


FCC PART 15 SUBPART B CLASS B MEASUREMENT AND TEST REPORT

For

Beijing InHand Networks Technology Co., Ltd.
Room 302, floor 3, building 103, lize zhongyuan, chaoyang district, Beijing, China

Tested Model: InDTU332N
FCC ID: 2AANYINDTU3XXN

Report Type: Original Report		Product Name: Industrial cellular modem	
Report Number:		RSC190319001	
Date of Report Issue:		2019-03-22	
Reviewed by:		Sula Huang	
Prepared By:		Bay Area Compliance Laboratories Corp. (Chengdu) No.5040, Huilongwan Plaza, No. 1, Shawan Road, Jinniu District, Chengdu, Sichuan, China Tel: +86-28-65525123 Fax: +86-28-65525125 www.baclcorp.com	

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). This report must not be used by the customer to claim product certification, approval, or endorsement by A2LA* or any agency of the Federal Government. * This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk "**". The information marked # is provided by the applicant, the laboratory is not responsible for its authenticity.

TABLE OF CONTENTS

GENERAL INFORMATION	3
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT)	3
OBJECTIVE	3
RELATED SUBMITTAL(S)/GRANT(S).....	3
MEASUREMENT UNCERTAINTY	4
TEST METHODOLOGY	4
TEST FACILITY	4
SYSTEM TEST CONFIGURATION.....	5
JUSTIFICATION.....	5
EUT EXERCISE SOFTWARE.....	5
SPECIAL ACCESSORIES	5
EQUIPMENT MODIFICATIONS	5
SUPPORT EQUIPMENT LIST AND DETAILS.....	5
EXTERNAL I/O CABLE	5
BLOCK DIAGRAM OF TEST SETUP	6
SUMMARY OF TEST RESULTS.....	7
TEST EQUIPMENTS LIST.....	8
FCC §15.107 CONDUCTED EMISSION TEST	9
APPLICABLE STANDARD	9
EUT SETUP	9
EMI TEST RECEIVER SETUP	10
TEST PROCEDURE	10
CORRECTED AMPLITUDE & MARGIN CALCULATION	10
SUMMARY OF TEST RESULTS	10
TEST DATA.....	11
FCC §15.109 RADIATED EMISSION TEST	13
APPLICABLE STANDARD	13
EUT SETUP	13
EMI TEST RECEIVER SETUP	14
TEST PROCEDURE	14
CORRECTED AMPLITUDE & MARGIN CALCULATION	14
SUMMARY OF TEST RESULTS	14
TEST DATA.....	15

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Applicant	Beijing InHand Networks Technology Co., Ltd.
Product	Industrial cellular modem
Tested Model	InDTU332N
Multiple Model [#]	InDTU310N, InDTU311N, InDTU312N, InDTU313N, InDTU314N, InDTU315N, InDTU316N, InDTU317N, InDTU318N, InDTU319N, InDTU320N, InDTU321N, InDTU322N, InDTU323N, InDTU324N, InDTU325N, InDTU326N, InDTU327N, InDTU328N, InDTU329N, InDTU330N, InDTU331N, InDTU333N, InDTU334N, InDTU335N, InDTU336N, InDTU337N, InDTU338N, InDTU339N, InDTU380N, InDTU390N, InDTU931N, InDTU932N
Voltage Range	DC 5~35V(Typical:12V) from adapter
Measure approximately	110 mm (L) x 85 mm (W) x 35 mm (H)
Highest operating frequency	1990 MHz
Sample serial number	190319001/01 (assigned by the BACL, Chengdu)
Received date	2019-03-19
Sample/EUT Status	Good condition
Adapter Information :	Manufacturer: KUANTEN Model: SSA101F120100E2 Input: 100-240V~ 50/60Hz 0.4A Output: DC12V 1A

Note: The EUT conformed to test requirements and all measurement and test data in this report was gathered from final production sample. It may have deviation from any other sample.

Objective

The report was prepared on behalf of **Beijing InHand Networks Technology Co., 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 limits.

Related Submittal(s)/Grant(s)

No Related Submittals.

