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TEST REPORT

Application No.:	SEWA2309000114RG
Applicant:	Quectel Wireless Solutions Co., Ltd.
Address of Applicant:	Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, China 200233
Manufacturer: Quectel Wireless Solutions Co., Ltd.	
Address of Manufacturer:	Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, China 200233
EUT Description:	5G Sub-6 GHz M.2 Module
Model No.:	RM520N-GL
Trade Mark:	Quectel
FCC ID:	XMR2023RM520NGL
Standards:	47 CFR Part 2 47 CFR Part 22 47 CFR Part 24 47 CFR Part 27 47 CFR Part 90
Date of Receipt:	2022/04/14 (for report SEWA2204000008RG02) 2023/04/19 (for report SEWM2304000122RG02) 2023/09/26 (for report SEWA2309000114RG02)
Date of Test:	2022/03/10 to 2022/07/12 (for report SEWA2204000008RG02) 2023/05/09 to 2023/07/17 (for report SEWM2304000122RG02) 2023/10/04 to 2023/10/30 (for report SEWA2309000114RG02)
Date of Issue:	2023/10/31
Test Result:	PASS *

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

Authorized Signature:

SG

Well Wei Wireless Laboratory Manager



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Revision Record				
Version Chapter Date Modifier Remark				
01		2023/10/31		Original

Prepared By	(Levi Li) / Test Engineer
Checked By	Stone Ju (Stone Gu) / Reviewer



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2 Test Summary

2.1 NR Band n5/ n26(824~849 MHz)

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.29&36	Pass
Peak-Average Ratio	§22.913(d)	Limit≤13 dB	Section 2 of Appendix B.29&36	Pass
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.	Section 3 of Appendix B.29&36	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 4 of Appendix B.29&36	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 5 of Appendix B.29&36	Pass
Field Strength of Spurious Radiation	§2.1053, §22.917(a)	FCC: ≤ -13 dBm/100 kHz.	Section 6 of Appendix B.29&36	Pass
Frequency Stability	§2.1055(a)(1)(b) §2.1055(d)(1) §22.355	≤ ±2.5ppm.	Section 7 of Appendix B.29&36	Pass



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2.2 NR Band n7/n41/n38

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.30&39&38	Pass
Peak-Average Ratio		≤13 dB	Section 2 of Appendix B.30&39&38	Pass
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.	Section 3 of Appendix B.30&39&38	Pass
Band Edges Compliance	§2.1051, §27.53(m4)	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 de ned in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less that 43 + 10 log (P) dB on all frequencies between 2490.5 MHz and 2496 MHz and 55 + 10 log (P) dB at or below 2490.5 MHz.	Section 4 of Appendix B.30&39&38	Pass
Spurious Emission at Antenna Terminals	§2.1051, §27.53(m)	Channel Edge 7 MHz 9 kHz 25 dBm/ 1 MHz 9 kHz 25 dBm/ 1 MHz 35 MHz X=Max { 6MHz, EBW}	Section 5 of Appendix B.30&39&38	Pass
Field Strength of Spurious Radiation	§2.1053, §27.53(m)	Channel Edge 1 MHz 9 kHz 9.5 MHz 9 kHz V. MHz X=Max 4 (MHz, 10 th harmonics X=Max 4 (MHz, EBW)	Section 6 of Appendix B.30&39&38	Pass
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.30&39&38	Pass



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2.3 NR Band n2/n25

Test Item	FCC Rule No.	Requirements	Test Result	Verdict
Effective (Isotropic)	§2.1046,	EIRP ≤ 2 W	Section 1 of Appendix	Pass
Radiated Power Output Data	§24.232(c)		B.28&34	
Peak-Average Ratio	§24.232(d)	Limit≤13 dB	Section 2 of Appendix B.28&34	Pass
		ODW: No limit	Section 3 of	
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.	Appendix	Pass
			B.28&34	
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.28&34	Pass
Spurious Emission at Antenna Terminals	§2.1051, §24.238(a)	≤ -13 dBm/1 MHz, from 9 kHz to 10 th harmonics but outside authorized operating frequency ranges.	Section 5 of Appendix B.28&34	Pass
Field Strength of Spurious Radiation	§2.1053, §24.238(a)	≤ -13 dBm/1 MHz.	Section 6 of Appendix B.28&34	Pass
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.28&34	Pass



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2.4 NR Band n12

Test Item	FCC Rule No.	Requirements	Test Result	Verdict
Effective (Isotropic) Radiated Power Output Data	§2.1046 §27.50(c)(10)	ERP ≤ 3 W.	Section 1 of Appendix B.31	Pass
Peak-Average Ratio		Limit≤13 dB	Section 2 of Appendix B.31	Pass
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.	Section 3 of Appendix B.31	Pass
Band Edges Compliance	§2.1051, §27.53(g)	≤ -13 dBm/1%*EBW, in 1 MHz bands immediately outside and adjacent to the frequency block.	Section 4 of Appendix B.31	Pass
Spurious Emission at Antenna Terminals	§2.1051, §27.53(g)	FCC: ≤ -13 dBm/100 kHz, from 9 kHz to 10 th harmonics but outside authorized operating frequency ranges.	Section 5 of Appendix B.31	Pass
Field Strength of Spurious Radiation	§2.1053, §27.53(g)	FCC: ≤ -13 dBm/100 kHz.	Section 6 of Appendix B.31	Pass
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.31	Pass



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2.5 NR Band n13

Test Item	FCC Rule No.	Requirements	Test Result	Verdict
Effective (Isotropic) Radiated Power Output Data	§2.1046, §27.50(b)(10)	ERP ≤ 3 W.	Section 1 of Appendix B.32	Pass
Peak-Average Ratio		Limit≤13 dB	Section 2 of Appendix B.32	Pass
Bandwidth	§2.1049,	OBW: No limit. EBW: No limit.	Section 3 of Appendix B.32	Pass
Band Edges Compliance	§2.1051, §27.53(c)	≤ -13 dBm/1%*EBW, in 1 MHz bands immediately outside and adjacent to the frequency block.	Section 4 of Appendix B.32	Pass
Spurious Emission at Antenna Terminals	§2.1051, §27.53(c) §27.53(f)	 ≤ -13 dBm/100 kHz, from 9 kHz to 10th harmonics but outside authorized operating frequency ranges. On all frequencies between 763–775 MHz and 793–805 MHz, by a factor not less than 65 + 10 log (P) dB in a 6.25 kHz band segment, for mobile and portable stations. For operations in the 746-758 MHz, 775-788 MHz, and 805-806 MHz bands, emissions in the band 1559-1610 MHz shall be limited to -70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. 	Section 5 of Appendix B.32	Pass
Field Strength of Spurious Radiation	§2.1053, §27.53(c) §27.53(f)	FCC: ≤ -13 dBm/100 kHz. For operations in the 746-758 MHz, 775-788 MHz, and 805-806 MHz bands, emissions in the band 1559-1610 MHz shall be limited to -70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth.	Section 6 of Appendix B.32	Pass
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.32	Pass



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2.6 NR Band n14

Test Item	FCC Rule No.	Requirements	Test Result	Verdict
Effective (Isotropic) Radiated Power Output Data	§2.1046 §90.542(d)	ERP ≤ 3 W.	Section 1 of Appendix B.33	Pass
Peak-Average Ratio		Limit≤13 dB	Section 2 of Appendix B.33	Pass
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.	Section 3 of Appendix B.33	Pass
Emission Mask	§2.1051 §90.210(n)	Transmitters designed for operation under this part on frequencies other than listed in this section must meet the emission mask requirements of Emission Mask B. Equipment operating under this part on frequencies allocated to but shared with the Federal Government, must meet the applicable Federal Government technical standards (b) Emission Mask B. For transmitters that are equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as follows: (1) On any frequency removed from the assigned frequency by more than 50 percent, but not more than 100 percent of the authorized bandwidth: At least 25 dB.(2) On any frequency removed from the assigned frequency by more than 100 percent, but not more than 250 percent of the authorized bandwidth: At least 35 dB(3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least 43 + 10 log (P) dB.	Section 4 of Appendix B.33	Pass
Band Edges Compliance	§2.1051 §90.543(e)(2)(3)	 (1) On all frequencies between 769- 775 MHz and 799-805 MHz, by a factor not less than 76 + 10 log (P) dB in a 6.25 kHz band segment, for base and fixed stations.(2) On all 	Section 5 of Appendix B.33	Pass



