

FCC TEST REPORT
FOR
Guangzhou MCOHome Technology Co., Ltd
Thermostat
Test Model: MH8-FC4

Additional Model No.: Please Refer to Page 6

Prepared for : Guangzhou MCOHome Technology Co., Ltd
Address : Room 1504-1505, Building NO.23 Tianan Headquarter Center,
: No.555 Panyu Avenue North, Donghuan street, Panyu, Guangzhou
511400, China.

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Date of receipt of test sample : August 20, 2019
Number of tested samples : 1
Serial number : Prototype
Date of Test : August 21, 2019 ~ September 04, 2019
Date of Report : September 10, 2019

FCC TEST REPORT**FCC CFR 47 PART 15 C(15.249)****Report Reference No.** : LCS190812199AEA

Date of Issue..... : September 10, 2019

Testing Laboratory Name..... : Shenzhen LCS Compliance Testing Laboratory Ltd.

Address..... : 1/F., Xingyuan Industrial Park, Tongda Road, Bao'an Avenue, Bao'an District, Shenzhen, Guangdong, China

Full application of Harmonised standards Testing Location/ Procedure..... : Partial application of Harmonised standards
Other standard testing method **Applicant's Name**..... : Guangzhou MCOHome Technology Co., Ltd

Address..... : Room 1504-1505, Building NO.23 Tianan Headquarter Center, No.555 Panyu Avenue North, Donghuan street, Panyu, Guangzhou 511400, China.

Test Specification

Standard..... : FCC CFR 47 PART 15 C(15.249)

Test Report Form No..... : LCSEMC-1.0

TRF Originator..... : Shenzhen LCS Compliance Testing Laboratory Ltd.

Master TRF..... : Dated 2011-03

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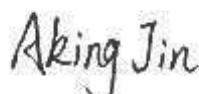
Test Item Description..... : Thermostat

Trade Mark..... : MCOHome

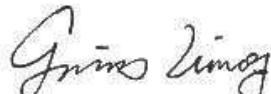
Model/ Type reference..... : MH8-FC4

Ratings..... : Input: AC 85V-260V, 50/60Hz
The worst voltage is AC120V/60Hz**Result** : Positive**Compiled by:**

Scent Hu / File administrators

Supervised by:

Aking Jin / Technique principal

Approved by:

Gavin Liang/ Manager

FCC -- TEST REPORT

Test Report No. : LCS190812199AEA	<u>September 10, 2019</u> Date of issue
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Type / Model..... : MH8-FC4

EUT..... : Thermostat

Applicant..... : Guangzhou MCOHome Technology Co., Ltd

Address..... : Room 1504-1505, Building NO.23 Tianan Headquarter Center,
No.555 Panyu Avenue North, Donghuan street, Panyu,
Guangzhou 511400, China.

Telephone..... : /

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Manufacturer..... : Guangzhou MCOHome Technology Co., Ltd

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Guangzhou 511400, China.

Telephone..... : /

Fax..... : /

/

Factory..... : Guangzhou MCOHome Technology Co., Ltd

Address..... : Room 1504-1505, Building NO.23 Tianan Headquarter Center,
No.555 Panyu Avenue North, Donghuan street, Panyu,
Guangzhou 511400, China.

Telephone..... : /

Fax..... : /

Test Result	Positive
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The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

Revision History

Revision	Issue Date	Revisions	Revised By
000	September 10, 2019	Initial Issue	Gavin Liang

TABLE OF CONTENTS

1. GENERAL INFORMATION.....	6
1.1. Description of Device (EUT).....	6
1.2. Host System Configuration List and Details.....	6
1.3. External I/O.....	6
1.4. Description of Test Facility.....	6
1.5. Statement of the measurement uncertainty.....	7
1.6. Measurement Uncertainty.....	7
1.7. Description of Test Modes.....	7
2. TEST METHODOLOGY.....	8
2.1. EUT Configuration.....	8
2.2. EUT Exercise.....	8
2.3. General Test Procedures.....	8
3. CONNECTION DIAGRAM OF TEST SYSTEM.....	9
3.1. Justification.....	9
3.2. EUT Exercise Software.....	9
3.3. Special Accessories.....	9
3.4. Block Diagram/Schematics.....	9
3.5. Equipment Modifications.....	9
3.6. Test Setup.....	9
4. SUMMARY OF TEST RESULTS.....	10
5. SUMMARY OF TEST EQUIPMENT.....	11
6. ANTENNA REQUIREMENT.....	12
6.1. Standard Applicable.....	12
6.2. Antenna Connected Construction.....	12
7. RADIATED EMISSION MEASUREMENT.....	13
7.1. Standard Applicable.....	13
7.2. Measuring Instruments and Setting.....	14
7.3. Test Procedure.....	14
7.4. Block Diagram of Test Setup.....	18
7.5. EUT Operation during Test.....	18
7.6. Test Results.....	19
8. BANDEDGES MEASUREMENT.....	23
8.1. Standard Applicable.....	23
8.2. Block Diagram of Test Setup.....	23
8.3. Test Procedure.....	23
8.4. Test Results.....	24
9. 20 DB BANDWIDTH MEASUREMENT.....	25
9.1. Standard Applicable.....	25
9.2. Block Diagram of Test Setup.....	25
9.3. Test Procedure.....	25
9.4. Test Results.....	25
10.AC POWER LINE CONDUCTED EMISSIONS.....	27
10.1 Standard Applicable.....	27
10.2. Block Diagram of Test Setup.....	27
10.3. Test Results.....	27
11. TEST SETUP PHOTOGRAPHS OF EUT.....	29
12. EXTERIOR PHOTOGRAPHS OF THE EUT.....	29
13. INTERIOR PHOTOGRAPHS OF THE EUT.....	29

1. GENERAL INFORMATION

1.1. Description of Device (EUT)

EUT	Thermostat
Test Model	MH8-FC4
Additional Model No.	MH8-FC, MH8S-FC, MH8SHV-FC, MH8-FC-EH, MH8SH-FC, MH8SH-FC4, ah-mh8-fc4.us, ah-mh8-fcaquastat.us
Model Declaration	PCB board, structure and internal of these model(s) are the same, So no additional models were tested.
Power Supply	Input: AC 85V-260V, 50/60Hz The worst voltage is AC120V/60Hz
Hardware version	6.2
Software version	2.01
Z-wave Operation frequency	908.4MHz
Modulation Type	FSK
Antenna Description	Internal Antenna, -0.5dBi(Max.)

