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# TEST REPORT

## FCC Part 22 Subpart H

Report Reference No. .... : CTL2410232073-WF02

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Product Name ..... : Battery Monitor

Model/Type reference ..... : BMS100

List Model(s) ..... : Please look at page 2.

Trade Mark ..... : QUICKLYNKS

FCC ID ..... : 2AU4A-BMS100

Applicant's name ..... : SHENZHEN LEAGEND OPTOELECTRONICS CO., LTD

Address of applicant ..... : 4F, Bld. 26, No. 1301, Guanguang Rd., Xinlan Community, Longhua District, Shenzhen, China

Test Firm ..... : Shenzhen CTL Testing Technology Co., Ltd.

Address of Test Firm ..... : Floor 1-A, Baisha Technology Park, No.3011, Shahexi Road, Nanshan District, Shenzhen, China 518055

Test specification ..... :

Standard ..... : FCC CFR Title 47 Part 2, Part 22H  
ANSI/TIA-603-E (2016)  
KDB 971168 D01

TRF Originator ..... : Shenzhen CTL Testing Technology Co., Ltd.

Master TRF ..... : Dated 2011-01

Date of receipt of test item ..... : Nov 14, 2024

Date of Test Date ..... : Nov 14, 2024–Mar 03, 2025

Date of Issue ..... : Mar 05, 2025

Result ..... : Pass

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# TEST REPORT

<b>Test Report No. :</b>	<b>CTL2410232073-WF02</b>	<b>Mar 05, 2025</b>
		<b>Date of issue</b>

Equipment under Test : Battery Monitor

Sample No : CTL2410232073

Model /Type : BMS100

Listed Models	:	BMS100 Pro, BMS200, BMS200 Pro, BMS300, BMS300 Pro, BMS400,BMS400 Pro, BMS500, BMS500 Pro, BMS600, BMS600Pro, BMS700, BMS700Pro, BMS800,BMS800Pro, BMS900, BMS900 Pro
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**Applicant** : SHENZHEN LEAGEND OPTOELECTRONICS CO., LTD

Address : 4F, Bld. 26, No. 1301, Guanguang Rd., Xinlan Community, Longhua District, Shenzhen, China

**Manufacturer** : SHENZHEN LEAGEND OPTOELECTRONICS CO., LTD

Address : 4F, Bld. 26, No. 1301, Guanguang Rd., Xinlan Community, Longhua District, Shenzhen, China

<b>Test result</b>	<b>Pass *</b>
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\*In the configuration tested, the EUT complied with the standards specified page 5.

The test results presented in this report relate only to the object tested.

This report shall not be reproduced, except in full, without the written approval of the issuing testing laboratory.

## \*\* Modified History \*\*

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## 1. SUMMARY

### 1.1. TEST STANDARDS

The tests were performed according to following standards:

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

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

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

[KDB971168 D01:v02r02 MEASUREMENT GUIDANCE FOR CERTIFICATION OF LICENSED DIGITAL TRANSMITTERS](#)

[ANSI C63.10-2013 Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz](#)

### 1.2. Test Description

Test Item	Section in CFR 47	Result
Effective (Isotropic) Radiated Power Output Data	§2.1046 §22.913	Pass
Peak-to-Average Ratio	§22.913 (d)	Pass
Modulation Characteristics	§2.1047	Pass
Bandwidth	§2.1049 §22.917	Pass
Band Edges Compliance	§ 2.1051 §22.917	Pass
Spurious Emission at Antenna Terminals	§2.1051 §22.917	Pass
Field Strength of Spurious Radiation	§2.1053 § 22.917	Pass
Frequency stability	§2.1055 §22.355	Pass

## 1.3. Test Facility

### 1.3.1 Address of the test laboratory

Shenzhen CTL Testing Technology Co., Ltd.

Floor 1-A, Baisha Technology Park, No. 3011, Shahexi Road, Nanshan, Shenzhen 518055 China

There is one 3m semi-anechoic chamber and two line conducted labs for final test. The Test Sites meet the requirements in documents ANSI C63.4 and CISPR 32/EN 55032 requirements.

### 1.3.2 Laboratory accreditation

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

#### CNAS-Lab Code: L7497

Shenzhen CTL Testing Technology Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC 17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories.

#### A2LA-Lab Cert. No. 4343.01

Shenzhen CTL Testing Technology Co., Ltd, EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

#### IC Registration No.: 9618B

#### CAB identifier: CN0041

The 3m alternate test site of Shenzhen CTL Testing Technology Co., Ltd. EMC Laboratory has been registered by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements with Registration No.: 9618B.

#### FCC-Registration No.: 399832

#### Designation No.: CN1216

Shenzhen CTL Testing Technology Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 399832.

