

RF TEST REPORT

No. 170101099SHA-001

Applicant : Yanzi Networks AB

Isafjordsgatan 32C, 16440 Kista Sweden

Manufacturer : Shanghai Pinyuan Info. Co., Ltd.

1007 No.9, No.970 Dalian Road, Shanghai 200082, China

Product Name : Comfort

Type/Model : SWAQ3-0372

TEST RESULT : PASS

SUMMARY

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

47CFR Part 15 (2016): Radio Frequency Devices

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

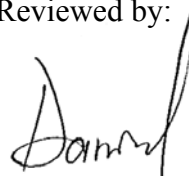
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Content

SUMMARY	1
DESCRIPTION OF TEST FACILITY	2
1. GENERAL INFORMATION	4
1.1 Applicant Information.....	4
1.2 Identification of the EUT	4
1.3 Mode of operation during the test / Test peripherals used.....	5
2. TEST SPECIFICATION	6
2.1 Instrument list	6
2.2 Test Standard	6
2.3 Test Summary	7
3. RADIATED EMISSION & BAND EDGE.....	8
3.1 Test limit	8
3.2 Test Configuration	8
3.3 Test procedure and test setup	9
3.4 Test protocol	10
4. ASSIGNED BANDWIDTH (20dB BANDWIDTH)	13
4.1 Limit.....	13
4.2 Test Configuration	13
4.3 Test procedure and test setup	13
4.4 Test protocol	14
5. POWER LINE CONDUCTED EMISSION	16
5.1 Limit.....	16
5.2 Test configuration	16
5.3 Test procedure and test set up	17
5.4 Test protocol	18

1. General Information

1.1 Applicant Information

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Tel : +46 8 559 21 440
Fax : /
Manufacturer : Shanghai Pinyuan Info. Co., Ltd.
1007 No.9, No.970 Dalian Road, Shanghai 200082, China

1.2 Identification of the EUT

Product description : Comfort
Type/model : SWAQ3-0372
Operation Frequency : 2400-2483.5MHz
Band
EUT Modes of : IEEE802.15.4
Modulation
Type of Modulation : O-QPSK
Channel Description : 16 channels (11-26)
Antenna Type : 0.5dBi Chip antenna
Port identification : /
Rating : 5V DC
Category of EUT : Class B
EUT type : ☒ Table top ☐ Floor standing
Sample received date : 2017.1.23
Sample Identification : /
No
Date of test : 2017.1.23 ~ 2017.2.22

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.

Three axes (X, Y, Z) were observed while the test receiver worked as “max hold” continuously and the highest reading among the whole test procedure was recorded. Compare with the test results that Z axis is the worst case.

Test Peripherals:

AC-DC adapter, Model: KA25-0501000EU

2. Test Specification

2.1 Instrument list

Selected	Equipment	Type	Manu.	Internal no.	Cal. Date	Due date
☒	PXA Analyzer	N9030A	Agilent	EC5338	2017/3/3	2018/3/2
☒	Vector SG	N5182B	Agilent	EC5175	2017/3/3	2018/3/2
☒	Power sensor	U2021XA	Agilent	EC5338-1	2017/3/3	2018/3/2
☒	MXG Analog SG	N5181A	Agilent	EC5338-2	2017/3/3	2018/3/2
☒	Power meter	N1911A/N1921A	Agilent	EC4318	2016/5/18	2017/5/17
☒	EMI chamber	3m	Albatross	EC 3048	2016/9/10	2017/9/9
☒	Test Receiver	ESIB 26	R&S	EC 3045	2016/10/19	2017/10/18
☒	Test Receiver	ESCI 7	R&S	EC4501	2017/2/23	2018/2/22
☒	Bilog Antenna	CBL 6112D	TESEQ	EC 4206	2016/6/2	2017/6/1
☒	Horn antenna	HF 906	R&S	EC 3049	2016/9/24	2017/9/23
☒	Horn antenna	HAP18-26W	TOYO	EC 4792-3	2014/6/12	2017/6/11
☒	Pre-amplifier	Pre-amp 18	R&S	EC 5262	2016/6/30	2017/6/29
☒	Pre-amplifier	Tpa0118-40	R&S	EC 4792-2	2016/4/11	2017/4/10
☒	EMI Receiver	ESCS 30	R&S	EC 2107	2016/10/19	2017/10/18
☒	A.M.N.	ESH2-Z5	R&S	EC 3119	2015/12/16	2017/12/15
☒	I.S.N.	FCC-TLISN-T8-02	FCC	EC3756	2017/2/15	2018/2/14
☒	Shielded room	-	Zhongyu	EC 2838	2017/1/8	2018/1/7

