

Test Report No.:  
**FCC2021-0008-2**

## **RF Test Report**

**EUT** : LC300 LTE CPE

**MODEL** : LC300,LC300SV,LC300CA , LC300A ,  
LC300B , LC300C , LC300D

**BRAND NAME** : sunvot

**CLIENT** : Ningbo Sunvot Technology Co., Ltd

**Classification Of Test** : Commission Test

**Vkan Certification & Testing Co., Ltd.**



# Vkan Certification & Testing Co., Ltd.

|                                                                                                                        |                                                                                                                        |                                                                                                                                                          |                       |
|------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| Test Report No.: FCC2021-0008-2                                                                                        |                                                                                                                        | Page 2 of 28                                                                                                                                             |                       |
| <b>Client</b>                                                                                                          |                                                                                                                        | Name : Ningbo Sunvot Technology Co., Ltd<br>Address : Building 3, NO 55 Longtan Shan Road, Beilun Daqi, Ningbo, Zhejiang                                 |                       |
| <b>Manufacturer</b>                                                                                                    |                                                                                                                        | Name : Ningbo Sunvot Technology Co., Ltd<br>Address : Building 3, NO 55 Longtan Shan Road, Beilun Daqi, Ningbo, Zhejiang                                 |                       |
| <b>Equipment Under Test</b>                                                                                            |                                                                                                                        | Name : LC300 LTE CPE<br>Model/Type: LC300, LC300SV, LC300CA, LC300A, LC300B, LC300C, LC300D<br>Trade mark : sunvot<br>Serial NO.: N/A<br>Sample NO.: 1-1 |                       |
| Date of Receipt.                                                                                                       | 2021.03.19                                                                                                             | Date of Receipt.                                                                                                                                         | 2021.03.19~2021.04.27 |
| <b>Test Specification</b>                                                                                              |                                                                                                                        | <b>Test Result</b>                                                                                                                                       |                       |
| FCC Part 24, Subpart E<br>FCC Part 2<br>ANSI C63.26-2015                                                               |                                                                                                                        | PASS                                                                                                                                                     |                       |
| <b>Evaluation of Test Result</b>                                                                                       | The equipment under test was found to comply with the requirements of the standards applied.<br>Issue Date: 2021.04.27 |                                                                                                                                                          |                       |
| Tested by: <i>Zhu Yulin</i><br><u>Zhu Yu Lin</u> □<br>Name Signature                                                   | Reviewed by: <i>Cheng Xiaochuan</i><br><u>Cheng Xiao Chuan</u> □<br>Name Signature                                     | Approved by: <i>Dong Sanbi</i><br><u>Dong San Bi</u> □<br>Name Signature                                                                                 |                       |
| <b>Other Aspects: NONE.</b>                                                                                            |                                                                                                                        |                                                                                                                                                          |                       |
| Abbreviations: OK, Pass= passed Fail = failed N/A= not applicable EUT= equipment, sample(s) under tested               |                                                                                                                        |                                                                                                                                                          |                       |
| This test report relates only to the EUT, and shall not be reproduced except in full, without written approval of CVC. |                                                                                                                        |                                                                                                                                                          |                       |



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**RELEASE CONTROL RECORD**

| ISSUE NO.      | REASON FOR CHANGE | DATE ISSUED   |
|----------------|-------------------|---------------|
| FCC2021-0008-2 | Original release  | Apr. 27, 2021 |



## 1 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

| APPLIED STANDARD: FCC Part 24 & Part 2 |                                     |        |                                |
|----------------------------------------|-------------------------------------|--------|--------------------------------|
| STANDARD SECTION                       | TEST TYPE                           | RESULT | REMARK                         |
| 2.1046<br>24.232                       | Equivalent Isotropic Radiated Power | PASS   | Meet the requirement of limit. |
| 2.1055<br>24.235                       | Frequency Stability                 | PASS   | Meet the requirement of limit. |
| 2.1049<br>24.238(b)                    | Occupied Bandwidth                  | PASS   | Meet the requirement of limit. |
| 24.232(d)                              | Peak to average ratio               | PASS   | Meet the requirement of limit. |
| 24.238(b)                              | Band Edge Measurements              | PASS   | Meet the requirement of limit. |
| 2.1051<br>24.238                       | Conducted Spurious Emissions        | PASS   | Meet the requirement of limit. |
| 2.1053<br>24.238                       | Radiated Spurious Emissions         | PASS   | Meet the requirement of limit. |

### 1.1 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

| MEASUREMENT                | UNCERTAINTY           |
|----------------------------|-----------------------|
| Effective Radiated Power   | $\pm 1.19\text{dB}$   |
| Frequency Stability        | $\pm 39.27\text{Hz}$  |
| Radiated emissions         | $\pm 3.55\text{dB}$   |
| Conducted emissions        | $\pm 1.407\text{ dB}$ |
| Occupied Channel Bandwidth | $\pm 0.624\text{KHz}$ |
| Band Edge Measurements     | $\pm 0.684\text{dB}$  |
| Peak to average ratio      | $\pm 0.4\text{dB}$    |

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

Test Firm:

CVC Testing Technology Co., Ltd.

