

FCC CFR47 PART 22H, 24E, 27 CERTIFICATION TEST REPORT FCC ID: 2AWAG-PINEPHONE

Product: PINEPHONE

Trade Mark:  PINE64

Model Number: PinePhone-Linux SmartPhone

Family Model: N/A

Report No.: S19112602606005

Prepared for

Pine Store Limited

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Prepared by

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TEST RESULT CERTIFICATION

Applicant's name : Pine Store Limited
Address..... : 1906, 19/F., Ginza Plaza, 2A Sai Yeung Choi South Street, Mongkok,
Kowloon, Hong Kong.
Manufacturer's Name..... : SHENZHEN ALONG COMMUNICATION TECH CO.,LTD
Address..... : Room 1301,13F,Zhenye International Business
Center,No,3101-90,Qianhai Road,Nanshan
District,Shenzhen,Guangdong province,China
Product name..... : PINEPHONE
Model and/or type reference .. : PinePhone-Linux SmartPhone
Family Model: N/A
Standards..... : FCC CFR 47 Part 22H, Part 24E, 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..... 25 Feb. 2020 ~ 08 May, 2020

Date of Issue 08 May, 2020

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

Testing Engineer : _____



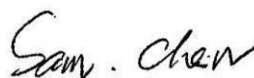
(Cheng Jiawen)

Technical Manager : _____



(Jason Chen)

Authorized Signatory : _____



(Sam Chen)

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1. GENERAL INFORMATION

1.1 PRODUCT DESCRIPTION

A major technical description of EUT is described as following:

Product Designation:	PINEPHONE
Trade Mark	 PINE64
Model Name	PinePhone-Linux SmartPhone
Family Model	N/A
Model Difference	N/A
FCC ID:	2AWAG-PINEPHONE
Frequency Bands:	U.S. Bands: ☒ LTE FDD Band 2,4,5,7
Frequency Range:	LTE FDD Band 2 Uplink: 1850MHz-1910MHz, Downlink: 1930MHz-1990MHz; 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;
Type of Modulation:	QPSK/16QAM
SIM Card	The Phone has one SIM Card socket.
Antenna:	PIFA Antenna
Antenna gain:	LTE FDD Band 2: 2.36dBi LTE FDD Band 4: 2.24dBi LTE FDD Band 5: 3.18dBi LTE FDD Band 7: 2.92dBi
Power Supply:	DC 3.8V/2800mAh from Battery or DC 5V from USB Port.
Adapter:	N/A
Extreme Vol. Limits:	DC 3.4V to DC 4.2V (Nominal DC 3.8V) (Note 1)
HW Version	AL_QZ01_MB_V12
SW Version	N/A
** Note1: The High Voltage DC 4.2V and Low Voltage 3.4V 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: 2AWAG-PINEPHONE** filing to comply with the FCC Part 22H&24E &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 2, Band 4, Band 5, Band 7.

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.

1.6 SUMMARY OF TEST RESULTS

FCC Part22, Subpart H/ FCC Part24, Subpart E, FCC Part27, Subpart L, KDB 971168 D01 Power Meas License Digital Systems v03			
FCC Rule	Test Item	Verdict	Remark
2.1046	Conducted Output Power	PASS	
22.913(d) 24.232(d) 27.50(d)(5) KDB 971168 D01 Clause 5.7	Peak-to-Average Ratio	PASS	
2.1049 22.917(b) 24.238(b) KDB 971168 D01 Clause 4.2	Occupied Bandwidth	PASS	
2.1051 22.917(a) 24.238(a) 27.53(c), (g), (h) KDB 971168 D01 Clause 6	Band Edge	PASS	
22.913(a)(2) 27.50(b)(10), (c)(10) KDB 971168 D01 Clause 5.6	Effective Radiated Power	PASS	
24.232(c) 27.50(h)(2), (d)(4) KDB 971168 D01 Clause 5.6	Equivalent Isotropic Radiated Power	PASS	
2.1053 22.917(a) 24.238(a) 27.53(c)(g)(h)(m) KDB 971168 D01 Clause 7	Field Strength of Spurious Radiation	PASS	
2.1055 22.355 24.235 27.54 KDB 971168 D01 Clause 9	Frequency Stability for Temperature & Voltage	PASS	

2.1051 22.917(a) 24.238(a) 27.53(c)(g)(h)(m) KDB 971168 D01 Clause 6	Conducted Emission	PASS	
Remark: 1. "N/A" denotes test is not applicable in this Test Report. 2. All test items were verified and recorded according to the standards and without any deviation during the test. 3. No modifications are made to the EUT during all test items.			

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

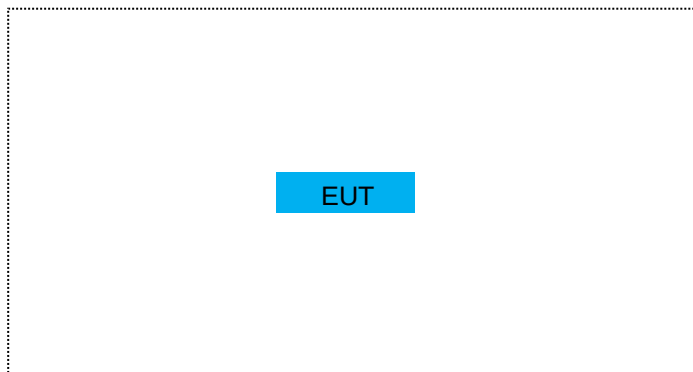
Table 2-1 Equipment Used in EUT System

Item	Equipment	Model No.	ID or Specification	Note
1	PINEPHONE	PinePhone-Linux SmartPhone	FCC ID: 2AWAG-PINEPHONE	EUT

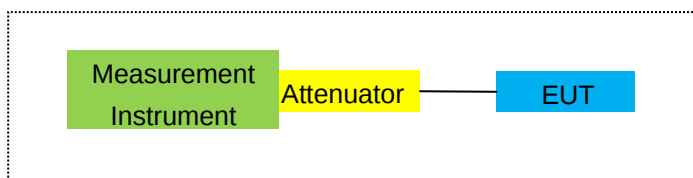
*Note: All the accessories have been used during the test.
the following "EUT" in setup diagram means EUT system.*

2.4 TEST SETUP

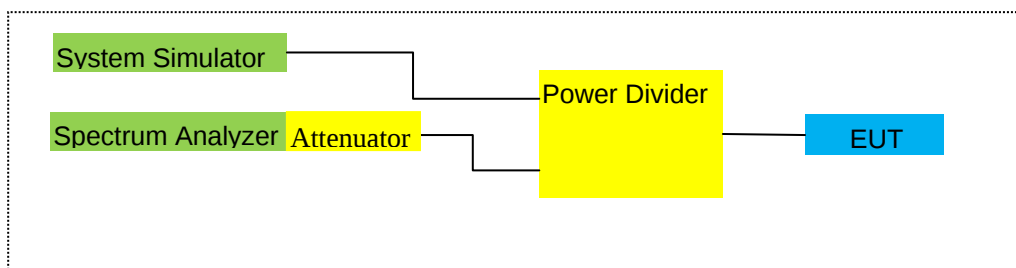
For Radiated Test Cases



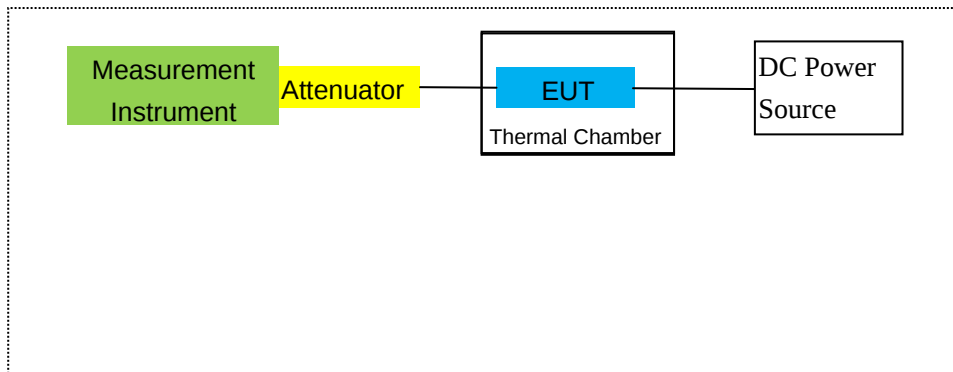
For Conducted Output Power



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



For Frequency Stability



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	2019.08.28	2020.08.27	1 year
2	Test Receiver	R&S	ESPI	101318	2019.05.13	2020.05.12	1 year
3	Bilog Antenna	TESEQ	CBL6111D	31216	2019.04.15 2020.04.11	2020.04.14 2021.04.10	1 year
4	50Ω Coaxial Switch	Anritsu	MP59B	6200983705	2019.05.13	2020.05.12	1 year
5	Horn Antenna	EM	EM-AH-1018 0	2011071402	2019.05.13	2020.05.12	1 year
6	Horn Ant	Schwarzbeck	BBHA 9170	9170-181	2019.11.18	2020.11.17	1 year
7	Amplifier	EM	EM-30180	060538	2019.08.06	2020.08.05	1 year
8	Loop Antenna	ARA	PLA-1030/B	1029	2019.05.13	2020.05.12	1 year
9	Power Meter	R&S	NRVS	100696	2019.08.06	2020.08.05	1 year
10	Power Sensor	R&S	URV5-Z4	0395.1619.0 5	2019.05.13	2020.05.12	1 year
11	Test Cable	N/A	R-01	N/A	2019.08.06	2022.08.05	3 year
12	Test Cable	N/A	R-02	N/A	2019.08.06	2022.08.05	3 year
13	Test Cable	N/A	R-03	N/A	2019.06.28	2022.06.27	3 year
14	Test Receiver	R&S	ESCI	101160	2019.05.13	2020.05.12	1 year
15	LISN	R&S	ENV216	101313	2019.05.13	2020.05.12	1 year
16	LISN	EMCO	3816/2	00042990	2019.05.13	2020.05.12	1 year
17	50Ω Coaxial Switch	Anritsu	MP59B	6200264417	2019.05.13	2020.05.12	1 year
18	Passive Voltage Probe	R&S	ESH2-Z3	100196	2017.04.21 2020.04.20	2020.04.20 2023.04.19	3 year
19	Test Cable	N/A	C01	N/A	2017.04.21 2020.04.20	2020.04.20 2023.04.19	3 year
20	Test Cable	N/A	C02	N/A	2017.04.21 2020.04.20	2020.04.20 2023.04.19	3 year
21	Test Cable	N/A	C03	N/A	2019.04.15 2020.04.14	2020.04.14 2021.04.13	1 year
22	Attenuator	MCE	24-10-34	BN9258	2019.04.15 2020.04.14	2020.04.14 2021.04.13	1 year
23	Spectrum Analyzer	agilent	e4440a	us44300399	2019.05.13	2020.05.12	1 year
24	test receiver	R&S	ESCI	a0304218	2019.05.13	2020.05.12	1 year
25	Communication Tester	R&S	CMU200	A0304247	2019.08.06	2020.08.05	1 year

26	Thermal Chamber	Ten Billion	TTC-B3C	TBN-960502	2019.05.13	2020.05.12	1 year
27	DC Power Source	N/A	PS-6005D	20170402923	2017.06.06	2020.06.05	3 year
28	PSG Analog Signal Generator	Agilent	E8257D	MY51110112	2019.08.06	2020.08.05	1 year
29	Communication Tester	R&S	CMW500	148500	2019.05.13	2020.05.12	1 year

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

- ☐ LTE Band 2
- LTE Band 4
- LTE Band 5
- LTE Band 7

RESULTS

PASS

Test data reference attachment.

