TEST REPORT

No. I15Z42203-GTE03

for

TCL Communication Ltd.

GSM Quad-band / UMTS Tri-band / LTE Quad-band mobile phone

Model Name: A621BL

FCC ID: 2ACCJA009

with

Hardware Version: 06

Software Version: SVN 01

Issued Date: 2015-09-17

Note:

The test results in this test report relate only to the devices specified in this report. This report shall not be reproduced except in full without the written approval of CTTL.

Test Laboratory:

FCC 2.948 Listed: No.525429

CTTL,Telecommunication Technology Labs, Academy of Telecommunication Research, MIIT

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REPORT HISTORY

Report Number	Revision	Description	Issue Date
I15Z42203-GTE03	Rev.0	1st edition	2015-09-17

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CONTENTS

1. TEST LABORATORY 4
1.1. TESTING LOCATION 4
1.2. TESTING ENVIRONMENT 4
1.3. PROJECT DATA 4
1.4. SIGNATURE 4
2. CLIENT INFORMATION 5
2.1. APPLICANT INFORMATION 5
2.2. MANUFACTURER INFORMATION 5
3. EQUIPMENT UNDER TEST (EUT) AND ANCILLARY EQUIPMENT (AE) 6
3.1. ABOUT EUT 6
3.2. INTERNAL IDENTIFICATION OF EUT USED DURING THE TEST 6
3.3. INTERNAL IDENTIFICATION OF AE USED DURING THE TEST 6
3.4. GENERAL DESCRIPTION 6
4. REFERENCE DOCUMENTS 7
4.1. REFERENCE DOCUMENTS FOR TESTING 7
5. LABORATORY ENVIRONMENT 8
6. SUMMARY OF TEST RESULTS 9
6.1. SUMMARY OF TEST RESULTS 9
6.2. STATEMENTS 11
7. TEST EQUIPMENTS UTILIZED 12
ANNEX A: MEASUREMENT RESULTS 13
A.1 OUTPUT POWER 13
A.2 EMISSION LIMIT 30
A.3 FREQUENCY STABILITY 40
A.4 OCCUPIED BANDWIDTH 43
A.5 EMISSION BANDWIDTH 62
A.6 BAND EDGE COMPLIANCE 81
A.7 CONDUCTED SPURIOUS EMISSION 94
A.8 PEAK-TO-AVERAGE POWER RATIO 97

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1. Test Laboratory

1.1. Testing Location

Company Name:	CTTL,Telecommunication Technology Labs, Academy of Telecommunication Research, MIIT
Address:	No. 52, Huayuan North Road, Haidian District, Beijing, P. R. China 100191
Postal Code:	100191
Telephone:	00861062304633
Fax:	00861062304793

1.2. Testing Environment

Normal Temperature:	15-35℃
Relative Humidity:	20-75%
Air pressure	980 - 1040 hPa

The climatic requirements above are general exclude the special requirements for dedicated test environments listed in section 5 and some specific test cases in other parts of this report.

1.3. Project data

Testing Start Date:	2015-08-11
Testing End Date:	2015-09-14

1.4. Signature

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2. Client Information

2.1. Applicant Information

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2.2. Manufacturer Information

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Contact Person:	Gong Zhizhou
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3. Equipment Under Test (EUT) and Ancillary Equipment (AE)

3.1. About EUT

Description	GSM Quad-band / UMTS Tri-band / LTE Quad-band mobile phone
Model Name	A621BL
FCC ID	2ACCJA009
Antenna	Integrated
Output power	27.27dBm maximum EIRP measured for LTE Band 4
Extreme vol. Limits	3.5VDC to 4.35VDC (nominal: 3.8VDC)
Extreme temp. Tolerance	-30°C to +50°C

Note: Components list, please refer to documents of the manufacturer; it is also included in the original test record of CTTL, Telecommunication Technology Labs, Academy of Telecommunication Research, MIIT

3.2. Internal Identification of EUT used during the test

EUT ID*	IMEI	HW Version	SW Version
UT16a	014470000050756	06	SVN 01
UT11a	014470000050194	06	SVN 01

*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
AE1	Battery
AE2	Travel charger

AE1

Model	CAC2500028C2
Manufacturer	SCUD (LG)
Capacitance	2500mAh

AE2

Model	CBA0057AG0C1
Manufacturer	BYD

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

3.4. General Description

The Equipment Under Test (EUT) is a model of GSM Quad-band / UMTS Tri-band / LTE Quad-band mobile phone with integrated antenna. Manual and specifications of the EUT were provided to fulfil the test.

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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	10-1-14 Edition
FCC Part 24	PERSONAL COMMUNICATIONS SERVICES	10-1-14 Edition
FCC Part 27	MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES	10-1-14 Edition
ANSI/TIA-603-D	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards	2015
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	v02r02

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5. LABORATORY ENVIRONMENT

Semi-anechoic chamber SAC-1 (23 meters×17meters×10meters) did not exceed following limits along the EMC testing:

Temperature	Min. = 15 ℃, Max. = 35 ℃
Relative humidity	Min. = 15 %, Max. = 75 %
Shielding effectiveness	0.014MHz - 1MHz, >60dB; 1MHz - 1000MHz, >90dB.
Electrical insulation	> 2 MΩ
Ground system resistance	< 4Ω
Normalised site attenuation (NSA)	< ± 4 dB, 3m/10m distance, from 30 to 1000 MHz
Site voltage standing-wave ratio (S_{VSWR})	Between 0 and 6 dB, from 1GHz to 18GHz
Uniformity of field strength	Between 0 and 6 dB, from 80 to 3000 MHz

Fully-anechoic chamber FAC-3 (9 meters×6.5 meters×4 meters) did not exceed following limits along the EMC testing:

Temperature	Min. = 15 ℃, Max. = 35 ℃
Relative humidity	Min. = 15 %, Max. = 75 %
Shielding effectiveness	0.014MHz - 1MHz, >60dB; 1MHz - 1000MHz, >90dB.
Electrical insulation	> 2 MΩ
Ground system resistance	< 4 Ω
Site voltage standing-wave ratio (S_{VSWR})	Between 0 and 6 dB, from 1GHz to 18GHz
Uniformity of field strength	Between 0 and 6 dB, from 80 to 4000 MHz

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

Temperature	Min. = 15 ℃, Max. = 35 ℃
Relative humidity	Min. = 20 %, Max. = 75 %
Shielding effectiveness	0.014MHz - 1MHz, >60dB; 1MHz - 1000MHz, >90dB.
Electrical insulation	> 2 MΩ
Ground system resistance	< 4 Ω

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6. SUMMARY OF TEST RESULTS

6.1. Summary of test results

Abbreviations used in this clause:		
Verdict Column	P	Pass
	F	Fail
	NA	Not applicable
	NM	Not measured
Location Column	A/B/C/D	The test is performed in test location A, B, C or D which are described in section 1.1 of this report

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

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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 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

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6.2. Statements

The test cases listed in section 6.1 of this report for the EUT specified in section 3 were performed by CTTL according to the standards or reference documents in section 4.1

The EUT met all applicable requirements of the standards or reference documents in section 4.1.

This report only deals with the LTE functions among the features described in section 3.

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7. Test Equipments Utilized

NO.	Description	TYPE	series number	MANUFACTURE	CAL DUE DATE	Calibration interval
1	Test Receiver	ESCI	100344	R&S	2016-03-02	1 year
2	Test Receiver	ESU26	100376	R&S	2015-10-29	1 year
3	EMI Antenna	VULB 9163	302	Schwarzbeck	2017-1-3	3 year
4	EMI Antenna	3117	00119024	ETS-Lindgren	2016-01-20	3 year
5	LISN	NV216	101200	R&S	2016-07-07	1 year
6	Universal Radio Communication Tester	CMW500	101675	R&S	2016-07-13	1 year
7	Universal Radio Communication Tester	E5515C	MY48361083	Agilent	2016-02-27	1 year
8	Spectrum Analyzer	E4440A	MY48250642	Agilent	2016-03-02	1 year
9	EMI Antenna	9117	167	Schwarzbeck	2016-04-01	3 year
10	EMI Antenna	VULB9163	9163-234	Schwarzbeck	2016-09-15	3 year
11	EMI Antenna	3117	00119024	ETS-Lindgren	2016-01-20	3 year
12	Signal Generator	N5183A	MY49060052	Agilent	2016-03-02	1 year
13	Climate chamber	SH-241	92007454	ESPEC	2015-12-14	2 year
14	Loop Antenna	HFH2-Z2	829324/007	R&S	2017-12-10	3 year

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ANNEX A: MEASUREMENT RESULTS

A.1 OUTPUT POWER

Reference

FCC: 22.913(a) ,24.232(c), 27.50(c)(10),27.50(d)(4)

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	1909.3	22.97	22.03
		1880.0	22.75	21.98
		1850.7	22.82	21.77
	1 RB low	1909.3	23.00	22.02
		1880.0	22.80	21.91
		1850.7	22.78	21.82
	50% RB mid	1909.3	22.94	21.94
		1880.0	23.01	22.21
		1850.7	23.07	22.05
	100% RB	1909.3	21.95	21.04
		1880.0	21.84	21.00
		1850.7	21.81	20.96
3MHz	1 RB high	1908.5	22.89	21.84
		1880.0	22.86	21.85
		1851.5	22.78	21.77
	1 RB low	1908.5	23.01	22.08
		1880.0	22.96	21.91
		1851.5	22.77	21.76
	50% RB mid	1908.5	21.91	21.23

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		1880.0	21.94	21.08
		1851.5	21.83	20.90
	100% RB	1908.5	21.89	20.88
		1880.0	21.91	20.77
		1851.5	21.87	20.94
5MHz	1 RB high	1907.5	22.90	22.33
		1880.0	22.87	21.95
		1852.5	22.72	21.83
	1 RB low	1907.5	23.19	22.50
		1880.0	22.73	21.88
		1852.5	22.79	21.81
	50% RB mid	1907.5	21.94	21.18
		1880.0	21.80	20.87
		1852.5	21.91	20.83
	100% RB	1907.5	21.98	20.88
		1880.0	21.85	21.02
		1852.5	21.86	20.96
10MHz	1 RB high	1905.0	22.95	22.28
		1880.0	22.88	21.98
		1855.0	22.74	21.83
	1 RB low	1905.0	22.90	22.14
		1880.0	22.92	21.97
		1855.0	22.97	22.00
	50% RB mid	1905.0	21.91	21.02
		1880.0	21.84	20.80
		1855.0	21.90	20.77
	100% RB	1905.0	21.90	21.05
		1880.0	21.97	20.99
		1855.0	21.95	20.97
15MHz	1 RB high	1902.5	23.06	22.02
		1880.0	22.96	22.30
		1857.5	22.70	21.81
	1 RB low	1902.5	23.12	22.26
		1880.0	23.07	22.23
		1857.5	23.03	22.02
	50% RB mid	1902.5	21.84	20.75
		1880.0	21.87	20.90
		1857.5	21.85	20.77
	100% RB	1902.5	21.86	20.87

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		1880.0	21.88	20.91
		1857.5	21.80	20.81
20MHz	1 RB high	1900.0	23.07	22.21
		1880.0	23.24	22.52
		1860.0	23.00	22.20
	1 RB low	1900.0	23.35	22.40
		1880.0	23.41	22.73
		1860.0	23.22	22.06
	50% RB mid	1900.0	21.86	20.88
		1880.0	21.83	20.87
		1860.0	21.85	20.86
	100% RB	1900.0	21.86	20.98
		1880.0	21.92	21.01
		1860.0	21.81	20.85

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LTE band 4

Bandwidth	RB size/offset	Frequency (MHz)	Power(dBm)	
			QPSK	16QAM
1.4MHz	1 RB high	1754.3	22.62	21.83
		1732.5	22.58	21.56
		1710.7	22.55	21.77
	1 RB low	1754.3	22.63	21.74
		1732.5	22.55	21.51
		1710.7	22.78	21.71
	50% RB mid	1754.3	22.68	21.83
		1732.5	22.75	21.63
		1710.7	22.66	21.70
	100% RB	1754.3	21.72	20.82
		1732.5	21.68	20.79
		1710.7	21.59	20.83
3MHz	1 RB high	1753.5	22.67	21.90
		1732.5	22.54	21.51
		1711.5	22.50	21.78
	1 RB low	1753.5	22.64	21.82
		1732.5	22.69	21.75
		1711.5	22.63	21.83
	50% RB mid	1753.5	21.77	20.79
		1732.5	21.64	20.83
		1711.5	21.56	20.66
	100% RB	1753.5	21.74	20.65
		1732.5	21.69	20.73
		1711.5	21.59	20.62
5MHz	1 RB high	1752.5	22.57	22.05
		1732.5	22.59	21.56
		1712.5	22.54	21.48
	1 RB low	1752.5	22.87	22.04
		1732.5	22.77	21.94
		1712.5	22.51	21.53
	50% RB mid	1752.5	21.69	20.68
		1732.5	21.67	20.55
		1712.5	21.60	20.69
	100% RB	1752.5	21.68	20.85
		1732.5	21.66	20.68
		1712.5	21.63	20.66
10MHz	1 RB high	1750	22.55	21.79
		1732.5	22.49	21.50

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		1715	22.64	21.68
	1 RB low	1750	22.69	21.95
		1732.5	22.80	21.79
		1715	22.82	21.73
	50% RB mid	1750	21.67	20.80
		1732.5	21.72	20.83
		1715	21.70	20.61
	100% RB	1750	21.71	20.76
		1732.5	21.68	20.69
		1715	21.66	20.67
15MHz	1 RB high	1747.5	22.56	21.83
		1732.5	22.62	21.77
		1717.5	22.65	21.73
	1 RB low	1747.5	22.64	21.91
		1732.5	22.86	22.01
		1717.5	22.81	21.87
	50% RB mid	1747.5	21.71	20.70
		1732.5	21.69	20.75
		1717.5	21.77	20.78
	100% RB	1747.5	21.57	20.65
		1732.5	21.69	20.69
		1717.5	21.74	20.79
20MHz	1 RB high	1745	22.85	21.94
		1732.5	22.63	21.54
		1720	22.78	21.91
	1 RB low	1745	22.91	22.04
		1732.5	22.85	22.01
		1720	22.93	22.15
	50% RB mid	1745	21.71	20.77
		1732.5	21.73	20.68
		1720	21.74	20.86
	100% RB	1745	21.69	20.63
		1732.5	21.71	20.69
		1720	21.73	20.74

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LTE band 5

Bandwidth	RB size/offset	Frequency (MHz)	Power(dBm)	
			QPSK	16QAM
1.4MHz	1 RB high	848.3	22.85	22.10
		836.5	22.68	21.55
		824.7	22.83	22.00
	1 RB low	848.3	22.79	22.18
		836.5	22.56	21.66
		824.7	23.02	21.89
	50% RB mid	848.3	23.01	21.89
		836.5	22.84	21.96
		824.7	22.90	21.83
	100% RB	848.3	21.80	20.90
		836.5	21.81	20.62
		824.7	21.81	20.96
3MHz	1 RB high	847.5	22.81	21.82
		836.5	22.51	21.99
		825.5	22.71	21.97
	1 RB low	847.5	22.97	22.05
		836.5	22.74	22.10
		825.5	22.84	22.11
	50% RB mid	847.5	21.87	20.69
		836.5	21.87	20.68
		825.5	21.85	20.65
	100% RB	847.5	21.92	20.95
		836.5	21.89	20.90
		825.5	21.88	20.80
5MHz	1 RB high	846.5	22.51	21.69
		836.5	22.67	21.67
		826.5	22.66	21.41
	1 RB low	846.5	22.82	21.80
		836.5	22.75	21.97
		826.5	22.89	21.81
	50% RB mid	846.5	21.89	20.96
		836.5	21.88	20.69
		826.5	21.85	20.97
	100% RB	846.5	21.89	20.72
		836.5	21.88	20.84
		826.5	21.83	21.03
10MHz	1 RB high	844.0	22.86	22.07
		836.5	22.81	21.91

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		829.0	22.70	21.95
	1 RB low	844.0	22.77	22.15
		836.5	22.98	21.92
		829.0	23.02	22.25
	50% RB mid	844.0	21.83	20.84
		836.5	21.97	20.85
		829.0	21.80	20.91
	100% RB	844.0	21.85	20.83
		836.5	21.90	20.95
		829.0	21.85	20.84

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LTE band 17

Bandwidth	RB size/offset	Frequency (MHz)	Power(dBm)	
			QPSK	16QAM
5MHz	1 RB high	713.5	22.83	21.31
		710.0	22.84	21.46
		706.5	22.74	21.91
	1 RB low	713.5	22.53	21.20
		710.0	22.92	21.65
		706.5	22.98	22.06
	50% RB mid	713.5	21.93	20.99
		710.0	21.89	20.95
		706.5	21.85	20.92
	100% RB	713.5	21.96	21.12
		710.0	21.89	21.00
		706.5	21.85	20.89
10MHz	1 RB high	711	22.83	21.93
		710	22.81	22.03
		709	22.77	21.88
	1 RB low	711	22.95	22.24
		710	22.76	22.24
		709	22.98	22.31
	50% RB mid	711	21.80	20.74
		710	21.90	21.04
		709	21.81	20.82
	100% RB	711	21.87	20.85
		710	21.78	20.74
		709	21.96	20.91

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A.1.3 Radiated

A.1.3.1 Description

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

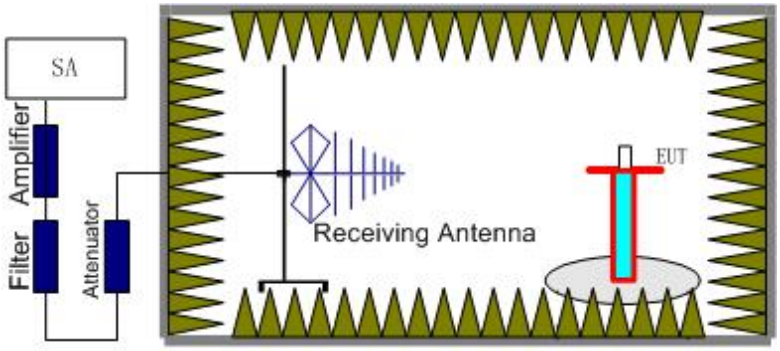
Rule Part 24.232(b) specifies, "Mobile/portable stations are limited to 2 watts e.i.r.p. Peak power" and 24.232(c) specifies that "Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage."

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”

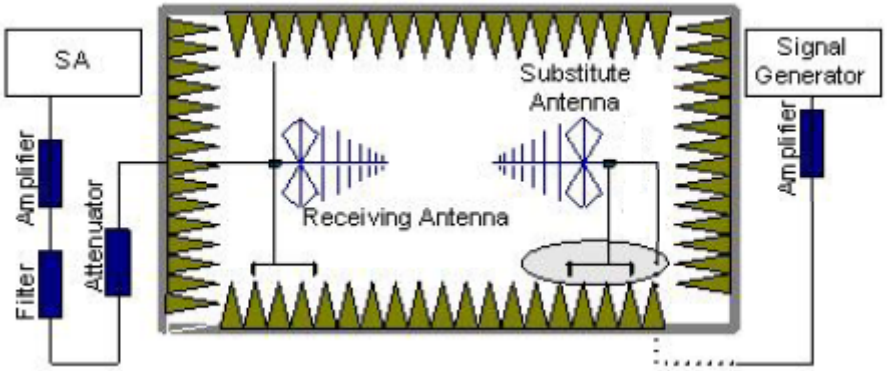
A.1.3.2 Method of Measurement

The measurements procedures in TIA-603D-2015 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

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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.

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A.1.3.3 Measurement result

LTE Band 2-EIRP

Limits: ≤33dBm (2W)

LTE Band 2_1.4MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dB)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1850.70	-22.08	2.92	-43.75	-4.87	23.62	33.00	9.38	H
1880.00	-21.96	2.85	-43.75	-4.82	**23.76**	33.00	9.24	H
1909.30	-22.85	2.87	-43.77	-4.76	22.81	33.00	10.19	H

LTE Band 2_3MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dB)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1851.50	-22.34	2.87	-43.75	-4.87	23.41	33.00	9.59	H
1880.00	-21.95	2.85	-43.75	-4.82	**23.77**	33.00	9.23	H
1908.50	-23.41	2.89	-43.78	-4.76	22.24	33.00	10.76	H

LTE Band 2_5MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dB)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1852.50	-22.11	2.87	-43.75	-4.87	**23.64**	33.00	9.36	H
1880.00	-22.14	2.85	-43.75	-4.82	23.58	33.00	9.42	H
1907.50	-23.57	2.84	-43.77	-4.77	22.13	33.00	10.87	H

LTE Band 2_10MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dB)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1855.00	-22.02	2.88	-43.74	-4.86	23.70	33.00	9.30	H
1880.00	-21.84	2.85	-43.75	-4.82	**23.88**	33.00	9.12	H
1905.00	-23.32	2.87	-43.77	-4.77	22.35	33.00	10.65	H

LTE Band 2_15MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dB)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1857.50	-21.91	2.87	-43.75	-4.86	**23.83**	33.00	9.17	H
1880.00	-22.18	2.85	-43.75	-4.82	23.54	33.00	9.46	H
1902.50	-23.45	2.86	-43.77	-4.78	22.24	33.00	10.76	H

LTE Band 2_20 MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dB)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1860.00	-21.93	2.86	-43.75	-4.85	23.81	33.00	9.19	H
1880.00	-21.85	2.85	-43.75	-4.82	**23.87**	33.00	9.13	H
1900.00	-23.22	2.87	-43.77	-4.78	22.46	33.00	10.54	H

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LTE Band 2_1.4MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dB)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1850.70	-23.00	2.92	-43.75	-4.87	22.70	33.00	10.30	H
1880.00	-22.77	2.85	-43.75	-4.82	**22.95**	33.00	10.05	H
1909.30	-23.78	2.87	-43.77	-4.76	21.88	33.00	11.12	H

LTE Band 2_3MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dB)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1851.50	-23.38	2.87	-43.75	-4.87	22.37	33.00	10.63	H
1880.00	-23.01	2.85	-43.75	-4.82	**22.71**	33.00	10.29	H
1908.50	-24.16	2.89	-43.78	-4.76	21.49	33.00	11.51	H

LTE Band 2_5MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dB)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1852.50	-23.00	2.87	-43.75	-4.87	22.75	33.00	10.25	H
1880.00	-22.78	2.85	-43.75	-4.82	**22.94**	33.00	10.06	H
1907.50	-24.40	2.84	-43.77	-4.77	21.30	33.00	11.70	H

LTE Band 2_10MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dB)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1855.00	-23.29	2.88	-43.74	-4.86	22.43	33.00	10.57	H
1880.00	-22.87	2.85	-43.75	-4.82	**22.85**	33.00	10.15	H
1905.00	-24.18	2.87	-43.77	-4.77	21.49	33.00	11.51	H

LTE Band 2_15MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dB)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1857.50	-22.53	2.87	-43.75	-4.86	**23.21**	33.00	9.79	H
1880.00	-23.22	2.85	-43.75	-4.82	22.50	33.00	10.50	H
1902.50	-24.77	2.86	-43.77	-4.78	20.92	33.00	12.08	H

LTE Band 2_20 MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dB)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1860.00	-22.91	2.86	-43.75	-4.85	**22.83**	33.00	10.17	H
1880.00	-22.93	2.85	-43.75	-4.82	22.79	33.00	10.21	H
1900.00	-24.31	2.87	-43.77	-4.78	21.37	33.00	11.63	H

Peak EIRP(dBm) = P_{Mea}(-21.84dBm) - G_a (-4.82dBi) - P_{Ag} (-43.75dB) - P_{cl} (2.85dB) = 23.88dBm

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LTE Band 4- EIRP

Limits: ≤30dBm (1W)

LTE Band 4_1.4MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dB)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1710.70	-19.72	3.17	-44.10	-5.12	**26.33**	30.00	3.67	H
1732.50	-20.28	3.33	-44.14	-5.08	25.61	30.00	4.39	H
1754.30	-20.66	3.76	-44.14	-5.04	24.76	30.00	5.24	H

LTE Band 4_3MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dB)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1711.50	-19.59	3.40	-44.10	-5.12	**26.23**	30.00	3.77	H
1732.50	-20.87	3.33	-44.14	-5.08	25.02	30.00	4.98	H
1753.50	-20.87	3.80	-44.13	-5.04	24.50	30.00	5.50	H

LTE Band 4_5MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dB)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1712.50	-19.31	3.66	-44.10	-5.12	**26.25**	30.00	3.75	H
1732.50	-20.74	3.33	-44.14	-5.08	25.15	30.00	4.85	H
1752.50	-20.90	3.82	-44.14	-5.05	24.47	30.00	5.53	H

LTE Band 4_10MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dB)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1715.00	-18.97	3.56	-44.10	-5.11	**26.68**	30.00	3.32	H
1732.50	-20.64	3.33	-44.14	-5.08	25.25	30.00	4.75	H
1750.50	-21.60	3.16	-44.14	-5.05	24.43	30.00	5.57	H

LTE Band 4_15MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dB)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1717.50	-18.83	3.47	-44.11	-5.11	**26.92**	30.00	3.08	H
1732.50	-20.67	3.33	-44.14	-5.08	25.22	30.00	4.78	H
1747.50	-21.47	3.34	-44.15	-5.05	24.39	30.00	5.61	H

LTE Band 4_20MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dB)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1720.00	-18.57	3.37	-44.11	-5.10	**27.27**	30.00	2.73	H
1732.50	-20.82	3.33	-44.14	-5.08	25.07	30.00	4.93	H
1745.00	-20.67	3.68	-44.16	-5.06	24.87	30.00	5.13	H

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LTE Band 4_1.4MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dB)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1710.70	-20.64	3.17	-44.10	-5.12	**25.41**	30.00	4.59	H
1732.50	-21.12	3.33	-44.14	-5.08	24.77	30.00	5.23	H
1754.30	-21.27	3.76	-44.14	-5.04	24.15	30.00	5.85	H

