TEST REPORT

No. I16Z40549-GTE04

for

TCL Communication Ltd.

CDMA/LTE/GSM/UMTS mobile phone

Model Name: 5027B

FCC ID: 2ACCJB053

with

Hardware Version: VC

Software Version: 5027BAS8

Issued Date: 2016-04-05

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
I16Z40549-GTE04	Rev.0	1st edition	2016-04-05

CONTENTS

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

1.2. Testing Environment

Normal Temperature:	15-35℃
Relative Humidity:	20-75%

1.3. Project data

Testing Start Date:	2016-03-23
Testing End Date:	2016-03-30

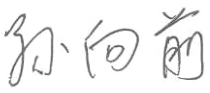
1.4. Signature

Shen Yi

(Prepared this test report)

Zhong Nan

(Reviewed this test report)



Sun Xiang Qian

Deputy Director of the laboratory

(Approved this test report)

2. Client Information

2.1. Applicant Information

Company Name:	TCL Communication Ltd.
Address /Post:	5F, C building, No. 232, Liang Jing Road ZhangJiang High-Tech Park, Pudong Area Shanghai, P.R. China. 201203
Contact Person:	Gong Zhizhou
Contact Email	zhizhou.gong@tcl.com
Telephone:	0086-21-31363544
Fax:	0086-21-61460602

2.2. Manufacturer Information

Company Name:	TCL Communication Ltd.
Address /Post:	5F, C building, No. 232, Liang Jing Road ZhangJiang High-Tech Park, Pudong Area Shanghai, P.R. China. 201203
Contact Person:	Gong Zhizhou
Contact Email	zhizhou.gong@tcl.com
Telephone:	0086-21-31363544
Fax:	0086-21-61460602

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

3.1. About EUT

Description	CDMA/LTE/GSM/UMTS mobile phone
Model Name	5027B
FCC ID	2ACCJB053
Antenna	Integrated
Output power	22.83dBm maximum EIRP measured for LTE Band 25
Extreme vol. Limits	3.6VDC 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
UT31a	35790707000138	VC	5027BAS8
UT32a	35790707000139	VC	5027BAS8

*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	Charger

AE1

Model	CAB1780002C1
Manufacturer	BYD
Capacitance	1780mAh

AE2

Model	CBA0058AG0C2
Manufacturer	TENPAO

*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 CDMA/LTE/GSM/UMTS mobile phone with integrated antenna. Manual and specifications of the EUT were provided to fulfil the test.

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 24	PERSONAL COMMUNICATIONS SERVICES	10-1-15 Edition
FCC Part 27	MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES	10-1-15 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

5. LABORATORY ENVIRONMENT

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

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

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

LTE Band 25

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 41

Items	Test Name	Clause in FCC rules	Section in this report	Verdict
1	Output Power	27.50(h)(2)	A.1	P
2	Emission Limit	27.53(m), 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(m)	A.5	P
6	Band Edge Compliance	27.53(m)	A.6	P
7	Conducted Spurious Emission	27.53(m), 2.1057	A.7	P
8	Peak to Average Power Ratio	27.50(a)	A.8	P

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.

7. Test Equipments Utilized

NO.	Description	TYPE	series number	MANUFACTURE	CAL DUE DATE	Calibration interval
1	Test Receiver	ESU26	100235	R&S	2017-03-02	1 year
2	Test Receiver	ESU26	100376	R&S	2016-10-29	1 year
3	EMI Antenna	VULB 9163	302	Schwarzbeck	2017-01-03	3 year
4	EMI Antenna	3117	00119024	ETS-Lindgren	2017-01-20	3 year
5	LISN	ENV216	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	2016-07-06	1 year
8	Spectrum Analyzer	E4440A	MY48250642	Agilent	2017-03-02	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	Signal Generator	N5183A	MY49060052	Agilent	2017-03-07	1 year
12	Climate chamber	SH-241	92007454	ESPEC	2017-12-14	2 year
13	Loop Antenna	HFH2-Z2	829324/007	R&S	2017-12-10	3 year

ANNEX A: MEASUREMENT RESULTS

A.1 OUTPUT POWER

Reference

FCC: 24.232(c), 27.50(h)(2)

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.

This result contains peak output power, ERP/EIRP measurements and peak-to-average power ratio (PAPR) for the EUT.

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.

The power was measured with spectrum analyzer's RMS detector.

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 25

Bandwidth	RB size/offset	Frequency (MHz)	Power(dBm)	
			QPSK	16QAM
1.4MHz	1 RB high	1914.3	23.20	22.56
		1882.5	23.81	22.74
		1850.7	23.46	22.65
	1 RB low	1914.3	23.60	22.95
		1882.5	23.99	23.21
		1850.7	23.61	22.78
	50% RB mid	1914.3	23.26	22.62
		1882.5	23.79	23.09
		1850.7	23.70	22.81
	100% RB	1914.3	22.92	21.86
		1882.5	22.77	21.72
		1850.7	22.72	21.77
3MHz	1 RB high	1913.5	23.01	22.35
		1882.5	23.69	22.85
		1851.5	23.68	23.21
	1 RB low	1913.5	24.07	23.42

		1882.5	23.85	23.29
		1851.5	23.85	22.87
	50% RB mid	1913.5	22.75	21.87
		1882.5	22.81	21.74
		1851.5	22.84	21.82
	100% RB	1913.5	22.88	21.79
		1882.5	22.76	21.73
		1851.5	22.76	21.91
5MHz	1 RB high	1912.5	23.02	22.49
		1882.5	23.57	22.90
		1852.5	23.59	23.00
	1 RB low	1912.5	24.00	23.10
		1882.5	24.04	23.16
		1852.5	23.85	23.00
	50% RB mid	1912.5	22.81	21.95
		1882.5	22.83	21.71
		1852.5	22.61	21.80
	100% RB	1912.5	22.77	22.07
		1882.5	22.80	21.82
		1852.5	22.71	21.79
10MHz	1 RB high	1910.0	22.66	22.00
		1882.5	23.76	23.24
		1855.0	23.69	23.17
	1 RB low	1910.0	24.02	23.10
		1882.5	24.01	23.37
		1855.0	23.79	23.08
	50% RB mid	1910.0	22.78	21.95
		1882.5	22.73	22.00
		1855.0	22.84	21.79
	100% RB	1910.0	22.76	21.79
		1882.5	22.83	21.67
		1855.0	22.81	21.73
15MHz	1 RB high	1907.5	23.02	22.38
		1882.5	23.69	23.25
		1857.5	23.58	23.28
	1 RB low	1907.5	23.87	23.06
		1882.5	23.89	23.00
		1857.5	23.75	22.92
	50% RB mid	1907.5	22.89	22.02

		1882.5	22.69	21.78
		1857.5	22.73	21.84
	100% RB	1907.5	22.81	21.85
		1882.5	22.68	21.74
		1857.5	22.65	21.73
20MHz	1 RB high	1905.0	22.88	22.25
		1882.5	23.72	23.00
		1860.0	24.03	23.14
	1 RB low	1905.0	23.66	22.96
		1882.5	24.05	23.13
		1860.0	23.71	23.05
	50% RB mid	1905.0	22.74	21.71
		1882.5	22.68	21.56
		1860.0	22.60	21.85
	100% RB	1905.0	22.71	21.71
		1882.5	22.70	21.75
		1860.0	22.66	21.73

LTE band 41

Bandwidth	RB size/offset	Frequency (MHz)	Power(dBm)	
			QPSK	16QAM
5MHz	1 RB high	2687.5	22.94	22.08
		2593.0	23.04	22.45
		2498.5	23.13	22.44
	1 RB low	2687.5	23.01	22.26
		2593.0	23.00	22.21
		2498.5	23.09	22.48
	50% RB mid	2687.5	22.05	21.03
		2593.0	22.18	21.29
		2498.5	22.12	21.00
	100% RB	2687.5	22.04	21.09
		2593.0	22.24	21.15
		2498.5	22.21	21.10
10MHz	1 RB high	2685.0	23.07	22.12
		2593.0	23.28	21.85
		2501.0	23.23	22.19
	1 RB low	2685.0	23.24	21.89
		2593.0	23.15	22.05
		2501.0	23.03	22.16
	50% RB mid	2685.0	22.10	20.92
		2593.0	22.32	21.13
		2501.0	22.12	20.91
	100% RB	2685.0	22.04	21.08
		2593.0	22.18	21.21
		2501.0	22.05	21.13
15MHz	1 RB high	2682.5	23.09	22.29
		2593.0	23.13	22.22
		2503.5	23.13	22.28
	1 RB low	2682.5	23.15	22.56
		2593.0	23.25	22.45
		2503.5	22.99	22.38
	50% RB mid	2682.5	21.99	21.02
		2593.0	22.19	21.03
		2503.5	22.22	21.21
	100% RB	2682.5	22.04	21.08
		2593.0	22.16	21.15
		2503.5	22.21	21.23

20MHz	1 RB high	2680.0	23.30	22.64
		2593.0	23.07	22.34
		2506.0	23.09	22.32
	1 RB low	2680.0	23.43	22.68
		2593.0	23.38	22.58
		2506.0	23.25	22.47
	50% RB mid	2680.0	22.16	21.23
		2593.0	22.13	20.98
		2506.0	22.21	21.32
	100% RB	2680.0	22.13	21.24
		2593.0	22.19	21.06
		2506.0	22.20	20.98

Note: Expanded measurement uncertainty is U = 0.83 dB, k = 2.

A.1.3 Radiated

A.1.3.1 Description

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

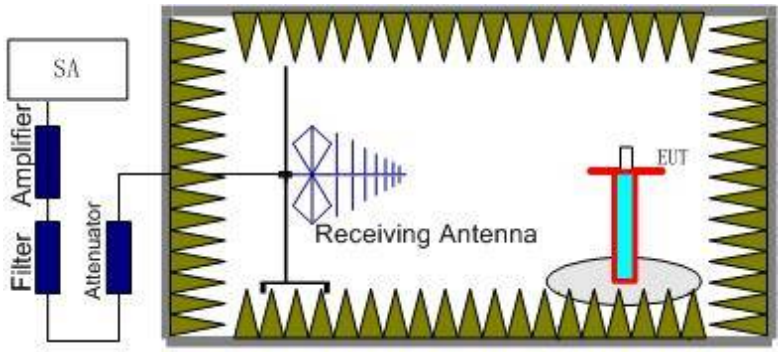
Rule Part 24.232(b) specifies, "Mobile/portable stations are limited to 2 watts e.i.r.p. Peak power" and 24.232(c) specifies that "Peak transmit power must be measured over any interval of

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

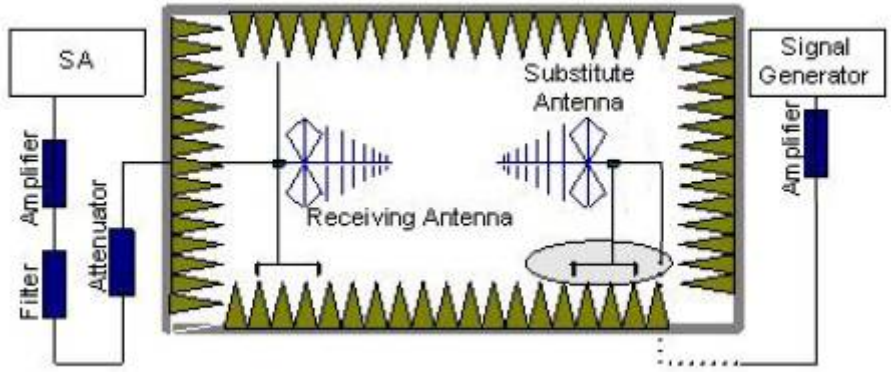
A.1.3.2 Method of Measurement

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 with the radiation pattern of the antenna. A power (P_{Mea}) is applied to the input of the substitution antenna. Adjust the level of the signal generator output until the value of the

receiver reaches the previously recorded (P_r). The power of signal source (P_{Mea}) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.

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

A.1.3.3 Measurement result

LTE Band 25- EIRP 24. 232(b)

Limits: ≤33dBm (2W)

LTE Band 25_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	-23.13	2.92	-43.75	-4.87	22.57	33.00	10.43	H
1882.50	-22.71	3.13	-43.75	-4.81	22.72	33.00	10.28	H
1914.30	-23.53	2.89	-43.78	-4.75	22.11	33.00	10.89	V

LTE Band 25_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	-23.27	2.87	-43.75	-4.87	22.48	33.00	10.52	H
1882.50	-22.89	3.13	-43.75	-4.81	22.54	33.00	10.46	H
1913.50	-23.29	2.88	-43.78	-4.76	22.37	33.00	10.63	V

LTE Band 25_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	-23.57	2.87	-43.75	-4.87	22.18	33.00	10.82	H
1882.50	-23.03	3.13	-43.75	-4.81	22.40	33.00	10.60	H
1912.50	-23.34	2.86	-43.77	-4.76	22.33	33.00	10.67	V

LTE Band 25_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	-23.53	2.88	-43.74	-4.86	22.19	33.00	10.81	V
1882.50	-22.60	3.13	-43.75	-4.81	**22.83**	33.00	10.17	H
1910.00	-23.14	2.88	-43.77	-4.76	22.51	33.00	10.49	V

LTE Band 25_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	-23.49	2.87	-43.75	-4.86	22.25	33.00	10.75	V
1882.50	-22.90	3.13	-43.75	-4.81	22.53	33.00	10.47	H
1907.50	-23.69	2.84	-43.77	-4.77	22.01	33.00	10.99	V

LTE Band 25_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	-23.02	2.86	-43.75	-4.85	22.72	33.00	10.28	V
1882.50	-22.67	3.13	-43.75	-4.81	22.76	33.00	10.24	H
1905.00	-23.45	2.87	-43.77	-4.77	22.22	33.00	10.78	H

LTE Band 25_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	-23.87	2.92	-43.75	-4.87	21.83	33.00	11.17	H
1882.50	-23.70	3.13	-43.75	-4.81	21.73	33.00	11.27	H
1914.30	-24.25	2.89	-43.78	-4.75	21.39	33.00	11.61	V

LTE Band 25_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	-24.18	2.87	-43.75	-4.87	21.57	33.00	11.43	H
1882.50	-23.52	3.13	-43.75	-4.81	21.91	33.00	11.09	H
1913.50	-23.98	2.88	-43.78	-4.76	21.68	33.00	11.32	V

LTE Band 25_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	-24.35	2.87	-43.75	-4.87	21.40	33.00	11.60	H
1882.50	-24.50	3.13	-43.75	-4.81	20.93	33.00	12.07	H
1912.50	-23.85	2.86	-43.77	-4.76	21.82	33.00	11.18	V

