TEST REPORT

Applicant:	Janam Technologies LLC
Address:	999 South Oyster Bay Rd Suite 409 Bethpage, NY 11714
Equipment Type:	Mobile Computer
Model Name:	XT4
Brand Name:	Janam
FCC ID:	UTWXT4WA
Test Standard:	47 CFR Part 2 (Others refer to chapter 3.1)
Sample Arrival Date:	Nov. 15, 2024
Test Date:	Nov. 20, 2024 - Mar. 06, 2025
Date of Issue:	Jun. 05, 2025

ISSUED BY:

Shenzhen BALUN Technology Co., Ltd.

Tested by: Jiamin Lu

Checked by: Wu Huihui

Approved by: Tolan Tu

(Testing Director)

Revision History

Version	Issue Date	Revisions
Rev. 01	Apr. 23, 2025	Initial Issue
Rev. 02	Jun. 05, 2025	Page 32, Corrected the UL Frequency of Channel 169300.

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1 GENERAL INFORMATION

1.1 Test Laboratory

Name	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1/F, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Phone Number	+86 755 6685 0100

1.2 Test Location

Name	Shenzhen BALUN Technology Co., Ltd.
Location	☐ Block B, 1/F, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
	☑ 1/F, Building B, Ganghongji High-tech Intelligent Industrial Park, No. 1008, Songbai Road, Yangguang Community, Xili Sub-district, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Accreditation Certificate	The laboratory is a testing organization accredited by FCC as a accredited testing laboratory. The designation number is CN1196.

2 PRODUCT INFORMATION

2.1 Applicant Information

Applicant	Janam Technologies LLC
Address	999 South Oyster Bay Rd Suite 409 Bethpage, NY 11714

2.2 Manufacturer Information

Manufacturer	Janam Technologies LLC
Address	999 South Oyster Bay Rd Suite 409 Bethpage, NY 11714

2.3 General Description for Equipment under Test (EUT)

EUT Name	Mobile Computer
Model Name Under Test	XT4
Series Model Name	N/A
Description of Model name differentiation	N/A
Hardware Version	QDC510
Software Version	XT4_CN_XX_WE__DS__R01_D_250109_01
Dimensions (Approx.)	N/A
Weight (Approx.)	N/A

2.4 Technical Information

All Network and Wireless connectivity for EUT	2G Network GPRS/EDGE 850/1900 3G Network WCDMA/HSDPA/HSUPA Band 2/4/5 4G Network FDD LTE Band 2/4/5/7/12/13/14/17/25/26/66/71 TDD LTE Band 38/41/42/43/48 5G Network SA: NR n2/n5/n7/n12/n13/n14/n25/n26/n38/n41/n48/n66/n71/n77/n78 NSA(EN-DC): DC_2A_n5A, DC_2A_n41A, DC_2A_n66A, DC_2A_n71A, DC_2A_n78A, DC_5A_n2A, DC_5A_n7A, DC_5A_n48A, DC_5A_n66A, DC_5A_n78A, DC_7A_n5A, DC_7A_n66A, DC_7A_n77A, DC_7A_n78A, DC_12A_n2A, DC_12A_n25A, DC_12A_n66A, DC_13A_n2A, DC_13A_n48A, DC_13A_n66A, DC_14A_n2A, DC_14A_n66A, DC_25A_n41A, DC_26A_n41A, DC_26A_n78A, DC_48A_n5A, DC_48A_n66A, DC_66A_n2A, DC_66A_n5A, DC_66A_n7A, DC_66A_n25A, DC_66A_n41A, DC_66A_n48A, DC_66A_n71A, DC_66A_n78A Bluetooth (BR+EDR+BLE) WIFI 802.11a, 802.11b, 802.11g, 802.11n(HT20/40), 802.11ac(VHT20/40/80/160) and 802.11ax(HE20/40/80/160) GPS, GLONASS, Galileo, BDS, NFC
About the Product	The equipment is Mobile Computer, intended for used with information technology equipment.
Note 1: The EUT is a Mobile Computer, supporting dual SIM card slots under the same transceiver. Both SIM card slots support GPRS, WCDMA, LTE and NR. And both SIM card slots share the same transceiver, so only SIM1 is tested in this report.	

The following is the technical information of the EUT tested frequency bands in this report.

Operating Bands	GPRS/EGPRS 850/1900 MHz WCDMA/HSDPA/HSUPA Band 2/4/5 FDD LTE Band 2/4/5/7/12/13/14/17/25/26/66/71 TDD LTE Band 38/41/42/43/48 SA: n2/n5/n7/n12/n13/n14/n25/n26/n38/n41/n48/n66/n71/n77/n78 NSA(EN-DC): DC_2A_n5A, DC_2A_n41A, DC_2A_n66A, DC_2A_n71A, DC_2A_n78A, DC_5A_n2A, DC_5A_n7A, DC_5A_n48A, DC_5A_n66A, DC_5A_n78A, DC_7A_n5A, DC_7A_n66A, DC_7A_n77A, DC_7A_n78A, DC_12A_n2A, DC_12A_n25A, DC_12A_n66A, DC_13A_n2A, DC_13A_n48A, DC_13A_n66A, DC_14A_n2A, DC_14A_n66A, DC_25A_n41A, DC_26A_n41A, DC_26A_n78A, DC_48A_n5A, DC_48A_n66A, DC_66A_n2A, DC_66A_n5A, DC_66A_n7A, DC_66A_n25A, DC_66A_n41A, DC_66A_n48A, DC_66A_n71A, DC_66A_n78A	
Modulation Type	GPRS	GMSK
	EGPRS	8PSK
	WCDMA	QPSK
	HSDPA /HSUPA	QPSK
		16QAM
	LTE	QPSK
		16QAM
		64QAM
	NR	CP-OFDM: QPSK / 16QAM / 64QAM / 256QAM
		DFT-s-OFDM: PI/2 BPSK / QPSK / 16QAM / 64QAM / 256QAM
Multislot Class	GPRS/EGPRS: 33	
Antenna Type	PIFA Antenna	
Antenna Gain	GPRS/EGPRS 850: -2.47 dBi GPRS/EGPRS 1900: 1.86 dBi WCDMA/HSDPA/HSUPA Band 2: 1.00 dBi WCDMA/HSDPA/HSUPA Band 4: 1.86 dBi WCDMA/HSDPA/HSUPA Band 5: -2.47 dBi LTE Band 2: 1.00 dBi LTE Band 4: 1.86 dBi LTE Band 5 -2.47 dBi LTE Band 7: 0.79 dBi LTE Band 12: -3.69 dBi LTE Band 13: -3.94 dBi LTE Band 14: -4.19 dBi LTE Band 17: -3.69 dBi LTE Band 25: 1.00 dBi LTE Band 26 (824-849MHz): -2.47 dBi	

	LTE Band 26 (814-824MHz): -4.26 dBi LTE Band 38: 1.98 dBi LTE Band 41: 2.30 dBi LTE Band 42(3450-3550MHz): -0.68 dBi LTE Band 43(3700-3800MHz): 0.79 dBi LTE Band 48: 0.79 dBi LTE Band 66: 1.86 dBi LTE Band 71: -3.61 dBi NR Band n2: 1.00 dBi NR Band n5: -2.47 dBi NR Band n7: 0.79 dBi NR Band n12: -3.69 dBi NR Band n13: -3.94 dBi NR Band n14: -4.19 dBi NR Band n25: 1.00 dBi NR Band n26 (814-824MHz): -4.26 dBi NR Band n26 (824-849MHz): -2.47 dBi NR Band n38: 1.98 dBi NR Band n41: 2.30 dBi NR Band n48: 0.79 dBi NR Band n66: 1.86 dBi NR Band n71: -3.61 dBi NR Band n77 (3450-3550MHz): -0.68 dBi NR Band n77 (3700-3980MHz): 0.97 dBi NR Band n78 (3450-3550MHz): -0.68 dBi NR Band n78 (3700-3800MHz): 0.79 dBi
The Max RF Output Power (EIRP/ERP)	GPRS/EGPRS 850: 28.56 dBm GPRS/EGPRS 1900: 32.07 dBm WCDMA/HSDPA/HSUPA Band 2: 24.36 dBm WCDMA/HSDPA/HSUPA Band 4: 25.14 dBm WCDMA/HSDPA/HSUPA Band 5: 18.58 dBm LTE Band 2: 24.42 dBm LTE Band 4: 25.45 dBm LTE Band 5: 18.80 dBm LTE Band 7: 24.06 dBm LTE Band 12: 17.27 dBm LTE Band 13: 17.17 dBm LTE Band 14: 16.88 dBm LTE Band 17: 17.34 dBm LTE Band 25: 24.71 dBm LTE Band 26 (814-824MHz): 17.04 dBm LTE Band 26 (824-849MHz): 18.68 dBm LTE Band 38: 24.82 dBm LTE Band 41: 27.96 dBm

	LTE Band 42: 22.20 dBm LTE Band 43: 24.06 dBm LTE Band 48: 22.72 dBm LTE Band 66: 25.23 dBm LTE Band 71: 17.43 dBm NR Band n2: 23.67 dBm NR Band n5: 18.18 dBm NR Band n7: 24.04 dBm NR Band n12: 17.57 dBm NR Band n13: 16.72 dBm NR Band n14: 18.72 dBm NR Band n25: 24.51 dBm NR Band n26 (814-824MHz): 16.34 dBm NR Band n26 (824-849MHz): 18.05 dBm NR Band n38: 26.12 dBm NR Band n41: 30.52 dBm NR Band n48: 22.42 dBm NR Band n66: 25.02 dBm NR Band n71: 19.19 dBm NR Band n77 (3450-3550MHz): 26.32 dBm NR Band n77 (3700-3980MHz): 28.32 dBm NR Band n78 (3450-3550MHz): 25.93 dBm NR Band n78 (3700-3800MHz): 28.21 dBm DC_2A_n5A: 22.15 dBm DC_2A_n41A: 27.76 dBm DC_2A_n66A: 24.94 dBm DC_2A_n71A: 22.23 dBm DC_2A_n78A (3450-3550MHz): 26.25 dBm DC_2A_n78A (3700-3800MHz): 23.96 dBm DC_5A_n2A: 21.76 dBm DC_5A_n7A: 22.54 dBm DC_5A_n48A: 21.66 dBm DC_5A_n66A: 23.19 dBm DC_5A_n78A (3450-3550MHz): 22.76 dBm DC_5A_n78A (3700-3800MHz): 25.45 dBm DC_7A_n5A: 21.85 dBm DC_7A_n66A: 24.72 dBm DC_7A_n77A (3450-3550MHz): 26.05 dBm DC_7A_n77A (3700-3980MHz): 26.84 dBm DC_7A_n78A (3450-3550MHz): 26.09 dBm DC_7A_n78A (3700-3800MHz): 26.74 dBm DC_12A_n2A: 21.22 dBm DC_12A_n25A: 22.24 dBm DC_12A_n66A: 22.89 dBm

	DC_13A_n2A: 21.23 dBm DC_13A_n48A: 21.37 dBm DC_13A_n66A: 23.57 dBm DC_14A_n2A: 21.20 dBm DC_14A_n66A: 23.29 dBm DC_25A_n41A: 27.72 dBm DC_26A_n41A: 25.59 dBm DC_26A_n78A (3450-3550MHz): 22.21 dBm DC_26A_n78A (3700-3800MHz): 23.45 dBm DC_48A_n5A: 21.56 dBm DC_48A_n66A: 22.53 dBm DC_66A_n2A: 24.48 dBm DC_66A_n5A: 23.53 dBm DC_66A_n7A: 25.01 dBm DC_66A_n25A: 24.55 dBm DC_66A_n41A: 27.93 dBm DC_66A_n48A: 22.22 dBm DC_66A_n71A: 23.31dBm DC_66A_n78A (3450-3550MHz): 26.22 dBm DC_66A_n78A (3700-3800MHz): 26.55 dBm
SCS and Channel Bandwidths	SA: n2_SCS 15kHz: 5 MHz, 10 MHz, 15 MHz, 20 MHz n5_SCS 15kHz: 5 MHz, 10 MHz, 15 MHz, 20 MHz n7_SCS 15kHz: 5 MHz, 10 MHz, 15 MHz, 20 MHz n12_SCS 15kHz: 5 MHz, 10 MHz, 15 MHz n13_SCS 15kHz: 5 MHz, 10 MHz n14_SCS 15kHz: 5 MHz, 10 MHz n25_SCS 15kHz: 5 MHz, 10 MHz, 15 MHz, 20 MHz n26_SCS 15kHz: 5 MHz, 10 MHz, 15 MHz, 20 MHz n38_SCS 30kHz: 20 MHz, 30 MHz, 40 MHz n41_SCS 30kHz: 20 MHz, 30 MHz, 40 MHz, 50 MHz, 60 MHz, 70 MHz, 80 MHz, 90 MHz, 100 MHz n48_SCS 30kHz: 10 MHz, 20 MHz, 40 MHz, n66_SCS 15kHz: 5 MHz, 10 MHz, 15 MHz, 20 MHz n71_SCS 15kHz: 5 MHz, 10 MHz, 15 MHz, 20 MHz n77_SCS 30kHz: 20 MHz, 30 MHz, 40 MHz, 60 MHz, 80 MHz, 100 MHz n78_SCS 30kHz: 20 MHz, 30 MHz, 40 MHz, 50 MHz, 60 MHz, 70 MHz, 80 MHz, 90 MHz, 100 MHz NSA: n2_SCS 15kHz: 5 MHz, 10 MHz, 15 MHz, 20 MHz n5_SCS 15kHz: 5 MHz, 10 MHz, 15 MHz, 20 MHz n7_SCS 15kHz: 5 MHz, 10 MHz, 15 MHz, 20 MHz n12_SCS 15kHz: 5 MHz, 10 MHz, 15 MHz n13_SCS 15kHz: 5 MHz, 10 MHz

