TEST REPORT

Applicant:	FIBOCOM Wireless Inc
EUT Description:	LTE Module
Model:	L716-LA
Brand:	Fibocom
FCC ID:	ZMOL716LA
Standards:	FCC CFR Title 47 Part 2
	FCC CFR Title 47 Part 22
	FCC CFR Title 47 Part 24
	FCC CFR Title 47 Part 27
Date of Receipt:	2023/10/27
Date of Test:	2023/10/27 ~ 2023/11/15
Date of Issue:	2023/11/16

TOWE. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

the results documented in this report apply only the tested sample, under the conditions and modes of operation as described herein. It is the manufacturer's responsibility assure that additional production units of the model are manufactured with identical electrical and mechanical components. All sample tested were in good operating condition throughout the entire test program. Measurement Uncertainties are published for informational purposes only and were not taken into account unless noted otherwise. without written approval of TOWE, the test report shall not be reproduced except in full.

Approved By: **Reviewed By:**

Revision History

Rev.	Issue Date	Description	Revised by
01	2023/11/16	Original	陈呈福

Summary of Test Results

FCC Part	Test Band	Test Item	Test Result	Verdict
§2.1046 §22.913(a)(5)	GSM850/WCDMA V/LTE B5	Effective Radiated Power	Appendix	Pass
§2.1046 §24.232(c) §27.50(d)(4) §27.50(h)(2)	GSM1900/WCDMA II LTE B4/66 LTE B7/38	Effective Isotropic Radiated Power	Appendix	Pass
§22.913(d) §24.232(d) §27.50(d)(5)	All	Peak-Average Ratio	Appendix	Pass
§2.1049	All	Occupied Bandwidth	Appendix	Pass
§2.1051 §22.917(a) §24.238(a) §27.53(h)	GSM850/WCDMA V/LTE B5 GSM1900/WCDMA II/LTE B2 WCDMA IV/LTE B4/66	Band Edge	Appendix	Pass
§2.1051 §27.53(m)	LTE B7/38	Band Edge	Appendix	Pass
§2.1051 §22.917(a) §24.238(a) §27.53(h)	GSM850/WCDMA V/LTE B5 GSM1900/WCDMA II/LTE B2 WCDMA IV/LTE B4/66	Spurious Emission at Antenna Terminals	Appendix	Pass
§2.1051 §27.53(m)	LTE B7/38	Spurious Emission at Antenna Terminals	Appendix	Pass
§2.1053 §22.917(a)	GSM850/WCDMA V/LTE B5	Field Strength of Spurious Radiation	Appendix	Pass
§2.1053 §24.238(a) §27.53(h)	GSM1900/WCDMA II/LTE B2 WCDMA IV/LTE B4/66	Field Strength of Spurious Radiation	Appendix	Pass
§2.1053 §27.53(m)	LTE B7/38	Field Strength of Spurious Radiation	Appendix	Pass
§2.1055 §22.355	GSM850/WCDMA V/LTE B5	Frequency Stability	Appendix	Pass
§2.1055 §24.235 §27.54	GSM1900/WCDMA II/LTE B2 WCDMA IV/LTE B4/7/38/66	Frequency Stability	Appendix	Pass

Table of Contents

1 General Description

1.1 Lab Information

1.1.1 Testing Location

These measurements tests were conducted at the Sushi TOWE Wireless Testing(Shenzhen) Co., Ltd. facility located at F401 and F101, Building E, Hongwei Industrial Zone, Liuxian 3rd Road, Bao'an District, Shenzhen, China. The measurement facility is compliant with the test site requirements specified in ANSI C63.4-2014
Tel.: +86-755-27212361
Contact Email: info@towewireless.com

1.1.2 Test Facility / Accreditations

A2LA (Certificate Number: 7088.01)
This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 General requirements for the competence of testing and calibration laboratories. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated April 2017).

FCC Designation No.: CN1353
Sushi TOWE Wireless Testing(Shenzhen) Co., Ltd. has been recognized as an accredited testing laboratory. Designation Number: CN1353.

ISED CAB identifier: CN0152
Sushi TOWE Wireless Testing(Shenzhen) Co., Ltd. has been recognized by ISED as an accredited testing laboratory.
CAB identifier: CN0152
Company Number: 31000

1.2 Client Information

1.2.1 Applicant

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

1.2.2 Manufacturer

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

1.3 Product Information

EUT Description:	LTE Module			
Model:	L716-LA			
Brand:	Fibocom			
Hardware Version:	V1.0			
Software Version:	17016.4000.00.38.01.04			
SN.:	BFW6PTGTJR BFW6PTGTH6			
Device Capabilities:				
Modulation Type:	GSM:	☒ GSM/GPRS: GMSK, ☒ EGPRS: 8PSK		
	WCDMA:	☒ BPSK ☒ QPSK	☒ 16QAM (only DL)	
	LTE:	☒ QPSK ☒ 16QAM	☒ 64QAM (only DL)	
Operation Frequency Range:	Band	TX Frequency	RX Frequency	
	GSM 850	824 ~ 849 MHz	869 ~ 894 MHz	
	PCS 1900	1850 ~ 1910 MHz	1930 ~ 1990 MHz	
	WCDMA Band II	1850 ~ 1910 MHz	1930 ~ 1990 MHz	
	WCDMA Band IV	1710 ~ 1755 MHz	2110 ~ 2155 MHz	
	WCDMA Band V	824 ~ 849 MHz	869 ~ 894 MHz	
	LTE Band 2	1850 ~ 1910 MHz	1930 ~ 1990 MHz	
	LTE Band 4	1710 ~ 1755 MHz	2110 ~ 2155 MHz	
	LTE Band 5	824 ~ 849 MHz	869 ~ 894 MHz	
	LTE Band 7	2500 ~ 2570 MHz	2620 ~ 2690 MHz	
	LTE Band 38	2570 ~ 2620 MHz	2570 ~ 2620 MHz	
	LTE Band 66	1710 ~ 1780 MHz	2110 ~ 2200 MHz	
Antenna Type:	☐ External, ☒ Integrated			
Antenna Gain:	GSM850:	1.32 dBi	GSM1900:	1.92 dBi
	WCDMA Band II:	1.92 dBi	WCDMA Band IV:	2.86 dBi
	WCDMA Band V:	1.32 dBi	LTE Band 2:	1.92 dBi
	LTE Band 4:	2.86 dBi	LTE Band 5:	1.32 dBi
	LTE Band 7:	1.07 dBi	LTE Band 38:	0.93 dBi
	LTE Band 66:	3.53 dBi		
Remark: The above EUT's information was declared by applicant, please refer to the specifications or user manual for more detailed description.				

