

FCC CFR47 PART 22H, 24E, 27 CERTIFICATION TEST REPORT

FCC ID: 2AOKUNOTE13P

Product: Smartphone

Trade Mark: HOTWAV

Model No.: Note 13 Pro

Family Model: Note 13, Note, T1, T1-S1L, Note 11, Note 12,
iHunt S24 Xtreme, HT02, HT03, Note 15,
Note 15 Pro, Note 16, Note 16 Pro, Note 12E,
Note 13e, Note 13 Plus, Note 15e, Note 15 Plus

Report No.: S23112101803006

Issue Date: Dec 12, 2023

Prepared for

SHENZHEN TUGAO INTELLIGENT CO.,LTD
8th Floor, Bldg A, Jinggang Science&Technology Park, Fuyong,
Bao'an District, Shenzhen, China

Prepared by

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
Tel. 400-800-6106, 0755-2320 0050, 0755-2320 0090
Website: <http://www.ntek.org.cn>

TEST RESULT CERTIFICATION

Applicant's name: SHENZHEN TUGAO INTELLIGENT CO.,LTD
Address: 8th Floor, Bldg A, Jinggang Science&Technology Park, Fuyong,
Bao'an District, Shenzhen, China
Manufacturer's Name: SHENZHEN TUGAO INTELLIGENT CO.,LTD
Address: 8th Floor, Bldg A, Jinggang Science&Technology Park, Fuyong,
Bao'an District, Shenzhen, China
Product name.....: Smartphone
Trade Mark.....: HOTWAV
Model and/or type reference ...: Note 13 Pro
Family Model.....: Note 13, Note, T1, T1-S1L, Note 11, Note 12, iHunt S24 Xtreme,
HT02, HT03, Note 15, Note 15 Pro, Note 16, Note 16 Pro, Note 12E,
Note 13e, Note 13 Plus, Note 15e, Note 15 Plus
Test Sample Number..... S231121018001
Date of Test.....: Nov 21, 2023 ~ Dec 12, 2023
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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Prepared By: Mary Hu
Mary Hu
(Project Engineer)

Reviewed By: Aaron Cheng
Aaron Cheng
(Supervisor)

Approved By: Alex Li
Alex Li
(Manager)

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1. GENERAL INFORMATION

1.1 PRODUCT DESCRIPTION

A major technical description of EUT is described as following:

Product Designation:	Smartphone
Trade Mark	HOTWAV
Model Name	Note 13 Pro
Family Model	Note 13, Note, T1, T1-S1L, Note 11, Note 12, iHunt S24 Xtreme, HT02, HT03, Note 15, Note 15 Pro, Note 16, Note 16 Pro, Note 12E, Note 13e, Note 13 Plus, Note 15e, Note 15 Plus
Model Difference	All the model are the same circuit and RF module, except the model names.
FCC ID:	2AOKUNOTE13P
Frequency Bands:	U.S. Bands: <input checked="" type="checkbox"/> LTE FDD Band 5,7 , 66 TDD Band 41
Frequency Range:	LTE FDD Band 5 Uplink: 824MHz-849MHz, Downlink: 869MHz-894MHz; LTE-FDD Band 7 Uplink: 2500MHz-2570MHz, Downlink: 2620MHz-2690MHz; LTE TDD Band 41 Uplink& Downlink: 2535MHz-2655MHz, LTE FDD Band 66 Uplink: 1710MHz-1780MHz, Downlink: 2110MHz-2200MHz;
Type of Modulation:	QPSK/16QAM/64QAM(Only Downlink)
Power Class	Class 3
SIM Card:	SIM 1 and SIM 2 is a chipset unit and tested as a single chipset. The SIM 1 is chosen for test.
Antenna:	PIFA Antenna
Antenna gain:	Band 5: -3.75dBi, Band 7: -3.08dBi, Band 41: 3.49dBi, Band 66: -2.76dBi
Adapter	Model: QZ-02002AC00 Input: 100-240V~50/60Hz 0.5A Output USB-C: 5.0V---3.0A or 9.0V---2.22A or 12.0V---1.67A(20.0W)
Battery	DC 3.87V, 5160mAh, 19.97Wh
Power supply	DC 3.87V from battery or DC 5V from adapter
Extreme Vol. Limits:	DC 3.29V to DC 4.45V (Nominal DC 3.87V) (Note 1)
HW Version	V1.0
SW Version	N/A
** Note1: The High Voltage DC 4.45V and Low Voltage 3.29V 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: 2AOKUNOTE13P** 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 = 2Uc(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 5/7/41/66

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

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

2. SYSTEM TEST CONFIGURATION

2.1 EUT CONFIGURATION

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

2.2 EUT EXERCISE

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

2.3 CONFIGURATION OF EUT SYSTEM

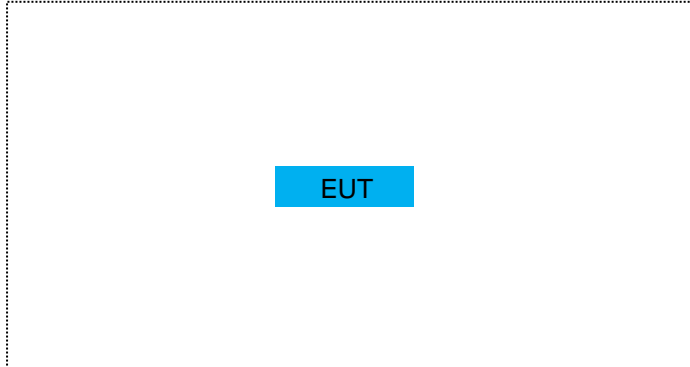
Table 2-1 Equipment Used in EUT System

Item	Equipment	Model No.	ID or Specification	Note
1	Smartphone	Note 13 Pro	FCC ID: 2AOKUNOTE13P	EUT

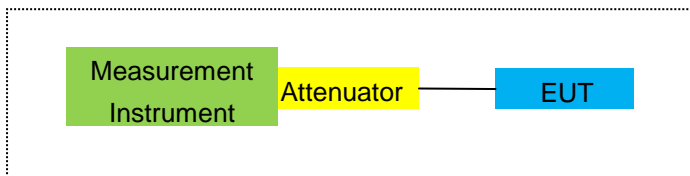
*Note: All the accessories have been used during the test.
the following “EUT” in setup diagram means EUT system.*

