

FCC CFR47 PART 24E, 27 CERTIFICATION TEST REPORT FCC ID:2A8K6-TK-X20L

Product: 10.1 INCH TABLET
Trade Mark: SWACONNECT
Model Number: TK-X20L
Family Model: E10AP, E101GC, E101GCM, E109GCM, P80,
P90, P30, P50, P86, P88
Report No.: S22080800402005

Prepared for

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TEST RESULT CERTIFICATION	
Applicant's name	SW CHANGZHOU SPORTS TECHNOLOGY LTD
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Manufacturer's Name	SW CHANGZHOU SPORTS TECHNOLOGY LTD
Address.....	No 105 Lvchangtuo, Putian community, Lanling Street, Tianning District, Changzhou , Jiangsu ,China
Product name	10.1 INCH TABLET
Model and/or type reference	TK-X20L
Family Model:	E10AP, E101GC, E101GCM, E109GCM, P80, P90, P30, P50, P86, P88
Sample number	S220808004002
Standards	FCC CFR 47 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	Aug 09, 2022 ~ Aug 30, 2022
Date of Issue.....	Aug 31, 2022
Test Result.....	Pass

Testing Engineer :



(Allen Liu)

Authorized Signatory :



(Alex Li)

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1. GENERAL INFORMATION

1.1 PRODUCT DESCRIPTION

A major technical description of EUT is described as following:

Product Designation:	10.1 INCH TABLET
Trade Mark	SWACONNECT
Model Name	TK-X20L
Family Model	E10AP, E101GC, E101GCM, E109GCM, P80, P90, P30, P50, P86, P88
Model Difference	All models are the same circuit and RF module, except the appearance.
FCC ID:	2A8K6-TK-X20L
Frequency Bands:	U.S. Bands: ☒ LTE FDD Band 2, 4, 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 7 Uplink: 2500MHz-2570MHz, Downlink: 2620MHz-2690MHz;
Type of Modulation:	QPSK/16QAM
Power Class	Class 3
Antenna:	PIFA Antenna
Antenna gain:	Band 2: 1.2dBi, Band 4:1.2dBi, Band 7: 1.2dBi
Adapter	MODEL: M4-050200A1 INPUT: AC100-240V~50/60Hz 0.3A OUTPUT: DC5V---2000mA
Battery	DC 3.7V, 6000mAh
Power supply	DC 3.7V from battery or DC 5V from Adapter.
Extreme Vol. Limits:	DC 3.4V to DC 4.2V (Nominal DC 3.7V) (Note 1)
HW Version	X20L_V4.5_20200820
SW Version	TK-X20L_20220729
** Note1: The High Voltage 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:2A8K6-TK-X20L** filing to comply with the FCC Part 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 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% ($U = 2Uc(y)$)	2.5dB
2	Conducted Emission Test	$\pm 1.38\text{dB}$
3	RF power, conducted	$\pm 0.16\text{dB}$
4	Spurious emissions, conducted	$\pm 0.21\text{dB}$
5	All emissions, radiated(<1G)	$\pm 4.68\text{dB}$
6	All emissions, radiated(>1G)	$\pm 4.89\text{dB}$
7	Temperature	$\pm 0.5^{\circ}\text{C}$
8	Humidity	$\pm 2\%$
9	Frequency error, conducted	$\pm 0.19\text{ ppm}$

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 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 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	
24.232(d) 27.50(d)(5) KDB 971168 D01 Clause 5.7	Peak-to-Average Ratio	PASS	
2.1049 24.238(b) KDB 971168 D01 Clause 4.2	Occupied Bandwidth	PASS	
2.1051 24.238(a) 27.53(m), (g), (h) KDB 971168 D01 Clause 6	Band Edge	PASS	
27.50(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 24.238(a) 27.53(g)(h)(m) KDB 971168 D01 Clause 7	Field Strength of Spurious Radiation	PASS	
2.1055 24.235 27.54 KDB 971168 D01 Clause 9	Frequency Stability for Temperature & Voltage	PASS	

2.1051 24.238(a) 27.53(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

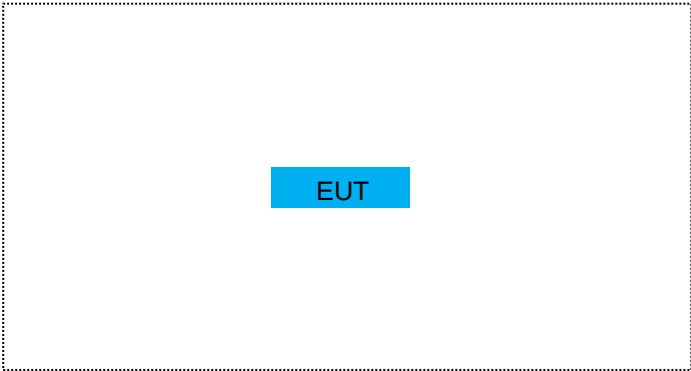
Table 2-1 Equipment Used in EUT System

Item	Equipment	Model No.	ID or Specification	Note
1	10.1 INCH TABLET	TK-X20L	FCC ID:2A8K6-TK-X20L	EUT

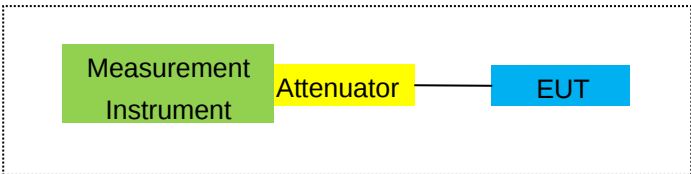
*Note: All the accessories have been used during the test.
the following "EUT" in setup diagram means EUT system.*

