

**FCC PART 22/24 TEST REPORT**

**FCC Part 22 / Part 24**

**Report Reference No.**.....: **LCS170928031AE3**

**FCC ID**.....: **X7I-GK310**

**Date of Issue**.....: **November 04, 2017**

**Testing Laboratory Name** .....: **Shenzhen LCS Compliance Testing Laboratory Ltd.**

**Address** .....: 1/F., Xingyuan Industrial Park, Tongda Road, Bao'an Avenue, Bao'an District, Shenzhen, Guangdong, China

**Applicant's name**.....: **Shenzhen Concox Information Technology Co.,Ltd**

**Address** .....: 4/F. Building C, Gaoxinqi Industrial Park, Liuxian 1st Road, No.67 Bao'an District, Shenzhen ,P.R.China

**Test specification** .....

**Standard** .....: **FCC Part 22: Public Mobile Services**

**FCC Part 24: Personal Communication Services**

**Test Report Form No** .....: LCSEMC-1.0

**TRF Originator**.....: Shenzhen LCS Compliance Testing Laboratory Ltd.

**Master TRF**.....: Dated 2011-03

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**Test item description** .....: **Personal GPS Tracker**

**Trade Mark** .....: N/A

**Model/Type reference**.....: GK310

**Listed Models** .....: ILW01 Z

**Ratings** .....: QPSK

DC 3.8V by Li-ion Battery (1500mAh)

Adapter model: HJ-0501000E1-US

**Modulation** .....: Charging parameter: Input: 100-240V~50/60Hz 0.2A ;

Output: DC 5V, 1A

**Hardware version** .....: KH3709\_V1.2

**Software version** .....: GK310\_11\_M35\_R0\_V01\_US

**Frequency Band** .....: UMTS Band II, UMTS Band V

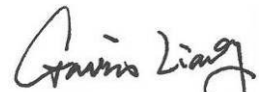
**Result**.....: **PASS**

**Compiled by:**

**Supervised by:**

**Approved by:**





Ace Chai/ Administrators

Dick Su/ Technique principal

Gavin Liang/ Manager

## TEST REPORT

<b>Test Report No. :</b>	<b>LCS170928031AE3</b>	November 04, 2017
		Date of issue

Equipment under Test : Personal GPS Tracker

Model /Type : GK310

Listed Models : ILW01 Z

Model Declaration : PCB board, structure and internal of these model(s) are the same, so no additional models were tested.

**Applicant** : **Shenzhen Concox Information Technology Co.,Ltd**

Address : 4/F.Building C, Gaoxinqi Industrial Park, Liuxian 1st Road, No,67 Bao'an District, Shenzhen ,P.R.China

**Manufacturer** : **Shenzhen Concox Information Technology Co.,Ltd**

Address : 4/F.Building C, Gaoxinqi Industrial Park, Liuxian 1st Road, No,67 Bao'an District, Shenzhen ,P.R.China

**Factory** : **Shenzhen Concox Information Technology Co.,Ltd**

Address : 4/F.Building C, Gaoxinqi Industrial Park, Liuxian 1st Road, No,67 Bao'an District, Shenzhen ,P.R.China

<b>Test Result:</b>	<b>PASS</b>
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The test report merely corresponds to the test sample.  
It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

## Revision History

Revision	Issue Date	Revisions	Revised By
00	November 04, 2017	Initial Issue	Gavin Liang

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# **1 TEST STANDARDS**

The tests were performed according to following standards:

[FCC Part 22](#): Private Land Mobile Radio Services.

[FCC Part 24](#): Public Mobile Services.

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

[47 CFR FCC Part 15 Subpart B](#): Unintentional Radiators.

[FCC Part 2](#): Frequency Allocations And Radio Treaty Matters: General Rules And Regulations.

[ANSI C63.4:2014](#): Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

[FCC KDB971168D01](#) Power Meas License Digital Systems

## 2 SUMMARY

### 2.1 General Remarks

Date of receipt of test sample	:	October 15, 2017
Testing commenced on	:	October 15, 2017
Testing concluded on	:	November 04, 2017

### 2.2 Product Description

The **Shenzhen Concox Information Technology Co.,Ltd**'s Model: GK310 or the "EUT" as referred to in this report; more general information as follows, for more details, refer to the user's manual of the EUT.

Name of EUT	Personal GPS Tracker
Model Number	GK310
Modulation Type	GMSK for GSM/GPRS, 8-PSK for EDGE, QPSK for UMTS, QPSK, 16QAM for LTE
Antenna Gain	1.0dBi (max.) For GSM 850; 1.0dBi (max.) For PCS 1900; 1.0dBi (max.) For WCDMA Band II; 1.0dBi (max.) For WCDMA Band V; 1.0dBi (max.) For LTE FDD Band 2; 1.21dBi (max.) For LTE FDD Band 4;
Hardware version	KH3709_V1.2
Software version	GK310_11_M35_R0_V01_US
GSM/EDGE/GPRS Operation Frequency Band	GPRS850/GPRS1900/EDGE850/EDGE1900
UMTS Operation Frequency Band	UMTS FDD Band II/V
LTE Operation Frequency Band	LTE FDD band 2, 4
GSM/EDGE/GPRS	Supported GSM/GPRS/EDGE
GSM Release Version	R99
GSM/EDGE/GPRS Power Class	GSM850:Power Class 4/ PCS1900:Power Class 1
GPRS/EDGE Multislot Class	GPRS/EDGE: Multi-slot Class 12
GPRS operation mode	Class B
WCDMA Release Version	R99
HSDPA Release Version	Release 8
HSUPA Release Version	Release 6
DC-HSUPA Release Version	Not Supported
LTE Release Version	R8
LTE/UMTS Power Class	Class 3
Antenna Type	Internal Antenna
Extreme temp. Tolerance	-20°C to +55°C
GPS function	Support and only RX
NFC Function	Not Supported
Extreme vol. Limits	3.50VDC to 4.20VDC (nominal: 3.80VDC)

### 2.3 Equipment under Test

#### Power supply system utilised

Power supply voltage	:	<input type="radio"/> 120V / 60 Hz	<input type="radio"/> 115V / 60Hz
		<input type="radio"/> 12 V DC	<input type="radio"/> 24 V DC
		<input checked="" type="radio"/> Other (specified in blank below)	