## 1.4. Statement of the 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 CISPR 16 - 4 „Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the Shenzhen CTL Testing Technology Co., 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 CTL laboratory is reported:

Test	Measurement Uncertainty	Notes
Transmitter power Radiated	±2.20 dB	(1)
Occupied Bandwidth	±0.02ppm	(1)
Radiated Emission 30~1000MHz	±4.08dB	(1)
Radiated Emission Above 1GHz	±4.32dB	(1)

Conducted Disturbance0.15~30MHz	$\pm 2.96\text{dB}$	(1)
20dB Emission Bandwidth	$\pm 1.9\%$	(1)
Carrier Frequency Separation	$\pm 1.9\%$	(1)
Maximum Power Spectral Density Level	$\pm 0.98\text{ dB}$	(1)
Number of Hopping Channel	$\pm 1.9\%$	(1)
Time of Occupancy	$\pm 0.11\%$	(1)
Max Peak Conducted Output Power	$\pm 0.98\text{ dB}$	(1)
Band-edge Spurious Emission	$\pm 1.21\text{dB}$	(1)
Conducted RF Spurious Emission	9kHz-7GHz: $\pm 1.09\text{dB}$ 7GHz-26.5GHz: $\pm 3.27\text{dB}$	(1)

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

## 2. GENERAL INFORMATION

### 2.1. Environmental conditions

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

Normal Temperature:	25°C
Relative Humidity:	55 %
Air Pressure:	101 kPa

### 2.2. General Description of EUT

Product Name:	Battery Monitor		
Model/Type reference:	BMS100		
Power supply:	DC 6V-32V		
Test Voltage:	DC12V		
<b>LTE</b>			
Mode:	LTE Band 5		
Modulation Type:	QPSK 16QAM		
Operating Frequency Range(S)	Band	Tx(MHz)	Rx(MHz)
	LTE Band 5	824~849	869~894
Release Version:	Release 9		
Category:	Cat 4		
Antenna type:	FPC Antenna		
Antenna gain:	3dBi		

Note: For more details, refer to the user's manual of the EUT.

### 2.3. Description of Test Modes

The EUT has been tested under typical operating condition. The CMW500 used to control the EUT staying in continuous transmitting and receiving mode for testing. Regards to the frequency band operation: the lowest, middle and highest frequency of channel were selected to perform the test, then shown on this report.

## 2.4. Equipments Used during the Test

Test Equipment	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Due Date
LISN	R&S	ESH2-Z5	860014/010	2024/04/30	2025/04/29
Limitator	ROHDE & SCHWARZ	ESH3-Z2	100408	2024/04/30	2025/04/29
EMI Test Receiver	ROHDE & SCHWARZ	ESCI	1166.5950.03	2024/04/30	2025/04/29
Double cone logarithmic antenna	Schwarzbeck	VULB 9168	824	2023/02/13	2026/02/12
EMI Test Receiver	R&S	ESCI	1166.5950.03	2024/04/30	2025/04/29
Spectrum Analyzer	Agilent	N9020A	US46220290	2024/05/02	2025/05/01
Spectrum Analyzer	Keysight	N9020A	MY53420874	2024/05/02	2025/05/01
Horn Antenna	Sunol Sciences Corp.	DRH-118	A062013	2024/11/25	2027/11/24
Horn Antenna	Ocean Microwave	OBH100400	26999002	2025/02/21	2028/02/20
Active Loop Antenna	Da Ze	ZN30900A	/	2024/04/30	2025/04/29
Amplifier	Agilent	8449B	3008A02306	2024/04/30	2025/04/29
Amplifier	Brief&Smart	LNA-4018	2104197	2024/05/03	2025/05/02
Temperature/Humidity Meter	Ji Yu	MC501	/	2024/05/04	2025/05/03
Power measurement module	TSTPASS	TSPS2023R	TSCB220016	2024/05/03	2025/05/02
Power Sensor	Agilent	U2021XA	MY53340004	2024/05/04	2025/05/03
Power Sensor	Agilent	U2021XA	MY54080012	2024/05/03	2025/05/02
Spectrum Analyzer	RS	FSP	1164.4391.38	2024/05/03	2025/05/02
Test Software					
Name of Software			Version		
TST-PASS			V2.0		
EZ_EMC(Below 1GHz)			V1.1.4.2		
EZ_EMC((Above 1GHz)			V1.1.4.2		

Test Equipment	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Due Date
Horn Antenna	Sunol Sciences Corp.	DRH-118	A062013	2021/11/26	2024/11/25
Horn Antenna	Ocean Microwave	OBH100400	26999002	2022/02/22	2025/02/21

## 2.5. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended to comply with of the Part 22 Rules.

## 2.6. Modifications

No modifications were implemented to meet testing criteria.

