

## FCC PART 15.247

## TEST REPORT

For

### **Huawei Technologies Co., Ltd.**

Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.C

**FCC ID: QISWIUA**

<b>Report Type:</b> Original Report	<b>Product Type:</b> Wireless Interface Unit
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<b>Report Number:</b> RDG150617002-00	
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## TABLE OF CONTENTS

<b>GENERAL INFORMATION.....</b>	<b>4</b>
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT) .....	4
OBJECTIVE .....	4
RELATED SUBMITTAL(S)/GRANT(S).....	4
TEST METHODOLOGY .....	4
TEST FACILITY .....	4
<b>SYSTEM TEST CONFIGURATION.....</b>	<b>5</b>
DESCRIPTION OF TEST CONFIGURATION .....	5
EUT EXERCISE SOFTWARE .....	5
SUPPORT EQUIPMENT LIST AND DETAILS .....	5
EXTERNAL I/O CABLE.....	5
BLOCK DIAGRAM OF TEST SETUP .....	6
<b>SUMMARY OF TEST RESULTS .....</b>	<b>7</b>
<b>FCC §15.247 (i) &amp; §1.1310 &amp; §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE).....</b>	<b>8</b>
<b>FCC §15.203 - ANTENNA REQUIREMENT.....</b>	<b>9</b>
APPLICABLE STANDARD .....	9
ANTENNA CONNECTOR CONSTRUCTION .....	9
<b>FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS .....</b>	<b>10</b>
APPLICABLE STANDARD .....	10
MEASUREMENT UNCERTAINTY.....	10
EUT SETUP .....	10
EMI TEST RECEIVER SETUP.....	11
TEST PROCEDURE .....	11
CORRECTED AMPLITUDE & MARGIN CALCULATION .....	11
TEST EQUIPMENT LIST AND DETAILS.....	12
TEST RESULTS SUMMARY .....	12
TEST DATA .....	12
<b>FCC §15.209, §15.205 &amp; §15.247(d) - SPURIOUS EMISSIONS.....</b>	<b>15</b>
APPLICABLE STANDARD .....	15
MEASUREMENT UNCERTAINTY.....	15
EUT SETUP .....	15
EMI TEST RECEIVER & SPECTRUM ANALYZER SETUP .....	16
TEST PROCEDURE .....	16
CORRECTED AMPLITUDE & MARGIN CALCULATION .....	17
TEST EQUIPMENT LIST AND DETAILS.....	17
TEST RESULTS SUMMARY .....	17
TEST DATA .....	17
<b>FCC §15.247(a) (2) – 6 dB EMISSION BANDWIDTH.....</b>	<b>22</b>
APPLICABLE STANDARD .....	22
TEST PROCEDURE .....	22
TEST EQUIPMENT LIST AND DETAILS.....	22
TEST DATA .....	22
<b>FCC §15.247(b) (3) - MAXIMUM CONDUCTED OUTPUT POWER.....</b>	<b>27</b>

APPLICABLE STANDARD .....27  
TEST PROCEDURE .....27  
TEST EQUIPMENT LIST AND DETAILS.....27  
TEST DATA .....27

**FCC §15.247(d) – 100 kHz BANDWIDTH OF FREQUENCY BAND EDGE.....32**  
APPLICABLE STANDARD .....32  
TEST PROCEDURE .....32  
TEST EQUIPMENT LIST AND DETAILS.....32  
TEST DATA .....32

**FCC §15.247(e) - POWER SPECTRAL DENSITY .....35**  
APPLICABLE STANDARD .....35  
TEST PROCEDURE .....35  
TEST EQUIPMENT LIST AND DETAILS.....35  
TEST DATA .....35



## GENERAL INFORMATION

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

The *Huawei Technologies Co., Ltd.*'s product, model number: *WIUA (FCC ID: QISWIUA)* (the "EUT") in this report was a *Wireless Interface Unit*, which was measured approximately: 5.5 cm (L) × 4.5 cm (W) × 2.7 cm (H), rated input voltage: DC 12V from Adapter.

*\* All measurement and test data in this report was gathered from production sample serial number: 150617002 (Assigned by BACL, Dongguan). The EUT was received on 2015-06-18*

### Objective

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

The tests were performed in order to determine the compliance of the EUT with FCC Part 15-Subpart C, section 15.203, 15.205, 15.207, 15.209 and 15.247 rules.

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

N/A

### 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 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 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.

## SYSTEM TEST CONFIGURATION

### Description of Test Configuration

The device was configured for testing in Engineering Mode, which was provided by the manufacturer.

For the device, 16 channels are provided as below table, and test with CH11, CH18, CH26 were selected to test.

Channel	Frequency (MHz)	Channel	Frequency (MHz)
11	2405	19	2445
12	2410	20	2450
13	2415	21	2455
14	2420	22	2460
15	2425	23	2465
16	2430	24	2470
17	2435	25	2475
18	2440	26	2480

### EUT Exercise Software

The SmartRF Studio 7 was used in testing, which was provided by manufacturer, and configured maximum power (100% duty cycle) as following table:

Test Software Version	SmartRF Studio 7		
Test Frequency	2405MHz	2440MHz	2480MHz
Power Level Setting	4.5	4.5	4.5

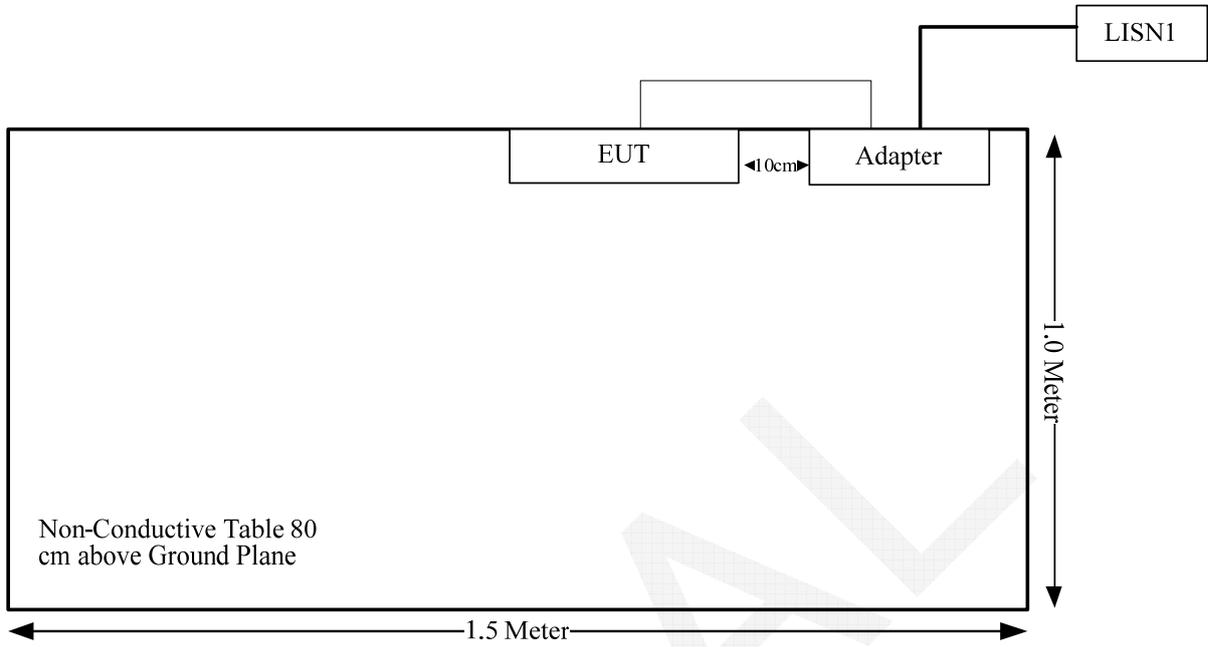
### Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
Tenda	Adapter	/	/

### External I/O Cable

Cable Description	Shielding Type	Ferrite Core	Length (m)	From Port	To
RJ45 Cable	No	No	0.8	Adapter	POE

**Block Diagram of Test Setup**



**SUMMARY OF TEST RESULTS**

<b>FCC Rules</b>	<b>Description of Test</b>	<b>Result</b>
FCC §15.247 (i) & §1.1310 & §2.1091	Maximum Permissible Exposure (MPE)	Compliance
§15.203	Antenna Requirement	Compliance
§15.207 (a)	AC Line Conducted Emissions	Compliance
§15.247(d)	Spurious Emissions at Antenna Port	Compliance
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliance
§15.247 (a)(2)	6 dB Emission Bandwidth	Compliance
§15.247(b)(3)	Maximum Peak Output Power	Compliance
§15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliance
§15.247(e)	Power Spectral Density	Compliance

**FCC §15.247 (i) & §1.1310 & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)**

According to subpart 1.1307 (b)(1) and §1.1310, 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>(B) Limits for General Population/Uncontrolled Exposure</b>				
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/4πR<sup>2</sup> = 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);

For simultaneously transmit system, the calculated power density should comply with:

$$\sum_i \frac{S_i}{S_{Limit,i}} \leq 1$$

**Calculated Data:**

Antenna	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)			
Outer (Chain 0)	2405	3.00	2.00	-1.74	0.67	20.00	0.0003	1.0
Internal (Chain 1)	2405	5.30	3.39	-6.19	0.24	20.00	0.0002	1.0

S<sub>0</sub>/S<sub>limit 0</sub> + S<sub>1</sub>/S<sub>limit 1</sub> = 0.003/1 + 0.002/1 = 0.005 < 1

Result: MPE evaluation of single and simultaneous transmission meet the requirement of standard.