1.2. Host System Configuration List and Details

Manufacturer	Description	Model	Serial Number	Certificate
---	---	---	---	---

1.3. External I/O

I/O Port Description	Quantity	Cable
---	---	---

1.4. Description of Test Facility

FCC Registration Number is 254912.
 Industry Canada Registration Number is 9642A-1.
 EMSD Registration Number is ARCB0108.
 UL Registration Number is 100571-492.
 TUV SUD Registration Number is SCN1081.
 TUV RH Registration Number is UA 50296516-001.
 NVLAP Accreditation Code is 600167-0.
 FCC Designation Number is CN5024.
 CAB identifier is CN0071.

1.5. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. To CISPR 16 – 4 “Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements” and is documented in the LCS quality system acc. To DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

1.6. Measurement Uncertainty

Test Item	Frequency Range	Uncertainty	Note
Radiation Uncertainty :	9KHz~30MHz	±3.10dB	(1)
	30MHz~200MHz	±2.96dB	(1)
	200MHz~1000MHz	±3.10dB	(1)
	1GHz~26.5GHz	±4.00dB	(1)
Conduction Uncertainty :	150kHz~30MHz	±1.63dB	(1)
Power disturbance :	30MHz~300MHz	±1.60dB	(1)

(1). This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

1.7. Description of Test Modes

The EUT operates in the unlicensed ISM band at 902~928MHz. The following operating modes were applied for the related test items. And the new battery is used during the measurement.

The EUT received AC 120V, 60Hz.

All test modes were tested, only the result of the worst case was recorded in the report.

The EUT is considered a portable unit; it was pre-tested on the positioned of each 3 axis. The worst case was found positioned on X-plane. Therefore only the test data of this X-plane was used for radiated emission measurement test.

Mode of Operations	Transmitting Frequency (MHz)
Z-wave	908.4MHz
For Conducted Emission	
Test Mode	TX Mode
For Radiated Emission	
Test Mode	TX Mode

***Note: Using a temporary antenna connector for the EUT when the conducted measurements(Band Edges Measurement and 20 dB Bandwidth) are performed.

2. TEST METHODOLOGY

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

The radiated testing was performed at an antenna-to-EUT distance of 3 meters. All radiated and conducted emissions measurement was performed at Shenzhen LCS Compliance Testing Laboratory Ltd.

2.1. EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

2.2. EUT Exercise

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements.

According to its specifications, the EUT must comply with the requirements of the Section 15.203, 15.205, 15.207, 15.209 and 15.249 under the FCC Rules Part 15 Subpart C.

2.3. General Test Procedures

2.3.1 Conducted Emissions (N/A)

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 6.2.1 of ANSI C63.10-2013 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using Quasi-peak and average detector modes.

2.3.2 Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 6.3 of ANSI C63.10-2013

3. CONNECTION DIAGRAM OF TEST SYSTEM

3.1. Justification

The system was configured for testing in a continuous transmit condition.

3.2. EUT Exercise Software

N/A

3.3. Special Accessories

N/A

3.4. Block Diagram/Schematics

Please refer to the related document

3.5. Equipment Modifications

Shenzhen LCS Compliance Testing Laboratory Ltd. has not done any modification on the EUT.

3.6. Test Setup

Please refer to the test setup photo.

4. SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result
§15.203	Antenna Requirement	Compliant
§15.207(a)	Conduction Emissions	Compliant
§15.205(a), §15.209(a), §15.249(a), §15.249(c)	Radiated Emissions Measurement	Compliant
§15.249	Band Edges Measurement	Compliant
§15.249, §15.215	20 dB Bandwidth	Compliant

5. SUMMARY OF TEST EQUIPMENT

Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1	MXA Signal Analyzer	Agilent	N9020A	MY49100060	2018-11-15	2019-11-14
2	DC Power Supply	Agilent	E3642A	N/A	2018-11-15	2019-11-14
3	Temperature & Humidity Chamber	GUANGZHOU GOGNWEN	GDS-100	70932	2018-10-10	2019-10-09
4	EMI Test Software	AUDIX	E3	/	N/A	N/A
5	3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	2019-06-12	2020-06-11
6	Positioning Controller	MF	MF-7082	/	2019-06-12	2020-06-11
7	Active Loop Antenna	SCHWARZBEC K	FMZB 1519B	00005	2019-07-25	2020-07-24
8	By-log Antenna	SCHWARZBEC K	VULB9163	9163-470	2019-07-25	2020-07-24
9	Horn Antenna	SCHWARZBEC K	BBHA 9120D	9120D-1925	2019-07-01	2020-06-30
10	EMI Test Receiver	R&S	ESR 7	101181	2019-06-12	2020-06-11
11	RS SPECTRUM ANALYZER	R&S	FSP40	100503	2018-11-15	2019-11-14
12	Broadband Preamplifier	/	BP-01M18G	P190501	2019-07-01	2020-06-30
13	RF Cable-R03m	Jye Bao	RG142	CB021	2019-06-12	2020-06-11
14	RF Cable-HIGH	SUHNER	SUCOFLEX 106	03CH03-HY	2019-06-12	2020-06-11
15	EMI Test Receiver	R&S	ESPI	101840	2019-06-11	2020-06-10
16	Artificial Mains	R&S	ENV216	101288	2019-06-12	2020-06-11
17	10dB Attenuator	SCHWARZBEC K	MTS-IMP-136	261115-001-0032	2019-06-11	2020-06-10

Note: All equipment is calibrated through CHINA CEPREI LABORATORY and GUANGZHOU LISAI CALIBRATION AND TEST CO., LTD.

6. ANTENNA REQUIREMENT

6.1. Standard Applicable

According to antenna requirement of §15.203.

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be re-placed by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

6.2. Antenna Connected Construction

6.2.1. Standard Applicable

According to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

6.2.2. Antenna Connector Construction

The directional gains of antenna used for transmitting is -0.5dBi, and the antenna is connect to PCB board and no consideration of replacement. Please see EUT photo for details.