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		frequencies between 769-775 MHz and 799-805 MHz, by a factor not less than 65 + 10 log (P) dB in a 6.25 kHz band segment, for mobile and portable stations.(3) On any frequency between 775-788 MHz, above 805 MHz, and below 758 MHz, by at least 43 + 10 log (P) dB. FCC: ≤ -13 dBm/100 kHz, from 9 kHz		
Spurious Emission at Antenna Terminals	§2.1051, §90.543(c) §90.543(f)	to 10th harmonics but outside authorized operating frequency ranges. For operations in the 758– 775 MHz and 788–805 MHz bands, all emissions including harmonics in the band 1559– 1610 MHz shall be limited to -70 dBW/ MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth.	Section 6 of Appendix B.33	Pass
Field Strength of Spurious Radiation	§2.1053, §90.543(c) §90.543(f)	FCC: ≤ -13 dBm/100 kHz. For operations in the 758–775 MHz and 788–805 MHz bands, all emissions including harmonics in the band 1559–1610 MHz shall be limited to -70 dBW/ MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth.	Section 7 of Appendix B.33	Pass
Frequency Stability	§2.1055(a)(1)(b) §2.1055(d)(1) §90.213	Within authorized bands of operation/frequency block.	Section 8 of Appendix B.33	Pass



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2.7 NR Band n26(814~824 MHz)

Test Item	FCC Rule No.	Requirements	Test Result	Verdict
Transmitter Conducted Power Output	§2.1046, §90.635(b)	< 100 W.	Section 1 of Appendix B.35	Pass
Peak-Average Ratio		Limit≤13 dB	Section 2 of Appendix B.35	Pass
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.	Section 3 of Appendix B.35	Pass
Emission Mask	§2.1051 § 90.691(a)	For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 116 Log10(f/6.1) decibels or 50+10Log10(P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz.	Section 4 of Appendix B.35	Pass
Spurious Emission at Antenna Terminals	§2.1051, §90.691	< 43 + 10Log10(P[Watts]) for all out- of-band emissions	Section 5 of Appendix B.35	Pass
Field Strength of Spurious Radiation	§2.1053, §90.691	< 43 + 10Log10(P[Watts]) for all out- of-band emissions	Section 6 of Appendix B.35	Pass
Frequency Stability	§2.1055(a)(1)(b) §2.1055(d)(1) §90.213	Within authorized bands of operation/frequency block.	Section 7 of Appendix B.35	Pass



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2.8 NR Band n30

Test Item	FCC Rule No.	Requirements	Test Result	Verdict
Effective (Isotropic) Radiated Power Output Data	§2.1046, §27.50(a)(3)	EIRP ≤ 50mW/1MHz EIRP ≤ 250mW/5MHz	Section 1 of Appendix B.37	Pass
Peak-Average Ratio		FCC: Limit≤13 dB	Section 3 of Appendix B.37	Pass
Bandwidth	§2.1049,	OBW: No limit. EBW: No limit.	Section 4 of Appendix B.37	Pass
Band Edges Compliance	§2.1051, §27.53(a)(4)	≤ -13 dBm/1%*EBW, in 1 MHz bands immediately outside and adjacent to the frequency block.	Section 5 of Appendix B.37	Pass
Spurious Emission at Antenna Terminals	§2.1051, §27.53(a)(4)	 First therefore the the server the the server the ser	Section 6 of Appendix B.37	Pass



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		10 log (P) dB on all frequencies		
		between 2296 and 2300 MHz, 61 +		
		10 log (P) dB on all frequencies		
		between 2292 and 2296 MHz, 67 +		
		10 log (P) dB on all frequencies		
		between 2288 and 2292 MHz, and		
		70 + 10 log (P) dB below 2288		
		MHz;(iii) By a factor of not less than		
		43 + 10 log (P) dB on all		
		frequencies between 2360 and		
		2365 MHz, and not less than 70 +		
		10 log (P) dB above 2365 MHz.		
Field Strength of Spurious Radiation	§2.1053, §27.53(a)(4)	≤ -40dBm/MHz.	Section 7 of Appendix B.37	Pass
Frequency Stability	§2.1055(a)(1)(b) §2.1055(d)(1) §27.54	within the range of the operating frequency blocks	Section 8 of Appendix B.37	Pass



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2.9 NR Band n66/NR Band n70

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.40&41	Pass
Peak-Average Ratio	§27.50(d)(5)	Limit≤13 dB	Section 2 of Appendix B.40&41	Pass
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.	Section 3 of Appendix B.40&41	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 4 of Appendix B.40&41	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 5 of Appendix B.40&41	Pass
Field Strength of Spurious Radiation	§2.1053, §27.53(h)	≤ -13 dBm/1 MHz.	Section 6 of Appendix B.40&41	Pass
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.40&41	Pass



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2.10 NR Band n71

Test Item	FCC Rule No.	Requirements	Test Result	Verdict
Effective (Isotropic) Radiated Power Output Data	§2.1046 §27.50(c)(10)	ERP ≤ 3 W	Section 1 of Appendix B.42	Pass
Peak-Average Ratio		Limit≤13 dB	Section 2 of Appendix B.42	Pass
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.	Section 3 of Appendix B.42	Pass
Band Edges Compliance	§2.1051, §27.53(g)	≤ -13 dBm/1%*EBW, in 1 MHz bands immediately outside and adjacent to the frequency block.	Section 4 of Appendix B.42	Pass
Spurious Emission at Antenna Terminals	§2.1051, §27.53(g)	≤ -13 dBm/1 MHz, from 9 kHz to 10 th harmonics but outside authorized operating frequency ranges.	Section 5 of Appendix B.42	Pass
Field Strength of Spurious Radiation	§2.1053, §27.53(g)	≤ -13 dBm/1 MHz.	Section 6 of Appendix B.42	Pass
Frequency Stability	§2.1055(a)(1)(b) §2.1055(d)(1) §27.54	within the authorized bands of operation.	Section 7 of Appendix B.42	Pass



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2.11 NR Band n77/ NR Band n78

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.44&46	Pass
Peak-Average Ratio		≤13 dB	Section 2 of Appendix B.44&46	Pass
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.	Section 3 of Appendix B.44&46	Pass
Band Edges Compliance	§2.1051, §27.53(I)(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 (I)(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 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.44&46	Pass
Spurious Emission at Antenna Terminals	§2.1051, §27.53(I)(2)	not exceed -13 dBm/MHz.	Section 5 of Appendix B.44&46	Pass
Field Strength of Spurious Radiation	§2.1053, §27.53(l)(2)	not exceed -13 dBm/MHz	Section 6 of Appendix B.44&46	Pass
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.44&46	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.43&45	Pass
Peak-Average Ratio	§27.50(k)(4)	FCC: Limit≤13 dB	Section 2 of Appendix B.45	Pass
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.	Section 3 of Appendix B.45	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 4 of Appendix B.45	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 5 of Appendix B.45	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 6 of Appendix B.43&45	Pass
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.45	Pass



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Remark for report SEWM2304000122RG02 issue on 2023/07/17:

This test report (Report No.: SEWM2304000122RG02 issue on 2023/07/17) is based on the original test report (Report No.: SEWA2204000008RG02 issue on 2022/07/12).

Review this report and original report, this report just changing the parts according to the declaration letter from client.

Considering to the difference, pre-scan were performed on the sample in this report to find the items which can be influential to the result in the original test report for fully retest.

Therefore in this report NR Band n41/n77/n78 UL MIMO and the item of Power were tested, Field Strength of Spurious Radiation were performed based on the worst case of the original report with report number SEWA2204000008RG02 issue on 2022/07/12 and other test data in this report are based on the previous report with report number SEWA2204000008RG02 issue on 2022/07/12.

Remark for report SEWA2309000114RG02 issue on 2023/10/31:

This test report (Report No.: SEWA2309000114RG02 issue on 2023/10/31) is based on the original test report (Report No.: SEWM2304000122RG02 issue on 2023/07/17).

Review this report and original report, this report just changing the parts according to the declaration letter from client.

Considering to the difference, pre-scan were performed on the sample in this report to find the items which can be influential to the result in the original test report for fully retest.

Therefore in this report the Field Strength of Spurious Radiation of NR Band n30/38/41/77/78/UL MIMO NR Band n41/DC_5A_n38A/NR UL CA n5A-n78A, Power of NR Band

n30/38/41/70/77(SA&MIMO)/78(SA&MIMO) were tested, and other test data in this report are based on the previous report with report number SEWM2304000122RG02 issue on 2023/07/17.



