



# FCC PART 15.239

## MEASUREMENT AND TEST REPORT

For

### Philex Electronic (Ningbo) Co., Ltd

Qi Fa Industrial Park, Qi Ming Road, Yinzhou District, Ningbo Zhejiang, 315000

**FCC ID: YSM-RFMT10Z**  
**Model Number: FT28101 (RFMT10Z)**

<b>Report Type:</b> Original Report	<b>Equipment Name:</b> FM Transmitter
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## GENERAL INFORMATION

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

The **Philex Electronic (Ningbo) Co., Ltd**'s product, model number: **FT28101 (RFMT10Z)** (**FCC ID: YSM-RFMT10Z**) or the "EUT" as referred to in this report is the **FM Transmitter**, which has a plastic enclosure. The highest frequency was 88.7MHz.

### Mechanical Description of EUT

The EUT was measured approximately 100 mm L x 50 mm W x 30 mm H.  
Rated input voltage: DC 12V-24V

*\*All measurement and test data in this report was gathered from final production sample, serial number: 160204005/01 (assigned by the BACL, Chengdu). It may have deviation from any other sample. The EUT supplied by the applicant was received on 2016-02-01, and EUT conformed to test requirement.*

### Objective

This type approval report is prepared on behalf of **Philex Electronic (Ningbo) Co., Ltd** in accordance with Part 2, Subpart J, 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, 15.209 and 15.239 rules.

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

N/A

### Test Methodology

All measurements contained in this report are conducted with ANSI C63.4-2014, 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 is performed at BACL. The radiated testing is performed at an antenna-to-EUT distance of 3 Meters.

## **Test Facility**

The test site used by BACL to collect test data is located in the 5040, HuiLongWan Plaza, No. 1, ShaWan Road, JinNiu District, ChengDu, China

Test site at BACL 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 July 31, 2009. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.10-2013.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 560332. 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**

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### **Description of Test Configuration**

The system was configured for testing in a typical fashion (as normally used by a typical user).

### **Equipment Modifications**

No modification was made to the unit tested.

### **EUT Exercise Software**

N/A.

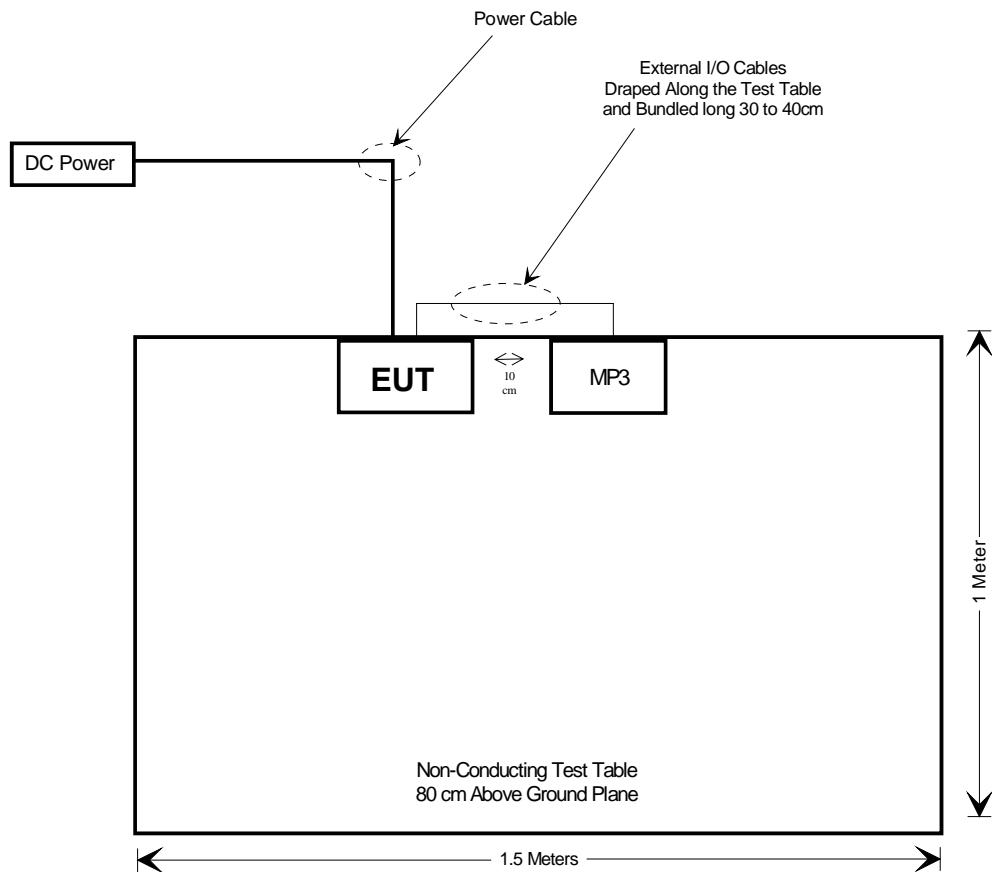
### **Local Support Equipment List and Details**

