



# TEST REPORT

No. I21N02075-RF-LTE

TCL Communication Ltd.

LTE/UMTS/GSM Smartphone

Model Name: 4165F

FCC ID: 2ACCJB156

with

Hardware Version: PROTO

Software Version: V1.0

Issued Date: 2021-07-05

**Note:**

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

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## **REPORT HISTORY**

<b>Report Number</b>	<b>Revision</b>	<b>Description</b>	<b>Issue Date</b>
I21N02075-RF-LTE	Rev.0	1st edition	2021-07-05

Note1: As the frequency band range of LTE Band 66(1710-1780 MHz) overlaps the range of LTE Band 4(1710-1755 MHz), LTE Band 12(698-716 MHz) overlaps the range of LTE Band 17(704-716 MHz), the channel bandwidth and other perating parameters for LTE Band 4 are fully supported by LTE Band 66, the channel bandwidth and other perating parameters for LTE Band 17 are fully supported by LTE Band 12,and the miximum output power of LTE Band 66 is larger than the LTE Band 4, the miximum output power of LTE Band 12 is larger than the LTE Band 17, we just need to test all the cases of LTE Band 66 and LTE Band 12.

Note2: The EUT is a variant model of 4065F, All the original values of this report are quoted directly from I21N01673-RF-LTE.



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## 1. SUMMARY OF TEST REPORT

### 1.1. Test Items

Description	LTE/UMTS/GSM Smartphone
Model Name	4165F
Applicant's name	TCL Communication Ltd.
Manufacturer's Name	TCL Communication Ltd.

### 1.2. Test Standards

FCC Part 2/22/24/27	10-1-19 Edition
ANSI C63.26	2015
KDB971168 D01	v03r01

### 1.3. Test Result

All test items are pass. Please refer to "6 Summary of Test Results" for detail.

### 1.4. Testing Location

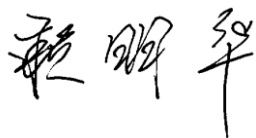
Address: Building G, Shenzhen International Innovation Center, No.1006 Shennan Road, Futian District, Shenzhen, Guangdong, P. R. China 518000

### 1.5. Project Data

Testing Start Date: 2021-05-26

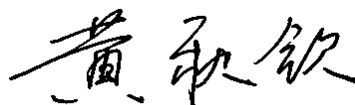
Testing End Date: 2021-06-28

### 1.6. Signature



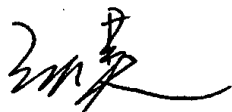
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Lai Minghua  
(Prepared this test report)



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Huang Qiuqin  
(Reviewed this test report)



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Zhang Hao  
(Approved this test report)



## **2. CLIENT INFORMATION**

### **2.1. Applicant Information**

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

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Contact Person: Gong Zhizhou  
Contact Email: zhizhou.gong@tcl.com  
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Fax: 0086-755-36612000-81722

### **3. EQUIPMENT UNDER TEST (EUT) AND ANCILLARY EQUIPMENT**

#### **(AE)**

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

Description	LTE/UMTS/GSM Smartphone
Model Name	4165F
FCC ID	2ACCJB156
Frequency Bands	LTE Bands 2,4,5,7,12,17 ,66
Antenna	Integrated
Extreme vol. Limits	3.5V to 4.4V (nominal: 3.85V)
Extreme temp. Tolerance	0°C to +60°C
Condition of EUT as received	No abnormality in appearance

Note: The Declaration of changes from Initial 4065F to Variant 4165F is Only Brand change as below:

Model	4065F	4165F
Brand	Alcatel	TCL

#### **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>Sample Arrival Date</b>
UT06aa	355246690000088	PROTO	V1.0	2021-05-26
UT02aa	355246690000153	PROTO	V1.0	2021-05-26

\*EUT ID: is used to identify the test sample in the lab internally.  
 UT06aa is used for conduction test, UT02aa is used for radiation test.

