



FCC PART 15 CLASS B

MEASUREMENT AND TEST REPORT

For

ZYCOO Co., LTD.

7F, B7, Tianfu Software Park, Chengdu, China

FCC ID: 2ADWH-COOVOXEX16S

Report Type: Original Report	Equipment Name: IP Expansion Box
Test Engineer:	Lorin Bian <i>Lorin Bian</i>
Report Number:	RSC170313002
Report Date:	2017-03-30
	Henry Ding <i>Henry Ding</i>
Reviewed By:	EMC Leader
Prepared By:	Bay Area Compliance Laboratories Corp. (Chengdu) No. 5040, Huilongwan Plaza, No. 1, Shawan Road, Jinniu District, Chengdu, Sichuan, China Tel: +86-28-65525123 Fax: +86-28-65525125 www.baclcorp.com

Note: This test report was prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (Chengdu) Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law. This report was valid only with a valid digital signature.

TABLE OF CONTENTS

GENERAL INFORMATION	3
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT)	3
MECHANICAL DESCRIPTION OF EUT	3
OBJECTIVE	3
RELATED SUBMITTAL(S)/GRANT(S)	3
TEST METHODOLOGY	3
TEST FACILITY	4
SYSTEM TEST CONFIGURATION	5
JUSTIFICATION	5
EUT EXERCISE SOFTWARE	5
SPECIAL ACCESSORIES	5
EQUIPMENT MODIFICATIONS	5
SUPPORT EQUIPMENT LIST AND DETAILS	5
EXTERNAL I/O CABLE	5
BLOCK DIAGRAM OF TEST SETUP	6
SUMMARY OF TEST RESULTS	7
FCC §15.107 CONDUCTED EMISSION TEST	8
APPLICABLE STANDARD	8
MEASUREMENT UNCERTAINTY	8
EUT SETUP	8
EMI TEST RECEIVER SETUP	9
TEST PROCEDURE	9
CORRECTED AMPLITUDE & MARGIN CALCULATION	9
TEST EQUIPMENT LIST AND DETAILS	10
SUMMARY OF TEST RESULTS	10
CONDUCTED EMISSION TEST DATA	11
FCC §15.109 RADIATED EMISSION TEST	13
APPLICABLE STANDARD	13
MEASUREMENT UNCERTAINTY	13
EUT SETUP	13
EMI TEST RECEIVER SETUP	14
TEST PROCEDURE	14
CORRECTED AMPLITUDE & MARGIN CALCULATION	15
TEST EQUIPMENT LIST AND DETAILS	15
TEST SOFTWARE	15
SUMMARY OF TEST RESULTS	15
RADIATED EMISSION TEST	16

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The **ZYCOO Co., LTD.**'s product, model number: **COOVOX EX16S (FCC ID: 2ADWH-COOVOXEX16S)** or the "EUT" as referred to in this report was the **IP Expansion Box**, which has a metallic enclosure. The highest operation frequency is 1GHz.

Mechanical Description of EUT

The EUT was measured approximately 280 mm (L) x 150 mm (W) x 65 mm (H).
Rated input voltage: DC12V from AC/DC ADAPTER.

ADAPTER INFORMATION

MODEL: ZF120A-1203500
INPUT: 100-240V~, 2.0A 50/60Hz
OUTPUT: 12VDC 3.5A

**All measurement and test data in this report was gathered from final production sample, serial number: 170313001/01 (assigned by the BACL, Chengdu). It may have deviation from any other sample. The EUT supplied by the applicant was received on 2017-03-13.*

Objective

The following Class B report was prepared on behalf of **ZYCOO Co., LTD.**, in accordance with Part 2, Subpart J, and Part 15, Subparts A and B of the Federal Communication Commissions rules.

The objective of the manufacturer is to demonstrate compliance with FCC Part 15 Class B limits.

Related Submittal(s)/Grant(s)

No Related Submittals.

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 No.5040, Huilongwan Plaza, No. 1, Shawan Road, Jinniu District, Chengdu, Sichuan, 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, The facility also complies with the radiated and

AC line conducted test site criteria set forth in ANSI C63.4-2014. The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 560332.

BACL's test facility has been fully described in reports on file and registered with the Innovation, Science and Economic Development Canada under Registration Numbers: 3062C-1.

ENVIA

SYSTEM TEST CONFIGURATION

Justification

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

EUT Exercise Software

N/A.

