

FCC PART 15D
MEASUREMENT AND TEST REPORT

For

Porta Phone Company Inc

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FCC ID: B4HHUB2015

Report Type: Original Report	Product Type: DUPLEX WIRELESS SYSTEMS
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Note: This test report is prepared for the customer shown above and for the equipment described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp.

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *Porta Phone Company Inc's* product, model number: *ComStar HUB(HUB2015)* (FCC ID: *B4HHUB2015*) or the "EUT" in this report was a *DUPLEX WIRELESS SYSTEMS*, the base unit was measured approximately: 14.3 mm (L) x 9.0 mm (W) x 5.2 mm (H), input voltage: DC 3.7V battery or DC 5.0V from adapter.

Adapter Information:

Model: YNQX09G050100UL

Input: AC 100-240V, 50/60 Hz, 0.3A

Output: DC 5.0V, 1.0A

** All measurement and test data in this report was gathered from production sample serial number: 20150916 (Assigned by BACL, Shenzhen). The EUT supplied by the applicant was received on 2015-09-16.*

Objective

This test report was based on the Electromagnetic Interference (EMI) tests performed on the EUT. The EMI measurements were performed according to the measurement procedure described in ANSI C63.17 - 2013.

The tests were performed in order to determine the compliance of the EUT with FCC Part 15-Subpart D, section 15.207, 15.315, 15.317, 15.319 and 15.323 rules.

Related Submittal(s)/Grant(s)

No related submittal(s).

Test Methodology

All measurements contained in this report were conducted with ANSI C63.17 - 2013, American National Standard Methods of Measurement of the Electromagnetic and Operational Compatibility of Unlicensed Personal Communications Services (UPCS) Devices.

All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Shenzhen).

The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Measurement uncertainty with radiated emission is 5.91 dB for 30MHz-1GHz and 4.92 dB for above 1GHz, 1.95dB for conducted measurement.

Test Facility

The test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 6/F, the 3rd Phase of WanLi Industrial Building, ShiHua Road, FuTian Free Trade Zone Shenzhen, Guangdong, China.

Test site at Bay Area Compliance Laboratories Corp. (Shenzhen) 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 October 31, 2013. 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.: 382179. 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

Description of Test Configuration

The system was configured for testing in TBR6 mode which is provided by the manufacturer.

Equipment Modifications

No modification was made to the EUT tested.

