TEST REPORT FOR LTE TESTING

Report No.: SRTC2024-9004(F)- 24101203(C)

Product Name: Cellular Router

Product Model: CR202-NAC6-WLAN

Series Model: CR202-NAC6-WLAN

Brand Name:inhand

Applicant: Beijing InHand Networks Technology Co., Ltd.

Manufacturer: Beijing InHand Networks Technology Co., Ltd.

Specification: FCC Part 2, Part 24E, Part 22H, Part 27, Part 90S,

Part 96, Part 96.47(2023)

FCC ID：2AANY- CR202LITE

The State Radio_monitoring_center Testing Center (SRTC)

15th Building, No.30Shixing Street, Shijingshan District, Beijing, P.R.China

Tel: 86-10-57996183 Fax: 86-10-57996388

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1. GENERAL INFORMATION

1.1 Notes of the test report

The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written permission of The State Radio_monitoring_center Testing Center (SRTC).The test results relate only to individual items of the samples which have been tested. The certification and accreditation identifiers used in this report shall not be applicable to the tested or calibrated samples thereof. The manufacturer shall not mark the tested samples or items (or a separate part of the item) with the identifiers of certification and accreditation to mislead relevant parties about the tested samples or items.

1.2 Information about the testing laboratory

Company:	The State Radio_monitoring_center Testing Center (SRTC)
Test Site 1:	15th Building, No.30 Shixing Street, Shijingshan District
Test Site 2:	No.80, Zhaojiachang, Beizang, Daxing District
City:	Beijing
Country or Region:	P.R.China
Contacted person:	Liu Jia
Tel:	+86 10 57996183
Fax:	+86 10 57996388
Email:	liujiaf@srtc.org.cn
Designation Number:	CN1267
Registration number:	239125

1.3 Applicant’s details

Company:	Beijing InHand Networks Technology Co., Ltd.
Address:	Room 501, floor 5, building 3, yard 18, ziyue road, chaoyang district, Beijing
City:	Beijing
Country or Region:	China
Contacted person:	GuJichi
Tel:	15281366255
Email:	gujc@inhand.com.cn

1.4 Manufacturer’s details

Company:	Beijing InHand Networks Technology Co., Ltd.
Address:	Room 501, floor 5, building 3, yard 18, ziyue road, chaoyang district, Beijing
City:	Beijing
Country or Region:	China
Contacted person:	GuJichi
Tel:	15281366255
Email:	gujc@inhand.com.cn

1.5 Test Environment

Date of Receipt of test sample at SRTC:	2024/10/12
Testing Start Date:	2024/10/13
Testing End Date:	2024/10/22

Environmental Data:	Temperature (°C)	Humidity (%)
Ambient	25	40
Maximum Extreme	75	---
Minimum Extreme	-25	---

Normal Supply Voltage (V d.c.):	5
Maximum Extreme Supply Voltage (V d.c.):	5.5
Minimum Extreme Supply Voltage (V d.c.):	4.5