LTE Band 25_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	-24.67	2.88	-43.74	-4.86	21.05	33.00	11.95	V
1882.50	-24.11	3.13	-43.75	-4.81	21.32	33.00	11.68	H
1910.00	-23.74	2.88	-43.77	-4.76	21.91	33.00	11.09	V

LTE Band 25_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	-24.69	2.87	-43.75	-4.86	21.05	33.00	11.95	V
1882.50	-23.37	3.13	-43.75	-4.81	22.06	33.00	10.94	H
1907.50	-24.15	2.84	-43.77	-4.77	21.55	33.00	11.45	V

LTE Band 25_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	-23.88	2.86	-43.75	-4.85	21.86	33.00	11.14	V
1882.50	-23.42	3.13	-43.75	-4.81	22.01	33.00	10.99	H
1905.00	-24.29	2.87	-43.77	-4.77	21.38	33.00	11.62	H

Peak EIRP(dBm) = P_{Mea}(-22.60dBm) - G_a (-4.81dBi) - P_{Ag} (-43.75dB) - P_{cl} (3.13dB) = 22.83dBm

LTE Band 41- EIRP Part 27.50(h)(2)

Limits: ≤33dBm (2W)

LTE Band 41_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
2498.50	-29.40	3.58	-45.59	-6.10	18.71	33.00	14.29	V
2593.00	-25.79	3.68	-44.93	-6.27	21.73	33.00	11.27	V
2687.50	-26.50	3.73	-44.98	-6.44	21.19	33.00	11.81	H

LTE Band 41_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
2501.00	-29.18	3.58	-45.65	-6.10	18.99	33.00	14.01	H
2593.00	-25.67	3.68	-44.93	-6.27	**21.85**	33.00	11.15	V
2685.00	-26.71	3.73	-44.98	-6.43	20.97	33.00	12.03	H

LTE Band 41_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
2503.50	-28.91	3.58	-45.65	-6.11	19.27	33.00	13.73	H
2593.00	-25.87	3.68	-44.93	-6.27	21.65	33.00	11.35	V
2682.50	-26.88	3.73	-44.98	-6.43	20.80	33.00	12.20	H

LTE Band 41_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
2506.00	-28.50	3.59	-45.15	-6.11	19.17	33.00	13.83	V
2593.00	-25.88	3.68	-44.93	-6.27	21.64	33.00	11.36	V
2680.00	-26.37	3.73	-44.97	-6.42	21.29	33.00	11.71	H

LTE Band 41_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
2498.50	-30.36	3.58	-45.59	-6.10	17.75	33.00	15.25	V
2593.00	-26.75	3.68	-44.93	-6.27	20.77	33.00	12.23	V
2687.50	-27.35	3.73	-44.98	-6.44	20.34	33.00	12.66	H

LTE Band 41_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
2501.00	-30.33	3.58	-45.65	-6.10	17.84	33.00	15.16	H
2593.00	-26.87	3.68	-44.93	-6.27	20.65	33.00	12.35	V
2685.00	-27.69	3.73	-44.98	-6.43	19.99	33.00	13.01	H

LTE Band 41_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
2503.50	-29.97	3.58	-45.65	-6.11	18.21	33.00	14.79	H
2593.00	-26.67	3.68	-44.93	-6.27	20.85	33.00	12.15	V
2682.50	-27.83	3.73	-44.98	-6.43	19.85	33.00	13.15	H

LTE Band 41_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
2506.00	-29.61	3.59	-45.15	-6.11	18.06	33.00	14.94	V
2593.00	-26.55	3.68	-44.93	-6.27	20.97	33.00	12.03	V
2680.00	-27.66	3.73	-44.97	-6.42	20.00	33.00	13.00	H

Peak EIRP(dBm) = P_{Mea}(-25.67dBm) - G_a (-6.27dBi) - P_{Ag} (-44.93dB) - P_{cl} (3.68dB) = 21.85dBm

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.

A.2 EMISSION LIMIT

Reference

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

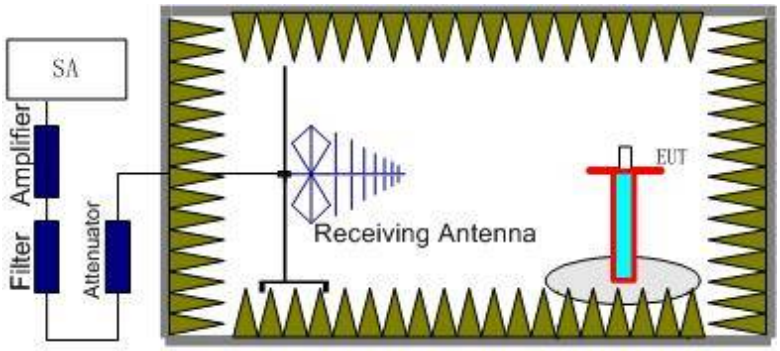
A.2.1 Measurement Method

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

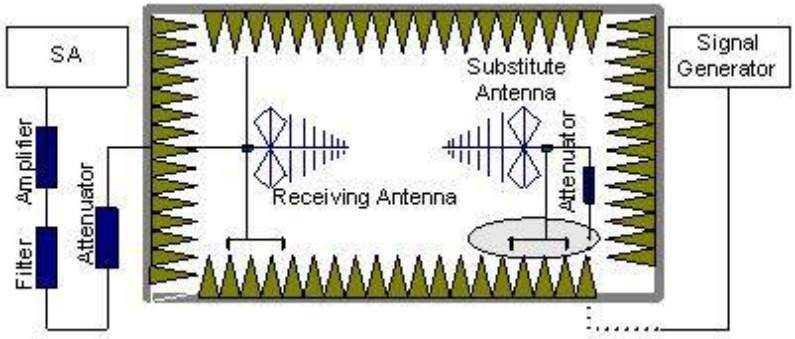
The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier. The resolution bandwidth is set 1MHz as outlined in Part 24.238(a), Part 27.53(m). The spectrum was scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of the LTE Band 25 and 41.

The procedure of radiated spurious emissions is as follows:

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



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



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

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

A.2.2 Measurement Limit

Part 24.238(a), 27.53(m) both 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 25 and 41. 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 25 and 41 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.

LTE Band 25, 1.4MHz, QPSK, Channel 26047

Frequency(MHz)	P_{Mea}(dBm)	Path Loss	Antenna Gain	Peak EIRP(dBm)	Limit （dBm）	Margin(dB)	Polarization
3773.54	-59.06	5.04	-8.58	-55.52	-13.00	42.52	V
7032.27	-64.09	7.46	-11.64	-59.91	-13.00	46.91	H
8580.94	-65.66	7.49	-13.02	-60.13	-13.00	47.13	V
9859.60	-63.94	8.43	-13.04	-59.33	-13.00	46.33	H
13617.78	-53.47	10.21	-14.27	-49.41	-13.00	36.41	H
15491.86	-52.85	10.85	-13.70	-50.00	-13.00	37.00	H

LTE Band 25, 1.4MHz, QPSK, Channel 26365

Frequency(MHz)	P_{Mea}(dBm)	Path Loss	Antenna Gain	Peak EIRP(dBm)	Limit （dBm）	Margin(dB)	Polarization
3765.07	-62.10	5.10	-8.57	-58.63	-13.00	45.63	V
5821.04	-64.39	6.60	-10.54	-60.45	-13.00	47.45	V
7325.10	-63.70	7.29	-11.99	-59.00	-13.00	46.00	H
9633.70	-63.69	8.52	-13.27	-58.94	-13.00	45.94	H
11361.05	-58.60	9.16	-13.13	-54.63	-13.00	41.63	H
12821.04	-55.66	9.60	-13.39	-51.87	-13.00	38.87	H

LTE Band 25, 1.4MHz, QPSK, Channel 26683

Frequency(MHz)	P_{Mea}(dBm)	Path Loss	Antenna Gain	Peak EIRP(dBm)	Limit （dBm）	Margin(dB)	Polarization
3828.56	-63.83	5.62	-8.66	-60.79	-13.00	47.79	H
4625.09	-68.71	5.95	-9.53	-65.13	-13.00	52.13	H
5743.25	-58.34	6.78	-10.55	-54.57	-13.00	41.57	H
7000.82	-64.14	7.21	-11.60	-59.75	-13.00	46.75	V
8178.61	-64.32	7.64	-12.74	-59.22	-13.00	46.22	H
10370.03	-62.17	8.55	-13.05	-57.67	-13.00	44.67	H

LTE Band 25, 1.4MHz, 16QAM, Channel 26047

Frequency(MHz)	P_{Mea}(dBm)	Path Loss	Antenna Gain	Peak EIRP(dBm)	Limit （dBm）	Margin(dB)	Polarization
3773.40	-57.56	5.04	-8.58	-54.02	-13.00	41.02	V
4699.66	-65.56	6.14	-9.60	-62.10	-13.00	49.10	H
6949.13	-65.39	7.10	-11.54	-60.95	-13.00	47.95	V
8554.21	-67.26	7.57	-13.01	-61.82	-13.00	48.82	V
13488.61	-57.34	9.91	-14.18	-53.07	-13.00	40.07	V
14471.91	-52.27	10.15	-14.41	-48.01	-13.00	35.01	V

LTE Band 25, 1.4MHz, 16QAM, Channel 26365

Frequency(MHz)	P_{Mea}(dBm)	Path Loss	Antenna Gain	Peak EIRP(dBm)	Limit （dBm）	Margin(dB)	Polarization
3765.02	-61.96	5.10	-8.57	-58.49	-13.00	45.49	V
5151.89	-62.85	6.34	-10.11	-59.08	-13.00	46.08	H
6924.15	-63.13	7.17	-11.51	-58.79	-13.00	45.79	H
8345.85	-63.20	7.95	-12.88	-58.27	-13.00	45.27	H
9858.15	-64.05	8.43	-13.04	-59.44	-13.00	46.44	V
12098.26	-58.93	9.43	-13.04	-55.32	-13.00	42.32	H

LTE Band 25, 1.4MHz, 16QAM, Channel 26683

Frequency(MHz)	P_{Mea}(dBm)	Path Loss	Antenna Gain	Peak EIRP(dBm)	Limit （dBm）	Margin(dB)	Polarization
3828.68	-65.28	5.63	-8.66	-62.25	-13.00	49.25	H
4675.58	-67.00	6.08	-9.58	-63.50	-13.00	50.50	H
6897.16	-62.74	6.93	-11.48	-58.19	-13.00	45.19	H
8331.88	-63.72	7.98	-12.87	-58.83	-13.00	45.83	H
9618.33	-60.48	8.73	-13.28	-55.93	-13.00	42.93	V
13360.54	-54.65	9.77	-14.00	-50.42	-13.00	37.42	V

LTE Band 41, 5MHz, QPSK, Channel 39675

Frequency(MHz)	P_{Mea}(dBm)	Path Loss	Antenna Gain	Peak EIRP(dBm)	Limit （dBm）	Margin(dB)	Polarization
4997.35	-42.47	6.31	-9.90	-38.88	-13.00	25.88	V
7495.84	-52.31	7.56	-12.20	-47.67	-13.00	34.67	H
9994.78	-54.28	8.50	-12.91	-49.87	-13.00	36.87	H
10967.18	-60.09	9.05	-13.19	-55.95	-13.00	42.95	V
13556.25	-53.71	9.95	-14.23	-49.43	-13.00	36.43	H
16857.26	-48.52	11.28	-13.74	-46.06	-13.00	33.06	V

LTE Band 41, 5MHz, QPSK, Channel 40620

Frequency(MHz)	P_{Mea}(dBm)	Path Loss	Antenna Gain	Peak EIRP(dBm)	Limit （dBm）	Margin(dB)	Polarization
5187.01	-57.72	6.43	-10.16	-53.99	-13.00	40.99	V
7779.55	-47.16	7.19	-12.42	-41.93	-13.00	28.93	H
10381.74	-60.47	8.75	-13.05	-56.17	-13.00	43.17	V
12975.99	-53.76	9.49	-13.49	-49.76	-13.00	36.76	H
15585.01	-52.00	10.66	-13.70	-48.96	-13.00	35.96	H
17808.76	-52.74	12.19	-15.33	-49.60	-13.00	36.60	H

LTE Band 41, 5MHz, QPSK, Channel 41565

Frequency(MHz)	P_{Mea}(dBm)	Path Loss	Antenna Gain	Peak EIRP(dBm)	Limit （dBm）	Margin(dB)	Polarization
3873.78	-62.70	5.94	-8.72	-59.92	-13.00	46.92	V
5375.44	-58.82	6.63	-10.43	-55.02	-13.00	42.02	V
8063.24	-49.14	7.59	-12.65	-44.08	-13.00	31.08	H
8836.81	-66.34	8.09	-13.07	-61.36	-13.00	48.36	V
13215.57	-52.70	9.76	-13.80	-48.66	-13.00	35.66	V
14381.98	-52.46	10.26	-14.42	-48.30	-13.00	35.30	V

LTE Band 41 5MHz, 16QAM, Channel 39675

Frequency(MHz)	P_{Mea}(dBm)	Path Loss	Antenna Gain	Peak EIRP(dBm)	Limit （dBm）	Margin(dB)	Polarization
4997.27	-42.61	6.31	-9.90	-39.02	-13.00	26.02	V
7496.29	-50.85	7.56	-12.20	-46.21	-13.00	33.21	H
9994.77	-54.69	8.50	-12.91	-50.28	-13.00	37.28	H
12278.97	-58.43	9.36	-13.11	-54.68	-13.00	41.68	V
13613.48	-52.80	10.17	-14.27	-48.70	-13.00	35.70	H
16446.20	-49.90	11.54	-13.61	-47.83	-13.00	34.83	V

LTE Band 41, 5MHz, 16QAM, Channel 40620

Frequency(MHz)	P_{Mea}(dBm)	Path Loss	Antenna Gain	Peak EIRP(dBm)	Limit （dBm）	Margin(dB)	Polarization
4016.89	-64.15	5.68	-8.92	-60.91	-13.00	47.91	V
5186.30	-53.17	6.43	-10.16	-49.44	-13.00	36.44	V
7779.68	-47.10	7.19	-12.42	-41.87	-13.00	28.87	H
9632.19	-61.71	8.54	-13.27	-56.98	-13.00	43.98	V
10741.09	-57.74	8.78	-13.15	-53.37	-13.00	40.37	H
12183.27	-59.45	8.99	-13.07	-55.37	-13.00	42.37	H

LTE Band 41, 5MHz, 16QAM, Channel 41565

Frequency(MHz)	P_{Mea}(dBm)	Path Loss	Antenna Gain	Peak EIRP(dBm)	Limit （dBm）	Margin(dB)	Polarization
3875.90	-63.46	5.92	-8.73	-60.65	-13.00	47.65	V
5375.63	-59.59	6.63	-10.43	-55.79	-13.00	42.79	V
8063.03	-49.06	7.59	-12.65	-44.00	-13.00	31.00	H
9052.35	-62.63	8.03	-13.13	-57.53	-13.00	44.53	V
10169.23	-62.52	8.61	-12.97	-58.16	-13.00	45.16	H
13200.27	-56.13	9.78	-13.78	-52.13	-13.00	39.13	V

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

A.3 FREQUENCY STABILITY

Reference

FCC: CFR Part 2.1055, 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 FDD band 25 and 41, 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 3.6VDC 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.