LTE Band 4_3MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dB)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1711.50	-20.56	3.40	-44.10	-5.12	**25.26**	30.00	4.74	H
1732.50	-21.86	3.33	-44.14	-5.08	24.03	30.00	5.97	H
1753.50	-22.18	3.80	-44.13	-5.04	23.19	30.00	6.81	H

LTE Band 4_5MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dB)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1712.50	-20.15	3.66	-44.10	-5.12	**25.41**	30.00	4.59	H
1732.50	-21.62	3.33	-44.14	-5.08	24.27	30.00	5.73	H
1752.50	-21.74	3.82	-44.14	-5.05	23.63	30.00	6.37	H

LTE Band 4_10MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dB)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1715.00	-19.72	3.56	-44.10	-5.11	**25.93**	30.00	4.07	H
1732.50	-21.59	3.33	-44.14	-5.08	24.30	30.00	5.70	H
1750.50	-22.55	3.16	-44.14	-5.05	23.48	30.00	6.52	H

LTE Band 4_15MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dB)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1717.50	-19.80	3.47	-44.11	-5.11	**25.95**	30.00	4.05	H
1732.50	-21.80	3.33	-44.14	-5.08	24.09	30.00	5.91	H
1747.50	-22.57	3.34	-44.15	-5.05	23.29	30.00	6.71	H

LTE Band 4_20MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dB)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1720.00	-19.41	3.37	-44.11	-5.10	**26.43**	30.00	3.57	H
1732.50	-21.76	3.33	-44.14	-5.08	24.13	30.00	5.87	H
1745.00	-21.62	3.68	-44.16	-5.06	23.92	30.00	6.08	H

Peak EIRP(dBm) = P_{Mea}(-18.57dBm) - G_a (-5.10dBi) - P_{Ag} (-44.11dB) - P_{cl} (3.37dB) = 27.27dBm

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LTE Band 5-ERP

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(dB)	Correction (dB)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
824.70	-23.32	2.26	-45.79	-0.95	2.15	**19.01**	38.45	19.44	V
836.50	-23.24	2.26	-45.66	-0.82	2.15	18.83	38.45	19.62	V
848.30	-23.51	2.27	-45.55	-0.80	2.15	18.42	38.45	20.03	V

LTE Band 5_3MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dB)	Correction (dB)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
825.50	-23.69	2.26	-45.79	-0.94	2.15	18.63	38.45	19.82	V
836.50	-23.37	2.26	-45.66	-0.82	2.15	**18.70**	38.45	19.75	V
847.50	-23.85	2.27	-45.56	-0.81	2.15	18.10	38.45	20.35	V

LTE Band 5_5MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dB)	Correction (dB)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
826.50	-23.64	2.25	-45.77	-0.93	2.15	**18.66**	38.45	19.79	H
836.50	-23.72	2.26	-45.66	-0.82	2.15	18.35	38.45	20.10	V
846.50	-23.89	2.26	-45.56	-0.82	2.15	18.08	38.45	20.37	V

LTE Band 5_10MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dB)	Correction (dB)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
829.00	-23.70	2.13	-45.74	-0.90	2.15	**18.66**	38.45	19.79	V
836.50	-23.43	2.26	-45.66	-0.82	2.15	18.64	38.45	19.81	V
844.00	-24.06	2.26	-45.59	-0.82	2.15	17.94	38.45	20.51	V

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LTE Band 5_1.4MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dB)	Correction (dB)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
824.70	-24.20	2.26	-45.79	-0.95	2.15	**18.13**	38.45	20.32	V
836.50	-24.19	2.26	-45.66	-0.82	2.15	17.88	38.45	20.57	V
848.30	-24.36	2.27	-45.55	-0.80	2.15	17.57	38.45	20.88	V

LTE Band 5_3MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dB)	Correction (dB)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
825.50	-24.42	2.26	-45.79	-0.94	2.15	**17.90**	38.45	20.55	H
836.50	-24.45	2.26	-45.66	-0.82	2.15	17.62	38.45	20.83	V
847.50	-24.60	2.27	-45.56	-0.81	2.15	17.35	38.45	21.10	V

LTE Band 5_5MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dB)	Correction (dB)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
826.50	-24.40	2.25	-45.77	-0.93	2.15	**17.90**	38.45	20.55	H
836.50	-24.79	2.26	-45.66	-0.82	2.15	17.28	38.45	21.17	V
846.50	-24.50	2.26	-45.56	-0.82	2.15	17.47	38.45	20.98	V

LTE Band 5_10MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dB)	Correction (dB)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
829.00	-24.54	2.13	-45.74	-0.90	2.15	**17.82**	38.45	20.63	V
836.50	-24.62	2.26	-45.66	-0.82	2.15	17.45	38.45	21.00	V
844.00	-24.69	2.26	-45.59	-0.82	2.15	17.31	38.45	21.14	V

Peak ERP(dBm)=P_{Mea}(-23.32dBm)-G_a(-0.95dBi)-P_{Ag}(-45.79dB)-P_{cl} (2.26dB)-2.15dB = 19.01dBm

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LTE Band 17- ERP

Limits: ≤34.77dBm (3W)

LTE Band 17_5MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dB)	Correction (dB)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
706.50	-26.06	1.91	-45.53	-0.66	2.15	16.07	34.77	18.70	V
710.00	-26.09	1.92	-45.68	-0.54	2.15	16.06	34.77	18.71	V
713.50	-25.26	1.92	-45.22	-0.50	2.15	**16.39**	34.77	18.38	V

LTE Band 17_10MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dB)	Correction (dB)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
709.00	-25.91	1.92	-45.64	-0.57	2.15	16.24	34.77	18.54	V
710.00	-25.94	1.92	-45.68	-0.54	2.15	16.21	34.77	18.56	V
711.00	-25.18	1.92	-45.19	-0.53	2.15	**16.47**	34.77	18.30	V

LTE Band 17_5MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dB)	Correction (dB)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
706.50	-27.00	1.91	-45.53	-0.66	2.15	15.13	34.77	19.64	V
710.00	-27.75	1.92	-45.68	-0.54	2.15	14.40	34.77	20.37	V
713.50	-26.24	1.92	-45.22	-0.50	2.15	**15.41**	34.77	19.36	V

LTE Band 17_10MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a Antenna Gain(dB)	Correction (dB)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
709.00	-26.70	1.92	-45.64	-0.57	2.15	**15.45**	34.77	19.33	V
710.00	-27.40	1.92	-45.68	-0.54	2.15	14.75	34.77	20.02	V
711.00	-26.44	1.92	-45.19	-0.53	2.15	15.21	34.77	19.56	V

Peak ERP(dBm)=P_{Mea}(-25.18dBm)-G_a(-0.53dBi)-P_{Ag}(-45.19dB)-P_{cl} (1.92dB)-2.15dB = 16.47dBm

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.

Note: Expanded measurement uncertainty is U = 0.96 dB, k = 2.

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A.2 EMISSION LIMIT

Reference

FCC: CFR 2.1051, 22.913(a) ,24.238(a), 27.53(g)

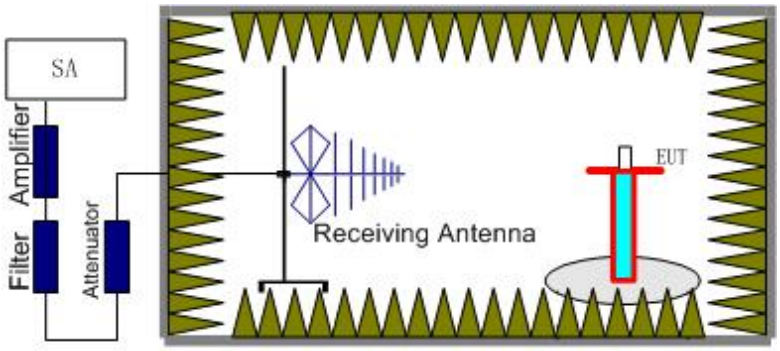
A.2.1 Measurement Method

The measurements procedures in TIA-603D-2015 are used. This measurement is carried out in fully-anechoic chamber FAC-3.

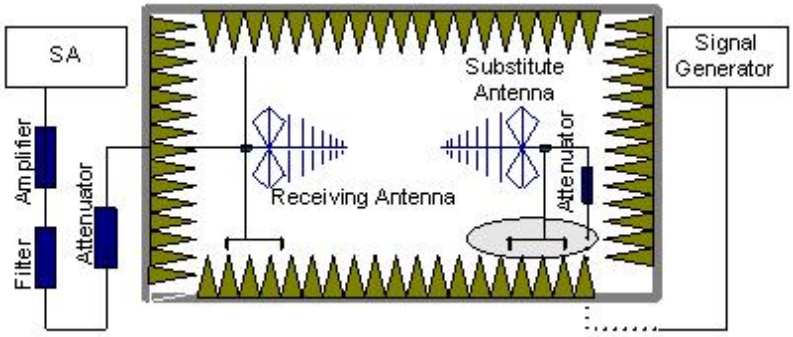
The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier. The resolution bandwidth is set 1MHz as outlined in Part 22.913(a) ,Part 24.238(a), Part 27.53(g). The spectrum was scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of the LTE Bands 2, 4, 5, 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.



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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 22.913(a), Part 24.238(a), Part 27.53(g) 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

Radiated emissions measurements were made only at the upper, middle, and lower carrier frequencies of the LTE Bands 2, 4, 5, 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, 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.

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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
5552.27	-40.35	6.60	-10.59	-36.36	-13.00	23.36	V
7403.32	-45.26	7.21	-12.08	-40.39	-13.00	27.39	H
9254.10	-48.79	8.30	-13.25	-43.84	-13.00	30.84	H
10941.30	-60.88	9.02	-13.19	-56.71	-13.00	43.71	V
14197.52	-53.02	10.35	-14.46	-48.91	-13.00	35.91	V
16532.45	-48.04	11.24	-13.61	-45.67	-13.00	32.67	V

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
3760.18	-42.88	5.14	-8.56	-39.46	-13.00	26.46	V
5640.18	-44.28	6.85	-10.57	-40.56	-13.00	27.56	V
7520.24	-46.04	7.51	-12.22	-41.33	-13.00	28.33	H
9400.32	-42.58	7.99	-13.34	-37.23	-13.00	24.23	H
12241.92	-57.72	9.89	-13.10	-54.51	-13.00	41.51	H
14297.61	-51.52	10.15	-14.44	-47.23	-13.00	34.23	H

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
3818.92	-42.14	5.47	-8.65	-38.96	-13.00	25.96	V
5728.14	-40.00	6.76	-10.55	-36.21	-13.00	23.21	V
7637.64	-38.34	7.56	-12.31	-33.59	-13.00	20.59	H
9546.78	-41.96	8.22	-13.35	-36.83	-13.00	23.83	H
11459.12	-57.48	8.88	-13.11	-53.25	-13.00	40.25	H
15476.13	-53.79	10.81	-13.71	-50.89	-13.00	37.89	H

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LTE Band 2, 1.4MHz, 16QAM, Channel 18607

Frequency(MHz)	P_{Mea}(dBm)	Path Loss	Antenna Gain	Peak EIRP(dBm)	Limit（dBm）	Margin(dB)	Polarization
3701.65	-43.04	5.35	-8.48	-39.91	-13.00	26.91	V
5552.27	-43.27	6.60	-10.59	-39.28	-13.00	26.28	V
7403.03	-46.13	7.21	-12.08	-41.26	-13.00	28.26	H
9253.97	-42.32	8.30	-13.25	-37.37	-13.00	24.37	H
10965.97	-61.80	9.05	-13.19	-57.66	-13.00	44.66	H
13260.88	-57.13	9.90	-13.87	-53.16	-13.00	40.16	V

LTE Band 2, 1.4MHz, 16QAM, Channel 18900

Frequency(MHz)	P_{Mea}(dBm)	Path Loss	Antenna Gain	Peak EIRP(dBm)	Limit（dBm）	Margin(dB)	Polarization
3760.14	-41.64	5.14	-8.56	-38.22	-13.00	25.22	V
5640.18	-45.73	6.85	-10.57	-42.01	-13.00	29.01	V
7520.44	-46.60	7.51	-12.22	-41.89	-13.00	28.89	V
9400.53	-43.44	7.99	-13.34	-38.09	-13.00	25.09	H
11264.50	-62.52	9.26	-13.15	-58.63	-13.00	45.63	H
13852.46	-55.87	10.14	-14.41	-51.60	-13.00	38.60	H

LTE Band 2, 1.4MHz, 16QAM, Channel 19193

Frequency(MHz)	P_{Mea}(dBm)	Path Loss	Antenna Gain	Peak EIRP(dBm)	Limit（dBm）	Margin(dB)	Polarization
3818.79	-42.21	5.47	-8.65	-39.03	-13.00	26.03	V
5728.20	-40.00	6.76	-10.55	-36.21	-13.00	23.21	V
7637.73	-37.49	7.56	-12.31	-32.74	-13.00	19.74	H
9547.26	-41.59	8.21	-13.35	-36.45	-13.00	23.45	H
11578.71	-60.55	9.04	-13.08	-56.51	-13.00	43.51	H
13882.28	-56.82	10.10	-14.43	-52.49	-13.00	39.49	V

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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
3421.59	-41.75	5.47	-8.01	-39.21	-13.00	26.21	H
5132.45	-48.17	6.42	-10.09	-44.50	-13.00	31.50	H
6843.25	-53.95	6.92	-11.41	-49.46	-13.00	36.46	V
8553.93	-36.56	7.57	-13.01	-31.12	-13.00	18.12	H
10264.66	-42.06	8.94	-13.01	-37.99	-13.00	24.99	V
13930.42	-57.83	10.07	-14.46	-53.44	-13.00	40.44	V

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
3465.14	-45.61	5.41	-8.12	-42.90	-13.00	29.90	V
5197.93	-42.84	6.56	-10.18	-39.22	-13.00	26.22	H
6930.40	-53.68	7.16	-11.52	-49.32	-13.00	36.32	H
8662.99	-43.43	7.69	-13.03	-38.09	-13.00	25.09	H
10395.58	-53.80	8.94	-13.06	-49.68	-13.00	36.68	V
11794.68	-59.10	9.06	-13.04	-55.12	-13.00	42.12	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
3508.84	-46.39	5.39	-8.21	-43.57	-13.00	30.57	H
5263.21	-41.42	6.45	-10.27	-37.60	-13.00	24.60	H
7017.78	-43.59	7.42	-11.62	-39.39	-13.00	26.39	H
8772.10	-37.36	8.05	-13.05	-32.36	-13.00	19.36	H
12280.76	-54.52	9.32	-13.11	-50.73	-13.00	37.73	H
14387.63	-57.21	10.27	-14.42	-53.06	-13.00	40.06	H

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LTE Band 4, 1.4MHz, 16QAM, Channel 19957

Frequency(MHz)	P_{Mea}(dBm)	Path Loss	Antenna Gain	Peak EIRP(dBm)	Limit（dBm）	Margin(dB)	Polarization
3421.75	-42.38	5.47	-8.01	-39.84	-13.00	26.84	H
5132.46	-48.02	6.42	-10.09	-44.35	-13.00	31.35	H
6842.96	-55.80	6.92	-11.41	-51.31	-13.00	38.31	V
8553.86	-38.20	7.57	-13.01	-32.76	-13.00	19.76	H
11031.60	-60.23	8.98	-13.19	-56.02	-13.00	43.02	V
13809.86	-58.94	9.97	-14.39	-54.52	-13.00	41.52	V

LTE Band 4, 1.4MHz, 16QAM, Channel 20175

Frequency(MHz)	P_{Mea}(dBm)	Path Loss	Antenna Gain	Peak EIRP(dBm)	Limit（dBm）	Margin(dB)	Polarization
3465.14	-44.27	5.41	-8.12	-41.56	-13.00	28.56	V
5197.78	-42.96	6.56	-10.18	-39.34	-13.00	26.34	H
6930.58	-52.07	7.16	-11.52	-47.71	-13.00	34.71	H
8663.26	-39.75	7.69	-13.03	-34.41	-13.00	21.41	H
10395.40	-48.04	8.94	-13.06	-43.92	-13.00	30.92	V
11852.43	-60.38	9.09	-13.03	-56.44	-13.00	43.44	V

LTE Band 4, 1.4MHz, 16QAM, Channel 20393

Frequency(MHz)	P_{Mea}(dBm)	Path Loss	Antenna Gain	Peak EIRP(dBm)	Limit（dBm）	Margin(dB)	Polarization
3508.74	-44.61	5.39	-8.21	-41.79	-13.00	28.79	H
5263.27	-41.61	6.45	-10.27	-37.79	-13.00	24.79	H
7017.60	-42.01	7.42	-11.62	-37.81	-13.00	24.81	H
8771.98	-35.86	8.05	-13.05	-30.86	-13.00	17.86	H
10937.42	-61.54	9.01	-13.19	-57.36	-13.00	44.36	V
14269.32	-54.14	10.20	-14.45	-49.89	-13.00	36.89	H

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LTE Band 5, 1.4MHz, QPSK, Channel 20407

Frequency(MHz)	P_{Mea}(dBm)	Path Loss	Antenna Gain	Correction (dB)	Peak ERP(dBm)	Limit （dBm）	Margin(dB)	Polarization
1649.54	-51.12	3.41	-5.23	2.15	-51.45	-13.00	38.45	V
3328.22	-63.76	5.17	-7.79	2.15	-63.29	-13.00	50.29	H
4369.39	-64.78	6.19	-9.27	2.15	-63.85	-13.00	50.85	V
5710.91	-65.36	6.70	-10.56	2.15	-63.65	-13.00	50.65	V
7113.74	-63.74	7.43	-11.74	2.15	-61.58	-13.00	48.58	H
8073.99	-64.33	7.46	-12.66	2.15	-61.28	-13.00	48.28	H

LTE Band 5, 1.4MHz, QPSK, Channel 20525

Frequency(MHz)	P_{Mea}(dBm)	Path Loss	Antenna Gain	Correction (dB)	Peak ERP(dBm)	Limit （dBm）	Margin(dB)	Polarization
1673.07	-49.10	3.54	-5.19	2.15	-49.60	-13.00	36.60	V
3595.42	-64.98	5.54	-8.33	2.15	-64.34	-13.00	51.34	V
4831.87	-62.44	6.35	-9.73	2.15	-61.21	-13.00	48.21	V
6015.31	-64.31	6.90	-10.52	2.15	-62.84	-13.00	49.84	V
7274.01	-62.46	7.12	-11.93	2.15	-59.80	-13.00	46.80	H
8460.72	-63.93	7.85	-12.97	2.15	-60.96	-13.00	47.96	H

LTE Band 5, 1.4MHz, QPSK, Channel 20643

Frequency(MHz)	P_{Mea}(dBm)	Path Loss	Antenna Gain	Correction (dB)	Peak ERP(dBm)	Limit （dBm）	Margin(dB)	Polarization
1697.09	-57.89	3.45	-5.15	2.15	-58.34	-13.00	45.34	V
3189.85	-60.62	5.34	-7.46	2.15	-60.65	-13.00	47.65	H
4290.50	-64.03	5.97	-9.19	2.15	-62.96	-13.00	49.96	V
5182.32	-65.03	6.38	-10.16	2.15	-63.40	-13.00	50.40	H
6190.96	-63.27	6.84	-10.69	2.15	-61.57	-13.00	48.57	H
7366.26	-66.09	6.98	-12.04	2.15	-63.18	-13.00	50.18	V

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LTE Band 5, 1.4MHz, 16QAM, Channel 20407

Frequency(MHz)	P_{Mea}(dBm)	Path Loss	Antenna Gain	Correction (dB)	Peak ERP(dBm)	Limit （dBm）	Margin(dB)	Polarization
1649.62	-51.78	3.41	-5.23	2.15	-52.11	-13.00	39.11	V
3035.81	-64.70	4.90	-7.09	2.15	-64.66	-13.00	51.66	V
4050.87	-64.17	5.61	-8.95	2.15	-62.98	-13.00	49.98	V
5127.08	-62.15	6.46	-10.08	2.15	-60.68	-13.00	47.68	V
5996.80	-61.16	6.92	-10.50	2.15	-59.73	-13.00	46.73	V
7013.39	-66.41	7.36	-11.62	2.15	-64.30	-13.00	51.30	V

LTE Band 5, 1.4MHz, 16QAM, Channel 20525

Frequency(MHz)	P_{Mea}(dBm)	Path Loss	Antenna Gain	Correction (dB)	Peak ERP(dBm)	Limit （dBm）	Margin(dB)	Polarization
1673.04	-47.49	3.54	-5.19	2.15	-47.99	-13.00	34.99	V
3306.45	-64.27	5.31	-7.74	2.15	-63.99	-13.00	50.99	V
4733.65	-62.75	6.13	-9.63	2.15	-61.40	-13.00	48.40	H
5926.16	-63.52	6.86	-10.51	2.15	-62.02	-13.00	49.02	H
7056.34	-60.16	7.33	-11.67	2.15	-57.97	-13.00	44.97	V
8201.23	-61.54	7.79	-12.76	2.15	-58.72	-13.00	45.72	H

LTE Band 5, 1.4MHz, 16QAM, Channel 20643

Frequency(MHz)	P_{Mea}(dBm)	Path Loss	Antenna Gain	Correction (dB)	Peak ERP(dBm)	Limit （dBm）	Margin(dB)	Polarization
3393.81	-59.73	5.46	-7.95	2.15	-59.39	-13.00	46.39	H
4301.30	-64.92	5.96	-9.20	2.15	-63.83	-13.00	50.83	V
5205.33	-65.88	6.59	-10.19	2.15	-64.43	-13.00	51.43	H
5938.68	-55.33	6.92	-10.51	2.15	-53.89	-13.00	40.89	H
6786.86	-57.68	7.06	-11.34	2.15	-55.55	-13.00	42.55	V
7635.93	-54.70	7.55	-12.31	2.15	-52.09	-13.00	39.09	H

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LTE Band 17, 5MHz, QPSK, Channel 23755

Frequency(MHz)	P_{Mea}(dBm)	Path Loss	Antenna Gain	Correction (dB)	Peak ERP(dBm)	Limit （dBm）	Margin(dB)	Polarization
1413.26	-54.65	3.10	-5.05	2.15	-54.85	-13.00	41.85	V
2119.92	-49.85	4.07	-4.96	2.15	-51.11	-13.00	38.11	H
3409.05	-65.38	5.51	-7.98	2.15	-65.06	-13.00	52.06	H
4620.25	-64.89	5.92	-9.52	2.15	-63.44	-13.00	50.44	H
6190.51	-64.99	6.84	-10.69	2.15	-63.29	-13.00	50.29	V
6868.24	-63.64	6.67	-11.44	2.15	-61.02	-13.00	48.02	V

LTE Band 17, 5MHz, QPSK, Channel 23790

Frequency(MHz)	P_{Mea}(dBm)	Path Loss	Antenna Gain	Correction (dB)	Peak ERP(dBm)	Limit （dBm）	Margin(dB)	Polarization
4319.99	-66.18	5.92	-9.22	2.15	-65.03	-13.00	52.03	V
5947.05	-63.79	6.96	-10.51	2.15	-62.39	-13.00	49.39	H
6418.43	-64.43	6.90	-10.92	2.15	-62.56	-13.00	49.56	H
6852.88	-63.23	6.79	-11.42	2.15	-60.75	-13.00	47.75	V
7517.35	-62.59	7.53	-12.21	2.15	-60.06	-13.00	47.06	V
8463.53	-64.37	7.84	-12.97	2.15	-61.39	-13.00	48.39	H

LTE Band 17, 5MHz, QPSK, Channel 23825

Frequency(MHz)	P_{Mea}(dBm)	Path Loss	Antenna Gain	Correction (dB)	Peak ERP(dBm)	Limit （dBm）	Margin(dB)	Polarization
1427.44	-47.49	3.09	-5.12	2.15	-47.61	-13.00	34.61	V
3760.05	-62.80	5.14	-8.56	2.15	-61.53	-13.00	48.53	V
4685.98	-62.05	6.09	-9.59	2.15	-60.70	-13.00	47.70	V
5599.05	-63.91	6.74	-10.58	2.15	-62.22	-13.00	49.22	H
6837.18	-63.05	6.99	-11.40	2.15	-60.79	-13.00	47.79	V
7852.50	-60.23	7.23	-12.48	2.15	-57.13	-13.00	44.13	V

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LTE Band 17, 5MHz, 16QAM, Channel 23755

Frequency(MHz)	P_{Mea}(dBm)	Path Loss	Antenna Gain	Correction (dB)	Peak ERP(dBm)	Limit （dBm）	Margin(dB)	Polarization
1413.24	-46.15	3.10	-5.05	2.15	-46.35	-13.00	33.35	V
2119.92	-50.34	4.07	-4.96	2.15	-51.60	-13.00	38.60	V
4527.00	-65.67	5.99	-9.43	2.15	-64.38	-13.00	51.38	V
5659.61	-65.18	6.78	-10.57	2.15	-63.54	-13.00	50.54	V
7055.91	-63.94	7.33	-11.67	2.15	-61.75	-13.00	48.75	V
8468.80	-66.16	7.82	-12.98	2.15	-63.15	-13.00	50.15	H

LTE Band 17, 5MHz, 16QAM, Channel 23790

Frequency(MHz)	P_{Mea}(dBm)	Path Loss	Antenna Gain	Correction (dB)	Peak ERP(dBm)	Limit （dBm）	Margin(dB)	Polarization
3306.10	-65.12	5.32	-7.73	2.15	-64.86	-13.00	51.86	H
3731.51	-66.08	5.25	-8.52	2.15	-64.96	-13.00	51.96	H
4669.82	-64.42	6.10	-9.57	2.15	-63.10	-13.00	50.10	V
5628.87	-68.42	6.85	-10.57	2.15	-66.85	-13.00	53.85	V
6212.38	-62.47	6.85	-10.71	2.15	-60.76	-13.00	47.76	V
7101.78	-62.27	7.48	-11.72	2.15	-60.18	-13.00	47.18	V

LTE Band 17, 5MHz, 16QAM, Channel 23825

Frequency(MHz)	P_{Mea}(dBm)	Path Loss	Antenna Gain	Correction (dB)	Peak ERP(dBm)	Limit （dBm）	Margin(dB)	Polarization
1427.42	-47.27	3.09	-5.12	2.15	-47.39	-13.00	34.39	V
3635.99	-63.59	5.52	-8.39	2.15	-62.87	-13.00	49.87	V
4295.71	-65.21	5.97	-9.20	2.15	-64.13	-13.00	51.13	H
5358.81	-65.28	6.64	-10.40	2.15	-63.67	-13.00	50.67	H
5785.12	-59.27	6.78	-10.54	2.15	-57.66	-13.00	44.66	H
7755.68	-63.84	7.36	-12.40	2.15	-60.95	-13.00	47.95	V

Note: The maximum value of expanded measurement uncertainty for this test item is U = 4.2 dB, k = 2.