Special Accessories

No special accessories were supplied by BACL.

Equipment Modifications

No modification was made to the EUT.

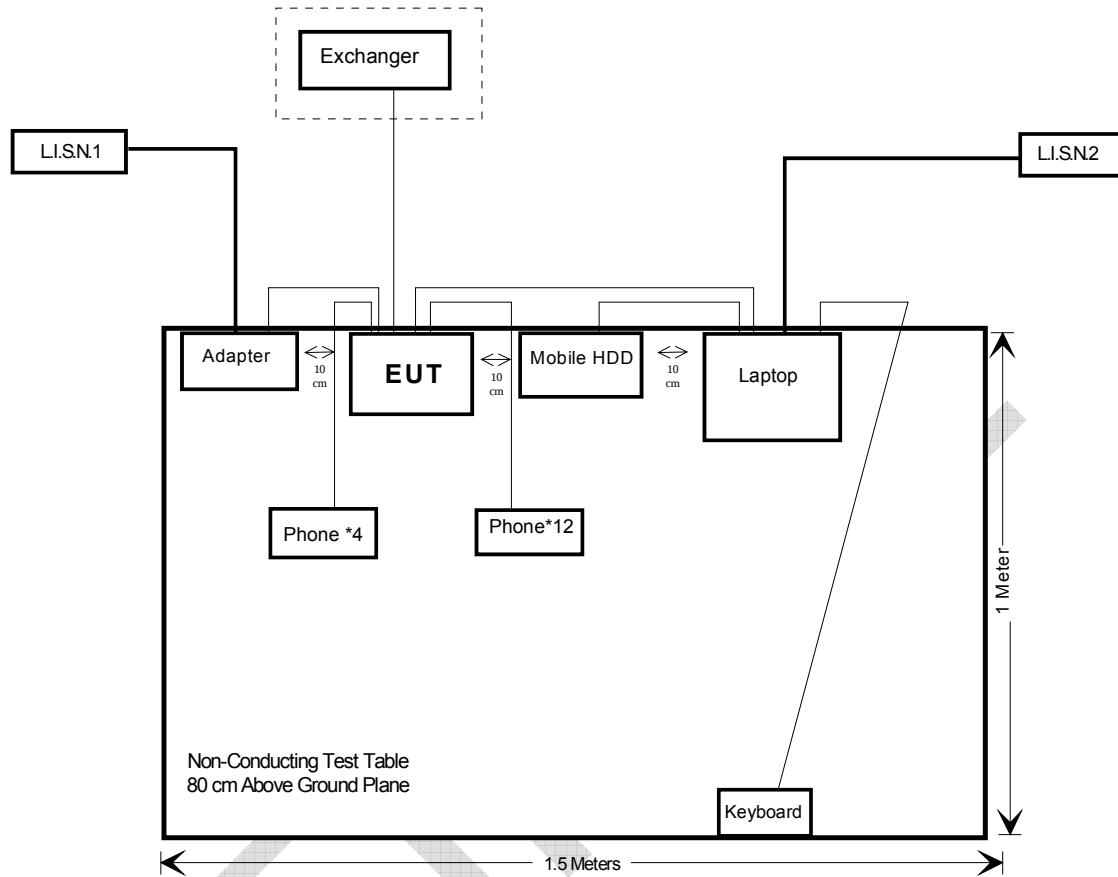
Support Equipment List and Details

Manufacturer	Description	Model Number	Serial Number
Toshiba	Mobile HDD	V63700-A	1297FHOYSRE8
Shenzhen CHINO	Phone *4	HA6238P/T	None
Jiangxi SHENAN	Phone *12	HCD6238(28)P/TSD11	None
DELL	Laptop	E6410	37417629385
DL	Exchanger	DL-S1005PM	None
LAPOP	Keyboard	JT-505	JT505U130200312

External I/O Cable

Cable Description	Length (m)	From	To
Unshielded USB Cable 1	0.5	Laptop/USB port	Mobile HDD
Unshielded RJ45 Cable 2	0.8	EUT/ LAN Port	Laptop
Unshielded USB Cable 1	1.8	Laptop/ USB Port	Keyboard
Unshielded RJ45 Cable 2	5.0	EUT/WAN Port	Exchanger
Unshielded RJ11 Cable 1*4	0.5	EUT/RJ11 Port	Phone *4
Unshielded RJ11 Cable 2*12	1.2	EUT/RJ11 Port	Phone *12

