



FCC PART 15 CLASS B

MEASUREMENT AND TEST REPORT

For

Chengdu Vantron Technology, Ltd.

No.5 GaoPeng Road, Hi-Tech Zone, Chengdu, SiChuan, P.R. China 610045

FCC ID: 2AAGEVTM2M-LV

Report Type: Class II Permissive Change	Equipment Name: M2M Gateway
Report Number: RSC171209001-0CA1	
Report Date: 2018-01-16	
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Reviewed By:	EMC Director
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Note: This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (Chengdu).

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	RSC150128001	Original Report	2015-02-10
1	RSC171209001-OCA1	CIIPC Report	2018-01-16

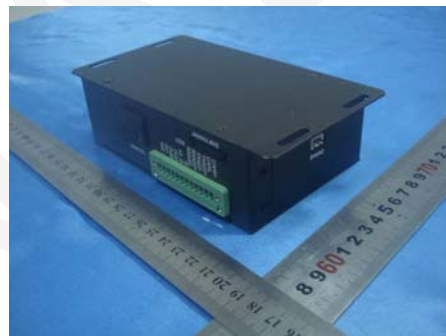
Note: This report was the CIIPC report, which was identical to the previously certified except for the changes as below for details.

1. Changing 3G module, change 3G module HE910 (FCC ID:RI7HE910) to 4G module LE910-SV1 (FCC ID: RI7LE910SVV2) or E910-NA1(FCC ID: RI7LE910NAV2) .

2. Adding one adapter, model: WT48-1203000-T.

3. Updating EUT external picture,

Original:



Current:



4. Updating LTE antennas

Original:



Current:



The above changes will affect tests, all test data were presented in this report.

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The **Chengdu Vantron Technology, Ltd.**'s product, model number: **VT-M2M-LV** (**FCC ID: 2AAGEVTM2M-LV**) (the "EUT") in this report was the **M2M Gateway**, which was measured approximately: 172 mm(L) x 93.5 mm (W) x 47 mm (H), rated input voltage:DC12V from adapter. The highest operating frequency is 2480MHz.

Adapter 1:

Manufacturer: Anthin

Model: API315-1212

Input: AC 100-240V, 50/60Hz, 0.3A

Output: DC 12V, 1.25A

Adapter 2:

Model: ZF120A-1203000

Input: AC 100-240V, 50/60Hz, 1.2A MAX

Output: DC 12V, 3.0A

Adapter 3:

Model: WT48-1203000-T

Input: AC 100-240V, 50/60Hz, 1.6A MAX

Output: DC 12V, 3.0A

**All measurement and test data in this report were gathered from final production sample, serial number: 171209001/01(Provided by BACL). It may have deviation from any other sample. The EUT supplied by the applicant was received on 2017-12-09, and EUT complied with test requirement.*

Objective

The report was prepared on behalf of **Chengdu Vantron Technology, Ltd.** 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 15 Subpart B Class B limit.

Related Submittal(s)/Grant(s)

FCC Part 15.247 DTS submissions with FCC ID: 2AAGEVTM2M-LV.

Measurement Uncertainty

Item			Uncertainty
AC power line conducted emission			2.71 dB
Radiated Emission(Field Strength)	30MHz-200MHz	H	4.57dB
		V	4.81dB
	200MHz-1GHz	H	5.69dB
		V	6.07dB
	1GHz-6GHz		5.49dB
	6GHz-18GHz		5.57dB
	18GHz-40GHz		5.48dB

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 Bay Area Compliance Laboratories Corp. (Chengdu) to collect test data is located No.5040, Huilongwan Plaza, No. 1, Shawan Road, Jinniu District, Chengdu, Sichuan, China.

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No. : 910975, the FCC Designation No. : CN1186.

The test site has been registered with ISED Canada under ISED Canada Registration Number 3062C-1.

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

Software name: tfgen.exe

Special Accessories

No special accessories were supplied by BACL.

Equipment Modifications

No modification was made to the EUT.

Local Support Equipment List and Details

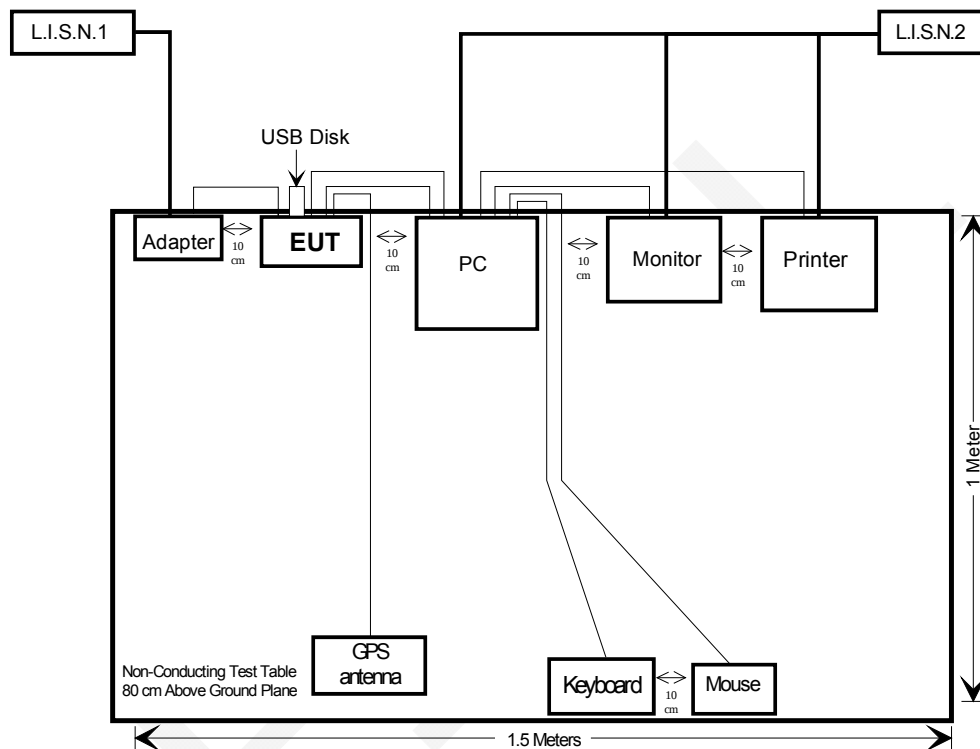
Manufacturer	Description	Model Number	Serial Number
IBM	PC	8176	99Y7315
Kingston	USB Disk	DTSE9	None
EPSON	Printer	Photo700	A2U0002196
Lenovo	Keyboard	KB-US19EB	IMHYX01107106460
Lenovo	Mouse	MU-513U	IMJS011041409259
DELL	LCD Monitor	SK-8815	9161649
Kingston	DTSE9	16G	No

External I/O Cable

Cable Description	Length (m)	From	To
Shielded VGA Cable	1.5	PC	LCD Monitor
Shielded Serial Cable	1.5	PC	EUT
Shielded Parallel Cable	1.8	PC	Printer
Shielded GPS Cable	3.0	GPS Antenna	EUT
Unshielded Mouse Cable	1.5	PC	Mouse
Unshielded Keyboard Cable	1.5	PC	Keyboard
Unshielded RJ45 Cable	1.2	PC	EUT

Block Diagram of Test Setup

Conducted emissions test:



Test Equipments List

Manufacturer	Description	Model Number	Serial Number	Calibration Date	Calibration Due Date
Conducted Emissions Test					
Rohde & Schwarz	EMI Test Receiver	ESCS 30	836858/0016	2017-12-02	2018-12-01
Rohde & Schwarz	L.I.S.N.	ENV216	100018	2017-05-20	2018-05-19
EMCO	L.I.S.N.	3810/2BR	9509-1102	2017-12-02	2018-12-01
Rohde & Schwarz	RF Limiter	ESH3Z2	DE14781	2017-11-10	2018-11-09
N/A	Conducted Cable	NO.5	N/A	2017-11-10	2018-11-09
Rohde & Schwarz	EMC32	N/A	V 8.52.0	N/A	N/A
Radiated Emissions Test					
Sonoma	Pre-Amplifier	310N	186684	2017-08-18	2018-08-17
Rohde & Schwarz	EMI Test Receiver	ESIB 40	100215	2017-09-12	2018-09-11
Rohde & Schwarz	EMI Test Receiver	ESCI	100028	2017-05-20	2018-05-19
Sunol Sciences	Broadband Antenna	JB3	A121808	2017-05-18	2020-05-17
ETS	Horn Antenna	3115	003-6076	2017-05-19	2020-05-18
A.H. Systems, Inc	Amplifier	PAM-0118P	467	2017-08-10	2018-08-09
INMET	Attenuator	18N-6dB	64671	2017-11-10	2018-11-09
EMCT	Semi-Anechoic Chamber	966	N/A	2015-04-24	2018-04-23
N/A	RF Cable (below 1GHz)	NO.1	N/A	2017-11-10	2018-11-09
N/A	RF Cable (below 1GHz)	NO.4	N/A	2017-11-10	2018-11-09
N/A	RF Cable (above 1GHz)	NO.2	N/A	2017-11-10	2018-11-09
Rohde & Schwarz	EMC32	N/A	V 8.52.0	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

