TEST REPORT

Application No:	SEWM2309000364RG
Applicant:	Fibocom Wireless Inc.
Address of Applicant:	1101, Tower A, Building 6, Shenzhen International Innovation Valley, Dashi 1st Rd, Nanshan, Shenzhen, China
Manufacturer:	Fibocom Wireless Inc.
Address of Manufacturer:	1101, Tower A, Building 6, Shenzhen International Innovation Valley, Dashi 1st Rd, Nanshan, Shenzhen, China
EUT Description:	5G Module
Model No.:	FM160-NA
Trade Mark:	Fibocom
FCC ID:	ZMOFM160NA
Standards:	47 CFR Part 2 47 CFR Part 22 47 CFR Part 24 47 CFR Part 27 47 CFR Part 90 47 CFR Part 96
Date of Receipt:	2022/03/10 (for report SUZR/2022/1002202) 2023/09/12 (for report SEWM2309000364RG02)
Date of Test:	2023/09/13 to 2023/09/27 (for report SEWM2309000364RG02)
Date of Issue:	2023/10/08
Test Result:	**PASS ***

* 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		2023/10/08		Original

Prepared By		King-p Li **(King-p Li) / Test Engineer**
Checked By		Stone Gu **(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	Reference report SUZR/2022/1002202	
Peak-Average Ratio	§22.913(d)	Limit≤13 dB		
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.		
Band Edges Compliance	§2.1051, §22.917(a)	≤ -13 dBm/1%*EBW, in 1 MHz bands immediately outside and adjacent to the frequency block.		
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.		
Field Strength of Spurious Radiation	§2.1053, §22.917(a)	FCC: ≤ -13 dBm/100 kHz.		
Frequency Stability	§2.1055(a)(1)(b) §2.1055(d)(1) §22.355	±2.5ppm.		

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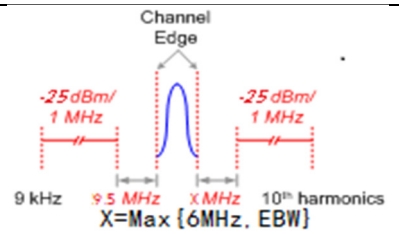
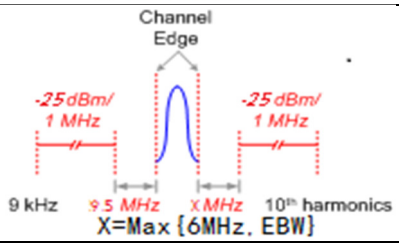
2.2 NR Band n41

Test Item	FCC Rule No.	Requirements	Test Result	Verdict
Effective (Isotropic) Radiated Power Output Data	§2.1046, §27.50(h)(2)	EIRP ≤ 2W	Reference report SUZR/2022/1002202	
Peak-Average Ratio	---	≤13 dB		
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.		
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, wdhere X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less that 43 + 10 log (P) dB on all frequencies between 2490.5 MHz and 2496 MHz and 55 + 10 log (P) dB at or below 2490.5 MHz.		
Spurious Emission at Antenna Terminals	§2.1051, §27.53(m)			
Field Strength of Spurious Radiation	§2.1053, §27.53(m)			
Frequency Stability	§2.1055(a)(1)(b) §2.1055(d)(1) §27.54	Within authorized bands of operation/frequency block.		

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2.3 NR Band n2

Test Item	FCC Rule No.	Requirements	Test Result	Verdict
Effective (Isotropic) Radiated Power Output Data	§2.1046, §24.232(c)	EIRP ≤ 2 W	Reference report SUZR/2022/1002202	
Peak-Average Ratio	§24.232(d)	Limit≤13 dB		
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.		
Band Edges Compliance	§2.1051, §24.238(a)	≤ -13 dBm/1%*EBW, in 1 MHz bands immediately outside and adjacent to the frequency block.		
Spurious Emission at Antenna Terminals	§2.1051, §24.238(a)	≤ -13 dBm/1 MHz, from 9 kHz to 10th harmonics but outside authorized operating frequency ranges.		
Field Strength of Spurious Radiation	§2.1053, §24.238(a)	≤ -13 dBm/1 MHz.	Section 1 of Appendix B.2	Pass
Frequency Stability	§2.1055(a)(1)(b) §2.1055(d)(1) §24.235	Within authorized bands of operation/frequency block.	Reference report SUZR/2022/1002202	

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2.4 NR Band n25

Test Item	FCC Rule No.	Requirements	Test Result	Verdict
Effective (Isotropic) Radiated Power Output Data	§2.1046, §24.232(c)	EIRP ≤ 2 W	Reference report SUZR/2022/1002202	
Peak-Average Ratio	§24.232(d)	Limit≤13 dB		
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.		
Band Edges Compliance	§2.1051, §24.238(a)	≤ -13 dBm/1%*EBW, in 1 MHz bands immediately outside and adjacent to the frequency block.		
Spurious Emission at Antenna Terminals	§2.1051, §24.238(a)	≤ -13 dBm/1 MHz, from 9 kHz to 10th harmonics but outside authorized operating frequency ranges.		
Field Strength of Spurious Radiation	§2.1053, §24.238(a)	≤ -13 dBm/1 MHz.		
Frequency Stability	§2.1055(a)(1)(b) §2.1055(d)(1) §24.235	Within authorized bands of operation/frequency block.		

