

FCC PART 15B 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: 2AAGEBTADE-PKR

Report Type: Original Report	Equipment Name: M2M Gateway
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The **Chengdu Vantron Technology, Ltd.**, model number: **VT-M2M-BTA-DE-PKR** (**FCC ID: 2AAGEBTADE-PKR**) or the "EUT" as referred to in this report was the **M2M Gateway**. The highest operating frequency is 2.48GHz.

Mechanical Description of EUT

The EUT was measured approximately: 176 mm (L) x 101 mm (W) x 52 mm (H).
Rated input voltage: DC9-36V (Typical: 12V) from adaptor.

Adaptor Information:

Manufacturer: Shenzhen Wentong Electronic Co., Ltd

Model: WT1205000

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

Output: DC 12V, 5A

**All measurement and test data in this report was gathered from final production sample, serial number: 180713001/01 (assigned by the BACL, Chengdu). It may have deviation from any other sample. The EUT supplied by the applicant was received on 2018-06-29, and EUT conformed to 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 Class B limits.

Related Submittal(s)/Grant(s)

FCC Part 15.247 DSS submissions with FCC ID: 2AAGEBTADE-PKR

FCC Part 15.247 DTS submissions with FCC ID: 2AAGEBTADE-PKR

Measurement Uncertainty

Item			Uncertainty
AC power line conducted emission			2.93 dB
Radiated Emission(Field Strength)	30MHz-200MHz	H	4.63 dB
		V	4.88 dB
	200MHz-1GHz	H	5.02 dB
		V	6.06 dB
	1GHz-6GHz		4.51 dB
	6GHz-18GHz		4.49 dB
	18GHz-40GHz		5.48 dB

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

LINUX

Special Accessories

No special accessories were supplied by BACL.

Equipment Modifications

No modification was made to the EUT.

Support Equipment List and Details

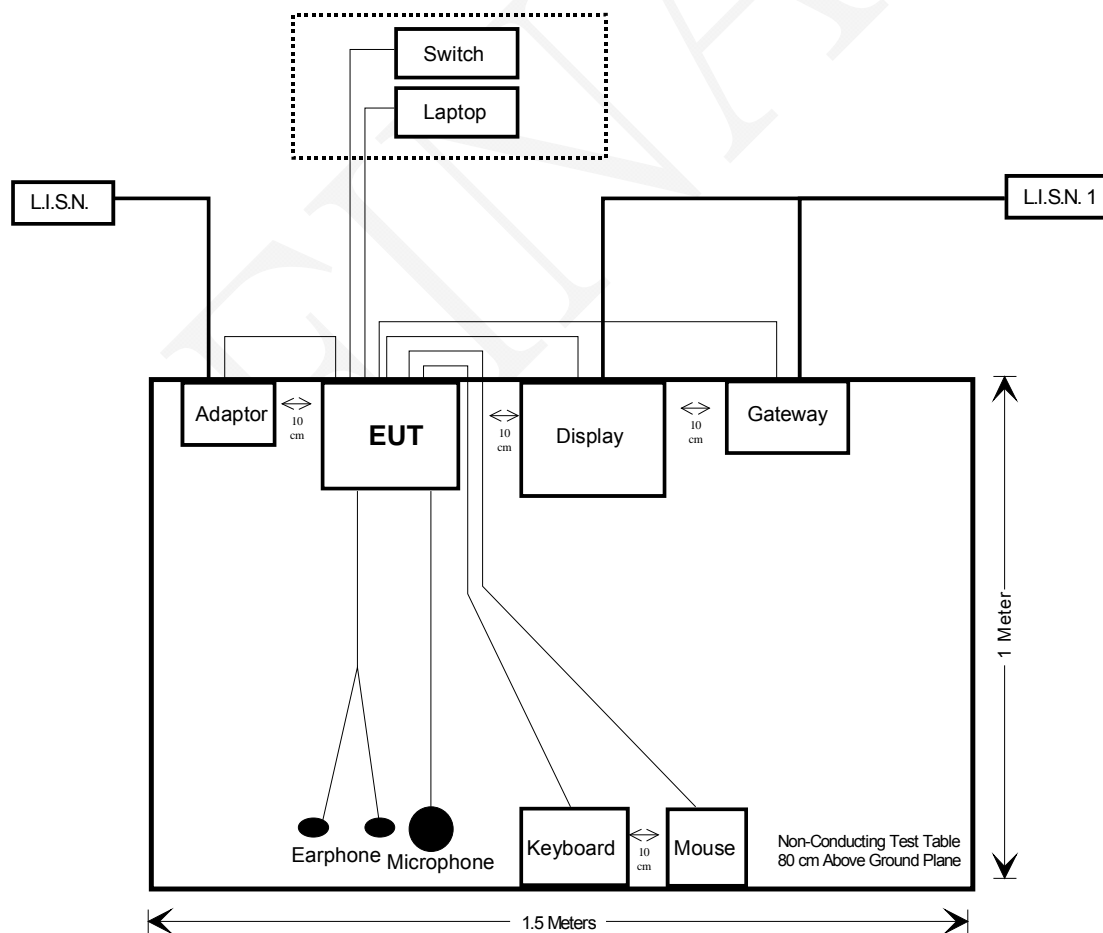
Manufacturer	Description	Model	Serial Number
Logitech	Mouse	M-U0004	810-001808
LAPOP	Keyboard	JT-505	JT5056UBD200312
DL	Switch	DL-S1005PM	None
HUAWEI	Earphone	P9	None
ANTER	Gateway	EGW802	0508350054-1B
DELL	Display	E157FPC	060229-11
NUBWO	Microphone	NO101	None
SONY	Laptop	SVF143A1QT	None

