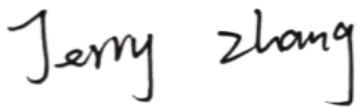
RF Test Report

Applicant:	Quectel Wireless Solutions Co., Ltd.
Address:	Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai,China,200233
Product:	5G Sub-6 GHz LGA Module
Model No.:	RG500U-LA
Brand Name:	QUECTEL
FCC ID:	XMR2023RG500ULA
Standards:	47 CFR Part 22 47 CFR Part 24 47 CFR Part 27 47 CFR Part 90
Report No.:	PD20230197RF01
Issue Date:	2024/03/02
Test Result:	PASS *

* **The above equipment has been tested and compliance with the requirement of the relative standards by Hefei Panwin Technology Co., Ltd.**



Reviewed By: Jerry Zhang **Approved By:** Alec Yang

Hefei Panwin Technology Co., Ltd.

Floor 1, Zone E, Plant 2#, Mingzhu Industrial Park, No.106 Chuangxin Avenue, High-tech Zone, Hefei City, Anhui Province,China

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Revision History

Report No.	Version	Description	Issue Date	Note
PD20230197RF01	1	Initial Report	2024/03/02	Valid

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Test Summary

UMTS Band V / LTE Band 5 / 26(824~849 MHz) / LTE CA_5B

No.	Test Case	FCC Rules	Limit	Verdict
1	RF Output Power & Effective Radiated Power	§2.1046 §22.913 (a)(5)	ERP ≤ 7 Watt	PASS
2	Peak-to-Average Ratio	§22.913 (d)	≤13 dB	PASS
3	Occupied Bandwidth	§2.1049	No limit.	Report Only
4	Conducted Band Edge Measurement	§2.1051 §22.917 (a)	≤ -13 dBm/1%*EBW, in 1 MHz bands immediately outside and adjacent to the frequency block.	PASS
5	Spurious Emissions 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.	PASS
6	Radiated Spurious Emission	§2.1053 §22.917(a)	FCC: ≤ -13 dBm/100 kHz.	PASS
7	Frequency Stability	§2.1055 §22.355	< ±2.5 ppm	PASS

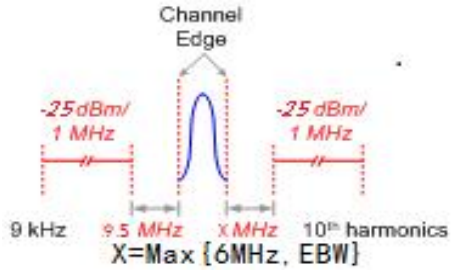
UMTS Band II / LTE Band 2 / LTE CA_2C

No.	Test Case	FCC Rules	Limit	Verdict
1	RF Output Power & Effective Radiated Power	§2.1046, §24.232(c)	EIRP ≤2 Watt	PASS
2	Peak-to-Average Ratio	§24.232(d)	≤13 dB	PASS
3	Occupied Bandwidth	§2.1049	No limit.	Report Only
4	Conducted Band Edge Measurement	§2.1051, §24.238(a)	≤ -13 dBm/1%*EBW, in 1 MHz bands immediately outside and adjacent to the frequency block.	PASS
5	Spurious Emissions at Antenna Terminals	§2.1051, §24.238(a)	≤ -13 dBm/1 MHz, from 9 kHz to 10th harmonics but outside authorized operating frequency ranges.	PASS
6	Radiated Spurious Emission	§2.1053, §24.238(a)	≤ -13 dBm/1 MHz.	PASS
7	Frequency Stability	§2.1055 §24.235	Within authorized bands of operation/frequency block.	PASS

UMTS Band IV / LTE Band 4 / 66 / LTE CA_66B / LTE CA_66C

No.	Test Case	FCC Rules	Limit	Verdict
1	RF Output Power & Effective Radiated Power	§2.1046, §27.50(d)(4)	EIRP ≤ 1 Watt	PASS
2	Peak-to-Average Ratio	§27.50(d)(5)	≤13 dB	PASS
3	Occupied Bandwidth	§2.1049	No limit.	Report Only
4	Conducted Band Edge Measurement	§2.1051, §27.53(h)	≤ -13 dBm/1%*EBW, in 1 MHz bands immediately outside and adjacent to the frequency block.	PASS
5	Spurious Emissions at Antenna Terminals	§2.1051, §27.53(h)	≤ -13 dBm/1 MHz, from 9 kHz to 10th harmonics but outside authorized operating frequency ranges.	PASS
6	Radiated Spurious Emission	§2.1053, §27.53(h)	≤ -13 dBm/1 MHz.	PASS
7	Frequency Stability	§2.1055 §27.54	Within authorized bands of operation/frequency block.	PASS

LTE Band 7 / 38/ CA_7B / CA_7C

No.	Test Case	FCC Rules	Limit	Verdict
1	RF Output Power & Effective Radiated Power	§2.1046, §27.50(h)(2)	EIRP ≤ 2 Watt	PASS
2	Peak-to-Average Ratio	--	≤13 dB	PASS
3	Occupied Bandwidth	§2.1049	No limit.	Report Only
4	Conducted Band Edge Measurement	§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 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.	PASS
5	Spurious Emissions at Antenna Terminals	§2.1051, §27.53(m)		PASS
6	Radiated Spurious Emission	§2.1053, §27.53(m)		PASS
7	Frequency Stability	§2.1055 §27.54	Within authorized bands of operation/frequency block.	PASS

LTE Band 26(814~824 MHz)

No.	Test Case	FCC Rules	Limit	Verdict
1	RF Output Power & Effective Radiated Power	§2.1046, §90.635(b)	< 100 W	PASS
2	Peak-to-Average Ratio	--	≤13 dB	PASS
3	Occupied Bandwidth	§2.1049	No limit.	Report Only
4	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 + 10 Log10(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.	PASS
5	Spurious Emissions at Antenna Terminals	§2.1051, §90.691	< 43 + 10Log10(P[Watts]) for all out-of- band emissions	PASS
6	Radiated Spurious Emission	§2.1053, §90.691		PASS
7	Frequency Stability	§2.1055 §90.213	Within authorized bands of operation/frequency block.	PASS

LTE Band 71

No.	Test Case	FCC Rules	Limit	Verdict
1	RF Output Power & Effective Radiated Power	§2.1046, §27.50(c)(10)	ERP ≤ 3 Watt	PASS
2	Peak-to-Average Ratio	--	≤13 dB	PASS
3	Occupied Bandwidth	§2.1049	No limit.	Report Only
4	Conducted Band Edge Measurement	§2.1051, §27.53(g)	≤ -13 dBm/1%*EBW, in 1 MHz bands immediately outside and adjacent to the frequency block.	PASS
5	Spurious Emissions at Antenna Terminals	§2.1051, §27.53(g)	FCC: ≤ -13 dBm/1 MHz, from 9 kHz to 10th harmonics but outside authorized operating frequency ranges.	PASS
6	Radiated Spurious Emission	§2.1053, §27.53(g)	≤ -13 dBm/1 MHz.	PASS
7	Frequency Stability	§2.1055 §27.54	within the authorized bands of operation.	PASS

Conducted detection date: 2023/11/10 to 2024/03/01
Radiated detection date: 2023/11/21 to 2024/01/26
Date of Sample Received: 2023/11/10

• We, Hefei Panwin Technology Co., Ltd., would like to declare that the tested sample has been evaluated in accordance with the procedures given in applied standard(s) in **Section 2.5** of this report and shown compliance with the applicable technical standards.

• All indications of PASS/FAIL in this report are based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only.

1 Test Laboratory

1.1 Notes of the Test Report

This report is invalid without signature of auditor and approver or with any alterations. The report shall not be partially reproduced without written approval of the testing company. Entrusted test results are only responsible for incoming samples. If there is any objection to the testing report, it shall be raised to the testing company within 15 days from the date of receiving the report. In the test results, "NA" means "not applicable", and the test items marked with "Δ" are subcontracted projects.