1.4 Technical characteristics

Band	Frequency Range (MHz)	Modulation	FCC Rule Part	Emission Designator	Output power(W)
GSM 850	824.2~848.8	GMSK	22	246KGXW	2.0654
GSM 850	824.2~848.8	8PSK	22	247KG7W	0.4898
GSM 1900	1850.2~1909.8	GMSK	24	249KGXW	1.0990
GSM 1900	1850.2~1909.8	8PSK	24	249KG7W	0.3733
Band II	1852.4~1907.6	QPSK	24	4M21F9W	0.2421
Band IV	1712.4~1752.6	QPSK	27	4M16F9W	0.2564
Band V	826.4~846.6	QPSK	22	4M16F9W	0.2547
Band 2	1850.7~1909.3	QPSK	24	1M12G7D	0.2812
Band 2	1850.7~1909.3	16QAM	24	1M12W7D	0.2582
Band 2	1851.5~1908.5	QPSK	24	2M71G7D	0.3034
Band 2	1851.5~1908.5	16QAM	24	2M71W7D	0.2606
Band 2	1852.5~1907.5	QPSK	24	4M54G7D	0.2938
Band 2	1852.5~1907.5	16QAM	24	4M55W7D	0.2649
Band 2	1855.0~1905.0	QPSK	24	9M07G7D	**0.3319**
Band 2	1855.0~1905.0	16QAM	24	9M08W7D	0.3020
Band 2	1857.5~1902.5	QPSK	24	13M7G7D	0.2951
Band 2	1857.5~1902.5	16QAM	24	13M7W7D	0.2748
Band 2	1860.0~1900.0	QPSK	24	18M0G7D	0.2897
Band 2	1860.0~1900.0	16QAM	24	18M1W7D	0.2773
Band 4	1710.7~1754.3	QPSK	27	1M12G7D	0.3034
Band 4	1710.7~1754.3	16QAM	27	1M12W7D	0.2851
Band 4	1711.5~1753.5	QPSK	27	2M71G7D	**0.3006**
Band 4	1711.5~1753.5	16QAM	27	2M70W7D	0.2864
Band 4	1712.5~1752.5	QPSK	27	4M54G7D	0.2944
Band 4	1712.5~1752.5	16QAM	27	4M54W7D	0.2897
Band 4	1715.0~1750.0	QPSK	27	9M06G7D	0.2992
Band 4	1715.0~1750.0	16QAM	27	9M09W7D	0.2799
Band 4	1717.5~1747.5	QPSK	27	13M6G7D	0.2911
Band 4	1717.5~1747.5	16QAM	27	13M6W7D	0.2742
Band 4	1720.0~1745.0	QPSK	27	18M0G7D	0.2636
Band 4	1720.0~1745.0	16QAM	27	18M1W7D	0.2864
Band 5	824.7~848.3	QPSK	22	1M12G7D	0.2570
Band 5	824.7~848.3	16QAM	22	1M14W7D	0.2377
Band 5	825.5~847.5	QPSK	22	2M71G7D	0.2612
Band 5	825.5~847.5	16QAM	22	2M72W7D	0.2489
Band 5	826.5~846.5	QPSK	22	4M53G7D	0.2673
Band 5	826.5~846.5	16QAM	22	4M54W7D	0.2466
Band 5	829.0~844.0	QPSK	22	9M06G7D	**0.2897**
Band 5	829.0~844.0	16QAM	22	9M07W7D	0.2812
Band 7	2502.5~2567.5	QPSK	27	4M53G7D	0.3155
Band 7	2502.5~2567.5	16QAM	27	4M53W7D	0.2904
Band 7	2505.0~2565.0	QPSK	27	9M09G7D	**0.3388**
Band 7	2505.0~2565.0	16QAM	27	9M09W7D	0.3296
Band 7	2507.5~2562.5	QPSK	27	13M6G7D	0.3404
Band 7	2507.5~2562.5	16QAM	27	13M6W7D	0.3170
Band 7	2510.0~2560.0	QPSK	27	18M1G7D	0.3311
Band 7	2510.0~2560.0	16QAM	27	18M1W7D	0.3192
Band 38	2572.5~2617.5	QPSK	27	4M63G7D	0.2512
Band 38	2572.5~2617.5	16QAM	27	4M64W7D	0.2223
Band 38	2575.0~2615.0	QPSK	27	9M26G7D	0.2600
Band 38	2575.0~2615.0	16QAM	27	9M28W7D	0.2421
Band 38	2577.5~2612.5	QPSK	27	13M6G7D	0.2594
Band 38	2577.5~2612.5	16QAM	27	13M6W7D	0.2432
Band 38	2580.0~2610.0	QPSK	27	18M0G7D	**0.2612**

