



FCC PART 15C

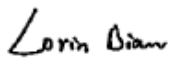
TEST REPORT

For

Roam Data Inc.

101 Federal Street, Suite 700, Boston, Massachusetts, United States

FCC ID: 2ABY6-MOB85

Report Type: Original Report	Product Name: Moby/X500 Mobile Payment Terminal
Test Engineer: <u>Lorin Bian</u>	
Report Number: <u>RXM170309050D</u>	
Report Date: <u>2017-04-10</u>	
Reviewed By: <u>Henry Ding</u> EMC Leader	
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GENERAL INFORMATION

Product Description for Equipment Under Test (EUT)

The **Roam Data Inc.**'s product, model number: **Moby/8500 (FCC ID: 2ABY6-MOB85)** (the "EUT") in this report was a **Moby/X500 Mobile Payment Terminal**, which was measured approximately: 11.4 cm (L) × 6.4 cm (W) × 1.48 cm (H), rated input voltage: DC3.7V rechargeable Li-ion battery or DC5V from USB port.

**All measurement and test data in this report was gathered from final production sample, serial number: 170309050 (assigned by the BACL, Chengdu). It may have deviation from any other sample. The EUT supplied by the applicant was received on 2017-03-09, and EUT conformed to test requirement.*

Objective

This Type approval report is prepared on behalf of **Roam Data Inc.** 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: 2ABY6-MOB85.

FCC Part 15C DTS submissions with FCC ID: 2ABY6-MOB85.

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 Bay Area Compliance Laboratories Corp. Chengdu's measurement Uncertainties (calculated for a k=2 Coverage Factor corresponding to approximately 95% Coverage) were as follows:

-For all of the AC Line Conducted Emissions Tests reported herein: ± 3.17 dB.

-For of all of the direct Radiated Emissions Tests reported herein are:

30 MHz to 200 MHz: ± 4.7 dB;

200 MHz to 1 GHz: ± 6.0 dB;

1 GHz to 6 GHz: ± 5.13 dB; and,

6 GHz to 40 GHz: ± 5.47 dB.

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

Test Facility

The test site used by BACL to collect test data is located in the No.5040, Huilongwan Plaza, No.1, Shawan Road, Jinniu District, Chengdu, Sichuan, 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.

SYSTEM TEST CONFIGURATION

Justification

The system was configured for testing in a test mode

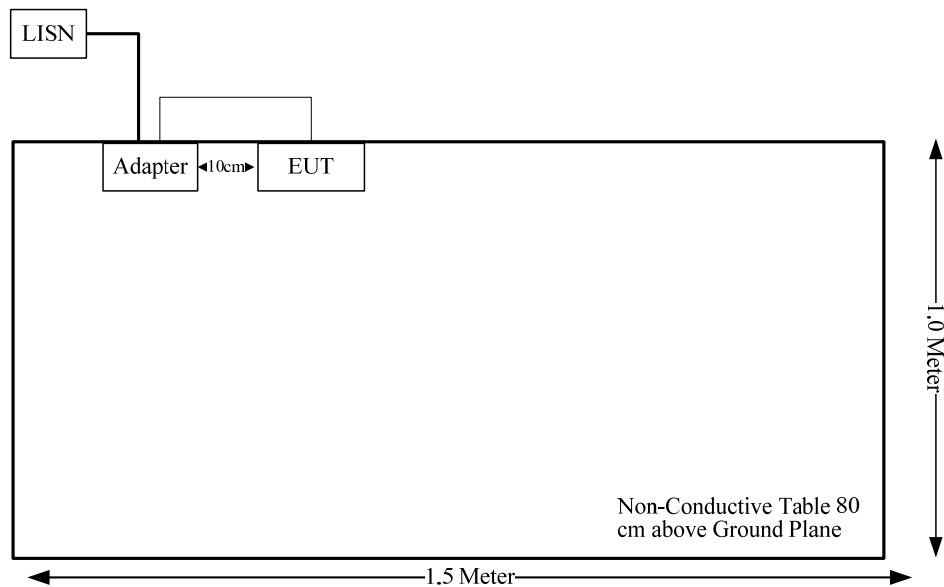
EUT Exercise Software

No software was performed under test.

