

FCC PART 15.247

TEST REPORT

For

Airsound Technologies Limited

Chapel House, West Mead Drive, Swindon, SN5 7UN, United Kingdom

FCC ID: 2AA8C-A70-01

Report Type: Original Report	Product Type: Spatial Soundbar with Bluetooth and Wireless Subwoofer
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Report Number: RDG140916002-00B	
Report Date: 2014-10-14	
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *Airsound Technologies Limited* 's product, model number: *A70 (FCC ID: 2AA8C-A70-01)* or ("EUT") in this report is a *Spatial Soundbar with Bluetooth and Wireless Subwoofer*, which was measured approximately: 77.5 cm (L) x 6.9 cm (W) x 7.2 cm (H), rated input voltage: DC 22V from adapter.

Adapter1 information: ORBITSOUND
Model: KSAS0652200250M2
Input: AC 100-240V, 50/60Hz, 1.2A
Output: DC 22V, 2.5A

Adapter2 information: Mass Power
Model: SKF2200250Y1BA
Input: AC 100-240V, 50/60Hz, 1.3A
Output: DC 22V, 2.5A

** All measurement and test data in this report was gathered from production sample serial number: 140916002. (Assigned by BAACL Dongguan). The EUT was received on 2014-09-16.*

Objective

This report is prepared on behalf of *Airsound Technologies Limited* 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: *2AA8C-A70-01* 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.

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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 BlueSuite 2.50” was used for testing, which was provided by manufacturer. The worst condition (maximum power) was setting by the software as following table:

Test Software Version	CSR BlueSuite 2.50		
Test Frequency	2402MHz	2440MHz	2480MHz
BLE	N/A	N/A	N/A

Equipment Modifications

No modification was made to the EUT.

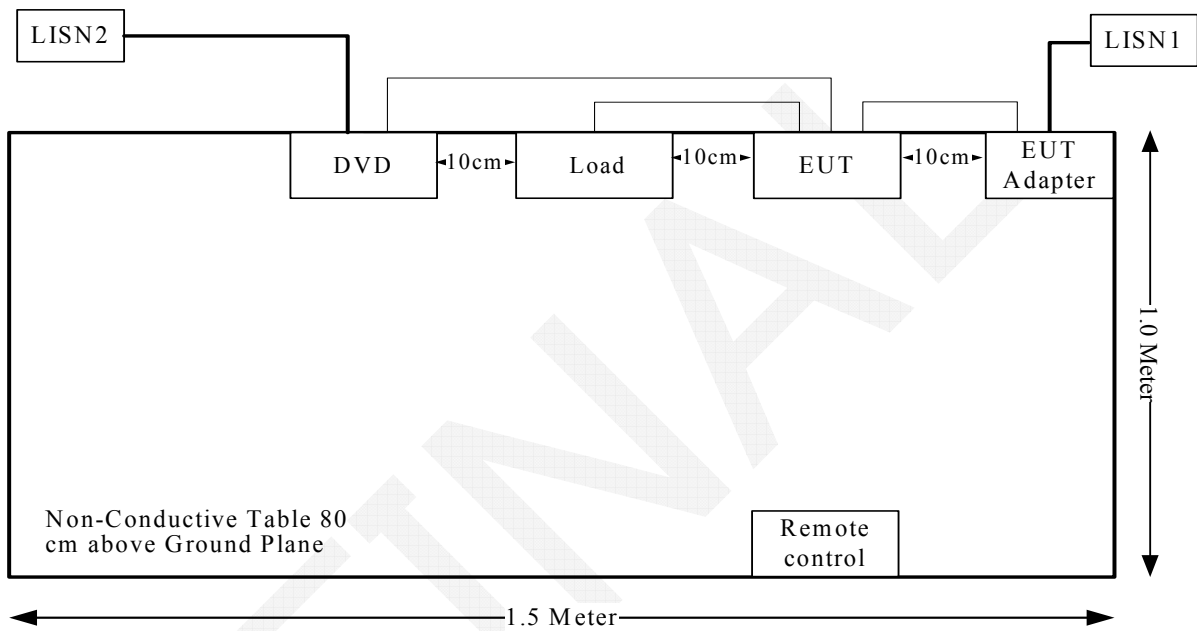
Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
PHILIPS	DVD	DVP3560K/93	KX1C1108079973

External Cable

Cable Description	Shielding Type	Ferrite Core	Length(m)	From Port	To
Audio Cable	No	No	1.5	DVD	EUT
Adapter Cable	No	No	1.4	Adapter	EUT
USB calbe	No	No	1.0	10Ω Load	EUT

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.247 (i), §1.1307,§2.1091	Maximum Permissible Exposure	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) Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Averaging Time (minutes)
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f ²)	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/cm²);

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 ²)	MPE Limit (mW/cm ²)
	(dBi)	(numeric)	(dBm)	(mW)			
2480	0.54	1.13	2.97	1.98	20.00	0.00045	1.0

Result: The device meet FCC MPE at 20 cm distance

FCC §15.203 - ANTENNA REQUIREMENT

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 0.54 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:

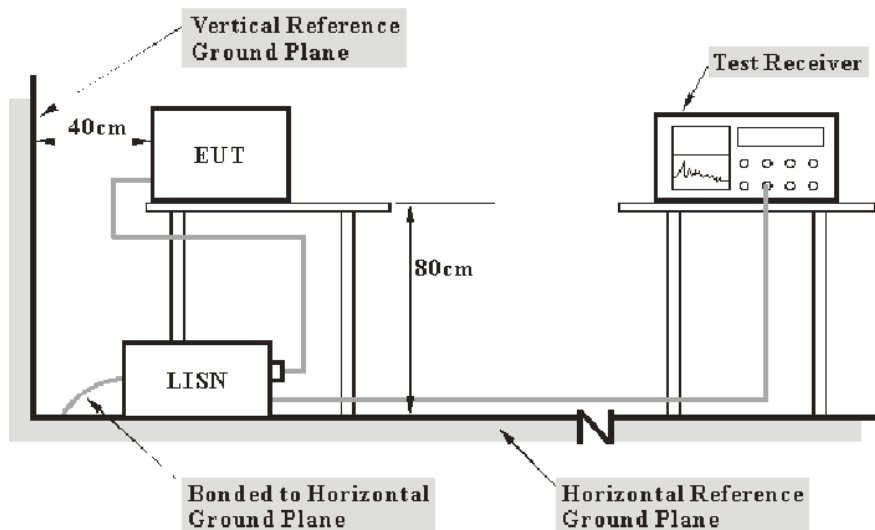
- compliance is deemed to occur if no measured disturbance level, increased by $(U_{lab} - U_{cispr})$, exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level, increased by $(U_{lab} - U_{cispr})$, exceeds the disturbance limit.

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 of EUT 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 of EUT was connected to the outlet of the first LISN and the other support equipments were connected to the outlet of the second LISN.

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

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

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	2014-11-20
R&S	L.I.S.N	ESH3-Z5	843331/015	2013-09-25	2014-09-25
R&S	Two-line V-network	ENV 216	3560.6550.12	2014-01-22	2015-01-22
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).