2.4 TEST SETUP

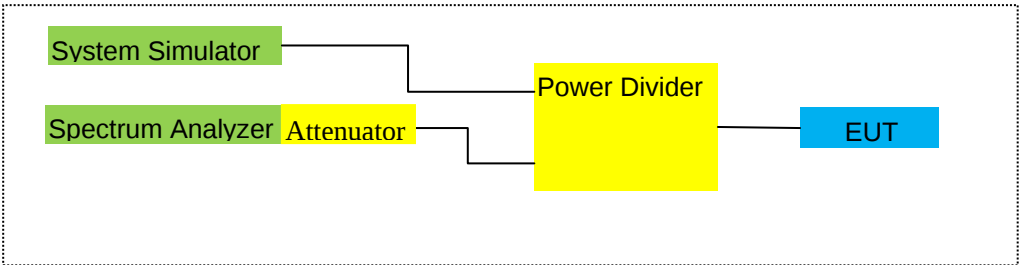
For Radiated Test Cases



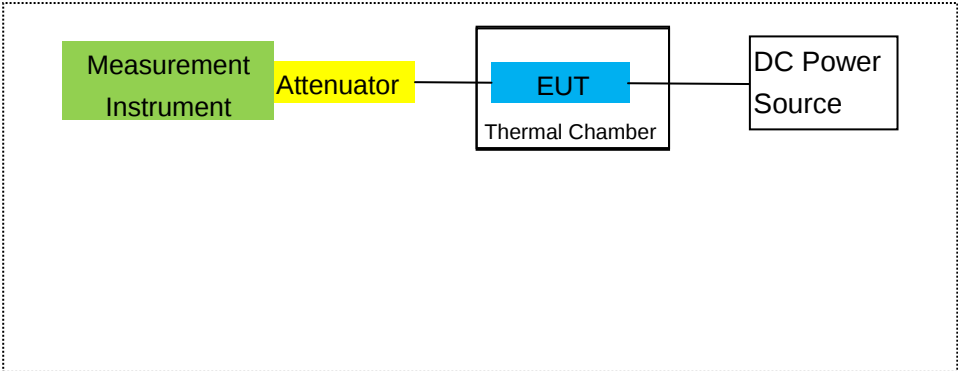
For Conducted Output Power



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



For Frequency Stability



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

3.TEST AND MEASUREMENT EQUIPMENT

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

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	MXA Signal Analyzer	Agilent	N9020A	MY49100060	2022.04.06	2023.04.05	1 year
2	Test Receiver	R&S	ESPI	101318	2022.04.06	2023.04.05	1 year
3	Bilog Antenna	TESEQ	CBL6111D	31216	2022.03.30	2023.03.29	1 year
4	50Ω Coaxial Switch	Anritsu	MP59B	6200983705	2020.05.11	2023.05.10	3 year
5	Horn Antenna	EM	EM-AH-10180	2011071402	2022.03.31	2023.03.30	1 year
6	Horn Ant	Schwarzbeck	BBHA 9170	9170-181	2021.11.07	2022.11.06	1 year
7	Amplifier	EM	EM-30180	060538	2022.06.17	2023.06.16	1 year
8	Loop Antenna	ARA	PLA-1030/B	1029	2022.04.06	2023.04.05	1 year
9	Power Meter	R&S	NRVS	100696	2022.06.17	2023.06.16	1 year
10	Power Sensor	R&S	URV5-Z4	0395.1619.05	2022.04.06	2023.04.05	1 year
11	Test Cable	N/A	R-01	N/A	2020.05.11	2023.05.10	3 year
12	Test Cable	N/A	R-02	N/A	2020.05.11	2023.05.10	3 year
13	Test Cable	N/A	R-03	N/A	2022.06.17	2025.06.16	3 year
14	Test Receiver	R&S	ESCI	101160	2022.04.06	2023.04.05	1 year
15	LISN	R&S	ENV216	101313	2022.04.06	2023.04.05	1 year
16	LISN	EMCO	3816/2	00042990	2022.04.06	2023.04.05	1 year
17	50Ω Coaxial Switch	Anritsu	MP59B	6200264417	2022.04.06	2023.04.05	1 year
18	Passive Voltage Probe	R&S	ESH2-Z3	100196	2022.04.06	2023.04.05	1 year
19	Test Cable	N/A	C01	N/A	2020.05.11	2023.05.10	3 year
20	Test Cable	N/A	C02	N/A	2020.05.11	2023.05.10	3 year
21	Test Cable	N/A	C03	N/A	2020.05.11	2023.05.10	3 year
22	Attenuator	MCE	24-10-34	BN9258	2022.06.17	2023.06.16	1 year
23	Spectrum Analyzer	agilent	e4440a	us44300399	2022.04.06	2023.04.05	1 year
24	test receiver	R&S	ESCI	a0304218	2022.04.06	2023.04.05	1 year
25	Communication Tester	R&S	CMU200	A0304247	2022.06.17	2023.06.16	1 year

26	Thermal Chamber	Ten Billion	TTC-B3C	TBN-960502	2022.04.06	2023.04.05	1 year
27	DC Power Source	N/A	PS-6005D	2017040292 3	2020.05.11	2023.05.10	3 year
28	PSG Analog Signal Generator	Agilent	E8257D	MY51110112	2022.06.16	2023.06.15	1 year
29	Communication Tester	R&S	CMW500	148500	2022.06.16	2023.06.15	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 Band2
- LTE Band 4
- LTE Band 7

RESULTS

PASS

Test data reference attachment.

6. BANDEDGE AND EMISSION MASK

RULE PART(S)

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

FCC: §2.1046, §24.232

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(g) for operations in the 698-746 MHz band, in the 100 kHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least 30 kHz may be employed to demonstrate compliance with the out-of-band emissions limit.

Per 27.53(c.5) for operations in the 776-788 MHz band, in the 100 kHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least 30 kHz may be employed to demonstrate compliance with the out-of-band emissions limit.

For all plots showing emissions in the 763 – 775MHz and 793 – 805MHz band, the FCC limit per 27.53(c.4) is $65 + 10\log_{10}(P) = -35\text{dBm}$ in a 6.25kHz bandwidth.

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 CMW500Test 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 2/4/7

RESULTS

Test data reference attachment.

7. OUT OF BAND EMISSIONS

RULE PART(S)

FCC: §2.1051, §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(g) for operations in the 698-746 MHz band, in the 100 kHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least 30 kHz may be employed to demonstrate compliance with the out-of-band emissions limit.

Per 27.53(c.5) for operations in the 776-788 MHz band, in the 100 kHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least 30 kHz may be employed to demonstrate compliance with the out-of-band emissions limit.

For all plots showing emissions in the 763 – 775MHz and 793 – 805MHz band, the FCC limit per 27.53(c.4) is $65 + 10\log_{10}(P) = -35\text{dBm}$ in a 6.25kHz bandwidth.

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 Band2
- LTE Band 4
- 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.

Note: the amplitude of spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported (LTE Band 2/4/7: above 10GHz).