DC 3.80V

**Test frequency list**

Test Mode	TX/RX	RF Channel		
		Low(L)	Middle (M)	High (H)
WCDMA Band V	TX	Channel 4132	Channel 4183	Channel 4233
		826.4 MHz	836.6 MHz	846.6 MHz
	RX	Channel 4357	Channel 4407	Channel 4458
		871.4 MHz	881.4 MHz	891.6 MHz
Test Mode	TX/RX	RF Channel		
		Low(L)	Middle (M)	High (H)
WCDMA Band II	TX	Channel 9262	Channel 9400	Channel 9538
		1852.4 MHz	1880.0 MHz	1907.6 MHz
	RX	Channel 9662	Channel 9800	Channel 9938
		1932.4 MHz	1960.0 MHz	1987.6 MHz

**2.4 Short description of the Equipment under Test (EUT)**

**2.4.1 General Description**

GK310 is subscriber equipment in the WCDMA/GSM/LTE system. The HSPA/UMTS frequency band is Band II/V, LTE frequency band is band 2, band 4. The GSM/GPRS/EDGE frequency band includes GSM850 and GSM900 and DCS1800 and PCS1900, but only Band II, Band V, GSM850 and PCS1900 bands test data included in this report. The GK310 implements such functions as RF signal receiving/transmitting, HSPA/UMTS and GSM/GPRS/EDGE protocol processing voice, data tc.

NOTE: Unless otherwise noted in the report, the functional boards installed in the units shall be selected from the below list, but not means all the functional boards listed below shall be installed in one unit.

**2.5 Internal Identification of AE used during the test**

AE ID*	Description
AE1	Battery
AE2	Charger

AE2  
 Model: HJ-0501000E1-US  
 INPUT: 100-240V~50/60Hz 0.2A  
 OUTPUT: DC 5.0V 1A

\*AE ID: is used to identify the test sample in the lab internally.

**2.6 Normal Accessory setting**

Fully charged battery was used during the test.

**2.7 EUT configuration**

The following peripheral devices and interface cables were connected during the measurement:

- - supplied by the manufacturer
- - supplied by the lab

<input type="radio"/>	Power Cable	Length (m) :	/
		Shield :	/
		Detachable :	/
<input type="radio"/>	Multimeter	Manufacturer :	/
		Model No. :	/

## 2.8 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for **FCC ID: X71-GK310** filing to comply with FCC Part 22 and Part 24 Rules.

## 2.9 Modifications

No modifications were implemented to meet testing criteria.

## 2.10 General Test Conditions/Configurations

### 2.10.1 Test Modes

NOTE: The test mode(s) are selected according to relevant radio technology specifications.

Test Mode	Test Modes Description
UMTS/TM1	WCDMA system, QPSK modulation
UMTS/TM2	HSDPA system, QPSK modulation
UMTS/TM3	HSUPA system, QPSK modulation

Note:

1. This EUT owns one SIM cards, SIM 1 support GSM/UMTS/LTE;
2. We measured conducted power at SIM 1 recorded worst case at SIM 1, after pre-check, we measured other items at SIM 1.
3. As GSM and GPRS with the same emission designator, test result recorded in this report at the worst case GSM/TM1 only after exploratory scan

### 2.10.2 Test Environment

Environment Parameter	Selected Values During Tests	
Relative Humidity	Ambient	
Temperature	TN	Ambient
Voltage	VL	3.50V
	VN	3.80V
	VH	4.20V

NOTE: VL=lower extreme test voltage VN=nominal voltage  
VH=upper extreme test voltage TN=normal temperature



### 3 TEST ENVIRONMENT

#### 3.1 Address of the test laboratory

**Shenzhen LCS Compliance Testing Laboratory Ltd**

1/F., Xingyuan Industrial Park, Tongda Road, Bao'an Avenue, Bao'an District, Shenzhen, Guangdong, China

The sites are constructed in conformance with the requirements of ANSI C63.4 (2014) and CISPR Publication 22.

#### 3.2 Test Facility

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

- CNAS Registration Number. is L4595.
- FCC Registration Number. is 254912.
- Industry Canada Registration Number. is 9642A-1.
- ESMD Registration Number. is ARCB0108.
- UL Registration Number. is 100571-492.
- TUV SUD Registration Number. is SCN1081.
- TUV RH Registration Number. is UA 50296516-001
- NVLAP Registration Code is 600167-0

#### 3.3 Environmental conditions

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

Temperature:	15-35 ° C
Humidity:	30-60 %
Atmospheric pressure:	950-1050mbar

(1)expressed at approximately the 95% confidence level using a coverage factor of k=1.96.

#### 3.4 Test Description

##### 3.4.1 Cellular Band (824-849MHz paired with 869-894MHz) (Band V)

Test Item	FCC Rule No.	Requirements	Verdict
Effective(Isotropic) Radiated Output Power	§2.1046, §22.913	FCC: ERP ≤ 7W.	Pass
Modulation Characteristics	§2.1047	Digital modulation	N/A
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.	Pass
Band Edges Compliance	§2.1051, §22.917	≤-13dBm/1%*EBW, in 1MHz bands immediately outside and adjacent to The frequency block.	Pass
Spurious Emission at Antenna Terminals	§2.1051, §22.917	≤ -13dBm/100kHz, from 9 KHz to 10 <sup>th</sup> harmonics but outside authorized operating frequency ranges.	Pass
Field Strength of Spurious Radiation	§2.1053, §22.917	≤ -13dBm/100kHz.	Pass
Frequency Stability	§2.1055, §22.355	≤ ±2.5ppm.	Pass
Peak-Average Ratio	N/A	≤13dB	Pass
Receiver Spurious Emissions	N/A	--	Pass

NOTE 1: For the verdict, the "N/A" denotes "not applicable", the "N/T" de notes "not tested".

### 3.4.2 PCS Band (1850-1915MHz paired with 1930-1995MHz) (Band II)

Test Item	FCC Rule No.	Requirements	Verdict
Effective(Isotropic) Radiated Output Power	§2.1046, §24.232	EIRP ≤ 2W	Pass
Peak-Average Ratio	§2.1046, §24.232	≤13dB	Pass
Modulation Characteristics	§2.1047	Digital modulation	N/A
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.	Pass
Band Edges Compliance	§2.1051, §24.238	≤ -13dBm/1%*EBW, In 1MHz bands immediately outside and adjacent to The frequency block.	Pass
Spurious Emission at Antenna Terminals	§2.1051, §24.238	≤-13dBm/1MHz, from 9kHz to 10 <sup>th</sup> harmonics but outside authorized operating frequency ranges.	Pass
Field Strength of Spurious Radiation	§2.1053, §24.238	≤ -13dBm/1MHz.	Pass
Frequency Stability	§2.1055, §24.235	≤ ±2.5ppm.	Pass
Receiver Spurious Emissions	N/A	--	Pass

NOTE 1: For the verdict, the "N/A" denotes "not applicable", the "N/T" de notes "not tested".