No.3, Tiantaiyi Road, Kaitai Avenue, Science City, Guangdong, China

Test Firm Registration Number: 937273



## 1.2 TEST SITE AND INSTRUMENTS

| Test Equipment                  | Type/Mode     | SERIAL NO.   | Manufacturer  | Cal. Due   |
|---------------------------------|---------------|--------------|---------------|------------|
| EMI Test Receiver               | ESCI          | 100857       | R&S           | 2021-12-08 |
| EMI Test Receiver               | ESR3          | 102394       | R&S           | 2022-03-05 |
| LISN                            | NSLK 8127     | 8127644      | SCHWARZBECK   | 2021-09-04 |
| LISN                            | NSLK 8128     | 8128-316     | SCHWARZBECK   | 2021-09-04 |
| LISN                            | NSLK 8129     | 8129-268     | SCHWARZBECK   | 2022-03-05 |
| Plus Limiter (#1)               | VTSD 9561 F-N | 00515        | SCHWARZBECK   | 2022-03-05 |
| Plus Limiter (#2)               | VTSD 9561     | 9561-F017    | SCHWARZBECK   | 2021-10-09 |
| Impedance Stabilization Network | ISN T800      | 27095        | TESEQ         | 2021-09-04 |
| Impedance Stabilization Network | NTFM8158      | 8158-0092    | SCHWARZBECK   | 2021-06-09 |
| ImpedanceStabilizationNetwork   | NTFM8131      | #184         | SCHWARZBECK   | 2021-06-09 |
| Voltage Probe                   | TK9420        | 9420-499     | SCHWARZBECK   | 2022-03-05 |
| Power Divider                   | 4901.17.B     | 22643830     | HUBER+SUHNER  | 2021-11-08 |
| Video Signal Generator          | GV-798+       | 151064920001 | PROMAX        | 2021-07-21 |
| AudioSignalGenerator            | GAG-810       | EK871591     | GW            | 2021-12-11 |
| Shielding Room(#1)              | GP1A          | 002          | LEINING       | 2024-08-08 |
| Shielding Room(#2)              | GP1A          | /            | LEINING       | 2024-08-08 |
| EMI Test Receiver               | N9038A-508    | MY532290079  | Agilent       | 2022-03-05 |
| EMI Test Receiver               | ESR7          | 102235       | R&S           | 2022-03-05 |
| EMI Test Receiver               | N9038A-508    | MY53290078   | Agilent       | 2022-03-05 |
| Spectrum Analyzer               | N9010B        | MY57470323   | KEYSIGHT      | 2022-03-05 |
| Radio Communication Test        | CMW500        | 156686       | R&S           | 2021-12-25 |
| Broadband Antenna(3m)           | VULB 9163     | 9163-530     | SCHWARZBECK   | 2021-07-11 |
| Loop Antenna                    | HLA 6121      | 540046       | TESEQ         | 2021-06-28 |
| Loop Antenna                    | FMZB1513      | 1513-170     | SCHWARZBECK   | 2022-03-05 |
| Monopole antenna                | HFH2-Z6E      | 101317       | R&S           | 2021-12-11 |
| Waveguide Horn Antenna          | BBHA9120B     | 602          | SCHWARZBECK   | 2022-03-05 |
| Waveguide Horn Antenna          | HF906         | 360306/008   | R&S           | 2022-03-05 |
| Semi-Anechoic Chamber(3m)       | FACT-4        | ST08035      | ETS           | 2024-12-12 |
| Preamplifier                    | SCU-01F       | 100298       | Rohde&Schwarz | 2021.5.19  |
| Preamplifier                    | SCU-18F       | 100799       | Rohde&Schwarz | 2021.5.19  |
| Signal&Spectrum Analyzer        | FSV 40        | 101898       | Rohde&Schwarz | 2021.5.19  |
| Signal&Spectrum Analyzer        | FSVA 3044     | 101013       | Rohde&Schwarz | 2021.5.19  |



## 2 GENERAL INFORMATION

### 2.1 GENERAL DESCRIPTION OF EUT

|                  |                                                     |                       |
|------------------|-----------------------------------------------------|-----------------------|
| PRODUCT          | LC300 LTE CPE                                       |                       |
| MODEL NAME       | LC300                                               |                       |
| ADDITIONAL MODEL | LC300SV,LC300CA , LC300A , LC300B , LC300C , LC300D |                       |
| FCC ID           | 2AZGN-LC300-202103                                  |                       |
| POWER SUPPLY     | DC 48V POE Supply                                   |                       |
| MODULATION TYPE  | LTE                                                 | QPSK, 16QAM           |
|                  | LTE Band 2<br>Channel Bandwidth: 1.4MHz             | 1850.7MHz ~ 1909.3MHz |
|                  | LTE Band 2<br>Channel Bandwidth: 3MHz               | 1851.5MHz ~ 1908.5MHz |
|                  | LTE Band 2<br>Channel Bandwidth: 5MHz               | 1852.5MHz ~ 1907.5MHz |
|                  | LTE Band 2<br>Channel Bandwidth: 10MHz              | 1855.0MHz ~ 1905.0MHz |
|                  | LTE Band 2<br>Channel Bandwidth: 15MHz              | 1857.5MHz ~ 1902.5MHz |
|                  | LTE Band 2<br>Channel Bandwidth: 20MHz              | 1860.0MHz ~ 1900.0MHz |
| ANTENNA TYPE     | External PCB antenna with 3 dBi gain                |                       |
| HW VERSION       | V1.0                                                |                       |
| SW VERSION       | V1.0                                                |                       |
| I/O PORTS        | Refer to user's manual                              |                       |
| CABLE            | LAN cable: non-shielded, detachable, 1.45meter      |                       |

**NOTE:**

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.
2. The EUT was powered by the following POE port from WiFi Router packaged with this CPE:  
DC 48V.
3. For the test results, the EUT had been tested with all conditions. But only the worst case was shown in test report.
4. Additional models (see about table)are identical with the test model LC300SV,LC300CA, LC300A, LC300B, LC300C, LC300D except the color of the appearance and model name for trading purpose.
5. Please refer to the EUT photo document (Reference No.: FCC2021-0008) for detailed product photo.
6. The EUT have MIMO function, provides 2 completed transmitter and 4 receiver.