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A.3 FREQUENCY STABILITY

Reference

FCC: CFR Part 2.1055, 22.917,24.235, 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 2/4/5/17, 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 ℃ increments 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 3.5VDC and 4.35VDC, 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. These voltages represent a tolerance from -5.4% to 10.8%. For the purposes of measuring frequency stability these voltage limits are to be used.

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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
3.5	-4	18	0.002	0.010
3.8	-3	14	0.001	0.008
4.35	-1	16	0.000	0.008

Frequency Error vs Temperature

Temperature (℃)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
50°	0	13	0.000	0.007
40°	-1	17	0.001	0.009
30°	-4	15	0.002	0.008
20°	1	15	0.000	0.008
10°	0	16	0.000	0.009
0°	-1	16	0.000	0.009
- 10°	0	13	0.000	0.007
- 20°	1	16	0.001	0.009
- 30°	1	11	0.000	0.006

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
3.5	2	21	0.001	0.012
3.8	2	20	0.001	0.011
4.35	5	23	0.003	0.013

Frequency Error vs Temperature

Temperature (℃)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
50°	4	20	0.002	0.011
40°	2	19	0.001	0.011
30°	2	21	0.001	0.012
20°	6	19	0.003	0.011
10°	1	21	0.001	0.012
0°	1	21	0.001	0.012
- 10°	1	22	0.001	0.013
- 20°	5	22	0.003	0.013
- 30°	3	22	0.002	0.013

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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
3.5	-2	20	0.002	0.024
3.8	-1	19	0.001	0.023
4.35	1	18	0.001	0.022

Frequency Error vs Temperature

Temperature (℃)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
50°	3	20	0.004	0.023
40°	-2	19	0.002	0.022
30°	2	19	0.002	0.023
20°	0	18	0.000	0.021
10°	0	20	0.000	0.024
0°	0	19	0.000	0.023
- 10°	-1	16	0.001	0.019
- 20°	-1	19	0.001	0.022
- 30°	-1	20	0.001	0.024

LTE Band 17, 10MHz bandwidth (worst case of all bandwidths)

Frequency Error vs Voltage

Voltage (V)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
3.5	-1	-7	0.002	0.010
3.8	-2	-3	0.002	0.005
4.35	-1	-5	0.001	0.007

Frequency Error vs Temperature

Temperature (℃)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
50°	-1	-5	0.001	0.007
40°	-1	-6	0.002	0.008
30°	1	-5	0.001	0.008
20°	-1	-3	0.001	0.004
10°	0	-5	0.000	0.006
0°	-3	-4	0.004	0.005
- 10°	-1	-5	0.002	0.007
- 20°	0	-5	0.001	0.008
- 30°	0	-4	0.000	0.006

Expanded measurement uncertainty for this test item is 10 Hz, k = 2.

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A.4 OCCUPIED BANDWIDTH

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 4.2:

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.

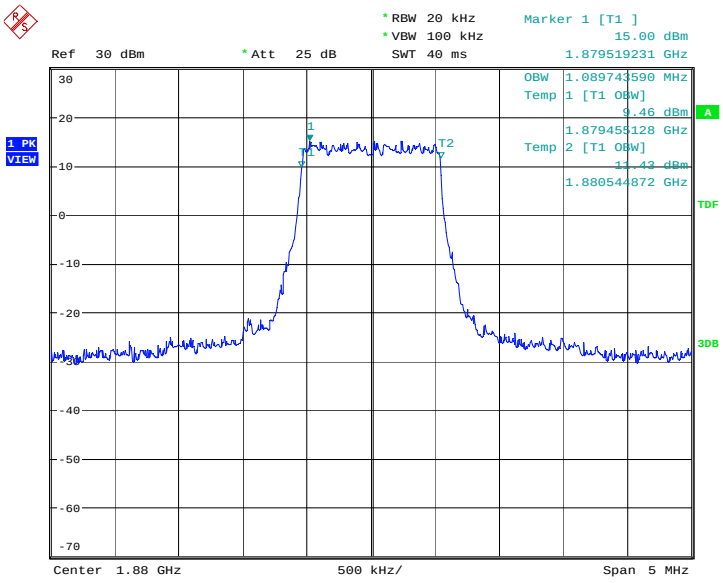
d) Set the detection mode to peak, and the trace mode to max hold.

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%)(kHz)	
1880.0	QPSK	16QAM
	1089.74	1097.76

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



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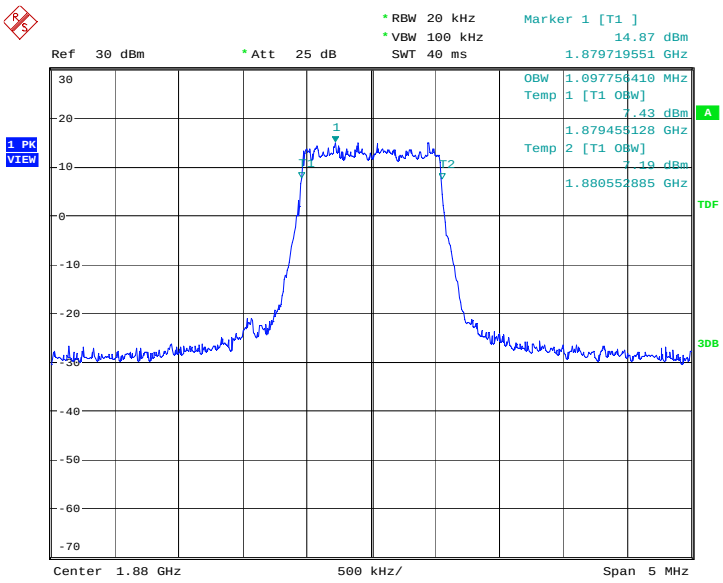
LTE band 2, 1.4MHz Bandwidth, 16QAM (99% BW)



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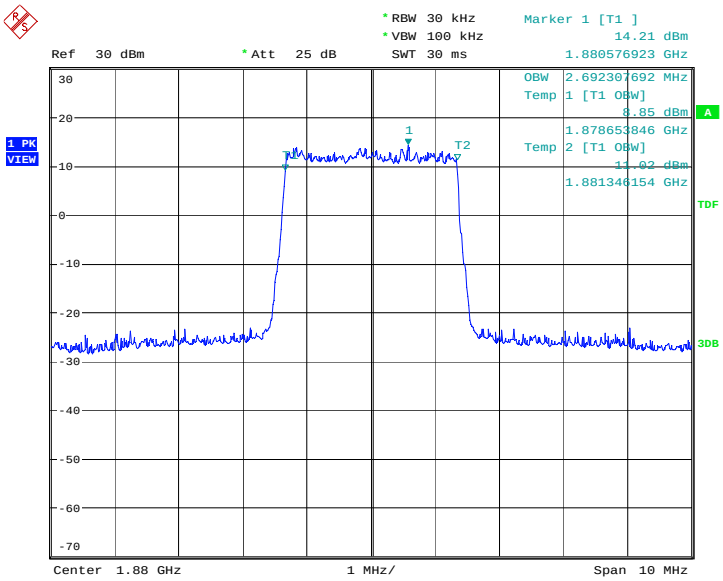
LTE band 2, 3MHz (99%)

Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
1880.0	QPSK	16QAM
	2692.31	2692.31

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



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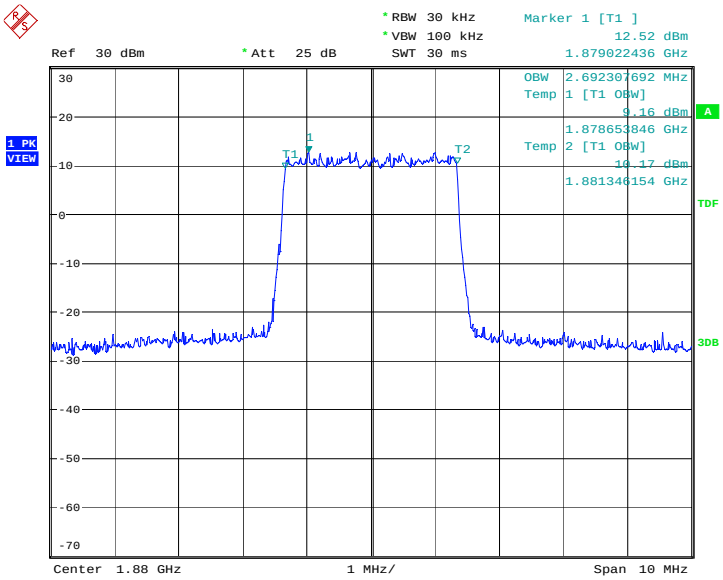
LTE band 2, 3MHz Bandwidth, 16QAM (99% BW)



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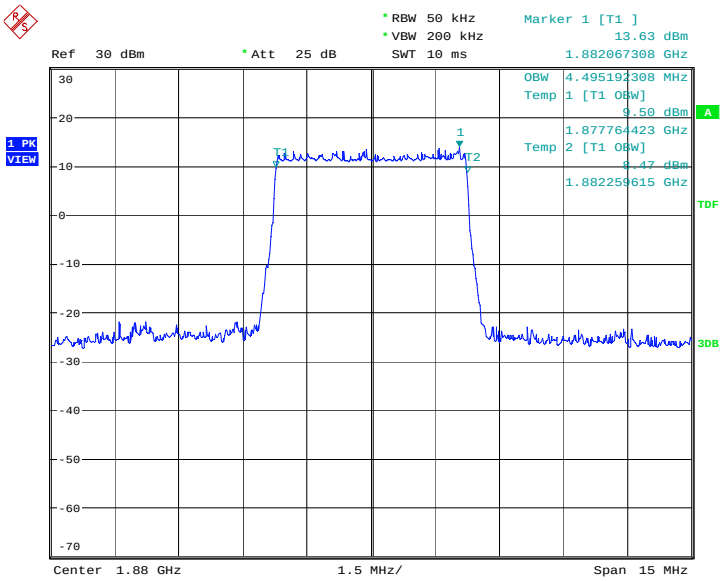
LTE band 2, 5MHz (99%)

Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
1880.0	QPSK	16QAM
	4495.19	4519.23

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



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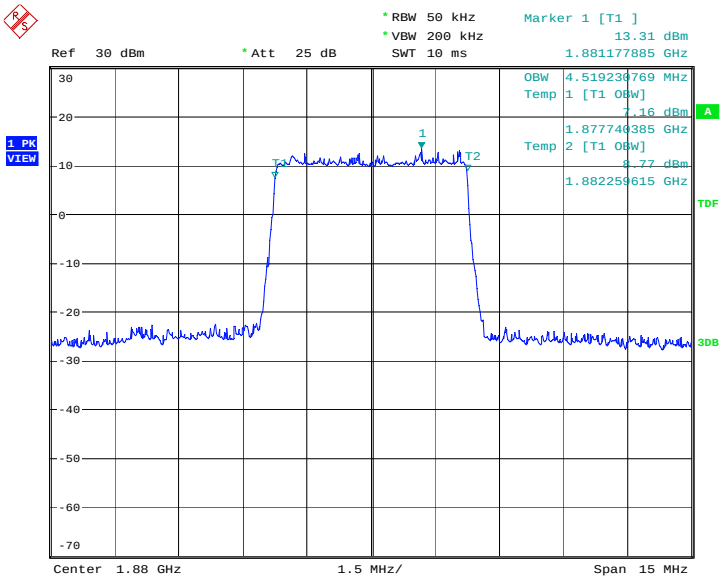
LTE band 2, 5MHz Bandwidth,16QAM (99% BW)



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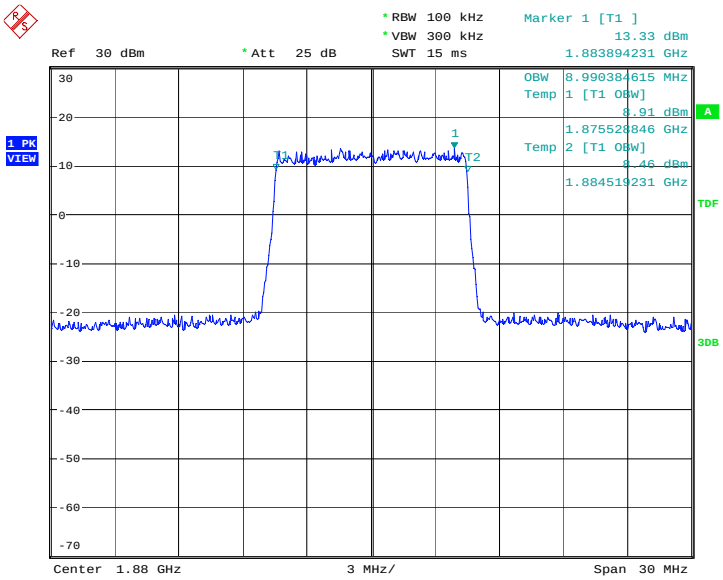
LTE band 2, 10MHz (99%)

Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
1880.0	QPSK	16QAM
	8990.38	8942.31

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



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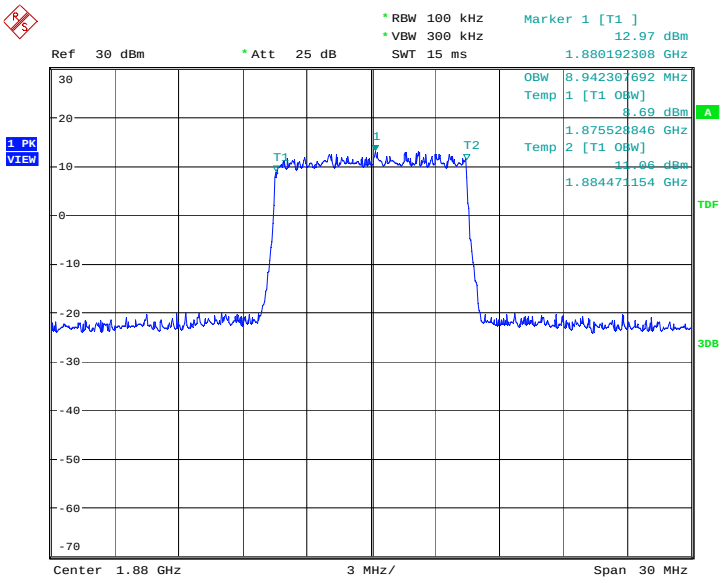
LTE band 2, 10MHz Bandwidth, 16QAM (99% BW)



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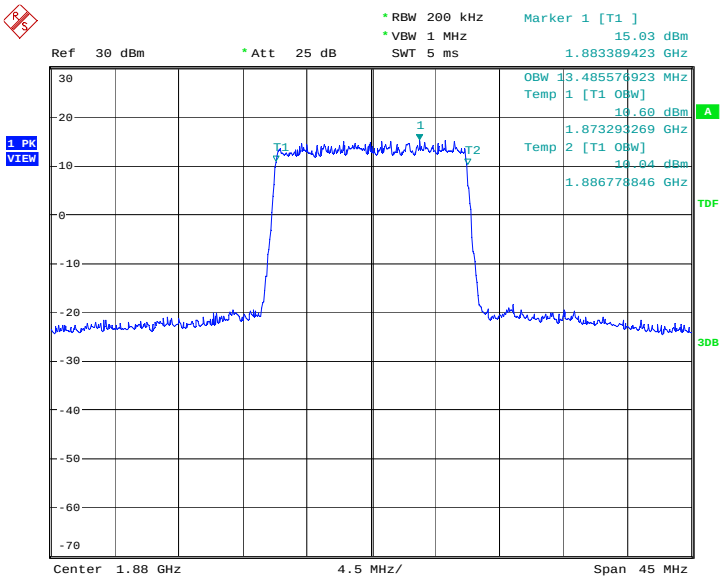
LTE band 2, 15MHz (99%)

Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
1880.0	QPSK	16QAM
	13485.58	13485.58

LTE band 2, 15MHz Bandwidth, QPSK (99% BW)



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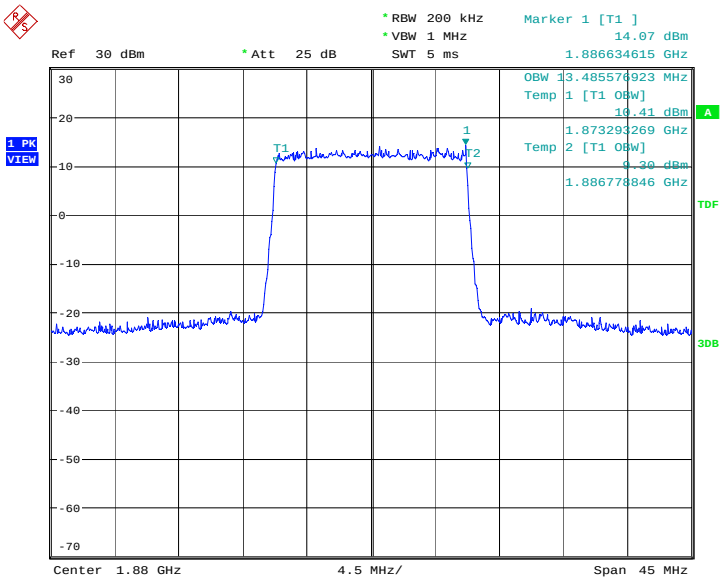
LTE band 2, 15MHz Bandwidth, 16QAM (99% BW)



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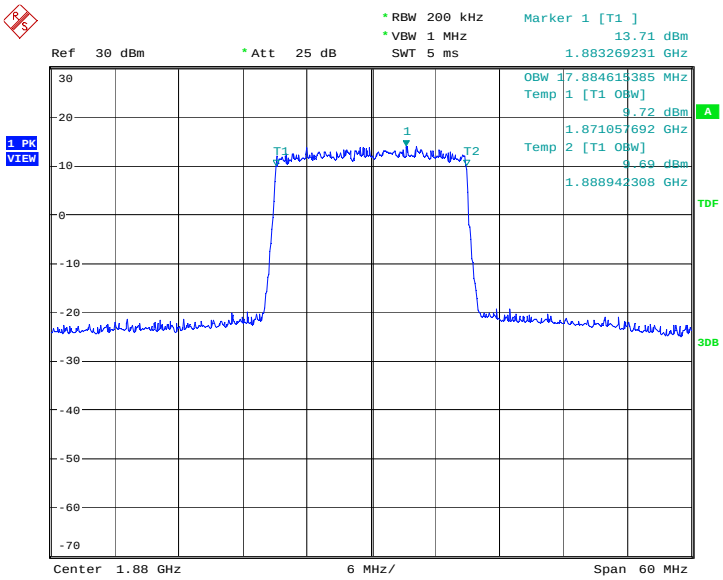
LTE band 2, 20MHz (99%)

Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
1880.0	QPSK	16QAM
	17884.62	17884.62

LTE band 2, 20MHz Bandwidth, QPSK (99% BW)



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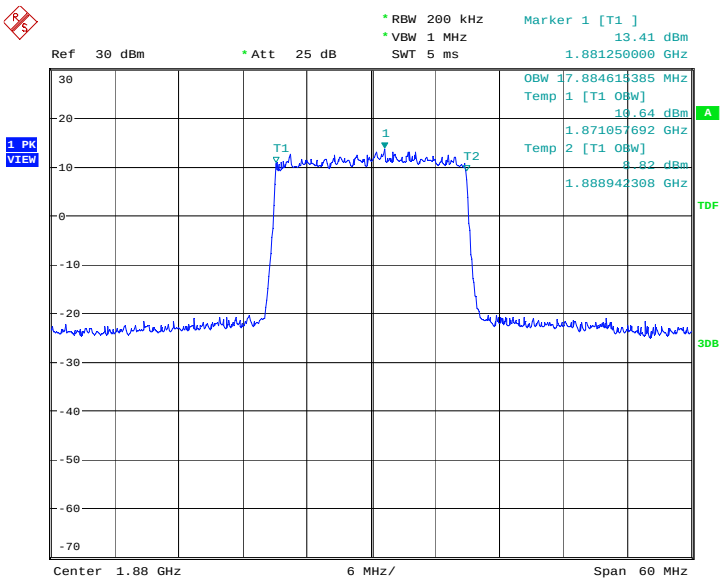
LTE band 2, 20MHz Bandwidth, 16QAM (99% BW)



Date: 17.AUG.2015 17:35:17

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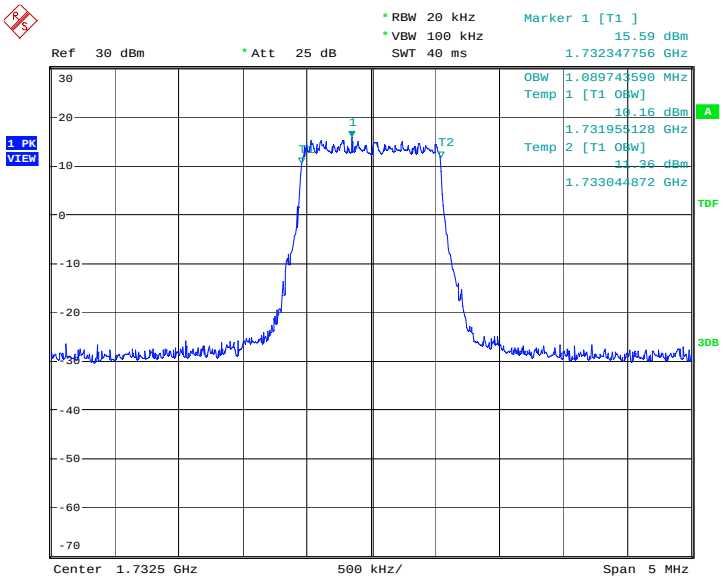
LTE band 4, 1.4MHz (99%)

Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
1732.5	QPSK	16QAM
	1089.74	1097.76

LTE band 4, 1.4MHz Bandwidth, QPSK (99% BW)



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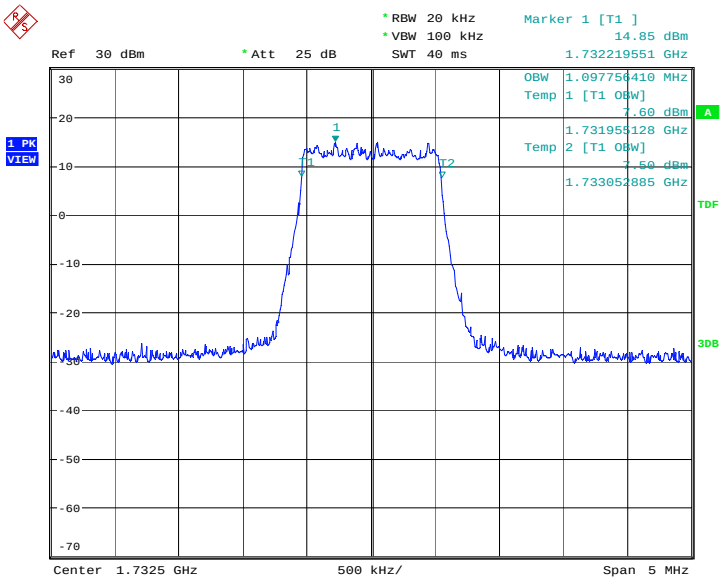
LTE band 4, 1.4MHz Bandwidth, 16QAM (99% BW)



Date: 17.AUG.2015 17:41:09

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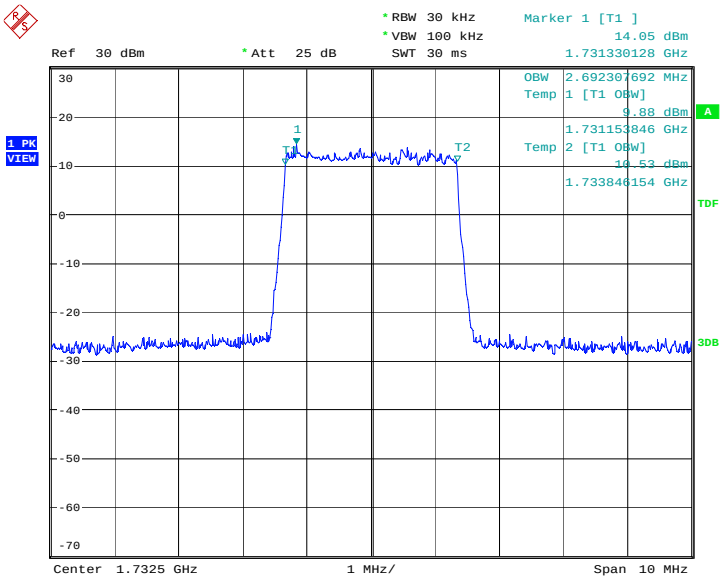
LTE band 4, 3MHz (99%)

Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
1732.5	QPSK	16QAM
	2692.31	2692.31

LTE band 4, 3MHz Bandwidth, QPSK (99% BW)



