



FCC Test Report

APPLICANT : Lenovo(Shanghai) Electronics
Technology Co., Ltd.
EQUIPMENT : Portable Tablet Computer
BRAND NAME : Lenovo
MODEL NAME : Lenovo TB-Q706F
FCC ID : O57TBQ706F
STANDARD : 47 CFR Part 15 Subpart B
CLASSIFICATION : Certification
TEST DATE(S) : Jul. 27, 2021 ~ Jul. 30, 2021

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

Alex Wang

Approved by: Alex Wang / Manager



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	3
SUMMARY OF TEST RESULT	4
1. GENERAL DESCRIPTION	5
1.1. Applicant.....	5
1.2. Manufacturer	5
1.3. Product Feature of Equipment Under Test	5
1.4. Product Specification of Equipment Under Test	6
1.5. Modification of EUT	6
1.6. Test Location	6
1.7. Test Software	7
1.8. Applicable Standards	7
2. TEST CONFIGURATION OF EQUIPMENT UNDER TEST	8
2.1. Test Mode	8
2.2. Connection Diagram of Test System	10
2.3. Support Unit used in test configuration and system	10
2.4. EUT Operation Test Setup	11
3. TEST RESULT	12
3.1. Test of AC Conducted Emission Measurement	12
3.2. Test of Radiated Emission Measurement	16
4. LIST OF MEASURING EQUIPMENT	21
5. UNCERTAINTY OF EVALUATION	22
APPENDIX A. SETUP PHOTOGRAPHS	



REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FC161617	Rev. 01	Initial issue of report	Aug. 16, 2021

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 7.75 dB at 0.167 MHz
3.2	15.109	Radiated Emission	< 15.109 limits	PASS	Under limit 3.18 dB at 891.36 MHz for QP

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 Place 979 King's Road, Quarry Bay, Hong Kong, China

1.3. Product Feature of Equipment Under Test

Product Feature	
Equipment	Portable Tablet Computer
Brand Name	Lenovo
Model Name	Lenovo TB-Q706F
FCC ID	O57TBQ706F
EUT supports Radios application	WLAN 2.4GHz 802.11b/g/n HT20/HT40 WLAN 2.4GHz 802.11ax HE20/ HE40 WLAN 5GHz 802.11a/n HT20/HT40 WLAN 5GHz 802.11ac VHT20/VHT40/VHT80 WLAN 5GHz 802.11 ax HE20/ HE40/ HE80 Bluetooth BR/EDR/LE, NFC (WLC)
HW Version	Lenovo TB-Q706F
SW Version	TB-Q706F_RF01_210811
EUT Stage	Identical Prototype

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. The device supports NFC wireless charging (WLC) function, and the NFC supports the function of charging the stylus only.
3. Sample 1 with battery 1, Sample 2 with battery 2. The difference between sample 1 and sample 2, refer to the Lenovo TB-Q706F_Operational Description of product equality declaration.

1.4. Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx Frequency	802.11b/g/n/ax: 2400 MHz ~ 2483.5 MHz 802.11a/n/ac/ax: 5150 MHz ~ 5250 MHz; 5250 MHz ~ 5350 MHz; 5470 MHz ~ 5725 MHz 5725 MHz ~ 5850 MHz Bluetooth: 2400 MHz ~ 2483.5 MHz NFC (WLC): 13.56MHz
Rx Frequency	802.11b/g/n/ax: 2400 MHz ~ 2483.5 MHz 802.11a/n/ac/ax: 5150 MHz ~ 5250 MHz; 5250 MHz ~ 5350 MHz; 5470 MHz ~ 5725 MHz 5725 MHz ~ 5850 MHz Bluetooth: 2400 MHz ~ 2483.5 MHz NFC (WLC): 13.56MHz
Antenna Type	WLAN : Metal Antenna Bluetooth : Metal Antenna NFC (WLC): Loop Antenna
Type of Modulation	802.11b : DSSS (DBPSK / DQPSK / CCK) 802.11a/g/n/ac/ax : OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM / 1024QAM) Bluetooth LE : GFSK Bluetooth (1Mbps) : GFSK Bluetooth (2Mbps) : $\pi/4$ -DQPSK Bluetooth (3Mbps) : 8-DPSK NFC (WLC): ASK

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 03CH02-KS	CN1257	314309

1.7. Test Software

Item	Site	Manufacturer	Name	Version
1.	03CH02-KS	AUDIX	E3	6.2009-8-24a
2.	CO01-KS	AUDIX	E3	6.2009-8-24

