

# TEST REPORT

**FCC ID: 2AKSAMOBULAA-NOTE**

**Product: Mobile Phone**

**Model No.: NOTE1**

**Additional Model No.: NOTE2, NOTE3, NOTE4, NOTE5, NOTE6, NOTE7, NOTE8,  
NOTE9, NOTE10, NOTE11, NOTE12, NOTE13, NOTE14, NOTE15, NOTE16,  
NOTE17, NOTE18, NOTE19, NOTE20, NOTE21, NOTE22, NOTE23, NOTE24,  
NOTE25, NOTE26, NOTE27, NOTE28, NOTE29, NOTE30**

**Trade Mark: MOBULAA**

**Report No.: TCT200831E050**

**Issued Date: Sep. 24, 2020**

Issued for:

**Shenzhen YLWD Technology Co., Ltd**

**RM1002.A.Haisong BLD.RD Tairan.FuTian District, Shenzhen, China**

Issued By:

**Shenzhen Tongce Testing Lab.**

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**Appendix A: Photographs of Test Setup**

**Appendix B: Photographs of EUT**

**Test Data: Refer to Appendix For LTE Band 2, Appendix For LTE Band 4**

## 1. Test Certification

<b>Product:</b>	Mobile Phone
<b>Model No.:</b>	NOTE1
<b>Additional Model No.:</b>	NOTE2, NOTE3, NOTE4, NOTE5, NOTE6, NOTE7, NOTE8, NOTE9, NOTE10, NOTE11, NOTE12, NOTE13, NOTE14, NOTE15, NOTE16, NOTE17, NOTE18, NOTE19, NOTE20, NOTE21, NOTE22, NOTE23, NOTE24, NOTE25, NOTE26, NOTE27, NOTE28, NOTE29, NOTE30
<b>Trade Mark:</b>	<b>MOBULAA</b>
<b>Applicant:</b>	Shenzhen YLWD Technology Co., Ltd
<b>Address:</b>	RM1002.A.Haisong BLD.RD Tairan.FuTian District, Shenzhen, China
<b>Manufacturer:</b>	Shenzhen YLWD Technology Co., Ltd
<b>Address:</b>	RM1002.A.Haisong BLD.RD Tairan.FuTian District, Shenzhen, China
<b>Date of Test:</b>	Sep. 01, 2020 – Sep. 23, 2020
<b>Applicable Standards:</b>	FCC CFR Title 47 Part 2 FCC CFR Title 47 Part22 FCC CFR Title 47 Part24 FCC CFR Title 47 Part27

The above equipment has been tested by Shenzhen Tongce Testing Lab. and found compliance with the requirements set forth in the technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Tested By:



Brews Xu

Date:

Sep. 23, 2020

Reviewed By:



Beryl Zhao

Date:

Sep. 24, 2020

Approved By:



Tomsin

Date:

Sep. 24, 2020

## 2. Test Result Summary

Requirement	CFR 47 Section	Result
Conducted Output Power	§2.1046; §22.913; §24.232(c); §27.50(d); §27.50(c); §27.50(b);	PASS
Peak-to-Average Ratio	§2.1046; §24.232(d) §27.50(d); §27.50(c); §27.50(b);	PASS
Effective Radiated Power	§2.1046; §22.913; §24.232(c); §27.50(d); §27.50(c); §27.50(b);	PASS
Equivalent Isotropic Radiated Power	§2.1046; §22.913; §24.232(c); §27.50(d); §27.50(c); §27.50(b);	PASS
Occupied Bandwidth	§2.1049; §24.238(b); §27.53;	PASS
Band Edge	§2.1051; §22.917(a); §27.53(h); §27.53(c); §27.53(g); §24.238(a);	PASS
Conducted Spurious Emission	§2.1051; §22.917(a); §27.53(h); §27.53(g); §27.53(c); §24.238(a);	PASS
Field Strength of Spurious Radiation	§2.1053; §22.917(a); §27.53(g) ; §27.53(c); §27.53(h); §24.238(a);	PASS
Frequency Stability for Temperature & Voltage	§2.1055; §22.355; §27.54; §24.235;	PASS

**Note:**

1. PASS: Test item meets the requirement.
2. Fail: Test item does not meet the requirement.
3. N/A: Test case does not apply to the test object.
4. The test result judgment is decided by the limit of test standard.

### 3. EUT Description

<b>Product:</b>	Mobile Phone
<b>Model No.:</b>	NOTE1
<b>Additional Model No.:</b>	NOTE2, NOTE3, NOTE4, NOTE5, NOTE6, NOTE7, NOTE8, NOTE9, NOTE10, NOTE11, NOTE12, NOTE13, NOTE14, NOTE15, NOTE16, NOTE17, NOTE18, NOTE19, NOTE20, NOTE21, NOTE22, NOTE23, NOTE24, NOTE25, NOTE26, NOTE27, NOTE28, NOTE29, NOTE30
<b>Trade Mark:</b>	<b>MOBULAA</b>
<b>Tx Frequency:</b>	LTE Band 2: 1850 MHz ~ 1910 MHz LTE Band 4: 1710 MHz ~ 1755 MHz
<b>Rx Frequency:</b>	LTE Band 2: 1930 MHz ~ 1990 MHz LTE Band 4: 2110 MHz ~ 2155 MHz
<b>Bandwidth:</b>	LTE Band 2: 1.4MHz /3MHz /5MHz /10MHz /15MHz /20MHz LTE Band 4: 1.4MHz /3MHz /5MHz /10MHz /15MHz /20MHz
<b>Maximum Output Power to Antenna:</b>	LTE Band 2: 23.54dBm LTE Band 4: 22.77dBm
<b>99% Occupied Bandwidth:</b>	LTE Band 2: 18M0G7D LTE Band 4: 17M9G7D
<b>Type of Modulation:</b>	QPSK/16QAM
<b>Antenna Type:</b>	Internal Antenna
<b>Antenna Gain:</b>	LTE Band 2: -2.38dBi LTE Band 4: -2.41dBi
<b>Power Supply:</b>	Rechargeable Li-ion Battery DC 3.8V
<b>AC adapter:</b>	Adapter Information: Model: MF-05002100SM1 Input: AC 100-240V, 50/60Hz, 0.4A Output: DC 5V, 2.1A
<b>Remark:</b>	All models above are identical in interior structure, electrical circuits and components, and just model names are different for the marketing requirement.