Remark: 1.The measurement uncertainty is not included in the test result.

### 3.5 Equipments Used during the Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1	Power Meter	R&S	NRVS	100444	2017-06-17	2018-06-16
2	Power Sensor	R&S	NRV-Z81	100458	2017-06-17	2018-06-16
3	Power Sensor	R&S	NRV-Z32	10057	2017-06-17	2018-06-16
4	X-series USB Peak and Average Power Sensor Aglient	Agilent	U2021XA	MY54080022	2017-10-26	2018-10-25
5	4 CH. Simultaneous Sampling 14 Bits 2MS/s	Agilent	U2531A	MY54080016	2017-10-26	2018-10-25
6	Test Software	Ascentest	AT890-SW	20160630	N/A	N/A
7	RF Control Unit	Ascentest	AT890-RFB	N/A	2017-06-17	2018-06-16
8	ESA-E SERIES SPECTRUM ANALYZER	Agilent	E4407B	MY41440754	2017-11-17	2018-11-16
9	MXA Signal Analyzer	Agilent	N9020A	MY49100040	2017-06-17	2018-06-16
10	SPECTRUM ANALYZER	R&S	FSP	100503	2017-06-17	2018-06-16
11	MXG Vector Signal Generator	Agilent	N5182A	MY47071151	2017-11-17	2018-11-16
12	ESG VECTOR SIGNAL GENERATOR	Agilent	E4438C	MY42081396	2017-11-17	2018-11-16
13	PSG Analog Signal Generator	Agilent	E8257D	MY4520521	2017-11-17	2018-11-16
14	Universal Radio Communication Tester	R&S	CMU 200	105788	2017-06-17	2018-06-16
15	WIDEBAND RADIO COMMUNICATION TESTER	R&S	CMW 500	103818	2017-06-17	2018-06-16
16	RF Control Unit	Tonscend	JS0806-1	N/A	2017-06-17	2018-06-16
17	DC Power Supply	Agilent	E3642A	N/A	2017-11-17	2018-11-16
18	LTE Test Software	Tonscend	JS1120-1	N/A	N/A	N/A
19	Temperature & Humidity Chamber	GUANGZHOU GOGNWEN	GDS-100	70932	2017-10-11	2018-10-10
20	DC Source	CHROMA	62012P-80-60	34782951	2017-10-11	2018-10-10
21	RF Filter	Micro-Tronics	BRC50718	S/N-017	2017-06-17	2018-06-16
22	RF Filter	Micro-Tronics	BRC50719	S/N-011	2017-06-17	2018-06-16
23	RF Filter	Micro-Tronics	BRC50720	S/N-011	2017-06-17	2018-06-16
24	RF Filter	Micro-Tronics	BRC50721	S/N-013	2017-06-17	2018-06-16
25	RF Filter	Micro-Tronics	BRM50702	S/N-195	2017-06-17	2018-06-16
26	Splitter/Combiner	Micro-Tronics	PS2-15	CB11-20	2017-06-17	2018-06-16
27	Splitter/Combiner	Micro-Tronics	CB11-20	N/A	2017-06-17	2018-06-16
28	Attenuator	Micro-Tronics	PAS-8-10	S/N23466	2017-06-17	2018-06-16
29	Exposure Level Tester	Narda	ELT-400	N-0713	2017-04-03	2018-04-02
30	B-Field Probe	Narda	ELT-400	M-1154	2017-04-11	2018-04-10
31	3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	2017-06-17	2018-06-16
32	Positioning Controller	MF	MF-7082	/	2017-06-17	2018-06-16
33	EMI Test Software	AUDIX	E3	N/A	2017-06-17	2018-06-16
34	EMI Test Receiver	R&S	ESR 7	101181	2017-06-17	2018-06-16
35	AMPLIFIER	QuieTek	QTK-A2525G	CHM10809065	2017-11-17	2018-11-16
36	Active Loop Antenna	SCHWARZBECK	FMZB 1519B	00005	2017-06-23	2018-06-22
37	By-log Antenna	SCHWARZBECK	VULB9163	9163-470	2017-05-02	2018-05-01
38	Horn Antenna	EMCO	3115	6741	2017-06-23	2018-06-22
39	Broadband Horn Antenna	SCHWARZBECK	BBHA 9170	791	2017-09-21	2018-09-20
40	Broadband Preamplifier	SCHWARZBECK	BBV 9719	9719-025	2017-09-21	2018-09-20
41	RF Cable-R03m	Jye Bao	RG142	CB021	2017-06-17	2018-06-16
42	RF Cable-HIGH	SUHNER	SUCOFLEX 106	03CH03-HY	2017-06-17	2018-06-16

Note: All equipment is calibrated through GUANGZHOU LISAI CALIBRATION AND TEST CO.,LTD.

### 3.6 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 ETSI TR 100 028 “ Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics” and is documented in the Shenzhen LCS Compliance Testing Laboratory Ltd. 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 Shenzhen LCS Compliance Testing Laboratory Ltd. is reported:

Test	Range	Measurement Uncertainty	Notes
Radiated Emission	30~1000MHz	3.10 dB	(1)
Radiated Emission	1~18GHz	3.80 dB	(1)
Radiated Emission	18-40GHz	3.90 dB	(1)
Conducted Disturbance	0.15~30MHz	1.63 dB	(1)
Conducted Power	9KHz~18GHz	0.61 dB	(1)
Spurious RF Conducted Emission	9KHz~40GHz	1.22 dB	(1)
Band Edge Compliance of RF Emission	9KHz~40GHz	1.22 dB	(1)
Occupied Bandwidth	9KHz~40GHz	-	(1)

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

## **4 TEST CONDITIONS AND RESULTS**

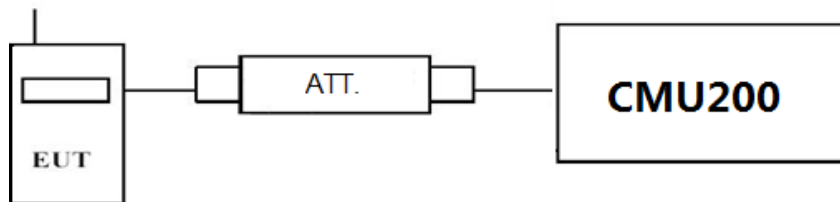
### **4.1 Output Power**

#### **TEST APPLICABLE**

During the process of testing, the EUT was controlled via R&S Digital Radio Communication tester (CMU200) to ensure max power transmission and proper modulation. This result contains output power and EIRP measurements for the EUT. In all cases, output power is within the specified limits.