1.2 Test Facility

FCC (Designation Number: CN1361, Test Firm Registration Number: 473156)

Hefei Panwin Technology Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform measurements.

A2LA (Certificate Number: 6849.01)

Hefei Panwin Technology Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform measurement.

1.3 Testing Laboratory

Company Name	Hefei Panwin Technology Co., Ltd.
Address	Floor 1, Zone E, Plant 2#, Mingzhu Industrial Park, No.106 Chuangxin Avenue, High-tech Zone, Hefei City, Anhui Province,China
Telephone	+86-0551-63811775
Post Code	230031

2 General Description of Equipment under Test

2.1 Details of Application

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

2.2 Details of EUT

Product	5G Sub-6 GHz LGA Module								
Model	RG500U-LA								
Hardware Version	R1.0								
Software Version	RG500ULAAAR03A03M4G								
SN	Conducted: D1Y23J94F000137 Radiated: D1Y23J94F000093								
UMTS Specification									
Power Class for UMTS	PC3								
Single Band	Band II, Band IV, Band V								
Type of Modulation	Supports QPSK, 16QAM and 64QAM modulations								
E-UTRA Specification									
Single Band	FDD Band: 2, 4, 5, 7, 26, 66, 71 TDD Band: 38								
Power Class for LTE	PC3								
LTE CA	LTE UL CA_2C; LTE UL CA_5B; LTE UL CA_7B; LTE UL CA_7C LTE UL CA_66B; LTE UL CA_66C								
Type of Modulation	UL: QPSK, 16QAM, 64QAM DL: QPSK, 16QAM, 64QAM, 256QAM								
Antenna Type	☑ External ☐ Integrated								
Antenna Gain	WCDMA Band II: 1.37dBi(Ant1) WCDMA Band IV: 1.14dBi(Ant1) WCDMA Band V: 1.18dBi(Ant1) LTE Band 2: 1.37dBi(Ant1) LTE Band 4: 1.14dBi(Ant1) LTE Band 5: 1.18dBi(Ant1) LTE Band 7: 1.48dBi(Ant1) LTE Band 26: 1.18dBi(Ant1) LTE Band 38: 0.81dBi(Ant1) LTE Band 66: 1.37dBi(Ant1) LTE Band 71: -1.00dBi(Ant1)								
Frequency Band(s)	**SISO Band**	**Supported Channel Bandwidth (MHz)**						**Tx (MHz)**	**Rx (MHz)**
		1.4	**3**	**5**	**10**	**15**	**20**		
	UMTS Band II	-	-	v	-	-	-	1850 to 1910	1930 to 1990
	UMTS Band IV	-	-	v	-	-	-	1710 to 1755	2110 to 2155
	UMTS Band V	-	-	v	-	-	-	824 to 849	869 to 894
	LTE Band 2	v	v	v	v	v	v	1850 to 1910	1930 to 1990
	LTE Band 4	v	v	v	v	v	v	1710 to 1755	2110 to 2155
	LTE Band 5	v	v	v	v	-	-	824 to 849	869 to 894
	LTE Band 7	-	-	v	v	v	v	2500 to 2570	2620 to 2690
	LTE Band 26 (814 to 824)	v	v	v	v	-	-	814 to 824	859 to 869

	LTE Band 26 (824 to 849)	v	v	v	v	v	-	824 to 849	869 to 894
	LTE Band 38	-	-	v	v	v	v	2570 to 2620	2570 to 2620
	LTE Band 66	v	v	v	v	v	v	1710 to 1780	2110 to 2200
	LTE Band 71	-	-	v	v	v	v	663 to 698	617 to 652
	CA Band	**Bandwidth (MHz)**							
	LTE CA_2C	10+15	10+20	15+10	15+15	15+20			
		20+10	20+15	20+20	20+5	5+20			
	LTE CA_5B	10+10	10+5	3+5	5+10	5+3			
	LTE CA_7B	15+5	-	-	-	-			
	LTE CA_7C	10+20	15+10	15+15	15+20	15+5			
		20+10	20+15	20+20	-	-			
	LTE CA_66B	10+10	10+5	15+5	5+15	5+5			
		5+10	-	-	-	-			
	LTE CA_66C	10+15	10+20	15+10	15+15	15+20			
		20+10	20+15	20+20	20+5	-			

Note: The declared of product specification for EUT and/or Antenna presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

2.3 Maximum Conducted power and Emission Designator

Bands	**Note 1:** WCDMA supports HSUPA, HSDPA, DC-HSDPA,HSPA+, but only the worst case was tested and the data displayed in this report. **Note 2:** Designation of Emissions (Remark: the necessary bandwidth of which is the worst value from the measured occupied bandwidths for each type of channel bandwidth configuration.)						
UMTS:	Bandwidth (MHz)	QPSK		/			
		Max Power (W)	Designator				
Band II	5	0.2323	4M70F9W				
Band IV	5	0.2158	4M70F9W				
Band V	5	0.2128	4M70F9W				
E-UTRA:	Bandwidth (MHz)	QPSK		16QAM		64QAM	
		Max Power (W)	Designator	Max Power (W)	Designator	Max Power (W)	Designator
LTE Band 2	1.4	0.2296	1M10G7D	0.2061	1M10W7D	0.1754	1M10W7D
	3	0.2307	2M71G7D	0.1888	2M71W7D	0.1750	2M71W7D
	5	0.2296	4M52G7D	0.1786	4M54W7D	0.1932	4M51W7D
	10	0.2312	9M01G7D	0.1968	9M00W7D	0.1702	9M00W7D
	15	0.2333	13M5G7D	0.1871	13M5W7D	0.1968	13M5W7D
	20	0.2427	18M0G7D	0.1879	18M0W7D	0.2018	18M0W7D
LTE Band 4	1.4	0.2360	1M10G7D	0.2153	1M11W7D	0.1667	1M10W7D
	3	0.2333	2M71G7D	0.1923	2M71W7D	0.1799	2M71W7D
	5	0.2399	4M51G7D	0.1888	4M54W7D	0.1932	4M52W7D
	10	0.2366	9M00G7D	0.1888	9M00W7D	0.1803	9M00W7D
	15	0.2388	13M5G7D	0.2188	13M5W7D	0.1932	13M5W7D
	20	0.2512	18M0G7D	0.1923	18M0W7D	0.2032	18M0W7D
LTE Band 5	1.4	0.2178	1M10G7D	0.1500	1M11W7D	0.1560	1M10W7D
	3	0.2133	2M71G7D	0.1306	2M71W7D	0.1545	2M72W7D
	5	0.2239	4M52G7D	0.1279	4M53W7D	0.1742	4M52W7D
	10	0.2188	9M01G7D	0.1462	9M00W7D	0.1552	9M00W7D
LTE Band 7	5	0.2317	4M52G7D	0.1807	4M52W7D	0.1770	4M51W7D
	10	0.2344	9M00G7D	0.1832	9M01W7D	0.1589	9M00W7D
	15	0.2399	13M5G7D	0.1875	13M5W7D	0.1774	13M5W7D
	20	0.2495	18M0G7D	0.1549	18M0W7D	0.1799	18M0W7D
LTE Band 26	1.4	0.2203	1M10G7D	0.2004	1M11W7D	0.1455	1M10W7D