2.2 Test Standard

47CFR Part 15 (2016)
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

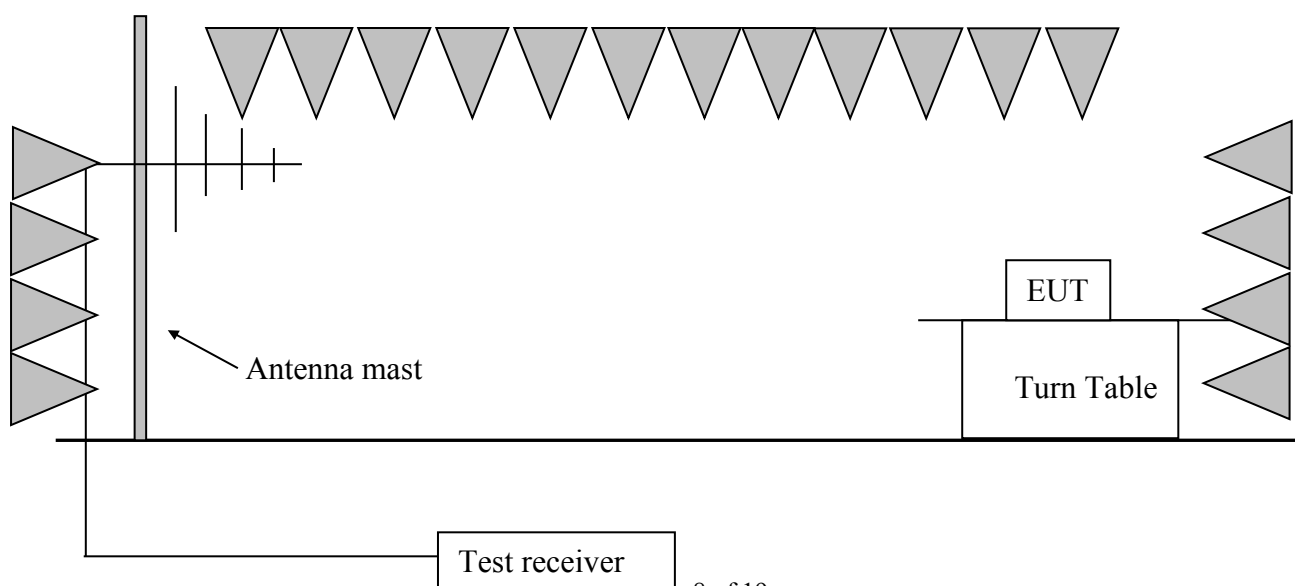
3.1 Test limit

Fundamental Frequency (MHz)	Fundamental limit (dBuV/m)	Harmonic limit (dBuV/m)
☐ 902 - 928	94	54
☒ 2400 - 2483.5	94	54
☐ 5725 - 5875	94	54
☐ 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 non-conducting 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:

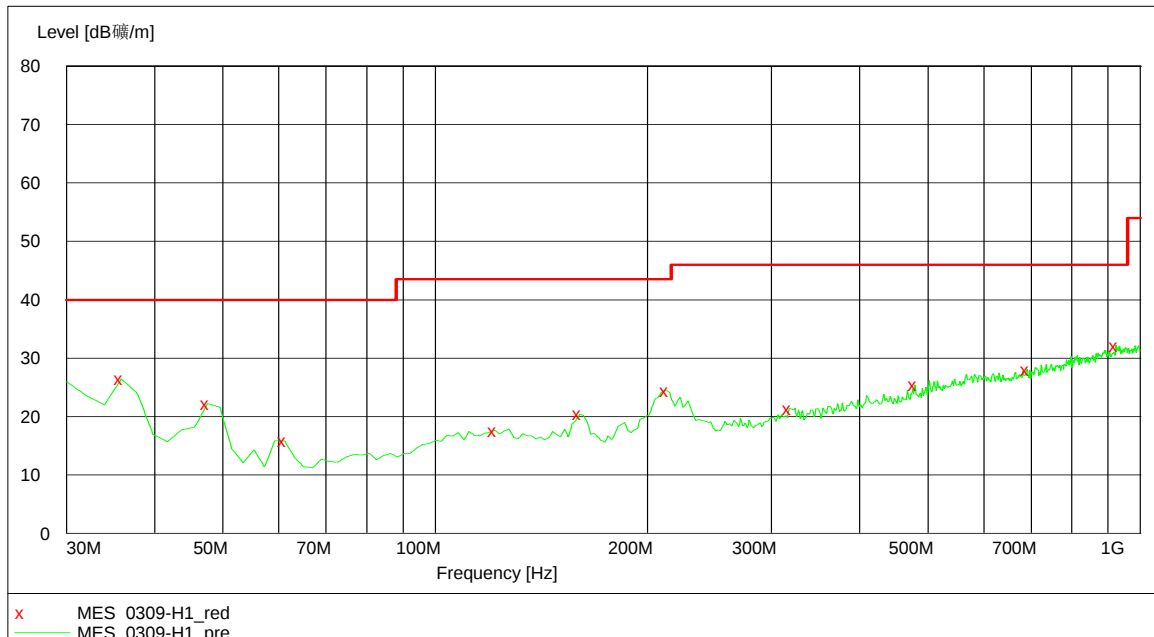
RBW = 300 Hz, VBW = 1 kHz (9 kHz~150 kHz);
RBW = 10 kHz, VBW = 30 kHz (150 kHz~30MHz);
RBW = 100 kHz, VBW = 300 kHz (30MHz~1GHz for PK)
RBW = 1MHz, VBW = 3MHz (>1GHz for PK);

3.4 Test protocol

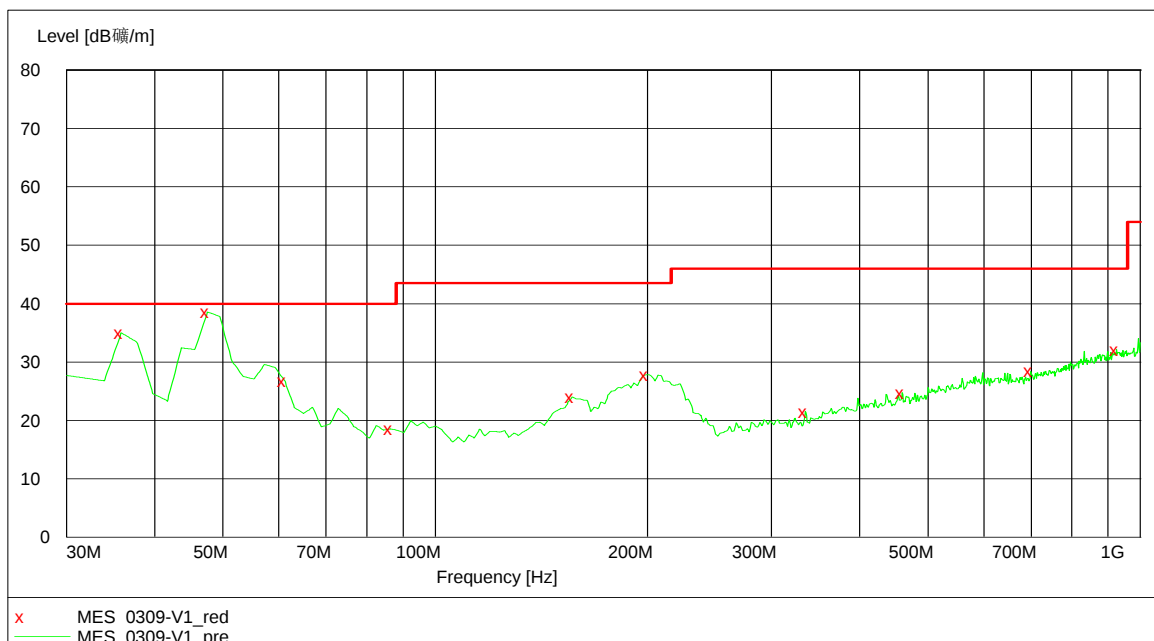
Temperature : 25 °C
Relative Humidity : 55 %