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

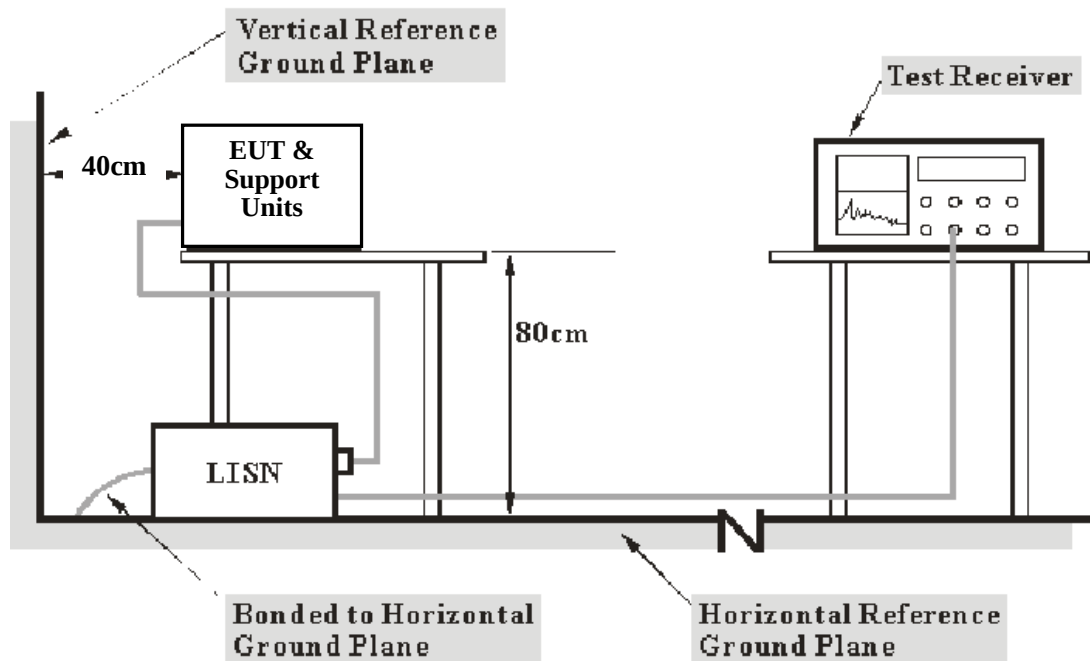
FCC §15.107 CONDUCTED EMISSION TEST

Applicable Standard

FCC §15.107

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.

The adapter was connected to AC120V/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 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.

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:

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

Summary of Test Results

According to the data in the following, the EUT complied with FCC PART 15 Subpart B Class B limit.

Test Data

Test Environment Conditions

Temperature:	19 °C
Relative Humidity:	42 %
ATM Pressure:	96.2 kPa

The testing was performed by Tom Tang on 2018-01-03.

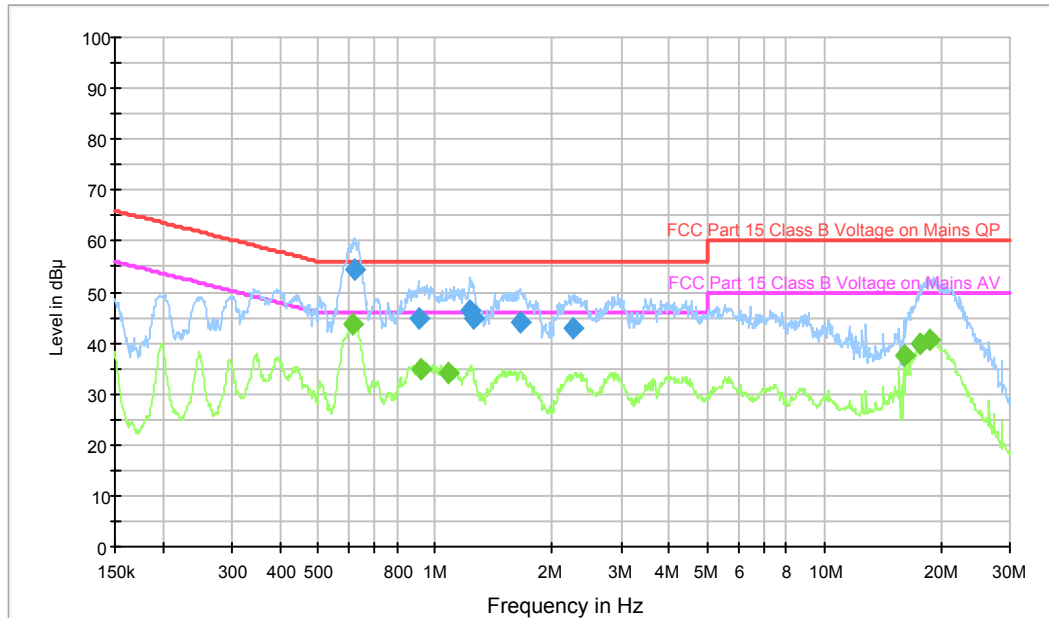
Test Mode: Running (LAN+ USB+RS232)

FINAL

1. Multi-listing 4G Module, Model: LE910-SV1

Adapter 1: API315-1212

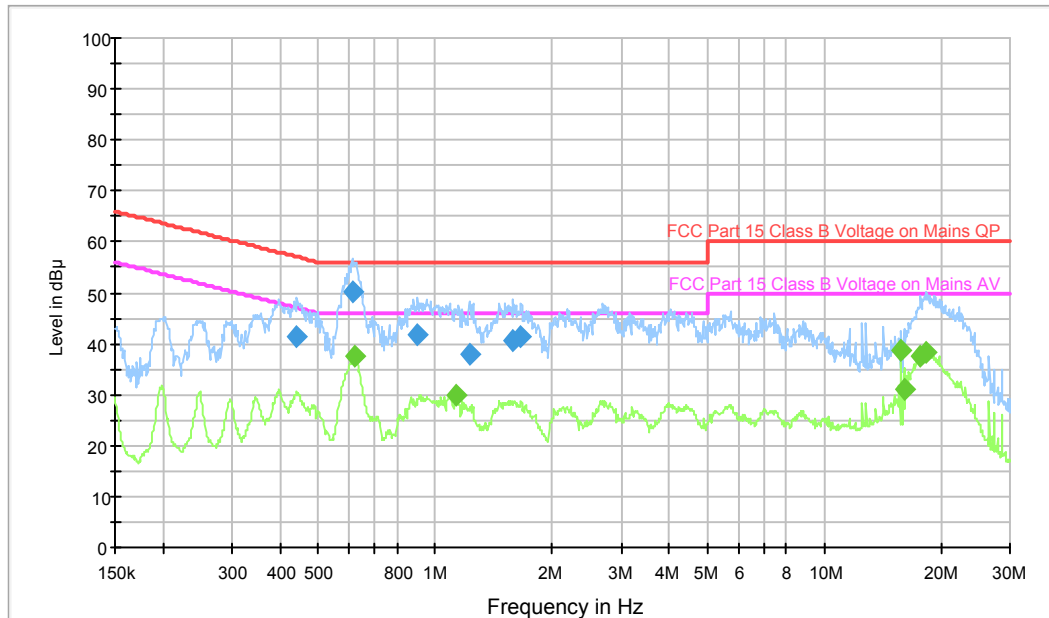
AC120V/60Hz, Line



Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Line	Corrected Factor (dB)	Margin (dB)	Limit (dBμV)
0.623774	54.6	9.000	L1	19.8	1.4	56.0
0.907812	44.7	9.000	L1	19.8	11.3	56.0
1.229584	46.3	9.000	L1	19.7	9.7	56.0
1.254373	44.7	9.000	L1	19.7	11.3	56.0
1.652163	44.1	9.000	L1	19.8	11.9	56.0
2.255706	42.8	9.000	L1	19.8	13.2	56.0

Frequency (MHz)	Average (dBμV)	Bandwidth (kHz)	Line	Corrected Factor (dB)	Margin (dB)	Limit (dBμV)
0.616348	43.8	9.000	L1	19.8	2.2	46.0
0.918750	34.9	9.000	L1	19.8	11.1	46.0
1.082130	34.0	9.000	L1	19.7	12.0	46.0
16.015317	37.5	9.000	L1	20.1	12.5	50.0
17.625630	39.7	9.000	L1	20.1	10.3	50.0
18.713298	40.5	9.000	L1	20.1	9.5	50.0

AC120V/60Hz, Neutral

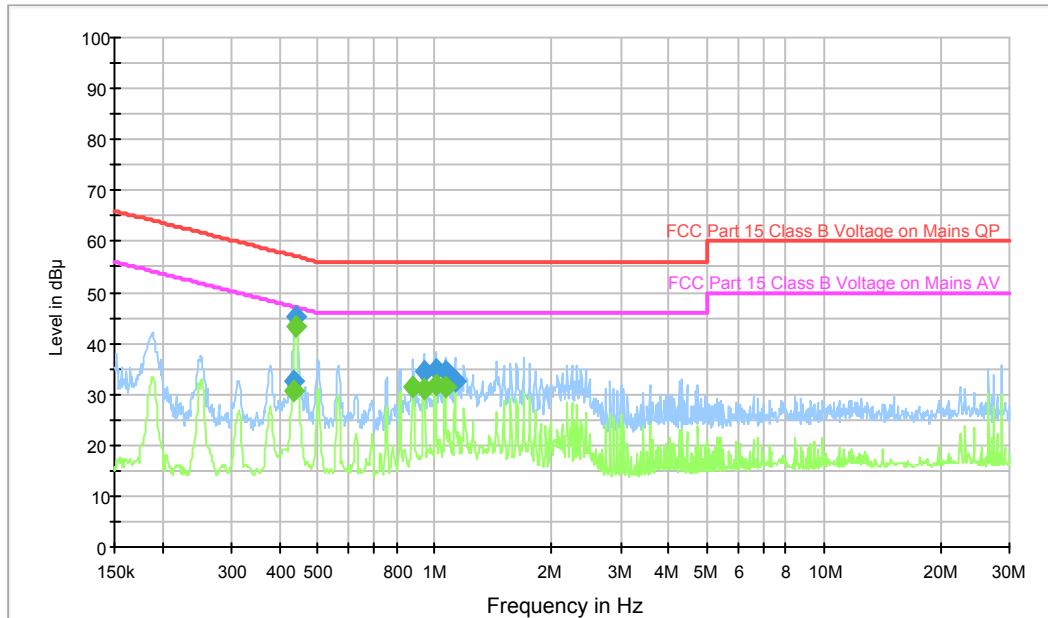


Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Line	Corrected Factor (dB)	Margin (dB)	Limit (dBμV)
0.440752	41.3	9.000	N	19.5	15.7	57.0
0.611446	50.2	9.000	N	19.5	5.8	56.0
0.900593	41.8	9.000	N	19.5	14.2	56.0
1.219806	37.8	9.000	N	19.5	18.2	56.0
1.581183	40.7	9.000	N	19.5	15.3	56.0
1.658772	41.5	9.000	N	19.5	14.5	56.0

