

Report No.: SEWM2311000456RG02
 Rev.: 01
 Page: 1 of 49

TEST REPORT

Application No.: SEWM2311000456RG
Applicant: Xiaomi Communications Co., Ltd.
Address of Applicant: #019, 9th Floor, Building 6, 33 Xi'erqi Middle Road, Haidian District, Beijing, China, 100085
Manufacturer: Xiaomi Communications Co., Ltd.
Address of Manufacturer: #019, 9th Floor, Building 6, 33 Xi'erqi Middle Road, Haidian District, Beijing, China, 100085
EUT Description: Mobile Phone
Model No.: 23124RN87G
Trade Mark: Redmi
FCC ID: 2AFZZN87G
Standards: 47 CFR Part 2
 47 CFR Part 22
 47 CFR Part 27
Date of Receipt: 2023/11/13
Date of Test: 2023/11/22 to 2023/12/15
Date of Issue: 2023/12/15

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

Authorized Signature:

Well Wei
 Wireless Laboratory Manager




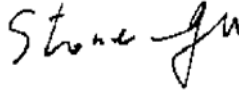
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1 Version

Revision Record				
Version	Chapter	Date	Modifier	Remark
01		2023/12/15		Original

Prepared By		 <hr/> (Levi Li) / Test Engineer
Checked By		 <hr/> (Stone Gu) / Reviewer



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2 Test Summary

2.1 NR Band n5

Test Item	FCC Rule No.	Requirements	Test Result	Verdict
Effective (Isotropic) Radiated Power Output Data	§2.1046, §22.913(a)(5)	FCC: ERP ≤ 7 W	Section 1 of Appendix B.18	Pass
Frequency Stability	§2.1055(a)(1)(b) §2.1055(d)(2) §22.355	±2.5ppm.	Section 2 of Appendix B.18	Pass
Field Strength of Spurious Radiation	§2.1053, §22.917(a)	FCC: ≤ -13 dBm/100 kHz.	Section 3 of Appendix B.18	Pass
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.	Section 4 of Appendix B.18	Pass
Peak-Average Ratio	§22.913(d)	Limit≤13 dB	Section 5 of Appendix B.18	Pass
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 6 of Appendix B.18	Pass
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 6 of Appendix B.18	Pass



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2.2 NR Band n7/ NR Band n38/ NR Band n41

Test Item	FCC Rule No.	Requirements	Test Result	Verdict
Effective (Isotropic) Radiated Power Output Data	§2.1046, §27.50(h)(2)	EIRP ≤ 2W	Section 1 of Appendix B.19&B.20&B.21	Pass
Frequency Stability	§2.1055(a)(1)(b) §2.1055(d)(2) §27.54	Within authorized bands of operation/frequency block.	Section 2 of Appendix B.19&B.20&B.21	Pass
Field Strength of Spurious Radiation	§2.1053, §27.53(m)	<p>Channel Edge -25 dBm/1 MHz -25 dBm/1 MHz 9 kHz 9.5 MHz X MHz 10th harmonics X=Max {6MHz, EBW}</p>	Section 3 of Appendix B.19&B.20&B.21	Pass
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.	Section 4 of Appendix B.19&B.20&B.21	Pass
Peak-Average Ratio	---	≤13 dB	Section 5 of Appendix B.19&B.20&B.21	Pass
Spurious Emission at Antenna Terminals	§2.1051, §27.53(m)	<p>Channel Edge -25 dBm/1 MHz -25 dBm/1 MHz 9 kHz 9.5 MHz X MHz 10th harmonics X=Max {6MHz, EBW}</p>	Section 6 of Appendix B.19&B.20&B.21	Pass
Band Edges Compliance	§2.1051, §27.53(m4)	<p>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 than 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.</p>	Section 6 of Appendix B.19&B.20&B.21	Pass



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2.3 NR Band n66

Test Item	FCC Rule No.	Requirements	Test Result	Verdict
Effective (Isotropic) Radiated Power Output Data	§2.1046, §27.50(d)(4)	EIRP ≤ 1 W	Section 1 of Appendix B.22	Pass
Frequency Stability	§2.1055(a)(1)(b) §2.1055(d)(2) §27.54	Within authorized bands of operation/frequency block.	Section 2 of Appendix B.22	Pass
Field Strength of Spurious Radiation	§2.1053, §27.53(h)	≤ -13 dBm/1 MHz.	Section 3 of Appendix B.22	Pass
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.	Section 4 of Appendix B.22	Pass
Peak-Average Ratio	§27.50(d)(5)	Limit≤13 dB	Section 5 of Appendix B.22	Pass
Spurious Emission at Antenna Terminals	§2.1051, §27.53(h)	≤ -13 dBm/1 MHz, from 9 kHz to 10 th harmonics but outside authorized operating frequency ranges.	Section 6 of Appendix B.22	Pass
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 6 of Appendix B.22	Pass



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2.4 NR Band n77

3700-3980MHz:

Test Item	FCC Rule No.	Requirements	Test Result	Verdict
Effective (Isotropic) Radiated Power Output Data	§2.1046, §27.50(j)(3)	EIRP ≤ 1W	Section 1 of Appendix B.24	Pass
Frequency Stability	§2.1055(a)(1)(b) §2.1055(d)(2) §27.54	Within authorized bands of operation/frequency block.	Section 2 of Appendix B.24	Pass
Field Strength of Spurious Radiation	§2.1053, §27.53(l)(2)	not exceed -13 dBm/MHz	Section 3 of Appendix B.24	Pass
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.	Section 4 of Appendix B.24	Pass
Peak-Average Ratio	---	≤13 dB	Section 5 of Appendix B.24	Pass
Spurious Emission at Antenna Terminals	§2.1051, §27.53(l)(2)	not exceed -13 dBm/MHz.	Section 6 of Appendix B.24	Pass
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 6 of Appendix B.24	Pass



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3450-3550MHz:

Test Item	FCC Rule No.	Requirements	Test Result	Verdict
Effective (Isotropic) Radiated Power Output Data	§2.1046, §27.50(k)(3)	EIRP ≤ 30dBm	Section 1 of Appendix B.23	Pass
Frequency Stability	§2.1055(a)(1)(b) §2.1055(d)(2) §27.54	Within authorized bands of operation/ frequency block.	Section 2 of Appendix B.23	Pass
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.23	Pass
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.	Section 4 of Appendix B.23	Pass
Peak-Average Ratio	§27.50(k)(4)	FCC: Limit≤13 dB	Section 5 of Appendix B.23	Pass
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 6 of Appendix B.23	Pass
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 6 of Appendix B.23	Pass



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2.5 NR Band n78

3700-3800MHz:

Test Item	FCC Rule No.	Requirements	Test Result	Verdict
Effective (Isotropic) Radiated Power Output Data	§2.1046, §27.50(j)(3)	EIRP ≤ 1W	Section 1 of Appendix B.26	Pass
Field Strength of Spurious Radiation	§2.1053, §27.53(l)(2)	not exceed -13 dBm/MHz	Section 2 of Appendix B.26	Pass

3450-3550MHz:

Test Item	FCC Rule No.	Requirements	Test Result	Verdict
Effective (Isotropic) Radiated Power Output Data	§2.1046, §27.50(k)(3)	EIRP ≤ 30dBm	Section 1 of Appendix B.25	Pass
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 2 of Appendix B.25	Pass



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Wireless Laboratories

South of No. 6 Plant, No. 1, Runsheng Road, Suzhou Industrial Park, Suzhou Area, China (Jiangsu) Pilot Free Trade Zone 215000
中国·苏州·中国(江苏)自由贸易试验区苏州片区苏州工业园区润胜路1号的6号厂房南楼 邮编: 215000

t (86-512) 62992980 www.sgs.com.cn
t (86-512) 62992980 sgs.china@sgs.com

3 General Information

3.1 Client Information

Applicant:	Xiaomi Communications Co., Ltd.
Address of Applicant:	#019, 9th Floor, Building 6, 33 Xi'erqi Middle Road, Haidian District, Beijing, China, 100085
Manufacturer:	Xiaomi Communications Co., Ltd.
Address of Manufacturer:	#019, 9th Floor, Building 6, 33 Xi'erqi Middle Road, Haidian District, Beijing, China, 100085

3.2 Test Location

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:	Levi Li, King-p Li

3.3 Test Facility

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

- 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**
 SGS-CSTC STANDARDS TECHNICAL SERVICES (SUZHOU) CO., LTD. has been recognized as an accredited testing laboratory.
 Designation Number: CN1312.
 Test Firm Registration Number: 717327



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3.4 General Description of EUT

EUT Description:	Mobile Phone		
Model No.:	23124RN87G		
Trade Mark:	Redmi		
Hardware Version:	13510C3V		
Software Version:	MIUI 14		
Power Supply:	DC 3.84V from internal rechargeable battery which can be charged by AC/DC adapter.		
IMEI:	RF Conducted	Sample1:865408060040960(IMEI1)/865408060040978(IMEI2) Sample2:865408060039707(IMEI1)/865408060039715(IMEI2)	
	RSE	Sample1:865408060041505(IMEI1)/865408060041513(IMEI2)	
HPUE Power Class:	Class 2: NR Band n77; NR Band n78		
Antenna Type:	PIFA Antenna		
Antenna Gain:	NR Band n5:	-4.1dBi (Ant1); -2dBi (Ant4)	
	NR Band n7:	1.3dBi (Ant1); -2.6dBi (Ant4)	
	NR Band n38:	1.7dBi (Ant1); -2.5dBi (Ant3); -2.3dBi (Ant4); -2.8dBi (Ant7)	
	NR Band n41:	1.7dBi (Ant1); -2.1dBi (Ant3); -2dBi (Ant4); -1.7dBi (Ant7)	
	NR Band n66:	-1.8dBi (Ant1); -1.6dBi (Ant4)	
	NR Band n77:	-2.1dBi (Ant2); -2.7dBi (Ant3); -2.8dBi (Ant5); -1.2dBi (Ant7)	
	NR Band n78:	-2.6dBi (Ant2); -3.6dBi (Ant3); -2.8dBi (Ant5); -1.2dBi (Ant7)	
	Note: The antenna gain are derived from the gain information report provided by the manufacturer.		
RF Cable:	0.8dB(Below 1GHz)	1.0dB(1.0~2.4GHz)	1.2dB(2.4~3.4GHz)
	1.5dB(Above 3.4GHz)		
Remark: 1. All antennas of Conduction Power & EIRP 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.			



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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	101.0 kPa Selected Values During Tests	
Relative Humidity	44-46 % RH Ambient	
Value	Temperature(°C)	Voltage(V)
NTNV	22~23	3.84
LTLV	-30	3.6
LTHV	-30	4.25
HTLV	50	3.6
HTHV	50	4.25

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.



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3.8 Technical Specification

Characteristics	Description		
Radio System Type	<input checked="" type="checkbox"/> SA <input checked="" type="checkbox"/> NSA		
Supported Frequency Range	Band	TX	RX
	NR Band n5	824 to 849 MHz	869 to 894 MHz
	NR Band n7	2500 to 2570 MHz	2620 to 2690 MHz
	NR Band n38	2570 to 2620 MHz	2570 to 2620 MHz
	NR Band n41	2496 to 2690 MHz	2496 to 2690 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 Band n78*	3700 to 3800 MHz	3700 to 3800 MHz
		3450 to 3550 MHz	3450 to 3550 MHz
ENDC: DC_2A_n66A; DC_2A_n78A; DC_38A_n78A; DC_41A_n78A; DC_4A_n38A; DC_4A_n41A; DC_4A_n78A; DC_4A_n7A; DC_5A_n78A; DC_66A_n38A; DC_66A_n41A; DC_66A_n78A; DC_66A_n7A; DC_7A_n5A; DC_7A_n78A; DC_26A_n78A; Remark: ENDC& NR CA only test RSE, report only show worst mode. Note*: The frequency range of NR Band n77 covers the frequency range of NR Band n78, and NR Band n77 was fully tested, NR Band n78 only test the items of Power and RSE.			
Supported Channel Bandwidth	NR Band n5	SCS 15kHz:	
		<input checked="" type="checkbox"/> 5 MHz	<input checked="" type="checkbox"/> 10 MHz <input checked="" type="checkbox"/> 15 MHz <input checked="" type="checkbox"/> 20 MHz
	NR Band n7	SCS 30kHz:	
		<input checked="" type="checkbox"/> 10 MHz	<input checked="" type="checkbox"/> 15 MHz <input checked="" type="checkbox"/> 20 MHz
		SCS 15kHz:	
		<input checked="" type="checkbox"/> 5 MHz	<input checked="" type="checkbox"/> 10 MHz <input checked="" type="checkbox"/> 15 MHz <input checked="" type="checkbox"/> 20 MHz
		<input checked="" type="checkbox"/> 25 MHz	<input checked="" type="checkbox"/> 30 MHz <input checked="" type="checkbox"/> 40 MHz <input checked="" type="checkbox"/> 50 MHz
		SCS 30kHz:	
	<input checked="" type="checkbox"/> 10 MHz	<input checked="" type="checkbox"/> 15 MHz <input checked="" type="checkbox"/> 20 MHz <input checked="" type="checkbox"/> 25 MHz	
	<input checked="" type="checkbox"/> 30 MHz	<input checked="" type="checkbox"/> 40 MHz <input checked="" type="checkbox"/> 50 MHz	
NR Band n38	SCS 15kHz:		
	<input checked="" type="checkbox"/> 5 MHz	<input checked="" type="checkbox"/> 10 MHz <input checked="" type="checkbox"/> 15 MHz <input checked="" type="checkbox"/> 20 MHz	