			n14_SCS 15kHz: 5 MHz, 10 MHz n25_SCS 15kHz: 5 MHz, 10 MHz, 15 MHz, 20 MHz n26_SCS 15kHz: 5 MHz, 10 MHz, 15 MHz, 20 MHz n38_SCS 30kHz: 20 MHz, 30 MHz, 40 MHz n41_SCS 30kHz: 20 MHz, 30 MHz, 40 MHz, 50 MHz, 60 MHz, 70 MHz, 80 MHz, 90 MHz, 100 MHz n48_SCS 30kHz: 10 MHz, 20 MHz, 40 MHz, n66_SCS 15kHz: 5 MHz, 10 MHz, 15 MHz, 20 MHz, 30 MHz n71_SCS 15kHz: 5 MHz, 10 MHz, 15 MHz, 20 MHz n77_SCS 30kHz: 20 MHz, 30 MHz, 40 MHz, 60 MHz, 80 MHz, 100 MHz n78_SCS 30kHz: 20 MHz, 30 MHz, 40 MHz, 50 MHz, 60 MHz, 70 MHz, 80 MHz, 90 MHz, 100 MHz	
Band	Power Class		Tx Frequency Range	Rx Frequency Range
	GMSK	8PSK		
GPRS850	4	E2	824 MHz ~ 849 MHz	869 MHz ~ 894 MHz
GPRS1900	1	E2	1850 MHz ~ 1910 MHz	1930 MHz ~ 1990 MHz
WCDMA B2	3		1850 MHz ~ 1910 MHz	1930 MHz ~ 1990 MHz
WCDMA B4	3		1710 MHz ~ 1755 MHz	2110 MHz ~ 2155 MHz
WCDMA B5	3		824 MHz ~ 849 MHz	869 MHz ~ 894 MHz
LTE B2	3		1850 MHz ~ 1910 MHz	1930 MHz ~ 1990 MHz
LTE B4	3		1710 MHz ~ 1755 MHz	2110 MHz ~ 2155 MHz
LTE B5	3		824 MHz ~ 849 MHz	869 MHz ~ 894 MHz
LTE B7	3		2500 MHz ~ 2570 MHz	2620 MHz ~ 2690 MHz
LTE B12	3		699 MHz ~ 716 MHz	729 MHz ~ 746 MHz
LTE B13	3		777 MHz ~ 787 MHz	746 MHz ~ 756 MHz
LTE B14	3		788 MHz ~ 798 MHz	758 MHz ~ 768 MHz
LTE B17	3		704 MHz ~ 716 MHz	734 MHz ~ 746 MHz
LTE B25	3		1850 MHz ~ 1915 MHz	1930 MHz ~ 1995 MHz
LTE B26	3		814 MHz ~ 824 MHz	859 MHz ~ 869 MHz
			824 MHz ~ 849 MHz	869 MHz ~ 894 MHz
LTE B38	3		2570 MHz ~ 2620 MHz	2570 MHz ~ 2620 MHz
LTE B41	3		2496 MHz ~ 2690 MHz	2496 MHz ~ 2690 MHz
LTE B42	3		3450 MHz ~ 3550 MHz	3450 MHz ~ 3550 MHz
LTE B43	3		3700 MHz ~ 3800 MHz	3700 MHz ~ 3800 MHz
LTE B48	3		3550 MHz ~ 3700 MHz	3550 MHz ~ 3700 MHz
LTE B66	3		1710 MHz ~ 1780 MHz	2110 MHz ~ 2180 MHz
LTE B71	3		663 MHz ~ 698 MHz	617 MHz ~ 652 MHz
NR n2	3		1850 MHz ~ 1910 MHz	1930 MHz ~ 1990 MHz
NR n5	3		824 MHz ~ 849 MHz	869 MHz ~ 894 MHz
NR n7	3		2500 MHz ~ 2570 MHz	2620 MHz ~ 2690 MHz
NR n12	3		699 MHz ~ 716 MHz	729 MHz ~ 746 MHz
NR n13	3		777 MHz ~ 787 MHz	746 MHz ~ 756 MHz

NR n14	3	788 MHz ~ 798 MHz	758 MHz ~ 768 MHz
NR n25	3	1850 MHz ~ 1915 MHz	1930 MHz ~ 1995 MHz
NR n26	3	814 MHz ~ 824 MHz	859 MHz ~ 869 MHz
		824 MHz ~ 849 MHz	869 MHz ~ 894 MHz
NR n38	3	2570 MHz ~ 2620 MHz	2570 MHz ~ 2620 MHz
NR n41	2&3	2496 MHz ~ 2690 MHz	2496 MHz ~ 2690 MHz
NR n48	3	3550 MHz ~ 3700 MHz	3550 MHz ~ 3700 MHz
NR n66	3	1710 MHz ~ 1780 MHz	2110 MHz ~ 2200 MHz
NR n71	3	663 MHz ~ 698 MHz	617 MHz ~ 652 MHz
NR n77	2&3	3450 MHz ~ 3550 MHz	3450 MHz ~ 3550 MHz
		3700 MHz ~ 3980 MHz	3700 MHz ~ 3980 MHz
NR n78	2&3	3450 MHz ~ 3550 MHz	3450 MHz ~ 3550 MHz
		3700 MHz ~ 3800 MHz	3700 MHz ~ 3800 MHz

Note 1: The EUT information provided by the applicant, except for The Max RF Conducted Power. For more detailed band specifications and features description, please refer to the manufacturer's specifications or user's manual.

Note 2: There are multiple antennas for WWAN to transceiving, which can be switched but can't transmit simultaneously. Details please refer to internal photos.

3 SUMMARY OF TEST RESULTS

3.1 Test Standards

No.	Identity	Document Title
1	47 CFR Part 2	Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
2	47 CFR Part 22 Subpart H	Cellular Radiotelephone Service
3	47 CFR Part 24 Subpart E	Broadband PCS
4	47 CFR Part 27	Miscellaneous Wireless Communications Services
5	47 CFR Part 90 Subpart S	Regulations Governing Licensing and Use of Frequencies in the 806-824, 851-869, 896-901, and 935-940 MHz Bands
6	47 CFR Part 90 Subpart R	Regulations Governing Licensing and Use of Frequencies in the 758-775 and 788-805 MHz Bands
7	47 CFR Part 96	CITIZENS BROADBAND RADIO SERVICE
8	ANSI C63.26-2015	American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services
9	KDB 971168 D01 v03	Measurement Guidance for Certification of Licensed Digital Transmitters

3.2 Test Verdict

No.	Test Description	FCC Part No.	Test Result	Test Verdict
1	Conducted RF Output Power	2.1046	Reporting only (ANNEX A.1)	Pass
2	Effective (Isotropic) Radiated Power	2.1046 22.913 24.232 27.50 90.635(b) 90.542(a) 96.41(b)	ANNEX A.1	Pass
3	Peak to Average Radio	2.1046 24.232(d) 27.50(d)	ANNEX A.2	Pass
4	Occupied Bandwidth	2.1049 22.917 24.238 27.53 90.209	ANNEX A.3	Pass
5	Frequency Stability	2.1055 22.355 24.235 27.54 90.213	ANNEX A.4	Pass
6	Spurious Emission at Antenna Terminals	2.1051 22.917 24.238 27.53 90.691 90.543 96.41(e)	ANNEX A.5	Pass
7	Band Edge	2.1051 22.917 24.238 27.53 90.691 90.543 96.41(e)	ANNEX A.6	Pass
8	Field Strength of Spurious Radiation	2.1053 22.917 24.238 27.53	ANNEX A.7	Pass

No.	Test Description	FCC Part No.	Test Result	Test Verdict
		90.691 90.543 96.41(e)		

3.3 Measurement Uncertainty

Test Case	Uncertainty
Conducted RF Output Power	0.68dB
Effective (Isotropic) Radiated Power	2.50dB
Peak to Average Radio	0.015%
Occupied Bandwidth	1.4/3MHz: 30kHz 5/10MHz: 100kHz 15/20MHz: 300kHz
Frequency Stability	12Hz
Spurious Emission at Antenna Terminals	2.56dB
Band Edge	1.48dB
Field Strength of Spurious Radiation	4.55dB

4 GENERAL TEST CONFIGURATIONS

4.1 Test Environments

During the measurement, the environmental conditions were within the listed ranges:

Relative Humidity		20% to 75%
Atmospheric Pressure		98 kPa to 102 kPa
Test Voltage of the EUT	NV (Normal Voltage)	3.84V
	LV (Low Voltage)	3.6V
	HV (High Voltage)	4.45V
Test Temperature of the EUT	NT (Normal Temperature)	15 °C to 35 °C
	LT (Low Temperature)	-30 °C
	HT (High Temperature)	60 °C

4.2 Test Equipment List

Description	Manufacturer	Model	Serial No.	Version	Cal. Date	Cal. Due
2/3/4/5G RF Test System						
BL410 Test Software	BALUN	BL410R	N/A	3.0.1.536	N/A	N/A
BL410 Test Software	BALUN	BL410R	N/A	3.0.1.536	N/A	N/A
CMUgo Test Software	R&S	CMUgo	N/A	V2.0.1	N/A	N/A
UCTS Test Software	Anritsu	UCTS	N/A	V 6.21.1105.0	N/A	N/A
Temperature Chamber	OK	OK-TH-100C	OK2022110401	N/A	2024-10-31	2025-10-30
Universal Radio Communication Tester	R&S	CMU 200	119280	V5.13	2024-01-12	2025-01-11
					2024-12-19	2025-12-18
Wideband Radio Communication Tester	R&S	CMW 500	100854	V3.7.172	2024-04-25	2025-04-24
Wideband Radio Communication Tester	R&S	CMW 500	120598	V3.7.172	2024-09-11	2025-09-10
Radio Communication Test Station	Anritsu	MT8821C	6201588572	40.10S #017	2024-05-07	2025-05-06
Radio Communication Test Station	Anritsu	MT8000A	6261940329	Ver.8.60.4.0	2024-12-23	2025-12-22
5G Wireless Test Platform	Starpoint	SP9500-CTS	20395	C1.0.7.30+SP1	2024-04-28	2025-04-27
Spectrum Analyzer	R&S	FSV40	101544	2.30.SP4	2023-12-27	2024-12-26
					2024-12-16	2025-12-15
DC Power Supply	ITECH	IT6863A	800014020757120008	N/A	2024-08-16	2025-08-15
Spectrum Analyzer	Agilent	E4440A	MY46181663	A.11.21	2024-08-12	2025-08-11

Radiated Test System						
Radiated Test System Test Software	BALUN	BL410-E	N/A	V22.4	N/A	N/A
Wideband Radio Communication Tester	R&S	CMW 500	100854	V3.7.172	2024-04-25	2025-04-24
Wideband Radio Communication Tester	R&S	CMW 500	120598	V3.7.172	2024-09-11	2025-09-10
5G Wireless Test Platform	Keysight	E7515B UXM	MY59321617	15.26.12.8161	2024-08-12	2025-08-11
Spectrum Analyzer	R&S	FSV40	101544	2.30.SP4	2023-12-27	2024-12-26
					2024-12-16	2025-12-15
Test Antenna-Horn (18-40 GHz)	A-INFO	LB-180400KF	J211060273	N/A	2024-06-15	2027-06-14
Test Antenna-Bi-Log (30 MHz-3 GHz)	Schwarzbeck	VULB 9163	01414	N/A	2023-11-03	2026-11-02
Test Antenna-Horn (1-18 GHz)	Schwarzbeck	BBHA 9120D	02459	N/A	2023-10-26	2026-10-25
Anechoic Chamber	YIHENG	C8-966	N/A	N/A	2024-05-15	2027-05-11
EMI Receiver	Keysight	N9038A	MY55330121	A.20.03	2024-04-23	2025-04-22

4.3 Test Configurations

Test Items	Test Mode	Test Channel		
		LCH	MCH	HCH
Effective (Isotropic) Radiated Power	GPRS 850	v	v	v
	GPRS 1900	v	v	v
	EGPRS 850	v	v	v
	EGPRS 1900	v	v	v
	WCDMA Band 2	v	v	v
	WCDMA Band 4	v	v	v
	WCDMA Band 5	v	v	v
	HSDPA Band 2	v	v	v
	HSDPA Band 4	v	v	v
	HSDPA Band 5	v	v	v
	HSUPA Band 2	v	v	v
	HSUPA Band 4	v	v	v
	HSUPA Band 5	v	v	v
Peak to Average Ratio	WCDMA Band 2	v	v	v
	WCDMA Band 4	v	v	v
	WCDMA Band 5	v	v	v
Occupied Bandwidth	GPRS 850	v	v	v
	GPRS 1900	v	v	v
	EGPRS 850	v	v	v
	EGPRS 1900	v	v	v
	WCDMA Band 2	v	v	v
	WCDMA Band 4	v	v	v
	WCDMA Band 5	v	v	v
Frequency Stability	GPRS 850	v	v	v
	GPRS 1900	v	v	v
	GPRS 850	v	v	v
	GPRS 1900	v	v	v
	EGPRS 850	v	v	v
	EGPRS 1900	v	v	v
	WCDMA Band 2	v	v	v
	WCDMA Band 4	v	v	v
	WCDMA Band 5	v	v	v
Spurious Emission at Antenna Terminals	GPRS 850	v	v	v
	GPRS 1900	v	v	v
	EGPRS 850	v	v	v
	EGPRS 1900	v	v	v
	WCDMA Band 2	v	v	v
	WCDMA Band 4	v	v	v
	WCDMA Band 5	v	v	v

Test Items	Test Mode	Test Channel		
		LCH	MCH	HCH
Band Edge	GPRS 850	v	--	v
	GPRS 1900	v	--	v
	EGPRS 850	v	--	v
	EGPRS 1900	v	--	v
	WCDMA Band 2	v	--	v
	WCDMA Band 4	v	--	v
	WCDMA Band 5	v	--	v
Field Strength of Spurious Radiation	GPRS 850	v	v	v
	GPRS 1900	v	v	v
	EGPRS 850	v	v	v
	EGPRS 1900	v	v	v
	WCDMA Band 2	v	v	v
	WCDMA Band 4	v	v	v
	WCDMA Band 5	v	v	v
Note 1: The mark “v” means that this configuration is chosen for testing.				

