





# FCC PART 15B TEST AND MEASUREMENT REPORT

For

## Yealink (Xiamen) Network Technology Co., LTD

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2nd Software Park, Xiamen, China

**Model: SIP-T28P**

<b>Report Type:</b> Original Report	<b>Product Type:</b> IP Phone
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**DOCUMENT REVISION HISTORY**

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0	R1308229	Original Report	2013-10-23

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## 1 General Information

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

This test and measurement report has been compiled on behalf of *Yealink (Xiamen) Network Technology Co., LTD*, and their product model: *SIP-T28P* which henceforth is referred to as the EUT (Equipment Under Test). The EUT is an IP Phone

### 1.2 Mechanical Description of EUT

The EUT measures approximately 27cm (L) x 20cm (W) x 6cm (H) and weighs approximately 1kg.

*The data gathered are from a production sample provided by the manufacturer, serial number: R1308229-01 (Serial number assigned by BACL).*

### 1.3 Objective

This report is prepared on behalf of *Yealink (Xiamen) Network Technology Co., LTD* in accordance with Part 15, Subparts A and B of the Federal Communications Commission rules.

The objective is to determine compliance with Part 15 of the FCC Rules.

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

N/A

### 1.5 Test Methodology

All measurements contained in this report were conducted in accordance 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 tests were performed at Bay Area Compliance Laboratories Corp.

## 1.6 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in the 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 CISPR16-4-2:2011, The Treatment of Uncertainty in EMC Measurements, the values ranging from  $\pm 2.0$  dB for Conducted Emissions tests and  $\pm 4.0$  dB for Radiated Emissions tests are the most accurate estimates pertaining to uncertainty of EMC measurements at BACL Corp.

## 1.7 Test Facility

Bay Area Compliance Laboratories Corp. (BACL) is:

1- An independent Commercial Test Laboratory accredited to **ISO 17025:2005** by **A2LA**, in the fields of: Electromagnetic Compatibility & Telecommunications covering Emissions, Immunity, Radio, RF Exposure, Safety and Telecom. This includes NEBS (Network Equipment Building System), Wireless RF, Telecommunications Terminal Equipment (TTE); Network Equipment; Information Technology Equipment (ITE); Medical Electrical Equipment; Industrial, Commercial, and Medical Test Equipment; Professional Audio and Video Equipment; Electronic (Digital) Products; Industrial and Scientific Instruments; Cabled Distribution Systems and Energy Efficiency Lighting.

2- An ENERGY STAR Recognized Laboratory, for the LM80 Testing, a wide variety of Luminaires and Computers.

3- A NIST Designated Phase-I and Phase-II CAB including: ACMA (Australian Communication and Media Authority), BSMI (Bureau of Standards, Metrology and Inspection of Taiwan), IDA (Infocomm Development Authority of Singapore), IC (Industry Canada), Korea (Ministry of Communications Radio Research Laboratory), NCC (Formerly DGT; Directorate General of Telecommunication of Chinese Taipei) OFTA (Office of the Telecommunications Authority of Hong Kong), Vietnam, VCCI - Voluntary Control Council for Interference of Japan and a designated EU CAB (Conformity Assessment Body) (Notified Body) for the EMC and R&TTE Directives.

4- A Product Certification Body accredited to **ISO Guide 65:1996** by **A2LA** to certify:

1- Unlicensed, Licensed radio frequency devices and Telephone Terminal Equipment for the FCC. Scope A1, A2, A3, A4, B1, B2, B3, B4 & C.

2. Radio Standards Specifications (RSS) in the Category I Equipment Standards List and All Broadcasting Technical Standards (BETS) in Category I Equipment Standards List for Industry Canada.

3. Radio Communication Equipment for Singapore.

4. Radio Equipment Specifications, GMDSS Marine Radio Equipment Specifications, and Fixed Network Equipment Specifications for Hong Kong.

5. Japan MIC Telecommunication Business Law (A1, A2) and Radio Law (B1, B2 and B3).

6. Audio/Video, Battery Charging Systems, Computers, Displays, Enterprise Servers, Imaging Equipment, Set-Top Boxes, Telephony, Televisions, Ceiling Fans, CFLs (Including GU24s), Decorative Light Strings, Integral LED Lamps, Luminaires, Residential Ventilating Fans.

The test site used by BACL Corp. to collect radiated and conducted emissions measurement data is located at its facility in Sunnyvale, California, USA.

The test site at BACL Corp. has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). 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 11 and December 10, 1997, and Article 8 of the VCCI regulations on December 25, 1997. The test site also complies with the test methods and procedures set forth in CISPR 22:2008 §10.4 for measurements below 1 GHz and §10.6 for measurements above 1 GHz as well as ANSI C63.4-2009, ANSI C63.4-2009, TIA/EIA-603 & CISPR 24:2010.

The Federal Communications Commission and Voluntary Control Council for Interference have the reports on file and they are listed under FCC registration number: 90464 and VCCI Registration No.: A-0027. The test site has been approved by the FCC and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, BACL Corp. is an American Association for Laboratory Accreditation (A2LA) accredited laboratory (Lab Code 3297-02). The current scope of accreditations can be found at <http://www.a2la.org/scopepdf/3297-02.pdf?CFID=1132286&CFTOKEN=e42a3240dac3f6ba-6DE17DCB-1851-9E57-477422F667031258&jsessionid=8430d44f1f47cf2996124343c704b367816b>

## 2 System Test Configuration

### 2.1 Justification

The EUT was configured in accordance to ANSI C63.4-2009 Standards.

The EUT was tested in a testing mode to represent the worst case results during the final qualification test.

### 2.2 EUT Exercise Software

N/A

### 2.3 Local Support Equipment

Manufacturer	Description	Model	Serial Number
NETGEAR	POE	FS108P	-

### 2.4 EUT Internal Configuration Details

Manufacturer	Description	Model	Serial Number
Yealink	Main Board	SIP-T28P	-

### 2.5 External I/O Cabling List and Details

Cable Descriptions	Length (m)	From	To
RJ 45 Cable	<3	EUT	Ethernet
RJ 45 Cable	<3	EUT	Network
Power Cable	<3	EUT	AC/DC Adapter
Power Cable	<3	POE	AC/DC Adapter

### 2.6 EUT Adapter Info

Manufacturer	Description	Model	Serial Number
Yealink	AC Adapter	NSA6EU-050120	-



### 3 Summary of Test Results

FCC & IC Rules	Descriptions of Test	Result(s)
FCC §15.107	Conducted Emissions	Compliance
FCC §15.109	Radiated Spurious Emissions	Compliance

## 4 FCC §15.107 – AC Line Conducted Emissions

### 4.1 Applicable Standards

#### As per FCC §15.107: Conducted Limits

(a) Except for Class A digital devices, for equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50  $\mu$ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the band edges.

