

FCC CFR47 PART 22H, 27 CERTIFICATION TEST REPORT FCC ID: 2AT55-IM421

Product: 4G feature phone

Trade Mark: i-MOBIL

Model No.: iM421

Family Model: N/A

Report No.: S23050900902003

Issue Date: May 30, 2023

Prepared for

i-MOBIL S.A. de C.V.

CALLE LAGO SAN MARTIN No. Ext. 41, COLONIA
ARGENTINA ANTIGUA, ALCALDIA MIGUEL HIDALGO,
CIUDAD DE MEXICO, PAIS MEXICO, CODIGO POSTAL 11270

Prepared by

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TEST RESULT CERTIFICATION

Applicant's name : i-MOBIL S.A. de C.V.

Address..... : CALLE LAGO SAN MARTIN No. Ext. 41, COLONIA ARGENTINA
ANTIGUA , ALCALDIA MIGUEL HIDALGO, CIUDAD DE MEXICO,
PAIS MEXICO,CODIGO POSTAL 11270

Manufacturer's Name..... : i-MOBIL S.A. de C.V.

Address..... : CALLE LAGO SAN MARTIN No. Ext. 41, COLONIA ARGENTINA
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PAIS MEXICO,CODIGO POSTAL 11270

Product name..... : 4G feature phone

Trade Mark..... : i-MOBIL

Model and/or type reference .. : iM421

Family Model..... : N/A

Test Sample Number..... S230509009002

Standards..... : FCC CFR 47 Part 22H, Part 27

Test procedure : ANSI C63.26:2015
ANSI/TIA-603-E-2016

This device described above has been tested by NTEK, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

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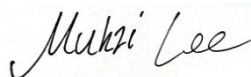
Date of Test

Date (s) of performance of tests..... May 09, 2023 ~ May 30, 2023

Date of Issue May 30, 2023

Test Result..... **Pass**

Testing Engineer :



(Mukzi Lee)

Authorized Signatory :



(Alex Li)

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1. GENERAL INFORMATION

1.1 PRODUCT DESCRIPTION

A major technical description of EUT is described as following:

Product Designation:	4G feature phone
Trade Mark	i-MOBIL
Model Name	iM421
Family Model	N/A
Model Difference	N/A
FCC ID:	2AT55-IM421
Frequency Bands:	U.S. Bands: ☒ LTE FDD Band 4,5,7,13
Frequency Range:	;LTE FDD Band 4 Uplink: 1710MHz-1755MHz, Downlink: 2110MHz-2155MHz; LTE FDD Band 5 Uplink: 824MHz-849MHz, Downlink: 869MHz-894MHz; LTE-FDD Band 7 Uplink: 2500MHz-2570MHz, Downlink: 2620MHz-2690MHz; LTE FDD Band 13 Uplink: 777MHz-787MHz, Downlink: 746MHz-756MHz;
Type of Modulation:	QPSK/16QAM/64QAM(Only Downlink)
Power Class	Class 3
UE Category	1
Antenna:	FPC Antenna
Antenna gain:	Band 4:0.22dBi; Band 5:-1.05dBi; Band 7:3.72dBi; Band 13:-3.72dBi;
Adapter	Model: iM421 Input: AC 100-240V, 50-60Hz, 0.15A Output: DC 5V---500mA
Battery	DC 3.7V, 1000mAh
Power supply	DC 3.7V from battery or DC 5V from Adapter.
Extreme Vol. Limits:	DC 3.15V to DC 4.26V (Nominal DC 3.7V) (Note 1)
HW Version	G04_T107_PCB_V1.0
SW Version	I-MOBIL_4G_iM421_MX_V01
** Note1: The High Voltage DC 4.26V and Low Voltage 3.15V was declared by manufacturer, The EUT couldn't be operate normally with higher or lower voltage.	

1.2 RELATED SUBMITTAL(S) / GRANT (S)

This submittal(s) (test report) is intended for **FCC ID: 2AT55-IM421** filing to comply with the FCC Part 22H&27.

1.3 TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI/TIA-603-E-2016, FCC CFR 47 Part 2, Part 22, Part 24, Part 27, ANSI C63.26:2015.

1.4 TEST FACILITY

The test site used to collect the radiated data is located at:

ShenZhen NTEK Testing Technology Co., Ltd.

1/F, Building E, Fenda Science Park, Sanwei Community, Xixiang Street, Bao'an District, Shenzhen 518126 P.R.China.

The test site is constructed and calibrated to meet the FCC requirements in documents ANSI C63.26:2015& ANSI C63.4: 2014.

FCC Registration No.:463705

IC Registration No.:9270A-1,

CNAS Registration No.:L5516

MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95 %.

No.	Item	Uncertainty
1	Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	2.5dB

1.5 SPECIAL ACCESSORIES

The battery and the charger, earphone supplied by the applicant were used as accessories and being tested with EUT intended for FCC grant together.

1.6 WORST-CASE CONFIGURATION AND MODE

The worst-case scenario for all measurements is based on the investigation results.

The device has LTE Bands of: Band 4/5/7/13

The RB Size was selected to measure for peak or average ERP and EIRP, which was based on the conducted power verification baseline data.

For the fundamental investigation of radiated emissions, the EUT is investigated for vertical and horizontal antenna orientations and X Y and Z orientations of the EUT alone. After the investigations the worst case was determined to be at X orientation for all LTE bands.

2. SYSTEM TEST CONFIGURATION

2.1 EUT CONFIGURATION

The EUT configuration for testing is installed on RF field strength measurement to meet the Commission's requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2 EUT EXERCISE

The Transmitter was operated in the maximum output power mode through Communication Tester. The TX frequency was fixed which was for the purpose of the measurements.

2.3 CONFIGURATION OF EUT SYSTEM

Table 2-1 Equipment Used in EUT System

Item	Equipment	Model No.	ID or Specification	Note
1	4G feature phone	iM421	FCC ID: 2AT55-IM421	EUT

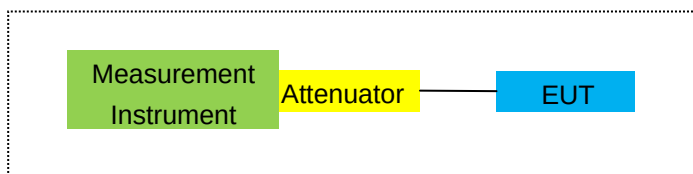
*Note: All the accessories have been used during the test.
the following "EUT" in setup diagram means EUT system.*

2.4 TEST SETUP

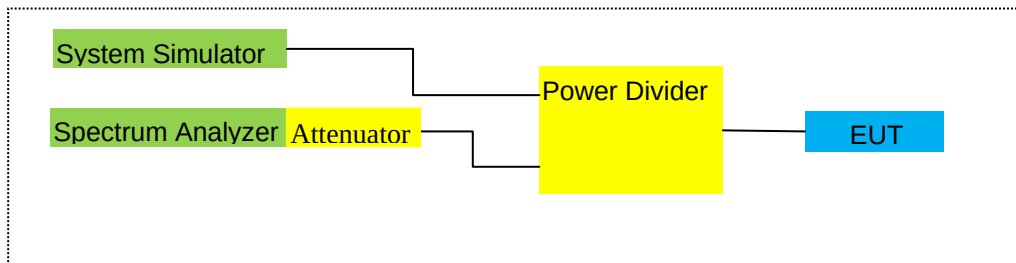
For Radiated Test Cases



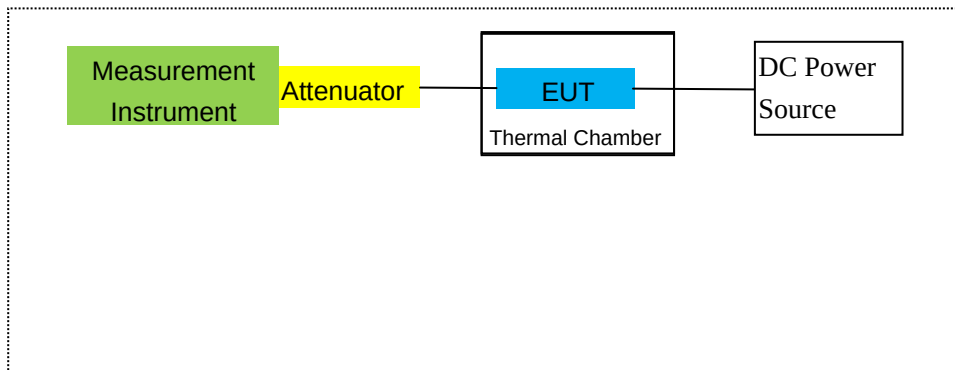
For Conducted Output Power



For Peak-to Average Ratio, Occupied Bandwidth, Conducted Band edge and Conducted Spurious Emission



For Frequency Stability



Note: EUT built-in battery-powered, the battery is fully-charged.

