



RF TEST REPORT

No. 160100174SHA-001

Applicant : Guangzhou MCOHome Technology Co., Ltd
Room 202, Hi-tech Innovation Plaza, Panyu Hi-tech
Ecological Park, Guangzhou 511400, China

Manufacturer : Guangzhou MCOHome Technology Co., Ltd
Room 202, Hi-tech Innovation Plaza, Panyu Hi-tech
Ecological Park, Guangzhou 511400, China

Product Name : Thermostat

Type/Model : MH4-US

TEST RESULT : PASS

SUMMARY

The equipment complies with the requirements according to the following standard(s):

47CFR Part 15 (2015): Radio Frequency Devices

ANSI C63.10 (2013): American National Standard for Testing Unlicensed Wireless Devices

Date of issue: July 7, 2016

Prepared by:

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Daniel Zhao (*Reviewer*)



Description of Test Facility

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1. General Information

1.1 Applicant Information

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Room 202, Hi-tech Innovation Plaza, Panyu Hi-tech
Ecological Park, Guangzhou 511400, China

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Manufacturer : Guangzhou MCOHome Technology Co., Ltd
Room 202, Hi-tech Innovation Plaza, Panyu Hi-tech
Ecological Park, Guangzhou 511400, China

1.2 Identification of the EUT

Product description : Thermostat

Type/model : MH4-US

Brand Name : MCOHome

Operation Frequency : 902 - 928 MHz

Band

Type of Modulation : FSK

Channel Description : 1Channel at 908.42MHz

Antenna Type : Internal 0dBi

Port identification : /

Rating : 120V AC 60Hz

Category of EUT : Class B

EUT type : ☒ Table top ☐ Floor standing

Sample received date : 2016.01.05

Sample Identification : *0160105-06-001*

No

Date of test : 2016.01.05 ~ 2016.04.05

1.3 Mode of operation during the test / Test peripherals used

Within this test report, EUT was tested with modulation and tested under its rating voltage and frequency.

The EUT was set to work normal and as receiving and transmitting mode during test. No standby function.

Test Peripherals: NA

2. Test Specification

2.1 Instrument list

Selected	Equipment	Type	Manu.	Internal no.	Cal. Date	Due date
<input checked="" type="checkbox"/>	PXA Analyzer	N9030A	Agilent	EC5338	2016/3/4	2017/3/3
<input checked="" type="checkbox"/>	Vector SG	N5182B	Agilent	EC5175	2016/3/4	2017/3/3
<input checked="" type="checkbox"/>	Power sensor	U2021XA	Agilent	EC5338-1	2016/3/4	2017/3/3
<input checked="" type="checkbox"/>	MXG Analog SG	N5181A	Agilent	EC5338-2	2016/3/4	2017/3/3
<input checked="" type="checkbox"/>	Power meter	N1911A/N1921A	Agilent	EC4318	2016/4/10	2017/4/9
<input checked="" type="checkbox"/>	EMI Receiver	ESCS 30	R&S	EC 2107	2015/10/20	2016/10/19
<input checked="" type="checkbox"/>	A.M.N.	ESH2-Z5	R&S	EC 3119	2015/12/16	2017/12/15
<input checked="" type="checkbox"/>	I.S.N.	FCC-TLISN-T8-02	FCC	EC3756	2016/2/16	2017/2/15
<input checked="" type="checkbox"/>	EMI chamber	3m	Albatross	EC 3048	2016/5/5	2017/5/4
<input checked="" type="checkbox"/>	Test Receiver	ESIB 26	R&S	EC 3045	2015/10/20	2016/10/19
<input checked="" type="checkbox"/>	Test Receiver	ESCI 7	R&S	EC4501	2016/2/24	2017/2/23
<input checked="" type="checkbox"/>	Bilog Antenna	CBL 6112D	TESEQ	EC 4206	2016/5/30	2017/5/29
<input checked="" type="checkbox"/>	Horn antenna	HF 906	R&S	EC 3049	2015/9/12	2016/9/11
<input checked="" type="checkbox"/>	Horn antenna	HAP18-26W	TOYO	EC 4792-3	2014/6/12	2017/6/11
<input checked="" type="checkbox"/>	Pre-amplifier	Pre-amp 18	R&S	EC 5262	2016/5/24	2017/5/23
<input checked="" type="checkbox"/>	Pre-amplifier	Tpa0118-40	R&S	EC 4792-2	2016/4/11	2017/4/10
<input checked="" type="checkbox"/>	Shielded room	-	Zhongyu	EC 2838	2016/1/9	2017/1/8

2.2 Test Standard

47CFR Part 15 (2015)
ANSI C63.10 (2013)

2.3 Test Summary

This report applies to tested sample only. This report shall not be reproduced in part without written approval of Intertek Testing Service Shanghai Limited.

