

FCC TEST REPORT

No. 150500697SHA-001

Applicant : NINGBO COMEN ELECTRONICS
TECHNOLOGY CO., LTD
No.599 Jinda Road, Zhenhai Economic
Development Zone, 315221 Ningbo, P.R. China

Manufacturer : NINGBO COMEN ELECTRONICS
TECHNOLOGY CO., LTD
No.599 Jinda Road, Zhenhai Economic
Development Zone, 315221 Ningbo, P.R. China

Product Name : Remote control power switch transmitter

Type/Model : SD-UN4-RF1

TEST RESULT : PASS

SUMMARY

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

47CFR Part 15 (2014): Radio Frequency Devices (Subpart C)

ANSI C63.10 (2009): American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

Date of issue: July 13, 2015

Prepared by:



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Reviewed by:



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Description of Test Facility

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1 GENERAL INFORMATION

1.1 Description of Client

Applicant : NINGBO COMEN ELECTRONICS TECHNOLOGY
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Email : rd@commen.com

Manufacturer : NINGBO COMEN ELECTRONICS TECHNOLOGY
CO., LTD

No.599 Jinda Road, Zhenhai Economic Development
Zone, 315221 Ningbo, P.R. China

1.2 Identification of the EUT

Product Name : Remote control power switch transmitter

Type/model : SD-UN4-RF1

FCC ID : XK8-SDUN4RF1

1.3 Technical Specification

Operation Frequency : 433.92MHz
Band
Modulation : ASK

Antenna Designation : Integral antenna, 0 dBi

Description of EUT : There is one model only.
The EUT is a transmitter to control the working condition of the corresponding receiver.

Rating : DC 3V

Category of EUT : Class B

EUT type : Table top
 Floor standing

Sample received date : 2015.5.28

Sample Identification : 0150528-33-002
No

Date of test : 2015.5.28 ~ 2015.6.12

2 TEST SPECIFICATIONS

2.1 Standards or specification

47CFR Part 15 (2014): Radio Frequency Device

ANSI C63.10 (2009): American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

2.2 Mode of operation during the test

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

The EUT is a handheld device, so 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.

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

| Selected | Instrument | EC no. | Model | Valid until date |
|-------------------------------------|-----------------------------|-----------|---------------------|------------------|
| <input type="checkbox"/> | Shielded room | EC 2838 | GB88 | 2016-1-8 |
| <input type="checkbox"/> | EMI test receiver | EC 2107 | ESCS 30 | 2015-10-19 |
| <input type="checkbox"/> | A.M.N. | EC 3119 | ESH2-Z5 | 2015-12-16 |
| <input type="checkbox"/> | A.M.N. | EC 3394 | ENV 216 | 2015-8-1 |
| <input checked="" type="checkbox"/> | Semi anechoic chamber | EC 3048 | - | 2016-5-11 |
| <input checked="" type="checkbox"/> | EMI test receiver | EC 3045 | ESIB26 | 2015-10-19 |
| <input type="checkbox"/> | Broadband antenna | EC 4206 | CBL6112D | 2016-4-27 |
| <input checked="" type="checkbox"/> | Broadband antenna | EC 3046-1 | HL562 | 2016-5-15 |
| <input type="checkbox"/> | Horn antenna | EC 3049 | HF906 | 2016-4-27 |
| <input checked="" type="checkbox"/> | Horn antenna | EC 4792-1 | 3117 | 2016-4-21 |
| <input type="checkbox"/> | Horn antenna | EC 4792-3 | HAP18-26W | 2016-6-11 |
| <input type="checkbox"/> | Pre-amplifier | EC 5262 | pre-amp 18 | 2016-5-25 |
| <input checked="" type="checkbox"/> | Pre-amplifier | EC 4792-2 | TPA0118-40 | 2016-4-10 |
| <input type="checkbox"/> | High Pass Filter | EC 4797-1 | WHKX 1.0/15G-10SS | 2016-1-8 |
| <input type="checkbox"/> | High Pass Filter | EC 4797-2 | WHKX 2.8/18G-12SS | 2016-1-8 |
| <input type="checkbox"/> | High Pass Filter | EC 4797-3 | WHKX 7.0/1.8G-8SS | 2016-1-8 |
| <input type="checkbox"/> | Band Reject Filter | EC 4797-4 | WRCGV2400/2483/10SS | 2016-1-8 |
| <input checked="" type="checkbox"/> | Test Receiver | EC 4501 | ESCI 7 | 2016-1-13 |
| <input checked="" type="checkbox"/> | PXA Signal Analyzer | EC5338 | N9030A | 2015-11-17 |
| <input type="checkbox"/> | Power sensor/Power meter | EC4318 | N1911A/N1921A | 2016-4-8 |
| <input type="checkbox"/> | Power sensor | EC5338-1 | U2021XA | 2016-3-5 |
| <input type="checkbox"/> | MXG Analog Signal Generator | EC5338-2 | N5181A | 2016-3-5 |
| <input type="checkbox"/> | MXG Vector Signal Generator | EC5175 | N51812B | 2016-1-8 |