6.2.3. Results: Compliance.

7. RADIATED EMISSION MEASUREMENT

7.1. Standard Applicable

15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	M Hz	M Hz	GH z
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
\1\ 0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293.	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	(\2\)
13.36-13.41			

\1\ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

\2\ Above 38.6

According to §15.249 (a): Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902-928 MHz	50	500
2400-2483.5 MHz	50	500
5725-5875 MHz	50	500
24.0-24.25 GHz	250	2500

* Field strength limits are specified at a distance of 3 meters.

* As shown in §15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For point-to-point operation under paragraph (b) of this section, the peak field strength shall not exceed 2500 millivolts/meter at 3 meters along the antenna azimuth.

* Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

7.2. Measuring Instruments and Setting

Please refer to equipment list in this report. The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10 th carrier harmonic
RB / VB (Emission in restricted band)	1MHz / 1MHz for Peak, 1 MHz / 1/B kHz for Average
RB / VB (Emission in non-restricted band)	1MHz / 1MHz for Peak, 1 MHz / 1/B kHz for Average

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB/VB 200Hz/1KHz for QP/AVG
Start ~ Stop Frequency	150kHz~30MHz / RB/VB 9kHz/30KHz for QP/AVG
Start ~ Stop Frequency	30MHz~1000MHz / RB/VB 120kHz/1MHz for QP

7.3. Test Procedure

1) Sequence of testing 9 kHz to 30 MHz

Setup:

- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
- If the EUT is a tabletop system, a rotatable table with 0.8 m height is used.
- If the EUT is a floor standing device, it is placed on the ground.
- Auxiliary equipment and cables were positioned to simulate normal operation conditions.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- The measurement distance is 3 meter.
- The EUT was set into operation.

Premasurement:

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna height is 0.8 meter.
- At each turntable position the analyzer sweeps with peak detection to find the maximum of all emissions

Final measurement:

- Identified emissions during the premeasurement the software maximizes by rotating the turntable position (0° to 360°) and by rotating the elevation axes (0° to 360°).
- The final measurement will be done in the position (turntable and elevation) causing the highest emissions with QPK detector.
- The final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

2) Sequence of testing 30 MHz to 1 GHz

Setup:

- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.
- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- Auxiliary equipment and cables were positioned to simulate normal operation conditions
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- The measurement distance is 3 meter.
- The EUT was set into operation.

Premeasurement:

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna is polarized vertical and horizontal.
- The antenna height changes from 1 to 3 meter.
- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

Final measurement:

- The final measurement will be performed with minimum the six highest peaks.
- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position ($\pm 45^\circ$) and antenna movement between 1 and 4 meter.
- The final measurement will be done with QP detector with an EMI receiver.
- The final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

3) Sequence of testing 1 GHz to 18 GHz

Setup:

- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.
- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- Auxiliary equipment and cables were positioned to simulate normal operation conditions
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- The measurement distance is 3 meter.
- The EUT was set into operation.

Premeasurement:

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna is polarized vertical and horizontal.
- The antenna height scan range is 1 meter to 2.5 meter.
- At each turntable position and antenna polarization the analyzer sweeps with peak detection to find the maximum of all emissions.

Final measurement:

- The final measurement will be performed with minimum the six highest peaks.
- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position ($\pm 45^\circ$) and antenna movement between 1 and 4 meter. This procedure is repeated for both antenna polarizations.
- The final measurement will be done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and Average detector.
- The final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

4) Sequence of testing above 18 GHz

Setup:

- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.
- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- Auxiliary equipment and cables were positioned to simulate normal operation conditions
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- The measurement distance is 1 meter.
- The EUT was set into operation.

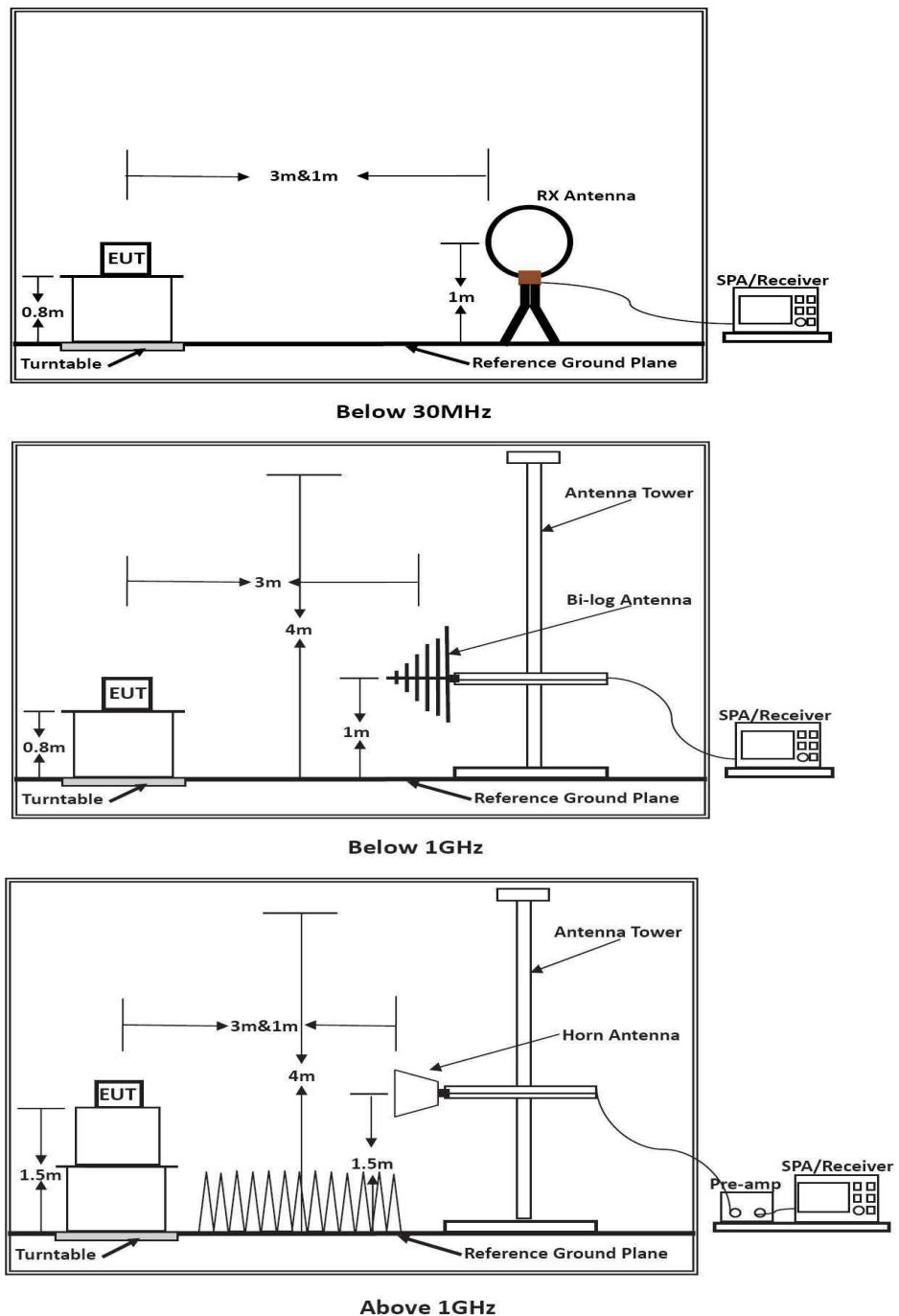
Premeasurement:

- The antenna is moved spherical over the EUT in different polarisations of the antenna.

Final measurement:

- The final measurement will be performed at the position and antenna orientation for all detected emissions that were found during the premeasurements with Peak and Average detector.
- The final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

7.4. Block Diagram of Test Setup



Above 18 GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade from 3m to 1m.

Distance extrapolation factor = $20 \log (\text{specific distance [3m]} / \text{test distance [1m]})$ (dB);
 Limit line = specific limits (dBuV) + distance extrapolation factor [6 dB].

7.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

7.6. Test Results

Results of Radiated Emissions (9 KHz~30MHz)

Temperature	23.8°C	Humidity	54.3%
Test Engineer	David Luo		

Frequency (MHz)	Level (dBuV)	Over Limit (dB)	Over Limit (dBuV)	Remark
---	--	---	---	See Note

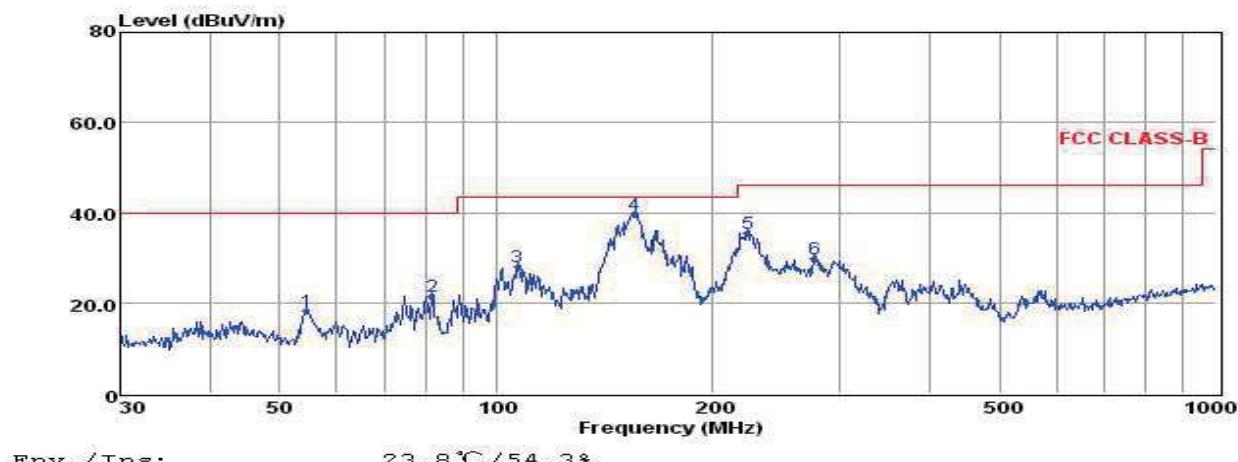
Note:

The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported.

Distance extrapolation factor = $40 \log (\text{specific distance} / \text{test distance})$ (dB);
Limit line = specific limits (dBuV) + distance extrapolation factor.

Results of Radiated Emissions (30MHz~1000MHz)

Horizontal

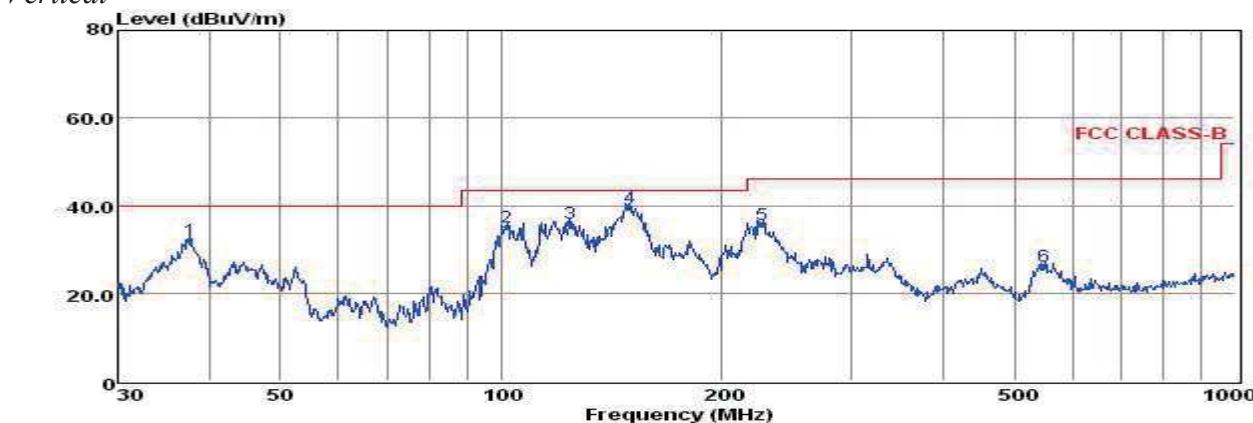


Note: 1. All readings are Quasi-peak values.

2. Measured= Reading + Antenna Factor + Cable Loss

3. The emission that are 20db below the official limit are not reported

Vertical



Note: 1. All readings are Quasi-peak values.

