FCC Test Report

APPLICANT	:	**Lenovo (Shanghai) Electronics Technology Co., Ltd.**
EQUIPMENT	:	**Lenovo smart Display**
BRAND NAME	:	**Lenovo**
MODEL NAME	:	**Lenovo CD-17302F**
FCC ID	:	**O57CD17302F**
STANDARD	:	**47 CFR Part 15 Subpart B**
CLASSIFICATION	:	**Certification**

The product was received on Jun. 26, 2019 and testing was completed on Aug. 22, 2019. We, Sporton International (Kunshan) Inc., would like to declare that the tested sample has been evaluated in accordance with the test procedures given in ANSI C63.4-2014 and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International (Kunshan) Inc., the test report shall not be reproduced except in full.

Jason Jia

Reviewed by: Jason Jia / Supervisor

James Huang

Approved by: James Huang / Manager

ACCREDITED Cert #5145.02

Sporton International (Kunshan) Inc.
No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300 People's Republic of China

TABLE OF CONTENTS

REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FC962620	Rev. 01	Initial issue of report	Sep. 05, 2019

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.107	AC Conducted Emission	< 15.107 limits	PASS	Under limit 13.50 dB at 0.489 MHz
3.2	15.109	Radiated Emission	< 15.109 limits	PASS	Under limit 4.01 dB at 41.640 MHz

Declaration of Conformity:
The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.
Comments and Explanations:
The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

1. General Description

1.1. Applicant

Lenovo (Shanghai) Electronics Technology Co., Ltd.
Section 304-305, Building No.4, #222, Meiyue Road, China (Shanghai) Pilot Free Trade Zone

1.2. Manufacturer

Lenovo PC HK Limited
23/F, Lincoln House, Taikoo Place979 King's Road, Quarry Bay, Hong Kong P.R.China

1.3. Product Feature of Equipment Under Test

Product Feature	
Equipment	Lenovo smart Display
Brand Name	Lenovo
Model Name	Lenovo CD-17302F
FCC ID	O57CD17302F
EUT supports Radios application	WLAN 2.4GHz 802.11b/g/n HT20 WLAN 5GHz 802.11a/n HT20 WLAN 5GHz 802.11ac VHT20/VHT40/VHT80 Bluetooth BR / EDR/ LE
HW Version	Lenovo CD-17302F_V01
SW Version	15.42.0+mt8167s_xl_prod.1.1.0.5800915
EUT Stage	Production Unit

Remark:

1. The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.
2. There are two types of EUT sample 1 and sample 2, for change note, please refer the product equality declaration exhibit submitted. According to the difference, we evaluate the sample 1 to full test and the sample 2 is verified difference.

1.4. Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx Frequency	802.11b/g/n: 2412 MHz ~ 2462 MHz 802.11a/n/ac: 5180 MHz ~ 5240 MHz; 5260 MHz ~ 5320 MHz; 5500 MHz ~ 5700 MHz 5745 MHz ~ 5825 MHz Bluetooth: 2402 MHz ~ 2480 MHz
Rx Frequency	802.11b/g/n: 2412 MHz ~ 2462 MHz 802.11a/n/ac: 5180 MHz ~ 5240 MHz; 5260 MHz ~ 5320 MHz; 5500 MHz ~ 5700 MHz 5745 MHz ~ 5825 MHz Bluetooth: 2402 MHz ~ 2480 MHz
Antenna Type	WLAN : PIFA Antenna Bluetooth : PIFA Antenna
Type of Modulation	802.11b : DSSS (DBPSK / DQPSK / CCK) 802.11a/g/n/ac : OFDM (BPSK / QPSK / 16QAM / 64QAM /256QAM) Bluetooth LE : GFSK Bluetooth (1Mbps) : GFSK Bluetooth (2Mbps) :π/4-DQPSK Bluetooth (3Mbps) : 8-DPSK

1.5. Modification of EUT

No modifications are made to the EUT during all test items.

1.6. Test Location

Sporton International (Kunshan) Inc. is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.02.

Test Firm	Sporton International (Kunshan) Inc.		
Test Site Location	No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300 People's Republic of China TEL : +86-512-57900158 FAX : +86-512-57900958		
Test Site No.	**Sporton Site No.**	**FCC Designation No.**	**FCC Test Firm Registration No.**
	CO01-KS 03CH06-KS	CN1257	314309

1.7. Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- 47 CFR Part 15 Subpart B
- ANSI C63.4-2014

Remark: All test items were verified and recorded according to the standards and without any deviation during the test.