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3 General Information

3.1 Client Information

Applicant:	Quectel Wireless Solutions Co., Ltd.
Address of Applicant:	Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, China 200233
Manufacturer:	Quectel Wireless Solutions Co., Ltd.
Address of Manufacturer:	Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, China 200233

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, Suz Area, China (Jiangsu) Pilot Free Trade Zone	
Post code:	215000
Test engineer:	Levi Li, Tizzy Song

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.

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Designation Number: CN1312.

Test Firm Registration Number: 717327



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3.4 General Description of EUT

EUT Description:	5G Sub-6 GHz	5G Sub-6 GHz M.2 Module			
Model No.:	RM520N-GL	RM520N-GL			
Trade Mark:	Quectel				
Hardware Version:	R1.0				
Software Version:	RM520NGLAAF	R03A01M4G			
Power Supply:	DC 3.7V				
	RF Conducted	RF Conducted 8683710			
IMEI:	RSE	8683710	50432802		
Antenna Type:	External Antenn PIFA Antenna	าล			
Feature:	UL 2*2 MIMO: N	NR Band n38,	NR Band n	41; NR Band n7	7; NR Band n78
HPUE Power Class:	NR Band n41; N	NR Band n77;	NR Band n	78	
	NR Band n2:	0.25dBi (Ant0)		NR Band n5:	2.68dBi (Ant0)
	NR Band n7:	0.55dBi (Ant0)		NR Band n12:	-0.2dBi (Ant0)
	NR Band n13:	1.54dBi (An	t0)	NR Band n14:	2.42dBi (Ant0)
	NR Band n25:	0.25dBi (An	t0)	NR Band n26:	2.87dBi (Ant0)
	NR Band n30:	-3dBi (Ant0)		NR Band n38:	2.4dBi (Ant0); 2.4dBi (Ant2)
Antenna Gain:	NR Band n41:	2.4dBi (Anto 2.4dBi (Anto		NR Band n66:	1.47dBi (Ant0)
	NR Band n70:	1.3dBi (Ant2	2)	NR Band n71:	1.22dBi (Ant0)
	NR Band n77:	1dBi (Ant0); 1dBi (Ant2)	1dBi (Ant0); 1dBi (Ant2)		1dBi (Ant0); 1dBi (Ant2)
	Note: The antenna ga manufacturer.	Note: The antenna gain are derived from the gain information report provided by t			
DE 0 11	0.8dB(Below 10	GHz)	1.0dB(1.0	~2.4GHz)	1.2dB(2.4~3.4GHz)
RF Cable:	1.5dB(Above 3)	1.5dB(Above 3.4GHz)		-	<u> </u>

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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	results shown in this test report refer only to the sample(s) tested an			
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	or email: CN.Doccheck@sgs.com			
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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} ≤ 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} ≥ 5.

Unequal antenna gains, with equal transmit powers. For antenna gains given by G1, G2, …, GN dBi ● If transmit signals are correlated, then

In transmit signals are correlated, then
 Directional gain = 10 log[(10^{G1/20} + 10^{G2/20} + ... + 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 = $10 \log[(10^{G1/10} + 10^{G2/10} + ... + 10^{GN/10})/N_{ANT}] dBi$

Band	ANT Gain0 (dBi)	ANT Gain2 (dBi)	Directional gain (dBi)
NR Band n38:	2.4	2.4	2.4
NR Band n41:	2.4	2.4	2.4
NR Band n77:	1	1	1
NR Band n78:	1	1	1



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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	44-46 % RH Ambient		
Value	Temperature(°C)	Voltage(V)		
NTNV	22-23	3.7		
LTLV	-30	3.135		
LTHV	-30	4.4		
HTLV	50	3.135		
HTHV	50	4.4		
•	ow Extreme Test Voltage w Extreme Test Temperature	HV: High Extreme Test Voltage HT: High Extreme Test Temperature		

3.7 Description of Support Units

Description	Manufacturer	Model No.	
Test auxiliary PCB board	Quectel	N/A	
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3.8 Technical Specification

Characteristics	Description		
Radio System Type	🖂 SA 🖾 NSA		
	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 n7	2500 to 2570 MHz	2620 to 2690 MHz
	NR Band n12	699 to 716 MHz	729 to 746 MHz
	NR Band n13	777 to 787 MHz	746 to 756 MHz
	NR Band n14	788 to 798 MHz	758 to 768 MHz
	NR Band n25	1850 to 1915MHz	1930 to 1995 MHz
	NR Band n26 (814 to 824 MHz)	814 to 824MHz	859 to 869 MHz
	NR Band n26 (824 to 849 MHz)	824 to 849 MHz	869 to 894 MHz
Supported Frequency Range	NR Band n30	2305 to 2315 MHz	2350 to 2360 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 2180 MHz
	NR Band n70	1695 to 1710 MHz	1995 to 2020 MHz
	NR Band n71	663 to 698 MHz	617 to 652 MHz
	NR Band n77*	3700 to 3980 MHz 3450 to 3550 MHz	3700 to 3980 MHz 3450 to 3550 MHz
	NR Band n78*	3700 to 3800 MHz 3450 to 3550 MHz	3700 to 3800 MHz 3450 to 3550 MHz
		and NR Band n78 have the sa and NR Band n78 was fully te and RSE.	, , ,



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	ENDC:				
	DC_13A_n66A;DC_5A_n2A;DC_14A_n2A;DC_30A_n2A;DC_2A_n5A;				
	DC_30A_n5A;DC_66A_n5A;DC_2A_n12A;DC_66A_n12A;DC_2A_n66A; DC_5A_n66A;DC_12A_n66A;DC_14A_n66A;DC_30A_n66A;DC_12A_n2A; DC_66A_n2A;DC_71A_n2A;DC_12A_n41A;DC_71A_n66A;DC_2A_n71A DC_66A_n71A;DC_66A_n25A;DC_25A_n41A;DC_12A_n78A;DC_13A_n78A				
	DC_25A_n78A;DC_	_12A_n77A;DC_13A_n77A;DC_14A_n77A;DC_26A_n78A			
	DC_2A_n78A;DC_2	26A_n41A;DC_2A_n41A;DC_7A_n5A;DC_38A_n78A			
	DC_7A_n71A;DC_4	1A_n78A;DC_5A_n7A;DC_12A_n7A;DC_66A_n7A			
	DC_13A_n2A; DC_	7A_n66A;DC_4A_n78A;DC_20A_n77A			
	DC_5A_n78A;DC_4	IA_n41A;DC_66A_n38A;DC_2A_n38A;DC_12A_n38A			
	DC_4A_n38A;DC_5	5A_n38A;DC_66A_n78A;DC_12A_n25A;DC_25A_n77A			
	DC_2A_n77A;DC_71A_n78A;DC_71A_n38A;DC_13A_n7A;DC_5A_n41A				
	DC_66A_n41A;DC_2A_n7A;DC_7A_n2A;DC_5A_n40A;DC_30A_n77A				
	DC_41A_n77A;DC_7A_n78A; DC_66A_n28A;DC_71A_n41A				
	DC_28A_n66A;DC_	DC_28A_n66A;DC_30A_n12A;DC_2A_n14A;DC_30A_n14A;DC_66A_n14A			
	DC_2A_n30A;DC_5A_n30A;DC_12A_n30A;DC_14A_n30A;DC_66A_n30A				
	DC_71A_n7A;DC_7A_n12A;DC_5A_n77A;DC_66A_n77A;DC_71A_n77A				
	DC_4A_n2A;DC_7A_n25A;DC_71A_n25A;DC_5A_n25A;DC_26A_n25A				
	DC_4A_n7A;DC_13	3A_n25A;DC_7A_n77A;			
	NR UL CA:				
	n25A-n41A;n41A-n66A;n41A-n71A;n7A-n78A;n5A-n78A				
	n66A-n78A;n7A-n77A;n2A-n77A;n5A-n77A;n66A-n77A				
	n30A-n77A;n71A-n77A;n71A-n78A;n25A-n78A;n38A-n66A				
	n25A-n77A;n25A-n38A;n13A-n77A; n2A-n41A ENDC& NRCA Only test RSE, report only show worst mode.				
		SCS 15kHz:			
Supported Channel Bandwidth	NR Band n2	⊠5 MHz ⊠10 MHz ⊠15 MHz ⊠20 MHz			
	NR Band n5	SCS 15kHz:			