The worst waveform from 30MHz to 1000MHz is listed as below:

Horizontal



Vertical



Test result below 1GHz:

Polarization	Frequency (MHz)	Measured level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector
H	35.83	26.4	40.0	13.6	PK
	47.49	22.2	40.0	17.8	PK
	61.10	15.8	40.0	24.2	PK
	121.36	17.6	43.5	25.9	PK
	160.24	20.4	43.5	23.1	PK
	212.73	24.4	43.5	19.1	PK
	317.70	21.4	46.0	24.6	PK
	479.04	25.4	46.0	20.6	PK
	690.92	28.1	46.0	17.9	PK
	924.19	32.2	46.0	13.8	PK
V	35.83	35.0	40.0	5.0	PK
	47.49	38.6	40.0	1.4	PK
	61.10	26.8	40.0	13.2	PK
	86.37	18.6	40.0	21.4	PK
	156.35	24.0	43.5	19.5	PK
	199.12	27.8	43.5	15.7	PK
	335.19	21.5	46.0	24.5	PK
	459.60	24.7	46.0	21.3	PK
	698.70	28.4	46.0	17.6	PK
	926.13	32.1	46.0	13.9	PK

Note: The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

Test result above 1GHz:

CH	Antenna	Frequency (MHz)	Correct Factor (dB/m)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	H	2405.00	30.70	91.70	94.00	2.30	PK
	V	2405.00	30.70	85.30	94.00	8.70	PK
	H	2389.00	30.30	52.20	54.00	1.80	PK
	H	2400.00	30.30	56.30	74.00	17.70	PK
	H	2400.00	30.30	49.20	54.00	4.80	AV
	H	4810.00	-1.50	42.80	54.00	11.20	PK
	V	4810.00	-1.50	36.60	54.00	17.40	PK
M	H	2440.00	30.70	91.90	94.00	2.10	PK
	V	2440.00	30.70	83.90	94.00	10.10	PK
	H	4880.00	-1.10	43.30	54.00	10.70	PK
	V	4880.00	-1.10	35.80	54.00	18.20	PK
H	H	2480.00	30.70	90.60	94.00	3.40	PK
	V	2480.00	30.70	84.20	94.00	9.80	PK
	H	2483.50	30.80	41.30	54.00	12.70	PK
	V	2483.50	30.80	37.20	54.00	16.80	PK
	H	4960.00	-0.80	42.90	54.00	11.10	PK
	V	4960.00	-0.80	37.80	54.00	16.20	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.