Frequency (MHz)	Average (dBμV)	Bandwidth (kHz)	Line	Corrected Factor (dB)	Margin (dB)	Limit (dBμV)
0.623774	37.6	9.000	N	19.5	8.4	46.0
1.130707	29.7	9.000	N	19.5	16.3	46.0
15.761614	38.8	9.000	N	19.9	11.2	50.0
16.015317	30.9	9.000	N	19.9	19.1	50.0
17.625630	37.7	9.000	N	19.9	12.3	50.0
18.270400	38.5	9.000	N	19.9	11.5	50.0

Adapter 2: ZF120A-1203000

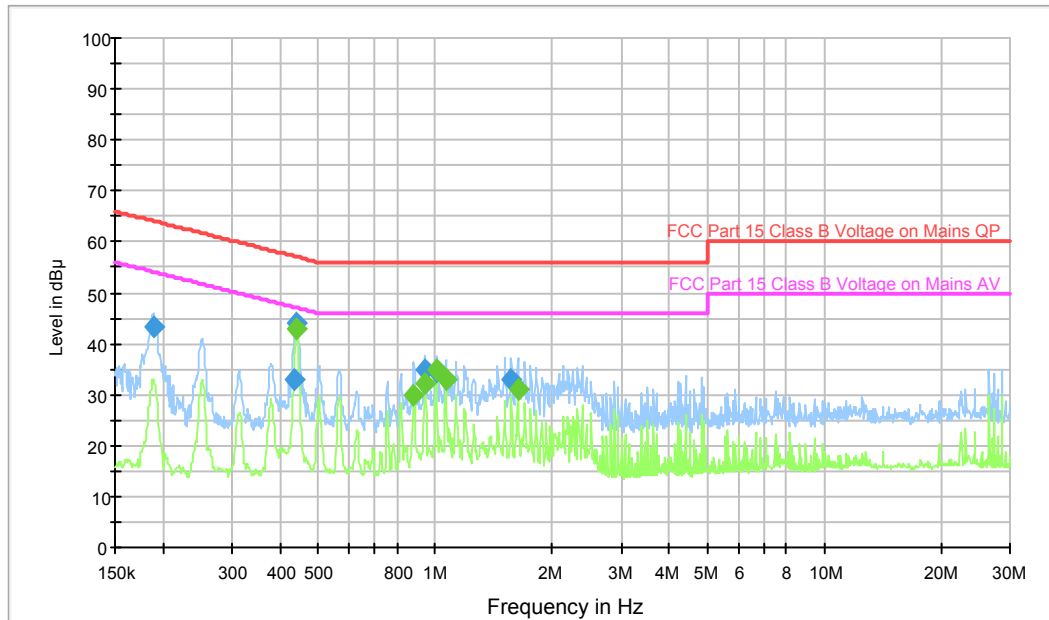
AC120V/60Hz, Line



Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Line	Corrected Factor (dB)	Margin (dB)	Limit (dBμV)
0.432041	32.6	9.000	L1	19.8	24.6	57.2
0.438996	45.2	9.000	L1	19.8	11.9	57.1
0.941021	34.6	9.000	L1	19.8	21.4	56.0
1.003088	34.7	9.000	L1	19.8	21.3	56.0
1.064988	34.6	9.000	L1	19.7	21.4	56.0
1.126203	32.6	9.000	L1	19.7	23.4	56.0

Frequency (MHz)	Average (dBμV)	Bandwidth (kHz)	Line	Corrected Factor (dB)	Margin (dB)	Limit (dBμV)
0.432041	30.5	9.000	L1	19.8	16.7	47.2
0.440752	43.4	9.000	L1	19.8	3.6	47.0
0.875775	31.3	9.000	L1	19.8	14.7	46.0
0.937272	30.9	9.000	L1	19.8	15.1	46.0
1.003088	31.7	9.000	L1	19.8	14.3	46.0
1.064988	31.5	9.000	L1	19.7	14.5	46.0

AC120V/60Hz, Neutral

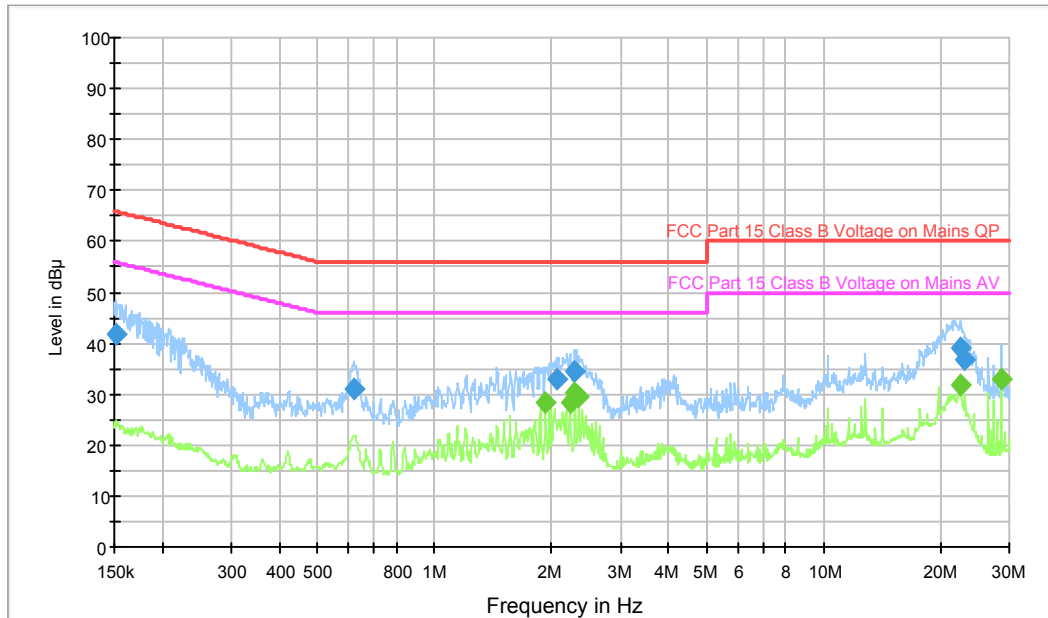


Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Line	Corrected Factor (dB)	Margin (dB)	Limit (dBμV)
0.188327	43.2	9.000	N	19.5	20.9	64.1
0.432041	32.8	9.000	N	19.5	24.4	57.2
0.440752	44.2	9.000	N	19.5	12.9	57.0
0.941021	34.8	9.000	N	19.5	21.2	56.0
1.003088	34.4	9.000	N	19.5	21.6	56.0
1.568609	33.1	9.000	N	19.5	22.9	56.0

Frequency (MHz)	Average (dBμV)	Bandwidth (kHz)	Line	Corrected Factor (dB)	Margin (dB)	Limit (dBμV)
0.440752	42.9	9.000	N	19.5	4.1	47.0
0.875775	29.9	9.000	N	19.5	16.1	46.0
0.941021	32.0	9.000	N	19.5	14.0	46.0
1.003088	34.7	9.000	N	19.5	11.3	46.0
1.064988	33.0	9.000	N	19.5	13.0	46.0
1.632495	31.1	9.000	N	19.5	14.9	46.0

Adapter 3: WT48-1203000-T

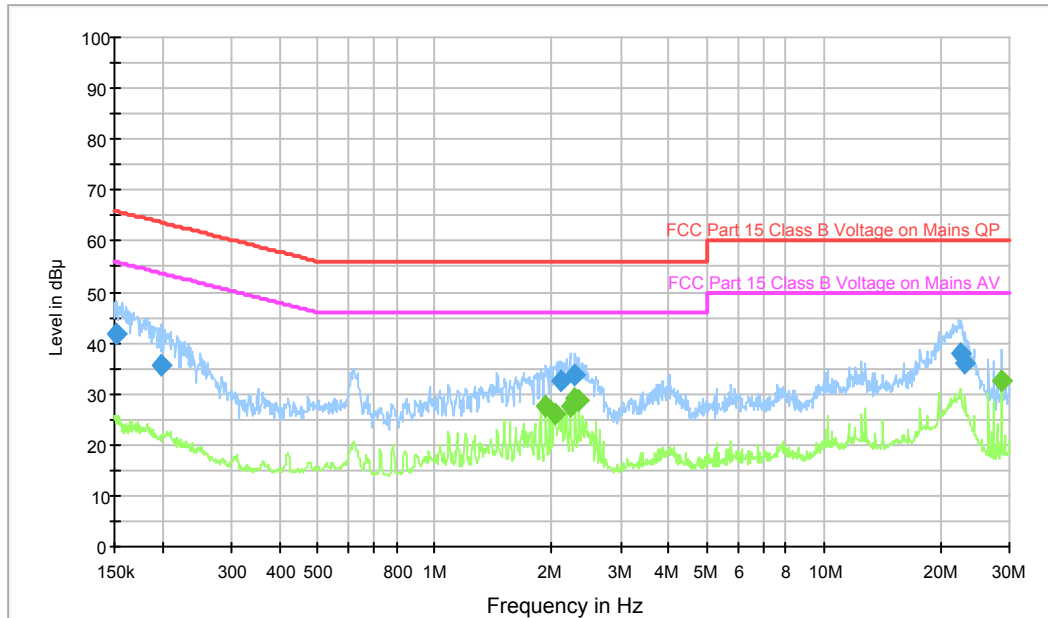
AC120V/60Hz, Line



Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Line	Corrected Factor (dB)	Margin (dB)	Limit (dBμV)
0.151203	41.8	9.000	L1	19.6	24.1	65.9
0.621288	31.2	9.000	L1	19.8	24.8	56.0
2.049620	32.8	9.000	L1	19.8	23.2	56.0
2.292015	34.6	9.000	L1	19.8	21.4	56.0
22.395843	39.1	9.000	L1	20.2	20.9	60.0
23.122624	36.8	9.000	L1	20.3	23.2	60.0