Support Equipment List and Details

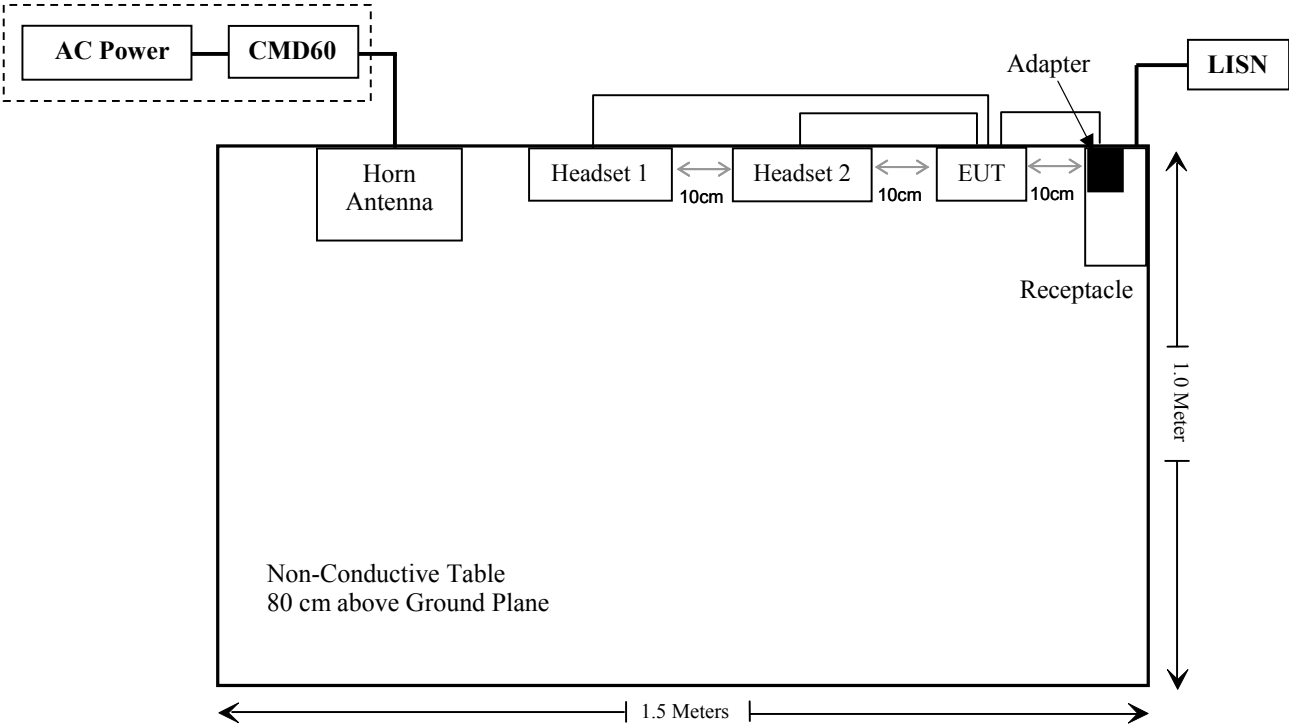
Manufacturer	Description	Model	Serial Number
R&S	Digital Radio-Communication Tester	CMD60	829902/026

External I/O Cable

Cable Description	Length (m)	From/Port	To
Un-shielding Un-detachable DC Power Cable	1.55	Adapter	EUT
Un-shielding un-detachable Audio cable	0.9	EUT	Handset 1
Un-shielding un-detachable Audio cable	0.9	EUT	Handset 2

Block Diagram of Test Setup

For conducted emission:



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§1.1307(b);§2.1093	RF Exposure	Compliance
§ 15.317, § 15.203	Antenna Requirement	Compliance
§ 15.315, § 15.207	Conducted Emission	Compliance
§ 15.323 (a)	Emission Bandwidth	Compliance*
§ 15.319 (c)	Peak Transmit Power	Compliance*
§ 15.319 (d)	Power Spectral Density	Compliance*
§ 15.323 (d)	Emission Inside and Outside the sub-band	Compliance*
§ 15.319 (g)	Radiated Emission	Compliance
§ 15.323 (f)	Frequency Stability Handset	Compliance*
§ 15.323 (c)(e) § 15.319 (f)	Specific Requirements for UPCS	Compliance*

Compliance*: the EUT (Model: ComStar HUB(HUB2015), FCC ID: B4HHUB2015) has used a certified module with model RF1G9V1 (FCC ID: B4HRF1900V1), the different test data between them are “FCC§15.315 & §15.207 - CONDUCTED EMISSIONS” and “FCC§15.319 (g) - RADIATED EMISSIONS”, so all the other test data are referred to the report RSZ151110830-00 with model number RF1G9V1 (FCC ID: B4HRF1900V1), issued on 2015-11-26 by Bay Area Compliance Laboratories Corp. (Shenzhen)

§1.1307 (b) (1) & §2.1093 – RF EXPOSURE

Applicable Standard

According to FCC §2.1093 and §1.1307(b) (1), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

According to KDB 447498 D01 General RF Exposure Guidance

1. For Standalone SAR test exclusion considerations:

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:

$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f_{\text{GHz}}}] \leq 3.0$ for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where

1. f_{GHz} is the RF channel transmit frequency in GHz.
2. Power and distance are rounded to the nearest mW and mm before calculation.
3. The result is rounded to one decimal place for comparison.
4. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test Exclusion.

