SGS-CSTC Standards Technical Services Co., Ltd.
Shenzhen Branch

TEST REPORT

Application No.:	ZEWM2306000857RG
Applicant:	Askey Computer Corporation
Address of Applicant:	10F, No. 119, Jiankang Rd., Zhonghe Dist., New Taipei City, Taiwan
Manufacturer:	Askey Computer Corporation
Address of Manufacturer:	10F, No. 119, Jiankang Rd., Zhonghe Dist., New Taipei City, Taiwan
EUT Description:	5G NR Sub 6 WiFi 7 Router
Model No.:	ASK-NCM1100
Trade Mark:	Verizon
FCC ID:	H8N-ASK-NCM1100
Standards:	47 CFR Part 2 47 CFR Part 22 47 CFR Part 24 47 CFR Part 27 47 CFR Part 96
Date of Receipt:	2023/06/28
Date of Test:	2023/07/09 to 2023/12/01
Date of Issue:	2023/12/05
Test Result:	**PASS ***

* In the configuration tested, the EUT detailed in this report complied with the standards specified above.

Authorized Signature:

Keny Xu
Laboratory Manager

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1 Version

Revision Record				
Version	***Chapter***	***Date***	***Modifier***	***Remark***
01		2023/12/01		Original
02		2023/12/05		Revised the photos in the Test Setup 2
This report supersedes our previous report ZEWM2306000857RG02, issued on 2023/12/01, which is hereby deemed null and void.				

Prepared By	Jack Huang **(Jack Huang) / Test Engineer**
Checked By	Flora Wang **(Flora Wang) / Reviewer**

Content

2 Test Summary

2.1 NR Band n5

Test Item	FCC Rule No.	Requirements	Test Result	Verdict	Test Lab[1]
Effective (Isotropic) Radiated Power Output Data	§2.1046, §22.913(a)(5)	FCC: ERP ≤ 7 W	Section 1 of Appendix B.10	Pass	B
Peak-Average Ratio	§22.913(d)	Limit≤13 dB	Section 2 of Appendix B.10	Pass	B
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.	Section 3 of Appendix B.10	Pass	B
Band Edges Compliance	§2.1051, §22.917(a)	≤ -13 dBm/1%*EBW, in 1 MHz bands immediately outside and adjacent to the frequency block.	Section 4 of Appendix B.10	Pass	B
Spurious Emission at Antenna Terminals	§2.1051, §22.917(a)	FCC: ≤ -13 dBm/100 kHz, from 9 kHz to 10th harmonics but outside authorized operating frequency ranges.	Section 5 of Appendix B.10	Pass	B
Field Strength of Spurious Radiation	§2.1053, §22.917(a)	FCC: ≤ -13 dBm/100 kHz.	Section 6 of Appendix B.10	Pass	B
Frequency Stability	§2.1055(a)(1)(b) §2.1055(d)(1) §22.355	±2.5ppm.	Section 7 of Appendix B.10	Pass	B
Remark: 1. Lab B SGS-CSTC Standards Technical Services (Suzhou) Co., Ltd.					

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2.2 NR Band n2

Test Item	FCC Rule No.	Requirements	Test Result	Verdict	Test Lab[1]
Effective (Isotropic) Radiated Power Output Data	§2.1046, §24.232(c)	EIRP ≤ 2 W	Section 1 of Appendix B.9	Pass	B
Peak-Average Ratio	§24.232(d)	Limit≤13 dB	Section 2 of Appendix B.9	Pass	B
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.	Section 3 of Appendix B.9	Pass	B
Band Edges Compliance	§2.1051, §24.238(a)	≤ -13 dBm/1%*EBW, in 1 MHz bands immediately outside and adjacent to the frequency block.	Section 4 of Appendix B.9	Pass	B
Spurious Emission at Antenna Terminals	§2.1051, §24.238(a)	≤ -13 dBm/1 MHz, from 9 kHz to 10th harmonics but outside authorized operating frequency ranges.	Section 5 of Appendix B.9	Pass	B
Field Strength of Spurious Radiation	§2.1053, §24.238(a)	≤ -13 dBm/1 MHz.	Section 6 of Appendix B.9	Pass	B
Frequency Stability	§2.1055(a)(1)(b) §2.1055(d)(1) §24.235	Within authorized bands of operation/frequency block.	Section 7 of Appendix B.9	Pass	B
Remark: 1. Lab B SGS-CSTC Standards Technical Services (Suzhou) Co., Ltd.					

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2.3 NR Band n66

Test Item	FCC Rule No.	Requirements	Test Result	Verdict	Test Lab[1]
Effective (Isotropic) Radiated Power Output Data	§2.1046, §27.50(d)(4)	EIRP ≤ 1 W	Section 1 of Appendix B.12	Pass	B
Peak-Average Ratio	§27.50(d)(5)	Limit≤13 dB	Section 2 of Appendix B.12	Pass	B
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.	Section 3 of Appendix B.12	Pass	B
Band Edges Compliance	§2.1051, §27.53(h)	≤ -13 dBm/1%*EBW, in 1 MHz bands immediately outside and adjacent to the frequency block.	Section 4 of Appendix B.12	Pass	B
Spurious Emission at Antenna Terminals	§2.1051, §27.53(h)	≤ -13 dBm/1 MHz, from 9 kHz to 10th harmonics but outside authorized operating frequency ranges.	Section 5 of Appendix B.12	Pass	B
Field Strength of Spurious Radiation	§2.1053, §27.53(h)	≤ -13 dBm/1 MHz.	Section 6 of Appendix B.12	Pass	B
Frequency Stability	§2.1055(a)(1)(b) §2.1055(d)(1) §27.54	Within authorized bands of operation/frequency block.	Section 7 of Appendix B.12	Pass	B

Remark:
1. Lab B SGS-CSTC Standards Technical Services (Suzhou) Co., Ltd.

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2.4 NR Band n48

Test Item	FCC Rule No.	Requirements	Test Result	Verdict	Test Lab[1]
Effective (Isotropic) Radiated Power Output Data	§2.1046, §96.41	EIRP ≤ 23dBm/10MHz	Section 1 of Appendix B.11	Pass	B
Peak-Average Ratio	§96.41	FCC: Limit≤13 dB	Section 2 of Appendix B.11	Pass	B
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.	Section 3 of Appendix B.11	Pass	B
Adjacent Channel Leakage Ratio	§96.41	the Adjacent Channel Leakage Ratio for End User Devices shall be at least 30 dB.	Section 4 of Appendix B.11	Pass	B
Band Edges Compliance	§2.1051, §96.41	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 (whether in or outside of the authorized band) shall not exceed −13 dBm/MHz within 0 to B megahertz (where B is the bandwidth in megahertz of the assigned channel or multiple contiguous channels of the End User Device) above the upper CBSD-assigned channel edge and within 0 to B megahertz below the lower CBSD-assigned channel edge.	Section 5 of Appendix B.11	Pass	B
Spurious Emission at Antenna Terminals	§2.1051, §96.41	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 (whether in or outside of the authorized band) shall not exceed −13 dBm/MHz within 0 to B megahertz (where B is the bandwidth in megahertz of the assigned channel or multiple contiguous channels of the End User Device) 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.	Section 6 of Appendix B.11	Pass	B

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		(2) Additional protection levels. Notwithstanding paragraph (e)(1) of this section, 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.			
Field Strength of Spurious Radiation	§2.1053, §96.41	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 (whether in or outside of the authorized band) shall not exceed −13 dBm/MHz within 0 to B megahertz (where B is the bandwidth in megahertz of the assigned channel or multiple contiguous channels of the End User Device) 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. (2) Additional protection levels. Notwithstanding paragraph (e)(1) of this section, 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.	Section 7 of Appendix B.11	Pass	B
Frequency Stability	§2.1055, §96.41	Within authorized bands of operation/ frequency block.	Section 8 of Appendix B.11	Pass	B
Remark: 1. Lab B SGS-CSTC Standards Technical Services (Suzhou) Co., Ltd.					

