FCC PART 15C

TEST REPORT

For

AKUVOX (XIAMEN) NETWORKS CO., LTD.

10/F, No.56, Software Park II , Xiamen, China

FCC ID: 2AHCR-R27X

Report Type:	**Product Name:**
Original Report	Door Phone

Report Number:	RXM170809051-00B
Report Date:	2017-09-20
Reviewed By:	Jerry Zhang EMC Manager
Test Laboratory:	Bay Area Compliance Laboratories Corp. (Dongguan) No.69 Pulongcun, Puxinhu Industry Area, Tangxia, Dongguan, Guangdong, China Tel: +86-769-86858888 Fax: +86-769-86858891 www.baclcorp.com.cn

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GENERAL INFORMATION

Product Description for Equipment Under Test (EUT)

The ***AKUVOX (XIAMEN) NETWORKS CO., LTD.*** 's product, model number: ***R27A (FCC ID: 2AHCR-R27X)*** (the "EUT") in this report was a ***Door Phone*** , which was measured approximately:28cm (L) x 13 cm (W) x 3.2 cm (H), rated input voltage: DC 48V from POE port.

**All measurement and test data in this report was gathered from production sample serial number: 170809051 (Assigned by BACL,Dongguan). The EUT was received on 2017-08-09.*

Objective

This Type approval report is prepared on behalf of ***AKUVOX (XIAMEN) NETWORKS CO., LTD.*** in accordance with Part 2, Subpart J, and Part 15, Subparts A and C of the Federal Communications Commission's rules.

The objective is to determine the compliance of the EUT with FCC rules, sec 15.203, 15.205, 15.207, 15.209 and 15.225.

Related Submittal(s)/Grant(s)

N/A

Test Methodology

All measurements detailed in this Test Report were performed in accordance with ANSI C63.10-2013 "American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices".

All emissions measurement was performed and Bay Area Compliance Laboratories Corp. (Dongguan). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Measurement Uncertainty

Parameter	Measurement Uncertainty
Occupied Channel Bandwidth	±5 %
radiated Emissions	9kHz~30MHz: 4.12dB 30M~200MHz: 4.58 dB for Horizontal, 4.59 dB for Vertical 200M~1GHz: 4.83 dB for Horizontal, 5.85 dB for Vertical
Temperature	±1℃
Humidity	±5%
DC and low frequency voltages	±0.4%
Duty Cycle	1%
AC Power Lines Conducted Emission	3.12 dB (150 kHz to 30 MHz)

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Dongguan) to collect test data is located on the No.69 Pulongcun, Puxinhu Industry Area, Tangxia, Dongguan, Guangdong, China

Bay Area Compliance Laboratories Corp. (Dongguan) has been accredited to ISO 17025 by CNAS(Lab code: L5662). And accredited to ISO 17025 by NVLAP(Test Laboratory Accreditation Certificate Number 500069-0), the FCC Designation No. CN5002 under the KDB 974614 D01.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 273710. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

Bay Area Compliance Laboratories Corp. (Dongguan) was registered with ISED Canada under ISED Canada Registration Number 3062D.

SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliance
§15.207	AC Line Conducted Emission	Compliance
§15.225 §15.209 §15.205	Radiated Emission Test	Compliance
§15.225(e)	Frequency Stability	Compliance
§15.215(c)	20 dB Emission Bandwidth	Compliance

SYSTEM TEST CONFIGURATION

Justification

The system was configured for testing in a test mode.

EUT Exercise Software

No software used in test.