External I/O Cable

Cable Description	Length (m)	From	To
Unshielded DC Power Cable	1.0	Adaptor	EUT
Unshielded USB Cable	1.5	EUT	Mouse
Unshielded USB Cable	1.5	EUT	Keyboard
Unshielded Earphone Cable	1.0	EUT	Earphone
Unshielded Microphone Cable	1.5	EUT	Microphone
Unshielded RJ45 Cable x2	10	EUT	Switch
Unshielded RS232 Cable	1.8	EUT	Gateway
Unshielded VGA Cable	1.8	EUT	Display
Unshielded RJ45 Cable	10	EUT	Laptop

Block Diagram of Test Setup

Conducted Emissions



SUMMARY OF TEST RESULTS

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

TEST EQUIPMENTS LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Conducted Emission					
Rohde & Schwarz	EMI Test Receiver	ESCS 30	836858/0016	2018-04-18	2019-04-17
Rohde & Schwarz	L.I.S.N.	ENV216	100018	2018-04-18	2019-04-17
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	L-E003	N/A	2017-11-10	2018-11-09
Rohde & Schwarz	EMC32	N/A	V 8.52.0	N/A	N/A
Radiated Emission					
EMCT	Semi-Anechoic Chamber	966	N/A	2017-05-18	2020-05-17
Sonoma	Pre-Amplifier	310N	186684	2017-08-18	2018-08-17
Rohde & Schwarz	EMI Test Receiver	ESIB 40	100215	2018-04-18	2019-04-17
R&S	Spectrum Analyzer	FSU26	200835	2018-05-03	2019-05-02
Rohde & Schwarz	EMI Test Receiver	ESCI	100028	2018-04-18	2019-04-17
A.H. Systems, Inc	Amplifier	PAM-0118P	467	2017-08-10	2018-08-09
SUNOL SCIENCES	Broadband Antenna	JB3	A121808	2017-05-19	2020-05-18
ETS	Horn Antenna	3115	003-6076	2017-05-19	2020-05-18
INMET	Attenuator	18N-6dB	64671	2017-11-10	2018-11-09
N/A	RF Cable (below 1GHz)	L-E005	N/A	2017-11-10	2018-11-09
N/A	RF Cable (below 1GHz)	T-E128	N/A	2017-11-10	2018-11-09
N/A	RF Cable (below 1GHz)	T-E129	N/A	2017-11-10	2018-11-09
N/A	RF Cable (above 1GHz)	T-E069	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).

