TEST REPORT

No. I19Z60716-WMD03

for

TCL Communication Ltd.

HSUPA/HSDPA/UMTS Tri Band/GSM Quad Band/LTE 5 Band Mobile Phone

Model Name: 4052R

FCC ID: 2ACCJN031

with

Hardware Version: 04

Software Version: ZXXD

Issued Date: 2019-06-19

TESTING
NVLAP LAB CODE 600118-0

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.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S.Government.

Test Laboratory:

CTTL, Telecommunication Technology Labs, CAICT

No. 52, Huayuan North Road, Haidian District, Beijing, P. R. China 100191.

Tel:+86(0)10-62304633-2512, Fax:+86(0)10-62304633-2504

Email: cttl_terminals@caict.ac.cn, website: www.caict.ac.cn

REPORT HISTORY

Report Number	Revision	Description	Issue Date
I19Z60716-WMD03	Rev.0	1st edition	2019-06-19

CONTENTS

1. Test Laboratory

1.1. Introduction & Accreditation

Telecommunication Technology Labs, CAICT is an ISO/IEC 17025:2005 accredited test laboratory under NATIONAL VOLUNTARY LABORATORY ACCREDITATION PROGRAM (NVLAP) with lab code 600118-0, and is also an FCC accredited test laboratory (CN5017), and ISED accredited test laboratory (CN0066). The detail accreditation scope can be found on NVLAP website.

1.2. Testing Location

Location 1: CTTL(huayuan North Road)

Address: No. 52, Huayuan North Road, Haidian District, Beijing, P. R. China 100191

Location 2: CTTL(Shouxiang)

Address: No. 51 Shouxiang Science Building, Xueyuan Road, Haidian District, Beijing, P. R. China 100191

Location 3:CTTL (BDA)

Address: No.18A, Kangding Street, Beijing Economic-Technology Development Area, Beijing, P. R. China 100176

1.3. Testing Environment

Normal Temperature: 15-35℃

Relative Humidity: 20-75%

1.4. Project data

Testing Start Date: 2019-05-10

Testing End Date: 2019-06-19

1.5. Signature

Dong Yuan

(Prepared this test report)

Zhou Yu

(Reviewed this test report)

Zhao Hui Lin

Deputy Director of the laboratory

(Approved this test report)

2. Client Information

2.1. Applicant Information

Company Name:	TCL Communication Ltd.
Address /Post:	7/F, Block F4, TCL International E City, Zhong Shan Yuan Road, Nanshan District, Shenzhen, Guangdong, P.R. China 518052
Contact:	Gong Zhizhou
Email:	zhizhou.gong@tcl.com
Telephone:	0086-755-36611722
Fax:	0086-755-36612000-81722

2.2. Manufacturer Information

Company Name:	TCL Communication Ltd.
Address /Post:	7/F, Block F4, TCL International E City, Zhong Shan Yuan Road, Nanshan District, Shenzhen, Guangdong, P.R. China 518052
Contact:	Gong Zhizhou
Email:	zhizhou.gong@tcl.com
Telephone:	0086-755-36611722
Fax:	0086-755-36612000-81722

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

3.1. About EUT

Description	HSUPA/HSDPA/UMTS Tri Band/GSM Quad Band/LTE 5 Band Mobile Phone
Model Name	4052R
FCC ID	2ACCJN031
Antenna	Embedded
Output power	23.76dBm maximum EIRP measured for LTE Band 2
Extreme vol. Limits	3.5VDC to 4.2VDC (nominal: 3.7VDC)
Extremetemp. Tolerance	-10°C to +55°C

Note: Components list, please refer to documents of the manufacturer; it is also included in the original test record of CTTL.

3.2. Internal Identification of EUT used during the test

EUT ID*	IMEI	HW Version	SW Version	Date of receipt
UT11a	015455000009422	04	ZXXD	2019-05-13
UT18a	015455000009299	04	ZXXD	2019-05-13

*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

AE1

Model	TLi013C1
Manufacturer	BYD
Capacitance	1350mAh
Nominal Voltage	3.7V

*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 HSUPA/HSDPA/UMTS Tri Band/GSM Quad Band/LTE 5 Band Mobile Phone with embedded 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	10-1-18 Edition
FCC Part 22	PUBLIC MOBILE SERVICES	10-1-18 Edition
FCC Part 27	MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES	10-1-18 Edition
FCC Part 90	PRIVATE LAND MOBILE RADIO SERVICES	10-1-18 Edition
ANSI/TIA-603-E	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards	2016
ANSI/TIA-102.CAAA-E	DIGITAL C4FMCQPSK TRANSCEIVER MEASUREMENT METHODS	2016
ANSI C63.26	American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services	2015
KDB 971168 D01	MEASUREMENT GUIDANCE FOR CERTIFICATION OF LICENSED DIGITAL TRANSMITTERS	v03r01

5. LABORATORY ENVIRONMENT

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

Temperature	Min. = 15 ˚C, Max. = 35 ˚C
Relative humidity	Min. =20 %, Max. = 80 %
Shielding effectiveness	> 110 dB
Electrical insulation	>2 MΩ
Ground system resistance	< 0.5 Ω

Fully-anechoic chamber 2 (8.6 meters×6.1 meters×3.85 meters) did not exceed following limits along the EMC testing:

Temperature	Min. = 15 ˚C, Max. = 30 ˚C
Relative humidity	Min. = 35 %, Max. = 60 %
Shielding effectiveness	> 110 dB
Electrical insulation	>2 MΩ
Ground system resistance	< 1 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

Semi-anechoic chamber 2 / Fully-anechoic chamber 3 (10 meters×6.7 meters×6.15 meters) did not exceed following limits along the EMC testing:

Temperature	Min. = 15 ˚C, Max. = 30 ˚C
Relative humidity	Min. = 35 %, Max. = 60 %
Shielding effectiveness	> 100 dB
Electrical insulation	>2 MΩ
Ground system resistance	< 0.5 Ω
Normalised site attenuation (NSA)	<±3.5 dB, 3 m distance
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

6. SUMMARY OF TEST RESULT

6.1. Summary of test results

LTE Band 2

Items	Test Name	Clause in FCC rules	Verdict
1	Output Power	24.232	P
2	Emission Limit	2.1051/24.238	P
3	Frequency Stability	2.1055	P
4	Occupied Bandwidth	2.1049	P
5	Emission Bandwidth	24.238	P
6	Band Edge Compliance	24.238	P
7	Conducted Spurious Emission	24.238	P
8	Peak-to-Average Power Ratio	24.232	P

LTE Band 4

Items	Test Name	Clause in FCC rules	Verdict
1	Output Power	27.50	P
2	Emission Limit	2.1051/27.53	P
3	Frequency Stability	2.1055	P
4	Occupied Bandwidth	2.1049	P
5	Emission Bandwidth	27.53	P
6	Band Edge Compliance	27.53	P
7	Conducted Spurious Emission	27.53	P
8	Peak-to-Average Power Ratio	27.50	P

LTE Band 5

Items	Test Name	Clause in FCC rules	Verdict
1	Output Power	22.913	P
2	Emission Limit	2.1051/22.917	P
3	Frequency Stability	2.1055	P
4	Occupied Bandwidth	2.1049	P
5	Emission Bandwidth	22.917	P
6	Band Edge Compliance	22.917	P
7	Conducted Spurious Emission	22.917	P

LTE Band 12

Items	Test Name	Clause in FCC rules	Verdict
1	Output Power	27.50	P
2	Emission Limit	2.1051/27.53	BR
3	Frequency Stability	2.1055	BR
4	Occupied Bandwidth	2.1049	BR
5	Emission Bandwidth	27.53	BR
6	Band Edge Compliance	27.53	BR
7	Conducted Spurious Emission	27.53	BR
8	Peak-to-Average Power Ratio	27.50	BR

LTE Band 14

Items	Test Name	Clause in FCC rules	Verdict
1	Output Power	90.542	P
2	Emission Limit	2.1051/90.543	P
3	Frequency Stability	2.1055	P
4	Occupied Bandwidth	2.1049	P
5	Emission Bandwidth	2.1049	P
6	Band Edge Compliance	90.543	P
7	Conducted Spurious Emission	90.543	P

Terms used in Verdict column

P	Pass, The EUT complies with the essential requirements in the standard.
NP	Not Perform, The test was not performed by CTTL
NA	Not Applicable,The test was not applicable
BR	Re-use test data from basic model report.
F	Fail, The EUT does not comply with the essential requirements in the standard

6.2. Explanation of re-use of test data

The Equipment Under Test (EUT) model 4052R(FCC ID: 2ACCJN031) is a variant product of 4052W(FCC ID: 2ACCJN032), according to the declaration of changes provided by the applicant and FCC KDB publication 484596 D01, spot check measurements were performed on this device, LTE band 2 4 5 14 are tested, other test results are derived from test report I19Z60613-WMD03. For detail differences between two models please refer the Declaration of Changes document.

6.3. 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	2020-02-27	1 year
2	Test Receiver	ESU26	100376	R&S	2019-11-26	1 year
3	EMI Antenna	3117	00058889	ETS-Lindgren	2020-01-02	1 year
4	Universal Radio Communication Tester	CMW500	159082	R&S	2019-12-25	1 year
5	Spectrum Analyzer	FSU26	200030	R&S	2020-06-03	1 year
6	EMI Antenna	VULB9163	9163-235	Schwarzbeck	2019-11-20	1 year
7	Signal Generator	SMF100A	101295	R&S	2019-11-27	1 year
8	Climate chamber	SH-242	93008556	ESPEC	2019-12-21	2 year
9	Loop Antenna	HFH2-Z2	829324/007	R&S	2019-12-03	1 year

ANNEX A: MEASUREMENT RESULTS

A.1 OUTPUT POWER

A.1.1 Summary

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

A.1.2 Conducted

A.1.2.1 Method of Measurements

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

A.1.2.2 Measurement result

LTE band 2

Bandwidth	RB size/offset	Frequency (MHz)	Power(dBm)	
			QPSK	16QAM
1.4MHz	1 RB high	1909.3	23.20	22.23
		1880.0	23.13	22.06
		1850.7	22.90	22.44
	1 RB low	1909.3	22.91	22.20
		1880.0	22.84	22.09
		1850.7	22.71	22.46
	50% RB mid	1909.3	23.15	22.43
		1880.0	22.94	22.08
		1850.7	22.90	21.95
	100% RB	1909.3	22.11	21.24
		1880.0	21.86	21.11
		1850.7	21.95	20.87
3MHz	1 RB high	1908.5	22.97	22.33
		1880.0	22.81	21.82
		1851.5	22.55	21.95
	1 RB low	1908.5	22.89	21.41
		1880.0	22.91	21.67
		1851.5	22.67	21.97
	50% RB mid	1908.5	21.77	20.83
		1880.0	21.92	20.86
		1851.5	21.87	20.68
	100% RB	1908.5	21.90	20.74

		1880.0	21.85	20.64
		1851.5	21.93	20.72
5MHz	1 RB high	1907.5	22.87	21.31
		1880.0	22.70	21.44
		1852.5	22.41	21.13
	1 RB low	1907.5	22.85	21.02
		1880.0	22.52	21.01
		1852.5	22.23	21.15
	50% RB mid	1907.5	21.82	20.95
		1880.0	21.62	20.60
		1852.5	21.60	20.56
	100% RB	1907.5	21.68	20.83
		1880.0	21.57	20.64
		1852.5	21.56	20.55
10MHz	1 RB high	1905.0	23.16	22.15
		1880.0	22.72	21.99
		1855.0	22.80	22.24
	1 RB low	1905.0	22.19	22.12
		1880.0	22.77	21.66
		1855.0	22.64	22.11
	50% RB mid	1905.0	22.04	20.92
		1880.0	21.99	20.83
		1855.0	21.97	20.75
	100% RB	1905.0	22.03	20.90
		1880.0	21.94	20.72
		1855.0	22.03	20.69
15MHz	1 RB high	1902.5	23.42	22.22
		1880.0	22.87	21.65
		1857.5	22.51	21.73
	1 RB low	1902.5	23.11	22.46
		1880.0	22.66	21.24
		1857.5	22.62	21.55
	50% RB mid	1902.5	21.93	20.75
		1880.0	21.73	20.82
		1857.5	21.79	20.54
	100% RB	1902.5	21.99	20.75
		1880.0	21.73	20.72
		1857.5	21.71	20.59
20MHz	1 RB high	1900.0	23.12	22.07

		1880.0	23.24	21.89
		1860.0	22.85	21.48
	1 RB low	1900.0	22.97	21.60
		1880.0	22.94	21.95
		1860.0	22.56	21.72
	50% RB mid	1900.0	22.24	21.13
		1880.0	22.16	20.87
		1860.0	22.00	20.71
	100% RB	1900.0	22.13	21.01
		1880.0	22.15	20.86
		1860.0	21.93	20.76

LTE band 4

Bandwidth	RB size/offset	Frequency (MHz)	Power(dBm)	
			QPSK	16QAM
1.4MHz	1 RB high	1754.3	22.91	21.89
		1732.5	22.92	21.92
		1710.7	22.97	22.30
	1 RB low	1754.3	22.91	21.61
		1732.5	22.97	21.94
		1710.7	22.91	22.15
	50% RB mid	1754.3	22.76	21.58
		1732.5	22.95	21.91
		1710.7	23.13	21.93
	100% RB	1754.3	21.82	21.00
		1732.5	21.89	21.45
		1710.7	21.92	20.77
3MHz	1 RB high	1753.5	23.04	21.66
		1732.5	23.31	21.24
		1711.5	22.81	21.96
	1 RB low	1753.5	23.03	21.69
		1732.5	23.20	21.36
		1711.5	23.11	21.85
	50% RB mid	1753.5	21.75	20.95
		1732.5	22.02	20.94
		1711.5	21.93	20.95
	100% RB	1753.5	21.84	20.77
		1732.5	22.02	21.22
		1711.5	21.92	20.84
5MHz	1 RB high	1752.5	22.89	21.31
		1732.5	23.31	21.11
		1712.5	22.98	21.58
	1 RB low	1752.5	22.97	21.32
		1732.5	23.29	21.29
		1712.5	22.83	21.29
	50% RB mid	1752.5	21.99	20.93
		1732.5	22.28	21.17
		1712.5	22.08	20.97
	100% RB	1752.5	21.95	20.91
		1732.5	22.05	21.17
		1712.5	21.94	20.99
10MHz	1 RB high	1750	23.14	21.77
		1732.5	23.10	21.95

		1715	23.16	22.27
	1 RB low	1750	23.28	21.49
		1732.5	23.17	21.94
		1715	22.92	22.21
	50% RB mid	1750	21.80	21.03
		1732.5	22.04	20.96
		1715	21.96	21.10
	100% RB	1750	21.89	20.89
		1732.5	21.82	20.97
		1715	21.91	20.99
15MHz	1 RB high	1747.5	23.09	22.32
		1732.5	23.30	22.09
		1717.5	23.34	21.31
	1 RB low	1747.5	23.00	22.42
		1732.5	23.22	22.02
		1717.5	22.89	22.14
	50% RB mid	1747.5	22.24	21.09
		1732.5	22.15	21.12
		1717.5	22.02	21.22
	100% RB	1747.5	22.08	20.99
		1732.5	22.12	20.89
		1717.5	22.08	21.15
20MHz	1 RB high	1745	23.01	21.36
		1732.5	22.62	21.39
		1720	23.05	21.82
	1 RB low	1745	23.06	21.96
		1732.5	22.84	21.54
		1720	22.93	21.78
	50% RB mid	1745	22.30	21.28
		1732.5	22.17	21.15
		1720	22.26	21.28
	100% RB	1745	22.14	21.13
		1732.5	22.05	21.19
		1720	22.26	21.18

LTE band 5

Bandwidth	RB size/offset	Frequency (MHz)	Power(dBm)	
			QPSK	16QAM
1.4MHz	1 RB high	848.3	23.01	22.01
		836.5	23.05	21.94
		824.7	22.79	22.06
	1 RB low	848.3	22.88	21.76
		836.5	23.01	21.89
		824.7	22.85	22.01
	50% RB mid	848.3	22.93	22.30
		836.5	22.97	22.01
		824.7	22.81	21.70
	100% RB	848.3	22.13	21.04
		836.5	21.85	21.25
		824.7	21.90	20.66
3MHz	1 RB high	847.5	23.13	22.15
		836.5	22.87	22.04
		825.5	22.98	21.51
	1 RB low	847.5	22.99	22.10
		836.5	22.89	22.07
		825.5	22.94	22.30
	50% RB mid	847.5	22.26	20.91
		836.5	22.19	21.26
		825.5	22.02	21.04
	100% RB	847.5	22.09	21.09
		836.5	22.07	21.22
		825.5	21.91	20.95
5MHz	1 RB high	846.5	23.03	21.57
		836.5	22.78	21.51
		826.5	22.97	21.65
	1 RB low	846.5	22.93	21.62
		836.5	22.92	21.35
		826.5	22.96	21.50
	50% RB mid	846.5	22.07	21.14
		836.5	22.00	21.10
		826.5	21.91	20.79
	100% RB	846.5	22.21	21.11
		836.5	21.91	21.16
		826.5	21.83	20.93
10MHz	1 RB high	844.0	23.25	22.20
		836.5	22.96	22.18

		829.0	22.79	21.58
	1 RB low	844.0	22.85	21.84
		836.5	22.90	21.96
		829.0	22.81	21.32
	50% RB mid	844.0	22.16	21.23
		836.5	22.13	21.26
		829.0	22.11	21.29
	100% RB	844.0	22.16	21.18
		836.5	22.04	21.10
		829.0	22.10	21.10

LTE band 14

Bandwidth	RB size/offset	Frequency (MHz)	Power(dBm)	
			QPSK	16QAM
5MHz	1 RB high	795.5	23.10	22.01
		793.0	23.44	22.19
		790.5	23.24	21.80
	1 RB low	795.5	23.44	22.06
		793.0	23.35	21.99
		790.5	23.14	22.08
	50% RB mid	795.5	22.40	21.37
		793.0	22.44	21.34
		790.5	22.38	21.26
	100% RB	795.5	22.31	21.47
		793.0	22.46	21.46
		790.5	22.29	21.26
10MHz	1 RB high	793.0	23.47	22.07
	1 RB low	793.0	23.23	21.95
	50% RB mid	793.0	22.41	21.43
	100% RB	793.0	22.48	21.49

Spot check Measurement Results:

LTE band 12

Bandwidth	RB size/offset	Frequency (MHz)	Power(dBm)	
			QPSK	16QAM
1.4MHz	1 RB high	715.3	22.93	22.11
		707.5	22.95	21.73
		699.7	23.03	22.04
	1 RB low	715.3	23.06	22.15
		707.5	22.76	21.66
		699.7	22.97	22.22
	50% RB mid	715.3	23.18	22.34
		707.5	23.02	21.43
		699.7	23.28	21.94
	100% RB	715.3	22.04	21.46
		707.5	21.78	20.91
		699.7	21.98	20.72
3MHz	1 RB high	714.5	22.83	21.98
		707.5	23.16	22.31
		700.5	22.93	22.24
	1 RB low	714.5	23.14	22.20
		707.5	22.82	21.68
		700.5	23.00	21.61
	50% RB mid	714.5	22.01	20.95
		707.5	21.72	21.22
		700.5	21.98	21.12
	100% RB	714.5	22.05	20.91
		707.5	22.03	20.89
		700.5	21.92	21.02
5MHz	1 RB high	713.5	22.79	21.24
		707.5	23.22	21.90
		701.5	22.55	21.64
	1 RB low	713.5	22.81	21.69
		707.5	23.01	21.20
		701.5	22.79	22.00
	50% RB mid	713.5	22.03	20.89
		707.5	21.78	20.81
		701.5	22.00	20.93
	100% RB	713.5	21.89	21.02
		707.5	21.97	21.13
		701.5	21.99	20.92

10MHz	1 RB high	711.0	23.10	21.99
		707.5	23.00	22.43
		704.0	23.17	22.32
	1 RB low	711.0	22.91	21.22
		707.5	23.00	21.86
		704.0	23.10	22.06
	50% RB mid	711.0	21.98	21.11
		707.5	21.70	20.89
		704.0	21.86	20.91
	100% RB	711.0	21.85	20.97
		707.5	21.89	20.86
		704.0	21.97	21.07

Reference Measurement Results from basic model:

LTE band 12

Bandwidth	RB size/offset	Frequency (MHz)	Power(dBm)	
			QPSK	16QAM
1.4MHz	1 RB high	715.3	22.93	21.98
		707.5	23.16	22.04
		699.7	22.91	21.93
	1 RB low	715.3	23.14	21.94
		707.5	23.17	21.91
		699.7	22.95	21.81
	50% RB mid	715.3	22.90	21.97
		707.5	22.92	21.54
		699.7	22.73	21.98
	100% RB	715.3	22.07	21.19
		707.5	22.01	21.01
		699.7	21.99	21.03
3MHz	1 RB high	714.5	23.04	21.62
		707.5	23.16	21.70
		700.5	23.01	21.86
	1 RB low	714.5	23.19	21.63
		707.5	22.99	21.92
		700.5	22.96	21.75
	50% RB mid	714.5	22.11	21.24
		707.5	22.17	21.12
		700.5	22.02	21.06
	100% RB	714.5	22.08	21.19
		707.5	22.09	21.18
		700.5	21.89	21.01
5MHz	1 RB high	713.5	23.03	21.94
		707.5	23.09	21.98
		701.5	23.07	21.80
	1 RB low	713.5	23.18	21.29
		707.5	23.05	21.64
		701.5	22.92	21.36
	50% RB mid	713.5	22.21	21.11
		707.5	22.22	21.01
		701.5	22.08	20.96
	100% RB	713.5	22.15	21.32
		707.5	22.15	21.11
		701.5	21.96	21.14

10MHz	1 RB high	711.0	23.01	22.15
		707.5	23.08	22.05
		704.0	23.05	22.13
	1 RB low	711.0	23.47	22.30
		707.5	23.02	22.14
		704.0	23.04	22.08
	50% RB mid	711.0	22.20	21.28
		707.5	22.15	21.14
		704.0	22.09	21.22
	100% RB	711.0	22.15	21.21
		707.5	22.12	21.19
		704.0	22.08	21.07

A.1.3 Radiated

A.1.3.1 Description

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

Rule Part 22.913(a) specifies “Mobile stations are limited to 2.0 watts EIRP.”.

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

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

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

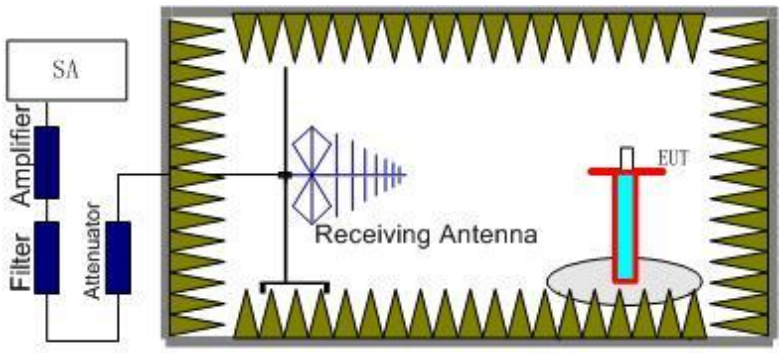
Rule Part 27.50(c) specifies “Portable stations (hand-held de-vices) are limited to 3 watts ERP.”.

Rule Part 90.541(d) specifies “The transmitting power of a portable (hand-held) unit must not exceed 3 watts ERP.”.

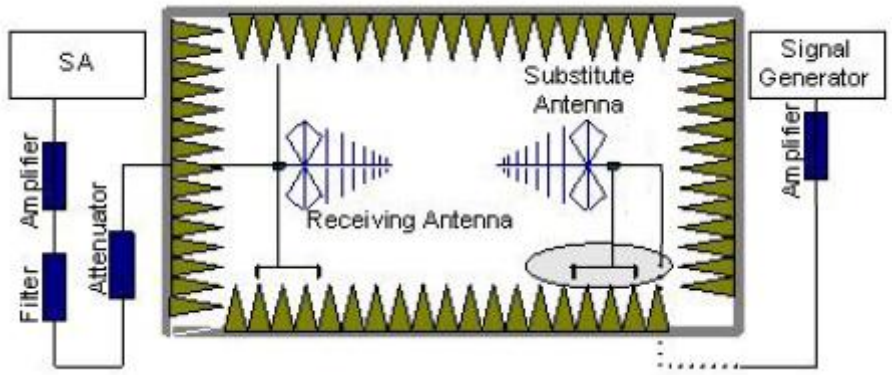
A.1.3.2 Method of Measurement

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

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



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



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

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

A.1.3.3 Measurement result

LTE Band 2- EIRP

Limits: ≤33dBm (2W)

LTE Band 2_1.4MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a (dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1850.70	-23.96	2.92	43.75	4.87	21.74	33.00	11.26	H
1880.00	-23.55	2.85	43.75	4.82	22.17	33.00	10.83	H
1909.30	-21.90	2.87	43.77	4.76	23.76	33.00	9.24	H

LTE Band 2_3MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a (dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1851.50	-23.91	2.87	43.75	4.87	21.84	33.00	11.16	H
1880.00	-23.63	2.85	43.75	4.82	22.09	33.00	10.91	H
1908.50	-21.96	2.89	43.78	4.76	23.69	33.00	9.31	H

LTE Band 2_5MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a (dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1852.50	-23.73	2.87	43.75	4.87	22.02	33.00	10.98	H
1880.00	-23.57	2.85	43.75	4.82	22.15	33.00	10.85	H
1907.50	-22.12	2.84	43.77	4.77	23.58	33.00	9.42	H

LTE Band 2_10MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a (dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1855.00	-24.06	2.88	43.74	4.86	21.66	33.00	11.34	H
1880.00	-23.71	2.85	43.75	4.82	22.01	33.00	10.99	H
1905.00	-22.61	2.87	43.77	4.77	23.06	33.00	9.94	H

LTE Band 2_15MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a (dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1857.50	-23.68	2.87	43.75	4.86	22.06	33.00	10.94	H
1880.00	-23.59	2.85	43.75	4.82	22.13	33.00	10.87	H
1902.50	-22.55	2.86	43.77	4.78	23.14	33.00	9.86	H

LTE Band 2_20 MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a (dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1860.00	-23.50	2.86	43.75	4.85	22.24	33.00	10.76	H
1880.00	-23.65	2.85	43.75	4.82	22.07	33.00	10.93	V
1900.00	-22.77	2.87	43.77	4.78	22.91	33.00	10.09	H

LTE Band 2_1.4MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a (dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1850.70	-24.73	2.92	43.75	4.87	20.97	33.00	12.03	H
1880.00	-24.27	2.85	43.75	4.82	21.45	33.00	11.55	V
1909.30	-22.81	2.87	43.77	4.76	22.85	33.00	10.15	H

LTE Band 2_3MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a (dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1851.50	-24.21	2.87	43.75	4.87	21.54	33.00	11.46	H
1880.00	-24.50	2.85	43.75	4.82	21.22	33.00	11.78	H
1908.50	-23.20	2.89	43.78	4.76	22.45	33.00	10.55	H

LTE Band 2_5MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a (dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1852.50	-24.27	2.87	43.75	4.87	21.48	33.00	11.52	H
1880.00	-24.51	2.85	43.75	4.82	21.21	33.00	11.79	H
1907.50	-23.40	2.84	43.77	4.77	22.30	33.00	10.70	H

LTE Band 2_10MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a (dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1855.00	-24.84	2.88	43.74	4.86	20.88	33.00	12.12	H
1880.00	-24.33	2.85	43.75	4.82	21.39	33.00	11.61	V
1905.00	-23.35	2.87	43.77	4.77	22.32	33.00	10.68	H

LTE Band 2_15MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a (dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1857.50	-24.40	2.87	43.75	4.86	21.34	33.00	11.66	H
1880.00	-24.33	2.85	43.75	4.82	21.39	33.00	11.61	H
1902.50	-23.56	2.86	43.77	4.78	22.13	33.00	10.87	H

LTE Band 2_20 MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a (dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1860.00	-24.15	2.86	43.75	4.85	21.59	33.00	11.41	H
1880.00	-24.40	2.85	43.75	4.82	21.32	33.00	11.68	V
1900.00	-23.55	2.87	43.77	4.78	22.13	33.00	10.87	H

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 (dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1710.70	-25.14	3.17	44.10	5.12	20.91	30.00	9.09	H
1732.50	-24.33	3.33	44.14	5.08	21.56	30.00	8.44	H
1754.30	-22.51	3.76	44.14	5.04	22.91	30.00	7.09	H

LTE Band 4_3MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a (dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1711.50	-24.96	3.40	44.10	5.12	20.86	30.00	9.14	H
1732.50	-24.87	3.33	44.14	5.08	21.02	30.00	8.98	H
1753.50	-22.06	3.80	44.13	5.04	23.31	30.00	6.69	H

LTE Band 4_5MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a (dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1712.50	-24.82	3.66	44.10	5.12	20.74	30.00	9.26	H
1732.50	-24.60	3.33	44.14	5.08	21.29	30.00	8.71	H
1752.50	-22.41	3.82	44.14	5.05	22.96	30.00	7.04	H

LTE Band 4_10MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a (dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1715.00	-24.66	3.56	44.10	5.11	20.99	30.00	9.01	H
1732.50	-24.57	3.33	44.14	5.08	21.32	30.00	8.68	H
1750.00	-23.60	3.00	44.15	5.05	22.60	30.00	7.40	H

LTE Band 4_15MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a (dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1717.50	-24.92	3.47	44.11	5.11	20.83	30.00	9.17	H
1732.50	-24.61	3.33	44.14	5.08	21.28	30.00	8.72	H
1747.50	-23.49	3.34	44.15	5.05	22.37	30.00	7.63	H

LTE Band 4_20MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a (dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1720.00	-24.90	3.37	44.11	5.10	20.94	30.00	9.06	H
1732.50	-24.53	3.33	44.14	5.08	21.36	30.00	8.64	H
1745.00	-23.39	3.68	44.16	5.06	22.15	30.00	7.85	H

LTE Band 4_1.4MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a (dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1710.70	-26.03	3.17	44.10	5.12	20.02	30.00	9.98	H
1732.50	-25.46	3.33	44.14	5.08	20.43	30.00	9.57	H
1754.30	-23.42	3.76	44.14	5.04	22.00	30.00	8.00	H

LTE Band 4_3MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a (dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1711.50	-25.85	3.40	44.10	5.12	19.97	30.00	10.03	H
1732.50	-25.95	3.33	44.14	5.08	19.94	30.00	10.06	H
1753.50	-22.98	3.80	44.13	5.04	22.39	30.00	7.61	H

