Industrial Internet Innovation Center (Shanghai) Co.,Ltd.

FCC 5G NR TEST REPORT

PRODUCT	SIMCom Module
BRAND	SIMCom
MODEL	SIM8262A-M2
APPLICANT	SIMCom Wireless Solutions Limited
FCC ID	2AJYU-8XN0003
ISSUE DATE	February 28,2023
STANDARD(S)	FCC 47 CFR Part 24;FCC 47 CFR Part 27;FCC 47 CFR Part 22;FCC 47 CFR Part 2;FCC 47 CFR Part 90

Prepared by: ***Fan Yuhang*** **Reviewed by:** ***Yang Fan*** **Approved by:** ***Zhang Min***

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1. Summary of Test Report

1.1 Test Standard (s)

No.	Test Standard	Title	Version
1	FCC 47 CFR Part 2	FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS	2021-10-01
2	FCC 47 CFR Part 22	PUBLIC MOBILE SERVICES	2021-10-01
3	FCC 47 CFR Part 24	PERSONAL COMMUNICATIONS SERVICES	2021-10-01
4	FCC 47 CFR Part 27	MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES	2021-10-01
5	FCC 47 CFR Part 90	PRIVATE LAND MOBILE RADIO SERVICES	2021-10-01

Note: FCC 47 CFR Part 2 is not in the scope of ISO 17025 accreditation by A2LA.

1.2 Reference Documents

No.	Test Standard（Include the version of standard）	Title	Version
1	ANSI/TIA-603-E	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards	2016
2	ANSI C63.26	American National Standard of Procedures for Compliance Testing of Licensed Transmitters Used in Licensed Radio	2015
3	KDB 971168 D01	Measurement Guidance for Certification of Licensed Digital Transmitters	v03r01
4	KDB 412172 D01	Guidelines For Determining The Effective Radiated Power (Erp) And Equivalent Isotropically Radiated Power (Eirp) Of An Rf Transmitting System	v01r01
5	KDB 662911 D01	Federal Communications Commission Office of Engineering and Technology Laboratory Division	v02r01

1.3 Summary of Test Results

Measurement Items	Sub-clause of FCC	Verdict
Conducted Output Power	2.1046	Pass
Effective Radiated Power	27.50(c)(10)/22.913 (a)(5)/27.50 (c) (10)/ 27.50 (b) (10)/90.542	Pass
Equivalent Isotropic Radiated Power	27.50(h)(2)/27.50 (j) (3), (k) (3)/24.232 (c)/27.50 (d) (4)/27.50 (a) (3)	Pass
Peak-to-Average Ratio	27.50 (j)(4)/24.232 (d)	Pass

Occupied Bandwidth	2.1049	Pass
Conducted Band Edge Measurement	2.1051/27.53(g)/27.53(l)(2)/2.1051/27.53(m)(4)/ 22.917(a)/24.238(a)/27.53(h)/27.53(a)(4)/27.53(g)/ 27.53(f)/90.543(e)/90.669(a	Pass
Conducted Spurious Emission	2.1051/27.53(g)/27.53(l)(2)/2.1051/27.53(m)(4)/ 22.917(a)/24.238(a)/27.53(h)/27.53(a)(4)/27.53(g)/ 27.53(f)/90.543(e)/90.669(a)	Pass
Frequency Stability Temperature & Voltage	2.1055/27.54/24.235/22.355	Pass
Emission Limit	2.1051/27.53(g)/27.53(l)(2)/2.1051/27.53(m)(4)/ 22.917(a)/24.238(a)/27.53(h)/27.53(a)(4)/27.53(g)/ 27.53(f)/90.543(e)/90.669(a)	Pass
Note: The SIM8262A-M2, manufactured by SIMCom Wireless Solutions Limited is a new product for testing. Because the customer advertised that NSA had lower power than SA, we only tested all use cases for SA and recorded them in this report. 5G NR n41 support UL MIMO mode, and only supports CP-OFDM modulation in UL MIMO mode.According to KDB 662911 D01 and ANSI C63.26-201, MIMO directional gain affects in-band power and out-of-band spurious emission, so we only tested condutced output power, conducted band edge and radiated spurious emission. The test results are recorded in this report and Appendix A&D. Industrial Internet Innovation Center (Shanghai) Co., Ltd. only performed test cases which identified with Pass/Fail/Inc result in section 1.3. Industrial Internet Innovation Center (Shanghai) Co., Ltd. has verified that the compliance of the tested device specified in section 4 of this test report is successfully evaluated according to the procedure and test methods as defined in type certification requirement listed in section 1 of this test report.		

1.4 Data Provided by Applicant

No.	Item(s)	Data/dBi
1	N2	1.35
2	N5	1.58
3	N7	1.15
4	N12	0.73
5	N13	1.01
6	N14	1.32
7	N25	0.83
8	N26	1.48
9	N30	1.25
10	N38	1.01
11	N41	1.13[Note 2]

12	N66	1.25
13	N71	0.74
14	N77	1.44
15	N78	1.12

Note 1: The data of 1.4 is provided by the customer may affect the validity of the test results in this report, and the impact and consequences of this shall be undertaken by the customer.
Note 2: According to KDB 662911 D01 section F), The MIMO antennas of N41 have the same antenna gain, and the transmit signals are correlated, so we use the calculation method of a) (i), Directional gain = G_{ANT}+10*log(N_{ANT}) dBi=1.13+10*log(2)=4.14 dBi.