**Note:** The antenna gain listed in this report is provided by applicant, and the test laboratory is not responsible for this parameter.

## Emission Designator

LTE Band 2	QPSK		16QAM	
BW(MHz)	Emission Designator (99%OBW)	Maximum EIRP(W)	Emission Designator (99%OBW)	Maximum EIRP(W)
1.4	1M08G7D	0.098	1M08W7D	0.086
3	2M69G7D	0.095	2M68W7D	0.074
5	4M48G7D	0.100	4M48W7D	0.081
10	8M97G7D	0.097	8M97W7D	0.089
15	13M5G7D	0.096	13M4W7D	0.086
20	17M9G7D	0.131	18M0W7D	0.114

LTE Band 4	QPSK		16QAM	
BW(MHz)	Emission Designator (99%OBW)	Maximum EIRP(W)	Emission Designator (99%OBW)	Maximum EIRP(W)
1.4	1M08G7D	0.105	1M08W7D	0.088
3	2M69G7D	0.102	2M69W7D	0.084
5	4M47G7D	0.108	4M47W7D	0.085
10	8M95G7D	0.102	8M94W7D	0.095
15	13M4G7D	0.101	13M4W7D	0.096
20	17M9G7D	0.109	17M9W7D	0.089

## 4. General Information

### 4.1. Test environment and mode

**Operating Environment:**

Temperature:	25.0 °C
Humidity:	56 % RH
Atmospheric Pressure:	1010 mbar

**Test Mode:**

Operation mode:	Keep the EUT in continuous transmitting with modulation
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The sample was placed 0.8m above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.

## Description Operation Frequency

LTE Band 2(1.4MHz)		LTE Band 2(3MHz)	
Channel	Frequency (MHz)	Channel	Frequency (MHz)
18607	1850.7	18615	1851.5
18900	1880	18900	1880
19193	1909.3	19185	1908.5
LTE Band 2(5MHz)		LTE Band 2(10MHz)	
Channel	Frequency (MHz)	Channel	Frequency (MHz)
18625	1852.5	18650	1855
18900	1880	18900	1880
19175	1907.5	19150	1905
LTE Band 2(15MHz)		LTE Band 2(20MHz)	
Channel	Frequency (MHz)	Channel	Frequency (MHz)
18675	1857.5	18700	1860
18900	1880	18900	1880
19125	1902.5	19100	1900

LTE Band 4(1.4MHz)		LTE Band 4(3MHz)	
Channel	Frequency (MHz)	Channel	Frequency (MHz)
19957	1710.7	19965	1711.5
20175	1732.5	20175	1732.5
20393	1754.3	20385	1753.5
LTE Band 4(5MHz)		LTE Band 4(10MHz)	
Channel	Frequency (MHz)	Channel	Frequency (MHz)
19975	1712.5	20000	1715
20175	1732.5	20175	1732.5
20375	1752.5	20350	1750
LTE Band 4(15MHz)		LTE Band 4(20MHz)	
Channel	Frequency (MHz)	Channel	Frequency (MHz)
20025	1717.5	20050	1720
20175	1732.5	20175	1732.5
20325	1747.5	20300	1745



## 4.2. Test Mode

All modes and data rates and positions were investigated.  
Test modes are chosen to be reported as the worst case configuration below:

Test Mode		
Band	Radiated TCs	Conducted TCs
LTE Band 2	QPSK Link (1.4MHz / 3MHz / 5MHz / 10MHz / 15MHz / 20MHz)	16QAM Link (1.4MHz / 3MHz / 5MHz / 10MHz / 15MHz / 20MHz)
LTE Band 4	QPSK Link (1.4MHz / 3MHz / 5MHz / 10MHz / 15MHz / 20MHz)	16QAM Link (1.4MHz / 3MHz / 5MHz / 10MHz / 15MHz / 20MHz)

Antenna port conducted and radiated test items were performed according to KDB 971168 D01 Power Meas License Digital Systems v03 with maximum output power. Radiated measurements were performed with rotating EUT in different three orthogonal test planes to find the maximum emission.

Test Items	Band	Bandwidth (MHz)						Modulation		RB #			Test Channel		
		1.4	3	5	10	15	20	QPSK	16QAM	1	Half	Full	L	M	H
Max. Output Power	2	v	v	v	v	v	v	v	v	v	v	v	v	v	v
	4	v	v	v	v	v	v	v	v	v	v	v	v	v	v
Peak-to-Average Ratio	2	v	v	v	v	v	v	v	v	v	v	v	v	v	v
	4	v	v	v	v	v	v	v	v	v	v	v	v	v	v
26dB and 99% Bandwidth	2	v	v	v	v	v	v	v	v	v	v	v	v	v	v
	4	v	v	v	v	v	v	v	v	v	v	v	v	v	v

