

FCC RF TEST REPORT

No. 171101780SHA-001

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

Manufacturing site : Guangzhou MCOHome Technology Co., Ltd
Room 1504-1505, Building NO.23 Tianan Headquarter
Center, No.555 Panyu Avenue North., DongHuan street,
Panyu, Guangzhou 511400, China

Product Name : Heat Pump Thermostat

Type/Model : MH6-HP

TEST RESULT : PASS

SUMMARY

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

47CFR Part 15 (2016): Radio Frequency Devices (Subpart C)

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

Date of issue: April 17, 2018

Prepared by:



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Description of Test Facility

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1 GENERAL INFORMATION

1.1 Description of Client

Applicant : Guangzhou MCOHome Technology Co., Ltd
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Manufacturer : Guangzhou MCOHome Technology Co., Ltd
Room 1504-1505, Building NO.23 Tianan Headquarter Center,
No.555 Panyu Avenue North., DongHuan street, Panyu,
Guangzhou 511400, China

1.2 Identification of the EUT

Product Name : Heat Pump Thermostat

Type/model : MH6-HP

FCC ID : 2ACTJMH6001

1.3 Technical Specification

Operation Frequency : 902-928MHz
Band

Modulation : FSK

Channel Frequency : 1Channel at 908.42MHz

Description of EUT : The EUT is a Heat Pump Thermostat which contains a Z-Wave module, and there have only one model, we test it and listed the Z-Wave results in this report.

Antenna : 0dBi, wire antenna

Rating : 24V AC

Category of EUT : Class B

EUT type : ☒ Table top
☐ Floor standing

Sample received date : April 2, 2018

Date of test : April 2, 2018 ~ April 17, 2018

2 TEST SPECIFICATIONS

2.1 Standards or specification

47CFR Part 15 (2016)
ANSI C63.10 (2013)

2.2 Mode of operation during the test

While testing transmitting mode of EUT, the internal modulation and continuously transmission was applied.

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

2.3 Test software list

Test Items	Software	Manufacturer	Version
Conducted emission	ESxS-K1	R&S	V2.1.0
Radiated emission	ES-K1	R&S	V1.71

2.4 Test peripherals list

Item No.	Name	Band and Model	Description
-	-	-	-

2.5 Instrument list

Radiated Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input checked="" type="checkbox"/>	Test Receiver	R&S	ESIB 26	EC 3045	2018-10-18
<input checked="" type="checkbox"/>	Bilog Antenna	TESEQ	CBL 6112D	EC 4206	2018-05-30
<input checked="" type="checkbox"/>	Horn antenna	R&S	HF 906	EC 3049	2018-09-22
<input checked="" type="checkbox"/>	Horn antenna	ETS	3117	EC 4792-1	2018-08-23
<input checked="" type="checkbox"/>	Horn antenna	TOYO	HAP18-26W	EC 4792-3	2020-07-09
<input checked="" type="checkbox"/>	Pre-amplifier	R&S	Pre-amp 18	EC5881	2018-06-19
<input checked="" type="checkbox"/>	Semi-anechoic chamber	Albatross project	-	EC 3048	2018-09-08
RF test					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input checked="" type="checkbox"/>	PXA Signal Analyzer	Keysight	N9030A	EC 5338	2018-09-10
<input checked="" type="checkbox"/>	Power sensor	Agilent	U2021XA	EC 5338-1	2019-03-03
<input checked="" type="checkbox"/>	Vector Signal Generator	Agilent	N5182B	EC 5175	2019-03-06
<input checked="" type="checkbox"/>	MXG Analog Signal Generator	Agilent	N5181A	EC 5338-2	2019-03-03
<input checked="" type="checkbox"/>	Mobile Test System	Litepoint	lqxel	EC 5176	2019-01-11
<input checked="" type="checkbox"/>	Test Receiver	R&S	ESCI 7	EC 4501	2019-02-23
Additional instrument					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input checked="" type="checkbox"/>	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3323	2018-06-14
<input checked="" type="checkbox"/>	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3324	2019-04-09
<input checked="" type="checkbox"/>	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3325	2019-03-23
<input checked="" type="checkbox"/>	Pressure meter	YM3	Shanghai Mengde	EC 3320	2018-06-28

2.6 Test Summary

This report applies to tested sample only. The test results have been compared directly with the limits, and the measurement uncertainty is recorded. 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

