Full

TEST REPORT

No. I18D00012-SRD02

For

Client : Shanghai BroadMobi Communication Technology Co., Ltd.

Production : LTE Wireless Module

Model Name : BM817C

FCC ID: 2AON8-BM817C

Hardware Version: P700A_MB_V1.0

Software Version: M1.0.3_E1.0.0_A1.0.2

Issued date: 2018-03-14

Test Laboratory:

ECIT Shanghai, East China Institute of Telecommunications

Add: 7-8F, G Area, No.668, Beijing East Road, Huangpu District, Shanghai, P. R. China

Tel: (+86)-021-63843300, E-Mail: welcome@ecit.org.cn

Revision Version

Report Number	Revision	Date	Memo
I18D00012-SRD02	00	2018-03-02	Initial creation of test report
I18D00012-SRD02	01	2018-03-13	Second creation of test report
I18D00012-SRD02	02	2018-03-14	Third creation of test report

CONTENTS

1. Test Laboratory

1.1. Testing Location

Company Name:	ECIT Shanghai, East China Institute of Telecommunications
Address:	7-8F, G Area, No. 668, Beijing East Road, Huangpu District, Shanghai, P. R. China
Postal Code:	200001
Telephone:	(+86)-021-63843300
Fax:	(+86)-021-63843301

1.2. Testing Environment

Normal Temperature:	15-35℃
Extreme Temperature:	-10/+55℃
Relative Humidity:	25-75%

1.3. Project data

Project Leader:	Ning Kang
Testing Start Date:	2018-01-26
Testing End Date:	2018-01-31

1.4. Signature

Yang Dejun
(Prepared this test report)

Ding Li
(Reviewed this test report)

Zheng Zhongbin
Director of the laboratory
(Approved this test report)

2. Client Information

2.1. Applicant Information

Company Name:	Shanghai BroadMobi Communication Technology Co., Ltd.
Address:	15F,Building9,No99.Tianzhou Rd.,Xuhui District,Shanghai,P.R.China
Postcode:	/
Telephone:	021-60913308-816

2.2. Manufacturer Information

Company Name:	Huizhou Dubon Industrial Co.,Ltd
Address:	North of Lian Fa Rd Tong Hu Economic Zone, Huizhou City, Guangdong Province ,P.R. China
Postcode:	/
Telephone:	/

3. Equipment Under Test (EUT) and Ancillary Equipment (AE)

3.1. About EUT

EUT Description	LTE Wireless Module
Model name	BM817C
FCC ID	2AON8-BM817C
Frequency	GSM850/900/1900； WCDMA BandII/IV/V/VIII LTE FDD2/4/5/8/12/17
Extreme Temperature	-10/+55℃
Nominal Voltage	3.8V
Extreme High Voltage	4.2V
Extreme Low Voltage	3.6V

Note: Photographs of EUT are shown in ANNEX A of this test report.

3.2. Internal Identification of EUT used during the test

EUT ID*	SN or IMEI	HW Version	SW Version	Date of receipt
N01	N/A	P700A_MB_V1.0	M1.0.3_E1.0.0_A1.0.2	2018-01-25

*EUT ID: is used to identify the test sample in the lab internally.

3.3. Internal Identification of AE used during the test

AE ID*	Description	SN
AE1	RF cable	---
AE2	Dummy Battery	---

*AE ID: is used to identify the test sample in the lab internally.

3.4. Statements

The BM817C, supporting GPRS/EDGE/WCDMA/LTE, manufactured by Huizhou Dubon Industrial Co.,Ltd. Which is a new product for testing.

ECIT has verified that the compliance of the tested device specified in section 5 of this test report is successfully evaluated according to the procedure and test methods as defined in type certification requirement listed in section 5 of this test report.

4. Reference Documents

4.1. Reference Documents for testing

The following documents listed in this section are referred for testing.

Reference	Title	Version
FCC Part 22	PUBLIC MOBILE SERVICES	2014
FCC Part 24	PERSONAL COMMUNICATIONS SERVICES	2014
FCC Part 27	MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES	2014
ANSI/TIA-603-E	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards	2016
ANSI C63.4	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz	2014
KDB 971168 D01	Measurement Guidance for Certification of Licensed Digital Transmitters	v03

5. SUMMARY OF TEST RESULTS

LTE Band 2

Items	Test Name	Clause in FCC rules	Section in this report	Verdict
1	Output Power	24.232(c)	A.1	P
2	Emission Limit	24.238(a), 2.1051	A.2	P
3	Frequency Stability	24.235, 2.1055	A.3	P
4	Occupied Bandwidth	2.1049(h)(i)	A.4	P
5	Emission Bandwidth	24.238(a)	A.5	P
6	Band Edge Compliance	24.238(a)	A.6	P
7	Conducted Spurious Emission	24.238, 2.1057	A.7	P
8	Peak to Average Power Ratio	24.232 (d)	A.8	P

LTE Band 4

Items	Test Name	Clause in FCC rules	Section in this report	Verdict
1	Output Power	27.50(d)(4)	A.1	P
2	Emission Limit	27.53(h), 2.1051	A.2	P
3	Frequency Stability	27.54, 2.1055	A.3	P
4	Occupied Bandwidth	2.1049(h)(i)	A.4	P
5	Emission Bandwidth	27.53(h)	A.5	P
6	Band Edge Compliance	27.53(h)	A.6	P
7	Conducted Spurious Emission	27.53(h), 2.1057	A.7	P
8	Peak to Average Power Ratio	27.50(a)	A.8	P

LTE Band 5

Items	Test Name	Clause in FCC rules	Section in this report	Verdict
1	Output Power	§2.1046(a), 22.913(a)	A.1	P
2	Emission Limit	22.917, 2.1051	A.2	P
3	Frequency Stability	22.235, 2.1055	A.3	P
4	Occupied Bandwidth	2.1049(h)(i)	A.4	P
5	Emission Bandwidth	22.917(b)	A.5	P
6	Band Edge Compliance	22.917(b)	A.6	P
7	Conducted Spurious Emission	22.917, 2.1057	A.7	P

LTE Band 12

Items	Test Name	Clause in FCC rules	Section in this report	Verdict
1	Output Power	27.50(c)(10)	A.1	P
2	Emission Limit	27.53(g), 2.1051	A.2	P
3	Frequency Stability	27.54, 2.1055	A.3	P
4	Occupied Bandwidth	2.1049(h)(i)	A.4	P
5	Emission Bandwidth	27.53(g)	A.5	P
6	Band Edge Compliance	27.53(g)	A.6	P
7	Conducted Spurious Emission	27.53(g), 2.1057	A.7	P
8	Peak to Average Power Ratio	27.50(a)	A.8	P

LTE Band 17

Items	Test Name	Clause in FCC rules	Section in this report	Verdict
1	Output Power	27.50(c)(10)	A.1	P
2	Emission Limit	27.53(g), 2.1051	A.2	P
3	Frequency Stability	27.54, 2.1055	A.3	P
4	Occupied Bandwidth	2.1049(h)(i)	A.4	P
5	Emission Bandwidth	27.53(g)	A.5	P
6	Band Edge Compliance	27.53(g)	A.6	P
7	Conducted Spurious Emission	27.53(g), 2.1057	A.7	P
8	Peak to Average Power Ratio	27.50(a)	A.8	P

6. Test Equipment Utilized

Climate chamber

No.	Equipment	Model	Serial Number	Manufacturer	Calibration date	Cal.interval
1	Climate chamber	SH-641	92012011	ESPEC	2017-12-25	2 Year

Radiated emission test system

The test equipment and ancillaries used are as follows.

No.	Equipment	Model	Serial Number	Manufacturer	Calibration date	Cal.interval
1	Universal Radio Communication Tester	CMW500	104178	R&S	2017-05-11	1 Year
2	Test Receiver	ESU40	100307	R&S	2017-05-11	1 Year
3	Trilog Antenna	VULB9163	VULB9163-515	Schwarzbeck	2017-02-25	3 Year
4	Double Ridged Guide Antenna	ETS-3117	135890	ETS	2017-01-11	3 Year
5	2-Line V-Network	ENV216	101380	R&S	2017-05-11	1 Year
6	Substitution Antenna	ETS-3117	00135890	ETS	2017-01-11	3 Year
7	RF Signal Generator	SMF100A	102314	R&S	2017-05-11	1 Year
8	Substitution Antenna	VUBA9117	9117-266	Schwarzbeck	2017-11-18	3 Year
9	Amplifier	SCU08	10146	R&S	2017-05-11	1 Year

Conducted test system

No.	Name	Type	SN	Manufacture	Calibration date	Cal.interval
1	Vector Signal Analyser	FSQ26	101096	Rohde&Schwarz	2017-05-11	1 Year
2	Wireless communication comprehensive tester	CMW500	148904	Rohde&Schwarz	2017-08-21	1 Year
3	DC Power Supply	ZUP60-14	LOC-220Z006-0007	TDL-Lambda	2017-05-11	1 Year

Software

Name	Version
Eagle FCC LTE auto test system	V3.0
EMC32	V9.15

7. Test Environment

Shielding Room1 (6.0 meters×3.0 meters×2.7 meters) did not exceed following limits along the conducted RF performance testing:

Temperature	Min. = 15 ℃, Max. = 35 ℃
Relative humidity	Min. = 20%, Max. = 75 %
Shielding effectiveness	> 100 dB
Ground system resistance	< 0.5 Ω

Control room did not exceed following limits along the EMC testing:

Temperature	Min. = 15 ℃, Max. = 35 ℃
Relative humidity	Min. =25 %, Max. =75 %
Shielding effectiveness	> 100 dB
Electrical insulation	> 10 kΩ
Ground system resistance	< 0.5 Ω

Fully-anechoic chamber1 (6.9 meters×10.9 meters×5.4 meters) did not exceed following limits along the EMC testing:

Temperature	Min. = 15 ℃, Max. = 35 ℃
Relative humidity	Min. = 25 %, Max. = 75 %
Shielding effectiveness	> 100 dB
Electrical insulation	> 10 kΩ
Ground system resistance	< 0.5 Ω
VSWR	Between 0 and 6 dB, from 1GHz to 18GHz
Site Attenuation Deviation	Between -4 and 4 dB,30MHz to 1GHz
Uniformity of field strength	Between 0 and 6 dB, from 80MHz to 3000 MHz

ANNEX A. MEASUREMENT RESULTS

ANNEX A.1. OUTPUT POWER

A.1.1. Summary

During the process of testing, the EUT was controlled via Rhode & Schwarz Digital Radio Communication tester (CMW500) to ensure max power transmission and proper modulation.
In all cases, output power is within the specified limits.