Test Items	Band	Bandwidth (MHz)						Modulation		RB #			Test Channel		
		1.4	3	5	10	15	20	QPSK	16QAM	1	Half	Full	L	M	H
Conducted Band Edge	2	v	v	v	v	v	v	v	v	v	v	v	v	-	v
	4	v	v	v	v	v	v	v	v	v	v	v	v	-	v
Conducted Spurious	2	v	v	v	v	v	v	v	v	v	-	-	v	v	v
	4	v	v	v	v	v	v	v	v	v	-	-	v	v	v
Frequency Stability	2	v	-	-	-	-	-	v	v	v	-	-	v	v	v
	4	v	-	-	-	-	-	v	v	v	-	-	v	v	v
E.R.P./ E.I.R.P.	2	v	v	v	v	v	v	v	v	v	v	v	v	v	v
	4	v	v	v	v	v	v	v	v	v	v	v	v	v	v
Radiated Spurious	2	v	-	-	-	-	-	v	v	v	-	-	v	v	v
	4	v	-	-	-	-	-	v	v	v	-	-	v	v	v
Note	<ol style="list-style-type: none"> <li>The mark "v" means that this configuration is chosen for testing</li> <li>The mark "-" means that this bandwidth is not supported.</li> </ol>														

### 4.3. Description of Support Units

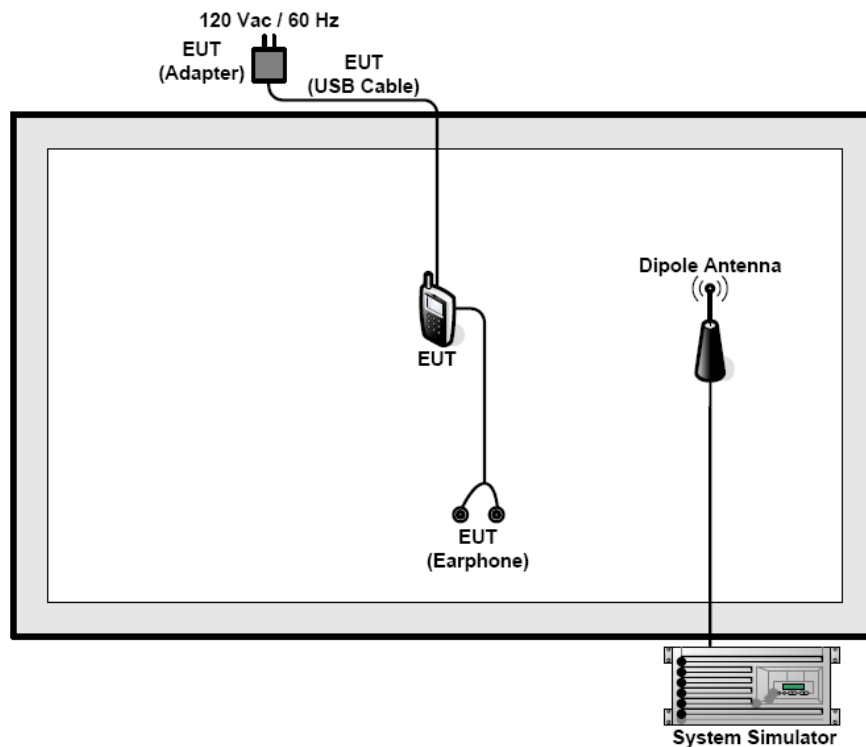
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Equipment	Model No.	Serial No.	FCC ID	Trade Name
/	/	/	/	/

**Note:**

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

### 4.4. Configuration of Tested System



### 4.5. Measurement Results Explanation Example

**For all conducted test items:**

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between RF conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level will be exactly the RF output level. The spectrum analyzer offset is derived from RF cable loss and attenuator factor.  

$$\text{Offset} = \text{RF cable loss} + \text{attenuator factor}.$$

## 5. Facilities and Accreditations

### 5.1. Facilities

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

- FCC - Registration No.: 645098

Shenzhen Tongce Testing Lab.

The 3m Semi-anechoic chamber has been registered and fully described in a report with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files.

- IC - Registration No.: 10668A-1

The 3m Semi-anechoic chamber of Shenzhen TCT Testing Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing

### 5.2. Location

Shenzhen Tongce Testing Lab.

Address: 1B/F., Building 1, Yibaolai Industrial Park, Qiaotou, Fuyong, Baoan District, Shenzhen, Guangdong, China

TEL: +86-755-27673339

### 5.3. Measurement Uncertainty

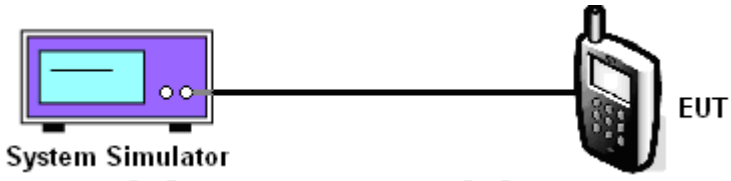
The reported uncertainty of measurement  $y \pm U$ , where expanded uncertainty  $U$  is based on a standard uncertainty multiplied by a coverage factor of  $k=2$ , providing a level of confidence of approximately 95 %.

No.	Item	MU
1	Conducted Emission	$\pm 2.56\text{dB}$
2	RF power, conducted	$\pm 0.12\text{dB}$
3	Spurious emissions, conducted	$\pm 0.11\text{dB}$
4	All emissions, radiated(<1G)	$\pm 3.92\text{dB}$
5	All emissions, radiated(>1G)	$\pm 4.28\text{dB}$
6	Temperature	$\pm 0.1^{\circ}\text{C}$
7	Humidity	$\pm 1.0\%$

