

FCC CFR47 PART 22H, 24E, 27 CERTIFICATION TEST REPORT FCC ID: 2BBNN-KSW-90

Product: Smart watch
Trade Mark: esenses
Model No.: KSW 90
Family Model: N/A
Report No.: S24030606905003
Issue Date: Mar 28, 2024

Prepared for

BEDIGITAL S.A.
Parque Industrial Santa Lucia Km 3.3 Via Funza Siberia
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Prepared by

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TEST RESULT CERTIFICATION

Applicant's name	:	BEDIGITAL S.A.
Address.....	:	Parque Industrial Santa Lucia Km 3.3 Via Funza Siberia Bodega 13A, Bogota, Colombia
Manufacturer's Name	:	HK LAGENIO TECHNOLOGY CO., LIMITED.
Address.....	:	FLAT 6 11/F CHEUNG HING BLDG540-544 NATHAN ROAD YAU MA TEIKL
Product name.....	:	Smart watch
Model and/or type reference ..	:	KSW 90
Trade Mark.....	:	esenses
Family Model.....	:	N/A
Test Sample Number.....	:	S240306069005
Standards	:	FCC CFR 47 Part 22H, Part 24E, Part 27
Test procedure	:	ANSI C63.26:2015
	:	ANSI/TIA-603-E-2016

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

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Date of Test

Date (s) of performance of tests..... Mar 06, 2024 ~ Mar 28, 2024

Date of Issue Mar 28, 2024

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

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(Project Engineer)

Reviewed : Aaron Cheng
By : Aaron Cheng
(Supervisor)

Approved : Alex Li
By : 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:	Smart watch
Trade Mark	esenses
Model Name	KSW 90
Family Model	N/A
Model Difference	N/A
FCC ID:	2BBNN-KSW-90
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/64QAM(Only Downlink)
Power Class	Class 3
Antenna:	PIFA Antenna
Antenna gain:	Band 2: -3.77 dBi, Band 4: -3.56dBi, Band 7: -2.79dBi
Adapter	N/A
Battery	DC 3.8V, 680mAh, 2.584Wh
Power supply	DC 3.8V from battery or DC 5V from magnetic charging port
Extreme Vol. Limits:	DC 3.23V to DC 4.37V (Nominal DC 3.8V) (Note 1)
HW Version	AC920-MB-V8.0A
SW Version	L11_21EB_AC920_80P
** Note1: The High Voltage DC 4.37V and Low Voltage 3.23V 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: 2BBNN-KSW-90** filing to comply with the FCC Part 22H&24E&27&90S.

1.3 TEST METHODOLOGY

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

1.4 TEST FACILITY

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

ShenZhen NTEK Testing Technology Co., Ltd.

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

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

FCC Registration No.:463705

IC Registration No.:9270A-1,

CNAS Registration No.:L5516

MEASUREMENT UNCERTAINTY

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

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

1.5 SPECIAL ACCESSORIES

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

1.6 WORST-CASE CONFIGURATION AND MODE

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

The device has LTE Bands of: Band 2/4/7

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.

1.7 SUMMARY OF TEST RESULTS

FCC Part22, Subpart H/ FCC Part24, Subpart E, FCC Part27, Subpart L, KDB 971168 D01 Power Meas License Digital Systems v03r01			
FCC Rule	Test Item	Verdict	Remark
2.1046	Conducted Output Power	PASS	
22.913(d) 24.232(d) 27.50(d)(5) KDB 971168 D01 Clause 5.7	Peak-to-Average Ratio	PASS	
2.1049 22.917(b) 24.238(b) KDB 971168 D01 Clause 4.2	Occupied Bandwidth	PASS	
2.1051 22.917(a) 24.238(a) 27.53(g), (h), (m) KDB 971168 D01 Clause 6	Band Edge	PASS	
22.913(a)(2) 27.50(b)(10), (c)(10) KDB 971168 D01 Clause 5.6	Effective Radiated Power	PASS	
24.232(c) 27.50(h)(2), (d)(4) KDB 971168 D01 Clause 5.6	Equivalent Isotropic Radiated Power	PASS	
2.1053 22.917(a) 24.238(a) 27.53(g), (h), (m) KDB 971168 D01 Clause 7	Field Strength of Spurious Radiation	PASS	
2.1055 22.355 24.235 27.54 KDB 971168 D01 Clause 9	Frequency Stability for Temperature & Voltage	PASS	

2. 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	Smart watch	KSW 90	FCC ID: 2BBNN-KSW-90	EUT

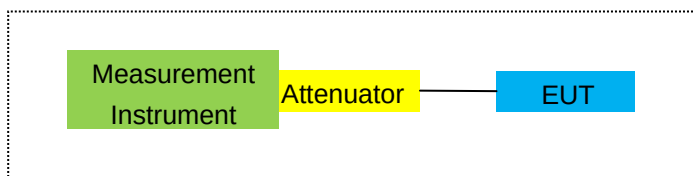
*Note: All the accessories have been used during the test.
the following "EUT" in setup diagram means EUT system.*

