



# FCC TEST REPORT FOR

ComNav Technology Ltd.  
Handheld GNSS Receiver  
Test Model: P6H  
Additional Model No.: P6

Prepared for : ComNav Technology Ltd.  
Address : Building 2, No.618 Chengliu Middle Rd. Malu town, Shanghai, China

Prepared by : Shenzhen LCS Compliance Testing Laboratory Ltd.  
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Date of receipt of test sample : May 27, 2024  
Number of tested samples : 2  
Sample No. : A240524043-1, A240524043-2  
Serial number : Prototype  
Date of Test : May 27, 2024 ~ June 20, 2024  
Date of Report : June 22, 2024



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**FCC PART 22/27 TEST REPORT****FCC Part 22H/Part 27**

<b>Report Reference No.....</b>	<b>LCSA04164013EI</b>
<b>FCC ID.....</b>	<b>2ACHBP6H</b>
<b>Date of Issue.....</b>	<b>June 22, 2024</b>
<b>Testing Laboratory Name.....</b>	<b>Shenzhen LCS Compliance Testing Laboratory Ltd.</b> 101, 201 Bldg A & 301 Bldg C, Juji Industrial Park Yabianxueziwei, Shajing Street, Baoan District, Shenzhen, 518000, China
<b>Applicant's name.....</b>	<b>ComNav Technology Ltd.</b> Building 2, No.618 Chengliu Middle Rd. Malu town, Shanghai, China
<b>Test specification.....</b>	<b>FCC CFR Title 47 Part 2, Part 22H, Part 27</b> <b>TIA-603-E: 2016</b> <b>KDB971168 D01 Power Meas License Digital Systems v03r01</b>
<b>Test Report Form No.....</b>	<b>LCSEMC-1.0</b>
<b>TRF Originator.....</b>	<b>Shenzhen LCS Compliance Testing Laboratory Ltd.</b>
<b>Master TRF.....</b>	<b>Dated 2011-03</b>
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<b>Test item description.....</b>	<b>Handheld GNSS Receiver</b>
<b>Trade Mark.....</b>	<b>SinoGNSS®</b>
<b>Test Model.....</b>	<b>P6H</b>
<b>Modulation Type.....</b>	<b>QPSK, 16QAM</b>
<b>Rating.....</b>	<b>Please Refer to Page 7</b>
<b>Result.....</b>	<b>PASS</b>

**Compiled by:**

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**Supervised by:**

Cary Luo/ Technique principal

**Approved by:**

Gavin Liang/ Manager



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## TEST REPORT

Test Report No. :	<b>LCSA04164013EI</b>	June 22, 2024
		Date of issue

EUT.....	:	Handheld GNSS Receiver
Test Model.....	:	P6H
<b>Applicant</b> .....	:	<b>ComNav Technology Ltd.</b>
Address.....	:	Building 2, No.618 Chengliu Middle Rd. Malu town, Shanghai, China
Telephone.....	:	/
Fax.....	:	/
<b>Manufacturer</b> .....	:	<b>ComNav Technology Ltd.</b>
Address.....	:	Building 2, No.618 Chengliu Middle Rd. Malu town, Shanghai, China
Telephone.....	:	/
Fax.....	:	/
<b>Factory</b> .....	:	<b>ComNav Technology Ltd.</b>
Address.....	:	Building 2, No.618 Chengliu Middle Rd. Malu town, Shanghai, China
Telephone.....	:	/
Fax.....	:	/

<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.



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## Revision History

Report Version	Issue Date	Revision Content	Revised By
000	June 22, 2024	Initial Issue	---



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## 1 TEST STANDARDS

The tests were performed according to following standards:

[FCC Part 22H](#): Cellular Radiotelephone Service

[FCC Part 27](#): MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES

[TIA-603-E March 2016](#): Land Mobile FM or PM Communications Equipment Measurement and Performance Standards.

[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 KDB971168 D01](#) Power Meas License Digital Systems v03r01



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## 2 SUMMARY

### 2.1 Product Description

The **ComNav Technology Ltd.**'s Model: P6H 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.

EUT	: Handheld GNSS Receiver
Test Model	: P6H
Additional Model No.	: P6
Model Declaration	: PCB board, structure and internal of these model(s) are the same, So no additional models were tested
Ratings	: Input: DC 5V/9V, 1.67A For AC Adapter Input: 100-240V~, 50/60Hz, 0.5A Max Adapter Output: 5V=3.0A 9V=2.0A 12V=1.5A DC 3.8V by Rechargeable Li-ion Battery, 6800mAh
Hardware Version	: V1.11
Software Version	: V1.4.2
Bluetooth	:
Frequency Range	: 2402MHz~2480MHz
Channel Number	: 79 channels for Bluetooth V5.0 (DSS) 40 channels for Bluetooth V5.0 (DTS)
Channel Spacing	: 1MHz for Bluetooth V5.0 (DSS) 2MHz for Bluetooth V5.0 (DTS)
Modulation Type	: GFSK, π/4-DQPSK, 8-DPSK for Bluetooth V5.0 (DSS) GFSK for Bluetooth V5.0 (DTS)
Bluetooth Version	: V5.0
Antenna Description	: FPC Antenna, -0.58dBi(Max.)
WIFI(2.4G Band)	:
Frequency Range	: 2412MHz~2462MHz
Channel Spacing	: 5MHz
Channel Number	: 11 Channels for 20MHz bandwidth (2412~2462MHz) 7 Channels for 40MHz bandwidth (2422~2452MHz)
Modulation Type	: IEEE 802.11b: DSSS (CCK, DQPSK, DBPSK) IEEE 802.11g: OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n: OFDM (64QAM, 16QAM, QPSK, BPSK)
Antenna Description	: FPC Antenna, -0.58dBi(Max.)
5.2G WLAN	:
Frequency Range	: 5180MHz~5240MHz
Channel Number	: 4 Channels for 20MHz bandwidth(5180MHz~5240MHz) 2 channels for 40MHz bandwidth(5190MHz~5230MHz) 1 channels for 80MHz bandwidth(5210MHz)
Modulation Type	: IEEE 802.11a: OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n: OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11ac: OFDM (256QAM, 64QAM, 16QAM, QPSK, BPSK)
Antenna Description	: FPC Antenna, 0.13dBi(Max.)
5.8G WLAN	:
Frequency Range	: 5745MHz~5825MHz
Channel Number	: 5 channels for 20MHz bandwidth(5745MHz~5825MHz) 2 channels for 40MHz bandwidth(5755MHz~5795MHz) 1 channels for 80MHz bandwidth(5775MHz)
Modulation Type	: IEEE 802.11a: OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n: OFDM (64QAM, 16QAM, QPSK, BPSK)





IEEE 802.11ac: OFDM (256QAM, 64QAM, 16QAM, QPSK, BPSK)

Antenna Description : FPC Antenna, 0.13dBi(Max.)

2G :

Support Band :  GSM 850 (U.S.-Band)  
 PCS 1900 (U.S.-Band)

Release Version : R99

GPRS Class : Class 12

EGPRS Class : Class 12

Type Of Modulation : GMSK for GSM/GPRS; GMSK/8PSK for EGPRS

Antenna Description : FPC Antenna  
-0.53dBi (max.) For GSM 850  
-0.32dBi (max.) For PCS 1900

3G :

Support Band :  WCDMA Band II (U.S.-Band)  
 WCDMA Band V (U.S.-Band)

Release Version : R8

Type Of Modulation : QPSK,16QAM

Antenna Description : FPC Antenna  
-0.32dBi (max.) For WCDMA Band II  
-0.53dBi (max.) For WCDMA Band V

LTE :

Support Band :  E-UTRA Band 5(U.S.-Band)  
 E-UTRA Band 7(U.S.-Band)  
 E-UTRA Band 41(U.S.-Band)

LTE Release Version : R9

Type Of Modulation : QPSK/16QAM

Antenna Description : FPC Antenna  
-0.53dBi (max.) For E-UTRA Band 5  
-0.26dBi (max.) For E-UTRA Band 7  
-0.26dBi (max.) For E-UTRA Band 41

Power Class : Class 3

Extreme temp. : -30°C to +50°C

Tolerance

Extreme vol. Limits : 3.4VDC to 4.35VDC (nominal: 3.8VDC)



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## 2.2 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): 3.8V		

## 2.3 Short description of the Equipment under Test (EUT)

### 2.4.1 General Description

Handheld GNSS Receiver is subscriber equipment in the BT/BLE/2.4GWIFI/5.2GWIFI/5.8GWIFI/GSM/WCDMA/LTE system. GSM/GPRS/EGPRS frequency band is Band II/V. The HSPA/UMTS frequency band is Band II/IV/V. LTE frequency band is band 5/7/41. The HSPA/UMTS frequency band II and Band IV and Band V test data included in this report. The Handheld GNSS Receiver implements such functions as RF signal receiving/transmitting, GSM/GPRS/EGPRS HSPA/UMTS/LTE protocol processing, video MMS service and etc. Externally it provides SIM card interface.

