Certificate Number: 5055.02

# TEST REPORT FOR RF TESTING

Report No.: SRTC2020-9004(F)-20060301(C)

Product Name: LTE/WCDMA/GSM(GPRS) Multi-Mode
Digital Mobile Phone

Product Model: Z2335L

Applicant: ZTE Corporation.

Manufacturer: ZTE Corporation.

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

FCC ID: SRQ-Z2335L

The State Radio_monitoring_center Testing Center (SRTC)

15th Building, No.30, Shixing Street, Shijingshan District,

Beijing, P.R.China

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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) |
| Address: | 15th Building, No.30 Shixing Street, Shijingshan District, P.R.China |
| City: | Beijing |
| Country or Region: | P.R.China |
| Contacted person: | Liu Jia |
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| Email: | liujiaf@srtc.org.cn |

## 1.3 Applicant's details

| | |
|---|---|
| Company: | ZTE Corporation. |
| Address: | ZTE Plaza, Keji Road South,Hi-Tech, Industrial Park, Nanshan District,Shenzhen, Guangdong,P.R.China |
| City: | Shenzhen |
| Country or Region: | China |
| Contacted person: | Gong Yu |
| Tel: | 021-68895397 |
| Fax: | --- |
| Email: | gongyu@zte.com.cn |

## 1.4 Manufacturer's details

| | |
|---|---|
| Company: | ZTE Corporation. |
| Address: | ZTE Plaza, Keji Road South,Hi-Tech, Industrial Park, Nanshan District,Shenzhen, Guangdong,P.R.China |
| City: | Shenzhen |
| Country or Region: | China |
| Contacted person: | Gong Yu |
| Tel: | 021-68895397 |
| Fax: | --- |
| Email: | gongyu@zte.com.cn |

## 1.5 Test Environment

| | |
|---|---|
| Date of Receipt of test sample at SRTC: | 2020-06-03 |
| Testing Start Date: | 2020-06-03 |
| Testing End Date: | 2020-07-13 |

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

| | |
|---|---|
| Normal Supply Voltage (V d.c.): | 3.8 |
| Maximum Extreme Supply Voltage (V d.c.): | 4.2 |
| Minimum Extreme Supply Voltage (V d.c.): | 3.6 |

# 2 DESCRIPTION OF THE EQUIPMENT UNDER TEST

## 2.1 Final Equipment Build Status

| | |
|---|---|
| Frequency Range | LTE Band 2: Tx:1850~1910MHz Rx:1930~1990MHz<br>LTE Band 4: Tx:1710~1755MHz Rx:2110~2155MHz<br>LTE Band 5: Tx:824~849 MHz Rx:869 ~894MHz<br>LTE Band 7: Tx:2500~2570MHz Rx:2620~2690MHz<br>LTE Band 12: Tx:699~716MHz Rx:729~746MHz<br>LTE Band 13: Tx:777~787MHz Rx:746~756MHz<br>LTE Band 66: Tx:1710~1780MHz Rx: 2110~2200MHz |
| Modulation Type | QPSK/16QAM/64QAM |
| Antenna Type | Fixed Internal Antenna |
| Antenna Gain | LTE 2/4/7: 2.0dBi<br>LTE 5: -5.0dBi<br>LTE 12/13: -3.0dBi<br>LTE66: 1.2dBi |
| Power Supply | Battery/Charger |
| Hardware Version | Z2335LHW1.0 |
| Software Version | Z2335LV1.0.0B01 |
| IMEI | 862741040000016 |

## 2.2 Support Equipment

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

| | |
|---|---|
| Equipment | Battery |
| Manufacturer | Jiada Energy Technolog Co.,Ltd |
| Model Number | Li3816T43P4h604550 |
| Serial Number | --- |

| | |
|---|---|
| Equipment | Battery |
| Manufacturer | Shanghai BYD Company Ltd. |
| Model Number | Li3816T43P4h604550 |
| Serial Number | --- |

| | |
|---|---|
| Equipment | Charger |
| Manufacturer | Jiangxi Jian Aohai Technology Co.,Ltd |
| Model Number | STC-A51D-Z |
| Serial Number | --- |

| | |
|---|---|
| Equipment | Charger |
| Manufacturer | Shenzhen Ruijing Industrial Co.,Ltd |
| Model Number | STC-A51D-Z |
| Serial Number | --- |

| | |
|---|---|
| Equipment | USB |
| Manufacturer | Shenzhen YU hong xing Development of science and technology Co., Ltd. |
| Model Number | USB-MU5-W-100-M |
| Serial Number | --- |

| | |
|---|---|
| Equipment | USB |
| Manufacturer | King Power Electronics Co., Ltd |
| Model Number | USB-MU5-W-100-M |
| Serial Number | --- |