Support Equipment List and Details

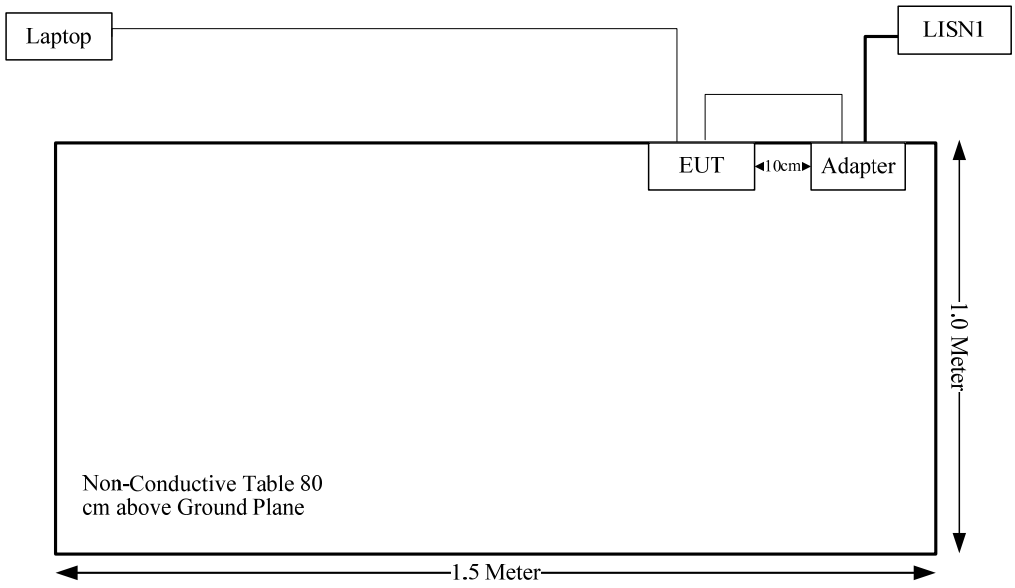
Manufacturer	Description	Model	Serial Number
GOSPELL	Power supply	GP005U-050-200	/
HUAWEI	POE Adapter	PoE35-54A	/
DELL	Laptop	PP11L	QDS-BRCM1017

Support Cable List and Details

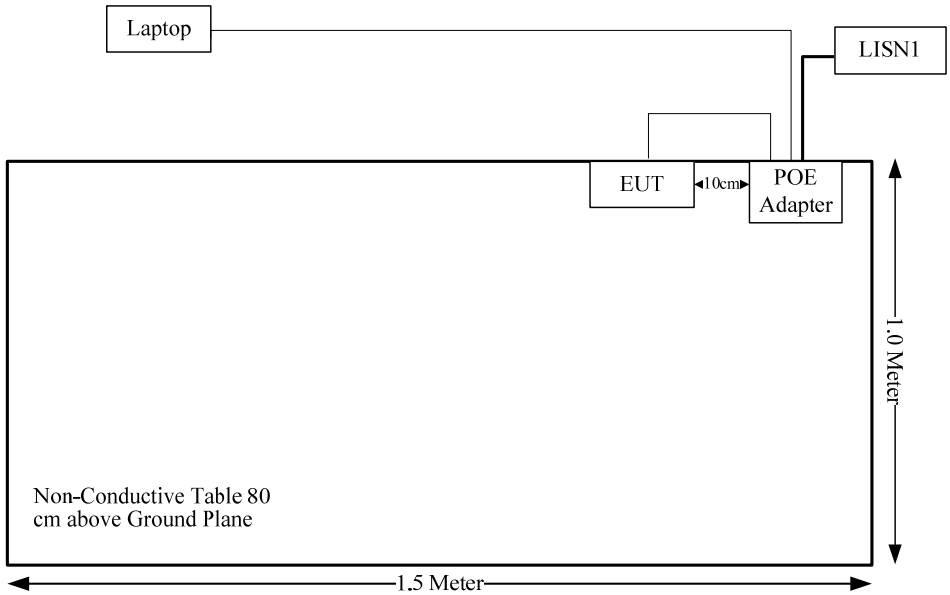
Cable Description	Shielding Type	Ferrite Core	Length (m)	From Port	To
RJ45 cable	Yes	No	1.2	POE Adapter	EUT
DC power cable	No	No	1.2	Adapter	EUT
RJ45 cable	No	No	10	POE Adapter	Laptop

Block Diagram of Test Setup

AC/DC adapter mode:



POE adapter mode:



FCC§15.203 - ANTENNA REQUIREMENT

Applicable Standard

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.