Notes: 1: NA =Not Applicable

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2.7 Measurement uncertainty

The measurement uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Test item	Measurement uncertainty
Maximum peak output power	$\pm 0.74\text{dB}$
Radiated Emissions in restricted frequency bands below 1GHz	$\pm 4.90\text{dB}$
Radiated Emissions in restricted frequency bands above 1GHz	$\pm 5.02\text{dB}$
Emission outside the frequency band	$\pm 2.89\text{dB}$
Power line conducted emission	$\pm 3.19\text{dB}$

3 Radiated emission

Test result: Pass

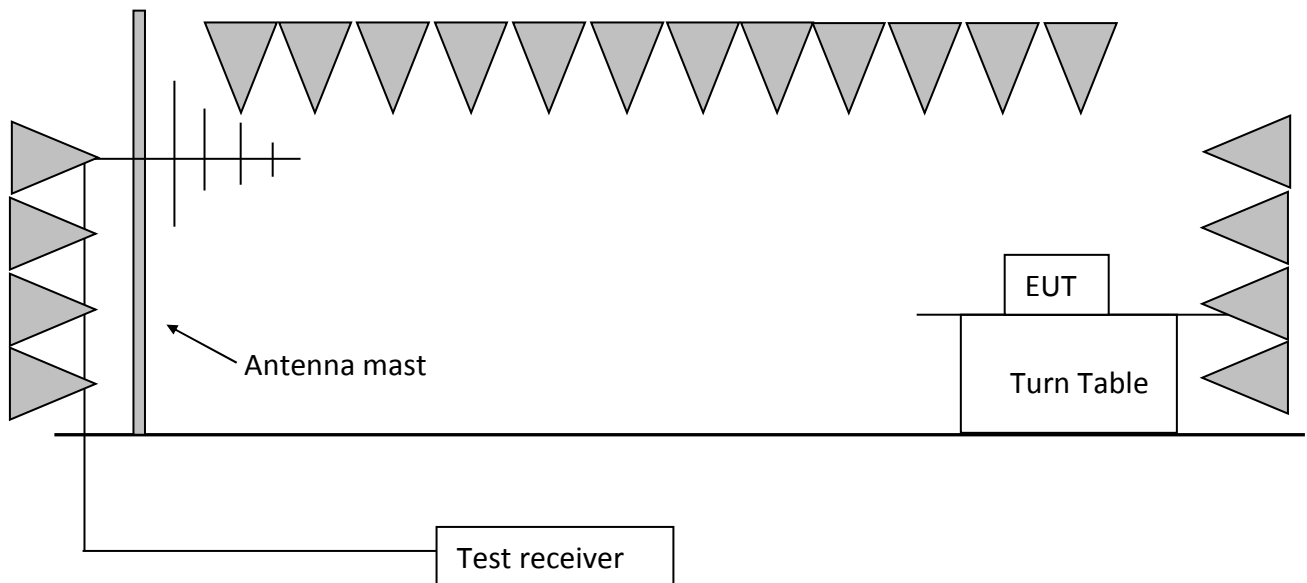
3.1 Test limit

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.

Tabletop devices shall be placed on a nonconducting platform with nominal top surface dimensions 1 m by 1.5 m. For emissions testing at or below 1 GHz, the table height shall be 80 cm above the reference ground plane. For emission measurements above 1 GHz, the table height shall be 1.5 m.

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

3.4 Test protocol

Temperature : 20 °C

Relative Humidity : 52 %

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
	H	902.00	25.4	35.3	46.0	10.7	PK
	H	928.00	25.6	36.4	46.0	9.6	PK
	H	30.00	22.2	19.2	40.0	17.8	PK
	H	43.61	15.4	11.6	40.0	24.6	PK
	H	76.65	15.0	7.6	40.0	25.0	PK
	H	96.09	18.1	11.1	43.5	25.4	PK
	H	156.35	19.4	11.3	43.5	24.1	PK
	H	212.73	20.7	10.7	43.5	22.8	PK
	H	255.49	23.7	14.6	46.0	22.3	PK
	H	492.65	24.1	19.2	46.0	21.9	PK
	H	661.76	27.3	20.8	46.0	18.7	PK
	H	957.23	31.7	23.5	46.0	14.3	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
	V	902.00	25.4	36.1	46.0	9.9	PK
	V	928.00	25.6	35.7	46.0	10.3	PK
	V	33.89	29.5	16.8	40.0	10.5	PK
	V	43.61	28.7	11.6	40.0	11.3	PK
	V	70.82	19.1	7.3	40.0	20.9	PK
	V	99.98	22.7	11.9	43.5	20.8	PK
	V	152.46	21.2	11.5	43.5	22.3	PK
	V	181.62	24.1	10.4	43.5	19.4	PK
	V	335.19	20.2	15.6	46.0	25.8	PK
	V	480.98	23.3	18.9	46.0	22.7	PK
	V	683.15	27.5	20.9	46.0	18.5	PK
	V	933.91	30.7	23.3	46.0	15.3	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. Correct Factor = Antenna Factor + Cable Loss (-Amplifier, is employed);
2. Corrected Reading = Original Receiver Reading + Correct Factor;
3. Margin = Limit – Corrected Reading;
4. If the PK Corrected reading is lower than AV limit, the AV test can be elided;

