

Test Report No.:  
**FCC2021-0008-1**

# **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.

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<b>Client</b>			Name : Ningbo Sunvot Technology Co., Ltd  Address : Building 3, NO 55 Longtan Shan Road, Beilun Daqi, Ningbo, Zhejiang
<b>Manufacturer</b>		Name : Ningbo Sunvot Technology Co., Ltd  Address : Building 3, NO 55 Longtan Shan Road, Beilun Daqi, Ningbo, Zhejiang	
<b>Equipment Under Test</b>		Name : LC300 LTE CPE  Model/Type: LC300,LC300SV,LC300CA , LC300A , LC300B , LC300C , LC300D  Trade mark : sunvot  Serial NO.:N/A  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 22, Subpart H  ANSI C63.26		PASS	
<b>Evaluation of Test Result</b>	The equipment under test was found to comply with the requirements of the standards applied.  <b>Issue Date:</b> 2021.04.27		
Tested by: <i>Zhu Yulin</i>  <i>Zhu Yu Lin</i> Name      Signature	Reviewed by: <i>Cheng Xiaochuan</i>  <i>Cheng Xiao Chuan</i> Name      Signature	Approved by: <i>Dong Sanbi</i>  <i>Dong San Bi</i> 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
FCC2021-0008-1	Original release	Apr. 27, 2021



## 1 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 22 & Part 2			
STANDARD SECTION	TEST TYPE	RESULT	REMARK
2.1046 22.913 (a)	Effective Radiated Power	PASS	Meet the requirement of limit.
2.1055 22.355	Frequency Stability	PASS	Meet the requirement of limit.
2.1049 22.917b	Occupied Bandwidth	PASS	Meet the requirement of limit.
--	Peak to average ratio*	PASS	Meet the requirement of limit.
22.917	Band Edge Measurements	PASS	Meet the requirement of limit.
2.1051 22.917	Conducted Spurious Emissions	PASS	Meet the requirement of limit.
2.1053 22.917	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	±1.19dB
Frequency Stability	±39.27Hz
Radiated emissions	±3.55dB
Conducted emissions	±1.407 dB
Occupied Channel Bandwidth	±0.624KHz
Band Edge Measurements	±0.684dB
Peak to average ratio	±0.4dB

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
Impedance Stabilization Network	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
Audio Signal Generator	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-LC300-202I03	
POWER SUPPLY	DC 48V POE Supply	
LTE	LTE	QPSK, 16QAM
	LTE Band 5 (Channel Bandwidth: 1.4MHz)	824.7MHz ~ 848.3MHz
	LTE Band 5 (Channel Bandwidth: 3MHz)	825.5MHz ~ 847.5MHz
	LTE Band 5 (Channel Bandwidth: 5MHz)	826.5MHz ~ 846.5MHz
	LTE Band 5 (Channel Bandwidth: 10MHz)	829MHz ~ 844MHz
ANTENNA TYPE	External PCB antenna with 0 dBi gain	
HW VERSION	V1.0	
SW VERSION	V1.0	
I/O PORTS	Refer to user's manual	
DATA 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 5 MODE

TEST ITEM	Available Channel	Tested Channel	Channel bandwidth	modulation	mode
ERP	20407 to 20643	20407, 20525, 20643	1.4MHz	QPSK,16QAM	1 RB / 0 RB Offset
	20415 to 20635	20415, 20525, 20635	3MHz	QPSK,16QAM	1 RB / 0 RB Offset
	20425 to 20625	20425, 20525, 20625	5MHz	QPSK,16QAM	1 RB / 0 RB Offset
	20450 to 20600	20450, 20525, 20600	10MHz	QPSK,16QAM	1 RB / 0 RB Offset
FREQUENCY STABILITY	20407 to 20643	20407, 20525, 20643	1.4MHz	QPSK,16QAM	6 RB / 0 RB Offset
	20415 to 20635	20415, 20525, 20635	3MHz	QPSK,16QAM	15 RB / 0 RB Offset
	20425 to 20625	20425, 20525, 20625	5MHz	QPSK,16QAM	25 RB / 0 RB Offset
	20450 to 20600	20450, 20525, 20600	10MHz	QPSK,16QAM	50 RB / 0 RB Offset
OCCUPIED BANDWIDTH	20407 to 20643	20407, 20525, 20643	1.4MHz	QPSK	6 RB / 0 RB Offset
				16QAM	6 RB / 0 RB Offset