Measurement Uncertainty

Item			Measurement Uncertainty	U _{cispr}
Power line conducted emission			2.93 dB	3.4dB
Signal line conducted emission			3.52 dB	3.9dB
Radiated Emission(Field Strength)	30MHz-200MHz	H	4.63 dB	6.3dB
		V	4.88 dB	6.3dB
	200MHz-1GHz	H	5.02 dB	6.3dB
		V	6.06 dB	6.3dB
	1GHz-6GHz		4.51 dB	5.2dB
	6GHz-18GHz		4.49 dB	5.5dB
	18GHz-40GHz		5.48 dB	-

Note: Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

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.

Bay Area Compliance Laboratories Corp. (Chengdu) lab is accredited to ISO/IEC 17025 by A2LA (Lab code: 4324.01) and the FCC designation No. CN1186 under the FCC KDB 974614 D01. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2014.

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

InDTU3XX_NB_v1.0.2

Special Accessories

No special accessories were supplied by BACL.

Equipment Modifications

No modification was made to the EUT.

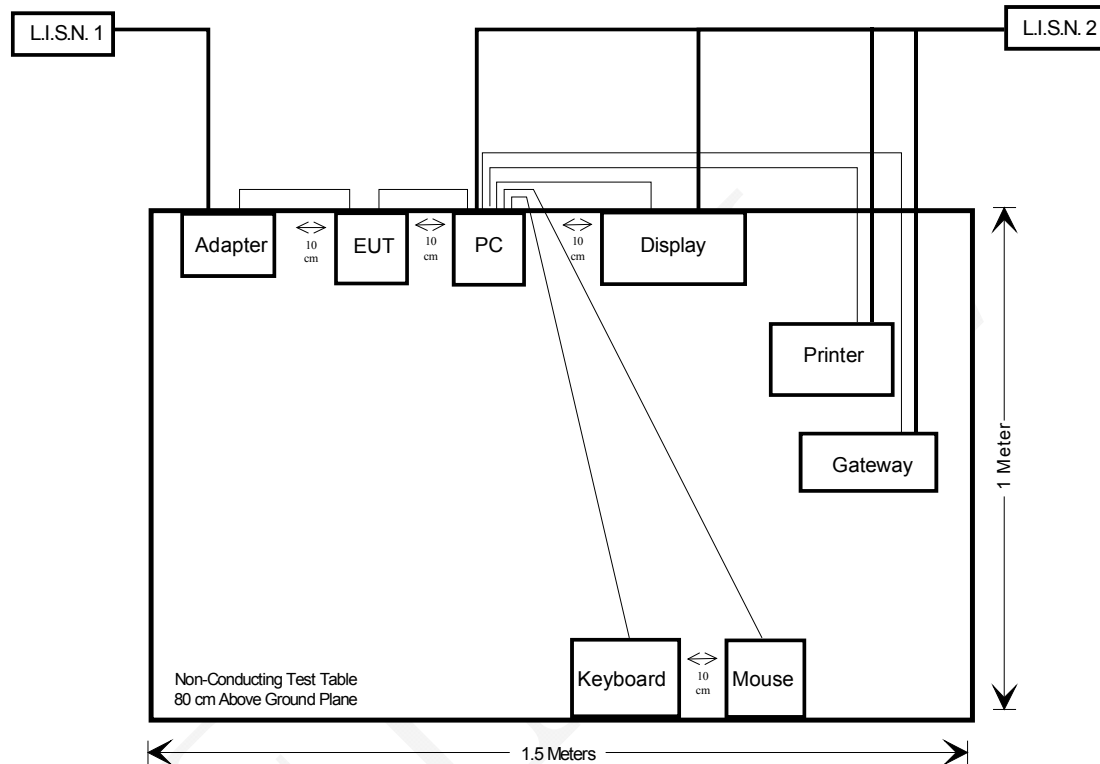
Support Equipment List and Details

Manufacturer	Description	Model Number	Serial Number
DL	Monitor	60FF-HCR3-CB	VV193567
Lenovo	PC	E75	PCOR364L
DL	Mouse	MOJU00	002B6M6
DL	Keyboard	SIL 17-W41	06548059
EPSON	Printer	PHOTO 700	A2V0002196
Anter	Gateway	EGW802	0508350054-1B

External I/O Cable

Cable Description	Length (m)	From	To
Unshielded Parallel Cable	2.0	PC	Printer
Unshielded Power Cable	2.0	Adapter	EUT
Unshielded VGA Cable	1.8	PC	Monitor
Unshielded USB Cable	1.8	PC	Keyboard
Unshielded USB Cable	1.5	PC	Mouse
Unshielded Serial port to USB cable	1.8	EUT	PC