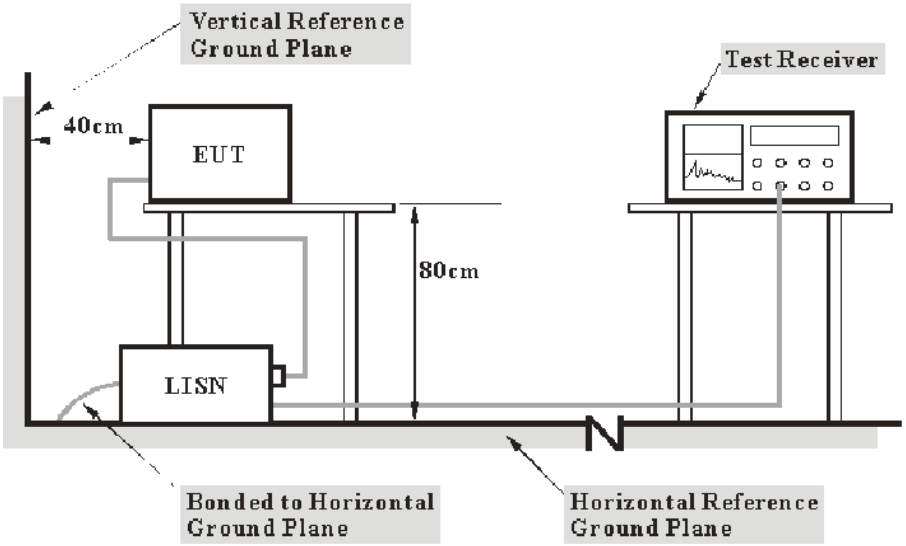
Antenna Connected Construction

The EUT has one integral antenna arrangement, which was permanently attached and fulfill the requirement of this section. Please refer to the EUT photos.

Result: Compliance.

FCC §15.207 – AC LINE CONDUCTED EMISSION

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 C63.10-2013 measurement procedure. The specification used was with the FCC Part 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 the main lisn with an AC 120V/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 Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESCS 30	830245/006	2016-12-08	2017-12-08
R&S	L.I.S.N	ESH2-Z5	892107/021	2017-09-01	2018-09-01
R&S	Two-line V-network	ENV 216	3560.6550.12	2016-12-08	2017-12-08
N/A	Coaxial Cable	2m	C0200/01	2017-09-05	2018-09-05
R&S	Test Software	EMC32	Version8.53.0	N/A	N/A

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

Test Procedure

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

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

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

According FCC publication number 174176,for a device with a permanent antenna operating at or below 30 MHz, the measurements done with a suitable dummy load, in lieu of the permanent antenna under the following conditions: (1) perform the AC line conducted tests with the permanent antenna to determine compliance with the Section 15.207 limits outside the transmitter's fundamental emission band; (2) retest with a dummy load in lieu of the permanent antenna to determine compliance with the Section 15.207 limits within the transmitter's fundamental emission band.

Corrected Amplitude & Margin Calculation

The basic equation is as follows:

$V_C = V_R + A_C + VDF$

Herein,
V_C: corrected voltage amplitude
V_R: reading voltage amplitude

A_c: 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:

Margin = Limit – Corrected Amplitude

Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Part 15.207.