LTE Band 4_5MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a (dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1712.50	-25.70	3.66	44.10	5.12	19.86	30.00	10.14	H
1732.50	-26.16	3.33	44.14	5.08	19.73	30.00	10.27	H
1752.50	-23.33	3.82	44.14	5.05	22.04	30.00	7.96	H

LTE Band 4_10MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a (dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1715.00	-25.52	3.56	44.10	5.11	20.13	30.00	9.87	H
1732.50	-25.96	3.33	44.14	5.08	19.93	30.00	10.07	H
1750.00	-24.46	3.00	44.15	5.05	21.74	30.00	8.26	H

LTE Band 4_15MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a (dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1717.50	-25.17	3.47	44.11	5.11	20.58	30.00	9.42	H
1732.50	-26.04	3.33	44.14	5.08	19.85	30.00	10.15	H
1747.50	-24.65	3.34	44.15	5.05	21.21	30.00	8.79	H

LTE Band 4_20MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a (dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1720.00	-25.55	3.37	44.11	5.10	20.29	30.00	9.71	H
1732.50	-26.14	3.33	44.14	5.08	19.75	30.00	10.25	H
1745.00	-24.48	3.68	44.16	5.06	21.06	30.00	8.94	H

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 (dBi)	Correction (dB)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
824.70	-22.08	2.26	45.79	0.95	2.15	20.25	38.45	18.20	H
836.50	-21.92	2.26	45.66	0.82	2.15	20.15	38.45	18.30	H
848.30	-23.14	2.27	45.55	0.80	2.15	18.79	38.45	19.66	H

LTE Band 5_3MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a (dBi)	Correction (dB)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
825.50	-22.23	2.26	45.79	0.94	2.15	20.09	38.45	18.36	H
836.50	-22.25	2.26	45.66	0.82	2.15	19.82	38.45	18.63	H
847.50	-23.40	2.27	45.56	0.81	2.15	18.55	38.45	19.90	H

LTE Band 5_5MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a (dBi)	Correction (dB)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
826.50	-22.22	2.25	45.77	0.93	2.15	20.08	38.45	18.37	H
836.50	-22.21	2.26	45.66	0.82	2.15	19.86	38.45	18.59	H
846.50	-23.35	2.26	45.56	0.82	2.15	18.62	38.45	19.83	H

LTE Band 5_10MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a (dBi)	Correction (dB)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
829.00	-22.28	2.13	45.74	0.90	2.15	20.08	38.45	18.37	H
836.50	-22.21	2.26	45.66	0.82	2.15	19.86	38.45	18.59	H
844.00	-23.35	2.26	45.59	0.82	2.15	18.65	38.45	19.80	V

LTE Band 5_1.4MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a (dBi)	Correction (dB)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
824.70	-22.74	2.26	45.79	0.95	2.15	19.59	38.45	18.86	H
836.50	-22.87	2.26	45.66	0.82	2.15	19.20	38.45	19.25	H
848.30	-24.17	2.27	45.55	0.80	2.15	17.76	38.45	20.69	H

LTE Band 5_3MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a (dBi)	Correction (dB)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
825.50	-22.84	2.26	45.79	0.94	2.15	19.48	38.45	18.97	H
836.50	-23.28	2.26	45.66	0.82	2.15	18.79	38.45	19.66	H
847.50	-24.33	2.27	45.56	0.81	2.15	17.62	38.45	20.83	H

LTE Band 5_5MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a (dBi)	Correction (dB)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
826.50	-22.81	2.25	45.77	0.93	2.15	19.49	38.45	18.96	H
836.50	-23.44	2.26	45.66	0.82	2.15	18.63	38.45	19.82	H
846.50	-24.21	2.26	45.56	0.82	2.15	17.76	38.45	20.69	H

LTE Band 5_10MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a (dBi)	Correction (dB)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
829.00	-22.85	2.13	45.74	0.90	2.15	19.51	38.45	18.94	H
836.50	-22.83	2.26	45.66	0.82	2.15	19.24	38.45	19.21	H
844.00	-23.92	2.26	45.59	0.82	2.15	18.08	38.45	20.37	H

LTE Band 12 - ERP

Limits: ≤34.77dBm (3W)

LTE Band 12_1.4MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a (dBi)	Correction (dB)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
699.70	-19.90	1.90	44.66	0.77	2.15	21.48	34.77	13.29	H
707.50	-19.72	1.91	44.94	0.62	2.15	21.78	34.77	12.99	V
715.30	-19.99	1.92	45.26	0.50	2.15	21.70	34.77	13.07	V

LTE Band 12_3MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a (dBi)	Correction (dB)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
700.50	-19.68	1.90	44.68	0.76	2.15	21.71	34.77	13.06	H
707.50	-19.80	1.91	44.94	0.62	2.15	21.70	34.77	13.07	V
714.50	-20.10	1.92	45.26	0.50	2.15	21.59	34.77	13.18	V

LTE Band 12_5MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a (dBi)	Correction (dB)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
701.50	-19.83	1.90	44.81	0.74	2.15	21.67	34.77	13.10	H
707.50	-20.00	1.91	44.94	0.62	2.15	21.50	34.77	13.27	V
713.50	-19.93	1.92	45.22	0.50	2.15	21.72	34.77	13.05	V

LTE Band 12_10MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a (dBi)	Correction (dB)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
704.00	-20.12	1.91	44.93	0.70	2.15	21.45	34.77	13.32	H
707.50	-20.04	1.91	44.94	0.62	2.15	21.46	34.77	13.31	V
711.00	-19.89	1.92	45.19	0.53	2.15	21.76	34.77	13.01	V

LTE Band 12_1.4MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a (dBi)	Correction (dB)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
699.70	-20.64	1.90	44.66	0.77	2.15	20.74	34.77	14.03	H
707.50	-20.78	1.91	44.94	0.62	2.15	20.72	34.77	14.05	V
715.30	-20.52	1.92	45.26	0.50	2.15	21.17	34.77	13.60	V

LTE Band 12_3MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a (dBi)	Correction (dB)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
700.50	-20.44	1.90	44.68	0.76	2.15	20.95	34.77	13.82	H
707.50	-20.82	1.91	44.94	0.62	2.15	20.68	34.77	14.09	V
714.50	-20.59	1.92	45.26	0.50	2.15	21.10	34.77	13.67	V

LTE Band 12_5MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a (dBi)	Correction (dB)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
701.50	-20.49	1.90	44.81	0.74	2.15	21.01	34.77	13.76	H
707.50	-20.79	1.91	44.94	0.62	2.15	20.71	34.77	14.06	V
713.50	-20.86	1.92	45.22	0.50	2.15	20.79	34.77	13.98	V

LTE Band 12_10MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a (dBi)	Correction (dB)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
704.00	-20.90	1.91	44.93	0.70	2.15	20.67	34.77	14.10	V
707.50	-21.04	1.91	44.94	0.62	2.15	20.46	34.77	14.31	H
711.00	-20.47	1.92	45.19	0.53	2.15	21.18	34.77	13.59	V

LTE Band 14- ERP

Limits: ≤50dBm (100W)

LTE Band 14_5MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a (dBi)	Correction (dB)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
790.50	-20.49	2.02	45.71	0.18	2.15	21.23	34.77	13.54	H
793.00	-20.54	2.03	45.72	0.19	2.15	21.19	34.77	13.58	H
795.50	-20.89	2.03	45.74	0.20	2.15	20.87	34.77	13.90	H

LTE Band 14_10MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a (dBi)	Correction (dB)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
793.00	-20.49	2.03	45.72	0.19	2.15	21.24	34.77	13.53	H

LTE Band 14_5MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a (dBi)	Correction (dB)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
790.50	-21.21	2.02	45.71	0.18	2.15	20.51	34.77	14.26	H
793.00	-21.64	2.03	45.72	0.19	2.15	20.09	34.77	14.68	H
795.50	-21.65	2.03	45.74	0.20	2.15	20.11	34.77	14.66	H

LTE Band 14_10MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_a (dBi)	Correction (dB)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
793.00	-21.39	2.03	45.72	0.19	2.15	20.34	34.77	14.43	H

Peak EIRP(dBm) = P_{Mea}(-21.90dBm) - G_a (-4.76dBi) - P_{Ag} (-43.77dB) - P_{cl} (2.87dB) = 23.76dBm

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 = 2.84 dB, k = 2.

A.2 EMISSION LIMIT

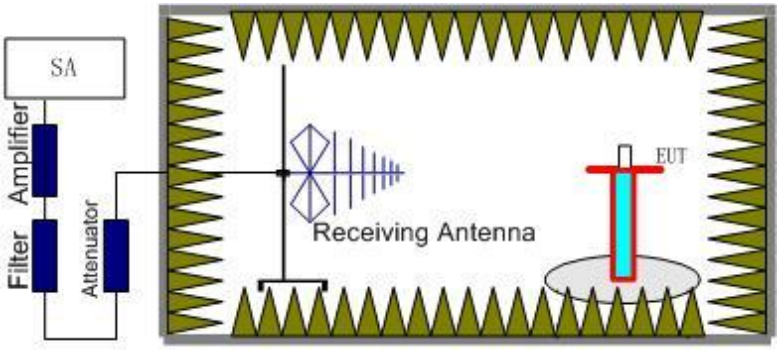
A.2.1 Measurement Method

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

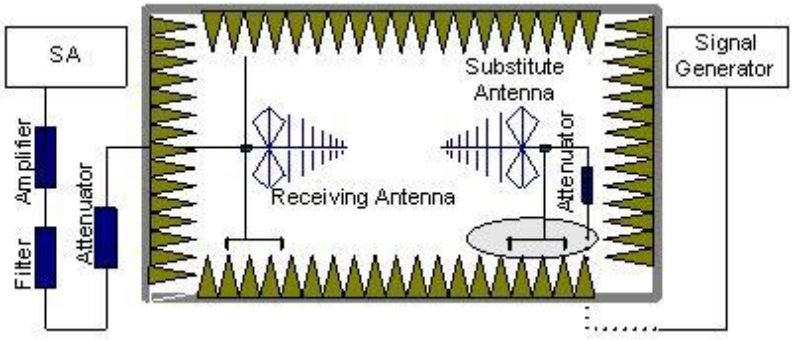
The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier. The resolution bandwidth is set 1MHz. The spectrum was scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of the LTE Bands 2 4 5 12 14.

The procedure of radiated spurious emissions is as follows:

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



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



In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (P_{Mea}) is applied to the input of the substitution antenna. Adjust the level of the signal generator output until the value of the

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

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

A.2.2 Measurement Limit

Part 22.917, Part 24.238 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 90.543 states that For operations in the 758–768 MHz and the 788–798 MHz bands, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following: (1) On all frequencies between 769–775 MHz and 799–805 MHz, by a factor not less than 76 + 10 log (P) dB in a 6.25 kHz band segment, for base and fixed stations. (2) On all frequencies between 769–775 MHz and 799–805 MHz, by a factor not less than 65 + 10 log (P) dB in a 6.25 kHz band segment, for mobile and portable stations. (3) On any frequency between 775–788 MHz, above 805 MHz, and below 758 MHz, by at least 43 + 10 log (P) dB. (4) Compliance with the provisions of paragraphs (e)(1) and (2) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment. (5) Compliance with the provisions of paragraph (e)(3) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of 30 kHz may be employed.

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 12 14. It was decided that measurements at these three carrier frequencies would be sufficient to demonstrate compliance with emissions limits because it was seen that all the significant spurs occur well outside the band and no radiation was seen from

a carrier in one block of the LTE Bands 2 4 5 12 14 into any of the other blocks. The equipment must still, however, meet emissions requirements with the carrier at all frequencies over which it is capable of operating and it is the manufacturer's responsibility to verify this.The evaluated frequency range is from 30MHz to 26GHz.

LTE Band 2, 1.4MHz, QPSK, Channel 18607

Frequency(MHz)	P_{Mea}(dBm)	Path Loss(dB)	Antenna Gain(dBi)	Peak EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
3702.02	-53.34	6.42	8.48	-51.28	-13.00	38.28	H
5556.02	-55.89	7.19	10.59	-52.49	-13.00	39.49	V
7405.01	-50.67	8.13	12.09	-46.71	-13.00	33.71	V
9219.01	-53.45	8.97	13.23	-49.19	-13.00	36.19	V
11149.01	-51.37	9.62	13.17	-47.82	-13.00	34.82	V
13000.01	-49.04	10.47	13.50	-46.01	-13.00	33.01	H

LTE Band 2, 1.4MHz, QPSK, Channel 18900

Frequency(MHz)	P_{Mea}(dBm)	Path Loss(dB)	Antenna Gain(dBi)	Peak EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
3760.02	-53.17	6.26	8.56	-50.87	-13.00	37.87	H
5644.02	-56.44	7.27	10.57	-53.14	-13.00	40.14	V
7526.01	-52.47	8.28	12.22	-48.53	-13.00	35.53	H
9438.01	-53.53	9.23	13.36	-49.40	-13.00	36.40	H
11252.01	-51.33	9.71	13.15	-47.89	-13.00	34.89	H
13114.01	-47.53	10.87	13.66	-44.74	-13.00	31.74	H

LTE Band 2, 1.4MHz, QPSK, Channel 19193

Frequency(MHz)	P_{Mea}(dBm)	Path Loss(dB)	Antenna Gain(dBi)	Peak EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
3819.02	-53.79	6.08	8.65	-51.22	-13.00	38.22	H
5731.02	-55.32	7.29	10.55	-52.06	-13.00	39.06	V
7642.01	-51.72	8.16	12.31	-47.57	-13.00	34.57	V
9574.01	-53.60	9.27	13.33	-49.54	-13.00	36.54	H
11493.01	-50.62	9.83	13.10	-47.35	-13.00	34.35	H
13335.01	-48.10	10.58	13.97	-44.71	-13.00	31.71	H

LTE Band 4, 1.4MHz QPSK, Channel 19957

Frequency(MHz)	P_{Mea}(dBm)	Path Loss(dB)	Antenna Gain(dBi)	Peak EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
3421.02	-53.44	5.38	8.01	-50.81	-13.00	37.81	H
5138.02	-47.70	6.86	10.09	-44.47	-13.00	31.47	H
6847.01	-54.45	7.83	11.42	-50.86	-13.00	37.86	V
8600.01	-54.52	8.49	13.02	-49.99	-13.00	36.99	H
10299.01	-52.13	9.64	13.02	-48.75	-13.00	35.75	H
12000.01	-49.30	10.05	13.00	-46.35	-13.00	33.35	V

LTE Band 4, 1.4MHz, QPSK, Channel 20175

Frequency(MHz)	P_{Mea}(dBm)	Path Loss(dB)	Antenna Gain(dBi)	Peak EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
3465.02	-52.00	5.46	8.12	-49.34	-13.00	36.34	H
5203.02	-46.55	6.96	10.18	-43.33	-13.00	30.33	H
6936.01	-53.51	7.80	11.52	-49.79	-13.00	36.79	V
8668.01	-53.89	8.40	13.03	-49.26	-13.00	36.26	H
10391.01	-51.59	9.79	13.06	-48.32	-13.00	35.32	H
12146.01	-48.75	10.21	13.06	-45.90	-13.00	32.90	V

LTE Band 4, 1.4MHz, QPSK, Channel 20393

Frequency(MHz)	P_{Mea}(dBm)	Path Loss(dB)	Antenna Gain(dBi)	Peak EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
3509.02	-54.34	5.54	8.21	-51.67	-13.00	38.67	H
5268.02	-47.50	6.99	10.28	-44.21	-13.00	31.21	H
7019.01	-54.12	8.27	11.62	-50.77	-13.00	37.77	H
8819.01	-54.00	8.70	13.06	-49.64	-13.00	36.64	H
10483.01	-51.71	9.68	13.09	-48.30	-13.00	35.30	V
12233.01	-48.52	10.04	13.09	-45.47	-13.00	32.47	H

LTE Band 5, 1.4MHz, QPSK, Channel 20407

Frequency(MHz)	P_{Mea}(dBm)	Path Loss(dB)	Antenna Gain(dBi)	Correction (dB)	Peak ERP(dBm)	Limit (dBm)	Margin(dB)	Polarization
1650.01	-55.07	3.57	5.23	2.15	-55.56	-13.00	42.56	H
2474.00	-46.99	4.60	6.02	2.15	-47.72	-13.00	34.72	H
3303.02	-55.27	5.29	7.73	2.15	-54.98	-13.00	41.98	H
4129.02	-55.80	6.05	9.03	2.15	-54.97	-13.00	41.97	H
4943.01	-55.59	6.70	9.84	2.15	-54.60	-13.00	41.60	H
5762.01	-54.67	7.25	10.55	2.15	-53.52	-13.00	40.52	H

LTE Band 5, 1.4MHz, QPSK, Channel 20525

Frequency(MHz)	P_{Mea}(dBm)	Path Loss(dB)	Antenna Gain(dBi)	Correction (dB)	Peak ERP(dBm)	Limit (dBm)	Margin(dB)	Polarization
1673.01	-56.24	3.58	5.19	2.15	-56.78	-13.00	43.78	V
2510.00	-46.74	4.63	6.12	2.15	-47.40	-13.00	34.40	V
3347.02	-54.30	5.32	7.83	2.15	-53.94	-13.00	40.94	H
4186.02	-54.79	6.17	9.09	2.15	-54.02	-13.00	41.02	H
5020.01	-55.47	6.57	9.93	2.15	-54.26	-13.00	41.26	H
5858.01	-53.56	7.26	10.53	2.15	-52.44	-13.00	39.44	H

LTE Band 5, 1.4MHz, QPSK, Channel 20643

Frequency(MHz)	P_{Mea}(dBm)	Path Loss(dB)	Antenna Gain(dBi)	Correction (dB)	Peak ERP(dBm)	Limit (dBm)	Margin(dB)	Polarization
1697.01	-53.00	3.60	5.15	2.15	-53.60	-13.00	40.60	H
2545.00	-46.17	4.66	6.18	2.15	-46.80	-13.00	33.80	V
3394.02	-53.78	5.36	7.95	2.15	-53.34	-13.00	40.34	H
4247.02	-50.96	6.24	9.15	2.15	-50.20	-13.00	37.20	H
5077.01	-55.56	6.71	10.01	2.15	-54.41	-13.00	41.41	V
5943.01	-52.86	7.47	10.51	2.15	-51.97	-13.00	38.97	V

LTE Band 12, 1.4MHz, QPSK, Channel 23017

Frequency(MHz)	P_{Mea}(dBm)	Path Loss(dB)	Antenna Gain(dBi)	Correction (dB)	Peak ERP(dBm)	Limit (dBm)	Margin(dB)	Polarization
1399.01	-49.73	3.23	4.97	2.15	-50.14	-13.00	37.14	V
2099.00	-48.43	4.19	4.90	2.15	-49.87	-13.00	36.87	V
2799.00	-49.41	4.91	6.64	2.15	-49.83	-13.00	36.83	H
3486.02	-56.32	5.49	8.17	2.15	-55.79	-13.00	42.79	H
4195.02	-55.07	6.19	9.10	2.15	-54.31	-13.00	41.31	V
4909.01	-55.75	6.73	9.81	2.15	-54.82	-13.00	41.82	H

LTE Band 12, 1.4MHz, QPSK, Channel 23095

Frequency(MHz)	P_{Mea}(dBm)	Path Loss(dB)	Antenna Gain(dBi)	Correction (dB)	Peak ERP(dBm)	Limit (dBm)	Margin(dB)	Polarization
1415.01	-46.56	3.25	5.06	2.15	-46.90	-13.00	33.90	V
2123.00	-53.26	4.21	4.97	2.15	-54.65	-13.00	41.65	V
2826.00	-52.26	4.95	6.69	2.15	-52.67	-13.00	39.67	V
3542.02	-56.42	5.74	8.26	2.15	-56.05	-13.00	43.05	V
4249.02	-55.29	6.24	9.15	2.15	-54.53	-13.00	41.53	H
4959.01	-55.36	6.67	9.86	2.15	-54.32	-13.00	41.32	H

LTE Band 12, 1.4MHz, QPSK, Channel 23173

Frequency(MHz)	P_{Mea}(dBm)	Path Loss(dB)	Antenna Gain(dBi)	Correction (dB)	Peak ERP(dBm)	Limit (dBm)	Margin(dB)	Polarization
1431.01	-54.78	3.28	5.14	2.15	-55.07	-13.00	42.07	V
2146.00	-50.84	4.24	5.04	2.15	-52.19	-13.00	39.19	V
2862.00	-50.77	4.96	6.75	2.15	-51.13	-13.00	38.13	H
3588.02	-55.86	6.21	8.32	2.15	-55.90	-13.00	42.90	V
4286.02	-55.49	6.21	9.19	2.15	-54.66	-13.00	41.66	H
5022.01	-55.48	6.57	9.93	2.15	-54.27	-13.00	41.27	H

LTE Band 14, 5 MHz, QPSK, Channel 23305

Frequency(MHz)	P_{Mea}(dBm)	Path Loss(dB)	Antenna Gain(dBi)	Correction (dB)	Peak ERP(dBm)	Limit (dBm)	Margin(dB)	Polarization
1581.01	-56.73	3.50	5.35	2.15	-57.03	-13.00	44.03	V
2372.00	-54.23	4.48	5.72	2.15	-55.14	-13.00	42.14	V
3172.02	-54.20	5.34	7.41	2.15	-54.28	-13.00	41.28	H
3953.02	-55.68	6.10	8.83	2.15	-55.10	-13.00	42.10	H
4734.02	-55.47	6.54	9.63	2.15	-54.53	-13.00	41.53	H
5530.01	-55.43	7.16	10.59	2.15	-54.15	-13.00	41.15	H

LTE Band 14, 5 MHz, QPSK, Channel 23330

Frequency(MHz)	P_{Mea}(dBm)	Path Loss(dB)	Antenna Gain(dBi)	Correction (dB)	Peak ERP(dBm)	Limit (dBm)	Margin(dB)	Polarization
1586.01	-46.43	3.50	5.35	2.15	-46.73	-13.00	33.73	V
2380.00	-36.95	4.49	5.74	2.15	-37.85	-13.00	24.85	V
3177.02	-54.34	5.33	7.42	2.15	-54.40	-13.00	41.40	V
3964.02	-56.19	6.09	8.85	2.15	-55.58	-13.00	42.58	H
4743.02	-54.93	6.56	9.64	2.15	-54.00	-13.00	41.00	V
5562.01	-55.62	7.19	10.59	2.15	-54.37	-13.00	41.37	H

LTE Band 14, 5 MHz, QPSK, Channel 23355

Frequency(MHz)	P_{Mea}(dBm)	Path Loss(dB)	Antenna Gain(dBi)	Correction (dB)	Peak ERP(dBm)	Limit (dBm)	Margin(dB)	Polarization
1591.01	-56.71	3.51	5.34	2.15	-57.03	-13.00	44.03	V
2387.00	-50.73	4.50	5.76	2.15	-51.62	-13.00	38.62	H
3182.02	-53.76	5.32	7.44	2.15	-53.79	-13.00	40.79	H
3982.02	-55.22	6.08	8.87	2.15	-54.58	-13.00	41.58	H
4759.01	-55.71	6.59	9.66	2.15	-54.79	-13.00	41.79	V
5573.01	-55.12	7.21	10.59	2.15	-53.89	-13.00	40.89	H

Note: The maximum value of expanded measurement uncertainty for this test item is U = 5.16 dB, k = 2.

A.3 FREQUENCY STABILITY

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 -10℃.
3. With the EUT, powered via nominal voltage, connected to the CMW500 and in a simulated call on middle channel for LTE band 2 4 5 12 14, 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 -10℃ 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 -10℃ to +50℃. 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.

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 4.2VDC, with a nominal voltage of 3.7VDC. 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.

A.3.2 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	-5.88	-28.88	0.0031	0.0154
3.7	-6.05	-28.68	0.0032	0.0153
4.2	-6.67	-29.57	0.0035	0.0157

Frequency Error vs Temperature

Temperature (℃)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
50	-5.76	-30.34	0.0031	0.0161
40	-5.91	-29.64	0.0031	0.0158
30	-5.99	-27.84	0.0032	0.0148
20	-5.88	-28.04	0.0031	0.0149
10	-5.97	-29.38	0.0032	0.0156
0	-7.93	-27.95	0.0042	0.0149
-10	-7.41	-29.30	0.0039	0.0156

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	5.36	-24.68	0.0031	0.0142
3.7	-4.29	-25.19	0.0025	0.0145
4.2	3.75	-23.65	0.0022	0.0137

Frequency Error vs Temperature

Temperature (℃)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
50	-3.38	-24.18	0.0020	0.0140
40	5.19	-25.23	0.0030	0.0146
30	3.66	-24.58	0.0021	0.0142
20	-4.22	-24.39	0.0024	0.0141
10	4.73	-23.20	0.0027	0.0134
0	4.38	-25.16	0.0025	0.0145
-10	3.12	-24.92	0.0018	0.0144

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	-5.02	-22.26	0.0060	0.0266
3.7	-3.69	-23.62	0.0044	0.0282
4.2	-2.93	-23.99	0.0035	0.0287

Frequency Error vs Temperature

Temperature (℃)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
50	-2.78	-23.70	0.0033	0.0283
40	-3.10	-24.09	0.0037	0.0288
30	-2.63	-22.85	0.0031	0.0273
20	-4.71	-23.50	0.0056	0.0281
10	-3.02	-22.92	0.0036	0.0274
0	-2.92	-23.85	0.0035	0.0285
-10	-3.81	-23.66	0.0046	0.0283

LTE Band 12, 5MHz bandwidth (worst case of all bandwidths)

Frequency Error vs Voltage

Voltage (V)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
3.5	-2.32	-10.07	0.0033	0.0142
3.7	-2.40	-9.61	0.0034	0.0136
4.2	-1.96	-11.47	0.0028	0.0162

Frequency Error vs Temperature

Temperature (℃)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
50	-2.32	-12.35	0.0033	0.0175
40	2.52	-11.26	0.0036	0.0159
30	-3.36	-11.86	0.0047	0.0168
20	-2.99	-11.27	0.0042	0.0159
10	-2.66	-12.25	0.0038	0.0173
0	-3.79	-11.07	0.0054	0.0156
-10	-2.52	-10.70	0.0036	0.0151

LTE Band 14, 5MHz bandwidth (worst case of all bandwidths)

Frequency Error vs Voltage

Voltage (V)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
3.5	-2.00	-11.83	0.0025	0.0149
3.7	-2.98	-11.82	0.0038	0.0149
4.2	-2.49	-11.20	0.0031	0.0141

Frequency Error vs Temperature

Temperature (℃)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
50	-3.09	-10.97	0.0039	0.0138
40	-2.37	-11.20	0.0030	0.0141
30	-2.72	-11.44	0.0034	0.0144
20	-1.99	-11.87	0.0025	0.0150
10	1.99	-10.96	0.0025	0.0138
0	-2.96	-9.58	0.0037	0.0121
-10	-4.02	-11.24	0.0051	0.0142

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.

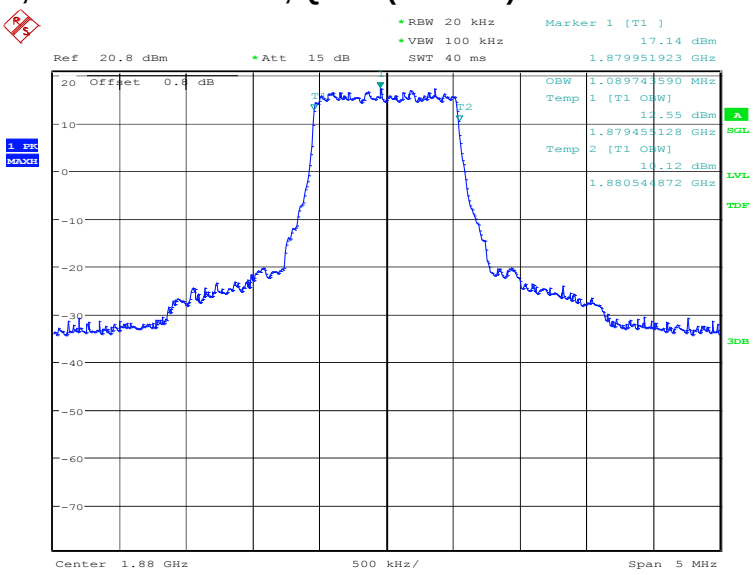
d) Set the detection mode to peak, and the trace mode to max hold.