## 6. Test Results and Measurement Data

### 6.1. Effective Radiated Power and Effective Isotropic Radiated Power Measurement

#### 6.1.1. Test Specification

<b>Test Requirement:</b>	FCC part 27.50(c), FCC part 27.50(d) and FCC part 27.50(h), FCC part 24.232(c), FCC part 22.913;
<b>Test Method:</b>	FCC part 2.1046
<b>Limit:</b>	LTE Band 2: 2W LTE Band 4: 1W
<b>Test Setup:</b>	 <p>The diagram illustrates the test setup. On the left is a 'System Simulator' represented by a computer monitor with a blue screen and two small circles below it. A black line representing a cable connects the simulator to a mobile phone on the right, labeled 'EUT' (Equipment Under Test). The phone is a black flip phone with an antenna.</p>
<b>Test Procedure:</b>	<ol style="list-style-type: none"> <li>1. The transmitter output port was connected to the system simulator.</li> <li>2. Set EUT at maximum power through system simulator.</li> <li>3. Select lowest, middle, highest channels for each band and different modulation.</li> <li>4. Measure and record the power level from the system simulator.</li> <li>5. Calculate the ERP and EIRP</li> </ol> <p>The relevant equation for determining the ERP or EIRP from the conducted RF output power measured using the guidance provided above is:</p> $\text{ERP or EIRP} = P_{\text{Meas}} + G_T - L_C$ <p>where:</p> <p>ERP or EIRP = effective radiated power or equivalent isotropically radiated power, respectively (expressed in the same units as <math>P_{\text{Meas}}</math>, typically dBW or dBm);</p> <p><math>P_{\text{Meas}}</math> = measured transmitter output power or PSD, in dBm or dBW;</p> <p><math>G_T</math> = gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP);</p> <p><math>L_C</math> = signal attenuation in the connecting cable between the transmitter and antenna, in dB.</p> <p><i>Note: For personal/portable radios utilizing an integral antenna, the factor <math>L_C</math> is typically negligible. However, in a fixed station transmit system that utilizes a long cable run between the transmitter and the transmitting antenna, this</i></p>

	<i>factor can be significant.</i>
<b>Test Result:</b>	PASS

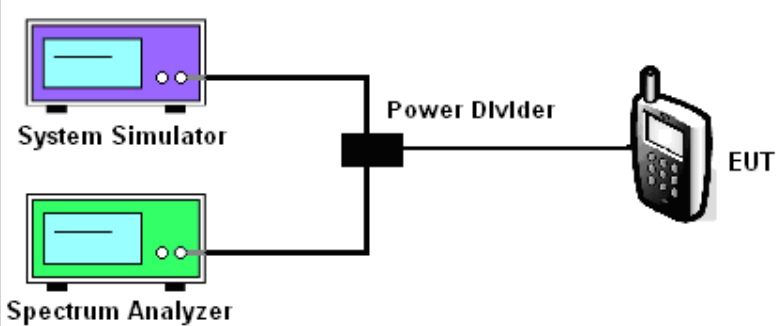
## 6.1.2. Test Instruments

Equipment	Manufacturer	Model	Serial Number	Calibration Due
Wideband Radio Communication Tester	R&S	CMW500	114220	Jul. 27, 2021
RF cable (9kHz-40GHz)	TCT	RE-05	N/A	Sep. 02, 2021
Antenna Connector	TCT	RFC-02	N/A	Sep. 02, 2021

**Note:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

## 6.2. Peak to Average Ratio

### 6.2.1. Test Specification

<b>Test Requirement:</b>	FCC part 2.1046; 22.913; 24.232; 27.50(d); 27.50(c); 27.50(b)
<b>Test Method:</b>	FCC KDB 971168 D01v03
<b>Limit:</b>	The peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.
<b>Test Setup:</b>	 <p>The diagram illustrates the test setup. A System Simulator (represented by a purple monitor icon) and a Spectrum Analyzer (represented by a green monitor icon) are connected to a central Power Divider (represented by a black square icon). The Power Divider is then connected to the EUT (Equipment Under Test, represented by a mobile phone icon).</p>
<b>Test Procedure:</b>	<ol style="list-style-type: none"> <li>1. The testing follows FCC KDB 971168 D01v03 Section 5.7.1.</li> <li>2. The EUT was connected to spectrum analyzer and system simulator via a power divider.</li> <li>3. Set EUT to transmit at maximum output power.</li> <li>4. Set the CCDF (Complementary Cumulative Distribution Function) option of the spectrum analyzer.</li> </ol> <p>Record the maximum PAPR level associated with a probability of 0.1%.</p>
<b>Test Result:</b>	PASS

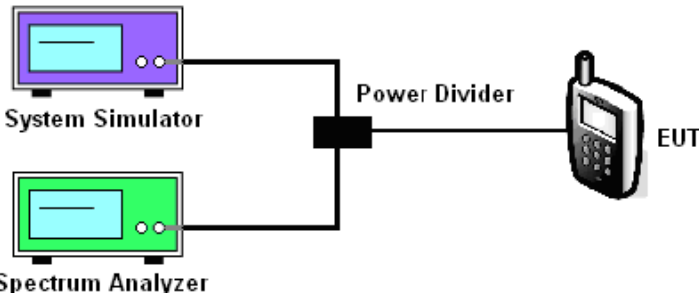
### 6.2.2. Test Instruments

Equipment	Manufacturer	Model	Serial Number	Calibration Due
Wideband Radio Communication Tester	R&S	CMW500	114220	Jul. 27, 2021
Spectrum Analyzer	Agilent	N9020A	MY49100619	Sep. 11, 2021
RF cable (9kHz-40GHz)	TCT	RE-05	N/A	Sep. 02, 2021
Antenna Connector	TCT	RFC-02	N/A	Sep. 02, 2021

**Note:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

### 6.3. 99% Occupied Bandwidth and 26dB Bandwidth Measurement

#### 6.3.1. Test Specification

<b>Test Requirement:</b>	FCC part 27.53(h)(3) and FCC part 27.53(m)(6), FCC part 24.238(b)
<b>Test Method:</b>	FCC part 2.1049
<b>Limit:</b>	N/A
<b>Test Setup:</b>	 <p>The diagram shows a System Simulator (purple box) and a Spectrum Analyzer (green box) connected to a Power Divider (black box). The Power Divider is then connected to the EUT (mobile phone icon). Labels: System Simulator, Power Divider, EUT, Spectrum Analyzer.</p>
<b>Test Procedure:</b>	<ol style="list-style-type: none"> <li>1. The testing follows FCC KDB 971168 D01v03 Section 4.2.</li> <li>2. The EUT was connected to the spectrum analyzer and system simulator via a power divider.</li> <li>3. The RF output of the EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.</li> <li>4. The 99% occupied bandwidth were measured, set RBW= 1% of OBW, VBW= 3*RBW, sample detector, trace maximum hold.</li> <li>5. The 26dB bandwidth were measured, set RBW= 1% of EBW, VBW= 3*RBW, peak detector, trace maximum hold.</li> </ol>
<b>Test Result:</b>	PASS

