



# FCC PART 15.249

## TEST REPORT

For

### Shenzhen Rapoo Technology Co., Ltd.

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

**FCC ID: PP2E9180P**

<b>Report Type:</b> Original Report		<b>Product Type:</b> Wireless Touch Keyboard	
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<b>Report Number:</b>	R2DG130607003-00		
<b>Report Date:</b>	2013-06-11		
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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: *E9180P* (FCC ID: *PP2E9180P*) (the "EUT") in this report was a *Wireless Touch Keyboard* which was measured approximately: 36.6cm(L) x 11 cm(W) x 2 cm(H), rated input voltage: DC 1.5V from two AAA batteries in parallel.

*All measurement and test data in this report was gathered from production sample serial number: 130607003 (Assigned by BACL, Dongguan). The EUT was received on 2013-06-07.*

### 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 C63.4-2003, 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 radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Dongguan).

## Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Dongguan) to collect test data is located on the No.69 Pulongcun, Puxinhu Industrial Zone, Tangxia, Dongguan, Guangdong, China

Test site at Bay Area Compliance Laboratories Corp. (Dongguan) has been fully described in reports submitted to the Federal 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 C63.4-2003.

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.

Additionally, Bay Area Compliance Laboratories Corp. (Dongguan) is an ISO/IEC 17025 accredited laboratory, and is accredited by National Voluntary Laboratory Accredited Program (Lab Code 500069-0).



The current scope of accreditations can be found at <http://ts.nist.gov/standards/scopes/5000690.htm>

## SYSTEM TEST CONFIGURATION

### Justification

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

16 channels are provided for testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	5727	5	5750	9	5771	13	5796
2	5730	6	5753	10	5776	14	5799
3	5734	7	5756	11	5779	15	5802
4	5738	8	5759	12	5782	16	5804

EUT was tested with Channel 1, 9 and 16.

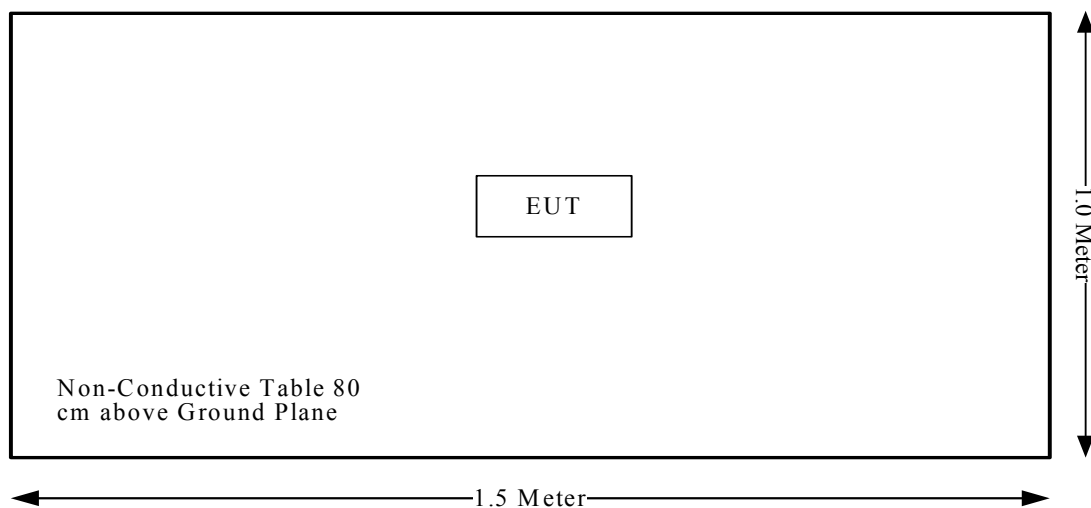
### EUT Exercise Software

No exercise software was used.

### Equipment Modifications

No modifications were made to the unit tested.

### Block Diagram of Test Setup



**SUMMARY OF TEST RESULTS**

FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliance
§15.207(a)	Conduction Emissions	Not applicable *
15.205, §15.209, §15.249	Radiated Emissions	Compliance
§15.215 (c)	20 dB Bandwidth	Compliance
§15.249(d)	Outside of Band Emission (50dB attenuation)	Compliance

Not applicable \*:The EUT only powered by battery.

