

FCC eCFR 47 PART 22H, 24E, 27L CERTIFICATION TEST REPORT

FCC ID: 2ATW5-R3

Product: R3 4G Tracker for Temperature + Humidity +
Light

Trade Mark: Cydiance

Model No.: R3

Family Model: N/A

Report No.: N25101604106E

Issue Date: Nov. 12, 2025

Prepared for

Shanghai Cydiance Technology Co.,Ltd

Room 815, Bldg 6, No.285 Rongxing Rd, Songjiang, 201600, Shanghai, China

Prepared by

Shenzhen NTEK Testing Technology Co., Ltd.

No. 24 Xinfu East Road, Xiangshan Community, Xinqiao Street,
Baoan District, Shenzhen, Guangdong, People's Republic of China

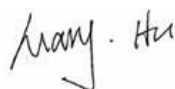
Tel. 0755-23200050 Website: <http://www.ntek.org.cn>

TEST RESULT CERTIFICATION

Applicant's name : Shanghai Cydiance Technology Co.,Ltd
Address..... : Room 815, Bldg 6, No.285 Rongxing Rd, Songjiang, 201600, Shanghai, China
Manufacturer's Name..... : Shanghai Cydiance Technology Co.,Ltd
Address..... : Room 815, Bldg 6, No.285 Rongxing Rd, Songjiang, 201600, Shanghai, China
Product name..... : R3 4G Tracker for Temperature + Humidity + Light
Model and/or type reference .. : R3
Family Model..... : N/A
Test Sample Number : S2510170116-1#
Date of Test..... : Oct. 17, 2025 ~ Dec. 18, 2025
Standards..... : FCC eCFR 47 Part 22H, Part 24E, Part 27L
Test procedure ANSI C63.26:2015

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.

This report shall not be reproduced except in full, without the written approval of NTEK, this document may be altered or revised by NTEK, personal only, and shall be noted in the revision of the document.

Prepared : 
 By : _____
 Mary Hu
 (Project Engineer)

Reviewed : 
 By : _____
 Aaron Cheng
 (Supervisor)

Approved : 
 By : _____
 Alex Li
 (Manager)

TABLE OF CONTENTS

1. GENERAL INFORMATION.....	5
1.1 PRODUCT DESCRIPTION	5
1.3 TEST METHODOLOGY	6
1.4 TEST FACILITY	6
MEASUREMENT UNCERTAINTY	6
1.5 SPECIAL ACCESSORIES.....	6
1.6 WORST-CASE CONFIGURATION AND MODE.....	6
2. SYSTEM TEST CONFIGURATION	7
2.1 EUT CONFIGURATION.....	7
2.2 EUT EXERCISE	7
2.3 CONFIGURATION OF EUT SYSTEM.....	7
2.4 TEST SETUP	8
3.TEST AND MEASUREMENT EQUIPMENT	9
4. OUTPUT POWER.....	11
4.1 OUTPUT POWER MEASUREMENT	11
6. BANDEDGE AND EMISSION MASK.....	14
7. OUT OF BAND EMISSIONS	16
7.1 MEASUREMENT METHOD	16
8. RADIATED MEASUREMENT	17
8.1. RADIATED POWER (ERP & EIRP)	17
8.2 LTE BAND 2.....	18
8.3 LTE BAND 4.....	20
8.4 LTE BAND 5.....	22
9. SPURIOUS RADIATION EMISSION	24
9.1 LTE BAND 2.....	26

9.2 LTE BAND 4.....	28
9.3 LTE BAND 5.....	30
10. FREQUENCY STABILITY	32
10.1 LTE BAND 2	33
10.2 LTE BAND 4	35
10.3 LTE BAND 5	37
11. PEAK-TO-AVERAGE RATIO.....	39
11.1 Description of the PAR Measurement	39
11.2 Measuring Instruments	39
11.3 Test Procedures.....	39
11.4 Test Setup.....	40

1. GENERAL INFORMATION

1.1 PRODUCT DESCRIPTION

A major technical description of EUT is described as following:

Product Designation:	R3 4G Tracker for Temperature + Humidity + Light
Trade Mark	Cydiance
Model Name	R3
Family Model	N/A
Model Difference	N/A
FCC ID:	2ATW5-R3
Frequency Bands:	U.S. Bands: ☒ LTE FDD Band 2,4,5
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;
Type of Modulation:	QPSK/16QAM/64QAM(Only Downlink)
Power Class	Class 3
Antenna:	FPC Antenna
Antenna gain:	Band 2: -0.85 dBi; Band 4: 0.95 dBi; Band 5: 2.78 dBi
Battery	DC 3.6V 2500mAh*3
Adapter	N/A
Power supply	DC 3.6V from battery or DC 5V from type-c Port
Extreme Vol. Limits:	DC 3.06V to DC 4.14V (Nominal DC 3.6V) (Note 1)
HW Version	V1.2
FW Version	V1.0.4v01
SW Version	N/A
** Note1: The High Voltage DC 4.14V and Low Voltage 3.06V 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: 2ATW5-R3** filing to comply with the FCC Part 22H&24E&27L.

1.3 TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, Part 22H, Part 24E, Part 27L, 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 2/4/5

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	R3 4G Tracker for Temperature + Humidity + Light	R3	FCC ID: 2ATW5-R3	EUT

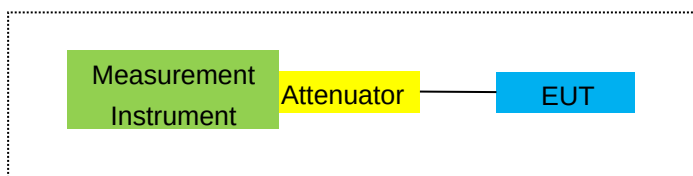
*Note: All the accessories have been used during the test.
the following "EUT" in setup diagram means EUT system.*

