



# TEST REPORT

No. I18Z61763-WMD03

for

**TCL Communication Ltd.**

**LTE/UMTS/GSM mobile phone**

**Model Name: A501DL**

**FCC ID: 2ACCJH099**

with

**Hardware Version: PIO**

**Software Version: vSV5**

**Issued Date: 2018-10-31**



**Note:**

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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.

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## **REPORT HISTORY**

<b>Report Number</b>	<b>Revision</b>	<b>Description</b>	<b>Issue Date</b>
I18Z61763-WMD03	Rev.0	1st edition	2018-10-31



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## **1. Test Laboratory**

### **1.1. 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

### **1.2. Testing Environment**

Normal Temperature: 15-35°C

Relative Humidity: 20-75%

### **1.3. Project data**

Testing Start Date: 2018-09-28

Testing End Date: 2018-10-29

### **1.4. Signature**



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**Dong Yuan**  
**(Prepared this test report)**



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**Zhou Yu**  
**(Reviewed this test report)**



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**Zhao Hui Lin**  
**Deputy Director of the laboratory**  
**(Approved this test report)**



## **2. Client Information**

### **2.1. Applicant Information**

Company Name: TCL Communication Ltd.  
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### **2.2. Manufacturer Information**

Company Name: TCL Communication Ltd.  
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Telephone: 0086-755-36611722  
Fax: 0086-755-36612000-81722

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

#### **3.1. About EUT**

Description	LTE/UMTS/GSM mobile phone
Model Name	A501DL
FCC ID	2ACCJH099
Antenna	Embedded
Output power	24.85dBm maximum EIRP measured for Band 66
Extreme vol. Limits	3.5VDC to 4.4VDC (nominal: 3.8VDC)
Extreme temp. Tolerance	0°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**

<b>EUT ID*</b>	<b>IMEI</b>	<b>HW Version</b>	<b>SW Version</b>	<b>Date of receipt</b>
UT21a	015293000110191	PIO	vSV5	2018-10-08
UT36A	015293000110167	PIO	vSV5	2018-10-15
UT20A	015293000110209	PIO	vSV5	2018-10-08

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

#### **3.3. Internal Identification of AE used during the test**

<b>AE ID*</b>	<b>Description</b>
AE1	Battery

AE1

Model	CAB2110002C1
Manufacturer	BYD
Capacitance	2200mAh

\*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 LTE/UMTS/GSM 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.

<b>Reference</b>	<b>Title</b>	<b>Version</b>
FCC Part 24	PERSONAL COMMUNICATIONS SERVICES	10-1-17 Edition
FCC Part 22	PUBLIC MOBILE SERVICES	10-1-17 Edition
FCC Part 27	MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES	10-1-17 Edition
ANSI/TIA-603-E	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards	2016
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 X 6.1 meters X 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 X 6.7 meters X 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 RESULTS

### 6.1. Summary of test results

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

#### LTE Band 2

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

#### LTE Band 5

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



**LTE Band 12**

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

**LTE Band 13**

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



**LTE Band 66**

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

**LTE Band 71**

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



## **6.2. Statements**

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

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

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

## 7. Test Equipments Utilized

NO.	Description	TYPE	series number	MANUFACTURE	CAL DUE DATE	Calibration interval
1	Test Receiver	ESU26	100235	R&S	2019-03-31	1 year
2	Test Receiver	ESU26	100376	R&S	2018-12-27	1 year
3	EMI Antenna	3117	00058889	ETS-Lindgren	2020-05-27	3 year
4	Universal Radio Communication Tester	CMU200	108646	R&S	2019-01-05	1 year
5	Universal Radio Communication Tester	CMW500	159082	R&S	2019-01-05	1 year
6	Spectrum Analyzer	FSU26	200030	R&S	2019-06-04	1 year
7	EMI Antenna	VULB9163	9163-235	Schwarzbeck	2019-05-10	3 year
8	Signal Generator	SMF100A	101295	R&S	2018-12-23	1 year
9	Climate chamber	SH-242	93008556	ESPEC	2019-12-21	2 year
10	Loop Antenna	HFH2-Z2	829324/007	R&S	2018-12-14	3 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	23.56	22.30
		1880.0	23.43	22.20
		1850.7	22.77	22.34
	1 RB low	1909.3	23.39	22.34
		1880.0	23.15	22.21
		1850.7	23.35	22.33
	50% RB mid	1909.3	23.53	22.59
		1880.0	23.31	22.29
		1850.7	23.21	22.30
	100% RB	1909.3	22.54	21.61
		1880.0	22.30	21.35
		1850.7	22.19	21.06
3MHz	1 RB high	1908.5	23.56	22.23
		1880.0	23.24	22.56
		1851.5	23.13	22.01
	1 RB low	1908.5	23.47	22.26
		1880.0	23.24	22.52
		1851.5	23.14	22.08
	50% RB mid	1908.5	22.51	21.56
		1880.0	22.25	21.37
		1851.5	22.18	21.22
	100% RB	1908.5	22.45	21.44

		1880.0	22.26	21.29
		1851.5	22.10	21.08
5MHz	1 RB high	1907.5	23.33	22.35
		1880.0	23.15	22.24
		1852.5	23.08	22.44
	1 RB low	1907.5	23.30	22.31
		1880.0	23.14	22.23
		1852.5	23.03	22.44
	50% RB mid	1907.5	22.44	21.49
		1880.0	22.26	21.35
		1852.5	22.15	21.31
	100% RB	1907.5	22.37	21.32
		1880.0	22.21	21.29
		1852.5	22.07	21.14
10MHz	1 RB high	1905.0	23.48	22.32
		1880.0	23.23	22.04
		1855.0	23.15	22.37
	1 RB low	1905.0	23.34	22.25
		1880.0	23.14	21.98
		1855.0	23.05	22.31
	50% RB mid	1905.0	22.43	21.49
		1880.0	22.33	21.31
		1855.0	22.15	21.23
	100% RB	1905.0	22.37	21.41
		1880.0	22.20	21.22
		1855.0	22.11	21.16
15MHz	1 RB high	1902.5	23.29	22.55
		1880.0	23.14	22.00
		1857.5	23.09	22.29
	1 RB low	1902.5	23.24	22.52
		1880.0	23.08	21.92
		1857.5	23.10	22.27
	50% RB mid	1902.5	22.49	21.42
		1880.0	22.30	21.31
		1857.5	22.19	21.25
	100% RB	1902.5	22.46	21.40
		1880.0	22.30	21.27
		1857.5	22.21	21.19
20MHz	1 RB high	1900.0	23.07	22.54



		1880.0	22.93	22.36
		1860.0	22.79	22.19
	1 RB low	1900.0	22.92	22.48
		1880.0	22.80	22.23
		1860.0	22.76	22.07
	50% RB mid	1900.0	22.33	21.40
		1880.0	22.23	21.27
		1860.0	22.13	21.15
	100% RB	1900.0	22.29	21.35
		1880.0	22.19	21.20
		1860.0	22.11	21.11



**LTE band 5**

Bandwidth	RB size/offset	Frequency (MHz)	Power(dBm)	
			QPSK	16QAM
1.4MHz	1 RB high	848.3	23.87	22.90
		836.5	23.92	23.27
		824.7	23.84	22.82
	1 RB low	848.3	23.85	22.92
		836.5	23.97	23.26
		824.7	23.83	22.79
	50% RB mid	848.3	23.97	22.98
		836.5	24.06	23.22
		824.7	23.97	23.12
	100% RB	848.3	23.06	22.07
		836.5	22.99	21.85
		824.7	23.00	22.10
3MHz	1 RB high	847.5	23.87	22.84
		836.5	23.94	22.79
		825.5	23.96	23.22
	1 RB low	847.5	23.93	22.92
		836.5	23.90	22.81
		825.5	23.97	23.16
	50% RB mid	847.5	23.02	22.01
		836.5	22.98	22.06
		825.5	22.97	21.99
	100% RB	847.5	22.94	21.85
		836.5	22.96	21.93
		825.5	22.87	21.90
5MHz	1 RB high	846.5	23.84	22.90
		836.5	23.93	22.97
		826.5	23.85	23.27
	1 RB low	846.5	23.86	22.87
		836.5	23.94	22.96
		826.5	23.86	23.26
	50% RB mid	846.5	22.96	22.01
		836.5	22.95	22.02
		826.5	22.91	22.05
	100% RB	846.5	22.93	21.86
		836.5	22.91	21.90
		826.5	22.87	21.88
10MHz	1 RB high	844.0	23.93	23.22
		836.5	23.88	22.92



		829.0	23.88	22.81
	1 RB low	844.0	23.95	23.20
		836.5	23.85	22.86
		829.0	23.90	22.70
	50% RB mid	844.0	22.94	21.99
		836.5	23.00	22.06
		829.0	22.93	21.93
	100% RB	844.0	22.97	21.99
		836.5	23.00	21.98
		829.0	22.90	21.85

**LTE band 12**

Bandwidth	RB size/offset	Frequency (MHz)	Power(dBm)	
			QPSK	16QAM
1.4MHz	1 RB high	715.3	23.95	22.81
		707.5	24.03	22.98
		699.7	24.10	23.26
	1 RB low	715.3	23.96	22.84
		707.5	24.05	22.93
		699.7	24.11	23.28
	50% RB mid	715.3	24.04	23.13
		707.5	24.05	23.03
		699.7	24.15	23.18
	100% RB	715.3	23.13	22.16
		707.5	23.08	22.14
		699.7	23.16	22.01
3MHz	1 RB high	714.5	23.96	22.81
		707.5	24.01	22.77
		700.5	24.12	23.27
	1 RB low	714.5	23.98	22.89
		707.5	23.97	22.81
		700.5	24.12	23.24
	50% RB mid	714.5	23.05	22.09
		707.5	23.05	22.12
		700.5	23.15	22.16
	100% RB	714.5	22.93	21.94
		707.5	22.96	22.01
		700.5	23.03	22.05
5MHz	1 RB high	713.5	23.89	22.82
		707.5	23.99	22.95
		701.5	23.93	23.35
	1 RB low	713.5	23.90	22.90
		707.5	23.99	22.92
		701.5	23.96	23.32
	50% RB mid	713.5	23.01	22.08
		707.5	23.01	22.08
		701.5	23.06	22.20
	100% RB	713.5	22.96	21.90
		707.5	22.97	21.99
		701.5	22.98	22.04
10MHz	1 RB high	711.0	24.03	22.75
		707.5	24.05	23.23

	1 RB low	704.0	23.97	22.90
		711.0	23.94	22.77
		707.5	24.03	23.23
	50% RB mid	704.0	24.03	22.89
		711.0	23.04	22.03
		707.5	23.02	22.06
	100% RB	704.0	23.02	22.11
		711.0	22.99	21.98
		707.5	23.01	22.03
			704.0	22.97

**LTE band 13**

Bandwidth	RB size/offset	Frequency (MHz)	Power(dBm)	
			QPSK	16QAM
5MHz	1 RB high	784.5	23.58	22.51
		782	23.62	22.61
		779.5	23.57	22.97
	1 RB low	784.5	23.54	22.57
		782	23.64	22.56
		779.5	23.62	22.84
	50% RB mid	784.5	22.69	21.73
		782	22.66	21.74
		779.5	22.67	21.79
	100% RB	784.5	22.66	21.62
		782	22.63	21.62
		779.5	22.57	21.61
10MHz	1 RB high	782.0	23.71	22.41
	1 RB low	782.0	23.68	22.36
	50% RB mid	782.0	22.67	21.71
	100% RB	782.0	22.73	21.66

**LTE band 66**

Bandwidth	RB size/offset	Frequency (MHz)	Power(dBm)	
			QPSK	16QAM
1.4MHz	1 RB high	1779.3	23.64	22.63
		1745.0	23.77	22.78
		1710.7	23.80	22.80
	1 RB low	1779.3	23.55	22.67
		1745.0	23.71	22.80
		1710.7	23.74	22.78
	50% RB mid	1779.3	23.73	22.77
		1745.0	23.84	23.10
		1710.7	23.88	23.13
	100% RB	1779.3	22.77	21.85
		1745.0	22.85	22.00
		1710.7	22.88	22.06
3MHz	1 RB high	1778.5	23.66	22.54
		1745.0	23.81	22.74
		1711.5	23.92	22.69
	1 RB low	1778.5	23.68	22.68
		1745.0	23.71	22.83
		1711.5	23.82	22.74
	50% RB mid	1778.5	22.73	21.73
		1745.0	22.82	21.90
		1711.5	22.88	22.02
	100% RB	1778.5	22.69	21.63
		1745.0	22.76	21.78
		1711.5	22.87	21.91
5MHz	1 RB high	1777.5	23.48	22.59
		1745.0	23.62	22.78
		1712.5	23.71	22.68
	1 RB low	1777.5	23.52	22.59
		1745.0	23.60	22.76
		1712.5	23.68	22.78
	50% RB mid	1777.5	22.68	21.76
		1745.0	22.80	21.88
		1712.5	22.90	21.96
	100% RB	1777.5	22.67	21.62
		1745.0	22.72	21.79
		1712.5	22.83	21.78
10MHz	1 RB high	1775.0	23.63	22.48
		1745.0	23.71	22.68

	1 RB low	1715.0	23.80	22.75
		1775.0	23.52	22.48
		1745.0	23.61	22.65
	50% RB mid	1715.0	23.75	22.79
		1775.0	22.72	21.73
		1745.0	22.83	21.82
	100% RB	1715.0	22.65	21.94
		1775.0	22.72	21.71
		1745.0	22.77	21.87
15MHz	1 RB high	1715.0	22.97	22.02
		1772.5	23.63	22.94
		1745.0	23.72	23.06
	1 RB low	1717.5	23.78	22.72
		1772.5	23.69	22.97
		1745.0	23.77	23.15
	50% RB mid	1717.5	23.78	22.69
		1772.5	22.90	21.81
		1745.0	22.89	21.85
	100% RB	1717.5	23.01	22.00
		1772.5	22.89	21.84
		1745.0	22.96	21.90
20MHz	1 RB high	1717.5	23.05	21.99
		1770.0	23.36	22.76
		1745.0	23.48	22.89
	1 RB low	1720.0	23.59	23.13
		1770.0	23.40	22.83
		1745.0	23.50	22.96
	50% RB mid	1720.0	23.54	23.06
		1770.0	22.74	21.71
		1745.0	22.85	21.85
100% RB	1720.0	22.94	21.92	
	1770.0	22.75	21.75	
	1745.0	22.94	21.91	
		1720.0	22.91	21.89

**LTE band 71**

Bandwidth	RB size/offset	Frequency (MHz)	Power(dBm)	
			QPSK	16QAM
5MHz	1 RB high	695.5	23.37	22.64
		680.5	23.31	22.24
		665.5	23.45	22.38
	1 RB low	695.5	23.39	22.61
		680.5	23.35	22.23
		665.5	23.39	22.29
	50% RB mid	695.5	22.50	21.65
		680.5	22.52	21.57
		665.5	22.57	21.46
	100% RB	695.5	22.46	21.48
		680.5	22.46	21.43
		665.5	22.57	21.49
10MHz	1 RB high	693	23.56	22.64
		680.5	23.52	22.61
		668	23.56	22.69
	1 RB low	693	23.51	22.64
		680.5	23.52	22.63
		668	23.49	22.60
	50% RB mid	693	22.63	21.61
		680.5	22.57	21.54
		668	22.59	21.64
	100% RB	693	22.67	21.59
		680.5	22.56	21.54
		668	22.62	21.59
15MHz	1 RB high	690.5	23.41	22.29
		680.5	23.41	22.78
		670.5	23.46	22.72
	1 RB low	690.5	23.33	22.21
		680.5	23.46	22.78
		670.5	23.49	22.70
	50% RB mid	690.5	22.61	21.58
		680.5	22.62	21.59
		670.5	22.67	21.63
	100% RB	690.5	22.63	21.57
		680.5	22.64	21.56
		670.5	22.69	21.63
20MHz	1 RB high	688	23.15	22.13



		680.5	23.17	22.18
		673	23.16	22.14
	1 RB low	688	23.12	22.10
		680.5	23.17	22.19
		673	23.15	22.13
	50% RB mid	688	22.47	21.48
		680.5	22.54	21.57
		673	22.58	21.49
	100% RB	688	22.49	21.52
		680.5	22.53	21.48
		673	22.49	21.51



### 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."

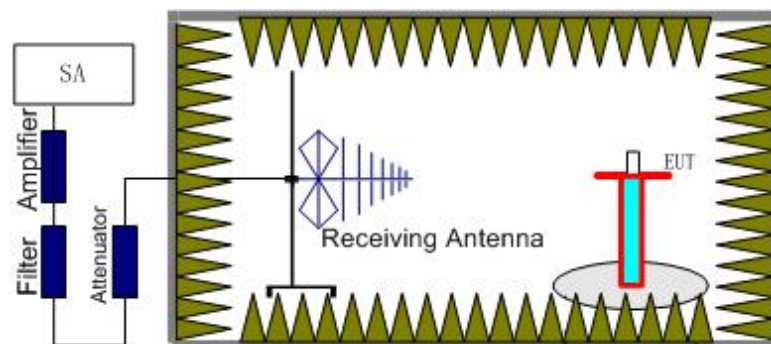
Rule Part 27.50(c) specifies "Portable stations (hand-held de-vices) are limited to 3 watts ERP."

Rule Part 27.50(a)(3) specifies "For mobile and portable stations transmitting in the 2305–2315 MHz band or the 2350–2360 MHz band, the average EIRP must not exceed 50 milliwatts within any 1 megahertz of authorized bandwidth, except that for mobile and portable stations compliant with 3GPP LTE standards or another advanced mobile broadband protocol that avoids concentrating energy at the edge of the operating band the average EIRP must not exceed 250 milliwatts within any 5 megahertz of authorized bandwidth but may exceed 50 milliwatts within any 1 megahertz of authorized bandwidth."

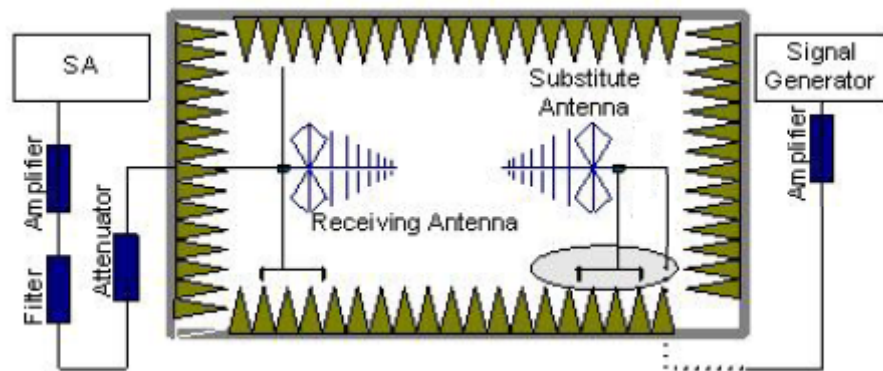
#### A.1.3.2 Method of Measurement

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:

$$\text{Power (EIRP)} = P_{Mea} - P_{Ag} - P_{cl} - G_a$$

5. This value is EIRP since the measurement is calibrated using an antenna of known gain (unit dBi) and known input power.
6. ERP can be calculated from EIRP by subtracting the gain of the dipole,  $ERP = EIRP - 2.15$ .

**A.1.3.3 Measurement result**

**LTE Band 2- EIRP 24. 232(b)**

**Limits:** ≤33dBm (2W)

**LTE Band 2\_1.4MHz\_QPSK**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>c</sub> (dB)	P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1850.70	-24.85	2.92	43.75	4.87	20.85	33.00	12.15	H
1880.00	-25.12	2.85	43.75	4.82	20.60	33.00	12.40	H
1909.30	-23.24	2.87	43.77	4.76	22.42	33.00	10.58	H

**LTE Band 2\_3MHz\_QPSK**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>c</sub> (dB)	P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1851.50	-24.77	2.87	43.75	4.87	20.98	33.00	12.02	H
1880.00	-25.64	2.85	43.75	4.82	20.08	33.00	12.92	H
1908.50	-23.30	2.89	43.78	4.76	22.35	33.00	10.65	H

**LTE Band 2\_5MHz\_QPSK**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>c</sub> (dB)	P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1852.50	-24.83	2.87	43.75	4.87	20.92	33.00	12.08	H
1880.00	-25.23	2.85	43.75	4.82	20.49	33.00	12.51	H
1907.50	-23.45	2.84	43.77	4.77	22.25	33.00	10.75	H

**LTE Band 2\_10MHz\_QPSK**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>c</sub> (dB)	P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1855.00	-25.18	2.88	43.74	4.86	20.54	33.00	12.46	H
1880.00	-25.21	2.85	43.75	4.82	20.51	33.00	12.49	H
1905.00	-23.09	2.87	43.77	4.77	22.58	33.00	10.42	H

**LTE Band 2\_15MHz\_QPSK**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>c</sub> (dB)	P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1857.50	-25.29	2.87	43.75	4.86	20.45	33.00	12.55	H
1880.00	-25.22	2.85	43.75	4.82	20.50	33.00	12.50	H
1902.50	-23.26	2.86	43.77	4.78	22.43	33.00	10.57	H

**LTE Band 2\_20 MHz\_QPSK**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>c</sub> (dB)	P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1860.00	-25.24	2.86	43.75	4.85	20.50	33.00	12.50	H
1880.00	-25.13	2.85	43.75	4.82	20.59	33.00	12.41	H
1900.00	-23.47	2.87	43.77	4.78	22.21	33.00	10.79	H



**LTE Band 2\_1.4MHz\_16QAM**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>c</sub> (dB)	P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1850.70	-26.08	2.92	43.75	4.87	19.62	33.00	13.38	H
1880.00	-26.11	2.85	43.75	4.82	19.61	33.00	13.39	H
1909.30	-24.18	2.87	43.77	4.76	21.48	33.00	11.52	H

**LTE Band 2\_3MHz\_16QAM**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>c</sub> (dB)	P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1851.50	-26.02	2.87	43.75	4.87	19.73	33.00	13.27	H
1880.00	-26.21	2.85	43.75	4.82	19.51	33.00	13.49	H
1908.50	-24.29	2.89	43.78	4.76	21.36	33.00	11.64	H

**LTE Band 2\_5MHz\_16QAM**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>c</sub> (dB)	P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1852.50	-26.04	2.87	43.75	4.87	19.71	33.00	13.29	H
1880.00	-26.06	2.85	43.75	4.82	19.66	33.00	13.34	H
1907.50	-24.35	2.84	43.77	4.77	21.35	33.00	11.65	H

**LTE Band 2\_10MHz\_16QAM**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>c</sub> (dB)	P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1855.00	-26.44	2.88	43.74	4.86	19.28	33.00	13.72	H
1880.00	-26.14	2.85	43.75	4.82	19.58	33.00	13.42	H
1905.00	-24.11	2.87	43.77	4.77	21.56	33.00	11.44	H

**LTE Band 2\_15MHz\_16QAM**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>c</sub> (dB)	P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1857.50	-26.49	2.87	43.75	4.86	19.25	33.00	13.75	H
1880.00	-26.08	2.85	43.75	4.82	19.64	33.00	13.36	H
1902.50	-24.49	2.86	43.77	4.78	21.20	33.00	11.80	H

**LTE Band 2\_20 MHz\_16QAM**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>c</sub> (dB)	P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1860.00	-26.49	2.86	43.75	4.85	19.25	33.00	13.75	H
1880.00	-25.98	2.85	43.75	4.82	19.74	33.00	13.26	H
1900.00	-24.72	2.87	43.77	4.78	20.96	33.00	12.04	H



**LTE Band 5- ERP 22.913(a)**

**Limits:** ≤38.45dBm (7W)

**LTE Band 5\_1.4MHz\_QPSK**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>ci</sub> (dB)	P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	Correction (dB)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
824.70	-19.82	2.26	45.79	0.95	2.15	22.51	38.45	15.94	H
836.50	-20.37	2.26	45.66	0.82	2.15	21.70	38.45	16.75	H
848.30	-20.16	2.27	45.55	0.80	2.15	21.77	38.45	16.68	H

**LTE Band 5\_3MHz\_QPSK**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>ci</sub> (dB)	P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	Correction (dB)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
825.50	-19.58	2.26	45.79	0.94	2.15	22.74	38.45	15.71	H
836.50	-19.95	2.26	45.66	0.82	2.15	22.12	38.45	16.33	H
847.50	-19.65	2.27	45.56	0.81	2.15	22.30	38.45	16.15	H

**LTE Band 5\_5MHz\_QPSK**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>ci</sub> (dB)	P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	Correction (dB)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
826.50	-19.34	2.25	45.77	0.93	2.15	22.96	38.45	15.49	H
836.50	-20.12	2.26	45.66	0.82	2.15	21.95	38.45	16.50	H
846.50	-19.57	2.26	45.56	0.82	2.15	22.40	38.45	16.05	H

**LTE Band 5\_10MHz\_QPSK**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>ci</sub> (dB)	P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	Correction (dB)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
829.00	-19.46	2.13	45.74	0.90	2.15	22.90	38.45	15.55	H
836.50	-20.22	2.26	45.66	0.82	2.15	21.85	38.45	16.60	H
844.00	-19.37	2.26	45.59	0.82	2.15	22.63	38.45	15.82	H



**LTE Band 5\_1.4MHz\_16QAM**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>ci</sub> (dB)	P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	Correction (dB)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
824.70	-21.10	2.26	45.79	0.95	2.15	21.23	38.45	17.22	H
836.50	-20.69	2.26	45.66	0.82	2.15	21.38	38.45	17.07	H
848.30	-21.20	2.27	45.55	0.80	2.15	20.73	38.45	17.72	H

**LTE Band 5\_3MHz\_16QAM**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>ci</sub> (dB)	P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	Correction (dB)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
825.50	-20.70	2.26	45.79	0.94	2.15	21.62	38.45	16.83	H
836.50	-20.61	2.26	45.66	0.82	2.15	21.46	38.45	16.99	H
847.50	-20.69	2.27	45.56	0.81	2.15	21.26	38.45	17.19	H

**LTE Band 5\_5MHz\_16QAM**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>ci</sub> (dB)	P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	Correction (dB)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
826.50	-20.68	2.25	45.77	0.93	2.15	21.62	38.45	16.83	H
836.50	-20.00	2.26	45.66	0.82	2.15	22.07	38.45	16.38	H
846.50	-20.67	2.26	45.56	0.82	2.15	21.30	38.45	17.15	H

**LTE Band 5\_10MHz\_16QAM**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>ci</sub> (dB)	P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	Correction (dB)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
829.00	-20.37	2.13	45.74	0.90	2.15	21.99	38.45	16.46	H
836.50	-20.31	2.26	45.66	0.82	2.15	21.76	38.45	16.69	H
844.00	-20.66	2.26	45.59	0.82	2.15	21.34	38.45	17.11	H



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

**Limits:** ≤34.77dBm (3W)

**LTE Band 12\_1.4MHz\_QPSK**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>ci</sub> (dB)	P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	Correction (dB)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
699.70	-27.89	1.90	44.66	0.77	2.15	13.49	34.77	21.28	V
707.50	-28.03	1.91	44.94	0.62	2.15	13.47	34.77	21.30	V
715.30	-27.80	1.92	45.26	0.50	2.15	13.89	34.77	20.88	V

**LTE Band 12\_3MHz\_QPSK**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>ci</sub> (dB)	P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	Correction (dB)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
700.50	-28.02	1.90	44.68	0.76	2.15	13.37	34.77	21.40	V
707.50	-28.11	1.91	44.94	0.62	2.15	13.39	34.77	21.38	H
714.50	-27.82	1.92	45.26	0.50	2.15	13.87	34.77	20.90	V

**LTE Band 12\_5MHz\_QPSK**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>ci</sub> (dB)	P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	Correction (dB)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
701.50	-27.85	1.90	44.81	0.74	2.15	13.65	34.77	21.12	V
707.50	-28.15	1.91	44.94	0.62	2.15	13.35	34.77	21.42	V
713.50	-27.95	1.92	45.22	0.50	2.15	13.70	34.77	21.07	V

**LTE Band 12\_10MHz\_QPSK**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>ci</sub> (dB)	P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	Correction (dB)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
704.00	-27.90	1.91	44.93	0.70	2.15	13.67	34.77	21.10	V
707.50	-28.20	1.91	44.94	0.62	2.15	13.30	34.77	21.47	V
711.00	-28.26	1.92	45.19	0.53	2.15	13.39	34.77	21.38	V



**LTE Band 12\_1.4MHz\_16QAM**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>ci</sub> (dB)	P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	Correction (dB)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
699.70	-28.87	1.90	44.66	0.77	2.15	12.51	34.77	22.26	V
707.50	-28.96	1.91	44.94	0.62	2.15	12.54	34.77	22.23	V
715.30	-28.53	1.92	45.26	0.50	2.15	13.16	34.77	21.61	V

**LTE Band 12\_3MHz\_16QAM**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>ci</sub> (dB)	P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	Correction (dB)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
700.50	-28.78	1.90	44.68	0.76	2.15	12.61	34.77	22.16	V
707.50	-29.05	1.91	44.94	0.62	2.15	12.45	34.77	22.32	V
714.50	-28.89	1.92	45.26	0.50	2.15	12.80	34.77	21.97	V

**LTE Band 12\_5MHz\_16QAM**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>ci</sub> (dB)	P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	Correction (dB)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
701.50	-28.83	1.90	44.81	0.74	2.15	12.67	34.77	22.10	V
707.50	-29.03	1.91	44.94	0.62	2.15	12.47	34.77	22.30	V
713.50	-28.68	1.92	45.22	0.50	2.15	12.97	34.77	21.80	V

**LTE Band 12\_10MHz\_16QAM**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>ci</sub> (dB)	P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	Correction (dB)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
704.00	-28.77	1.91	44.93	0.70	2.15	12.80	34.77	21.97	V
707.50	-29.09	1.91	44.94	0.62	2.15	12.41	34.77	22.36	V
711.00	-29.23	1.92	45.19	0.53	2.15	12.42	34.77	22.35	V





**LTE Band 13- ERP 27.50(b)(10)**

**Limits:** ≤34.77 dBm (3W)

**LTE Band 13\_5MHz\_QPSK**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>ci</sub> (dB)	P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	Correction (dB)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
779.50	-23.41	2.01	45.64	0.04	2.15	18.11	34.77	16.66	V
782.00	-23.17	2.01	45.65	0.09	2.15	18.41	34.77	16.36	V
784.50	-22.92	2.01	45.67	0.16	2.15	18.75	34.77	16.02	V

**LTE Band 13\_10MHz\_QPSK**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>ci</sub> (dB)	P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	Correction (dB)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
782.00	-22.94	2.01	45.65	0.09	2.15	18.64	34.77	16.13	V

**LTE Band 13\_5MHz\_16QAM**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>ci</sub> (dB)	P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	Correction (dB)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
779.50	-24.28	2.01	45.64	0.04	2.15	17.24	34.77	17.53	V
782.00	-24.34	2.01	45.65	0.09	2.15	17.24	34.77	17.53	V
784.50	-23.84	2.01	45.67	0.16	2.15	17.83	34.77	16.94	V

**LTE Band 13\_10MHz\_16QAM**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>ci</sub> (dB)	P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	Correction (dB)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
782.00	-24.26	2.01	45.65	0.09	2.15	17.32	34.77	17.45	V



**LTE Band 66- EIRP 27.50(d)**

**Limits:** ≤30dBm (1W)

**LTE Band 66\_1.4MHz\_QPSK**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>c</sub> (dB)	P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1710.70	-31.02	3.17	44.10	5.12	21.37	33.00	11.63	H
1745.00	-31.27	3.68	44.16	5.06	21.63	33.00	11.37	H
1779.30	-27.22	3.04	44.03	5.00	24.85	33.00	8.15	H

**LTE Band 66\_3MHz\_QPSK**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>c</sub> (dB)	P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1711.50	-31.49	3.40	44.10	5.12	21.13	33.00	11.87	H
1745.00	-31.38	3.68	44.16	5.06	21.52	33.00	11.48	H
1778.50	-27.30	3.04	44.03	5.00	24.77	33.00	8.23	H

**LTE Band 66\_5MHz\_QPSK**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>c</sub> (dB)	P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1712.50	-24.11	3.66	44.10	5.12	21.45	33.00	11.55	H
1745.00	-23.82	3.68	44.16	5.06	21.72	33.00	11.28	H
1777.50	-22.02	3.04	44.04	5.00	23.98	33.00	9.02	H

**LTE Band 66\_10MHz\_QPSK**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>c</sub> (dB)	P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1715.00	-24.24	3.56	44.10	5.11	21.41	33.00	11.59	H
1745.00	-23.78	3.68	44.16	5.06	21.76	33.00	11.24	H
1775.00	-21.91	3.05	44.05	5.01	24.09	33.00	8.91	H

**LTE Band 66\_15MHz\_QPSK**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>c</sub> (dB)	P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1717.50	-24.32	3.47	44.11	5.11	21.43	33.00	11.57	H
1745.00	-23.81	3.68	44.16	5.06	21.73	33.00	11.27	H
1772.50	-22.41	3.05	44.06	5.01	23.61	33.00	9.39	H

**LTE Band 66\_20MHz\_QPSK**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>c</sub> (dB)	P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1720.00	-24.25	3.37	44.11	5.10	21.59	33.00	11.41	H
1745.00	-23.90	3.68	44.16	5.06	21.64	33.00	11.36	V
1770.00	-22.11	3.05	44.07	5.01	23.93	33.00	9.07	H

**LTE Band 66\_1.4MHz\_16QAM**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>c</sub> (dB)	P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1710.70	-31.97	3.17	44.10	5.12	20.42	33.00	12.58	H
1745.00	-32.14	3.68	44.16	5.06	20.76	33.00	12.24	H
1779.30	-28.13	3.04	44.03	5.00	23.94	33.00	9.06	H

**LTE Band 66\_3MHz\_16QAM**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>c</sub> (dB)	P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1711.50	-32.37	3.40	44.10	5.12	20.25	33.00	12.75	H
1745.00	-32.10	3.68	44.16	5.06	20.80	33.00	12.20	V
1778.50	-28.22	3.04	44.03	5.00	23.85	33.00	9.15	H

**LTE Band 66\_5MHz\_16QAM**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>c</sub> (dB)	P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1712.50	-24.92	3.66	44.10	5.12	20.64	33.00	12.36	H
1745.00	-24.56	3.68	44.16	5.06	20.98	33.00	12.02	H
1777.50	-22.94	3.04	44.04	5.00	23.06	33.00	9.94	H

**LTE Band 66\_10MHz\_16QAM**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>c</sub> (dB)	P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1715.00	-24.75	3.56	44.10	5.11	20.90	33.00	12.10	H
1745.00	-24.51	3.68	44.16	5.06	21.03	33.00	11.97	H
1775.00	-22.66	3.05	44.05	5.01	23.34	33.00	9.66	H

**LTE Band 66\_15MHz\_16QAM**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>c</sub> (dB)	P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1717.50	-25.09	3.47	44.11	5.11	20.66	33.00	12.34	H
1745.00	-24.58	3.68	44.16	5.06	20.96	33.00	12.04	H
1772.50	-23.49	3.05	44.06	5.01	22.53	33.00	10.47	H

**LTE Band 66\_20MHz\_16QAM**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>c</sub> (dB)	P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Margin(dB)	Polarization
1720.00	-25.28	3.37	44.11	5.10	20.56	33.00	12.44	H
1745.00	-24.47	3.68	44.16	5.06	21.07	33.00	11.93	H
1770.00	-23.25	3.05	44.07	5.01	22.79	33.00	10.21	H



**LTE Band 71- ERP 27.50(c)(10)**

**Limits:** ≤34.77 dBm (3W)

**LTE Band 71\_5MHz\_QPSK**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>c</sub> (dB)	P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	Correction (dB)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
665.50	-30.21	1.87	44.73	0.78	2.15	11.28	34.77	23.49	V
680.50	-28.91	1.88	44.72	0.78	2.15	12.55	34.77	22.22	V
695.50	-28.11	1.89	44.67	0.77	2.15	13.29	34.77	21.48	V

**LTE Band 71\_10MHz\_QPSK**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>c</sub> (dB)	P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	Correction (dB)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
668.00	-29.84	1.87	44.75	0.78	2.15	11.68	34.77	23.09	V
680.50	-28.74	1.88	44.72	0.78	2.15	12.73	34.77	22.04	V
693.00	-27.98	1.89	44.67	0.77	2.15	13.42	34.77	21.35	V

**LTE Band 71\_15MHz\_QPSK**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>c</sub> (dB)	P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	Correction (dB)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
670.50	-29.12	1.88	44.75	0.78	2.15	12.38	34.77	22.39	V
680.50	-29.12	1.88	44.72	0.78	2.15	12.34	34.77	22.43	V
690.50	-28.25	1.89	44.73	0.77	2.15	13.22	34.77	21.55	V

**LTE Band 71\_20MHz\_QPSK**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>c</sub> (dB)	P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	Correction (dB)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
673.00	-29.75	1.88	44.71	0.78	2.15	11.71	34.77	23.06	V
680.50	-29.13	1.88	44.72	0.78	2.15	12.33	34.77	22.44	V
688.00	-28.66	1.89	44.72	0.77	2.15	12.80	34.77	21.97	V



**LTE Band 71\_5MHz\_16QAM**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)	P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	Correction (dB)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
665.50	-31.05	1.87	44.73	0.78	2.15	10.44	34.77	24.33	V
680.50	-29.83	1.88	44.72	0.78	2.15	11.63	34.77	23.14	V
695.50	-28.87	1.89	44.67	0.77	2.15	12.53	34.77	22.24	V

**LTE Band 71\_10MHz\_16QAM**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)	P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	Correction (dB)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
668.00	-30.77	1.87	44.75	0.78	2.15	10.75	34.77	24.02	V
680.50	-29.91	1.88	44.72	0.78	2.15	11.56	34.77	23.21	V
693.00	-28.92	1.89	44.67	0.77	2.15	12.48	34.77	22.29	V

**LTE Band 71\_15MHz\_16QAM**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)	P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	Correction (dB)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
670.50	-30.46	1.88	44.75	0.78	2.15	11.04	34.77	23.73	V
680.50	-29.93	1.88	44.72	0.78	2.15	11.53	34.77	23.24	V
690.50	-29.05	1.89	44.73	0.77	2.15	12.42	34.77	22.35	V

**LTE Band 71\_20MHz\_16QAM**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)	P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	Correction (dB)	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
673.00	-30.73	1.88	44.71	0.78	2.15	10.73	34.77	24.04	V
680.50	-29.98	1.88	44.72	0.78	2.15	11.49	34.77	23.28	V
688.00	-29.42	1.89	44.72	0.77	2.15	12.04	34.77	22.73	V

Peak EIRP(dBm) = P<sub>Mea</sub>(-27.22dBm) - G<sub>a</sub> (-5.00dBi) - P<sub>Ag</sub> (-44.03dB) - P<sub>cl</sub> (3.04dB) = 24.85dBm

**ANALYZER SETTINGS:**

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

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

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

## A.2 EMISSION LIMIT

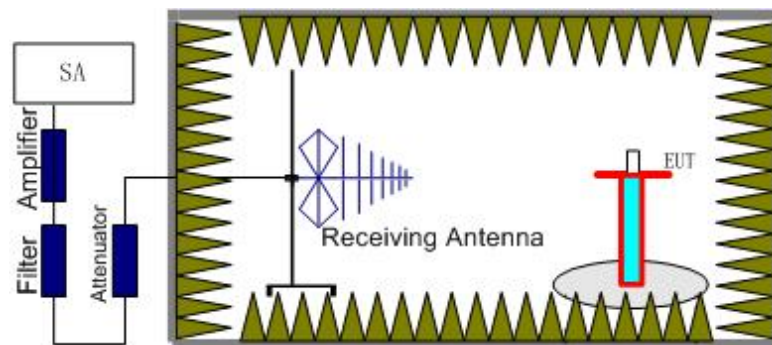
### A.2.1 Measurement Method

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

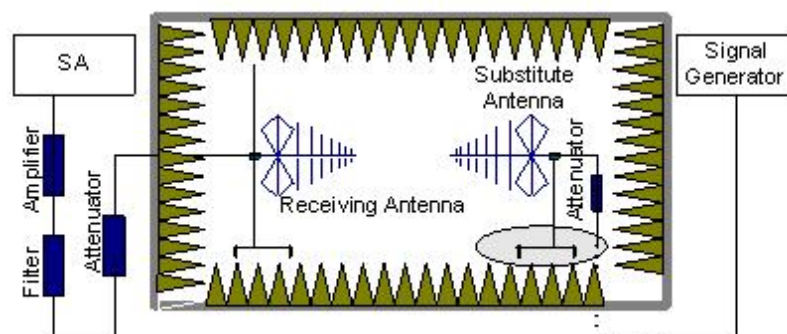
The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier. The resolution bandwidth is set 1MHz. The spectrum was scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of the LTE Bands 2 5 12 13 66 71.