8. RADIATED MEASUREMENT

8.1. RADIATED POWER (ERP & EIRP)

RULE PART(S)

FCC: §2.1046, §24.232(c) and §27.50 (h)(2), (b)(10), (c)(10), (d)(4)

LIMITS:

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 Band2
- LTE Band 4
- 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 Factor (dB)	Max. EIRP Average (dBm)	Max. EIRP	Polarization Of Max. ERP	
							Average		
							(mW)		
1.4MHz Band QPSK	1/#Mid	1850.7	-2.45	3.76	28.24	22.03	159.588	Horizontal	Pass
		1880	-2.26	3.91	28.22	22.05	160.325	Horizontal	Pass
		1909.3	-2.17	3.93	28.20	22.10	162.181	Horizontal	Pass
3.0MHz Band QPSK	1/#Mid	1851.5	-2.51	3.77	28.23	21.95	156.675	Horizontal	Pass
		1880	-2.36	3.91	28.24	21.97	157.398	Horizontal	Pass
		1908.5	-2.23	3.94	28.25	22.08	161.436	Horizontal	Pass
5.0MHz Band QPSK	1/#Mid	1852.5	-2.40	3.77	28.31	22.14	163.682	Horizontal	Pass
		1880	-2.02	3.91	28.22	22.29	169.434	Horizontal	Pass
		1907.5	-1.95	3.94	28.20	22.31	170.216	Horizontal	Pass
10.0MHz Band QPSK	1/#Mid	1855	-2.26	3.79	28.33	22.28	169.044	Horizontal	Pass
		1880	-1.96	3.95	28.22	22.31	170.216	Horizontal	Pass
		1905	-1.85	3.97	28.19	22.37	172.584	Horizontal	Pass
15.0MHz Band QPSK	1/#Mid	1857.5	-2.22	3.79	28.34	22.33	171.002	Horizontal	Pass
		1880	-2.01	3.95	28.22	22.26	168.267	Horizontal	Pass
		1902.5	-1.87	3.97	28.18	22.34	171.396	Horizontal	Pass
20.0MHz Band QPSK	1/#Mid	1860	-2.21	3.81	28.35	22.33	171.002	Horizontal	Pass
		1880	-1.88	3.96	28.22	22.38	172.982	Horizontal	Pass
		1900	-1.82	4.00	28.16	22.34	171.396	Horizontal	Pass
1.4MHz Band QPSK	1/#Mid	1850.7	-2.83	3.76	28.24	21.65	146.218	Vertical	Pass
		1880	-2.87	3.91	28.22	21.44	139.316	Vertical	Pass
		1909.3	-3.33	3.93	28.20	20.94	124.165	Vertical	Pass
3.0MHz Band QPSK	1/#Mid	1851.5	-3.41	3.77	28.23	21.05	127.350	Vertical	Pass
		1880	-3.44	3.91	28.24	20.89	122.744	Vertical	Pass
		1908.5	-3.46	3.94	28.25	20.85	121.619	Vertical	Pass
5.0MHz Band QPSK	1/#Mid	1852.5	-3.33	3.77	28.31	21.21	132.130	Vertical	Pass
		1880	-2.65	3.91	28.22	21.66	146.555	Vertical	Pass
		1907.5	-2.65	3.94	28.20	21.61	144.877	Vertical	Pass
10.0MHz Band QPSK	1/#Mid	1855	-3.40	3.79	28.33	21.14	130.017	Vertical	Pass
		1880	-2.52	3.95	28.22	21.75	149.624	Vertical	Pass
		1905	-2.85	3.97	28.19	21.37	137.088	Vertical	Pass
15.0MHz	1/#Mid	1857.5	-3.74	3.79	28.34	20.81	120.504	Vertical	Pass

Band QPSK		1880	-2.65	3.95	28.22	21.62	145.211	Vertical	Pass
		1902.5	-2.73	3.97	28.18	21.48	140.605	Vertical	Pass
20.0MHz Band QPSK	1/#Mid	1860	-3.34	3.81	28.35	21.20	131.826	Vertical	Pass
		1880	-3.05	3.96	28.22	21.21	132.130	Vertical	Pass
		1900	-3.25	4.00	28.16	20.91	123.310	Vertical	Pass

Note:

SG Level= Signal generator output

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

Radiated Power (EIRP) for Band 2									
Mode	RB/RB SIZE	Frequency	Result						Conclusion
			SG Level (dBm)	Cable Loss (dBm)	Antenna Factor (dB)	Max. EIRP Average (dBm)	Max. EIRP	Polarization Of Max. ERP	
							Average		
							(mW)		
1.4MHz Band 16 QAM	1/#Mid	1850.7	-3.57	3.76	28.24	20.91	123.310	Horizontal	Pass
1880		-3.04	3.91	28.22	21.27	133.968	Horizontal	Pass	
1909.3		-2.97	3.93	28.20	21.30	134.896	Horizontal	Pass	
3.0MHz Band 16 QAM	1/#Mid	1851.5	-3.07	3.77	28.23	21.39	137.721	Horizontal	Pass
1880		-3.15	3.91	28.24	21.18	131.220	Horizontal	Pass	
1908.5		-3.36	3.94	28.25	20.95	124.451	Horizontal	Pass	
5.0MHz Band 16 QAM	1/#Mid	1852.5	-3.01	3.77	28.31	21.53	142.233	Horizontal	Pass
1880		-2.92	3.91	28.22	21.39	137.721	Horizontal	Pass	
1907.5		-2.60	3.94	28.20	21.66	146.555	Horizontal	Pass	
10.0MHz Band 16 QAM	1/#Mid	1855	-3.06	3.79	28.33	21.48	140.605	Horizontal	Pass
1880		-3.05	3.95	28.22	21.22	132.434	Horizontal	Pass	
1905		-2.52	3.97	28.19	21.70	147.911	Horizontal	Pass	
15.0MHz Band 16 QAM	1/#Mid	1857.5	-3.04	3.79	28.34	21.51	141.579	Horizontal	Pass
1880		-2.83	3.95	28.22	21.44	139.316	Horizontal	Pass	
1902.5		-2.79	3.97	28.18	21.42	138.676	Horizontal	Pass	
20.0MHz Band 16 QAM	1/#Mid	1860	-2.93	3.81	28.35	21.61	144.877	Horizontal	Pass
1880		-2.63	3.96	28.22	21.63	145.546	Horizontal	Pass	
1900		-2.45	4.00	28.16	21.71	148.252	Horizontal	Pass	
1.4MHz Band 16 QAM	1/#Mid	1850.7	-4.23	3.76	28.24	20.25	105.925	Vertical	Pass
1880		-3.95	3.91	28.22	20.36	108.643	Vertical	Pass	
1909.3		-4.46	3.93	28.20	19.81	95.719	Vertical	Pass	
3.0MHz Band 16 QAM	1/#Mid	1851.5	-4.64	3.77	28.23	19.82	95.940	Vertical	Pass
1880		-3.94	3.91	28.24	20.39	109.396	Vertical	Pass	
1908.5		-3.71	3.94	28.25	20.60	114.815	Vertical	Pass	
5.0MHz Band 16 QAM	1/#Mid	1852.5	-4.28	3.77	28.31	20.26	106.170	Vertical	Pass
1880		-4.01	3.91	28.22	20.30	107.152	Vertical	Pass	
1907.5		-4.12	3.94	28.20	20.14	103.276	Vertical	Pass	
10.0MHz Band 16 QAM	1/#Mid	1855	-4.64	3.79	28.33	19.90	97.724	Vertical	Pass
1880		-4.39	3.95	28.22	19.88	97.275	Vertical	Pass	
1905		-3.75	3.97	28.19	20.47	111.429	Vertical	Pass	
15.0MHz Band 16 QAM	1/#Mid	1857.5	-4.29	3.79	28.34	20.26	106.170	Vertical	Pass
1880		-3.57	3.95	28.22	20.70	117.490	Vertical	Pass	
1902.5		-3.47	3.97	28.18	20.74	118.577	Vertical	Pass	

