



## CTC Laboratories, Inc.

1-2/F., Building 2, Jiaquan Building, Guanlan High-Tech Park, Shenzhen, Guangdong, China

Tel: +86-755-27521059 Fax: +86-755-27521011 Http://www.sz-ctc.com.cn

# TEST REPORT

**Report No.** .....: **CTC20210767E02**  
**FCC ID**.....: **2AZPZ-T25**  
**IC**.....: **27212-T25**  
**Applicant**.....: **YAHAM OPTOELECTRONICS CO., LTD**  
**Address**.....: Bldg. A&D, Yongwei Industrial Park, #118 Yongfu Road, Fuhai Str., Bao'an Dist. Shenzhen China  
**Manufacturer**.....: YAHAM OPTOELECTRONICS CO., LTD  
**Address**.....: Bldg. A&D, Yongwei Industrial Park, #118 Yongfu Road, Fuhai Str., Bao'an Dist. Shenzhen China  
**Product Name**.....: **Taxi Roof LED Display**  
**Trade Mark**.....: /  
**Model/Type reference**.....: YHT-TAXI-T2.5  
**Listed Model(s)** .....: YHT-TAXI-T2.96, YHT-TAXI-T3.33  
**Standard**.....: **FCC CFR47 PART 22H, 24E**  
**RSS-132 ISSUE 3, RSS-133 ISSUE 6**  
**Date of receipt of test sample**...: Apr. 21, 2021  
**Date of testing**.....: Apr. 21, 2021 to May 21, 2021  
**Date of issue**.....: May 21, 2021  
**Result**.....: **PASS**

Compiled by:

(Printed name+signature)

Jim Jiang

*Jim Jiang*

Supervised by:

(Printed name+signature)

Miller Ma

*Miller Ma*

Approved by:

(Printed name+signature)

Walter Chen

*Walter Chen*

**Testing Laboratory Name**.....: **CTC Laboratories, Inc.**

**Address**.....: 1-2/F., Building 2, Jiaquan Building, Guanlan High-Tech Park, Shenzhen, Guangdong, China

This test report may be duplicated completely for legal use with the approval of the applicant. It should not be reproduced except in full, without the written approval of our laboratory. The client should not use it to claim product endorsement by CTC. The test results in the report only apply to the tested sample. The test report shall be invalid without all the signatures of testing engineers, reviewer and approver. Any objections must be raised to CTC within 15 days since the date when the report is received. It will not be taken into consideration beyond this limit. The test report merely correspond to the test sample.



## Table of Contents

## Page

<b>1. SUMMARY.....</b>	<b>3</b>
1.1. TEST STANDARDS.....	3
1.2. REPORT VERSION .....	3
1.3. TEST DESCRIPTION.....	4
1.4. TEST FACILITY .....	5
1.5. MEASUREMENT UNCERTAINTY .....	6
1.6. ENVIRONMENTAL CONDITIONS.....	6
<b>2. GENERAL INFORMATION .....</b>	<b>7</b>
2.1. CLIENT INFORMATION .....	7
2.2. GENERAL DESCRIPTION OF EUT .....	7
2.3. DESCRIPTION OF TEST MODES AND TEST FREQUENCY.....	7
2.4. MEASUREMENT INSTRUMENTS LIST .....	8
<b>3. TEST ITEM AND RESULTS .....</b>	<b>10</b>
3.1. CONDUCTED OUTPUT POWER .....	10
3.2. PEAK-TO-AVERAGE RATIO .....	11
3.3. OCCUPY BANDWIDTH.....	12
3.4. OUT OF BAND EMISSIONS .....	13
3.5. RECEIVER SPURIOUS EMISSIONS AT ANTENNA TERMINAL .....	14
3.6. BAND EDGE COMPLIANCE .....	16
3.7. RADIATED POWER MEASUREMENT .....	18
3.8. RADIATED SPURIOUS EMISSION.....	21
3.9. FREQUENCY STABILITY .....	25

CTC Laboratories, Inc.

1-2/F., Building 2, Jiaquan Building, Guanlan High-Tech Park, Shenzhen, Guangdong, China

Tel.: (86)755-27521059

Fax: (86)755-27521011

Http://www.sz-ctc.org.cn



For anti-fake verification, please visit the official website of Certification and Accreditation Administration of the People's Republic of China : <http://yz.cnca.cn>



# 1. SUMMARY

## 1.1. Test Standards

[FCC Rules Part 2:](#) FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS

[FCC Rules Part 22:](#) PRIVATE LAND MOBILE RADIO SERVICES.

[FCC Rules Part 24:](#) PUBLIC MOBILE SERVICES

[ANSI C63.26: 2015:](#) American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services

[KDB 971168 D01 Power Meas License Digital Systems v03:](#) MEASUREMENT GUIDANCE FOR CERTIFICATION OF LICENSED DIGITAL TRANSMITTERS

[RSS-Gen Issue 5:](#) General Requirements for Compliance of Radio Apparatus

[RSS-132 Issue 3:](#) Cellular Telephone Systems Operating in the Bands 824-849MHz and 869-894MHz.

[RSS-133 Issue 6:](#) 2 GHz Personal Communications Services

## 1.2. Report Version

Revised No.	Date of issue	Description
01	May 21, 2021	Original

CTC Laboratories, Inc.

1-2/F., Building 2, Jiaquan Building, Guanlan High-Tech Park, Shenzhen, Guangdong, China

Tel.: (86)755-27521059

Fax: (86)755-27521011

Http://www.sz-ctc.org.cn



For anti-fake verification, please visit the official website of Certification and Accreditation Administration of the People's Republic of China : <http://yz.cnca.cn>