Frequency (MHz)	Average (dBμV)	Bandwidth (kHz)	Line	Corrected Factor (dB)	Margin (dB)	Limit (dBμV)
1.922800	28.5	9.000	L1	19.8	17.5	46.0
2.237768	28.4	9.000	L1	19.8	17.6	46.0
2.292015	30.2	9.000	L1	19.8	15.8	46.0
2.347576	29.6	9.000	L1	19.8	16.4	46.0
22.395843	32.0	9.000	L1	20.2	18.0	50.0
28.685182	33.1	9.000	L1	20.4	16.9	50.0

AC120V/60Hz, Neutral



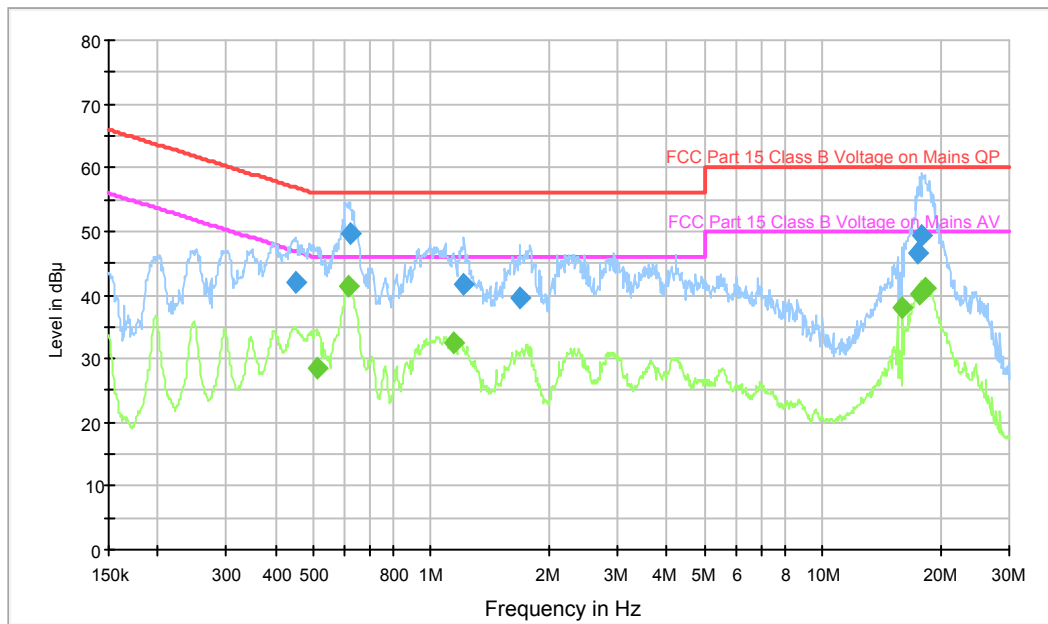
Frequency (MHz)	QuasiPeak (dB μ V)	Bandwidth (kHz)	Line	Corrected Factor (dB)	Margin (dB)	Limit (dB μ V)
0.152415	42.0	9.000	N	19.5	23.9	65.9
0.198359	35.5	9.000	N	19.5	28.2	63.7
2.107703	32.4	9.000	N	19.5	23.6	56.0
2.292015	33.8	9.000	N	19.6	22.2	56.0
22.575368	38.0	9.000	N	20.0	22.0	60.0
23.122624	35.9	9.000	N	20.1	24.1	60.0

Frequency (MHz)	Average (dB μ V)	Bandwidth (kHz)	Line	Corrected Factor (dB)	Margin (dB)	Limit (dB μ V)
1.922800	27.5	9.000	N	19.5	18.5	46.0
2.033321	26.1	9.000	N	19.5	19.9	46.0
2.228853	27.6	9.000	N	19.5	18.4	46.0
2.292015	29.0	9.000	N	19.6	17.0	46.0
2.347576	28.9	9.000	N	19.6	17.1	46.0
28.685182	32.8	9.000	N	20.1	17.2	50.0

2. Multi-listing 4G Module, Model: LE910-NA1

Adapter 1: API315-1212

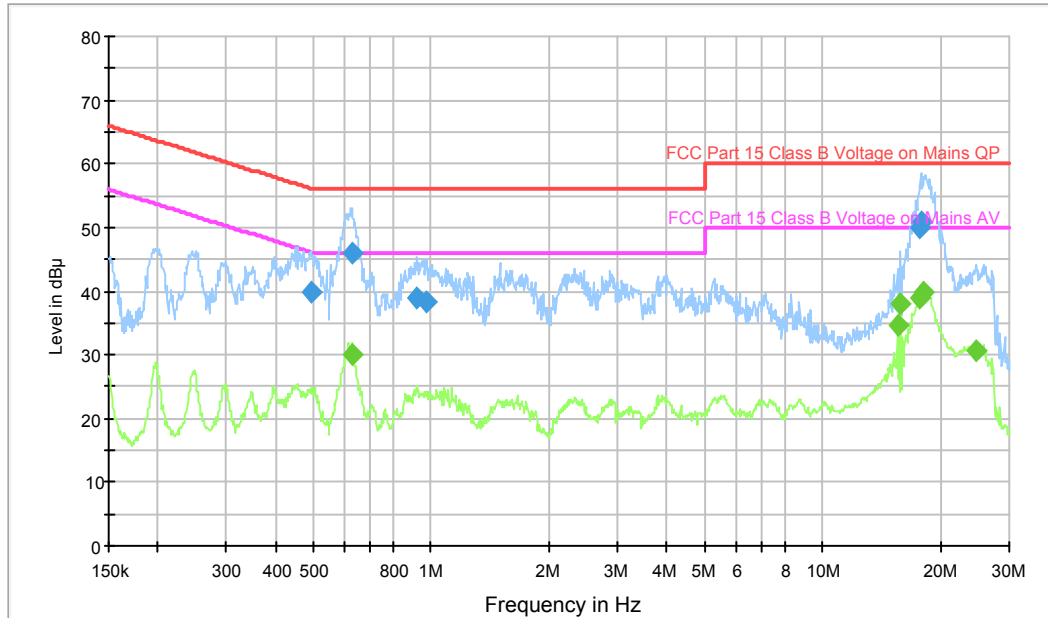
AC120V/60Hz, Line



Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Line	Corrected Factor (dB)	Margin (dB)	Limit (dBμV)
0.451436	42.0	9.000	L1	19.8	14.8	56.8
0.618813	49.5	9.000	L1	19.8	6.5	56.0
1.214946	41.8	9.000	L1	19.7	14.2	56.0
1.685472	39.5	9.000	L1	19.8	16.5	56.0
17.415803	46.7	9.000	L1	20.1	13.3	60.0
17.980974	49.3	9.000	L1	20.1	10.7	60.0

Frequency (MHz)	Average (dBμV)	Bandwidth (kHz)	Line	Corrected Factor (dB)	Margin (dB)	Limit (dBμV)
0.508871	28.4	9.000	L1	19.8	17.6	46.0
0.616348	41.3	9.000	L1	19.8	4.7	46.0
1.139771	32.6	9.000	L1	19.7	13.4	46.0
16.015317	38.2	9.000	L1	20.1	11.8	50.0
17.625630	40.0	9.000	L1	20.1	10.0	50.0
18.270400	41.0	9.000	L1	20.1	9.0	50.0

AC120V/60Hz, Neutral

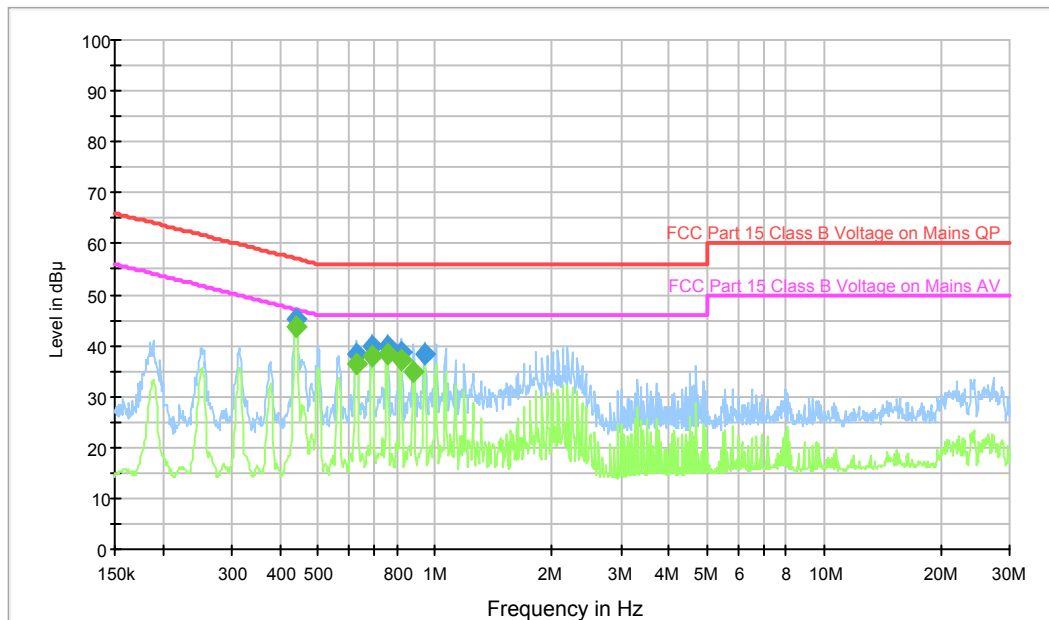


Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Line	Corrected Factor (dB)	Margin (dB)	Limit (dBμV)
0.492876	40.0	9.000	N	19.5	16.1	56.1
0.626269	45.8	9.000	N	19.5	10.2	56.0
0.922425	38.9	9.000	N	19.5	17.1	56.0
0.975445	38.2	9.000	N	19.5	17.8	56.0
17.625630	50.0	9.000	N	19.9	10.0	60.0
17.837984	50.8	9.000	N	19.9	9.2	60.0