TEST ITEM	FCC REFERENCE	RESULT
Radiated emission	15.249 & 15.209	Pass
Assigned bandwidth (20dB bandwidth)	15.215(c)	Pass
Power line conducted emission	15.207	Pass

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3. Radiated emission & Band Edge

Test result: **PASS**

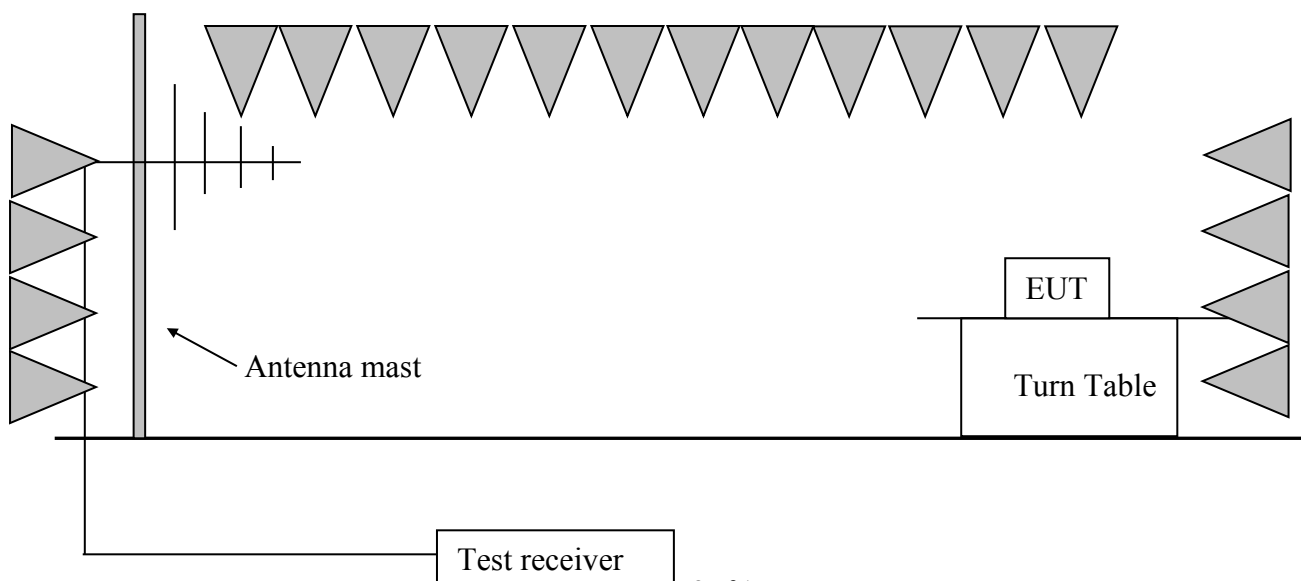
3.1 Test limit

Fundamental Frequency (MHz)	Fundamental limit (dBuV/m)	Harmonic limit (dBuV/m)
<input checked="" type="checkbox"/> 902 - 928	94	54
<input type="checkbox"/> 2400 - 2483.5	94	54
<input type="checkbox"/> 5725 - 5875	94	54
<input type="checkbox"/> 24000 - 24250	108	68

The radiated emissions which fall outside allocated band, must also comply with the radiated emission limits specified in § 15.209(a) and Band edge emissions radiated outside of the specified frequency bands shall be attenuated by at least 50 dB below the level of the fundamental or comply with the radiated emissions limits specified in section 15.209(a) limit in the table below has to be followed.

Frequency (MHz)	Field Strength (dBuV/m)	Measurement Distance (m)
30 - 88	40.0	3
88 - 216	43.5	3
216 - 960	46.0	3
Above 960	54.0	3

3.2 Test Configuration



3.3 Test procedure and test setup

The measurement was applied in a semi-anechoic chamber. While testing for spurious emission higher than 1GHz, if applied, the pre-amplifier would be equipped just at the output terminal of the antenna.