Manufacturer	Description	Model	Serial Number
ONDA	MP3	VX818	VX818DGHV115247

### **External I/O Cable**

Cable Description	Length (m)	From/Port	To
DC Power Cable	1	DC Power Socket	EUT
Audio Cable	0.7	MP3	EUT

## Block Diagram of Test Setup



## **SUMMARY OF TEST RESULTS**

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<b>FCC Rules</b>	<b>Description of Test</b>	<b>Result</b>
§15.203	Antenna Requirement	Compliant
§15.239(a)	Occupied Bandwidth	Compliant
§15.239(b)	Within 200 kHz Bandwidth Field Strength	Compliant
§15.239(c)	Outside 200 kHz Bandwidth Field Strength	Compliant

## **FCC §15.203 – ANTENNA REQUIREMENT**

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### **Standard Applicable**

According to FCC § 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 use of a standard antenna jack or electrical connector is prohibited.

### **Antenna Connector Construction**

The EUT has one spring coil antenna, which is permanently attached to PCB and complied with 15.203, Antenna maximum gain is 2.0 dBi. Please refer to EUT internal photos.

## **FCC §15.239(a) – OCCUPIED BANDWIDTH**

### **Applicable Standard**

According to 15.239(a), emissions from the intentional radiator shall be confined within a band 200 kHz wide centered on the operating frequency. The 200 kHz band shall lie wholly within the frequency range of 88-108 MHz.

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

<b>Manufacturer</b>	<b>Description</b>	<b>Model Number</b>	<b>Serial Number</b>	<b>Calibration Date</b>	<b>Calibration Due Date</b>
Rohde & Schwarz	EMI Test Receiver	ESCI	100028	2015-12-02	2016-12-01
Sunol Sciences	Broadband Antenna	JB3	A101808	2016-04-08	2018-04-07
EMCT	Semi-Anechoic Chamber	966	N/A	2015-04-24	2018-04-23
N/A	RF Cable (below 1GHz)	NO.1	N/A	2015-11-10	2016-11-09
N/A	RF Cable (below 1GHz)	NO.2	N/A	2015-11-10	2016-11-09

\* **Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

### **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 as shown in figure and measurement then turn on the EUT. Then set it to any one convenient frequency within its operating range.
3. Set both RBW and VBW of receiver to 30 kHz and 100 kHz respectively with a convenient frequency span including 200 kHz bandwidth of the emission. And set a reference level on the measuring instrument equal to the highest peak value.
4. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
5. Repeat above procedures until all frequencies measured were complete.

## Test Data

### Environmental Conditions

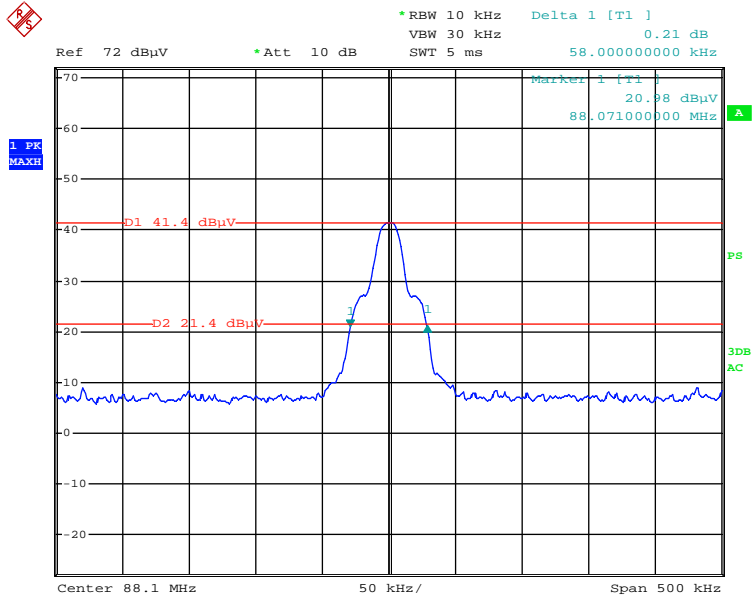
Temperature:	23 °C
Relative Humidity:	60 %
ATM Pressure:	101.2 kPa