	3	0.2198	2M72G7D	0.1687	2M71W7D	0.1570	2M72W7D
	5	0.2163	4M52G7D	0.1734	4M54W7D	0.1758	4M52W7D
	10	0.2123	9M00G7D	0.1611	9M01W7D	0.1592	9M00W7D
LTE Band 26 (824 to 849)	1.4	0.2218	1M10G7D	0.1936	1M11W7D	0.1524	1M10W7D
	3	0.2244	2M72G7D	0.1710	2M71W7D	0.1592	2M71W7D
	5	0.2265	4M52G7D	0.1718	4M52W7D	0.1750	4M51W7D
	10	0.2203	9M00G7D	0.1714	8M99W7D	0.1592	9M00W7D
	15	0.2275	13M5	0.2046	13M5W7D	0.1774	13M5W7D
LTE Band 38	5	0.2223	4M51G7D	0.1694	4M52W7D	0.1622	4M52W7D
	10	0.2099	9M00G7D	0.2128	8M99W7D	0.1734	9M00W7D
	15	0.2158	13M5G7D	0.2143	13M5W7D	0.1746	13M5W7D
	20	0.2138	18M0G7D	0.1346	17M9W7D	0.1706	17M9W7D
LTE Band 66	1.4	0.2265	1M10G7D	0.2004	1M11W7D	0.1644	1M10W7D
	3	0.2254	2M72G7D	0.1910	2M71W7D	0.1698	2M71W7D
	5	0.2333	4M52G7D	0.1778	4M53W7D	0.1770	4M52W7D
	10	0.2286	9M01G7D	0.1892	9M00W7D	0.1706	9M00W7D
	15	0.2296	13M5G7D	0.2084	13M5W7D	0.1837	13M5W7D
	20	0.2399	18M0G7D	0.1959	18M0W7D	0.1884	18M0W7D
LTE Band 71	5	0.1995	4M52G7D	0.1589	4M51W7D	0.1535	4M52W7D
	10	0.1941	9M00G7D	0.1600	9M00W7D	0.1393	9M81W7D
	15	0.1982	13M5G7D	0.1750	13M5W7D	0.1396	13M7W7D
	20	0.1991	18M0G7D	0.1549	18M0W7D	0.1496	19M6W7D
LTE CA_2C	10+15	0.2427	23M3G7D	0.2099	23M3W7D	0.2999	23M2W7D
	10+20	0.2421	27M8G7D	0.2070	27M8W7D	0.1892	27M7W7D
	15+10	0.2553	23M4G7D	0.2333	23M4W7D	0.3006	23M2W7D
	15+15	0.2443	28M4G7D	0.2249	28M4W7D	0.1901	28M3W7D
	15+20	0.2393	32M7G7D	0.1982	32M6W7D	0.1919	32M6W7D
	20+10	0.2523	27M8G7D	0.2249	27M8W7D	0.1832	27M8W7D
	20+15	0.2449	32M6G7D	0.2280	32M6W7D	0.1799	32M6W7D
	20+20	0.2443	37M8G7D	0.2065	37M7W7D	0.1687	37M7W7D
	20+5	0.2460	23M1G7D	0.1791	23M1W7D	0.1963	22M9W7D
	5+20	0.2399	23M1G7D	0.1954	23M0W7D	0.1854	23M0W7D
LTE CA_5B	10+10	0.2153	18M9G7D	0.1897	18M9W7D	0.1762	19M0W7D
	10+5	0.2163	14M0G7D	0.1845	14M0W7D	0.1750	14M0W7D

	3+5	0.2265	7M57G7D	0.2153	7M56W7D	0.2723	7M56W7D
	5+10	0.2307	14M0G7D	0.1778	14M0W7D	0.1888	14M0W7D
	5+3	0.3350	7M56G7D	0.2153	7M54W7D	0.2323	7M56W7D
LTE CA_7B	15+5	0.2547	18M4G7D	0.2183	18M4W7D	0.2748	18M4W7D
LTE CA_7C	10+20	0.2234	27M8G7D	0.1854	27M7W7D	0.1807	27M7W7D
	15+10	0.2249	23M3G7D	0.1901	23M2W7D	0.2729	23M3W7D
	15+15	0.2239	28M4G7D	0.1782	28M4W7D	0.1746	28M3W7D
	15+20	0.2223	32M6G7D	0.1910	32M6W7D	0.1758	32M6W7D
	15+5	0.2360	18M4G7D	0.1919	18M4W7D	0.1923	18M4W7D
	20+10	0.2249	27M7G7D	0.1905	27M7W7D	0.1849	27M8W7D
	20+15	0.2270	32M6G7D	0.1914	32M6W7D	0.1607	32M6W7D
	20+20	0.2259	37M7G7D	0.1959	37M8W7D	0.1675	37M7W7D
LTE CA_66B	10+10	0.2818	19M0G7D	0.2432	19M1W7D	0.1945	19M0W7D
	10+5	0.2825	14M0G7D	0.2350	14M0W7D	0.1982	14M0W7D
	15+5	0.2965	18M4G7D	0.2455	18M4W7D	0.2924	18M4W7D
	5+15	0.2979	18M4G7D	0.2393	18M4W7D	0.2512	18M4W7D
	5+5	0.2858	9M34G7D	0.2382	9M33W7D	0.2410	9M35W7D
	5+10	0.2831	14M0G7D	0.2360	14M0W7D	0.1897	14M0W7D
LTE CA_66C	10+15	0.2333	23M3G7D	0.1914	23M3W7D	0.2716	23M2W7D
	10+20	0.2317	27M9G7D	0.1905	27M8W7D	0.1758	27M7W7D
	15+10	0.2393	23M2G7D	0.1972	23M2W7D	0.2938	23M2W7D
	15+15	0.2366	28M5G7D	0.2153	28M5W7D	0.1901	28M3W7D
	15+20	0.2323	32M7G7D	0.2032	32M8W7D	0.1862	32M3W7D
	20+10	0.2404	27M9G7D	0.2037	27M9W7D	0.1667	27M8W7D
	20+15	0.2355	32M8G7D	0.1866	32M8W7D	0.1581	32M6W7D
	20+20	0.2410	37M9G7D	0.2023	37M9W7D	0.1641	37M7W7D
	20+5	0.2377	23M0G7D	0.2046	23M1W7D	0.1581	22M9W7D
	5+20	0.2371	23M0G7D	0.2333	23M0W7D	0.1679	22M9W7D

2.4 Frequency List of Low/Middle/High Channels

WCDMA Band II Channel and Frequency List				
BW [MHz]	Channel/Frequency(MHz)	Lowest	Middle	Highest
5	Channel	9262	9400	9538
	Frequency	1852.4	1880.0	1907.6

WCDMA Band IV Channel and Frequency List				
BW [MHz]	Channel/Frequency(MHz)	Lowest	Middle	Highest
5	Channel	1312	1413	1513
	Frequency	1712.4	1732.6	1752.6

WCDMA Band V Channel and Frequency List				
BW [MHz]	Channel/Frequency(MHz)	Lowest	Middle	Highest
5	Channel	4132	4182	4233
	Frequency	826.4	836.4	846.6

LTE Band 2 Channel and Frequency List				
BW [MHz]	Channel/Frequency(MHz)	Lowest	Middle	Highest
1.4	Channel	18607	18900	19193
	Frequency	1850.7	1880.0	1909.3
3	Channel	18615	18900	19185
	Frequency	1851.5	1880	1908.5
5	Channel	18625	18900	19175
	Frequency	1852.5	1880	1907.5
10	Channel	18650	18900	19150
	Frequency	1855	1880	1905
15	Channel	18675	18900	19125
	Frequency	1857.5	1880	1902.5
20	Channel	18700	18900	19100
	Frequency	1860	1880	1900

LTE Band 4 Channel and Frequency List				
BW [MHz]	Channel/Frequency(MHz)	Lowest	Middle	Highest
1.4	Channel	19957	20175	20393
	Frequency	1710.7	1732.5	1754.3
3	Channel	19965	20175	20385
	Frequency	1711.5	1732.5	1753.5
5	Channel	19975	20175	20375
	Frequency	1712.5	1732.5	1752.5
10	Channel	20000	20175	20350

	Frequency	1715	1732.5	1750
15	Channel	20025	20175	20325
	Frequency	1717.5	1732.5	1747.5
20	Channel	20050	20175	20300
	Frequency	1720	1732.5	1745