Band 38	2580.0~2610.0	16QAM	27	18M0W7D	0.2415
Band 66	1710.7~1779.3	QPSK	27	1M13G7D	0.2871
Band 66	1710.7~1779.3	16QAM	27	1M14W7D	0.2679
Band 66	1711.5~1778.5	QPSK	27	2M72G7D	0.2786
Band 66	1711.5~1778.5	16QAM	27	2M72W7D	0.2698
Band 66	1712.5~1777.5	QPSK	27	4M53G7D	0.2679
Band 66	1712.5~1777.5	16QAM	27	4M55W7D	0.2630
Band 66	1715.0~1775.0	QPSK	27	9M09G7D	0.2858
Band 66	1715.0~1775.0	16QAM	27	9M08W7D	**0.2938**
Band 66	1717.5~1772.5	QPSK	27	13M6G7D	0.2818
Band 66	1717.5~1772.5	16QAM	27	13M6W7D	0.2844
Band 66	1720.0~1770.0	QPSK	27	18M0G7D	0.2710
Band 66	1720.0~1770.0	16QAM	27	18M0W7D	0.2812

2 Test Configuration

2.1 Test Channel

Band	TX Frequency			RX Frequency		
	Range	Channel	Frequency	Range	Channel	Frequency
GSM 850	Low	128	824.2 MHz	Low	128	869.2 MHz
	Middle	190	836.6 MHz	Middle	190	881.6 MHz
	High	251	848.8 MHz	High	251	893.8 MHz
PCS 1900	Low	512	1850.2MHz	Low	512	1930.2 MHz
	Middle	661	1880.0 MHz	Middle	661	1960.0 MHz
	High	810	1909.8 MHz	High	810	1989.8 MHz
WCDMA Band II	Low	9262	1852.4 MHz	Low	9662	1932.4 MHz
	Middle	9400	1880.0 MHz	Middle	9800	1960.0 MHz
	High	9538	1907.6 MHz	High	9938	1987.6 MHz
WCDMA Band IV	Low	1312	1712.4MHz	Low	1537	2112.4 MHz
	Middle	1413	1732.6 MHz	Middle	1638	2132.6 MHz
	High	1513	1752.6 MHz	High	1738	2152.6 MHz
WCDMA Band V	Low	4132	826.4 MHz	Low	4357	871.4 MHz
	Middle	4182	836.4 MHz	Middle	4407	881.4 MHz
	High	4233	846.6 MHz	High	4458	891.6 MHz

Band	Bandwidth	TX Frequency			RX Frequency		
		Range	Channel	Frequency	Range	Channel	Frequency
LTE band 2	1.4MHz	Low	18607	1850.7 MHz	Low	607	1930.7 MHz
		Middle	18900	1880 MHz	Middle	900	1960 MHz
		High	19193	1909.3 MHz	High	1193	1989.3 MHz
	3MHz	Low	18615	1851.5 MHz	Low	615	1931.5 MHz
		Middle	18900	1880 MHz	Middle	900	1960 MHz
		High	19185	1908.5 MHz	High	1185	1988.5 MHz
	5MHz	Low	18625	1852.5 MHz	Low	625	1932.5 MHz
		Middle	18900	1880 MHz	Middle	900	1960 MHz
		High	19175	1907.5 MHz	High	1175	1987.5 MHz
	10MHz	Low	18650	1855 MHz	Low	650	1935 MHz
		Middle	18900	1880 MHz	Middle	900	1960 MHz
		High	19150	1935 MHz	High	1150	1985 MHz
	15MHz	Low	18675	1857.5 MHz	Low	675	1937.5 MHz
		Middle	18900	1880 MHz	Middle	900	1960 MHz
		High	19125	1902.5 MHz	High	1125	1982.5 MHz
	20MHz	Low	18700	1860 MHz	Low	700	1940 MHz
		Middle	18900	1880 MHz	Middle	900	1960 MHz
		High	19100	1900 MHz	High	1100	1980 MHz
LTE band 4	1.4MHz	Low	19957	1710.7 MHz	Low	1975	2110.7 MHz
		Middle	20175	1732.5 MHz	Middle	2175	2132.5MHz
		High	20393	1754.3 MHz	High	2375	2154.3 MHz
	3MHz	Low	19965	1711.5 MHz	Low	2000	2115 MHz
		Middle	20175	1732.5 MHz	Middle	2175	2132.5MHz
		High	20385	1753.5 MHz	High	2350	2150 MHz
	5MHz	Low	19975	1712.5 MHz	Low	1975	2112.5 MHz
		Middle	20175	1732.5 MHz	Middle	2175	2132.5MHz
		High	20375	1752.5 MHz	High	2375	2152.5 MHz
	10MHz	Low	20000	1715 MHz	Low	2115	2115 MHz
		Middle	20175	1732.5 MHz	Middle	2175	2132.5MHz
		High	20350	1750 MHz	High	2350	2150 MHz
	15MHz	Low	20025	1717.5 MHz	Low	2025	2117.5 MHz
		Middle	20175	1732.5 MHz	Middle	2175	2132.5MHz
		High	20325	1747.5 MHz	High	2325	2147.5 MHz