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## **FCC§15.203 - ANTENNA REQUIREMENT**

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### **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.

### **Antenna Connector Construction**

The EUT has an internal chip antenna permanently soldering on the printed circuit board, which complied with 15.203, the maximum gain was 1.4 dBi. Please refer to the internal photos.

**Result:** Compliant.

## **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:

<b>Fundamental frequency</b>	<b>Field strength of fundamental (millivolts/meter)</b>	<b>Field strength of harmonics (microvolts/meter)</b>
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**

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 radiated emission at a distance of 3m at Bay Area Compliance Laboratories Corp. (Dongguan) is:

30M~200MHz: 5.0 dB

200M~1GHz: 6.2 dB

1G~6GHz: 4.45 dB

6G~18GHz: 5.23 dB



Table 1 – Values of  $U_{cispr}$

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

**Test Equipment Setup**

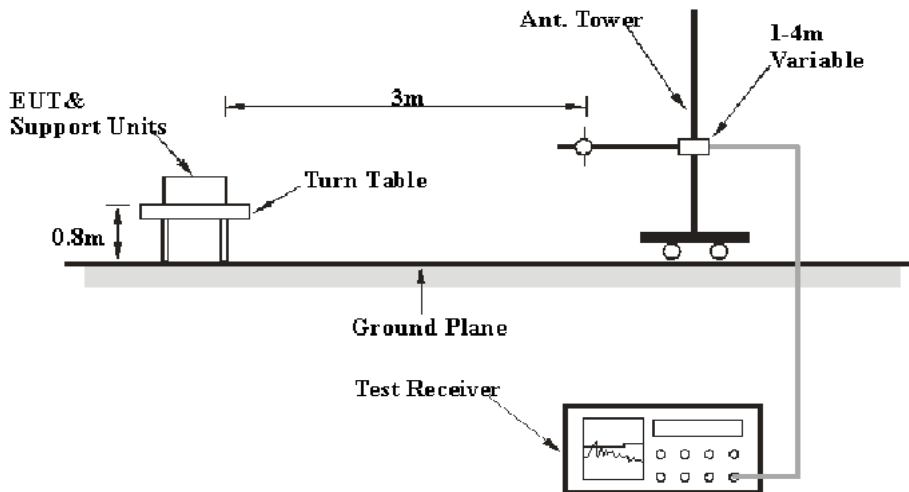
The system was investigated from 30 MHz to 40GHz.

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

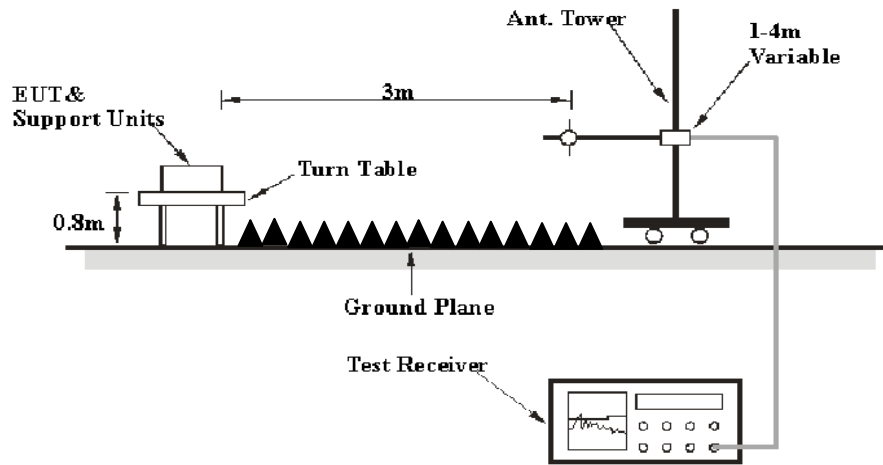
Frequency Range	RBW	Video B/W	Detector
30MHz – 1000 MHz	100 kHz	300 kHz	QP
1000 MHz – 40GHz	1 MHz	3 MHz	PK
1000 MHz – 40GHz	1 MHz	10 Hz	Ave

**EUT Setup**

Below 1 GHz:



Above 1 GHz:



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 C63.4-2003. 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 meter, 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:

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

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	2013-5-6	2014-5-5
Sunol Sciences	Antenna	JB3	A060611-1	2012-9-6	2015-9-5
HP	HP AMPLIFIER	8447E	2434A02181	N/A	N/A
R&S	Spectrum analyzer	FSEM 30	849016/001	2012-9-4	2013-9-3
ETS LINDGREN	horn antenna	3115	000 527 35	2012-9-6	2015-9-5
Mini-Circuit	Amplifier	ZVA-213-S+	54201245	N/A	N/A
Rohde & Schwarz	Spectrum Analyzer	FSP38	100478	2013-5-14	2014-5-13

\* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to National Primary Standards and International System of Units (SI).