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		<input checked="" type="checkbox"/> 25 MHz <input checked="" type="checkbox"/> 30 MHz <input checked="" type="checkbox"/> 40 MHz		
		SCS 30kHz:		
		<input checked="" type="checkbox"/> 10 MHz <input checked="" type="checkbox"/> 15 MHz <input checked="" type="checkbox"/> 20 MHz <input checked="" type="checkbox"/> 25 MHz		
		<input checked="" type="checkbox"/> 30 MHz <input checked="" type="checkbox"/> 40 MHz		
	NR Band n41	SCS 15kHz:	<input checked="" type="checkbox"/> 10 MHz <input checked="" type="checkbox"/> 15 MHz <input checked="" type="checkbox"/> 20 MHz <input checked="" type="checkbox"/> 25 MHz	
		<input checked="" type="checkbox"/> 30 MHz <input checked="" type="checkbox"/> 40 MHz <input checked="" type="checkbox"/> 50 MHz		
		SCS 30kHz:	<input checked="" type="checkbox"/> 10 MHz <input checked="" type="checkbox"/> 15 MHz <input checked="" type="checkbox"/> 20 MHz <input checked="" type="checkbox"/> 25 MHz	
		<input checked="" type="checkbox"/> 30 MHz <input checked="" type="checkbox"/> 40 MHz <input checked="" type="checkbox"/> 50 MHz <input checked="" type="checkbox"/> 60 MHz		
		<input checked="" type="checkbox"/> 70 MHz <input checked="" type="checkbox"/> 80 MHz <input checked="" type="checkbox"/> 90 MHz <input checked="" type="checkbox"/> 100 MHz		
		NR Band n66	SCS 15kHz:	<input checked="" type="checkbox"/> 5 MHz <input checked="" type="checkbox"/> 10 MHz <input checked="" type="checkbox"/> 15 MHz <input checked="" type="checkbox"/> 20 MHz
			<input checked="" type="checkbox"/> 25 MHz <input checked="" type="checkbox"/> 30 MHz <input checked="" type="checkbox"/> 35 MHz <input checked="" type="checkbox"/> 40 MHz	
	SCS 30kHz:		<input checked="" type="checkbox"/> 10 MHz <input checked="" type="checkbox"/> 15 MHz <input checked="" type="checkbox"/> 20 MHz <input checked="" type="checkbox"/> 25 MHz	
	<input checked="" type="checkbox"/> 30 MHz <input checked="" type="checkbox"/> 35 MHz <input checked="" type="checkbox"/> 40 MHz			
	NR Band n77		SCS 15kHz	<input checked="" type="checkbox"/> 10 MHz <input checked="" type="checkbox"/> 15 MHz <input checked="" type="checkbox"/> 20 MHz <input checked="" type="checkbox"/> 25 MHz
		<input checked="" type="checkbox"/> 30 MHz <input checked="" type="checkbox"/> 40 MHz <input checked="" type="checkbox"/> 50 MHz		
		SCS 30kHz	<input checked="" type="checkbox"/> 10 MHz <input checked="" type="checkbox"/> 15 MHz <input checked="" type="checkbox"/> 20 MHz <input checked="" type="checkbox"/> 25 MHz	
		<input checked="" type="checkbox"/> 30 MHz <input checked="" type="checkbox"/> 40 MHz <input checked="" type="checkbox"/> 50 MHz <input checked="" type="checkbox"/> 60 MHz		
		<input checked="" type="checkbox"/> 70 MHz <input checked="" type="checkbox"/> 80 MHz <input checked="" type="checkbox"/> 90 MHz <input checked="" type="checkbox"/> 100 MHz		
		NR Band n78	SCS 15kHz	<input checked="" type="checkbox"/> 10 MHz <input checked="" type="checkbox"/> 15 MHz <input checked="" type="checkbox"/> 20 MHz <input checked="" type="checkbox"/> 25 MHz
	<input checked="" type="checkbox"/> 30 MHz <input checked="" type="checkbox"/> 40 MHz <input checked="" type="checkbox"/> 50 MHz			
	SCS 30kHz		<input checked="" type="checkbox"/> 10 MHz <input checked="" type="checkbox"/> 15 MHz <input checked="" type="checkbox"/> 20 MHz <input checked="" type="checkbox"/> 25 MHz	
	<input checked="" type="checkbox"/> 30 MHz <input checked="" type="checkbox"/> 40 MHz <input checked="" type="checkbox"/> 50 MHz <input checked="" type="checkbox"/> 60 MHz			
	<input checked="" type="checkbox"/> 70 MHz <input checked="" type="checkbox"/> 80 MHz <input checked="" type="checkbox"/> 90 MHz <input checked="" type="checkbox"/> 100 MHz			
	Designation of Emissions (Remark: the necessary bandwidth of which is		NR Band n5	DFT-s-Pi/2-BPSK CP-16QAM
SCS 15kHz:				
4M55G7D 4M54W7D				



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the worst value from the measured occupied bandwidths for each type of channel bandwidth configuration.)		9M10G7D	9M40W7D
		13M6G7D	14M3W7D
		18M1G7D	19M1W7D
		SCS 30kHz:	
		8M73G7D	8M70W7D
		13M1G7D	13M7W7D
		18M2G7D	18M4W7D
	NR Band n7	SCS 15kHz:	
		4M55G7D	4M54W7D
		9M10G7D	9M40W7D
		13M6G7D	14M3W7D
		18M1G7D	19M2W7D
		23M3G7D	24M1W7D
		29M0G7D	28M9W7D
		39M1G7D	39M0W7D
		48M7G7D	48M9W7D
		SCS 30kHz:	
		8M73G7D	8M70W7D
		13M1G7D	13M8W7D
		18M2G7D	18M5W7D
		23M2G7D	23M6W7D
		27M2G7D	28M3W7D
		36M4G7D	38M4W7D
		46M3G7D	48M1W7D
	NR Band n38	SCS 15kHz:	
		4M55G7D	4M52W7D
		9M08G7D	9M38W7D
		13M6G7D	14M3W7D
		18M1G7D	19M1W7D
		23M2G7D	24M0W7D
		28M9G7D	28M8W7D
		38M9G7D	38M9W7D
		SCS 30kHz:	
	8M72G7D	8M65W7D	
	13M1G7D	13M7W7D	



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		18M2G7D	18M4W7D
		23M2G7D	23M6W7D
		27M1G7D	28M1W7D
		36M2G7D	38M2W7D
	NR Band n41	SCS 15kHz:	
		9M18G7D	9M43W7D
		13M6G7D	14M3W7D
		18M1G7D	19M1W7D
		23M1G7D	24M0W7D
		28M9G7D	28M8W7D
		38M9G7D	38M9W7D
		48M7G7D	48M6W7D
		SCS 30kHz:	
		8M72G7D	8M69W7D
		13M1G7D	13M7W7D
		18M1G7D	18M4W7D
		23M2G7D	23M5W7D
		27M2G7D	28M2W7D
		36M2G7D	38M2W7D
		46M2G7D	47M8W7D
		58M4G7D	58M2W7D
		65M0G7D	68M1W7D
		77M8G7D	78M0W7D
		87M7G7D	88M2W7D
	98M3G7D	98M1W7D	
	NR Band n66	SCS 15kHz:	
		4M55G7D	4M54W7D
		9M10G7D	9M37W7D
		13M6G7D	14M3W7D
		18M2G7D	19M1W7D
		23M1G7D	24M0W7D
		28M9G7D	28M8W7D
		32M6G7D	34M0W7D
		38M9G7D	38M8W7D
SCS 30kHz:			



