



FCC PART 15B CLASS B

MEASUREMENT AND TEST REPORT

For

Sierra Monitor Corporation

1991 Tarob Court, Milpitas CA 95035-6840, UNITED STATES

FCC ID:2AIVJ-FPAC34
Model Number: FPA-C34, FPA-W34

Report Type: Original Report	Equipment Name: M2M Gateway
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Report Number:	RSC160616002-0B
Report Date:	2016-07-19
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The **Sierra Monitor Corporation's** product, model number: **FPA-C34**, (**FCC ID: 2AIVJ-FPAC34**) or the "EUT" as referred to in this report was the **M2M Gateway**, which has a plastic enclosure. The highest frequency was 2.48GHz.

Mechanical Description of EUT

The EUT was measured approximately 100 mm L x 78 mm W x 28 mm H.

Rated input voltage: DC 12-24V

The products, test model: FPA-C34, multiple model: FPA-W34, FPA-C34-XXXX, FPA-W34-XXXX, Where X can be used as "0-9" for application software changes or marketing purposes only. Their differences were presented in Product Difference Statement provided by the applicant. And we selected FPA-C34 to fully test.

**All measurement and test data in this report was gathered from final production sample, serial number: 160616002/03 (Assigned by Chengdu BACL). It may have deviation from any other sample. The EUT supplied by the applicant was received on 2016-06-20, and EUT conformed to test requirement.*

Objective

The following Class B report was prepared on behalf of **Sierra Monitor Corporation**, in accordance with Part 2, Subpart J, and Part 15, Subparts A and B of the Federal Communication Commissions rules.

The objective of the manufacturer is to demonstrate compliance with FCC Part 15B Class B limits.

Related Submittal(s)/Grant(s)

FCC Part 15.247 DTS submission with FCC ID: 2AIVJ-FPAC34.

FCC Part 15.247 DSS submission with FCC ID: 2AIVJ-FPAC34.

Test Methodology

All measurements contained in this report are conducted with ANSI C63.4-2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz. All radiated and conducted emissions measurement is performed at BACL. The radiated testing is performed at an antenna-to-EUT distance of 3 Meters.

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.

SYSTEM TEST CONFIGURATION

Justification

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

EUT Exercise Software

N/A

Special Accessories

No special accessories were supplied by BACL.

Equipment Modifications

No modification to the EUT was made by BACL to make sure the EUT comply with applicable limits.

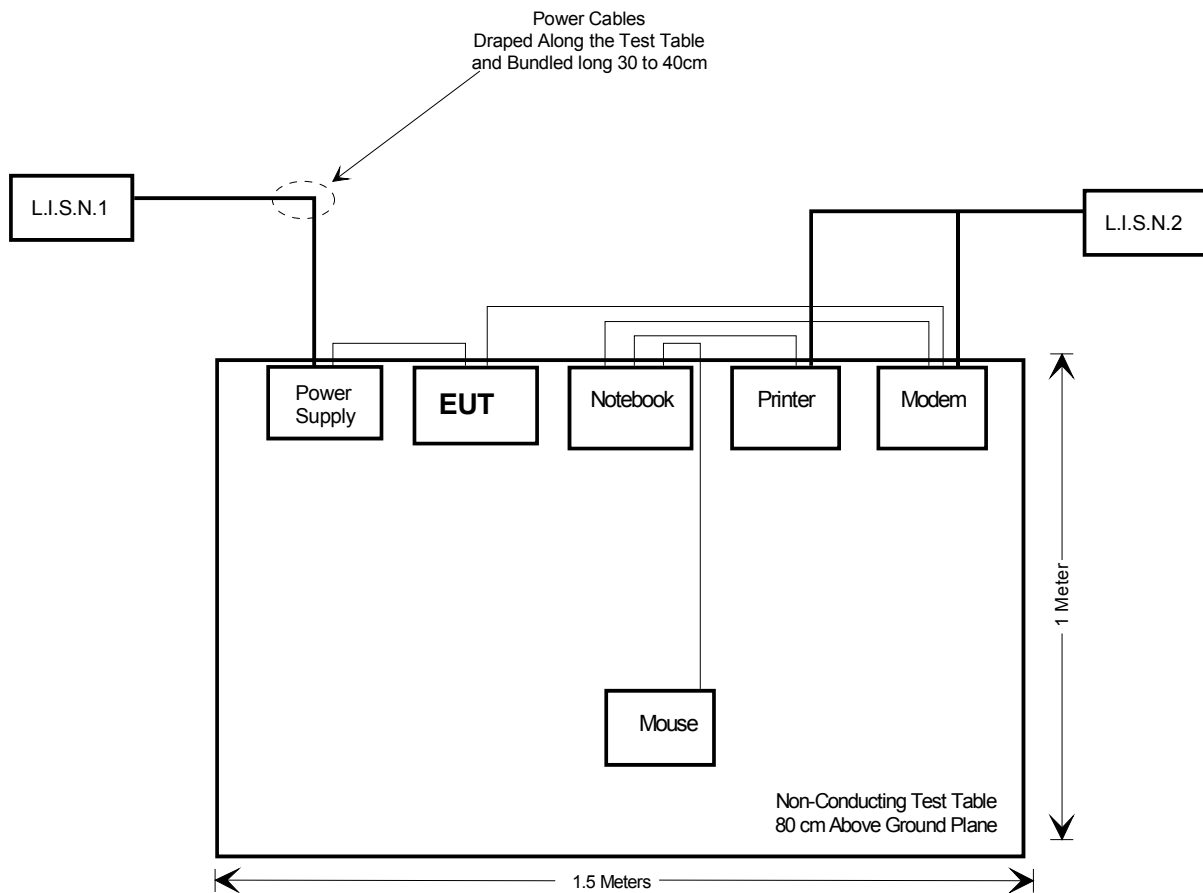
Local Support Equipment List and Details