## 2.2 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

| Support Equipment |             |                   |             |                      |                    |                |             |
|-------------------|-------------|-------------------|-------------|----------------------|--------------------|----------------|-------------|
| NO                | Description | Brand             | Model No.   | Serial Number        | Supplied by        |                |             |
| N/A               | N/A         | N/A               | N/A         | N/A                  | N/A                |                |             |
|                   |             |                   |             |                      |                    |                |             |
| Support Cable     |             |                   |             |                      |                    |                |             |
| NO                | Description | Quantity (Number) | Length (cm) | Detachable (Yes/ No) | Shielded (Yes/ No) | Cores (Number) | Supplied by |
| N/A               | N/A         | N/A               | N/A         | N/A                  | N/A                | N/A            | N/A         |
|                   |             |                   |             |                      |                    |                |             |

## 2.3 TEST ITEM AND TEST CONFIGURATION

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis and antenna ports

The worst case in ERP and radiated emission was found when positioned on X-plane. Following channel(s) was (were) selected for the final test as listed below:

| EUT CONFIGURE MODE | DESCRIPTION                                   |
|--------------------|-----------------------------------------------|
| A                  | EUT + LAN Cable + Router + Adaptor + LTE link |

### LTE BAND 2

| TEST ITEM           | AVAILABLE CHANNEL | TESTED CHANNEL      | CHANNEL BANDWIDTH | MODULATION | MODE                |
|---------------------|-------------------|---------------------|-------------------|------------|---------------------|
| EIRP                | 18607 to 19193    | 18607, 18900, 19193 | 1.4MHz            | QPSK,16QAM | 1 RB / 0 RB Offset  |
|                     | 18615 to 19185    | 18615, 18900, 19185 | 3MHz              | QPSK,16QAM | 1 RB / 0 RB Offset  |
|                     | 18625 to 19175    | 18625, 18900, 19175 | 5MHz              | QPSK,16QAM | 1 RB / 0 RB Offset  |
|                     | 18650 to 19150    | 18650, 18900, 19150 | 10MHz             | QPSK,16QAM | 1 RB / 0 RB Offset  |
|                     | 18675 to 19125    | 18675, 18900, 19125 | 15MHz             | QPSK,16QAM | 1 RB / 0 RB Offset  |
|                     | 18700 to 19100    | 18700, 18900, 19100 | 20MHz             | QPSK,16QAM | 1 RB / 0 RB Offset  |
| FREQUENCY STABILITY | 18607 to 19193    | 18607, 18900, 19193 | 1.4MHz            | QPSK,16QAM | 6 RB / 0 RB Offset  |
|                     | 18615 to 19185    | 18615, 18900, 19185 | 3MHz              | QPSK,16QAM | 15 RB / 0 RB Offset |
|                     | 18625 to 19175    | 18625, 18900, 19175 | 5MHz              | QPSK,16QAM | 25 RB / 0 RB Offset |
|                     | 18650 to 19150    | 18650, 18900, 19150 | 10MHz             | QPSK,16QAM | 50 RB / 0 RB Offset |



|                             |                |                     |        |            |                      |
|-----------------------------|----------------|---------------------|--------|------------|----------------------|
|                             | 18675 to 19125 | 18675, 18900, 19125 | 15MHz  | QPSK,16QAM | 75 RB / 0 RB Offset  |
|                             | 18700 to 19100 | 18700, 18900, 19100 | 20MHz  | QPSK,16QAM | 100 RB / 0 RB Offset |
| OCCUPIED<br>BANDWIDTH       | 18607 to 19193 | 18607, 18900, 19193 | 1.4MHz | QPSK,16QAM | 6 RB / 0 RB Offset   |
|                             | 18615 to 19185 | 18615, 18900, 19185 | 3MHz   | QPSK,16QAM | 15 RB / 0 RB Offset  |
|                             | 18625 to 19175 | 18625, 18900, 19175 | 5MHz   | QPSK,16QAM | 25 RB / 0 RB Offset  |
|                             | 18650 to 19150 | 18650, 18900, 19150 | 10MHz  | QPSK,16QAM | 50 RB / 0 RB Offset  |
|                             | 18675 to 19125 | 18675, 18900, 19125 | 15MHz  | QPSK,16QAM | 75 RB / 0 RB Offset  |
|                             | 18700 to 19100 | 18700, 18900, 19100 | 20MHz  | QPSK,16QAM | 100 RB / 0 RB Offset |
| PEAK TO<br>AVERAGE<br>RATIO | 18607 to 19193 | 18607, 18900, 19193 | 1.4MHz | QPSK,16QAM | 1 RB / 0 RB Offset   |
|                             |                |                     |        |            | 6 RB / 0 RB Offset   |
|                             | 18615 to 19185 | 18615, 18900, 19185 | 3MHz   | QPSK,16QAM | 1 RB / 0 RB Offset   |
|                             |                |                     |        |            | 15 RB / 0 RB Offset  |
|                             | 18625 to 19175 | 18625, 18900, 19175 | 5MHz   | QPSK,16QAM | 1 RB / 0 RB Offset   |
|                             |                |                     |        |            | 25 RB / 0 RB Offset  |
|                             | 18650 to 19150 | 18650, 18900, 19150 | 10MHz  | QPSK,16QAM | 1 RB / 0 RB Offset   |
|                             |                |                     |        |            | 50 RB / 0 RB Offset  |
|                             | 18675 to 19125 | 18675, 18900, 19125 | 15MHz  | QPSK,16QAM | 1 RB / 0 RB Offset   |
|                             |                |                     |        |            | 75 RB / 0 RB Offset  |
|                             | 18700 to 19100 | 18700, 18900, 19100 | 20MHz  | QPSK,16QAM | 1 RB / 0 RB Offset   |
|                             |                |                     |        |            | 100 RB / 0 RB Offset |