2.4 TEST SETUP

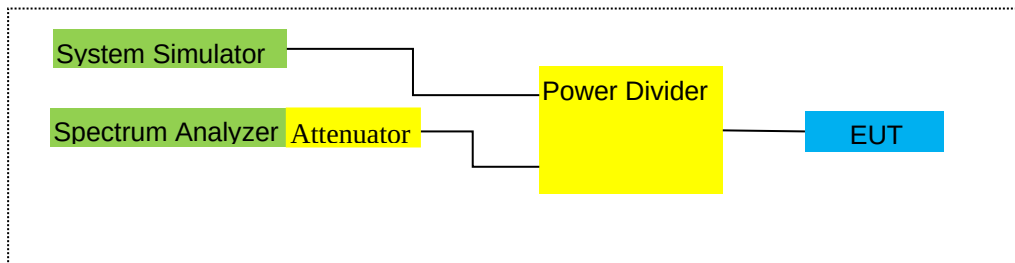
For Radiated Test Cases



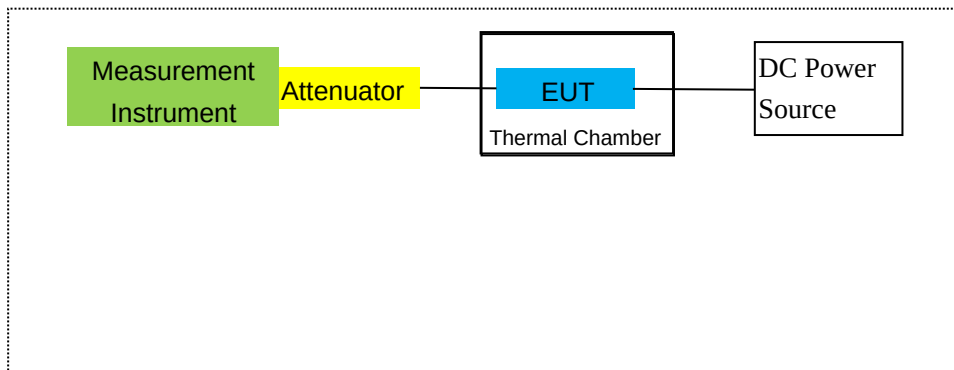
For Conducted Output Power



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	2025.04.17	2026.04.16	1 year
2	Test Receiver	R&S	ESPI	101318	2025.04.17	2026.04.16	1 year
3	Bilog Antenna	TESEQ	CBL6111D	31216	2025.04.17	2026.04.16	1 year
4	50Ω Coaxial Switch	Anritsu	MP59B	6200983705	2024.04.26	2027.04.25	3 year
5	Broadband Horn Antenna	SCHWARZBECK	BBHA 9120 D	2816	2024.05.18	2027.05.17	3 year
6	Broadband Horn Antenna	SCHWARZBECK	BBHA 9120 D	2817	2024.05.18	2027.05.17	3 year
7	Amplifier	EM	EM-30180	060538	2025.04.17	2026.04.16	1 year
8	Active Loop Antenna	SCHWARZBECK	FMZB 1519 B	055	2024.05.17	2027.05.16	3 year
9	Power Meter	R&S	NRVS	100696	2025.04.17	2026.04.16	1 year
10	Power Sensor	R&S	URV5-Z4	0395.1619.05	2025.04.17	2026.04.16	1 year
11	Test Cable	N/A	R-01	N/A	2023.06.17	2026.06.16	3 year
12	Test Cable	N/A	R-02	N/A	2023.06.17	2026.06.16	3 year
13	Test Cable	N/A	R-03	N/A	2023.06.17	2026.06.16	3 year
14	Test Receiver	R&S	ESCI	101160	2025.04.17	2026.04.16	1 year
15	LISN	R&S	ENV216	101313	2025.04.17	2026.04.16	1 year
16	LISN	EMCO	3816/2	00042990	2025.04.17	2026.04.16	1 year
17	50Ω Coaxial Switch	Anritsu	MP59B	6200983705	2024.04.26	2027.04.25	3 year
18	Field strength probe	narda	EP601	711WX81278	2025.04.17	2026.04.16	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	MY41000130	2025.04.17	2026.04.16	1 year
23	EMI Test Receiver	R&S	ESCI	101160	2025.04.17	2026.04.16	1 year
24	Universal Radio Communication Tester	R&S	CMU200	105747	2025.04.17	2026.04.16	1 year

25	High and Low Temperature Box	WEISS	WT 20/40 EMC Simpac	58226119460030	2024.05.30	2027.05.29	3 year
26	DC Power Source	N/A	PS-6005D	20170402923	2024.04.25	2027.04.24	3 year
27	MXG Vector Signal Generator	Agilent	N5183B	MY57280984	2025.04.17	2026.04.16	1 year
28	Log-Periodic Antenna	SCHWARZBECK	VULB 9162	584	2025.04.17	2026.04.16	1 year
29	Log-Periodic Antenna	SCHWARZBECK	VULB 9162	586	2025.04.17	2026.04.16	1 year
30	Communication Tester	R&S	CMW500	148500	2025.05.06	2026.05.05	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.

Item	Manufacturer	Software Name	Software Version	Description
1	MWRFTtest	MTS 8200	2.0	RF Conducted Test
2	Farad	EZ-EMC_RE	AIT-03A	RadiatedTest

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 2/4/5

RESULTS

PASS

Test data reference attachment.

6. BANDEDGE AND EMISSION MASK

RULE PART(S)

FCC: §2.1051, §22.917, §24.238, §27.53

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;

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 2/4/5

RESULTS

Test data reference attachment.

7. OUT OF BAND EMISSIONS

RULE PART(S)

FCC: §2.1051, §22.917, §24.238, §27.53

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 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 2/4/5

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

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.

24.232(c) The maximum output power of the transmitter for mobile and portable stations are limited to 2 watts EIRP.