## 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 | 0.357 | 0.021 | 1M08G7D | 1.4M | 1.266 | QPSK |
| | 1850.7-1909.3 | 0.294 | 0.021 | 1M08D7W | 1.4M | 1.254 | 16QAM |
| | 1850.7-1909.3 | 0.286 | 0.021 | 1M08W7D | 1.4M | 1.266 | 64QAM |
| | 1851.5-1908.5 | 0.345 | -0.022 | 2M68G7D | 3M | 2.942 | QPSK |
| | 1851.5-1908.5 | 0.293 | -0.022 | 2M68D7W | 3M | 2.928 | 16QAM |
| | 1851.5-1908.5 | 0.263 | -0.022 | 2M68W7D | 3M | 2.933 | 64QAM |
| | 1852.5-1907.5 | 0.350 | 0.019 | 4M48G7D | 5M | 4.956 | QPSK |
| | 1852.5-1907.5 | 0.280 | 0.019 | 4M48D7W | 5M | 4.953 | 16QAM |
| | 1852.5-1907.5 | 0.289 | 0.019 | 4M48W7D | 5M | 4.946 | 64QAM |
| | 1855-1905 | 0.331 | 0.026 | 8M94G7D | 10M | 9.746 | QPSK |
| | 1855-1905 | 0.288 | 0.026 | 8M94D7W | 10M | 9.730 | 16QAM |
| | 1855-1905 | 0.264 | 0.026 | 8M94W7D | 10M | 9.742 | 64QAM |
| | 1857.5-1902.5 | 0.394 | -0.025 | 13M4G7D | 15M | 14.510 | QPSK |
| | 1857.5-1902.5 | 0.277 | -0.025 | 13M4D7W | 15M | 14.410 | 16QAM |
| | 1857.5-1902.5 | 0.258 | -0.025 | 13M4W7D | 15M | 14.390 | 64QAM |
| | 1860-1900 | 0.378 | 0.013 | 17M8G7D | 20M | 19.040 | QPSK |
| | 1860-1900 | 0.279 | 0.013 | 17M8D7W | 20M | 19.110 | 16QAM |
| | 1860-1900 | 0.295 | 0.013 | 17M8W7D | 20M | 19.100 | 64QAM |
| LTE BAND4 | | | | | | | |
| 27 | 1710.7-1754.3 | 0.338 | 0.028 | 1M08G7D | 1.4M | 1.273 | QPSK |
| | 1710.7-1754.3 | 0.252 | 0.028 | 1M08D7W | 1.4M | 1.271 | 16QAM |
| | 1710.7-1754.3 | 0.296 | 0.028 | 1M08W7D | 1.4M | 1.266 | 64QAM |
| | 1711.5-1753.5 | 0.353 | -0.022 | 2M68G7D | 3M | 2.936 | QPSK |
| | 1711.5-1753.5 | 0.270 | -0.022 | 2M68D7W | 3M | 2.945 | 16QAM |
| | 1711.5-1753.5 | 0.279 | -0.022 | 2M68W7D | 3M | 2.943 | 64QAM |
| | 1712.5-1752.5 | 0.355 | -0.016 | 4M48G7D | 5M | 4.983 | QPSK |
| | 1712.5-1752.5 | 0.299 | -0.016 | 4M48D7W | 5M | 4.954 | 16QAM |
| | 1712.5-1752.5 | 0.233 | -0.016 | 4M48W7D | 5M | 4.973 | 64QAM |
| | 1715-1750 | 0.356 | 0.020 | 8M94G7D | 10M | 9.742 | QPSK |
| | 1715-1750 | 0.287 | 0.020 | 8M95D7W | 10M | 9.731 | 16QAM |
| | 1715-1750 | 0.304 | 0.020 | 8M94W7D | 10M | 9.770 | 64QAM |
| | 1717.5-1747.5 | 0.421 | -0.012 | 13M4G7D | 15M | 14.490 | QPSK |
| | 1717.5-1747.5 | 0.294 | -0.012 | 13M4D7W | 15M | 14.440 | 16QAM |
| | 1717.5-1747.5 | 0.278 | -0.012 | 13M4W7D | 15M | 14.390 | 64QAM |
| | 1720-1745 | 0.337 | 0.019 | 17M8G7D | 20M | 19.210 | QPSK |
| | 1720-1745 | 0.296 | 0.019 | 17M8D7W | 20M | 19.060 | 16QAM |
| | 1720-1745 | 0.303 | 0.019 | 17M8W7D | 20M | 19.190 | 64QAM |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LTE BAND5 | | | | | | | |
| 22H | 824.7-848.3 | 0.067 | 0.018 | 1M08G7D | 1.4M | 1.320 | QPSK |
| | 824.7-848.3 | 0.049 | 0.018 | 1M08D7W | 1.4M | 1.318 | 16QAM |
| | 824.7-848.3 | 0.049 | 0.018 | 1M08W7D | 1.4M | 1.312 | 64QAM |
| | 825.5-847.5 | 0.070 | -0.026 | 2M69G7D | 3M | 2.974 | QPSK |
| | 825.5-847.5 | 0.055 | -0.026 | 2M70D7W | 3M | 2.944 | 16QAM |
| | 825.5-847.5 | 0.051 | -0.026 | 2M69W7D | 3M | 2.953 | 64QAM |
| | 826.5-846.5 | 0.072 | 0.033 | 4M49G7D | 5M | 4.987 | QPSK |
| | 826.5-846.5 | 0.050 | 0.033 | 4M48D7W | 5M | 4.980 | 16QAM |
| | 826.5-846.5 | 0.049 | 0.033 | 4M49W7D | 5M | 4.982 | 64QAM |
| | 829-844 | 0.073 | 0.023 | 8M94G7D | 10M | 9.757 | QPSK |
| | 829-844 | 0.050 | 0.023 | 8M94D7W | 10M | 9.661 | 16QAM |
| | 829-844 | 0.047 | 0.023 | 8M94W7D | 10M | 9.735 | 64QAM |
| LTE BAND7 | | | | | | | |
| 27 | 2502.5-2567.5 | 0.397 | -0.029 | 4M48G7D | 5M | 4.946 | QPSK |
