



FCC PART 15 CLASS B

MEASUREMENT AND TEST REPORT

For

Sangoma U.S., Inc.

2414 Industrial Drive, Unit D, Neenah, Wisconsin, United States

FCC ID: 2AJQ9CPE004

Report Type: Original Report	Equipment Name: CPE004
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Report Number: RSC160613001	
Report Date: 2016-06-24	
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The **Sangoma U.S., Inc.**'s product, model number: **CPE004 (FCC ID: 2AJQ9CPE004)** or the "EUT" as referred to in this report was the **CPE004**, which has a metallic enclosure. The highest frequency was 1GHz.

Mechanical Description of EUT

The EUT was measured approximately 170mm (L) x 115mm (W) x 35mm (H).

Rated input voltage: DC12V from adapter or DC48V from POE.

Adapter Information:

Manufacturer: GOLDEN PROFIT

Model: GPE024D-120200D

Input: 100-240V AC

Output: 12V DC

**All measurement and test data in this report was gathered from final production sample, serial number: 160613001/01 (assigned by the BACL, Chengdu). It may have deviation from any other sample. The EUT supplied by the applicant was received on 2016-06-08, and EUT conformed to test requirement.*

Objective

The following Class B report was prepared on behalf of **Sangoma U.S., Inc.**, 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 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 April 24,2015. 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. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

F E M N A L

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 BAACL.

Equipment Modifications

No modification to the EUT was made by BAACL(ChengDu).

Support Equipment List and Details

Manufacturer	Description	Model Number	Serial Number
SHENAN CHINO	Phone	HA6238P/T	110100001
SHENAN CHINO	Phone	HA6238P/T	110100002
SHENAN CHINO	Phone	HA6238P/T	110100003
SHENAN CHINO	Phone	HA6238P/T	110100004
DELL	Laptop	E640	5P804A00
KINGSTON	USB Disk	101G2	None
HUAWEI	Power Over Ethernet Injector	POI-101U	75310103901545
DL	Exchange HUB	DL-S1005PM	None
LAPOP	Keyboard	JT-505	JT505U13 0200312
TOSHIBA	Hard Disk	V63700-A500G	1297FH0YSRE8

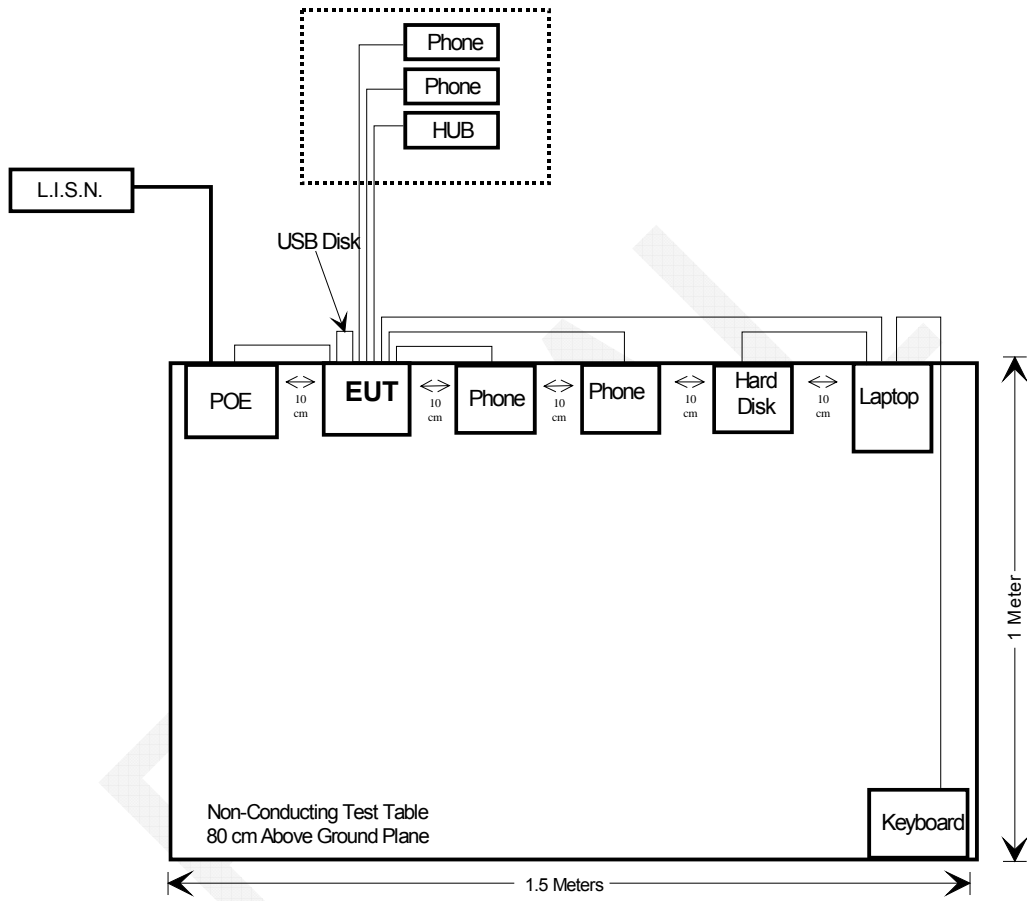
External I/O Cable (for Adapter Mode)