A.3.3 Measurement results

LTE Band 25, 1.4MHz bandwidth (worst case of all bandwidths)

Frequency Error vs Voltage

Voltage (V)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
3.6	0	16	0.000	0.009
3.8	0	15	0.000	0.008
4.35	3	17	0.001	0.009

Frequency Error vs Temperature

Temperature (℃)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
50°	-3	15	0.002	0.008
40°	0	18	0.000	0.010
30°	0	21	0.000	0.011
20°	-3	16	0.001	0.009
10°	1	22	0.000	0.011
0°	1	19	0.001	0.010
- 10°	-1	18	0.001	0.009
- 20°	3	15	0.002	0.008
- 30°	-2	18	0.001	0.010

LTE Band 41, 5MHz bandwidth (worst case of all bandwidths)

Frequency Error vs Voltage

Voltage (V)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
3.6	-2	-9	0.001	0.003
3.8	5	1	0.002	0.000
4.35	2	-2	0.001	0.001

Frequency Error vs Temperature

Temperature (℃)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
50°	-3	1	0.001	0.000
40°	5	3	0.002	0.001
30°	0	9	0.000	0.003
20°	-3	13	0.001	0.005
10°	-1	1	0.000	0.000
0°	2	1	0.001	0.000
- 10°	1	5	0.000	0.002
- 20°	3	1	0.001	0.000
- 30°	0	6	0.000	0.002

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

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:

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.

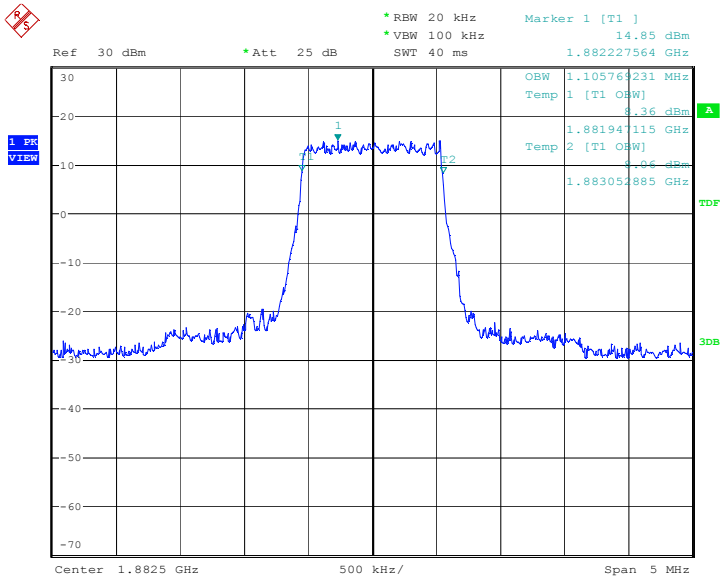
d) Set the detection mode to peak, and the trace mode to max hold.

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

LTE band 25, 1.4MHz (99%)

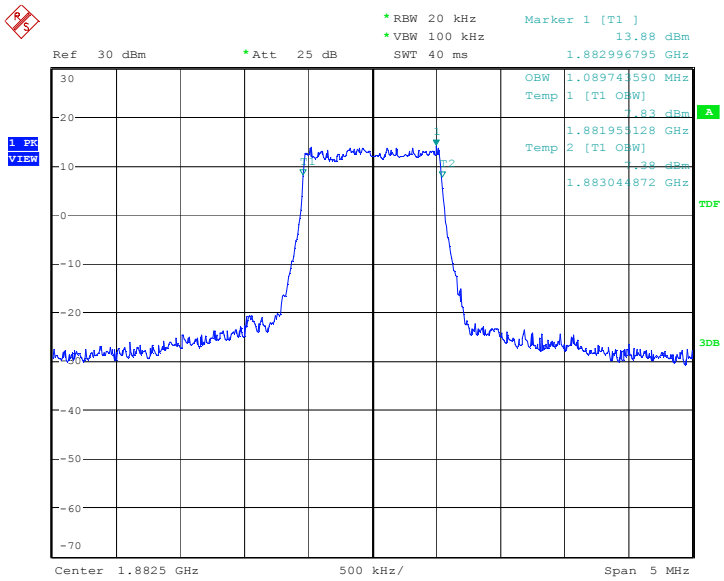
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
1882.5	QPSK	16QAM
	1105.77	1089.74

LTE band 25, 1.4MHz Bandwidth, QPSK (99% BW)



Date: 24.MAR.2016 06:31:48

LTE band 25, 1.4MHz Bandwidth, 16QAM (99% BW)

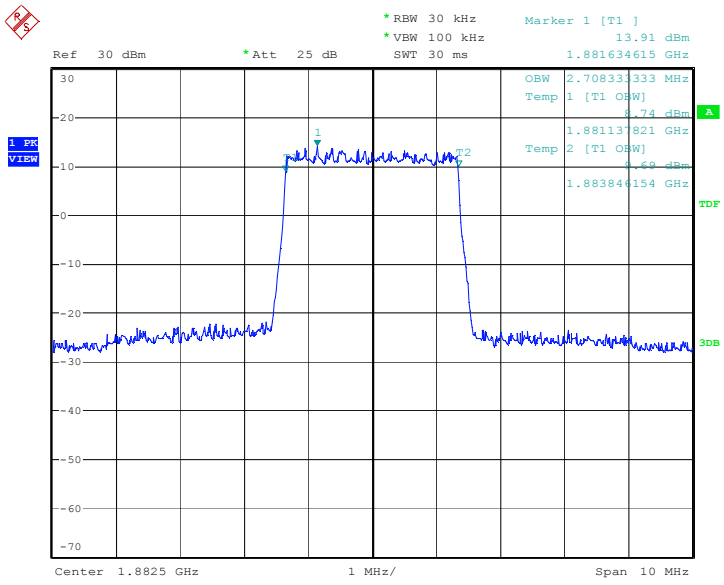


Date: 24.MAR.2016 06:32:03

LTE band 25, 3MHz (99%)

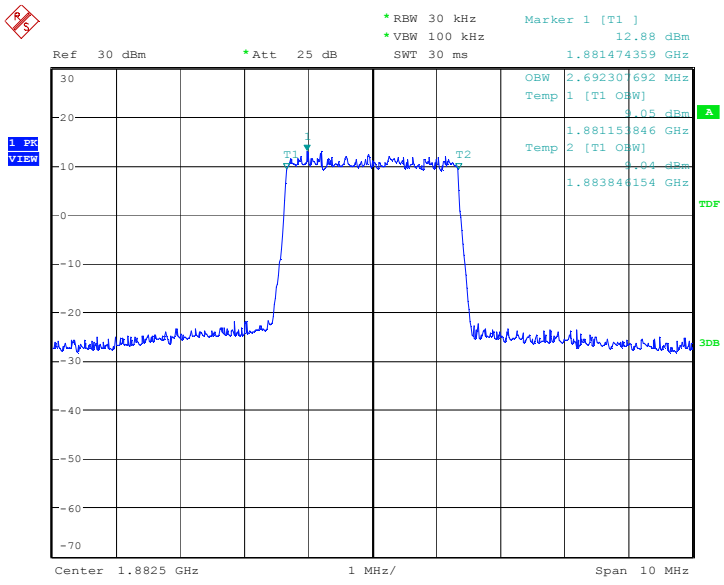
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
1882.5	QPSK	16QAM
	2708.33	2692.31

LTE band 25, 3MHz Bandwidth, QPSK (99% BW)



Date: 24.MAR.2016 06:37:32

LTE band 25, 3MHz Bandwidth, 16QAM (99% BW)

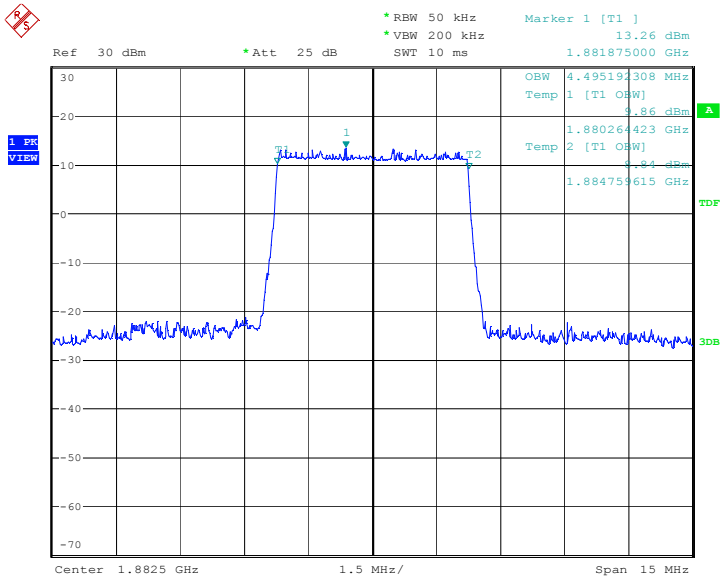


Date: 24.MAR.2016 06:37:47

LTE band 25, 5MHz (99%)

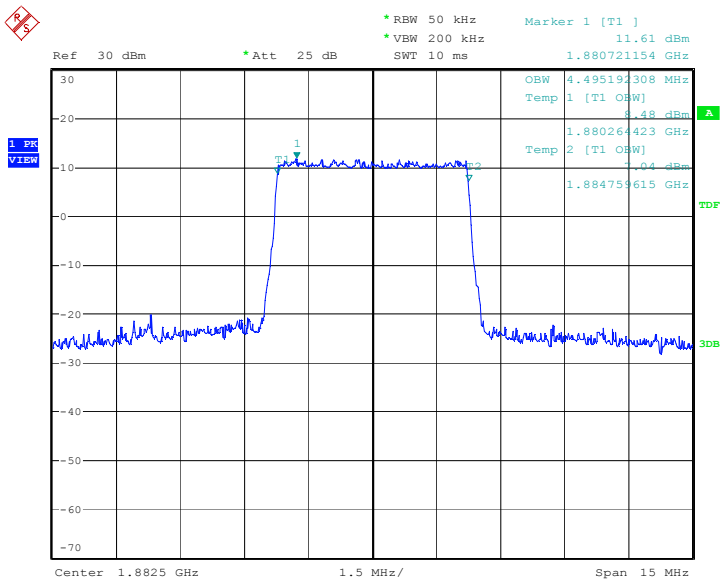
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
1882.5	QPSK	16QAM
	4495.19	4495.19

LTE band 25, 5MHz Bandwidth, QPSK (99% BW)



Date: 24.MAR.2016 06:43:14

LTE band 25, 5MHz Bandwidth,16QAM (99% BW)

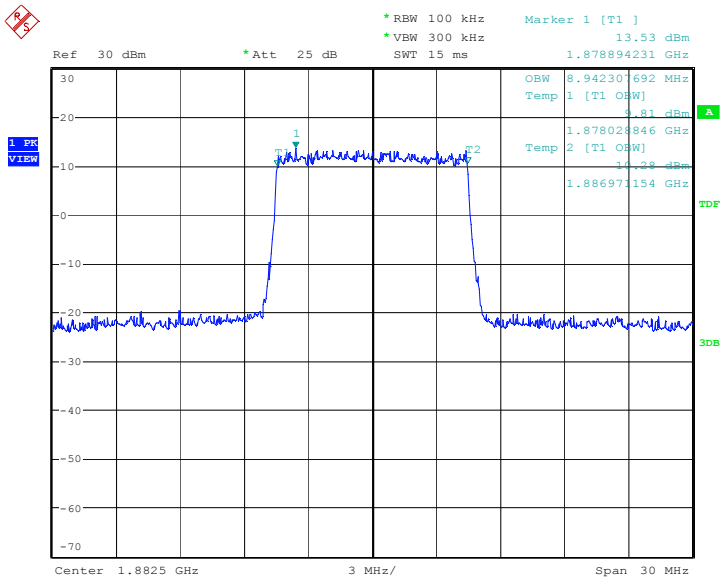


Date: 24.MAR.2016 06:43:29

LTE band 25, 10MHz (99%)

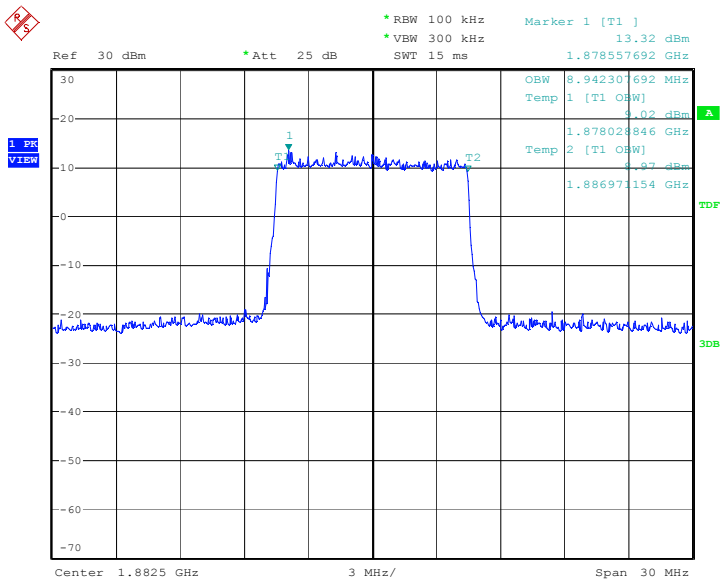
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
1882.5	QPSK	16QAM
	8942.31	8942.31

LTE band 25, 10MHz Bandwidth, QPSK (99% BW)



Date: 24.MAR.2016 06:48:59

LTE band 25, 10MHz Bandwidth, 16QAM (99% BW)

