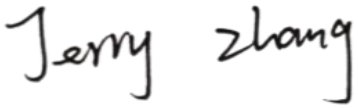
RF Test Report

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 NR Module
Model No.:	AG568N-NA
Brand Name:	QUECTEL
FCC ID:	XMR2024AG568NNA
Standards:	47 CFR Part 22 47 CFR Part 24 47 CFR Part 27
Report No.:	PD20230212RF01
Issue Date:	2024/03/08
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
PD20230212RF01	1	Initial Report	2024/03/08	Valid

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Test Summary

LTE Band 2

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

LTE Band 4 /66

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 5

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

LTE Band 12

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/100 kHz, from 9 kHz to 10th harmonics but outside authorized operating frequency ranges.	PASS
6	Radiated Spurious Emission	§2.1053, §27.53(g)	FCC: ≤ -13 dBm/100 kHz.	PASS
7	Frequency Stability	§2.1055 §27.54	Within authorized bands of operation/frequency block.	PASS

Conducted detection date: 2024/01/18 to 2024/03/08
Radiated detection date: 2024/01/31 to 2024/03/01
Date of Sample Received: 2024/01/16

• 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 NR Module							
Model		AG568N-NA							
Hardware Version		R1.1							
Software Version		AG568NAAR06A13M8G							
SN		Conducted: E1A23LJ15000062 Radiated: E1A23LJ15000019							
E-UTRA Specification									
Single Band		FDD Band: 2, 4, 5, 12, 66							
Power Class for LTE		PC3							
Type of Modulation		UL: QPSK, 16QAM, 64QAM, 256QAM DL: QPSK, 16QAM, 64QAM, 256QAM							
Antenna Type		☑ External ☐ Integrated							
Antenna Gain		LTE Band 2: 0.98dBi LTE Band 4: 0.54dBi LTE Band 5: 0.12dBi LTE Band 12: 0.97dBi LTE Band 66: 0.54dBi							
Frequency Band(s)	**SISO Band**	**Supported Channel Bandwidth (MHz)**						**Tx (MHz)**	**Rx (MHz)**
		1.4	**3**	**5**	**10**	**15**	**20**		
	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 12	v	v	v	v	-	-	699 to 716	729 to 746
	LTE Band 66	v	v	v	v	v	v	1710 to 1780	2110 to 2200
	CA Band	**Bandwidth (MHz)**							
	LTE CA_5B	10+10		10+5		3+5		5+10	5+3
	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.									

Support Equipment				
Equipment	**Manufacturer**	**Description**	**Model**	**Serial Number**
EVB	QUECTEL	/	/	/
Power Adapter	Dong Guan City GangQi Electronic Co.,Ltd	/	GQ36-120300-AX	/
External Antenna	QUECTEL	/	YECT003AA	/

