



# FCC PART 15.249 TEST REPORT

For

# ShenZhen Rapoo Technology Co., Ltd.

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

**FCC ID: PP2H8030** 

Report Type: Original Report		Product Type: Wireless Stereo Headset
Test Engineer:	•	cam, lus
Report Number:	R1DG12062800	07-00A
Report Date:	2012-07-09	
	Ivan Cao	han Car
Reviewed By:	EMC Engineer	
Prepared By:	Bay Area Compliance Laboratories Corp. (Shenzhen) 6/F, the 3rd Phase of WanLi Industrial Building, ShiHua Road, FuTian Free Trade Zone Shenzhen, Guangdong, China Tel: +86-755-33320018 Fax: +86-755-33320008 www.baclcorp.com.cn	

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\* This report may contain data that are not covered by the NVLAP accreditation and shall be marked with an asterisk "★(Rev.2)

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#### **GENERAL INFORMATION**

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

The ShenZhen Rapoo Technology Co., Ltd.'s product, model number: H8030 (FCC ID: PP2H8030) (the "EUT") in this report was a Wireless Stereo Headset, which was measured approximately: 18.0cm(H) x 16.0 cm(W) x 5.5 cm(D), rated input voltage: DC 5.0 V from system or DC 3.7 V from battery.

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All measurement and test data in this report was gathered from production sample serial number: 120628007 (Assigned by BACL, Dongguan). The EUT was received on 2012-06-28.

#### **Objective**

This type approval report is prepared on behalf of *ShenZhen Rapoo Technology Co., Ltd.* in accordance with Part 2-Subpart J, and Part 15-Subparts A, B and C of the Federal Communication Commissions rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.249 rules.

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

No related submittal(s)

#### **Test Methodology**

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

All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Dongguan). 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 Communication 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 C63.4-2009.

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.

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Additionally, Bay Area Compliance Laboratories Corp. (Shenzhen) is an ISO/IEC 17025 accredited laboratory, and is accredited by National Voluntary Laboratory Accredited Program (Lab Code 200707-0).



The current scope of accreditations can be found at <a href="http://ts.nist.gov/Standards/scopes/2007070.htm">http://ts.nist.gov/Standards/scopes/2007070.htm</a>

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# **SYSTEM TEST CONFIGURATION**

#### **Justification**

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

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25 channels are provided to testing:

Channel NO.	Frequency (MHz)	Channel NO.	Frequency (MHz)	Channel NO.	Frequency (MHz)	Channel NO.	Frequency (MHz)
1	2404	8	2425	15	2446	22	2467
2	2407	9	2428	16	2449	23	2470
3	2410	10	2431	17	2452	24	2473
4	2413	11	2434	18	2455	25	2476
5	2416	12	2437	19	2458	\	\
6	2419	13	2440	20	2461	\	\
7	2422	14	2443	21	2464	\	\

EUT was tested with Channel 1, 13 and 25.

#### **EUT Exercise Software**

The test was performed under "Project 1.exe" which was provided by the manufacturer.

# **Equipment Modifications**

No modifications were made to the unit tested.

# **Local Support Equipment List and Details**

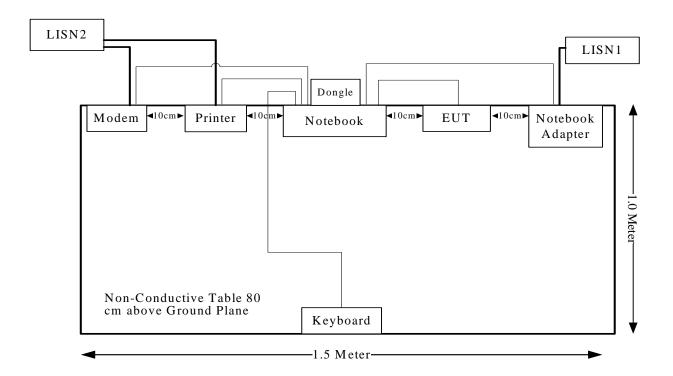
Manufacturer	Description	Model	Serial Number
DELL	Notebook computer	PP11L	QDS-BRCM1017
HP	Printer	C3941A	JPTVO13237
DELL	Keyboard	SK-8115	CN-ODJ313-716716-05A-ODSO
SAST	Modem	AEM-2100	090200213
Rapoo	USB adapter	03041	N/A

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# **External Cable**

Cable Description	Length (m)	From Port	То
Shielded Detachable Printer Cable	1.2	Parallel Port of Notebook	Printer
Shielded Detachable Serial Cable	1.2	Serial Port of Notebook	Modem
Shielded Detachable Keyboard Cable	1.5	Keyboard Port of Notebook	Keyboard
Shielded Detachable USB Cable	1.0	USB Port of Notebook	Modem

# **Block Diagram of Test Setup**



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# **SUMMARY OF TEST RESULTS**

FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliance
§15.207(a)	AC Line Conduction Emissions	Compliance
15.205, §15.209, §15.249	Radiated Emissions	Compliance
§15.249(d)	Outside of Band Emissions	Compliance

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# FCC §15.203 - ANTENNA REQUIREMENT

#### **Applicable Standard**

For intentional device, 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.