2.4 TEST SETUP

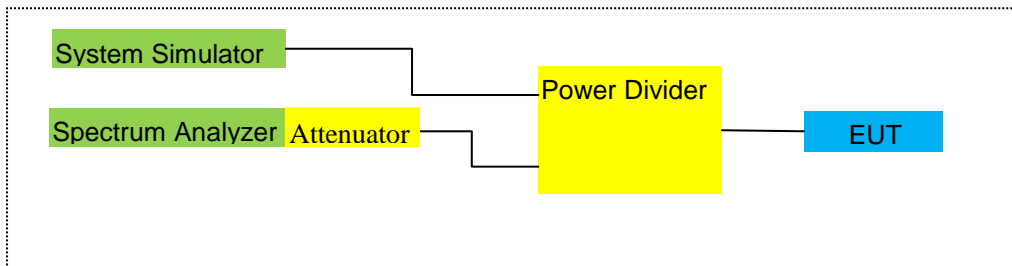
For Radiated Test Cases



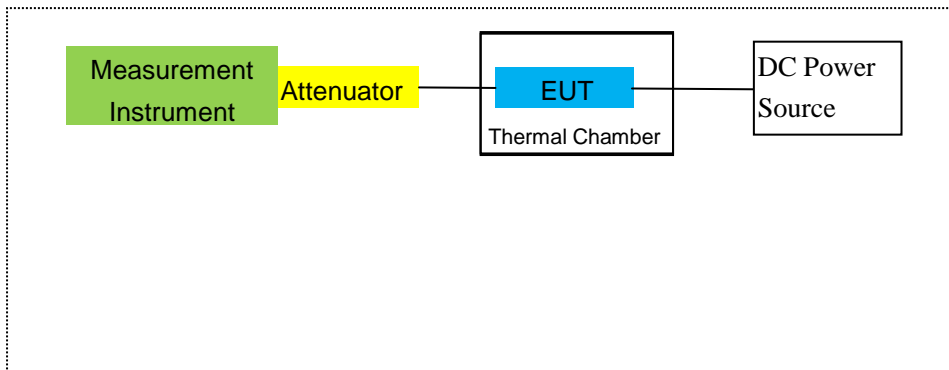
For Conducted Output Power



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	2024.03.26	1 year
3	Bilog Antenna	TESEQ	CBL6111D	31216	2023.03.16	2024.03.15	1 year
4	50Ω Coaxial Switch	Anritsu	MP59B	6200983705	2023.05.06	2026.05.05	3 year
5	Horn Antenna	EM	EM-AH-10180	2011071402	2022.03.31	2025.03.30	3 year
6	Horn Ant	Schwarzbeck	BBHA 9170	9170-181	2022.11.07	2025.11.06	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	2024.03.26	1 year
15	LISN	R&S	ENV216	101313	2023.03.27	2024.03.26	1 year
16	LISN	EMCO	3816/2	00042990	2023.03.27	2024.03.26	1 year
17	50Ω Coaxial Switch	Anritsu	MP59B	6200264417	2023.03.27	2024.03.26	1 year
18	Passive Voltage Probe	R&S	ESH2-Z3	100196	2023.03.27	2024.03.26	1 year
19	Test Cable	N/A	C01	N/A	2023.05.06	2026.05.05	3 year
20	Test Cable	N/A	C02	N/A	2023.05.06	2026.05.05	3 year
21	Test Cable	N/A	C03	N/A	2023.05.06	2026.05.05	3 year
22	Spectrum Analyzer	agilent	e4440a	us44300399	2023.03.27	2024.03.26	1 year
23	test receiver	R&S	ESCI	a0304218	2023.03.27	2024.03.26	1 year
24	Communication Tester	R&S	CMU200	A0304247	2023.05.29	2024.05.28	1 year
25	Thermal Chamber	Ten Billion	TTC-B3C	TBN-960502	2023.03.27	2024.03.26	1 year

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

4. OUTPUT POWER

4.1 OUTPUT POWER MEASUREMENT

LTE Measurement Procedure:

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

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

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

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

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

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

Network Signalling value	Requirements (sub-clause)	E-UTRA Band	Channel bandwidth (MHz)	Resources Blocks (N_{RB})	A-MPR (dB)
NS_01	6.6.2.1.1	Table 5.5-1	1.4, 3, 5, 10, 15, 20	Table 5.6-1	NA
NS_03	6.6.2.2.1	2, 4, 10, 23, 25, 35, 36	3	>5	≤ 1
			5	>6	≤ 1
			10	>6	≤ 1
			15	>8	≤ 1
			20	>10	≤ 1
NS_04	6.6.2.2.2	41	5	>6	≤ 1
			10, 15, 20	See Table 6.2.4-4	
NS_05	6.6.3.3.1	1	10, 15, 20	≥ 50	≤ 1
NS_06	6.6.2.2.3	12, 13, 14, 17	1.4, 3, 5, 10	Table 5.6-1	n/a
NS_07	6.6.2.2.3	13	10	Table 6.2.4-2	Table 6.2.4-2
	6.6.3.3.2				
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 5/741/66

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 that $43 + 10 \log (P)$ dB on all frequencies between 2490.5 MHz and 2496 MHz and $55 + 10 \log (P)$ dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees. Show citation box.

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

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

(a) Out-of-band emission requirement shall apply only to the “outer” channels included in an EA license and to spectrum adjacent to interior channels used by incumbent licensees. The emission limits are as follows:

(1) For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least $116 \log_{10}(f/6.1)$ decibels or $50 + 10 \log_{10}(P)$ decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz.

(2) For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least $43 + 10 \log_{10}(P)$ decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.

TEST PROCEDURE

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

For each band edge measurement:

Set the spectrum analyzer span to include the block edge frequency

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

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

MODES TESTED

Band 5/741/66

RESULTS

Test data reference attachment.

7. OUT OF BAND EMISSIONS

RULE PART(S)

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

LIMITS

1. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log (P)$ dB.
2. The Band 7/41 emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $55 + 10 \log (P)$ dB.

TEST PROCEDURE

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

For each out of band emissions measurement:

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

MODES TESTED

- Band 5/741/66
-

7.1 MEASUREMENT METHOD

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

Test data reference attachment.

8. RADIATED MEASUREMENT

8.1. RADIATED POWER (ERP & EIRP)

RULE PART(S)

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

LIMITS:

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

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

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

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

27.50 (h)(2) Mobile and other user stations. Mobile stations are limited to 2.0 watts EIRP. All user stations are limited to 2.0 watts transmitter output power.