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2.5 NR Band n77

3450-3550MHz:

Test Item	FCC Rule No.	Requirements	Test Result	Verdict	Test Lab[1]
Effective (Isotropic) Radiated Power Output Data	§2.1046, §27.50(k)(3)	EIRP ≤ 30dBm	Section 1 of Appendix B.13	Pass	B
Peak-Average Ratio	§27.50(k)(4)	FCC: Limit≤13 dB	Section 2 of Appendix B.13	Pass	B
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.	Section 3 of Appendix B.13	Pass	B
Band Edges Compliance	§2.1051, §27.50(n)(2)	For mobile operations in the 3450-3550 MHz band, the conducted power of any emission outside the licensee's authorized bandwidth shall not exceed −13 dBm/MHz.	Section 4 of Appendix B.13	Pass	B
Spurious Emission at Antenna Terminals	§2.1051, §27.50(n)(2)	For mobile operations in the 3450-3550 MHz band, the conducted power of any emission outside the licensee's authorized bandwidth shall not exceed −13 dBm/MHz.	Section 5 of Appendix B.13	Pass	B
Field Strength of Spurious Radiation	§2.1053, §27.50(n)(2)	For mobile operations in the 3450-3550 MHz band, the conducted power of any emission outside the licensee's authorized bandwidth shall not exceed −13 dBm/MHz.	Section 6 of Appendix B.13	Pass	B
Frequency Stability	§2.1055(a)(1)(b) §2.1055(d)(1) §27.54	Within authorized bands of operation/ frequency block.	Section 7 of Appendix B.13	Pass	B
Remark: 1. Lab B SGS-CSTC Standards Technical Services (Suzhou) Co., Ltd.					

3700-3980MHz:

Test Item	FCC Rule No.	Requirements	Test Result	Verdict	Test Lab[1]
Effective (Isotropic) Radiated Power Output Data	§2.1046, §27.50(j)(3)	EIRP ≤ 1W	Section 1 of Appendix B.14	Pass	B
Peak-Average Ratio	---	≤13 dB	Section 2 of Appendix B.14	Pass	B
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.	Section 3 of Appendix B.14	Pass	B
Band Edges Compliance	§2.1051, §27.53(l)(2)	(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 (l)(2) 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.	Section 4 of Appendix B.14	Pass	B
Spurious Emission at Antenna Terminals	§2.1051, §27.53(l)(2)	not exceed -13 dBm/MHz.	Section 5 of Appendix B.14	Pass	B
Field Strength of Spurious Radiation	§2.1053, §27.53(l)(2)	not exceed -13 dBm/MHz	Section 6 of Appendix B.14	Pass	B
Frequency Stability	§2.1055(a)(1)(b) §2.1055(d)(1) §27.54	Within authorized bands of operation/frequency block.	Section 7 of Appendix B.14	Pass	B

Remark:
1. Lab B SGS-CSTC Standards Technical Services (Suzhou) Co., Ltd.

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2.6 NR CA_n5B

Test Item	FCC Rule No.	Requirements	Test Result	Verdict	Test Lab[1]
Effective (Isotropic) Radiated Power Output Data	§2.1046, §22.913(a)(5)	FCC: ERP ≤ 7 W	Section 1 of Appendix B.15	Pass	A
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.	Section 2 of Appendix B.15	Pass	A
Field Strength of Spurious Radiation	§2.1053, §22.917(a)	FCC: ≤ -13 dBm/100 kHz.	Section 3 of Appendix B.15	Pass	B
Remark: 1. Lab A SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch Lab B SGS-CSTC Standards Technical Services (Suzhou) Co., Ltd.					

2.7 NR CA_n48B

Test Item	FCC Rule No.	Requirements	Test Result	Verdict	Test Lab[1]
Effective (Isotropic) Radiated Power Output Data	§2.1046, §96.41	EIRP ≤ 23dBm/10MHz	Section 1 of Appendix B.16	Pass	A
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.	Section 2 of Appendix B.16	Pass	A
Field Strength of Spurious Radiation	§2.1053, §96.41	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 (whether in or outside of the authorized band) shall not exceed −13 dBm/MHz within 0 to B megahertz (where B is the bandwidth in megahertz of the assigned channel or multiple contiguous channels of the End User Device) 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. (2) Additional protection levels. Notwithstanding paragraph (e)(1) of this section, 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.	Section 3 of Appendix B.16	Pass	B

Remark:
1. Lab A SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch
Lab B SGS-CSTC Standards Technical Services (Suzhou) Co., Ltd.

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2.8 NR CA_n66B

Test Item	FCC Rule No.	Requirements	Test Result	Verdict	Test Lab[1]
Effective (Isotropic) Radiated Power Output Data	§2.1046, §27.50(d)(4)	EIRP ≤ 1 W	Section 1 of Appendix B.17	Pass	A
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.	Section 2 of Appendix B.17	Pass	A
Field Strength of Spurious Radiation	§2.1053, §27.53(h)	≤ -13 dBm/1 MHz.	Section 3 of Appendix B.17	Pass	B
Remark: 1. Lab A SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch Lab B SGS-CSTC Standards Technical Services (Suzhou) Co., Ltd.					

2.9 NR CA_n77C

3450-3550MHz:

Test Item	FCC Rule No.	Requirements	Test Result	Verdict	Test Lab[1]
Effective (Isotropic) Radiated Power Output Data	§2.1046, §27.50(k)(3)	EIRP ≤ 30dBm	Section 1 of Appendix B.18	Pass	A
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.	Section 2 of Appendix B.18	Pass	A
Field Strength of Spurious Radiation	§2.1053, §27.50(n)(2)	For mobile operations in the 3450-3550 MHz band, the conducted power of any emission outside the licensee's authorized bandwidth shall not exceed −13 dBm/MHz.	Section 3 of Appendix B.18	Pass	B
Remark: 1. Lab A SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch Lab B SGS-CSTC Standards Technical Services (Suzhou) Co., Ltd.					

3700-3980MHz:

Test Item	FCC Rule No.	Requirements	Test Result	Verdict	Test Lab[1]
Effective (Isotropic) Radiated Power Output Data	§2.1046, §27.50(j)(3)	EIRP ≤ 1W	Section 1 of Appendix B.19	Pass	A
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.	Section 2 of Appendix B.19	Pass	A
Field Strength of Spurious Radiation	§2.1053, §27.53(l)(2)	not exceed -13 dBm/MHz	Section 3 of Appendix B.19	Pass	B
Remark: 1. Lab A SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch Lab B SGS-CSTC Standards Technical Services (Suzhou) Co., Ltd.					

3 General Information

3.1 Client Information

Applicant:	Askey Computer Corporation
Address of Applicant:	10F, No. 119, Jiankang Rd., Zhonghe Dist., New Taipei City, Taiwan
Manufacturer:	Askey Computer Corporation
Address of Manufacturer:	10F, No. 119, Jiankang Rd., Zhonghe Dist., New Taipei City, Taiwan

3.2 Test Location

Lab A:	
Company:	SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch
Address:	No. 1 Workshop, M-10, Middle section, Science & Technology Park, Nanshan District, Shenzhen, Guangdong, China
Post code:	518057
Test engineer:	Ruby Huang
Lab B:	
Company:	SGS-CSTC Standards Technical Services (Suzhou) Co., Ltd.
Address:	South of No. 6 Plant, No. 1, Runsheng Road, Suzhou Industrial Park, Suzhou Area, China (Jiangsu) Pilot Free Trade Zone
Post code:	215000
Test engineer:	Tizzy Song, Levi Li

3.3 Test Facility

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

Lab A:

• A2LA (Certificate No. 3816.01)

SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

• VCCI

The 3m Fully-anechoic chamber for above 1GHz, 10m Semi-anechoic chamber for below 1GHz, Shielded Room for Mains Port Conducted Interference Measurement and Telecommunication Port Conducted Interference Measurement of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-20026, R-14188, C-12383 and T-11153 respectively.

• Innovation, Science and Economic Development Canada

SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch has been recognized by ISED as an accredited testing laboratory.

CAB identifier: CN0006.

IC#: 4620C.

• FCC –Designation Number: CN1336

SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch has been recognized as an accredited testing laboratory.

Designation Number: CN1336.

Test Firm Registration Number: 787754

Lab B:

• A2LA (Certificate No. 6336.01)

SGS-CSTC STANDARDS TECHNICAL SERVICES (SUZHOU) CO., LTD. is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 6336.01.

• Innovation, Science and Economic Development Canada

SGS-CSTC STANDARDS TECHNICAL SERVICES (SUZHOU) CO., LTD. has been recognized by ISED as an accredited testing laboratory.

CAB identifier: CN0120.

IC#: 27594.

• FCC –Designation Number: CN1312

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Designation Number: CN1312.