Cable Description	Length (m)	From	To
Unshielded RJ45 Cable	8.0	EUT/WAN	Exchange HUB
Unshielded DC Power Cable	1.8	EUT/DC in	Adaptor
Unshielded RJ45 Cable	1.0	EUT/LAN	Laptop
Unshielded RJ11 Cable	0.5	EUT/Port 3	Phone 1
Unshielded RJ11 Cable	0.5	EUT/Port 4	Phone 2
Unshielded RJ11 Cable	5.0	EUT/Port 1	Phone 3
Unshielded RJ11 Cable	5.0	EUT/Port 2	Phone 4
Unshielded Keyboard cable	1.5	Laptop/USB Port	Keyboard
Unshielded USB Cable	0.5	Laptop/USB Port	Hard disk

External I/O Cable (for POE Mode)

Cable Description	Length (m)	From	To
Unshielded RJ45 Cable	1.0	EUT/LAN	Laptop
Unshielded RJ45 Cable	8.0	EUT/WAN	Exchange HUB
Unshielded RJ45 Cable	5.0	EUT/WAN	POE
Unshielded RJ11 Cable	0.5	EUT/Port 3	Phone 1
Unshielded RJ11 Cable	0.5	EUT/Port 4	Phone 2
Unshielded RJ11 Cable	5.0	EUT/Port 1	Phone 3
Unshielded RJ11 Cable	5.0	EUT/Port 2	Phone 4
Unshielded Keyboard cable	1.5	Laptop/USB Port	Keyboard
Unshielded USB Cable	0.5	Laptop/USB Port	Hard disk

For POE mode:



SUMMARY OF TEST RESULTS

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

F U N D A M E N T A L

FCC §15.107 CONDUCTED EMISSION TEST

Applicable Standard

FCC §15.107

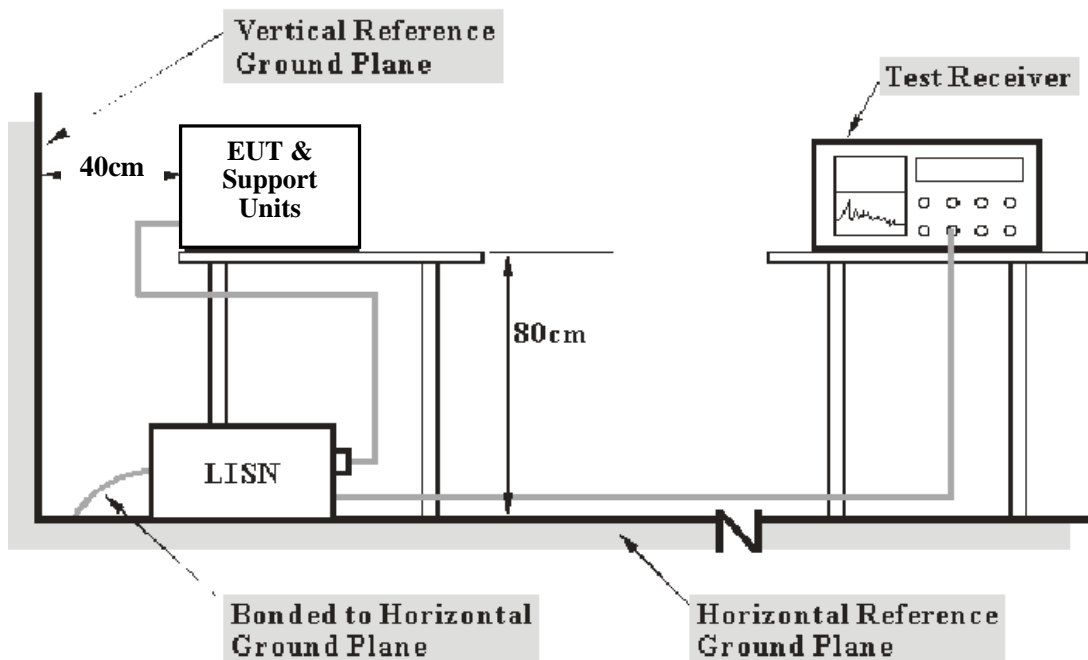
Measurement Uncertainty

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 spacing between the peripherals unit & EUT was 10 cm.

The adapter or POE was connected to AC120V/60Hz.

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.

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	2015-12-02	2016-12-01
Rohde & Schwarz	L.I.S.N.	ENV216	3560.6550.06	2015-12-02	2016-12-01
Rohde & Schwarz	L.I.S.N.	ENV216	3560.6550.12	None	None
Rohde & Schwarz	PULSE LIMITER	ESH3Z2	357.8810.52	2015-10-31	2016-10-30
N/A	Conducted Cable	NO.5	N/A	2015-11-10	2016-11-09

* **Statement of Traceability:** BAAC (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 data in the following, the EUT complied with the FCC Part 15B Conducted margin for a Class B device.

Please refer to the Test Data and Plots.

Conducted Emission Test Data and Plots

Test Environment Conditions

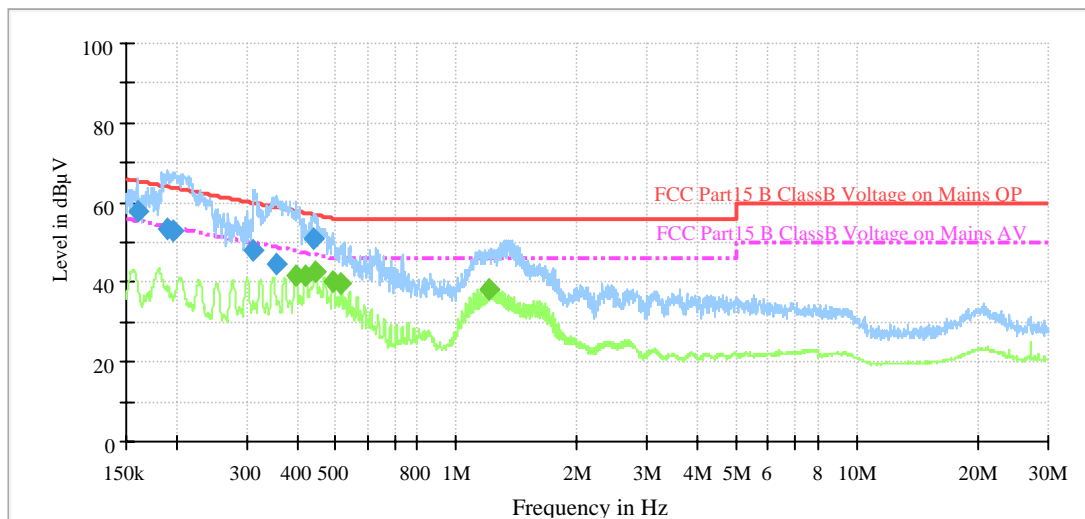
Temperature:	24 °C
Relative Humidity:	70 %
ATM Pressure:	101.1 kPa

The testing was performed by Kevin Hu on 2016-06-20.