Block Diagram of Test Setup



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 Emissions Test					
Rohde & Schwarz	EMI Test Receiver	ESCI	100028	2018-04-18	2019-04-17
ROHDE&SCHWARZ	L.I.S.N.	ENV216	3560.6550.16	2019-02-25	2020-02-24
EMCO	L.I.S.N.	3810/2BR	9509-1102	NCR	NCR
HP	RF Limiter	11947A	3107A01270	2018-11-02	2019-11-01
Unknown	Conducted Cable	L-E003	000003	2018-11-02	2019-11-01
Rohde & Schwarz	EMC32	EMC32	V 8.52.0	NCR	NCR
Radiated Emissions Test					
EMCT	Semi-Anechoic Chamber	966	001	2017-05-18	2020-05-17
SONOMA INSTRUMENT	Amplifier	310 N	186684	2018-08-24	2019-08-23
SUNOL SCIENCES	Broadband Antenna	JB3	A121808	2017-05-19	2020-05-18
INMET	Attenuator	18N-6dB	N/A	2018-11-27	2019-11-26
Rohde & Schwarz	Spectrum Analyzer	FSU26	200835	2018-05-09	2019-05-08
ETS	Horn Antenna	3115	003-6076	2017-05-19	2020-05-18
A.H. Systems, Inc	Amplifier	PAM-0118P	467	2018-10-19	2019-10-18
Rohde & Schwarz	EMI Test Receiver	ESR 3	102456	2018-06-22	2019-06-21
Unknown	RF Cable (Below 1GHz)	L-E005	000005	2018-11-27	2019-11-26
Unknown	RF Cable (Below 1GHz)	T-E128	000128	2018-11-27	2019-11-26
Unknown	RF Cable (Below 1GHz)	T-E129	000129	2018-11-27	2019-11-26
Unknown	RF Cable (Above 1GHz)	T-E069	000069	2018-11-27	2019-11-26
Micro-coax	RF Cable (Above 1GHz)	T-E209	MFR 64639 2310	2019-03-14	2020-03-13
Rohde & Schwarz	EMC32	EMC32	V9.10.00	NCR	NCR

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

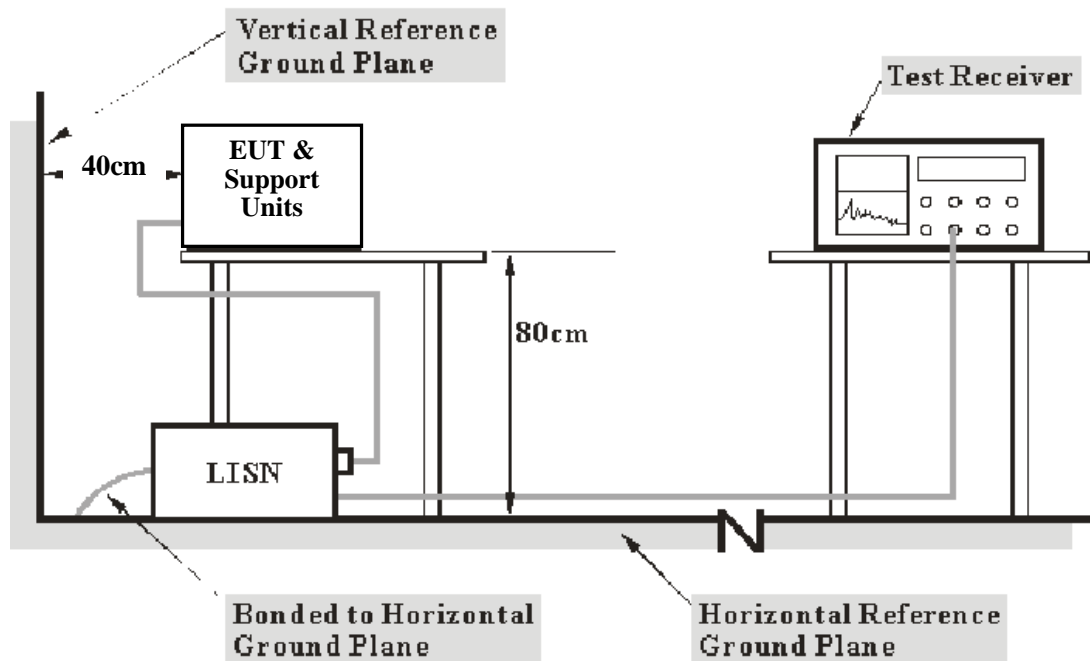
FCC §15.107 CONDUCTED EMISSION TEST

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 and Transient Limiter Factor