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		8M72G7D	8M68W7D
		13M1G7D	13M8W7D
		18M2G7D	18M4W7D
		23M1G7D	23M5W7D
		27M1G7D	28M2W7D
		32M6G7D	33M2W7D
		36M4G7D	38M2W7D
	NR Band n77 (3450-3550)	SCS 15kHz:	
		9M08G7D	9M37W7D
		13M6G7D	14M3W7D
		18M1G7D	19M1W7D
		23M2G7D	23M9W7D
		28M9G7D	28M7W7D
		38M9G7D	38M9W7D
		48M7G7D	43M7W7D
		SCS 30kHz:	
		8M71G7D	8M68W7D
		13M1G7D	13M7W7D
		18M2G7D	18M4W7D
		23M2G7D	23M5W7D
		27M2G7D	28M1W7D
		36M2G7D	38M2W7D
		46M2G7D	47M8W7D
		58M4G7D	58M3W7D
	65M1G7D	68M1W7D	
	77M8G7D	78M0W7D	
	87M4G7D	87M9W7D	
	97M4G7D	98M1W7D	
NR Band n77 (3700-3980)	SCS 15kHz:		
	9M07G7D	9M37W7D	
	13M6G7D	14M3W7D	
	18M1G7D	19M2W7D	
	23M2G7D	24M0W7D	
	28M8G7D	28M8W7D	
	38M9G7D	38M9W7D	



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t (86-512) 62992980 www.sgs.com.cn
t (86-512) 62992980 sgs.china@sgs.com



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	48M6G7D	43M6W7D
	SCS 30kHz:	
	8M70G7D	8M68W7D
	13M1G7D	13M7W7D
	18M1G7D	18M4W7D
	23M2G7D	23M5W7D
	27M1G7D	28M2W7D
	36M2G7D	38M1W7D
	46M2G7D	47M9W7D
	58M5G7D	58M3W7D
	65M1G7D	68M2W7D
	77M9G7D	78M1W7D
	87M5G7D	88M3W7D
	97M4G7D	98M1W7D



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3.9 Test Frequencies

3.9.1 Reference test frequencies for NR operating band n5

3.9.1.1 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	

3.9.1.2 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	



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3.9.2 Reference test frequencies for NR operating band n7

3.9.2.1 Test frequencies for NR operating band n7 and SCS 15 kHz

Bandwidth [MHz]	Range		Carrier centre [MHz]	Carrier centre [ARFCN]	SS block SCS [kHz]
5	Downlink	Low	2622.5	524500	15
		Mid	2655	531000	
		High	2687.5	537500	
	Uplink	Low	2502.5	500500	-
		Mid	2535	507000	
		High	2567.5	513500	
10	Downlink	Low	2625	525000	15
		Mid	2655	531000	
		High	2685	537000	
	Uplink	Low	2505	501000	-
		Mid	2535	507000	
		High	2565	513000	
15	Downlink	Low	2627.5	525500	15
		Mid	2655	531000	
		High	2682.5	536500	
	Uplink	Low	2507.5	501500	-
		Mid	2535	507000	
		High	2562.5	512500	
20	Downlink	Low	2630	526000	15
		Mid	2655	531000	
		High	2680	536000	
	Uplink	Low	2510	502000	-
		Mid	2535	507000	
		High	2560	512000	
25	Downlink	Low	2632.5	526500	15
		Mid	2655	531000	
		High	2677.5	535500	
	Uplink	Low	2512.5	502500	-
		Mid	2535	507000	
		High	2557.5	511500	
30	Downlink	Low	2635	527000	15
		Mid	2655	531000	
		High	2675	535000	
	Uplink	Low	2515	503000	-
		Mid	2535	507000	
		High	2555	511000	
40	Downlink	Low	2640	528000	15
		Mid	2655	531000	
		High	2670	534000	
	Uplink	Low	2520	504000	-
		Mid	2535	507000	
		High	2550	510000	
50	Downlink	Low	2645	529000	15
		Mid	2655	531000	
		High	2665	533000	
	Uplink	Low	2525	505000	-
		Mid	2535	507000	
		High	2545	509000	



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Wireless Laboratory

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中国·苏州·中国(江苏)自由贸易试验区苏州片区苏州工业园区润胜路1号的6号厂房南楼 邮编: 215000

t (86-512) 62992980 www.sgsgroup.com.cn
s (86-512) 62992980 sgs.china@sgs.com

3.9.2.2 Test frequencies for NR operating band n7 and SCS 30 kHz

Bandwidth [MHz]	Range	Carrier centre [MHz]	Carrier centre [ARFCN]	SS block SCS [kHz]	
10	Downlink	Low	2625	525000	15
		Mid	2655	531000	
		High	2685	537000	
	Uplink	Low	2505	501000	-
		Mid	2535	507000	
		High	2565	513000	
15	Downlink	Low	2627.5	525500	15
		Mid	2655	531000	
		High	2682.5	536500	
	Uplink	Low	2507.5	501500	-
		Mid	2535	507000	
		High	2562.5	512500	
20	Downlink	Low	2630	526000	15
		Mid	2655	531000	
		High	2680	536000	
	Uplink	Low	2510	502000	-
		Mid	2535	507000	
		High	2560	512000	
25	Downlink	Low	2632.5	526500	15
		Mid	2655	531000	
		High	2677.5	535500	
	Uplink	Low	2512.5	502500	-
		Mid	2535	507000	
		High	2557.5	511500	
30	Downlink	Low	2635	527000	15
		Mid	2655	531000	
		High	2675	535000	
	Uplink	Low	2515	503000	-
		Mid	2535	507000	
		High	2555	511000	
40	Downlink	Low	2640	528000	15
		Mid	2655	531000	
		High	2670	534000	
	Uplink	Low	2520	504000	-
		Mid	2535	507000	
		High	2550	510000	
50	Downlink	Low	2645	529000	15
		Mid	2655	531000	
		High	2665	533000	
	Uplink	Low	2525	505000	-
		Mid	2535	507000	
		High	2545	509000	



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s (86-512) 62992980 sgs.china@sgs.com

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3.9.3 Reference test frequencies for NR operating band n38

3.9.3.1 Test frequencies for NR operating band n38 and SCS 15 kHz

Bandwidth [MHz]	Range		Carrier centre [MHz]	Carrier centre [ARFCN]	SS block SCS [kHz]
5	Downlink & Uplink	Low	2572.5	514500	15
		Mid	2592.5	518500	
		High	2617.5	523500	
10	Downlink & Uplink	Low	2575	515000	30
		Mid	2595	519000	
		High	2615	523000	
15	Downlink & Uplink	Low	2577.5	515500	30
		Mid	2595	519000	
		High	2612.5	522500	
20	Downlink & Uplink	Low	2580	516000	30
		Mid	2595	519000	
		High	2610	522000	
25	Downlink & Uplink	Low	2582.5	516500	30
		Mid	2595	519000	
		High	2607.5	521500	
30	Downlink & Uplink	Low	2585	517000	30
		Mid	2595	519000	
		High	2605	521000	
40	Downlink & Uplink	Low	2590	518000	30
		Mid	2595	519000	
		High	2600	520000	