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 REFERANCE | RESULT |
|---------------------------------|---------------|--------|
| Fundamental & spurious emission | 15.231(b) | Pass |
| Restrict band radiated emission | 15.205 | Pass |
| Conducted emission | 15.207 | Pass |
| Emission bandwidth | 15.231(c) | Pass |
| Deactivating time | 15.231(a)(1) | Pass |

Notes: 1: NA =Not Applicable



3 Fundamental & Spurious Emission & Restrict band radiated emission

Test result: Pass

3.1 Test limit

The emission shall test through the 10th harmonic or to 40GHz, whichever is lower. It must comply with the limits below:

| Fundamental Frequency (MHz) | Fundamental limit (uV/m) | Spurious limit (uV/m) |
|---|--------------------------|-----------------------|
| <input type="checkbox"/> 40.66 – 40.70 | 2250 | 225 |
| <input type="checkbox"/> 70 – 130 | 1250 | 125 |
| <input type="checkbox"/> 130 - 174 | 1250 to 3750 | 125 to 375 |
| <input type="checkbox"/> 174 - 260 | 3750 | 375 |
| <input checked="" type="checkbox"/> 260 – 470 | 3750 to 12500 | 375 to 1250 |
| <input type="checkbox"/> Above 470 | 12500 | 1250 |

The formulas for calculating the maximum permitted fundamental field strengths are as follows: for the band 130-174 MHz, uV/m at 3 meters = 56.81818(Frequency) - 6136.3636; for the band 260-470 MHz, uV/m at 3 meters = 41.6667(Frequency) - 7083.3333. The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.

For that the EUT use fundamental frequency of 433.92MHz, after calculation, the limit is:

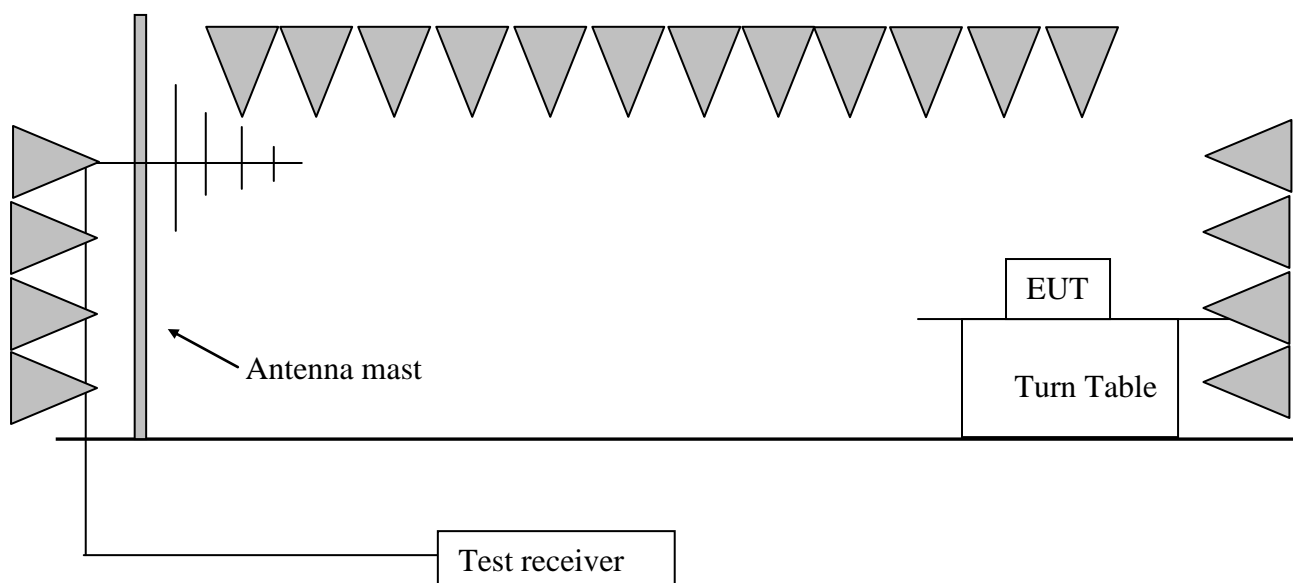
Fundamental limit = 41.6667 * 433.92 - 7083.3333 = 10996.68uV/m =80.83 dBuV/m
 Spurious limit = 80.83 – 20 = 60.83dBuV/m

////////////////////////////////////

The radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) showed as below:

| 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, the pre-amplifier and high pass filter is 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 turntable 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.

Both horizontal and vertical polarities of the receiving antenna were assessed and the higher reading was listed in this report.

The radiated emission was measured using the test receiver 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)

RBW = 1MHz, VBW = 3MHz (>1GHz for PK);

3.4 Test protocol

Temperature : 22 °C
Relative Humidity : 52 %

| Antenna Polarization | Frequency (MHz) | Corrected Reading (dBuV/m) | Correct Factor (dB/m) | Emission Type | Limit (dBuV/m) | Margin | Detector |
|----------------------|-----------------|----------------------------|-----------------------|---------------|----------------|--------|----------|
| H | 433.92 | 66.60 | 18.30 | Fundamental | 100.83 | 34.23 | PK |
| H | 1286.59 | 57.80 | -14.20 | Spurious | 80.83 | 23.03 | PK |
| H | 1737.34 | 68.70 | -11.40 | Spurious | 80.83 | 12.13 | PK |
| H | 2170.34 | 60.90 | -8.90 | Spurious | 80.83 | 19.93 | PK |
| H | 2603.21 | 60.60 | -7.60 | Spurious | 80.83 | 20.23 | PK |
| H | 3036.07 | 55.40 | -6.20 | Spurious | 80.83 | 25.43 | PK |
| H | 3476.95 | 55.10 | -5.30 | Spurious | 80.83 | 25.73 | PK |
| H | 3909.82 | 51.10 | -4.50 | Restrict | 74.00 | 22.90 | PK |
| V | 433.92 | 84.20 | 18.30 | Fundamental | 100.83 | 16.63 | PK |
| V | 867.85 | 46.20 | 25.10 | Spurious | 80.83 | 34.63 | PK |
| V | 1286.59 | 56.60 | -14.20 | Spurious | 80.83 | 24.23 | PK |
| V | 1737.34 | 68.70 | -11.40 | Spurious | 80.83 | 12.13 | PK |
| V | 2170.34 | 58.90 | -8.90 | Spurious | 80.83 | 21.93 | PK |
| V | 2603.21 | 61.00 | -7.60 | Spurious | 80.83 | 19.83 | PK |
| V | 3036.07 | 53.10 | -6.20 | Spurious | 80.83 | 27.73 | PK |
| V | 3476.95 | 48.10 | -5.30 | Spurious | 80.83 | 32.73 | PK |
| V | 3909.82 | 47.90 | -4.50 | Restrict | 74.00 | 26.10 | PK |
| V | 325.47 | 33.30 | 15.80 | Restrict | 46.00 | 12.70 | PK |
| V | 406.70 | 28.20 | 18.10 | Restrict | 46.00 | 17.80 | PK |