### 1.3. Test Description

Test Item	Section in CFR 47	RSS Rule	Result	Test Engineer
Conducted Output Power	Part 2.1046 Part 22.913(a) Part 24.232(c)	RSS-132(5.4) RSS-133(6.4)	Pass	Rod Luo
Peak-to-Average Ratio	Part 24.232	RSS-132(5.4) RSS-133(6.4)	Pass	Rod Luo
99% Occupied Bandwidth & 26 dB Bandwidth	Part 2.1049 Part 22.917(b) Part 24.238(b)	RSS-GEN(6.6) RSS-133(6.5)	Pass	Rod Luo
Band Edge	Part 2.1051 Part 22.917 Part 24.238	RSS-132(5.5) RSS-133(6.5)	Pass	Rod Luo
Conducted Spurious Emissions	Part 2.1051 Part 22.917 Part 24.238	RSS-132(5.5) RSS-133(6.5)	Pass	Rod Luo
Frequency stability vs temperature	Part 2.1055(a)(1)(b) Part 22.355 Part 24.235	RSS-GEN(6.11) RSS-132(5.3)	Pass	Rod Luo
Frequency stability vs voltage	Part 2.1055(d)(1)(2) Part 22.355 Part 24.235	RSS-GEN(6.11) RSS-132(5.3)	Pass	Rod Luo
ERP and EIRP	Part 22.913(a) Part 24.232(b)	RSS-132(5.4) RSS-133(6.4)	Pass	Rod Luo
Radiated Spurious Emissions	Part 2.1053 Part 22.917 Part 24.238	RSS-132(5.5) RSS-133(6.5)	Pass	Rod Luo
Receiver Spurious Emissions	/	RSS-GEN(7.1.3)	Pass	Rod Luo

Note:

1. The measurement uncertainty is not included in the test result.
2. The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, Part 22, Part 24, FCC KDB 971168 D01 v03r01/ D02 v02r01, KDB 412172 D01 v01r01, ANSI C63.26:2015, IC RSS-132, RSS-133.

CTC Laboratories, Inc.

1-2/F., Building 2, Jiaquan Building, Guanlan High-Tech Park, Shenzhen, Guangdong, China  
Tel.: (86)755-27521059 Fax: (86)755-27521011 Http://www.sz-ctc.org.cn



For anti-fake verification, please visit the official website of Certification and Accreditation Administration of the People's Republic of China : <http://yz.cnca.cn>



## 1.4. Test Facility

### Address of the report laboratory

#### CTC Laboratories, Inc.

Add: 2/F., Building 1 and 1-2/F., Building 2, Jiaquan Building, Guanlan High-Tech Park, Longhua District, Shenzhen, Guangdong, China

### Laboratory accreditation

The test facility is recognized, certified, or accredited by the following organizations:

#### CNAS-Lab Code: L5365

CTC Laboratories, Inc. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation. Criteria for Testing and Calibration Laboratories (identical to ISO/IEC17025: 2017 General Requirements) for the Competence of Testing and Calibration Laboratories.

#### A2LA-Lab Cert. No.: 4340.01

CTC Laboratories, Inc. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2017 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

#### Industry Canada (Registration No.: 9783A, CAB Identifier: CN0029)

CTC Laboratories, Inc. EMC Laboratory has been registered by Certification and Engineer Bureau of Industry Canada for the performance of with Registration NO.: 9783A on Jan, 2016.

#### FCC (Registration No.: 951311, Designation Number CN1208)

CTC Laboratories, Inc. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 951311, Aug. 26, 2017.

CTC Laboratories, Inc.

1-2/F., Building 2, Jiaquan Building, Guanlan High-Tech Park, Shenzhen, Guangdong, China  
Tel.: (86)755-27521059 Fax: (86)755-27521011 Http://www.sz-ctc.org.cn



For anti-fake verification, please visit the official website of Certification and Accreditation Administration of the People's Republic of China : <http://yz.cnca.cn>



## 1.5. Measurement Uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to TR-100028-01”

Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 1” and TR-100028-02 “Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 2 “ and is documented in the CTC Laboratories, Inc. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for General Testing & Inspection laboratory is reported:

Test Items	Measurement Uncertainty	Notes
Frequency stability	25 Hz	(1)
Transmitter power conducted	0.57 dB	(1)
Transmitter power Radiated	2.20 dB	(1)
Conducted spurious emission 9KHz-12.75 GHz	1.60 dB	(1)
Conducted Emission 9KHz-30MHz	3.39 dB	(1)
Radiated Emission 30~1000MHz	4.24 dB	(1)
Radiated Emission 1~18GHz	5.16 dB	(1)
Radiated Emission 18-40GHz	5.54 dB	(1)
Occupied Bandwidth	-----	(1)
Emission Mask	-----	(1)
Modulation Characteristic	-----	(1)
Transmitter Frequency Behavior	-----	(1)

Note: (1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of  $k=1.96$ .

## 1.6. Environmental Conditions

During the measurement the environmental conditions were within the listed ranges:

Normal Temperature:	21°C~27°C
Relative Humidity:	40%~60%
Air Pressure:	101kPa

CTC Laboratories, Inc.

1-2/F., Building 2, Jiaquan Building, Guanlan High-Tech Park, Shenzhen, Guangdong, China

Tel.: (86)755-27521059

Fax: (86)755-27521011

Http://www.sz-ctc.org.cn



For anti-fake verification, please visit the official website of Certification and Accreditation Administration of the People's Republic of China : <http://yz.cnca.cn>



## 2. GENERAL INFORMATION

### 2.1. Client Information

Applicant:	YAHAM OPTOELECTRONICS CO., LTD
Address:	Bldg. A&D, Yongwei Industrial Park, #118 Yongfu Road, Fuhai Str., Bao'an Dist. Shenzhen China
Manufacturer:	YAHAM OPTOELECTRONICS CO., LTD
Address:	Bldg. A&D, Yongwei Industrial Park, #118 Yongfu Road, Fuhai Str., Bao'an Dist. Shenzhen China

### 2.2. General Description of EUT

Product Name:	Taxi Roof LED Display
Trade Mark:	/
Model/Type reference:	YHT-TAXI-T2.5
Listed Model(s):	YHT-TAXI-T2.96, YHT-TAXI-T3.33
Model Difference:	All models are identical with each other except for LED spacing and LED numbers. Unless otherwise specified, all tests were performed on model YHT-TAXI-T2.5 to represent other models.
Power supply:	DC9~36V 34A~8A
Hardware version:	V1.0
Software version:	V1.0
<b>WCDMA</b>	
Operation Band:	Band II: UL: 1852.4MHz~1907.6MHz, DL: 1932.4MHz~1987.6MHz Band V: UL: 826.4MHz~846.6MHz, DL: 871.4MHz~891.6MHz
Modulation Type:	QPSK for WCDMA/HSUPA/HSDPA
Antenna Type:	Patch Antenna
Antenna Gain:	WCDMA II: 2.4dBi WCDMA V: 3.7dBi

### 2.3. Description of Test Modes and Test Frequency

The EUT has been tested under typical operating condition. The CMW500 used to control the EUT staying in continuous transmitting and receiving mode for testing.