A.1.2. Conducted

A.1.2.1. Method of Measurements

The EUT was set up for the max output power with pseudo random data modulation.
These measurements were done at 3 frequencies (bottom, middle and top of operational frequency range) for each bandwidth.

A.1.2.2 Measurement result

LTE band 2

Bandwidth	RB size/offset	Frequency (MHz)	Power(dBm)	
			QPSK	16QAM
1.4MHz	1 RB high	1850.7	21.85	20.73
		1880.0	22.35	21.13
		1909.3	22.1	21.13
	1 RB low	1850.7	21.89	20.65
		1880.0	22.37	21.05
		1909.3	22.12	21.07
	50% RB mid	1850.7	21.89	21.95
		1880.0	22.13	22.22
		1909.3	22.15	22.13
	100% RB	1850.7	20.88	19.96
		1880.0	21.1	20.11
		1909.3	21.11	20.21
3MHz	1 RB high	1851.5	22.02	20.8
		1880.0	22.25	21.11
		1908.5	22.16	20.89
	1 RB low	1851.5	22.08	20.91
		1880.0	22.22	20.91
		1908.5	22.21	21.13
	50% RB mid	1851.5	20.9	19.9
		1880.0	21.05	20.14
		1908.5	21.09	20.09

	100% RB	1851.5	20.92	19.96
		1880.0	21.13	20.12
		1908.5	21.13	20.24
5MHz	1 RB high	1852.5	21.92	20.93
		1880.0	22.2	21.11
		1907.5	22.12	21.03
	1 RB low	1852.5	21.97	20.91
		1880.0	22.13	21.07
		1907.5	22.18	21.14
	50% RB mid	1852.5	20.91	20.9
		1880.0	21.06	21.01
		1907.5	21.08	21.09
	100% RB	1852.5	20.92	19.98
		1880.0	21.11	20.12
		1907.5	21.07	20.15
10MHz	1 RB high	1855.0	22.02	20.92
		1880.0	22.25	21.09
		1905.0	22.26	21.06
	1 RB low	1855.0	22.16	21.02
		1880.0	22.23	20.98
		1905.0	22.24	21.15
	50% RB mid	1855.0	20.96	20.94
		1880.0	21.21	21.17
		1905.0	21.13	21.14
	100% RB	1855.0	21	19.97
		1880.0	21.07	20.16
		1905.0	21.07	20.21
15MHz	1 RB high	1857.5	22.05	21
		1880.0	22.15	21.16
		1902.5	22.14	21.11
	1 RB low	1857.5	22.05	21.02
		1880.0	22.23	21.03
		1902.5	22.14	21.13
	50% RB mid	1857.5	21.06	21.03
		1880.0	21.15	21.16
		1902.5	21.12	21.12
	100% RB	1857.5	21	19.98
		1880.0	21.08	20.15
		1902.5	21.12	20.2

20MHz	1 RB high	1860.0	22.16	20.85
		1880.0	22.03	20.96
		1900.0	22.29	20.88
	1 RB low	1860.0	22.18	20.88
		1880.0	22.11	21.21
		1900.0	22.28	20.96
	50% RB mid	1860.0	21.01	21.07
		1880.0	21.24	21.18
		1900.0	21.07	21.15
	100% RB	1860.0	21.1	20.09
		1880.0	21.01	20.06
		1900.0	21.2	20.24

LTE band 4

Bandwidth	RB size/offset	Frequency (MHz)	Power(dBm)	
			QPSK	16QAM
1.4MHz	1 RB high	1754.3	21.89	20.85
		1732.5	21.96	20.88
		1710.7	21.79	20.77
	1 RB low	1754.3	21.85	20.77
		1732.5	21.99	20.81
		1710.7	21.79	20.66
	50% RB mid	1754.3	21.89	21.93
		1732.5	21.83	21.81
		1710.7	21.81	21.78
	100% RB	1754.3	20.83	19.83
		1732.5	20.78	19.74
		1710.7	20.76	19.8
3MHz	1 RB high	1753.5	21.93	20.77
		1732.5	21.78	20.79
		1711.5	21.83	20.64
	1 RB low	1753.5	21.95	20.78
		1732.5	21.86	20.59
		1711.5	21.91	20.77
	50% RB mid	1753.5	20.85	19.83
		1732.5	20.8	19.85
		1711.5	20.81	19.78
	100% RB	1753.5	20.82	19.92
		1732.5	20.76	19.76
		1711.5	20.81	19.89
5MHz	1 RB high	1752.5	21.94	20.98
		1732.5	21.8	20.74
		1712.5	21.93	21.08
	1 RB low	1752.5	22.04	21.11
		1732.5	21.74	20.69
		1712.5	21.83	20.73
	50% RB mid	1752.5	20.93	20.9
		1732.5	20.73	20.74
		1712.5	20.84	20.82
	100% RB	1752.5	20.95	20.03
		1732.5	20.75	19.78
		1712.5	20.77	19.84
10MHz	1 RB high	1750	22.05	20.92

		1732.5	21.93	20.65
		1715	21.96	20.83
	1 RB low	1750	22.11	20.87
		1732.5	21.9	20.75
		1715	21.93	20.81
	50% RB mid	1750	20.95	20.94
		1732.5	20.8	20.8
		1715	20.97	20.95
	100% RB	1750	21.03	20.03
		1732.5	20.72	19.84
		1715	20.97	19.98
15MHz	1 RB high	1747.5	22.02	20.97
		1732.5	22.02	20.67
		1717.5	21.92	20.83
	1 RB low	1747.5	22.02	21.03
		1732.5	21.94	20.67
		1717.5	21.88	20.88
	50% RB mid	1747.5	21	21
		1732.5	20.8	20.8
		1717.5	20.85	20.92
	100% RB	1747.5	21	20.08
		1732.5	20.72	19.81
		1717.5	20.88	19.96
20MHz	1 RB high	1745	22.23	20.87
		1732.5	21.97	21.16
		1720	22.07	20.7
	1 RB low	1745	22.15	20.95
		1732.5	21.84	20.9
		1720	21.93	20.63
	50% RB mid	1745	21	20.99
		1732.5	20.73	20.74
		1720	20.94	20.93
	100% RB	1745	21	20.1
		1732.5	20.78	19.8
		1720	20.92	19.97

LTE band 5

Bandwidth	RB size/offset	Frequency (MHz)	Power(dBm)	
			QPSK	16QAM
1.4MHz	1 RB high	848.3	21.8	20.67
		836.5	22.16	21.01
		824.7	21.9	20.88
	1 RB low	848.3	21.78	20.74
		836.5	22.15	21.08
		824.7	21.91	20.85
	50% RB mid	848.3	21.82	21.79
		836.5	21.99	22.03
		824.7	21.93	21.99
	100% RB	848.3	20.77	19.9
		836.5	20.94	19.99
		824.7	20.92	20.1
3MHz	1 RB high	847.5	21.86	20.64
		836.5	22.04	20.73
		825.5	21.96	20.85
	1 RB low	847.5	21.8	20.72
		836.5	21.97	20.55
		825.5	22.01	20.84
	50% RB mid	847.5	20.8	19.77
		836.5	20.94	19.96
		825.5	20.95	20
	100% RB	847.5	20.72	19.74
		836.5	20.81	19.85
		825.5	20.95	19.96
5MHz	1 RB high	846.5	21.82	20.88
		836.5	21.92	21
		826.5	21.93	20.89
	1 RB low	846.5	21.85	20.76
		836.5	21.82	20.93
		826.5	21.91	20.86
	50% RB mid	846.5	20.81	20.82
		836.5	20.94	20.95
		826.5	20.89	20.93
	100% RB	846.5	20.74	19.75
		836.5	20.86	19.84
		826.5	20.9	19.87

10MHz	1 RB high	844.0	21.87	20.78
		836.5	21.95	20.7
		829.0	21.9	20.86
	1 RB low	844.0	21.98	20.87
		836.5	22	20.87
		829.0	22.03	20.86
	50% RB mid	844.0	20.75	20.75
		836.5	20.93	20.94
		829.0	20.95	20.95
	100% RB	844.0	20.72	19.78
		836.5	20.9	19.89
		829.0	20.94	19.95