2. Test Configuration of Equipment Under Test

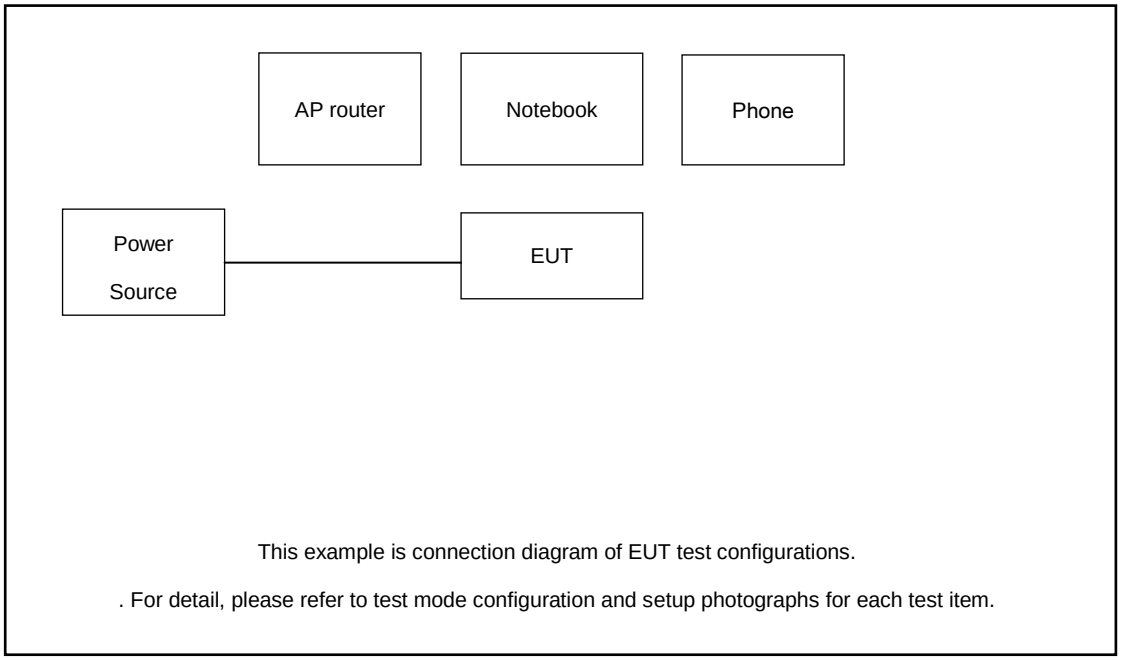
2.1. Test Mode

The EUT has been associated with peripherals pursuant to ANSI C63.4-2014 and configuration operated in a manner tended to maximize its emission characteristics in a typical application.

Frequency range investigated: conduction emission (150 kHz to 30 MHz), radiation emission (30MHz to the 5th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower).

Test Items	Function Type
AC Conducted Emission	Mode 1 : Bluetooh Idle + WLAN Idle(2.4G) + Camera(Front) + Adapter for Sample 1 Mode 2 : Bluetooh Idle + WLAN Link(5G) + MPEG4 + Adapter for Sample 1 Mode 3 : Bluetooh Idle + WLAN Link(5G) + MPEG4 + Adapter for Sample 2 Mode 4 : Bluetooh Idle + WLAN Link(5G) + Camera(Front) + Adapter for Sample 2
Radiated Emissions	Mode 1 : Bluetooh Idle + WLAN Idle(2.4G) + Camera(Front) + Adapter for Sample 1 Mode 2 **:** Bluetooh Idle + WLAN Link(5G) + MPEG4 + Adapter for Sample 1 Mode 3 : Bluetooh Idle + WLAN Link(5G) + MPEG4 + Adapter for Sample 2 Mode 4 : Bluetooh Idle + WLAN Link(5G) + Camera(Front) + Adapter for Sample 2
Remark: **1.** The worst case of AC is mode 2; only the test data of this mode is reported. **2.** The worst case of RE is mode 3; only the test data of this mode is reported.	

2.2. Connection Diagram of Test System



This example is connection diagram of EUT test configurations.

. For detail, please refer to test mode configuration and setup photographs for each test item.

