

## TEST REPORT FOR RF TESTING

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Report No.: SRTC2020-9004(F)-20090802(C)

Product Name: Mobile Broadband Internet Device

Product Model: K87CC

Applicant: ZTE Corporation

Manufacturer: ZTE Corporation

Specification: FCC Part 2, Part 24E, Part 22H, Part 27 (2019)

FCC ID: SRQ-K87CC

The State Radio\_monitoring\_center Testing Center (SRTC)

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## 1. GENERAL INFORMATION

### 1.1 Notes of the test report

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### 1.2 Information about the testing laboratory

Company:	The State Radio_monitoring_center Testing Center (SRTC)
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### 1.3 Applicant's details

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### 1.4 Manufacturer's details

Company:	ZTE Corporation
Address:	ZTE Plaza, Keji Road South, Hi-Tech, Industrial Park, Nanshan District, Shenzhen, Guangdong, 518057, P.R.China
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Country or Region:	P.R.China
Contacted person:	Zhao Yang
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## 1.5 Test Environment

Date of Receipt of test sample at SRTC:	2020-09-08
Testing Start Date:	2020-09-08
Testing End Date:	2020-09-30

Environmental Data:	Temperature (°C)	Humidity (%)
Ambient	25	30
Maximum Extreme	55	---
Minimum Extreme	-10	---

Normal Supply Voltage (V d.c.):	3.80
Maximum Extreme Supply Voltage (V d.c.):	3.60
Minimum Extreme Supply Voltage (V d.c.):	4.35

## **2 DESCRIPTION OF THE EQUIPMENT UNDER TEST**

### **2.1 Final Equipment Build Status**

Frequency Range	LTE Band 2: Tx:1850~1910MHz Rx:1930~1990MHz LTE Band 4: Tx:1710~1755MHz Rx:2110~2155MHz LTE Band 5: Tx:824~849 MHz Rx:869 ~894MHz LTE Band 12: Tx:699~716MHz Rx:729~746MHz LTE Band 25: Tx:1850.7~1914.3MHz Rx:1930.7~1962.5MHz LTE Band 41: Tx:2498.5~2687.5MHz Rx:2498.5~2687.5MHz LTE Band 66: Tx:1710.7~1779.3MHz Rx:2110.7~2179.3MHz LTE Band 71: Tx:665.5~695.5MHz Rx:619.5~649.5MHz
Modulation Type	QPSK/16QAM/64QAM
Antenna Type	Fixed Internal Antenna
Antenna Gain	LTE Band2:0.7dBi LTE Band4:0.5dBi LTE Band5:-2dBi LTE Band12:-2.3dBi LTE Band 25:0.7dBi LTE Band 41:0.5dBi LTE Band 66:0.5dBi LTE Band 71:-2.4dBi
Power Supply	Battery/Charger
Hardware Version	K87CCHW1.0
Software Version	K87CCV1.0.0B01
IMEI	863753050001643

## 2.2 Support Equipment

The following support equipment was used to exercise the DUT during testing:

Equipment	Battery
Manufacturer	ZHUHAI COSMX BATTERY CO., LTD.
Model Number	Li3945T44P8hA69203

Equipment	Charger 1
Manufacturer	PUAN
Model Number	STC-A51D-Z

Equipment	Charger 2
Manufacturer	AOHAI
Model Number	STC-A51D-Z

Equipment	Charger 3
Manufacturer	Ruijing
Model Number	STC-A51D-Z

Equipment	USB Cable 1
Manufacturer	Shen Zhen Shi Yi HUA XING Electron Co.,Ltd
Model Number	USB-MU5-W-100-M

Equipment	USB Cable 2
Manufacturer	Kingpower Co.,Ltd
Model Number	USB-MU5-W-100-M