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

TEST PROCEDURE

ANSI/TIA-603-E Clause 2.2.17

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

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

MODES TESTED

- Band 5/741/66

RESULTS

Pass

8.2 LTE BAND 5

Radiated Power (ERP) for Band 5											
Mode	RB/RB SIZE	Frequency	Result							Polarization Of Max. ERP	Conclusion
			SG Level	Cable Loss (dBm)	Factor (dB)	Correction (dB)	Max. ERP	Max. ERP			
			(dBm)				Average	Average			
							(dBm)	(mW)			
1.4MHz Band QPSK	6/0	824.7	19.10	2.01	5.30	2.15	20.24	105.68	Horizontal	Pass	
		836.5	19.45	2.01	5.30	2.15	20.59	114.55	Horizontal	Pass	
		848.3	19.87	2.02	5.70	2.15	21.4	138.04	Horizontal	Pass	
3.0MHz Band QPSK	15/0	825.5	19.86	2.01	5.30	2.15	21	125.89	Horizontal	Pass	
		836.5	21.05	2.01	5.30	2.15	22.19	165.58	Horizontal	Pass	
		847.5	19.49	2.02	5.70	2.15	21.02	126.47	Horizontal	Pass	
5.0MHz Band QPSK	25/0	826.5	18.97	2.01	5.30	2.15	20.11	102.57	Horizontal	Pass	
		836.5	20.81	2.01	5.30	2.15	21.95	156.68	Horizontal	Pass	
		846.5	20.26	2.02	5.70	2.15	21.79	151.01	Horizontal	Pass	
10.0MHz Band QPSK	50/0	829	20.40	2.01	5.30	2.15	21.54	142.56	Horizontal	Pass	
		836.5	20.52	2.01	5.30	2.15	21.66	146.55	Horizontal	Pass	
		844	19.69	2.02	5.70	2.15	21.22	132.43	Horizontal	Pass	
1.4MHz Band QPSK	6/0	824.7	20.42	2.01	5.30	2.15	21.56	143.22	Vertical	Pass	
		836.5	20.61	2.01	5.30	2.15	21.75	149.62	Vertical	Pass	
		848.3	21.00	2.02	5.70	2.15	22.53	179.06	Vertical	Pass	
3.0MHz Band QPSK	15/0	825.5	20.38	2.01	5.30	2.15	21.52	141.91	Vertical	Pass	
		836.5	20.39	2.01	5.30	2.15	21.53	142.23	Vertical	Pass	
		847.5	19.58	2.02	5.70	2.15	21.11	129.12	Vertical	Pass	
5.0MHz Band QPSK	25/0	826.5	19.70	2.01	5.30	2.15	20.84	121.34	Vertical	Pass	
		836.5	20.51	2.01	5.30	2.15	21.65	146.22	Vertical	Pass	
		846.5	18.02	2.02	5.70	2.15	19.55	90.16	Vertical	Pass	
10.0MHz Band QPSK	50/0	829	17.24	2.01	5.30	2.15	18.38	68.87	Vertical	Pass	
		836.5	21.89	2.01	5.30	2.15	23.03	200.91	Vertical	Pass	
		844	18.35	2.02	5.70	2.15	19.88	97.27	Vertical	Pass	

Radiated Power (ERP) for Band 5											
Mode	RB/RB SIZE	Frequency	Result							Polarization Of Max. ERP	Conclusion
			SG Level	Cable Loss (dBm)	Factor (dB)	Correction (dB)	Max. ERP	Max. ERP			
			(dBm)				Average	Average			
							(dBm)	(mW)			
1.4MHz Band 16 QAM	6/0	824.7	20.07	2.01	5.30	2.15	21.21	132.13	Horizontal	Pass	
		836.5	20.35	2.01	5.30	2.15	21.49	140.93	Horizontal	Pass	
		848.3	19.77	2.02	5.70	2.15	21.3	134.90	Horizontal	Pass	
3.0MHz Band 16 QAM	15/0	825.5	20.69	2.01	5.30	2.15	21.83	152.41	Horizontal	Pass	
		836.5	18.27	2.01	5.30	2.15	19.41	87.30	Horizontal	Pass	
		847.5	18.33	2.02	5.70	2.15	19.86	96.83	Horizontal	Pass	
5.0MHz Band 16 QAM	25/0	826.5	17.40	2.01	5.30	2.15	18.54	71.45	Horizontal	Pass	
		836.5	18.23	2.01	5.30	2.15	19.37	86.50	Horizontal	Pass	
		846.5	19.50	2.02	5.70	2.15	21.03	126.77	Horizontal	Pass	
10.0MHz z Band 16 QAM	50/0	829	18.60	2.01	5.30	2.15	19.74	94.19	Horizontal	Pass	
		836.5	18.27	2.01	5.30	2.15	19.41	87.30	Horizontal	Pass	
		844	19.00	2.02	5.70	2.15	20.53	112.98	Horizontal	Pass	
1.4MHz Band 16 QAM	6/0	824.7	21.20	2.01	5.30	2.15	22.34	171.40	Vertical	Pass	
		836.5	19.59	2.01	5.30	2.15	20.73	118.30	Vertical	Pass	
		848.3	19.94	2.02	5.70	2.15	21.47	140.28	Vertical	Pass	
3.0MHz Band 16 QAM	15/0	825.5	18.31	2.01	5.30	2.15	19.45	88.10	Vertical	Pass	
		836.5	19.37	2.01	5.30	2.15	20.51	112.46	Vertical	Pass	
		847.5	18.82	2.02	5.70	2.15	20.35	108.39	Vertical	Pass	
5.0MHz Band 16 QAM	25/0	826.5	19.29	2.01	5.30	2.15	20.43	110.41	Vertical	Pass	
		836.5	17.55	2.01	5.30	2.15	18.69	73.96	Vertical	Pass	
		846.5	18.43	2.02	5.70	2.15	19.96	99.08	Vertical	Pass	
10.0MHz z Band 16 QAM	50/0	829	19.27	2.01	5.30	2.15	20.41	109.90	Vertical	Pass	
		836.5	21.22	2.01	5.30	2.15	22.36	172.19	Vertical	Pass	
		844	19.38	2.02	5.70	2.15	20.91	123.31	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 7

Radiated Power (EIRP) for Band 7										
Mode	RB/RB SIZE	Frequency	Result						Polarization Of Max. ERP	Conclusion
			SG Level	Cable Loss	Factor (dB)	Max. EIRP	Max. EIRP			
			(dBm)			Average	Average			
				(dBm)	(mW)					
5.0MHz Band QPSK	25/0	2502.5	17.16	4.54	9.00	21.62	145.21	Horizontal	Pass	
		2535	17.14	4.69	9.00	21.45	139.64	Horizontal	Pass	
		2567.5	17.10	4.71	9.00	21.39	137.72	Horizontal	Pass	
10.0MHz Band QPSK	50/0	2505	17.52	4.55	9.00	21.97	157.40	Horizontal	Pass	
		2535	17.50	4.69	9.00	21.81	151.71	Horizontal	Pass	
		2565	18.20	4.72	9.00	22.48	177.01	Horizontal	Pass	
15.0MHz Band QPSK	75/0	2507.5	18.77	4.55	9.00	23.22	209.89	Horizontal	Pass	
		2535	16.28	4.69	9.00	20.59	114.55	Horizontal	Pass	
		2562.5	17.31	4.72	9.00	21.59	144.21	Horizontal	Pass	
20.0MHz Band QPSK	100/0	2510	16.91	4.57	9.00	21.34	136.14	Horizontal	Pass	
		2535	17.45	4.73	9.00	21.72	148.59	Horizontal	Pass	
		2560	16.81	4.75	9.00	21.06	127.64	Horizontal	Pass	
5.0MHz Band QPSK	25/0	2502.5	18.59	4.54	9.00	23.05	201.84	Vertical	Pass	
		2535	17.95	4.69	9.00	22.26	168.27	Vertical	Pass	
		2567.5	17.48	4.71	9.00	21.77	150.31	Vertical	Pass	
10.0MHz Band QPSK	50/0	2505	17.92	4.55	9.00	22.37	172.58	Vertical	Pass	
		2535	17.28	4.69	9.00	21.59	144.21	Vertical	Pass	
		2565	19.00	4.72	9.00	23.28	212.81	Vertical	Pass	
15.0MHz Band QPSK	75/0	2507.5	18.22	4.55	9.00	22.67	184.93	Vertical	Pass	
		2535	18.06	4.69	9.00	22.37	172.58	Vertical	Pass	
		2562.5	17.60	4.72	9.00	21.88	154.17	Vertical	Pass	
20.0MHz Band QPSK	100/0	2510	19.03	4.57	9.00	23.46	221.82	Vertical	Pass	
		2535	18.34	4.73	9.00	22.61	182.39	Vertical	Pass	
		2560	18.50	4.75	9.00	22.75	188.36	Vertical	Pass	