Example:

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

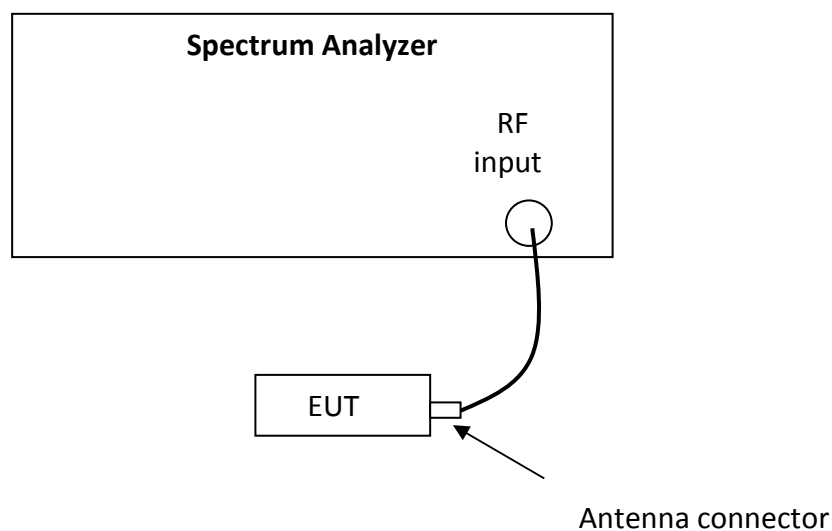
4 Assigned bandwidth (20dB bandwidth)

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.