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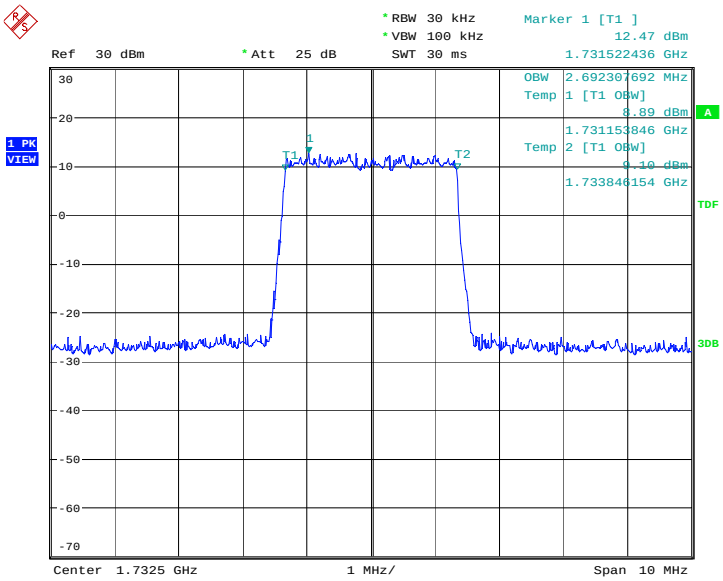
LTE band 4, 3MHz Bandwidth, 16QAM (99% BW)



Date: 17.AUG.2015 17:47:22

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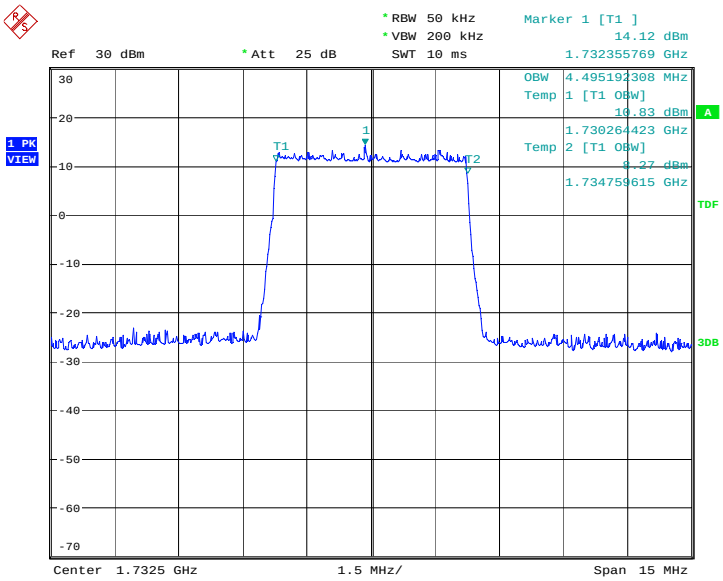
LTE band 4, 5MHz (99%)

Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
1732.5	QPSK	16QAM
	4495.19	4495.19

LTE band 4, 5MHz Bandwidth, QPSK (99% BW)



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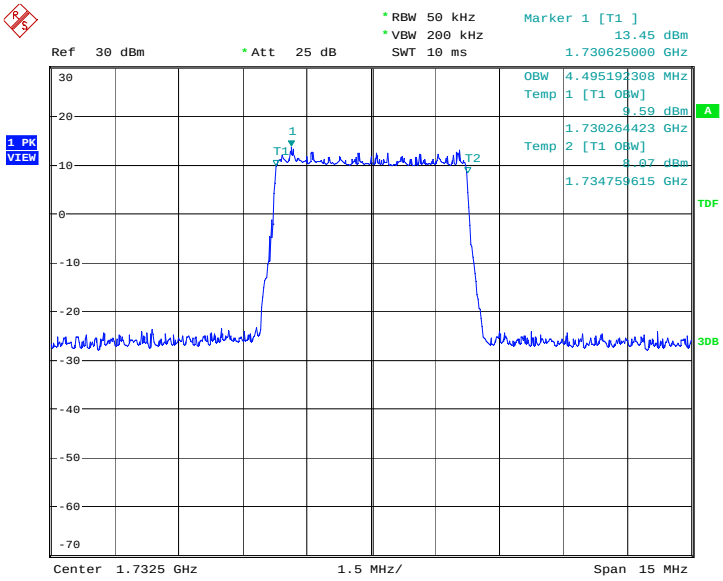
LTE band 4, 5MHz Bandwidth,16QAM (99% BW)



Date: 17.AUG.2015 17:53:09

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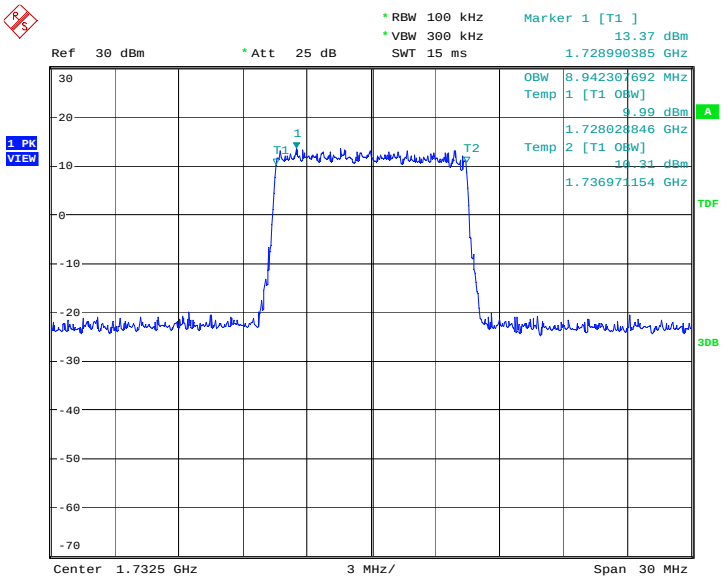
LTE band 4, 10MHz (99%)

Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
1732.5	QPSK	16QAM
	8942.31	8990.38

LTE band 4, 10MHz Bandwidth, QPSK (99% BW)



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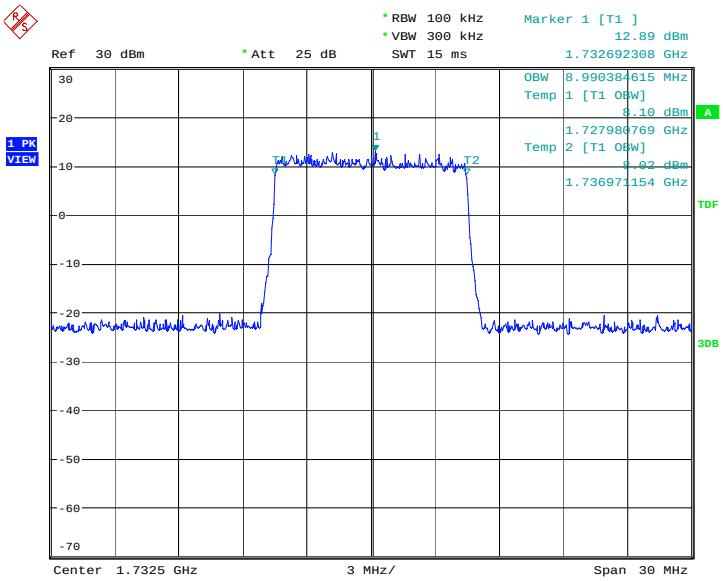
LTE band 4, 10MHz Bandwidth, 16QAM (99% BW)



Date: 17.AUG.2015 17:58:53

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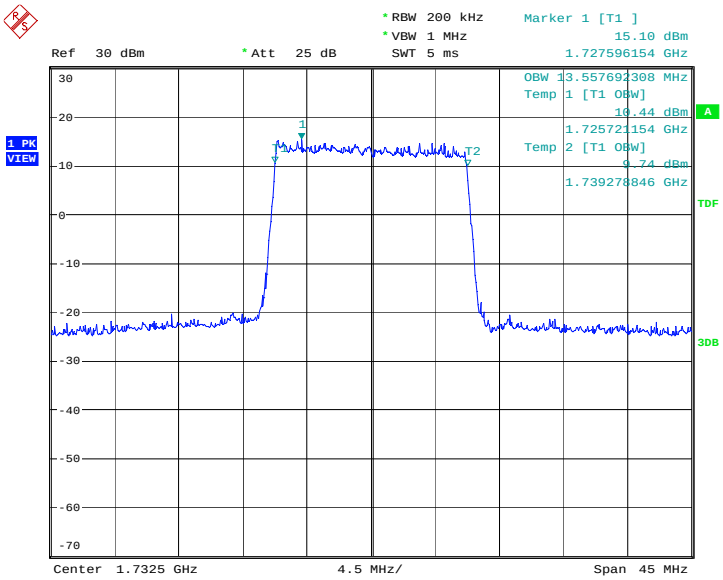
LTE band 4, 15MHz (99%)

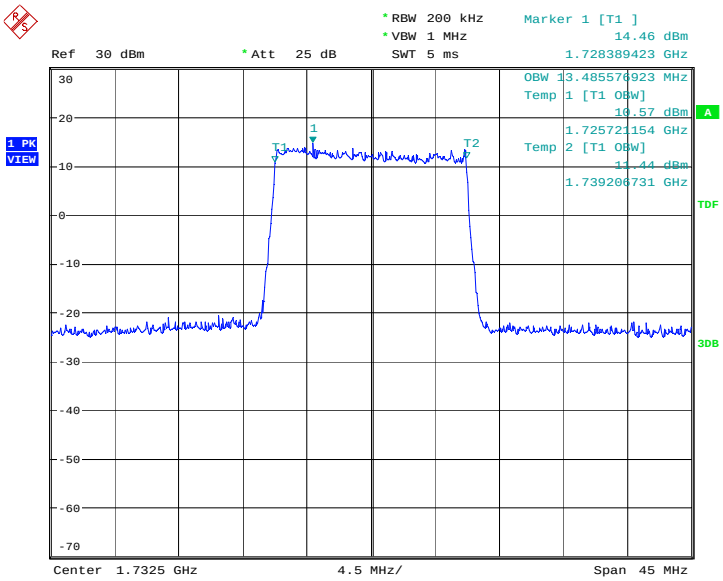
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
1732.5	QPSK	16QAM
	13557.69	13485.58

LTE band 4, 15MHz Bandwidth, QPSK (99% BW)



Date: 17.AUG.2015 18:04:28

LTE band 4, 15MHz Bandwidth, 16QAM (99% BW)



Date: 17.AUG.2015 18:04:43

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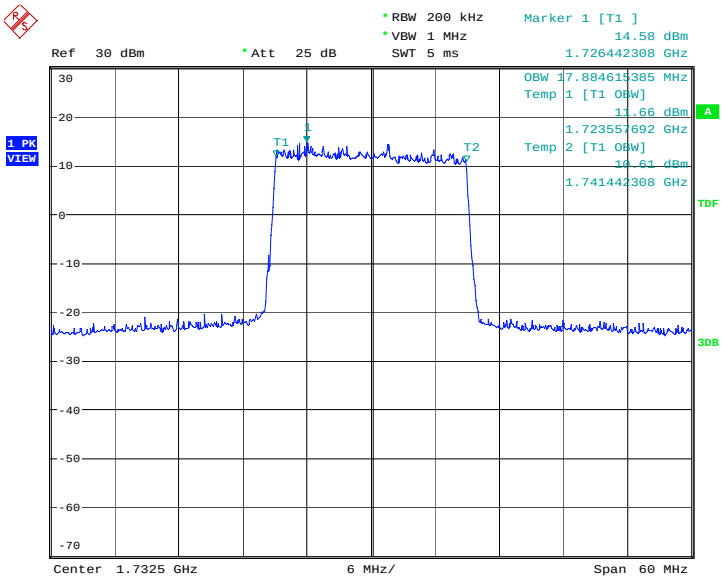
LTE band 4, 20MHz (99%)

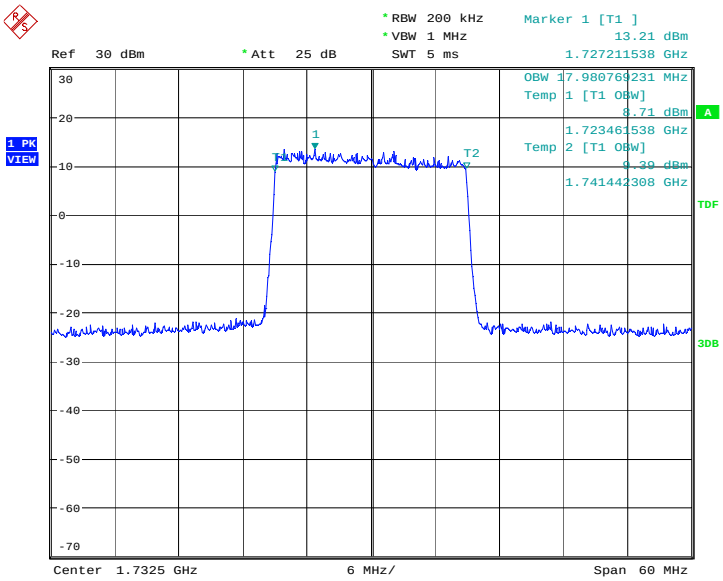
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
1732.5	QPSK	16QAM
	17884.62	17980.77

LTE band 4, 20MHz Bandwidth, QPSK (99% BW)



Date: 17.AUG.2015 18:10:20

LTE band 4, 20MHz Bandwidth, 16QAM (99% BW)



Date: 17.AUG.2015 18:10:35

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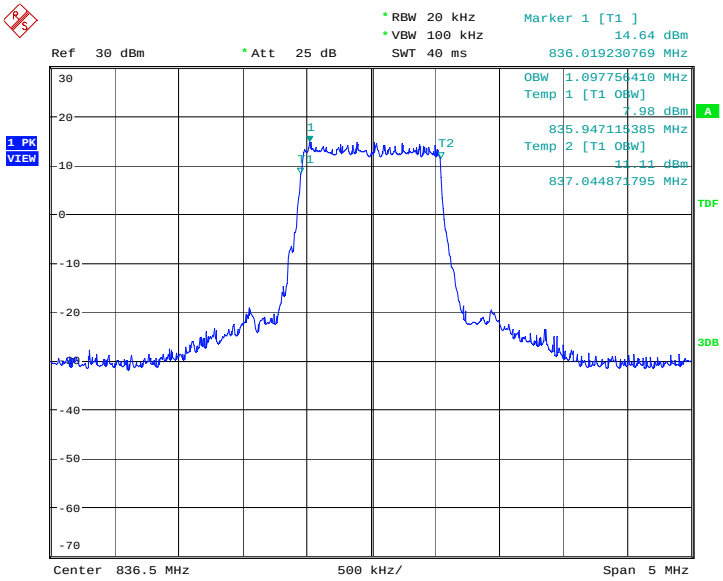
LTE band 5, 1.4MHz (99%)

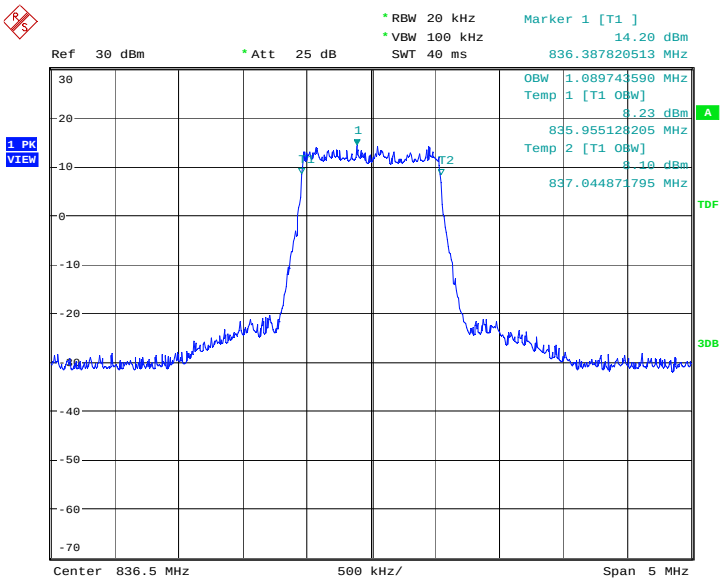
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
836.5	QPSK	16QAM
	1097.76	1089.74

LTE band 5, 1.4MHz Bandwidth, QPSK (99% BW)



Date: 9.SEP.2015 19:17:55

LTE band 5, 1.4MHz Bandwidth, 16QAM (99% BW)



Date: 9.SEP.2015 19:18:10

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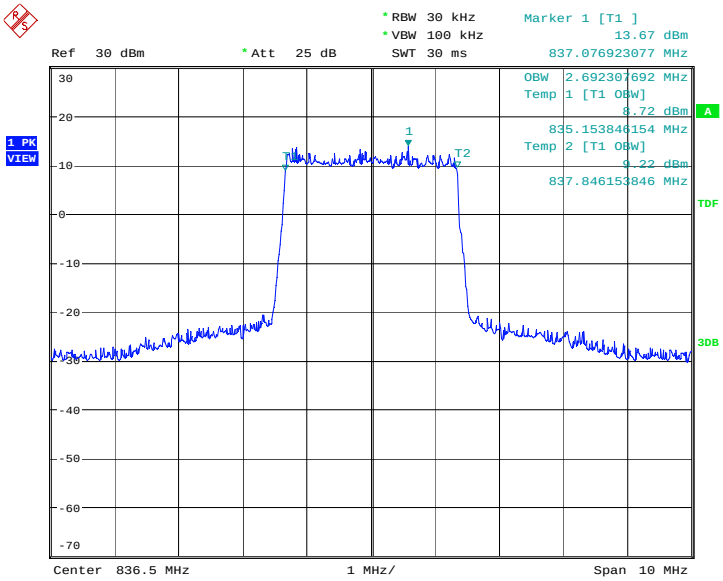
LTE band 5, 3MHz (99%)

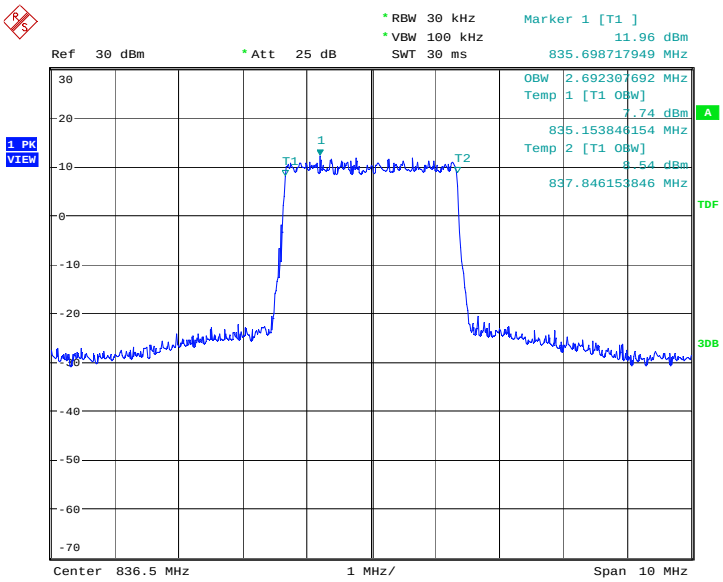
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
836.5	QPSK	16QAM
	2692.31	2692.31

LTE band 5, 3MHz Bandwidth, QPSK (99% BW)



Date: 9.SEP.2015 20:19:53

LTE band 5, 3MHz Bandwidth, 16QAM (99% BW)



Date: 9.SEP.2015 20:20:08

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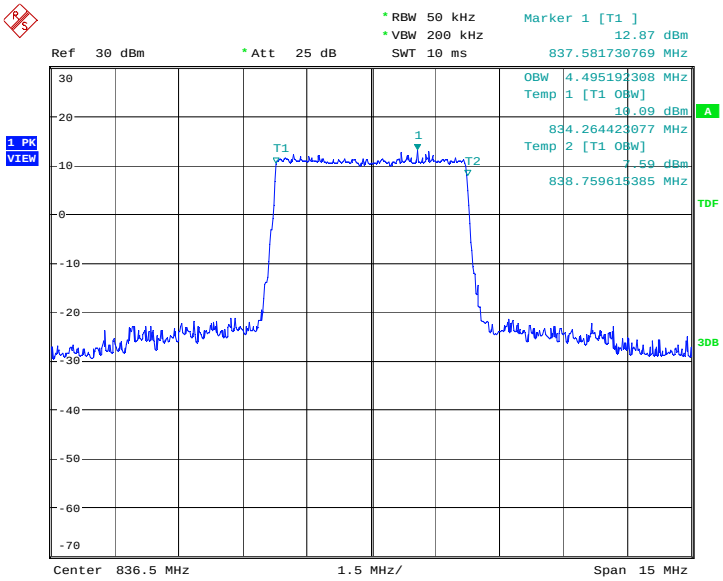
LTE band 5, 5MHz (99%)

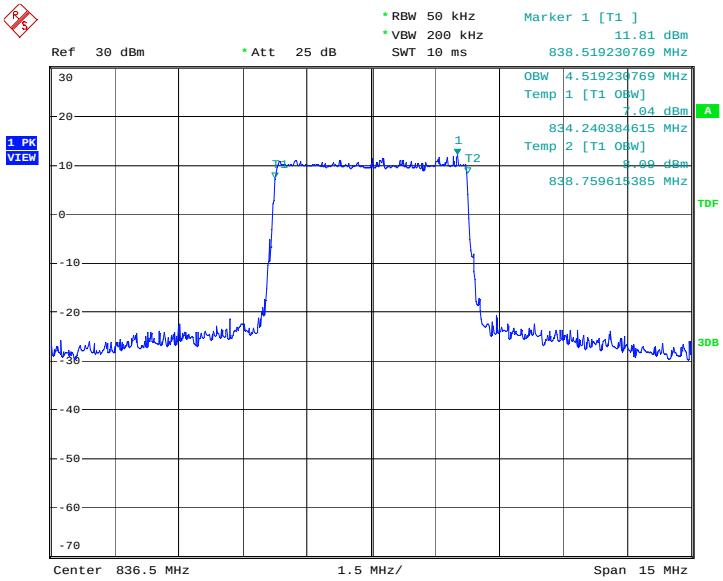
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
836.5	QPSK	16QAM
	4495.19	4519.23

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



Date: 9.SEP.2015 20:28:41

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



Date: 9.SEP.2015 20:28:56

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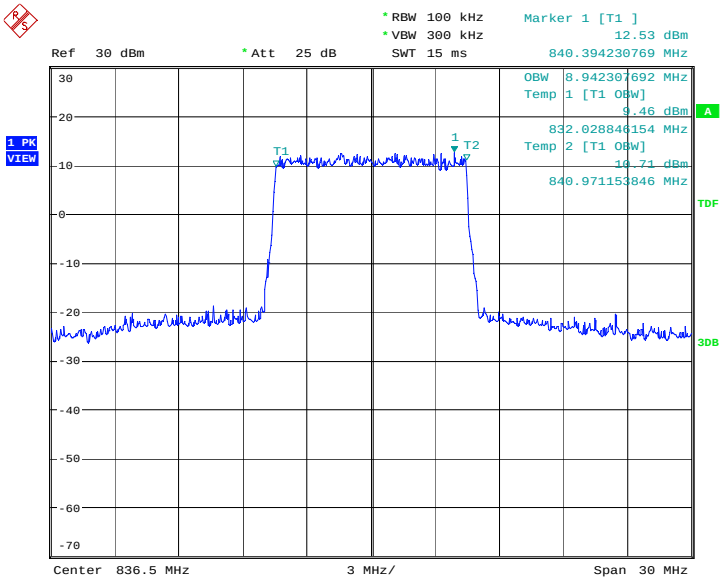
LTE band 5, 10MHz (99%)

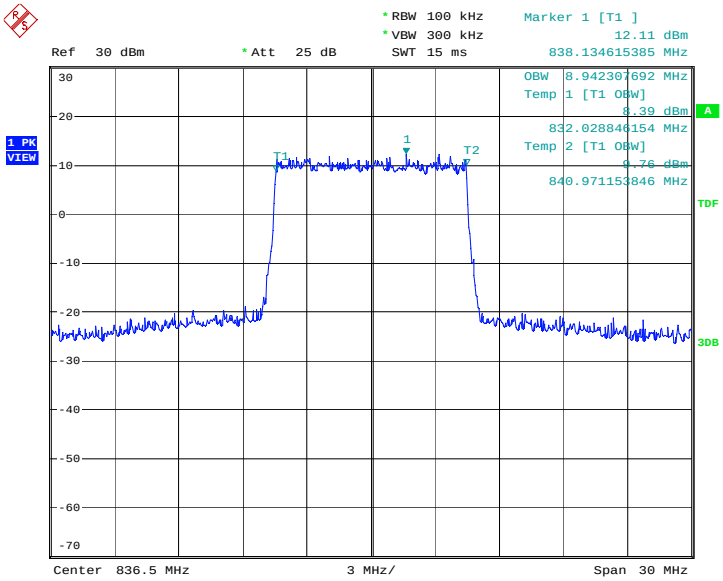
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
836.5	QPSK	16QAM
	8942.31	8942.31

LTE band 5, 10MHz Bandwidth, QPSK (99% BW)



Date: 9.SEP.2015 20:43:00

LTE band 5, 10MHz Bandwidth, 16QAM (99% BW)



Date: 9.SEP.2015 20:43:15

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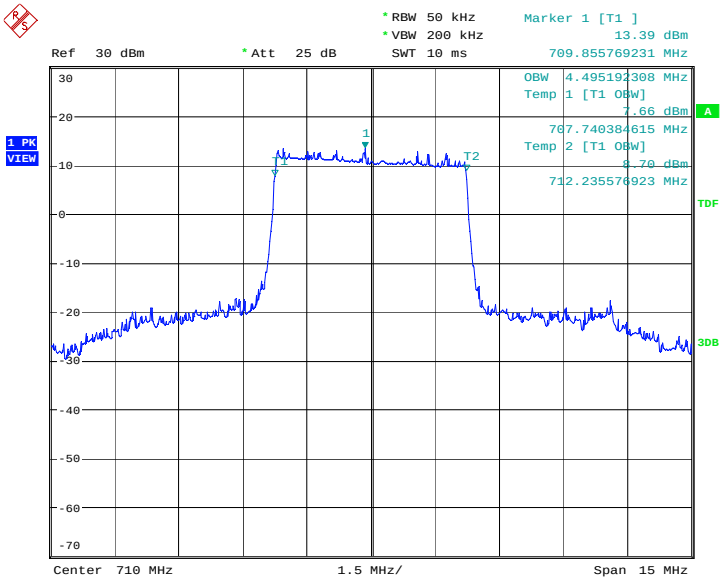
LTE band 17, 5MHz (99%)