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 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:

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:

5.10 at **0.384091 MHz** in the **Neutral** conducted mode(supply from adapter1)
8.00 at **0.384091 MHz** in the **Line** conducted mode(supply from adapter2)

Test Data

Environmental Conditions

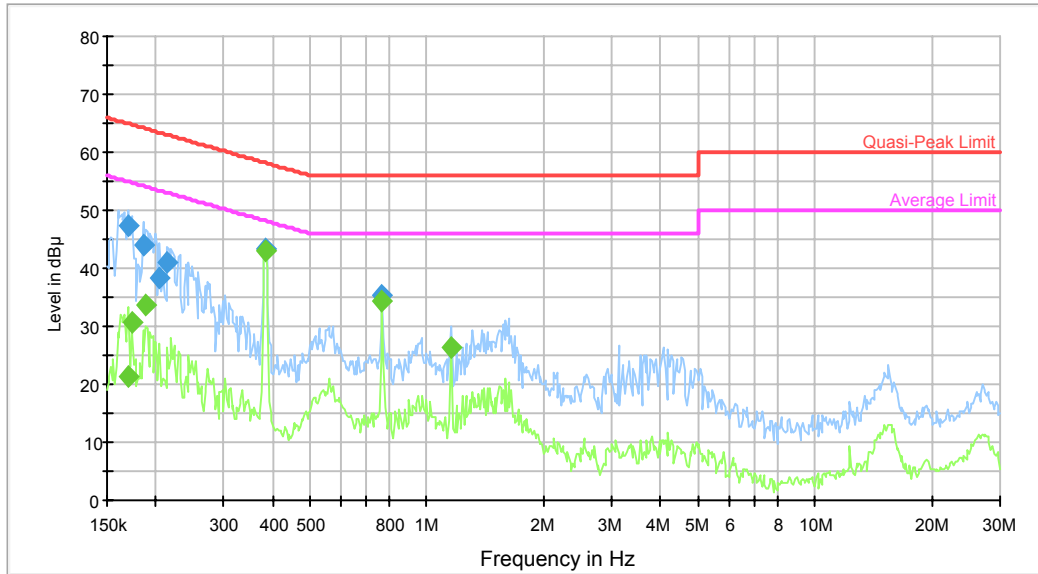
Temperature:	30.4 °C
Relative Humidity:	57 %
ATM Pressure:	99.8kPa

The testing was performed by Dean Liu on 2014-09-18.

Test Mode: Transmitting

Supply from adapter1:

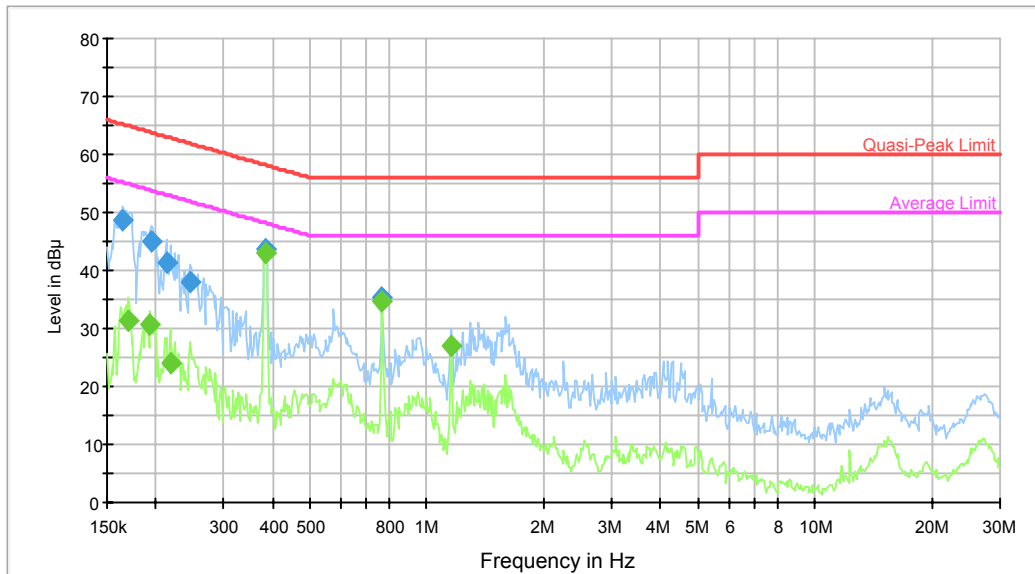
AC120 V, 60 Hz, Line:



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.170396	47.4	9.000	L1	10.3	17.6	64.9	Compliance
0.186006	43.9	9.000	L1	10.5	20.3	64.2	Compliance
0.204669	38.2	9.000	L1	10.8	25.2	63.4	Compliance
0.214692	40.9	9.000	L1	10.7	22.1	63.0	Compliance
0.384091	43.3	9.000	L1	10.6	14.9	58.2	Compliance
0.768247	35.2	9.000	L1	10.5	20.8	56.0	Compliance

Frequency (MHz)	Average (dB µ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)	Comment
0.170396	21.3	9.000	L1	10.3	33.6	54.9	Compliance
0.173134	30.5	9.000	L1	10.3	24.3	54.8	Compliance
0.188994	33.6	9.000	L1	10.6	20.5	54.1	Compliance
0.384091	42.9	9.000	L1	10.6	5.3	48.2	Compliance
0.768247	34.5	9.000	L1	10.5	11.5	46.0	Compliance
1.153421	26.5	9.000	L1	10.4	19.5	46.0	Compliance

AC120 V, 60 Hz, Neutral:

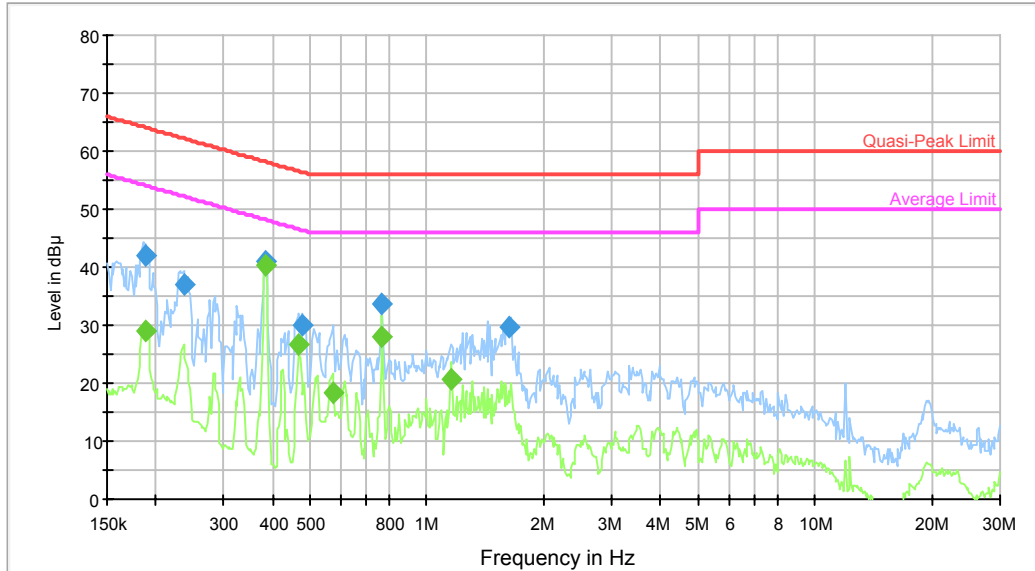


Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.165051	48.7	9.000	N	10.5	16.5	65.2	Compliance
0.195114	45.1	9.000	N	11.2	18.8	63.8	Compliance
0.212988	41.3	9.000	N	11.3	21.8	63.1	Compliance
0.245835	37.9	9.000	N	11.2	24.0	61.9	Compliance
0.384091	43.6	9.000	N	10.8	14.6	58.2	Compliance
0.768247	35.2	9.000	N	10.5	20.8	56.0	Compliance

Frequency (MHz)	Average (dB µ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)	Comment
0.170396	31.5	9.000	N	10.6	23.4	54.9	Compliance
0.193566	30.8	9.000	N	11.2	23.1	53.9	Compliance
0.218141	24.1	9.000	N	11.3	28.8	52.9	Compliance
0.384091	43.1	9.000	N	10.8	5.1	48.2	Compliance
0.768247	34.7	9.000	N	10.5	11.3	46.0	Compliance
1.153421	27.1	9.000	N	10.5	18.9	46.0	Compliance

Supply from adapter2:

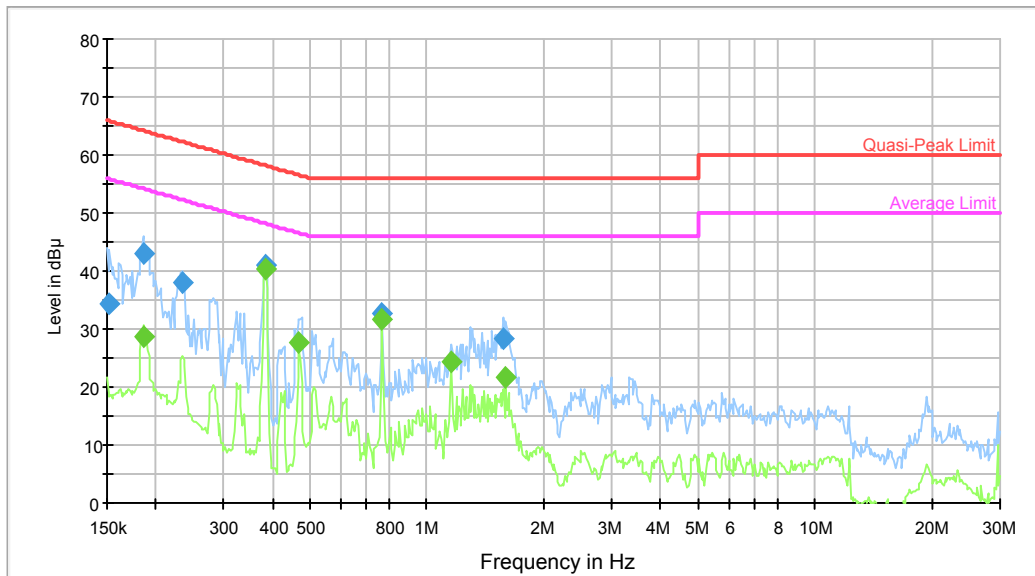
AC120 V, 60 Hz, Line:



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.188994	42.1	9.000	L1	10.6	22.0	64.1	Compliance
0.236234	37.0	9.000	L1	10.7	25.2	62.2	Compliance
0.384091	41.0	9.000	L1	10.6	17.2	58.2	Compliance
0.476287	29.9	9.000	L1	10.4	26.5	56.4	Compliance
0.768247	33.7	9.000	L1	10.5	22.3	56.0	Compliance
1.624765	29.8	9.000	L1	10.4	26.2	56.0	Compliance

Frequency (MHz)	Average (dB µ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)	Comment
0.188994	29.2	9.000	L1	10.6	24.9	54.1	Compliance
0.384091	40.2	9.000	L1	10.6	8.0	48.2	Compliance
0.468757	26.6	9.000	L1	10.4	19.9	46.5	Compliance
0.572086	18.3	9.000	L1	10.4	27.7	46.0	Compliance
0.768247	28.0	9.000	L1	10.5	18.0	46.0	Compliance
1.153421	20.5	9.000	L1	10.4	25.5	46.0	Compliance

AC120 V, 60 Hz, Neutral:



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.152410	34.2	9.000	N	10.3	31.6	65.9	Compliance
0.186006	42.9	9.000	N	11.0	21.3	64.2	Compliance
0.234359	37.9	9.000	N	11.3	24.4	62.3	Compliance
0.384091	41.1	9.000	N	10.8	17.1	58.2	Compliance
0.768247	32.8	9.000	N	10.5	23.2	56.0	Compliance
1.573796	28.2	9.000	N	10.5	27.8	56.0	Compliance

Frequency (MHz)	Average (dB µ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)	Comment
0.187494	28.5	9.000	N	11.1	25.6	54.1	Compliance
0.384091	40.2	9.000	N	10.8	8.0	48.2	Compliance
0.468757	27.7	9.000	N	10.5	18.9	46.5	Compliance
0.768247	31.6	9.000	N	10.5	14.4	46.0	Compliance
1.153421	24.2	9.000	N	10.5	21.8	46.0	Compliance
1.599078	21.7	9.000	N	10.5	24.3	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:

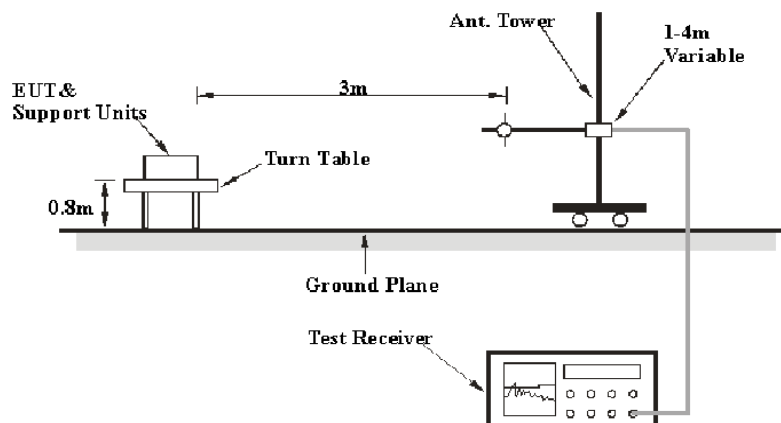
30M~200MHz: 5.0 dB
 200M~1GHz: 6.2 dB
 1G~6GHz: 4.45 dB
 6G~18GHz: 5.23 dB

Table 2 – Values of U_{cispr}

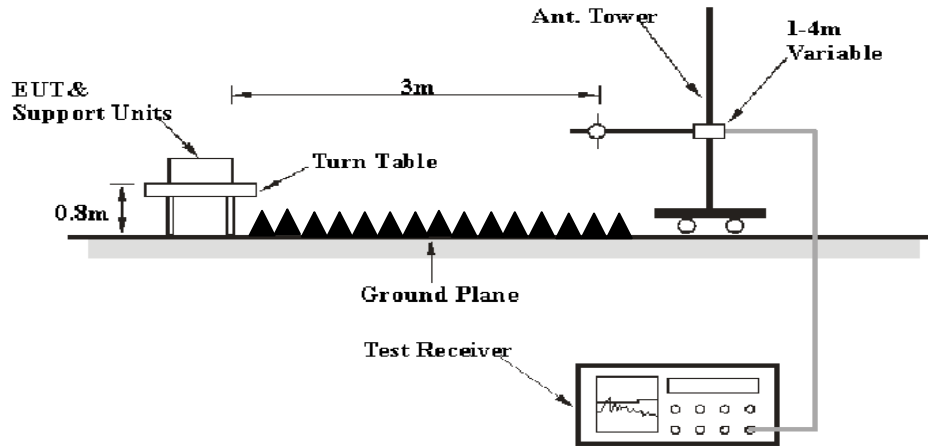
Measurement	U_{cispr}
Radiated disturbance (electric field strength at an OATS or in a SAC) (30 MHz to 1000 MHz)	6.3 dB
Radiated disturbance (electric field strength in a FAR) (1 GHz to 6 GHz)	5.2 dB
Radiated disturbance (electric field strength in a FAR) (6 GHz to 18 GHz)	5.5 dB

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 of EUT 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	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
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:

Bellow 1GHz:

2.80 dB at **40.6700 MHz** in the **Horizontal** polarization(supply from adapter1)

1.80 dB at **51.3400 MHz** in the **Horizontal** polarization(supply from adapter2)

Above 1GHz:

9.91 dB at **9608 MHz** in the **Vertical** polarization

Test Data

Environmental Conditions

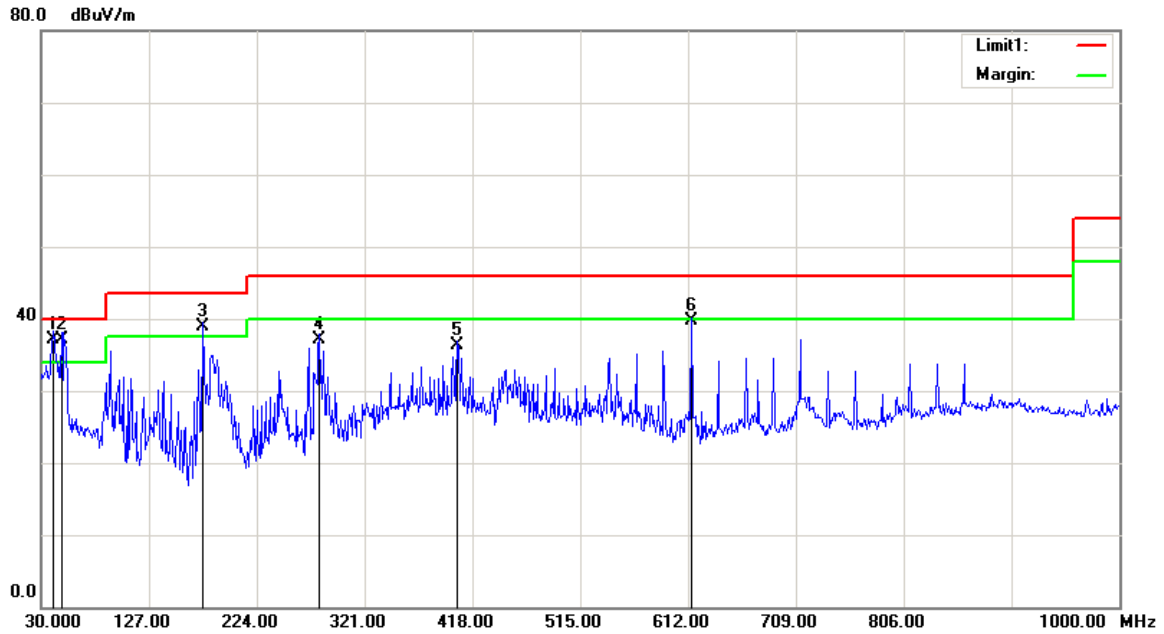
Temperature:	26.7 °C
Relative Humidity:	52 %
ATM Pressure:	100.5 kPa