## 2.4 Support equipment List

Manufacturer	Description	Model	Serial Number	Certificate
Shenzhen Qijia Electronic Co.,Ltd.	Quick Charger	QJ15QC09-ZU	---	FCC

## 2.5 External I/O Cable

I/O Port Description	Quantity	Cable
Type-C USB Port	1	USB Cable: 0.8m, unshielded

## 2.6 Normal Accessory setting

Fully charged battery was used during the test.

## 2.7 Test Sample

The application provides 2 samples to meet requirement;

Sample Number	Description
Sample 1(A240524043-1)	Engineer sample – continuous transmit
Sample 2(A240524043-2)	Normal sample – Intermittent transmit

## 2.8 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. :	/



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

This submittal(s) (test report) is intended for FCC ID: 2ACHBP6H filing to comply with FCC Part 22 and Part 27 Rules

## 2.10 Modifications

No modifications were implemented to meet testing criteria.

## 2.11 General Test Conditions/Configurations

### 2.10.1 Test Environment

EnvironmentParameter	SelectedValuesDuringTests	
Relative Humidity	Ambient	
Temperature	TN	Ambient
Voltage	VL	DC 3.4V
	VN	DC 3.8V
	VH	DC 4.35V

NOTE: VL=lower extreme test voltage VN=nominal voltage

VH=upper extreme test voltage TN=normal temperature



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### 3 TEST ENVIRONMENT

#### 3.1 Address of the test laboratory

##### Shenzhen LCS Compliance Testing Laboratory Ltd

101, 201 Bldg A & 301 Bldg C, Juji Industrial Park Yabianxueziwei, Shajing Street, Baoan District, Shenzhen, 518000, 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:

NVLAP Accreditation Code is 600167-0.

FCC Designation Number is CN5024.

CAB identifier is CN0071.

CNAS Registration Number is L4595.

#### 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

#### 3.4 Test Description

##### Band 5 (824-849MHz paired with 869-894MHz)

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	FCC: ≤ -13dBm/100kHz, from 9kHz to 10th harmonics but outside authorized operating frequency ranges.	Pass
Field Strength of Spurious Radiation	§2.1053, §22.917	FCC: ≤ -13dBm/100kHz.	Pass
Frequency Stability	§2.1055, §22.355	≤ ±2.5ppm.	Pass

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



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## Band 7 (2500-2570MHz paired with 2620-2690MHz)

Test Item	FCC Rule No.	Requirements	Verdict
Effective(Isotropic) Radiated Output Power	§2.1046, §27.50(h)	FCC: EIRP ≤ 2W.	Pass
Peak-Average Ratio	§2.1046, §27.50(a)	Limit ≤ 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, §27.53(m)	More details specified in §27.53(m)(4)	Pass
Spurious Emission at Antenna Terminals	§2.1051, §27.53(m)	More details specified in §27.53(m)(4)	Pass
Field Strength of Spurious Radiation	§2.1053, §27.53(m)	More details specified in §27.53(m)(4)	Pass
Frequency Stability	§2.1055, §27.54	≤ ±2.5ppm.	Pass

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



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## TDD Band 41(2496-2690MHz)

Test Item	FCC Rule No.	Requirements	Verdict
Effective(Isotropic) Radiated Power Output Data	§2.1046, §27.50(h)	ERP ≤ 2W;	PASS
Peak-Average Ratio	§2.1046, §27.50	Limit≤13dB	PASS
Modulation Characteristics	§2.1047	Digitalmodulation	N/A
Bandwidth	§2.1049	OBW: Nolimit. EBW: Nolimit.	PASS
BandEdges Compliance	§2.1051, §27.53(m)	≤ -13dBm/1%*EBW,in1 MHz bands immediately outside and adjacent to The frequency block.	PASS
Spurious Emission at Antenna Terminals	§2.1051, §27.53(m)	≤ -13dBm/1MHz, from 9kHz to10th harmonics but outside authorized Operating frequency ranges.	PASS
Frequency Stability	§2.1055, §27.54	Within authorized bands of operation/frequency block.	PASS
Radiated spurious emission	§2.1053, §27.53(m)	≤ -25dBm/1MHz.	PASS

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



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### 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	2023-06-09	2024-06-08
					2024-06-06	2025-06-05
2	Power Sensor	R&S	NRV-Z81	100458	2023-06-09	2024-06-08
					2024-06-06	2025-06-05
3	Power Sensor	R&S	NRV-Z32	10057	2023-06-09	2024-06-08
					2024-06-06	2025-06-05
4	LTE Test Software	Tonscend	JS1120-1	N/A	N/A	N/A
5	RF Control Unit	Tonscend	JS0806-1	158060009	2023-10-18	2024-10-17
6	MXA Signal Analyzer	Agilent	N9020A	MY51250905	2023-10-18	2024-10-17
7	WIDEBAND RADIO COMMUNICATION TESTER	R&S	CMW 500	103818	2023-06-09	2024-06-08
					2024-06-06	2025-06-05
8	DC Power Supply	Agilent	E3642A	N/A	2023-10-18	2024-10-17
9	EMI Test Software	AUDIX	E3	/	N/A	N/A
10	3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	2023-06-09	2024-06-08
					2024-06-06	2025-06-05
11	Positioning Controller	Max-Full	MF7802BS	MF780208586	N/A	N/A
12	Active Loop Antenna	SCHWARZBECK	FMZB 1519B	00005	2021-08-29	2024-08-28
13	By-log Antenna	SCHWARZBECK	VULB9163	9163-470	2021-09-12	2024-09-11
14	By-log Antenna	SCHWARZBECK	VULB9163	9163-471	2021-09-12	2024-09-11
15	Horn Antenna	SCHWARZBECK	BBHA 9120D	9120D-1925	2021-09-05	2024-09-04
16	Horn Antenna	SCHWARZBECK	BBHA 9120D	9120D-1926	2021-09-05	2024-09-04
17	Broadband Horn Antenna	SCHWARZBECK	BBHA 9170	791	2021-08-29	2024-08-28
18	Broadband Horn Antenna	SCHWARZBECK	BBHA 9170	792	2021-08-29	2024-08-28
19	Broadband Preamplifier	SCHWARZBECK	BBV9719	9719-025	2021-08-29	2024-08-28
20	EMI Test Receiver	R&S	ESR 7	101181	2023-08-15	2024-08-14
21	RS SPECTRUM ANALYZER	R&S	FSP40	100503	2023-07-17	2024-07-16
22	Low-frequency amplifier	SchwarzBECK	BBV9745	00253	2023-10-18	2024-10-17
23	High-frequency amplifier	JS Denki Pte	PA0118-43	JSPA21009	2023-10-18	2024-10-17
24	6dB Attenuator	/	100W/6dB	1172040	2023-06-09	2024-06-08
					2024-06-06	2025-06-05
26	3dB Attenuator	/	2N-3dB	/	2023-10-18	2024-10-17
27	Temperature & Humidity Chamber	GUANGZHOU GOGNWEN	GDS-100	70932	2023-10-05	2024-10-04
28	EMI Test Software	Farad	EZ	/	N/A	N/A
29	RADIO COMMUNICATION TESTER	R&S	CMU 200	105988	2023-06-09	2024-06-08
					2024-06-06	2025-06-05





### 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  $k=1.96$ .



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Scan code to check authenticity

## 4 TEST CONDITIONS AND RESULTS

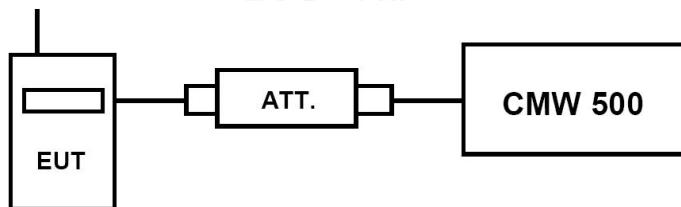
### 4.1 Output Power

#### TEST APPLICABLE

During the process of testing, the EUT was controlled via R&S Digital Radio Communication tester (CMW 500) 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:**

- Place the EUT on a bench and set it in transmitting mode.
- Connect a low loss RF cable from the antenna port to a CMW 500 by an Att.
- EUT Communicate with CMW 500 then selects a channel for testing.
- Add a correction factor to the display CMW 500, and then test.