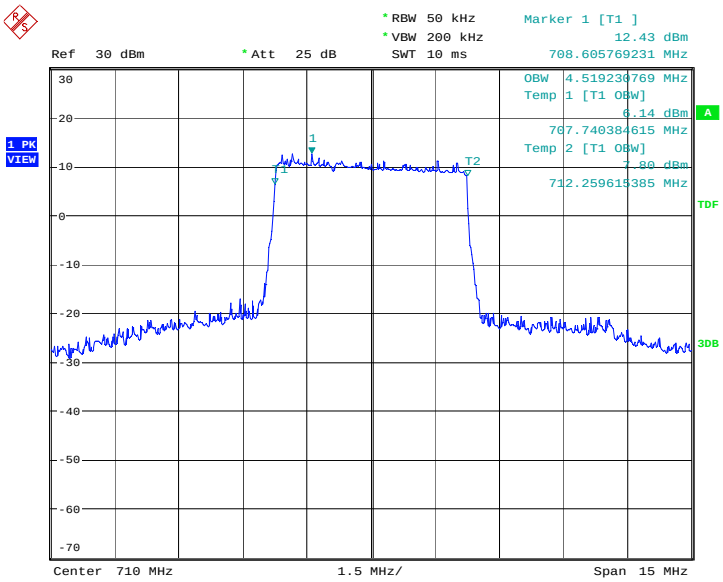
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
710.0	QPSK	16QAM
	4495.19	4519.23

LTE band 17, 5MHz Bandwidth, QPSK (99% BW)



Date: 9.SEP.2015 20:51:17

LTE band 17, 5MHz Bandwidth,16QAM (99% BW)



Date: 9.SEP.2015 20:51:32

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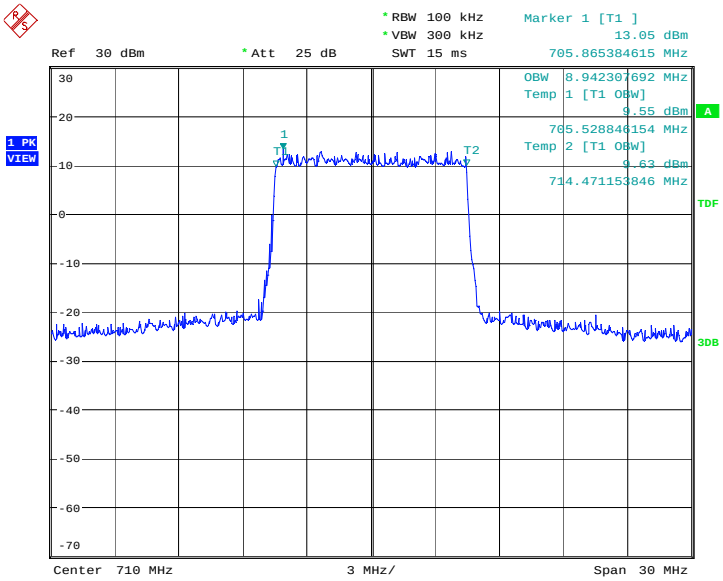
LTE band 17, 10MHz (99%)

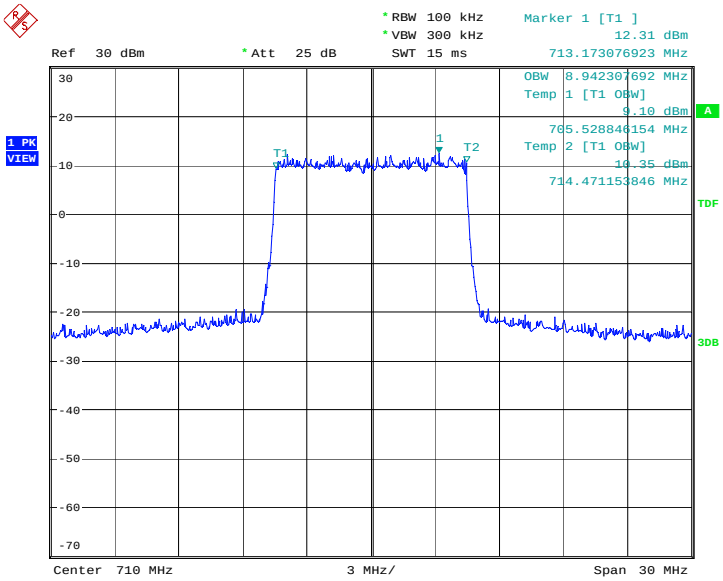
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
710.0	QPSK	16QAM
	8942.31	8942.31

LTE band 17, 10MHz Bandwidth, QPSK (99% BW)



Date: 9.SEP.2015 21:48:04

LTE band 17, 10MHz Bandwidth, 16QAM (99% BW)



Date: 9.SEP.2015 21:48:19

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A.5 EMISSION BANDWIDTH

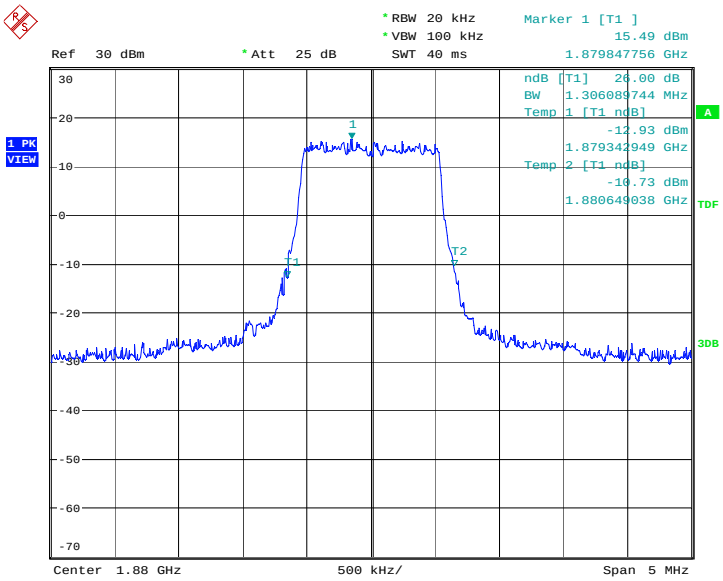
A.5.1Emission Bandwidth Results

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. Table below lists the measured -26dBc BW. Spectrum analyzer plots are included on the following pages.

LTE band 2, 1.4MHz (-26dBc)

Frequency(MHz)	Occupied Bandwidth (-26dBc)(kHz)	
1880.0	QPSK	16QAM
	1306.09	1298.08

LTE band 2, 1.4MHz Bandwidth, QPSK (-26dBc BW)



Date: 17.AUG.2015 17:07:19

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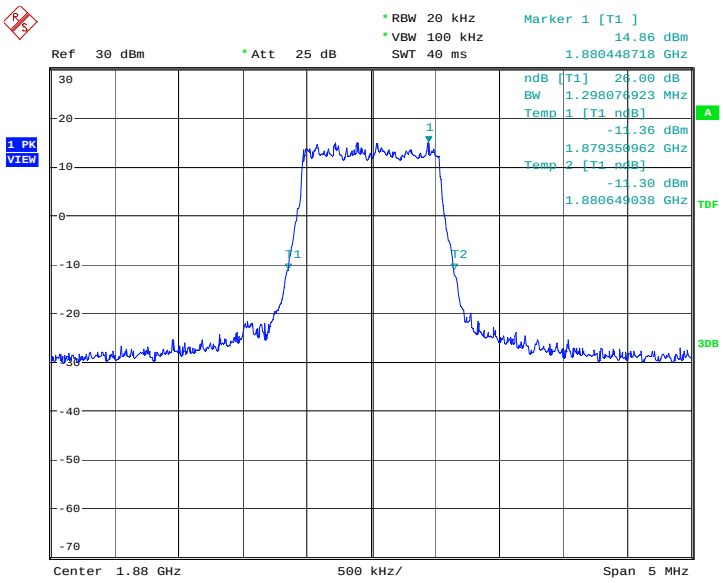
LTE band 2, 1.4MHz Bandwidth, 16QAM (-26dBc BW)



Date: 17.AUG.2015 17:07:37

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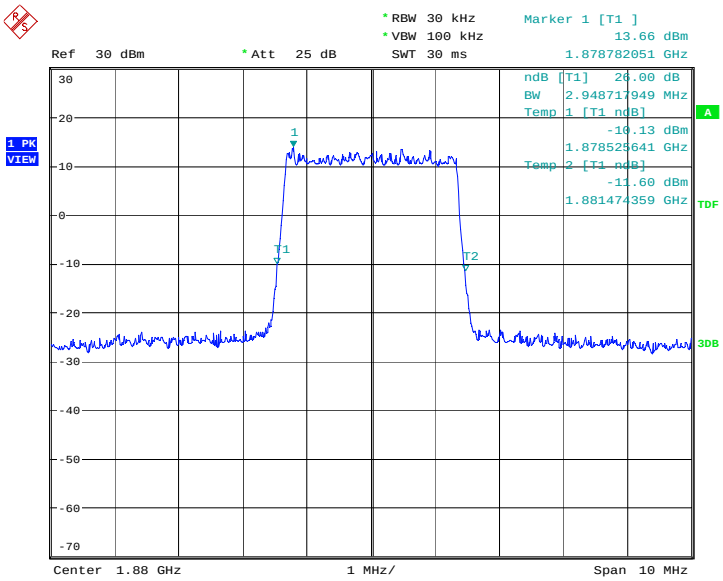
LTE band 2, 3MHz (-26dBc)

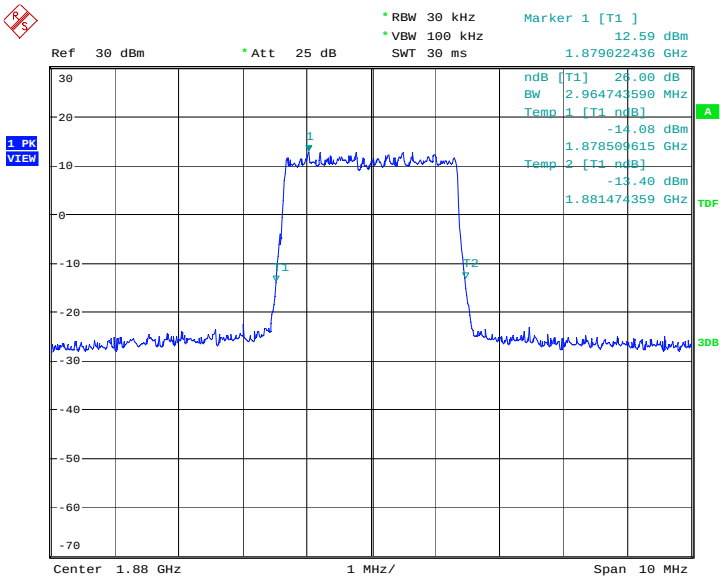
Frequency(MHz)	Occupied Bandwidth (-26dBc)(kHz)	
1880.0	QPSK	16QAM
	2948.72	2964.74

LTE band 2, 3MHz Bandwidth, QPSK (-26dBc BW)



Date: 17.AUG.2015 17:13:03

LTE band 2, 3MHz Bandwidth, 16QAM (-26dBc BW)



Date: 17.AUG.2015 17:13:20

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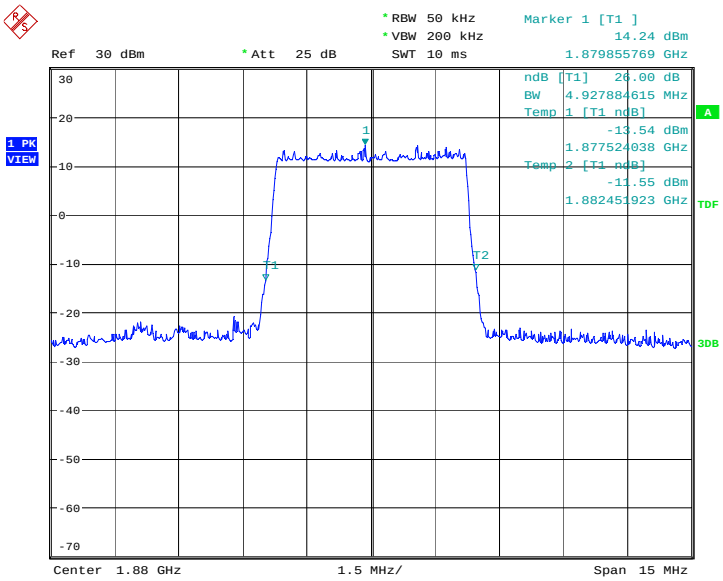
LTE band 2, 5MHz (-26dBc)

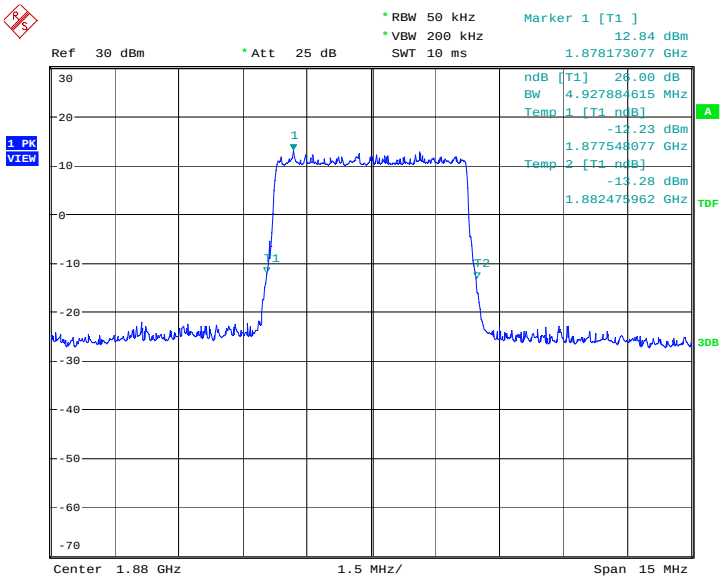
Frequency(MHz)	Occupied Bandwidth (-26dBc)(kHz)	
1880.0	QPSK	16QAM
	4927.88	4927.88

LTE band 2, 5MHz Bandwidth, QPSK (-26dBc BW)



Date: 17.AUG.2015 17:18:46

LTE band 2, 5MHz Bandwidth,16QAM (-26dBc BW)



Date: 17.AUG.2015 17:19:03

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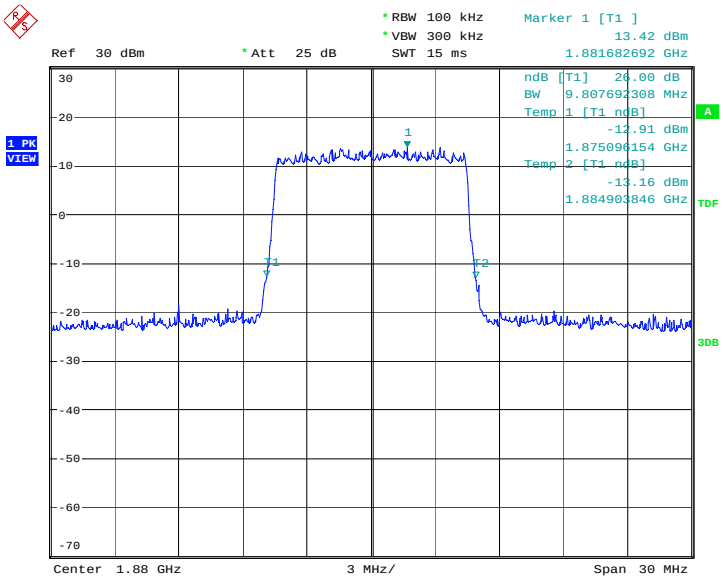
LTE band 2, 10MHz (-26dBc)

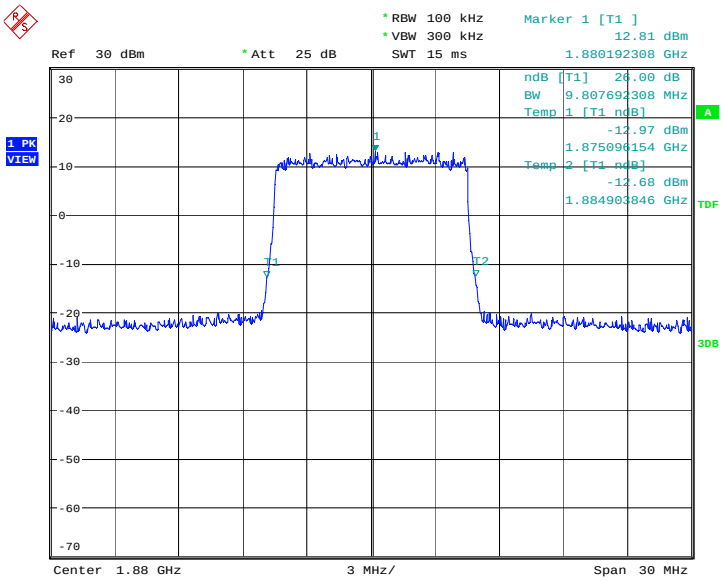
Frequency(MHz)	Occupied Bandwidth (-26dBc)(kHz)	
1880.0	QPSK	16QAM
	9807.69	9807.69

LTE band 2, 10MHz Bandwidth, QPSK (-26dBc BW)



Date: 17.AUG.2015 17:24:30

LTE band 2, 10MHz Bandwidth, 16QAM (-26dBc BW)



Date: 17.AUG.2015 17:24:47

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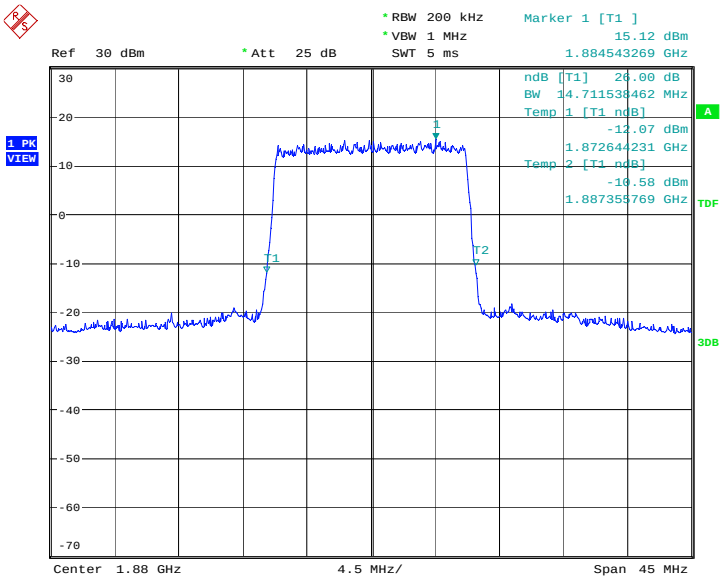
LTE band 2, 15MHz (-26dBc)

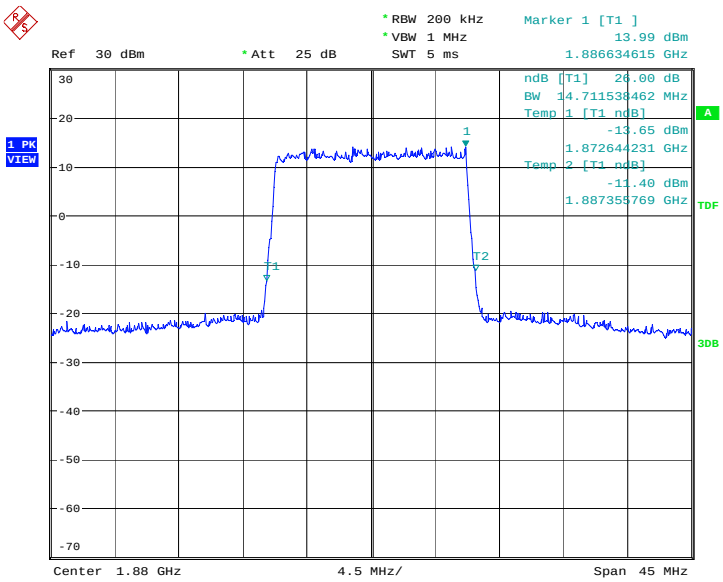
Frequency(MHz)	Occupied Bandwidth (-26dBc)(kHz)	
1880.0	QPSK	16QAM
	14711.54	14711.54

LTE band 2, 15MHz Bandwidth, QPSK (-26dBc BW)



Date: 17.AUG.2015 17:30:18

LTE band 2, 15MHz Bandwidth, 16QAM (-26dBc BW)



Date: 17.AUG.2015 17:30:35

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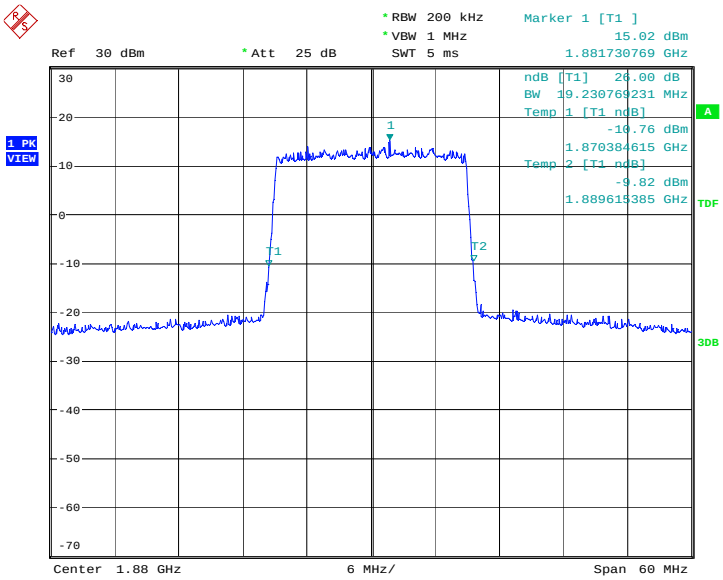
LTE band 2, 20MHz (-26dBc)

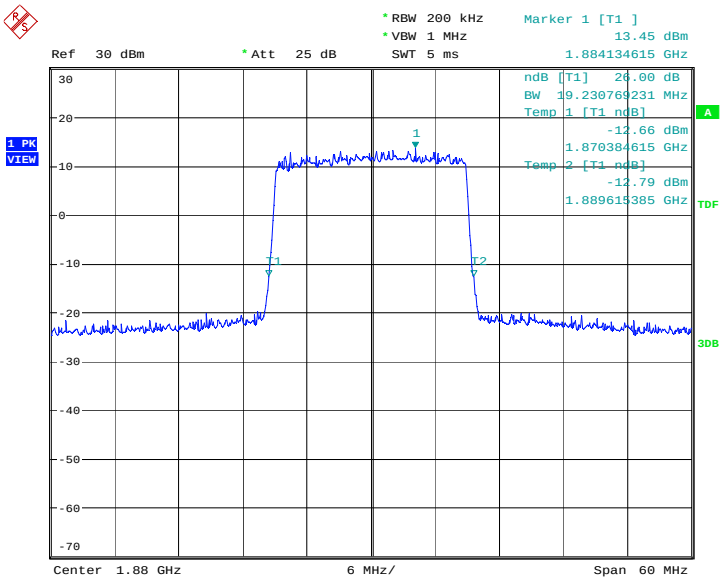
Frequency(MHz)	Occupied Bandwidth (-26dBc)(kHz)	
1880.0	QPSK	16QAM
	19230.77	19230.77

LTE band 2, 20MHz Bandwidth, QPSK (-26dBc BW)



Date: 17.AUG.2015 17:36:10

LTE band 2, 20MHz Bandwidth, 16QAM (-26dBc BW)



Date: 17.AUG.2015 17:36:27

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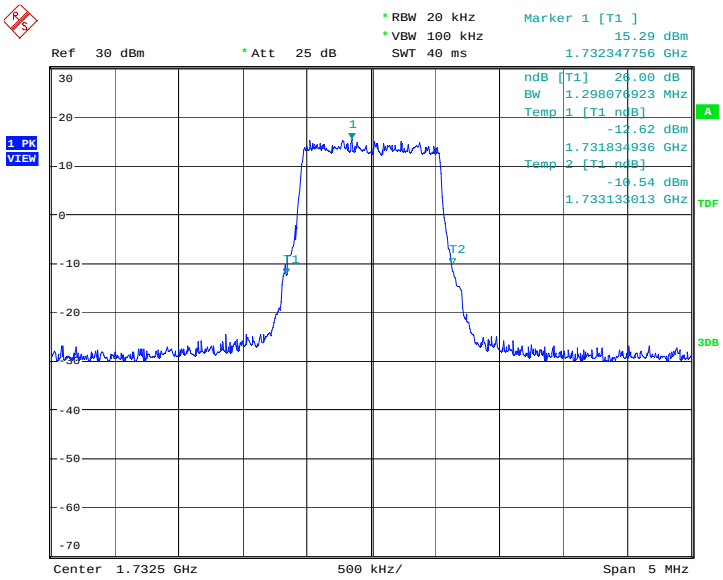
LTE band 4, 1.4MHz (-26dBc)

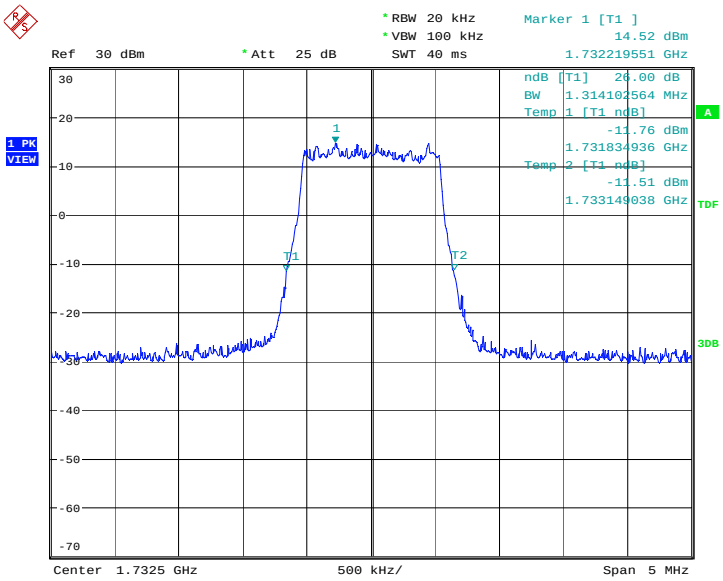
Frequency(MHz)	Occupied Bandwidth (-26dBc)(kHz)	
1732.5	QPSK	16QAM
	1298.08	1314.10