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: 824~849MHz Rx: 869~894MHz LTE Band 7: Tx: 2500~2570MHz Rx: 2620~2690MHz LTE Band 12: Tx:699~716MHz Rx: 729~746MHz LTE Band 13: Tx: 777~787MHz Rx: 746~756MHz LTE Band 14: Tx: 788 ~798 MHz Rx: 758 ~768 MHz LTE Band 25: Tx: 1850 ~ 1915 MHz Rx: 1930 ~ 1995 MHz LTE Band 26: Tx: 814~849MHz Rx: 859~894MHz LTE Band 30: Tx: 2305 ~ 2315 MHz Rx: 2350 ~ 2360 MHz LTE Band 41: Tx: 2496~2690MHz Rx: 2496~2690MHz LTE Band 48: Tx:3550~3700MHz Rx:3550~3700MHz LTE Band 66: Tx: 1710~1780MHz Rx: 2110~2200MHz LTE Band 71: Tx: 663 ~698 MHz Rx: 617 ~652 MHz
Modulation Type(Uplink):	QPSK/16QAM
Antenna Type:	Sucker antenna
Antenna Gain:	LTE B2: 3.5dBi(MAX) LTE B4:2.6dBi(MAX) LTE B5:-0.8dBi(MAX) LTE B7:3.0dBi(MAX) LTE B12:-0.8dBi(MAX) LTE B13:-0.8dBi(MAX) LTE B14:-0.8dBi(MAX) LTE B25:3.5dBi(MAX) LTE B26:-0.8dBi(MAX) LTE B30:0.82dBi(MAX) LTE B41:3.0dBi(MAX) LTE B48:0.25dBi(MAX) LTE B66:2.6dBi(MAX) LTE B71:-0.8dBi(MAX) ERP = EIRP(Power+Gain) – 2.15 (dB)
Power Supply:	DC supply
Software Revision:	V1.0
Hardware Revision:	V1.0
SN:	CR20224378IA7TE

Test Model No.: CR202-NAC6-WLAN
Series Model：CR212-NAC6-WLAN, CR252-NAC6-WLAN, CR292-NAC6-WLAN

These models are the same in these: appearance, PCB layout and basic software function; The only difference is that the products are used in different markets.

2.2 Support Equipment

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

Note：This product uses the module model EG060K-NA and supports LTE frequency bands 2/4/5/7/12/13/14/25/26/30/41/48/66/71. Therefore, for this product, we referred to the EG060K-NA test report and evaluated the frequency spectrum of the radiated spurious emissions.
For module EM060K-NA: Report No.: SEWA2208000035RG01
FCC ID：XMR2022EG060KNA

3. REFERENCE SPECIFICATION

Specification	Version	Title
FCC Part 2	2023	Frequency allocations and radio treaty matters; general rules and regulations
FCC Part 22	2023	Public mobile services
FCC Part 24	2023	Personal communications services
FCC Part 27	2023	Miscellaneous wireless communications services
FCC Part 90	2023	Private Land Mobile Radio Services
FCC Part 96	2023	Citizens Broadband Radio Service
FCC Part 96.47	2023	End user device additional requirements
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	Test Site
1	RF Power Output	2.1046	Pass	1
2	Effective Radiated Power and Effective Isotropic Radiated Power	96.41(b)	Pass	1
3	Occupied Bandwidth	2.1049	Pass	1
4	Peak-Average Ratio	96.41(g)	Pass	1
5	Emission Bandwidth	2.1049	Pass	1
6	Spurious Emissions at antenna terminals	2.1051, 96.41(e)	Pass	1
7	Band Edges Compliance	2.1051, 96.41(e)	Pass	1
8	Frequency Stability	2.1055	Pass	1
9	End user device additional requirements	WINNF-18-IN-00178	Pass	1

Test Site 1: 15th Building, No.30 Shixing Street, Shijingshan District

This Test Report Is Approved by: Mr. Peng Zhen	Review by: Mr. Li Bin
Tested and Issued by: Mr. Liang Xisheng	Approved date: 20241022

No.	Test case	FCC reference	Verdict	Test Site
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) , 90.691(a)	Pass	2

Test Site 2: No.80, Zhaojiachang, Beizang, Daxing District

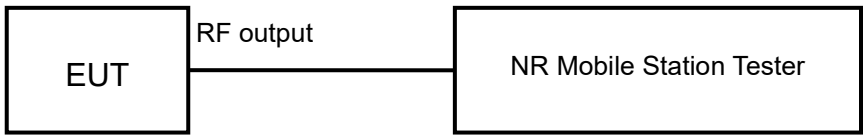
This Test Report Is Approved by: Mr. Liu Wei	Review by: Mr. Guo Yu
Tested and Issued by: Mr. Dong Qifeng	Approved date: 20241022