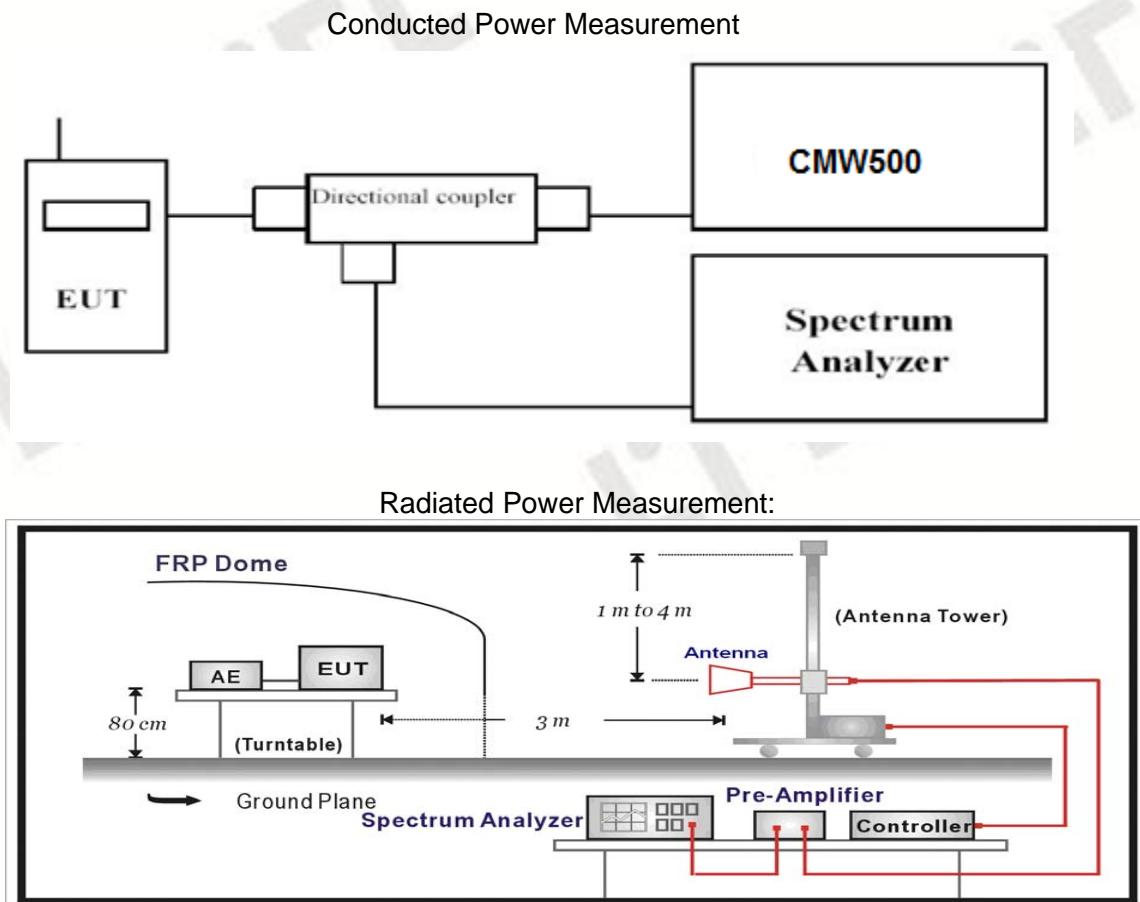
### 3. TEST CONDITIONS AND RESULTS

#### 3.1. Output Power

##### LIMIT

According to § 22.913(a) specifies The EIRP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts."

##### TEST CONFIGURATION



##### TEST PROCEDURE

The EUT was setup according to ANSI/TIA-603-E (2016)

##### **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 spectrum analyzer and CMW500 by a Directional Couple.
- EUT Communicate with CMW500 then selects a channel for testing.
- Add a correction factor to the display of spectrum, and then test.

##### **Radiated Power Measurement:**

- The EUT shall be placed at the specified height on a support, and in the position closest to normal use as declared by provider.
- The test antenna shall be oriented initially for vertical polarization and shall be chosen to correspond to the frequency of the transmitter
- The output of the test antenna shall be connected to the measuring receiver.

- d) The transmitter shall be switched on and the measuring receiver shall be tuned to the frequency of the transmitter under test.
- e) The test antenna shall be raised and lowered through the specified range of height until a maximum signal level is detected by the measuring receiver.
- f) The transmitter shall then be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
- g) The test antenna shall be raised and lowered again through the specified range of height until a maximum signal level is detected by the measuring receiver.
- h) The maximum signal level detected by the measuring receiver shall be noted.
- i) The transmitter shall be replaced by a substitution antenna.
- j) The substitution antenna shall be orientated for vertical polarization and the length of the substitution antenna shall be adjusted to correspond to the frequency of the transmitter.
- k) The substitution antenna shall be connected to a calibrated signal generator.
- l) If necessary, the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
- m) The test antenna shall be raised and lowered through the specified range of height to ensure that the maximum signal is received.
- n) The input signal to the substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver, that is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuator setting of the measuring receiver.
- o) The measurement shall be repeated with the test antenna and the substitution antenna orientated for horizontal polarization.
- p) The measure of the effective radiated power is the larger of the two levels recorded at the input to the substitution antenna, corrected for gain of the substitution antenna if necessary.
- q) Test site anechoic chamber refer to ANSI C63.4.

**TEST RESULTS****Conducted Measurement:**

1. please refer to Appendix for 4G\_LTE\_band\_5: Section 1

**Radiated Measurement:***Remark:*

1. We tested the bandwidth of each channel of all RB configurations in LTE band 5 with reference to 3GPP TS136 521. The worst cases in the horizontal direction of each channel bandwidth of LTE band 5 were recorded.
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.