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

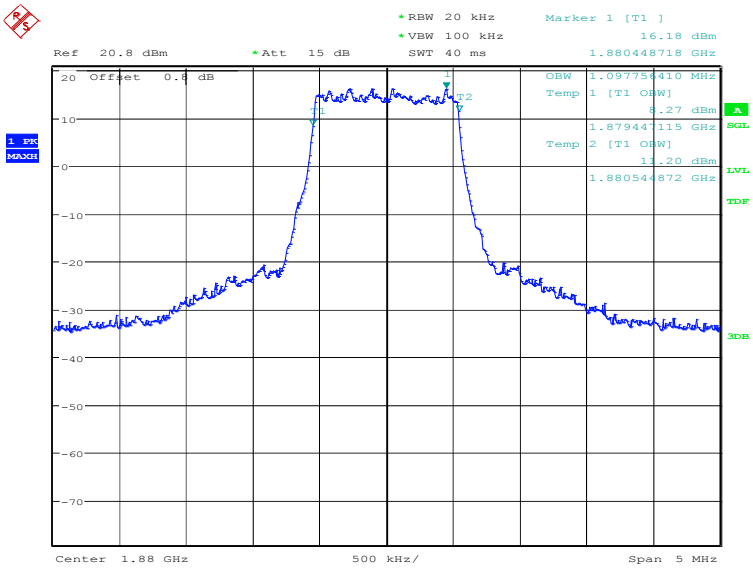
LTE band 2, 1.4MHz (99%)

Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
1880.0	QPSK	16QAM
	1089.74	1097.76

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



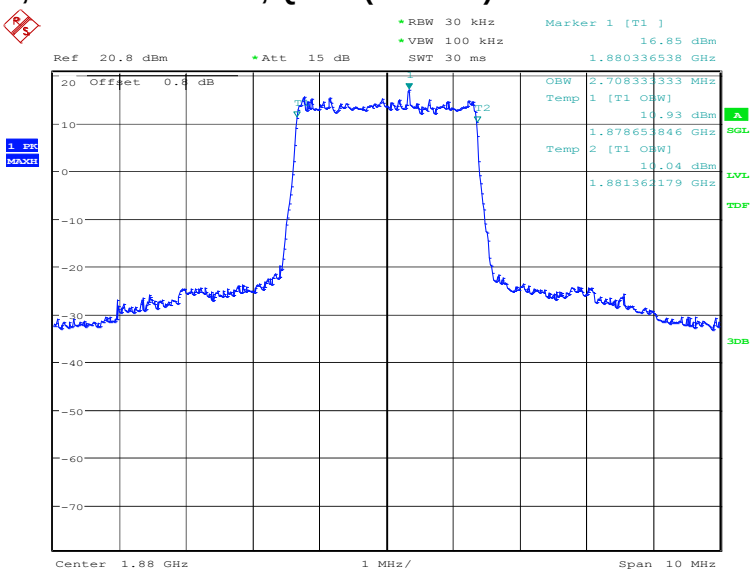
LTE band 2, 1.4MHz Bandwidth, 16QAM (99% BW)



LTE band 2, 3MHz (99%)

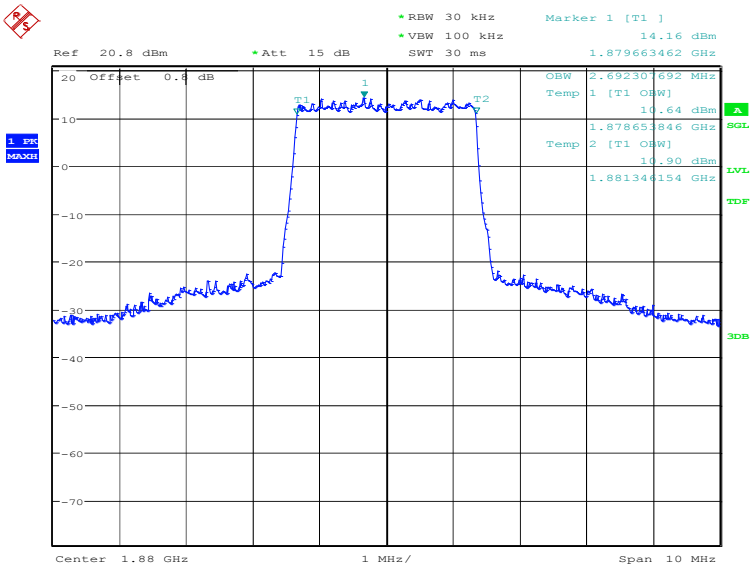
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
1880.0	QPSK	16QAM
	2708.33	2692.31

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



Date: 4.JUN.2019 16:10:21

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

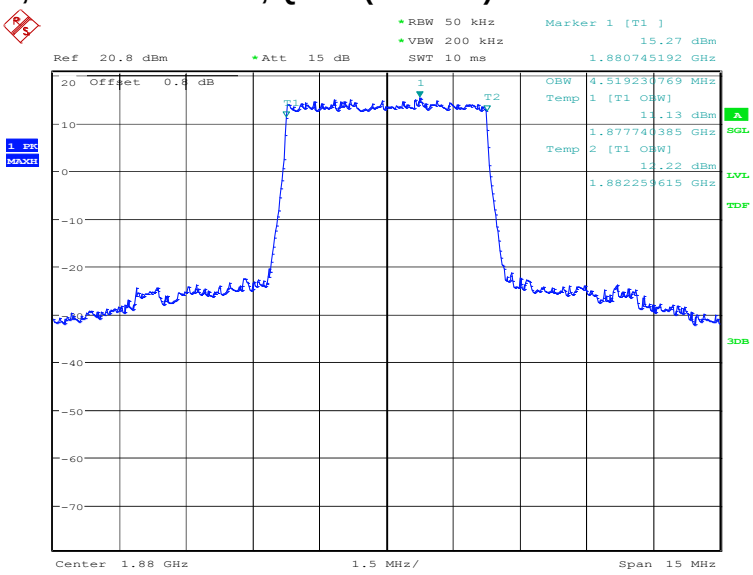


Date: 4.JUN.2019 16:11:45

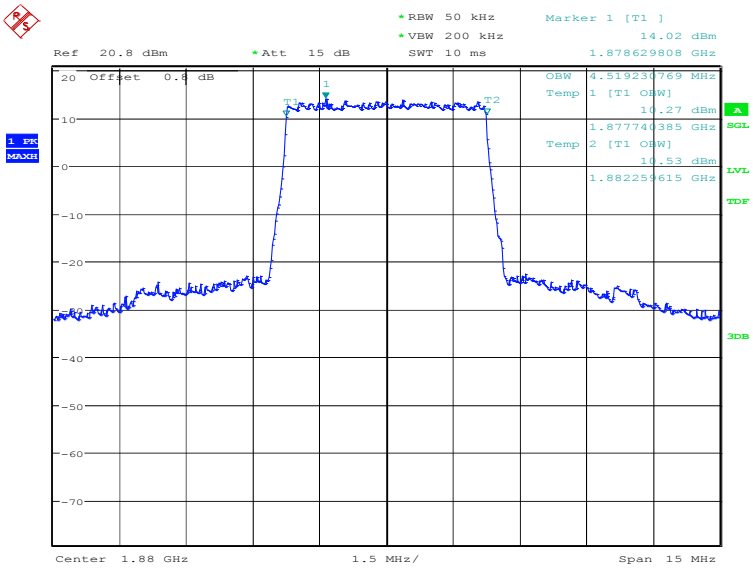
LTE band 2, 5MHz (99%)

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

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



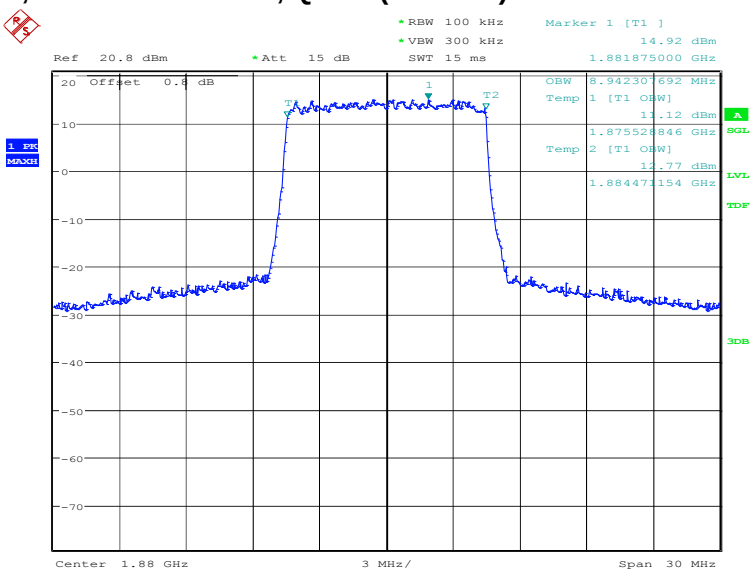
LTE band 2, 5MHz Bandwidth, 16QAM (99% BW)



LTE band 2, 10MHz (99%)

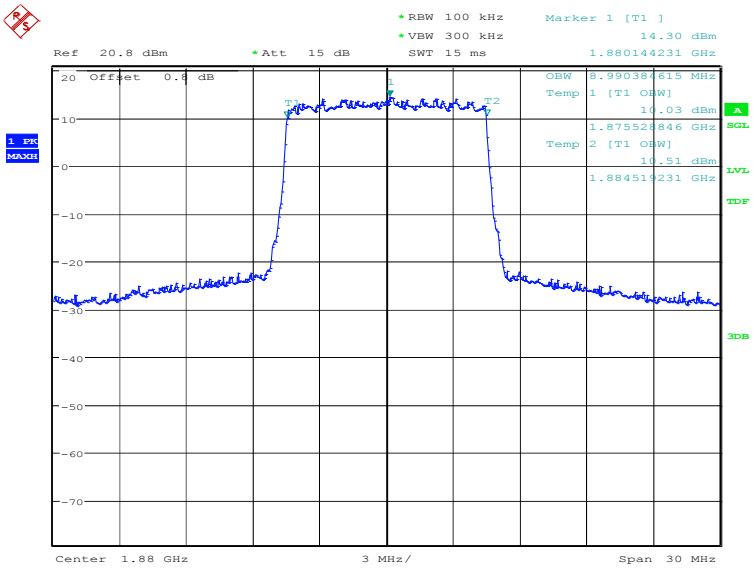
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
1880.0	QPSK	16QAM
	8942.31	8990.38

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



Date: 4.JUN.2019 16:16:01

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

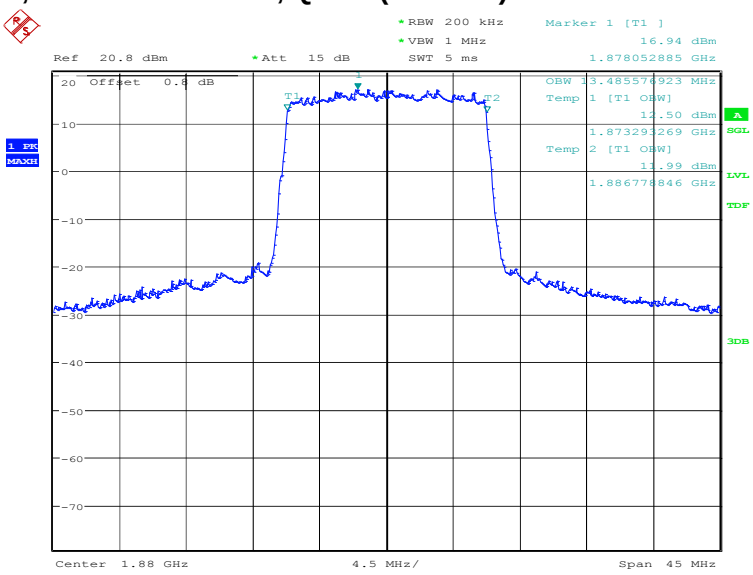


Date: 4.JUN.2019 16:17:26

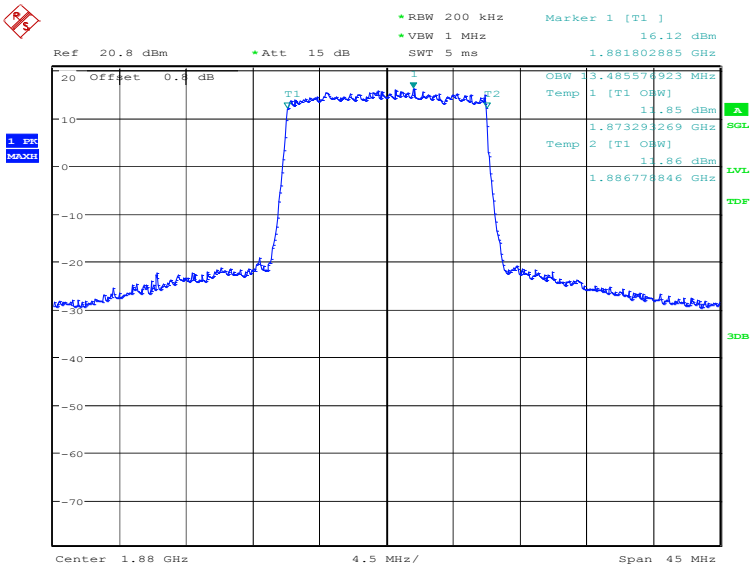
LTE band 2, 15MHz (99%)

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

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



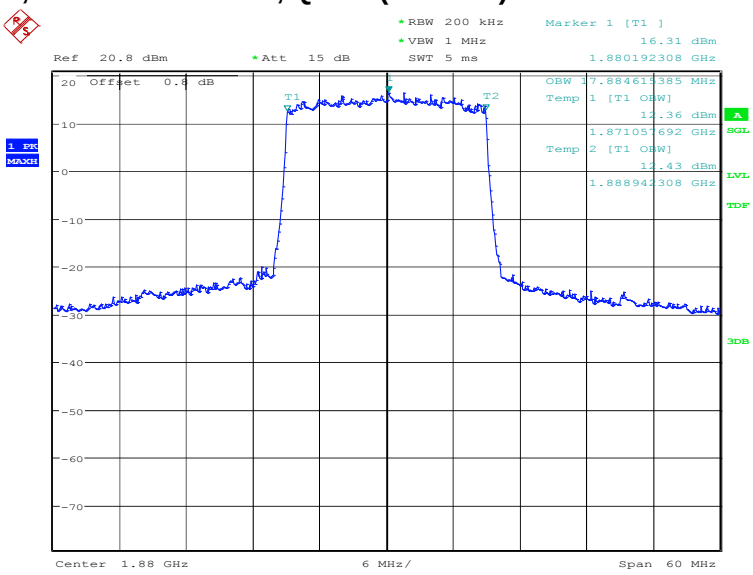
LTE band 2, 15MHz Bandwidth, 16QAM (99% BW)



LTE band 2, 20MHz (99%)

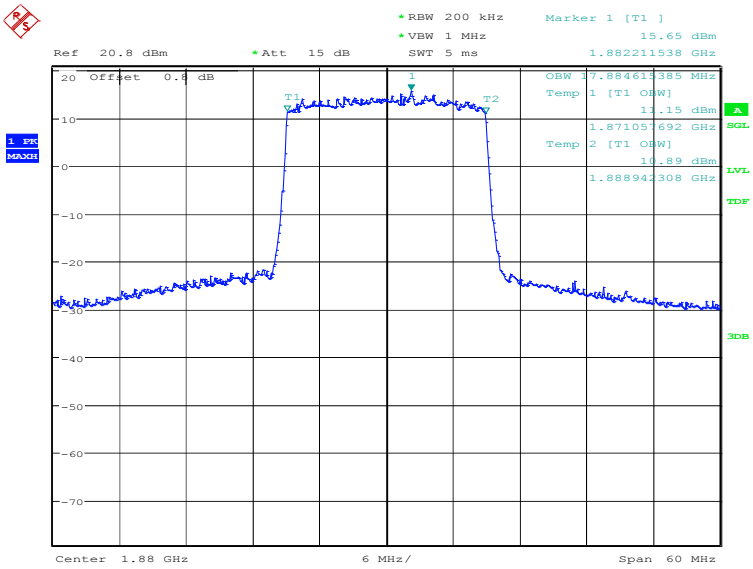
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
1880.0	QPSK	16QAM
	17884.62	17884.62

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



Date: 4.JUN.2019 16:21:41

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

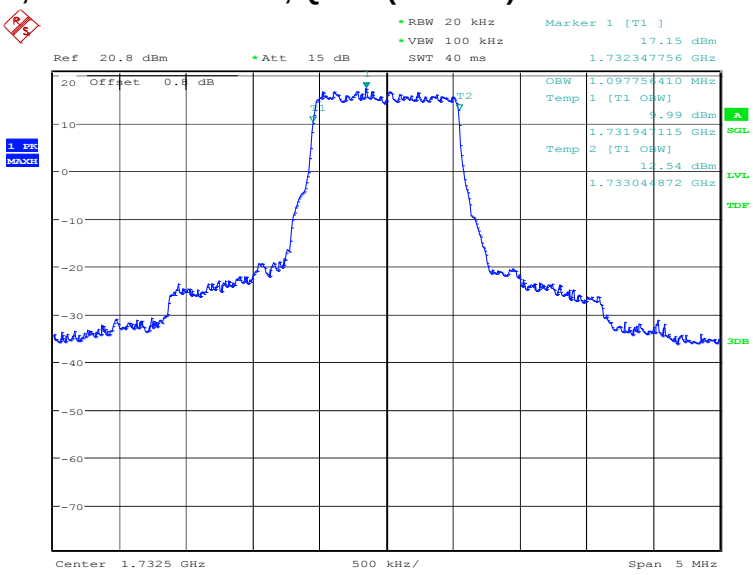


Date: 4.JUN.2019 16:23:05

LTE band 4, 1.4MHz (99%)

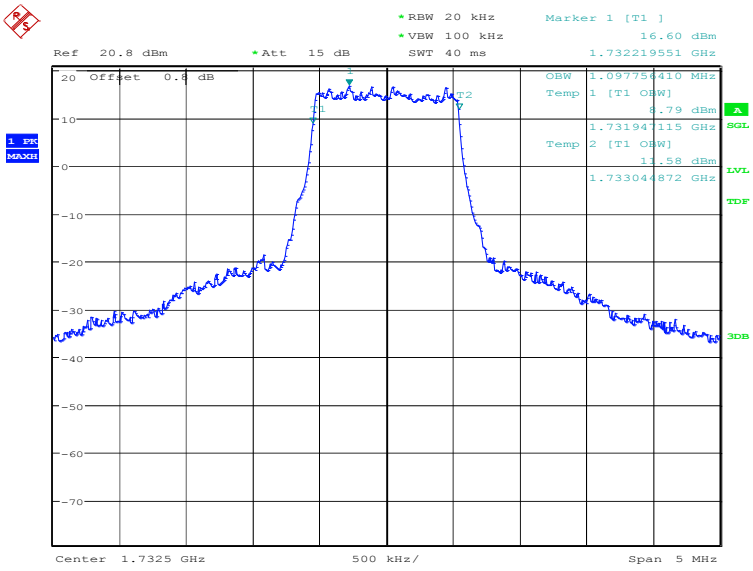
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
1732.5	QPSK	16QAM
	1097.76	1097.76

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



Date: 4.JUN.2019 16:24:37

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

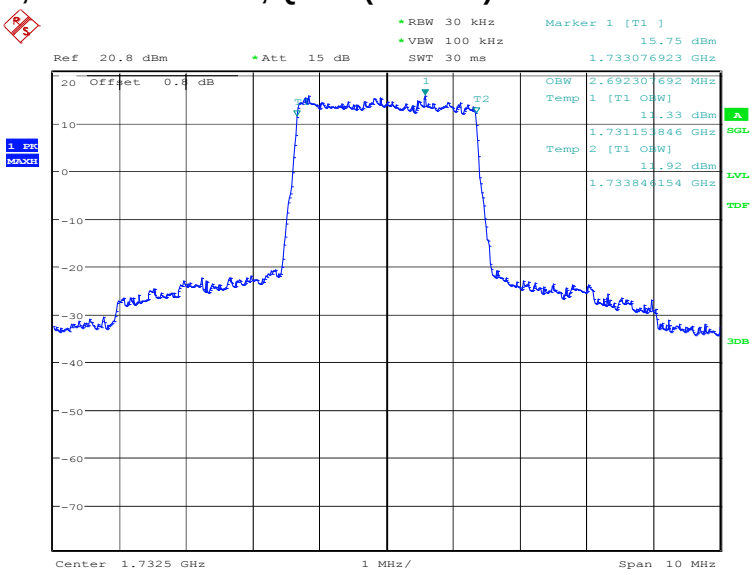


Date: 4.JUN.2019 16:26:01

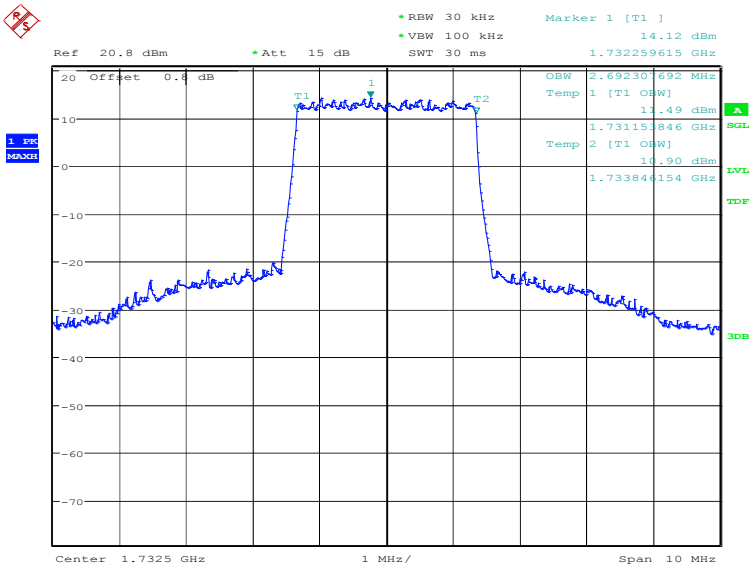
LTE band 4, 3MHz (99%)

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

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



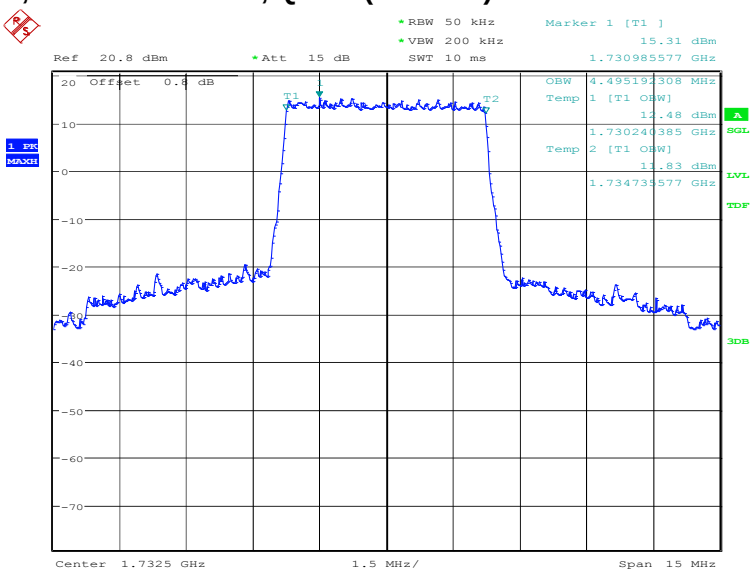
LTE band 4, 3MHz Bandwidth, 16QAM (99% BW)



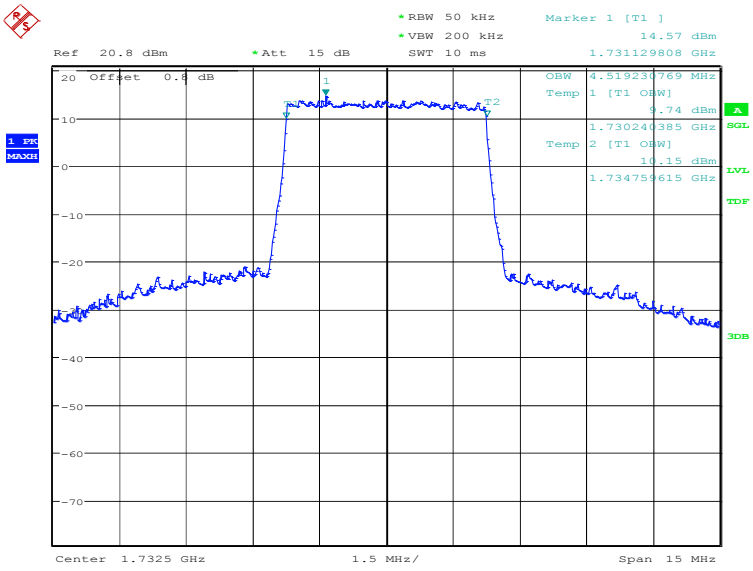
LTE band 4, 5MHz (99%)

Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
1732.5	QPSK	16QAM
	4495.19	4519.23

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



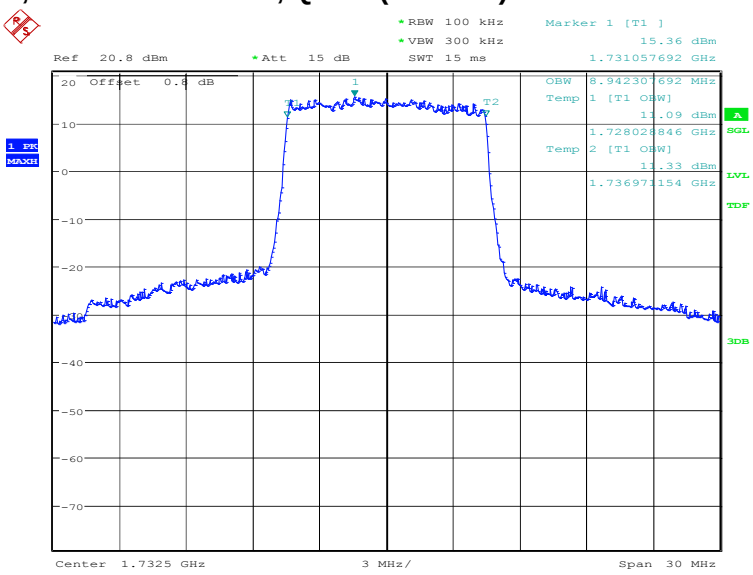
LTE band 4, 5MHz Bandwidth, 16QAM (99% BW)



LTE band 4, 10MHz (99%)

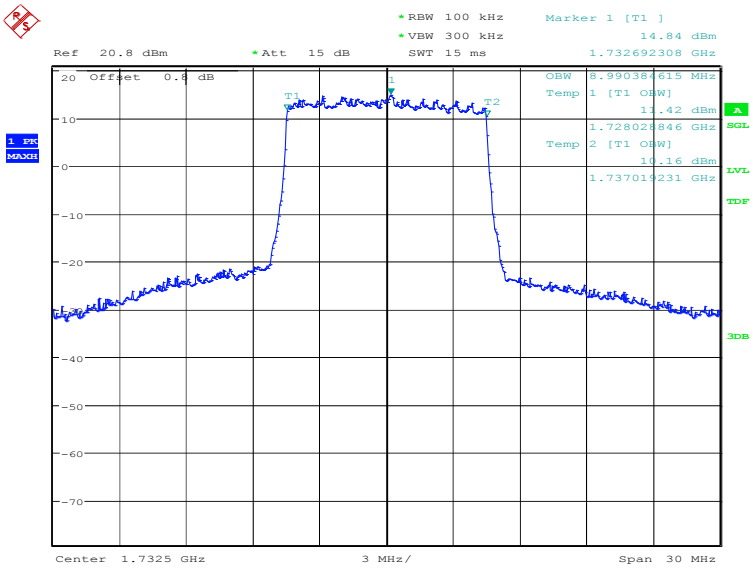
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
1732.5	QPSK	16QAM
	8942.31	8990.38

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



Date: 4.JUN.2019 16:33:07

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

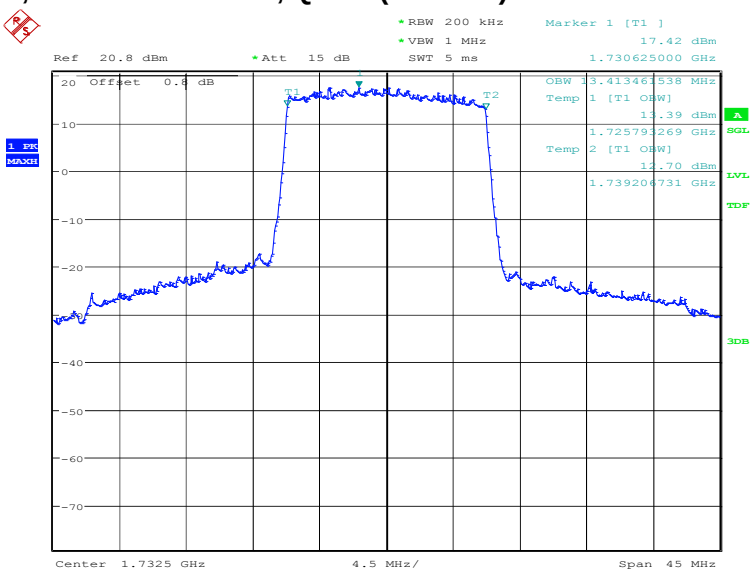


Date: 4.JUN.2019 16:34:31

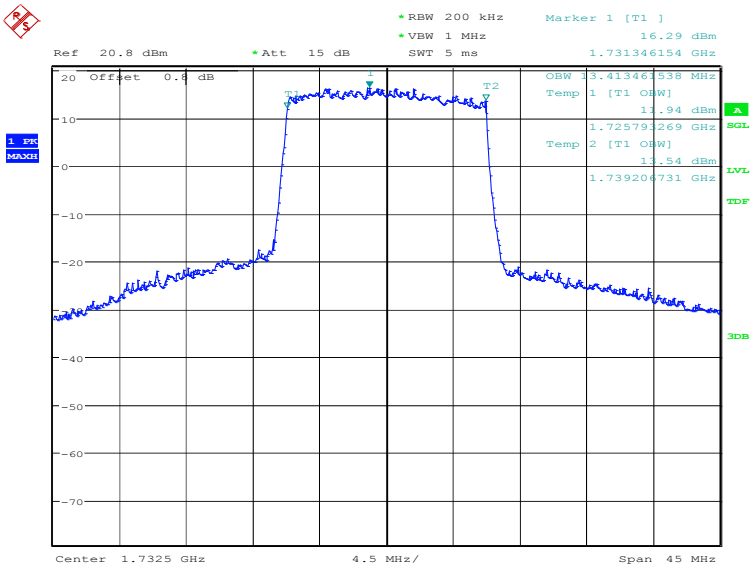
LTE band 4, 15MHz (99%)

Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
1732.5	QPSK	16QAM
	13413.46	13413.46

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



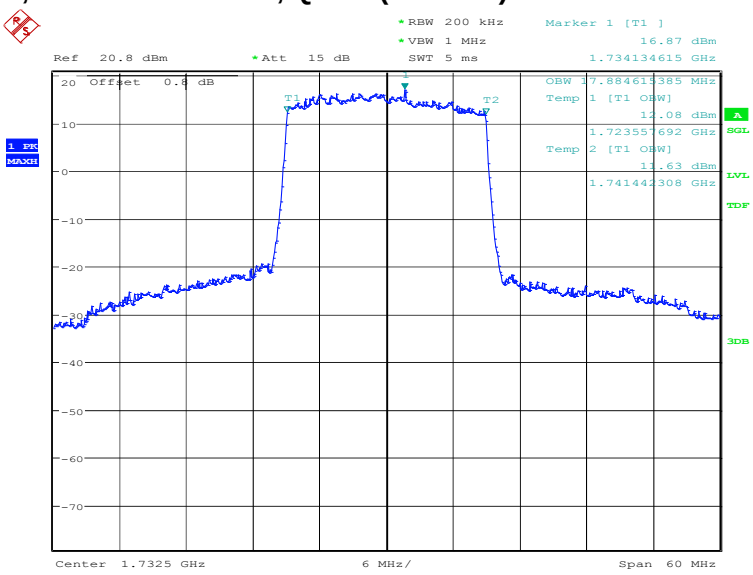
LTE band 4, 15MHz Bandwidth, 16QAM (99% BW)



LTE band 4, 20MHz (99%)

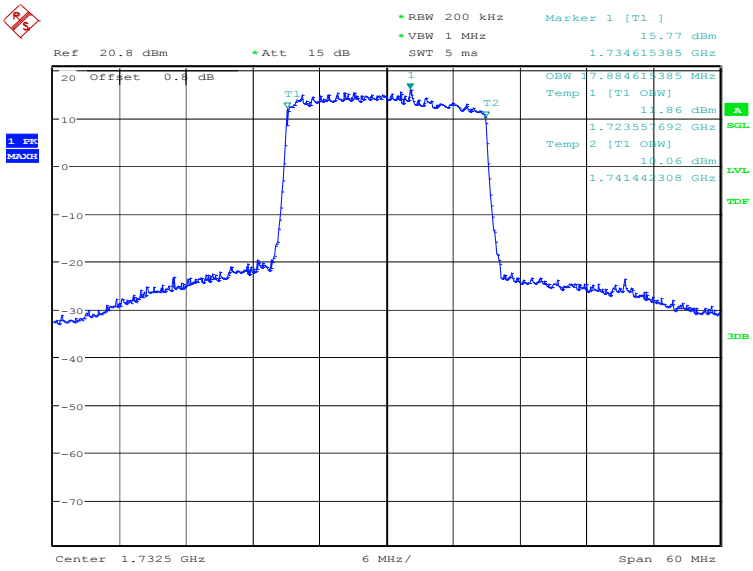
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
1732.5	QPSK	16QAM
	17884.62	17884.62