#### TEST RESULTS

##### *Remark:*

- We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 5, LTE FDD Band 7, LTE FDD Band 41; recorded worst case for each Channel Bandwidth of LTE FDD Band 5, LTE FDD Band 7, LTE FDD Band 41.
- For E-UTRA Band 5, please refer to Appendix F: Section F.1
- For E-UTRA Band 7, please refer to Appendix G: Section G.1
- For E-UTRA Band 41, please refer to Appendix H: Section H.1



#### 4.1.2. Radiated Output Power

##### LIMIT

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

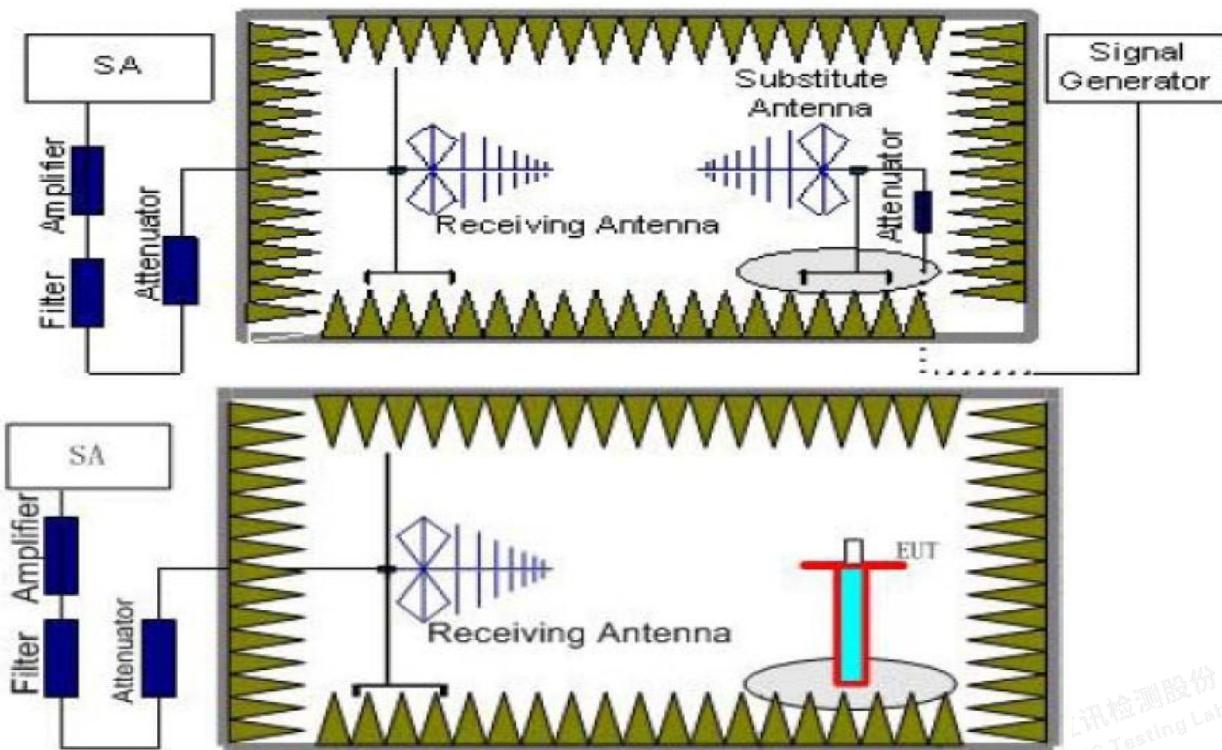
Per §22.913(2) Extend coverage on a secondary basis into cellular unserved areas, as those areas are defined in §22.949, the ERP of base transmitters and cellular repeaters of such systems must not exceed 1000 Watts. The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

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.

Per Part 27.50(c) (10) specifies, Portable stations (hand-held devices) in the 600 MHz uplink band and the 698-746 MHz band, and fixed and mobile stations in the 600 MHz uplink band are limited to 3 watts EIRP.

Per Part 27.50(h) (2) specifies Mobile and other user stations. Mobile stations are limited to 2.0 watts EIRP. All user stations are limited to 2.0 watts transmitter output power.

##### 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=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:  
$$\text{Power(EIRP)} = P_{Mea} + P_{Ag} - P_{cl} + G_a$$
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,  $\text{ERP} = \text{EIRP} - 2.15\text{dBi}$ .

## TEST RESULTS

### Radiated Measurement:

#### Remark:

1. We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 5, LTE FDD Band 7, LTE FDD Band 41; recorded worst case for each Channel Bandwidth of LTE FDD Band 5, LTE FDD Band 7, LTE FDD Band 41.
2.  $\text{EIRP} = P_{Mea}(\text{dBm}) - P_{cl}(\text{dB}) + P_{Ag}(\text{dB}) + G_a(\text{dBi})$
3.  $\text{ERP} = \text{EIRP} - 2.15\text{dBi}$  as EIRP by subtracting the gain of the dipole.
4. Margin = Emission Level - Limit
5. We tested the worst-case records for H and V directions, and only the worst-case records for V direction were recorded in the report.





## LTE FDD Band 5\_Channel Bandwidth 1.4MHz\_QPSK

Frequency (MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)	G <sub>a</sub> Antenna Gain(dB)	Correction (dB)	P <sub>Ag</sub> (dB)	Peak ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
824.70	-16.35	3.45	8.45	2.15	33.79	20.29	38.45	-18.16	V
836.50	-15.91	3.49	8.45	2.15	33.85	20.75	38.45	-17.70	V
848.30	-15.60	3.55	8.36	2.15	33.88	20.94	38.45	-17.51	V

## LTE FDD Band 5\_Channel Bandwidth 3MHz\_QPSK

Frequency (MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)	G <sub>a</sub> Antenna Gain(dB)	Correction (dB)	P <sub>Ag</sub> (dB)	Peak ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
825.50	-15.86	3.45	8.45	2.15	33.79	20.78	38.45	-17.67	V
836.50	-15.66	3.49	8.45	2.15	33.85	21.00	38.45	-17.45	V
847.50	-16.47	3.55	8.36	2.15	33.88	20.07	38.45	-18.38	V

## LTE FDD Band 5\_Channel Bandwidth 5MHz\_QPSK

Frequency (MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)	G <sub>a</sub> Antenna Gain(dB)	Correction (dB)	P <sub>Ag</sub> (dB)	Peak ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
826.50	-16.32	3.45	8.45	2.15	33.79	20.32	38.45	-18.13	V
836.50	-16.27	3.49	8.45	2.15	33.85	20.39	38.45	-18.06	V
846.50	-15.58	3.55	8.36	2.15	33.88	20.96	38.45	-17.49	V

## LTE FDD Band 5\_Channel Bandwidth 10MHz\_QPSK

Frequency (MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)	G <sub>a</sub> Antenna Gain(dB)	Correction (dB)	P <sub>Ag</sub> (dB)	Peak ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
829.00	-16.21	3.45	8.45	2.15	33.79	20.43	38.45	-18.02	V
836.50	-15.84	3.49	8.45	2.15	33.85	20.82	38.45	-17.63	V
844.00	-16.32	3.55	8.36	2.15	33.88	20.22	38.45	-18.23	V

## LTE FDD Band 5\_Channel Bandwidth 1.4MHz\_16QAM

Frequency (MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)	G <sub>a</sub> Antenna Gain(dB)	Correction (dB)	P <sub>Ag</sub> (dB)	Peak ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
824.70	-17.07	3.45	8.45	2.15	33.79	19.57	38.45	-18.88	V
836.50	-17.29	3.49	8.45	2.15	33.85	19.37	38.45	-19.08	V
848.30	-16.56	3.55	8.36	2.15	33.88	19.98	38.45	-18.47	V

## LTE FDD Band 5\_Channel Bandwidth 3MHz\_16QAM

Frequency (MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)	G <sub>a</sub> Antenna Gain(dB)	Correction (dB)	P <sub>Ag</sub> (dB)	Peak ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
825.50	-16.87	3.45	8.45	2.15	33.79	19.77	38.45	-18.68	V
836.50	-17.13	3.49	8.45	2.15	33.85	19.53	38.45	-18.92	V
847.50	-16.77	3.55	8.36	2.15	33.88	19.77	38.45	-18.68	V

## LTE FDD Band 5\_Channel Bandwidth 5MHz\_16QAM

Frequency (MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)	G <sub>a</sub> Antenna Gain(dB)	Correction (dB)	P <sub>Ag</sub> (dB)	Peak ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
826.50	-17.34	3.45	8.45	2.15	33.79	19.30	38.45	-19.15	V
836.50	-16.92	3.49	8.45	2.15	33.85	19.74	38.45	-18.71	V
846.50	-16.75	3.55	8.36	2.15	33.88	19.79	38.45	-18.66	V





## LTE FDD Band 5 Channel Bandwidth 10MHz\_16QAM

Frequency (MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)	G <sub>a</sub> Antenna Gain(dB)	Correction (dB)	P <sub>Ag</sub> (dB)	Peak ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
829.00	-16.60	3.45	8.45	2.15	33.79	20.04	38.45	-18.41	V
836.50	-17.24	3.49	8.45	2.15	33.85	19.42	38.45	-19.03	V
844.00	-17.49	3.55	8.36	2.15	33.88	19.05	38.45	-19.40	V