2.3 Maximum Conducted power and Emission Designator

Bands	**Note:** 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.)								
LTE Band	Bandwidth (MHz)	QPSK		16QAM		64QAM		256QAM	
		Max Power (W)	Designator	Max Power (W)	Designator	Max Power (W)	Designator	Max Power (W)	Designator
LTE Band 2	1.4	0.2004	1M09G7D	0.1567	1M10W7D	0.1327	1M09W7D	0.0649	1M09W7D
	3	0.2051	2M69G7D	0.1618	2M69W7D	0.1247	2M69W7D	0.0667	2M69W7D
	5	0.2123	4M50G7D	0.1633	4M49W7D	0.1396	4M49W7D	0.0700	4M50W7D
	10	0.2080	8M98G7D	0.1626	8M98W7D	0.1247	8M96W7D	0.0673	8M98W7D
	15	0.2051	13M5G7D	0.1629	13M5W7D	0.1271	13M4W7D	0.0670	13M4W7D
	20	0.2094	17M9G7D	0.1706	18M0W7D	0.1337	17M9W7D	0.0690	17M9W7D
LTE Band 4	1.4	0.1950	1M09G7D	0.1528	1M10W7D	0.1355	1M10W7D	0.0647	1M10W7D
	3	0.2084	2M70G7D	0.1652	2M69W7D	0.1309	2M69W7D	0.0671	2M69W7D
	5	0.2153	4M49G7D	0.1618	4M50W7D	0.1439	4M50W7D	0.0703	4M51W7D
	10	0.2084	8M99G7D	0.1644	8M98W7D	0.1330	9M00W7D	0.0670	9M01W7D
	15	0.2018	13M5G7D	0.1607	13M5W7D	0.1337	13M5W7D	0.0653	13M5W7D
	20	0.2028	17M9G7D	0.1687	17M9W7D	0.1361	17M9W7D	0.0687	18M0W7D
LTE Band 5	1.4	0.2000	1M10G7D	0.1517	1M09W7D	0.1285	1M10W7D	0.0617	1M10W7D
	3	0.1995	2M69G7D	0.1531	2M69W7D	0.1148	2M69W7D	0.0640	2M68W7D
	5	0.2023	4M51G7D	0.1578	4M52W7D	0.1346	4M50W7D	0.0662	4M51W7D
	10	0.1995	9M00G7D	0.1538	8M99W7D	0.1186	8M99W7D	0.0643	9M02W7D
LTE Band 12	1.4	0.1914	1M09G7D	0.1496	1M10W7D	0.1346	1M09W7D	0.0622	1M10W7D
	3	0.1963	2M69G7D	0.1556	2M69W7D	0.1343	2M69W7D	0.0635	2M69W7D
	5	0.2004	4M49G7D	0.1560	4M49W7D	0.1358	4M49W7D	0.0659	4M50W7D
	10	0.1963	8M97G7D	0.1563	8M97W7D	0.1312	8M97W7D	0.0643	8M99W7D
LTE Band 66	1.4	0.1995	1M09G7D	0.1549	1M09W7D	0.1365	1M10W7D	0.0658	1M09W7D
	3	0.2065	2M69G7D	0.1626	2M69W7D	0.1294	2M70W7D	0.0661	2M69W7D
	5	0.2133	4M49G7D	0.1607	4M50W7D	0.1416	4M49W7D	0.0698	4M51W7D
	10	0.2065	8M97G7D	0.1622	8M98W7D	0.1303	8M98W7D	0.0670	8M99W7D
	15	0.2649	13M5G7D	0.2099	13M5W7D	0.1294	13M5W7D	0.0661	13M5W7D
	20	0.2630	18M0G7D	0.2143	17M9W7D	0.1368	17M9W7D	0.0685	17M9W7D
LTE CA_5B	10+10	0.1750	18M9G7D	0.1531	18M9W7D	0.1102	18M8W7D	0.0713	18M8W7D
	10+5	0.1770	13M9G7D	0.1514	13M9W7D	0.1114	13M9W7D	0.0619	13M9W7D

	3+5	0.1910	7M50G7D	0.2104	7M49W7D	0.1977	7M51W7D	0.1871	7M50W7D
	5+10	0.1791	13M9G7D	0.1413	13M9W7D	0.1099	13M9W7D	0.0641	13M9W7D
	5+3	0.1849	7M51G7D	0.1862	7M50W7D	0.1854	7M51W7D	0.1862	7M51W7D
LTE CA_66 B	10+10	0.1742	18M8G7D	0.1466	18M9W7D	0.1439	18M9W7D	0.0690	18M9W7D
	10+5	0.1738	13M9G7D	0.1556	13M9W7D	0.1439	13M9W7D	0.0681	13M9W7D
	15+5	0.1791	18M3G7D	0.1432	18M3W7D	0.1472	18M3W7D	0.0735	18M3W7D
	5+15	0.1656	18M3G7D	0.1268	18M3W7D	0.1219	18M3W7D	0.0634	18M3W7D
	5+5	0.1782	9M27G7D	0.1459	9M26W7D	0.1396	9M26W7D	0.0789	9M25W7D
	5+10	0.1820	13M9G7D	0.1374	13M9W7D	0.1393	13M9W7D	0.0706	13M9W7D
LTE CA_66 C	10+15	0.1683	23M1G7D	0.1462	23M2W7D	0.1396	23M1W7D	0.0701	23M1W7D
	10+20	0.1820	27M7G7D	0.1675	27M7W7D	0.1371	27M7W7D	0.0631	27M7W7D
	15+10	0.1738	23M2G7D	0.1531	23M2W7D	0.1435	23M1W7D	0.0692	23M1W7D
	15+15	0.1738	28M3G7D	0.1358	28M3W7D	0.1439	28M3W7D	0.0701	28M3W7D
	15+20	0.1778	32M6G7D	0.1538	32M5W7D	0.1346	32M6W7D	0.0653	32M6W7D
	20+10	0.1702	27M7G7D	0.1545	27M7W7D	0.1318	27M7W7D	0.0628	27M7W7D
	20+15	0.1742	32M6G7D	0.1426	32M6W7D	0.1374	32M6W7D	0.0640	32M6W7D
	20+20	0.1871	37M7G7D	0.1510	37M8W7D	0.1242	37M6W7D	0.0612	37M6W7D
	20+5	0.1690	22M9G7D	0.1507	22M9W7D	0.1340	22M9W7D	0.0587	22M9W7D
	5+20	0.1884	22M9G7D	0.1445	22M9W7D	0.1496	22M9W7D	0.0646	22M9W7D