Test Mode	UL Channel	UL Channel No.	UL Frequency (MHz)
GPRS/EGPRS 850	Low Channel	128	824.2
	Middle Channel	190	836.6
	High Channel	251	848.8
GPRS/EGPRS 1900	Low Channel	512	1850.2
	Middle Channel	661	1880.0
	High Channel	810	1909.8
WCDMA Band 2	Low Channel	9262	1852.4
	Middle Channel	9400	1880.0
	High Channel	9538	1907.6
WCDMA Band 4	Low Channel	1312	1712.4
	Middle Channel	1412	1732.4
	High Channel	1513	1752.6
WCDMA Band 5	Low Channel	4132	826.4
	Middle Channel	4182	836.4
	High Channel	4233	846.6

LTE Band	Bandwidth (MHz)						Modulation Type			RB#			Test Channel		
	1.4	3	5	10	15	20	QPSK	16-QAM	64-QAM	1	Half	Full	LCH	MCH	HCH
Effective (Isotropic) Radiated Power															
2	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v
4	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v
5	v	v	v	v	n	n	v	v	v	v	v	v	v	v	v
7	n	n	v	v	v	v	v	v	v	v	v	v	v	v	v
12	v	v	v	v	n	n	v	v	v	v	v	v	v	v	v
13	n	n	v	v	n	n	v	v	v	v	v	v	v	v	v
14	n	n	v	v	n	n	v	v	v	v	v	v	v	v	v
17	n	n	v	v	n	n	v	v	v	v	v	v	v	v	v
25	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v
26(Part22)	v	v	v	v	v	n	v	v	v	v	v	v	v	v	v
26(Part90)	v	v	v	v	--	n	v	v	v	v	v	v	v	v	v
38	n	n	v	v	v	v	v	v	v	v	v	v	v	v	v
41	n	n	v	v	v	v	v	v	v	v	v	v	v	v	v
42	n	n	v	v	v	v	v	v	v	v	v	v	v	v	v
43	n	n	v	v	v	v	v	v	v	v	v	v	v	v	v
48	n	n	v	v	v	v	v	v	v	v	v	v	v	v	v
66	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v
71	n	n	v	v	v	v	v	v	v	v	v	v	v	v	v
Peak to Average Ratio															
2	--	--	--	--	--	v	v	v	--	v	--	v	v	v	v
4	--	--	--	--	--	v	v	v	--	v	--	v	v	v	v
5	--	--	--	v	n	n	v	v	--	v	--	v	v	v	v
7	n	n	--	--	--	v	v	v	--	v	--	v	v	v	v
12	--	--	--	v	n	n	v	v	--	v	--	v	v	v	v
13	n	n	--	v	n	n	v	v	--	v	--	v	v	v	v
14	n	n	--	v	n	n	v	v	--	v	--	v	v	v	v
17	n	n	--	v	n	n	v	v	--	v	--	v	v	v	v
25	--	--	--	--	--	v	v	v	--	v	--	v	v	v	v
26(Part22)	--	--	--	--	v	n	v	v	--	v	--	v	v	v	v
26(Part90)	--	--	--	v	--	n	v	v	--	v	--	v	--	v	--
38	n	n	--	--	--	v	v	v	--	v	--	v	v	v	v
41	n	n	--	--	--	v	v	v	--	v	--	v	v	v	v
42	n	n	--	--	--	v	v	v	--	v	--	v	v	v	v
43	n	n	--	--	--	v	v	v	--	v	--	v	v	v	v
48	n	n	--	v	--	--	v	v	--	v	--	v	v	v	v
66	--	--	--	--	--	v	v	v	--	v	--	v	v	v	v
71	n	n	--	--	--	v	v	v	--	v	--	v	v	v	v
Occupied Bandwidth															

LTE Band	Bandwidth (MHz)						Modulation Type			RB#			Test Channel		
	1.4	3	5	10	15	20	QPSK	16-QAM	64-QAM	1	Half	Full	LCH	MCH	HCH
2	v	v	v	v	v	v	v	v	v	--	--	v	v	v	v
4	v	v	v	v	v	v	v	v	v	--	--	v	v	v	v
5	v	v	v	v	n	n	v	v	v	--	--	v	v	v	v
7	n	n	v	v	v	v	v	v	v	--	--	v	v	v	v
12	v	v	v	v	n	n	v	v	v	--	--	v	v	v	v
13	n	n	v	v	n	n	v	v	v	--	--	v	v	v	v
14	n	n	v	v	n	n	v	v	v	--	--	v	v	v	v
17	n	n	v	v	n	n	v	v	v	--	--	v	v	v	v
25	v	v	v	v	v	v	v	v	v	--	--	v	v	v	v
26(Part22)	v	v	v	v	v	n	v	v	v	--	--	v	v	v	v
26(Part90)	v	v	v	v	--	n	v	v	v	--	--	v	v	v	v
38	n	n	v	v	v	v	v	v	v	--	--	v	v	v	v
41	n	n	v	v	v	v	v	v	v	--	--	v	v	v	v
42	n	n	v	v	v	v	v	v	v	--	--	v	v	v	v
43	n	n	v	v	v	v	v	v	v	--	--	v	v	v	v
48	n	n	v	v	v	v	v	v	v	--	--	v	v	v	v
66	v	v	v	v	v	v	v	v	v	--	--	v	v	v	v
71	n	n	v	v	v	v	v	v	v	--	--	v	v	v	v
Frequency Stability															
2	--	--	--	v	--	--	v	v	--	--	--	v	--	v	--
4	--	--	--	v	--	--	v	v	--	--	--	v	--	v	--
5	--	--	--	v	n	n	v	v	--	--	--	v	--	v	--
7	n	n	--	v	--	--	v	v	--	--	--	v	--	v	--
12	--	--	--	v	n	n	v	v	--	--	--	v	--	v	--
13	n	n	--	v	n	n	v	v	--	--	--	v	--	v	--
14	n	n	--	v	n	n	v	v	--	--	--	v	--	v	--
17	n	n	--	v	n	n	v	v	--	--	--	v	--	v	--
25	--	--	--	v	--	--	v	v	--	--	--	v	--	v	--
26(Part22)	--	--	--	v	--	n	v	v	--	--	--	v	--	v	--
26(Part90)	--	--	--	v	--	n	v	v	--	--	--	v	--	v	--
38	n	n	--	v	--	--	v	v	--	--	--	v	--	v	--
41	n	n	--	v	--	--	v	v	--	--	--	v	--	v	--
42	n	n	--	v	--	--	v	v	--	--	--	v	--	v	--
43	n	n	--	v	--	--	v	v	--	--	--	v	--	v	--
48	n	n	--	v	--	--	v	v	--	--	--	v	--	v	--
66	--	--	--	v	--	--	v	v	--	--	--	v	--	v	--
71	n	n	--	v	--	--	v	v	--	--	--	v	--	v	--
Spurious Emission at Antenna Terminals															
2	v	v	v	v	v	v	v	v	--	v	--	--	v	v	v
4	v	v	v	v	v	v	v	v	--	v	--	--	v	v	v

LTE Band	Bandwidth (MHz)						Modulation Type			RB#			Test Channel		
	1.4	3	5	10	15	20	QPSK	16-QAM	64-QAM	1	Half	Full	LCH	MCH	HCH
5	v	v	v	v	n	n	v	v	--	v	--	--	v	v	v
7	n	n	v	v	v	v	v	v	--	v	--	--	v	v	v
12	v	v	v	v	n	n	v	v	--	v	--	--	v	v	v
13	n	n	v	v	n	n	v	v	--	v	--	--	v	v	v
14	n	n	v	v	n	n	v	v	--	v	--	--	v	v	v
17	n	n	v	v	n	n	v	v	--	v	--	--	v	v	v
25	v	v	v	v	v	v	v	v	--	v	--	--	v	v	v
26(Part22)	v	v	v	v	v	n	v	v	--	v	--	--	v	v	v
26(Part90)	v	v	v	v	--	n	v	v	--	v	--	--	v	v	v
38	n	n	v	v	v	v	v	v	--	v	--	--	v	v	v
41	n	n	v	v	v	v	v	v	--	v	--	--	v	v	v
42	n	n	v	v	v	v	v	v	--	v	--	--	v	v	v
43	n	n	v	v	v	v	v	v	--	v	--	--	v	v	v
48	n	n	v	v	v	v	v	v	--	v	--	--	v	v	v
66	v	v	v	v	v	v	v	v	--	v	--	--	v	v	v
71	n	n	v	v	v	v	v	v	--	v	--	--	v	v	v
Band Edge															
2	v	v	v	v	v	v	v	v	--	v	--	v	v	--	v
4	v	v	v	v	v	v	v	v	--	v	--	v	v	--	v
5	v	v	v	v	n	n	v	v	--	v	--	v	v	--	v
7	n	n	v	v	v	v	v	v	--	v	--	v	v	--	v
12	v	v	v	v	n	n	v	v	--	v	--	v	v	--	v
13	n	n	v	v	n	n	v	v	--	v	--	v	v	--	v
14	n	n	v	v	n	n	v	v	--	v	--	v	v	--	v
17	n	n	v	v	n	n	v	v	--	v	--	v	v	--	v
25	v	v	v	v	v	v	v	v	--	v	--	v	v	--	v
26(Part22)	v	v	v	v	v	n	v	v	--	v	--	v	v	--	v
26(Part90)	v	v	v	v	--	n	v	v	--	v	--	v	v	--	v
38	n	n	v	v	v	v	v	v	--	v	--	v	v	--	v
41	n	n	v	v	v	v	v	v	--	v	--	v	v	--	v
42	n	n	v	v	v	v	v	v	--	v	--	v	v	--	v
43	n	n	v	v	v	v	v	v	--	v	--	v	v	--	v
48	n	n	v	v	v	v	v	v	--	v	--	v	v	--	v
66	v	v	v	v	v	v	v	v	--	v	--	v	v	--	v
71	n	n	v	v	v	v	v	v	--	v	--	v	v	--	v
Field Strength of Spurious Radiation															
2	Worst Case														
4	Worst Case														
5	Worst Case														
7	Worst Case														

LTE Band	Bandwidth (MHz)						Modulation Type			RB#			Test Channel		
	1.4	3	5	10	15	20	QPSK	16-QAM	64-QAM	1	Half	Full	LCH	MCH	HCH
12	Worst Case														
13	Worst Case														
14	Worst Case														
17	Worst Case														
25	Worst Case														
26(Part22)	Worst Case														
26(Part90)	Worst Case														
38	Worst Case														
41	Worst Case														
42	Worst Case														
43	Worst Case														
48	Worst Case														
66	Worst Case														
71	Worst Case														
Note 1: The mark “v” means that this configuration is chosen for testing. Note 2: The mark “n” means that this bandwidth is not supported.															

Test Mode	UL Channel	Channel Bandwidth (MHz)	UL Channel No.	UL Frequency (MHz)
LTE Band 2	Low Range	1.4	18607	1850.7
		3	18615	1851.5
		5	18625	1852.5
		10	18650	1855
		15	18675	1857.5
		20	18700	1860
	Middle Range	1.4/3/5/10/15/20	18900	1880
	High Range	1.4	19193	1909.3
		3	19185	1908.5
		5	19175	1907.5
		10	19150	1905
		15	19125	1902.5
		20	19100	1900
LTE Band 4	Low Range	1.4	19957	1710.7
		3	19965	1711.5
		5	19975	1712.5
		10	20000	1715
		15	20025	1717.5
		20	20050	1720
	Middle Range	1.4/3/5/10/15/20	20175	1732.5
	High Range	1.4	20393	1754.3
		3	20385	1753.5
		5	20375	1752.5
		10	20350	1750
		15	20325	1747.5
		20	20300	1745
LTE Band 5	Low Range	1.4	20407	824.7
		3	20415	825.5
		5	20425	826.5
		10	20450	829
	Middle Range	1.4/3/5/10	20525	836.5
	High Range	1.4	20643	848.3
		3	20635	847.5
		5	20625	846.5
		10	20600	844
LTE Band 7	Low Range	5	20775	2502.5
		10	20800	2505
		15	20825	2507.5
		20	20850	2510
	Middle Range	5/10/15/20	21100	2535

Test Mode	UL Channel	Channel Bandwidth (MHz)	UL Channel No.	UL Frequency (MHz)
	High Range	5	21425	2567.5
		10	21400	2565
		15	21375	2562.5
		20	21350	2560
LTE Band 12	Low Range	1.4	23017	699.7
		3	23025	700.5
		5	23035	701.5
		10	23060	704
	Middle Range	1.4/3/5/10	23095	707.5
	High Range	1.4	23173	715.3
		3	23165	714.5
		5	23155	713.5
		10	23130	711
LTE Band 13	Low Range	5	23205	779.5
		10	23230	782
	Middle Range	5/10	23230	782
	High Range	5	23255	784.5
		10	23230	782
LTE Band 14	Low Range	5	23305	790.5
		10	23330	793
	Middle Range	5/10	23330	793
	High Range	5	23355	795.5
		10	23330	793
LTE Band 17	Low Range	5	23755	706.5
		10	23780	709
	Middle Range	5/10	23790	710
	High Range	5	23825	713.5
		10	23800	711
LTE Band 25	Low Range	1.4	26047	1850.7
		3	26055	1851.5
		5	26065	1852.5
		10	26090	1855
		15	26115	1857.5
		20	26140	1860
	Middle Range	1.4/3/5/10/15/20	26365	1882.5
	High Range	1.4	26683	1914.3
		3	26675	1913.5
		5	26665	1912.5
		10	26640	1910
		15	26615	1907.5
		20	26590	1905

Test Mode	UL Channel	Channel Bandwidth (MHz)	UL Channel No.	UL Frequency (MHz)
LTE Band 26 (Part22)	Low Range	1.4	26797	824.7
		3	26805	825.5
		5	26815	826.5
		10	26840	829
		15	26865	831.5
	Middle Range	1.4/3/5/10/15	26915	836.5
	High Range	1.4	27033	848.3
		3	27025	847.5
		5	27015	846.5
		10	26990	844
		15	26965	841.5
LTE Band 26 (Part90)	Low Range	1.4	26697	814.7
		3	26705	815.5
		5	26715	816.5
		10	---	---
	Middle Range	1.4/3/5/10	26740	819
	High Range	1.4	26783	823.3
		3	26775	822.5
		5	26765	821.5
		10	---	---
LTE Band 38	Low Range	5	37775	2572.5
		10	37800	2575
		15	37825	2577.5
		20	37850	2580
	Middle Range	5/10/15/20	38000	2595
	High Range	5	38225	2617.5
		10	38200	2615
		15	38175	2612.5
		20	38150	2610
LTE Band 41	Low Range	5	39675	2498.5
		10	39700	2501
		15	39725	2503.5
		20	39750	2506
	Middle Range	5/10/15/20	40620	2593
	High Range	5	41565	2687.5
		10	41540	2685
		15	41515	2682.5
		20	41490	2680
LTE Band 42	Low Range	5	42115	3452.5
		10	42140	3455
		15	42165	3457.5