* The testing was performed by Dean Liu on 2014-09-28.

1). Bellow 1GHz

Test Mode: Transmitting

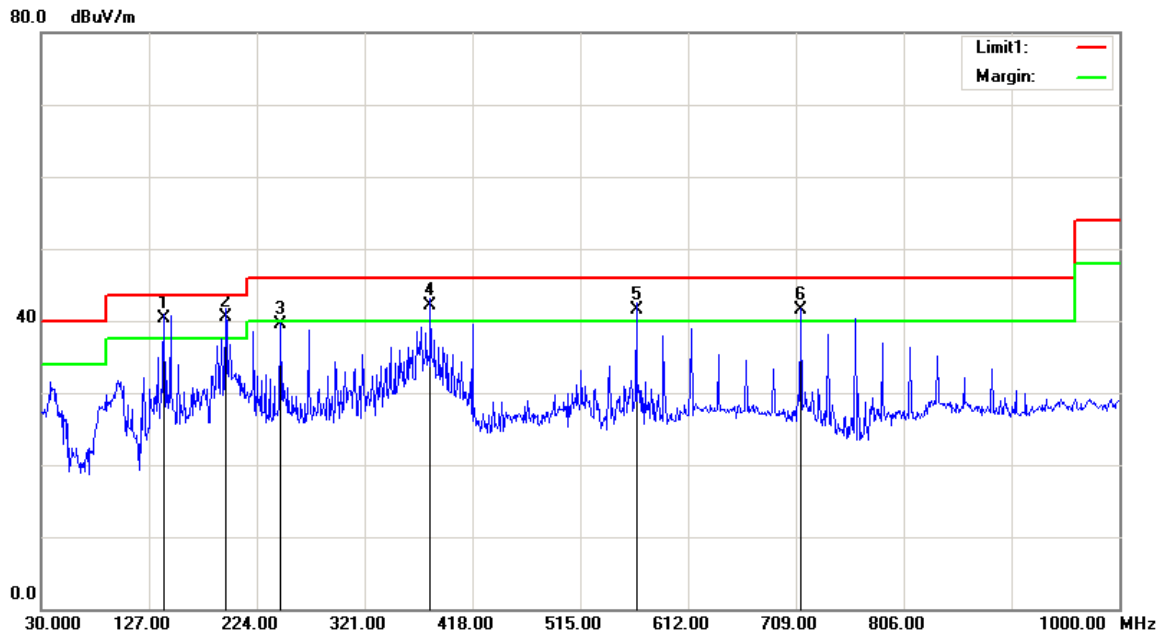
Supply from adapter1:



Frequency (MHz)	Receiver Reading (dBμV)	Detector (PK/QP/Ave)	Correction Factor (dB/m)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
40.6700	43.74	QP	-6.54	37.20	40.00	2.80*
48.4300	48.21	QP	-11.11	37.10	40.00	2.90*
175.5000	47.07	QP	-8.17	38.90	43.50	4.60*
280.2600	42.82	QP	-5.62	37.20	46.00	8.80
404.4200	39.18	QP	-2.88	36.30	46.00	9.70
614.9100	39.61	QP	0.19	39.80	46.00	6.20

*Within measurement uncertainty!

Vertical

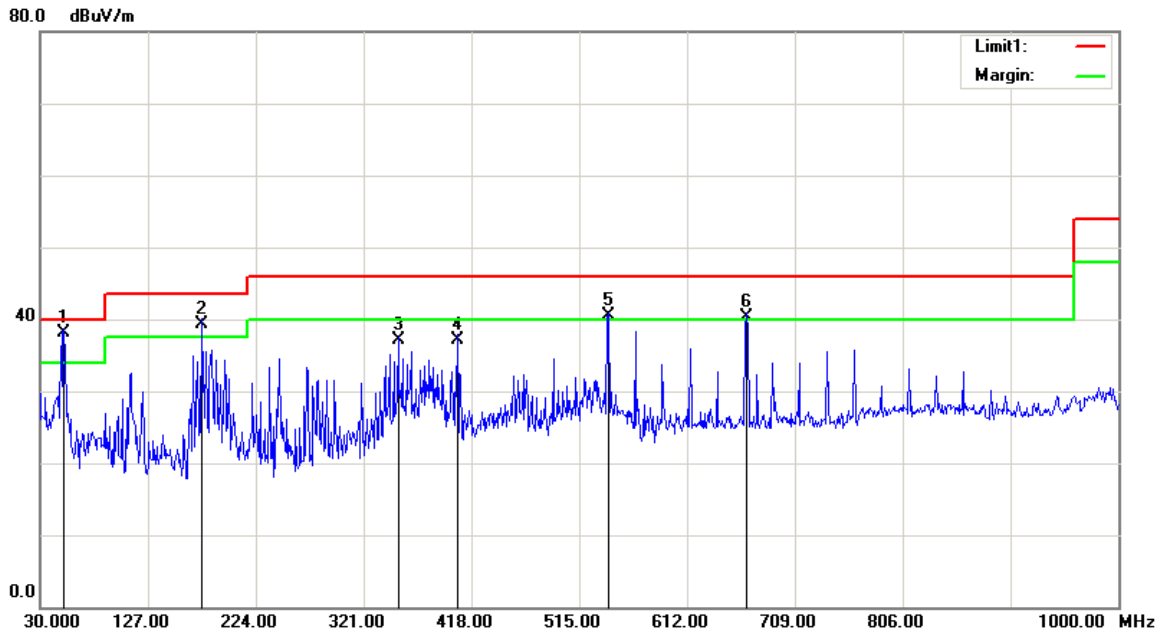


Frequency (MHz)	Receiver Reading (dBμV)	Detector (PK/QP/Ave)	Correction Factor (dB/m)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
140.5800	46.89	QP	-6.59	40.30	43.50	3.20*
195.8700	48.08	QP	-7.48	40.60	43.50	2.90*
245.3400	46.86	QP	-7.26	39.60	46.00	6.40
380.1700	45.57	QP	-3.47	42.10	46.00	3.90*
565.4400	41.90	QP	-0.30	41.60	46.00	4.40*
713.8500	40.08	QP	1.52	41.60	46.00	4.40*

*Within measurement uncertainty!