2.4 Frequency List of Low/Middle/High Channels

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	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 12 Channel and Frequency List				
BW [MHz]	**Channel/Frequency(MHz)**	**Lowest**	**Middle**	**Highest**
1.4	Channel	23017	23095	23173
	Frequency	699.7	707.5	715.3
3	Channel	23025	23095	23165
	Frequency	700.5	707.5	714.5
5	Channel	23035	23095	23155
	Frequency	701.5	707.5	713.5
10	Channel	23060	23095	23130
	Frequency	704	707.5	711

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

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 4.3.1.1.66A-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
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	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	--
Conducted Band Edge	all	v	--	--	--	v	v	v	--	v
Spurious Emissions at Antenna Terminals	all	v	--	--	--	v	--	v	v	v
Peak-to-Average Ratio	max	v	v	v	v	--	v	--	v	--
Frequency Stability	max	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

5.For radiation spurious emission, the worst cases were recorded for QPSK modulation in this report.

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
Base Station Simulator	R&S	CMW500	PWC0052	1 Year	2024/10/11
Spectrum Analyzer	KEYSIGHT	N9020B	PWC0047	1 Year	2024/10/10
Matrix Control Unit	Tonscend	JS0806-1	PWC0007	1 Year	2024/10/12
DC Power	KEYSIGHT	E3640A	PWC0028	1 Year	2024/10/11
Climate Chamber	Boyi	B-T-48C	PWC0051	1 Year	2024/11/12
Climate Chamber	ESPEC	GSU-64	PWC0025	1 Year	2024/10/10
Shielded Chamber	Mao Rui	MR534	PWC0041	3 Years	2026/08/26
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	2026/03/23
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	Below 1GHz: 4.88 dB Above 1GH: 5.06 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]	20.8 to 25.2
Humidity [%RH]	26 to 48
Pressure [kPa]	100.7 to 103.1

Anechoic Chamber

Temperature [°C]	20.0 to 24.6
Humidity [%RH]	40 to 48
Pressure [kPa]	100.8 to 103.0

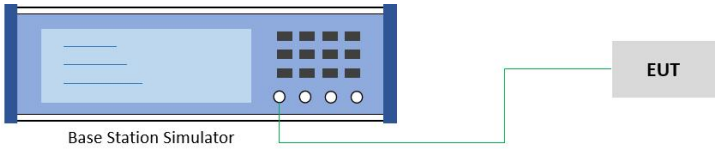
4.1 RF Output Power & Effective (Isotropic) Radiated Power

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



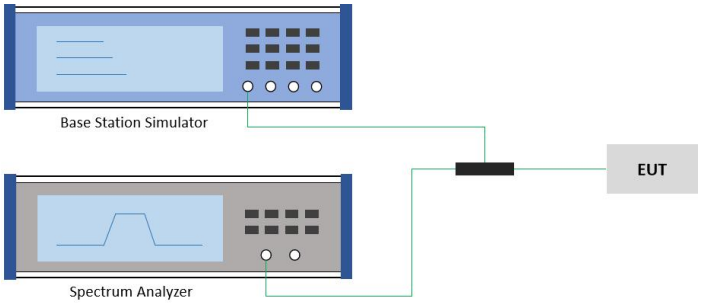
1.The testing follows ANSI C63.26 Section 5.2.
2.The transmitter output port was connected to the base station simulator.
3.Set EUT at maximum power through the base station simulator
4.Select lowest, middle, and highest channels for each band and different modulation.
5.Measure and record the power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

4.2 EIRP Power Density

Methods of Measurement

Measurement Procedure: C63.26 -2015 section 5.2.4

Test Setup



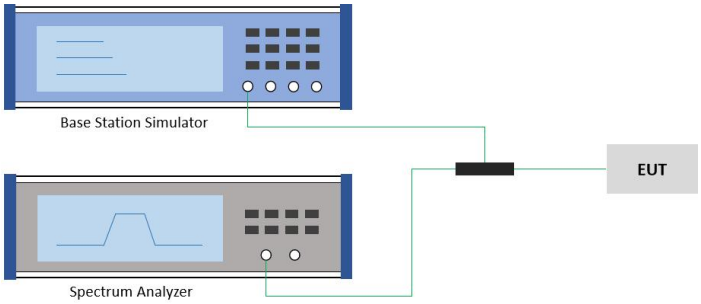
1.Set instrument center frequency to OBW center frequency.
2.Set span to at least 1.5 times the OBW.
3.Set the RBW to the specified reference bandwidth (often 1 MHz).
4.Set VBW ≥ 3 × RBW.
5.Detector = RMS (power averaging).
6.Ensure that the number of measurement points in the sweep ≥ 2 × span/RBW.
7.Sweep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