3.TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	MXA Signal Analyzer	Agilent	N9020A	MY49100060	2022.06.16	2023.06.15	1 year
2	Test Receiver	R&S	ESPI	101318	2023.03.27	2024.03.26	1 year
3	Bilog Antenna	TESEQ	CBL6111D	31216	2023.03.16	2024.03.15	1 year
4	50Ω Coaxial Switch	Anritsu	MP59B	6200983705	2023.05.06	2026.05.05	3 year
5	Horn Antenna	EM	EM-AH-10180	2011071402	2022.03.31	2025.03.30	3 year
6	Horn Ant	Schwarzbeck	BBHA 9170	9170-181	2022.11.07	2023.11.06	1 year
7	Amplifier	EM	EM-30180	060538	2022.06.17	2023.06.16	1 year
8	Loop Antenna	ARA	PLA-1030/B	1029	2022.11.04	2023.11.05	1 year
9	Power Meter	R&S	NRVS	100696	2022.06.17	2023.06.16	1 year
10	Power Sensor	R&S	URV5-Z4	0395.1619.05	2022.06.17	2023.06.16	1 year
11	Test Cable	N/A	R-01	N/A	2022.06.17	2025.06.16	3 year
12	Test Cable	N/A	R-02	N/A	2022.06.17	2025.06.16	3 year
13	Test Cable	N/A	R-03	N/A	2022.06.17	2025.06.16	3 year
14	Test Receiver	R&S	ESCI	101160	2023.03.27	2024.03.26	1 year
15	LISN	R&S	ENV216	101313	2023.03.27	2024.03.26	1 year
16	LISN	EMCO	3816/2	00042990	2023.03.27	2024.03.26	1 year
17	50Ω Coaxial Switch	Anritsu	MP59B	6200264417	2023.03.27	2024.03.26	1 year
18	Passive Voltage Probe	R&S	ESH2-Z3	100196	2023.03.27	2024.03.26	1 year
19	Test Cable	N/A	C01	N/A	2023.05.06	2026.05.05	3 year
20	Test Cable	N/A	C02	N/A	2023.05.06	2026.05.05	3 year
21	Test Cable	N/A	C03	N/A	2023.05.06	2026.05.05	3 year
22	Spectrum Analyzer	agilent	e4440a	us44300399	2023.03.27	2024.03.26	1 year
23	test receiver	R&S	ESCI	a0304218	2023.03.27	2024.03.26	1 year
24	Communication Tester	R&S	CMU200	A0304247	2022.06.16	2023.06.15	1 year
25	Thermal Chamber	Ten Billion	TTC-B3C	TBN-960502	2023.03.27	2024.03.26	1 year

26	DC Power Source	N/A	PS-6005D	2017040292 3	2023.05.06	2026.05.05	3 year
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Note: Each piece of equipment is scheduled for calibration once a year except the Test Cable& DC Power Source which is scheduled for calibration every 3 years.

4. OUTPUT POWER

4.1 OUTPUT POWER MEASUREMENT

LTE Measurement Procedure:

All LTE bands conducted power peak and average are obtained from the CMW500 telecommunication test set. The following tests were conducted according to the test requirements outlined in section 6.2 of the 3GPP TS36.101 specification.

UE Power Class: 3 (23 +/- 2dBm). The allowed Maximum Power Reduction (MPR) for the maximum output power due to higher order modulation and transmit bandwidth configuration (resource blocks) is specified in Table 6.2.3-1 of the 3GPP TS36.101.

Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3

Modulation	Channel bandwidth / Transmission bandwidth (RB)						MPR (dB)
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2

The allowed A-MPR values specified below in Table 6.2.4.-1 of 3GPP TS36.101 are in addition to the allowed MPR requirements. All the measurements below were performed with A-MPR disabled, by using Network Signaling Value of "NS_01".3

Table 6.2.4-1: Additional Maximum Power Reduction (A-MPR)

Network Signalling value	Requirements (sub-clause)	E-UTRA Band	Channel bandwidth (MHz)	Resources Blocks (N_{RB})	A-MPR (dB)
NS_01	6.6.2.1.1	Table 5.5-1	1.4, 3, 5, 10, 15, 20	Table 5.6-1	NA
NS_03	6.6.2.2.1	2, 4, 10, 23, 25, 35, 36	3	>5	≤ 1
			5	>6	≤ 1
			10	>6	≤ 1
			15	>8	≤ 1
			20	>10	≤ 1
NS_04	6.6.2.2.2	41	5	>6	≤ 1
			10, 15, 20	See Table 6.2.4-4	
NS_05	6.6.3.3.1	1	10, 15, 20	≥ 50	≤ 1
NS_06	6.6.2.2.3	12, 13, 14, 17	1.4, 3, 5, 10	Table 5.6-1	n/a
NS_07	6.6.2.2.3 6.6.3.3.2	13	10	Table 6.2.4-2	Table 6.2.4-2
NS_08	6.6.3.3.3	19	10, 15	> 44	≤ 3
NS_09	6.6.3.3.4	21	10, 15	> 40	≤ 1
				> 55	≤ 2
NS_10		20	15, 20	Table 6.2.4-3	Table 6.2.4-3
NS_11	6.6.2.2.1	23 ¹	1.4, 3, 5, 10	Table 6.2.4-5	Table 6.2.4-5
..					
NS_32	-	-	-	-	-

Note 1: Applies to the lower block of Band 23, i.e. a carrier placed in the 2000-2010 MHz region.

Test data reference attachment.

5. OCCUPIED BANDWIDTH

RULE PART(S)

FCC: §2.1049

LIMITS

For reporting purposes only

TEST PROCEDURE

The transmitter output was connected to a calibrated coaxial cable and coupler, the other end of which was connected to a spectrum analyzer. The occupied bandwidth was measured with the spectrum analyzer at the low, middle and high channel in each band. The -26dB bandwidth was also measured and recorded.

MODES TESTED

☐

Band 4/5/7/13

RESULTS

PASS

Test data reference attachment.

6. BANDEDGE AND EMISSION MASK

RULE PART(S)

FCC: §2.1051, §22.901, §22.917, §24.238, §27.53, and §90.691

FCC: §22.359

LIMITS

FCC: §22.917, §24.238, §27.53

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.

(m)(4) For mobile digital stations, the attenuation factor shall be not less than $40 + 10 \log (P)$ dB on all frequencies between the channel edge and 5 megahertz from the channel edge, $43 + 10 \log (P)$ dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and $55 + 10 \log (P)$ dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less than $43 + 10 \log (P)$ 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. Show citation box.

(c)(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;

FCC: §90.691 Emission mask requirements for EA-based systems.

(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 $43 + 10 \log_{10}(P)$ 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 37.5 kHz.

TEST PROCEDURE

The transmitter output was connected to a CMW500 Test Set and configured to operate at maximum power. The band edge emissions were measured at the required operating frequencies in each band on the Spectrum Analyzer.

For each band edge measurement:

Set the spectrum analyzer span to include the block edge frequency

Set a marker to point the corresponding band edge frequency in each test case.

Set resolution bandwidth to at least 1% of emission bandwidth.

MODES TESTED

Band 4/5/7/13

RESULTS

Test data reference attachment.

7. OUT OF BAND EMISSIONS

RULE PART(S)

FCC: §2.1051, §22.901, §22.917, §24.238, §27.53 and §90.691

LIMITS

1. 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.
2. The Band 7/41 emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $55 + 10 \log (P)$ dB.

TEST PROCEDURE

The RF output of the transmitter was connected to a spectrum analyzer through a calibrated coaxial cable. Sufficient scans were taken to show the out-of-band Emissions, if any, up to 10th harmonic. Multiple sweeps were recorded in maximum hold mode using a peak detector to ensure that the worst-case emissions were caught.

For each out of band emissions measurement:

- ☐
- ☐ Set RBW & VBW to 100 kHz for the measurement below 1 GHz, and 1 MHz for the measurement above 1 GHz.

MODES TESTED

- ☐ Band 4/5/7/13
- ☐

7.1 MEASUREMENT METHOD

The test set up and general procedure is similar to conducted peak output power test. Only different for setting the measurement configuration of the measuring instrument of Spectrum Analyzer.

Test data reference attachment.

8. RADIATED MEASUREMENT

8.1. RADIATED POWER (ERP & EIRP)

RULE PART(S)

FCC: §2.1046, §22.913, §24.232, §27.50 and §90.635

LIMITS:

22.913(a) - The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

27.50 (c) (10) the following power and antenna height requirements apply to stations transmitting in the 698–746 MHz band, the portable stations (hand-held devices) are limited to 3 watts ERP.

27.50 (b)(10) Portable stations (hand-held devices) transmitting in the 746–757 MHz, 758–763 MHz, 776–793 MHz, and 805–806 MHz bands are limited to 3 watts ERP.