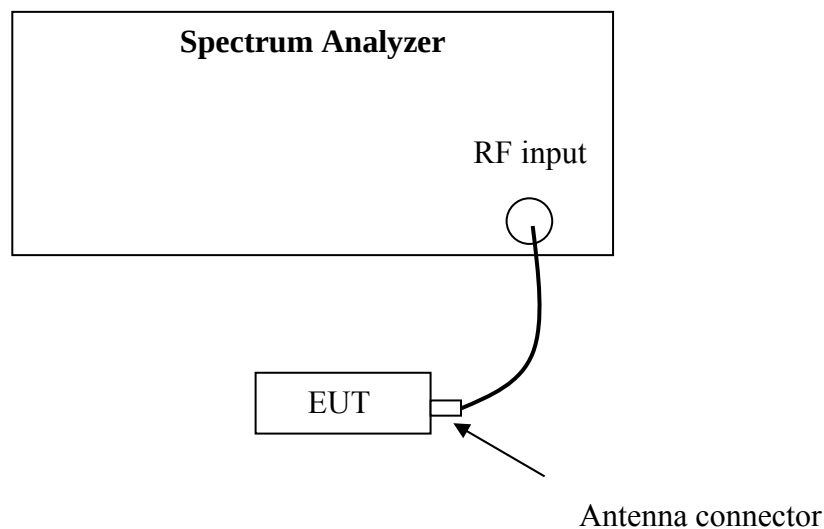
4. Assigned bandwidth (20dB bandwidth)

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

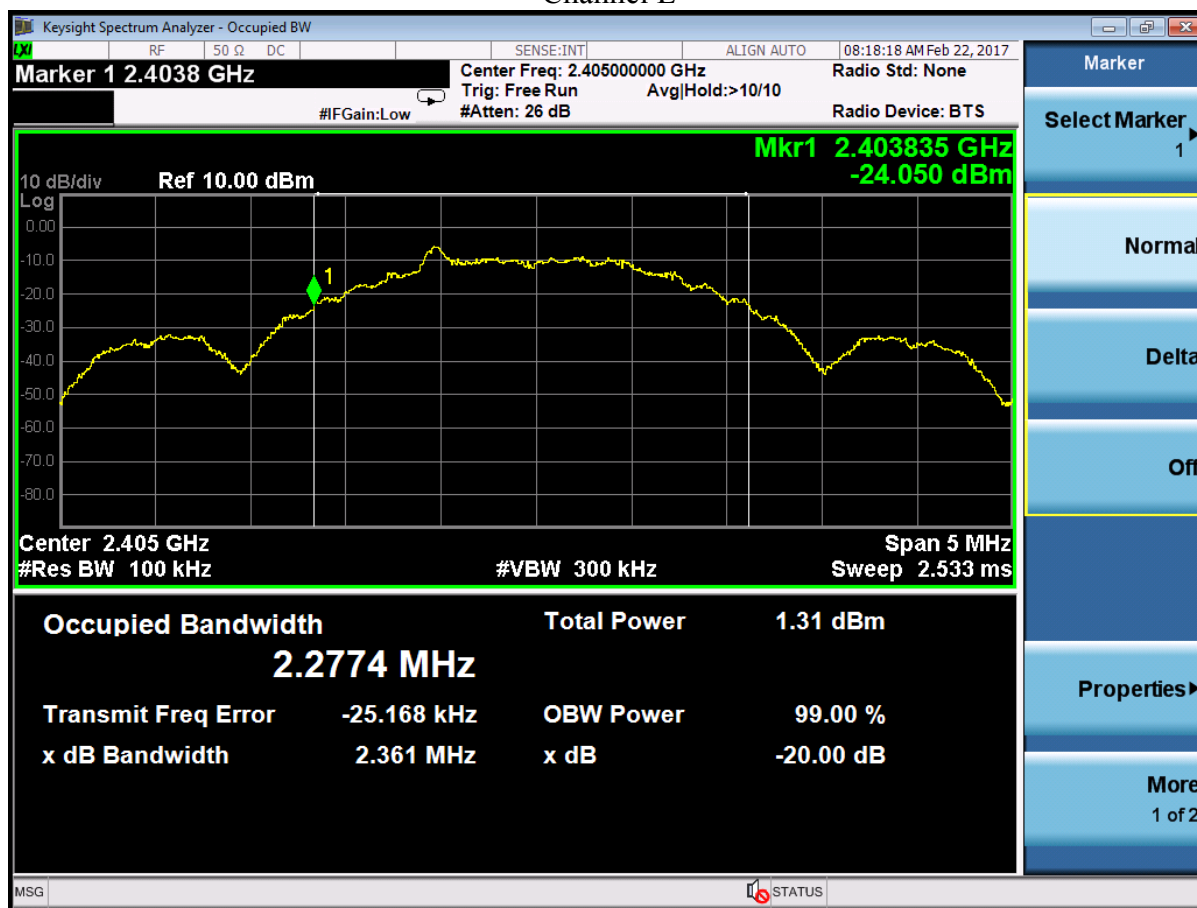
The 20dB Bandwidth per FCC § 15.215(c) is measured using the Spectrum Analyzer. Set Span = 2 to 3 times the 20 dB bandwidth, $RBW \geq 1\%$ of the 20 dB bandwidth, $VBW \geq RBW$, Sweep = auto, Detector = peak, Trace = max hold. The test was performed at 2 channels (lowest and highest channel).