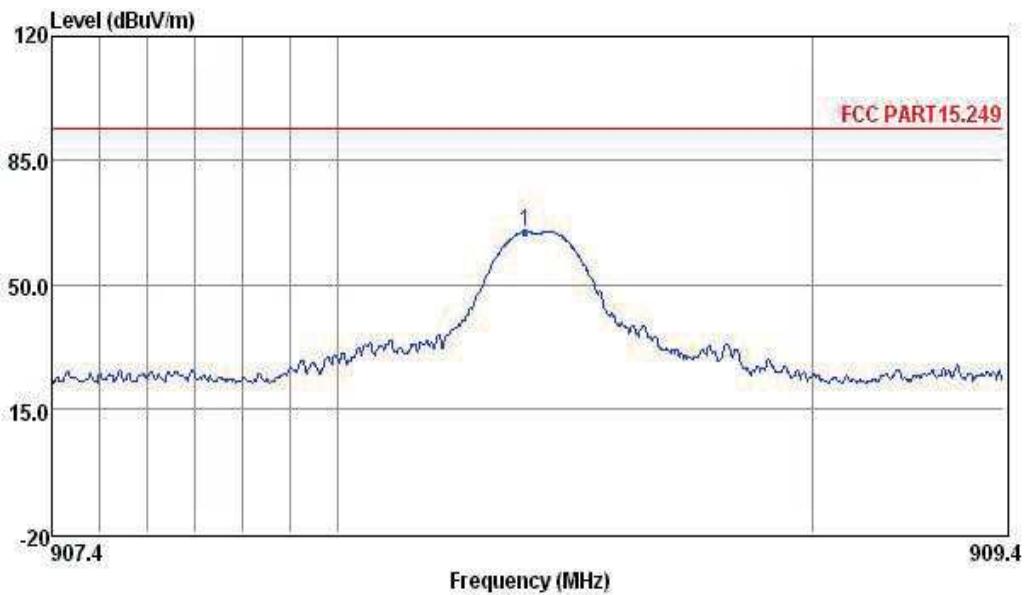
2. Measured= Reading + Antenna Factor + Cable Loss

3. The emission that are 20db below the official limit are not reported

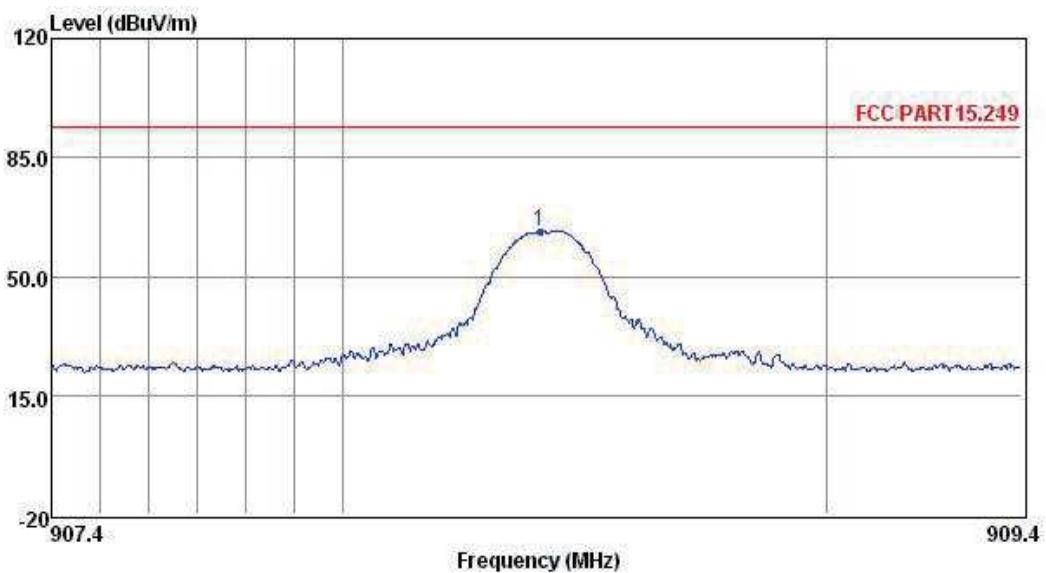
Field strength of fundamental:

Frequency (MHz)	Pol.	Measure Result (PK, dBuV/m)	Limit (dBuV/m)	Result
908.40	H	64.93	94	Pass
908.40	V	63.34	94	Pass

Horizontal



Vertical



Note:

Because the test value of PK is less than the AV limit, the AV test value does not need to be provided.

Above 1G (The worst test result for Tx) :

Freq. MHz	Reading dBuv	Ant. Fac dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
908.40MHz									
1816.80	48.60	33.01	35	3.86	50.47	74.00	-23.53	Peak	Horizontal
1816.80	30.73	33.01	35	3.86	32.60	54.00	-21.40	Average	Horizontal
2725.20	47.52	33.03	35.02	3.91	49.37	74.00	-24.63	Peak	Horizontal
2725.20	33.82	33.03	35.02	3.91	36.35	54.00	-17.65	Average	Horizontal
1816.80	49.97	33.01	35	3.86	51.84	74.00	-22.16	Peak	Vertical
1816.80	30.58	33.01	35	3.86	32.45	54.00	-21.55	Average	Vertical
2725.20	47.53	33.03	35.02	3.91	49.45	74.00	-24.55	Peak	Vertical
2725.20	34.09	33.03	35.02	3.91	36.01	54.00	-17.99	Average	Vertical

Notes:

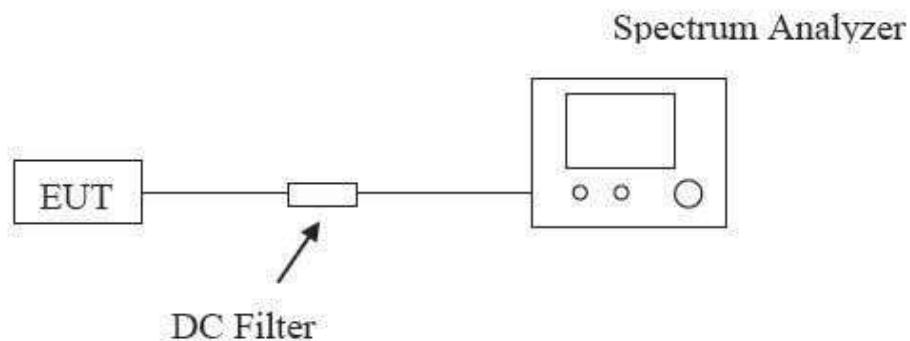
1. Measuring frequencies from 9k~10th harmonic (ex. 10GHz), No emission found between lowest internal used/generated frequency to 30 MHz.
2. Radiated emissions measured in frequency range from 9k~10th harmonic (ex. 10GHz) were made with an instrument using Peak detector mode.