20415 to 20635	20415, 20525, 20635	3MHz	QPSK	15 RB / 0 RB Offset
			16QAM	15 RB / 0 RB Offset
20425 to 20625	20425, 20525, 20625	5MHz	QPSK	25 RB / 0 RB Offset
			16QAM	25 RB / 0 RB Offset
20450 to 20600	20450, 20525, 20600	10MHz	QPSK	50 RB / 0 RB Offset
			16QAM	50 RB / 0 RB Offset

BAND EDGE	20407 to 20643	20407	1.4 MHz	QPSK,16QAM	1 RB / 0 RB Offset
					1 RB / 5 RB Offset
					6 RB / 0 RB Offset
	20407 to 20643	20643	1.4 MHz	QPSK,16QAM	1 RB / 0 RB Offset
					1 RB / 5 RB Offset
					6 RB / 0 RB Offset
	20415 to 20635	20415	3 MHz	QPSK,16QAM	1 RB / 0 RB Offset
					1 RB / 14 RB Offset
					15 RB / 0 RB Offset
	20415 to 20635	20635	3 MHz	QPSK,16QAM	1 RB / 0 RB Offset
					1 RB / 14 RB Offset
					15 RB / 0 RB Offset
	20425 to 20625	20425	5MHz	QPSK,16QAM	1 RB / 0 RB Offset
					1 RB / 24 RB Offset
					25 RB / 0 RB Offset
	20425 to 20625	20625	5MHz	QPSK,16QAM	1 RB / 0 RB Offset
					1 RB / 24 RB Offset
					25 RB / 0 RB Offset
	20450 to 20600	20450	10MHz	QPSK,16QAM	1 RB / 0 RB Offset
					1 RB / 49 RB Offset
					50 RB / 0 RB Offset
	20450 to 20600	20600	10MHz	QPSK,16QAM	1 RB / 0 RB Offset
					1 RB / 49 RB Offset
					50 RB / 0 RB Offset
CONDUCTED	20407 to 20643	20407, 20525, 20643	1.4MHz	QPSK,16QAM	1 RB / 0 RB Offset



EMISSION	20415 to 20635	20415, 20525, 20635	3MHz	QPSK,16QAM	1 RB / 0 RB Offset
	20425 to 20625	20425, 20525, 20625	5MHz	QPSK,16QAM	1 RB / 0 RB Offset
	20450 to 20600	20450, 20525, 20600	10MHz	QPSK,16QAM	1 RB / 0 RB Offset
RADIATED EMISSION	20407 to 20643	20450, 20525, 20600	1.4MHz	QPSK	1 RB / 0 RB Offset
	20415 to 20635	20525	3MHz	QPSK	1 RB / 0 RB Offset
	20425 to 20625	20525	5MHz	QPSK	1 RB / 0 RB Offset
	20450 to 20600	20525	10MHz	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 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
CONDUCDETED 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 call 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 22**

**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 / Portable station are limited to 7 watts e.r.p.

#### 3.1.2 TEST PROCEDURES

##### EIRP / ERP MEASUREMENT:

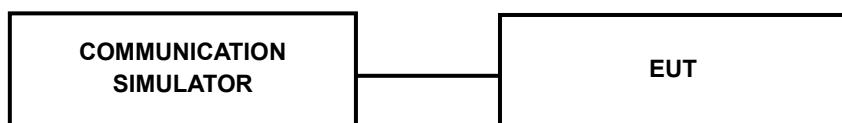
- a. All measurements were done at low, middle and high operational frequency range. RBW and VBW is1MHz for GSM, GPRS & EDGE, 5MHz for WCDMA mode and 10MHz for LTE mode.
- b. EIRP = Reading (dBm)+ RF cable loss (dB) + Antenna Gain (dBi)
- c. E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole, E.R.P power = E.I.R.P power - 2.15dBi.

##### CONDUCTED POWER MEASUREMENT:

The EUT was set up for the maximum power w 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 22 Test Data Appendix A**

**Note:** Total directional gain (dBi) = ANT gain (dBi) + array gain (dB)  
=0+10 log(2)=3.01 dBi

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

Total Conducted Power =  $10 \log(ANT0 \text{ Conducted Power} + ANT2 \text{ Conducted Power})$

ANT0,ANT2 The unit is mW.