Evaluation data:

The maximum tune-up conducted peak output power is 20 dBm(100 mW) @1928.448 MHz

And

Duty Cycle = $T_{\text{on}}/T_{\text{p}} \times 100\% = 4.10\%$

Which, $T_{\text{on}} = 412 \mu\text{s}$, $T_{\text{p}} = 10.05 \text{ ms}$, please refer to the report RSZ151110830-00 with model number RF1G9V1 (FCC ID: B4HRF1900V1) page 44 and 45 for plot detail

So, the maximum conducted source-based, time-averaged output power is:

$100 \times 4.10\% \text{ mW} = 4.10 \text{ mW} @ 1928.448 \text{ MHz}$

$(4.10/5) \times \sqrt{1.928448} = 1.14 < 3.0$

Result: No SAR test is required for Standalone SAR

2. Simultaneous transmission SAR test exclusion considerations

When an antenna qualifies for the standalone SAR test exclusion of 4.3.1 and also transmits simultaneously with other antennas, the standalone SAR value must be estimated according to the following to determine the simultaneous transmission SAR test exclusion criteria:

$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f_{\text{GHz}}/x}] \text{ W/kg}$, for test separation distances ≤ 50 mm;
where $x = 7.5$ for 1-g SAR and $x = 18.75$ for 10-g SAR.

Estimated SAR (1-g SAR) per chain:

$(4.10/5) \times (\sqrt{1.928448/7.5}) = 0.152 \text{ W/kg}$

Summation SAR = $0.152 \times 2 = 0.304 < 1.6 \text{ W/kg}$

Result: No SAR test is required for Simultaneous transmission SAR

FCC§15.317 & §15.203 - ANTENNA REQUIREMENT

Applicable Standard

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 four integral antennas arrangement, which was permanently attached and the gain is 0 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

Result: Compliant.

FCC§15.315 & §15.207 - CONDUCTED EMISSIONS

Applicable Standard

FCC§15.315, an unlicensed PCS device that is designed to be connected to the public utility (AC) power line must meet the limits specified in §15.207.

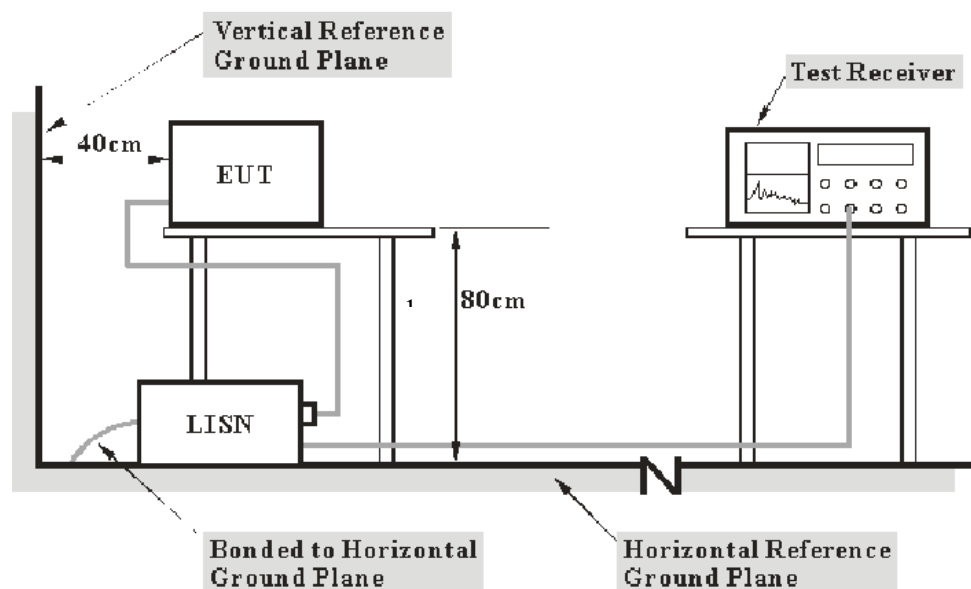
Measurement Uncertainty

Input quantities to be considered for conducted disturbance measurements maybe receiver reading, attenuation of the connection between AMN/ISN and receiver, AMN/ISN voltage division factor, AMN/ISN VDF frequency interpolation and receiver related input quantities, etc.