Supply from adapter2:

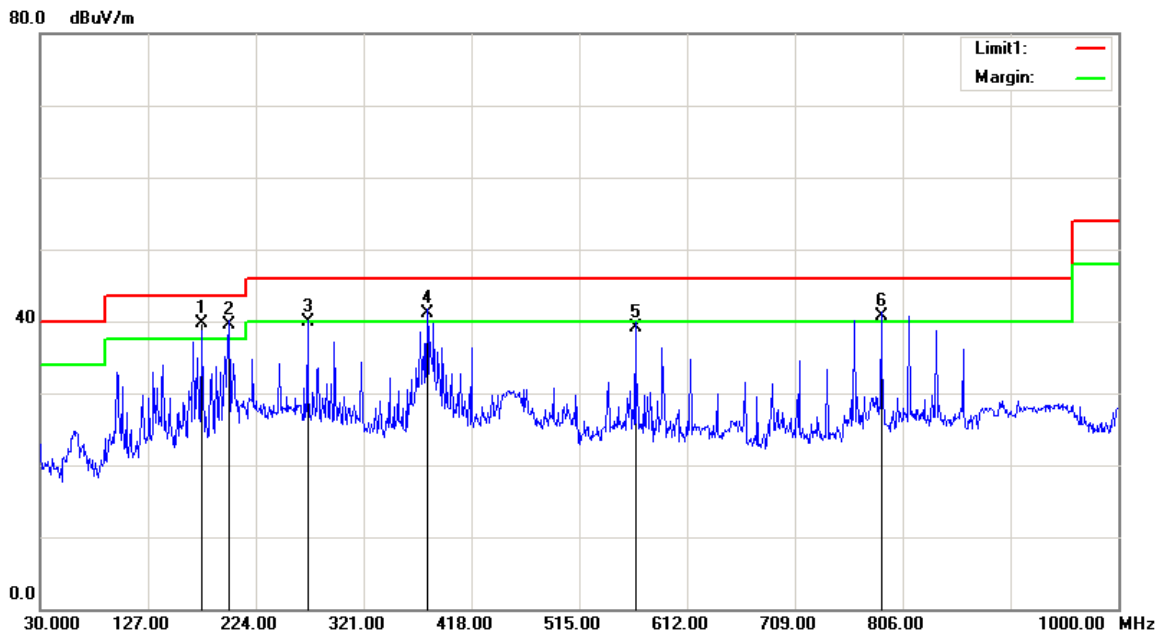
Horizontal



Frequency (MHz)	Receiver Reading (dBμV)	Detector (PK/QP/Ave)	Correction Factor (dB/m)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
51.3400	50.24	QP	-12.04	38.20	40.00	1.80*
175.5000	47.57	QP	-8.17	39.40	43.50	4.10*
352.0400	41.06	QP	-3.96	37.10	46.00	8.90
405.3900	40.04	QP	-2.84	37.20	46.00	8.80
541.1900	41.31	QP	-0.71	40.60	46.00	5.40*
665.3500	39.09	QP	1.21	40.30	46.00	5.70*

*Within measurement uncertainty!

Vertical



Frequency (MHz)	Receiver Reading (dBµV)	Detector (PK/QP/Ave)	Correction Factor (dB/m)	Cord. Amp. (dBµV/m)	Limit (dBµV/m)	Margin (dB)
175.5000	47.87	QP	-8.17	39.70	43.50	3.80*
199.7500	46.49	QP	-6.89	39.60	43.50	3.90*
270.5600	45.76	QP	-5.76	40.00	46.00	6.00*
378.2300	44.70	QP	-3.50	41.20	46.00	4.80*
565.4400	39.50	QP	-0.30	39.20	46.00	6.80
786.6000	38.04	QP	2.66	40.70	46.00	5.30*

*Within measurement uncertainty!

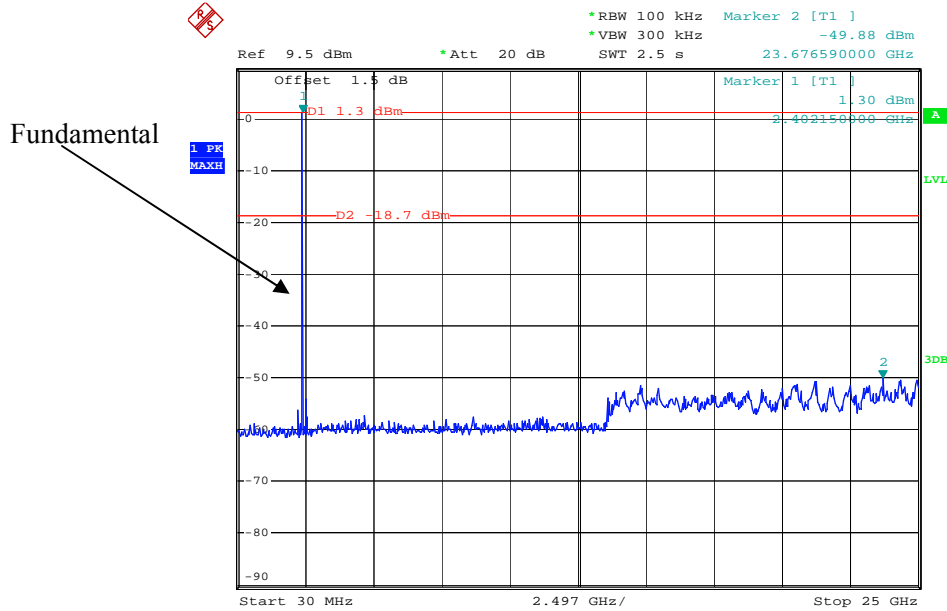
2). Above 1GHz

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	91.54	PK	H	25.65	4.42	27.32	94.29	N/A	N/A
2402	86.52	AV	H	25.65	4.42	27.32	89.27	N/A	N/A
2402	92.7	PK	V	25.65	4.42	27.32	95.45	N/A	N/A
2402	87.64	AV	V	25.65	4.42	27.32	90.39	N/A	N/A
2390	36.55	PK	V	25.61	4.39	27.32	39.23	74.00	34.77
2390	25.17	AV	V	25.61	4.39	27.32	27.85	54.00	26.15
4804	40.44	PK	V	30.59	5.98	27.41	49.60	74.00	24.40
4804	24.25	AV	V	30.59	5.98	27.41	33.41	54.00	20.59
7206	34.62	PK	V	34.09	7.45	25.91	50.25	74.00	23.75
7206	20.89	AV	V	34.09	7.45	25.91	36.52	54.00	17.48
9608	38.15	PK	V	35.96	8.80	27.55	55.36	74.00	18.64
9608	26.88	AV	V	35.96	8.80	27.55	44.09	54.00	9.91
2815	35.73	PK	V	26.72	5.50	27.56	40.39	74.00	33.61
2815	20.02	AV	V	26.72	5.50	27.56	24.68	54.00	29.32
Middle Channel: 2440 MHz									
2440	92.73	PK	H	25.74	4.40	27.34	95.53	N/A	N/A
2440	87.07	AV	H	25.74	4.40	27.34	89.87	N/A	N/A
2440	92.95	PK	V	25.74	4.40	27.34	95.75	N/A	N/A
2440	87.14	AV	V	25.74	4.40	27.34	89.94	N/A	N/A
4880	40.36	PK	V	30.79	6.08	27.42	49.81	74.00	24.19
4880	24.12	AV	V	30.79	6.08	27.42	33.57	54.00	20.43
7320	32.91	PK	V	34.37	7.51	25.88	48.91	74.00	25.09
7320	20.03	AV	V	34.37	7.51	25.88	36.03	54.00	17.97
9760	29.68	PK	V	36.32	8.83	27.21	47.62	74.00	26.38
9760	19.21	AV	V	36.32	8.83	27.21	37.15	54.00	16.85
2815	34.98	PK	V	26.72	5.50	27.56	39.64	74.00	34.36
2815	20.12	AV	V	26.72	5.50	27.56	24.78	54.00	29.22
5745	33.21	PK	V	32.15	6.10	26.60	44.86	74.00	29.14
5745	20.14	AV	V	32.15	6.10	26.60	31.79	54.00	22.21
High Channel: 2480 MHz									
2480	92.87	PK	H	25.85	4.48	27.36	95.84	N/A	N/A
2480	88.34	AV	H	25.85	4.48	27.36	91.31	N/A	N/A
2480	93.6	PK	V	25.85	4.48	27.36	96.57	N/A	N/A
2480	88.9	AV	V	25.85	4.48	27.36	91.87	N/A	N/A
4960	40.63	PK	V	31.00	5.90	27.43	50.10	74.00	23.90
4960	27.67	AV	V	31.00	5.90	27.43	37.14	54.00	16.86
7440	33.98	PK	V	34.66	7.58	25.97	50.25	74.00	23.75
7440	22.14	AV	V	34.66	7.58	25.97	38.41	54.00	15.59
9920	28.71	PK	V	36.71	8.87	26.66	47.63	74.00	26.37
9920	18.86	AV	V	36.71	8.87	26.66	37.78	54.00	16.22
2483.5	43.42	PK	V	25.86	4.49	27.36	46.41	74.00	27.59
2483.5	31.02	AV	V	25.86	4.49	27.36	34.01	54.00	19.99
2815	35.32	PK	V	26.72	5.50	27.56	39.98	74.00	34.02
2815	21.24	AV	V	26.72	5.50	27.56	25.90	54.00	28.10

