

# FCC PART 15.247

## TEST REPORT

For

### Shenzhen Rapoo Technology Co., Ltd.

22, Jinxiu Road East, Pingshan District, Shenzhen, China

**FCC ID: PP2A800**

<b>Report Type:</b> Original Report	<b>Product Type:</b> Bluetooth Stereo Speaker
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<b>Report Number:</b> R2DG140228002-00B	
<b>Report Date:</b> 2014-05-15	
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## GENERAL INFORMATION

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

The *Shenzhen Rapoo Technology Co., Ltd.*'s product, model number: *A800 (FCC ID: PP2A800)* (the "EUT") in this report was a *Bluetooth Stereo Speaker*, which was measured approximately: 43.0 cm (L) x 10.5 cm (W) x 12.0 cm (H), rated input voltage: DC 7.4 V from rechargeable Li-ion battery or DC12.0V from adapter.

Adapter information: Rapoo  
Model: F18W-120200SPAU  
Input: AC 100-240V 50/60Hz 0.6A  
Output: DC12V, 2A

*All measurement and test data in this report was gathered from production sample serial number: 140228002 (Assigned by BACL, Dongguan). The EUT was received on 2014-03-03.*

### Objective

This report is prepared on behalf of *Shenzhen Rapoo Technology 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)

FCC Part15C DSS submissions with FCC ID: *PP2A800 for Bluetooth BDR, EDR mode.*

### 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). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

## **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 provided by manufacturer. The engineering mode was configured the system transmitting with maximum power.

For Bluetooth LE mode, 40 channels are provided for testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	20	2442
1	2404	...	...
...	...	...	...
...	...	...	...
..	...	38	2478
19	2440	39	2480

EUT was tested with channel 0, 19 and 39.

### EUT Exercise Software

The software “CSR Blue suite 2.5.0” was used.

### Equipment Modifications

No modification was made to the EUT.

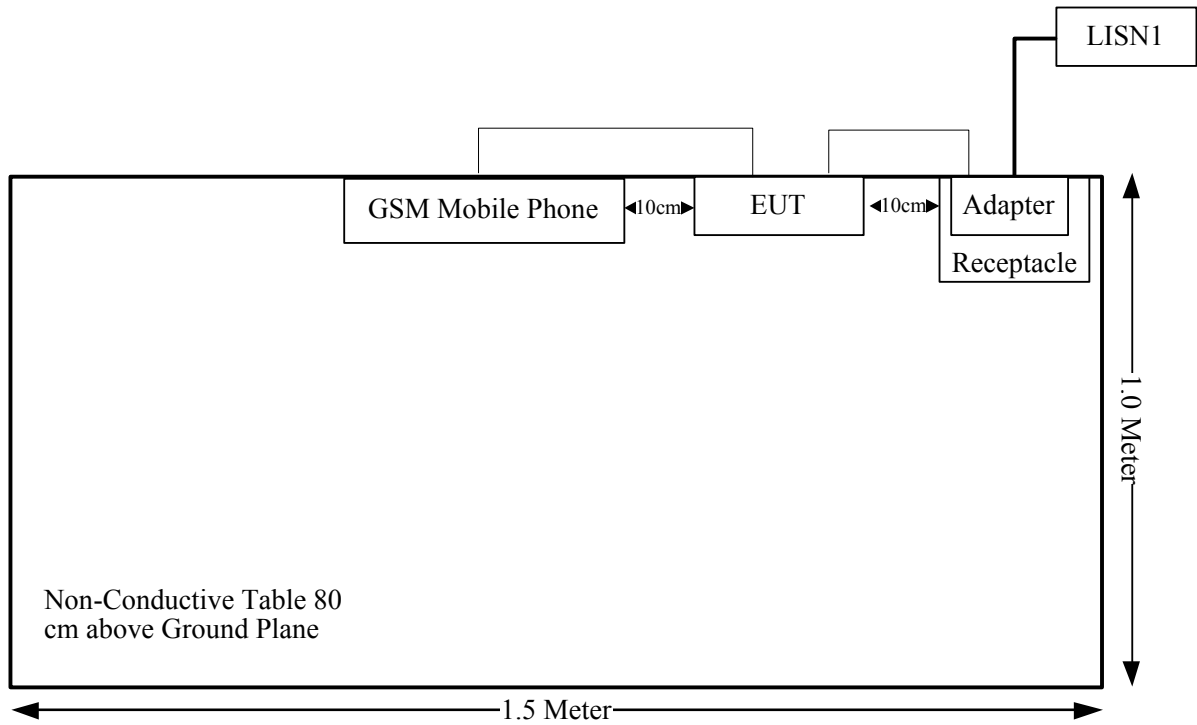
### Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
Karbon	GSM mobile phone	K21	/

### External Cable

Cable Description	Shielding Type	Ferrite Core	Length (m)	From Port	To
DC cable	No	No	1.5	Adapter	EUT
Audio In Cable	No	No	1.5	Earphone port of GSM mobile phone	EUT

**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)**

**Applicable Standard**

According to subpart 15.247(i) and subpart §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

$S = PG/4\pi R^2$  = 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:**

Mode	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)			
BLE	2402	-1.21	0.76	0.94	1.24	20	0.0001	1.0

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

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## **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 has one integral antenna arrangement, which was permanently attached and the antenna gain is -1.21 dBi, 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:

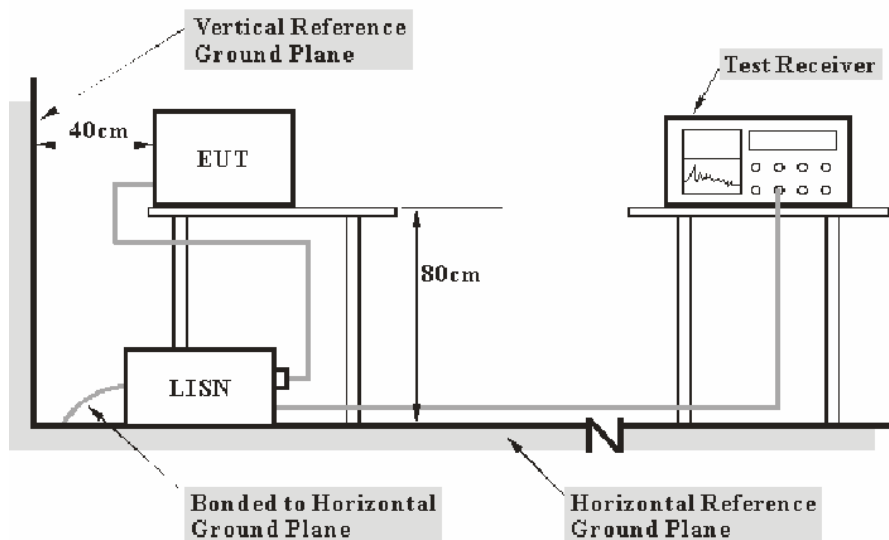
- compliance is deemed to occur if no measured disturbance level, increased by  $(U_{lab} - U_{cispr})$ , exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level, increased by  $(U_{lab} - U_{cispr})$ , exceeds the disturbance limit.