Total EIRP = Total Conducted Power+ Total directional gain (dBi)

E.R.P power = E.I.R.P power - 2.15dBi.

### 3.2 FREQUENCY STABILITY MEASUREMENT

#### 3.2.1 LIMITS OF FREQUENCY STABILITY MEASUREMENT

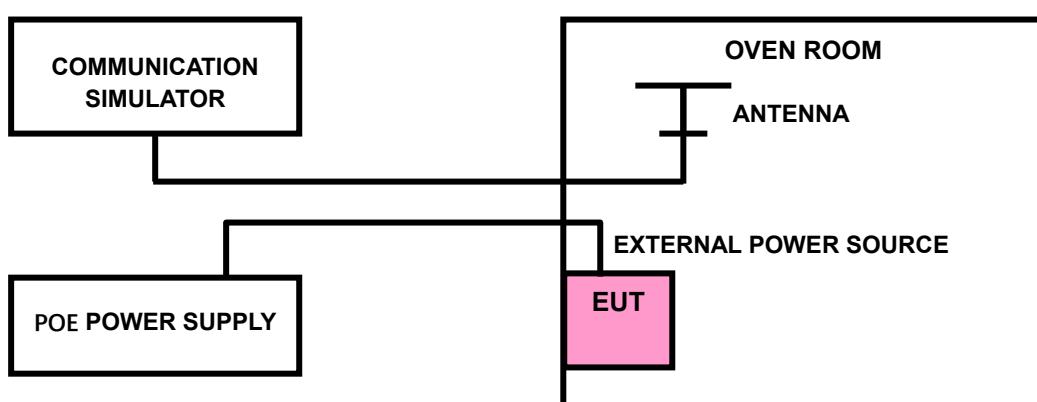
1.5 ppm is for base and fixed station. 2.5 ppm is for mobile station.

#### 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

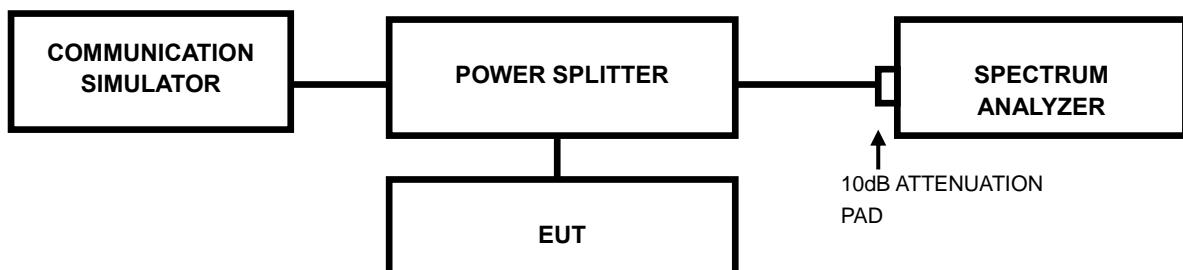
Refer to attached Part 22 Test Data Appendix F

### 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

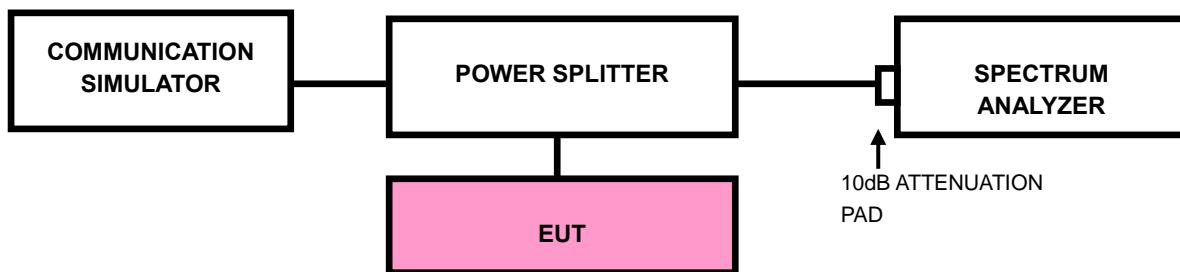
Refer to attached Part 22 Test Data Appendix C

### 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

- a. All measurements were done at low and high operational frequency range.
- b. The center frequency of spectrum is the band edge frequency and span is 1.5MHz. RBW of the spectrum is 10kHz and VBW of the spectrum is 30kHz (GSM/GPRS/EDGE).
- c. 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).
- d. 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).
- e. 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. Record the max trace plot into the test report.