Test Firm Registration Number: 717327

3.4 General Description of EUT

EUT Description:	5G NR Sub 6 WiFi 7 Router		
Model No.:	ASK-NCM1100		
Trade Mark:	Verizon		
Hardware Version:	Rev4		
Software Version:	SDK 2.0.6		
Power Supply:	input 100~120V output:12V		
IMEI:	RF Conducted	Sample 1: 358664490000842 Sample 2: 358664490000859	
	RSE	Sample 1: 358664490021541	
Feature:	UL 2*2 MIMO: NR Band n2; NR Band n48; NR Band n66; NR Band n77;		
Power Class:	Class 1.5: NR Band n77; NR CA_n77C		
Antenna Type:	monopole antenna		
Antenna Gain:	NR Band n2:	3.5dBi (Ant3); 3.5dBi (Ant7)	
	NR Band n5:	3.4dBi (Ant3); 3.4dBi (Ant7)	
	NR Band n48:	-2.3dBi (Ant3); -2.3dBi (Ant8)	
	NR Band n66:	3.6dBi (Ant3); 3.6dBi (Ant7)	
	NR Band n77:	-2.3dBi (Ant3); -2.3dBi (Ant8)	
	NR CA_n5B:	3.4dBi (Ant3); 3.4dBi (Ant7)	
	NR CA_n48B:	-2.3dBi (Ant3); -2.3dBi (Ant8)	
	NR CA_n66B:	3.6dBi (Ant3); 3.6dBi (Ant7)	
	NR CA_n77C:	-2.3dBi (Ant3); -2.3dBi (Ant8)	
	Note: The antenna gain are derived from the gain information report provided by the manufacturer.		
RF Cable:	Lab A:		
	9kHz ~ 30MHz (0.3dB)	30MHz ~ 1000MHz (0.6dB)	1000MHz ~ 2000MHz (0.8dB)
	2000MHz ~ 4000MHz (1.1dB)	4000MHz ~ 6000MHz (1.8dB)	6000MHz ~ 12750MHz (2.6dB)
	Above 12750MHz (3.5dB)		
	Lab B:		
	0.8dB(Below 1GHz)	1.0dB(1.0~2.4GHz)	1.2dB(2.4~3.4GHz)
	1.5dB(Above 3.4GHz)		

Note:
1. EIRP of all antennas are tested, and only the worst data is presented.
2. As above information is provided and confirmed by the applicant. SGS is not liable to the accuracy, suitability, reliability or/and integrity of the information.

MIMO Model:

FCC KDB 662911 D01 Multiple Transmitter Output v02r01
If all antennas have the same gain, G_{ANT}, Directional gain = G_{ANT} + Array Gain, where Array Gain is as follows.

- For power measurements on IEEE 802.11 devices:
  Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$;
  Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any N_{ANT};
  Array Gain = 5 log(N_{ANT}/N_{SS}=1) dB or 3 dB, whichever is less, for 20-MHz channel widths with $N_{ANT} \geq 5$.

Unequal antenna gains, with equal transmit powers. For antenna gains given by G1, G2, …, GN dBi

- If transmit signals are correlated, then
  Directional gain = 10 log[($10^{G1/20} + 10^{G2/20} + \ldots + 10^{GN/20})^2 / N_{ANT}$] dBi [Note the "20"s in the denominator of each exponent and the square of the sum of terms; the object is to combine the signal levels coherently.]
- If all transmit signals are completely uncorrelated, then
  Directional gain = 10 log[($10^{G1/10} + 10^{G2/10} + \ldots + 10^{GN/10}$)/$N_{ANT}$] dBi

Band	ANT Gain3 (dBi)	ANT Gain7 (dBi)	Directional gain (dBi)
NR Band n2:	3.5	3.5	3.5
NR Band n66:	3.6	3.6	3.6
Band	ANT Gain3 (dBi)	ANT Gain8 (dBi)	Directional gain (dBi)
NR Band n48:	-2.3	-2.3	-2.3
NR Band n77:	-2.3	-2.3	-2.3

3.5 Test Mode

Test Mode	Test Modes Description
NR/TM1	NR system, DFT-s-Pi/2-BPSK modulation
NR/TM2	NR system, DFT-s-QPSK modulation
NR/TM3	NR system, DFT-s-16QAM modulation
NR/TM4	NR system, DFT-s-64QAM modulation
NR/TM5	NR system, DFT-s-256QAM modulation
NR/TM6	NR system, CP-QPSK modulation
NR/TM7	NR system, CP-16QAM modulation
NR/TM8	NR system, CP-64QAM modulation
NR/TM9	NR system, CP-256QAM modulation
Remark: The test mode(s) are selected according to relevant radio technology specifications.	

3.6 Test Environment

Environment Parameter	101 kPa Selected Values During Tests	
Relative Humidity	44-60 % RH Ambient	
Value	**Temperature(℃)**	**Voltage(V)**
NTNV	22~25	12
LTLV	-30	11.4
LTHV	-30	12.6
HTLV	50	11.4
HTHV	50	12.6
Remark:		
NV: Normal Voltage	LV: Low Extreme Test Voltage	HV: High Extreme Test Voltage
NT: Normal Temperature	LT: Low Extreme Test Temperature	HT: High Extreme Test Temperature

3.7 Description of Support Units

The EUT has been tested as an independent unit.

3.8 Technical Specification

Characteristics	Description				
Radio System Type	☒ SA ☒ NSA				
Supported Frequency Range	Band	TX	RX		
	NR Band n2	1850 to 1910 MHz	1930 to 1990 MHz		
	NR Band n5	824 to 849 MHz	869 to 894 MHz		
	NR Band n48	3550 to 3700 MHz	3550 to 3700 MHz		
	NR Band n66	1710 to 1780 MHz	2110 to 2200 MHz		
	NR Band n77	3700 to 3980 MHz	3700 to 3980 MHz		
		3450 to 3550 MHz	3450 to 3550 MHz		
	NR CA: CA_n48B; CA_n5B; CA_n66B; CA_n77C; CA_n2A-n5A; CA_n2A-n48A; CA_n2A-n66A; CA_n2A-n77A; CA_n48A-n66A; CA_n48A-n77A; CA_n5A-n48A; CA_n5A-n66A; CA_n5A-n77A; CA_n66A-n77A EN_DC: DC_13A_n2A; DC_13A_n66A; DC_2A_n5A; DC_2A_n66A; DC_48A_n5A; DC_5A_n2A; DC_5A_n66A; DC_66A_n2A; DC_66A_n5A; DC_13A_n77A; DC_2A_n77A; DC_48A_n77A; DC_5A_n77A; DC_66A_n77A; DC_13A_n5A, DC_48A_n66A; DC_48A_n2A; Remark: 1、ENDC& NR CA only test RSE, report only show worst mode. 2、DFT of NR CA has a high power, so other test items are measured using DFT mode.				
Supported Channel Bandwidth	NR Band n2	SCS 15kHz:			
		☒5 MHz	☒10 MHz	☒15 MHz	☒20 MHz
		SCS 30kHz:			
		☒10 MHz	☒15 MHz	☒20 MHz	
	NR Band n5	SCS 15kHz:			
		☒5 MHz	☒10 MHz	☒15 MHz	☒20 MHz
		SCS 30kHz:			
		☒10 MHz	☒15 MHz	☒20 MHz	
	NR Band n48	SCS 15kHz:			
		☒5 MHz	☒10 MHz	☒15 MHz	☒20 MHz
		☒40 MHz	☒50 MHz		
		SCS 30kHz:			
		☒10 MHz	☒15 MHz	☒20 MHz	☒40 MHz