20.0MHz		1860	-3.86	3.81	28.35	20.68	116.950	Vertical	Pass
Band 16	1/#Mid	1880	-4.28	3.96	28.22	19.98	99.541	Vertical	Pass
QAM		1900	-3.76	4.00	28.16	20.40	109.648	Vertical	Pass

Note:

SG Level= Signal generator output

Max. EIRP Average (dBm)= Antenna Factor (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 Factor	Max. EIRP	Max. EIRP	Polarization Of	
			(dBm)	(dBm)	(dB)	Average	Average	Max. ERP	
						(dBm)	(mW)		
1.4MHz Band QPSK	1/#Mid	1710.7	-2.36	3.12	27.58	22.10	162.181	Horizontal	Pass
		1732.5	-2.35	3.27	27.61	21.99	158.125	Horizontal	Pass
		1754.3	-2.33	3.29	27.63	22.01	158.855	Horizontal	Pass
3.0MHz Band QPSK	1/#Mid	1711.5	-2.53	3.13	27.61	21.95	156.675	Horizontal	Pass
		1732.5	-2.45	3.27	27.61	21.89	154.525	Horizontal	Pass
		1753.5	-2.37	3.30	27.62	21.95	156.675	Horizontal	Pass
5.0MHz Band QPSK	1/#Mid	1712.5	-2.30	3.13	27.63	22.20	165.959	Horizontal	Pass
		1732.5	-2.20	3.27	27.61	22.14	163.682	Horizontal	Pass
		1752.5	-2.08	3.30	27.60	22.22	166.725	Horizontal	Pass
10.0MHz Band QPSK	1/#Mid	1715	-2.24	3.15	27.64	22.25	167.880	Horizontal	Pass
		1732.5	-2.01	3.31	27.61	22.29	169.434	Horizontal	Pass
		1750	-2.03	3.33	27.59	22.23	167.109	Horizontal	Pass
15.0MHz Band QPSK	1/#Mid	1717.5	-2.25	3.15	27.65	22.25	167.880	Horizontal	Pass
		1732.5	-2.09	3.31	27.61	22.21	166.341	Horizontal	Pass
		1747.5	-2.03	3.33	27.57	22.21	166.341	Horizontal	Pass
20.0MHz Band QPSK	1/#Mid	1720	-2.19	3.17	27.66	22.30	169.824	Horizontal	Pass
		1732.5	-2.02	3.32	27.61	22.27	168.655	Horizontal	Pass
		1745	-1.96	3.36	27.56	22.24	167.494	Horizontal	Pass
1.4MHz Band QPSK	1/#Mid	1710.7	-3.19	3.12	27.58	21.27	133.968	Vertical	Pass
		1732.5	-3.23	3.27	27.61	21.11	129.122	Vertical	Pass
		1754.3	-3.41	3.29	27.63	20.93	123.880	Vertical	Pass
3.0MHz Band QPSK	1/#Mid	1711.5	-3.47	3.13	27.61	21.01	126.183	Vertical	Pass
		1732.5	-3.34	3.27	27.61	21.00	125.893	Vertical	Pass
		1753.5	-2.69	3.30	27.62	21.63	145.546	Vertical	Pass
5.0MHz Band QPSK	1/#Mid	1712.5	-3.69	3.13	27.63	20.81	120.504	Vertical	Pass
		1732.5	-2.67	3.27	27.61	21.67	146.893	Vertical	Pass
		1752.5	-3.02	3.30	27.60	21.28	134.276	Vertical	Pass
10.0MHz Band QPSK	1/#Mid	1715	-3.23	3.15	27.64	21.26	133.660	Vertical	Pass
		1732.5	-2.58	3.31	27.61	21.72	148.594	Vertical	Pass
		1750	-2.84	3.33	27.59	21.42	138.676	Vertical	Pass

15.0MHz Band QPSK	1/#Mid	1717.5	-3.27	3.15	27.65	21.23	132.739	Vertical	Pass
		1732.5	-2.72	3.31	27.61	21.58	143.880	Vertical	Pass
		1747.5	-2.78	3.33	27.57	21.46	139.959	Vertical	Pass
20.0MHz Band QPSK	1/#Mid	1720	-3.70	3.17	27.66	20.79	119.950	Vertical	Pass
		1732.5	-3.00	3.32	27.61	21.29	134.586	Vertical	Pass
		1745	-2.68	3.36	27.56	21.52	141.906	Vertical	Pass

Note:

SG Level= Signal generator output

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

Radiated Power (EIRP) for Band 4									
Mode	RB/RB SIZE	Frequency	Result						Conclusion
			SG Level	Cable	Antenna	Max. EIRP	Max. EIRP	Polarization	
			(dBm)	Loss	Factor	Average	Average	Of Max. ERP	
				(dBm)	(dB)	(dBm)	(mW)		
1.4MHz	1/#Mid	1710.7	-3.17	3.12	27.58	21.29	134.586	Horizontal	Pass
Band 16		1732.5	-3.02	3.27	27.61	21.32	135.519	Horizontal	Pass
QAM		1754.3	-3.02	3.29	27.63	21.32	135.519	Horizontal	Pass
3.0MHz	1/#Mid	1711.5	-3.11	3.13	27.61	21.37	137.088	Horizontal	Pass
Band 16		1732.5	-3.24	3.27	27.61	21.10	128.825	Horizontal	Pass
QAM		1753.5	-3.46	3.30	27.62	20.86	121.899	Horizontal	Pass
5.0MHz	1/#Mid	1712.5	-2.94	3.13	27.63	21.56	143.219	Horizontal	Pass
Band 16		1732.5	-2.90	3.27	27.61	21.44	139.316	Horizontal	Pass
QAM		1752.5	-2.59	3.30	27.60	21.71	148.252	Horizontal	Pass
10.0MHz	1/#Mid	1715	-3.01	3.15	27.64	21.48	140.605	Horizontal	Pass
Band 16		1732.5	-3.20	3.31	27.61	21.10	128.825	Horizontal	Pass
QAM		1750	-2.58	3.33	27.59	21.68	147.231	Horizontal	Pass
15.0MHz	1/#Mid	1717.5	-2.81	3.15	27.65	21.69	147.571	Horizontal	Pass
Band 16		1732.5	-2.87	3.31	27.61	21.43	138.995	Horizontal	Pass
QAM		1747.5	-2.89	3.33	27.57	21.35	136.458	Horizontal	Pass
20.0MHz	1/#Mid	1720	-2.76	3.17	27.66	21.73	148.936	Horizontal	Pass
Band 16		1732.5	-2.77	3.32	27.61	21.52	141.906	Horizontal	Pass
QAM		1745	-2.58	3.36	27.56	21.62	145.211	Horizontal	Pass
1.4MHz	1/#Mid	1710.7	-4.30	3.12	27.58	20.16	103.753	Vertical	Pass
Band 16		1732.5	-4.44	3.27	27.61	19.90	97.724	Vertical	Pass
QAM		1754.3	-3.84	3.29	27.63	20.50	112.202	Vertical	Pass
3.0MHz	1/#Mid	1711.5	-3.76	3.13	27.61	20.72	118.032	Vertical	Pass
Band 16		1732.5	-4.47	3.27	27.61	19.87	97.051	Vertical	Pass
QAM		1753.5	-4.48	3.30	27.62	19.84	96.383	Vertical	Pass
5.0MHz	1/#Mid	1712.5	-4.69	3.13	27.63	19.81	95.719	Vertical	Pass
Band 16		1732.5	-3.91	3.27	27.61	20.43	110.408	Vertical	Pass
QAM		1752.5	-4.42	3.30	27.60	19.88	97.275	Vertical	Pass
10.0MHz	1/#Mid	1715	-3.99	3.15	27.64	20.50	112.202	Vertical	Pass
Band 16		1732.5	-3.75	3.31	27.61	20.55	113.501	Vertical	Pass
QAM		1750	-4.19	3.33	27.59	20.07	101.625	Vertical	Pass
15.0MHz	1/#Mid	1717.5	-4.16	3.15	27.65	20.34	108.143	Vertical	Pass
Band 16		1732.5	-4.38	3.31	27.61	19.92	98.175	Vertical	Pass
QAM		1747.5	-3.88	3.33	27.57	20.36	108.643	Vertical	Pass

20.0MHz		1720	-4.35	3.17	27.66	20.14	103.276	Vertical	Pass
Band 16	1/#Mid	1732.5	-3.92	3.32	27.61	20.37	108.893	Vertical	Pass
QAM		1745	-3.66	3.36	27.56	20.54	113.240	Vertical	Pass

Note:

SG Level= Signal generator output

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

8.4 LTE BAND 7

Radiated Power (EIRP) for Band 7									
Mode	RB/RB SIZE	Frequency	Result						Conclusion
			SG	Cable	Antenna	Max. EIRP	Max. EIRP	Polarization Of	
			Level	Loss	Factor			Max. ERP	
			(dBm)	(dBm)	(dB)	Average	Average		
						(dBm)	(mW)		
5.0MHz Band QPSK	1/#Mid	2502.5	-0.64	4.54	27.75	22.57	180.717	Horizontal	Pass
		2535	-0.47	4.69	27.72	22.56	180.302	Horizontal	Pass
		2567.5	-0.40	4.71	27.71	22.60	181.970	Horizontal	Pass
10.0MHz Band QPSK	1/#Mid	2505	-0.57	4.55	27.76	22.64	183.654	Horizontal	Pass
		2535	-0.38	4.69	27.72	22.65	184.077	Horizontal	Pass
		2565	-0.30	4.72	27.70	22.68	185.353	Horizontal	Pass
15.0MHz Band QPSK	1/#Mid	2507.5	-0.58	4.55	27.77	22.64	183.654	Horizontal	Pass
		2535	-0.44	4.69	27.72	22.59	181.552	Horizontal	Pass
		2562.5	-0.34	4.72	27.69	22.63	183.231	Horizontal	Pass
20.0MHz Band QPSK	1/#Mid	2510	-0.52	4.57	27.78	22.69	185.780	Horizontal	Pass
		2535	-0.34	4.73	27.72	22.65	184.077	Horizontal	Pass
		2560	-0.30	4.75	27.68	22.63	183.231	Horizontal	Pass
5.0MHz Band QPSK	1/#Mid	2502.5	-1.89	4.54	27.75	21.32	135.519	Vertical	Pass
		2535	-1.43	4.69	27.72	21.60	144.544	Vertical	Pass
		2567.5	-1.95	4.71	27.71	21.05	127.350	Vertical	Pass
10.0MHz Band QPSK	1/#Mid	2505	-1.83	4.55	27.76	21.38	137.404	Vertical	Pass
		2535	-2.19	4.69	27.72	20.84	121.339	Vertical	Pass
		2565	-2.20	4.72	27.70	20.78	119.674	Vertical	Pass
15.0MHz Band QPSK	1/#Mid	2507.5	-1.54	4.55	27.77	21.68	147.231	Vertical	Pass
		2535	-1.28	4.69	27.72	21.75	149.624	Vertical	Pass
		2562.5	-1.80	4.72	27.69	21.17	130.918	Vertical	Pass
20.0MHz Band QPSK	1/#Mid	2510	-2.23	4.57	27.78	20.98	125.314	Vertical	Pass
		2535	-1.62	4.73	27.72	21.37	137.088	Vertical	Pass
		2560	-1.78	4.75	27.68	21.15	130.317	Vertical	Pass