#### 3.4.4 TEST RESULTS

**Refer to attached Part 22 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

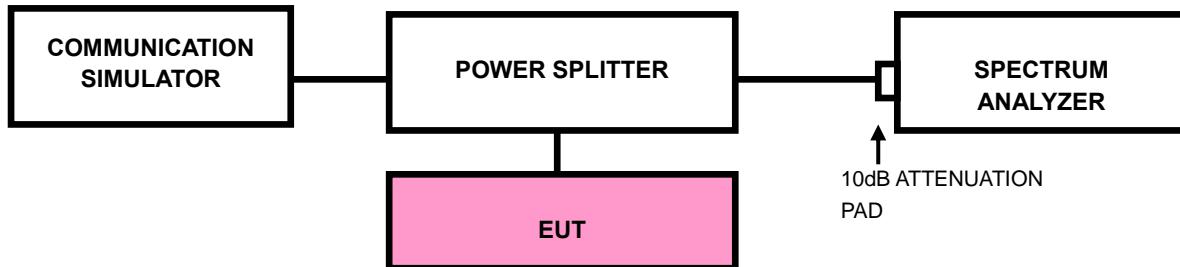
### 3.5.1 LIMITS OF CONDUCTED SPURIOUS EMISSIONS MEASUREMENT

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 9GHz. 10dB attenuation pad is connected with spectrum. RBW=1MHz and VBW=3MHz is used for conducted emission measurement.

### 3.5.3 TEST SETUP





## 3.5.4 TEST RESULTS

Refer to attached Part 22 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 Emissions measurement. In the Full-anechoic chamber, EUT placed on the 0.8m height of Turn Table below 1GHz and 1.5m height of Turn Table above 1GHz, 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. Result = Output power level of S.G – TX cable loss + Antenna gain of substitution horn.

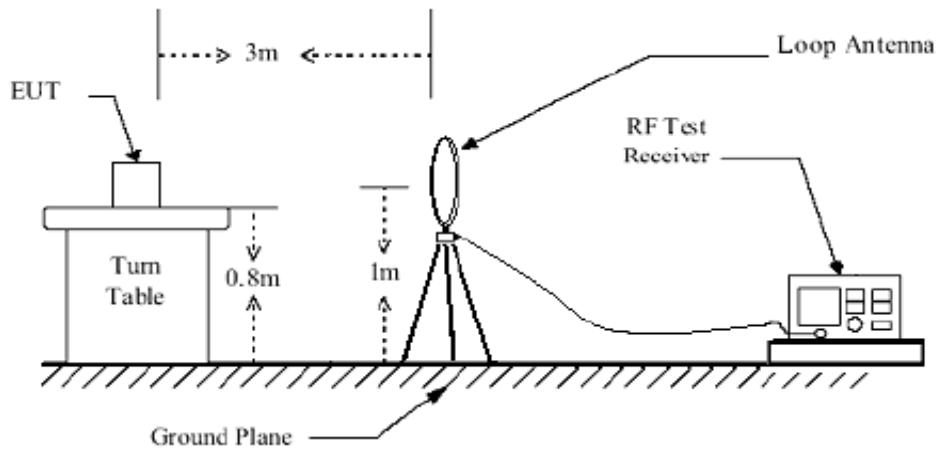
**NOTE:** The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1MHz/3MHz.