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

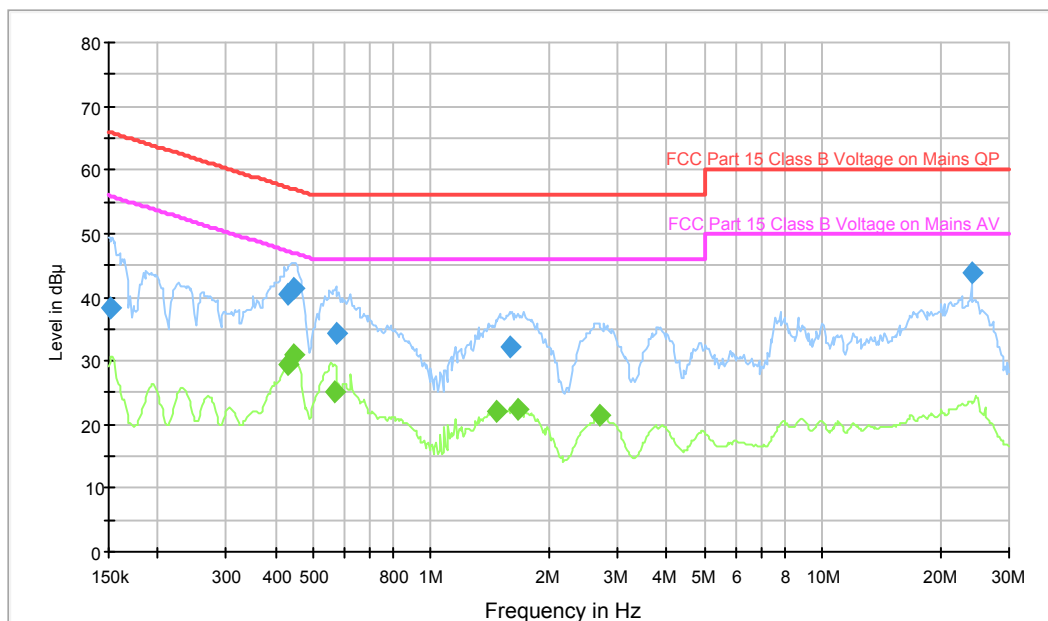
Test Environment Conditions

Temperature:	18 °C
Relative Humidity:	58 %
ATM Pressure:	95 kPa

The testing was performed by Tom Tang on 2019-03-20.

Test mode: Operating(RS232/485 communication)

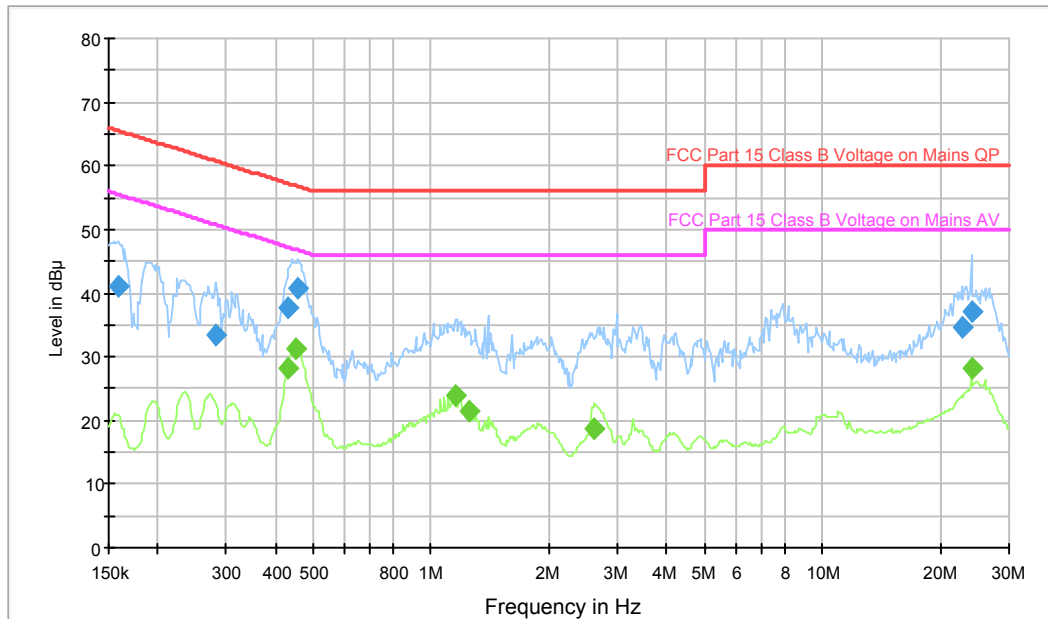
AC120 V, 60 Hz, Line:



Frequency (MHz)	QuasiPeak (dB μ V)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.151200	38.3	100.0	9.000	L1	19.6	27.6	65.9
0.429420	40.6	100.0	9.000	L1	19.6	16.7	57.3
0.446873	41.4	100.0	9.000	L1	19.6	15.5	56.9
0.572086	34.4	100.0	9.000	L1	19.6	21.6	56.0
1.586387	32.3	100.0	9.000	L1	19.6	23.7	56.0
24.013226	43.8	100.0	9.000	L1	20.4	16.2	60.0

Frequency (MHz)	Average (dB μ V)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.429420	29.4	100.0	9.000	L1	19.6	17.9	47.3
0.446873	31.0	100.0	9.000	L1	19.6	15.9	46.9
0.567545	25.1	100.0	9.000	L1	19.6	20.9	46.0
1.464886	22.0	100.0	9.000	L1	19.6	24.0	46.0
1.664073	22.5	100.0	9.000	L1	19.6	23.5	46.0
2.684134	21.4	100.0	9.000	L1	19.6	24.6	46.0

AC120 V, 60 Hz, Neutral:



Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.158604	41.0	100.0	9.000	N	19.6	24.5	65.5
0.281497	33.3	100.0	9.000	N	19.6	27.5	60.8
0.429420	37.7	100.0	9.000	N	19.6	19.6	57.3
0.457684	40.9	100.0	9.000	N	19.6	15.8	56.7
22.710504	34.7	100.0	9.000	N	20.4	25.3	60.0
24.013226	37.1	100.0	9.000	N	20.5	22.9	60.0

Frequency (MHz)	Average (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.429420	28.1	100.0	9.000	N	19.6	19.2	47.3
0.450448	31.3	100.0	9.000	N	19.6	15.6	46.9
1.153421	24.0	100.0	9.000	N	19.7	22.0	46.0
1.249088	21.5	100.0	9.000	N	19.7	24.5	46.0
2.620732	18.6	100.0	9.000	N	19.7	27.4	46.0
24.013226	28.1	100.0	9.000	N	20.5	21.9	50.0

Note:

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

FCC §15.109 RADIATED EMISSION TEST

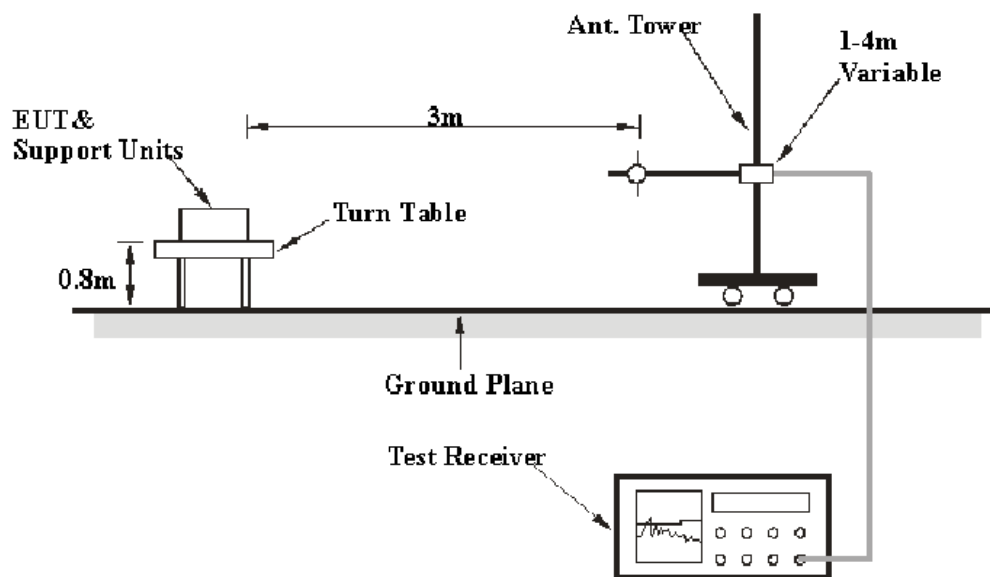
Applicable Standard

FCC §15.109

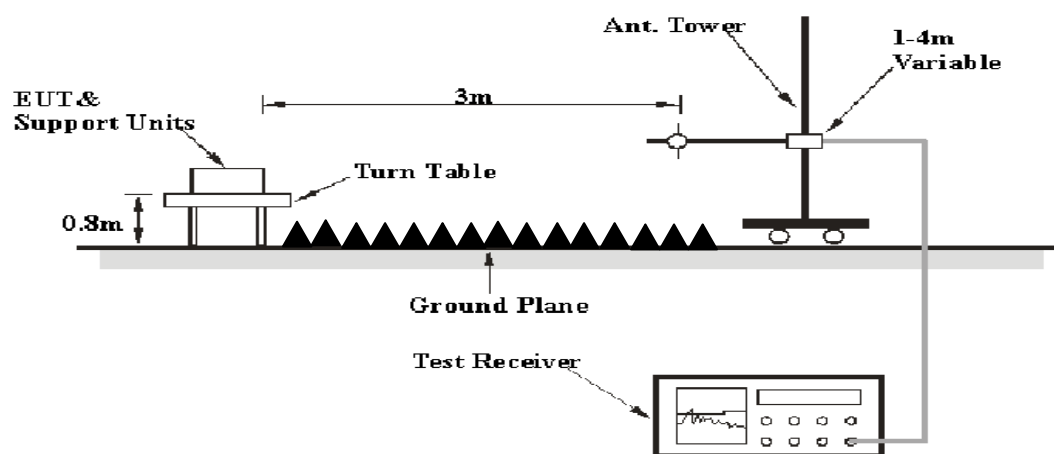
EUT Setup

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 Subpart B 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.

EMI Test Receiver Setup

The frequency range is investigated from 30 MHz to 18 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:

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 15 Subpart B Class B limit.