Test Frequency:

WCDMA Band II		WCDMA Band V	
Channel	Frequency (MHz)	Channel	Frequency (MHz)
9262	1852.40	4132	826.40
9400	1880.00	4183	836.60
9538	1907.60	4233	846.60

CTC Laboratories, Inc.

1-2/F., Building 2, Jiaquan Building, Guanlan High-Tech Park, Shenzhen, Guangdong, China  
Tel.: (86)755-27521059 Fax: (86)755-27521011 Http://www.sz-ctc.org.cn



For anti-fake verification, please visit the official website of Certification and Accreditation Administration of the People's Republic of China : <http://yz.cnca.cn>



## 2.4. Measurement Instruments List

Output Power (Radiated) & Radiated Spurious Emission					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	EMI Test Receiver	R&S	ESCI	100967	Dec. 25, 2021
2	High pass filter	Compliance Direction systems	BSU-6	34202	Dec. 25, 2021
3	Log-Bicon Antenna	Schwarzbeck	CBL6141A	4180	Dec. 25, 2021
4	Log-Bicon Antenna	Schwarzbeck	CBL6141A	4181	Dec. 25, 2021
5	Spectrum Analyzer	HP	8563E	02052	Dec. 25, 2021
6	Horn Antenna	Schwarzbeck	BBHA 9120D	648	Dec. 25, 2021
7	Horn Antenna	Schwarzbeck	BBHA 9120D	649	Dec. 25, 2021
8	Ultra-Broadband Antenna	ShwarzBeck	BBHA9170	25841	Dec. 25, 2021
9	Ultra-Broadband Antenna	ShwarzBeck	BBHA9170	25842	Dec. 25, 2021
10	Pre-Amplifier	HP	8447D	1937A03050	Dec. 25, 2021
11	Pre-Amplifier	EMCI	EMC051835	980075	Dec. 25, 2021
12	Splitter	Mini-Circuit	ZAPD-4	400059	Dec. 25, 2021
13	Signal Generator	Agilent	N5182A	1019356	Dec. 25, 2021
14	Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	116410	Dec. 25, 2021
15	Antenna Mast	UC	UC3000	N/A	N/A
16	Antenna mast	MATURO	TAM-4.0-P	N/A	N/A
17	Turn Table	UC	UC3000	N/A	N/A
18	Cable Below 1GHz	Schwarzbeck	AK9515E	33155	Dec. 25, 2021
19	Cable Above 1GHz	Hubersuhner	SUCOFLEX102	DA1580	Dec. 25, 2021

Output Power(Conducted) & Occupied Bandwidth & Emission Bandwidth & Band Edge Compliance & Conducted Spurious Emission					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	116410	Dec. 25, 2021
2	Spectrum Analyzer	Rohde & Schwarz	FSU	100105	Dec. 25, 2021
3	Spectrum Analyzer	Rohde & Schwarz	FUV40-N	101331	Mar. 15, 2022
4	Splitter	Mini-Circuit	ZAPD-4	400059	Dec. 25, 2021
5	RF Connection Cable	HUBER+SUHNER	RE-7-FL	N/A	Dec. 25, 2021
6	RF Connection Cable	Chengdu E-Microwave	---	---	Dec. 25, 2021
7	Attenuator	Chengdu E-Microwave	EMCAXX-10RN Z-3	---	Dec. 25, 2021

Frequency Stability					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	116410	Dec. 25, 2021

CTC Laboratories, Inc.

1-2/F., Building 2, Jiaquan Building, Guanlan High-Tech Park, Shenzhen, Guangdong, China

Tel.: (86)755-27521059

Fax: (86)755-27521011

Http://www.sz-ctc.org.cn



For anti-fake verification, please visit the official website of Certification and Accreditation Administration of the People's Republic of China : <http://yz.cnca.cn>



2	Spectrum Analyzer	Rohde & Schwarz	FSU	100105	Dec. 25, 2021
3	Spectrum Analyzer	Rohde & Schwarz	FUV40-N	101331	Mar. 15, 2022
4	Splitter	Mini-Circuit	ZAPD-4	400059	Dec. 25, 2021
5	Climate Chamber	ESPEC	EL-10KA	05107008	Dec. 25, 2021

Note:

1. The Cal. Interval was one year.
2. The cable loss has calculated in test result which connection between each test instruments.

CTC Laboratories, Inc.

1-2/F., Building 2, Jiaquan Building, Guanlan High-Tech Park, Shenzhen, Guangdong, China  
Tel.: (86)755-27521059

Fax: (86)755-27521011      [Http://www.sz-ctc.org.cn](http://www.sz-ctc.org.cn)



For anti-fake verification, please visit the official website of Certification and Accreditation Administration of the People's Republic of China : <http://yz.cnca.cn>

### 3. TEST ITEM AND RESULTS

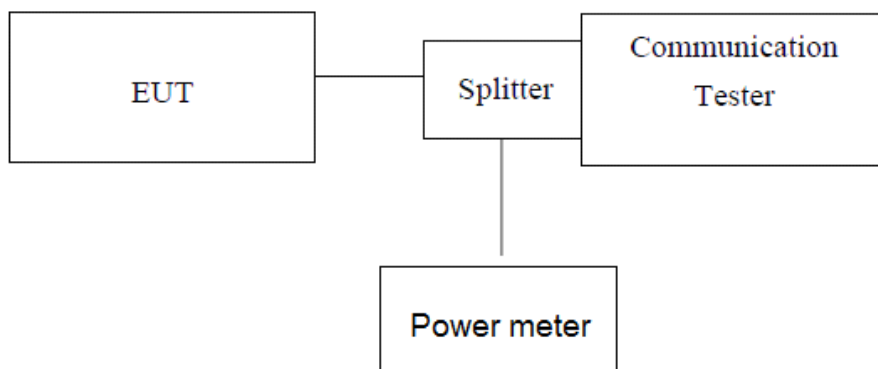
#### 3.1. Conducted Output Power

##### LIMIT

FCC: §2.1046, §22.913, §24.232

IC: RSS 132§5.4, RSS 133§6.4

##### TEST CONFIGURATION



*Note: Measurement setup for testing on Antenna connector*

##### TEST PROCEDURE

1. The transmitter output port was connected to base station.
2. The RF output of EUT was connected to the power meter by RF cable and attenuator, the path loss was compensated to the results for each measurement.
3. Set EUT at maximum power through base station.
4. Select lowest, middle, and highest channels for each band and different modulation.
5. Measure the maximum PK burst power and maximum Avg. burst power.