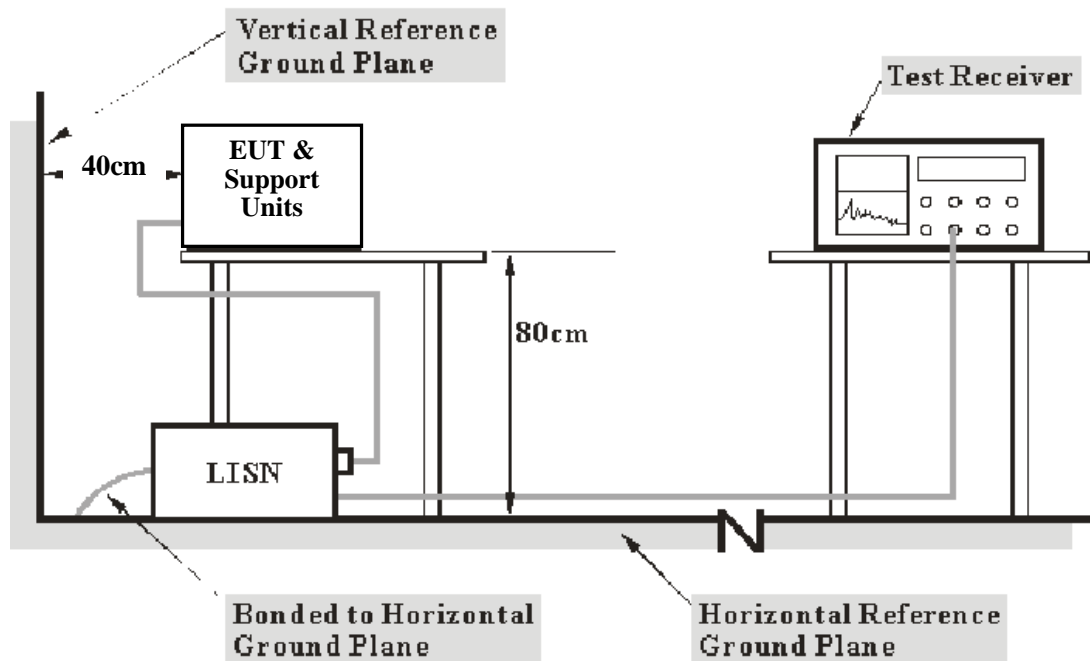
FCC §15.107 CONDUCTED EMISSION TEST

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 15B 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:

$$V_C = V_R + A_C + VDF$$
$$C_f = A_C + VDF$$

Herein,

V_C (cord. Reading): corrected voltage amplitude

V_R : reading voltage amplitude

A_C : attenuation caused by cable loss

VDF: voltage division factor of AMN

C_f : Correction Factor

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 the FCC Part 15B Class B limit.