## LTE FDD Band 7 Channel Bandwidth 5MHz\_QPSK

Frequency (MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)	G <sub>a</sub> Antenna Gain(dB)	P <sub>Ag</sub> (dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
2502.5	-18.78	4.32	6.80	36.14	19.84	33.01	-13.17	V
2535.0	-18.60	4.32	6.61	36.17	19.86	33.01	-13.15	V
2567.5	-18.94	4.33	6.57	36.22	19.52	33.01	-13.49	V

## LTE FDD Band 7 Channel Bandwidth 10MHz\_QPSK

Frequency (MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)	G <sub>a</sub> Antenna Gain(dB)	P <sub>Ag</sub> (dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
2505.0	-18.22	4.32	6.80	36.14	20.40	33.01	-12.61	V
2535.0	-18.53	4.32	6.61	36.17	19.93	33.01	-13.08	V
2565.0	-18.95	4.33	6.57	36.22	19.51	33.01	-13.50	V

## LTE FDD Band 7 Channel Bandwidth 15MHz\_QPSK

Frequency (MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)	G <sub>a</sub> Antenna Gain(dB)	P <sub>Ag</sub> (dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
2507.5	-18.23	4.32	6.80	36.14	20.39	33.01	-12.62	V
2535.0	-18.63	4.32	6.61	36.17	19.83	33.01	-13.18	V
2562.5	-18.28	4.33	6.57	36.22	20.18	33.01	-12.83	V

## LTE FDD Band 7 Channel Bandwidth 20MHz\_QPSK

Frequency (MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)	G <sub>a</sub> Antenna Gain(dB)	P <sub>Ag</sub> (dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
2510.0	-18.82	4.32	6.80	36.14	19.80	33.01	-13.21	V
2535.0	-18.35	4.32	6.61	36.17	20.11	33.01	-12.90	V
2560.0	-18.28	4.33	6.57	36.22	20.18	33.01	-12.83	V

## LTE FDD Band 7 Channel Bandwidth 5MHz\_16QAM

Frequency (MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)	G <sub>a</sub> Antenna Gain(dB)	P <sub>Ag</sub> (dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
2502.5	-19.83	4.32	6.80	36.14	18.79	33.01	-14.22	V
2535.0	-19.08	4.32	6.61	36.17	19.38	33.01	-13.63	V
2567.5	-18.93	4.33	6.57	36.22	19.53	33.01	-13.48	V

## LTE FDD Band 7 Channel Bandwidth 10MHz\_16QAM

Frequency (MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)	G <sub>a</sub> Antenna Gain(dB)	P <sub>Ag</sub> (dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
2505.0	-18.93	4.32	6.80	36.14	19.69	33.01	-13.32	V
2535.0	-19.83	4.32	6.61	36.17	18.63	33.01	-14.38	V
2565.0	-19.79	4.33	6.57	36.22	18.67	33.01	-14.34	V





## LTE FDD Band 7\_Channel Bandwidth 15MHz\_16QAM

Frequency (MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)	G <sub>a</sub> Antenna Gain(dB)	P <sub>Ag</sub> (dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
2507.5	-19.70	4.32	6.80	36.14	18.92	33.01	-14.09	V
2535.0	-19.50	4.32	6.61	36.17	18.96	33.01	-14.05	V
2562.5	-19.32	4.33	6.57	36.22	19.14	33.01	-13.87	V

## LTE FDD Band 7\_Channel Bandwidth 20MHz\_16QAM

Frequency (MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)	G <sub>a</sub> Antenna Gain(dB)	P <sub>Ag</sub> (dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
2510.0	-19.25	4.32	6.80	36.14	19.37	33.01	-13.64	V
2535.0	-19.62	4.32	6.61	36.17	18.84	33.01	-14.17	V
2560.0	-19.19	4.33	6.57	36.22	19.27	33.01	-13.74	V

## LTE TDD Band 41\_Channel Bandwidth 5MHz\_QPSK

Frequency (MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)	G <sub>a</sub> Antenna Gain(dB)	P <sub>Ag</sub> (dB)	Burst Average EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
2498.5	-18.89	4.32	6.8	36.13	19.72	33.01	-13.29	V
2593.0	-18.83	4.36	6.55	36.26	19.62	33.01	-13.39	V
2687.5	-18.04	4.51	6.37	36.54	20.36	33.01	-12.65	V

## LTE TDD Band 41\_Channel Bandwidth 10MHz\_QPSK

Frequency (MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)	G <sub>a</sub> Antenna Gain(dB)	P <sub>Ag</sub> (dB)	Burst Average EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
2501.0	-18.88	4.32	6.8	36.13	19.73	33.01	-13.28	V
2593.0	-18.35	4.36	6.55	36.26	20.10	33.01	-12.91	V
2685.0	-18.35	4.51	6.37	36.54	20.05	33.01	-12.96	V

## LTE TDD Band 41\_Channel Bandwidth 15MHz\_QPSK

Frequency (MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)	G <sub>a</sub> Antenna Gain(dB)	P <sub>Ag</sub> (dB)	Burst Average EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
2503.5	-18.29	4.32	6.8	36.13	20.32	33.01	-12.69	V
2593.0	-18.53	4.36	6.55	36.26	19.92	33.01	-13.09	V
2682.5	-18.14	4.51	6.37	36.54	20.26	33.01	-12.75	V

## LTE TDD Band 41\_Channel Bandwidth 20MHz\_QPSK

Frequency (MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)	G <sub>a</sub> Antenna Gain(dB)	P <sub>Ag</sub> (dB)	Burst Average EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
2506.0	-18.65	4.32	6.8	36.13	19.96	33.01	-13.05	V
2593.0	-18.13	4.36	6.55	36.26	20.32	33.01	-12.69	V
2680.0	-18.80	4.51	6.37	36.54	19.60	33.01	-13.41	V



## LTE TDD Band 41\_Channel Bandwidth 5MHz\_16QAM

Frequency (MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)	G <sub>a</sub> Antenna Gain(dB)	P <sub>Ag</sub> (dB)	Burst Average EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
2498.5	-19.37	4.32	6.8	36.13	19.24	33.01	-13.77	V
2593.0	-19.33	4.36	6.55	36.26	19.12	33.01	-13.89	V
2687.5	-19.50	4.51	6.37	36.54	18.90	33.01	-14.11	V

## LTE TDD Band 41\_Channel Bandwidth 10MHz\_16QAM

Frequency (MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)	G <sub>a</sub> Antenna Gain(dB)	P <sub>Ag</sub> (dB)	Burst Average EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
2501.0	-19.66	4.32	6.8	36.13	18.95	33.01	-14.06	V
2593.0	-19.89	4.36	6.55	36.26	18.56	33.01	-14.45	V
2685.0	-19.04	4.51	6.37	36.54	19.36	33.01	-13.65	V

## LTE TDD Band 41\_Channel Bandwidth 15MHz\_16QAM

Frequency (MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)	G <sub>a</sub> Antenna Gain(dB)	P <sub>Ag</sub> (dB)	Burst Average EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
2503.5	-18.96	4.32	6.8	36.13	19.65	33.01	-13.36	V
2593.0	-19.57	4.36	6.55	36.26	18.88	33.01	-14.13	V
2682.5	-19.31	4.51	6.37	36.54	19.09	33.01	-13.92	V

## LTE TDD Band 41\_Channel Bandwidth 20MHz\_16QAM

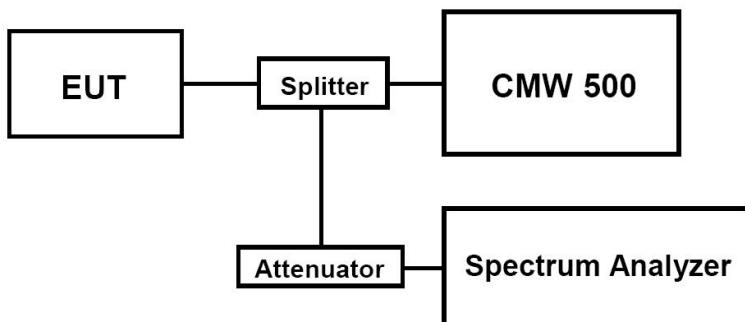
Frequency (MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)	G <sub>a</sub> Antenna Gain(dB)	P <sub>Ag</sub> (dB)	Burst Average EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
2506.0	-19.63	4.32	6.8	36.13	18.98	33.01	-14.03	V
2593.0	-19.63	4.36	6.55	36.26	18.82	33.01	-14.19	V
2680.0	-19.29	4.51	6.37	36.54	19.11	33.01	-13.90	V