Radiated Power (EIRP) for Band 7									
Mode	RB/RB SIZE	Frequency	Result						Conclusion
			SG Level (dBm)	Cable Loss (dBm)	Antenna Factor (dB)	Max. EIRP	Max. EIRP	Polarization Of Max. ERP	
						Average	Average		
						(dBm)	(mW)		
5.0MHz Band 16 QAM	25/0	2502.5	16.15	4.54	9.00	20.61	115.08	Horizontal	Pass
		2535	15.17	4.69	9.00	19.48	88.72	Horizontal	Pass
		2567.5	17.02	4.71	9.00	21.31	135.21	Horizontal	Pass
10.0MHz Band 16 QAM	50/0	2505	17.27	4.55	9.00	21.72	148.59	Horizontal	Pass
		2535	17.77	4.69	9.00	22.08	161.44	Horizontal	Pass
		2565	15.51	4.72	9.00	19.79	95.28	Horizontal	Pass
15.0MHz Band 16 QAM	75/0	2507.5	17.36	4.55	9.00	21.81	151.71	Horizontal	Pass
		2535	17.82	4.69	9.00	22.13	163.31	Horizontal	Pass
		2562.5	17.68	4.72	9.00	21.96	157.04	Horizontal	Pass
20.0MHz Band 16 QAM	100/0	2510	16.61	4.57	9.00	21.04	127.06	Horizontal	Pass
		2535	17.62	4.73	9.00	21.89	154.53	Horizontal	Pass
		2560	17.11	4.75	9.00	21.36	136.77	Horizontal	Pass
5.0MHz Band 16 QAM	25/0	2502.5	17.20	4.54	9.00	21.66	146.55	Vertical	Pass
		2535	15.99	4.69	9.00	20.3	107.15	Vertical	Pass
		2567.5	18.02	4.71	9.00	22.31	170.22	Vertical	Pass
10.0MHz Band 16 QAM	50/0	2505	16.84	4.55	9.00	21.29	134.59	Vertical	Pass
		2535	17.44	4.69	9.00	21.75	149.62	Vertical	Pass
		2565	15.24	4.72	9.00	19.52	89.54	Vertical	Pass
15.0MHz Band 16 QAM	75/0	2507.5	17.59	4.55	9.00	22.04	159.96	Vertical	Pass
		2535	17.71	4.69	9.00	22.02	159.22	Vertical	Pass
		2562.5	15.41	4.72	9.00	19.69	93.11	Vertical	Pass
20.0MHz Band 16 QAM	100/0	2510	16.02	4.57	9.00	20.45	110.92	Vertical	Pass
		2535	18.19	4.73	9.00	22.46	176.20	Vertical	Pass
		2560	16.44	4.75	9.00	20.69	117.22	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 41

Radiated Power (EIRP) for Band 41									
Mode	RB/RB SIZE	Frequency	Result						Conclusion
			SG Level (dBm)	Cable Loss (dBm)	Antenna Gain (dB)	Max. EIRP Average (dBm)	Max. EIRP Average (mW)	Polarization Of Max. ERP	
5.0MHz Band QPSK	1/#Mid	2537.5	17.33	4.54	9.00	21.79	151.01	Horizontal	Pass
		2595	17.01	4.69	9.00	21.32	135.52	Horizontal	Pass
		2652.5	15.69	4.71	9.00	19.98	99.54	Horizontal	Pass
10.0MHz Band QPSK	1/#Mid	2540	17.43	4.55	9.00	21.88	154.17	Horizontal	Pass
		2595	16.78	4.69	9.00	21.09	128.53	Horizontal	Pass
		2650	15.89	4.72	9.00	20.17	103.99	Horizontal	Pass
15.0MHz Band QPSK	1/#Mid	2542.5	14.53	4.55	9.00	18.98	79.07	Horizontal	Pass
		2595	16.76	4.69	9.00	21.07	127.94	Horizontal	Pass
		2647.5	17.33	4.72	9.00	21.61	144.88	Horizontal	Pass
20.0MHz Band QPSK	1/#Mid	2545	16.35	4.57	9.00	20.78	119.67	Horizontal	Pass
		2595	16.47	4.73	9.00	20.74	118.58	Horizontal	Pass
		2645	17.41	4.75	9.00	21.66	146.55	Horizontal	Pass
5.0MHz Band QPSK	1/#Mid	2537.5	17.33	4.54	9.00	21.79	151.01	Vertical	Pass
		2595	15.92	4.69	9.00	20.23	105.44	Vertical	Pass
		2562.5	15.70	4.71	9.00	19.99	99.77	Vertical	Pass
10.0MHz Band QPSK	1/#Mid	2540	14.97	4.55	9.00	19.42	87.50	Vertical	Pass
		2595	16.09	4.69	9.00	20.4	109.65	Vertical	Pass
		2650	16.55	4.72	9.00	20.83	121.06	Vertical	Pass
15.0MHz Band QPSK	1/#Mid	2542.5	15.20	4.55	9.00	19.65	92.26	Vertical	Pass
		2595	17.04	4.69	9.00	21.35	136.46	Vertical	Pass
		2647.5	16.57	4.72	9.00	20.85	121.62	Vertical	Pass
20.0MHz Band QPSK	1/#Mid	2545	17.51	4.57	9.00	21.94	156.31	Vertical	Pass
		2595	14.98	4.73	9.00	19.25	84.14	Vertical	Pass
		2645	16.57	4.75	9.00	20.82	120.78	Vertical	Pass