#### 6.3.2. Test Instruments

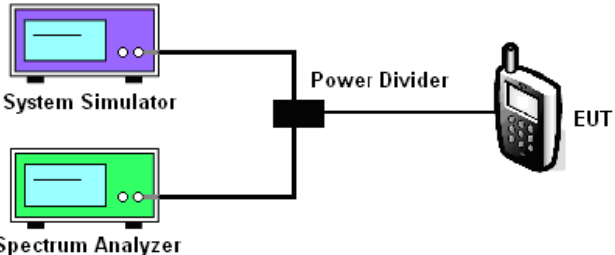
Equipment	Manufacturer	Model	Serial Number	Calibration Due
Wideband Radio Communication Tester	R&S	CMW500	114220	Jul. 27, 2021
Spectrum Analyzer	Agilent	N9020A	MY49100619	Sep. 11, 2021
RF cable (9kHz-40GHz)	TCT	RE-05	N/A	Sep. 02, 2021
Antenna Connector	TCT	RFC-02	N/A	Sep. 02, 2021

**Note:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).



## 6.4. Band Edge and Conducted Spurious Emission Measurement

### 6.4.1. Test Specification

<b>Test Requirement:</b>	FCC part 27.53(h), FCC part 27.53(g) , FCC part 27.53(m)(4), FCC part 24.238(a), 22.917(a)
<b>Test Method:</b>	FCC part 2.1051
<b>Limit:</b>	-13dBm
<b>Test Setup:</b>	 <p>The diagram shows a System Simulator (top) and a Spectrum Analyzer (bottom) connected to a central Power Divider. The Power Divider is then connected to the EUT (Equipment Under Test), represented by a mobile phone icon.</p>
<b>Test Procedure:</b>	<ol style="list-style-type: none"> <li>1. The testing follows FCC KDB 971168 D01v03 Section 6.0.</li> <li>2. The EUT was connected to the spectrum analyzer and system simulator via a power divider.</li> <li>3. The RF output of EUT was connected to the spectrum analyzer by an RF cable and attenuator. The path loss was compensated to the results for each measurement.</li> <li>4. The band edges of low and high channels for the highest RF powers were measured.</li> <li>5. The conducted spurious emission for the whole frequency range was taken.</li> <li>6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.</li> <li>7. The limit line is derived from <math>43 + 10\log(P)</math> dB below the transmitter power  <math>P(\text{Watts}) = P(\text{W}) - [43 + 10\log(P)] (\text{dB}) = [30 + 10\log(P)] (\text{dBm}) - [43 + 10\log(P)] (\text{dB}) = -13\text{dBm}</math>.  For Band 17, the limit line is derived from <math>55 + 10\log(P)</math> dB below the transmitter power</li> </ol>
<b>Test Result:</b>	PASS

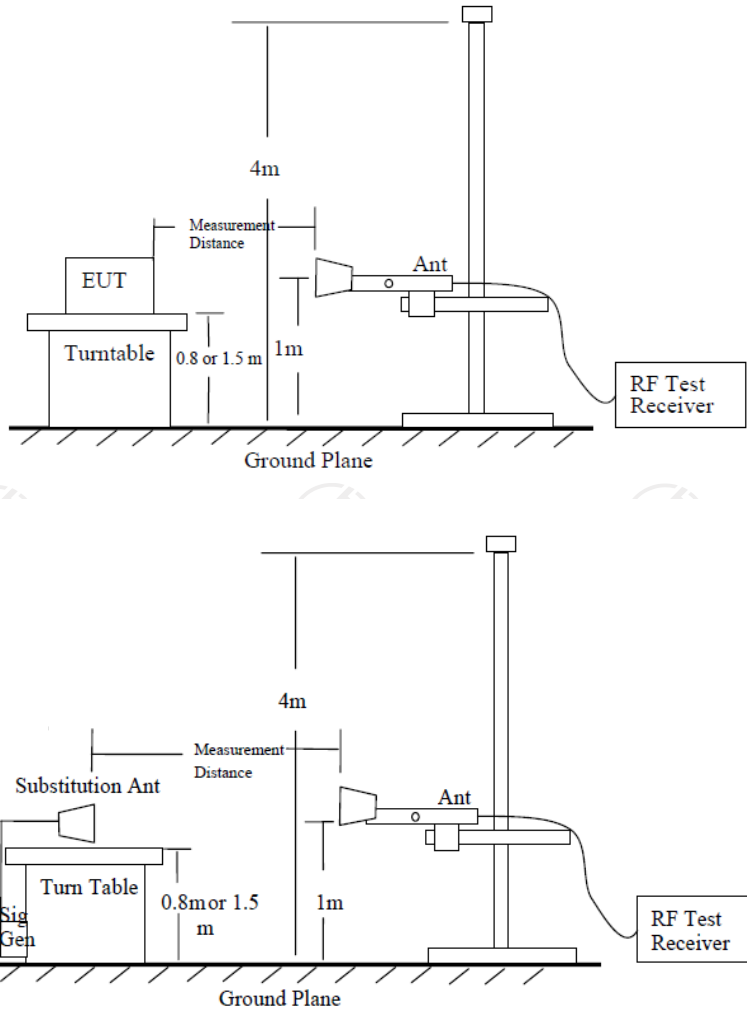
#### 6.4.2. Test Instruments

Equipment	Manufacturer	Model	Serial Number	Calibration Due
Wideband Radio Communication Tester	R&S	CMW500	114220	Jul. 27, 2021
Spectrum Analyzer	Agilent	N9020A	MY49100619	Sep. 11, 2021
RF cable (9kHz-40GHz)	TCT	RE-05	N/A	Sep. 02, 2021
Antenna Connector	TCT	RFC-02	N/A	Sep. 02, 2021