| | 2502.5-2567.5 | 0.263 | -0.029 | 4M47D7W | 5M | 4.930 | 16QAM |
| | 2502.5-2567.5 | 0.290 | -0.029 | 4M47W7D | 5M | 4.928 | 64QAM |
| | 2505-2565 | 0.403 | -0.019 | 8M94G7D | 10M | 9718 | QPSK |
| | 2505-2565 | 0.264 | -0.019 | 8M94D7W | 10M | 9.677 | 16QAM |
| | 2505-2565 | 0.281 | -0.019 | 8M94W7D | 10M | 9.665 | 64QAM |
| | 2507.5-2562.5 | 0.379 | 0.023 | 13M4G7D | 15M | 14.420 | QPSK |
| | 2507.5-2562.5 | 0.301 | 0.023 | 13M4D7W | 15M | 14.440 | 16QAM |
| | 2507.5-2562.5 | 0.317 | 0.023 | 13M4W7D | 15M | 14360 | 64QAM |
| | 2510-2560 | 0.395 | 0.018 | 17M9G7D | 20M | 19.140 | QPSK |
| | 2510-2560 | 0.282 | 0.018 | 17M9D7W | 20M | 19.130 | 16QAM |
| | 2510-2560 | 0.308 | 0.018 | 17M8W7D | 20M | 19.080 | 64QAM |
| LTE BAND12 | | | | | | | |
| 27 | 699.7-715.3 | 0.115 | 0.029 | 1M08G7D | 1.4M | 1.312 | QPSK |
| | 699.7-715.3 | 0.089 | 0.029 | 1M08D7W | 1.4M | 1.289 | 16QAM |
| | 699.7-715.3 | 0.084 | 0.029 | 1M08W7D | 1.4M | 1.292 | 64QAM |
| | 700.5-714.5 | 0.112 | -0.023 | 2M69G7D | 3M | 2.967 | QPSK |
| | 700.5-714.5 | 0.086 | -0.023 | 2M69D7W | 3M | 2.940 | 16QAM |
| | 700.5-714.5 | 0.091 | -0.023 | 2M69W7D | 3M | 2.967 | 64QAM |
| | 701.5-713.5 | 0.108 | 0.015 | 4M49G7D | 5M | 4.929 | QPSK |
| | 701.5-713.5 | 0.086 | 0.015 | 4M49D7W | 5M | 4.903 | 16QAM |
| | 701.5-713.5 | 0.097 | 0.015 | 4M48W7D | 5M | 4.903 | 64QAM |
| | 704-711 | 0.120 | 0.024 | 8M95G7D | 10M | 9.746 | QPSK |
| | 704-711 | 0.079 | 0.024 | 8M96D7W | 10M | 9.706 | 16QAM |
| | 704-711 | 0.085 | 0.024 | 8M94W7D | 10M | 9.695 | 64QAM |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LTE BAND13 | | | | | | | |
| 27 | 779.5-784.5 | 0.164 | 0.012 | 4M48G7D | 5M | 4.951 | QPSK |
| | 779.5-784.5 | 0.160 | 0.012 | 4M48D7W | 5M | 4.939 | 16QAM |
| | 779.5-784.5 | 0.103 | 0.012 | 4M48W7D | 5M | 4.920 | 64QAM |
| | 782 | 0.119 | 0.025 | 8M93G7D | 10M | 9.640 | QPSK |
| | 782 | 0.115 | 0.025 | 8M91D7W | 10M | 9.582 | 16QAM |
| | 782 | 0.151 | 0.025 | 8M92W7D | 10M | 9.566 | 64QAM |
| LTE BAND66 | | | | | | | |
| 27 | 1710.7-1779.3 | 0.320 | 0.031 | 1M08G7D | 1.4M | 1.248 | QPSK |
| | 1710.7-1779.3 | 0.284 | 0.031 | 1M08D7W | 1.4M | 1.244 | 16QAM |
| | 1710.7-1779.3 | 0.279 | 0.031 | 1M08W7D | 1.4M | 1.242 | 64QAM |
| | 1711.5-1778.5 | 0.310 | -0.018 | 2M68G7D | 3M | 2.933 | QPSK |
| | 1711.5-1778.5 | 0.307 | -0.018 | 2M68D7W | 3M | 2.932 | 16QAM |
| | 1711.5-1778.5 | 0.249 | -0.018 | 2M68W7D | 3M | 2.941 | 64QAM |
| | 1712.5-1777.5 | 0.366 | 0.027 | 4M48G7D | 5M | 4.950 | QPSK |
| | 1712.5-1777.5 | 0.231 | 0.027 | 4M48D7W | 5M | 4.953 | 16QAM |
| | 1712.5-1777.5 | 0.300 | 0.027 | 4M47W7D | 5M | 4.920 | 64QAM |
| | 1715-1775 | 0.319 | -0.022 | 8M94G7D | 10M | 9.697 | QPSK |
| | 1715-1775 | 0.331 | -0.022 | 8M93D7W | 10M | 9.702 | 16QAM |
| | 1715-1775 | 0.260 | -0.022 | 8M95W7D | 10M | 9.641 | 64QAM |
| | 1717.5-1772.5 | 0.306 | -0.016 | 13M4G7D | 15M | 14.380 | QPSK |
| | 1717.5-1772.5 | 0.272 | -0.016 | 13M4D7W | 15M | 14.410 | 16QAM |
| | 1717.5-1772.5 | 0.247 | -0.016 | 13M4W7D | 15M | 14.350 | 64QAM |
| | 1720-1770 | 0.403 | 0.026 | 17M8G7D | 20M | 19.110 | QPSK |
| | 1720-1770 | 0.349 | 0.026 | 17M9D7W | 20M | 19.020 | 16QAM |
| | 1720-1770 | 0.316 | 0.026 | 17M8D7W | 20M | 19.030 | 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:<br>Mr. Peng Zhen | Checked by:<br>Mr. Li Bin |
| Tested by:<br>Mr. Tong Daocheng | Issued date:<br>20200714 |