**Table 1- Limits for conducted disturbance at the mains ports of class B ITE**

Frequency range (MHz)	Limits dB ( $\mu$ V/)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.5 to 5	56	46
5 to 30	60	50

### 4.2 EUT Setup

The conducted emissions tests were performed in the 5-meter test chamber, using the setup in accordance with FCC Part 15 measurement procedures. The specifications used were in accordance with FCC Part 15B Class B limits.

The spacing between the peripherals was 10 cm.

The external I/O cables were draped along the test table and bundled as required.

The adapter of the EUT was connected to a 120 V, 60 Hz AC line power source.

The adapter of the POE was connected to a 120 V, 60 Hz AC line power source.

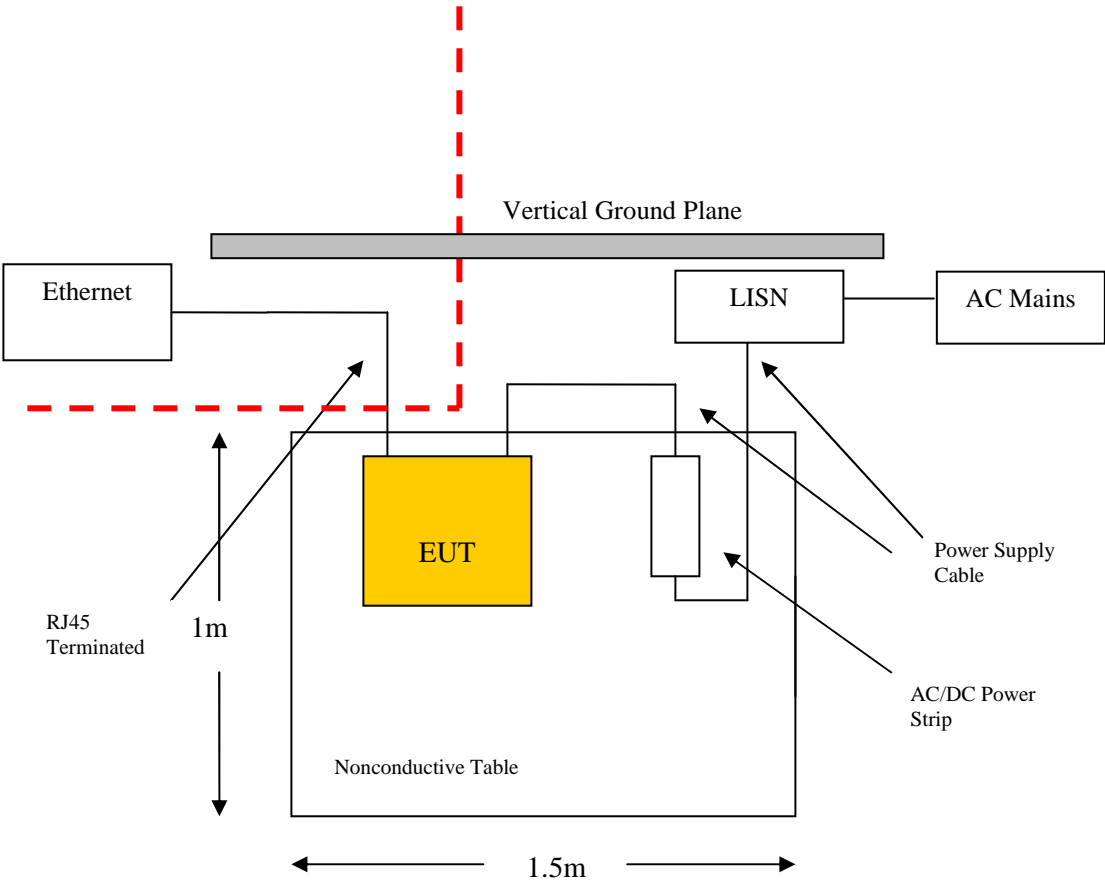
### 4.3 Test Procedure

Using the procedure in ANSI C63.4-2009 §7.2.3, determine the mode of operation and cable positions of the EUT system that produce the emission with the highest amplitude relative to the limit. This arrangement shall be used in final ac power-line conducted emission measurement of the EUT.

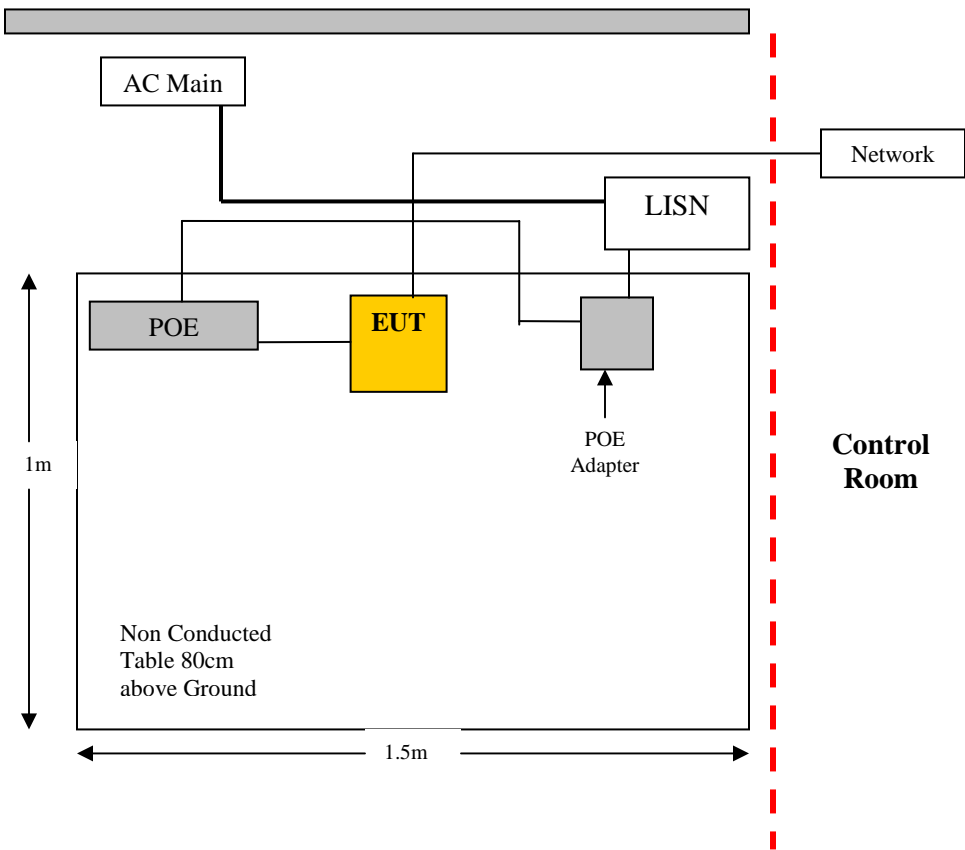
Using the mode of operation and arrangement of the EUT determined in ANSI C63.4-2009 §11.5.1, follow the procedure in ANSI C63.4-2009 §7.2.4 to perform final ac power-line conducted emission measurements. Measure significant emissions, select and record the six highest emissions relative to the limit on each of the power cords, measuring all of the current-carrying conductors of each of the power cords of the equipment that comprises the EUT over the frequency range specified by the procuring or regulatory agency.

