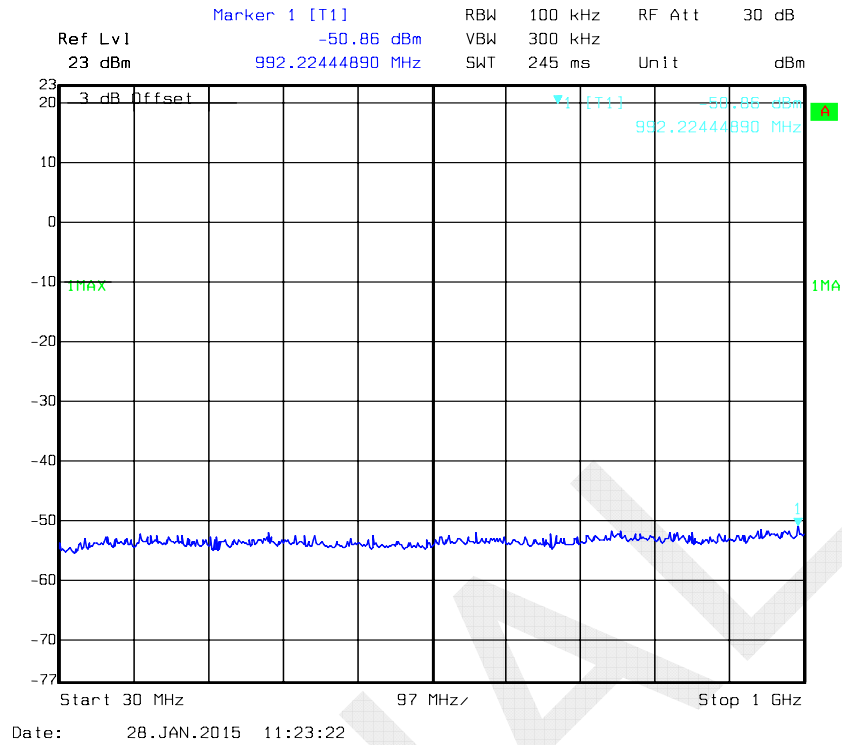
### High Channel 26.5GHz-40GHz (Antenna 0)



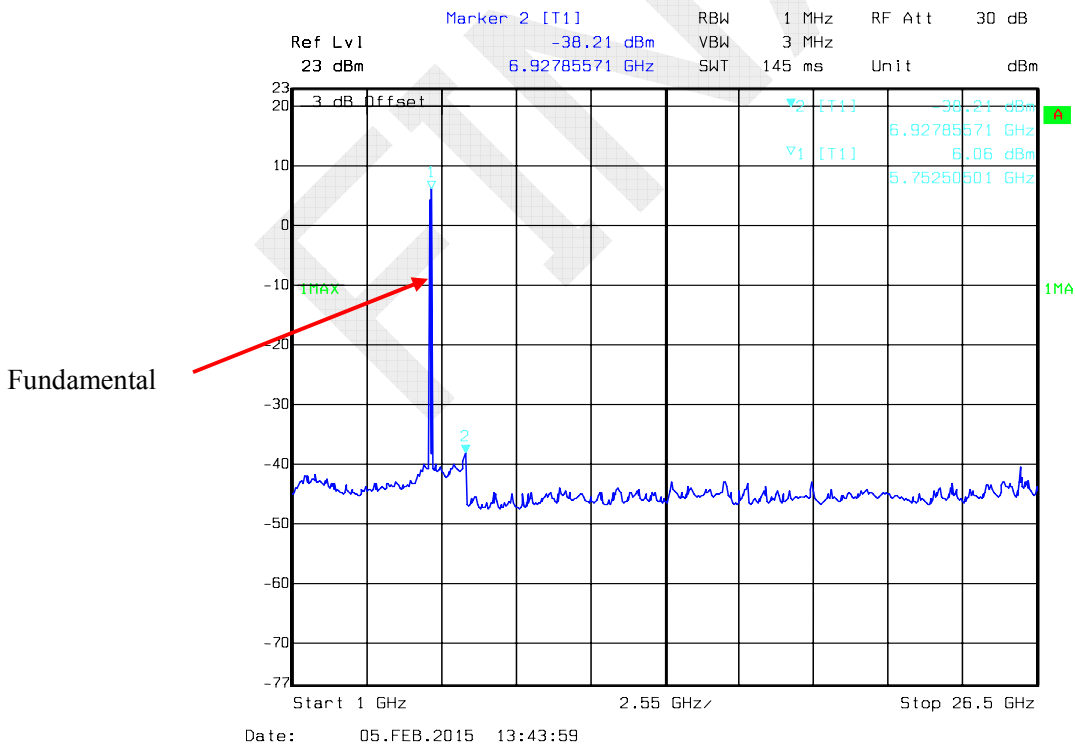
Date: 5.FEB.2015 14:05:38



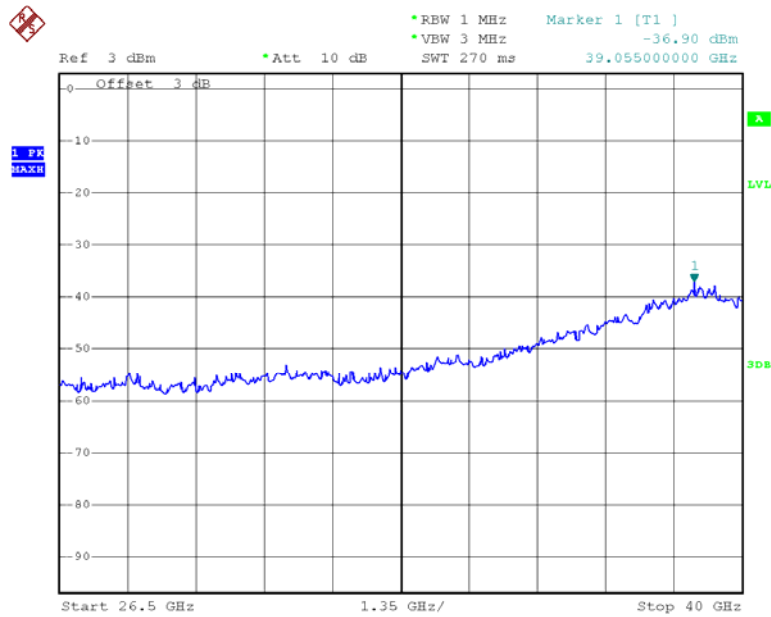
### Low Channel 30MHz-1GHz (Antenna 1)