Test Data

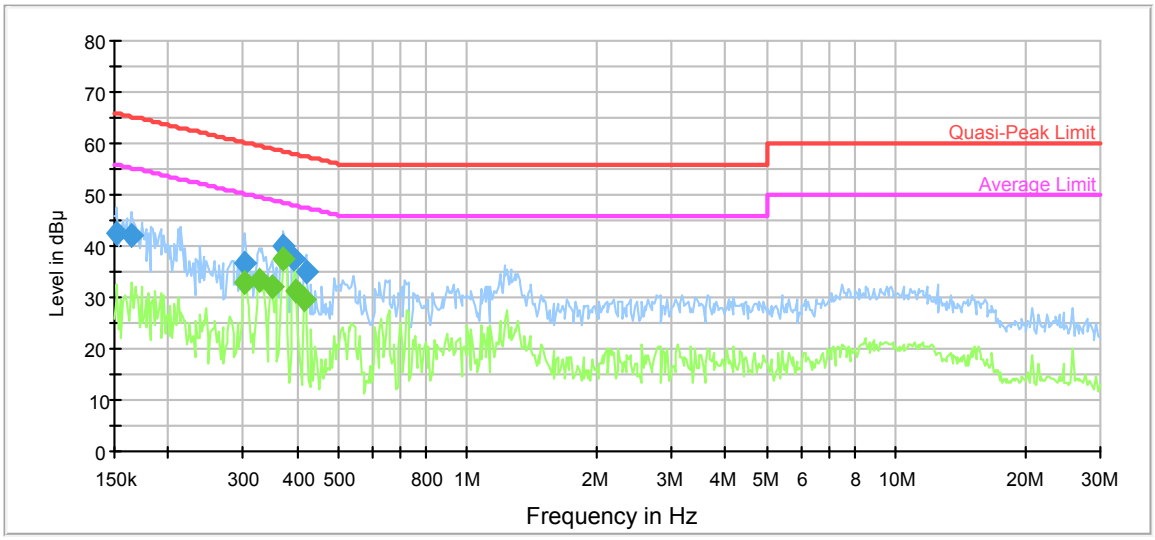
Environmental Conditions

Temperature:	27.2 °C
Relative Humidity:	43 %
ATM Pressure:	99.9 kPa

The testing was performed by Gonggaochao on 2017-08-21.

Test Mode: Transmitting(AC/DC adapter)

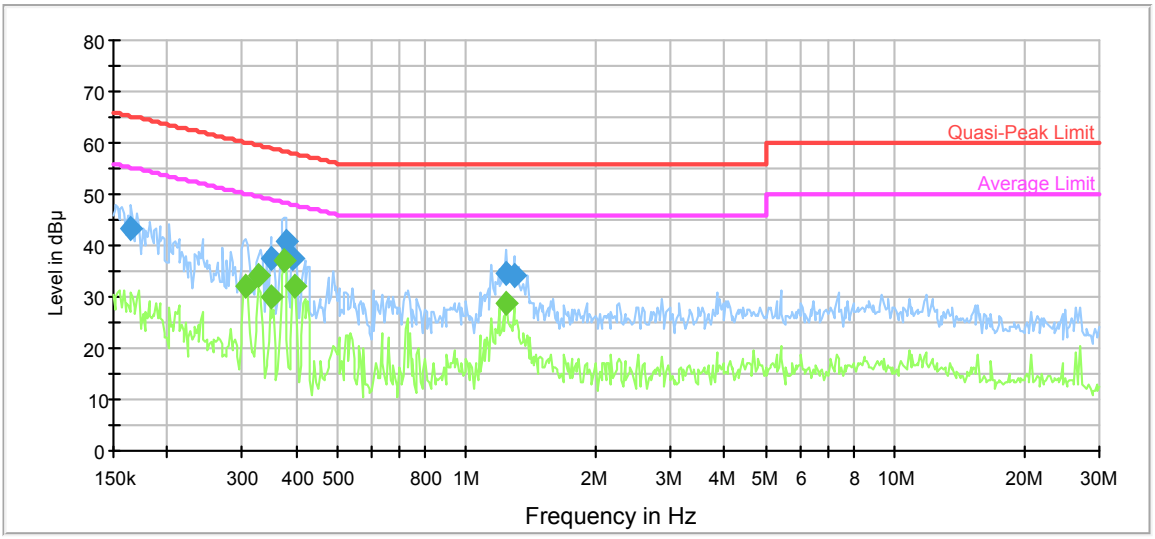
AC 120V, 60 Hz, Line:



Frequency (MHz)	Quasi Peak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.152410	42.4	9.000	L1	11.1	23.5	65.9	Compliance
0.163741	42.1	9.000	L1	11.0	23.2	65.3	Compliance
0.302425	36.6	9.000	L1	10.1	23.6	60.2	Compliance
0.372042	39.8	9.000	L1	10.0	18.7	58.5	Compliance
0.393383	37.6	9.000	L1	10.0	20.4	58.0	Compliance
0.419276	34.8	9.000	L1	9.9	22.7	57.5	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.302425	32.8	9.000	L1	10.1	17.4	50.2	Compliance
0.327509	33.3	9.000	L1	10.1	16.2	49.5	Compliance
0.349066	32.0	9.000	L1	10.0	17.0	49.0	Compliance
0.372042	37.5	9.000	L1	10.0	11.0	48.5	Compliance
0.396530	31.0	9.000	L1	10.0	16.9	47.9	Compliance
0.415949	29.6	9.000	L1	9.9	17.9	47.5	Compliance

AC120 V, 60 Hz, Neutral:

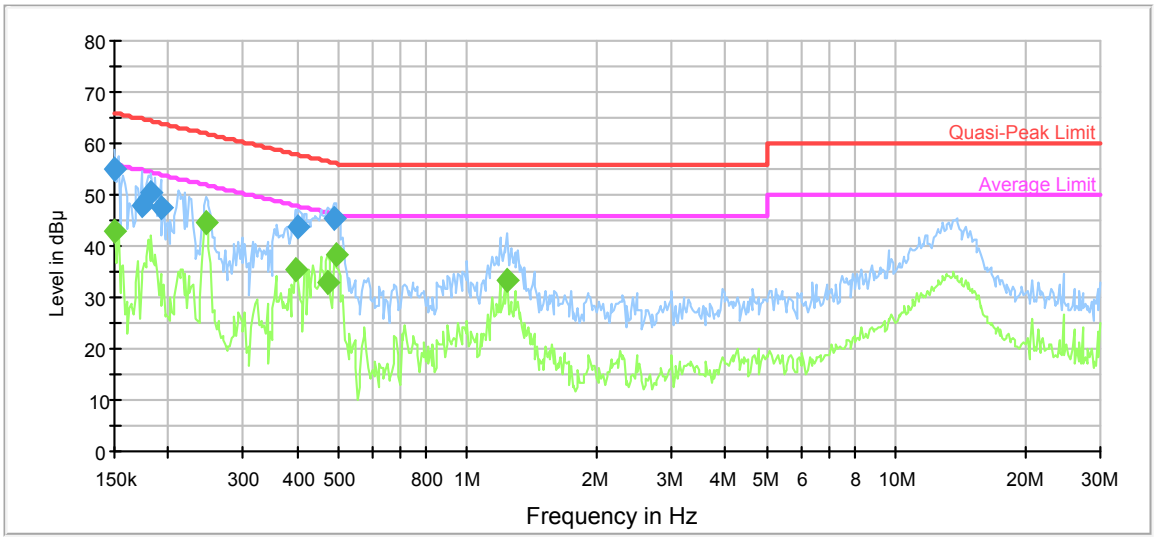


Frequency (MHz)	Quasi Peak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.165051	43.2	9.000	N	11.0	22.0	65.2	Compliance
0.349066	37.3	9.000	N	10.0	21.7	59.0	Compliance
0.378019	40.6	9.000	N	10.0	17.7	58.3	Compliance
0.393383	37.3	9.000	N	10.0	20.7	58.0	Compliance
1.239175	34.8	9.000	N	9.7	21.2	56.0	Compliance
1.289541	34.0	9.000	N	9.7	22.0	56.0	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.150000	41.2	9.000	N	19.7	14.8	56.0	Compliance
0.170396	33.8	9.000	N	19.7	21.2	54.9	Compliance
0.198249	35.2	9.000	N	19.6	18.4	53.7	Compliance
0.465037	28.6	9.000	N	19.6	18.0	46.6	Compliance
1.239175	30.3	9.000	N	19.6	15.7	46.0	Compliance
1.289541	27.3	9.000	N	19.6	18.7	46.0	Compliance

Test Mode: Transmitting(POE adapter)

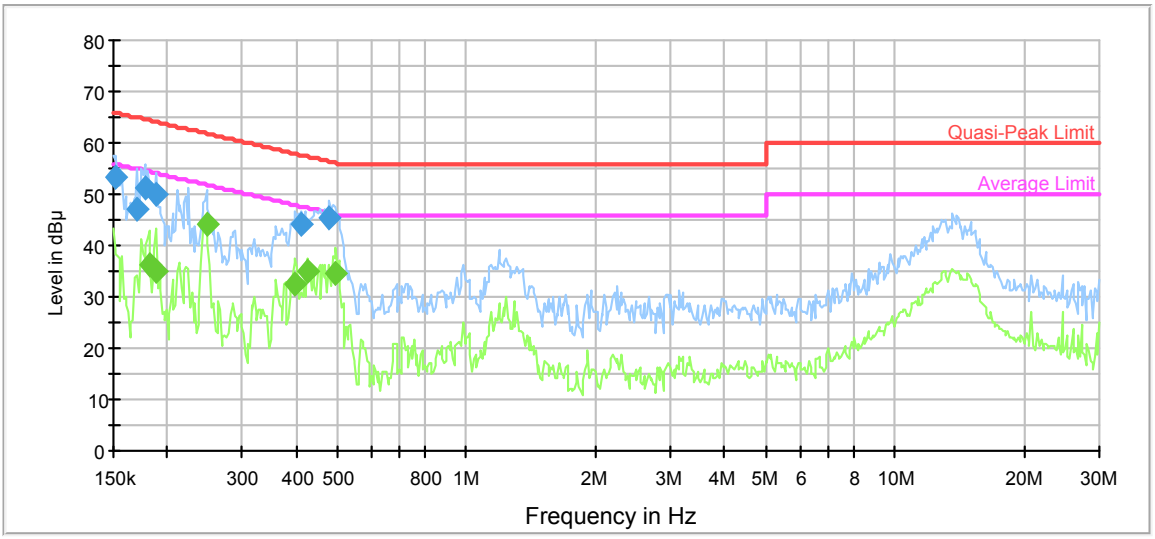
AC 120V, 60 Hz, Line:



Frequency (MHz)	Quasi Peak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.150000	54.8	9.000	L1	11.2	11.2	66.0	Compliance
0.173134	47.7	9.000	L1	10.9	17.1	64.8	Compliance
0.183065	50.3	9.000	L1	10.8	14.0	64.3	Compliance
0.192030	47.6	9.000	L1	10.7	16.3	63.9	Compliance
0.402900	43.8	9.000	L1	10.0	14.0	57.8	Compliance
0.487810	45.4	9.000	L1	9.9	10.8	56.2	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.150000	43.1	9.000	L1	11.2	12.9	56.0	Compliance
0.245835	44.7	9.000	L1	10.3	7.2	51.9	Compliance
0.396530	35.4	9.000	L1	10.0	12.5	47.9	Compliance
0.472507	32.7	9.000	L1	9.9	13.8	46.5	Compliance
0.491712	38.4	9.000	L1	9.9	7.7	46.1	Compliance
1.239175	33.1	9.000	L1	9.7	12.9	46.0	Compliance

AC120 V, 60 Hz, Neutral:



Frequency (MHz)	Quasi Peak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.152410	53.4	9.000	N	11.1	12.5	65.9	Compliance
0.170396	47.2	9.000	N	10.9	17.7	64.9	Compliance
0.177322	51.3	9.000	N	10.8	13.3	64.6	Compliance
0.188994	50.1	9.000	N	10.7	14.0	64.1	Compliance
0.412647	44.1	9.000	N	9.9	13.5	57.6	Compliance
0.480097	45.3	9.000	N	9.9	11.0	56.3	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.181612	36.2	9.000	N	10.8	18.2	54.4	Compliance
0.188994	35.0	9.000	N	10.7	19.1	54.1	Compliance
0.247802	44.1	9.000	N	10.3	7.7	51.8	Compliance
0.399703	32.5	9.000	N	10.0	15.4	47.9	Compliance
0.426011	34.9	9.000	N	9.9	12.4	47.3	Compliance
0.495646	34.5	9.000	N	9.9	11.6	46.1	Compliance

FCC§15.225, §15.205 & §15.209 - RADIATED EMISSIONS TEST

Applicable Standard

As per FCC Part 15.225

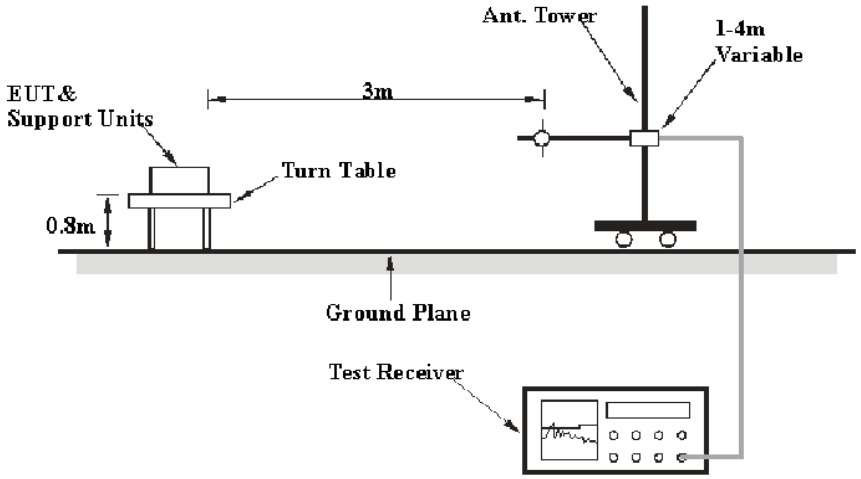
(a) The field strength of any emissions within the band 13.553–13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.