LTE Band 5 Channel and Frequency List				
BW [MHz]	**Channel/Frequency(MHz)**	**Lowest**	**Middle**	**Highest**
1.4	Channel	20407	20525	20643
	Frequency	824.7	836.5	848.3
3	Channel	20415	20525	20635
	Frequency	825.5	836.5	847.5
5	Channel	20425	20525	20625
	Frequency	826.5	836.5	846.5
10	Channel	20450	20525	20600
	Frequency	829	836.5	844

LTE Band 7 Channel and Frequency List				
BW [MHz]	**Channel/Frequency(MHz)**	**Lowest**	**Middle**	**Highest**
5	Channel	20775	21100	21425
	Frequency	2502.5	2535	2567.5
10	Channel	20800	21100	21400
	Frequency	2505	2535	2565
15	Channel	20825	21100	21375
	Frequency	2507.5	2535	2562.5
20	Channel	20850	21100	21350
	Frequency	2510	2535	2560

LTE Band 26 (814 to 824) Channel and Frequency List				
BW [MHz]	**Channel/Frequency(MHz)**	**Lowest**	**Middle**	**Highest**
1.4	Channel	26697	26740	26783
	Frequency	814.7	819	823.3
3	Channel	26705	26740	26775
	Frequency	815.5	819	822.5
5	Channel	26715	26740	26765
	Frequency	816.5	819	821.5
10	Channel	26740	26740	26740
	Frequency	819	819	819

LTE Band 26 (824 to 849) Channel and Frequency List				
BW [MHz]	**Channel/Frequency(MHz)**	**Lowest**	**Middle**	**Highest**

1.4	Channel	26797	26915	27033
	Frequency	824.7	836.5	848.3
3	Channel	26805	26915	27025
	Frequency	825.5	836.5	847.5
5	Channel	26815	26915	27015
	Frequency	826.5	836.5	846.5
10	Channel	26840	26915	26990
	Frequency	829.0	836.5	844.0
15	Channel	26865	26915	26965
	Frequency	831.5	836.5	841.5

LTE Band 38 Channel and Frequency List				
BW [MHz]	**Channel/Frequency(MHz)**	**Lowest**	**Middle**	**Highest**
5	Channel	37775	38000	38225
	Frequency	2572.5	2595	2617.5
10	Channel	37800	38000	38200
	Frequency	2575	2595	2615
15	Channel	37825	38000	38175
	Frequency	2577.5	2595	2612.5
20	Channel	37850	38000	38150
	Frequency	2580	2595	2610

LTE Band 66 Channel and Frequency List				
BW [MHz]	**Channel/Frequency(MHz)**	**Lowest**	**Middle**	**Highest**
1.4	Channel	131979	132322	132665
	Frequency	1710.7	1745	1779.3
3	Channel	131987	132322	132657
	Frequency	1711.5	1745	1778.5
5	Channel	131997	132322	132647
	Frequency	1712.5	1745	1777.5
10	Channel	132022	132322	132622
	Frequency	1715	1745	1775
15	Channel	132047	132322	132597
	Frequency	1717.5	1745	1772.5
20	Channel	132072	132322	132572
	Frequency	1720	1745	1770

LTE Band 71 Channel and Frequency List				
BW [MHz]	**Channel/Frequency(MHz)**	**Lowest**	**Middle**	**Highest**
5	Channel	133147	133297	133447
	Frequency	665.5	680.5	695.5
10	Channel	133172	133297	133422

	Frequency	668	680.5	693
15	Channel	133197	133297	133397
	Frequency	670.5	680.5	690.5
20	Channel	133222	133297	133372
	Frequency	673	680.5	688

Table 4.3.1.1.2A-2: Test frequencies for CA_2C

Range	CC-Combo / N_{RB_agg} [RB]	CC1 Note1					CC2 Note1				
		BW [RB]	N_{UL}	f_{UL} [MHz]	N_{DL}	f_{DL} [MHz]	BW [RB]	N_{UL}	f_{UL} [MHz]	N_{DL}	f_{DL} [MHz]
Low	25+100	25	18633	1853.3	633	1933.3	100	18750	1865	750	1945
		100	18700	1860	700	1940	25	18817	1871.7	817	1951.7
	50+75	50	18653	1855.3	653	1935.3	75	18773	1867.3	773	1947.3
		75	18675	1857.5	675	1937.5	50	18795	1869.5	795	1949.5
	50+100	50	18655	1855.5	655	1935.5	100	18799	1869.9	799	1949.9
		100	18700	1860	700	1940	50	18844	1874.4	844	1954.4
	75+75	75	18675	1857.5	675	1937.5	75	18825	1872.5	825	1952.5
	75+100	75	18678	1857.8	678	1937.8	100	18849	1874.9	849	1954.9
		100	18700	1860	700	1940	75	18871	1877.1	871	1957.1
	100+100	100	18700	1860	700	1940	100	18898	1879.8	898	1959.8
Mid	25+100	25	18808	1870.8	808	1950.8	100	18925	1882.5	925	1962.5
		100	18875	1877.5	875	1957.5	25	18992	1889.2	992	1969.2
	50+75	50	18829	1872.9	829	1952.9	75	18949	1884.9	949	1964.9
		75	18851	1875.1	851	1955.1	50	18971	1887.1	971	1967.1
	50+100	50	18806	1870.6	806	1950.6	100	18950	1885	950	1965
		100	18851	1875.1	851	1955.1	50	18995	1889.5	995	1969.5
	75+75	75	18825	1872.5	825	1952.5	75	18975	1887.5	975	1967.5
	75+100	75	18803	1870.3	803	1950.3	100	18974	1887.4	974	1967.4
		100	18826	1872.6	826	1952.6	75	18997	1889.7	997	1969.7
	100+100	100	18801	1870.1	801	1950.1	100	18999	1889.9	999	1969.9
High	25+100	25	18983	1888.3	983	1968.3	100	19100	1900	1100	1980
		100	19050	1895	1050	1975	25	19167	1906.7	1167	1986.7
	50+75	50	19005	1890.5	1005	1970.5	75	19125	1902.5	1125	1982.5
		75	19027	1892.7	1027	1972.7	50	19147	1904.7	1147	1984.7
	50+100	50	18956	1885.6	956	1965.6	100	19100	1900	1100	1980
		100	19001	1890.1	1001	1970.1	50	19145	1904.5	1145	1984.5
	75+75	75	18975	1887.5	975	1967.5	75	19125	1902.5	1125	1982.5
	75+100	75	18929	1882.9	929	1962.9	100	19100	1900	1100	1980
		100	18951	1885.1	951	1965.1	75	19122	1902.2	1122	1982.2
	100+100	100	18902	1880.2	902	1960.2	100	19100	1900	1100	1980
Note 1: Carriers in increasing frequency order.											

Table 4.3.1.1.5A-1: Test frequencies for CA_5B

Range	CC-Combo / N_{RB_agg} [RB]	CC1 Note1					CC2 Note1				
		BW [RB]	N_{UL}	f_{UL} [MHz]	N_{DL}	f_{DL} [MHz]	BW [RB]	N_{UL}	f_{UL} [MHz]	N_{DL}	f_{DL} [MHz]
Low	15+25	15	20416	825.6	2416	870.6	25	20455	829.5	2455	874.5
		25	20425	826.5	2425	871.5	15	20464	830.4	2464	875.4
	25+50	25	20428	826.8	2428	871.8	50	20500	834	2500	879
	50+25	50	20450	829	2450	874	25	20522	836.2	2522	881.2
	50+50	50	20450	829	2450	874	50	20549	838.9	2549	883.9
Mid	15+25	15	20501	834.1	2501	879.1	25	20540	838.0	2540	883.0
		25	20510	835.0	2510	880.0	15	20549	838.9	2549	883.9
	25+50	25	20478	831.8	2478	876.8	50	20550	839	2550	884
	50+25	50	20500	834	2500	879	25	20572	841.2	2572	886.2
	50+50	50	20476	831.6	2476	876.6	50	20575	841.5	2575	886.5
High	15+25	15	20586	842.6	2586	887.6	25	20625	846.5	2625	891.5
		25	20595	843.5	2595	888.5	15	20634	847.4	2634	892.4
	25+50	25	20528	836.8	2528	881.8	50	20600	844	2600	889
	50+25	50	20550	839	2550	884	25	20622	846.2	2622	891.2
	50+50	50	20501	834.1	2501	879.1	50	20600	844	2600	889
Note 1: Carriers in increasing frequency order.											