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2.5 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.	Reference report SUZR/2022/1002202	
Peak-Average Ratio	---	Limit≤13 dB		
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.		
Band Edges Compliance	§2.1051, §27.53(g)	≤ -13 dBm/1%*EBW, in 1 MHz bands immediately outside and adjacent to the frequency block.		
Spurious Emission at Antenna Terminals	§2.1051, §27.53(g)	FCC: ≤ -13 dBm/100 kHz, from 9 kHz to 10th harmonics but outside authorized operating frequency ranges.		
Field Strength of Spurious Radiation	§2.1053, §27.53(g)	FCC: ≤ -13 dBm/100 kHz.		
Frequency Stability	§2.1055(a)(1)(b) §2.1055(d)(1) §27.54	Within authorized bands of operation/frequency block.		

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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(a)	ERP ≤ 3 W.	Reference report SUZR/2022/1002202	
Peak-Average Ratio	---	Limit≤13 dB		
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.		
Emission Mask	§2.1051 §90.210(b)	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.		
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 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,		

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		above 805 MHz, and below 758 MHz, by at least 43 + 10 log (P) dB.	
Spurious Emission at Antenna Terminals	§2.1051, §90.543(c) §90.543(f)	FCC: ≤ -13 dBm/100 kHz, from 9 kHz 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.	
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.	
Frequency Stability	§2.1055(a)(1)(b) §2.1055(d)(1) §90.213	Within authorized bands of operation/frequency block.	

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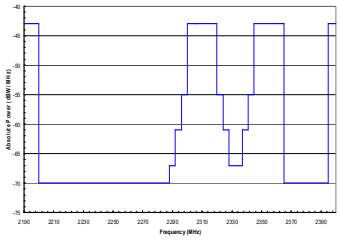
2.7 NR Band n30

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	Reference report SUZR/2022/1002202	
Peak-Average Ratio	---	FCC: Limit≤13 dB		
Bandwidth	§2.1049,	OBW: No limit. EBW: No limit.		
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.		
Spurious Emission at Antenna Terminals	§2.1051, §27.53(a)(4)	Figure 1: Unwanted Emissions for Mobile, Portable, and Low Power Fixed Subscriber Equipment  For mobile and portable stations operating in the 2305-2315 MHz and 2350-2360 MHz bands: (i) By a factor of not less than: 43 + 10 log (P) dB on all frequencies between 2305 and 2320 MHz and on all frequencies between 2345 and 2360 MHz that are outside the licensed band(s) of operation, not less than 55 + 10 log (P) dB on all frequencies between 2320 and 2324 MHz and on all frequencies between 2341 and 2345 MHz, not less than 61 + 10 log (P) dB on all frequencies between 2324 and 2328 MHz and on all frequencies between 2337 and 2341 MHz, and not less than 67 + 10 log (P) dB on all frequencies between 2328 and 2337 MHz; (ii) By a factor of not less than 43 + 10 log (P) dB on all frequencies between 2300 and 2305 MHz, 55 + 10 log (P) dB on all frequencies between 2296 and 2300 MHz, 61 + 10 log (P) dB on all frequencies between 2292 and 2296 MHz, 67 + 10 log (P) dB on all frequencies		

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		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.	
Frequency Stability	§2.1055(a)(1)(b) §2.1055(d)(1) §27.54	within the range of the operating frequency blocks	

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2.8 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	Reference report SUZR/2022/1002202	
Peak-Average Ratio	§27.50(d)(5)	Limit≤13 dB		
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.		
Band Edges Compliance	§2.1051, §27.53(h)	≤ -13 dBm/1%*EBW, in 1 MHz bands immediately outside and adjacent to the frequency block.		
Spurious Emission at Antenna Terminals	§2.1051, §27.53(h)	≤ -13 dBm/1 MHz, from 9 kHz to 10th harmonics but outside authorized operating frequency ranges.		
Field Strength of Spurious Radiation	§2.1053, §27.53(h)	≤ -13 dBm/1 MHz.	Section 1 of Appendix B.2	Pass
Frequency Stability	§2.1055(a)(1)(b) §2.1055(d)(1) §27.54	Within authorized bands of operation/frequency block.	Reference report SUZR/2022/1002202	

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2.9 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	Reference report SUZR/2022/1002202	
Peak-Average Ratio	§27.50(d)(5)	Limit≤13 dB		
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.		
Band Edges Compliance	§2.1051, §27.53(h)	≤ -13 dBm/1%*EBW, in 1 MHz bands immediately outside and adjacent to the frequency block.		
Spurious Emission at Antenna Terminals	§2.1051, §27.53(h)	≤ -13 dBm/1 MHz, from 9 kHz to 10th harmonics but outside authorized operating frequency ranges.		
Field Strength of Spurious Radiation	§2.1053, §27.53(h)	≤ -13 dBm/1 MHz.		
Frequency Stability	§2.1055(a)(1)(b) §2.1055(d)(1) §27.54	Within authorized bands of operation/frequency block.		

