



FCC Test Report

APPLICANT : Hangzhou Tuya Information Technology Co., Ltd
EQUIPMENT : Module
MODEL NAME : WBR3D
FCC ID : 2ANDL-WBR3D
STANDARD : 47 CFR Part 15 Subpart B
CLASSIFICATION : Certification

The product was received on Sep. 25, 2019 and testing was completed on Nov. 06, 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



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 7

 1.7. Applicable Standards 7

2. TEST CONFIGURATION OF EQUIPMENT UNDER TEST 8

 2.1. Test Mode 8

 2.2. Connection Diagram of Test System 9

 2.3. Support Unit used in test configuration and system 10

 2.4. EUT Operation Test Setup 10

3. TEST RESULT 11

 3.1. Test of AC Conducted Emission Measurement 11

 3.2. Test of Radiated Emission Measurement 15

4. LIST OF MEASURING EQUIPMENT 19

5. UNCERTAINTY OF EVALUATION 20

APPENDIX A. SETUP PHOTOGRAPHS



REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FC992508	Rev. 01	Initial issue of report	Nov. 19, 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 12.04 dB at 0.152 MHz
3.2	15.109	Radiated Emission	< 15.109 limits	PASS	Under limit 4.65 dB at 320.030 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

Hangzhou Tuya Information Technology Co., Ltd
Room701, Building3, More Center, No.87 GuDun Road, Hangzhou, Zhejiang, China

1.2. Manufacturer

Hangzhou Tuya Information Technology Co., Ltd
Room701, Building3, More Center, No.87 GuDun Road, Hangzhou, Zhejiang, China

1.3. Product Feature of Equipment Under Test

Product Feature	
Equipment	Module
Model Name	WBR3D
EUT supports Radios application	WLAN 2.4GHz 802.11b/g/n HT20/HT40 WLAN 5GHz 802.11a/n HT20/HT40 Bluetooth LE
HW Version	V1.0.2
SW Version	2V1

Remark: The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

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: 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: 5180 MHz ~ 5240 MHz; 5260 MHz ~ 5320 MHz; 5500 MHz ~ 5700 MHz 5745 MHz ~ 5825 MHz Bluetooth: 2402 MHz ~ 2480 MHz
Antenna Type	WLAN : PCB Antenna Bluetooth : PCB Antenna
Type of Modulation	802.11b : DSSS (DBPSK / DQPSK / CCK) 802.11a/g/n : OFDM (BPSK / QPSK / 16QAM / 64QAM) Bluetooth LE : GFSK

Note: WLAN operation in 5600 MHz ~ 5650 MHz is notched

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. 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

