

FCC PART 15.225

TEST REPORT

For

Jiangsu SEUIC Technology Co.,Ltd

No23, Wenzhu Road, Yuhuatai District Nanjing, Jiangsu, China

FCC ID: 2AC68-CRUISE1

Report Type: Original Report	Product Type: Portable Data Collection Terminal
Test Engineer: Chris Wang <i>Chris Wang</i>	
Report Number: RKS160913001-00M	
Report Date: 2016-12-02	
Reviewed By: EMC Manager Jesse Huang <i>Jesse Huang</i>	
Prepared By: Bay Area Compliance Laboratories Corp. (Kunshan) No.248 Chenghu Road, Kunshan, Jiangsu province, China Tel: +86-0512-86175000 Fax: +86-0512-88934268 www.baclcorp.com.cn	

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.

TABLE OF CONTENTS

GENERAL INFORMATION.....	3
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (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
EQUIPMENT MODIFICATIONS	5
LOCAL SUPPORT EQUIPMENT.....	5
EXTERNAL I/O CABLE.....	5
BLOCK DIAGRAM OF TEST SETUP	6
SUMMARY OF TEST RESULTS	7
FCC§15.203 - ANTENNA REQUIREMENT.....	8
APPLICABLE STANDARD	8
ANTENNA CONNECTED CONSTRUCTION	8
FCC §15.207 - AC LINE CONDUCTED EMISSIONS.....	9
APPLICABLE STANDARD	9
MEASUREMENT UNCERTAINTY.....	9
EUT SETUP	9
EMI TEST RECEIVER SETUP.....	10
TEST PROCEDURE	10
TEST EQUIPMENT LIST AND DETAILS.....	10
CORRECTED FACTOR & MARGIN CALCULATION	10
TEST RESULTS SUMMARY	11
TEST DATA	11
FCC§15.225, §15.205 & §15.209 - RADIATED EMISSIONS TEST	14
APPLICABLE STANDARD	14
MEASUREMENT UNCERTAINTY.....	14
EUT SETUP	14
EMI TEST RECEIVER SETUP.....	15
CORRECTED AMPLITUDE & MARGIN CALCULATION	15
TEST EQUIPMENT LIST AND DETAILS.....	15
TEST RESULTS SUMMARY	16
TEST DATA	16
FCC§15.225(E) - FREQUENCY STABILITY.....	18
APPLICABLE STANDARD	18
TEST PROCEDURE	18
TEST EQUIPMENT LIST AND DETAILS.....	18
TEST DATA	18
§15.215(C) - 20DB EMISSION BANDWIDTH TESTING	20
REQUIREMENT	20
TEST EQUIPMENT LIST AND DETAILS.....	20
TEST PROCEDURE	20
TEST DATA	21

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Manufacturer	Jiangsu SEUIC Technology Co.,Ltd.
Model	CRUISE 1
Series Model	CRUISE 1-HC
Product	Portable Data Collection Terminal
Dimension	152mm(H)×75.9mm(W)×12.8mm(T)
Power input	DC 3.8V From rechargeable battery or DC 5V Adapter

Adapter 1 Information:

Model: SW-3530

INPUT: 100-240V~50/60Hz 0.7A

OUTPUT: 5V, 2.5A

Adapter 2 Information:

Model: FJ-SW1260502000UB

INPUT: 100-240V~50/60Hz 0.4A Max

OUTPUT: 5V, 2000mA

Note: * The difference between tested model and series model was explained in the declaration letter.

*All measurement and test data in this report was gathered from production sample serial number: 20160909001 (Assigned by BACL, Kunshan). The EUT was received on 2016-09-09.

Objective

This Type approval report is prepared on behalf of Jiangsu SEUIC Technology Co.,Ltd. in accordance with Part 2- Subpart J, and Part 15-Subparts A, B and C of the Federal Communication 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)

FCC Part 15B JBP, Part 15.247 DTS, Part 15.247 DSS, Part 15.407 NII and Part 22H24E27 PCE submissions with FCC ID: 2AC68-CRUISE1

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

All radiated and conducted emissions measurement was performed at Bay Area Compliance Lab Corp. (Kunshan). 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. (Kunshan) to collect test data is located on the No.248 Chenghu Road, Kunshan, Jiangsu province, China.