LTE band 12

Bandwidth	RB size/offset	Frequency (MHz)	Power(dBm)	
			QPSK	16QAM
1.4MHz	1 RB high	715.3	22.05	21.18
		707.5	22.09	21.08
		699.7	21.85	20.73
	1 RB low	715.3	21.91	20.84
		707.5	22.22	21.2
		699.7	21.95	20.88
	50% RB mid	715.3	21.96	21.94
		707.5	22.09	22.01
		699.7	21.93	21.94
	100% RB	715.3	20.88	19.9
		707.5	20.9	19.77
		699.7	20.92	19.83
3MHz	1 RB high	714.5	22.11	21.05
		707.5	22.02	20.58
		700.5	21.91	20.61
	1 RB low	714.5	22.1	20.71
		707.5	21.98	20.77
		700.5	22.01	20.7
	50% RB mid	714.5	20.88	19.89
		707.5	20.9	19.84
		700.5	21.11	20.02
	100% RB	714.5	20.91	19.91
		707.5	20.89	19.89
		700.5	20.94	19.94
5MHz	1 RB high	713.5	21.86	20.91
		707.5	21.96	20.65
		701.5	22.04	21.06
	1 RB low	713.5	21.98	20.85
		707.5	21.88	20.92
		701.5	21.94	21
	50% RB mid	713.5	20.84	20.82
		707.5	20.93	20.91
		701.5	21.05	21.05
	100% RB	713.5	20.79	19.78
		707.5	20.94	19.91
		701.5	20.88	19.88

10MHz	1 RB high	711.0	21.84	20.83
		707.5	21.99	20.74
		704.0	21.95	20.81
	1 RB low	711.0	22.06	20.65
		707.5	22.04	21.02
		704.0	21.88	20.74
	50% RB mid	711.0	20.87	20.87
		707.5	20.88	20.88
		704.0	20.93	20.91
	100% RB	711.0	20.84	19.88
		707.5	20.93	19.83
		704.0	20.9	19.9

LTE band 17

Bandwidth	RB size/offset	Frequency (MHz)	Power(dBm)	
			QPSK	16QAM
5MHz	1 RB high	713.5	21.27	20.3
		710.0	21.38	20.29
		706.5	21.38	20.5
	1 RB low	713.5	21.36	20.27
		710.0	21.28	20.33
		706.5	21.35	20.42
	50% RB mid	713.5	20.33	20.35
		710.0	20.42	20.42
		706.5	20.45	20.46
	100% RB	713.5	20.36	19.35
		710.0	20.43	19.41
		706.5	20.43	19.43
10MHz	1 RB high	711	21.37	20.34
		710	21.5	20.12
		709	21.55	20.36
	1 RB low	711	21.36	20.25
		710	21.49	20.18
		709	21.52	20.56
	50% RB mid	711	20.4	20.42
		710	20.44	20.41
		709	20.58	20.62
	100% RB	711	20.43	19.45
		710	20.43	19.47
		709	20.57	19.5

A.1.3 Radiated

A.1.3.1 Description

This is the test for the maximum radiated power from the EUT.

Rule Part 24.232(b) specifies, "Mobile/portable stations are limited to 2 watts e.i.r.p. Peak power" and 24.232(c) specifies that "Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage."

Rule Part 27.50(d) specifies “Fixed, mobile, and portable (handheld) stations operating in the 1710–1755 MHz band are limited to 1 watt EIRP”.

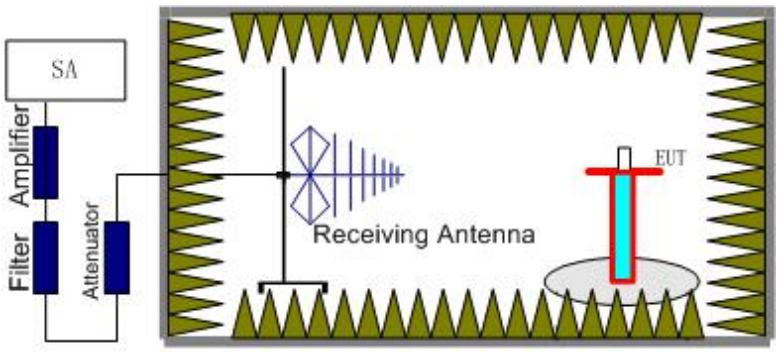
Rule Part 27.50(h)(2) specifies “Mobile stations are limited to 2.0 watts EIRP.”.

Rule Part 27.50(c) specifies “Portable stations (hand-held de-vices) are limited to 3 watts ERP.”.

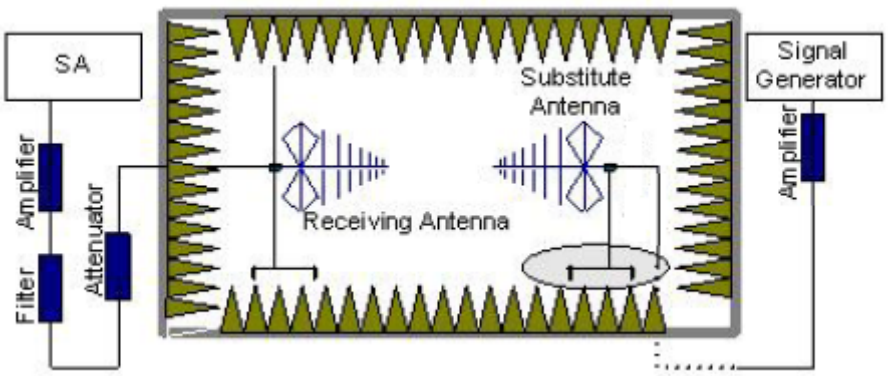
A.1.3.2 Method of Measurement

The measurements procedures in TIA-603E-2016 are used.

1. EUT was placed on a 1.5 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1.5m. The test setup refers to figure below. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all transmit frequencies in three channels (High, Middle, Low) were measured with peak detector.



2. The EUT is then put into continuously transmitting mode at its maximum power level during the test. And the maximum value of the receiver should be recorded as (Pr).
3. The EUT shall be replaced by a substitution antenna. The test setup refers to figure below.



In the chamber, a substitution antenna for the frequency band of interest is placed at the

reference point of the chamber. An RF signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (P_{Mea}) is applied to the input of the substitution antenna. Adjust the level of the signal generator output until the value of the receiver reaches the previously recorded (P_r). The power of signal source (P_{Mea}) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.

4. An amplifier should be connected to the Signal Source output port. And the cable should be connected between the amplifier and the substitution antenna.
   The cable loss (P_{cl}), the substitution antenna Gain (G_a) and the amplifier Gain (P_{Ag}) should be recorded after test.
   The measurement results are obtained as described below:
   Power (EIRP) = P_{Mea} - P_{Ag} - P_{cl} - G_a
5. This value is EIRP since the measurement is calibrated using an antenna of known gain (unit dBi) and known input power.
6. ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP -2.15.

A.1.3.3 Measurement result

LTE Band 2- EIRP 24. 232(b)

Limits: ≤33dBm (2W)

LTE Band 2_1.4MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1850.70	-15.53	36	4.6	2.9	18.77	33.00	14.23	H
1880.00	-14.64	36	4.6	2.9	19.66	33.00	13.34	H
1909.30	-14.18	36	4.6	2.9	20.12	33.00	12.88	H

LTE Band 2_3MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1851.50	-15.07	36	4.6	2.9	19.23	33.00	13.77	H
1880.00	-14.67	36	4.6	2.9	19.63	33.00	13.37	H
1908.50	-13.83	36	4.6	2.9	20.47	33.00	12.53	H

LTE Band 2_5MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1852.50	-15.07	36	4.6	2.9	19.23	33.00	13.77	H
1880.00	-14.49	36	4.6	2.9	19.81	33.00	13.19	H
1907.50	-13.92	36	4.6	2.9	20.38	33.00	12.62	H

LTE Band 2_10MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1855.00	-14.87	36	4.6	2.9	19.43	33.00	13.57	H
1880.00	-14.44	36	4.6	2.9	19.86	33.00	13.14	H
1905.00	-13.69	36	4.6	2.9	20.61	33.00	12.39	H

LTE Band 2_15MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization

1857.50	-14.79	36	4.6	2.9	19.51	33.00	13.49	H
1880.00	-14.35	36	4.6	2.9	19.95	33.00	13.05	H
1902.50	-13.64	36	4.6	2.9	20.66	33.00	12.34	H

LTE Band 2_20 MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1860.00	-14.99	36	4.6	2.9	19.31	33.00	13.69	H
1880.00	-14.38	36	4.6	2.9	19.92	33.00	13.08	H
1900.00	-13.87	36	4.6	2.9	20.43	33.00	12.57	H

LTE Band 2_1.4MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1850.70	-15.31	36	4.6	2.9	18.99	33.00	14.01	H
1880.00	-14.65	36	4.6	2.9	19.65	33.00	13.35	H
1909.30	-13.97	36	4.6	2.9	20.33	33.00	12.67	H

LTE Band 2_3MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1851.50	-15.06	36	4.6	2.9	19.24	33.00	13.76	H
1880.00	-14.59	36	4.6	2.9	19.71	33.00	13.29	H
1908.50	-13.73	36	4.6	2.9	20.57	33.00	12.43	H