	20MHz	Low	20050	1720 MHz	Low	2050	2120 MHz
		Middle	20175	1732.5 MHz	Middle	2175	2132.5MHz
		High	20300	1745 MHz	High	2300	2145 MHz
LTE band 5	1.4MHz	Low	20407	824.7 MHz	Low	2407	869.7 MHz
		Middle	20525	836.5 MHz	Middle	2525	881.5 MHz
		High	20643	848.3 MHz	High	2643	893.3 MHz
	3MHz	Low	20415	825.5 MHz	Low	2415	870.5 MHz
		Middle	20525	836.5 MHz	Middle	2525	881.5 MHz
		High	20635	847.5 MHz	High	2635	892.5 MHz
	5MHz	Low	20425	826.5 MHz	Low	2425	871.5 MHz
		Middle	20525	836.5 MHz	Middle	2525	881.5 MHz
		High	20625	846.5 MHz	High	2625	891.5 MHz
	10MHz	Low	20450	829 MHz	Low	2450	874 MHz
		Middle	20525	836.5 MHz	Middle	2525	881.5 MHz
		High	20600	844 MHz	High	2600	889 MHz
LTE band 7	5MHz	Low	20775	2502.5 MHz	Low	2775	2622.5 MHz
		Middle	21100	2535 MHz	Middle	3100	2655 MHz
		High	21425	2567.5 MHz	High	3425	2687.5 MHz
	10MHz	Low	20800	2505 MHz	Low	2800	2625 MHz
		Middle	21100	2535 MHz	Middle	3100	2655 MHz
		High	21400	2565 MHz	High	3400	2685 MHz
	15MHz	Low	20825	2507.5 MHz	Low	2825	2627.5 MHz
		Middle	21100	2535 MHz	Middle	3100	2655 MHz
		High	21375	2562.5 MHz	High	3375	2682.5 MHz
	20MHz	Low	20850	2510 MHz	Low	2850	2630 MHz
		Middle	21100	2535 MHz	Middle	3100	2655 MHz
		High	21350	2560 MHz	High	3350	2680 MHz
LTE band 38	5MHz	Low	37775	2572.5 MHz	Low	37775	2572.5 MHz
		Middle	38000	2595 MHz	Middle	38000	2595 MHz
		High	38225	2617.5 MHz	High	38225	2617.5 MHz
	10MHz	Low	37800	2575 MHz	Low	37800	2575 MHz
		Middle	38000	2595 MHz	Middle	38000	2595 MHz
		High	38200	2615 MHz	High	38200	2615 MHz
	15MHz	Low	37825	2577.5 MHz	Low	37825	2577.5 MHz
		Middle	38000	2595 MHz	Middle	38000	2595 MHz
		High	38175	2612.5 MHz	High	38175	2612.5 MHz
	20MHz	Low	37850	2580 MHz	Low	37850	2580 MHz
		Middle	38000	2595 MHz	Middle	38000	2595 MHz
		High	38150	2610 MHz	High	38150	2610 MHz
LTE band 66	1.4MHz	Low	131979	1710.7 MHz	Low	66443	2110.7 MHz
		Middle	132322	1745 MHz	Middle	66786	2145MHz
		High	132665	1779.3 MHz	High	67329	2199.3 MHz
	3MHz	Low	131987	1711.5 MHz	Low	66451	2111.5 MHz
		Middle	132322	1745 MHz	Middle	66786	2145MHz
		High	132657	1778.5MHz	High	67321	2198.5MHz
	5MHz	Low	131997	1712.5 MHz	Low	66461	2112.5 MHz
		Middle	132322	1745 MHz	Middle	66786	2145MHz
		High	132647	1777.5 MHz	High	67311	2197.5 MHz
	10MHz	Low	132022	1715 MHz	Low	66486	2115 MHz
		Middle	132322	1745 MHz	Middle	66786	2145MHz
		High	132622	1775 MHz	High	67286	2195 MHz
	15MHz	Low	132047	1717.5 MHz	Low	66511	2117.5 MHz
		Middle	132322	1745 MHz	Middle	66786	2145MHz
		High	132597	1772.5 MHz	High	67261	2192.5 MHz
	20MHz	Low	132072	1720 MHz	Low	66536	2120 MHz
		Middle	132322	1745 MHz	Middle	66786	2145MHz
		High	132572	1770 MHz	High	67236	2190 MHz

2.2 Test Mode

Test Mode	Description
TM 1	EUT communication with simulated station in GMSK mode
TM 2	EUT communication with simulated station in 8PSK mode
TM 3	EUT communication with simulated station in WCDMA/RMC mode
TM 4	EUT communication with simulated station in LTE/QPSK mode
TM 5	EUT communication with simulated station in LTE/16QAM mode

2.3 Support Unit used in test

Description	Manufacturer	Model	Serial Number
Development Board*	Fibocom	ADP- L716-CN-80-00	/
Laptop	Dell	Latitude 5520	C196418CAB1C
Remark: *the information is provided by applicant.			

2.4 Test Environment

Temperature:	Normal: 15℃ ~ 35℃, Extreme: -30℃ ~ +50℃
Relative Humidity	45-56 % RH Ambient
Voltage:	Nominal: 3.80 Vdc, Extreme: Low 3.3 Vdc, High 4.4 Vdc