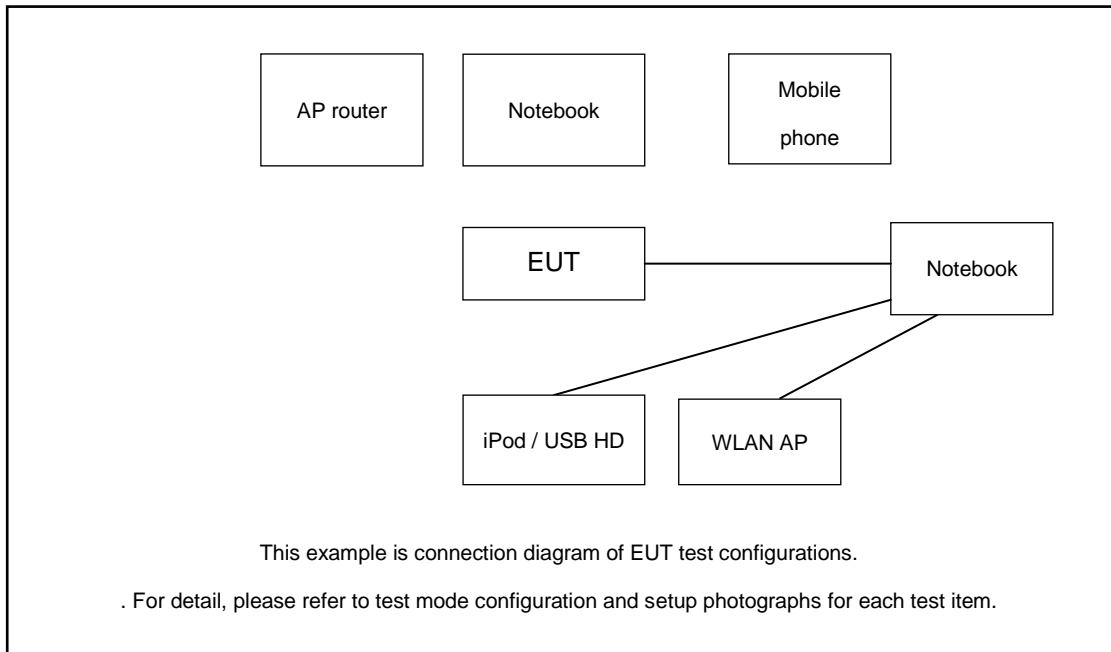
2.1. Test Mode

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 : Bluetooth Idle + WLAN Idle(2.4G) + Charging from Notebook Mode 2 : Bluetooth Idle + WLAN Idle(5G) + Charging from Notebook
Radiated Emissions	Mode 1 : Bluetooth Idle + WLAN Idle(2.4G) + Charging from Notebook Mode 2 : Bluetooth Idle + WLAN Idle(5G) + Charging from Notebook
Remark:	
<ol style="list-style-type: none"> 1. The worst case of AC is mode 1; only the test data of this mode is reported. 2. The worst case of RE is mode 2; only the test data of this mode is reported. 	

2.2. Connection Diagram of Test System



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	D-Link	DIR-655	KA21R655B1	N/A	Unshielded,1.8m
2.	WLAN AP	TP-Link	TL-WDR5600	N/A	N/A	Unshielded,1.8m
3.	Notebook	Lenovo	V130	N/A	N/A	AC I/P: Unshielded, 1.8 m DC O/P: Shielded, 1.8 m
4.	Notebook	Dell	Latitude3440	N/A	N/A	AC I/P: Unshielded, 1.8 m DC O/P: Shielded, 1.8 m
5.	Hard disk	Lenovo	FH310	Fcc DoC	Shielded, 1.2m	N/A
6.	iPod	Apple	A1199	Fcc DoC	Shielded, 1.2m	N/A
7.	Phone	Apple	Iphone 6s	BCG-E2946A	N/A	N/A
8.	SD Card	Kingston	8GB	N/A	N/A	N/A

2.4. EUT Operation Test Setup

At the same time, the EUT was attached to the Mobile phone via Bluetooth function or WLAN AP during the test.



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.