*The testing was performed by Kevin Hu on 2016-04-11.*

**Test Result:** Compliant, Please refer to following tables and plots.

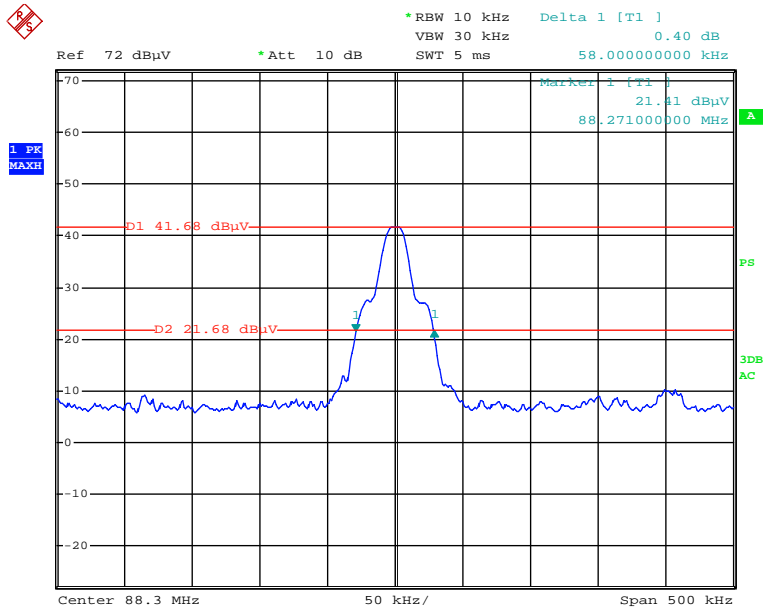
Channel	Frequency (MHz)	20dB Bandwidth (kHz)	Max limit (kHz)	Result
1	88.1	58	200	Compliant
2	88.3	58	200	Compliant
3	88.5	58	200	Compliant
4	88.7	58	200	Compliant