## **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 user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

- a. Antenna must be permanently attached to the unit.
- b. Antenna must use a unique type of connector to attach to the EUT.

Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

### **Antenna Connector Construction**

The EUT have 1 internal PCB antennas with 5.3 dBi antenna gain, and a standard SMA external antenna port, the antenna installed at this port should with a gain less than 3dBi, the device will professionally installed, that fulfill the requirement of this section. Please refer to the EUT photos.

**Result:** Compliance.

## FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

### Applicable Standard

FCC§15.207

### 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:

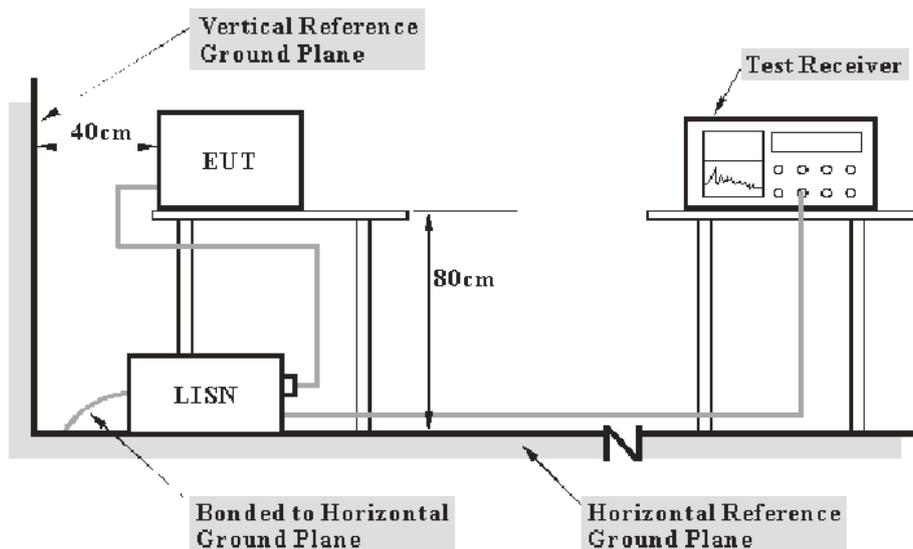
- compliance is deemed to occur if no measured disturbance level, increased by  $(U_{lab} - U_{cispr})$ , exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level, increased by  $(U_{lab} - U_{cispr})$ , exceeds the disturbance limit.

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 C63.4-2009 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

### Test Procedure

During the conducted emission test, the adapter was connected to the outlet of the 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:

$$V_C = V_R + A_C + VDF$$

$$C_f = A_C + VDF$$

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	2014-10-20	2015-10-20
R&S	L.I.S.N	ESH2-Z5	892107/021	2015-06-09	2016-06-09
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 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:

**14.3 dB at 0.268355 MHz** in the **Neutral** conducted mode

### Test Data

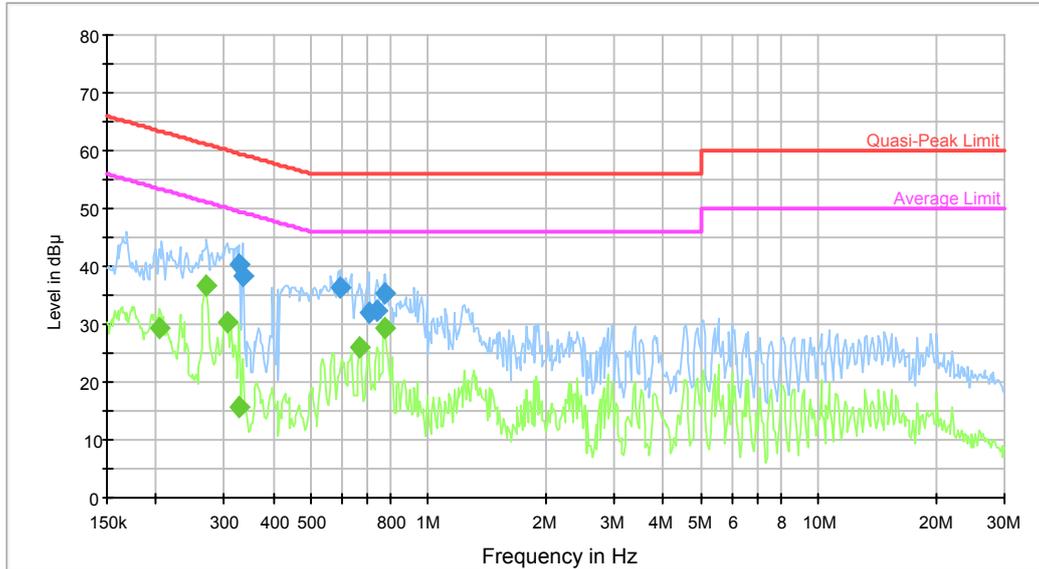
#### Environmental Conditions

<b>Temperature:</b>	28.1 °C
<b>Relative Humidity:</b>	58 %
<b>ATM Pressure:</b>	99.7 kPa

*The testing was performed by Allen Qiao on 2015-06-23.*

Test Mode: Transmitting

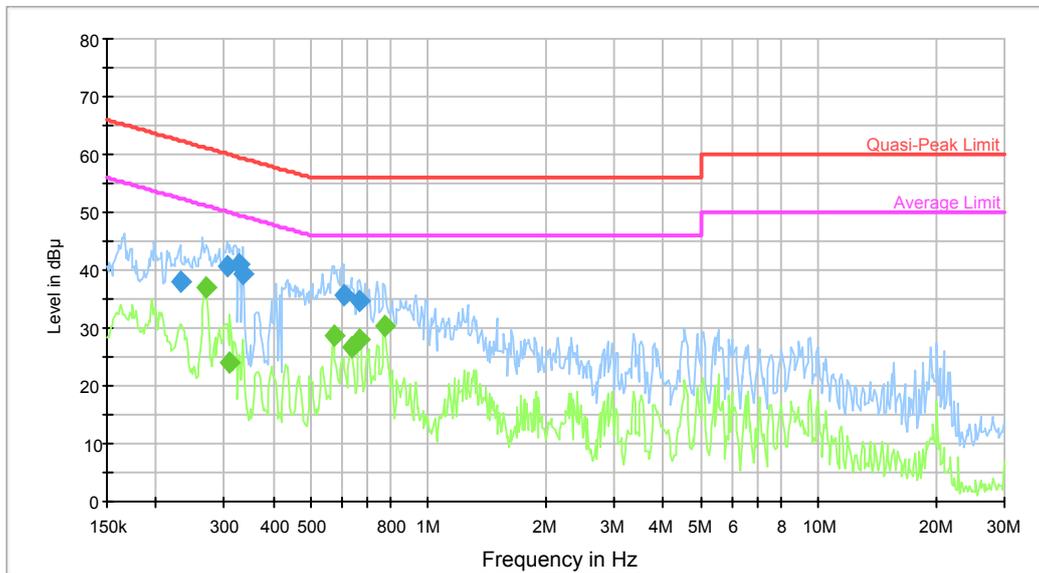
AC120 V, 60 Hz, Line:



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.327509	40.2	9.000	L1	10.3	19.3	59.5	Compliance
0.335433	38.3	9.000	L1	10.3	21.0	59.3	Compliance
0.590613	36.2	9.000	L1	10.2	19.8	56.0	Compliance
0.703777	32.1	9.000	L1	10.5	23.9	56.0	Compliance
0.738241	32.2	9.000	L1	10.4	23.8	56.0	Compliance
0.774393	35.3	9.000	L1	10.4	20.7	56.0	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.204669	29.2	9.000	L1	10.2	24.2	53.4	Compliance
0.268355	36.5	9.000	L1	10.2	14.7	51.2	Compliance
0.304845	30.2	9.000	L1	10.3	19.9	50.1	Compliance
0.327509	15.5	9.000	L1	10.3	34.0	49.5	Compliance
0.665597	25.9	9.000	L1	10.4	20.1	46.0	Compliance
0.774393	29.2	9.000	L1	10.4	16.8	46.0	Compliance

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



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.230654	38.1	9.000	N	10.2	24.3	62.4	Compliance
0.304845	40.7	9.000	N	10.3	19.4	60.1	Compliance
0.327509	41.1	9.000	N	10.3	18.4	59.5	Compliance
0.335433	39.2	9.000	N	10.3	20.1	59.3	Compliance
0.604902	35.7	9.000	N	10.3	20.3	56.0	Compliance
0.665597	34.6	9.000	N	10.4	21.4	56.0	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.268355	36.9	9.000	N	10.2	14.3	51.2	Compliance
0.309742	24.1	9.000	N	10.3	25.9	50.0	Compliance
0.572086	28.7	9.000	N	10.2	17.3	46.0	Compliance
0.634524	26.8	9.000	N	10.3	19.2	46.0	Compliance
0.665597	27.9	9.000	N	10.4	18.1	46.0	Compliance
0.774393	30.2	9.000	N	10.4	15.8	46.0	Compliance

## FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

### Applicable Standard

FCC §15.247 (d); §15.209; §15.205;

### 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 2, 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 2, 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 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