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 C63.4-2003 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

### Test Procedure

During the conducted emission test, the adapter was connected to the outlet of the main 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 Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESCS 30	830245/006	2013-11-20	2014-11-19
R&S	Two-line V-network	ENV216	3560.6550.12	2014-01-22	2015-01-21
R&S	L.I.S.N	ESH3-Z5	100113	N/A	N/A
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:

**13.70 dB at 0.387164 MHz** in the **Neutral** conducted mode

### Test Data

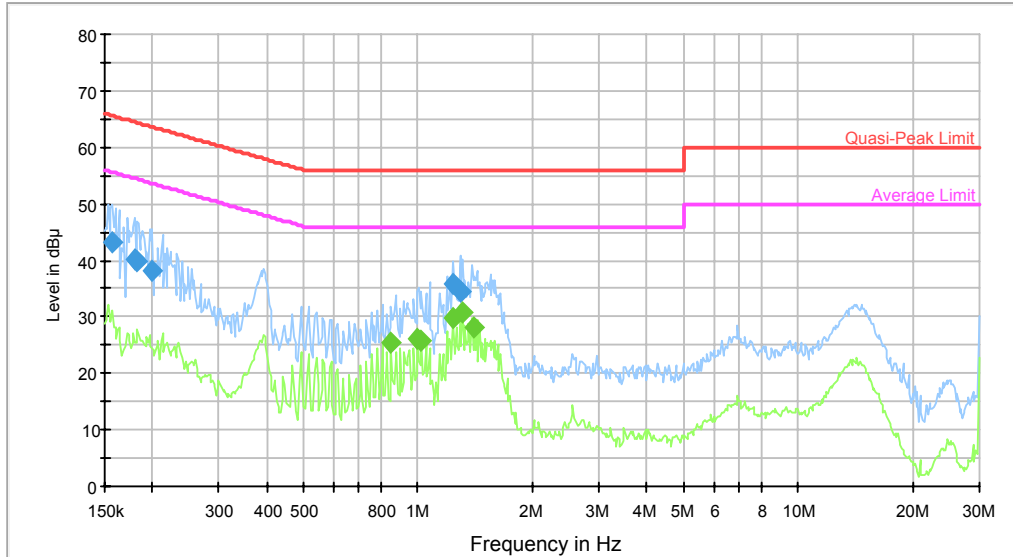
#### Environmental Conditions

<b>Temperature:</b>	25.6 °C
<b>Relative Humidity:</b>	64 %
<b>ATM Pressure:</b>	100.8 kPa

*The testing was performed by Allen Qiao on 2014-04-14.*

Test Mode: Charging&Transmitting

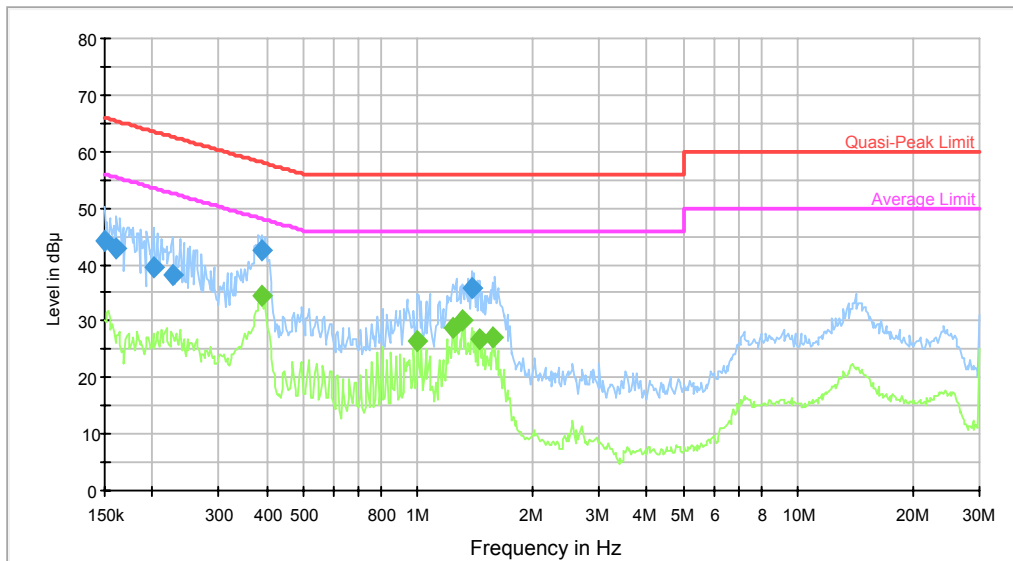
AC120 V, 60 Hz, Line:



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.157346	43.3	9.000	L1	9.6	22.3	65.6	Compliance
0.180171	40.3	9.000	L1	9.9	24.2	64.5	Compliance
0.183065	39.9	9.000	L1	10.0	24.5	64.3	Compliance
0.199835	38.0	9.000	L1	10.2	25.6	63.6	Compliance
1.239175	35.8	9.000	L1	9.7	20.2	56.0	Compliance
1.289541	34.4	9.000	L1	9.7	21.6	56.0	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.852094	25.4	9.000	L1	9.8	20.6	46.0	Compliance
0.999305	26.2	9.000	L1	9.7	19.8	46.0	Compliance
1.023481	25.9	9.000	L1	9.7	20.2	46.0	Compliance
1.239175	29.8	9.000	L1	9.7	16.2	46.0	Compliance
1.310256	30.8	9.000	L1	9.7	15.2	46.0	Compliance
1.407671	28.1	9.000	L1	9.7	17.9	46.0	Compliance

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



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.150000	44.2	9.000	N	9.7	21.8	66.0	Compliance
0.161152	42.9	9.000	N	10.0	22.5	65.4	Compliance
0.201433	39.5	9.000	N	10.8	24.1	63.6	Compliance
0.227007	38.1	9.000	N	10.7	24.5	62.6	Compliance
0.390261	42.5	9.000	N	10.3	15.6	58.1	Compliance
1.385415	35.8	9.000	N	9.8	20.2	56.0	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.387164	34.4	9.000	N	10.3	13.7	48.1	Compliance
0.999305	26.5	9.000	N	9.8	19.5	46.0	Compliance
1.239175	28.8	9.000	N	9.8	17.2	46.0	Compliance
1.310256	30.1	9.000	N	9.8	15.9	46.0	Compliance
1.453260	26.8	9.000	N	9.8	19.2	46.0	Compliance
1.573796	27.0	9.000	N	9.8	19.0	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 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 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