# 6 TEST RESULT

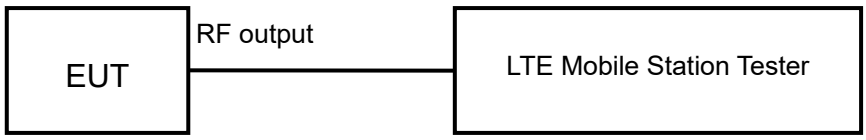
## 6.1 RF Power Output

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.

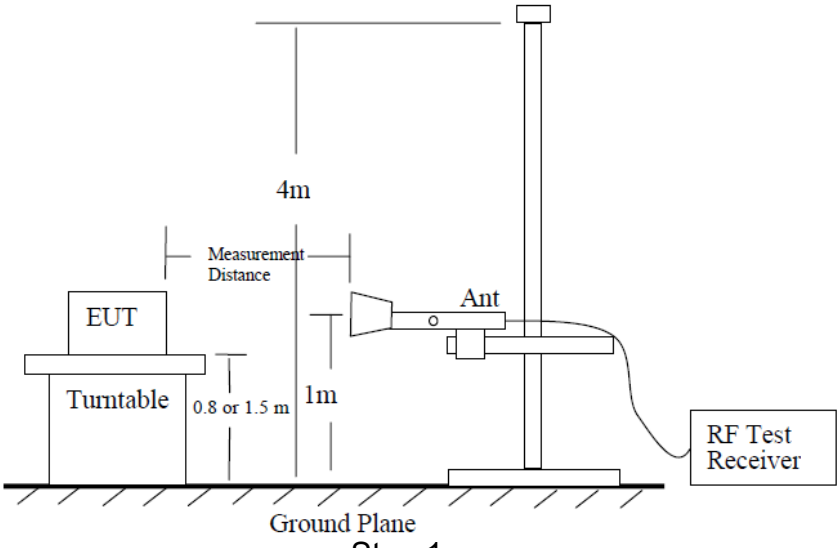
## 6.2 Effective Radiated Power and Effective Isotropic Radiated Power