6. BANDEDGE AND EMISSION MASK

RULE PART(S)

FCC: §2.1051, §22.917(a), §24.238(a), §27.53(c)(g)(h)(m)

LIMITS

The minimum permissible attenuation level of any spurious emission is $43 + \log_{10}(P[\text{Watts}])$, where P is the transmitter power in Watts.

The minimum permissible attenuation level for Band 7 is as following.

Per 27.53(m) for operations in the BRS/EBS bands, 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.

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 display line

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

MODES TESTED

- ☐ LTE Band 2/4/5/7

RESULTS

Test data reference attachment.

7. OUT OF BAND EMISSIONS

RULE PART(S)

FCC: §2.1051, §22.917(a), §24.238(a), §27.53(c)(g)(h)(m)

LIMITS

The minimum permissible attenuation level of any spurious emission is $43 + \log_{10}(P[\text{Watts}])$, where P is the transmitter power in Watts.

The minimum permissible attenuation level for Band 7 is as following.

Per 27.53(m) for operations in the BRS/EBS bands, 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.

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

MODES TESTED

- ☐ LTE Band 2
- LTE Band 4
- ☐ LTE Band 5
- LTE Band 7

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(a)(2), §24.232(c) and §27.50 (h)(2), (b)(10), (c)(10), (d)(4)

LIMITS:

22.913(a) (2)- The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.
24.232 (c) Mobile and portable stations are limited to 2 watts EIRP.
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 in the 2500–2570 MHz and 2620–2690 MHz bands. Mobile stations are limited to 2.0 watts EIRP. All user stations are limited to 2.0 watts transmitter output power.

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

- ☐ LTE Band 2
- LTE Band 4
- ☐ LTE Band 5
- LTE Band 7

RESULTS

Pass

8.2 LTE BAND 2

Radiated Power (EIRP) for Band 2									
Mode	RB/RB SIZE	Frequency	Result						Conclusion
			SG Level (dBm)	Cable Loss (dBm)	Antenna Gain (dB)	Max. EIRP Average (dBm)	Max. EIRP	Polarization Of Max. ERP	
							Average		
							(mW)		
1.4MHz Band QPSK	1/#Midd	1850.7	-0.32	3.76	28.24	24.16	260.615	Horizontal	Pass
		1880	-0.03	3.91	28.22	24.28	267.917	Horizontal	Pass
		1909.3	-0.10	3.93	28.20	24.17	261.216	Horizontal	Pass
3.0MHz Band QPSK	1/#Midd	1851.5	0.02	3.77	28.23	24.48	280.543	Horizontal	Pass
		1880	-0.14	3.91	28.24	24.19	262.422	Horizontal	Pass
		1908.5	0.12	3.94	28.25	24.43	277.332	Horizontal	Pass
5.0MHz Band QPSK	1/#Midd	1852.5	-0.17	3.77	28.31	24.37	273.527	Horizontal	Pass
		1880	0.12	3.91	28.22	24.43	277.332	Horizontal	Pass
		1907.5	-0.24	3.94	28.20	24.02	252.348	Horizontal	Pass
10.0MHz Band QPSK	1/#Midd	1855	-0.14	3.79	28.33	24.40	275.423	Horizontal	Pass
		1880	0.08	3.95	28.22	24.35	272.270	Horizontal	Pass
		1905	0.09	3.97	28.19	24.31	269.774	Horizontal	Pass
15.0MHz Band QPSK	1/#Midd	1857.5	-0.06	3.79	28.34	24.49	281.190	Horizontal	Pass
		1880	0.23	3.95	28.22	24.50	281.838	Horizontal	Pass
		1902.5	0.26	3.97	28.18	24.47	279.898	Horizontal	Pass
20.0MHz Band QPSK	1/#Midd	1860	-0.26	3.81	28.35	24.28	267.917	Horizontal	Pass
		1880	0.09	3.96	28.22	24.35	272.270	Horizontal	Pass
		1900	0.29	4.00	28.16	24.45	278.612	Horizontal	Pass
1.4MHz Band QPSK	1/#Midd	1850.7	-0.01	3.76	28.24	24.47	279.898	Vertical	Pass
		1880	0.18	3.91	28.22	24.49	281.190	Vertical	Pass
		1909.3	-0.22	3.93	28.20	24.05	254.097	Vertical	Pass
3.0MHz Band QPSK	1/#Midd	1851.5	0.01	3.77	28.23	24.47	279.898	Vertical	Pass
		1880	0.20	3.91	28.24	24.53	283.792	Vertical	Pass
		1908.5	0.21	3.94	28.25	24.52	283.139	Vertical	Pass
5.0MHz Band QPSK	1/#Midd	1852.5	-0.18	3.77	28.31	24.36	272.898	Vertical	Pass
		1880	0.07	3.91	28.22	24.38	274.157	Vertical	Pass
		1907.5	-0.05	3.94	28.20	24.21	263.633	Vertical	Pass
10.0MHz Band	1/#Midd	1855	-0.10	3.79	28.33	24.44	277.971	Vertical	Pass
		1880	0.12	3.95	28.22	24.39	274.789	Vertical	Pass

QPSK		1905	-0.16	3.97	28.19	24.06	254.683	Vertical	Pass
15.0MHz Band QPSK	1/#Midd	1857.5	-0.06	3.79	28.34	24.49	281.190	Vertical	Pass
		1880	0.19	3.95	28.22	24.46	279.254	Vertical	Pass
		1902.5	0.07	3.97	28.18	24.28	267.917	Vertical	Pass
20.0MHz Band QPSK	1/#Midd	1860	-0.08	3.81	28.35	24.46	279.254	Vertical	Pass
		1880	0.08	3.96	28.22	24.34	271.644	Vertical	Pass
		1900	0.39	4.00	28.16	24.55	285.102	Vertical	Pass

Note:

SG Level= Signal generator output

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

Radiated Power (EIRP) for Band 2									
Mode	RB/RB SIZE	Frequency	Result					Polarization Of Max. ERP	Conclusion
			SG Level (dBm)	Cable Loss (dBm)	Antenna Gain (dB)	Max. EIRP Average (dBm)	Max. EIRP		
							Average		
							(mW)		
1.4MHz Band 16 QAM	1/#Midd	1850.7	-0.70	3.76	28.24	23.78	238.781	Horizontal	Pass
		1880	-0.50	3.91	28.22	23.81	240.436	Horizontal	Pass
		1909.3	-0.43	3.93	28.20	23.84	242.103	Horizontal	Pass
3.0MHz Band 16 QAM	1/#Midd	1851.5	-0.65	3.77	28.23	23.81	240.436	Horizontal	Pass
		1880	-0.65	3.91	28.24	23.68	233.346	Horizontal	Pass
		1908.5	-0.67	3.94	28.25	23.64	231.206	Horizontal	Pass
5.0MHz Band 16 QAM	1/#Midd	1852.5	-0.75	3.77	28.31	23.79	239.332	Horizontal	Pass
		1880	-0.61	3.91	28.22	23.70	234.423	Horizontal	Pass
		1907.5	-0.48	3.94	28.20	23.78	238.781	Horizontal	Pass
10.0MHz Band 16 QAM	1/#Midd	1855	-0.64	3.79	28.33	23.90	245.471	Horizontal	Pass
		1880	-0.40	3.95	28.22	23.87	243.781	Horizontal	Pass
		1905	-0.37	3.97	28.19	23.85	242.661	Horizontal	Pass
15.0MHz Band 16 QAM	1/#Midd	1857.5	-0.78	3.79	28.34	23.77	238.232	Horizontal	Pass
		1880	-0.77	3.95	28.22	23.50	223.872	Horizontal	Pass
		1902.5	-0.35	3.97	28.18	23.86	243.220	Horizontal	Pass
20.0MHz Band 16 QAM	1/#Midd	1860	-0.81	3.81	28.35	23.73	236.048	Horizontal	Pass
		1880	-0.46	3.96	28.22	23.80	239.883	Horizontal	Pass
		1900	-0.42	4.00	28.16	23.74	236.592	Horizontal	Pass
1.4MHz Band 16	1/#Midd	1850.7	-0.63	3.76	28.24	23.85	242.661	Vertical	Pass
		1880	-0.63	3.91	28.22	23.68	233.346	Vertical	Pass

QAM		1909.3	-0.56	3.93	28.20	23.71	234.963	Vertical	Pass
3.0MHz Band 16 QAM	1/#Mid	1851.5	-0.61	3.77	28.23	23.85	242.661	Vertical	Pass
		1880	-0.80	3.91	28.24	23.53	225.424	Vertical	Pass
		1908.5	-0.53	3.94	28.25	23.78	238.781	Vertical	Pass
5.0MHz Band 16 QAM	1/#Mid	1852.5	-0.76	3.77	28.31	23.78	238.781	Vertical	Pass
		1880	-0.61	3.91	28.22	23.70	234.423	Vertical	Pass
		1907.5	-0.38	3.94	28.20	23.88	244.343	Vertical	Pass
10.0MHz z Band 16 QAM	1/#Mid	1855	-0.68	3.79	28.33	23.86	243.220	Vertical	Pass
		1880	-0.85	3.95	28.22	23.42	219.786	Vertical	Pass
		1905	-0.42	3.97	28.19	23.80	239.883	Vertical	Pass
15.0MHz z Band 16 QAM	1/#Mid	1857.5	-0.70	3.79	28.34	23.85	242.661	Vertical	Pass
		1880	-0.51	3.95	28.22	23.76	237.684	Vertical	Pass
		1902.5	-0.71	3.97	28.18	23.50	223.872	Vertical	Pass
20.0MHz z Band 16 QAM	1/#Mid	1860	-0.93	3.81	28.35	23.61	229.615	Vertical	Pass
		1880	-0.31	3.96	28.22	23.95	248.313	Vertical	Pass
		1900	-0.50	4.00	28.16	23.66	232.274	Vertical	Pass