Table 4.3.1.1.7A-1: Test frequencies for CA_7C

Range	CC-Combo / N_{RB_agg} [RB]	CC1 Note1					CC2 Note1				
		BW [RB]	N_{UL}	f_{UL} [MHz]	N_{DL}	f_{DL} [MHz]	BW [RB]	N_{UL}	f_{UL} [MHz]	N_{DL}	f_{DL} [MHz]
Low	50+100	50	20805	2505.5	2805	2625.5	100	20949	2519.9	2949	2639.9
		100	20850	2510	2850	2630	50	20994	2524.4	2994	2644.4
	75+50	75	20825	2507.5	2825	2627.5	50	20945	2519.5	2945	2639.5
	75+75	75	20825	2507.5	2825	2627.5	75	20975	2522.5	2975	2642.5
	75+100	75	20828	2507.8	2828	2627.8	100	20999	2524.9	2999	2644.9
		100	20850	2510	2850	2630	75	21021	2527.1	3021	2647.1
	100+100	100	20850	2510	2850	2630	100	21048	2529.8	3048	2649.8
Mid	50+100	50	21006	2525.6	3006	2645.6	100	21150	2540	3150	2660
		100	21051	2530.1	3051	2650.1	50	21195	2544.5	3195	2664.5
	75+50	75	21051	2530.1	3051	2650.1	50	21171	2542.1	3171	2662.1
	75+75	75	21025	2527.5	3025	2647.5	75	21175	2542.5	3175	2662.5
	75+100	75	21003	2525.3	3003	2645.3	100	21174	2542.4	3174	2662.4
		100	21026	2527.6	3026	2647.6	75	21197	2544.7	3197	2664.7
	100+100	100	21001	2525.1	3001	2645.1	100	21199	2544.9	3199	2664.9
High	50+100	50	21206	2545.6	3206	2665.6	100	21350	2560	3350	2680
		100	21251	2550.1	3251	2670.1	50	21395	2564.5	3395	2684.5
	75+50	75	21277	2552.7	3277	2672.7	50	21397	2564.7	3397	2684.7
	75+75	75	21225	2547.5	3225	2667.5	75	21375	2562.5	3375	2682.5
	75+100	75	21179	2542.9	3179	2662.9	100	21350	2560	3350	2680
		100	21201	2545.1	3201	2665.1	75	21372	2562.2	3372	2682.2
	100+100	100	21152	2540.2	3152	2660.2	100	21350	2560	3350	2680
Note 1: Carriers in increasing frequency order.											

Table 4.3.1.1.7A-2 : Test frequencies for CA_7B

Range	CC-Combo / N_{RB_agg} [RB]	CC1 Note1					CC2 Note1				
		BW [RB]	N_{UL}	f_{UL} [MHz]	N_{DL}	f_{DL} [MHz]	BW [RB]	N_{UL}	f_{UL} [MHz]	N_{DL}	f_{DL} [MHz]
Low	75+25	75	20825	2507.5	2825	2627.5	25	20918	2516.8	2918	2636.8
Mid	75+25	75	21076	2532.6	3076	2652.6	25	21169	2541.9	3169	2661.9
High	75+25	75	21327	2557.7	3327	2677.7	25	21420	2567.0	3420	2687.0
Note 1:	Carriers in increasing frequency order										

Table 4.3.1.1.66A-1: Test frequencies for CA_66B

Range	CC-Combo / N_{RB_agg} [RB]	CC1 Note1					CC2 Note1				
		BW [RB]	N_{UL}	f_{UL} [MHz]	N_{DL}	f_{DL} [MHz]	BW [RB]	N_{UL}	f_{UL} [MHz]	N_{DL}	f_{DL} [MHz]
Low	25+25	25	131997	1712.5	66461	2112.5	25	132045	1717.3	66509	2117.3
	25+50	25	132000	1712.8	66464	2112.8	50	132072	1720	66536	2120
		50	132022	1715	66486	2115	25	132094	1722.2	66558	2122.2
	25+75	25	132002	1713	66466	2113	75	132095	1722.3	66559	2122.3
		75	132047	1717.5	66511	2117.5	25	132140	1726.8	66604	2126.8
	50+50	50	132022	1715	66486	2115	50	132121	1724.9	66585	2124.9
Mid	25+25	25	132398	1752.6	66862	2152.6	25	132446	1757.4	66910	2157.4
	25+50	25	132375	1750.3	66839	2150.3	50	132447	1757.5	66911	2157.5
		50	132397	1752.5	66861	2152.5	25	132469	1759.7	66933	2159.7
	25+75	25	132353	1748.1	66817	2148.1	75	132446	1757.4	66910	2157.4
		75	132398	1752.6	66862	2152.6	25	132491	1761.9	66955	2161.9
	50+50	50	132373	1750.1	66837	2150.1	50	132472	1760	66936	2160
High[2]	25+25	25	132647	1777.5	67111	2177.5	25	NA	NA	67159	2182.3
	25+50	25	132647	1777.5	67111	2177.5	50	NA	NA	67183	2184.7
		50	132622	1775	67086	2175	25	NA	NA	67158	2182.2
	25+75	25	132647	1777.5	67111	2177.5	75	NA	NA	67204	2186.8
		75	132597	1772.5	67061	2172.5	25	NA	NA	67154	2181.8
	50+50	50	132622	1775	67086	2175	50	NA	NA	67185	2184.9
High[3]	25+25	25	132599	1772.7	67063	2172.7	25	132647	1777.5	67111	2177.5
	25+50	25	132550	1767.8	67014	2167.8	50	132622	1775.	67086	2175
		50	132572	1770	67036	2170	25	132644	1777.2	67108	2177.2
	25+75	25	132504	1763.2	66968	2163.2	75	132597	1772.5	67061	2172.5
		75	132549	1767.7	67013	2167.7	25	132642	1777	67106	2177
	50+50	50	132523	1765.1	66987	2165.1	50	132622	1775	67086	2175
Note 1:	Carriers in increasing frequency order.										
Note 2:	Applicable for intra-band contiguous CA without UL CA.										
Note 3:	Applicable for intra-band contiguous CA with UL CA.										