#### The procedure of radiated spurious emissions is as follows:

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



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



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

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

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

### A.2.2 Measurement Limit

Part 22.917, Part 24.238(a), Part 27.53(g), Part 27.53(h) specify that the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB.

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

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

### A.2.3 Measurement Results

Radiated emissions measurements were made only at the upper, middle, and lower carrier frequencies of the LTE Bands 2 5 12 13 66 71. 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 5 12 13 66 71 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 30 MHz to 26 GHz.

**LTE Band 2, 1.4MHz, QPSK, Channel 18607**

Frequency(MHz )	P <sub>Mea</sub> (dB m)	Path Loss	Antenna Gain	Peak EIRP(dBm )	Limit (dBm)	Margin(dB )	Polarization
3701.02	-49.52	6.42	8.48	-47.46	-13.00	34.46	H
5554.02	-47.36	7.19	10.59	-43.96	-13.00	30.96	H
7405.01	-37.27	8.13	12.09	-33.31	-13.00	20.31	H
9260.01	-41.15	9.06	13.26	-36.95	-13.00	23.95	V
11113.01	-51.74	9.78	13.18	-48.34	-13.00	35.34	H
13001.01	-48.99	10.47	13.50	-45.96	-13.00	32.96	H

**LTE Band 2, 1.4MHz, QPSK, Channel 18900**

Frequency(MHz )	P <sub>Mea</sub> (dB m)	Path Loss	Antenna Gain	Peak EIRP(dBm )	Limit (dBm)	Margin(dB )	Polarization
3760.02	-46.84	6.26	8.56	-44.54	-13.00	31.54	H
5645.02	-55.18	7.27	10.57	-51.88	-13.00	38.88	V
7524.01	-35.69	8.29	12.22	-31.76	-13.00	18.76	H
9409.01	-49.24	9.08	13.35	-44.97	-13.00	31.97	H
11239.01	-50.80	9.63	13.15	-47.28	-13.00	34.28	H
13161.01	-47.09	10.67	13.73	-44.03	-13.00	31.03	H

**LTE Band 2, 1.4MHz, QPSK, Channel 19193**

Frequency(MHz )	P <sub>Mea</sub> (dB m)	Path Loss	Antenna Gain	Peak EIRP(dBm )	Limit (dBm)	Margin(dB )	Polarization
3819.02	-48.59	6.08	8.65	-46.02	-13.00	33.02	H
5731.02	-52.67	7.29	10.55	-49.41	-13.00	36.41	H
7641.01	-33.68	8.16	12.31	-29.53	-13.00	16.53	H
9553.01	-40.05	9.35	13.35	-36.05	-13.00	23.05	H
11469.01	-50.39	9.89	13.11	-47.17	-13.00	34.17	H
13390.01	-47.31	10.57	14.05	-43.83	-13.00	30.83	H



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

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain	Peak EIRP(dBm)	Limit (dBm)	Margin(dB)	Polarization
3701.02	-49.54	6.42	8.48	-47.48	-13.00	34.48	H
5556.02	-48.51	7.19	10.59	-45.11	-13.00	32.11	H
7406.01	-40.11	8.13	12.09	-36.15	-13.00	23.15	H
9259.01	-40.99	9.06	13.26	-36.79	-13.00	23.79	H
11147.01	-51.67	9.63	13.17	-48.13	-13.00	35.13	V
12922.01	-48.24	10.50	13.45	-45.29	-13.00	32.29	V

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

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain	Peak EIRP(dBm)	Limit (dBm)	Margin(dB)	Polarization
3760.02	-46.00	6.26	8.56	-43.70	-13.00	30.70	H
5644.02	-55.15	7.27	10.57	-51.85	-13.00	38.85	V
7525.01	-40.61	8.29	12.22	-36.68	-13.00	23.68	H
9406.01	-49.17	9.07	13.34	-44.90	-13.00	31.90	H
11245.01	-50.96	9.67	13.15	-47.48	-13.00	34.48	H
13130.01	-47.01	10.80	13.68	-44.13	-13.00	31.13	H

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

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain	Peak EIRP(dBm)	Limit (dBm)	Margin(dB)	Polarization
3819.02	-48.66	6.08	8.65	-46.09	-13.00	33.09	H
5731.02	-53.73	7.29	10.55	-50.47	-13.00	37.47	H
7641.01	-33.05	8.16	12.31	-28.90	-13.00	15.90	H
9553.01	-39.48	9.35	13.35	-35.48	-13.00	22.48	H
11500.01	-49.98	9.81	13.10	-46.69	-13.00	33.69	V
13376.01	-47.26	10.57	14.03	-43.80	-13.00	30.80	H



**LTE Band 5, 1.4MHz, QPSK, Channel 20407**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain	Correction (dB)	Peak ERP(dBm)	Limit (dBm)	Margin(dB)	Polarization
1650.01	-58.92	3.57	5.23	2.15	-59.41	-13.00	46.41	H
2474.00	-48.09	4.60	6.02	2.15	-48.82	-13.00	35.82	H
3299.02	-44.71	5.29	7.72	2.15	-44.43	-13.00	31.43	H
4130.02	-35.67	6.05	9.03	2.15	-34.84	-13.00	21.84	H
4954.01	-47.21	6.68	9.85	2.15	-46.19	-13.00	33.19	H
5782.01	-53.96	7.22	10.54	2.15	-52.79	-13.00	39.79	H

**LTE Band 5, 1.4MHz, QPSK, Channel 20525**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain	Correction (dB)	Peak ERP(dBm)	Limit (dBm)	Margin(dB)	Polarization
1673.01	-49.98	3.58	5.19	2.15	-50.52	-13.00	37.52	H
2510.00	-52.27	4.63	6.12	2.15	-52.93	-13.00	39.93	H
3346.02	-38.34	5.31	7.83	2.15	-37.97	-13.00	24.97	H
4189.02	-36.88	6.18	9.09	2.15	-36.12	-13.00	23.12	H
5023.01	-47.84	6.56	9.93	2.15	-46.62	-13.00	33.62	V
5861.01	-53.44	7.27	10.53	2.15	-52.33	-13.00	39.33	H

**LTE Band 5, 1.4MHz, QPSK, Channel 20643**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain	Correction (dB)	Peak ERP(dBm)	Limit (dBm)	Margin(dB)	Polarization
1697.01	-53.63	3.60	5.15	2.15	-54.23	-13.00	41.23	H
2545.00	-46.44	4.66	6.18	2.15	-47.07	-13.00	34.07	H
3394.02	-52.09	5.36	7.95	2.15	-51.65	-13.00	38.65	H
4247.02	-43.89	6.24	9.15	2.15	-43.13	-13.00	30.13	H
5102.01	-55.06	6.78	10.04	2.15	-53.95	-13.00	40.95	V
5932.01	-53.22	7.47	10.51	2.15	-52.33	-13.00	39.33	H



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

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain	Correction (dB)	Peak ERP(dBm)	Limit (dBm)	Margin(dB)	Polarization
1650.01	-58.19	3.57	5.23	2.15	-58.68	-13.00	45.68	H
2474.00	-48.26	4.60	6.02	2.15	-48.99	-13.00	35.99	H
3299.02	-45.29	5.29	7.72	2.15	-45.01	-13.00	32.01	H
4128.02	-35.08	6.04	9.03	2.15	-34.24	-13.00	21.24	H
4955.01	-48.22	6.68	9.86	2.15	-47.19	-13.00	34.19	H
5765.01	-54.06	7.24	10.55	2.15	-52.90	-13.00	39.90	H

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

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain	Correction (dB)	Peak ERP(dBm)	Limit (dBm)	Margin(dB)	Polarization
1673.01	-49.99	3.58	5.19	2.15	-50.53	-13.00	37.53	H
2509.00	-52.01	4.63	6.12	2.15	-52.67	-13.00	39.67	H
3346.02	-40.40	5.31	7.83	2.15	-40.03	-13.00	27.03	H
4186.02	-32.75	6.17	9.09	2.15	-31.98	-13.00	18.98	H
5022.01	-47.21	6.57	9.93	2.15	-46.00	-13.00	33.00	H
5852.01	-53.09	7.24	10.53	2.15	-51.95	-13.00	38.95	V

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

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain	Correction (dB)	Peak ERP(dBm)	Limit (dBm)	Margin(dB)	Polarization
1697.01	-53.11	3.60	5.15	2.15	-53.71	-13.00	40.71	H
2545.00	-45.77	4.66	6.18	2.15	-46.40	-13.00	33.40	H
3394.02	-48.10	5.36	7.95	2.15	-47.66	-13.00	34.66	H
4246.02	-39.91	6.24	9.15	2.15	-39.15	-13.00	26.15	H
5093.01	-48.83	6.75	10.03	2.15	-47.70	-13.00	34.70	V
5924.01	-52.95	7.47	10.52	2.15	-52.05	-13.00	39.05	H



**LTE Band 12, 1.4MHz, QPSK, Channel 23017**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain	Correction (dB)	Peak ERP(dBm)	Limit (dBm)	Margin(dB)	Polarization
1400.01	-50.33	3.24	4.98	2.15	-50.74	-13.00	37.74	V
2099.00	-43.32	4.19	4.90	2.15	-44.76	-13.00	31.76	H
2799.00	-48.81	4.91	6.64	2.15	-49.23	-13.00	36.23	V
3499.02	-51.00	5.52	8.20	2.15	-50.47	-13.00	37.47	H
4202.02	-43.71	6.21	9.10	2.15	-42.97	-13.00	29.97	H
4908.01	-55.11	6.73	9.81	2.15	-54.18	-13.00	41.18	H

**LTE Band 12, 1.4MHz, QPSK, Channel 23095**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain	Correction (dB)	Peak ERP(dBm)	Limit (dBm)	Margin(dB)	Polarization
1415.01	-55.75	3.25	5.06	2.15	-56.09	-13.00	43.09	V
2123.00	-51.94	4.21	4.97	2.15	-53.33	-13.00	40.33	H
2830.00	-46.80	4.95	6.69	2.15	-47.21	-13.00	34.21	V
3538.02	-53.84	5.70	8.25	2.15	-53.44	-13.00	40.44	H
4249.02	-45.64	6.24	9.15	2.15	-44.88	-13.00	31.88	H
4945.01	-54.88	6.70	9.85	2.15	-53.88	-13.00	40.88	V

**LTE Band 12, 1.4MHz, QPSK, Channel 23173**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain	Correction (dB)	Peak ERP(dBm)	Limit (dBm)	Margin(dB)	Polarization
1431.01	-54.02	3.28	5.14	2.15	-54.31	-13.00	41.31	V
2146.00	-51.87	4.24	5.04	2.15	-53.22	-13.00	40.22	H
2861.00	-40.12	4.96	6.75	2.15	-40.48	-13.00	27.48	V
3577.02	-49.53	6.10	8.31	2.15	-49.47	-13.00	36.47	H
4293.02	-40.99	6.20	9.19	2.15	-40.15	-13.00	27.15	H
5009.01	-52.96	6.59	9.91	2.15	-51.79	-13.00	38.79	H



**LTE Band 12, 1.4MHz, 16QAM, Channel 23017**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain	Correction (dB)	Peak ERP(dBm)	Limit (dBm)	Margin(dB)	Polarization
1400.01	-51.10	3.24	4.98	2.15	-51.51	-13.00	38.51	H
2099.00	-43.88	4.19	4.90	2.15	-45.32	-13.00	32.32	H
2799.00	-50.15	4.91	6.64	2.15	-50.57	-13.00	37.57	H
3499.02	-52.30	5.52	8.20	2.15	-51.77	-13.00	38.77	H
4203.02	-43.20	6.21	9.10	2.15	-42.46	-13.00	29.46	H
4905.01	-54.65	6.73	9.81	2.15	-53.72	-13.00	40.72	H

**LTE Band 12, 1.4MHz 16QAM, Channel 23095**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain	Correction (dB)	Peak ERP(dBm)	Limit (dBm)	Margin(dB)	Polarization
1415.01	-56.84	3.25	5.06	2.15	-57.18	-13.00	44.18	V
2123.00	-53.35	4.21	4.97	2.15	-54.74	-13.00	41.74	H
2830.00	-48.32	4.95	6.69	2.15	-48.73	-13.00	35.73	H
3538.02	-54.71	5.70	8.25	2.15	-54.31	-13.00	41.31	H
4247.02	-49.20	6.24	9.15	2.15	-48.44	-13.00	35.44	H
4959.01	-55.50	6.67	9.86	2.15	-54.46	-13.00	41.46	V

**LTE Band 12, 1.4MHz, 16QAM, Channel 23173**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain	Correction (dB)	Peak ERP(dBm)	Limit (dBm)	Margin(dB)	Polarization
1431.01	-52.60	3.28	5.14	2.15	-52.89	-13.00	39.89	V
2146.00	-50.85	4.24	5.04	2.15	-52.20	-13.00	39.20	H
2862.00	-41.37	4.96	6.75	2.15	-41.73	-13.00	28.73	V
3577.02	-50.42	6.10	8.31	2.15	-50.36	-13.00	37.36	H
4295.02	-42.56	6.20	9.20	2.15	-41.71	-13.00	28.71	H
5013.01	-55.03	6.58	9.92	2.15	-53.84	-13.00	40.84	H



**LTE Band 13, 5MHz, QPSK, Channel 23205**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain	Correction (dB)	Peak ERP(dBm)	Limit (dBm)	Margin(dB)	Polarization
1554.01	-60.15	3.47	5.40	2.15	-60.37	-13.00	47.37	H
2346.00	-54.78	4.45	5.64	2.15	-55.74	-13.00	42.74	V
3118.02	-51.73	5.38	7.28	2.15	-51.98	-13.00	38.98	H
3898.02	-48.83	6.11	8.76	2.15	-48.33	-13.00	35.33	H
4680.02	-51.10	6.49	9.58	2.15	-50.16	-13.00	37.16	H
5454.01	-55.21	6.89	10.54	2.15	-53.71	-13.00	40.71	V

**LTE Band 13, 5MHz, QPSK, Channel 23230**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain	Correction (dB)	Peak ERP(dBm)	Limit (dBm)	Margin(dB)	Polarization
1567.01	-59.82	3.48	5.38	2.15	-60.07	-13.00	47.07	H
2356.00	-53.98	4.46	5.67	2.15	-54.92	-13.00	41.92	V
3113.02	-53.85	5.36	7.27	2.15	-54.09	-13.00	41.09	H
3910.02	-48.63	6.12	8.77	2.15	-48.13	-13.00	35.13	H
4695.02	-54.69	6.50	9.60	2.15	-53.74	-13.00	40.74	H
5465.01	-55.20	6.93	10.55	2.15	-53.73	-13.00	40.73	V

**LTE Band 13, 5MHz, QPSK, Channel 23255**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain	Correction (dB)	Peak ERP(dBm)	Limit (dBm)	Margin(dB)	Polarization
1571.01	-60.56	3.49	5.37	2.15	-60.83	-13.00	47.83	V
2357.00	-53.53	4.47	5.67	2.15	-54.48	-13.00	41.48	V
3136.02	-54.02	5.39	7.33	2.15	-54.23	-13.00	41.23	H
3923.02	-47.89	6.12	8.79	2.15	-47.37	-13.00	34.37	H
4713.02	-51.51	6.52	9.61	2.15	-50.57	-13.00	37.57	H
5505.01	-54.87	7.08	10.60	2.15	-53.50	-13.00	40.50	H



**LTE Band 13, 5MHz, 16QAM, Channel 23205**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain	Correction (dB)	Peak ERP(dBm)	Limit (dBm)	Margin(dB)	Polarization
1554.01	-60.61	3.47	5.40	2.15	-60.83	-13.00	47.83	H
2346.00	-54.20	4.45	5.64	2.15	-55.16	-13.00	42.16	H
3119.02	-52.04	5.38	7.29	2.15	-52.28	-13.00	39.28	H
3899.02	-48.08	6.11	8.76	2.15	-47.58	-13.00	34.58	H
4682.02	-54.07	6.49	9.58	2.15	-53.13	-13.00	40.13	H
5452.01	-55.09	6.88	10.53	2.15	-53.59	-13.00	40.59	H

**LTE Band 13, 5 MHz, 16QAM, Channel 23230**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain	Correction (dB)	Peak ERP(dBm)	Limit (dBm)	Margin(dB)	Polarization
1567.01	-60.11	3.48	5.38	2.15	-60.36	-13.00	47.36	H
2357.00	-53.77	4.47	5.67	2.15	-54.72	-13.00	41.72	V
3122.02	-53.99	5.39	7.29	2.15	-54.24	-13.00	41.24	H
3911.02	-49.74	6.12	8.78	2.15	-49.23	-13.00	36.23	H
4705.02	-54.52	6.51	9.61	2.15	-53.57	-13.00	40.57	H
5478.01	-55.37	6.98	10.57	2.15	-53.93	-13.00	40.93	H

**LTE Band13, 5MHz, 16QAM, Channel 23255**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain	Correction (dB)	Peak ERP(dBm)	Limit (dBm)	Margin(dB)	Polarization
1564.01	-60.06	3.48	5.38	2.15	-60.31	-13.00	47.31	H
2357.00	-54.26	4.47	5.67	2.15	-55.21	-13.00	42.21	V
3130.02	-53.87	5.40	7.31	2.15	-54.11	-13.00	41.11	H
3923.02	-47.44	6.12	8.79	2.15	-46.92	-13.00	33.92	H
4711.02	-51.64	6.51	9.61	2.15	-50.69	-13.00	37.69	H
5501.01	-54.91	7.06	10.60	2.15	-53.52	-13.00	40.52	V

**LTE Band 66, 1.4MHz QPSK, Channel 131979**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain	Peak EIRP(dBm)	Limit (dBm)	Margin(dB)	Polarization
3422.02	-46.58	5.38	8.01	-43.95	-13.00	30.95	H
5137.02	-50.97	6.86	10.09	-47.74	-13.00	34.74	H
6846.01	-42.86	7.83	11.42	-39.27	-13.00	26.27	H
8557.01	-45.67	8.57	13.01	-41.23	-13.00	28.23	H
10264.01	-52.19	9.52	13.01	-48.70	-13.00	35.70	H
11979.01	-49.04	10.15	13.00	-46.19	-13.00	33.19	V

**LTE Band 66, 1.4MHz, QPSK, Channel 132322**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain	Peak EIRP(dBm)	Limit (dBm)	Margin(dB)	Polarization
3490.02	-45.93	5.50	8.18	-43.25	-13.00	30.25	H
5237.02	-53.82	7.00	10.23	-50.59	-13.00	37.59	V
6983.01	-44.97	8.17	11.58	-41.56	-13.00	28.56	H
8729.01	-49.73	8.45	13.05	-45.13	-13.00	32.13	H
10472.01	-51.77	9.69	13.09	-48.37	-13.00	35.37	H
12214.01	-49.25	10.05	13.09	-46.21	-13.00	33.21	H

**LTE Band 66, 1.4MHz, QPSK, Channel 132665**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain	Peak EIRP(dBm)	Limit (dBm)	Margin(dB)	Polarization
3559.02	-43.19	5.92	8.28	-40.83	-13.00	27.83	H
5342.02	-51.84	6.95	10.38	-48.41	-13.00	35.41	V
7122.01	-44.51	8.16	11.75	-40.92	-13.00	27.92	H
8900.01	-47.38	8.85	13.08	-43.15	-13.00	30.15	V
10676.01	-51.19	9.30	13.14	-47.35	-13.00	34.35	V
12456.01	-49.77	10.29	13.18	-46.88	-13.00	33.88	V



**LTE Band 66, 1.4MHz, 16QAM, Channel 131979**

Frequency(MHz )	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain	Peak EIRP(dBm )	Limit (dBm)	Margin(dB )	Polarization
3421.02	-47.62	5.38	8.01	-44.99	-13.00	31.99	H
5137.02	-49.63	6.86	10.09	-46.40	-13.00	33.40	H
6846.01	-42.66	7.83	11.42	-39.07	-13.00	26.07	H
8557.01	-49.47	8.57	13.01	-45.03	-13.00	32.03	H
10268.01	-52.82	9.53	13.01	-49.34	-13.00	36.34	V
11975.01	-50.29	10.17	13.00	-47.46	-13.00	34.46	H

**LTE Band 66, 1.4MHz, 16QAM, Channel 132322**

Frequency(MHz )	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain	Peak EIRP(dBm )	Limit (dBm)	Margin(dB )	Polarization
3490.02	-45.98	5.50	8.18	-43.30	-13.00	30.30	H
5237.02	-53.76	7.00	10.23	-50.53	-13.00	37.53	H
6983.01	-44.95	8.17	11.58	-41.54	-13.00	28.54	H
8729.01	-48.10	8.45	13.05	-43.50	-13.00	30.50	H
10469.01	-51.76	9.70	13.09	-48.37	-13.00	35.37	V
12214.01	-49.39	10.05	13.09	-46.35	-13.00	33.35	H

**LTE Band 66, 1.4MHz, 16QAM, Channel 132665**

Frequency(MHz )	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain	Peak EIRP(dBm )	Limit (dBm)	Margin(dB )	Polarization
3559.02	-43.96	5.92	8.28	-41.60	-13.00	28.60	H
5341.02	-52.82	6.95	10.38	-49.39	-13.00	36.39	H
7121.01	-44.06	8.16	11.75	-40.47	-13.00	27.47	H
8900.01	-48.04	8.85	13.08	-43.81	-13.00	30.81	V
10677.01	-51.43	9.30	13.14	-47.59	-13.00	34.59	V
12458.01	-49.33	10.29	13.18	-46.44	-13.00	33.44	H



**LTE Band 71, 5MHz, QPSK, Channel 133147**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain	Correction (dB)	Peak ERP(dBm)	Limit (dBm)	Margin(dB)	Polarization
1331.01	-51.97	3.15	4.62	2.15	-52.65	-13.00	39.65	H
1983.01	-55.25	4.00	4.63	2.15	-56.77	-13.00	43.77	V
2663.00	-51.55	4.75	6.39	2.15	-52.06	-13.00	39.06	H
3328.02	-52.39	5.30	7.79	2.15	-52.05	-13.00	39.05	H
3994.02	-50.35	6.07	8.89	2.15	-49.68	-13.00	36.68	H
4688.02	-54.06	6.50	9.59	2.15	-53.12	-13.00	40.12	H

**LTE Band 71, 5MHz, QPSK, Channel 133297**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain	Correction (dB)	Peak ERP(dBm)	Limit (dBm)	Margin(dB)	Polarization
1361.01	-53.16	3.19	4.78	2.15	-53.72	-13.00	40.72	V
2042.00	-50.41	4.14	4.73	2.15	-51.97	-13.00	38.97	H
2732.00	-51.37	4.82	6.52	2.15	-51.82	-13.00	38.82	H
3404.02	-52.76	5.37	7.97	2.15	-52.31	-13.00	39.31	H
4088.02	-47.05	6.04	8.99	2.15	-46.25	-13.00	33.25	H
4769.01	-55.13	6.61	9.67	2.15	-54.22	-13.00	41.22	H

**LTE Band 71, 5MHz, QPSK, Channel 133447**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain	Correction (dB)	Peak ERP(dBm)	Limit (dBm)	Margin(dB)	Polarization
1407.01	-58.41	3.24	5.02	2.15	-58.78	-13.00	45.78	H
2087.00	-54.72	4.18	4.86	2.15	-56.19	-13.00	43.19	H
2755.00	-52.11	4.85	6.56	2.15	-52.55	-13.00	39.55	H
3448.02	-55.07	5.43	8.08	2.15	-54.57	-13.00	41.57	H
4175.02	-49.80	6.15	9.08	2.15	-49.02	-13.00	36.02	H
4865.01	-54.95	6.72	9.77	2.15	-54.05	-13.00	41.05	H



**LTE Band 71, 5MHz, 16QAM, Channel 133147**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain	Correction (dB)	Peak ERP(dBm)	Limit (dBm)	Margin(dB)	Polarization
1331.01	-53.19	3.15	4.62	2.15	-53.87	-13.00	40.87	V
1969.01	-55.02	3.96	4.66	2.15	-56.47	-13.00	43.47	V
2645.00	-51.71	4.74	6.36	2.15	-52.24	-13.00	39.24	V
3328.02	-52.85	5.30	7.79	2.15	-52.51	-13.00	39.51	H
3994.02	-49.85	6.07	8.89	2.15	-49.18	-13.00	36.18	H
4685.02	-52.80	6.49	9.59	2.15	-51.85	-13.00	38.85	V

**LTE Band 71, 5MHz, 16QAM, Channel 133297**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain	Correction (dB)	Peak ERP(dBm)	Limit (dBm)	Margin(dB)	Polarization
1361.01	-52.90	3.19	4.78	2.15	-53.46	-13.00	40.46	V
2042.00	-52.98	4.14	4.73	2.15	-54.54	-13.00	41.54	H
2706.00	-51.57	4.79	6.47	2.15	-52.04	-13.00	39.04	H
3403.02	-53.19	5.36	7.97	2.15	-52.73	-13.00	39.73	H
4088.02	-47.50	6.04	8.99	2.15	-46.70	-13.00	33.70	H
4734.02	-54.77	6.54	9.63	2.15	-53.83	-13.00	40.83	H

**LTE Band 71, 5MHz, 16QAM, Channel 133447**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain	Correction (dB)	Peak ERP(dBm)	Limit (dBm)	Margin(dB)	Polarization
1391.01	-56.43	3.22	4.93	2.15	-56.87	-13.00	43.87	V
2087.00	-54.07	4.18	4.86	2.15	-55.54	-13.00	42.54	H
2803.00	-51.87	4.92	6.65	2.15	-52.29	-13.00	39.29	H
3459.02	-55.32	5.45	8.10	2.15	-54.82	-13.00	41.82	H
4177.02	-50.22	6.15	9.08	2.15	-49.44	-13.00	36.44	H
4844.01	-54.30	6.72	9.74	2.15	-53.43	-13.00	40.43	V

Note: The maximum value of expanded measurement uncertainty for this test item is  $U = 4.2$  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°C.
3. With the EUT, powered via nominal voltage, connected to the CMW500 and in a simulated call on middle channel for LTE bands 2 5 12 13 66 71, 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°C increments from 0°C to +50°C. 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°C.
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 °C increments from 0°C to +50°C. Allow at least 1.5 hours at each temperature, unpowered, before making measurements.
9. At all temperature levels hold the temperature to +/- 0.5°C during the measurement procedure.

#### **A.3.2 Measurement Limit**

According to the JTC standard the frequency stability of the carrier shall be accurate to within 0.1 ppm of the received frequency from the base station. This accuracy is sufficient to meet Sec. 24.235, Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. As this transceiver is considered "Hand carried, battery powered equipment" Section 2.1055(d) (2) applies. This requires that the lower voltage for frequency stability testing be specified by the manufacturer. This transceiver is specified to operate with an input voltage of between 3.5VDC and 4.4VDC, with a nominal voltage of 3.8VDC. Operation above or below these voltage limits is prohibited by transceiver software in order to prevent improper operation as well as to protect components from overstress. These voltages represent a tolerance from -5.4% to 10.8%. For the purposes of measuring frequency stability these voltage limits are to be used.

### A.3.3 Measurement results

#### LTE Band 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	8.37	-24.96	0.0045	0.0133
3.8	-7.81	-22.00	0.0042	0.0117
4.4	8.98	-24.39	0.0048	0.0130

##### Frequency Error vs Temperature

Temperature (°C)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
50	10.10	-26.78	0.0054	0.0142
40	-5.65	-26.11	0.0030	0.0139
30	5.89	-25.02	0.0031	0.0133
20	8.64	-23.66	0.0046	0.0126
10	-6.64	-23.26	0.0035	0.0124
0	11.59	-33.70	0.0062	0.0179

#### 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	-17.37	-31.19	0.0208	0.0373
3.8	-16.38	-33.47	0.0196	0.0400
4.4	-20.18	-34.88	0.0241	0.0417

##### Frequency Error vs Temperature

Temperature (°C)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
50	-17.52	-28.80	0.0209	0.0344
40	8.45	-23.19	0.0101	0.0277
30	-16.31	-31.81	0.0195	0.0380
20	-15.65	-31.13	0.0187	0.0372
10	-16.57	-30.97	0.0198	0.0370
0	-18.20	-28.10	0.0218	0.0336

**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	-16.55	-21.23	0.0234	0.0300
3.8	-22.86	-16.78	0.0323	0.0237
4.4	-11.84	-19.86	0.0167	0.0281

**Frequency Error vs Temperature**

Temperature (°C)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
50	-12.19	-20.14	0.0172	0.0285
40	-13.99	-18.47	0.0198	0.0261
30	-17.18	-15.45	0.0243	0.0218
20	-18.15	-24.85	0.0257	0.0351
10	-17.11	-16.04	0.0242	0.0227
0	-13.76	-18.71	0.0194	0.0264

**LTE Band 13, 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	-13.45	-23.75	0.0172	0.0304
3.8	-17.94	-17.82	0.0229	0.0228
4.4	-14.93	-14.62	0.0191	0.0187

**Frequency Error vs Temperature**

Temperature (°C)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
50	-12.76	-16.55	0.0163	0.0212
40	-9.13	-18.74	0.0117	0.0240
30	-12.10	-19.97	0.0155	0.0255
20	-11.96	-19.23	0.0153	0.0246
10	-15.62	-23.79	0.0200	0.0304
0	-8.96	-20.04	0.0115	0.0256

**LTE Band 66, 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	-19.60	-29.67	0.0112	0.0170
3.8	24.81	-34.02	0.0142	0.0195
4.4	-18.32	-30.80	0.0105	0.0177

**Frequency Error vs Temperature**

Temperature (°C)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
50	-19.60	-29.67	0.0112	0.0170
40	24.81	-34.02	0.0142	0.0195
30	-18.32	-30.80	0.0105	0.0177
20	-17.35	-26.66	0.0099	0.0153
10	-20.81	-32.76	0.0119	0.0188
0	-19.31	-33.62	0.0111	0.0193

**LTE Band 71, 10MHz bandwidth (worst case of all bandwidths)**

**Frequency Error vs Voltage**

Voltage (V)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
3.5	-11.50	-13.13	0.0169	0.0193
3.8	-13.50	-10.33	0.0198	0.0152
4.4	-17.50	-10.04	0.0257	0.0148

**Frequency Error vs Temperature**

Temperature (°C)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
50	-10.53	-13.72	0.0155	0.0202
40	-11.50	-12.87	0.0169	0.0189
30	-6.92	-15.02	0.0102	0.0221
20	-11.10	-19.31	0.0163	0.0284
10	-13.88	-17.50	0.0204	0.0257
0	-13.32	-17.22	0.0196	0.0253

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



## **A.4 OCCUPIED BANDWIDTH**

### **A.4.1 Occupied Bandwidth Results**

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

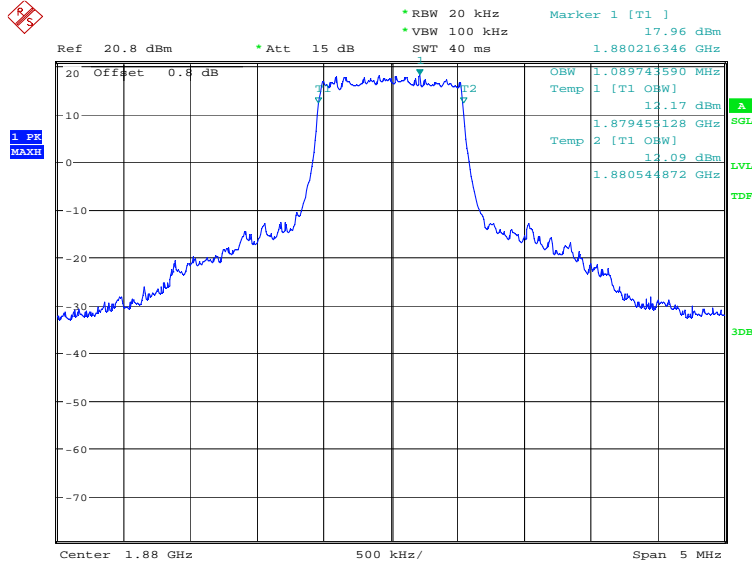
The measurement method is from KDB 971168 4.2:

- 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  $10\log(\text{OBW} / \text{RBW})$  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%)**

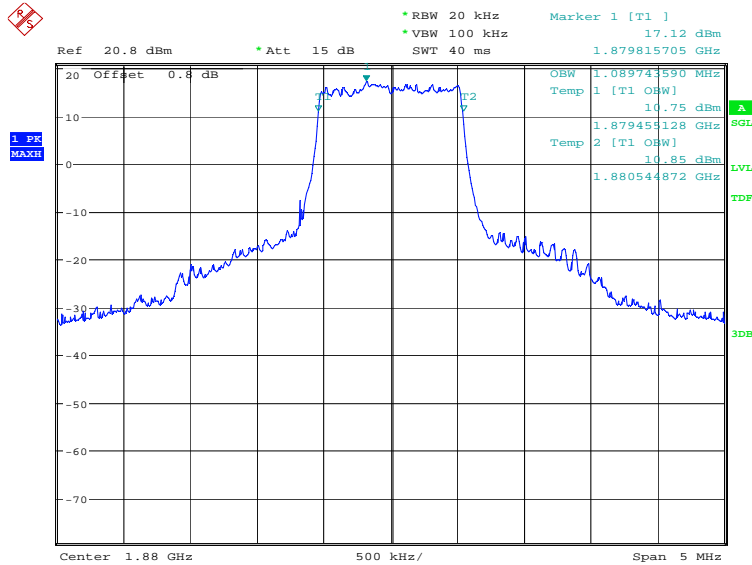
Frequency(MHz)	Occupied Bandwidth (99%)( kHz)	
1880.0	QPSK	16QAM
	1089.74	1089.74