Frequency (MHz)	Average (dB μ V)	Bandwidth (kHz)	Line	Corrected Factor (dB)	Margin (dB)	Limit (dB μ V)
0.626269	30.0	9.000	N	19.5	16.0	46.0
15.573978	34.8	9.000	N	19.9	15.2	50.0
15.824660	37.9	9.000	N	19.9	12.1	50.0
17.625630	39.1	9.000	N	19.9	10.9	50.0
18.197610	39.7	9.000	N	19.9	10.3	50.0
24.746298	30.7	9.000	N	20.1	19.3	50.0

Adapter 2: ZF120A-1203000

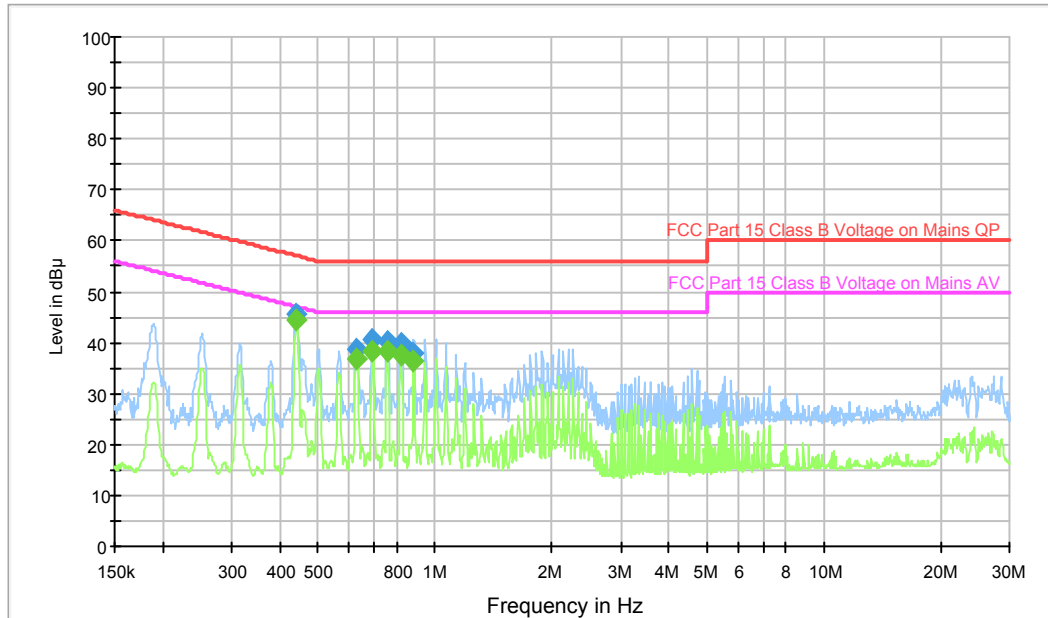
AC120V/60Hz, Line



Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Line	Corrected Factor (dB)	Margin (dB)	Limit (dBμV)
0.438996	45.2	9.000	L1	19.8	11.9	57.1
0.626269	38.3	9.000	L1	19.8	17.7	56.0
0.689239	39.8	9.000	L1	19.8	16.2	56.0
0.752509	39.8	9.000	L1	19.7	16.2	56.0
0.815053	38.8	9.000	L1	19.7	17.2	56.0
0.941021	38.2	9.000	L1	19.8	17.8	56.0

Frequency (MHz)	Average (dB μ V)	Bandwidth (kHz)	Line	Corrected Factor (dB)	Margin (dB)	Limit (dB μ V)
0.438996	43.6	9.000	L1	19.8	3.4	47.1
0.626269	36.4	9.000	L1	19.8	9.6	46.0
0.689239	38.0	9.000	L1	19.8	8.0	46.0
0.752509	38.2	9.000	L1	19.7	7.8	46.0
0.815053	37.3	9.000	L1	19.7	8.7	46.0
0.875775	34.9	9.000	L1	19.8	11.1	46.0

AC120V/60Hz, Neutral

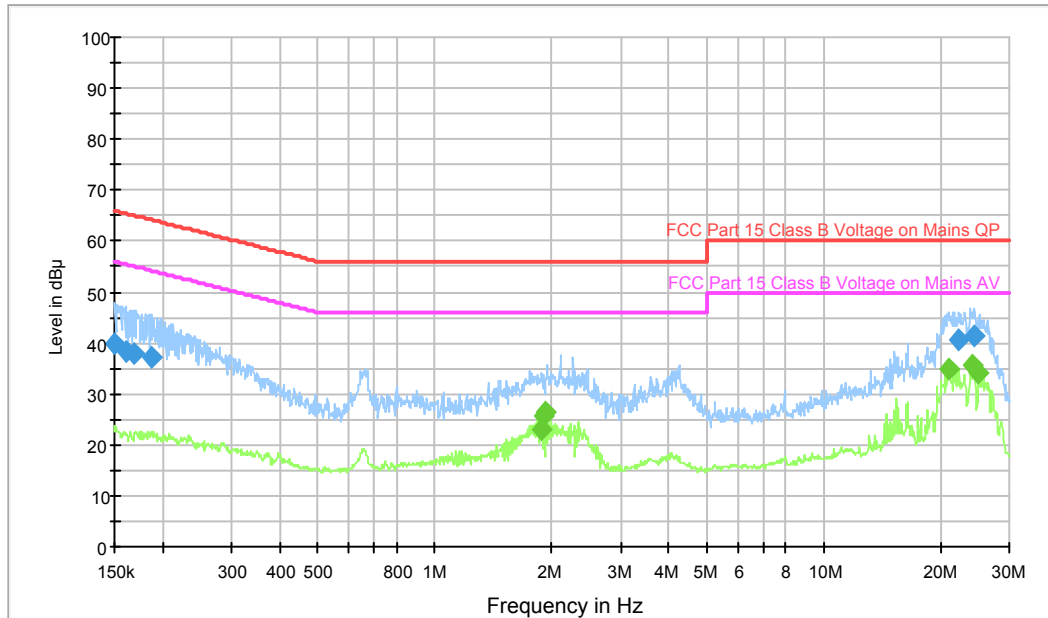


Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Line	Corrected Factor (dB)	Margin (dB)	Limit (dBμV)
0.440752	45.6	9.000	N	19.5	11.4	57.0
0.628774	38.8	9.000	N	19.5	17.2	56.0
0.691996	40.4	9.000	N	19.5	15.6	56.0
0.755519	40.3	9.000	N	19.5	15.7	56.0
0.818313	39.8	9.000	N	19.5	16.2	56.0
0.879278	37.8	9.000	N	19.5	18.2	56.0

Frequency (MHz)	Average (dBμV)	Bandwidth (kHz)	Line	Corrected Factor (dB)	Margin (dB)	Limit (dBμV)
0.440752	44.4	9.000	N	19.5	2.6	47.0
0.628774	36.8	9.000	N	19.5	9.2	46.0
0.691996	38.3	9.000	N	19.5	7.7	46.0
0.755519	38.4	9.000	N	19.5	7.6	46.0
0.818313	37.6	9.000	N	19.5	8.4	46.0
0.879278	36.3	9.000	N	19.5	9.7	46.0

Adapter 3: WT48-1203000-T

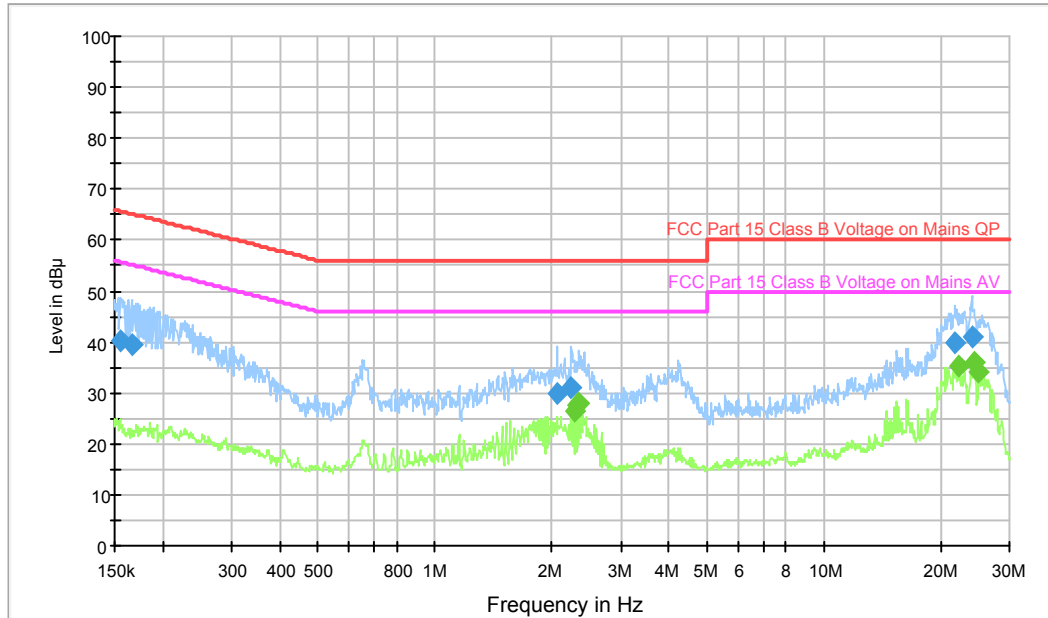
AC120V/60Hz, Line



Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Line	Corrected Factor (dB)	Margin (dB)	Limit (dBμV)
0.150000	39.8	9.000	L1	19.6	26.2	66.0
0.160533	38.2	9.000	L1	19.6	27.2	65.4
0.169084	38.0	9.000	L1	19.6	27.0	65.0
0.186085	37.3	9.000	L1	19.6	26.9	64.2
22.306616	40.8	9.000	L1	20.2	19.2	60.0
24.257256	41.4	9.000	L1	20.3	18.6	60.0