The EUT and simulators were placed on a 0.8m high wooden turntable above the horizontal metal ground plane. The turn table rotated 360 degrees to determine the position of the maximum emission level. The EUT was set 3 meters away from the receiving antenna which was mounted on an antenna mast. The antenna moved up and down between from 1meter to 4 meters to find out the maximum emission level.

The radiated emission was measured using the Spectrum Analyzer with the resolutions bandwidth set as:

RBW=300 Hz, VBW=1 kHz (9 kHz~150 kHz);
RBW=10kHz, VBW=30kHz (150kHz~30MHz);
RBW = 100 kHz, VBW = 300 kHz (30MHz~1GHz)
RBW = 1MHz, VBW = 3MHz (>1GHz);

3.4 Test protocol

Temperature : 25 °C
Relative Humidity : 55 %

Continues mode:

CH	Antenna	Frequency (MHz)	Correct Factor (dB/m)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
908.42 MHz	H	908.42	25.5	78.4	94.0	15.6	PK
	<i>H</i>	<i>902.00</i>	<i>25.4</i>	<i>35.3</i>	<i>46.0</i>	<i>10.7</i>	<i>PK</i>
	<i>H</i>	<i>928.00</i>	<i>25.6</i>	<i>36.4</i>	<i>46.0</i>	<i>9.6</i>	<i>PK</i>
	H	37.78	15.9	28.6	40.0	11.4	PK
	H	82.48	9.2	17.6	40.0	22.4	PK
	H	101.92	13.1	29.1	43.5	14.4	PK
	H	168.02	12.0	42.8	43.5	0.7	PK
	H	232.16	13.6	45.2	46.0	0.8	PK
	H	276.87	15.7	44.6	46.0	1.4	PK
	H	344.91	17.7	38.5	46.0	7.5	PK
	H	399.34	19.3	36.6	46.0	9.4	PK
	H	523.75	21.2	28.3	46.0	17.7	PK
	H	873.65	25.3	41.6	46.0	4.4	PK
	H	1816.84	-8.7	47.5	54.0	6.5	PK
	H	2725.26	-6.8	45.2	54.0	8.8	PK
	H	3633.68	-4.6	42.8	54.0	11.2	PK
	V	908.42	25.5	75.2	94.0	18.8	PK
	<i>V</i>	<i>902.00</i>	<i>25.4</i>	<i>36.1</i>	<i>46.0</i>	<i>9.9</i>	<i>PK</i>
	<i>V</i>	<i>928.00</i>	<i>25.6</i>	<i>35.7</i>	<i>46.0</i>	<i>10.3</i>	<i>PK</i>
	V	37.78	15.9	36.0	40.0	4.0	PK
	V	57.21	8.4	31.6	40.0	8.4	PK
	V	121.36	14.4	37.9	43.5	5.6	PK
	V	138.86	13.7	42.5	43.5	1.0	PK
	V	183.57	11.7	42.7	43.5	0.8	PK
	V	321.58	16.9	44.7	46.0	1.3	PK
	V	364.35	18.3	39.6	46.0	6.4	PK
	V	712.30	23.2	37.4	46.0	8.6	PK
	V	863.93	25.1	42.4	46.0	3.6	PK
	V	873.65	25.3	43.2	46.0	2.8	PK
	V	1816.84	-8.7	45.3	54.0	8.7	PK
	V	2725.26	-6.8	42.5	54.0	11.5	PK
	V	3633.68	-4.6	41.2	54.0	12.8	PK

Remark:

1. For fundamental emission test, no pre-amplifier is employed;
2. Correct Factor = Antenna Factor + Cable Loss (-Amplifier, is employed);
3. Corrected Reading = Original Receiver Reading + Correct Factor;
4. Margin = limit – Corrected Reading;
5. If the PK reading is lower than AV limit, the AV test can be elided;
6. The shaded data is the fundamental emission;
7. Both emissions on “horizontal” and “vertical” axes were assessed and the worse test data was listed in this report;

Example:

Assuming Antenna Factor = 30.20dB/m, Cable Loss = 2.00dB,
Gain of Preamplifier = 32.00dB, Original Receiver Reading = 10dBuV,
Then Correct Factor = 30.20 + 2.00 – 32.00 = 0.20dB/m,
Corrected Reading = 10dBuV + 0.20dB/m = 10.20dBuV/m,
Assuming limit = 54dBuV/m, Corrected Reading = 10.20dBuV/m,
Then Margin = 54 -10.20 = 43.80dBuV/m.