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#### **Antenna Connector Construction**

The EUT has two PCB antennas, which was permanently attached and the maximum gain was 0 dBi, fulfill the requirement of this section. Please refer to the internal photos.

Result: Compliant.

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

#### **Applicable Standard**

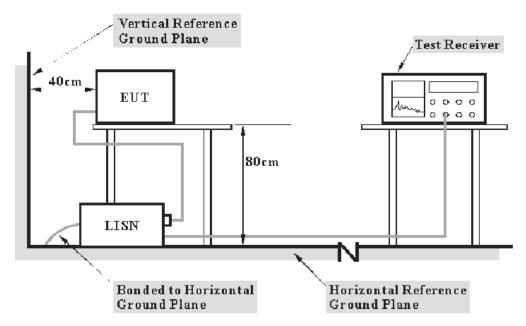
FCC §15.207

#### **Measurement Uncertainty**

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

Based on CISPR 16-4-2, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any conducted emissions measurement at Bay Area Compliance Laboratories Corp. (Dongguan) is 2.4 dB, and the uncertainty will not be taken into consideration for all the test data recorded in the report.

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

The notebook was connected to a 120 VAC/60 Hz power source.

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## **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:

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Frequency Range	IF BW
150 kHz – 30 MHz	9 kHz

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

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCS 30	830245/006	2011-10-8	2012-10-7
Rohde & Schwarz	LISN	ESH3-Z5	843331/015	2011-10-8	2012-10-7
Rohde & Schwarz	LISN	ESH3-Z5	100113	2011-10-8	2012-10-7

<sup>\*</sup> **Statement of Traceability:** Bay Area Compliance Laboratory Corp. (Dongguan) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

#### **Test Procedure**

During the conducted emission test, the notebook 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 Results Summary**

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

4.22 dB at 0.280 MHz in Line conducted mode.

#### **Test Data**

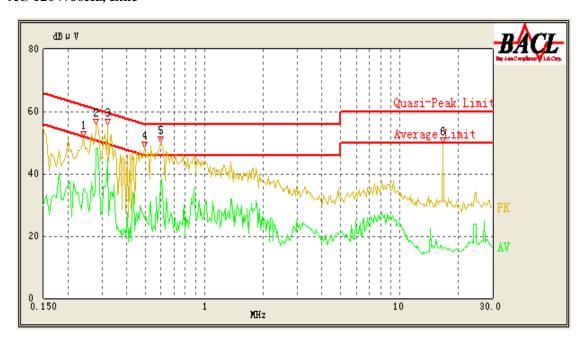
#### **Environmental Conditions**

Temperature:	27.7 °C
Relative Humidity:	54 %
ATM Pressure:	99.6 kPa

<sup>\*</sup> The testing was performed by Cary Luo on 2012-07-02.

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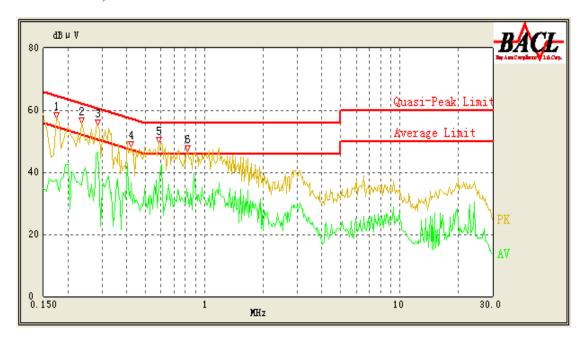
# Test Mode: Transmitting AC 120V/60Hz, Line



Frequency (MHz)	Cord. Reading (dBµV)	Correction Factor (dB)	Limit (dBµV)	Margin (dB)	Detector (PK/Ave./QP)
0.280	48.07	0.42	52.29	4.22	Ave.
0.320	45.23	0.42	51.14	5.91	Ave.
0.600	37.31	0.43	46.00	8.69	Ave.
0.320	50.26	0.42	61.14	10.88	QP
0.280	51.09	0.42	62.29	11.20	QP
0.600	44.74	0.43	56.00	11.26	QP
0.495	41.12	0.42	56.14	15.02	QP
0.240	35.04	0.42	53.43	18.39	Ave.
0.240	44.29	0.42	63.43	19.14	QP
0.495	25.80	0.42	46.14	20.34	Ave.
16.575	15.69	1.40	50.00	34.31	Ave.
16.725	21.99	1.42	60.00	38.01	QP