27.50 (d)(4) The following power and antenna height requirements apply to stations transmitting in the 1710–1755 MHz and 2110–2155 MHz bands: Fixed, mobile, and portable (hand-held) stations operating in the 1710–1755 MHz band are limited to 1 watt EIRP.

27.50 (h)(2) 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.

90.635(b) The maximum output power of the transmitter for mobile stations is 100 watts (20 dBw).

TEST PROCEDURE

ANSI/TIA-603-E Clause 2.2.17

KDB 971168 v02r01 RF power output using broadband peak and average power meter method.

KDB 971168 D01 Power Meas License Digital Systems v02r01, "Measurement Guidance for Certification of Licensed Digital Transmitters"

MODES TESTED

☐ Band 4/5/7/13

RESULTS

Pass

8.2 LTE BAND 4

Radiated Power (EIRP) for Band 4									
Mode	RB/RB SIZE	Frequency	Result						Conclusion
			SG Level	Cable Loss (dBm)	Factor (dB)	Max. EIRP	Max. EIRP	Polarization Of Max. ERP	
						Average	Average		
						(dBm)	(mW)		
1.4MHz Band QPSK	1/#Mid	1710.7	-1.78	3.12	27.58	22.68	185.353	Horizontal	Pass
		1732.5	-1.69	3.27	27.61	22.65	184.077	Horizontal	Pass
		1754.3	-1.79	3.29	27.63	22.55	179.887	Horizontal	Pass
3.0MHz Band QPSK	1/#Mid	1711.5	-1.84	3.13	27.61	22.64	183.654	Horizontal	Pass
		1732.5	-1.79	3.27	27.61	22.55	179.887	Horizontal	Pass
		1753.5	-1.66	3.30	27.62	22.66	184.502	Horizontal	Pass
5.0MHz Band QPSK	1/#Mid	1712.5	-1.83	3.13	27.63	22.67	184.927	Horizontal	Pass
		1732.5	-1.79	3.27	27.61	22.55	179.887	Horizontal	Pass
		1752.5	-1.74	3.30	27.60	22.56	180.302	Horizontal	Pass
10.0MHz Band QPSK	1/#Mid	1715	-1.84	3.15	27.64	22.65	184.077	Horizontal	Pass
		1732.5	-1.63	3.31	27.61	22.67	184.927	Horizontal	Pass
		1750	-1.63	3.33	27.59	22.63	183.231	Horizontal	Pass
15.0MHz Band QPSK	1/#Mid	1717.5	-1.95	3.15	27.65	22.55	179.887	Horizontal	Pass
		1732.5	-1.70	3.31	27.61	22.60	181.970	Horizontal	Pass
		1747.5	-1.67	3.33	27.57	22.57	180.717	Horizontal	Pass
20.0MHz Band QPSK	1/#Mid	1720	-1.95	3.17	27.66	22.54	179.473	Horizontal	Pass
		1732.5	-1.63	3.32	27.61	22.66	184.502	Horizontal	Pass
		1745	-1.62	3.36	27.56	22.58	181.134	Horizontal	Pass
1.4MHz Band QPSK	1/#Mid	1710.7	-1.84	3.12	27.58	22.62	182.810	Vertical	Pass
		1732.5	-1.77	3.27	27.61	22.57	180.717	Vertical	Pass
		1754.3	-1.69	3.29	27.63	22.65	184.077	Vertical	Pass
3.0MHz Band QPSK	1/#Mid	1711.5	-1.79	3.13	27.61	22.69	185.780	Vertical	Pass
		1732.5	-1.73	3.27	27.61	22.61	182.390	Vertical	Pass
		1753.5	-1.64	3.30	27.62	22.68	185.353	Vertical	Pass
5.0MHz Band QPSK	1/#Mid	1712.5	-1.89	3.13	27.63	22.61	182.390	Vertical	Pass
		1732.5	-1.67	3.27	27.61	22.67	184.927	Vertical	Pass
		1752.5	-1.76	3.30	27.60	22.54	179.473	Vertical	Pass
10.0MHz Band QPSK	1/#Mid	1715	-1.82	3.15	27.64	22.67	184.927	Vertical	Pass
		1732.5	-1.70	3.31	27.61	22.60	181.970	Vertical	Pass
		1750	-1.57	3.33	27.59	22.69	185.780	Vertical	Pass

15.0MHz Band QPSK	1/#Mid	1717.5	-1.89	3.15	27.65	22.61	182.390	Vertical	Pass
		1732.5	-1.68	3.31	27.61	22.62	182.810	Vertical	Pass
		1747.5	-1.68	3.33	27.57	22.56	180.302	Vertical	Pass
20.0MHz Band QPSK	1/#Mid	1720	-1.76	3.17	27.66	22.73	187.499	Vertical	Pass
		1732.5	-1.54	3.32	27.61	22.75	188.365	Vertical	Pass
		1745	-1.48	3.36	27.56	22.72	187.068	Vertical	Pass

Radiated Power (EIRP) for Band 4									
Mode	RB/RB SIZE	Frequency	Result					Polarization Of Max. ERP	Conclusion
			SG Level	Cable Loss (dBm)	Factor (dB)	Max. EIRP	Max. EIRP		
			(dBm)			Average	Average		
						(dBm)	(mW)		
1.4MHz Band 16 QAM	1/#Mid	1710.7	-2.13	3.12	27.58	22.33	171.002	Horizontal	Pass
		1732.5	-1.98	3.27	27.61	22.36	172.187	Horizontal	Pass
		1754.3	-2.00	3.29	27.63	22.34	171.396	Horizontal	Pass
3.0MHz Band 16 QAM	1/#Mid	1711.5	-2.21	3.13	27.61	22.27	168.655	Horizontal	Pass
		1732.5	-1.94	3.27	27.61	22.40	173.780	Horizontal	Pass
		1753.5	-2.05	3.30	27.62	22.27	168.655	Horizontal	Pass
5.0MHz Band 16 QAM	1/#Mid	1712.5	-2.20	3.13	27.63	22.30	169.824	Horizontal	Pass
		1732.5	-2.06	3.27	27.61	22.28	169.044	Horizontal	Pass
		1752.5	-1.95	3.30	27.60	22.35	171.791	Horizontal	Pass
10.0MHz Band 16 QAM	1/#Mid	1715	-2.24	3.15	27.64	22.25	167.880	Horizontal	Pass
		1732.5	-1.95	3.31	27.61	22.35	171.791	Horizontal	Pass
		1750	-1.99	3.33	27.59	22.27	168.655	Horizontal	Pass
15.0MHz Band 16 QAM	1/#Mid	1717.5	-2.12	3.15	27.65	22.38	172.982	Horizontal	Pass
		1732.5	-2.03	3.31	27.61	22.27	168.655	Horizontal	Pass
		1747.5	-1.87	3.33	27.57	22.37	172.584	Horizontal	Pass
20.0MHz Band 16 QAM	1/#Mid	1720	-2.19	3.17	27.66	22.30	169.824	Horizontal	Pass
		1732.5	-1.94	3.32	27.61	22.35	171.791	Horizontal	Pass
		1745	-1.81	3.36	27.56	22.39	173.380	Horizontal	Pass
1.4MHz Band 16 QAM	1/#Mid	1710.7	-2.09	3.12	27.58	22.37	172.584	Vertical	Pass
		1732.5	-1.98	3.27	27.61	22.36	172.187	Vertical	Pass
		1754.3	-1.99	3.29	27.63	22.35	171.791	Vertical	Pass
3.0MHz Band 16 QAM	1/#Mid	1711.5	-2.23	3.13	27.61	22.25	167.880	Vertical	Pass
		1732.5	-2.08	3.27	27.61	22.26	168.267	Vertical	Pass
		1753.5	-2.00	3.30	27.62	22.32	170.608	Vertical	Pass
5.0MHz	1/#Mid	1712.5	-2.20	3.13	27.63	22.30	169.824	Vertical	Pass

Band 16		1732.5	-2.11	3.27	27.61	22.23	167.109	Vertical	Pass
QAM		1752.5	-2.05	3.30	27.60	22.25	167.880	Vertical	Pass
10.0MHz	1/#Mid	1715	-2.24	3.15	27.64	22.25	167.880	Vertical	Pass
Band 16		1732.5	-1.99	3.31	27.61	22.31	170.216	Vertical	Pass
QAM		1750	-1.97	3.33	27.59	22.29	169.434	Vertical	Pass
15.0MHz	1/#Mid	1717.5	-2.22	3.15	27.65	22.28	169.044	Vertical	Pass
Band 16		1732.5	-2.02	3.31	27.61	22.28	169.044	Vertical	Pass
QAM		1747.5	-1.86	3.33	27.57	22.38	172.982	Vertical	Pass
20.0MHz	1/#Mid	1720	-2.08	3.17	27.66	22.41	174.181	Vertical	Pass
Band 16		1732.5	-1.85	3.32	27.61	22.44	175.388	Vertical	Pass
QAM		1745	-1.79	3.36	27.56	22.41	174.181	Vertical	Pass