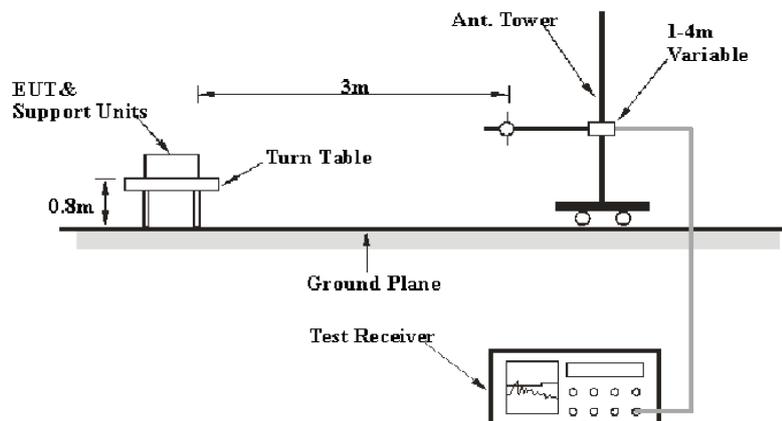
6G~18GHz: 5.23 dB

Table 2 – Values of  $U_{cispr}$

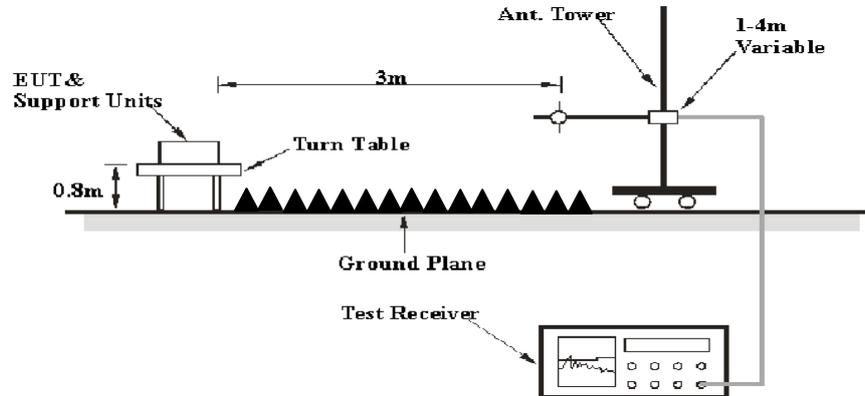
Measurement	$U_{cispr}$
Radiated disturbance (electric field strength at an OATS or in a SAC) (30 MHz to 1000 MHz)	6.3 dB
Radiated disturbance (electric field strength in a FAR) (1 GHz to 6 GHz)	5.2 dB
Radiated disturbance (electric field strength in a FAR) (6 GHz to 18 GHz)	5.5 dB

### EUT Setup

#### Below 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 15.209, and FCC 15.247 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 was connected to a 120 VAC/60 Hz power source

**EMI Test Receiver & Spectrum Analyzer Setup**

The system was investigated from 30 MHz to 25 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
30MHz – 1000 MHz	120 kHz	300 kHz	120kHz	QP
Above 1 GHz	1MHz	3 MHz	/	PK
	1MHz	10 Hz	/	Ave.

**Test Procedure**

During the radiated emission test, the adapter was connected to the 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-1 GHz, peak and Average detection modes for frequencies above 1 GHz.

## 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:

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

## Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESCI	100224	2015-05-09	2016-05-09
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
R&S	Spectrum Analyzer	FSP 38	100478	2015-05-09	2016-05-09
Ducommun Technologies	Horn Antenna	ARH-4223-02	1007726-01 1304	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, Section 15.205, 15.209 and 15.247, with the worst margin reading of:

**5.42 dB at 4880 MHz in the Horizontal polarization Mode**

## Test Data

### Environmental Conditions

Temperature:	28°C
Relative Humidity:	52 %
ATM Pressure:	99.7 kPa

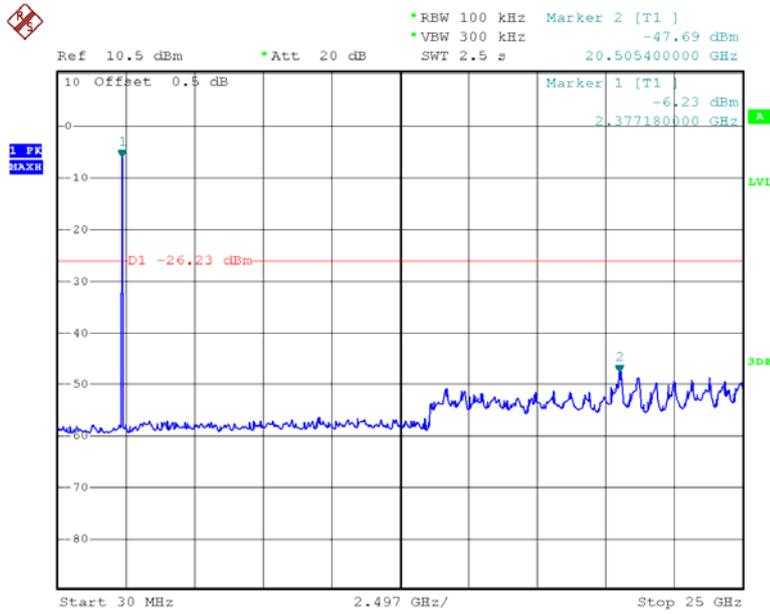
*The testing was performed by Allen Qiao on 2015-06-22.*

*Mode: Transmitting*

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBµV/m)	Limit (dBµV/m)	Margin (dB)
	Reading (dBµV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB)					
Low Channel: 2405 MHz									
2405	60.13	PK	H	25.65	3.66	0.00	89.44	N/A	N/A
2405	57.82	AV	H	25.65	3.66	0.00	87.13	N/A	N/A
2405	58.35	PK	V	25.65	3.66	0.00	87.66	N/A	N/A
2405	56.13	AV	V	25.65	3.66	0.00	85.44	N/A	N/A
2390	26.72	PK	H	25.61	3.63	0.00	55.96	74.00	18.04
2390	13.48	AV	H	25.61	3.63	0.00	42.72	54.00	11.28
4810	43.4	PK	H	30.61	5.05	27.41	51.65	74.00	22.35
4810	40.11	AV	H	30.61	5.05	27.41	48.36	54.00	5.64
7215	35.74	PK	H	34.12	6.62	25.91	50.57	74.00	23.43
7215	25.86	AV	H	34.12	6.62	25.91	40.69	54.00	13.31
9620	30.51	PK	H	35.99	8.54	27.53	47.51	74.00	26.49
9620	20.38	AV	H	35.99	8.54	27.53	37.38	54.00	16.62
1800	35.64	PK	H	24.20	2.60	27.53	34.91	74.00	39.09
1800	25.37	AV	H	24.20	2.60	27.53	24.64	54.00	29.36
261.3	30.6	QP	H	12.98	1.95	21.50	24.03	46.00	21.97
Middle Channel: 2440 MHz									
2440	57.3	PK	H	25.74	3.76	0.00	86.80	N/A	N/A
2440	55.18	AV	H	25.74	3.76	0.00	84.68	N/A	N/A
2440	59.05	PK	V	25.74	3.76	0.00	88.55	N/A	N/A
2440	56.87	AV	V	25.74	3.76	0.00	86.37	N/A	N/A
4880	42.55	PK	H	30.79	5.18	27.42	51.10	74.00	22.90
4880	40.03	AV	H	30.79	5.18	27.42	48.58	54.00	5.42
7320	33.47	PK	H	34.37	6.75	25.88	48.71	74.00	25.29
7320	23.25	AV	H	34.37	6.75	25.88	38.49	54.00	15.51
9760	30.24	PK	H	36.32	8.62	27.21	47.97	74.00	26.03
9760	20.12	AV	H	36.32	8.62	27.21	37.85	54.00	16.15
1840	35.54	PK	H	24.28	2.98	27.52	35.28	74.00	38.72
1840	25.31	AV	H	24.28	2.98	27.52	25.05	54.00	28.95
7040	30.72	PK	H	33.70	6.42	26.17	44.67	74.00	29.33
7040	20.52	AV	H	33.70	6.42	26.17	34.47	54.00	19.53
261.3	30.1	QP	H	12.98	1.95	21.50	23.53	46.00	22.47
High Channel: 2480 MHz									
2480	55.48	PK	H	25.85	3.68	0.00	85.01	N/A	N/A
2480	52.66	AV	H	25.85	3.68	0.00	82.19	N/A	N/A
2480	57.43	PK	V	25.85	3.68	0.00	86.96	N/A	N/A
2480	55.09	AV	V	25.85	3.68	0.00	84.62	N/A	N/A
2483.5	27.4	PK	V	25.86	3.67	0.00	56.93	74.00	17.07
2483.5	18.05	AV	V	25.86	3.67	0.00	47.58	54.00	6.42
4960	40.59	PK	V	31.00	5.34	27.43	49.50	74.00	24.50
4960	37.29	AV	V	31.00	5.34	27.43	46.20	54.00	7.80
7440	33.23	PK	V	34.66	6.89	25.97	48.81	74.00	25.19
7440	23.15	AV	V	34.66	6.89	25.97	38.73	54.00	15.27
9920	30.52	PK	V	36.71	8.71	26.66	49.28	74.00	24.72
9920	20.46	AV	V	36.71	8.71	26.66	39.22	54.00	14.78
1760	34.75	PK	V	24.12	2.62	27.59	33.90	74.00	40.10
1760	24.58	AV	V	24.12	2.62	27.59	23.73	54.00	30.27
261.3	30.4	QP	H	12.98	1.95	21.50	23.83	46.00	22.17