Rule Part(s)
FCC: 22.913(a) (5), 24.232(c), 27.50(b) (10), 27.50(c) (10), 27.50(h) (2), 27.50(d) (4), 27.50(a) (3)

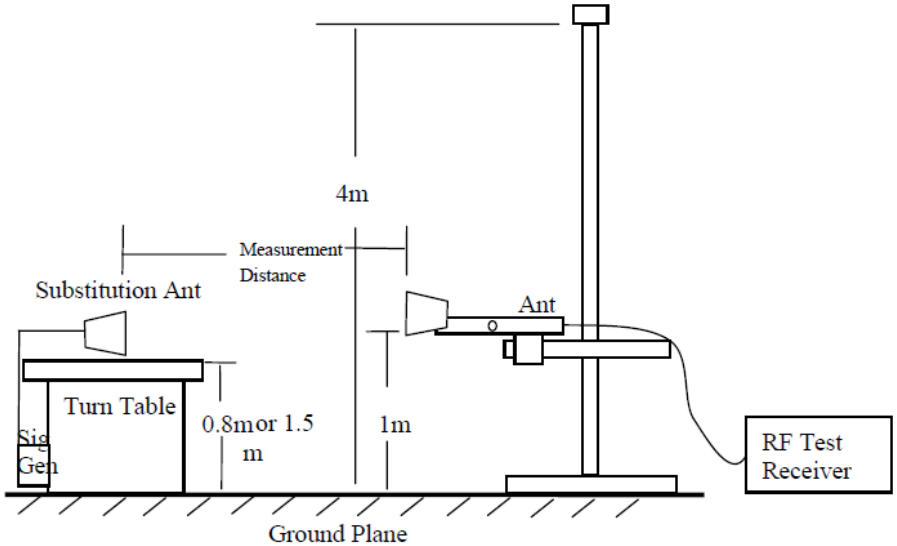
Ambient condition:

| Temperature | Relative humidity | Pressure |
|---|---|---|
| 25°C | 30% | 101.9kPa |

Test setup:




Step 1




Step 2

Test procedure:
The measurements procedures in TIA-603-E-2016 are used.
Step 1:
The measurement is carried out in the chamber. EUT was placed on a 0.8m (f<1GHz)/ 1.5m (f>1GHz) 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 100KHz(f<1GHz)/1MHz (f>1GHz). 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. And the maximum value of the receiver should be recorded as (Pr).
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. To repeat the same procedure as step1 and the level of signal generator will be adjusted till the same power value on the spectrum analyzer or receiver. The ERP/EIRP of the EUT can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna.
A power (Pmea) 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 (Pr). The power of signal source (Pmea) 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 (Pca) and the Substitution Antenna Gain (Ga).
The measurement results are obtained as described below:
Power (EIRP) = Pmea+ Pca+ Ga

**ERP/EIRP LIMIT**

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, ERP = EIRP – 2.15 (dB).
22.913(a) (5)
The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 watts.
24.232(c)
Mobile and portable stations are limited to 2 watts EIRP and the equipment must employ a means for limiting power to the minimum necessary for successful communications.
27.50(b) (10)
Portable stations (hand-held devices) transmitting in the 746-757 MHz, 776-788 MHz, and 805-806 MHz bands are limited to 3 watts ERP.
27.50(c) (10)
Portable stations (hand-held devices) in the 600 MHz uplink band and the 698-746 MHz band, and fixed and mobile stations in the 600 MHz uplink band are limited to 3 watts ERP.
27.50(h) (2)
Mobile and other user stations.Mobile stations are limited to 2.0 watts EIRP. All user stations are limited to 2.0 watts transmitter output power.