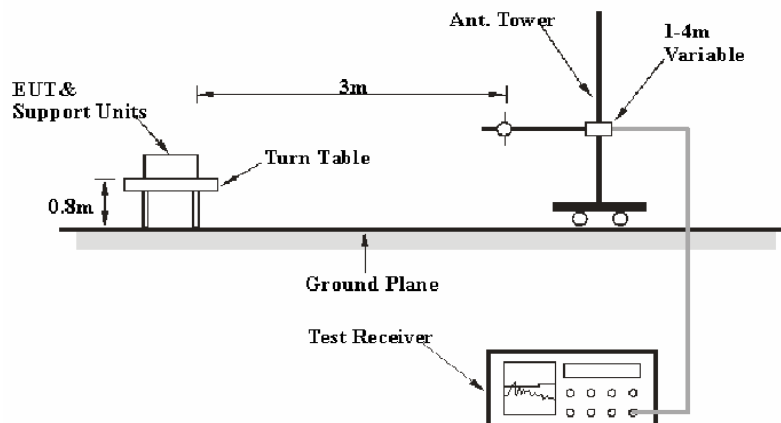
6G~18GHz: 5.23 dB

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

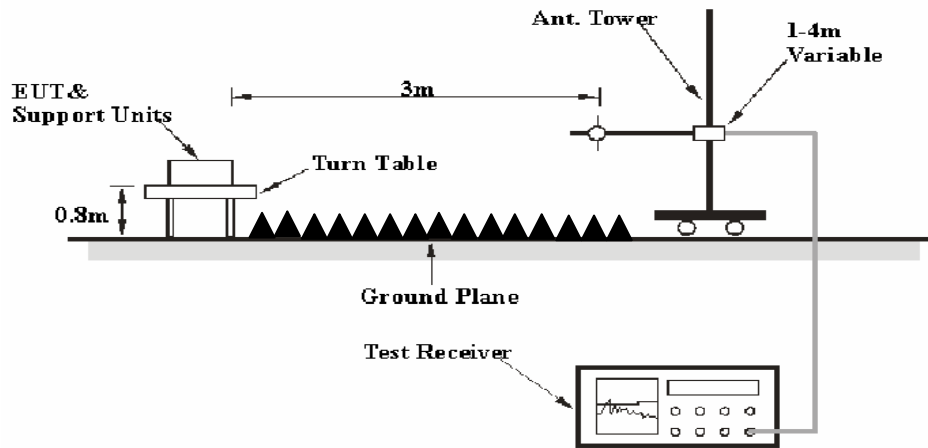
**EUT Setup**

**Below 1GHz:**





**Above 1GHz:**



The radiated emission tests were performed in the 3 meters test site, using the setup accordance with the ANSI C63.4-2003. 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
30 MHz – 1000 MHz	120 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1MHz	3 MHz	/	PK
	1MHz	10 Hz	/	Ave.

**Test Procedure**

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 Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

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

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	2013-05-06	2014-05-05
Sunol Sciences	Antenna	JB3	A060611-1	2011-09-06	2014-09-05
HP	Amplifier	8447E	2434A02181	2013-09-06	2014-09-05
R&S	Spectrum Analyzer	FSEM	DE31388	2013-05-07	2014-05-06
ETS LINDGREN	Horn Antenna	3115	000 527 35	2012-09-06	2015-09-05
Mini-Circuit	Amplifier	ZVA-213-S+	054201245	2014-02-19	2015-02-18
R&S	Spectrum Analyzer	FSP 38	100478	2013-06-16	2014-06-15
Ducommun Technologies	Horn Antenna	ARH-4223-02	1007726-01 1304	2013-06-16	2014-06-15
Quinstar	Amplifier	QLW-18405536-JO	15964001001	2013-09-06	2014-09-05

\* **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:

**5.04 dB at 7440 MHz in the Vertical polarization**

## Test Data

### Environmental Conditions

Temperature:	22.6 °C
Relative Humidity:	70 %
ATM Pressure:	101 kPa

\* The testing was performed by Allen Qiao on 2014-04-10.