Table 4.3.1.1.66A-2: Test frequencies for CA_66C

Range	CC-Combo / N_{RB_agg} [RB]	CC1 Note1					CC2 Note1				
		BW [RB]	N_{UL}	f_{UL} [MHz]	N_{DL}	f_{DL} [MHz]	BW [RB]	N_{UL}	f_{UL} [MHz]	N_{DL}	f_{DL} [MHz]
Low	50+75	50	132025	1715.3	66489	2115.3	75	132145	1727.3	66609	2127.3
		75	132047	1717.5	66511	2117.5	50	132167	1729.5	66631	2129.5
	50+100	50	132027	1715.5	66491	2115.5	100	132171	1729.9	66635	2129.9
		100	132072	1720	66536	2120	50	132216	1734.4	66680	2134.4
	75+75	75	132047	1717.5	66511	2117.5	75	132197	1732.5	66661	2132.5
	75+100	75	132050	1717.8	66514	2117.8	100	132221	1734.9	66685	2134.9
		100	132072	1720	66536	2120	75	132243	1737.1	66707	2137.1
	100+25	100	132072	1720	66536	2120	25	132189	1731.7	66653	2131.7
		25	132005	1713.3	66469	2113.3	100	132122	1725.0	66586	2125.0
	100+100	100	132072	1720	66536	2120	100	132270	1739.8	66734	2139.8
Mid	50+75	50	132351	1747.9	66815	2147.9	75	132471	1759.9	66935	2159.9
		75	132373	1750.1	66837	2150.1	50	132493	1762.1	66957	2162.1
	50+100	50	132328	1745.6	66792	2145.6	100	132472	1760	66936	2160
		100	132373	1750.1	66837	2150.1	50	132517	1764.5	66981	2164.5
	75+75	75	132347	1747.5	66811	2147.5	75	132497	1762.5	66961	2162.5
	75+100	75	132325	1745.3	66789	2145.3	100	132496	1762.4	66960	2162.4
		100	132348	1747.6	66812	2147.6	75	132519	1764.7	66983	2164.7
	100+25	100	132397	1752.5	66861	2152.5	25	132514	1764.2	66978	2164.2
		25	132330	1745.8	66794	2145.8	100	132447	1757.5	66911	2157.5
	100+100	100	132323	1745.1	66787	2145.1	100	132521	1764.9	66985	2164.9
High[2]	50+75	50	132622	1775	67086	2175	75	NA	NA	67206	2187
		75	132597	1772.5	67061	2172.5	50	NA	NA	67181	2184.5
	50+100	50	132622	1775	67086	2175	100	NA	NA	67230	2189.4
		100	132572	1770	67036	2170	50	NA	NA	67180	2184.4
	75+75	75	132597	1772.5	67061	2172.5	75	NA	NA	67211	2187.5
	75+100	75	132597	1772.5	67061	2172.5	100	NA	NA	67232	2189.6
		100	132572	1770	67036	2170	75	NA	NA	67207	2187.1
	100+25	100	132572	1770	67036	2170	25	NA	NA	67153	2181.7
		25	132647	1777.5	67111	2177.5	100	NA	NA	67228	2189.2
	100+100	100	132572	1770	67036	2170	100	NA	NA	67234	2189.8
High[3]	50+75	50	132477	1760.5	66941	2160.5	75	132597	1772.5	67061	2172.5
		75	132499	1762.7	66963	2162.7	50	132619	1774.7	67083	2174.7
	50+100	50	132428	1755.6	66892	2155.6	100	132572	1770	67036	2170
		100	132473	1760.1	66937	2160.1	50	132617	1774.5	67081	2174.5
	75+75	75	132447	1757.5	66911	2157.5	75	132597	1772.5	67061	2172.5
	75+100	75	132401	1752.9	66885	2152.9	100	132572	1770	67036	2170
		100	132423	1755.1	66887	2155.1	75	132594	1772.2	67058	2172.2
	100+25	100	132522	1765	66986	2165	25	132639	1776.7	67103	2176.7
		25	132455	1758.3	66919	2158.3	100	132572	1770.0	67036	2170.0
	100+100	100	132374	1750.2	66838	2150.2	100	132572	1770	67036	2170

Note 1: Carriers in increasing frequency order.
Note 2: Applicable for intra-band contiguous CA without UL CA.
Note 3: Applicable for intra-band contiguous CA with UL CA.

2.5 Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

47 CFR Part 2
47 CFR Part 22
47 CFR Part 24
47 CFR Part 27
47 CFR Part 90
ANSI C63.26-2015
FCC KDB 971168 D01 Power Meas License Digital Systems v03r01
FCC KDB 412172 D01 Determining ERP and EIRP v01r01

Remark: All test items were verified and recorded according to the standards and without any deviation during the test.

3 Test Condition

3.1 Test Environmental Conditions

During testing, environmental conditions are described below.

Normal Configuration		Extreme Configuration		
Voltage	3.8V	Voltage	High: 4.3V	Low: 3.3V

3.2 Test Configuration

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture). The worst cases were recorded in this report.

Radiated measurements are performed by rotating the EUT in three different orthogonal test planes (Z, X, Y axis), receiver antenna polarization (horizontal and vertical), the worst emission was found in ‘ Z ‘ position and the worst case was recorded.

LTE											
Test Case	BW	modulation				RB			CH		
		QPSK	16QAM	64QAM	256QAM	1	half	full	L	M	H
RF Output Power & Effective (Isotropic) Radiated	all	v	v	v	--	v	v	v	v	v	v
Occupied Bandwidth	all	v	v	v	--	--	--	v	v	v	v
Conducted Band Edge	all	v	v	v	--	v	--	v	v	--	v
Spurious Emissions at Antenna Terminals	all	v	v	--	--	v	--	--	v	v	v
Peak-to-Average Ratio	all	v	v	v	--	v	--	v	v	v	v
Frequency Stability	all	v	v	--	--	--	--	v	v	v	v
Radiated Spurious Emission	worst case										
WCDMA											
Test Case	BW	modulation				RB			CH		
		QPSK	16QAM	64QAM	256QAM	1	half	full	L	M	H
RF Output Power & Effective (Isotropic) Radiated	5	v	--	--	--	--	--	--	v	v	v
Occupied Bandwidth	5	v	--	--	--	--	--	--	v	v	v
Conducted Band Edge	5	v	--	--	--	--	--	--	v	--	v
Spurious Emissions at Antenna Terminals	5	v	--	--	--	--	--	--	v	v	v

Peak-to-Average Ratio	5	v	--	--	--	--	--	--	v	v	v
Frequency Stability	5	v	--	--	--	--	--	--	v	v	v
Radiated Spurious Emission	worst case										

Note:

1.The mark " V " means that this configuration is chosen for testing.

2.The mark " -- " means that this bandwidth is not supported.

3.The device is investigated from 30Hz to 10 times of fundamental signal for radiated spurious emission test under different RB size/offset and modulations in exploratory test. Subsequently, only the worst case emissions are reported.

4.Frequency Stability : Normal Voltage = 3.8V ; Low Voltage =3.3V. ; High Voltage =4.3V

3.3 Equipment List

Instrument	Manufacturer	Model	Asset No.	Cal. Interval	Cal. Due Date
Base Station Simulator	R&S	CMW500	PWC0006	1 Year	2024/10/11
Spectrum Analyzer	R&S	FSV3030	PWC0003	1 Year	2024/10/11
Matrix Control Unit	Tonscend	JS0806-1	PWC0007	1 Year	2024/10/12
DC Power	KEYSIGHT	E3640A	PWC0028	1 Year	2024/10/11
Climate Chamber	ESPEC	GSU-64	PWC0025	1 Year	2024/10/10
Shielded Chamber	MIX-BEP	SR 433	PWC0002	3 Years	2024/08/08
Test Software	Tonscend	JS1120 V3.1.46	/	/	/
Receiver	R&S	ESR7	PWB0023	1 Year	2024/10/11
Spectrum Analyzer	R&S	FSV3044	PWB0024	1 Year	2024/10/11
TRILOG Broadband Antenna	Schwarzbeck	VULB9162	PWB0029	1 Year	2024/10/14
Double-Ridged Guide Antenna	ETS-Lindgren	3117	PWB0031	1 Year	2024/10/12
Loop Antenna	R&S	HFH2-Z2E	PWB0026	1 Year	2024/10/21
k Type Horn Antenna	Steatite Antennas	QMS-00880	PWB0035	1 Year	2024/10/17
Horn Antenna	Steatite Antennas	QMS-00208	PWB0033	1 Year	2024/10/21
Pre-Amplifier	R&S	SCU08F1	PWB0030	1 Year	2024/10/11
Pre-Amplifier	R&S	SCU40F1	PWB0036	1 Year	2024/10/11
Pre-Amplifier	R&S	OSP220 (OSP-B155G)	PWB0042	1 Year	2024/10/13
Pre-Amplifier	R&S	SCU18F	PWB0034	1 Year	2024/10/11
Pre-Amplifier	COM-MW	DLNA8	PWB0094	1 Year	2024/11/08
Anechoic Chamber	ETS.LINDGREN	Fact 3-2m	PWB0003	3 Years	2026/06/05
Test Software	R&S	ELEKTRA 4.20.2	/	/	/