Test site at Bay Area Compliance Laboratories Corp. (Kunshan) 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 December 06, 2014. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 815570. 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

Justification

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

EUT Exercise Software

No exercise software.

Equipment Modifications

No modification on the EUT.

Local Support Equipment

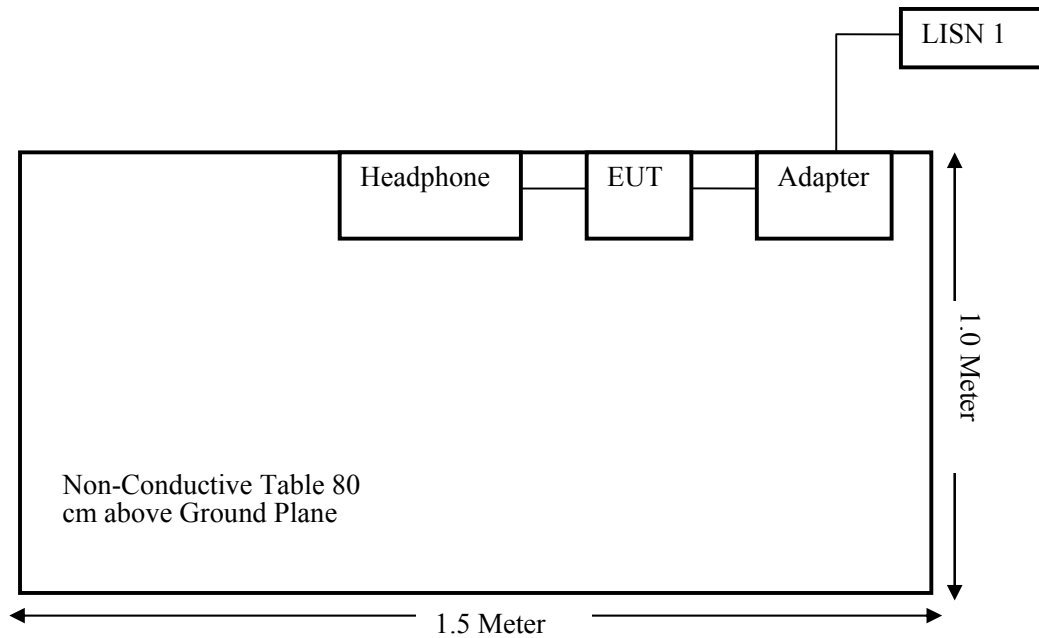
Manufacturer	Description	Model	Serial Number
SEUIC	Headphone	/	/

External I/O Cable

Cable Description	Length (m)	From/Port	To
/	/	/	/

Block Diagram of Test Setup

For conducted emission:



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)	20dB Emission Bandwidth Testing	Compliance

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 a PIFA antenna which was permanently attached; fulfill the requirement of this section. Please see EUT photo for details.

Result: Compliance.

FCC §15.207 - AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC§15.207.

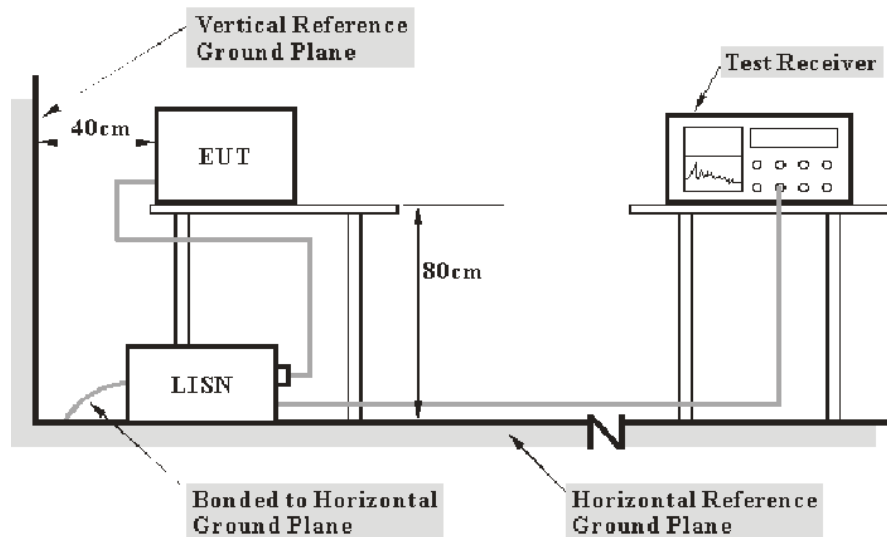
Measurement Uncertainty

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

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

Port	Expanded 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 C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 limits.