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

<b>AE ID*</b>	<b>Description</b>
AE1	Battery
AE1-1	
Model	TLp029D7
SN	CAC2900009C7
Manufacturer	BYD
Capacity	3000mAh
Nominal Voltage	3.85V
AE1-2	
Model	TLp029D1
SN	CAC2900019C1
Manufacturer	BYD
Capacity	3000mAh
Nominal Voltage	3.85V

\*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 LTE/UMTS/GSM Smartphone with integrated antenna. It consists of normal options: lithium battery, charger. Manual and specifications of the EUT were provided to fulfil the test. Samples undergoing test were selected by the Client.



#### **4. REFERENCE DOCUMENTS**

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

<b>Reference</b>	<b>Title</b>	<b>Version</b>
FCC Part 22	PUBLIC MOBILE SERVICES	10-1-19 Edition
FCC Part 24	PERSONAL COMMUNICATIONS SERVICES	10-1-19 Edition
FCC Part 2	FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS	10-1-19 Edition
FCC Part 27	MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES	10-1-19 Edition
ANSI C63.26	American National Standard of Procedures for Compliance Testing of Licensed Transmitters Used in Licensed Radio Service	2015
KDB971168 D01	Power Meas License Digital Systems	v03r01

## 5. LABORATORY ENVIRONMENT

**Shielded room** did not exceed following limits along the RF testing:

Temperature	Min. = 15 °C, Max. = 35 °C
Relative humidity	Min. = 15 %, Max. = 75 %
Shielding effectiveness	0.014MHz-1MHz>60 dB; 1MHz-18000MHz>90 dB
Electrical insulation	>2 MΩ
Ground system resistance	< 4 Ω

**Fully-anechoic chamber** did not exceed following limits along the EMC testing

Temperature	Min. = 15 °C, Max. = 35 °C
Relative humidity	Min. = 15 %, Max. = 75 %
Shielding effectiveness	0.014MHz-1MHz> 60 dB; 1MHz-18000MHz>90 dB
Electrical insulation	> 2MΩ
Ground system resistance	< 4 Ω
Voltage Standing Wave Ratio (VSWR)	≤ 6 dB, from 1 to 18 GHz, 3 m distance
Uniformity of field strength	Between 0 and 6 dB, from 80 to 6000 MHz





## 6. 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 1.4 of this report

### LTE Band 2

Items	Test Name	Clause in FCC rules	Section in this report	Verdict
1	Output Power	2.1046/24.232	A.1	P
2	Field Strength of Spurious Radiation	2.1053/24.238	A.2	P
3	Frequency Stability	2.1055/24.235	A.3	P
4	Occupied Bandwidth	2.1049/24.238	A.4	P
5	Emission Bandwidth	2.1049/24.238	A.5	P
6	Band Edge Compliance	2.1051/24.238	A.6	P
7	Conducted Spurious Emission	2.1051/24.238	A.7	P
8	Peak-to-Average Power Ratio	24.232/ KDB971168 D01	A.8	P

### LTE Band 5

Items	Test Name	Clause in FCC rules	Section in this report	Verdict
1	Output Power	2.1046/22.913	A.1	P
2	Field Strength of Spurious Radiation	2.1053/22.917	A.2	P
3	Frequency Stability	2.1055/22.355	A.3	P
4	Occupied Bandwidth	2.1049/22.917	A.4	P
5	Emission Bandwidth	2.1049/22.917	A.5	P
6	Band Edge Compliance	2.1051/22.917	A.6	P
7	Conducted Spurious Emission	2.1051/22.917	A.7	P
8	Peak-to-Average Power Ratio	KDB971168 D01	A.8	P