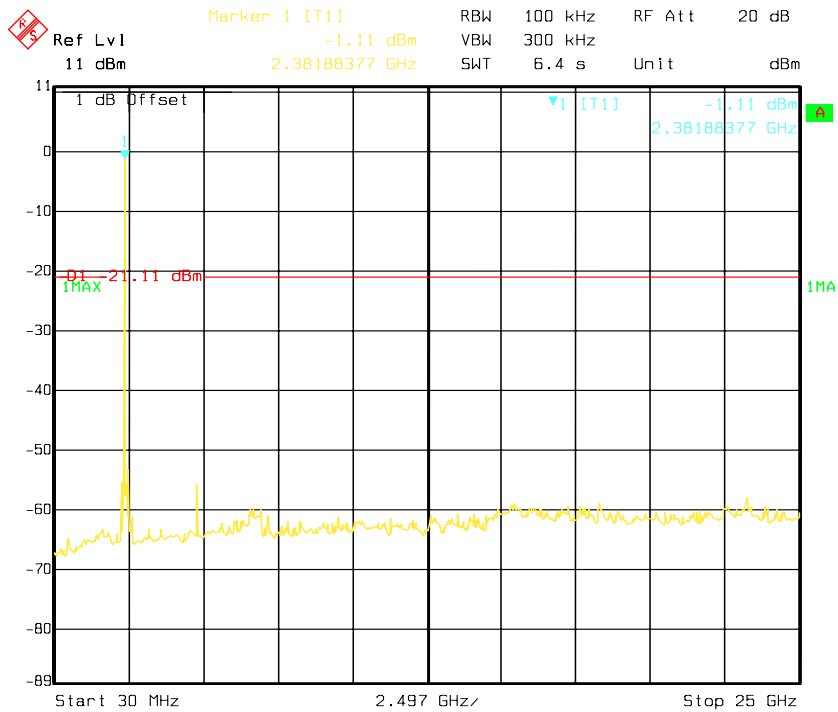
Mode: Transmitting

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBµV/m)	FCC 15.247	
	Reading (dBµV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB)				Limit (dBµV/m)	Margin (dB)
Low Channel: 2402 MHz									
2402	89.51	PK	H	25.65	4.42	27.32	92.26	N/A	N/A
2402	75.32	AV	H	25.65	4.42	27.32	78.07	N/A	N/A
2402	93.73	PK	V	25.65	4.42	27.32	96.48	N/A	N/A
2402	79.64	AV	V	25.65	4.42	27.32	82.39	N/A	N/A
4804	49.84	PK	V	30.59	5.98	27.41	59.00	74.00	15.00
4804	37.80	AV	V	30.59	5.98	27.41	46.96	54.00	7.04
7206	43.08	PK	V	34.09	7.45	25.91	58.71	74.00	15.29
7206	31.69	AV	V	34.09	7.45	25.91	47.32	54.00	6.68
2390	54.97	PK	V	25.61	4.39	27.32	57.65	74.00	16.35
2390	41.70	AV	V	25.61	4.39	27.32	44.38	54.00	9.62
1600	49.85	PK	V	23.80	3.23	27.81	49.07	74.00	24.93
1600	25.12	AV	V	23.80	3.23	27.81	24.34	54.00	29.66
7600	39.49	PK	V	34.88	7.59	26.41	55.55	74.00	18.45
7600	25.86	AV	V	34.88	7.59	26.41	41.92	54.00	12.08
257.95	39.94	QP	H	12.49	1.93	21.49	32.87	46.00	13.13
405.39	35.36	QP	V	16.37	2.44	21.78	32.39	46.00	13.61
Middle Channel: 2440 MHz									
2440	88.73	PK	H	25.74	4.4	27.34	91.53	N/A	N/A
2440	74.67	AV	H	25.74	4.4	27.34	77.47	N/A	N/A
2440	92.75	PK	V	25.74	4.4	27.34	95.55	N/A	N/A
2440	78.49	AV	V	25.74	4.4	27.34	81.29	N/A	N/A
4880	50.64	PK	V	30.79	6.08	27.42	60.09	74.00	13.91
4880	38.90	AV	V	30.79	6.08	27.42	48.35	54.00	5.65
7320	44.75	PK	V	34.37	7.51	25.88	60.75	74.00	13.25
7320	31.86	AV	V	34.37	7.51	25.88	47.86	54.00	6.14
1600	51.17	PK	V	23.80	3.23	27.81	50.39	74.00	23.61
1600	24.36	AV	V	23.80	3.23	27.81	23.58	54.00	30.42
7600	39.96	PK	V	34.88	7.59	26.41	56.02	74.00	17.98
7600	26.65	AV	V	34.88	7.59	26.41	42.71	54.00	11.29
257.95	39.82	QP	H	12.49	1.93	21.49	32.75	46.00	13.25
405.39	35.43	QP	V	16.37	2.44	21.78	32.46	46.00	13.54
High Channel: 2480 MHz									
2480	88.25	PK	H	25.85	4.48	27.36	91.22	N/A	N/A
2480	73.87	AV	H	25.85	4.48	27.36	76.84	N/A	N/A
2480	92.48	PK	V	25.85	4.48	27.36	95.45	N/A	N/A
2480	77.23	AV	V	25.85	4.48	27.36	80.20	N/A	N/A
4960	49.35	PK	V	31.00	5.90	27.43	58.82	74.00	15.18
4960	38.21	AV	V	31.00	5.90	27.43	47.68	54.00	6.32
7440	44.45	PK	V	34.66	7.58	25.97	60.72	74.00	13.28
7440	32.69	AV	V	34.66	7.58	25.97	48.96	54.00	5.04 *
2483.5	54.93	PK	V	25.86	4.49	27.36	57.92	74.00	16.08
2483.5	38.66	AV	V	25.86	4.49	27.36	41.65	54.00	12.35
1600	47.96	PK	V	23.80	3.23	27.81	47.18	74.00	26.82
1600	24.78	AV	V	23.80	3.23	27.81	24.00	54.00	30.00
7600	40.06	PK	V	34.88	7.59	26.41	56.12	74.00	17.88
7600	26.07	AV	V	34.88	7.59	26.41	42.13	54.00	11.87
257.95	40.3	QP	H	12.49	1.93	21.49	33.23	46.00	12.77
405.39	34.72	QP	V	16.37	2.44	21.78	31.75	46.00	14.25

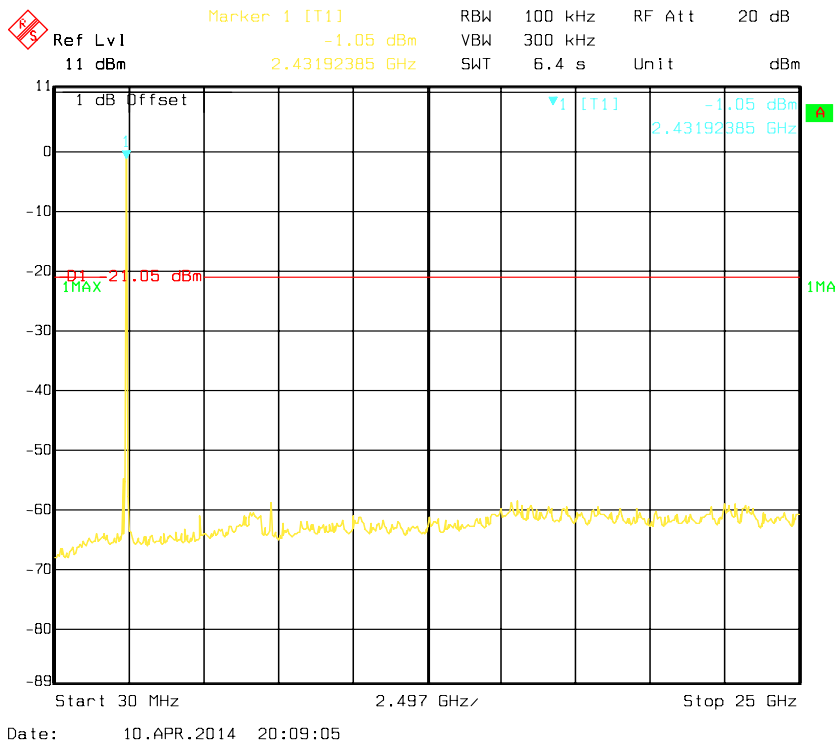
\*Within measurement uncertainty!