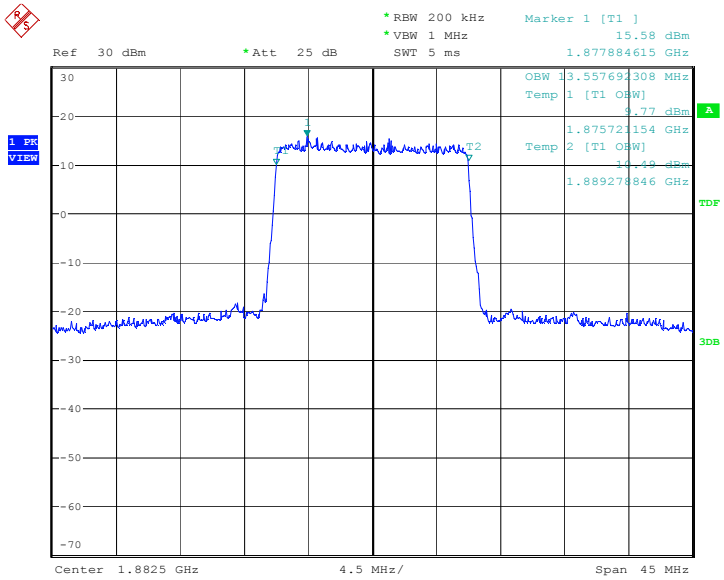


Date: 24.MAR.2016 06:49:14

LTE band 25, 15MHz (99%)

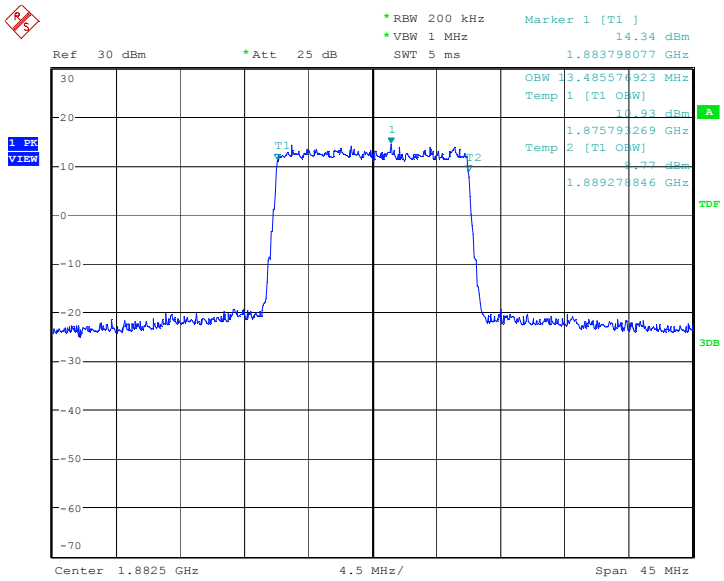
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
1882.5	QPSK	16QAM
	13557.69	13485.58

LTE band 25, 15MHz Bandwidth, QPSK (99% BW)



Date: 24.MAR.2016 06:54:48

LTE band 25, 15MHz Bandwidth, 16QAM (99% BW)

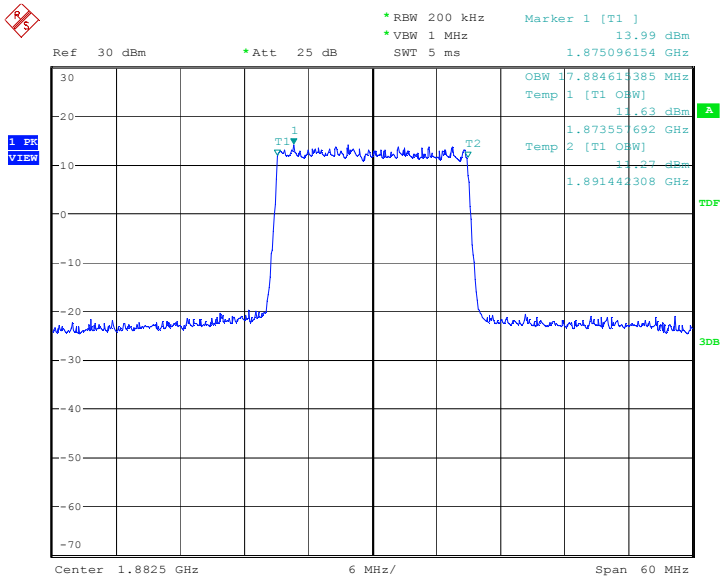


Date: 24.MAR.2016 06:55:03

LTE band 25, 20MHz (99%)

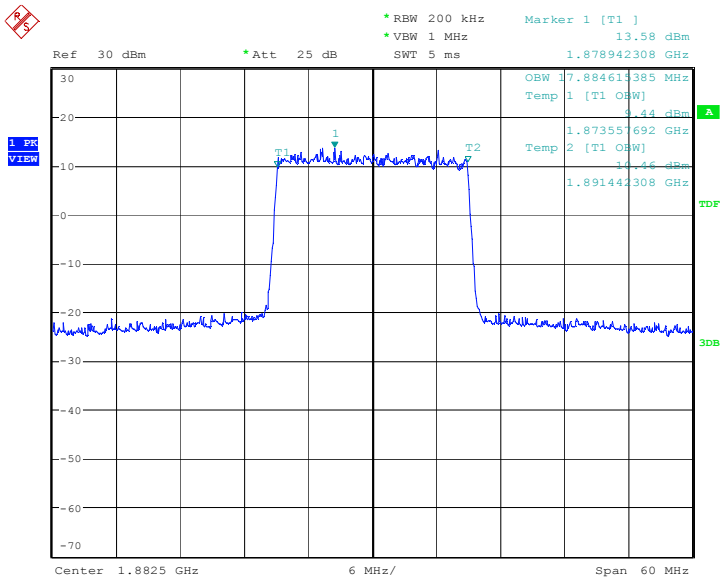
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
1882.5	QPSK	16QAM
	17884.62	17884.62

LTE band 25, 20MHz Bandwidth, QPSK (99% BW)



Date: 24.MAR.2016 07:00:40

LTE band 25, 20MHz Bandwidth, 16QAM (99% BW)

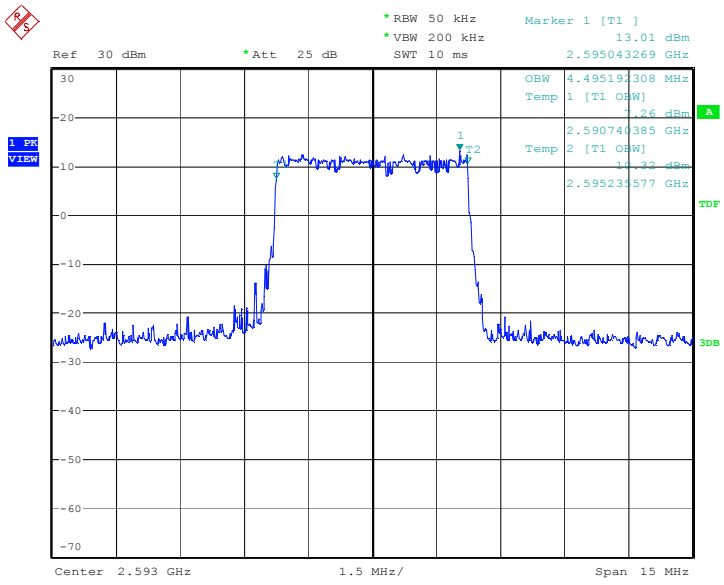


Date: 24.MAR.2016 07:00:55

LTE band 41, 5MHz (99%)

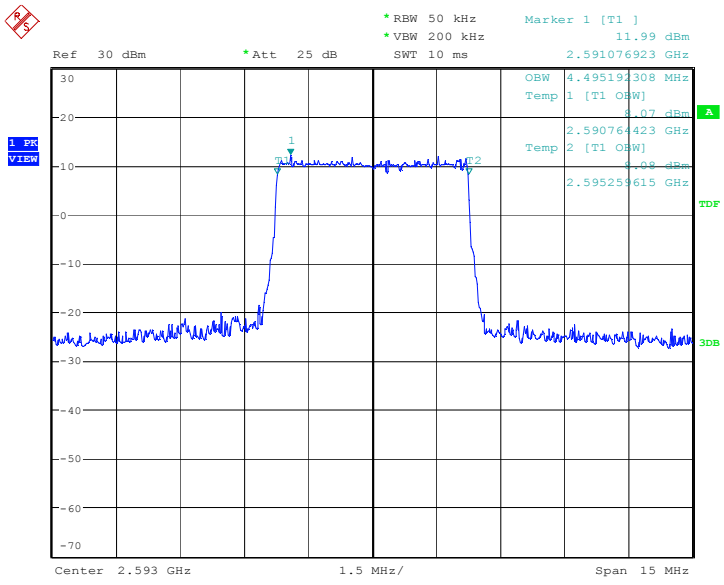
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
2593.0	QPSK	16QAM
	4495.19	4495.19

LTE band 41, 5MHz Bandwidth, QPSK (99% BW)



Date: 29.MAR.2016 23:35:55

LTE band 41, 5MHz Bandwidth,16QAM (99% BW)

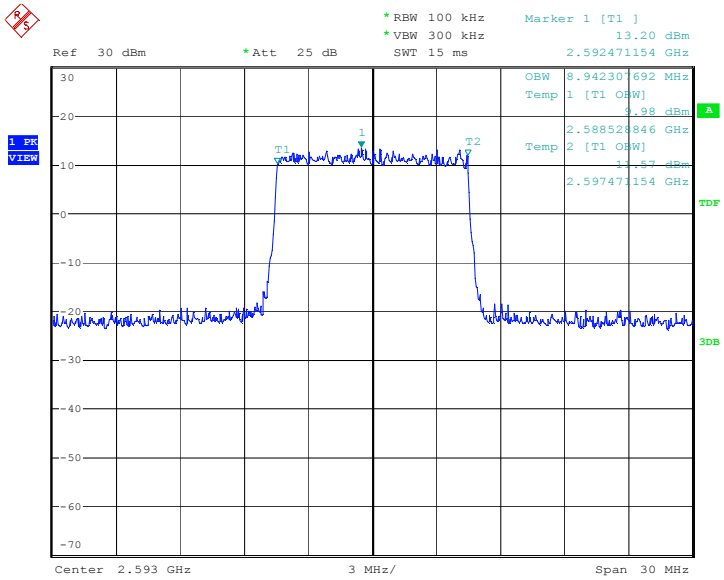


Date: 29.MAR.2016 23:36:10

LTE band 41, 10MHz (99%)

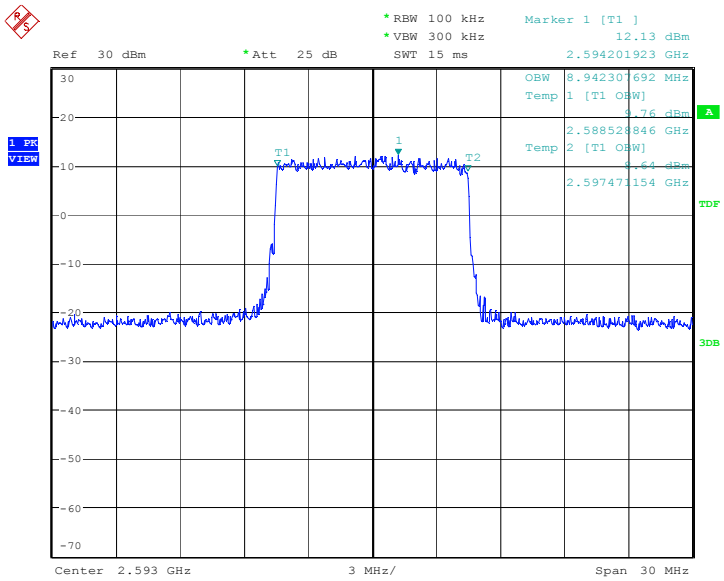
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
2593.0	QPSK	16QAM
	8942.31	8942.31

LTE band 41, 10MHz Bandwidth, QPSK (99% BW)



Date: 29.MAR.2016 23:41:39

LTE band 41, 10MHz Bandwidth, 16QAM (99% BW)

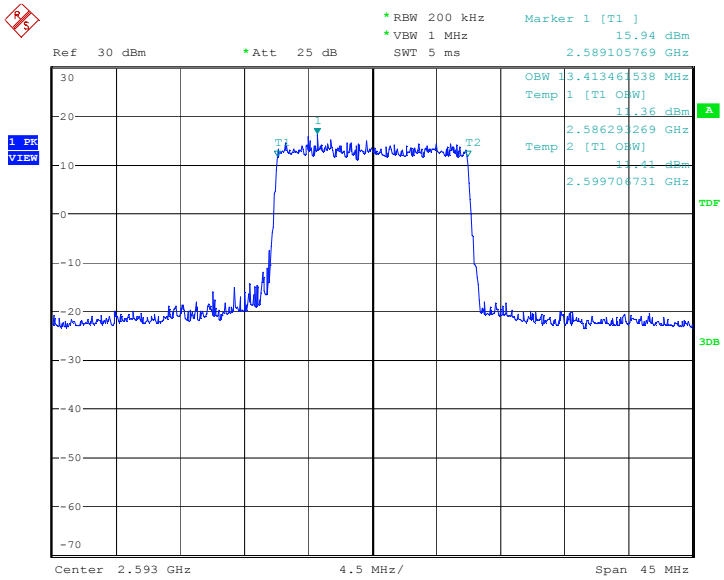


Date: 29.MAR.2016 23:41:55

LTE band 41, 15MHz (99%)

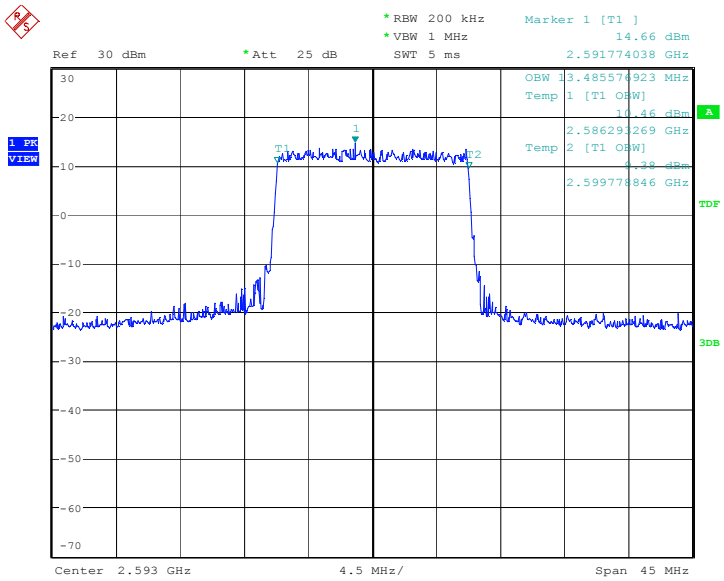
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
2593.0	QPSK	16QAM
	13413.46	13485.58

LTE band 41, 15MHz Bandwidth, QPSK (99% BW)



Date: 29.MAR.2016 23:47:28

LTE band 41, 15MHz Bandwidth, 16QAM (99% BW)