3.9.3.2 Test frequencies for NR operating band n38 and SCS 30 kHz

Bandwidth [MHz]	Range		Carrier centre [MHz]	Carrier centre [ARFCN]	SS block SCS [kHz]
10	Downlink & Uplink	Low	2575	515000	30
		Mid	2595	519000	
		High	2615	523000	
15	Downlink & Uplink	Low	2577.5	515500	30
		Mid	2595	519000	
		High	2612.5	522500	
20	Downlink & Uplink	Low	2580	516000	30
		Mid	2595	519000	
		High	2610	522000	
25	Downlink & Uplink	Low	2582.5	516500	30
		Mid	2595	519000	
		High	2607.5	521500	
30	Downlink & Uplink	Low	2585	517000	30
		Mid	2595	519000	
		High	2605	521000	
40	Downlink & Uplink	Low	2590	518000	30
		Mid	2595	519000	
		High	2600	520000	



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3.9.4 Reference test frequencies for NR operating band n41

3.9.4.1 Test frequencies for NR operating band n41 and SCS 15 kHz

Bandwidth [MHz]	Range		Carrier centre [MHz]	Carrier centre [ARFCN]	SS block SCS [kHz]
10	Downlink	Low	2501.01	500202	15
	&	Mid	2593.005	518601	
	Uplink	High	2685	537000	
15	Downlink	Low	2503.5	500700	15
	&	Mid	2593.005	518601	
	Uplink	High	2682.495	536499	
20	Downlink	Low	2506.005	501201	15
	&	Mid	2593.005	518601	
	Uplink	High	2679.99	535998	
25	Downlink	Low	2508.51	501702	15
	&	Mid	2592.99	518598	
	Uplink	High	2677.5	535500	
30	Downlink	Low	2511	502200	15
	&	Mid	2593.005	518601	
	Uplink	High	2674.995	534999	
40	Downlink	Low	2516.01	503202	15
	&	Mid	2593.005	518601	
	Uplink	High	2670	534000	
50	Downlink	Low	2521.005	504201	15
	&	Mid	2593.005	518601	
	Uplink	High	2664.99	532998	



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3.9.4.2 Test frequencies for NR operating band n41 and SCS 30 kHz

Bandwidth [MHz]	Range		Carrier centre [MHz]	Carrier centre [ARFCN]	SS block SCS [kHz]
10	Downlink	Low	2501.01	500202	30
	&	Mid	2592.99	518598	
	Uplink	High	2685	537000	
15	Downlink	Low	2503.5	500700	30
	&	Mid	2592.99	518598	
	Uplink	High	2682.48	536496	
20	Downlink	Low	2506.02	501204	30
	&	Mid	2592.99	518598	
	Uplink	High	2679.99	535998	
25	Downlink	Low	2508.51	501702	30
	&	Mid	2592.99	518598	
	Uplink	High	2677.5	535500	
30	Downlink	Low	2511	502200	30
	&	Mid	2592.99	518598	
	Uplink	High	2674.98	534996	
40	Downlink	Low	2516.01	503202	30
	&	Mid	2592.99	518598	
	Uplink	High	2670	534000	
50	Downlink	Low	2521.02	504204	30
	&	Mid	2592.99	518598	
	Uplink	High	2664.99	532998	
60	Downlink	Low	2526	505200	30
	&	Mid	2592.99	518598	
	Uplink	High	2659.98	531996	
70	Downlink	Low	2531	506200	30
	&	Mid	2592.29	518598	
	Uplink	High	2655	531000	
80	Downlink	Low	2536.02	507204	30
	&	Mid	2592.99	518598	
	Uplink	High	2649.99	529998	
90	Downlink	Low	2541	508200	30
	&	Mid	2592.99	518598	
	Uplink	High	2644.98	528996	
100	Downlink	Low	2546.01	509202	30
	&	Mid	2592.99	518598	
	Uplink	High	2640	528000	



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3.9.5 Reference test frequencies for NR operating band n66

3.9.5.1 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	
35	Downlink	Low	2127.5	425500	15
		Mid	2155	431000	
		High	2182.5	436500	
	Uplink	Low	1727.5	345500	-
		Mid	1745	349000	
		High	1762.5	352500	
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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中国·苏州·中国(江苏)自由贸易试验区苏州片区苏州工业园区润胜路1号的6号厂房南楼 邮编: 215000

t (86-512) 62992980 www.sgsgr.com.cn
t (86-512) 62992980 sgs.china@sgs.com

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3.9.5.2 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	
35	Downlink	Low	2127.5	425500	15
		Mid	2155	431000	
		High	2182.5	436500	
	Uplink	Low	1727.5	345500	-
		Mid	1745	349000	
		High	1762.5	352500	
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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中国·苏州·中国(江苏)自由贸易试验区苏州片区苏州工业园区润胜路1号的6号厂房南楼 邮编: 215000

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t (86-512) 62992980 sgs.china@sgs.com

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3.9.6 Reference test frequencies for NR operating band n77

3.9.6.1 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	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	
25	Downlink & Uplink	Low	3712.515	647501	30
		Mid	3840	656000	
		High	3967.485	664499	
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	

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	
25	Downlink & Uplink	Low	3462.51	630834	30
		Mid	3500.01	633334	
		High	3537.51	635834	
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	



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t (86-512) 62992980 sgs.china@sgs.com

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3.9.6.2 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	30
		Mid	3840	
		High	3975	
15	Downlink & Uplink	Low	3707.52	30
		Mid	3840	
		High	3972.48	
20	Downlink & Uplink	Low	3710.01	30
		Mid	3840	
		High	3969.99	
25	Downlink & Uplink	Low	3712.515	30
		Mid	3840	
		High	3967.485	
30	Downlink & Uplink	Low	3714.99	30
		Mid	3840	
		High	3965.01	
40	Downlink & Uplink	Low	3720	30
		Mid	3840	
		High	3960	
50	Downlink & Uplink	Low	3725.01	30
		Mid	3840	
		High	3954.99	
60	Downlink & Uplink	Low	3730.02	30
		Mid	3840	
		High	3949.98	
70	Downlink & Uplink	Low	3735	30
		Mid	3840	
		High	3945	
80	Downlink & Uplink	Low	3740.01	30
		Mid	3840	
		High	3939.99	
90	Downlink & Uplink	Low	3745.02	30
		Mid	3840	
		High	3934.98	
100	Downlink & Uplink	Low	3750	30
		Mid	3840	
		High	3930	



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3450-3550:

CBW [MHz]	Range	Carrier centre [MHz]	Carrier centre [ARFCN]	SS block SCS [kHz]
10	Downlink & Uplink	Low	3455.01	630334
		Mid	3500.01	633334
		High	3545.01	636334
15	Downlink & Uplink	Low	3457.5	630500
		Mid	3500.01	633334
		High	3542.49	636166
20	Downlink & Uplink	Low	3460.02	630668
		Mid	3500.01	633334
		High	3540	636000
25	Downlink & Uplink	Low	3462.51	630834
		Mid	3500.01	633334
		High	3537.51	635834
30	Downlink & Uplink	Low	3465	631000
		Mid	3500.01	633334
		High	3534.99	635666
40	Downlink & Uplink	Low	3470.01	631334
		Mid	3500.01	633334
		High	3530.01	635334
50	Downlink & Uplink	Low	3475.02	631668
		Mid	3500.01	633334
		High	3525	635000
60	Downlink & Uplink	Low	3480	632000
		Mid	3500.01	633334
		High	3519.99	634666
70	Downlink & Uplink	Low	3485.01	632334
		Mid	3500.01	633334
		High	3515.01	634334
80	Downlink & Uplink	Low	3490.02	632668
		Mid	3500.01	633334
		High	3510	634000
90	Downlink & Uplink	Low	3495	633000
		Mid	3500.01	633334
		High	3504.99	633666
100	Downlink & Uplink	Low	\	\
		Mid	3500.01	633334
		High	\	\



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t (86-512) 62992980 www.sgs.com.cn
t (86-512) 62992980 sgs.china@sgs.com

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3.9.7 Reference test frequencies for NR operating band n78

3.9.7.1 Test frequencies for NR operating band n78 and SCS 15 kHz

3700-3800:

CBW [MHz]	Range	Carrier centre [MHz]	Carrier centre [ARFCN]	SS block SCS [kHz]
10	Downlink & Uplink	Low	3705	647000
		Mid	3750	650000
		High	3795	653000
15	Downlink & Uplink	Low	3707.52	647168
		Mid	3750	650000
		High	3792.48	652832
20	Downlink & Uplink	Low	3710.01	647334
		Mid	3750	650000
		High	3789.99	652666
25	Downlink & Uplink	Low	3712.5	647500
		Mid	3750	650000
		High	3787.5	652500
30	Downlink & Uplink	Low	3715.02	647668
		Mid	3750	650000
		High	3785.01	652334
40	Downlink & Uplink	Low	3720	648000
		Mid	3750	650000
		High	3780	652000
50	Downlink & Uplink	Low	3725.01	648334
		Mid	3750	650000
		High	3774.99	651666

3450-3550:

CBW [MHz]	Range	Carrier centre [MHz]	Carrier centre [ARFCN]	SS block SCS [kHz]
10	Downlink & Uplink	Low	3455.01	630334
		Mid	3500.01	633334
		High	3545.01	636334
15	Downlink & Uplink	Low	3457.5	630500
		Mid	3500.01	633334
		High	3542.49	636166
20	Downlink & Uplink	Low	3460.02	630668
		Mid	3500.01	633334
		High	3540	636000
25	Downlink & Uplink	Low	3462.52	630835
		Mid	3500.01	633334
		High	3537.50	635833
30	Downlink & Uplink	Low	3465	631000
		Mid	3500.01	633334
		High	3534.99	635666
40	Downlink & Uplink	Low	3470.01	631334
		Mid	3500.01	633334
		High	3530.01	635334
50	Downlink & Uplink	Low	3475.02	631668
		Mid	3500.01	633334
		High	3525	635000



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3.9.7.2 Test frequencies for NR operating band n78 and SCS 30 kHz

3700-3800:

CBW [MHz]	Range	Carrier centre [MHz]	Carrier centre [ARFCN]	SS block SCS [kHz]
10	Downlink & Uplink	Low	3705	30
		Mid	3750	
		High	3795	
15	Downlink & Uplink	Low	3707.52	30
		Mid	3750	
		High	3792.48	
20	Downlink & Uplink	Low	3710.01	30
		Mid	3750	
		High	3789.99	
25	Downlink & Uplink	Low	3712.5	30
		Mid	3750	
		High	3787.5	
30	Downlink & Uplink	Low	3715.02	30
		Mid	3750	
		High	3785.01	
40	Downlink & Uplink	Low	3720	30
		Mid	3750	
		High	3780	
50	Downlink & Uplink	Low	3725.01	30
		Mid	3750	
		High	3774.99	
60	Downlink & Uplink	Low	3730.02	30
		Mid	3750	
		High	3769.98	
70	Downlink & Uplink	Low	3735	30
		Mid	3750	
		High	3765	
80	Downlink & Uplink	Low	3740.01	30
		Mid	3750	
		High	3759.99	
90	Downlink & Uplink	Low	3745.02	30
		Mid	3750	
		High	3754.98	
100	Downlink & Uplink	Low	/	30
		Mid	3750	
		High	/	



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3450-3550:

CBW [MHz]	Range	Carrier centre [MHz]	Carrier centre [ARFCN]	SS block SCS [kHz]
10	Downlink & Uplink	Low	3455.01	630334
		Mid	3500.01	633334
		High	3545.01	636334
15	Downlink & Uplink	Low	3457.5	630500
		Mid	3500.01	633334
		High	3542.49	636166
20	Downlink & Uplink	Low	3460.02	630668
		Mid	3500.01	633334
		High	3540	636000
25	Downlink & Uplink	Low	3462.52	630835
		Mid	3500.01	633334
		High	3537.50	635833
30	Downlink & Uplink	Low	3465	631000
		Mid	3500.01	633334
		High	3534.99	635666
40	Downlink & Uplink	Low	3470.01	631334
		Mid	3500.01	633334
		High	3530.01	635334
50	Downlink & Uplink	Low	3475.02	631668
		Mid	3500.01	633334
		High	3525	635000
60	Downlink & Uplink	Low	3480	632000
		Mid	3500.01	633334
		High	3519.99	634666
70	Downlink & Uplink	Low	3485.01	632334
		Mid	3500.01	633334
		High	3515.01	634334
80	Downlink & Uplink	Low	3490.02	632668
		Mid	3500.01	633334
		High	3510	634000
90	Downlink & Uplink	Low	3495	633000
		Mid	3500.01	633334
		High	3504.99	633666
100	Downlink & Uplink	Low	\	\
		Mid	3500.01	633334
		High	\	\



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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



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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



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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



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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. $RBW \geq 1\%$ of the emission bandwidth
4. $VBW \geq 3 \times RBW$
5. Detector = RMS
6. Number of sweep points $\geq 2 \times \text{Span}/RBW$
7. Trace mode = trace average for continuous emissions, max hold for pulse emissions
8. Sweep time = auto couple
9. The trace was allowed to stabilize



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 emissions, 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



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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



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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.

$$E \text{ (dB}\mu\text{V/m)} = \text{Measured amplitude level (dB}\mu\text{V)} + (\text{Cable Loss (dB)} + \text{Antenna Factor (dB/m)} - \text{AMP(dB)})$$

$$\text{EIRP (dBm)} = E \text{ (dB}\mu\text{V/m)} + 20 \log D - 104.8; \text{ where D is the measurement distance in meters}$$

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:

$$E \text{ (dB}\mu\text{V/m)} = \text{Measured amplitude level (dB}\mu\text{V)} + (\text{Cable Loss (dB)} + \text{Antenna Factor (dB/m)} - \text{AMP(dB)})$$

$$\text{EIRP (dBm)} = E \text{ (dB}\mu\text{V/m)} + 20 \log D - 104.8; \text{ where D is the measurement distance in meters}$$
- 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 $20 \cdot \text{LOG}(3/1) = 9.54 \text{ dB}$.