2. General Information of The Laboratory

2.1 Testing Laboratory

Lab Name	Industrial Internet Innovation Center (Shanghai) Co.,Ltd.
Address	Building 4，No. 766，Jingang Road，Pudong，Shanghai，China
Telephone	021-68866880
FCC Registration No.	958356
FCC Designation No.	CN1177

2.2 Laboratory Environmental Requirements

Temperature	15℃~35℃
Relative Humidity	25%RH~75%RH
Atmospheric Pressure	101kPa

2.3 Project Information

Project Manager	Zhang Heng
Test Date	September 10, 2022 to February 28, 2023

3. General Information of The Customer

3.1 Applicant

Company	SIMCom Wireless Solutions Limited
Address	SIMCom Headquarters Building, Building 3, No.289 Linhong Road, Changning District, Shanghai, China
Telephone	86 21 3157 5100

3.2 Manufacturer

Company	SIMCom Wireless Solutions Limited
Address	SIMCom Headquarters Building, Building 3, No.289 Linhong Road, Changning District, Shanghai, China

4. General Information of The Product

4.1 Product Description for Equipment under Test (EUT)

Product	SIMCom Module
Model	SIM8262A-M2
Date of Receipt	S02aa/S03aa/S08aa:August 29,2022
EUT ID*	S02aa/S03aa/S08aa
SN/IMEI	S02aa: 866713060007227 S03aa: 866713060007227 S08aa: 866713060007276
Supported Radio Technology and Bands	WCDMA Band II/IV/V LTE Band 2/4/5/7/12/13/14/17/25/26/30/41/42/43/48/66/71 5G NR n2/n5/n7/n12/n13/n14/n25/n26/n30/n38/n41/n66/n71/n77/n78
Hardware Version	V1.02
Software Version	2212B02X62M44A-M2
FCC ID	2AJYU-8XN0003
NOTE： EUT ID is the internal identification code of the laboratory.	

4.2 Description for Auxiliary Equipment (AE)

AE ID*	Description	Model	SN/Remark
AE1	RF Cable	N/A	N/A
NOTE： AE ID is the internal identification code of the laboratory.			

4.3 Additional Information

Type of modulation	CP-OFDM: QPSK/16QAM/64QAM/256QAM DFT-s-OFDM:PI/2 BPSK/QPSK/16QAM/64QAM/256QAM

5. Test Configuration Information

5.1 Laboratory Environmental Conditions

5.1.1 Permanent Facilities

Relative Humidity	Min. = 45%, Max. = 55 %		
Atmospheric Pressure	101kPa		
Temperature	Normal	Minimum	Maximum
	25℃	-30℃	70℃
Working Voltage of EUT	Normal	Minimum	Maximum
	3.8V	3.315V	4.4V

5.2 Test Equipments Utilized

Radiated emission test system

No.	Name	Model	S/N	Manufacturer	Cal. Date	Cal. Interval
1	Universal Radio Communication Tester	CMU200	123123	R&S	October 17,2022	1 Year
					May 10,2021	1.5 Years
2	Universal Radio Communication Tester	CMW500	104178	R&S	October 17,2022	1 Year
					May 10,2021	1.5 Years
3	EMI Test Receiver	ESU40	100307	R&S	February 23, 2022	1 Year
4	TRILOG Broadband Antenna	VULB9163	VULB9163-515	Schwarzbeck	March 11, 2022	1 Year
5	Double- ridged Waveguide Antenna	ETS-3117	00135890	ETS	March 9, 2022	2 Years
6	2-Line V-Network	ENV216	101380	R&S	February 21,2022	1 Year
					December 12,2022	
7	EMI Test Software	EMC32 V9.15.00	N/A	R&S	N/A	N/A

Anechoic chamber

Fully anechoic chamber by ETS.

Conducted Test System

No.	Name	Model	S/N	Manufacturer	Cal. Date	Cal. Interval
1	Signal Generator	MG3692C	203306	Anritsu	September 9,2023	1 Year

2	Signal Analyzer	MS2692A	6262076977	Anritsu	September 9,2023	1 Year
3	Universal Radio Communication tester	MT8821C	6262170417	Anritsu	September 9,2023	1 Year
4	Universal Radio Communication tester	MT8000A	6262134925	Anritsu	September 8,2023	1 Year
5	Signal Generator	MG3710E	6262176868	Anritsu	August 22,2023	1 Year
6	Temperature box	B-TF-107C	BTF107C-201804107	Boyi	June 30, 2023	1 Year
7	Programmable Power Supply	Keithley 2303	4039070	Keithley	July 12, 2023	1 Year
8	Band reject filter group	JS0806-F	22L8060636	Tonscend	N/A	N/A
9	RF control unit	JS0806-1	22L8060638	Tonscend	N/A	N/A
10	Test Software	TS1120	10610	Tonscend	N/A	N/A

5.3 Measurement Uncertainty

Measurement uncertainty for all the testing in this report are within the limit specified in 3IN documents. The detailed measurement uncertainty is defined in 3IN documents.

Measurement Uncertainty of Conducted test:

Measurement Items	Extended uncertainty (k=2)
Conducted Output Power	400MHz≤f＜3GHz 0.543dB 3GHz≤f＜6GHz 0.538dB
Frequency Stability Temperature & Voltage	28.62Hz
Occupied Bandwidth	5M： U_C =2*Uo= 14876Hz 10M:U_C =2*Uo = 2876Hz 15M: U_C =2*Uo = 34876Hz 20M: U_C =2*Uo = 44876Hz 25M: U_C =2*Uo = 54876Hz 30M: U_C =2*Uo = 64876Hz 35M: U_C =2*Uo = 74876Hz 40M: U_C =2*Uo = 84876Hz 45M: U_C =2*Uo = 94876Hz 50M:U_C =2*Uo = 104876Hz 60M: U_C =2*Uo = 124876Hz 70M: U_C =2*Uo = 144876Hz 80M: U_C =2*Uo = 164876Hz 90M: U_C =2*Uo = 174876Hz 100M: U_C =2*Uo = 204876Hz
Conducted Spurious Emission Conducted Band Edge Measurement Peak-to-Average Ratio	9kHz～3.6GHz： U_C=1.418dB 3.6GHz～7.5GHz： U_C =1.47dB 7.5GHz～13.6GHz： U_C =2.554dB 13.6GHz～26GHz： U_C =3.174dB 26GHz～40GHz： U_C =3.864dB

Measurement Uncertainty of Radiation test:

Measurement Items	Range	Confidence Level	Calculated Uncertainty
Transmitter Spurious Emission-Radiated	9KHz-30MHz	95%	±5.66dB
Transmitter Spurious Emission-Radiated	30MHz-1000MHz	95%	±4.98dB
Transmitter Spurious Emission-Radiated	1000MHz -18000MHz	95%	±5.06dB
Transmitter Spurious Emission-Radiated	18000MHz -40000MHz	95%	±5.20dB

6. Test Results

6.1 Conducted Output Power and ERP/EIRP

6.1.1 Description of the Conducted Output Power Measurement and ERP/EIRPMeasurement

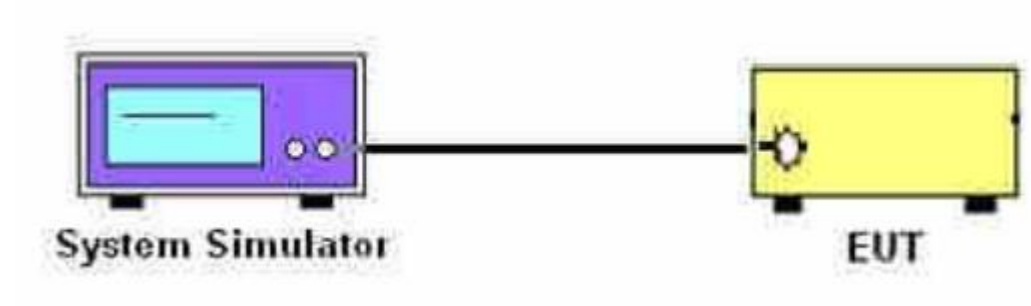
A system simulator was used to establish communication with the EUT. lts parameters were set to force the EUT transmitting at maximum output power. The measured power in the radio frequency on the transmitter output terminals shall be reported.
The ERP of mobile transmitters must not exceed 3 Watts for 5G NR n71,n12,n13 and n14
The ERP of mobile transmitters must not exceed 7 Watts for 5G NR n5 and n26.
The EIRP of mobile transmitters must not exceed 2 Watts for 5G NR n2,n7,n25,n38 and n41.
The EIRP of mobile transmitters must not exceed 1 Watts for 5G NR n66,n77,N78.
The EIRP of mobile transmitters must not exceed 250mW/5MHz for 5G NR n30.

According to KDB 412172 D01 Power Approach,
EIRP = P_T + G_T - L_C, ERP = EIRP -2.15, where
P_T = transmitter output power in dBm
G_T = gain of the transmitting antenna in dBi
L_C = signal attenuation in the connecting cable between the transmitter and antenna in dB

6.1.2 Test procedures

1. The testing follows ANSI C63.26 Section 5.2
2. The transmitter output port was connected to the system simulator.
3. Set EUT at maximum power through the system simulator.
4. Select lowest, middle, and highest channels for each band and different modulation.
5. Measure and record the power level from the system simulator

6.1.3 Test Setup



6.1.4 Test Result

Please refer to document “I22I30073-RF03-V00 Annex A”.

6.2 Peak-to-Average Power Ratio

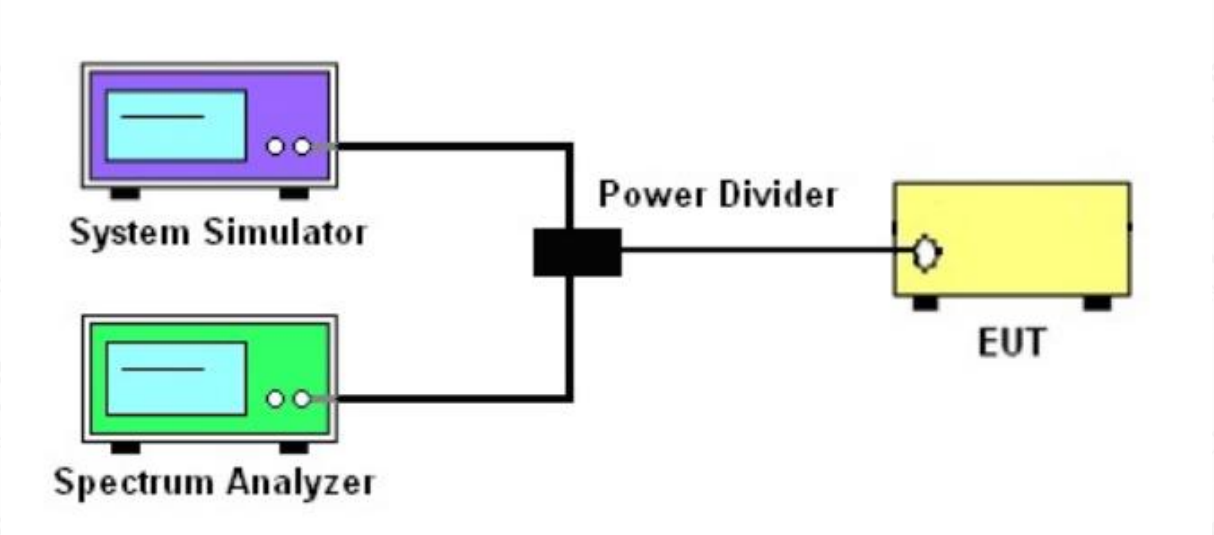
6.2.1 Description of the PAR Measurement

Power Complementary Cumulative Distribution Function (CCDF) curves provide a means for characterizing the power peaks of a digitally modulated signal on a statistical basis. A CCDF curvedepicts the probability of the peak signal amplitude exceeding the average power level. Most contemporary measurement instrumentation include the capability to produce CCDF curves for aninput signal provided that the instrument's resolution bandwidth can be set wide enough toaccommodate the entire input signal bandwidth. In measuring transmissions in this band using anaverage power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13dB.

6.2.2 Test procedures

1. The testing follows ANSI C63.26 Section 5.2.3.4 (CCDF).
2. The EUT was connected to spectrum and system simulator via a power divider.
3. Set the CCDF (Complementary Cumulative Distribution Function) option in spectrum analyzer.
4. The highest RF powers were measured and recorded the maximum PAPR level associated with a probability of 0.1 %.
5. Record the deviation as Peak to Average Ratio

6.2.3 Test Setup



6.2.4 Test results

Please refer to document “I22I30073-RF03-V00 Annex B”.