- Remark: 1. Correct Factor = Antenna Factor + Cable Loss (+ Amplifier, for higher than 1GHz)
 2. Corrected Reading = Original Receiver Reading + Correct Factor
 3. Margin = Limit - Corrected Reading
 4. If PK Corrected reading is less 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 = 10.00dBuV, limit = 40.00dBuV/m.
 Then Correct Factor = 30.20 + 2.00 – 32.00 = 0.20dB/m; Corrected Reading = 10dBuV + 0.20dB/m = 10.20dBuV/m; Margin = 40.00dBuV/m - 10.20dBuV/m = 29.80dB.

Calculating the AV value according to the duty cycle:

| Antenna Polarization | Frequency (MHz) | Corrected PK Reading (dBuV/m) | Duty Cycle Factor (dB) | Corrected AV Reading (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
|----------------------|-----------------|-------------------------------|------------------------|-------------------------------|----------------|-------------|
| H | 1737.34 | 68.70 | -13.18 | 55.52 | 60.83 | 5.31 |
| H | 2170.34 | 60.90 | | 47.72 | 60.83 | 13.11 |
| V | 433.92 | 84.20 | | 71.02 | 80.83 | 9.81 |
| V | 1737.34 | 68.70 | | 55.52 | 60.83 | 5.31 |
| V | 2603.21 | 61.00 | | 47.82 | 60.83 | 13.01 |

- Remark: 1. Duty Cycle Factor = 20lg (duty cycle) = 20lg (0.2192) = -13.18dB
 2. Corrected AV Reading = Corrected PK Reading + Duty Cycle Factor
 3. Margin = limit – Corrected AV Reading