LTE band 4, 1.4MHz Bandwidth, QPSK (-26dBc BW)



Date: 17.AUG.2015 17:42:32

LTE band 4, 1.4MHz Bandwidth, 16QAM (-26dBc BW)



Date: 17.AUG.2015 17:42:49

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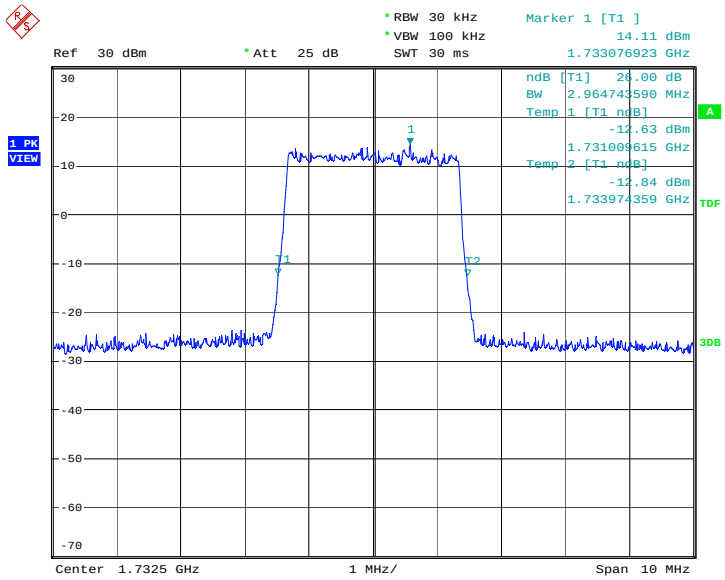
LTE band 4, 3MHz (-26dBc)

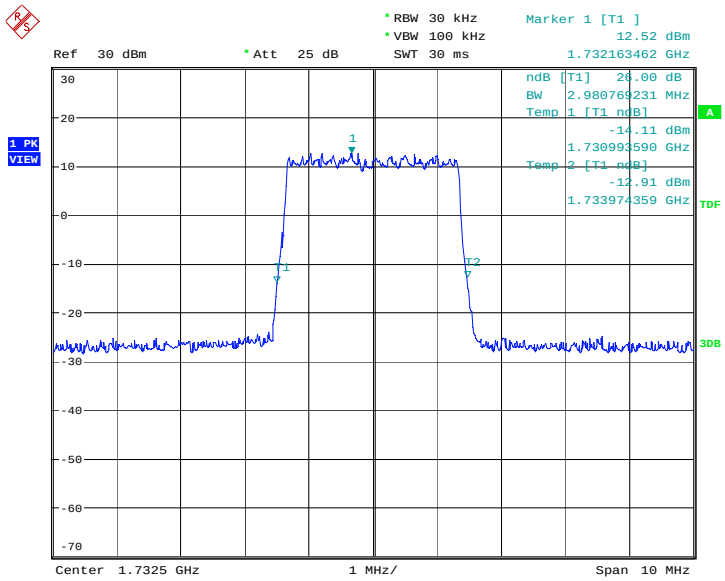
Frequency(MHz)	Occupied Bandwidth (-26dBc)(kHz)	
1732.5	QPSK	16QAM
	2964.74	2980.77

LTE band 4, 3MHz Bandwidth, QPSK (-26dBc BW)



Date: 17.AUG.2015 17:48:17

LTE band 4, 3MHz Bandwidth, 16QAM (-26dBc BW)



Date: 17.AUG.2015 17:48:34

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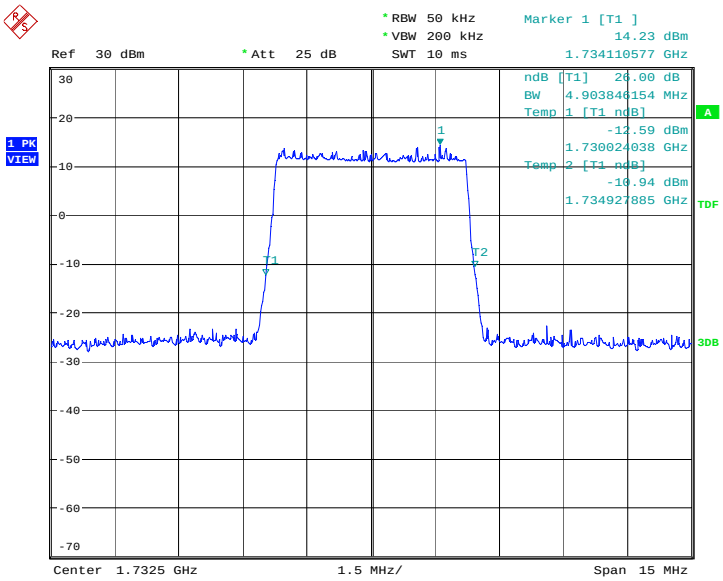
LTE band 4, 5MHz (-26dBc)

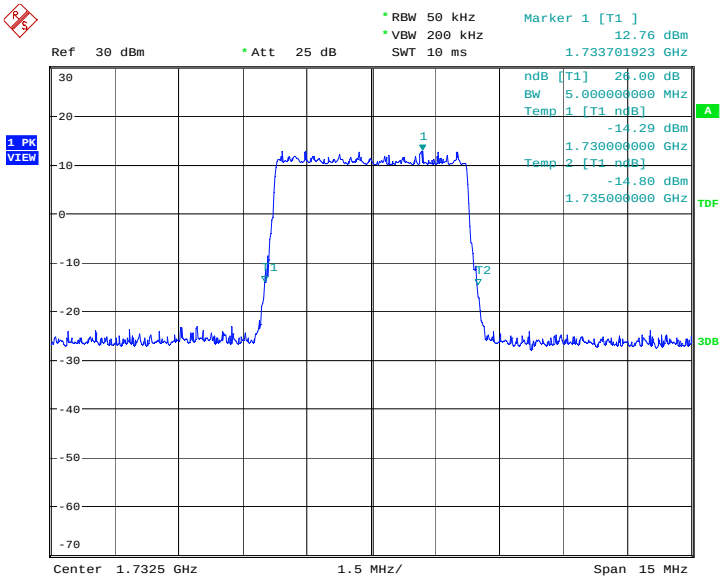
Frequency(MHz)	Occupied Bandwidth (-26dBc)(kHz)	
1732.5	QPSK	16QAM
	4903.85	5000.00

LTE band 4, 5MHz Bandwidth, QPSK (-26dBc BW)



Date: 17.AUG.2015 17:54:03

LTE band 4, 5MHz Bandwidth,16QAM (-26dBc BW)



Date: 17.AUG.2015 17:54:20

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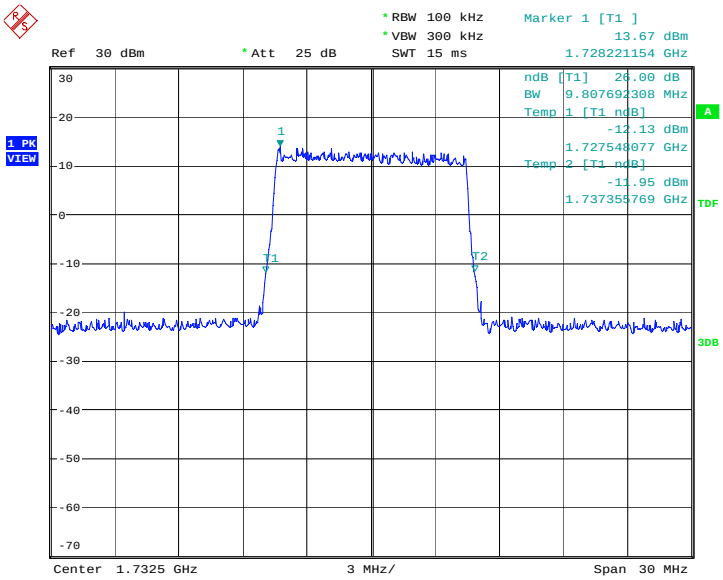
LTE band 4, 10MHz (-26dBc)

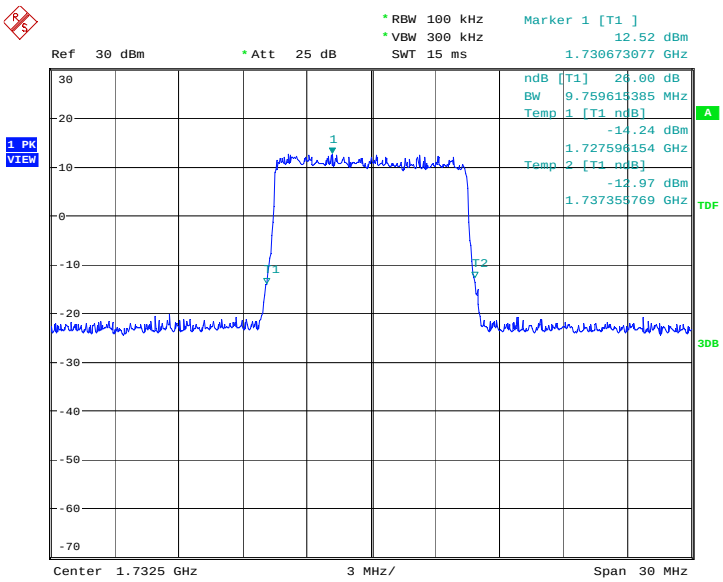
Frequency(MHz)	Occupied Bandwidth (-26dBc)(kHz)	
1732.5	QPSK	16QAM
	9807.69	9759.62

LTE band 4, 10MHz Bandwidth, QPSK (-26dBc BW)



Date: 17.AUG.2015 17:59:46

LTE band 4, 10MHz Bandwidth, 16QAM (-26dBc BW)



Date: 17.AUG.2015 18:00:03

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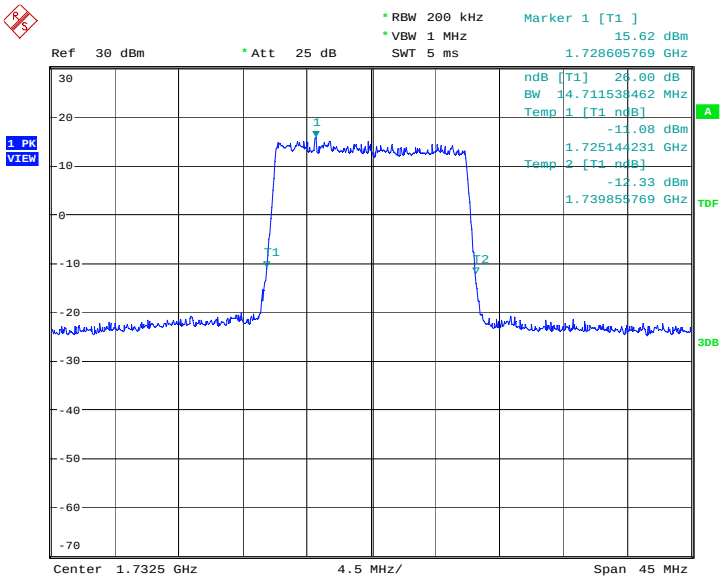
LTE band 4, 15MHz (-26dBc)

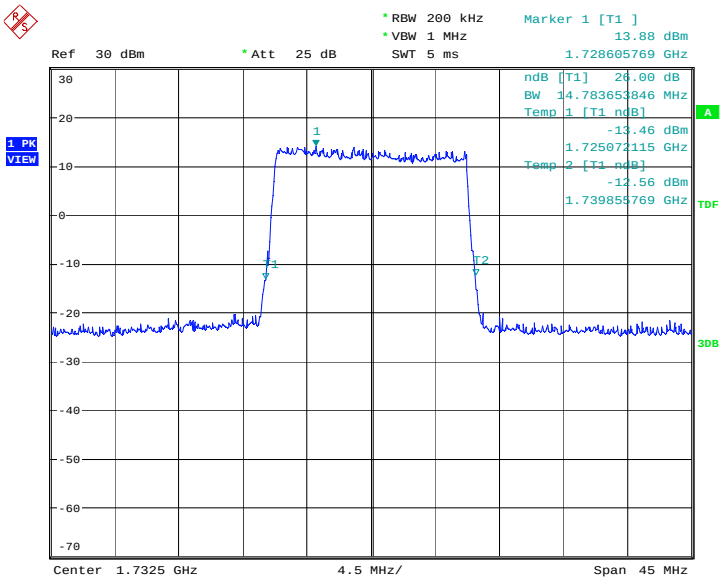
Frequency(MHz)	Occupied Bandwidth (-26dBc)(kHz)	
1732.5	QPSK	16QAM
	14711.54	14783.65

LTE band 4, 15MHz Bandwidth, QPSK (-26dBc BW)



Date: 17.AUG.2015 18:05:37

LTE band 4, 15MHz Bandwidth, 16QAM (-26dBc BW)



Date: 17.AUG.2015 18:05:54

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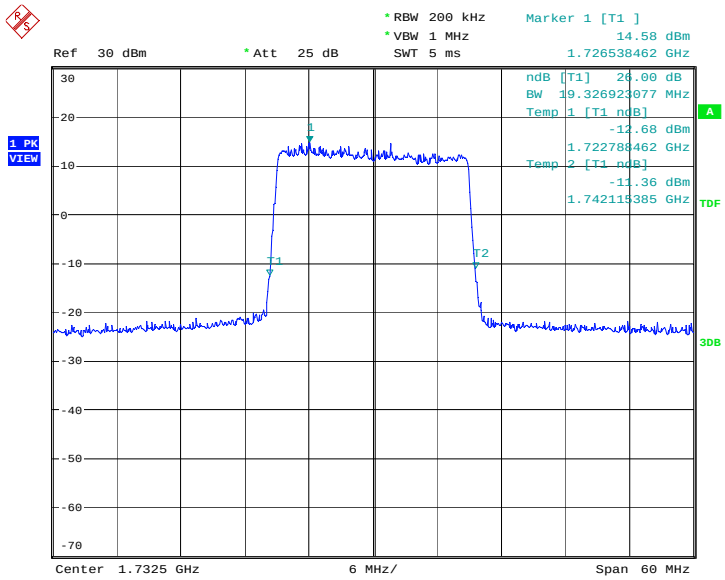
LTE band 4, 20MHz (-26dBc)

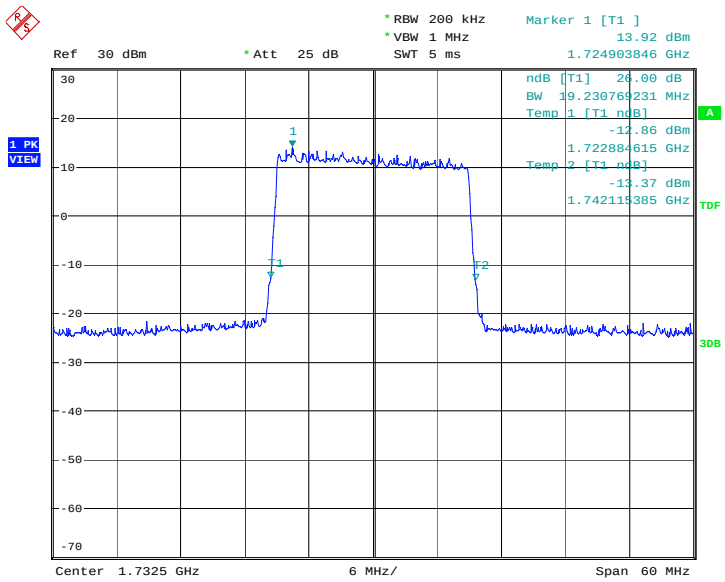
Frequency(MHz)	Occupied Bandwidth (-26dBc)(kHz)	
1732.5	QPSK	16QAM
	19326.92	19230.77

LTE band 4, 20MHz Bandwidth, QPSK (-26dBc BW)



Date: 17.AUG.2015 18:11:31

LTE band 4, 20MHz Bandwidth, 16QAM (-26dBc BW)



Date: 17.AUG.2015 18:11:48

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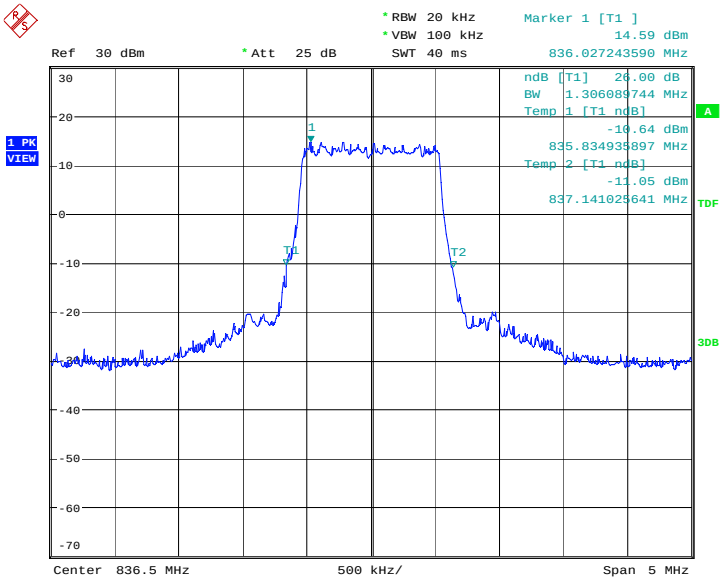
LTE band 5, 1.4MHz (-26dBc)

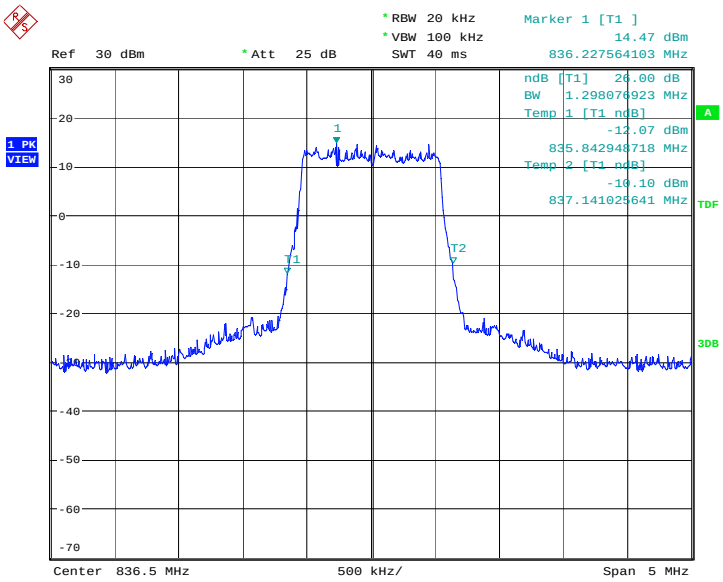
Frequency(MHz)	Occupied Bandwidth (-26dBc)(kHz)	
836.5	QPSK	16QAM
	1306.09	1298.08

LTE band 5, 1.4MHz Bandwidth, QPSK (-26dBc BW)



Date: 9.SEP.2015 20:07:07

LTE band 5, 1.4MHz Bandwidth, 16QAM (-26dBc BW)



Date: 9.SEP.2015 20:07:24

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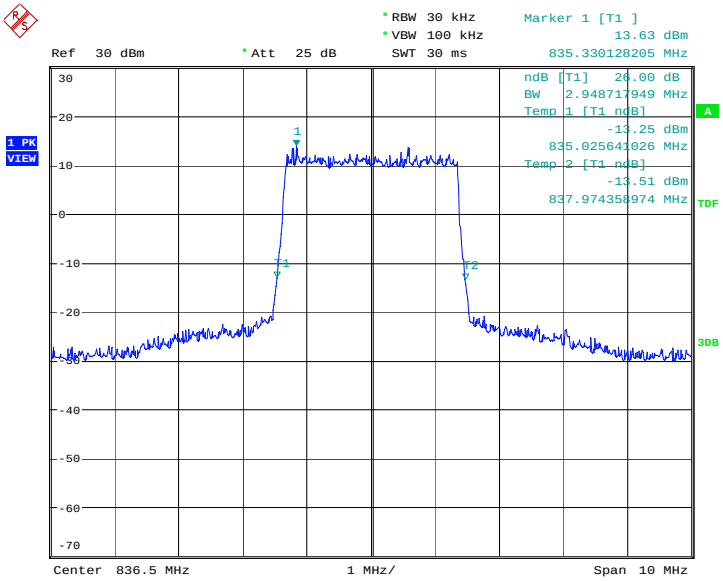
LTE band 5, 3MHz (-26dBc)

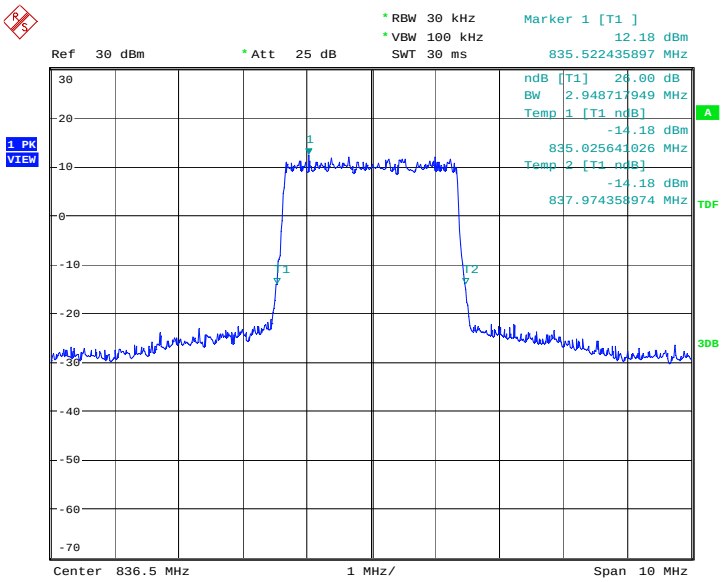
Frequency(MHz)	Occupied Bandwidth (-26dBc)(kHz)	
836.5	QPSK	16QAM
	2948.72	2948.72

LTE band 5, 3MHz Bandwidth, QPSK (-26dBc BW)



Date: 9.SEP.2015 20:21:01

LTE band 5, 3MHz Bandwidth, 16QAM (-26dBc BW)



Date: 9.SEP.2015 20:21:18

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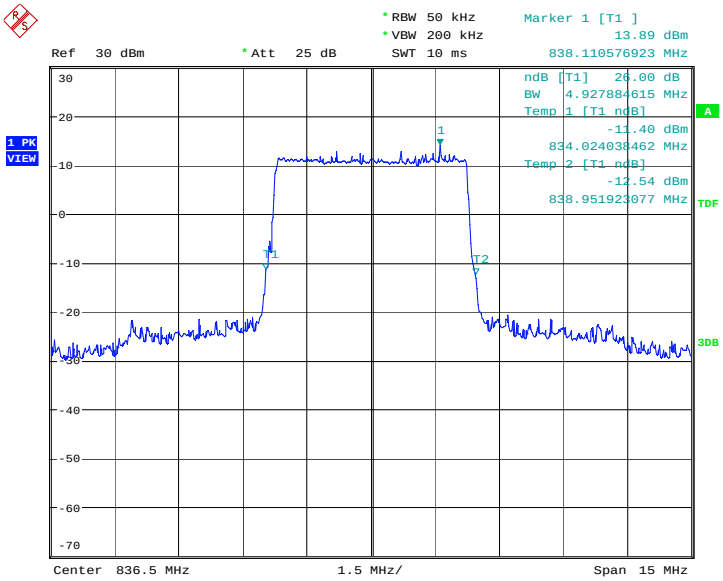
LTE band 5, 5MHz (-26dBc)

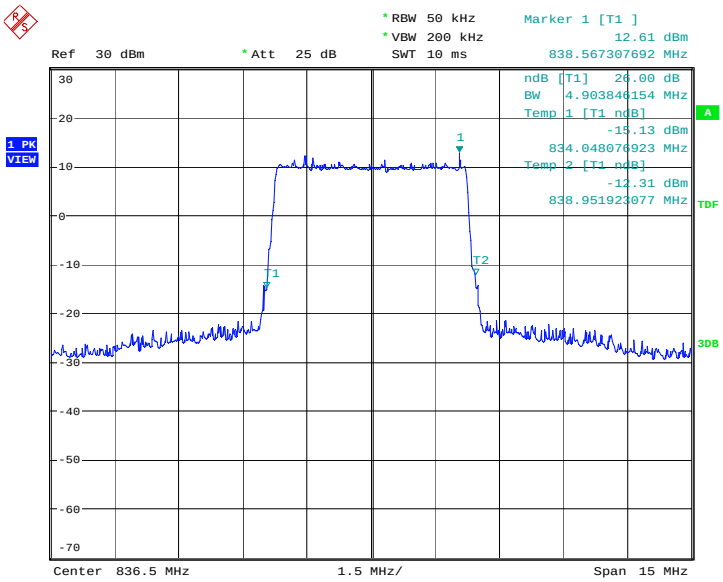
Frequency(MHz)	Occupied Bandwidth (-26dBc)(kHz)	
836.5	QPSK	16QAM
	4927.88	4903.85

LTE band 5, 5MHz Bandwidth, QPSK (-26dBc BW)



Date: 9.SEP.2015 20:34:23

LTE band 5, 5MHz Bandwidth,16QAM (-26dBc BW)