(b) Within the bands 13.410–13.553 MHz and 13.567–13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.

(c) Within the bands 13.110–13.410 MHz and 13.710–14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

(d) The field strength of any emissions appearing outside of the 13.110–14.010 MHz band shall not exceed the general radiated emission limits in §15.209.

EUT Setup



The radiated emission tests were performed in the 3-meter chamber test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC Part Subpart C limits.

The spacing between the peripherals was 10 cm.

EMI Test Receiver Setup

The system was investigated from 9 kHz to 1 GHz.

During the radiated emission test, the EMI test Receiver was set with the following configurations:

Frequency Range	RBW	Video B/W	Detector
9 kHz – 150 kHz	200 Hz	1 kHz	QP
150 kHz – 30 MHz	9 kHz	30 kHz	QP
30 MHz – 1000 MHz	120 kHz	300 kHz	QP

Corrected Amplitude & Margin Calculation

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

Corr. Ampl. = Meter Reading + Antenna Factor + Cable Loss - 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:

Margin = Limit - Corr. Ampl.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESCI	100224	2017-09-01	2018-09-01
Sunol Sciences	Antenna	JB3	A060611-1	2014-11-06	2017-11-06
HP	Amplifier	8447D	2727A05902	2016-09-05	2018-09-05
EMCO	Passive Loop	6512	9706-1206	2017-03-05	2020-03-05
Unknown	Coaxial Cable	4m	C0400/01	2016-09-05	2018-09-05
Unknown	Coaxial Cable	10m	C1000/01	2016-09-05	2018-09-05

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

Test Results Summary

According to the data in the following table, the EUT complied with the FCC Part 15.209&15.225.

Test Data

Environmental Conditions

Temperature:	28.3 °C
Relative Humidity:	48 %
ATM Pressure:	100.2 kPa

** The testing was performed by Costa Dong on 2017-09-07.*

Test mode: Transmitting(AC/DC adapter was the worst)

1) 9 kHz~30 MHz:

Frequency (MHz)	Receiver		Rx Antenna Factor dB(1/m)	Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector (PK/QP/AV)						
8.92	28.7	QP	32.62	0.28	21.42	40.18	69.54	29.36
27.42	30.6	QP	30.42	0.44	21.45	40.01	69.54	29.53
13.648	31.9	QP	32.08	0.35	21.44	42.89	90.50	47.61
13.542	28.4	QP	32.08	0.35	21.44	39.39	90.50	51.11
13.56	54.7	QP	32.08	0.35	21.44	65.69	124.00	58.31
13.164	26.8	QP	32.06	0.35	21.43	37.78	80.50	42.72
13.475	29.5	QP	32.07	0.35	21.43	40.49	80.50	40.01

2) 30 MHz ~1 GHz:

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector (PK/QP/AV)	Polar (H/V)	Factor dB(1/m)					
62.48	42.22	QP	H	7.44	0.56	28.42	21.80	40.00	18.20
143.6	46.95	QP	H	12.96	0.69	28.10	32.50	43.50	11.00
184.5	46.85	QP	H	11.52	0.90	27.87	31.40	43.50	12.10
204.6	46.13	QP	H	12.49	0.93	27.75	31.80	43.50	11.70
344.5	39.05	QP	H	15.00	1.22	27.77	27.50	46.00	18.50
426.8	32.28	QP	H	16.83	1.50	28.41	22.20	46.00	23.80
48.67	53.21	QP	V	9.47	0.40	28.48	34.60	40.00	5.40
56.72	53.44	QP	V	7.70	0.40	28.44	33.10	40.00	6.90
196.64	44.41	QP	V	12.96	0.91	27.78	30.50	43.50	13.00
213.85	36.74	QP	V	11.42	0.95	27.71	21.40	43.50	22.10
429.6	27.95	QP	V	16.85	1.52	28.42	17.90	46.00	28.10
534.8	28.29	QP	V	18.45	1.69	28.83	19.60	46.00	26.40

FCC§15.225(e) - FREQUENCY STABILITY

Applicable Standard

The frequency tolerance of the carrier signal shall be maintained within ±0.01% of the operating frequency over a temperature variation of −20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

Test Procedure

Frequency Stability vs. Temperature: The equipment under test was connected to an external DC power.