TEST PROCEDURE

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 2/4/5

RESULTS

Pass

8.2 LTE BAND 2

Radiated Power (EIRP) for Band 2										
Mode	RB/RB SIZE	Frequency	Result						Limit (W)	Conclusion
			SG Level (dBm)	Cable Loss (dBm)	Antenna Gain (dB)	Max. EIRP Average (dBm)	Max. EIRP Average (mW)	Polarization Of Max. ERP		
1.4MHz Band QPSK	1/#Mid	1850.7	16.64	3.76	8.90	21.78	150.661	Horizontal	2	Pass
		1880	14.96	3.91	8.90	19.95	98.855	Horizontal	2	Pass
		1909.3	15.42	3.93	8.90	20.39	109.396	Horizontal	2	Pass
3.0MHz Band QPSK	1/#Mid	1851.5	13.02	3.77	8.90	18.15	65.313	Horizontal	2	Pass
		1880	14.68	3.91	8.90	19.67	92.683	Horizontal	2	Pass
		1908.5	16.37	3.94	8.90	21.33	135.831	Horizontal	2	Pass
5.0MHz Band QPSK	1/#Mid	1852.5	16.19	3.77	8.90	21.32	135.519	Horizontal	2	Pass
		1880	16.87	3.91	8.90	21.86	153.462	Horizontal	2	Pass
		1907.5	16.27	3.94	8.90	21.23	132.739	Horizontal	2	Pass
10.0MHz Band QPSK	1/#Mid	1855	15.66	3.79	8.90	20.77	119.399	Horizontal	2	Pass
		1880	16.89	3.95	8.90	21.84	152.757	Horizontal	2	Pass
		1905	15.83	3.97	8.90	20.76	119.124	Horizontal	2	Pass
15.0MHz Band QPSK	1/#Mid	1857.5	15.81	3.79	8.90	20.92	123.595	Horizontal	2	Pass
		1880	15.99	3.95	8.90	20.94	124.165	Horizontal	2	Pass
		1902.5	15.12	3.97	8.90	20.05	101.158	Horizontal	2	Pass
20.0MHz Band QPSK	1/#Mid	1860	15.91	3.81	8.90	21	125.893	Horizontal	2	Pass
		1880	14.60	3.96	8.90	19.54	89.950	Horizontal	2	Pass
		1900	16.13	4.00	8.90	21.03	126.765	Horizontal	2	Pass
1.4MHz Band QPSK	1/#Mid	1850.7	15.54	3.76	8.90	20.68	116.950	Vertical	2	Pass
		1880	14.46	3.91	8.90	19.45	88.105	Vertical	2	Pass
		1909.3	16.09	3.93	8.90	21.06	127.644	Vertical	2	Pass
3.0MHz Band QPSK	1/#Mid	1851.5	15.77	3.77	8.90	20.9	123.027	Vertical	2	Pass
		1880	16.01	3.91	8.90	21	125.893	Vertical	2	Pass
		1908.5	14.49	3.94	8.90	19.45	88.105	Vertical	2	Pass
5.0MHz Band QPSK	1/#Mid	1852.5	15.61	3.77	8.90	20.74	118.577	Vertical	2	Pass
		1880	15.19	3.91	8.90	20.18	104.232	Vertical	2	Pass
		1907.5	16.44	3.94	8.90	21.4	138.038	Vertical	2	Pass
10.0MHz Band QPSK	1/#Mid	1855	14.30	3.79	8.90	19.41	87.297	Vertical	2	Pass
		1880	12.71	3.95	8.90	17.66	58.345	Vertical	2	Pass
		1905	13.54	3.97	8.90	18.47	70.307	Vertical	2	Pass
15.0MHz Band QPSK	1/#Mid	1857.5	14.49	3.79	8.90	19.6	91.201	Vertical	2	Pass
		1880	16.25	3.95	8.90	21.2	131.826	Vertical	2	Pass
		1902.5	16.12	3.97	8.90	21.05	127.350	Vertical	2	Pass
20.0MHz Band QPSK	1/#Mid	1860	17.72	3.81	8.90	22.81	190.985	Vertical	2	Pass
		1880	15.19	3.96	8.90	20.13	103.039	Vertical	2	Pass
		1900	15.39	4.00	8.90	20.29	106.905	Vertical	2	Pass