Date: 9.SEP.2015 20:34:40

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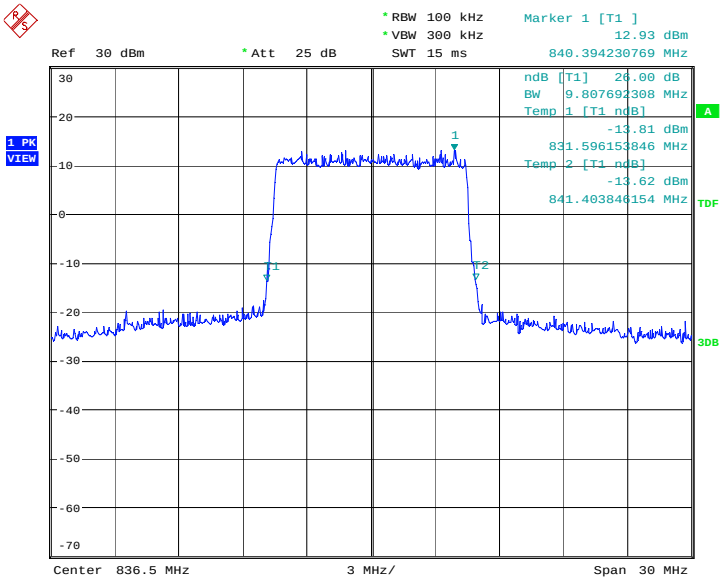
LTE band 5, 10MHz (-26dBc)

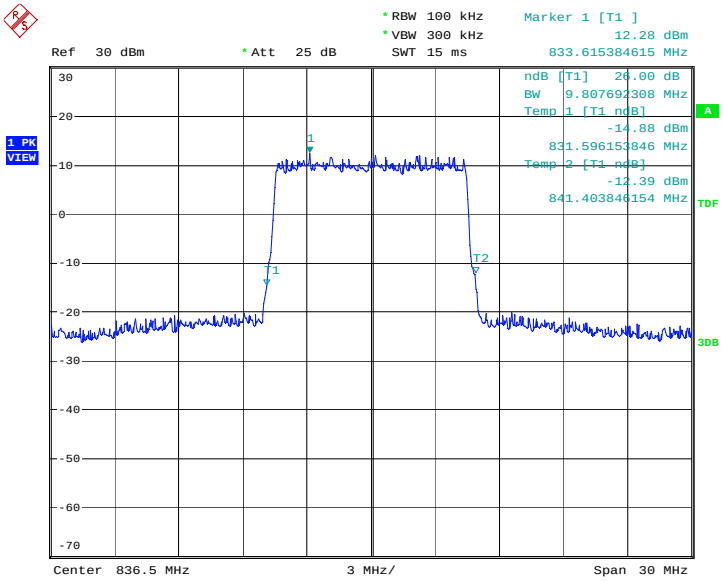
Frequency(MHz)	Occupied Bandwidth (-26dBc)(kHz)	
836.5	QPSK	16QAM
	9807.69	9807.69

LTE band 5, 10MHz Bandwidth, QPSK (-26dBc BW)



Date: 9.SEP.2015 20:44:08

LTE band 5, 10MHz Bandwidth, 16QAM (-26dBc BW)



Date: 9.SEP.2015 20:44:25

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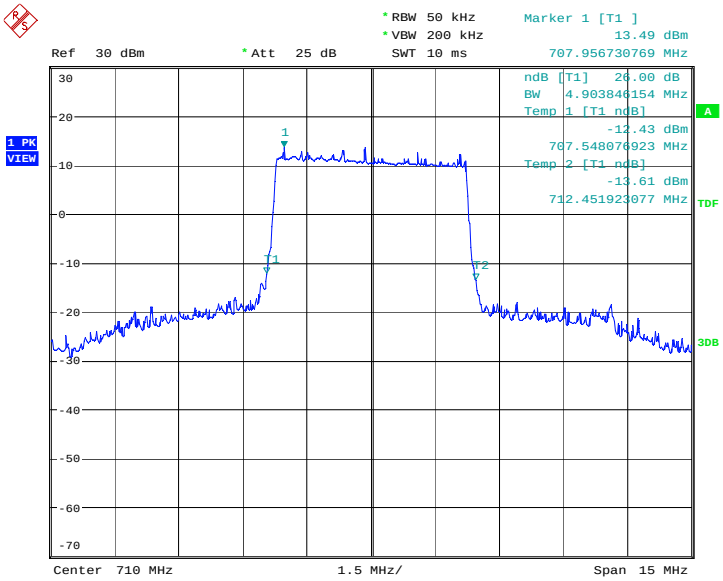
LTE band 17, 5MHz (-26dBc)

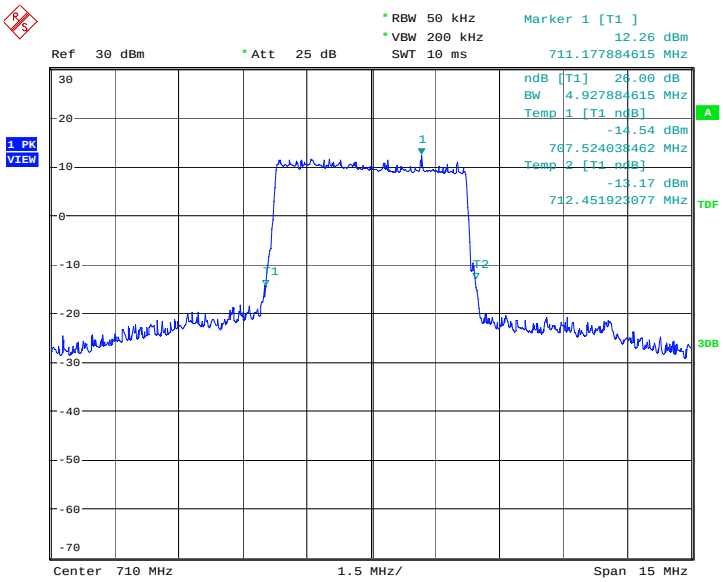
Frequency(MHz)	Occupied Bandwidth (-26dBc)(kHz)	
710.0	QPSK	16QAM
	4903.85	4927.88

LTE band 17, 5MHz Bandwidth, QPSK (-26dBc BW)



Date: 9.SEP.2015 20:54:57

LTE band 17, 5MHz Bandwidth,16QAM (-26dBc BW)



Date: 9.SEP.2015 20:55:14

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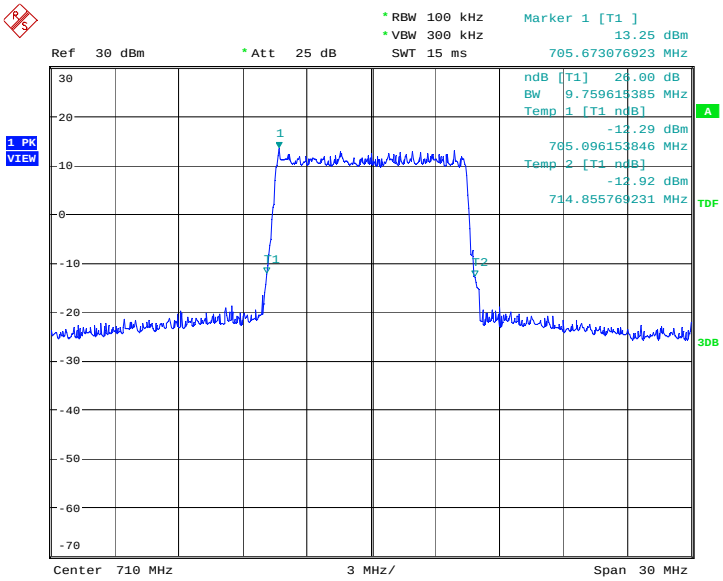
LTE band 17, 10MHz (-26dBc)

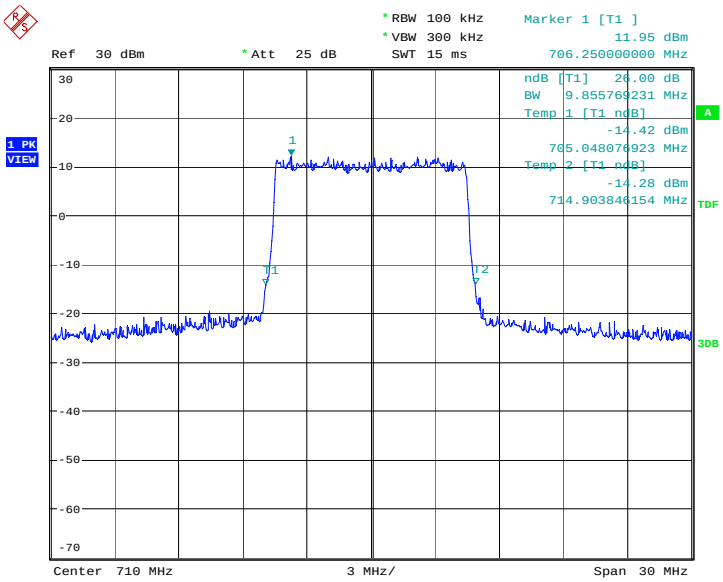
Frequency(MHz)	Occupied Bandwidth (-26dBc)(kHz)	
710.0	QPSK	16QAM
	9759.62	9855.77

LTE band 17, 10MHz Bandwidth, QPSK (-26dBc BW)



Date: 9.SEP.2015 21:49:13

LTE band 17, 10MHz Bandwidth, 16QAM (-26dBc BW)



Date: 9.SEP.2015 21:49:29

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A.6 BAND EDGE COMPLIANCE

A.6.1 Measurement limit

Part 22.917(b), 24.238(a), 27.53(h) state that on any frequency outside frequency band of the US Cellular/PCS spectrum, the power of any emission shall be attenuated below the transmitter power (P, in Watts) by at least 43+10Log (P) dB. For all power levels +30 dBm to 0 dBm, this becomes a constant specification limit of -13 dBm.

According to KDB 971168 6.0, a relaxation of the reference bandwidth is often provided for measurements within a specified frequency range at the edge of the authorized frequency block/band. This is often implemented by permitting the use of a narrower RBW (typically limited to a minimum RBW of 1% of the OBW) for measuring the out-of-band emissions without a requirement to integrate the result over the full reference bandwidth

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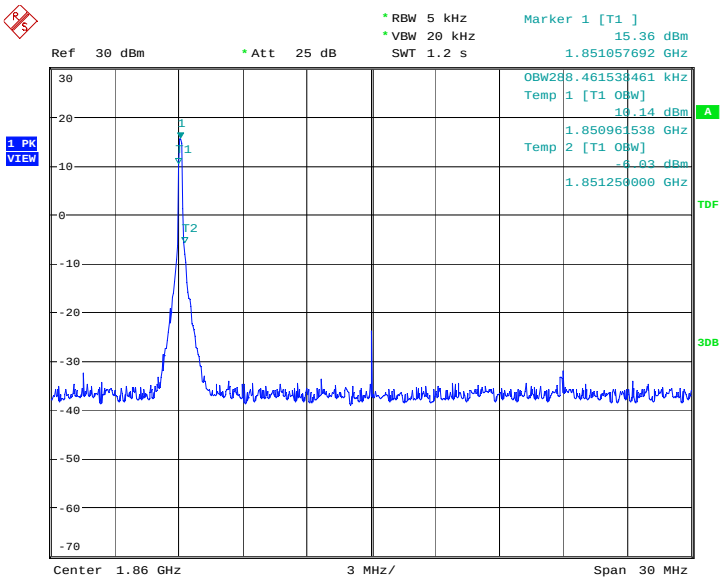
A.6.2 Measurement result

Only worst case result is given below

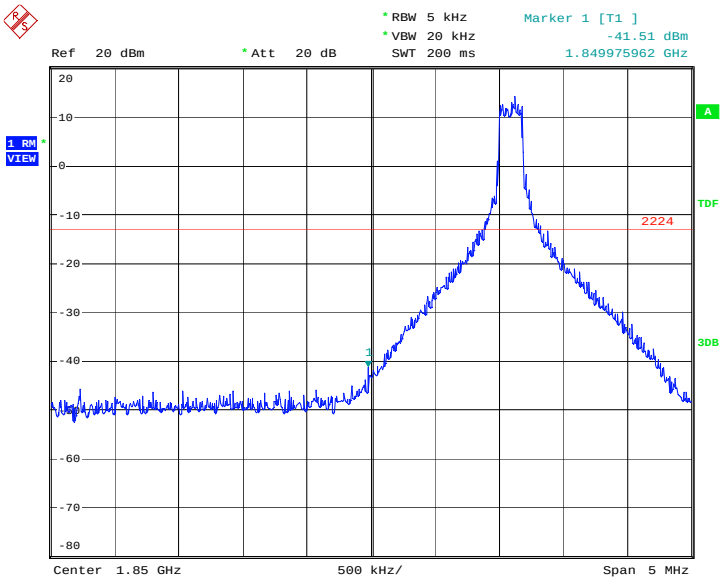
LTE band 2

OBW: 1RB-low_offset



Date: 18.AUG.2015 20:00:40

LOW BAND EDGE BLOCK-1RB-low_offset



Date: 18.AUG.2015 20:01:26

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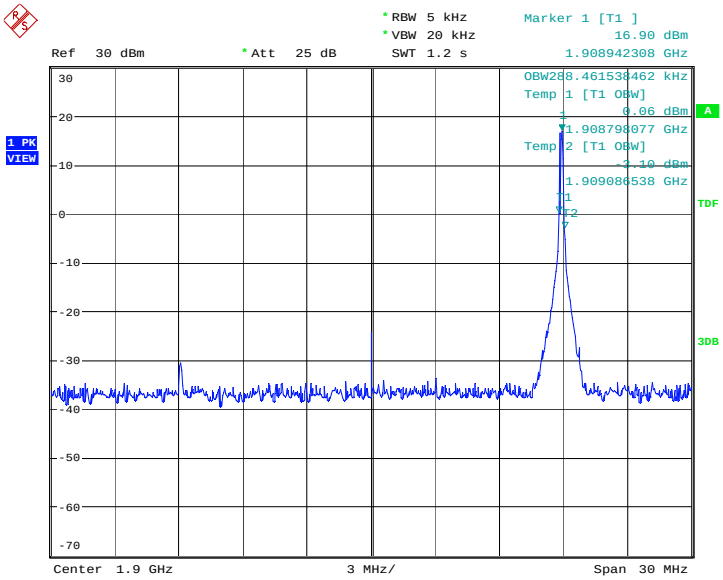
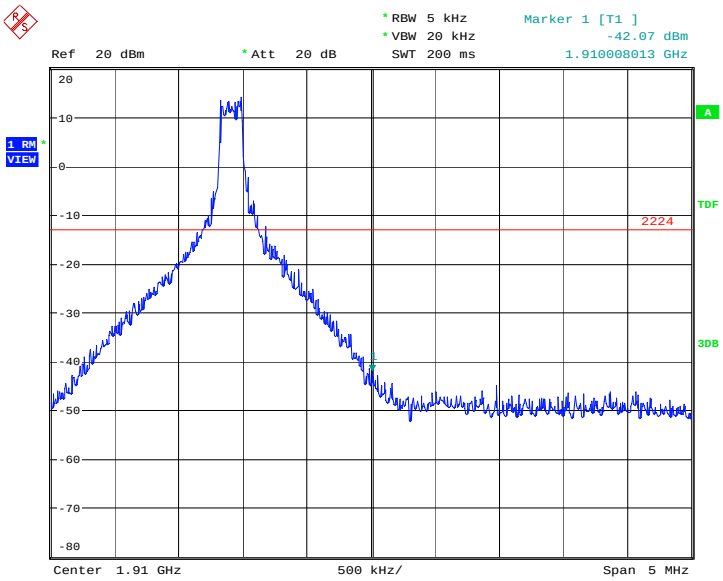
OBW: 1RB-high_offset



Date: 18.AUG.2015 17:35:55

HIGH BAND EDGE BLOCK-1RB-high_offset



Date: 18.AUG.2015 17:36:40

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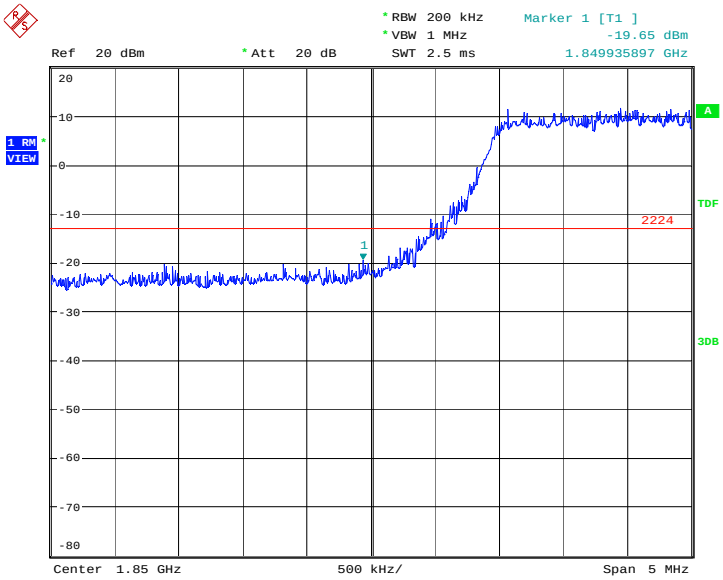
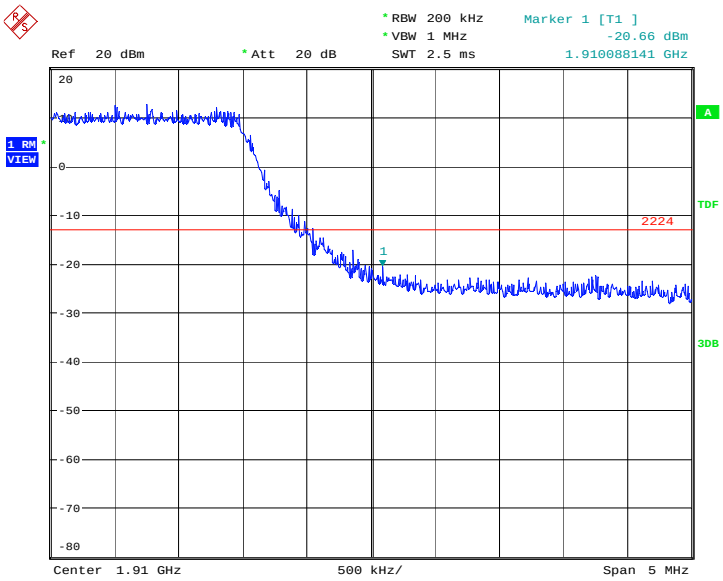
LOW BAND EDGE BLOCK-20MHz-100%RB



Date: 18.AUG.2015 15:36:20

HIGH BAND EDGE BLOCK-20MHz-100%RB



Date: 18.AUG.2015 15:37:09

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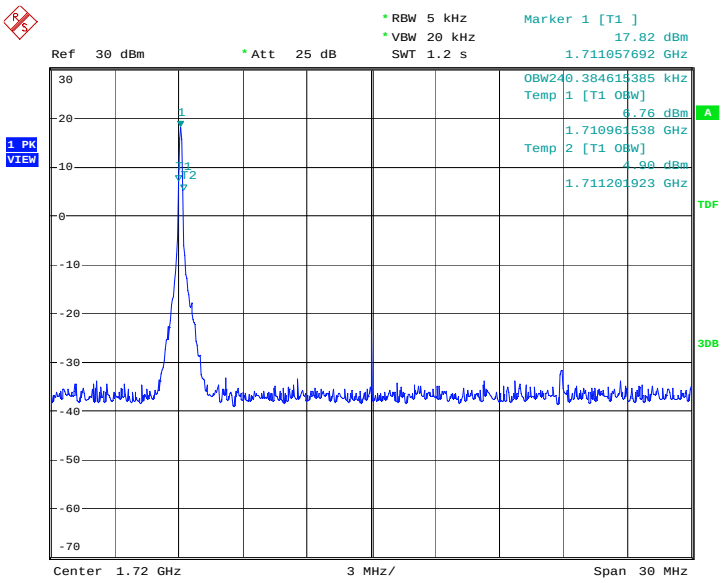
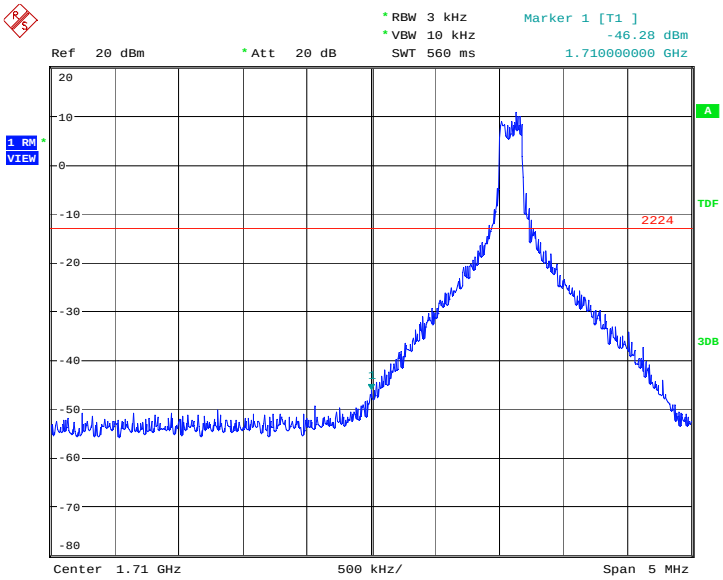
LTE band 4

OBW: 1RB-low_offset



Date: 18.AUG.2015 20:02:25

LOW BAND EDGE BLOCK-1RB-low_offset



Date: 18.AUG.2015 20:03:12

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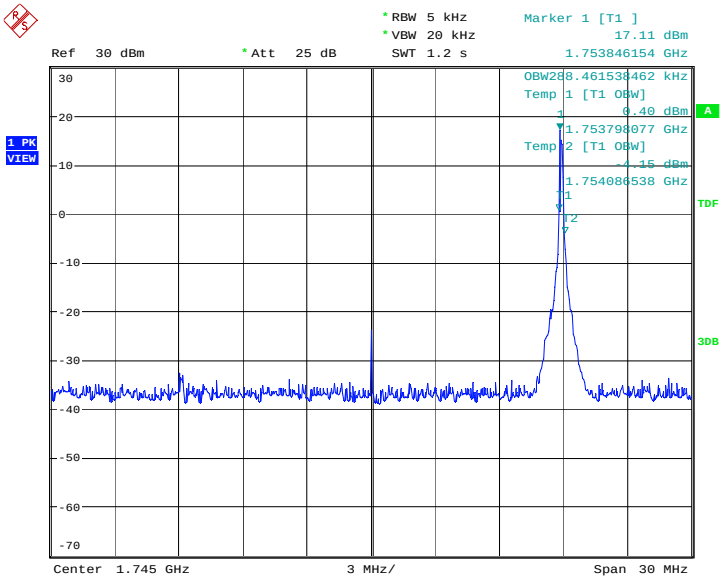
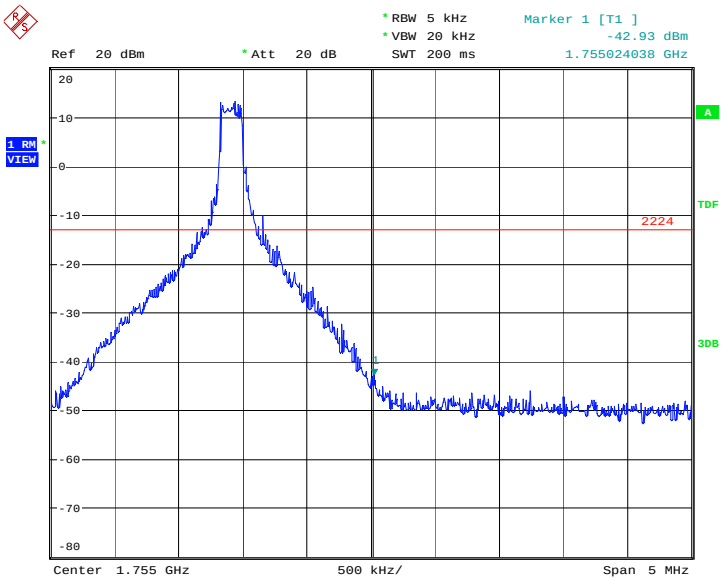
OBW: 1RB-high_offset



Date: 18.AUG.2015 17:37:33

HIGH BAND EDGE BLOCK-1RB-high_offset



Date: 18.AUG.2015 17:38:19

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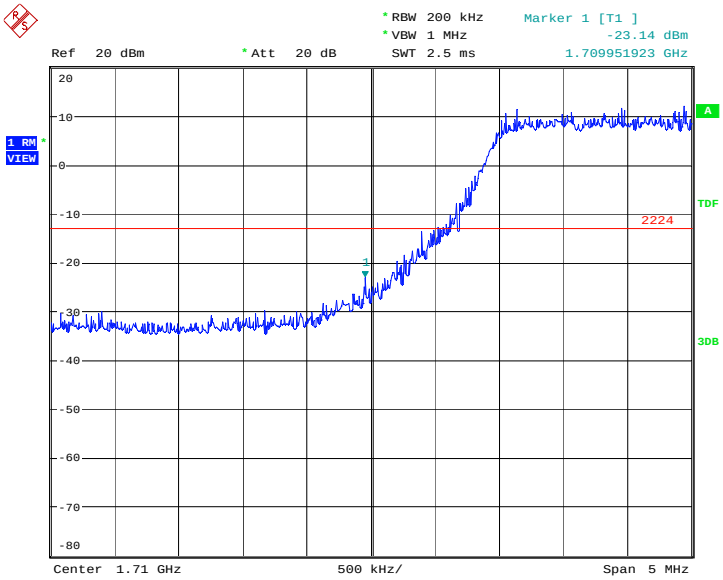
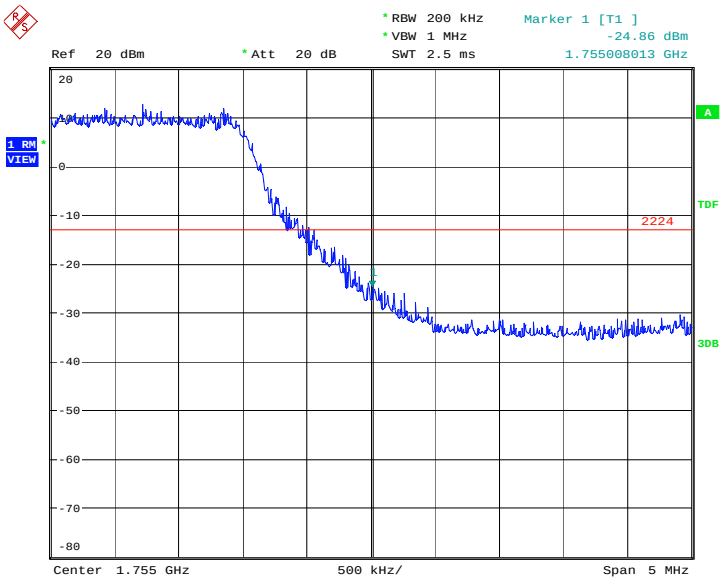
LOW BAND EDGE BLOCK-20MHz-100%RB