1.8. 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

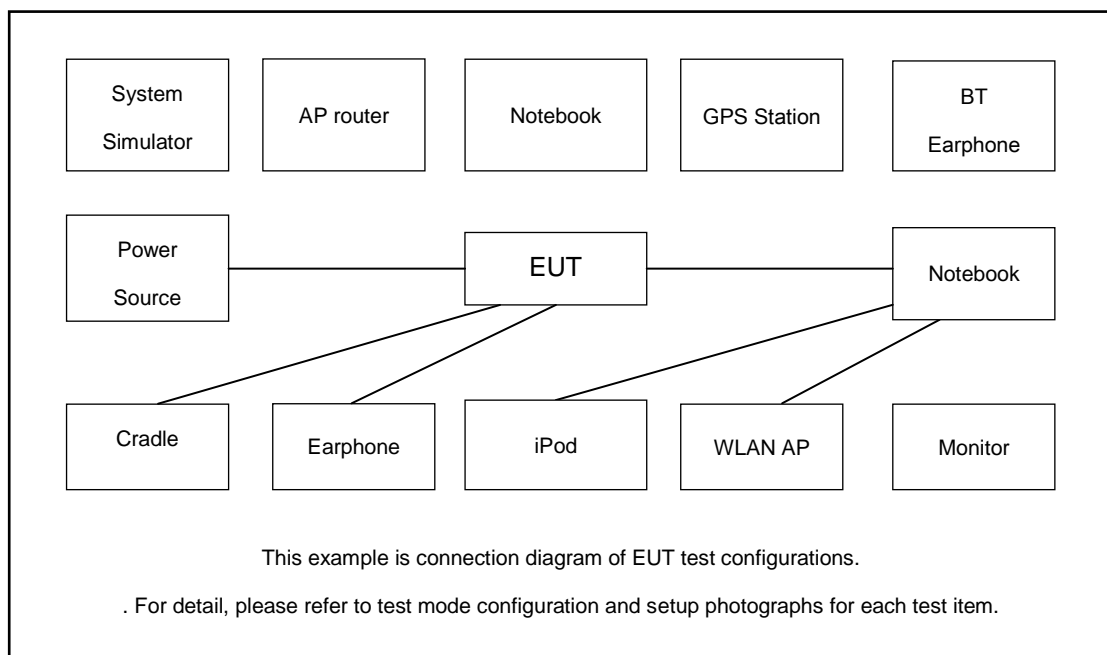
The EUT has been associated with peripherals pursuant to ANSI C63.4-2014 and configuration operated in a manner tended to maximize its emission characteristics in a typical application.

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

Test Items	Function Type
AC Conducted Emission	Mode 1: Bluetooth Idle With Keyboard+ WLAN(2.4G)Idle+ EUT Charger to Stylus(NFC)+USB Cable(Charging from Adapter1)+ Camera(Rear)+ Battery+ Sample 1
	Mode 2: Bluetooth Idle With Keyboard+WLAN (5G) Idle+EUT Charger to Stylus(NFC)+ USB Cable(Charging from Adapter2)+ Camera(Front)+ Battery+ Sample 1
	Mode 3: Bluetooth Idle With Keyboard+WLAN (2.4G) Idle+EUT Charger to Stylus(NFC)+USB Cable(Charging from Adapter2)+MPEG4(Run Color Bar)+ Battery +Sample 1
	Mode 4: Bluetooth Idle Keyboard + Keyboard pin With EUT +WLAN (5G) Idle+EUT Charger to Stylus(NFC)+USB Cable(Charging from Adapter2)+MPEG4(Run Color Bar)+Battery +Sample 1
	Mode 5: Bluetooth Idle With Keyboard+ WLAN (5G) Idle+EUT Charger to Stylus(NFC)+USB Cable(Charging from Adapter2)+ Camera(Front)+ Battery +Sample 2
	Mode 6: Bluetooth Idle With Keyboard+WLAN (2.4G) Idle+EUT Charger to Stylus(NFC)+USB Cable (Data Link with Notebook)+Battery +Sample 2