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		⊠5 MHz	⊠10 MHz	🛛 15 MHz	⊠20 MHz
		SCS 15kHz:			
	NR Band n7	⊠5 MHz	⊠10 MHz	🛛 15 MHz	⊠20 MHz
		⊠25 MHz	⊠30 MHz	⊠40 MHz	
		SCS 15kHz:			
	NR Band n12	⊠5 MHz	⊠10 MHz	🛛 15 MHz	
	ND Dood p12	SCS 15kHz:			
	NR Band n13	⊠5 MHz	⊠10 MHz		
		SCS 15kHz:			
	NR Band n14	⊠5 MHz	⊠10 MHz		
		SCS 15kHz:			
	NR Band n25	⊠5 MHz	⊠10 MHz	🛛 15 MHz	⊠20 MHz
		25 MHz	⊠30 MHz	⊠40 MHz	
	NR Band n26 (814 to 824 MHz)	SCS 15kHz:			
		⊠5 MHz	⊠10 MHz		
	NR Band n26 (824 to 849 MHz)	SCS 15kHz:			
		⊠5 MHz	⊠10 MHz	🛛 15 MHz	⊠20 MHz
	NR Band n30	SCS 15kHz:			
		⊠5 MHz	⊠10 MHz		
		SCS 30kHz:			
	NR Band n38	⊠10 MHz	⊠15 MHz;	⊠20 MHz;	⊠30 MHz;
		⊠40 MHz;			
		SCS 30kHz:			
	ND Dood of 1	20 MHz	⊠30 MHz	⊠40 MHz	⊠50 MHz
	NR Band n41	⊠60 MHz	⊠70 MHz	⊠80 MHz	⊠90 MHz
		⊠100 MHz			
		SCS 15kHz:			
	NR Band n66	⊠5 MHz	⊠10 MHz	🛛 15 MHz	⊠20 MHz
		⊠30 MHz	⊠40 MHz		
	ND Dood =70	SCS 15kHz:			
	NR Band n70	⊠5 MHz	⊠10 MHz	🛛 15 MHz	
	NR Band n71	SCS 15kHz:			



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		⊠5 MHz	⊠10 MHz	⊠15 MHz	20 MHz
		SCS 30kHz			
		⊠10 MHz	X15 MHz	20 MHz	⊠30 MHz
	NR Band n77	40 MHz	S 0 MHz		⊠70 MHz
		80 MHz	⊠90 MHz	100 MHz	
		SCS 30kHz			
		10 MHz	X15 MHz	20 MHz	30 MHz
	NR Band n78	40 MHz	⊠50 MHz	⊠60 MHz	⊠70 MHz
		DFT-s-Pi/2- BPSK	CP-16QAM		
		SCS 15kHz:			
	NR Band n2	4M49G7D	4M49W7D		
		8M97G7D	9M30W7D		
		13M4G7D	14M1W7D		
		17M9G7D	19M0W7D		
	NR Band n5	SCS 15kHz:			
Designation of		4M49G7D	4M49W7D		
Emissions		8M95G7D	9M29W7D		
(Remark: the necessary		13M4G7D	14M1W7D		
bandwidth of which is the worst value from		17M9G7D	18M9W7D		
the measured occupied		SCS 15kHz:			
bandwidths for each		4M49G7D	4M49W7D		
type of channel bandwidth		8M96G7D	9M30W7D		
configuration.)	NR Band n7	13M4G7D	14M1W7D		
		17M9G7D	19M0W7D		
		22M9G7D	23M8W7D		
		28M7G7D	28M6W7D		
		38M6G7D	38M6W7D		
		SCS 15kHz:			
	NR Band n12	4M49G7D	4M48W7D		
		8M95G7D	9M29W7D		
		13M4G7D	14M1W7D		



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	1	
	SCS 15kHz:	
NR Band n13	4M48G7D	4M47W7D
	8M92G7D	9M26W7D
	SCS 15kHz:	
NR Band n14	4M49G7D	4M49W7D
	8M96G7D	9M29W7D
	SCS 15kHz:	
	4M48G7D	4M49W7D
	8M94G7D	9M30W7D
	13M5G7D	14M1W7D
NR Band n25	17M9G7D	19M0W7D
	22M9G7D	23M8W7D
	28M7G7D	28M6W7D
	38M6G7D	38M6W7D
	SCS 15kHz:	
NR Band n26 (814 to 824 MHz)	4M47G7D	4M49W7D
	8M95G7D	9M29W7D
	SCS 15kHz:	
	4M47G7D	4M48W7D
NR Band n26 (824 to 849 MHz)	8M94G7D	9M29W7D
	13M4G7D	14M1W7D
	18M9G7D	18M9W7D
	SCS 15kHz:	
NR Band n30	4M48G7D	4M49W7D
	8M95G7D	9M33W7D
	SCS 30kHz:	
	8M58G7D	8M62W7D
	12M9G7D	13M6W7D
NR Band n38	17M9G7D	18M2W7D
	26M9G7D	27M9W7D
	35M8G7D	38M0W7D
	SCS 30kHz:	



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	17M9G7D	18M3W7D
	26M9G7D	27M9W7D
	35M8G7D	38M0W7D
	45M8G7D	47M6W7D
	57M9G7D	58M0W7D
	64M3G7D	67M6W7D
	77M3G7D	77M8W7D
	85M8G7D	87M5W7D
	96M2G7D	97M7W7D
	SCS 15kHz:	
	4M48G7D	4M49W7D
	8M96G7D	9M30W7D
NR Band n66	13M5G7D	14M1W7D
	17M9G7D	18M9W7D
	28M6G7D	28M6W7D
	38M6G7D	38M6W7D
	SCS 15kHz:	
	4M48G7D	4M49W7D
NR Band n70	8M95G7D	9M31W7D
	13M4G7D	14M1W7D
	SCS 15kHz:	
	4M50G7D	4M48W7D
NR Band n71	8M95G7D	9M30W7D
	13M5G7D	14M1W7D
	17M9G7D	18M9W7D
	SCS 30kHz:	
	8M58G7D	8M61W7D
	12M9G7D	13M6W7D
NR Band n77 (3700-3980 MHz)	17M9G7D	18M2W7D
	26M8G7D	27M9W7D
	35M8G7D	37M9W7D
·	45M7G7D	47M5W7D



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		58M0G7D	58M0W7D
		64M2G7D	67M4W7D
		77M3G7D	77M6W7D
		85M7G7D	87M6W7D
		96M4G7D	97M5W7D
		SCS 30kHz:	
		8M58G7D	8M59W7D
		12M9G7D	13M6W7D
		17M9G7D	18M2W7D
		26M8G7D	27M9W7D
	NR Band n78	35M8G7D	37M9W7D
	(3450-3550 MHz)	45M8G7D	47M4W7D
		57M9G7D	57M9W7D
		64M3G7D	67M4W7D
		77M3G7D	77M7W7D
		85M7G7D	87M6W7D
		96M4G7D	97M6W7D
		SCS 30kHz:	
		8M57G7D	8M59W7D
		12M9G7D	13M6W7D
		17M9G7D	18M2W7D
		26M8G7D	27M9W7D
	NR Band n78	35M8G7D	37M9W7D
	(3700-3800 MHz)	45M7G7D	47M5W7D
		57M9G7D	57M9W7D
		64M4G7D	67M6W7D
		77M3G7D	77M7W7D
		85M6G7D	87M6W7D
		96M4G7D	97M6W7D
		SCS 30kHz:	
	NR Band n41 UL MIMO	17M9G7D	18M3W7D



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	35M7G7D 37M9W7D
	45M8G7D 47M4W7D
	57M9G7D 57M9W7D
	64M4G7D 67M3W7D
	77M1G7D 77M6W7D
	85M7G7D 87M4W7D
	96M5G7D 97M5W7D
	SCS 30kHz:
	8M61G7D 8M59W7D
	12M9G7D 13M6W7D
	17M8G7D 18M2W7D
	26M8G7D 27M9W7D
NR Band n77	35M7G7D 37M8W7D
UL MIMO (3700-3980 MHz)	45M7G7D 47M5W7D
	57M9G7D 57M7W7D
	64M3G7D 67M4W7D
	77M2G7D 77M7W7D
	85M7G7D 87M5W7D
	96M4G7D 97M7W7D
	SCS 30kHz:
	8M61G7D 8M58W7D
	12M9G7D 13M6W7D
	17M8G7D 18M3W7D
	26M8G7D 27M9W7D
NR Band n78	35M8G7D 37M8W7D
UL MIMO (3450-3550 MHz)	45M8G7D 47M5W7D
	58M0G7D 57M9W7D
	64M3G7D 67M4W7D
	77M2G7D 77M4W7D
	85M8G7D 87M3W7D
	96M1G7D 97M5W7D
NR Band n78 UL MIMO	SCS 30kHz:



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(3700-3800 MHz)	8M59G7D	8M60W7D
	12M9G7D	13M6W7D
	17M9G7D	18M2W7D
	26M8G7D	27M8W7D
	35M8G7D	37M9W7D
	45M7G7D	47M5W7D
	57M9G7D	57M7W7D
	64M3G7D	67M4W7D
	77M1G7D	77M5W7D
	85M6G7D	87M3W7D
	96M3G7D	97M3W7D



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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]	
		Low	1932.5	386500		
	Downlink	Mid	1960	392000	15	
5		High	1987.5	397500		
5		Low	1852.5	370500	-	
	Uplink	Mid	1880	376000		
		High	1907.5	381500	7	
		Low	1935	387000		
	Downlink	Mid	1960	392000	15	
10		High	1985	397000		
10		Low	1855	371000		
	Uplink	Mid	1880	376000	-	
		High	1905	381000		
		Low	1937.5	387500		
	Downlink	Mid	1960	392000	15	
15		High	1982.5	396500		
15		Low	1857.5	371500		
	Uplink	Mid	1880	376000	-	
		High	1902.5	380500	7	
		Low	1940	388000		
	Downlink	Mid	1960	392000	15	
20		High	1980	396000		
20		Low	1860	372000		
	Uplink	Mid	1880	376000] -	
		High	1900	380000	7	



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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]
		Low	871.5	174300	
	Downlink	Mid	881.5	176300	15
F		High	891.5	178300]
5		Low	826.5	165300	
	Uplink	Mid	836.5	167300] -
		High	846.5	169300]
		Low 874	874	174800	
	Downlink	Mid	881.5	176300	15
10		High	889	177800	
10		Low	829	165800	
	Uplink	Mid	836.5	167300	-
		High	844	168800	
		Low	876.5	175300	
	Downlink	Mid	881.5	176300	15
15		High	886.5	177300	
15		Low	831.5	166300	
	Uplink	Mid	836.5	167300	-
		High	841.5	168300	
		Low	879	175800	
	Downlink	Mid	881.5	176300	15
20		High	884	176800]
20		Low	834	166800	
	Uplink	Mid	836.5	167300	-
		High	839	167800]



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			g band n7 and SC		
Bandwidth [MHz]	Range)	Carrier centre [MHz]	Carrier centre [ARFCN]	SS block SCS [kHz]
		Low	2622.5	524500	
	Downlink	Mid	2655	531000	15
_		High	2687.5	537500	
5 –		Low	2502.5	500500	
	Uplink	Mid	2535	507000	
	·	High	2567.5	513500	
		Low	2625	525000	
	Downlink	Mid	2655	531000	15
10		High	2685	537000	
10		Low	2505	501000	
	Uplink	Mid	2535	507000	
	- 1	High	2565	513000	
		Low	2627.5	525500	
	Downlink	Mid	2655	531000	15
	2000	High	2682.5	536500	
15 –		Low	2507.5	501500	
	Uplink	Mid	2535	507000	
	•••••••	High	2562.5	512500	
		Low	2630	526000	
	Downlink	Mid	2655	531000	15
	DOWININ	High	2680	536000	
20 –		Low	2510	502000	
	Uplink	Mid	2535	507000	
	opinit	High	2560	512000	
		Low	2632.5	526500	
	Downlink	Mid	2655	531000	15
	DOWININ	High	2677.5	535500	10
25 –		Low	2512.5	502500	
	Uplink	Mid	2535	507000	
	Opinik	High	2557.5	511500	-
		Low	2635	52700	
	Downlink	Mid	2655	531000	15
	DOWININK	High	2675	535000	10
30		Low	2515	503000	
	Uplink	Mid	2535	507000	
	Opinik	High	2555	511000	
		Low	2640	528000	
	Downlink	Mid	2655	531000	15
	DOWININK	High	2635	534000	. 15
40 —		Low	2520	504000	
	Liplink		2520		4
	Uplink	Mid		507000	
		High	2550	510000	

3.9.3 Reference test frequencies for NR operating band n7

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3.9.4 Reference test frequencies for NR operating band n12 3.9.4.1 Test frequencies for NR operating band n12 and SCS 15 kHz

SG:

Bandwidth [MHz]	Rang	e	Carrier centre [MHz]	Carrier centre [ARFCN]	SS block SCS [kHz]
		Low	731.5	146300	
		737.5	147500	15	
F		High	743.5	148700	
5	5 <u> </u>	701.5	140300		
	Uplink	Mid	707.5	141500]
		High	713.5	142700	
		Low	734	146800	
	Downlink 10	Mid	737.5	147500	15
10		High	741	148200	
10		Low	704	140800	
	Uplink	Mid	707.5	141500	
		High	711	142200	
		Low	736.5	147300	
	Downlink	Mid	737.5	147500	15
15 -	Hi	High	738.5	147700	
15		Low	706.5	141300	
	Uplink	Mid	707.5	141500]
		High	708.5	141700]

3.9.5 Reference test frequencies for NR operating band n13 3.9.5.1 Test frequencies for NR operating band n13 and SCS 15 kHz

Bandwidth [MHz]	Range		Carrier centre [MHz]	Carrier centre [ARFCN]	SS block SCS [kHz]
5	Downlink	Low	748.5	149700	15
		Mid	751	150200	
		High	753.5	150700	
	Uplink	Low	779.5	155900	
		Mid	782	156400	
		High	784.5	156900	
10	Downlink	Low	1	/	15
		Mid	751	150200	
		High	1	1	
	Uplink	Low	/	/	
		Mid	779.5	156400	
		High	1	1	



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3.9.6 Reference test frequencies for NR operating band n14 3.9.6.1 Test frequencies for NR operating band n14 and SCS 15 kHz

Bandwidth [MHz]	Rang	le	Carrier centre [MHz]	Carrier centre [ARFCN]	SS block SCS [kHz]
		Low	760.5	151200	
	Downlink	Mid	763	152600	15
5		High	765.5	153100	
5		Low	790.5	158100	
	Uplink	Mid	793	158600]
		High	795.5	159100]
		Low	1	1	
	Downlink	Mid	763	152600	15
10		High	1	1]
10		Low	1	1	
	Uplink	Mid	763	152600]
	-	High	1	1	1



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CBW [MHz]	Range		Carrier centre [MHz]	Carrier centre [ARFCN]	SS block SCS [kHz]
		Low	1932.5	386500	
	Downlink	Mid	1962.5	392500	15
_		High	1992.5	398500	
5 -		Low	1852.5	370500	
	Uplink	Mid	1882.5	376500	
		High	1912.5	382500	
		Low	1935	387000	
	Downlink	Mid	1962.5	392500	15
10		High	1990	398000	
10		Low	1855	371000	
	Uplink	Mid	1882.5	376500	
		High	1910	382000	-
		Low	1937.5	387500	
	Downlink	Mid	1962.5	392500	15
		High	1987.5	397500	
15 -	Uplink	Low	1857.5	371500	
		Mid	1882.5	376500	
	• • • • • •	High	1907.5	381500	-
		Low	1940	388000	
	Downlink	Mid	1962.5	392500	15
		High	1985	397000	
20		Low	1860	372000	
	Uplink	Mid	1882.5	376500	
	Opinit	High	1905	381000	-
		Low	1942.5	388500	
	Downlink	Mid	1962.5	392500	15
	Dominik	High	1982.5	396500	
25 -		Low	1862.5	372500	1
	Uplink	Mid	1882.5	376500	1
	- Pinin	High	1902.5	380500	-
		Low	1945	389000	1
	Downlink	Mid	1962.5	392500	15
	Domini	High	1980	396000	
30 -		Low	1865	373000	1
	Uplink	Mid	1882.5	376500	1
	Opinik	High	1900	380000	-
		Low	1950	390000	1
	Downlink	Mid	1962.5	392500	15
	Downing	High	1975	395000	
40		Low	1870	374000	
	Uplink	Mid	1882.5	376500	┥
	Obmix	High	1895	379000	-