2.3. Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	WLAN AP	TP-Link	TL-WDR5600	N/A	N/A	Unshielded,1.8m
2.	WLAN AP	D-link	DIR-655	KA21R655B1	N/A	Unshielded,1.8m
3.	Notebook	Lenovo	G480	QDS-BRCM1050I	N/A	AC I/P: Unshielded, 1.8 m DC O/P: Shielded, 1.8 m
4.	Phone	MOTO	XT1952-1	N/A	N/A	N/A

2.4. EUT Operation Test Setup

The EUT was attached to the WLAN AP/ BT Idle with phone, and the following programs installed in the EUT were programmed during the test.

1. Turn on camera to capture images.
2. Turn on MPEG4 function.

3. Test Result

3.1. Test of AC Conducted Emission Measurement

3.1.1 Limits of AC Conducted Emission

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

<Class B Limit>

Frequency of emission (MHz)	Conducted limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

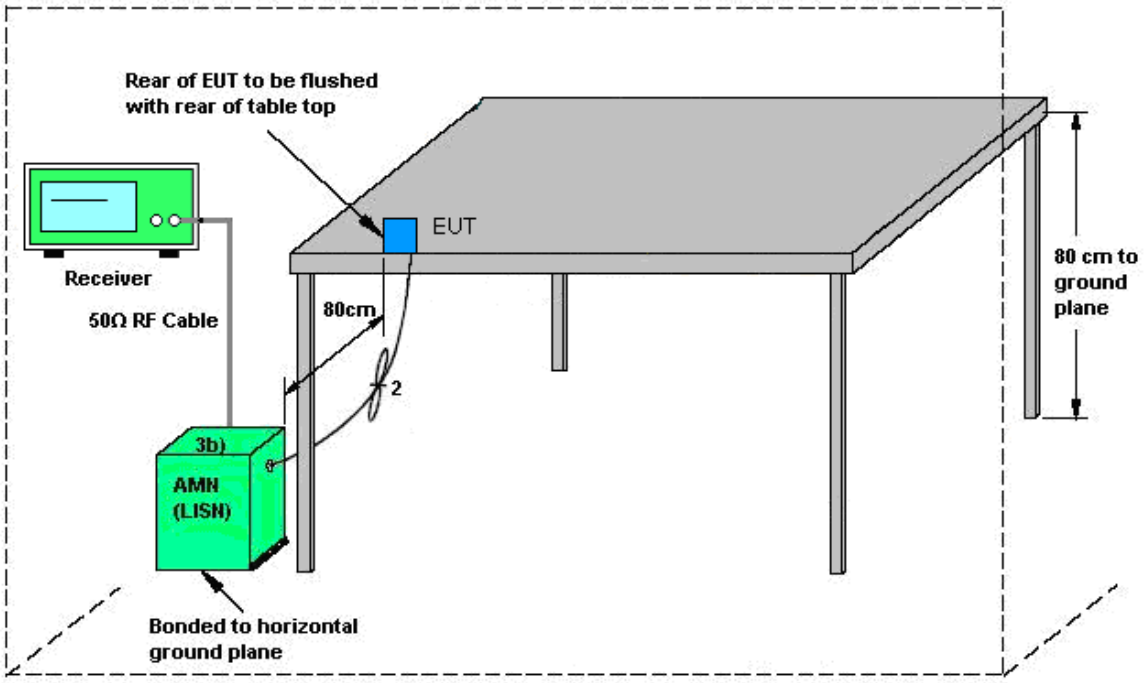
3.1.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.1.3 Test Procedure