Manufacturer	Description	Model Number	Serial Number
Anthin	Power Supply	AP1315-1212	None
DELL	Notebook	C640	5P804A00
IBM	Mouse	MO28UO	89P5089
EPSON	Printer	R230	C62607000W
NONE	Modem	DL-S1005PM	NONE

External I/O Cable

Cable Description	Length (m)	From	To
Power Supply Cable	2	EUT	Power Supply
Unshielded USB Cable	1.5	Printer	Notebook
Shielded Mouse Cable	2	Notebook	Mouse
Shielded Ethernet Cable	1.5	Modem	Notebook
Shielded Ethernet Cable	2	Modem	EUT

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

Standard	Description	Result
FCC §15.107	Conducted Emission	Compliance
FCC §15.109	Radiated Emission	Compliance

FCC §15.107 CONDUCTED EMISSION TEST

Applicable Standard

FCC §15.107

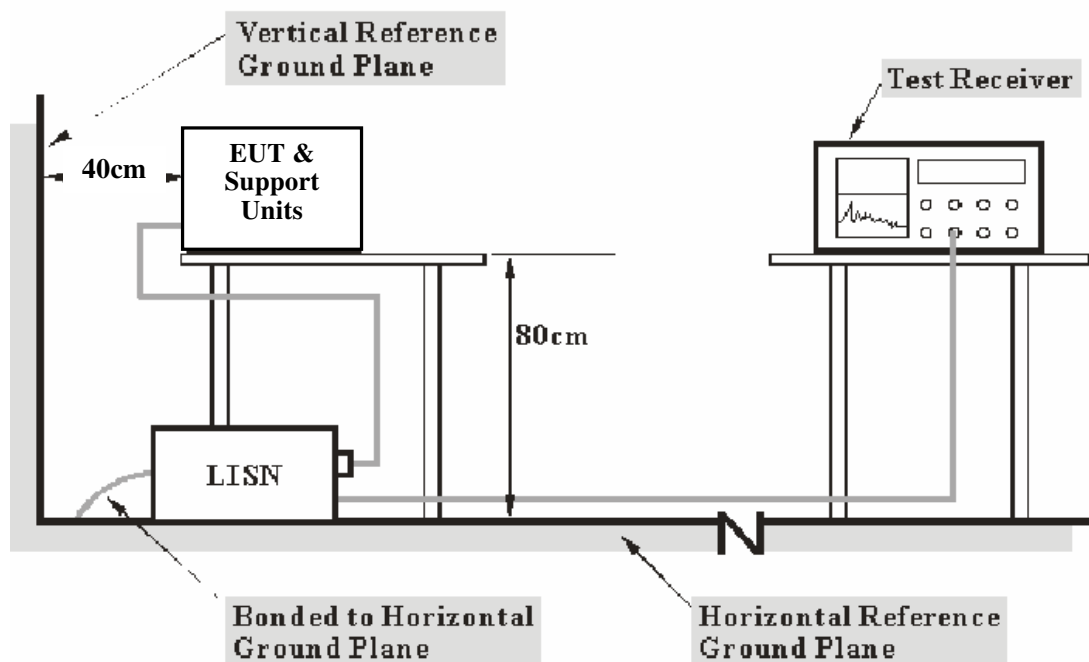
Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMI. The factors contributing to uncertainties are EMI Test Receiver, cable loss, and L.I.S.N.