4.4 Test protocol

Temperature : 25°C
Relative Humidity : 55 %

Mode	20dB Bandwidth		Permitted Bandwidth (MHz)	Result
	F _L (MHz)	F _H (MHz)		
1	2403.835	2481.155	2400-2483.5	Pass

Channel L



Channel H



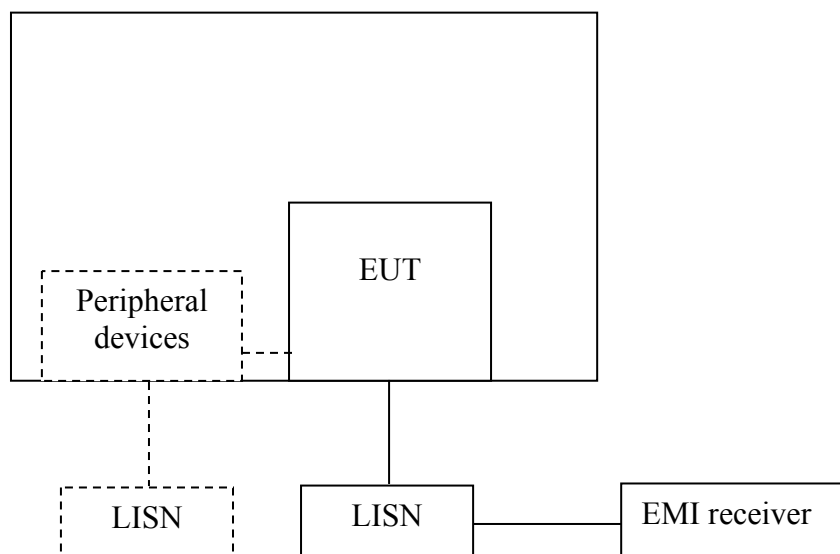
5. Power line conducted emission

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.