4.4 Test Setup Block Diagram

AC Line



POE Line



#### 4.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude (CA) is calculated by adding the Cable Loss (CL) plus the High Pass Filter/Attenuator value (HA) and subtracting the Amplifier Gain (Ga) to the indicated Amplitude (Ai) reading. The basic equation is as follows:

$$CA = Ai + CL + HA - Ga$$

For example, a corrected amplitude (CA) of 36 dBuV = Indicated Amplitude reading (Ai) of 50.0 dBuV + Cable Loss (CL) 1.0 dB + High Pass Filter/Attenuator (IA) 5 dB - Amplifier Gain (Ga) 20 dB

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

$$\text{Margin (dB)} = \text{Corrected Amplitude (dBuV)} - \text{Class B Limit (dBuV)}$$

#### 4.6 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Interval
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100337	2013-03-28	1 year
Solar Electronics	LISN	9252-50-R-24-N	511205	2013-06-25	1 year
TTE	Filter, High Pass	H985-150k-50-720N	M1195	2013-05-30	1 year

**Statement of Traceability:** BACL Corp. attests that all calibrations have been performed according to A2LA requirements, traceable to the NIST.

#### 4.7 Test Environmental Conditions

<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	61 %
<b>ATM Pressure:</b>	101.56 kPa

*The testing was performed by Jerry Wang on 2013-09-27 in 5 m chamber 3.*

## 4.8 Summary of Test Results

According to the recorded data, the EUT complied with FCC Part 15B, Class B limits, and had the worst margin reading of:

### AC Line

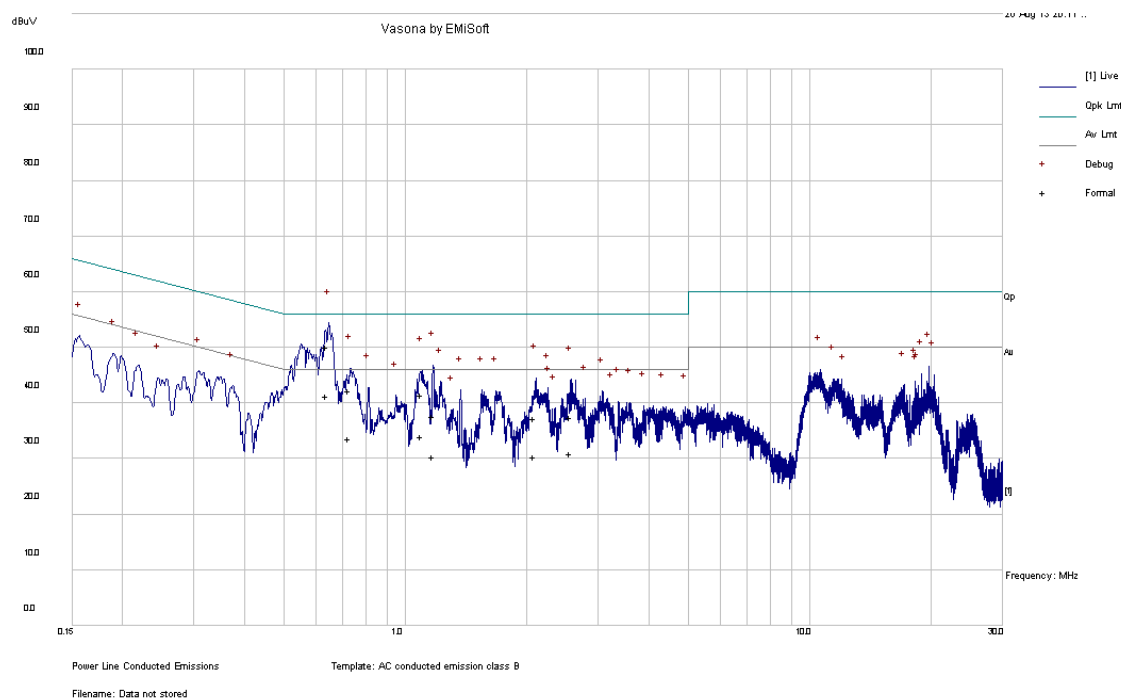
Mode: 120 V/ 60 Hz			
Margin (dB)	Frequency (MHz)	Conductor (Line/Neutral)	Range (MHz)
-1.88	0.635163	Neutral	0.15-30

### POE

Mode: 120 V/ 60 Hz			
Margin (dB)	Frequency (MHz)	Conductor (Line/Neutral)	Range (MHz)
-9.59	0.303144	Neutral	0.15 MHz to 30 MHz