### Conducted Spurious Emissions at Antenna Port

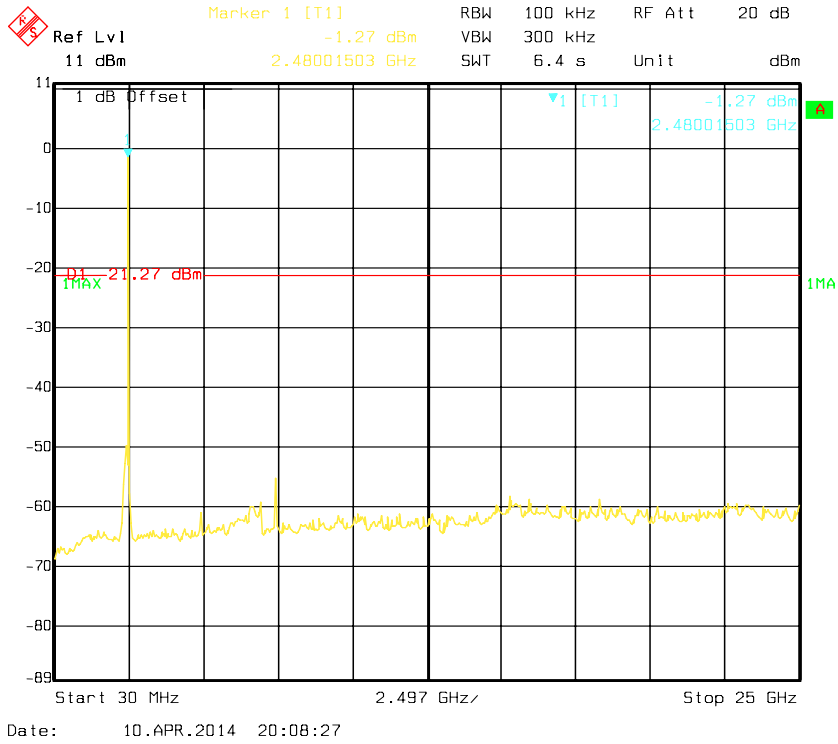
#### Low Channel



#### Middle Channel



### High Channel



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

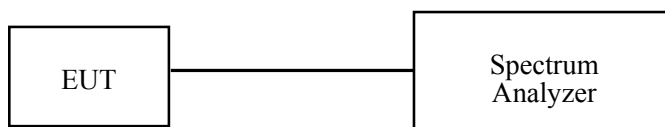
### Applicable Standard

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

According to KDB 558074 D01 DTS Meas Guidance v03r01clause8.1 Option 1:

- Set RBW = 100 kHz.
- Set the video bandwidth (VBW)  $\geq 3 \times$  RBW.
- Detector = Peak.
- Trace mode = max hold.
- Sweep = auto couple.
- Allow the trace to stabilize.
- Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.



### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSEM	DE31388	2013-05-07	2014-05-06

\* **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 Data

#### Environmental Conditions

Temperature:	24.4 °C
Relative Humidity:	67 %
ATM Pressure:	101 kPa

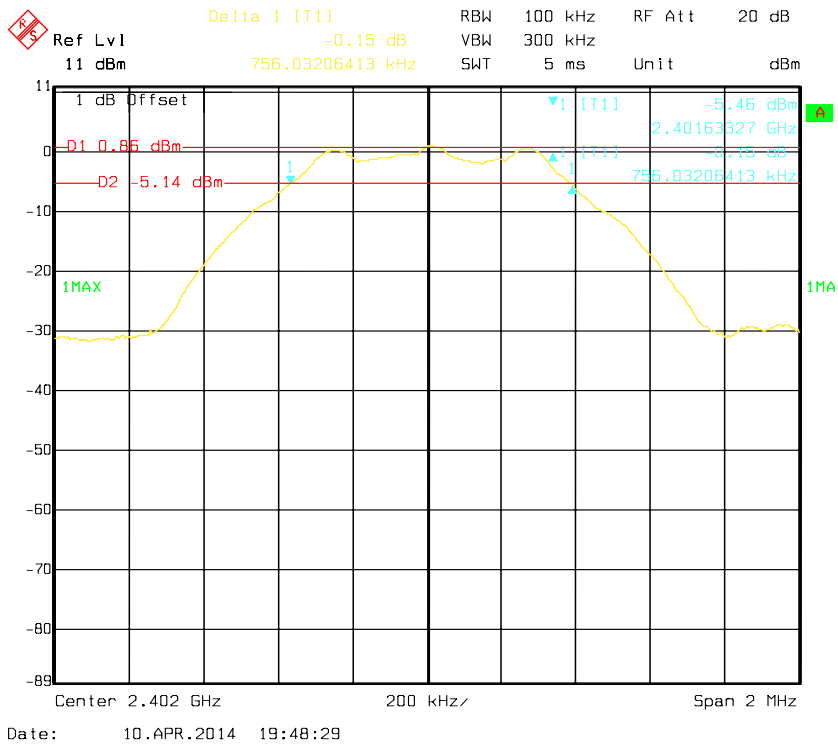
\* The testing was performed by Allen Qiao on 2014-04-10.

**Test Result:** Pass.

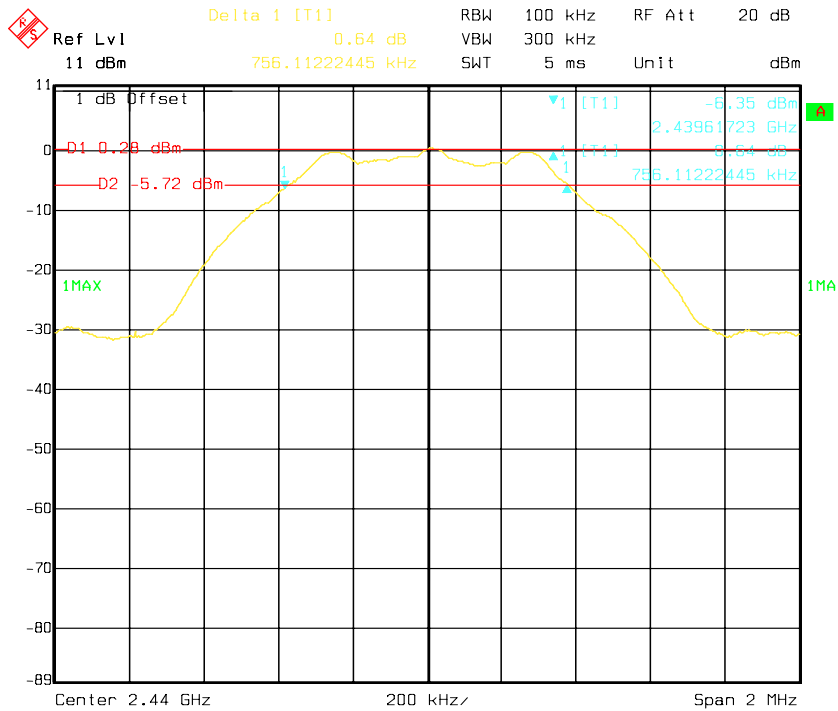
Please refer to the following tables and plots.

Channel	Frequency	6 dB Bandwidth	Limit
	(MHz)	(MHz)	(kHz)
Low	2402	0.756	≥500
Middle	2440	0.756	≥500
High	2480	0.758	≥500