## 4.2 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. We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 5, LTE FDD Band 7, LTE FDD Band 41; recorded worst case for each Channel Bandwidth of LTE FDD Band 5, LTE FDD Band 7, LTE FDD Band 41.
2. For E-UTRA Band 5, please refer to Appendix F: Section F.2
3. For E-UTRA Band 7, please refer to Appendix G: Section G.2
4. For E-UTRA Band 41, please refer to Appendix H: Section H.2

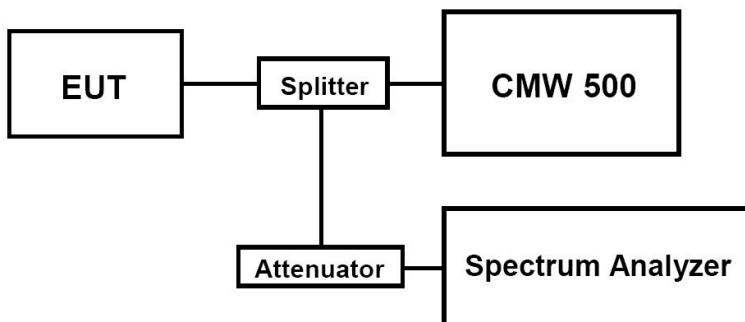


## 4.3 Occupied Bandwidth and Emission Bandwidth

### LIMIT

N/A

### TEST CONFIGURATION



### TEST PROCEDURE

The transmitter output was connected to a calibrated coaxial cable and coupler, the other end of which was connected to a spectrum analyzer. The occupied bandwidth was measured with the spectrum analyzer at low, middle and high channel in each band. The -26dBc Emission bandwidth was also measured and recorded. Set RBW was set to about 1% of emission BW,  $VBW \geq 3$  times RBW.

-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 RESULTS

#### *Remark:*

1. We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 5, LTE FDD Band 7, LTE FDD Band 41; recorded worst case for each Channel Bandwidth of LTE FDD Band 5, LTE FDD Band 7, LTE FDD Band 41.
2. For E-UTRA Band 5, please refer to Appendix F: Section F.3
3. For E-UTRA Band 7, please refer to Appendix G: Section G.3
4. For E-UTRA Band 41, please refer to Appendix H: Section H.3



## 4.4 Band Edge compliance

### LIMIT

For LTE FDD Band 5: Per FCC §22.917 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.

For LTE FDD Band 7: Per FCC §27.53 (m)(4): For mobile digital stations, the attenuation factor shall be not less than:

- $40 + 10\log(P)$  dB ( $-10$  dBm,  $100$  nW) on all frequencies between the channel edge and  $5$  MHz from the channel edge,
- $43 + 10\log(P)$  dB ( $-13$  dBm,  $50$  nW) on all frequencies between  $5$  MHz and  $X$  MHz from the channel edge, and
- $55 + 10\log(P)$  dB ( $-25$  dBm,  $3$  nW) on all frequencies more than  $X$  MHz from the channel edge, where  $X$  is the greater of  $6$  MHz or the actual emission bandwidth ( $26$  dB). [§ 27.53(m)(4)]

In addition, the attenuation factor (fixed limit) shall not be less than:

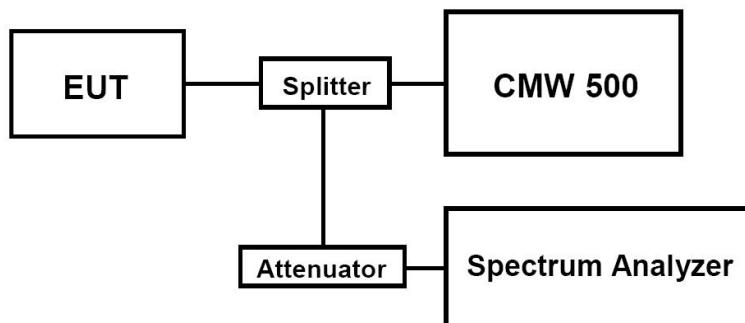
- $43 + 10\log(P)$  dB on all frequencies between  $2490.5$  MHz and  $2496$  MHz, and
- $55 + 10\log(P)$  dB at or below  $2490.5$  MHz. [§ 27.53(m)(4)]

For LTE TDD Band 41: Per §27.53 (m)(6) Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of  $1$  megahertz or greater.

However, 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; for mobile digital stations, in the  $1$  megahertz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least two percent may be employed, except when the  $1$  megahertz band is  $2495$ - $2496$  MHz, in which case a resolution bandwidth of at least one percent may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e.  $1$  megahertz or  $1$  percent of emission bandwidth, as specified; or  $1$  megahertz or  $2$  percent for mobile digital stations, except in the band  $2495$ - $2496$  MHz). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least  $26$  dB below the transmitter power. With respect to television operations, measurements must be made of the separate visual and aural operating powers at sufficiently frequent intervals to ensure compliance with the rules.

(m)(4) For mobile digital stations, the attenuation factor shall be not less than  $40 + 10 \log (P)$  dB on all frequencies between the channel edge and  $5$  megahertz from the channel edge,  $43 + 10 \log (P)$  dB on all frequencies between  $5$  megahertz and  $X$  megahertz from the channel edge, and  $55 + 10 \log (P)$  dB on all frequencies more than  $X$  megahertz from the channel edge, where  $X$  is the greater of  $6$  megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less than  $43 + 10 \log (P)$  dB on all frequencies between  $2490.5$  MHz and  $2496$  MHz and  $55 + 10 \log (P)$  dB at or below  $2490.5$  MHz. Mobile Satellite Service licensees operating on frequencies below  $2495$  MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees. Show citation box.

### TEST CONFIGURATION





## 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 and highest channels for each band and different modulation.
5. Measure Band edge using RMS (Average) detector by spectrum

## TEST RESULTS

### *Remark:*

1. We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 5, LTE FDD Band 7, LTE FDD Band 41; recorded worst case for each Channel Bandwidth of LTE FDD Band 5, LTE FDD Band 7, LTE FDD Band 41.
2. For E-UTRA Band 5, please refer to Appendix F: Section F.4
3. For E-UTRA Band 7, please refer to Appendix G: Section G.4
4. For E-UTRA Band 41, please refer to Appendix H: Section H.4



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Scan code to check authenticity



## 4.5 Spurious Emission on Antenna Port

### LIMIT

For LTE FDD Band 5: Per FCC §22.917 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.

For LTE FDD Band 7: Per FCC §27.53 (m)(4): For mobile digital stations, the attenuation factor shall be not less than:

- $40 + 10\log P$  dB ( $-10$  dBm,  $100$  nW) on all frequencies between the channel edge and  $5$  MHz from the channel edge,
- $43 + 10\log P$  dB ( $-13$  dBm,  $50$  nW) on all frequencies between  $5$  MHz and  $X$  MHz from the channel edge, and
- $55 + 10\log P$  dB ( $-25$  dBm,  $3$  nW) on all frequencies more than  $X$  MHz from the channel edge, where  $X$  is the greater of  $6$  MHz or the actual emission bandwidth ( $26$  dB). [§ 27.53(m)(4)]

In addition, the attenuation factor (fixed limit) shall not be less than:

- $43 + 10\log P$  dB on all frequencies between  $2490.5$  MHz and  $2496$  MHz, and
- $55 + 10\log P$  dB at or below  $2490.5$  MHz. [§ 27.53(m)(4)]

For LTE TDD Band 41: Per §27.53 (m)(6) Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of  $1$  megahertz or greater.

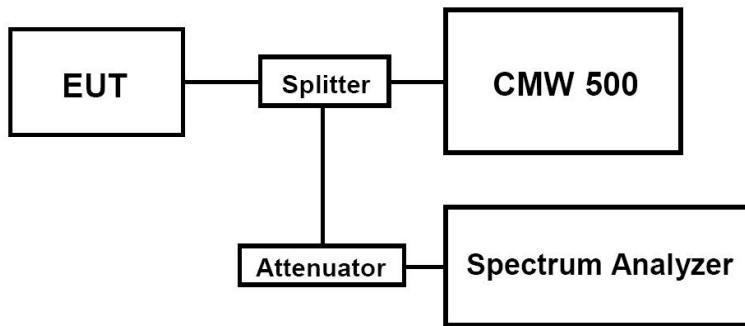
However, in the  $1$  MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed; for mobile digital stations, in the  $1$  megahertz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least two percent may be employed, except when the  $1$  megahertz band is  $2495$ - $2496$  MHz, in which case a resolution bandwidth of at least one percent may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e.  $1$  megahertz or  $1$  percent of emission bandwidth, as specified; or  $1$  megahertz or  $2$  percent for mobile digital stations, except in the band  $2495$ - $2496$  MHz). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least  $26$  dB below the transmitter power. With respect to television operations, measurements must be made of the separate visual and aural operating powers at sufficiently frequent intervals to ensure compliance with the rules.