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

Frequency (MHz)	$P_{Mea}$ (dBm)	$P_{cl}$ (dB)	$G_a$ Antenna Gain(dB)	Correction (dB)	$P_{Ag}$ (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
824.7	-19.55	3.62	9.56	2.15	33.79	18.03	38.45	-20.42
836.5	-18.15	3.62	9.13	2.15	34.64	19.85	38.45	-18.60
848.3	-19.68	3.64	9.04	2.15	34.75	18.32	38.45	-20.13

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

Frequency (MHz)	$P_{Mea}$ (dBm)	$P_{cl}$ (dB)	$G_a$ Antenna Gain(dB)	Correction (dB)	$P_{Ag}$ (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
825.5	-19.63	3.62	9.56	2.15	33.79	17.95	38.45	-20.50
836.5	-18.25	3.62	9.13	2.15	34.64	19.75	38.45	-18.70
847.5	-19.71	3.64	9.04	2.15	34.75	18.29	38.45	-20.16

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

Frequency (MHz)	$P_{Mea}$ (dBm)	$P_{cl}$ (dB)	$G_a$ Antenna Gain(dB)	Correction (dB)	$P_{Ag}$ (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
826.5	-19.70	3.62	9.56	2.15	33.79	17.88	38.45	-20.57
836.5	-18.15	3.62	9.13	2.15	34.64	19.85	38.45	-18.60
846.5	-19.79	3.64	9.04	2.15	34.75	18.21	38.45	-20.24

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

Frequency (MHz)	$P_{Mea}$ (dBm)	$P_{cl}$ (dB)	$G_a$ Antenna Gain(dB)	Correction (dB)	$P_{Ag}$ (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
829.0	-19.53	3.62	9.56	2.15	33.79	18.05	38.45	-20.40
836.5	-18.20	3.62	9.13	2.15	34.64	19.80	38.45	-18.65
844.0	-19.64	3.64	9.04	2.15	34.75	18.36	38.45	-20.09

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

Frequency (MHz)	$P_{Mea}$ (dBm)	$P_{cl}$ (dB)	$G_a$ Antenna Gain(dB)	Correction (dB)	$P_{Ag}$ (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
824.7	-19.41	3.62	9.56	2.15	33.79	18.17	38.45	-20.28
836.5	-18.10	3.62	9.13	2.15	34.64	19.90	38.45	-18.55
848.3	-19.39	3.64	9.04	2.15	34.75	18.61	38.45	-19.84

## 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)	ERP (dBm)	Limit (dBm)	Margin (dB)
825.5	-19.71	3.62	9.56	2.15	33.79	17.87	38.45	-20.58
836.5	-18.13	3.62	9.13	2.15	34.64	19.87	38.45	-18.58
847.5	-19.50	3.64	9.04	2.15	34.75	18.50	38.45	-19.95

## 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)	ERP (dBm)	Limit (dBm)	Margin (dB)
826.5	-19.56	3.62	9.56	2.15	33.79	18.02	38.45	-20.43
836.5	-18.19	3.62	9.13	2.15	34.64	19.81	38.45	-18.64
846.5	-19.45	3.64	9.04	2.15	34.75	18.55	38.45	-19.90

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

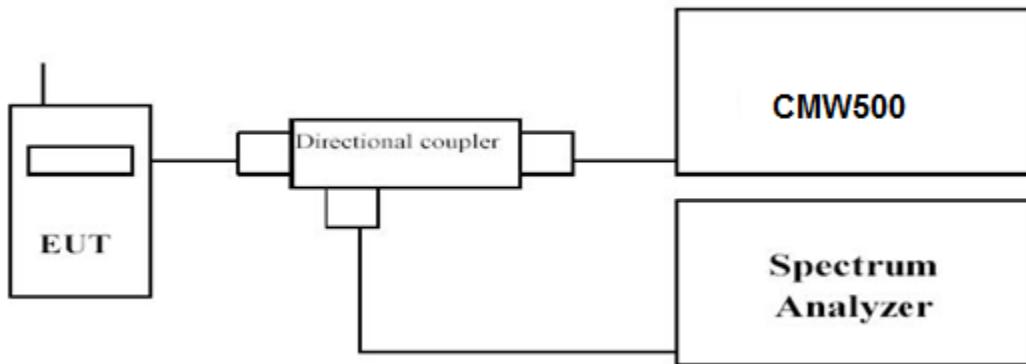
Frequency (MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)	G <sub>a</sub> Antenna Gain(dB)	Correction (dB)	P <sub>Ag</sub> (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
829.0	-19.68	3.62	9.56	2.15	33.79	17.90	38.45	-20.55
836.5	-18.29	3.62	9.13	2.15	34.64	19.71	38.45	-18.74
844.0	-19.63	3.64	9.04	2.15	34.75	18.37	38.45	-20.08