## LTE Band 7

Items	Test Name	Clause in FCC rules	Section in this report	Verdict
1	Output Power	2.1046/27.50(h)	A.1	P
2	Field Strength of Spurious Radiation	2.1053/27.53(m)	A.2	P
3	Frequency Stability	2.1055/27.54	A.3	P
4	Occupied Bandwidth	2.1049/27.53(m)	A.4	P
5	Emission Bandwidth	2.1049/27.53(m)	A.5	P
6	Band Edge Compliance	2.1051/27.53(m)	A.6	P
7	Conducted Spurious Emission	2.1051/27.53(m)	A.7	P
8	Peak-to-Average Power Ratio	27.50(a)/ KDB971168 D01	A.8	P

## LTE Band 12

Items	Test Name	Clause in FCC rules	Section in this report	Verdict
1	Output Power	2.1046/27.50(c)	A.1	P
2	Field Strength of Spurious Radiation	2.1053/27.53(g)	A.2	P
3	Frequency Stability	2.1055/27.54	A.3	P
4	Occupied Bandwidth	2.1049/27.53(g)	A.4	P
5	Emission Bandwidth	2.1049/27.53(g)	A.5	P
6	Band Edge Compliance	2.1051/27.53(g)	A.6	P
7	Conducted Spurious Emission	2.1051/27.53(g)	A.7	P
8	Peak-to-Average Power Ratio	27.50(a)/ KDB971168 D01	A.8	P

## LTE Band 66

Items	Test Name	Clause in FCC rules	Section in this report	Verdict
1	Output Power	2.1046/27.50(d)	A.1	P
2	Field Strength of Spurious Radiation	2.1053/27.53(h)	A.2	P
3	Frequency Stability	2.1055/27.54	A.3	P
4	Occupied Bandwidth	2.1049/27.53(h)	A.4	P
5	Emission Bandwidth	2.1049/27.53(h)	A.5	P
6	Band Edge Compliance	2.1051/27.53(h)	A.6	P
7	Conducted Spurious Emission	2.1051/27.53(h)	A.7	P
8	Peak-to-Average Power Ratio	27.50(a)/ KDB971168 D01	A.8	P



## **7. STATEMENT**

Since the information of samples in this report is provided by the client, the laboratory is not responsible for the authenticity of sample information.

This report takes measured values as criterion of test conclusion. The test conclusion meets the limit requirements.

### 8. TEST EQUIPMENTS UTILIZED

NO.	Description	TYPE	Manufacture	series number	CAL DUE DATE
1	Test Receiver	ESR7	R&S	101676	2021-11-25
2	BiLog Antenna	VULB 9163	Schwarzbeck	9163-330	2024-03-22
3	Horn Antenna	3117	ETS-Lindgren	00066577	2022-04-02
4	Horn Antenna	QSH-SL-18 -26-S-20	Q-par	17013	2023-01-06
5	Antenna	BBHA 9120D	Schwarzbeck	1593	2022-12-05
6	Antenna	VUBA 9117	Schwarzbeck	207	2023-07-15
7	Antenna	QWH-SL-18 -40-K-SG	Q-par	15979	2023-01-06
8	preamplifier	83017A	Agilent	MY39501110	/
9	Signal Generator	SMB100A	R&S	179725	2021-11-25
10	Fully Anechoic Chamber	FACT3-2.0	ETS-Lindgren	1285	2021-07-19
11	Spectrum Analyzer	FSV40	R&S	101192	2022-01-13
12	Universal Radio Communication Tester	CMW500	R&S	152499	2021-07-16
13	Universal Radio Communication Tester	CMW500	R&S	129146	2022-04-24
14	Spectrum Analyzer	FSU	R&S	101506	2021-12-13
15	Temperature Chamber	SH-241	ESPEC	92007516	2021-10-15
16	DC Power Supply	U3606A	Agilent Technologies	MY50450012	2021-11-13

#### Test software

Item	Name	Vesion
Radiated	EMC32	V10.50.40

## **ANNEX A: MEASUREMENT RESULTS**

### **A.1 OUTPUT POWER**

#### **Reference**

FCC: CFR Part 2.1046, 22.913, 24.232, 27.50.