Note:

SG Level= Signal generator output

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

8.3 LTE BAND 4

Radiated Power (EIRP) for Band 4									
Mode	RB/RB SIZE	Frequency	Result						Conclusion
			SG Level	Cable Loss	Antenna Gain	Max. EIRP	Max. EIRP	Polarization Of Max. ERP	
			(dBm)	(dBm)	(dB)	Average (dBm)	Average (mW)		
1.4MHz Band QPSK	1/#Midd	1710.7	0.43	3.12	27.58	24.89	308.319	Horizontal	Pass
		1732.5	0.13	3.27	27.61	24.47	279.898	Horizontal	Pass
		1754.3	0.29	3.29	27.63	24.63	290.402	Horizontal	Pass
3.0MHz Band QPSK	1/#Midd	1711.5	-0.68	3.13	27.61	23.80	239.883	Horizontal	Pass
		1732.5	-0.45	3.27	27.61	23.89	244.906	Horizontal	Pass
		1753.5	-0.24	3.30	27.62	24.08	255.859	Horizontal	Pass
5.0MHz Band QPSK	1/#Midd	1712.5	0.19	3.13	27.63	24.69	294.442	Horizontal	Pass
		1732.5	-1.06	3.27	27.61	23.28	212.814	Horizontal	Pass
		1752.5	0.68	3.30	27.60	24.98	314.775	Horizontal	Pass
10.0MHz Band QPSK	1/#Midd	1715	0.44	3.15	27.64	24.93	311.172	Horizontal	Pass
		1732.5	0.70	3.31	27.61	25.00	316.228	Horizontal	Pass
		1750	0.80	3.33	27.59	25.06	320.627	Horizontal	Pass
15.0MHz Band QPSK	1/#Midd	1717.5	0.03	3.15	27.65	24.53	283.792	Horizontal	Pass
		1732.5	-0.03	3.31	27.61	24.27	267.301	Horizontal	Pass
		1747.5	0.27	3.33	27.57	24.51	282.488	Horizontal	Pass
20.0MHz Band QPSK	1/#Midd	1720	0.11	3.17	27.66	24.60	288.403	Horizontal	Pass
		1732.5	0.49	3.32	27.61	24.78	300.608	Horizontal	Pass
		1745	0.22	3.36	27.56	24.42	276.694	Horizontal	Pass
1.4MHz Band QPSK	1/#Midd	1710.7	-0.26	3.12	27.58	24.20	263.027	Vertical	Pass
		1732.5	-0.10	3.27	27.61	24.24	265.461	Vertical	Pass
		1754.3	-0.16	3.29	27.63	24.18	261.818	Vertical	Pass
3.0MHz Band QPSK	1/#Midd	1711.5	0.61	3.13	27.61	25.09	322.849	Vertical	Pass
		1732.5	0.71	3.27	27.61	25.05	319.890	Vertical	Pass
		1753.5	0.53	3.30	27.62	24.85	305.492	Vertical	Pass
5.0MHz Band QPSK	1/#Midd	1712.5	-1.10	3.13	27.63	23.40	218.776	Vertical	Pass
		1732.5	-0.56	3.27	27.61	23.78	238.781	Vertical	Pass
		1752.5	-0.61	3.30	27.60	23.69	233.884	Vertical	Pass
10.0MHz Band	1/#Midd	1715	-0.44	3.15	27.64	24.05	254.097	Vertical	Pass
		1732.5	0.07	3.31	27.61	24.37	273.527	Vertical	Pass

QPSK		1750	0.57	3.33	27.59	24.83	304.089	Vertical	Pass
15.0MHz Band QPSK	1/#Mid	1717.5	0.12	3.15	27.65	24.62	289.734	Vertical	Pass
		1732.5	0.17	3.31	27.61	24.47	279.898	Vertical	Pass
		1747.5	0.37	3.33	27.57	24.61	289.068	Vertical	Pass
20.0MHz Band QPSK	1/#Mid	1720	-0.13	3.17	27.66	24.36	272.898	Vertical	Pass
		1732.5	0.81	3.32	27.61	25.10	323.594	Vertical	Pass
		1745	0.04	3.36	27.56	24.24	265.461	Vertical	Pass

Note:

SG Level= Signal generator output

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

Radiated Power (EIRP) for Band 4									
Mode	RB/RB SIZE	Frequency	Result						Conclusion
			SG Level	Cable Loss	Antenna Gain	Max. EIRP	Max. EIRP	Polarization Of Max. ERP	
			(dBm)	(dBm)	(dB)	Average (dBm)	Average (mW)		
1.4MHz Band 16 QAM	1/#Mid	1710.7	-0.52	3.12	27.58	23.94	247.742	Horizontal	Pass
		1732.5	-0.70	3.27	27.61	23.64	231.206	Horizontal	Pass
		1754.3	-1.02	3.29	27.63	23.32	214.783	Horizontal	Pass
3.0MHz Band 16 QAM	1/#Mid	1711.5	-1.80	3.13	27.61	22.68	185.353	Horizontal	Pass
		1732.5	-1.95	3.27	27.61	22.39	173.380	Horizontal	Pass
		1753.5	-1.40	3.30	27.62	22.92	195.884	Horizontal	Pass
5.0MHz Band 16 QAM	1/#Mid	1712.5	-2.18	3.13	27.63	22.32	170.608	Horizontal	Pass
		1732.5	-2.00	3.27	27.61	22.34	171.396	Horizontal	Pass
		1752.5	-0.22	3.30	27.60	24.08	255.859	Horizontal	Pass
10.0MHz Band 16 QAM	1/#Mid	1715	-1.30	3.15	27.64	23.19	208.449	Horizontal	Pass
		1732.5	-1.20	3.31	27.61	23.10	204.174	Horizontal	Pass
		1750	-1.53	3.33	27.59	22.73	187.499	Horizontal	Pass
15.0MHz Band 16 QAM	1/#Mid	1717.5	-0.95	3.15	27.65	23.55	226.464	Horizontal	Pass
		1732.5	-0.32	3.31	27.61	23.98	250.035	Horizontal	Pass
		1747.5	-0.55	3.33	27.57	23.69	233.884	Horizontal	Pass
20.0MHz Band 16 QAM	1/#Mid	1720	-1.21	3.17	27.66	23.28	212.814	Horizontal	Pass
		1732.5	-0.85	3.32	27.61	23.44	220.800	Horizontal	Pass
		1745	-1.13	3.36	27.56	23.07	202.768	Horizontal	Pass
1.4MHz Band 16	1/#Mid	1710.7	-0.56	3.12	27.58	23.90	245.471	Vertical	Pass
		1732.5	-0.78	3.27	27.61	23.56	226.986	Vertical	Pass

QAM		1754.3	-0.80	3.29	27.63	23.54	225.944	Vertical	Pass
3.0MHz Band 16 QAM	1/#Mid	1711.5	-1.18	3.13	27.61	23.30	213.796	Vertical	Pass
		1732.5	-1.78	3.27	27.61	22.56	180.302	Vertical	Pass
		1753.5	-1.38	3.30	27.62	22.94	196.789	Vertical	Pass
5.0MHz Band 16 QAM	1/#Mid	1712.5	-2.14	3.13	27.63	22.36	172.187	Vertical	Pass
		1732.5	-1.41	3.27	27.61	22.93	196.336	Vertical	Pass
		1752.5	-1.38	3.30	27.60	22.92	195.884	Vertical	Pass
10.0MHz z Band 16 QAM	1/#Mid	1715	-0.67	3.15	27.64	23.82	240.991	Vertical	Pass
		1732.5	-0.75	3.31	27.61	23.55	226.464	Vertical	Pass
		1750	-0.52	3.33	27.59	23.74	236.592	Vertical	Pass
15.0MHz z Band 16 QAM	1/#Mid	1717.5	-1.01	3.15	27.65	23.49	223.357	Vertical	Pass
		1732.5	-1.52	3.31	27.61	22.78	189.671	Vertical	Pass
		1747.5	-0.77	3.33	27.57	23.47	222.331	Vertical	Pass
20.0MHz z Band 16 QAM	1/#Mid	1720	-0.71	3.17	27.66	23.78	238.781	Vertical	Pass
		1732.5	-1.09	3.32	27.61	23.20	208.930	Vertical	Pass
		1745	-0.06	3.36	27.56	24.14	259.418	Vertical	Pass

Note:

SG Level= Signal generator output

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

8.4 LTE BAND 5

Radiated Power (ERP) for Band 5										
Mode	RB/ RB SIZE	Freque ncy	Result							Conclu sion
			SG Level (dBm)	Cable Loss (dBm)	Anten na Gain (dB)	Corre ction (dB)	Max. ERP Averag e (dBm)	Max. ERP Averag e (mW)	Polarizati on Of Max. ERP	
1.4MHz Band QPSK	1/#M id	824.7	10.19	2.01	19.68	2.15	25.71	372.392	Horizontal	Pass
		836.5	9.90	2.01	19.77	2.15	25.51	355.631	Horizontal	Pass
		848.3	9.68	2.02	19.82	2.15	25.33	341.193	Horizontal	Pass
3.0MHz Band QPSK	1/#M id	825.5	9.84	2.01	19.70	2.15	25.38	345.144	Horizontal	Pass
		836.5	9.15	2.01	19.77	2.15	24.76	299.226	Horizontal	Pass
		847.5	10.06	2.02	19.81	2.15	25.70	371.535	Horizontal	Pass
5.0MHz Band QPSK	1/#M id	826.5	10.31	2.01	19.71	2.15	25.86	385.478	Horizontal	Pass
		836.5	9.67	2.01	19.77	2.15	25.28	337.287	Horizontal	Pass
		846.5	10.08	2.02	19.79	2.15	25.70	371.535	Horizontal	Pass
10.0MH z Band QPSK	1/#M id	829	9.74	2.01	19.73	2.15	25.31	339.625	Horizontal	Pass
		836.5	9.48	2.01	19.77	2.15	25.09	322.849	Horizontal	Pass
		844	9.45	2.02	19.78	2.15	25.06	320.627	Horizontal	Pass
1.4MHz Band QPSK	1/#M id	824.7	10.19	2.01	19.68	2.15	25.71	372.392	Vertical	Pass
		836.5	9.75	2.01	19.77	2.15	25.36	343.558	Vertical	Pass
		848.3	9.53	2.02	19.82	2.15	25.18	329.610	Vertical	Pass
3.0MHz Band QPSK	1/#M id	825.5	9.51	2.01	19.70	2.15	25.05	319.890	Vertical	Pass
		836.5	9.83	2.01	19.77	2.15	25.44	349.945	Vertical	Pass
		847.5	9.48	2.02	19.81	2.15	25.12	325.087	Vertical	Pass
5.0MHz Band QPSK	1/#M id	826.5	10.05	2.01	19.71	2.15	25.60	363.078	Vertical	Pass
		836.5	9.05	2.01	19.77	2.15	24.66	292.415	Vertical	Pass
		846.5	9.99	2.02	19.79	2.15	25.61	363.915	Vertical	Pass
10.0MH z Band QPSK	1/#M id	829	10.05	2.01	19.73	2.15	25.62	364.754	Vertical	Pass
		836.5	10.35	2.01	19.77	2.15	25.96	394.457	Vertical	Pass
		844	9.71	2.02	19.78	2.15	25.32	340.408	Vertical	Pass

Note:

SG Level= Signal generator output

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

Max. ERP Average (dBm)= Max. EIRP Average (dBm)-2.15

Radiated Power (ERP) for Band 5										
Mode	RB/ RB SIZE	Freque ncy	Result							Conclu sion
			SG Level (dBm)	Cable Loss (dBm)	Anten na Gain (dB)	Corre ction (dB)	Max. ERP	Max. ERP	Polarizati on Of Max. ERP	
							Averag e	Averag e		
							(dBm)	(mW)		
1.4MHz Band 16 QAM	1/#M id	824.7	8.52	2.01	19.68	2.15	24.04	253.513	Horizontal	Pass
		836.5	8.66	2.01	19.77	2.15	24.27	267.301	Horizontal	Pass
		848.3	8.05	2.02	19.82	2.15	23.70	234.423	Horizontal	Pass
3.0MHz Band 16 QAM	1/#M id	825.5	8.51	2.01	19.70	2.15	24.05	254.097	Horizontal	Pass
		836.5	8.31	2.01	19.77	2.15	23.92	246.604	Horizontal	Pass
		847.5	7.80	2.02	19.81	2.15	23.44	220.800	Horizontal	Pass
5.0MHz Band 16 QAM	1/#M id	826.5	8.61	2.01	19.71	2.15	24.16	260.615	Horizontal	Pass
		836.5	8.51	2.01	19.77	2.15	24.12	258.226	Horizontal	Pass
		846.5	8.25	2.02	19.79	2.15	23.87	243.781	Horizontal	Pass
10.0MH z Band 16 QAM	1/#M id	829	8.77	2.01	19.73	2.15	24.34	271.644	Horizontal	Pass
		836.5	8.22	2.01	19.77	2.15	23.83	241.546	Horizontal	Pass
		844	8.28	2.02	19.78	2.15	23.89	244.906	Horizontal	Pass
1.4MHz Band 16 QAM	1/#M id	824.7	8.77	2.01	19.68	2.15	24.29	268.534	Vertical	Pass
		836.5	8.00	2.01	19.77	2.15	23.61	229.615	Vertical	Pass
		848.3	8.24	2.02	19.82	2.15	23.89	244.906	Vertical	Pass
3.0MHz Band 16 QAM	1/#M id	825.5	8.10	2.01	19.70	2.15	23.64	231.206	Vertical	Pass
		836.5	8.71	2.01	19.77	2.15	24.32	270.396	Vertical	Pass
		847.5	7.76	2.02	19.81	2.15	23.40	218.776	Vertical	Pass
5.0MHz Band 16 QAM	1/#M id	826.5	8.07	2.01	19.71	2.15	23.62	230.144	Vertical	Pass
		836.5	8.77	2.01	19.77	2.15	24.38	274.157	Vertical	Pass
		846.5	8.75	2.02	19.79	2.15	24.37	273.527	Vertical	Pass
10.0MH z Band 16 QAM	1/#M id	829	8.31	2.01	19.73	2.15	23.88	244.343	Vertical	Pass
		836.5	8.94	2.01	19.77	2.15	24.55	285.102	Vertical	Pass
		844	8.26	2.02	19.78	2.15	23.87	243.781	Vertical	Pass

Note:

SG Level= Signal generator output

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

Max. ERP Average (dBm)= Max. EIRP Average (dBm)-2.15

8.5 LTE BAND 7

Radiated Power (EIRP) for Band 7									
Mode	RB/ RB SIZE	Frequency	Result						Conclusion
			SG Level	Cabl e Loss	Antenn a Gain	Max. EIRP	Max. EIRP	Polarizati on Of	
			(dBm)	(dBm)	(dB)	Averag e (dBm)	Averag e (mW)	Max. ERP	
5.0MHz Band QPSK	1/#M id	2502.5	3.07	4.54	27.75	26.28	424.620	Horizontal	Pass
		2535	3.10	4.69	27.72	26.13	410.204	Horizontal	Pass
		2567.5	2.94	4.71	27.71	25.94	392.645	Horizontal	Pass
5.0MHz Band 16 QAM	1/#M id	2505	2.48	4.55	27.76	25.69	370.681	Horizontal	Pass
		2535	2.91	4.69	27.72	25.94	392.645	Horizontal	Pass
		2565	2.58	4.72	27.70	25.56	359.749	Horizontal	Pass
10.0MH z Band QPSK	1/#M id	2507.5	2.46	4.55	27.77	25.68	369.828	Horizontal	Pass
		2535	2.52	4.69	27.72	25.55	358.922	Horizontal	Pass
		2562.5	2.75	4.72	27.69	25.72	373.250	Horizontal	Pass
10.0MH z Band 16 QAM	1/#M id	2510	2.81	4.57	27.78	26.02	399.945	Horizontal	Pass
		2535	2.29	4.73	27.72	25.28	337.287	Horizontal	Pass
		2560	3.28	4.75	27.68	26.21	417.830	Horizontal	Pass
15.0MH z Band QPSK	1/#M id	2502.5	2.42	4.54	27.75	25.63	365.595	Vertical	Pass
		2535	3.07	4.69	27.72	26.10	407.380	Vertical	Pass
		2567.5	2.67	4.71	27.71	25.67	368.978	Vertical	Pass
15.0MH z Band 16 QAM	1/#M id	2505	2.55	4.55	27.76	25.76	376.704	Vertical	Pass
		2535	3.03	4.69	27.72	26.06	403.645	Vertical	Pass
		2565	2.35	4.72	27.70	25.33	341.193	Vertical	Pass
20.0MH z Band QPSK	1/#M id	2507.5	2.79	4.55	27.77	26.01	399.025	Vertical	Pass
		2535	2.62	4.69	27.72	25.65	367.282	Vertical	Pass
		2562.5	2.88	4.72	27.69	25.85	384.592	Vertical	Pass
20.0MH z Band 16 QAM	1/#M id	2510	3.22	4.57	27.78	26.43	439.542	Vertical	Pass
		2535	3.19	4.73	27.72	26.18	414.954	Vertical	Pass
		2560	3.06	4.75	27.68	25.99	397.192	Vertical	Pass

Note:

SG Level= Signal generator output

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

Radiated Power (EIRP) for Band 7									
Mode	RB/ RB SIZE	Frequency	Result						Conclusion
			SG Level (dBm)	Cabl e Loss (dBm)	Antenn a Gain (dB)	Max. EIRP	Max. EIRP	Polarizati on Of Max. ERP	
						Avera ge	Average		
						(dBm)	(mW)		
5.0MHz Band QPSK	1/#M id	2502.5	1.02	4.54	27.75	24.23	264.850	Horizontal	Pass
		2535	1.63	4.69	27.72	24.66	292.415	Horizontal	Pass
		2567.5	1.86	4.71	27.71	24.86	306.196	Horizontal	Pass
5.0MHz Band 16 QAM	1/#M id	2505	1.26	4.55	27.76	24.47	279.898	Horizontal	Pass
		2535	1.90	4.69	27.72	24.93	311.172	Horizontal	Pass
		2565	1.25	4.72	27.70	24.23	264.850	Horizontal	Pass
10.0MH z Band QPSK	1/#M id	2507.5	0.99	4.55	27.77	24.21	263.633	Horizontal	Pass
		2535	1.68	4.69	27.72	24.71	295.801	Horizontal	Pass
		2562.5	1.85	4.72	27.69	24.82	303.389	Horizontal	Pass
10.0MH z Band 16 QAM	1/#M id	2510	1.14	4.57	27.78	24.35	272.270	Horizontal	Pass
		2535	1.39	4.73	27.72	24.38	274.157	Horizontal	Pass
		2560	1.77	4.75	27.68	24.70	295.121	Horizontal	Pass
15.0MH z Band QPSK	1/#M id	2502.5	1.19	4.54	27.75	24.40	275.423	Vertical	Pass
		2535	0.84	4.69	27.72	23.87	243.781	Vertical	Pass
		2567.5	0.98	4.71	27.71	23.98	250.035	Vertical	Pass
15.0MH z Band 16 QAM	1/#M id	2505	0.91	4.55	27.76	24.12	258.226	Vertical	Pass
		2535	1.41	4.69	27.72	24.44	277.971	Vertical	Pass
		2565	1.81	4.72	27.70	24.79	301.301	Vertical	Pass
20.0MH z Band QPSK	1/#M id	2507.5	1.04	4.55	27.77	24.26	266.686	Vertical	Pass
		2535	1.24	4.69	27.72	24.27	267.301	Vertical	Pass
		2562.5	1.37	4.72	27.69	24.34	271.644	Vertical	Pass
20.0MH z Band 16 QAM	1/#M id	2510	1.67	4.57	27.78	24.88	307.610	Vertical	Pass
		2535	1.97	4.73	27.72	24.96	313.329	Vertical	Pass
		2560	1.37	4.75	27.68	24.30	269.153	Vertical	Pass

Note:

SG Level= Signal generator output

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

9. SPURIOUS RADIATION EMISSION

RULE PART(S)

FCC: §2.1051, §22.917(a), §24.238(a), §27.53(c)(g)(h)(m)

LIMIT

For Band 7, the minimum permissible attenuation level of any spurious emission is $55 + \log_{10}(P)$ [Watts]).