### Low Channel 1GHz-26.5GHz (Antenna 1)

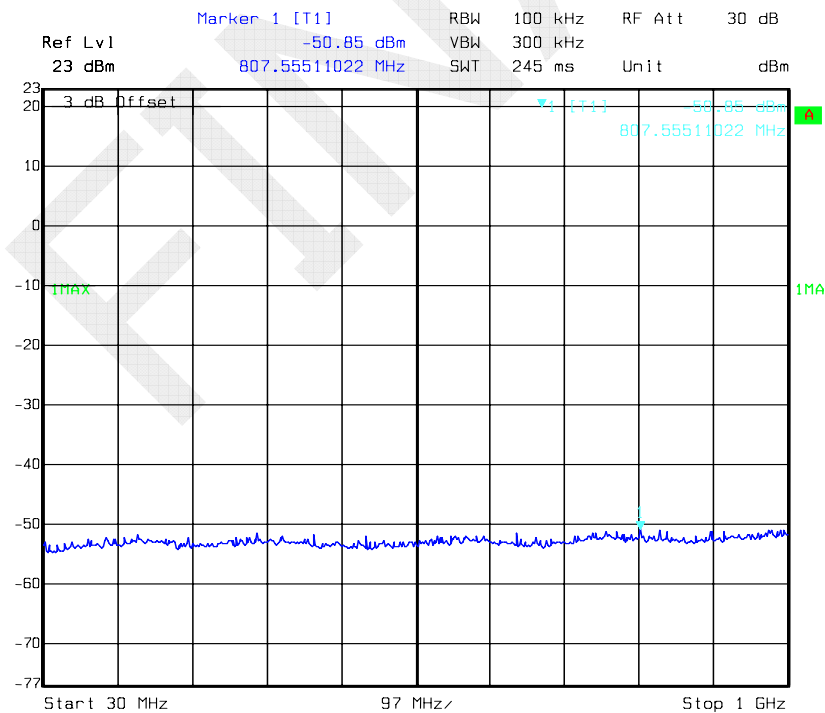


### Low Channel 26.5GHz-40GHz (Antenna 1)



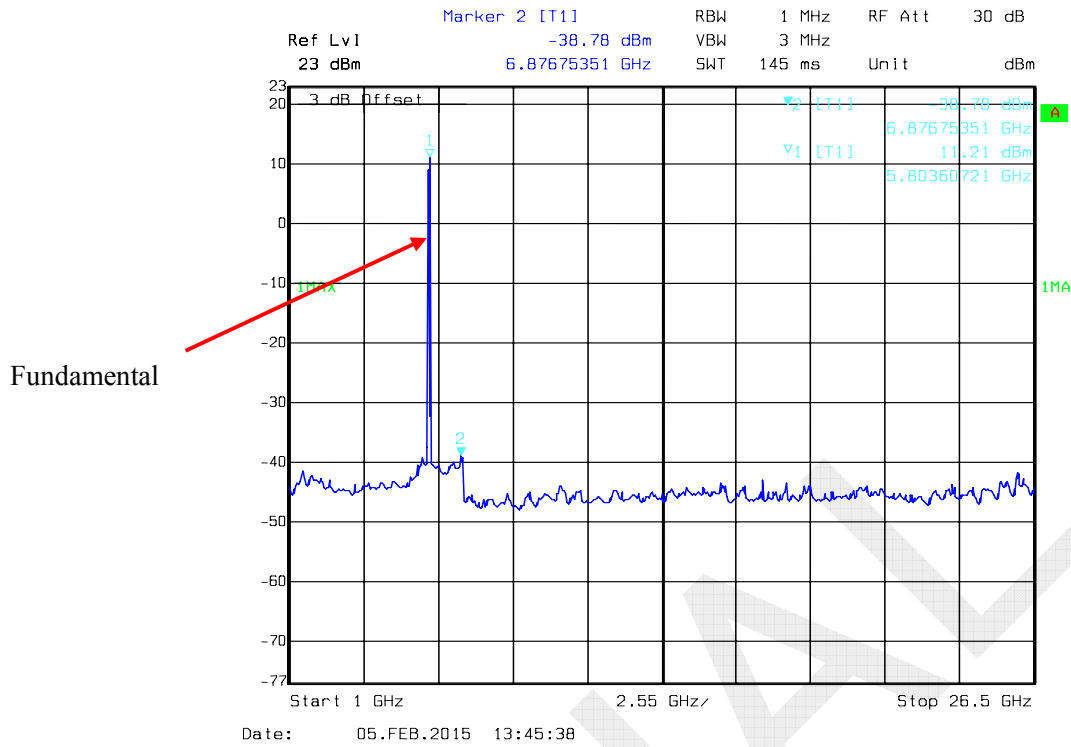
Date: 5.FEB.2015 14:12:17

### High Channel 30MHz-1GHz (Antenna 1)

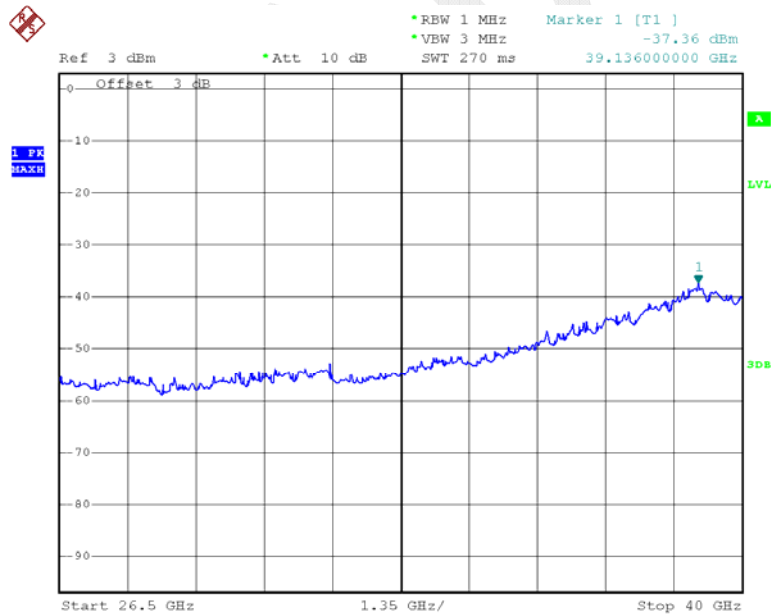


Date: 28.JAN.2015 11:06:03

### High Channel 1GHz-26.5GHz (Antenna 1)



### High Channel 26.5GHz-40GHz (Antenna 1)



Date: 5.FEB.2015 14:18:58

## **FCC §15.407(b) (1) –BAND EDGE**

### **Applicable Standard**

FCC §15.407 (b) (1), (2), (3), (4);

(b) Undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

(1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

(2) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

(3) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

(4) For transmitters operating in the 5.725-5.85 GHz band: All emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of -17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of -27 dBm/MHz.