LTE Band 2_5MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1852.50	-15.19	36	4.6	2.9	19.11	33.00	13.89	H
1880.00	-14.58	36	4.6	2.9	19.72	33.00	13.28	H
1907.50	-13.76	36	4.6	2.9	20.54	33.00	12.46	H

LTE Band 2_10MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1855.00	-15.06	36	4.6	2.9	19.24	33.00	13.76	H
1880.00	-14.52	36	4.6	2.9	19.78	33.00	13.22	H
1905.00	-13.6	36	4.6	2.9	20.70	33.00	12.3	H

LTE Band 2_15MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1857.50	-14.9	36	4.6	2.9	19.4	33.00	13.6	H
1880.00	-14.48	36	4.6	2.9	19.82	33.00	13.18	H
1902.50	-13.81	36	4.6	2.9	20.49	33.00	12.51	H

LTE Band 2_20 MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1860.00	-14.93	36	4.6	2.9	19.37	33.00	13.63	H
1880.00	-14.42	36	4.6	2.9	19.88	33.00	13.12	H
1900.00	-14.34	36	4.6	2.9	19.96	33.00	13.04	H

Peak EIRP(dBm) = P_{Mea}(-14.93dBm) - G_a (2.9dBi) - P_{Ag} (4.6dB) - P_{cl} (36dB) = 19.37dBm

LTE Band 4- EIRP 27.50(d)

Limits: ≤30dBm (1W)

LTE Band 4_1.4MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1710.70	-13.26	36	4.5	2.9	21.14	30.00	8.86	H
1732.50	-11.18	36	4.5	2.9	23.22	30.00	6.78	H
1754.30	-13.06	36	4.5	2.9	21.34	30.00	8.66	H

LTE Band 4_3MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1711.50	-14.77	36	4.5	2.9	19.63	30.00	10.37	H
1732.50	-14.8	36	4.5	2.9	19.60	30.00	10.4	H
1753.50	-15.17	36	4.5	2.9	19.23	30.00	10.77	H

LTE Band 4_5MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1712.50	-15.92	36	4.5	2.9	18.48	30.00	11.52	H
1732.50	-16.24	36	4.5	2.9	18.16	30.00	11.84	H
1752.50	-15.96	36	4.5	2.9	18.44	30.00	11.56	H

LTE Band 4_10MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1715.00	-14.82	36	4.5	2.9	19.58	30.00	10.42	H
1732.50	-15.1	36	4.5	2.9	19.30	30.00	10.7	H
1750.50	-14.88	36	4.5	2.9	19.52	30.00	10.48	H

LTE Band 4_15MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1717.50	-15.57	36	4.5	2.9	18.83	30.00	11.17	H
1732.50	-16.45	36	4.5	2.9	17.95	30.00	12.05	H
1747.50	-16.09	36	4.5	2.9	18.31	30.00	11.69	H

LTE Band 4_20MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1720.00	-14.61	36	4.5	2.9	19.79	30.00	10.21	H
1732.50	-15.06	36	4.5	2.9	19.34	30.00	10.66	H
1745.00	-15.13	36	4.5	2.9	19.27	30.00	10.73	H

LTE Band 4_1.4MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1710.70	-16.38	36	4.5	2.9	18.02	30.00	11.98	H
1732.50	-16.96	36	4.5	2.9	17.44	30.00	12.56	H
1754.30	-16.76	36	4.5	2.9	17.64	30.00	12.36	H

LTE Band 4_3MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1711.50	-15.87	36	4.5	2.9	18.53	30.00	11.47	H
1732.50	-15.8	36	4.5	2.9	18.60	30.00	11.4	H
1753.50	-15.86	36	4.5	2.9	18.54	30.00	11.46	H

LTE Band 4_5MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1712.50	-16.74	36	4.5	2.9	17.66	30.00	12.34	H
1732.50	-17.19	36	4.5	2.9	17.21	30.00	12.79	H
1752.50	-16.88	36	4.5	2.9	17.52	30.00	12.48	H

LTE Band 4_10MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1715.00	-15.95	36	4.5	2.9	18.45	30.00	11.55	H
1732.50	-16.13	36	4.5	2.9	18.27	30.00	11.73	H
1750.50	-15.75	36	4.5	2.9	18.65	30.00	11.35	H

LTE Band 4_15MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1717.50	-16.36	36	4.5	2.9	18.04	30.00	11.96	H
1732.50	-17.35	36	4.5	2.9	17.05	30.00	12.95	H
1747.50	-16.9	36	4.5	2.9	17.50	30.00	12.5	H

LTE Band 4_20MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1720.00	-16.01	36	4.5	2.9	18.39	30.00	11.61	H
1732.50	-16.08	36	4.5	2.9	18.32	30.00	11.68	H
1745.00	-15.99	36	4.5	2.9	18.41	30.00	11.59	H

Peak EIRP(dBm) = P_{Mea}(-16.01dBm) - G_a (2.9dBi) - P_{Ag} (4.5dB) - P_{cl} (36dB) = 18.39dBm

LTE Band 5- ERP 22.913(a)

Limits: ≤38.45dBm (7W)

LTE Band 5_1.4MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dBd)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
824.70	-6.19	37	3.1	-3.11	24.6	38.45	13.85	H
836.50	-5.76	37	3.1	-3.11	25.03	38.45	13.42	H
848.30	-7.88	37	3.1	-3.11	22.91	38.45	15.54	H

LTE Band 5_3MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dBd)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
825.50	-6.11	37	3.1	-3.11	24.68	38.45	13.77	H
836.50	-5.89	37	3.1	-3.11	24.90	38.45	13.55	H
847.50	-7.77	37	3.1	-3.11	23.02	38.45	15.43	H

LTE Band 5_5MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dBd)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
826.50	-6.27	37	3.1	-3.11	24.52	38.45	13.93	H
836.50	-5.75	37	3.1	-3.11	25.04	38.45	13.41	H
846.50	-7.79	37	3.1	-3.11	23.00	38.45	15.45	H

LTE Band 5_10MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dBd)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
829.00	-6.2	37	3.1	-3.11	24.59	38.45	13.86	H
836.50	-5.62	37	3.1	-3.11	25.17	38.45	13.28	H
844.00	-8.02	37	3.1	-3.11	22.77	38.45	15.68	H

LTE Band 5_1.4MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dBd)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
824.70	-6.18	37	3.1	-3.11	24.61	38.45	13.84	H
836.50	-5.89	37	3.1	-3.11	24.90	38.45	13.55	H
848.30	-7.85	37	3.1	-3.11	22.94	38.45	15.51	H

LTE Band 5_3MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dBd)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
825.50	-6.19	37	3.1	-3.11	24.6	38.45	13.85	H
836.50	-5.84	37	3.1	-3.11	24.95	38.45	13.5	H
847.50	-7.79	37	3.1	-3.11	23.00	38.45	15.45	H

LTE Band 5_5MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dBd)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
826.50	-6.17	37	3.1	-3.11	24.62	38.45	13.83	H
836.50	-5.85	37	3.1	-3.11	24.94	38.45	13.51	H
846.50	-7.81	37	3.1	-3.11	22.98	38.45	15.47	H

LTE Band 5_10MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dBd)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
829.00	-6.19	37	3.1	-3.11	24.6	38.45	13.85	H
836.50	-5.62	37	3.1	-3.11	25.17	38.45	13.28	H
844.00	-7.86	37	3.1	-3.11	22.93	38.45	15.52	H

Peak ERP(dBm)=P_{Mea}(-6.19dBm)-G_a(-3.11dBd)-P_{Ag}(3.1dB)-P_{cl} (37dB)-2.15dB = 24.6dBm

LTE Band 12 - ERP 27.50(c)(10)

Limits: ≤34.77dBm (3W)

LTE Band 12_1.4MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dBd)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
699.70	-9.21	37	2.8	-3.26	21.73	34.77	13.04	H
707.50	-9.66	37	2.8	-3.26	21.28	34.77	13.49	H
715.30	-10.79	37	2.8	-3.26	20.15	34.77	14.62	H

LTE Band 12_3MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dBd)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
700.50	-9.38	37	2.8	-3.26	21.56	34.77	13.21	H
707.50	-9.95	37	2.8	-3.26	20.99	34.77	13.78	H
714.50	-10.5	37	2.8	-3.26	20.44	34.77	14.33	H

LTE Band 12_5MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dBd)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
701.50	-9.65	37	2.8	-3.26	21.29	34.77	13.48	H
707.50	-9.89	37	2.8	-3.26	21.05	34.77	13.72	H
713.50	-10.71	37	2.8	-3.26	20.23	34.77	14.54	H

LTE Band 12_10MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dBd)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
704.00	-9.97	37	2.8	-3.26	20.97	34.77	13.8	H
707.50	-9.98	37	2.8	-3.26	20.96	34.77	13.81	H
711.00	-10.61	37	2.8	-3.26	20.33	34.77	14.44	H

LTE Band 12_1.4MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dBd)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
699.70	-9.2	37	2.8	-3.26	21.74	34.77	13.03	H
707.50	-10	37	2.8	-3.26	20.94	34.77	13.83	H
715.30	-10.63	37	2.8	-3.26	20.31	34.77	14.46	H

LTE Band 12_3MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dBd)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
700.50	-9.33	37	2.8	-3.26	21.61	34.77	13.16	H
707.50	-9.92	37	2.8	-3.26	21.02	34.77	13.75	H
714.50	-10.56	37	2.8	-3.26	20.38	34.77	14.39	H