##### TEST RESULT

Please see the Appendix A.

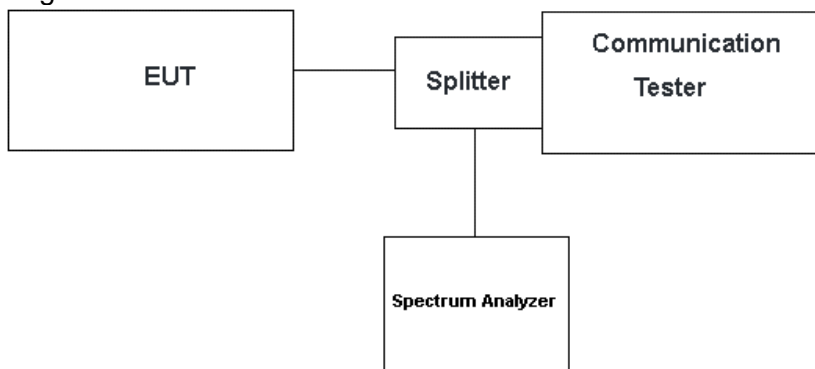
## 3.2. Peak-to-Average Ratio

### LIMIT

In addition, the peak-to-average power ratio (PAPR) of the transmitter shall not exceed 13 dB for more than 0.1% of the time and shall use a signal corresponding to the highest PAPR during periods of continuous transmission.

### TEST CONFIGURATION

- For Peak-to-Average Ratio



### TEST PROCEDURE

- For Peak-to-Average Ratio
  1. The testing follows FCC KDB 971168 v02r02 Section 5.7.1.
  2. The EUT was connected to spectrum and communication tester via a splitter
  3. Set the CCDF (Complementary Cumulative Distribution Function) option in spectrum analyzer.
  4. The highest RF powers were measured and recorded the maximum PAPR level associated with a probability of 0.1 %.
  6. Record the deviation as Peak to Average Ratio.

### TEST RESULT

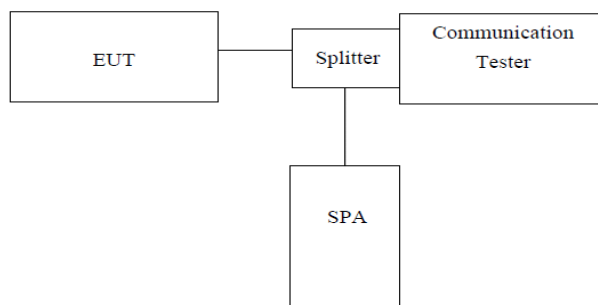
Please see the Appendix B.

### 3.3. Occupy Bandwidth

#### LIMIT

For reporting purposes only.

#### TEST CONFIGURATION



*Note: Measurement setup for testing on Antenna connector*

#### TEST PROCEDURE

1. The EUT's output RF connector was connected with a short cable to the spectrum analyzer
2. RBW was set to about 1% of emission BW,  $VBW \geq 3$  times RBW.
3. -26dBc display line was placed on the screen (or 99% bandwidth), the occupied bandwidth is the delta frequency between the two points where the display line intersects the signal trace.

#### TEST RESULT

Please see the Appendix C.

### 3.4. Out Of Band Emissions

#### LIMIT

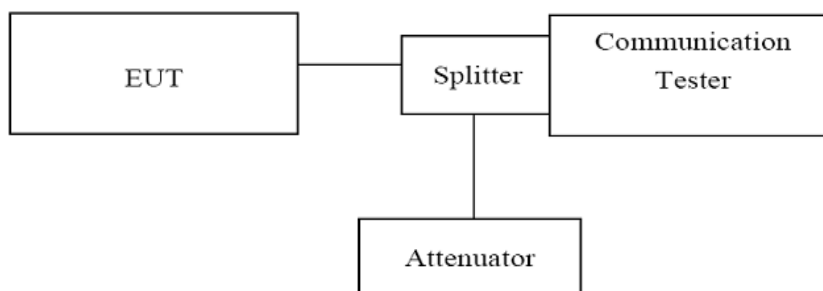
FCC: §22.917, §24.238

The minimum permissible attenuation level of any spurious emissions is  $43 + 10 \log (P)$  dB where transmitting power (P) in Watts.

IC: RSS 132§5.5, RSS 133§6.5

The minimum permissible attenuation level of any spurious emissions is  $43 + 10 \log (P)$  dB where transmitting power (P) in Watts.

#### TEST CONFIGURATION



#### TEST PROCEDURE

1. The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation.
2. The resolution bandwidth of the spectrum analyzer was set at 1MHz; sufficient scans were taken to show the out of band Emissions if any up to 10th harmonic.
3. For the out of band: Set the RBW = 1MHz VBW  $\geq 3$  times RBW, Start=30MHz, Stop= 10th harmonic.

#### TEST RESULT

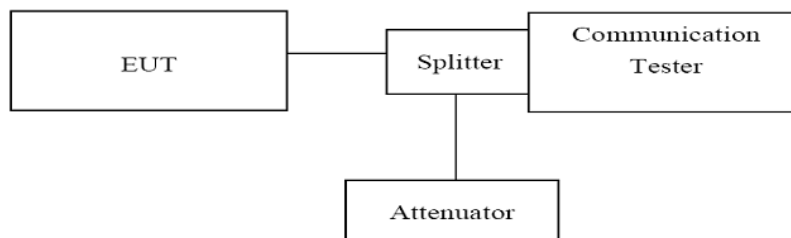
Please see the Appendix E.

### 3.5. Receiver Spurious Emissions at Antenna Terminal

#### LIMIT

RSS-GEN7.1.3, Receiver-spurious emissions at any discrete frequency shall not exceed 2 nW in the band 30-1000 MHz, nor 5 nW above 1000 MHz.