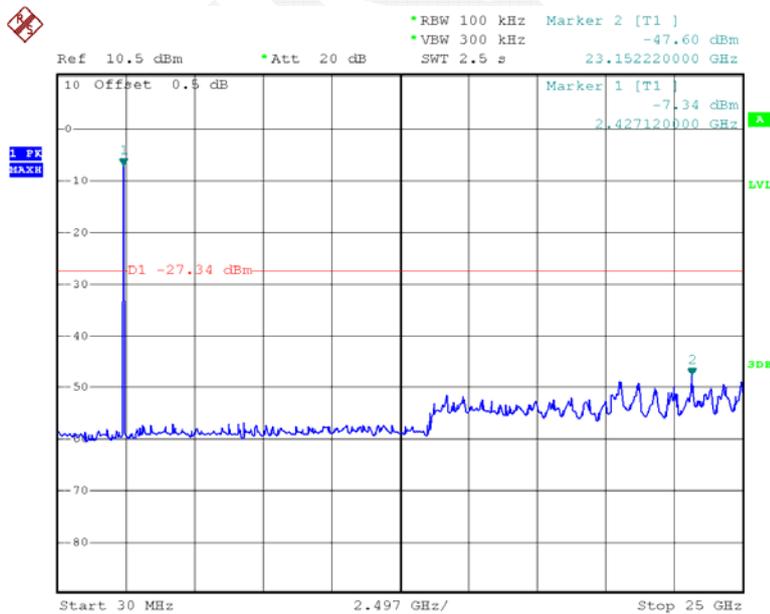
### Conducted Spurious Emissions at Antenna Port

#### Chain 0 Low Channel



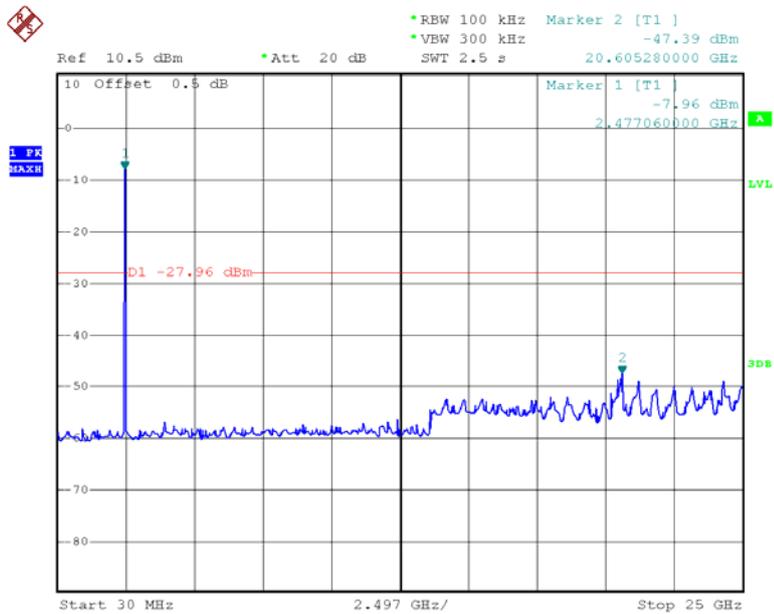
Date: 22.JUN.2015 13:35:01

#### Chain 0 Middle Channel



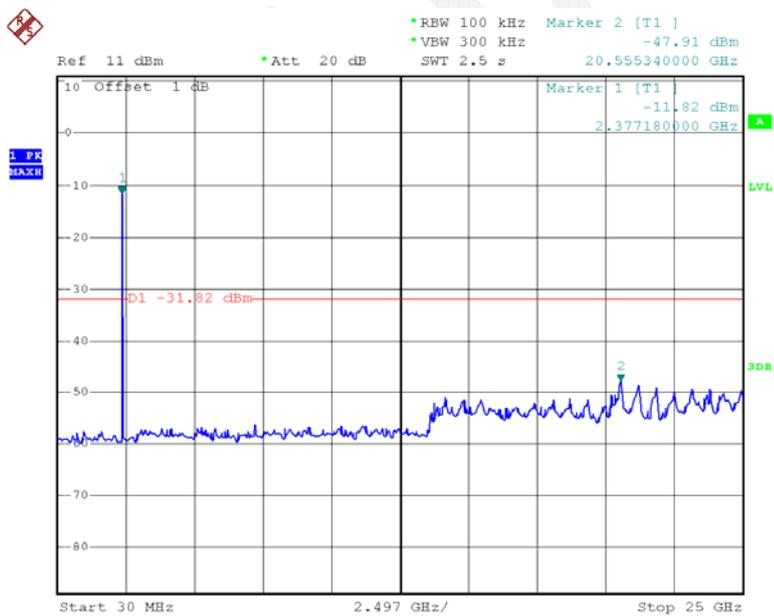
Date: 22.JUN.2015 13:36:03

### Chain 0 High Channel



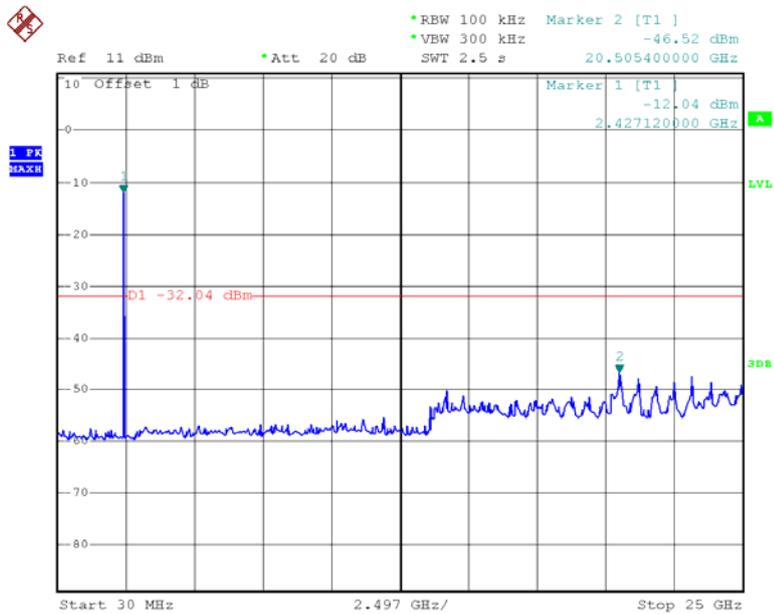
Date: 22.JUN.2015 13:36:33

### Chain 1 Low Channel



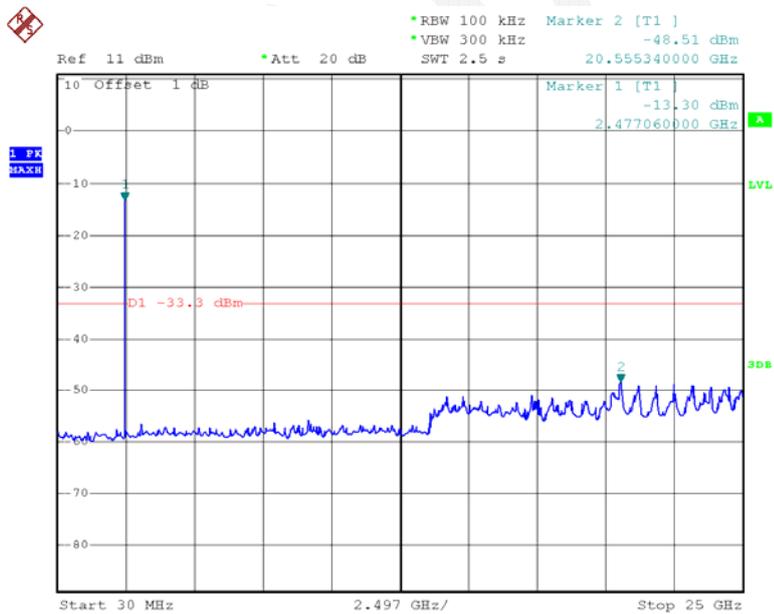
Date: 22.JUN.2015 13:42:41

### Chain 1 Middle Channel



Date: 22.JUN.2015 13:41:52

### Chain 1 High Channel



Date: 22.JUN.2015 13:41:06

## FCC §15.247(a) (2) – 6 dB EMISSION BANDWIDTH

### Applicable Standard

Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

### Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 6 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. 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	FSP 38	100478	2015-05-09	2016-05-09

\* **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>	25.4°C
<b>Relative Humidity:</b>	53 %
<b>ATM Pressure:</b>	100.0kPa

\* The testing was performed by Allen Qiao on 2015-06-19 & 2015-06-22.