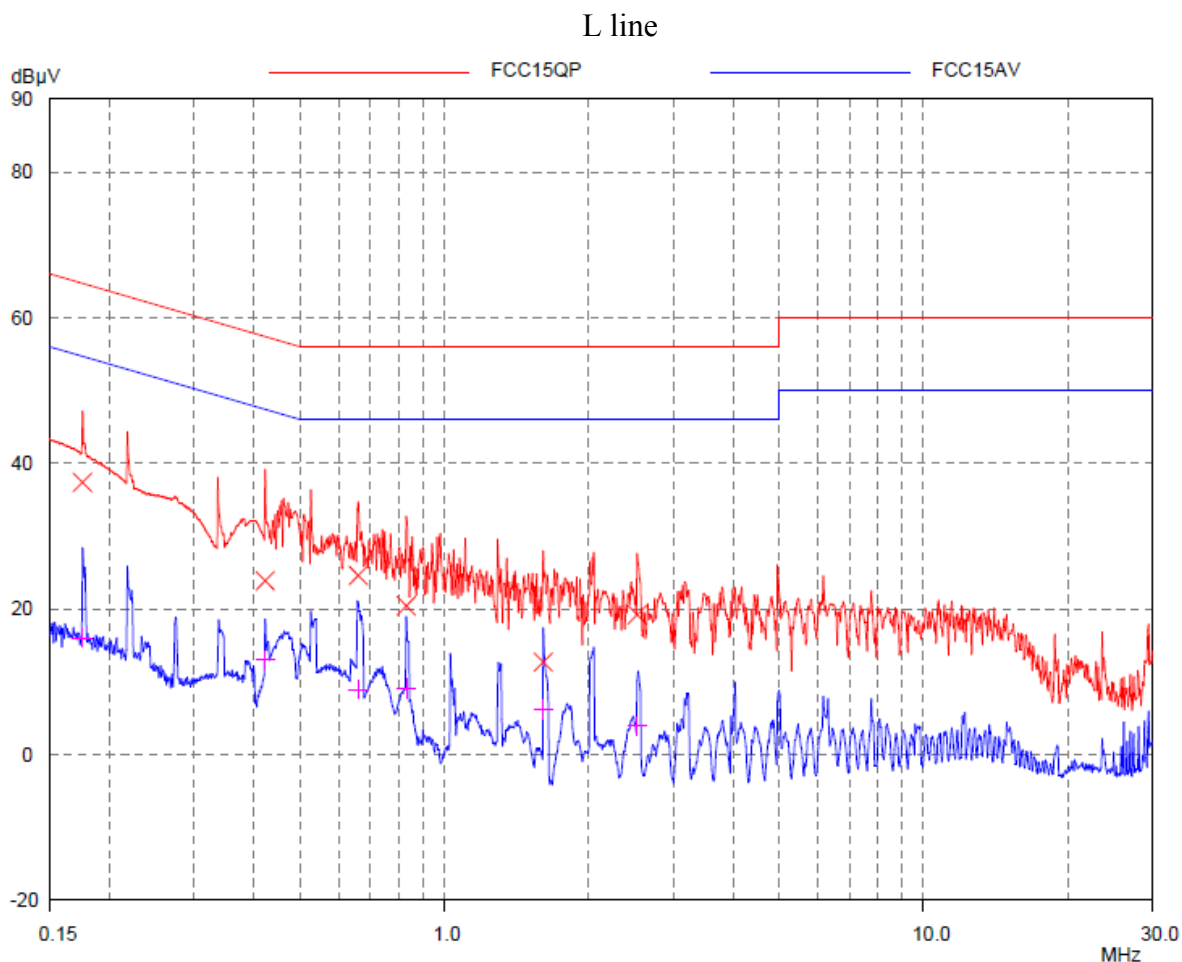
5.3 Test procedure and test set up

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.