### 88.1MHz



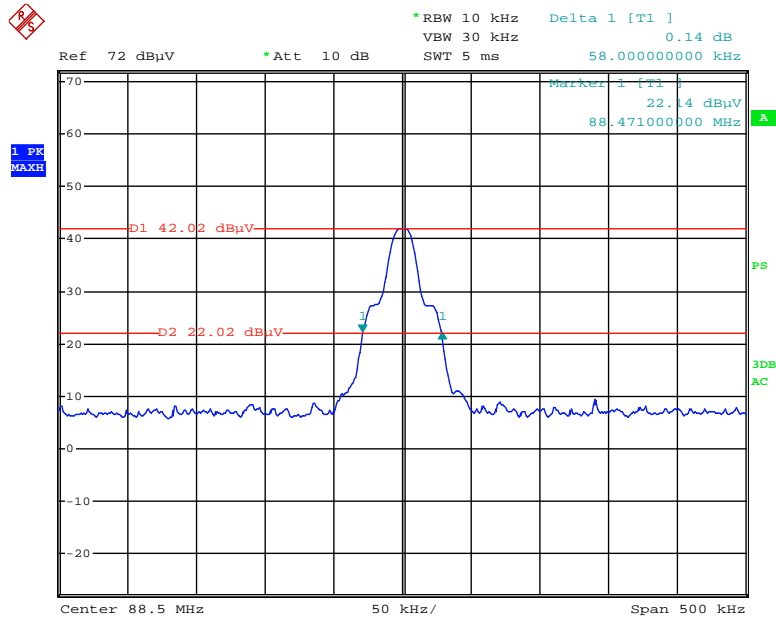
Date: 11.APR.2016 14:49:50

### 88.3MHz



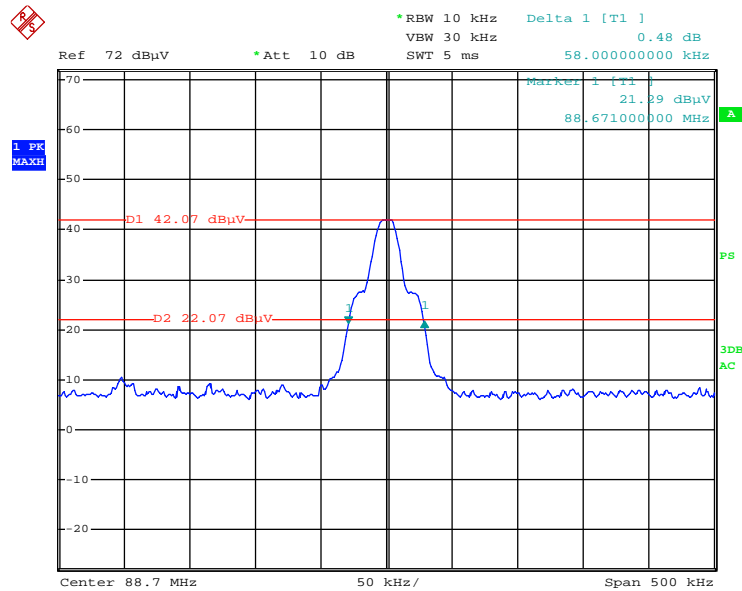
Date: 11.APR.2016 14:46:57

### 88.5MHz



Date: 11.APR.2016 14:43:44

### 88.7MHz



Date: 11.APR.2016 14:40:21

## FCC §15.239(b) – WITHIN 200 kHz BANDWIDTH FIELD STRENGTH

### Applicable Standard

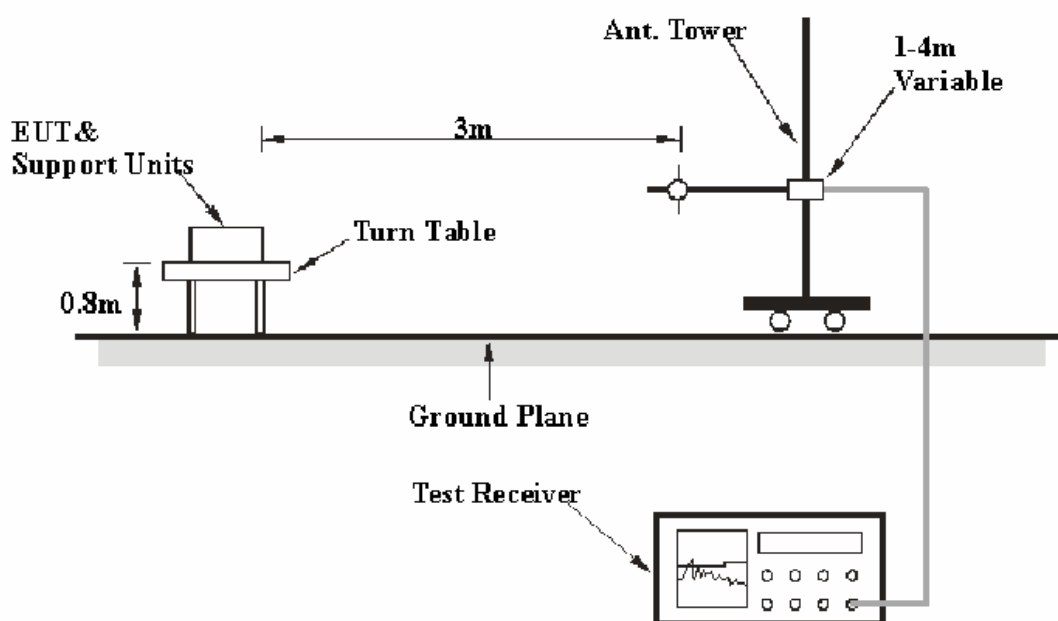
According to 15.239(a), the field strength of any emissions within the permitted 200 kHz band shall not exceed 250 microvolts/meter at 3 meters. The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in Section 15.35 for limiting peak emissions apply.

### 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 EMI Measurements, the best estimate of the uncertainty of a radiation emissions measurement at BACL is 30M~200MHz:  $\pm 4.7$  dB ; 200M~1GHz:  $\pm 6.0$  dB.