#### TEST CONFIGURATION

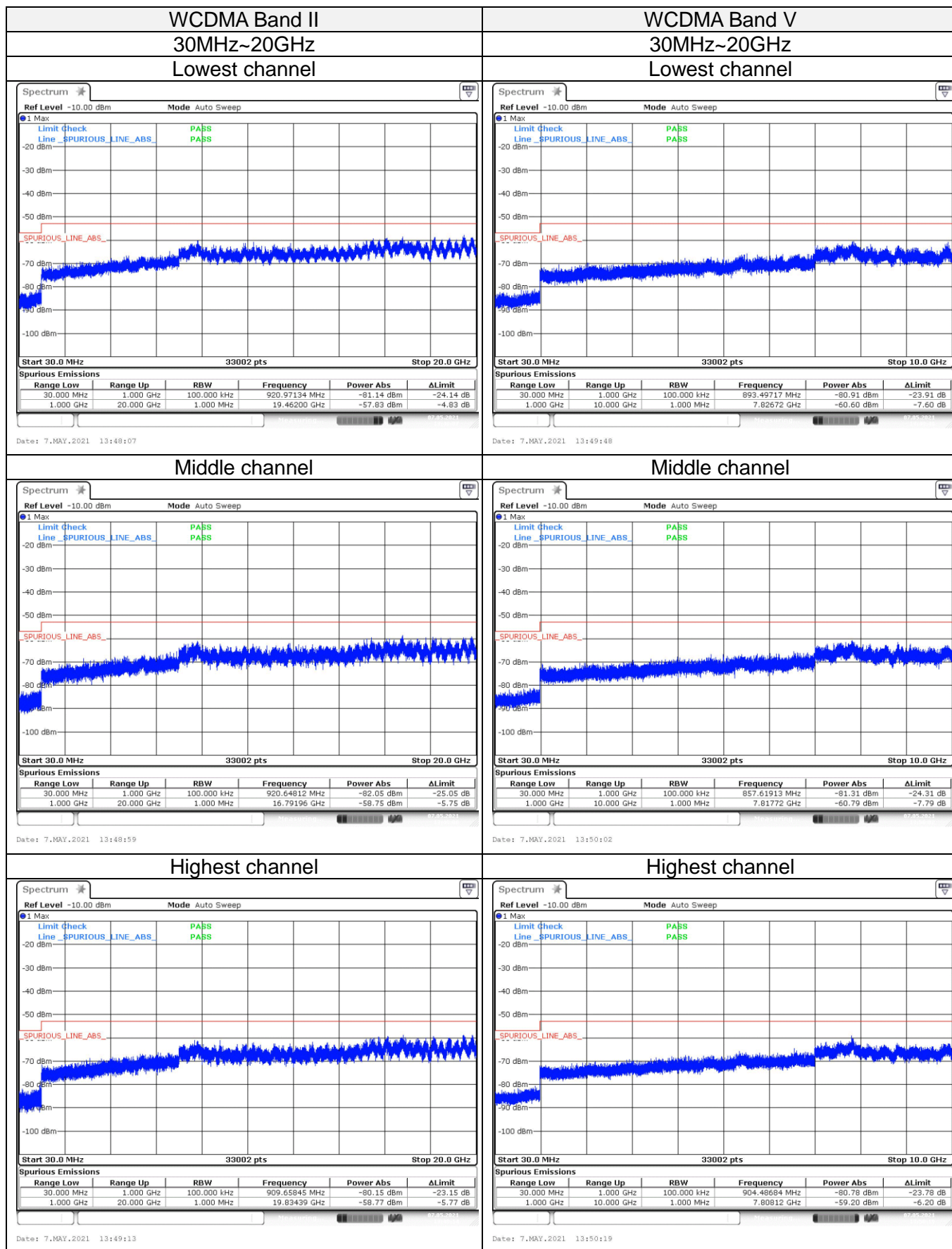


#### TEST PROCEDURE

1. The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation.
2. The resolution bandwidth of the spectrum analyzer was set at 1MHz, sufficient scans were taken to show the out of band Emissions if any up to 10th harmonic.
3. Set the RBW = 100kHz, VBW = 300kHz, Below 1GHz.
4. Set the RBW = 1MHz, VBW = 3MHz, Above 1GHz.
5. Start = 30MHz, Stop = 10th harmonic.

#### TEST RESULT

Remark: We test all modulation type and record worst case at Voice mode for WCDMA.



CTC Laboratories, Inc.

1-2/F., Building 2, Jiaquan Building, Guanlan High-Tech Park, Shenzhen, Guangdong, China

Tel.: (86)755-27521059

Fax: (86)755-27521011

Http://www.sz-ctc.org.cn



For anti-fake verification, please visit the official website of Certification and

Accreditation Administration of the People's Republic of China : <http://yz.cnca.cn>



### 3.6. Band Edge Compliance

#### LIMIT

FCC: §22.917, §24.238

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.

FCC: §90.691 Emission mask requirements for EA-based systems.

(a) Out-of-band emission requirement shall apply only to the “outer” channels included in an EA license and to spectrum adjacent to interior channels used by incumbent licensees. The emission limits are as follows:

(1) For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least  $116 \log_{10}(f/6.1)$  decibels or  $50 + 10 \log_{10}(P)$  decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz.

(2) For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least  $43 + 10 \log_{10}(P)$  decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5kHz.

IC: RSS 132§5.5

Mobile and base station equipment shall comply with the limits in (i) and (ii) below.

(i) In the first 1.0 MHz band immediately outside and adjacent to each of the sub-bands specified in Section 5.1, the power of emissions per any 1% of the occupied bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least  $43 + 10 \log_{10}p$  (watts).

(ii) After the first 1.0 MHz immediately outside and adjacent to each of the sub-bands, the power of emissions in any 100 kHz bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least  $43 + 10 \log_{10} p$  (watts). If the measurement is performed using 1% of the occupied bandwidth, power integration over 100 kHz is required.

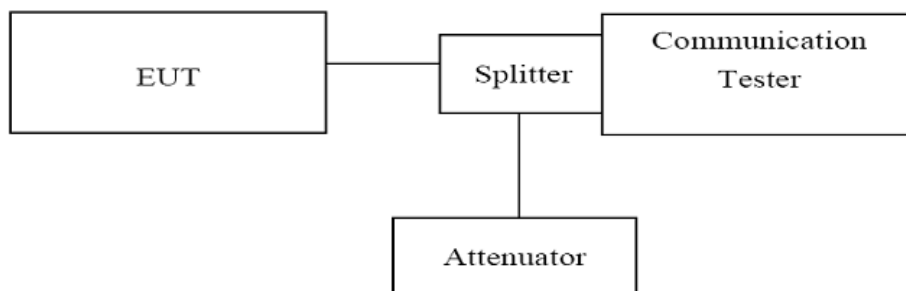
IC: RSS 133§6.5

Equipment shall comply with the limits in (i) and (ii) below.