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



Date: 4.JUN.2019 16:38:47

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

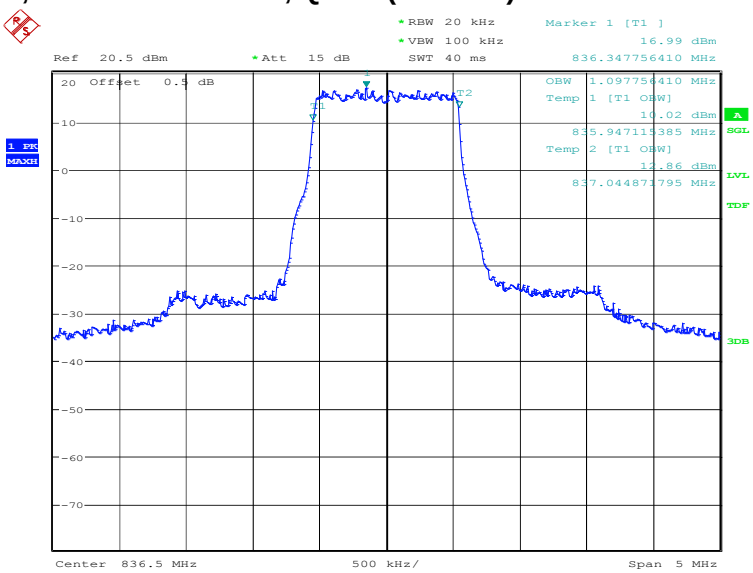


Date: 4.JUN.2019 16:40:11

LTE band 5, 1.4MHz (99%)

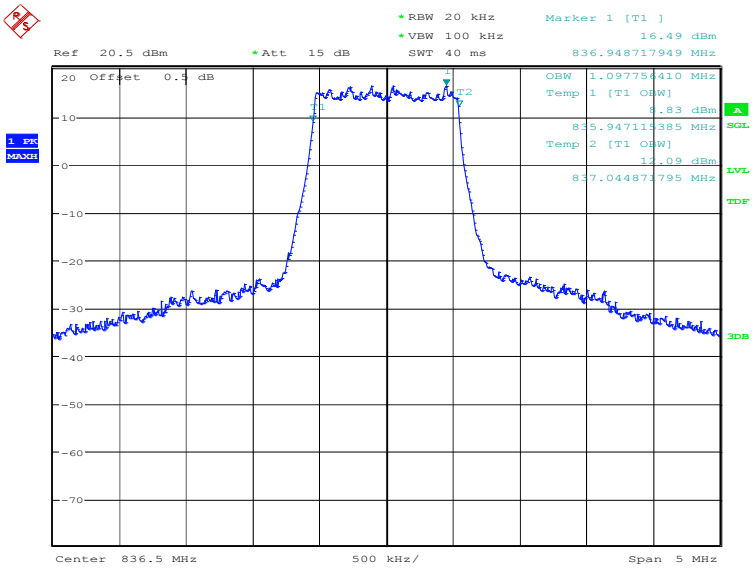
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
836.5	QPSK	16QAM
	1097.76	1097.76

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



Date: 4.JUN.2019 16:42:25

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

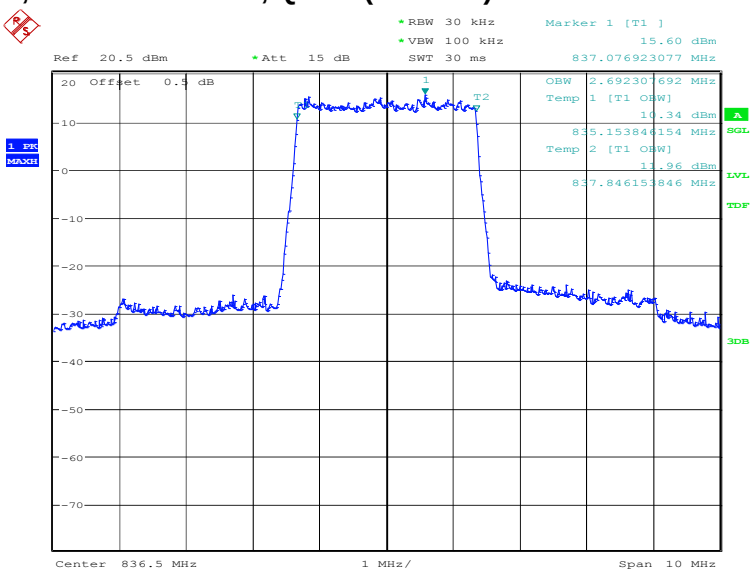


Date: 4.JUN.2019 16:43:49

LTE band 5, 3MHz (99%)

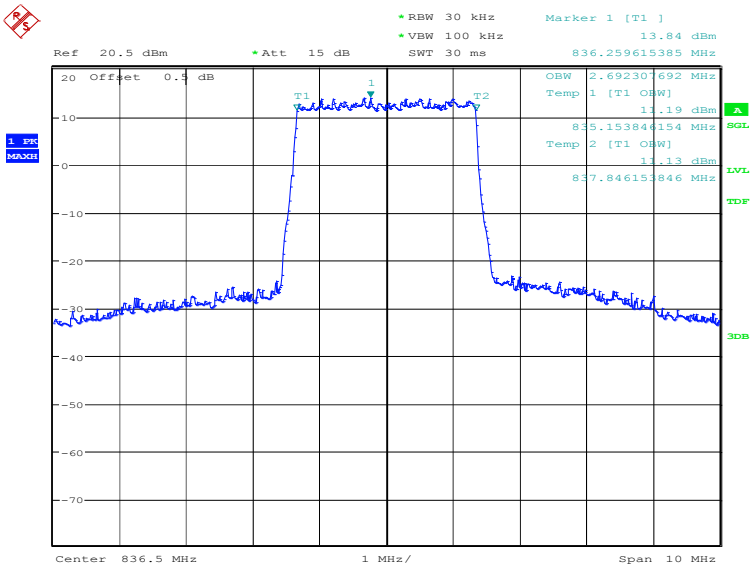
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
836.5	QPSK	16QAM
	2692.31	2692.31

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



Date: 4.JUN.2019 16:45:15

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

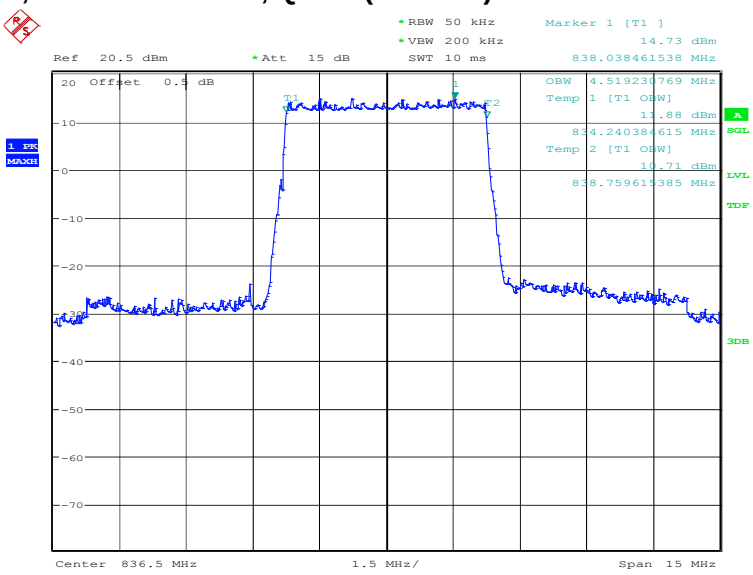


Date: 4.JUN.2019 16:46:39

LTE band 5, 5MHz (99%)

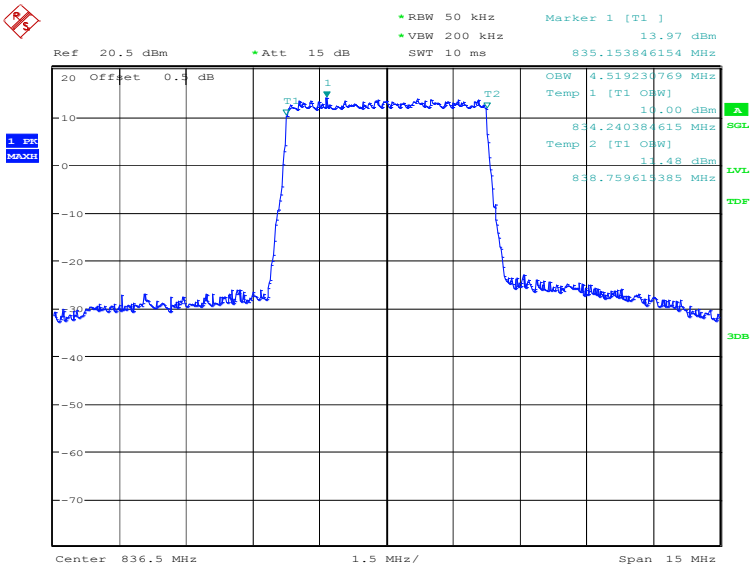
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
836.5	QPSK	16QAM
	4519.23	4519.23

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



Date: 4.JUN.2019 16:48:05

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

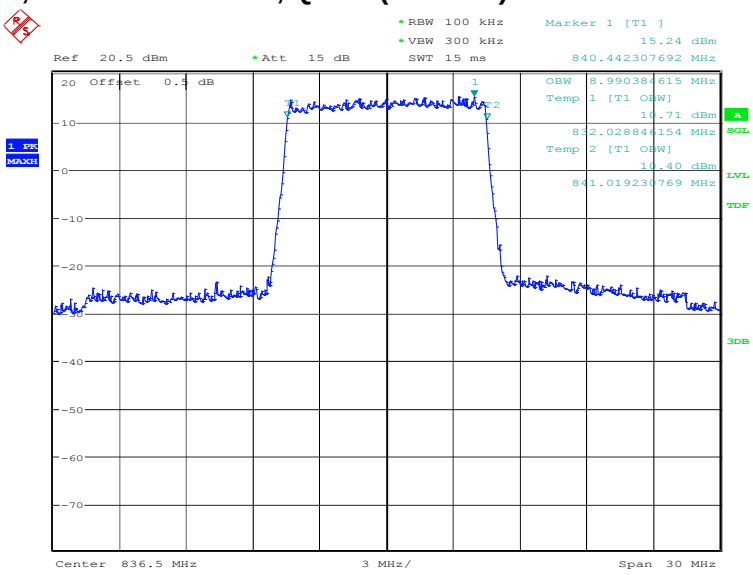


Date: 4.JUN.2019 16:49:29

LTE band 5, 10MHz (99%)

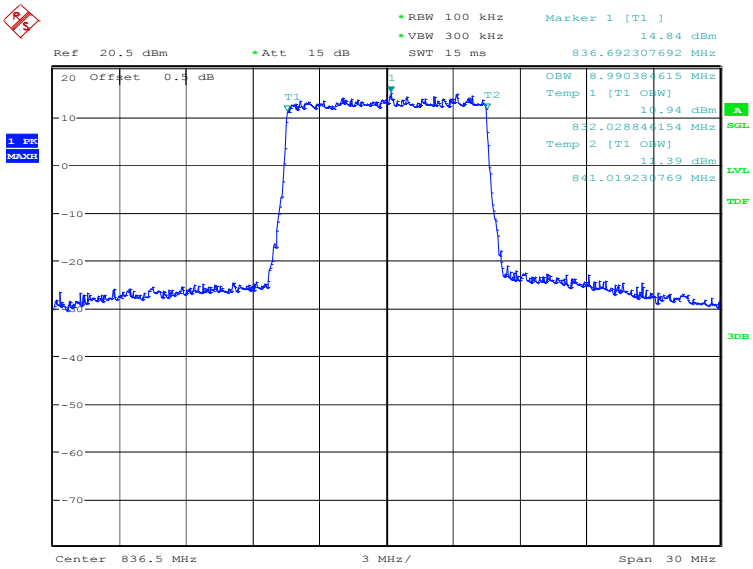
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
836.5	QPSK	16QAM
	8990.38	8990.38

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



Date: 4.JUN.2019 16:50:55

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

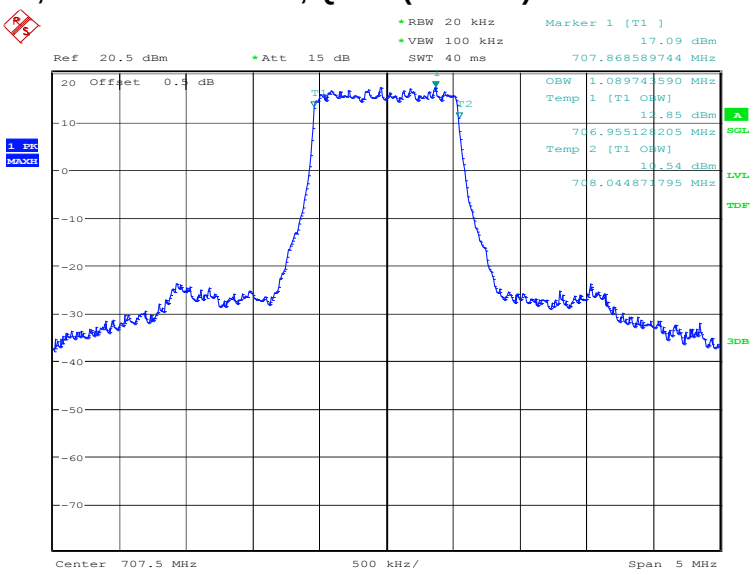


Date: 4.JUN.2019 16:52:19

LTE band 12, 1.4MHz (99%)

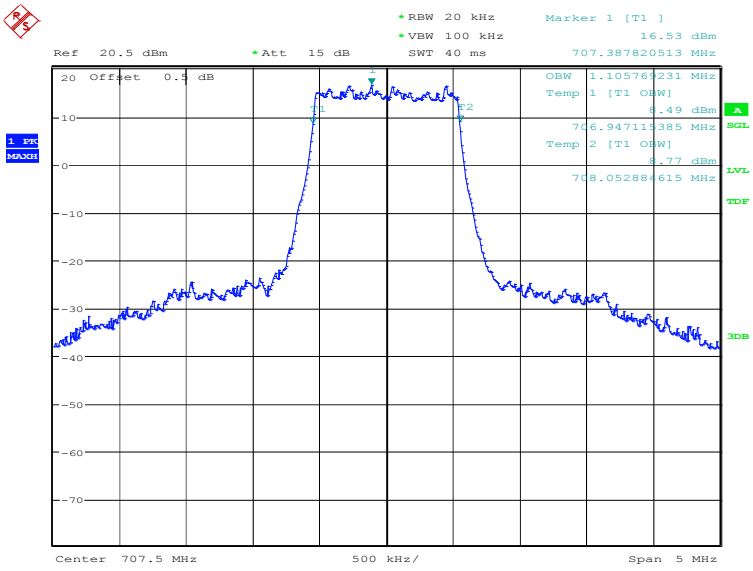
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
707.5	QPSK	16QAM
	1089.74	1105.77

LTE band 12, 1.4MHz Bandwidth, QPSK (99% BW)



Date: 16.MAY.2019 19:32:35

LTE band 12, 1.4MHz Bandwidth, 16QAM (99% BW)

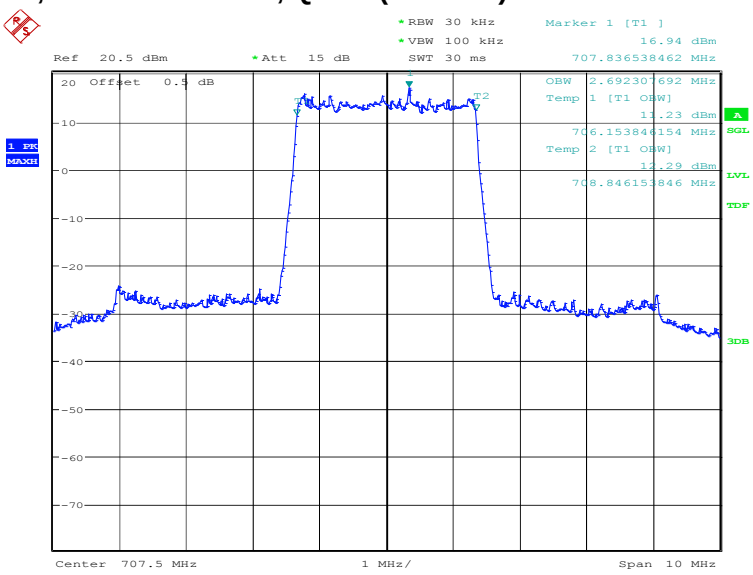


Date: 16.MAY.2019 19:34:00

LTE band 12, 3MHz (99%)

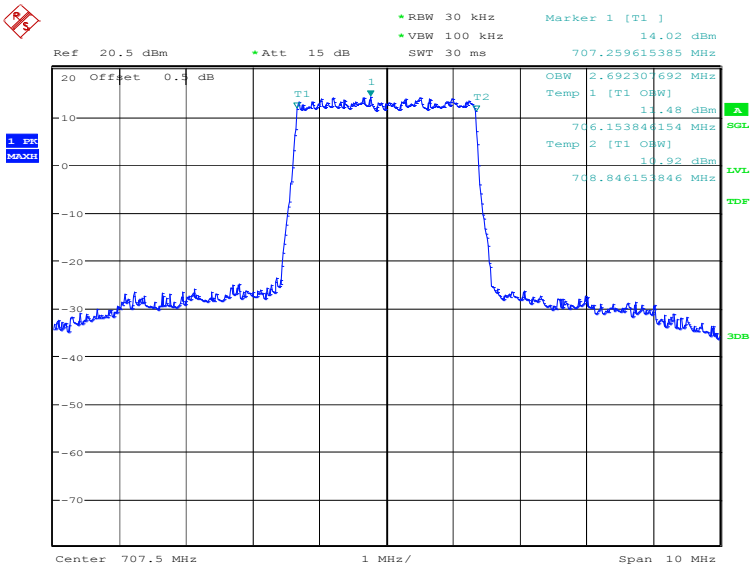
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
707.5	QPSK	16QAM
	2692.31	2692.31

LTE band 12, 3MHz Bandwidth, QPSK (99% BW)



Date: 16.MAY.2019 19:35:26

LTE band 12, 3MHz Bandwidth, 16QAM (99% BW)

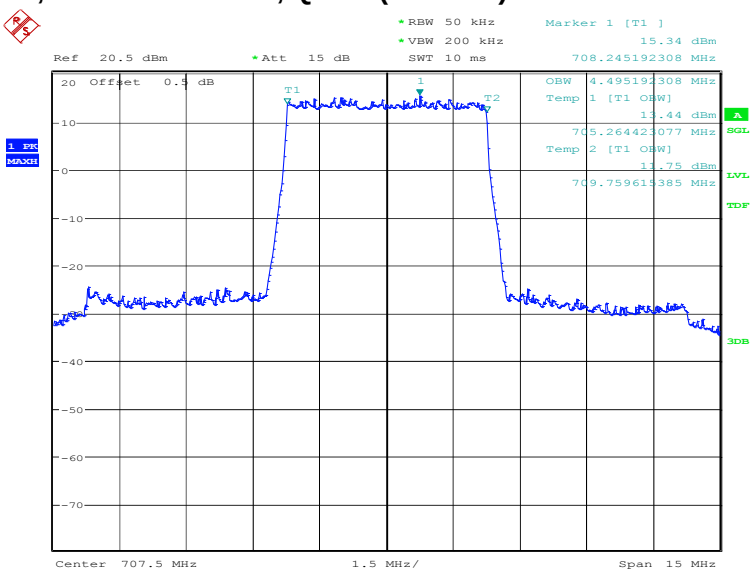


Date: 16.MAY.2019 19:36:50

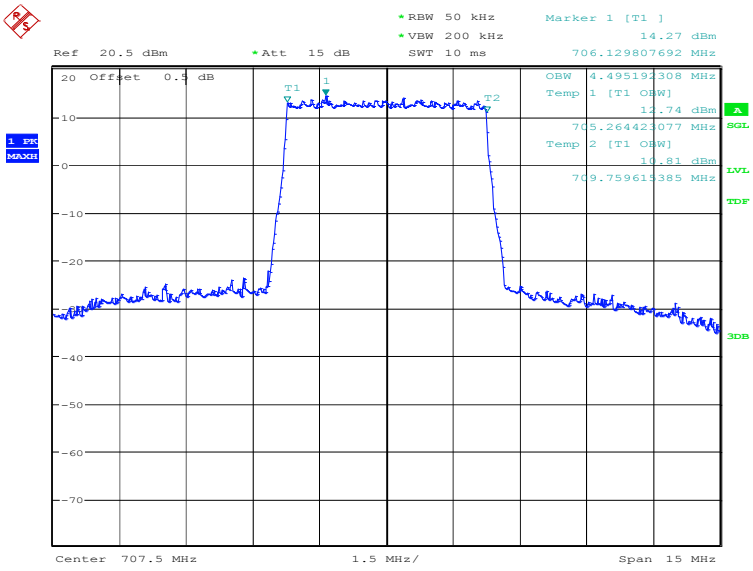
LTE band 12, 5MHz (99%)

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

LTE band 12, 5MHz Bandwidth, QPSK (99% BW)



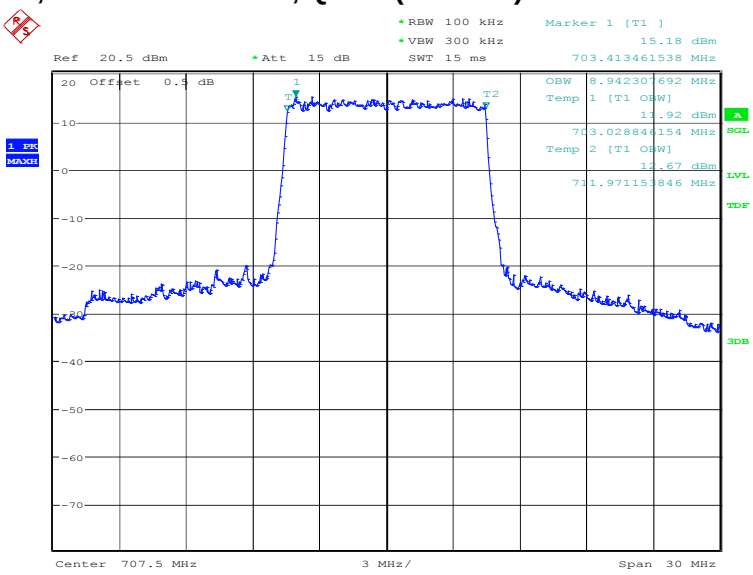
LTE band 12, 5MHz Bandwidth, 16QAM (99% BW)



LTE band 12, 10MHz (99%)

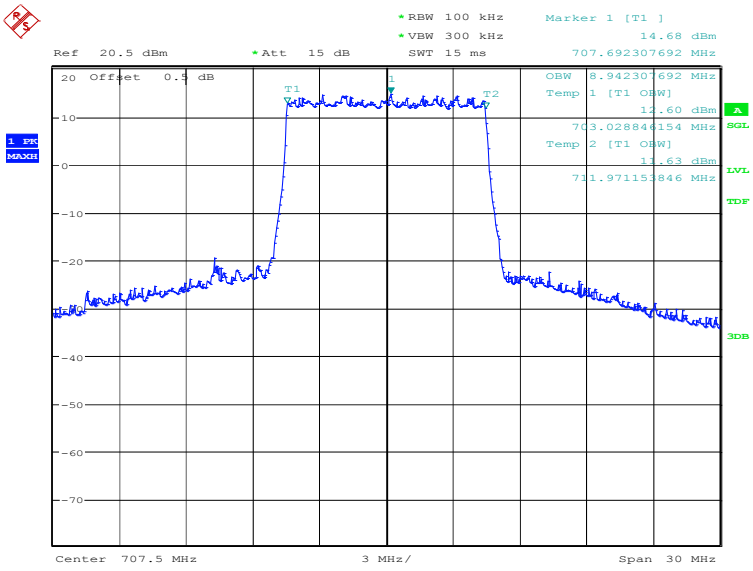
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
707.5	QPSK	16QAM
	8942.31	8942.31

LTE band 12, 10MHz Bandwidth, QPSK (99% BW)



Date: 16.MAY.2019 19:41:07

LTE band 12, 10MHz Bandwidth, 16QAM (99% BW)

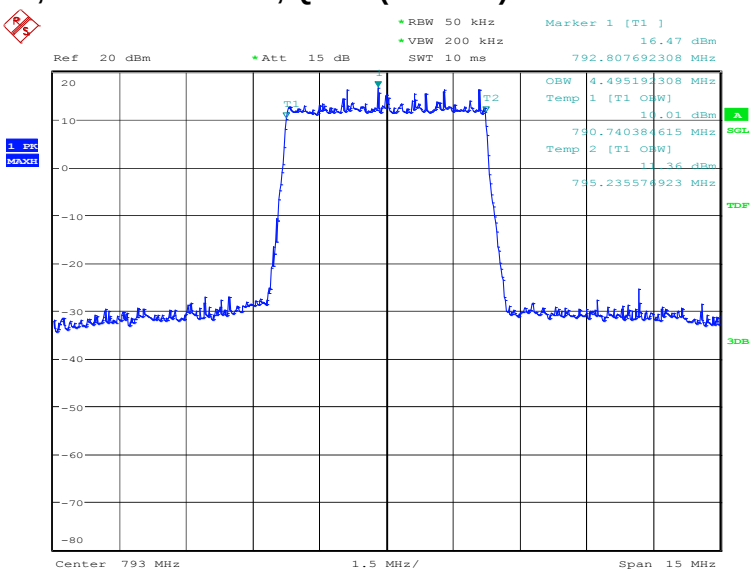


Date: 16.MAY.2019 19:42:32

LTE band 14, 5MHz (99%)

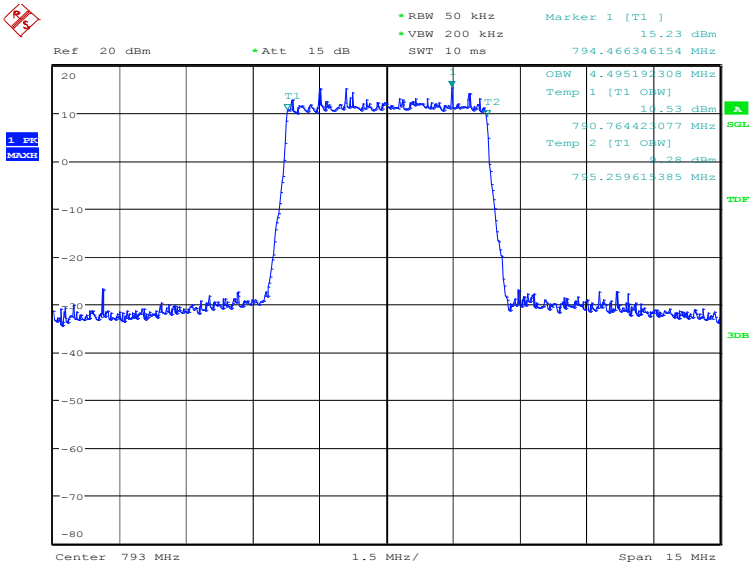
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
793.0	QPSK	16QAM
	4495.19	4495.19

LTE band 14, 5MHz Bandwidth, QPSK (99% BW)



Date: 4.JUN.2019 16:53:46

LTE band 14, 5MHz Bandwidth,16QAM (99% BW)

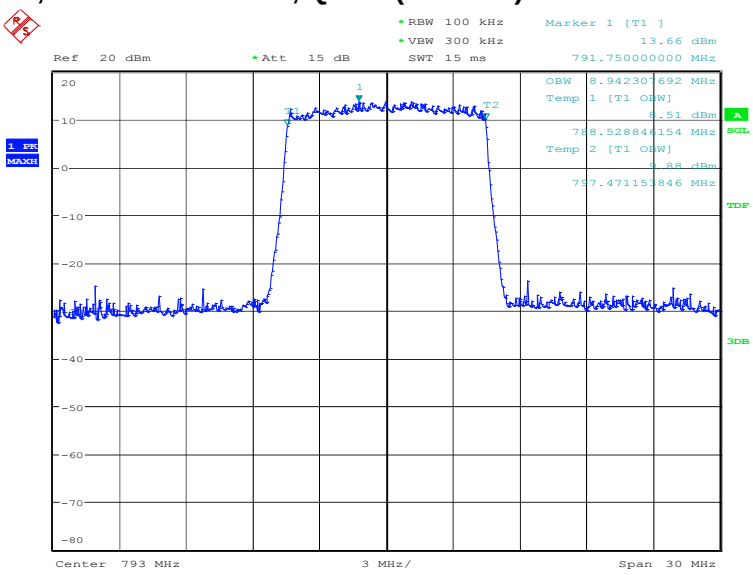


Date: 4.JUN.2019 16:55:10

LTE band 14, 10MHz (99%)

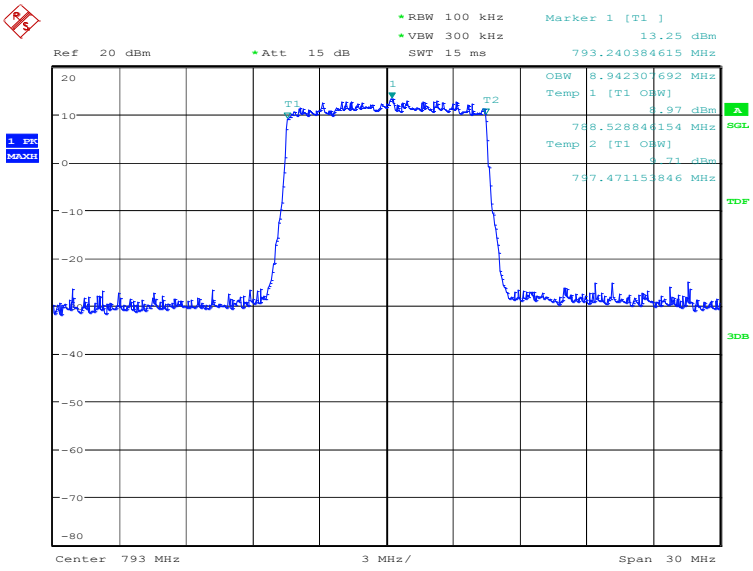
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
793.0	QPSK	16QAM
	8942.31	8942.31

LTE band 14, 10MHz Bandwidth, QPSK (99% BW)



Date: 4.JUN.2019 16:56:36

LTE band 14, 10MHz Bandwidth,16QAM (99% BW)



Date: 4.JUN.2019 16:58:00

A.5 EMISSION BANDWIDTH

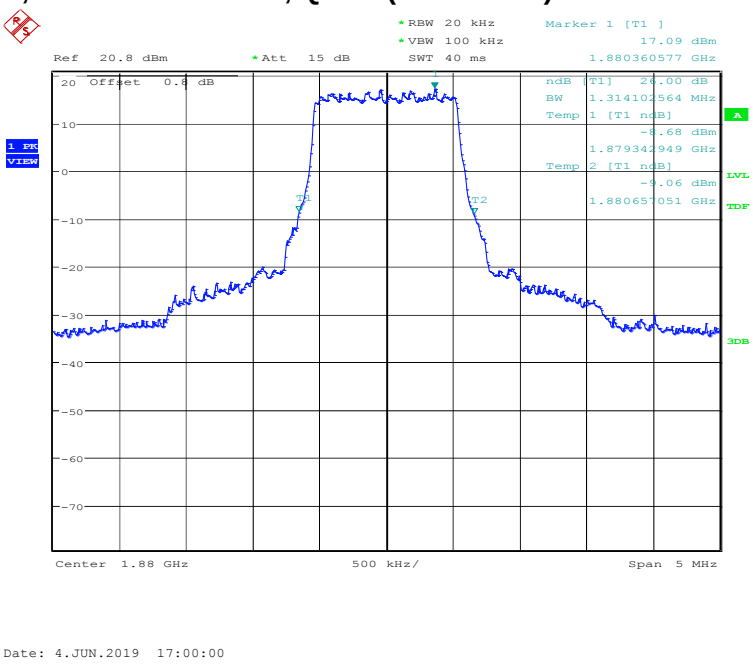
A.5.1Emission Bandwidth Results

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.