Test Data

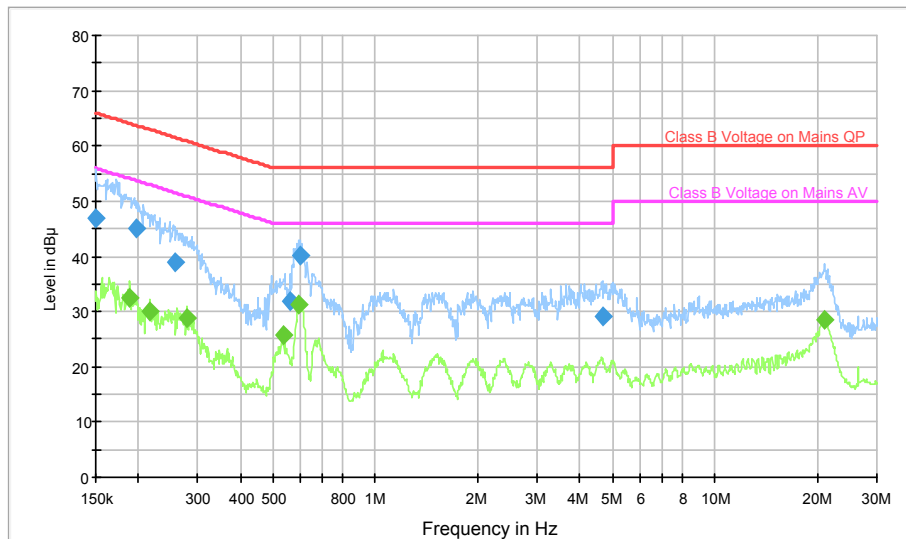
Test Environment Conditions

Temperature:	28 °C
Relative Humidity:	53%
ATM Pressure:	95.2 kPa

The testing was performed by Tom Tang on 2018-08-06.

Test mode: Play video& audio file +LAN

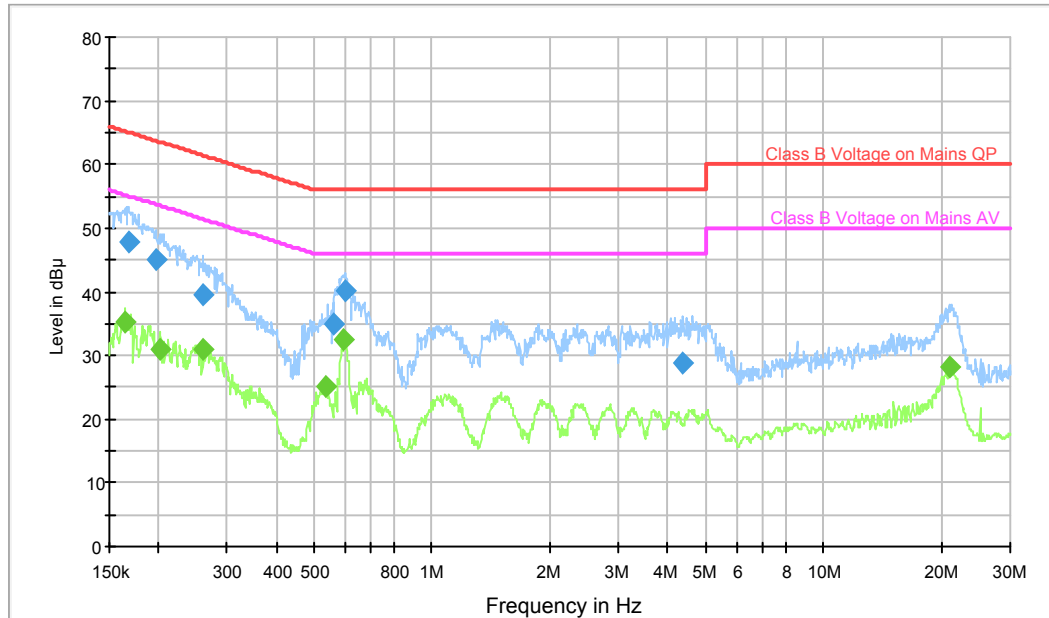
AC120 V, 60 Hz, Line:



Frequency (MHz)	QuasiPeak (dB μ V)	Bandwidth (kHz)	Line	Corrected Factor (dB)	Margin (dB)	Limit (dB μ V)
0.150600	47.0	9.000	L1	19.7	19.0	66.0
0.198359	45.1	9.000	L1	19.7	18.6	63.7
0.256100	38.8	9.000	L1	19.7	22.8	61.6
0.560037	31.8	9.000	L1	19.7	24.2	56.0
0.599363	40.1	9.000	L1	19.7	15.9	56.0
4.664642	29.2	9.000	L1	19.8	26.8	56.0