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 $\pm 0.00025\%$ (± 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.

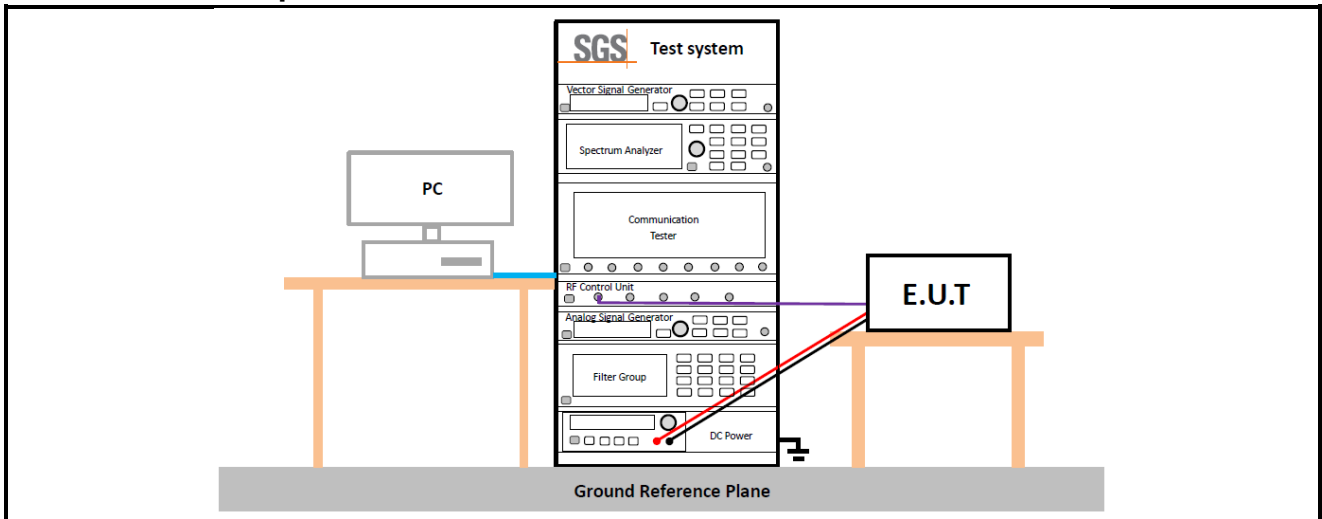
Remark: Reference test setup 3



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4.9 Test Setups

4.9.1 Test Setup 1



4.9.2 Test Setup 2

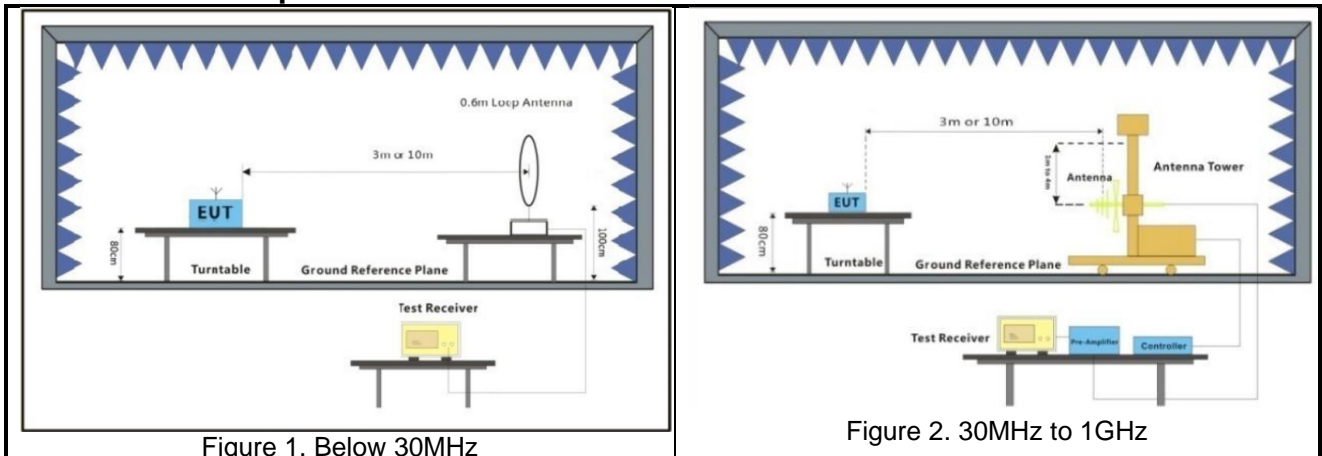


Figure 1. Below 30MHz

Figure 2. 30MHz to 1GHz

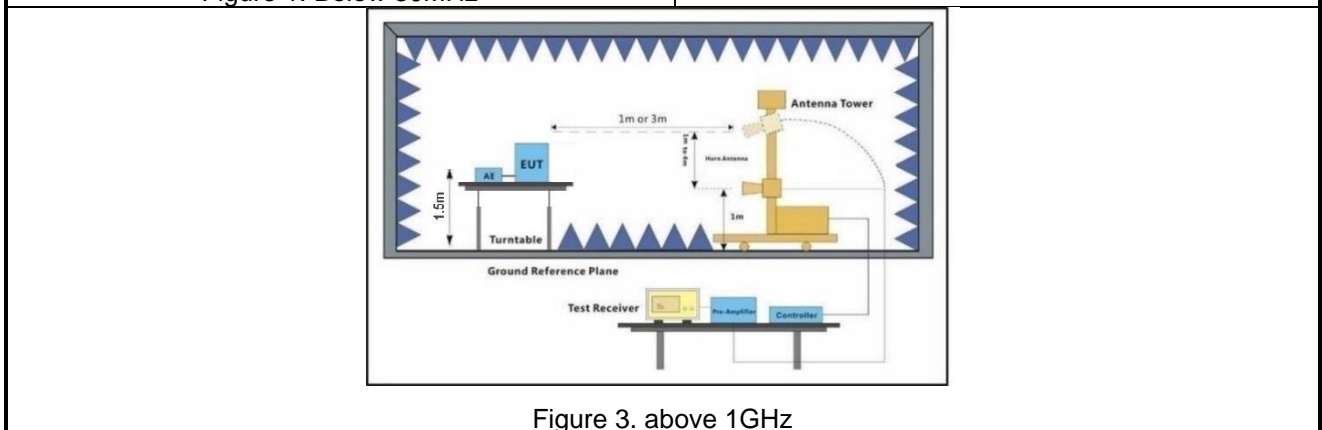


Figure 3. above 1GHz



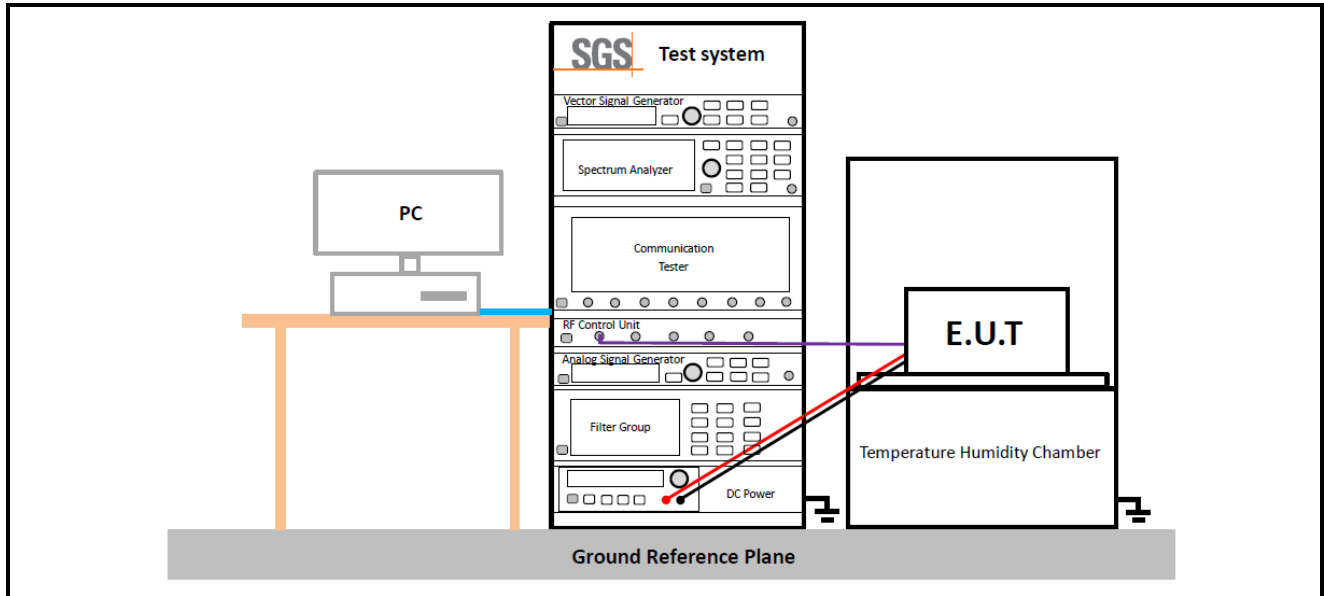
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4.9.3 Test Setup 3



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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; NR/TM6; NR/TM7; NR/TM8; NR/TM9
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/TM1; NR/TM2; NR/TM3; NR/TM4; NR/TM5; NR/TM6; NR/TM7; NR/TM8; NR/TM9
Bandwidth - Occupied Bandwidth	
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; 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)	L, M, H (L= low channel, M= middle channel, H= high channel)
Test Mode	NR/TM1; NR/TM2; NR/TM3; NR/TM4; NR/TM5; NR/TM6; NR/TM7; NR/TM8; NR/TM9
Band Edges Compliance	
Test Case	Test Conditions
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/TM2; NR/TM6
Spurious Emission at Antenna Terminals	
Test Case	Test Conditions



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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/TM6
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/TM2; NR/TM3; NR/TM4; NR/TM5; NR/TM6; NR/TM7; NR/TM8; NR/TM9 The report only show the bandwidth with the worst case.



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5 Main Test Instruments

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
Measurement Software	TST	TST-271-2.0	SUWI-03-55-01	NCR	NCR
Radio Communication Analyzer	Anritsu	MT8821C	SUWI-01-26-03	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
Receiving antenna	SCHWRZBECK MESS- ELEKTRONIK	BBHA 9120D	SUWI-01-11-02	2023/05/13	2024/05/12
Wideband Radio Communication Test Ststion	Anritsu	MT8000A	SUWI-01-34-02	2023/09/12	2024/09/11
Radio Communication Analyzer	StarPoint	SP9500E	SUWI-01-28-01	2023/09/13	2024/09/12
Signal Analyzer	ROHDE&SCHWARZ	FSW43	SUWI-01-02-04	2023/05/11	2024/05/10