6.TEST RESULT

6.1 RF Power Output

Rule Part(s)
FCC: 2.1046

Test Setup:



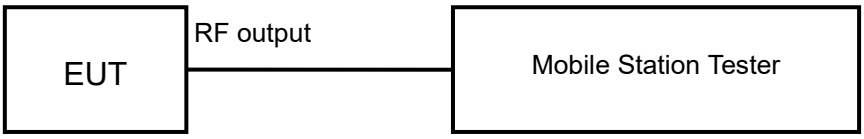
Test procedure:
After a radio link has been established between EUT and Tester, the output power of the cell signal of the testing equipment will be decreased until the output power of the EUT reach a maximum value. Then the test data can be read at the tester screen. The loss between RF output port 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: 96.41(b)
Test setup:



Test procedure:
KDB 971168 D01 v03r01 – Section 5.6
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:
ERP/EIRP = PMeas – LC + GT
Where:
ERP/EIRP = effective or equivalen 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)
ERP/EIRP LIMIT
The maximum effective isotropic radiated power (EIRP) and maximum Power Spectral Density (PSD) of any CBSD and End User Device must comply with the limits shown in the table in this paragraph (b):

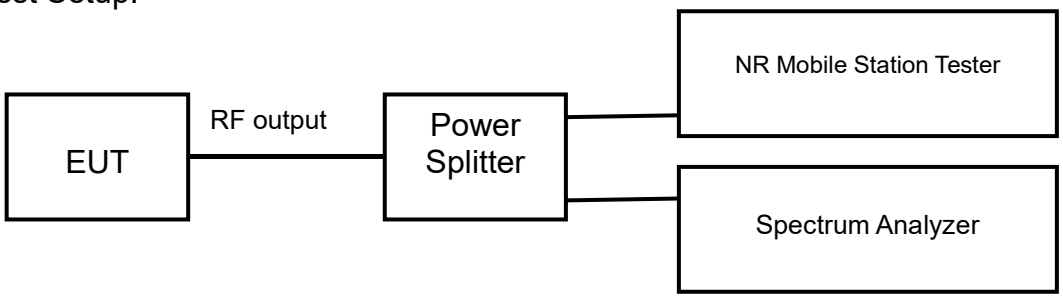
Device Maximum	EIRP(dBm/10megahertz)	Maximum PSD(dBm/MHz)
End User Device	23	n/a
Category A CBSD	30	20
Category B CBSD	47	37

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

6.3 Occupied Bandwidth

Rule Part(s)
FCC: 2.1049

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

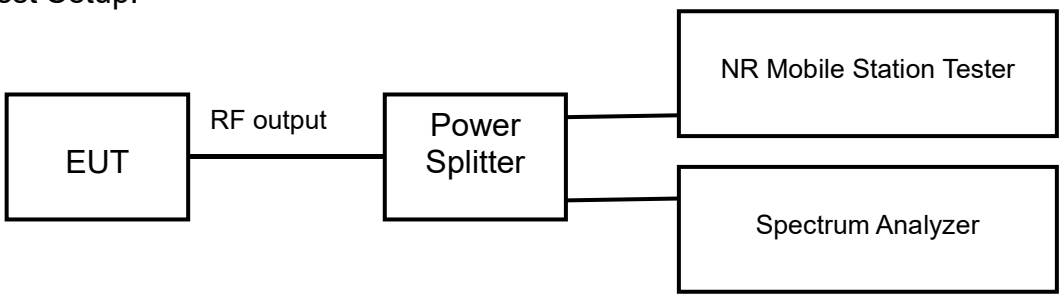
Limits: No specific occupied bandwidth requirements in part 2.1049