|                     |                |                     |        |            |                      |
|---------------------|----------------|---------------------|--------|------------|----------------------|
| BAND EDGE           | 18607 to 19193 | 18607               | 1.4MHz | QPSK,16QAM | 1 RB / 0 RB Offset   |
|                     |                |                     |        |            | 1 RB / 5 RB Offset   |
|                     |                |                     |        |            | 6 RB / 0 RB Offset   |
|                     |                | 19193               | 1.4MHz | QPSK,16QAM | 1 RB / 0 RB Offset   |
|                     |                |                     |        |            | 1 RB / 5 RB Offset   |
|                     |                |                     |        |            | 6 RB / 0 RB Offset   |
|                     | 18615 to 19185 | 18615               | 3MHz   | QPSK,16QAM | 1 RB / 0 RB Offset   |
|                     |                |                     |        |            | 1 RB / 14 RB Offset  |
|                     |                |                     |        |            | 15 RB / 0 RB Offset  |
|                     |                | 19185               | 3MHz   | QPSK,16QAM | 1 RB / 0 RB Offset   |
|                     |                |                     |        |            | 1 RB / 14 RB Offset  |
|                     |                |                     |        |            | 15 RB / 0 RB Offset  |
|                     | 18625 to 19175 | 18625               | 5MHz   | QPSK,16QAM | 1 RB / 0 RB Offset   |
|                     |                |                     |        |            | 1 RB / 24 RB Offset  |
|                     |                |                     |        |            | 25 RB / 0 RB Offset  |
|                     |                | 19175               | 5MHz   | QPSK,16QAM | 1 RB / 0 RB Offset   |
|                     |                |                     |        |            | 1 RB / 24 RB Offset  |
|                     |                |                     |        |            | 25 RB / 0 RB Offset  |
|                     | 18650 to 19150 | 18650               | 10MHz  | QPSK,16QAM | 1 RB / 0 RB Offset   |
|                     |                |                     |        |            | 1 RB / 49 RB Offset  |
|                     |                |                     |        |            | 50 RB / 0 RB Offset  |
|                     |                | 19150               | 10MHz  | QPSK,16QAM | 1 RB / 0 RB Offset   |
|                     |                |                     |        |            | 1 RB / 49 RB Offset  |
|                     |                |                     |        |            | 50 RB / 0 RB Offset  |
|                     | 18675 to 19125 | 18675               | 15MHz  | QPSK,16QAM | 1 RB / 0 RB Offset   |
|                     |                |                     |        |            | 1 RB / 74 RB Offset  |
|                     |                |                     |        |            | 75 RB / 0 RB Offset  |
|                     |                | 19125               | 15MHz  | QPSK,16QAM | 1 RB / 0 RB Offset   |
|                     |                |                     |        |            | 1 RB / 74 RB Offset  |
|                     |                |                     |        |            | 75 RB / 0 RB Offset  |
|                     | 18700 to 19100 | 18700               | 20MHz  | QPSK,16QAM | 1 RB / 0 RB Offset   |
|                     |                |                     |        |            | 1 RB / 99 RB Offset  |
|                     |                |                     |        |            | 100 RB / 0 RB Offset |
|                     |                | 19100               | 20MHz  | QPSK,16QAM | 1 RB / 0 RB Offset   |
|                     |                |                     |        |            | 1 RB / 99 RB Offset  |
|                     |                |                     |        |            | 100 RB / 0 RB Offset |
| CONDCUETED EMISSION | 18607 to 19193 | 18607, 18900, 19193 | 1.4MHz | QPSK,16QAM | 1 RB / 0 RB Offset   |
|                     | 18615 to 19185 | 18615, 18900, 19185 | 3MHz   | QPSK,16QAM | 1 RB / 0 RB Offset   |
|                     | 18625 to 19175 | 18625, 18900, 19175 | 5MHz   | QPSK,16QAM | 1 RB / 0 RB Offset   |
|                     | 18650 to 19150 | 18650, 18900, 19150 | 10MHz  | QPSK,16QAM | 1 RB / 0 RB Offset   |
|                     | 18675 to 19125 | 18675, 18900, 19125 | 15MHz  | QPSK,16QAM | 1 RB / 0 RB Offset   |
|                     | 18700 to 19100 | 18700, 18900, 19100 | 20MHz  | QPSK,16QAM | 1 RB / 0 RB Offset   |
| RADIATED EMISSION   | 18607 to 19193 | 18650, 18900, 19150 | 1.4MHz | QPSK       | 1 RB / 0 RB Offset   |
|                     | 18615 to 19185 | 18900               | 3MHz   | QPSK       | 1 RB / 0 RB Offset   |
|                     | 18625 to 19175 | 18900               | 5MHz   | QPSK       | 1 RB / 0 RB Offset   |
|                     | 18650 to 19150 | 18900               | 10MHz  | QPSK       | 1 RB / 0 RB Offset   |



|  |                |       |       |      |                    |
|--|----------------|-------|-------|------|--------------------|
|  | 18675 to 19125 | 18900 | 15MHz | QPSK | 1 RB / 0 RB Offset |
|  | 18700 to 19100 | 18900 | 20MHz | QPSK | 1 RB / 0 RB Offset |

**Note:** This device was tested under all bandwidths, RB configurations and modulations. Only the worst case was shown in test report.