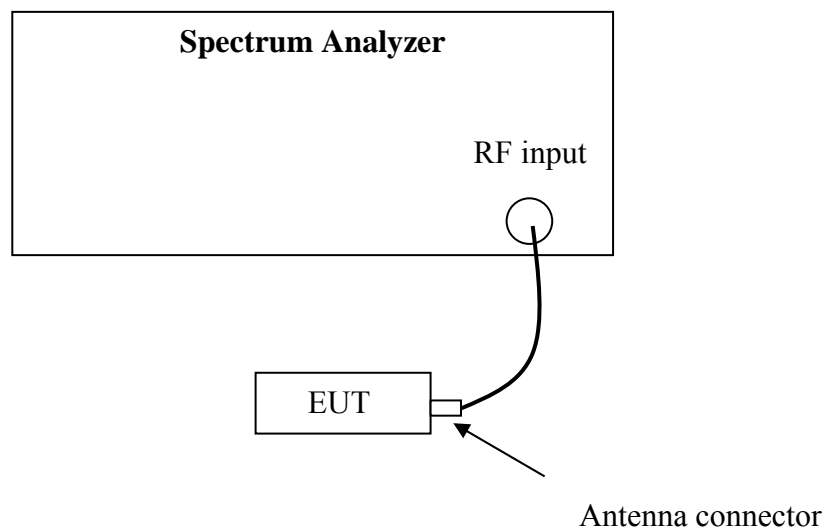
4. Assigned bandwidth (20dB bandwidth)

Test result: PASS

4.1 Limit

Intentional radiators must be designed to ensure that the 20 dB bandwidth of the emission is contained within the allocated frequency band as clause 3.1 shows.