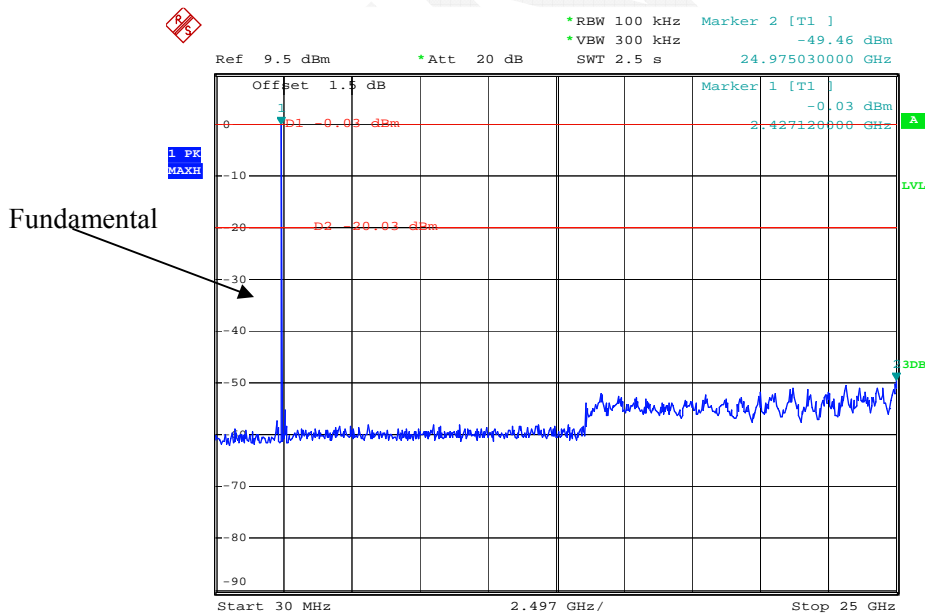
Conducted Spurious Emissions at Antenna Port

Low Channel



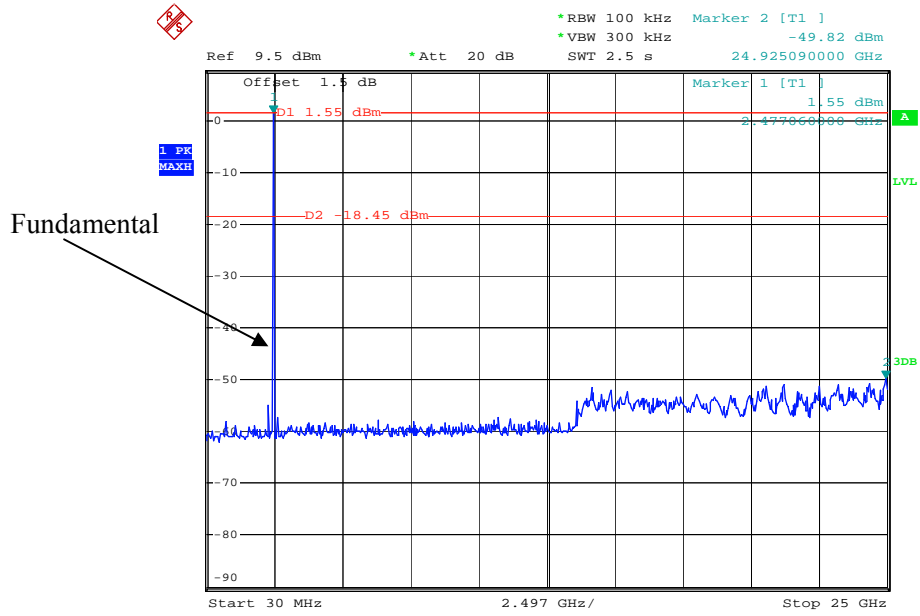
Date: 28.SEP.2014 21:10:00

Middle Channel



Date: 28.SEP.2014 21:18:22

High Channel



Date: 28.SEP.2014 21:20:30

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:

- a) Set RBW = 100 kHz.
- b) Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
- c) Detector = Peak.
- d) Trace mode = max hold.
- e) Sweep = auto couple.
- f) Allow the trace to stabilize.
- g) 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	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:	27.9 °C-28.4°C
Relative Humidity:	60 %-44%
ATM Pressure:	100.5 kPa-100.6 kPa

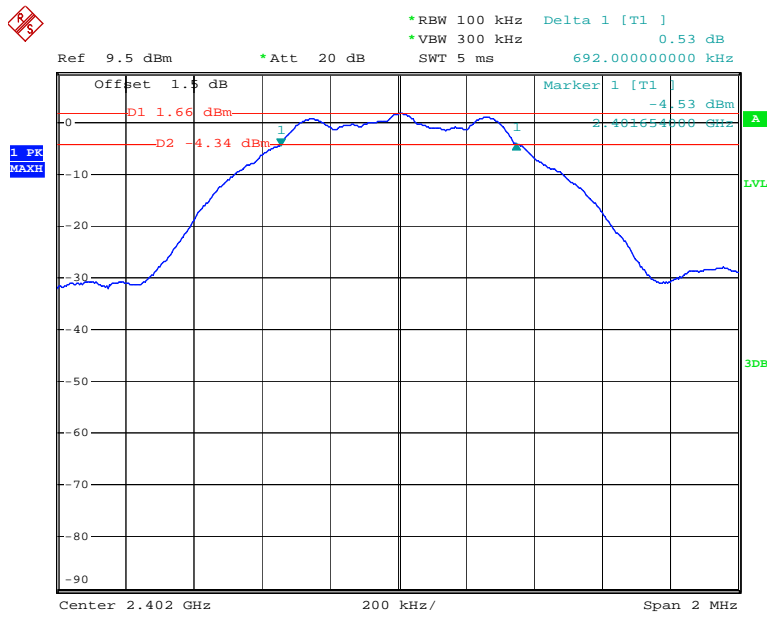
* The testing was performed by Dean Liu on 2014-09-28&2014-10-13.

Test Result: Pass.

Please refer to the following tables and plots.

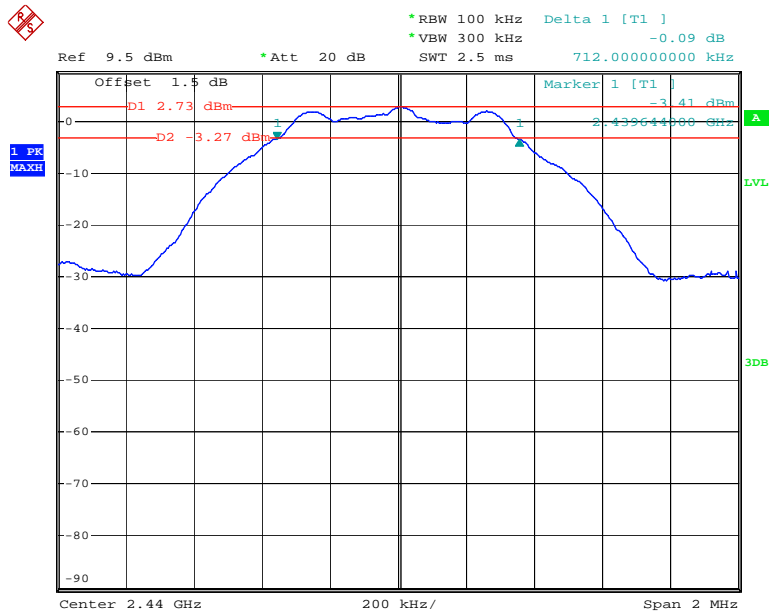
Channel	Frequency	6 dB Bandwidth	Limit
	(MHz)	(MHz)	(kHz)
Low	2402	0.692	≥500
Middle	2440	0.712	≥500
High	2480	0.706	≥500