Based on CISPR 16-4-2, the Treatment of Uncertainty in EMI Measurements, the best estimate of the uncertainty of any conducted emissions measurement at Bay Area Compliance Laboratories Corp. (Chengdu) is ± 3.17 dB.

EUT Setup

The setup of EUT was in accordance with ANSI C63.4-2014 measurement procedure. The specification used was the FCC Part 15 Class B limits.



- 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 power cables and excess cables shall be folded at the cable center into a bundle no longer than 40 cm.

The spacing between the peripherals unit & EUT was 10 cm.

DC 12V power source was provided to EUT.

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

Maximizing procedure was performed on the six (6) highest emissions to ensure EUT is compliant with all installation combination.

All data are recorded in the Quasi-peak and Average detection mode. Quasi-peak readings are distinguished with a "**QP**". Average readings are distinguished with an "**AV**".

The EUT is in the normal operating mode during the final qualification test to represent the worst cases results.

Test Equipment List and Details

Manufacturer	Description	Model Number	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.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).

Summary of Test Results

According to the data in the following, the EUT complied with the FCC Part 15B Conducted margin for a Class B device, with the *worst* margin reading of:

3.3 dB at 0.463825 MHz in the Neutral Phase

Conducted Emission Test Data and Plots

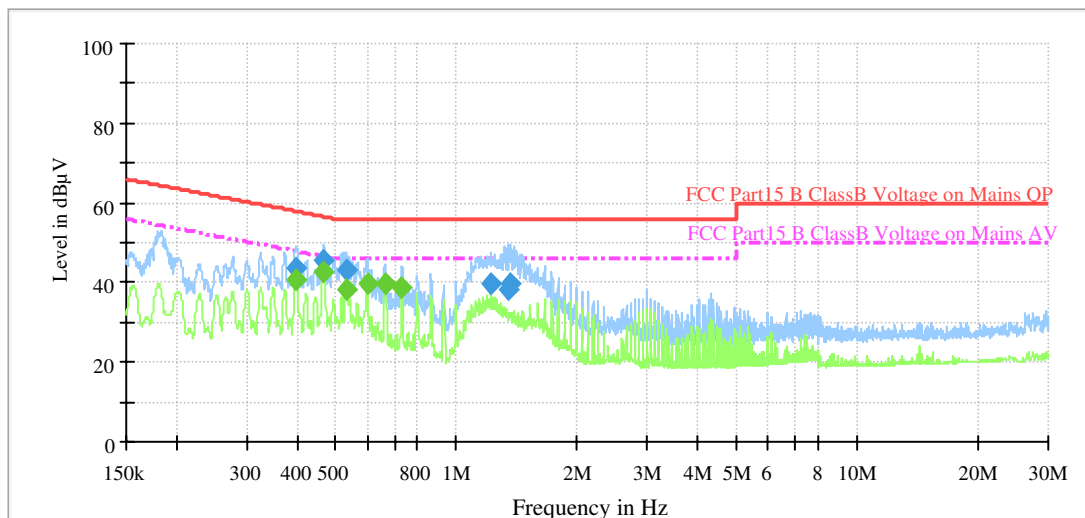
Test Environment Conditions

Temperature:	29 °C
Relative Humidity:	50 %
ATM Pressure:	94.2 kPa

The testing was performed by Kevin Hu on 2016-07-16.
Test Mode: Running Mode

0.15 MHz – 30 MHz

Line

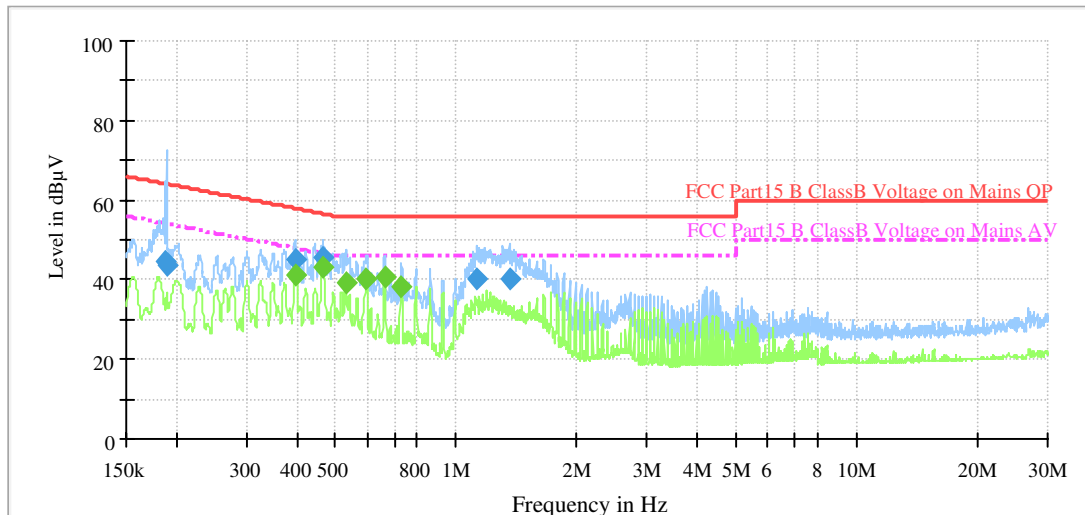


Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.396099	43.8	9.000	L1	19.9	14.1	57.9
0.467547	45.5	9.000	L1	19.9	11.1	56.6
0.529205	43.1	9.000	L1	20.0	12.9	56.0
1.217485	39.8	9.000	L1	20.0	16.2	56.0
1.345395	38.5	9.000	L1	20.0	17.5	56.0
1.367073	39.5	9.000	L1	20.0	16.5	56.0

Frequency (MHz)	Average (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.397685	40.5	9.000	L1	19.9	7.4	47.9
0.465682	42.5	9.000	L1	19.9	4.1	46.6
0.531324	38.0	9.000	L1	20.0	8.0	46.0
0.598994	39.7	9.000	L1	20.0	6.3	46.0
0.664575	39.7	9.000	L1	20.0	6.3	46.0
0.731467	38.6	9.000	L1	19.9	7.4	46.0

0.15 MHz – 30 MHz

Neutral



Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.187619	44.5	9.000	N	18.8	19.6	64.1
0.188747	43.6	9.000	N	18.8	20.5	64.1
0.395309	44.9	9.000	N	19.9	13.1	58.0
0.464753	45.6	9.000	N	19.9	11.0	56.6
1.128471	40.4	9.000	N	20.0	15.6	56.0
1.356190	40.2	9.000	N	20.0	15.8	56.0

Frequency (MHz)	Average (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.396892	41.1	9.000	N	19.9	6.8	47.9
0.463825	43.3	9.000	N	19.9	3.3	46.6
0.530263	39.0	9.000	N	19.9	7.0	46.0
0.596605	40.4	9.000	N	19.9	5.6	46.0
0.663249	40.6	9.000	N	19.9	5.4	46.0
0.728550	38.4	9.000	N	19.9	7.6	46.0