### EUT Setup



The radiated emission tests were performed in the 3 meters chamber B test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC §15.239(b).

The power cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

12V DC power source was provided to the EUT.

### EMI Test Receiver Setup

The centre frequency of the receiver was set to the transmitting frequency of the EUT. And the span set to 1MHz.

During the radiated emission test, the EMI test receiver setup were set with the following configurations:

<b><i>RBW</i></b>	<b><i>Video B/W</i></b>	<b><i>Detector</i></b>
100 kHz	300 kHz	AV & PK

### Test Equipment List and Details

Manufacturer	Description	Model Number	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100028	2015-12-02	2016-12-01
Sunol Sciences	Broadband Antenna	JB3	A101808	2016-04-08	2018-04-07
EMCT	Semi-Anechoic Chamber	966	N/A	2015-04-24	2018-04-23
N/A	RF Cable (below 1GHz)	NO.1	N/A	2015-11-10	2016-11-09
N/A	RF Cable (below 1GHz)	NO.2	N/A	2015-11-10	2016-11-09

\* **Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

### Test Procedure

For the radiated emissions test, the power cord of the EUT is connected to the outlet of the DC power.

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

Data was recorded in peak detection mode and in average detection.

## Corrected Amplitude 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:

$$\text{PK Level \& AV Level} = \text{Meter Reading} + \text{Antenna Factor} + \text{Cable Loss}$$

## Test Data

### Environmental Conditions

Temperature:	19 °C
Relative Humidity:	68 %
ATM Pressure:	102.5 kPa

*The testing was performed by Kevin Hu on 2016-03-25.*

Test Result: Compliant, Please refer to the following table.

Frequency (MHz)	PK reading	AV Reading	Antenna Factor (Db)	Cable Loss (dB)	PK Level (dBuV/m)	AV Level (dBuV/m)	Max. PK Limit (dBuV/m)	Max. AV Limit (dBuV/m)	Result
88.1	37.60	36.85	8.4	0.6	46.60	45.85	68	48	Compliant
88.3	37.65	36.89	8.4	0.6	46.65	45.89	68	48	Compliant
88.5	37.76	37.05	8.4	0.6	46.76	46.05	68	48	Compliant
88.7	37.72	36.98	8.4	0.6	46.72	45.98	68	48	Compliant

## **FCC §15.239(c) – OUTSIDE 200 kHz BANDWIDTH FIELD STRENGTH**

### **Applicable Standard**

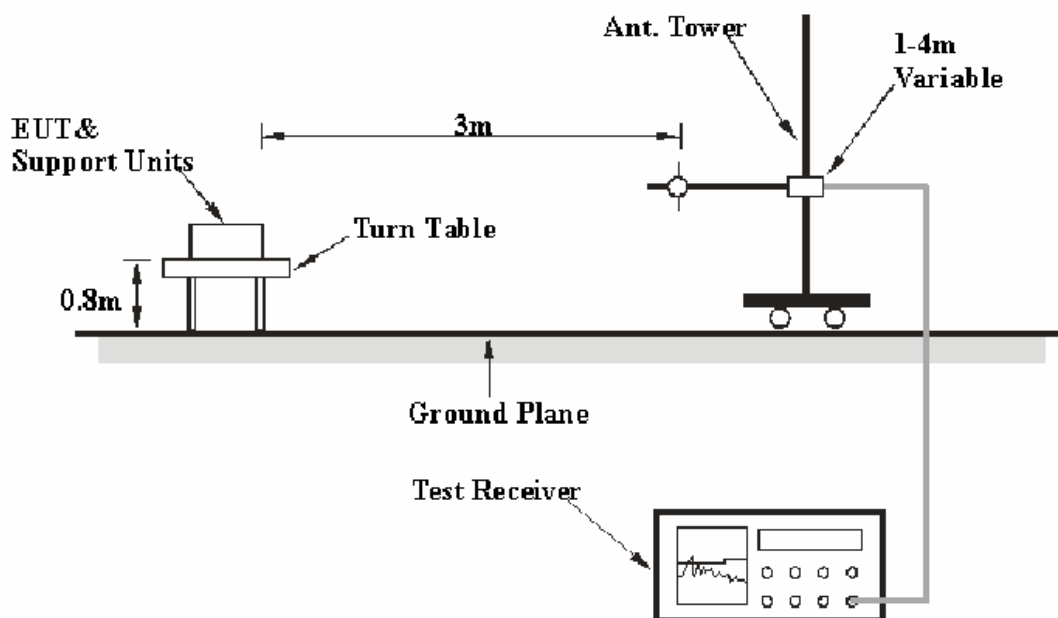
According to 15.239(c), the field strength of any emissions radiated on any frequency outside of the specified 200 kHz band shall not exceed the general radiated emission limits in section 15.209.