## 2.3 Summary table

FCC Rule Part	Frequency Range(MHz)	EIRP/ERP (W)	Frequency Tolerance (ppm)	Emission Designator	Emission Bandwidth (MHz)	Measured 26dBC Bandwidth (MHz)	Communication Type
LTE BAND2							
24E	1850.7-1909.3	0.292	0.049	1M08G7D	1.4M	1.287	QPSK
	1850.7-1909.3	0.220	0.049	1M08D7W	1.4M	1.292	16QAM
	1850.7-1909.3	0.221	0.049	1M08W7D	1.4M	1.289	64QAM
	1851.5-1908.5	0.289	0.051	2M70G7D	3M	2.987	QPSK
	1851.5-1908.5	0.249	0.051	2M71D7W	3M	2.992	16QAM
	1851.5-1908.5	0.223	0.051	2M70W7D	3M	3.000	64QAM
	1852.5-1907.5	0.263	0.046	4M49G7D	5M	4.879	QPSK
	1852.5-1907.5	0.210	0.046	4M48D7W	5M	4.920	16QAM
	1852.5-1907.5	0.210	0.046	4M48W7D	5M	4.875	64QAM
	1855-1905	0.275	0.053	8M93G7D	10M	9.724	QPSK
	1855-1905	0.205	0.053	8M95D7W	10M	9.784	16QAM
	1855-1905	0.192	0.053	8M94W7D	10M	9.781	64QAM
	1857.5-1902.5	0.261	0.044	13M4G7D	15M	14.24	QPSK
	1857.5-1902.5	0.200	0.044	13M4D7W	15M	14.29	16QAM
	1857.5-1902.5	0.194	0.044	13M4W7D	15M	14.31	64QAM
	1860-1900	0.261	0.048	17M9G7D	20M	19.12	QPSK
	1860-1900	0.196	0.048	17M9D7W	20M	19.06	16QAM
	1860-1900	0.185	0.048	17M9W7D	20M	19.14	64QAM
LTE BAND4							
27	1710.7-1754.3	0.270	0.043	1M08G7D	1.4M	1.412	QPSK
	1710.7-1754.3	0.205	0.043	1M08D7W	1.4M	1.379	16QAM
	1710.7-1754.3	0.213	0.043	1M09W7D	1.4M	1.407	64QAM
	1711.5-1753.5	0.270	-0.042	2M71G7D	3M	3.055	QPSK
	1711.5-1753.5	0.229	-0.042	2M71D7W	3M	3.012	16QAM
	1711.5-1753.5	0.210	-0.042	2M71W7D	3M	3.047	64QAM
	1712.5-1752.5	0.271	0.052	4M50G7D	5M	4.967	QPSK
	1712.5-1752.5	0.222	0.052	4M49D7W	5M	5.257	16QAM
	1712.5-1752.5	0.211	0.052	4M50W7D	5M	4.967	64QAM
	1715-1750	0.272	0.050	8M99G7D	10M	10.320	QPSK
	1715-1750	0.211	0.050	8M97D7W	10M	10.160	16QAM
	1715-1750	0.210	0.050	8M97W7D	10M	10.570	64QAM
	1717.5-1747.5	0.281	0.047	13M4G7D	15M	14.73	QPSK
	1717.5-1747.5	0.207	0.047	13M4D7W	15M	14.87	16QAM
	1717.5-1747.5	0.198	0.047	13M5W7D	15M	15.45	64QAM
	1720-1745	0.302	0.047	17M9G7D	20M	19.69	QPSK
	1720-1745	0.216	0.047	17M9D7W	20M	19.51	16QAM
	1720-1745	0.217	0.047	17M9W7D	20M	19.2	64QAM

LTE BAND5							
22H	824.7-848.3	0.122	0.047	1M08G7D	1.4M	1.246	QPSK
	824.7-848.3	0.087	0.047	1M08D7W	1.4M	1.258	16QAM
	824.7-848.3	0.095	0.047	1M08W7D	1.4M	1.250	64QAM
	825.5-847.5	0.126	0.041	2M71G7D	3M	2.970	QPSK
	825.5-847.5	0.101	0.041	2M70D7W	3M	2.952	16QAM
	825.5-847.5	0.088	0.041	2M70W7D	3M	3.000	64QAM
	826.5-846.5	0.119	0.050	4M48G7D	5M	4.899	QPSK
	826.5-846.5	0.083	0.050	4M49D7W	5M	4.875	16QAM
	826.5-846.5	0.084	0.050	4M49W7D	5M	4.941	64QAM
	829-844	0.119	0.050	8M93G7D	10M	9.601	QPSK
	829-844	0.087	0.050	8M94D7W	10M	9.583	16QAM
	829-844	0.088	0.050	8M95W7D	10M	9.707	64QAM
LTE BAND12							
27	699.7-715.3	0.109	0.049	1M08G7D	1.4M	1.258	QPSK
	699.7-715.3	0.085	0.049	1M08D7W	1.4M	1.253	16QAM
	699.7-715.3	0.086	0.049	1M08W7D	1.4M	1.251	64QAM
	700.5-714.5	0.112	0.048	2M71G7D	3M	2.965	QPSK
	700.5-714.5	0.083	0.048	2M71D7W	3M	2.990	16QAM
	700.5-714.5	0.084	0.048	2M70W7D	3M	2.978	64QAM
	701.5-713.5	0.115	0.052	4M49G7D	5M	4.886	QPSK
	701.5-713.5	0.082	0.052	4M49D7W	5M	4.930	16QAM
	701.5-713.5	0.083	0.052	4M50W7D	5M	4.879	64QAM
	704-711	0.109	0.050	8M94G7D	10M	9.691	QPSK
	704-711	0.084	0.050	8M94D7W	10M	9.699	16QAM
	704-711	0.076	0.050	8M96W7D	10M	9.645	64QAM
LTE BAND25							
24E	1850.7-1914.3	0.361	0.050	1M08G7D	1.4M	1.288	QPSK
	1850.7-1914.3	0.284	0.050	1M08D7W	1.4M	1.281	16QAM
	1850.7-1914.3	0.256	0.050	1M08W7D	1.4M	1.303	64QAM
	1851.5-1913.5	0.355	-0.049	2M70G7D	3M	2.972	QPSK
	1851.5-1913.5	0.251	-0.049	2M70D7W	3M	2.991	16QAM
	1851.5-1913.5	0.255	-0.049	2M70W7D	3M	2.980	64QAM
	1852.5-1912.5	0.326	0.049	4M49G7D	5M	4.917	QPSK
	1852.5-1912.5	0.247	0.049	4M48D7W	5M	4.935	16QAM
	1852.5-1912.5	0.260	0.049	4M48W7D	5M	4.919	64QAM
	1855-1910	0.340	0.051	8M93G7D	10M	9.678	QPSK
	1855-1910	0.255	0.051	8M95D7W	10M	9.593	16QAM
	1855-1910	0.229	0.051	8M95W7D	10M	9.652	64QAM
	1857.5-1907.5	0.331	0.049	13M4G7D	15M	14.37	QPSK
	1857.5-1907.5	0.223	0.049	13M4D7W	15M	14.26	16QAM
	1857.5-1907.5	0.224	0.049	13M4W7D	15M	14.31	64QAM
	1860-1905	0.340	0.050	17M9G7D	20M	19.21	QPSK
	1860-1905	0.247	0.050	17M9D7W	20M	19.98	16QAM
	1860-1905	0.230	0.050	17M9W7D	20M	19.17	64QAM