Radiated Emissions	<p>Mode 1: Bluetooth Idle With Keyboard+ WLAN(2.4G)Idle+ EUT Charger to Stylus(NFC)+USB Cable(Charging from Adapter1)+ Camera(Rear)+ Battery+ Sample 1</p> <p>Mode 2: Bluetooth Idle With Keyboard+WLAN (5G) Idle+EUT Charger to Stylus(NFC)+ USB Cable(Charging from Adapter2)+ Camera(Front)+ Battery+ Sample 1</p> <p>Mode 3: Bluetooth Idle With Keyboard+ WLAN(2.4G)Idle+ EUT Charger to Stylus(NFC)+ MPEG4(Run Color Bar)+ Earphone(Audio Dongle)+ Battery+ Sample 1</p> <p>Mode 4: Bluetooth Idle Keyboard + Keyboard pin With EUT +WLAN (5G) Idle+EUT Charger to Stylus(NFC)+MPEG4(Run Color Bar)+ HDMI Play+ Battery+ Sample 1</p> <p>Mode 5: Bluetooth Idle With Keyboard+ WLAN (2.4G)Idle+ EUT Charger to Stylus(NFC)+ USB Cable (Data Link with Notebook)+ Battery+ Sample 1</p> <p>Mode 6: Bluetooth Idle With Keyboard+ WLAN (5G) Idle+EUT Charger to Stylus(NFC)+MPEG4(Run Color Bar)+ HDMI Play+ Battery+ Sample 2</p> <p>Mode 7: Bluetooth Idle With Keyboard+WLAN (2.4G) Idle+EUT Charger to Stylus(NFC)+USB Cable (Data Link with Notebook)+Battery +Sample 2</p>
<p>Remark:</p> <ol style="list-style-type: none"> 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 4; only the test data of this mode is reported. 3. Data Link with Notebook means data application transferred mode between EUT and Notebook 	

2.2. Connection Diagram of Test System



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

2.3. Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	LTE Base Station	Anritus	MT8820C	N/A	N/A	Unshielded,1.8m
2.	Signal Generator	R&S	SMBV100A	N/A	N/A	Unshielded,1.8m
3.	WLAN AP	TP-Link	TL-WDR5600	N/A	N/A	Unshielded,1.8m
4.	WLAN AP	D-link	DIR-655	KA21R655B1	N/A	Unshielded,1.8m
5.	Earphone	Lenovo	SH100	N/A	N/A	N/A
6.	Notebook	Lenovo	S730-13IWL	N/A	N/A	AC I/P: Unshielded, 1.8 m DC O/P: Shielded, 1.8 m
7.	Notebook	Lenovo	G480	QDS-BRCM1050I	N/A	AC I/P: Unshielded, 1.8 m DC O/P: Shielded, 1.8 m
8.	Monitor	Lenovo	32A21	N/A	N/A	Unshielded,1.8m
9.	Hard Disk	Lenovo	F310	DoC	Shielded, 1.2m	N/A

2.4. EUT Operation Test Setup

At the same time, the EUT was attached to the Bluetooth earphone or WLAN AP, and the following programs installed in the EUT were programmed during the test.

1. Data application is transferred between notebook and EUT via USB cable
2. Turn on camera to capture images.
3. Connect LCD Monitor via HDMI Cable.
4. Turn on MPEG4 function.
5. NFC wireless charging (WLC) the stylus.

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.