Test Mode: Running(WAN+LAN+Talking)

For Adapter Mode

AC120V/60Hz, Line

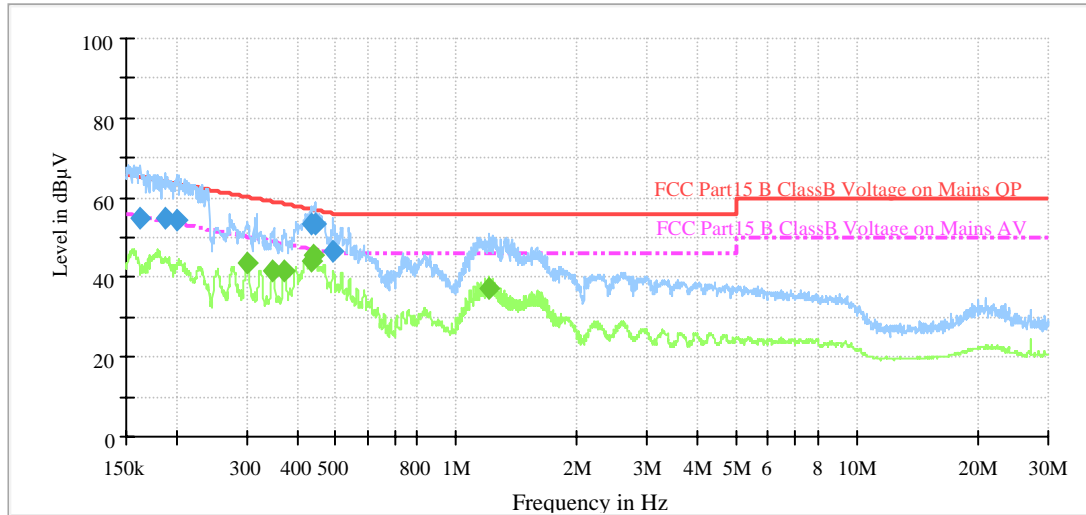


Note: Blue plot is Peak plot. Green plot is Average plot.

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.159585	58.1	9.000	L1	18.8	7.4	65.5
0.189124	53.5	9.000	L1	18.9	10.6	64.1
0.196442	52.9	9.000	L1	18.9	10.9	63.8
0.311658	47.9	9.000	L1	19.6	12.0	59.9
0.357012	44.5	9.000	L1	19.7	14.3	58.8
0.442109	50.8	9.000	L1	19.9	6.3	57.0

Frequency (MHz)	Average (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.396892	41.7	9.000	L1	19.9	6.2	47.9
0.420568	41.7	9.000	L1	19.9	5.7	47.4
0.444766	42.8	9.000	L1	19.9	4.2	47.0
0.493462	40.4	9.000	L1	19.9	5.7	46.1
0.516668	39.7	9.000	L1	20.0	6.3	46.0
1.202977	38.0	9.000	L1	20.0	8.0	46.0

AC120V/60Hz, Neutral



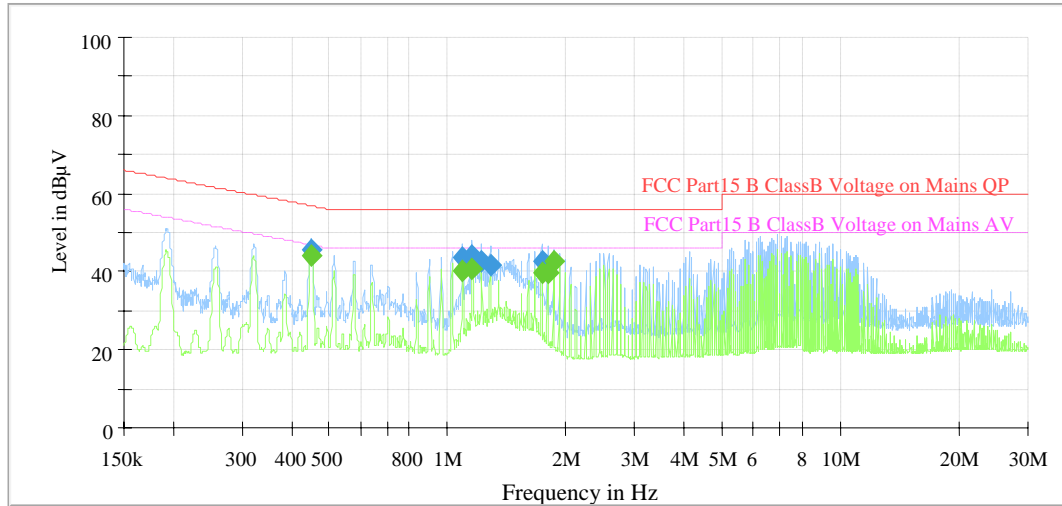
Note: Blue plot is Peak plot. Green plot is Average plot.