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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	Reference report SUZR/2022/1002202	
Peak-Average Ratio	---	Limit≤13 dB		
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.		
Band Edges Compliance	§2.1051, §27.53(g)	≤ -13 dBm/1%*EBW, in 1 MHz bands immediately outside and adjacent to the frequency block.		
Spurious Emission at Antenna Terminals	§2.1051, §27.53(g)	≤ -13 dBm/1 MHz, from 9 kHz to 10th harmonics but outside authorized operating frequency ranges.		
Field Strength of Spurious Radiation	§2.1053, §27.53(g)	≤ -13 dBm/1 MHz.		
Frequency Stability	§2.1055(a)(1)(b) §2.1055(d)(1) §27.54	within the authorized bands of operation.		

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2.11 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	Reference report SUZR/2022/1002202	
Peak-Average Ratio	---	≤13 dB		
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.		
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.		
Spurious Emission at Antenna Terminals	§2.1051, §27.53(l)(2)	not exceed -13 dBm/MHz.		
Field Strength of Spurious Radiation	§2.1053, §27.53(l)(2)	not exceed -13 dBm/MHz	Section 1 of Appendix B.2	Pass
Frequency Stability	§2.1055(a)(1)(b) §2.1055(d)(1) §27.54	Within authorized bands of operation/frequency block.	Reference report SUZR/2022/1002202	

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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	Reference report SUZR/2022/1002202	
Peak-Average Ratio	§27.50(k)(4)	FCC: Limit≤13 dB		
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.		
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.		
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.		
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 1 of Appendix B.2	Pass
Frequency Stability	§2.1055(a)(1)(b) §2.1055(d)(1) §27.54	Within authorized bands of operation/ frequency block.	Reference report SUZR/2022/1002202	

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2.12 NR Band n48

3550-3700MHz:

Test Item	FCC Rule No.	Requirements	Test Result	Verdict
Effective (Isotropic) Radiated Power Output Data	§2.1046, §96.41	EIRP ≤ 23dBm/10MHz	Reference report FYCR220400010001	
Peak-Average Ratio	§96.41	FCC: Limit≤13 dB		
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.		
Band Edges Compliance	§2.1051, §96.41	for channel and frequency assignments made by a CBSD to End User Devices, the conducted power of any End User Device emission outside the fundamental emission (whether in or outside of the authorized band) shall not exceed −13 dBm/MHz within 0 to B megahertz (where B is the bandwidth in megahertz of the assigned channel or multiple contiguous channels of the End User Device) above the upper CBSD-assigned channel edge and within 0 to B megahertz below the lower CBSD-assigned channel edge.		
Spurious Emission at Antenna Terminals	§2.1051, §96.41	for channel and frequency assignments made by a CBSD to End User Devices, the conducted power of any End User Device emission outside the fundamental emission (whether in or outside of the authorized band) shall not exceed −13 dBm/MHz within 0 to B megahertz (where B is the bandwidth in megahertz of the assigned channel or multiple contiguous channels of the End User Device) above the upper CBSD-assigned channel edge and within 0 to B megahertz below the lower CBSD-assigned channel edge. At all frequencies greater than B megahertz above the upper CBSD assigned channel edge and less than B megahertz below the lower CBSD-assigned channel edge, the conducted power of any End User Device emission shall not exceed −25 dBm/MHz. Notwithstanding the emission limits in this paragraph, the Adjacent Channel Leakage Ratio for End User Devices shall be at least 30 dB. (2) Additional protection levels. Notwithstanding paragraph (e)(1) of this section, for CBSDs and End User Devices,		

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		the conducted power of emissions below 3540 MHz or above 3710 MHz shall not exceed −25 dBm/MHz, and the conducted power of emissions below 3530 MHz or above 3720 MHz shall not exceed −40dBm/MHz.	
Field Strength of Spurious Radiation	§2.1053, §96.41	for channel and frequency assignments made by a CBSD to End User Devices, the conducted power of any End User Device emission outside the fundamental emission (whether in or outside of the authorized band) shall not exceed −13 dBm/MHz within 0 to B megahertz (where B is the bandwidth in megahertz of the assigned channel or multiple contiguous channels of the End User Device) above the upper CBSD-assigned channel edge and within 0 to B megahertz below the lower CBSD-assigned channel edge. At all frequencies greater than B megahertz above the upper CBSD assigned channel edge and less than B megahertz below the lower CBSD-assigned channel edge, the conducted power of any End User Device emission shall not exceed −25 dBm/MHz. Notwithstanding the emission limits in this paragraph, the Adjacent Channel Leakage Ratio for End User Devices shall be at least 30 dB. (2) Additional protection levels. Notwithstanding paragraph (e)(1) of this section, for CBSDs and End User Devices, the conducted power of emissions below 3540 MHz or above 3710 MHz shall not exceed −25 dBm/MHz, and the conducted power of emissions below 3530 MHz or above 3720 MHz shall not exceed −40dBm/MHz.	
Frequency Stability	§2.1055, §96.41	Within authorized bands of operation/ frequency block.	