Test Data

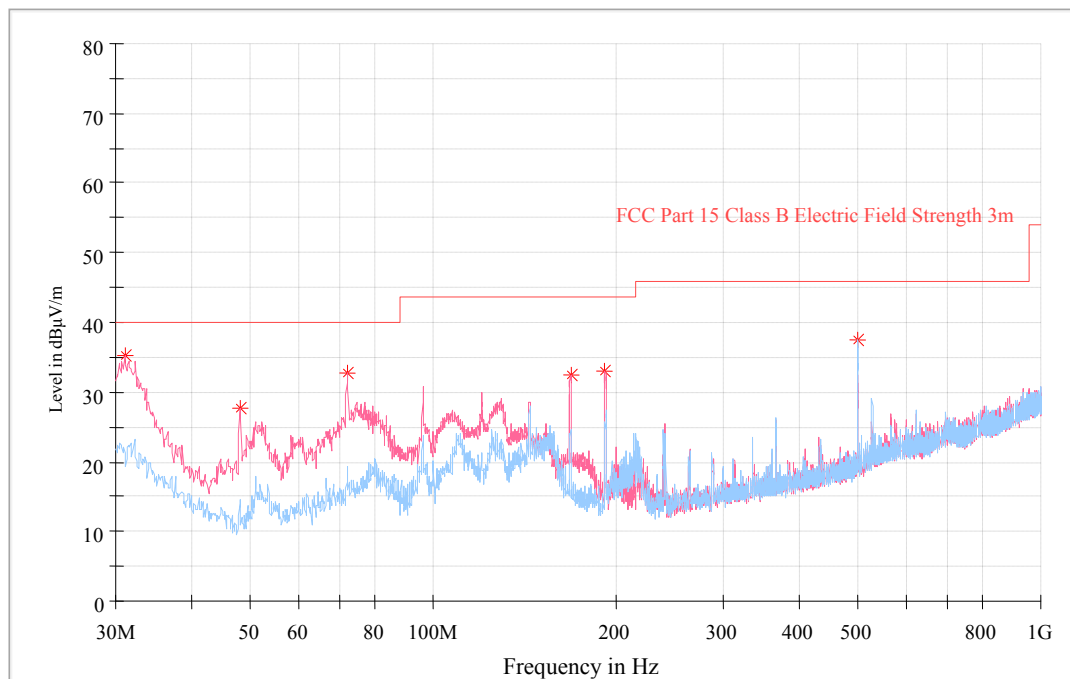
Test Environment Conditions

Temperature:	18 °C
Relative Humidity:	51 %
ATM Pressure:	94.6 kPa

The testing was performed by Tom Tang on 2019-03-21.

Test mode: Operating(RS232/485 communication)

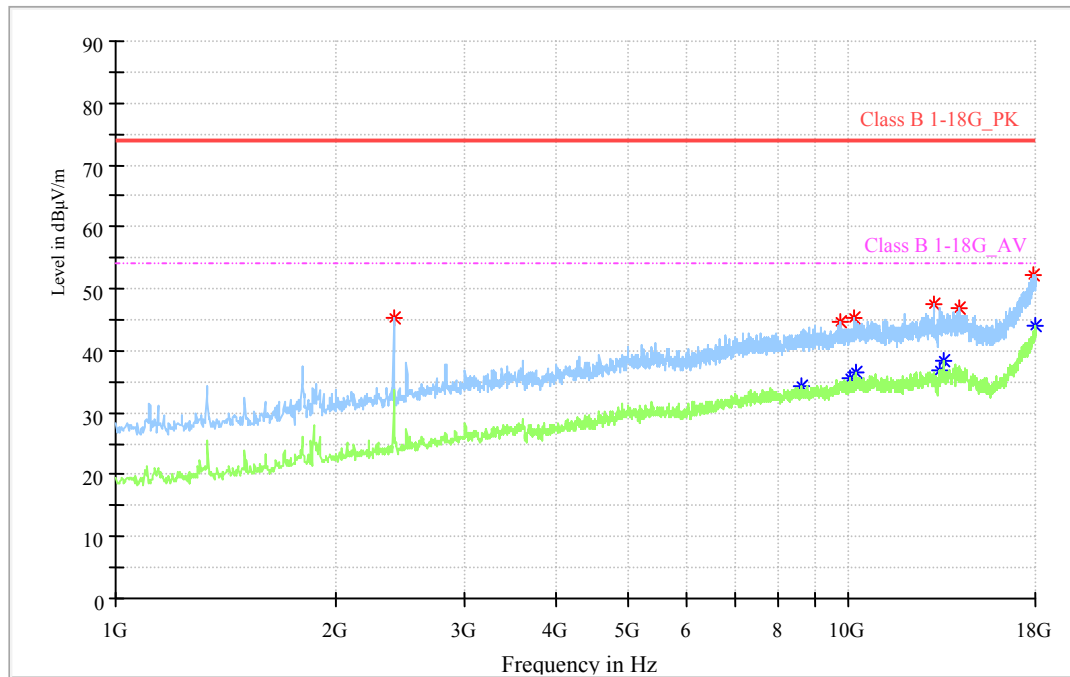
1) 30 MHz – 1 GHz:



Frequency (MHz)	QuasiPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
31.091250	35.31	40.00	4.69	100.0	V	351.0	-5.6
47.945000	27.56	40.00	12.44	100.0	V	128.0	-15.5
72.195000	32.80	40.00	7.20	100.0	V	163.0	-16.4
168.225000	32.34	43.50	11.16	100.0	V	41.0	-11.9
191.990000	33.12	43.50	10.38	100.0	V	0.0	-13.0
500.813750	37.48	46.00	8.52	150.0	H	206.0	-6.8