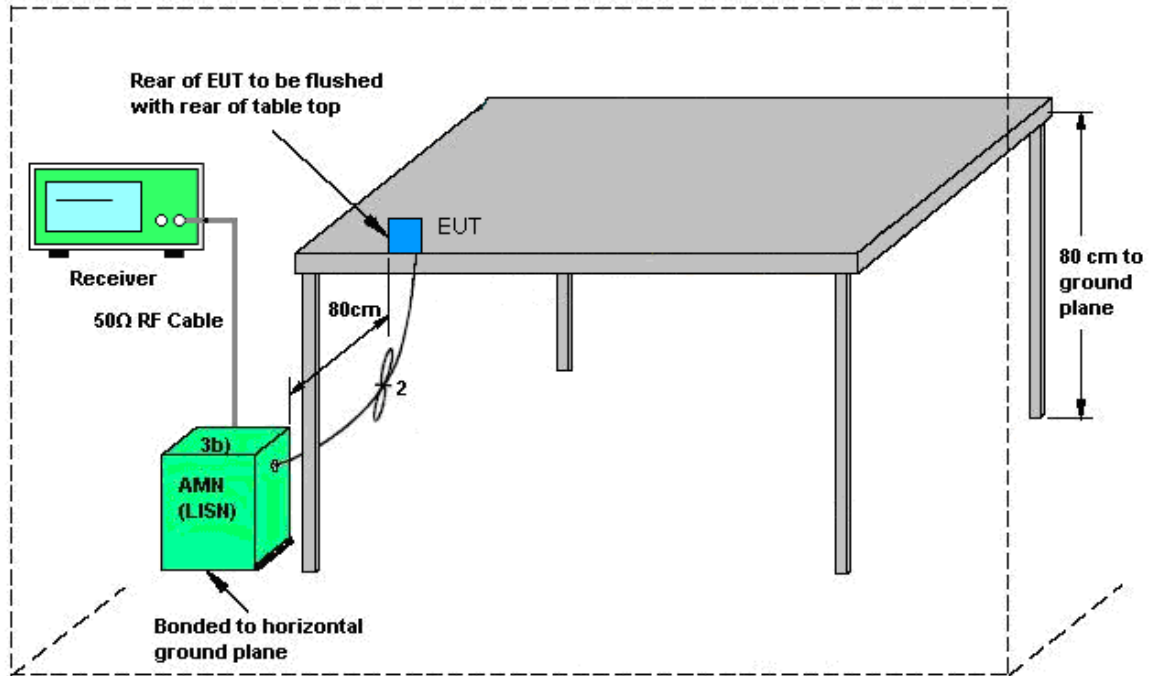
3.1.2 Measuring Instruments

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.