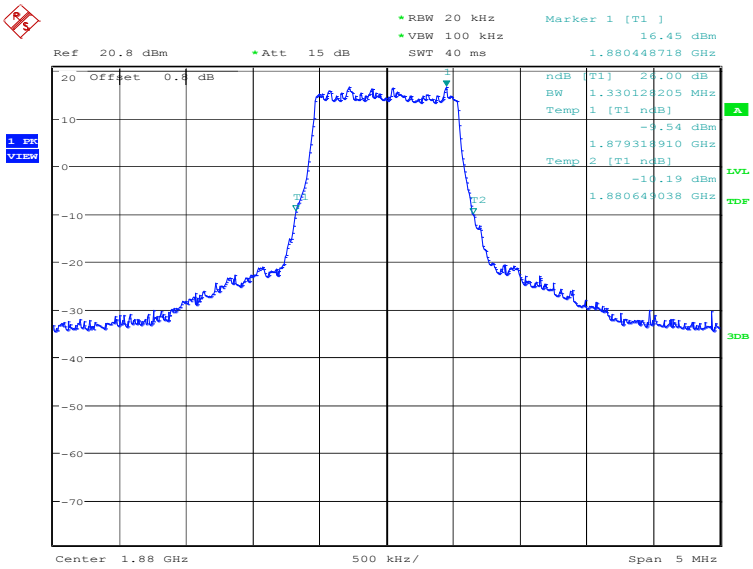
LTE band 2, 1.4MHz (-26dBc)

Frequency(MHz)	Occupied Bandwidth (-26dBc)(kHz)	
1880.0	QPSK	16QAM
	1314.10	1330.13

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



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

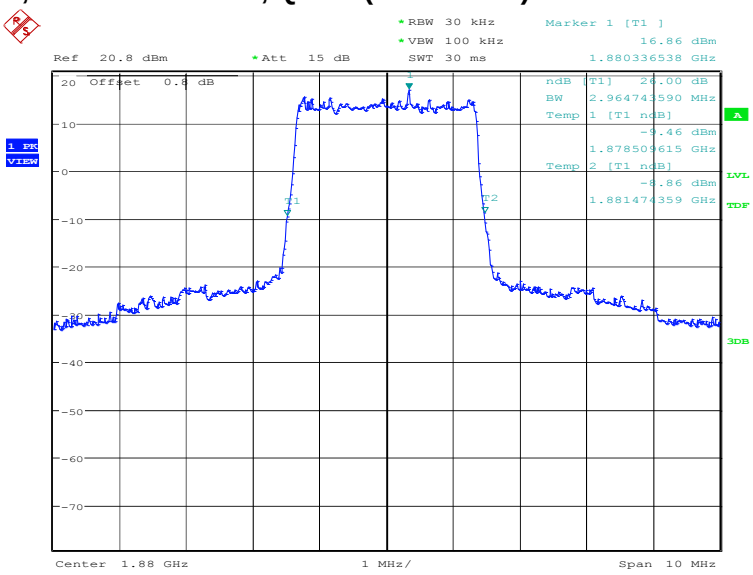


Date: 4.JUN.2019 17:01:25

LTE band 2, 3MHz (-26dBc)

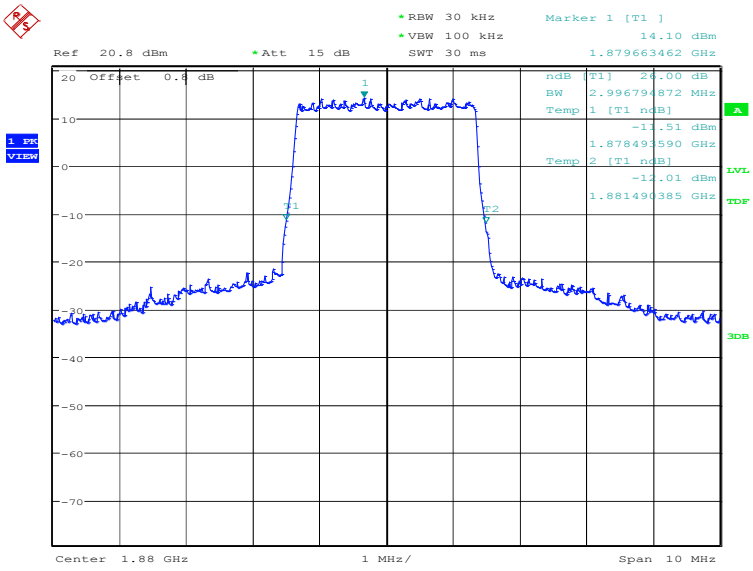
Frequency(MHz)	Occupied Bandwidth (-26dBc)(kHz)	
1880.0	QPSK	16QAM
	2964.74	2996.79

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



Date: 4.JUN.2019 17:02:51

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

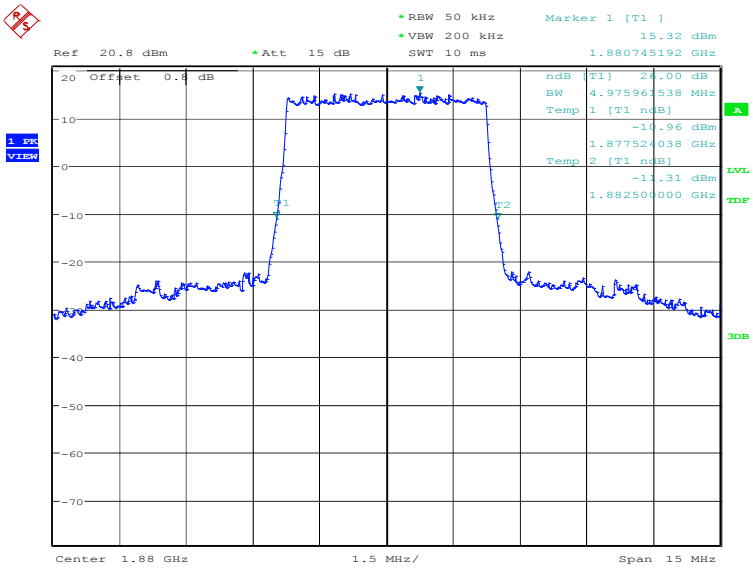


Date: 4.JUN.2019 17:04:16

LTE band 2, 5MHz (-26dBc)

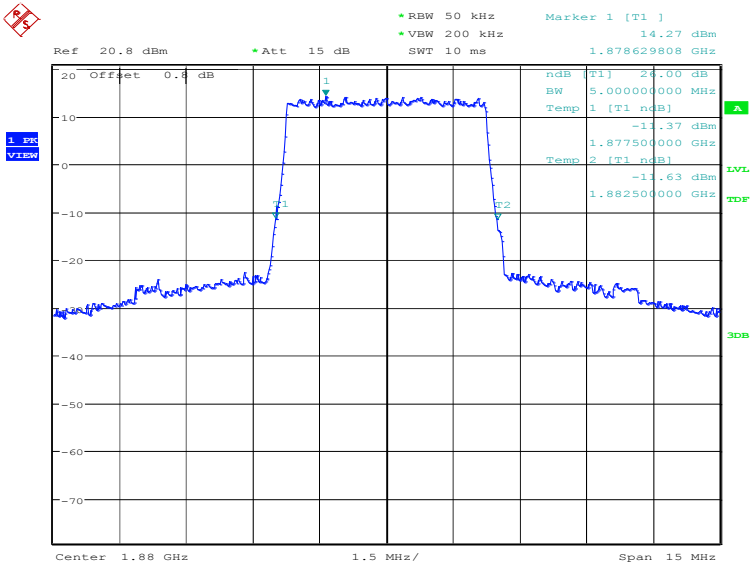
Frequency(MHz)	Occupied Bandwidth (-26dBc)(kHz)	
1880.0	QPSK	16QAM
	4975.96	5000.00

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



Date: 4.JUN.2019 17:05:42

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

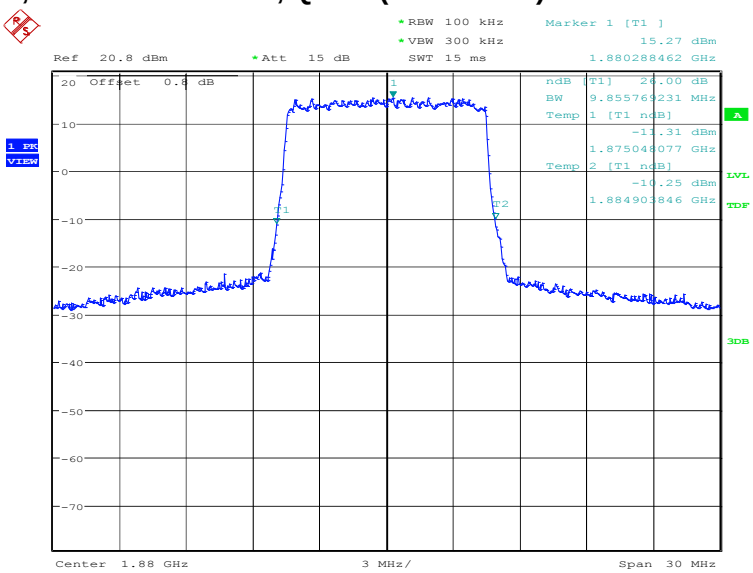


Date: 4.JUN.2019 17:07:06

LTE band 2, 10MHz (-26dBc)

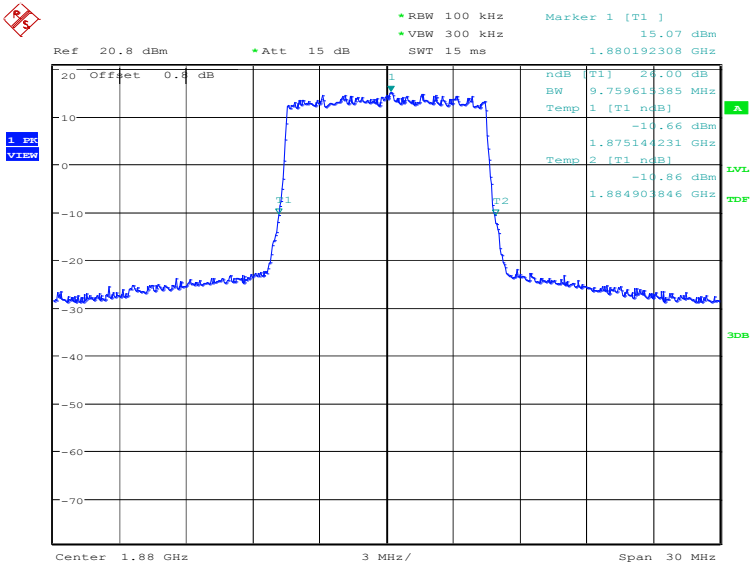
Frequency(MHz)	Occupied Bandwidth (-26dBc)(kHz)	
1880.0	QPSK	16QAM
	9855.77	9759.62

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



Date: 4.JUN.2019 17:08:32

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

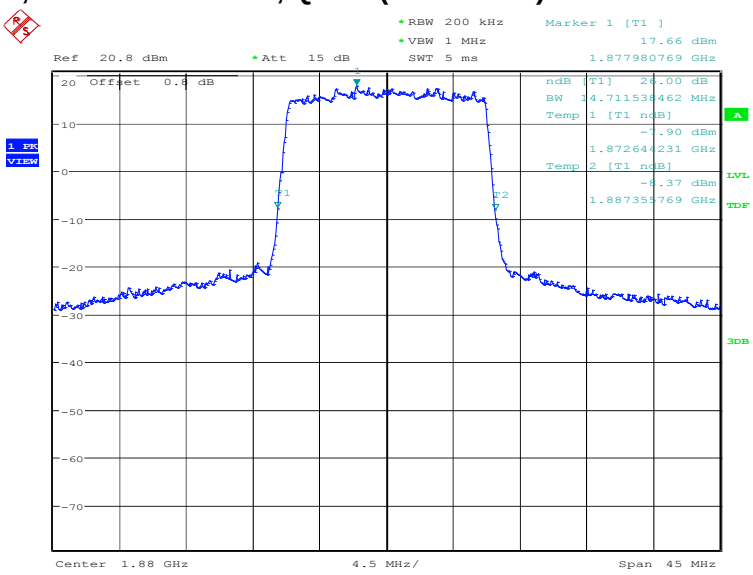


Date: 4.JUN.2019 17:09:57

LTE band 2, 15MHz (-26dBc)

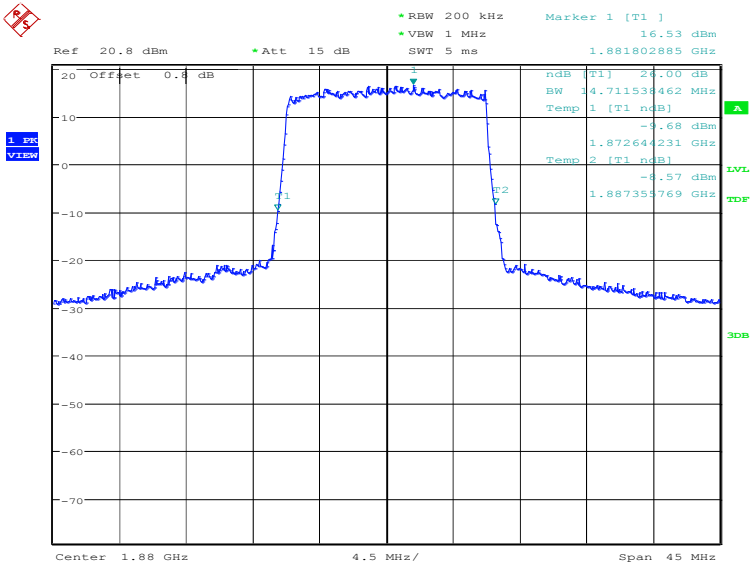
Frequency(MHz)	Occupied Bandwidth (-26dBc)(kHz)	
1880.0	QPSK	16QAM
	14711.54	14711.54

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



Date: 4.JUN.2019 17:11:23

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

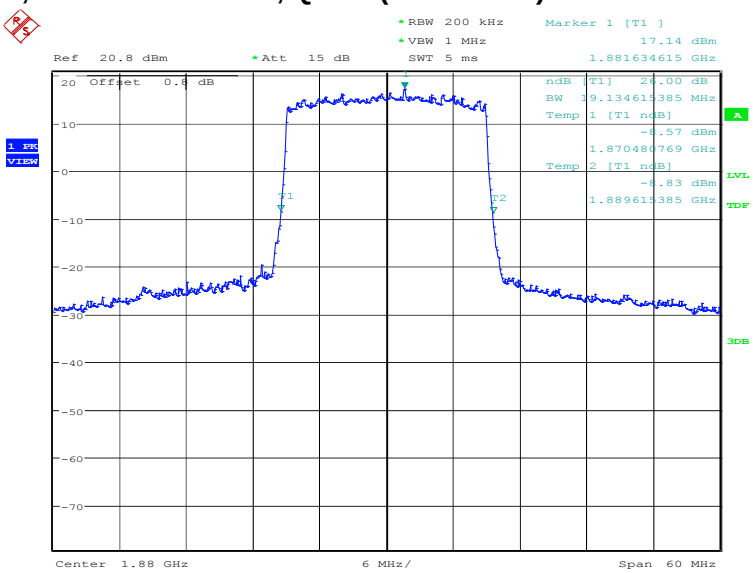


Date: 4.JUN.2019 17:12:48

LTE band 2, 20MHz (-26dBc)

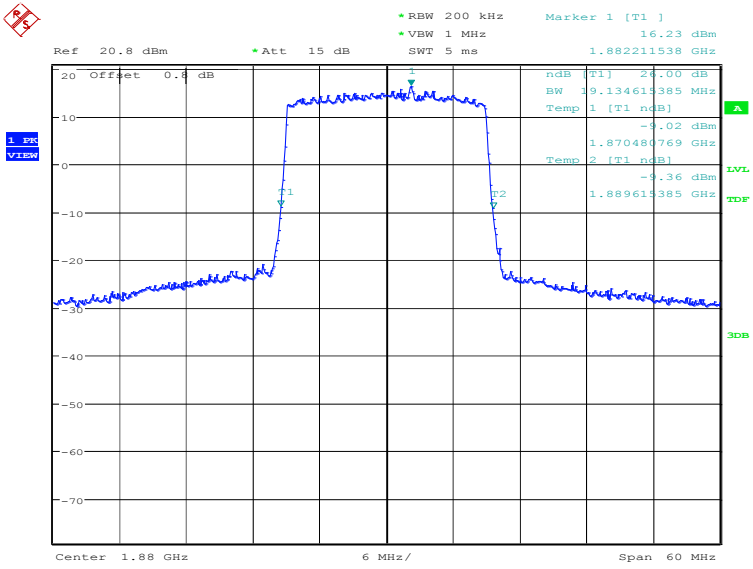
Frequency(MHz)	Occupied Bandwidth (-26dBc)(kHz)	
1880.0	QPSK	16QAM
	19134.62	19134.62

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



Date: 4.JUN.2019 17:14:14

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

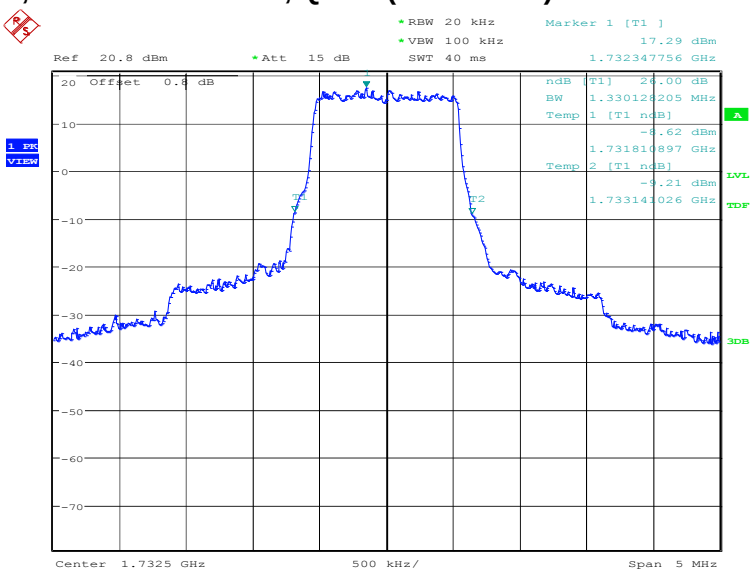


Date: 4.JUN.2019 17:15:38

LTE band 4, 1.4MHz (-26dBc)

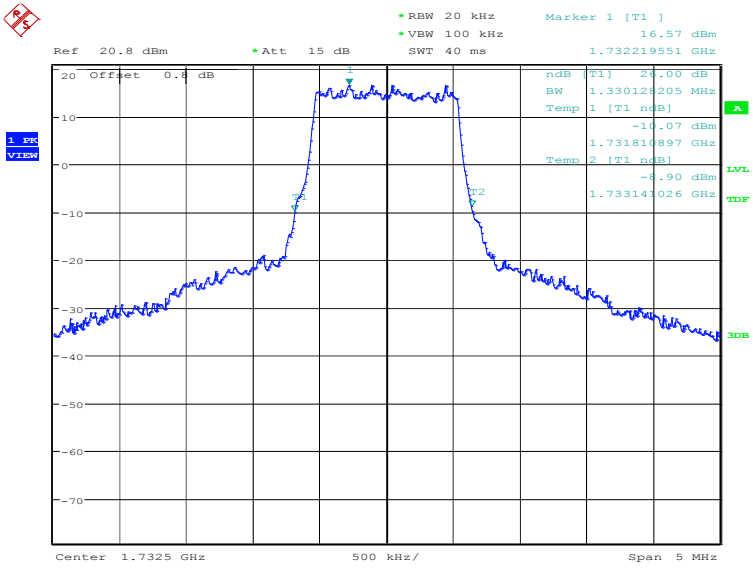
Frequency(MHz)	Occupied Bandwidth (-26dBc)(kHz)	
1732.5	QPSK	16QAM
	1330.13	1330.13

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



Date: 4.JUN.2019 17:17:06

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

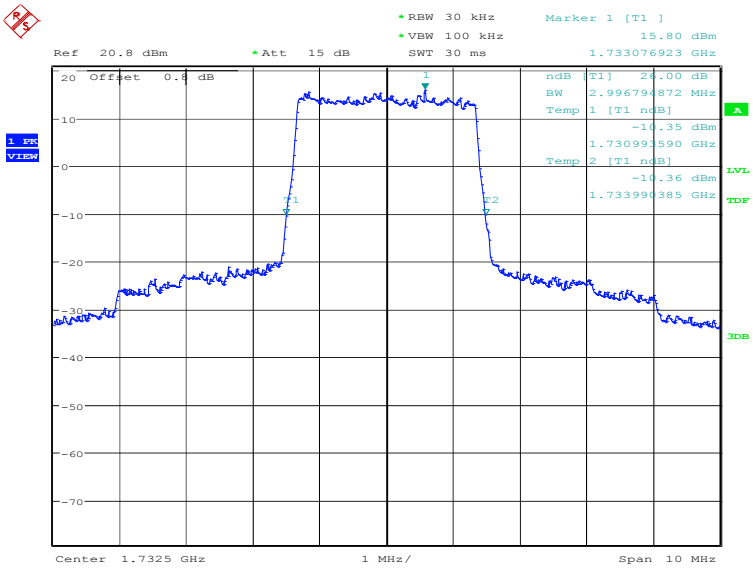


Date: 4.JUN.2019 17:18:30

LTE band 4, 3MHz (-26dBc)

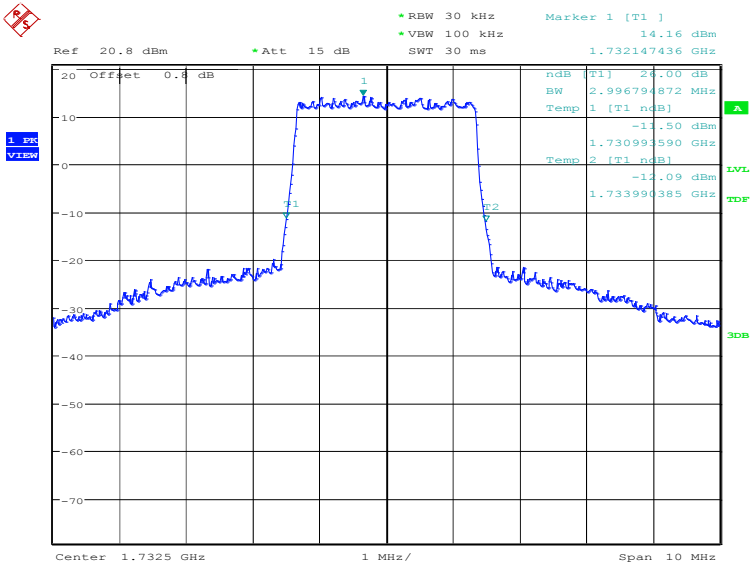
Frequency(MHz)	Occupied Bandwidth (-26dBc)(kHz)	
1732.5	QPSK	16QAM
	2996.79	2996.79

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



Date: 4.JUN.2019 17:19:57

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

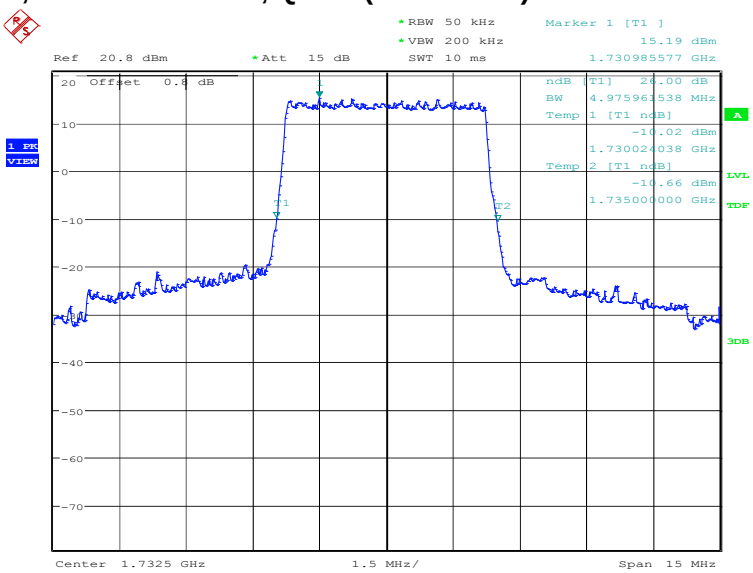


Date: 4.JUN.2019 17:21:21

LTE band 4, 5MHz (-26dBc)

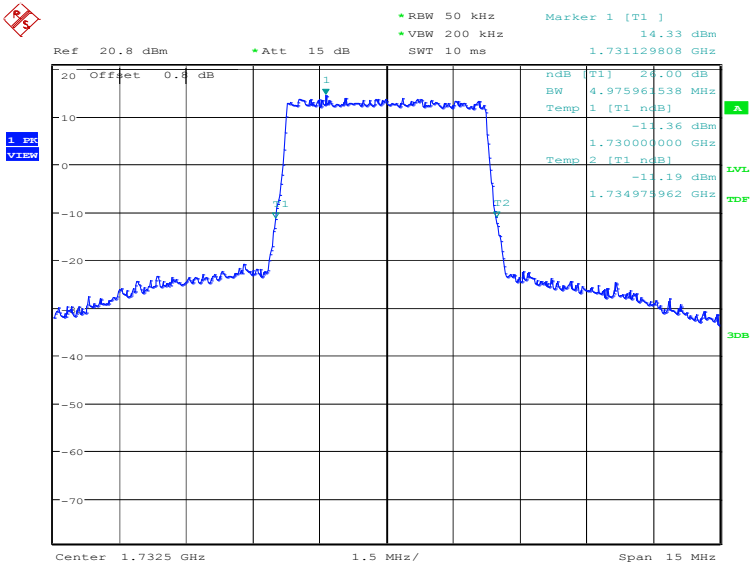
Frequency(MHz)	Occupied Bandwidth (-26dBc)(kHz)	
1732.5	QPSK	16QAM
	4975.96	4975.96

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



Date: 4.JUN.2019 17:22:47

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

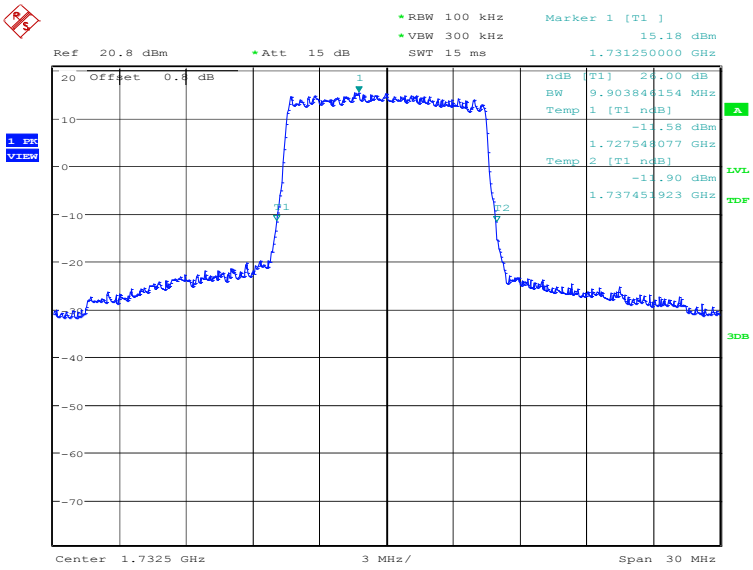


Date: 4.JUN.2019 17:24:12

LTE band 4, 10MHz (-26dBc)

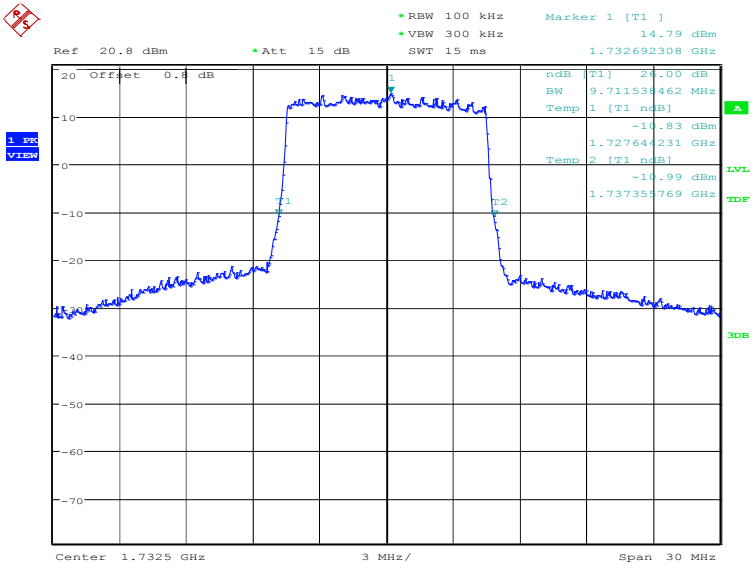
Frequency(MHz)	Occupied Bandwidth (-26dBc)(kHz)	
1732.5	QPSK	16QAM
	9903.85	9711.54