### 3.2. 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

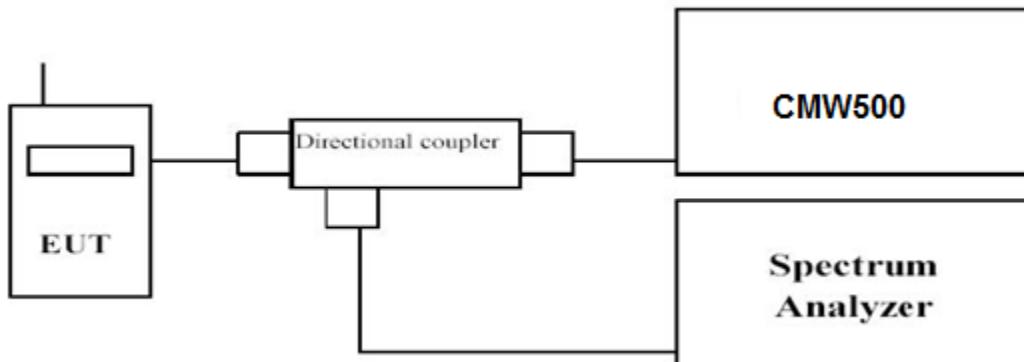
1. please refer to Appendix for 4G\_LTE\_band\_5: Section 5

### 3.3. 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

1. please refer to Appendix for 4G\_LTE\_band\_5: Section 4

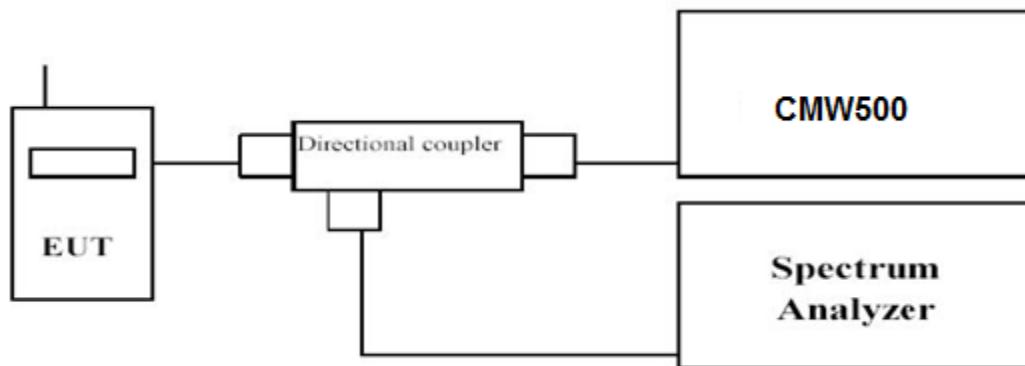
### 3.4. Band Edge compliance

#### LIMIT

According to Part §22.917 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 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

1. please refer to Appendix for 4G\_LTE\_band\_5: Section 6

### 3.5. Spurious Emission

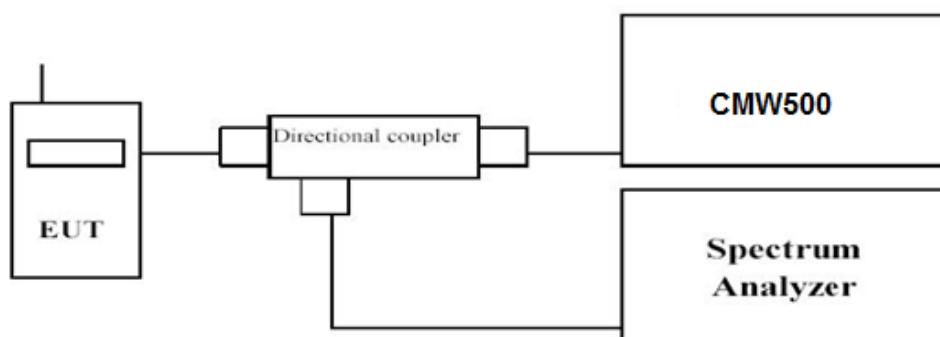
#### LIMIT

According to Part §22.917 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.

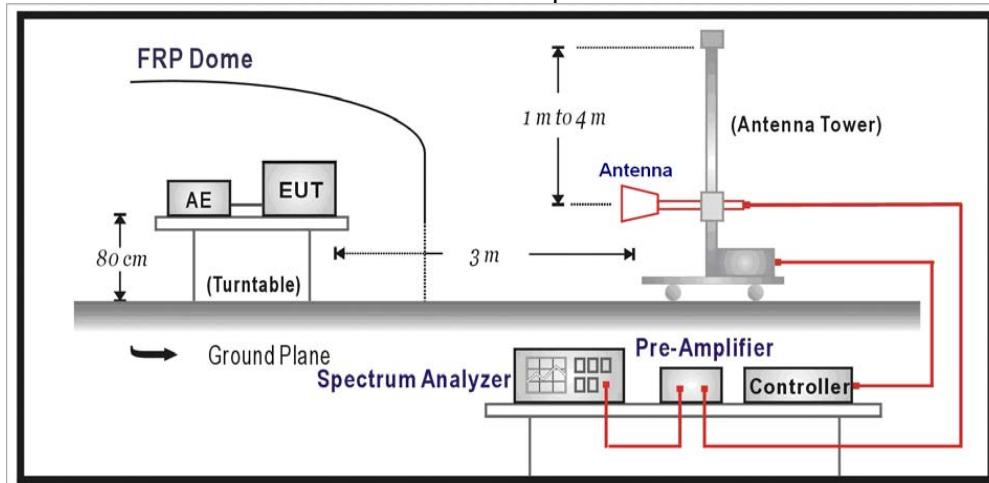
The specification that emissions shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log (P)$  dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -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 CONFIGURATION