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



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

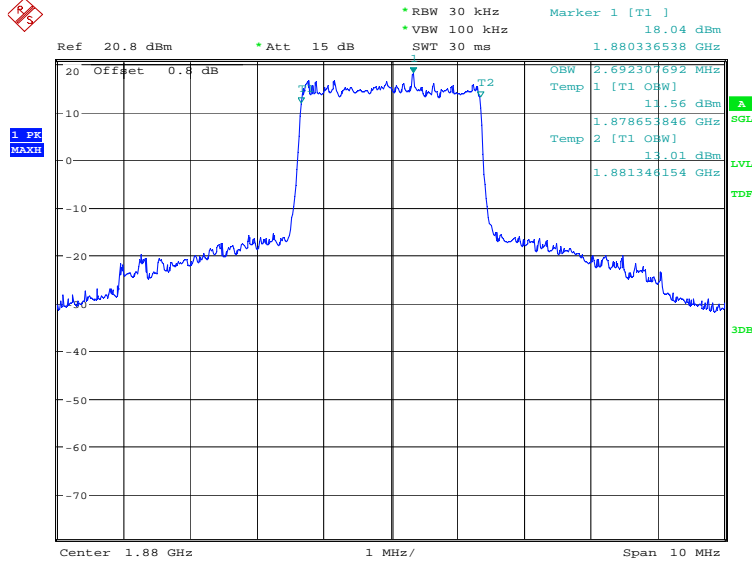


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**LTE band 2, 3MHz (99%)**

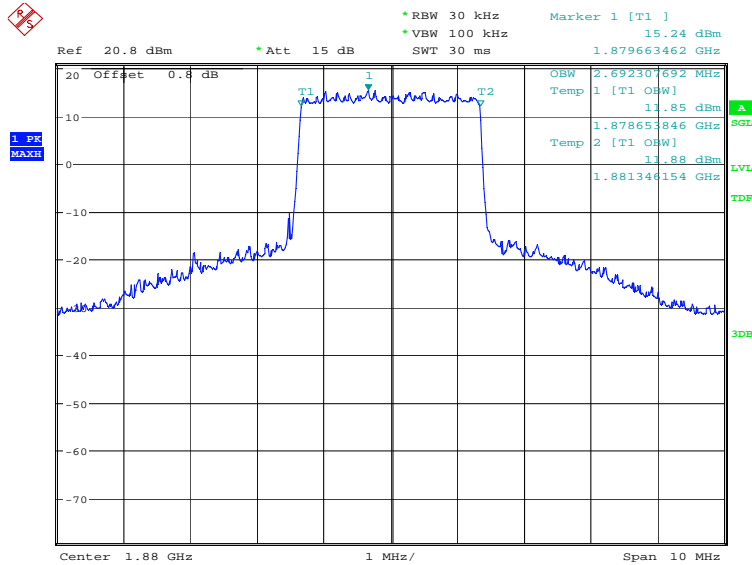
Frequency(MHz)	Occupied Bandwidth (99%)( kHz)	
1880.0	QPSK	16QAM
	2692.31	2692.31

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



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

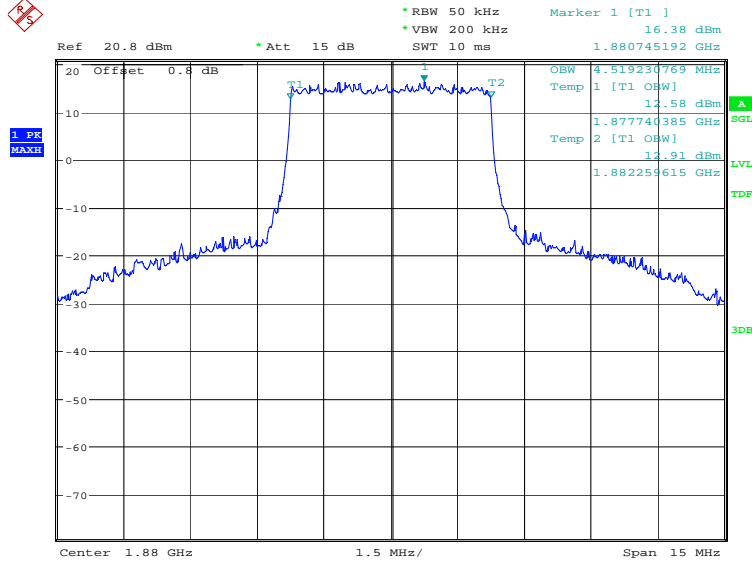


Date: 24.OCT.2018 17:03:32

**LTE band 2, 5MHz (99%)**

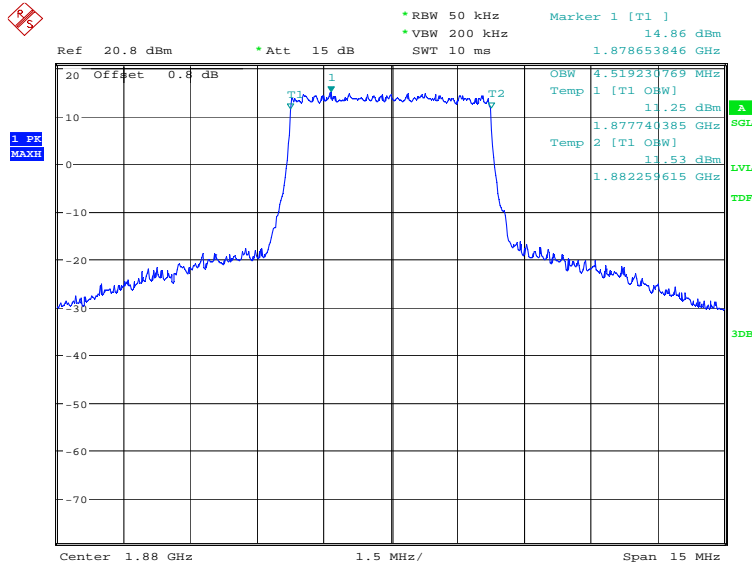
Frequency(MHz)	Occupied Bandwidth (99%)( kHz)	
1880.0	QPSK	16QAM
	4519.23	4519.23

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



Date: 24.OCT.2018 17:05:45

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

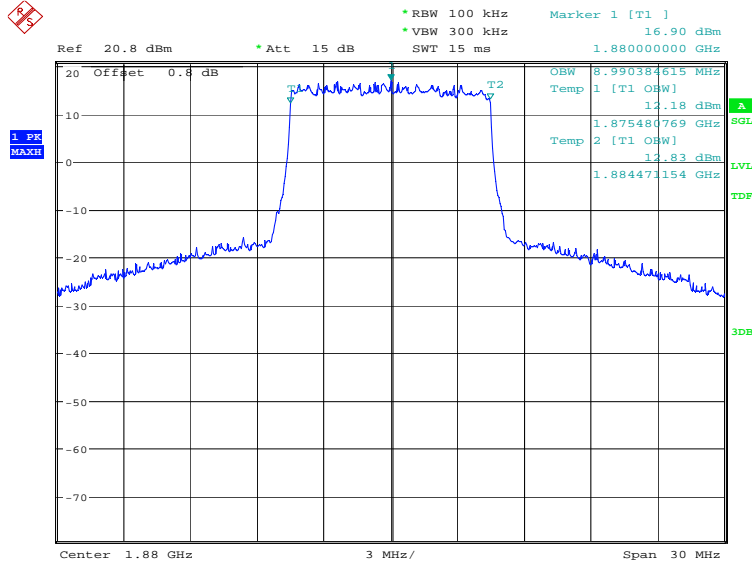


Date: 24.OCT.2018 17:07:10

**LTE band 2, 10MHz (99%)**

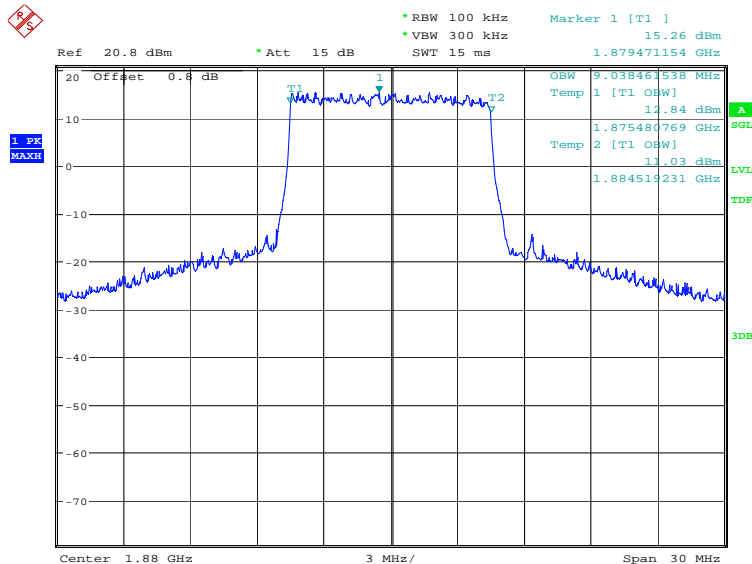
Frequency(MHz)	Occupied Bandwidth (99%)( kHz)	
1880.0	QPSK	16QAM
	8990.38	9038.46

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



Date: 24.OCT.2018 17:09:23

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

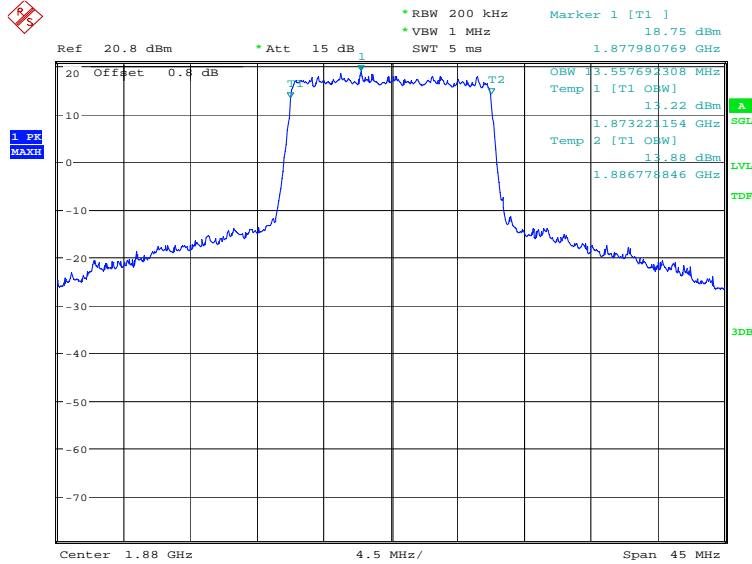


Date: 24.OCT.2018 17:10:48

**LTE band 2, 15MHz (99%)**

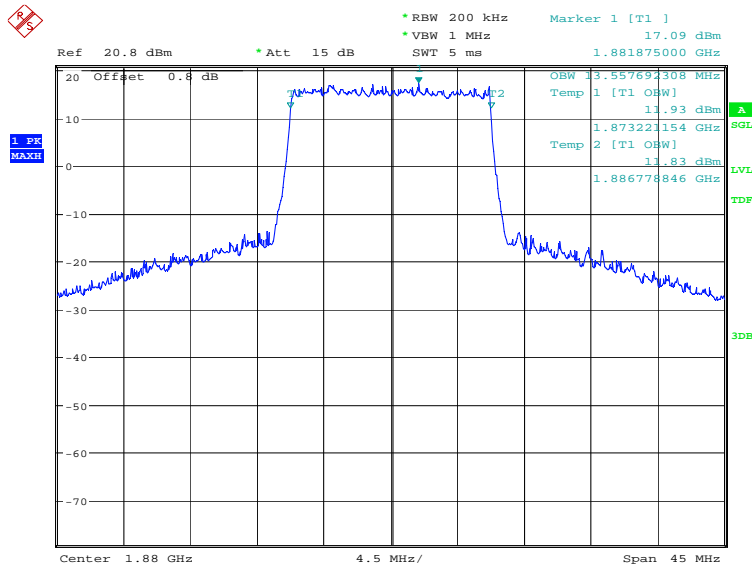
Frequency(MHz)	Occupied Bandwidth (99%)( kHz)	
1880.0	QPSK	16QAM
	13557.69	13557.69

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



Date: 24.OCT.2018 17:13:01

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

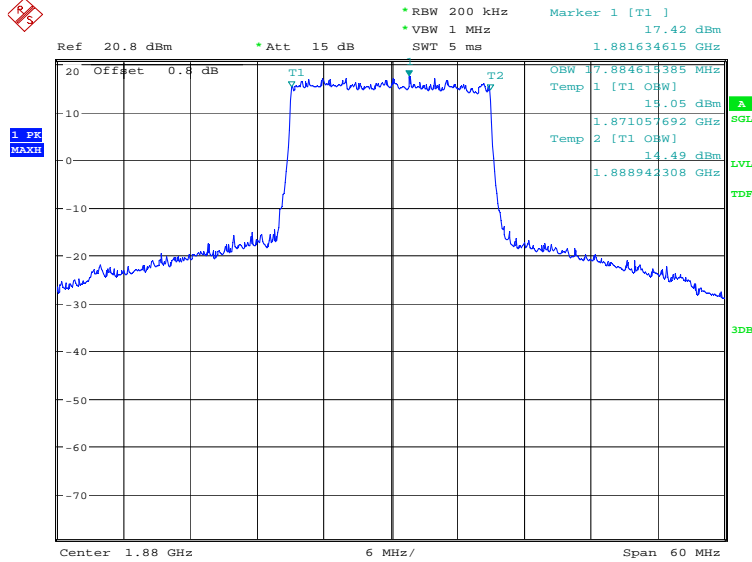


Date: 24.OCT.2018 17:14:26

**LTE band 2, 20MHz (99%)**

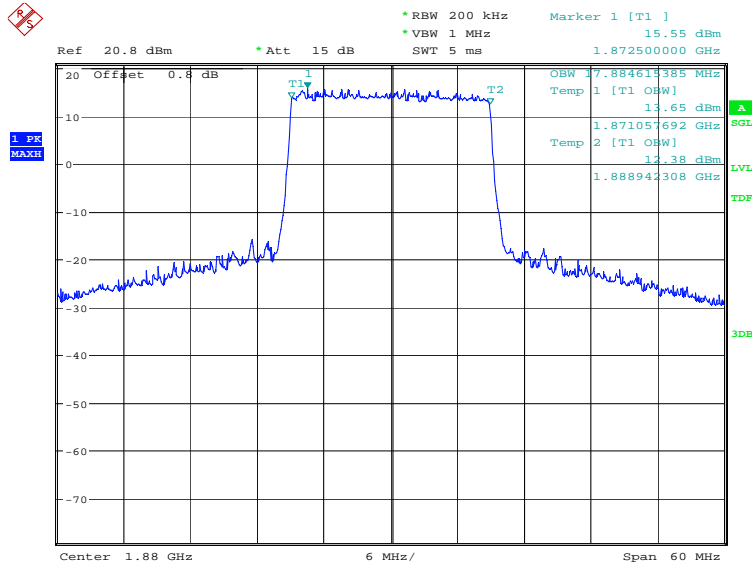
Frequency(MHz)	Occupied Bandwidth (99%)( kHz)	
1880.0	QPSK	16QAM
	17884.62	17884.62

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



Date: 24.OCT.2018 17:16:39

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

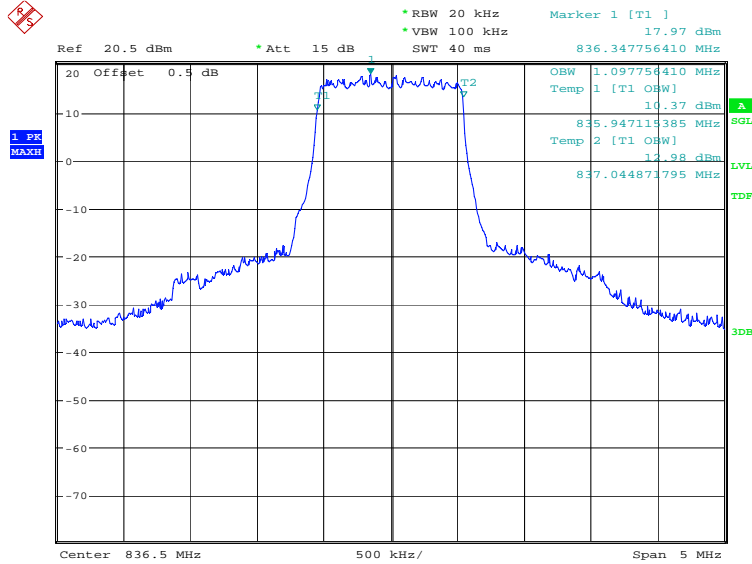


Date: 24.OCT.2018 17:18:03

**LTE band 5, 1.4MHz (99%)**

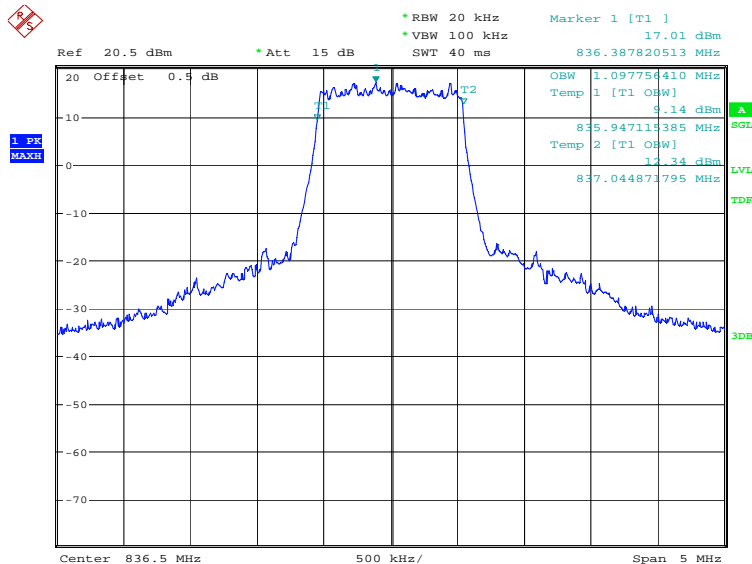
Frequency(MHz)	Occupied Bandwidth (99%)( kHz)	
836.5	QPSK	16QAM
	1097.76	1097.76

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



Date: 24.OCT.2018 17:20:18

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



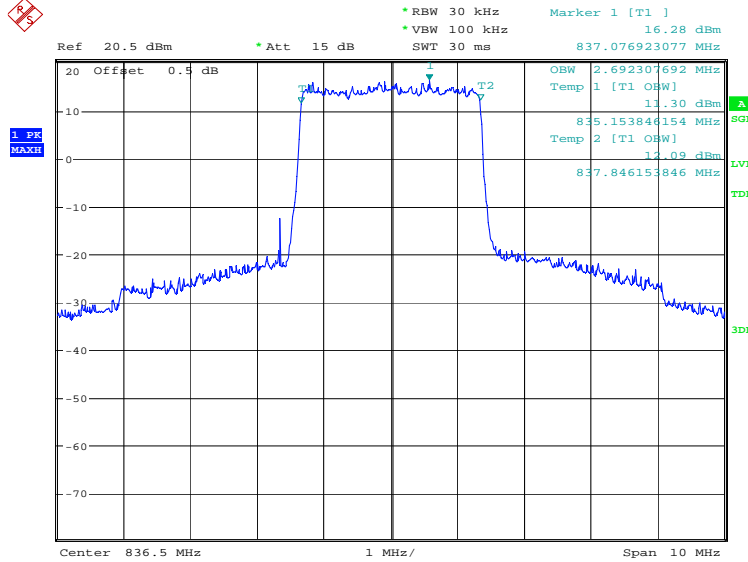
Date: 24.OCT.2018 17:21:42



**LTE band 5, 3MHz (99%)**

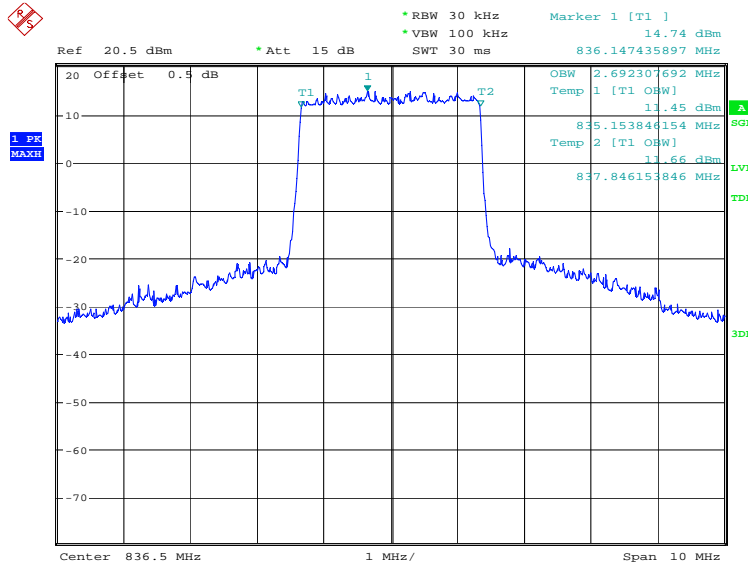
Frequency(MHz)	Occupied Bandwidth (99%)( kHz)	
836.5	QPSK	16QAM
	2692.31	2692.31

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



Date: 24.OCT.2018 17:23:56

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

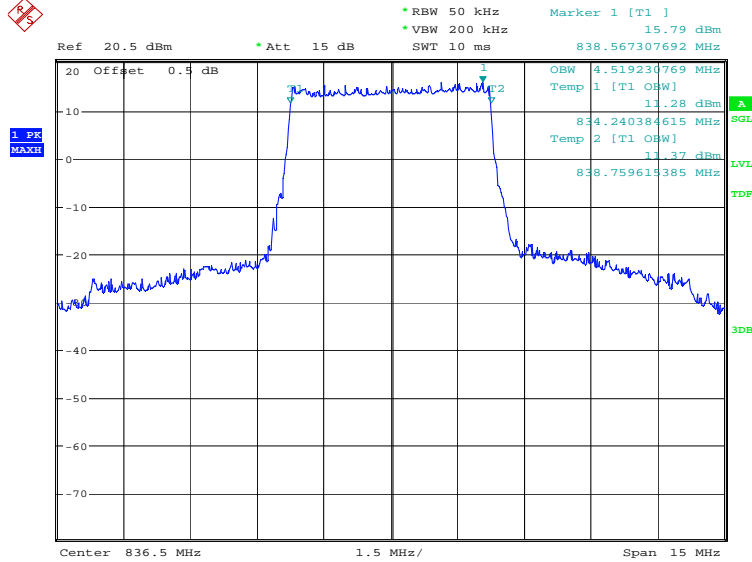


Date: 24.OCT.2018 17:25:20

**LTE band 5, 5MHz (99%)**

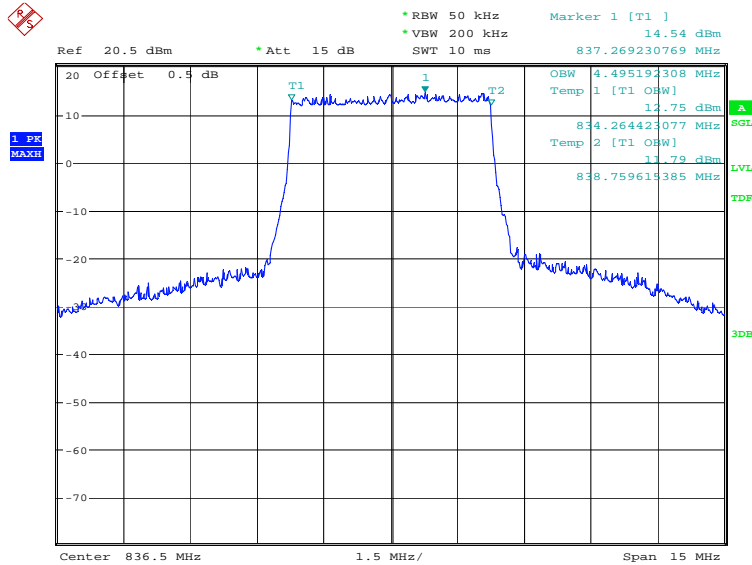
Frequency(MHz)	Occupied Bandwidth (99%)( kHz)	
836.5	QPSK	16QAM
	4519.23	4495.19

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



Date: 24.OCT.2018 17:27:33

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

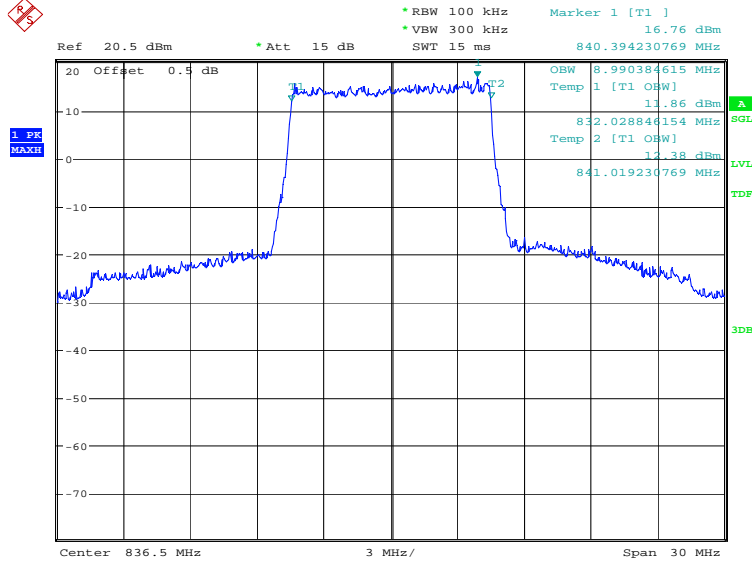


Date: 24.OCT.2018 17:28:58

**LTE band 5, 10MHz (99%)**

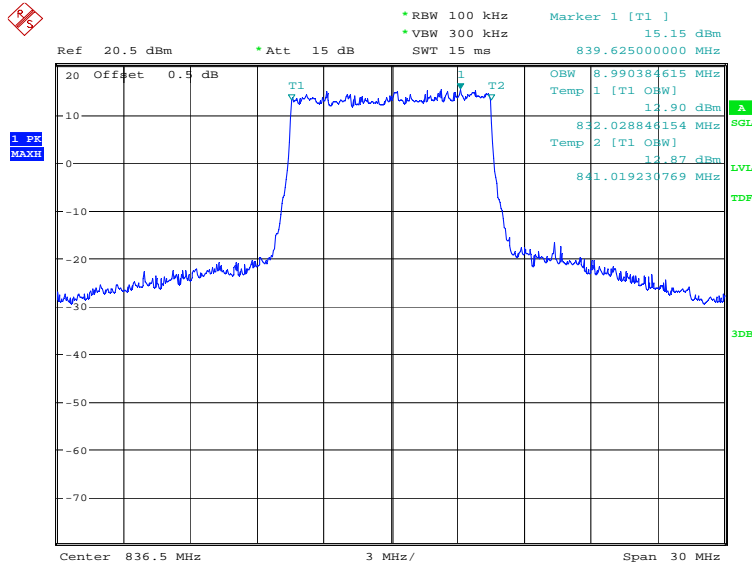
Frequency(MHz)	Occupied Bandwidth (99%)( kHz)	
836.5	QPSK	16QAM
	8990.38	8990.38

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



Date: 24.OCT.2018 17:31:11

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

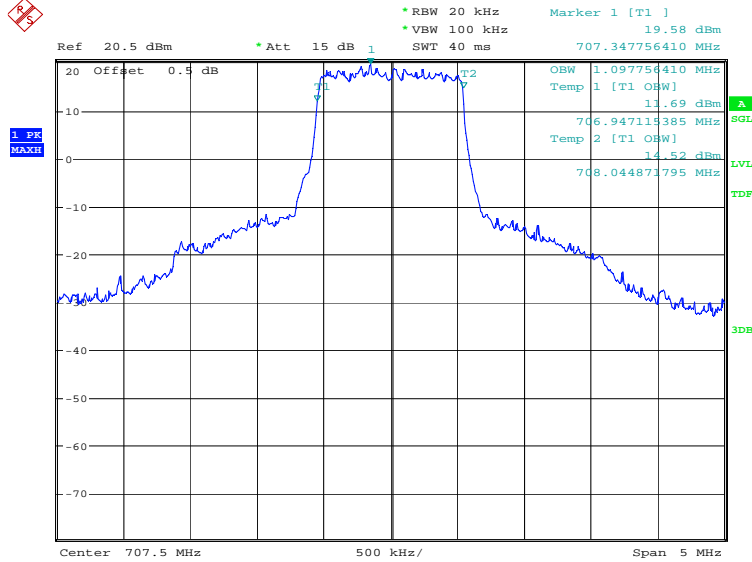


Date: 24.OCT.2018 17:32:36

**LTE band 12, 1.4MHz (99%)**

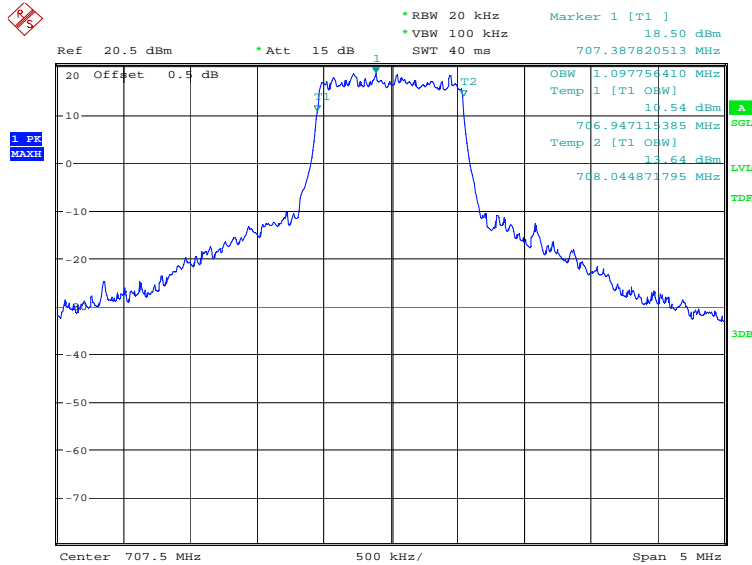
Frequency(MHz)	Occupied Bandwidth (99%)( kHz)	
707.5	QPSK	16QAM
	1097.76	1097.76

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



Date: 24.OCT.2018 17:34:50

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

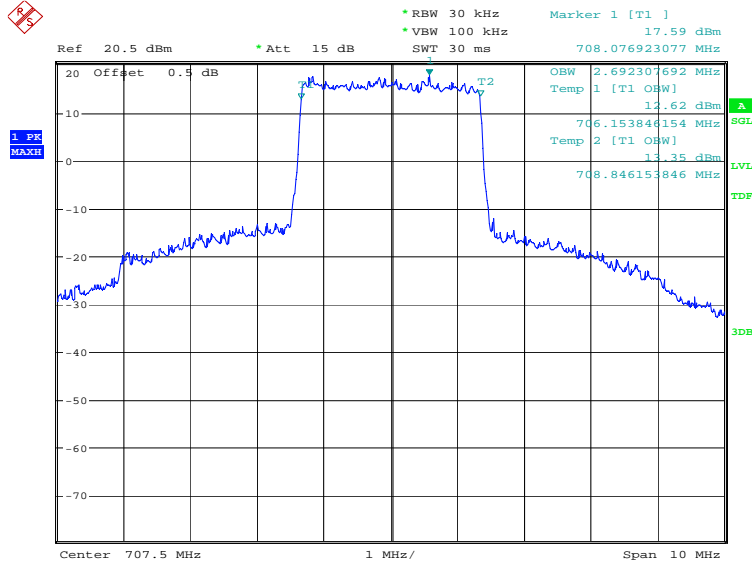


Date: 24.OCT.2018 17:36:15

**LTE band 12, 3MHz (99%)**

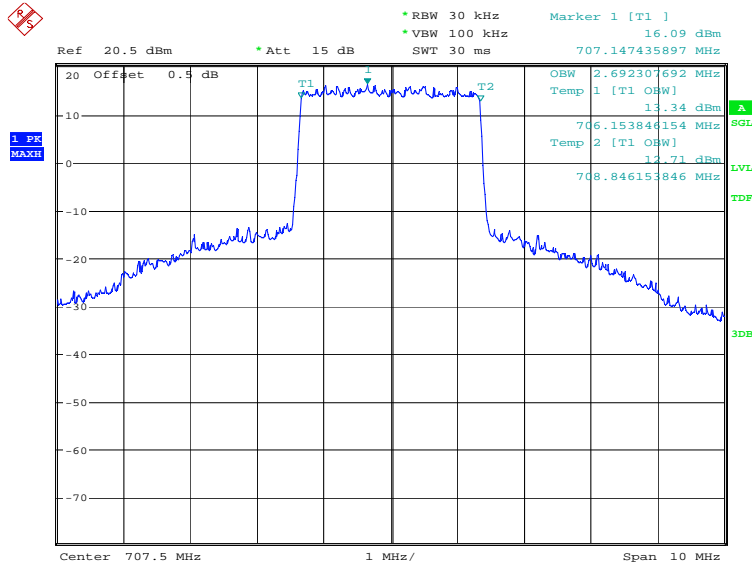
Frequency(MHz)	Occupied Bandwidth (99%)( kHz)	
707.5	QPSK	16QAM
	2692.31	2692.31

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



Date: 24.OCT.2018 17:38:28

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

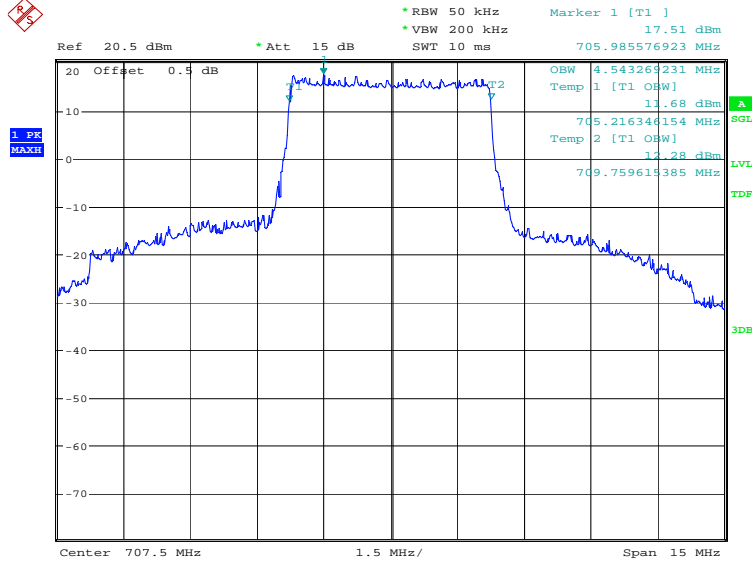


Date: 24.OCT.2018 17:39:53

**LTE band 12, 5MHz (99%)**

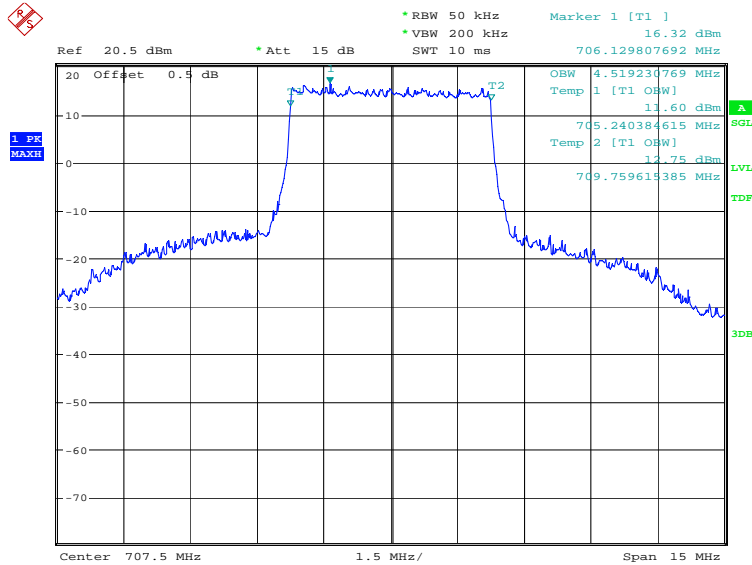
Frequency(MHz)	Occupied Bandwidth (99%)( kHz)	
707.5	QPSK	16QAM
	4543.27	4519.23

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



Date: 24.OCT.2018 17:42:06

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

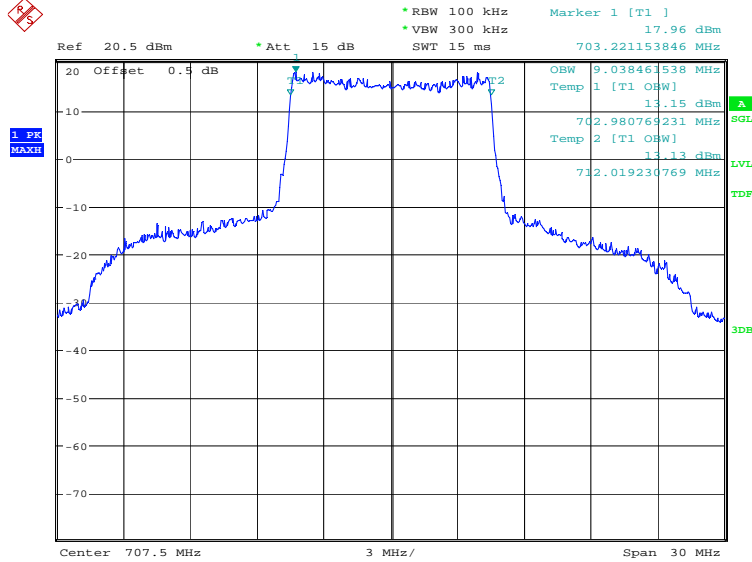


Date: 24.OCT.2018 17:43:31

**LTE band 12, 10MHz (99%)**

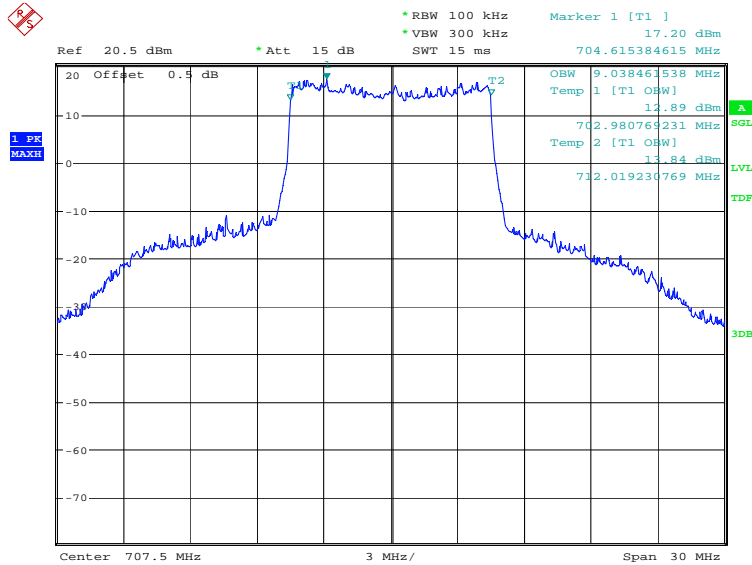
Frequency(MHz)	Occupied Bandwidth (99%)( kHz)	
707.5	QPSK	16QAM
	9038.46	9038.46