Radiated Power (EIRP) for Band 2										
Mode	RB/RB SIZE	Frequency	Result						Limit (W)	Conclusion
			SG Level (dBm)	Cable Loss (dBm)	Antenna Gain (dB)	Max. EIRP Average (dBm)	Max. EIRP Average (mW)	Polarization Of Max. ERP		
1.4MHz Band 16 QAM	1/#Mid	1850.7	14.60	3.76	8.90	21.54	142.561	Horizontal	2	Pass
		1880	15.75	3.91	8.90	20.88	122.462	Horizontal	2	Pass
		1909.3	15.45	3.93	8.90	20.96	124.738	Horizontal	2	Pass
3.0MHz Band 16 QAM	1/#Mid	1851.5	15.29	3.77	8.90	19.21	83.368	Horizontal	2	Pass
		1880	14.95	3.91	8.90	20.31	107.399	Horizontal	2	Pass
		1908.5	14.55	3.94	8.90	19.88	97.275	Horizontal	2	Pass
5.0MHz Band 16 QAM	1/#Mid	1852.5	15.14	3.77	8.90	21.33	135.831	Horizontal	2	Pass
		1880	15.50	3.91	8.90	20.23	105.439	Horizontal	2	Pass
		1907.5	14.00	3.94	8.90	19.18	82.794	Horizontal	2	Pass
10.0MHz Band 16 QAM	1/#Mid	1855	15.35	3.79	8.90	20.87	122.180	Horizontal	2	Pass
		1880	14.05	3.95	8.90	20.16	103.753	Horizontal	2	Pass
		1905	15.36	3.97	8.90	21.25	133.352	Horizontal	2	Pass
15.0MHz Band 16 QAM	1/#Mid	1857.5	13.68	3.79	8.90	20.37	108.893	Horizontal	2	Pass
		1880	15.77	3.95	8.90	19.15	82.224	Horizontal	2	Pass
		1902.5	15.65	3.97	8.90	20.18	104.232	Horizontal	2	Pass
20.0MHz Band 16 QAM	1/#Mid	1860	13.84	3.81	8.90	19.31	85.310	Horizontal	2	Pass
		1880	16.17	3.96	8.90	20.54	113.240	Horizontal	2	Pass
		1900	14.55	4.00	8.90	19.05	80.353	Horizontal	2	Pass
1.4MHz Band 16 QAM	1/#Mid	1850.7	14.61	3.76	8.90	20.04	100.925	Vertical	2	Pass
		1880	15.84	3.91	8.90	19.47	88.512	Vertical	2	Pass
		1909.3	15.13	3.93	8.90	20.01	100.231	Vertical	2	Pass
3.0MHz Band 16 QAM	1/#Mid	1851.5	13.77	3.77	8.90	19.81	95.719	Vertical	2	Pass
		1880	14.83	3.91	8.90	21.65	146.218	Vertical	2	Pass
		1908.5	14.56	3.94	8.90	19.1	81.283	Vertical	2	Pass
5.0MHz Band 16 QAM	1/#Mid	1852.5	13.76	3.77	8.90	21.02	126.474	Vertical	2	Pass
		1880	15.05	3.91	8.90	20.88	122.462	Vertical	2	Pass
		1907.5	15.69	3.94	8.90	19.51	89.331	Vertical	2	Pass
10.0MHz Band 16 QAM	1/#Mid	1855	13.98	3.79	8.90	20.63	115.611	Vertical	2	Pass
		1880	15.57	3.95	8.90	19.75	94.406	Vertical	2	Pass
		1905	15.12	3.97	8.90	20.4	109.648	Vertical	2	Pass
15.0MHz Band 16 QAM	1/#Mid	1857.5	13.85	3.79	8.90	18.77	75.336	Vertical	2	Pass
		1880	14.87	3.95	8.90	21.67	146.893	Vertical	2	Pass
		1902.5	13.66	3.97	8.90	20.02	100.462	Vertical	2	Pass
20.0MHz Band 16 QAM	1/#Mid	1860	14.29	3.81	8.90	21.96	157.036	Vertical	2	Pass
		1880	14.90	3.96	8.90	20.23	105.439	Vertical	2	Pass
		1900	13.78	4.00	8.90	19.83	96.161	Vertical	2	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 4

Radiated Power (EIRP) for Band 4										
Mode	RB/RB SIZE	Frequency	Result						Limit (W)	Conclusion
			SG Level (dBm)	Cable Loss (dBm)	Antenna Gain (dB)	Max. EIRP Average (dBm)	Max. EIRP Average (mW)	Polarization Of Max. ERP		
1.4MHz Band QPSK	1/#Mid	1710.7	14.13	3.12	8.90	19.91	97.949	Horizontal	1	Pass
		1732.5	13.91	3.27	8.90	19.54	89.950	Horizontal	1	Pass
		1754.3	15.36	3.29	8.90	20.97	125.026	Horizontal	1	Pass
3.0MHz Band QPSK	1/#Mid	1711.5	14.58	3.13	8.90	20.35	108.393	Horizontal	1	Pass
		1732.5	14.02	3.27	8.90	19.65	92.257	Horizontal	1	Pass
		1753.5	14.29	3.30	8.90	19.89	97.499	Horizontal	1	Pass
5.0MHz Band QPSK	1/#Mid	1712.5	14.40	3.13	8.90	20.17	103.992	Horizontal	1	Pass
		1732.5	15.08	3.27	8.90	20.71	117.761	Horizontal	1	Pass
		1752.5	13.71	3.30	8.90	19.31	85.310	Horizontal	1	Pass
10.0MHz Band QPSK	1/#Mid	1715	15.10	3.15	8.90	20.85	121.619	Horizontal	1	Pass
		1732.5	14.55	3.31	8.90	20.14	103.276	Horizontal	1	Pass
		1750	15.50	3.33	8.90	21.07	127.938	Horizontal	1	Pass
15.0MHz Band QPSK	1/#Mid	1717.5	14.51	3.15	8.90	20.26	106.170	Horizontal	1	Pass
		1732.5	15.72	3.31	8.90	21.31	135.207	Horizontal	1	Pass
		1747.5	14.84	3.33	8.90	20.41	109.901	Horizontal	1	Pass
20.0MHz Band QPSK	1/#Mid	1720	13.23	3.17	8.90	18.96	78.705	Horizontal	1	Pass
		1732.5	14.00	3.32	8.90	19.58	90.782	Horizontal	1	Pass
		1745	13.82	3.36	8.90	19.36	86.298	Horizontal	1	Pass
1.4MHz Band QPSK	1/#Mid	1710.7	13.54	3.12	8.90	19.32	85.507	Vertical	1	Pass
		1732.5	14.91	3.27	8.90	20.54	113.240	Vertical	1	Pass
		1754.3	14.61	3.29	8.90	20.22	105.196	Vertical	1	Pass
3.0MHz Band QPSK	1/#Mid	1711.5	14.36	3.13	8.90	20.13	103.039	Vertical	1	Pass
		1732.5	15.34	3.27	8.90	20.97	125.026	Vertical	1	Pass
		1753.5	16.57	3.30	8.90	22.17	164.816	Vertical	1	Pass
5.0MHz Band QPSK	1/#Mid	1712.5	13.07	3.13	8.90	18.84	76.560	Vertical	1	Pass
		1732.5	16.18	3.27	8.90	21.81	151.705	Vertical	1	Pass
		1752.5	13.58	3.30	8.90	19.18	82.794	Vertical	1	Pass
10.0MHz Band QPSK	1/#Mid	1715	12.45	3.15	8.90	18.2	66.069	Vertical	1	Pass
		1732.5	14.18	3.31	8.90	19.77	94.842	Vertical	1	Pass
		1750	13.85	3.33	8.90	19.42	87.498	Vertical	1	Pass
15.0MHz Band QPSK	1/#Mid	1717.5	16.32	3.15	8.90	22.07	161.065	Vertical	1	Pass
		1732.5	15.50	3.31	8.90	21.09	128.529	Vertical	1	Pass
		1747.5	13.85	3.33	8.90	19.42	87.498	Vertical	1	Pass
20.0MHz Band QPSK	1/#Mid	1720	15.40	3.17	8.90	21.13	129.718	Vertical	1	Pass
		1732.5	16.78	3.32	8.90	22.36	172.187	Vertical	1	Pass
		1745	13.08	3.36	8.90	18.62	72.778	Vertical	1	Pass