External Cable

Cable Description	Shielding Type	Ferrite Core	Length (m)	From Port	To
USB Cable	No	NO	1.0	Adapter	EUT

Block Diagram of Test Setup



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

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.

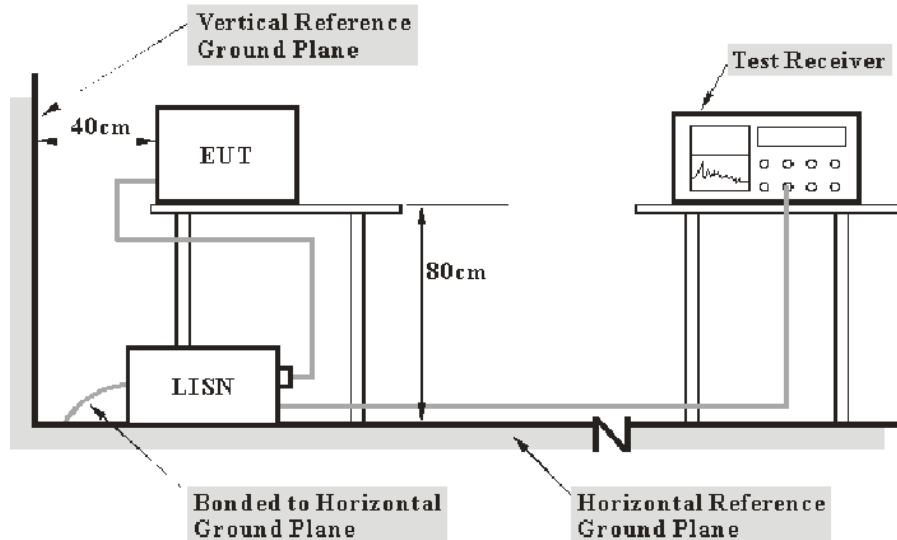
Antenna Connected Construction

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.

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 Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCS 30	836858/0016	2016-12-02	2017-12-01
Rohde & Schwarz	PULSE LIMITER	ESH3Z2	357.8810.52	2016-10-31	2017-10-30
Rohde & Schwarz	L.I.S.N.	ENV216	3560.6550.06	2016-12-02	2017-12-01
N/A	Conducted Cable	NO.5	N/A	2016-11-10	2017-11-09
R&S	Test Software	EMC32	Version8.53.0	N/A	N/A

* **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.

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:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

Test Results Summary

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

Test Data

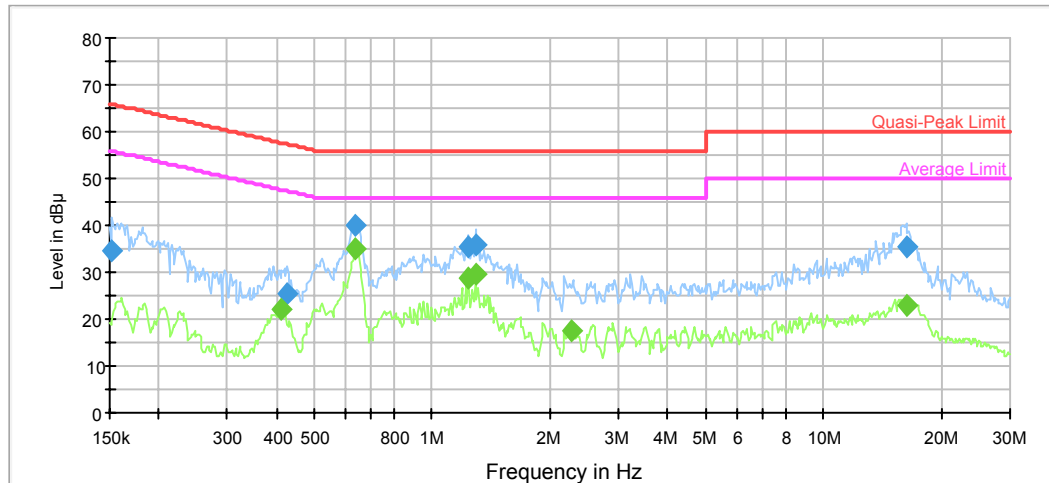
Environmental Conditions

Temperature:	29.6°C
Relative Humidity:	46%
ATM Pressure:	100kPa

The testing was performed by Lorin Bian on 2017-03-23.