### **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 EMI Measurements, the best estimate of the uncertainty of a radiation emissions measurement at BACL is 30M~200MHz:  $\pm 4.7$  dB ; 200M~1GHz:  $\pm 6.0$  dB.

### **EUT Setup**



The radiated emission tests were performed in the 3 meters chamber B test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC §15.239(c) and §15.209(a) limits.

The power cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

12V DC power source was provided to the EUT.

### EMI Test Receiver

According to FCC Rules, the highest frequency in the device is 88.7 MHz, so the frequency range to be tested from 30 MHz to 1 GHz.

During the radiated emission test, the EMI test receiver is 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

### Test Equipment List and Details

Manufacturer	Description	Model Number	Serial Number	Calibration Date	Calibration Due Date
Agilent	Amplifier	8447D	2944A10442	2015-12-02	2016-12-01
Rohde & Schwarz	EMI Test Receiver	ESCI	100028	2015-12-02	2016-12-01
Sunol Sciences	Broadband Antenna	JB3	A101808	2016-04-08	2018-04-07
EMCT	Semi-Anechoic Chamber	966	N/A	2015-04-24	2018-04-23
N/A	RF Cable (below 1GHz)	NO.1	N/A	2015-11-10	2016-11-09
N/A	RF Cable (below 1GHz)	NO.2	N/A	2015-11-10	2016-11-09

\* **Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

### Test Procedure

For the radiated test, the power cord of the EUT is connected to the outlet of the DC power.

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-1GHz

### 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 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 Title 47, Part 15, Subpart C, section 15.209(a) and 15.239(c), with the worst margin reading of:

**9.0 dB at 47.988750 MHz** in the **Vertical** polarization for 88.1 MHz

## Test Data

### Environmental Conditions

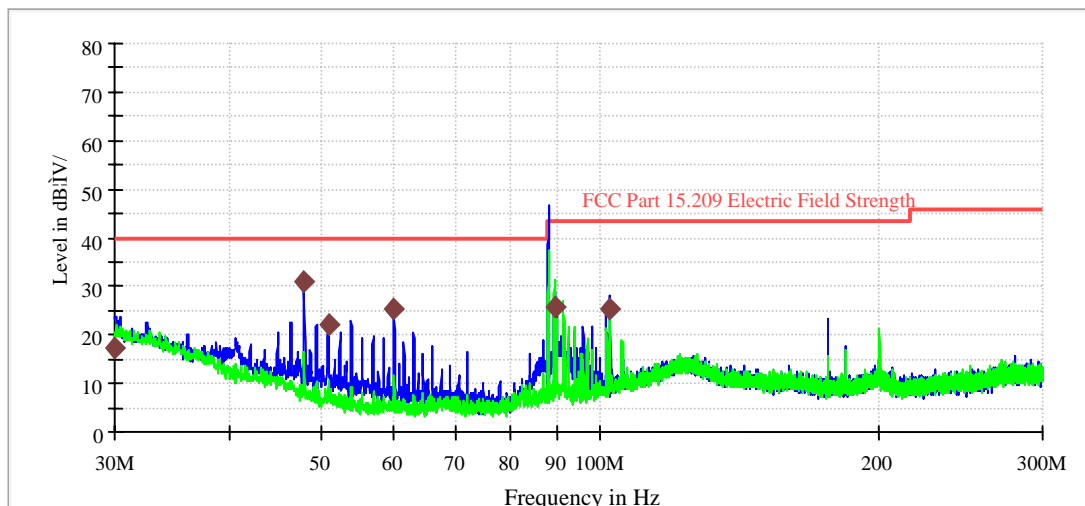
Temperature:	19 °C
Relative Humidity:	68 %
ATM Pressure:	102.5 kPa

The testing was performed by Kevin Hu on 2016-04-11.