## 4.9 Conducted Emissions Test Plots and Data

### AC Line - 120V, 60 Hz – Line

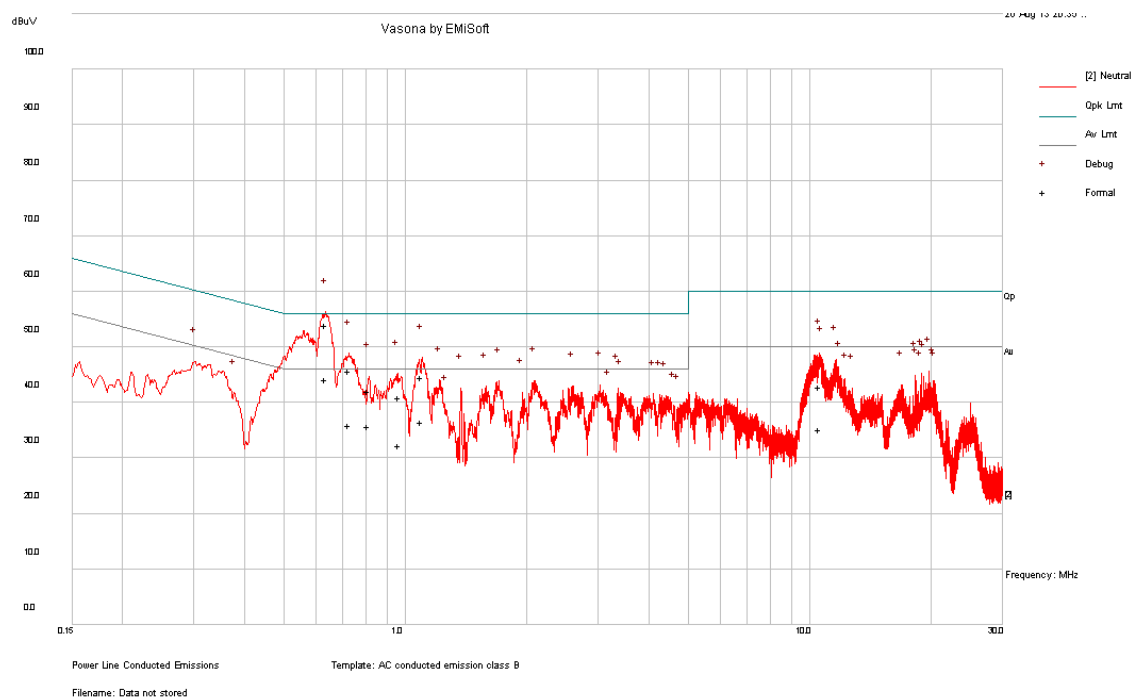


### Quasi-Peak Measurements

Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor	Limit (dBuV)	Margin (dB)
0.638058	50.03	Line	56	-5.97
0.726792	42.2	Line	56	-13.8
1.098105	41.4	Line	56	-14.6
1.172406	37.67	Line	56	-18.33
2.569386	37.45	Line	56	-18.55
2.084996	37.21	Line	56	-18.79

### Average Measurements

Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor	Limit (dBuV)	Margin (dB)
0.638058	41.21	Line	46	-4.79
1.098105	33.93	Line	46	-12.07
0.726792	33.68	Line	46	-12.32
2.569386	30.98	Line	46	-15.02
1.172406	30.36	Line	46	-15.64
2.084996	30.36	Line	46	-15.64

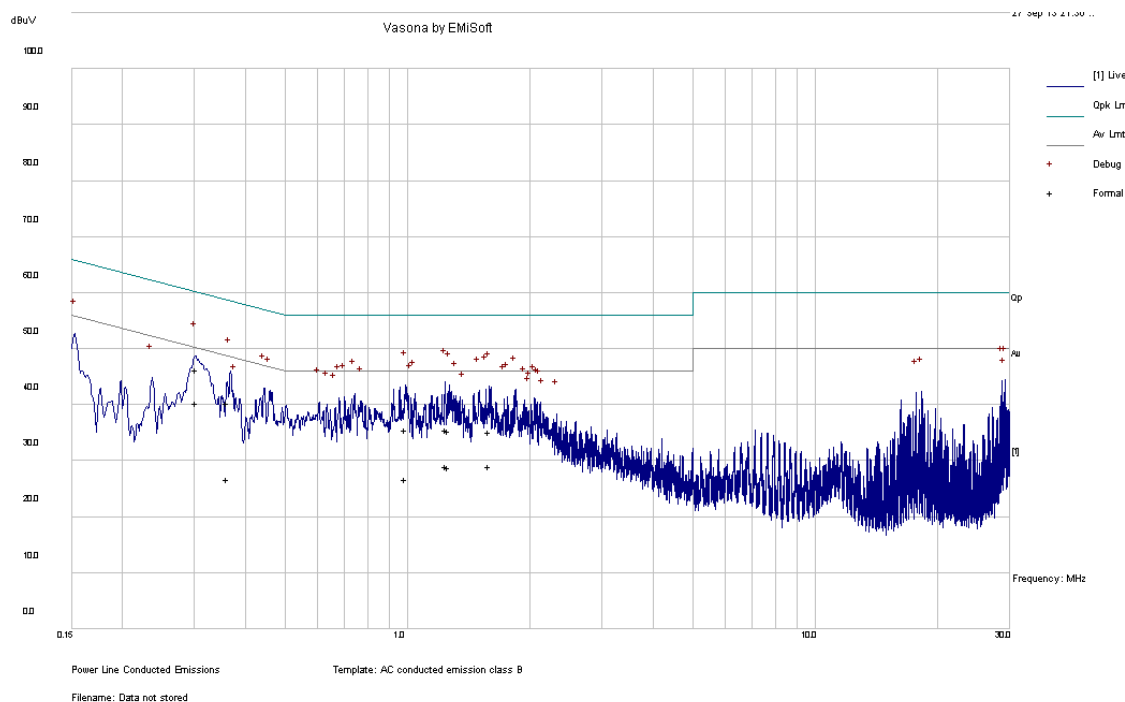
**AC Line - 120V, 60 Hz – Neutral****Quasi-Peak Measurements**

Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor	Limit (dBuV)	Margin (dB)
0.635163	53.97	Neutral	56	-2.03
0.728616	45.77	Neutral	56	-10.23
1.099995	44.61	Neutral	56	-11.39
0.808128	42.08	Neutral	56	-13.92
0.964230	40.91	Neutral	56	-15.09
10.548690	42.81	Neutral	60	-17.19

**Average Measurements**

Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor	Limit (dBuV)	Margin (dB)
0.635163	44.12	Neutral	46	-1.88
1.099995	36.57	Neutral	46	-9.43
0.728616	35.99	Neutral	46	-10.01
0.808128	35.71	Neutral	46	-10.29
0.964230	32.35	Neutral	46	-13.65
10.54869	35.14	Neutral	50	-14.86