Test Mode	UL Channel	Channel Bandwidth (MHz)	UL Channel No.	UL Frequency (MHz)
		20	42190	3460
	Middle Range	5/10/15/20	42590	3500
	High Range	5	43065	3547.5
		10	43040	3545
		15	43015	3542.5
		20	42990	3540
LTE Band 43	Low Range	5	44615	3702.5
		10	44640	3705
		15	44665	3707.5
		20	44690	3710
	Middle Range	5/10/15/20	45090	3750
	High Range	5	45565	3797.5
		10	45540	3795
		15	44665	3792.5
		20	45490	3790
LTE Band 48	Low Range	5	55265	3552.5
		10	55290	3555
		15	55315	3557.5
		20	55340	3560
	Middle Range	5/10/15/20	55990	3625
	High Range	5	56715	3697.5
		10	56690	3695
		15	56665	3692.5
		20	56640	3690
LTE Band 66	Low Range	1.4	131979	1710.7
		3	131987	1711.5
		5	131997	1712.5
		10	132022	1715
		15	132047	1717.5
		20	132072	1720
	Middle Range	1.4/3/5/10/15/20	132322	1745
	High Range	1.4	132665	1779.3
		3	132657	1778.5
		5	132647	1777.5
		10	132622	1775
		15	132597	1772.5
		20	132572	1770
LTE Band 71	Low Range	5	133147	665.5
		10	133172	668
		15	133197	670.5
		20	133222	673

Test Mode	UL Channel	Channel Bandwidth (MHz)	UL Channel No.	UL Frequency (MHz)
	Middle Range	5/10/15/20	133297	680.5
	High Range	5	133447	695.5
		10	133422	693
		15	133397	690.5
		20	133372	688

Test Mode	Channel Bandwidth (MHz)	UL Channel	UL Channel No.	UL Frequency (MHz)
NR Band n2	5	Low Range	370500	1852.5
		Middle Range	376000	1880
		High Range	381500	1907.5
	10	Low Range	371000	1855
		Middle Range	376000	1880
		High Range	381000	1905
	15	Low Range	371500	1857.5
		Middle Range	376000	1880
		High Range	380500	1902.5
	20	Low Range	372000	1860
		Middle Range	376000	1880
		High Range	380000	1900

Test Mode	Channel Bandwidth (MHz)	UL Channel	UL Channel No.	UL Frequency (MHz)
NR Band n5	5	Low Range	165300	826.5
		Middle Range	167300	836.5
		High Range	169300	846.5
	10	Low Range	165800	829
		Middle Range	167300	836.5
		High Range	168300	844
	15	Low Range	166300	831.5
		Middle Range	167300	836.5
		High Range	168300	841.5
	20	Low Range	166800	834
		Middle Range	167300	836.5
		High Range	167800	839

Test Mode	Channel Bandwidth (MHz)	UL Channel	UL Channel No.	UL Frequency (MHz)
NR Band n7	5	Low Range	500500	2502.5
		Middle Range	507000	2535
		High Range	513500	2567.5
	10	Low Range	501000	2505
		Middle Range	507000	2535
		High Range	513000	2565
	15	Low Range	501500	2507.5
		Middle Range	507000	2535
		High Range	512500	2562.5
	20	Low Range	502000	2510
		Middle Range	507000	2535
		High Range	512000	2560
	25	Low Range	502500	2512.5
		Middle Range	507000	2535
		High Range	511500	2557.5
	30	Low Range	503000	2515
		Middle Range	507000	2535
		High Range	511000	2555
	40	Low Range	504000	2520
		Middle Range	507000	2535
		High Range	510000	2550

Test Mode	Channel Bandwidth (MHz)	UL Channel	UL Channel No.	UL Frequency (MHz)
NR Band n12	5	Low Range	140300	701.5
		Middle Range	141500	707.5
		High Range	142700	713.5
	10	Low Range	140800	704
		Middle Range	141500	707.5
		High Range	142200	711
	15	Low Range	141300	706.5
		Middle Range	141500	707.5
		High Range	141700	708.5

Test Mode	Channel Bandwidth (MHz)	UL Channel	UL Channel No.	UL Frequency (MHz)
NR Band n13	5	Low Range	155900	779.5
		Middle Range	156400	782
		High Range	156900	784.5
	10	Low Range	156400	782
		Middle Range	156400	782
		High Range	156400	782

Test Mode	Channel Bandwidth (MHz)	UL Channel	UL Channel No.	UL Frequency (MHz)
NR Band n14	5	Low Range	158100	790.5
		Middle Range	158600	793
		High Range	159100	795.5
	10	Low Range	158600	793
		Middle Range	158600	793
		High Range	158600	793

Test Mode	Channel Bandwidth (MHz)	UL Channel	UL Channel No.	UL Frequency (MHz)
NR Band n25	5	Low Range	370500	1852.5
		Middle Range	376500	1882.5
		High Range	382500	1912.5
	10	Low Range	371000	1855
		Middle Range	376500	1882.5
		High Range	382000	1910
	15	Low Range	371500	1857.5
		Middle Range	376500	1882.5
		High Range	381500	1907.5
	20	Low Range	372000	1860
		Middle Range	376500	1882.5
		High Range	381000	1905

Test Mode	Channel Bandwidth (MHz)	UL Channel	UL Channel No.	UL Frequency (MHz)
NR Band n26 (Part22)	5	Low Range	165300	826.5
		Middle Range	167300	836.5
		High Range	169300	846.5
	10	Low Range	165800	829
		Middle Range	167300	836.5
		High Range	168800	844
	15	Low Range	166300	831.5
		Middle Range	167300	836.5
		High Range	168300	841.5
	20	Low Range	166800	834
		Middle Range	167300	836.5
		High Range	167800	839

Test Mode	Channel Bandwidth (MHz)	UL Channel	UL Channel No.	UL Frequency (MHz)
NR Band n26 (Part90)	5	Low Range	163300	819.5
		Middle Range	163800	819
		High Range	164300	821.5
	10	Low Range	163800	819
		Middle Range	163800	819
		High Range	163800	819

Test Mode	Channel Bandwidth (MHz)	UL Channel	UL Channel No.	UL Frequency (MHz)
NR Band n38	20	Low Range	516000	2580
		Middle Range	519000	2595
		High Range	522000	2610
	30	Low Range	517000	2585
		Middle Range	519000	2595
		High Range	521000	2605
	40	Low Range	518000	2590
		Middle Range	519000	2595
		High Range	520000	2600

Test Mode	Channel Bandwidth (MHz)	UL Channel	UL Channel No.	UL Frequency (MHz)
NR Band n41	20	Low Range	501204	2506.02
		Middle Range	518598	2592.99
		High Range	535998	2679.99
	30	Low Range	502200	2511
		Middle Range	518598	2592.99
		High Range	534996	2674.98
	40	Low Range	503202	2516.01
		Middle Range	518598	2592.99
		High Range	534000	2670
	50	Low Range	504204	2521.02
		Middle Range	518598	2592.99
		High Range	532998	2664.99
	60	Low Range	505200	2526
		Middle Range	518598	2592.99
		High Range	531996	2659.98
	70	Low Range	506202	2531.01
		Middle Range	518598	2592.99
		High Range	531000	2655
	80	Low Range	507204	2536.02
		Middle Range	518598	2592.99
		High Range	529998	2649.99
	90	Low Range	508200	2541
		Middle Range	518598	2592.99
		High Range	528996	2644.98
	100	Low Range	509202	2546.01
		Middle Range	518598	2592.99
		High Range	528000	2640

Test Mode	Channel Bandwidth (MHz)	UL Channel	UL Channel No.	UL Frequency (MHz)
NR Band n48	10	Low Range	637000	3555
		Middle Range	641666	3624.99
		High Range	646332	3694.98
	20	Low Range	637334	3560.01
		Middle Range	641666	3624.99
		High Range	646000	3690
	40	Low Range	638000	3570
		Middle Range	641666	3624.99
		High Range	645332	3679.98

Test Mode	Channel Bandwidth (MHz)	UL Channel	UL Channel No.	UL Frequency (MHz)
NR Band n66	5	Low Range	342500	1712.5
		Middle Range	349000	1745
		High Range	355500	1777.5
	10	Low Range	343000	1715
		Middle Range	349000	1745
		High Range	355000	1775
	15	Low Range	343500	1717.5
		Middle Range	349000	1745
		High Range	354500	1772.5
	20	Low Range	344000	1720
		Middle Range	349000	1745
		High Range	354000	1770

Test Mode	Channel Bandwidth (MHz)	UL Channel	UL Channel No.	UL Frequency (MHz)
NR Band n71	5	Low Range	133100	665.5
		Middle Range	136100	680.5
		High Range	139100	695.5
	10	Low Range	133600	668
		Middle Range	136100	680.5
		High Range	138600	693
	15	Low Range	134100	670.5
		Middle Range	136100	680.5
		High Range	138100	690.5
	20	Low Range	134600	673
		Middle Range	136100	680.5
		High Range	137600	688

Test Mode	Channel Bandwidth (MHz)	UL Channel	UL Channel No.	UL Frequency (MHz)
NR Band n77 (3450-3550 MHz)	20	Low Range	630668	3460.02
		Middle Range	633332	3499.98
		High Range	636000	3540
	30	Low Range	631000	3465
		Middle Range	633332	3499.98
		High Range	635666	3534.99
	40	Low Range	631334	3470.01
		Middle Range	633332	3499.98
		High Range	635332	3529.98
	60	Low Range	632000	3480
		Middle Range	633332	3499.98
		High Range	634666	3519.99
	80	Low Range	632668	3490.02
		Middle Range	633332	3499.98
		High Range	634000	3510
	100	Low Range	633332	3499.98
		Middle Range	633332	3499.98
		High Range	633332	3499.98
NR Band n77 (3700-3980 MHz)	20	Low Range	647334	3710.01
		Middle Range	656000	3840
		High Range	664666	3969.99
	30	Low Range	647668	3715.02
		Middle Range	656000	3840
		High Range	664332	3964.98
	40	Low Range	648000	3720

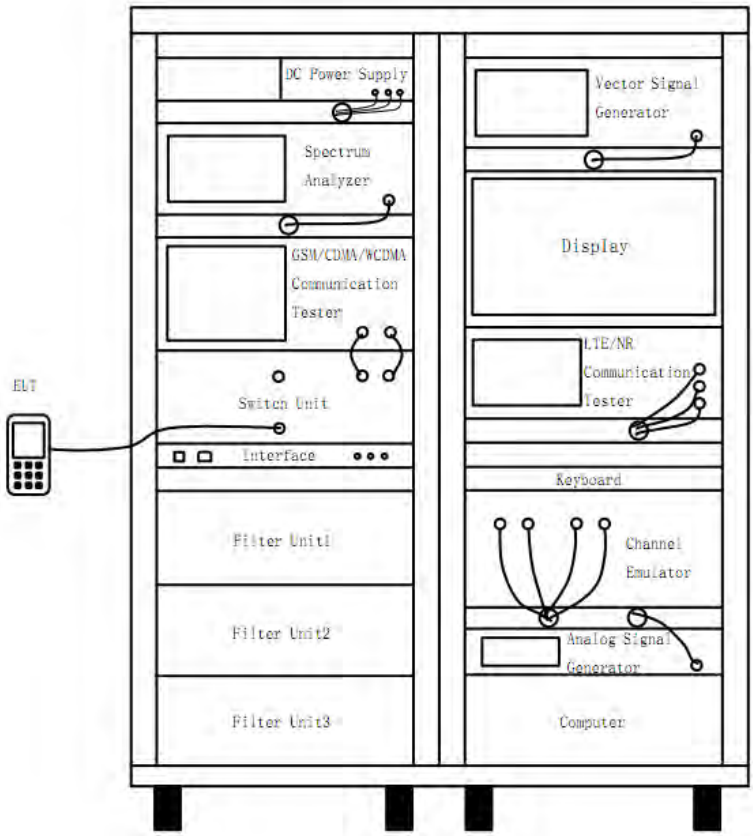
Test Mode	Channel Bandwidth (MHz)	UL Channel	UL Channel No.	UL Frequency (MHz)
		Middle Range	656000	3840
		High Range	664000	3960
	60	Low Range	648668	3730.02
		Middle Range	656000	3840
		High Range	663332	3949.98
	80	Low Range	649334	3740.01
		Middle Range	656000	3840
		High Range	662666	3939.99
	100	Low Range	650000	3750
		Middle Range	656000	3840
		High Range	662000	3930

Test Mode	Channel Bandwidth (MHz)	UL Channel	UL Channel No.	UL Frequency (MHz)
NR Band n78 (3450-3550 MHz)	20	Low Range	630668	3460.02
		Middle Range	633332	3499.98
		High Range	636000	3540
	30	Low Range	631000	3465
		Middle Range	633332	3499.98
		High Range	635666	3534.99
	40	Low Range	631334	3470.01
		Middle Range	633332	3499.98
		High Range	635332	3529.98
	50	Low Range	631668	3475.02
		Middle Range	633332	3499.98
		High Range	635000	3525
	60	Low Range	632000	3480
		Middle Range	633332	3499.98
		High Range	634666	3519.99
	70	Low Range	632334	3485.01
		Middle Range	633332	3499.98
		High Range	634332	3514.98
	80	Low Range	632668	3490.02
		Middle Range	633332	3499.98
		High Range	634000	3510
	90	Low Range	633000	3495
		Middle Range	633332	3499.98
		High Range	633666	3504.99
	100	Low Range	633332	3499.98
		Middle Range	633332	3499.98
		High Range	633332	3499.98
NR Band n78 (3700-3800 MHz)	20	Low Range	647334	3710.01
		Middle Range	650000	3750
		High Range	652666	3789.99
	30	Low Range	647668	3715.02
		Middle Range	650000	3750
		High Range	652332	3784.98
	40	Low Range	648000	3720
		Middle Range	650000	3750
		High Range	652000	3780
	50	Low Range	648334	3725.01
		Middle Range	650000	3750
		High Range	651666	3774.99
	60	Low Range	648668	3730.02