**Note:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

## 6.5. Field Strength of Spurious Radiation Measurement

### 6.5.1. Test Specification

<b>Test Requirement:</b>	FCC part 27.53(g) ,FCC part 27.53(h), FCC part 27.53(m)(4), FCC part 22.917(a), 24.238(b)
<b>Test Method:</b>	FCC part 2.1053
<b>Limit:</b>	30MHz~20GHz -13dBm
<b>Test setup:</b>	 <p>The diagrams illustrate the test setup for field strength measurement. The top diagram shows an EUT (Equipment Under Test) on a turntable, with a measurement distance of 0.8 or 1.5 m from the ground plane. The bottom diagram shows a substitution antenna on a turntable, with a measurement distance of 0.8 or 1.5 m from the ground plane. Both diagrams show an antenna tower with an antenna at a height of 4m, connected to an RF Test Receiver.</p>
<b>Test Procedure:</b>	<ol style="list-style-type: none"> <li>1. The testing follows FCC KDB 971168 D01v03 Section 5.8 and ANSI / TIA-603-D-2010Section 2.2.12.</li> <li>2. The EUT was placed on a rotatable wooden table 0.8 meters above the ground.</li> <li>3. The EUT was set 3 meters from the receiving antenna, which was mounted on the antenna tower.</li> <li>4. The table was rotated 360 degrees to determine the position of the highest spurious emission.</li> <li>5. The height of the receiving antenna is varied between one meter and four meters to search for the maximum</li> </ol>

	<p>spurious emission for both horizontal and vertical polarizations.</p> <p>6. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz, taking record of maximum spurious emission.</p> <p>7. A horn antenna was substituted in place of the EUT and was driven by a signal generator.</p> <p>8. Tune the output power of signal generator to the same emission level with EUT maximum spurious emission.</p> <p>9. Taking the record of output power at antenna port.</p> <p>10. Repeat step 7 to step 8 for another polarization.</p> <p>11. EIRP (dBm) = S.G. Power – Tx Cable Loss + Tx Antenna Gain</p> <p>12. ERP (dBm) = EIRP - 2.15</p> <p>13. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.</p> <p>14. The limit line is derived from 43 + 10log(P) dB below the transmitter power P(Watts)</p> $= P(W) - [43 + 10\log(P)] \text{ (dB)}$ $= [30 + 10\log(P)] \text{ (dBm)} - [43 + 10\log(P)] \text{ (dB)}$ $= -13\text{dBm}.$
<b>Test results:</b>	PASS
<b>Remark:</b>	All modulations have been tested, but only the worst modulation show in this test item.

## 6.5.2. Test Instruments

Radiated Emission Test Site (966)				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
System simulator	R&S	CMU200	110188	Sep. 11, 2021
Spectrum Analyzer	ROHDE&SCHW ARZ	R&S	FSQ40	Sep. 11, 2021
Signal Generator	HP	83623B	3614A00396	Sep. 02, 2021
Broadband Antenna	Schwarzbeck	VULB9163	340	Sep. 04, 2022
Horn Antenna	Schwarzbeck	BBHA 9120D	631	Sep. 04, 2022
Broadband Antenna	Schwarzbeck	VULB9163	412	Sep. 04, 2022
Horn Antenna	Schwarzbeck	BBHA 9120D	1201	Sep. 04, 2022
Horn Antenna	A-INFO	LB-180400-KF	J211020657	Sep. 04, 2022
Dipole Antenna	TCT	TCT-RF	N/A	Sep. 02, 2021
Line-4	TCT	RE-high-04	N/A	Sep. 02, 2021
Line-8	TCT	RE-01	N/A	Jul. 27, 2021
Antenna Mast	Keleto	CC-A-4M	N/A	N/A
EMI Test Software	Shurple Technology	EZ-EMC	N/A	N/A

**Note:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

### 6.5.3. Test Data

#### Frequency Range (9 kHz-30MHz)

Frequency (MHz)	Level@3m (dBμV/m)	Limit@3m (dBμV/m)
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**Note:** 1. Emission Level=Reading+ Cable loss+Antenna factor-Amp factor

2. The emission levels are 20 dB below the limit value, which are not reported. It is deemed to comply with the requirement

Band	Band 2(QPSK, 20MHz)	Test channel:	Lowest
Test mode:		Temperature :	25°C
		Relative Humidity:	56%

**Note:** Spurious emissions within 30-1000MHz were found more than 20dB below limit line.

Frequency (MHz)	Spurious Emission				Limit (dBm)	Result
	Polarization	Level (dBm)	Correction Factor (dB)	Spurious emissions (dBm)		
3720.00	Vertical	-56.94	23.54	-33.40	-13.00	PASS
5580.00	V	-62.58	23.81	-38.77		
7440.00	V	-77.59	23.96	-53.63		
3720.00	Horizontal	-54.41	23.54	-30.87		
5580.00	H	-61.57	23.81	-37.76		
7440.00	H	-74.31	23.96	-50.35		

Band	Band 2(QPSK, 20MHz)	Test channel:	Middle
Test mode:		Temperature :	25°C
		Relative Humidity:	56%