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

Standard	Description	Result
FCC §15.107	Conducted Emission	Compliance
FCC §15.109	Radiated Emission	Compliance

FINAL

FCC §15.107 CONDUCTED EMISSION TEST

Applicable Standard

FCC §15.107

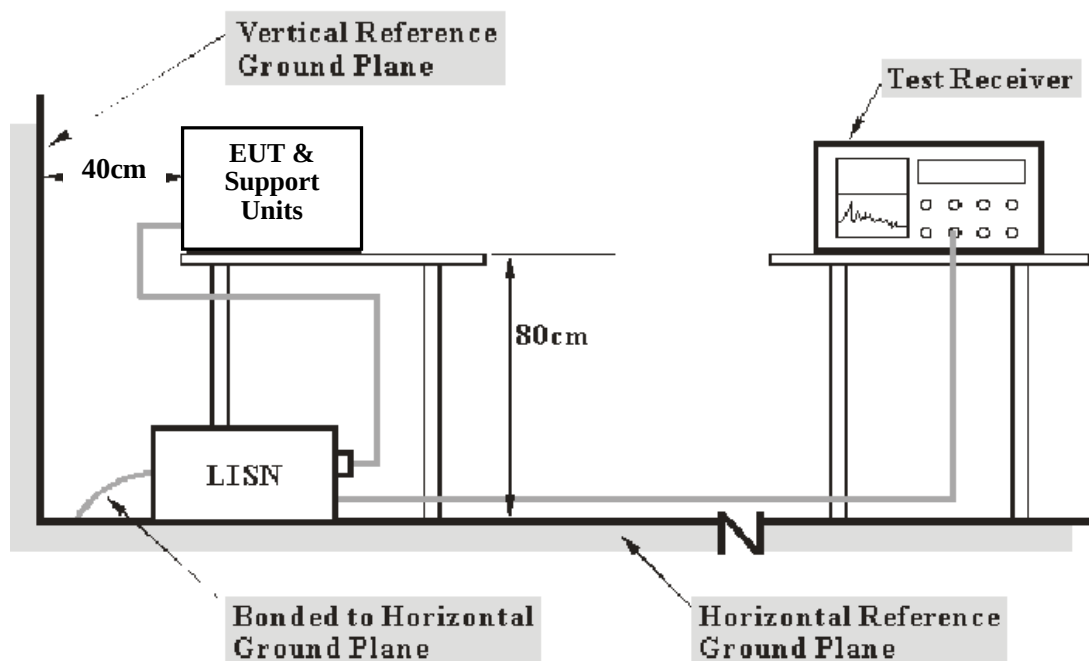
Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMI. The factors contributing to uncertainties are EMI Test Receiver, cable loss, and L.I.S.N.

Based on CISPR 16-4-2, the Treatment of Uncertainty in EMI Measurements, the best estimate of the uncertainty of any conducted emissions measurement at Bay Area Compliance Laboratories Corp. (Chengdu) is ± 3.17 dB.

EUT Setup

The setup of EUT was in accordance with ANSI C63.4-2014 measurement procedure. The specification used was the FCC Part 15 Class B limits.



- 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 power cables and excess cables shall be folded at the cable center into a bundle no longer than 40 cm.

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

The adapter was connected to AC120V/60Hz 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

Maximizing procedure was performed on the six (6) highest emissions to ensure EUT is compliant with all installation combination.

All data are recorded in the Quasi-peak and Average detection mode. Quasi-peak readings are distinguished with a "**QP**". Average readings are distinguished with an "**AV**".

The EUT is in the normal operating mode during the final qualification test to represent the worst cases results.

Corrected Amplitude & Margin Calculation

The basic equation is as follows:

$$VC = VR + AC + VDF$$

Herein,

VC: corrected voltage amplitude

VR: reading voltage amplitude

Ac: attenuation caused by cable loss

VDF: voltage division factor of AMN or ISN

The "Margin" column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

Test Equipment List and Details

Manufacturer	Description	Model Number	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCS 30	836858/0016	2016-12-02	2017-12-01
Rohde & Schwarz	L.I.S.N.	ENV216	3560.6550.06	2016-12-02	2017-12-01
EMCO	L.I.S.N.	3810-2/NM	9803-1907	2016-12-02	2017-12-01
N/A	Conducted Cable	NO.1	N/A	2016-11-10	2017-11-09
Rohde & Schwarz	Pulse Limiter	ESH3Z2	357.8810.52	2016-10-31	2017-10-30
R&S	Test Software	EMC32	Version8.53.0	N/A	N/A

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

Summary of Test Results

According to the recorded data in following table, the EUT complied with the FCC Part 15 B Class B.