Note:

SG Level= Signal generator output

Max. EIRP Average (dBm)= Antenna Gain(dB)+ SG Level (dBm)- Cable Loss(dBm)

Factor Gain(dB)=Antenna Gain(dB) + Amplifier Factor (dB)

8.3 LTE BAND 5

Radiated Power (ERP) for Band 5										
Mode	RB/RB SIZE	Frequency	Result							Conclusi on
			SG	Cable Loss (dBm)	Factor (dB)	Correction		Max. ERP	Polarization Of Max. ERP	
			(dBm)			(dB)	Average	Average		
							(dBm)	(mW)		
1.4MHz Band QPSK	1/#Mid	824.7	5.02	2.01	19.68	2.15	20.54	113.240	Horizontal	Pass
		836.5	5.00	2.01	19.77	2.15	20.61	115.080	Horizontal	Pass
		848.3	4.91	2.02	19.82	2.15	20.56	113.763	Horizontal	Pass
3.0MHz Band QPSK	1/#Mid	825.5	5.10	2.01	19.70	2.15	20.64	115.878	Horizontal	Pass
		836.5	5.01	2.01	19.77	2.15	20.62	115.345	Horizontal	Pass
		847.5	4.93	2.02	19.81	2.15	20.57	114.025	Horizontal	Pass
5.0MHz Band QPSK	1/#Mid	826.5	5.02	2.01	19.71	2.15	20.57	114.025	Horizontal	Pass
		836.5	4.95	2.01	19.77	2.15	20.56	113.763	Horizontal	Pass
		846.5	5.03	2.02	19.79	2.15	20.65	116.145	Horizontal	Pass
10.0MH z Band QPSK	1/#Mid	829	4.91	2.01	19.73	2.15	20.48	111.686	Horizontal	Pass
		836.5	4.91	2.01	19.77	2.15	20.52	112.720	Horizontal	Pass
		844	4.96	2.02	19.78	2.15	20.57	114.025	Horizontal	Pass
1.4MHz Band QPSK	1/#Mid	824.7	5.02	2.01	19.68	2.15	20.54	113.240	Vertical	Pass
		836.5	4.92	2.01	19.77	2.15	20.53	112.980	Vertical	Pass
		848.3	4.98	2.02	19.82	2.15	20.63	115.611	Vertical	Pass
3.0MHz Band QPSK	1/#Mid	825.5	5.02	2.01	19.70	2.15	20.56	113.763	Vertical	Pass
		836.5	4.97	2.01	19.77	2.15	20.58	114.288	Vertical	Pass
		847.5	4.90	2.02	19.81	2.15	20.54	113.240	Vertical	Pass
5.0MHz Band QPSK	1/#Mid	826.5	4.94	2.01	19.71	2.15	20.49	111.944	Vertical	Pass
		836.5	5.03	2.01	19.77	2.15	20.64	115.878	Vertical	Pass
		846.5	4.95	2.02	19.79	2.15	20.57	114.025	Vertical	Pass
10.0MH z Band QPSK	1/#Mid	829	5.11	2.01	19.73	2.15	20.68	116.950	Vertical	Pass
		836.5	5.06	2.01	19.77	2.15	20.67	116.681	Vertical	Pass
		844	5.07	2.02	19.78	2.15	20.68	116.950	Vertical	Pass

Radiated Power (ERP) for Band 5										
Mode	RB/RB SIZE	Frequency	Result							Conclu sion
			SG Level	Cable Loss (dBm)	Factor (dB)	Correction	Max. ERP	Max. ERP	Polarization Of Max. ERP	
			(dBm)			(dB)	Average	Average		
							(dBm)	(mW)		
1.4MHz Band 16 QAM	1/#Mid	824.7	4.90	2.01	19.68	2.15	20.42	110.154	Horizontal	Pass
		836.5	4.81	2.01	19.77	2.15	20.42	110.154	Horizontal	Pass
		848.3	4.84	2.02	19.82	2.15	20.49	111.944	Horizontal	Pass
3.0MHz Band 16 QAM	1/#Mid	825.5	5.00	2.01	19.70	2.15	20.54	113.240	Horizontal	Pass
		836.5	4.79	2.01	19.77	2.15	20.40	109.648	Horizontal	Pass
		847.5	4.76	2.02	19.81	2.15	20.40	109.648	Horizontal	Pass
5.0MHz Band 16 QAM	1/#Mid	826.5	4.89	2.01	19.71	2.15	20.44	110.662	Horizontal	Pass
		836.5	4.87	2.01	19.77	2.15	20.48	111.686	Horizontal	Pass
		846.5	4.79	2.02	19.79	2.15	20.41	109.901	Horizontal	Pass
10.0MH z Band 16 QAM	1/#Mid	829	4.88	2.01	19.73	2.15	20.45	110.917	Horizontal	Pass
		836.5	4.92	2.01	19.77	2.15	20.53	112.980	Horizontal	Pass
		844	4.93	2.02	19.78	2.15	20.54	113.240	Horizontal	Pass
1.4MHz Band 16 QAM	1/#Mid	824.7	4.99	2.01	19.68	2.15	20.51	112.460	Vertical	Pass
		836.5	4.83	2.01	19.77	2.15	20.44	110.662	Vertical	Pass
		848.3	4.78	2.02	19.82	2.15	20.43	110.408	Vertical	Pass
3.0MHz Band 16 QAM	1/#Mid	825.5	4.96	2.01	19.70	2.15	20.50	112.202	Vertical	Pass
		836.5	4.91	2.01	19.77	2.15	20.52	112.720	Vertical	Pass
		847.5	4.84	2.02	19.81	2.15	20.48	111.686	Vertical	Pass
5.0MHz Band 16 QAM	1/#Mid	826.5	4.96	2.01	19.71	2.15	20.51	112.460	Vertical	Pass
		836.5	4.81	2.01	19.77	2.15	20.42	110.154	Vertical	Pass
		846.5	4.87	2.02	19.79	2.15	20.49	111.944	Vertical	Pass
10.0MH z Band 16 QAM	1/#Mid	829	4.99	2.01	19.73	2.15	20.56	113.763	Vertical	Pass
		836.5	4.94	2.01	19.77	2.15	20.55	113.501	Vertical	Pass
		844	4.95	2.02	19.78	2.15	20.56	113.763	Vertical	Pass

Note:

SG Level= Signal generator output

Max. EIRP Average (dBm)= Antenna Gain(dB)+ SG Level (dBm)- Cable Loss(dBm)

Factor Gain(dB)=Antenna Gain(dB) + Amplifier Factor (dB)

8.4 LTE BAND 7

Radiated Power (EIRP) for Band 7									
Mode	RB/RB SIZE	Frequency	Result						Conclusion
			SG Level	Cable Loss	Factor	Max. EIRP	Max. EIRP	Polarization	
			(dBm)	(dBm)	(dB)	Average	Average	Of Max. ERP	
						(dBm)	(mW)		
5.0MHz Band QPSK	1/#Mid	2502.5	-0.62	4.54	27.75	22.59	181.552	Horizontal	Pass
		2535	-0.46	4.69	27.72	22.57	180.717	Horizontal	Pass
		2567.5	-0.38	4.71	27.71	22.62	182.810	Horizontal	Pass
10.0MHz Band QPSK	1/#Mid	2505	-0.66	4.55	27.76	22.55	179.887	Horizontal	Pass
		2535	-0.41	4.69	27.72	22.62	182.810	Horizontal	Pass
		2565	-0.44	4.72	27.70	22.54	179.473	Horizontal	Pass
15.0MHz Band QPSK	1/#Mid	2507.5	-0.67	4.55	27.77	22.55	179.887	Horizontal	Pass
		2535	-0.51	4.69	27.72	22.52	178.649	Horizontal	Pass
		2562.5	-0.38	4.72	27.69	22.59	181.552	Horizontal	Pass
20.0MHz Band QPSK	1/#Mid	2510	-0.74	4.57	27.78	22.47	176.604	Horizontal	Pass
		2535	-0.47	4.73	27.72	22.52	178.649	Horizontal	Pass
		2560	-0.44	4.75	27.68	22.49	177.419	Horizontal	Pass
5.0MHz Band QPSK	1/#Mid	2502.5	-0.66	4.54	27.75	22.55	179.887	Vertical	Pass
		2535	-0.50	4.69	27.72	22.53	179.061	Vertical	Pass
		2567.5	-0.48	4.71	27.71	22.52	178.649	Vertical	Pass
10.0MHz Band QPSK	1/#Mid	2505	-0.68	4.55	27.76	22.53	179.061	Vertical	Pass
		2535	-0.43	4.69	27.72	22.60	181.970	Vertical	Pass
		2565	-0.49	4.72	27.70	22.49	177.419	Vertical	Pass
15.0MHz Band QPSK	1/#Mid	2507.5	-0.75	4.55	27.77	22.47	176.604	Vertical	Pass
		2535	-0.45	4.69	27.72	22.58	181.134	Vertical	Pass
		2562.5	-0.52	4.72	27.69	22.45	175.792	Vertical	Pass
20.0MHz Band QPSK	1/#Mid	2510	-0.57	4.57	27.78	22.64	183.654	Vertical	Pass
		2535	-0.36	4.73	27.72	22.63	183.231	Vertical	Pass
		2560	-0.31	4.75	27.68	22.62	182.810	Vertical	Pass