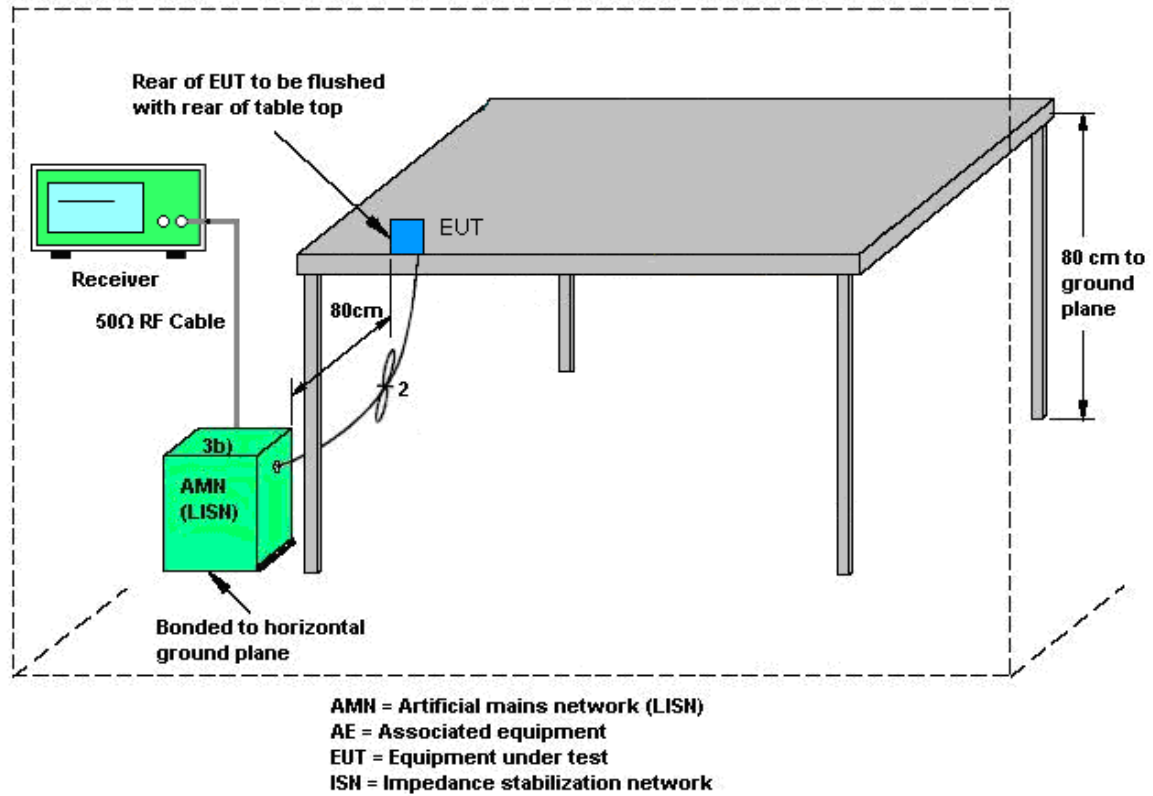
3.1.2 Measuring Instruments

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.

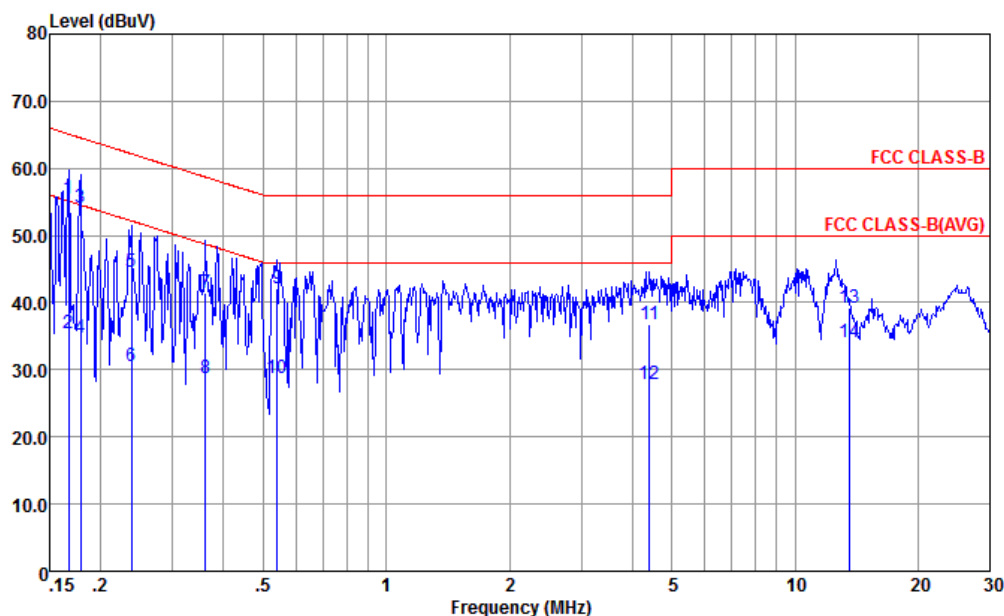
3.1.4 Test Setup





3.1.5 Test Result of AC Conducted Emission

Test Engineer :	Amos Zhang	Temperature :	25.3~26.2°C
		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.		