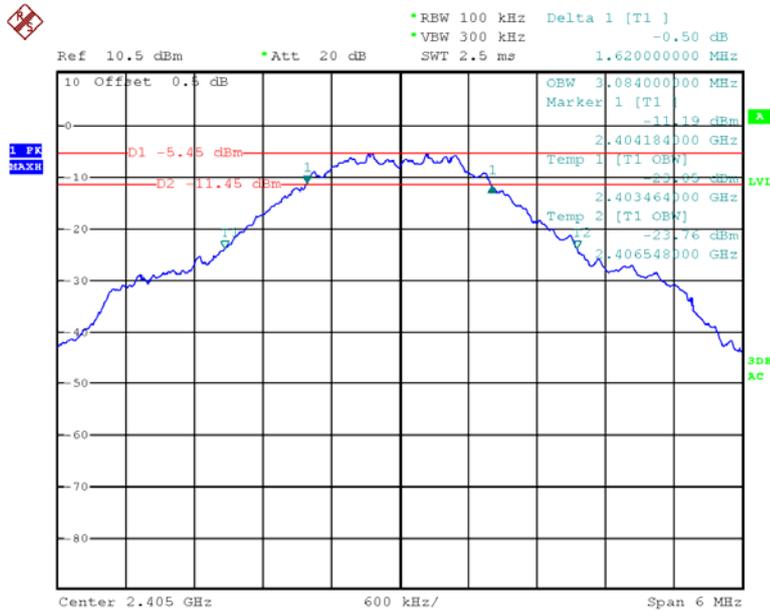
**Test Result:** Pass.

Please refer to the following tables and plots.

Test Mode: Transmitting

Channel	Frequency(MHz)	6 dB Emission Bandwidth (MHz)		
		Chain 0	Chain 1	Limit
Low	2405	1.62	1.63	0.5
Middle	2440	1.62	1.61	0.5
High	2480	1.62	1.60	0.5

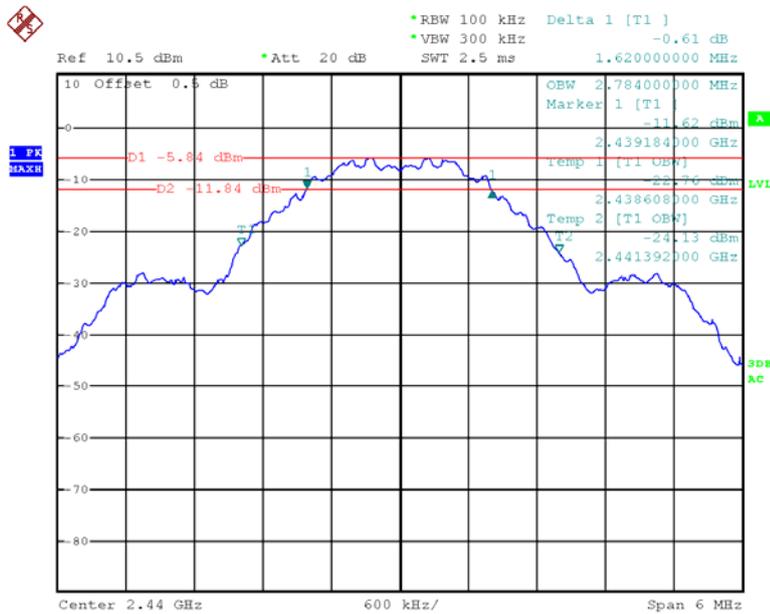
Chain 0 Low Channel



Date: 19.JUL.2005 17:08:08

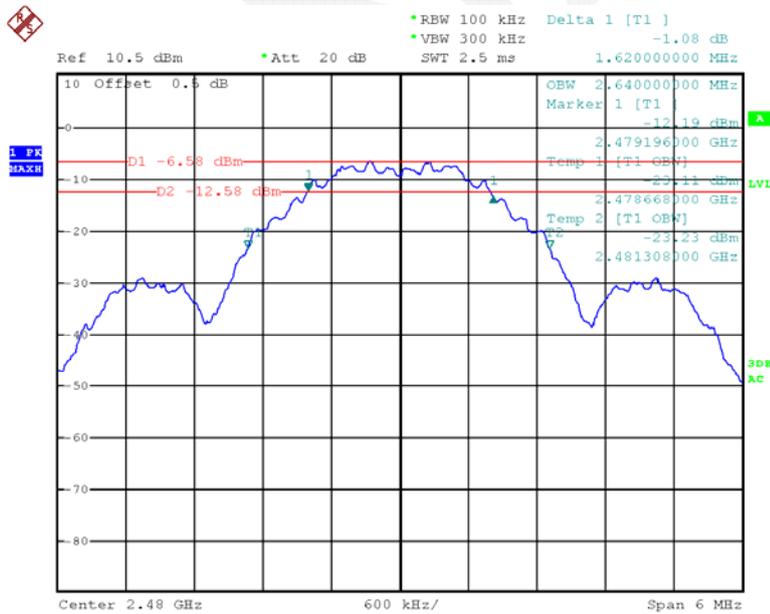


### Chain 0 Middle Channel



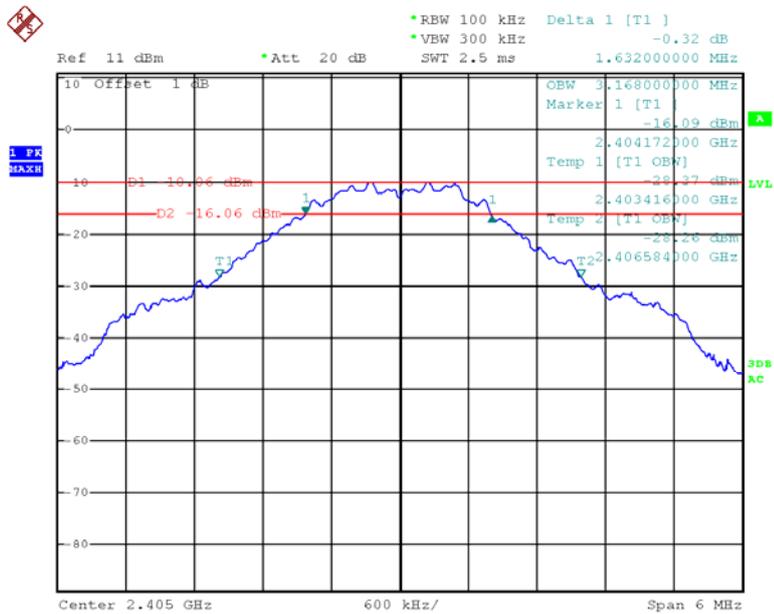
Date: 19.JUL.2005 17:06:48

### Chain 0 High Channel



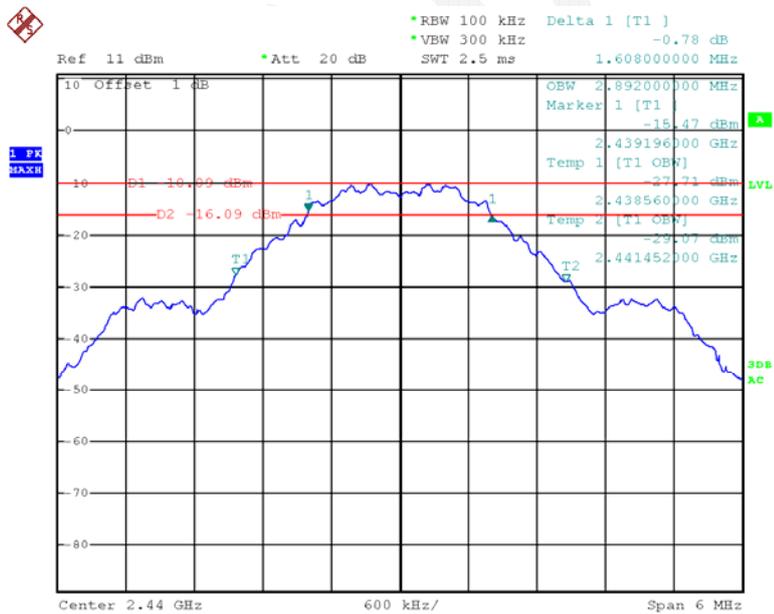
Date: 19.JUL.2005 17:05:52

### Chain 1 Low Channel



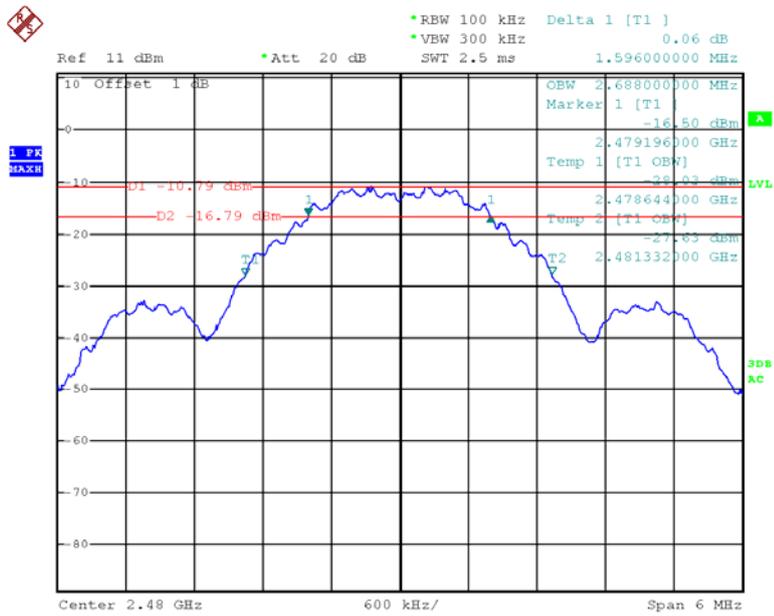
Date: 22.JUL.2005 09:25:02

### Chain 1 Middle Channel



Date: 22.JUL.2005 09:24:05

### Chain 1 High Channel



Date: 22.JUL.2005 09:23:11

FEMV

## FCC §15.247(b) (3) - MAXIMUM CONDUCTED OUTPUT POWER

### Applicable Standard

According to FCC §15.247(b) (3), for systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

### Test Procedure

1. According to KDB 558074 D01 DTS Meas Guidance v03r02, place the EUT on a bench and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to a spectrum analyzer or power meter sensor and power meter.
3. Add a correction factor to the display.