(i) In the 1.0 MHz bands immediately outside and adjacent to the equipment's operating frequency block, the emission power per any 1% of the emission bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least  $43 + 10 \log_{10}p$  (watts).

(ii) After the first 1.0 MHz, the emission power in any 1 MHz bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least  $43 + 10 \log_{10}p$  (watts). If the measurement is performed using 1% of the emission bandwidth, power integration over 1.0 MHz is required.

## **TEST CONFIGURATION**



## **TEST PROCEDURE**

The transmitter output was connected to a R&S CMW500 Test Set and configured to operate at maximum power. The band edge emissions were measured at the required operating frequencies in each band on the Spectrum Analyzer.

For each band edge measurement:

- Set the spectrum analyzer span to include the block edge frequency.
- Set a marker to point the corresponding band edge frequency in each test case.
- Set display line at -13 dBm.
- Set resolution bandwidth to at least 1% of emission bandwidth.

## **TEST RESULT**

Please see the Appendix D.

### 3.7. Radiated Power Measurement

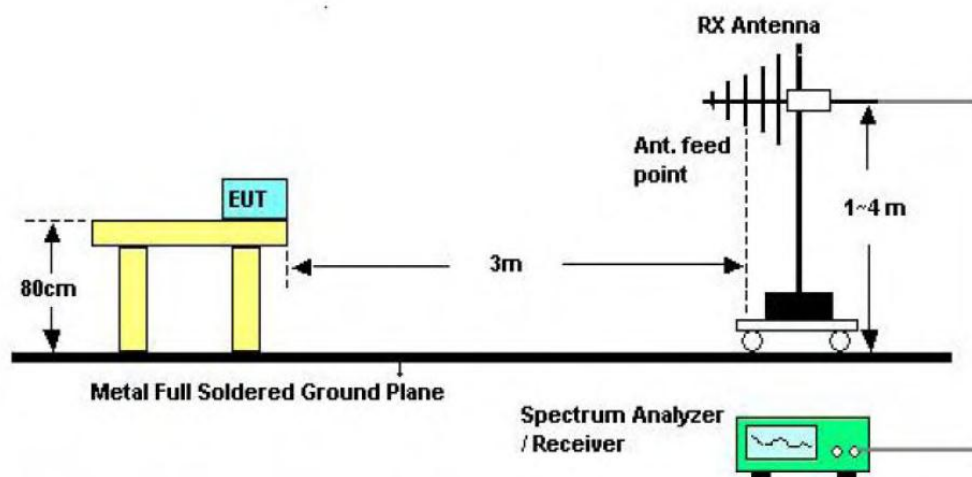
#### LIMIT

FCC: §2.1046, §22.913, §24.232

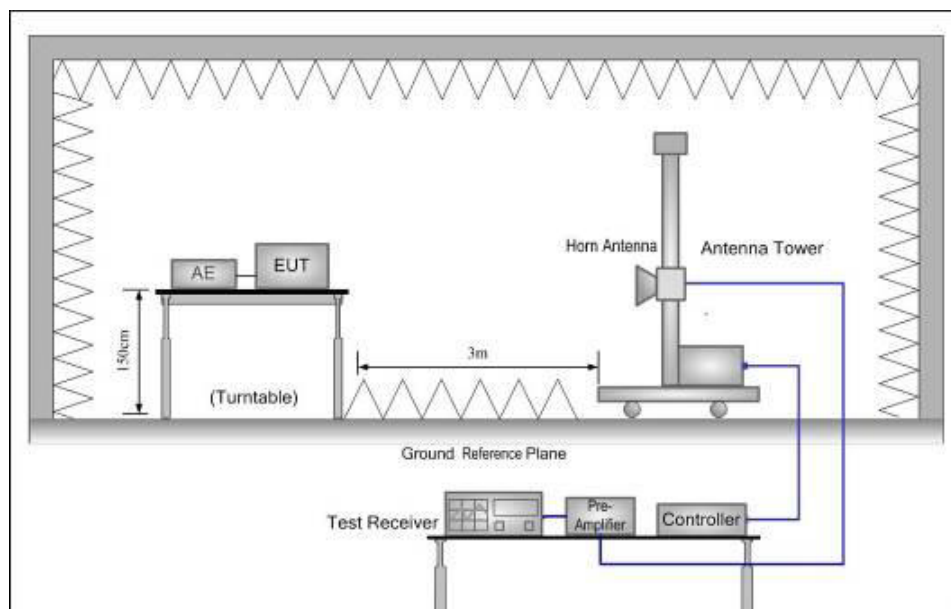
IC: RSS 132§5.4, RSS 133§6.4

#### TEST CONFIGURATION

For the actual test configuration, please refer to the related Item – EUT Test Photos.



Below 1GHz



Above 1GHz

CTC Laboratories, Inc.

1-2/F., Building 2, Jiaquan Building, Guanlan High-Tech Park, Shenzhen, Guangdong, China

Tel.: (86)755-27521059

Fax: (86)755-27521011

Http://www.sz-ctc.org.cn



## **TEST PROCEDURE**

1. EUT was placed on a 1.50 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1.50m. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all transmit frequencies in three channels (High, Middle, Low) were measured with peak detector.
2. A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.
3. The EUT is then put into continuously transmitting mode at its maximum power level during the test. Set Test Receiver or Spectrum RBW=1MHz, VBW=3MHz, and the maximum value of the receiver should be recorded as (Pr).
4. The EUT shall be replaced by a substitution antenna. In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (PMea) is applied to the input of the substitution antenna, and adjusts the level of the signal generator output until the value of the receiver reach the previously recorded (Pr). The power of signal source (PMea) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.
5. An amplifier should be connected to the Signal Source output port. And the cable should be connecting between the Amplifier and the Substitution Antenna. The cable loss (Pcl), the Substitution Antenna Gain (Ga) and the Amplifier Gain (PAg) should be recorded after test.
6. The measurement results are obtained as described below:  
$$\text{Power(EIRP)} = \text{PMea} - \text{PAg} - \text{Pcl} + \text{Ga}$$

We used N5182A microwave signal generator which signal level can up to 33dBm,so we not used power Amplifier for substitution test; The measurement results are amend as described below:  
$$\text{Power(EIRP)} = \text{PMea} - \text{Pcl} + \text{Ga}$$
7. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.  
ERP can be calculated from EIRP by subtracting the gain of the dipole,  $\text{ERP} = \text{EIRP} - 2.15\text{dBi}$ .