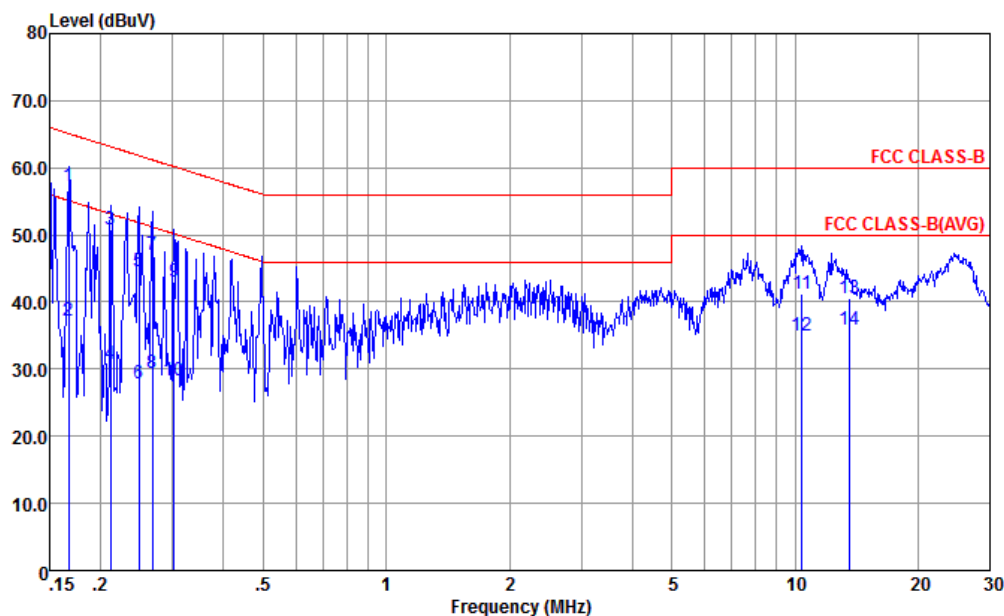


Site : CO01-KS
Condition : FCC CLASS-B TWO-LISN-CN02-L LINE

	Freq	Level	Over	Limit	Read	LISN	Cable	
	MHz	dBuV	Limit	Line	Level	Factor	Loss	Remark
			dB	dBuV	dBuV	dB	dB	
1 *	0.167	55.58	-9.54	65.12	35.50	9.64	10.44	QP
2	0.167	35.38	-19.74	55.12	15.30	9.64	10.44	Average
3	0.179	54.25	-10.30	64.55	34.20	9.64	10.41	QP
4	0.179	34.85	-19.70	54.55	14.80	9.64	10.41	Average
5	0.238	44.48	-17.69	62.17	24.50	9.64	10.34	QP
6	0.238	30.58	-21.59	52.17	10.60	9.64	10.34	Average
7	0.361	41.52	-17.17	58.69	21.60	9.64	10.28	QP
8	0.361	28.82	-19.87	48.69	8.90	9.64	10.28	Average
9	0.541	42.19	-13.81	56.00	22.30	9.65	10.24	QP
10	0.541	28.79	-17.21	46.00	8.90	9.65	10.24	Average
11	4.407	36.66	-19.34	56.00	16.20	10.20	10.26	QP
12	4.407	27.76	-18.24	46.00	7.30	10.20	10.26	Average
13	13.560	39.28	-20.72	60.00	18.10	10.80	10.38	QP
14	13.560	34.08	-15.92	50.00	12.90	10.80	10.38	Average



Test Engineer :	Amos Zhang	Temperature :	25.3~26.2°C
		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 TWO-LISN-CN02-N NEUTRAL

	Freq	Level	Over	Limit	Read	LISN	Cable	Remark
	MHz	dBuV	Limit	Line	Level	Factor	Loss	
			dB	dBuV	dBuV	dB	dB	
1 *	0.167	57.37	-7.75	65.12	37.10	9.83	10.44	QP
2	0.167	37.17	-17.95	55.12	16.90	9.83	10.44	Average
3	0.212	50.84	-12.30	63.14	30.60	9.88	10.36	QP
4	0.212	30.74	-22.40	53.14	10.50	9.88	10.36	Average
5	0.248	44.67	-17.15	61.82	24.50	9.84	10.33	QP
6	0.248	27.77	-24.05	51.82	7.60	9.84	10.33	Average
7	0.267	46.94	-14.26	61.20	26.80	9.82	10.32	QP
8	0.267	29.34	-21.86	51.20	9.20	9.82	10.32	Average
9	0.302	43.00	-17.19	60.19	22.90	9.79	10.31	QP
10	0.302	28.30	-21.89	50.19	8.20	9.79	10.31	Average
11	10.397	41.14	-18.86	60.00	20.20	10.59	10.35	QP
12	10.397	34.90	-15.10	50.00	13.96	10.59	10.35	Average
13	13.560	40.61	-19.39	60.00	19.31	10.92	10.38	QP
14	13.560	35.81	-14.19	50.00	14.51	10.92	10.38	Average

Note:

- Level(dBμV) = Read Level(dBμV) + LISN Factor(dB) + Cable Loss(dB)
- Over Limit(dB) = Level(dBμV) – Limit Line(dBμV)

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

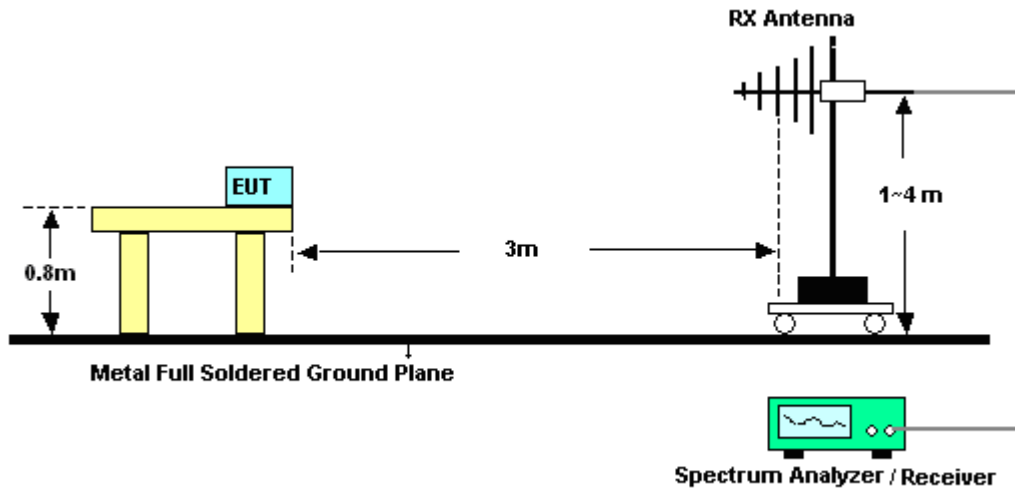
The measuring equipment is listed in the section 4 of this test report.