LTE BAND41							
27	2537.5-2652.5	0.982	0.046	4M51G7D	5M	8.520	QPSK
	2537.5-2652.5	0.716	0.046	4M52D7W	5M	7.240	16QAM
	2537.5-2652.5	0.714	0.046	4M52W7D	5M	9.224	64QAM
	2540-2650	0.962	0.047	9M02G7D	10M	14.480	QPSK
	2540-2650	0.750	0.047	9M00D7W	10M	16.280	16QAM
	2540-2650	0.748	0.047	9M04W7D	10M	15.750	64QAM
	2542.5-2647.5	0.955	0.044	13M4G7D	15M	14.720	QPSK
	2542.5-2647.5	0.710	0.044	13M4D7W	15M	14.520	16QAM
	2542.5-2647.5	0.684	0.044	13M4W7D	15M	14.390	64QAM
	2545-2645	0.920	0.053	17M8G7D	20M	19.140	QPSK
	2545-2645	0.705	0.053	17M9D7W	20M	18.940	16QAM
	2545-2645	0.661	0.053	17M8W7D	20M	19.340	64QAM
LTE BAND66							
27	1710.7-1779.3	0.292	0.053	1M08G7D	1.4M	1.292	QPSK
	1710.7-1779.3	0.209	0.053	1M08D7W	1.4M	1.266	16QAM
	1710.7-1779.3	0.207	0.053	1M08W7D	1.4M	1.281	64QAM
	1711.5-1778.5	0.300	0.049	2M71G7D	3M	2.992	QPSK
	1711.5-1778.5	0.235	0.049	2M71D7W	3M	2.987	16QAM
	1711.5-1778.5	0.234	0.049	2M71W7D	3M	3.002	64QAM
	1712.5-1777.5	0.291	0.050	4M49G7D	5M	4.954	QPSK
	1712.5-1777.5	0.208	0.050	4M48D7W	5M	4.998	16QAM
	1712.5-1777.5	0.207	0.050	4M49W7D	5M	4.903	64QAM
	1715-1775	0.277	0.050	8M96G7D	10M	9.677	QPSK
	1715-1775	0.208	0.050	8M95D7W	10M	9.776	16QAM
	1715-1775	0.207	0.050	8M94W7D	10M	9.744	64QAM
	1717.5-1772.5	0.275	0.053	13M5G7D	15M	14.65	QPSK
	1717.5-1772.5	0.201	0.053	13M4D7W	15M	14.46	16QAM
	1717.5-1772.5	0.200	0.053	13M4W7D	15M	14.41	64QAM
	1720-1770	0.282	0.049	17M9G7D	20M	19.08	QPSK
	1720-1770	0.202	0.049	17M9D7W	20M	19.15	16QAM
	1720-1770	0.201	0.049	17M9W7D	20M	19.03	64QAM
LTE BAND71							
27	665.5-695.5	0.105	0.051	4M49G7D	5M	4.930	QPSK
	665.5-695.5	0.097	0.051	4M49D7W	5M	4.891	16QAM
	665.5-695.5	0.097	0.051	4M47W7D	5M	4.907	64QAM
	668-693	0.105	0.048	8M94G7D	10M	9.724	QPSK
	668-693	0.097	0.048	8M96D7W	10M	9.692	16QAM
	668-693	0.097	0.048	8M96W7D	10M	9.650	64QAM
	670.5-690.5	0.104	0.052	13M4G7D	15M	14.480	QPSK
	670.5-690.5	0.097	0.052	13M4D7W	15M	14.320	16QAM
	670.5-690.5	0.097	0.052	13M4W7D	15M	14.410	64QAM
	673-688	0.105	0.052	17M8G7D	20M	19.250	QPSK
	673-688	0.097	0.052	17M8D7W	20M	18.900	16QAM
	673-688	0.097	0.052	17M8W7D	20M	19.050	64QAM

### **3 REFERENCE SPECIFICATION**

Specification	Version	Title
FCC Part 2	2019	Frequency allocations and radio treaty matters; general rules and regulations
FCC Part 22	2019	Public mobile services
FCC Part 24	2019	Personal communications services
FCC Part 27	2019	Miscellaneous wireless communications services
ANSI C63.26	2015	American national standard for compliance testing of transmitters used in licensed radio services
KDB 971168 D01	April 9, 2018	Measurement guidance for certification of licensed digital transmitters
TIA-603-E-2016	March 2016	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards



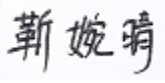
### **4 KEY TO NOTES AND RESULT CODES**

The following are the definition of the test result.