Radiated Power (EIRP) for Band 7									
Mode	RB/RB SIZE	Frequency	Result						Conclusion
			SG Level	Cable	Antenna	Max. EIRP	Max. EIRP	Polarization	
			(dBm)	Loss	Factor	Average	Average	Of Max. ERP	
				(dBm)	(dB)	(dBm)	(mW)		
5.0MHz	1/#Mid	2502.5	-1.33	4.54	27.75	21.88	154.170	Horizontal	Pass
Band 16		2535	-1.02	4.69	27.72	22.01	158.855	Horizontal	Pass
QAM		2567.5	-1.10	4.71	27.71	21.90	154.882	Horizontal	Pass
10.0MHz	1/#Mid	2505	-1.22	4.55	27.76	21.99	158.125	Horizontal	Pass
Band 16		2535	-1.23	4.69	27.72	21.80	151.356	Horizontal	Pass
QAM		2565	-1.50	4.72	27.70	21.48	140.605	Horizontal	Pass
15.0MHz	1/#Mid	2507.5	-1.40	4.55	27.77	21.82	152.055	Horizontal	Pass
Band 16		2535	-1.37	4.69	27.72	21.66	146.555	Horizontal	Pass
QAM		2562.5	-0.98	4.72	27.69	21.99	158.125	Horizontal	Pass
20.0MHz	1/#Mid	2510	-1.28	4.57	27.78	21.93	155.955	Horizontal	Pass
Band 16		2535	-0.95	4.73	27.72	22.04	159.956	Horizontal	Pass
QAM		2560	-1.05	4.75	27.68	21.88	154.170	Horizontal	Pass
5.0MHz	1/#Mid	2502.5	-2.47	4.54	27.75	20.74	118.577	Vertical	Pass
Band 16		2535	-2.92	4.69	27.72	20.11	102.565	Vertical	Pass
QAM		2567.5	-1.39	4.71	27.71	21.61	144.877	Vertical	Pass
10.0MHz	1/#Mid	2505	-3.35	4.55	27.76	19.86	96.828	Vertical	Pass
Band 16		2535	-1.63	4.69	27.72	21.40	138.038	Vertical	Pass
QAM		2565	-1.57	4.72	27.70	21.41	138.357	Vertical	Pass
15.0MHz	1/#Mid	2507.5	-2.05	4.55	27.77	21.17	130.918	Vertical	Pass
Band 16		2535	-2.87	4.69	27.72	20.16	103.753	Vertical	Pass
QAM		2562.5	-2.28	4.72	27.69	20.69	117.220	Vertical	Pass
20.0MHz	1/#Mid	2510	-1.92	4.57	27.78	21.29	134.586	Vertical	Pass
Band 16		2535	-2.28	4.73	27.72	20.71	117.761	Vertical	Pass
QAM		2560	-2.64	4.75	27.68	20.29	106.905	Vertical	Pass

Note:

SG Level= Signal generator output

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

9. SPURIOUS RADIATION EMISSION

RULE PART(S)

FCC: §2.1051, §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 Band2
- LTE Band 4
- 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 Factor(dB)	Absolute Level(dBm)	Limit (dBm)	Margin(dBm)	Polarity
3701.4	-51.64	4.04	33.51	-22.17	-13	-9.17	Horizontal
3701.4	-50.28	4.04	33.51	-20.81	-13	-7.81	Vertical
5552.1	-48.37	5.24	35.84	-17.77	-13	-4.77	Vertical
5552.1	-52.57	5.24	35.84	-21.97	-13	-8.97	Horizontal
180.7	-37.47	1.43	16.02	-22.88	-13	-9.88	Vertical
237.8	-35.04	1.30	17.99	-18.35	-13	-5.35	Horizontal
Test Results for Mid Channel 1880MHz							
3760.0	-51.62	4.04	33.56	-22.10	-13	-9.10	Horizontal
3760.0	-51.73	4.04	33.56	-22.21	-13	-9.21	Vertical
5640.0	-50.08	5.24	35.91	-19.41	-13	-6.41	Vertical
5640.0	-50.77	5.24	35.91	-20.10	-13	-7.10	Horizontal
179.0	-40.80	1.62	16.97	-25.45	-13	-12.45	Vertical
395.0	-39.71	1.74	15.98	-25.48	-13	-12.48	Horizontal
Test Results for High Channel 1909.3MHz							
3818.6	-47.50	4.04	34.00	-17.54	-13	-4.54	Horizontal
3818.6	-53.31	4.04	34.00	-23.35	-13	-10.35	Vertical
5727.9	-53.36	5.24	36.04	-22.56	-13	-9.56	Vertical
5727.9	-50.90	5.24	36.04	-20.10	-13	-7.10	Horizontal
181.8	-40.40	1.42	17.29	-24.53	-13	-11.53	Vertical
283.4	-36.91	1.50	17.90	-20.50	-13	-7.50	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 Factor(dB)	Absolute Level(dBm)	Limit (dBm)	Margin(dBm)	Polarity
3720.0	-46.83	4.07	33.54	-17.36	-13	-4.36	Horizontal
3720.0	-48.71	4.07	33.54	-19.24	-13	-6.24	Vertical
5580.0	-49.88	5.28	35.86	-19.30	-13	-6.30	Vertical
5580.0	-51.48	5.28	35.86	-20.90	-13	-7.90	Horizontal
196.3	-38.38	1.58	16.89	-23.06	-13	-10.06	Vertical
292.2	-44.45	1.76	17.26	-28.95	-13	-15.95	Horizontal
Test Results for Mid Channel 1880MHz							
3760.0	-47.95	4.04	33.56	-18.43	-13	-5.43	Horizontal
3760.0	-49.71	4.04	33.56	-20.19	-13	-7.19	Vertical
5640.0	-50.55	5.24	35.91	-19.88	-13	-6.88	Vertical
5640.0	-53.99	5.24	35.91	-23.32	-13	-10.32	Horizontal
212.5	-37.60	1.46	16.27	-22.79	-13	-9.79	Vertical
363.3	-38.76	1.59	15.15	-25.20	-13	-12.20	Horizontal
Test Results for High Channel 1900MHz							
3800.0	-47.60	4.04	34.00	-17.64	-13	-4.64	Horizontal
3800.0	-47.67	4.04	34.00	-17.71	-13	-4.71	Vertical
5700.0	-51.66	5.24	36.04	-20.86	-13	-7.86	Vertical
5700.0	-51.44	5.24	36.04	-20.64	-13	-7.64	Horizontal
212.5	-34.37	1.36	17.39	-18.33	-13	-5.33	Vertical
355.8	-41.33	1.66	15.39	-27.60	-13	-14.60	Horizontal