3.4 Test Uncertainty

No.	Parameter	Uncertainty
1	Maximum transmit power	0.677dB
2	Frequency error	37.064Hz
3	Bandwidth occupied	5.9kHz
4	Emission spurious, Band edge and PAPR	10Hz-3.5GHz: 0.982dB 3.5GHz-18GHz: 1dB 18GHz-26.5GHz: 0.777dB 26.5GHz-40GHz: 1.066dB
5	Radiated Spurious Emission	30MHz-18GHz: ±4.46 dB 18GHz-40GHz: ±4.46 dB
6	Temperature	3°C
7	Humidity	1.3 %
8	Supply voltages	0.006 V

4 Test Items Description

Ambient condition

Shielded Chamber

Temperature [°C]	22.5 to 25.5
Humidity [%RH]	34 to 48
Pressure [kPa]	100.7 to 102.5

Anechoic Chamber

Temperature [°C]	20.1 to 24.7
Humidity [%RH]	40 to 43
Pressure [kPa]	100.9 to 102.3

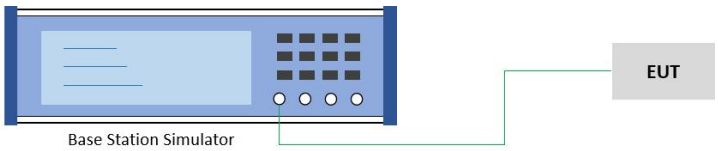
4.1 RF Output Power & Effective (Isotropic) Radiated Power

Methods of Measurement

Base Station Simulator was used to establish communication with the EUT. Its parameters were set to force the EUT transmitting at maximum output power. The measured power in the radio frequency on the transmitter output terminals shall be reported.

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

Test Setup



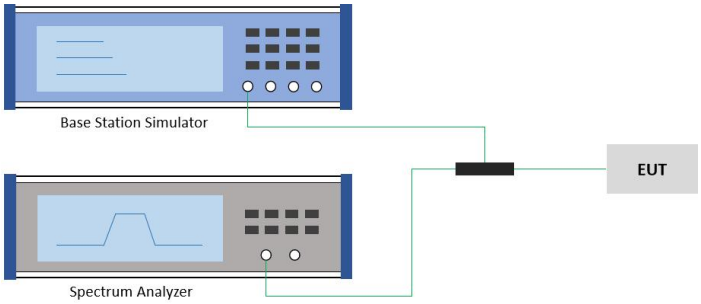
1.The testing follows ANSI C63.26 Section 5.2.
2.The transmitter output port was connected to the base station simulator.
3.Set EUT at maximum power through the base station simulator
4.Select lowest, middle, and highest channels for each band and different modulation.
5.Measure and record the power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

4.2 EIRP Power Density

Methods of Measurement

Measurement Procedure: C63.26 -2015 section 5.2.4

Test Setup



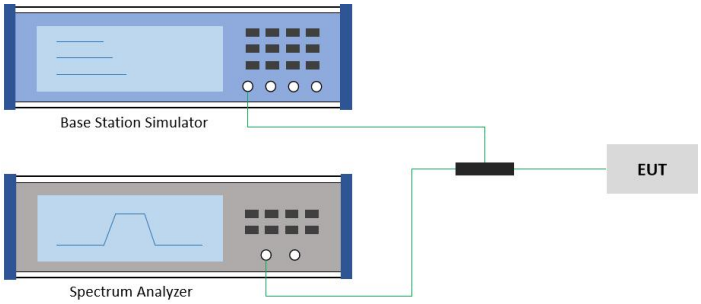
1.Set instrument center frequency to OBW center frequency.
2.Set span to at least 1.5 times the OBW.
3.Set the RBW to the specified reference bandwidth (often 1 MHz).
4.Set VBW ≥ 3 × RBW.
5.Detector = RMS (power averaging).
6.Ensure that the number of measurement points in the sweep ≥ 2 × span/RBW.
7.Sweep 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).

4.3 Peak-to-Average Ratio

Methods of Measurement

Power Complementary Cumulative Distribution Function (CCDF) curves provide a means for characterizing the power peaks of a digitally modulated signal on a statistical basis. A CCDF curve depicts the probability of the peak signal amplitude exceeding the average power level. Most contemporary measurement instrumentation include the capability to produce CCDF curves for an input signal provided that the instrument's resolution bandwidth can be set wide enough to accommodate the entire input signal bandwidth.

Test Setup



1.The testing follows ANSI C63.26 Section 5.2.3.4 (CCDF).

2.The EUT was connected to spectrum and system simulator via a power divider.

3.Set the CCDF (Complementary Cumulative Distribution Function) option in spectrum analyzer.

4.The highest RF powers were measured and recorded the maximum PAPR level associated with a probability of 0.1 %.

5.Record the deviation as Peak to Average Ratio.

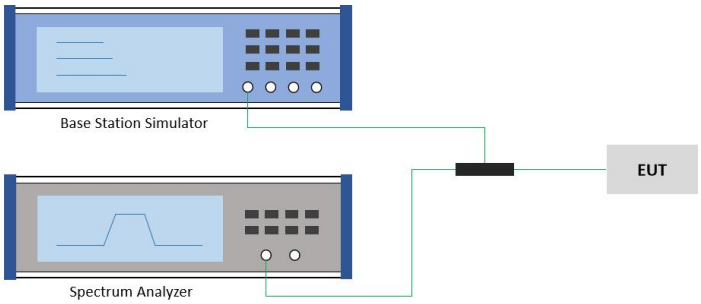
4.4 Occupied Bandwidth

Methods of Measurement

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

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

Test Setup



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

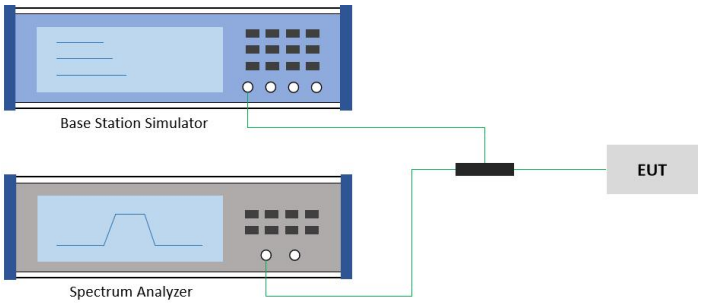
4.5 Conducted Band Edge Measurement

Methods of Measurement

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 RMS.

Test Setup



1.The testing follows ANSI C63.26 section 5.7

2.The EUT was connected to spectrum analyzer and system simulator via a power divider.

3.The band edges of low and high channels for the highest RF powers were measured.

4.Set RBW >= 1% EBW in the 1MHz band immediately outside and adjacent to the band edge.

5.Beyond the 1 MHz band from the band edge, RBW=1MHz was used or a narrower RBW was used and the measured power was integrated over the full required measurement bandwidth of 1 MHz.

6.Set spectrum analyzer with RMS detector.

7.The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

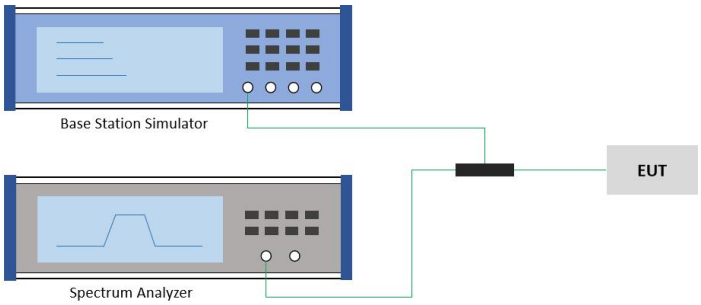
4.6 Spurious Emissions at Antenna Terminals

Methods of Measurement

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 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.

Test Setup



1.The testing follows ANSI C63.26 section 5.7

2.The EUT was connected to spectrum analyzer and system simulator via a power divider.

3.The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.

4.The middle channel for the highest RF power within the transmitting frequency was measured.