The minimum permissible attenuation level of any spurious emission is $43 + \log_{10}(P)$ [Watts]), where P is the transmitter power in Watts.

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 2
LTE Band 4
- ☐ LTE Band 5
LTE Band 7

RESULTS

PASS

9.1 LTE BAND 2

QPSK EIRP POWER FOR LTE BAND 2 (1.4MHZ BANDWIDTH)

Test Results for Low Channel 1850.7MHz							
Frequency(MHz)	SG Level(dBm)	Cable Loss(dB)	Antenna Gain(dB)	Absolute Level(dBm)	Limit (dBm)	Margin(dBm)	Polarity
3701.4	-50.38	4.04	33.51	-20.91	-13	-7.91	Horizontal
3701.4	-47.25	4.04	33.51	-17.78	-13	-4.78	Vertical
5552.1	-47.09	5.24	35.84	-16.49	-13	-3.49	Vertical
5552.1	-51.65	5.24	35.84	-21.05	-13	-8.05	Horizontal
236.1	-53.31	1.36	16.39	-38.28	-13	-25.28	Vertical
263.5	-53.75	1.54	16.82	-38.47	-13	-25.47	Horizontal
Test Results for Mid Channel 1880MHz							
3760.0	-55.52	4.04	33.56	-26.00	-13	-13.00	Horizontal
3760.0	-49.87	4.04	33.56	-20.35	-13	-7.35	Vertical
5640.0	-52.67	5.24	35.91	-22.00	-13	-9.00	Vertical
5640.0	-48.00	5.24	35.91	-17.33	-13	-4.33	Horizontal
140.5	-58.90	1.77	15.94	-44.73	-13	-31.73	Vertical
97.6	-58.44	1.77	15.43	-44.78	-13	-31.78	Horizontal
Test Results for High Channel 1909.3MHz							
3818.6	-48.48	4.04	34.00	-18.52	-13	-5.52	Horizontal
3818.6	-47.93	4.04	34.00	-17.97	-13	-4.97	Vertical
5727.9	-54.42	5.24	36.04	-23.62	-13	-10.62	Vertical
5727.9	-54.32	5.24	36.04	-23.52	-13	-10.52	Horizontal
119.6	-72.75	1.39	16.95	-57.19	-13	-44.19	Vertical
186.1	-64.14	1.69	16.49	-49.34	-13	-36.34	Horizontal

16QAM EIRP POWER FOR LTE BAND 2 (1.4MHZ BANDWIDTH)

Test Results for Low Channel 1850.7MHz							
Frequency(MHz)	SG Level(dBm)	Cable Loss(dB)	Antenna Gain(dB)	Absolute Level(dBm)	Limit (dBm)	Margin(dBm)	Polarity
3701.4	-56.89	4.04	33.51	-27.42	-13	-14.42	Horizontal
3701.4	-56.20	4.04	33.51	-26.73	-13	-13.73	Vertical
5552.1	-55.12	5.24	35.84	-24.52	-13	-11.52	Vertical
5552.1	-49.45	5.24	35.84	-18.85	-13	-5.85	Horizontal
256.5	-50.96	1.67	15.22	-37.41	-13	-24.41	Vertical
100.4	-58.74	1.78	17.87	-42.65	-13	-29.65	Horizontal
Test Results for Mid Channel 1880MHz							
3760.0	-52.11	4.04	33.56	-22.59	-13	-9.59	Horizontal
3760.0	-55.54	4.04	33.56	-26.02	-13	-13.02	Vertical
5640.0	-53.24	5.24	35.91	-22.57	-13	-9.57	Vertical
5640.0	-55.13	5.24	35.91	-24.46	-13	-11.46	Horizontal

81.8	-49.76	1.78	16.56	-34.98	-13	-21.98	Vertical
123.7	-58.36	1.31	16.23	-43.44	-13	-30.44	Horizontal
Test Results for High Channel 1909.3MHz							
3818.6	-56.67	4.04	34.00	-26.71	-13	-13.71	Horizontal
3818.6	-57.29	4.04	34.00	-27.33	-13	-14.33	Vertical
5727.9	-56.14	5.24	36.04	-25.34	-13	-12.34	Vertical
5727.9	-52.41	5.24	36.04	-21.61	-13	-8.61	Horizontal
122.2	-60.39	1.70	16.73	-45.36	-13	-32.36	Vertical
275.4	-65.62	1.64	15.37	-51.89	-13	-38.89	Horizontal

QPSK EIRP POWER FOR LTE BAND 2 (20.0MHZ BANDWIDTH)

Test Results for Low Channel 1860MHz							
Frequency(MHz)	SG Level(dBm)	Cable Loss(dB)	Antenna Gain(dB)	Absolute Level(dBm)	Limit (dBm)	Margin(dBm)	Polarity
3720.0	-51.73	4.07	33.54	-22.26	-13	-9.26	Horizontal
3720.0	-56.18	4.07	33.54	-26.71	-13	-13.71	Vertical
5580.0	-50.14	5.28	35.86	-19.56	-13	-6.56	Vertical
5580.0	-55.03	5.28	35.86	-24.45	-13	-11.45	Horizontal
95.0	-56.53	1.31	17.93	-39.91	-13	-26.91	Vertical
224.9	-51.82	1.77	15.73	-37.86	-13	-24.86	Horizontal
Test Results for Mid Channel 1880MHz							
3760.0	-56.51	4.04	33.56	-26.99	-13	-13.99	Horizontal
3760.0	-49.54	4.04	33.56	-20.02	-13	-7.02	Vertical
5640.0	-53.71	5.24	35.91	-23.04	-13	-10.04	Vertical
5640.0	-52.44	5.24	35.91	-21.77	-13	-8.77	Horizontal
127.9	-56.43	1.56	16.37	-41.62	-13	-28.62	Vertical
209.5	-55.74	1.37	17.30	-39.81	-13	-26.81	Horizontal
Test Results for High Channel 1900MHz							
3800.0	-51.73	4.04	34.00	-21.77	-13	-8.77	Horizontal
3800.0	-49.78	4.04	34.00	-19.82	-13	-6.82	Vertical
5700.0	-54.63	5.24	36.04	-23.83	-13	-10.83	Vertical
5700.0	-55.88	5.24	36.04	-25.08	-13	-12.08	Horizontal
199.5	-60.91	1.54	16.90	-45.55	-13	-32.55	Vertical
202.9	-62.52	1.66	17.75	-46.43	-13	-33.43	Horizontal

16QAM EIRP POWER FOR LTE BAND 2 (20.0MHZ BANDWIDTH)

Test Results for Low Channel 1860MHz							
Frequency(MHz)	SG Level(dBm)	Cable Loss(dB)	Antenna Gain(dB)	Absolute Level(dBm)	Limit (dBm)	Margin(dBm)	Polarity
3720.0	-51.70	4.07	33.54	-22.23	-13	-9.23	Horizontal
3720.0	-51.95	4.07	33.54	-22.48	-13	-9.48	Vertical
5580.0	-56.13	5.28	35.86	-25.55	-13	-12.55	Vertical
5580.0	-54.47	5.28	35.86	-23.89	-13	-10.89	Horizontal
212.0	-49.67	1.50	17.65	-33.52	-13	-20.52	Vertical
161.5	-51.23	1.33	15.15	-37.41	-13	-24.41	Horizontal
Test Results for Mid Channel 1880MHz							
3760.0	-51.45	4.04	33.56	-21.93	-13	-8.93	Horizontal
3760.0	-52.36	4.04	33.56	-22.84	-13	-9.84	Vertical
5640.0	-51.63	5.24	35.91	-20.96	-13	-7.96	Vertical
5640.0	-54.56	5.24	35.91	-23.89	-13	-10.89	Horizontal
141.2	-53.12	1.38	17.47	-37.03	-13	-24.03	Vertical
268.6	-59.94	1.45	17.16	-44.23	-13	-31.23	Horizontal
Test Results for High Channel 1900MHz							
3800.0	-53.10	4.04	34.00	-23.14	-13	-10.14	Horizontal
3800.0	-49.77	4.04	34.00	-19.81	-13	-6.81	Vertical
5700.0	-50.95	5.24	36.04	-20.15	-13	-7.15	Vertical
5700.0	-54.37	5.24	36.04	-23.57	-13	-10.57	Horizontal
166.0	-56.90	1.58	15.46	-43.02	-13	-30.02	Vertical
96.2	-69.95	1.54	17.19	-54.30	-13	-41.30	Horizontal

Note: P_{Mea}(dBm)= Power(dBm)+ ARpl (dBm)
 Over Limit= : P_{Mea}(dBm)-Limit(dBm)

9.2 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	-48.18	4.02	29.80	-22.40	-13	-9.40	Horizontal
3421.4	-46.77	4.02	29.80	-20.99	-13	-7.99	Vertical
5132.1	-52.66	5.24	35.84	-22.06	-13	-9.06	Vertical
5132.1	-47.53	5.24	35.84	-16.93	-13	-3.93	Horizontal
165.0	-66.47	1.77	15.12	-53.12	-13	-40.12	Vertical
90.2	-49.46	1.75	15.33	-35.88	-13	-22.88	Horizontal
Test Results for Mid Channel 1732.5MHz							
3465.0	-42.88	4.03	30.00	-16.91	-13	-3.91	Horizontal
3465.0	-53.78	4.03	30.00	-27.81	-13	-14.81	Vertical
5197.5	-51.18	5.25	35.86	-20.57	-13	-7.57	Vertical
5197.5	-53.11	5.25	35.86	-22.50	-13	-9.50	Horizontal
137.9	-47.80	1.78	15.24	-34.34	-13	-21.34	Vertical
165.1	-55.51	1.54	17.67	-39.38	-13	-26.38	Horizontal
Test Results for High Channel 1754.3MHz							
3508.6	-54.56	4.05	30.01	-28.60	-13	-15.60	Horizontal
3508.6	-48.72	4.05	30.01	-22.76	-13	-9.76	Vertical
5262.9	-54.55	5.26	35.86	-23.95	-13	-10.95	Vertical
5262.9	-52.54	5.26	35.86	-21.94	-13	-8.94	Horizontal
172.5	-62.94	1.58	17.05	-47.47	-13	-34.47	Vertical
229.7	-59.72	1.39	17.86	-43.25	-13	-30.25	Horizontal