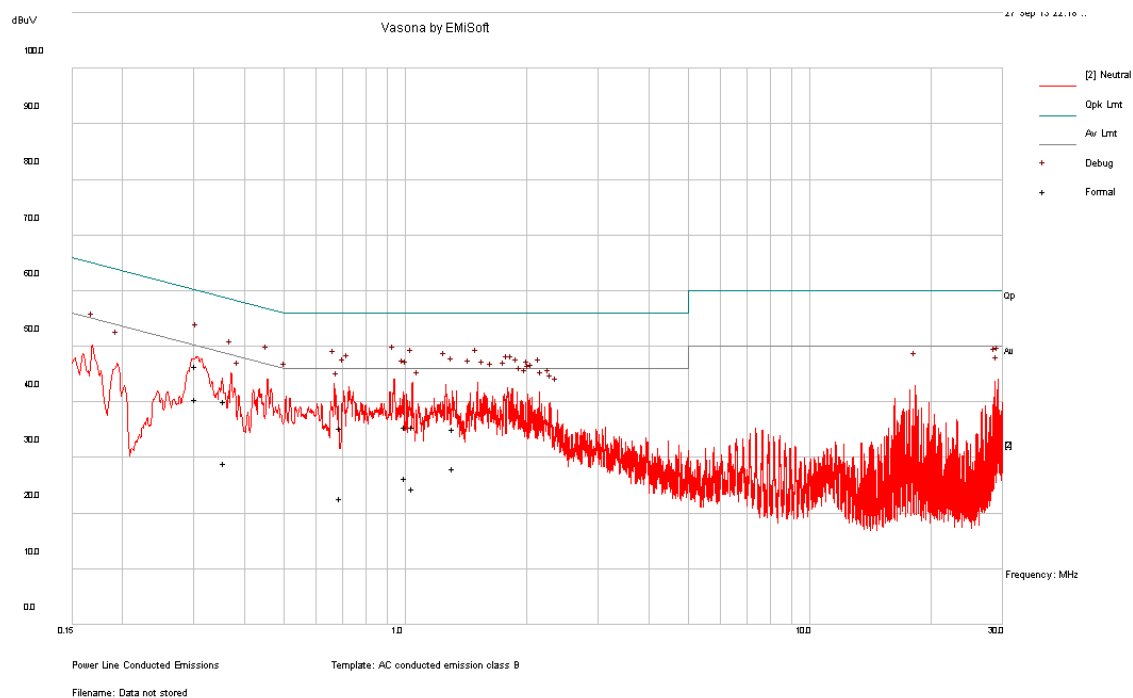


**POE Line- 120V, 60 Hz – Line****Quasi-Peak Measurements**

Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor	Limit (dBuV)	Margin (dB)
0.303144	46.23	Line	60.16	-13.92
0.362367	40.34	Line	58.67	-18.33
0.991323	35.61	Line	56	-20.39
1.243917	35.49	Line	56	-20.51
1.263612	35.33	Line	56	-20.67
1.584228	35.19	Line	56	-20.81

**Average Measurements**

Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor	Limit (dBuV)	Margin (dB)
0.303144	40.38	Line	50.16	-9.78
1.243917	29.03	Line	46	-16.97
1.584228	28.99	Line	46	-17.01
1.263612	28.92	Line	46	-17.08
0.991323	26.78	Line	46	-19.22
0.362367	26.7	Line	48.67	-21.98

**POE Line- 120V, 60 Hz – Neutral****Quasi-Peak Measurements**

Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor	Limit (dBuV)	Margin (dB)
0.303144	45.89	Neutral	60.16	-14.27
0.362367	40.11	Neutral	58.67	-18.56
0.991323	36.05	Neutral	56	-19.95
1.584228	35.96	Neutral	56	-20.04
1.243917	35.8	Neutral	56	-20.2
1.263612	34.8	Neutral	56	-21.2

**Average Measurements**

Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor	Limit (dBuV)	Margin (dB)
0.303144	40.57	Neutral	50.16	-9.59
1.243917	29.95	Neutral	46	-16.05
1.584228	28.99	Neutral	46	-17.01
1.263612	28.91	Neutral	46	-17.09
0.991323	26.36	Neutral	46	-19.64
0.362367	27.32	Neutral	48.67	-21.35

## 5 FCC § 15.109 – Radiated Emissions

### 5.1 Applicable Standard

#### As per FCC §15.109: Radiated Emission Limits

(a) Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency (MHz)	Field Strength ( $\mu$ V/m)
30-88	100
88-216	150
216-960	200
Above 960	500

(g) As an alternative to the radiated emission limits shown in paragraphs (a) and (b) of this section, digital devices may be shown to comply with the standards contained in Third Edition of the International Special Committee on Radio Interference (CISPR), Pub. 22, "Information Technology Equipment—Radio Disturbance Characteristics—Limits and Methods of Measurement."

### 5.2 Test Setup

The radiated emissions tests were performed in the 5-meter test chamber, using the setup in accordance with ANSI C63.4-2009 measurement procedures.

The spacing between the peripherals was 10 cm.

The external I/O cables were draped along the test table and bundled as required.

The adapter of the EUT was connected to a 120 V, 60 Hz AC line power source.

The adapter of the POE was connected to a 120 V, 60 Hz AC line power source.

### 5.3 Test Procedure

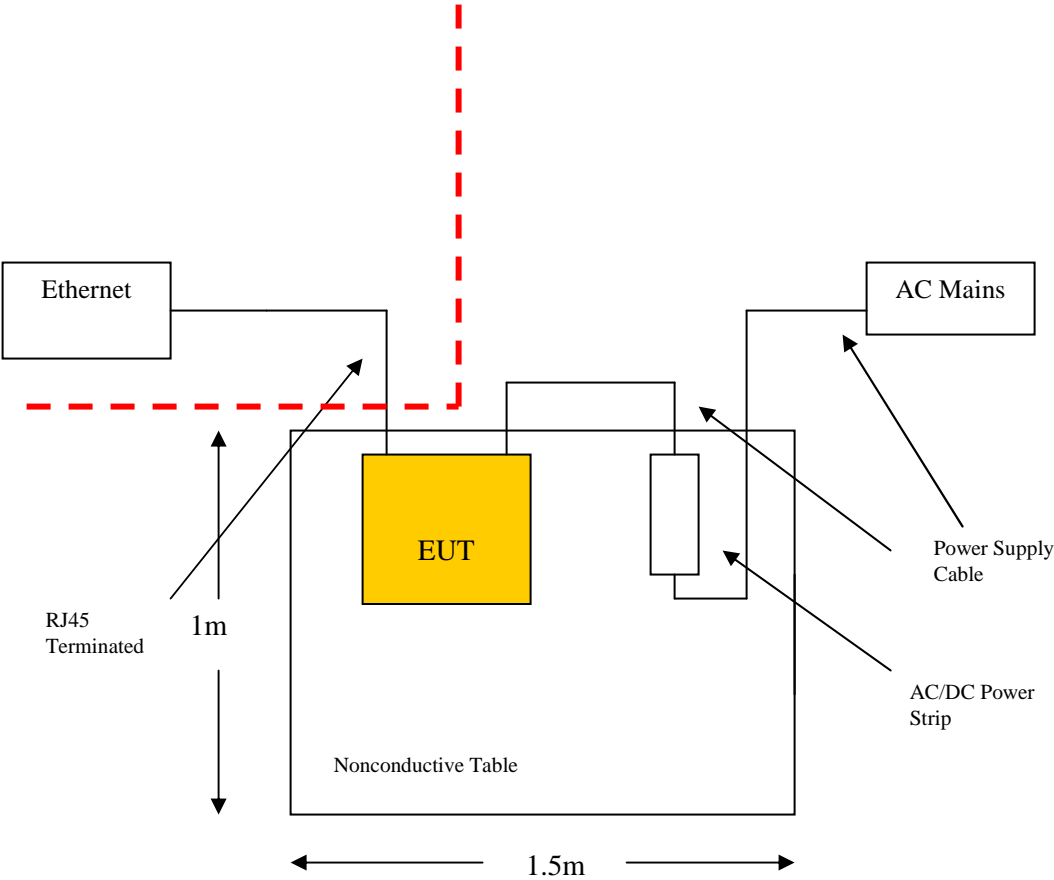
Using the procedure in ANSI C63.4-2009 §8.3.1.1, determine the mode of operation and cable positions of the EUT system that produce the emission with the highest amplitude relative to the limit. This equipment arrangement shall be used in final radiated emission measurements of the EUT.