Conducted Spurious Measurement:



Radiated Spurious Measurement:



#### TEST PROCEDURE

The EUT was setup according to ANSI/TIA-603-E (2016)

##### **Conducted Spurious 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 spectrum analyzer and CMW500 by a Directional Couple.
- EUT Communicate with CMW500 then selects a channel for testing.
- Add a correction factor to the display of spectrum, and then test.
- The resolution bandwidth of the spectrum analyzer was set sufficient scans were taken to show the out of band Emission if any up to 10th harmonic.

**Radiated Spurious Measurement:**

- a. The EUT shall be placed at the specified height on a support, and in the position closest to normal use as declared by provider.
- b. The test antenna shall be oriented initially for vertical polarization and shall be chosen to correspond to the frequency of the transmitter
- c. The output of the test antenna shall be connected to the measuring receiver.
- d. The transmitter shall be switched on and the measuring receiver shall be tuned to the frequency of the transmitter under test.
- e. The test antenna shall be raised and lowered through the specified range of height until a maximum signal level is detected by the measuring receiver.
- f. The transmitter shall then be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
- g. The test antenna shall be raised and lowered again through the specified range of height until a maximum signal level is detected by the measuring receiver.
- h. The maximum signal level detected by the measuring receiver shall be noted.
- i. The transmitter shall be replaced by a substitution antenna.
- j. The substitution antenna shall be orientated for vertical polarization and the length of the substitution antenna shall be adjusted to correspond to the frequency of the transmitter.
- k. The substitution antenna shall be connected to a calibrated signal generator.
- l. If necessary, the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
- m. The test antenna shall be raised and lowered through the specified range of height to ensure that the maximum signal is received.
- n. The input signal to the substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver, that is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuator setting of the measuring receiver.
- o. The measurement shall be repeated with the test antenna and the substitution antenna orientated for horizontal polarization.
- p. The measure of the effective radiated power is the larger of the two levels recorded at the input to the substitution antenna, corrected for gain of the substitution antenna if necessary.
- q. The resolution bandwidth of the spectrum analyzer was set at 100 kHz for Part 22 and 1MHz for Part 24. The frequency range was checked up to 10th harmonic.
- r. Test site anechoic chamber refer to ANSI C63.

**TEST RESULTS**

1. please refer to Appendix for 4G\_LTE\_band\_5: Section 6

**Radiated Measurement:****Remark:**

1. We were tested all RB Configuration refer 3GPP TS136 52.1 for each Channel Bandwidth of LTE FDD Band 5; recorded worst case for each Channel Bandwidth of LTE FDD Band 5
2.  $EIRP = P_{\text{Mea}}(\text{dBm}) - P_{\text{cl}}(\text{dB}) + G_a(\text{dBi})$
3. We were not recorded other points as values lower than limits.
4. Margin = Limit - EIRP

**LTE FDD Band 5\_Channel Bandwidth 1.4MHz\_QPSK\_Low Channel**

Frequency (MHz)	$P_{\text{Mea}}$ (dBm)	$P_{\text{cl}}$ (dB)	Diatance	$G_a$ Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1649.5	-48.00	3.86	3.00	8.56	-43.30	-13.00	-30.30	H
2474.7	-49.10	4.29	3.00	6.98	-46.41	-13.00	-33.41	H
1649.5	-43.92	3.86	3.00	8.56	-39.22	-13.00	-26.22	V
2474.7	-44.51	4.29	3.00	6.98	-41.82	-13.00	-28.82	V

**LTE FDD Band 5\_Channel Bandwidth 1.4MHz\_QPSK\_Middle Channel**

Frequency (MHz)	$P_{\text{Mea}}$ (dBm)	$P_{\text{cl}}$ (dB)	Diatance	$G_a$ Antenna Gain(dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1671.0	-48.00	3.86	3.00	8.56	-43.30	-13.00	-30.30	H
2510.5	-49.11	4.29	3.00	6.98	-46.42	-13.00	-33.42	H
1671.0	-43.90	3.86	3.00	8.56	-39.20	-13.00	-26.20	V
2510.5	-44.58	4.29	3.00	6.98	-41.89	-13.00	-28.89	V