Radiated Power (EIRP) for Band 41									
Mode	RB/RB SIZE	Frequency	Result						Conclusion
			SG Level (dBm)	Cable Loss (dBm)	Antenna Gain (dB)	Max. EIRP Average (dBm)	Max. EIRP Average (mW)	Polarization Of Max. ERP	
5.0MHz Band 16 QAM	1/#Mid	2537.5	14.89	4.54	9.00	19.35	86.10	Horizontal	Pass
		2595	16.07	4.69	9.00	20.38	109.14	Horizontal	Pass
		2652.5	17.03	4.71	9.00	21.32	135.52	Horizontal	Pass
10.0MHz Band 16 QAM	1/#Mid	2540	16.32	4.55	9.00	20.77	119.40	Horizontal	Pass
		2595	17.01	4.69	9.00	21.32	135.52	Horizontal	Pass
		2650	17.37	4.72	9.00	21.65	146.22	Horizontal	Pass
15.0MHz Band 16 QAM	1/#Mid	2542.5	16.86	4.55	9.00	21.31	135.21	Horizontal	Pass
		2595	17.05	4.69	9.00	21.36	136.77	Horizontal	Pass
		2647.5	17.44	4.72	9.00	21.72	148.59	Horizontal	Pass
20.0MHz Band 16 QAM	1/#Mid	2545	16.70	4.57	9.00	21.13	129.72	Horizontal	Pass
		2595	17.05	4.73	9.00	21.32	135.52	Horizontal	Pass
		2645	17.02	4.75	9.00	21.27	133.97	Horizontal	Pass
5.0MHz Band 16 QAM	1/#Mid	2537.5	17.11	4.54	9.00	21.57	143.55	Vertical	Pass
		2595	16.90	4.69	9.00	21.21	132.13	Vertical	Pass
		2562.5	17.23	4.71	9.00	21.52	141.91	Vertical	Pass
10.0MHz Band 16 QAM	1/#Mid	2540	17.17	4.55	9.00	21.62	145.21	Vertical	Pass
		2595	16.13	4.69	9.00	20.44	110.66	Vertical	Pass
		2650	15.49	4.72	9.00	19.77	94.84	Vertical	Pass
15.0MHz Band 16 QAM	1/#Mid	2542.5	16.87	4.55	9.00	21.32	135.52	Vertical	Pass
		2595	16.82	4.69	9.00	21.13	129.72	Vertical	Pass
		2647.5	17.04	4.72	9.00	21.32	135.52	Vertical	Pass
20.0MHz Band 16 QAM	1/#Mid	2545	16.83	4.57	9.00	21.26	133.66	Vertical	Pass
		2595	17.58	4.73	9.00	21.85	153.11	Vertical	Pass
		2645	17.63	4.75	9.00	21.88	154.17	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)

8.5 LTE BAND 66

Radiated Power (EIRP) for Band 66									
Mode	RB/RB SIZE	Frequency	Result						Conclusion
			SG Level (dBm)	Cable Loss (dBm)	Antenna Gain (dB)	Max. EIRP Average (dBm)	Max. EIRP Average (mW)	Polarization Of Max. ERP	
1.4MHz Band QPSK	6/0	1710.7	18.30	3.76	8.90	23.44	220.80	Horizontal	Pass
		1745	18.58	3.91	8.90	23.57	227.51	Horizontal	Pass
		1779.3	18.43	3.93	8.90	23.4	218.78	Horizontal	Pass
3.0MHz Band QPSK	15/0	1711.5	18.14	3.77	8.90	23.27	212.32	Horizontal	Pass
		1745	18.96	3.91	8.90	23.95	248.31	Horizontal	Pass
		1778.5	18.65	3.94	8.90	23.61	229.61	Horizontal	Pass
5.0MHz Band QPSK	25/0	1712.5	18.72	3.77	8.90	23.85	242.66	Horizontal	Pass
		1745	18.97	3.91	8.90	23.96	248.89	Horizontal	Pass
		1777.5	18.29	3.94	8.90	23.25	211.35	Horizontal	Pass
10.0MHz Band QPSK	50/0	1715	17.80	3.79	8.90	22.91	195.43	Horizontal	Pass
		1745	18.97	3.95	8.90	23.92	246.60	Horizontal	Pass
		1775	18.24	3.97	8.90	23.17	207.49	Horizontal	Pass
15.0MHz Band QPSK	75/0	1717.5	17.86	3.79	8.90	22.97	198.15	Horizontal	Pass
		1745	18.13	3.95	8.90	23.08	203.24	Horizontal	Pass
		1772.5	18.11	3.97	8.90	23.04	201.37	Horizontal	Pass
20.0MHz Band QPSK	100/0	1720	17.97	3.81	8.90	23.06	202.30	Horizontal	Pass
		1745	18.93	3.96	8.90	23.87	243.78	Horizontal	Pass
		1770	18.78	4	8.90	23.68	233.35	Horizontal	Pass
1.4MHz Band QPSK	6/0	1710.7	18.46	3.76	8.90	23.6	229.09	Vertical	Pass
		1745	19.24	3.91	8.90	24.23	264.85	Vertical	Pass
		1779.3	18.95	3.93	8.90	23.92	246.60	Vertical	Pass
3.0MHz Band QPSK	15/0	1711.5	17.99	3.77	8.90	23.12	205.12	Vertical	Pass
		1745	18.38	3.91	8.90	23.37	217.27	Vertical	Pass
		1778.5	18.14	3.94	8.90	23.1	204.17	Vertical	Pass
5.0MHz Band QPSK	25/0	1712.5	18.17	3.77	8.90	23.3	213.80	Vertical	Pass
		1745	18.00	3.91	8.90	22.99	199.07	Vertical	Pass
		1777.5	18.02	3.94	8.90	22.98	198.61	Vertical	Pass
10.0MHz Band QPSK	50/0	1715	18.78	3.79	8.90	23.89	244.91	Vertical	Pass
		1745	18.81	3.95	8.90	23.76	237.68	Vertical	Pass
		1775	18.62	3.97	8.90	23.55	226.46	Vertical	Pass
15.0MHz	75/0	1717.5	19.01	3.79	8.90	24.12	258.23	Vertical	Pass

Band QPSK		1745	18.44	3.95	8.90	23.39	218.27	Vertical	Pass
		1772.5	18.28	3.97	8.90	23.21	209.41	Vertical	Pass
20.0MHz	100/0	1720	18.90	3.81	8.90	23.99	250.61	Vertical	Pass
Band QPSK		1745	18.81	3.96	8.90	23.75	237.14	Vertical	Pass
		1770	19.65	4	8.90	24.55	285.10	Vertical	Pass

Radiated Power (EIRP) for Band 66										
Mode	RB/RB SIZE	Frequency	Result						Polarization Of Max. ERP	Conclusion
			SG Level (dBm)	Cable Loss (dBm)	Antenna Gain (dB)	Max. EIRP Average (dBm)	Max. EIRP Average (mW)			
1.4MHz Band 16 QAM	6/0	1710.7	17.20	3.76	8.90	22.34	171.40	Horizontal	Pass	
		1745	16.39	3.91	8.90	21.38	137.40	Horizontal	Pass	
		1779.3	15.44	3.93	8.90	20.41	109.90	Horizontal	Pass	
3.0MHz Band 16 QAM	15/0	1711.5	16.07	3.77	8.90	21.2	131.83	Horizontal	Pass	
		1745	16.19	3.91	8.90	21.18	131.22	Horizontal	Pass	
		1778.5	16.68	3.94	8.90	21.64	145.88	Horizontal	Pass	
5.0MHz Band 16 QAM	25/0	1712.5	16.86	3.77	8.90	21.99	158.12	Horizontal	Pass	
		1745	15.56	3.91	8.90	20.55	113.50	Horizontal	Pass	
		1777.5	15.89	3.94	8.90	20.85	121.62	Horizontal	Pass	
10.0MHz Band 16 QAM	50/0	1715	17.17	3.79	8.90	22.28	169.04	Horizontal	Pass	
		1745	16.35	3.95	8.90	21.3	134.90	Horizontal	Pass	
		1775	17.49	3.97	8.90	22.42	174.58	Horizontal	Pass	
15.0MHz Band 16 QAM	75/0	1717.5	16.56	3.79	8.90	21.67	146.89	Horizontal	Pass	
		1745	16.79	3.95	8.90	21.74	149.28	Horizontal	Pass	
		1772.5	17.15	3.97	8.90	22.08	161.44	Horizontal	Pass	
20.0MHz Band 16 QAM	100/0	1720	16.94	3.81	8.90	22.03	159.59	Horizontal	Pass	
		1745	17.38	3.96	8.90	22.32	170.61	Horizontal	Pass	
		1770	16.46	4	8.90	21.36	136.77	Horizontal	Pass	
1.4MHz Band 16 QAM	6/0	1710.7	16.15	3.76	8.90	21.29	134.59	Vertical	Pass	
		1745	17.44	3.91	8.90	22.43	174.98	Vertical	Pass	
		1779.3	17.27	3.93	8.90	22.24	167.49	Vertical	Pass	
3.0MHz Band 16 QAM	15/0	1711.5	17.26	3.77	8.90	22.39	173.38	Vertical	Pass	
		1745	17.17	3.91	8.90	22.16	164.44	Vertical	Pass	
		1778.5	17.06	3.94	8.90	22.02	159.22	Vertical	Pass	
5.0MHz Band 16	25/0	1712.5	17.03	3.77	8.90	22.16	164.44	Vertical	Pass	
		1745	17.11	3.91	8.90	22.1	162.18	Vertical	Pass	