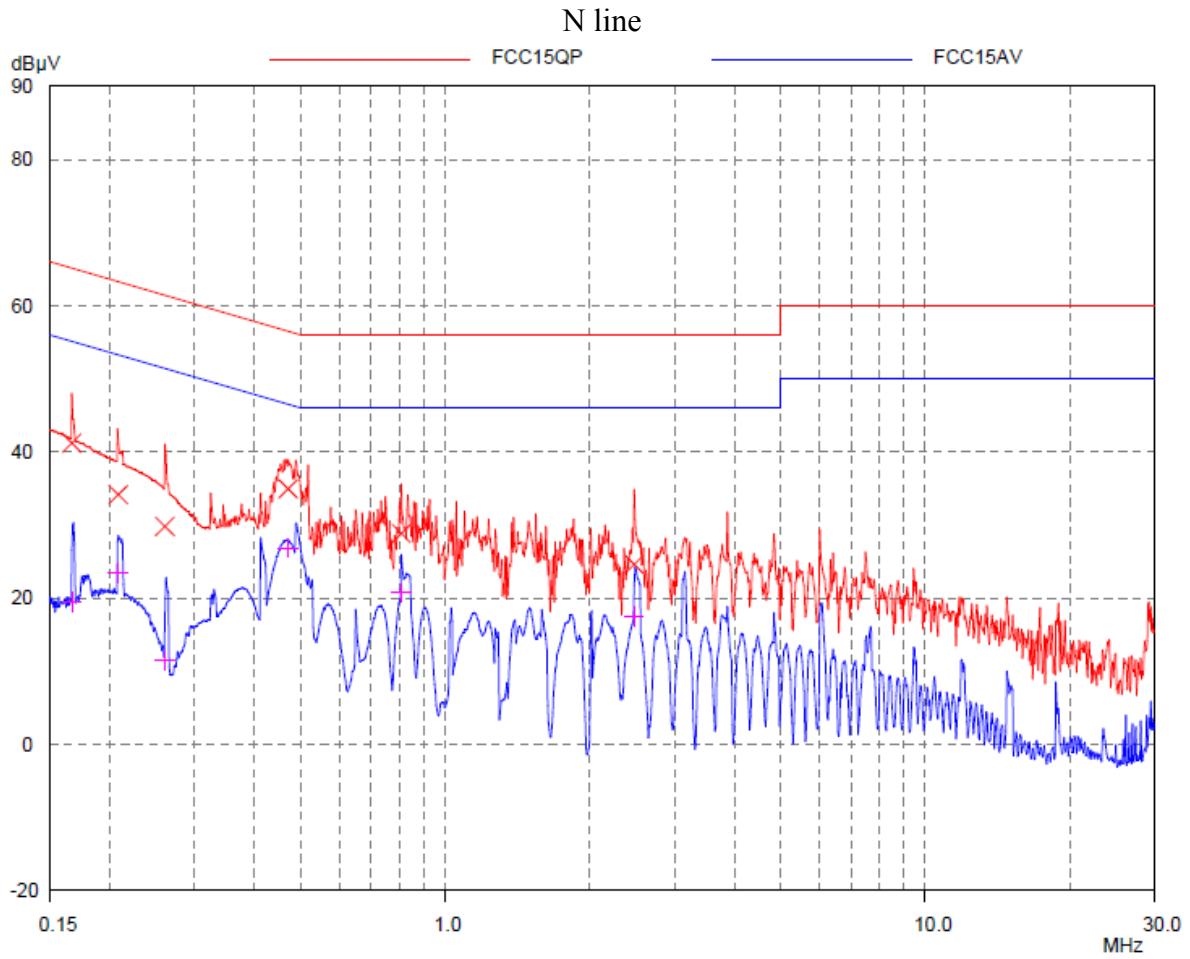
5.4 Test protocol

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)
0.175	37.39	64.71	27.32	16.03	54.71	38.68
0.422	23.88	57.41	33.53	13.04	47.41	34.37
0.660	24.61	56.00	31.39	8.94	46.00	37.06
0.831	20.43	56.00	35.57	9.15	46.00	36.85
1.607	12.70	56.00	43.30	6.26	46.00	39.74
2.522	19.22	56.00	36.78	3.90	46.00	42.10



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	41.22	65.14	23.92	19.51	55.14	35.63
0.208	34.17	63.28	29.11	23.44	53.28	29.84
0.260	29.82	61.42	31.60	11.42	51.42	40.00
0.470	34.97	56.52	21.55	26.92	46.52	19.60
0.809	28.85	56.00	27.15	20.73	46.00	25.27
2.473	24.63	56.00	31.37	17.52	46.00	28.48