**TEST CONDITION:**

| TEST ITEM           | ENVIRONMENTAL CONDITIONS | INPUT POWER        | TESTED BY  |
|---------------------|--------------------------|--------------------|------------|
| ERP                 | 23deg. C, 62%RH          | DC 48V POE Supply  | Zhu Yu Lin |
| FREQUENCY STABILITY | 23deg. C, 62%RH          | DC 40.8V/48V/55.2V | Zhu Yu Lin |
| OCCUPIED BANDWIDTH  | 23deg. C, 62%RH          | DC 48V POE Supply  | Zhu Yu Lin |
| BAND EDGE           | 23deg. C, 62%RH          | DC 48V POE Supply  | Zhu Yu Lin |
| CONDCUDED EMISSION  | 23deg. C, 62%RH          | DC 48V POE Supply  | Zhu Yu Lin |
| RADIATED EMISSION   | 25deg. C, 63.6%RH        | DC 48V POE Supply  | Zhu Yu Lin |



## 2.4 EUT OPERATING CONDITIONS

The EUT makes a link to the communication simulator. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency

## 2.5 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is a RF product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

**FCC 47 CFR Part 2**

**FCC 47 CFR Part 24**

**KDB 971168 D01 Power Meas License Digital Systems v03**

**ANSI C63.26-2015**

**NOTE:** All test items have been performed and recorded as per the above standards.

### 3 TEST TYPES AND RESULTS

#### 3.1 OUTPUT POWER MEASUREMENT

##### 3.1.1 LIMITS OF OUTPUT POWER MEASUREMENT

Mobile and portable stations are limited to 2 watts EIRP.

##### 3.1.2 TEST PROCEDURES

###### **EIRP MEASUREMENT:**

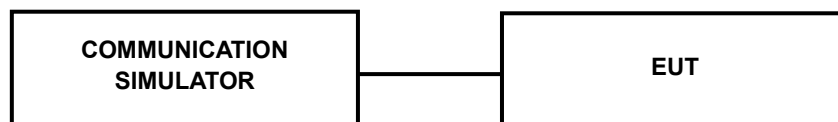
- a. All measurements were done at low, middle and high operational frequency range. RBW and VBW is 1MHz for GSM & GPRS, 5MHz for WCDMA mode and 10MHz for LTE mode.
- b.  $EIRP = \text{Reading (dBm)} + \text{RF cable loss (dB)} + \text{Antenna Gain (dBi)}$

###### **CONDUCTED POWER MEASUREMENT:**

The EUT was set up for the maximum power with GSM, GPRS, EDGE & WCDMA link data modulation and link up with simulator. Set the EUT to transmit under low, middle and high channel and record the power level shown on simulator.

##### 3.1.3 TEST SETUP

###### **EIRP / ERP Measurement / Conducted Power Measurement**





## 3.1.4 TEST RESULTS

### Refer to attached Part 24 Test Data Appendix A

**Note:** Total directional gain (dBi) = ANT gain (dBi) + array gain (dB)  
 $= 3 + 10 \log(2) = 6.01 \text{ dBi}$

$$\text{Array gain} = 10 \log(N_{\text{ANT}})$$

Total Conducted Power  $= 10 \log(\text{ANT0 Conducted Power} + \text{ANT2 Conducted Power})$  ANT0, ANT2 The unit mW.

$$\text{Total EIRP} = \text{Total Conducted Power} + \text{Total directional gain (dBi)}$$

### 3.2 FREQUENCY STABILITY MEASUREMENT

#### 3.2.1 LIMITS OF FREQUENCY STABILITY MEASUREMENT

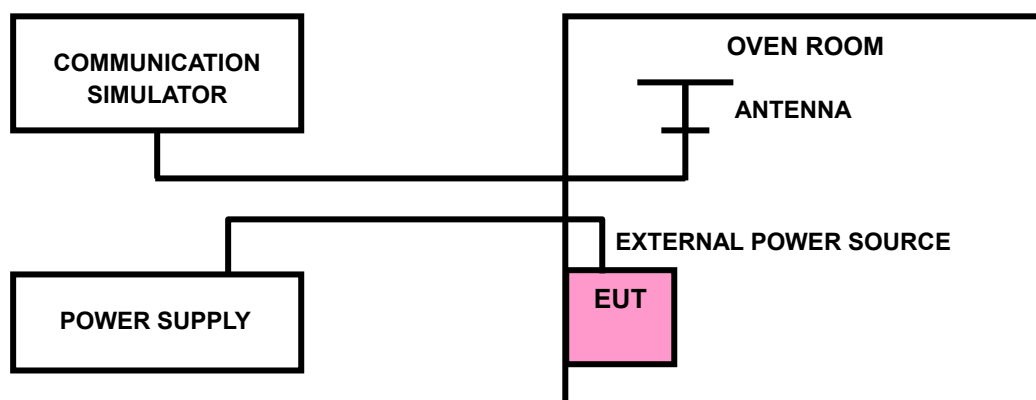
The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

#### 3.2.2 TEST PROCEDURE

- a. Device is placed at the oven room. The oven room could control the temperatures and humidity. Power warm up is at least 15 min and power applied should perform before recording frequency error.
- b. EUT is connected the external power supply to control the DC input power. The test voltage range is from minimum to maximum working voltage. Each step shall be record the frequency error rate.
- c. The temperature range step is 10 degrees in this test items. All temperature levels shall be hold the  $\pm 0.5^{\circ}\text{C}$  during the measurement testing. The each temperature step shall be at least 0.5 hours, consider the EUT could be test under the stability condition.