5.The conducted spurious emission for the whole frequency range was taken.

6.Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz.

7.Set spectrum analyzer with RMS detector.

8.Taking the record of maximum spurious emission.

9.The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

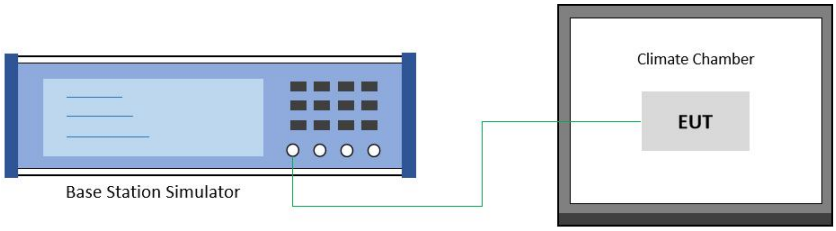
Note: As described in Section C63.26 4.2.3: Generally, the measurement must be corrected by adding 10 log [(reference bandwidth) / (resolution or measurement bandwidth)] to the measured value (such bandwidth scaling is limited to cases where the measurement bandwidth used to perform the measurement is less than the reference bandwidth). Therefore, the converted limit value is the standard limit value minus the conversion factor.

4.7 Frequency Stability

Methods of Measurement

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

Test Setup



Test Procedures for Temperature Variation

1.The testing follows ANSI C63.26 section 5.6.4

2.The EUT was set up in the thermal chamber and connected with the system simulator.

3.With power OFF, the temperature was decreased to -30°C and the EUT was stabilized before testing. Power was applied and the maximum change in frequency was recorded within one minute.

4.With power OFF, the temperature was raised in 10°C step up to 50°C. The EUT was stabilized at each step for at least half an hour. Power was applied and the maximum frequency change was recorded within one minute.

Test Procedures for Voltage Variation

1.The testing follows ANSI C63.26 section 5.6.5

2.The EUT was placed in a temperature chamber at 20±5°C and connected with the system simulator.

3.The power supply voltage to the EUT was varied from 85% to 115% of the nominal value for other than hand carried battery equipment.

4.For hand carried, battery powered equipment, reduce the primary ac or dc supply voltage to the battery operating end point, which shall be specified by the manufacturer.

5.The variation in frequency was measured for the worst case.

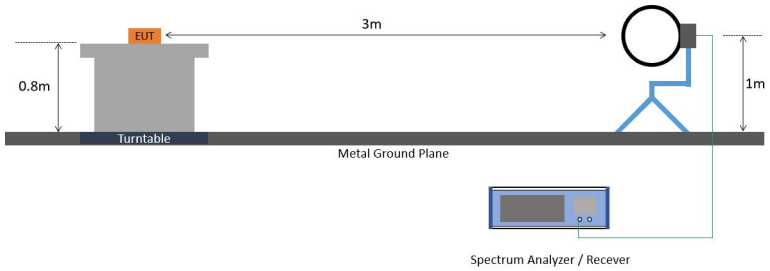
4.8 Radiated Spurious Emission

Methods of Measurement

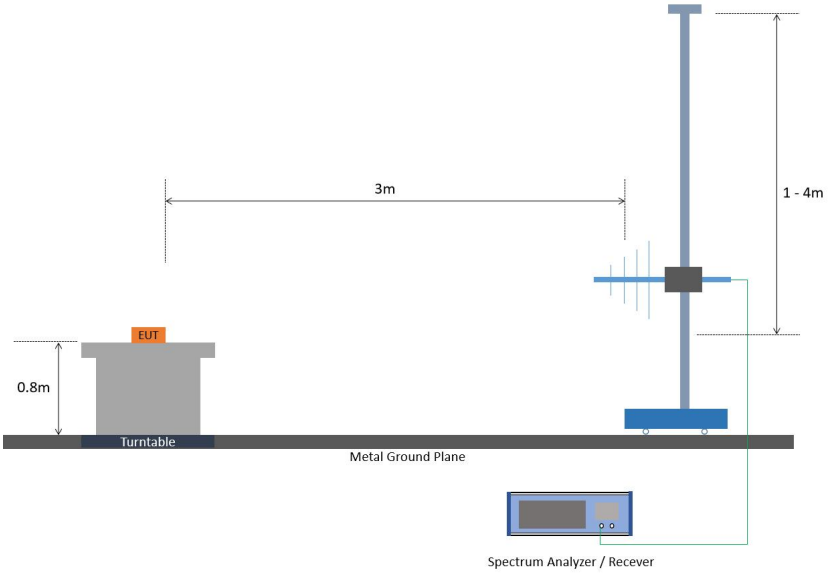
The radiated spurious emission was measured by substitution method according to ANSI C63.26. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitter power (P) by a factor of at least 43 + 10 log (P) dB.

The spectrum is scanned from 30 MHz up to a frequency including its 10th harmonic.

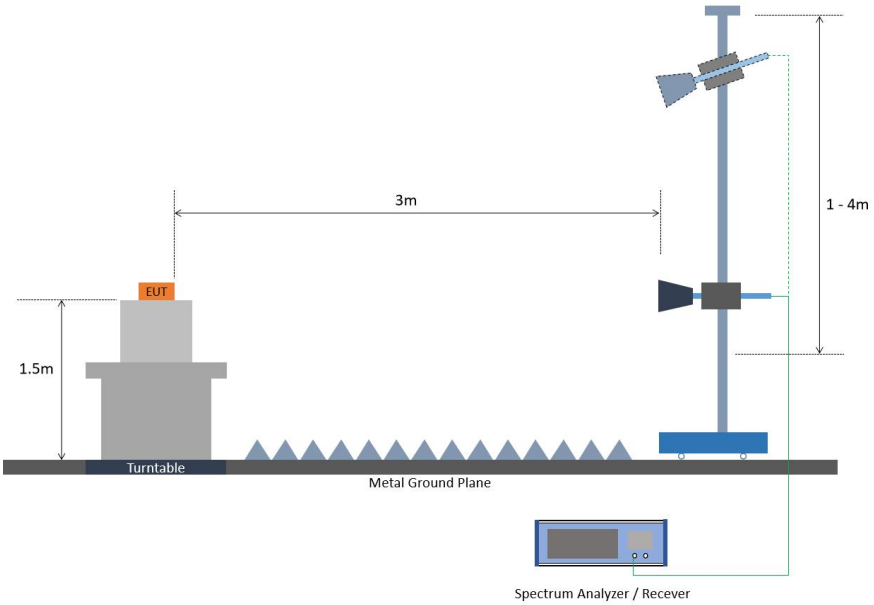
Test Setup



For radiated test below 30MHz



For radiated test from 30MHz to 1GHz



For radiated test above 1GHz

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

Remark: The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line was not reported.

Appendixes

Appendix A.1	PD20230197_EUT External Photograph
Appendix A.2	PD20230197_EUT Internal Photograph
Appendix A.3	PD20230197RF_Setup Photograph

Test Results of Conducted Test

Appendix B.1	WCDMA Band II	Appendix B.10	LTE Band 38
Appendix B.2	WCDMA Band IV	Appendix B.11	LTE Band 66
Appendix B.3	WCDMA Band V	Appendix B.12	LTE Band 71
Appendix B.4	LTE Band 2	Appendix B.13	LTE CA_2C
Appendix B.5	LTE Band 4	Appendix B.14	LTE CA_5B
Appendix B.6	LTE Band 5	Appendix B.15	LTE CA_7B
Appendix B.7	LTE Band 7	Appendix B.16	LTE CA_7C
Appendix B.8	LTE Band 26(814-824)	Appendix B.17	LTE CA_66B
Appendix B.9	LTE Band 26(824-849)	Appendix B.18	LTE CA_66C

Test Results of Radiated Test

Appendix C.1	All WCDMA Bands
Appendix C.2	All LTE SISO Bands
Appendix C.3	All LTE CA Bands

****** End of the Report ******