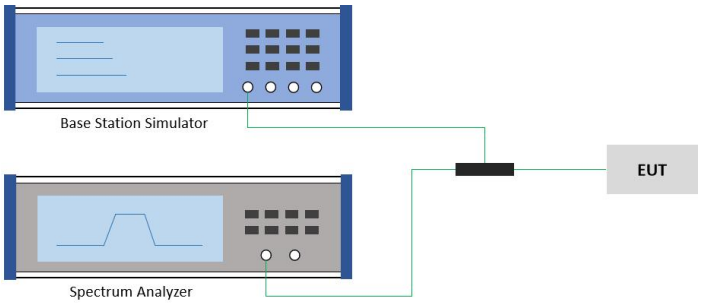
4.4 Occupied Bandwidth

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.

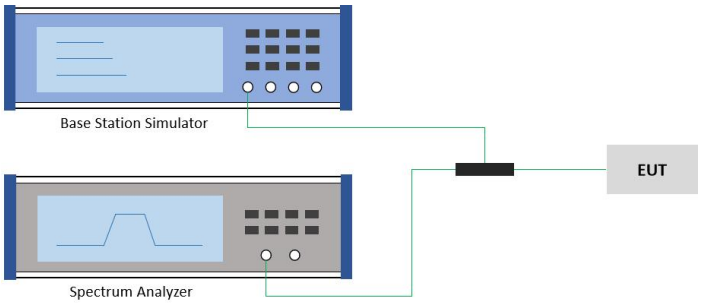
4.5 Conducted Band Edge Measurement

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.

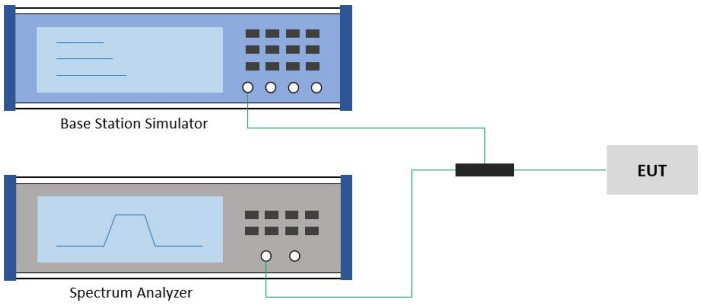
4.6 Spurious Emissions at Antenna Terminals

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.

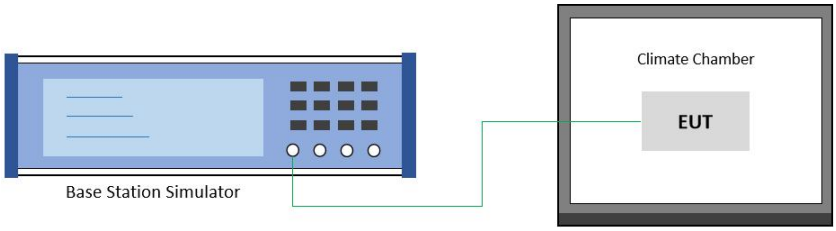
Note: As described in Section C63.26 4.2.3: Generally, the measurement must be corrected by adding 10 log [(reference bandwidth) / (resolution or measurement bandwidth)] to the measured value (such bandwidth scaling is limited to cases where the measurement bandwidth used to perform the measurement is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