Radiated Power (EIRP) for Band 7												
Mode	RB/RB SIZE	Frequency	Result						Conclusion			
			SG Level	Cable Loss	Antenna Factor	Max. EIRP	Max. EIRP	Polarization Of Max. ERP				
						(dBm)	(dBm)			(dB)	Average	Average
											(dBm)	(mW)
5.0MHz Band 16 QAM	1/#Mid	2502.5	1.74	4.54	27.75	24.95	312.608	Horizontal	Pass			
		2535	1.95	4.69	27.72	24.98	314.775	Horizontal	Pass			
		2567.5	1.91	4.71	27.71	24.91	309.742	Horizontal	Pass			
10.0MHz Band 16 QAM	1/#Mid	2505	1.79	4.55	27.76	25.00	316.228	Horizontal	Pass			
		2535	1.88	4.69	27.72	24.91	309.742	Horizontal	Pass			
		2565	1.88	4.72	27.70	24.86	306.196	Horizontal	Pass			
15.0MHz Band 16 QAM	1/#Mid	2507.5	1.70	4.55	27.77	24.92	310.456	Horizontal	Pass			
		2535	1.84	4.69	27.72	24.87	306.902	Horizontal	Pass			
		2562.5	2.04	4.72	27.69	25.01	316.957	Horizontal	Pass			
20.0MHz Band 16 QAM	1/#Mid	2510	1.73	4.57	27.78	24.94	311.889	Horizontal	Pass			
		2535	2.02	4.73	27.72	25.01	316.957	Horizontal	Pass			
		2560	2.02	4.75	27.68	24.95	312.608	Horizontal	Pass			
5.0MHz Band 16 QAM	1/#Mid	2502.5	1.71	4.54	27.75	24.92	310.456	Vertical	Pass			
		2535	1.93	4.69	27.72	24.96	313.329	Vertical	Pass			
		2567.5	2.00	4.71	27.71	25.00	316.228	Vertical	Pass			
10.0MHz Band 16 QAM	1/#Mid	2505	1.78	4.55	27.76	24.99	315.500	Vertical	Pass			
		2535	1.84	4.69	27.72	24.87	306.902	Vertical	Pass			
		2565	2.01	4.72	27.70	24.99	315.500	Vertical	Pass			
15.0MHz Band 16 QAM	1/#Mid	2507.5	1.69	4.55	27.77	24.91	309.742	Vertical	Pass			
		2535	1.95	4.69	27.72	24.98	314.775	Vertical	Pass			
		2562.5	1.90	4.72	27.69	24.87	306.902	Vertical	Pass			
20.0MHz Band 16 QAM	1/#Mid	2510	1.86	4.57	27.78	25.07	321.366	Vertical	Pass			
		2535	2.03	4.73	27.72	25.02	317.687	Vertical	Pass			
		2560	2.10	4.75	27.68	25.03	318.420	Vertical	Pass			

Note:

SG Level= Signal generator output

Max. EIRP Average (dBm)= Antenna Factor (dB)+ SG Level (dBm)- Cable Loss(dBm)

8.5 LTE BAND 13

Radiated Power (ERP) for Band 13										
Mode	RB/RB SIZE	Frequency	Result							Conclusion
			SG Level (dBm)	Cable Loss (dBm)	Antenna Gain (dB)	Correction (dB)	Max. ERP Average (dBm)	Max. ERP Average (mW)	Polarization Of Max. ERP	
5.0MHz Band QPSK	1/#Mid	779.5	2.51	1.95	19.23	2.15	17.64	58.076	Vertical	Pass
		782	2.42	1.95	19.26	2.15	17.58	57.280	Vertical	Pass
		784.5	2.44	1.96	19.33	2.15	17.66	58.345	Vertical	Pass
10.0MHz Band QPSK	1/#Mid	782	2.48	1.95	19.25	2.15	17.63	57.943	Vertical	Pass
5.0MHz Band QPSK	1/#Mid	779.5	2.52	1.95	19.23	2.15	17.65	58.210	Horizontal	Pass
		782	2.49	1.95	19.26	2.15	17.65	58.210	Horizontal	Pass
		784.5	2.38	1.96	19.33	2.15	17.60	57.544	Horizontal	Pass
10.0MHz Band QPSK	1/#Mid	782	2.54	1.95	19.25	2.15	17.69	58.749	Horizontal	Pass

Radiated Power (ERP) for Band 13										
Mode	RB/RB SIZE	Frequency	Result							Conclusion
			SG Level (dBm)	Cable Loss (dBm)	Antenna Gain (dB)	Correction (dB)	Max. EIRP Average (dBm)	Max. EIRP Average (mW)	Polarization Of Max. ERP	
5.0MHz Band QPSK	1/#Mid	779.5	1.75	1.95	19.23	2.15	16.88	48.753	Vertical	Pass
		782	1.76	1.95	19.26	2.15	16.92	49.204	Vertical	Pass
		784.5	1.75	1.96	19.33	2.15	16.97	49.774	Vertical	Pass
10.0MHz Band QPSK	1/#Mid	782	1.82	1.95	19.25	2.15	16.97	49.774	Vertical	Pass
5.0MHz Band QPSK	1/#Mid	779.5	1.71	1.95	19.23	2.15	16.84	48.306	Horizontal	Pass
		782	1.77	1.95	19.26	2.15	16.93	49.317	Horizontal	Pass
		784.5	1.72	1.96	19.33	2.15	16.94	49.431	Horizontal	Pass
10.0MHz Band QPSK	1/#Mid	782	1.87	1.95	19.25	2.15	17.02	50.350	Horizontal	Pass

Note:

ERP=EIRP-2.15

SG Level= Signal generator output

Max. EIRP Average (dBm)= Antenna Factor (dB)+ SG Level (dBm)- Cable Loss(dBm)

9. SPURIOUS RADIATION EMISSION

RULE PART(S)

FCC: §2.1053, §22.917, §24.238, §27.53 and §90.691

LIMIT

§22.917 (e) and §24.238 and §90.691 (a): Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log (P)$ dB.

§27.53 (g) For operations in the 698–746 MHz 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.

§27.53 (h) For operations in the 1710–1755 MHz and 2110–2155 MHz bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least $43 + 10 \log_{10}(P)$ dB.

TEST PROCEDURE

For Cellular equipment - Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. 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. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 100 kHz or 1 percent of emission bandwidth, as specified). 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.

For PCS equipment - Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 MHz or 1 percent of emission bandwidth, as specified). 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.

The unwanted emission power shall be measured with a resolution bandwidth of at least 1% of the occupied bandwidth in the 1 MHz band immediately outside and adjacent to the channel edge of the equipment. Beyond the 1 MHz band immediately outside the channel edge of the equipment, a resolution bandwidth of 1 MHz shall be employed. A narrower resolution bandwidth is allowed to be used provided that the measured power is integrated over the full required measurement bandwidth of 1 MHz or 1% of the occupied bandwidth as applicable.

The power of any unwanted emissions measured from the channel edge of the equipment shall be attenuated below the transmitter power, P (dBW), as follows:

- a. for base station and subscriber equipment, other than mobile subscriber equipment, the attenuation shall not be less than $43 + 10 \log_{10}(p)$, dB; and
- b. for mobile subscriber equipment, the attenuation shall not be less than $43 + 10 \log_{10}(p)$, dB at the channel edges and $55 + 10 \log_{10}(p)$ at 5.5 MHz away and beyond the channel edges where p in (a) and (b) is the transmitter power measured in watts.

