

FCC PART 15C TEST REPORT

For

Logic Instrument SA

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FCC ID: XGIFBF1

Report Type: Original Report		Product Name: Mobile Phone					
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Report Number:	RBJ160829050A						
Report Date:			. 4				
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GENERAL INFORMATION

Product Description for Equipment Under Test (EUT)

The *Logic Instrument SA*'s product, model number: *Fieldbook F1 (FCC ID: XGIFBF1)* (the "EUT") in this report was a *Mobile Phone*, which was measured approximately: 17.7 cm (L) \times 8.9 cm (W) \times 1.1cm (H), rated input voltage: DC 3.7V from rechargeable Li-ion battery or DC 5V from adapter.

Adapter information:

MODEL: HKA01105021-XE INPUT: 100-240V ~ 50/60Hz 0.5A

OUTPUT: DC 5.0V, 2.1A

*All measurement and test data in this report was gathered from final production sample, serial number: 160829050 (assigned by the BACL, Chengdu). It may have deviation from any other sample. The EUT supplied by the applicant was received on 2016-08-28, and EUT conformed to test requirement.

Objective

This Type approval report is prepared on behalf of *Logic Instrument SA* in accordance with Part 2, Subpart J, and Part 15, Subparts A, B 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)

FCC Part 15C DSS submissions with FCC ID: XGIFBF1.

FCC Part 22H, 24E,27 PCE submissions with FCC ID: XGIFBF1.

FCC Part 15C DTS submissions with FCC ID: XGIFBF1.

FCC Part 15E NII submissions with FCC ID: XGIFBF1.

FCC Part 15B JBP submissions with FCC ID: XGIFBF1.

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

The uncertainty of any RF tests which use conducted method measurement is ± 3.17 dB, the uncertainty of any radiation on emissions measurement is:

30M~200MHz: ±4.7 dB; 200M~1GHz: ±6.0 dB; 1G-6GHz:: ±5.13dB; 6G~25GHz: ±5.47dB;

And the uncertainty will not be taken into consideration for all test data recorded in the report.

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Bay Area Compliance Laboratories Corp. (Chengdu)

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.

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SYSTEM TEST CONFIGURATION

Justification

The system was configured for testing in a test mode

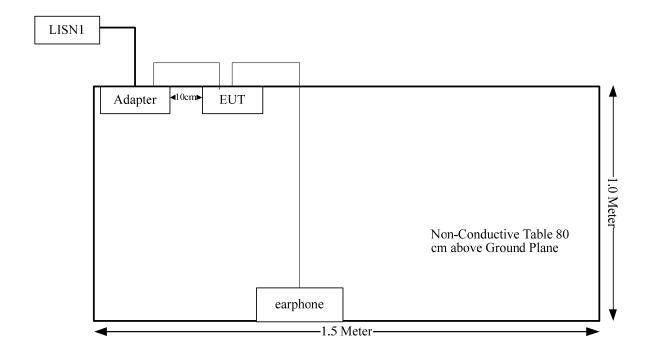
EUT Exercise Software

No software was performed under test.

Support Cable List and Details

Cable Description	Shielding Type	Ferrite Core	Length (m)	From Port	То
Adapter cable	Yes	No	1.2	Adapter	EUT
Earphone Cable	No	No	1.6	EUT	Earphone

Block Diagram of Test Setup



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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

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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.

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FCC §15.207 - AC LINE CONDUCTED EMISSION

Measurement Uncertainty

Compliance or non- compliance with a disturbance limit shall be determined in the following manner:

If U_{lab} is less than or equal to U_{cispr} of Table 1, then:

- -compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
 -non compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.
- If U_{lab} is greater than U_{cispr} of Table 1, then:
- –compliance is deemed to occur if no measured disturbance level, increased by ($U_{lab} U_{cispr}$), exceeds the disturbance limit;
- -non compliance is deemed to occur if any measured disturbance level, increased by $(U_{lab} U_{cispr})$, exceeds the disturbance limit.