6.3 Occupied Bandwidth

6.3.1 Description of Occupied Bandwidth Measurement

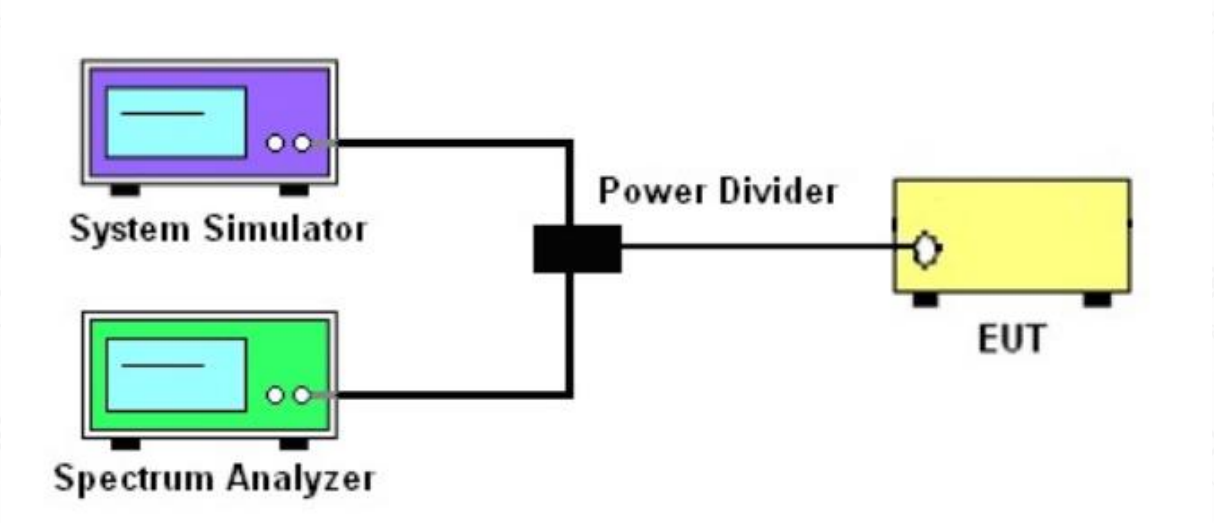
The occupied bandwidth is the width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5% of the total mean transmitted power.

The 26 dB emission bandwidth is defined as the frequency range between two points, one above and one below the carrier frequency, at which the spectral density of the emission is attenuated 26 dB below the maximum in-band spectral density of the modulated signal. Spectral density (power per unit bandwidth) is to be measured with a detector of resolution bandwidth equal to approximately 1.0% of the emission bandwidth.

6.3.2 Test Procedure

1. The testing follows ANSI C63.26 Section 5.4.
2. The EUT was connected to spectrum analyzer and system simulator via a power divider.
3. The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The span range for the spectrum analyzer shall be between two and five times the anticipated OBW.
4. The nominal resolution bandwidth (RBW) shall be in the range of 1 to 5 % of the anticipated OBW, and the VBW shall be at least 3 times the RBW.
5. Set the detection mode to peak, and the trace mode to max hold.
6. Determine the reference value: Set the EUT to transmit a modulated signal. Allow the trace to stabilize. Set the spectrum analyzer marker to the highest level of the displayed trace.(this is the reference value)
7. Determine the “-26 dB down amplitude" as equal to (Reference Value - X).
8. Place two markers, one at the lowest and the other at the highest frequency of the envelope of the spectral display such that each marker is at or slightly below the “-X dB down amplitude” determined in step 6. If a marker is below this “-X dB down amplitude” value it shall be placed as close as possible to this value. The OBW is the positive frequency difference between the two markers.
9. Use the 99 % power bandwidth function of the spectrum analyzer and report the measured bandwidth.

6.3.3 Test Setup



6.3.4 Test result

Please refer to document “I22I30073-RF03-V00 Annex C”.

6.4 Conducted Band Edge

6.4.1 Description of Conducted Band Edge Measurement

22.917(a)

For operations in the 824 - 849 MHz band, the FCC limit is 43 + 10log(P[Watts]) dB below the transmitter power P(Watts) in a 100kHz bandwidth. However, in the 1MHz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

24.238 (a)

For operations in the 1850-1910 and 1930-1990 MHz band, the FCC limit is 43 + 10log10(P[Watts]) dB below the transmitter power P(Watts) in a 1MHz bandwidth. However, 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.

27.53 (a)(4)

For mobile and portable stations operating in the 2305-2315 MHz and 2350-2360 MHz bands:

(i) By a factor of not less than: 43 + 10 log (P) dB on all frequencies between 2305 and 2320 MHz and on all frequencies between 2345 and 2360 MHz that are outside the licensed band(s) of operation, not less than 55 + 10 log (P) dB on all frequencies between 2320 and 2324 MHz and on all frequencies between 2341 and 2345 MHz, not less than 61 + 10 log (P) dB on all frequencies between 2324 and 2328 MHz and on all frequencies between 2337 and 2341 MHz, and not less than 67 + 10 log (P) dB on all frequencies between 2328 and 2337 MHz;

(ii) By a factor of not less than 43 + 10 log (P) dB on all frequencies between 2300 and 2305 MHz, 55 + 10 log (P) dB on all frequencies between 2296 and 2300 MHz, 61 + 10 log (P) dB on all frequencies between 2292 and 2296 MHz, 67 + 10 log (P) dB on all frequencies between 2288 and 2292 MHz, and 70 + 10 log (P) dB below 2288 MHz;

(iii) By a factor of not less than 43 + 10 log (P) dB on all frequencies between 2360 and 2365 MHz, and not less than 70 + 10 log (P) dB above 2365 MHz.