### 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:

**5.95 dB at 17412 MHz in the Horizontal polarization**

### Test Data

#### Environmental Conditions

<b>Temperature:</b>	25.1 °C
<b>Relative Humidity:</b>	65 %
<b>ATM Pressure:</b>	99.6kPa

*The testing was performed by Leon Chen on 2013-06-10.*

Test Mode: Transmitting

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBµV/m)	Limit (dBµV/m)	Margin (dB)
	Reading (dBµV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB)					
Low Channel:5727 MHz									
5727	70.27	PK	H	32.15	4.85	26.78	80.49	114.00	33.51
5727	66.06	AV	H	32.15	4.85	26.78	76.28	94.00	17.72
5727	65.07	PK	V	32.15	4.85	26.78	75.29	114.00	38.71
5727	55.07	AV	V	32.15	4.85	26.78	55.29	94.00	38.71
5725	53.09	PK	H	32.15	4.83	26.78	63.29	74.00	10.71
5725	21.13	AV	H	32.15	4.83	26.78	31.33	54.00	22.67
11454	36.05	PK	H	37.85	7.95	25.92	55.93	74.00	18.07
11454	19.08	AV	H	37.85	7.95	25.92	38.96	54.00	15.04
17181	34.51	PK	H	40.59	12.80	25.05	62.85	74.00	11.15
17181	19.27	AV	H	40.59	12.80	25.05	47.61	54.00	6.39
2234	30.26	PK	H	25.21	3.63	27.24	31.86	74.00	42.14
2234	17.92	AV	H	25.21	3.63	27.24	19.52	54.00	34.48
3351	32.64	PK	H	28.32	4.60	27.34	38.22	74.00	35.78
3351	18.98	AV	H	28.32	4.60	27.34	24.56	54.00	29.44
462.62	26.5	QP	H	17.57	2.62	21.93	24.76	46.00	21.24
Middle Channel:5771 MHz									
5771	70.12	PK	H	32.15	5.16	26.72	80.71	114.00	33.29
5771	66.02	AV	H	32.15	5.16	26.72	76.61	94.00	17.39
5771	65.03	PK	V	32.15	5.16	26.72	75.62	114.00	38.38
5771	55.05	AV	V	32.15	5.16	26.72	65.64	94.00	28.36
11542	36.13	PK	H	37.90	7.91	25.92	56.02	74.00	17.98
11542	19.38	AV	H	37.90	7.91	25.92	39.27	54.00	14.73
17313	32.51	PK	H	41.38	12.39	24.77	61.51	74.00	12.49
17313	18.52	AV	H	41.38	12.39	24.77	47.52	54.00	6.48
2233.8	32.11	PK	H	25.21	3.63	27.24	33.71	74.00	40.29
2233.8	21.95	AV	H	25.21	3.63	27.24	23.55	54.00	30.45
3351.1	32.49	PK	H	28.32	4.60	27.34	38.07	74.00	35.93
3351.1	19.65	AV	H	28.32	4.60	27.34	25.23	54.00	28.77
3742	32.24	PK	H	29.33	4.71	27.44	38.84	74.00	35.16
3742	19.87	AV	H	29.33	4.71	27.44	26.47	54.00	27.53
462.58	26.2	QP	H	17.57	2.62	21.93	24.46	46.00	21.54
High Channel:5804 MHz									
5804	69.39	PK	H	32.16	5.17	26.69	80.03	114.00	33.97
5804	65.81	AV	H	32.16	5.17	26.69	76.45	94.00	17.55
5804	64.59	PK	V	32.16	5.17	26.69	75.23	114.00	38.77
5804	54.98	AV	V	32.16	5.17	26.69	65.62	94.00	28.38
5850	33.62	PK	H	32.17	5.56	26.69	44.66	74.00	29.34
5850	17.76	AV	H	32.17	5.56	26.69	28.80	54.00	25.20
11608	35.84	PK	H	37.90	8.05	25.89	55.90	74.00	18.10
11608	18.92	AV	H	37.90	8.05	25.89	38.98	54.00	15.02
17412	32.62	PK	H	41.97	12.08	24.53	62.14	74.00	11.86
17412	18.53	AV	H	41.97	12.08	24.53	48.05	54.00	5.95
2234	30.87	PK	H	25.21	3.63	27.24	32.47	74.00	41.53
2234	17.89	AV	H	25.21	3.63	27.24	19.49	54.00	34.51
3351	30.03	PK	H	28.32	4.60	27.34	35.61	74.00	38.39
3351	19.92	AV	H	28.32	4.60	27.34	25.50	54.00	28.50
462.59	26.7	QP	H	17.57	2.62	21.93	24.96	46.00	21.04