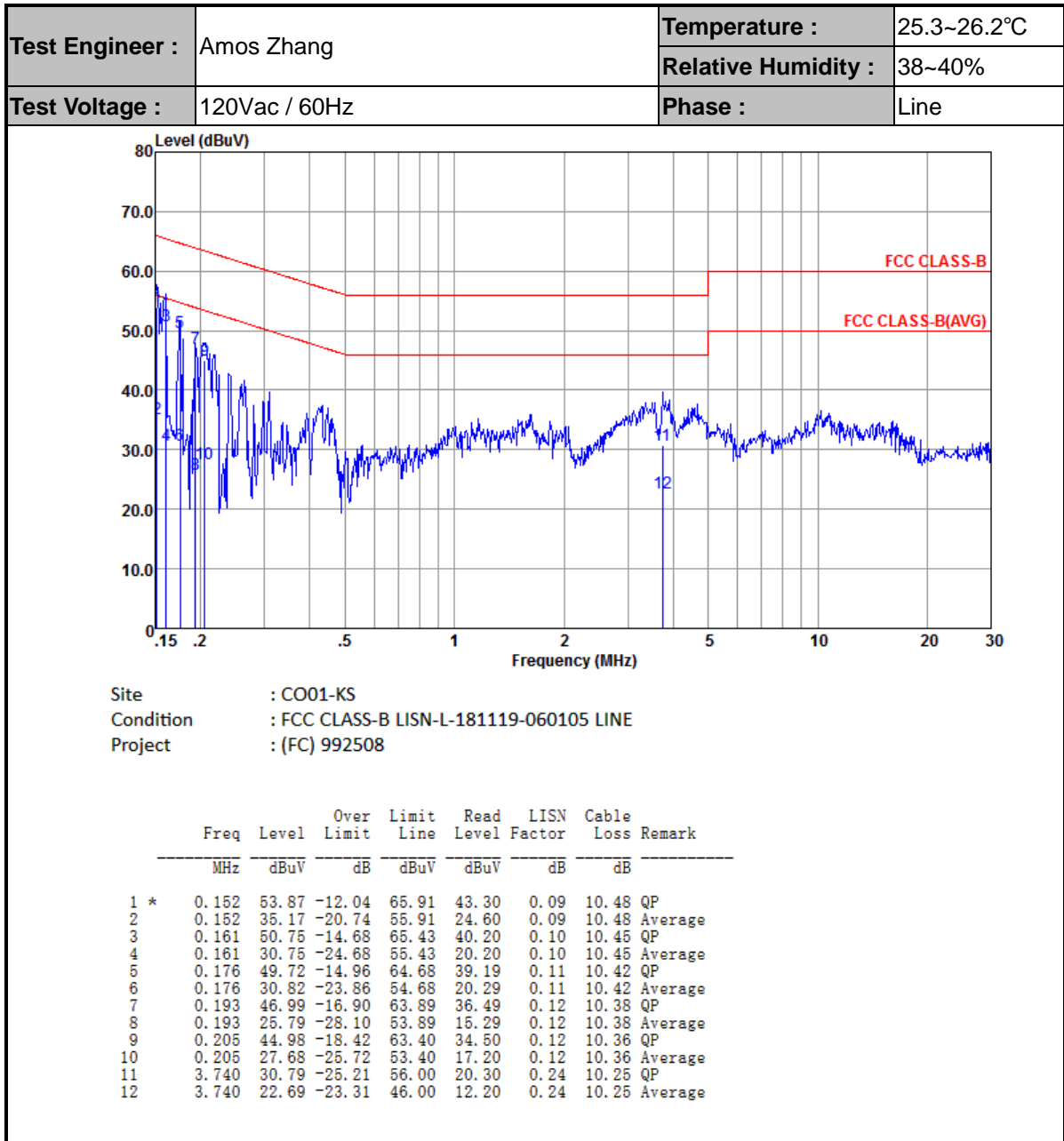
3.1.4 Test Setup



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

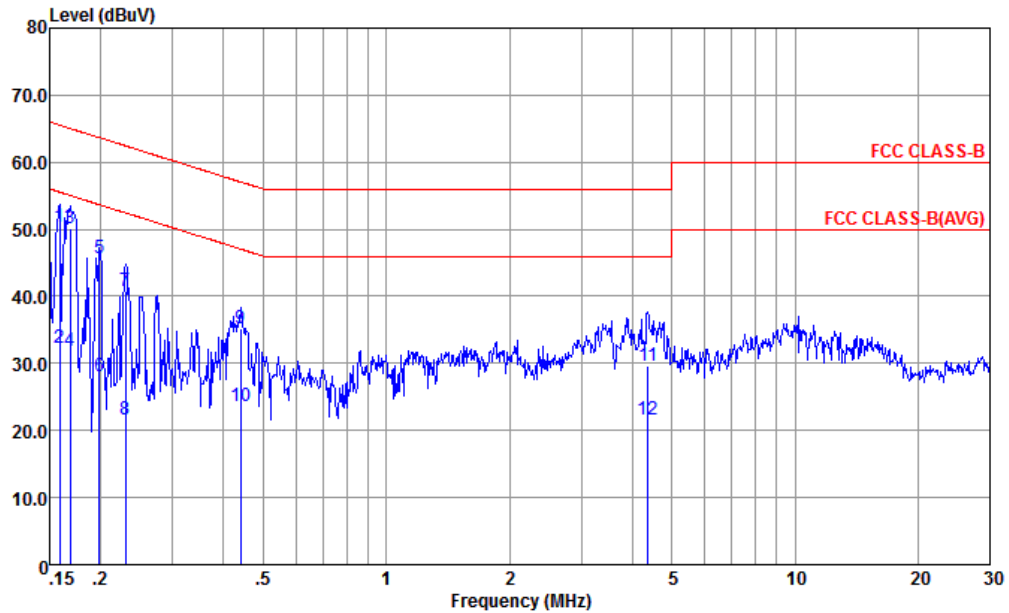


3.1.5 Test Result of AC Conducted Emission





Test Engineer :	Amos Zhang	Temperature :	25.3~26.2°C
		Relative Humidity :	38~40%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral



Site : CO01-KS
 Condition : FCC CLASS-B LISN-N-181119-060105 NEUTRAL
 Project : (FC) 992508

	Freq	Level	Over	Limit	Read	LISN	Cable	Remark
	MHz	dBuV	Limit	Line	Level	Factor	Loss	
			dB	dBuV	dBuV	dB	dB	
1	0.159	50.43	-15.09	65.52	39.79	0.18	10.46	QP
2	0.159	32.23	-23.29	55.52	21.59	0.18	10.46	Average
3 *	0.169	50.11	-14.92	65.03	39.50	0.18	10.43	QP
4	0.169	31.91	-23.12	55.03	21.30	0.18	10.43	Average
5	0.199	45.64	-18.03	63.67	35.10	0.17	10.37	QP
6	0.199	28.14	-25.53	53.67	17.60	0.17	10.37	Average
7	0.230	40.71	-21.73	62.44	30.20	0.17	10.34	QP
8	0.230	21.71	-30.73	52.44	11.20	0.17	10.34	Average
9	0.440	35.21	-21.86	57.07	24.81	0.15	10.25	QP
10	0.440	23.71	-23.36	47.07	13.31	0.15	10.25	Average
11	4.361	29.63	-26.37	56.00	19.19	0.18	10.26	QP
12	4.361	21.63	-24.37	46.00	11.19	0.18	10.26	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