Test Mode	Channel Bandwidth (MHz)	UL Channel	UL Channel No.	UL Frequency (MHz)
		Middle Range	650000	3750
		High Range	651332	3769.98
	70	Low Range	649000	3735
		Middle Range	650000	3750
		High Range	651000	3765
	80	Low Range	649332	3739.98
		Middle Range	650000	3750
		High Range	650666	3759.99
	90	Low Range	649668	3745.02
		Middle Range	650000	3750
		High Range	650332	3754.98
	100	Low Range	650000	3750
		Middle Range	650000	3750
		High Range	650000	3750

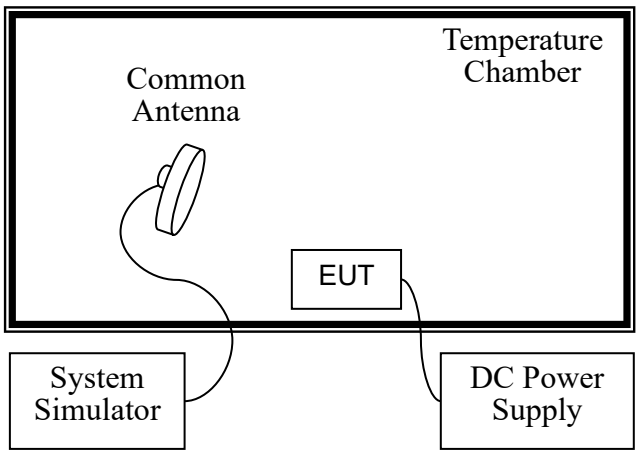
4.4 Test Setup

4.4.1 For Antenna Port Test



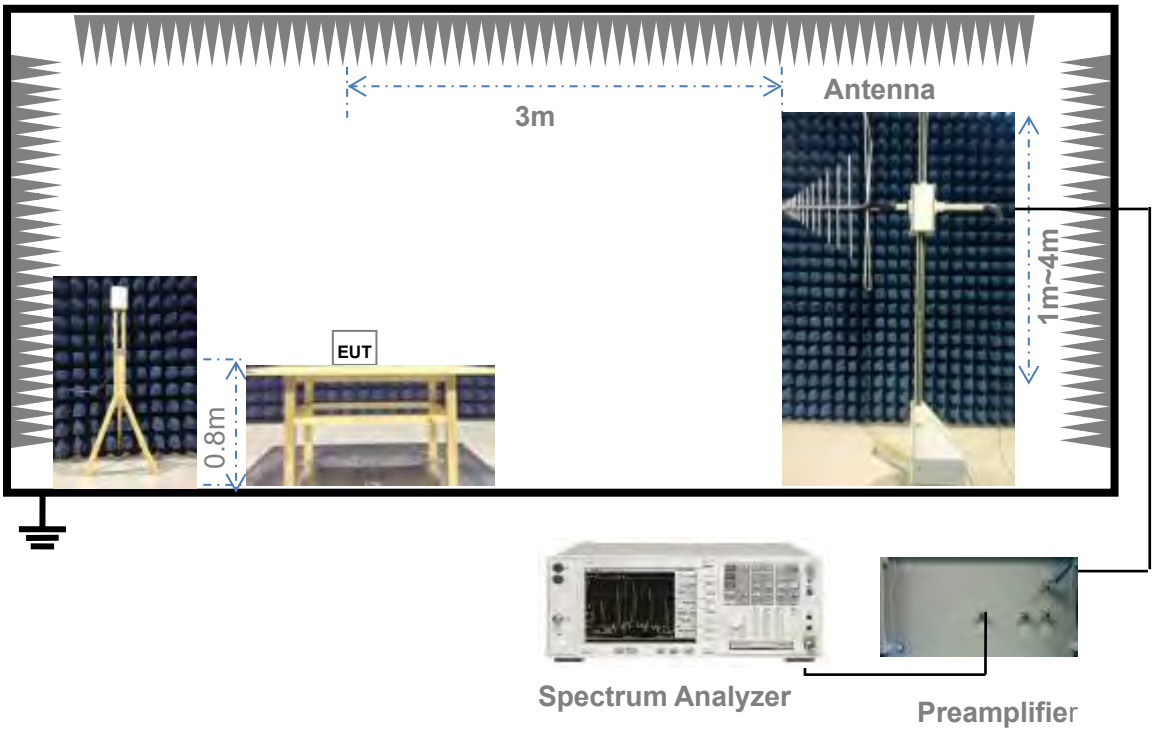
(Diagram 1)

4.4.2 For Frequency Stability Test



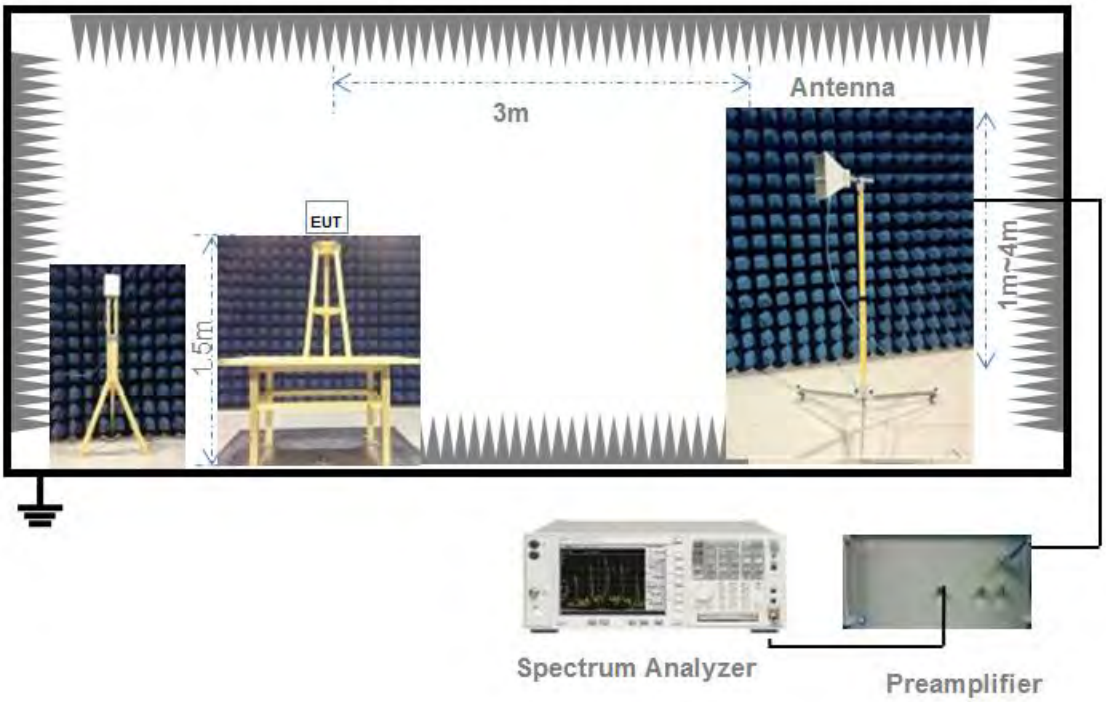
(Diagram 2)

4.4.3 For Radiated Test (30 MHz ~ 1 GHz)



(Diagram 3)

4.4.4 For Radiated Test (Above 1 GHz)



(Diagram 4)

5 TEST ITEMS

5.1 Transmitter Radiated Power (EIRP/ERP)

5.1.1 Limit

FCC § 2.1046 & 22.913(a) & 24.232(c) & 27.50(a) & 27.50(b) & 27.50(c) & 27.50(d) & 27.50(h) & 27.50(j) & 27.50(k) & 90.635(b) & 90.542(a) & 96.41(b)

According to FCC section 22.913(a) (5), the Effective Radiated Power (ERP) of mobile transmitters and auxiliary test transmitters must not exceed 7 watts.

According to FCC section 24.232(c), 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.

According to FCC section 27.50(a) (3), for mobile and portable stations transmitting in the 2305-2315MHz band or the 2350-2360MHz band, the average EIRP must not exceed 50 milliwatts within any 1 megahertz of authorized bandwidth, except that for mobile and portable stations compliant with 3GPP LTE standards or another advanced mobile broadband protocol that avoids concentrating energy at the edge of the operating band the average EIRP must not exceed 250 milliwatts within any 5 megahertz of authorized bandwidth but may exceed 50 milliwatts within any 1 megahertz of authorized bandwidth. For mobile and portable stations using time division duplexing (TDD) technology, the duty cycle must not exceed 38 percent in the 2305-2315 MHz and 2350-2360 MHz bands.

FCC section 27.50(b) (10), portable stations (hand-held devices) transmitting in the 746-757MHz, 776-788MHz, and 805-806MHz bands are limited to 3 watts ERP.

FCC section 27.50(c) (10), portable stations (hand-held devices) in the 600MHz uplink band and the 698-746MHz band, and fixed and mobile stations in the 600MHz uplink band are limited to 3 watts ERP.

FCC section 27.50(d) (4), fixed, mobile, and portable (hand-held) stations operating in the 1710-1755 MHz band and mobile and portable stations operating in the 1695-1710 MHz and 1755-1780 MHz bands are limited to 1 watt EIRP. Fixed stations operating in the 1710-1755 MHz 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.

(7) Fixed, mobile, and portable (hand-held) stations operating in the 2000-2020 MHz band are limited to 2 watts EIRP.

And FCC section 27.50(h) (2), for 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.

FCC section 27.50(j) (3), for mobile, and portable (hand-held) stations operating in the 3700-3980 MHz band are limited to 1 watt EIRP.

FCC section 27.50(k) (3), Mobile devices are limited to 1Watt (30 dBm) EIRP in the 3450-3550 MHz band.

According to FCC section 90.635(b), the maximum output power of the transmitter for mobile stations is 100 watts (20dBW).

According to FCC section 90.542(a) (7), portable stations (hand-held devices) transmitting in the 758-768 MHz band and the 788-798 MHz band are limited to 3 watts ERP.

FCC section 96.41(b), the maximum effective isotropic radiated power (EIRP) and maximum Power Spectral Density (PSD) of any CBSD and End User Device must comply with the limits shown in the table in this paragraph below:

Device	Maximum EIRP (dBm/10 megahertz)	Maximum PSD (dBm/MHz)
End User Device	23	N/A
Category A CBSD	30	20
Category B CBSD[note1]	47	37
Note1: Category B CBSDs will only be authorized for use after an ESC is approved and commercially deployed consistent with §§ 96.15 and 96.67.		

5.1.2 Test Setup

The section 4.4.1 (Diagram 1) test setup description is used for conducted test, and the section 4.4.3 and 4.4.4 (Diagram 3, 4) test setup description is used for radiated test. The photo of test setup please refer to ANNEX B.

5.1.3 Test Procedure

Description of the Conducted Output Power Measurement

The EUT is coupled to the SS with attenuator through power splitter; the RF load attached to EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. A system simulator is used to establish communication with the EUT, and its parameters are 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.

The relevant equation for determining the conducted measured value is:

Conducted Output Power Value (dBm) = Measured Value (dBm) + Path Loss (dB)

where:
Conducted Output Power Value = final conducted measured value in the conducted power test, in dBm;
Measured Value = measured conducted power received by spectrum analyzer or power meter, in dBm;
Path Loss = signal attenuation in the connecting cable between the transmitter and spectrum analyzer or power meter, including external cable loss, in dB;

During the test, the data of Path Loss (dB) is added in the spectrum analyzer or power meter, so Measured Value (dBm) is the final values which contains the data of Path Loss (dB).

For example:

In the conducted output power test, when measured value for GSM850 is 24.7 dBm, and path loss is 8.5 dB, then final conducted output power value is:

Conducted Output Power Value (dBm) = 24.7 dBm + 8.5 dB = 33.2 dBm

Description of the Transmitter Radiated Power Measurement

In many cases, the RF output power limits for licensed digital transmission devices is specified in terms of effective radiated power (ERP) or equivalent isotropic radiated power (EIRP). Typically, ERP is specified when the operating frequency is less than or equal to 1 GHz and EIRP is specified when the operating frequency is greater than 1 GHz. Both are determined by adding the transmit antenna gain to the conducted RF output power with the primary difference between the two being that when determining the ERP, the transmit antenna gain is referenced to a dipole antenna (i.e., dBd) whereas when determining the EIRP, the transmit antenna gain is referenced to an isotropic antenna (dBi).

Final measurement calculation as below:

The relevant equation for determining the ERP or EIRP from the conducted RF output power measured using the guidance provided above is:

ERP/EIRP = P_{Meas} + GT − LC

where:
ERP/EIRP = effective or equivalent radiated power, respectively (expressed in the same units as P_{Meas}, typically dBW or dBm);
P_{Meas} = measured transmitter output power or PSD, in dBm or dBW;
GT = gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP);
dBd (ERP)=dBi (EIRP) -2.15 dB
LC = signal attenuation in the connecting cable between the transmitter and antenna, in dB.

For devices utilizing multiple antennas, KDB 662911 provides guidance for determining the effective array transmit antenna gain term to be used in the above equation.

For example:
In the EIRP test, when P_{Meas} value for GSM1900 is 30.2 dBm, LC is 0.6 dB, and GT is -3.4 dB, then final EIRP value is:
EIRP for GSM1900 = 30.2 dBm - 3.4 dBi - 0.6 dB = 26.2 dBm

The relevant equation for determining the ERP/EIRP from the radiated RF output power is:
ERP/EIRP (dBm) = SA Read Value (dBm) + Correction Factor (dB)

where:
ERP/EIRP = effective or equivalent radiated power, in dBm;
SA Read Value = measured transmitter power received by EMI receiver or spectrum analyzer, in dBm;
Correction Factor = total correction factor including cable loss, in dB;

During the test, the data of Correction Factor (dB) is added in the EMI receiver or spectrum analyzer, so SA Read Value (dBm) is the final values which contains the data of Correction Factor (dB).

For example:

In the ERP test, when SA read value for GSM850 is 21dBm, and correction factor is 8dB, then final ERP value for GSM850 is:

ERP (dBm) = 21dBm + 8dB = 29dBm

5.1.4 Test Result

Please refer to ANNEX A.1.

5.2 Peak to Average Ratio

5.2.1 Limit

FCC § 2.1046 & 24.232(d) & 27.50(d) & 27.50(j) & 27.50(k)

In addition, when the transmitter power is measured in terms of average value, the peak-to-average power ratio (PAPR) of the transmitter shall not exceed 13 dB for more than 0.1% of the time using a signal corresponding to the highest PAPR during periods of continuous transmission.