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

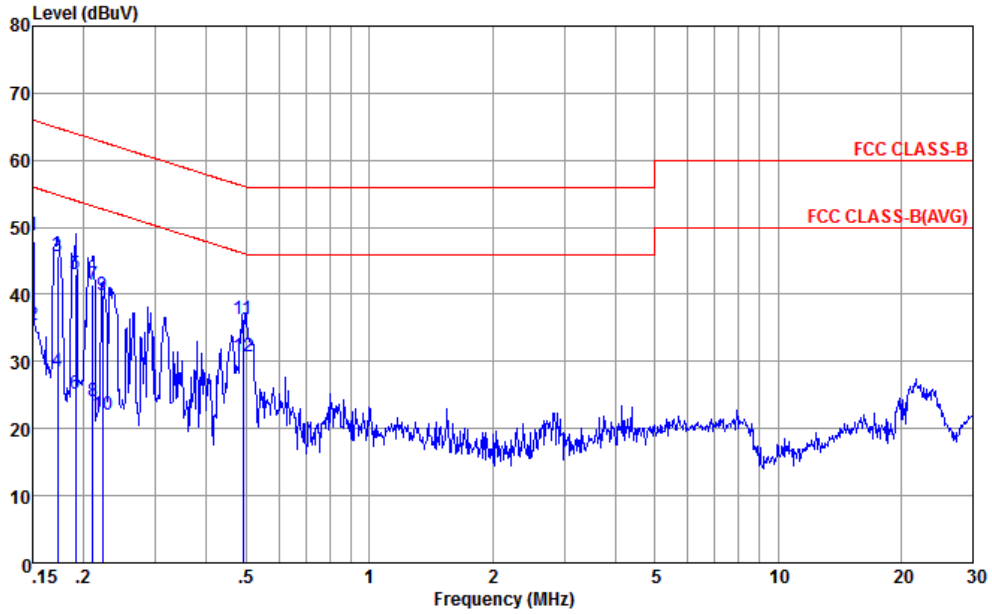
3.1.4 Test Setup



AMN = Artificial mains network (LISN)
AE = Associated equipment
EUT = Equipment under test
ISN = Impedance stabilization network

3.1.5 Test Result of AC Conducted Emission

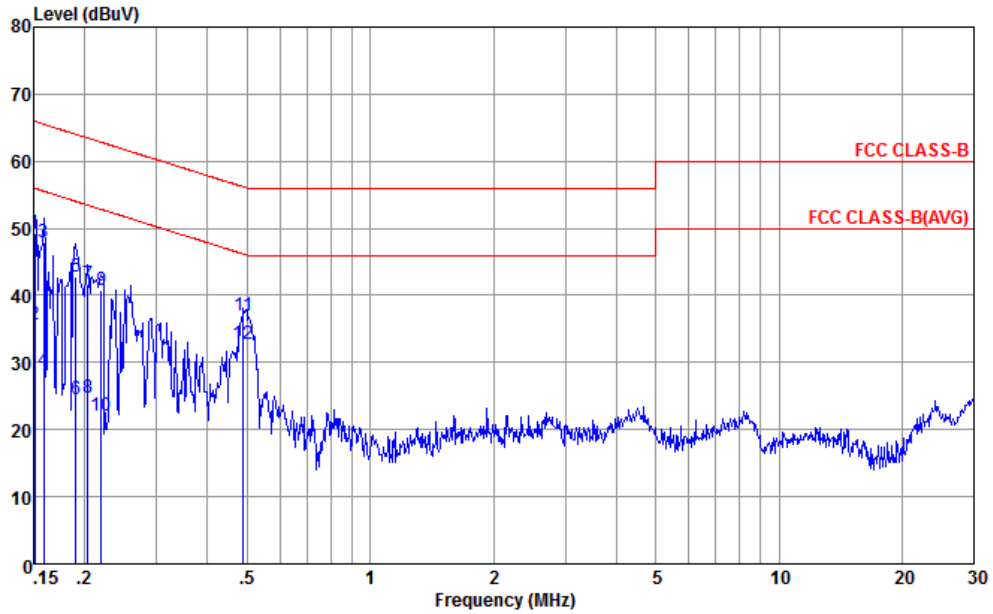
Test Engineer :	Amos Zhang	**Temperature :**	25.3~26.2℃
		Relative Humidity :	38~40%
Test Voltage :	120Vac / 60Hz	**Phase :**	Line
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



Site : CO01-KS
Condition : FCC CLASS-B LISN-L-181119-060105 LINE
Project : (FC) 962620
mode : Mode 2

		Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
		MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1		0.150	48.77	-17.23	66.00	38.20	0.09	10.48	QP
2		0.150	35.47	-20.53	56.00	24.90	0.09	10.48	Average
3		0.173	45.73	-19.08	64.81	35.21	0.10	10.42	QP
4		0.173	28.43	-26.38	54.81	17.91	0.10	10.42	Average
5		0.191	43.10	-20.88	63.98	32.60	0.12	10.38	QP
6		0.191	25.10	-28.88	53.98	14.60	0.12	10.38	Average
7		0.211	41.38	-21.80	63.18	30.90	0.12	10.36	QP
8		0.211	24.08	-29.10	53.18	13.60	0.12	10.36	Average
9		0.222	39.98	-22.76	62.74	29.50	0.13	10.35	QP
10		0.222	22.08	-30.66	52.74	11.60	0.13	10.35	Average
11		0.491	36.31	-19.83	56.14	25.90	0.17	10.24	QP
12	*	0.491	30.71	-15.43	46.14	20.30	0.17	10.24	Average