Frequency (MHz)	Average (dB μ V)	Bandwidth (kHz)	Line	Corrected Factor (dB)	Margin (dB)	Limit (dB μ V)
0.189081	32.6	9.000	L1	19.7	21.5	54.1
0.216567	30.1	9.000	L1	19.7	22.8	52.9
0.277385	28.7	9.000	L1	19.7	22.2	50.9
0.533841	25.8	9.000	L1	19.7	20.2	46.0
0.594597	31.2	9.000	L1	19.7	14.8	46.0
21.010095	28.4	9.000	L1	20.1	21.6	50.0

AC120 V, 60 Hz, Neutral:



Frequency (MHz)	QuasiPeak (dB μ V)	Bandwidth (kHz)	Line	Corrected Factor (dB)	Margin (dB)	Limit (dB μ V)
0.167740	47.7	9.000	N	19.7	17.4	65.1
0.197569	45.1	9.000	N	19.7	18.6	63.7
0.260222	39.7	9.000	N	19.8	21.7	61.4
0.562277	34.8	9.000	N	19.8	21.2	56.0
0.601760	40.2	9.000	N	19.8	15.8	56.0
4.393520	28.9	9.000	N	19.9	27.1	56.0

Frequency (MHz)	Average (dB μ V)	Bandwidth (kHz)	Line	Corrected Factor (dB)	Margin (dB)	Limit (dB μ V)
0.164425	35.1	9.000	N	19.7	20.1	55.2
0.201552	30.9	9.000	N	19.7	22.6	53.5
0.260222	30.9	9.000	N	19.8	20.5	51.4
0.533841	25.0	9.000	N	19.8	21.0	46.0
0.596975	32.4	9.000	N	19.8	13.6	46.0
21.010095	28.3	9.000	N	20.3	21.7	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