		☒50 MHz	☒60 MHz	☒80 MHz	☒90 MHz
		☒100 MHz			
	NR Band n66	SCS 15kHz:			
		☒5 MHz	☒10 MHz	☒15 MHz	☒20 MHz
		☒25 MHz	☒30 MHz	☒40 MHz	
		SCS 30kHz:			
		☒10 MHz	☒15 MHz	☒20 MHz	☒25 MHz
		☒30 MHz	☒40 MHz		
	NR Band n77	SCS 15kHz			
		☒10 MHz	☒15 MHz	☒20 MHz	☒30 MHz
		☒40 MHz	☒50 MHz		
		SCS 30kHz			
		☒10 MHz	☒15 MHz	☒20 MHz	☒30 MHz
		☒40 MHz	☒50 MHz	☒60 MHz	☒80 MHz
		☒90 MHz	☒100 MHz		
Designation of Emissions (Remark: the necessary bandwidth of which is the worst value from the measured occupied bandwidths for each type of channel bandwidth configuration.)	NR Band n2	DFT-s-Pi/2-BPSK	CP-16QAM		
		SCS 15kHz:			
		4M48G7D	4M46W7D		
		8M92G7D	9M30W7D		
		13M4G7D	14M1W7D		
		17M9G7D	18M9W7D		
	NR Band n5	SCS 15kHz:			
		4M46G7D	4M47W7D		
		8M91G7D	9M26W7D		
		13M4G7D	14M1W7D		
		17M9G7D	18M9W7D		
	NR Band n48	SCS 30kHz:			
		8M92G7D	9M29W7D		
		13M3G7D	14M1W7D		
		17M8G7D	18M9W7D		
		38M5G7D	38M6W7D		
		48M3G7D	48M2W7D		
		57M9G7D	57M7W7D		

		77M0G7D 77M4W7D
		85M8G7D 87M2W7D
		96M1G7D 97M1W7D
	NR Band n66	SCS 15kHz:
		4M47G7D 4M48W7D
		8M90G7D 9M28W7D
		13M4G7D 14M1W7D
		17M9G7D 18M9W7D
		22M8G7D 23M8W7D
		28M6G7D 28M6W7D
		38M5G7D 38M5W7D
	NR Band n77 (3450 to 3550 MHz)	SCS 30kHz:
		8M93G7D 9M29W7D
		13M4G7D 14M1W7D
		17M8G7D 18M9W7D
		28M7G7D 28M6W7D
		38M8G7D 38M6W7D
		45M8G7D 47M4W7D
		57M8G7D 57M8W7D
		77M0G7D 77M4W7D
		85M7G7D 87M4W7D
		96M0G7D 97M4W7D
	NR Band n77 (3700 to 3980 MHz)	SCS 30kHz:
		8M93G7D 9M28W7D
		13M4G7D 14M1W7D
		17M9G7D 18M9W7D
		28M6G7D 28M6W7D
		38M5G7D 38M6W7D
		45M7G7D 47M5W7D
		57M7G7D 57M7W7D
		77M1G7D 77M2W7D
		85M8G7D 87M5W7D
		96M1G7D 97M3W7D
	NR CA_n5B	DFT-QPSK

		5MHz+10MHz:
		13M6G7D
		5MHz+15MHz:
		18M4G7D
		5MHz+20MHz:
		22M8G7D
	NR CA_n48B	10MHz+10MHz:
		18M7G7D
		10MHz+15MHz:
		22M9G7D
		10MHz+20MHz:
		27M6G7D
		10MHz+30MHz:
		39M2G7D
		10MHz+40MHz:
		45M2G7D
		10MHz+50MHz:
		55M4G7D
		10MHz+60MHz:
		66M8G7D
		10MHz+70MHz:
		73M3G7D
		10MHz+80MHz:
		87M0G7D
		10MHz+90MHz:
		92M0G7D
		15MHz+20MHz:
		32M2G7D
		15MHz+30MHz:
		41M6G7D
		15MHz+40MHz:
		50M2G7D
		15MHz+50MHz:
		60M2G7D

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		15MHz+60MHz:
		71M6G7D
		15MHz+70MHz:
		78M3G7D
		15MHz+80MHz:
		91M8G7D
	NR CA_n66B	5MHz+20MHz:
		22M6G7D
		5MHz+40MHz:
		43M3G7D
		10MHz+20MHz:
		27M3G7D
		10MHz+40MHz:
		48M0G7D
		15MHz+20MHz:
		32M4G7D
	NR CA_n77C (3450-3550)	40MHz+60MHz:
		97M2G7D
	NR CA_n77C (3700-3980)	100MHz+80MHz:
		175M9G7D
		100MHz+90MHz:
		185M8G7D

3.9 Test Frequencies

3.9.1 Reference test frequencies for NR operating band n2

3.9.1.1 Test frequencies for NR operating band n2 and SCS 15 kHz

CBW [MHz]	Range		Carrier centre [MHz]	Carrier centre [ARFCN]	SS block SCS [kHz]
5	Downlink	Low	1932.5	386500	15
		Mid	1960	392000	
		High	1987.5	397500	
	Uplink	Low	1852.5	370500	-
		Mid	1880	376000	
		High	1907.5	381500	
10	Downlink	Low	1935	387000	15
		Mid	1960	392000	
		High	1985	397000	
	Uplink	Low	1855	371000	-
		Mid	1880	376000	
		High	1905	381000	
15	Downlink	Low	1937.5	387500	15
		Mid	1960	392000	
		High	1982.5	396500	
	Uplink	Low	1857.5	371500	-
		Mid	1880	376000	
		High	1902.5	380500	
20	Downlink	Low	1940	388000	15
		Mid	1960	392000	
		High	1980	396000	
	Uplink	Low	1860	372000	-
		Mid	1880	376000	
		High	1900	380000	

3.9.1.2 Test frequencies for NR operating band n2 and SCS 30 kHz

CBW [MHz]	Range		Carrier centre [MHz]	Carrier centre [ARFCN]	SS block SCS [kHz]
10	Downlink	Low	1935	387000	15
		Mid	1960	392000	
		High	1985	397000	
	Uplink	Low	1855	371000	-
		Mid	1880	376000	
		High	1905	381000	
15	Downlink	Low	1937.5	387500	15
		Mid	1960	392000	
		High	1982.5	396500	
	Uplink	Low	1857.5	371500	-
		Mid	1880	376000	
		High	1902.5	380500	
20	Downlink	Low	1940	388000	15
		Mid	1960	392000	
		High	1980	396000	
	Uplink	Low	1860	372000	-
		Mid	1880	376000	
		High	1900	380000	

3.9.2 Reference test frequencies for NR operating band n5

3.9.2.1 Test frequencies for NR operating band n5 and SCS 15 kHz

CBW [MHz]	Range		Carrier centre [MHz]	Carrier centre [ARFCN]	SS block SCS [kHz]
5	Downlink	Low	871.5	174300	15
		Mid	881.5	176300	
		High	891.5	178300	
	Uplink	Low	826.5	165300	-
		Mid	836.5	167300	
		High	846.5	169300	
10	Downlink	Low	874	174800	15
		Mid	881.5	176300	
		High	889	177800	
	Uplink	Low	829	165800	-
		Mid	836.5	167300	
		High	844	168800	
15	Downlink	Low	876.5	175300	15
		Mid	881.5	176300	
		High	886.5	177300	
	Uplink	Low	831.5	166300	-
		Mid	836.5	167300	
		High	841.5	168300	
20	Downlink	Low	879	175800	15
		Mid	881.5	176300	
		High	884	176800	
	Uplink	Low	834	166800	-
		Mid	836.5	167300	
		High	839	167800	

3.9.2.2 Test frequencies for NR operating band n5 and SCS 30 kHz

Bandwidth [MHz]	Range		Carrier centre [MHz]	Carrier centre [ARFCN]	SS block SCS [kHz]
10	Downlink	Low	874	174800	30
		Mid	881.5	176300	
		High	889	177800	
	Uplink	Low	829	165800	-
		Mid	836.5	167300	
		High	844	168800	
15	Downlink	Low	876.5	175300	30
		Mid	881.5	176300	
		High	886.5	177300	
	Uplink	Low	831.5	166300	-
		Mid	836.5	167300	
		High	841.5	168300	
20	Downlink	Low	879	175800	30
		Mid	881.5	176300	
		High	884	176800	
	Uplink	Low	834	166800	-
		Mid	836.5	167300	
		High	839	167800	

3.9.3 Reference test frequencies for NR operating band n48

3.9.3.1 Test frequencies for NR operating band n48 and SCS 15 kHz

Bandwidth [MHz]	Range		Carrier centre [MHz]	Carrier centre [ARFCN]	SS block SCS [kHz]
5	Downlink & Uplink	Low	3552.51	636834	30
		Mid	3625.005	641667	
		High	3697.5	646500	
10	Downlink & Uplink	Low	3555	637000	30
		Mid	3624.99	641666	
		High	3694.98	646332	
15	Downlink & Uplink	Low	3557.52	637168	30
		Mid	3624.99	641666	
		High	3692.49	646166	
20	Downlink & Uplink	Low	3560.01	637334	30
		Mid	3624.99	641666	
		High	3690	646000	
40	Downlink & Uplink	Low	3570	638000	30
		Mid	3624.99	641666	
		High	3679.98	645332	
50	Downlink & Uplink	Low	3575.01	638334	30
		Mid	3624.99	641666	
		High	3675	645000	