Frequency (MHz)	Average (dBμV)	Bandwidth (kHz)	Line	Corrected Factor (dB)	Margin (dB)	Limit (dBμV)
1.884801	23.2	9.000	L1	19.8	22.8	46.0
1.907509	25.5	9.000	L1	19.8	20.5	46.0
1.930491	26.4	9.000	L1	19.8	19.6	46.0
20.926389	34.9	9.000	L1	20.2	15.1	50.0
23.968482	35.8	9.000	L1	20.3	14.2	50.0
25.044443	34.1	9.000	L1	20.3	15.9	50.0

AC120V/60Hz, Neutral



Frequency (MHz)	QuasiPeak (dB μ V)	Bandwidth (kHz)	Line	Corrected Factor (dB)	Margin (dB)	Limit (dB μ V)
0.156109	40.2	9.000	N	19.5	25.5	65.7
0.165743	39.6	9.000	N	19.5	25.6	65.2
2.057819	30.0	9.000	N	19.5	26.0	56.0
2.246719	31.1	9.000	N	19.5	24.9	56.0
21.778673	39.8	9.000	N	20.0	20.2	60.0
23.968482	41.2	9.000	N	20.1	18.8	60.0

Frequency (MHz)	Average (dB μ V)	Bandwidth (kHz)	Line	Corrected Factor (dB)	Margin (dB)	Limit (dB μ V)
2.273788	26.4	9.000	N	19.5	19.6	46.0
2.301183	27.6	9.000	N	19.6	18.4	46.0
2.338223	27.9	9.000	N	19.6	18.1	46.0
22.306616	35.2	9.000	N	20.0	14.8	50.0
24.257256	36.0	9.000	N	20.1	14.0	50.0
25.044443	34.0	9.000	N	20.1	16.0	50.0

Note:

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

FCC §15.109 RADIATED EMISSION TEST

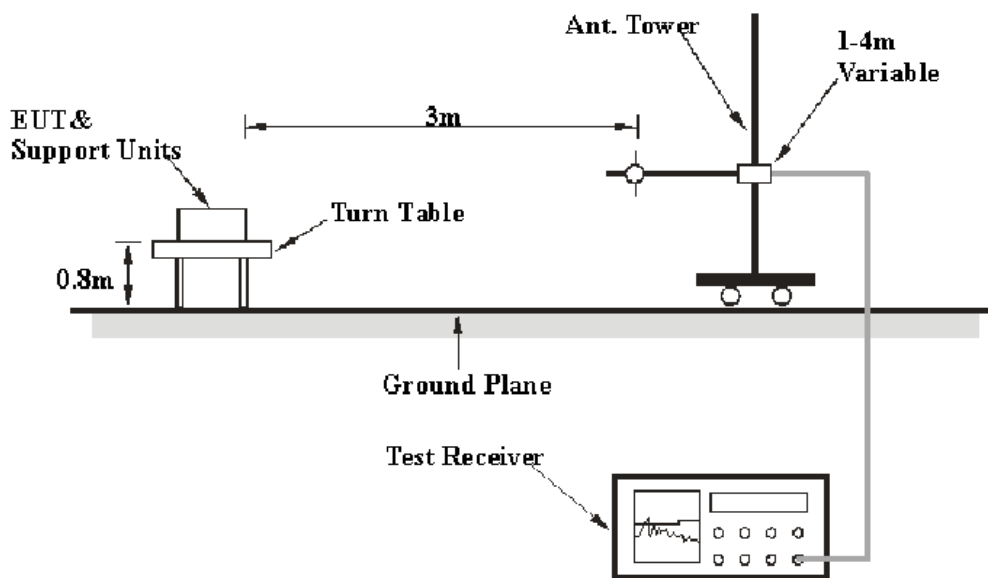
Applicable Standard

FCC §15.109

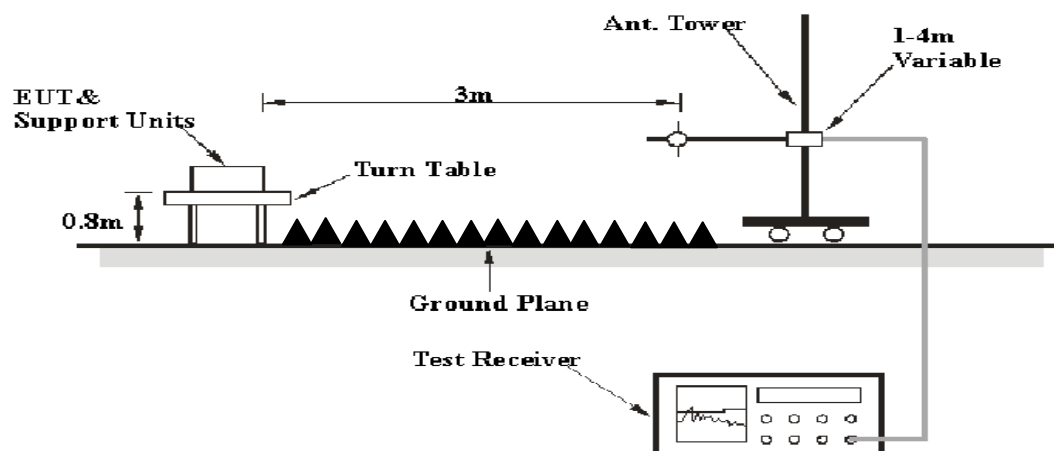
EUT Setup

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.

The adapter was connected to AC120V/60Hz power source.

EMI Test Receiver Setup

Per FCC 15.33 requirement, the frequency range is investigated 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	3 MHz	/	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 7dB below the limit. The equation for margin calculation is as follows:

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

Summary of Test Results

According to the data in the following, the EUT complied with FCC PART 15 Subpart B Class B limit.

Test Data

Test Environment Conditions

Temperature:	21 °C
Relative Humidity:	47 %
ATM Pressure:	95.8 kPa

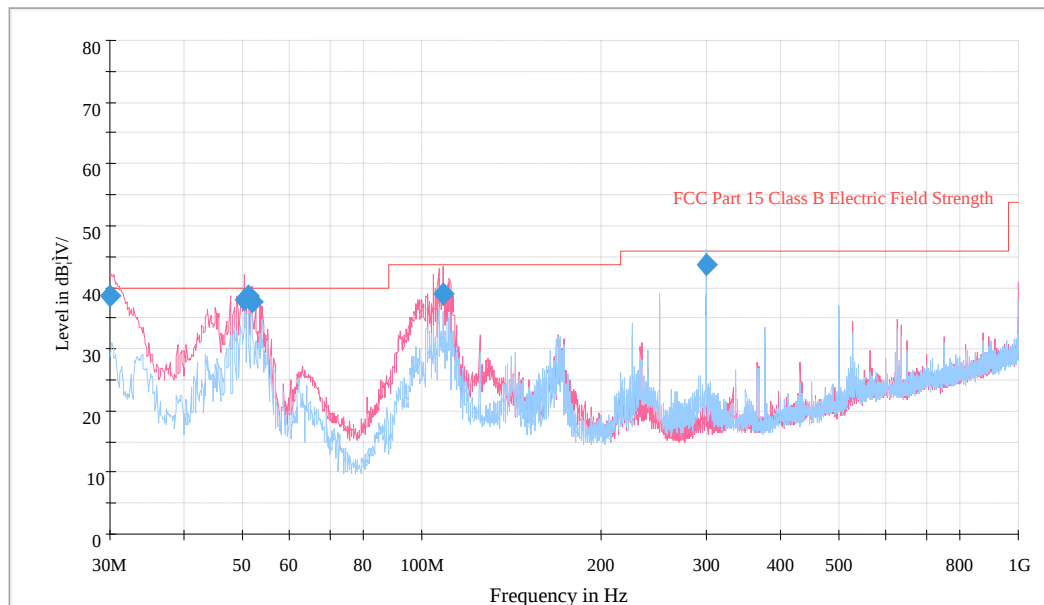
The testing was performed by Tom Tang on 2018-01-11.

Test Mode: Running (LAN+ USB+RS232)

1. Multi-listing 4G Module, Model: LE910-SV1

Below 1GHz

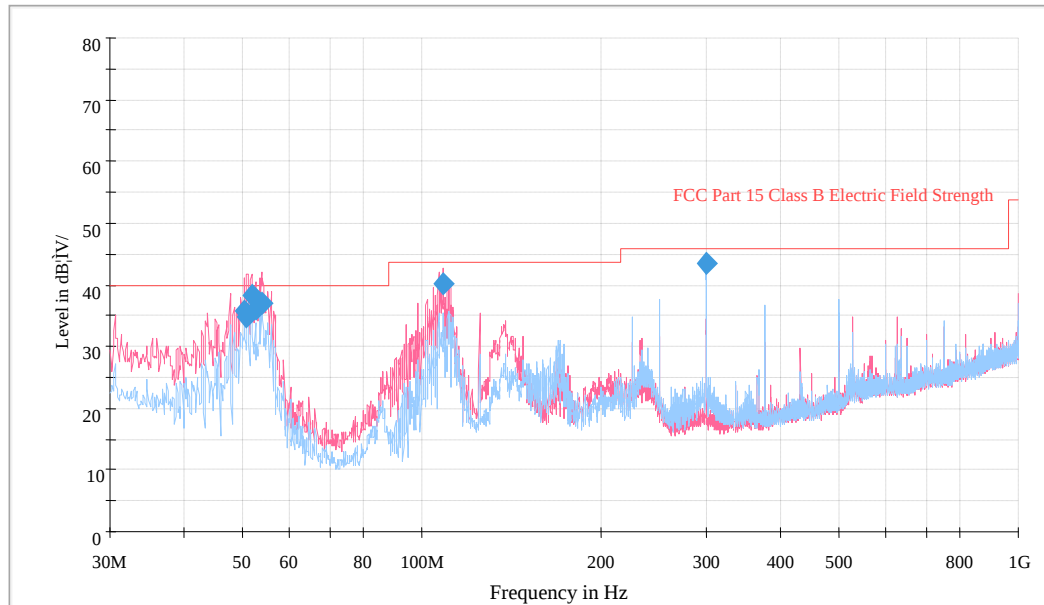
Adapter 1: API315-1212



Frequency (MHz)	QuasiPeak (dB μ V/m)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corrected Factor (dB/m)	Margin (dB)	Limit (dB μ V/m)
30.000000	39.6	120.000	100.0	V	32.0	-4.8	*0.4	40.0
50.370000	37.7	120.000	115.0	V	285.0	-17.0	*2.3	40.0
51.097500	39.7	120.000	108.0	V	278.0	-17.1	*0.3	40.0
51.825000	39.7	120.000	109.0	V	278.0	-17.1	*0.3	40.0
108.812500	39.6	120.000	128.0	V	236.0	-13.0	*3.9	43.5
300.508750	44.3	120.000	145.0	H	350.0	-10.5	*1.7	46.0

* Within Measurement Uncertainty.