2.4 TEST SETUP

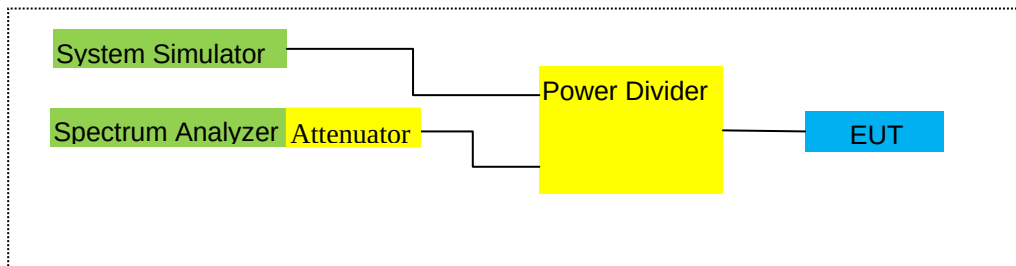
For Radiated Test Cases



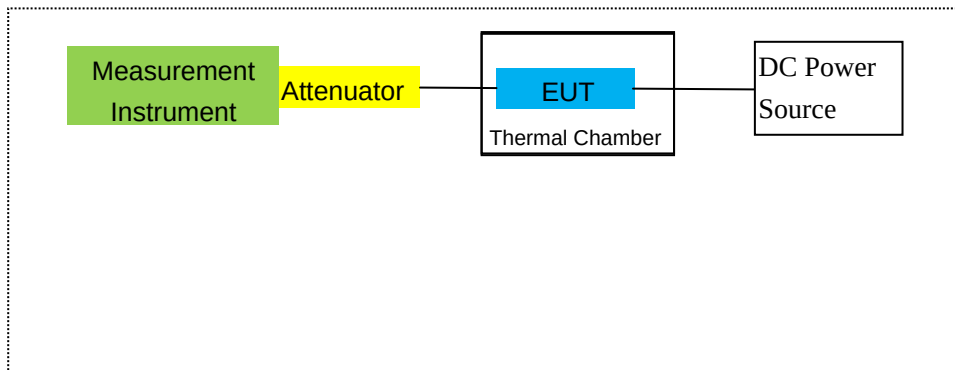
For Conducted Output Power



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	2023.05.29	2024.05.28	1 year
2	Test Receiver	R&S	ESPI	101318	2023.03.27 2024.03.12	2024.03.26 2025.03.11	1 year
3	Bilog Antenna	TESEQ	CBL6111D	31216	2023.03.16 2024.03.11	2024.03.15 2025.03.10	1 year
4	50Ω Coaxial Switch	Anritsu	MP59B	6200983705	2023.05.06	2026.05.05	3 year
5	Horn Antenna	EM	EM-AH-10180	2011071402	2022.03.31	2025.03.30	3 year
6	Horn Ant	Schwarzbeck	BBHA 9170	9170-181	2022.03.31	2025.03.30	3 year
7	Amplifier	EM	EM-30180	060538	2023.05.29	2024.05.28	1 year
8	Loop Antenna	ARA	PLA-1030/B	1029	2023.11.03	2026.11.02	3 year
9	Power Meter	R&S	NRVS	100696	2023.05.29	2024.05.28	1 year
10	Power Sensor	R&S	URV5-Z4	0395.1619.05	2023.05.29	2024.05.28	1 year
11	Test Cable	N/A	R-01	N/A	2022.06.17	2025.06.16	3 year
12	Test Cable	N/A	R-02	N/A	2022.06.17	2025.06.16	3 year
13	Test Cable	N/A	R-03	N/A	2022.06.17	2025.06.16	3 year
14	Test Receiver	R&S	ESCI	101160	2023.03.27 2024.03.12	2024.03.26 2025.03.11	1 year
15	LISN	R&S	ENV216	101313	2023.03.27 2024.03.12	2024.03.26 2025.03.11	1 year
16	LISN	EMCO	3816/2	00042990	2023.03.27 2024.03.12	2024.03.26 2025.03.11	1 year
17	50Ω Coaxial Switch	Anritsu	MP59B	6200264417	2023.05.06	2026.05.05	1 year
18	Passive Voltage Probe	R&S	ESH2-Z3	100196	2023.03.27 2024.03.12	2024.03.26 2025.03.11	1 year
19	Test Cable	N/A	C01	N/A	2023.05.06	2026.05.05	3 year
20	Test Cable	N/A	C02	N/A	2023.05.06	2026.05.05	3 year
21	Test Cable	N/A	C03	N/A	2023.05.06	2026.05.05	3 year
22	Spectrum Analyzer	agilent	e4440a	us44300399	2023.03.27 2024.03.12	2024.03.26 2025.03.11	1 year

23	test receiver	R&S	ESCI	a0304218	2023.03.27 2024.03.12	2024.03.26 2025.03.11	1 year
24	Communication Tester	R&S	CMU200	A0304247	2023.05.29	2024.05.28	1 year
25	Thermal Chamber	Ten Billion	TTC-B3C	TBN-960502	2023.03.27 2024.03.12	2024.03.26 2025.03.11	1 year
26	DC Power Source	N/A	PS-6005D	20170402923	2023.05.06	2026.05.05	3 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

☐

Band 2/4/7

RESULTS

PASS

Test data reference attachment.

6. BANDEDGE AND EMISSION MASK

RULE PART(S)

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

FCC: §22.359

LIMITS

FCC: §22.917, §24.238, §27.53

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log (P)$ dB.

(m)(4) For mobile digital stations, the attenuation factor shall be not less than $40 + 10 \log (P)$ dB on all frequencies between the channel edge and 5 megahertz from the channel edge, $43 + 10 \log (P)$ dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and $55 + 10 \log (P)$ dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less than $43 + 10 \log (P)$ dB on all frequencies between 2490.5 MHz and 2496 MHz and $55 + 10 \log (P)$ dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees. Show citation box.

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

.

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 2/4/7

RESULTS

Test data reference attachment.

7. OUT OF BAND EMISSIONS

RULE PART(S)

FCC: §2.1051, §22.901, §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 2/4/7

☐

7.1 MEASUREMENT METHOD

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

Test data reference attachment.

8. RADIATED MEASUREMENT

8.1. RADIATED POWER (ERP & EIRP)

RULE PART(S)

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

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.