Conducted Emission Test Data

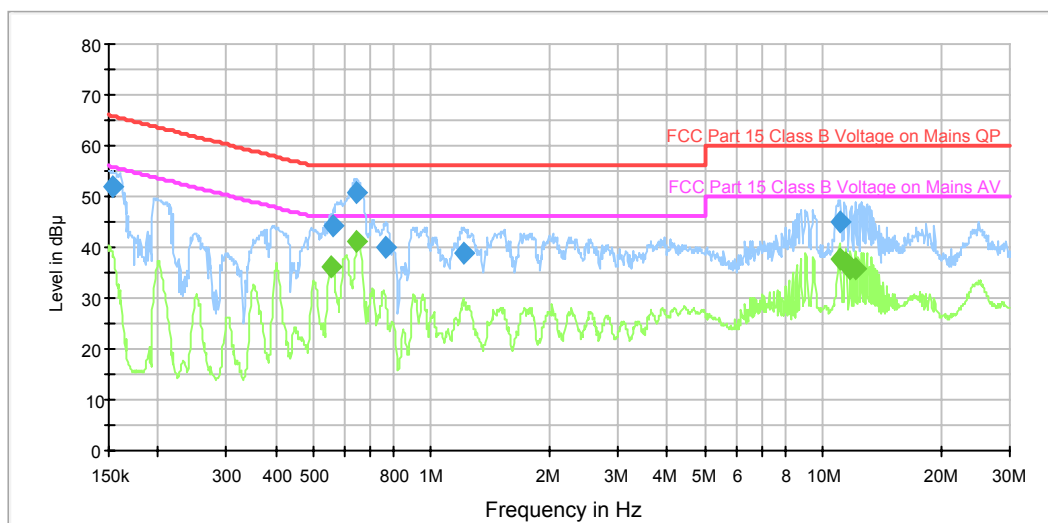
Test Environment Conditions

Temperature:	21 °C
Relative Humidity:	54 %
ATM Pressure:	95.2 kPa

The testing was performed by Lorin Bian on 2017-03-20.

Test Mode: Operation (WAN+LAN+Talking)

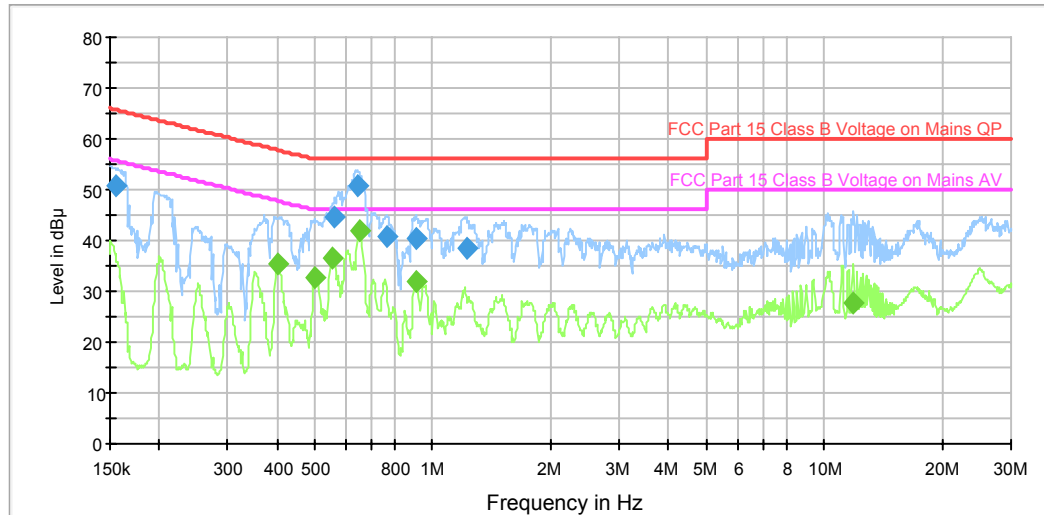
AC120/60Hz, Line:



Frequency (MHz)	QuasiPeak (dB μ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.153636	51.9	L1	19.7	13.9	65.8
0.562277	44.2	L1	19.6	11.8	56.0
0.641450	50.7	L1	19.6	5.3	56.0
0.767680	39.9	L1	19.6	16.1	56.0
1.205285	39.0	L1	19.6	17.0	56.0
11.048422	45.0	L1	19.8	15.0	60.0

Frequency (MHz)	Average (dB μ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.555584	36.3	L1	19.6	9.7	46.0
0.646592	41.0	L1	19.6	5.0	46.0
11.004404	37.9	L1	19.8	12.1	50.0
11.452589	37.1	L1	19.9	12.9	50.0
11.777135	35.7	L1	19.9	14.3	50.0
12.062628	35.6	L1	19.9	14.4	50.0

AC120/60Hz, Neutral:



Frequency (MHz)	QuasiPeak (dB μ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.155487	50.9	N	19.7	14.8	65.7
0.562277	44.8	N	19.7	11.2	56.0
0.641450	51.0	N	19.7	5.0	56.0
0.761575	40.9	N	19.7	15.1	56.0
0.907812	40.3	N	19.7	15.7	56.0
1.224685	38.6	N	19.7	17.4	56.0

Frequency (MHz)	Average (dB μ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.403694	35.5	N	19.7	12.3	47.8
0.500810	32.5	N	19.7	13.5	46.0
0.555584	36.5	N	19.7	9.5	46.0
0.649179	41.9	N	19.7	4.1	46.0
0.904195	32.1	N	19.7	13.9	46.0
11.871540	27.6	N	20.0	22.4	50.0

FCC §15.109 RADIATED EMISSION TEST

Applicable Standard

FCC §15.109

Measurement Uncertainty

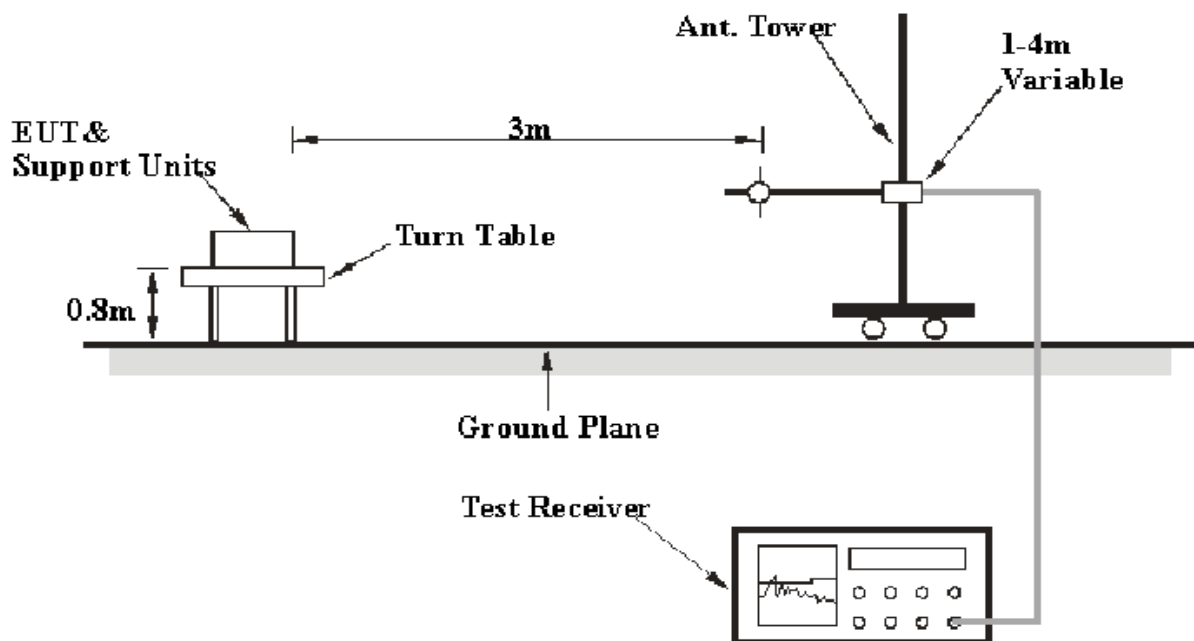
All measurements involve certain levels of uncertainties, especially in the field of EMI. The factors contributing to uncertainties are EMI Test Receiver, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor 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: ± 4.7 dB; 200M~1GHz: ± 6.0 dB; 1G-6GHz: ± 5.13 dB; 6G-25GHz: ± 5.47 dB.