Radiated Power (EIRP) for Band 4										
Mode	RB/RB SIZE	Frequency	Result						Limit (W)	Conclusion
			SG Level (dBm)	Cable Loss (dBm)	Antenna Gain (dB)	Max. EIRP Average (dBm)	Max. EIRP Average (mW)	Polarization Of Max. ERP		
1.4MHz Band 16 QAM	1/#Mid	1710.7	14.97	3.12	8.90	20.75	118.850	Horizontal	1	Pass
		1732.5	17.24	3.27	8.90	22.87	193.642	Horizontal	1	Pass
		1754.3	14.58	3.29	8.90	20.19	104.472	Horizontal	1	Pass
3.0MHz Band 16 QAM	1/#Mid	1711.5	14.79	3.13	8.90	20.56	113.763	Horizontal	1	Pass
		1732.5	15.61	3.27	8.90	21.24	133.045	Horizontal	1	Pass
		1753.5	14.36	3.30	8.90	19.96	99.083	Horizontal	1	Pass
5.0MHz Band 16 QAM	1/#Mid	1712.5	15.26	3.13	8.90	21.03	126.765	Horizontal	1	Pass
		1732.5	13.91	3.27	8.90	19.54	89.950	Horizontal	1	Pass
		1752.5	16.01	3.30	8.90	21.61	144.877	Horizontal	1	Pass
10.0MHz Band 16 QAM	1/#Mid	1715	16.60	3.15	8.90	22.35	171.791	Horizontal	1	Pass
		1732.5	14.50	3.31	8.90	20.09	102.094	Horizontal	1	Pass
		1750	13.56	3.33	8.90	19.13	81.846	Horizontal	1	Pass
15.0MHz Band 16 QAM	1/#Mid	1717.5	15.36	3.15	8.90	21.11	129.122	Horizontal	1	Pass
		1732.5	15.60	3.31	8.90	21.19	131.522	Horizontal	1	Pass
		1747.5	16.02	3.33	8.90	21.59	144.212	Horizontal	1	Pass
20.0MHz Band 16 QAM	1/#Mid	1720	14.70	3.17	8.90	20.43	110.408	Horizontal	1	Pass
		1732.5	15.50	3.32	8.90	21.08	128.233	Horizontal	1	Pass
		1745	15.94	3.36	8.90	21.48	140.605	Horizontal	1	Pass
1.4MHz Band 16 QAM	1/#Mid	1710.7	15.59	3.12	8.90	21.37	137.088	Vertical	1	Pass
		1732.5	14.90	3.27	8.90	20.53	112.980	Vertical	1	Pass
		1754.3	14.30	3.29	8.90	19.91	97.949	Vertical	1	Pass
3.0MHz Band 16 QAM	1/#Mid	1711.5	14.64	3.13	8.90	20.41	109.901	Vertical	1	Pass
		1732.5	16.28	3.27	8.90	21.91	155.239	Vertical	1	Pass
		1753.5	15.77	3.30	8.90	21.37	137.088	Vertical	1	Pass
5.0MHz Band 16 QAM	1/#Mid	1712.5	16.88	3.13	8.90	22.65	184.077	Vertical	1	Pass
		1732.5	14.82	3.27	8.90	20.45	110.917	Vertical	1	Pass
		1752.5	13.81	3.30	8.90	19.41	87.297	Vertical	1	Pass
10.0MHz Band 16 QAM	1/#Mid	1715	14.26	3.15	8.90	20.01	100.231	Vertical	1	Pass
		1732.5	16.34	3.31	8.90	21.93	155.955	Vertical	1	Pass
		1750	15.81	3.33	8.90	21.38	137.404	Vertical	1	Pass
15.0MHz Band 16 QAM	1/#Mid	1717.5	13.72	3.15	8.90	19.47	88.512	Vertical	1	Pass
		1732.5	13.69	3.31	8.90	19.28	84.723	Vertical	1	Pass
		1747.5	16.08	3.33	8.90	21.65	146.218	Vertical	1	Pass
20.0MHz Band 16 QAM	1/#Mid	1720	15.04	3.17	8.90	20.77	119.399	Vertical	1	Pass
		1732.5	16.03	3.32	8.90	21.61	144.877	Vertical	1	Pass
		1745	17.42	3.36	8.90	22.96	197.697	Vertical	1	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 5