Date: 18.AUG.2015 15:37:58

HIGH BAND EDGE BLOCK-20MHz-100%RB



Date: 18.AUG.2015 15:38:47

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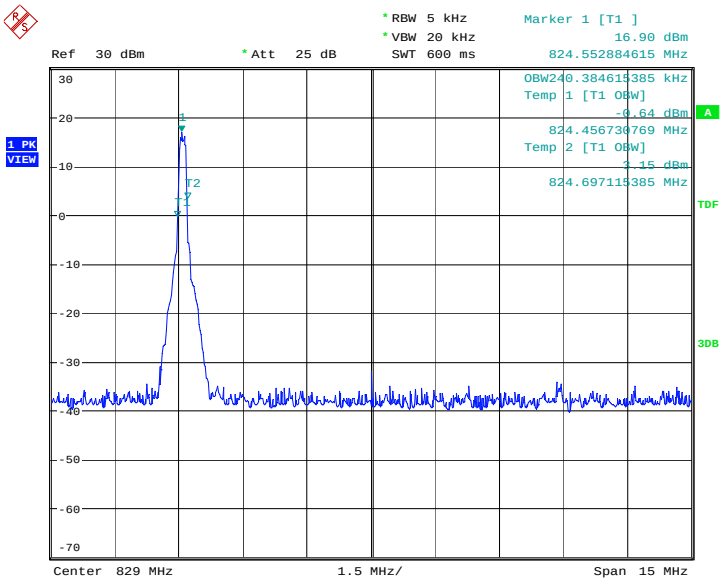
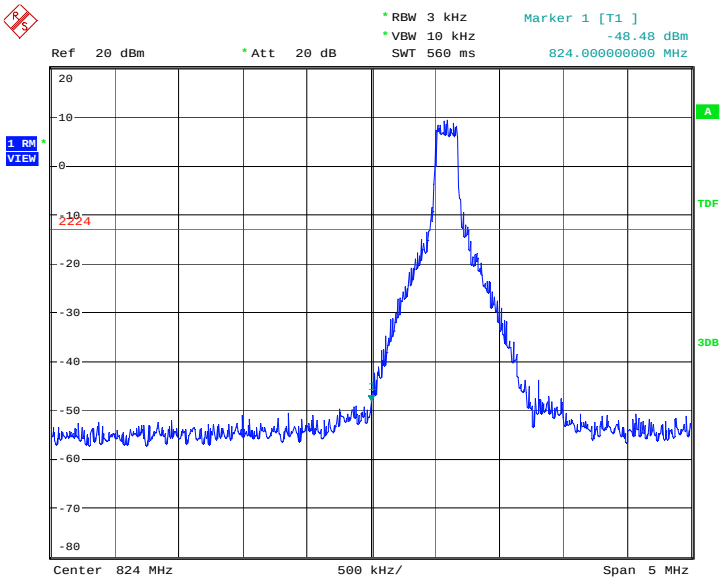
LTE band 5

OBW: 1RB-low_offset



Date: 10.SEP.2015 15:55:50

LOW BAND EDGE BLOCK-1RB-low_offset



Date: 10.SEP.2015 15:59:08

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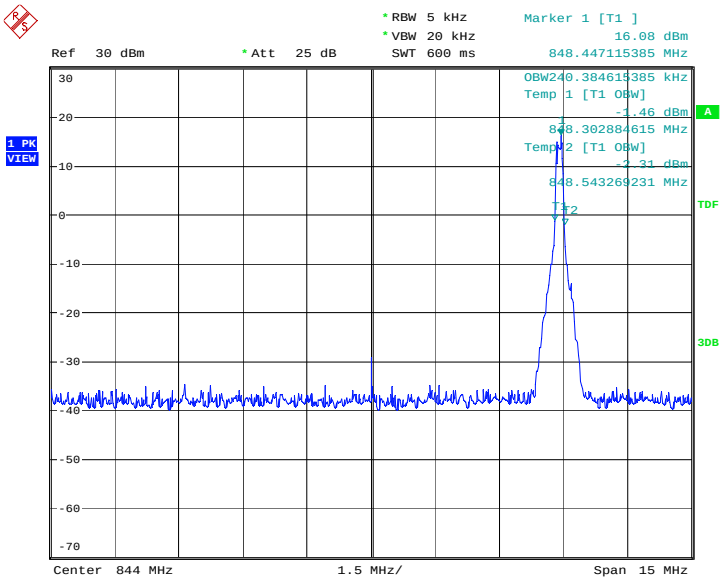
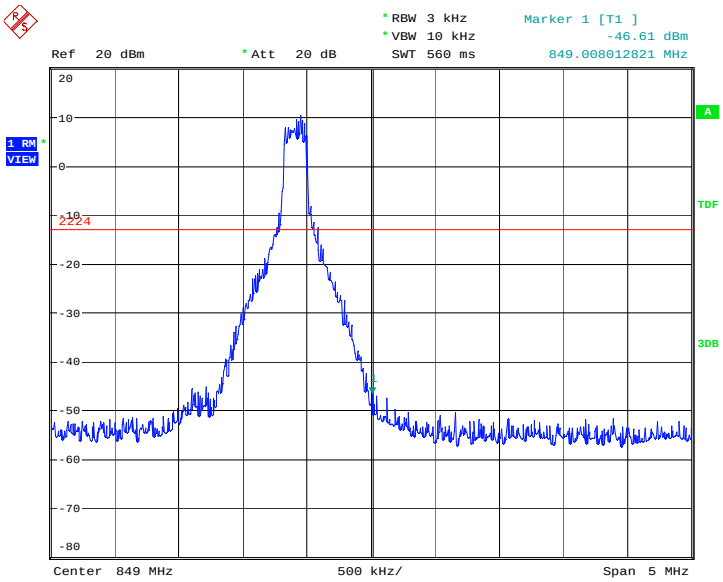
OBW: 1RB-high_offset



Date: 10.SEP.2015 20:50:34

HIGH BAND EDGE BLOCK-1RB-high_offset



Date: 10.SEP.2015 20:51:20

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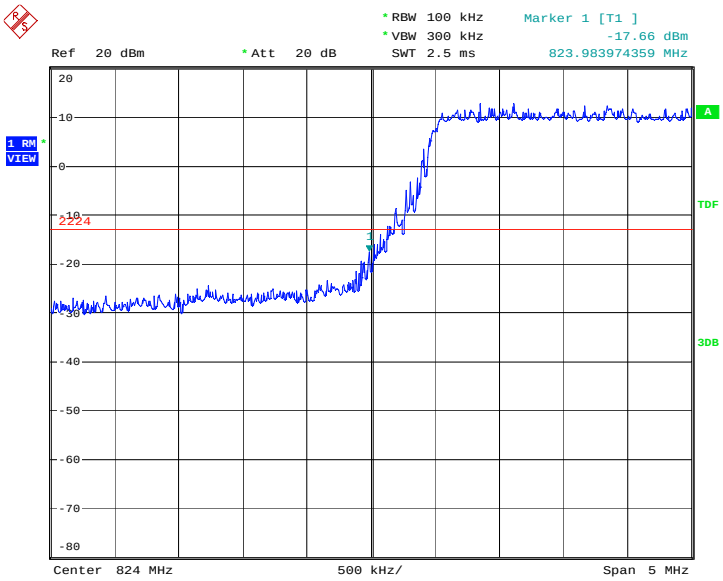
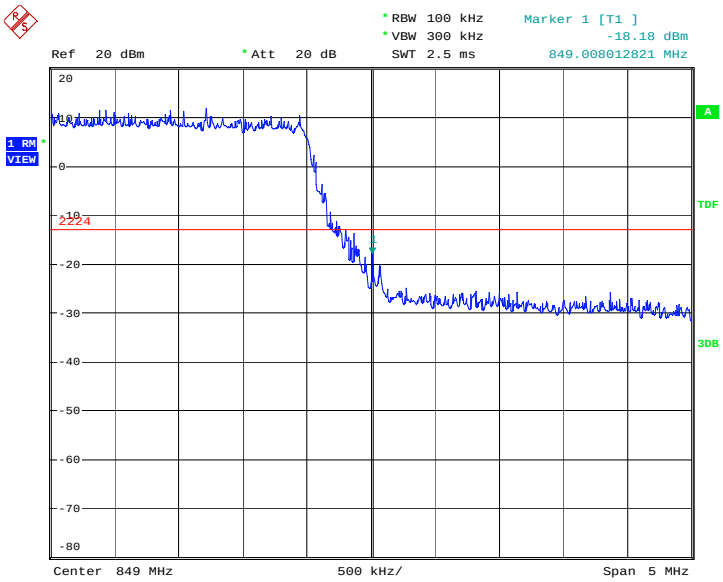
LOW BAND EDGE BLOCK-10MHz-100%RB



Date: 9.SEP.2015 22:58:25

HIGH BAND EDGE BLOCK-10MHz-100%RB



Date: 9.SEP.2015 23:04:26

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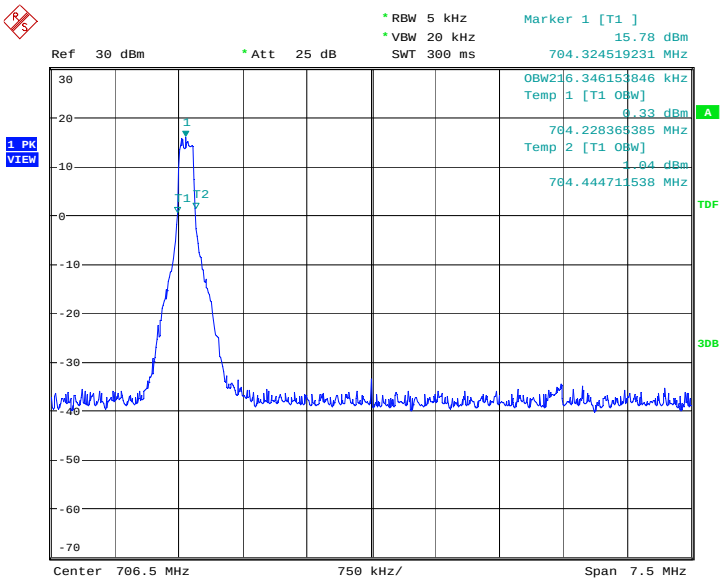
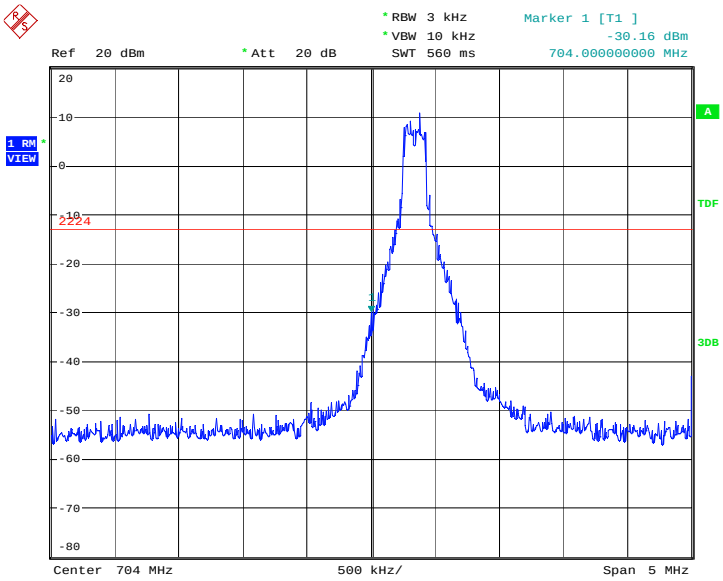
LTE band 17

OBW: 1RB-low_offset



Date: 10.SEP.2015 16:28:58

LOW BAND EDGE BLOCK-1RB-low_offset



Date: 10.SEP.2015 16:29:45

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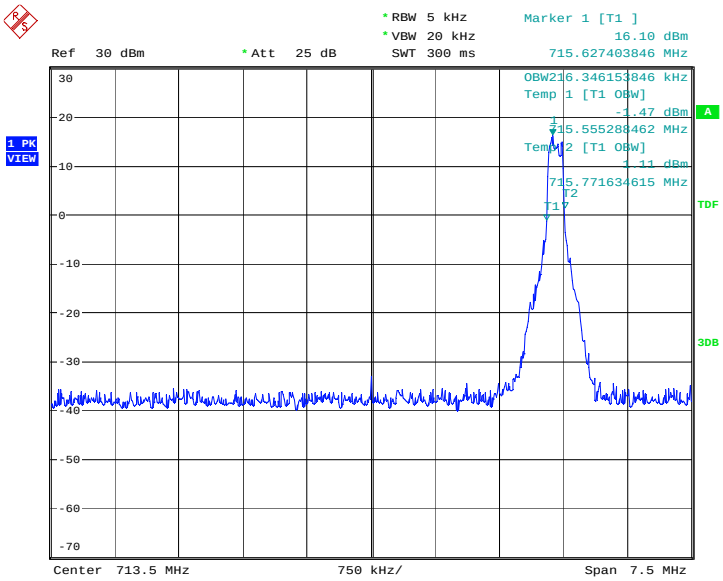
OBW: 1RB-high_offset



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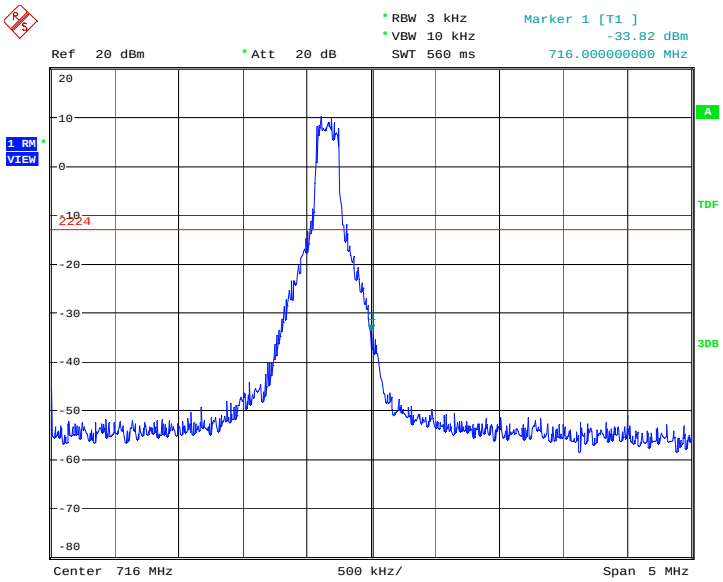
HIGH BAND EDGE BLOCK-1RB-high_offset



Date: 10.SEP.2015 21:23:09

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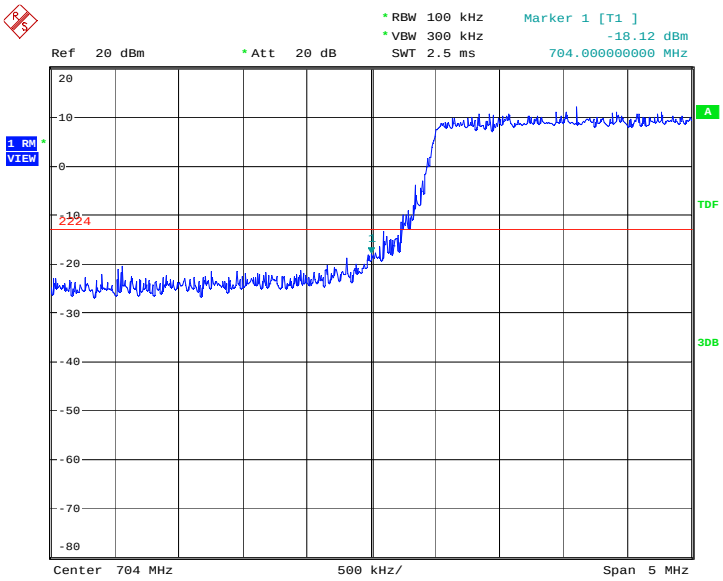
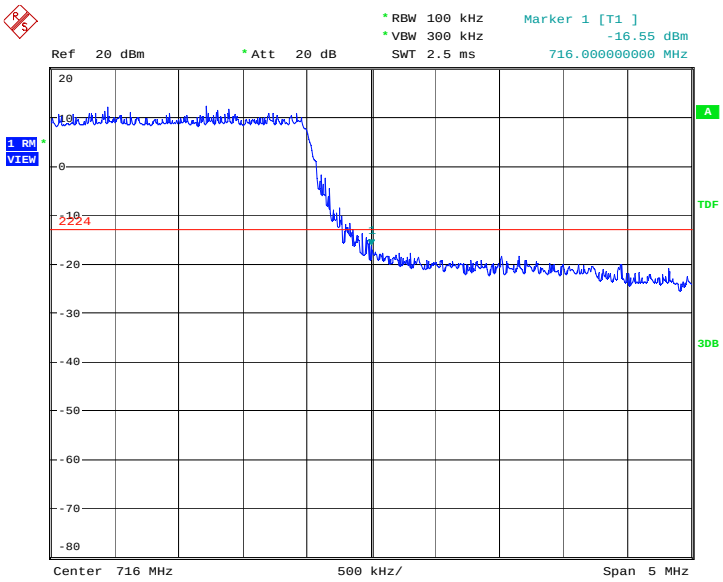
LOW BAND EDGE BLOCK-10MHz-100%RB



Date: 10.SEP.2015 21:42:02

HIGH BAND EDGE BLOCK-10MHz-100%RB



Date: 10.SEP.2015 21:43:54

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A.7 CONDUCTED SPURIOUS EMISSION

A.7.1 Measurement Method

The following steps outline the procedure used to measure the conducted emissions from the EUT.

1. Determine frequency range for measurements: From CFR 2.1057 the spectrum should be investigated from the lowest radio frequency generated in the equipment up to at least the 10th harmonic of the carrier frequency. For the mobile station equipment tested, this equates to a frequency range of 13 MHz to 9 GHz, data taken from 10 MHz to 25 GHz.
2. Determine EUT transmit frequencies: below outlines the band edge frequencies pertinent to conducted emissions testing.
3. The number of sweep points of spectrum analyzer is set to 30001 which is greater than span/RBW.

A. 7.2 Measurement Limit

Part 22.917, Part 24.238 and Part 27.53(h) 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.

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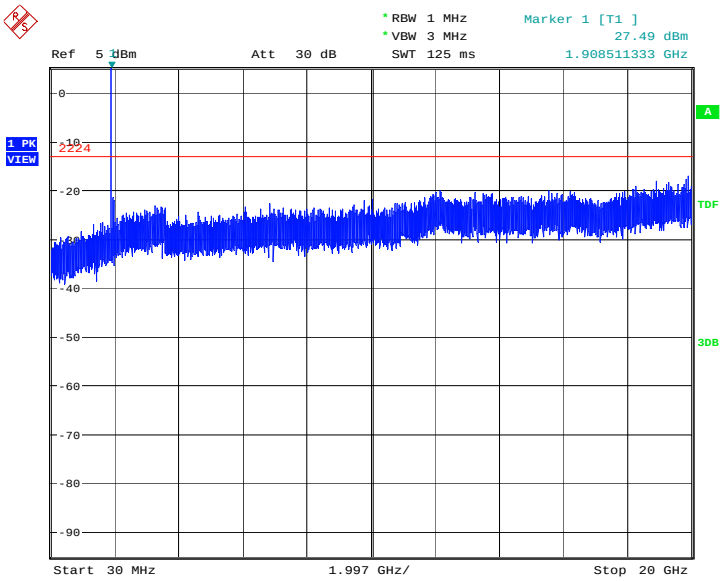
A. 7.3 Measurement result

Only worst case result is given below

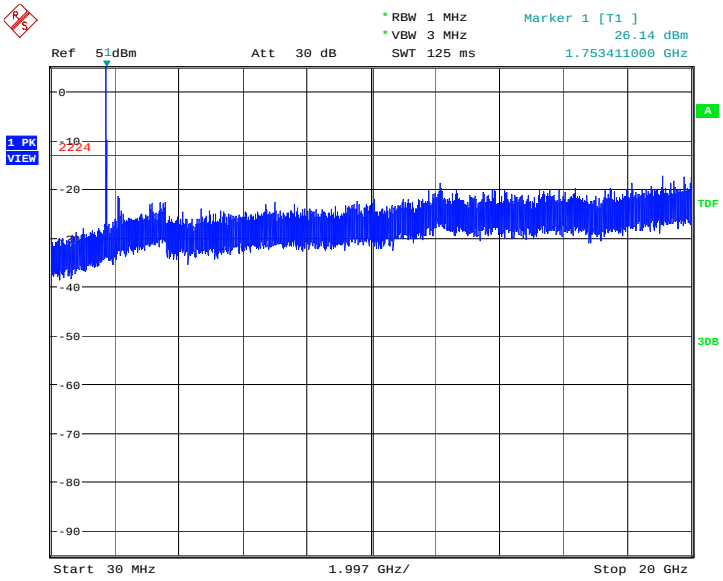
LTE band 2: 30MHz – 20GHz

Spurious emission limit –13dBm.



LTE band 4: 30MHz – 20GHz

Spurious emission limit –13dBm.



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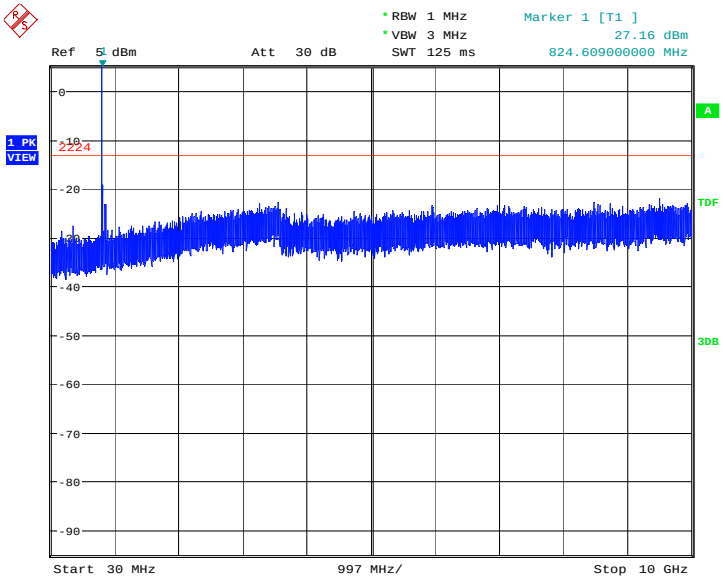
LTE band 5: 30MHz – 10GHz

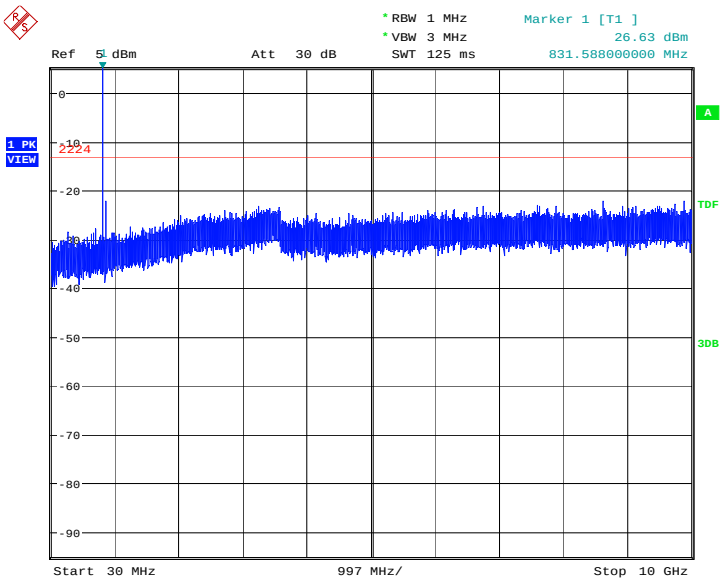
Spurious emission limit –13dBm.



Date: 10.SEP.2015 15:49:30

LTE band 17: 30MHz – 10GHz

Spurious emission limit –13dBm.



Date: 10.SEP.2015 15:53:00

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A.8 PEAK-TO-AVERAGE POWER RATIO

Reference

FCC: CFR Part 24.232 (d), 27.50(a)

The peak-to-average power ratio (PAPR) of the transmitter output power must not exceed 13 dB. The PAPR measurements should be made using either an instrument with complementary cumulative distribution function (CCDF) capabilities to determine that PAPR will not exceed 13 dB for more than 0.1 percent of the time or other Commission approved procedure. The measurement must be performed using a signal corresponding to the highest PAPR expected during periods of continuous transmission.

According to KDB 971168 v02r02 5.7.1:

a)Refer to instrument's analyzer instruction manual for details on how to use the power statistics/CCDF function;

b) Set resolution/measurement bandwidth ≥ signal' s occupied bandwidth;

c) Set the number of counts to a value that stabilizes the measured CCDF curve;

d) Set the measurement interval to 1 ms

e)Record the maximum PAPR level associated with a probability of 0.1%

A.8.1 Measurement limit

not exceed 13 dB

A.8.2 Measurement results

LTE band 2, 20MHz

Frequency(MHz)	PAPR(dB)	
1860.0	QPSK	16QAM
	6.57	7.40

LTE band 4, 20MHz

Frequency(MHz)	PAPR(dB)	
1745.0	QPSK	16QAM
	6.70	7.31

LTE band 17,10MHz

Frequency(MHz)	PAPR(dB)	
710.0	QPSK	16QAM
	5.54	6.31

*****END OF REPORT*****

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