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

6.4 Emission Bandwidth

Rule Part(s)
FCC: 2.1049

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

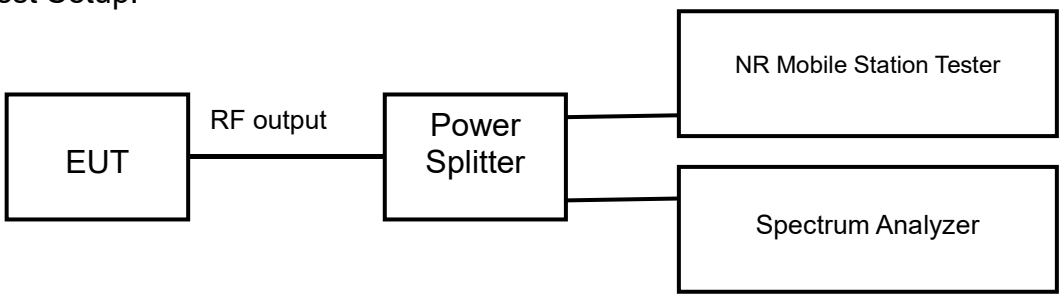
Limits: No specific emission bandwidth requirements in part 2.1049.

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

6.5 Peak-Average Ratio

Rule Part(s)
FCC: 96.41(g)

Test Setup:



Test procedure:
KDB 971168 D01 v03r01 – Section 5.7.1

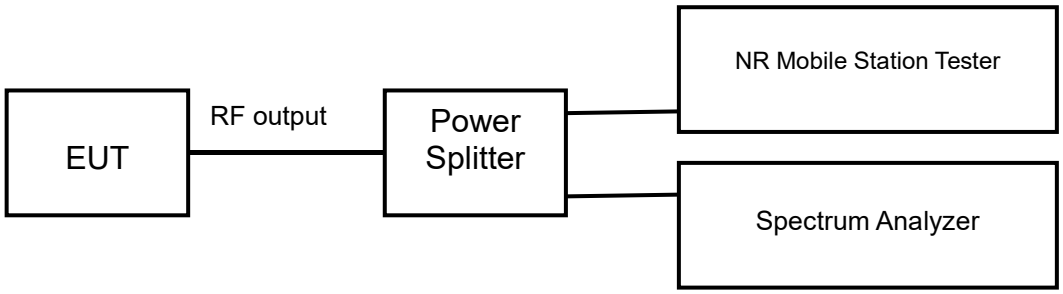
Test Setting:
1. The signal analyzer's CCDF measurement profile is enabled
2. Frequency = carrier center frequency
3. Measurement BW ≥ OBW or specified reference bandwidth
4. The signal analyzer was set to collect one million samples to generate the CCDF curve
5. The measurement interval was set depending 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
96.41(g)
The peak-to-average power ratio (PAPR) of any CBSD transmitter output power must 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, 96.41(e)
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
for channel and frequency assignments made by a CBSD to End User Devices, the conducted power of any End User Device emission outside the fundamental emission shall not exceed −13 dBm/MHz within 0 to B megahertz above the upper CBSD-assigned channel edge and within 0 to B megahertz below the lower CBSD-assigned channel edge. At all frequencies greater than B megahertz above the upper CBSD assigned channel edge and less than B megahertz below the lower CBSD-assigned channel edge, the conducted power of any End User Device emission shall not exceed −25 dBm/MHz. the Adjacent Channel Leakage Ratio for End User Devices shall be at least 30 dB.

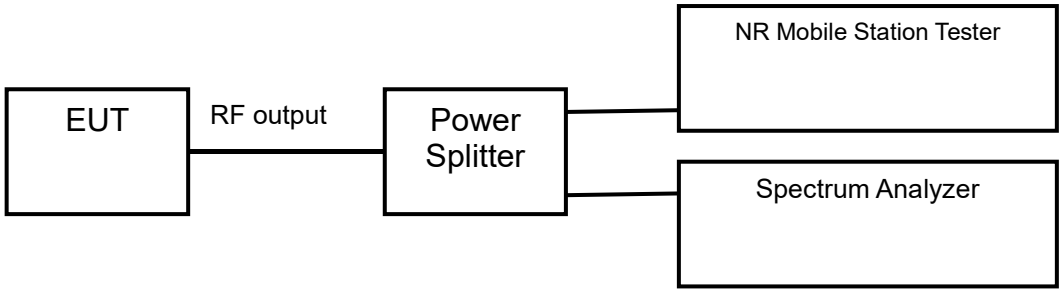
for CBSDs and End User Devices, the conducted power of emissions below 3540 MHz or above 3710 MHz shall not exceed −25 dBm/MHz, and the conducted power of emissions below 3530 MHz or above 3720 MHz shall not exceed −40dBm/MHz.