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



Date: 4.JUN.2019 17:25:38

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

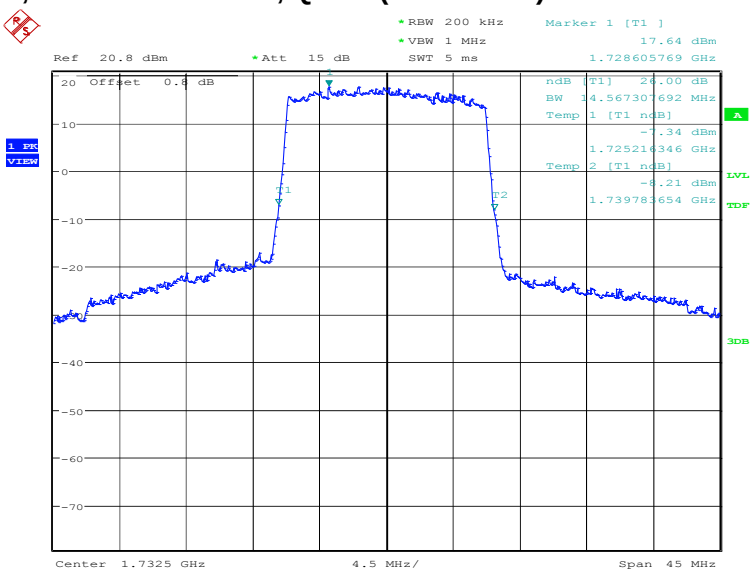


Date: 4.JUN.2019 17:27:03

LTE band 4, 15MHz (-26dBc)

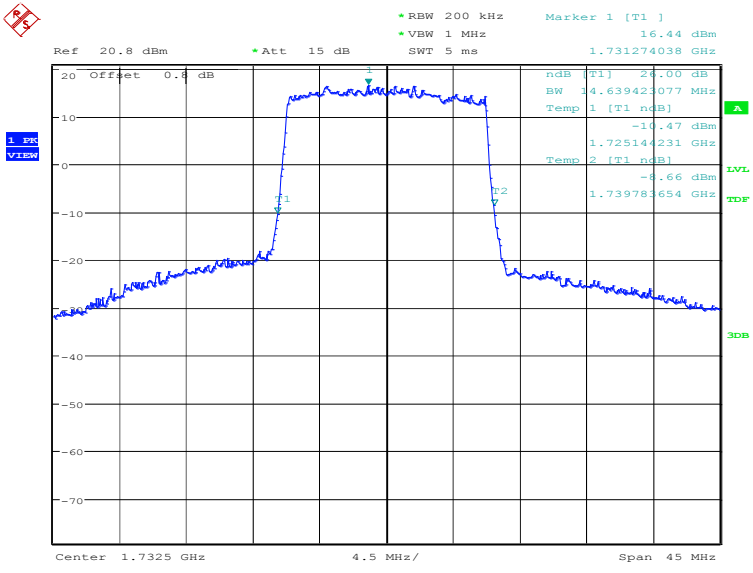
Frequency(MHz)	Occupied Bandwidth (-26dBc)(kHz)	
1732.5	QPSK	16QAM
	14567.31	14639.42

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



Date: 4.JUN.2019 17:28:29

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

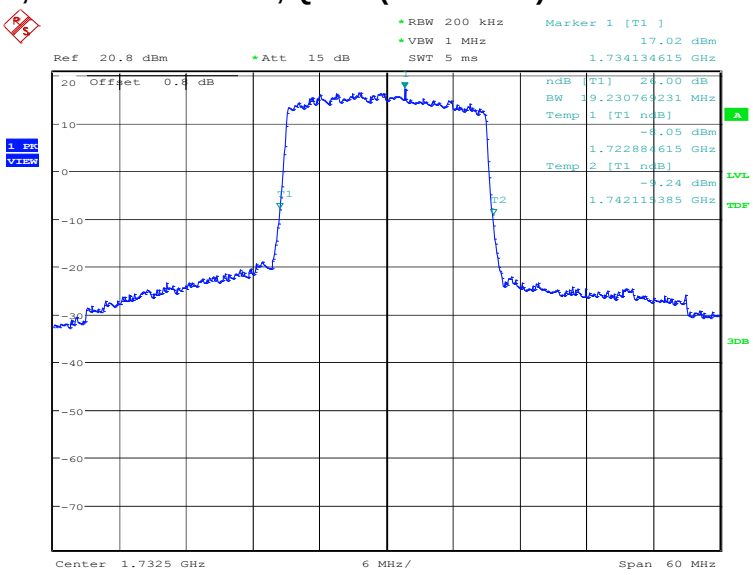


Date: 4.JUN.2019 17:29:54

LTE band 4, 20MHz (-26dBc)

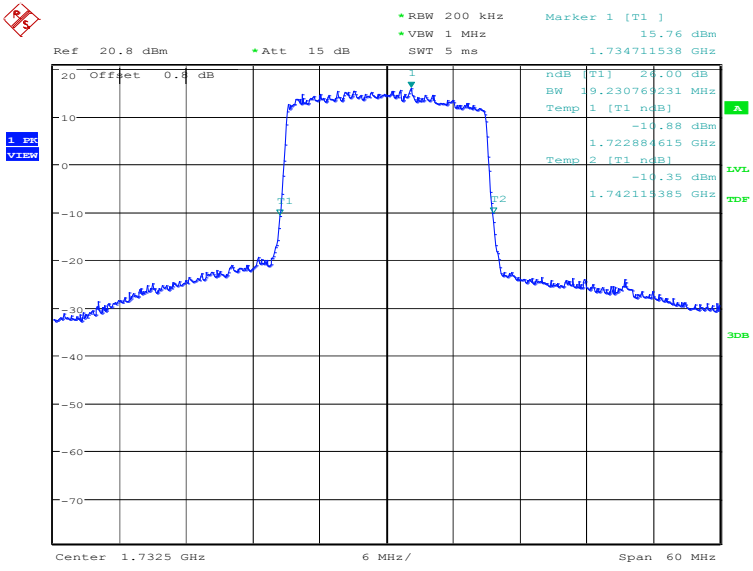
Frequency(MHz)	Occupied Bandwidth (-26dBc)(kHz)	
1732.5	QPSK	16QAM
	19230.77	19230.77

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



Date: 4.JUN.2019 17:31:20

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

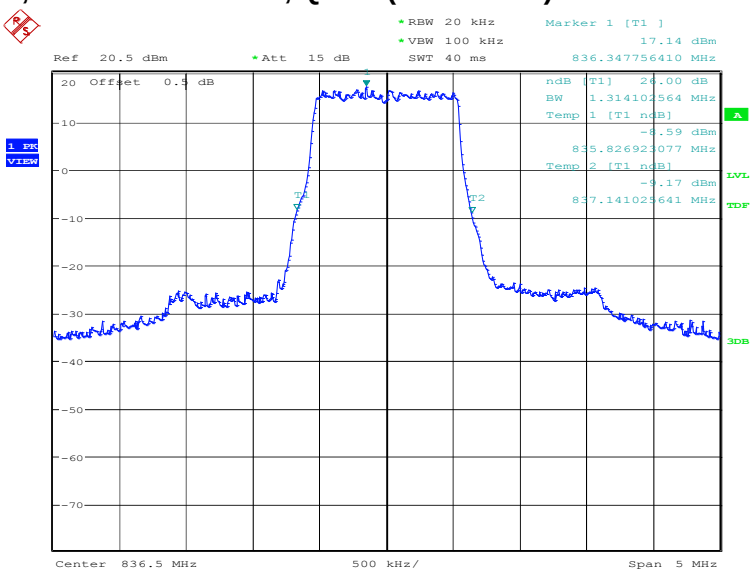


Date: 4.JUN.2019 17:32:44

LTE band 5, 1.4MHz (-26dBc)

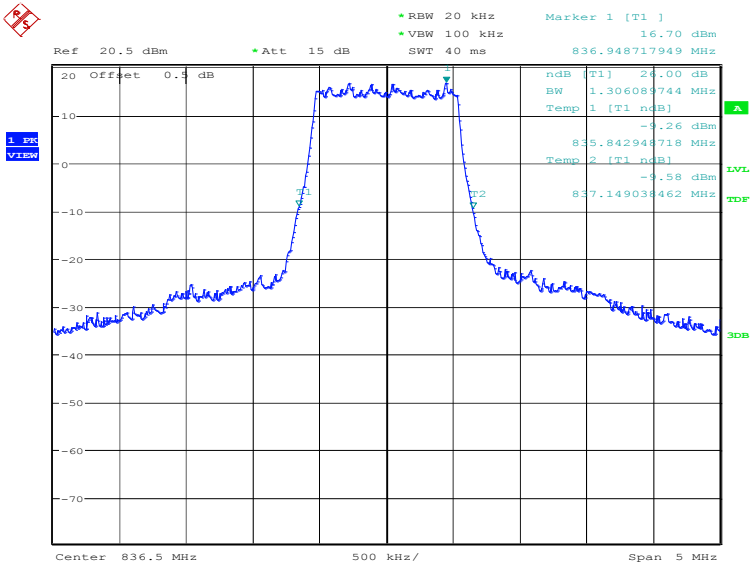
Frequency(MHz)	Occupied Bandwidth (-26dBc)(kHz)	
836.5	QPSK	16QAM
	1314.10	1306.09

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



Date: 4.JUN.2019 17:34:58

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

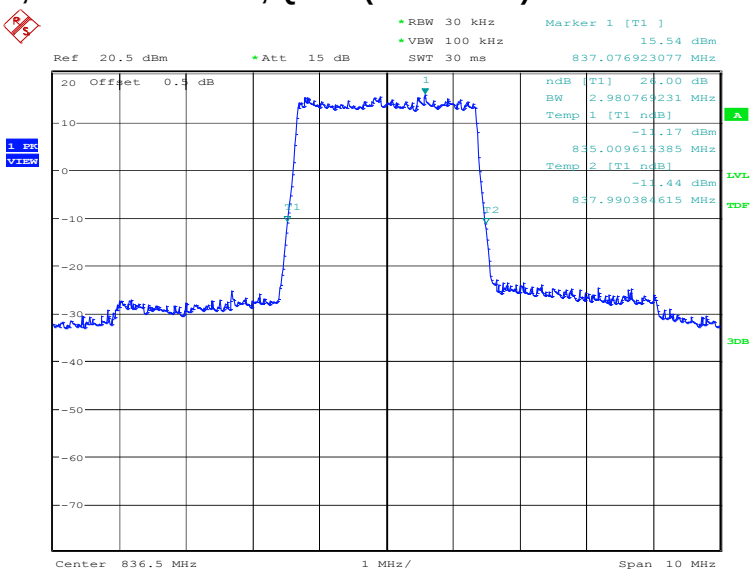


Date: 4.JUN.2019 17:36:23

LTE band 5, 3MHz (-26dBc)

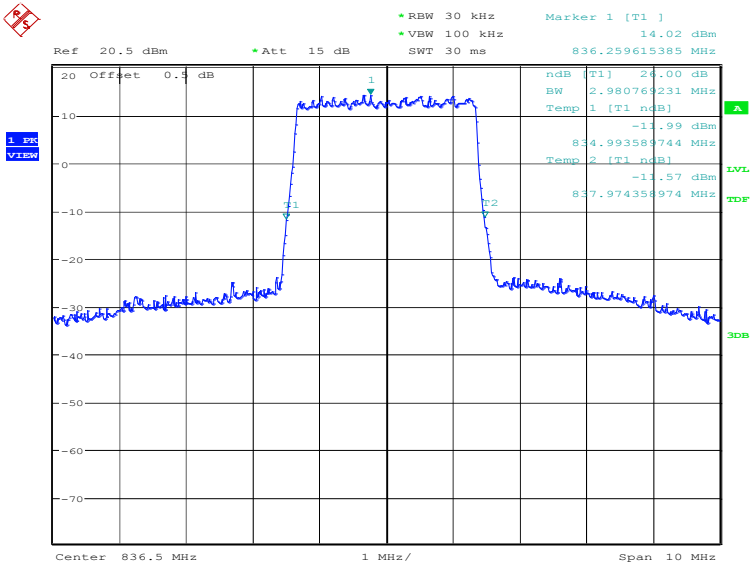
Frequency(MHz)	Occupied Bandwidth (-26dBc)(kHz)	
836.5	QPSK	16QAM
	2980.77	2980.77

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



Date: 4.JUN.2019 17:37:49

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

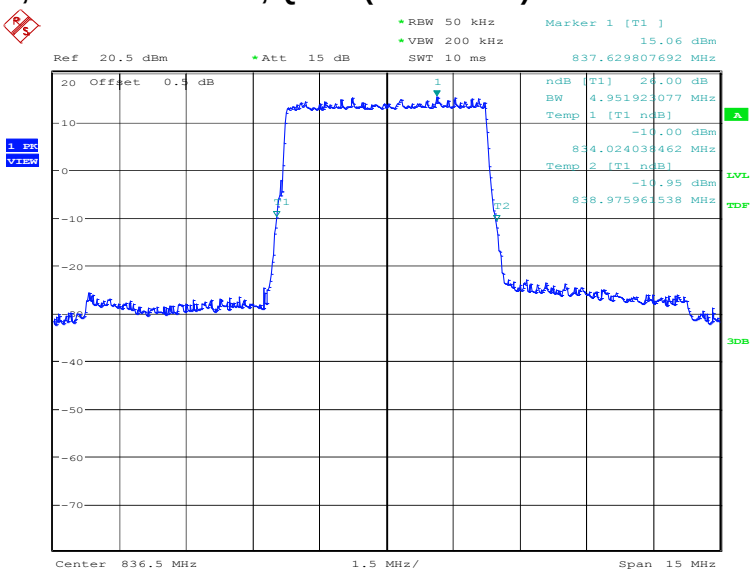


Date: 4.JUN.2019 17:39:14

LTE band 5, 5MHz (-26dBc)

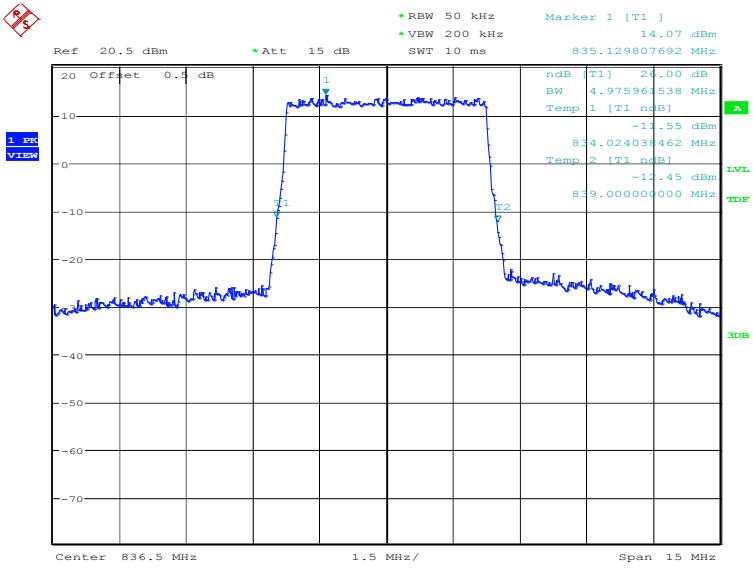
Frequency(MHz)	Occupied Bandwidth (-26dBc)(kHz)	
836.5	QPSK	16QAM
	4951.92	4975.96

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



Date: 4.JUN.2019 17:40:40

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

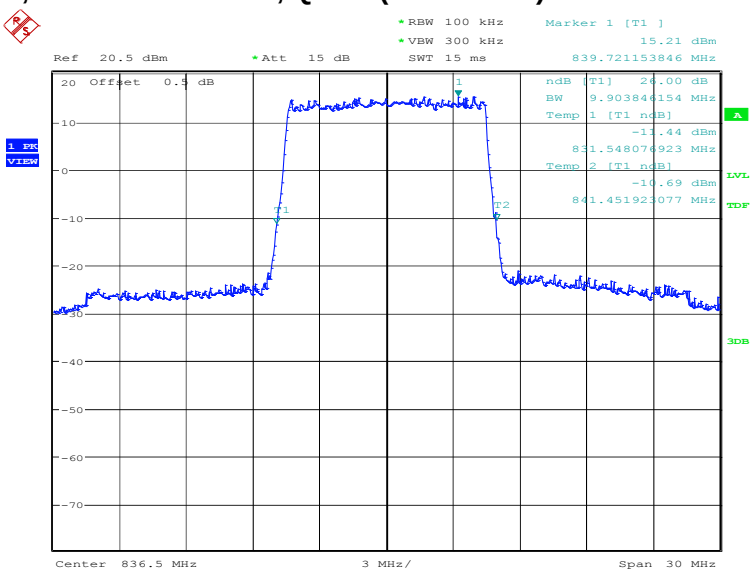


Date: 4.JUN.2019 17:42:05

LTE band 5, 10MHz (-26dBc)

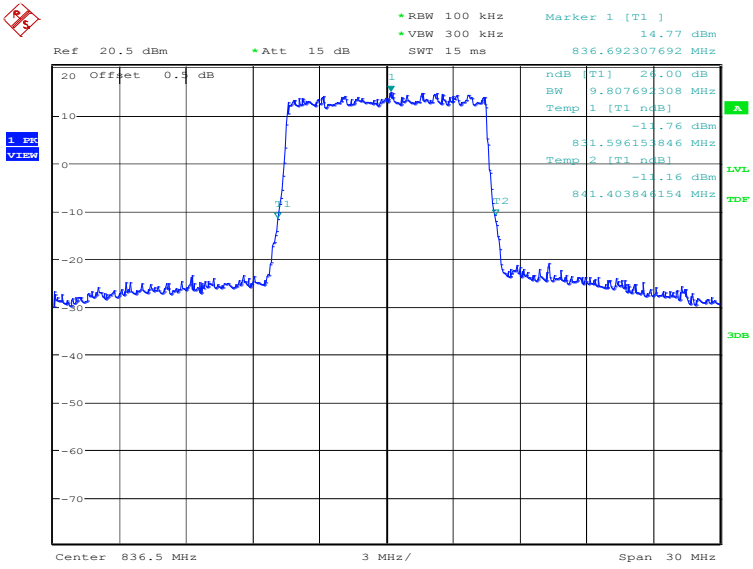
Frequency(MHz)	Occupied Bandwidth (-26dBc)(kHz)	
836.5	QPSK	16QAM
	9903.85	9807.69

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



Date: 4.JUN.2019 17:43:31

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

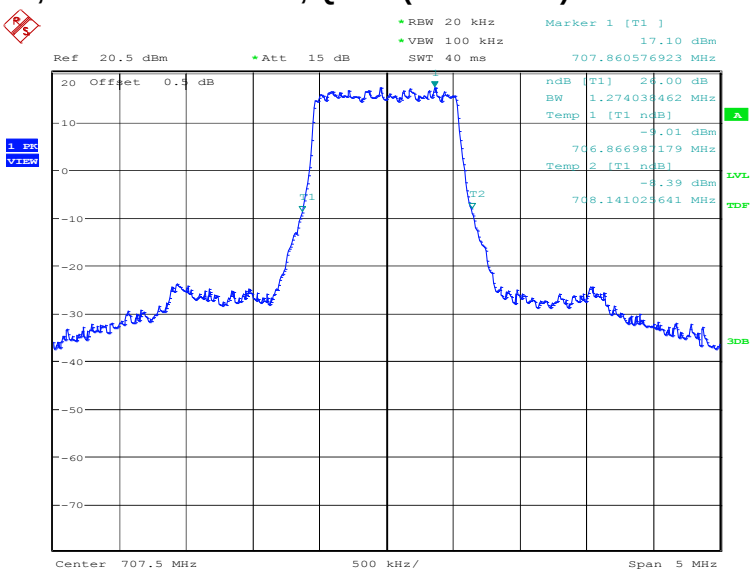


Date: 4.JUN.2019 17:44:55

LTE band 12, 1.4MHz (-26dBc)

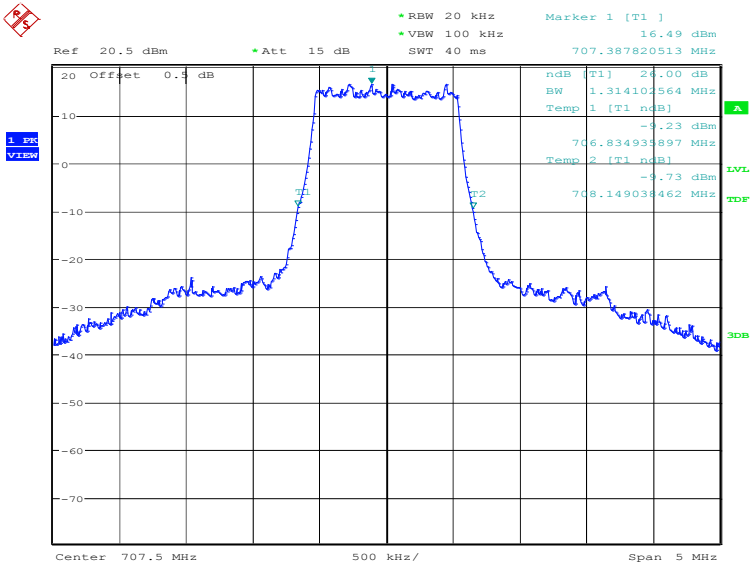
Frequency(MHz)	Occupied Bandwidth (-26dBc)(kHz)	
707.5	QPSK	16QAM
	1274.04	1314.10

LTE band 12, 1.4MHz Bandwidth, QPSK (-26dBc BW)



Date: 16.MAY.2019 21:09:42

LTE band 12, 1.4MHz Bandwidth, 16QAM (-26dBc BW)

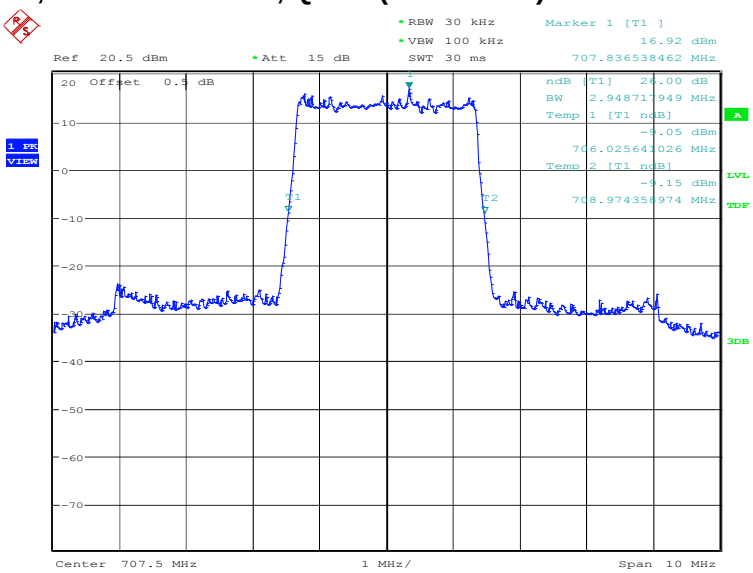


Date: 16.MAY.2019 21:11:07

LTE band 12, 3MHz (-26dBc)

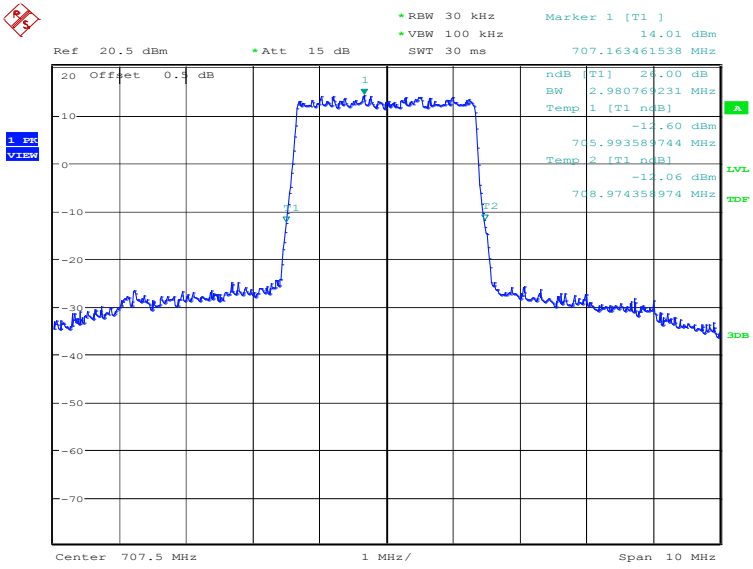
Frequency(MHz)	Occupied Bandwidth (-26dBc)(kHz)	
707.5	QPSK	16QAM
	2948.72	2980.77

LTE band 12, 3MHz Bandwidth, QPSK (-26dBc BW)



Date: 16.MAY.2019 21:12:34

LTE band 12, 3MHz Bandwidth, 16QAM (-26dBc BW)

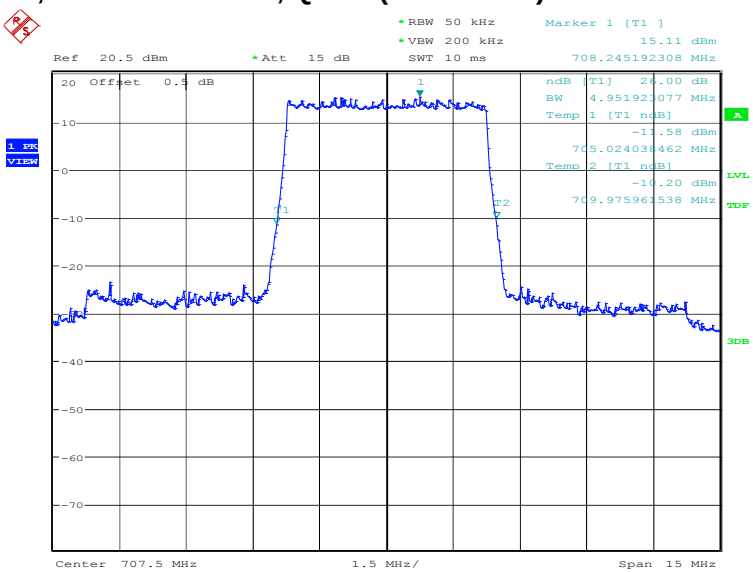


Date: 16.MAY.2019 21:13:59

LTE band 12, 5MHz (-26dBc)

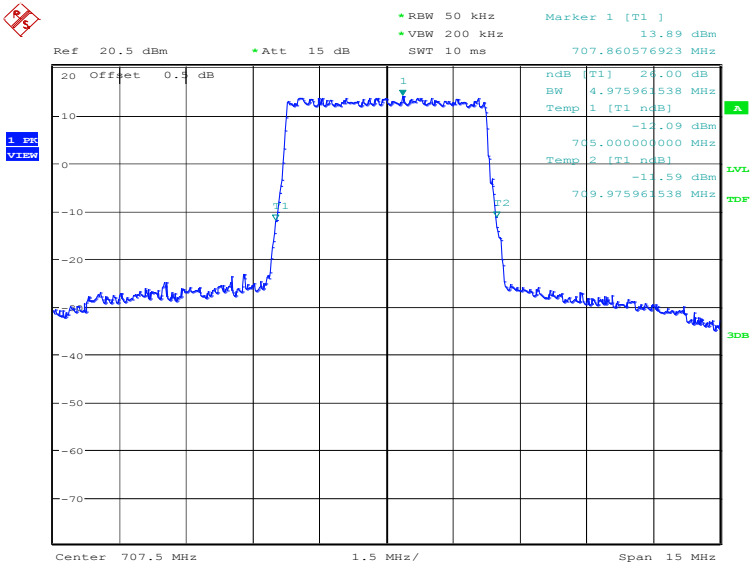
Frequency(MHz)	Occupied Bandwidth (-26dBc)(kHz)	
707.5	QPSK	16QAM
	4951.92	4975.96

LTE band 12, 5MHz Bandwidth, QPSK (-26dBc BW)



Date: 16.MAY.2019 21:15:25

LTE band 12, 5MHz Bandwidth, 16QAM (-26dBc BW)

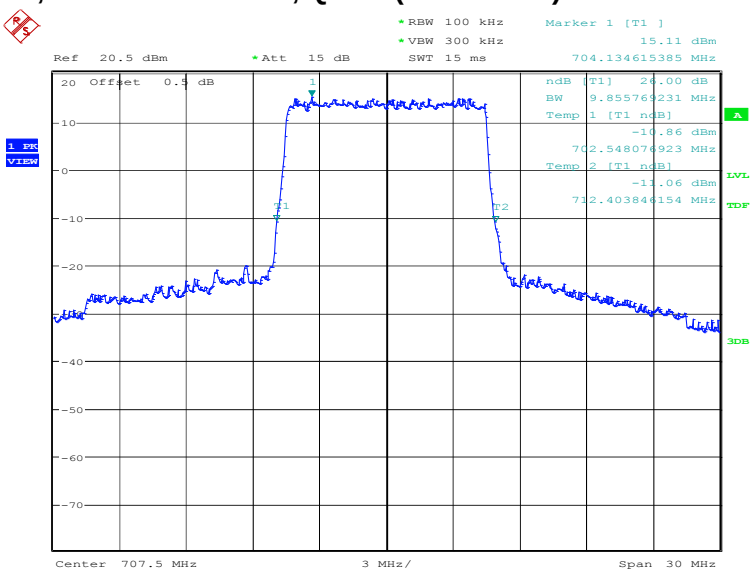


Date: 16.MAY.2019 21:16:50

LTE band 12, 10MHz (-26dBc)

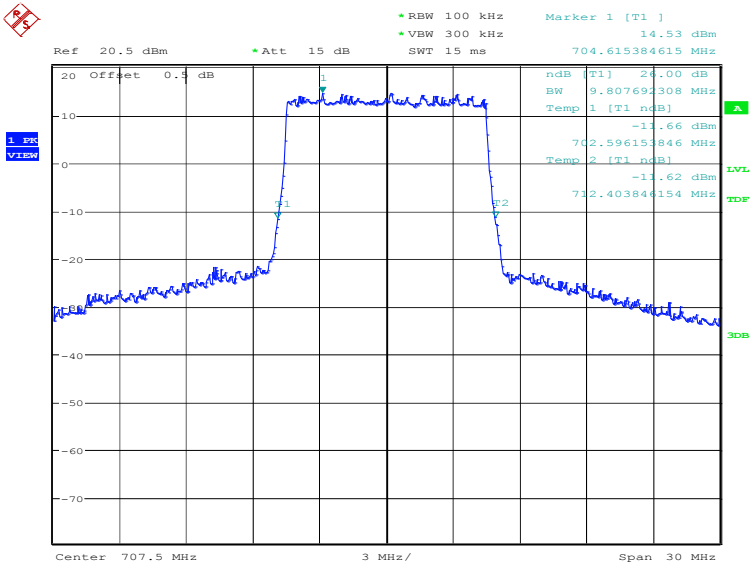
Frequency(MHz)	Occupied Bandwidth (-26dBc)(kHz)	
707.5	QPSK	16QAM
	9855.77	9807.69