#### **4.1.1. Conducted Output Power**

#### **TEST CONFIGURATION**



#### **TEST PROCEDURE**

##### **Conducted Power Measurement:**

- a) Place the EUT on a bench and set it in transmitting mode.
- b) Connect a low loss RF cable from the antenna port to a CMU200 by an Att.
- c) EUT Communicate with CMU200 then selects a channel for testing.
- d) Add a correction factor to the display CMU200, and then test.

#### **TEST RESULTS**

*Remark:*

1. Please refer to the appendix D.1 of Conducted Power Output Data

## 4.1.1 Radiated Output Power

### TEST DESCRIPTION

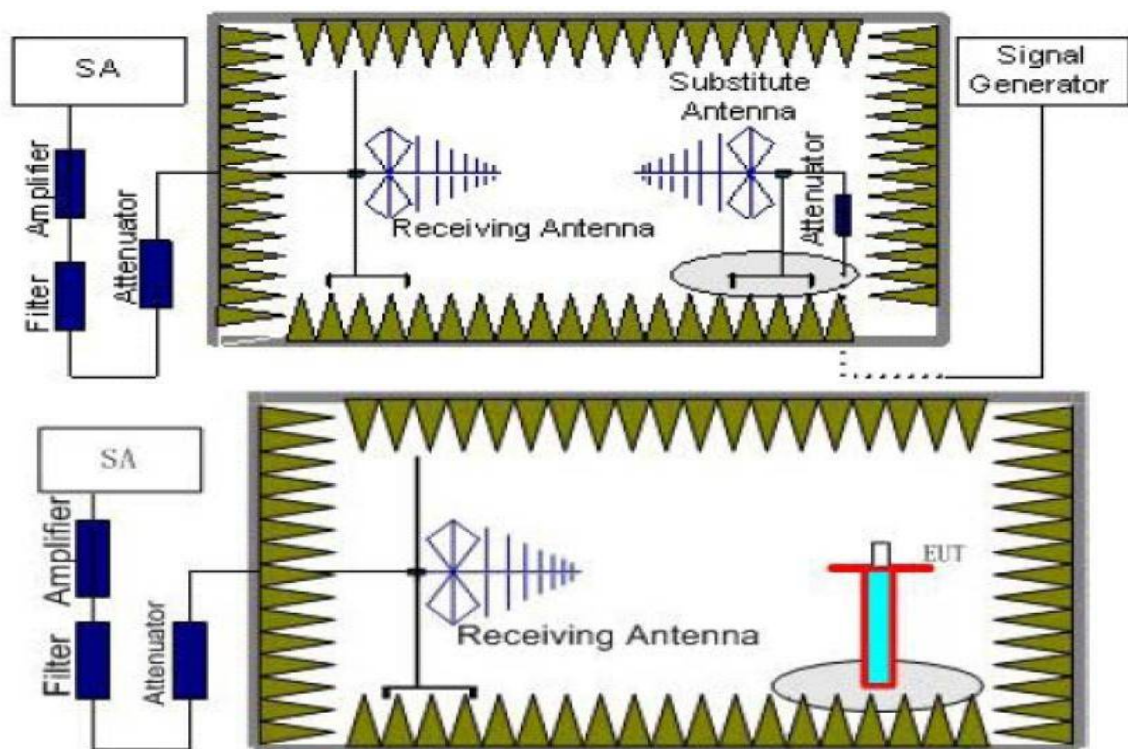
This is the test for the maximum radiated power from the EUT.

Rule Part 27.232(c) specifies, "Mobile/portable stations are limited to 2 watts e.i.r.p. Peak power" and 24.232(e) specifies that "Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage."

Rule Part 22.913(a) specifies "The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts."

Per Part 27.50(d) (4) specifies, Fixed, mobile, and portable (hand-held) stations operating in the 1710-1755MHz band are limited to 1W EIRP. Fixed stations operating in this band are limited to a maximum antenna height of 10 meters above ground. Mobile and portable stations operating in this band must employ a means for limiting power to the minimum necessary for successful communications.

### TEST CONFIGURATION



### 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=10MHz, VBW=10MHz, And the maximum value of the receiver should be recorded as ( $P_r$ ).
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 ( $P_{Mea}$ ) is applied to the input of the

substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded ( $P_r$ ). The power of signal source ( $P_{Mea}$ ) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.

5. A amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna. The cable loss ( $P_{cl}$ ), the Substitution Antenna Gain ( $G_a$ ) and the Amplifier Gain ( $P_{Ag}$ ) should be recorded after test.

The measurement results are obtained as described below:

$$\text{Power(EIRP)} = P_{Mea} + P_{Ag} - P_{cl} + G_a$$

6. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.
7. ERP can be calculated from EIRP by subtracting the gain of the dipole,  $ERP = EIRP - 2.15\text{dBi}$ .

### TEST LIMIT

According to 22.913(a)(5), 24.232(c), the ERP(EIRP) should be not exceeding following table limits:

	Burst Average EIRP
UMTS Band II	FCC: $\leq 33.01\text{dBm}$ (2W)

	Burst Average ERP
UMTS Band V	FCC: $\leq 38.45\text{dBm}$ (7W)

### TEST RESULTS

Remark:

1. We were tested all Configuration refer 3GPP TS134 121.
2.  $EIRP = P_{Mea}(\text{dBm}) - P_{cl}(\text{dB}) + P_{Ag}(\text{dB}) + G_a(\text{dBi})$
3.  $ERP = EIRP - 2.15\text{dBi}$  as EIRP by subtracting the gain of the dipole.
4. Margin = Emission Level - Limit
5. We test the H direction and V direction recorded worst case.