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.163131	54.8	9.000	N	18.8	10.5	65.3
0.187244	54.8	9.000	N	18.8	9.4	64.2
0.200006	54.2	9.000	N	18.8	9.4	63.6
0.432498	53.4	9.000	N	19.9	3.8	57.2
0.444766	53.3	9.000	N	19.9	3.7	57.0
0.493462	46.7	9.000	N	19.9	9.4	56.1

Frequency (MHz)	Average (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.300648	43.6	9.000	N	19.5	6.6	50.2
0.348554	41.8	9.000	N	19.7	7.2	49.0
0.373055	41.7	9.000	N	19.8	6.7	48.4
0.432498	43.9	9.000	N	19.9	3.3	47.2
0.439466	45.7	9.000	N	19.9	*1.4	47.1
1.205383	37.4	9.000	N	20.0	8.6	46.0

For POE Mode

AC120V/60Hz, Line



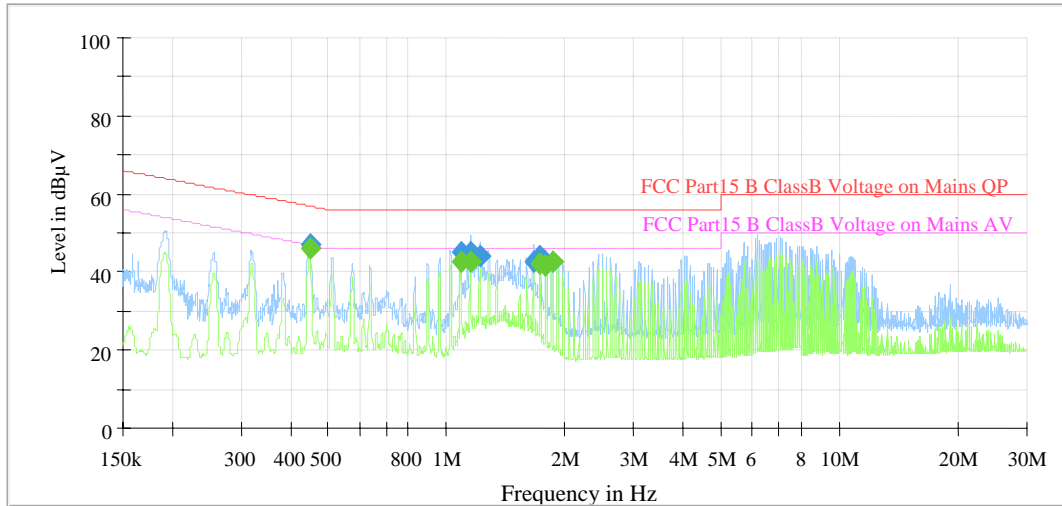
Note: Blue plot is Peak plot. Green plot is Average plot.

Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.450130	45.8	9.000	L1	19.9	11.1	56.9
1.092966	43.8	9.000	L1	19.9	12.2	56.0
1.155854	44.1	9.000	L1	20.0	11.9	56.0
1.219920	42.5	9.000	L1	20.0	13.5	56.0
1.284968	41.9	9.000	L1	20.0	14.1	56.0
1.734005	42.6	9.000	L1	20.0	13.4	56.0

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.449232	44.3	9.000	L1	19.9	*2.6	46.9
1.090785	40.4	9.000	L1	19.9	5.6	46.0
1.155854	40.8	9.000	L1	20.0	5.2	46.0
1.734005	39.9	9.000	L1	20.0	6.1	46.0
1.797502	39.5	9.000	L1	20.0	6.5	46.0
1.863324	42.5	9.000	L1	20.1	3.5	46.0

* Within Measurement Uncertainty

AC120V/60Hz,Neutral



Note: Blue plot is Peak plot. Green plot is Average plot.

Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.447440	46.9	9.000	N	19.9	10.0	56.9
1.088607	44.9	9.000	N	20.0	11.1	56.0
1.151244	45.2	9.000	N	20.0	10.8	56.0
1.215055	44.1	9.000	N	20.0	11.9	56.0
1.662755	42.7	9.000	N	20.0	13.3	56.0
1.727090	43.9	9.000	N	20.0	12.1	56.0

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.447440	45.9	9.000	N	19.9	*1.0	46.9
1.086435	42.6	9.000	N	20.0	3.4	46.0
1.151244	42.7	9.000	N	20.0	3.3	46.0
1.727090	42.1	9.000	N	20.0	3.9	46.0
1.790334	41.6	9.000	N	20.0	4.4	46.0
1.855893	42.4	9.000	N	20.1	3.6	46.0

* Within Measurement Uncertainty

FCC §15.109 RADIATED EMISSION TEST

Applicable Standard

FCC §15.109

Measurement Uncertainty

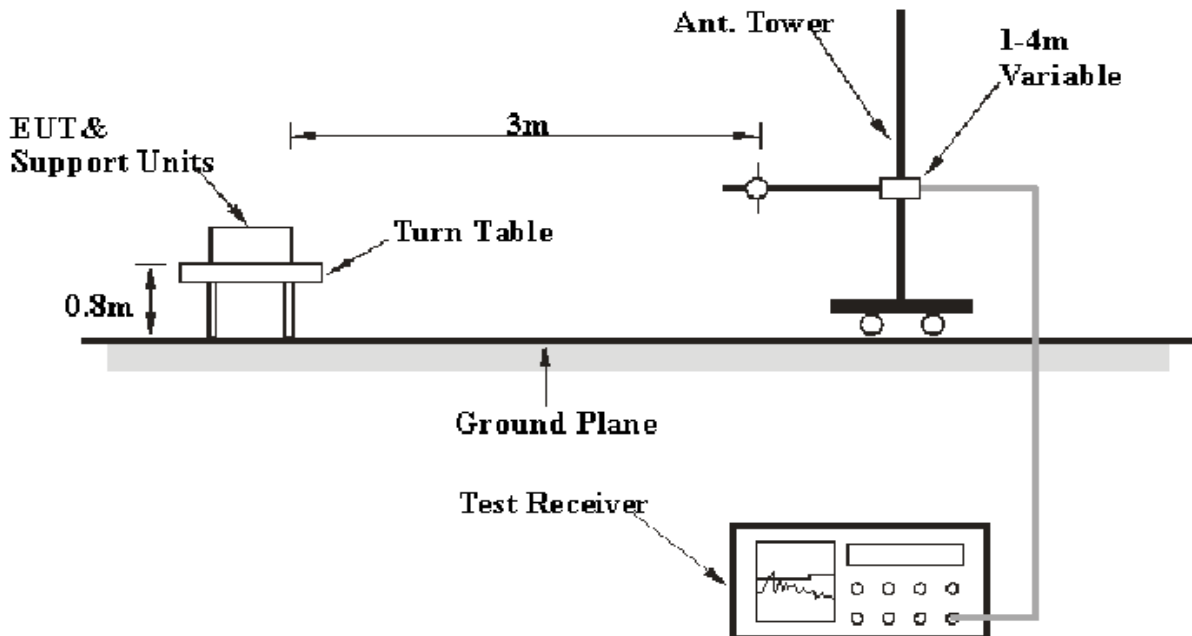
All measurements involve certain levels of uncertainties, especially in the field of EMI. The factors contributing to uncertainties are EMI Test Receiver, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor 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.

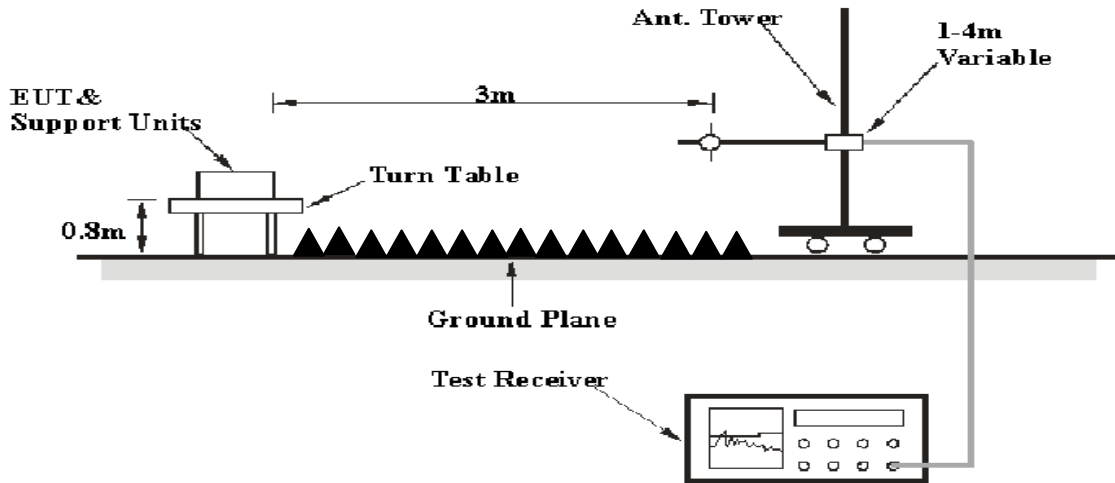
EUT Setup

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 or POE was connected to AC120V/60Hz.