4.2 Test Configuration



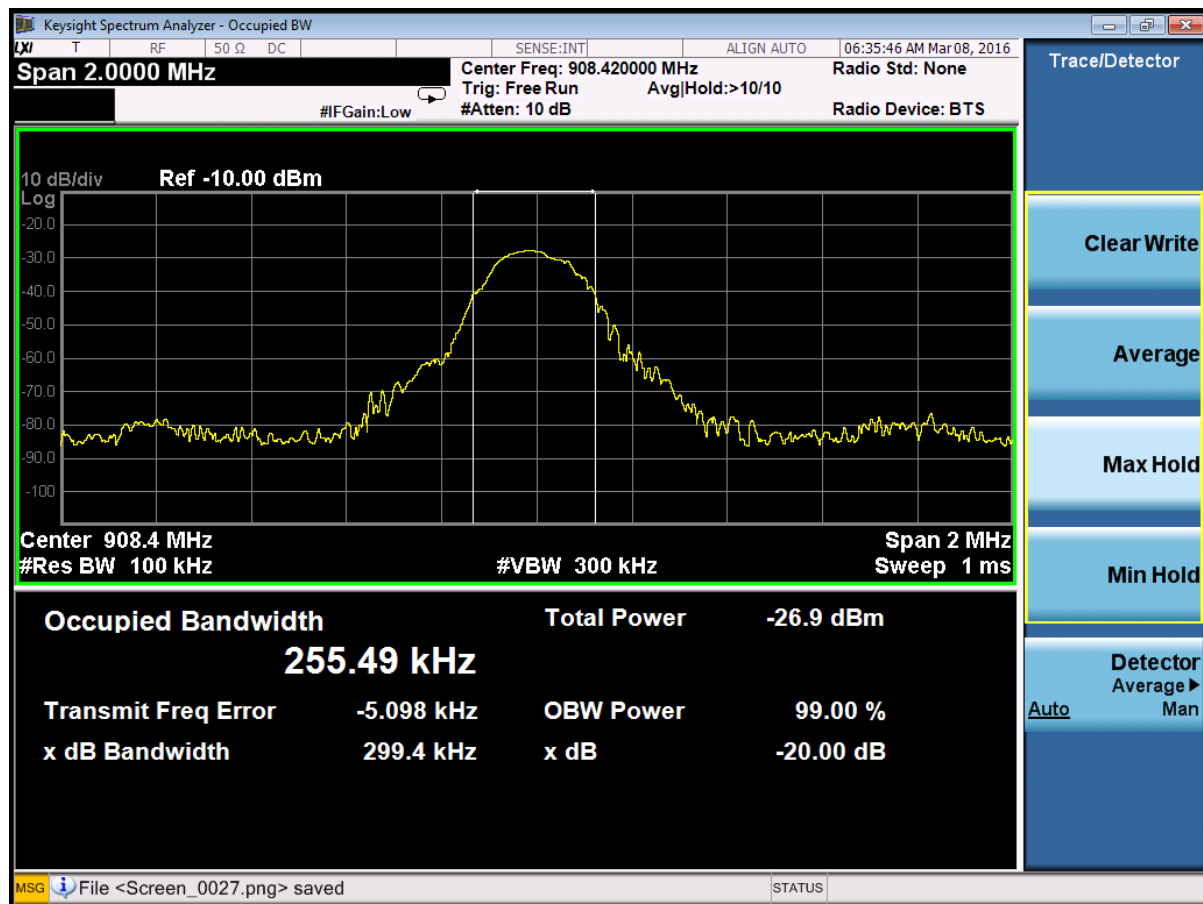
4.3 Test procedure and test setup

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 = approximately 1% of the 20 dB bandwidth, VBW>RBW, Sweep = auto, Detector = peak, Trace = max hold.

4.4 Test protocol

Temperature : 20°C
Relative Humidity : 52 %

Mode	Channel Frequency	20dB Bandwidth (kHz)	F _L (MHz)	F _H (MHz)
1	908.42MHz	299.4	> 902	< 928



5 Power line conducted emission

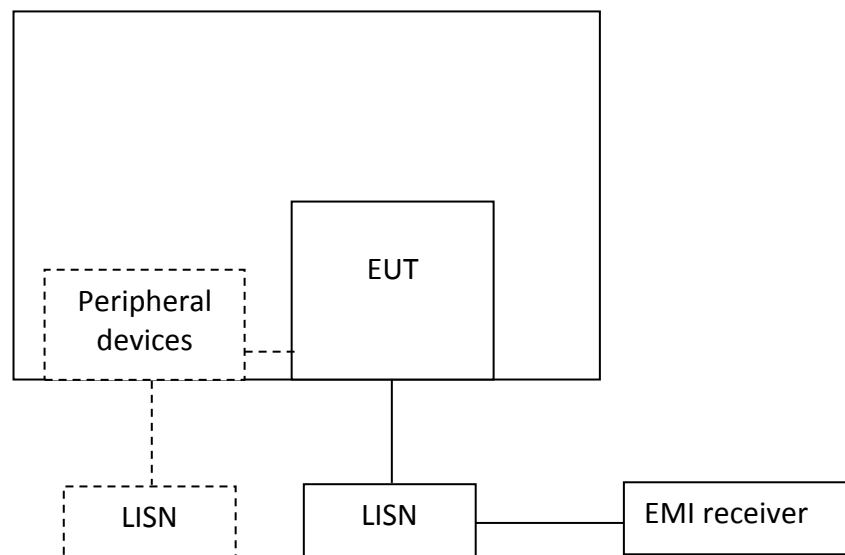
Test result: Pass

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

Measured levels of ac power-line conducted emission shall be the emission voltages from the voltage probe, where permitted, or across the 50 Ω LISN port (to which the EUT is connected), where permitted, terminated into a 50 Ω measuring instrument. All emission voltage and current measurements shall be made on each current-carrying conductor at the plug end of the EUT power cord by the use of mating plugs and receptacles on the LISN, if used. Equipment shall be tested with power cords that are normally supplied or recommended by the manufacturer and that have electrical and shielding characteristics that are the same as those cords normally supplied or recommended by the manufacturer. For those measurements using a LISN, the 50 Ω measuring port is terminated by a measuring instrument having 50 Ω input impedance. All other ports are terminated in 50 Ω loads.

Tabletop devices shall be placed on a platform of nominal size 1 m by 1.5 m, raised 80 cm above the reference ground plane. The vertical conducting plane or wall of an RF-shielded (screened) room shall be located 40 cm to the rear of the EUT. Floor-standing devices shall be placed either directly on the reference ground-plane or on insulating material as described in ANSI C63.4. All other surfaces of tabletop or floor-standing EUTs shall be at least 80 cm from any other grounded conducting surface, including the case or cases of one or more LISNs.