27.53 (f)

For operations in the 746-758 MHz, 775-788 MHz, and 805-806 MHz bands, emissions in the band 1559-1610 MHz shall be limited to −70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and −80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

27.53 (g)

For operations in the 600MHz band and 698 -746 MHz band, the FCC limit is 43 + 10log10(P[Watts]) dB below the transmitter power P(Watts) in a 100 kHz bandwidth. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

27.53 (h)

For operations in the 1710 - 1755 MHz band, the FCC limit is 43 + 10logo(P[Watts]) dB below the transmitter power P(Watts) in a 1 MHz bandwidth. However,in the 1MHz bands immediately outsideand adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

27.53(m)(4)

For mobile digital stations, 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 as defined in paragraph (m)(6) of this section. 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 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

27.53(l)(2)

For mobile operations in the 3700-3980 MHz band, the conducted power of any emission outside the licensee's authorized bandwidth shall not exceed -13 dBm/MHz. Compliance with this paragraph is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 megahertz bands immediately outside and adjacent to the licensee's frequency block, the minimum resolution bandwidth for the measurement shall be either one percent of the emission bandwidth of the fundamental emission of the transmitter or 350 kHz. In the bands between 1 and 5 MHz removed from the licensee's frequency block, the minimum resolution bandwidth for the measurement shall be 500 kHz.

90.543(e)

For operations in the 758-768 MHz and the 788-798 MHz bands, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

(1) On all frequencies between 769-775 MHz and 799-805 MHz, by a factor not less than 76 + 10 log (P) dB in a 6.25 kHz band segment, for base and fixed stations.

(2) On all frequencies between 769-775 MHz and 799-805 MHz, by a factor not less than 65 + 10 log (P) dB in a 6.25 kHz band segment, for mobile and portable stations.

(3) On any frequency between 775-788 MHz, above 805 MHz, and below 758 MHz, by at least 43 + 10 log (P) dB.

(4) Compliance with the provisions of paragraphs (e)(1) and (2) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment.

(5) Compliance with the provisions of paragraph (e)(3) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of 30 kHz may be employed.

90.669(a)

On any frequency in an MTA licensee's spectrum block that is adjacent to a non-MTA frequency, the power of any emission shall be attenuated below the transmitter power (P) by at least 43 plus 10 log10(P) decibels or 80 decibels, whichever is the lesser attenuation.

6.4.2 Test procedure:

1. The testing follows ANSI C63.26 section 5.7

2. The EUT was connected to spectrum analyzer and system simulator via a power divider.
3. The band edges of low and high channels for the highest RF powers were measured.
4. Set RBW >= 1% EBW in the 1MHz band immediately outside and adjacent to the band edge.
5. Beyond the 1 MHz band from the band edge, RBW=1MHz was used.
6. Set spectrum analyzer with RMS detector.
7. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
8. Checked that all the results comply with the emission limit line.

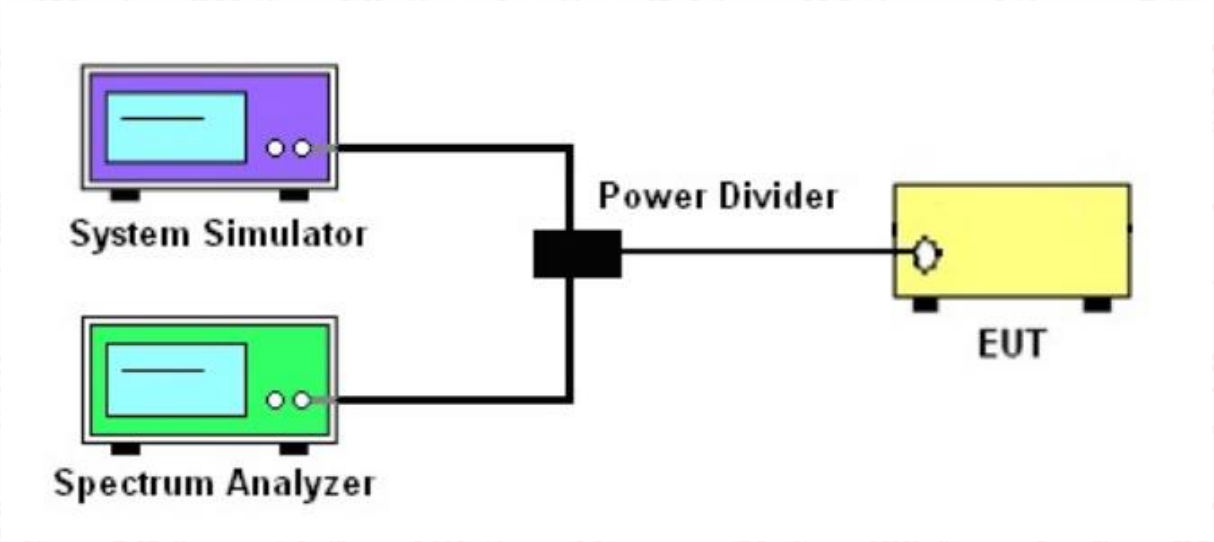
Example:

The limit line is derived from 43 + 10log(P)dB below the transmitter power P(Watts)

= P(W)- [43 + 10log(P)] (dB)

=[30 + 10log(P)] (dBm) - [43 + 10log(P)] (dB) = -13dBm.

6.4.3 Test Setup



6.4.4 Test Result:

Please refer to document “I22I30073-RF03-V00 Annex D”.