## **TEST RESULT**

Note:

By preliminary testing and verifying three axis (X, Y and Z) position of EUT transmitted status, it was found that "X axis" position was the worst, and test data recorded in this report.

**Measurement Data (Worst case):**

Mode	Channel	Antenna Pol.	EIRP	Limit (dBm)	Result
WCDMA Band II (QPSK)	9262	V	27.77	33.00	Pass
		H	23.32		
	9400	V	26.46		
		H	24.53		
	9538	V	27.60		
		H	24.56		

Mode	Channel	Antenna Pol.	ERP	Limit (dBm)	Result
WCDMA Band V (QPSK)	4132	V	26.15	38.45	Pass
		H	24.17		
	4183	V	27.40		
		H	24.06		
	4233	V	26.79		
		H	24.15		

CTC Laboratories, Inc.

1-2/F., Building 2, Jiaquan Building, Guanlan High-Tech Park, Shenzhen, Guangdong, China  
Tel.: (86)755-27521059

Fax: (86)755-27521011 Http://www.sz-ctc.org.cn

For anti-fake verification, please visit the official website of Certification and Accreditation Administration of the People's Republic of China : <http://yz.cnca.cn>



### 3.8. Radiated Spurious Emission

#### LIMIT

FCC: §22.917(a), §24.238(a)

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.

IC: RSS 132§5.5

Mobile and base station equipment shall comply with the limits in (i) and (ii) below.

(i) In the first 1.0 MHz band immediately outside and adjacent to each of the sub-bands specified in Section 5.1, the power of emissions per any 1% of the occupied bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least  $43 + 10 \log_{10} p$  (watts).

(ii) After the first 1.0 MHz immediately outside and adjacent to each of the sub-bands, the power of emissions in any 100 kHz bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least  $43 + 10 \log_{10} p$  (watts). If the measurement is performed using 1% of the occupied bandwidth, power integration over 100 kHz is required.

IC: RSS 133§6.5

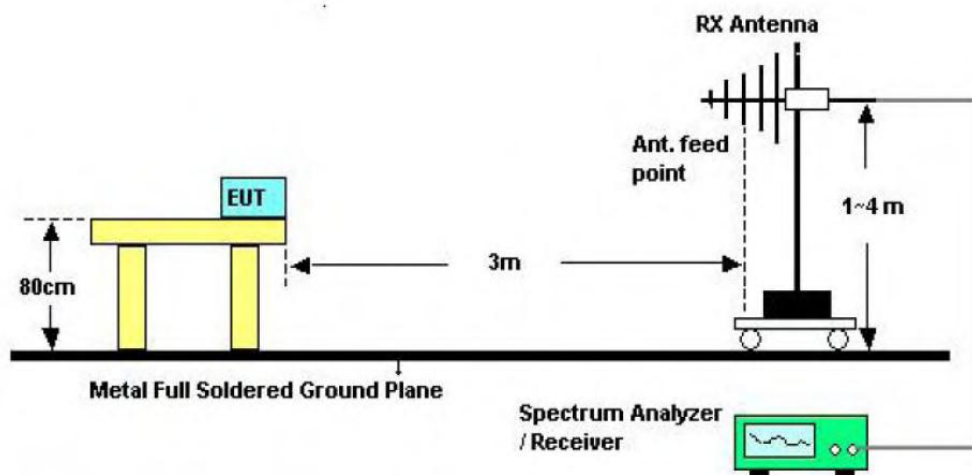
Equipment shall comply with the limits in (i) and (ii) below.

(i) In the 1.0 MHz bands immediately outside and adjacent to the equipment's operating frequency block, the emission power per any 1% of the emission bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least  $43 + 10 \log_{10} p$  (watts).

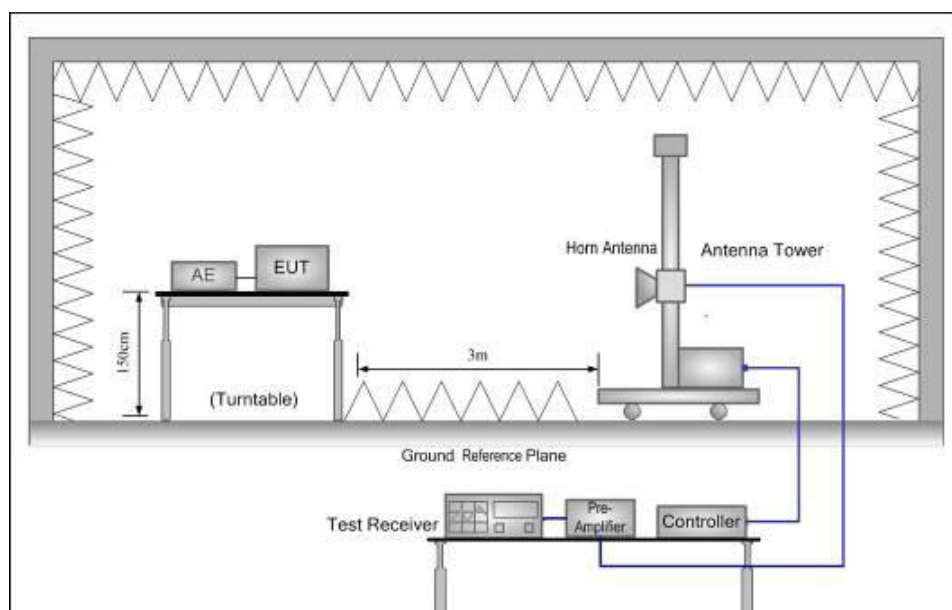
(ii) After the first 1.0 MHz, the emission power in any 1 MHz bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least  $43 + 10 \log_{10} p$  (watts). If the measurement is performed using 1% of the emission bandwidth, power integration over 1.0 MHz is required.

## TEST CONFIGURATION

For the actual test configuration, please refer to the related Item – EUT Test Photos.



Below 1GHz



Above 1GHz

CTC Laboratories, Inc.