(5) The emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.

### **Test Procedure**

According to KDB 789033 D02 General UNII Test Procedures New Rules v01.

### **Test Equipment List and Details**

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSP 38	100478	2014-05-09	2015-05-09

\* **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).

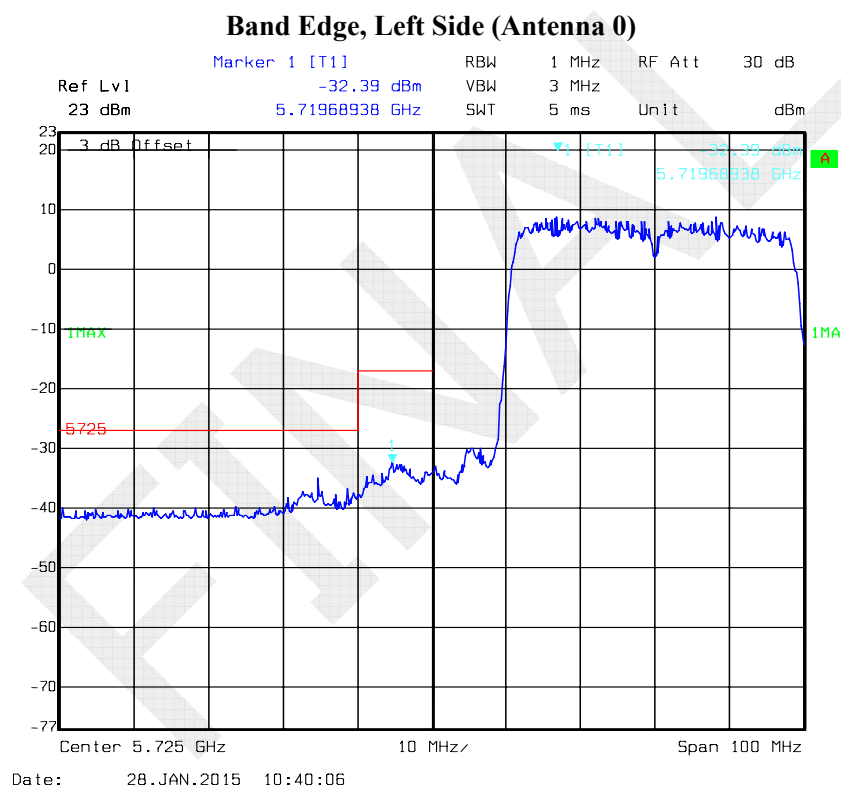
**Test Data****Environmental Conditions**

Temperature:	23.4 °C
Relative Humidity:	49 %
ATM Pressure:	101.3 kPa

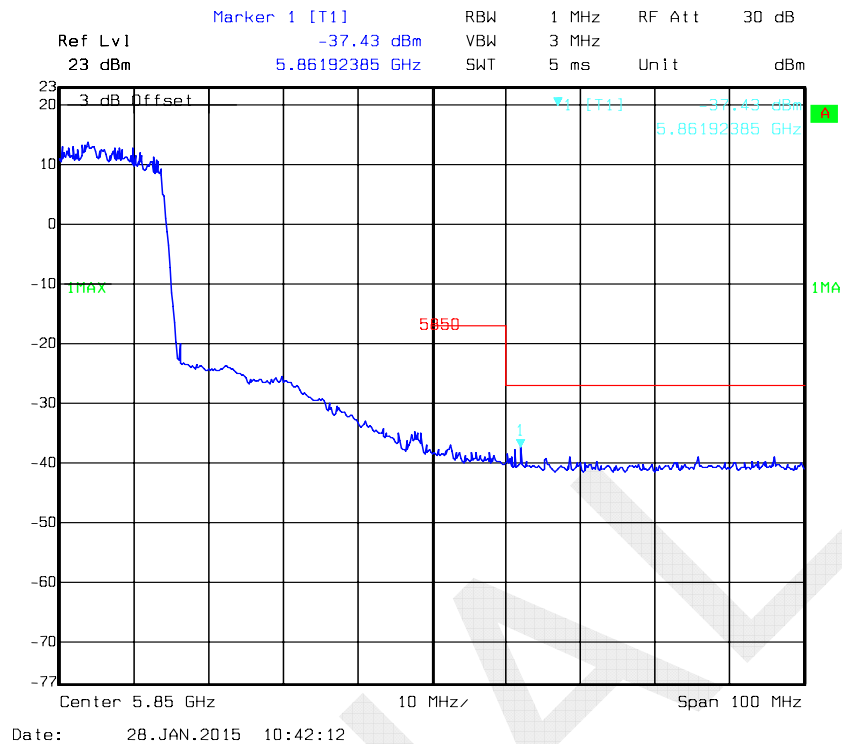
The testing was performed by Dean Liu on 2015-01-28.