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, 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.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCS30	834115/007	2015-11-12	2016-11-11
Rohde & Schwarz	LISN	ESH3-Z5	862770/011	2016-10-10	2017-10-10
Haojintech	Coaxial Cable	HMR400UF	NN11600	2016-09-08	2017-09-08
Rohde & Schwarz	CE Test software	EMC32	V 09.10.0	--	--

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

Corrected Factor & Margin Calculation

The Corrected factor is calculated by adding LISN VDF (Voltage Division Factor), Cable Loss and Transient Limiter Attenuation. The basic equation is as follows:

$$\text{Correction Factor} = \text{LISN VDF} + \text{Cable Loss}$$

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 EUT complied with the FCC Part 15.207, the worst margin reading as below:

9.45dB at 0.605000MHz in the **Line** conducted mode

Refer to CISPR16-4-2 and CISPR 16-4-1, the measured level complies 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.

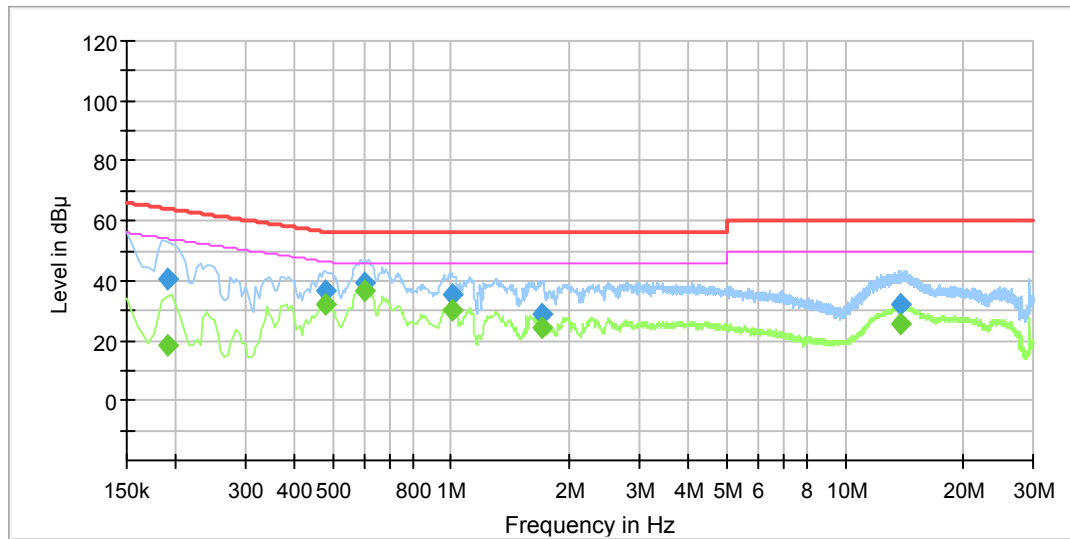
Test Data

Environmental Conditions

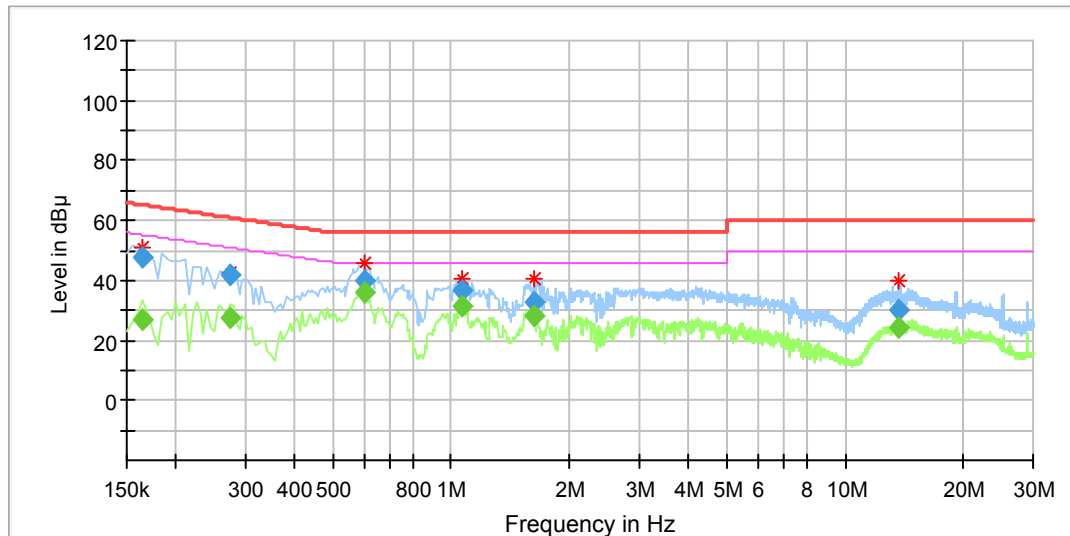
Temperature:	23 °C
Relative Humidity:	56 %
ATM Pressure:	101.0 kPa

The testing was performed by Chris Wang on 2016-10-31.

EUT operation mode: Charging and Transmitting.

AC 120V/60 Hz, Line

Frequency (MHz)	QuasiPeak (dBμV)	Average (dB μ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.190000	---	18.34	9.000	L1	10.3	35.70	54.04	Compliance
0.190000	40.36	---	9.000	L1	10.3	23.68	64.04	Compliance