Code	Meaning
PASS	Test result shows that the requirements of the relevant specification have been met.
FAIL	Test result shows that the requirements of the relevant specification have not been met.
NT	Normal Temperature
NV	Nominal voltage
HV	High voltage
LV	Low voltage

## 5 RESULT SUMMARY

No.	Test case	FCC reference	Verdict
1	RF Power Output	2.1046	Pass
2	Effective Radiated Power and Effective Isotropic Radiated Power	22.913(a)(5), 24.232(c), 27.50(b)(10), 27.50(c)(10), 27.50(h)(2), 27.50(d)(4), 27.50(a)(3)	Pass
3	Occupied Bandwidth	2.1049	Pass
4	Peak-Average Ratio	24.232(d), 27.50(d)(5)	Pass
5	Emission Bandwidth	2.1049	Pass
6	Spurious Emissions at antenna terminals	2.1051, 22.917(a), 24.238(a), 27.53(c), 27.53(g), 27.53(h), 27.53(m), 27.53(a)	Pass
7	Band Edges Compliance	2.1051, 22.917(a), 24.238(a), 27.53(c), 27.53(g), 27.53(h), 27.53(m), 27.53(a)	Pass
8	Frequency Stability	2.1055, 22.355, 24.235, 27.54	Pass
9	Radiated Spurious Emissions	2.1053, 22.917(a), 24.238(a), 27.53(c), 27.53(g), 27.53(h), 27.53(f), 27.53(a), 27.53(m)	Pass

This Test Report Is Issued by: Mr. Peng Zhen 	Checked by: Mr. Li Bin 
Tested by: Miss. Jin Wanqing 	Issued date:  20200930

## **6 TEST RESULT**

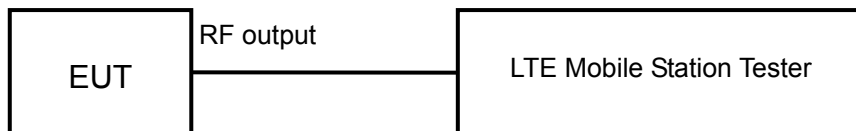
### **6.1 RF Power Output**

Rule Part(s)  
FCC: 2.1046

Ambient condition:

Temperature	Relative humidity	Pressure
25°C	30%	101.9kPa

Test Setup:



Test procedure:

After a radio link has been established between EUT and Tester, the output power of the cell signal of the testing equipment will be decreased until the output power of the EUT reach a maximum value. Then the test data can be read at the tester screen. The loss between RF output port of the EUT and the input port of the tester will be taken into consideration.

Limits: No RF Power Output requirements in part 2.1046.

Test result:

The test results are shown in Appendix A.

## 6.2 Effective Radiated Power and Effective Isotropic Radiated Power

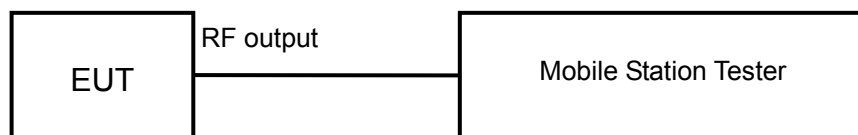
Rule Part(s)

FCC: 22.913(a)(5), 24.232(c)

Ambient condition:

Temperature	Relative humidity	Pressure
25°C	47%	101.9kPa

Test setup:



Test procedure:

KDB 971168 D01 v03r01 – Section 5.2.1

Test Settings

Subclause 5.2.5.5 of ANSI C63.26-2015 is applicable, along with the following provisions. For personal/portable radios utilizing an integral antenna, the factor LC is typically negligible. However, in a fixed station transmit system that utilizes a long cable run between the transmitter and the transmitting antenna, this factor can be significant. The minimum cable loss should be used in this equation.

The relevant equation for determining the ERP or EIRP from the conducted RF output power measured is:

$$\text{ERP/EIRP} = \text{PMeas} - \text{LC} + \text{GT}$$

Where:

ERP/EIRP = effective or equivalent radiated power, respectively (expressed in the same units as PMeas, typically dBW or dBm)

PMeas = measured transmitter output power or PSD, in dBW or dBm

LC = signal attenuation in the connecting cable between the transmitter and antenna in dB

GT = gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP)

Test result:

The test results are shown in Appendix B.

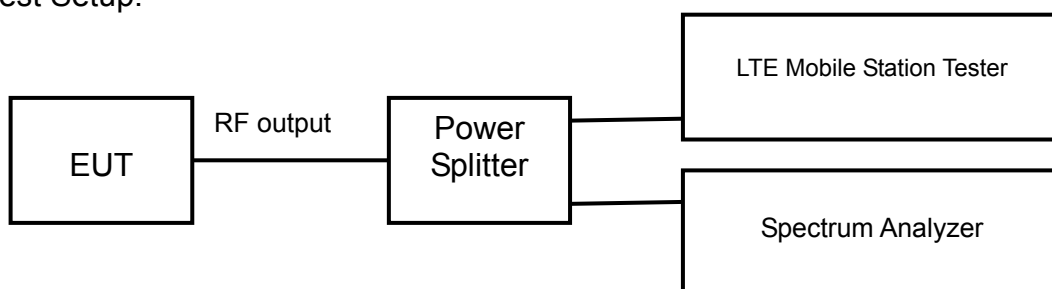
### 6.3 Occupied Bandwidth

Rule Part(s)  
FCC: 2.1049

Ambient condition:

Temperature	Relative humidity	Pressure
25°C	30%	101.9kPa

Test Setup:



Test procedure:  
KDB 971168 D01 v03r01 – Section 4.2

Test Setting:

1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 99% occupied bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = 1 – 5% of the expected OBW
3. VBW  $\geq 3 \times$  RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. The trace was allowed to stabilize
8. If necessary, steps 2 – 7 were repeated after changing the RBW such that it would be within 1 – 5% of the 99% occupied bandwidth observed in Step 7

Limits: No specific occupied bandwidth requirements in part 2.1049

Test result:

The test results are shown in Appendix A.