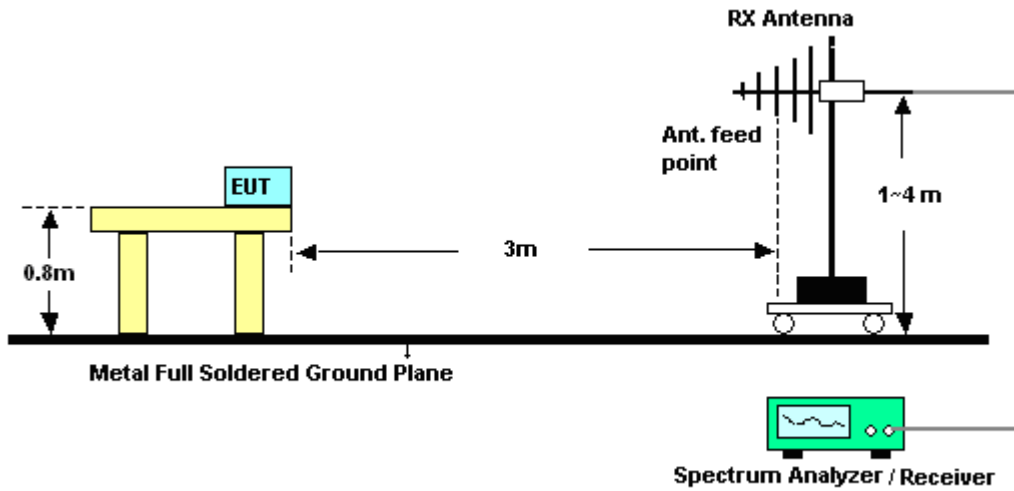
3.2.2. Measuring Instruments

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

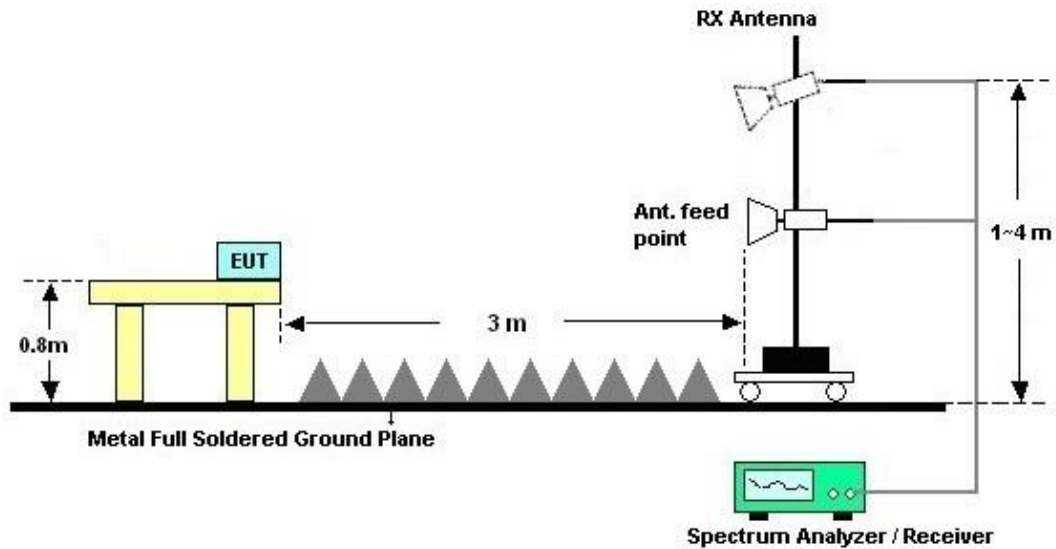
3.2.3. Test Procedures

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 (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