0.480000	---	31.87	9.000	L1	10.3	14.47	46.34	Compliance
0.480000	36.35	---	9.000	L1	10.3	19.99	56.34	Compliance
0.605000	---	36.55	9.000	L1	10.3	9.45	46.00	Compliance
0.605000	39.45	---	9.000	L1	10.3	16.55	56.00	Compliance
1.005000	---	30.45	9.000	L1	10.5	15.55	46.00	Compliance
1.005000	35.54	---	9.000	L1	10.5	20.46	56.00	Compliance
1.700000	---	24.41	9.000	L1	10.4	21.59	46.00	Compliance
1.700000	28.76	---	9.000	L1	10.4	27.24	56.00	Compliance
13.800000	---	25.36	9.000	L1	10.5	24.64	50.00	Compliance
13.800000	32.03	---	9.000	L1	10.5	27.97	60.00	Compliance

AC 120V/60 Hz, Neutral

Frequency (MHz)	QuasiPeak (dBμV)	Average (dB μ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.165000	---	27.12	9.000	N	10.3	28.09	55.21	Compliance
0.165000	47.59	---	9.000	N	10.3	17.62	65.21	Compliance
0.275000	---	27.30	9.000	N	10.3	23.67	50.97	Compliance
0.275000	41.83	---	9.000	N	10.3	19.14	60.97	Compliance
0.600000	---	35.68	9.000	N	10.3	10.32	46.00	Compliance
0.600000	39.61	---	9.000	N	10.3	16.39	56.00	Compliance
1.060000	---	31.59	9.000	N	10.6	14.41	46.00	Compliance
1.060000	36.67	---	9.000	N	10.6	19.33	56.00	Compliance
1.625000	---	28.08	9.000	N	10.5	17.92	46.00	Compliance
1.625000	32.64	---	9.000	N	10.5	23.36	56.00	Compliance
13.700000	---	24.33	9.000	N	10.5	25.67	50.00	Compliance
13.700000	30.27	---	9.000	N	10.5	29.73	60.00	Compliance

Note:

- 1) Corr.=LISN VDF (Voltage Division Factor) + Cable Loss
- 2) Corrected Amplitude = Reading + Corr.
- 3) Margin = Limit –Corrected Amplitude