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



Date: 24.OCT.2018 17:45:45

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

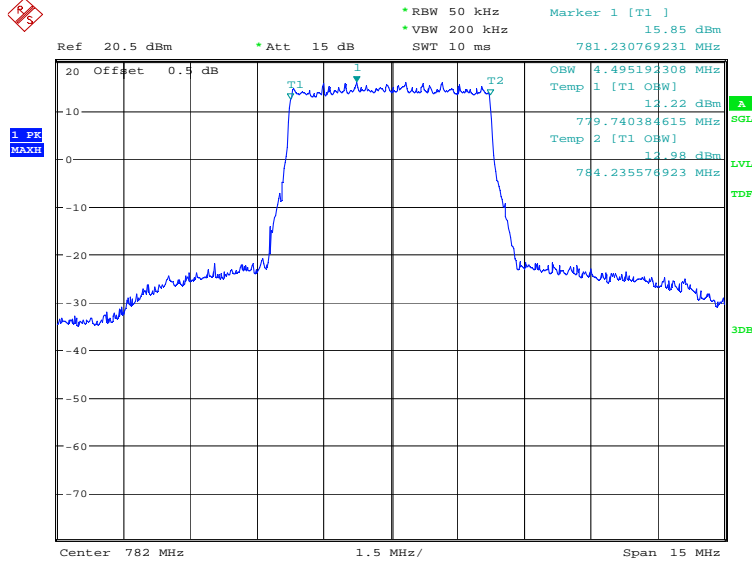


Date: 24.OCT.2018 17:47:09

**LTE band 13, 5MHz (99%)**

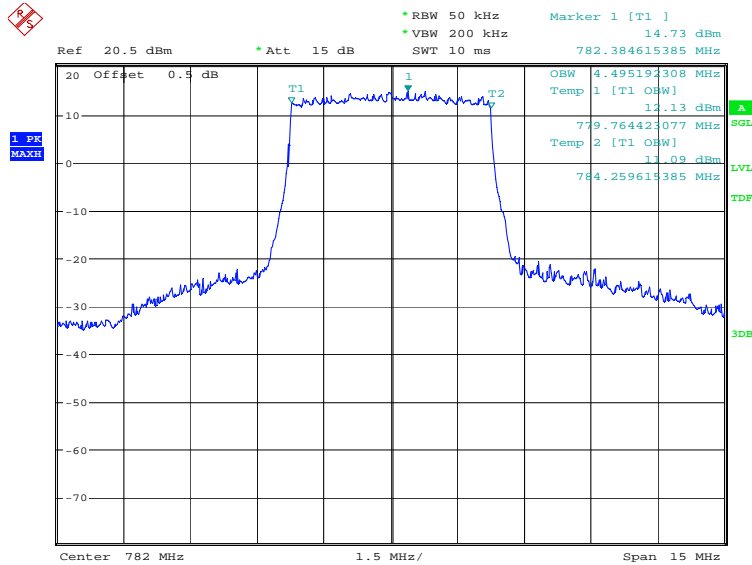
Frequency(MHz)	Occupied Bandwidth (99%)( kHz)	
782.0	QPSK	16QAM
	4495.19	4495.19

**LTE band 13, 5MHz Bandwidth, QPSK (99% BW)**



Date: 24.OCT.2018 17:49:24

**LTE band 13, 5MHz Bandwidth,16QAM (99% BW)**



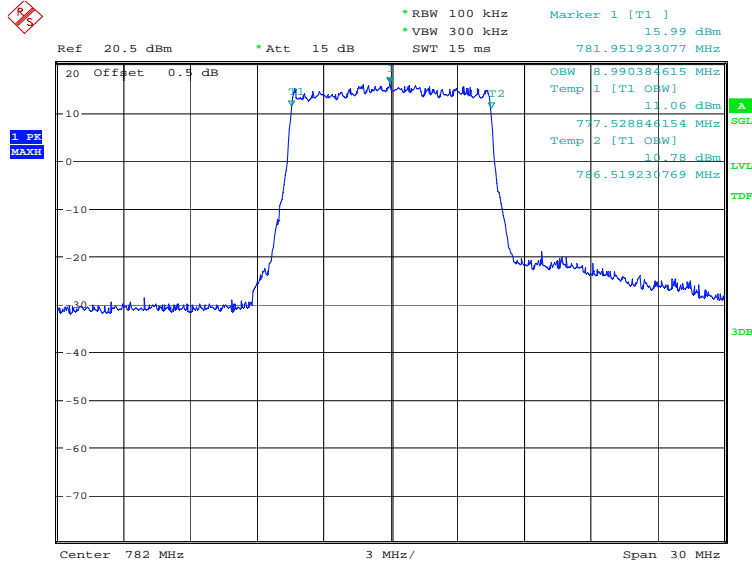
Date: 24.OCT.2018 17:50:48



**LTE band 13, 10MHz (99%)**

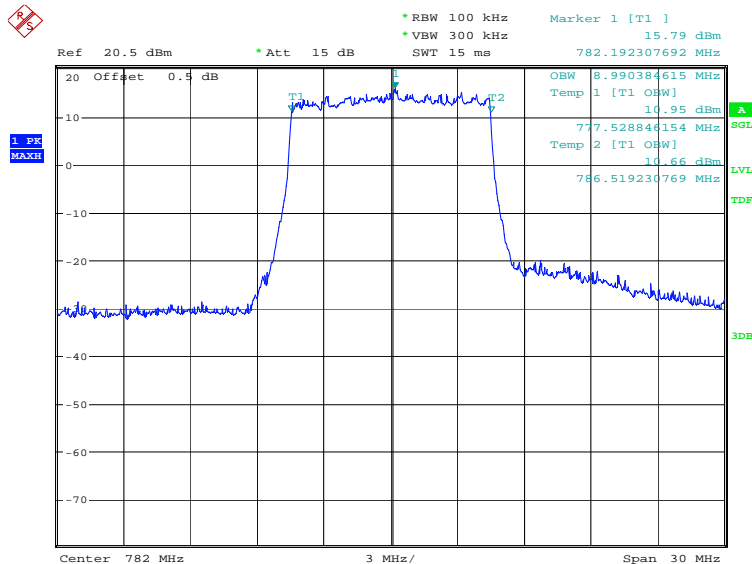
Frequency(MHz)	Occupied Bandwidth (99%)( kHz)	
782.0	QPSK	16QAM
	8990.38	8990.38

**LTE band 13, 10MHz Bandwidth, QPSK (99% BW)**



Date: 24.OCT.2018 17:53:02

**LTE band 13, 10MHz Bandwidth,16QAM (99% BW)**

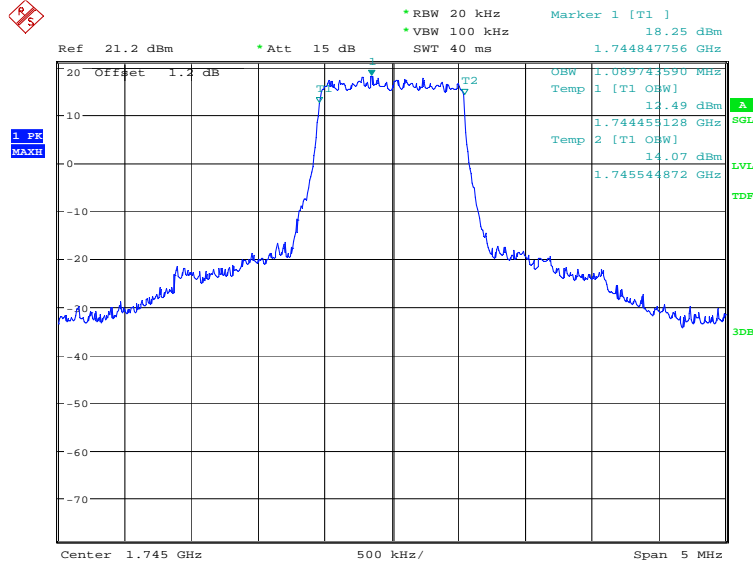


Date: 24.OCT.2018 17:54:26

**LTE band 66, 1.4MHz (99%)**

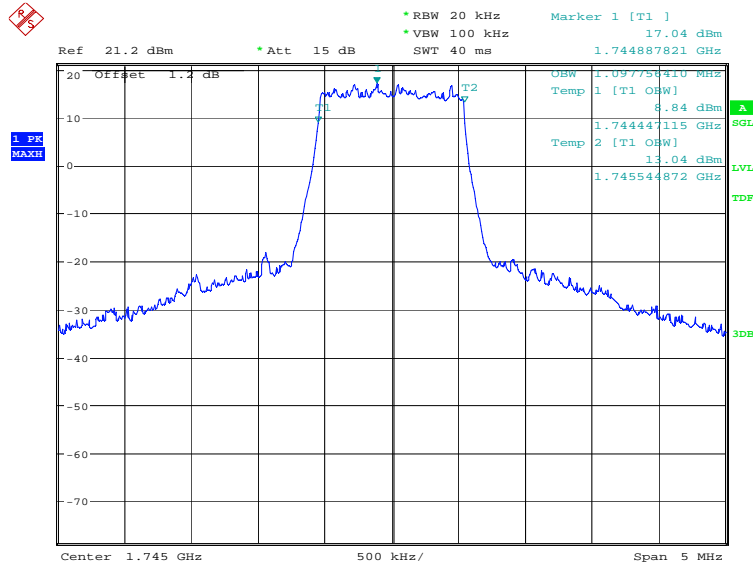
Frequency(MHz)	Occupied Bandwidth (99%)( kHz)	
1745.0	QPSK	16QAM
	1089.74	1097.76

**LTE band 66, 1.4MHz Bandwidth, QPSK (99% BW)**



Date: 24.OCT.2018 17:56:41

**LTE band 66, 1.4MHz Bandwidth, 16QAM (99% BW)**

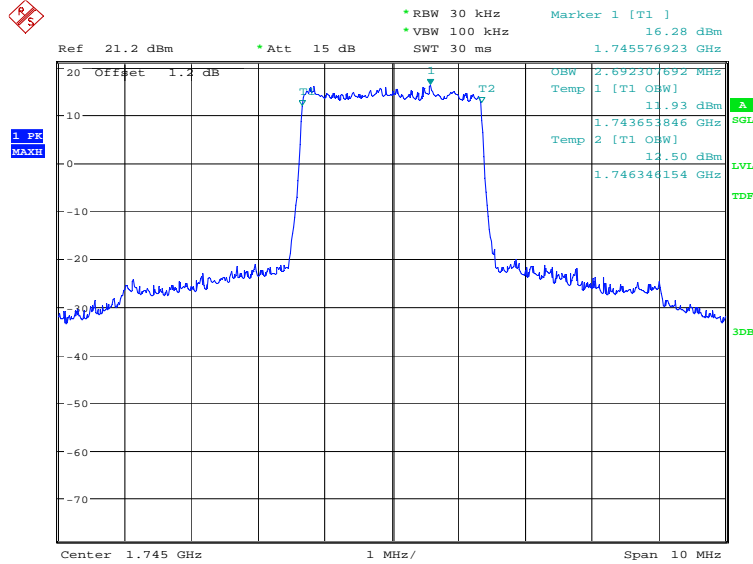


Date: 24.OCT.2018 17:58:06

**LTE band 66, 3MHz (99%)**

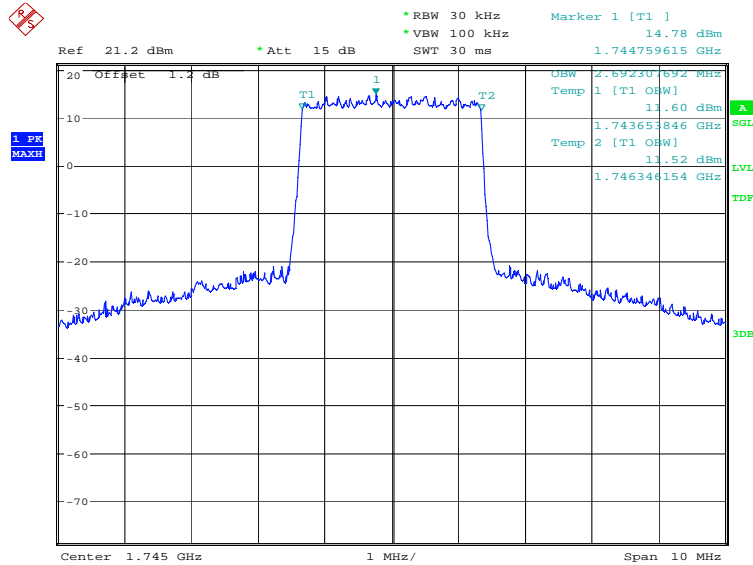
Frequency(MHz)	Occupied Bandwidth (99%)( kHz)	
1745.0	QPSK	16QAM
	2692.31	2692.31

**LTE band 66, 3MHz Bandwidth, QPSK (99% BW)**



Date: 24.OCT.2018 18:00:19

**LTE band 66, 3MHz Bandwidth, 16QAM (99% BW)**

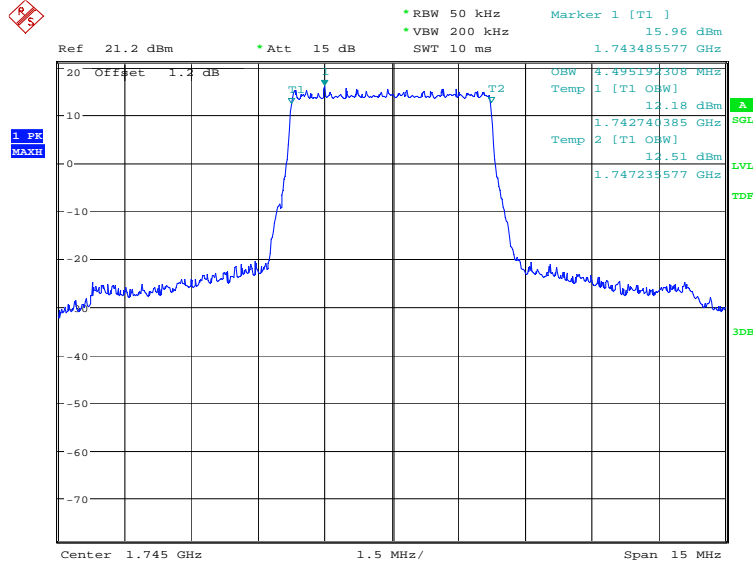


Date: 24.OCT.2018 18:01:43

**LTE band 66, 5MHz (99%)**

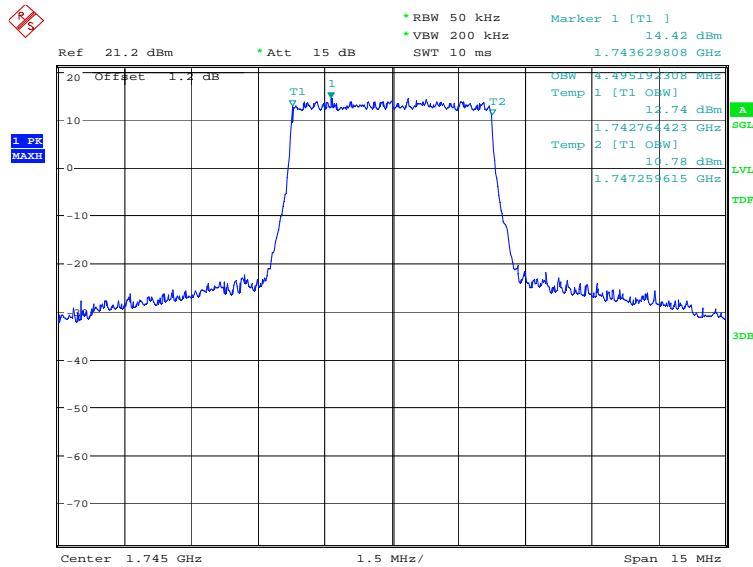
Frequency(MHz)	Occupied Bandwidth (99%)( kHz)	
1745.0	QPSK	16QAM
	4495.19	4495.19

**LTE band 66, 5MHz Bandwidth, QPSK (99% BW)**



Date: 24.OCT.2018 18:03:57

**LTE band 66, 5MHz Bandwidth, 16QAM (99% BW)**

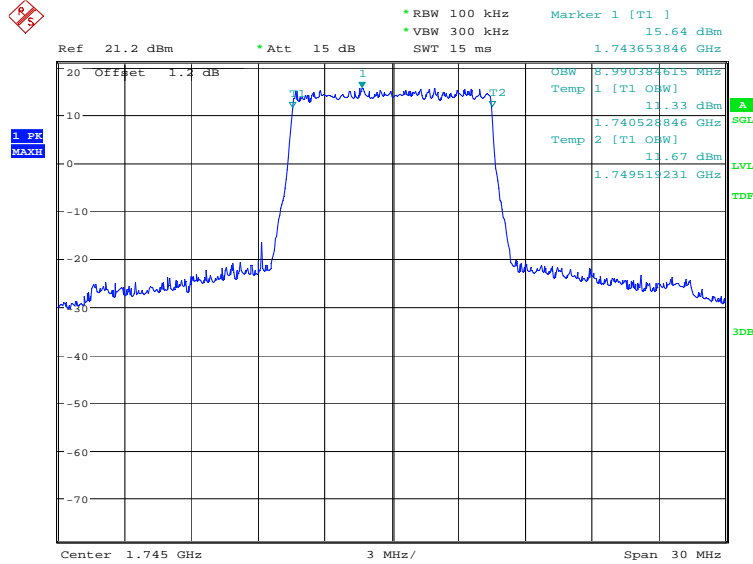


Date: 24.OCT.2018 18:05:22

**LTE band 66, 10MHz (99%)**

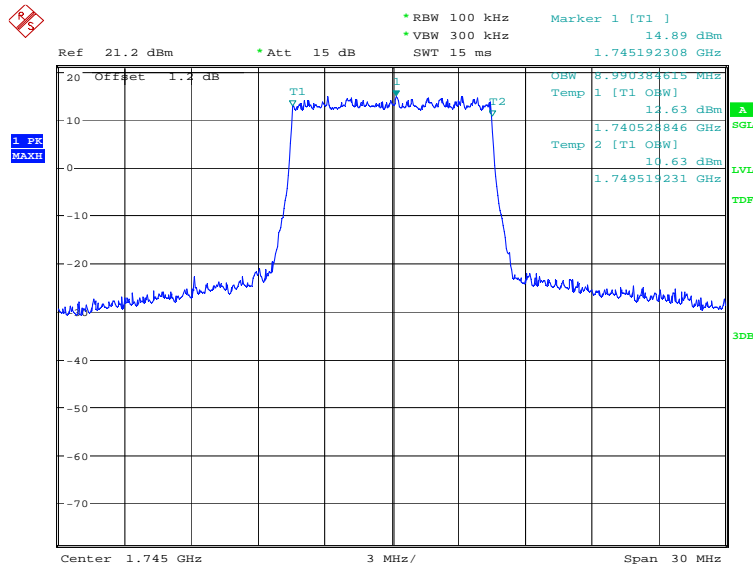
Frequency(MHz)	Occupied Bandwidth (99%)( kHz)	
1745.0	QPSK	16QAM
	8990.38	8990.38

**LTE band 66, 10MHz Bandwidth, QPSK (99% BW)**



Date: 24.OCT.2018 18:07:35

**LTE band 66, 10MHz Bandwidth, 16QAM (99% BW)**

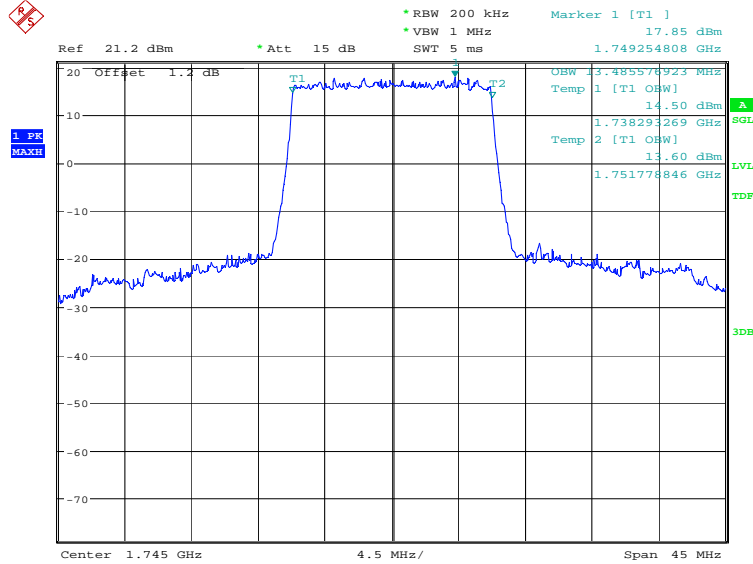


Date: 24.OCT.2018 18:09:00

**LTE band 66, 15MHz (99%)**

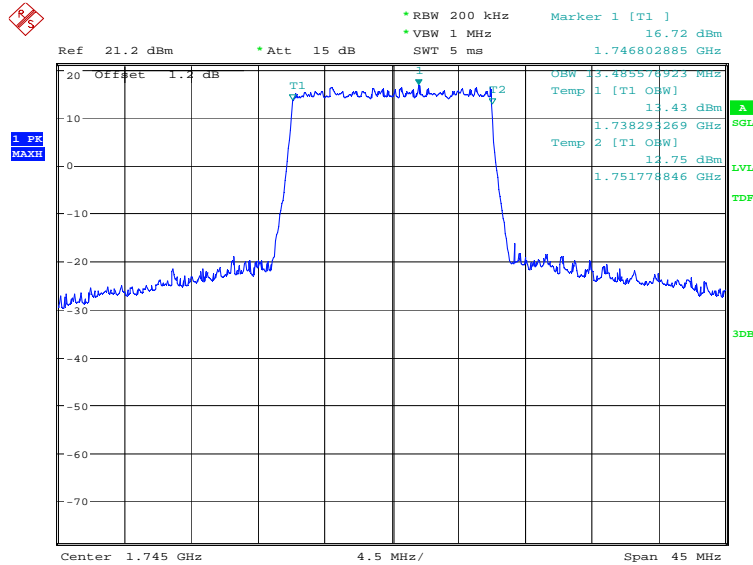
Frequency(MHz)	Occupied Bandwidth (99%)( kHz)	
1745.0	QPSK	16QAM
	13485.58	13485.58

**LTE band 66, 15MHz Bandwidth, QPSK (99% BW)**



Date: 24.OCT.2018 18:11:13

**LTE band 66, 15MHz Bandwidth, 16QAM (99% BW)**

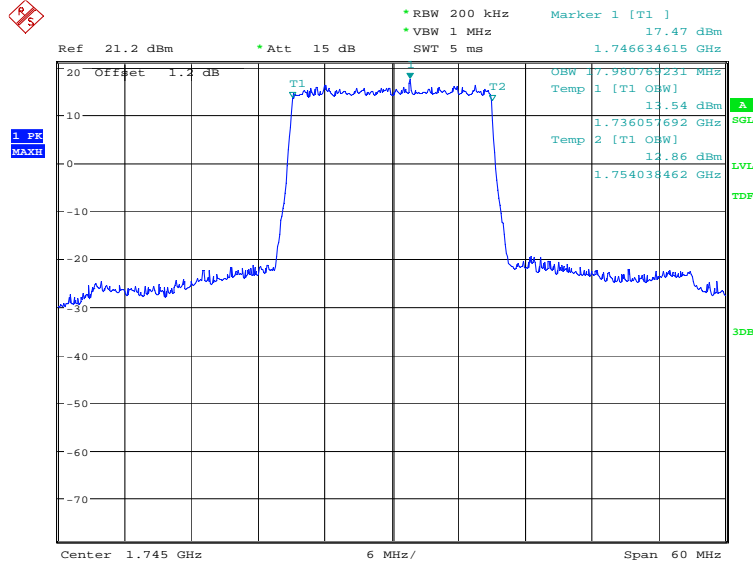


Date: 24.OCT.2018 18:12:38

**LTE band 66, 20MHz (99%)**

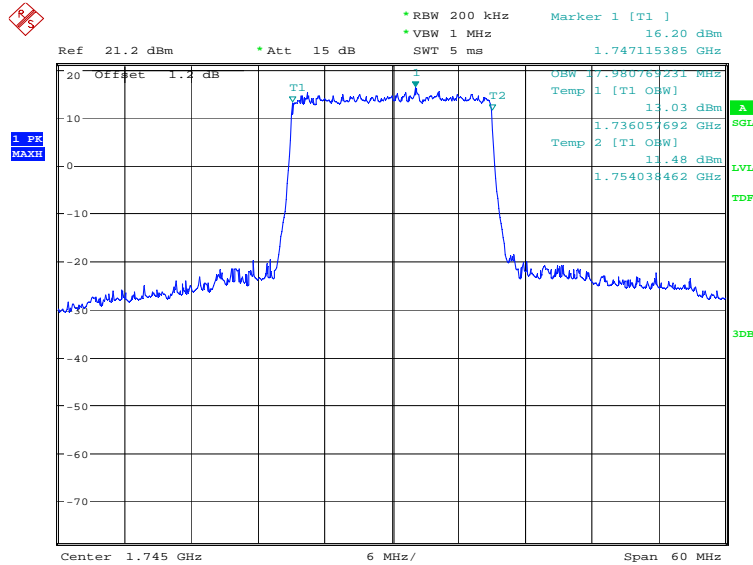
Frequency(MHz)	Occupied Bandwidth (99%)( kHz)	
1745.0	QPSK	16QAM
	17980.77	17980.77

**LTE band 66, 20MHz Bandwidth, QPSK (99% BW)**



Date: 24.OCT.2018 18:14:51

**LTE band 66, 20MHz Bandwidth, 16QAM (99% BW)**

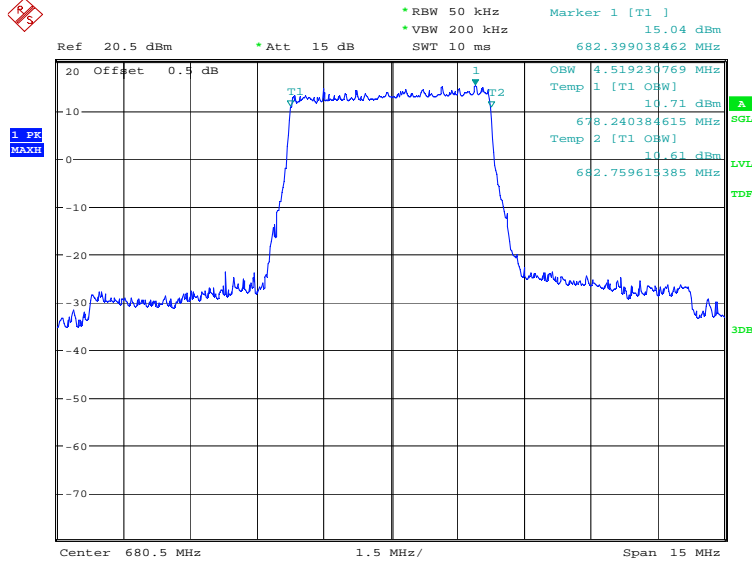


Date: 24.OCT.2018 18:16:16

**LTE band 71, 5MHz (99%)**

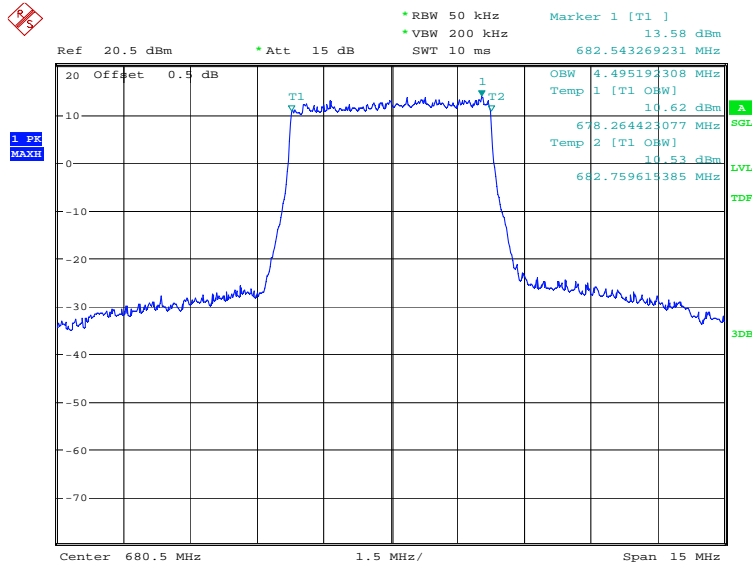
Frequency(MHz)	Occupied Bandwidth (99%)( kHz)	
680.5	QPSK	16QAM
	4519.23	4495.19

**LTE band 71, 5MHz Bandwidth, QPSK (99% BW)**



Date: 24.OCT.2018 18:18:38

**LTE band 71, 5MHz Bandwidth, 16QAM (99% BW)**



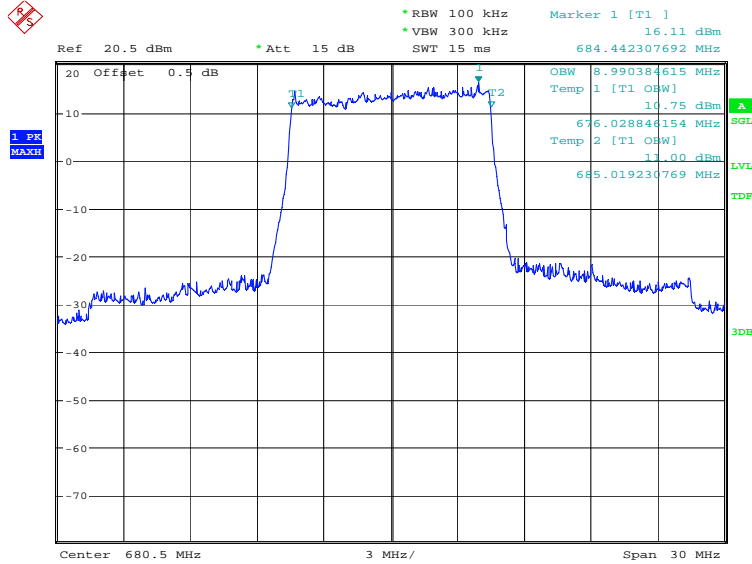
Date: 24.OCT.2018 18:20:02



**LTE band 71, 10MHz (99%)**

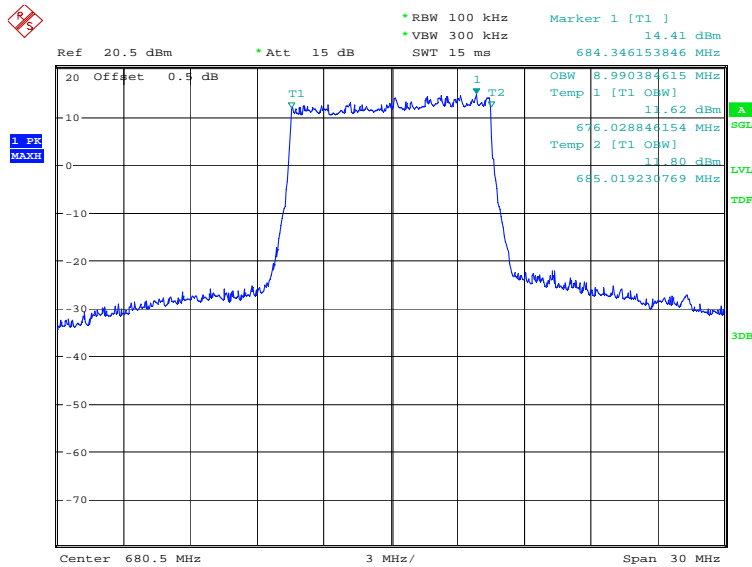
Frequency(MHz)	Occupied Bandwidth (99%)( kHz)	
680.5	QPSK	16QAM
	8990.38	8990.38

**LTE band 71, 10MHz Bandwidth, QPSK (99% BW)**



Date: 24.OCT.2018 18:22:16

**LTE band 71, 10MHz Bandwidth, 16QAM (99% BW)**

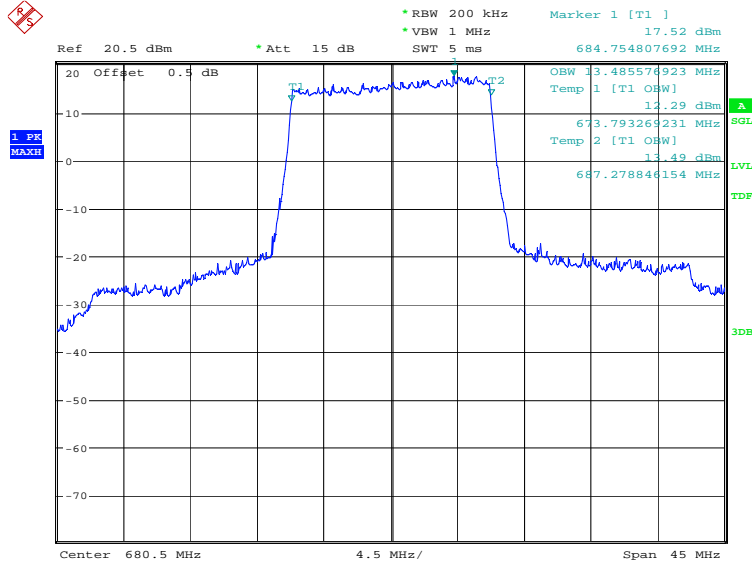


Date: 24.OCT.2018 18:23:40

**LTE band 71, 15MHz (99%)**

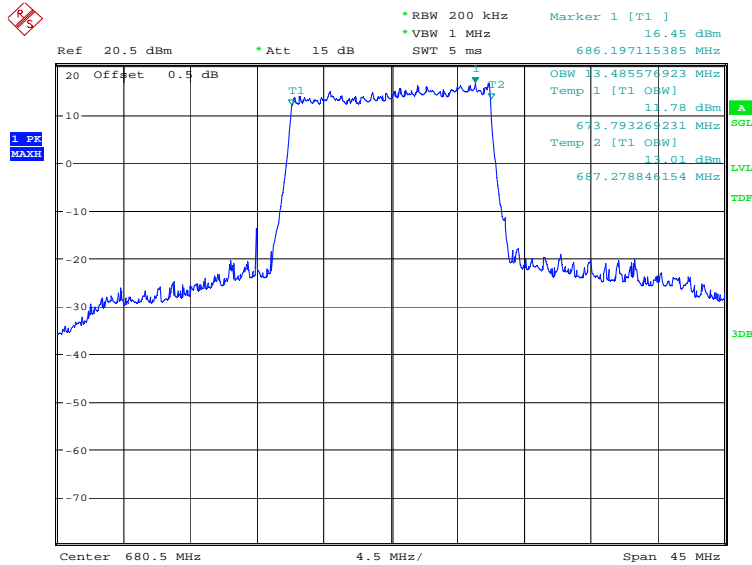
Frequency(MHz)	Occupied Bandwidth (99%)( kHz)	
680.5	QPSK	16QAM
	13485.58	13485.58

**LTE band 71, 15MHz Bandwidth, QPSK (99% BW)**



Date: 24.OCT.2018 18:25:54

**LTE band 71, 15MHz Bandwidth, 16QAM (99% BW)**

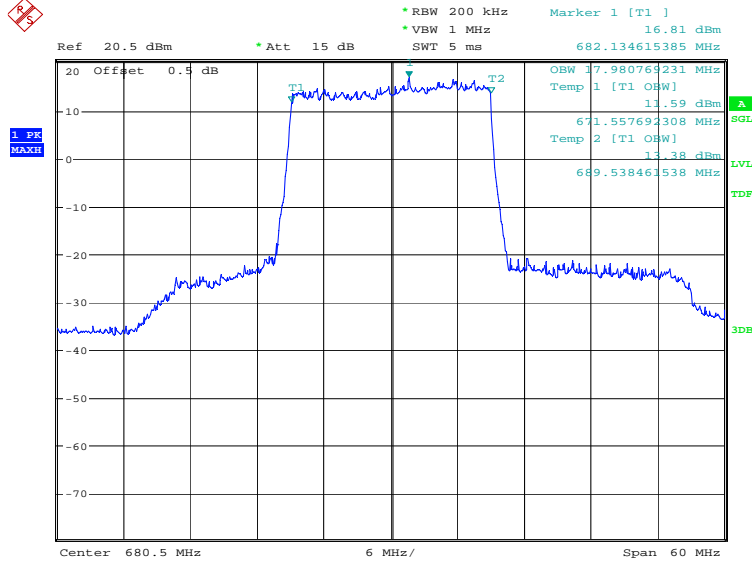


Date: 24.OCT.2018 18:27:18

**LTE band 71, 20MHz (99%)**

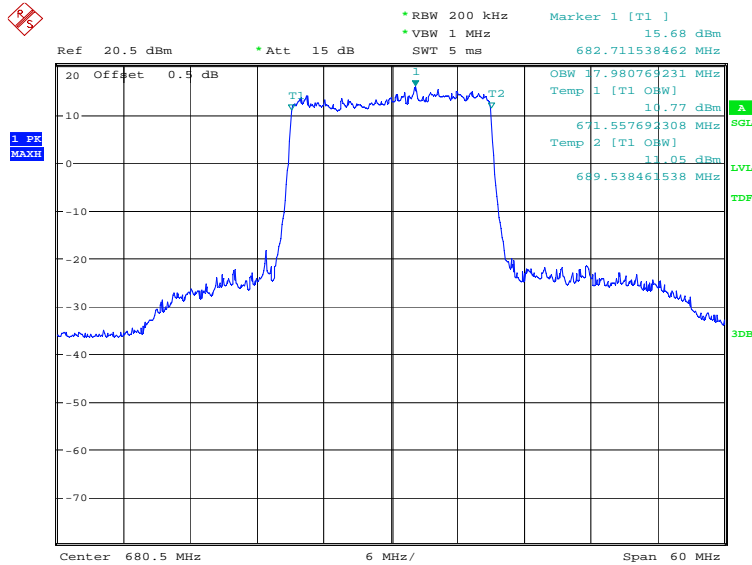
Frequency(MHz)	Occupied Bandwidth (99%)( kHz)	
680.5	QPSK	16QAM
	17980.77	17980.77