**Test Result:** Compliance,

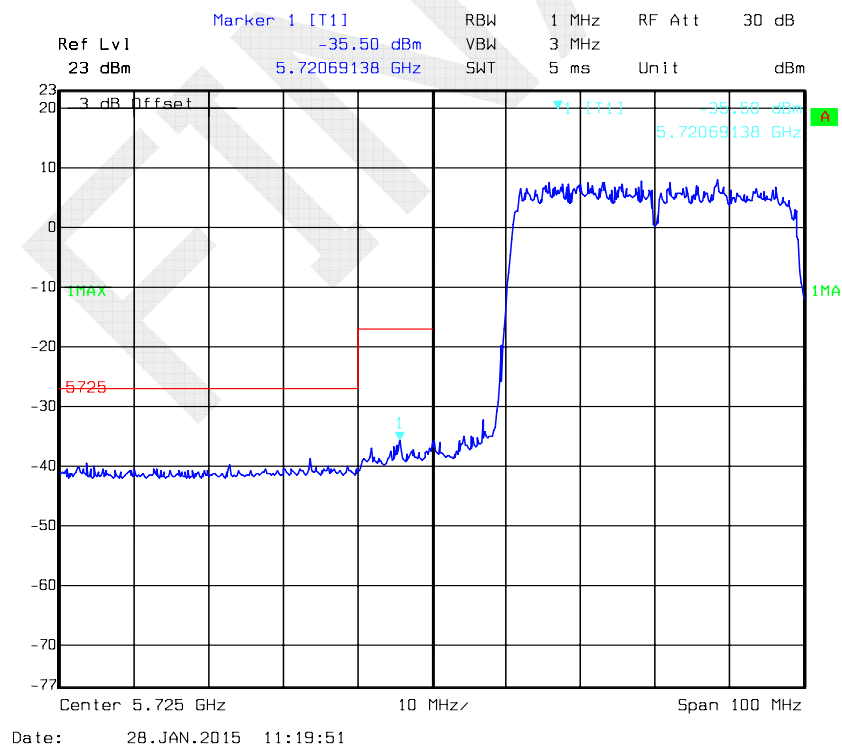
Note: All the Spurious emissions at each antenna was under limit 3dBc, so the total emissions combined under the limit. Please refer to the following plots:



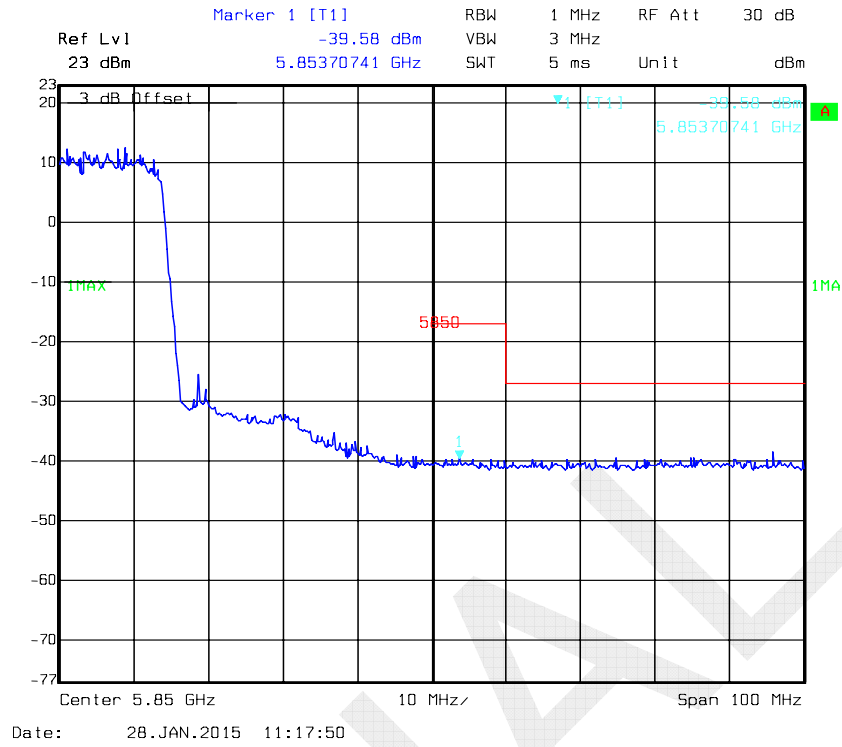
### Band Edge, Right Side (Antenna 0)



### Band Edge, Left Side (Antenna 1)



### Band Edge, Right Side (Antenna 1)



## FCC §15.407(a)(2),(e) –EMISSION BANDWIDTH

### Applicable Standard

According to 15.407(a)(2) and (e)

(a)(2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(e) Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSP 38	100478	2014-05-09	2015-05-09

\* **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

According to KDB 789033 D02 General UNII Test Procedures New Rules v01

### Test Data

#### Environmental Conditions

Temperature:	23.4 °C
Relative Humidity:	49 %
ATM Pressure:	101.3 kPa

The testing was performed by Dean Liu on 2015-01-28.

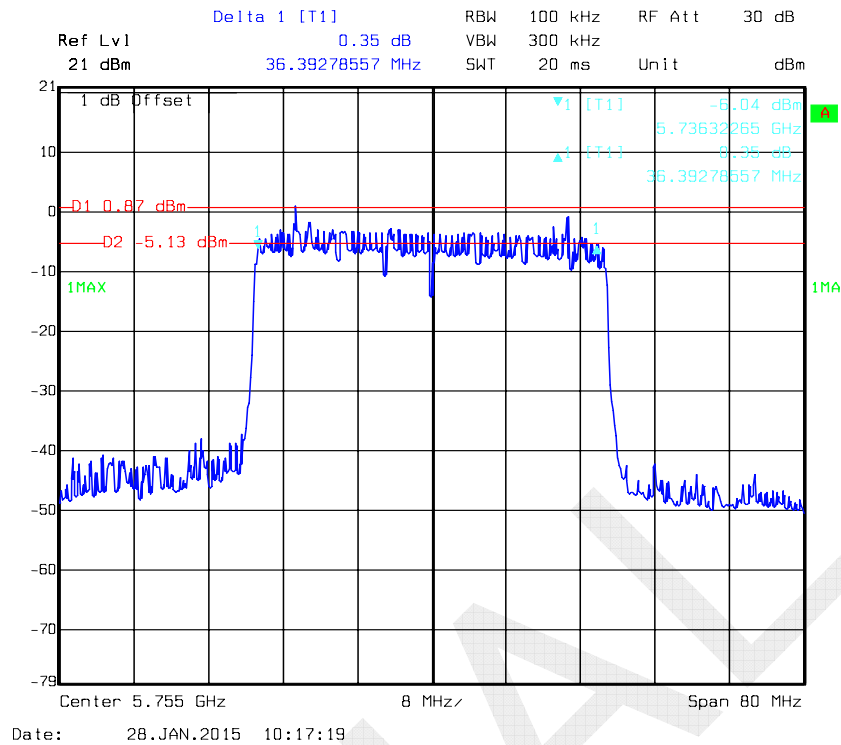
**Test Result:** Pass. Please refer to the following tables and plots.