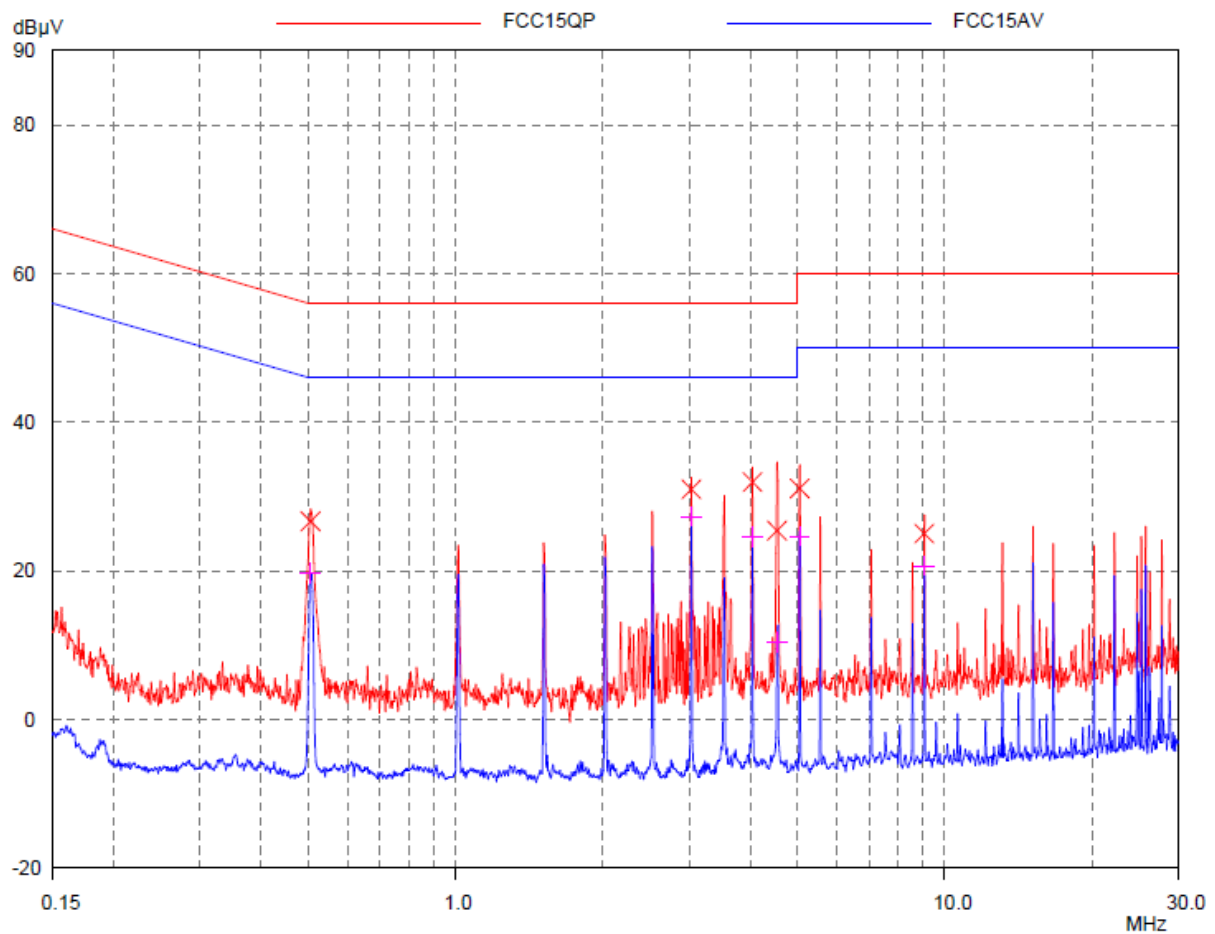
The bandwidth of the test receiver is set at 9 kHz.