3.9.7 Reference test frequencies for NR operating band n25

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3.9.8 Reference test frequencies for NR operating band n26

3.9.8.1 Test frequencies for NR operating band n26 and SCS 15 kHz

814-824:					
CBW [MHz]	Range		Carrier centre [MHz]	Carrier centre [ARFCN]	SS block SCS [kHz]
		Low	861.5	172300	
	Downlink	Mid	864	172800	15
F		High	866.5	173300	
Э	5	Low	816.5	163300	
	Uplink	Mid	819	163800	-
		High	821.5	164300	
		Low	1	1	
	Downlink	Mid	864	172800	15
10		High	1	1	
10		Low	1	1	
	Uplink	Mid	819	163800	
		High	1	1	7

824-849:

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CBW [MHz]	Range		Carrier centre [MHz]	Carrier centre [ARFCN]	SS block SCS [kHz]
		Low	871.5	174300	
	Downlink	Mid	881.5	176300	15
5		High	891.5	178300	
5		Low	826.5	165300	
	Uplink	Mid	836.5	167300] -
		High	846.5	169300	7
		Low	874	174800	
	Downlink	Mid	881.5	176300	15
10		High	889	177800	7
10	10	Low	829	165800	
	Uplink	Mid	836.5	167300	1 -
	•	High	844	168800	1
		Low	876.5	175300	
	Downlink	Mid	881.5	176300	15
15		High	886.5	177300	7
15		Low	831.5	166300	
	Uplink	Mid	836.5	167300] -
		High	841.5	168300	7
		Low	879	175800	
	Downlink	Mid	881.5	176300	15
20		High	884	176800	7
20		Low	834	166800	
	Uplink	Mid	836.5	167300	1 -
	-	High	839	167800]



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3.9.9 Reference test frequencies for NR operating band n30 3.9.9.1 Test frequencies for NR operating band n30 and SCS 15 kHz

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3.3.3.1 Test frequencies for the operating band how and 503 13 kHz								
CBW [MHz]	Range		Carrier centre [MHz]	Carrier centre [ARFCN]	SS block SCS [kHz]			
		Low	2352.5	470500				
	Downlink	Mid	2355	471000	15			
5		High	2357.5	471500				
5		Low	2307.5	461500				
	Uplink	Mid	2310	462000	-			
		High	2312.5	462500	-			
		Low	2355	471000				
	Downlink	Mid	2355	471000	15			
10		High	2355	471000	-			
10		Low	2310	462000				
	Uplink	Mid	2310	462000] -			
		High	2310	462000				

3.9.10 Reference test frequencies for NR operating band n38 3.9.10.1 Test frequencies for NR operating band n38 and SCS 30 kHz

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



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CBW [MHz]	Range		Carrier centre [MHz]	Carrier centre [ARFCN]	SS block SCS [kHz]
	Downlink	Low	2506.02	501204	
20	&	Mid	2592.99	518598	30
	Uplink	High	2670	534000	
	Downlink	Low	2511	502200	
30	&	Mid	2592.99	518598	30
	Uplink	High	2675	535000	
	Downlink	Low	2516.01	503202	
40	&	Mid	2592.99	518598	30
	Uplink	High	2670	534000	
	Downlink	Low	2521.02	504204	
50	&	Mid	2592.99	518598	30
	Uplink	High	2664.99	532998	
	Downlink	Low	2526	505200	
60	&	Mid	2592.99	518598	30
	Uplink	High	2659.98	531996	
	Downlink	Low	2531	506200	
70	&	Mid	2592.29	518598	30
	Uplink	High	2655	531000	
	Downlink	Low	2536.02	507204	
80	&	Mid	2592.99	518598	30
	Uplink	High	2649.99	529998	
	Downlink	Low	2541	508200	
90	&	Mid	2592.99	518598	30
	Uplink	High	2644.98	528996]
	Downlink Lo	Low	2546.01	509202	
100	&	Mid	2592.99	518598	30
	Uplink	High	2640	528000	7

3.9.11 Reference test frequencies for NR operating band n41 3.9.11.1 Test frequencies for NR operating band n41 and SCS 30 kHz

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CBW [MHz]	Range	•	Carrier centre [MHz]	Carrier centre [ARFCN]	SS block SCS [kHz]
		Low	2112.5	422500	
	Downlink	Mid	2145	429000	15
-		High	2177.5	435500	
5		Low	1712.5	342500	
	Uplink	Mid	1745	349000	-
	·	High	1777.5	355500	
		Low	2115	423000	
	Downlink	Mid	2145	429000	15
10		High	2175	435000	1
10		Low	1715	343000	
	Uplink	Mid	1745	349000	1 -
		High	1775	355000	1
		Low	2117.5	423500	
	Downlink	Mid	2145	429000	15
4.5		High	2172.5	434500	1
15 -	15 Uplink	Low	1717.5	343500	
		Mid	1745	349000	1 -
		High	1772.5	354500	1
		Low	2120	424000	
	Downlink		429000	15	
		High	2170	434000	1
20		Low	1720	344000	
	Uplink	Mid	1745	349000	1 -
		High	1770	354000	1
		Low	2125	425000	
	Downlink	Mid	2145	429000	15
		High	2165	433000	1
30		Low	1725	345000	
	Uplink	Mid	1745	349000	1 -
		High	1765	353000	1
		Low	2130	426000	
	Downlink	Mid	2145	429000	15
		High	2160	432000	1
40		Low	1730	346000	
	Uplink	Mid	1745	349000	1 -
		High	1760	352000	1

3.9.12 Reference test frequencies for NR operating band n66 3.9.12.1 Test frequencies for NR operating band n66 and SCS 15 kHz

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3.9.13 Reference test frequencies for NR operating band n70 3.9.13.1 Test frequencies for NR operating band n70 and SCS 15 kHz

Bandwidth [MHz]	Rang	e	Carrier centre [MHz]	Carrier centre [ARFCN]	SS block SCS [kHz]
		Low	1997.5	399500	
	Downlink	Mid	2002.5	400500	15
5 –		High	2007.5	401500	
5		Low	1697.5	339500	
	Uplink	Mid	1702.5	340500]
		High	1707.7	341500	
		Low	2000	400000	
	Downlink	Mid	2002.5	400500	15
10		High	2005	401000]
10		Low	1700	340000	
	Uplink	Mid	1702.5	340500]
		High	1705	341000	
		Low	/	1	
	Downlink	Mid	2002.5	400500	15
45		High	/	1	
15 Upli		Low	/	/	
	Uplink	Mid	1702.5	340500]
		High	1	1	1



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3.9.14 Reference test frequencies for NR operating band n713.9.14.1 Test frequencies for NR operating band n71 and SCS 15 kHzCBWRangeCarrier centreCarrier centre

CBW [MHz]	Range		Carrier centre [MHz]	Carrier centre [ARFCN]	SS block SCS [kHz]
		Low	619.5	123900	
	Downlink	Mid	634.5	126900	15
5		High	649.5	129900	
5		Low	665.5	133100	
	Uplink	Mid	680.5	136100	-
		High	695.5	139100	
		Low	622	124400	
	Downlink	Mid	634.5	126900	15
10		High	647	129400]
10		Low	668	133600	
	Uplink	Mid	680.5	136100	-
		High	693	138600	
		Low	624.5	124900	
	Downlink	Mid	634.5	126900	15
15		High	644.5	128900	
15		Low	670.5	134100	
	Uplink	Mid	680.5	136100	- [
		High	690.5	138100	1
		Low	627	125400	
	Downlink	Mid	634.5	126900	15
20		High	642	128400]
20		Low	673	134600	
	Uplink	Mid	680.5	136100	1 -
	-	High	688	137600]



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3.9.15 Reference test frequencies for NR operating band n77 3.9.15.1 Test frequencies for NR operating band n77 and SCS 30 kHz