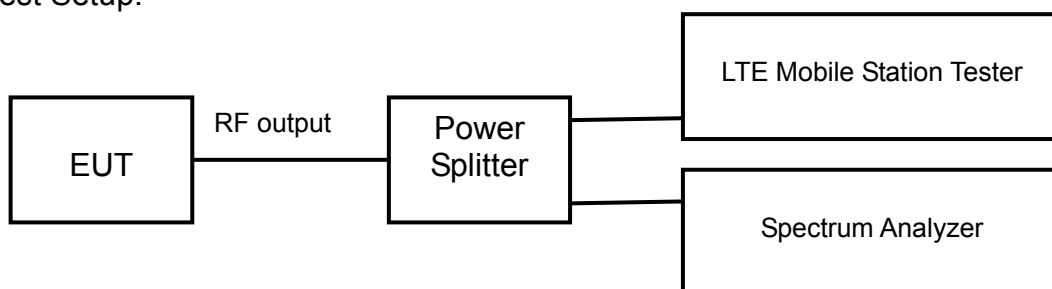
## 6.4 Emission Bandwidth

Rule Part(s)  
FCC: 2.1049

Ambient condition:

Temperature	Relative humidity	Pressure
25°C	30%	101.9kPa

Test Setup:



Test procedure:  
KDB 971168 D01 v03r01 – Section 4.2

Test Setting:

1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 26dB bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = 1 – 5% of the expected OBW
3. VBW  $\geq$  3 x RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. The trace was allowed to stabilize
8. If necessary, steps 2 – 7 were repeated after changing the RBW such that it would be within 1 – 5% of 26dB bandwidth observed in Step 7

Limits: No specific emission bandwidth requirements in part 2.1049.

Test result:  
The test results are shown in Appendix A.

## 6.5 Peak-Average Ratio

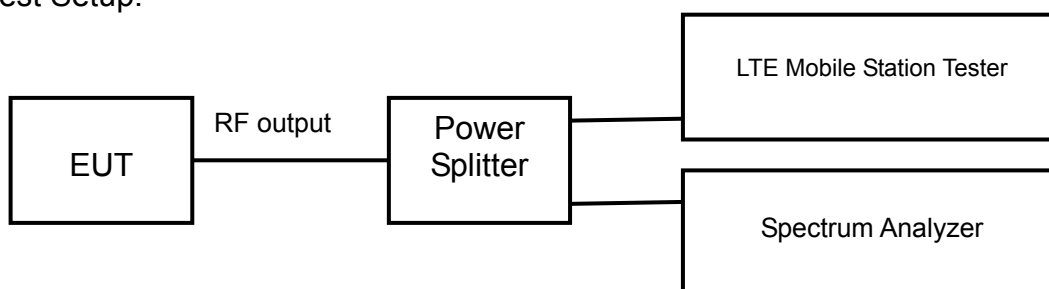
Rule Part(s)

FCC: 24.232(d), 27.50(d) (5)

Ambient condition:

Temperature	Relative humidity	Pressure
25°C	30%	101.9kPa

Test Setup:



Test procedure:

KDB 971168 D01 v03r01 – Section 5.7.1

Test Setting:

1. The signal analyzer's CCDF measurement profile is enabled
2. Frequency = carrier center frequency
3. Measurement BW ≥ OBW or specified reference bandwidth
4. The signal analyzer was set to collect one million samples to generate the CCDF curve
5. The measurement interval was set depending on the type of signal analyzed. For continuous signals (>98% duty cycle), the measurement interval was set to 1ms. For burst transmissions, the spectrum analyzer is set to use an internal "RF Burst" trigger that is synced with an incoming pulse and the measurement interval is set to less than the duration of the "on time" of one burst to ensure that energy is only captured during a time in which the transmitter is operating at maximum power

Limits

24.232(d), 27.50(d) (5)

In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

Test result:

The test results are shown in Appendix A.



## 6.6 Spurious Emissions at antenna terminal

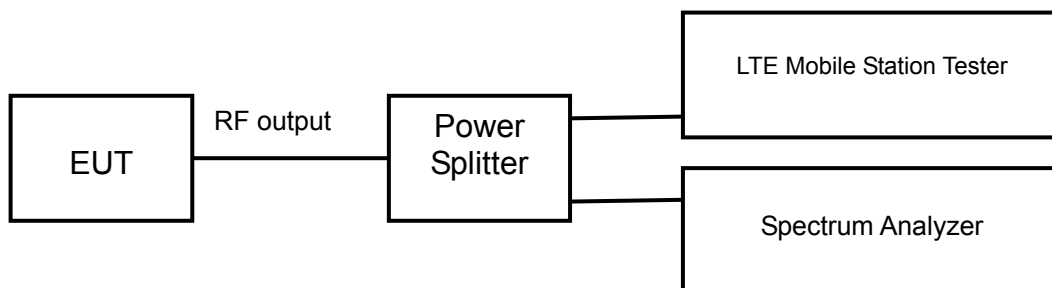
Rule Part(s)