### 3.6.3 DEVIATION FROM TEST STANDARD

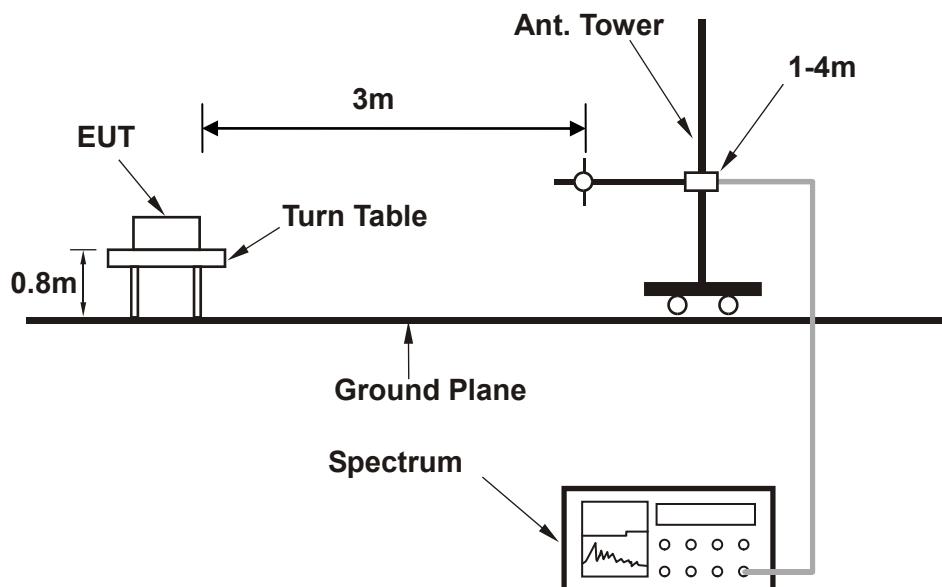
No deviation

### 3.6.4 TEST SETUP

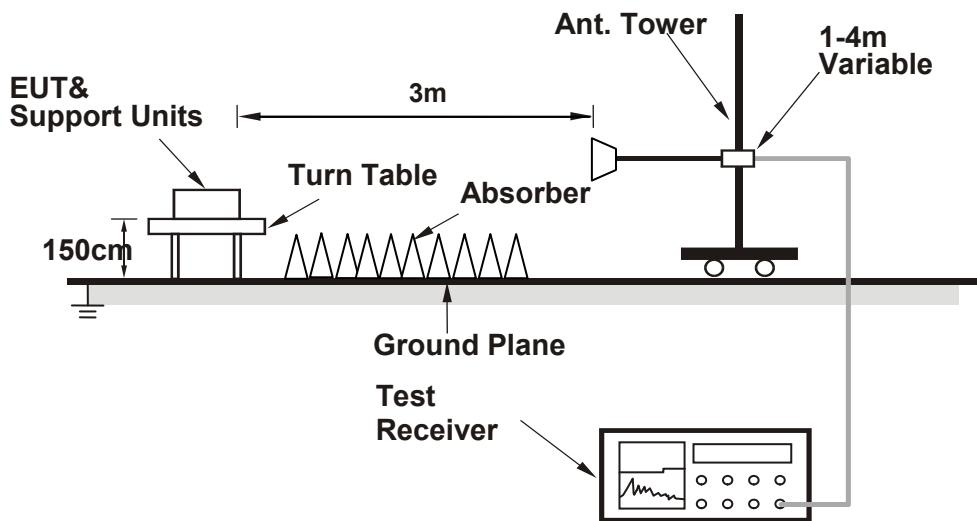
#### <Below 30MHz>



#### < 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 22 Test Data Appendix G

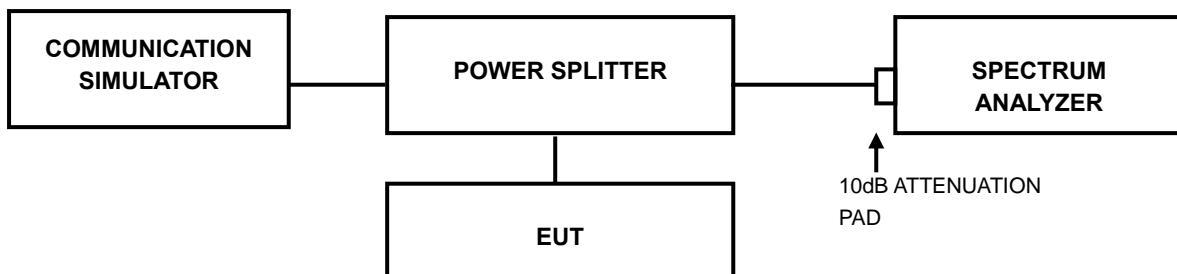
Note: For the test results, the EUT had been tested with all conditions. But only the worst case (MIMO Mode) was shown in test report.

### 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 22 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:*

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*Post Code : 510663      Tel : 020-32293888*

*FAX : 020-32293889      E-mail : office@cvc.org.cn*

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