3.2.3. Test Procedures

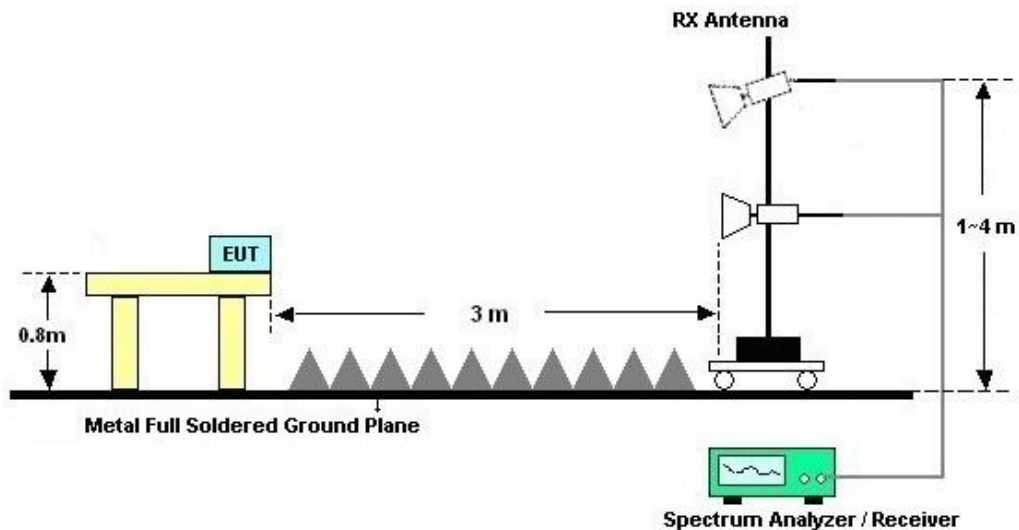
1. The EUT was placed on a turntable with 0.8 meter above ground.
2. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest radiation.
4. The antenna 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 (dB μ V/m) = 20 log Emission level (μ V/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