TEST PROCEDURE

ANSI/TIA-603-E Clause 2.2.17

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

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

MODES TESTED

☐ Band 2/4/7

RESULTS

Pass

8.2 LTE BAND 2

Radiated Power (EIRP) for Band 2									
Mode	RB/RB SIZE	Frequency	Result						Conclusion
			SG Level (dBm)	Cable Loss (dBm)	Antenna Gain (dBi)	Max. EIRP Average (dBm)	Max. EIRP	Polarization Of Max. ERP	
							Average		
							(mW)		
1.4MHz Band QPSK	6/0	1850.7	15.12	3.76	8.90	20.26	106.225	Horizontal	Pass
		1880	16.25	3.91	8.90	21.24	132.897	Horizontal	Pass
		1909.3	16.38	3.93	8.90	21.35	136.458	Horizontal	Pass
3.0MHz Band QPSK	15/0	1851.5	15.69	3.77	8.90	20.82	120.753	Horizontal	Pass
		1880	16.36	3.91	8.90	21.35	136.458	Horizontal	Pass
		1908.5	14.53	3.94	8.90	19.49	88.995	Horizontal	Pass
5.0MHz Band QPSK	25/0	1852.5	12.76	3.77	8.90	17.89	61.492	Horizontal	Pass
		1880	16.37	3.91	8.90	21.36	136.773	Horizontal	Pass
		1907.5	16.05	3.94	8.90	21.01	126.222	Horizontal	Pass
10.0MHz Band QPSK	50/0	1855	13.21	3.79	8.90	18.32	67.920	Horizontal	Pass
		1880	16.41	3.95	8.90	21.36	136.773	Horizontal	Pass
		1905	14.84	3.97	8.90	19.77	94.803	Horizontal	Pass
15.0MHz Band QPSK	75/0	1857.5	16.22	3.79	8.90	21.33	135.831	Horizontal	Pass
		1880	16.10	3.95	8.90	21.05	127.490	Horizontal	Pass
		1902.5	16.35	3.97	8.90	21.28	134.223	Horizontal	Pass
20.0MHz Band QPSK	100/0	1860	14.54	3.81	8.90	19.63	91.751	Horizontal	Pass
		1880	16.42	3.96	8.90	21.36	136.773	Horizontal	Pass
		1900	16.51	4.00	8.90	21.41	138.388	Horizontal	Pass
1.4MHz Band QPSK	6/0	1850.7	14.05	3.76	8.90	19.19	82.965	Vertical	Pass
		1880	16.35	3.91	8.90	21.34	136.299	Vertical	Pass
		1909.3	14.45	3.93	8.90	19.42	87.588	Vertical	Pass
3.0MHz Band QPSK	15/0	1851.5	16.47	3.77	8.90	21.60	144.663	Vertical	Pass
		1880	16.52	3.91	8.90	21.51	141.511	Vertical	Pass
		1908.5	16.37	3.94	8.90	21.33	135.831	Vertical	Pass
5.0MHz Band QPSK	25/0	1852.5	13.95	3.77	8.90	19.08	80.860	Vertical	Pass
		1880	15.27	3.91	8.90	20.26	106.171	Vertical	Pass
		1907.5	15.14	3.94	8.90	20.10	102.253	Vertical	Pass
10.0MHz Band QPSK	50/0	1855	15.25	3.79	8.90	20.36	108.643	Vertical	Pass
		1880	14.32	3.95	8.90	19.27	84.537	Vertical	Pass
		1905	14.41	3.97	8.90	19.34	85.855	Vertical	Pass

15.0MHz	75/0	1857.5	16.25	3.79	8.90	21.36	136.773	Vertical	Pass
Band		1880	14.72	3.95	8.90	19.67	92.778	Vertical	Pass
QPSK		1902.5	13.15	3.97	8.90	18.08	64.339	Vertical	Pass
20.0MHz	100/0	1860	15.10	3.81	8.90	20.19	104.450	Vertical	Pass
Band		1880	16.75	3.96	8.90	21.69	147.571	Vertical	Pass
QPSK		1900	15.30	4.00	8.90	20.20	104.664	Vertical	Pass

Radiated Power (EIRP) for Band 2									
Mode	RB/RB SIZE	Frequency	Result						Conclusion
			SG Level (dBm)	Cable Loss (dBm)	Antenna Gain (dBi)	Max. EIRP Average (dBm)	Max. EIRP	Polarization Of Max. ERP	
							Average		
							(mW)		
1.4MHz Band 16 QAM	6/0	1850.7	14.60	3.76	8.90	19.51	89.351	Horizontal	Pass
		1880	15.75	3.91	8.90	20.66	116.312	Horizontal	Pass
		1909.3	15.45	3.93	8.90	20.45	110.810	Horizontal	Pass
3.0MHz Band 16 QAM	15/0	1851.5	15.29	3.77	8.90	20.02	100.462	Horizontal	Pass
		1880	14.95	3.91	8.90	19.32	85.507	Horizontal	Pass
		1908.5	14.55	3.94	8.90	20.11	102.565	Horizontal	Pass
5.0MHz Band 16 QAM	25/0	1852.5	15.14	3.77	8.90	20.33	107.895	Horizontal	Pass
		1880	15.50	3.91	8.90	20.14	103.358	Horizontal	Pass
		1907.5	14.00	3.94	8.90	20.12	102.802	Horizontal	Pass
10.0MHz Band 16 QAM	50/0	1855	15.35	3.79	8.90	20.03	100.693	Horizontal	Pass
		1880	14.05	3.95	8.90	18.67	73.619	Horizontal	Pass
		1905	15.36	3.97	8.90	20.03	100.807	Horizontal	Pass
15.0MHz Band 16 QAM	75/0	1857.5	13.68	3.79	8.90	20.33	107.952	Horizontal	Pass
		1880	15.77	3.95	8.90	20.35	108.393	Horizontal	Pass
		1902.5	15.65	3.97	8.90	19.63	91.833	Horizontal	Pass
20.0MHz Band 16 QAM	100/0	1860	13.84	3.81	8.90	19.96	99.175	Horizontal	Pass
		1880	16.17	3.96	8.90	18.96	78.629	Horizontal	Pass
		1900	14.55	4.00	8.90	18.58	72.151	Horizontal	Pass
1.4MHz Band 16 QAM	6/0	1850.7	14.61	3.76	8.90	20.33	107.895	Vertical	Pass
		1880	15.84	3.91	8.90	19.90	97.688	Vertical	Pass
		1909.3	15.13	3.93	8.90	19.68	92.983	Vertical	Pass
3.0MHz Band 16 QAM	15/0	1851.5	13.77	3.77	8.90	18.87	77.108	Vertical	Pass
		1880	14.83	3.91	8.90	20.25	106.032	Vertical	Pass
		1908.5	14.56	3.94	8.90	20.50	112.191	Vertical	Pass
5.0MHz	25/0	1852.5	13.76	3.77	8.90	19.37	86.497	Vertical	Pass