**LTE band 71, 20MHz Bandwidth, QPSK (99% BW)**



Date: 24.OCT.2018 18:29:32

**LTE band 71, 20MHz Bandwidth, 16QAM (99% BW)**



Date: 24.OCT.2018 18:30:56



## **A.5 EMISSION BANDWIDTH**

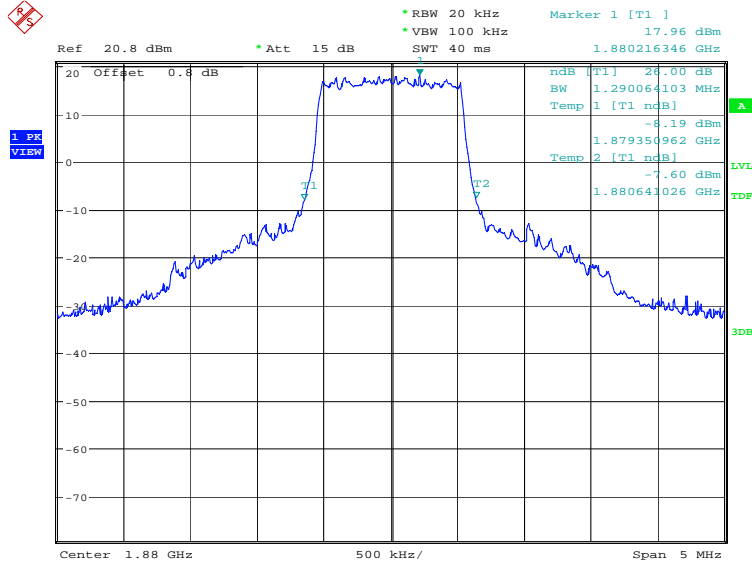
### **A.5.1 Emission Bandwidth Results**

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)**

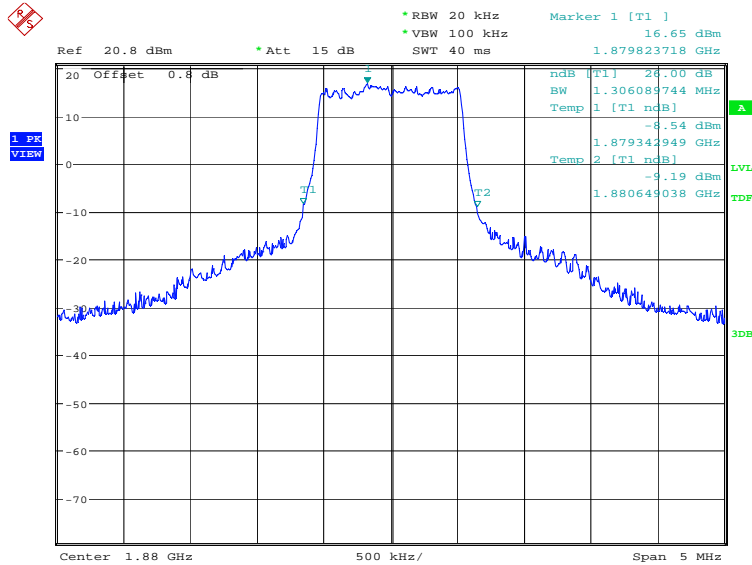
Frequency(MHz)	Occupied Bandwidth (-26dBc)( kHz)	
1880.0	QPSK	16QAM
	1290.06	1306.09

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



Date: 24.OCT.2018 18:32:57

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

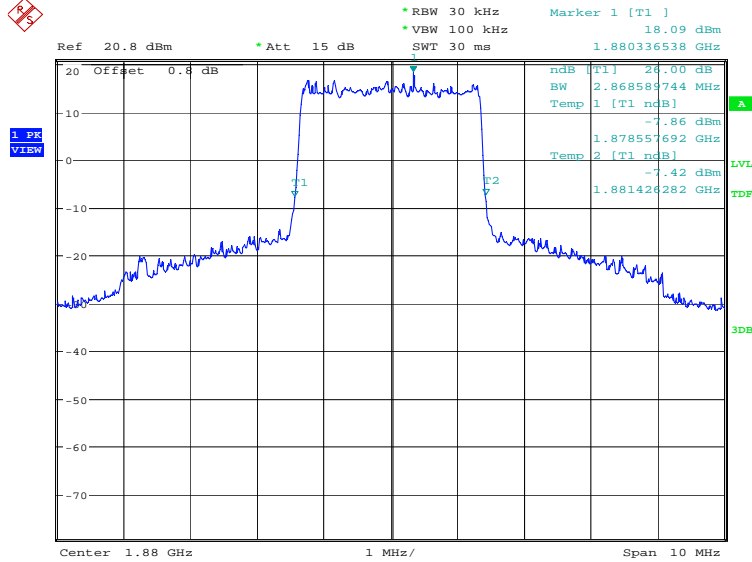


Date: 24.OCT.2018 18:34:22

**LTE band 2, 3MHz (-26dBc)**

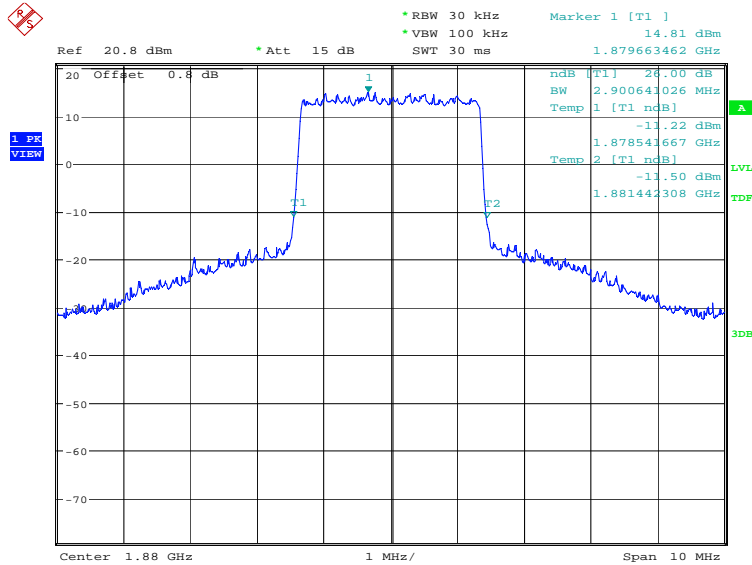
Frequency(MHz)	Occupied Bandwidth (-26dBc)( kHz)	
1880.0	QPSK	16QAM
	2868.59	2900.64

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



Date: 24.OCT.2018 18:36:36

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

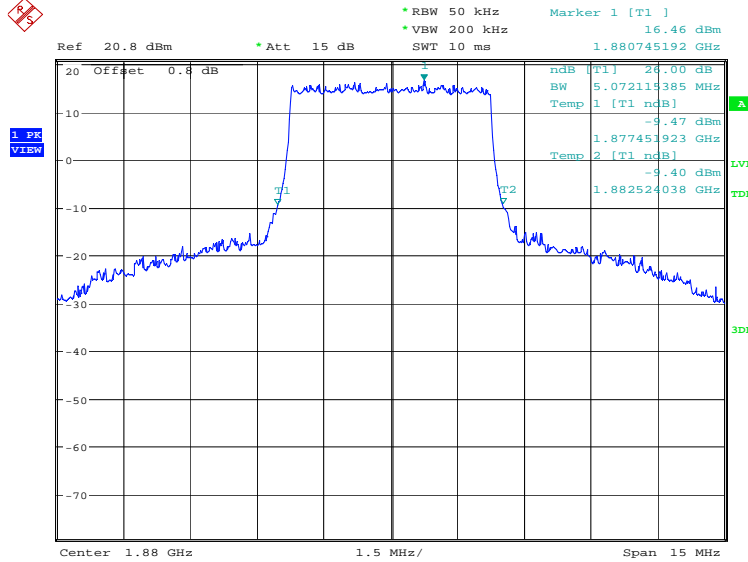


Date: 24.OCT.2018 18:38:01

**LTE band 2, 5MHz (-26dBc)**

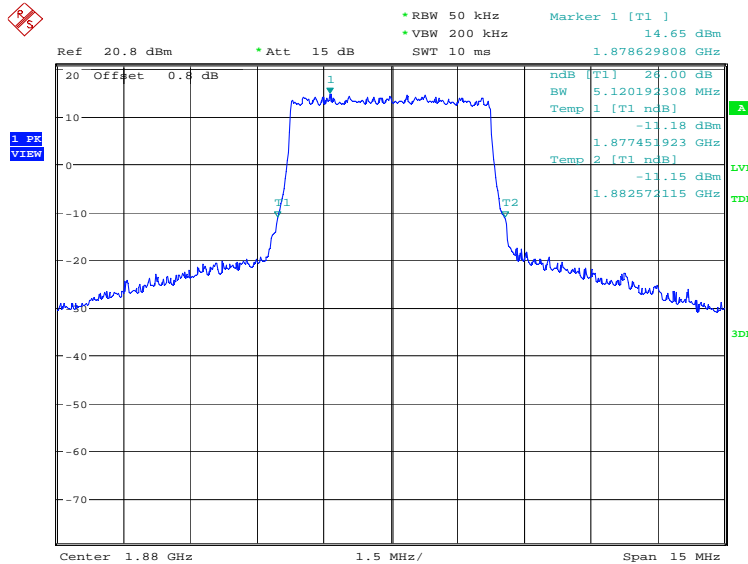
Frequency(MHz)	Occupied Bandwidth (-26dBc)( kHz)	
	1880.0	QPSK
5072.12		5120.19

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



Date: 24.OCT.2018 18:40:15

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

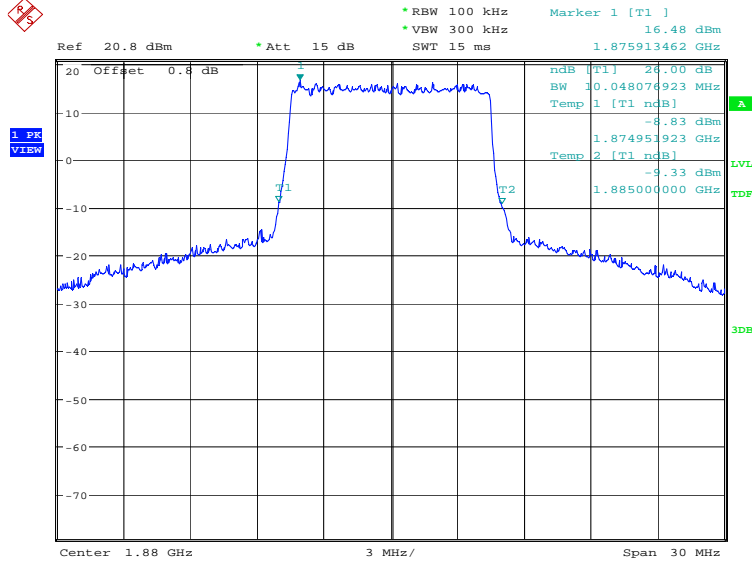


Date: 24.OCT.2018 18:41:40

**LTE band 2, 10MHz (-26dBc)**

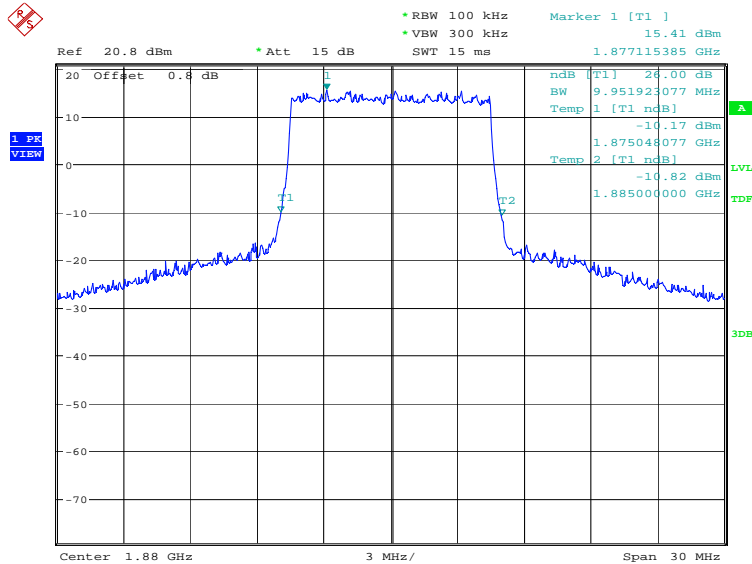
Frequency(MHz)	Occupied Bandwidth (-26dBc)( kHz)	
1880.0	QPSK	16QAM
	10048.08	9951.92

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



Date: 24.OCT.2018 18:43:54

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



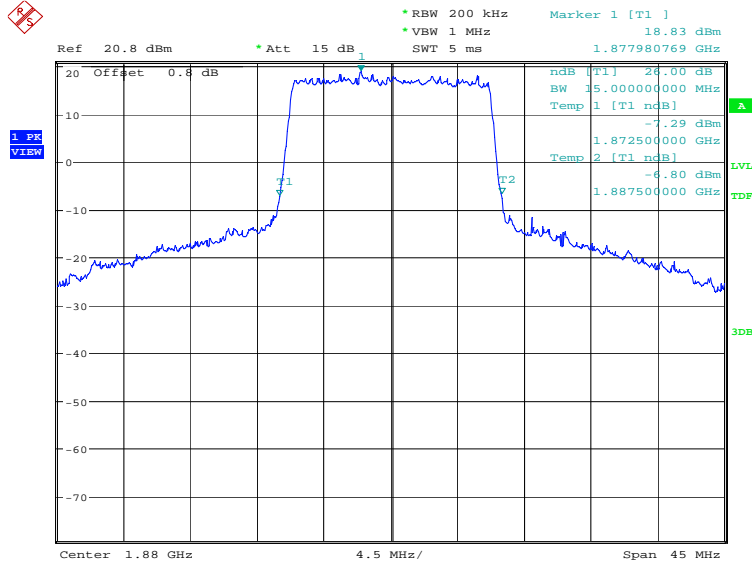
Date: 24.OCT.2018 18:45:18



**LTE band 2, 15MHz (-26dBc)**

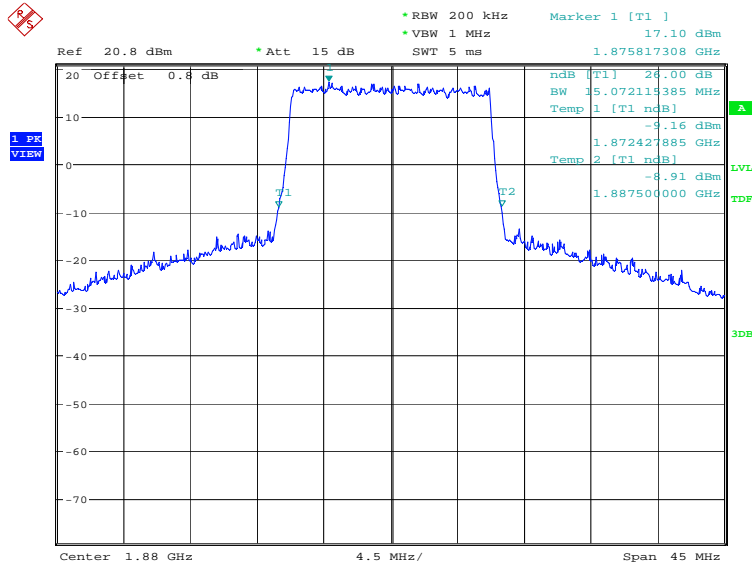
Frequency(MHz)	Occupied Bandwidth (-26dBc)( kHz)	
1880.0	QPSK	16QAM
	15000.00	15072.12

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



Date: 24.OCT.2018 18:47:32

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

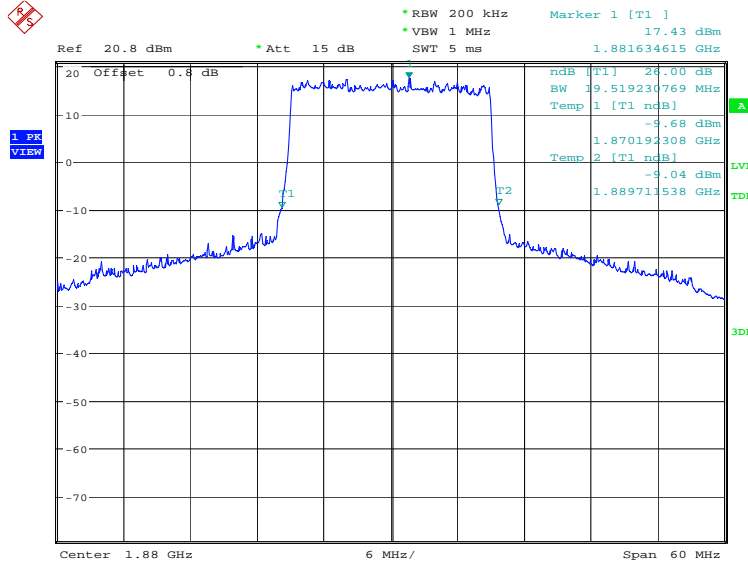


Date: 24.OCT.2018 18:48:57

**LTE band 2, 20MHz (-26dBc)**

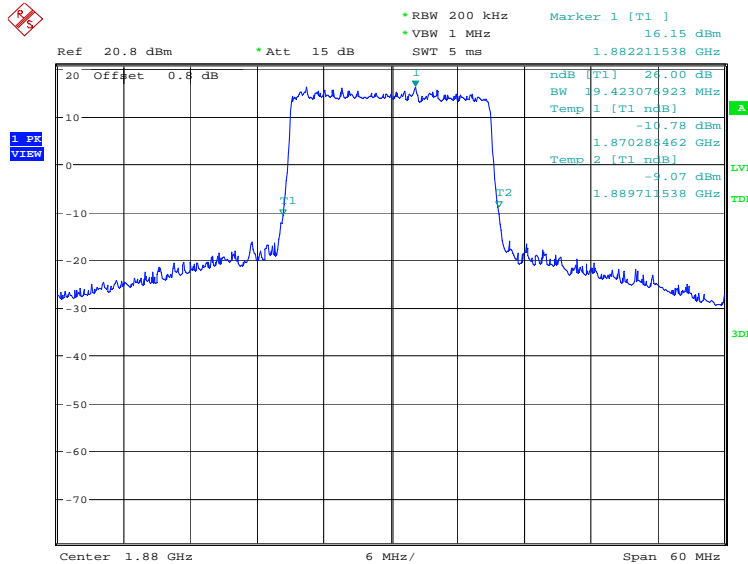
Frequency(MHz)	Occupied Bandwidth (-26dBc)( kHz)	
1880.0	QPSK	16QAM
	19519.23	19423.08

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



Date: 24.OCT.2018 18:51:11

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

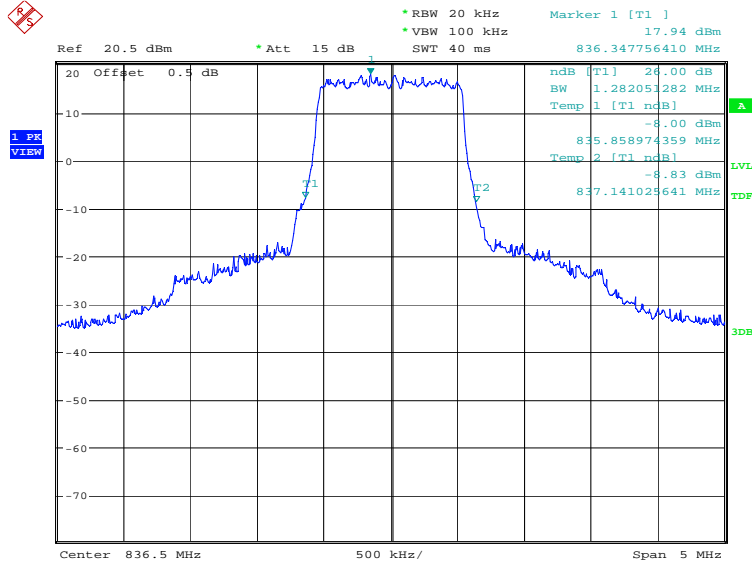


Date: 24.OCT.2018 18:52:36

**LTE band 5, 1.4MHz (-26dBc)**

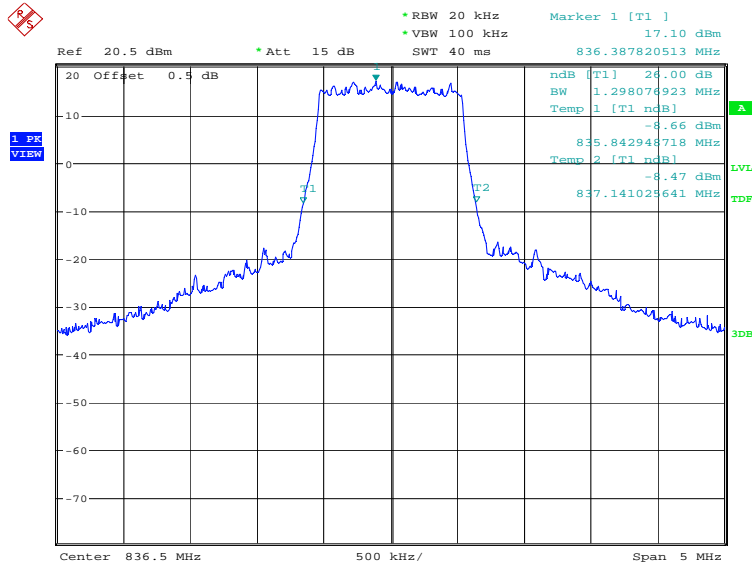
Frequency(MHz)	Occupied Bandwidth (-26dBc)( kHz)	
836.5	QPSK	16QAM
	1282.05	1298.08

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



Date: 24.OCT.2018 18:54:51

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

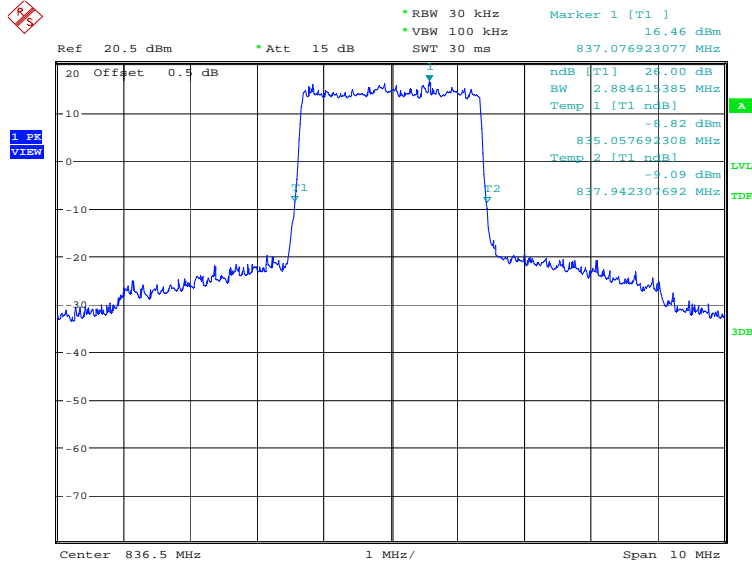


Date: 24.OCT.2018 18:56:16

**LTE band 5, 3MHz (-26dBc)**

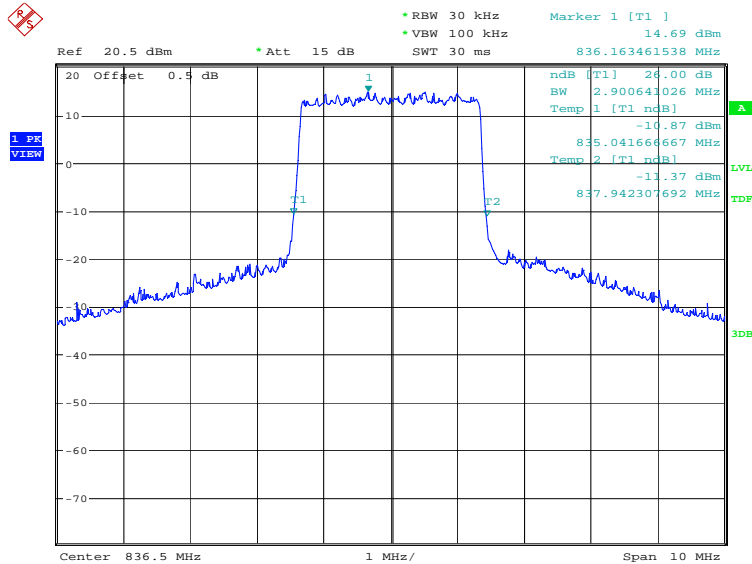
Frequency(MHz)	Occupied Bandwidth (-26dBc)( kHz)	
836.5	QPSK	16QAM
	2884.62	2900.64

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



Date: 24.OCT.2018 18:58:30

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

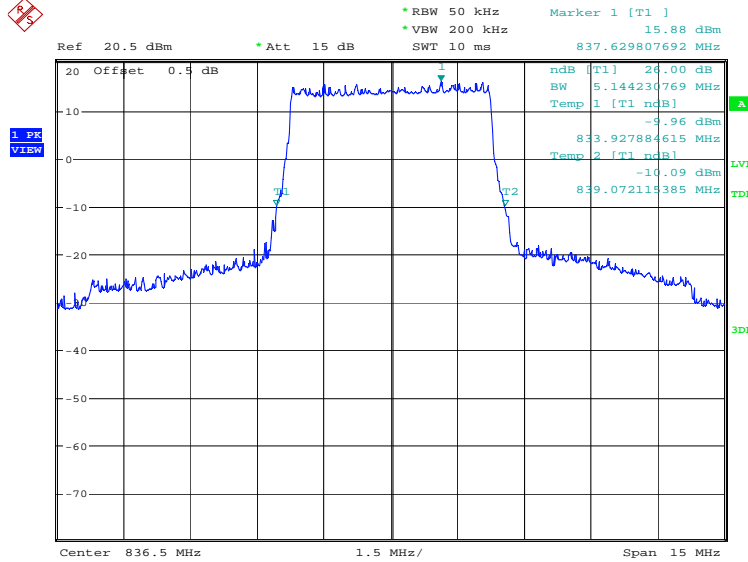


Date: 24.OCT.2018 18:59:55

**LTE band 5, 5MHz (-26dBc)**

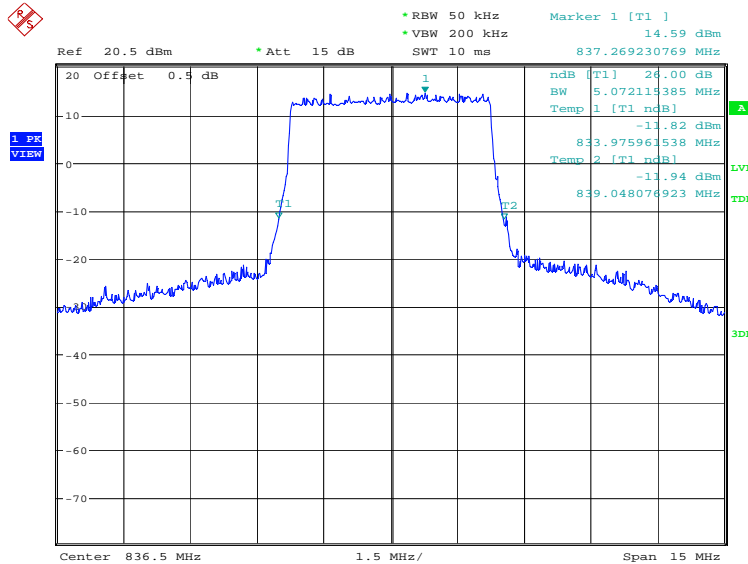
Frequency(MHz)	Occupied Bandwidth (-26dBc)( kHz)	
836.5	QPSK	16QAM
	5144.23	5072.12

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



Date: 24.OCT.2018 19:02:09

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

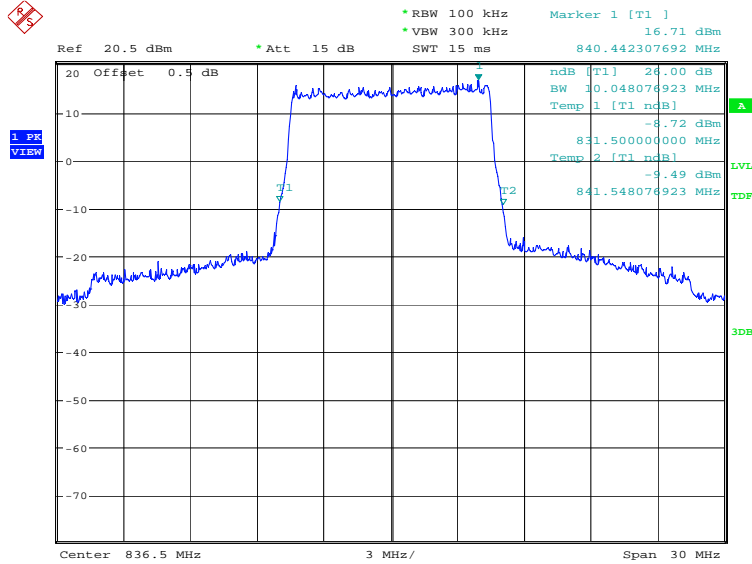


Date: 24.OCT.2018 19:03:34

**LTE band 5, 10MHz (-26dBc)**

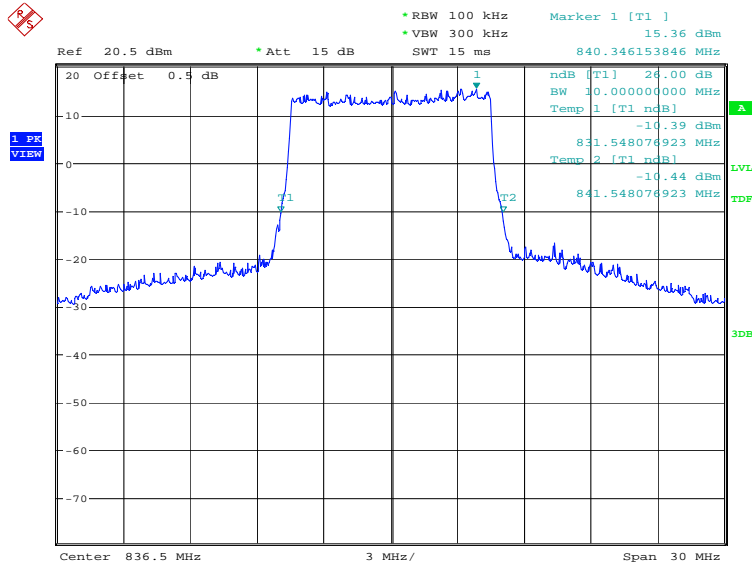
Frequency(MHz)	Occupied Bandwidth (-26dBc)( kHz)	
836.5	QPSK	16QAM
	10048.08	10000.00

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



Date: 24.OCT.2018 19:05:48

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

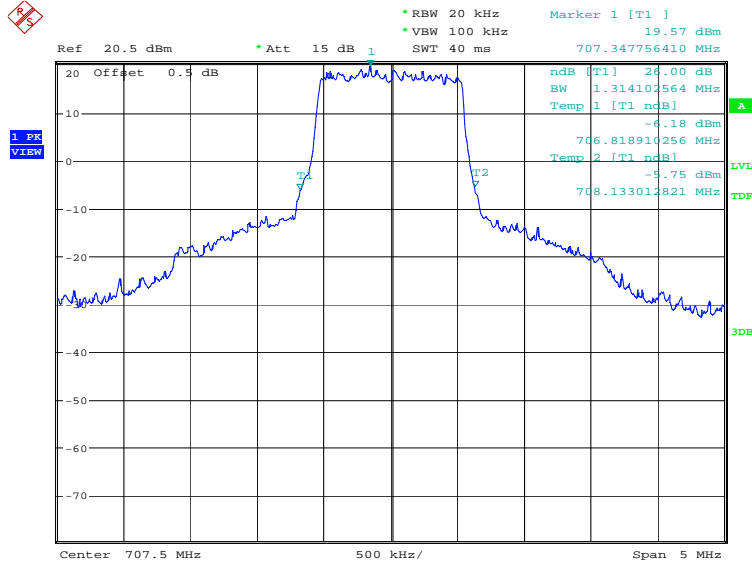


Date: 24.OCT.2018 19:07:13

**LTE band 12, 1.4MHz (-26dBc)**

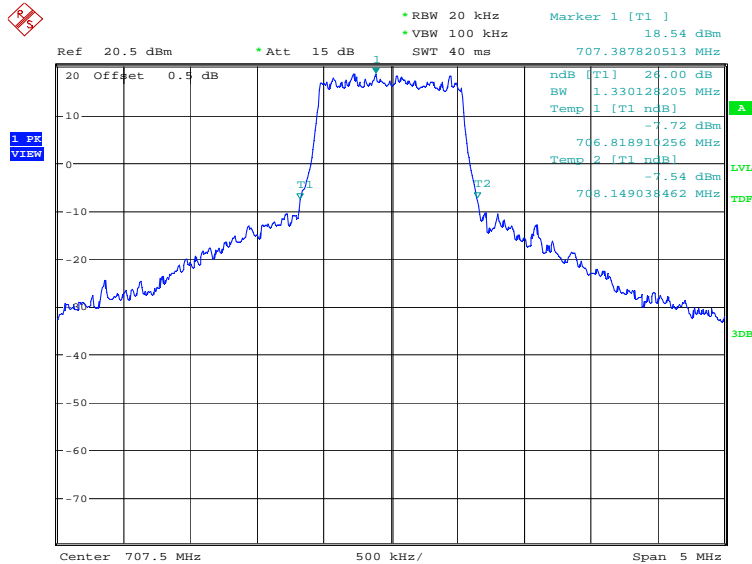
Frequency(MHz)	Occupied Bandwidth (-26dBc)( kHz)	
707.5	QPSK	16QAM
	1314.10	1330.13

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



Date: 24.OCT.2018 19:09:28

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

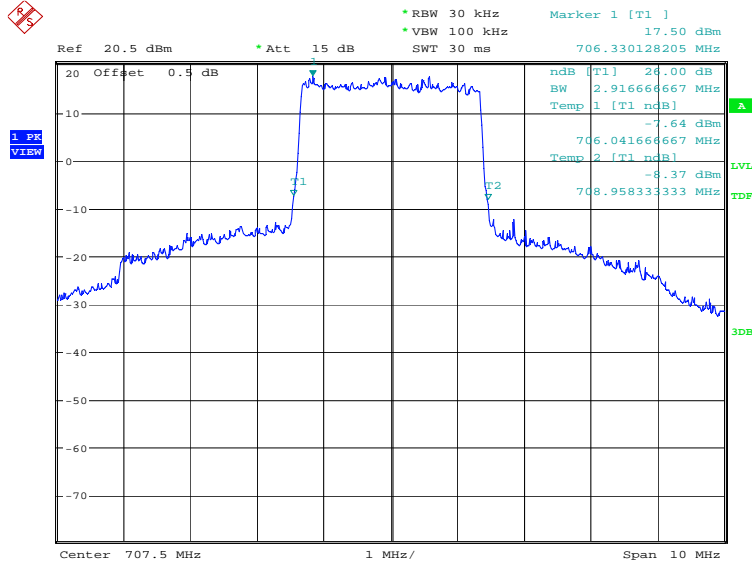


Date: 24.OCT.2018 19:10:53

**LTE band 12, 3MHz (-26dBc)**

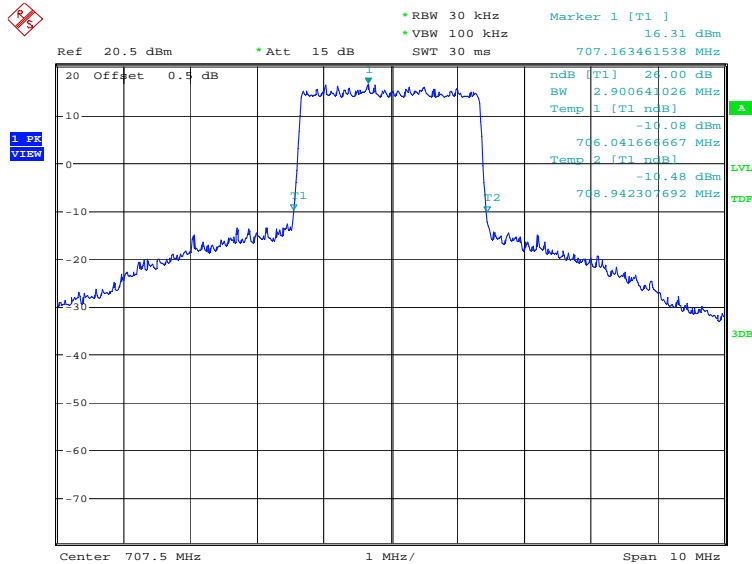
Frequency(MHz)	Occupied Bandwidth (-26dBc)( kHz)	
707.5	QPSK	16QAM
	2916.67	2900.64