Test Engineer :	Amos Zhang	**Temperature :**	25.3~26.2℃
		Relative Humidity :	38~40%
Test Voltage :	120Vac / 60Hz	**Phase :**	Neutral
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



Site : CO01-KS
Condition : FCC CLASS-B LISN-N-181119-060105 NEUTRAL
Project : (FC) 962620
mode : Mode 2

		Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
		MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1		0.151	49.16	-16.80	65.96	38.50	0.18	10.48	QP
2		0.151	35.56	-20.40	55.96	24.90	0.18	10.48	Average
3		0.159	47.83	-17.69	65.52	37.19	0.18	10.46	QP
4		0.159	28.83	-26.69	55.52	18.19	0.18	10.46	Average
5		0.190	42.76	-21.26	64.02	32.21	0.17	10.38	QP
6		0.190	24.46	-29.56	54.02	13.91	0.17	10.38	Average
7		0.204	41.73	-21.72	63.45	31.20	0.17	10.36	QP
8		0.204	24.63	-28.82	53.45	14.10	0.17	10.36	Average
9		0.220	40.72	-22.11	62.83	30.20	0.17	10.35	QP
10		0.220	22.02	-30.81	52.83	11.50	0.17	10.35	Average
11		0.489	36.99	-19.20	56.19	26.60	0.15	10.24	QP
12	*	0.489	32.69	-13.50	46.19	22.30	0.15	10.24	Average

3.2. Test of Radiated Emission Measurement

3.2.1. Limit of Radiated Emission

The emissions from an unintentional radiator shall not exceed the field strength levels specified in the following table:

<Class B Limit>

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
30 – 88	100	3
88 – 216	150	3
216 - 960	200	3
Above 960	500	3

3.2.2. Measuring Instruments

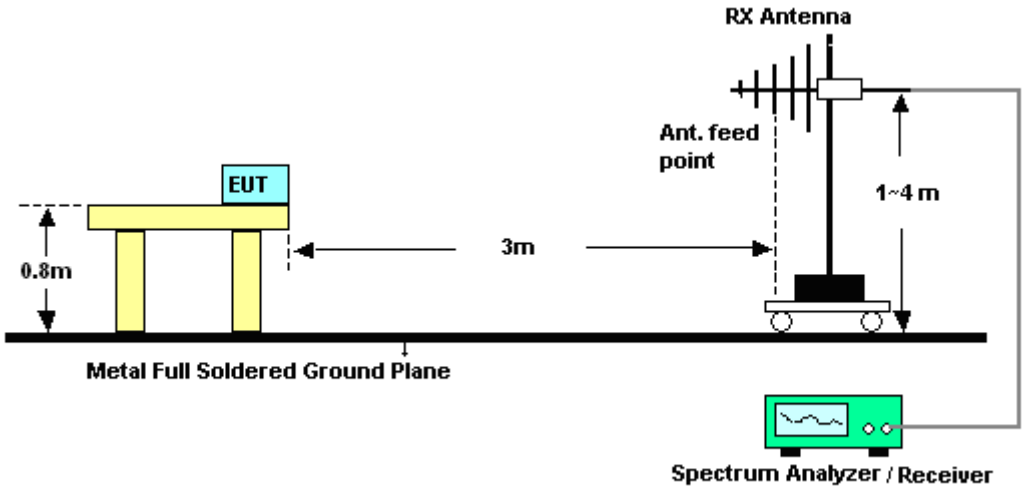
The measuring equipment is listed in the section 4 of this test report.