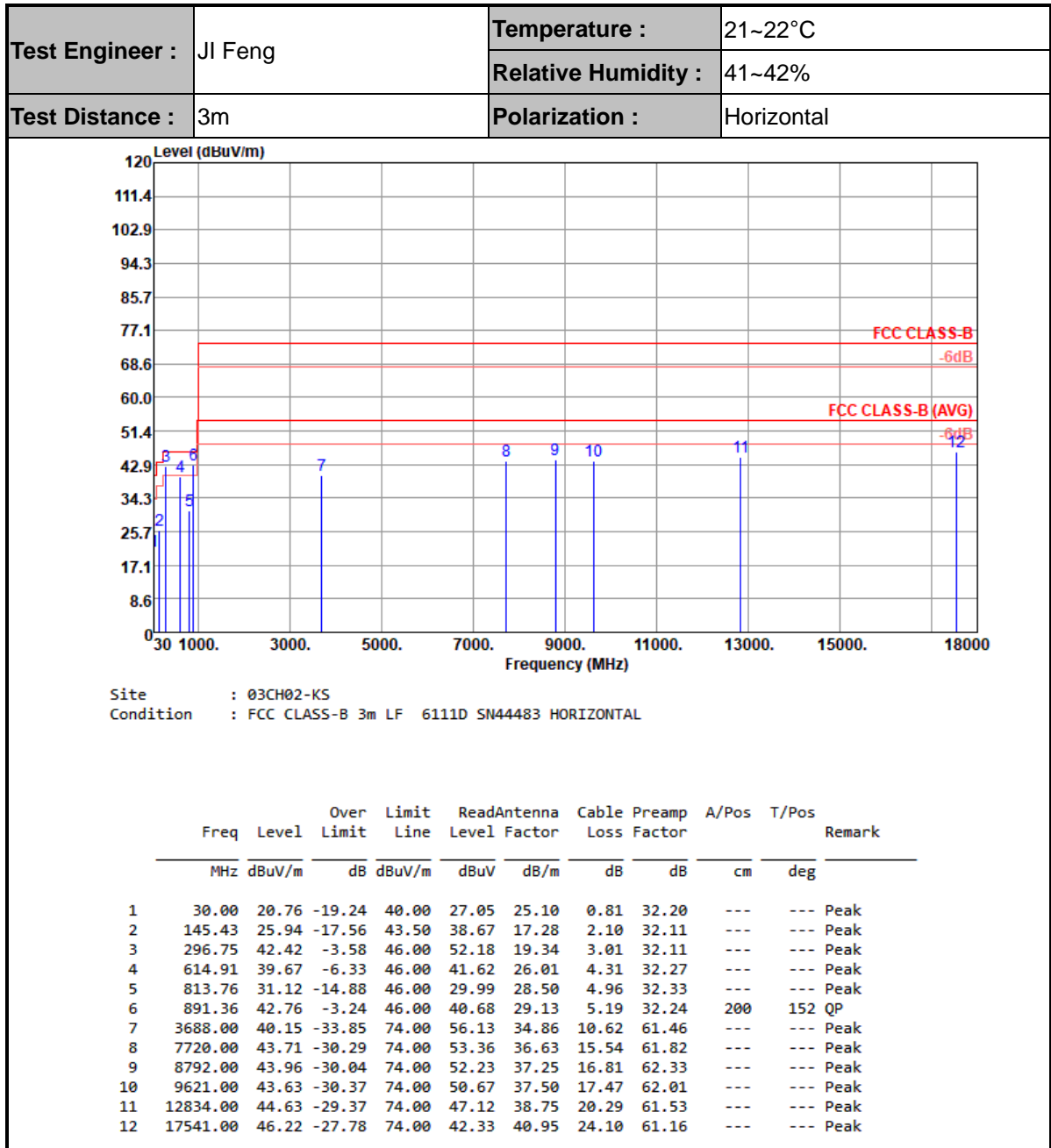


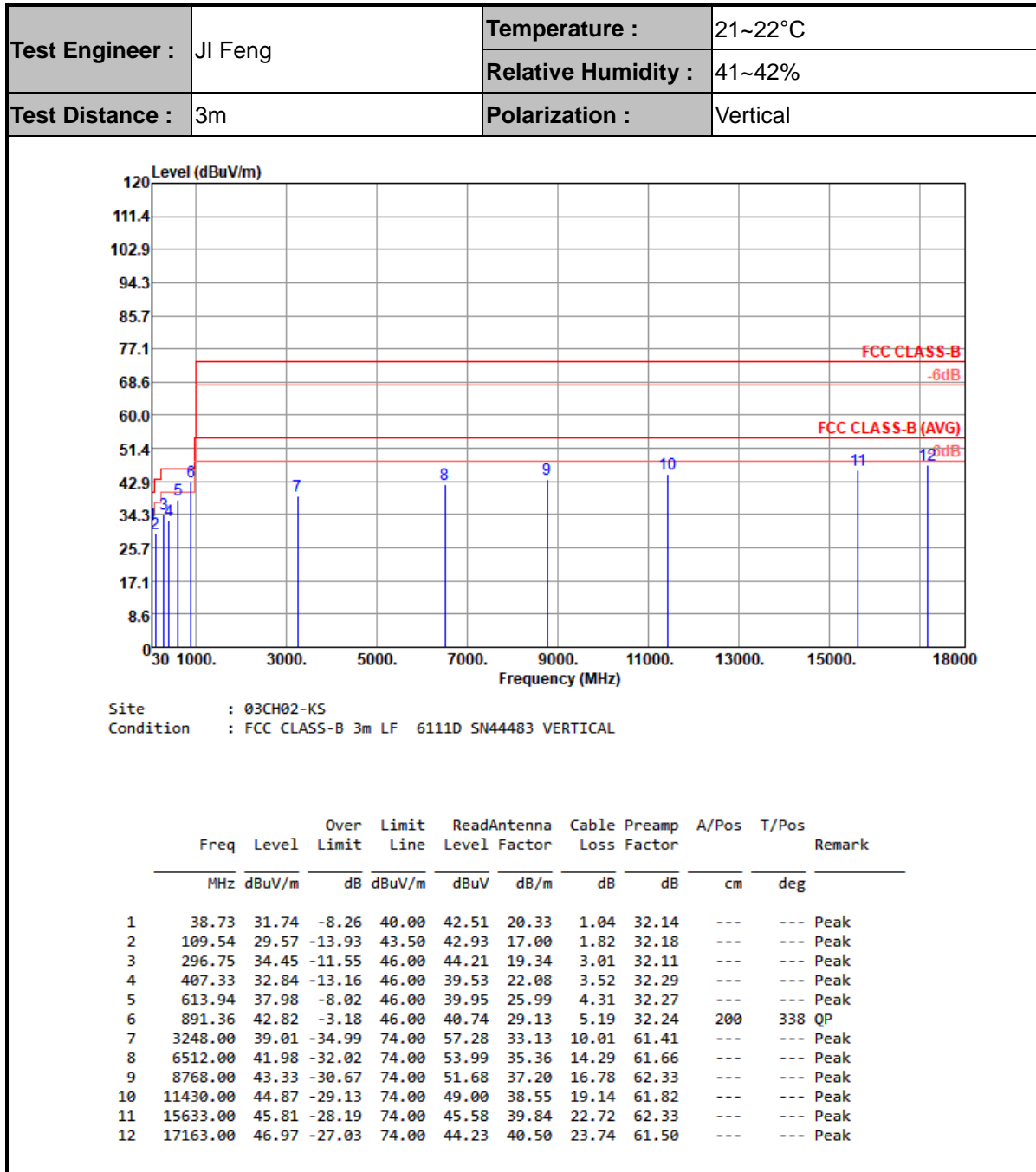
For radiated emissions above 1GHz





3.2.5. Test Result of Radiated Emission





Note:

- Level(dBμV/m) = Read Level(dBμV) + Antenna Factor(dB/m) + Cable Loss(dB) - Preamp Factor(dB)
- Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)
- The frequency from 18GHz to 40GHz, the test result which was 20dB lower than the limit line was not reported



4. List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
EMI Receiver	R&S	ESC17	100768	9kHz~7GHz;	Apr. 21, 2021	Jul. 27, 2021	Apr. 20, 2022	Conduction (CO01-KS)
AC LISN (for auxiliary equipment)	MessTec	AN3016	060103	9kHz~30MHz	Oct. 17, 2020	Jul. 27, 2021	Oct. 16, 2021	Conduction (CO01-KS)
AC LISN	R&S	ENV216	100334	9kHz~30MHz	Oct. 17, 2020	Jul. 27, 2021	Oct. 16, 2021	Conduction (CO01-KS)
AC Power Source	Chroma	61602	ABP0000008 11	AC 0V~300V, 45Hz~1000Hz	Oct. 17, 2020	Jul. 27, 2021	Oct. 16, 2021	Conduction (CO01-KS)
EMI Test Receiver	R&S	ESR7	101403	9kHz~7GHz;Ma x 30dBm	Oct. 17, 2020	Jul. 30, 2021	Oct. 16, 2021	Radiation (03CH02-KS)
EXA Spectrum Analyzer	Keysight	N9010A	MY55370528	10Hz~44G,MAX 30dB	Oct. 17, 2020	Jul. 30, 2021	Oct. 16, 2021	Radiation (03CH02-KS)