Based on CISPR 16-4-2:2011, the expended combined standard uncertainty of conducted disturbance test at Bay Area Compliance Laboratories Corp. (Shenzhen) is shown as below. And the uncertainty will not be taken into consideration for the test data recorded in the report

Port	Measurement uncertainty
AC Mains	3.26 dB (k=2, 95% level of confidence)
CAT 3	3.70 dB (k=2, 95% level of confidence)
CAT 5	3.86 dB (k=2, 95% level of confidence)
CAT 6	4.64 dB (k=2, 95% level of confidence)

EUT Setup



- 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 setup of EUT is according with per ANSI C63.4-2014 measurement procedure. The specification used was with the FCC 15.315 and FCC 15.207 limits.

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

The spacing between the peripherals was 10 cm.

The adapter was connected to a 120 VAC/60 Hz 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

During the conducted emission test, adapter was connected to the outlet of the LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All final data was recorded in the Quasi-peak and average detection mode.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCS30	100176	2015-06-03	2016-06-03
Rohde & Schwarz	LISN	ENV216	3560.6650.12-101613-Yb	2015-12-01	2016-12-01
Rohde & Schwarz	Transient Limiter	ESH3Z2	DE25985	2015-05-14	2016-05-14
Rohde & Schwarz	CE Test software	EMC 32	V8.53	NCR	NCR

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

Corrected Factor & Margin Calculation

The Corrected factor is calculated by adding the Outlet Cable Loss, LISN Insertion Loss, Cable Loss and Transient Limiter Attenuation. The basic equation is as follows:

Correction Factor = Outlet Cable Loss + LISN Insertion Loss + Cable Loss + Transient Limiter Attenuation

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7 dB means the emission is 7 dB below the 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 worst margin reading as below:

13.4 dB at 0.459190 MHz in the Neutral conducted mode

Refer to CISPR16-4-2:2011 and CISPR 16-4-1:2009, the measured level is in compliance with the limit if

$$L_m + U_{(Lm)} \leq L_{lim} + U_{cisp\text{r}}$$

In BACL, $U_{(Lm)}$ is less than $U_{cisp\text{r}}$, if L_m is less than L_{lim} , it implies that the EUT complies with the limit.

Test Data

Environmental Conditions

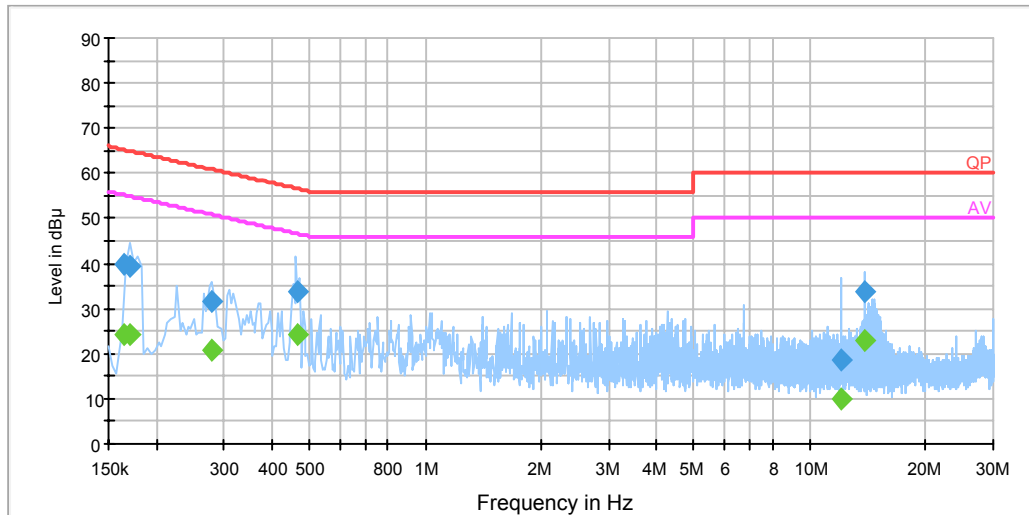
Temperature:	24 °C
Relative Humidity:	52 %
ATM Pressure:	101.0 kPa