(m)(4) For mobile digital stations, the attenuation factor shall be not less than  $40 + 10 \log (P)$  dB on all frequencies between the channel edge and  $5$  megahertz from the channel edge,  $43 + 10 \log (P)$  dB on all frequencies between  $5$  megahertz and  $X$  megahertz from the channel edge, and  $55 + 10 \log (P)$  dB on all frequencies more than  $X$  megahertz from the channel edge, where  $X$  is the greater of  $6$  megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less than  $43 + 10 \log (P)$  dB on all frequencies between  $2490.5$  MHz and  $2496$  MHz and  $55 + 10 \log (P)$  dB at or below  $2490.5$  MHz. Mobile Satellite Service licensees operating on frequencies below  $2495$  MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees. Show citation box.

For LTE FDD Band 66: Per §27.53(h): For operations in the  $1710$ - $1780$  MHz and  $2110$ - $2200$  MHz bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log(P)$  dB.



## TEST CONFIGURATION



## TEST PROCEDURE

The EUT was setup according to TIA-603-E

- 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 spectrum analyzer and CMW 500 by a Directional Couple.
- c. EUT Communicate with CMW 500, then select a channel for testing.
- d. Add a correction factor to the display of spectrum, and then test.
- e. The resolution bandwidth of the spectrum analyzer was set sufficient scans were taken to show the out of band Emission if any up to 10<sup>th</sup> harmonic.
- f. Please refer to following tables for test antenna conducted emissions.

Working Frequency	Sub range (GHz)	RBW	VBW	Sweep time (s)
LTE FDD Band 5	0.000009~0.000015	1KHz	3KHz	Auto
	0.000015~0.03	10KHz	30KHz	Auto
	0.03~26	1 MHz	3 MHz	Auto
LTE FDD Band 7	0.000009~0.000015	1KHz	3KHz	Auto
	0.000015~0.03	10KHz	30KHz	Auto
	0.03~26	1 MHz	3 MHz	Auto
LTE FDD Band 41	0.000009~0.000015	1KHz	3KHz	Auto
	0.000015~0.03	10KHz	30KHz	Auto
	0.03~26	1 MHz	3 MHz	Auto

## TEST RESULTS

### Remark:

1. We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 5, LTE FDD Band 7, LTE FDD Band 41; recorded worst case for each Channel Bandwidth of LTE FDD Band 5, LTE FDD Band 7, LTE FDD Band 41.
2. For E-UTRA Band 5, please refer to Appendix F: Section F.5
3. For E-UTRA Band 7, please refer to Appendix G: Section G.5
4. For E-UTRA Band 41, please refer to Appendix H: Section H.5



## 4.6 Radiated Spurious Emission

### LIMIT

For LTE FDD Band 5: Per FCC §22.917 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.

For LTE FDD Band 7: Per FCC §27.53 (m)(4): For mobile digital stations, the attenuation factor shall be not less than:

- $40 + 10\log P$  dB ( $-10$  dBm,  $100$  nW) on all frequencies between the channel edge and  $5$  MHz from the channel edge,
- $43 + 10\log P$  dB ( $-13$  dBm,  $50$  nW) on all frequencies between  $5$  MHz and  $X$  MHz from the channel edge, and
- $55 + 10\log P$  dB ( $-25$  dBm,  $3$  nW) on all frequencies more than  $X$  MHz from the channel edge, where  $X$  is the greater of  $6$  MHz or the actual emission bandwidth ( $26$  dB). [§ 27.53(m)(4)]

In addition, the attenuation factor (fixed limit) shall not be less than:

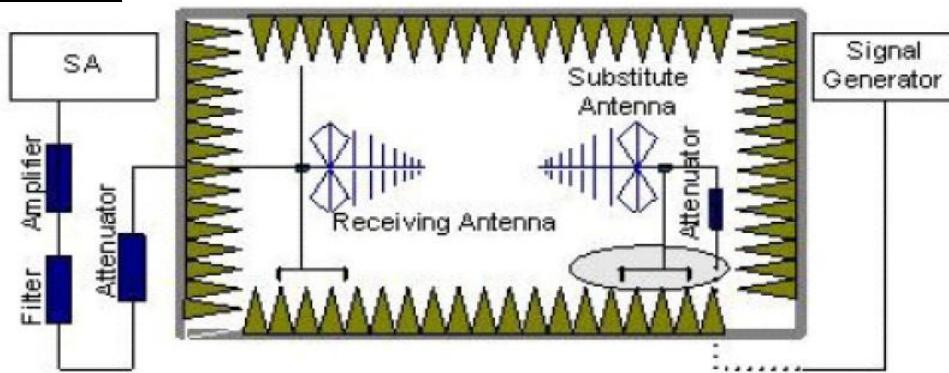
- $43 + 10\log P$  dB on all frequencies between  $2490.5$  MHz and  $2496$  MHz, and
- $55 + 10\log P$  dB at or below  $2490.5$  MHz. [§ 27.53(m)(4)]

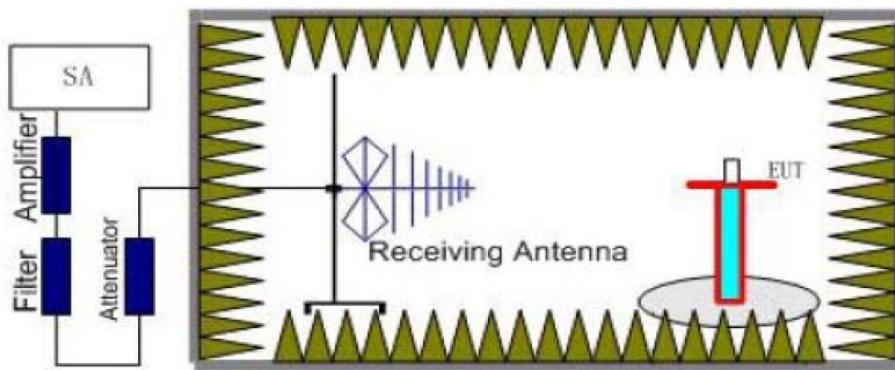
For LTE TDD Band 41: Per §27.53 (m)(6) Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of  $1$  megahertz or greater.

However, 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; for mobile digital stations, in the  $1$  megahertz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least two percent may be employed, except when the  $1$  megahertz band is  $2495$ - $2496$  MHz, in which case a resolution bandwidth of at least one percent may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e.  $1$  megahertz or  $1$  percent of emission bandwidth, as specified; or  $1$  megahertz or  $2$  percent for mobile digital stations, except in the band  $2495$ - $2496$  MHz). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least  $26$  dB below the transmitter power. With respect to television operations, measurements must be made of the separate visual and aural operating powers at sufficiently frequent intervals to ensure compliance with the rules.

(m)(4) For mobile digital stations, the attenuation factor shall be not less than  $40 + 10 \log (P)$  dB on all frequencies between the channel edge and  $5$  megahertz from the channel edge,  $43 + 10 \log (P)$  dB on all frequencies between  $5$  megahertz and  $X$  megahertz from the channel edge, and  $55 + 10 \log (P)$  dB on all frequencies more than  $X$  megahertz from the channel edge, where  $X$  is the greater of  $6$  megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less than  $43 + 10 \log (P)$  dB on all frequencies between  $2490.5$  MHz and  $2496$  MHz and  $55 + 10 \log (P)$  dB at or below  $2490.5$  MHz. Mobile Satellite Service licensees operating on frequencies below  $2495$  MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees. Show citation box.