**NOTE:** The frequency error was recorded frequency error from the communication simulator.

#### 3.2.3 TEST SETUP



#### 3.2.4 TEST RESULTS

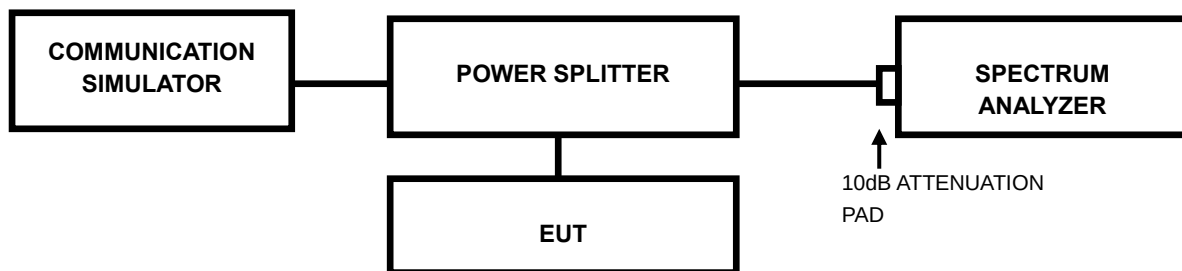
Refer to attached Part 24 Test Data Appendix F

### 3.3 OCCUPIED BANDWIDTH MEASUREMENT

#### 3.3.1 TEST PROCEDURES

The EUT makes a call to the communication simulator. All measurements were done at low, middle and high operational frequency range. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency. Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth.

#### 3.3.2 TEST SETUP



#### 3.3.3 TEST RESULTS

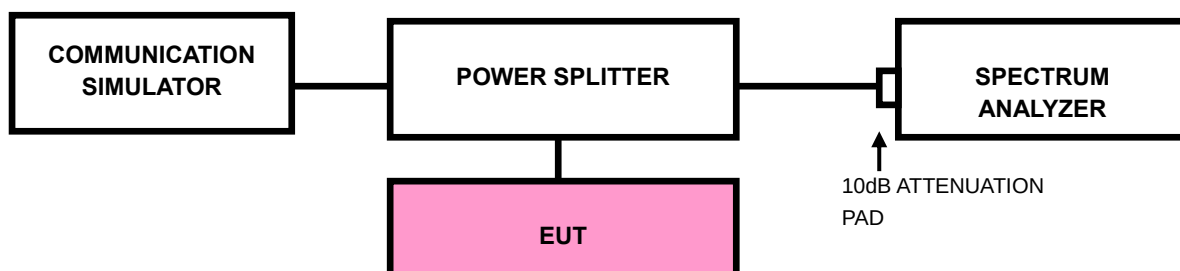
Refer to attached Part 24 Test Data Appendix C

### 3.4 BAND EDGE MEASUREMENT

#### 3.4.1 LIMITS OF BAND EDGE MEASUREMENT

Power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

#### 3.4.2 TEST SETUP



#### 3.4.3 TEST PROCEDURES

- All measurements were done at low and high operational frequency range.
- The center frequency of spectrum is the band edge frequency and span is 1.5 MHz. RBW of the spectrum is 10kHz and VBW of the spectrum is 30kHz (GSM/GPRS/ EDGE).
- The center frequency of spectrum is the band edge frequency and span is 10MHz. RBW of the spectrum is 100kHz and VBW of the spectrum is 300kHz (WCDMA).
- The center frequency of spectrum is the band edge frequency and span is 1~5 MHz. RBW of the spectrum is 30kHz and VBW of the spectrum is 100 kHz. (LTE bandwidth 1.4MHz)
- The center frequency of spectrum is the band edge frequency and span is 1~5 MHz. RBW of the spectrum is 30kHz and VBW of the spectrum is 100kHz. (LTE bandwidth 3MHz)



- f. The center frequency of spectrum is the band edge frequency and span is 1~5 MHz. RBW of the spectrum is 100kHz and VBW of the spectrum is 300kHz. (LTE bandwidth 5MHz)
- g. The center frequency of spectrum is the band edge frequency and span is 1~5 MHz. RBW of the spectrum is 200kHz and VBW of the spectrum is 1MHz. (LTE bandwidth 10MHz)
- h. The center frequency of spectrum is the band edge frequency and span is 1~5 MHz. RBW of the spectrum is 300kHz and VBW of the spectrum is 1MHz. (LTE bandwidth 15MHz)
- i. The center frequency of spectrum is the band edge frequency and span is 1~5 MHz. RBW of the spectrum is 200kHz and VBW of the spectrum is 1MHz. (LTE bandwidth 20MHz)
- j. Record the max trace plot into the test report.