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

Applicable Standard

As per FCC Part 15.225

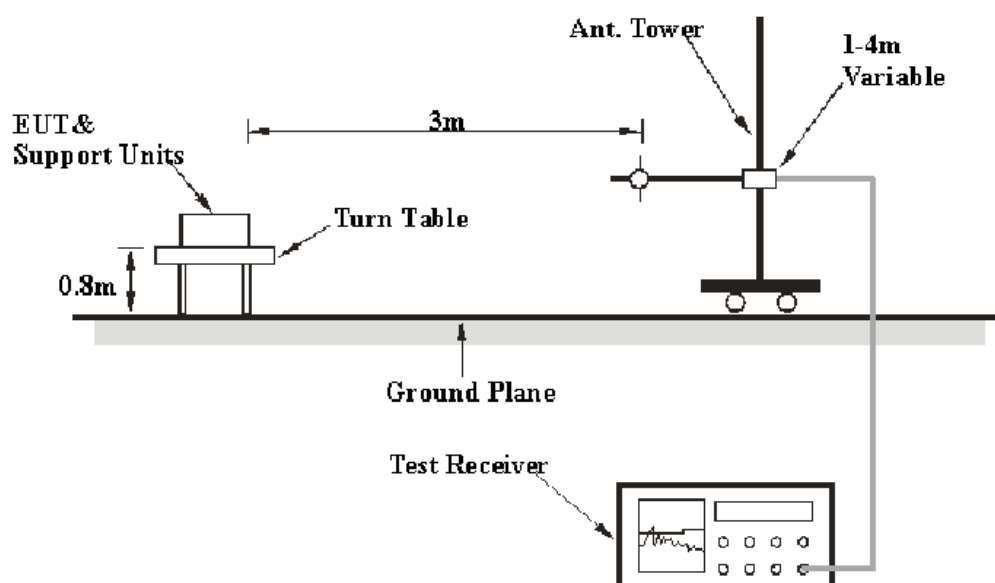
- (a) The field strength of any emissions within the band 13.553–13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.
- (b) Within the bands 13.410–13.553 MHz and 13.567–13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.
- (c) Within the bands 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.

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 expended combined standard uncertainty of radiation emissions at Bay Area Compliance Laboratories Corp. (Kunshan) 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



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

The spacing between the peripherals was 10 cm.

EMI Test Receiver Setup

According to FCC Rules, 47 CFR 15.33, the EUT emissions were investigated up to 1000 MHz.

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

Frequency Range	RBW	Video B/W	IF B/W	Detector
9 kHz – 150 kHz	300 Hz	1 kHz	/	QP
150 kHz –30 MHz	10 kHz	30 kHz	/	QP
30 MHz – 1000 MHz	100 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 Meter Reading. The basic equation is as follows:

$$\text{Corrected Factor} = \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

$$\text{Corrected Amplitude} = \text{Meter Reading} + \text{Corrected Factor}$$

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 Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Sonoma Instrunent	Amplifier	330	171377	2016-10-21	2017-10-21
ETS-LINDGREN	PASSIVE LOOP	6512	0108100	2016-01-09	2017-01-08
Rohde & Schwarz	EMI Test Receiver	ESCI	100195	2015-11-12	2016-11-11
Sunol Sciences	Broadband Antenna	JB3	A090314-2	2016-01-09	2019-01-08
Narda	Pre-amplifier	AFS42-00101800	2001270	2016-09-08	2017-09-08
R&S	Auto test Software	EMC32	V 09.10.0	-	-
Haojintech	Coaxial Cable	SR	SS11800	2016-09-08	2017-09-08

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Kunshan) attests that all calibrations have been performed in accordance to requirements that 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.

Refer to CISPR16-4-2:2011 and CISPR 16-4-1:2009, the measured level complies 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:	23 °C
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

The testing was performed by Chris Wang on 2016-10-22.

Test mode: Charging and Transmitting.

1) Spurious Emissions (9 kHz~30 MHz):

Indicated		Detector PK/QP/Ave.	Correction Factor			Corrected Amplitude (dB μ V/m) @3m	FCC Part 15.225\15.209	
Frequency (MHz)	Maximum Reading (dBuV)		Ant. Factor (dB)	Cable Loss (dB)	Pre- Amp. Gain (dB)		Limit (dB μ V/m) @3m	Margin (dB)
13.342	36.15	QP	35.2	0.26	25.23	46.38	80.5	34.12
13.473	36.75	QP	35.2	0.26	25.23	46.98	90.5	43.52
13.561	69.60	QP	35.2	0.26	25.23	79.83	124	44.17
13.624	39.75	QP	35.2	0.26	25.23	49.98	90.5	40.52
13.869	35.26	QP	35.2	0.26	25.23	45.49	80.5	35.01