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSP 38	100478	2015-05-09	2016-05-09

\* **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

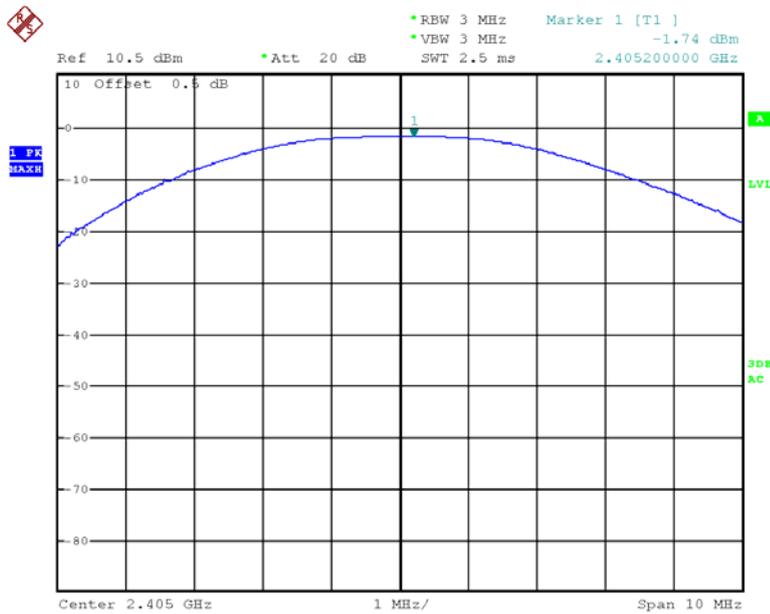
Temperature:	25.4°C
Relative Humidity:	53 %
ATM Pressure:	100.0kPa

\* The testing was performed by Allen Qiao on 2015-06-19 & 2015-06-22.

Test Mode: Transmitting

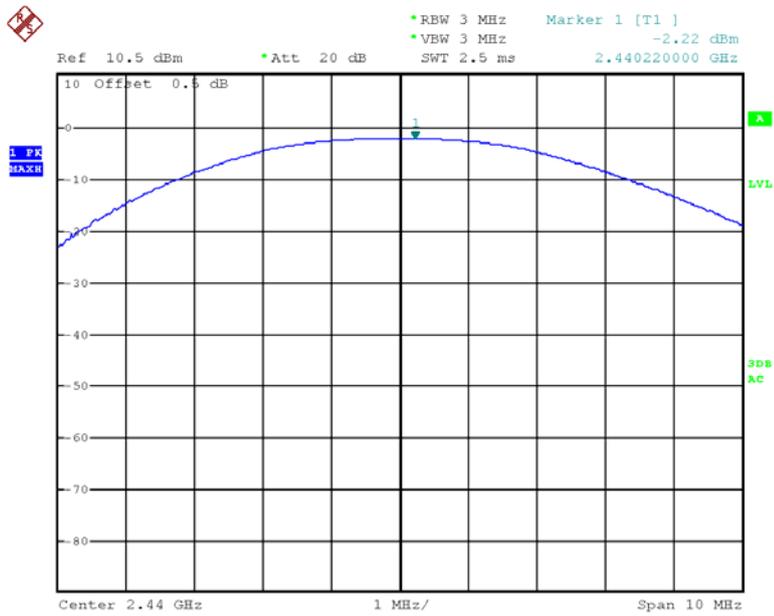
Channel	Frequency (MHz)	Peak Conducted Output Power (dBm)			
		Chain 0	Chain 1	Total	Limit
Low	2405	-1.74	-6.19	-0.41	30
Middle	2440	-2.22	-6.48	-0.84	30
High	2480	-2.93	-7.01	-1.5	30

Chain 0 Low Channel



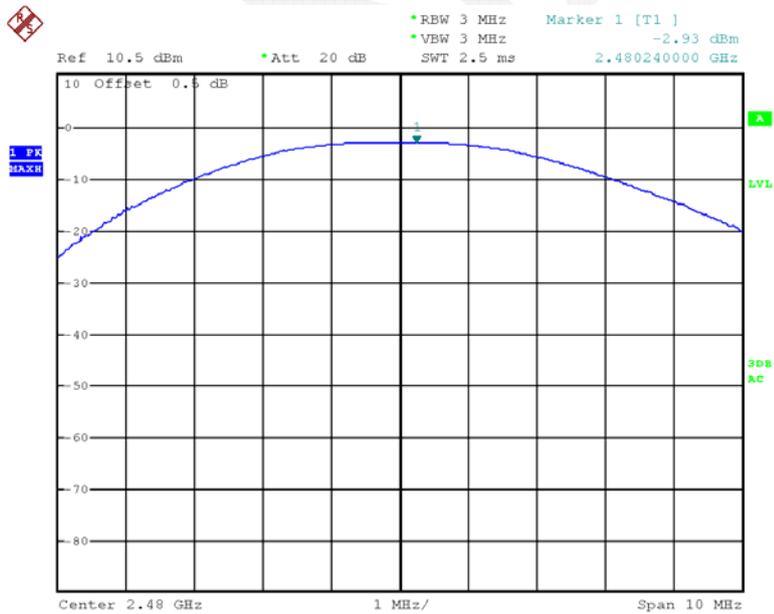
Date: 19.JUL.2005 16:59:28

### Chain 0 Middle Channel



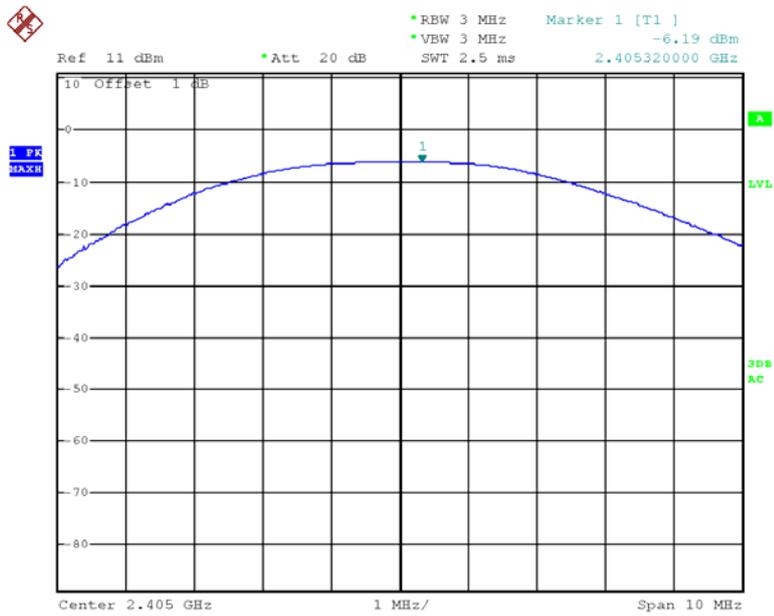
Date: 19.JUL.2005 17:00:00

### Chain 0 High Channel



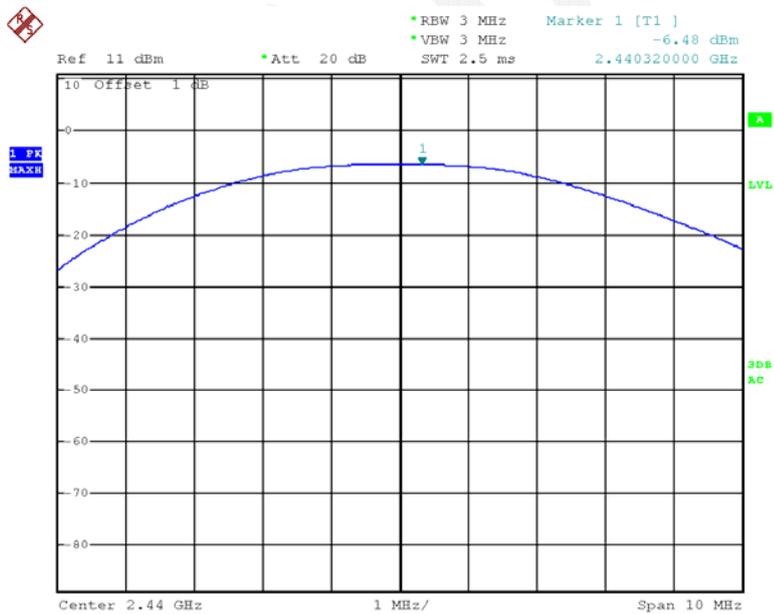
Date: 19.JUL.2005 17:00:22

### Chain 1 Low Channel



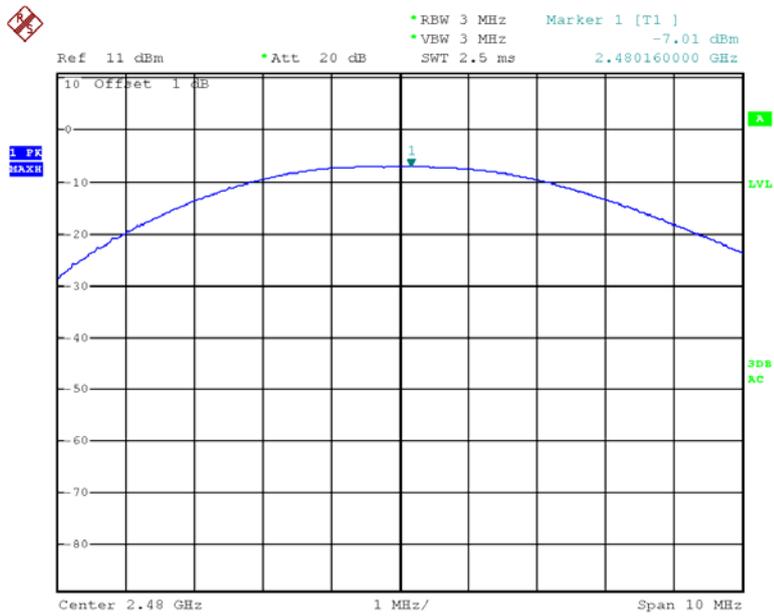
Date: 22.JUL.2005 09:21:40

### Chain 1 Middle Channel



Date: 22.JUL.2005 09:22:03

### Chain 1 High Channel



Date: 22.JUL.2005 09:22:20

FEMV

## FCC §15.247(d) – 100 kHz BANDWIDTH OF FREQUENCY BAND EDGE

### Applicable Standard

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

### Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSP 38	100478	2015-05-09	2016-05-09