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Remark:

This test report (Report No.: SEWM2309000364RG02 issue on 2023/10/08) is based on the original test report (Report No.: SUZR/2022/1002202 issue on 2022/06/28 and FYCR220400010001 issue on 2022/05/20).

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 DC_14A_n2A, DC_14A_n66A and DC_14A_n77A of Field Strength of Spurious Radiation were tested, and other items data please refer to the test report with report number SUZR/2022/1002202 issue on 2022/06/28 and FYCR220400010001 issue on 2022/05/20.

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3 General Information

3.1 Client Information

Applicant:	Fibocom Wireless Inc.
Address of Applicant:	1101, Tower A, Building 6, Shenzhen International Innovation Valley, Dashi 1st Rd, Nanshan, Shenzhen, China
Manufacturer:	Fibocom Wireless Inc.
Address of Manufacturer:	1101, Tower A, Building 6, Shenzhen International Innovation Valley, Dashi 1st Rd, Nanshan, Shenzhen, China

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:	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:	5G Module		
Model No.:	FM160-NA		
Trade Mark:	Fibocom		
Hardware Version:	V1.1		
Software Version:	89610.1000.00.02.02.12		
Power Supply:	DC 3.8V		
IMEI:	862513050028512		
Feature:	UL 2*2 MIMO: NR Band n41; NR Band n77		
Power Class:	Class 1.5: UL MIMO NR Band n41; UL MIMO NR Band n77		
Antenna Type:	☒ External, ☐ Integrated		
Antenna Gain:	NR Band n2:	2.63dBi(Ant0)	2.63dBi(Ant3)
	NR Band n5:	1.32dBi(Ant0)	1.32dBi(Ant3)
	NR Band n12:	1.61dBi(Ant3)	
	NR Band n14:	2.19dBi(Ant3)	
	NR Band n25:	1.93dBi(Ant0)	1.93dBi(Ant3)
	NR Band n30:	0.22dBi(Ant0)	
	NR Band n41:	1.52dBi(Ant0)	1.52dBi(Ant3)
	NR Band n48:	-0.13dBi(Ant0)	-0.13dBi(Ant3)
	NR Band n66:	3.76dBi(Ant0)	3.76dBi(Ant3)
	NR Band n70:	3.76dBi(Ant0)	
	NR Band n71:	1.39dBi(Ant3)	
	NR Band n77:	-0.13dBi(Ant0)	-0.13dBi(Ant3)
	Note: The antenna gain are derived from the gain information report provided by the manufacturer.		
Remark: 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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MIMO Model:

FCC KDB 662911 D01 Multiple Transmitter Output v02r01

If all antennas have the same gain, G_{ANT}, Directional gain = G_{ANT} + Array Gain, where Array Gain is as follows.

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

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

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

Band	ANT Gain1 (dBi)	ANT Gain2 (dBi)	Directional gain (dBi)
NR Band n41:	1.52	1.52	1.52
NR Band n77:	-0.13	-0.13	-0.13

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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	101kPa Selected Values During Tests	
Relative Humidity	44-46 % RH Ambient	
Value	Temperature (℃)	Voltage(V)
NTNV	22~23	3.8
LTLV	-30	3.135
LTHV	-30	4.4
HTLV	50	3.135
HTHV	50	4.4
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

Description	Manufacturer	Model No.
Mother board	Fibocom	EVB-M2V1.2
Adapter	Jiyin	TEKA018-1201500UK
Remark: all above the information of table are provided by client.		