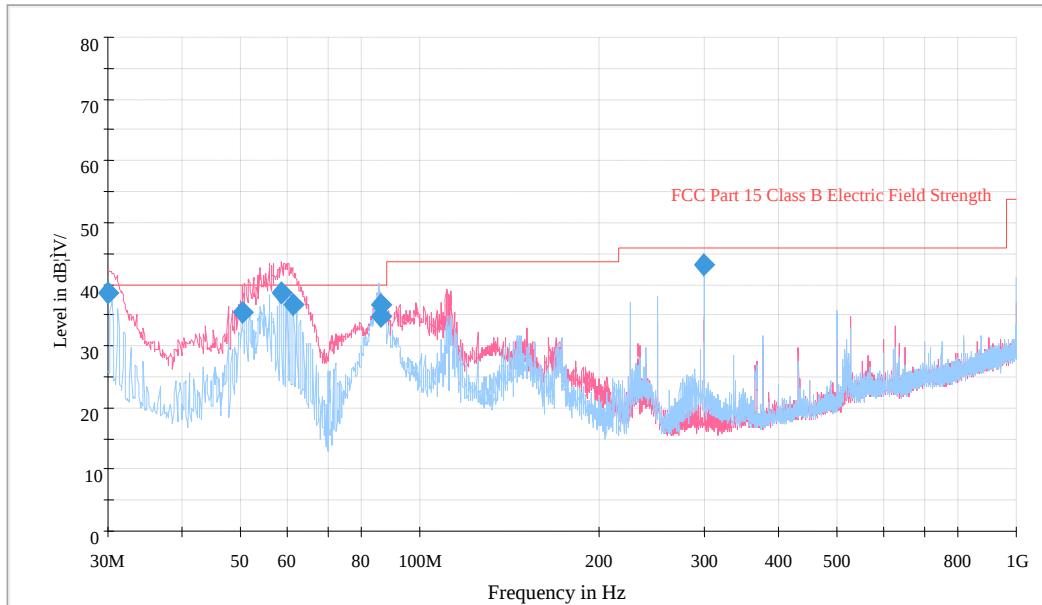
Adapter 2: ZF120A-1203000



Frequency (MHz)	QuasiPeak (dBμV/m)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corrected Factor (dB/m)	Margin (dB)	Limit (dBμV/m)
50.370000	35.6	120.000	111.0	V	260.0	-17.0	*4.4	40.0
50.976250	35.3	120.000	117.0	V	301.0	-17.0	*4.7	40.0
51.825000	38.7	120.000	115.0	V	293.0	-17.1	*1.3	40.0
52.552500	35.5	120.000	119.0	V	301.0	-17.2	*4.5	40.0
53.765000	36.1	120.000	118.0	V	301.0	-17.4	*3.9	40.0
108.812500	40.0	120.000	128.0	V	123.0	-13.0	*3.5	43.5
300.508750	44.1	120.000	148.0	H	352.0	-10.5	*1.9	46.0

* Within Measurement Uncertainty.

Adapter 3: WT48-1203000-T



Frequency (MHz)	QuasiPeak (dBμV/m)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corrected Factor (dB/m)	Margin (dB)	Limit (dBμV/m)
30.000000	39.8	120.000	102.0	V	240.0	-4.8	*0.2	40.0
50.370000	35.1	120.000	102.0	V	277.0	-17.0	4.9	40.0
58.615000	38.1	120.000	115.0	V	310.0	-17.7	*1.9	40.0
61.161250	36.6	120.000	119.0	V	268.0	-17.6	*3.4	40.0
85.411250	36.5	120.000	149.0	H	98.0	-17.2	*3.5	40.0
86.017500	34.3	120.000	145.0	V	198.0	-17.2	5.7	40.0
300.508750	44.4	120.000	145.0	H	353.0	-10.5	*1.6	46.0

* Within Measurement Uncertainty.

Adapter 1: API315-1212 (worst case)

Above 1GHz

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
2394.78	55.86	PK	H	28.68	3.80	43.95	44.39	74.00	29.61
2394.78	45.73	AV	H	28.68	3.80	43.95	34.26	54.00	19.74
2995.00	51.65	PK	H	30.58	4.28	44.27	42.24	74.00	31.76
2995.00	44.22	AV	H	30.58	4.28	44.27	34.81	54.00	19.19
3597.19	51.56	PK	H	31.97	5.60	44.43	44.70	74.00	29.30
3597.19	37.39	AV	H	31.97	5.60	44.43	30.53	54.00	23.47
1192.30	60.24	PK	V	24.26	2.66	43.44	43.72	74.00	30.28
1192.30	49.68	AV	V	24.26	2.66	43.44	33.16	54.00	20.84
1312.60	57.82	PK	V	24.55	2.82	43.49	41.70	74.00	32.30
1312.60	45.81	AV	V	24.55	2.82	43.49	29.69	54.00	24.31
2394.78	51.60	PK	V	28.68	3.80	43.95	40.13	74.00	33.87
2394.78	39.83	AV	V	28.68	3.80	43.95	28.36	54.00	25.64

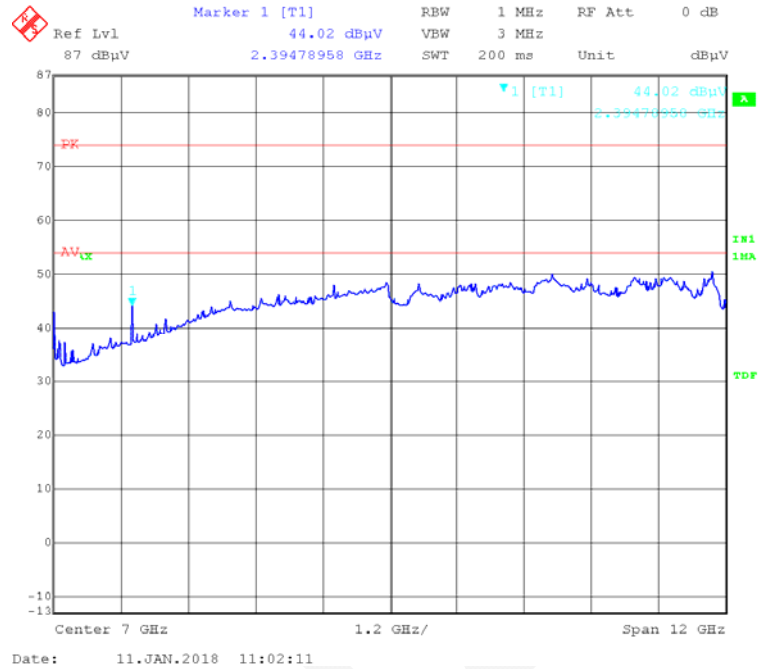
Note:

Corrected Amplitude = Corrected Factor + Reading

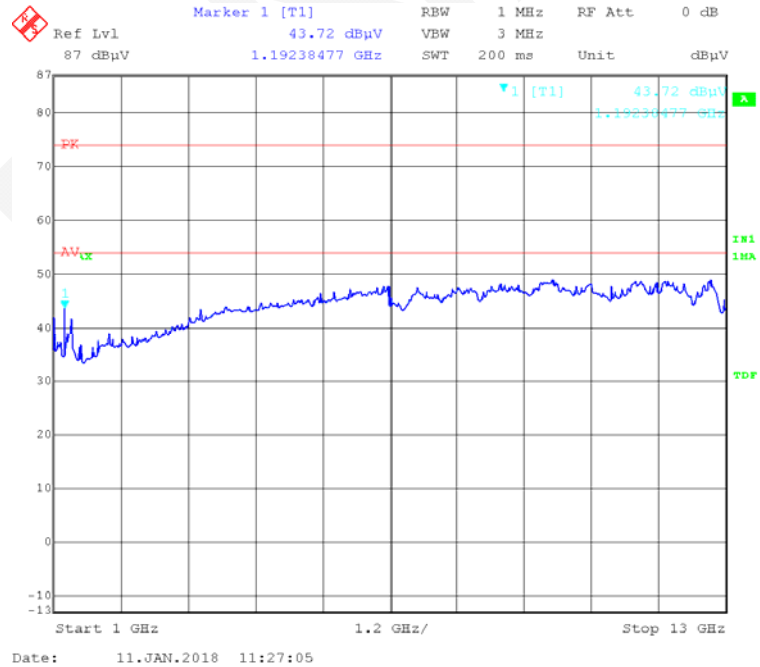
Corrected Factor=Antenna factor (RX) + Cable Loss – Amplifier Factor