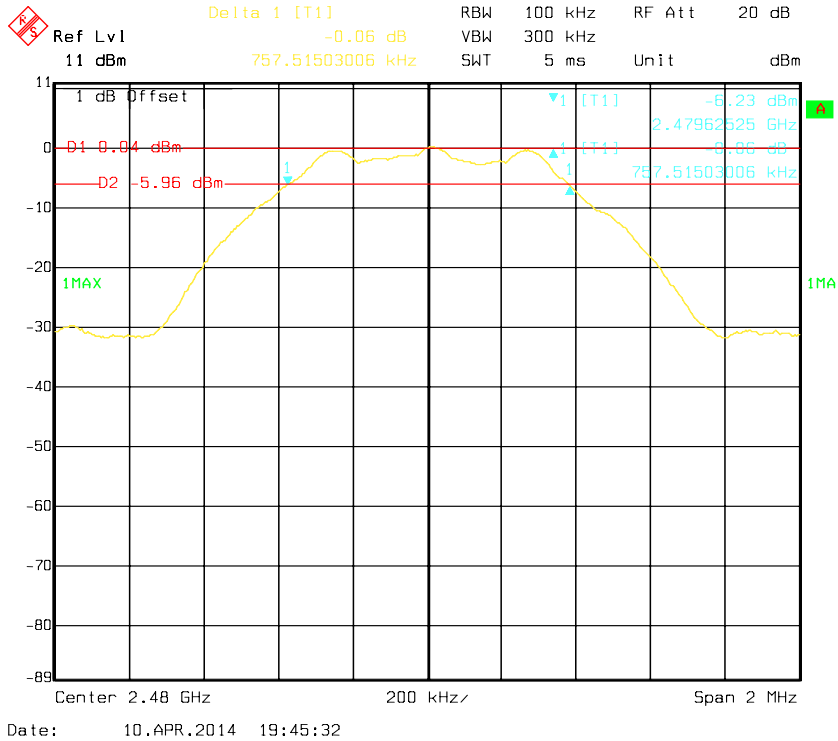
Low Channel



### Middle Channel



### High Channel





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

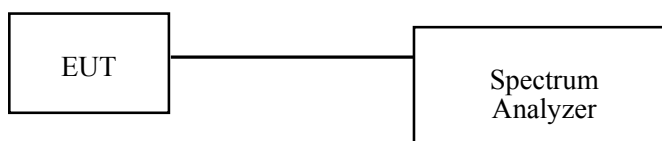
### Applicable Standard

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

According to KDB 558074 D01 DTS Meas Guidance v03r01clause9.1.1:

- a) Set the RBW  $\geq$  DTS bandwidth.
- b) Set VBW  $\geq 3 \times$  RBW.
- c) Set span  $\geq 3 \times$  RBW
- d) Sweep time = auto couple.
- e) Detector = peak.
- f) Trace mode = max hold.
- g) Allow trace to fully stabilize.
- h) Use peak marker function to determine the peak amplitude level.



### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSEM	DE31388	2013-05-07	2014-05-06

\* **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 Data

#### Environmental Conditions

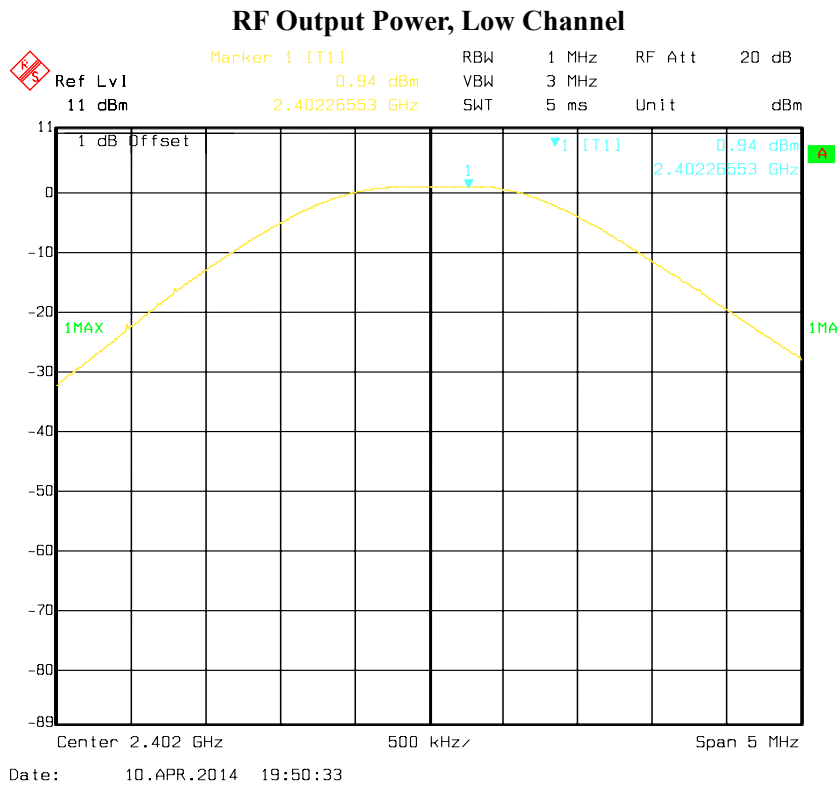
Temperature:	24.4 °C
Relative Humidity:	67 %
ATM Pressure:	101 kPa

\* The testing was performed by Allen Qiao on 2014-04-10.

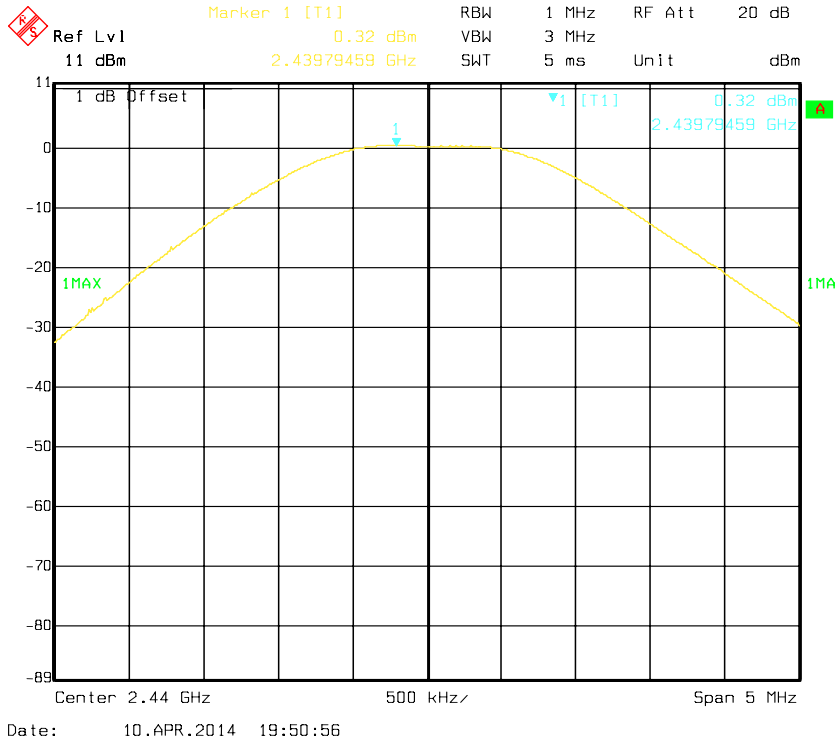
Test Mode: Transmitting

Channel	Frequency	Max Peak Conducted Output Power	Limit	Result
	(MHz)	(dBm)	(dBm)	
Low	2402	0.94	30	PASS
Middle	2440	0.32	30	PASS
High	2480	0.20	30	PASS