2) Spurious Emissions (30 MHz ~1 GHz):

Frequency (MHz)	Corrected Amplitude (dB μ V/m)	Detector PK/QP/Ave.	Antenna Height (m)	Antenna Polarity (H/V)	Turntable Position (deg)	Correction Factor (dB)	Limit (dB μ V/m)	Margin (dB)
33.47	34.06	QP	101	215	V	-7.00	40	5.94
35.42	32.28	QP	101	297	H	-8.00	40	7.72
40.67	35.02	QP	101	119	V	-10.80	40	4.98
68.02	28.74	QP	101	288	V	-17.10	40	11.26
70.17	26.51	QP	199	307	H	-17.10	40	13.49
86.13	22.08	QP	101	323	V	-17.00	40	17.92

FCC§15.225(e) - FREQUENCY STABILITY**Applicable Standard**

The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ 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 PC, then to an external AC power supply and inductive antenna was connected to a Spectrum Analyzer. 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 AC power supply Source. The voltage was set to 115% of the nominal value and was then decreased until the transmitter light no longer illuminated; i.e., the end point. The output frequency was recorded for each voltage.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100195	2015-11-12	2016-11-11
BACL	Temp&Humi Test Chamber	BTH-150	30023	2016-10-10	2017-10-10
MCH	REGULATED DC POWER SUPPLY	MCH-303D-II	201	/	/

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

Test Data**Environmental Conditions**

Temperature:	23 °C
Relative Humidity:	53 %
ATM Pressure:	101.0 kPa

The testing was performed by Chris Wang on 2016-10-17.

Test Mode: Transmitting.

Test Result: Pass

F₀=13.56MHz				
Power Supply	Temperature (°C)	Measured Frequency (MHz)	Frequency Error	Part 15.225 Limit
3.8V	-20	13.56107904	0.0079%	±0.01%
	0	13.56096729	0.0071%	±0.01%
	20	13.56102913	0.0075%	±0.01%
	50	13.56101045	0.0074%	±0.01%
3.23V	20	13.5611599	0.0085%	±0.01%
4.37V	20	13.56111287	0.0082%	±0.01%

§15.215(c) - 20dB EMISSION BANDWIDTH TESTING

Requirement

Per 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 Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
ETS-LINDGREN	PASSIVE LOOP	6512	0108100	2016-01-09	2017-01-08
Rohde & Schwarz	EMI Test Receiver	ESCI	100195	2015-11-12	2016-11-11

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

Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.

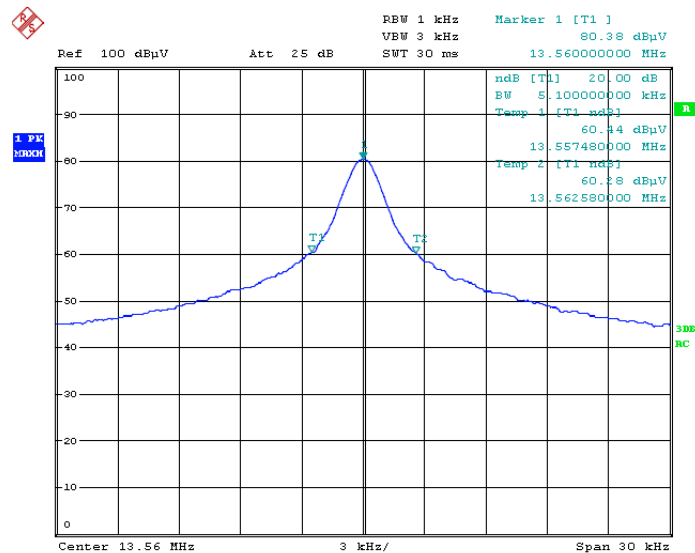
Test Data**Environmental Conditions**

Temperature:	23 °C
Relative Humidity:	53 %
ATM Pressure:	101.0 kPa

The testing was performed by Chris Wang on 2016-10-22.

Test Mode: Transmitting

Test Result: Pass

20 dB Emission Bandwidth

Date: 22.OCT.2016 13:44:04

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