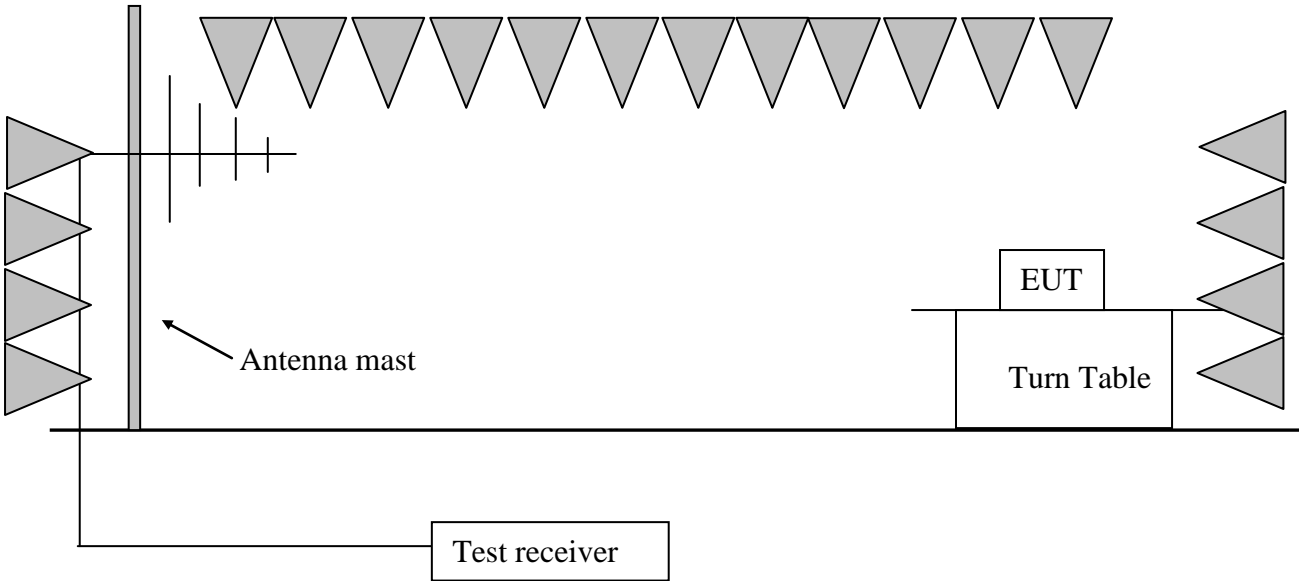
4 Deactivating time

Test result: Pass

4.1 Test limit

- (1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.
- (2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.
- (3) Periodic transmissions at regular predetermined intervals are not permitted. However, polling or supervision transmissions, including data, to determine system integrity of transmitters used in security or safety applications are allowed if the total duration of transmissions does not exceed more than two seconds per hour for each transmitter. There is no limit on the number of individual transmissions, provided the total transmission time does not exceed two seconds per hour.
- (4) Intentional radiators which are employed for radio control purposes during emergencies involving fire, security, and safety of life, when activated to signal an alarm, may operate during the pendency of the alarm condition.
- (5) Transmission of set-up information for security systems may exceed the transmission duration limits in (1) and (2) above, provided such transmission are under the control of a professional installer and do not exceed ten seconds after a manually operated switch is released or a transmitter is activated automatically. Such set-up information may include data.

4.2 Test Configuration



4.3 Test procedure and test setup

The measurement was applied in a semi-anechoic chamber.
The central frequency of test receiver was set as the operating frequency of EUT and the Span was set as 0.
The EUT was switched once. The test receiver recorded the whole time from the triggered moment to the time of stopping radiating. For manual switching, to avoid uncertainty, the operating above would be repeated five times and the worst data is recorded.

4.4 Test protocol

Temperature : 22 °C
Relative Humidity : 52 %

Whole time from the triggered moment to the time of stopping radiating: 0.48s.
As a result, the EUT complies with the limit of 5s' deactivating time.