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# AC 120V/60Hz, Neutral



Frequency (MHz)	Cord. Reading (dBµV)	Correction Factor (dB)	Limit (dBµV)	Margin (dB)	Detector (PK/Ave./QP)
0.285	46.36	0.42	52.14	5.78	Ave.
0.285	50.85	0.42	62.14	11.29	QP
0.420	36.60	0.42	48.29	11.69	Ave.
0.585	44.25	0.43	56.00	11.75	QP
0.820	32.97	0.44	46.00	13.03	Ave.
0.580	31.92	0.43	46.00	14.08	Ave.
0.235	48.20	0.42	63.57	15.37	QP
0.420	42.32	0.42	58.29	15.97	QP
0.820	39.22	0.44	56.00	16.78	QP
0.175	48.13	0.41	65.29	17.16	QP
0.175	37.63	0.41	55.29	17.66	Ave.
0.235	35.85	0.42	53.57	17.72	Ave.

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# FCC §15.205, §15.209 & §15.249 - RADIATED EMISSIONS

## **Applicable Standard**

As per FCC§15.249 (a), except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

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Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902–928 MHz	50	500
2400–2483.5 MHz	50	500
5725–5875 MHz	50	500
24.0–24.25 GHz	250	2500

As per FCC§15.249 (c), Field strength limits are specified at a distance of 3 meters.

(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

#### **Measurement Uncertainty**

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on CISPR 16-4-2, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement from 30MHz to 1GHz at Bay Area Compliance Laboratories Corp. (Dongguan) is 4.0 dB. (k=2, 95% level of confidence), and the uncertainty will not be taken into consideration for all the test data recorded in the report.

#### **Test Equipment Setup**

The spectrum analyzer or receiver is set as:

Below 1000 MHz:

RBW = 100 kHz / VBW = 300 kHz / Sweep = Auto

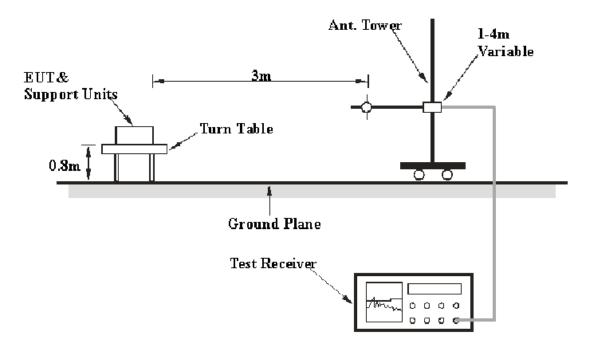
Above 1000 MHz:

Peak: RBW = 1MHz / VBW = 1MHz / Sweep = Auto

Average: RBW = 1MHz / VBW = 10Hz / Sweep = Auto

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#### **EUT Setup**



The radiated emission and out of band 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 15.209/15.205 and FCC 15.249 limits.

#### **Test Procedure**

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

The EUT is set 3 meter away from the testing antenna, which is varied from 1-4 mete, and the EUT is placed on a turntable, which is 0.8 meter above ground plane, the table shall be rotated for 360 degrees to find out the highest emission. The receiving antenna should be changed the polarization both of horizontal and vertical.

#### **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:

Corrected Amplitude = Meter Reading + Antenna Factor + Cable Loss - 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:

Margin = Limit – Corrected Amplitude

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## **Test Equipment List and Details**

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	101121	2011-10-8	2012-10-7
Sunol Sciences	Hybrid Antennas	ЈВ3	A060611-1	2011-9-6	2013-9-5
HP	Pre-amplifier	8447E	2434A02181	2011-10-8	2012-10-7
Rohde & Schwarz	Spectrum Analyzer	FSEM 30	1079 8500	2011-10-9	2012-10-8
Dayang	Horn Antenna	OMCDH101 80	10279001B	2010-7-30	2015-7-29
Mini-Circuits	Wideband Amplifier	ZVA-183-S+	96901149	N/A	N/A

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## **Test Results Summary**

According to the data in the following table, the EUT complied with the FCC Part 15.209 &15.205 & 15.249, with the worst margin reading of:

#### 2.84 dB at 2400 MHz in the Horizontal polarization

#### **Test Data**

#### **Environmental Conditions**

Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	100.2 kPa

The testing was performed by Cary Luo on 2012-07-02.