Test mode: Transmitting

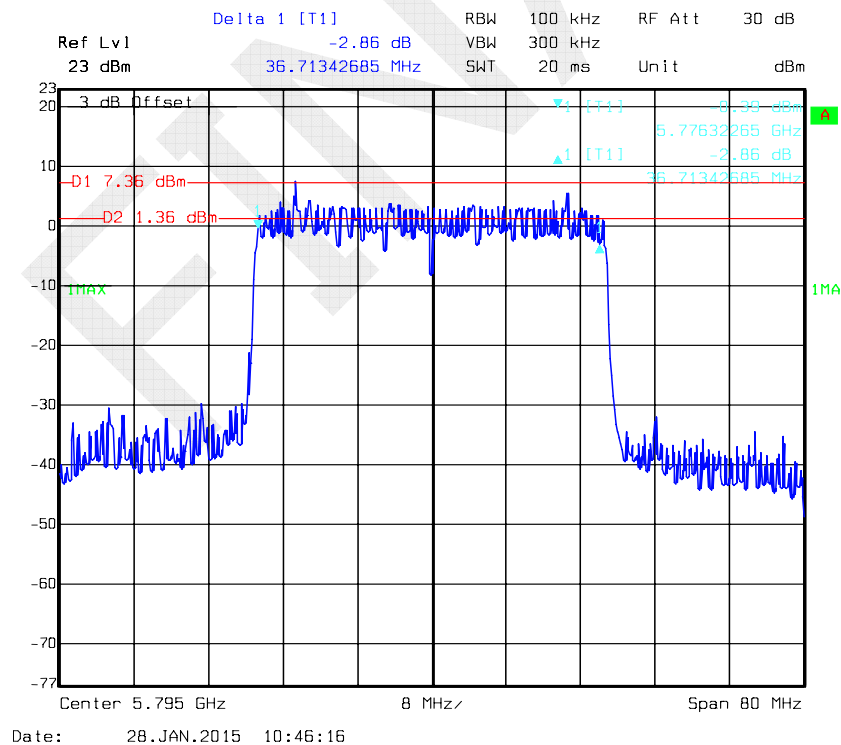
Channel	Frequency	6 dB Bandwidth (MHz)			Result
	MHz	Chain 0	Chain 1	Limits	
Low	5755	36.39	37.35	0.50	PASS
High	5795	36.71	37.19	0.50	PASS



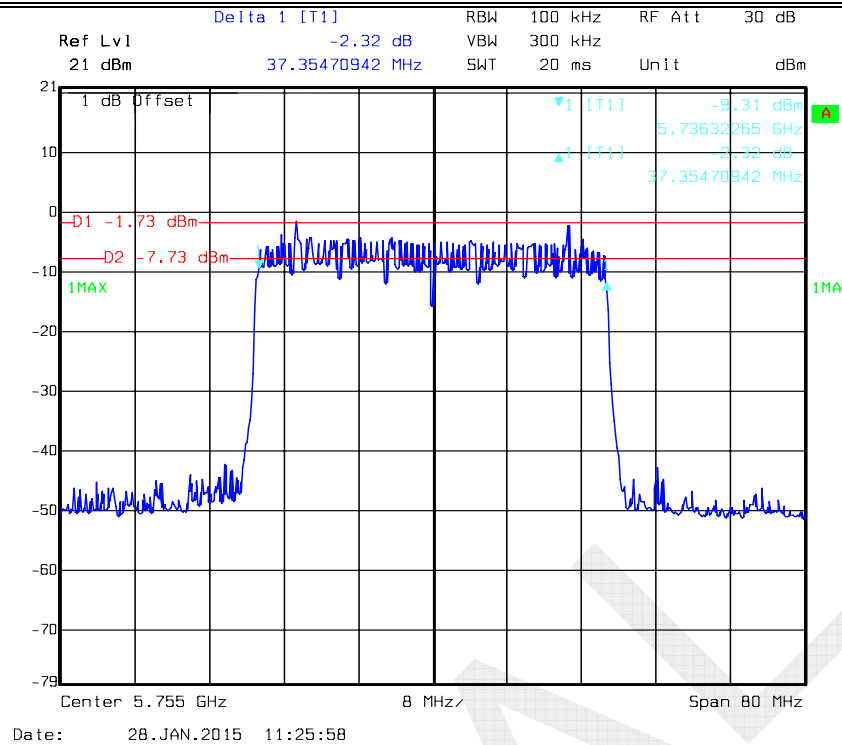
### Low Channel (Antenna 0)



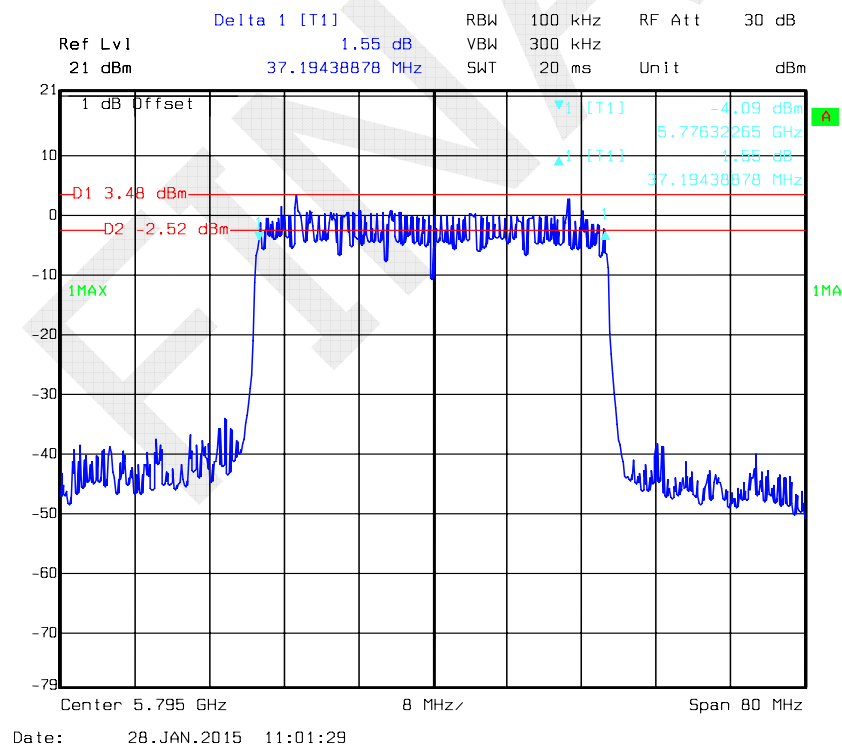
### High Channel (Antenna 0)



### Low Channel (Antenna 1)



### High Channel (Antenna 1)



**FCC §15.407(a) (1) (ii) (4) –MAXIMUM CONDUCTED OUTPUT POWER****Applicable Standard**

(a) Power limits:

(1) For the band 5.15-5.25 GHz.