4.2 Test Configuration



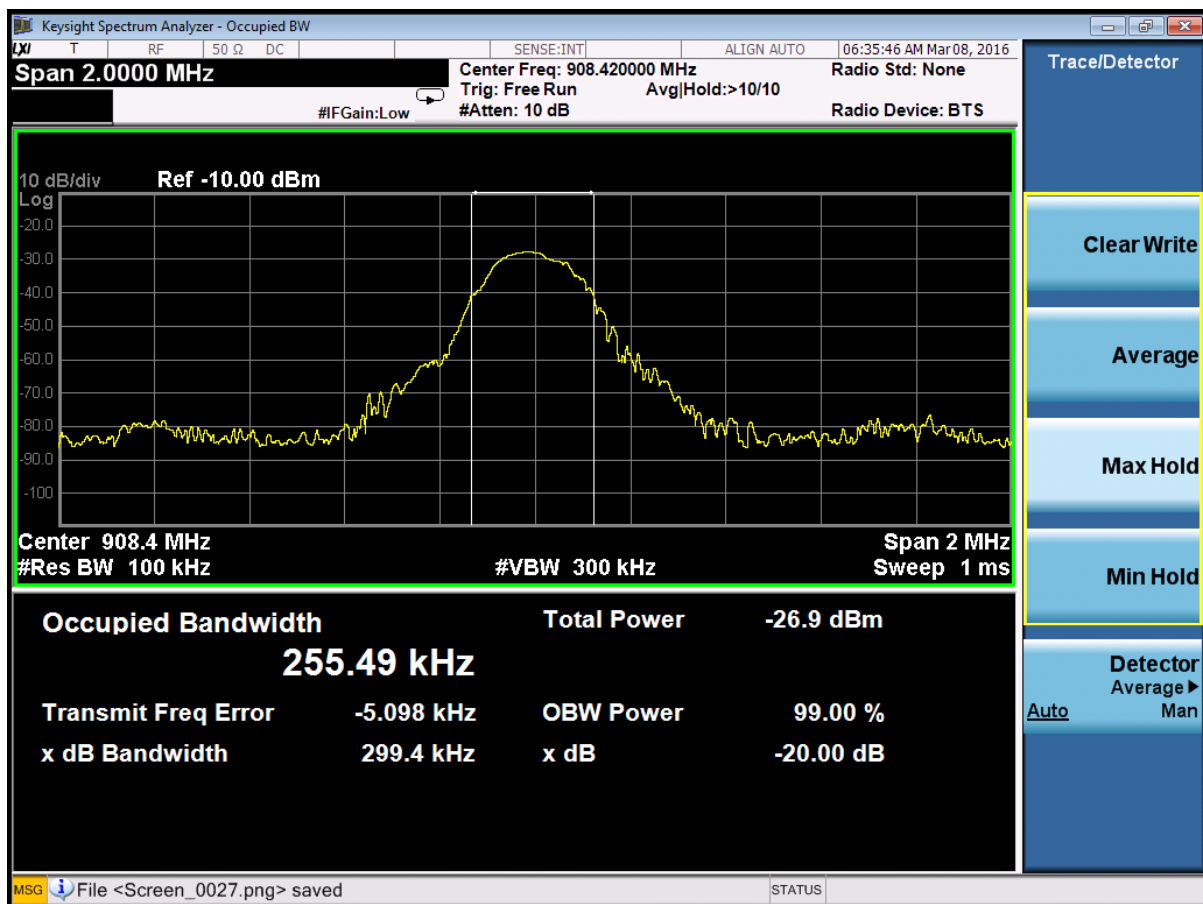
4.3 Test procedure and test setup

The 20dB Bandwidth per FCC § 15.215(c) is measured using the Spectrum Analyzer. Set Span = 2 to 3 times the 20 dB bandwidth, $RBW \geq 1\%$ of the 20 dB bandwidth, $VBW \geq RBW$, Sweep = auto, Detector = peak, Trace = max hold. The test was performed at 3 channels (lowest, middle and highest channel).

4.4 Test protocol

Temperature : 25°C
Relative Humidity : 55 %

Frequency	20dB Bandwidth (kHz)
908.42MHz	255.49



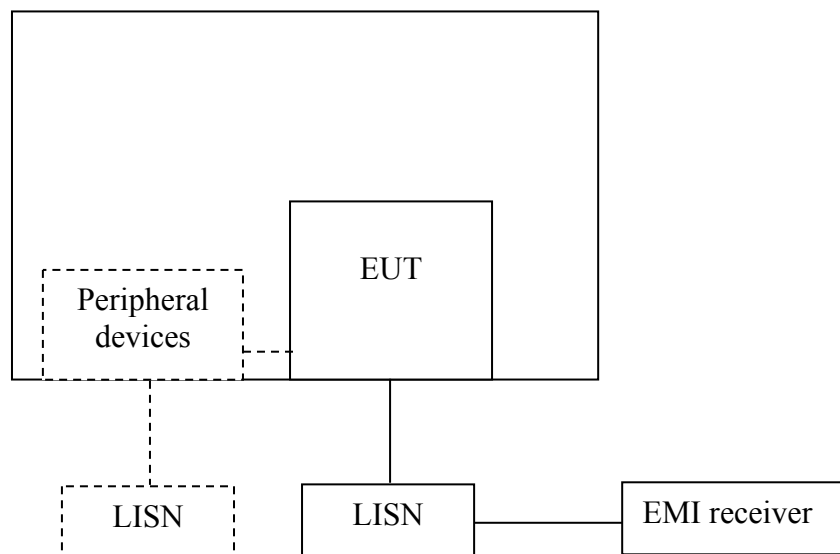
5. Power line conducted emission

Test result: **PASS**

5.1 Limit

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	QP	AV
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.		

5.2 Test configuration



☒ For table top equipment, wooden support is 0.8m height table

☐ For floor standing equipment, wooden support is 0.1m height rack.