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

. Margin = Spurious Emission Level - Limit

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

9.2 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 Factor(dB)	Absolute Level(dBm)	Limit (dBm)	Margin(dBm)	Polarity
3421.4	-45.33	4.02	29.80	-19.55	-13	-6.55	Horizontal
3421.4	-51.45	4.02	29.80	-25.67	-13	-12.67	Vertical
5132.1	-47.02	5.24	35.84	-16.42	-13	-3.42	Vertical
5132.1	-50.45	5.24	35.84	-19.85	-13	-6.85	Horizontal
194.6	-38.01	1.68	16.04	-23.65	-13	-10.65	Vertical
423.6	-42.78	1.78	17.74	-26.82	-13	-13.82	Horizontal
Test Results for Mid Channel 1732.5MHz							
3465.0	-45.40	4.03	30.00	-19.43	-13	-6.43	Horizontal
3465.0	-53.11	4.03	30.00	-27.14	-13	-14.14	Vertical
5197.5	-47.50	5.25	35.86	-16.89	-13	-3.89	Vertical
5197.5	-52.51	5.25	35.86	-21.90	-13	-8.90	Horizontal
207.1	-39.17	1.72	17.69	-23.20	-13	-10.20	Vertical
327.1	-37.41	1.62	16.02	-23.00	-13	-10.00	Horizontal
Test Results for High Channel 1754.3MHz							
3508.6	-49.38	4.05	30.01	-23.42	-13	-10.42	Horizontal
3508.6	-46.35	4.05	30.01	-20.39	-13	-7.39	Vertical
5262.9	-48.22	5.26	35.86	-17.62	-13	-4.62	Vertical
5262.9	-49.73	5.26	35.86	-19.13	-13	-6.13	Horizontal
178.3	-40.24	1.80	16.69	-25.35	-13	-12.35	Vertical
239.8	-42.69	1.75	16.66	-27.79	-13	-14.79	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 Factor(dB)	Absolute Level(dBm)	Limit (dBm)	Margin(dBm)	Polarity
3440.0	-51.65	4.02	29.80	-25.87	-13	-12.87	Horizontal
3440.0	-44.72	4.02	29.80	-18.94	-13	-5.94	Vertical
5160.0	-51.06	5.24	35.84	-20.46	-13	-7.46	Vertical
5160.0	-49.96	5.24	35.84	-19.36	-13	-6.36	Horizontal
179.7	-40.17	1.57	17.26	-24.48	-13	-11.48	Vertical
265.2	-36.70	1.78	16.35	-22.13	-13	-9.13	Horizontal
Test Results for Mid Channel 1732.5MHz							
3465.0	-49.71	4.03	30.00	-23.74	-13	-10.74	Horizontal
3465.0	-51.90	4.03	30.00	-25.93	-13	-12.93	Vertical
5197.5	-53.81	5.25	35.86	-23.20	-13	-10.20	Vertical
5197.5	-53.01	5.25	35.86	-22.40	-13	-9.40	Horizontal
194.4	-42.96	1.44	17.95	-26.45	-13	-13.45	Vertical
324.5	-37.47	1.65	16.09	-23.03	-13	-10.03	Horizontal
Test Results for High Channel 1745MHz							
3490.0	-52.77	2.91	27.68	-28.00	-13	-15.00	Horizontal
3490.0	-51.91	2.91	27.68	-27.14	-13	-14.14	Vertical
5235.0	-51.84	5.26	35.86	-21.24	-13	-8.24	Vertical
5235.0	-49.82	5.26	35.86	-19.22	-13	-6.22	Horizontal
175.6	-37.14	1.61	16.85	-21.90	-13	-8.90	Vertical
280.8	-37.23	1.61	15.19	-23.65	-13	-10.65	Horizontal

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

. Margin = Spurious Emission Level - Limit

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

9.3 LTE BAND 7

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

Test Results for Low Channel 2502.5MHz							
Frequency(MHz)	SG Level(dBm)	Cable Loss(dB)	Antenna Factor(dB)	Absolute Level(dBm)	Limit (dBm)	Margin(dBm)	Polarity
5005.0	-63.36	5.23	35.81	-32.78	-25	-7.78	Horizontal
5005.0	-63.08	5.23	35.81	-32.50	-25	-7.50	Vertical
7507.5	-60.17	5.67	36.85	-28.99	-25	-3.99	Vertical
7507.5	-60.22	5.67	36.85	-29.04	-25	-4.04	Horizontal
184.8	-52.91	1.73	17.97	-36.67	-25	-11.67	Vertical
374.6	-49.55	1.38	15.11	-35.82	-25	-10.82	Horizontal
Test Results for Mid Channel 2535MHz							
5070.0	-59.36	5.23	35.82	-28.77	-25	-3.77	Horizontal
5070.0	-63.54	5.23	35.82	-32.95	-25	-7.95	Vertical
7605.0	-63.18	5.67	36.85	-32.00	-25	-7.00	Vertical
7605.0	-61.27	5.67	36.85	-30.09	-25	-5.09	Horizontal
185.1	-53.99	1.77	16.17	-39.58	-25	-14.58	Vertical
297.2	-46.83	1.63	15.21	-33.25	-25	-8.25	Horizontal
Test Results for High Channel 2567.5MHz							
5135.0	-63.89	5.24	35.83	-33.30	-25	-8.30	Horizontal
5135.0	-59.47	5.24	35.83	-28.88	-25	-3.88	Vertical
7702.5	-61.88	5.68	36.87	-30.69	-25	-5.69	Vertical
7702.5	-63.21	5.68	36.87	-32.02	-25	-7.02	Horizontal
196.6	-49.05	1.58	17.56	-33.07	-25	-8.07	Vertical
464.9	-52.02	1.45	16.58	-36.89	-25	-11.89	Horizontal

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

Test Results for Low Channel 2510MHz							
Frequency(MHz)	SG Level(dBm)	Cable Loss(dB)	Antenna Factor(dB)	Absolute Level(dBm)	Limit (dBm)	Margin(dBm)	Polarity
5020.0	-61.32	5.23	35.82	-30.73	-25	-5.73	Horizontal
5020.0	-59.60	5.23	35.82	-29.01	-25	-4.01	Vertical
7530.0	-64.94	5.67	36.86	-33.75	-25	-8.75	Vertical
7530.0	-63.09	5.67	36.86	-31.90	-25	-6.90	Horizontal
175.6	-51.37	1.63	15.76	-37.24	-25	-12.24	Vertical
420.2	-54.42	1.71	15.44	-40.69	-25	-15.69	Horizontal
Test Results for Mid Channel 2535MHz							
5070.0	-63.42	5.23	35.82	-32.83	-25	-7.83	Horizontal
5070.0	-60.09	5.23	35.82	-29.50	-25	-4.50	Vertical
7605.0	-61.39	5.67	36.85	-30.21	-25	-5.21	Vertical
7605.0	-62.29	5.67	36.85	-31.11	-25	-6.11	Horizontal
184.1	-53.36	1.79	16.84	-38.30	-25	-13.30	Vertical
365.7	-52.33	1.71	17.64	-36.40	-25	-11.40	Horizontal
Test Results for High Channel 2560MHz							
5120.0	-63.05	5.24	35.83	-32.46	-25	-7.46	Horizontal
5120.0	-64.86	5.24	35.83	-34.27	-25	-9.27	Vertical
7680.0	-64.70	5.70	36.88	-33.52	-25	-8.52	Vertical
7680.0	-61.39	5.70	36.88	-30.21	-25	-5.21	Horizontal
190.8	-49.14	1.79	16.84	-34.08	-25	-9.08	Vertical
292.7	-48.88	1.71	17.64	-32.95	-25	-7.95	Horizontal

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

. Margin = Spurious Emission Level - Limit

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

10. FREQUENCY STABILITY

RULE PART(S)

FCC: §2.1055, §24.235, §27.54

LIMITS

§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°C
- ☐ Voltage = low voltage, DC 34V, Normal, DC 3.7V 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°C is reached.