3.9.3.2 Test frequencies for NR operating band n48 and SCS 30 kHz

CBW [MHz]	Range		Carrier centre [MHz]	Carrier centre [ARFCN]	SS block SCS [kHz]
10	Downlink & Uplink	Low	3555	637000	30
		Mid	3624.99	641666	
		High	3694.98	646332	
15	Downlink & Uplink	Low	3557.52	637168	30
		Mid	3624.99	641666	
		High	3692.49	646166	
20	Downlink & Uplink	Low	3560.01	637334	30
		Mid	3624.99	641666	
		High	3690	646000	
40	Downlink & Uplink	Low	3570	638000	30
		Mid	3624.99	641666	
		High	3679.98	645332	
50	Downlink & Uplink	Low	3575.01	638334	30
		Mid	3624.99	641666	
		High	3675	645000	
60	Downlink & Uplink	Low	3580.02	638668	30
		Mid	3624.99	641666	
		High	3669.99	644666	
80	Downlink & Uplink	Low	3590.01	639334	30
		Mid	3624.99	641666	
		High	3660	644000	
90	Downlink & Uplink	Low	3595.02	639668	30
		Mid	3624.99	641666	
		High	3654.99	643666	
100	Downlink & Uplink	Low	3600	640000	30
		Mid	3624.99	641666	
		High	3649.98	643332	

3.9.4 Reference test frequencies for NR operating band n66

3.9.4.1 Test frequencies for NR operating band n66 and SCS 15 kHz

CBW [MHz]	Range		Carrier centre [MHz]	Carrier centre [ARFCN]	SS block SCS [kHz]
5	Downlink	Low	2112.5	422500	15
		Mid	2155	431000	
		High	2197.5	439500	
	Uplink	Low	1712.5	342500	-
		Mid	1745	349000	
		High	1777.5	355500	
10	Downlink	Low	2115	423000	15
		Mid	2155	431000	
		High	2195	439000	
	Uplink	Low	1715	343000	-
		Mid	1745	349000	
		High	1775	355000	
15	Downlink	Low	2117.5	423500	15
		Mid	2155	431000	
		High	2192.5	438500	
	Uplink	Low	1717.5	343500	-
		Mid	1745	349000	
		High	1772.5	354500	
20	Downlink	Low	2120	424000	15
		Mid	2155	431000	
		High	2190	438000	
	Uplink	Low	1720	344000	-
		Mid	1745	349000	
		High	1770	354000	
25	Downlink	Low	2122.5	424500	15
		Mid	2155	431000	
		High	2187.5	437500	
	Uplink	Low	1722.5	344500	-
		Mid	1745	349000	
		High	1767.5	353500	
30	Downlink	Low	2125	425000	15
		Mid	2155	431000	
		High	2185	437000	
	Uplink	Low	1725	345000	-
		Mid	1745	349000	
		High	1765	353000	
40	Downlink	Low	2130	426000	15
		Mid	2155	431000	
		High	2180	436000	
	Uplink	Low	1730	346000	-
		Mid	1745	349000	
		High	1760	352000	

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3.9.4.2 Test frequencies for NR operating band n66 and SCS 30 kHz

CBW [MHz]	Range		Carrier centre [MHz]	Carrier centre [ARFCN]	SS block SCS [kHz]
10	Downlink	Low	2115	423000	15
		Mid	2155	431000	
		High	2195	439000	
	Uplink	Low	1715	343000	-
		Mid	1745	349000	
		High	1775	355000	
15	Downlink	Low	2117.5	423500	15
		Mid	2155	431000	
		High	2192.5	438500	
	Uplink	Low	1717.5	343500	-
		Mid	1745	349000	
		High	1772.5	354500	
20	Downlink	Low	2120	424000	15
		Mid	2155	431000	
		High	2190	438000	
	Uplink	Low	1720	344000	-
		Mid	1745	349000	
		High	1770	354000	
25	Downlink	Low	2122.5	424500	15
		Mid	2155	431000	
		High	2187.5	437500	
	Uplink	Low	1722.5	344500	-
		Mid	1745	349000	
		High	1767.5	353500	
30	Downlink	Low	2125	425000	15
		Mid	2155	431000	
		High	2185	437000	
	Uplink	Low	1725	345000	-
		Mid	1745	349000	
		High	1765	353000	
40	Downlink	Low	2130	426000	15
		Mid	2155	431000	
		High	2180	436000	
	Uplink	Low	1730	346000	-
		Mid	1745	349000	
		High	1760	352000	

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3.9.5 Reference test frequencies for NR operating band n77

3.9.5.1 Test frequencies for NR operating band n77 and SCS 15 kHz

3700-3980:

CBW [MHz]	Range		Carrier centre [MHz]	Carrier centre [ARFCN]	SS block SCS [kHz]
10	Downlink & Uplink	Low	3705	647000	15
		Mid	3840	656000	
		High	3975	665000	
15	Downlink & Uplink	Low	3707.52	647168	15
		Mid	3840	656000	
		High	3972.48	664832	
20	Downlink & Uplink	Low	3710.01	647334	15
		Mid	3840	656000	
		High	3969.99	664666	
30	Downlink & Uplink	Low	3714.99	647666	15
		Mid	3840	656000	
		High	3965.01	664334	
40	Downlink & Uplink	Low	3720	648000	15
		Mid	3840	656000	
		High	3960	664000	
50	Downlink & Uplink	Low	3725.01	648334	15
		Mid	3840	656000	
		High	3954.99	663666	

3450-3550:

CBW [MHz]	Range		Carrier centre [MHz]	Carrier centre [ARFCN]	SS block SCS [kHz]
10	Downlink & Uplink	Low	3455.01	630334	15
		Mid	3500.01	633334	
		High	3545.01	636334	
15	Downlink & Uplink	Low	3457.5	630500	15
		Mid	3500.01	633334	
		High	3542.49	636166	
20	Downlink & Uplink	Low	3460.02	630668	15
		Mid	3500.01	633334	
		High	3540	636000	
30	Downlink & Uplink	Low	3465	631000	15
		Mid	3500.01	633334	
		High	3534.99	635666	
40	Downlink & Uplink	Low	3470.01	631334	15
		Mid	3500.01	633334	
		High	3530.01	635334	
50	Downlink & Uplink	Low	3475.02	631668	15
		Mid	3500.01	633334	
		High	3525	635000	

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3.9.5.2 Test frequencies for NR operating band n77 and SCS 30 kHz

3700-3980:

CBW [MHz]	Range		Carrier centre [MHz]	Carrier centre [ARFCN]	SS block SCS [kHz]
10	Downlink & Uplink	Low	3705	647000	30
		Mid	3840	656000	
		High	3975	665000	
15	Downlink & Uplink	Low	3707.52	647168	30
		Mid	3840	656000	
		High	3972.48	664832	
20	Downlink & Uplink	Low	3710.01	647334	30
		Mid	3840	656000	
		High	3969.99	664666	
30	Downlink & Uplink	Low	3714.99	647666	30
		Mid	3840	656000	
		High	3965.01	664334	
40	Downlink & Uplink	Low	3720	648000	30
		Mid	3840	656000	
		High	3960	664000	
50	Downlink & Uplink	Low	3725.01	648334	30
		Mid	3840	656000	
		High	3954.99	663666	
60	Downlink & Uplink	Low	3730.02	648668	30
		Mid	3840	656000	
		High	3949.98	663332	
80	Downlink & Uplink	Low	3740.01	649334	30
		Mid	3840	656000	
		High	3939.99	662666	
90	Downlink & Uplink	Low	3745.02	649668	30
		Mid	3840	656000	
		High	3934.98	662332	
100	Downlink & Uplink	Low	3750	650000	30
		Mid	3840	656000	
		High	3930	662000	

3450-3550:

CBW [MHz]	Range		Carrier centre [MHz]	Carrier centre [ARFCN]	SS block SCS [kHz]
10	Downlink & Uplink	Low	3455.01	630334	30
		Mid	3500.01	633334	
		High	3545.01	636334	
15	Downlink & Uplink	Low	3457.5	630500	30
		Mid	3500.01	633334	
		High	3542.49	636166	
20	Downlink & Uplink	Low	3460.02	630668	30
		Mid	3500.01	633334	
		High	3540	636000	
30	Downlink & Uplink	Low	3465	631000	30
		Mid	3500.01	633334	
		High	3534.99	635666	
40	Downlink & Uplink	Low	3470.01	631334	30
		Mid	3500.01	633334	
		High	3530.01	635334	
50	Downlink & Uplink	Low	3475.02	631668	30
		Mid	3500.01	633334	
		High	3525	635000	
60	Downlink & Uplink	Low	3480	632000	30
		Mid	3500.01	633334	
		High	3519.99	634666	
80	Downlink & Uplink	Low	3490.02	632668	30
		Mid	3500.01	633334	
		High	3510	634000	
90	Downlink & Uplink	Low	3495	633000	30
		Mid	3500.01	633334	
		High	3504.99	633666	
100	Downlink & Uplink	Low	\	\	30
		Mid	3500.01	633334	
		High	\	\	

4 Description of Tests

4.1 Conducted Output Power

Measurement Procedure: FCC KDB 971168 D01 V03r01 Section 5.2.1

The transmitter output was connected to a calibrated coaxial cable, attenuator and power meter, the other end of which was connected to a Base Station Simulator. The Base Station Simulator was set to force the EUT to its maximum power setting. The power output at the transmitter antenna port was determined by adding the value of the cable insertion loss to the power reading. The tests were performed at three frequencies (low channel, middle channel and high channel) and on the highest power levels, which can be setup on the transmitters.

Remark: Reference test setup 1

4.2 Effective (Isotropic) Radiated Power of Transmitter

Measurement Procedure: FCC KDB 971168 D01 V03r01 Section 5.8.4

Calculate power in dBm by the following formula:

ERP (dBm) = Conducted Power (dBm) + antenna gain (dBd)

EIRP(dBm) = Conducted Power (dBm) + antenna gain (dBi)

EIRP=ERP+2.15dB

4.3 Occupied Bandwidth

Measurement Procedure: FCC KDB 971168 D01 V03r01 Section 4.2 & 4.3

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured. The transmitter output was connected to a calibrated coaxial cable, attenuator and Spectrum analyser, the other end of which was connected to a Base Station Simulator. The Base Station Simulator was set to force the EUT to its maximum power setting. The tests were performed at three frequencies (low channel, middle channel and high channel).The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts. The resolution bandwidth shall be set to as close to 1 percent of the selected span as is possible without being below 1 percent. The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical, a sampling detector shall be used since a peak or, peak hold, may produce a wider bandwidth than actual. The trace data points are recovered and are directly summed in linear terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5 percent of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points. This frequency is recorded. The span between the two recorded frequencies is the occupied bandwidth.

Remark: Reference test setup 1

Test Settings

1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 99% occupied bandwidth and 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 the 99% occupied bandwidth observed in Step 7

4.4 Band Edge at Antenna Terminals

Measurement Procedure: FCC KDB 971168 D01 V03r01 Section 6.0

The transmitter output was connected to a calibrated coaxial cable, attenuator and Spectrum analyser, the other end of which was connected to a Base Station Simulator. The Base Station Simulator was set to force the EUT to its maximum power setting. The tests were performed at two frequencies (low channel and high channel).in the 1MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of 100kHz or 1% of the emission bandwidth of the fundamental emission of the transmitter may be employed. The EUT emission bandwidth is measured as the width of the signal between two points, outside of which all emission are attenuated at least 26dB below the transmitter power. The video bandwidth of the spectrum analyzer was set at thrice the resolution bandwidth. Detector Mode was set to peak or peak hold power.

Remark: Reference test setup 1

Test Settings

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

4.5 Spurious And Harmonic Emissions at Antenna Terminal

Measurement Procedure: FCC KDB 971168 D01 V03r01 Section 6.0

The transmitter output was connected to a calibrated coaxial cable, attenuator and Spectrum analyzer, the other end of which was connected to a Base Station Simulator. The Base Station Simulator was set to force the EUT to its maximum power setting. The tests were performed at three frequencies (low channel and high channel).The level of the carrier and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10th harmonic. On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least 43 + 10 log(P) dB. Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. 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. 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.

Remark: Reference test setup 1

Test Settings

1. Start frequency was set to 9kHz and stop frequency was set to at least 10* the fundamental frequency(Separated into at least two plots per channel)
2. Detector = RMS
3. Trace mode = trace average for continuous emissinos, max hold for pulse emissions
4. Sweep time = auto couple
5. The trace was allowed to stabilize
6. Please see test notes below for RBW and VBW settings

4.6 Peak-Average Ratio

Measurement Procedure: FCC KDB 971168 D01 V03r01 Section 5.7.2

A peak to average ratio measurement is performed at the conducted port of the EUT. For WCDMA signals, the spectrum analyzers Complementary Cumulative Distribution Function (CCDF) measurement profile is used to determine the largest deviation between the average and the peak power of the EUT in a given bandwidth. The CCDF curve shows how much time the peak waveform spends at or above a given average power level. The percent of time the signal spends at or above the level defines the probability for that particular power level. For GSM signals, an average and a peak trace are used on a spectrum analyzer to determine the largest deviation between the average and the peak power of the EUT in a bandwidth greater than the emission bandwidth. The traces are generated with the spectrum analyzer set to zero span mode.

Remark: Reference test setup 1

Test Settings

1. The signal analyzer's CCDF measurement profile is enabled
2. Frequency = carrier center frequency
3. Measurement BW > Emission bandwidth of signal
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

4.7 Field Strength of Spurious Radiation

Measurement Procedure: FCC KDB 971168 D01 V03r01 Section 5.8

Below 1GHz test procedure as below:

1). The EUT was powered ON and placed on a 80cm high table in the chamber. The antenna of the transmitter was extended to its maximum length.

2). The disturbance of the transmitter was maximized on the test receiver display by raising and lowering from 1m to 4m (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) the receive antenna and by rotating through 360° the turntable. After the fundamental emission was maximized, a field strength measurement was made.

3). Steps 1) and 2) were performed with the EUT and the receive antenna in both vertical and horizontal polarization.

4). Test the EUT in the lowest channel, the middle channel ,the Highest channel.

5). The radiation measurements are performed in X, Y, Z axis positioning. And found the X axis positioning which it is worse case, Only the test worst case mode is recorded in the report.

6). Repeat above procedures until all frequencies measured was complete.

E (dBμV/m) = Measured amplitude level (dBμV) + (Cable Loss (dB) + Antenna Factor (dB/m) – AMP(dB))

EIRP (dBm) = E (dBμV/m) + 20 log D − 104.8; where D is the measurement distance in meters

Above 1GHz test procedure as below:

1) Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber

2) Calculate power in dBm by the following formula:

E (dBμV/m) = Measured amplitude level (dBμV) + (Cable Loss (dB) + Antenna Factor (dB/m) – AMP(dB))

EIRP (dBm) = E (dBμV/m) + 20 log D − 104.8; where D is the measurement distance in meters

3). Test the EUT in the lowest channel, the middle channel the Highest channel

4). The radiation measurements are performed in X, Y, Z axis positioning. And found the X axis positioning which it is worse case, Only the test worst case mode is recorded in the report.

5). Repeat above procedures until all frequencies measured was complete

Remark1: Reference test setup 2

Remark2: The emission below 18G were measured at a 3m test distance, while emissions above 18GHz were measured at a 1m test distance. At a measurement distance of 1 meter the limit line was increased by 20*LOG(3/1) = 9.54 dB.

Remark: Reference test setup 2

Remark:

1) The field strength is calculated by adding the Antenna Factor, Cable Factor & AMP. The basic equation with a sample calculation is as follows:

AF = Antenna Factor(dB/m)

Factor = Cable Factor(dB) - Preamplifier (dB)

Level = Reading Level + AF + Factor -95.26

Margin = Limit – Level

2) Scan from 9kHz to 40GHz, The disturbance between 9KHz to 30MHz and 18GHz to 40GHz was very low, and the harmonics were the highest point could be found when testing, so only the harmonics had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.

3) All modes have been tested, but only the worst case data displayed in this report.