FCC §15.109 RADIATED EMISSION TEST

Applicable Standard

FCC §15.109

Measurement Uncertainty

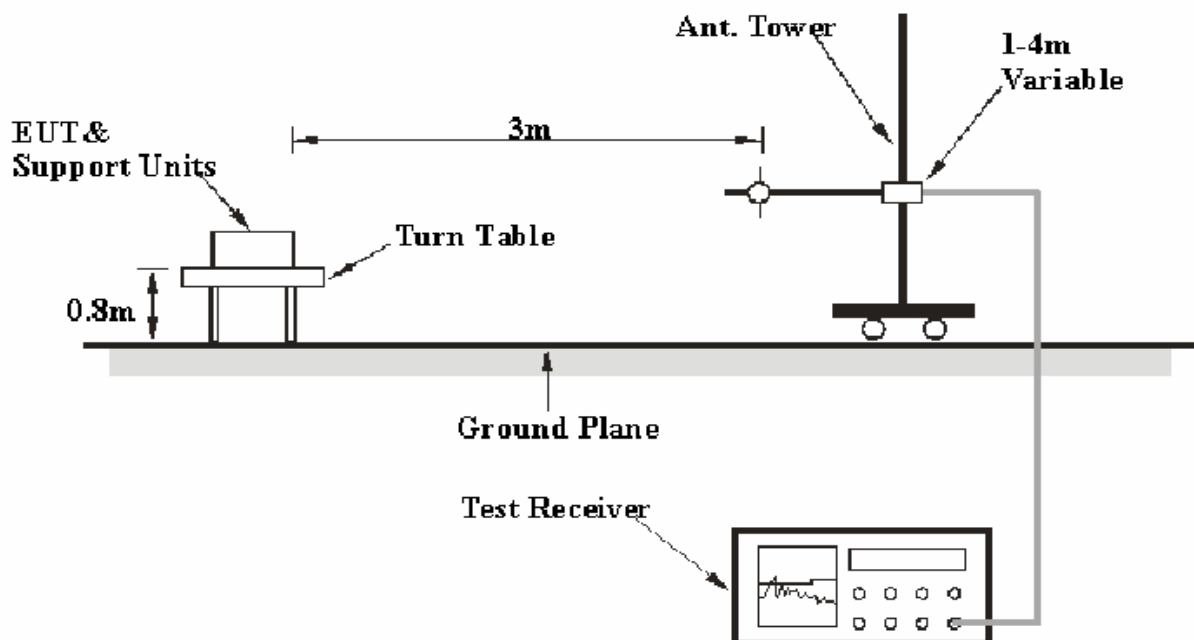
All measurements involve certain levels of uncertainties, especially in the field of EMI. The factors contributing to uncertainties are EMI Test Receiver, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on CISPR 16-4-2, the Treatment of Uncertainty in EMI Measurements, the best estimate of the uncertainty of a radiation emissions measurement at BACL is 30M~200MHz: ± 4.7 dB ; 200M~1GHz: ± 6.0 dB ; 1G-6GHz: ± 5.13 dB; 6G~25GHz: ± 5.47 dB.

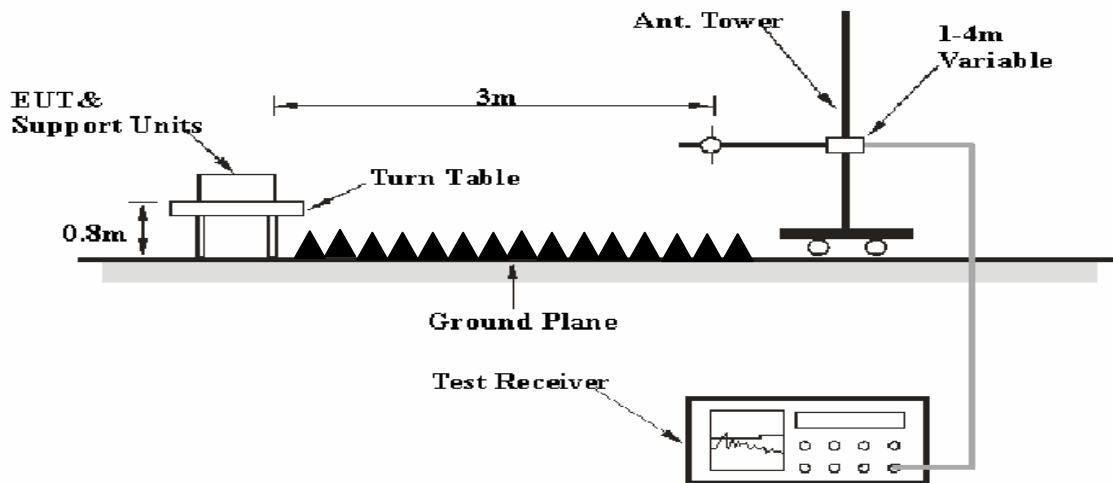
EUT Setup

The radiated emission tests were performed in the 3 meter Semi Anechoic Chamber, using the setup in accordance with the ANSI C63.4-2014. The specification used was the FCC Part 15 Class B limits.

Below 1GHz:



Above 1GHz:



The excess cables shall be folded at the cable center into a bundle no longer than 40 cm.

The spacing between the peripherals unit & EUT was 10 cm.