16QAM 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	-50.10	4.02	29.80	-24.32	-13	-11.32	Horizontal
3421.4	-53.73	4.02	29.80	-27.95	-13	-14.95	Vertical
5132.1	-50.49	5.24	35.84	-19.89	-13	-6.89	Vertical
5132.1	-48.73	5.24	35.84	-18.13	-13	-5.13	Horizontal
233.0	-68.43	1.59	16.28	-53.74	-13	-40.74	Vertical
83.1	-55.68	1.78	16.17	-41.29	-13	-28.29	Horizontal
Test Results for Mid Channel 1732.5MHz							
3465.0	-54.59	4.03	30.00	-28.62	-13	-15.62	Horizontal
3465.0	-54.55	4.03	30.00	-28.58	-13	-15.58	Vertical
5197.5	-50.06	5.25	35.86	-19.45	-13	-6.45	Vertical

5197.5	-51.49	5.25	35.86	-20.88	-13	-7.88	Horizontal
146.9	-73.76	1.69	17.81	-57.64	-13	-44.64	Vertical
95.8	-63.08	1.54	15.15	-49.47	-13	-36.47	Horizontal
Test Results for High Channel 1754.3MHz							
3508.6	-55.39	4.05	30.01	-29.43	-13	-16.43	Horizontal
3508.6	-50.68	4.05	30.01	-24.72	-13	-11.72	Vertical
5262.9	-53.09	5.26	35.86	-22.49	-13	-9.49	Vertical
5262.9	-50.38	5.26	35.86	-19.78	-13	-6.78	Horizontal
223.1	-56.33	1.35	15.69	-41.99	-13	-28.99	Vertical
194.0	-49.90	1.65	15.18	-36.37	-13	-23.37	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	-54.35	4.02	29.80	-28.57	-13	-15.57	Horizontal
3440.0	-51.13	4.02	29.80	-25.35	-13	-12.35	Vertical
5160.0	-51.03	5.24	35.84	-20.43	-13	-7.43	Vertical
5160.0	-51.18	5.24	35.84	-20.58	-13	-7.58	Horizontal
116.6	-63.44	1.33	15.69	-49.08	-13	-36.08	Vertical
96.1	-60.23	1.41	16.23	-45.41	-13	-32.41	Horizontal
Test Results for Mid Channel 1732.5MHz							
3465.0	-54.82	4.03	30.00	-28.85	-13	-15.85	Horizontal
3465.0	-56.73	4.03	30.00	-30.76	-13	-17.76	Vertical
5197.5	-55.18	5.25	35.86	-24.57	-13	-11.57	Vertical
5197.5	-55.85	5.25	35.86	-25.24	-13	-12.24	Horizontal
114.4	-51.43	1.64	15.55	-37.52	-13	-24.52	Vertical
267.5	-64.65	1.38	17.56	-48.47	-13	-35.47	Horizontal
Test Results for High Channel 1745MHz							
3490.0	-55.45	2.91	27.68	-30.68	-13	-17.68	Horizontal
3490.0	-49.72	2.91	27.68	-24.95	-13	-11.95	Vertical
5235.0	-57.96	5.26	35.86	-27.36	-13	-14.36	Vertical
5235.0	-54.44	5.26	35.86	-23.84	-13	-10.84	Horizontal
223.4	-54.13	1.71	15.37	-40.47	-13	-27.47	Vertical
198.4	-57.26	1.63	17.69	-41.20	-13	-28.20	Horizontal

16QAM 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	-48.24	4.02	29.80	-22.46	-13	-9.46	Horizontal
3440.0	-51.31	4.02	29.80	-25.53	-13	-12.53	Vertical
5160.0	-46.78	5.24	35.84	-16.18	-13	-3.18	Vertical
5160.0	-53.97	5.24	35.84	-23.37	-13	-10.37	Horizontal
268.3	-54.98	1.41	16.46	-39.93	-13	-26.93	Vertical
191.1	-62.71	1.35	17.33	-46.73	-13	-33.73	Horizontal
Test Results for Mid Channel 1732.5MHz							
3465.0	-54.40	4.03	30.00	-28.43	-13	-15.43	Horizontal
3465.0	-54.23	4.03	30.00	-28.26	-13	-15.26	Vertical
5197.5	-53.07	5.25	35.86	-22.46	-13	-9.46	Vertical
5197.5	-49.33	5.25	35.86	-18.72	-13	-5.72	Horizontal
94.2	-58.66	1.46	15.48	-44.64	-13	-31.64	Vertical
168.4	-48.55	1.47	15.07	-34.95	-13	-21.95	Horizontal
Test Results for High Channel 1745MHz							
3490.0	-55.28	2.91	27.68	-30.51	-13	-17.51	Horizontal
3490.0	-50.63	2.91	27.68	-25.86	-13	-12.86	Vertical
5235.0	-58.94	5.26	35.86	-28.34	-13	-15.34	Vertical
5235.0	-58.87	5.26	35.86	-28.27	-13	-15.27	Horizontal
136.4	-57.20	1.50	15.57	-43.13	-13	-30.13	Vertical
190.3	-58.05	1.68	16.59	-43.14	-13	-30.14	Horizontal

Note: P_{Mea}(dBm)= Power(dBm)+ ARpl (dBm)
 Over Limit= : P_{Mea}(dBm)-Limit(dBm)

9.3 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	-51.13	2.78	27.50	-26.41	-13	-13.41	Horizontal
1649.4	-50.89	2.78	27.50	-26.17	-13	-13.17	Vertical
2474.1	-53.17	2.90	27.80	-28.27	-13	-15.27	Vertical
2474.1	-51.82	2.90	27.80	-26.92	-13	-13.92	Horizontal
155.3	-71.24	1.55	17.88	-54.91	-13	-41.91	Vertical
139.2	-49.71	1.57	16.53	-34.75	-13	-21.75	Horizontal
Test Results For Mid Channel 836.5MHz							
1673.0	-48.91	2.80	27.48	-24.23	-13	-11.23	Horizontal
1673.0	-48.33	2.80	27.48	-23.65	-13	-10.65	Vertical
2509.5	-48.83	2.91	27.70	-24.04	-13	-11.04	Vertical
2509.5	-58.58	2.91	27.70	-33.79	-13	-20.79	Horizontal
216.3	-63.94	1.47	16.68	-48.73	-13	-35.73	Vertical
201.0	-62.85	1.43	17.84	-46.44	-13	-33.44	Horizontal
Test Results for High Channel 848.3MHz							
1696.6	-52.42	2.82	27.43	-27.81	-13	-14.81	Horizontal
1696.6	-57.03	2.82	27.43	-32.42	-13	-19.42	Vertical
2544.9	-51.69	2.92	27.74	-26.87	-13	-13.87	Vertical
2544.9	-51.49	2.92	27.74	-26.67	-13	-13.67	Horizontal
177.8	-55.09	1.31	17.86	-38.54	-13	-25.54	Vertical
91.1	-49.39	1.62	15.53	-35.48	-13	-22.48	Horizontal

16QAM 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	-51.51	2.78	27.50	-26.79	-13	-13.79	Horizontal
1649.4	-57.09	2.78	27.50	-32.37	-13	-19.37	Vertical
2474.1	-53.04	2.90	27.80	-28.14	-13	-15.14	Vertical
2474.1	-55.02	2.90	27.80	-30.12	-13	-17.12	Horizontal
241.8	-56.75	1.34	15.07	-43.02	-13	-30.02	Vertical
124.1	-65.98	1.33	15.38	-51.93	-13	-38.93	Horizontal
Test Results For Mid Channel 836.5MHz							
1673.0	-53.30	2.80	27.48	-28.62	-13	-15.62	Horizontal
1673.0	-53.18	2.80	27.48	-28.50	-13	-15.50	Vertical
2509.5	-51.94	2.91	27.70	-27.15	-13	-14.15	Vertical
2509.5	-55.39	2.91	27.70	-30.60	-13	-17.60	Horizontal

103.0	-65.78	1.63	16.48	-50.93	-13	-37.93	Vertical
182.4	-52.16	1.36	16.80	-36.72	-13	-23.72	Horizontal
Test Results for High Channel 848.3MHz							
1696.6	-53.81	2.82	27.43	-29.20	-13	-16.20	Horizontal
1696.6	-52.41	2.82	27.43	-27.80	-13	-14.80	Vertical
2544.9	-47.17	2.92	27.74	-22.35	-13	-9.35	Vertical
2544.9	-53.35	2.92	27.74	-28.53	-13	-15.53	Horizontal
126.3	-61.00	1.54	15.89	-46.65	-13	-33.65	Vertical
202.8	-72.15	1.66	15.92	-57.89	-13	-44.89	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	-50.67	2.78	27.50	-25.95	-13	-12.95	Horizontal
1658.0	-48.76	2.78	27.50	-24.04	-13	-11.04	Vertical
2487.0	-50.69	2.90	27.80	-25.79	-13	-12.79	Vertical
2487.0	-47.99	2.90	27.80	-23.09	-13	-10.09	Horizontal
87.3	-52.64	1.79	16.39	-38.04	-13	-25.04	Vertical
164.6	-62.17	1.75	17.62	-46.30	-13	-33.30	Horizontal
Test Results For Mid Channel 836.5MHz							
1673.0	-51.53	2.80	27.48	-26.85	-13	-13.85	Horizontal
1673.0	-51.47	2.80	27.48	-26.79	-13	-13.79	Vertical
2509.5	-48.68	2.91	27.70	-23.89	-13	-10.89	Vertical
2509.5	-58.48	2.91	27.70	-33.69	-13	-20.69	Horizontal
146.6	-58.20	1.69	17.36	-42.53	-13	-29.53	Vertical
234.4	-69.74	1.51	17.57	-53.68	-13	-40.68	Horizontal
Test Results for High Channel 844MHz							
1688.0	-53.54	2.82	27.43	-28.93	-13	-15.93	Horizontal
1688.0	-48.01	2.82	27.43	-23.40	-13	-10.40	Vertical
2532.0	-55.38	2.92	27.74	-30.56	-13	-17.56	Vertical
2532.0	-50.18	2.92	27.74	-25.36	-13	-12.36	Horizontal
102.2	-62.88	1.49	16.09	-48.28	-13	-35.28	Vertical
248.9	-64.94	1.62	16.05	-50.51	-13	-37.51	Horizontal