8. BANDEDGES MEASUREMENT

8.1. Standard Applicable

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.

8.2. Block Diagram of Test Setup



8.3. Test Procedure

The EUT is placed on a turntable, which is 0.8m above the ground plane. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.

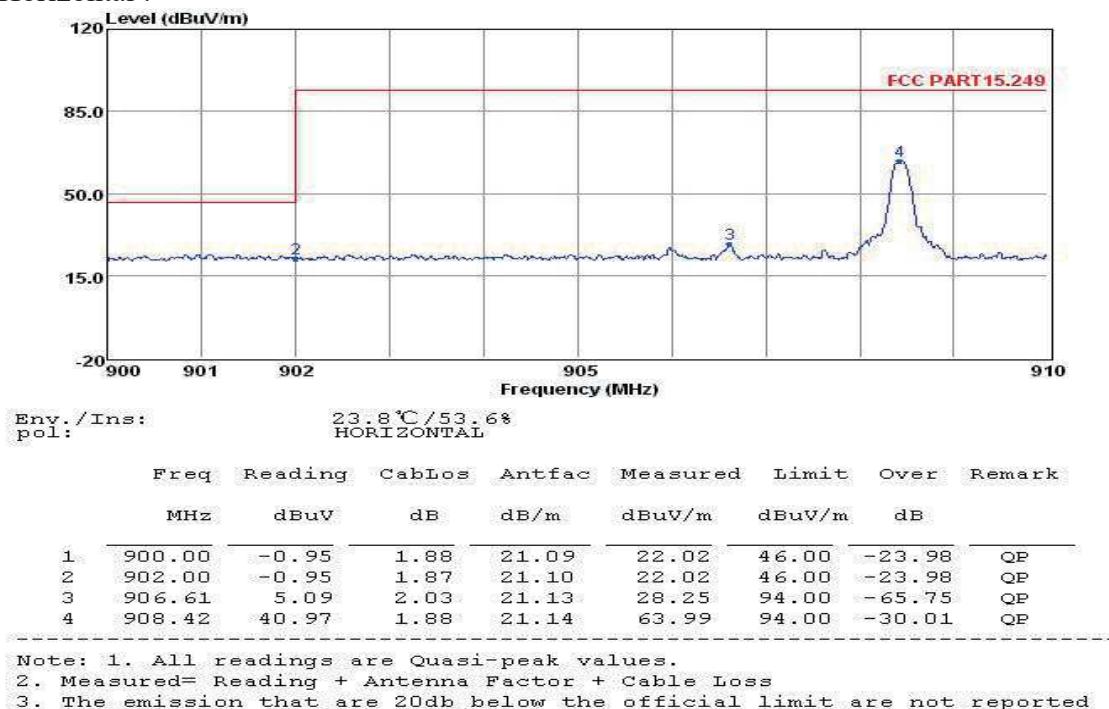
EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission. Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission:

Peak: RBW=120MHz, RBW=300MHz / Sweep=AUTO

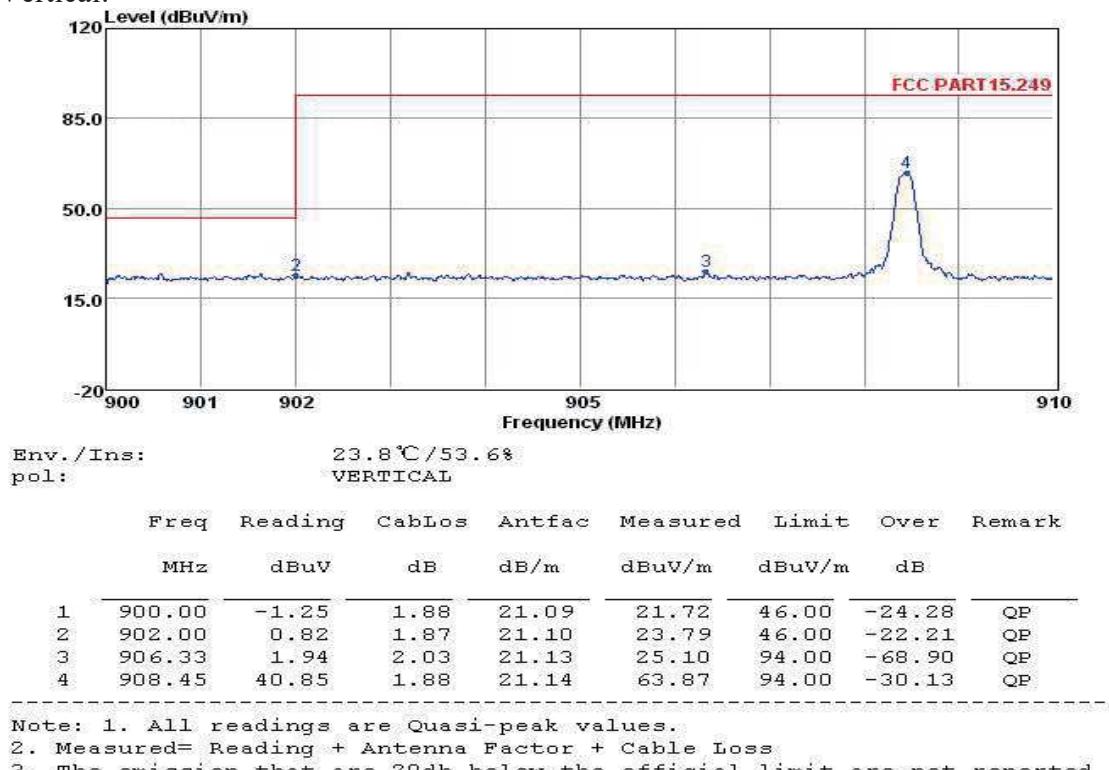
Repeat the procedures until the peak versus polarization are measured.