5 Emission Bandwidth

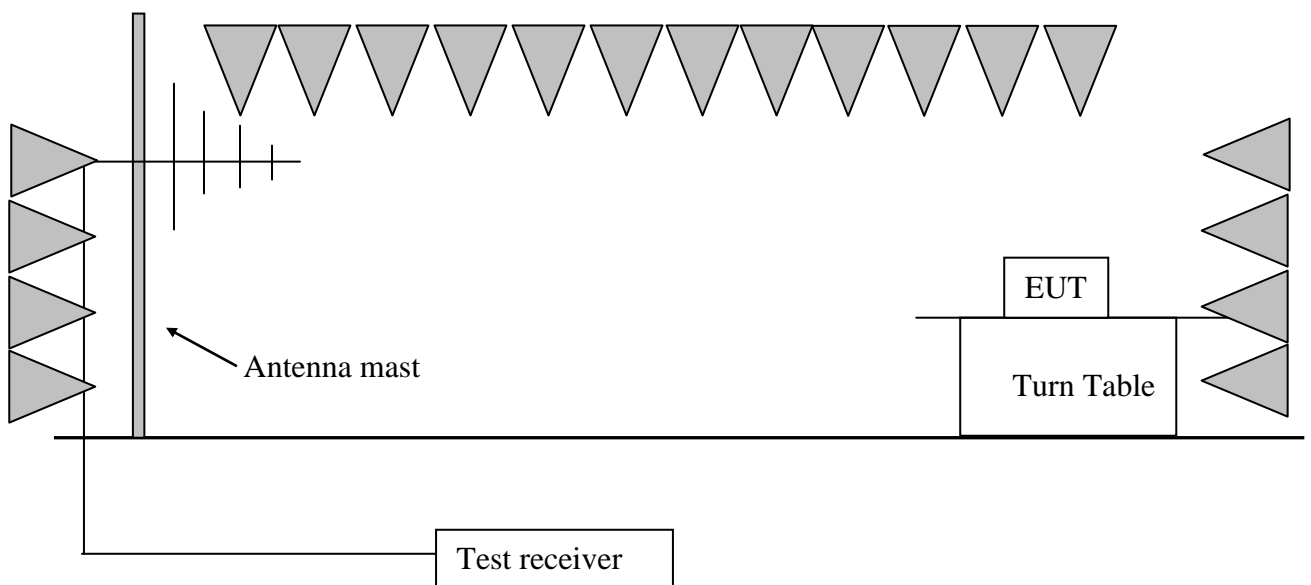
Test Status: Pass

5.1 Test limit

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70MHz and below 900MHz. For devices operating above 900MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20dB down from the modulated carrier.

The limit for the EUT = $0.25\% * 433.92\text{MHz} = 1084.8\text{kHz}$

5.2 Test Configuration



5.3 *Test procedure and test setup

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 central frequency of test receiver was set near the operating frequency of EUT. The test was conducted using the Spectrum Analyzer with the resolutions bandwidth set below:

RBW = approximately 1% of the emission bandwidth.

VBW > RBW.

5.4 Test protocol

Temperature : 22°C
Relative Humidity : 52%

| Channel | Emission Bandwidth (kHz) | Limit (kHz) |
|---------|--------------------------|-------------|
| 1 | 55.2 | 1084.8 |

6 Conducted emission

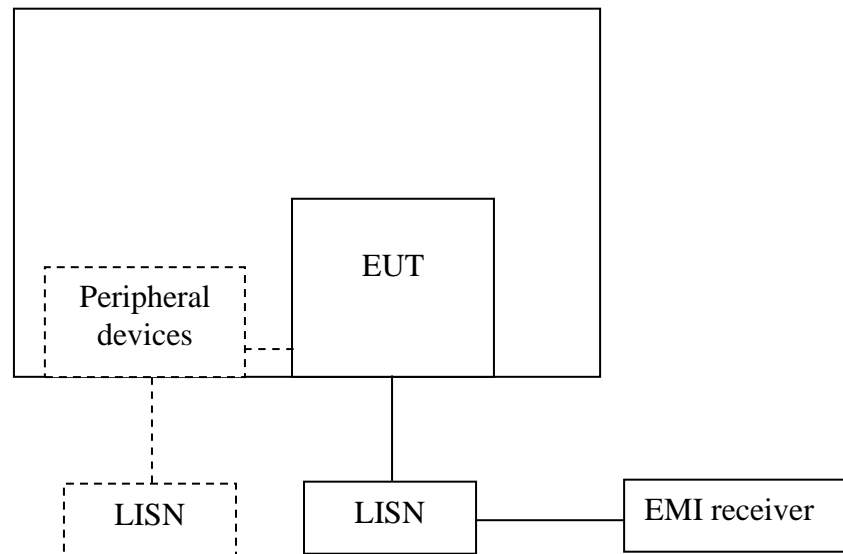
Test result: NA

6.1 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.

6.2 Test configuration



- For table top equipment, wooden support is 0.8m height table
- For floor standing equipment, wooden support is 0.1m height rack.

6.3 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.

6.4 Test protocol

Temperature : °C
Relative Humidity : %

Power line: L

| Frequency (MHz) | Quasi-peak | | | Average | | |
|--|--------------|--------------|-------------|--------------|--------------|-------------|
| | level dB(μV) | Limit dB(μV) | Margin (dB) | level dB(μV) | limit dB(μV) | Margin (dB) |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| Remark: If the margin higher than 20dB, it would be marked as *. | | | | | | |

Power line: N

| Frequency (MHz) | Quasi-peak | | | Average | | |
|--|--------------|--------------|-------------|--------------|--------------|-------------|
| | level dB(μV) | Limit dB(μV) | Margin (dB) | level dB(μV) | limit dB(μV) | Margin (dB) |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| Remark: If the margin higher than 20dB, it would be marked as *. | | | | | | |