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

6.7 Band Edges Compliance

Rule Part(s)
FCC: 2.1051, 96.41(e)

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

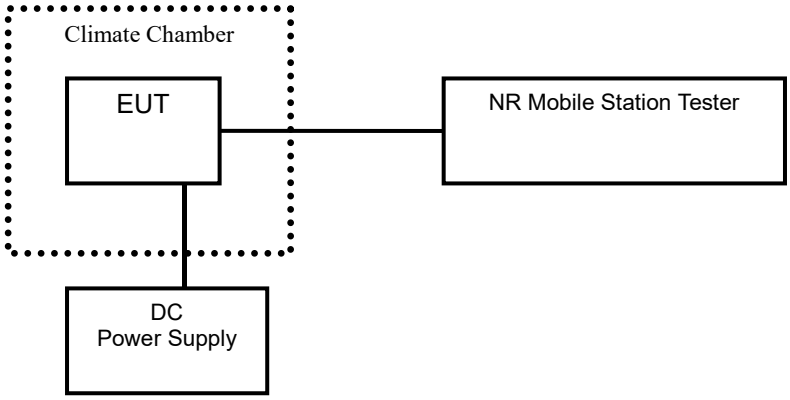
Limits
for channel and frequency assignments made by a CBSD to End User Devices, the conducted power of any End User Device emission outside the fundamental emission shall not exceed −13 dBm/MHz within 0 to B megahertz above the upper CBSD-assigned channel edge and within 0 to B megahertz below the lower CBSD-assigned channel edge. At all frequencies greater than B megahertz above the upper CBSD assigned channel edge and less than B megahertz below the lower CBSD-assigned channel edge, the conducted power of any End User Device emission shall not exceed −25 dBm/MHz. the Adjacent Channel Leakage Ratio for End User Devices shall be at least 30 dB.

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

6.8 Frequency Stability

Rule Part(s)
FCC: 2.1055

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.

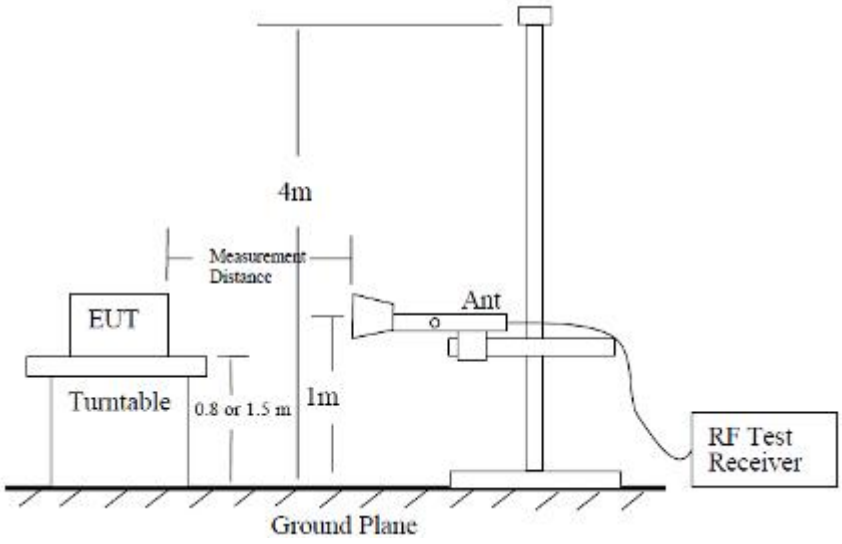
Limits: For Part 24, Part 27, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