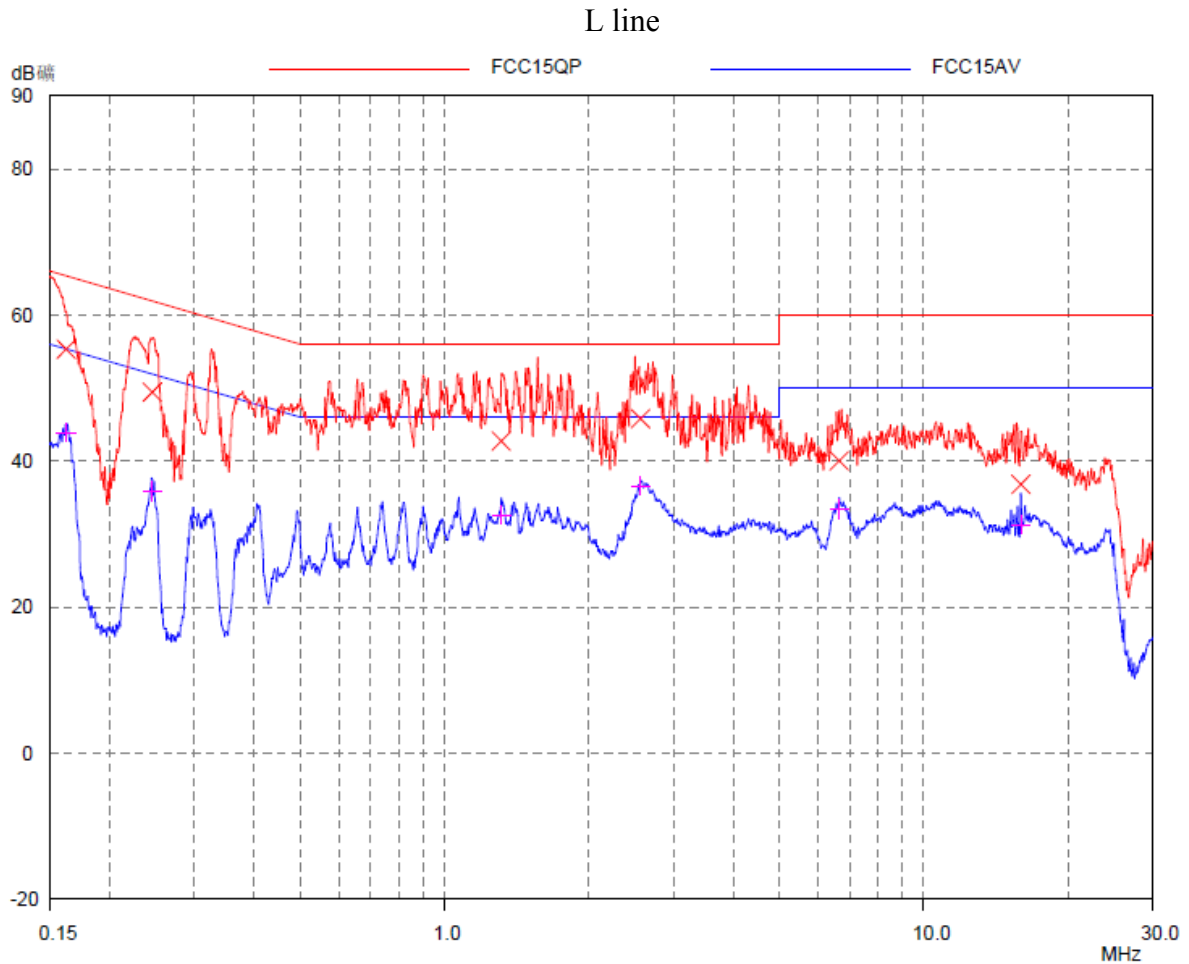
5.3 Test procedure and test set up

The EUT are connected to the main power through a line impedance stabilization network (LISN). This provides a $50\Omega/50\mu\text{H}$ coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a $50\Omega/50\mu\text{H}$ coupling impedance with 50Ω termination.

Both sides (Line and Neutral) of AC line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4 on conducted measurement. The bandwidth of the test receiver is set at 9 kHz.