QAM		1777.5	17.01	3.94	8.90	21.97	157.40	Vertical	Pass
10.0MHz	50/0	1715	17.09	3.79	8.90	22.2	165.96	Vertical	Pass
Band 16		1745	16.74	3.95	8.90	21.69	147.57	Vertical	Pass
QAM		1775	16.62	3.97	8.90	21.55	142.89	Vertical	Pass
15.0MHz	75/0	1717.5	16.62	3.79	8.90	21.73	148.94	Vertical	Pass
Band 16		1745	17.25	3.95	8.90	22.2	165.96	Vertical	Pass
QAM		1772.5	16.51	3.97	8.90	21.44	139.32	Vertical	Pass
20.0MHz	100/0	1720	17.30	3.81	8.90	22.39	173.38	Vertical	Pass
Band 16		1745	17.50	3.96	8.90	22.44	175.39	Vertical	Pass
QAM		1770	17.44	4	8.90	22.34	171.40	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)

9. SPURIOUS RADIATION EMISSION

RULE PART(S)

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

LIMIT

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

§27.53 (g) For operations in the 698–746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least $43 + 10 \log (P)$ dB.

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

TEST PROCEDURE

For Cellular equipment - Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 100 kHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

For PCS equipment - Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 MHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

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

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

- a. for base station and subscriber equipment, other than mobile subscriber equipment, the attenuation shall not be less than $43 + 10 \text{ Log}_{10}(p)$, dB; and
- b. for mobile subscriber equipment, the attenuation shall not be less than $43 + 10 \text{ Log}_{10}(p)$, dB at the channel edges and $55 + 10 \text{ Log}_{10}(p)$ 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 5/7/41/66

RESULTS

PASS

9.1 LTE BAND 5

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

Test Results for Low Channel 824.7MHz							
Frequency(MHz)	SG Level(dBm)	Cable Loss(dB)	Antenna Gain(dB)	Absolute Level(dBm)	Limit (dBm)	Margin(dBm)	Polarity
1649.4	-42.80	2.78	27.50	-18.08	-13	-5.08	Horizontal
1649.4	-51.65	2.78	27.50	-26.93	-13	-13.93	Vertical
2474.1	-49.65	2.90	27.80	-24.75	-13	-11.75	Vertical
2474.1	-49.14	2.90	27.80	-24.24	-13	-11.24	Horizontal
Test Results For Mid Channel 836.5MHz							
1673	-45.99	2.78	27.48	-21.29	-13	-8.29	Horizontal
1673	-45.78	2.78	27.48	-21.08	-13	-8.08	Vertical
2509.5	-45.68	2.91	27.70	-20.89	-13	-7.89	Vertical
2509.5	-45.36	2.91	27.70	-20.57	-13	-7.57	Horizontal
Test Results for High Channel 848.3MHz							
1696.6	-46.55	2.78	27.43	-21.90	-13	-8.90	Horizontal
1696.6	-48.47	2.78	27.43	-23.82	-13	-10.82	Vertical
2544.9	-44.40	2.92	27.74	-19.58	-13	-6.58	Vertical
2544.9	-44.95	2.92	27.74	-20.13	-13	-7.13	Horizontal

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

Test Results for Low Channel 829MHz							
Frequency(MHz)	SG Level(dBm)	Cable Loss(dB)	Antenna Gain(dB)	Absolute Level(dBm)	Limit (dBm)	Margin(dBm)	Polarity
1658	-45.64	2.78	27.50	-20.92	-13	-7.92	Horizontal
1658	-44.85	2.78	27.50	-20.13	-13	-7.13	Vertical
2487	-47.43	2.90	27.80	-22.53	-13	-9.53	Vertical
2487	-47.66	2.90	27.80	-22.76	-13	-9.76	Horizontal
Test Results for Mid Channel 836.5MHz							
1673	-48.04	2.78	27.48	-23.34	-13	-10.34	Horizontal
1673	-46.43	2.78	27.48	-21.73	-13	-8.73	Vertical
2509.5	-49.75	2.91	27.70	-24.96	-13	-11.96	Vertical
2509.5	-46.19	2.91	27.70	-21.40	-13	-8.40	Horizontal
Test Results for High Channel 844MHz							
1688	-48.24	2.78	27.43	-23.59	-13	-10.59	Horizontal
1688	-44.14	2.78	27.43	-19.49	-13	-6.49	Vertical
2532	-44.24	2.92	27.74	-19.42	-13	-6.42	Vertical
2532	-44.42	2.92	27.74	-19.60	-13	-6.60	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 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	-63.86	5.23	35.81	-33.28	-25	-8.28	Horizontal
5005	-61.21	5.23	35.81	-30.63	-25	-5.63	Vertical
7507.5	-67.34	5.67	36.85	-36.16	-25	-11.16	Vertical
7507.5	-64.76	5.67	36.85	-33.58	-25	-8.58	Horizontal
Test Results for Mid Channel 2535MHz							
5070	-61.35	5.23	35.82	-30.76	-25	-5.76	Horizontal
5070	-64.92	5.23	35.82	-34.33	-25	-9.33	Vertical
7605	-63.57	5.67	36.85	-32.39	-25	-7.39	Vertical
7605	-65.84	5.67	36.85	-34.66	-25	-9.66	Horizontal
Test Results for High Channel 2567.5MHz							
5135	-67.49	5.24	35.83	-36.90	-25	-11.90	Horizontal
5135	-62.15	5.24	35.83	-31.56	-25	-6.56	Vertical
7702.5	-65.44	5.68	36.87	-34.25	-25	-9.25	Vertical
7702.5	-67.90	5.68	36.87	-36.71	-25	-11.71	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	-65.05	5.23	35.82	-34.46	-25	-9.46	Horizontal
5020	-61.07	5.23	35.82	-30.48	-25	-5.48	Vertical
7530	-66.63	5.67	36.86	-35.44	-25	-10.44	Vertical
7530	-61.95	5.67	36.86	-30.76	-25	-5.76	Horizontal
Test Results for Mid Channel 2535MHz							
5070	-62.19	5.23	35.82	-31.60	-25	-6.60	Horizontal
5070	-62.27	5.23	35.82	-31.68	-25	-6.68	Vertical
7605	-64.11	5.67	36.85	-32.93	-25	-7.93	Vertical
7605	-66.84	5.67	36.85	-35.66	-25	-10.66	Horizontal
Test Results for High Channel 2560MHz							
5120	-62.86	5.24	35.83	-32.27	-25	-7.27	Horizontal
5120	-66.21	5.24	35.83	-35.62	-25	-10.62	Vertical
7680	-66.11	5.70	36.88	-34.93	-25	-9.93	Vertical
7680	-66.64	5.70	36.88	-35.46	-25	-10.46	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 41