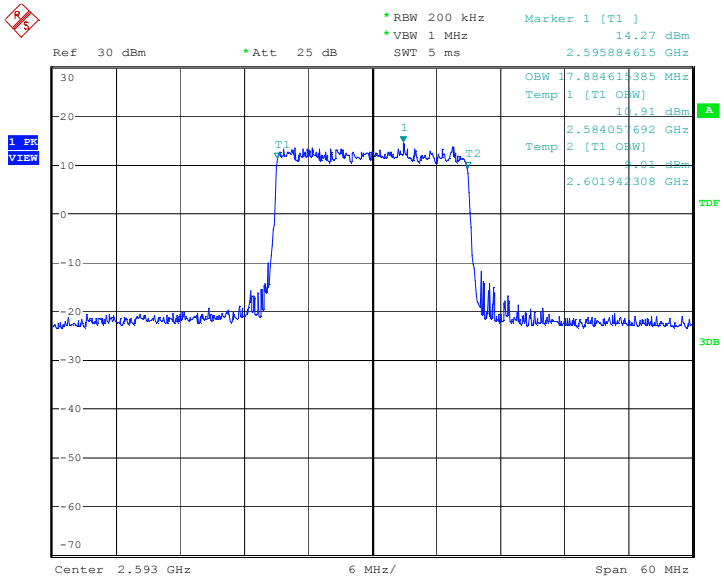


Date: 29.MAR.2016 23:47:44

LTE band 41, 20MHz (99%)

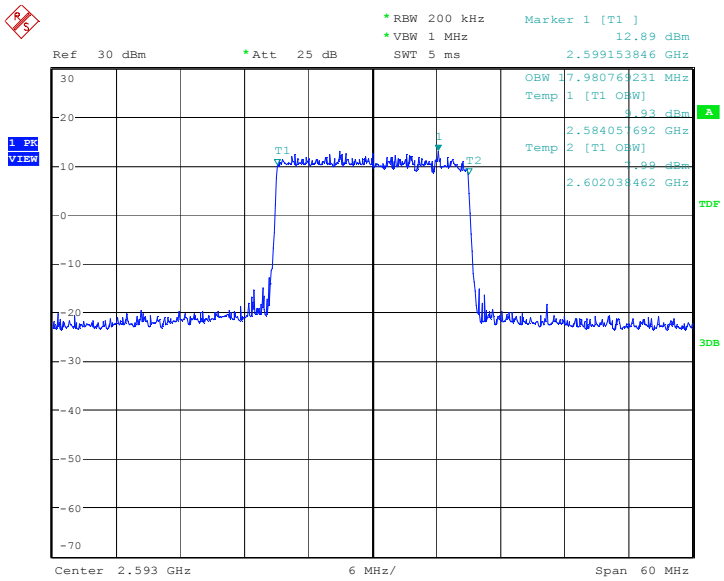
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
2593.0	QPSK	16QAM
	17884.62	17980.77

LTE band 41, 20MHz Bandwidth, QPSK (99% BW)



Date: 29.MAR.2016 23:53:21

LTE band 41, 20MHz Bandwidth, 16QAM (99% BW)



Date: 29.MAR.2016 23:53:36

A.5 EMISSION BANDWIDTH

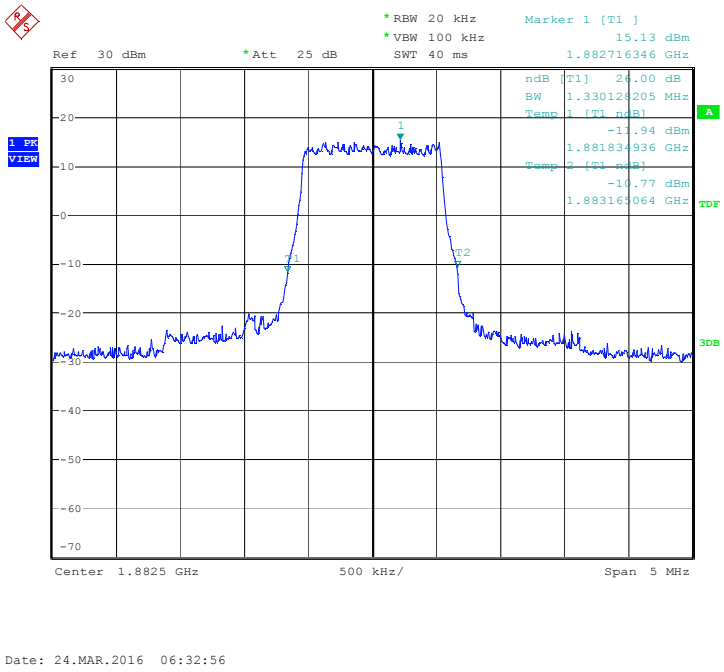
A.5.1Emission Bandwidth Results

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 at least 26 dB below the transmitter power. Table below lists the measured -26dBc BW. Spectrum analyzer plots are included on the following pages.

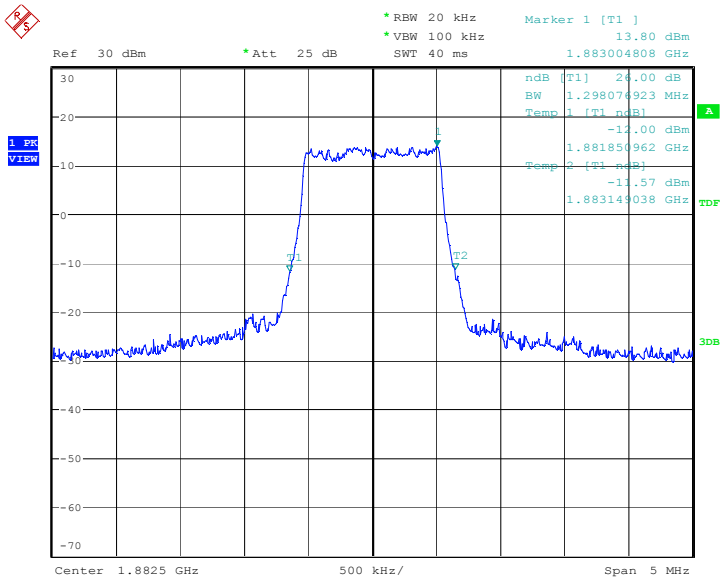
LTE band 25, 1.4MHz (-26dBc)

Frequency(MHz)	Occupied Bandwidth (-26dBc)(kHz)	
1882.5	QPSK	16QAM
	1330.13	1298.08

LTE band 25, 1.4MHz Bandwidth, QPSK (-26dBc BW)



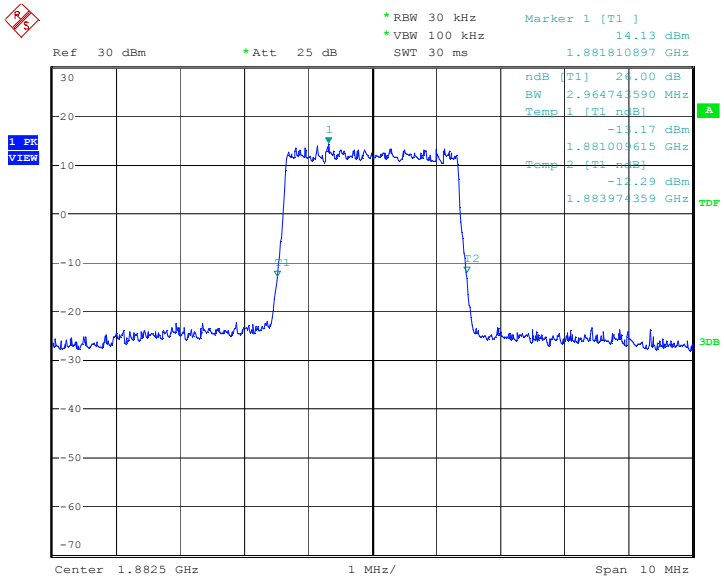
LTE band 25, 1.4MHz Bandwidth, 16QAM (-26dBc BW)



LTE band 25, 3MHz (-26dBc)

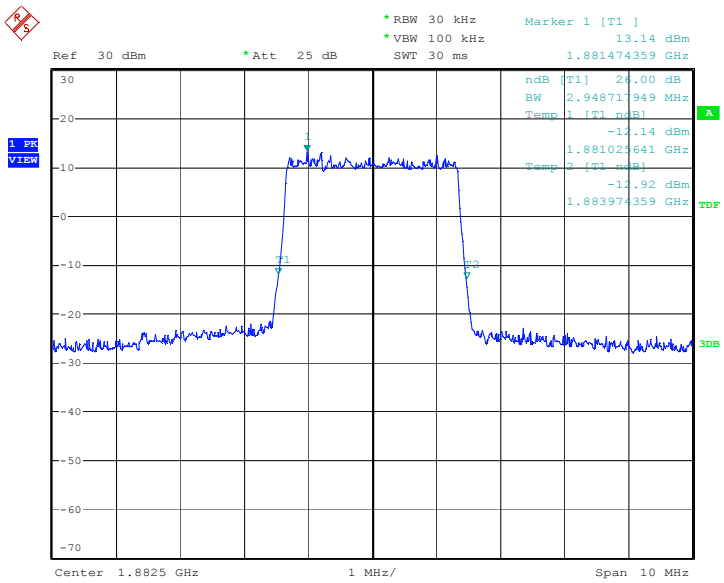
Frequency(MHz)	Occupied Bandwidth (-26dBc)(kHz)	
1882.5	QPSK	16QAM
	2964.74	2948.72

LTE band 25, 3MHz Bandwidth, QPSK (-26dBc BW)



Date: 24.MAR.2016 06:38:40

LTE band 25, 3MHz Bandwidth, 16QAM (-26dBc BW)

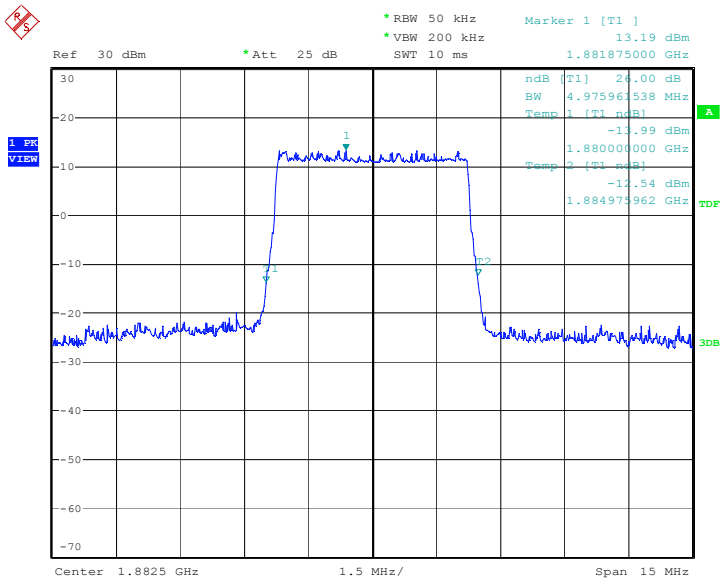


Date: 24.MAR.2016 06:38:57

LTE band 25, 5MHz (-26dBc)

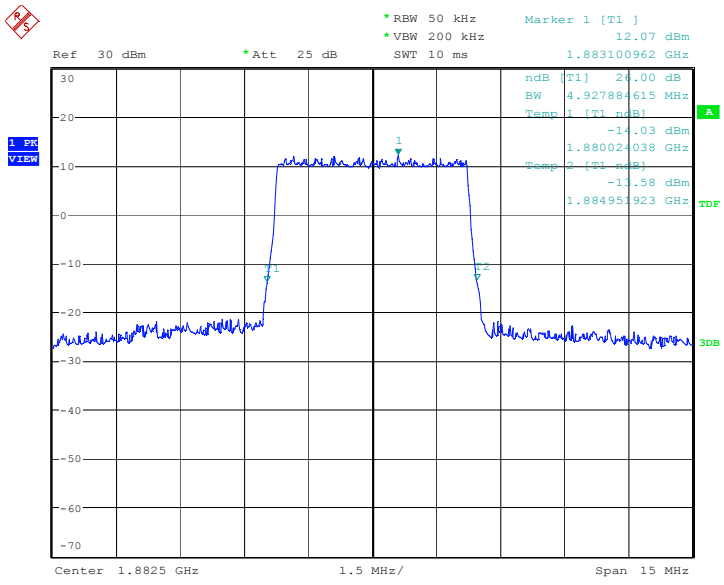
Frequency(MHz)	Occupied Bandwidth (-26dBc)(kHz)	
1882.5	QPSK	16QAM
	4975.96	4927.88

LTE band 25, 5MHz Bandwidth, QPSK (-26dBc BW)



Date: 24.MAR.2016 06:44:23

LTE band 25, 5MHz Bandwidth,16QAM (-26dBc BW)

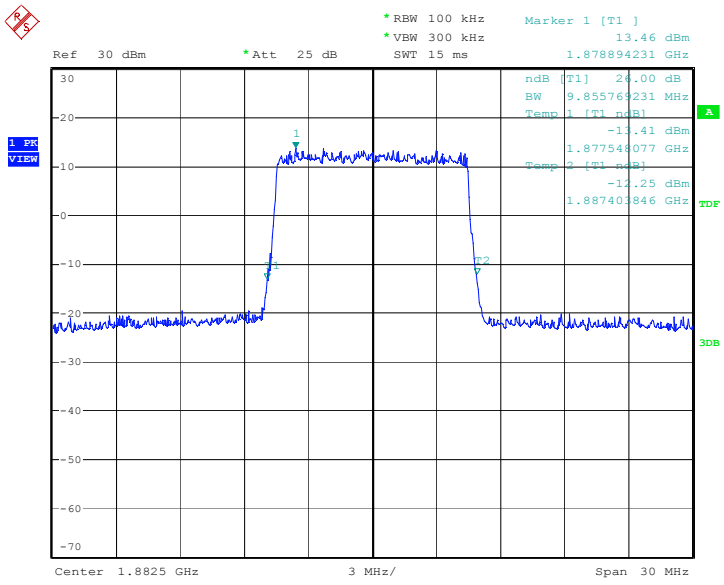


Date: 24.MAR.2016 06:44:40

LTE band 25, 10MHz (-26dBc)