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CBW [MHz]	Range)	Carrier centre [MHz]	Carrier centre [ARFCN]	SS block SCS [kHz]
	Downlink	Low	3705	647000	
10	&	Mid	3840	656000	30
	Uplink	High	3975	665000	
	Downlink	Low	3707.52	647168	
15	&	Mid	3840	656000	30
	Uplink	High	3972.48	664832	1
	Downlink	Low	3710.01	647334	
20	&	Mid	3840	656000	30
	Uplink	High	3969.99	664666	1
	Downlink	Low	3714.99	647666	
30	&	Mid	3840	656000	30
	Uplink	High	3965.01	664334	7
	Downlink	Low	3720	648000	
40	&	Mid	3840	656000	30
	Uplink	High	3960	664000	
	Downlink	Low	3725.01	648334	
50	&	Mid	3840	656000	30
	Uplink	High	3954.99	663666	
	Downlink	Low	3730.02	648668	
60	&	Mid	3840	656000	30
	Uplink	High	3949.98	663332	
	Downlink	Low	3735	649000	
70	&	Mid	3840	656000	30
	Uplink	High	3945	663000	
	Downlink	Low	3740.01	649334	
80	&	Mid	3840	656000	30
	Uplink	High	3939.99	662666	1
	Downlink	Low	3745.02	649668	
90	&	Mid	3840	656000	
	Uplink	High	3934.98	662332	
	Downlink	Low	3750	650000	
100	&	Mid	3840	656000	
	Uplink	High	3930	662000	



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CBW [MHz]	Range	•	Carrier centre [MHz]	Carrier centre [ARFCN]	SS block SCS [kHz]
	Downlink	Low	3455.01	630334	
10	&	Mid	3500.01	633334	30
	Uplink	High	3545.01	636334	7
	Downlink	Low	3457.5	630500	
15	&	Mid	3500.01	633334	30
	Uplink	High	3542.49	636166	1
	Downlink	Low	3460.02	630668	
20	&	Mid	3500.01	633334	30
	Uplink	High	3540	636000	1
	Downlink	Low	3465	631000	
30	&	Mid	3500.01	633334	30
	Uplink	High	3534.99	635666	7
	Downlink	Low	3470.01	631334	
40	&	Mid	3500.01	633334	30
	Uplink	High	3530.01	635334	7
	Downlink	Low	3475.02	631668	
50	&	Mid	3500.01	633334	30
	Uplink	High	3525	635000	
	Downlink	Low	3480	632000	
60	&	Mid	3500.01	633334	30
	Uplink	High	3519.99	634666	7
	Downlink	Low	3485.01	632334	
70	&	Mid	3500.01	633334	30
	Uplink	High	3515.01	634334	7
	Downlink	Low	3490.02	632668	
80	&	Mid	3500.01	633334	30
	Uplink	High	3510	634000]
	Downlink	Low	3495	633000	30
90	&	Mid	3500.01	633334	
	Uplink	High	3504.99	633666	
	Downlink	Low		1	
100	&	Mid	3500.01	633334	30
	Uplink	High	\	\	



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3.9.16 Reference test frequencies for NR operating band n78 3.9.16.1 Test frequencies for NR operating band n78 and SCS 30 kHz

SG

CBW [MHz]	Range)	Carrier centre [MHz]	Carrier centre [ARFCN]	SS block SCS [kHz]
	Downlink	Low	3705	647000	
10	&	Mid	3750	650000	30
	Uplink	High	3795	653000	
	Downlink	Low	3707.52	647168	
15	&	Mid	3750	650000	30
	Uplink	High	3792.48	652832	1
	Downlink	Low	3710.01	647334	
20	&	Mid	3750	650000	30
	Uplink	High	3789.99	652666	1
	Downlink	Low	3715.02	647668	
30	&	Mid	3750	650000	30
	Uplink	High	3785.01	652334	7
	Downlink	Low	3720	648000	30
40	&	Mid	3750	650000	
	Uplink	High	3780	652000	
	Downlink	Low	3725.01	648334	
50	&	Mid	3750	650000	
	Uplink	High	3774.99	651666	
	Downlink	Low	3730.02	648668	
60	&	Mid	3750	650000	30
	Uplink	High	3769.98	651332	1
	Downlink	Low	3735	649000	
70	&	Mid	3750	650000	30
-	Uplink	High	3765	651000	
	Downlink	Low	3740.01	649334	
80	&	Mid	3750	650000	30
	Uplink	High	3759.99	650666	1
90	Downlink	Low	3745.02	649668	
	&	Mid	3750	650000	30
	Uplink	High	3754.98	650332	1
	Downlink	Low	1	1	
100	&	Mid	3750	650000	30
	Uplink	High	1	/	1



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CBW [MHz]	Range	•	Carrier centre [MHz]	Carrier centre [ARFCN]	SS block SCS [kHz]
	Downlink	Low	3455.01	630334	
10	&	Mid	3500.01	633334	30
	Uplink	High	3545.01	636334	7
	Downlink	Low	3457.5	630500	
15	&	Mid	3500.01	633334	30
	Uplink	High	3542.49	636166	1
	Downlink	Low	3460.02	630668	
20	&	Mid	3500.01	633334	30
	Uplink	High	3540	636000	1
	Downlink	Low	3465	631000	
30	&	Mid	3500.01	633334	30
	Uplink	High	3534.99	635666	7
	Downlink	Low	3470.01	631334	30
40	&	Mid	3500.01	633334	
	Uplink	High	3530.01	635334	
	Downlink	Low	3475.02	631668	30
50	&	Mid	3500.01	633334	
	Uplink	High	3525	635000	
	Downlink	Low	3480	632000	
60	&	Mid	3500.01	633334	30
	Uplink	High	3519.99	634666	7
	Downlink	Low	3485.01	632334	
70	&	Mid	3500.01	633334	30
	Uplink	High	3515.01	634334	7
	Downlink	Low	3490.02	632668	
80	&	Mid	3500.01	633334	30
	Uplink	High	3510	634000	
	Downlink	Low	3495	633000	
90	&	Mid	3500.01	633334	30
	Uplink	High	3504.99	633666	
	Downlink	Low		1	
100	&	Mid	3500.01	633334	30
	Uplink	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 EIRP Power Density

Measurement Procedure: FCC KDB 971168 D01 V03r01 Section 5.3

Test Settings

- 1. Set instrument center frequency to OBW center frequency.
- 2. Set span to at least 1.5 times the OBW.
- 3. Set the RBW to the specified reference bandwidth (often 1 MHz).
- 4. Set VBW ≥ 3 × RBW.
- 5. Detector = RMS (power averaging).
- 6. Ensure that the number of measurement points in the sweep \geq 2 × span/RBW.
- 7. Sweep time = auto couple.
- 8. Employ trace averaging (RMS) mode over a minimum of 100 traces.

9. Use the peak marker function to determine the maximum amplitude level within the reference bandwidth (PSD).



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4.4 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

- 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 \geq 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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4.5 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. $VBW \ge 3 \times RBW$
- 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



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4.6 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



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4.7 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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4.8 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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4.9 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



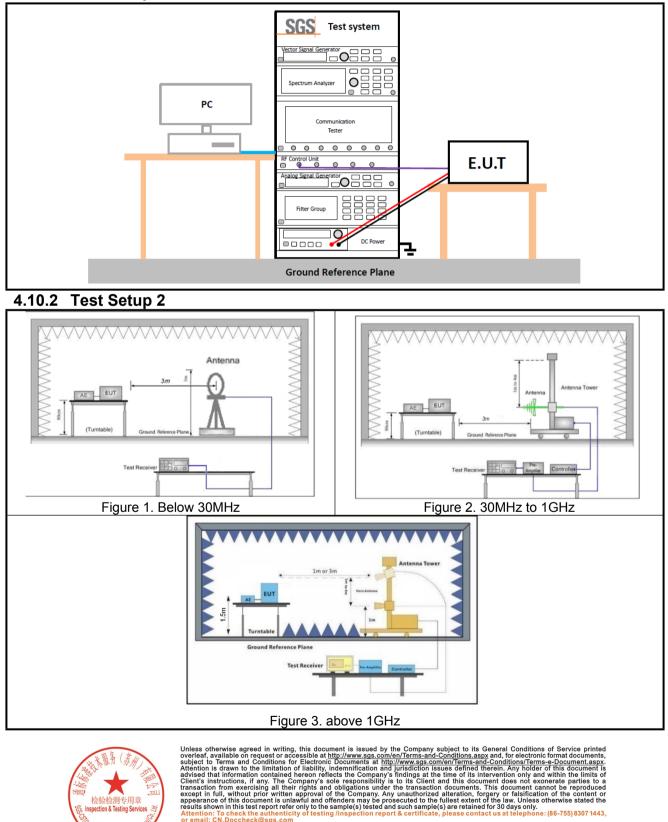
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4.10 Test Setups

4.10.1 Test Setup 1



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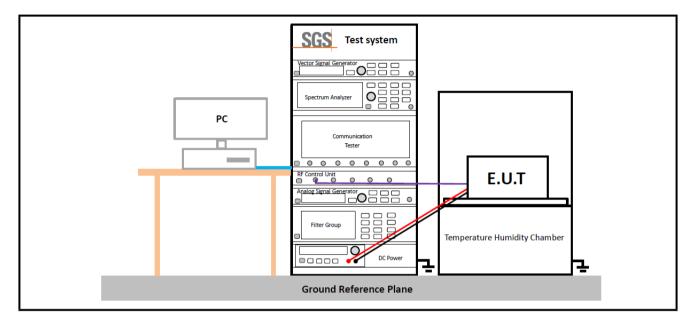
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4.10.3 Test Setup 3





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4.11 Test Conditions

	Transmit Output Power Data - Average Power, Spectral Density				
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/TM5; 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/TM6				
Spurious Emission at Antenna Terminals					



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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
rest Environment	(2) VL, VN and VH of Rated Voltage at Ambient Climate.
Test Setup	Test Setup 3
RF Channels (TX)	M (M= middle channel)
TestMeste	NR/TM1; NR/TM6
Test Mode	The report only show the bandwidth with the worst case.