Band 16 QAM		1880	15.05	3.91	8.90	19.42	87.443	Vertical	Pass
		1907.5	15.69	3.94	8.90	19.66	92.531	Vertical	Pass
10.0MHz Band 16 QAM	50/0	1855	13.98	3.79	8.90	18.63	72.954	Vertical	Pass
		1880	15.57	3.95	8.90	19.36	86.298	Vertical	Pass
		1905	15.12	3.97	8.90	19.06	80.616	Vertical	Pass
15.0MHz Band 16 QAM	75/0	1857.5	13.85	3.79	8.90	18.52	71.056	Vertical	Pass
		1880	14.87	3.95	8.90	20.12	102.802	Vertical	Pass
		1902.5	13.66	3.97	8.90	17.90	61.704	Vertical	Pass
20.0MHz Band 16 QAM	100/0	1860	14.29	3.81	8.90	20.69	117.257	Vertical	Pass
		1880	14.90	3.96	8.90	20.36	108.643	Vertical	Pass
		1900	13.78	4.00	8.90	17.86	61.092	Vertical	Pass

Note:

SG Level= Signal generator output

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

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

8.3 LTE BAND 4

Radiated Power (EIRP) for Band 4									
Mode	RB/RB SIZE	Frequency	Result						Conclusion
			SG	Cable Loss (dBm)	Antenna Gain (dBi)	Max.	Max.	Polarization Of Max. ERP	
			Level			EIRP	EIRP		
			(dBm)			Average	Average		
						(dBm)	(mW)		
1.4MHz Band QPSK	6/0	1710.7	14.66	3.12	8.90	20.44	110.595	Horizontal	Pass
		1732.5	14.18	3.27	8.90	19.81	95.783	Horizontal	Pass
		1754.3	14.32	3.29	8.90	19.93	98.350	Horizontal	Pass
3.0MHz Band QPSK	15/0	1711.5	14.81	3.13	8.90	20.58	114.409	Horizontal	Pass
		1732.5	13.84	3.27	8.90	19.47	88.501	Horizontal	Pass
		1753.5	13.78	3.30	8.90	19.38	86.739	Horizontal	Pass
5.0MHz Band QPSK	25/0	1712.5	11.92	3.13	8.90	17.69	58.701	Horizontal	Pass
		1732.5	11.93	3.27	8.90	17.56	57.049	Horizontal	Pass
		1752.5	13.18	3.30	8.90	18.78	75.550	Horizontal	Pass
10.0MHz Band QPSK	50/0	1715	14.62	3.15	8.90	20.37	108.787	Horizontal	Pass
		1732.5	13.71	3.31	8.90	19.30	85.207	Horizontal	Pass
		1750	13.96	3.33	8.90	19.53	89.669	Horizontal	Pass
15.0MHz Band QPSK	75/0	1717.5	13.23	3.15	8.90	18.98	79.002	Horizontal	Pass
		1732.5	14.37	3.31	8.90	19.96	99.107	Horizontal	Pass
		1747.5	12.91	3.33	8.90	18.48	70.477	Horizontal	Pass
20.0MHz Band QPSK	100/0	1720	14.77	3.17	8.90	20.50	112.314	Horizontal	Pass
		1732.5	13.13	3.32	8.90	18.71	74.377	Horizontal	Pass
		1745	14.74	3.36	8.90	20.28	106.561	Horizontal	Pass
1.4MHz Band QPSK	6/0	1710.7	12.48	3.12	8.90	18.26	66.999	Vertical	Pass
		1732.5	13.52	3.27	8.90	19.15	82.148	Vertical	Pass
		1754.3	14.84	3.29	8.90	20.45	110.917	Vertical	Pass
3.0MHz Band QPSK	15/0	1711.5	13.64	3.13	8.90	19.41	87.251	Vertical	Pass
		1732.5	13.70	3.27	8.90	19.33	85.623	Vertical	Pass
		1753.5	12.81	3.30	8.90	18.41	69.317	Vertical	Pass
5.0MHz Band QPSK	25/0	1712.5	14.60	3.13	8.90	20.37	108.914	Vertical	Pass
		1732.5	14.23	3.27	8.90	19.86	96.731	Vertical	Pass
		1752.5	12.93	3.30	8.90	18.53	71.217	Vertical	Pass
10.0MHz Band QPSK	50/0	1715	14.37	3.15	8.90	20.12	102.802	Vertical	Pass
		1732.5	14.64	3.31	8.90	20.23	105.439	Vertical	Pass
		1750	13.07	3.33	8.90	18.64	73.074	Vertical	Pass