2.5 Test RF Cable

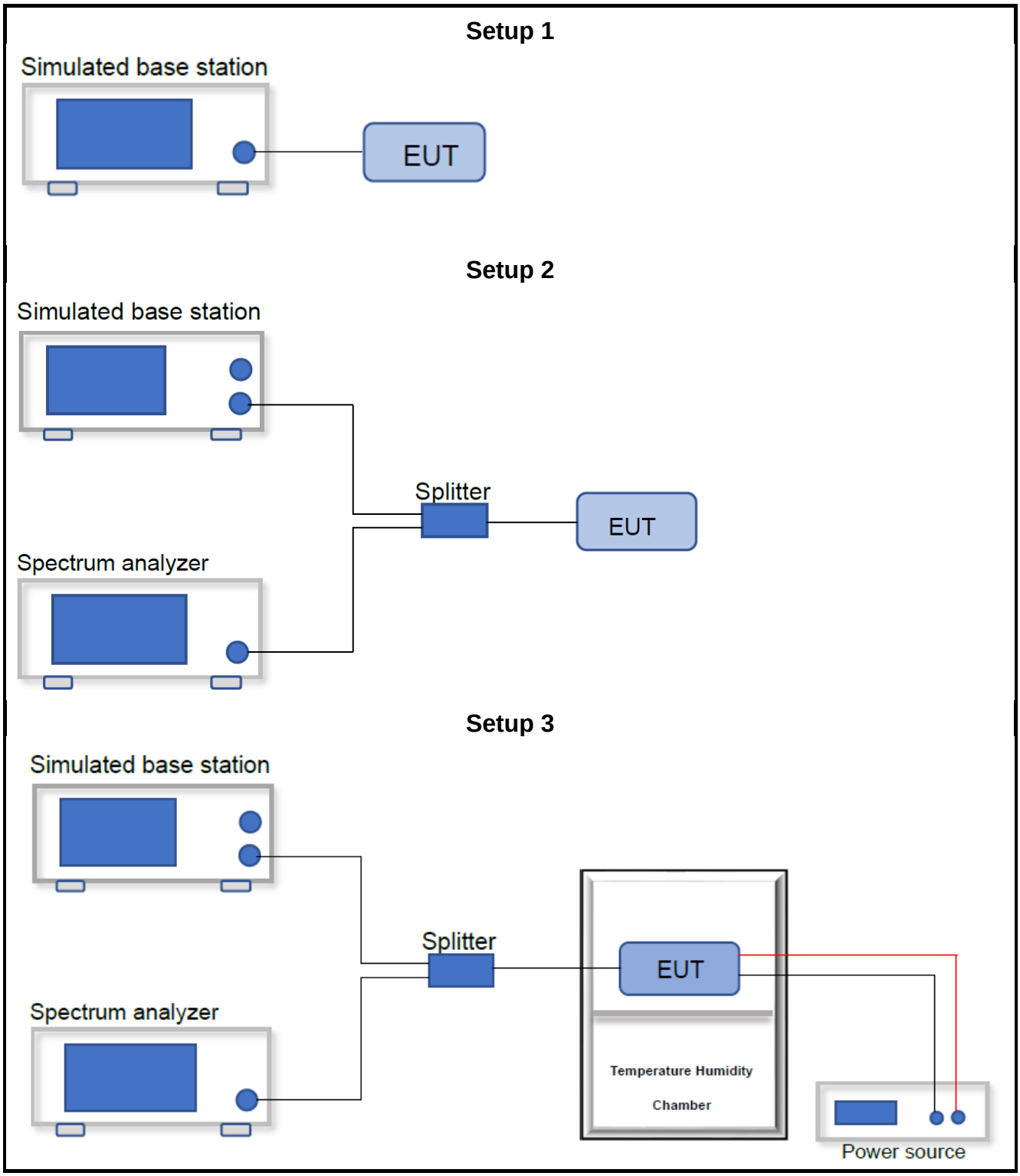
For all conducted test items: The offset level is set spectrum analyzer to compensate the RF cable loss and attenuator factor between RF conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level will be exactly the RF output level.
The spectrum analyzer offset is derived from RF cable loss and attenuator factor.
Offset = RF cable loss + attenuator factor.

2.6 Modifications

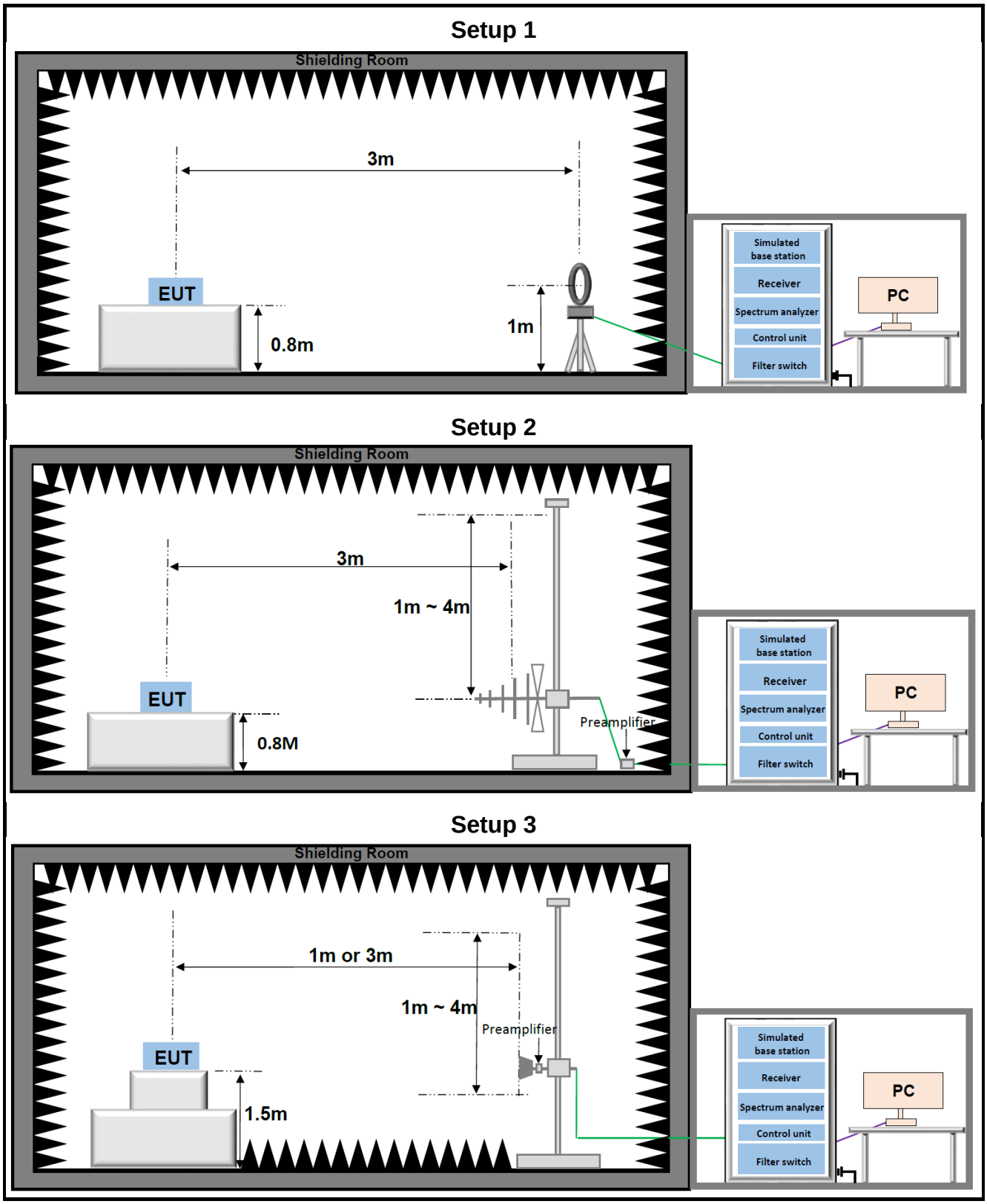
No modifications were made during testing.