#### UMTS/TM1/UMTS Band II

Frequency (MHz)	$P_{Mea}$ (dBm)	$P_{cl}$ (dB)	$G_a$ Antenna Gain (dB)	$P_{Ag}$ (dB)	Burst Average EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1852.40	-19.44	4.03	8.38	35.51	20.42	33.00	-12.58	V
1880.00	-18.38	4.08	8.33	35.56	21.43	33.00	-11.57	V
1907.60	-20.56	4.14	8.26	35.63	19.19	33.00	-13.81	V

#### UMTS/TM1/UMTS Band V

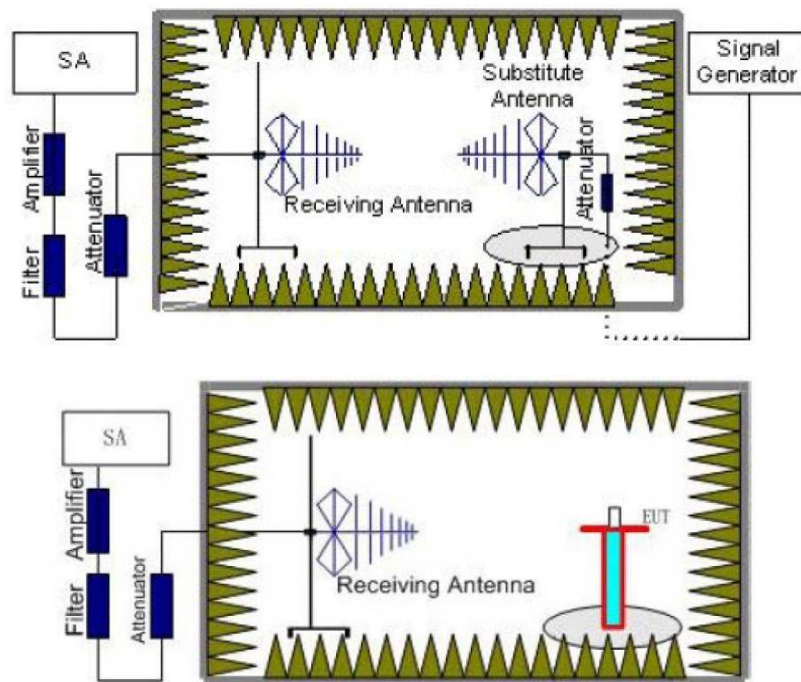
Frequency (MHz)	$P_{Mea}$ (dBm)	$P_{cl}$ (dB)	$G_a$ Antenna Gain (dB)	Correction (dB)	$P_{Ag}$ (dB)	Burst Average ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
826.40	-15.94	3.45	8.45	2.15	33.79	20.70	38.45	-17.75	V
836.60	-16.58	3.49	8.45	2.15	33.85	20.08	38.45	-18.37	V
846.60	-16.32	3.55	8.36	2.15	33.88	20.22	38.45	-18.23	V

## 4.2 Radiated Spurious Emission

### TEST APPLICABLE

According to the ANSI C63.26:2015 and FCC Part 2.1033 test method, The Receiver or Spectrum was scanned from lowest frequency frequency generated within the equipment to the 10<sup>th</sup> harmonic of the highest frequency generated within the equipment, which is the transmitted carrier that can be as high as 1910 MHz. The resolution bandwidth is set as outlined in Part 27.238, Part 24.238, Part 22.917, RSS-132 §5.5 and RSS-133 §6.5. The spectrum is scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of WCDMA Band II, WCDMA Band IV and WCDMA Band V.

### TEST CONFIGURATION



### 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 1.50 m. 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 ( $P_r$ ).
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 ( $P_{Mea}$ ) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded ( $P_r$ ). The power of signal source ( $P_{Mea}$ ) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.



5. A amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna. The cable loss ( $P_{cl}$ ), the Substitution Antenna Gain ( $G_a$ ) and the Amplifier Gain ( $P_{Ag}$ ) should be recorded after test.  
The measurement results are obtained as described below:  
 $Power(EIRP)=P_{Mea}+ P_{Ag} - P_{cl} + G_a$
6. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.
7. ERP can be calculated from EIRP by subtracting the gain of the dipole,  $ERP = EIRP - 2.15dBi$ .
8. In order to make sure test results more clearly, we set frequency range and sweep time for difference frequency range as follows table:

Working Frequency	Subrange (GHz)	RBW	VBW	Sweep time (s)
UMTS/TM1/ WCDMA Band V	0.00009~0.15	1KHz	3KHz	30
	0.00015~0.03	10KHz	30KHz	10
	0.03~1	100KHz	300KHz	10
	1~2	1 MHz	3 MHz	2
	2~5	1 MHz	3 MHz	3
	5~8	1 MHz	3 MHz	3
	8~10	1 MHz	3 MHz	3
UMTS/TM1/ WCDMA Band II	0.00009~0.15	1KHz	3KHz	30
	0.00015~0.03	10KHz	30KHz	10
	0.03~1	100KHz	300KHz	10
	1~2	1 MHz	3 MHz	2
	2~5	1 MHz	3 MHz	3
	5~8	1 MHz	3 MHz	3
	8~11	1 MHz	3 MHz	3
	11~14	1 MHz	3 MHz	3
	14~18	1 MHz	3 MHz	3
18~20	1 MHz	3 MHz	2	

### TEST LIMITS

According to 24.238, 22.917 and 27.54 specify that 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 specification that emissions shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log(P)$  dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB, which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

Frequency	Channel	Frequency Range	Verdict
UMTS/TM1/ WCDMA Band V	Low	9 KHz – 10 GHz	PASS
	Middle	9 KHz – 10 GHz	PASS
	High	9 KHz – 10 GHz	PASS
UMTS/TM1/ WCDMA Band II	Low	9 KHz – 20 GHz	PASS
	Middle	9 KHz – 20 GHz	PASS
	High	9 KHz – 20 GHz	PASS

### TEST RESULTS

Remark:

1. We were tested all Configuration refer 3GPP TS134 121.
2.  $EIRP=P_{Mea}(dBm)-P_{cl}(dB)+P_{Ag}(dB)+G_a(dBi)$
3.  $ERP = EIRP - 2.15dBi$  as EIRP by subtracting the gain of the dipole.
4.  $Margin = EIRP - Limit$