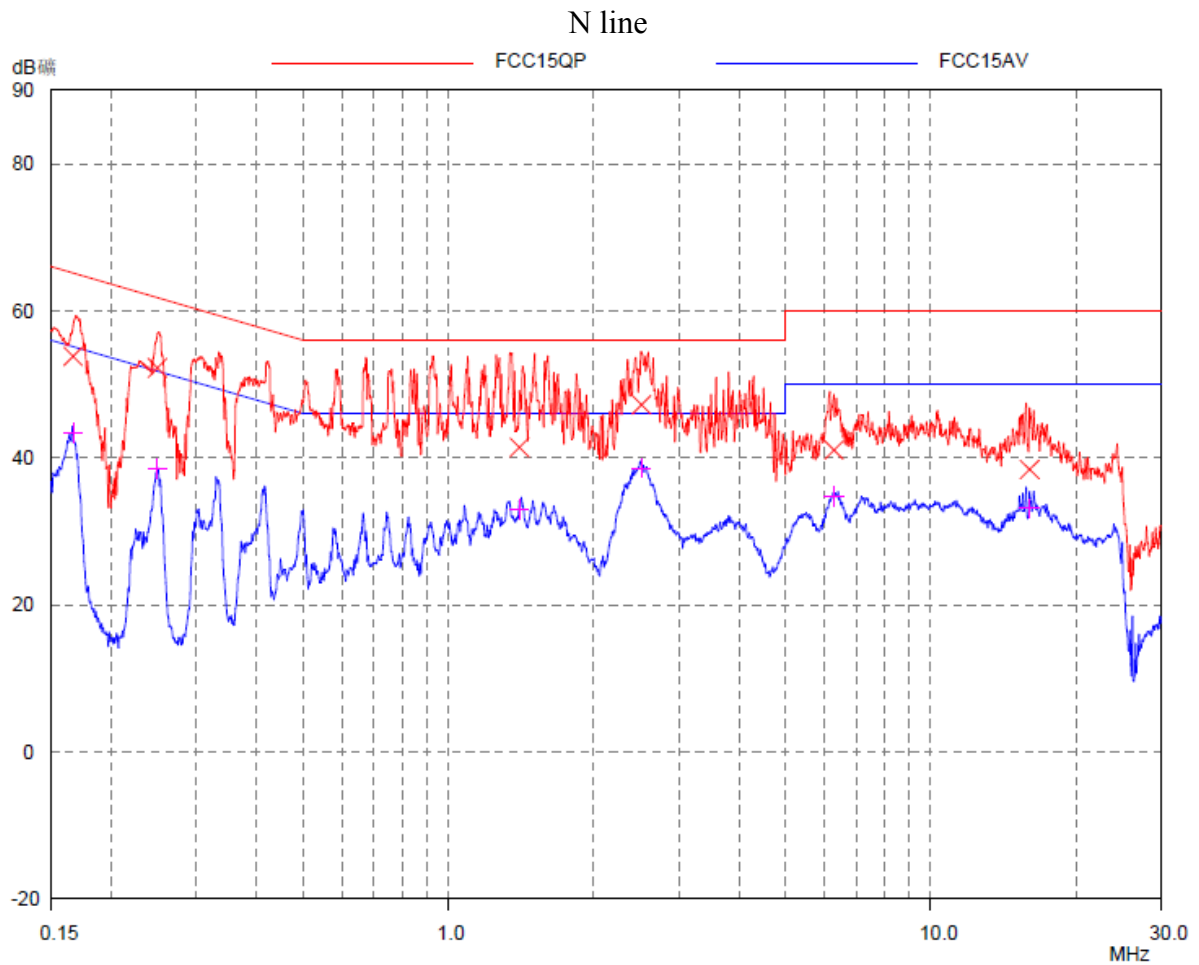
5.4 Test protocol

Temperature : 25°C
Relative Humidity : 55 %



Test Data:

Frequency (MHz)	Quasi-peak			Average		
	level dB(μV)	Limit dB(μV)	Margin (dB)	level dB(μV)	limit dB(μV)	Margin (dB)
0.162	55.32	65.37	10.05	43.93	55.37	11.44
0.245	49.46	61.92	12.46	35.86	51.92	16.06
1.311	42.75	56.00	13.25	32.63	46.00	13.37
2.563	45.82	56.00	10.18	36.64	46.00	9.36
6.655	40.04	60.00	19.96	33.45	50.00	16.55
15.952	36.84	60.00	23.16	31.27	50.00	18.73



Test Data:

Frequency (MHz)	Quasi-peak			Average		
	level dB(μV)	Limit dB(μV)	Margin (dB)	level dB(μV)	limit dB(μV)	Margin (dB)
0.166	53.84	65.14	11.30	43.40	55.14	11.74
0.249	52.26	61.79	9.53	38.56	51.79	13.23
1.403	41.42	56.00	14.58	32.97	46.00	13.03
2.512	47.25	56.00	8.75	38.61	46.00	7.39
6.293	41.03	60.00	18.97	34.74	50.00	15.26
16.015	38.45	60.00	21.55	33.16	50.00	16.84