### 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=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:  
$$\text{Power(EIRP)} = P_{Mea} + P_{Ag} - P_{cl} + G_a$$
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,  $\text{ERP} = \text{EIRP} - 2.15\text{dBi}$ .
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)
LTE FDD Band 5	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
	8~9	1 MHz	3 MHz	3
LTE FDD Band 7	0.00009~0.15	1KHz	3KHz	30
	0.00015~0.03	10KHz	30KHz	10
	0.03~1	100KHz	300KHz	10





LTE TDD Band 41	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
	20~26	1 MHz	3 MHz	2
	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

Frequency	Channel	Frequency Range	Verdict
LTE FDD Band 5	Low	9KHz -9GHz	PASS
	Middle	9KHz -9GHz	PASS
	High	9KHz -9GHz	PASS
LTE FDD Band 7	Low	9KHz -26GHz	PASS
	Middle	9KHz -26GHz	PASS
	High	9KHz -26GHz	PASS
LTE TDD Band 41	Low	9KHz -26GHz	PASS
	Middle	9KHz -26GHz	PASS
	High	9KHz -26GHz	PASS

## TEST RESULTS

### Remark:

1. We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 5, LTE FDD Band 7, LTE FDD Band 41; recorded worst case for each Channel Bandwidth of LTE FDD Band 5, LTE FDD Band 7, LTE FDD Band 41.
3. We were not recorded other points as values lower than limits.
4. Power(EIRP)= $P_{Mea} + P_{Ag} - P_{cl} + G_a$
5. Margin = EIRP - Limit





## LTE FDD Band 5\_Channel Bandwidth 10MHz\_QPSK\_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
1658.00	-39.91	3.86	3.00	8.56	-35.21	-13.00	-22.21	H
2487.00	-47.26	4.29	3.00	6.98	-44.57	-13.00	-31.57	H
1658.00	-33.71	3.86	3.00	8.56	-29.01	-13.00	-16.01	V
2487.00	-37.31	4.29	3.00	6.98	-34.62	-13.00	-21.62	V

## LTE FDD Band 5\_Channel Bandwidth 10MHz\_QPSK\_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
1673.00	-40.20	3.90	3.00	8.58	-35.52	-13.00	-22.52	H
2509.50	-44.95	4.32	3.00	6.80	-42.47	-13.00	-29.47	H
1673.00	-33.66	3.90	3.00	8.58	-28.98	-13.00	-15.98	V
2509.50	-39.03	4.32	3.00	6.80	-36.55	-13.00	-23.55	V

## LTE FDD Band 5\_Channel Bandwidth 10MHz\_QPSK\_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
1688.00	-39.31	3.91	3.00	9.06	-34.16	-13.00	-21.16	H
2532.00	-45.29	4.32	3.00	6.65	-42.96	-13.00	-29.96	H
1688.00	-35.97	3.91	3.00	9.06	-30.82	-13.00	-17.82	V
2532.00	-39.97	4.32	3.00	6.65	-37.64	-13.00	-24.64	V

## LTE FDD Band 5\_Channel Bandwidth 10MHz\_16QAM\_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
1658.00	-44.18	3.86	3.00	8.56	-39.48	-13.00	-26.48	H
2487.00	-46.34	4.29	3.00	6.98	-43.65	-13.00	-30.65	H
1658.00	-36.89	3.86	3.00	8.56	-32.19	-13.00	-19.19	V
2487.00	-41.44	4.29	3.00	6.98	-38.75	-13.00	-25.75	V

## LTE FDD Band 5\_Channel Bandwidth 10MHz\_16QAM\_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
1673.00	-42.78	3.90	3.00	8.58	-38.10	-13.00	-25.10	H
2509.50	-49.88	4.32	3.00	6.80	-47.40	-13.00	-34.40	H
1673.00	-39.74	3.90	3.00	8.58	-35.06	-13.00	-22.06	V
2509.50	-42.57	4.32	3.00	6.80	-40.09	-13.00	-27.09	V

## LTE FDD Band 5\_Channel Bandwidth 10MHz\_16QAM\_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
1688.00	-41.71	3.91	3.00	9.06	-36.56	-13.00	-23.56	H
2532.00	-47.41	4.32	3.00	6.65	-45.08	-13.00	-32.08	H
1688.00	-36.11	3.91	3.00	9.06	-30.96	-13.00	-17.96	V
2532.00	-40.95	4.32	3.00	6.65	-38.62	-13.00	-25.62	V





## LTE FDD Band 7\_Channel Bandwidth 20MHz\_QPSK\_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
5020.0	-40.50	5.88	3.00	10.77	-35.61	-25.00	-10.61	H
7530.0	-44.93	7.12	3.00	12.26	-39.79	-25.00	-14.79	H
5020.0	-36.66	5.88	3.00	10.77	-31.77	-25.00	-6.77	V
7530.0	-39.87	7.12	3.00	12.26	-34.73	-25.00	-9.73	V

## LTE FDD Band 7\_Channel Bandwidth 20MHz\_QPSK\_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
5070.0	-38.35	5.90	3.00	10.81	-33.44	-25.00	-8.44	H
7605.0	-46.13	7.19	3.00	12.32	-41.00	-25.00	-16.00	H
5070.0	-36.58	5.90	3.00	10.81	-31.67	-25.00	-6.67	V
7605.0	-36.28	7.19	3.00	12.32	-31.15	-25.00	-6.15	V

## LTE FDD 7\_Channel Bandwidth 20MHz\_QPSK\_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
5120.0	-40.83	5.94	3.00	10.86	-35.91	-25.00	-10.91	H
7680.0	-46.60	7.25	3.00	12.98	-40.87	-25.00	-15.87	H
5120.0	-33.84	5.94	3.00	10.86	-28.92	-25.00	-3.92	V
7680.0	-36.29	7.25	3.00	12.98	-30.56	-25.00	-5.56	V

## LTE FDD Band 7\_Channel Bandwidth 20MHz\_16QAM\_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
5020.0	-41.09	5.88	3.00	10.77	-36.20	-25.00	-11.20	H
7530.0	-49.99	7.12	3.00	12.26	-44.85	-25.00	-19.85	H
5020.0	-39.75	5.88	3.00	10.77	-34.86	-25.00	-9.86	V
7530.0	-39.67	7.12	3.00	12.26	-34.53	-25.00	-9.53	V

## LTE FDD Band 7\_Channel Bandwidth 20MHz\_16QAM\_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
5070.0	-41.89	5.90	3.00	10.81	-36.98	-25.00	-11.98	H
7605.0	-46.57	7.19	3.00	12.32	-41.44	-25.00	-16.44	H
5070.0	-37.92	5.90	3.00	10.81	-33.01	-25.00	-8.01	V
7605.0	-42.80	7.19	3.00	12.32	-37.67	-25.00	-12.67	V

## LTE FDD Band 7\_Channel Bandwidth 20MHz\_16QAM\_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
5120.0	-42.77	5.94	3.00	10.86	-37.85	-25.00	-12.85	H
7680.0	-48.85	7.25	3.00	12.98	-43.12	-25.00	-18.12	H
5120.0	-37.22	5.94	3.00	10.86	-32.30	-25.00	-7.30	V
7680.0	-40.84	7.25	3.00	12.98	-35.11	-25.00	-10.11	V





## LTE TDD Band 41\_Channel Bandwidth 20MHz\_QPSK\_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
5012.0	-40.25	7.15	3.00	9.88	-37.52	-25.00	-12.52	H
7518.0	-44.54	8.36	3.00	11.36	-41.54	-25.00	-16.54	H
5012.0	-46.57	7.15	3.00	9.88	-43.84	-25.00	-18.84	V
7518.0	-40.80	8.36	3.00	11.36	-37.80	-25.00	-12.80	V

## LTE TDD Band 41\_Channel Bandwidth 20MHz\_QPSK\_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
5186.0	-39.76	7.26	3.00	10.03	-36.99	-25.00	-11.99	H
7779.0	-44.36	8.48	3.00	11.41	-41.43	-25.00	-16.43	H
5186.0	-46.12	7.26	3.00	10.03	-43.35	-25.00	-18.35	V
7779.0	-43.15	8.48	3.00	11.41	-40.22	-25.00	-15.22	V

## LTE TDD Band 41\_Channel Bandwidth 20MHz\_QPSK\_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
5360.0	-40.72	7.17	3.00	9.62	-38.27	-25.00	-13.27	H
8040.0	-44.49	8.39	3.00	11.46	-41.42	-25.00	-16.42	H
5360.0	-44.62	7.17	3.00	9.62	-42.17	-25.00	-17.17	V
8040.0	-41.03	8.39	3.00	11.46	-37.96	-25.00	-12.96	V

## LTE TDD Band 41\_Channel Bandwidth 20MHz\_16QAM\_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
5012.0	-44.56	7.15	3.00	9.88	-41.83	-25.00	-16.83	H
7518.0	-46.11	8.36	3.00	11.36	-43.11	-25.00	-18.11	H
5012.0	-45.31	7.15	3.00	9.88	-42.58	-25.00	-17.58	V
7518.0	-40.87	8.36	3.00	11.36	-37.87	-25.00	-12.87	V

## LTE TDD Band 41\_Channel Bandwidth 20MHz\_16QAM\_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
5186.0	-44.48	7.26	3.00	10.03	-41.71	-25.00	-16.71	H
7779.0	-48.56	8.48	3.00	11.41	-45.63	-25.00	-20.63	H
5186.0	-45.41	7.26	3.00	10.03	-42.64	-25.00	-17.64	V
7779.0	-41.42	8.48	3.00	11.41	-38.49	-25.00	-13.49	V

## LTE TDD Band 41\_Channel Bandwidth 20MHz\_16QAM\_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
5360.0	-43.87	7.17	3.00	9.62	-41.42	-25.00	-16.42	H
8040.0	-47.82	8.39	3.00	11.46	-44.75	-25.00	-19.75	H
5360.0	-46.06	7.17	3.00	9.62	-43.61	-25.00	-18.61	V
8040.0	-41.96	8.39	3.00	11.46	-38.89	-25.00	-13.89	V

Notes: All channel bandwidth were tested, the report recorded the worst data.