FCC: 2.1051, 22.917(a), 24.238(a), 27.53(c), 27.53(g), 27.53(h), 27.53(m), 27.53(a)

Ambient condition:

Temperature	Relative humidity	Pressure
25°C	30%	101.9kPa

Test Setup:



Test procedure:

KDB 971168 D01 v03r01 – Section 6.0

Test Setting:

1. Start frequency was set to 30MHz and stop frequency was set to at least 10 \* the fundamental frequency
2. Detector = RMS
3. RBW=1MHz
4. VBW=3MHz
5. Trace mode = trace average for continuous emissions, max hold for pulse emissions
6. Sweep time = auto couple
7. The trace was allowed to stabilize

Limits

The minimum permissible attenuation level of any spurious emission is  $43 + \log_{10} (P \text{ [Watts]})$ , where P is the transmitter power in Watts.

For Band 30, the minimum permissible attenuation level of any spurious emission <2288MHz and >2365MHz is  $70 + \log_{10} (P \text{ [Watts]})$ .

For Band 7 and 41, the minimum permissible attenuation level of any spurious emission is  $55 + \log_{10} (P \text{ [Watts]})$ .

Test result:

The test results are shown in Appendix A.

## 6.7 Band Edges Compliance

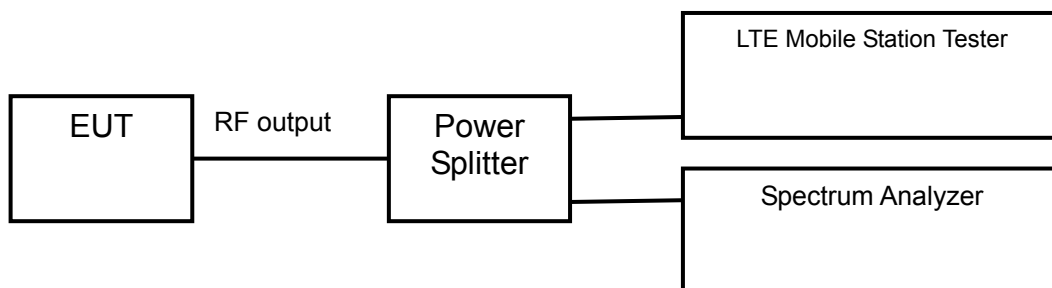
Rule Part(s)

FCC: 2.1051, 22.917(a), 24.238(a), 27.53(c), 27.53(g), 27.53(h), 27.53(m), 27.53(a)

Ambient condition:

Temperature	Relative humidity	Pressure
25°C	30%	101.9kPa

Test Setup:



Test procedure:

KDB 971168 D01 v03r01 – Section 6.0

Test Setting:

1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
2. Span was set large enough so as to capture all out of band emissions near the band edge
3. RBW > 1% of the emission bandwidth
4. VBW > 3 x RBW
5. Detector = RMS
6. Number of sweep points  $\geq 2 \times \text{Span/RBW}$
7. Trace mode = trace average for continuous emissions, max hold for pulse emissions
8. Sweep time = auto couple
9. The trace was allowed to stabilize

Limits

The minimum permissible attenuation level of any spurious emission is  $43 + \log_{10}(P)$  [Watts], where P is the transmitter power in Watts.

The minimum permissible attenuation level for Band 30 is  $> 43 + 10\log_{10}(P)$  [Watts] at 2300-2305MHz & 2345-2360MHz,  $> 55 + 10\log_{10}(P)$  [Watts] at 2320-2324MHz & 2341-2345MHz,  $> 61 + 10\log_{10}(P)$  [Watts] at 2324-2328MHz & 2337-2341MHz,  $> 67 + 10\log_{10}(P)$  [Watts] at 2288-2292MHz & 2328- 2337MHz, and  $> 70 + 10\log_{10}(P)$  [Watts] at frequencies < 2288MHz & >2365MHz.

Per 22.917(b) 24.238(a) 27.53(h) 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 to demonstrate compliance with the out-of-band emissions limit. 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 emission are attenuated at least 26 dB below the transmitter power.

Per 27.53(g) for operations in the 698-746 MHz band, in the 100 kHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least 30 kHz may be employed to demonstrate compliance with the out-of-band emissions limit.

Per 27.53(c)(5) for operations in the 776-788 MHz band, in the 100 kHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least 30 kHz may be employed to demonstrate compliance with the out-of-band emissions limit.

For all plots showing emissions in the 763 – 775MHz and 793 – 805MHz band, the FCC limit per 27.53(c)(4) is  $65 + 10\log_{10}(P) = -35\text{dBm}$  in a 6.25kHz bandwidth.

Per 27.53(a)(5) in the 1 MHz bands immediately outside and adjacent to the channel blocks at 2305, 2310, 2315, 2320, 2345, 2350, 2355, and 2360 MHz, a resolution bandwidth of at least 1 percent of the emission bandwidth of the fundamental emission of the transmitter 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 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.

Per 27.53(m) for operations in the BRS/EBS bands, 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. In addition, the attenuation factor shall not be less that  $43 + 10 \log (P)$  dB on all frequencies between 2490.5 MHz and 2496 MHz and  $55 + 10 \log (P)$  dB at or below 2490.5MHz.

Test result:

The test results are shown in Appendix A.