## FCC §15.215(c) – 20 dB BANDWIDTH TESTING

### Applicable Standard

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

### 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 on the test table without connection to measurement instrument. Turn on the EUT. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde&Schwarz	Spectrum analyzer	FSEM	DE31388	2013-5-7	2014-5-6

\* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to National Primary Standards and International System of Units (SI).

### Test Data

#### Environmental Conditions

Temperature:	28.2 °C
Relative Humidity:	69 %
ATM Pressure:	99.6 kPa

\* The testing was performed by Leon Chen on 2013-06-10.

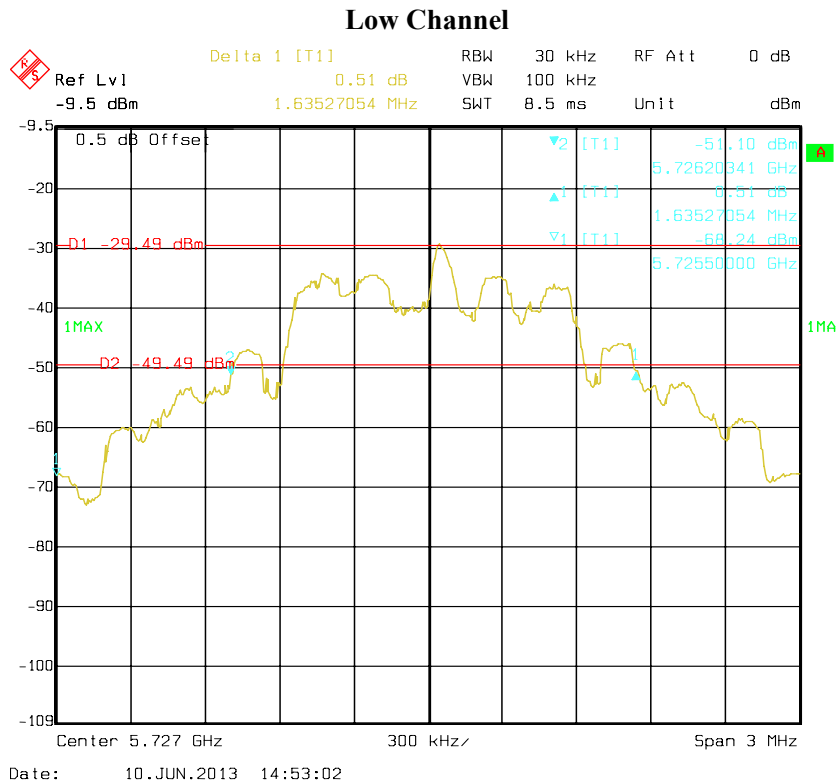
**Test Result:** Compliance.