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RSE Test System					
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-04-02-01	2021/05/08	2024/05/07
Temperature and humidity meter	MingGao	TH101B	SUWI-01-01-05	2023/02/07	2024/02/06
Signal Analyzer	ROHDE & SCHWARZ	FSW43	SUWI-01-02-04	2023/05/11	2024/05/10
Test receiver	ROHDE & SCHWARZ	ESR7	SUWI-01-10-01	2023/02/08	2024/02/07
Receiving antenna	SCHWRZBECK MESS-ELEKTRONIK	VULB 9163	SUWI-01-11-01	2023/05/13	2024/05/12
Receiving antenna	SCHWRZBECK MESS-ELEKTRONIK	BBHA 9120D	SUWI-01-11-02	2023/05/13	2024/05/12
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	TAP9K3G40	SUWI-01-14-01	2023/02/06	2024/02/05
Amplifier	Tonscend	TAP01018050	SUWI-01-14-02	2023/02/06	2024/02/05
Amplifier	Tonscend	TAP18040048	SUWI-01-14-03	2023/02/08	2024/02/07
Wideband Radio Communication Tester	Anritsu	MT8820C	SUWI-01-26-01	2023/09/13	2024/09/12
Wideband Radio Communication Tester	Anritsu	MT8821C	SUWI-01-26-03	2023/11/21	2024/11/20
Radio Communication Analyzer	StarPoint	SP9500E	SUWI-01-28-03	2023/05/11	2024/05/10
Measurement Software	Tonscend	JS32-RE 4.0.0.0	SUWI-02-09-04	NCR	NCR



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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:

No.	Item	Measurement Uncertainty
1	Total RF power, conducted	$\pm 0.54\text{dB}$
2	RF power density, conducted	$\pm 1.03\text{dB}$
3	Spurious emissions, conducted	$\pm 0.54\text{dB}$
4	Radio Frequency	$\pm 1.0\%$
5	Duty Cycle	$\pm 0.37\%$
6	Occupied Bandwidth	$\pm 1.0\%$
7	Radiated Emission	$\pm 3.13\text{dB}$ (9k -30MHz)
		$\pm 4.8\text{dB}$ (30M -1GHz)
		$\pm 4.8\text{dB}$ (1GHz to 18GHz)
		$\pm 4.80\text{dB}$ (Above 18GHz)

Remark:

The U_{lab} (lab Uncertainty) is less than $U_{\text{CISPR/ETSI}}$ (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.



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7 Appendixes

Appendix A.3	WWAN Setup Photos
Appendix B.18	NR Band n5
Appendix B.19	NR Band n7
Appendix B.20	NR Band n38
Appendix B.21	NR Band n41
Appendix B.22	NR Band n66
Appendix B.23	NR Band n77(3450-3550)
Appendix B.24	NR Band n77(3700-3980)
Appendix B.25	NR Band n78(3450-3550)
Appendix B.26	NR Band n78(3700-3800)

---End of Report---



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