### 3.4.4. TEST RESULTS

#### Refer to attached Part 24 Test Data Appendix D

Note: For the test results, the EUT had been tested with all conditions. But only the worst case was shown in test report.

### 3.5 CONDUCTED SPURIOUS EMISSIONS

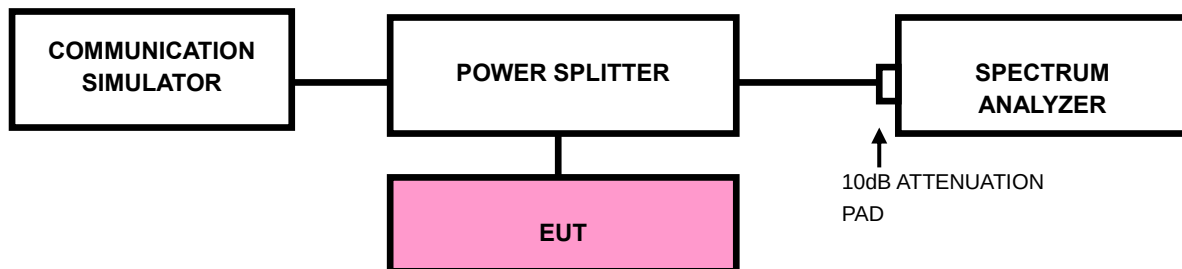
#### 3.5.1 LIMITS OF CONDUCTED SPURIOUS EMISSIONS MEASUREMENT

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB. The emission limit equal to  $-13\text{dBm}$ .

#### 3.5.2 TEST PROCEDURE

- a. The EUT makes a phone call to the communication simulator. All measurements were done at low, middle and high operational frequency range.
- b. Measuring frequency range is from 9 kHz to 19.1GHz. 10dB attenuation pad is connected with spectrum. RBW=1MHz and VBW=3MHz is used for conducted emission measurement.

#### 3.5.3 TEST SETUP



#### 6.1.1 TEST RESULTS

Refer to attached Part 24 Test Data Appendix E



## 3.6 RADIATED EMISSION MEASUREMENT

### 3.6.1 LIMITS OF RADIATED EMISSION MEASUREMENT

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB. The emission limit equal to  $-13\text{dBm}$ .

### 3.6.2 TEST PROCEDURES

- a. Substitution method is used for Radiated Spurious Emissions Measurement. In the semi-anechoic chamber, EUT placed on the 0.8m height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m to find the maximum polar radiated power. The "Read Value" is the spectrum reading the maximum power value.
- b. The substitution horn antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a TX cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to "Read Value" of step a. Record the power level of S.G
- c.  $RSE = \text{Output power level of S.G} - \text{TX cable loss} + \text{Antenna gain of substitution horn}.$

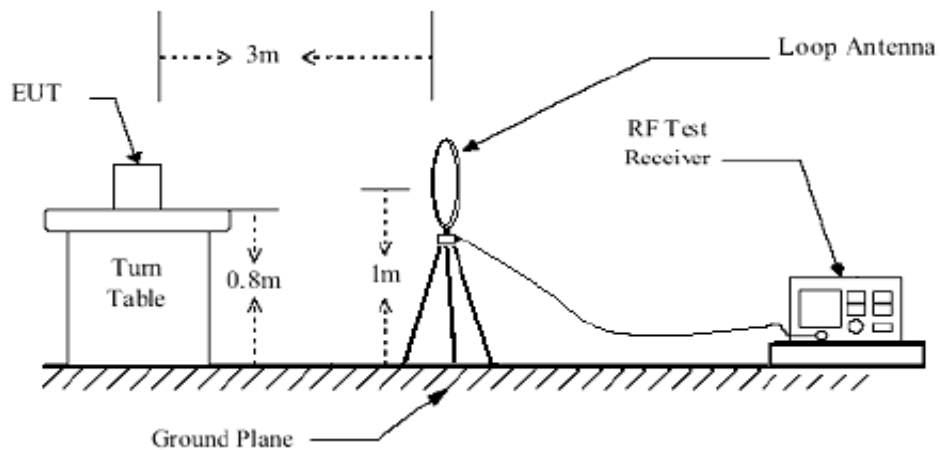
**NOTE:** The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1MHz/3MHz.