## UMTS/TM1/ WCDMA Band II \_ Low Channel

Frequency (MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)	Diatance	G <sub>a</sub> Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3704.8	-43.04	5.26	3.00	9.88	-38.42	-13.00	-25.42	H
5557.2	-48.09	6.11	3.00	11.36	-42.84	-13.00	-29.84	H
3704.8	-45.99	5.26	3.00	9.88	-41.37	-13.00	-28.37	V
5557.2	-49.59	6.11	3.00	11.36	-44.34	-13.00	-31.34	V

## UMTS/TM1/ WCDMA Band II \_ Middle Channel

Frequency (MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)	Diatance	G <sub>a</sub> Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3760.0	-44.39	5.32	3.00	10.03	-39.68	-13.00	-26.68	H
5640.0	-49.10	6.19	3.00	11.41	-43.88	-13.00	-30.88	H
3760.0	-45.35	5.32	3.00	10.03	-40.64	-13.00	-27.64	V
5640.0	-50.72	6.19	3.00	11.41	-45.50	-13.00	-32.50	V

## UMTS/TM1/ WCDMA Band II \_ High Channel

Frequency (MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)	Diatance	G <sub>a</sub> Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3815.2	-44.57	5.36	3.00	9.62	-40.31	-13.00	-27.31	H
5722.8	-48.67	6.24	3.00	11.46	-43.45	-13.00	-30.45	H
3815.2	-46.99	5.36	3.00	9.62	-42.73	-13.00	-29.73	V
5722.8	-51.00	6.24	3.00	11.46	-45.78	-13.00	-32.78	V

## UMTS/TM1/ WCDMA Band V \_ Low Channel

Frequency (MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)	Diatance	G <sub>a</sub> Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1652.8	-46.25	3.86	3.00	8.56	-41.55	-13.00	-28.55	H
2479.2	-47.01	4.29	3.00	6.98	-44.32	-13.00	-31.32	H
1652.8	-45.46	3.86	3.00	8.56	-40.76	-13.00	-27.76	V
2479.2	-48.52	4.29	3.00	6.98	-45.83	-13.00	-32.83	V

## UMTS/TM1/ WCDMA Band V \_ Middle Channel

Frequency (MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)	Diatance	G <sub>a</sub> Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1672.8	-46.31	3.90	3.00	8.58	-41.63	-13.00	-28.63	H
2509.2	-46.52	4.32	3.00	6.80	-44.04	-13.00	-31.04	H
1672.8	-46.48	3.90	3.00	8.58	-41.80	-13.00	-28.80	V
2509.2	-49.56	4.32	3.00	6.80	-47.08	-13.00	-34.08	V

## UMTS/TM1/ WCDMA Band V \_ High Channel

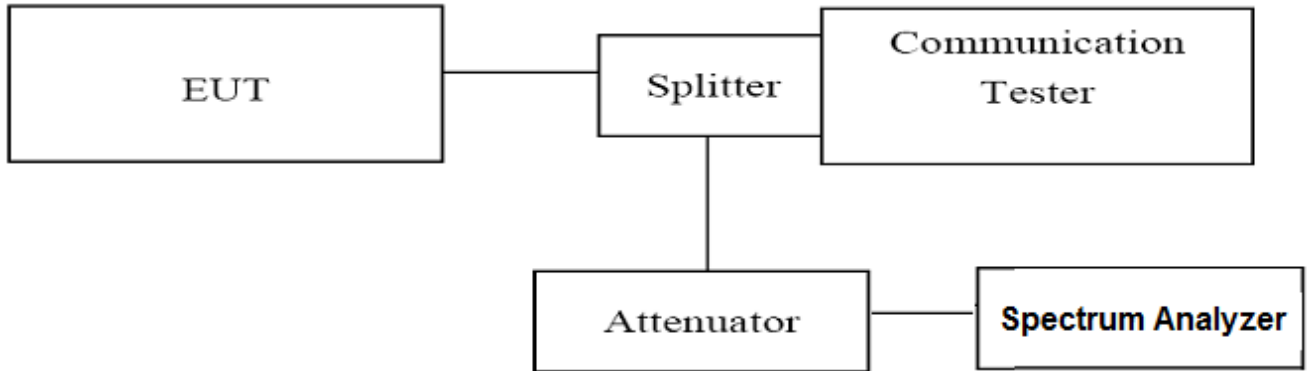
Frequency (MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)	Diatance	G <sub>a</sub> Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1693.2	-44.29	3.91	3.00	9.06	-39.14	-13.00	-26.14	H
2539.8	-45.43	4.32	3.00	6.65	-43.10	-13.00	-30.10	H
1693.2	-46.19	3.91	3.00	9.06	-41.04	-13.00	-28.04	V
2539.8	-48.05	4.32	3.00	6.65	-45.72	-13.00	-32.72	V

### 4.3 Occupied Bandwidth and Emission Bandwidth

#### TEST APPLICABLE

Similar to conducted emissions; occupied bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. The table below lists the measured 99% Bandwidth and -26dBc Bandwidth.

#### TEST CONFIGURATION



#### TEST PROCEDURE

1. The EUT was set up for the max output power with pseudo random data modulation;
2. The Occupied bandwidth and Emission Bandwidth were measured with Agilent Spectrum Analyzer N9020A (peak);
3. Set RBW=100KHz,VBW=300KHz,Span=10MHz,SWT=Auto;
4. Set SPA Max hold and View, Set 99% Occupied Bandwidth/ Set -26dBc Occupied Bandwidth
5. These measurements were done at 3 frequencies for WCDMA band II/IV/V. (low, middle and high of operational frequency range).