15.0MHz		1717.5	13.04	3.15	8.90	18.79	75.724	Vertical	Pass
Band	75/0	1732.5	13.16	3.31	8.90	18.75	74.948	Vertical	Pass
QPSK		1747.5	12.72	3.33	8.90	18.29	67.386	Vertical	Pass
20.0MHz		1720	15.01	3.17	8.90	20.74	118.539	Vertical	Pass
Band	100/0	1732.5	15.05	3.32	8.90	20.63	115.704	Vertical	Pass
QPSK		1745	14.77	3.36	8.90	20.31	107.399	Vertical	Pass

Radiated Power (EIRP) for Band 4									
Mode	RB/RB SIZE	Frequency	Result						Conclusion
			SG Level	Cable Loss (dBm)	Antenna Gain (dBi)	Max. EIRP	Max. EIRP	Polarization Of Max. ERP	
			(dBm)			Average	Average		
						(dBm)	(mW)		
1.4MHz Band 16 QAM	6/0	2502.5	17.04	4.54	9.00	21.50	141.411	Horizontal	Pass
		2535	15.75	4.69	9.00	20.06	101.293	Horizontal	Pass
		2567.5	13.68	4.71	9.00	17.97	62.623	Horizontal	Pass
3.0MHz Band 16 QAM	15/0	2505	12.27	4.55	9.00	16.72	46.971	Horizontal	Pass
		2535	16.28	4.69	9.00	20.59	114.608	Horizontal	Pass
		2565	15.30	4.72	9.00	19.58	90.683	Horizontal	Pass
5.0MHz Band 16 QAM	25/0	2507.5	16.78	4.55	9.00	21.23	132.725	Horizontal	Pass
		2535	15.40	4.69	9.00	19.71	93.609	Horizontal	Pass
		2562.5	16.00	4.72	9.00	20.28	106.777	Horizontal	Pass
10.0MHz Band 16 QAM	50/0	2510	15.20	4.57	9.00	19.63	91.851	Horizontal	Pass
		2535	17.31	4.73	9.00	21.58	143.852	Horizontal	Pass
		2560	14.09	4.75	9.00	18.34	68.219	Horizontal	Pass
15.0MHz Band 16 QAM	75/0	2502.5	14.10	4.54	9.00	18.56	71.786	Vertical	Pass
		2535	15.63	4.69	9.00	19.94	98.611	Vertical	Pass
		2567.5	14.09	4.71	9.00	18.38	68.840	Vertical	Pass
20.0MHz Band 16 QAM	100/0	2505	16.02	4.55	9.00	20.47	111.479	Vertical	Pass
		2535	15.18	4.69	9.00	19.49	88.999	Vertical	Pass
		2565	17.08	4.72	9.00	21.36	136.773	Vertical	Pass
1.4MHz Band 16 QAM	6/0	2507.5	15.80	4.55	9.00	20.25	105.874	Vertical	Pass
		2535	17.13	4.69	9.00	21.44	139.294	Vertical	Pass
		2562.5	16.68	4.72	9.00	20.96	124.837	Vertical	Pass
3.0MHz Band 16 QAM	15/0	2510	17.68	4.57	9.00	22.11	162.435	Vertical	Pass
		2535	17.16	4.73	9.00	21.43	138.853	Vertical	Pass
		2560	17.43	4.75	9.00	21.68	147.228	Vertical	Pass
5.0MHz	25/0	2502.5	17.04	4.54	9.00	21.50	141.411	Horizontal	Pass

Band 16 QAM		2535	15.75	4.69	9.00	20.06	101.293	Horizontal	Pass
		2567.5	13.68	4.71	9.00	17.97	62.623	Horizontal	Pass
10.0MHz Band 16 QAM	50/0	2505	12.27	4.55	9.00	16.72	46.971	Horizontal	Pass
		2535	16.28	4.69	9.00	20.59	114.608	Horizontal	Pass
		2565	15.30	4.72	9.00	19.58	90.683	Horizontal	Pass
15.0MHz Band 16 QAM	75/0	2507.5	16.78	4.55	9.00	21.23	132.725	Horizontal	Pass
		2535	15.40	4.69	9.00	19.71	93.609	Horizontal	Pass
		2562.5	16.00	4.72	9.00	20.28	106.777	Horizontal	Pass
20.0MHz Band 16 QAM	100/0	2510	15.20	4.57	9.00	19.63	91.851	Horizontal	Pass
		2535	17.31	4.73	9.00	21.58	143.852	Horizontal	Pass
		2560	14.09	4.75	9.00	18.34	68.219	Horizontal	Pass

Note:

SG Level= Signal generator output

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

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

8.4 LTE BAND 7

Radiated Power (EIRP) for Band 7									
Mode	RB/RB SIZE	Frequency	Result						Conclusion
			SG Level	Cable Loss	Antenna Gain	Max. EIRP	Max. EIRP	Polarization	
			(dBm)	(dBm)	(dB)	Average	Average	Of Max. ERP	
						(dBm)	(mW)		
5.0MHz Band QPSK	25/0	2502.5	17.04	4.54	9.00	21.50	141.411	Horizontal	Pass
		2535	15.75	4.69	9.00	20.06	101.293	Horizontal	Pass
		2567.5	13.68	4.71	9.00	17.97	62.623	Horizontal	Pass
10.0MHz Band QPSK	50/0	2505	12.27	4.55	9.00	16.72	46.971	Horizontal	Pass
		2535	16.28	4.69	9.00	20.59	114.608	Horizontal	Pass
		2565	15.30	4.72	9.00	19.58	90.683	Horizontal	Pass
15.0MHz Band QPSK	75/0	2507.5	16.78	4.55	9.00	21.23	132.725	Horizontal	Pass
		2535	15.40	4.69	9.00	19.71	93.609	Horizontal	Pass
		2562.5	16.00	4.72	9.00	20.28	106.777	Horizontal	Pass
20.0MHz Band QPSK	100/0	2510	15.20	4.57	9.00	19.63	91.851	Horizontal	Pass
		2535	17.31	4.73	9.00	21.58	143.852	Horizontal	Pass
		2560	14.09	4.75	9.00	18.34	68.219	Horizontal	Pass
5.0MHz Band QPSK	25/0	2502.5	14.10	4.54	9.00	18.56	71.786	Vertical	Pass
		2535	15.63	4.69	9.00	19.94	98.611	Vertical	Pass
		2567.5	14.09	4.71	9.00	18.38	68.840	Vertical	Pass
10.0MHz Band QPSK	50/0	2505	16.02	4.55	9.00	20.47	111.479	Vertical	Pass
		2535	15.18	4.69	9.00	19.49	88.999	Vertical	Pass
		2565	17.08	4.72	9.00	21.36	136.773	Vertical	Pass
15.0MHz Band QPSK	75/0	2507.5	15.80	4.55	9.00	20.25	105.874	Vertical	Pass
		2535	17.13	4.69	9.00	21.44	139.294	Vertical	Pass
		2562.5	16.68	4.72	9.00	20.96	124.837	Vertical	Pass
20.0MHz Band QPSK	100/0	2510	17.68	4.57	9.00	22.11	162.435	Vertical	Pass
		2535	17.16	4.73	9.00	21.43	138.853	Vertical	Pass
		2560	17.43	4.75	9.00	21.68	147.228	Vertical	Pass

Radiated Power (EIRP) for Band 7									
Mode	RB/RB SIZE	Frequency	Result						Conclusion
			SG Level	Cable Loss	Antenna Factor	Max. EIRP	Max. EIRP	Polarization	
			(dBm)	(dBm)	(dB)	Average	Average	Of Max. ERP	
						(dBm)	(mW)		
5.0MHz Band 16 QAM	25/0	2502.5	16.68	4.54	9.00	21.14	130.057	Horizontal	Pass
		2535	17.35	4.69	9.00	21.66	146.612	Horizontal	Pass
		2567.5	16.06	4.71	9.00	20.35	108.393	Horizontal	Pass
10.0MHz Band 16 QAM	50/0	2505	14.82	4.55	9.00	19.27	84.587	Horizontal	Pass
		2535	16.32	4.69	9.00	20.63	115.611	Horizontal	Pass
		2565	15.87	4.72	9.00	20.15	103.514	Horizontal	Pass
15.0MHz Band 16 QAM	75/0	2507.5	15.68	4.55	9.00	20.13	103.039	Horizontal	Pass
		2535	17.17	4.69	9.00	21.48	140.630	Horizontal	Pass
		2562.5	16.42	4.72	9.00	20.70	117.424	Horizontal	Pass
20.0MHz Band 16 QAM	100/0	2510	16.09	4.57	9.00	20.52	112.599	Horizontal	Pass
		2535	16.01	4.73	9.00	20.28	106.705	Horizontal	Pass
		2560	16.10	4.75	9.00	20.35	108.393	Horizontal	Pass
5.0MHz Band 16 QAM	25/0	2502.5	15.90	4.54	9.00	20.36	108.643	Vertical	Pass
		2535	15.95	4.69	9.00	20.26	106.149	Vertical	Pass
		2567.5	15.84	4.71	9.00	20.13	103.039	Vertical	Pass
10.0MHz Band 16 QAM	50/0	2505	16.78	4.55	9.00	21.23	132.817	Vertical	Pass
		2535	16.55	4.69	9.00	20.86	121.816	Vertical	Pass
		2565	16.04	4.72	9.00	20.32	107.647	Vertical	Pass
15.0MHz Band 16 QAM	75/0	2507.5	15.90	4.55	9.00	20.35	108.393	Vertical	Pass
		2535	16.38	4.69	9.00	20.69	117.220	Vertical	Pass
		2562.5	14.95	4.72	9.00	19.23	83.840	Vertical	Pass
20.0MHz Band 16 QAM	100/0	2510	16.64	4.57	9.00	21.07	127.917	Vertical	Pass
		2535	17.47	4.73	9.00	21.74	149.377	Vertical	Pass
		2560	15.22	4.75	9.00	19.47	88.464	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: §2.1053, §22.917, §24.238, §27.53 and

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 2/4/7

RESULTS

PASS

9.1 LTE BAND 2

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

Test Results for Low Channel 1850.7MHz							
Frequency(MHz)	SG Level(dBm)	Cable Loss(dB)	Antenna Gain(dB)	Absolute Level(dBm)	Limit (dBm)	Margin(dBm)	Polarity
3701.4	-48.95	4.04	33.51	-19.48	-13	-6.48	Horizontal
3701.4	-48.80	4.04	33.51	-19.33	-13	-6.33	Vertical
5552.1	-53.17	5.24	35.84	-22.57	-13	-9.57	Vertical
5552.1	-56.76	5.24	35.84	-26.16	-13	-13.16	Horizontal
Test Results for Mid Channel 1880MHz							
3760	-49.39	4.04	33.56	-19.87	-13	-6.87	Horizontal
3760	-50.25	4.04	33.56	-20.73	-13	-7.73	Vertical
5640	-50.20	5.24	35.91	-19.53	-13	-6.53	Vertical
5640	-52.60	5.24	35.91	-21.93	-13	-8.93	Horizontal
Test Results for High Channel 1909.3MHz							
3818.6	-49.98	4.04	34.00	-20.02	-13	-7.02	Horizontal
3818.6	-52.69	4.04	34.00	-22.73	-13	-9.73	Vertical
5727.9	-54.60	5.24	36.04	-23.80	-13	-10.80	Vertical
5727.9	-55.25	5.24	36.04	-24.45	-13	-11.45	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	-52.46	4.07	33.54	-22.99	-13	-9.99	Horizontal
3720	-48.38	4.07	33.54	-18.91	-13	-5.91	Vertical
5580	-54.16	5.28	35.86	-23.58	-13	-10.58	Vertical
5580	-56.71	5.28	35.86	-26.13	-13	-13.13	Horizontal
Test Results for Mid Channel 1880MHz							
3760	-52.33	4.04	33.56	-22.81	-13	-9.81	Horizontal
3760	-48.58	4.04	33.56	-19.06	-13	-6.06	Vertical
5640	-51.37	5.24	35.91	-20.70	-13	-7.70	Vertical
5640	-53.07	5.24	35.91	-22.40	-13	-9.40	Horizontal
Test Results for High Channel 1900MHz							
3800	-49.65	4.04	34.00	-19.69	-13	-6.69	Horizontal
3800	-51.07	4.04	34.00	-21.11	-13	-8.11	Vertical
5700	-53.11	5.24	36.04	-22.31	-13	-9.31	Vertical
5700	-53.46	5.24	36.04	-22.66	-13	-9.66	Horizontal