QPSK EIRP POWER FOR LTE BAND 41 (5MHZ BANDWIDTH)

Test Results for Low Channel 2537.5MHz							
Frequency(MHz)	SG Level(dBm)	Cable Loss(dB)	Antenna Gain(dB)	Absolute Level(dBm)	Limit (dBm)	Margin(dBm)	Polarity
5075	-61.06	2.63	27.26	-36.43	-25	-11.43	Horizontal
5075	-62.29	2.63	27.26	-37.66	-25	-12.66	Vertical
7612.5	-64.71	2.67	27.58	-39.80	-25	-14.80	Vertical
7612.5	-65.34	2.67	27.58	-40.43	-25	-15.43	Horizontal
Test Results for Mid Channel 2595MHz							
5190	-57.45	2.62	27.28	-32.79	-25	-7.79	Horizontal
5190	-57.58	2.62	27.28	-32.92	-25	-7.92	Vertical
7785	-59.88	2.85	27.62	-35.11	-25	-10.11	Vertical
7785	-59.45	2.85	27.62	-34.68	-25	-9.68	Horizontal
Test Results for High Channel 2652.5MHz							
5125	-56.33	2.64	27.28	-31.69	-25	-6.69	Horizontal
5125	-59.64	2.64	27.28	-35.00	-25	-10.00	Vertical
7687.5	-60.25	2.85	27.70	-35.40	-25	-10.40	Vertical
7687.5	-57.37	2.85	27.70	-32.52	-25	-7.52	Horizontal

QPSK EIRP POWER FOR LTE BAND 41 (20MHZ BANDWIDTH)

Test Results for Low Channel 2545MHz							
Frequency(MHz)	SG Level(dBm)	Cable Loss(dB)	Antenna Gain(dB)	Absolute Level(dBm)	Limit (dBm)	Margin(dBm)	Polarity
5090	-59.78	2.63	27.30	-35.11	-25	-10.11	Horizontal
5090	-57.89	2.63	27.30	-33.22	-25	-8.22	Vertical
7635	-61.05	2.67	27.62	-36.10	-25	-11.10	Vertical
7635	-64.29	2.67	27.62	-39.34	-25	-14.34	Horizontal
Test Results for Mid Channel 2595MHz							
5190	-59.63	2.62	27.33	-34.92	-25	-9.92	Horizontal
5190	-57.72	2.62	27.33	-33.01	-25	-8.01	Vertical
7785	-61.93	2.85	27.67	-37.11	-25	-12.11	Vertical
7785	-62.71	2.85	27.67	-37.89	-25	-12.89	Horizontal
Test Results for High Channel 2645MHz							
5290	-57.49	2.64	27.33	-32.80	-25	-7.80	Horizontal
5290	-60.68	2.64	27.33	-35.99	-25	-10.99	Vertical
7935	-62.50	2.85	27.67	-37.68	-25	-12.68	Vertical
7935	-58.91	2.85	27.67	-34.09	-25	-9.09	Horizontal

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

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

. We test both H direction and V direction, recorded worst case direction.

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

9.4 LTE BAND 66

QPSK EIRP POWER FOR LTE BAND 66 (5MHZ BANDWIDTH)

Test Results for Low Channel 1710.5MHz							
Frequency(MHz)	SG Level(dBm)	Cable Loss(dB)	Antenna Gain(dB)	Absolute Level(dBm)	Limit (dBm)	Margin(dBm)	Polarity
3421.4	-55.00	2.61	27.28	-30.33	-13	-17.33	Horizontal
3421.4	-60.03	2.61	27.28	-35.36	-13	-22.36	Vertical
5132.1	-62.23	2.87	27.59	-37.51	-13	-24.51	Vertical
5132.1	-49.53	2.87	27.59	-24.81	-13	-11.81	Horizontal
Test Results for Mid Channel 1745MHz							
3490	-53.33	2.62	27.3	-28.65	-13	-15.65	Horizontal
3490	-62.29	2.62	27.3	-37.61	-13	-24.61	Vertical
5337.9	-59.51	2.87	27.62	-34.76	-13	-21.76	Vertical
5337.9	-58.11	2.87	27.62	-33.36	-13	-20.36	Horizontal
Test Results for High Channel 1779.3MHz							
3558.6	-60.04	2.66	27.28	-35.42	-13	-22.42	Horizontal
3558.6	-53.17	2.66	27.28	-28.55	-13	-15.55	Vertical
5337.9	-55.35	2.88	27.6	-30.63	-13	-17.63	Vertical
5337.9	-59.93	2.88	27.6	-35.21	-13	-22.21	Horizontal

QPSK EIRP POWER FOR LTE BAND 66 (10MHZ 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	-51.14	2.62	27.3	-26.46	-13	-13.46	Horizontal
3440	-57.42	2.62	27.3	-32.74	-13	-19.74	Vertical
5160	-60.38	2.87	27.62	-35.63	-13	-22.63	Vertical
5160	-55.52	2.87	27.62	-30.77	-13	-17.77	Horizontal
Test Results for Mid Channel 1745MHz							
3490	-56.29	2.62	27.3	-31.61	-13	-18.61	Horizontal
3490	-54.00	2.62	27.3	-29.32	-13	-16.32	Vertical
5337.9	-58.80	2.87	27.62	-34.05	-13	-21.05	Vertical
5337.9	-56.21	2.87	27.62	-31.46	-13	-18.46	Horizontal
Test Results for High Channel 1770MHz							
3540	-56.60	2.62	27.3	-31.92	-13	-18.92	Horizontal
3540	-55.21	2.62	27.3	-30.53	-13	-17.53	Vertical
5310	-53.43	2.87	27.62	-28.68	-13	-15.68	Vertical
5310	-52.52	2.87	27.62	-27.77	-13	-14.77	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.

10. FREQUENCY STABILITY

RULE PART(S)

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

LIMITS

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

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

TEST PROCEDURE

Use CMW 500 with Frequency Error measurement capability.

- Temp. = -30° to $+50^{\circ}\text{C}$
- Voltage = low voltage, DC 3.29V, Normal, DC 3.87V and High voltage, DC 4.45V.

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 5/7/41/66

RESULTS

See the following pages.