2.7 Test Setup Diagram

2.7.1 Conducted Configuration



2.7.2 Radiated Configuration



3 Equipment and Measurement Uncertainty

All test and measuring equipment utilized to perform the tests documented in this report are calibrated on a regular basis, whichever is less, and where applicable is traceable recognized national standards.

3.1 Test Equipment List

RF4 Test System					
Description	**Manufacturer**	**Model**	**SN**	**Last Due**	**Cal Due**
Radio Communication Analyzer	Anritsu	MT8821C	6262170436	2023/04/08	2024/04/07
Signal Analyzer	Keysight	N9020A	US46220152	2023/04/08	2024/04/07
Signal Generator	Keysight	N5182A	MY49060761	2023/04/08	2024/04/07
Signal Generator	R&S	SMR20	101691	2023/04/08	2024/04/07
Hygrometer	BingYu	HTC-1	N/A	2023/06/01	2024/05/31
Band Reject Filter Group	Tonscend	JS0806-F	23B806F0662	N/A	N/A
RF Control Unit	Tonscend	JS0806-1	22L8060650	N/A	N/A
Test software	Tonscend	V3.1.46	10770	N/A	N/A

RF5 Test System					
Description	**Manufacturer**	**Model**	**SN**	**Last Due**	**Cal Due**
Wideband Radio Communication Teste	R&S	CMW500	151064	2023/04/08	2024/04/07
Signal Analyzer	Keysight	N9020A	US46470468	2023/04/08	2024/04/07
Signal Generator	Keysight	N5182A	MY50144316	2023/04/08	2024/04/07
Signal Generator	R&S	SMR20	100621	2023/04/08	2024/04/07
Hygrometer	BingYu	HTC-1	N/A	2023/06/01	2024/05/31
Band Reject Filter Group	Tonscend	JS0806-F	22L8060639	N/A	N/A
RF Control Unit	Tonscend	JS0806-1	23A806F0647	N/A	N/A
Test software	Tonscend	V3.1.46	10763	N/A	N/A

Description	**Manufacturer**	**Model**	**SN**	**Last Due**	**Cal Due**
Temperature Humidity Chamber	ESPEC	GSU-24V	0060-001324	2023/05/26	2024/05/25
DC Power Supply	Keysight	N6732B	MY54002055	2023/03/28	2024/03/27

3.2 Measurement Uncertainty

Parameter	U_{lab}
Output power	0.76dB
Occupied bandwidth/out-of-band emission/frequency range	6.8kHz
Conducted spurious emissions	2.22dB
Radiation 9kHz~30MHz	2.4dB
Radiation 30MHz~1000MHz	4.66dB
Radiation 1000MHz~18GHz	5.42dB
Radiated 18GHz~40GHHz	5.46dB

Uncertainty figures are valid to a confidence level of 95%

4 Test Results

4.1 Output Power (ERP / EIRP / Conducted Power)

Limits

FCC Part	Test Band	Limit
§22.913(a)(5)	GSM 850 WCDMA Band V LTE Band 5	The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7watts.
§24.232(c)	PCS 1900 WCDMA Band II LTE Band 2/25	Mobile and portable stations are limited to 2 watts EIRP and the equipment must employ a means for limiting power to the minimum necessary for successful communications.
§27.50(h)(2)	LTE Band 7/38	Mobile and other user stations. Mobile stations are limited to 2.0 watts EIRP. All user stations are limited to 2.0 watts transmitter output power
§27.50(d)(4)	WCDMA Band IV LTE Band 4/66	Fixed, mobile, and portable (hand-held) stations operating in the 1710-1755MHz band and mobile and portable stations operating in the 1695-1710 MHz and 1755-1780MHz bands are limited to 1watt EIRP. Fixed stations operating in the 1710-1755MHz band are limited to a maximum antenna height of 10 meters above ground. Mobile and portable stations operating in these bands must employ a means for limiting power to the minimum necessary for successful communications.

Test Procedure

KDB 971168 D01 V03r01 Section 5.2.1, for Conducted Output Power
KDB 971168 D01 V03r01 Section 5.2, for Effective (Isotropic) Radiated Power

Test Settings

Conducted Output Power:

The transmitter output was connected to a calibrated attenuator, the other end of which was connected to the simulated base station. The simulated station was set to force the EUT to its maximum power setting, Transmitter output power was read off in dBm, read values have added cable loss and attenuation.