Using the mode of operation and equipment arrangement of the EUT determined in ANSI C63.4-2009 §11.6.1, follow the procedure in ANSI C63.4-2009 §8.3.1.2 to perform final radiated emission measurements. Record the six highest emissions relative to the limit in the frequency range specified by the procuring or regulatory agency.

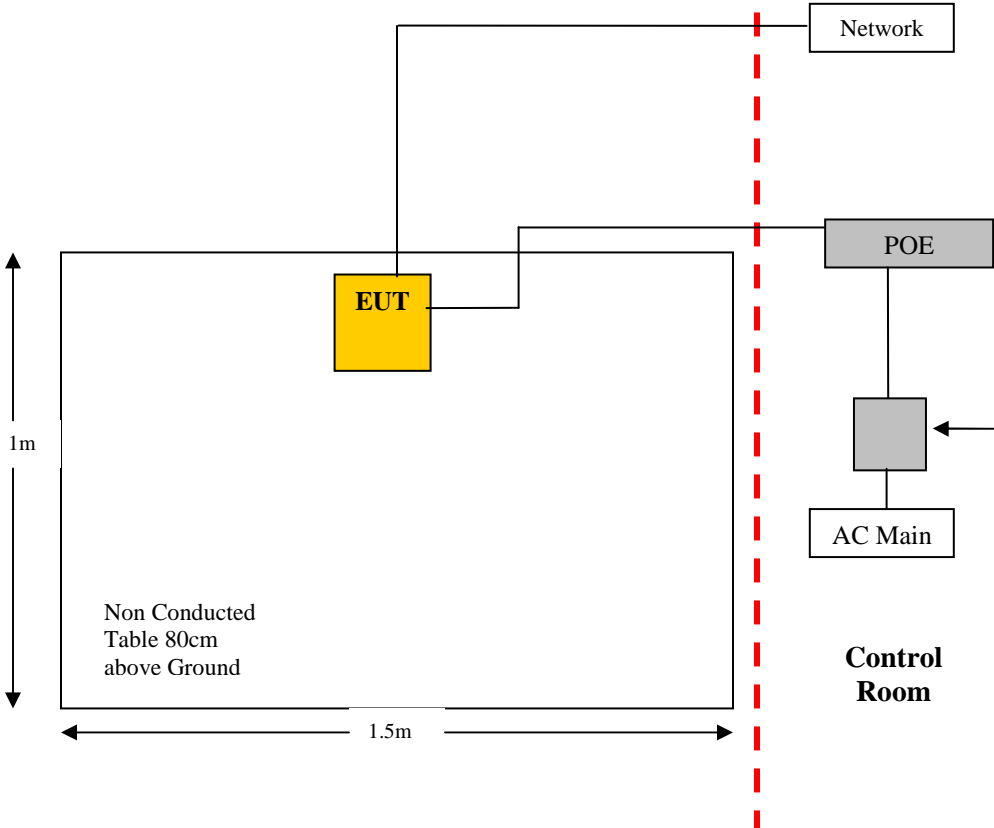
For emission below 1 GHz, all data was recorded in the peak detection mode and Quasi-peak readings, for emission above 1 GHz, all data was recorded in the peak detection mode and Average readings.

5.4 Test Setup Block Diagram

AC Line



POE Line



## 5.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude (CA) is calculated by adding the Antenna Factor (AF), the Cable Loss (CL), the Attenuator Factor (Atten) and subtracting the Amplifier Gain (Ga) to indicated Amplitude (Ai) reading. The basic equation is as follows:

$$CA = Ai + AF + CL + Atten - Ga$$

For example, a corrected amplitude of 40.3 dBuV/m = Indicated Reading (32.5 dBuV) + Antenna Factor (+23.5dB) + Cable Loss (3.7 dB) + Attenuator (10 dB) - Amplifier Gain (29.4 dB)

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

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

## 5.6 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Interval
Hewlett Packard	Pre amplifier	8447D	2944A07030	2013-04-09	1 year
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100044	2013-04-23	1 year
Sunol Science Corp	System Controller	SC99V	122303-1	N/R	N/R
Sunol Science Corp	Combination Antenna	JB1	A020106-1	2013-06-17	1 year

**Statement of Traceability:** BACL Corp. attests that all calibrations have been performed according to A2LA requirements, traceable to the NIST.

## 5.7 Test Environmental Conditions

<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	61 %
<b>ATM Pressure:</b>	101.56 kPa

The testing was performed by Jerry Wang on 2012-09-27 in 5 m chamber 3.