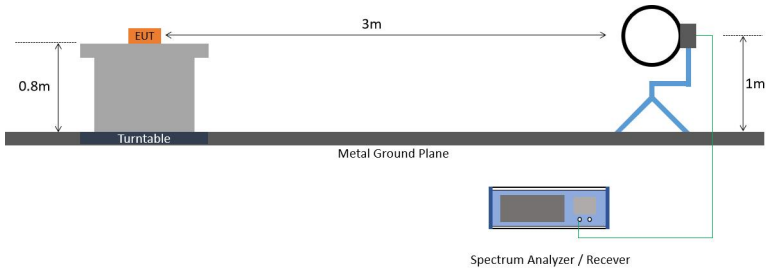
4.8 Radiated Spurious Emission

Methods of Measurement

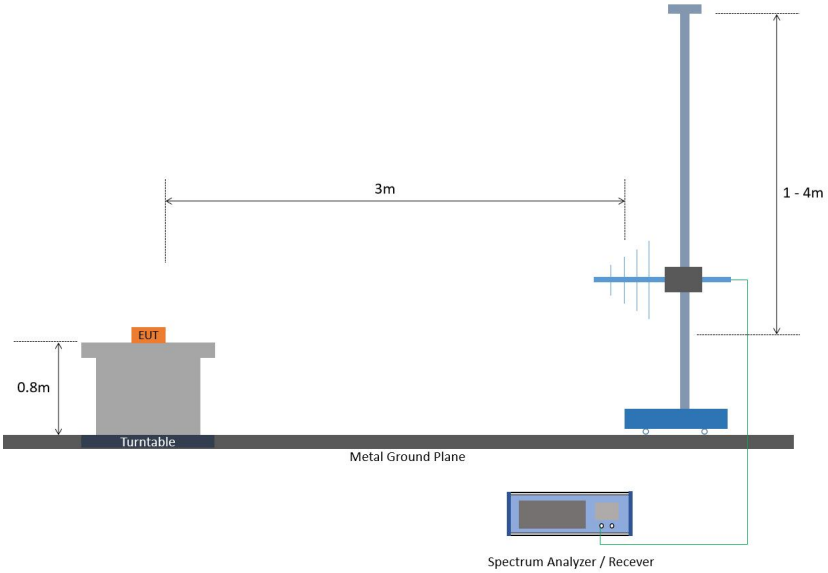
The radiated spurious emission was measured by substitution method according to ANSI C63.26. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitter power (P) by a factor of at least 43 + 10 log (P) dB.

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

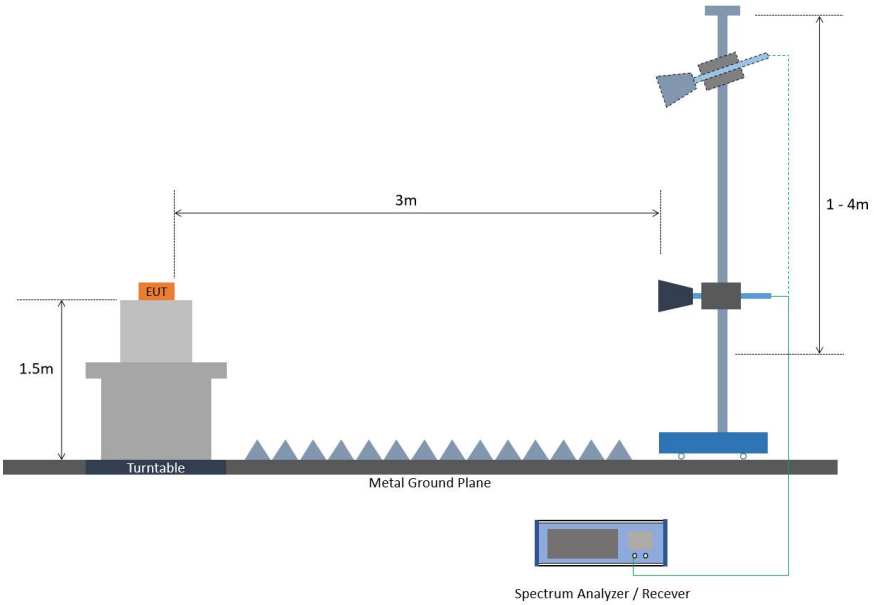
Test Setup



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

External Photograph	Refer to “Attachment A.1: External Photograph” file.
Internal Photograph	Refer to “Attachment A.2: Internal Photograph” file.
Test Setup Photograph	Refer to “Attachment A.4: RF Test Setup Photograph” file.

Test Results of Conducted Test

LTE Band 2	Refer to “Attachment B.1” file.
LTE Band 4	Refer to “Attachment B.2” file.
LTE Band 5	Refer to “Attachment B.3” file.
LTE Band 12	Refer to “Attachment B.4” file.
LTE Band 66	Refer to “Attachment B.5” file.
LTE CA_5B	Refer to “Attachment B.6” file.
LTE CA_66B	Refer to “Attachment B.7” file.
LTE CA_66C	Refer to “Attachment B.8” file.

Test Results of Radiated Test

All LTE SISO Bands	Refer to “Attachment C.1” file.
All LTE CA Bands	Refer to “Attachment C.2” file.

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