The testing was performed by Candy Li on 2015-12-04.

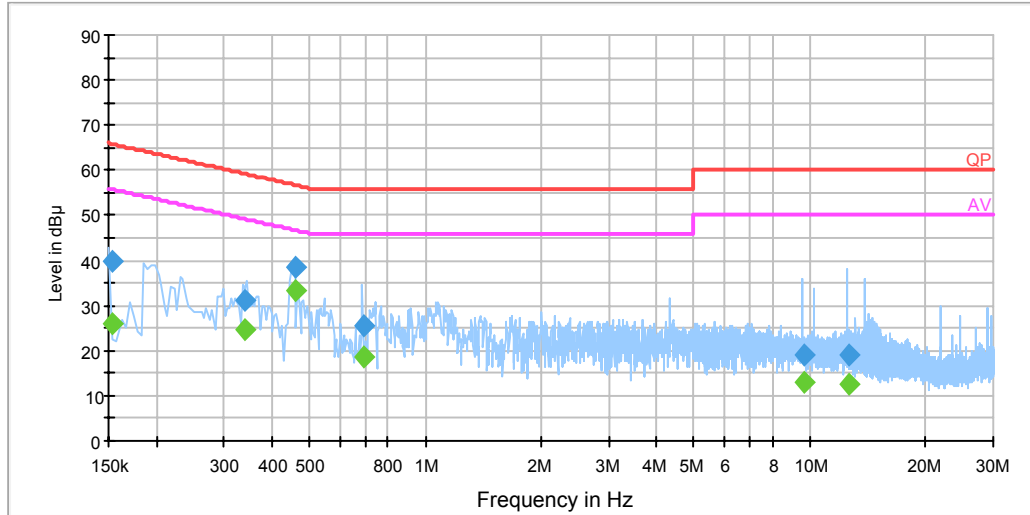
Test mode: Transmitting

AC 120V/60 Hz, Line

EMI Auto Test L



Frequency (MHz)	Corrected Amplitude (dBμV)	Corrected Factor (dB)	Limit (dBμV)	Margin (dB)	Detector (PK/QP/Ave)
0.165500	39.9	20.0	65.2	25.3	QP
0.165500	24.3	20.0	55.2	30.9	Ave.
0.170501	39.4	20.0	64.9	25.5	QP
0.170501	24.3	20.0	54.9	30.6	Ave.
0.277500	31.4	19.9	60.9	29.5	QP
0.277500	20.9	19.9	50.9	30.0	Ave.
0.463070	33.9	19.9	56.6	22.7	QP
0.463070	24.4	19.9	46.6	22.2	Ave.
12.096350	18.7	20.1	60.0	41.3	QP
12.096350	10.1	20.1	50.0	39.9	Ave.
13.826610	33.9	20.1	60.0	26.1	QP
13.826610	23.0	20.1	50.0	27.0	Ave.