3.2.3. Test Procedures

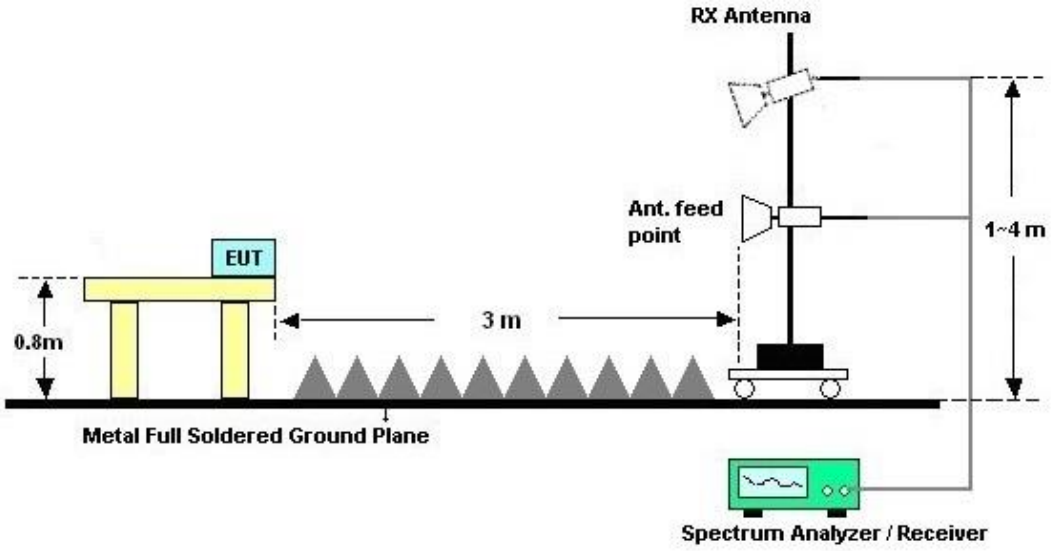
1. The EUT was placed on a turntable with 0.8 meter above ground.
2. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest radiation.
4. The antenna is a Bi-Log antenna and its height is adjusted between one to four meters above ground to find the maximum value of the field strength for both horizontal polarization and vertical polarization of the antenna.
5. For each suspected emission, the EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading.
6. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode (RBW=120kHz/VBW=300kHz for frequency below 1GHz; RBW=1MHz VBW=3MHz (Peak), RBW=1MHz/VBW=10Hz (Average) for frequency above 1GHz).
7. If the emission level of the EUT in peak mode was 3 dB lower than the limit specified, peak values of EUT will be reported. Otherwise, the emission will be repeated by using the quasi-peak method and reported.
8. Emission level (dBμV/m) = 20 log Emission level (μV/m)
9. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level