Test Result: Compliant, Please refer to the following table and plots.

### 88.1 MHz

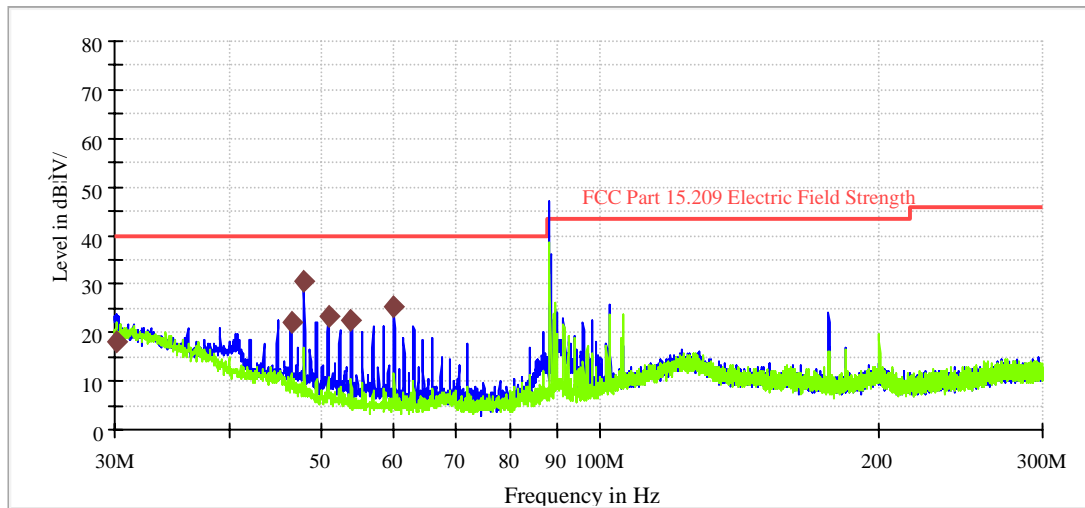
Electric Field Strength with Scans



Frequency (MHz)	QuasiPeak (dBµV/m)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
30.067500	17.4	120.000	100.0	V	37.0	-5.6	22.6	40.0
47.988750	31.0	120.000	100.0	V	29.0	-18.3	9.0	40.0
51.026250	22.1	120.000	100.0	V	54.0	-19.5	17.9	40.0
60.003750	25.1	120.000	100.0	V	140.0	-20.4	14.9	40.0
88.083750	46.2	120.000	100.0	V	222.0	-19.4	--	--
89.400000	25.8	120.000	100.0	H	340.0	-19.4	17.7	43.5
102.596250	25.2	120.000	100.0	V	148.0	-16.2	18.3	43.5