#### TEST RESULTS

Remark:

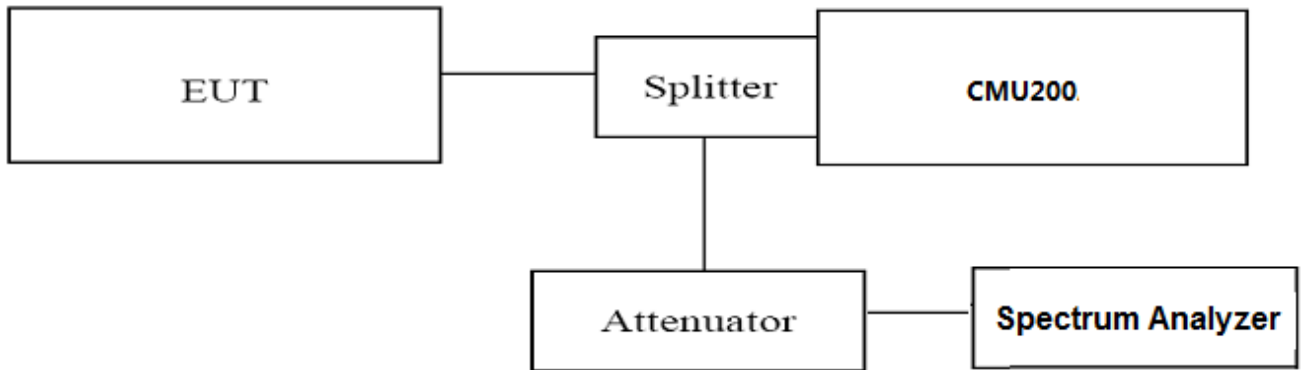
1. Test results including cable loss;
2. Please refer to the appendix D.3 of 26dB Bandwidth and Occupied Bandwidth;

## 4.4 Band Edge Compliance

### TEST APPLICABLE

During the process of testing, the EUT was controlled via Digital Radio Communication tester (CMU200) to ensure max power transmission and proper modulation.

### TEST CONFIGURATION



### TEST PROCEDURE

1. The EUT was set up for the max output power with pseudo random data modulation;
  2. The power was measured with Spectrum Analyzer N9020A;
  3. Set RBW=100KHz,VBW=300KHz,Span=10MHz,SWT=Auto,Dector: RMS;
- These measurements were done at 2 frequencies for WCDMA Band II/V. (low and high of operational frequency range).

### TEST RESULTS

*Remark:*

1. Test results including cable loss;
2. Please refer to the appendix D.4 of Band Edge;

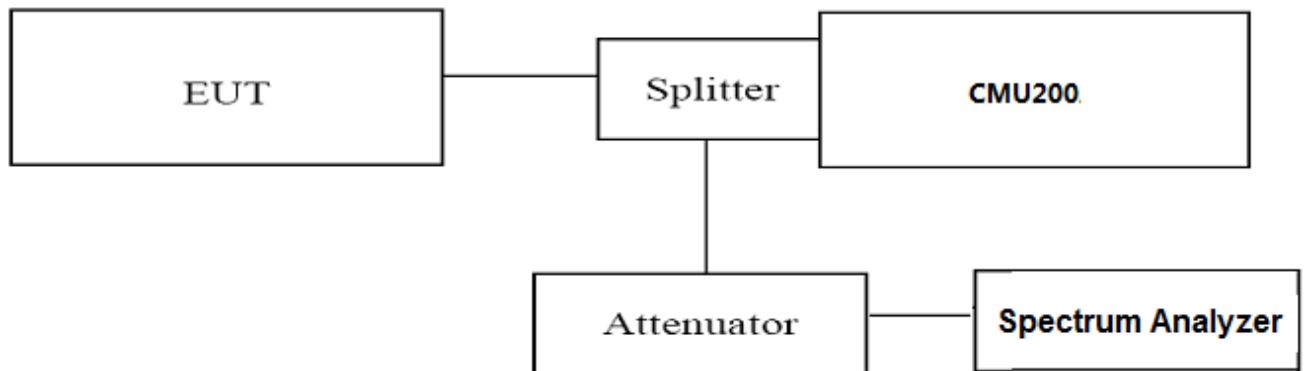
## 4.5 Spurious Emission on Antenna Port

### TEST APPLICABLE

The following steps outline the procedure used to measure the conducted emissions from the EUT.

1. Determine frequency range for measurements: From CFR 2.1057 the spectrum should be investigated from the lowest radio frequency generated in the equipment up to at least the 10th harmonic of the carrier frequency. For the equipment of WCDMA band II/IV, this equates to a frequency range of 9 KHz to 20GHz. For WCDMA Band V, this equates to a frequency range of 9 KHz to 20 GH.
2. The sweep time is set automatically by instrument itself. That should be the optimal sweep time for the span and the RBW. If the sweep time is too short, that is sweep is too fast, the sweep result is not accurate; if the sweep time is too long, that is sweep is too low, some frequency components may be lost. The instrument will give an optimal sweep time according the selected span and RBW.
3. The procedure to get the conducted spurious emission is as follows:  
The trace mode is set to MaxHold to get the highest signal at each frequency;  
Wait 25 seconds;  
Get the result.
4. Determine EUT transmit frequencies: below outlines the band edge frequencies pertinent to conducted emissions testing.

### TEST CONFIGURATION



### TEST PROCEDURE

1. The EUT was set up for the max output power with pseudo random data modulation;
2. The power was measured with Spectrum Analyzer N9020A;
3. These measurements were done at 3 frequencies for WCDMA band II/IV/V. (low, middle and high of operational frequency range).

### TEST LIMIT

Part 24.238, Part 22.917 and Part 27.54 specify that 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 specification that emissions shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log(P)$  dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB, which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