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3.8 Technical Specification

Characteristics	Description		
Radio System Type	☒ SA ☒ NSA		
Supported Frequency Range	Band	TX	RX
	NR Band n2	1850 to 1910 MHz	1930 to 1990 MHz
	NR Band n5	824 to 849 MHz	869 to 894 MHz
	NR Band n12	699 to 716 MHz	729 to 746 MHz
	NR Band n14	788 to 798 MHz	758 to 768 MHz
	NR Band n25	1850 to 1915MHz	1930 to 1995 MHz
	NR Band n30	2305 to 2315 MHz	2350 to 2360 MHz
	NR Band n41	2496 to 2690 MHz	2496 to 2690 MHz
	NR Band n48	3550 to 3700 MHz	3550 to 3700 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	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
	Note*: Both NR Band n77 and NR Band n78 have the same frequency range 3450 MHz to 3550 MHz, and NR Band n78 was fully tested, NR Band n77 only test the items of Power.		
	ENDC: DC_5A_n2A, DC_12A_n2A, DC_13A_n2A, DC_30A_n2A, DC_66A_n2A, DC_2A_n5A, DC_12A_n5A, DC_13A_n5A, DC_30A_n5A, DC_48A_n5A, DC_66A_n5A DC_12A_n25A, DC_48A_n25, DC_66A_n25A DC_2A_n30A, DC_5A_n30A, DC_12A_n30A, DC_66A_n30A DC_2A_n41A, DC_66A_n41A DC_2A_n66A, DC_5A_n66A, DC_12A_n66A, DC_13A_n66A, DC_30A_n66A, DC_48A_n66A DC_2A_n71A, DC_66A_n71A DC_2A_n77A, DC_5A_n77A, DC_12A_n77A, DC_13A_n77A, DC_66A_n77A DC_14A_n2A, DC_14A_n66A, DC_14A_n77A ENDC& NRCA Only test RSE, report only show worst mode.		

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Supported Channel Bandwidth	NR Band n2	SCS 15kHz:			
		☒5 MHz	☒10 MHz	☒15 MHz	☒20 MHz
	NR Band n5	SCS 15kHz:			
		☒5 MHz	☒10 MHz	☒15 MHz	☒20 MHz
	NR Band n12	SCS 15kHz:			
		☒5 MHz	☒10 MHz	☒15 MHz	
	NR Band n14	SCS 15kHz:			
		☒5 MHz	☒10 MHz		
	NR Band n25	SCS 15kHz:			
		☒5 MHz	☒10 MHz	☒15 MHz	☒20 MHz
		☒25 MHz	☒30 MHz	☒40 MHz	
	NR Band n30	SCS 15kHz:			
		☒5 MHz	☒10 MHz		
	NR Band n41	SCS 30kHz:			
		☒20 MHz	☒30 MHz	☒40 MHz	☒50 MHz
		☒60 MHz	☒70 MHz	☒80 MHz	☒90 MHz
		☒100 MHz			
	NR Band n48	SCS 15kHz:			
		☒10 MHz	☒20 MHz	☒30 MHz	☒40 MHz
		☒50 MHz	☒60 MHz	☒80 MHz	☒90 MHz
		☒100 MHz			
	NR Band n66	SCS 15kHz:			
		☒5 MHz	☒10 MHz	☒15 MHz	☒20 MHz
		☒30 MHz	☒40 MHz		
	NR Band n70	SCS 15kHz:			
		☒5 MHz	☒10 MHz	☒15 MHz	
	NR Band n71	SCS 15kHz:			
		☒5 MHz	☒10 MHz	☒15 MHz	☒20 MHz
	NR Band n77	SCS 30kHz			
		☒10 MHz	☒15 MHz	☒20 MHz	☒30 MHz
		☒40 MHz	☒50 MHz	☒60 MHz	☒70 MHz
		☒80 MHz	☒90 MHz	☒100 MHz	

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

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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]
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	

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3.9.3 Reference test frequencies for NR operating band n12

3.9.3.1 Test frequencies for NR operating band n12 and SCS 15 kHz

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

3.9.4 Reference test frequencies for NR operating band n14

3.9.4.1 Test frequencies for NR operating band n14 and SCS 15 kHz

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

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3.9.5 Reference test frequencies for NR operating band n25

3.9.5.1 Test frequencies for NR operating band n25 and SCS 15 kHz

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

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3.9.6 Reference test frequencies for NR operating band n30

3.9.6.1 Test frequencies for NR operating band n30 and SCS 15 kHz

CBW [MHz]	Range		Carrier centre [MHz]	Carrier centre [ARFCN]	SS block SCS [kHz]
5	Downlink	Low	2352.5	470500	15
		Mid	2355	471000	
		High	2357.5	471500	
	Uplink	Low	2307.5	461500	-
		Mid	2310	462000	
		High	2312.5	462500	
10	Downlink	Low	2355	471000	15
		Mid	2355	471000	
		High	2355	471000	
	Uplink	Low	2310	462000	-
		Mid	2310	462000	
		High	2310	462000	

3.9.7 Reference test frequencies for NR operating band n41

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

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

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3.9.8 Reference test frequencies for NR operating band n48

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

3550-3700:

CBW [MHz]	Range		Carrier centre [MHz]	Carrier centre [ARFCN]	SS block SCS [kHz]
10	Downlink & Uplink	Low	3555	637000	30
		Mid	3624.99	641666	
		High	3694.98	646332	
20	Downlink & Uplink	Low	3560.01	637334	30
		Mid	3624.99	641666	
		High	3690	646000	
30	Downlink & Uplink	Low	3564.99	637666	30
		Mid	3624.99	641666	
		High	3684.99	645666	
40	Downlink & Uplink	Low	3570	638000	30
		Mid	3624.99	641666	
		High	3679.98	645332	
50	Downlink & Uplink	Low	3575.01	638334	30
		Mid	3624.99	641666	
		High	3675	645000	
60	Downlink & Uplink	Low	3580.02	638668	30
		Mid	3624.99	641666	
		High	3669.99	644666	
80	Downlink & Uplink	Low	3590.01	639334	30
		Mid	3624.99	641666	
		High	3660	644000	
90	Downlink & Uplink	Low	3595.02	639668	30
		Mid	3624.99	641666	
		High	3654.99	643666	
100	Downlink & Uplink	Low	3600	640000	30
		Mid	3624.99	641666	
		High	3649.98	643332	

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3.9.9 Reference test frequencies for NR operating band n66

3.9.9.1 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	2145	429000	
		High	2177.5	435500	
	Uplink	Low	1712.5	342500	-
		Mid	1745	349000	
		High	1777.5	355500	
10	Downlink	Low	2115	423000	15
		Mid	2145	429000	
		High	2175	435000	
	Uplink	Low	1715	343000	-
		Mid	1745	349000	
		High	1775	355000	
15	Downlink	Low	2117.5	423500	15
		Mid	2145	429000	
		High	2172.5	434500	
	Uplink	Low	1717.5	343500	-
		Mid	1745	349000	
		High	1772.5	354500	
20	Downlink	Low	2120	424000	15
		Mid	2145	429000	
		High	2170	434000	
	Uplink	Low	1720	344000	-
		Mid	1745	349000	
		High	1770	354000	
30	Downlink	Low	2125	425000	15
		Mid	2145	429000	
		High	2165	433000	
	Uplink	Low	1725	345000	-
		Mid	1745	349000	
		High	1765	353000	
40	Downlink	Low	2130	426000	15
		Mid	2145	429000	
		High	2160	432000	
	Uplink	Low	1730	346000	-
		Mid	1745	349000	
		High	1760	352000	

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3.9.10 Reference test frequencies for NR operating band n70

3.9.10.1 Test frequencies for NR operating band n70 and SCS 15 kHz

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

3.9.11 Reference test frequencies for NR operating band n71

3.9.11.1 Test frequencies for NR operating band n71 and SCS 15 kHz

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

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3.9.12 Reference test frequencies for NR operating band n77

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

3700-3980:

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

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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	30
		Mid	3500.01	633334	
		High	3545.01	636334	
15	Downlink & Uplink	Low	3457.5	630500	30
		Mid	3500.01	633334	
		High	3542.49	636166	
20	Downlink & Uplink	Low	3460.02	630668	30
		Mid	3500.01	633334	
		High	3540	636000	
30	Downlink & Uplink	Low	3465	631000	30
		Mid	3500.01	633334	
		High	3534.99	635666	
40	Downlink & Uplink	Low	3470.01	631334	30
		Mid	3500.01	633334	
		High	3530.01	635334	
50	Downlink & Uplink	Low	3475.02	631668	30
		Mid	3500.01	633334	
		High	3525	635000	
60	Downlink & Uplink	Low	3480	632000	30
		Mid	3500.01	633334	
		High	3519.99	634666	
70	Downlink & Uplink	Low	3485.01	632334	30
		Mid	3500.01	633334	
		High	3515.01	634334	
80	Downlink & Uplink	Low	3490.02	632668	30
		Mid	3500.01	633334	
		High	3510	634000	
90	Downlink & Uplink	Low	3495	633000	30
		Mid	3500.01	633334	
		High	3504.99	633666	
100	Downlink & Uplink	Low	\	\	30
		Mid	3500.01	633334	
		High	\	\	

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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 ≥ 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

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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4.5 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 ≥ 3 x RBW
5. Detector = RMS
6. Number of sweep points ≥ 2 x Span/RBW
7. Trace mode = trace average for continuous emissions, max hold for pulse emissions
8. Sweep time = auto couple
9. The trace was allowed to stabilize