**LTE FDD Band 5\_Channel Bandwidth 1.4MHz\_QPSK\_High Channel**

Frequency (MHz)	$P_{\text{Mea}}$ (dBm)	$P_{\text{cl}}$ (dB)	Diatance	$G_a$ Antenna Gain(dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1696.7	-52.33	3.91	3.00	9.06	-47.18	-13.00	-34.18	H
2544.8	-55.13	4.32	3.00	6.65	-52.80	-13.00	-39.80	H
1696.7	-49.55	3.91	3.00	9.06	-44.40	-13.00	-31.40	V
2544.8	-51.54	4.32	3.00	6.65	-49.21	-13.00	-36.21	V

**LTE FDD Band 5\_Channel Bandwidth 3MHz\_QPSK\_Low Channel**

Frequency (MHz)	$P_{\text{Mea}}$ (dBm)	$P_{\text{cl}}$ (dB)	Diatance	$G_a$ Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1651.1	-48.27	3.86	3.00	8.56	-43.57	-13.00	-30.57	H
2476.4	-49.20	4.29	3.00	6.98	-46.51	-13.00	-33.51	H
1651.1	-43.91	3.86	3.00	8.56	-39.21	-13.00	-26.21	V
2476.4	-44.69	4.29	3.00	6.98	-42.00	-13.00	-29.00	V

**LTE FDD Band 5\_Channel Bandwidth 3MHz\_QPSK\_Middle Channel**

Frequency (MHz)	$P_{\text{Mea}}$ (dBm)	$P_{\text{cl}}$ (dB)	Diatance	$G_a$ Antenna Gain(dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1673.2	-49.28	3.90	3.00	8.58	-44.60	-13.00	-31.60	H
2509.4	-51.30	4.32	3.00	6.80	-48.82	-13.00	-35.82	H
1673.2	-45.29	3.90	3.00	8.58	-40.61	-13.00	-27.61	V
2509.4	-45.31	4.32	3.00	6.80	-42.83	-13.00	-29.83	V

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

Frequency (MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)	Diatance	G <sub>a</sub> Antenna Gain(dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1695.1	-47.99	3.86	3.00	8.56	-43.29	-13.00	-30.29	H
2542.3	-49.14	4.29	3.00	6.98	-46.45	-13.00	-33.45	H
1695.1	-43.91	3.86	3.00	8.56	-39.21	-13.00	-26.21	V
2542.3	-44.54	4.29	3.00	6.98	-41.85	-13.00	-28.85	V

## LTE FDD Band 5\_Channel Bandwidth 5MHz\_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
1653.2	-49.52	3.90	3.00	8.58	-44.84	-13.00	-31.84	H
2479.3	-51.32	4.32	3.00	6.80	-48.84	-13.00	-35.84	H
1653.2	-45.11	3.90	3.00	8.58	-40.43	-13.00	-27.43	V
2479.3	-45.27	4.32	3.00	6.80	-42.79	-13.00	-29.79	V

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

Frequency (MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)	Diatance	G <sub>a</sub> Antenna Gain(dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1673.1	-52.61	3.91	3.00	9.06	-47.46	-13.00	-34.46	H
2509.3	-55.08	4.32	3.00	6.65	-52.75	-13.00	-39.75	H
1673.1	-49.65	3.91	3.00	9.06	-44.50	-13.00	-31.50	V
2509.3	-51.56	4.32	3.00	6.65	-49.23	-13.00	-36.23	V

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

Frequency (MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)	Diatance	G <sub>a</sub> Antenna Gain(dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1693.2	-47.98	3.86	3.00	8.56	-43.28	-13.00	-30.28	H
2539.3	-49.22	4.29	3.00	6.98	-46.53	-13.00	-33.53	H
1693.2	-43.87	3.86	3.00	8.56	-39.17	-13.00	-26.17	V
2539.3	-44.68	4.29	3.00	6.98	-41.99	-13.00	-28.99	V

## 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
1658.2	-47.98	3.86	3.00	8.56	-43.28	-13.00	-30.28	H
2487.1	-49.22	4.29	3.00	6.98	-46.53	-13.00	-33.53	H
1658.2	-43.87	3.86	3.00	8.56	-39.17	-13.00	-26.17	V
2487.1	-44.68	4.29	3.00	6.98	-41.99	-13.00	-28.99	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)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1673.5	-49.29	3.90	3.00	8.58	-44.61	-13.00	-31.61	H
2509.3	-51.03	4.32	3.00	6.80	-48.55	-13.00	-35.55	H
1673.5	-45.27	3.90	3.00	8.58	-40.59	-13.00	-27.59	V
2509.3	-45.31	4.32	3.00	6.80	-42.83	-13.00	-29.83	V