## 88.3 MHz

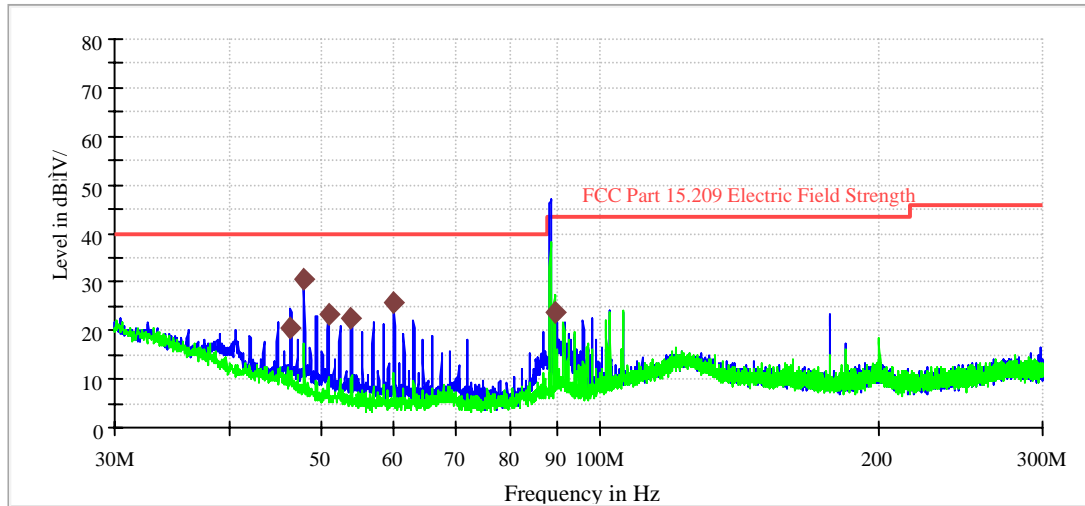
Electric Field Strength with Scans



Frequency (MHz)	QuasiPeak (dBµV/m)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
30.135000	18.0	120.000	100.0	V	4.0	-5.6	22.0	40.0
46.503750	22.2	120.000	100.0	V	145.0	-17.6	17.8	40.0
47.988750	30.6	120.000	100.0	V	205.0	-18.3	9.4	40.0
50.992500	23.2	120.000	100.0	V	62.0	-19.5	16.8	40.0
53.996250	22.6	120.000	100.0	V	145.0	-20.1	17.4	40.0
60.003750	25.5	120.000	100.0	V	46.0	-20.4	14.5	40.0
88.286250	46.6	120.000	100.0	V	229.0	-19.4	--	--

## 88.5 MHz

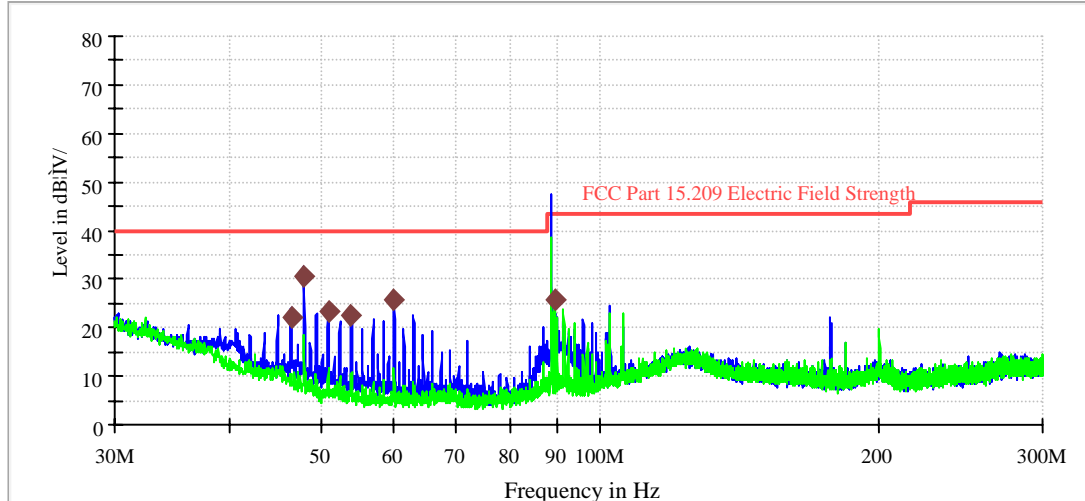
Electric Field Strength with Scans



Frequency (MHz)	QuasiPeak (dBµV/m)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
46.470000	20.6	120.000	100.0	V	39.0	-17.6	19.4	40.0
48.022500	30.7	120.000	100.0	V	340.0	-18.3	9.3	40.0
50.992500	23.3	120.000	100.0	V	340.0	-19.5	16.7	40.0
53.996250	22.6	120.000	100.0	V	110.0	-20.1	17.4	40.0
60.003750	25.6	120.000	100.0	V	185.0	-20.4	14.4	40.0
88.488750	46.8	120.000	100.0	V	236.0	-19.4	--	--
89.400000	23.7	120.000	100.0	H	128.0	-19.4	19.8	43.5

## 88.7 MHz

Electric Field Strength with Scans



Frequency (MHz)	QuasiPeak (dBμV/m)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
46.503750	22.2	120.000	100.0	V	175.0	-17.6	17.8	40.0
48.022500	30.5	120.000	100.0	V	138.0	-18.3	9.5	40.0
50.992500	23.2	120.000	100.0	V	108.0	-19.5	16.8	40.0
53.996250	22.5	120.000	100.0	V	168.0	-20.1	17.5	40.0
60.003750	25.7	120.000	100.0	V	108.0	-20.4	14.3	40.0
88.691250	47.0	120.000	100.0	V	232.0	-19.4	--	--
89.400000	25.7	120.000	100.0	H	205.0	-19.4	17.8	43.5

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