3.2.4. Test Setup of Radiated Emission

For radiated emissions from 30MHz to 1GHz

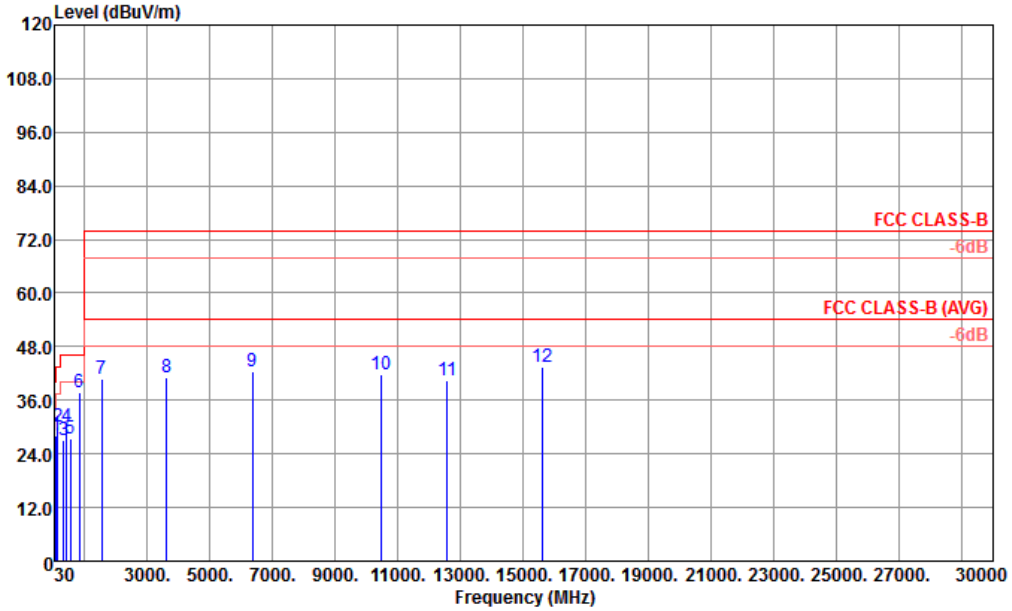


For radiated emissions above 1GHz



3.2.5. Test Result of Radiated Emission

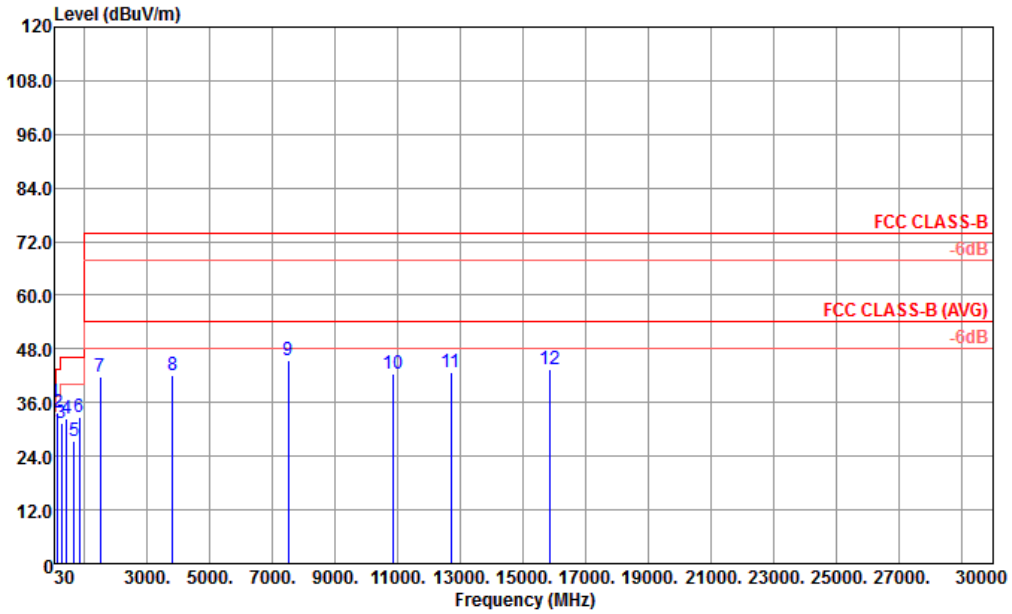
Test Engineer :	Jack Guo	Temperature :	21~22°C
		Relative Humidity :	41~42%
Test Distance :	3m	Polarization :	Horizontal



Site : 03CH06-KS
Condition : FCC CLASS-B 3m LF ANT 6112D SN35406 HORIZONTAL
Project : (FC)962620
Mode : 3

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	86.26	28.10	-11.90	40.00	45.59	13.98	0.89	32.36	---	---	Peak
2	130.88	30.11	-13.39	43.50	43.53	17.57	1.15	32.14	---	---	Peak
3	326.82	27.06	-18.94	46.00	37.10	19.85	1.90	31.79	---	---	Peak
4	416.06	30.18	-15.82	46.00	37.90	21.89	2.16	31.77	---	---	Peak
5	535.37	27.46	-18.54	46.00	32.87	23.82	2.44	31.67	---	---	Peak
6	832.19	37.70	-8.30	46.00	39.94	26.23	3.23	31.70	100	0	Peak
7	1536.00	40.74	-33.26	74.00	49.45	24.30	4.46	37.47	---	---	Peak
8	3624.00	41.18	-32.82	74.00	42.41	28.30	7.10	36.63	---	---	Peak
9	6344.00	42.56	-31.44	74.00	36.27	33.59	9.34	36.64	---	---	Peak
10	10476.00	41.68	-32.32	74.00	28.42	38.19	12.39	37.32	---	---	Peak
11	12573.00	40.50	-33.50	74.00	24.09	38.74	13.93	36.26	---	---	Peak
12	15615.00	43.33	-30.67	74.00	24.85	39.83	15.15	36.50	---	---	Peak

Test Engineer :	Jack Guo	**Temperature :**	21~22°C
		Relative Humidity :	41~42%
Test Distance :	3m	**Polarization :**	Vertical



Site : 03CH06-KS
Condition : FCC CLASS-B 3m LF ANT 6112D SN35406 VERTICAL
Project : (FC)962620
Mode : 3