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5 Main Test Instruments

RF Test Equipment (for report SEWA2204000008RG02)						
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	2024/05/08	
Temperature and humidity meter	MingGao	TH101B	SUWI-01-01-07	2022/02/16	2023/02/15	
Signal Analyzer	ROHDE&SCHWARZ	FSV3030	SUWI-01-02-02	2021/05/28	2022/05/27	
Signal Analyzei	RUNDEQSCHWARZ	F3V3030	30001-01-02-02	2022/05/17	2023/05/16	
Measurement Software	Tonscend	JS1120-3 Test System V 2.6.88.0336	SUWI-02-09-09	NCR	NCR	
Wideband Radio Communication Tester	Anritsu	MT8821C	SUWI-01-26-03	2021/12/04	2022/12/03	
Wideband Radio Communication Tester	ROHDE&SCHWARZ	CMW500	SUWI-01-16-05	2022/02/14	2023/02/13	
DC Power Supply	HYELEC	HY3005B	SUWI-01-18-01	2022/02/15	2023/02/14	
Temperature Chamber	ESPEC	SU-242	SUWI-01-13-01	2022/02/15	2023/2/14	
Radio Communication Analyzer	StarPoint	SP9500E	SUWI-01-28-01	2021/08/11	2022/08/10	
Signal	ROHDE&SCHWARZ	FSW43	SUWI-01-02-04	2021/05/28	2022/05/27	
Analyzer*	ROHDEQUOINTARE	1 0 1 4 0	00001-01-02-04	2022/05/28	2023/05/27	



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	RSE Test Equipment (for report SEWA2204000008RG02)						
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	2022/02/16	2023/02/15		
Signal Analyzer*	ROHDE&SCHWARZ	FSW43	SUWI-01-02-04	2021/05/28	2022/05/27		
				2022/05/28	2023/05/27		
Signal Analyzer	KEYSIGHT	N9020A	SUWI-01-02-05	2021/12/04	2022/12/03		
Test receiver	ROHDE&SCHWARZ	ESR7	SUWI-01-10-01	2022/02/19	2023/02/18		
Receiving antenna	SCHWRZBECK MESS- ELEKTRONIK	VULB 9163	SUWI-01-11-01	2021/05/16	2023/05/15		
Receiving antenna	SCHWRZBECK MESS- ELEKTRONIK	BBHA 9120D	SUWI-01-11-02	2021/05/16	2023/05/15		
Receiving antenna	SCHWRZBECK MESS- ELEKTRONIK	BBHA 9170	SUWI-01-11-03	2021/05/14	2023/05/13		
Active Loop Antenna	SCHWRZBECK MESS- ELEKTRONIK	FMZB 1519B	SUWI-01-21-01	2021/06/10	2023/06/09		
Amplifier	Tonscend	TAP9K3G40	SUWI-01-14-01	2022/02/14	2023/02/13		
Amplifier	Tonscend	TAP01018050	SUWI-01-14-02	2022/02/14	2023/02/13		
Amplifier	Tonscend	TAP18040048	SUWI-01-14-03	2022/02/19	2023/02/18		
Wideband Radio Communication Tester	Anritsu	MT8820C	SUWI-01-16-08	2022/02/14	2023/02/13		
Wideband Radio Communication Tester	Anritsu	MT8821C	SUWI-01-26-03	2021/12/04	2022/12/03		
Radio Communication Analyzer	StarPoint	SP9500E	SUWI-01-28-01	2021/08/11	2022/08/10		
Measurement Software	Tonscend	JS32-RSE 4.0.0.1	SUWI-02-09-06	NCR	NCR		

*Note: This equipment was not used for testing on 2022/05/28.



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RF conducted test (for report SEWM2304000122RG02 & SEWA2309000114RG02)						
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 Analyzar		FSV3030	SUWI-01-02-02	2022/05/17	2023/05/16	
Signal Analyzer	ROHDE&SCHWARZ	F3V3030	50001-01-02-02	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	
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	A a rita	MT0000A		2022/09/16	2023/09/15	
Communication Test Ststion	Anritsu	MT8000A	SUWI-01-34-02	2023/09/12	2024/09/11	
Cianal Analyza		E014/42		2022/05/28	2023/05/27	
Signal Analyzer	ROHDE&SCHWARZ	FSW43	SUWI-01-02-04	2023/05/11	2024/05/10	



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	RE Test System (for report SEWM2304000122RG02)					
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	
		E014/42		2022/05/28	2023/05/27	
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	
Signal Analyzer	KEYSIGHT	N9020A	SUWI-01-02-05	2022/11/23	2023/11/22	
Receiving	SCHWRZBECK	VULB 9163	SUWI-01-11-01	2021/05/16	2023/05/15	
antenna	MESS-ELEKTRONIK	VULB 9103	5000-01-11-01	2023/05/13	2024/05/12	
Receiving	SCHWRZBECK		SUWI-01-11-02	2021/05/16	2023/05/15	
antenna	MESS-ELEKTRONIK	BBHA 9120D		2023/05/13	2024/05/12	
Receiving	SCHWRZBECK			2021/05/14	2023/05/13	
antenna	MESS-ELEKTRONIK	BBHA 9170	A 9170 SUWI-01-11-03	2023/05/12	2024/05/11	
Active Loop	SCHWRZBECK		SUWI-01-21-01	2021/05/16	2023/05/15	
Antenna	MESS-ELEKTRONIK	FMZB 1519B	50001-21-01	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	
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 4.0.0.0	SUWI-02-09-04	NCR	NCR	



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	RSE Test System (for report SEWA2309000114RG02)					
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	



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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:

	For report SEWA220400008RG02& SEWM2304000122RG02				
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%			
		± 3.13dB (9kHz to 30MHz)			
7	Dedicted Emission	± 4.8dB (30MHz to 1GHz)			
7	Radiated Emission	± 4.8dB (1GHz to 18GHz)			
		± 4.8dB (Above 18GHz)			
Pemark:	·	·			

Remark:

SG

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.



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	For report SEWA2309000114RG02					
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 %				
		± 3.13dB (9k to 30MHz)				
7	Dedicted Enviorien	± 4.88dB (30M to 1GHz)				
7	Radiated Emission	± 4.75dB (1GHz to 18GHz)				
		± 4.77dB (Above 18GHz)				
Remark:						

The U_{Iab} (Iab 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.



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7 Appendixes

Appendix A.2	WWAN Setup Photos
Appendix B.28	NR Band n2
Appendix B.29	NR Band n5
Appendix B.30	NR Band n7
Appendix B.31	NR Band n12
Appendix B.32	NR Band n13
Appendix B.33	NR Band n14
Appendix B.34	NR Band n25
Appendix B.35	NR Band n26(814-824)
Appendix B.36	NR Band n26(824-849)
Appendix B.37	NR Band n30
Appendix B.38	NR Band n38
Appendix B.39	NR Band n41
Appendix B.40	NR Band n66
Appendix B.41	NR Band n70
Appendix B.42	NR Band n71
Appendix B.43	NR Band n77(3450-3550)
Appendix B.44	NR Band n77(3700-3980)
Appendix B.45	NR Band n78(3450-3550)
Appendix B.46	NR Band n78(3700-3800)

---End of Report---



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