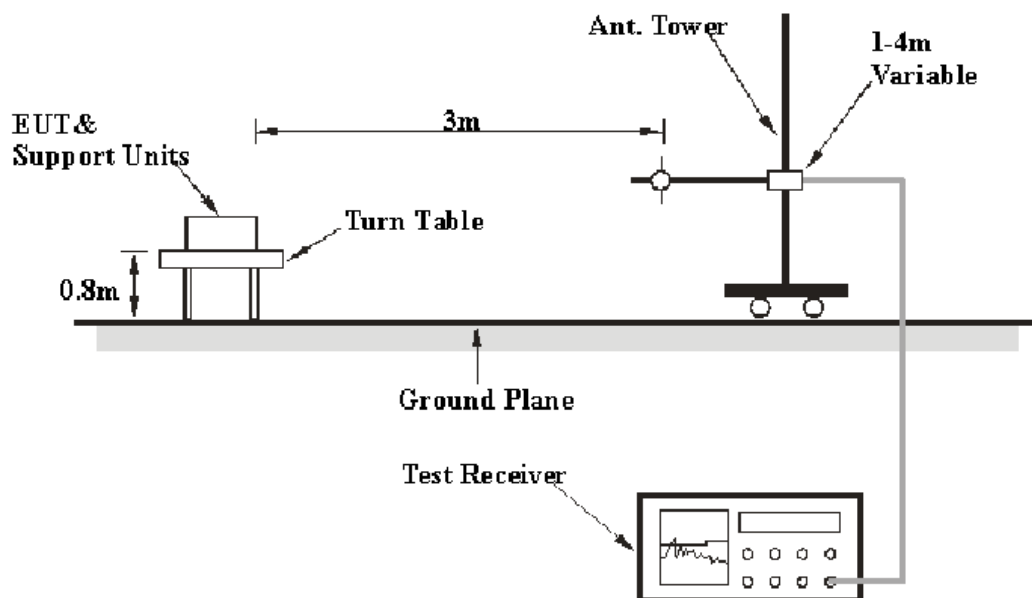
Applicable Standard

FCC §15.109

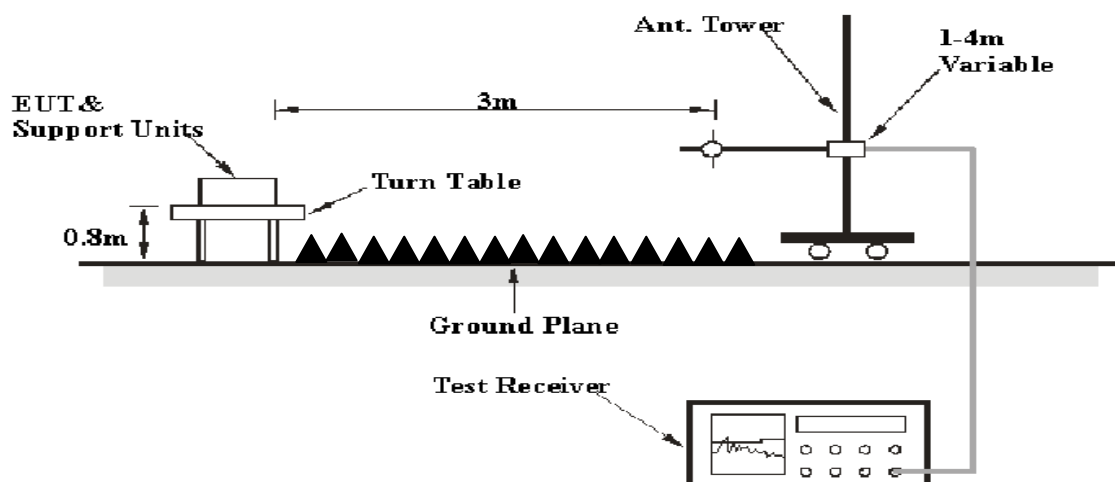
EUT Setup

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 15B 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 AC 120V/60Hz power source.

EMI Test Receiver Setup

The frequency range is investigated from 30MHz to 18GHz.

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	1 MHz	PK
	1 MHz	3 MHz	1 MHz	AV

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:

Corrected Amplitude = Indicated Reading + Antenna Factor + Cable Factor - 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:

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

Summary of Test Results

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

Test Data

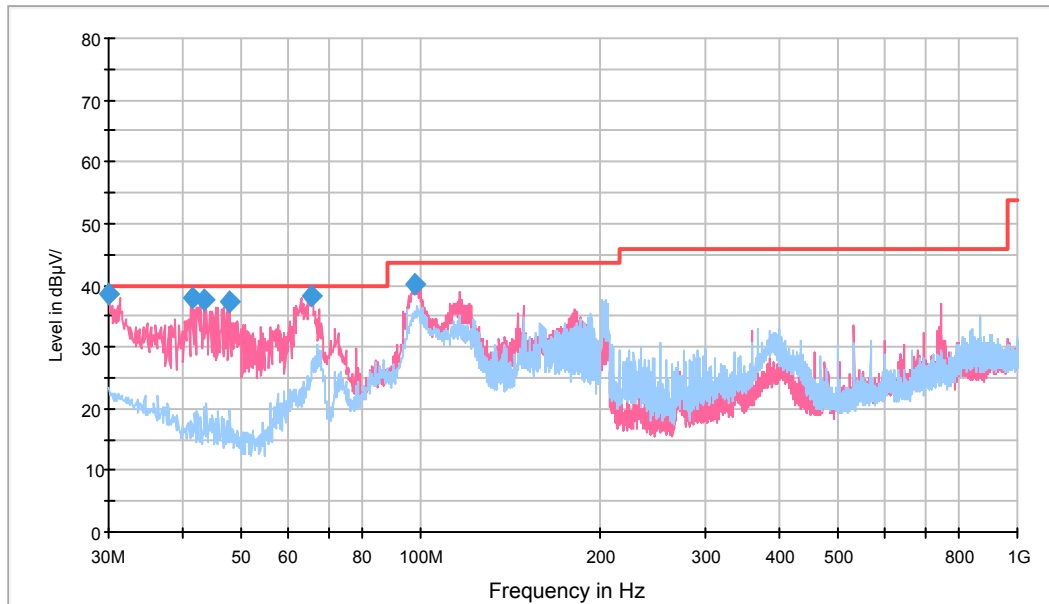
Test Environment Conditions

Temperature:	29 °C
Relative Humidity:	49 %
ATM Pressure:	95 kPa

The testing was performed by Tom Tang on 2018-08-06.