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1 !	41.64	35.99	-4.01	40.00	50.11	17.78	0.56	32.46	100	0	Peak
2	148.34	33.82	-9.68	43.50	47.98	16.70	1.24	32.10	---	---	Peak
3	257.95	31.36	-14.64	46.00	41.66	19.85	1.67	31.82	---	---	Peak
4	416.06	32.45	-13.55	46.00	40.17	21.89	2.16	31.77	---	---	Peak
5	649.83	27.37	-18.63	46.00	31.61	24.75	2.71	31.70	---	---	Peak
6	832.19	32.84	-13.16	46.00	35.08	26.23	3.23	31.70	---	---	Peak
7	1504.00	41.75	-32.25	74.00	50.63	24.25	4.40	37.53	---	---	Peak
8	3800.00	42.22	-31.78	74.00	43.28	28.38	7.01	36.45	---	---	Peak
9	7504.00	45.41	-28.59	74.00	36.03	35.91	10.21	36.74	---	---	Peak
10	10845.00	42.51	-31.49	74.00	28.15	38.74	12.74	37.12	---	---	Peak
11	12681.00	42.83	-31.17	74.00	26.15	38.84	13.95	36.11	---	---	Peak
12	15858.00	43.58	-30.42	74.00	24.81	40.19	15.28	36.70	---	---	Peak

4. List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
EMI Test Receiver	Keysight	N9038A	MY56400023	3Hz~8.5GHz;Max 30dBm	Oct. 12, 2018	Aug. 19, 2019	Oct. 11, 2019	Radiation (03CH06-KS)
EXA Spectrum Analyzer	Keysight	N9010A	MY55150208	10Hz-44GHz	Apr. 16, 2019	Aug. 19, 2019	Apr. 18, 2020	Radiation (03CH06-KS)
Bilog Antenna	TeseQ	CBL6111D	44483	30MHz-1GHz	Dec. 28, 2018	Aug. 19, 2019	Dec. 27, 2019	Radiation (03CH06-KS)
Double Ridge Horn Antenna	ETS-Lindgren	3117	75957	1GHz~18GHz	Oct. 20, 2018	Aug. 19, 2019	Oct. 19, 2019	Radiation (03CH06-KS)
SHF-EHF Horn	Com-power	AH-840	101070	18GHz~40GHz	Jan. 05, 2019	Aug. 19, 2019	Jan. 04, 2020	Radiation (03CH06-KS)
Amplifier	MITEQ	TTA1840-35-HG	2014749	18~40GHz	Jan. 14, 2019	Aug. 19, 2019	Jan. 13, 2020	Radiation (03CH06-KS)
Amplifier	SONOMA	310N	187289	9KHz ~1GHZ	Aug. 06, 2019	Aug. 19, 2019	Aug. 05, 2020	Radiation (03CH06-KS)
Amplifier	Keysight	83017A	MY53270203	500MHz~26.5GHz	Apr. 15, 2019	Aug. 19, 2019	Apr. 14, 2020	Radiation (03CH06-KS)
AC Power Source	Chroma	61601	F104090004	N/A	NCR	Aug. 19, 2019	NCR	Radiation (03CH06-KS)
Turn Table	ChamPro	EM 1000-T	060762-T	0~360 degree	NCR	Aug. 19, 2019	NCR	Radiation (03CH06-KS)
Antenna Mast	ChamPro	EM 1000-A	060762-A	1 m~4 m	NCR	Aug. 19, 2019	NCR	Radiation (03CH06-KS)
EMI Receiver	R&S	ESCI7	100768	9kHz~7GHz;	Apr. 16, 2019	Aug. 22, 2019	Apr. 15, 2020	Conduction (CO01-KS)
AC LISN	MessTec	AN3016	060103	9kHz~30MHz	Oct. 12, 2018	Aug. 22, 2019	Oct. 11, 2019	Conduction (CO01-KS)
AC LISN (for auxiliary equipment)	MessTec	AN3016	060105	9kHz~30MHz	Nov. 19, 2018	Aug. 22, 2019	Nov. 18, 2019	Conduction (CO01-KS)
AC Power Source	Chroma	61602	ABP000000811	AC 0V~300V, 45Hz~1000Hz	Oct. 12, 2018	Aug. 22, 2019	Oct. 11, 2019	Conduction (CO01-KS)

NCR: No Calibration Required

5. Uncertainty of Evaluation

Uncertainty of Conducted Emission Measurement (150 kHz ~ 30 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**2.9dB**

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.0dB**

Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.0dB**

Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.0dB**