6.5 Conducted Spurious Emission

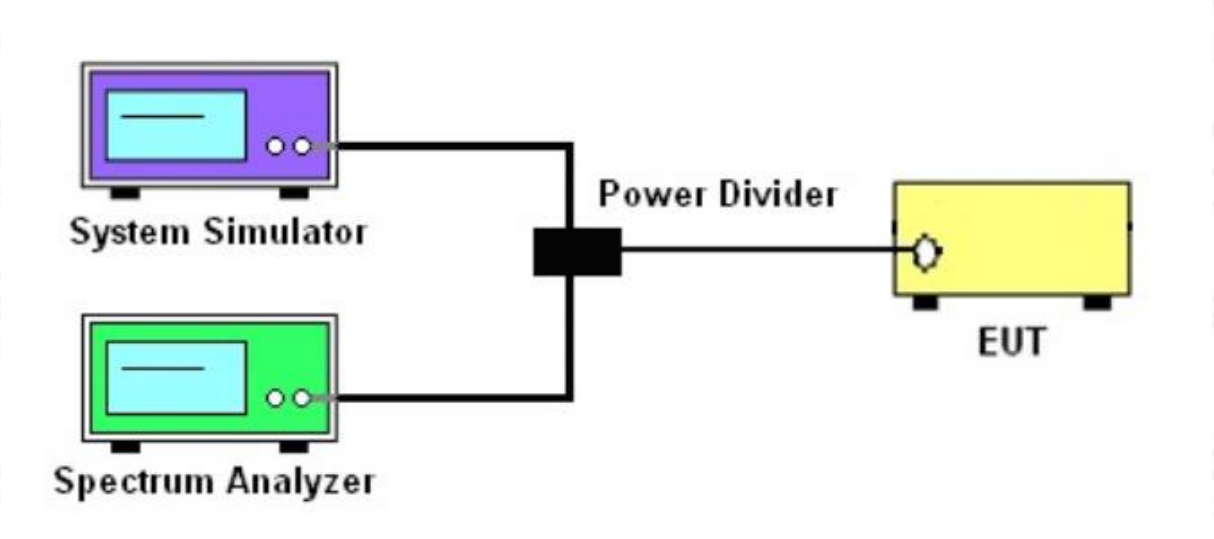
6.5.1 Description of Conducted Spurious Emission Measurement

The power of any emission outside of the authorized operating frequency ranges must be lower than the transmitter power (P) by a factor of at least 43 + 10 log (P) dB.
For 5G NR n7/n38/n41
The power of any emission outside of the authorized operating frequency ranges must be attenuatedbelow the transmitter power (P) by a factor of at least 55 + 10 log (P) dB.
For 5G NR n30
The power of any emission outside of the authorized operating frequency ranges must be attenuatedbelow the transmitter power (P) by a factor of at least 70 + 10 log (P) dB.
For 5G NR n26(814M-824MHz)
On all frequencies between 769-775 MHz and 799-805 MHz, the power of any emission outside of the authorized operating frequency ranges must be attenuatedbelow the transmitter power (P) by a factor of at least 76 + 10 log (P) dB in a 6.25 kHz for base and fixed stations and at least 65 + 10 log (P) dB in a 6.25 kHz for mobile and portable stations .
On any frequency between 775-788 MHz, The power of any emission outside of the authorized operating frequency ranges must be lower than the transmitter power (P) by a factor of at least 43 + 10 log (P) dB.
lt is measured by means of a calibrated spectrum analyzer and scanned from 30 MHz up to a frequency including its 10^{th} harmonic.

6.5.2 Test Procedures

1. The testing follows ANSI C63.26 section 5.7
2. The EUT was connected to spectrum analyzer and system simulator via a power divider.
3. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator.The path loss was compensated to the results for each measurement.
4. The middle channel for the highest RF power within the transmitting frequency was measured.
5. The conducted spurious emission for the whole frequency range was taken.
6. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz.
7. Set spectrum analyzer with RMS detector.
8. Taking the record of maximum spurious emission.
9. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
10. The limit line is derived from 43 + 10log(P)dB below the transmitter power P(Watts)
= P(W)- [43 + 10log(P)] (dB)
=[30 + 10log(P)] (dBm) - [43 + 10log(P)] (dB)
= -13dBm.
11.For 5G NR n7/n38/n41: The limit line is derived from 55 + 10log(P)dB below the transmitter power P(Watts)The limitline is derived from 55 + 10log(P)dB below the transmitter power P(Watts).
For 5G NR n30: The limit line is derived from 70 + 10log(P)dB below the transmitter power P(Watts)The limitline is derived from 70 + 10log(P)dB below the transmitter power P(Watts)

6.5.3 Test Setup



6.5.4 Measurement result

Please refer to document “I22I30073-RF03-V00 Annex E”.

6.6 Frequency Stability

6.6.1 Description of Frequency Stability Measurement

The frequency stability shall be measured by variation of ambient temperature and variation of primary supply voltage to ensure that the fundamental emission stays within the authorized frequency block. The frequency stability of the transmitter shall be maintained within +0.00025% (2.5ppm) ofthe center frequency.

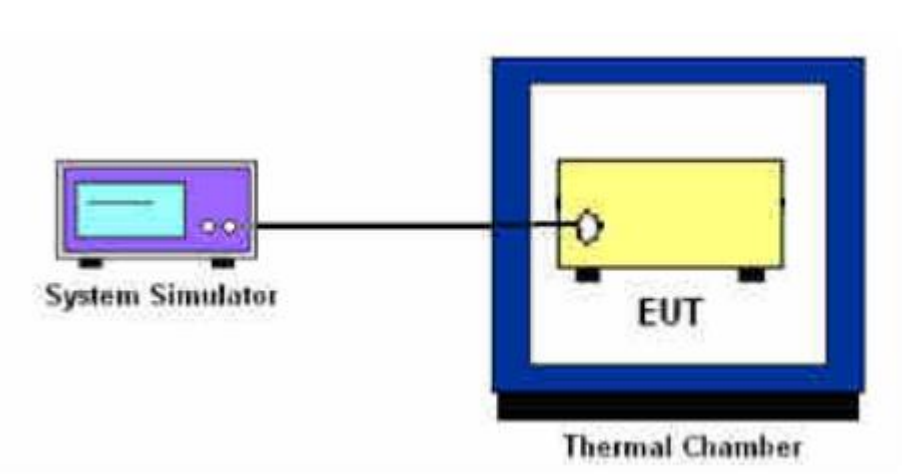
6.6.2 Test Procedures for Temperature Variation

1. The testing follows ANSI C63.26 section 5.6.4
2. The EUT was set up in the thermal chamber and connected with the system simulator.
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.
4. With power OFF, the temperature was raised in 10°C step 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.