Test Mode: Transmitting

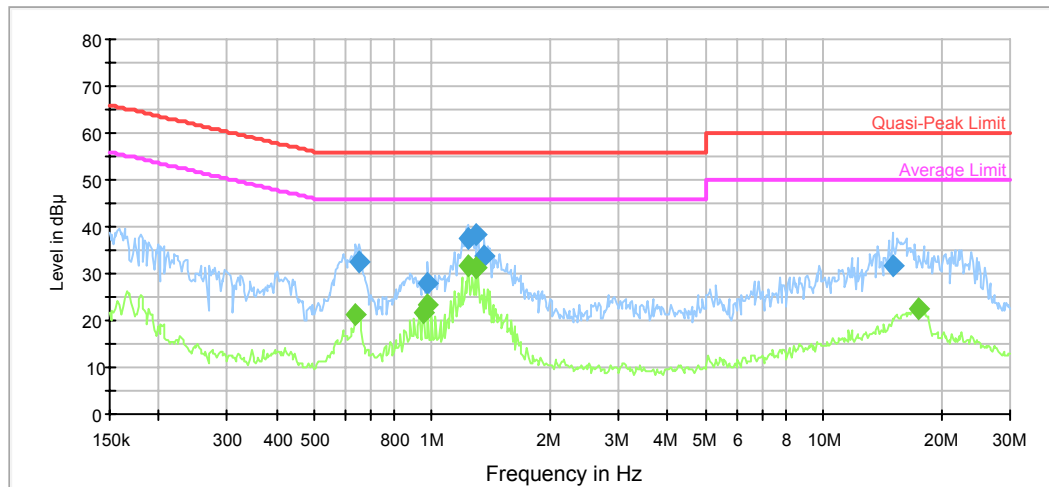
Line:



Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.152410	34.7	9.000	L1	19.7	31.2	65.9	Compliance
0.426011	25.6	9.000	L1	19.7	31.7	57.3	Compliance
0.639600	40.1	9.000	L1	19.7	15.9	56.0	Compliance
1.239175	35.6	9.000	L1	19.7	20.4	56.0	Compliance
1.289541	35.7	9.000	L1	19.7	20.3	56.0	Compliance
16.251162	35.5	9.000	L1	20.1	24.5	60.0	Compliance

Frequency (MHz)	Average (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.412647	22.0	9.000	L1	19.8	25.6	47.6	Compliance
0.639600	35.0	9.000	L1	19.7	11.0	46.0	Compliance
1.239175	28.7	9.000	L1	19.7	17.3	46.0	Compliance
1.289541	29.4	9.000	L1	19.7	16.6	46.0	Compliance
2.270560	17.7	9.000	L1	19.7	28.3	46.0	Compliance
16.381172	23.0	9.000	L1	20.1	27.0	50.0	Compliance

Neutral:



Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.649874	32.5	9.000	N	19.6	23.5	56.0	Compliance
0.975701	28.0	9.000	N	19.7	28.0	56.0	Compliance
1.239175	37.3	9.000	N	19.6	18.7	56.0	Compliance
1.289541	38.2	9.000	N	19.6	17.8	56.0	Compliance
1.363512	33.6	9.000	N	19.7	22.4	56.0	Compliance
15.006489	31.7	9.000	N	19.9	28.3	60.0	Compliance

Frequency (MHz)	Average (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.639600	21.1	9.000	N	19.6	24.9	46.0	Compliance
0.952654	21.5	9.000	N	19.7	24.5	46.0	Compliance
0.975701	23.2	9.000	N	19.7	22.8	46.0	Compliance
1.239175	31.6	9.000	N	19.6	14.4	46.0	Compliance
1.289541	31.1	9.000	N	19.6	14.9	46.0	Compliance
17.459396	22.5	9.000	N	19.9	27.5	50.0	Compliance