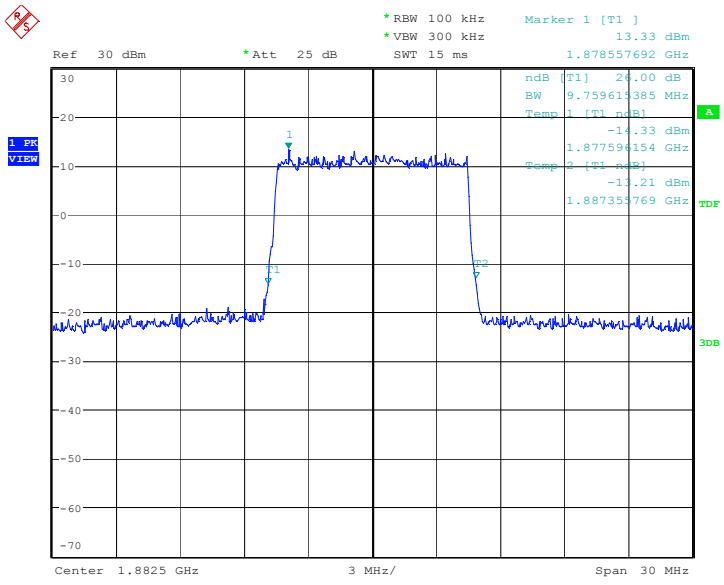
Frequency(MHz)	Occupied Bandwidth (-26dBc)(kHz)	
1882.5	QPSK	16QAM
	9855.77	9759.62

LTE band 25, 10MHz Bandwidth, QPSK (-26dBc BW)



Date: 24.MAR.2016 06:50:07

LTE band 25, 10MHz Bandwidth, 16QAM (-26dBc BW)

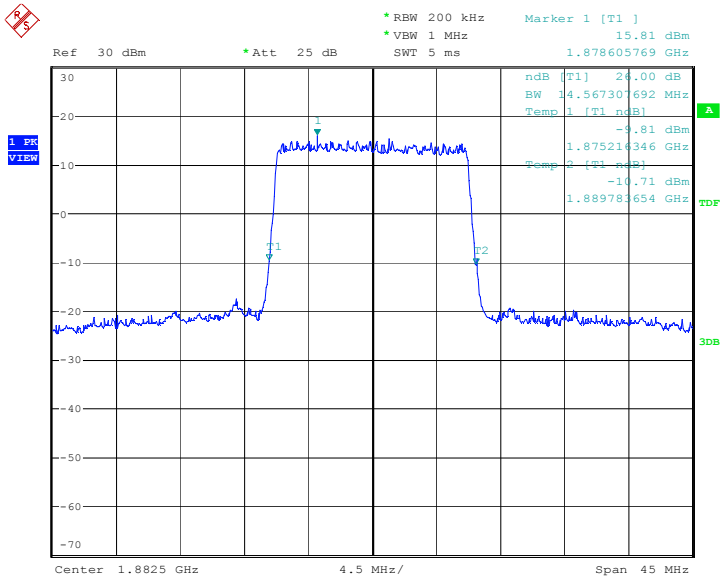


Date: 24.MAR.2016 06:50:24

LTE band 25, 15MHz (-26dBc)

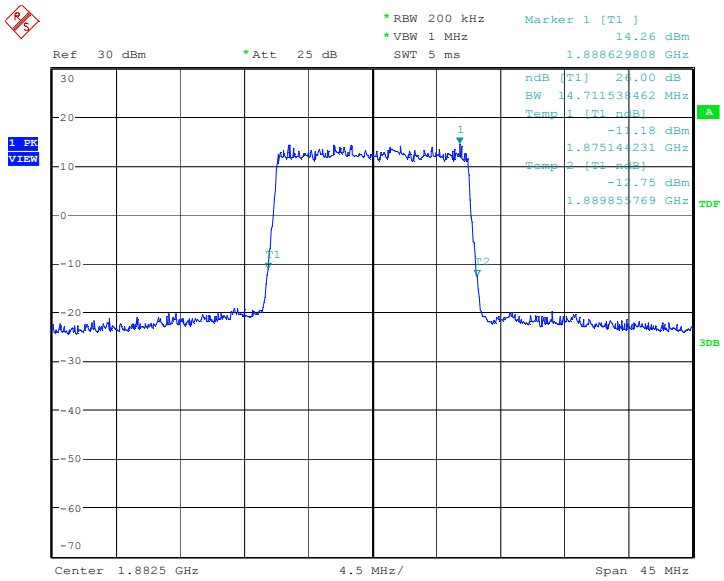
Frequency(MHz)	Occupied Bandwidth (-26dBc)(kHz)	
1882.5	QPSK	16QAM
	14567.31	14711.54

LTE band 25, 15MHz Bandwidth, QPSK (-26dBc BW)



Date: 24.MAR.2016 06:55:56

LTE band 25, 15MHz Bandwidth, 16QAM (-26dBc BW)

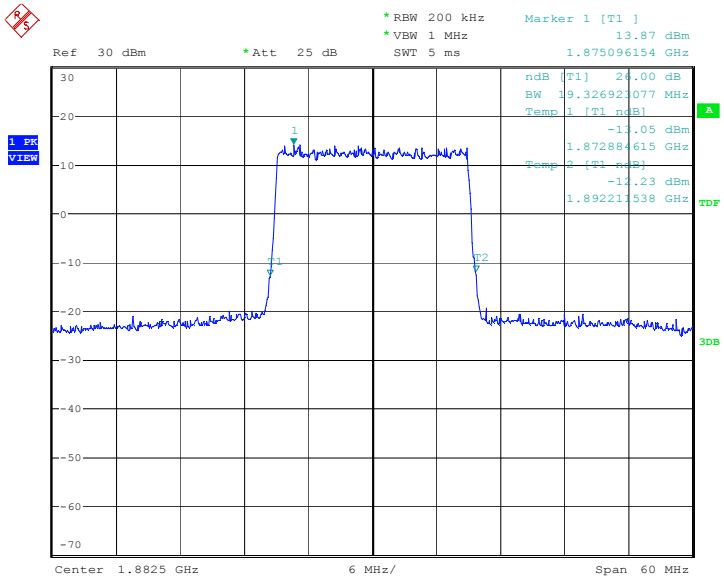


Date: 24.MAR.2016 06:56:13

LE band 25, 20MHz (-26dBc)

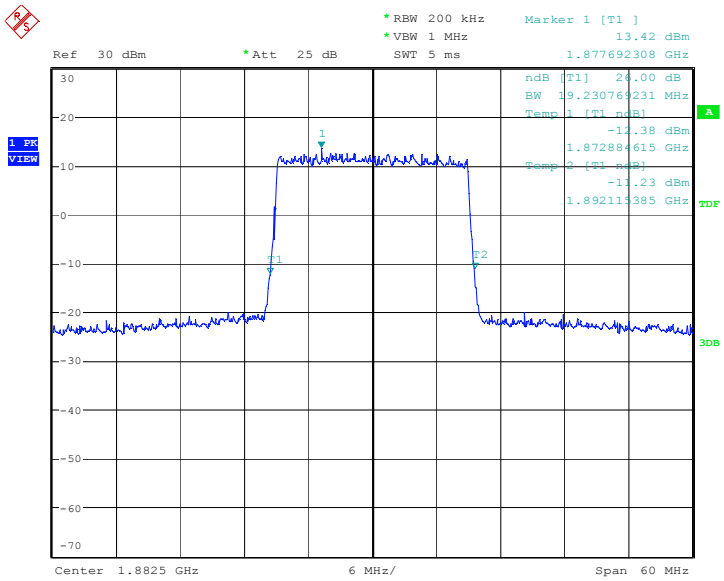
Frequency(MHz)	Occupied Bandwidth (-26dBc)(kHz)	
1882.5	QPSK	16QAM
	19326.92	19230.77

LTE band 25, 20MHz Bandwidth, QPSK (-26dBc BW)



Date: 24.MAR.2016 07:01:49

LTE band 25, 20MHz Bandwidth, 16QAM (-26dBc BW)

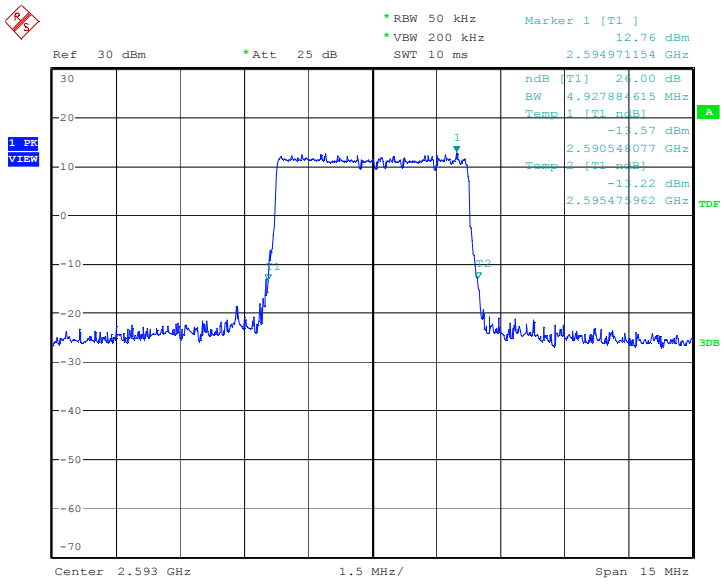


Date: 24.MAR.2016 07:02:06

LTE band 41, 5MHz (-26dBc)

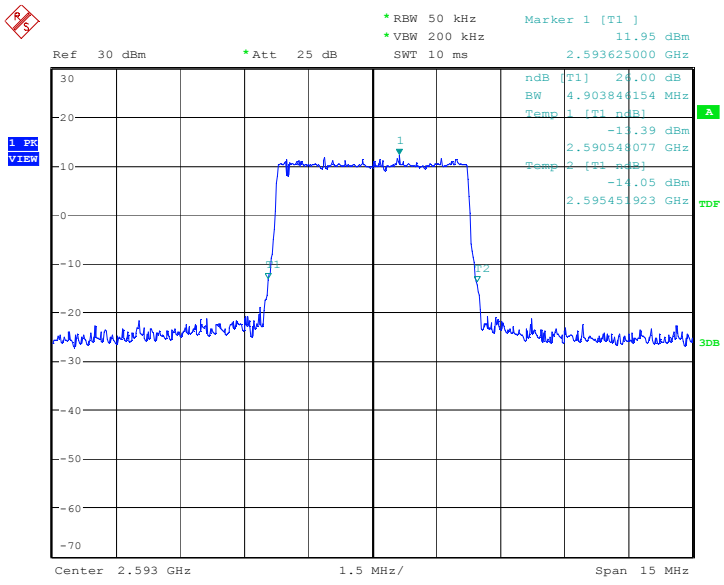
Frequency(MHz)	Occupied Bandwidth (-26dBc)(kHz)	
	QPSK	16QAM
2593.0	4927.88	4903.85

LTE band 41, 5MHz Bandwidth, QPSK (-26dBc BW)



Date: 29.MAR.2016 23:37:04

LTE band 41, 5MHz Bandwidth,16QAM (-26dBc BW)

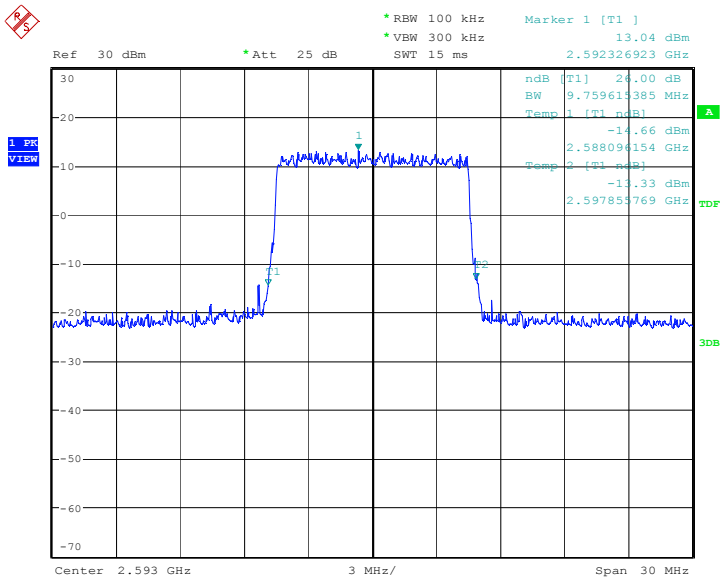


Date: 29.MAR.2016 23:37:21

LTE band 41, 10MHz (-26dBc)

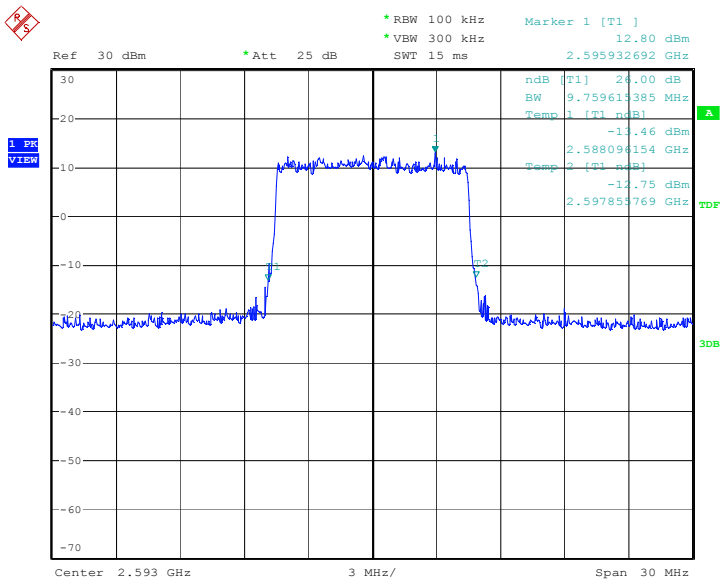
Frequency(MHz)	Occupied Bandwidth (-26dBc)(kHz)	
2593.0	QPSK	16QAM
	9759.62	9759.62

LTE band 41, 10MHz Bandwidth, QPSK (-26dBc BW)



Date: 29.MAR.2016 23:42:48

LTE band 41, 10MHz Bandwidth, 16QAM (-26dBc BW)

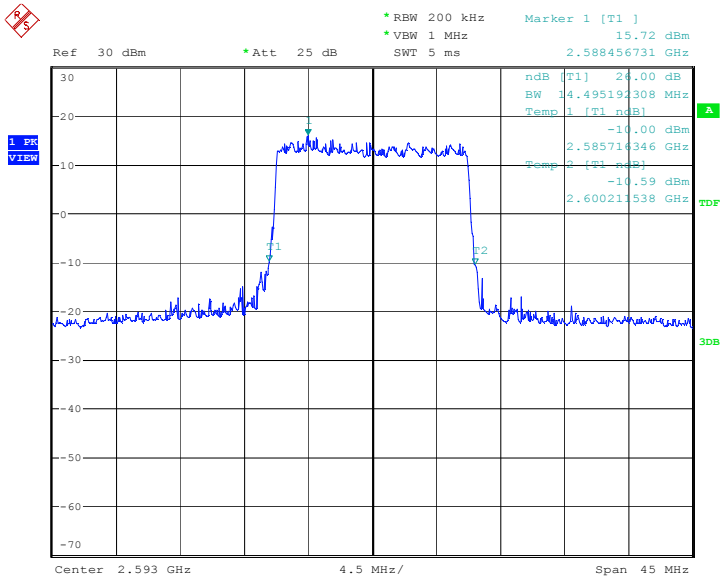


Date: 29.MAR.2016 23:43:05

LTE band 41, 15MHz (-26dBc)