6.6.3 Test Procedures for Voltage Variation

1. The testing follows ANSI C63.26 section 5.6.5
2. The EUT was placed in a temperature chamber at 20+5°C and connected with the system simulator.
3. The power supply voltage to the EUT was varied from 85% to 115% of the nominal value for other than hand carried battery equipment.
4. For hand carried, battery powered equipment, reduce the primary ac or dc supply voltage to the battery operating end point, which shall be specified by the manufacturer.
5. The variation in frequency was measured for the worst case.

6.6.4 Test Setup



6.6.5 Test results

Please refer to document “I22I30073-RF03-V00 Annex F”.

6.7 Emission Limit

6.7.1 Description of Radiated Spurious Emission

The radiated spurious emission was measured by substitution method according to ANSI C63.26.
The power of any emission outside of the authorized operating frequency ranges must be lower than the transmitter power (P) by a factor of at least 43 + 10 log (P) dB.
For 5G NR n7/n38/n41
The power of any emission outside of the authorized operating frequency ranges must be attenuatedbelow the transmitter power (P) by a factor of at least 55 + 10 log (P) dB.
For 5G NR n30
The power of any emission outside of the authorized operating frequency ranges must be attenuatedbelow the transmitter power (P) by a factor of at least 70 + 10 log (P) dB.
For 5G NR n26(814M-824MHz)
On all frequencies between 769-775 MHz and 799-805 MHz, the power of any emission outside of the authorized operating frequency ranges must be attenuatedbelow the transmitter power (P) by a factor of at least 76 + 10 log (P) dB in a 6.25 kHz for base and fixed stations and at least 65 + 10 log (P) dB in a 6.25 kHz for mobile and portable stations .
On any frequency between 775-788 MHz, The power of any emission outside of the authorized operating frequency ranges must be lower than the transmitter power (P) by a factor of at least 43 + 10 log (P) dB.
It is measured by means of a calibrated spectrum analyzer and scanned from 30 MHz up to a frequency including its 10^{th} harmonic.

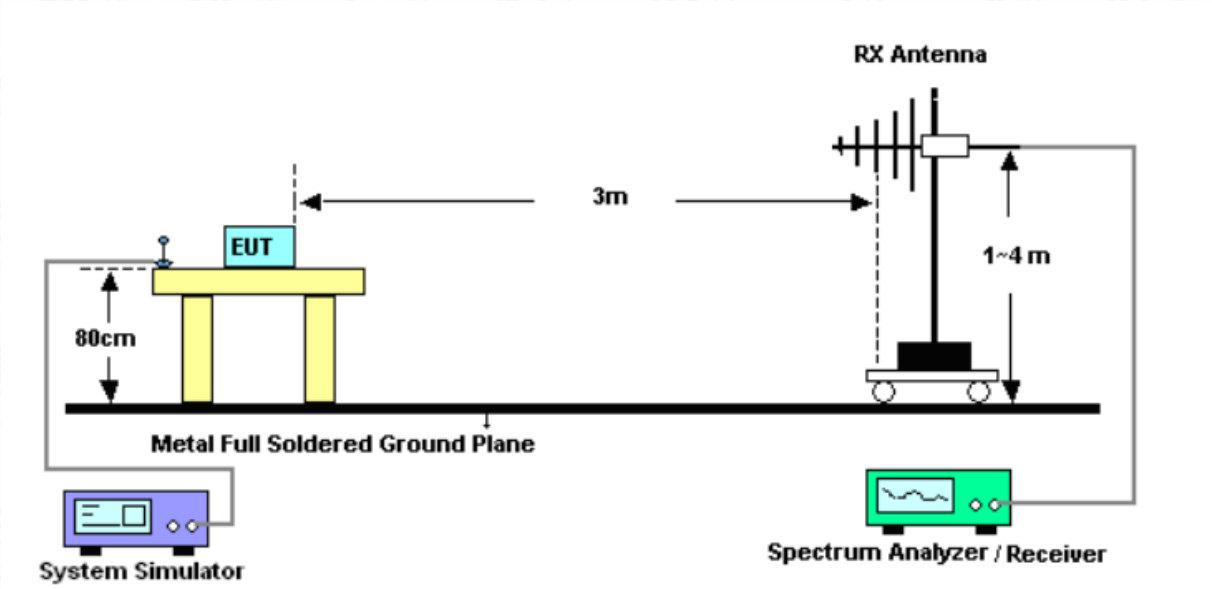
6.7.2 Test Procedures

1. The testing follows ANSI C63.26 Section 5.5
2.The EUT was placed on a turntable with 0.8 meter height for frequency below 1GHz and 1.5 meter height for frequency above 1GHz respectively above ground.
3.The EUT was set 3 meters from the receiving antenna mounted on the antenna tower.
4.The table was rotated 360 degrees to determine the position of the highest spurious emission.
5.The height of the receiving antenna is varied between 1m to 4m to search the maximum spurious emission for both horizontal and vertical polarizations.
6.During the measurement, the system simulator parameters were set to force the EUT transmitting at maximum output power.
7.Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz, taking therecord of maximum spurious emission.
8.A horn antenna was substituted in place of the EUT and was driven by a signal generator.
9.Tune the output power of signal generator to the same emission level with EUT maximum spurious emission.
10.EIRP (dBm) = S.G. Power - Tx Cable Loss + Tx Antenna Gain
11.ERP (dBm) = EIRP-2.15
12.The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
The limit line is derived from 43 + 10log(P)dB below the transmitter power P(Watts)
= P(W)- [43 + 10log(P)] (dB)