Radiated Power:

The formula for calculating ERP/EIRP based on conduction power is as follows:
EIRP (dBm) = Conducted Power (dBm) + antenna gain (dBi)
ERP=EIRP - 2.15dB

Test Setup

Refer to section 2.7.1 Setup 1

Measuring Instruments

The measuring equipment is listed in the section 3.1 of this test report.

Test Results

The detailed test data see: **Appendix.**

4.2 Peak-Average Ratio

Limits

§22.913(d): The peak-to-average ratio (PAR) of the transmission must not exceed 13 dB.

§24.232(d): The peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

§27.50(d)(5): The peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

Test Procedure

KDB 971168 D01 V03r01 Section 5.7.1

Test Settings

The following guidelines are offered for performing a CCDF measurement.

1. Set resolution/measurement bandwidth ≥ OBW or specified reference bandwidth.
2. Set the number of counts to a value that stabilizes the measured CCDF curve.
3. Set the measurement interval as follows:
   a) For continuous transmissions, set to the greater of [10 × (number of points in sweep) × (transmission symbol period)] or 1 ms.
   b) For burst transmissions, employ an external trigger that is synchronized with the EUT burst timing sequence, or use the internal burst trigger with a trigger level that allows the burst to stabilize. Set the measurement interval to a time that is less than or equal to the burst duration.
   c) If there are several carriers in a single antenna port, the peak power shall be determined for each individual carrier (by disabling the other carriers while measuring the required carrier) and the total peak power calculated from the sum of the individual carrier peak powers.
4. Record the maximum PAPR level associated with a probability of 0.1%.
5. The peak power level is calculated form the sum of the PAPR value from step d) to the measured average power.

Test Setup

Refer to section 2.7.1 Setup 2

Measuring Instruments

The measuring equipment is listed in the section 3.1 of this test report.

Test Result

The detailed test data see: **Appendix.**

4.3 Occupied Bandwidth

Limits

For Reporting Purposes only

Test Procedure

KDB 971168 D01 V03r01 Section 4.2 & 4.3

Test Settings

1. The transmitter output was connected to a calibrated coaxial cable and coupler, The other end is connected to the spectrum analyzer and simulated station.
2. The signal analyzer automatic bandwidth measurement capability was used to perform the 99% occupied bandwidth and the 26dB bandwidth. The bandwidth measurement was not influenced by ant intermediate power nulls in the fundamental emission.
3. The simulated base station was set to force the EUT to its maximum transmitting power.
4. RBW = 1 - 5% of the expected OBW
5. VBW ≥ 3 times the RBW
6. Sweep = Auto
7. Detector = Peak
8. Trace = Max hold
9. The trace was allowed to stabilize

Test Setup

Refer to section 2.7.1 Setup 2

Measuring Instruments

The measuring equipment is listed in the section 3.1 of this test report.

Test Result

The detailed test data see: **Appendix.**

4.4 Band Edge and Emission Mask

Limits

FCC part	Test Band	Limit
§22.917(a) §24.238(a) §27.53(h)	GSM 850/ PCS 1900 WCDMA Band II/IV/V LTE Band 2/4/5/66	The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.
§27.53(m)	LTE Band 7/38	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 MHz from the channel edge, 43 + 10 log (P) dB on all frequencies between 5 MHz and X MHz from the channel edge, and 55 + 10 log (P) dB on all frequencies more than X MHz from the channel edge, where X is the greater of 6 MHz 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.

Test Procedure

KDB 971168 D01 V03r01 Section 6.0

Test Settings

1. The transmitter output was connected to a calibrated coaxial cable and coupler, The other end is connected to the spectrum analyzer and simulated station.
2. The simulated base station was set to force the EUT to its maximum transmitting power.
3. Start and stop frequency were set such that the band edge would be placed in the center of the plot.
4. RBW ≥ 1% of the emission bandwidth
5. VBW ≥ 3 times the RBW
6. Detector = RMS
7. Number of sweep point ≥ 2 times Span/RBW
8. Sweep = Auto
9. Trace = Max hold
10. The trace was allowed to stabilize

Test Setup

Refer to section 2.7.1. Setup 2

Measuring Instruments

The measuring equipment is listed in the section 3.1 of this test report.

Test Result

The detailed test data see: **Appendix.**

4.5 Spurious Emission at Antenna Terminals

Limits

FCC part	Test Band	Limit
§22.917(a) §24.238(a) §27.53(h)	GSM 850 / PCS 1900 WCDMA Band V/ II/ IV LTE Band 2/4/5/66	The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.
§27.53(m)	LTE Band 7/38	All frequencies between 2490.5 MHz and 2496 MHz and 55 + 10 log (P) dB at or below 2490.5 MHz.

Test Procedure

KDB 971168 D01 V03r01 Section 6.0

Test Settings

1. The transmitter output was connected to a calibrated coaxial cable and coupler, The other end is connected to the spectrum analyzer and simulated station.
2. The simulated base station was set to force the EUT to its maximum transmitting power.
3. Start frequency was set to 9kHz and stop frequency was set to 10th harmonic.
4. RBW and VBW (see test notes)
5. Detector = RMS
6. Sweep = Auto
7. Sweep point = below 30MHz(1001pts); 30MHz – 1GHz(2001pts); above 1GHz(40001pts)
8. Trace = trace average for continuous emissions, max hold for pulse emissions
9. Allow trace to fully stabilize

Test Notes

1. Compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth 100kHz or greater for measurements below 1GHz. However, in the 1MHz 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 is attenuated at least 26dB below the transmitter power.
2. 9kHz – 150kHz: RBW=1kHz, VBW≥3 times the RBW
3. 150kHz – 30MHz: RBW=10kHz, VBW≥3 times the RBW

Test Setup

Refer to section 2.7.2 for details

Measuring Instruments

The measuring equipment is listed in the section 3.1 of this test report.