DC 12V power source was provided to EUT.

EMI Test Receiver Setup

According to FCC Rules, the frequency range to be tested from 30 MHz to 13 GHz.

During the radiated emission test, the EMI test receiver is set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Detector
30 MHz – 1000 MHz	120 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 six (6) highest emissions to ensure EUT is compliant with all installation combinations.

All data were recorded in the quasi-peak detection mode from 30 MHz to 1 GHz. Peak and average detection mode above 1 GHz.

The EUT was in the normal operating mode during the final qualification test to represent the worst case results.

Corrected Amplitude & Margin Calculation

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

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

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 7 dB μ V/m below the maximum limit for FCC Part 15 Class B. The equation for margin calculation is as follows:

$$\text{Margin} = \text{FCC Part 15 Class B Limit} - \text{Corr. Ampl.}$$

Test Equipment List and Details

Manufacturer	Description	Model Number	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
Rohde & Schwarz	Spectrum Analyzer	FSEM30	100018	2015-12-02	2016-12-01
EM TEST	Horn Antenna	3115	003-6076	2015-12-02	2016-12-01
Ducommun Technologies	Horn Antenna	ARH-4223-02	1007726-0113024	2014-06-16	2017-06-15
HP	Amplifier	8449B	3008A00277	2016-04-09	2019-04-08
EMCT	Semi-Anechoic Chamber	966	N/A	2015-04-24	2018-04-23
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
N/A	RF Cable (above 1GHz)	NO.2	N/A	2015-11-10	2016-11-09
WEINSCHL ENGINEERING	Attenuator	1A10dB	AA4135	2015-11-10	2016-11-09
Rohde & Schwarz	EMC32	N/A	V 8.54.0	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).

Summary of Test Results

According to the data in the following, the EUT complied with the FCC Part 15 Class B standards, and had the worst margin of:

5.97 dB at 12587.000 MHz in the Vertical polarization

Radiated Emission Test

Test Environment Conditions

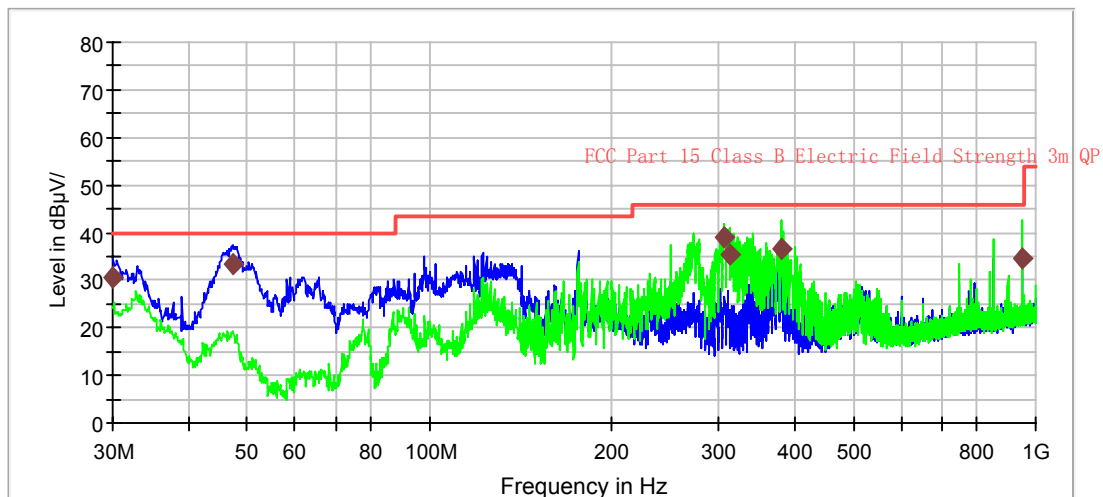
Temperature:	28 °C
Relative Humidity:	66 %
ATM Pressure:	94.8 kPa

The testing was performed by Kevin Hu on 2016-07-06.
Test Mode: Running Mode

Test Model: FPA-C34

Below 1GHz

Electric Field Strength with Scans



Frequency (MHz)	QuasiPeak (dB µ V/m)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB µ V/m)
30.000000	30.7	120.000	100.0	V	223.0	-5.6	9.3	40.0
47.338750	33.3	120.000	120.0	V	66.0	-18.0	6.7	40.0
305.965000	39.1	120.000	100.0	H	304.0	-12.2	6.9	46.0
311.906250	35.4	120.000	200.0	H	316.0	-12.0	10.6	46.0
379.927500	36.7	120.000	155.0	H	272.0	-11.0	9.3	46.0
950.045000	34.7	120.000	100.0	H	223.0	-2.0	11.3	46.0