Test mode: Play video& audio file +LAN

1) 30MHz-1GHz:

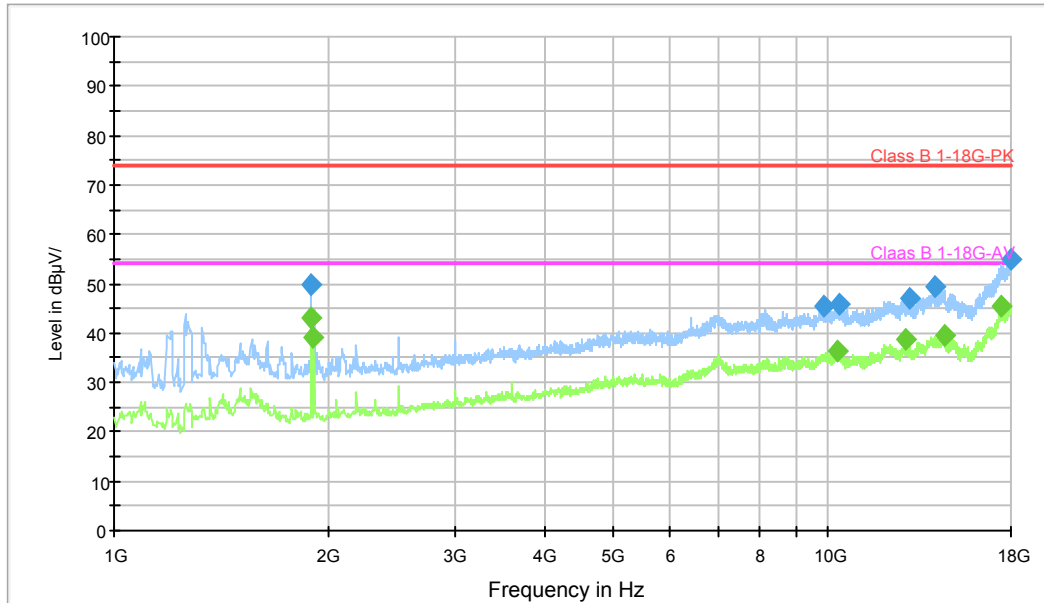


Frequency (MHz)	QuasicPeak (dB μ V/m)	Height (cm)	Polarization	Azimuth (deg)	Corrected Factor (dB/m)	Margin (dB)	Limit (dB μ V/m)
30.000000	38.5	100.0	V	8.0	-4.8	1.5*	40.0
41.397500	38.0	100.0	V	0.0	-12.1	2.0*	40.0
43.337500	37.7	100.0	V	99.0	-13.3	2.3*	40.0
47.823750	37.2	100.0	V	39.0	-15.8	2.8*	40.0
65.647500	38.3	100.0	V	279.0	-16.9	1.7*	40.0
97.536250	40.2	100.0	V	0.0	-16.1	3.3*	43.5

**with measurement uncertainty!*

1GHz-18GHz:

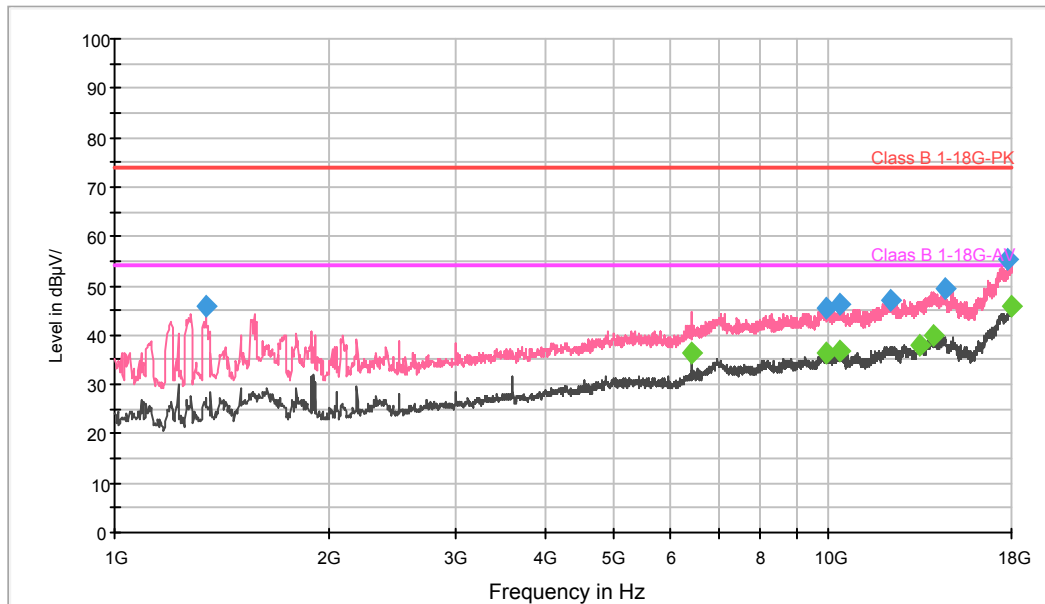
Horizontal



Frequency (MHz)	MaxPeak (dB μ V/m)	Height (cm)	Polarization	Azimuth (deg)	Corrected Factor (dB/m)	Margin (dB)	Limit (dB μ V/m)
1884.000000	49.8	100.0	H	174.0	-13.5	24.2	74.0
9860.400000	45.5	150.0	H	12.0	1.8	28.5	74.0
10370.400000	45.7	100.0	H	359.0	2.2	28.3	74.0
12985.000000	47.0	100.0	H	281.0	6.0	27.0	74.0
14117.200000	49.5	100.0	H	75.0	8.6	24.5	74.0
17993.200000	55.0	100.0	H	273.0	15.4	19.0	74.0

Frequency (MHz)	Average (dB μ V/m)	Height (cm)	Polarization	Azimuth (deg)	Corrected Factor (dB/m)	Margin (dB)	Limit (dB μ V/m)
1887.400000	42.9	100.0	H	25.0	-13.5	11.1	54.0
1901.000000	39.3	100.0	H	207.0	-13.4	14.7	54.0
10299.000000	36.4	150.0	H	166.0	2.2	17.6	54.0
12804.800000	38.7	100.0	H	339.0	5.9	15.3	54.0
14532.000000	39.7	100.0	H	248.0	8.6	14.3	54.0
17439.000000	45.4	150.0	H	268.0	14.3	8.6	54.0

Vertical



Frequency (MHz)	MaxPeak (dB µ V/m)	Height (cm)	Polarization	Azimuth (deg)	Corrected Factor (dB/m)	Margin (dB)	Limit (dB µ V/m)
1343.400000	45.8	100.0	V	243.0	-16.2	28.2	74.0
9914.800000	45.5	100.0	V	261.0	2.0	28.5	74.0
10326.200000	46.4	100.0	V	0.0	2.2	27.6	74.0
12155.400000	47.1	100.0	V	234.0	5.6	26.9	74.0
14538.800000	49.3	100.0	V	316.0	8.6	24.7	74.0
17779.000000	55.2	100.0	V	289.0	15.1	18.8	74.0

Frequency (MHz)	Average (dB µ V/m)	Height (cm)	Polarization	Azimuth (deg)	Corrected Factor (dB/m)	Margin (dB)	Limit (dB µ V/m)
6416.200000	36.5	100.0	V	216.0	-3.0	17.5	54.0
9887.600000	36.5	100.0	V	0.0	1.9	17.5	54.0
10322.800000	36.8	100.0	V	243.0	2.2	17.2	54.0
13399.800000	38.1	150.0	V	3.0	6.7	15.9	54.0
14025.400000	40.0	100.0	V	358.0	8.6	14.0	54.0
17993.200000	46.0	100.0	V	206.0	15.4	8.0	54.0

****END OF REPORT****