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<sup>\*</sup> **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

Test Mode: Transmitting

Frequency (MHz)	S.A. Reading (dBµV)	Detector (PK/QP/Ave.)	Ant. Polar (H/V)	Correction Factor (dB)	Cord. Amp. (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Comment
			Low	Channel (240	4 MHz)			
2400	16.25	Ave.	Н	34.91	51.16	54	2.84*	spurious
2400	15.47	Ave.	V	34.91	50.38	54	3.62*	spurious
2390	14.29	Ave.	V	34.91	49.2	54	4.8	spurious
2390	14.22	Ave.	Н	34.91	49.13	54	4.87	spurious
2400	33.26	PK	Н	34.91	68.17	74	5.83	spurious
2400	32.02	PK	V	34.91	66.93	74	7.07	spurious
2390	31.02	PK	V	34.91	65.93	74	8.07	spurious
2390	30.15	PK	Н	34.91	65.06	74	8.94	spurious
9616	17.39	Ave.	V	17.59	34.98	54	19.02	Harmonic
9616	17.26	Ave.	Н	17.59	34.85	54	19.15	Harmonic
2404	58.2	PK	Н	34.91	93.11	114	20.89	Fund.
7212	17.45	Ave.	V	15.26	32.71	54	21.29	Harmonic
9616	34.72	PK	V	17.59	52.31	74	21.69	Harmonic
4808	41.26	PK	V	10.79	52.05	74	21.95	Harmonic
7212	16.45	Ave.	Н	15.26	31.71	54	22.29	Harmonic
4808	40.35	PK	Н	10.79	51.14	74	22.86	Harmonic
425.6	27.6	QP	V	-4.83	22.77	46	23.23	spurious
9616	33.06	PK	Н	17.59	50.65	74	23.35	Harmonic
425.6	26.4	QP	Н	-4.83	21.57	46	24.43	spurious
2404	33.28	Ave.	Н	34.91	68.19	94	25.81	Fund.
2404	52.74	PK	V	34.91	87.65	114	26.35	Fund.
7212	32.06	PK	V	15.26	47.32	74	26.68	Harmonic
4808	16.34	Ave.	V	10.54	26.88	54	27.12	Harmonic
4808	15.43	Ave.	Н	10.54	25.97	54	28.03	Harmonic
7212	30.12	PK	Н	15.26	45.38	74	28.62	Harmonic
2404	27.82	Ave.	V	34.91	62.73	94	31.27	Fund.

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Frequency (MHz)	S.A. Reading (dBµV)	Detector (PK/QP/Ave.)	Ant. Polar (H/V)	Correction Factor (dB)	Cord. Amp. (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Comment
	Middle Channel (2440 MHz)							
9760	16.59	Ave.	Н	17.89	34.48	54	19.52	Harmonic
9760	16.59	Ave.	Н	17.89	34.48	54	19.52	Harmonic
9760	15.69	Ave.	V	17.89	33.58	54	20.42	Harmonic
9760	15.69	Ave.	V	17.89	33.58	54	20.42	Harmonic
7320	16.98	Ave.	V	15.67	32.65	54	21.35	Harmonic
7320	16.98	Ave.	V	15.67	32.65	54	21.35	Harmonic
7320	16.58	Ave.	Н	15.67	32.25	54	21.75	Harmonic
7320	16.58	Ave.	Н	15.67	32.25	54	21.75	Harmonic
7320	16.58	Ave.	Н	15.67	32.25	54	21.75	Harmonic
9760	33.06	PK	Н	17.89	50.95	74	23.05	Harmonic
9760	33.06	PK	Н	17.89	50.95	74	23.05	Harmonic
7320	34.31	PK	V	15.67	49.98	74	24.02	Harmonic
7320	34.31	PK	V	15.67	49.98	74	24.02	Harmonic
9760	32.06	PK	V	17.89	49.95	74	24.05	Harmonic
9760	32.06	PK	V	17.89	49.95	74	24.05	Harmonic
7320	34.26	PK	Н	15.67	49.93	74	24.07	Harmonic
7320	34.26	PK	Н	15.67	49.93	74	24.07	Harmonic
7320	34.26	PK	Н	15.67	49.93	74	24.07	Harmonic
			High	Channel (247	6 MHz)			
4952	43.26	PK	Н	10.96	54.22	74	19.78	Harmonic
567.8	27.8	QP	Н	-2.52	25.28	46	20.72	spurious
2483.5	20.99	Ave.	V	7.53	28.52	54	25.48	spurious
4952	16.86	Ave.	V	10.96	27.82	54	26.18	Harmonic
2476	61.59	PK	Н	35.3	96.89	114	27.87	Fund.
2476	36.67	Ave.	Н	35.3	71.97	94	29.152	Fund.
2476	56.12	PK	V	35.3	91.42	114	30.434	Fund.
2476	31.2	Ave.	V	35.3	66.5	94	31.716	Fund.
7428	34.02	PK	Н	16.02	50.04	74	32.998	Harmonic
7428	17.59	Ave.	Н	16.02	33.61	54	34.28	Harmonic
7428	33.69	PK	V	16.02	49.71	74	35.562	Harmonic
7428	16.97	Ave.	V	16.02	32.99	54	36.844	Harmonic
9904	34.98	PK	Н	18.44	53.42	74	38.126	Harmonic
9904	18.26	Ave.	Н	18.44	36.7	54	39.408	Harmonic
9904	33.79	PK	V	18.44	52.23	74	40.69	Harmonic
9904	17.06	Ave.	V	18.44	35.5	54	41.972	Harmonic
2483.5	48.89	PK	Н	7.53	56.42	74	17.58	spurious
567.8	29.3	QP	V	-2.52	26.78	46	19.22	spurious
2483.5	45.91	PK	V	7.53	53.44	74	20.56	spurious
4952	41.78	PK	V	10.96	52.74	74	21.26	Harmonic
2483.5	23.97	Ave.	Н	7.53	31.5	54	22.5	spurious
4952	18.34	Ave.	Н	10.96	29.3	54	24.7	Harmonic