Low Channel



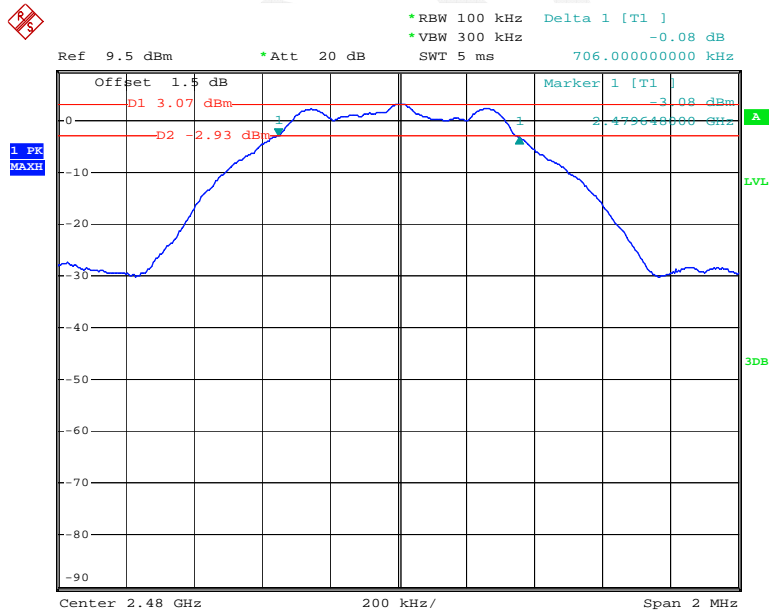
Date: 28.SEP.2014 21:04:17

Middle Channel



Date: 13.OCT.2014 11:40:56

High Channel



Date: 28.SEP.2014 21:21:39

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	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:	27.9 °C-28.4°C
Relative Humidity:	60 %-44%
ATM Pressure:	100.5 kPa-100.6 kPa

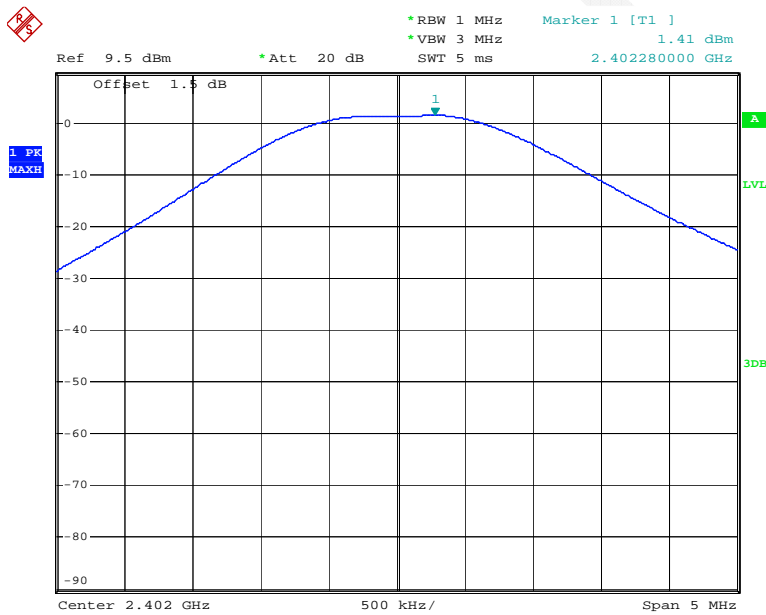
* The testing was performed by Dean Liu on 2014-09-28&2014-10-13.

Test Mode: Transmitting

Channel	Frequency	Max Peak Conducted Output Power	Limit	Result
	(MHz)	(dBm)	(dBm)	
Low	2402	1.41	30	PASS
Middle	2440	2.87	30	PASS
High	2480	2.97	30	PASS

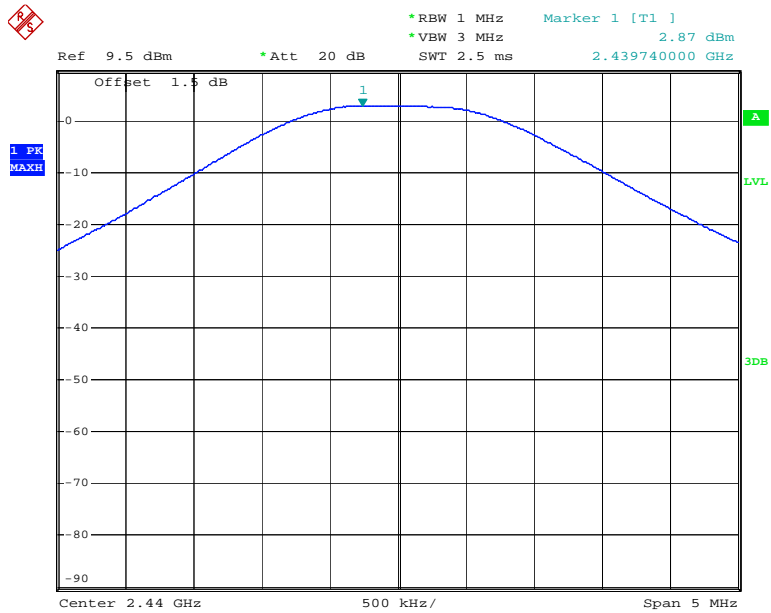
Please refer to the following plots

RF Output Power, Low Channel



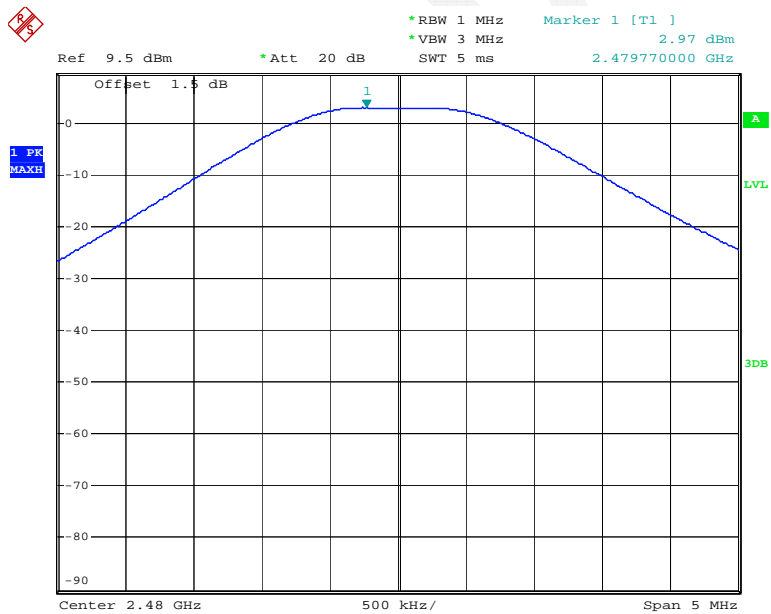
Date: 28.SEP.2014 21:05:02

RF Output Power, Middle Channel



Date: 13.OCT.2014 11:41:35

RF Output Power, High Channel



Date: 28.SEP.2014 21:22:21

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	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

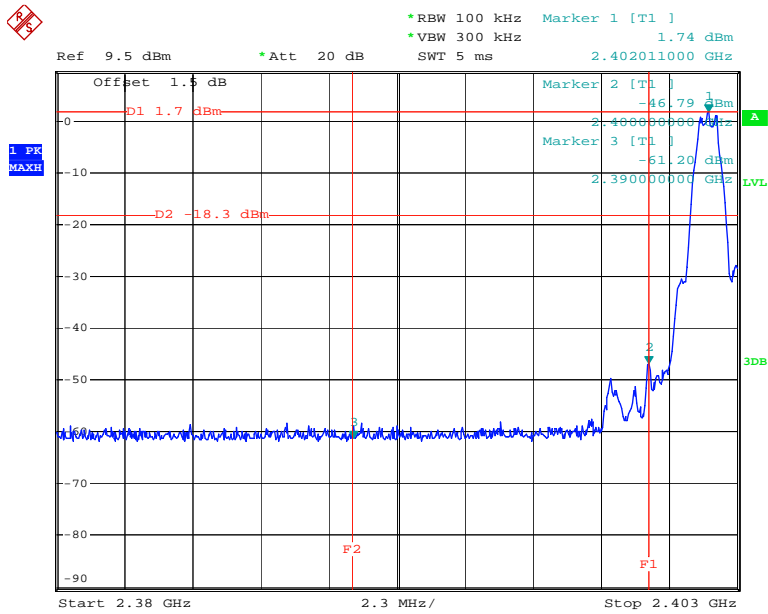
Temperature:	27.9 °C
Relative Humidity:	60 %
ATM Pressure:	100.5 kPa

* The testing was performed by Dean Liu on 2014-09-28.