## 5.8 Summary of Test Results

According to the recorded data, the EUT complied with FCC §15.109 Standard, Class B limits, and had the worst margin reading Class B limits – of:

### AC Line

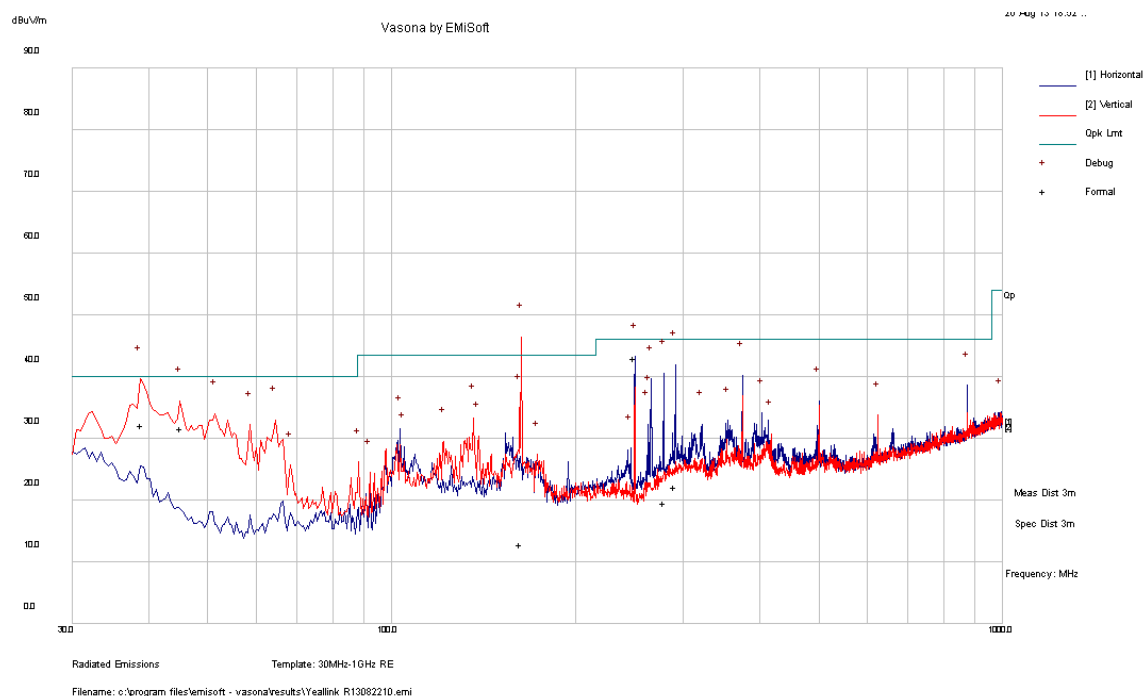
Mode: 30 MHz to 1 GHz			
Margin (dB)	Frequency (MHz)	Polarization (Horizontal/Vertical)	Range (MHz)
-2.91	249.9995	H	30-1000

### POE Line

Mode: 30 MHz to 1 GHz			
Margin (dB)	Frequency (MHz)	Polarization (Horizontal/Vertical)	Range (MHz)
-4.64	250.0375	H	30-1000

## 5.9 Radiated Spurious Emissions Test Plots and Data

### 30-1000 MHz measured at 3 meters distance – AC Line

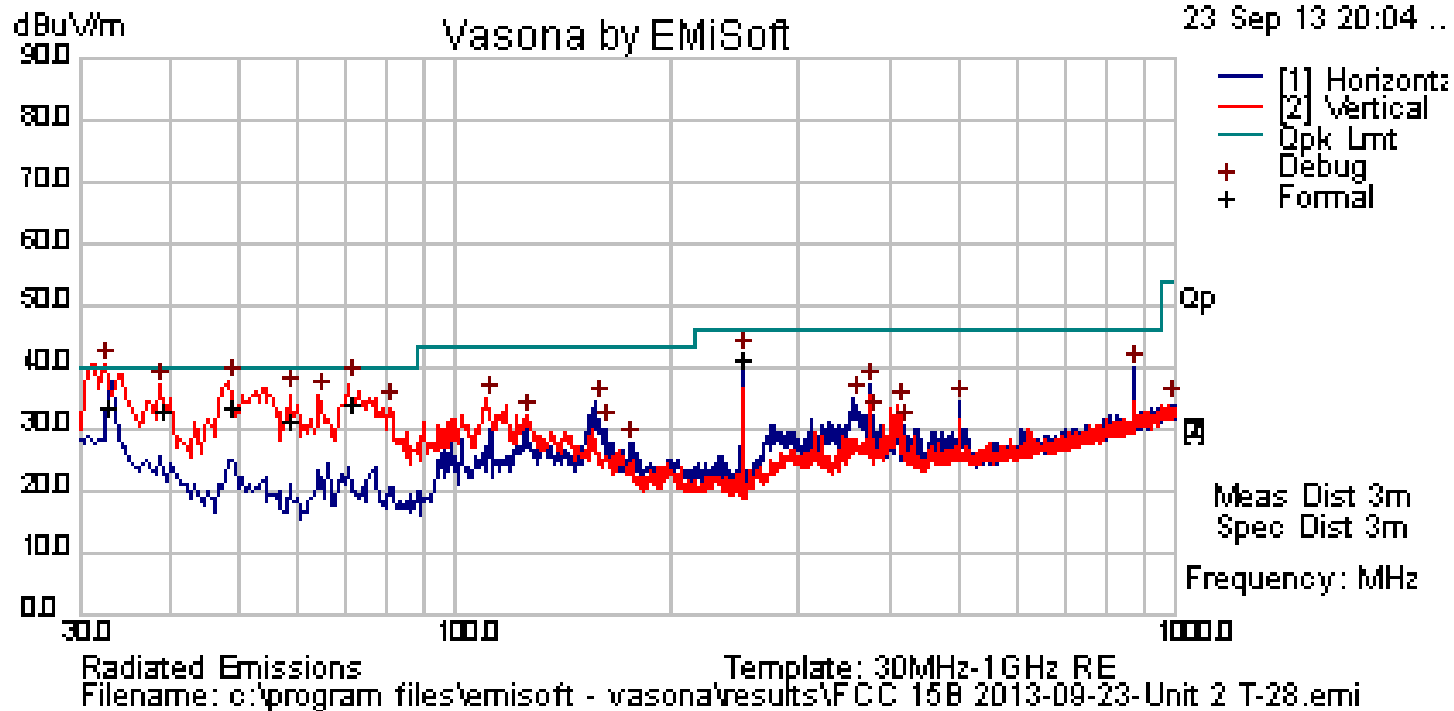


### Quasi-Peak Measurements:

Frequency (MHz)	Corrected Amplitude (dBuV)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBuV)	Margin (dB)
249.9995	43.09	104	H	284	46	-2.91
38.952	32.21	180	V	0	40	-7.79
45.2665	31.56	153	V	294	40	-8.44
290.8838	22.16	99	H	301	46	-23.84
278.8633	19.61	111	H	277	46	-26.39
162.8388	12.91	174	V	313	43.5	-30.59



## 30-1000 MHz measured at 3 meters distance – POE Line



## Quasi-Peak Measurements:

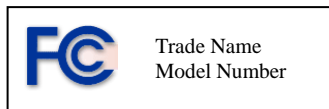
Frequency (MHz)	Corrected Amplitude (dBuV)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBuV)	Margin (dB)
250.0375	41.36	107	H	142	46	-4.64
71.41775	34.12	99	V	53	40	-5.88
32.6005	33.82	99	V	323	40	-6.18
48.4375	33.74	106	V	101	40	-6.26
38.91375	33.26	105	V	318	40	-6.74
58.7215	31.13	108	V	28	40	-8.87

## 6 Exhibit A – FCC Product Labeling Requirements

### 6.1 Label Information

#### As per FCC §15.19: Labelling Requirements Paragraph 3

(3) All other devices shall bear the following statement in a conspicuous location on the device:



This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Specifications: Text is white in color and is left justified. Labels are printed in indelible ink on permanent adhesive backing or silk-screened and shall be affixed at a conspicuous location on the EUT.