### 3.6.3 DEVIATION FROM TEST STANDARD

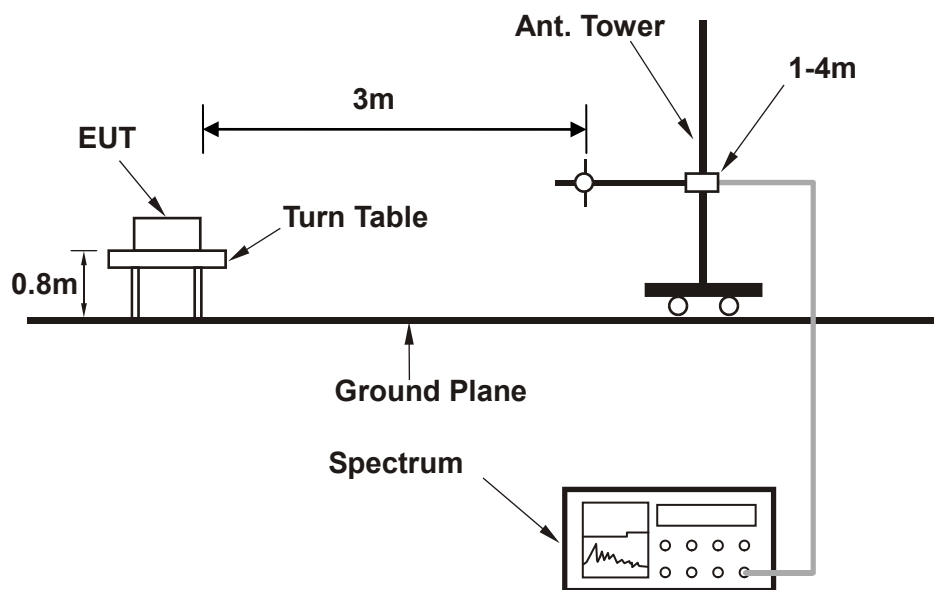
No deviation

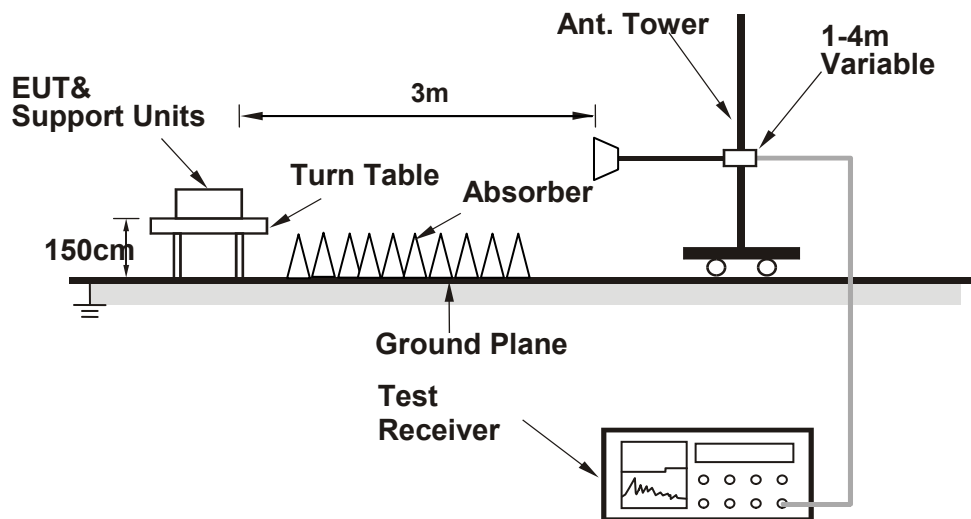
## 3.6.4 TEST SETUP

### <Below 30MHz>



### < Frequency Range 30MHz~1GHz >



**< Frequency Range above 1GHz >**

For the actual test configuration, please refer to the attached file (Test Setup Photo).



## 3.6.5 TEST RESULTS

### **Refer to attached Part 24 Test Data Appendix G**

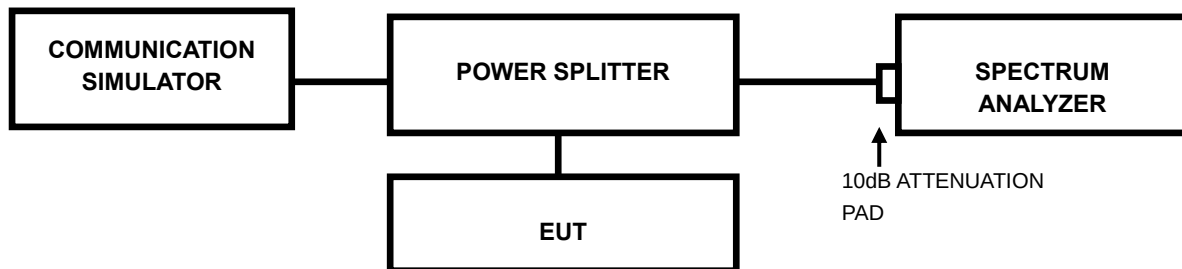
Note: For the test results, the EUT had been tested with all conditions. But only the worst case (MIMO Mode) was shown in test report.

### 3.7 PEAK TO AVERAGE RATIO

#### 3.7.1 LIMITS OF peak to average ratio MEASUREMENT

In measuring transmissions in this band using an average power technique, the peak to-average ratio (PAR) of the transmission may not exceed 13 dB

#### 3.7.2 TEST SETUP



#### 3.7.3 TEST PROCEDURES

1. Set resolution/measurement bandwidth  $\geq$  signal's occupied bandwidth;
2. Set the number of counts to a value that stabilizes the measured CCDF curve;
3. Record the maximum PAPR level associated with a probability of 0.1%.

#### 3.7.4 TEST RESULTS

**Refer to attached Part 24 Test Data Appendix B**



#### **4 PHOTOGRAPHS OF THE TEST CONFIGURATION**

Please refer to the attached file (Test Setup Photo).



## **5 MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB**

No any modifications are made to the EUT by the lab during the test.



### Important

- (1) The test report is valid with the official seal of the laboratory and the signatures of Test engineer, Author and Reviewer simultaneously.
- (2) The test report is invalid if altered.
- (3) Any photocopies or part photocopies in the test report are forbidden without the written permission from the laboratory.
- (4) Objections to the test report must be submitted to the laboratory within 15 days.
- (5) Generally, commission test is responsible for the tested samples only.

*Address of the laboratory:*

*Vkan Certification & Testing Co., Ltd.*

*Address:*

*No.3, Tiantaiyi Road, Kaitai Avenue, Science City, Guangzhou, China*

*Post Code : 510663*

*Tel : 020-32293888*

*FAX : 020-32293889*

*E-mail : office@cvc.org.cn*

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