LTE band 12, 10MHz Bandwidth, QPSK (-26dBc BW)



Date: 16.MAY.2019 21:18:17

LTE band 12, 10MHz Bandwidth, 16QAM (-26dBc BW)

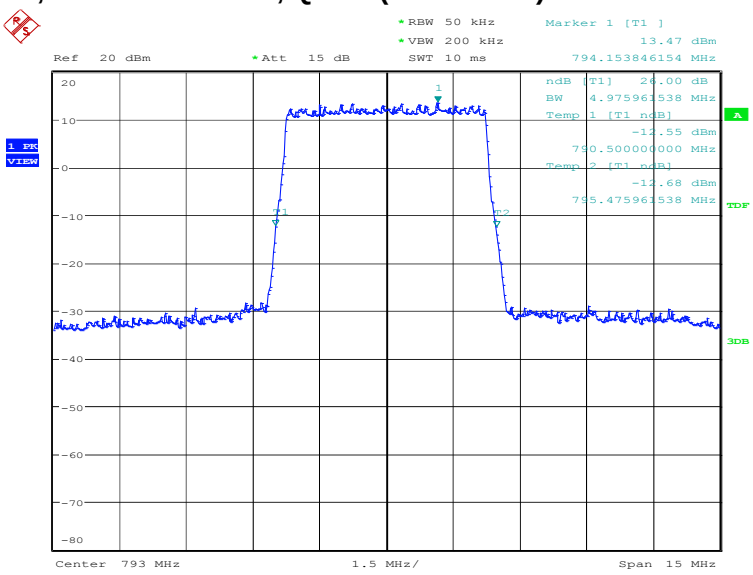


Date: 16.MAY.2019 21:19:42

LTE band 14, 5MHz (-26dBc)

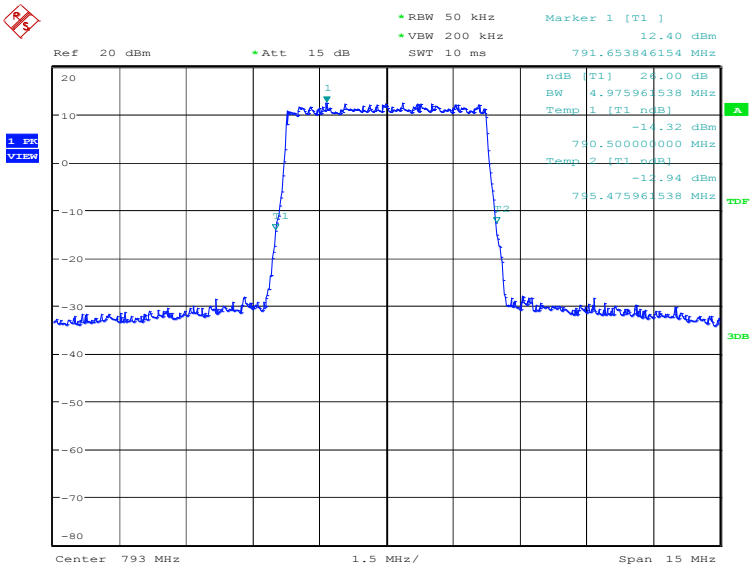
Frequency(MHz)	Occupied Bandwidth (-26dBc)(kHz)	
793.0	QPSK	16QAM
	4975.96	4975.96

LTE band 14, 5MHz Bandwidth, QPSK (-26dBc BW)



Date: 4.JUN.2019 17:46:23

LTE band 14, 5MHz Bandwidth,16QAM (-26dBc BW)

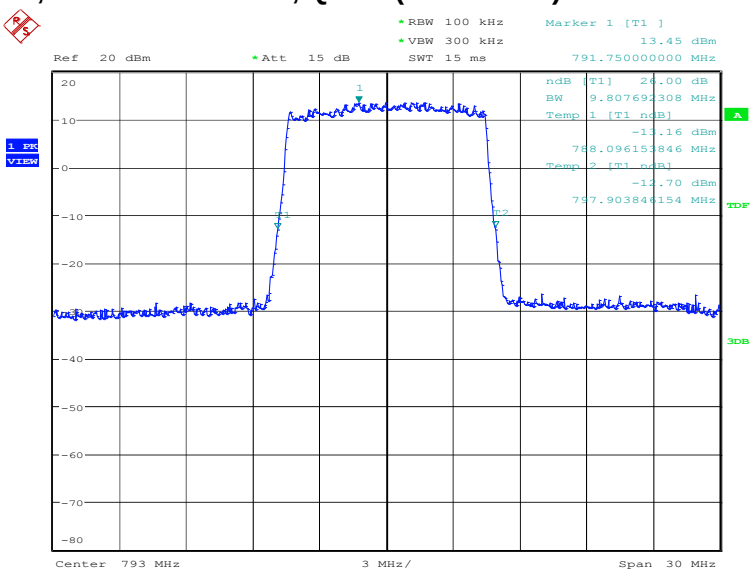


Date: 4.JUN.2019 17:47:48

LTE band 14, 10MHz (-26dBc)

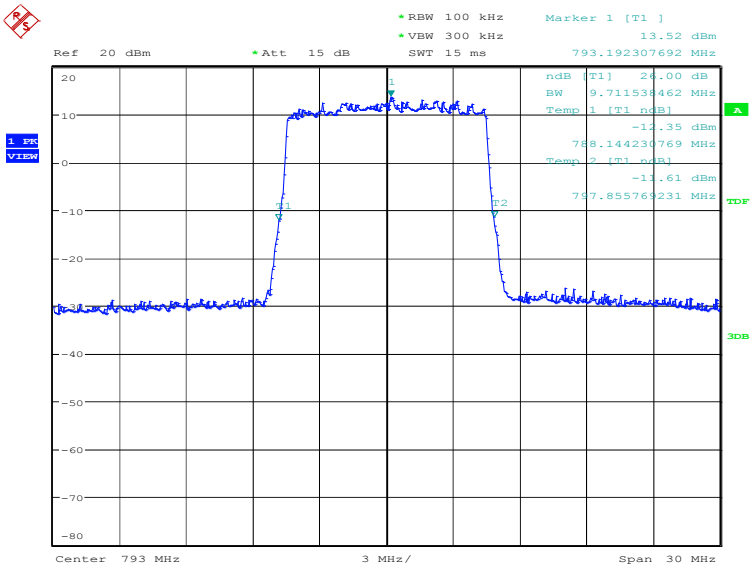
Frequency(MHz)	Occupied Bandwidth (-26dBc)(kHz)	
793.0	QPSK	16QAM
	9807.69	9711.54

LTE band 14, 10MHz Bandwidth, QPSK (-26dBc BW)



Date: 4.JUN.2019 17:49:14

LTE band 14, 10MHz Bandwidth,16QAM (-26dBc BW)



Date: 4.JUN.2019 17:50:38

A.6 BAND EDGE COMPLIANCE

A.6.1 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.

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.

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(c) states for operations in the 746-758 MHz band and the 776-788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:(1) On any frequency outside the 746-758 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB;(2) On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB;(4) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than 65 + 10 log (P) dB in a 6.25 kHz band segment, for mobile and portable stations.

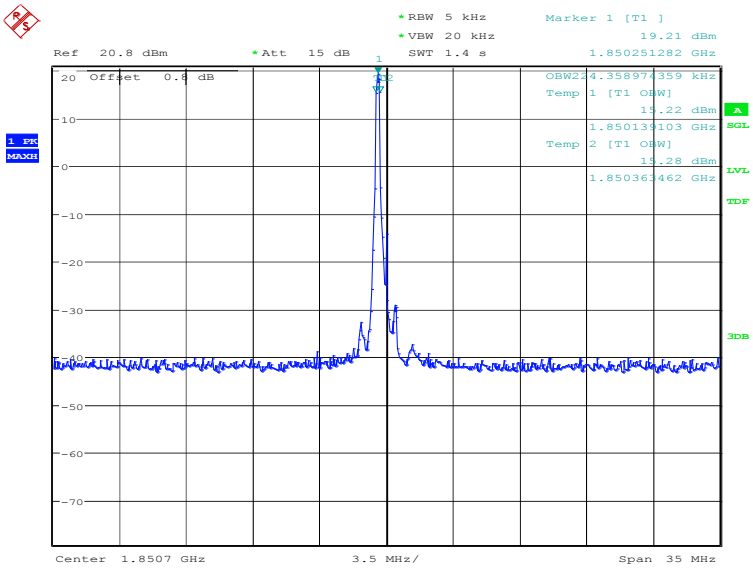
Part 90.543 states that For operations in the 758–768 MHz and the 788–798 MHz bands, the power of any emission outside the licensee’s frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following: (1) On all frequencies between 769–775 MHz and 799–805 MHz, by a factor not less than 76 + 10 log (P) dB in a 6.25 kHz band segment, for base and fixed stations. (2) On all frequencies between 769–775 MHz and 799–805 MHz, by a factor not less than 65 + 10 log (P) dB in a 6.25 kHz band segment, for mobile and portable stations. (3) On any frequency between 775–788 MHz, above 805 MHz, and below 758 MHz, by at least 43 + 10 log (P) dB. (4) Compliance with the provisions of paragraphs (e)(1) and (2) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment. (5) Compliance with the provisions of paragraph (e)(3) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of 30 kHz may be employed.