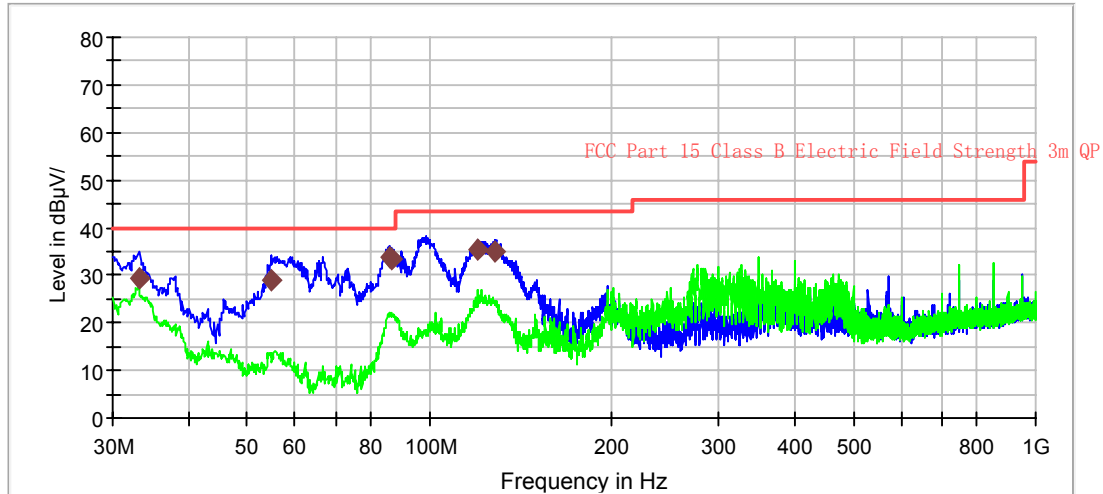
Above 1 GHz

Frequency	Result	Polarity	Detector	Corrected factor	Limit	Antenna Height	Turntable Position	Margin
MHz	(dBμV/m)	V/H	PK/Ave.	(dB)	(dBμV/m)	(cm)	(deg)	(dB)
10467.000	61.30	H	PK	18.42	74	125	86	12.70
10467.000	45.54	H	AV	12.62	54	125	86	8.46
9562.000	60.54	V	PK	18.79	74	150	200	13.46
9562.000	46.58	V	AV	18.79	54	150	200	7.42
6642.000	59.03	V	PK	14.11	74	100	128	14.97
6642.000	47.13	V	AV	14.11	54	100	128	6.87

Multi-listing Model: FPA-W34

Below 1GHz

Electric Field Strength with Scans



Frequency (MHz)	QuasiPeak (dB μ V/m)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)
33.273750	29.3	120.000	160.0	V	279.0	-7.6	10.7	40.0
54.856250	29.1	120.000	125.0	V	113.0	-20.2	10.9	40.0
85.653750	33.7	120.000	150.0	V	82.0	-19.3	6.3	40.0
86.381250	33.3	120.000	130.0	V	82.0	-19.3	6.7	40.0
119.967500	35.2	120.000	200.0	V	317.0	-11.9	8.3	43.5
127.848750	35.0	120.000	100.0	V	279.0	-11.8	8.5	43.5

Test Result: Compliance

Above 1GHz

Frequency	Result	Polarity	Detector	Corrected factor	Limit	Antenna Height	Turntable Position	Margin
MHz	(dB μ V/m)	V/H	PK/Ave.	(dB)	(dB μ V/m)	(cm)	(deg)	(dB)
12587.000	63.80	V	PK	20.47	74	150	95	10.20
12587.000	48.03	V	AV	20.47	54	150	95	5.97
9650.000	60.15	H	PK	18.42	74	115	185	13.85
9650.000	47.33	H	AV	18.42	54	115	185	6.67
6874.000	58.06	V	PK	14.11	74	100	136	15.94
6874.000	46.35	V	AV	14.11	54	100	136	7.65

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