\* **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

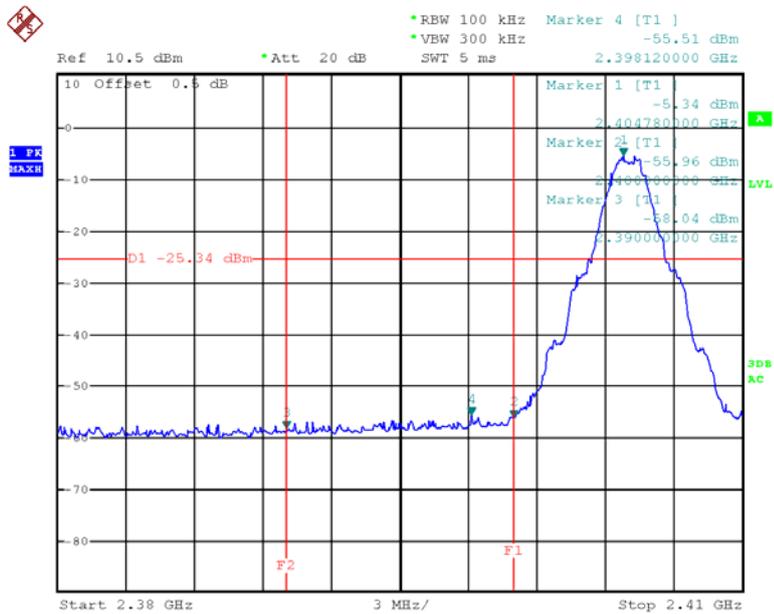
Temperature:	25.4°C
Relative Humidity:	53 %
ATM Pressure:	100.0kPa

\* The testing was performed by Allen Qiao on 2015-06-19 & 2015-06-22.

#### Test Result: Compliance

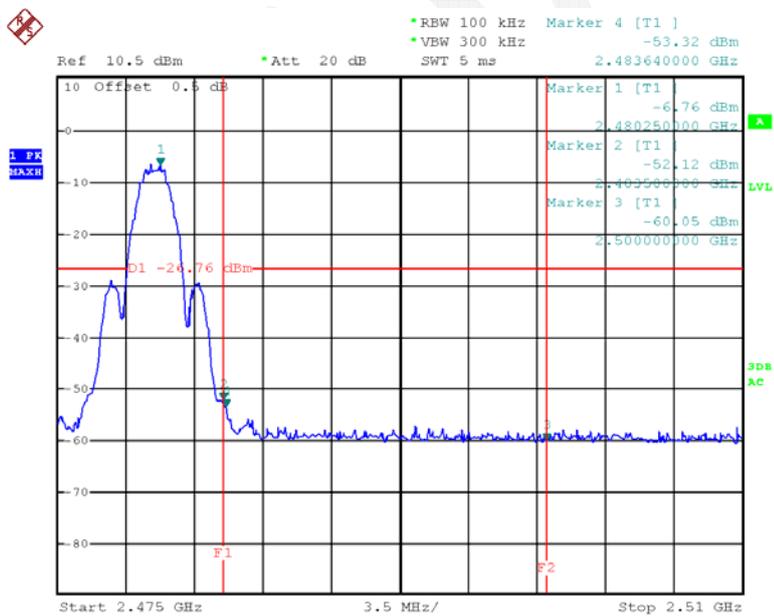
Please refer to following table and plots.

### Chain 0 Band Edge, Left Side



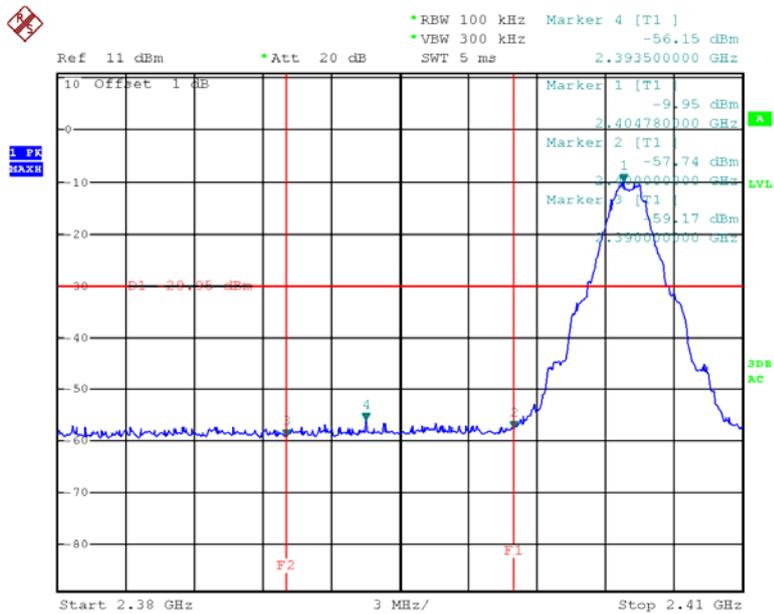
Date: 19.JUL.2005 17:10:03

### Chain 0 Band Edge, Right Side



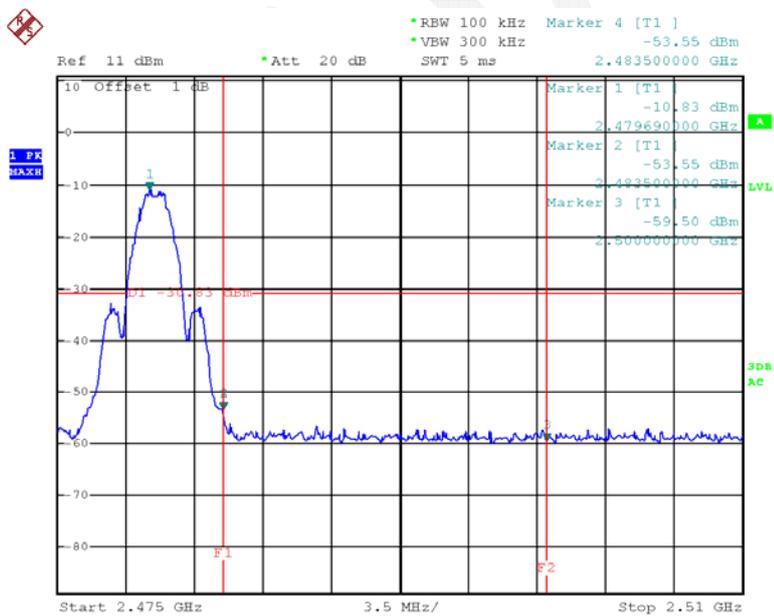
Date: 19.JUL.2005 17:12:14

### Chain 1 Band Edge, Left Side



Date: 22.JUL.2005 09:27:41

### Chain 1 Band Edge, Right Side



Date: 22.JUL.2005 09:29:24

## FCC §15.247(e) - POWER SPECTRAL DENSITY

### Applicable Standard

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

### Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT was set without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set the RBW = 3 kHz, VBW = 10 kHz, Set the span to 1.5 times the DTS bandwidth.
4. Use the peak marker function to determine the maximum amplitude level.

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSP 38	100478	2015-05-09	2016-05-09

\* **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:	25.4°C
Relative Humidity:	53 %
ATM Pressure:	100.0kPa

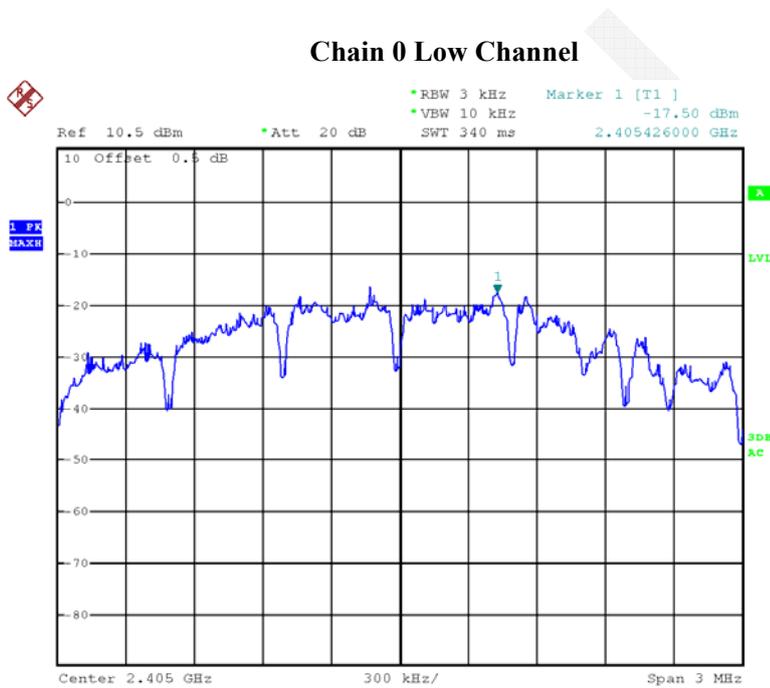
\* The testing was performed by Allen Qiao on 2015-06-19 & 2015-06-22.