### TEST RESULTS

*Remark:*

1. Test results including cable loss;
2. Please see the appendix D.5 of Conducted Spurious Emission;

## 4.6 Frequency Stability Test

### TEST APPLICABLE

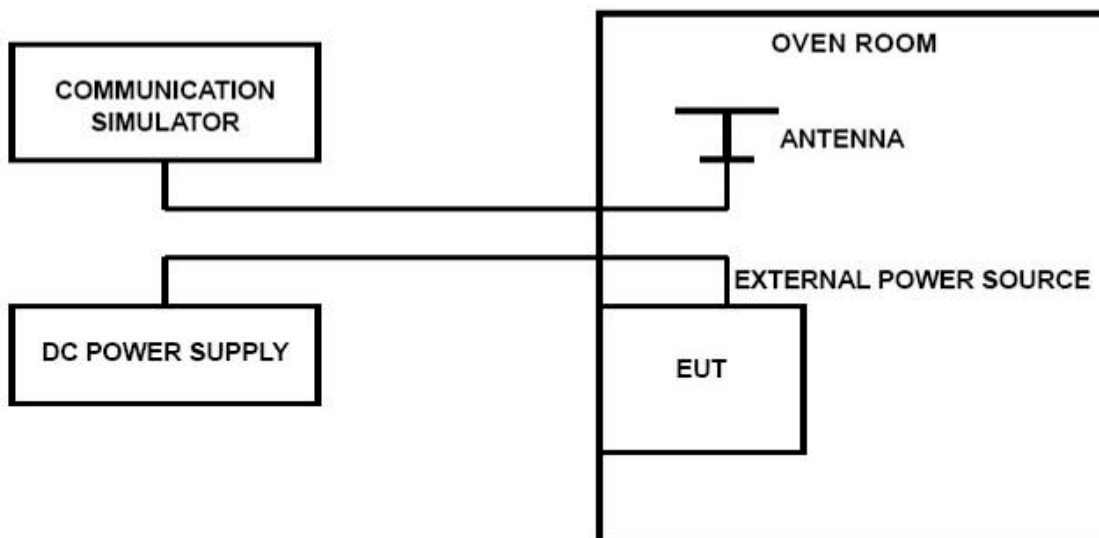
1. According to FCC Part 2 Section 2.1055 (a)(1), the frequency stability shall be measured with variation of ambient temperature from -30°C to +50°C centigrade.
2. According to FCC Part 2 Section 2.1055 (e)(2) and RSS-GEN, for battery powered equipment, the frequency stability shall be measured with reducing primary supply voltage to the battery operating end point, which is specified by the manufacture.
3. Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried voltage equipment and the end voltage point was 3.50V.

### TEST PROCEDURE

In order to measure the carrier frequency under the condition of AFC lock, it is necessary to make measurements with the EUT in a "call mode". This is accomplished with the use of R&S CMU200 DIGITAL RADIO COMMUNICATION TESTER.

1. Measure the carrier frequency at room temperature;
2. Subject the EUT to overnight soak at -30°C;
3. With the EUT, powered via nominal voltage, connected to the CMU200 and in a simulated call on middle channel of WCDMA Band II/V, measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming;
4. Repeat the above measurements at 10°C increments from -30°C to +50°C. Allow at least 0.5 hours at each temperature, unpowered, before making measurements;
5. Remeasure carrier frequency at room temperature with nominal voltage. Vary supply voltage from minimum voltage to maximum voltage, in 0.1Volt increments remeasuring carrier frequency at each voltage. Pause at nominal voltage for 0.5 hours unpowered, to allow any self-heating to stabilize, before continuing;
6. Subject the EUT to overnight soak at +50°C;
7. With the EUT, powered via nominal voltage, connected to the CMU200 and in a simulated call on the centre channel, measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming;
8. Repeat the above measurements at 10°C increments from +50°C to -30°C. Allow at least 0.5 hours at each temperature, unpowered, before making measurements;
9. At all temperature levels hold the temperature to +/- 0.5°C during the measurement procedure;

### TEST CONFIGURATION



## **TEST LIMITS**

### ***For Hand carried battery powered equipment***

According to the JTC standard the frequency stability of the carrier shall be accurate to within 0.1 ppm of the received frequency from the base station. This accuracy is sufficient to meet Sec. 24.235, Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. As this transceiver is considered "Hand carried, battery powered equipment" Section 2.1055(d)(2) applies. This requires that the lower voltage for frequency stability testing be specified by the manufacturer. This transceiver is specified to operate with an input voltage of between 3.50VDC and 4.20VDC, with a nominal voltage of 3.80DC. Operation above or below these voltage limits is prohibited by transceiver software in order to prevent improper operation as well as to protect components from overstress. These voltages represent a tolerance of -10 % and +12.5 %. For the purposes of measuring frequency stability these voltage limits are to be used.

### ***For equipment powered by primary supply voltage***

According to the JTC standard the frequency stability of the carrier shall be accurate to within 0.1 ppm of the received frequency from the base station. This accuracy is sufficient to meet Sec. 24.235, Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. For this EUT section 2.1055(d)(1) applies. This requires varying primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

## **TEST RESULTS**

*Remark:*

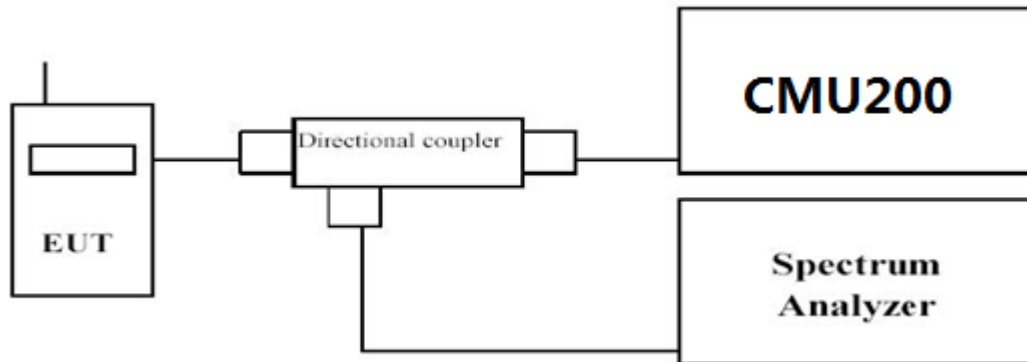
1. *The test data Please see the appendix D of Frequency Stability;*

## 4.7 Peak-to-Average Ratio (PAR)

### LIMIT

The Peak-to-Average Ratio (PAR) of the transmission may not exceed 13 dB.

### TEST CONFIGURATION



### TEST PROCEDURE

1. Refer to instrument's analyzer instruction manual for details on how to use the power statistics/CCDF function;
2. Set resolution/measurement bandwidth  $\geq$  signal's occupied bandwidth;
3. Set the number of counts to a value that stabilizes the measured CCDF curve;
4. Set the measurement interval as follows:
  - 1). for continuous transmissions, set to 1 ms,
  - 2). for burst transmissions, employ an external trigger that is synchronized with the EUT burst timing sequence, or use the internal burst trigger with a trigger level that allows the burst to stabilize and set the measurement interval to a time that is less than or equal to the burst duration.
5. Record the maximum PAPR level associated with a probability of 0.1%.

### TEST RESULTS

Remark:

1. Test results including cable loss;
2. The test data Please see the appendix D of Peak-to-Average Ratio;



**5 Test Setup Photos of the EUT**

Please refer to separated files for Test Setup Photos of the EUT.

**6 External Photos of the EUT**

Please refer to separated files for External Photos of the EUT.

**7 Internal Photos of the EUT**

Please refer to separated files for Internal Photos of the EUT.

.....**End of Report**.....