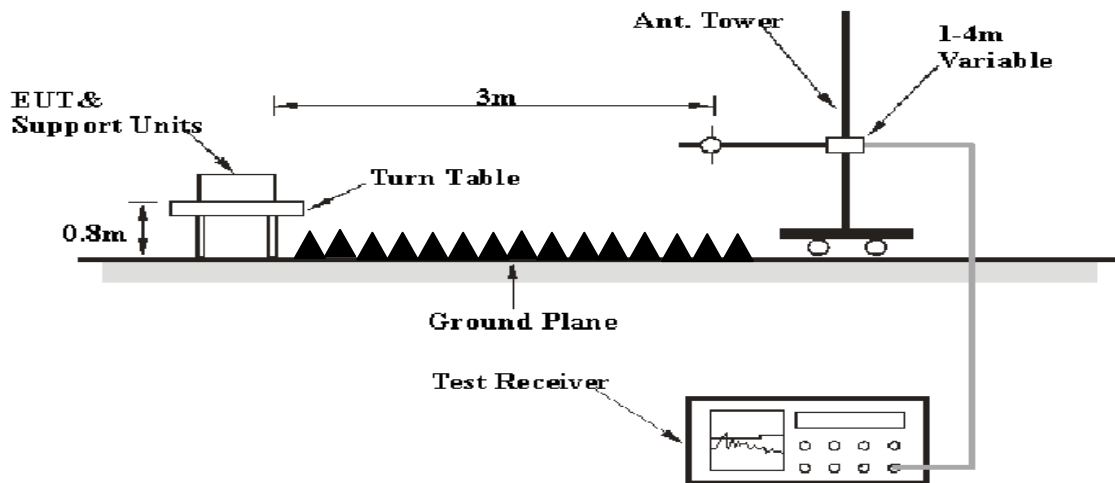
EUT Setup

The radiated emission tests were performed in the 3 meter Semi Anechoic Chamber, using the setup in accordance with the ANSI C63.4-2014. The specification used was the FCC Part 15 Class B limits.

Below 1GHz:



Above 1GHz:



The excess cables shall be folded at the cable center into a bundle no longer than 40 cm.

The spacing between the peripherals unit & EUT was 10 cm.

The adapter was connected to AC120V/60Hz power source.

EMI Test Receiver Setup

According to FCC15.33, the system was investigated from 30 MHz to 5 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
Above 1 GHz	1 MHz	3 MHz	/	PK
	1 MHz	10 Hz	/	Ave.

Test Procedure

Maximizing procedure was performed on the six (6) highest emissions to ensure EUT is compliant with all installation combinations.

All data were recorded in the quasi-peak detection mode from 30 MHz to 1 GHz, peak and average detection mode above 1 GHz.

The EUT was in the normal operating mode during the final qualification test to represent the worst case results.

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Antenna Factor} + \text{Cable Factor} - \text{Amplifier Gain}$$

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 7 dB below the limit.

The equation for margin calculation is as follows:

$$\text{Margin} = \text{Limit} - \text{Corr. Ampl.}$$

Test Equipment List and Details

Manufacturer	Description	Model Number	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100028	2016-12-2	2017-12-1
Agilent	Amplifier	8447D	2944A10442	2016-12-2	2017-12-1
SUNOL SCIENCES	Broadband Antenna	JB3	A101808	2016-4-10	2019-4-9
INMET	Attenuator	18N-6DB	64671	2016-4-10	2019-4-9
Rohde & Schwarz	Spectrum Analyzer	FSEM30	100018	2016-12-02	2017-12-01
Mini-circuits	Amplifier	ZVA-183-S+	771001215	2016-05-20	2017-05-19
ETS	Horn Antenna	3115	0036076	2016-4-9	2019-4-8
N/A	RF Cable (below 1GHz)	NO.1	N/A	2016-11-10	2017-11-09
N/A	RF Cable (below 1GHz)	NO.3	N/A	2016-11-10	2017-11-09
N/A	RF Cable (above 1GHz)	NO.2	N/A	2016-11-10	2017-11-09
EMCT	Semi-Anechoic Chamber	966	N/A	2015-4-24	2018-4-23
R&S	Test Software	EMC32	Version8.53.0	N/A	N/A

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

Test Software

Description	Manufacturer	Version
EMC32	R&S	V 8.54.0

Summary of Test Results

According to the data in the following, the EUT complied with the FCC Part 15 Class B.