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4.8 Frequency Stability / Temperature Variation

Measurement Procedure:
Frequency stability testing is performed in accordance with the guidelines of FCC KDB 971168 D01 V03r01 Section 9
The frequency stability of the transmitter is measured by:

a.) **Temperature:** The temperature is varied from -30°C to +50°C in 10°C increments using an environmental chamber.

b.) **Primary Supply Voltage:** The primary supply voltage is varied from 85% to 115% of the nominal value for non hand-carried battery and AC powered equipment. For hand-carried, battery-powered equipment, primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacturer.

Specification – The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. The frequency stability of the transmitter shall be maintained within ±0.00025% (±2.5 ppm) of the center frequency.

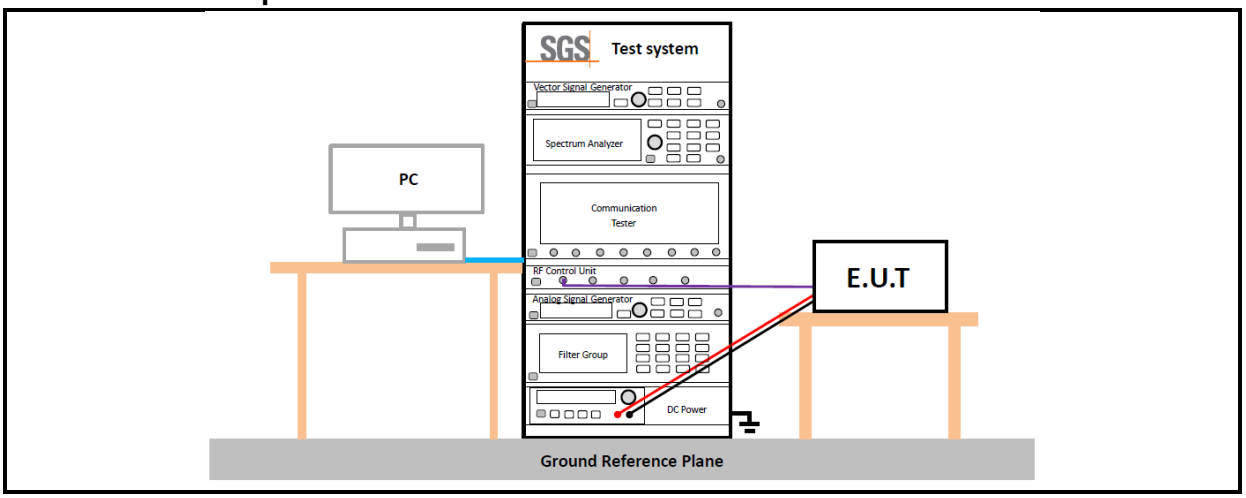
Time Period and Procedure:

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. A period of at least one half-hour is provided to allow stabilization of the equipment at each temperature level.

Remark: Reference test setup 3

4.9 Test Setups

4.9.1 Test Setup 1



4.9.2 Test Setup 2

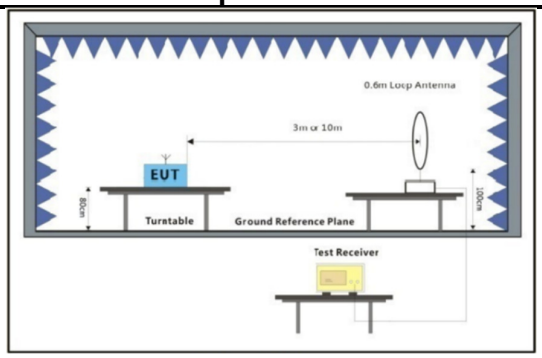


Figure 1. Below 30MHz

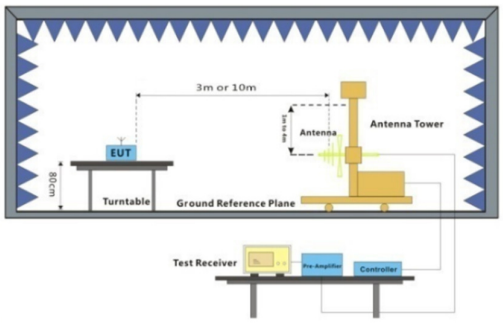


Figure 2. 30MHz to 1GHz

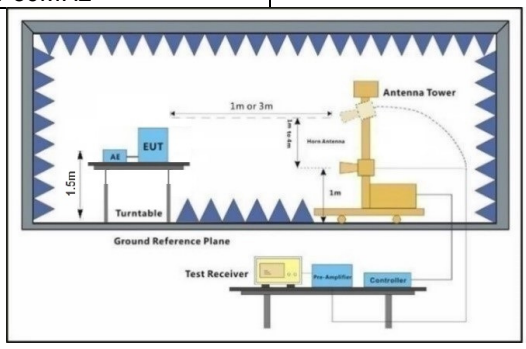
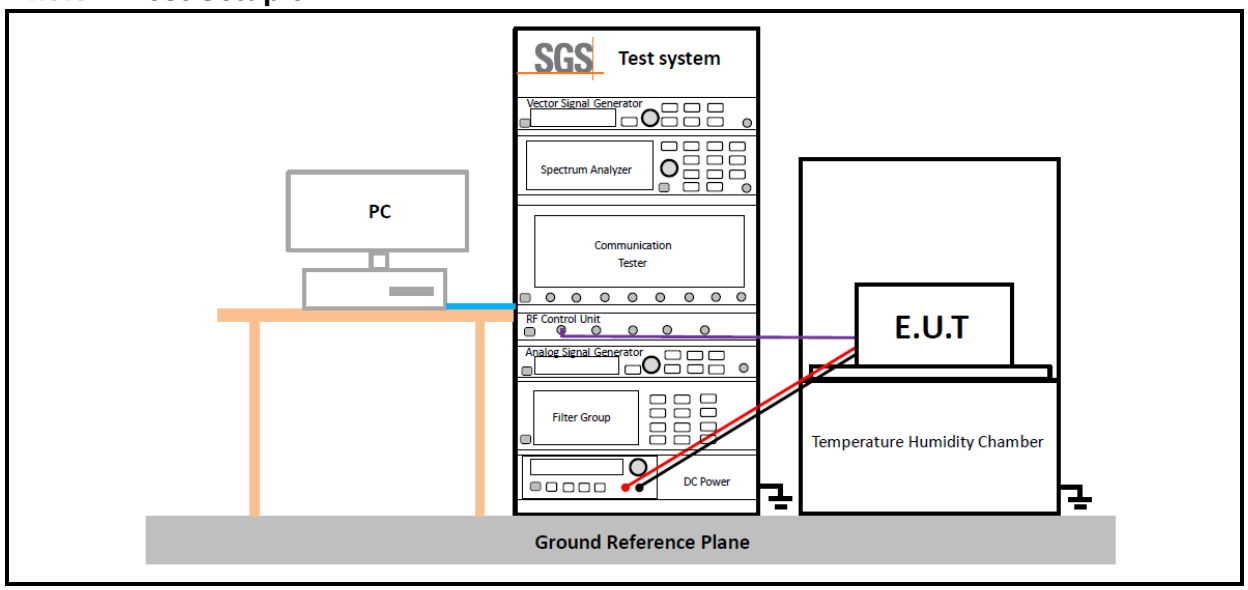


Figure 3. above 1GHz

4.9.3 Test Setup 3



4.10 Test Conditions

Transmit Output Power Data - Average Power, Total	
Test Case	**Test Conditions**
Test Environment	Ambient Climate & Rated Voltage
Test Setup	Test Setup 1
RF Channels (TX)	L, M, H (L= low channel, M= middle channel, H= high channel)
Test Mode	NR/TM1; NR/TM2; NR/TM3; NR/TM4; NR/TM5
Peak-to-Average Ratio	
Test Case	**Test Conditions**
Test Environment	Ambient Climate & Rated Voltage
Test Setup	Test Setup 1
RF Channels (TX)	L, M, H (L= low channel, M= middle channel, H= high channel)
Test Mode	NR/TM5; NR/TM9
Bandwidth - Occupied Bandwidth	
Test Case	**Test Conditions**
Test Environment	Ambient Climate & Rated Voltage
Test Setup	Test Setup 1
RF Channels (TX)	M (M= middle channel)
Test Mode	NR/TM1; NR/TM2; NR/TM3; NR/TM4; NR/TM5; NR/TM6; NR/TM7; NR/TM8; NR/TM9
Bandwidth - Emission Bandwidth	
Test Case	**Test Conditions**
Test Environment	Ambient Climate & Rated Voltage
Test Setup	Test Setup 1
RF Channels (TX)	M (M= middle channel)
Test Mode	NR/TM1; NR/TM2; NR/TM3; NR/TM4; NR/TM5; NR/TM6; NR/TM7; NR/TM8; NR/TM9
Adjacent Channel Leakage Ratio	
Test Case	**Test Conditions**
Test Environment	Ambient Climate & Rated Voltage
Test Setup	Test Setup 1
RF Channels (TX)	L, M, H (L= low channel, M= middle channel, H= high channel)
Test Mode	NR/TM1
Band Edges Compliance	
Test Case	**Test Conditions**