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

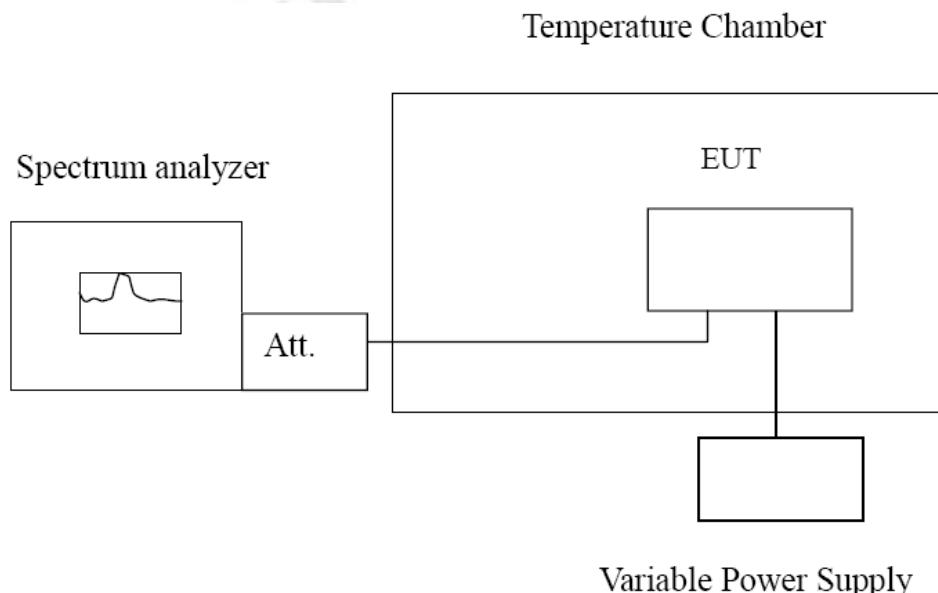
Frequency (MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)	Distance	G <sub>a</sub> Antenna Gain(dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1688.2	-52.49	3.91	3.00	9.06	-47.34	-13.00	-34.34	H
2532.1	-54.99	4.32	3.00	6.65	-52.66	-13.00	-39.66	H
1688.2	-49.64	3.91	3.00	9.06	-44.49	-13.00	-31.49	V
2532.1	-51.38	4.32	3.00	6.65	-49.05	-13.00	-36.05	V

### 3.6. Frequency Stability under Temperature & Voltage Variations

#### LIMIT

According to §22.917, §2.1055 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 ANSI/TIA-603-E (2016)

##### **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 CMW500 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 CMW500 and in a simulated call on middle channel for LTE Band 5, 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 0.1 Volt 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 CMW500 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.

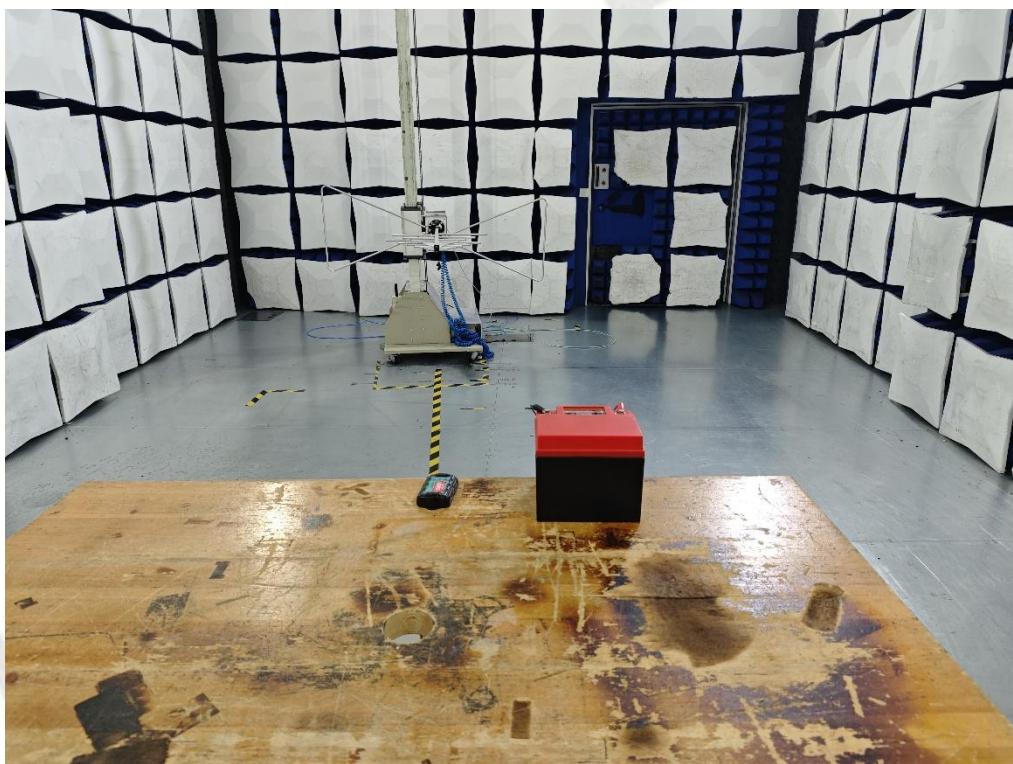
Reduce the input voltage to specify extreme voltage variation ( $\pm 15\%$ ) and endpoint, record the

maximum frequency change.

**TEST RESULTS**

1. please refer to Appendix for 4G\_LTE\_band\_5: Section 2

## 4. Test Setup Photos of the EUT



## 5. External and Internal Photos of the EUT

Reference to the test report No. CTL2410232073-WF01

\*\*\*\*\* End of Report \*\*\*\*\*