Please refer to following tables and plots

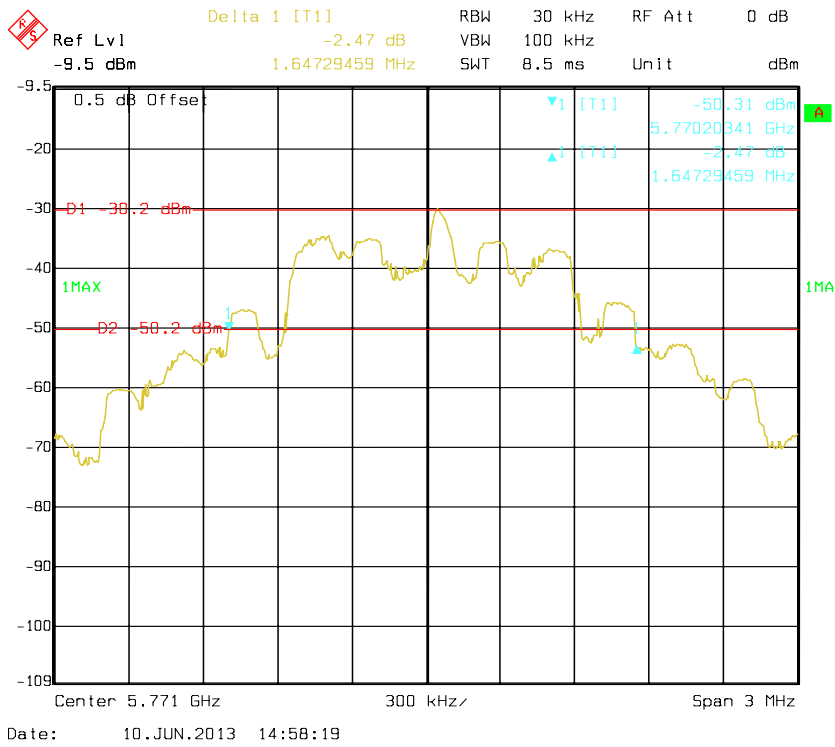
*Test Mode: Transmitting*

Channel	Frequency (MHz)	20 dB Bandwidth (MHz)
Low	5727	1.635
Middle	5771	1.647
High	5804	1.629

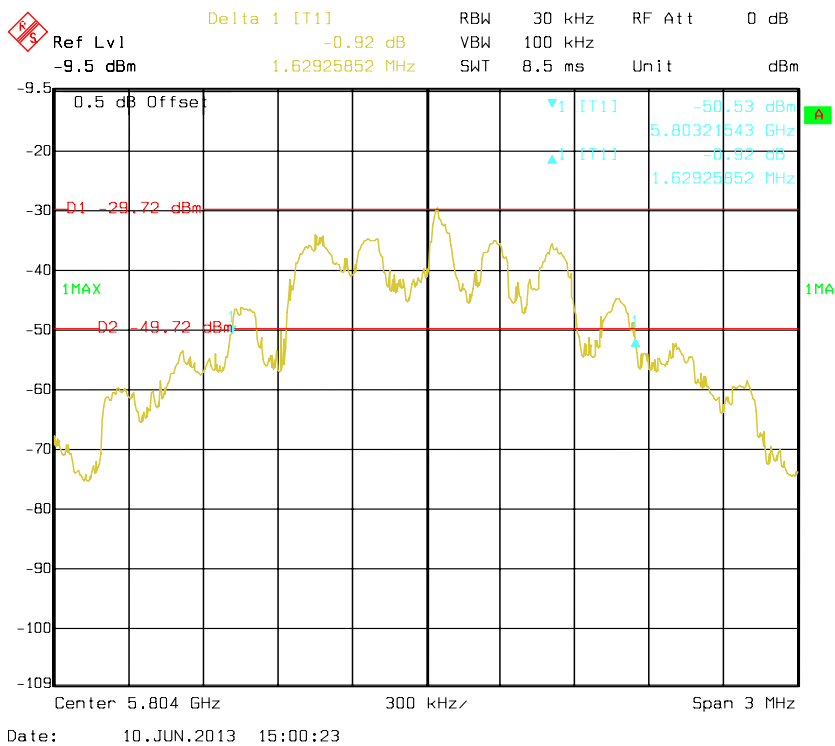
Please refer to the following plots.



### Middle Channel



### High Channel



## FCC§15.249(d) - OUT OF BAND EMISSION (50dB ATTENUATION)

### 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

### 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	FSEM	DE31388	2013-5-7	2014-5-6

\* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to National Primary Standards and International System of Units (SI).

### Test Data

#### Environmental Conditions

Temperature:	27.6 °C
Relative Humidity:	67 %
ATM Pressure:	99.6 kPa

\* The testing was performed by Leon Chen on 2013-06-11.