(i) For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

(ii) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(iii) For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

(iv) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or  $11 + 10 \log B$  dBm, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(3) For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

(4) The maximum conducted output power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage.

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSP 38	100478	2014-05-09	2015-05-09

\* **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

According to KDB 789033 D02 General UNII Test Procedures New Rules v01.

### Test Data

#### Environmental Conditions

Temperature:	23.4 °C
Relative Humidity:	49 %
ATM Pressure:	101.3 kPa

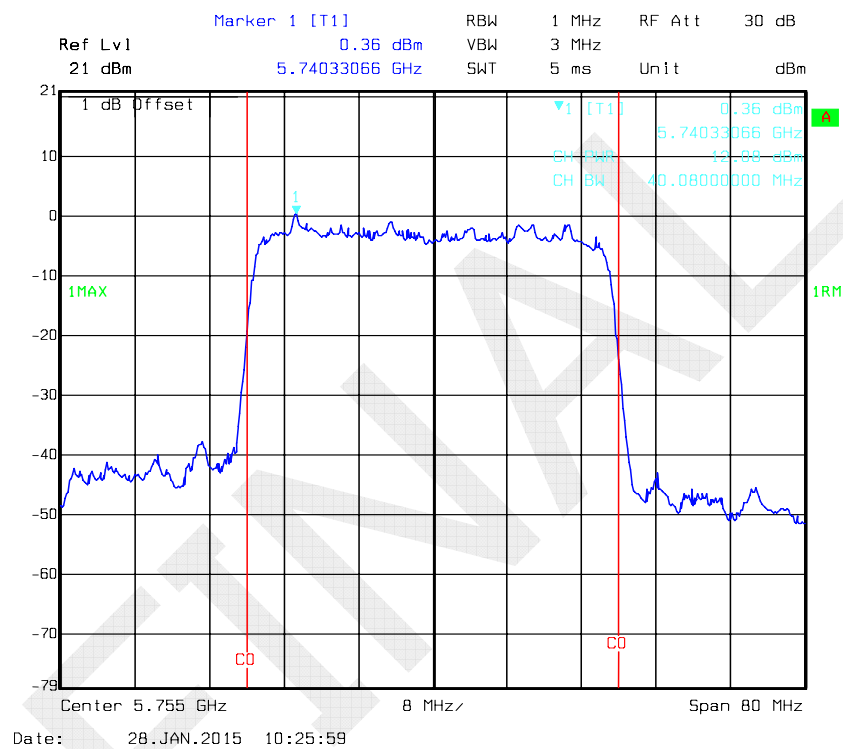
*The testing was performed by Dean Liu on 2015-01-28.*

Test Mode: Transmitting

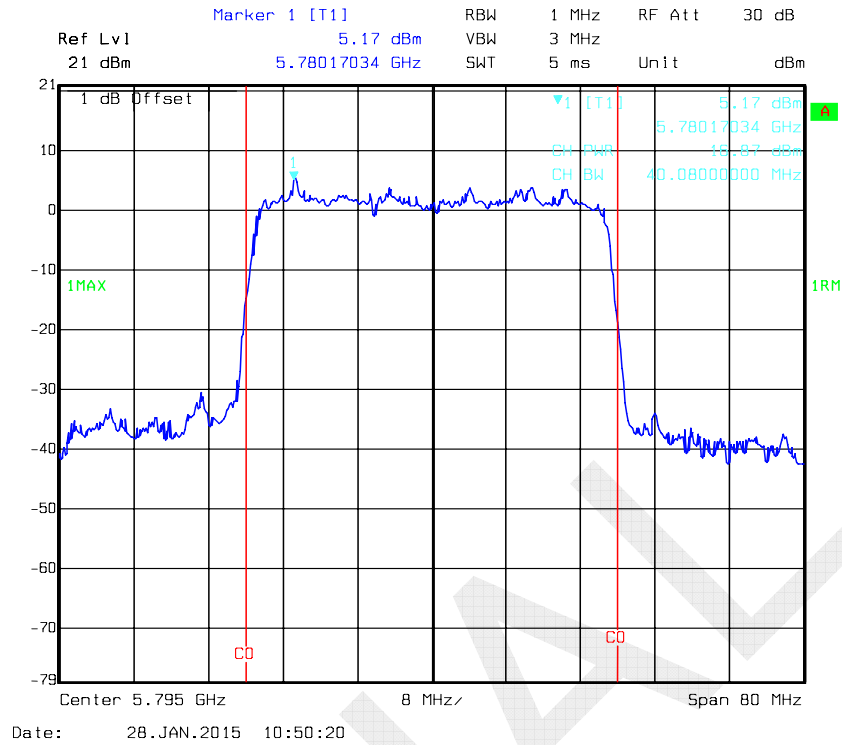
Channel	Frequency MHz	Conducted Output Power dBm			Limit dBm	Result
		Antenna0	Antenna1	Total		
Low	5755	12.08	11.06	14.61	30	PASS
High	5795	16.87	16.00	19.47	30	PASS

Note: The duty cycle is 100%.

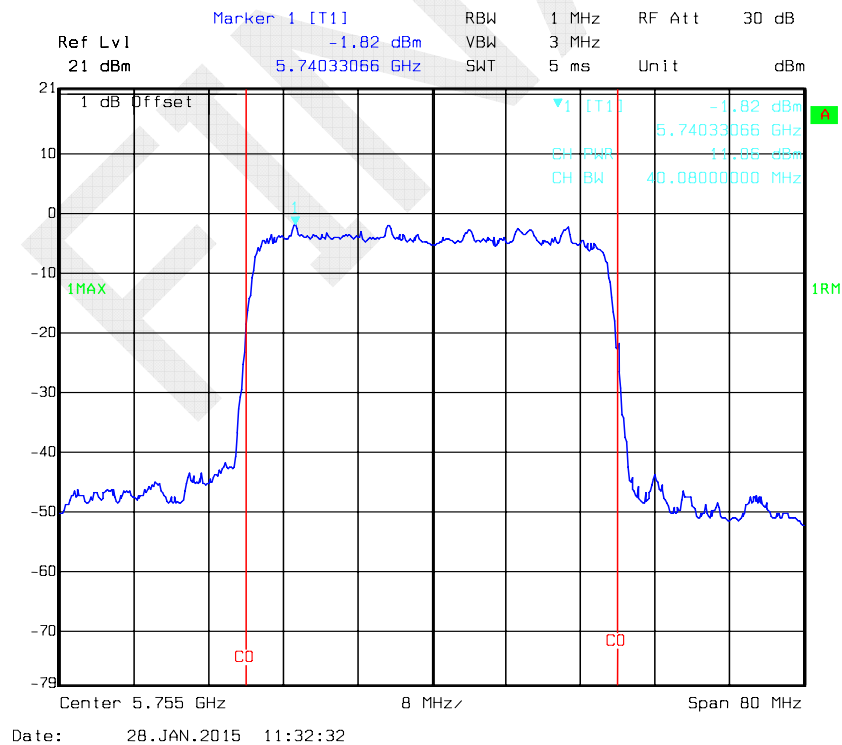
### Low Channel (Antenna 0)