Test Result

The detailed test data see: **Appendix.**

4.6 Field Strength of Spurious Radiation

Limits

FCC part	Test Band	Limit
§22.917(a) §24.238(a) §27.53(h)	GSM 850 / PCS 1900 WCDMA Band V/ II/ IV LTE Band 2/4/566	The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.
§27.53(m)	LTE Band 7/38	All frequencies between 2490.5 MHz and 2496 MHz and 55 + 10 log (P) dB at or below 2490.5 MHz.

Test Procedure

KDB 971168 D01 V03r01 Section 7

Test Settings

1. For radiated emissions measurements performed at frequencies less than or equal to 1GHz, the EUT shall be placed on a RF-transparent table or support at a nominal height of 80cm above the reference ground plane.
2. For radiated emissions measurements performed at frequencies above 1GHz, the EUT shall be placed on a RF-transparent table or support at a nominal height of 150cm above the ground plane.
3. Radiated measurements shall be made with the measurement antenna positioned in both horizontal and vertical polarization. The measurement antenna shall be varied from 1m to 4m in height above the reference ground in a search for the relative positioning that produces the maximum radiated signal level (i.e, field strength or received power), when orienting the measurement antenna in vertical polarization, the minimum height of the lowest element of the antenna shall clear the site reference ground plane by at least 25cm.
4. For each suspected emission, the EUT was ranged its worst case and then tune the antenna tower(from 1~4m) and turntable(from 0~360°) find the maximum reading. Preamplifier and a high pass filter are used for the test in order get better signal level comply with the guidelines.
5. The simulated base station was set to force the EUT to its maximum transmitting power.
6. spectrum analyzer setting:
   Measurements 9KHz~150KHz: RBW = 300Hz; VBW ≥ 3 kHz; Detector = RMS
   Measurements 150KHz~30MHz: RBW = 10KHz; VBW ≥ 30 kHz; Detector = RMS
   Measurements 30MHz~1000MHz: RBW = 100KHz or 1MHz; VBW ≥ 1MHz or 3MHz; Detector = RMS
   Measurements Above 1000MHz: RBW = 1 MHz; VBW ≥ 3 MHz; Detector = RMS
7. The field strength is calculated by adding the Antenna Factor, Cable Factor. The basic equation with a sample calculation is as follows:
   E(dBμV/m) = Measured amplitude level (dBμV) + Cable Loss (dB) + Antenna Factor (dB/m).
   E(dBμV/m) = Measured amplitude level (dBm) + 107 + Cable Loss (dB) + Antenna Factor (dB/m).
   E(dBuV/m) = EIRP(dBm) - 20log(D) + 104.8; where D is the measurement distance(in the far field region) in m.
   EIRP(dBm) = E(dBμV/m) + 20log(D) - 104.8; where D is the measurement distance(in the far field region) in m.
   *So, from d: The measuring distance is usually at 3m, then 20*Log(3)=9.5424*
   Then, EIRP (dBm)= E (dBμV/m) +9.5424-104.8=E (dBμV/m)-95.2576
8. Repeat above procedures until all frequencies measured was complete.
9. Measure and record the results in the test report.

Test notes

1. This device employs GSM, GPRS, and EGPRS capabilities. The EUT was tested under all configurations and the highest powers is reported in GPRS mode while transmitting with one slot active.
2. This device employs UMTS technology with WCDMA(AMR/RMC) and HSDPA capabilities. The EUT was tested under all configurations and the highest power is reported in WCDMA mode with HSDPA Inactive at 12.2kbps RMC and TPC bits all set to “1”.
3. The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst-case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the tables below.

4. Emissions below 18GHz were measured at a 3-meter test distance while emissions above 18GHz were measured at a 1-meter test distance with the application of a distance correction factor.
5. Radiated spurious emissions were investigated from 9kHz to 30MHz, 30MHz-1GHz and above 1GHz. the disturbance between 9KHz to 30MHz and 18GHz to 40GHz was very low. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be recorded, so only the harmonics had been displayed.
6. In the test at 30MHz to 1000MHz, we predicted low to medium to high channels and found no significant changes. in the report, we only reflected a set of channel data.
7. The "/" shown in the following RSE tables are used to denote a noise floor measurement.

Test Setup

Refer to section 2.7.2 for details.

Measuring Instruments

The measuring equipment is listed in the section 3.1 of this test report.

Test Result

The detailed test data see: **Appendix.**

4.7 Frequency Stability V.S. Temperature, Voltage

Limits

§22.355:

The carrier frequency shall not depart from the reference frequency in excess of ±2.5 ppm for mobile stations.

§24.235 / §27.54

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Test Procedure

KDB 971168 D01 V03r01 Section 9

Test Settings

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.

Test Notes

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.

Test Setup

Refer to section 2.7.1 Setup 3

Measuring Instruments

The measuring equipment is listed in the section 3.1 of this test report.

Test Result

The detailed test data see: **Appendix.**

4.8 Test Setup Photos

The detailed test data see: **Appendix**

Appendix

Appendix List:

Appendix A-GSM
Appendix A-WCDMA
Appendix A-LTE BAND2
Appendix A-LTE BAND4
Appendix A-LTE BAND5
Appendix A-LTE BAND7
Appendix A-LTE BAND38
Appendix A-LTE BAND66
Appendix B-Test Setup Photos

~The End~