Margin = Limit- Corr. Amplitude

Pre-scan with Horizontal



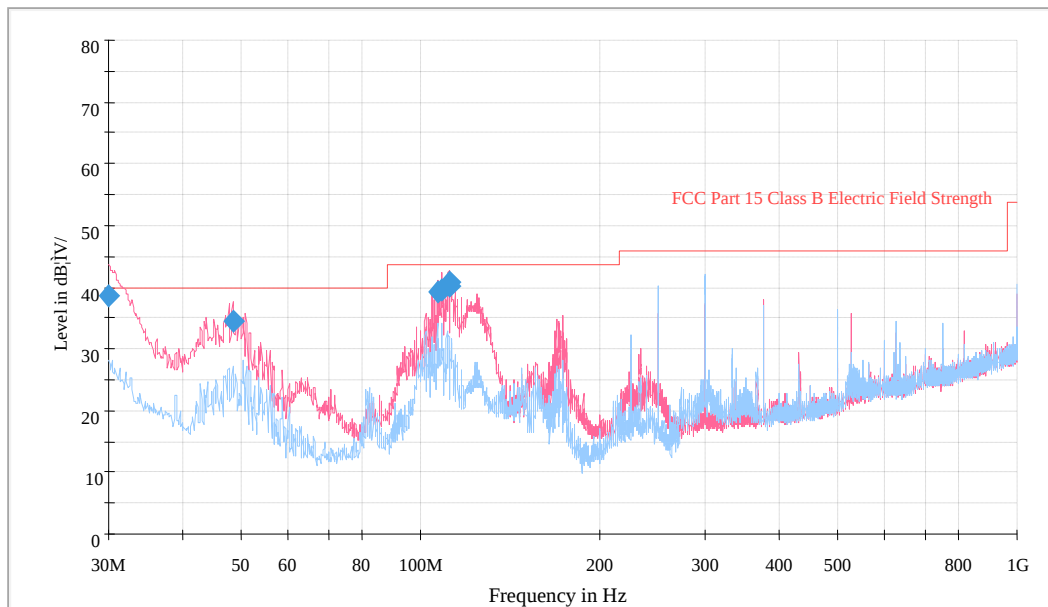
Pre-scan with Vertical



2. Multi-listing 4G Module, Model: LE910-NA1

Below 1GHz

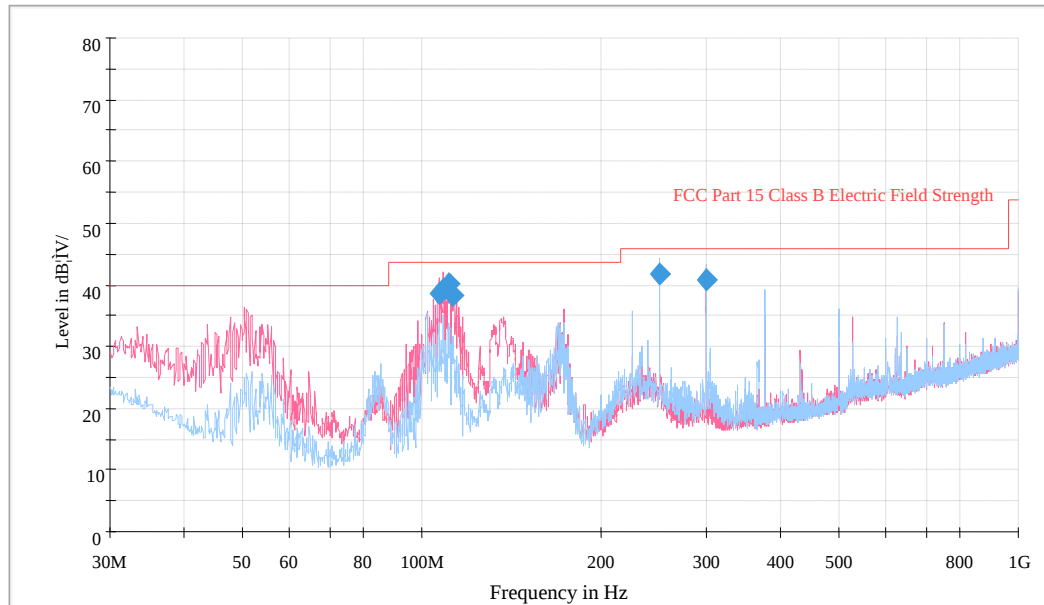
Adapter 1: API315-1212



Frequency (MHz)	QuasiPeak (dBµV/m)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corrected Factor (dB)	Margin (dB)	Limit (dBµV/m)
30.000000	39.4	120.000	100.0	V	207.0	-4.8	*0.6	40.0
48.430000	34.6	120.000	107.0	V	266.0	-16.1	5.4	40.0
106.630000	39.1	120.000	125.0	V	0.0	-13.6	*4.4	43.5
108.812500	40.2	120.000	131.0	V	0.0	-13.0	*3.3	43.5
111.601250	40.7	120.000	118.0	V	290.0	-12.5	*2.8	43.5
112.207500	41.6	120.000	122.0	V	307.0	-12.5	*1.9	43.5

* Within Measurement Uncertainty.

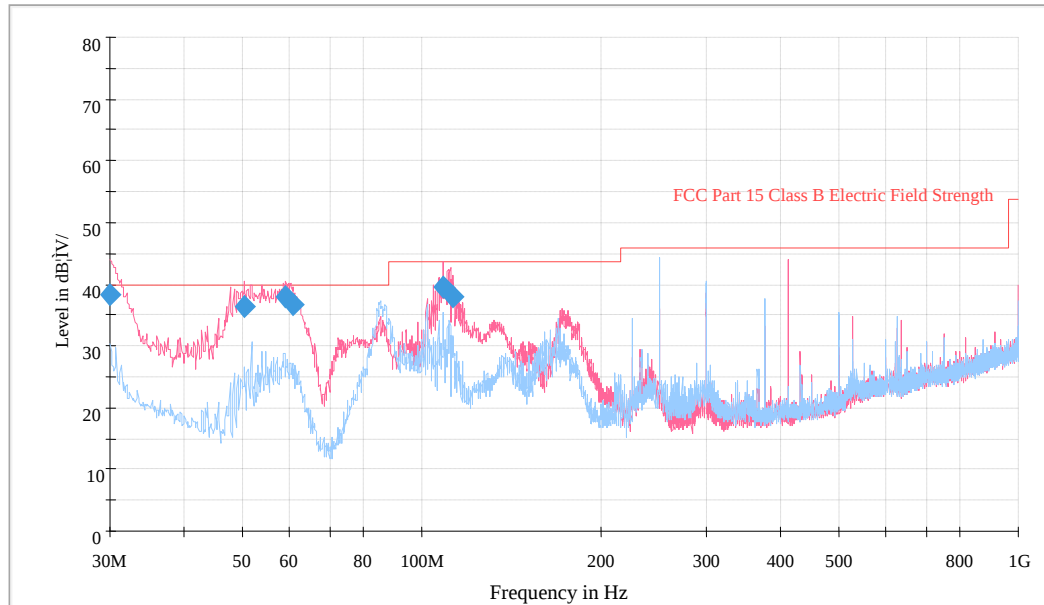
Adapter 2: ZF120A-1203000



Frequency (MHz)	QuasiPeak (dBμV/m)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corrected Factor (dB)	Margin (dB)	Limit (dBμV/m)
106.751250	39.0	120.000	121.0	V	265.0	-13.6	*4.5	43.5
108.812500	39.2	120.000	125.0	V	90.0	-13.0	*4.3	43.5
110.752500	41.1	120.000	120.0	V	281.0	-12.6	*2.4	43.5
112.813750	38.2	120.000	132.0	V	108.0	-12.4	5.3	43.5
250.068750	41.4	120.000	102.0	H	234.0	-12.5	*4.6	46.0
299.538750	40.5	120.000	136.0	H	217.0	-10.6	*5.5	46.0

* Within Measurement Uncertainty.

Adapter 3: WT48-1203000-T



Frequency (MHz)	QuasiPeak (dBµV/m)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corrected Factor (dB)	Margin (dB)	Limit (dBµV/m)
30.000000	38.2	120.000	101.0	V	98.0	-4.8	*1.8	40.0
50.370000	36.0	120.000	109.0	V	342.0	-17.0	*4.0	40.0
59.221250	38.4	120.000	112.0	V	73.0	-17.7	*1.6	40.0
60.797500	36.7	120.000	107.0	V	157.0	-17.7	*3.3	40.0
108.812500	39.7	120.000	137.0	V	351.0	-13.0	*3.8	43.5
113.056250	37.0	120.000	131.0	V	301.0	-12.4	6.5	43.5

* Within Measurement Uncertainty.

Adapter 1: API315-1212 (Worst Case)

Above 1GHz

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
2394.78	55.49	PK	H	28.68	3.80	43.95	44.02	74.00	29.98
2394.78	45.73	AV	H	28.68	3.80	43.95	34.26	54.00	19.74
2995.00	51.65	PK	H	30.58	4.28	44.27	42.24	74.00	31.76
2995.00	44.22	AV	H	30.58	4.28	44.27	34.81	54.00	19.19
3597.19	51.56	PK	H	31.97	5.60	44.43	44.70	74.00	29.30
3597.19	37.39	AV	H	31.97	5.60	44.43	30.53	54.00	23.47
1000.00	59.65	PK	V	23.80	2.40	43.37	42.48	74.00	31.52
1000.00	46.78	AV	V	23.80	2.40	43.37	29.61	54.00	24.39
1192.30	60.24	PK	V	24.26	2.66	43.44	43.72	74.00	30.28
1192.30	49.68	AV	V	24.26	2.66	43.44	33.16	54.00	20.84
2394.78	51.60	PK	V	28.68	3.80	43.95	40.13	74.00	33.87
2394.78	39.83	AV	V	28.68	3.80	43.95	28.36	54.00	25.64

Note:

Corrected Amplitude = Corrected Factor + Reading

Corrected Factor=Antenna factor (RX) + Cable Loss – Amplifier Factor

Margin = Limit- Corr. Amplitude

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