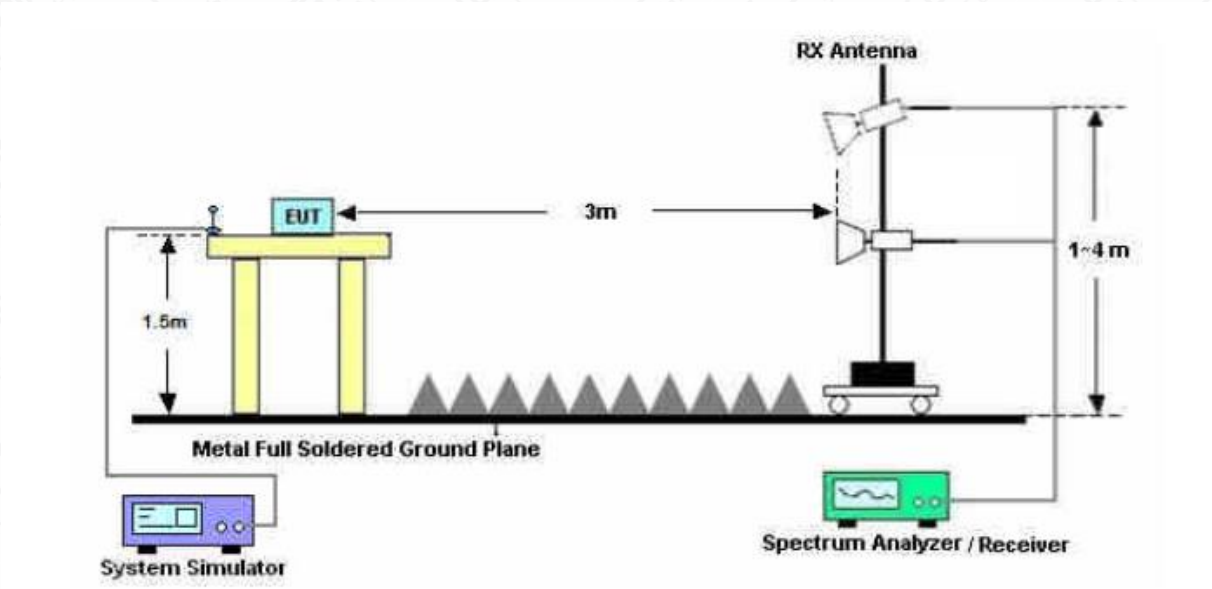
=[30 + 10log(P)] (dBm) - [43 + 10l0g(P)] (dB)
= -13dBm.
13.For 5G NR n7/n38/n41: The limit line is derived from 55 + 10log(P)dB below the transmitter power P(Watts)The limitline is derived from 55 + 10log(P)dB below the transmitter power P(Watts).
For 5G NR n30: The limit line is derived from 70 + 10log(P)dB below the transmitter power P(Watts)The limitline is derived from 70 + 10log(P)dB below the transmitter power P(Watts)

6.7.3 Test Setup

For radiated test from 30MHz to 1GHz



For radiated test above 1GHz



6.7.4 Test Result

Only data in worst mode is provided.

NR SA n78A-L

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit （dBm）	Polarization
5374.4	-42.08	8.1	9.4	-40.78	-13	H
7249.6	-39.19	9.5	11.1	-37.59	-13	V
9334.0	-50.91	10.7	12.6	-49.01	-13	V
11399.0	-45.67	12.1	12.3	-45.47	-13	H
12917.0	-45.19	13	12.3	-45.89	-13	H
16137.0	-37.09	15	12.3	-39.79	-13	V

NR SA n78A-M

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit （dBm）	Polarization
4751.3	-43.19	7.5	9	-41.69	-13	V
7373.9	-39.2	9.6	11.4	-37.4	-13	V
8752.0	-51.14	10.4	12.7	-48.84	-13	H
10752.0	-46.88	11.7	12.3	-46.28	-13	H
12572.0	-44.68	12.7	12.3	-45.08	-13	H
15284.0	-40.26	14.5	12.3	-42.46	-13	V

NR SA n78A-H

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit （dBm）	Polarization
5329.8	-42.23	8	9.4	-40.83	-13	H
6765.8	-38.23	9.2	10.9	-36.53	-13	H
8911.0	-51.31	10.4	12.7	-49.01	-13	H
10483.0	-47.57	11.6	12.5	-46.67	-13	V
12313.0	-43.51	12.7	12.3	-43.91	-13	H
16650.0	-34.16	14.9	12.3	-36.76	-13	V

NR SA n41 MIMO-L

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit （dBm）	Polarization
3625.0	-44.93	6.6	7.9	-43.63	-25	V
4748.3	-43.19	7.5	9.0	-41.69	-25	V
7515.2	-37.76	9.7	11.6	-35.86	-25	V
9483.0	-49.79	10.7	12.7	-47.79	-25	H
12299.0	-43.63	12.7	12.3	-44.03	-25	H
16231.0	-37.83	14.9	12.3	-40.43	-25	V

NR SA n41 MIMO-M

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit （dBm）	Polarization
3719.7	-43.76	6.6	7.9	-42.46	-25	V
5324.2	-42.21	8.0	9.4	-40.81	-25	V

7534.5	-39.27	9.7	11.6	-37.37	-25	V
8957.0	-50.29	10.4	12.6	-48.09	-25	H
11459.0	-46.4	12.3	12.3	-46.4	-25	V
13114.0	-44.27	13.0	12.3	-44.97	-25	V

NR SA n41 MIMO-H

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit （dBm）	Polarization
3627.0	-45.1	6.6	7.9	-43.8	-25	V
4881.0	-43.28	7.7	9.6	-41.38	-25	H
6917.3	-40.23	9.3	11.1	-38.43	-25	V
8608.0	-50.44	10.3	12.6	-48.14	-25	H
11019.0	-46.73	12.0	12.3	-46.43	-25	H
14942.0	-40.21	14.3	12.3	-42.21	-25	V

Annex A: Revised History

Version	Revised Content
V00	Initial

Annex B: Accreditation Certificate

Accredited Laboratory

A2LA has accredited

INDUSTRIAL INTERNET INNOVATION CENTER (SHANGHAI) CO., LTD.

Shanghai, People's Republic of China

for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 *General requirements for the competence of testing and calibration laboratories*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated April 2017*).

Presented this 12th day of April 2021.

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 3682.01
Valid to February 28, 2023

For the tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.

END OF REPORT