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Test Environment	Ambient Climate & Rated Voltage
Test Setup	Test Setup 1
RF Channels (TX)	L, H (L= low channel, H= high channel)
Test Mode	NR/TM1; NR/TM6
Spurious Emission at Antenna Terminals	
Test Case	**Test Conditions**
Test Environment	Ambient Climate & Rated Voltage
Test Setup	Test Setup 1
RF Channels (TX)	L, M, H (L= low channel, M= middle channel, H= high channel)
Test Mode	NR/TM1
Field Strength of Spurious Radiation	
Test Case	**Test Conditions**
Test Environment	Ambient Climate & Rated Voltage
Test Setup	Test Setup 2
RF Channels (TX)	L, M, H (L= low channel, M= middle channel, H= high channel)
Test Mode	NR/TM1 Remark: All bandwidth and modulation of NR have been pre tested, and only the worst results are reflected in the report.
Frequency Stability	
Test Case	**Test Conditions**
Test Environment	(1) -30 °C to +50 °C with step 10 °C at Rated Voltage (2) VL, VN and VH of Rated Voltage at Ambient Climate.
Test Setup	Test Setup 3
RF Channels (TX)	M (M= middle channel)
Test Mode	NR/TM1; NR/TM6 The report only show the bandwidth with the worst case.

5 Main Test Instruments

Lab A:

RF conducted test					
Test Equipment	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal. date (yyyy/mm/dd)**	**Cal.Due date (yyyy/mm/dd)**
Spectrum Analyzer	Keysight	N9020A	SZ-WRG-M-004	2022/09/22	2023/09/21
				2023/09/14	2024/09/13
Radio Communication Tester	Anritsu	MT8821C	SZ-WRG-M-014	2022/09/22	2023/09/21
				2023/09/14	2024/09/13
Radio Communication Tester	Anritsu	MT8000A	SZ-WRG-M-013	2022/09/22	2023/09/21
				2023/09/14	2024/09/13
DC power supply	HYELEC	HY3005B	SZ-WRG-M-024	2022/09/22	2023/09/21
				2023/09/14	2024/09/13

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Lab B:

RF conducted test					
Test Equipment	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal. date (yyyy/mm/dd)**	**Cal.Due date (yyyy/mm/dd)**
Shielding Room	Brilliant-emc	N/A	SUWI-04-01-06	2021/05/08	2024/05/07
Temperature and humidity meter	MingGao	TH101B	SUWI-01-01-07	2023/02/06	2024/02/05
Signal Analyzer	ROHDE&SCHWARZ	FSV3030	SUWI-01-02-02	2023/05/11	2024/05/10
Measurement Software	Tonscend	JS1120-3 Test System V 2.6.88.0336	SUWI-02-09-09	NCR	NCR
Radio Communication Analyzer	Anritsu	MT8821C	SUWI-01-26-03	2022/11/23	2023/11/22
				2023/11/21	2024/11/20
Wideband Radio Communication Tester	ROHDE&SCHWARZ	CMW500	SUWI-01-16-05	2023/02/06	2024/02/05
DC Power Supply	HYELEC	HY3005B	SUWI-01-18-01	2023/02/06	2024/02/05
Temperature Chamber	ESPEC	SU-242	SUWI-01-13-01	2023/02/06	2024/02/05
Wideband Radio Communication Test Ststion	Anritsu	MT8000A	SUWI-01-34-02	2022/09/16	2023/09/15
				2023/09/12	2024/09/11
Signal Analyzer	ROHDE&SCHWARZ	FSW43	SUWI-01-02-04	2023/05/11	2024/05/10

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RSE Test System					
Test Equipment	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal. date (yyyy/mm/dd)**	**Cal.Due date (yyyy/mm/dd)**
Semi-Anechoic Chamber	Brilliant-emc	N/A	SUWI-04-02-02	2021/11/25	2024/11/24
Temperature and humidity meter	MingGao	TH101B	SUWI-01-01-13	2023/02/07	2024/02/06
Signal Analyzer	ROHDE&SCHWARZ	FSW43	SUWI-01-02-04	2023/05/11	2024/05/10
Signal Analyzer*	KEYSIGHT	N9020A	SUWI-01-02-06	2022/11/23	2023/11/22
Test receiver	ROHDE&SCHWARZ	ESR7	SUWI-01-10-01	2023/02/08	2024/02/07
Receiving antenna	SCHWRZBECK MESS-ELEKTRONIK	VULB 9168	SUWI-01-11-04	2021/12/05	2023/12/04
Receiving antenna	SCHWRZBECK MESS-ELEKTRONIK	BBHA 9120D	SUWI-01-11-05	2021/12/05	2023/12/04
Receiving antenna	SCHWRZBECK MESS-ELEKTRONIK	BBHA 9170	SUWI-01-11-03	2023/05/12	2024/05/11
Active Loop Antenna	SCHWRZBECK MESS-ELEKTRONIK	FMZB 1519B	SUWI-01-21-01	2023/05/13	2024/05/12
Amplifier*	Tonscend	TAP9K3G32	SUWI-01-14-06	2022/11/23	2023/11/22
Amplifier*	Tonscend	TAP01018050	SUWI-01-14-04	2022/11/23	2023/11/22
Amplifier*	Tonscend	TAP30M7G30	SUWI-01-14-05	2022/11/23	2023/11/22
Wideband Radio Communication Tester	Anritsu	MT8820C	SUWI-01-16-08	2023/02/06	2024/02/05
Radio Communication Analyzer*	Anritsu	MT8821C	SUWI-01-26-03	2022/11/23	2023/11/22
UXM 5G Wireless Test Platform	KEYSIGHT	E7515B	SUWI-01-04-01	2023/02/06	2024/02/05
Measurement Software	Tonscend	JS32-RE V4.0.0.0	SUWI-02-09-04	NCR	NCR

Note*:The equipment will not be used after 2023/11/22.

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6 Measurement Uncertainty

For a 95% confidence level (k = 2), the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 as following:

Lab A:

No.	Item	Measurement Uncertainty
1	Radio Frequency	± 9.84Hz
2	Duty cycle	± 0.185%
3	Occupied Bandwidth	± 0.20%
4	RF conducted power	± 0.42dB
5	RF power density	± 1.97dB
6	Conducted Spurious emissions	± 0.42dB
Remark: The U_{lab} (lab Uncertainty) is less than $U_{cispr/ETSI}$ (CISPR/ETSI Uncertainty), so the test results – compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit; – non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.		

Lab B:

No.	Item	Measurement Uncertainty
1	Total RF power, conducted	±0.54dB
2	RF power density, conducted	±1.03dB
3	Spurious emissions, conducted	±0.54dB
4	Radio Frequency	±1.0 %
5	Duty Cycle	±0.37%
6	Occupied Bandwidth	±1.0 %
7	Radiated Emission	± 3.13dB (9k -30MHz)
		± 4.88dB (30M -1GHz)
		± 4.75dB (1GHz to 18GHz)
		± 4.77dB (Above 18GHz)
Remark: The U_{lab} (lab Uncertainty) is less than $U_{cispr/ETSI}$ (CISPR/ETSI Uncertainty), so the test results – compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit; – non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.		

7 Appendixes

Appendix A.1	WWAN Setup Photos
Appendix B.9	NR Band n2
Appendix B.10	NR Band n5
Appendix B.11	NR Band n48
Appendix B.12	NR Band n66
Appendix B.13	NR Band n77(3450-3550)
Appendix B.14	NR Band n77(3700-3980)
Appendix B.15	NR CA_n5B
Appendix B.16	NR CA_n48B
Appendix B.17	NR CA_n66B
Appendix B.18	NR CA_n77C(3450-3550)
Appendix B.19	NR CA_n77C(3700-3980)

---End of Report---

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