MODES TESTED

LTE Band 4/5/7/13

RESULTS

PASS

9.1 LTE BAND 4

QPSK EIRP POWER FOR LTE BAND 4 (1.4MHZ BANDWIDTH)

Test Results for Low Channel 1710.7MHz							
Frequency(MHz)	SG Level(dBm)	Cable Loss(dB)	Antenna Gain(dB)	Absolute Level(dBm)	Limit (dBm)	Margin(dBm)	Polarity
3421.4	-48.38	4.02	29.80	-22.60	-13	-9.60	Horizontal
3421.4	-46.13	4.02	29.80	-20.35	-13	-7.35	Vertical
5132.1	-49.67	5.24	35.84	-19.07	-13	-6.07	Vertical
5132.1	-50.96	5.24	35.84	-20.36	-13	-7.36	Horizontal
201.0	-43.95	1.68	16.04	-29.59	-13	-16.59	Vertical
327.5	-38.76	1.78	17.74	-22.80	-13	-9.80	Horizontal
Test Results for Mid Channel 1732.5MHz							
3465.0	-51.80	4.03	30.00	-25.83	-13	-12.83	Horizontal
3465.0	-50.92	4.03	30.00	-24.95	-13	-11.95	Vertical
5197.5	-45.09	5.25	35.86	-14.48	-13	-1.48	Vertical
5197.5	-49.99	5.25	35.86	-19.38	-13	-6.38	Horizontal
208.1	-40.51	1.72	17.69	-24.54	-13	-11.54	Vertical
338.8	-43.16	1.62	16.02	-28.75	-13	-15.75	Horizontal
Test Results for High Channel 1754.3MHz							
3508.6	-47.73	4.05	30.01	-21.77	-13	-8.77	Horizontal
3508.6	-52.78	4.05	30.01	-26.82	-13	-13.82	Vertical
5262.9	-49.15	5.26	35.86	-18.55	-13	-5.55	Vertical
5262.9	-51.09	5.26	35.86	-20.49	-13	-7.49	Horizontal
184.7	-43.68	1.80	16.69	-28.79	-13	-15.79	Vertical
320.7	-34.70	1.75	16.66	-19.80	-13	-6.80	Horizontal

QPSK EIRP POWER FOR LTE BAND 4 (20.0MHZ BANDWIDTH)

Test Results for Low Channel 1720MHz							
Frequency(MHz)	SG Level(dBm)	Cable Loss(dB)	Antenna Gain(dB)	Absolute Level(dBm)	Limit (dBm)	Margin(dBm)	Polarity
3440.0	-53.56	4.02	29.80	-27.78	-13	-14.78	Horizontal
3440.0	-49.70	4.02	29.80	-23.92	-13	-10.92	Vertical
5160.0	-52.58	5.24	35.84	-21.98	-13	-8.98	Vertical
5160.0	-52.12	5.24	35.84	-21.52	-13	-8.52	Horizontal
184.9	-42.69	1.57	17.26	-27.00	-13	-14.00	Vertical
329.9	-37.93	1.78	16.35	-23.36	-13	-10.36	Horizontal
Test Results for Mid Channel 1732.5MHz							
3465.0	-53.48	4.03	30.00	-27.51	-13	-14.51	Horizontal
3465.0	-48.15	4.03	30.00	-22.18	-13	-9.18	Vertical
5197.5	-51.44	5.25	35.86	-20.83	-13	-7.83	Vertical
5197.5	-52.16	5.25	35.86	-21.55	-13	-8.55	Horizontal
205.7	-37.45	1.44	17.95	-20.94	-13	-7.94	Vertical
407.2	-43.19	1.65	16.09	-28.75	-13	-15.75	Horizontal
Test Results for High Channel 1745MHz							
3490.0	-49.15	4.05	27.68	-25.52	-13	-12.52	Horizontal
3490.0	-45.55	4.05	27.68	-21.92	-13	-8.92	Vertical
5235.0	-45.09	5.26	35.86	-14.49	-13	-1.49	Vertical
5235.0	-50.85	5.26	35.86	-20.25	-13	-7.25	Horizontal
178.8	-34.37	1.61	16.85	-19.13	-13	-6.13	Vertical
440.9	-44.23	1.61	15.19	-30.65	-13	-17.65	Horizontal

Note: P_{Mea}(dBm)= Power(dBm)+ AR_{pl} (dBm)

. Over Limit= : P_{Mea}(dBm)-Limit(dBm)

. Both QPSK and 16QAM has been tested, the worst case is QPSK mode, the report just reported the worst case.

9.2 LTE BAND 5

QPSK EIRP POWER FOR LTE BAND 5 (1.4MHZ BANDWIDTH)

Test Results for Low Channel 824.7MHz							
Frequency(MHz)	SG Level(dBm)	Cable Loss(dB)	Antenna Gain(dB)	Absolute Level(dBm)	Limit (dBm)	Margin(dBm)	Polarity
1649.4	-49.19	2.78	27.50	-24.47	-13	-11.47	Horizontal
1649.4	-52.79	2.78	27.50	-28.07	-13	-15.07	Vertical
2474.1	-46.77	2.90	27.80	-21.87	-13	-8.87	Vertical
2474.1	-51.68	2.90	27.80	-26.78	-13	-13.78	Horizontal
208.6	-37.98	1.76	17.59	-22.15	-13	-9.15	Vertical
334.1	-42.11	1.63	15.87	-27.87	-13	-14.87	Horizontal
Test Results For Mid Channel 836.5MHz							
1673.0	-51.89	2.80	27.48	-27.21	-13	-14.21	Horizontal
1673.0	-49.75	2.80	27.48	-25.07	-13	-12.07	Vertical
2509.5	-53.29	2.91	27.70	-28.50	-13	-15.50	Vertical
2509.5	-53.14	2.91	27.70	-28.35	-13	-15.35	Horizontal
212.5	-44.31	1.61	15.68	-30.24	-13	-17.24	Vertical
365.8	-40.92	1.59	17.52	-25.00	-13	-12.00	Horizontal
Test Results for High Channel 848.3MHz							
1696.6	-52.62	2.82	27.43	-28.01	-13	-15.01	Horizontal
1696.6	-49.70	2.82	27.43	-25.09	-13	-12.09	Vertical
2544.9	-48.30	2.92	27.74	-23.48	-13	-10.48	Vertical
2544.9	-52.94	2.92	27.74	-28.12	-13	-15.12	Horizontal
176.5	-36.05	1.69	16.67	-21.06	-13	-8.06	Vertical
330.5	-35.79	1.70	17.18	-20.31	-13	-7.31	Horizontal

QPSK EIRP POWER FOR LTE BAND 5 (10MHZ BANDWIDTH)

Test Results for Low Channel 829MHz							
Frequency(MHz)	SG Level(dBm)	Cable Loss(dB)	Antenna Gain(dB)	Absolute Level(dBm)	Limit (dBm)	Margin(dBm)	Polarity
1658.0	-46.71	2.78	27.50	-21.99	-13	-8.99	Horizontal
1658.0	-48.59	2.78	27.50	-23.87	-13	-10.87	Vertical
2487.0	-46.64	2.90	27.80	-21.74	-13	-8.74	Vertical
2487.0	-53.40	2.90	27.80	-28.50	-13	-15.50	Horizontal
201.6	-35.14	1.71	15.57	-21.28	-13	-8.28	Vertical
409.6	-37.35	1.34	16.40	-22.29	-13	-9.29	Horizontal
Test Results for Mid Channel 836.5MHz							
1673.0	-48.86	2.80	27.48	-24.18	-13	-11.18	Horizontal
1673.0	-53.24	2.80	27.48	-28.56	-13	-15.56	Vertical
2509.5	-44.66	2.91	27.70	-19.87	-13	-6.87	Vertical
2509.5	-51.81	2.91	27.70	-27.02	-13	-14.02	Horizontal
181.4	-42.28	1.44	17.04	-26.68	-13	-13.68	Vertical
438.3	-35.71	1.76	17.62	-19.85	-13	-6.85	Horizontal
Test Results for High Channel 844MHz							
1688.0	-50.02	2.82	27.43	-25.41	-13	-12.41	Horizontal
1688.0	-51.51	2.82	27.43	-26.90	-13	-13.90	Vertical
2532.0	-53.43	2.92	27.74	-28.61	-13	-15.61	Vertical
2532.0	-53.54	2.92	27.74	-28.72	-13	-15.72	Horizontal
212.6	-36.80	1.74	17.70	-20.84	-13	-7.84	Vertical
331.7	-34.88	1.41	17.46	-18.82	-13	-5.82	Horizontal

Note: P_{Mea}(dBm)= Power(dBm)+ AR_{pl} (dBm)

. Over Limit= : P_{Mea}(dBm)-Limit(dBm)

. Both QPSK and 16QAM has been tested, the worst case is QPSK mode, the report just reported the worst case.