Radiated Power (ERP) for Band 5											
Mode	RB/RB SIZE	Frequency	Result							Limit (W)	Conclusion
			SG Level (dBm)	Cable Loss (dBm)	Antenna Gain (dB)	Correction (dB)	Max. ERP Average (dBm)	Max. ERP Average (mW)	Polarization Of Max. ERP		
1.4MHz Band QPSK	3/#Mid	824.7	19.67	2.01	5.30	2.15	20.81	120.504	Horizontal	7	Pass
		836.5	20.21	2.01	5.30	2.15	21.35	136.458	Horizontal	7	Pass
		848.3	18.62	2.02	5.70	2.15	20.15	103.514	Horizontal	7	Pass
3.0MHz Band QPSK	1/#Mid	825.5	20.38	2.01	5.30	2.15	21.52	141.906	Horizontal	7	Pass
		836.5	20.77	2.01	5.30	2.15	21.91	155.239	Horizontal	7	Pass
		847.5	19.38	2.02	5.70	2.15	20.91	123.310	Horizontal	7	Pass
5.0MHz Band QPSK	1/#Mid	826.5	19.41	2.01	5.30	2.15	20.55	113.501	Horizontal	7	Pass
		836.5	19.98	2.01	5.30	2.15	21.12	129.420	Horizontal	7	Pass
		846.5	19.75	2.02	5.70	2.15	21.28	134.276	Horizontal	7	Pass
10.0MHz Band QPSK	1/#Mid	829	19.19	2.01	5.30	2.15	20.33	107.895	Horizontal	7	Pass
		836.5	20.54	2.01	5.30	2.15	21.68	147.231	Horizontal	7	Pass
		844	18.80	2.02	5.70	2.15	20.33	107.895	Horizontal	7	Pass
1.4MHz Band QPSK	1/#Mid	824.7	20.84	2.01	5.30	2.15	21.98	157.761	Vertical	7	Pass
		836.5	21.22	2.01	5.30	2.15	22.36	172.187	Vertical	7	Pass
		848.3	19.80	2.02	5.70	2.15	21.33	135.831	Vertical	7	Pass
3.0MHz Band QPSK	1/#Mid	825.5	20.07	2.01	5.30	2.15	21.21	132.130	Vertical	7	Pass
		836.5	19.85	2.01	5.30	2.15	20.99	125.603	Vertical	7	Pass
		847.5	18.15	2.02	5.70	2.15	19.68	92.897	Vertical	7	Pass
5.0MHz Band QPSK	1/#Mid	826.5	18.23	2.01	5.30	2.15	19.37	86.497	Vertical	7	Pass
		836.5	20.31	2.01	5.30	2.15	21.45	139.637	Vertical	7	Pass
		846.5	19.72	2.02	5.70	2.15	21.25	133.352	Vertical	7	Pass
10.0MHz Band QPSK	1/#Mid	829	18.48	2.01	5.30	2.15	19.62	91.622	Vertical	7	Pass
		836.5	21.82	2.01	5.30	2.15	22.96	197.697	Vertical	7	Pass
		844	19.00	2.02	5.70	2.15	20.53	112.980	Vertical	7	Pass

Radiated Power (ERP) for Band 5											
Mode	RB/RB SIZE	Frequency	Result							Limit (W)	Conclusion
			SG Level (dBm)	Cable Loss (dBm)	Antenna Gain (dB)	Correction (dB)	Max. ERP Average (dBm)	Max. ERP Average (mW)	Polarization Of Max. ERP		
1.4MHz Band 16 QAM	3/#Mid	824.7	18.37	2.01	5.30	2.15	19.51	89.331	Horizontal	7	Pass
		836.5	19.70	2.01	5.30	2.15	20.84	121.339	Horizontal	7	Pass
		848.3	18.13	2.02	5.70	2.15	19.66	92.470	Horizontal	7	Pass
3.0MHz Band 16 QAM	1/#Mid	825.5	18.91	2.01	5.30	2.15	20.05	101.158	Horizontal	7	Pass
		836.5	18.27	2.01	5.30	2.15	19.41	87.297	Horizontal	7	Pass
		847.5	18.13	2.02	5.70	2.15	19.66	92.470	Horizontal	7	Pass
5.0MHz Band 16 QAM	1/#Mid	826.5	17.67	2.01	5.30	2.15	18.81	76.033	Horizontal	7	Pass
		836.5	17.13	2.01	5.30	2.15	18.27	67.143	Horizontal	7	Pass
		846.5	18.59	2.02	5.70	2.15	20.12	102.802	Horizontal	7	Pass
10.0MHz Band 16 QAM	1/#Mid	829	17.95	2.01	5.30	2.15	19.09	81.096	Horizontal	7	Pass
		836.5	17.61	2.01	5.30	2.15	18.75	74.989	Horizontal	7	Pass
		844	16.88	2.02	5.70	2.15	18.41	69.343	Horizontal	7	Pass
1.4MHz Band 16 QAM	1/#Mid	824.7	19.28	2.01	5.30	2.15	20.42	110.154	Vertical	7	Pass
		836.5	18.92	2.01	5.30	2.15	20.06	101.391	Vertical	7	Pass
		848.3	17.48	2.02	5.70	2.15	19.01	79.616	Vertical	7	Pass
3.0MHz Band 16 QAM	1/#Mid	825.5	16.34	2.01	5.30	2.15	17.48	55.976	Vertical	7	Pass
		836.5	18.08	2.01	5.30	2.15	19.22	83.560	Vertical	7	Pass
		847.5	16.86	2.02	5.70	2.15	18.39	69.024	Vertical	7	Pass
5.0MHz Band 16 QAM	1/#Mid	826.5	18.36	2.01	5.30	2.15	19.5	89.125	Vertical	7	Pass
		836.5	15.65	2.01	5.30	2.15	16.79	47.753	Vertical	7	Pass
		846.5	18.78	2.02	5.70	2.15	20.31	107.399	Vertical	7	Pass
10.0MHz Band 16 QAM	1/#Mid	829	17.02	2.01	5.30	2.15	18.16	65.464	Vertical	7	Pass
		836.5	20.18	2.01	5.30	2.15	21.32	135.519	Vertical	7	Pass
		844	20.59	2.02	5.70	2.15	22.12	162.930	Vertical	7	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)

9. SPURIOUS RADIATION EMISSION

RULE PART(S)