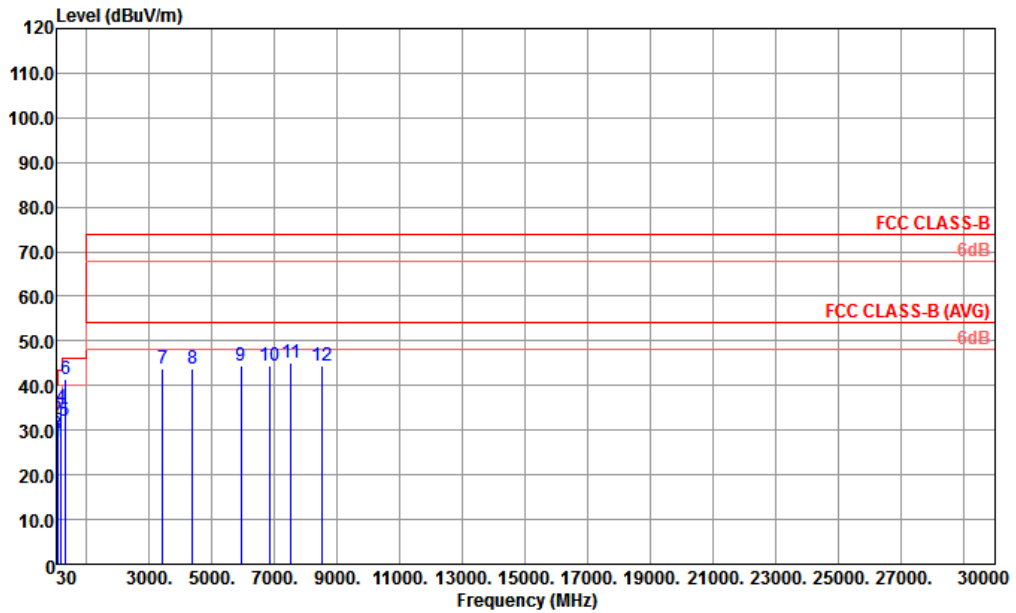
For radiated emissions above 1GHz





3.2.5. Test Result of Radiated Emission

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

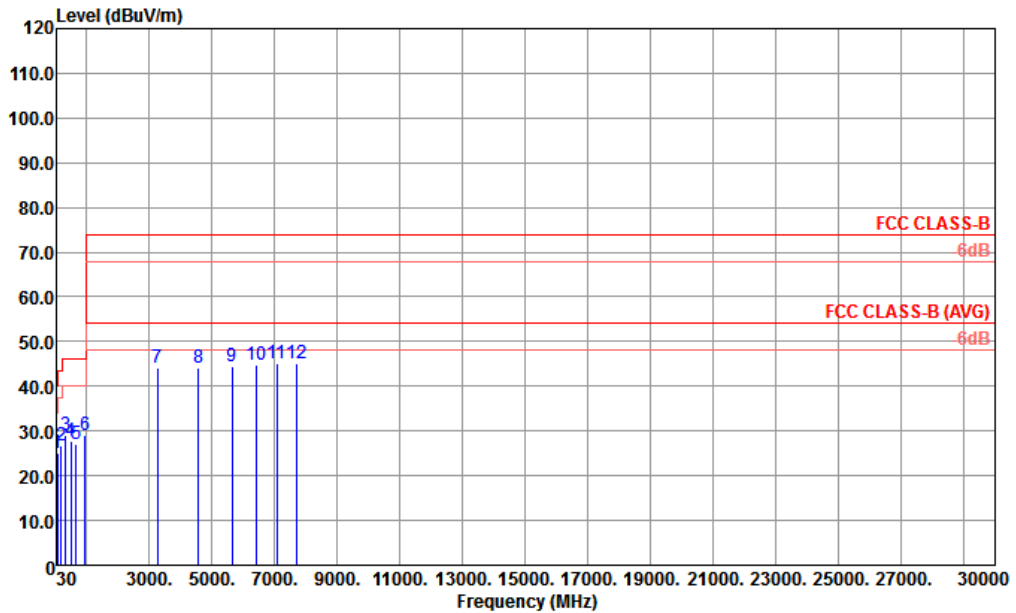


Site : 03CH02-KS
 Condition : FCC CLASS-B 3m LF 49922-3M HORIZONTAL
 Project : (FC)992508

	Freq	Level	Over Limit	Limit Line	ReadAntenna 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	61.040	27.56	-12.44	40.00	46.30	12.28	0.90	31.92	---	---	Peak
2	71.710	32.56	-7.44	40.00	50.66	12.84	0.98	31.92	---	---	Peak
3	77.530	29.20	-10.80	40.00	46.63	13.45	1.04	31.92	---	---	Peak
4	174.530	35.01	-8.49	43.50	49.23	16.17	1.53	31.92	---	---	Peak
5	297.720	32.18	-13.82	46.00	43.00	19.28	1.98	32.08	---	---	Peak
6	320.030	41.35	-4.65	46.00	51.53	19.82	2.03	32.03	100	0	Peak
7	3416.000	43.80	-30.20	74.00	36.56	32.48	6.84	32.08	---	---	Peak
8	4368.000	43.80	-30.20	74.00	34.15	33.57	7.85	31.77	---	---	Peak
9	5936.000	44.48	-29.52	74.00	31.96	34.93	9.07	31.48	---	---	Peak
10	6832.000	44.60	-29.40	74.00	30.87	35.30	9.89	31.46	---	---	Peak
11	7520.000	45.14	-28.86	74.00	30.62	36.19	10.31	31.98	---	---	Peak
12	8504.000	44.62	-29.38	74.00	28.83	36.50	11.24	31.95	---	---	Peak



Test Engineer :	Carl Ni	Temperature :	21~22°C
		Relative Humidity :	41~42%
Test Distance :	3m	Polarization :	Vertical



Site : 03CH02-KS
 Condition : FCC CLASS-B 3m LF 49922-3M VERTICAL
 Project : (FC)992508