EMI Test Receiver Setup

Per FCC 15.33 requirement, the highest frequency in the device is 1 GHz, so the frequency range to be 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 7dB 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
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	2016-04-10	2019-04-09
Rohde & Schwarz	Spectrum Analyzer	FSEM30	100018	2015-12-02	2016-12-01
EM TEST	Horn Antenna	3115	003-6076	2015-12-02	2016-12-01
Ducommun Technologies	Horn Antenna	ARH-4223-02	1007726-0113024	2014-06-16	2017-06-15
Mini-circuits	Amplifier	ZVA-183-S+	771001215	2016-5-20	2017-5-19
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.4	N/A	2015-11-10	2016-11-09
N/A	RF Cable (above 1GHz)	NO.2	N/A	2015-11-10	2016-11-09
WEINSCHEL ENGINEERING	Attenuator	1A10dB	AA4135	2015-11-10	2016-11-09
Rohde & Schwarz	EMC32	N/A	V 8.54.0	N/A	N/A

* **Statement of Traceability:** BA CL (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 standards.

Please refer to the Test Data and Plots.

Radiated Emission Test

Test Environment Conditions

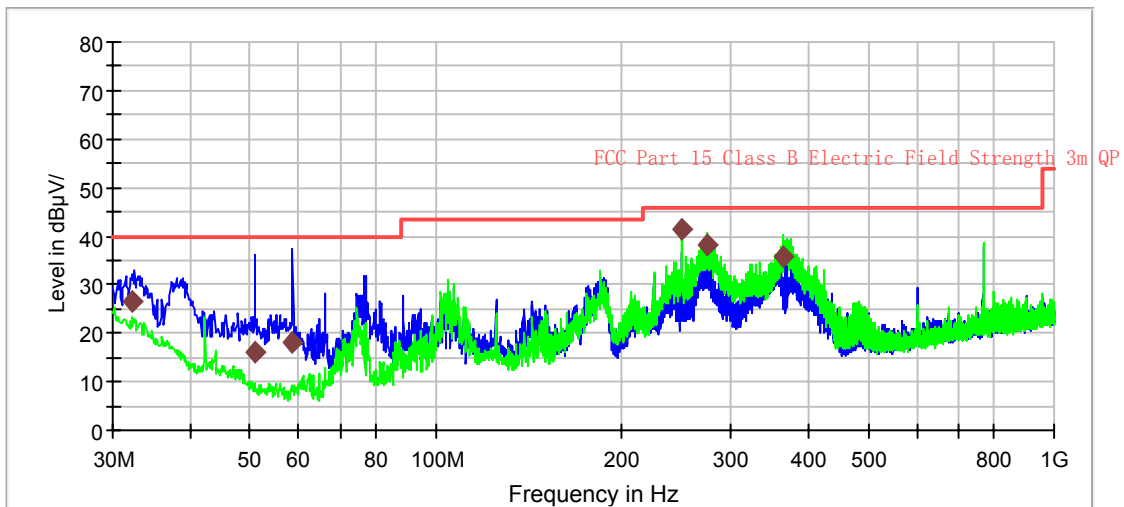
Temperature:	24 °C
Relative Humidity:	70 %
ATM Pressure:	101.3 kPa

The testing was performed by Kevin Hu on 2016-06-20.