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

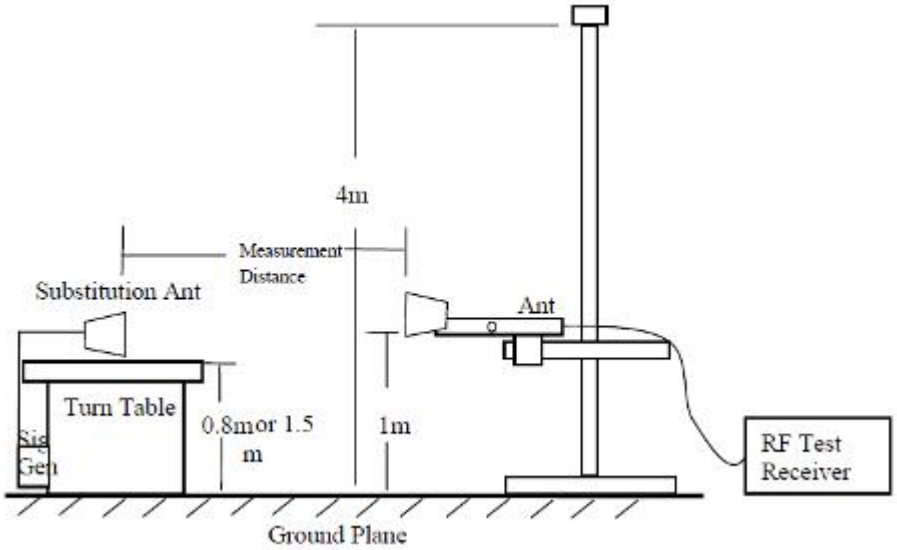
6.9 Radiated Spurious Emissions

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)

Test Setup:



Step 1



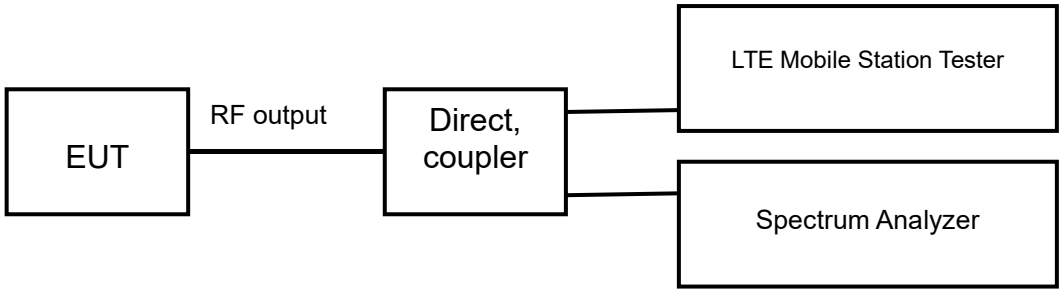
Step 2

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
Note: We tested both horizontal and vertical polarization, but only the largest numerical polarity of the two polarities was recorded in the final report.

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

6.10 End user device additional requirements

Rule Part(s)
Part96.47
Test Setup:



Test Procedure:
WINNF-18-IN-00178

Test Setting:
1. Setup with frequency and power level 20dBm/MHz
2. Enable AP service from Ruckus Cloud managementCheck
3. Check EUD Tx Frequency and power
4. Disable AP service from Ruckus Cloud management
5. Check EUD stops transmission within 10seconds.
6. Setup with frequency and power level 8dBm/MHz
7. Enable AP service from Ruckus Cloud management
8. Check EUD Tx Frequency and power
9. Disable AP service from Ruckus Cloud management
10. Check EUD stops transmission within 10seconds.