	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp	A/Pos	T/Pos	Remark	
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	60.070	25.05	-14.95	40.00	43.79	12.30	0.88	31.92	100	0 Peak	
2	174.530	26.63	-16.87	43.50	40.85	16.17	1.53	31.92	---	---	Peak
3	320.030	28.94	-17.06	46.00	39.12	19.82	2.03	32.03	---	---	Peak
4	498.510	27.82	-18.18	46.00	33.47	24.06	2.55	32.26	---	---	Peak
5	672.140	27.11	-18.89	46.00	29.86	26.64	2.96	32.35	---	---	Peak
6	952.470	29.16	-16.84	46.00	25.69	30.88	3.55	30.96	---	---	Peak
7	3248.000	44.01	-29.99	74.00	36.88	32.93	6.66	32.46	---	---	Peak
8	4568.000	43.99	-30.01	74.00	34.17	33.47	7.95	31.60	---	---	Peak
9	5640.000	44.37	-29.63	74.00	31.71	34.70	8.95	30.99	---	---	Peak
10	6432.000	44.91	-29.09	74.00	31.78	35.18	9.54	31.59	---	---	Peak
11	7080.000	45.25	-28.75	74.00	31.13	35.46	10.02	31.36	---	---	Peak
12	7704.000	45.24	-28.76	74.00	30.49	36.16	10.60	32.01	---	---	Peak

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)



4. List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
EMI Test Receiver	R&S	ESR7	101403	9kHz~7GHz;Max 30dBm	Aug. 06, 2019	Oct. 30, 2019	Aug. 05, 2020	Radiation (03CH02-KS)
EXA Spectrum Analyzer	Keysight	N9010A	MY55150208	10Hz-44G,MAX 30dB	Apr. 16, 2019	Oct. 30, 2019	Apr. 15, 2020	Radiation (03CH02-KS)
Bilog Antenna	TeseQ	CBL6112D	23182	30MHz-2GHz	May 30, 2019	Oct. 30, 2019	May 29, 2020	Radiation (03CH02-KS)
Double Ridge Horn Antenna	ETS-Lindgren	3117	75959	1GHz~18GHz	Jan. 27, 2019	Oct. 30, 2019	Jan. 26, 2020	Radiation (03CH02-KS)
SHF-EHF Horn	Com-power	AH-840	101070	18GHz~40GHz	Jan. 05, 2019	Oct. 30, 2019	Jan. 04, 2020	Radiation (03CH02-KS)
Amplifier	MITEQ	TTA1840-35-HG	1887435	18~40GHz	Feb. 08, 2019	Oct. 30, 2019	Feb. 07, 2020	Radiation (03CH02-KS)
Amplifier	SONOMA	310N	187289	9KHz-1GHz	Aug. 06, 2019	Oct. 30, 2019	Aug. 05, 2020	Radiation (03CH02-KS)
Amplifier	Keysight	83017A	MY57280106	500MHz~26.5GHz	Apr. 15, 2019	Oct. 30, 2019	Apr. 14, 2020	Radiation (03CH02-KS)
AC Power Source	Chroma	61601	616010002473	N/A	NCR	Oct. 30, 2019	NCR	Radiation (03CH02-KS)
Turn Table	MF	MF7802	N/A	0~360 degree	NCR	Oct. 30, 2019	NCR	Radiation (03CH02-KS)
Antenna Mast	MF	MF7802	N/A	1 m~4 m	NCR	Oct. 30, 2019	NCR	Radiation (03CH02-KS)
EMI Receiver	R&S	ESC17	100768	9kHz~7GHz;	Apr. 16, 2019	Nov. 06, 2019	Apr. 15, 2020	Conduction (CO01-KS)
AC LISN	MessTec	AN3016	060103	9kHz~30MHz	Oct. 11, 2019	Nov. 06, 2019	Oct. 10, 2020	Conduction (CO01-KS)
AC LISN (for auxiliary equipment)	MessTec	AN3016	060105	9kHz~30MHz	Nov. 19, 2018	Nov. 06, 2019	Nov. 18, 2019	Conduction (CO01-KS)
AC Power Source	Chroma	61602	ABP000000811	AC 0V~300V, 45Hz~1000Hz	Oct. 11, 2019	Nov. 06, 2019	Oct. 10, 2020	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% ($U = 2Uc(y)$)	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
---	-------

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.1dB
---	-------