Test Mode: Transmitting

Test Result: Pass

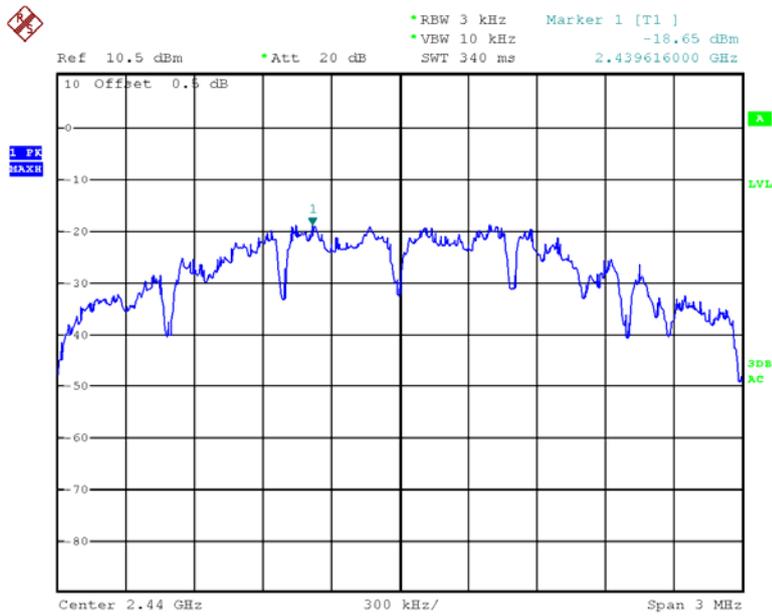
Channel	Frequency(MHz)	Power Spectral Density(dBm/3kHz)		Total (dBm/3kHz)	Limit (dBm/3kHz)
		Chain 0	Chain 1		
Low	2405	-17.5	-21.87	-16.15	8
Middle	2440	-18.65	-21.98	-16.99	8
High	2480	-18.32	-23.46	-17.16	8

Please refer to the following plots



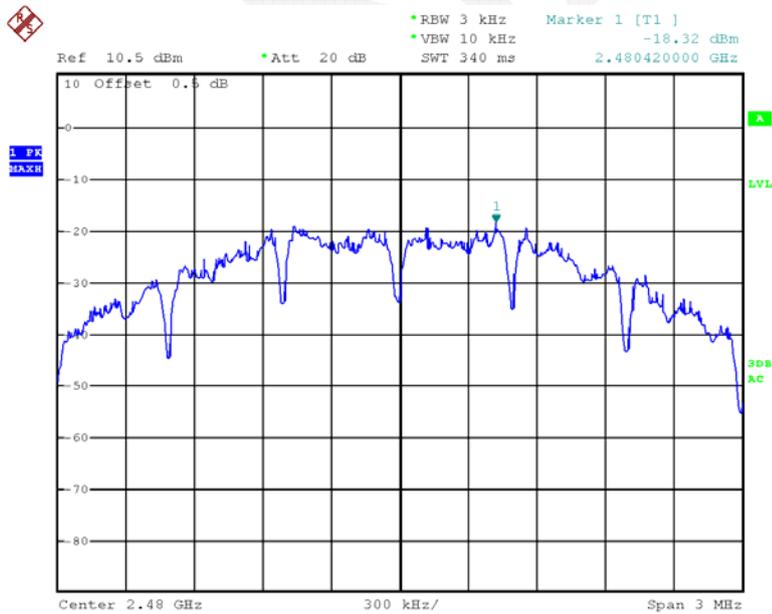
Date: 19.JUL.2005 17:17:54

### Chain 0 Middle Channel



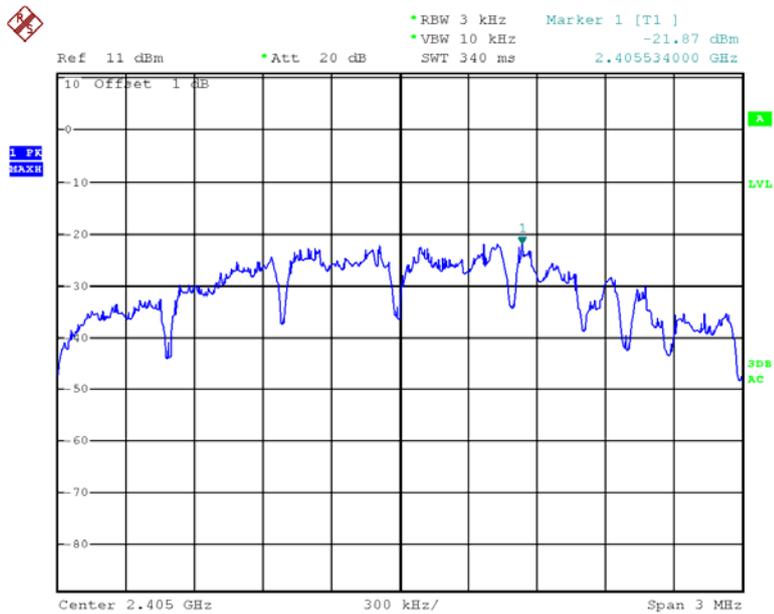
Date: 19.JUL.2005 17:17:15

### Chain 0 High Channel



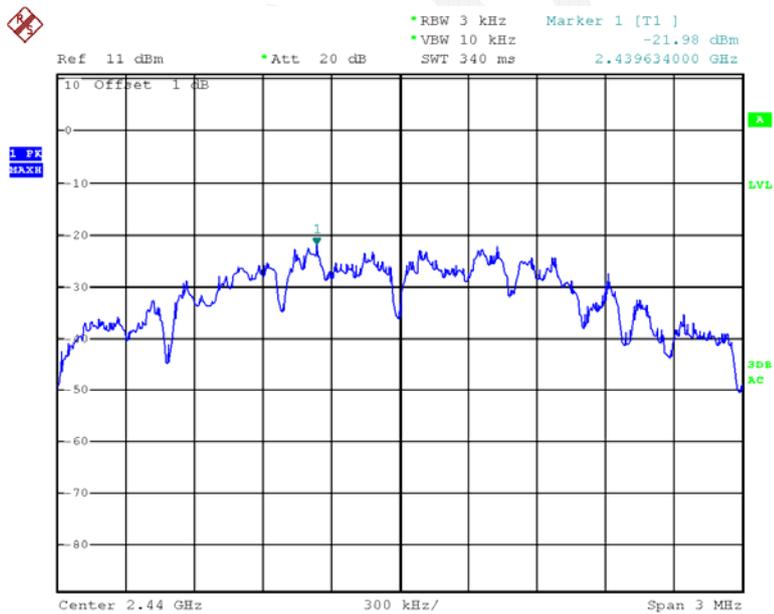
Date: 19.JUL.2005 17:16:33

### Chain 1 Low Channel



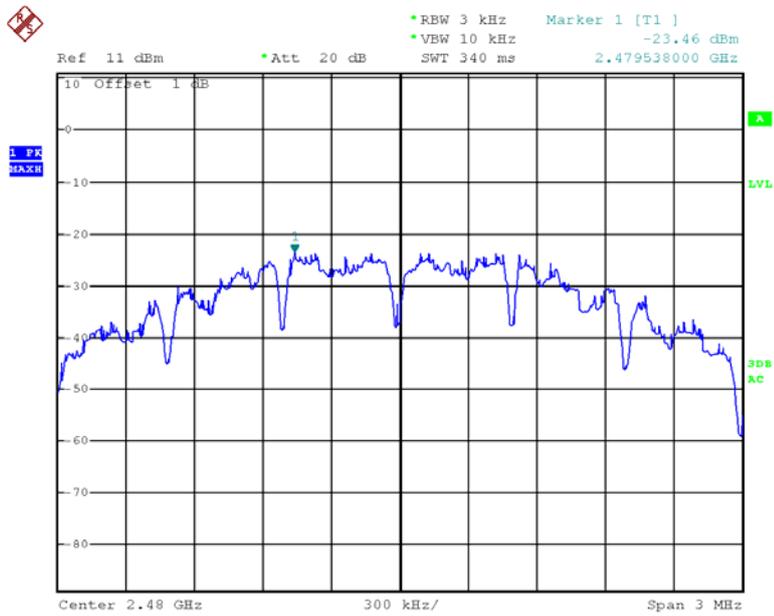
Date: 22.JUL.2005 09:33:04

### Chain 1 Middle Channel



Date: 22.JUL.2005 09:32:15

### Chain 1 High Channel



Date: 22.JUL.2005 09:31:38

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