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

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 2/4/5

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	-52.59	4.04	33.51	-23.12	-13	-10.12	Horizontal
3701.4	-53.95	4.04	33.51	-24.48	-13	-11.48	Vertical
5552.1	-52.80	5.24	35.84	-22.20	-13	-9.20	Vertical
5552.1	-49.63	5.24	35.84	-19.03	-13	-6.03	Horizontal
Test Results for Mid Channel 1880MHz							
3760	-53.47	4.04	33.56	-23.95	-13	-10.95	Horizontal
3760	-52.53	4.04	33.56	-23.01	-13	-10.01	Vertical
5640	-56.11	5.24	35.91	-25.44	-13	-12.44	Vertical
5640	-56.78	5.24	35.91	-26.11	-13	-13.11	Horizontal
Test Results for High Channel 1909.3MHz							
3818.6	-52.75	4.04	34.00	-22.79	-13	-9.79	Horizontal
3818.6	-52.79	4.04	34.00	-22.83	-13	-9.83	Vertical
5727.9	-49.60	5.24	36.04	-18.80	-13	-5.80	Vertical
5727.9	-49.09	5.24	36.04	-18.29	-13	-5.29	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	-50.30	4.07	33.54	-20.83	-13	-7.83	Horizontal
3720	-47.58	4.07	33.54	-18.11	-13	-5.11	Vertical
5580	-52.14	5.28	35.86	-21.56	-13	-8.56	Vertical
5580	-55.75	5.28	35.86	-25.17	-13	-12.17	Horizontal
Test Results for Mid Channel 1880MHz							
3760	-48.68	4.04	33.56	-19.16	-13	-6.16	Horizontal
3760	-53.66	4.04	33.56	-24.14	-13	-11.14	Vertical
5640	-49.07	5.24	35.91	-18.40	-13	-5.40	Vertical
5640	-49.78	5.24	35.91	-19.11	-13	-6.11	Horizontal
Test Results for High Channel 1900MHz							
3800	-48.86	4.04	34.00	-18.90	-13	-5.90	Horizontal
3800	-51.79	4.04	34.00	-21.83	-13	-8.83	Vertical
5700	-53.77	5.24	36.04	-22.97	-13	-9.97	Vertical
5700	-56.91	5.24	36.04	-26.11	-13	-13.11	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 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	-49.60	4.02	29.80	-23.82	-13	-10.82	Horizontal
3421.4	-51.38	4.02	29.80	-25.60	-13	-12.60	Vertical
5132.1	-56.96	5.24	35.84	-26.36	-13	-13.36	Vertical
5132.1	-51.76	5.24	35.84	-21.16	-13	-8.16	Horizontal
Test Results for Mid Channel 1732.5MHz							
3465	-50.04	4.03	30.00	-24.07	-13	-11.07	Horizontal
3465	-52.27	4.03	30.00	-26.30	-13	-13.30	Vertical
5197.5	-57.04	5.25	35.86	-26.43	-13	-13.43	Vertical
5197.5	-57.04	5.25	35.86	-26.43	-13	-13.43	Horizontal
Test Results for High Channel 1754.3MHz							
3508.6	-54.27	4.05	30.01	-28.31	-13	-15.31	Horizontal
3508.6	-51.03	4.05	30.01	-25.07	-13	-12.07	Vertical
5262.9	-53.76	5.26	35.86	-23.16	-13	-10.16	Vertical
5262.9	-55.33	5.26	35.86	-24.73	-13	-11.73	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	-53.91	4.02	29.80	-28.13	-13	-15.13	Horizontal
3440	-54.36	4.02	29.80	-28.58	-13	-15.58	Vertical
5160	-51.97	5.24	35.84	-21.37	-13	-8.37	Vertical
5160	-53.90	5.24	35.84	-23.30	-13	-10.30	Horizontal
Test Results for Mid Channel 1732.5MHz							
3465	-49.68	4.03	30.00	-23.71	-13	-10.71	Horizontal
3465	-53.75	4.03	30.00	-27.78	-13	-14.78	Vertical
5197.5	-55.74	5.25	35.86	-25.13	-13	-12.13	Vertical
5197.5	-57.83	5.25	35.86	-27.22	-13	-14.22	Horizontal
Test Results for High Channel 1745MHz							
2490	-48.16	2.91	27.68	-23.39	-13	-10.39	Horizontal
3490	-49.27	2.91	27.68	-24.50	-13	-11.50	Vertical
5235	-56.86	5.26	35.86	-26.26	-13	-13.26	Vertical
5235	-53.39	5.26	35.86	-22.79	-13	-9.79	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 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	-49.72	2.78	27.50	-25.00	-13	-12.00	Horizontal
1649.4	-51.37	2.78	27.50	-26.65	-13	-13.65	Vertical
2474.1	-55.81	2.90	27.80	-30.91	-13	-17.91	Vertical
2474.1	-49.46	2.90	27.80	-24.56	-13	-11.56	Horizontal
Test Results For Mid Channel 836.5MHz							
1673	-48.27	2.78	27.48	-23.57	-13	-10.57	Horizontal
1673	-51.10	2.78	27.48	-26.40	-13	-13.40	Vertical
2509.5	-51.61	2.91	27.70	-26.82	-13	-13.82	Vertical
2509.5	-53.70	2.91	27.70	-28.91	-13	-15.91	Horizontal
Test Results for High Channel 848.3MHz							
1696.6	-49.71	2.78	27.43	-25.06	-13	-12.06	Horizontal
1696.6	-51.79	2.78	27.43	-27.14	-13	-14.14	Vertical
2544.9	-57.64	2.92	27.74	-32.82	-13	-19.82	Vertical
2544.9	-49.98	2.92	27.74	-25.16	-13	-12.16	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	-50.14	2.78	27.50	-25.42	-13	-12.42	Horizontal
1658	-53.58	2.78	27.50	-28.86	-13	-15.86	Vertical
2487	-53.89	2.90	27.80	-28.99	-13	-15.99	Vertical
2487	-51.86	2.90	27.80	-26.96	-13	-13.96	Horizontal
Test Results for Mid Channel 836.5MHz							
1673	-53.72	2.78	27.48	-29.02	-13	-16.02	Horizontal
1673	-54.55	2.78	27.48	-29.85	-13	-16.85	Vertical
2509.5	-50.16	2.91	27.70	-25.37	-13	-12.37	Vertical
2509.5	-51.24	2.91	27.70	-26.45	-13	-13.45	Horizontal
Test Results for High Channel 844MHz							
1688	-50.88	2.78	27.43	-26.23	-13	-13.23	Horizontal
1688	-54.16	2.78	27.43	-29.51	-13	-16.51	Vertical
2532	-53.76	2.92	27.74	-28.94	-13	-15.94	Vertical
2532	-49.94	2.92	27.74	-25.12	-13	-12.12	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

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 3.06V, Normal, DC 3.6V and High voltage, DC 4.14V

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 2/4/5

RESULTS

See the following pages.