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



Date: 24.OCT.2018 19:13:07

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



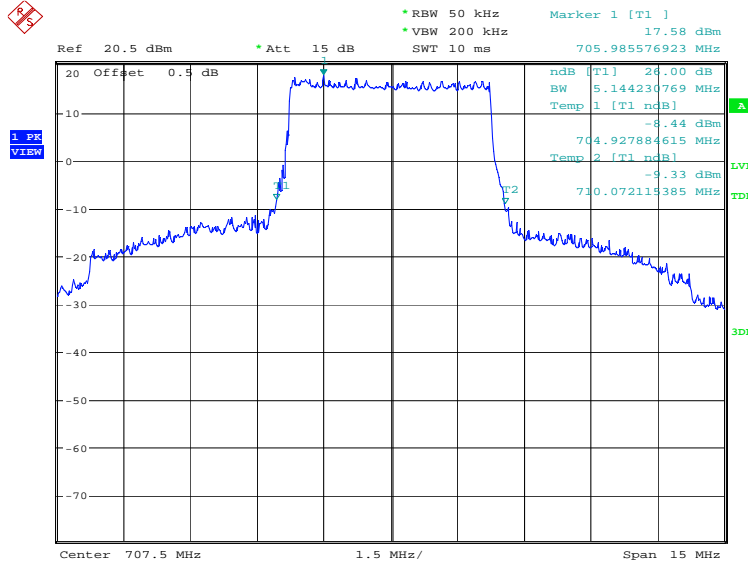
Date: 24.OCT.2018 19:14:32



**LTE band 12, 5MHz (-26dBc)**

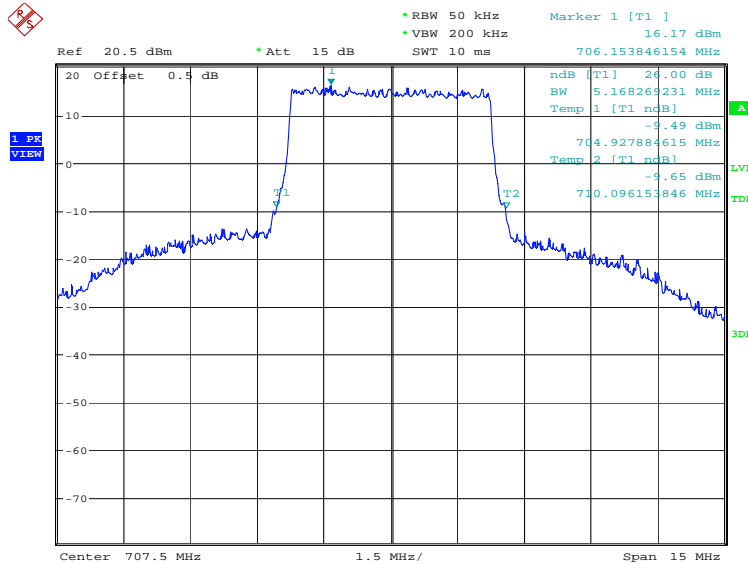
Frequency(MHz)	Occupied Bandwidth (-26dBc)( kHz)	
707.5	QPSK	16QAM
	5144.23	5168.27

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



Date: 24.OCT.2018 19:16:46

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

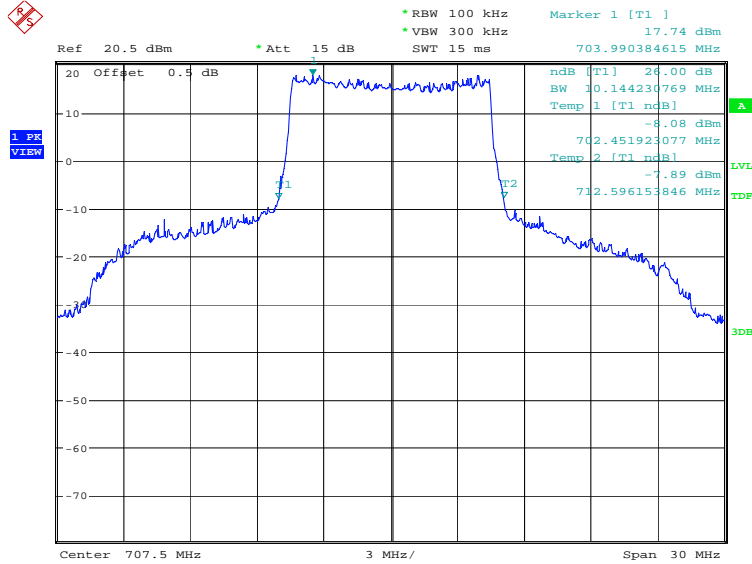


Date: 24.OCT.2018 19:18:11

**LTE band 12, 10MHz (-26dBc)**

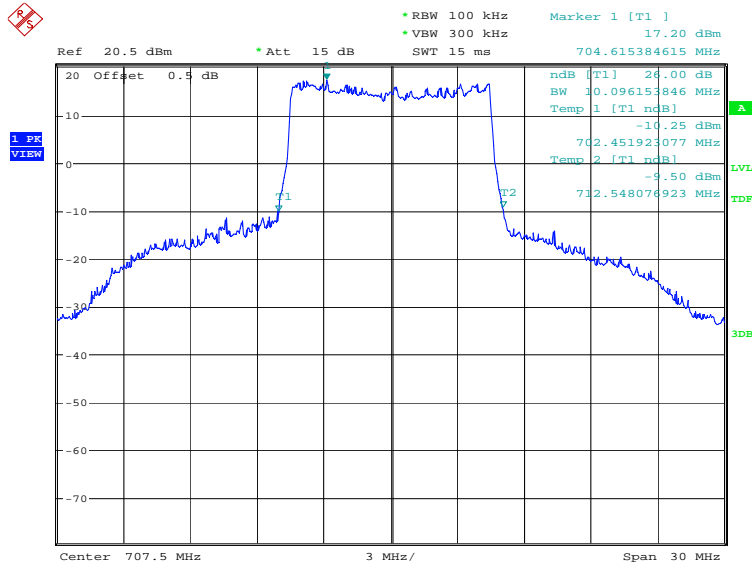
Frequency(MHz)	Occupied Bandwidth (-26dBc)( kHz)	
707.5	QPSK	16QAM
	10144.23	10096.15

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



Date: 24.OCT.2018 19:20:25

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

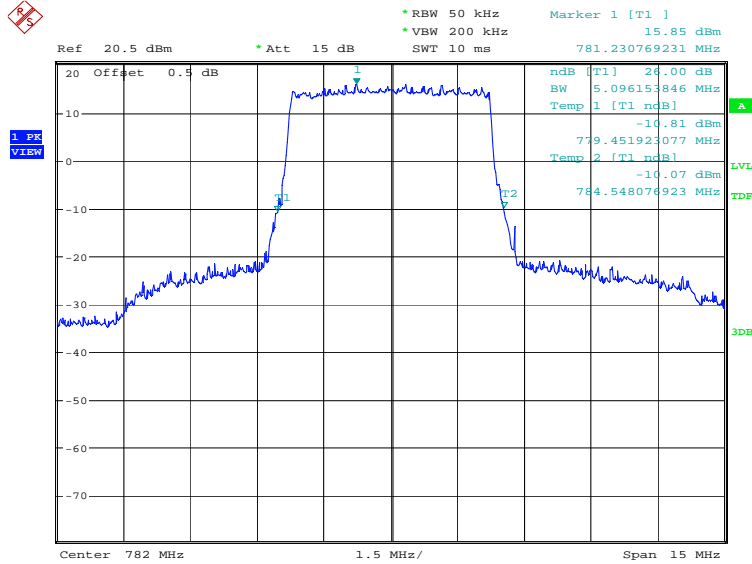


Date: 24.OCT.2018 19:21:50

**LTE band 13, 5MHz (-26dBc)**

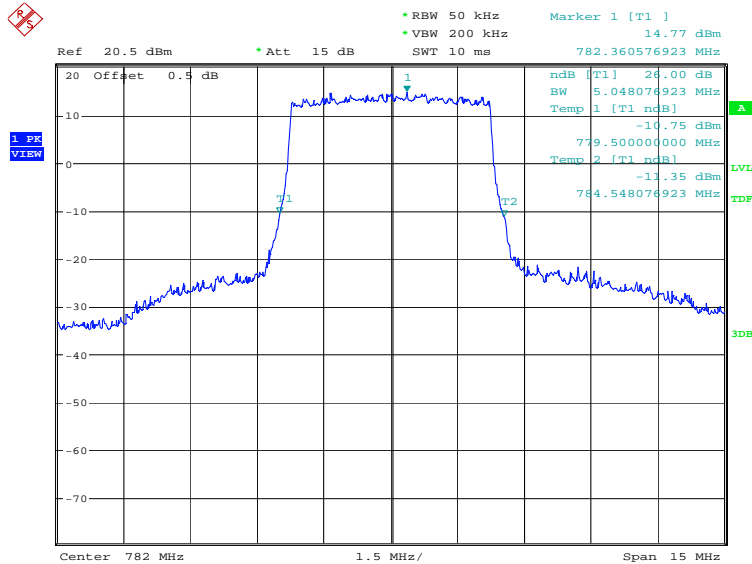
Frequency(MHz)	Occupied Bandwidth (-26dBc)( kHz)	
782.0	QPSK	16QAM
	5096.15	5048.08

**LTE band 13, 5MHz Bandwidth, QPSK (-26dBc BW)**



Date: 24.OCT.2018 19:24:05

**LTE band 13, 5MHz Bandwidth,16QAM (-26dBc BW)**

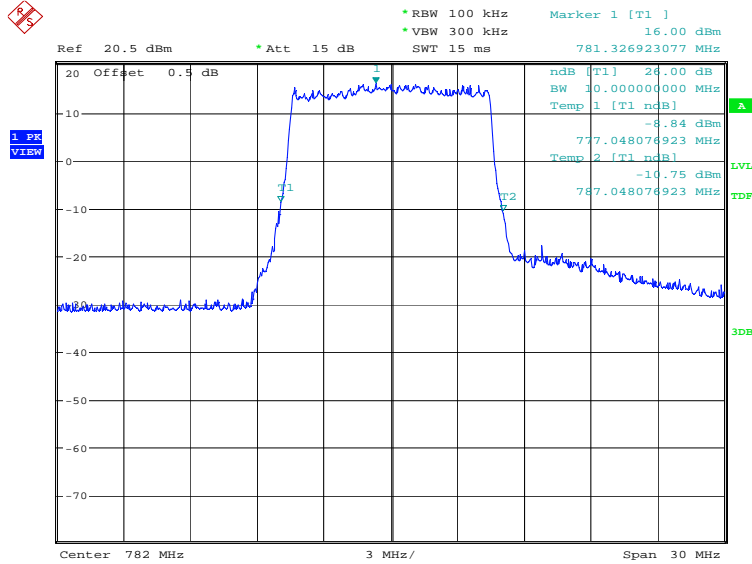


Date: 24.OCT.2018 19:25:30

**LTE band 13, 10MHz (-26dBc)**

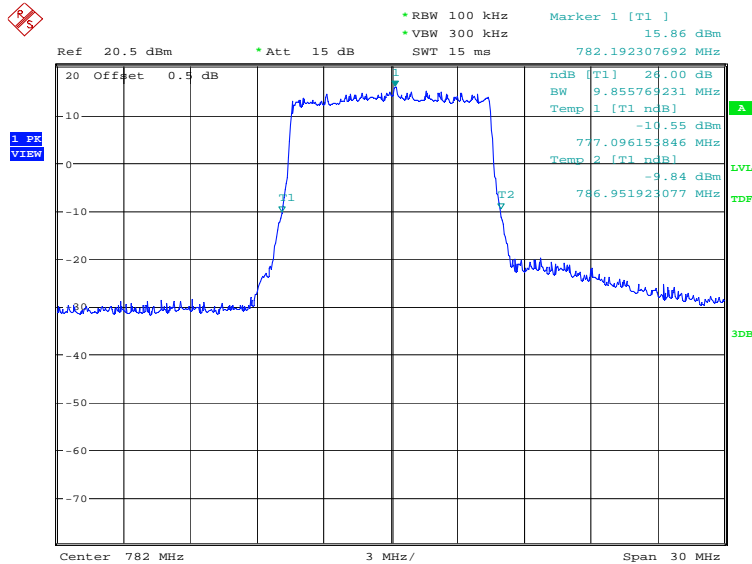
Frequency(MHz)	Occupied Bandwidth (-26dBc)( kHz)	
782.0	QPSK	16QAM
	10000.00	9855.77

**LTE band 13, 10MHz Bandwidth, QPSK (-26dBc BW)**



Date: 24.OCT.2018 19:27:44

**LTE band 13, 10MHz Bandwidth,16QAM (-26dBc BW)**

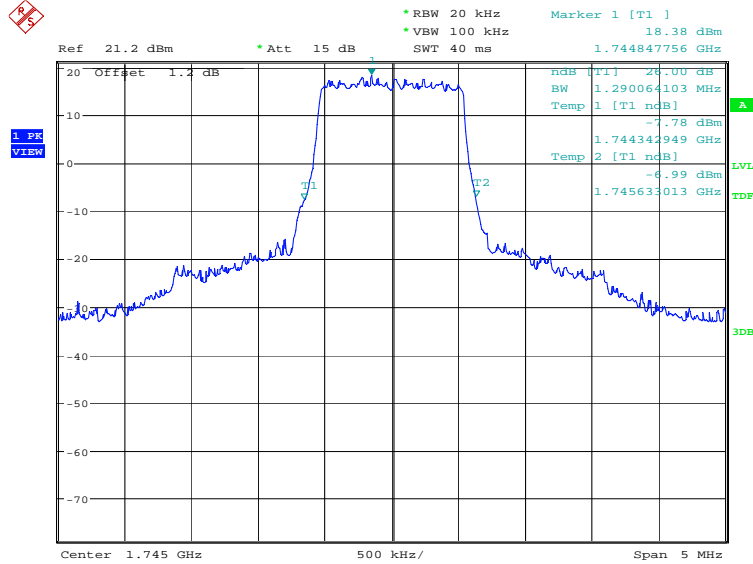


Date: 24.OCT.2018 19:29:09

**LTE band 66, 1.4MHz (-26dBc)**

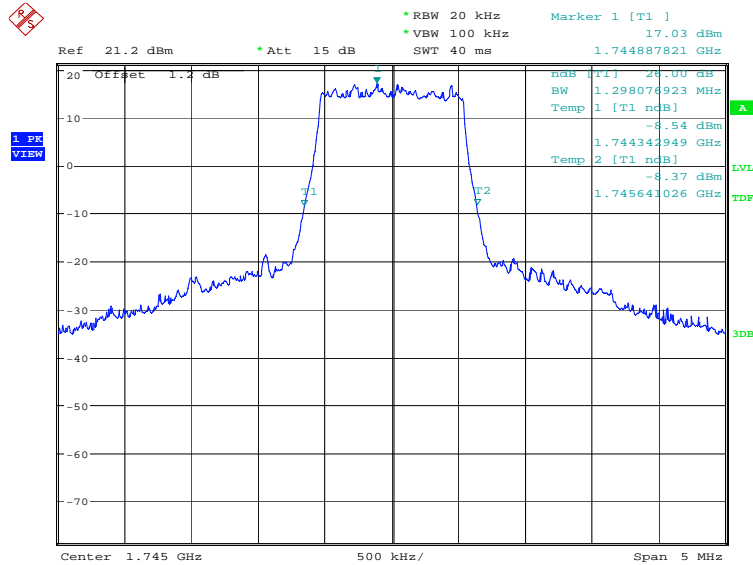
Frequency(MHz)	Occupied Bandwidth (-26dBc)( kHz)	
	1745.0	QPSK
1290.06		1298.08

**LTE band 66, 1.4MHz Bandwidth, QPSK (-26dBc BW)**



Date: 24.OCT.2018 19:31:24

**LTE band 66, 1.4MHz Bandwidth, 16QAM (-26dBc BW)**

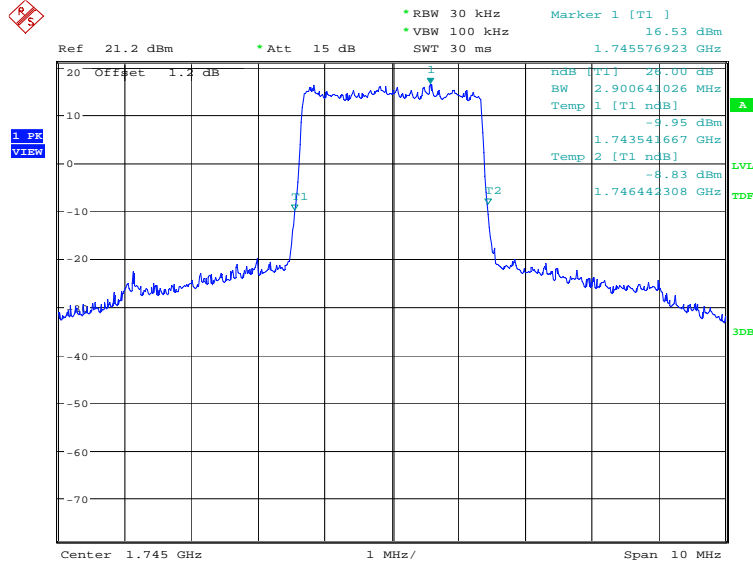


Date: 24.OCT.2018 19:32:49

**LTE band 66, 3MHz (-26dBc)**

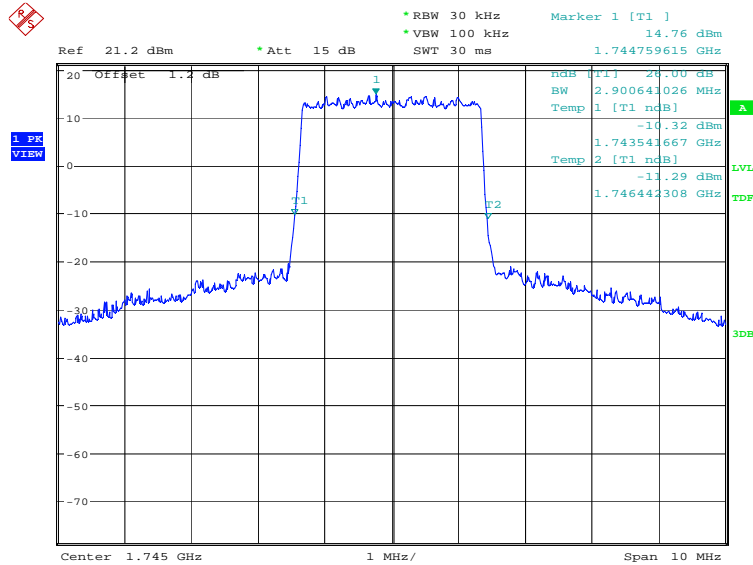
Frequency(MHz)	Occupied Bandwidth (-26dBc)( kHz)	
	1745.0	QPSK
2900.64		2900.64

**LTE band 66, 3MHz Bandwidth, QPSK (-26dBc BW)**



Date: 24.OCT.2018 19:35:03

**LTE band 66, 3MHz Bandwidth, 16QAM (-26dBc BW)**

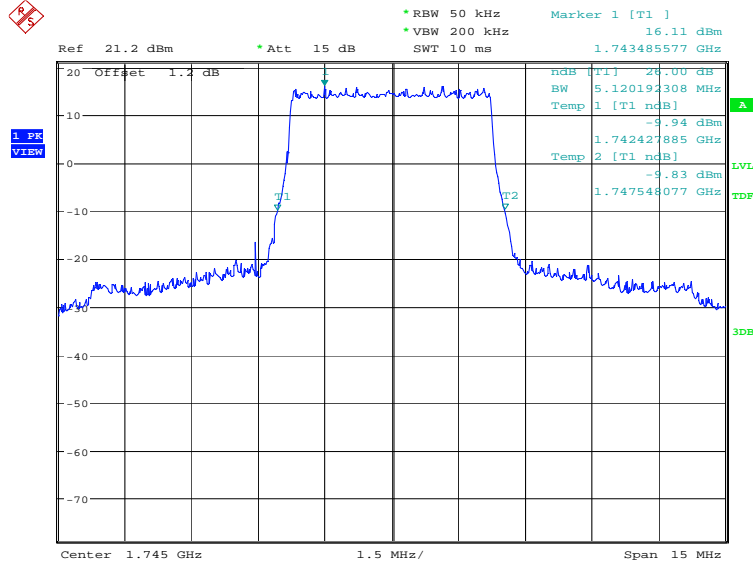


Date: 24.OCT.2018 19:36:28

**LTE band 66, 5MHz (-26dBc)**

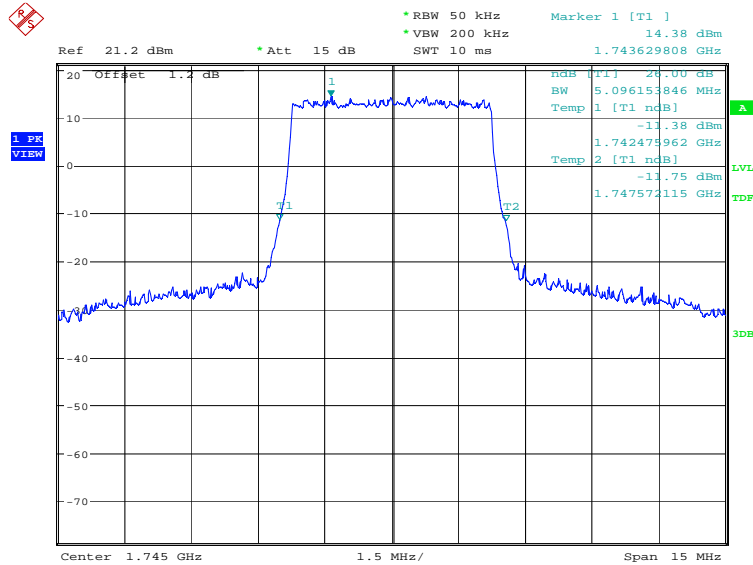
Frequency(MHz)	Occupied Bandwidth (-26dBc)( kHz)	
	1745.0	QPSK
	5120.19	5096.15

**LTE band 66, 5MHz Bandwidth, QPSK (-26dBc BW)**



Date: 24.OCT.2018 19:38:42

**LTE band 66, 5MHz Bandwidth, 16QAM (-26dBc BW)**

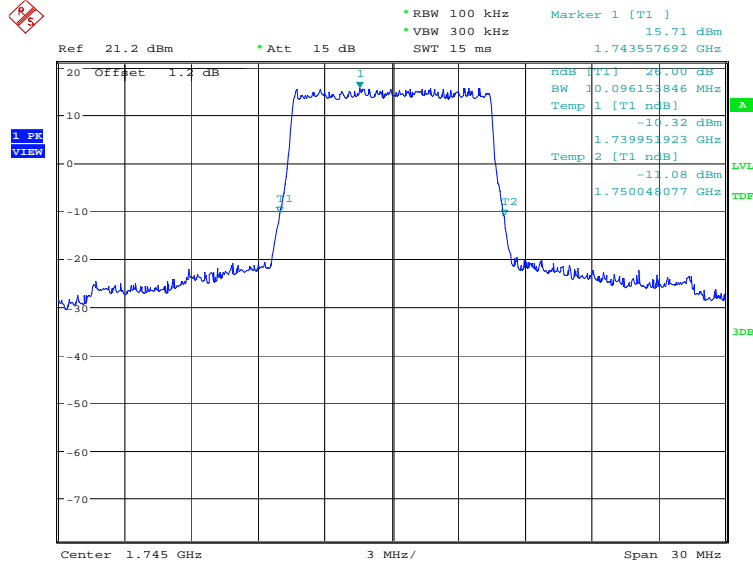


Date: 24.OCT.2018 19:40:07

**LTE band 66, 10MHz (-26dBc)**

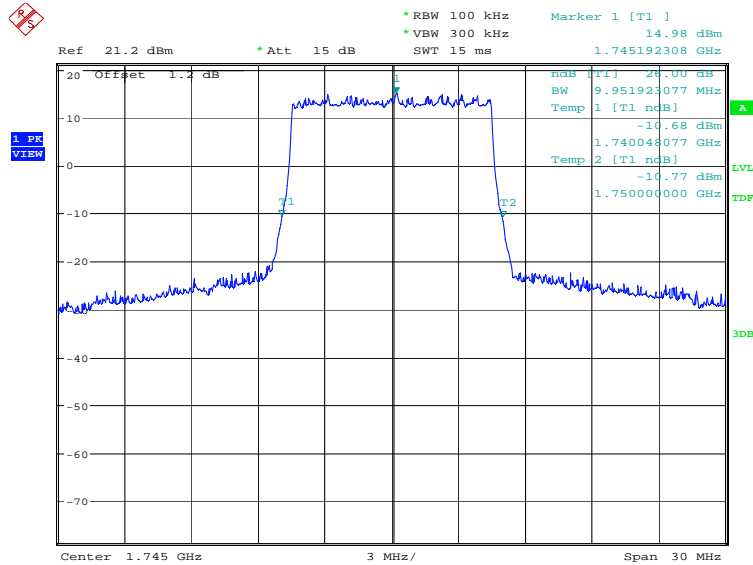
Frequency(MHz)	Occupied Bandwidth (-26dBc)( kHz)	
	1745.0	QPSK
	10096.15	9951.92

**LTE band 66, 10MHz Bandwidth, QPSK (-26dBc BW)**



Date: 24.OCT.2018 19:42:21

**LTE band 66, 10MHz Bandwidth, 16QAM (-26dBc BW)**



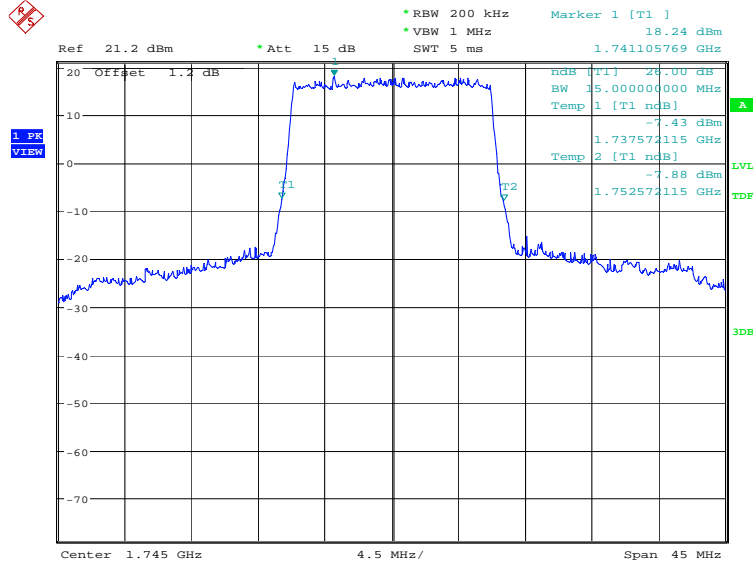
Date: 24.OCT.2018 19:43:46



**LTE band 66, 15MHz (-26dBc)**

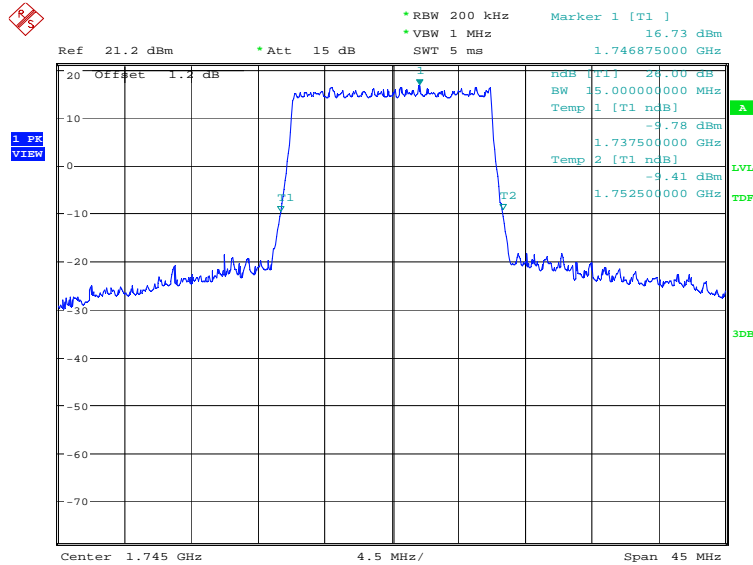
Frequency(MHz)	Occupied Bandwidth (-26dBc)( kHz)	
1745.0	QPSK	16QAM
	15000.00	15000.00

**LTE band 66, 15MHz Bandwidth, QPSK (-26dBc BW)**



Date: 24.OCT.2018 19:46:00

**LTE band 66, 15MHz Bandwidth, 16QAM (-26dBc BW)**

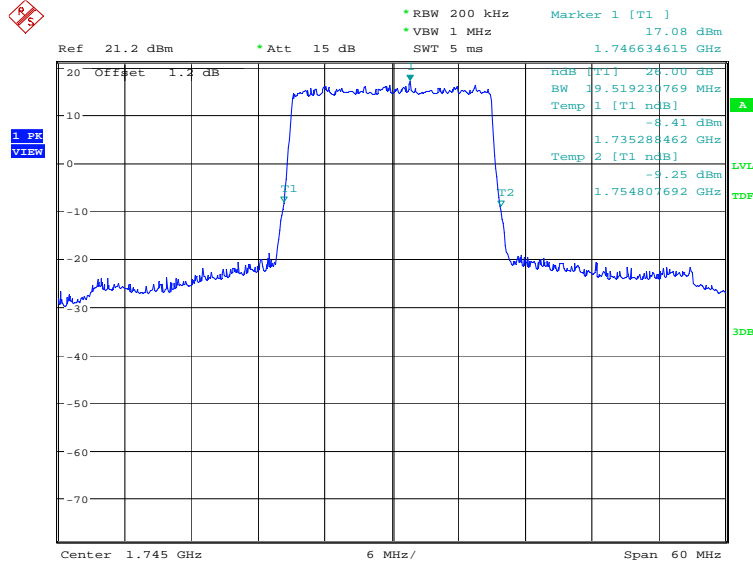


Date: 24.OCT.2018 19:47:26

**LTE band 66, 20MHz (-26dBc)**

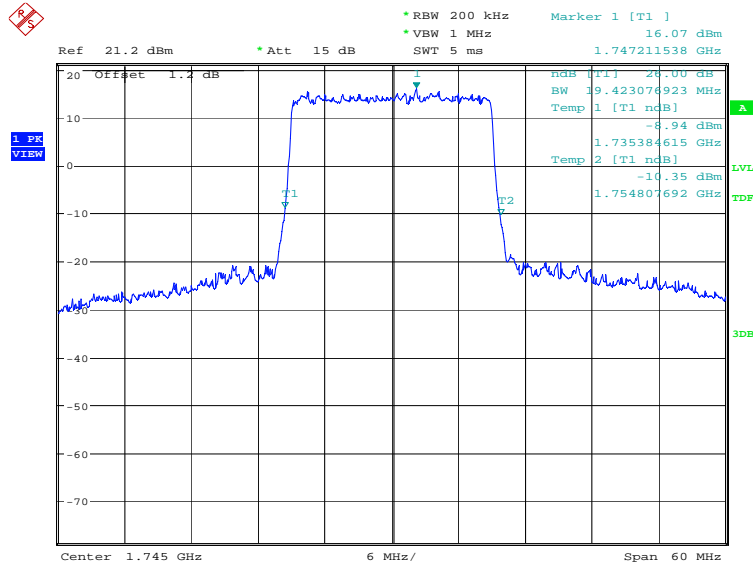
Frequency(MHz)	Occupied Bandwidth (-26dBc)( kHz)	
	1745.0	QPSK
	19519.23	19423.08

**LTE band 66, 20MHz Bandwidth, QPSK (-26dBc BW)**



Date: 24.OCT.2018 19:49:40

**LTE band 66, 20MHz Bandwidth, 16QAM (-26dBc BW)**

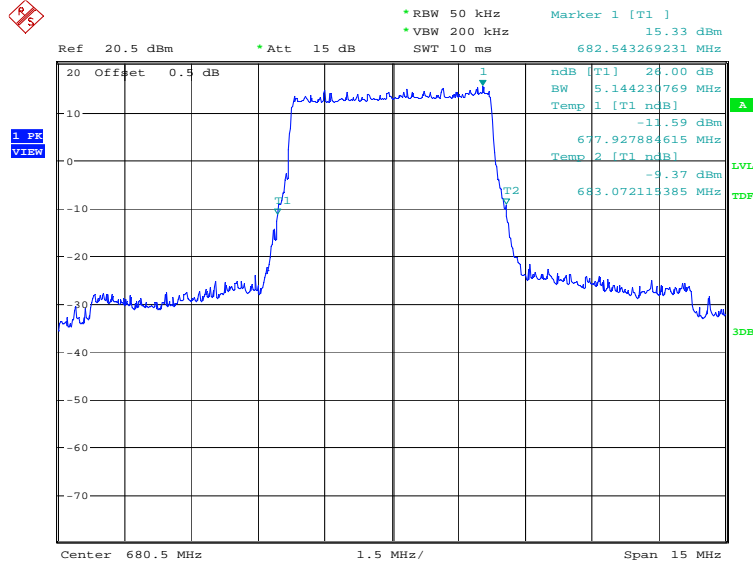


Date: 24.OCT.2018 19:51:05

**LTE band 71, 5MHz (-26dBc)**

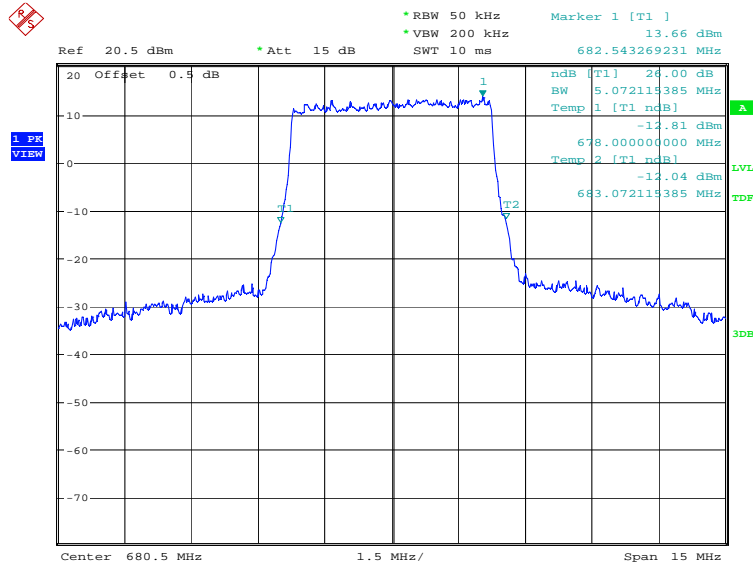
Frequency(MHz)	Occupied Bandwidth (-26dBc)( kHz)	
	680.5	QPSK
5144.23		5072.12

**LTE band 71, 5MHz Bandwidth, QPSK (-26dBc BW)**



Date: 24.OCT.2018 19:53:28

**LTE band 71, 5MHz Bandwidth, 16QAM (-26dBc BW)**

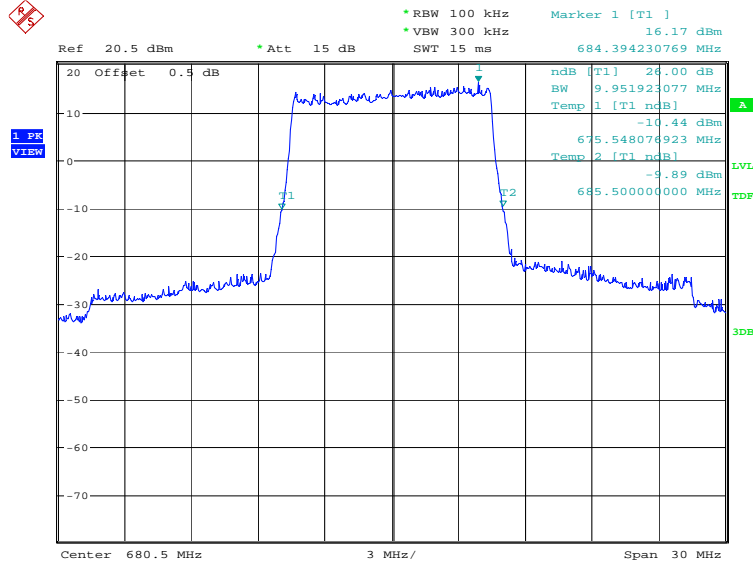


Date: 24.OCT.2018 19:54:53

**LTE band 71, 10MHz (-26dBc)**

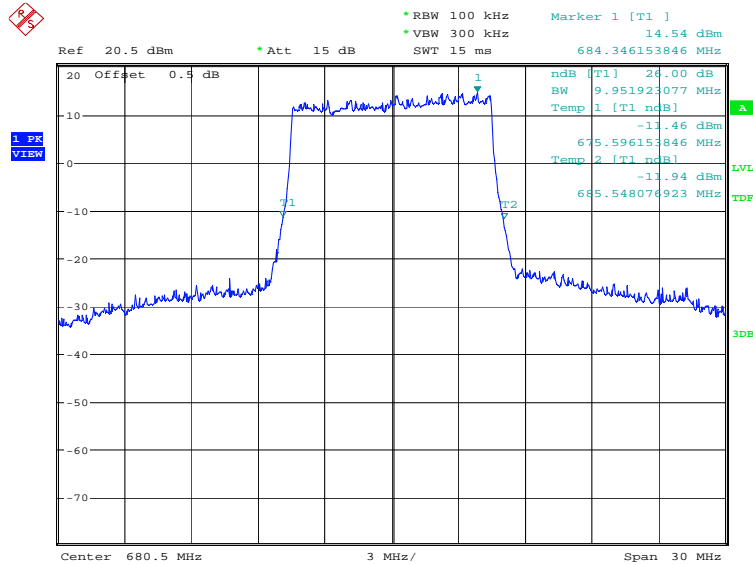
Frequency(MHz)	Occupied Bandwidth (-26dBc)( kHz)	
	680.5	QPSK
9951.92		9951.92