1-2/F., Building 2, Jiaquan Building, Guanlan High-Tech Park, Shenzhen, Guangdong, China

Tel.: (86)755-27521059

Fax: (86)755-27521011

Http://www.sz-ctc.org.cn



## **TEST PROCEDURE**

1. EUT was placed on a 1.50 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1.50m. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all transmit frequencies in three channels (High, Middle, Low) were measured with peak detector.
2. A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.
3. The EUT is then put into continuously transmitting mode at its maximum power level during the test. Set Test Receiver or Spectrum RBW=1MHz, VBW=3MHz, and the maximum value of the receiver should be recorded as (Pr).
4. The EUT shall be replaced by a substitution antenna. In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (PMea) is applied to the input of the substitution antenna, and adjusts the level of the signal generator output until the value of the receiver reach the previously recorded (Pr). The power of signal source (PMea) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.
5. An amplifier should be connected to the Signal Source output port. And the cable should be connecting between the Amplifier and the Substitution Antenna. The cable loss (Pcl), the Substitution Antenna Gain (Ga) and the Amplifier Gain (PAg) should be recorded after test.
6. The measurement results are obtained as described below:  
$$\text{Power(EIRP)} = \text{PMea} - \text{PAg} - \text{Pcl} + \text{Ga}$$

We used SMF100A microwave signal generator which signal level can up to 33dBm,so we not used power Amplifier for substitution test; The measurement results are amend as described below:

$$\text{Power(EIRP)} = \text{PMea} - \text{Pcl} + \text{Ga}$$
7. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.  
ERP can be calculated from EIRP by subtracting the gain of the dipole,  $\text{ERP} = \text{EIRP} - 2.15\text{dBi}$ .
8. Test frequency range should extend to 10<sup>th</sup> harmonic of highest fundamental frequency.

## **TEST RESULT**

Remark:

1. By preliminary testing and verifying three axis (X, Y and Z) position of EUT transmitted status, it was found that "X axis" position was the worst, and test data recorded in this report.



WCDMA Band II									
Channel	Frequency (MHz)	Spurious Emission		Limit (dBm)	Result				
		Polarization	Level (dBm)						
9262	3705.20	Vertical	-36.85	-13.00	Pass				
	5557.80	Vertical	-52.10						
	3705.20	Horizontal	-49.99						
	5557.80	Horizontal	-51.48						
9400	3760.00	Vertical	-43.74			-13.00	Pass		
	5640.00	Vertical	-51.96						
	3760.00	Horizontal	-42.96						
	5640.00	Horizontal	-53.62						
9538	3814.80	Vertical	-40.95					-13.00	Pass
	5722.20	Vertical	-51.40						
	3814.80	Horizontal	-40.39						
	5722.20	Horizontal	-49.82						

Remark:

1. The emission levels of below 1 GHz are very lower than the limit above 10dB and not show in test report.

WCDMA Band V									
Channel	Frequency (MHz)	Spurious Emission		Limit (dBm)	Result				
		Polarization	Level (dBm)						
4132	1653.20	Vertical	-40.88	-13.00	Pass				
	2479.80	Vertical	-54.37						
	1653.20	Horizontal	-48.97						
	2479.80	Horizontal	-54.67						
4183	1672.80	Vertical	-42.76			-13.00	Pass		
	2509.20	Vertical	-51.14						
	1672.80	Horizontal	-46.26						
	2509.20	Horizontal	-50.53						
4233	1692.80	Vertical	-39.33					-13.00	Pass
	2539.20	Vertical	-50.18						
	1692.80	Horizontal	-46.41						
	2539.20	Horizontal	-54.75						

Remark:

1. The emission levels of below 1 GHz are very lower than the limit above 10dB and not show in test report.

CTC Laboratories, Inc.

1-2/F., Building 2, Jiaquan Building, Guanlan High-Tech Park, Shenzhen, Guangdong, China

Tel.: (86)755-27521059

Fax: (86)755-27521011

Http://www.sz-ctc.org.cn



For anti-fake verification, please visit the official website of Certification and Accreditation Administration of the People's Republic of China : <http://yz.cnca.cn>

### 3.9. Frequency Stability

#### LIMIT

FCC: §22.355

The carrier frequency shall not depart from the reference frequency in excess of  $\pm 2.5$  ppm for mobile stations.

FCC: §24.235

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

IC: RSS 132§5.3

The carrier frequency shall not depart from the reference frequency in excess of  $\pm 2.5$  SRSP for mobile stations and  $\pm 1.5$  ppm for base stations.

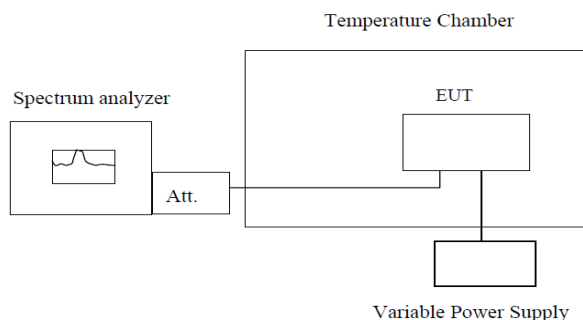
In lieu of meeting the above stability values, the test report may show that the frequency stability is sufficient to ensure that the occupied bandwidth stays within each of the sub-bands (see Section 5.1) when tested to the temperature and supply voltage variations specified in RSS-Gen.

IC: RSS 133§6.4

The carrier frequency shall not depart from the reference frequency, in excess of  $\pm 2.5$  ppm for mobile stations and  $\pm 1.0$  ppm for base stations.

In lieu of meeting the above stability values, the test report may show that the frequency stability is sufficient to ensure that the emission bandwidth stays within the operating frequency block when tested to the temperature and supply voltage variations specified in RSS-Gen.

#### TEST CONFIGURATION



Note : Measurement setup for testing on Antenna connector



## **TEST PROCEDURE**

1. The equipment under test was connected to an external DC power supply and input rated voltage.
2. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators.
3. The EUT was placed inside the temperature chamber.
4. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 25°C operating frequency as reference frequency.
5. Turn EUT off and set the chamber temperature to -30°C. After the temperature stabilized for approximately 30 minutes recorded the frequency.
6. Repeat step measure with 10°C increased per stage until the highest temperature of +50°C reached.
7. Reduce the input voltage to specified extreme voltage variation (+/- 15%) and endpoint, record the maximum frequency change.

## **TEST RESULT**

Please see the Appendix F.

\*\*\*\*\*THE END\*\*\*\*\*