27.50(d) (4)
Fixed, mobile, and portable (hand-held) stations operating in the 1710-1755 MHz band and mobile and portable stations operating in the 1695-1710 MHz and 1755-1780 MHz bands are limited to 1 watt EIRP. Fixed stations operating in the 1710-1755 MHz band are limited to a maximum antenna height of 10 meters above ground. Mobile and portable stations operating in these bands must employ a means for limiting power to the minimum necessary for successful communications.
27.50(a) (3)
Mobile and portable stations (i) For mobile and portable stations transmitting in the 2305-2315 MHz band or the 2350-2360 MHz band, the average EIRP must not exceed 50 milliwatts within any 1 megahertz of authorized bandwidth, except that for mobile and portable stations compliant with 3GPP LTE standards or another advanced mobile broadband protocol that avoids concentrating energy at the edge of the operating band the average EIRP must not exceed 250 milliwatts within any 5 megahertz of authorized bandwidth but may exceed 50 milliwatts within any 1 megahertz of authorized bandwidth.

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

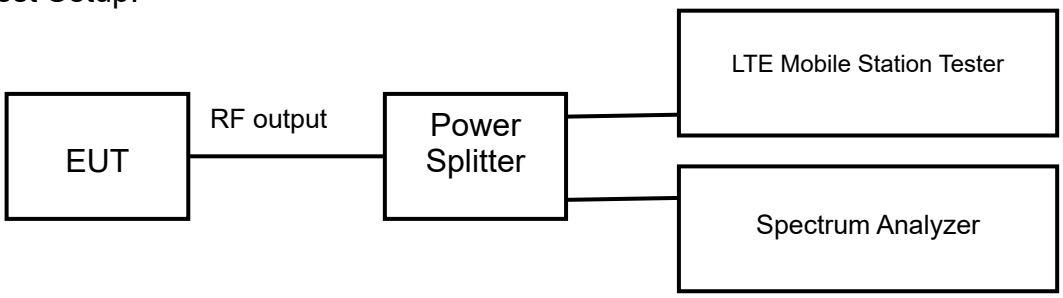
## 6.3 Occupied Bandwidth

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 ≥ 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 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.

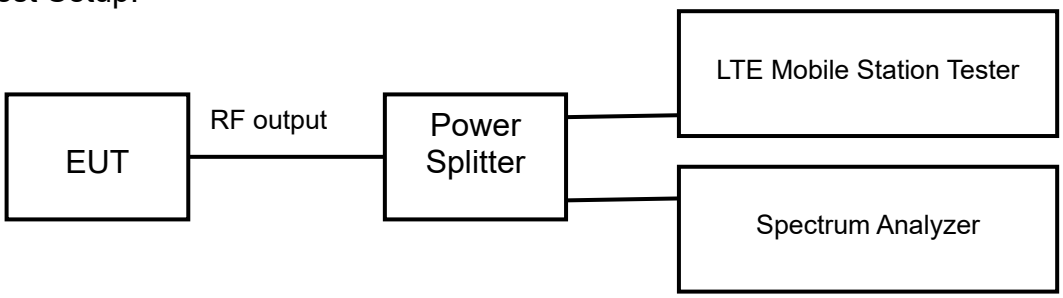
## 6.4 Emission Bandwidth

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 ≥ 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.

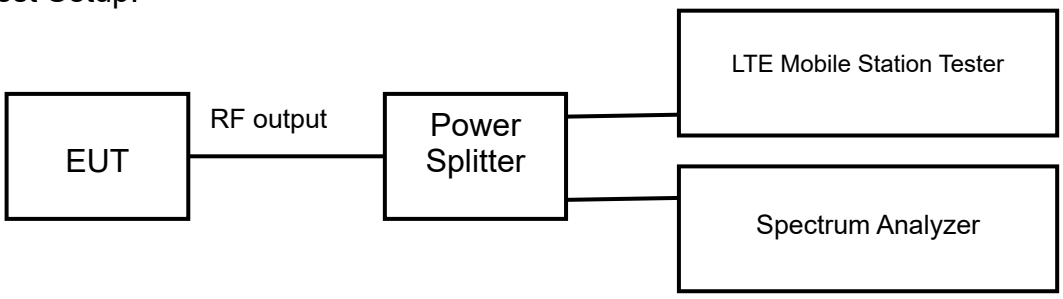
## 6.5 Peak-Average Ratio

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.

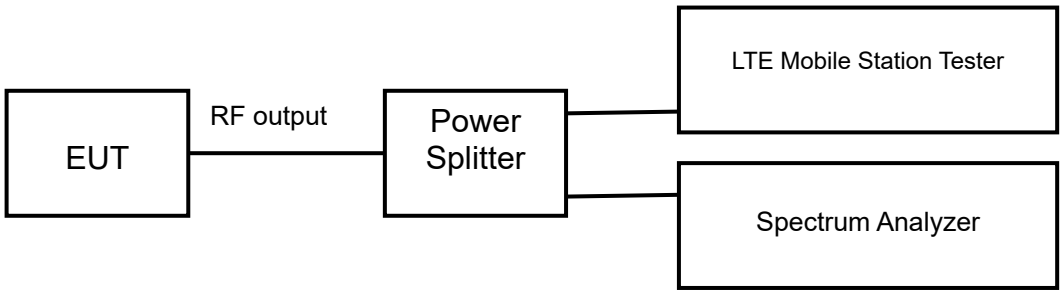
## 6.6 Spurious Emissions at antenna terminal

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 + log10 (P [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 + log10 (P [Watts]).
For Band 7 and 41, the minimum permissible attenuation level of any spurious emission is 55 + log10 (P [Watts]).