**LTE band 71, 10MHz Bandwidth, QPSK (-26dBc BW)**



Date: 24.OCT.2018 19:57:07

**LTE band 71, 10MHz Bandwidth, 16QAM (-26dBc BW)**

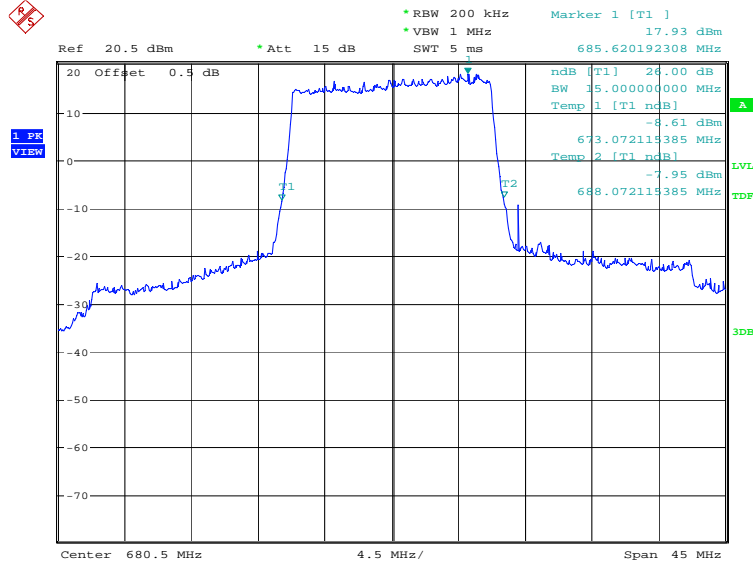


Date: 24.OCT.2018 19:58:32

**LTE band 71, 15MHz (-26dBc)**

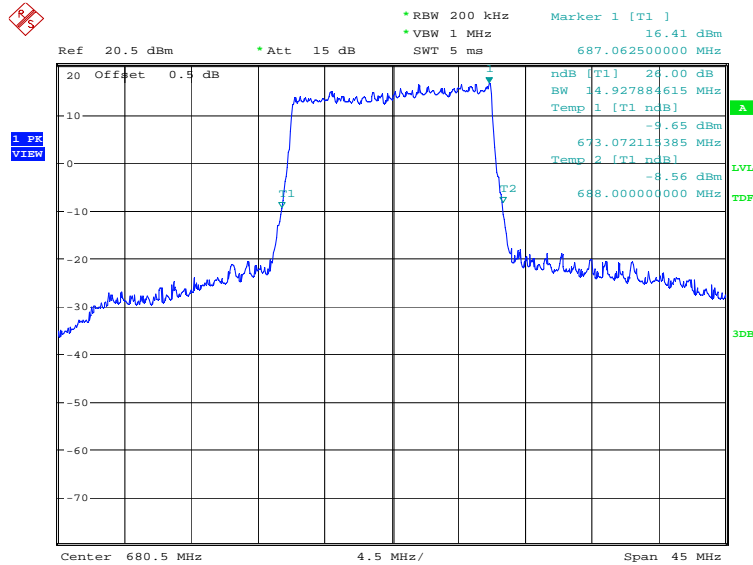
Frequency(MHz)	Occupied Bandwidth (-26dBc)( kHz)	
	680.5	QPSK
	15000.00	14927.88

**LTE band 71, 15MHz Bandwidth, QPSK (-26dBc BW)**



Date: 24.OCT.2018 20:00:46

**LTE band 71, 15MHz Bandwidth, 16QAM (-26dBc BW)**

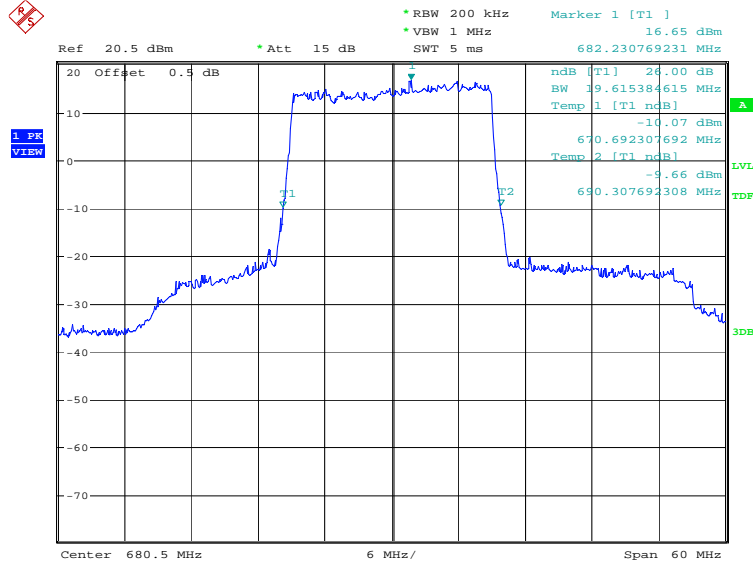


Date: 24.OCT.2018 20:02:11

**LTE band 71, 20MHz (-26dBc)**

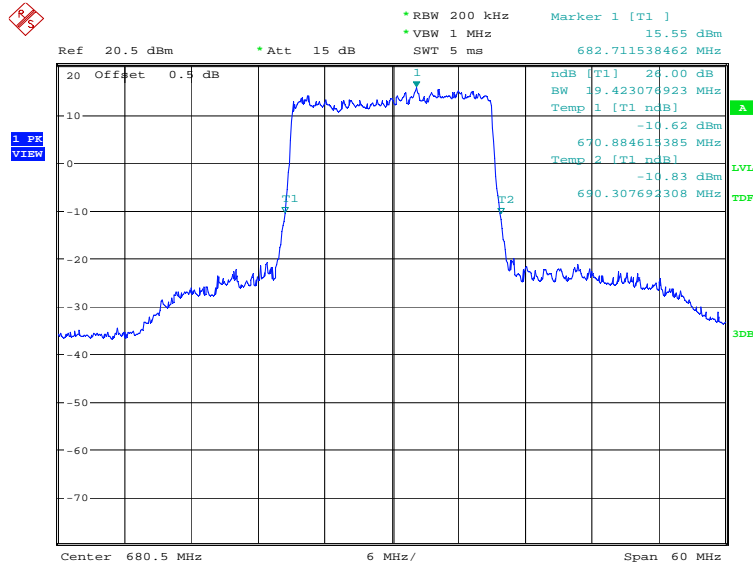
Frequency(MHz)	Occupied Bandwidth (-26dBc)( kHz)	
	680.5	QPSK
19615.38		19423.08

**LTE band 71, 20MHz Bandwidth, QPSK (-26dBc BW)**



Date: 24.OCT.2018 20:04:25

**LTE band 71, 20MHz Bandwidth, 16QAM (-26dBc BW)**



Date: 24.OCT.2018 20:05:50

## **A.6 BAND EDGE COMPLIANCE**

### **A.6.1 Measurement limit**

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

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

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

Part 27.53(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

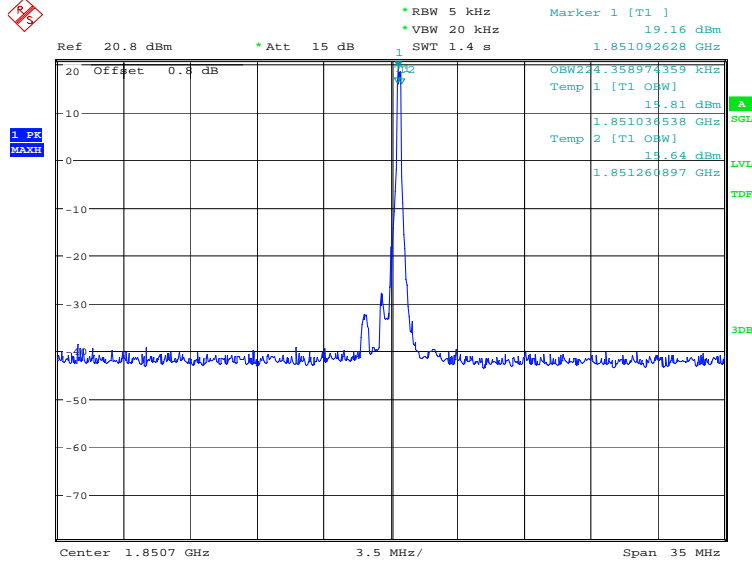
Part 27.53(a) states for mobile and portable stations operating in the 2305–2315 MHz and 2350–2360 MHz bands: By a factor of not less than:  $43 + 10 \log(P)$  dB on all frequencies between 2305 and 2320 MHz and on all frequencies between 2345 and 2360 MHz that are outside the licensed band(s) of operation,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



dB on all frequencies between 2360 and 2365 MHz, and not less than  $70 + 10 \log (P)$  dB above 2365 MHz.

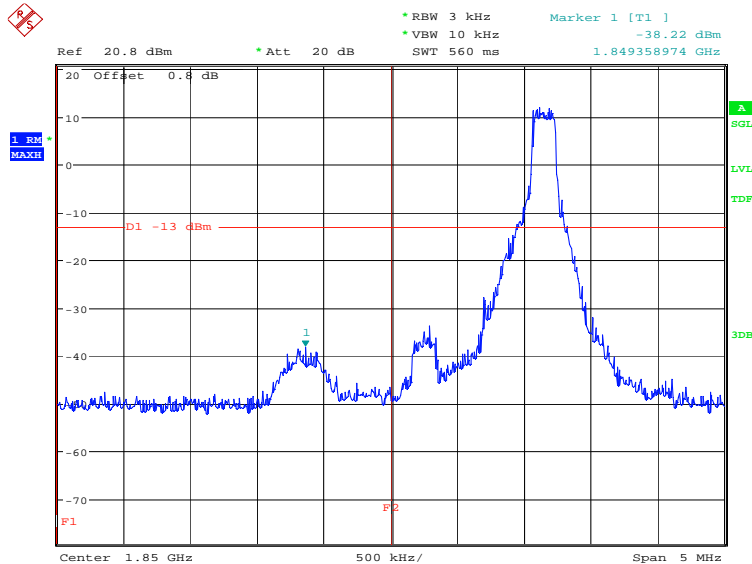


**A.6.2 Measurement result**  
**Only worst case result is given below**  
**LTE band 2**  
**OBW: 1RB-low\_offset**



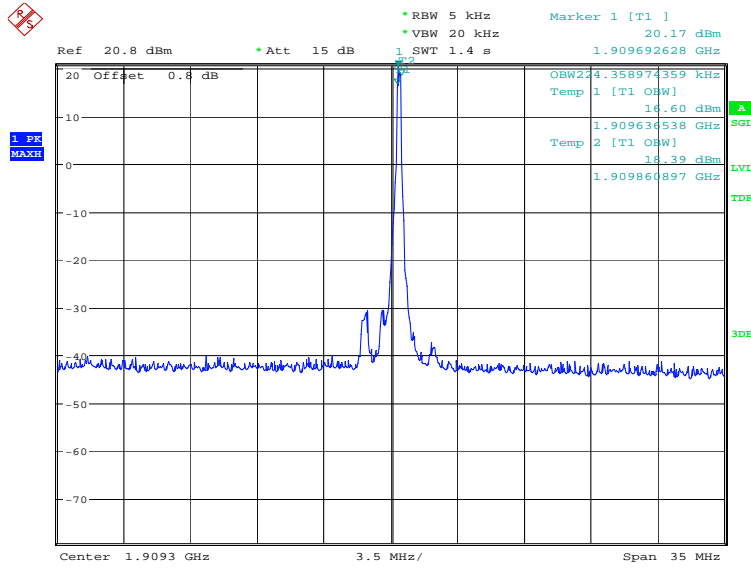
Date: 25.OCT.2018 09:18:01

**LOW BAND EDGE BLOCK-1RB-low\_offset**



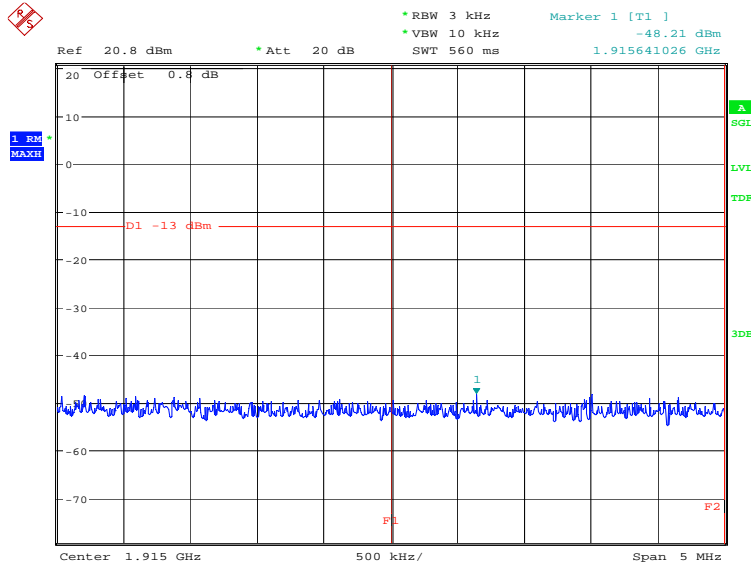
Date: 25.OCT.2018 09:18:17

**OBW: 1RB-high\_offset**



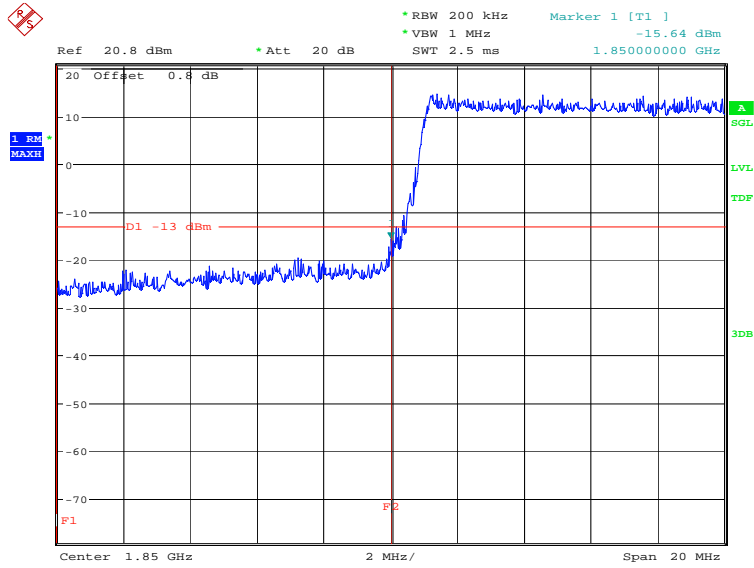
Date: 25.OCT.2018 09:23:38

**HIGH BAND EDGE BLOCK-1RB-high\_offset**



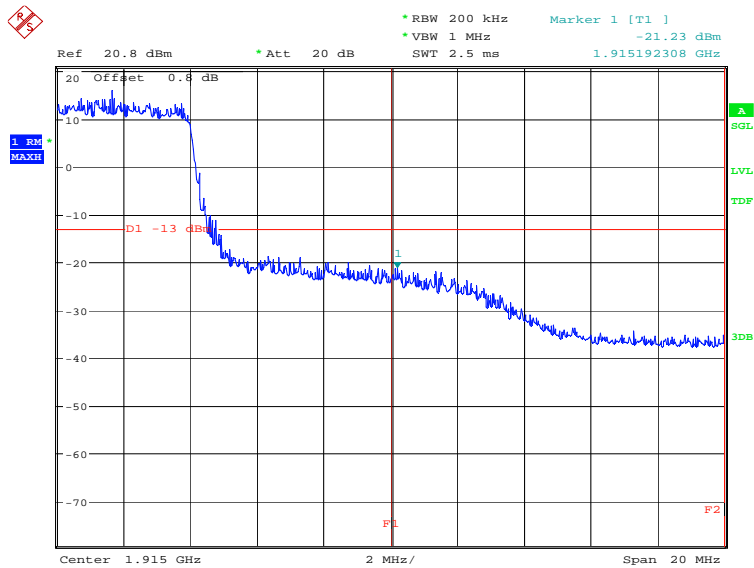
Date: 25.OCT.2018 09:23:54

### LOW BAND EDGE BLOCK-20MHz-100%RB



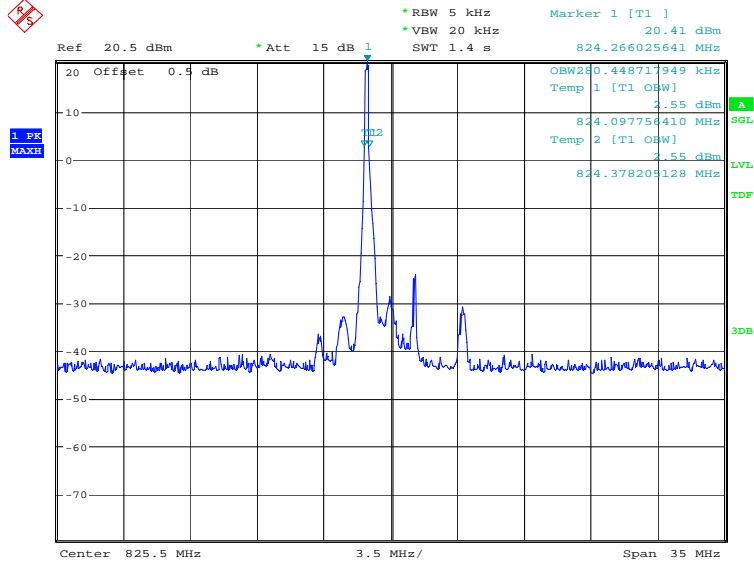
Date: 25.OCT.2018 09:21:40

### HIGH BAND EDGE BLOCK-20MHz-100%RB



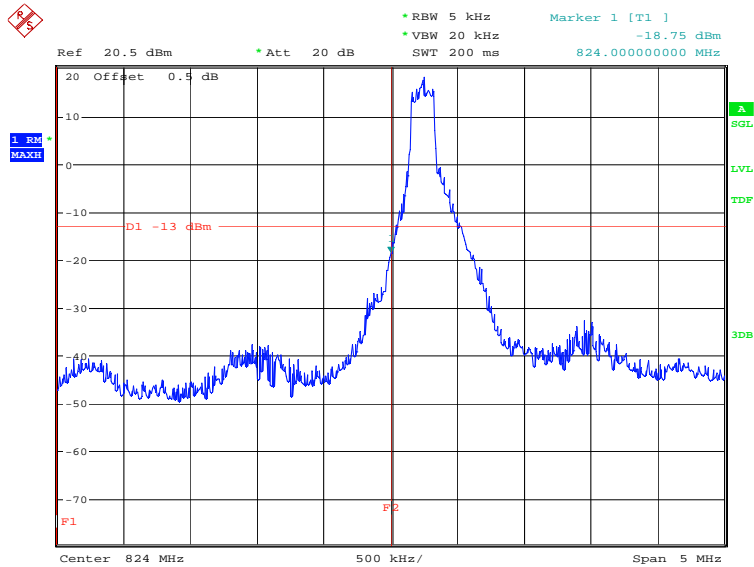
Date: 25.OCT.2018 09:24:30

**LTE band 5**  
**OBW: 1RB-low\_offset**



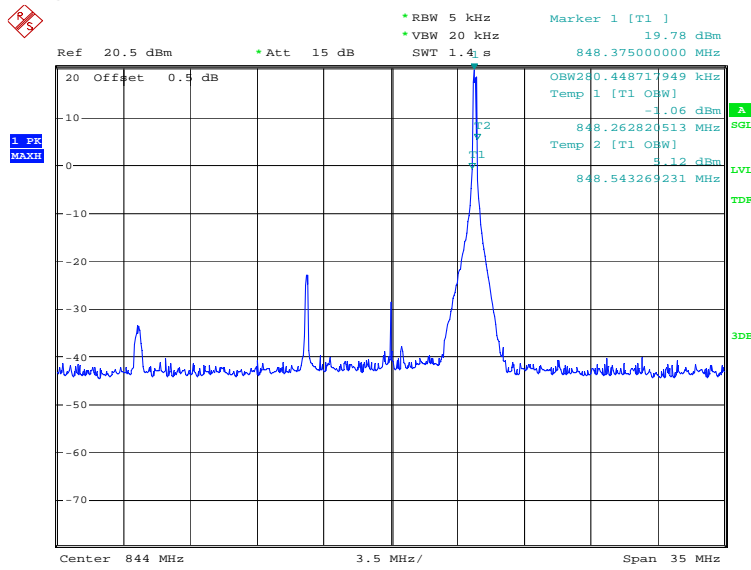
Date: 25.OCT.2018 09:28:22

**LOW BAND EDGE BLOCK-1RB-low\_offset**



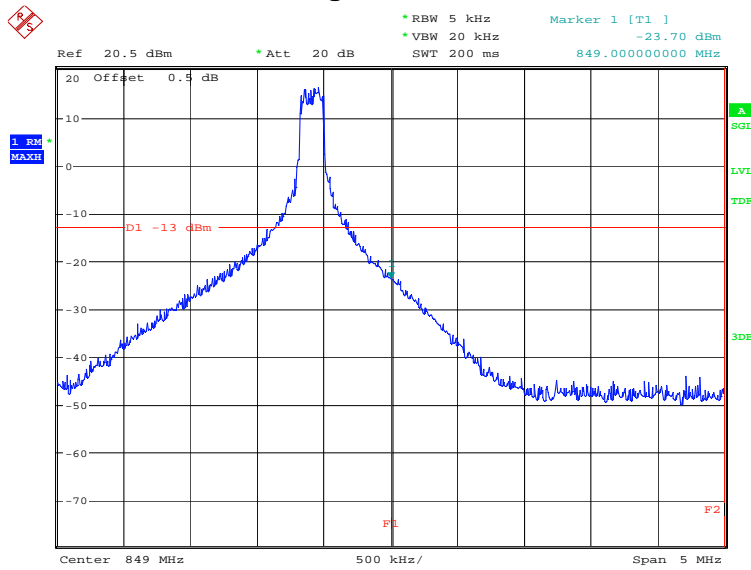
Date: 25.OCT.2018 09:28:38

**OBW: 1RB-high\_offset**



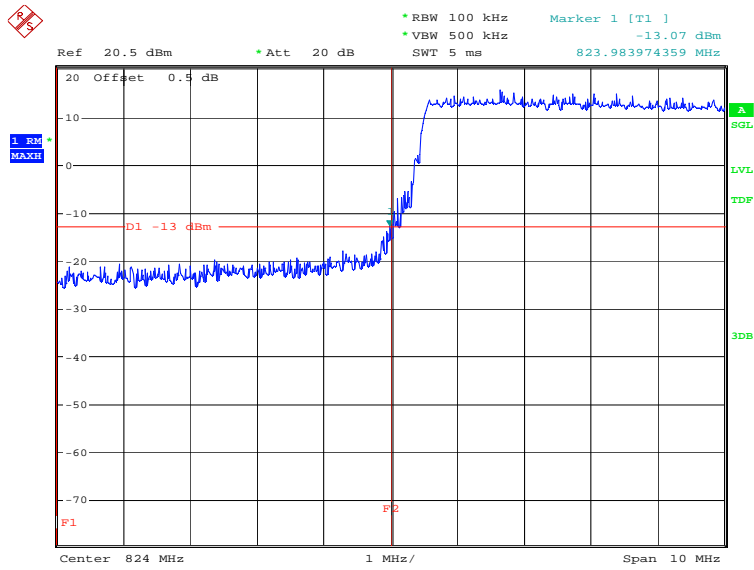
Date: 25.OCT.2018 09:30:33

**HIGH BAND EDGE BLOCK-1RB-high\_offset**



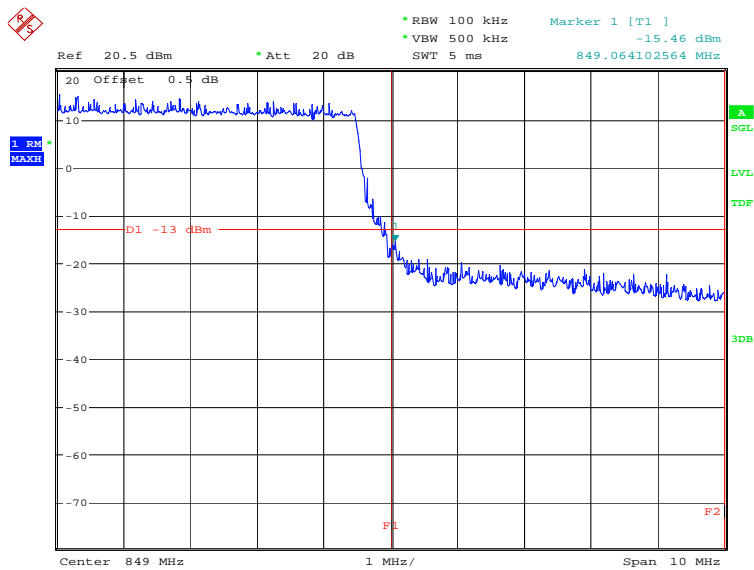
Date: 25.OCT.2018 09:30:49

### LOW BAND EDGE BLOCK-10MHz-100%RB



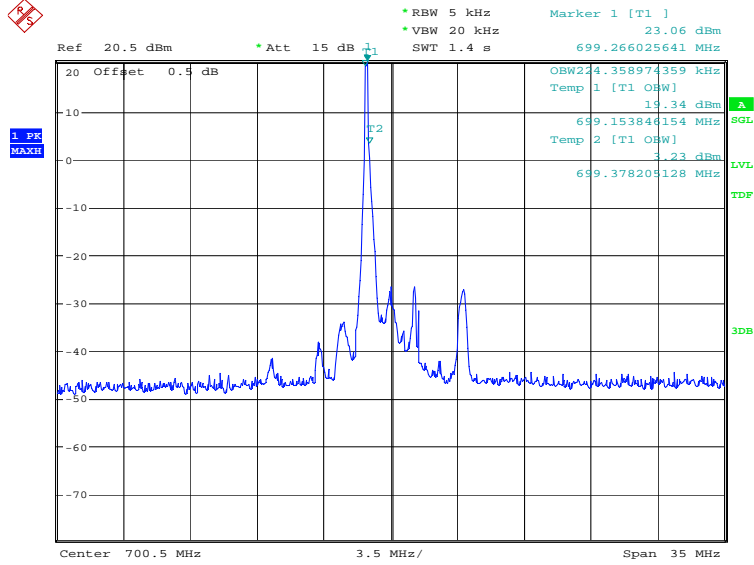
Date: 25.OCT.2018 09:36:30

### HIGH BAND EDGE BLOCK-10MHz-100%RB



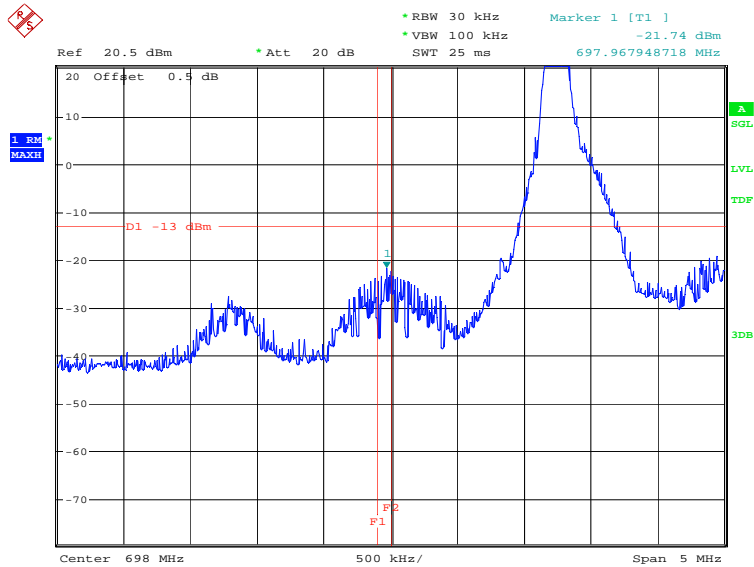
Date: 25.OCT.2018 09:31:17

**LTE band 12**  
**OBW: 1RB-low\_offset**



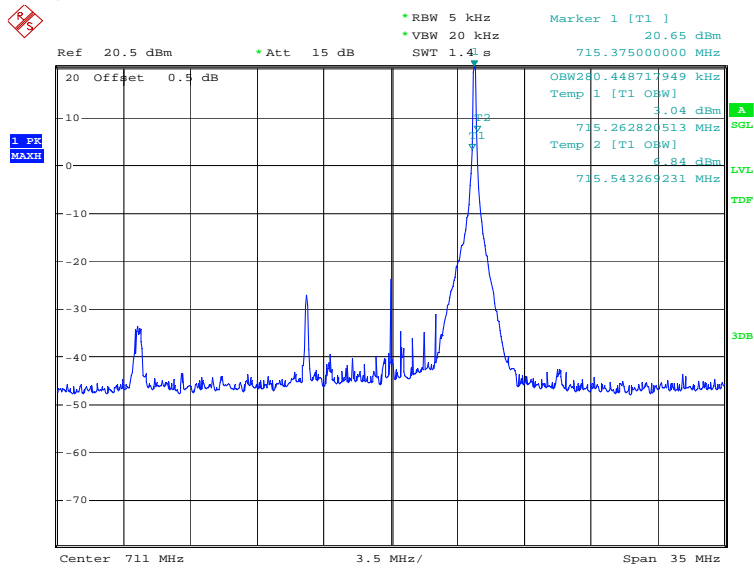
Date: 25.OCT.2018 09:40:25

**LOW BAND EDGE BLOCK-1RB-low\_offset**



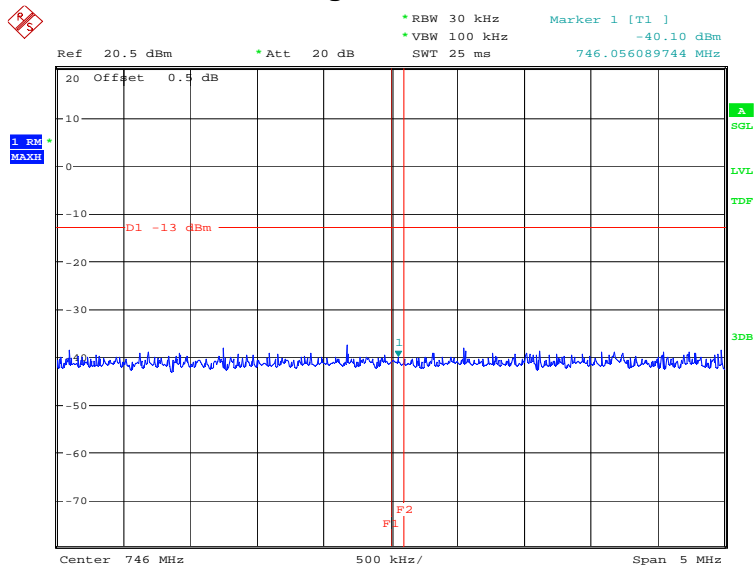
Date: 25.OCT.2018 09:40:40

### OBW: 1RB-high\_offset



Date: 25.OCT.2018 14:11:36

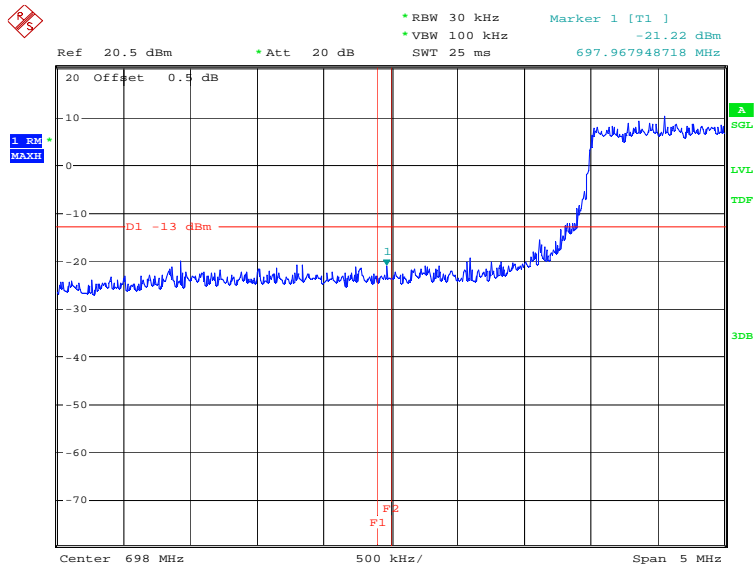
### HIGH BAND EDGE BLOCK-1RB-high\_offset