## 6.8 Frequency Stability

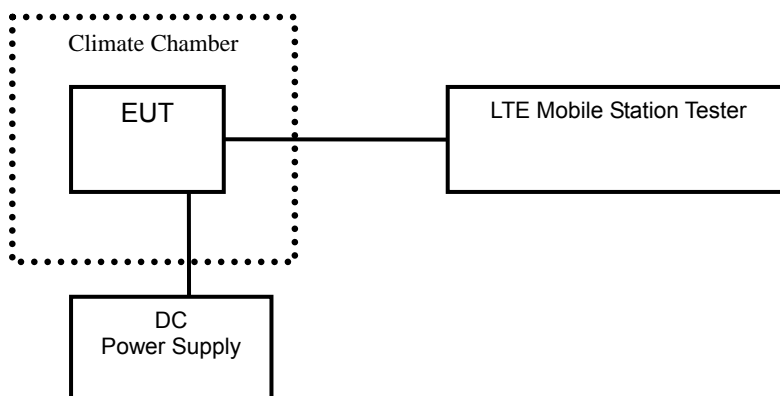
Rule Part(s)

FCC: 2.1055, 22.355, 24.235, 27.54

Ambient condition:

Temperature	Relative humidity	Pressure
25°C	30%	101.9kPa

Test setup:



Test Procedure:

ANSI/TIA-603-E-2016

Test Settings

1. The carrier frequency of the transmitter is measured at room temperature (20°C to provide a reference).
2. The equipment is turned on in a “standby” condition for fifteen minutes before applying power to the transmitter. Measurement of the carrier frequency of the transmitter is made within one minute after applying power to the transmitter.
3. Frequency measurements are made at 10°C intervals ranging from -30°C to +50°C (The temperature range can be declared by the manufacturer). A period of at least one half-hour is provided to allow stabilization of the equipment at each temperature level.

Limits: For Part 22, the frequency stability of the transmitter shall be maintained within  $\pm 0.00025\%$  ( $\pm 2.5$  ppm) of the center frequency. For Part 24, Part 27, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Test result:

The test results are shown in Appendix A.

## 6.9 Radiated Spurious Emissions

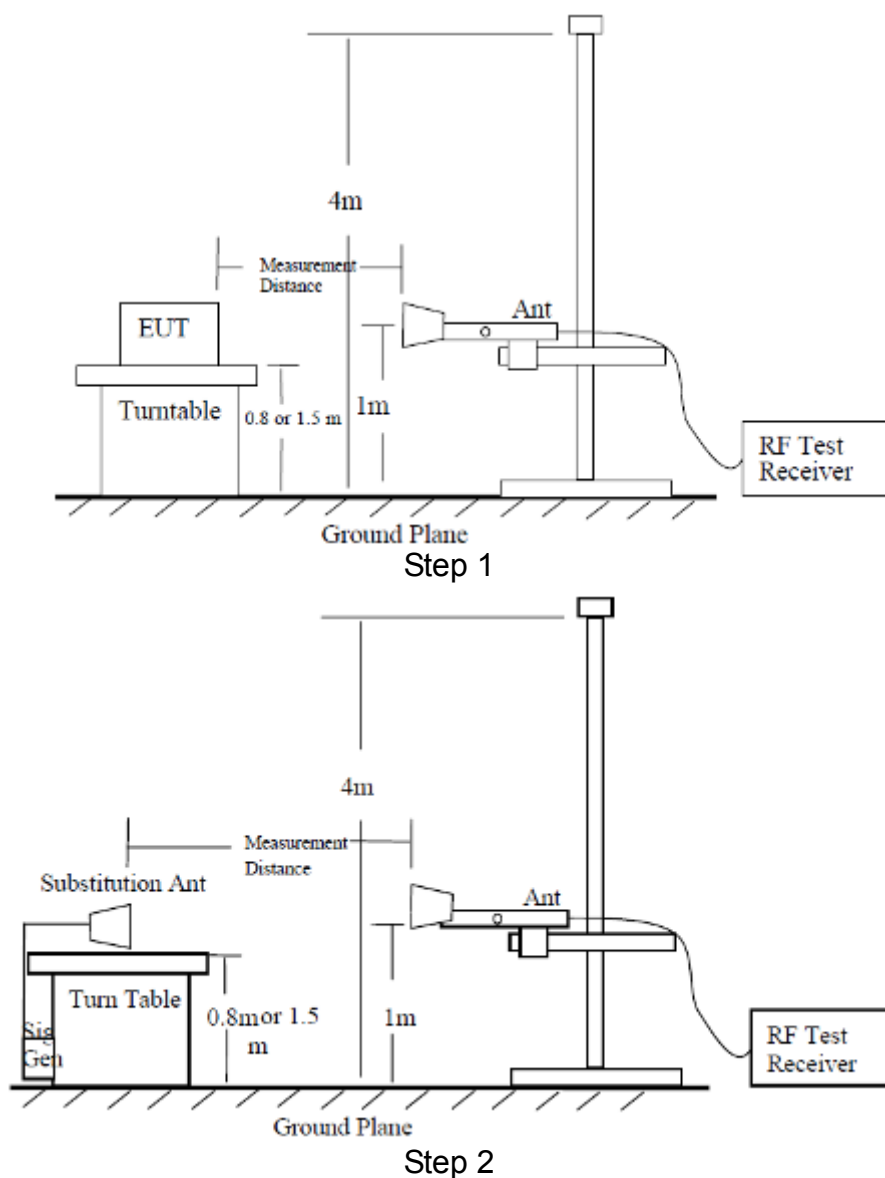
Rule Part(s)

FCC: 2.1053, 22.917(a), 24.238(a), 27.53(c), 27.53(g), 27.53(h), 27.53(f), 27.53(a), 27.53(m)

Ambient condition:

Temperature	Relative humidity	Pressure
25°C	30%	101.9kPa

Test Setup:



#### Test procedure:

The measurements procedures in TIA-603-E-2016 are used.