According to FCC section 24.232(d), power measurements for transmissions by stations authorized under this section may be made either in accordance with a Commission-approved average power technique or in compliance with 24.232 (e) of this section. In both instances, equipment employed must be authorized in accordance with the provisions of § 24.51. In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

FCC section 24.232(e), peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms equivalent voltage. The measurement results shall be properly adjusted for any instrument limitations, such as detector response times, limited resolution bandwidth capability when compared to the emission bandwidth, sensitivity, etc., so as to obtain a true peak measurement for the emission in question over the full bandwidth of the channel.

According to FCC section 27.50(d) (5) & 27.50(j) & 27.50(k), in measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13dB.

5.2.2 Test Setup

The section 4.4.1 (Diagram 1) test setup description is used for this test. The photo of test setup please refer to ANNEX B.

5.2.3 Test Procedure

Here the lowest, middle and highest channels are selected to perform testing to verify the peak-to-average ratio.

According to KDB 971168 D01, there is CCDF procedure for PAPR:

a) Refer to instrument’s analyzer instruction manual for details on how to use the power statistics/CCDF function;

b) Set resolution/measurement bandwidth ≥ signal’s occupied bandwidth;

c) Set the number of counts to a value that stabilizes the measured CCDF curve;

d) Set the measurement interval as follows:

1) for continuous transmissions, set to 1 ms,

2) 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 and set the measurement interval to a time that is less than or equal to the burst duration.

e) Record the maximum PAPR level associated with a probability of 0.1%.

Alternate procedure for PAPR:

Use one of the procedures presented in 4.1 to measure the total peak power and record as P_{Pk}. Use one of the applicable procedures presented 4.2 to measure the total average power and record as P_{Avg}. Both the peak and average power levels must be expressed in the same logarithmic units (e.g., dBm). Determine the PAPR from:

PAPR (dB) = P_{Pk} (dBm) - P_{Avg} (dBm).

5.2.4 Test Result

Please refer to ANNEX A.2.

5.3 Occupied Bandwidth

5.3.1 Limit

FCC § 2.1049

The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission.

Many of the individual rule parts specify a relative OBW in lieu of the 99% OBW. In such cases, the OBW is defined as the width of the signal between two points, one below the carrier center frequency and on above the carrier center frequency, outside of which all emissions are attenuated by at least X dB below the transmitter power, where the value of X is typically specified as 26.

5.3.2 Test Setup

The section 4.4.1 (Diagram 1) test setup description is used for this test. The photo of test setup please refer to ANNEX B.

5.3.3 Test Procedure

The following procedure shall be used for measuring power bandwidth.

a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be set wide enough to capture all modulation products including the emission skirts (i.e., two to five times the anticipated OBW).

b) The nominal IF filter bandwidth (3 dB 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.

c) Set the reference level of the instrument as required to keep the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope must be at least 10log (OBW / RBW) below the reference level.

d) NOTE—Steps a) through c) may require iteration to adjust within the specified tolerances.

e) For -26 dB OBW, the dynamic range of the spectrum analyzer at the selected RBW shall be at least 10dB below the target “-X dB down” requirement, e.g. -26 dB OBW, the spectrum analyzer noise floor at the selected RBW shall be 36dB below the reference value.

f) Set the detection mode to peak, and the trace mode to max hold.

g) For 99% OBW, use the 99 % power bandwidth function of the spectrum analyzer (if available) and report the measured bandwidth.

If the instrument does not have a 99 % power bandwidth function, the trace data points are to be recovered and directly summed in linear power terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5 % of the total is reached; that frequency is

recorded as the lower frequency. The process is repeated until 99.5 % of the total is reached; that frequency is recorded as the upper frequency. The 99 % power bandwidth is the difference between these two frequencies.

h) For -26 dB OBW, 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 “-X dB down amplitude” as equal to (reference value -X). Alternatively, this calculation can be performed by the analyzer by using the marker-delta function.

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 “-X dB down amplitude” determined in step g). 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.

i) The OBW shall be reported by providing plot(s) of the measuring instrument display. The frequency and amplitude axes and scale shall be clearly labeled. Tabular data may be reported in addition to the plot(s).

j) Change variable modulations, coding, or channel bandwidth settings, then repeat above test procedures.

5.3.4 Test Result

Please refer to ANNEX A.3.

5.4 Frequency Stability

5.4.1 Limit

FCC § 2.1055 & 22.355 & 24.235 & 27.54 & 90.213

FCC § 2.1055

The frequency stability shall be measured with variation of ambient temperature as follows:

(1) The temperature is varied from -30°C to +50°C.

(2) Frequency measurements shall be made at the extremes of the specified temperature range and at intervals of not more than 10°C through the range.

The frequency stability shall be measured with variation of primary supply voltage as follows:

(1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than carried battery equipment.

(2) For hand carried, battery powered equipment, reduce primary supply voltage to the battery operating and point which shall be specified by the manufacture.

(3) The supply voltage shall be measured at the input to the cable normally provided with the equipment, or at the power supply terminals if cables are not normally provided.

FCC § 22.355

Except as otherwise provided in this part, the carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances given in Table C-1 of this section.

Table C-1—Frequency Tolerance for Transmitters in the Public Mobile Services

Frequency range (MHz)	Base, fixed (ppm)	Mobile > 3 watts (ppm)	Mobile ≤ 3 watts (ppm)
25 to 50	20.0	20.0	50.0
50 to 450	5.0	5.0	50.0
450 to 512	2.5	5.0	5.0
821 to 896	1.5	2.5	2.5
928 to 929	5.0	n/a	n/a
929 to 960	1.5	n/a	n/a
2110 to 2220	10.0	n/a	n/a

FCC § 24.235

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

FCC § 27.54

The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

FCC § 90.213

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

5.4.2 Test Setup

The section 4.4.2 (Diagram 2) test setup description is used for this test. The photo of test setup please refer to ANNEX B.

5.4.3 Test Procedure

1. The EUT is placed in a temperature chamber.

2. The temperature is set to 25°C and allowed to stabilize. After sufficient soak time, the transmitting frequency error is measured.

3. The temperature is increased by not more than 10 degrees, allowed to stabilize and soak, and then repeat the frequency error measurement.

4. Repeat procedure 3 until +50°C and -30°C is reached.

5. Change supply voltage, and repeat measurement until extreme voltage is reached.

5.4.4 Test Result

Please refer to ANNEX A.4.

5.5 Spurious Emission at Antenna Terminals

5.5.1 Limit

FCC § 2.1051 & 22.917(a) & 24.238(a) & 27.53(a) & 27.53(c) & 27.53(f) & 27.53(g) & 27.53(h) & 27.53(l) & 27.53(m) & 27.53(n) & 90.691 & 90.543 & 96.41(e)

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 emissions are attenuated at least 26 dB below the transmitter power.

FCC § 22.917(a) & 24.238(a)

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. This is calculated to be -13 dBm.

FCC § 27.53(a) (4)

For mobile and portable stations operating in the 2305-2315MHz and 2350-2360MHz bands:

(1)By a factor of not less than: 43 + 10 log (P) dB on all frequencies between 2305 and 2320MHz and on all frequencies between 2345 and 2360MHz that are outside the licensed band(s) of operation, not less than 55 + 10 log (P) dB on all frequencies between 2320 and 2324MHz and on all frequencies between 2341 and 2345MHz, not less than 61 + 10 log (P) dB on all frequencies between 2324 and 2328MHz and on all frequencies between 2337 and 2341MHz, and not less than 67 + 10 log (P) dB on all frequencies between 2328 and 2337MHz.

(2)By a factor of not less than 43 + 10 log (P) dB on all frequencies between 2300 and 2305MHz, 55 + 10 log (P) dB on all frequencies between 2296 and 2300MHz, 61 + 10 log (P) dB on all frequencies between 2292 and 2296MHz, 67 + 10 log (P) dB on all frequencies between 2288 and 2292MHz, and 70 + 10 log (P) dB below 2288MHz.

(3)By a factor of not less than 43 + 10 log (P) dB on all frequencies between 2360 and 2365MHz, and not less than 70 + 10 log (P) dB above 2365MHz.

FCC § 27.53(c)

For operations in the 746–758 MHz band and the 776–788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

(1) On any frequency outside the 746–758 MHz band, the power of any emission shall be attenuated outside the

band below the transmitter power (P) by at least 43 + 10 log (P) dB;

(2) On any frequency outside the 776–788 MHz band, the power of any emission shall be attenuated outside the

band below the transmitter power (P) by at least 43 + 10 log (P) dB;

(3) On all frequencies between 763–775 MHz and 793–805 MHz, by a factor not less than 76 + 10 log (P) dB in a 6.25 kHz band segment, for base and fixed stations;

(4) On all frequencies between 763–775 MHz and 793–805 MHz, by a factor not less than 65 + 10 log (P) dB in a 6.25 kHz band segment, for mobile and portable stations;

(5) Compliance with the provisions of paragraphs (c)(1) and (c)(2) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater.

However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth

of at least 30 kHz may be employed;

(6) Compliance with the provisions of paragraphs (c)(3) and (c)(4) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment.

FCC § 27.53(f)

For operations in the 746–758 MHz, 775–788 MHz, and 805–806 MHz bands, emissions in the band 1559–1610 MHz shall be limited to - 70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

FCC § 27.53(g)

For operations in the 600MHz band and the 698-746MHz band, the power of any emission outside a licensee’s frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43+10*log(P) dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz bands immediately outside and adjacent to a licensee’s frequency block, a resolution bandwidth of at least 30 kHz may be employed.

FCC § 27.53(h) (1)

Except as otherwise specified below, for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least 43 + 10 $\log_{10}$ (P) dB.

FCC § 27.53(l) (2)

For mobile operations in the 3700-3980 MHz band, the conducted power of any emission outside the licensee's authorized bandwidth shall not exceed −13 dBm/MHz.

FCC § 27.53(m) (4)

For mobile digital stations (BRS and EBS stations), the attenuation factor shall be not less than:

• 40+10logP dB (−10 dBm, 100 nW) on all frequencies between the channel edge and 5 MHz from the channel edge.

• 43+10logP dB (−13 dBm, 50 nW) on all frequencies between 5 MHz and X MHz from the channel edge,

• 55+10logP dB (−25 dBm, 3 nW) on all frequencies more than X MHz from the channel edge, where X is the greater of 6 MHz or the actual emission bandwidth (26 dB).

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. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

FCC § 27.53(n) (2)

For mobile operations in the 3450-3550 MHz band, the conducted power of any emission outside the licensee's authorized bandwidth shall not exceed −13 dBm/MHz.

FCC § 90.691

(a) Out-of-band emission requirement shall apply only to the “outer” channels included in an EA license and to spectrum adjacent to interior channels used by incumbent licensees. The emission limits are as follows:

(1) 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 $Log_{10}(f/6.1)$ decibels or 50 + 10 $Log_{10}(P)$ 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.

(2) For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 43 + $10Log_{10}(P)$ 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 37.5 kHz.

(b) When an emission outside of the authorized bandwidth causes harmful interference, the Commission may, at its discretion, require greater attenuation than specified in this section.

FCC § 90.543

(e) For operations in the 758–768 MHz and the 788–798 MHz bands, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

(1) On all frequencies between 769–775 MHz and 799–805 MHz, by a factor not less than 76 + 10 log (P) dB in a 6.25 kHz band segment, for base and fixed stations.

(2) On all frequencies between 769–775 MHz and 799–805 MHz, by a factor not less than 65 + 10 log (P) dB in a 6.25 kHz band segment, for mobile and portable stations.

(3) On any frequency between 775–788 MHz, above 805 MHz, and below 758 MHz, by at least 43 + 10 log (P) dB.

(4) Compliance with the provisions of paragraphs (e)(1) and (2) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment.

(f) For operations in the 758–775 MHz and 788–805 MHz bands, all emissions including harmonics in the band 1559– 1610 MHz shall be limited to -70 dBW/ MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

FCC § 96.41(e)

The conducted power of any emission outside the fundamental emission (whether in or outside of the authorized band) shall not exceed -13 dBm/MHz within 0-10 megahertz above the upper SAS-assigned channel edge and within 0-10 megahertz below the lower SAS-assigned channel edge. At all frequencies greater than 10 megahertz above the upper SAS assigned channel edge and less than 10 MHz below the lower SAS assigned channel edge, the conducted power of any emission shall not exceed-25 dBm/MHz.The conducted power of any emissions below 3530 MHz or above 3720 MHz shall not exceed-40 dBm/MHz.

Compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater for frequencies less than 1 GHz and 1 MHz or greater for frequencies greater than1GHz.However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolutionbandwidth 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 least26 dB below the transmitter power.

5.5.2 Test Setup

The section 4.4.1 (Diagram 1) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

5.5.3 Test Procedure

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 blocks 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 emissions are attenuated at least 26 dB below the transmitter power.

1. The EUT is coupled to the system simulator and spectrum analyzer; the RF load attached to EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading.

2. Base Station is used to establish communication with the EUT, and its parameters are set to force the EUT transmitting at maximum output power.

3. The RF output of the transmitter is connected to the input of the spectrum analyzer through sufficient attenuation.

4. Spurious emissions are tested with 0.001MHz RBW for frequency less than 150kHz, 0.01MHz RBW for frequency less than 30MHz, 0.1MHz RBW for frequency less than 1GHz, and 1MHz RBW for frequency above 1GHz. And sweep point number are at least 401, referring to following formula.

   Sweep point number = Span/RBW

   VBW=3*RBW

   Detector Mode=mean or average power

5. Record the frequencies and levels of spurious emissions.

5.5.4 Test Result

Please refer to ANNEX A.5.

5.6 Band Edge

5.6.1 Limit

FCC § 2.1051 & 22.917(a) & 24.238(a) & 27.53(a) & 27.53(c) & 27.53(f) & 27.53(g) & 27.53(h) & 27.53(l) & 27.53(m) & 27.53(n) & 90.691 & 90.543 & 96.41(e)

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 emissions are attenuated at least 26 dB below the transmitter power.

FCC § 22.917(a) & 24.238(a)

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. This is calculated to be -13 dBm.