8.4. Test Results

Horizontal :



Vertical:

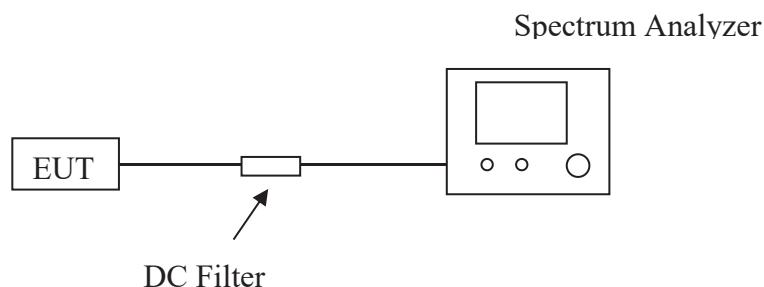


9. 20 DB BANDWIDTH MEASUREMENT

9.1. Standard Applicable

According to §15.215

9.2. Block Diagram of Test Setup



9.3. Test Procedure

Use the following spectrum analyzer settings:

Span = approximately 2 to 5 times the 20 dB bandwidth, centered on a hopping channel

RBW = 1% to 5% of the 20 dB bandwidth

VBW = 3 RBW

Sweep = auto

Detector function = peak

Trace = max hold

The EUT should be transmitting at its maximum data rate. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. Use the marker-delta function to measure 20 dB down one side of the emission. Reset the marker-delta function, and move the marker to the other side of the emission, until it is (as close as possible to) even with the reference marker level. The marker-delta reading at this point is the 20 dB bandwidth of the emission. If this value varies with different modes of operation (e.g., data rate, modulation format, etc.), repeat this test for each variation. The limit is specified in one of the subparagraphs of this Section. Submit this plot(s).

9.4. Test Results

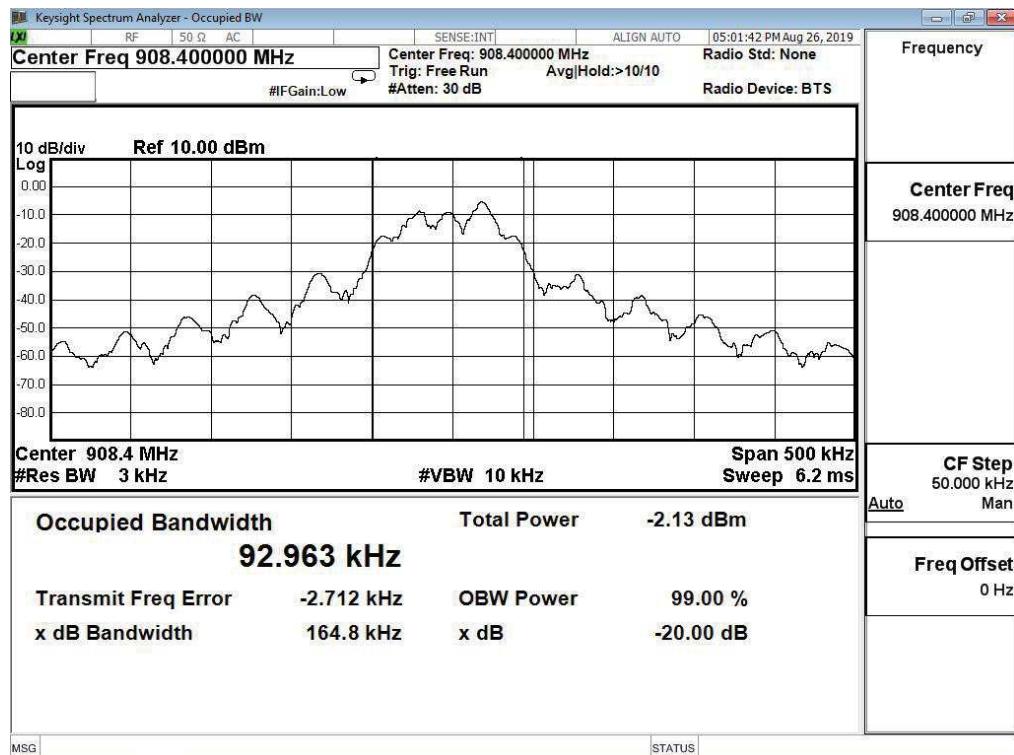
Please refer to the following page.

Result: Pass

Temperature	23.8°C	Humidity	53.1%
Test Engineer	David Luo		

Test Result Of 20dB Bandwidth Measurement

Test Frequency (MHz)	20dB Bandwidth (kHz)	Limit (MHz)
908.40	164.8	Non-Specified



10.AC Power line conducted emissions

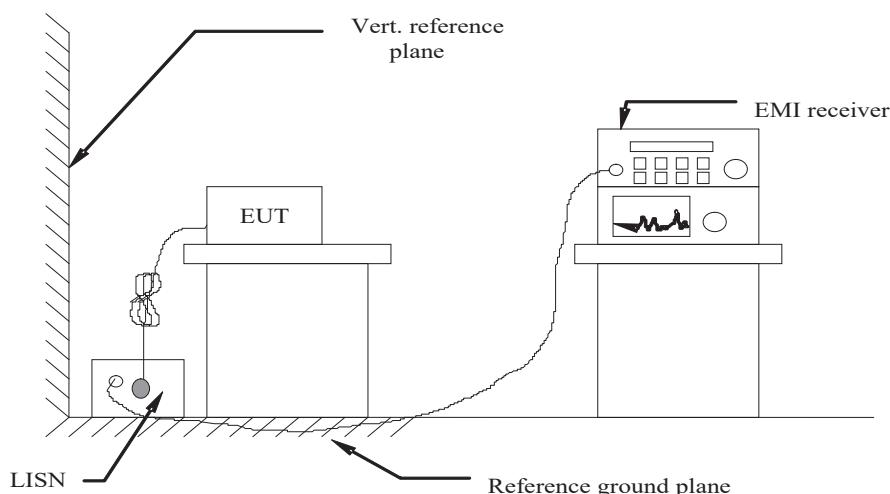
10.1 Standard Applicable

According to §15.207 (a): For an intentional radiator which 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 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range is listed as follows:

Frequency Range (MHz)	Limits (dB μ V)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