The spectrum was scanned from 30MHz to the 10th harmonic of the highest frequency generated within the equipment.

#### Step 1:

The measurement is carried out in the chamber. EUT was placed on a 0.8m ( $f < 1\text{GHz}$ )/1.5m ( $f > 1\text{GHz}$ ) high non-conductive table at a 3 meters test distance from the test receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT. The height of receiving antenna from 1m to 4m and varies in certain range to find the maximum power value. A radio link shall be established between EUT and Tester. The output power of the cell signal of the tester will be decreased until the output power of the EUT reach a maximum value. A peak detector is used and RBW is set to 100 kHz ( $f < 1\text{GHz}$ )/1MHz ( $f > 1\text{GHz}$ ). The antenna shall be performed under horizontal and vertical polarization. The turn table shall be rotated from 0 to 360 degrees for detecting the maximum power value on spectrum analyzer or receiver. The spectrum analyzer scans from 30MHz to 10th harmonic of the carrier. A notch filter is necessary in the band near to the carrier frequency. A high pass filter is needed to avoid the distortion of the testing equipment in the band above the carrier frequency.

#### Step 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.

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

A "reference path loss" should be calculated after test. The attenuation of "reference path loss" is the cable loss between the Signal Source with the Substitution Antenna ( $P_{\text{ca}}$ ) and the Substitution Antenna Gain ( $G_a$ ).

#### Calculation procedure:

The data of cable loss and antenna gain has been calibrated in full testing frequency range before the testing.

The power of the Radiated Spurious Emissions is calculated by adding the cable loss and antenna gain. The basic equation with a sample calculation is as followed:

$$\text{Power (EIRP)} = P_{\text{mea}} + P_{\text{ca}} + G_a$$

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

Assumed the power of signal source record is -20dBm. A cable loss of -30dB, and an antenna gain of 11dB are added.

$$P = P_{\text{mea}} + P_{\text{ca}} + G_a = (-20\text{dBm}) + (-30\text{dB}) + (11\text{dB}) = -39\text{dBm}$$

#### Test result:

The test results are shown in Appendix B.

## **7 MEASUREMENT UNCERTAINTIES**

Items	Uncertainty	
RF Power Output	0.6 dB	
Occupied Bandwidth	3 kHz	
Spurious Emissions	30MHz~1GHz	2.83 dB
	1GHz~12.75GHz	2.50 dB
	12.75GHz~25GHz	2.75 dB
Band Edges Compliance	1.2dB	
Frequency Stability	4 Hz	

## 8 TEST EQUIPMENTS

No.	Name/Model	Manufacturer	S/N	Calibration Date	Calibration Due Date
1	MT8820C Mobile Station Tester	Anritsu	6201300660	2020.08.20	2021.08.19
2	FSV40 Spectrum Analyzer	R&S	101065	2020.08.20	2021.08.19
2	N9020A Spectrum Analyzer	Agilent	MY48010771	2020.08.20	2021.08.19
3	6007 Power Divider	Weinschel	6007-GJ-1	2020.08.20	2021.08.19
4	DC Power Supply E3645A	Agilent	MY40000741	2020.03.01	2021.02.28
5	Temperature chamber SH241	ESPEC	92013758	2020.08.20	2021.08.19
6	12.65m×8.03m×7.50m Fully-Anechoic Chamber	FRANKONIA	----	----	----
7	23.18m×16.88m×9.60m Semi-Anechoic Chamber	FRANKONIA	---	----	----
8	Turn table Diameter:1m	FRANKONIA	----	----	----
9	Turn table Diameter:5m	FRANKONIA	----	----	----
10	Antenna master FAC(MA4.0)	MATURO	----	----	----
11	Antenna master SAC(MA4.0)	MATURO	----	----	----
12	9.080m×5.255m×3.525m Shielding room	FRANKONIA	----	----	----
13	HF 907 Double-Ridged Waveguide Horn Antenna	R&S	100512	2020.08.20	2021.08.19
14	HF 907 Double-Ridged Waveguide Horn Antenna	R&S	100513	2020.08.20	2021.08.19
15	HL562 Ultra log antenna	R&S	100016	2020.08.20	2021.08.19
16	3160-09 Receive antenna	SCHWARZ-BECK	002058-002	2020.08.20	2021.08.19
17	ESI 40 EMI test receiver	R&S	100015	2020.08.20	2021.08.19
18	ESCS30 EMI test receiver	R&S	100029	2020.08.20	2021.08.19
19	HL562 Receive antenna	R&S	100167	2020.08.20	2021.08.19
20	ENV216 AMN	R&S	3560.6550.12	2020.08.20	2021.08.19



**APPENDIX A – TEST DATA OF CONDUCTED EMISSION**

Please refer to the attachment.

**APPENDIX B – TEST DATA OF RADIATED EMISSION**

Please refer to the attachment.