FCC § 27.53(a) (4)

For mobile and portable stations operating in the 2305-2315MHz and 2350-2360MHz bands:

(1)By a factor of not less than: 43 + 10 log (P) dB on all frequencies between 2305 and 2320MHz and on all frequencies between 2345 and 2360MHz that are outside the licensed band(s) of operation, not less than 55 + 10 log (P) dB on all frequencies between 2320 and 2324MHz and on all frequencies between 2341 and 2345MHz, not less than 61 + 10 log (P) dB on all frequencies between 2324 and 2328MHz and on all frequencies between 2337 and 2341MHz, and not less than 67 + 10 log (P) dB on all frequencies between 2328 and 2337MHz.

(2)By a factor of not less than 43 + 10 log (P) dB on all frequencies between 2300 and 2305MHz, 55 + 10 log (P) dB on all frequencies between 2296 and 2300MHz, 61 + 10 log (P) dB on all frequencies between 2292 and 2296MHz, 67 + 10 log (P) dB on all frequencies between 2288 and 2292MHz, and 70 + 10 log (P) dB below 2288MHz.

(3)By a factor of not less than 43 + 10 log (P) dB on all frequencies between 2360 and 2365MHz, and not less than 70 + 10 log (P) dB above 2365MHz.

FCC § 27.53(c)

For operations in the 746–758 MHz band and the 776–788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

(1) On any frequency outside the 746–758 MHz band, the power of any emission shall be attenuated outside the

band below the transmitter power (P) by at least 43 + 10 log (P) dB;

(2) On any frequency outside the 776–788 MHz band, the power of any emission shall be attenuated outside the

band below the transmitter power (P) by at least 43 + 10 log (P) dB;

(3) On all frequencies between 763–775 MHz and 793–805 MHz, by a factor not less than 76 + 10 log (P) dB in a 6.25 kHz band segment, for base and fixed stations;

(4) On all frequencies between 763–775 MHz and 793–805 MHz, by a factor not less than 65 + 10 log (P) dB in a 6.25 kHz band segment, for mobile and portable stations;

(5) Compliance with the provisions of paragraphs (c)(1) and (c)(2) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater.

However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth

of at least 30 kHz may be employed;

(6) Compliance with the provisions of paragraphs (c)(3) and (c)(4) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment.

FCC § 27.53(f)

For operations in the 746–758 MHz, 775–788 MHz, and 805–806 MHz bands, emissions in the band 1559–1610 MHz shall be limited to - 70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

FCC § 27.53(g)

For operations in the 600MHz band and the 698-746MHz band, the power of any emission outside a licensee’s frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43+10*log(P) dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz bands immediately outside and adjacent to a licensee’s frequency block, a resolution bandwidth of at least 30 kHz may be employed.

FCC § 27.53(h) (1)

Except as otherwise specified below, for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least 43 + 10 $\log_{10}$ (P) dB.

FCC § 27.53(l) (2)

For mobile operations in the 3700-3980 MHz band, the conducted power of any emission outside the licensee's authorized bandwidth shall not exceed −13 dBm/MHz.

FCC § 27.53(m) (4)

For mobile digital stations (BRS and EBS stations), the attenuation factor shall be not less than:

• 40+10logP dB (−10 dBm, 100 nW) on all frequencies between the channel edge and 5 MHz from the channel edge.

• 43+10logP dB (−13 dBm, 50 nW) on all frequencies between 5 MHz and X MHz from the channel edge,

• 55+10logP dB (−25 dBm, 3 nW) on all frequencies more than X MHz from the channel edge, where X is the greater of 6 MHz or the actual emission bandwidth (26 dB).

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. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

FCC § 27.53(n) (2)

For mobile operations in the 3450-3550 MHz band, the conducted power of any emission outside the licensee's authorized bandwidth shall not exceed −13 dBm/MHz.

FCC § 90.691

(a) Out-of-band emission requirement shall apply only to the “outer” channels included in an EA license and to spectrum adjacent to interior channels used by incumbent licensees. The emission limits are as follows:

(1) 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 $Log_{10}(f/6.1)$ decibels or 50 + 10 $Log_{10}(P)$ 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.

(2) For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 43 + $10Log_{10}(P)$ 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 37.5 kHz.

(b) When an emission outside of the authorized bandwidth causes harmful interference, the Commission may, at its discretion, require greater attenuation than specified in this section.

FCC § 90.543

(e) For operations in the 758–768 MHz and the 788–798 MHz bands, the power of any emission outside the licensee’s frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

(1) On all frequencies between 769–775 MHz and 799–805 MHz, by a factor not less than 76 + 10 log (P) dB in a 6.25 kHz band segment, for base and fixed stations.

(2) On all frequencies between 769–775 MHz and 799–805 MHz, by a factor not less than 65 + 10 log (P) dB in a 6.25 kHz band segment, for mobile and portable stations.

(3) On any frequency between 775–788 MHz, above 805 MHz, and below 758 MHz, by at least 43 + 10 log (P) dB.

(4) Compliance with the provisions of paragraphs (e)(1) and (2) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment.

FCC § 96.41(e)

The conducted power of any emission outside the fundamental emission (whether in or outside of the authorized band) shall not exceed -13 dBm/MHz within 0-10 megahertz above the upper SAS-assigned channel edge and within 0-10 megahertz below the lower SAS-assigned channel edge. At all frequencies greater than 10 megahertz above the upper SAS assigned channel edge and less than 10 MHz below the lower SAS assigned channel edge, the conducted power of any emission shall not exceed-25 dBm/MHz.The conducted power of any emissions below 3530 MHz or above 3720 MHz shall not exceed-40 dBm/MHz.

Compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater for frequencies less than 1 GHz and 1 MHz or greater for frequencies greater than1GHz.However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolutionbandwidth 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 least26 dB below the transmitter power.

5.6.2 Test Setup

The section 4.4.1 (Diagram 1) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

5.6.3 Test Procedure

The EUT, which is powered by the Battery, is coupled to the Spectrum Analyzer (SA) and the System Simulator (SS) with attenuators through the Power Splitter; the RF load attached to the EUT antenna terminal is 50 Ohm; the path loss as the factor is calibrated to correct the reading.

1.The EUT is coupled to the system simulator and spectrum analyzer; the RF load attached to EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading.

2. Base Station is used to establish communication with the EUT, and its parameters are set to force the EUT transmitting at maximum output power.

3. The RF output of the transmitter is connected to the input of the spectrum analyzer through sufficient attenuation.

4. The center of the spectrum analyzer was set to block edge frequency.

5. Band edge are tested with 1%*cBW (RBW), and sweep point number referred to following formula.

   Sweep point number = 2*Span/RBW

   VBW=3RBW

6. Record the frequencies and levels of spurious emissions.

For mobile and portable stations, on all frequencies between 763–775 MHz and 793–805 MHz, by a factor not less than 65 + 10 log (P) dB in a 6.25 kHz band segment. Since it was not possible to set the resolution bandwidth to 6.25 kHz with the available equipment, a bandwidth of 10 kHz was used instead to show compliance. By using a 10 kHz bandwidth on the spectrum analyzer.

10*log(10 kHz / 6.25 kHz) = 2.04 dB
Limit Line = -35 dBm + 2.04 dB = -32.96dBm

5.6.4 Test Result

Please refer to ANNEX A.6.

5.7 Field Strength of Spurious Radiation

5.7.1 Limit

FCC § 2.1053 & 22.917(a) & 24.238(a) & 27.53(a) & 27.53(c) & 27.53(f) & 27.53(g) & 27.53(h) & 27.53(l) & 27.53(m) & 27.53(n) & 90.691& 90.543 & 96.41(e)

FCC § 22.917(a) & 24.238(a)

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. This is calculated to be -13 dBm.

FCC § 27.53(a) (4)

For mobile and portable stations operating in the 2305-2315MHz and 2350-2360MHz bands:

(1)By a factor of not less than: 43 + 10 log (P) dB on all frequencies between 2305 and 2320MHz and on all frequencies between 2345 and 2360MHz that are outside the licensed band(s) of operation, not less than 55 + 10 log (P) dB on all frequencies between 2320 and 2324MHz and on all frequencies between 2341 and 2345MHz, not less than 61 + 10 log (P) dB on all frequencies between 2324 and 2328MHz and on all frequencies between 2337 and 2341MHz, and not less than 67 + 10 log (P) dB on all frequencies between 2328 and 2337MHz.

(2)By a factor of not less than 43 + 10 log (P) dB on all frequencies between 2300 and 2305MHz, 55 + 10 log (P) dB on all frequencies between 2296 and 2300MHz, 61 + 10 log (P) dB on all frequencies between 2292 and 2296MHz, 67 + 10 log (P) dB on all frequencies between 2288 and 2292MHz, and 70 + 10 log (P) dB below 2288MHz.

(3)By a factor of not less than 43 + 10 log (P) dB on all frequencies between 2360 and 2365MHz, and not less than 70 + 10 log (P) dB above 2365MHz.

FCC § 27.53(c)

For operations in the 746–758 MHz band and the 776–788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

(1) On any frequency outside the 746–758 MHz band, the power of any emission shall be attenuated outside the

band below the transmitter power (P) by at least 43 + 10 log (P) dB;

(2) On any frequency outside the 776–788 MHz band, the power of any emission shall be attenuated outside the

band below the transmitter power (P) by at least 43 + 10 log (P) dB;

(3) On all frequencies between 763–775 MHz and 793–805 MHz, by a factor not less than 76 + 10 log (P) dB in a 6.25 kHz band segment, for base and fixed stations;

(4) On all frequencies between 763–775 MHz and 793–805 MHz, by a factor not less than 65 + 10 log (P) dB in a 6.25 kHz band segment, for mobile and portable stations;

(5) Compliance with the provisions of paragraphs (c)(1) and (c)(2) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater.

However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth

of at least 30 kHz may be employed;

(6) Compliance with the provisions of paragraphs (c)(3) and (c)(4) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment.

FCC § 27.53(f)

For operations in the 746–758 MHz, 775–788 MHz, and 805–806 MHz bands, emissions in the band 1559–1610 MHz shall be limited to - 70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

FCC § 27.53(g)

For operations in the 600MHz band and the 698-746MHz band, the power of any emission outside a licensee’s frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43+10*log(P) dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz bands immediately outside and adjacent to a licensee’s frequency block, a resolution bandwidth of at least 30 kHz may be employed.

FCC § 27.53(h) (1)

Except as otherwise specified below, for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least 43 + 10 $\log_{10}$ (P) dB.

FCC § 27.53(l) (2)

For mobile operations in the 3700-3980 MHz band, the conducted power of any emission outside the licensee's authorized bandwidth shall not exceed −13 dBm/MHz.

FCC § 27.53(m) (4)

For mobile digital stations (BRS and EBS stations), the attenuation factor shall be not less than:

• 40+10logP dB (−10 dBm, 100 nW) on all frequencies between the channel edge and 5 MHz from the channel edge.

• 43+10logP dB (−13 dBm, 50 nW) on all frequencies between 5 MHz and X MHz from the channel edge,

• 55+10logP dB (−25 dBm, 3 nW) on all frequencies more than X MHz from the channel edge, where X is the greater of 6 MHz or the actual emission bandwidth (26 dB).

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. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

FCC § 27.53(n) (2)

For mobile operations in the 3450-3550 MHz band, the conducted power of any emission outside the licensee's authorized bandwidth shall not exceed −13 dBm/MHz.

FCC § 90.691

(a) Out-of-band emission requirement shall apply only to the “outer” channels included in an EA license and to spectrum adjacent to interior channels used by incumbent licensees. The emission limits are as follows:

(1) 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 $Log_{10}(f/6.1)$ decibels or 50 + 10 $Log_{10}(P)$ 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.

(2) For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 43 + $10Log_{10}(P)$ 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 37.5 kHz.

(b) When an emission outside of the authorized bandwidth causes harmful interference, the Commission may, at its discretion, require greater attenuation than specified in this section.

FCC § 90.543

(e) For operations in the 758–768 MHz and the 788–798 MHz bands, the power of any emission outside the licensee’s frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

(1) On all frequencies between 769–775 MHz and 799–805 MHz, by a factor not less than 76 + 10 log (P) dB in a 6.25 kHz band segment, for base and fixed stations.

(2) On all frequencies between 769–775 MHz and 799–805 MHz, by a factor not less than 65 + 10 log (P) dB in a 6.25 kHz band segment, for mobile and portable stations.

(3) On any frequency between 775–788 MHz, above 805 MHz, and below 758 MHz, by at least 43 + 10 log (P) dB.

(4) Compliance with the provisions of paragraphs (e)(1) and (2) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment.

(f) For operations in the 758–775 MHz and 788–805 MHz bands, all emissions including harmonics in the band 1559– 1610 MHz shall be limited to -70 dBW/ MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

FCC § 96.41(e)

The conducted power of any emission outside the fundamental emission (whether in or outside of the authorized band) shall not exceed -13 dBm/MHz within 0-10 megahertz above the upper SAS-assigned channel edge and within 0-10 megahertz below the lower SAS-assigned channel edge. At all frequencies greater than 10 megahertz above the upper SAS assigned channel edge and less than 10 MHz below the lower SAS assigned channel edge, the conducted power of any emission shall not exceed-25 dBm/MHz.The conducted power of any emissions below 3530 MHz or above 3720 MHz shall not exceed-40 dBm/MHz.

Compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater for frequencies less than 1 GHz and 1 MHz or greater for frequencies greater than1GHz.However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolutionbandwidth 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 least26 dB below the transmitter power.

5.7.2 Test Setup

The section 4.4.3 and 4.4.4 (Diagram 3, 4) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

5.7.3 Test Procedure

1. On a test site, the EUT shall be placed at 80cm height on a turn table, and in the position close to normal use as declared by the applicant.

2. The test antenna shall be oriented initially for vertical polarization located 3 m from EUT to correspond to the fundamental frequency of the transmitter.

3. The output of the test antenna shall be connected to the measuring receiver and the peak detector is used for the measurement.

4. During the measurement of the EUT, the resolution bandwidth was to 1 MHz and the average bandwidth

was set to 1 MHz.

5. The transmitter shall be switched on; the measuring receiver shall be tuned to the frequency of the

transmitter under test.

6. The test antenna shall be raised and lowered through the specified range of height until the maximum signal level is detected by the measuring receiver.

7. The transmitter shall be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.

8. The test antenna shall be raised and lowered again through the specified range of height until the maximum signal level is detected by the measuring receiver.

9. The maximum signal level detected by the measuring receiver shall be noted.

10. The EUT was replaced by half-wave dipole (824 ~ 849 MHz) or horn antenna (1 850 ~ 1 910 MHz) connected to a signal generator.