LTE Band 12_5MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dBd)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
701.50	-9.63	37	2.8	-3.26	21.31	34.77	13.46	H
707.50	-9.75	37	2.8	-3.26	21.19	34.77	13.58	H
713.50	-10.67	37	2.8	-3.26	20.27	34.77	14.5	H

LTE Band 12_10MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dBd)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
704.00	-10.06	37	2.8	-3.26	20.88	34.77	13.89	H
707.50	-9.97	37	2.8	-3.26	20.97	34.77	13.8	H
711.00	-10.68	37	2.8	-3.26	20.26	34.77	14.51	H

Peak ERP(dBm)=P_{Mea}(-10.06dBm)-G_a(-3.26dBd)-P_{Ag}(2.8dB)-P_{cl} (37dB)-2.15dB = 20.88dBm

LTE Band 17- EIRP 27.50(c)(10)

Limits: ≤34.77dBm (3W)

LTE Band 17_5MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dBd)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
706.50	-9.64	37	2.8	-3.26	21.3	34.77	13.47	H
710.00	-10	37	2.8	-3.26	20.94	34.77	13.83	H
713.50	-10.68	37	2.8	-3.26	20.26	34.77	14.51	H

LTE Band 17_10MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dBd)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
709.00	-9.4	37	2.8	-3.26	21.54	34.77	13.23	H
710.00	-9.7	37	2.8	-3.26	21.24	34.77	13.53	H
711.00	-10.26	37	2.8	-3.26	20.68	34.77	14.09	H

LTE Band 17_5MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dBd)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
706.50	-9.78	37	2.8	-3.26	21.16	34.77	13.61	H
710.00	-10.01	37	2.8	-3.26	20.93	34.77	13.84	H
713.50	-10.83	37	2.8	-3.26	20.11	34.77	14.66	H

LTE Band 17_10MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dBd)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
709.00	-9.54	37	2.8	-3.26	21.4	34.77	13.37	H
710.00	-9.68	37	2.8	-3.26	21.26	34.77	13.51	H
711.00	-10.22	37	2.8	-3.26	20.72	34.77	14.05	H

Peak ERP(dBm)=P_{Mea}(-9.54dBm)-G_a(-3.26dBd)-P_{Ag}(2.8dB)-P_{cl} (37dB)-2.15dB = 21.4dBm

ANALYZER SETTINGS:

RBW = VBW = 8MHz for occupied bandwdiths equal to or less than 5MHz.

RBW = VBW = 20MHz for occupied bandwidths equal to or greater than 10MHz.

ANNEX A.2. EMISSION LIMT

Reference

FCC: CFR 2.1051, 22.917,24.238(a), 27.53(g), 27.53(h) , 27.53(m).

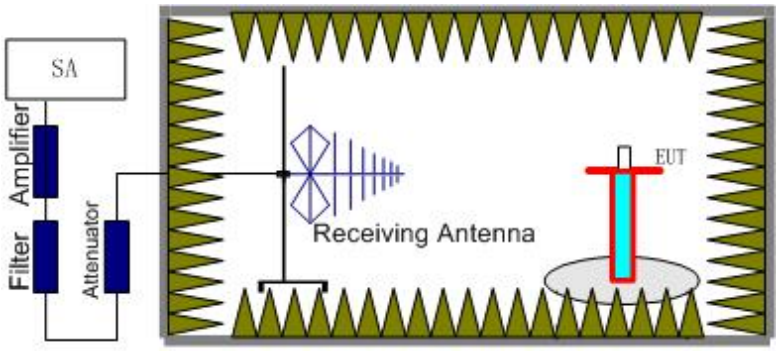
A.2.1 Measurement Method

The measurements procedures in TIA-603E-2016 are used. This measurement is carried out in fully-anechoic chamber FAC-3.

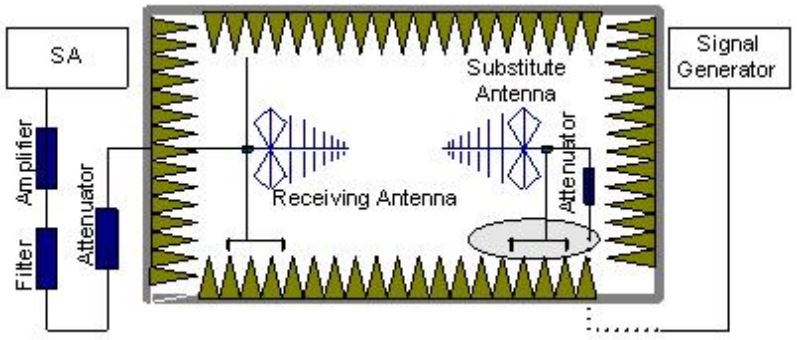
The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier. The resolution bandwidth is set 1MHz as outlined in Part 22.917,Part 24.238(a), Part 27.53(g), Part 27.53(h), Part 27.53(m). The spectrum was scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of the LTE Bands 2, 4, 5 , 12, 17.

The procedure of radiated spurious emissions is as follows:

1. EUT was placed on a 1.5 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1.5m. The test setup refers to figure below. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all non-harmonic and harmonics of the transmit frequency through the 10th harmonic were measured with peak detector.



2. The EUT is then put into continuously transmitting mode at its maximum power level during the test. And the maximum value of the receiver should be recorded as (Pr).
3. The EUT shall be replaced by a substitution antenna. The test setup refers to figure below.



In the chamber, an substitution antenna for the frequency band of interest is placed at the

reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (P_{Mea}) is applied to the input of the substitution antenna. Adjust the level of the signal generator output until the value of the receiver reaches the previously recorded (P_r). The power of signal source (P_{Mea}) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.

4. The Path loss (P_{pl}) between the Signal Source with the Substitution Antenna and the Substitution Antenna Gain (G_a) should be recorded after test.
   An amplifier should be connected in for the test.
   The Path loss (P_{pl}) is the summation of the cable loss and the gain of the amplifier.
   The measurement results are obtained as described below:
   Power (EIRP)=P_{Mea}+ P_{pl} + G_a
5. This value is EIRP since the measurement is calibrated using an antenna of known gain (unit: dBi) and known input power.
6. ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP -2.15dB.

A.2.2 Measurement Limit

Part 22.917,Part 24.238(a), Part 27.53(g), Part 27.53(h), Part 27.53(m) all specify that 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. The specification that emissions shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB, which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

A.2.3 Measurement Results

7. Radiated emissions measurements were made only at the upper, middle, and lower carrier frequencies of the LTE Bands 2, 4, 5, 12, 17. It was decided that measurements at these three carrier frequencies would be sufficient to demonstrate compliance with emissions limits because it was seen that all the significant spurs occur well outside the band and no radiation was seen from a carrier in one block of the LTE Bands 2, 4, 5, 12, 17 into any of the other blocks. The equipment must still, however, meet emissions requirements with the carrier at all frequencies over which it is capable of operating and it is the manufacturer's responsibility to verify this. The evaluated frequency range is from 30MHz to 26GHz.

LTE Band 2, 1.4MHz, QPSK, Channel 18607

Frequency(MHz)	P_{Mea}(dBm)	Path Loss	Antenna Gain	Peak EIRP(dBm)	Limit（dBm）	Margin(dB)	Polarization
3700.400000	-50.48	6.6	6.2	-50.88	-13.00	37.88	V
5550.800000	-46.78	8.3	9.5	-45.58	-13.00	32.58	V

7400.800000	-40.44	9.7	14.6	-35.54	-13.00	22.54	V
9251.200000	-52.48	10.7	18.5	-44.68	-13.00	31.68	V
11100.800000	-48.08	12.1	18.1	-42.08	-13.00	29.08	V
13207.800000	-47.57	13.2	21.8	-38.97	-13.00	25.97	H

LTE Band 2, 1.4MHz, QPSK, Channel 18900

Frequency(MHz)	P_{Mea}(dBm)	Path Loss	Antenna Gain	Peak EIRP(dBm)	Limit（dBm）	Margin(dB)	Polarization
3758.800000	-48.07	6.6	6.2	-48.47	-13.00	35.47	H
5638.800000	-46.51	8.3	9.5	-45.31	-13.00	32.31	V
7518.000000	-43.73	9.7	14.6	-38.83	-13.00	25.83	V
9397.600000	-48.43	10.7	18.5	-40.63	-13.00	27.63	V
11277.200000	-47.78	12.1	18.1	-41.78	-13.00	28.78	V
13046.800000	-48.48	13.2	21.8	-39.88	-13.00	26.88	V

LTE Band 2, 1.4MHz, QPSK, Channel 19193

Frequency(MHz)	P_{Mea}(dBm)	Path Loss	Antenna Gain	Peak EIRP(dBm)	Limit（dBm）	Margin(dB)	Polarization
3817.600000	-47.37	6.7	6.2	-47.87	-13.00	34.87	H
5726.800000	-49.27	8.5	10.5	-47.27	-13.00	34.27	V
7635.200000	-46.63	9.7	14.6	-41.73	-13.00	28.73	V
9543.600000	-53.15	10.7	18.6	-45.25	-13.00	32.25	V
11777.000000	-46.95	12.4	17.6	-41.75	-13.00	28.75	V
14551.800000	-46.32	14.2	22.7	-37.82	-13.00	24.82	V