Test Result: Compliance

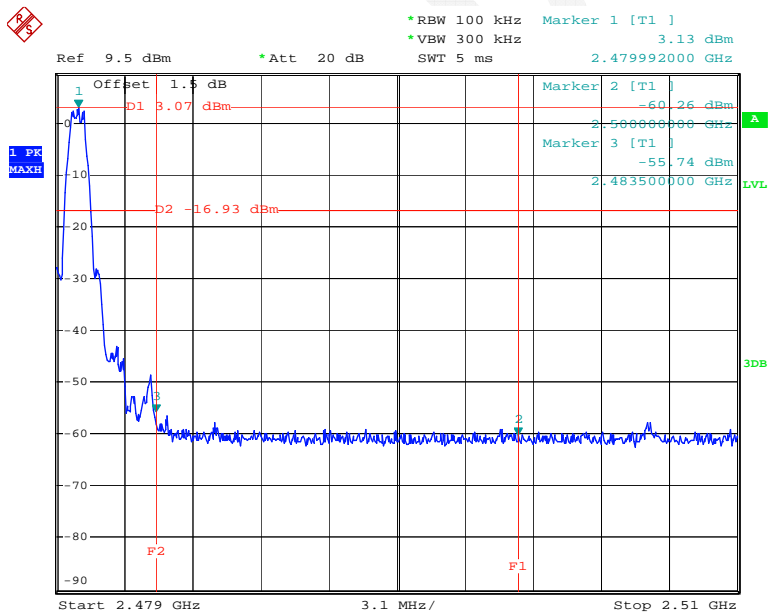
Please refer to following plots.

Band Edge, Left Side



Date: 28.SEP.2014 21:08:19

Band Edge, Right Side



Date: 28.SEP.2014 21:24:04

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	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:	27.9 °C
Relative Humidity:	60 %
ATM Pressure:	100.5 kPa

* The testing was performed by Dean Liu on 2014-09-28.

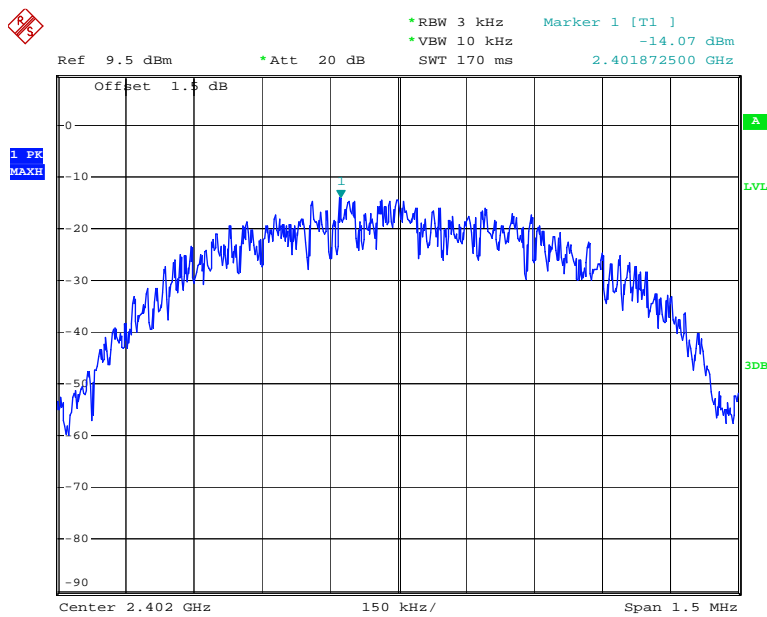
Test Mode: Transmitting

Test Result: Pass

Channel	Frequency	PSD	Limit	Result
	MHz	(dBm/3kHz)	(dBm/3kHz)	
Low	2402	-14.07	≤8	PASS
Middle	2440	-15.77	≤8	PASS
High	2480	-16.22	≤8	PASS

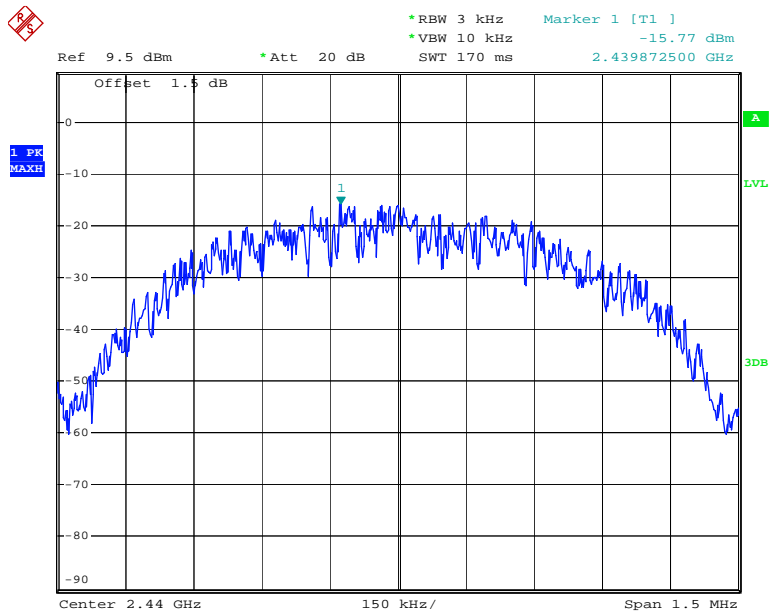
Please refer to the following plots

Power Spectral Density, Low Channel



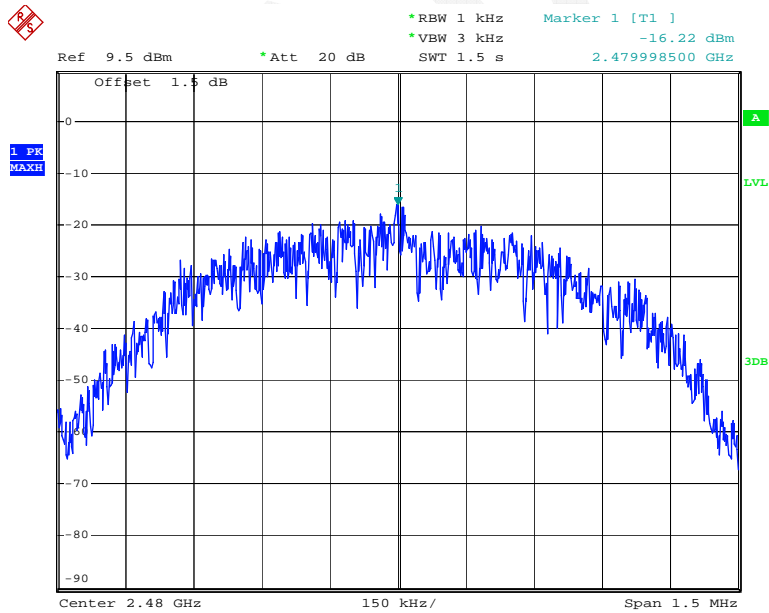
Date: 28.SEP.2014 21:06:24

Power Spectral Density, Middle Channel



Date: 28.SEP.2014 21:17:28

Power Spectral Density, High Channel



Date: 28.SEP.2014 21:22:45

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