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

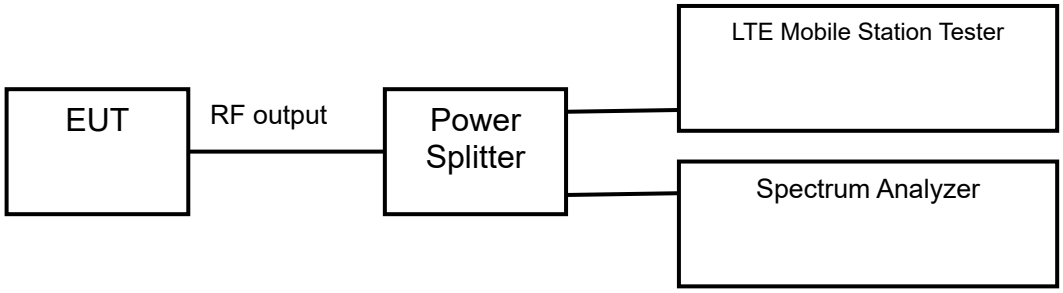
## 6.7 Band Edges Compliance

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 ≥ 2 x 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 + log10 (P [Watts]), where P is the transmitter power in Watts.
The minimum permissible attenuation level for Band 30 is > 43 + 10log10 (P [Watts] at 2300-2305MHz & 2345-2360MHz, > 55 + 10log10 (P [Watts]) at 2320-2324MHz & 2341-2345MHz, > 61 + 10log10 (P [Watts]) at 2324-2328MHz & 2337-2341MHz, > 67 + 10log10 (P [Watts]) at 2288-2292MHz & 2328- 2337MHz, and > 70 + 10log10 (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 + 10log10(P) = -35dBm 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.

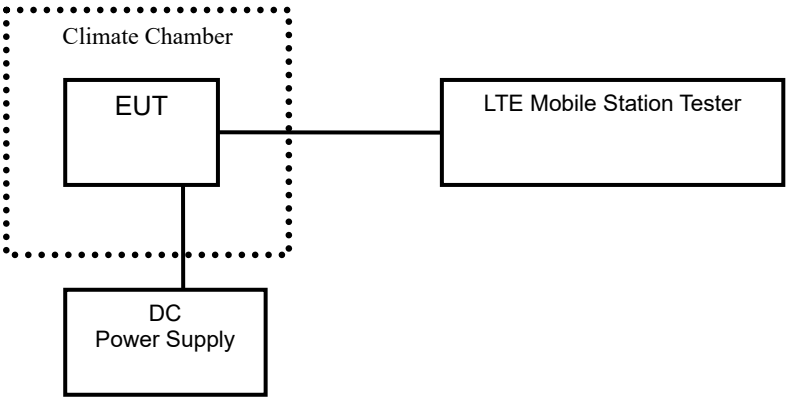
## 6.8 Frequency Stability

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 ±0.00025% (±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.

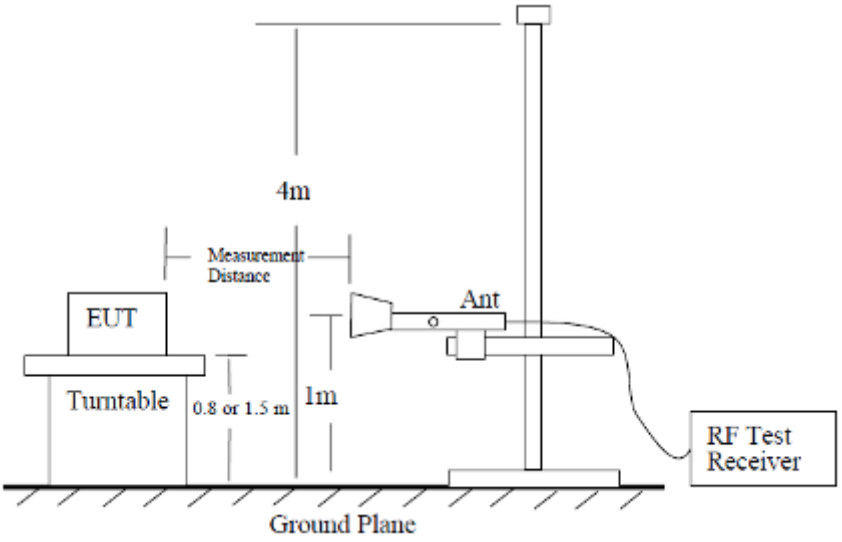
## 6.9 Radiated Spurious Emissions

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)