LTE Band 4, 1.4MHz QPSK, Channel 19957

Frequency(MHz)	P_{Mea}(dBm)	Path Loss	Antenna Gain	Peak EIRP(dBm)	Limit（dBm）	Margin(dB)	Polarization
3420.400000	-49.62	6.4	6.2	-49.82	-13.00	36.82	V
5208.000000	-51.71	7.9	8.7	-50.91	-13.00	37.91	H
6841.200000	-40.37	9.3	12.3	-37.37	-13.00	24.37	V
8551.200000	-49.5	10.3	18.1	-41.70	-13.00	28.7	V
11971.600000	-43.94	12.6	17.1	-39.44	-13.00	26.44	V
17818.000000	-39.37	16.0	20.6	-34.77	-13.00	21.77	H

LTE Band 4, 1.4MHz, QPSK, Channel 20175

Frequency(MHz)	P_{Mea}(dBm)	Path Loss	Antenna Gain	Peak EIRP(dBm)	Limit（dBm）	Margin(dB)	Polarization
3464.000000	-51.28	6.4	6.2	-51.48	-13.00	38.48	V
5196.000000	-50.17	7.9	8.7	-49.37	-13.00	36.37	V
6928.400000	-39.39	9.3	12.3	-36.39	-13.00	23.39	V
8660.400000	-49.26	10.3	18.1	-41.46	-13.00	28.46	V
10360.800000	-50.25	11.5	17.1	-44.65	-13.00	31.65	H
12124.200000	-44.27	12.6	17.1	-39.77	-13.00	26.77	V

LTE Band 4, 1.4MHz, QPSK, Channel 20393

Frequency(MHz)	P_{Mea}(dBm)	Path Loss	Antenna Gain	Peak EIRP(dBm)	Limit（dBm）	Margin(dB)	Polarization
3568.400000	-51.65	6.4	6.2	-51.85	-13.00	38.85	H
5261.600000	-48.82	8.0	8.7	-48.12	-13.00	35.12	V
7015.200000	-41.35	9.3	12.3	-38.35	-13.00	25.35	V
8768.800000	-52.78	10.4	18.1	-45.08	-13.00	32.08	V
12783.600000	-47.72	12.7	19.2	-41.22	-13.00	28.22	H
17827.800000	-39.12	16.0	20.6	-34.52	-13.00	21.52	H

LTE Band 5, 1.4MHz, QPSK, Channel 20407

Frequency(MHz)	P_{Mea}(dBm)	Path Loss	Antenna Gain	Peak ERP(dBm)	Limit （dBm）	Margin(dB)	Polarization
1464.500000	-49.58	4.1	3.4	-50.28	-13.00	37.28	V
2240.384615	-39.44	5.1	3.3	-41.24	-13.00	28.24	H
2817.692308	-36.44	5.7	4.1	-38.04	-13.00	25.04	V
4121.200000	-51.08	7.0	7.2	-50.88	-13.00	37.88	V
4945.200000	-49.77	7.7	9.0	-48.47	-13.00	35.47	V
6364.400000	-50.93	8.8	10.8	-48.93	-13.00	35.93	H

LTE Band 5, 1.4MHz, QPSK, Channel 20525

Frequency(MHz)	P_{Mea}(dBm)	Path Loss	Antenna Gain	Peak ERP(dBm)	Limit （dBm）	Margin(dB)	Polarization
1833.846154	-39.96	4.6	2.9	-41.66	-13.00	28.66	H
2428.076923	-39.7	5.3	3.7	-41.30	-13.00	28.3	V
3202.800000	-49.96	6.1	4.9	-51.16	-13.00	38.16	H
4180.000000	-51.48	7.0	7.7	-50.78	-13.00	37.78	V
4870.000000	-51.1	7.7	7.9	-50.90	-13.00	37.9	H
6426.400000	-52.06	8.9	11.5	-49.46	-13.00	36.46	V

LTE Band 5, 1.4MHz, QPSK, Channel 20643

Frequency(MHz)	P_{Mea}(dBm)	Path Loss	Antenna Gain	Peak ERP(dBm)	Limit （dBm）	Margin(dB)	Polarization
1635.846154	-48.42	4.3	2.9	-49.82	-13.00	36.82	H
2456.923077	-39.62	5.3	3.7	-41.22	-13.00	28.22	H
3380.000000	-52.55	6.3	4.9	-53.95	-13.00	40.95	H
4239.200000	-50.49	7.1	7.7	-49.89	-13.00	36.89	V
5086.400000	-51.78	7.8	9.0	-50.58	-13.00	37.58	V
6401.200000	-50.82	8.9	10.8	-48.92	-13.00	35.92	V

LTE Band 12, 1.4MHz, QPSK, Channel 23017

Frequency(MHz)	P_{Mea}(dBm)	Path Loss	Antenna Gain	Peak ERP(dBm)	Limit （dBm）	Margin(dB)	Polarization
1445.807692	-51.82	4.0	3.4	-52.42	-13.00	39.42	H
2146.538462	-42.17	5.0	3.3	-43.87	-13.00	30.87	V
2832.307692	-36.82	5.8	4.1	-38.52	-13.00	25.52	H
3573.200000	-50.94	6.4	6.0	-51.34	-13.00	38.34	H
4280.000000	-52.56	7.1	7.7	-51.96	-13.00	38.96	H
5621.200000	-51.99	8.3	9.5	-50.79	-13.00	37.79	H

LTE Band 12, 1.4MHz, QPSK, Channel 23095

Frequency(MHz)	P_{Mea}(dBm)	Path Loss	Antenna Gain	Peak ERP(dBm)	Limit （dBm）	Margin(dB)	Polarization
1410.153846	-50.32	4.0	3.4	-50.92	-13.00	37.92	H
2128.076923	-41.78	5.0	2.8	-43.98	-13.00	30.98	H
2861.538462	-36.75	5.8	4.1	-38.45	-13.00	25.45	H
3580.800000	-51.33	6.4	6.0	-51.73	-13.00	38.73	H
4242.000000	-52.2	7.1	7.7	-51.60	-13.00	38.6	H
5991.600000	-48.84	8.5	10.4	-46.94	-13.00	33.94	H

LTE Band 12, 1.4MHz, QPSK, Channel 23173

Frequency(MHz)	P_{Mea}(dBm)	Path Loss	Antenna Gain	Peak ERP(dBm)	Limit （dBm）	Margin(dB)	Polarization
1438.192308	-49.67	4.0	3.4	-50.27	-13.00	37.27	H
2163.461539	-41.95	5.0	2.8	-44.15	-13.00	31.15	V
2888.461538	-36.82	5.8	4.1	-38.52	-13.00	25.52	H
3574.000000	-48.6	6.4	6.0	-49.00	-13.00	36	V
4289.200000	-47.76	7.1	7.7	-47.16	-13.00	34.16	H
5004.400000	-50.54	7.8	9.0	-49.34	-13.00	36.34	H

LTE Band 17, 5MHz, QPSK, Channel 23755

Frequency(MHz)	P_{Mea}(dBm)	Path Loss	Antenna Gain	Peak ERP(dBm)	Limit （dBm）	Margin(dB)	Polarization
1431.961539	-50.14	4.0	3.4	-50.74	-13.00	37.74	H
2149.615385	-41.44	5.0	2.8	-43.64	-13.00	30.64	V
2869.230769	-36.17	5.8	4.1	-37.87	-13.00	24.87	H
3570.400000	-51.02	6.4	6.0	-51.42	-13.00	38.42	H
4943.200000	-52.09	7.1	7.7	-51.49	-13.00	38.49	V
5687.600000	-51.08	8.3	9.0	-50.38	-13.00	37.38	H

LTE Band 17, 5MHz, QPSK, Channel 23790

Frequency(MHz)	P_{Mea}(dBm)	Path Loss	Antenna Gain	Peak ERP(dBm)	Limit （dBm）	Margin(dB)	Polarization
1438.192308	-50.62	4.0	3.4	-51.22	-13.00	38.22	H
2111.923077	-41.16	5.0	2.8	-43.36	-13.00	30.36	V
2868.076923	-36.94	5.8	4.1	-38.64	-13.00	25.64	V
3573.200000	-51.59	6.4	6.0	-51.99	-13.00	38.99	H
4229.200000	-52.59	7.1	7.7	-51.99	-13.00	38.99	H
5617.600000	-51.86	8.3	9.0	-51.16	-13.00	38.16	V

LTE Band 17, 5MHz, QPSK, Channel 23825

Frequency(MHz)	P_{Mea}(dBm)	Path Loss	Antenna Gain	Peak ERP(dBm)	Limit （dBm）	Margin(dB)	Polarization
1428.500000	-50.21	4.0	3.4	-50.81	-13.00	37.81	H
2158.461539	-41.77	5.0	2.8	-43.97	-13.00	30.97	V
2834.615385	-37.19	5.8	4.1	-38.89	-13.00	25.89	H
3577.200000	-51.52	6.4	6.0	-51.92	-13.00	38.92	H
4268.000000	-51.62	7.1	7.7	-51.02	-13.00	38.02	V
5641.200000	-51.46	8.3	9.0	-50.76	-13.00	37.76	H

ANNEX A.3. FREQUENCY STABILITY

Reference

FCC: CFR Part 2.1055, 22.235,24.235, 27.54.