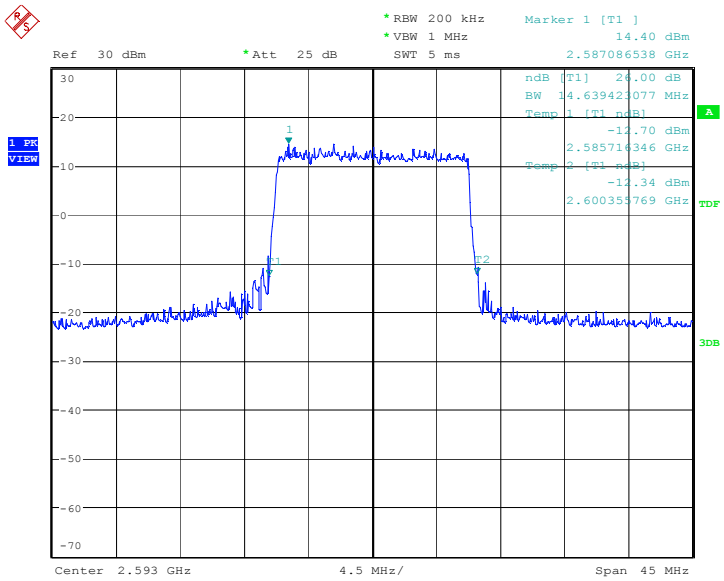
Frequency(MHz)	Occupied Bandwidth (-26dBc)(kHz)	
2593.0	QPSK	16QAM
	14495.19	14639.42

LTE band 41, 15MHz Bandwidth, QPSK (-26dBc BW)



Date: 29.MAR.2016 23:48:37

LTE band 41, 15MHz Bandwidth, 16QAM (-26dBc BW)

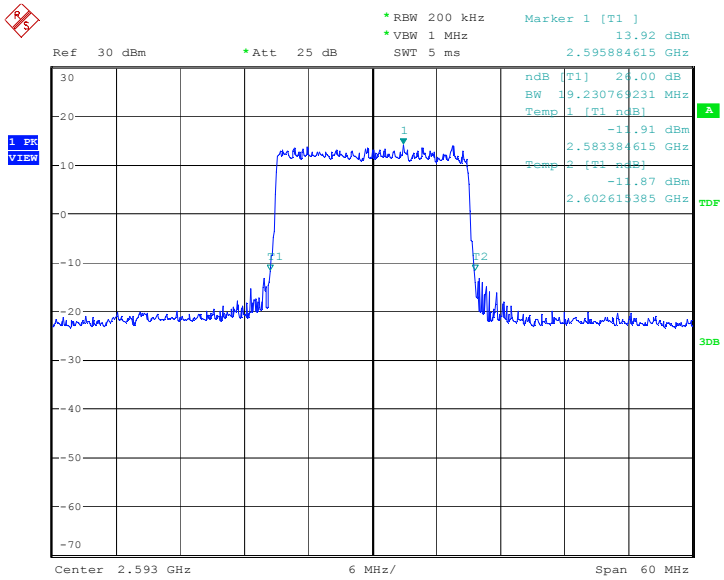


Date: 29.MAR.2016 23:48:55

LTE band 41, 20MHz (-26dBc)

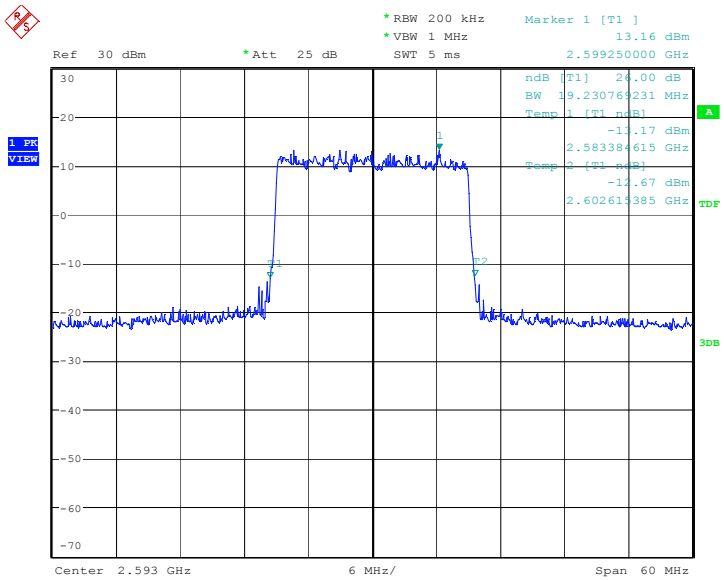
Frequency(MHz)	Occupied Bandwidth (-26dBc)(kHz)	
2593.0	QPSK	16QAM
	19230.77	19230.77

LTE band 41, 20MHz Bandwidth, QPSK (-26dBc BW)



Date: 29.MAR.2016 23:54:30

LTE band 41, 20MHz Bandwidth, 16QAM (-26dBc BW)



Date: 29.MAR.2016 23:54:47

A.6 BAND EDGE COMPLIANCE

A.6.1 Measurement limit

Part 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, 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.

Part 27.53(m) states that for mobile digital stations, the attenuation factor shall be not less than 40 + 10 log (P) dB on all frequencies between the channel edge and 5 megahertz from the channel edge, 43 + 10 log (P) dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and 55 + 10 log (P) dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less that 43 + 10 log (P) dB on all frequencies between 2490.5 MHz and 2496 MHz and 55 + 10 log (P) dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

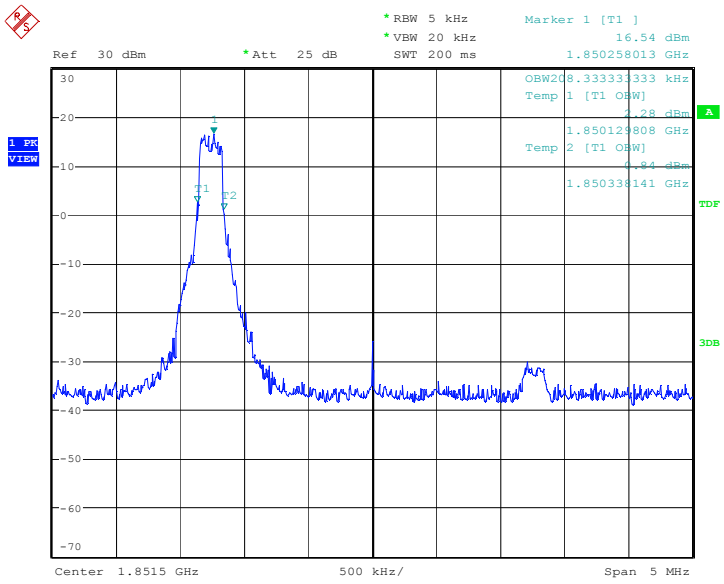
Part 27.53(a) states for mobile and portable stations operating in the 2305–2315 MHz and 2350–2360 MHz bands: By a factor of not less than: 43 +10 log (P) dB on all frequencies between 2305 and 2320 MHz and on all frequencies between 2345 and 2360 MHz that are outside the licensed band(s) of operation, not less than 55 + 10 log (P) dB on all frequencies between 2320 and 2324 MHz and on all frequencies between 2341 and 2345 MHz, not less than 61 + 10 log (P) dB on all frequencies between 2324 and 2328 MHz and on all frequencies between 2337 and 2341 MHz, and not less than 67 + 10 log (P) dB onall frequencies between 2328 and 2337MHz; By a factor of not less than 43 + 10 log (P) dB on all frequencies between 2300 and 2305 MHz, 55 + 10 log (P) dB on all frequencies between 2296 and 2300MHz, 61 + 10 log (P) dB on all frequencies between 2292 and 2296 MHz, 67 + 10 log (P) dB on all frequencies between 2288 and 2292 MHz, and 70 + 10 log (P) dB below 2288 MHz; By a factor of not less than 43 + 10 log (P) dB on all frequencies between 2360 and 2365 MHz, and not less than 70 + 10 log (P) dB above 2365 MHz.