AC 120V/60 Hz, Neutral**EMI Auto Test N**

Frequency (MHz)	Corrected Amplitude (dBμV)	Corrected Factor (dB)	Limit (dBμV)	Margin (dB)	Detector (PK/QP/Ave)
0.154000	39.7	20.0	65.8	26.1	QP
0.154000	25.9	20.0	55.8	29.9	Ave.
0.340870	31.2	19.9	59.2	28.0	QP
0.340870	24.8	19.9	49.2	24.4	Ave.
0.459190	38.7	19.9	56.7	18.0	QP
0.459190	33.3	19.9	46.7	13.4	Ave.
0.695710	25.4	19.9	56.0	30.6	QP
0.695710	18.7	19.9	46.0	27.3	Ave.
9.705970	19.1	20.1	60.0	40.9	QP
9.705970	13.2	20.1	50.0	36.8	Ave.
12.614890	19.0	20.1	60.0	41.0	QP
12.614890	12.5	20.1	50.0	37.5	Ave.

Note:

- 1) Correction Factor = LISN VDF (Voltage Division Factor) + Cable Loss + Transient Limiter Attenuation
The corrected factor has been input into the transducer of the test software.
- 2) Corrected Amplitude = Reading + Correction Factor
- 3) Margin = Limit – Corrected Amplitude

FCC§15.319 (g) - RADIATED EMISSIONS

Applicable Standard

According to FCC§15.319(g), notwithstanding other technical requirements specified in this subpart, attenuation of emissions below the general emission limits in §15.209 is not required.

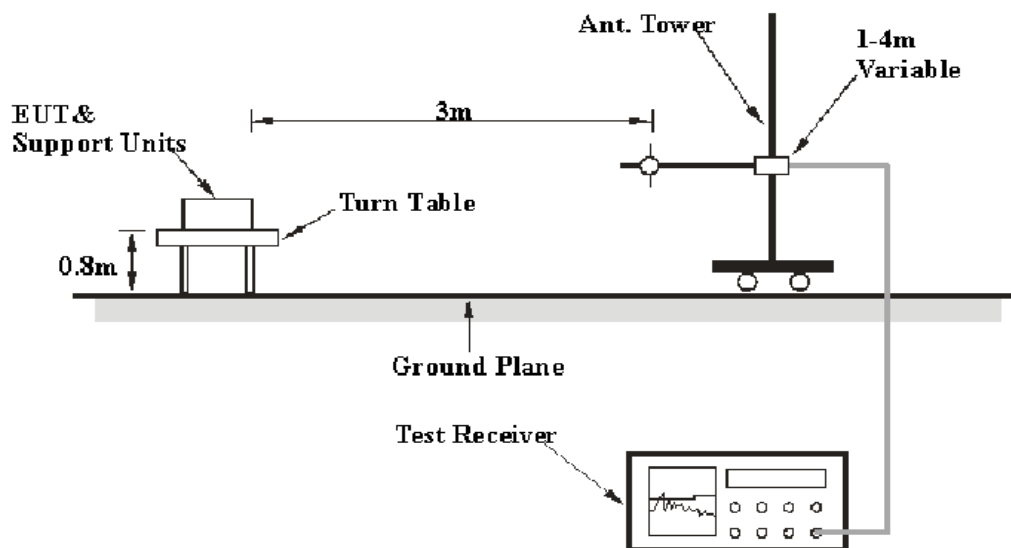
Measurement Uncertainty

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.