**Note:** Spurious emissions within 30-1000MHz were found more than 20dB below limit line.

Frequency (MHz)	Spurious Emission				Limit (dBm)	Result
	Polarization	Level (dBm)	Correction Factor (dB)	Spurious emissions (dBm)		
3760.00	Vertical	-56.60	23.58	-33.02	-13.00	PASS
5640.00	V	-68.35	23.85	-44.50		
7520.00	V	-76.08	23.99	-52.09		
3760.00	Horizontal	-55.77	23.58	-32.19		
5640.00	H	-62.34	23.85	-38.49		
7520.00	H	-76.75	23.99	-52.76		

Band	Band 2(QPSK, 20MHz)	Test channel:	Highest
Test mode:		Temperature :	25°C
		Relative Humidity:	56%

**Note:** Spurious emissions within 30-1000MHz were found more than 20dB below limit line.

Frequency (MHz)	Spurious Emission				Limit (dBm)	Result
	Polarization	Level (dBm)	Correction Factor (dB)	Spurious emissions (dBm)		
3800.00	Vertical	-59.47	23.60	-35.87	-13.00	PASS
5700.00	V	-68.03	23.88	-44.15		
7600.00	V	-75.98	24.02	-51.96		
3800.00	Horizontal	-54.82	23.60	-31.22		
5700.00	H	-63.53	23.88	-39.65		
7600.00	H	-78.03	24.02	-54.01		

<b>Band</b>	<b>Band 2(16QAM, 20MHz)</b>	<b>Test channel:</b>	<b>Lowest</b>
<b>Test mode:</b>		<b>Temperature :</b>	<b>25°C</b>
		<b>Relative Humidity:</b>	<b>56%</b>

**Note:** Spurious emissions within 30-1000MHz were found more than 20dB below limit line.

Frequency (MHz)	Spurious Emission				Limit (dBm)	Result
	Polarization	Level (dBm)	Correction Factor (dB)	Spurious emissions (dBm)		
3720.00	Vertical	-56.53	23.54	-32.99	-13.00	PASS
5580.00	V	-63.47	23.81	-39.66		
7440.00	V	-76.33	23.96	-52.37		
3720.00	Horizontal	-55.48	23.54	-31.94		
5580.00	H	-62.21	23.81	-38.40		
7440.00	H	-74.46	23.96	-50.50		

<b>Band</b>	<b>Band 2(16QAM, 20MHz)</b>	<b>Test channel:</b>	<b>Middle</b>
<b>Test mode:</b>		<b>Temperature :</b>	<b>25°C</b>
		<b>Relative Humidity:</b>	<b>56%</b>

**Note:** Spurious emissions within 30-1000MHz were found more than 20dB below limit line.

Frequency (MHz)	Spurious Emission				Limit (dBm)	Result
	Polarization	Level (dBm)	Correction Factor (dB)	Spurious emissions (dBm)		
3760.00	Vertical	-57.17	23.58	-33.59	-13.00	PASS
5640.00	V	-67.53	23.85	-43.68		
7520.00	V	-75.64	23.99	-51.65		
3760.00	Horizontal	-55.05	23.58	-31.47		
5640.00	H	-63.36	23.85	-39.51		
7520.00	H	-76.74	23.99	-52.75		

<b>Band</b>	<b>Band 2(16QAM, 20MHz)</b>	<b>Test channel:</b>	<b>Highest</b>
<b>Test mode:</b>		<b>Temperature :</b>	<b>25°C</b>
		<b>Relative Humidity:</b>	<b>56%</b>

**Note:** Spurious emissions within 30-1000MHz were found more than 20dB below limit line.

Frequency (MHz)	Spurious Emission				Limit (dBm)	Result
	Polarization	Level (dBm)	Correction Factor (dB)	Spurious emissions (dBm)		
3800.00	Vertical	-58.58	23.60	-34.98	-13.00	PASS
5700.00	V	-67.76	23.88	-43.88		
7600.00	V	-76.22	24.02	-52.20		
3800.00	Horizontal	-54.33	23.60	-30.73		
5700.00	H	-63.29	23.88	-39.41		
7600.00	H	-77.84	24.02	-53.82		



Band	Band 4(QPSK, 20MHz)	Test channel:	Lowest
Test mode:		Temperature :	25°C
		Relative Humidity:	56%

**Note:** Spurious emissions within 30-1000MHz were found more than 20dB below limit line.

Frequency (MHz)	Spurious Emission				Limit (dBm)	Result
	Polarization	Level (dBm)	Correction Factor (dB)	Spurious emissions (dBm)		
3440.00	Vertical	-56.89	23.40	-33.49	-13.00	PASS
5160.00	V	-62.32	23.69	-38.63		
6880.00	V	-76.79	23.75	-53.04		
3440.00	Horizontal	-55.39	23.40	-31.99		
5160.00	H	-62.11	23.69	-38.42		
6880.00	H	-74.73	23.75	-50.98		

Band	Band 4(QPSK, 20MHz)	Test channel:	Middle
Test mode:		Temperature :	25°C
		Relative Humidity:	56%

**Note:** Spurious emissions within 30-1000MHz were found more than 20dB below limit line.

Frequency (MHz)	Spurious Emission				Limit (dBm)	Result
	Polarization	Level (dBm)	Correction Factor (dB)	Spurious emissions (dBm)		
3465.00	Vertical	-56.97	23.42	-33.55	-13.00	PASS
5197.50	V	-67.68	23.73	-43.95		
6930.00	V	-76.20	23.79	-52.41		
3465.00	Horizontal	-54.71	23.42	-31.29		
5197.50	H	-62.88	23.73	-39.15		
6930.00	H	-75.25	23.79	-51.46		

Band	Band 4(QPSK, 20MHz)	Test channel:	Highest
Test mode:		Temperature :	25°C
		Relative Humidity:	56%