#### As per FCC §15.105: Information to the User

(b) For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

## 6.2 Suggested Label Location on EUT



## 7 Exhibit B- Test Setup Photos

### 7.1 Conducted Emissions – Front View - AC Line



### 7.2 Conducted Emissions – Side View - AC Line

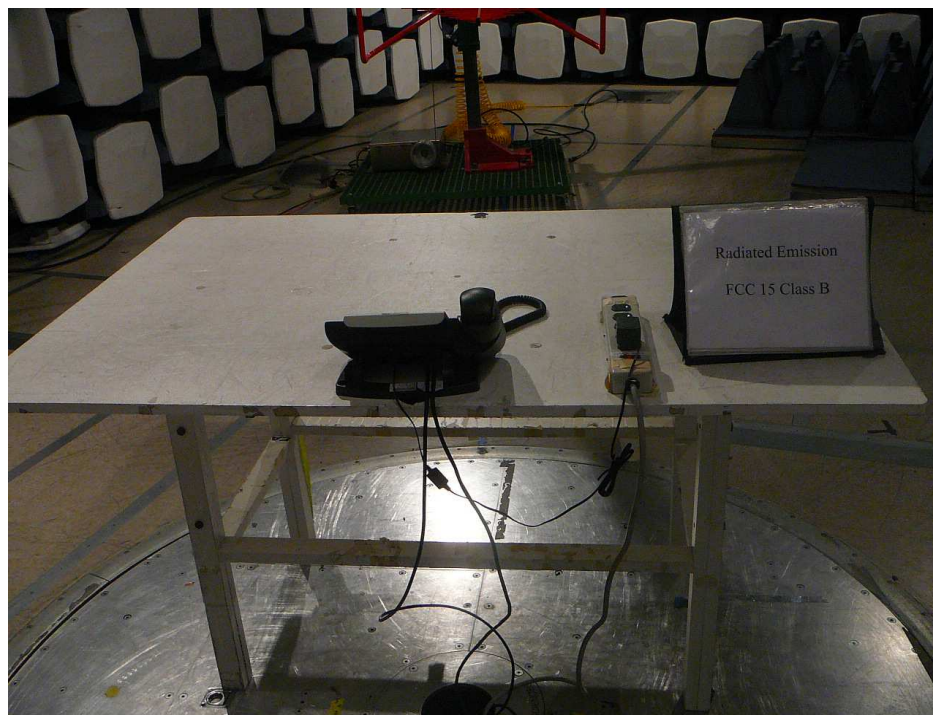




### 7.3 Radiated Spurious Emissions – Front View



### 7.4 Radiated Spurious Emissions – Rear View



## 8 Exhibit C- EUT Photos

### 8.1 EUT - Top View

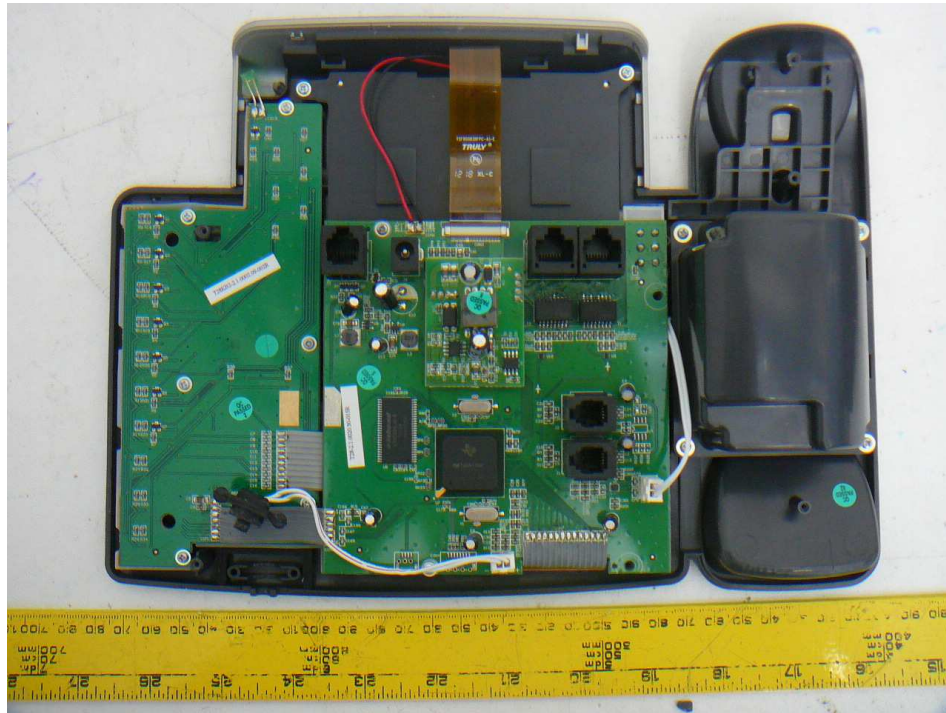


### 8.2 EUT - Bottom View





### 8.3 EUT – Cover off View



### 8.4 EUT – Adapter Photo



## 8.5 EUT – Adapter Photo



## 8.6 EUT – Adapter Photo





## 9 Declaration of Similarity

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2013-6-21

### **Product Similarity Declaration Letter**

To Whom It May Concern,

We, Yealink (Xiamen) Network Technology Co., LTD. hereby declare that our product IP Phone, the model SIP-T28P and SIP-T28 are electrically identical, they have the same PCB layout and schematic, the only difference is the model T28P with POE circuit, the model T28 without POE circuit. SIP-T28P was tested by BACL.

Please contact me if you have any question.

Signature:

A handwritten signature in black ink that reads "Stone Lu".

Stone Lu

Vice General Manager

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