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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 ±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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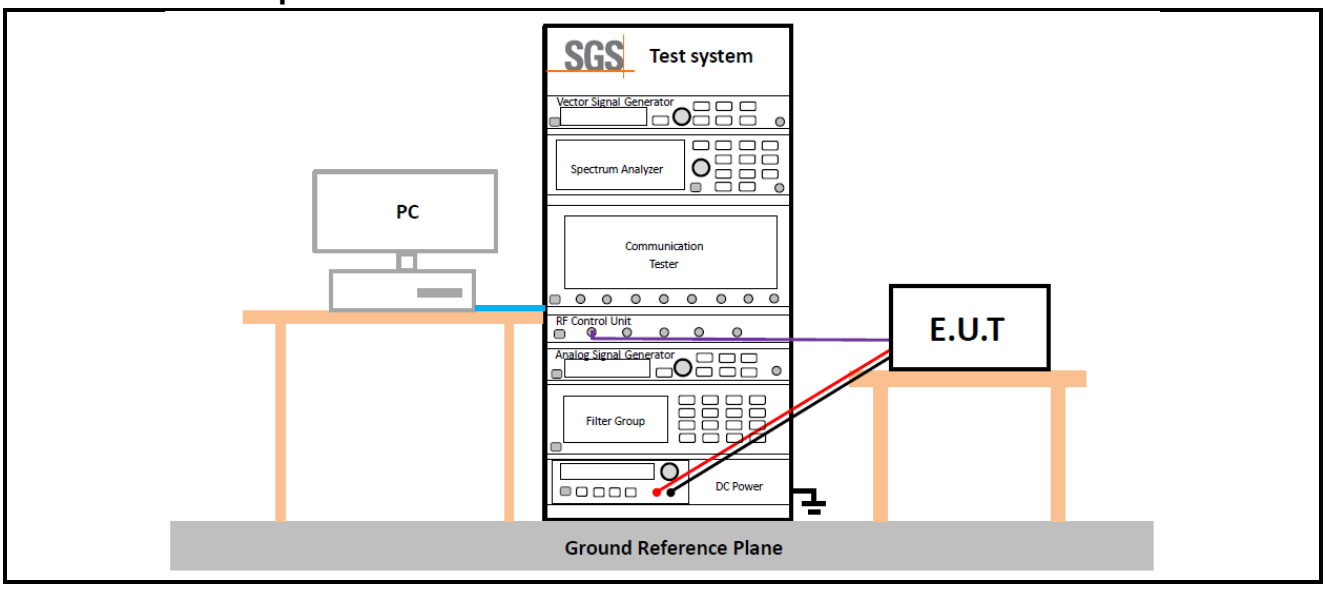
4.10 Test Setups