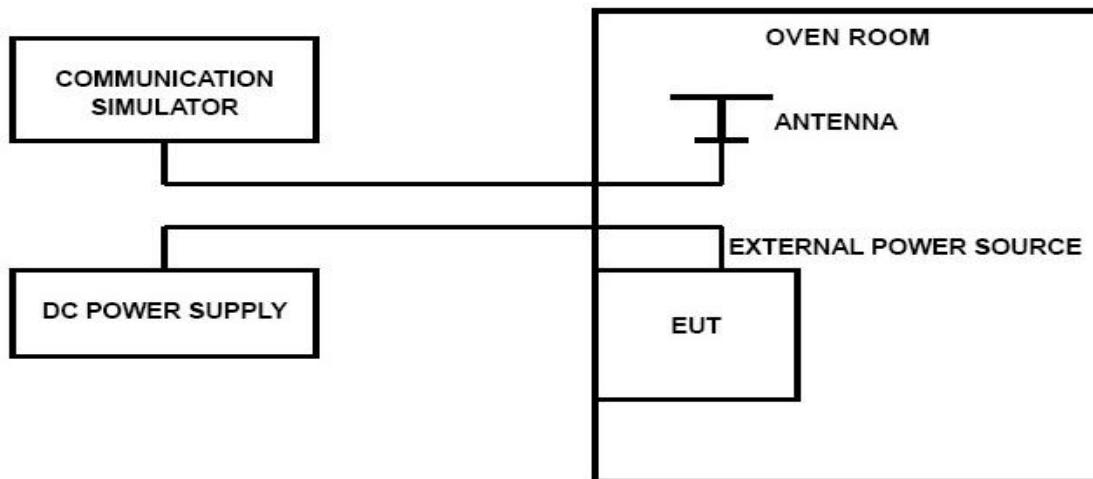
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## 4.7 Frequency Stability under Temperature & Voltage Variations

### LIMIT

According to FCC §2.1055, §22.355, §27.54 requirement, the frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation and should not exceed 2.5ppm.

### TEST CONFIGURATION



### TEST PROCEDURE

The EUT was setup according to TIA-603-E

#### **Frequency Stability Under Temperature Variations:**

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 CMW 500 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 CMW 500 and in a simulated call on middle channel for LTE band 5, LTE band 7, LTE band 41; 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 1.5 hours at each temperature, unpowered, before making measurements.
5. Re-measure carrier frequency at room temperature with nominal voltage. Vary supply voltage from minimum voltage to maximum voltage, in 0.1Volt increments re-measuring carrier frequency at each voltage. Pause at nominal voltage for 1.5 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 CMW 500 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 1.5 hours at each temperature, unpowered, before making measurements
9. At all temperature levels hold the temperature to +/- 0.5°C during the measurement procedure.

#### **Frequency Stability Under Voltage Variations:**

Set chamber temperature to 20°C. Use a variable AC power supply / DC power source to power the EUT and set the voltage to rated voltage. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and recorded the frequency.

Reduce the input voltage to specify extreme voltage variation ( $\pm 15\%$ ) and endpoint, record the maximum frequency change.





## TEST RESULTS

### Remark:

We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 5, LTE FDD Band 7, LTE FDD Band 41; recorded worst case for each Channel Bandwidth of LTE FDD Band 5, LTE FDD Band 7, LTE FDD Band 41.

### LTE Band 5, QPSK, 1.4MHz bandwidth(worst case of all bandwidths)

LTE FDD Band 5					
DC Power	Temperature (°C)	Frequency error(Hz)	Frequency error(ppm)	Limit (ppm)	Verdict
VL	20	23	0.028	±2.50	PASS
VN	20	31	0.038	±2.50	PASS
VH	20	9	0.011	±2.50	PASS
VN	-30	-17	-0.021	±2.50	PASS
VN	-20	29	0.035	±2.50	PASS
VN	-10	6	0.007	±2.50	PASS
VN	0	20	0.024	±2.50	PASS
VN	10	-16	-0.019	±2.50	PASS
VN	20	19	0.023	±2.50	PASS
VN	30	28	0.034	±2.50	PASS
VN	40	3	0.004	±2.50	PASS
VN	50	36	0.044	±2.50	PASS

### LTE Band 5, 16QAM, 1.4MHz bandwidth(worst case of all bandwidths)

LTE FDD Band 5					
DC Power	Temperature (°C)	Frequency error(Hz)	Frequency error(ppm)	Limit (ppm)	Verdict
VL	20	-43	-0.052	±2.50	PASS
VN	20	-15	-0.018	±2.50	PASS
VH	20	-34	-0.041	±2.50	PASS
VN	-30	-28	-0.034	±2.50	PASS
VN	-20	-4	-0.005	±2.50	PASS
VN	-10	40	0.049	±2.50	PASS
VN	0	-31	-0.038	±2.50	PASS
VN	10	-42	-0.051	±2.50	PASS
VN	20	26	0.032	±2.50	PASS
VN	30	31	0.038	±2.50	PASS
VN	40	28	0.034	±2.50	PASS
VN	50	-15	-0.018	±2.50	PASS





LTE Band 7, QPSK, 5MHz bandwidth (worst case of all bandwidths and modulation type)

LTE FDD Band 7					
DC Power	Temperature (°C)	Frequency error(Hz)	Frequency error(ppm)	Limit (ppm)	Verdict
VL	20	-7	-0.003	±2.50	PASS
VN	20	5	0.002	±2.50	PASS
VH	20	2	0.001	±2.50	PASS
VN	-30	9	0.004	±2.50	PASS
VN	-20	-12	-0.005	±2.50	PASS
VN	-10	-2	-0.001	±2.50	PASS
VN	0	19	0.007	±2.50	PASS
VN	10	-2	-0.001	±2.50	PASS
VN	20	-20	-0.008	±2.50	PASS
VN	30	3	0.001	±2.50	PASS
VN	40	-19	-0.007	±2.50	PASS
VN	50	10	0.004	±2.50	PASS

LTE Band 7, 16QAM, 5MHz bandwidth (worst case of all bandwidths and modulation type)

LTE FDD Band 7					
DC Power	Temperature (°C)	Frequency error(Hz)	Frequency error(ppm)	Limit (ppm)	Verdict
VL	20	-5	-0.002	±2.50	PASS
VN	20	-18	-0.007	±2.50	PASS
VH	20	19	0.007	±2.50	PASS
VN	-30	0	0.000	±2.50	PASS
VN	-20	2	0.001	±2.50	PASS
VN	-10	-10	-0.004	±2.50	PASS
VN	0	17	0.007	±2.50	PASS
VN	10	9	0.004	±2.50	PASS
VN	20	18	0.007	±2.50	PASS
VN	30	-17	-0.007	±2.50	PASS
VN	40	-18	-0.007	±2.50	PASS
VN	50	10	0.004	±2.50	PASS

LTE Band 41, 5MHz bandwidth, QPSK (worst case of all bandwidths)

LTE TDD Band 41					
DC Power	Temperature (°C)	Frequency error(Hz)	Frequency error(ppm)	Limit (ppm)	Verdict
VL	20	12	0.006	2.50	PASS
VN	20	29	0.014	2.50	PASS
VH	20	16	0.008	2.50	PASS
VN	-30	23	0.011	2.50	PASS
VN	-20	69	0.033	2.50	PASS
VN	-10	78	0.037	2.50	PASS
VN	0	22	0.011	2.50	PASS
VN	10	49	0.023	2.50	PASS
VN	20	77	0.037	2.50	PASS
VN	30	60	0.029	2.50	PASS
VN	40	50	0.024	2.50	PASS
VN	50	54	0.026	2.50	PASS



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LTE Band 41, 5MHz bandwidth, 16QAM (worst case of all bandwidths)

## LTE TDD Band 41

DC Power	Temperature (°C)	Frequency error(Hz)	Frequency error(ppm)	Limit (ppm)	Verdict
VL	20	72	0.034	2.50	PASS
VN	20	78	0.037	2.50	PASS
VH	20	28	0.013	2.50	PASS
VN	-30	78	0.037	2.50	PASS
VN	-20	69	0.033	2.50	PASS
VN	-10	51	0.024	2.50	PASS
VN	0	20	0.010	2.50	PASS
VN	10	96	0.046	2.50	PASS
VN	20	61	0.029	2.50	PASS
VN	30	51	0.024	2.50	PASS
VN	40	87	0.042	2.50	PASS
VN	50	36	0.017	2.50	PASS



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## 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.

-----THE END OF TEST REPORT-----



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