*Test Result: Compliance.*

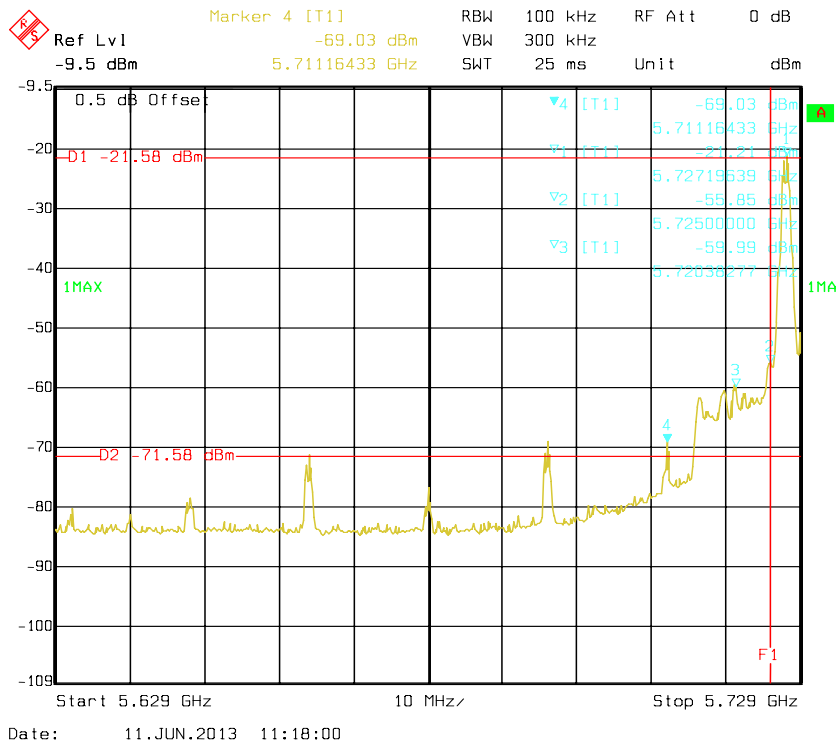
*Please refer to the following table and plots:*

Frequency (MHz)	Delta Peak to Band Emission (dBc)
5725	34.64(note)
5885.86	41.94(note)

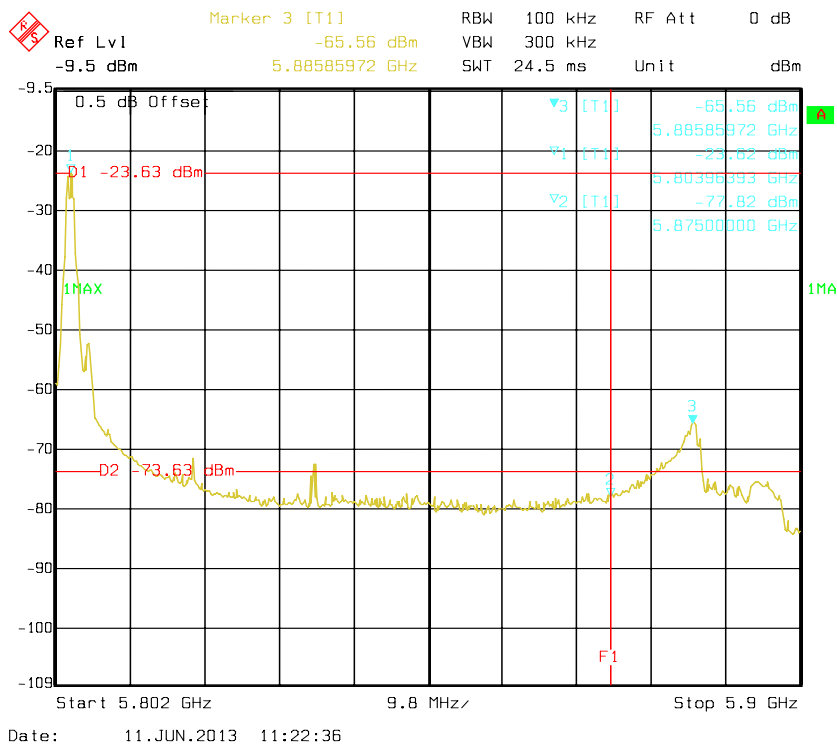
*note: The delta peak to band emission compliance with 15.209 in the radiation test.*



**Band Edge, Left Side**



**Band Edge, Right Side**



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