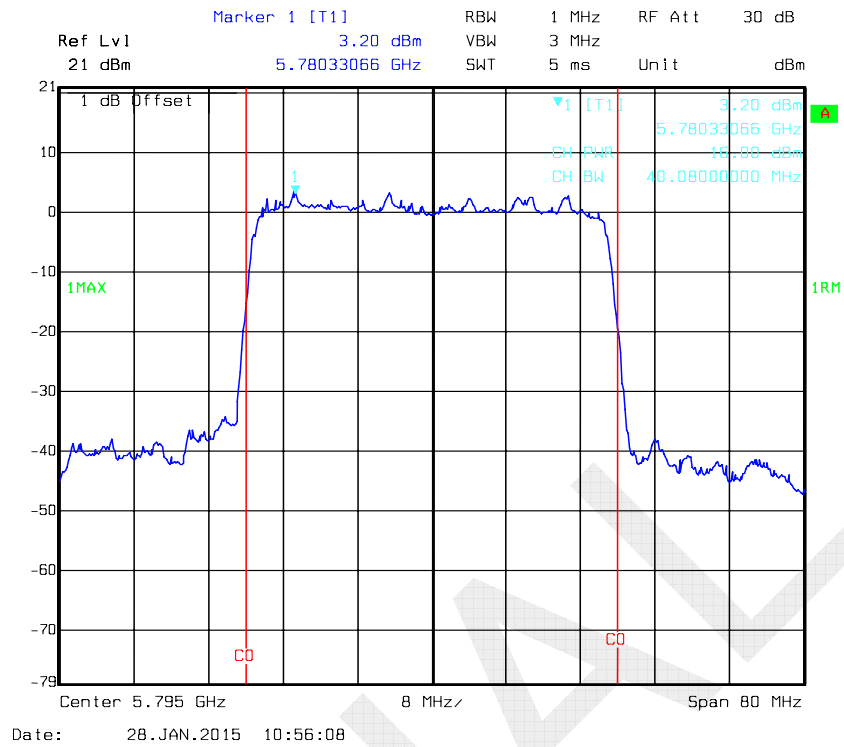
### High Channel (Antenna 0)



### Low Channel (Antenna 1)



# High Channel (Antenna 1)



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**FCC §15.407(a) - POWER SPECTRAL DENSITY**

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**Applicable Standard**

## (a) Power limits:

## (1) For the band 5.15-5.25 GHz.

(i) For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

(ii) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(iii) For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

(iv) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm  $10 \log B$ , where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.



(3) For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

### Test Procedure

According to KDB 789033 D02 General UNII Test Procedures New Rules v01

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSP 38	100478	2014-05-09	2015-05-09

\* **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 Data

#### Environmental Conditions

Temperature:	23.4 °C
Relative Humidity:	49 %
ATM Pressure:	101.3 kPa

The testing was performed by Dean Liu on 2015-01-28.

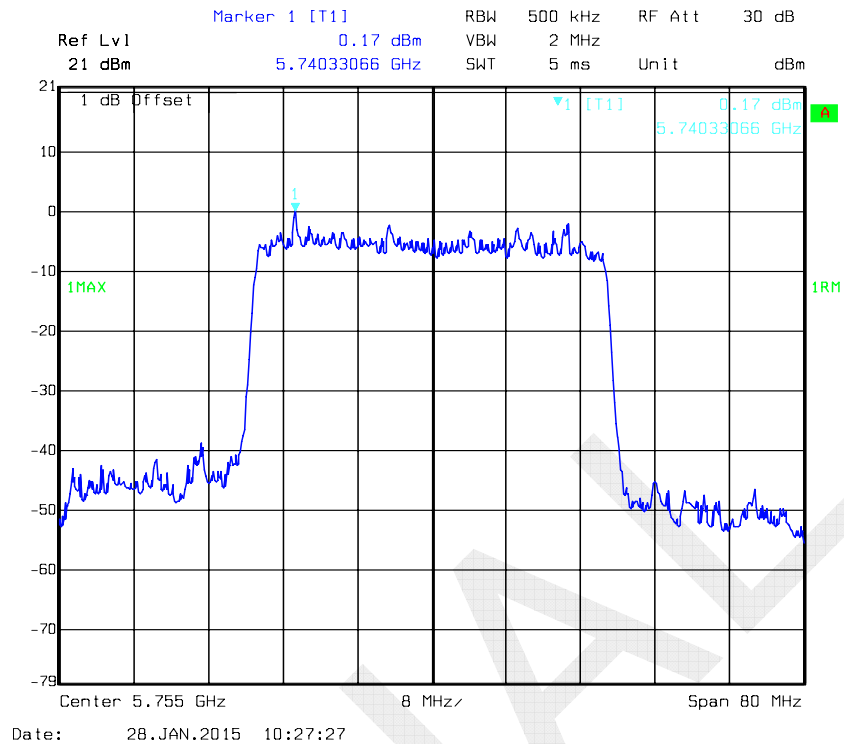
**Test Result: Compliance.** Please refer to the following table and plot.