9.3 LTE BAND 7

QPSK EIRP POWER FOR LTE BAND 7 (5.0MHZ BANDWIDTH)

Test Results for Low Channel 2502.5MHz							
Frequency(MHz)	SG Level(dBm)	Cable Loss(dB)	Antenna Factor(dB)	Absolute Level(dBm)	Limit (dBm)	Margin(dBm)	Polarity
5005.0	-59.03	5.23	35.81	-28.45	-25	-3.45	Horizontal
5005.0	-64.60	5.23	35.81	-34.02	-25	-9.02	Vertical
7507.5	-61.44	5.67	36.85	-30.26	-25	-5.26	Vertical
7507.5	-61.67	5.67	36.85	-30.49	-25	-5.49	Horizontal
206.4	-50.49	1.73	17.97	-34.25	-25	-9.25	Vertical
299.6	-47.89	1.38	15.11	-34.16	-25	-9.16	Horizontal
Test Results for Mid Channel 2535MHz							
5070.0	-59.91	5.23	35.82	-29.32	-25	-4.32	Horizontal
5070.0	-61.16	5.23	35.82	-30.57	-25	-5.57	Vertical
7605.0	-60.43	5.67	36.85	-29.25	-25	-4.25	Vertical
7605.0	-63.05	5.67	36.85	-31.87	-25	-6.87	Horizontal
207.6	-47.61	1.77	16.17	-33.20	-25	-8.20	Vertical
241.6	-48.70	1.63	15.21	-35.12	-25	-10.12	Horizontal
Test Results for High Channel 2567.5MHz							
5135.0	-61.91	5.24	35.83	-31.32	-25	-6.32	Horizontal
5135.0	-61.89	5.24	35.83	-31.30	-25	-6.30	Vertical
7702.5	-60.65	5.68	36.87	-29.46	-25	-4.46	Vertical
7702.5	-62.74	5.68	36.87	-31.55	-25	-6.55	Horizontal
200.0	-52.43	1.58	17.56	-36.45	-25	-11.45	Vertical
248.8	-49.17	1.45	16.58	-34.04	-25	-9.04	Horizontal

QPSK EIRP POWER FOR LTE BAND 7 (20.0MHZ BANDWIDTH)

Test Results for Low Channel 2510MHz							
Frequency(MHz)	SG Level(dBm)	Cable Loss(dB)	Antenna Factor(dB)	Absolute Level(dBm)	Limit (dBm)	Margin(dBm)	Polarity
5020.0	-61.26	5.23	35.82	-30.67	-25	-5.67	Horizontal
5020.0	-64.17	5.23	35.82	-33.58	-25	-8.58	Vertical
7530.0	-63.18	5.67	36.86	-31.99	-25	-6.99	Vertical
7530.0	-60.11	5.67	36.86	-28.92	-25	-3.92	Horizontal
201.1	-54.93	1.63	15.76	-40.80	-25	-15.80	Vertical
284.7	-47.33	1.71	15.44	-33.60	-25	-8.60	Horizontal
Test Results for Mid Channel 2535MHz							
5070.0	-63.32	5.23	35.82	-32.73	-25	-7.73	Horizontal
5070.0	-62.66	5.23	35.82	-32.07	-25	-7.07	Vertical
7605.0	-61.78	5.67	36.85	-30.60	-25	-5.60	Vertical
7605.0	-59.92	5.67	36.85	-28.74	-25	-3.74	Horizontal
189.4	-45.83	1.79	16.84	-30.77	-25	-5.77	Vertical
242.5	-53.94	1.71	17.64	-38.01	-25	-13.01	Horizontal
Test Results for High Channel 2560MHz							
5120.0	-60.36	5.24	35.83	-29.77	-25	-4.77	Horizontal
5120.0	-60.11	5.24	35.83	-29.52	-25	-4.52	Vertical
7680.0	-62.94	5.70	36.88	-31.76	-25	-6.76	Vertical
7680.0	-63.84	5.70	36.88	-32.66	-25	-7.66	Horizontal
211.3	-49.71	1.79	16.84	-34.65	-25	-9.65	Vertical
301.8	-48.01	1.71	17.64	-32.08	-25	-7.08	Horizontal

Note: Spurious Emission Level = Spectrum Analyzer Read Value + Cable Loss+ Antenna Factor + 11.74

. Margin = Spurious Emission Level - Limit

. Both QPSK and 16QAM has been tested, the worst case is QPSK mode, the report just reported the worst case.

9.4 LTE BAND 13

QPSK EIRP POWER FOR LTE BAND 13 (5MHZ BANDWIDTH)

Test Results for Low Channel 779.5MHz							
Frequency(MHz)	SG Level(dBm)	Cable Loss(dB)	Antenna Gain(dB)	Absolute Level(dBm)	Limit (dBm)	Margin(dBm)	Polarity
1559.0	-71.80	2.61	27.28	-47.13	-40	-7.13	Horizontal
1559.0	-71.19	2.61	27.28	-46.52	-40	-6.52	Vertical
2338.5	-70.63	2.87	27.59	-45.91	-13	-32.91	Vertical
2338.5	-71.49	2.87	27.59	-46.77	-13	-33.77	Horizontal
177.4	-68.48	1.71	16.15	-54.04	-13	-41.04	Vertical
345.7	-74.00	1.41	17.32	-58.09	-13	-45.09	Horizontal
Test Results For Mid Channel 782MHz							
1564.0	-70.24	2.62	27.30	-45.56	-40	-5.56	Horizontal
1564.0	-70.01	2.62	27.30	-45.33	-40	-5.33	Vertical
2346.0	-69.18	2.87	27.62	-44.43	-13	-31.43	Vertical
2346.0	-72.41	2.87	27.62	-47.66	-13	-34.66	Horizontal
196.3	-72.45	1.42	15.25	-58.63	-13	-45.63	Vertical
420.4	-72.59	1.36	17.19	-56.76	-13	-43.76	Horizontal
Test Results for High Channel 784.5MHz							
1569.0	-67.35	2.66	27.28	-42.73	-40	-2.73	Horizontal
1569.0	-76.92	2.66	27.28	-52.30	-40	-12.30	Vertical
2353.5	-73.68	2.88	27.60	-48.96	-13	-35.96	Vertical
2353.5	-74.02	2.88	27.60	-49.30	-13	-36.30	Horizontal
179.7	-69.09	1.32	17.29	-53.12	-13	-40.12	Vertical
385.6	-72.04	1.72	16.89	-56.87	-13	-43.87	Horizontal

QPSK EIRP POWER FOR LTE BAND 13 (10MHZ BANDWIDTH)

Test Results for Channel 782MHz							
Frequency(MHz)	SG Level(dBm)	Cable Loss(dB)	Antenna Gain(dB)	Absolute Level(dBm)	Limit (dBm)	Margin(dBm)	Polarity
1564.0	-72.79	2.62	27.30	-48.11	-40	-8.11	Horizontal
1564.0	-77.54	2.62	27.30	-52.86	-40	-12.86	Vertical
2346.0	-69.95	2.87	27.62	-45.20	-13	-32.20	Vertical
2346.0	-73.83	2.87	27.62	-49.08	-13	-36.08	Horizontal
187.4	-68.47	1.35	16.91	-52.91	-13	-39.91	Vertical
328.9	-74.73	1.62	16.31	-60.04	-13	-47.04	Horizontal

Note: P_{Mea}(dBm)= Power(dBm)+ AR_{pl} (dBm)

. Over Limit= : P_{Mea}(dBm)-Limit(dBm)

. Both QPSK and 16QAM has been tested, the worst case is QPSK mode, the report just reported the worst case.

10. FREQUENCY STABILITY

RULE PART(S)

FCC: §2.1055, §22.355, §24.235, §27.54, §90.213

LIMITS

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

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

TEST PROCEDURE

Use CMW 500 with Frequency Error measurement capability.

- ☐ Temp. = -30° to $+50^{\circ}\text{C}$
- ☐ Voltage = low voltage, DC 3.15V, Normal, DC 3.7V and High voltage, DC 4.26V.

Frequency Stability vs Temperature:

The EUT is placed inside a temperature chamber. The temperature is set to -30°C and allowed to stabilize. After sufficient soak time, the transmitting frequency error is measured. The temperature is increased by 10 degrees, allowed to stabilize and soak, and then the measurement is repeated. This is repeated until $+50^{\circ}\text{C}$ is reached.

Frequency Stability vs Voltage:

The peak frequency error is recorded (worst-case).

MODES TESTED

LTE Band 4/5/7/13

RESULTS

See the following pages.