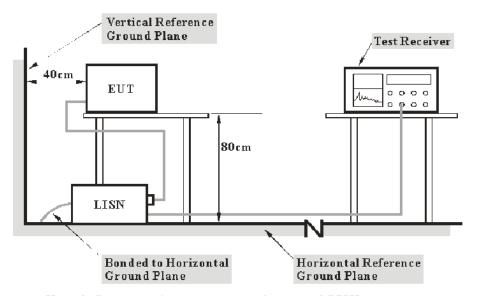
Based on CISPR 16-4-2:2011, measurement uncertainty of conducted disturbance at mains port using AMN at Bay Area Compliance Laboratories Corp. (Chengdu) is ±3.17 dB (150 kHz to 30 MHz).

Table 1 – Values of U_{cispr}

Measurement	U_{cispr}
Conducted disturbance at mains port using AMN (9 kHz to 150 kHz)	3.8 dB
(150 kHz to 30 MHz)	3.4 dB
Conducted disturbance at mains port using voltage probe (9 kHz to 30 MHz)	2.9 dB
Conducted disturbance at telecommunication port using AAN (150 kHz to 30	5.0 dB
MHz) Conducted disturbance at telecommunication port using CVP (150 kHz	3.9 dB
to 30 MHz) Conducted disturbance at telecommunication port using CP (150	2.9 dB
kHz to 30 MHz)	

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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.

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

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Test Equipment List and Details

Manufacturer	Description	Description Model 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
N/A	Conducted Cable	NO.5	N/A	2015-11-10	2016-11-09

^{*} **Statement of Traceability:** BACL (Chengdu) attested 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.

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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 maximum 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

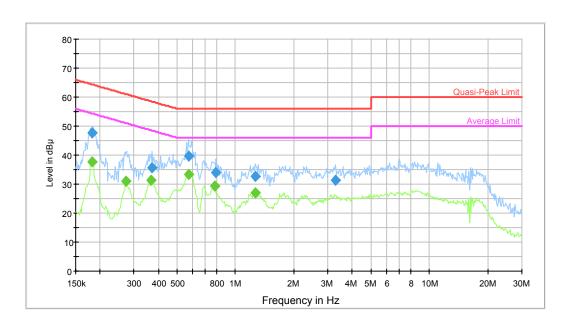
Temperature:	28.6 °C		
Relative Humidity:	60 %		
ATM Pressure:	101.1 kPa		

The testing was performed by Lorin Bian on 2016-10-26.

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Test Mode: Transmitting

Line:

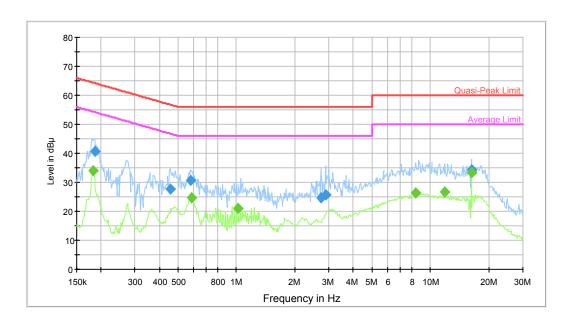


Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.183065	47.5	9.000	L1	9.7	16.8	64.3	Compliance
0.372042	35.7	9.000	L1	9.7	22.8	58.5	Compliance
0.572086	39.8	9.000	L1	9.7	16.2	56.0	Compliance
0.793127	34.0	9.000	L1	9.7	22.0	56.0	Compliance
1.269154	32.8	9.000	L1	9.7	23.2	56.0	Compliance
3.275801	31.5	9.000	L1	9.7	24.5	56.0	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.183065	37.7	9.000	L1	9.7	16.6	54.3	Compliance
0.272666	30.9	9.000	L1	9.6	20.1	51.0	Compliance
0.366160	31.4	9.000	L1	9.7	17.2	48.6	Compliance
0.572086	33.3	9.000	L1	9.7	12.7	46.0	Compliance
0.780588	29.2	9.000	L1	9.7	16.8	46.0	Compliance
1.269154	27.0	9.000	L1	9.7	19.0	46.0	Compliance