A.3.1 Method of Measurement

In order to measure the carrier frequency under the condition of AFC lock, it is necessary to make measurements with the EUT in a “call mode”. This is accomplished with the use of R&S CMW500 DIGITAL RADIO COMMUNICATION TESTER.

1. Measure the carrier frequency at room temperature.
2. Subject the EUT to overnight soak at -30℃.
3. With the EUT, powered via nominal voltage, connected to the CMW500 and in a simulated call on middle channel for LTE band 2/4/5/12/17, measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.
4. Repeat the above measurements at 10℃ increments from -30℃ to +50℃. Allow at least 1.5 hours at each temperature, unpowered, before making measurements.
5. Re-measure carrier frequency at room temperature with nominal voltage. Vary supply voltage from minimum voltage to maximum voltage, in 0.1Volt increments re-measuring carrier frequency at each voltage. Pause at nominal voltage for 1.5 hours unpowered, to allow any self-heating to stabilize, before continuing.
6. Subject the EUT to overnight soak at +50℃.
7. With the EUT, powered via nominal voltage, connected to the CMW500 and in a simulated call on the centre channel, measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.
8. Repeat the above measurements at 10 ℃ decrements from +50℃ to -30℃. Allow at least 1.5 hours at each temperature, unpowered, before making measurements.
9. At all temperature levels hold the temperature to +/- 0.5℃ during the measurement procedure.

A.3.2 Measurement Limit

According to the JTC standard the frequency stability of the carrier shall be accurate to within 0.1 ppm of the received frequency from the base station. This accuracy is sufficient to meet Sec. 24.235, Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. As this transceiver is considered "Hand carried, battery powered equipment" Section 2.1055(d) (2) applies. This requires that the lower voltage for frequency stability testing be specified by the manufacturer. This transceiver is specified to operate with an input voltage of between 3.6VDC and 4.2VDC, with a nominal voltage of 3.8VDC. Operation above or below these voltage limits is prohibited by transceiver software in order to prevent improper operation as well as to protect components from overstress. For the purposes of measuring frequency stability these voltage limits are to be used.

A.3.3 Measurement results

LTE Band 2, 1.4MHz bandwidth (worst case of all bandwidths)

Frequency Error vs Voltage

Voltage (V)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
3.6	-10.07	31.9	0.005	0.017
3.8	-8.96	-41	0.005	0.022
4.2	-8.15	-27.01	0.004	0.014

Frequency Error vs Temperature

Temperature (℃)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
50°	-8.63	-25.75	0.005	0.014
40°	-8.18	-25.36	0.004	0.013
30°	-10.43	-40.6	0.006	0.022
20°	-9.53	26.64	0.005	0.014
10°	-6.34	-30.56	0.003	0.016
0°	-10.39	-32.07	0.006	0.017
- 10°	-9.36	-29.35	0.005	0.016
- 20°	-7.78	-34.35	0.004	0.018
- 30°	-6.95	-34.68	0.004	0.018

LTE Band 4, 1.4MHz bandwidth (worst case of all bandwidths)

Frequency Error vs Voltage

Voltage (V)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
3.6	-4.46	-30.93	0.003	0.018
3.8	5.72	40.86	0.003	0.024
4.2	-4.16	-33.62	0.002	0.019

Frequency Error vs Temperature

Temperature (℃)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
50°	5.35	19.3	0.003	0.011
40°	5.38	-49.5	0.003	0.029
30°	-5.82	-32.47	0.003	0.019
20°	-5.32	-30.17	0.003	0.017
10°	-5.88	12.95	0.003	0.007
0°	5.74	39.11	0.003	0.023
- 10°	-5.26	36.29	0.003	0.021
- 20°	-6.35	-28.52	0.004	0.016
- 30°	4.38	40	0.003	0.023

LTE Band 5, 1.4MHz bandwidth (worst case of all bandwidths)

Frequency Error vs Voltage

Voltage (V)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
3.6	-3.98	-20.91	0.005	0.025
3.8	-2.68	22.46	0.003	0.027
4.2	-3.69	-21.74	0.004	0.026

Frequency Error vs Temperature

Temperature (℃)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
50°	-3.18	27.81	0.004	0.033
40°	-2.79	27.35	0.003	0.033
30°	2.95	26.11	0.004	0.031
20°	-3.18	-15.58	0.004	0.019
10°	-2.78	25.59	0.003	0.031
0°	-2.92	43.03	0.003	0.051
- 10°	1.95	-35.93	0.002	0.043
- 20°	-3.42	32.76	0.004	0.039
- 30°	-4.25	-29.74	0.005	0.036

LTE Band 12, 1.4MHz bandwidth (worst case of all bandwidths)

Frequency Error vs Voltage

Voltage (V)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
3.6	-3.85	-35.71	0.005	0.050
3.8	-4.12	20.84	0.006	0.029
4.2	-3.81	56.58	0.005	0.080

Frequency Error vs Temperature

Temperature (℃)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
50°	-2.95	29.83	0.004	0.042
40°	-4.45	27.74	0.006	0.039
30°	-2.17	31.87	0.003	0.045
20°	-3.02	-34.33	0.004	0.049
10°	-2.82	-29.3	0.004	0.041
0°	-2.99	-33.26	0.004	0.047
- 10°	-3.88	34.42	0.005	0.049
- 20°	-4.33	39.47	0.006	0.056
- 30°	-4.32	36.33	0.006	0.051

LTE Band 17, 5MHz bandwidth (worst case of all bandwidths)

Frequency Error vs Voltage

Voltage (V)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
3.6	-3.1	-20.44	0.004	0.029
3.8	-2.82	-20.94	0.004	0.029
4.2	-3.35	-22.24	0.005	0.031

Frequency Error vs Temperature

Temperature (℃)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
50°	-2.59	-14.71	0.004	0.021
40°	-2.46	-19.33	0.003	0.027
30°	-2.83	-15.05	0.004	0.021
20°	-3.16	-15.54	0.004	0.022
10°	-3.46	-19.76	0.005	0.028
0°	-2.62	-10.97	0.004	0.015
- 10°	-3.76	-11.64	0.005	0.016
- 20°	-2.46	-13.32	0.003	0.019
- 30°	-3.15	-14.59	0.004	0.021

ANNEX A.4. OCCUPIED BANDWIDTH

Reference

FCC: CFR Part 2.1049(h)(i)

A.4.1 Occupied Bandwidth Results

Occupied bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequencies of the US Cellular/PCS frequency bands. The table below lists the measured 99% BW. Spectrum analyzer plots are included on the following pages.

The measurement method is from KDB 971168 4.0:

a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be set wide enough to capture all modulation products including the emission skirts (i.e., two to five times the OBW).

b) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1 to 5 % of the anticipated OBW, and the VBW shall be at least 3 times the RBW.

c) Set the reference level of the instrument as required to keep the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope must be at least 10log (OBW / RBW) below the reference level.

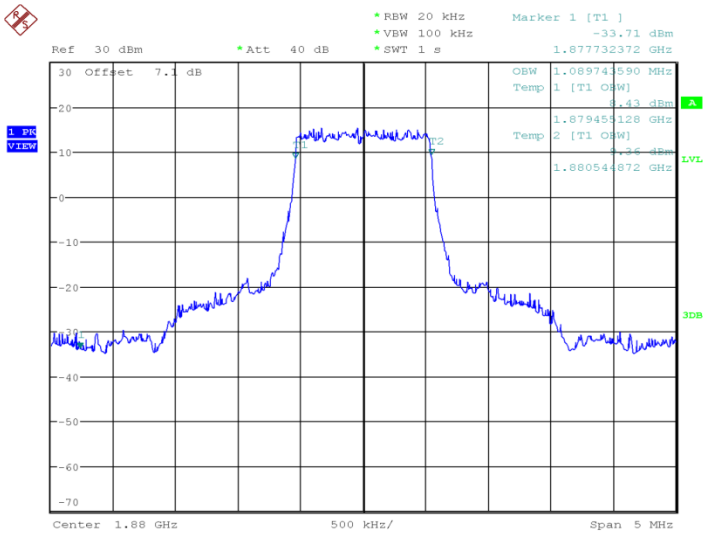
d) Set the detection mode to peak, and the trace mode to max hold.

e) Use the 99 % power bandwidth function of the spectrum analyzer and report the measured bandwidth.