Test Mode: Running(WAN+LAN+Talking)
For Adapter Mode

1) 30MHz-1GHz:

Electric Field Strength with Auto Test



Frequency (MHz)	QuasiPeak (dBµV/m)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
32.346000	26.3	120.000	100.0	V	35.0	-7.0	13.7	40.0
50.994850	15.9	120.000	100.0	V	257.0	-19.5	24.1	40.0
58.576600	18.2	120.000	225.0	V	13.0	-20.4	21.8	40.0
249.999900	41.6	120.000	175.0	H	184.0	-14.0	*4.4	46.0
274.985600	38.2	120.000	175.0	H	225.0	-12.4	7.8	46.0
365.307800	35.6	120.000	100.0	H	336.0	-10.8	10.4	46.0

* Within Measurement Uncertainty

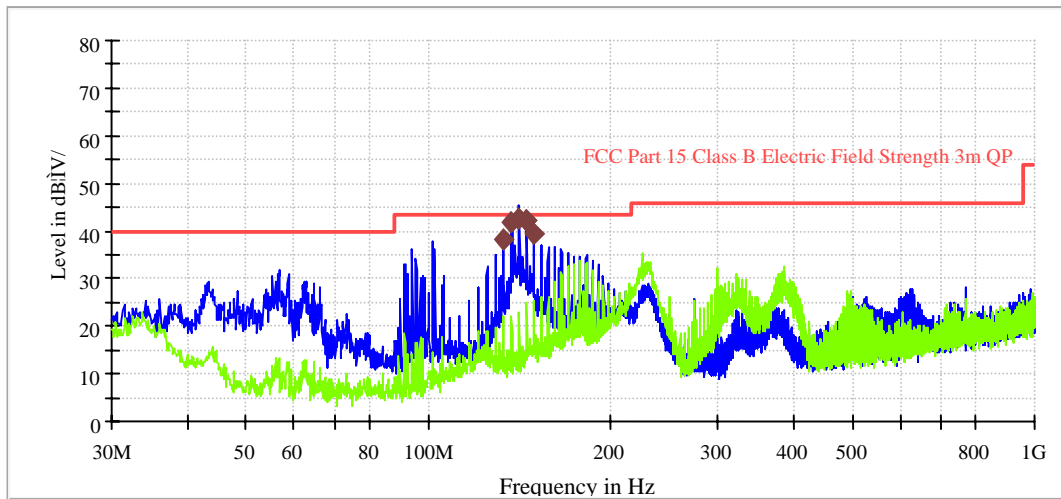
2) 1-5 GHz:

Frequency	Result	Polarity	Detector	Corrected factor	Limit	Antenna Height	Turntable Position	Margin
MHz	(dB μ V/m)	V/H	QP/Ave.	(dB)	(dB μ V/m)	(cm)	(deg)	(dB)
1250.000	56.15	V	PK	1.07	74	100	135	17.85
1250.000	35.43	V	AV	1.07	54	100	135	18.57
2180.000	56.36	V	PK	0.78	74	100	172	17.64
2180.000	35.58	V	AV	0.78	54	100	172	18.42
3200.000	57.22	H	PK	2.14	74	120	161	16.78
3200.000	35.69	H	AV	2.14	54	120	161	18.31

For POE Mode

1) 30MHz-1GHz:

Electric Field Strength with Auto Test



Frequency (MHz)	QuasiPeak (dB μ V/m)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)
133.112900	38.3	120.000	100.0	V	19.0	-13.4	5.2	43.5
137.209150	42.0	120.000	100.0	V	11.0	-14.0	*1.5	43.5
141.318750	42.7	120.000	100.0	V	19.0	-14.4	*0.8	43.5
145.400850	42.2	120.000	100.0	V	19.0	-14.5	*1.3	43.5
145.403450	42.2	120.000	100.0	V	19.0	-14.5	*1.3	43.5
149.512400	39.2	120.000	100.0	V	19.0	-14.5	*4.3	43.5

* Within Measurement Uncertainty

2) 1-5 GHz:

Frequency	Result	Polarity	Detector	Corrected factor	Limit	Antenna Height	Turntable Position	Margin
MHz	(dB μ V/m)	V/H	QP/Ave.	(dB)	(dB μ V/m)	(cm)	(deg)	(dB)
1251.078	57.23	V	PK	1.07	74	110	98	16.77
1251.078	34.68	V	AV	1.07	54	110	98	19.32
2180.689	57.22	V	PK	0.78	74	100	105	16.78
2180.689	34.41	V	AV	0.78	54	100	105	19.59
3219.962	60.05	H	PK	2.14	74	120	223	13.95
3219.962	34.69	H	AV	2.14	54	120	223	19.31

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