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Neutral:



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.186006	40.6	9.000	N	9.6	23.6	64.2	Compliance
0.454052	27.7	9.000	N	9.6	29.1	56.8	Compliance
0.581275	30.8	9.000	N	9.6	25.2	56.0	Compliance
2.727252	24.7	9.000	N	9.7	31.3	56.0	Compliance
2.883693	25.7	9.000	N	9.7	30.3	56.0	Compliance
16.251162	34.3	9.000	N	10.0	25.7	60.0	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.183065	33.9	9.000	N	9.6	20.4	54.3	Compliance
0.585926	24.7	9.000	N	9.6	21.3	46.0	Compliance
1.023481	21.1	9.000	N	9.7	24.9	46.0	Compliance
8.388036	26.4	9.000	N	9.8	23.6	50.0	Compliance
11.910327	26.7	9.000	N	9.9	23.3	50.0	Compliance
16.251162	33.2	9.000	N	10.0	16.8	50.0	Compliance

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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

Compliance or non- compliance with a disturbance limit shall be determined in the following manner:

If U_{lab} is less than or equal to U_{cispr} of Table 1, then:

- -compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit; -non compliance is deemed to occur if any measured disturbance level exceeds the
- -non compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.

If U_{lab} is greater than U_{cispr} of Table 1, then:

- –compliance is deemed to occur if no measured disturbance level, increased by ($U_{lab} U_{cispr}$), exceeds the disturbance limit;
- -non compliance is deemed to occur if any measured disturbance level, increased by $(U_{lab} U_{cispr})$, exceeds the disturbance limit.

Based on CISPR 16-4-2-2011, measurement uncertainty of radiated emission at a distance of 3m at Bay Area Compliance Laboratories Corp. (Chengdu) is:

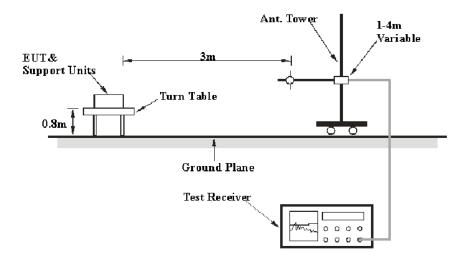
30M~200MHz: ±4.7 dB; 200M~1GHz: ±6.0 dB; 1G-6GHz: ±5.13dB; 6G~25GHz: ±5.47 dB;

Table 1 – Values of U_{cispr}

Measurement	U cispr
Radiated disturbance (electric field strength at an OATS or in a SAC) (30 MHz to 1000 MHz)	6.3 dB
Radiated disturbance (electric field strength in a FAR) (1 GHz to 6 GHz)	5.2 dB
Radiated disturbance (electric field strength in a FAR) (6 GHz to 18 GHz)	5.5 dB

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EUT Setup



All measurements contained in this report were conducted with ANSI C63.10-2013. The specification used was the FCC Part Subpart C limits.

The spacing between the peripherals was 10 cm.

The adapter was connected to 120VAC/60Hz power source.

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	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 Loss and Cable Loss, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corr. Ampl. = Meter Reading + Antenna Loss+ 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 maximum limit. The equation for margin calculation is as follows:

Margin = Limit - Corr. Ampl.

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Test Equipment List and Details

Manufacturer	Description	Model	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
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
The Electro- Mechanics Company	Passive Loop Antenna	6512	9706-1224	2014-11-30	2017-11-29

^{*} **Statement of Traceability:** BACL (Chengdu) attested 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 .

Test Data

Environmental Conditions

Temperature:	28.6 °C
Relative Humidity:	60 %
ATM Pressure:	101.1 kPa

^{*} The testing was performed by Lorin Bian on 2016-10-26.