11. In necessary, the input attenuator setting on the measuring receiver shall be adjusted in order to increase

the sensitivity of the measuring receiver.

12. The test antenna shall be raised and lowered through the specified range of height to ensure that the maximum signal is received.

13. The input signal to the substitution antenna shall be adjusted to the level that produces a level detected by the measuring received, which is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuator setting of the measuring receiver.

14. The input level to the substitution antenna shall be recorded as power level in dBm, corrected for any change of input attenuator setting of the measuring receiver.

15. The measurement shall be repeated with the test antenna and the substitution antenna orientated for horizontal polarization.

Final measurement calculation as below:

The relevant equation for determining the ERP/EIRP from the radiated RF output power is:

ERP/EIRP (dBm) = SA Read Value (dBm) + Correction Factor (dB)

where:
ERP/EIRP = effective or equivalent radiated power, in dBm;
SA Read Value = measured transmitter power received by EMI receiver or spectrum analyzer, in dBm;
Correction Factor = total correction factor including cable loss, in dB;

During the test, the data of Correction Factor (dB) is added in the EMI receiver or spectrum analyzer, so SA Read Value (dBm) is the final values which contains the data of Correction Factor (dB).

For example:

In the ERP test, when SA read value for GSM850 is 21dBm, and correction factor is 8dB, then final ERP value for GSM850 is:

ERP (dBm) = 21dBm + 8dB = 29dBm

5.7.4 Test Result

Please refer to ANNEX A.7.

ANNEX A TEST RESULTS

A.1 Transmitter Radiated Power (EIRP/ERP)

GPRS Mode Test Data

Test Band	Test Channel	Conducted Output Peak Power (dBm)	Antenna Gain (dBi)	Antenna Gain (dBd)	ERP (dBm)	ERP (W)	Limit (W)	Verdict
GPRS 850	LCH	32.69	-2.47	-4.62	28.07	0.641	7.000	Pass
	MCH	33.18	-2.47	-4.62	28.56	0.718	7.000	Pass
	HCH	32.76	-2.47	-4.62	28.14	0.652	7.000	Pass
EGPRS 850	LCH	30.22	-2.47	-4.62	25.60	0.363	7.000	Pass
	MCH	30.31	-2.47	-4.62	25.69	0.371	7.000	Pass
	HCH	30.21	-2.47	-4.62	25.59	0.362	7.000	Pass

Test Band	Test Channel	Conducted Output Peak Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (W)	Limit (W)	Verdict
GPRS 1900	LCH	30.21	1.86	32.07	1.611	2.000	Pass
	MCH	29.79	1.86	31.65	1.462	2.000	Pass
	HCH	30.00	1.86	31.86	1.535	2.000	Pass
EGPRS 1900	LCH	29.41	1.86	31.27	1.340	2.000	Pass
	MCH	29.39	1.86	31.25	1.334	2.000	Pass
	HCH	29.67	1.86	31.53	1.422	2.000	Pass

Note 1: For the GPRS and EGPRS mode, all slots were tested and just the worst data were recorded in this table.

Note 2: ERP/EIRP = P_{Meas} + GT − LC

ERP/EIRP = effective or equivalent radiated power, respectively (expressed in the same units as P_{Meas}, typically dBW or dBm);

P_{Meas} = measured transmitter output power or PSD, in dBm or dBW;

GT = gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP);

LC = signal attenuation in the connecting cable between the transmitter and antenna, in dB.

ERP = EIRP – 2.15; where ERP and EIRP are expressed in consistent units.

Note 3: Set PCL to 5 for GPRS 850 (power class 4) and 0 for GPRS 1900 (power class 1).

Set PCL to 8 for EGPRS850 (power class E2) and 2 for EGPRS1900 (power class E2).

GPRS Conducted Output Power

Band	Channel	Conducted Output Peak Power							
		1 Slot (dBm)	1 Slot (W)	2 Slots (dBm)	2 Slots (W)	3 Slots (dBm)	3 Slots (W)	4 Slots (dBm)	4 Slots (W)
GPRS 850	LCH	32.69	1.86	32.50	1.78	32.37	1.72	32.28	1.69
	MCH	33.18	2.08	33.00	1.99	32.84	1.92	32.73	1.88
	HCH	32.76	1.89	32.57	1.81	32.46	1.76	32.32	1.71
GPRS 1900	LCH	30.21	1.05	30.07	1.02	29.82	0.96	29.70	0.93
	MCH	29.79	0.95	29.55	0.90	29.32	0.86	29.11	0.81
	HCH	30.00	1.00	29.72	0.94	29.39	0.87	29.17	0.83

EGPRS Conducted Output Power

Band	Channel	Conducted Output Peak Power							
		1 Slot (dBm)	1 Slot (W)	2 Slots (dBm)	2 Slots (W)	3 Slots (dBm)	3 Slots (W)	4 Slots (dBm)	4 Slots (W)
EGPRS 850	LCH	30.22	1.05	29.96	0.99	29.91	0.98	29.80	0.96
	MCH	30.31	1.07	30.05	1.01	29.95	0.99	29.88	0.97
	HCH	30.21	1.05	30.03	1.01	29.88	0.97	29.83	0.96
EGPRS 1900	LCH	29.41	0.87	29.26	0.84	29.14	0.82	28.90	0.78
	MCH	29.39	0.87	29.24	0.84	29.00	0.79	28.70	0.74
	HCH	29.67	0.93	29.22	0.84	28.98	0.79	28.76	0.75

WCDMA Mode Test Data

Test Band	Test Channel	Conducted Output AV Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (W)	Limit (W)	Verdict
WCDMA Band 2	LCH	23.29	1	24.29	0.269	2.000	Pass
	MCH	23.35	1	24.35	0.272	2.000	Pass
	HCH	23.36	1	24.36	0.273	2.000	Pass
HSDPA Band 2	LCH	22.36	1	23.36	0.217	2.000	Pass
	MCH	22.36	1	23.36	0.217	2.000	Pass
	HCH	22.42	1	23.42	0.220	2.000	Pass
HSUPA Band 2	LCH	22.35	1	23.35	0.216	2.000	Pass
	MCH	22.40	1	23.40	0.219	2.000	Pass
	HCH	22.36	1	23.36	0.217	2.000	Pass

Test Band	Test Channel	Conducted Output AV Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (W)	Limit (W)	Verdict
WCDMA Band 4	LCH	23.11	1.86	24.97	0.314	1.000	Pass
	MCH	23.25	1.86	25.11	0.324	1.000	Pass
	HCH	23.28	1.86	25.14	0.327	1.000	Pass
HSDPA Band 4	LCH	22.17	1.86	24.03	0.253	1.000	Pass
	MCH	22.30	1.86	24.16	0.261	1.000	Pass
	HCH	22.32	1.86	24.18	0.262	1.000	Pass
HSUPA Band 4	LCH	22.30	1.86	24.16	0.261	1.000	Pass
	MCH	22.30	1.86	24.16	0.261	1.000	Pass
	HCH	22.33	1.86	24.19	0.262	1.000	Pass

Test Band	Test Channel	Conducted Output AV Power (dBm)	Antenna Gain (dBi)	Antenna Gain (dBd)	ERP (dBm)	ERP (W)	Limit (W)	Verdict
WCDMA Band 5	LCH	23.17	-2.47	-4.62	18.55	0.072	7.000	Pass
	MCH	23.20	-2.47	-4.62	18.58	0.072	7.000	Pass
	HCH	23.11	-2.47	-4.62	18.49	0.071	7.000	Pass
HSDPA Band 5	LCH	22.14	-2.47	-4.62	17.52	0.056	7.000	Pass
	MCH	22.13	-2.47	-4.62	17.51	0.056	7.000	Pass
	HCH	22.04	-2.47	-4.62	17.42	0.055	7.000	Pass
HSUPA Band 5	LCH	22.07	-2.47	-4.62	17.45	0.056	7.000	Pass
	MCH	22.12	-2.47	-4.62	17.50	0.056	7.000	Pass
	HCH	22.08	-2.47	-4.62	17.46	0.056	7.000	Pass

Note 1: For the HSDPA and HSUPA mode, all subtests were tested and just the worst data were recorded in this table.

Note 2: ERP/EIRP = P_{Meas} + GT − LC

ERP/EIRP = effective or equivalent radiated power, respectively (expressed in the same units as P_{Meas}, typically dBW or dBm);

P_{Meas} = measured transmitter output power or PSD, in dBm or dBW;

GT = gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP);

LC = signal attenuation in the connecting cable between the transmitter and antenna, in dB.

ERP = EIRP – 2.15; where ERP and EIRP are expressed in consistent units.

HSDPA Conducted Output Power

Conducted Output Power		EIRP (dBm)			EIRP (W)		
Band	Configuration	LCH	MCH	HCH	LCH	MCH	HCH
HSDPA B2	Subtest 1	22.31	22.36	22.41	0.170	0.172	0.174
	Subtest 2	22.36	22.36	22.42	0.172	0.172	0.175
	Subtest 3	21.84	21.85	21.89	0.153	0.153	0.155
	Subtest 4	21.81	21.91	21.89	0.152	0.155	0.155
HSDPA B4	Subtest 1	22.14	22.26	22.32	0.164	0.168	0.171
	Subtest 2	22.17	22.30	22.30	0.165	0.170	0.170
	Subtest 3	21.65	21.81	21.80	0.146	0.152	0.151
	Subtest 4	21.64	21.82	21.84	0.146	0.152	0.153
Conducted Output Power		ERP (dBm)			ERP (W)		
Band	Configuration	LCH	MCH	HCH	LCH	MCH	HCH
HSDPA B5	Subtest 1	22.11	22.11	22.04	0.163	0.163	0.160
	Subtest 2	22.14	22.13	22.02	0.164	0.163	0.159
	Subtest 3	21.62	21.63	21.53	0.145	0.146	0.142
	Subtest 4	21.59	21.62	21.53	0.144	0.145	0.142

HSUPA Conducted Output Power

Conducted Output Power		EIRP (dBm)			EIRP (W)		
Band	Configuration	LCH	MCH	HCH	LCH	MCH	HCH
HSUPA B2	Subtest 1	22.35	22.38	22.33	0.172	0.173	0.171
	Subtest 2	20.38	20.39	20.46	0.109	0.109	0.111
	Subtest 3	21.37	21.42	21.39	0.137	0.139	0.138
	Subtest 4	20.38	20.38	20.37	0.109	0.109	0.109
	Subtest 5	22.35	22.40	22.36	0.172	0.174	0.172
HSUPA B4	Subtest 1	22.24	22.30	22.33	0.167	0.170	0.171
	Subtest 2	20.26	20.30	20.44	0.106	0.107	0.111
	Subtest 3	21.27	21.28	21.29	0.134	0.134	0.135
	Subtest 4	20.28	20.21	20.42	0.107	0.105	0.110
	Subtest 5	22.30	22.26	22.32	0.170	0.168	0.171
Conducted Output Power		ERP (dBm)			ERP (W)		
Band	Configuration	LCH	MCH	HCH	LCH	MCH	HCH
HSUPA B5	Subtest 1	22.07	22.12	22.08	0.161	0.163	0.161
	Subtest 2	20.10	20.13	20.03	0.102	0.103	0.101
	Subtest 3	21.05	21.17	20.97	0.127	0.131	0.125
	Subtest 4	20.07	20.15	20.02	0.102	0.104	0.100
	Subtest 5	22.03	22.11	22.04	0.160	0.163	0.160

LTE Mode Test Data

Test BW	Test Channel	Test Mode	Test RB (Size#Offset)	Conducted Output AV Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (W)	Limit (W)	Verdict
LTE Band 2									
1.4 MHz	LCH	QPSK	RB1#0	23.02	1	24.02	0.252	2.000	Pass
			RB1#3	22.99	1	23.99	0.251	2.000	Pass
			RB1#5	23.09	1	24.09	0.256	2.000	Pass
			RB3#0	23.23	1	24.23	0.265	2.000	Pass
			RB3#2	23.22	1	24.22	0.264	2.000	Pass
			RB3#3	23.18	1	24.18	0.262	2.000	Pass
			RB6#0	22.23	1	23.23	0.210	2.000	Pass
		16-QAM	RB1#0	22.54	1	23.54	0.226	2.000	Pass
			RB1#3	22.46	1	23.46	0.222	2.000	Pass
			RB1#5	22.43	1	23.43	0.220	2.000	Pass
			RB3#0	22.37	1	23.37	0.217	2.000	Pass
			RB3#2	22.2	1	23.20	0.209	2.000	Pass
			RB3#3	22.11	1	23.11	0.205	2.000	Pass
			RB6#0	21.62	1	22.62	0.183	2.000	Pass
		64-QAM	RB1#0	21.35	1	22.35	0.172	2.000	Pass
			RB1#3	21.4	1	22.40	0.174	2.000	Pass
			RB1#5	21.32	1	22.32	0.171	2.000	Pass
			RB3#0	20.99	1	21.99	0.158	2.000	Pass
			RB3#2	21.13	1	22.13	0.163	2.000	Pass
			RB3#3	21.26	1	22.26	0.168	2.000	Pass
			RB6#0	19.7	1	20.70	0.117	2.000	Pass
	MCH	QPSK	RB1#0	23.08	1	24.08	0.256	2.000	Pass
			RB1#3	23.11	1	24.11	0.258	2.000	Pass
			RB1#5	22.97	1	23.97	0.249	2.000	Pass
			RB3#0	23.1	1	24.10	0.257	2.000	Pass
			RB3#2	22.97	1	23.97	0.249	2.000	Pass
			RB3#3	23.12	1	24.12	0.258	2.000	Pass
			RB6#0	22.07	1	23.07	0.203	2.000	Pass
		16-QAM	RB1#0	22.36	1	23.36	0.217	2.000	Pass
			RB1#3	22.61	1	23.61	0.230	2.000	Pass
			RB1#5	22.31	1	23.31	0.214	2.000	Pass
			RB3#0	22.14	1	23.14	0.206	2.000	Pass
			RB3#2	22.17	1	23.17	0.207	2.000	Pass
			RB3#3	22.15	1	23.15	0.207	2.000	Pass
			RB6#0	21.37	1	22.37	0.173	2.000	Pass
		64-QAM	RB1#0	21.48	1	22.48	0.177	2.000	Pass
			RB1#3	21.34	1	22.34	0.171	2.000	Pass