LTE band 2, 1.4MHz (99%)

Frequency(MHz)	Occupied Bandwidth (99%)(MHz)	
1880.0	QPSK	16QAM
	1.09	1.09

LTE band 2, 1.4MHz Bandwidth, QPSK (99% BW)



IF Overload

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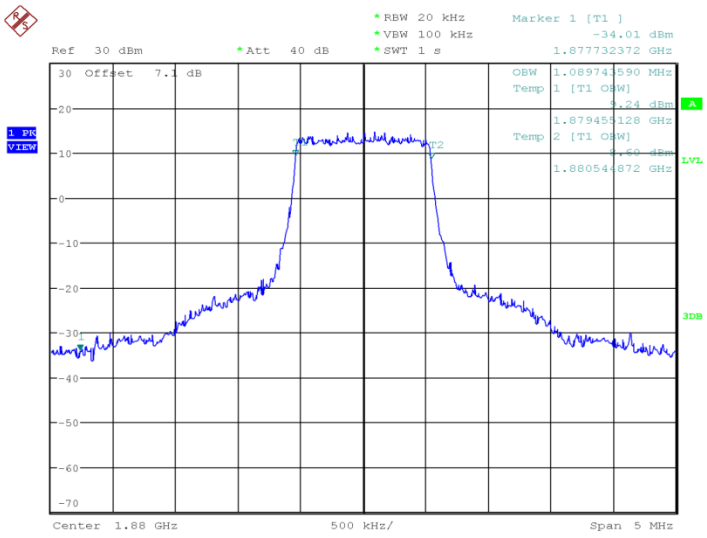
LTE band 2, 1.4MHz Bandwidth, 16QAM (99% BW)



IF Overload

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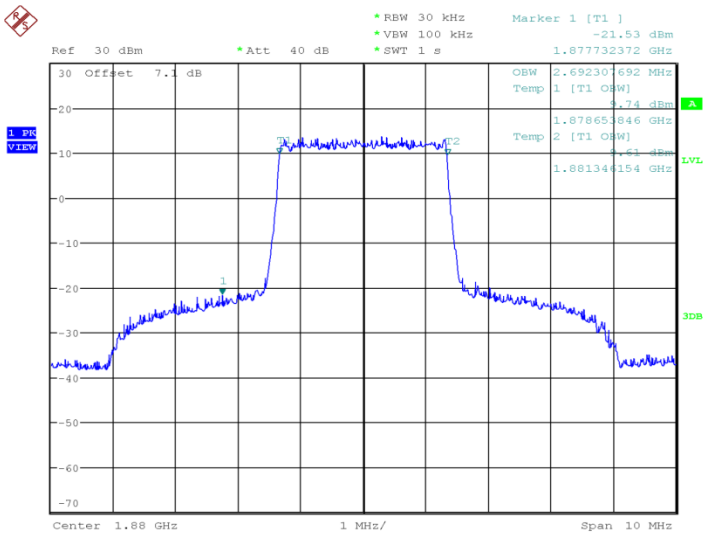
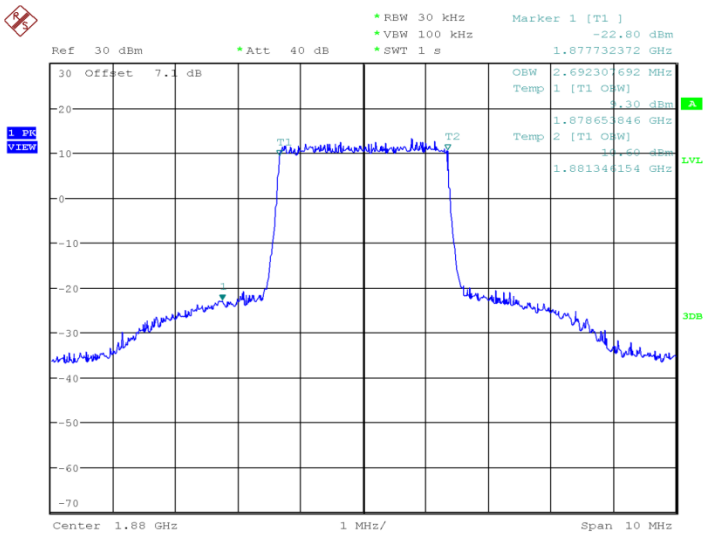
LTE band 2, 3MHz (99%)

Frequency(MHz)	Occupied Bandwidth (99%)(MHz)	
1880.0	QPSK	16QAM
	2.692	2.692

LTE band 2, 3MHz Bandwidth, QPSK (99% BW)



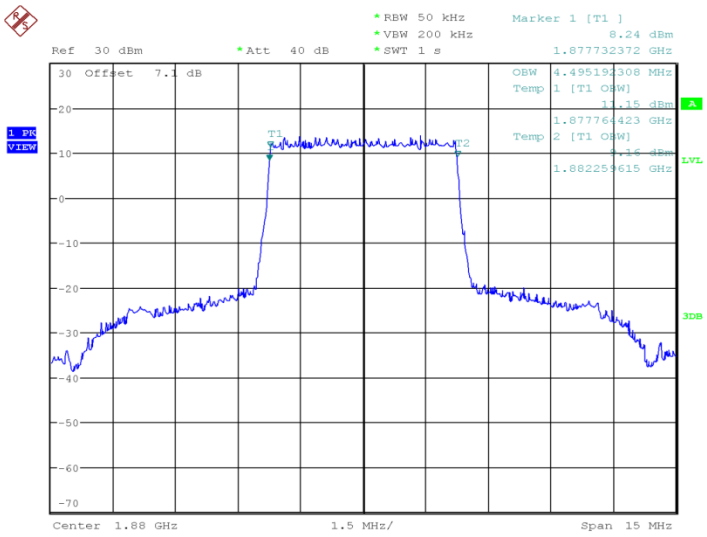
LTE band 2, 3MHz Bandwidth, 16QAM (99% BW)



LTE band 2, 5MHz (99%)

Frequency(MHz)	Occupied Bandwidth (99%)(MHz)	
1880.0	QPSK	16QAM
	4.495	4.471

LTE band 2, 5MHz Bandwidth, QPSK (99% BW)



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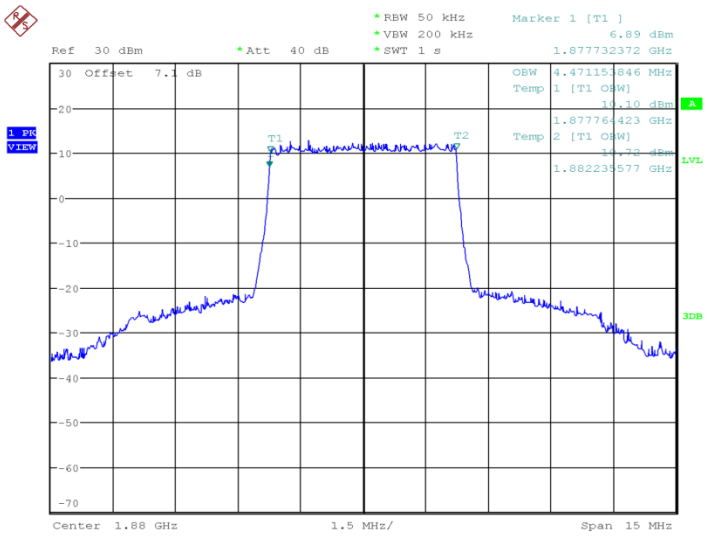
LTE band 2, 5MHz Bandwidth,16QAM (99% BW)



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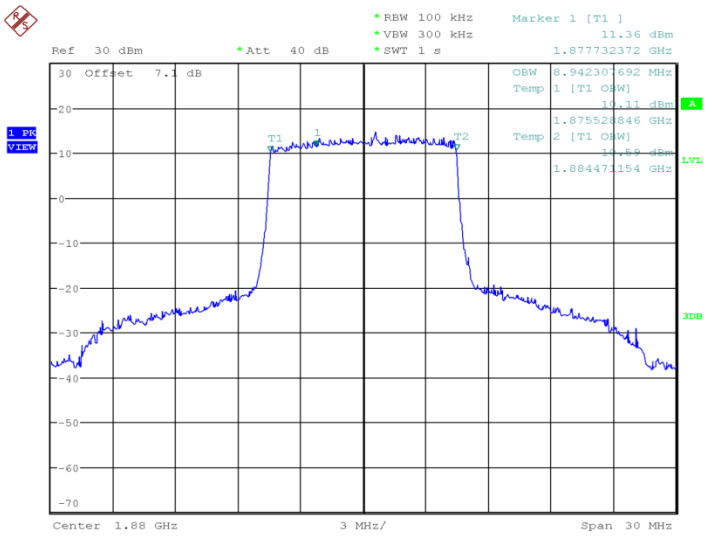
LTE band 2, 10MHz (99%)

Frequency(MHz)	Occupied Bandwidth (99%)(MHz)	
1880.0	QPSK	16QAM
	8.942	8.942

LTE band 2, 10MHz Bandwidth, QPSK (99% BW)



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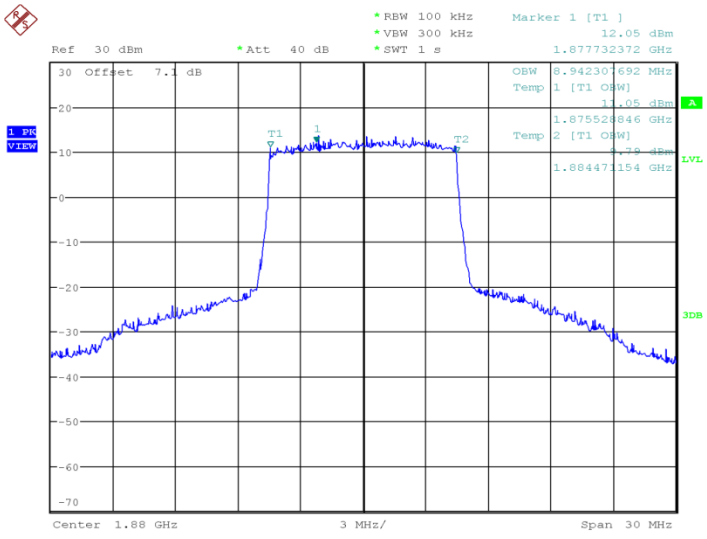
LTE band 2, 10MHz Bandwidth, 16QAM (99% BW)



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