4.10.1 Test Setup 1



4.10.2 Test Setup 2

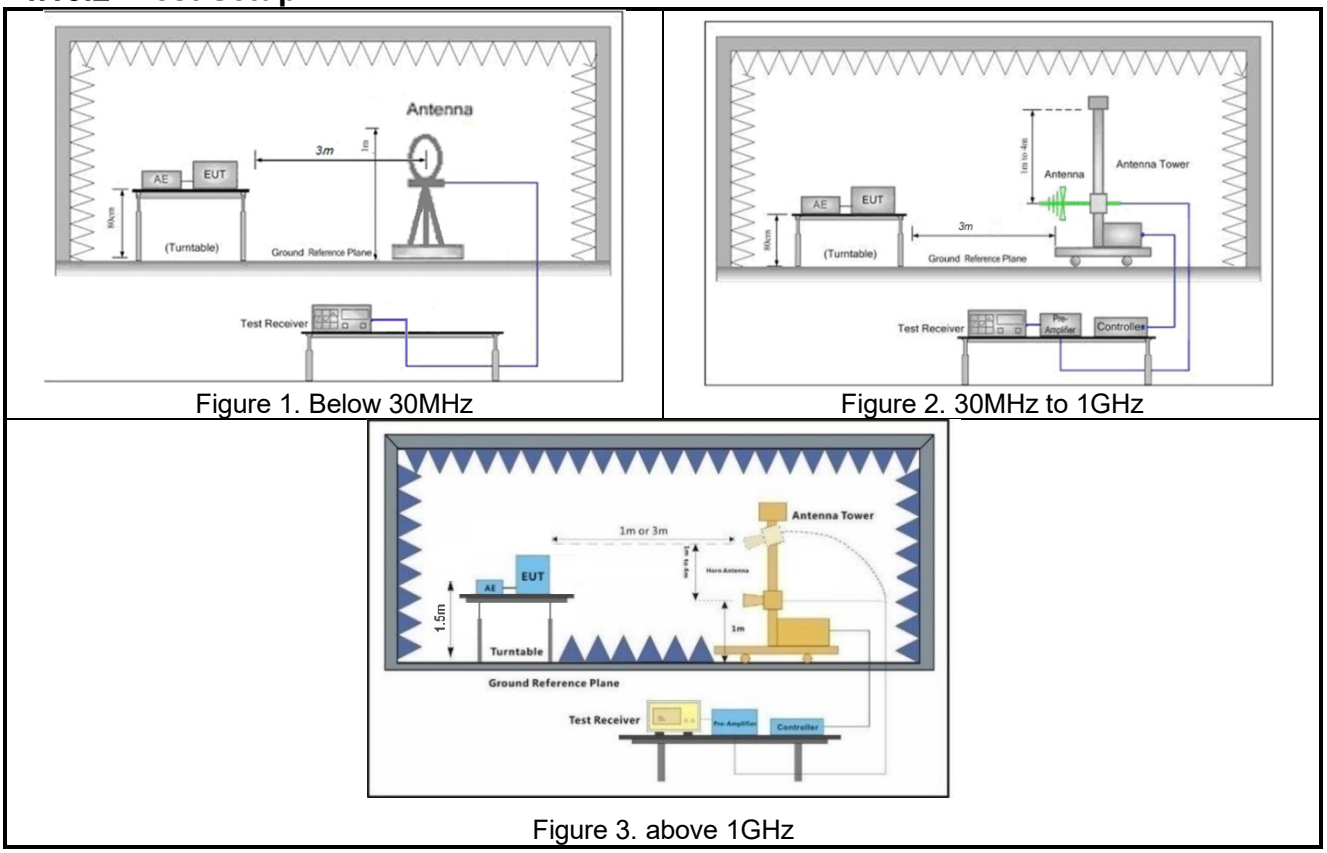


Figure 1. Below 30MHz

Figure 2. 30MHz to 1GHz

Figure 3. above 1GHz

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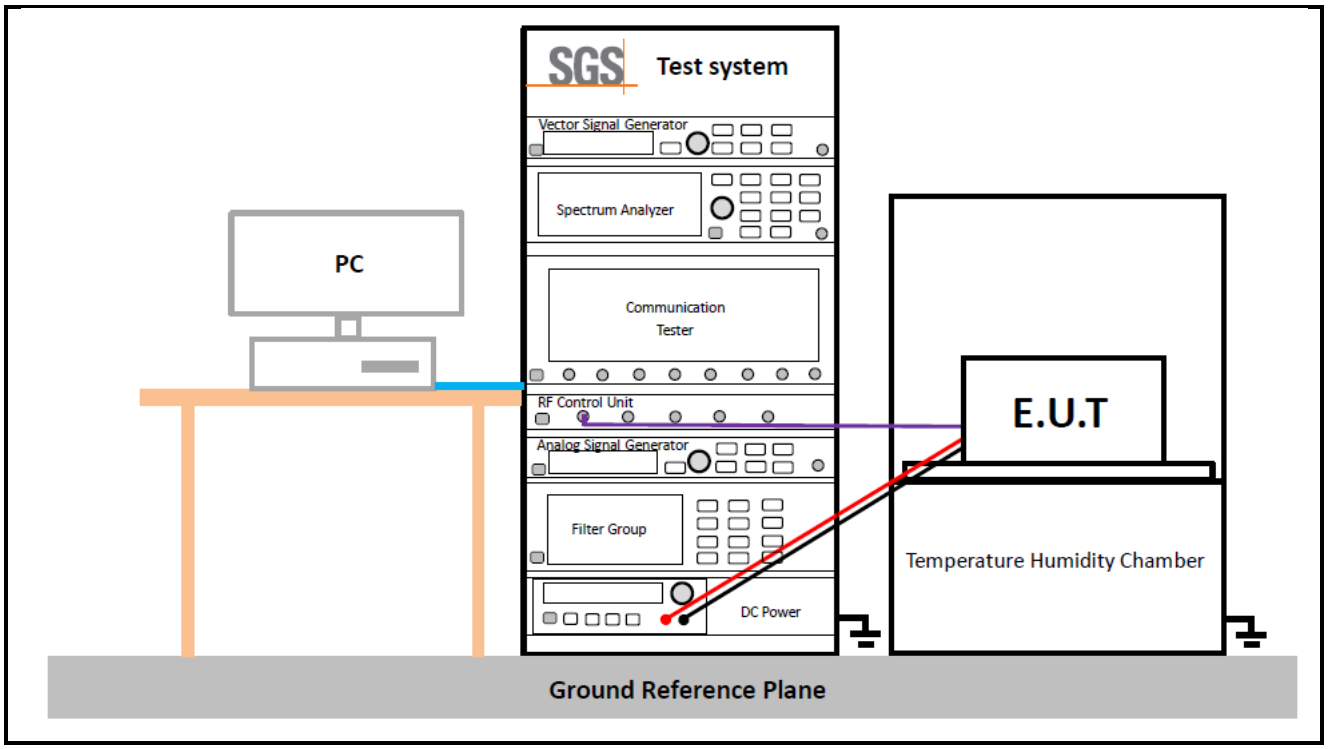
4.10.3 Test Setup 3



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4.11 Test Conditions

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.

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5 Main Test Instruments

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
Signal Analyzer	KEYSIGHT	N9020A	SUWI-01-02-05	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 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
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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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	Radiated Emission	± 3.13dB (9k to 30MHz)
		± 4.8dB (30M to 1GHz)
		± 4.8dB (1GHz to 18GHz)
		± 4.80dB (Above 18GHz)

Remark:
The U_{lab} (lab Uncertainty) is less than $U_{cispr/ETSI}$ (CISPR/ETSI Uncertainty), so the test results
– compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
– non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.

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7 Appendixes

Appendix A.1	WWAN Setup Photos
Appendix B.2	ENDC

---End of Report---

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