5725MHz-5850MHz:

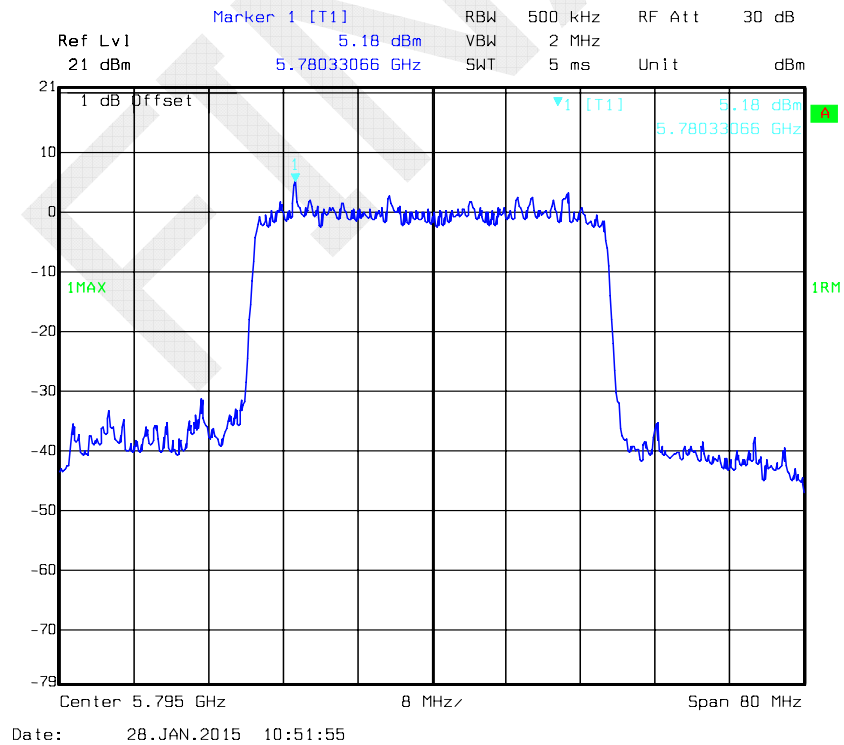
Mode	Channel	Frequency (MHz)	PSD (dBm/500 kHz)			Limit (dBm/500kHz)	Result
			Antenna 0	Antenna 1	Total		
802.11n40	Low	5755	0.17	-1.96	2.24	30	PASS
	High	5795	5.18	3.08	7.27	30	PASS

Note:  
The duty cycle is 100%.

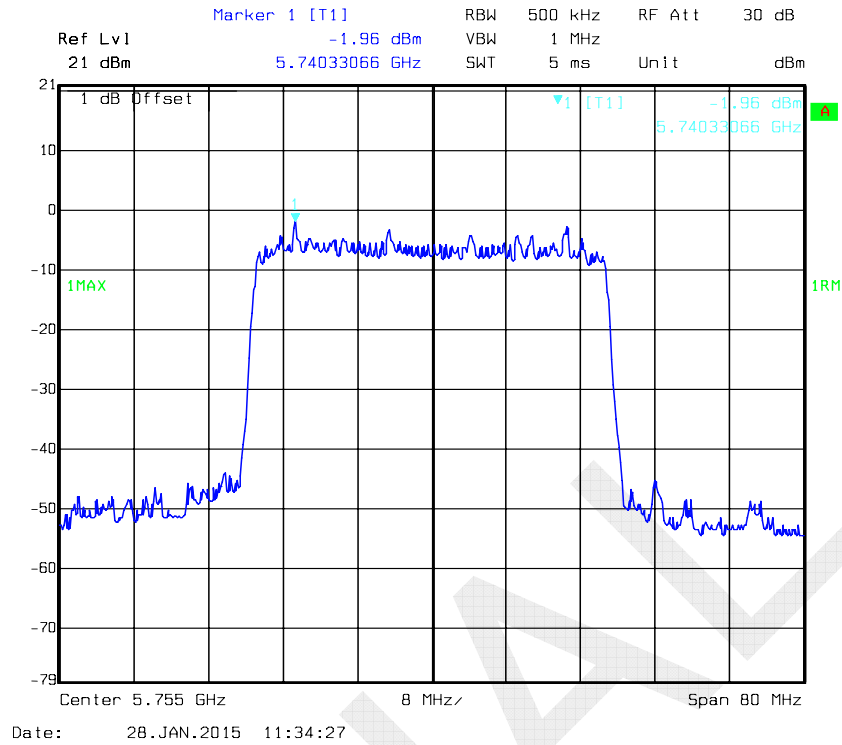
### Low Channel (Antenna 0)



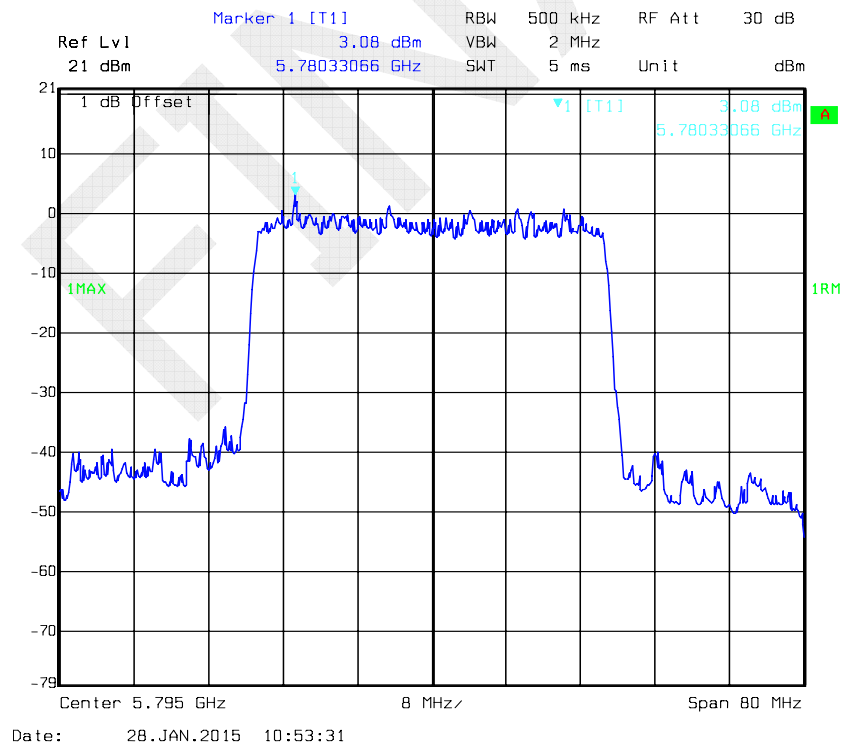
### High Channel (Antenna 0)



### Low Channel (Antenna1)



### High Channel (Antenna 1)



\*\*\*\*\* END OF REPORT \*\*\*\*\*