Radiated Emission Test

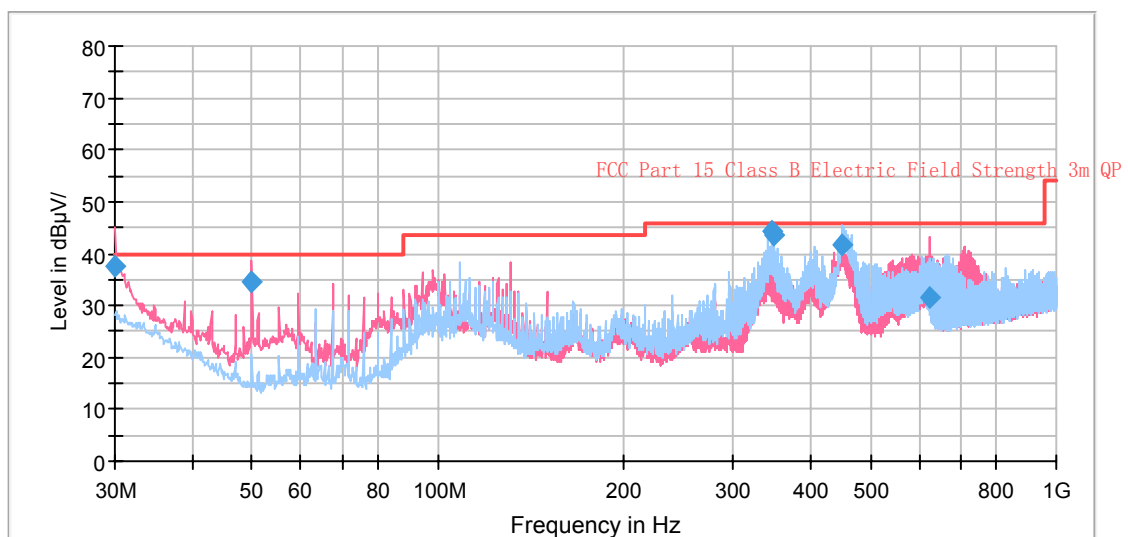
Test Environment Conditions

Temperature:	20 °C
Relative Humidity:	54 %
ATM Pressure:	95.4 kPa

The testing was performed by Lorin Bian on 2017-03-24.

Test Mode: Operation (WAN+LAN+Talking)

Below 1 GHz:



Frequency (MHz)	QuasiPeak (dB µ V/m)	Polarization	Corr. (dB)	Margin (dB)	Limit (dB µ V/m)
30.000000	37.7	V	1.0	*2.3	40.0
50.006250	34.6	V	-12.6	5.4	40.0
346.098750	44.3	H	-4.7	*1.7	46.0
350.221250	43.4	H	-4.6	*2.6	46.0
451.222500	41.8	H	-2.9	*4.2	46.0
622.670000	31.7	V	-0.2	14.3	46.0

* Within Measurement Uncertainty

Above 1 GHz:

Frequency	Receiver		Rx Antenna		Cable loss	Amplifier Gain	Corrected Amplitude	Limit	Margin
	Reading	Detector	Polar	Factor					
MHz	dB μ V	PK/QP/AV	H/V	dB(1/m)	dB	dB	dB μ V/m	dB μ V/m	dB
1296.59	49.86	PK	V	23.57	2.39	26.53	49.29	74.00	24.71
1296.59	38.24	AV	V	23.57	2.39	26.53	37.67	54.00	16.33
1256.51	48.96	PK	V	23.47	2.33	26.56	48.20	74.00	25.80
1256.51	37.58	AV	V	23.47	2.33	26.56	36.82	54.00	17.18
1653.30	43.73	PK	V	24.35	2.79	26.48	44.39	74.00	29.61
1653.30	33.51	AV	V	24.35	2.79	26.48	34.17	54.00	19.83
1300.60	48.08	PK	H	23.58	2.39	26.52	47.53	74.00	26.47
1300.60	37.28	AV	H	23.58	2.39	26.52	36.73	54.00	17.27
1316.63	46.95	PK	H	23.62	2.42	26.51	46.48	74.00	27.52
1316.63	36.78	AV	H	23.62	2.42	26.51	36.31	54.00	17.69
1236.47	46.27	PK	H	23.41	2.31	26.58	45.41	74.00	28.59
1236.47	35.63	AV	H	23.41	2.31	26.58	34.77	54.00	19.23

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