16QAM 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	-52.04	2.78	27.50	-27.32	-13	-14.32	Horizontal
1658.0	-51.40	2.78	27.50	-26.68	-13	-13.68	Vertical
2487.0	-51.66	2.90	27.80	-26.76	-13	-13.76	Vertical
2487.0	-47.71	2.90	27.80	-22.81	-13	-9.81	Horizontal
120.4	-56.39	1.42	15.54	-42.27	-13	-29.27	Vertical
84.2	-57.94	1.45	15.29	-44.10	-13	-31.10	Horizontal
Test Results For Mid Channel 836.5MHz							
1673.0	-47.86	2.80	27.48	-23.18	-13	-10.18	Horizontal
1673.0	-54.84	2.80	27.48	-30.16	-13	-17.16	Vertical
2509.5	-54.04	2.91	27.70	-29.25	-13	-16.25	Vertical
2509.5	-56.95	2.91	27.70	-32.16	-13	-19.16	Horizontal
213.1	-71.55	1.42	15.86	-57.11	-13	-44.11	Vertical
204.0	-69.35	1.37	15.05	-55.67	-13	-42.67	Horizontal
Test Results for High Channel 844MHz							
1688.0	-52.29	2.82	27.43	-27.68	-13	-14.68	Horizontal
1688.0	-54.59	2.82	27.43	-29.98	-13	-16.98	Vertical
2532.0	-55.36	2.92	27.74	-30.54	-13	-17.54	Vertical
2532.0	-52.31	2.92	27.74	-27.49	-13	-14.49	Horizontal
163.3	-51.44	1.76	16.72	-36.48	-13	-23.48	Vertical
190.1	-55.91	1.50	15.48	-41.93	-13	-28.93	Horizontal

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

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

9.4 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 Gain(dB)	Absolute Level(dBm)	Limit (dBm)	Margin(dBm)	Polarity
5005.0	-61.35	5.23	35.81	-30.77	-25	-5.77	Horizontal
5005.0	-61.91	5.23	35.81	-31.33	-25	-6.33	Vertical
7507.5	-64.28	5.67	36.85	-33.10	-25	-8.10	Vertical
7507.5	-65.69	5.67	36.85	-34.51	-25	-9.51	Horizontal
86.8	-73.33	1.73	15.37	-59.69	-25	-34.69	Vertical
539.9	-82.24	1.72	16.26	-67.70	-25	-42.70	Horizontal
Test Results for Mid Channel 2535MHz							
5070.0	-64.90	5.23	35.82	-34.31	-25	-9.31	Horizontal
5070.0	-65.19	5.23	35.82	-34.60	-25	-9.60	Vertical
7605.0	-62.01	5.67	36.85	-30.83	-25	-5.83	Vertical
7605.0	-65.27	5.67	36.85	-34.09	-25	-9.09	Horizontal
81.5	-69.49	1.55	17.23	-53.81	-25	-28.81	Vertical
115.6	-81.93	1.65	15.70	-67.88	-25	-42.88	Horizontal
Test Results for High Channel 2567.5MHz							
5135.0	-64.61	5.24	35.83	-34.02	-25	-9.02	Horizontal
5135.0	-68.14	5.24	35.83	-37.55	-25	-12.55	Vertical
7702.5	-61.49	5.68	36.87	-30.30	-25	-5.30	Vertical
7702.5	-70.09	5.68	36.87	-38.90	-25	-13.90	Horizontal
474.3	-69.63	1.54	16.73	-54.44	-25	-29.44	Vertical
278.6	-84.21	1.36	16.33	-69.24	-25	-44.24	Horizontal

16QAM 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 Gain(dB)	Absolute Level(dBm)	Limit (dBm)	Margin(dBm)	Polarity
5005.0	-71.57	5.23	35.81	-40.99	-25	-15.99	Horizontal
5005.0	-73.66	5.23	35.81	-43.08	-25	-18.08	Vertical
7507.5	-68.96	5.67	36.85	-37.78	-25	-12.78	Vertical
7507.5	-75.14	5.67	36.85	-43.96	-25	-18.96	Horizontal
519.6	-83.70	1.36	16.72	-68.34	-25	-43.34	Vertical
358.6	-76.17	1.58	16.65	-61.10	-25	-36.10	Horizontal
Test Results for Mid Channel 2535MHz							
5070.0	-73.90	5.23	35.82	-43.31	-25	-18.31	Horizontal
5070.0	-71.30	5.23	35.82	-40.71	-25	-15.71	Vertical
7605.0	-69.56	5.67	36.85	-38.38	-25	-13.38	Vertical

7605.0	-70.65	5.67	36.85	-39.47	-25	-14.47	Horizontal
344.5	-76.67	1.32	17.33	-60.66	-25	-35.66	Vertical
129.1	-70.42	1.50	17.46	-54.46	-25	-29.46	Horizontal
Test Results for High Channel 2567.5MHz							
5135.0	-73.00	5.24	35.83	-42.41	-25	-17.41	Horizontal
5135.0	-74.58	5.24	35.83	-43.99	-25	-18.99	Vertical
7702.5	-69.28	5.68	36.87	-38.09	-25	-13.09	Vertical
7702.5	-70.85	5.68	36.87	-39.66	-25	-14.66	Horizontal
565.4	-63.02	1.78	15.82	-48.98	-25	-23.98	Vertical
537.0	-67.93	1.55	16.68	-52.80	-25	-27.80	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 Gain(dB)	Absolute Level(dBm)	Limit (dBm)	Margin(dBm)	Polarity
5020.0	-58.67	5.23	35.82	-28.08	-25	-3.08	Horizontal
5020.0	-59.06	5.23	35.82	-28.47	-25	-3.47	Vertical
7530.0	-65.92	5.67	36.86	-34.73	-25	-9.73	Vertical
7530.0	-65.44	5.67	36.86	-34.25	-25	-9.25	Horizontal
142.8	-63.36	1.37	16.05	-48.68	-25	-23.68	Vertical
277.8	-80.67	1.70	15.26	-67.11	-25	-42.11	Horizontal
Test Results for Mid Channel 2535MHz							
5070.0	-63.06	5.23	35.82	-32.47	-25	-7.47	Horizontal
5070.0	-66.32	5.23	35.82	-35.73	-25	-10.73	Vertical
7605.0	-65.45	5.67	36.85	-34.27	-25	-9.27	Vertical
7605.0	-66.01	5.67	36.85	-34.83	-25	-9.83	Horizontal
408.7	-75.48	1.39	16.44	-60.43	-25	-35.43	Vertical
523.6	-61.18	1.57	15.10	-47.65	-25	-22.65	Horizontal
Test Results for High Channel 2560MHz							
5120.0	-64.44	5.24	35.83	-33.85	-25	-8.85	Horizontal
5120.0	-60.23	5.24	35.83	-29.64	-25	-4.64	Vertical
7680.0	-68.62	5.70	36.88	-37.44	-25	-12.44	Vertical
7680.0	-65.68	5.70	36.88	-34.50	-25	-9.50	Horizontal
388.4	-71.33	1.78	15.71	-57.40	-25	-32.40	Vertical
189.4	-65.23	1.34	16.15	-50.42	-25	-25.42	Horizontal

16QAM EIRP POWER FOR LTE BAND 7 (20.0MHZ BANDWIDTH)

Test Results for Low Channel 2510MHz							
Frequency(MHz)	SG Level(dBm)	Cable Loss(dB)	Antenna Gain(dB)	Absolute Level(dBm)	Limit (dBm)	Margin(dBm)	Polarity
5020.0	-74.66	5.23	35.82	-44.07	-25	-19.07	Horizontal
5020.0	-71.02	5.23	35.82	-40.43	-25	-15.43	Vertical
7530.0	-70.92	5.67	36.86	-39.73	-25	-14.73	Vertical
7530.0	-69.37	5.67	36.86	-38.18	-25	-13.18	Horizontal
263.0	-62.55	1.38	17.72	-46.21	-25	-21.21	Vertical
86.8	-61.77	1.42	16.10	-47.09	-25	-22.09	Horizontal
Test Results for Mid Channel 2535MHz							
5070.0	-75.72	5.23	35.82	-45.13	-25	-20.13	Horizontal
5070.0	-76.70	5.23	35.82	-46.11	-25	-21.11	Vertical
7605.0	-74.56	5.67	36.85	-43.38	-25	-18.38	Vertical
7605.0	-71.65	5.67	36.85	-40.47	-25	-15.47	Horizontal
158.0	-68.54	1.31	17.19	-52.66	-25	-27.66	Vertical
530.0	-60.31	1.53	15.38	-46.46	-25	-21.46	Horizontal
Test Results for High Channel 2560MHz							
5120.0	-75.83	5.24	35.83	-45.24	-25	-20.24	Horizontal
5120.0	-75.44	5.24	35.83	-44.85	-25	-19.85	Vertical
7680.0	-68.94	5.70	36.88	-37.76	-25	-12.76	Vertical
7680.0	-69.84	5.70	36.88	-38.66	-25	-13.66	Horizontal
486.5	-65.56	1.79	16.45	-50.90	-25	-25.90	Vertical
376.5	-73.44	1.64	16.06	-59.02	-25	-34.02	Horizontal

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

10. FREQUENCY STABILITY

RULE PART(S)

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

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 3.4V, Normal, DC 3.8V and High voltage, DC 4.2V.

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 2
LTE Band 4
- ☐ LTE Band 5
LTE Band 7

RESULTS

See the following pages.