A.6.2 Measurement result

Only worst case result is given below

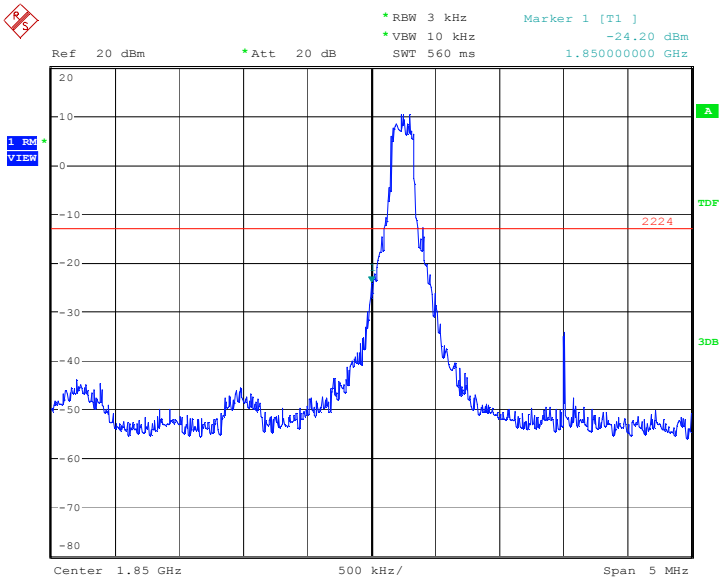
LTE band 25

OBW: 1RB-low_offset



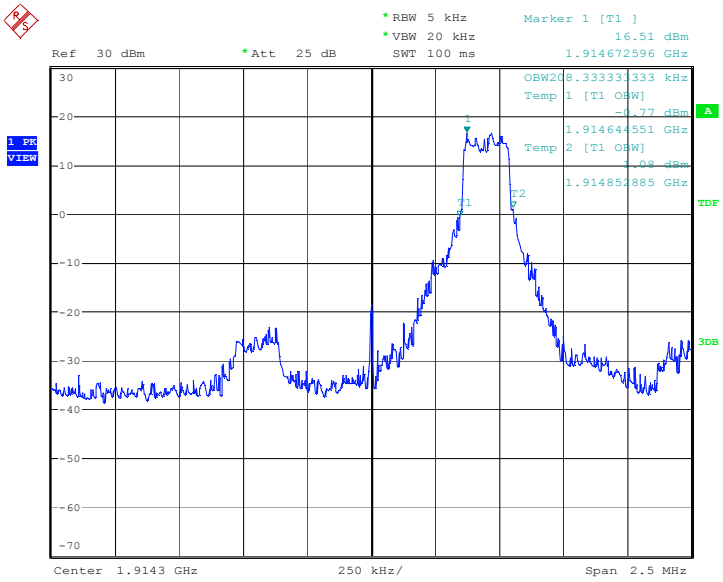
Date: 30.MAR.2016 03:49:14

LOW BAND EDGE BLOCK-1RB-low_offset



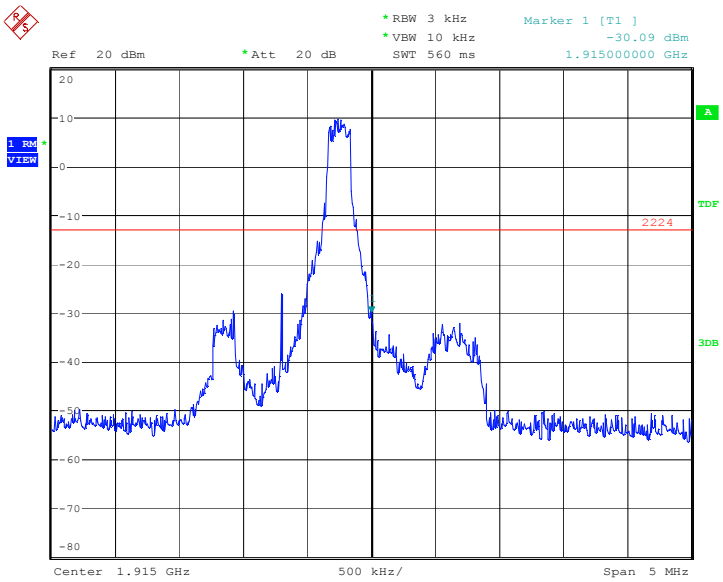
Date: 30.MAR.2016 03:50:01

OBW: 1RB-high_offset



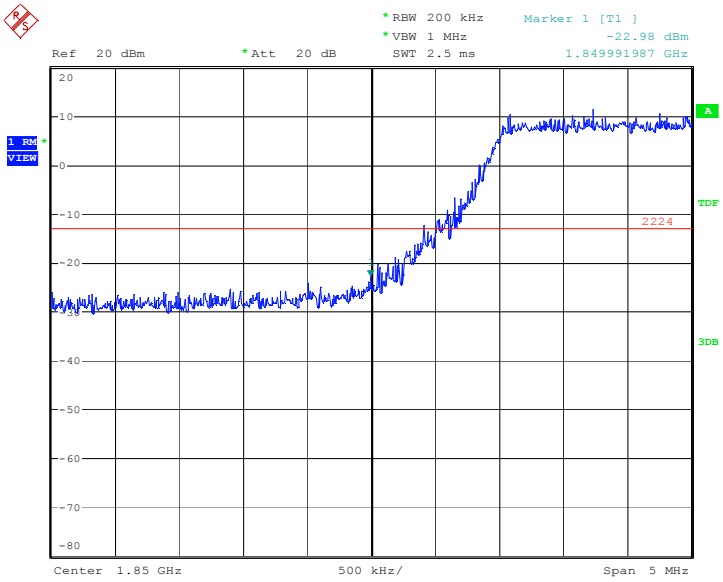
Date: 30.MAR.2016 03:46:56

HIGH BAND EDGE BLOCK-1RB-high_offset



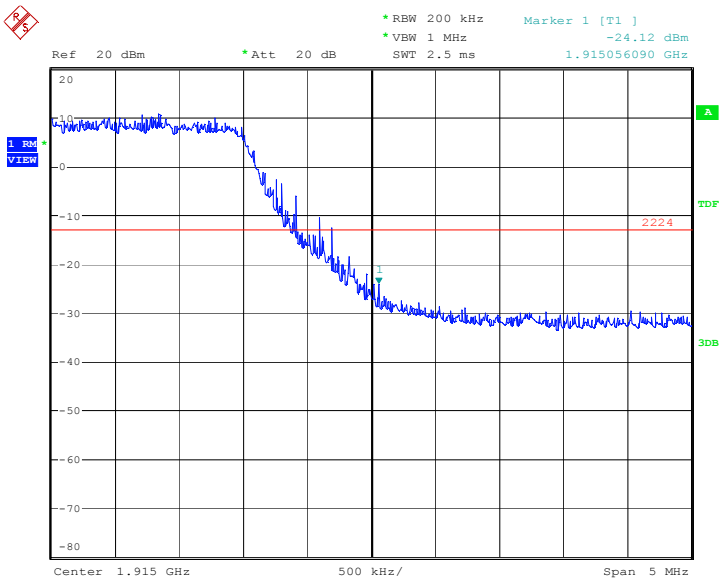
Date: 30.MAR.2016 03:47:42

LOW BAND EDGE BLOCK-20MHz-100%RB



Date: 30.MAR.2016 01:39:52

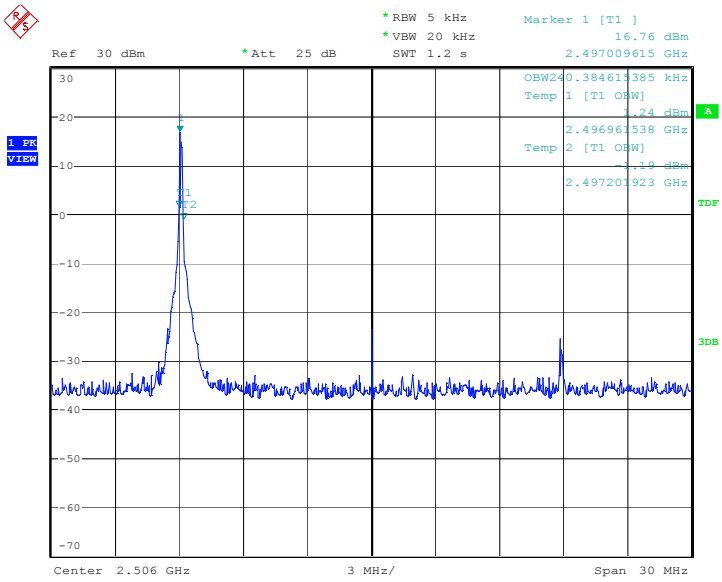
HIGH BAND EDGE BLOCK-20MHz-100%RB



Date: 30.MAR.2016 01:40:41

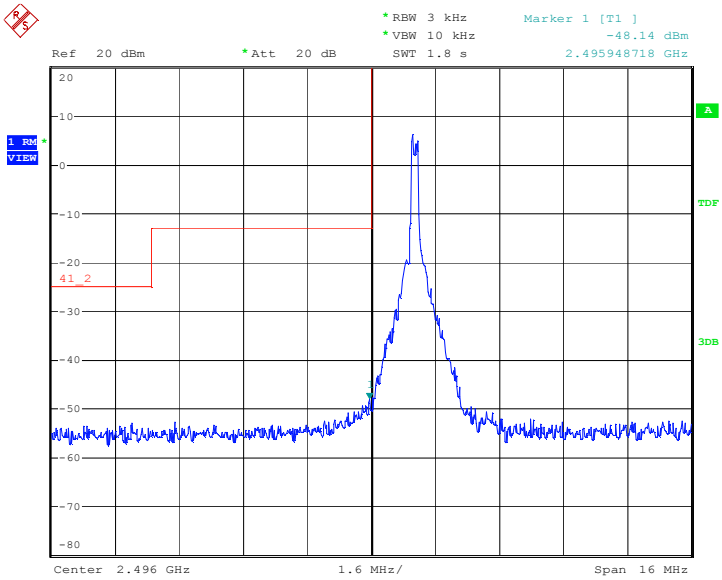
LTE band 41

OBW: 1RB-low_offset



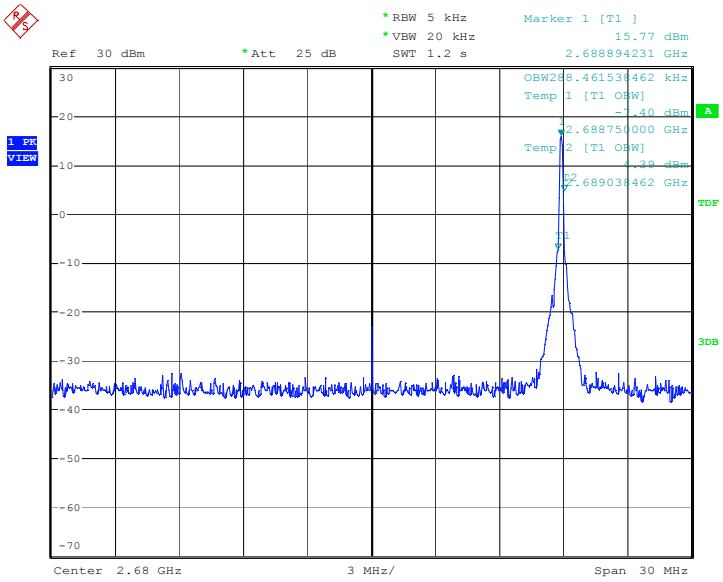
Date: 30.MAR.2016 06:31:59

LOW BAND EDGE BLOCK-1RB-low_offset



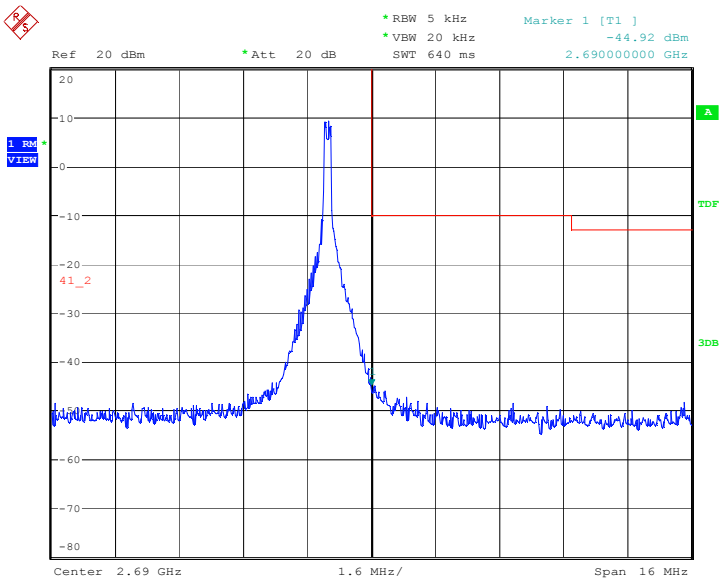
Date: 30.MAR.2016 06:32:46

OBW: 1RB-high_offset



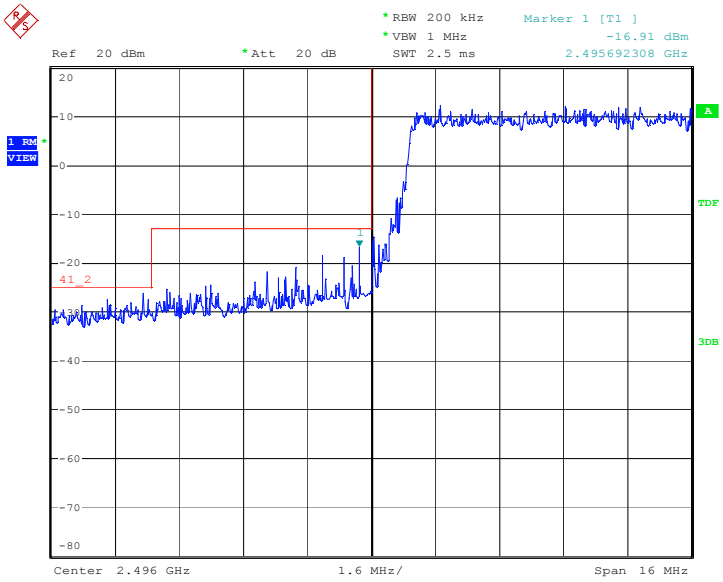
Date: 30.MAR.2016 06:30:14

HIGH BAND EDGE BLOCK-1RB-high_offset



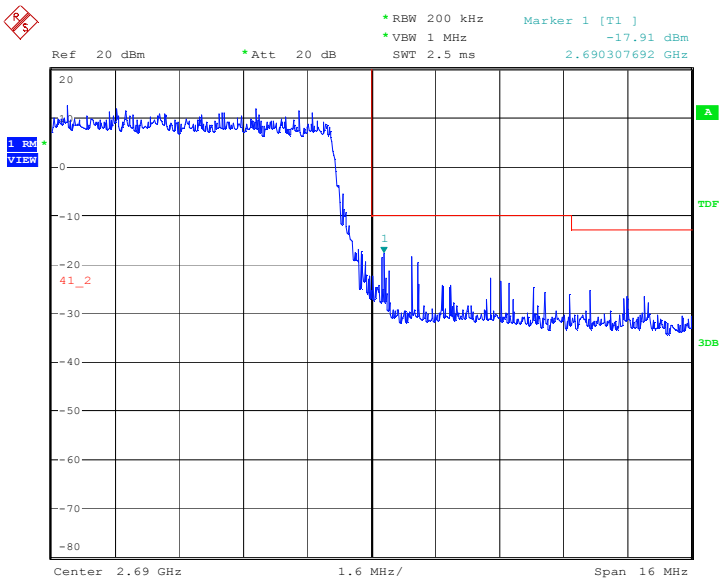
Date: 30.MAR.2016 06:31:00

LOW BAND EDGE BLOCK-20MHz-100%RB



Date: 30.MAR.2016 06:33:43

HIGH BAND EDGE BLOCK-20MHz-100%RB



Date: 30.MAR.2016 06:34:31

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 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.

Part 27.53(m)(4) specifies for mobile digital stations, the attenuation factor shall be not less than 40 + 10 log (P) dB on all frequencies between the channel edge and 5 megahertz from the channel edge, 43 + 10 log (P) dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and 55 + 10 log (P) dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less that 43 + 10 log (P) dB on all frequencies between 2490.5 MHz and 2496 MHz and 55 + 10 log (P) dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

Part 27.53(a) states for mobile and portable stations operating in the 2305–2315 MHz and 2350–2360 MHz bands: By a factor of not less than: 43 +10 log (P) dB on all frequencies between 2305 and 2320 MHz and on all frequencies between 2345 and 2360 MHz that are outside the licensed band(s) of operation, not less than 55 + 10 log (P) dB on all frequencies between 2320 and 2324 MHz and on all frequencies between 2341 and 2345 MHz, not less than 61 + 10 log (P) dB on all frequencies between 2324 and 2328 MHz and on all frequencies between 2337 and 2341 MHz, and not less than 67 + 10 log (P) dB onall frequencies between 2328 and 2337MHz; By a factor of not less than 43 + 10 log (P) dB on all frequencies between 2300 and 2305 MHz, 55

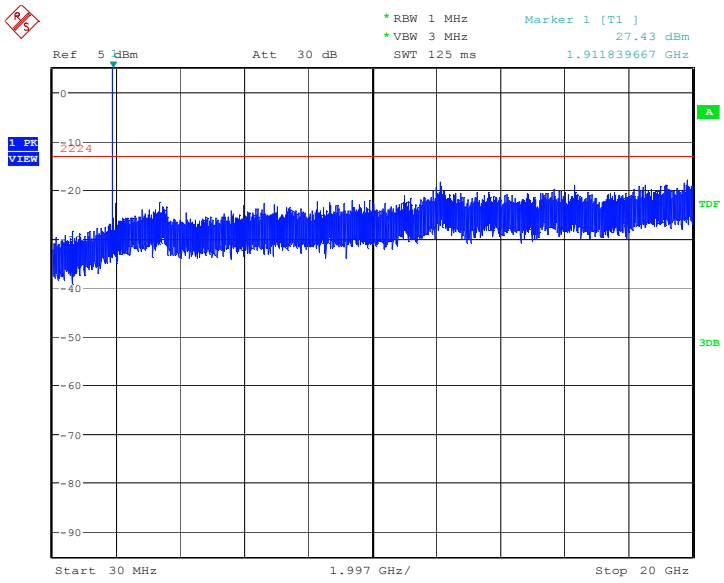
+ 10 log (P) dB on all frequencies between 2296 and 2300MHz, 61 + 10 log (P) dB on all frequencies between 2292 and 2296 MHz, 67 + 10 log (P) dB on all frequencies between 2288 and 2292 MHz, and 70 + 10 log (P) dB below 2288 MHz; By a factor of not less than 43 + 10 log (P) dB on all frequencies between 2360 and 2365 MHz, and not less than 70 + 10 log (P) dB above 2365 MHz.

A. 7.3 Measurement result

Only worst case result is given below

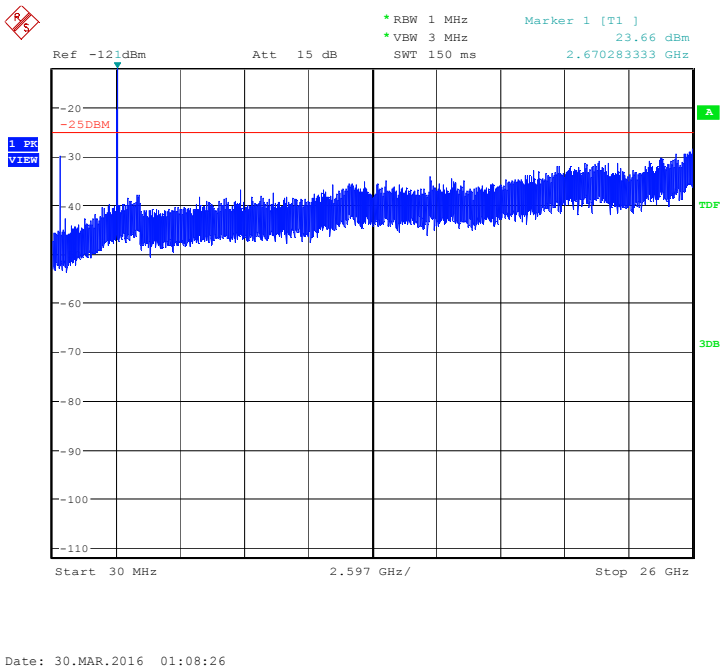
LTE band 25: 30MHz – 20GHz

Spurious emission limit –13dBm.



LTE band 41: 30MHz – 26GHz

Spurious emission limit –13dBm.



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:

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 25, 20MHz

Frequency(MHz)	PAPR(dB)	
1860.0	QPSK	16QAM
	6.73	7.37

LTE band 41, 5MHz

Frequency(MHz)	PAPR(dB)	
2680.0	QPSK	16QAM
	6.70	7.53

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