Test mode: Transmitting

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Bay Area Compliance Laboratories Corp. (Chengdu)

1) Fundamental (9 kHz~30 MHz):

F	Red	ceiver	Rx	Cable	Amplifier	Corrected	Limais	Manain	
Frequency	Reading	Detector	Antenna Factor	loss Gain		Amplitude	Limit	Margin	
MHz	dΒμV	PK/QP/AV	dB(1/m)	dB	dB	dBµV/m	dBμV/m	dB	
13.56	38.5	QP	32.08	0.35	21.44	49.49	124.00	74.51	
13.553	24.7	QP	32.08	0.35	21.44	35.69	90.47	54.78	
13.567	25.4	QP	32.08	0.35	21.44	36.39	90.47	54.08	
13.309	21.8	QP	32.07	0.35	21.43	32.79	80.51	47.72	
13.902	22.5	QP	32.10	0.35	21.44	33.51	80.51	47.00	
14.918	19.7	QP	32.05	0.35	21.44	30.66	69.50	38.84	
23.12	22.1	QP	31.08	0.42	21.45	32.15	69.50	37.35	

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

Fraguency	Red	eiver	Rx Ar	ntenna	Cable	Amplifier	Corrected	Limit	Margin	
Frequency	Reading	Detector	Polar	Factor	loss Gain	loss	Factor loss	Amplitude	LIIII	Margin
MHz	dΒμV	PK/QP/AV	H/V	dB(1/m)	dB	dB	dBµV/m	dΒμV/m	dB	
103.72	48.28	QP	Н	11.82	0.61	28.27	32.44	43.50	11.06	
61.04	34.25	QP	V	7.45	0.53	28.42	13.81	40.00	26.19	
103.72	37.58	QP	V	11.82	0.61	28.27	21.74	43.50	21.76	

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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 one laptop which connected to an external AC power supply and loop 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
Dongzhixu	High Temperature Test Chamber	DP1000	201105083-4	2015-08-11	2017-08-11
The Electro- Mechanics Company	Passive Loop Antenna	6512	9706-1224	2014-11-30	2017-11-29
Rohde & Schwarz	EMI Test Receiver	ESCI	100028	2015-12-02	2016-12-01
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

^{*} **Statement of Traceability:** BACL (Chengdu) attested 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:	40 %
ATM Pressure:	101.1 kPa

^{*} The testing was performed by Lorin Bian on 2016-10-31.

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Bay Area Compliance Laboratories Corp. (Chengdu)

Test Mode: Transmitting

Test Result: Pass

	f _o = 13.56 MHz						
Temperature	Voltage	Measured frequency	Frequency Error	Limit(Hz)			
င	V _{DC}	MHz	(Hz)	` ,			
-20		13.559913	87	±1356			
-10		13.559893	107	±1356			
0		13.559931	69	±1356			
10	3.7	13.559888	112	±1356			
20	3.1	13.559899	101	±1356			
30		13.559896	104	±1356			
40		13.559918	82	±1356			
50		13.559936	64	±1356			
25	3.5	13.559919	81	±1356			

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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

- 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 Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
The Electro- Mechanics Company	Passive Loop Antenna	6512	9706-1224	2014-11-30	2017-11-29
Rohde & Schwarz	Signal Analyzer	FSIQ26	831929/005	2016-09-21	2017-09-20
N/A	RF Cable (below 1GHz)	NO.1	N/A	2015-11-10	2016-11-09

^{*} **Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

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Test Data

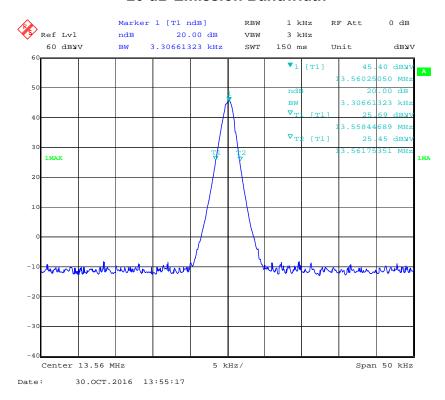
Environmental Conditions

Temperature:	29.8 °C
Relative Humidity:	39 %
ATM Pressure:	101.2 kPa

^{*} The testing was performed by Lorin Bian on 2016-10-30.

Test Mode: Transmitting

20 dB Emission Bandwidth



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

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