Note: $P_{Mea}(dBm) = Power(dBm) + ARpl(dBm)$

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	-53.88	4.02	29.80	-28.10	-13	-15.10	Horizontal
3421.4	-52.84	4.02	29.80	-27.06	-13	-14.06	Vertical
5132.1	-55.95	5.24	35.84	-25.35	-13	-12.35	Vertical
5132.1	-57.83	5.24	35.84	-27.23	-13	-14.23	Horizontal
Test Results for Mid Channel 1732.5MHz							
3465	-46.32	4.03	30.00	-20.35	-13	-7.35	Horizontal
3465	-52.68	4.03	30.00	-26.71	-13	-13.71	Vertical
5197.5	-52.70	5.25	35.86	-22.09	-13	-9.09	Vertical
5197.5	-52.52	5.25	35.86	-21.91	-13	-8.91	Horizontal
Test Results for High Channel 1754.3MHz							
3508.6	-47.55	4.05	30.01	-21.59	-13	-8.59	Horizontal
3508.6	-55.12	4.05	30.01	-29.16	-13	-16.16	Vertical
5262.9	-52.95	5.26	35.86	-22.35	-13	-9.35	Vertical
5262.9	-51.54	5.26	35.86	-20.94	-13	-7.94	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	-50.78	4.02	29.80	-25.00	-13	-12.00	Horizontal
3440	-52.60	4.02	29.80	-26.82	-13	-13.82	Vertical
5160	-55.22	5.24	35.84	-24.62	-13	-11.62	Vertical
5160	-57.59	5.24	35.84	-26.99	-13	-13.99	Horizontal
Test Results for Mid Channel 1732.5MHz							
3465	-45.61	4.03	30.00	-19.64	-13	-6.64	Horizontal
3465	-48.25	4.03	30.00	-22.28	-13	-9.28	Vertical
5197.5	-55.20	5.25	35.86	-24.59	-13	-11.59	Vertical
5197.5	-53.63	5.25	35.86	-23.02	-13	-10.02	Horizontal
Test Results for High Channel 1745MHz							
2490	-48.02	2.91	27.68	-23.25	-13	-10.25	Horizontal
3490	-51.79	2.91	27.68	-27.02	-13	-14.02	Vertical
5235	-55.03	5.26	35.86	-24.43	-13	-11.43	Vertical
5235	-54.27	5.26	35.86	-23.67	-13	-10.67	Horizontal

Note: $P_{Mea}(dBm) = Power(dBm) + ARpl(dBm)$

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

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

9.3 LTE BAND 7

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

Test Results for Low Channel 2502.5MHz							
Frequency(MHz)	SG Level(dBm)	Cable Loss(dB)	Antenna Factor(dB)	Absolute Level(dBm)	Limit (dBm)	Margin(dBm)	Polarity
5005	-65.21	5.23	35.81	-34.63	-25	-9.63	Horizontal
5005	-63.75	5.23	35.81	-33.17	-25	-8.17	Vertical
7507.5	-68.34	5.67	36.85	-37.16	-25	-12.16	Vertical
7507.5	-64.03	5.67	36.85	-32.85	-25	-7.85	Horizontal
Test Results for Mid Channel 2535MHz							
5070	-61.78	5.23	35.82	-31.19	-25	-6.19	Horizontal
5070	-64.94	5.23	35.82	-34.35	-25	-9.35	Vertical
7605	-66.58	5.67	36.85	-35.40	-25	-10.40	Vertical
7605	-65.60	5.67	36.85	-34.42	-25	-9.42	Horizontal
Test Results for High Channel 2567.5MHz							
5135	-65.97	5.24	35.83	-35.38	-25	-10.38	Horizontal
5135	-63.63	5.24	35.83	-33.04	-25	-8.04	Vertical
7702.5	-65.67	5.68	36.87	-34.48	-25	-9.48	Vertical
7702.5	-68.37	5.68	36.87	-37.18	-25	-12.18	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	-65.64	5.23	35.82	-35.05	-25	-10.05	Horizontal
5020	-62.64	5.23	35.82	-32.05	-25	-7.05	Vertical
7530	-65.60	5.67	36.86	-34.41	-25	-9.41	Vertical
7530	-61.28	5.67	36.86	-30.09	-25	-5.09	Horizontal
Test Results for Mid Channel 2535MHz							
5070	-62.27	5.23	35.82	-31.68	-25	-6.68	Horizontal
5070	-63.69	5.23	35.82	-33.10	-25	-8.10	Vertical
7605	-63.83	5.67	36.85	-32.65	-25	-7.65	Vertical
7605	-65.86	5.67	36.85	-34.68	-25	-9.68	Horizontal
Test Results for High Channel 2560MHz							
5120	-60.36	5.24	35.83	-29.77	-25	-4.77	Horizontal
5120	-66.01	5.24	35.83	-35.42	-25	-10.42	Vertical
7680	-65.10	5.70	36.88	-33.92	-25	-8.92	Vertical
7680	-66.24	5.70	36.88	-35.06	-25	-10.06	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, §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 3.3V, Normal, DC 3.8V and High voltage, DC 4.37V.