5.4 Test protocol

Temperature : 20°C
Relative Humidity : 54%

L line:

Test Curve:

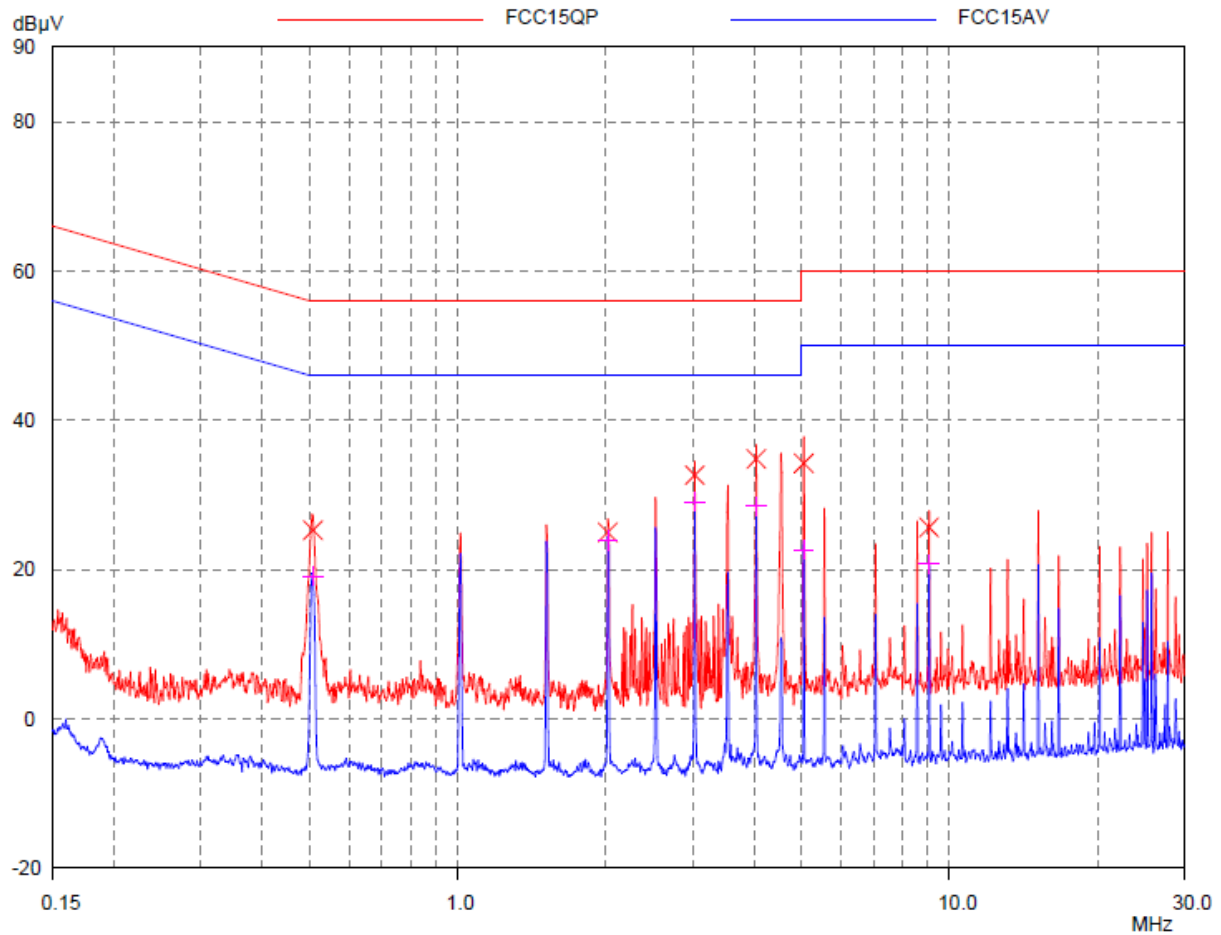


Test Data:

Frequency (MHz)	Quasi-peak			Average		
	Level dB(μV)	Limit dB (μV)	Margin dB	Level dB (μV)	Limit dB (μV)	Margin dB
0.505	26.68	56.00	29.32	19.72	46.00	26.28
3.031	30.98	56.00	25.02	27.33	46.00	18.67
4.040	31.95	56.00	24.05	24.62	46.00	21.38
4.536	25.42	56.00	30.58	10.41	46.00	35.59
5.052	31.11	60.00	28.89	24.65	50.00	25.35
9.085	25.04	60.00	34.96	20.71	50.00	29.29

N line:

Test Curve:



Test Data:

Frequency (MHz)	Quasi-peak			Average		
	Level dB(μV)	Limit dB (μV)	Margin dB	Level dB (μV)	Limit dB (μV)	Margin dB
0.507	25.27	56.00	30.73	19.15	46.00	26.85
2.017	25.01	56.00	30.99	23.94	46.00	22.06
3.031	32.66	56.00	23.34	29.12	46.00	16.88
4.040	34.85	56.00	21.15	28.52	46.00	17.48
5.052	34.25	60.00	25.75	22.66	50.00	27.34
9.085	25.67	60.00	34.33	20.75	50.00	29.25

***** END *****