10.1 LTE BAND 2

Band 2 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]
3.06	1880	5	0.002660	2.5
3.6	1880	7	0.003723	2.5
4.14	1880	14	0.007447	2.5

Frequency error vs. Temperature

Temperature [°C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
Normal (25C)	1880	7	0.003723	2.5
Extreme (50C)	1880	23	0.012234	2.5
Extreme (40C)	1880	19	0.010106	2.5
Extreme (30C)	1880	3	0.001596	2.5
Extreme (10C)	1880	6	0.003191	2.5
Extreme (0C)	1880	4	0.002128	2.5
Extreme (-10C)	1880	13	0.006915	2.5
Extreme (-20C)	1880	18	0.009574	2.5
Extreme (-30C)	1880	19	0.010106	2.5

Band 2 16QAM, (20MHz BANDWIDTH RB size 100 RB Offset 0)

Frequency error vs. Voltage

Voltage [Vdc]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
3.06	1880	16	0.008511	2.5
3.6	1880	4	0.002128	2.5
4.14	1880	5	0.002660	2.5

Frequency error vs. Temperature

Temperature [°C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
Normal (25C)	1880	2	0.001064	2.5
Extreme (50C)	1880	25	0.013298	2.5
Extreme (40C)	1880	14	0.007447	2.5
Extreme (30C)	1880	1	0.000532	2.5
Extreme (10C)	1880	19	0.010106	2.5
Extreme (0C)	1880	18	0.009574	2.5
Extreme (-10C)	1880	10	0.005319	2.5
Extreme (-20C)	1880	6	0.003191	2.5
Extreme (-30C)	1880	16	0.008511	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

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]
3.06	1732.5	17	0.009812	2.5
3.6	1732.5	21	0.012121	2.5
4.14	1732.5	7	0.004040	2.5

Frequency error vs. Temperature

Temperature [°C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
Normal (25C)	1732.5	20	0.011544	2.5
Extreme (50C)	1732.5	5	0.002886	2.5
Extreme (40C)	1732.5	21	0.012121	2.5
Extreme (30C)	1732.5	10	0.005772	2.5
Extreme (10C)	1732.5	1	0.000577	2.5
Extreme (0C)	1732.5	21	0.012121	2.5
Extreme (-10C)	1732.5	17	0.009812	2.5
Extreme (-20C)	1732.5	21	0.012121	2.5
Extreme (-30C)	1732.5	11	0.006349	2.5

Band 4 16QAM, (20MHz BANDWIDTH RB size 100 RB Offset 0)

Frequency error vs. Voltage

Voltage [Vdc]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
3.06	1732.5	10	0.005772	2.5
3.6	1732.5	9	0.005195	2.5
4.14	1732.5	10	0.005772	2.5

Frequency error vs. Temperature

Temperature [°C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
Normal (25C)	1732.5	8	0.004618	2.5
Extreme (50C)	1732.5	3	0.001732	2.5
Extreme (40C)	1732.5	14	0.008081	2.5
Extreme (30C)	1732.5	8	0.004618	2.5
Extreme (10C)	1732.5	10	0.005772	2.5
Extreme (0C)	1732.5	9	0.005195	2.5
Extreme (-10C)	1732.5	12	0.006926	2.5
Extreme (-20C)	1732.5	24	0.013853	2.5
Extreme (-30C)	1732.5	20	0.011544	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

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]
3.06	836.5	3	0.003586	2.5
3.6	836.5	24	0.028691	2.5
4.14	836.5	1	0.001195	2.5

Frequency error vs. Temperature

Temperature [°C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
Normal (25C)	836.5	21	0.025105	2.5
Extreme (50C)	836.5	5	0.005977	2.5
Extreme (40C)	836.5	23	0.027496	2.5
Extreme (30C)	836.5	5	0.005977	2.5
Extreme (10C)	836.5	18	0.021518	2.5
Extreme (0C)	836.5	10	0.011955	2.5
Extreme (-10C)	836.5	19	0.022714	2.5
Extreme (-20C)	836.5	27	0.032277	2.5
Extreme (-30C)	836.5	10	0.011955	2.5

Band 5 16QAM, (10MHz BANDWIDTH RB size 50 RB Offset 0)

Frequency error vs. Voltage

Voltage [Vdc]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
3.06	836.5	5	0.005977	2.5
3.6	836.5	9	0.010759	2.5
4.14	836.5	15	0.017932	2.5

Frequency error vs. Temperature

Temperature [°C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
Normal (25C)	836.5	8	0.009564	2.5
Extreme (50C)	836.5	6	0.007173	2.5
Extreme (40C)	836.5	9	0.010759	2.5
Extreme (30C)	836.5	18	0.021518	2.5
Extreme (10C)	836.5	7	0.008368	2.5
Extreme (0C)	836.5	7	0.008368	2.5
Extreme (-10C)	836.5	11	0.013150	2.5
Extreme (-20C)	836.5	22	0.026300	2.5
Extreme (-30C)	836.5	20	0.023909	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.

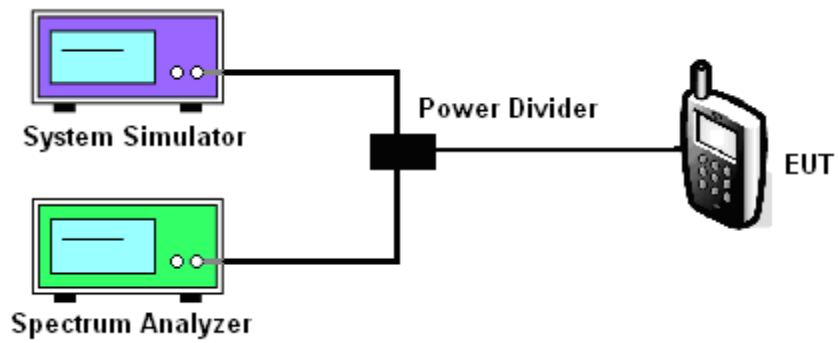
11.2 Measuring Instruments

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 2/4/5

Test data reference attachment.

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