10.1 LTE BAND 2

QPSK, (20MHz BANDWIDTH)

Frequency error vs. Voltage

Voltage [Vdc]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
BAND 2 QPSK, (CH 18900 RB size 100 RB Offset 0 20MHz BANDWIDTH)				
3.4	1880	-2.93	-0.001559	2.5
3.8	1880	-6.42	-0.003415	2.5
4.2	1880	-3.51	-0.001867	2.5

Frequency error vs. Temperature

Temperature [° C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
BAND 2 QPSK, (CH 18900 RB size 100 RB Offset 0 20MHz BANDWIDTH)				
Normal (25C)	1880	-2.78	-0.001479	2.5
Extreme (50C)	1880	-5.23	-0.002782	2.5
Extreme (40C)	1880	-4.54	-0.002415	2.5
Extreme (30C)	1880	-4.71	-0.002505	2.5
Extreme (10C)	1880	-2.33	-0.001239	2.5
Extreme (0C)	1880	-3.99	-0.002122	2.5
Extreme (-10C)	1880	0.74	0.000394	2.5
Extreme (-20C)	1880	1.39	0.000739	2.5
Extreme (-30C)	1880	-3.09	-0.001644	2.5

16QAM, (20MHz BANDWIDTH)

Frequency error vs. Voltage

Voltage [Vdc]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
BAND 2 16QAM, (CH 18900 RB size 100 RB Offset 0 20MHz BANDWIDTH)				
3.4	1880	-3.56	-0.001894	2.5
3.8	1880	-0.45	-0.000239	2.5
4.2	1880	-2.96	-0.001574	2.5

Frequency error vs. Temperature

Temperature [° C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
BAND 2 16QAM, (CH 18900 RB size 100 RB Offset 0 20MHz BANDWIDTH)				
Normal (25C)	1880	-1.53	-0.000814	2.5
Extreme (50C)	1880	1.43	0.000761	2.5
Extreme (40C)	1880	-1.96	-0.001043	2.5
Extreme (30C)	1880	1.72	0.000915	2.5
Extreme (10C)	1880	0.36	0.000191	2.5
Extreme (0C)	1880	-0.26	-0.000138	2.5
Extreme (-10C)	1880	-5.10	-0.002713	2.5
Extreme (-20C)	1880	1.96	0.001043	2.5
Extreme (-30C)	1880	-1.04	-0.000553	2.5

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

10.2 LTE BAND 4

QPSK, (10MHz BANDWIDTH)

Frequency error vs. Voltage

Voltage [Vdc]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
BAND 4 QPSK, (CH 20175 RB size 100 RB Offset 0 20MHz BANDWIDTH)				
3.4	1732.5	1.02	0.000589	2.5
3.8	1732.5	-2.25	-0.001299	2.5
4.2	1732.5	-3.04	-0.001755	2.5

Frequency error vs. Temperature

Temperature [°C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
BAND 4 QPSK, (CH 20175 RB size 100 RB Offset 0 20MHz BANDWIDTH)				
Normal (25C)	1732.5	4.55	0.002626	2.5
Extreme (50C)	1732.5	3.68	0.002124	2.5
Extreme (40C)	1732.5	4.84	0.002794	2.5
Extreme (30C)	1732.5	2.84	0.001639	2.5
Extreme (10C)	1732.5	0.20	0.000115	2.5
Extreme (0C)	1732.5	3.74	0.002159	2.5
Extreme (-10C)	1732.5	2.05	0.001183	2.5
Extreme (-20C)	1732.5	-0.01	-0.000006	2.5
Extreme (-30C)	1732.5	6.06	0.003498	2.5

16QAM, (20MHz BANDWIDTH)

Frequency error vs. Voltage

Voltage [Vdc]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
BAND 4 16QAM, (CH 20175 RB size 100 RB Offset 0 20MHz BANDWIDTH)				
3.4	1732.5	-0.12	-0.000069	2.5
3.8	1732.5	-2.73	-0.001576	2.5
4.2	1732.5	0.89	0.000514	2.5

Frequency error vs. Temperature

Temperature [°C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
BAND 4 16QAM, (CH 20175 RB size 100 RB Offset 0 20MHz BANDWIDTH)				
Normal (25C)	1732.5	1.49	0.000860	2.5
Extreme (50C)	1732.5	3.90	0.002251	2.5
Extreme (40C)	1732.5	5.67	0.003273	2.5
Extreme (30C)	1732.5	4.08	0.002355	2.5
Extreme (10C)	1732.5	4.97	0.002869	2.5
Extreme (0C)	1732.5	0.46	0.000266	2.5
Extreme (-10C)	1732.5	4.76	0.002747	2.5
Extreme (-20C)	1732.5	2.40	0.001385	2.5
Extreme (-30C)	1732.5	0.67	0.000387	2.5

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

10.3 LTE BAND 5

QPSK, (10MHz BANDWIDTH)

Frequency error vs. Voltage

Voltage [Vdc]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
BAND 5 QPSK, (CH 20525 RB size 50 RB Offset 0 10MHz BANDWIDTH)				
3.4	836.5	-0.9	-0.001076	2.5
3.8	836.5	-2.10	-0.002510	2.5
4.2	836.5	-0.20	-0.000239	2.5

Frequency error vs. Temperature

Temperature [° C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
BAND 5 QPSK, (CH 20525 RB size 50 RB Offset 0 10MHz BANDWIDTH)				
Normal (25C)	836.5	3.21	0.003837	2.5
Extreme (50C)	836.5	3.04	0.003634	2.5
Extreme (40C)	836.5	2.65	0.003168	2.5
Extreme (30C)	836.5	4.67	0.005583	2.5
Extreme (10C)	836.5	-2.79	-0.003335	2.5
Extreme (0C)	836.5	1.97	0.002355	2.5
Extreme (-10C)	836.5	-2.93	-0.003503	2.5
Extreme (-20C)	836.5	5.02	0.006001	2.5
Extreme (-30C)	836.5	-3.97	-0.004746	2.5

16QAM, (10MHz BANDWIDTH)

Frequency error vs. Voltage

Voltage [Vdc]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
BAND 5 16QAM, (CH 20525 RB size 50 RB Offset 0 10MHz BANDWIDTH)				
3.4	836.5	-0.52	-0.000622	2.5
3.8	836.5	-2.73	-0.003264	2.5
4.2	836.5	0.2	0.000239	2.5

Frequency error vs. Temperature

Temperature [° C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
BAND 5 16QAM, (CH 20525 RB size 50 RB Offset 0 10MHz BANDWIDTH)				
Normal (25C)	836.5	-0.18	-0.000215	2.5
Extreme (50C)	836.5	-2.57	-0.003072	2.5
Extreme (40C)	836.5	-2.76	-0.003299	2.5
Extreme (30C)	836.5	3.05	0.003646	2.5
Extreme (10C)	836.5	-3.26	-0.003897	2.5
Extreme (0C)	836.5	0.45	0.000538	2.5
Extreme (-10C)	836.5	-2.70	-0.003228	2.5
Extreme (-20C)	836.5	2.27	0.002714	2.5
Extreme (-30C)	836.5	-2.17	-0.002594	2.5

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

10.4 LTE BAND 7

QPSK, (20MHz BANDWIDTH)

Frequency error vs. Voltage

Voltage [Vdc]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
BAND 7 QPSK, (CH 21100 RB size 100 RB Offset 0 20MHz BANDWIDTH)				
3.4	2535	-2.94	-0.001160	2.5
3.8	2535	0.30	0.000118	2.5
4.2	2535	0.69	0.000272	2.5

Frequency error vs. Temperature

Temperature [° C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
BAND 7 QPSK, (CH 21100 RB size 100 RB Offset 0 20MHz BANDWIDTH)				
Normal (25C)	2535	1.01	0.000398	2.5
Extreme (50C)	2535	-1.05	-0.000414	2.5
Extreme (40C)	2535	-4.60	-0.001815	2.5
Extreme (30C)	2535	1.47	0.000580	2.5
Extreme (10C)	2535	-4.97	-0.001961	2.5
Extreme (0C)	2535	-3.01	-0.001187	2.5
Extreme (-10C)	2535	0.34	0.000134	2.5
Extreme (-20C)	2535	1.11	0.000438	2.5
Extreme (-30C)	2535	-3.46	-0.001365	2.5

16QAM, (20MHz BANDWIDTH)

Frequency error vs. Voltage

Voltage [Vdc]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
BAND 7 16QAM, (CH 21100 RB size 100 RB Offset 0 20MHz BANDWIDTH)				
3.4	2535	-3.27	-0.001290	2.5
3.8	2535	-0.32	-0.000126	2.5
4.2	2535	-4.50	-0.001775	2.5

Frequency error vs. Temperature

Temperature [° C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
BAND 7 16QAM, (CH 21100 RB size 100 RB Offset 0 20MHz BANDWIDTH)				
Normal (25C)	2535	-7.07	-0.002789	2.5
Extreme (50C)	2535	1.72	0.000679	2.5
Extreme (40C)	2535	0.75	0.000296	2.5
Extreme (30C)	2535	-2.31	-0.000911	2.5
Extreme (10C)	2535	1.55	0.000611	2.5
Extreme (0C)	2535	-3.63	-0.001432	2.5
Extreme (-10C)	2535	-3.40	-0.001341	2.5
Extreme (-20C)	2535	-1.98	-0.000781	2.5
Extreme (-30C)	2535	2.00	0.000789	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.

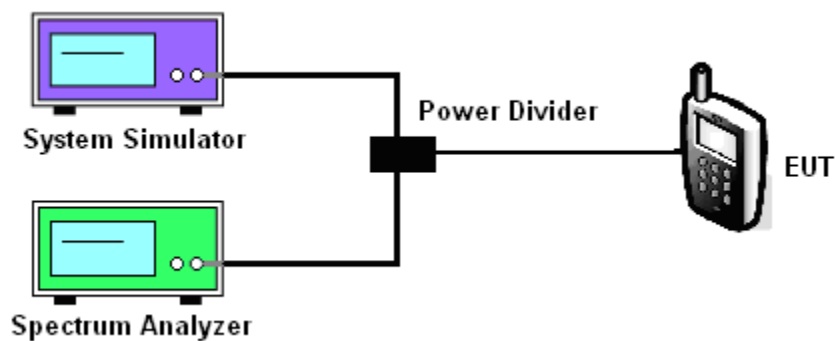
11.2 Measuring Instruments

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 GSM/EGPRS operating modes:
 - a. Set the RBW = 1MHz, VBW = 1MHz, Peak detector in spectrum analyzer.
 - b. Set EUT in maximum power output, and triggered the burst signal.
 - c. Measured respectively the Peak level and Mean level, and the deviation was recorded as Peak to Average Ratio.
4. For UMTS 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 Band2
- LTE Band 4
- ☐ LTE Band5
- LTE Band 7
- Test data reference attachment.

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