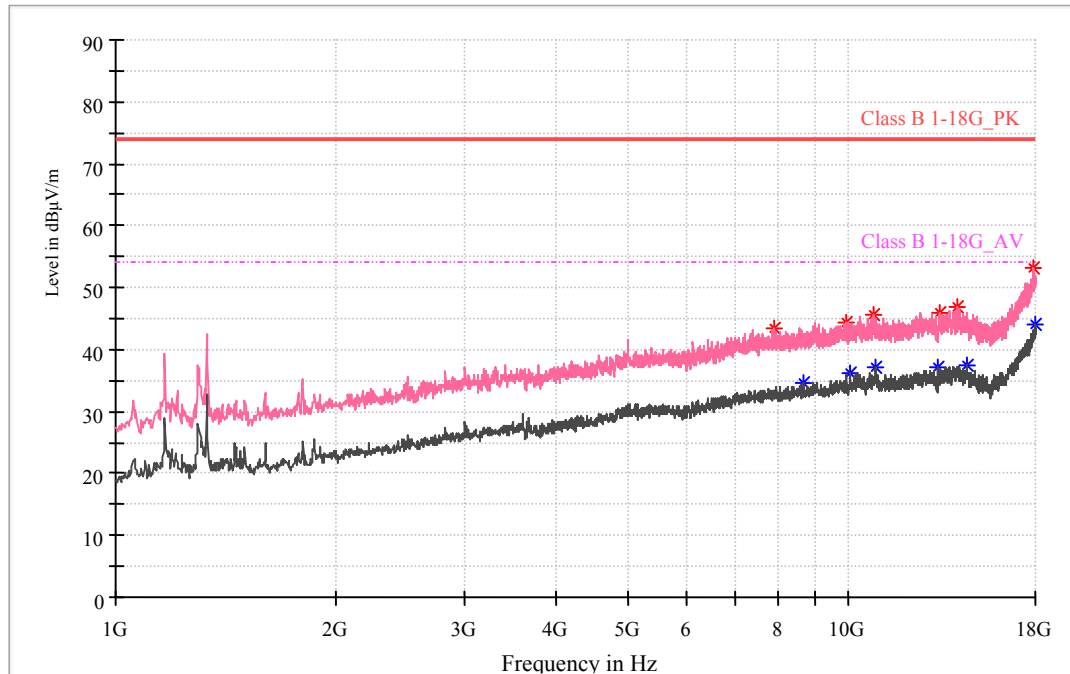
2) 1GHz – 18 GHz:

Horizontal



Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
2400.800000	45.32	---	74.00	28.68	100.0	H	206.0	-11.2
8616.000000	---	34.23	54.00	19.77	100.0	H	228.0	0.3
9768.600000	44.55	---	74.00	29.45	100.0	H	214.0	1.2
10033.800000	---	35.46	54.00	18.54	100.0	H	28.0	1.7
10186.800000	45.45	---	74.00	28.55	100.0	H	64.0	1.9
10217.400000	---	36.57	54.00	17.43	100.0	H	256.0	1.9
13083.600000	47.44	---	74.00	26.56	100.0	H	352.0	5.6
13348.800000	---	36.85	54.00	17.15	100.0	H	57.0	5.9
13535.800000	---	38.50	54.00	15.50	100.0	H	285.0	6.1
14168.200000	46.76	---	74.00	27.24	100.0	H	0.0	7.1
17894.600000	52.33	---	74.00	21.67	100.0	H	0.0	14.2
17986.400000	---	44.04	54.00	9.96	100.0	H	164.0	14.8

Vertical



Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
7919.000000	43.42	---	74.00	30.58	100.0	V	161.0	-0.2
8697.600000	---	34.67	54.00	19.33	100.0	V	210.0	0.4
9928.400000	44.30	---	74.00	29.70	100.0	V	0.0	1.5
10033.800000	---	36.15	54.00	17.85	100.0	V	27.0	1.7
10826.000000	45.53	---	74.00	28.47	100.0	V	354.0	2.6
10897.400000	---	37.16	54.00	16.84	100.0	V	210.0	2.6
13277.400000	---	37.12	54.00	16.88	100.0	V	267.0	5.8
13318.200000	45.97	---	74.00	28.03	100.0	V	132.0	5.9
14107.000000	46.82	---	74.00	27.18	100.0	V	260.0	7.1
14542.200000	---	37.48	54.00	16.52	100.0	V	0.0	6.9
17881.000000	53.05	---	74.00	20.95	100.0	V	246.0	14.2
17952.400000	---	44.08	54.00	9.92	100.0	V	253.0	14.6

Note:

Corrected Amplitude = Corrected Factor + Reading

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

Margin = Limit- Corrected Amplitude

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