Frequency Stability vs Voltage:

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

MODES TESTED

- ☐ LTE Band2
- LTE Band 4
- LTE Band 7

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]
3.4	1880	12.3	0.006532	2.5
3.7	1880	13.5	0.007196	2.5
4.2	1880	13.4	0.007131	2.5

Frequency error vs. Temperature

Temperature [° C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
Normal (25C)	1880	13.1	0.006974	2.5
Extreme (50C)	1880	11.3	0.006016	2.5
Extreme (40C)	1880	14.0	0.007437	2.5
Extreme (30C)	1880	13.9	0.007391	2.5
Extreme (10C)	1880	13.6	0.007256	2.5
Extreme (0C)	1880	12.6	0.006696	2.5
Extreme (-10C)	1880	12.7	0.006753	2.5
Extreme (-20C)	1880	13.9	0.007374	2.5
Extreme (-30C)	1880	14.9	0.007910	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]
3.4	1880	9.4	0.005005	2.5
3.7	1880	9.0	0.004779	2.5
4.2	1880	8.5	0.004538	2.5

Frequency error vs. Temperature

Temperature [° C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
Normal (25C)	1880	9.7	0.005174	2.5
Extreme (50C)	1880	8.5	0.004511	2.5
Extreme (40C)	1880	8.3	0.004417	2.5
Extreme (30C)	1880	8.7	0.004604	2.5
Extreme (10C)	1880	8.8	0.004673	2.5
Extreme (0C)	1880	8.3	0.004401	2.5
Extreme (-10C)	1880	8.9	0.004728	2.5
Extreme (-20C)	1880	9.2	0.004912	2.5
Extreme (-30C)	1880	8.2	0.004337	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]
3.4	1732.5	8.5	0.004906	2.5
3.7	1732.5	8.6	0.004987	2.5
4.2	1732.5	8.0	0.004636	2.5

Frequency error vs. Temperature

Temperature [°C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
Normal (25C)	1732.5	8.5	0.004910	2.5
Extreme (50C)	1732.5	8.4	0.004856	2.5
Extreme (40C)	1732.5	7.7	0.004421	2.5
Extreme (30C)	1732.5	6.1	0.003544	2.5
Extreme (10C)	1732.5	6.6	0.003810	2.5
Extreme (0C)	1732.5	9.4	0.005422	2.5
Extreme (-10C)	1732.5	8.3	0.004765	2.5
Extreme (-20C)	1732.5	7.3	0.004223	2.5
Extreme (-30C)	1732.5	8.8	0.005107	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]
3.4	1732.5	9.8	0.005635	2.5
3.7	1732.5	9.1	0.005229	2.5
4.2	1732.5	7.8	0.004519	2.5

Frequency error vs. Temperature

Temperature [°C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
Normal (25C)	1732.5	9.2	0.005317	2.5
Extreme (50C)	1732.5	9.1	0.005226	2.5
Extreme (40C)	1732.5	8.2	0.004722	2.5
Extreme (30C)	1732.5	8.7	0.005015	2.5
Extreme (10C)	1732.5	9.1	0.005264	2.5
Extreme (0C)	1732.5	7.7	0.004418	2.5
Extreme (-10C)	1732.5	8.5	0.004929	2.5
Extreme (-20C)	1732.5	8.7	0.005024	2.5
Extreme (-30C)	1732.5	8.3	0.004790	2.5

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

10.3 LTE BAND 7

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

Frequency error vs. Voltage

Voltage [Vdc]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
3.4	2535	10.4	0.004113	2.5
3.7	2535	8.7	0.003429	2.5
4.2	2535	8.2	0.003226	2.5

Frequency error vs. Temperature

Temperature [° C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
Normal (25C)	2535	9.5	0.003750	2.5
Extreme (50C)	2535	9.0	0.003535	2.5
Extreme (40C)	2535	8.7	0.003417	2.5
Extreme (30C)	2535	8.7	0.003449	2.5
Extreme (10C)	2535	8.5	0.003361	2.5
Extreme (0C)	2535	8.9	0.003506	2.5
Extreme (-10C)	2535	9.7	0.003812	2.5
Extreme (-20C)	2535	9.2	0.003614	2.5
Extreme (-30C)	2535	8.2	0.003244	2.5

Band 7 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]
3.4	2535	6.9	0.002722	2.5
3.7	2535	5.9	0.002327	2.5
4.2	2535	5.7	0.002231	2.5

Frequency error vs. Temperature

Temperature [° C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
Normal (25C)	2535	6.9	0.002722	2.5
Extreme (50C)	2535	5.7	0.002251	2.5
Extreme (40C)	2535	5.6	0.002194	2.5
Extreme (30C)	2535	6.7	0.002647	2.5
Extreme (10C)	2535	6.1	0.002425	2.5
Extreme (0C)	2535	5.5	0.002183	2.5
Extreme (-10C)	2535	5.6	0.002193	2.5
Extreme (-20C)	2535	5.5	0.002184	2.5
Extreme (-30C)	2535	5.6	0.002225	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.

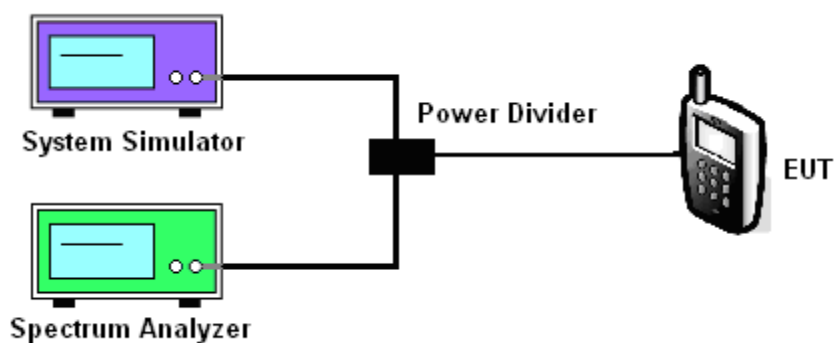
11.2 Measuring Instruments

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 2/4/7

☐

Test data reference attachment.

----END OF REPORT----