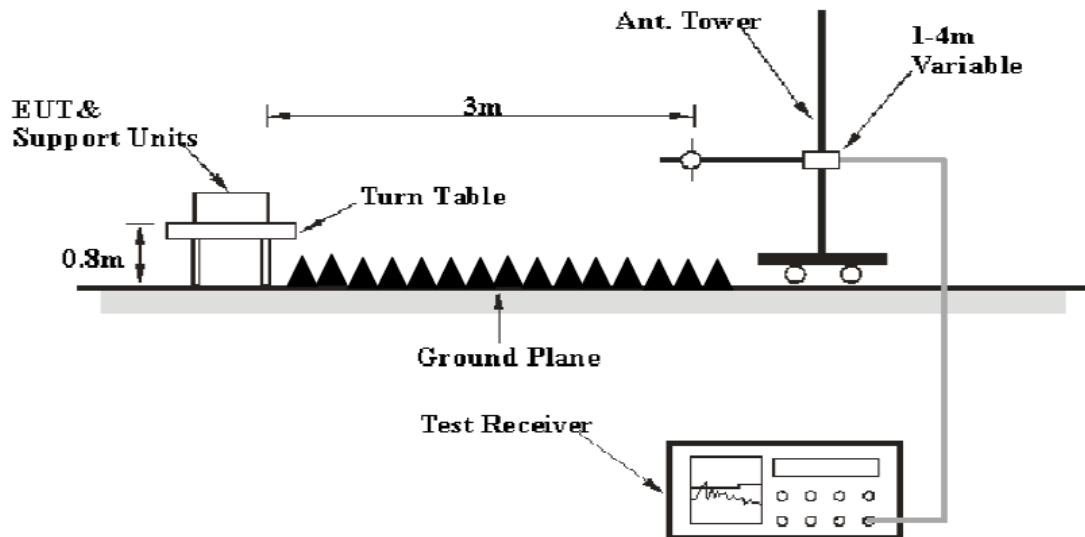
Based on CISPR 16-4-2:2011, the expanded combined standard uncertainty of radiation emissions at Bay Area Compliance Laboratories Corp. (Shenzhen) is 5.91 dB for 30MHz-1GHz and 4.92 dB for above 1GHz, and it will not be taken into consideration for the test data recorded in the report

EUT Setup

Below 1GHz:



Above 1GHz:



The radiated emission tests were performed in the 3 meters test site, using the setup accordance with the ANSI C63.4 - 2014. The specification used was the FCC 15§ 15.319(g).

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 a 120 VAC/60 Hz power source.

EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 20 GHz.

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

Frequency Range	RBW	Video B/W	IF B/W	Detector
30 MHz – 1000 MHz	100 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 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-1 GHz and peak and Average detection modes for frequencies above 1 GHz.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
HP	Amplifier	HP8447E	1937A01046	2015-05-06	2016-05-06
Rohde & Schwarz	EMI Test Receiver	ESCI	101120	2015-11-12	2016-11-12
Sunol Sciences	Bi-log Antenna	JB1	A040904-2	2014-12-07	2017-12-06
Mini	Pre-amplifier	ZVA-183-S+	5969001149	2015-04-23	2016-04-23
Sunol Sciences	Horn Antenna	DRH-118	A052304	2015-12-01	2016-11-30
Rohde & Schwarz	EMI Test Receiver	ESR	1316.3003K03-101746-zn	2015-06-13	2016-06-13
the electro-Mechanics Co.	Horn Antenna	3116	9510-2270	2013-10-14	2016-10-13
DUCOMMUN	Pre-amplifier	ALN-22093530-01	991373-01	2015-08-03	2016-08-03

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

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 worst margin reading as below:

13.43 dB at 51.34 MHz in the Vertical polarization

Refer to CISPR16-4-2:2011 and CISPR 16-4-1:2009, the measured level is in compliance with the limit if

$$L_m + U_{(Lm)} \leq L_{lim} + U_{cispr}$$

In BACL, $U_{(Lm)}$ is less than U_{cispr} , if L_m is less than L_{lim} , it implies that the EUT complies with the limit.

Test Data

Environmental Conditions

Temperature:	24 °C
Relative Humidity:	52 %
ATM Pressure:	101.0 kPa

**The testing was performed by Candy Li on 2015-12-04.*

Test Result: Compliance. Please refer to following tables

Test mode: Transmitting (Pre-scan with each of antenna for two chains, and the worst case was recorded as below)