The EUT was placed inside the temperature chamber.

After the temperature stabilized for approximately 20 minutes, the frequency output was recorded from the Spectrum Analyzer.

Frequency Stability vs. Voltage: An external variable DC power supply Source. The voltage was set to the end point of the battery. The output frequency was recorded for each voltage.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESCI	100224	2017-09-01	2018-09-01
HP	Amplifier	8447D	2727A05902	2016-09-05	2018-09-05
EMCO	Passive Loop	6512	9706-1206	2017-03-05	2020-03-05
Unknown	Coaxial Cable	4m	C0400/01	2016-09-05	2018-09-05
Unknown	Coaxial Cable	10m	C1000/01	2016-09-05	2018-09-05

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

Test Data

Environmental Conditions

Temperature:	28.4 °C
Relative Humidity:	43 %
ATM Pressure:	100.3 kPa

** The testing was performed by Costa Dong on 2017-09-14.*

Test Mode: Transmitting

Test Result: Pass

f_o = 13.56 MHz				
Temperature	**Voltage**	**Measured frequency**	**Frequency Error**	**Limit**
℃	**V_{AC}**	**MHz**	**%**	**%**
-20	120	13.559910	-0.00066%	0.01%
-10		13.559895	-0.00077%	0.01%
0		13.559926	-0.00055%	0.01%
10		13.559894	-0.00078%	0.01%
20		13.559901	-0.00073%	0.01%
30		13.559896	-0.00077%	0.01%
40		13.559913	-0.00064%	0.01%
50		13.559938	-0.00046%	0.01%
20	138	13.559908	-0.00068%	0.01%
-20	102	13.559910	-0.00066%	0.01%

FCC §15.215(c) – 20 dB EMISSION BANDWIDTH

Applicable Standard

Per FCC §15.215 (c) Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §15.217 through § 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of - band operation.

Test Procedure

Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESCI	100224	2017-09-01	2018-09-01
HP	Amplifier	8447D	2727A05902	2016-09-05	2018-09-05
EMCO	Passive Loop	6512	9706-1206	2017-03-05	2020-03-05
Unknown	Coaxial Cable	4m	C0400/01	2016-09-05	2018-09-05
Unknown	Coaxial Cable	10m	C1000/01	2016-09-05	2018-09-05

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

Test Data

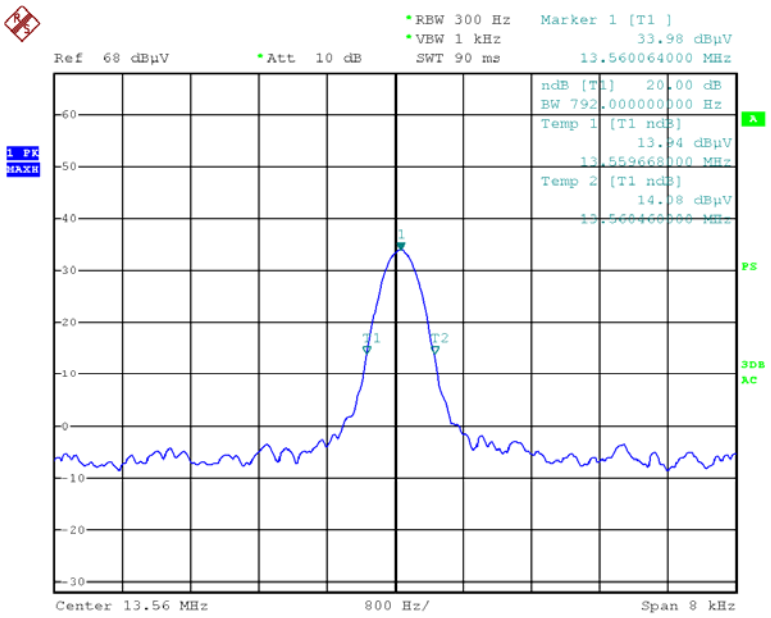
Environmental Conditions

Temperature:	28.4°C
Relative Humidity:	43%
ATM Pressure:	100.3 kPa

** The testing was performed by Costa Dong on 2017-09-14*

Test Mode: Transmitting

20 dB Emission Bandwidth



Date: 14.SEP.2017 23:20:58

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