A.6.2 Measurement result

Only worst case result is given below

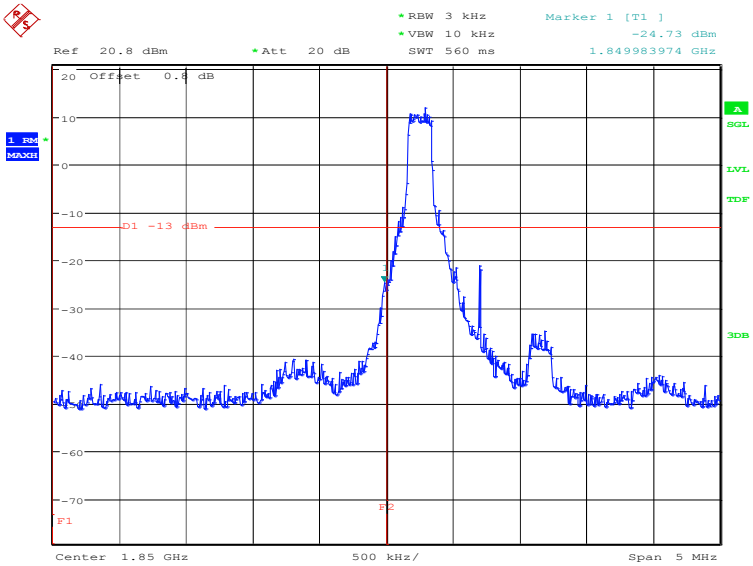
LTE band 2

OBW: 1RB-low_offset



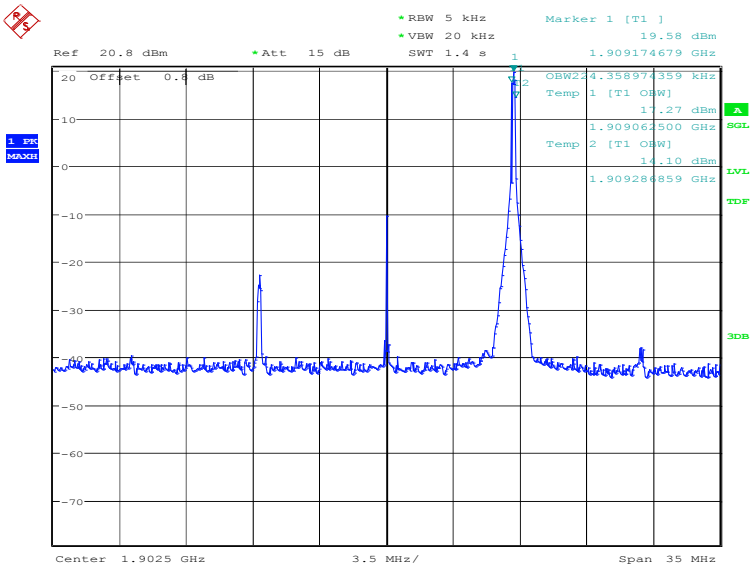
Date: 17.JUN.2019 13:13:08

LOW BAND EDGE BLOCK-1RB-low_offset



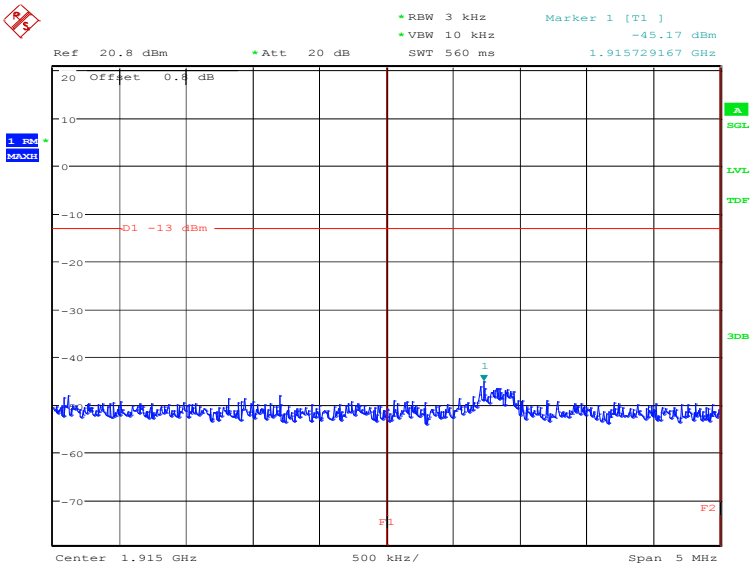
Date: 17.JUN.2019 13:13:23

OBW: 1RB-high_offset



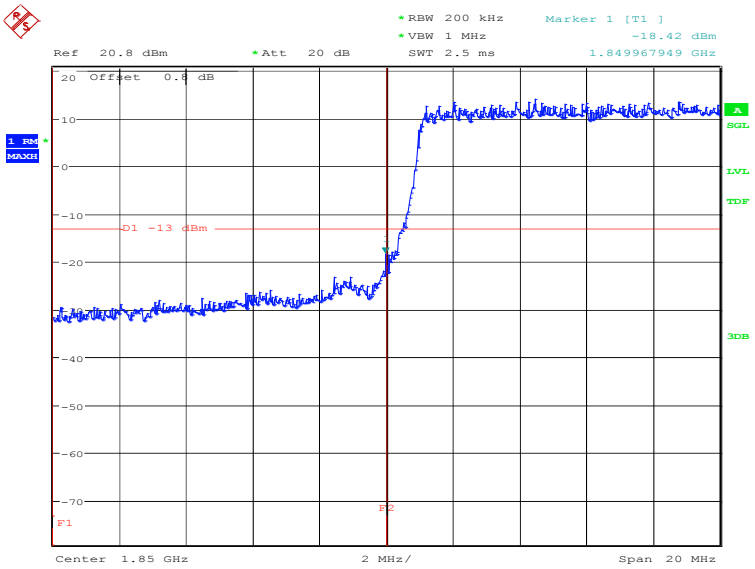
Date: 17.JUN.2019 13:16:13

HIGH BAND EDGE BLOCK-1RB-high_offset



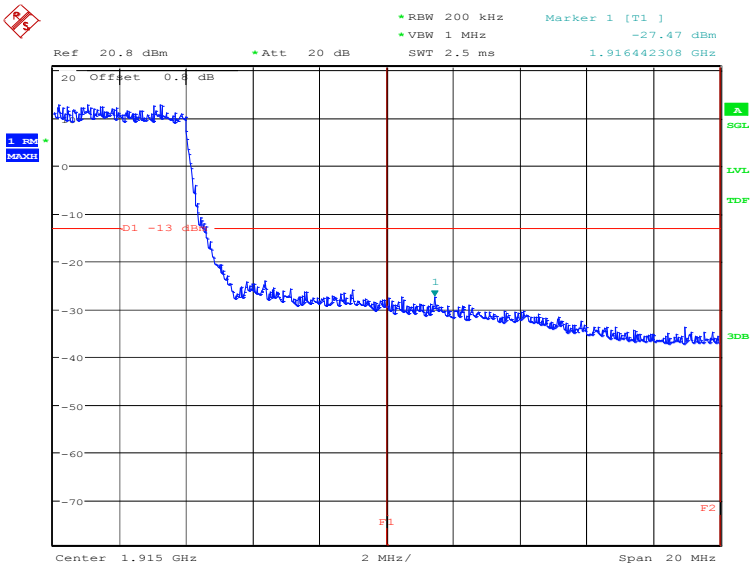
Date: 17.JUN.2019 13:16:29

LOW BAND EDGE BLOCK-20MHz-100%RB



Date: 17.JUN.2019 13:41:52

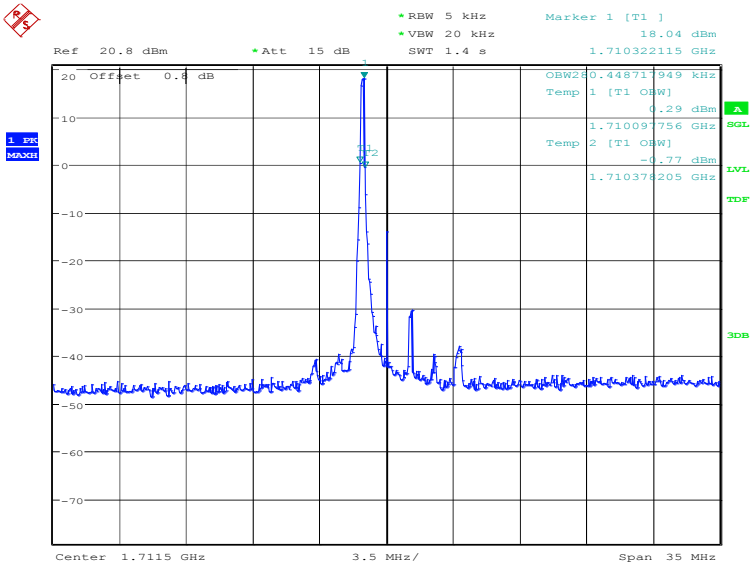
HIGH BAND EDGE BLOCK-20MHz-100%RB



Date: 17.JUN.2019 13:44:31

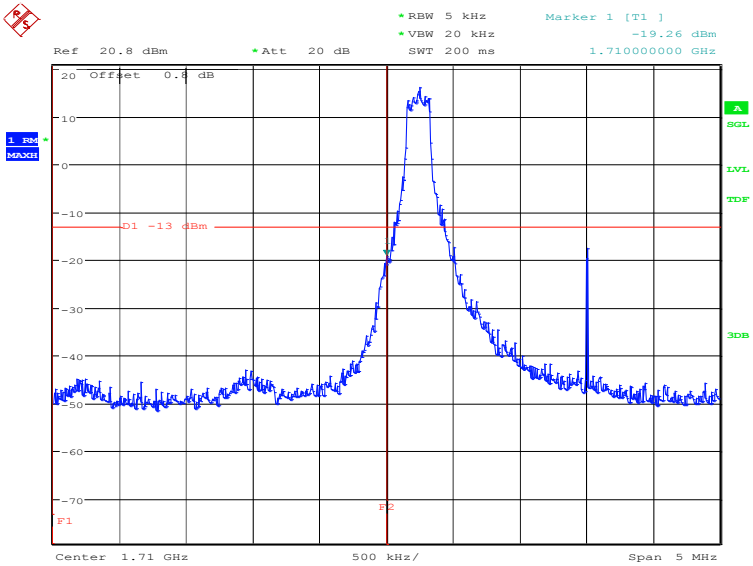
LTE band 4

OBW: 1RB-low_offset



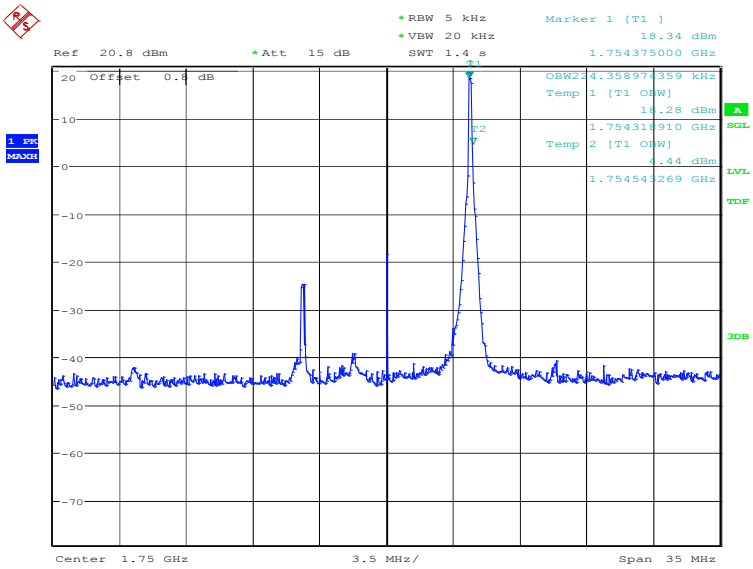
Date: 17.JUN.2019 13:23:57

LOW BAND EDGE BLOCK-1RB-low_offset



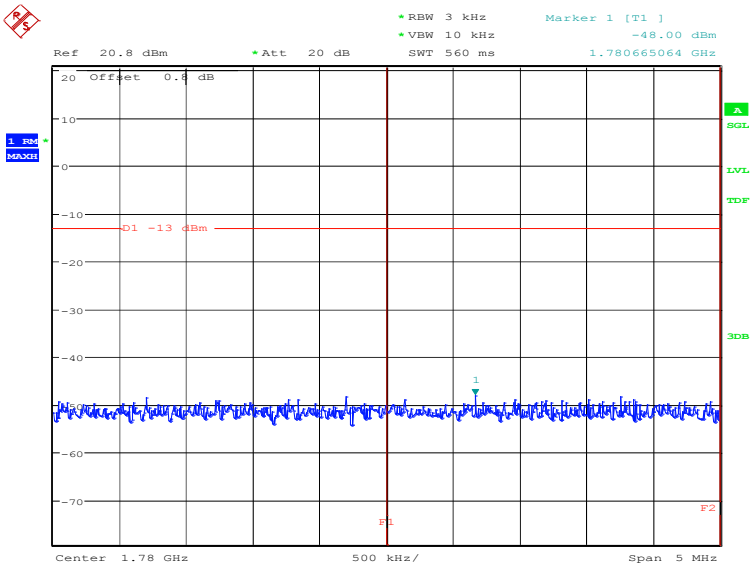
Date: 17.JUN.2019 13:24:12

OBW: 1RB-high_offset



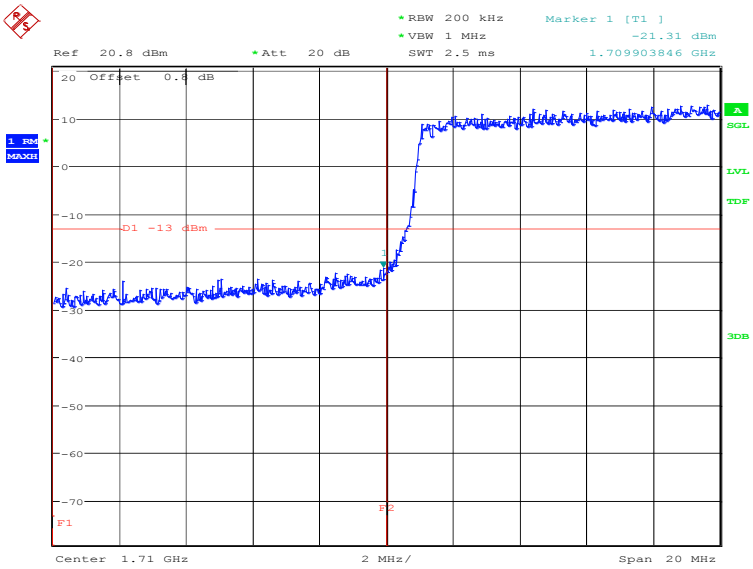
Date: 17.JUN.2019 13:27:03

HIGH BAND EDGE BLOCK-1RB-high_offset



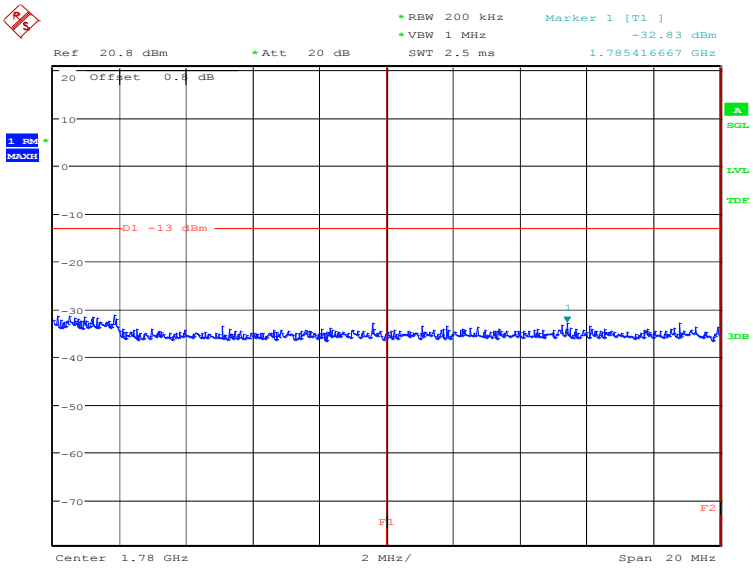
Date: 17.JUN.2019 13:27:18

LOW BAND EDGE BLOCK-20MHz-100%RB



Date: 17.JUN.2019 13:57:05

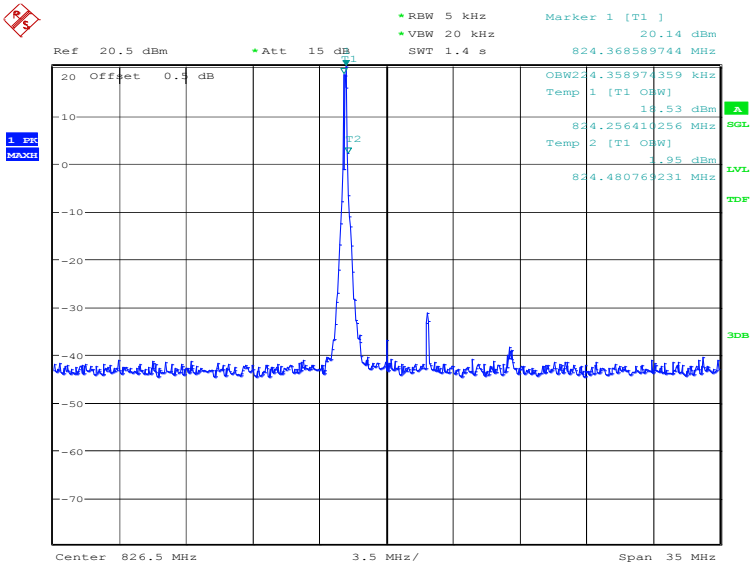
HIGH BAND EDGE BLOCK-20MHz-100%RB



Date: 17.JUN.2019 13:58:42

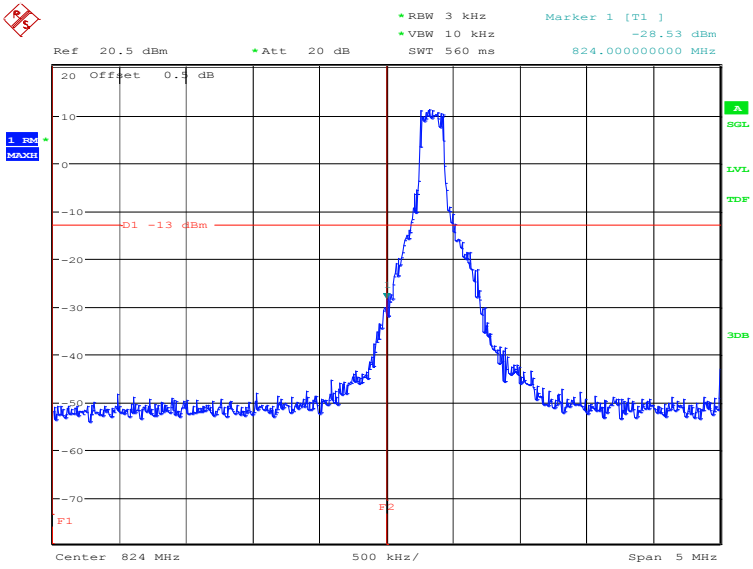
LTE band 5

OBW: 1RB-low_offset



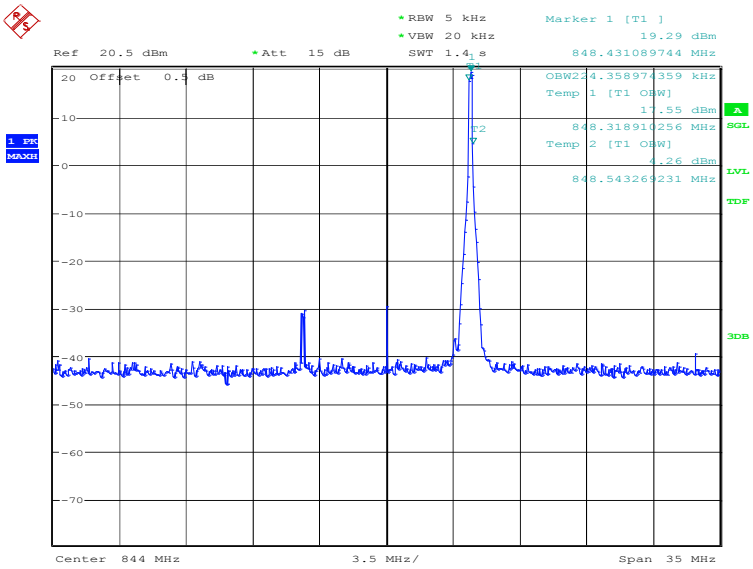
Date: 17.JUN.2019 13:30:38

LOW BAND EDGE BLOCK-1RB-low_offset



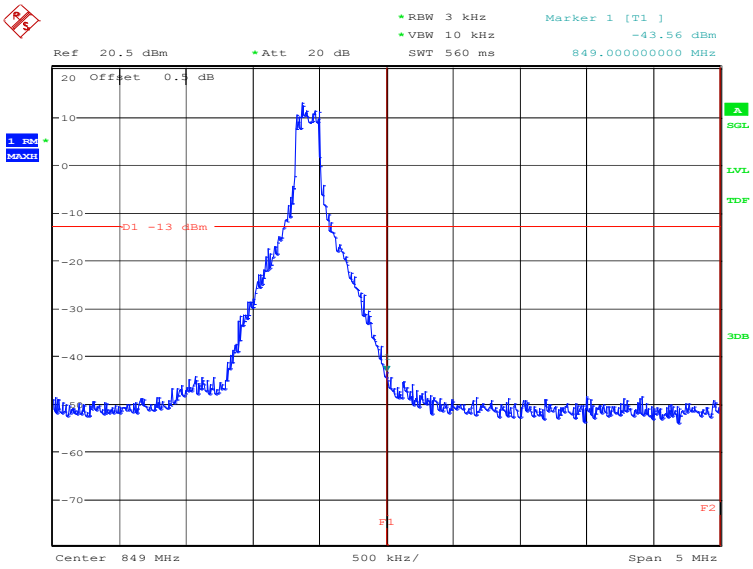
Date: 17.JUN.2019 13:30:53

OBW: 1RB-high_offset



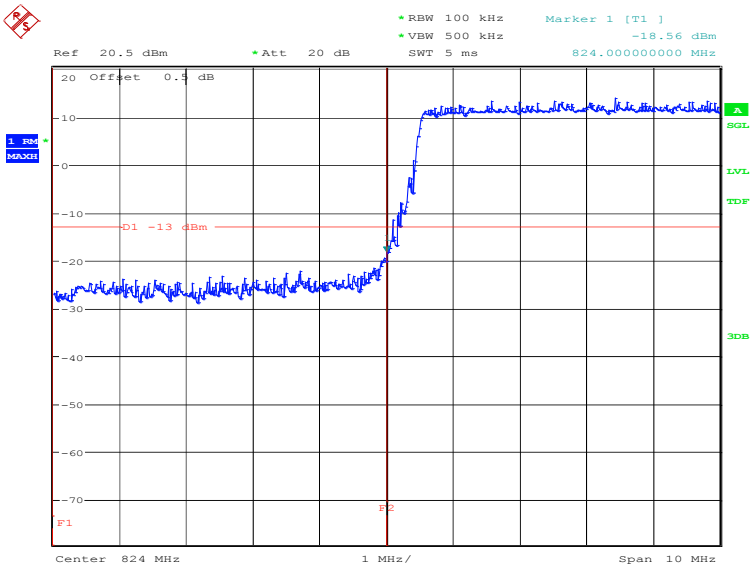
Date: 17.JUN.2019 13:34:19

HIGH BAND EDGE BLOCK-1RB-high_offset



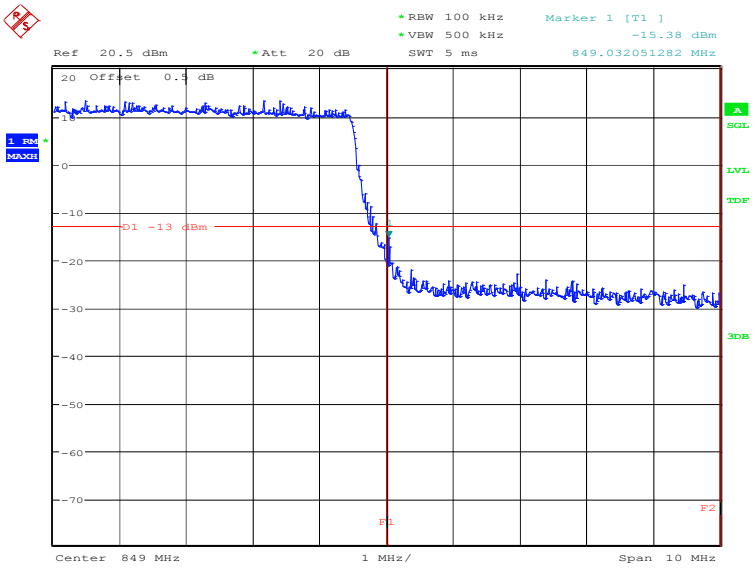
Date: 17.JUN.2019 13:34:35

LOW BAND EDGE BLOCK-10MHz-100%RB



Date: 17.JUN.2019 14:04:46

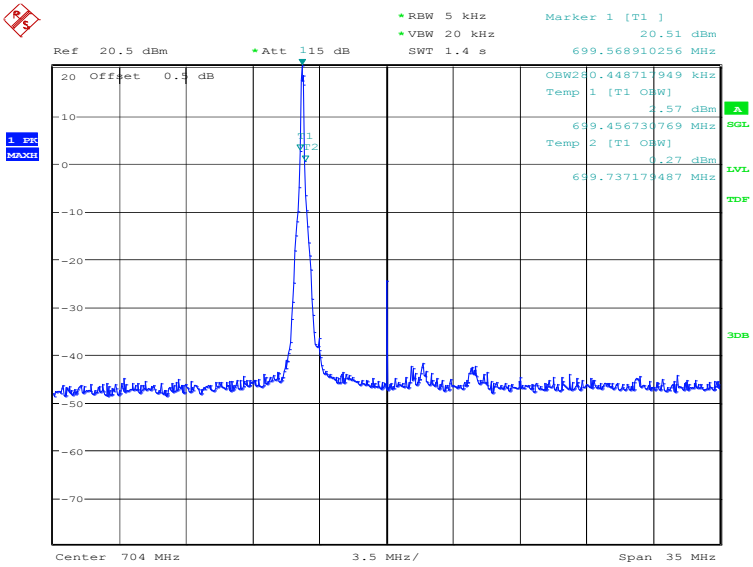
HIGH BAND EDGE BLOCK-10MHz-100%RB



Date: 17.JUN.2019 14:06:39

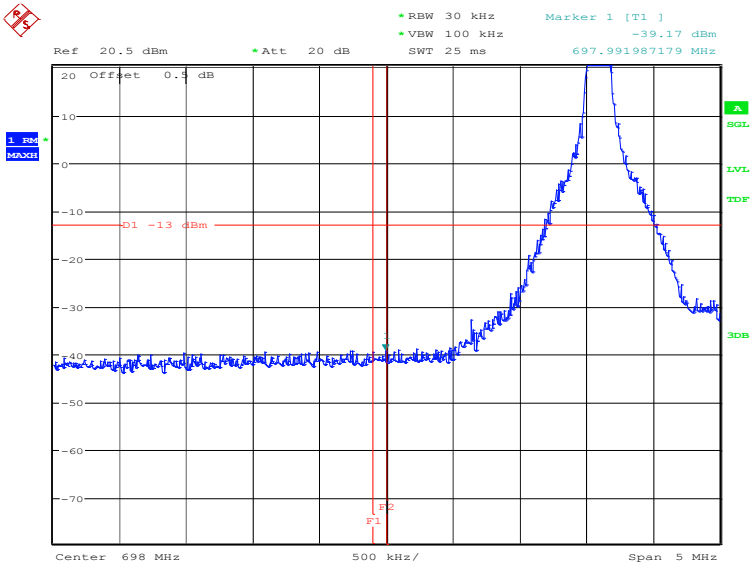
LTE band 12

OBW: 1RB-low_offset



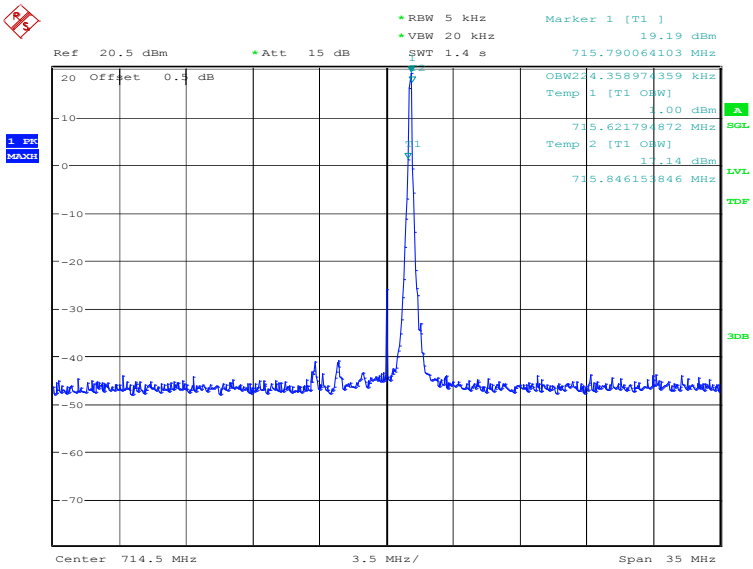
Date: 11.JUN.2019 15:44:06

LOW BAND EDGE BLOCK-1RB-low_offset



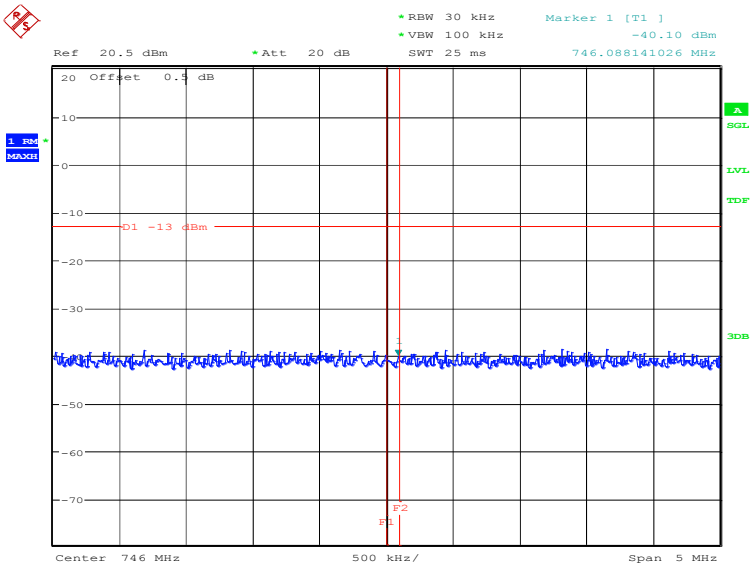
Date: 11.JUN.2019 15:44:22

OBW: 1RB-high_offset



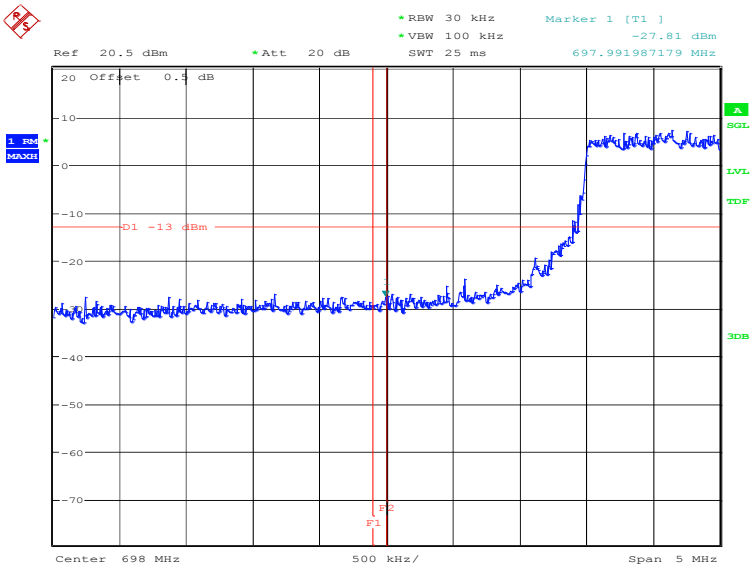
Date: 11.JUN.2019 15:46:50

HIGH BAND EDGE BLOCK-1RB-high_offset



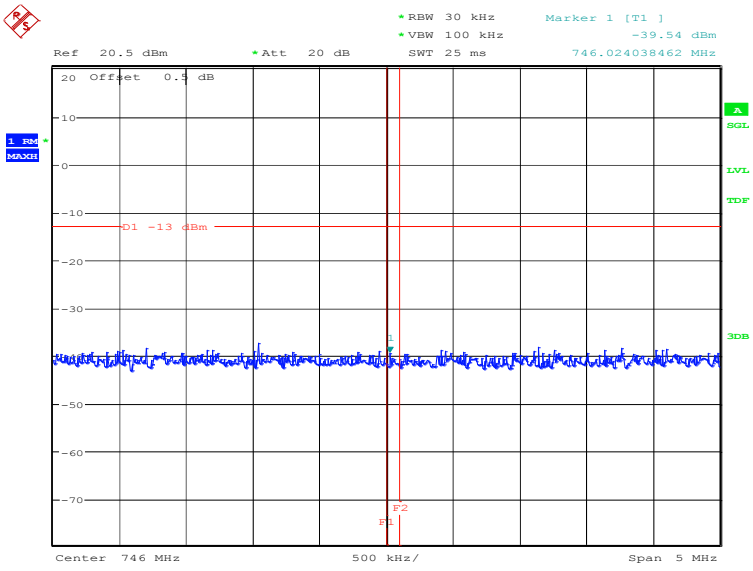
Date: 11.JUN.2019 15:47:05

LOW BAND EDGE BLOCK-10MHz-100%RB



Date: 11.JUN.2019 15:44:51

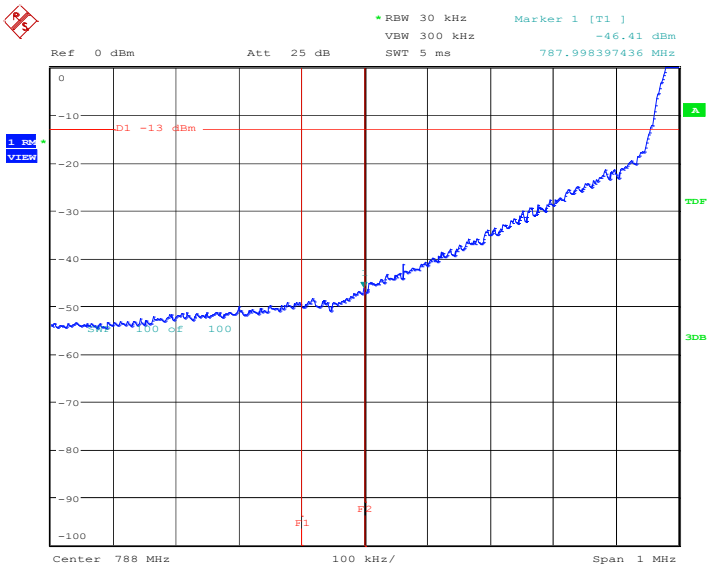
HIGH BAND EDGE BLOCK-10MHz-100%RB



Date: 11.JUN.2019 15:47:37

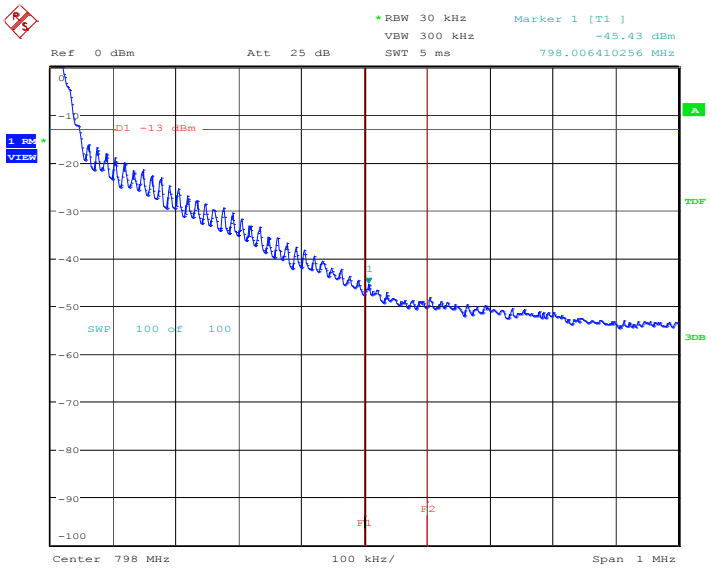
LTE band 14

LOW BAND EDGE BLOCK-1RB-low_offset



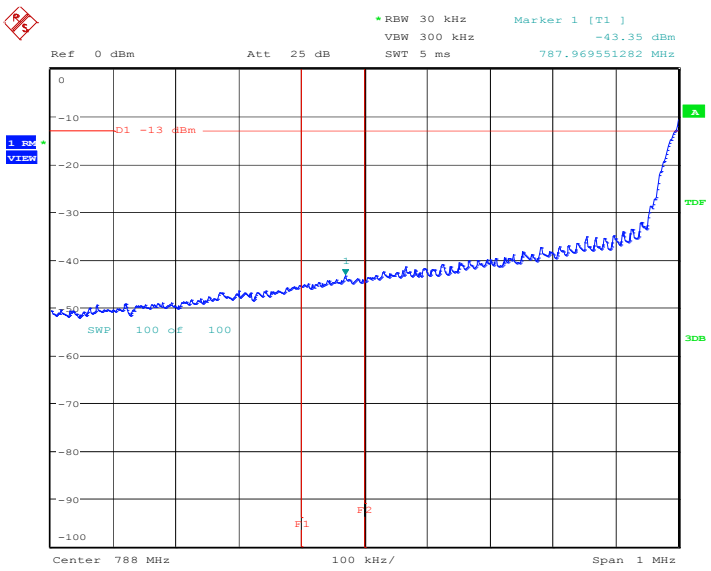
Date: 19.JUN.2019 15:33:45

HIGH BAND EDGE BLOCK-1RB-high_offset



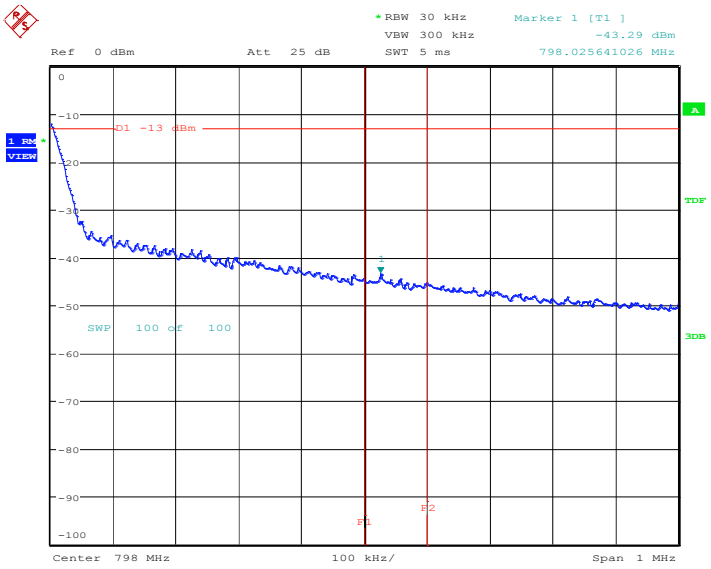
Date: 17.JUN.2019 16:51:20

LOW BAND EDGE BLOCK-10MHz-100%RB



Date: 17.JUN.2019 16:45:46

HIGH BAND EDGE BLOCK-10MHz-100%RB



Date: 17.JUN.2019 16:47:36

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.

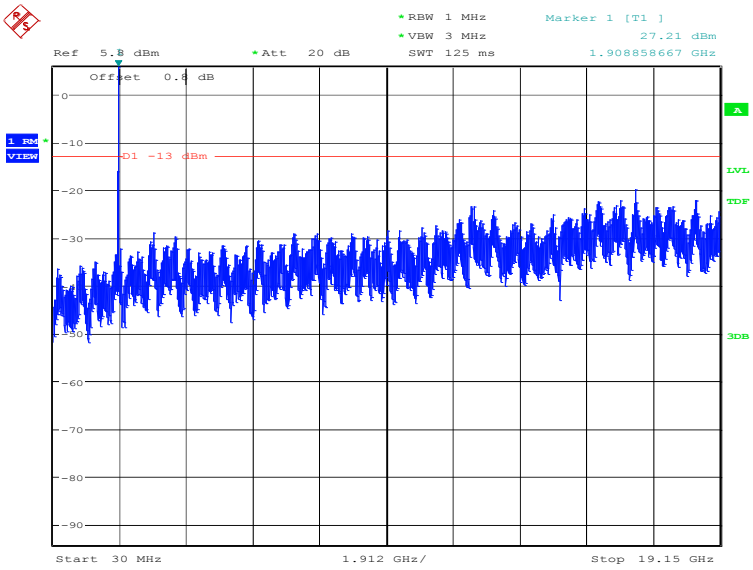
The specification that emissions shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. 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.

Part 90.543 states that For operations in the 758–768 MHz and the 788–798 MHz bands, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following: (1) On all frequencies between 769–775 MHz and 799–805 MHz, by a factor not less than 76 + 10 log (P) dB in a 6.25 kHz band segment, for base and fixed stations. (2) On all frequencies between 769–775 MHz and 799–805 MHz, by a factor not less than 65 + 10 log (P) dB in a 6.25 kHz band segment, for mobile and portable stations. (3) On any frequency between 775–788 MHz, above 805 MHz, and below 758 MHz, by at least 43 + 10 log (P) dB. (4) Compliance with the provisions of paragraphs (e)(1) and (2) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment. (5) Compliance with the provisions of paragraph (e)(3) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of 30 kHz may be employed.

A. 7.2 Measurement result

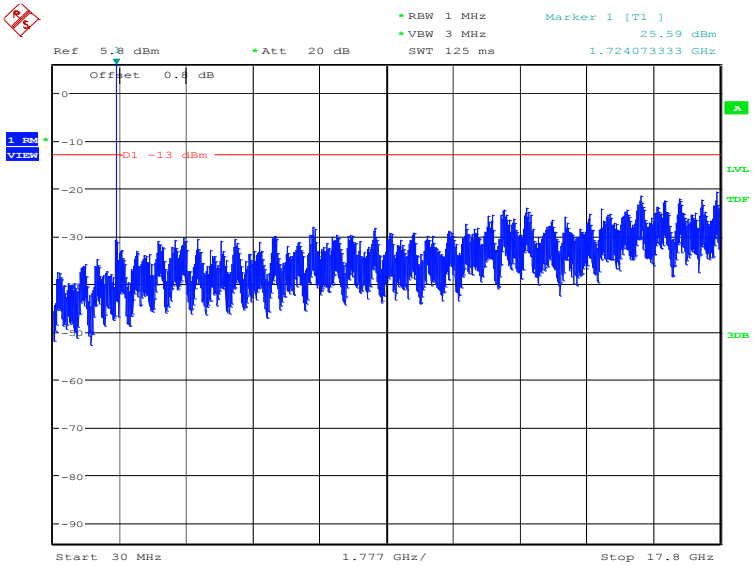
Only worst case result is given below

LTE band 2: 30MHz – 19.15GHz



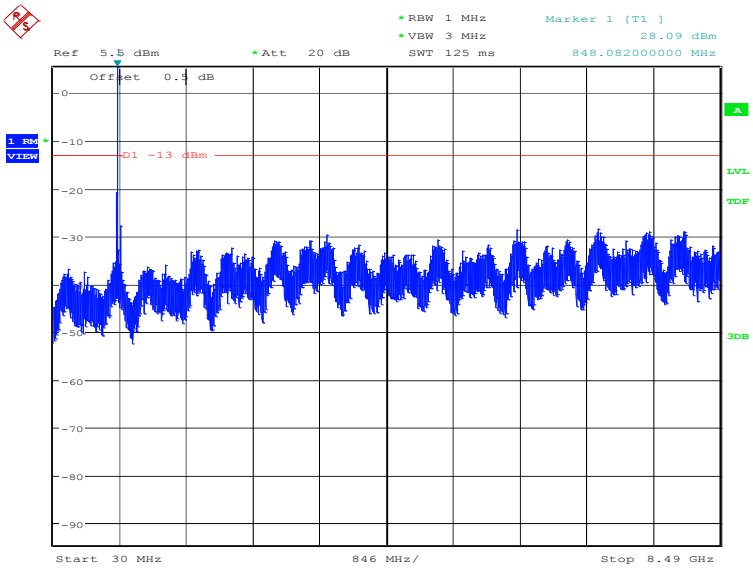
Date: 17.JUN.2019 13:05:00

LTE band 4: 30MHz – 17.8GHz



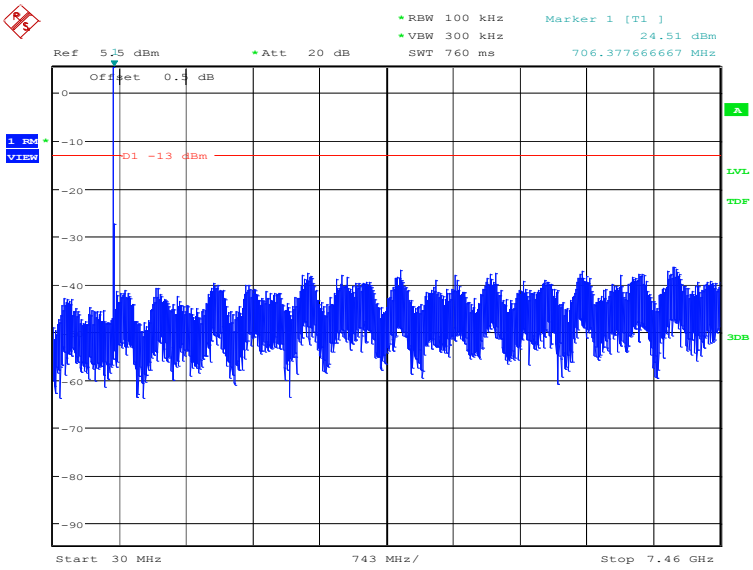
Date: 17.JUN.2019 13:07:09

LTE band 5: 30MHz – 8.49GHz



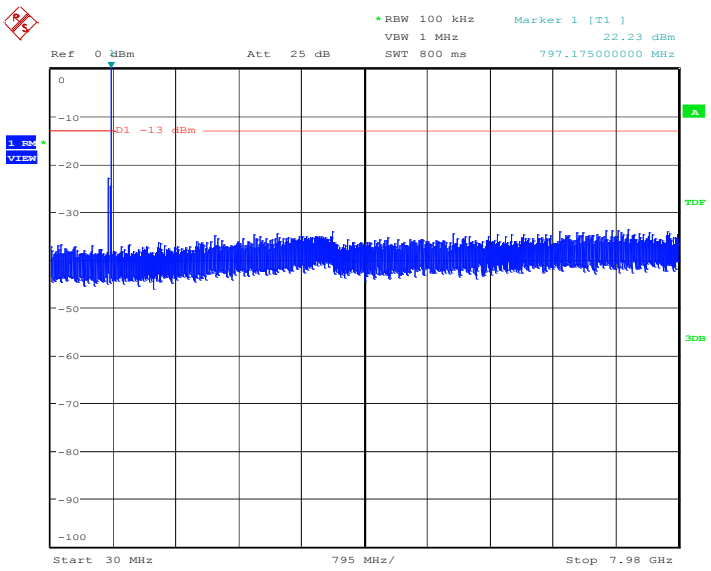
Date: 17.JUN.2019 13:09:08

LTE band 12: 30MHz – 7.46GHz

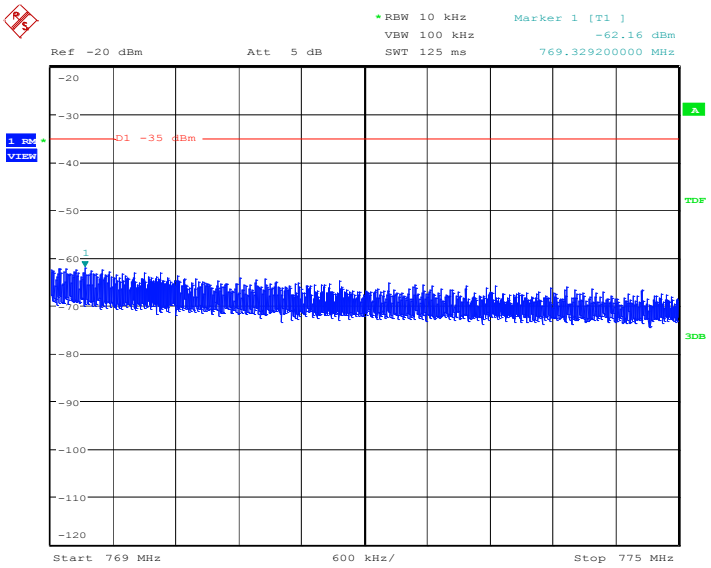


Date: 11.JUN.2019 16:10:37

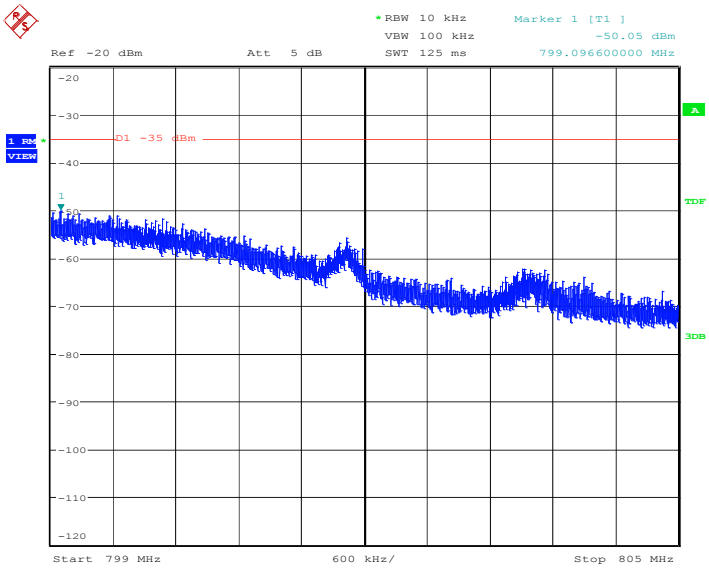
LTE band 14: 30MHz – 7.98GHz



Date: 17.JUN.2019 17:01:11



Date: 17.JUN.2019 16:56:44



Date: 17.JUN.2019 16:58:32

A.8 PEAK-TO-AVERAGE POWER RATIO

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 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)	
1880.0	QPSK	16QAM
	6.67	7.37

LTE band 4, 20MHz

Frequency(MHz)	PAPR(dB)	
1732.5	QPSK	16QAM
	6.51	7.21

LTE band 12,10MHz

Frequency(MHz)	PAPR(dB)	
707.5	QPSK	16QAM
	5.32	6.19

ANNEX B: Accreditation Certificate

United States Department of Commerce
National Institute of Standards and Technology

NVLAP®

Certificate of Accreditation to ISO/IEC 17025:2005

NVLAP LAB CODE: 600118-0

Telecommunication Technology Labs, CAICT
Beijing
China

is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:

Electromagnetic Compatibility & Telecommunications

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).

2018-09-28 through 2019-09-30
Effective Dates

For the National Voluntary Laboratory Accreditation Program

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