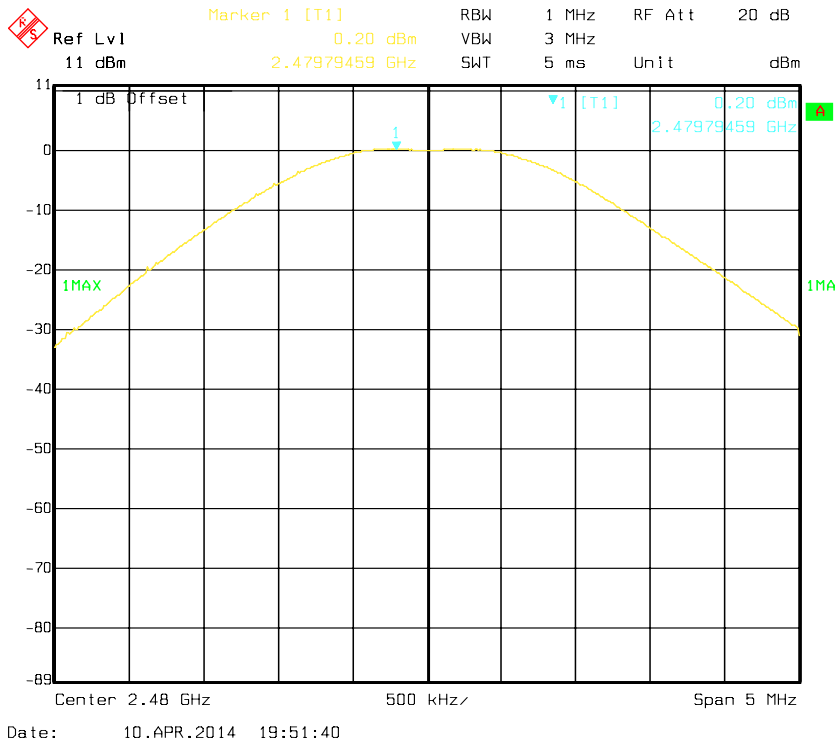
Please refer to the following plots



### RF Output Power, Middle Channel



### RF Output Power, High Channel



## **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	FSEM	DE31388	2013-05-07	2014-05-06

\* **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 Data**

#### **Environmental Conditions**

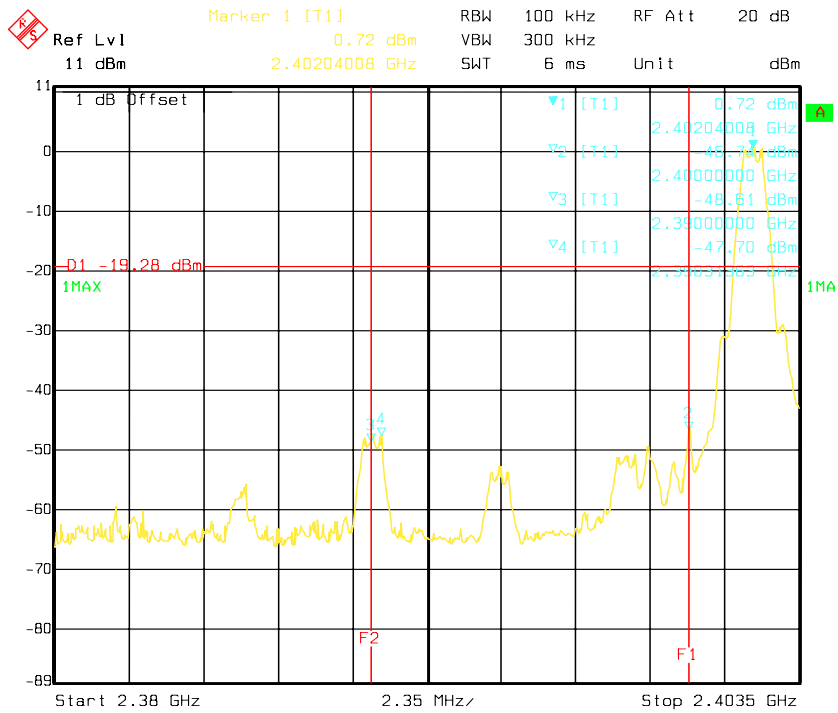
<b>Temperature:</b>	24.4 °C
<b>Relative Humidity:</b>	67 %
<b>ATM Pressure:</b>	101 kPa

\* The testing was performed by Allen Qiao on 2014-04-10.

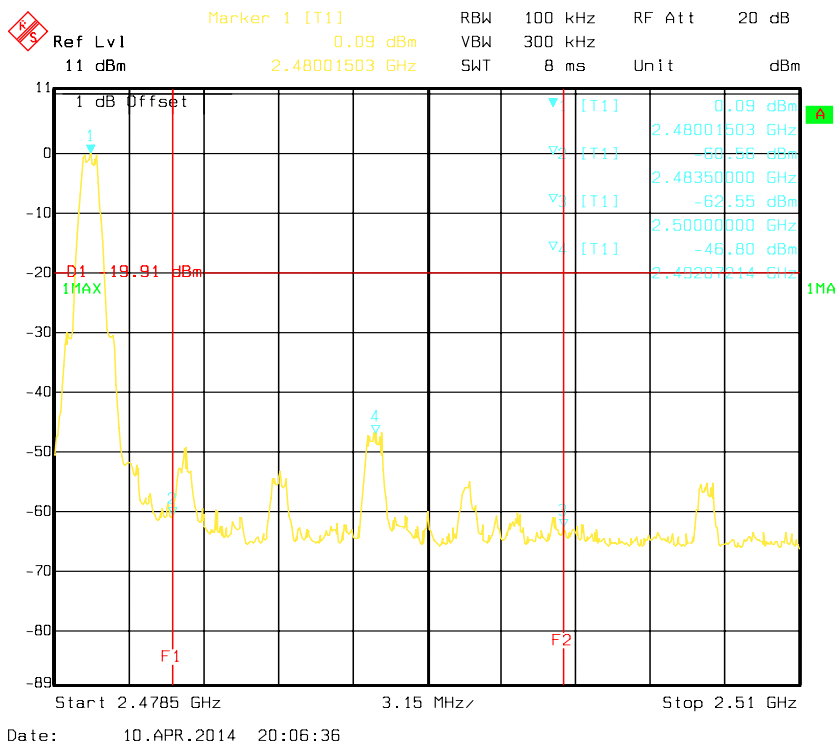
#### **Test Result: Compliance**

Please refer to following plots.