<sup>\*</sup>Within measurement uncertainty!

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# FCC §15.249(d) - OUT OF BAND EMISSIONS

## **Applicable Standard**

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation

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#### **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
Rohde & Schwarz	Spectrum Analyzer	FSP38	100478	2012-5-14	2013-5-13

<sup>\*</sup> **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

#### **Test Data**

#### **Environmental Conditions**

Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	100.9kPa

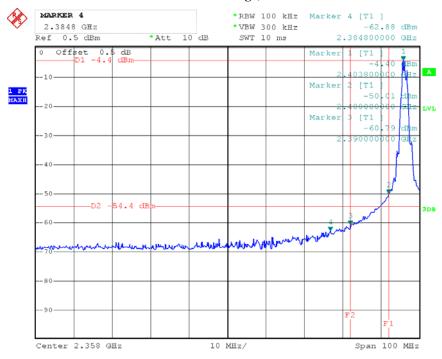
<sup>\*</sup> The testing was performed by Cary Luo on 2012-07-09.

Test Result: Compliance.

Please refer to the following table and plots:

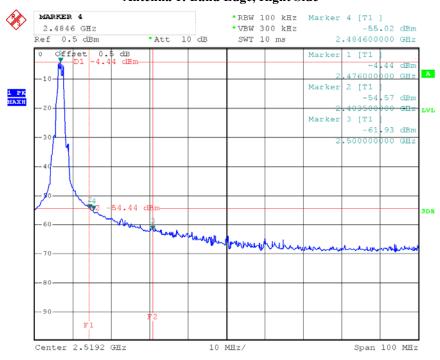
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#### Antenna 1: Band Edge, Left Side



Date: 9.JUL.2012 15:59:18

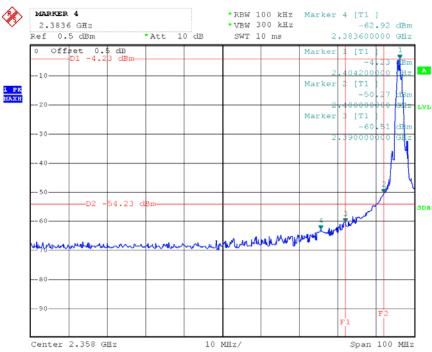
#### Antenna 1: Band Edge, Right Side



Date: 9.JUL.2012 15:43:36

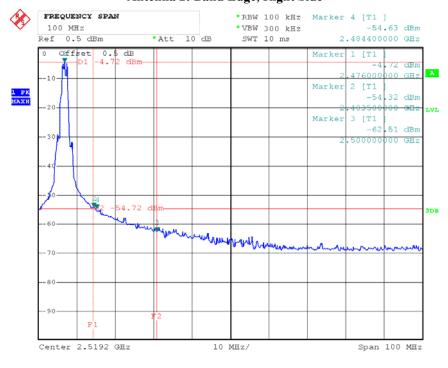
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#### Antenna 2: Band Edge, Left Side



Date: 9.JUL.2012 16:02:18

#### Antenna 2: Band Edge, Right Side



Date: 9.JUL.2012 15:49:31

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

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