10.1 LTE BAND 4

Band 4 QPSK, (20MHz BANDWIDTH RB size 100 RB Offset 0)

Frequency error vs. Voltage

Voltage [Vdc]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
3.15	1732.5	8.8	0.005053	2.5
3.7	1732.5	9.1	0.005273	2.5
4.26	1732.5	8.5	0.004914	2.5

Frequency error vs. Temperature

Temperature [°C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
Normal (25C)	1732.5	8.6	0.004967	2.5
Extreme (50C)	1732.5	8.8	0.005056	2.5
Extreme (40C)	1732.5	7.4	0.004289	2.5
Extreme (30C)	1732.5	5.5	0.003193	2.5
Extreme (10C)	1732.5	7.0	0.004052	2.5
Extreme (0C)	1732.5	9.8	0.005645	2.5
Extreme (-10C)	1732.5	8.0	0.004624	2.5
Extreme (-20C)	1732.5	7.3	0.004217	2.5
Extreme (-30C)	1732.5	7.9	0.004580	2.5

Band 4 16QAM, (5MHz BANDWIDTH RB size 25 RB Offset 0)

Frequency error vs. Voltage

Voltage [Vdc]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
3.15	1732.5	9.5	0.005491	2.5
3.7	1732.5	8.4	0.004860	2.5
4.26	1732.5	7.9	0.004580	2.5

Frequency error vs. Temperature

Temperature [°C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
Normal (25C)	1732.5	9.4	0.005410	2.5
Extreme (50C)	1732.5	8.9	0.005143	2.5
Extreme (40C)	1732.5	8.6	0.004941	2.5
Extreme (30C)	1732.5	8.7	0.005008	2.5
Extreme (10C)	1732.5	8.8	0.005081	2.5
Extreme (0C)	1732.5	7.8	0.004509	2.5
Extreme (-10C)	1732.5	8.9	0.005161	2.5
Extreme (-20C)	1732.5	9.2	0.005285	2.5
Extreme (-30C)	1732.5	8.0	0.004639	2.5

***Note:** Frequency error measurements were made by using the build-in capability of the Wireless Communication Test Set.

10.2 LTE BAND 5

Band 5 QPSK, (10MHz BANDWIDTH RB size 50 RB Offset 0)

Frequency error vs. Voltage

Voltage [Vdc]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
3.15	836.5	5.4	0.006470	2.5
3.7	836.5	6.9	0.008236	2.5
4.26	836.5	5.1	0.006088	2.5

Frequency error vs. Temperature

Temperature [°C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
Normal (25C)	836.5	6.0	0.007189	2.5
Extreme (50C)	836.5	6.1	0.007276	2.5
Extreme (40C)	836.5	5.9	0.007071	2.5
Extreme (30C)	836.5	6.1	0.007260	2.5
Extreme (10C)	836.5	5.8	0.006941	2.5
Extreme (0C)	836.5	5.2	0.006247	2.5
Extreme (-10C)	836.5	6.0	0.007205	2.5
Extreme (-20C)	836.5	5.9	0.007079	2.5
Extreme (-30C)	836.5	6.4	0.007626	2.5

Band 5 16QAM, (5MHz BANDWIDTH RB size 25 RB Offset 0)

Frequency error vs. Voltage

Voltage [Vdc]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
3.15	836.5	5.7	0.006784	2.5
3.7	836.5	6.8	0.008134	2.5
4.26	836.5	4.8	0.005790	2.5

Frequency error vs. Temperature

Temperature [°C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
Normal (25C)	836.5	6.5	0.007733	2.5
Extreme (50C)	836.5	5.6	0.006683	2.5
Extreme (40C)	836.5	6.5	0.007749	2.5
Extreme (30C)	836.5	6.8	0.008121	2.5
Extreme (10C)	836.5	5.6	0.006656	2.5
Extreme (0C)	836.5	5.3	0.006335	2.5
Extreme (-10C)	836.5	5.9	0.007070	2.5
Extreme (-20C)	836.5	5.7	0.006772	2.5
Extreme (-30C)	836.5	6.8	0.008083	2.5

***Note:** Frequency error measurements were made by using the build-in capability of the Wireless Communication Test Set.

10.3 LTE BAND 7

Band 7 QPSK, (20MHz BANDWIDTH RB size 100 RB Offset 0)

Frequency error vs. Voltage

Voltage [Vdc]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
3.15	2535	9.9	0.003904	2.5
3.7	2535	9.4	0.003691	2.5
4.26	2535	8.5	0.003340	2.5

Frequency error vs. Temperature

Temperature [°C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
Normal (25C)	2535	9.9	0.003896	2.5
Extreme (50C)	2535	9.2	0.003635	2.5
Extreme (40C)	2535	8.2	0.003220	2.5
Extreme (30C)	2535	9.3	0.003672	2.5
Extreme (10C)	2535	7.6	0.003003	2.5
Extreme (0C)	2535	8.2	0.003230	2.5
Extreme (-10C)	2535	9.7	0.003830	2.5
Extreme (-20C)	2535	9.2	0.003636	2.5
Extreme (-30C)	2535	8.7	0.003445	2.5

Band 7 16QAM, (5MHz BANDWIDTH RB size 25 RB Offset 0)

Frequency error vs. Voltage

Voltage [Vdc]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
3.15	2535	6.9	0.002722	2.5
3.7	2535	6.1	0.002412	2.5
4.26	2535	5.7	0.002259	2.5

Frequency error vs. Temperature

Temperature [°C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
Normal (25C)	2535	6.9	0.002722	2.5
Extreme (50C)	2535	5.9	0.002345	2.5
Extreme (40C)	2535	5.2	0.002032	2.5
Extreme (30C)	2535	6.7	0.002651	2.5
Extreme (10C)	2535	6.1	0.002425	2.5
Extreme (0C)	2535	4.9	0.001918	2.5
Extreme (-10C)	2535	5.5	0.002173	2.5
Extreme (-20C)	2535	5.4	0.002149	2.5
Extreme (-30C)	2535	5.5	0.002177	2.5

***Note:** Frequency error measurements were made by using the build-in capability of the Wireless Communication Test Set.

10.4 LTE BAND 13

Band 13 QPSK, (10MHz BANDWIDTH RB size 50 RB Offset 0)

Frequency error vs. Voltage

Voltage [Vdc]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
3.15	782.0	12.6	0.016136	2.5
3.7	782.0	13.5	0.017235	2.5
4.26	782.0	12.9	0.016493	2.5

Frequency error vs. Temperature

Temperature [°C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
Normal (25C)	782.0	14.4	0.018464	2.5
Extreme (50C)	782.0	13.6	0.017392	2.5
Extreme (40C)	782.0	14.9	0.019040	2.5
Extreme (30C)	782.0	13.7	0.017478	2.5
Extreme (10C)	782.0	14.1	0.018074	2.5
Extreme (0C)	782.0	13.8	0.017708	2.5
Extreme (-10C)	782.0	13.9	0.017745	2.5
Extreme (-20C)	782.0	13.8	0.017665	2.5
Extreme (-30C)	782.0	13.9	0.017751	2.5

Band 13 16QAM, (5MHz BANDWIDTH RB size 25 RB Offset 0)

Frequency error vs. Voltage

Voltage [Vdc]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
3.15	782.0	12.6	0.016172	2.5
3.7	782.0	13.9	0.017804	2.5
4.26	782.0	13.5	0.017266	2.5

Frequency error vs. Temperature

Temperature [°C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
Normal (25C)	782.0	12.7	0.016234	2.5
Extreme (50C)	782.0	12.0	0.015312	2.5
Extreme (40C)	782.0	13.8	0.017654	2.5
Extreme (30C)	782.0	13.7	0.017516	2.5
Extreme (10C)	782.0	13.5	0.017263	2.5
Extreme (0C)	782.0	12.1	0.015517	2.5
Extreme (-10C)	782.0	13.2	0.016927	2.5
Extreme (-20C)	782.0	14.2	0.018189	2.5
Extreme (-30C)	782.0	14.8	0.018967	2.5

***Note:** Frequency error measurements were made by using the build-in capability of the Wireless Communication Test Set.

11. Peak-to-Average Ratio

11.1 Description of the PAR Measurement

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

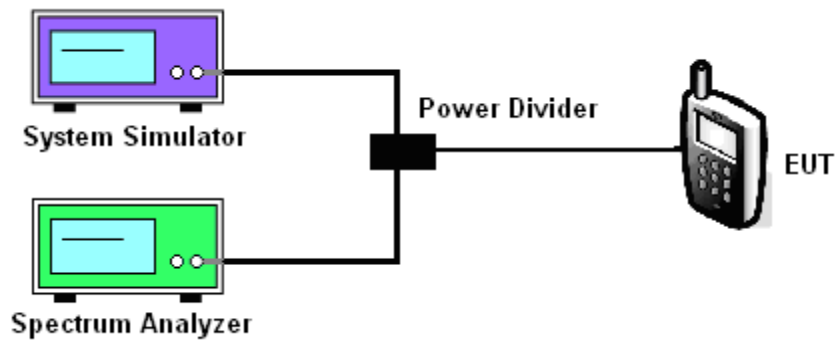
11.2 Measuring Instruments

See list of measuring instruments of this test report.

11.3 Test Procedures

1. The EUT was connected to Spectrum Analyzer and Base Station via power divider.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. For LTE operating modes:
 - a. Set the CCDF (Complementary Cumulative Distribution Function) option in spectrum analyzer.
 - b. The highest RF powers were measured and recorded the maximum PAPR level associated with a probability of 0.1 %.

11.4 Test Setup



MODES TESTED

LTE Band 4/5/7/13

Test data reference attachment.

-----END OF REPORT-----