* Decreasing linearly with the logarithm of the frequency

10.2. Block Diagram of Test Setup



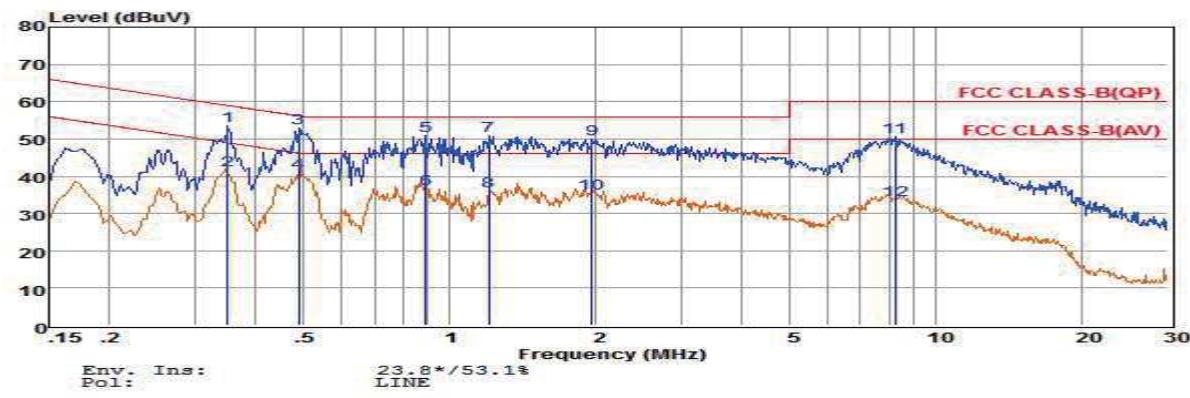
10.3. Test Results

PASS.

The test data please refer to following page.

Temperature	23.8°C	Humidity	53.1%
Test Engineer	David Luo	Configurations	Z-wave

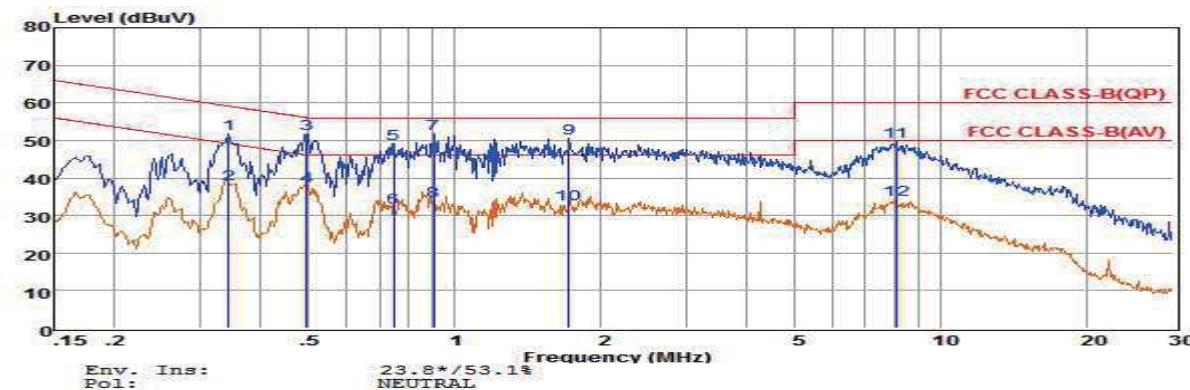
Line



Freq	Reading	LISNFac	CabLos	Aux2Fac	Measured	Limit	Over	Remark
MHz	dBuV	dB	dB	dB	dBuV	dBuV	dB	
1	0.35	33.77	9.62	0.03	10.00	53.42	58.96	-5.54 QP
2	0.35	21.94	9.62	0.03	10.00	41.59	48.96	-7.37 Average
3	0.49	33.19	9.62	0.04	10.00	52.85	56.19	-3.34 QP
4	0.49	21.37	9.62	0.04	10.00	41.03	46.18	-5.15 Average
5	0.89	31.26	9.63	0.05	10.00	50.94	56.00	-5.06 QP
6	0.89	16.81	9.63	0.05	10.00	36.49	46.00	-9.51 Average
7	1.20	31.28	9.63	0.05	10.00	50.96	56.00	-5.04 QP
8	1.20	16.19	9.63	0.05	10.00	35.87	46.00	-10.13 Average
9	1.96	30.34	9.64	0.05	10.00	50.03	56.00	-5.97 QP
10	1.96	15.83	9.64	0.05	10.00	35.52	46.00	-10.48 Average
11	8.24	30.67	9.68	0.07	10.00	50.42	60.00	-9.58 QP
12	8.24	13.79	9.68	0.07	10.00	33.54	50.00	-16.46 Average

Remarks: 1. Measured = Reading + LISNFac + Cable Loss + Aux2 Fac.
2. The emission levels that are 20dB below the official limit are not reported.

Neutral



Freq	Reading	LISNFac	CabLos	Aux2Fac	Measured	Limit	Over	Remark
MHz	dBuV	dB	dB	dB	dBuV	dBuV	dB	
1	0.34	32.05	9.61	0.03	10.00	51.69	59.13	-7.44 QP
2	0.34	18.76	9.61	0.03	10.00	38.40	49.13	-10.73 Average
3	0.50	31.99	9.62	0.04	10.00	51.65	56.05	-4.40 QP
4	0.50	18.18	9.62	0.04	10.00	37.84	46.05	-8.21 Average
5	0.75	29.41	9.63	0.04	10.00	49.08	56.00	-6.92 QP
6	0.75	12.52	9.63	0.04	10.00	32.19	46.00	-13.81 Average
7	0.90	32.17	9.63	0.05	10.00	51.85	56.00	-4.15 QP
8	0.90	14.18	9.63	0.05	10.00	33.86	46.00	-12.14 Average
9	1.72	31.01	9.63	0.05	10.00	50.69	56.00	-5.31 QP
10	1.72	13.40	9.63	0.05	10.00	33.08	46.00	-12.92 Average
11	8.11	29.79	9.70	0.07	10.00	49.56	60.00	-10.44 QP
12	8.11	14.36	9.70	0.07	10.00	34.13	50.00	-15.87 Average

Remarks: 1. Measured = Reading + LISNFac + Cable Loss + Aux2 Fac.
2. The emission levels that are 20dB below the official limit are not reported.

11. TEST SETUP PHOTOGRAPHS OF EUT

Please refer to separated files for Test Setup Photographs of the EUT.

12. EXTERIOR PHOTOGRAPHS OF THE EUT

Please refer to separated files for External Photographs of the EUT.

13. INTERIOR PHOTOGRAPHS OF THE EUT

Please refer to separated files for Internal Photographs of the EUT.

-----THE END OF REPORT-----