Bilog Antenna	TeseQ	CBL6111D	44483	30MHz~1GHz	Jan. 26, 2021	Jul. 30, 2021	Jan. 25, 2022	Radiation (03CH02-KS)
Double Ridge Horn Antenna	ETS-Lindgren	3117	75957	1GHz~18GHz	Nov. 01, 2020	Jul. 30, 2021	Oct. 31, 2021	Radiation (03CH02-KS)
SHF-EHF Horn	Com-power	AH-840	101115	18GHz~40GHz	Nov. 06, 2020	Jul. 30, 2021	Nov. 05, 2021	Radiation (03CH02-KS)
Amplifier	MITEQ	EM18G40GGA	060728	18~40GHz	Jan. 06, 2021	Jul. 30, 2021	Jan. 05, 2022	Radiation (03CH02-KS)
Amplifier	SONOMA	310N	187289	9KHz~1GHz	Apr. 12, 2021	Jul. 30, 2021	Apr. 11, 2022	Radiation (03CH02-KS)
Amplifier	Keysight	83017A	MY53270316	500MHz~26.5G Hz	Oct. 17, 2020	Jul. 30, 2021	Oct. 16, 2021	Radiation (03CH02-KS)
AC Power Source	Chroma	61601	61601000247 3	N/A	NCR	Jul. 30, 2021	NCR	Radiation (03CH02-KS)
Turn Table	MF	MF7802	N/A	0~360 degree	NCR	Jul. 30, 2021	NCR	Radiation (03CH02-KS)
Antenna Mast	MF	MF7802	N/A	1 m~4 m	NCR	Jul. 30, 2021	NCR	Radiation (03CH02-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% ($U = 2Uc(y)$)	4.9dB
--	-------

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

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