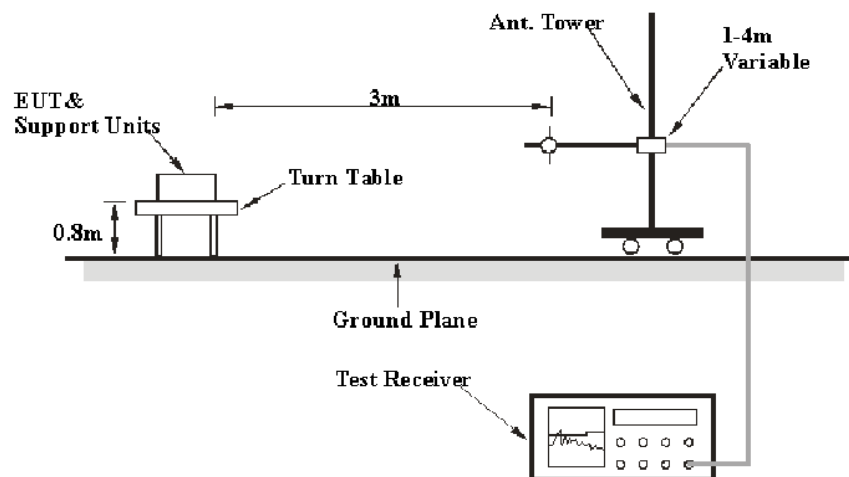
FCC§15.225, §15.205 & §15.209 - RADIATED EMISSIONS TEST

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



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.

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

$$\text{Corr. Ampl.} = \text{Meter Reading} + \text{Antenna Loss} + \text{Cable Loss} - \text{Amplifier Gain}$$

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:

$$\text{Margin} = \text{Limit} - \text{Corr. Ampl.}$$

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Agilent	Amplifier	8447D	2944A10442	2016-12-02	2017-12-01
Rohde & Schwarz	EMI Test Receiver	ESCI	100028	2016-12-02	2017-12-01
Sunol Sciences	Broadband Antenna	JB3	A101808	2016-04-10	2019-04-09
N/A	RF Cable (below 1GHz)	NO.1	N/A	2016-11-10	2017-11-09
N/A	RF Cable (below 1GHz)	NO.4	N/A	2016-11-10	2017-11-09
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:	23.1°C
Relative Humidity:	34%
ATM Pressure:	97.8kPa

* The testing was performed by Lorin Bian on 2017-03-29.

Test mode: Transmitting

1) Fundamental (9 kHz~30 MHz):

Frequency	Receiver		Rx Antenna Factor	Cable loss	Amplifier Gain	Corrected Amplitude	Limit	Margin
	Reading	Detector						
MHz	dBμV	PK/QP/AV	dB(1/m)	dB	dB	dBμV/m	dBμV/m	dB
13.56	55.7	QP	32.08	0.35	21.44	66.69	124.00	57.31
7.84	42.8	QP	33.01	0.27	21.42	54.66	63.32	8.66
8.03	42.1	QP	32.89	0.27	21.42	53.84	69.54	15.70
4.538	37.9	QP	35.84	0.20	21.45	52.49	69.54	17.05
13.4	33.4	QP	32.07	0.35	21.43	44.39	69.54	25.15
18.564	34.6	QP	31.79	0.39	21.44	45.34	69.54	24.20

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

Frequency	Receiver		Rx Antenna		Cable loss	Amplifier Gain	Corrected Amplitude	Limit	Margin
	Reading	Detector	Polar	Factor					
MHz	dBμV	PK/QP/AV	H/V	dB(1/m)	dB	dB	dBμV/m	dBμV/m	dB
99.84	35.4	QP	H	10.71	0.51	28.31	18.31	43.50	25.19
301.6	38.5	QP	H	14.14	1.05	27.55	26.14	46.00	19.86
421.88	36.42	QP	H	16.81	1.47	28.40	26.30	46.00	19.70
543.13	37.66	QP	H	18.53	1.71	28.83	29.07	46.00	16.93
663.41	35.88	QP	H	20.43	1.94	28.82	29.43	46.00	16.57
724.52	32.53	QP	H	21.14	2.08	28.64	27.11	46.00	18.89
783.69	35.78	QP	H	21.77	2.28	28.47	31.36	46.00	14.64
40.67	37.47	QP	V	14.70	0.34	28.52	23.99	40.00	16.01
79.47	36.74	QP	V	8.05	0.45	28.40	16.84	40.00	23.16
301.6	38.53	QP	V	14.14	1.05	27.55	26.17	46.00	19.83
421.88	43.04	QP	V	16.81	1.47	28.40	32.92	46.00	13.08
543.13	37.83	QP	V	18.53	1.71	28.83	29.24	46.00	16.76
663.41	39.83	QP	V	20.43	1.94	28.82	33.38	46.00	12.62