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

7. MEASUREMENT UNCERTAINTIES

Items	Uncertainty	
RF Power Output	0.6 dB	
Effective Radiated Power and Effective Isotropic Radiated Power	0.6 dB	
Occupied Bandwidth	3kHz	
Emission Bandwidth	3kHz	
Peak-Average Ratio	0.8dB	
Frequency Stability	48Hz	
Band Edges Compliance	1.2dB	
Spurious Emissions at antenna terminal	9kHz~2GHz	1.2dB
	2G~3.6GHz	1.4dB
	3.6G~8GHz	2.2dB
	8G~12.75GHz	2.7dB
Radiated Emission Measurement	30MHz～200MHz	4.88dB
	200MHz～1GHz	4.87dB
	1GHz～18GHz	4.58dB
	18GHz~40GHz	4.35dB

Note 1: According to the test specification limit (The test results fully compliance with the test standard limit requirements)

Note 2: According to test specification limits plus uncertainties (The test results exceed the standard limit requirements and meet the standard requirements after adding the system uncertainty)

Note 3: Test operation mode is Note 1

8. TEST EQUIPMENTS

No.	Name/Model	Manufacturer	S/N	Calibration Date	Calibration Due Date
1	Mobile Station Tester / MT8820C	Anritsu	6201300660	2024.06.21	2025.06.20
2	Radio Communication Station / CMW500	R&S	161702	2024.06.21	2025.06.20
3	Spectrum Analyzer / FSV40	R&S	101065	2024.06.21	2025.06.20
4	Spectrum Analyzer / N9020A	Agilent	MY48010771	2024.03.06	2025.03.05
5	Power Divider / 11667A	HP	19632	2024.06.21	2025.06.20
6	Switching box/CBOX-FULL	TSTPASS	SN5308466	2024.07.21	2025.07.20
7	DC Power Supply / E3645A	Agilent	MY40000741	2024.03.06	2025.03.05
8	Temperature chamber / SH241	ESPEC	92013758	2024.06.21	2025.06.20
9	Fully-Anechoic Chamber / 12.65m×8.03m×7.50m	FRANKONIA	-----	-----	-----
10	Semi-Anechoic/Chamber / 23.18m×16.88m×9.60m	FRANKONIA	---	-----	-----
11	Turn table Diameter:1m	FRANKONIA	-----	-----	-----
12	Turn table Diameter:5m	FRANKONIA	-----	-----	-----
13	Antenna master FAC(MA4.0)	MATURO	-----	-----	-----
14	Antenna master SAC(MA4.0)	MATURO	-----	-----	-----
15	Shielding room / 9.080m×5.255m×3.525m	FRANKONIA	-----	-----	-----
16	Double-Ridged Waveguide Horn Antenna / HF 907	R&S	100512	2024.06.21	2025.06.20
17	Double-Ridged Waveguide Horn Antenna / HF 907	R&S	100513	2024.06.21	2025.06.20
18	Ultra log antenna / HL562	R&S	100016	2024.06.21	2025.06.20
19	Receive antenna /3160-09	SCHWARZ-BECK	002058-002	2024.06.21	2025.06.20
20	EMI test receiver / ESI 40	R&S	100015	2024.06.21	2025.06.20
21	EMI test receiver / ESCS30	R&S	100029	2024.06.21	2025.06.20
22	Receive antenna / HL562	R&S	100167	2024.06.21	2025.06.20
23	AMN / ENV216	R&S	3560.6550.12	2024.06.21	2025.06.20
24	FCC auto test system / RT9100L-2	Radiosky	V1.0	/	/
25	EMI test software / EMC32	R&S	V10.20.01	/	/

APPENDIX A – TEST DATA OF CONDUCTED EMISSION

The worst channel results are reflected in the report,Please refer to the attachment.

APPENDIX B – TEST DATA OF RADIATED EMISSION

The worst channel results are reflected in the report,Please refer to the attachment.

---End of Test Report---