Date: 25.OCT.2018 14:17:25

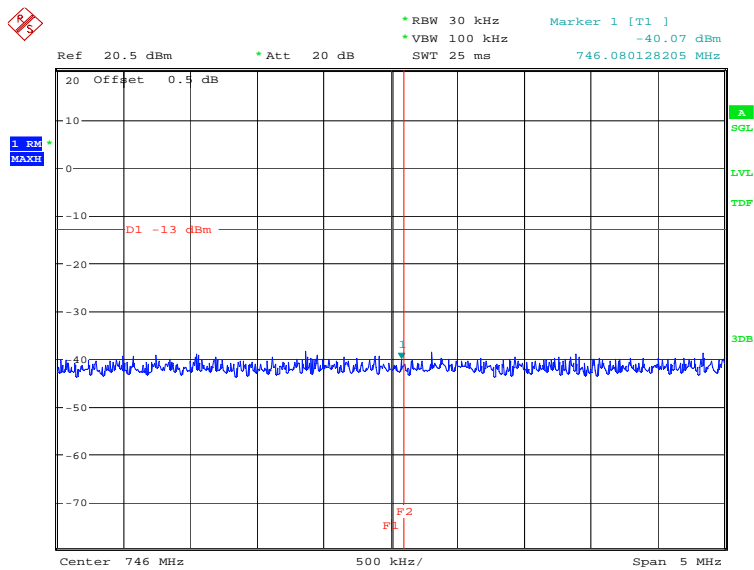


### LOW BAND EDGE BLOCK-10MHz-100%RB



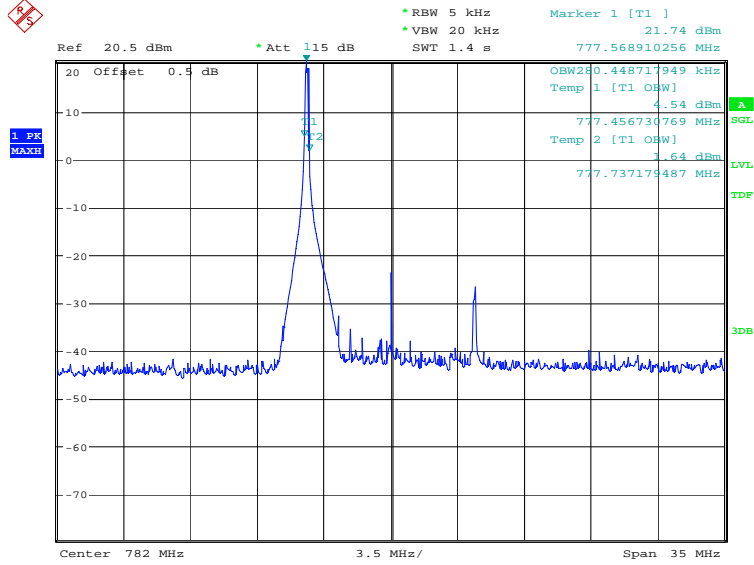
Date: 25.OCT.2018 09:41:16

### HIGH BAND EDGE BLOCK-10MHz-100%RB



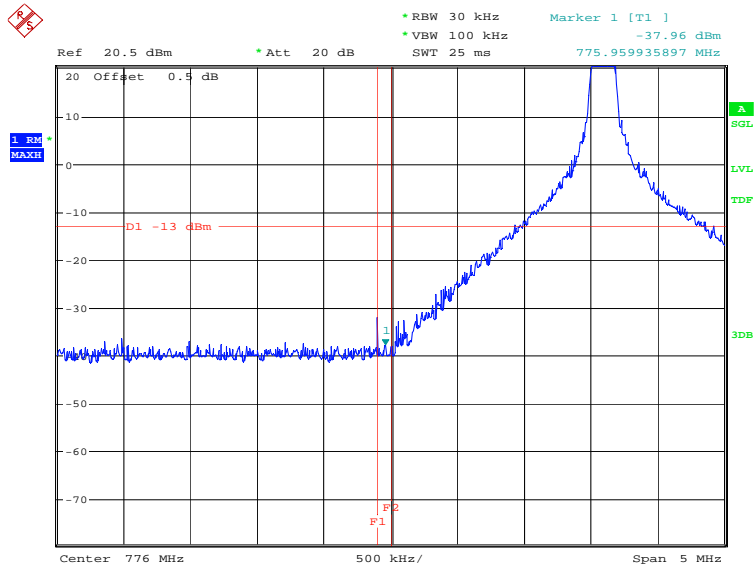
Date: 25.OCT.2018 14:22:28

**LTE band 13**  
**OBW: 1RB-low\_offset**



Date: 26.OCT.2018 16:29:34

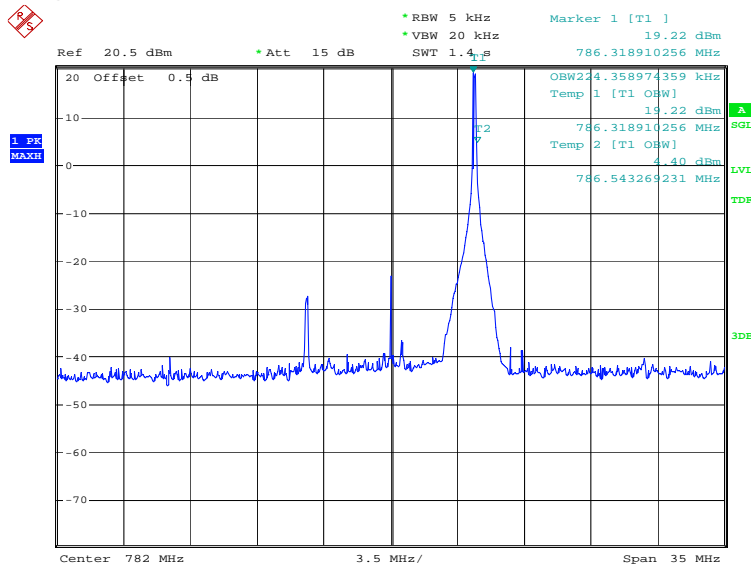
**LOW BAND EDGE BLOCK-1RB-low\_offset**



Date: 26.OCT.2018 16:30:42

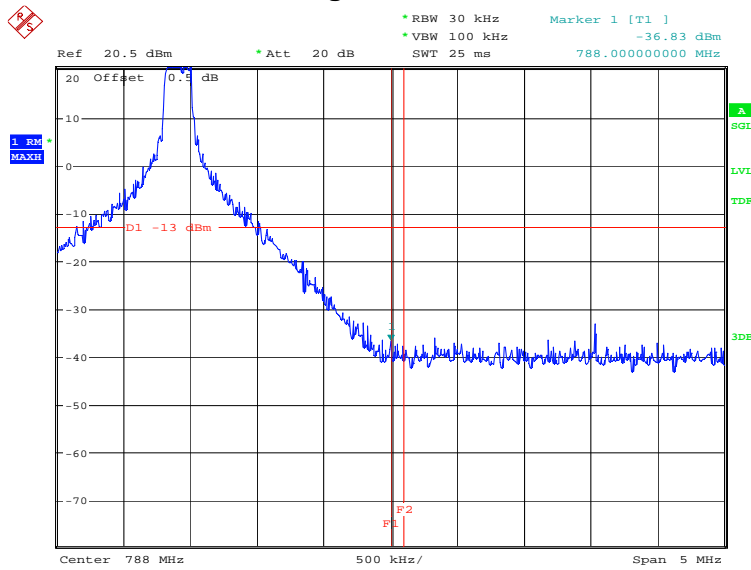


**OBW: 1RB-high\_offset**

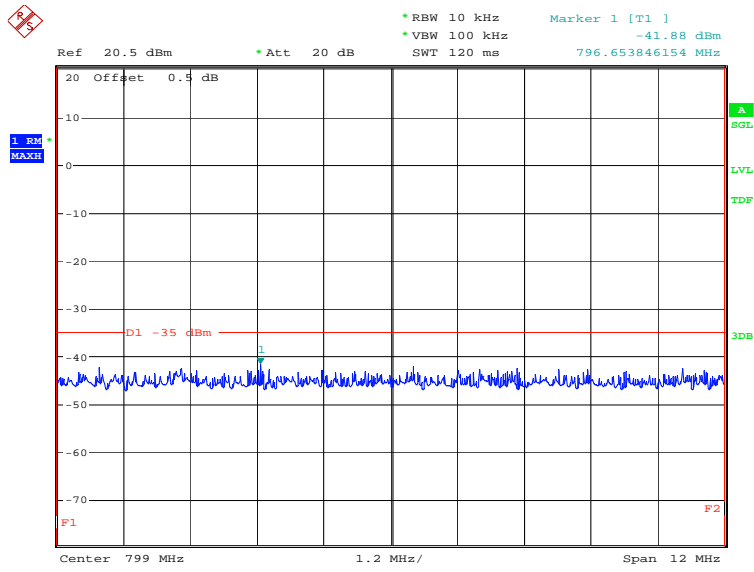


Date: 26.OCT.2018 16:33:13

**HIGH BAND EDGE BLOCK-1RB-high\_offset**



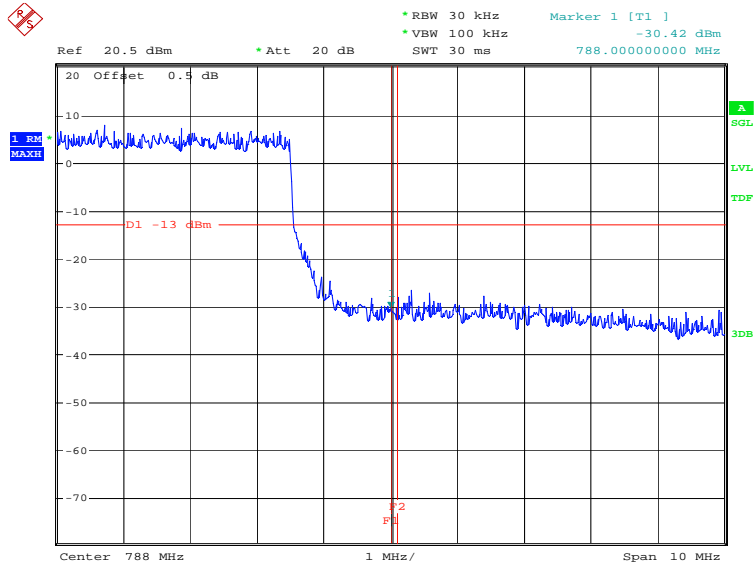
Date: 26.OCT.2018 16:34:03



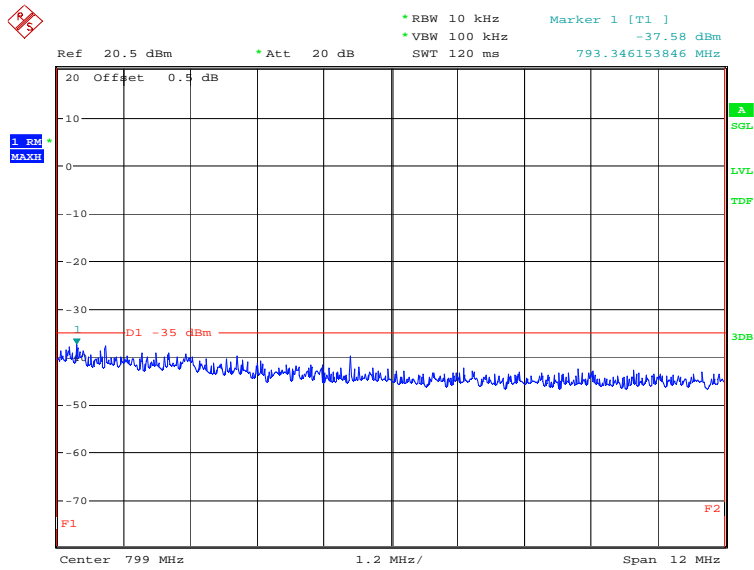
Date: 26.OCT.2018 16:34:18



### HIGH BAND EDGE BLOCK-10MHz-100%RB

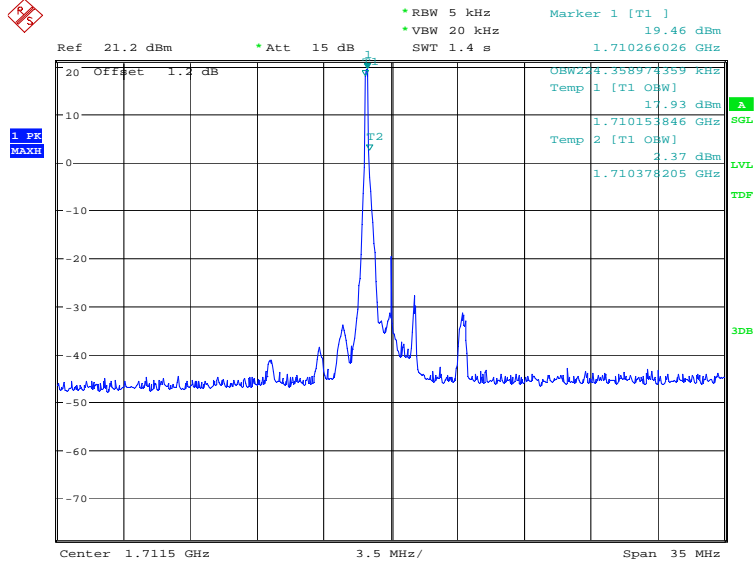


Date: 26.OCT.2018 16:38:47



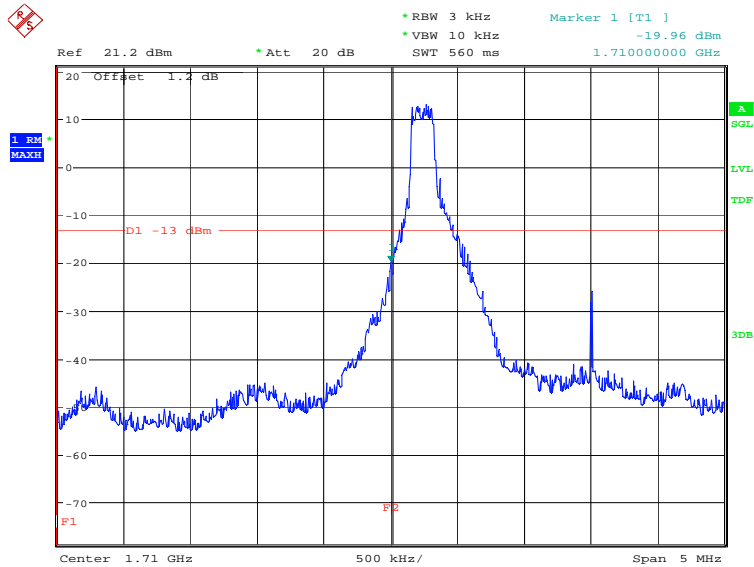
Date: 26.OCT.2018 16:39:02

**LTE band 66**  
**OBW: 1RB-low\_offset**



Date: 25.OCT.2018 11:10:29

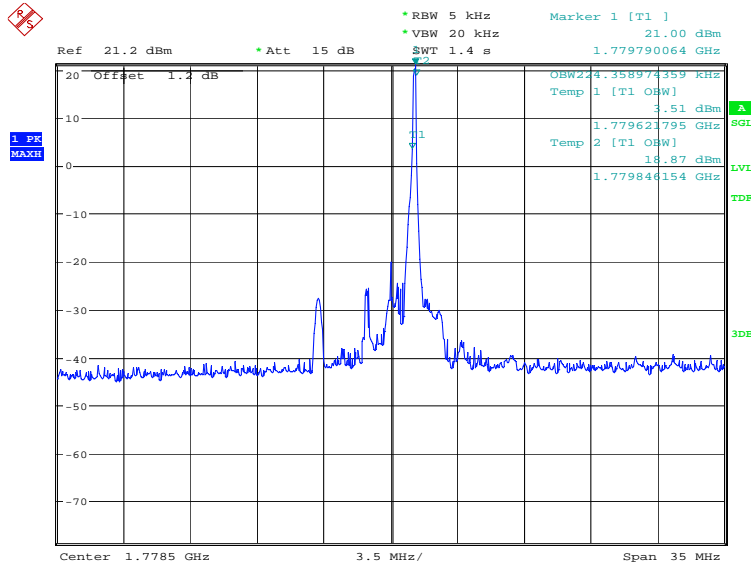
**LOW BAND EDGE BLOCK-1RB-low\_offset**



Date: 25.OCT.2018 11:10:44

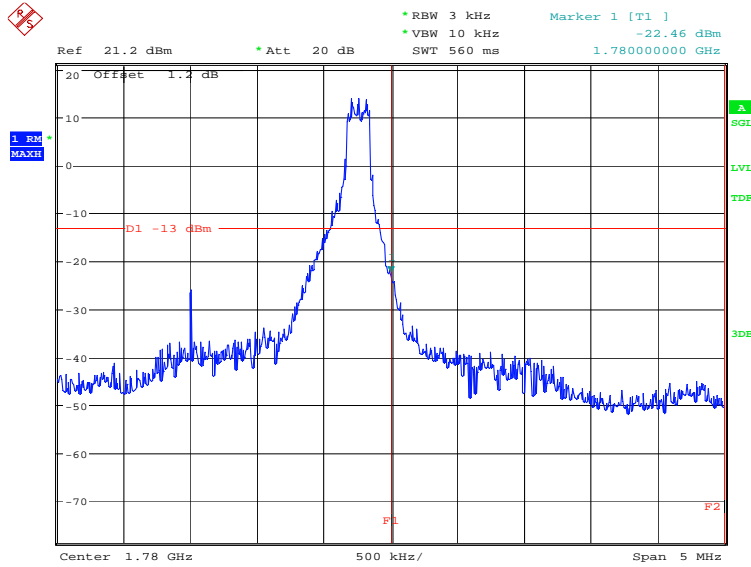


**OBW: 1RB-high\_offset**



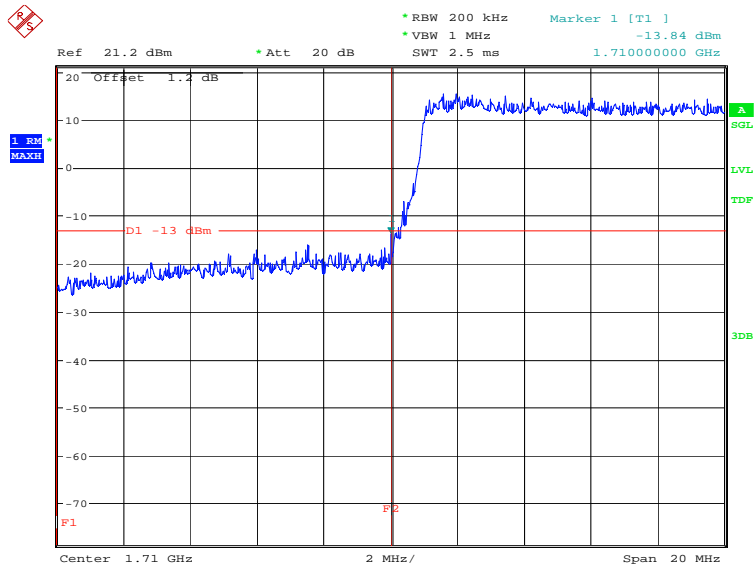
Date: 25.OCT.2018 11:12:41

**HIGH BAND EDGE BLOCK-1RB-high\_offset**



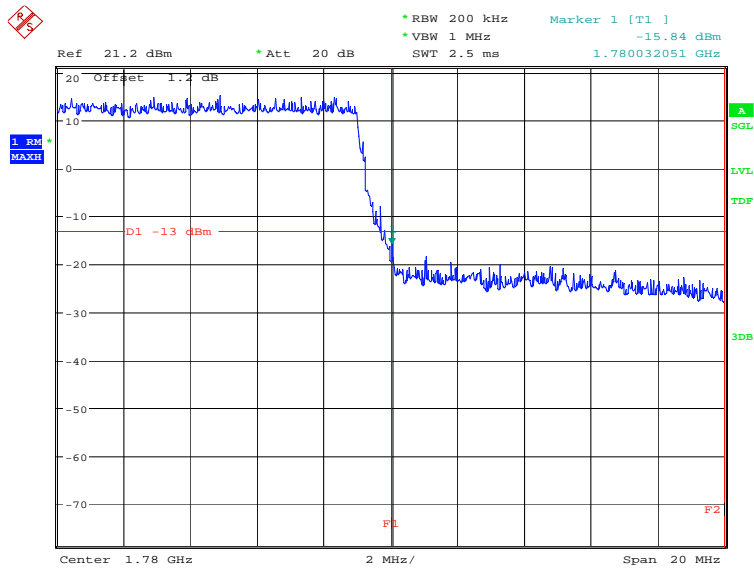
Date: 25.OCT.2018 11:12:57

### LOW BAND EDGE BLOCK-20MHz-100%RB



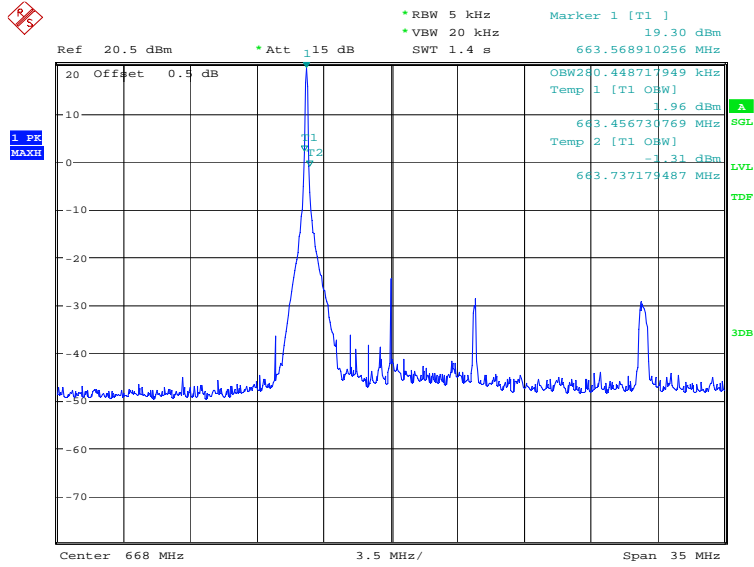
Date: 25.OCT.2018 11:11:21

### HIGH BAND EDGE BLOCK-20MHz-100%RB



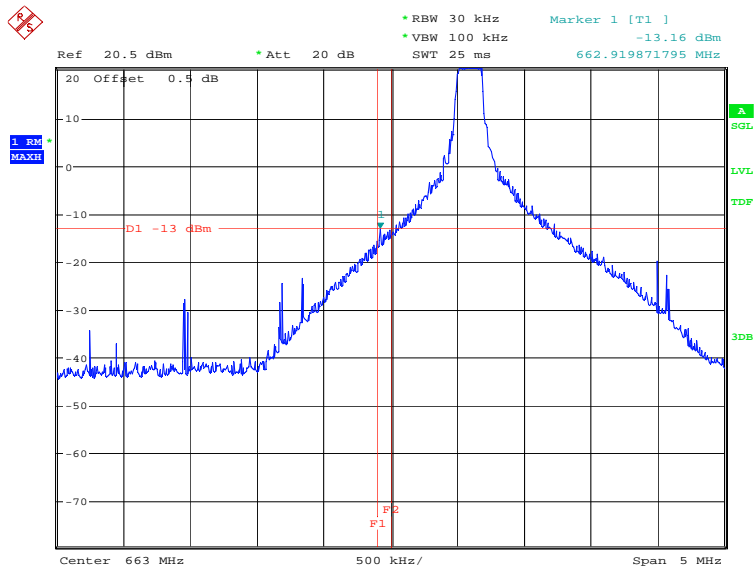
Date: 25.OCT.2018 11:13:33

**LTE band 71**  
**OBW: 1RB-low\_offset**



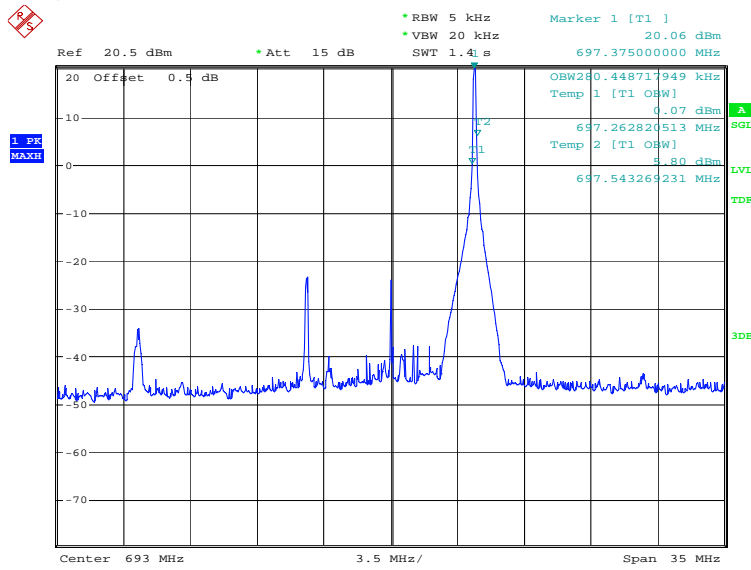
Date: 26.OCT.2018 16:03:42

**LOW BAND EDGE BLOCK-1RB-low\_offset**



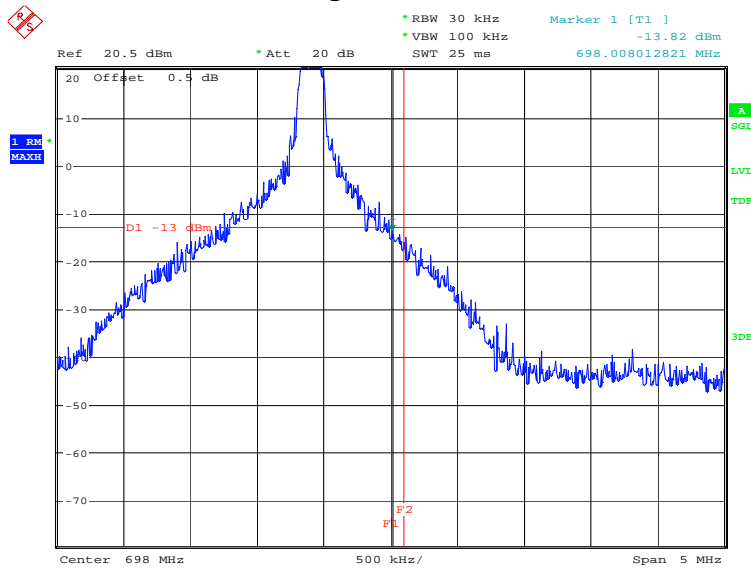
Date: 26.OCT.2018 16:03:57

**OBW: 1RB-high\_offset**



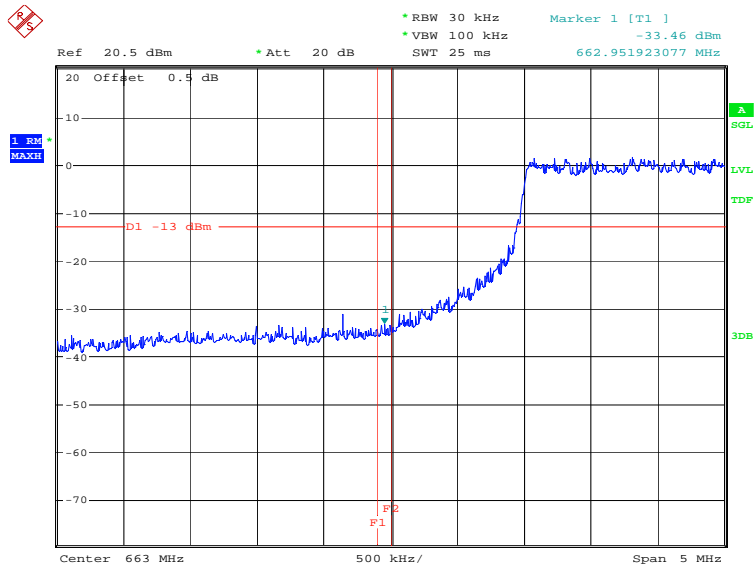
Date: 26.OCT.2018 16:09:49

**HIGH BAND EDGE BLOCK-1RB-high\_offset**



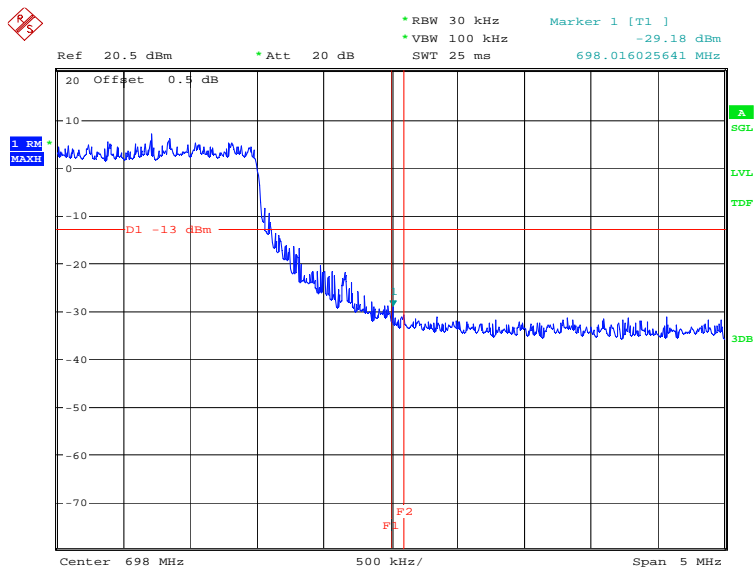
Date: 26.OCT.2018 16:23:10

### LOW BAND EDGE BLOCK-20MHz-100%RB



Date: 26.OCT.2018 16:04:33

### HIGH BAND EDGE BLOCK-20MHz-100%RB



Date: 26.OCT.2018 16:07:24

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

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



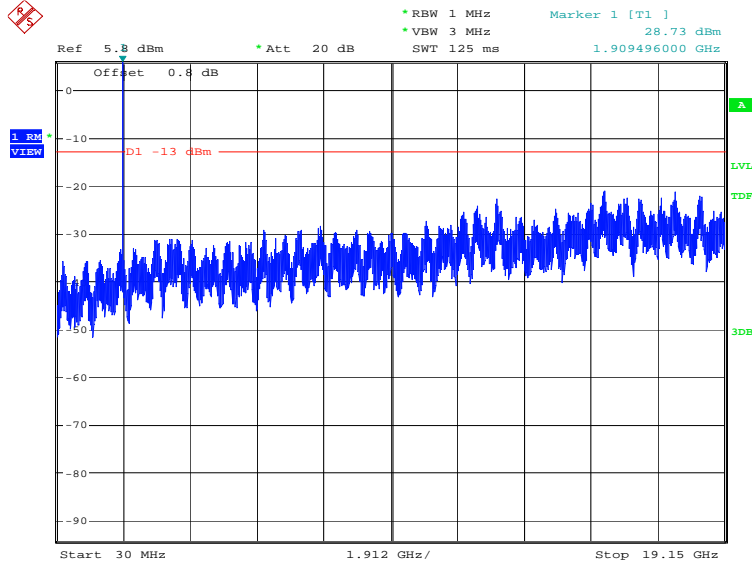
and 2292 MHz, and  $70 + 10 \log (P)$  dB below 2288 MHz; By a factor of not less than  $43 + 10 \log (P)$  dB on all frequencies between 2360 and 2365 MHz, and not less than  $70 + 10 \log (P)$  dB above 2365 MHz.

**A. 7.2 Measurement result**

Only worst case result is given below

**LTE band 2: 30MHz – 19.15GHz**

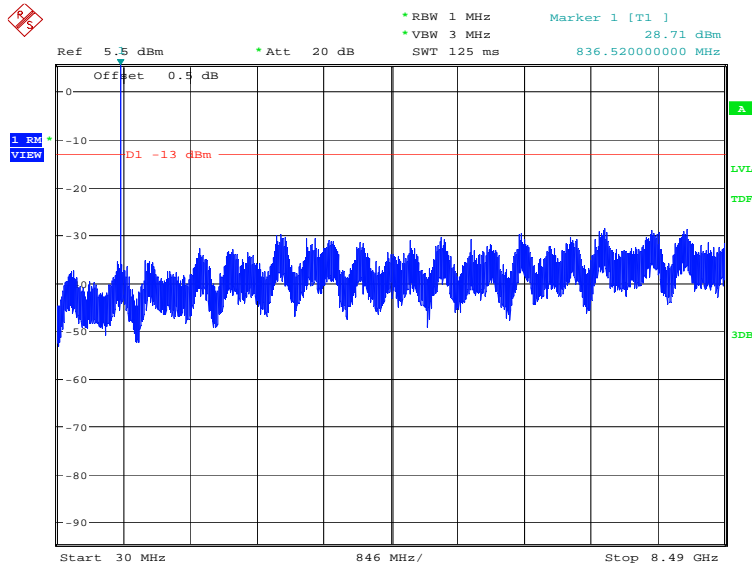
Spurious emission limit –13dBm.



Date: 25.OCT.2018 14:03:23

**LTE band 5: 30MHz – 8.49GHz**

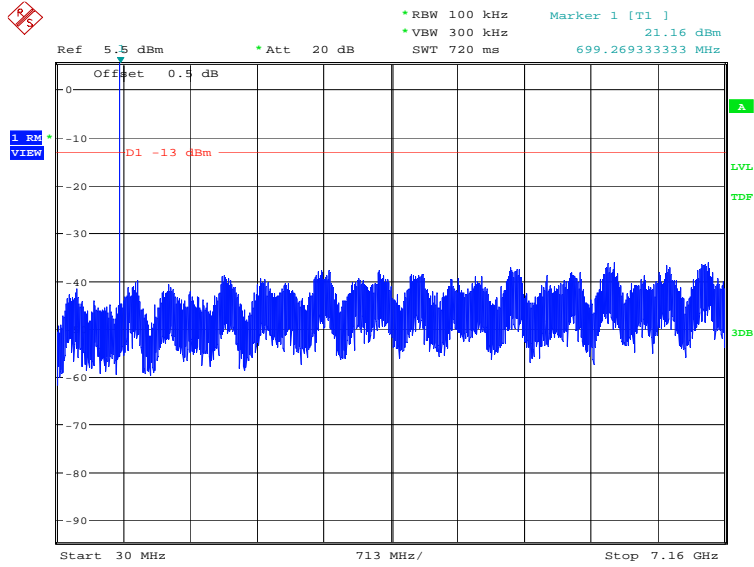
Spurious emission limit –13dBm.



Date: 25.OCT.2018 14:01:42

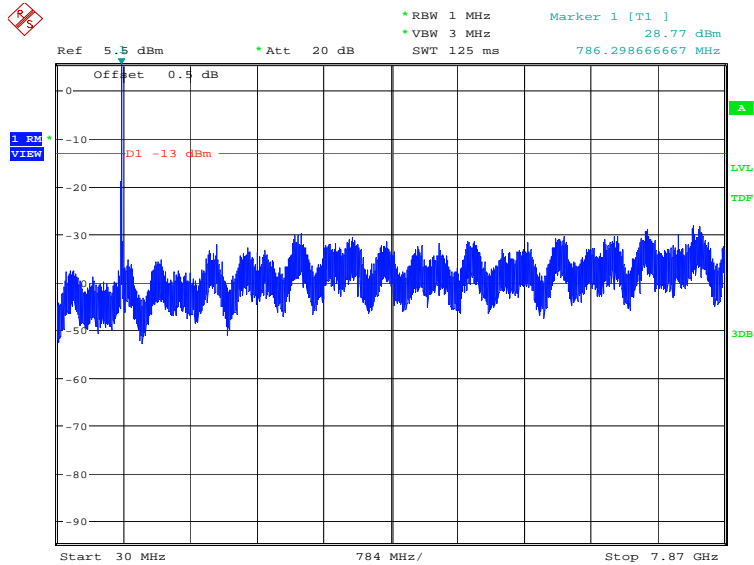


**LTE band 12: 30MHz – 7.16GHz**  
Spurious emission limit –13dBm.



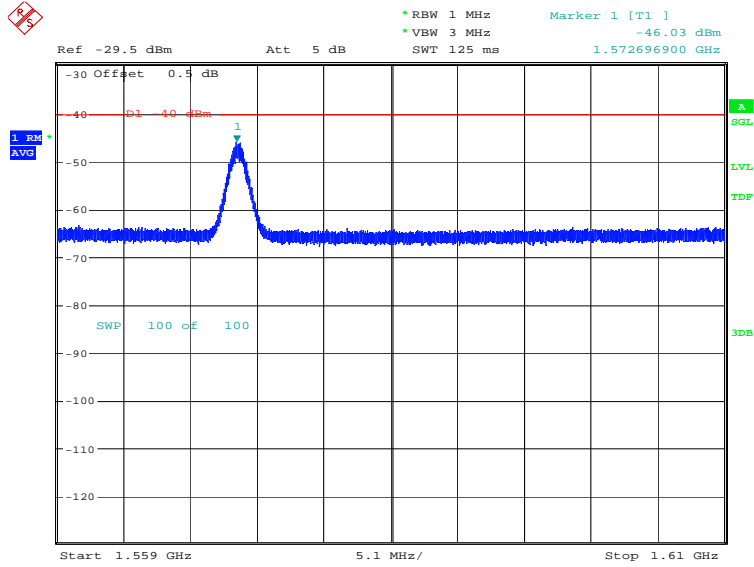
Date: 25.OCT.2018 14:00:18

**LTE band 13: 30MHz – 7870MHz**  
Spurious emission limit –13dBm.



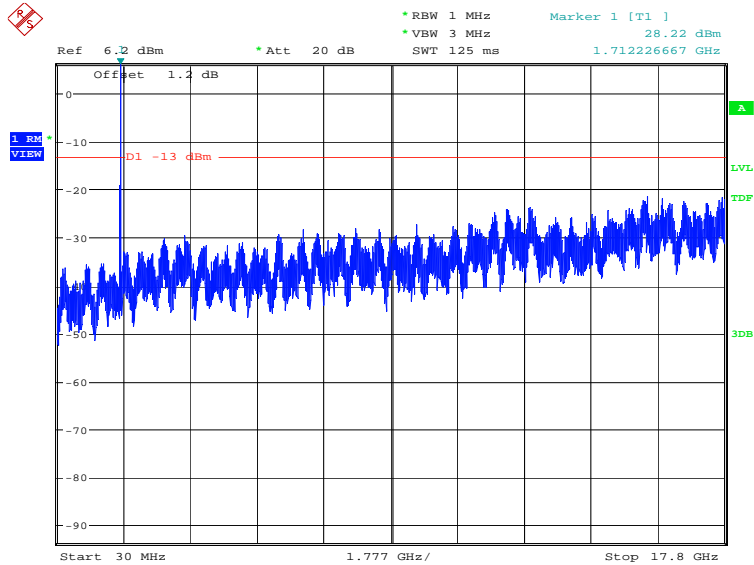
Date: 25.OCT.2018 13:57:44

**LTE band 13: 1559MHz – 1610MHz**  
Spurious emission limit –13dBm.



Date: 25.OCT.2018 13:58:18

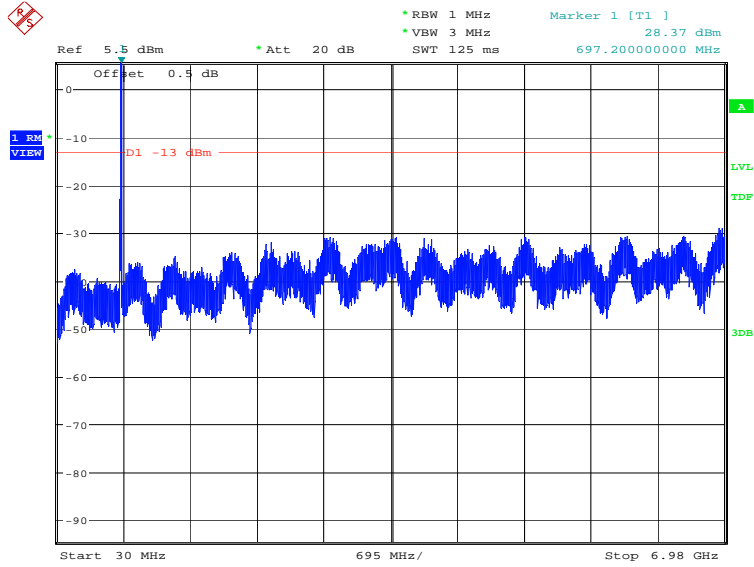
**LTE band 66: 30MHz – 17.8GHz**  
Spurious emission limit –13dBm.



Date: 25.OCT.2018 13:54:30



**LTE band 71: 30MHz – 6.98GHz**  
Spurious emission limit –13dBm.



Date: 25.OCT.2018 13:52:46

## **A.8 PEAK-TO-AVERAGE POWER RATIO**

### **Reference**

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

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

According to KDB 971168 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  $\geq$  signal's occupied bandwidth;
- c) Set the number of counts to a value that stabilizes the measured CCDF curve;
- d) Set the measurement interval to 1 ms
- e) Record the maximum PAPR level associated with a probability of 0.1%

### **A.8.1 Measurement limit**

not exceed 13 dB

### **A.8.2 Measurement results**

#### **LTE band 2, 20MHz**

Frequency(MHz)	PAPR(dB)	
1860.0	QPSK	16QAM
	6.73	7.40

#### **LTE band 12,10MHz**

Frequency(MHz)	PAPR(dB)	
707.5	QPSK	16QAM
	5.19	5.96

#### **LTE band 13,10MHz**

Frequency(MHz)	PAPR(dB)	
782.0	QPSK	16QAM
	5.19	6.12

#### **LTE band 66, 20MHz**

Frequency(MHz)	PAPR(dB)	
1745.0	QPSK	16QAM
	6.57	7.18



**LTE band 71, 20MHz**

Frequency(MHz)	PAPR(dB)	
680.5	QPSK	16QAM
	6.35	7.18

**ANNEX B: Accreditation Certificate**

**United States Department of Commerce  
National Institute of Standards and Technology**

**NVLAP<sup>®</sup>**

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**Certificate of Accreditation to ISO/IEC 17025:2005**

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**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).*

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



  
*For the National Voluntary Laboratory Accreditation Program*

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