### Band Edge, Left Side



### Band Edge, Right Side



## 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

According to KDB 558074 D01 DTS Meas Guidance v03r01clause10.2:

- a) Set analyzer center frequency to DTS channel center frequency.
- b) Set the span to 1.5 times the DTS bandwidth.
- c) Set the RBW to:  $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$ .
- d) Set the VBW  $\geq 3 \times \text{RBW}$ .
- e) Detector = peak.
- f) Sweep time = auto couple.
- g) Trace mode = max hold.
- h) Allow trace to fully stabilize.
- i) Use the peak marker function to determine the maximum amplitude level within the RBW.
- j) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSEM	DE31388	2013-05-07	2014-05-06

\* **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 Data

#### Environmental Conditions

<b>Temperature:</b>	24.4 °C
<b>Relative Humidity:</b>	67 %
<b>ATM Pressure:</b>	101 kPa

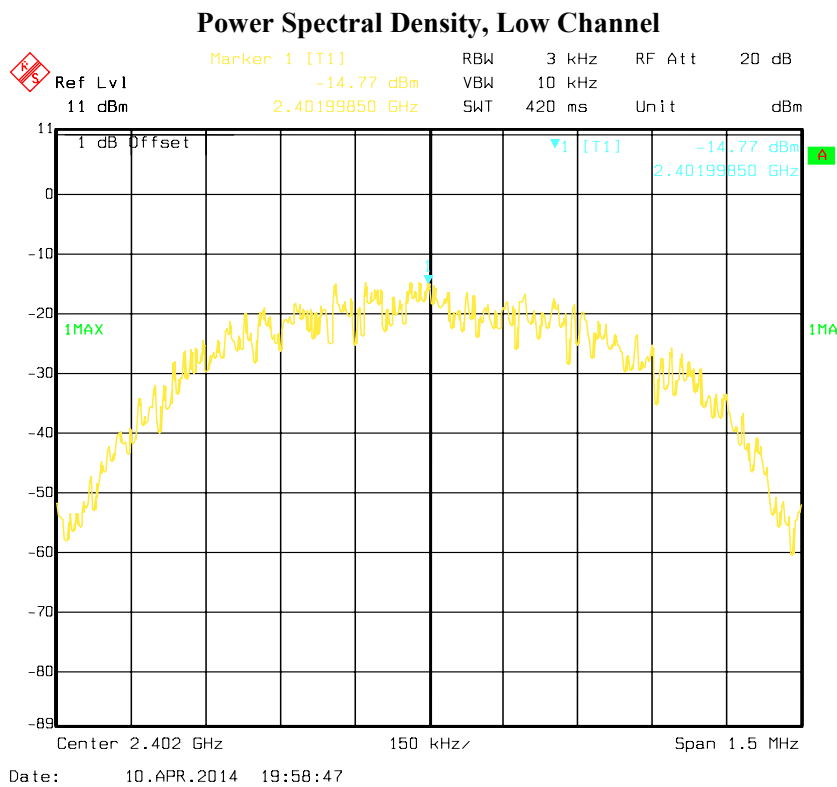
\* The testing was performed by Allen Qiao on 2014-04-10.

Test Mode: Transmitting

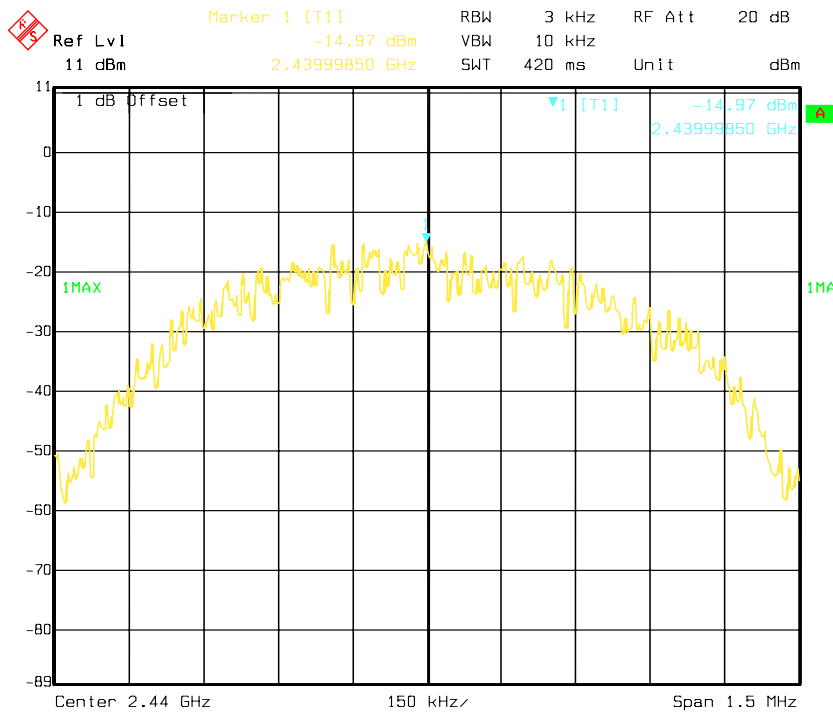
Test Result: Pass

Channel	Frequency	PSD	Limit	Result
	MHz	(dBm/3kHz)	(dBm/3kHz)	
Low	2402	-14.77	≤8	PASS
Middle	2440	-14.97	≤8	PASS
High	2480	-15.09	≤8	PASS

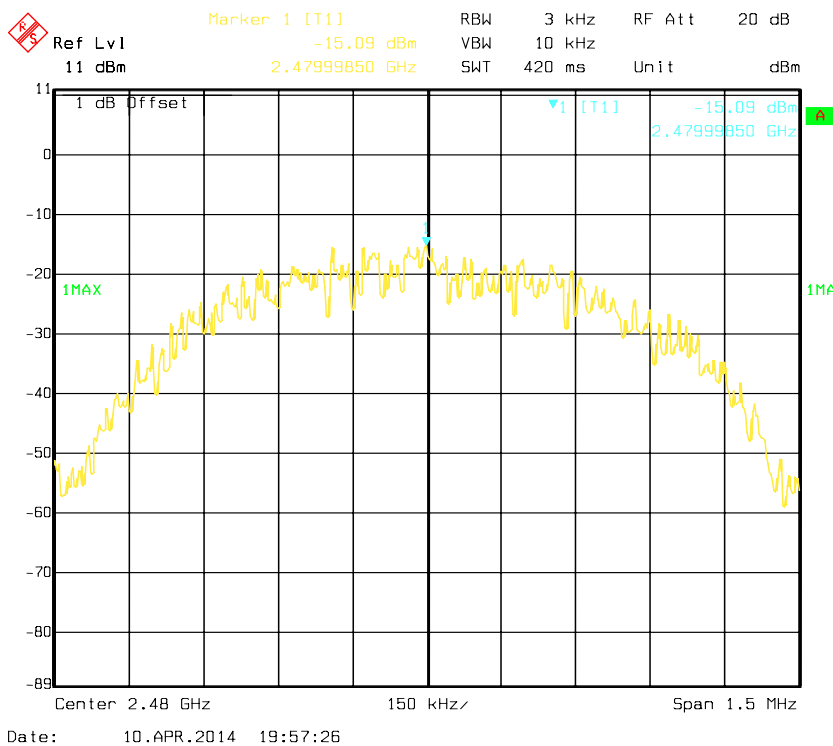
Please refer to the following plots



**Power Spectral Density, Middle Channel**



**Power Spectral Density, High Channel**



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