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 2/4/7

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]
3.23	1880	1	0.000532	2.5
3.8	1880	6	0.003191	2.5
4.37	1880	19	0.010106	2.5

Frequency error vs. Temperature

Temperature [°C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
Normal (25C)	1880	9	0.004787	2.5
Extreme (50C)	1880	3	0.001596	2.5
Extreme (40C)	1880	15	0.007979	2.5
Extreme (30C)	1880	12	0.006383	2.5
Extreme (10C)	1880	17	0.009043	2.5
Extreme (0C)	1880	1	0.000532	2.5
Extreme (-10C)	1880	17	0.009043	2.5
Extreme (-20C)	1880	1	0.000532	2.5
Extreme (-30C)	1880	12	0.006383	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]
3.23	1880	15	0.007979	2.5
3.8	1880	5	0.002660	2.5
4.37	1880	16	0.008511	2.5

Frequency error vs. Temperature

Temperature [°C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
Normal (25C)	1880	10	0.005319	2.5
Extreme (50C)	1880	4	0.002128	2.5
Extreme (40C)	1880	21	0.011170	2.5
Extreme (30C)	1880	2	0.001064	2.5
Extreme (10C)	1880	8	0.004255	2.5
Extreme (0C)	1880	6	0.003191	2.5
Extreme (-10C)	1880	17	0.009043	2.5
Extreme (-20C)	1880	14	0.007447	2.5
Extreme (-30C)	1880	25	0.013298	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]
3.23	1732.5	2	0.001154	2.5
3.8	1732.5	3	0.001732	2.5
4.37	1732.5	12	0.006926	2.5

Frequency error vs. Temperature

Temperature [°C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
Normal (25C)	1732.5	18	0.010390	2.5
Extreme (50C)	1732.5	13	0.007504	2.5
Extreme (40C)	1732.5	22	0.012698	2.5
Extreme (30C)	1732.5	2	0.001154	2.5
Extreme (10C)	1732.5	8	0.004618	2.5
Extreme (0C)	1732.5	10	0.005772	2.5
Extreme (-10C)	1732.5	1	0.000577	2.5
Extreme (-20C)	1732.5	16	0.009235	2.5
Extreme (-30C)	1732.5	2	0.001154	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]
3.23	1732.5	15	0.008658	2.5
3.8	1732.5	8	0.004618	2.5
4.37	1732.5	9	0.005195	2.5

Frequency error vs. Temperature

Temperature [°C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
Normal (25C)	1732.5	6	0.003463	2.5
Extreme (50C)	1732.5	12	0.006926	2.5
Extreme (40C)	1732.5	10	0.005772	2.5
Extreme (30C)	1732.5	3	0.001732	2.5
Extreme (10C)	1732.5	21	0.012121	2.5
Extreme (0C)	1732.5	13	0.007504	2.5
Extreme (-10C)	1732.5	11	0.006349	2.5
Extreme (-20C)	1732.5	19	0.010967	2.5
Extreme (-30C)	1732.5	10	0.005772	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]
3.23	2535	10	0.003945	2.5
3.8	2535	13	0.005128	2.5
4.37	2535	18	0.007101	2.5

Frequency error vs. Temperature

Temperature [°C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
Normal (25C)	2535	9	0.003550	2.5
Extreme (50C)	2535	6	0.002367	2.5
Extreme (40C)	2535	12	0.004734	2.5
Extreme (30C)	2535	20	0.007890	2.5
Extreme (10C)	2535	10	0.003945	2.5
Extreme (0C)	2535	4	0.001578	2.5
Extreme (-10C)	2535	15	0.005917	2.5
Extreme (-20C)	2535	9	0.003550	2.5
Extreme (-30C)	2535	11	0.004339	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]
3.23	2535	2	0.000789	2.5
3.8	2535	10	0.003945	2.5
4.37	2535	18	0.007101	2.5

Frequency error vs. Temperature

Temperature [°C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
Normal (25C)	2535	14	0.005523	2.5
Extreme (50C)	2535	16	0.006312	2.5
Extreme (40C)	2535	18	0.007101	2.5
Extreme (30C)	2535	12	0.004734	2.5
Extreme (10C)	2535	8	0.003156	2.5
Extreme (0C)	2535	15	0.005917	2.5
Extreme (-10C)	2535	11	0.004339	2.5
Extreme (-20C)	2535	12	0.004734	2.5
Extreme (-30C)	2535	16	0.006312	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.

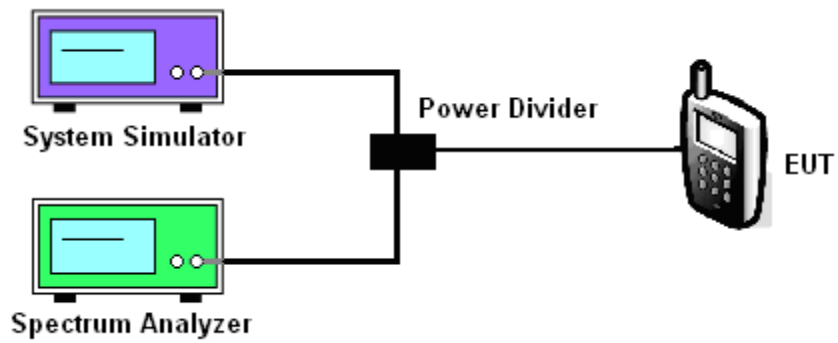
11.2 Measuring Instruments

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-----