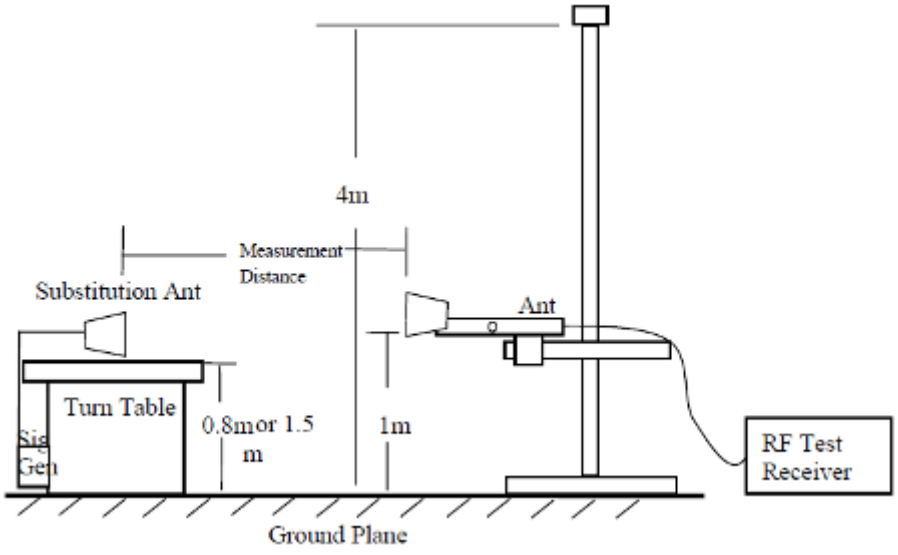
Ambient condition:

| Temperature | Relative humidity | Pressure |
|---|---|---|
| 25°C | 30% | 101.9kPa |

Test Setup:




Step 1




Step 2

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<1GHz)/ 1.5m (f>1GHz) 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<1GHz)/1MHz (f>1GHz). 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 (Pmea) 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 (Pr). The power of signal source (Pmea) 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 (Pca) and the Substitution Antenna Gain (Ga).
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:
Power (EIRP) = Pmea+ Pca + Ga
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, ERP = EIRP – 2.15 (dB).
Assumed the power of signal source record is -20dBm. A cable loss of -30dB, and an antenna gain of 11dB are added.
P=Pmea+Pca+Ga=(-20dBm)+(-30dB)+(11dB)= -39dBm

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 | 2019.08.20 | 2020.08.19 |
| 2 | FSV40 Spectrum Analyzer | R&S | 101065 | 2019.08.20 | 2020.08.19 |
| 2 | N9020A Spectrum Analyzer | Agilent | MY48010771 | 2019.08.20 | 2020.08.19 |
| 3 | 6007 Power Divider | Weinschel | 6007-GJ-1 | 2019.08.20 | 2020.08.19 |
| 4 | DC Power Supply E3645A | Agilent | MY40000741 | 2020.03.01 | 2021.02.28 |
| 5 | Temperature chamber SH241 | ESPEC | 92013758 | 2019.08.20 | 2020.08.19 |
| 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 | 2019.08.20 | 2020.08.19 |
| 14 | HF 907 Double-Ridged Waveguide Horn Antenna | R&S | 100513 | 2019.08.20 | 2020.08.19 |
| 15 | HL562 Ultra log antenna | R&S | 100016 | 2019.08.20 | 2020.08.19 |
| 16 | 3160-09 Receive antenna | SCHWARZ-BECK | 002058-002 | 2019.08.20 | 2020.08.19 |
| 17 | ESI 40 EMI test receiver | R&S | 100015 | 2019.08.20 | 2020.08.19 |
| 18 | ESCS30 EMI test receiver | R&S | 100029 | 2019.08.20 | 2020.08.19 |
| 19 | HL562 Receive antenna | R&S | 100167 | 2019.08.20 | 2020.08.19 |
| 20 | ENV216 AMN | R&S | 3560.6550.12 | 2019.08.20 | 2020.08.19 |

# APPENDIX A – TEST DATA OF CONDUCTED EMISSION

Please refer to the attachment.

# APPENDIX B – TEST DATA OF RADIATED EMISSION

Please refer to the attachment.