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
BACL	High Temperature Test Chamber	BTH-150	30024	2016-12-02	2017-12-01
The Electro-Mechanics Company	Passive Loop Antenna	6512	9706-1224	2014-11-30	2017-11-29
FLUKE	Multimeter	1587	27870099	2016-12-30	2017-12-29
Rohde & Schwarz	EMI Test Receiver	ESCI	100028	2016-12-02	2017-12-01
N/A	RF Cable (below 1GHz)	NO.1	N/A	2016-11-10	2017-11-09
N/A	RF Cable (below 1GHz)	NO.4	N/A	2016-11-10	2017-11-09

* **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:	24.1°C
Relative Humidity:	36%
ATM Pressure:	98.6kPa

* The testing was performed by Lorin Bian on 2017-04-06.

Test Mode: Transmitting

Test Result: Pass

f_o = 13.56 MHz				
Temperature	Voltage	Measured frequency	Frequency Error	Limit
°C	V_{DC}	MHz	(%)	(%)
-30	3.7	13.560800	0.0059%	0.01%
-20		13.560700	0.0052%	0.01%
-10		13.560600	0.0044%	0.01%
0		13.560900	0.0066%	0.01%
10		13.560500	0.0037%	0.01%
20		13.560800	0.0059%	0.01%
30		13.560600	0.0044%	0.01%
40		13.560700	0.0052%	0.01%
50		13.560600	0.0044%	0.01%
25	3.3	13.560800	0.0059%	0.01%
25	4.3	13.560900	0.0066%	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
The Electro-Mechanics Company	Passive Loop Antenna	6512	9706-1224	2014-11-30	2017-11-29
Rohde & Schwarz	EMI Test Receiver	ESCI	100028	2016-12-02	2017-12-01
N/A	RF Cable (below 1GHz)	NO.1	N/A	2016-11-10	2017-11-09
N/A	RF Cable (below 1GHz)	NO.4	N/A	2016-11-10	2017-11-09

*** 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

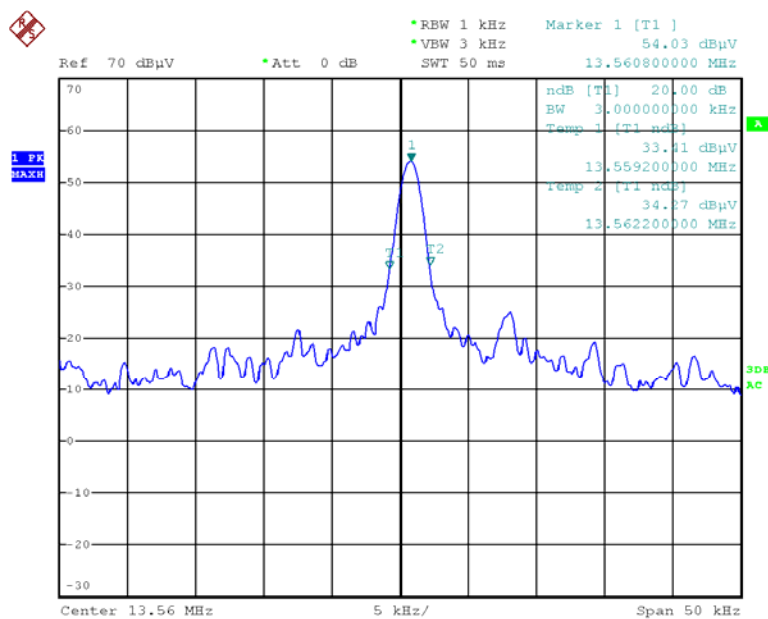
Environmental Conditions

Temperature:	20.1 °C
Relative Humidity:	36%
ATM Pressure:	97.6kPa

* The testing was performed by Lorin Bian on 2017-03-30.

Test Mode: Transmitting

20 dB Emission Bandwidth



Date: 30.MAR.2017 09:52:53

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