**Note:** Spurious emissions within 30-1000MHz were found more than 20dB below limit line.

Frequency (MHz)	Spurious Emission				Limit (dBm)	Result
	Polarization	Level (dBm)	Correction Factor (dB)	Spurious emissions (dBm)		
3490.00	Vertical	-58.91	23.46	-35.45	-13.00	PASS
5235.00	V	-67.88	23.77	-44.11		
6980.00	V	-75.85	23.81	-52.04		
3490.00	Horizontal	-54.96	23.46	-31.50		
5235.00	H	-64.10	23.77	-40.33		
6980.00	H	-77.79	23.81	-53.98		

Band	Band 4(16QAM, 20MHz)	Test channel:	Lowest
Test mode:		Temperature :	25°C
		Relative Humidity:	56%

**Note:** Spurious emissions within 30-1000MHz were found more than 20dB below limit line.

Frequency (MHz)	Spurious Emission				Limit (dBm)	Result
	Polarization	Level (dBm)	Correction Factor (dB)	Spurious emissions (dBm)		
3440.00	Vertical	-57.64	23.40	-34.24	-13.00	PASS
5160.00	V	-63.24	23.69	-39.55		
6880.00	V	-77.36	23.75	-53.61		
3440.00	Horizontal	-56.12	23.40	-32.72		
5160.00	H	-63.01	23.69	-39.32		
6880.00	H	-74.49	23.75	-50.74		

Band	Band 4(16QAM, 20MHz)	Test channel:	Middle
Test mode:		Temperature :	25°C
		Relative Humidity:	56%

**Note:** Spurious emissions within 30-1000MHz were found more than 20dB below limit line.

Frequency (MHz)	Spurious Emission				Limit (dBm)	Result
	Polarization	Level (dBm)	Correction Factor (dB)	Spurious emissions (dBm)		
3465.00	Vertical	-56.83	23.42	-33.41	-13.00	PASS
5197.50	V	-68.37	23.73	-44.64		
6930.00	V	-76.44	23.79	-52.65		
3465.00	Horizontal	-55.05	23.42	-31.63		
5197.50	H	-63.98	23.73	-40.25		
6930.00	H	-77.13	23.79	-53.34		

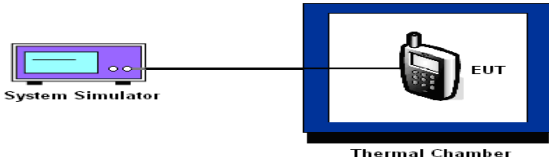
Band	Band 4(16QAM, 20MHz)	Test channel:	Highest
Test mode:		Temperature :	25°C
		Relative Humidity:	56%

**Note:** Spurious emissions within 30-1000MHz were found more than 20dB below limit line.

Frequency (MHz)	Spurious Emission				Limit (dBm)	Result
	Polarization	Level (dBm)	Correction Factor (dB)	Spurious emissions (dBm)		
3490.00	Vertical	-59.41	23.46	-35.95	-13.00	PASS
5235.00	V	-67.83	23.77	-44.06		
6980.00	V	-76.79	23.81	-52.98		
3490.00	Horizontal	-55.09	23.46	-31.63		
5235.00	H	-65.23	23.77	-41.46		
6980.00	H	-78.44	23.81	-54.63		

## 6.6. Frequency Stability Measurement

### 6.6.1. Test Specification

<b>Test Requirement:</b>	FCC part 27.54, FCC part 22.355, 24.235
<b>Test Method:</b>	FCC Part 2.1055
<b>Limit:</b>	±2.5 ppm
<b>Test Setup:</b>	 <p>The diagram illustrates the test setup. On the left, a 'System Simulator' is connected via a cable to an 'EUT' (Equipment Under Test) which is placed inside a 'Thermal Chamber'.</p>
<b>Test Procedure:</b>	<p><b>Test Procedures for Temperature Variation</b></p> <ol style="list-style-type: none"> <li>1. The testing follows FCC KDB 971168 D01v03 Section 9.0.</li> <li>2. The EUT was set up in the thermal chamber and connected with the system simulator.</li> <li>3. With power OFF, the temperature was decreased to -30°C and the EUT was stabilized before testing. Power was applied and the maximum change in frequency was recorded within one minute.</li> <li>4. With power OFF, the temperature was raised in 10°C steps up to 50°C. The EUT was stabilized at each step for at least half an hour. Power was applied and the maximum frequency change was recorded within one minute.</li> </ol> <p><b>Test Procedures for Voltage Variation</b></p> <ol style="list-style-type: none"> <li>1. The testing follows FCC KDB 971168 D01v03 Section 9.0.</li> <li>2. The EUT was placed in a temperature chamber at 25±5° C and connected with the system simulator.</li> <li>3. The power supply voltage to the EUT was varied from BEP to 115% of the nominal value measured at the input to the EUT.</li> <li>4. The variation in frequency was measured for the worst case.</li> <li>5. The worst case(worst bandwidth) for frequency stability reported in the Test Data. The worst bandwidth is as follow: 1.4M is for LTE Band 2, 1.4M is for LTE Band 4</li> </ol>
<b>Test Result:</b>	PASS

## 6.6.2. Test Instruments

Equipment	Manufacturer	Model	Serial Number	Calibration Due
Wideband Radio Communication Tester	R&S	CMW500	114220	Jul. 27, 2021
Programable tempratuce and humidity chamber	JQ	JQ-2000	N/A	Sep. 02, 2021
DC power supply	Kingrang	KR3005K 30V/5A	N/A	Sep. 02, 2021
RF cable (9kHz-40GHz)	TCT	RE-04	N/A	Sep. 02, 2021
Antenna Connector	TCT	RFC-03	N/A	Sep. 02, 2021

**Note:** 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

## Appendix A: Photographs of Test Setup

Refer to the test report No. TCT200831E010

## Appendix B: Photographs of EUT

Refer to the test report No. TCT200831E010

## Test Data for Appendix For LTE Band 2, Appendix For LTE Band 4

**\*\*\*\*\*END OF REPORT\*\*\*\*\***