30 MHz ~ 20 GHz:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBμV/m)	FCC Part 15.319(g)/209/205	
	Reading (dBμV)	Detector (PK/QP/Ave.)		Height (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
Low Channel (1921.536 MHz)									
51.34	45.39	QP	121	1.9	V	-19.56	25.83	40	14.17
1921.54	107.99	PK	258	2.2	H	3.23	111.22	/	/
1921.54	107.41	PK	285	1.4	V	3.23	110.64	/	/
3843.07	38.70	PK	164	1.2	H	13.75	52.45	74	21.55
3843.07	39.11	PK	244	1.7	V	13.75	52.86	74	21.14
5764.61	34.65	PK	224	1.5	H	19.23	53.88	74	20.12
5764.61	35.89	PK	121	2.3	V	19.23	55.12	74	18.88
Middle Channel (1924.992 MHz)									
51.34	46.13	QP	135	2.2	V	-19.56	26.57	40	13.43
1924.99	103.94	PK	90	2.1	H	3.23	107.17	/	/
1924.99	101.33	PK	243	2.0	V	3.23	104.56	/	/
3849.98	45.96	PK	331	1.3	H	13.75	59.71	74	14.29
3849.98	45.18	PK	175	1.7	V	13.75	58.93	74	15.07
5774.98	35.68	PK	150	2.2	H	19.23	54.91	74	19.09
5774.98	36.19	PK	23	1.7	V	19.23	55.42	74	18.58
High Channel (1928.448 MHz)									
51.34	45.05	QP	176	1.8	V	-19.56	25.49	40	14.51
1928.45	105.55	PK	88	2.3	H	3.23	108.78	/	/
1928.45	103.10	PK	355	1.7	V	3.23	106.33	/	/
3856.90	38.15	PK	169	2.3	H	12.48	50.63	74	23.37
3856.90	37.99	PK	69	2.2	V	12.48	50.47	74	23.53
5785.35	34.46	PK	130	1.9	H	19.23	53.69	74	20.31
5785.35	35.82	PK	75	2.1	V	19.23	55.05	74	18.95

Note:

Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor

Corrected Amplitude = Corrected Factor + Reading

Margin = Limit - Corrected. Amplitude

Field Strength of Radiated Emission Average						
Frequency (MHz)	Corrected Peak Amplitude (dBμV/m)	Rx Antenna	Duty Cycle Factor (dB)	Corrected Average Amplitude (dBμV/m)	FCC Part 15.319(g)/209/205	
		Polar (H/V)			Limit (dBμV/m)	Margin (dB)
Low Channel (1921.536 MHz)						
1921.54	111.22	H	-27.75	83.47	/	/
1921.54	110.64	V	-27.75	82.89	/	/
3843.07	52.45	H	-27.75	24.70	54	29.30
3843.07	52.86	V	-27.75	25.11	54	28.89
5764.61	53.88	H	-27.75	26.13	54	27.87
5764.61	55.12	V	-27.75	27.37	54	26.63
Middle Channel (1924.992 MHz)						
1924.99	107.17	H	-27.75	79.42	/	/
1924.99	104.56	V	-27.75	76.81	/	/
3849.98	59.71	H	-27.75	31.96	54	22.04
3849.98	58.93	V	-27.75	31.18	54	22.82
5774.98	54.91	H	-27.75	27.16	54	26.84
5774.98	55.42	V	-27.75	27.67	54	26.33
High Channel (1928.448 MHz)						
1928.45	108.78	H	-27.75	81.03	/	/
1928.45	106.33	V	-27.75	78.58	/	/
3856.90	50.63	H	-27.75	22.88	54	31.12
3856.90	50.47	V	-27.75	22.72	54	31.28
5785.35	53.69	H	-27.75	25.94	54	28.06
5785.35	55.05	V	-27.75	27.30	54	26.70

Note:

Corrected Average Amplitude = Corrected Peak Amplitude + Duty Cycle Factor

Margin = Limit - Corrected Average Amplitude

Duty Cycle = $T_{on}/T_p \times 100\%$, $T_{on} = 412\mu s$, $T_p = 10.05$

Duty Cycle Factor = $20\lg(\text{Duty Cycle}) = -27.75$

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