10.1 LTE BAND 5

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

Frequency error vs. Voltage

Voltage [Vdc]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
3.29	836.5	14	0.01674	2.5
3.87	836.5	6	0.00717	2.5
4.45	836.5	8	0.00956	2.5

Frequency error vs. Temperature

Temperature [°C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
Normal (25C)	836.5	3	0.00359	2.5
Extreme (50C)	836.5	16	0.01913	2.5
Extreme (40C)	836.5	20	0.02391	2.5
Extreme (30C)	836.5	13	0.01554	2.5
Extreme (10C)	836.5	24	0.02869	2.5
Extreme (0C)	836.5	19	0.02271	2.5
Extreme (-10C)	836.5	9	0.01076	2.5
Extreme (-20C)	836.5	13	0.01554	2.5
Extreme (-30C)	836.5	5	0.00598	2.5

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

Frequency error vs. Voltage

Voltage [Vdc]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
3.29	836.5	16	0.01913	2.5
3.87	836.5	15	0.01793	2.5
4.45	836.5	10	0.01195	2.5

Frequency error vs. Temperature

Temperature [°C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
Normal (25C)	836.5	10	0.01195	2.5
Extreme (50C)	836.5	25	0.02989	2.5
Extreme (40C)	836.5	5	0.00598	2.5
Extreme (30C)	836.5	9	0.01076	2.5
Extreme (10C)	836.5	12	0.01435	2.5
Extreme (0C)	836.5	26	0.03108	2.5
Extreme (-10C)	836.5	11	0.01315	2.5
Extreme (-20C)	836.5	5	0.00598	2.5
Extreme (-30C)	836.5	25	0.02989	2.5

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

10.2 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]
3.29	2535	9	0.00355	2.5
3.87	2535	18	0.00710	2.5
4.45	2535	15	0.00592	2.5

Frequency error vs. Temperature

Temperature [°C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
Normal (25C)	2535	11	0.00434	2.5
Extreme (50C)	2535	3	0.00118	2.5
Extreme (40C)	2535	3	0.00118	2.5
Extreme (30C)	2535	7	0.00276	2.5
Extreme (10C)	2535	6	0.00237	2.5
Extreme (0C)	2535	14	0.00552	2.5
Extreme (-10C)	2535	11	0.00434	2.5
Extreme (-20C)	2535	7	0.00276	2.5
Extreme (-30C)	2535	22	0.00868	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]
3.29	2535	14	0.00552	2.5
3.87	2535	6	0.00237	2.5
4.45	2535	2	0.00079	2.5

Frequency error vs. Temperature

Temperature [°C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
Normal (25C)	2535	12	0.00473	2.5
Extreme (50C)	2535	10	0.00394	2.5
Extreme (40C)	2535	2	0.00079	2.5
Extreme (30C)	2535	14	0.00552	2.5
Extreme (10C)	2535	15	0.00592	2.5
Extreme (0C)	2535	14	0.00552	2.5
Extreme (-10C)	2535	5	0.00197	2.5
Extreme (-20C)	2535	10	0.00394	2.5
Extreme (-30C)	2535	12	0.00473	2.5

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

10.3 LTE BAND 41

Band 41 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]
3.29	2595	8	0.00308	2.5
3.87	2595	9	0.00347	2.5
4.45	2595	7	0.00270	2.5

Frequency error vs. Temperature

Temperature [°C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
Normal (25C)	2595	6	0.00231	2.5
Extreme (50C)	2595	11	0.00424	2.5
Extreme (40C)	2595	4	0.00154	2.5
Extreme (30C)	2595	6	0.00231	2.5
Extreme (10C)	2595	3	0.00116	2.5
Extreme (0C)	2595	2	0.00077	2.5
Extreme (-10C)	2595	3	0.00116	2.5
Extreme (-20C)	2595	12	0.00462	2.5
Extreme (-30C)	2595	5	0.00193	2.5

Band 41 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]
3.29	2595	7	0.00270	2.5
3.87	2595	5	0.00193	2.5
4.45	2595	6	0.00231	2.5

Frequency error vs. Temperature

Temperature [°C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
Normal (25C)	2595	17	0.00655	2.5
Extreme (50C)	2595	13	0.00501	2.5
Extreme (40C)	2595	10	0.00385	2.5
Extreme (30C)	2595	3	0.00116	2.5
Extreme (10C)	2595	19	0.00732	2.5
Extreme (0C)	2595	14	0.00539	2.5
Extreme (-10C)	2595	3	0.00116	2.5
Extreme (-20C)	2595	2	0.00077	2.5
Extreme (-30C)	2595	11	0.00424	2.5

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

10.4 LTE BAND 66

Band 66 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]
3.29	1745	7	0.00401	2.5
3.87	1745	2	0.00115	2.5
4.45	1745	3	0.00172	2.5

Frequency error vs. Temperature

Temperature [°C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
Normal (25C)	1745	8	0.00458	2.5
Extreme (50C)	1745	3	0.00172	2.5
Extreme (40C)	1745	11	0.00630	2.5
Extreme (30C)	1745	13	0.00745	2.5
Extreme (10C)	1745	8	0.00458	2.5
Extreme (0C)	1745	17	0.00974	2.5
Extreme (-10C)	1745	7	0.00401	2.5
Extreme (-20C)	1745	6	0.00344	2.5
Extreme (-30C)	1745	9	0.00516	2.5

Band 66 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]
3.29	1745	9	0.00516	2.5
3.87	1745	5	0.00287	2.5
4.45	1745	3	0.00172	2.5

Frequency error vs. Temperature

Temperature [°C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
Normal (25C)	1745	9	0.00516	2.5
Extreme (50C)	1745	10	0.00573	2.5
Extreme (40C)	1745	2	0.00115	2.5
Extreme (30C)	1745	5	0.00287	2.5
Extreme (10C)	1745	2	0.00115	2.5
Extreme (0C)	1745	10	0.00573	2.5
Extreme (-10C)	1745	3	0.00172	2.5
Extreme (-20C)	1745	6	0.00344	2.5
Extreme (-30C)	1745	7	0.00401	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.

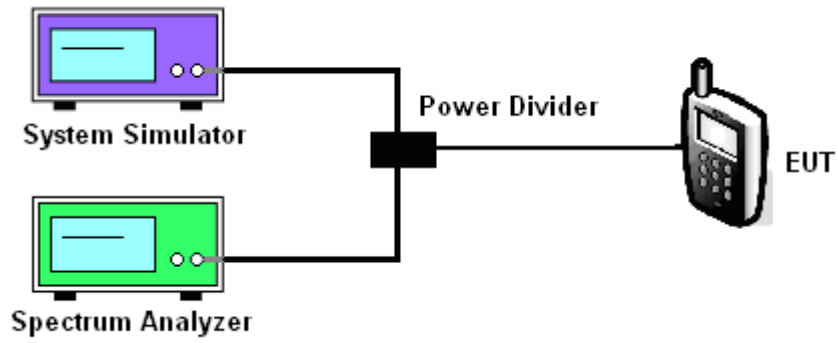
11.2 Measuring Instruments

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 5/7/41/66

Test data reference attachment.

----END OF REPORT----