#### **A.1.1 Summary**

During the process of testing, the EUT was controlled via Rhode & Schwarz Digital Radio Communication tester (CMW500) to ensure max power transmission and proper modulation.

This result contains peak output power and ERP/EIRP measurements for the EUT.

In all cases, output power is within the specified limits.

#### **A.1.2 Conducted**

##### **A.1.2.1 Method of Measurements**

The EUT was set up for the max output power with pseudo random data modulation.

These measurements were done at 3 frequencies (bottom, middle and top of operational frequency range) for each bandwidth.

##### **A.1.2.2 Measurement result**

#### **LTE band 2**

Bandwidth	RB size/offset	Frequency (MHz)	Power(dBm)	
			QPSK	16QAM
1.4MHz	1 RB high	1909.3	22.06	21.74
		1880.0	21.97	21.18
		1850.7	21.74	21.28
	1 RB low	1909.3	22.14	21.70
		1880.0	22.00	21.11
		1850.7	21.74	21.31
	50% RB mid	1909.3	22.26	21.51
		1880.0	22.12	21.15
		1850.7	21.80	21.14
	100% RB	1909.3	21.18	20.99
		1880.0	20.90	20.98
		1850.7	20.79	20.92
3MHz	1 RB high	1908.5	22.10	21.76
		1880.0	22.00	21.24
		1851.5	21.74	21.33
	1 RB low	1908.5	22.17	21.77
		1880.0	21.90	21.19
		1851.5	21.79	21.38
	50% RB mid	1908.5	21.17	20.82
		1880.0	21.12	20.88
		1851.5	20.86	20.94



	100% RB	1908.5	21.14	20.85
		1880.0	20.97	20.91
		1851.5	20.83	20.87
5MHz	1 RB high	1907.5	22.20	21.80
		1880.0	22.03	21.66
		1852.5	21.56	21.31
	1 RB low	1907.5	22.14	21.83
		1880.0	21.92	21.60
		1852.5	21.62	21.39
	50% RB mid	1907.5	21.22	20.90
		1880.0	21.00	20.87
		1852.5	20.67	20.70
	100% RB	1907.5	21.18	20.74
		1880.0	21.01	20.89
		1852.5	20.77	20.56
10MHz	1 RB high	1905.0	22.10	21.56
		1880.0	21.89	21.56
		1855.0	21.71	21.24
	1 RB low	1905.0	22.06	21.51
		1880.0	21.80	21.41
		1855.0	21.72	21.22
	50% RB mid	1905.0	21.23	20.97
		1880.0	20.98	20.86
		1855.0	20.79	20.65
	100% RB	1905.0	21.23	20.99
		1880.0	20.94	20.92
		1855.0	20.76	20.77
15MHz	1 RB high	1902.5	22.19	21.83
		1880.0	21.88	21.54
		1857.5	21.68	21.42
	1 RB low	1902.5	22.05	21.74
		1880.0	21.79	21.37
		1857.5	21.67	21.41
	50% RB mid	1902.5	21.27	20.93
		1880.0	21.03	20.80
		1857.5	20.85	20.73
	100% RB	1902.5	21.12	20.77
		1880.0	20.92	20.90
		1857.5	20.82	20.83



20MHz	1 RB high	1900.0	22.05	21.63
		1880.0	22.18	21.06
		1860.0	21.69	21.40
	1 RB low	1900.0	21.97	21.52
		1880.0	21.90	20.72
		1860.0	21.72	21.34
	50% RB mid	1900.0	21.23	20.95
		1880.0	20.90	20.65
		1860.0	20.75	20.89
	100% RB	1900.0	21.17	20.98
		1880.0	21.03	20.90
		1860.0	20.87	20.98

Note: Expanded measurement uncertainty is  $U = 0.49$  dB,  $k = 1.96$



LTE band 5

Bandwidth	RB size/offset	Frequency (MHz)	Power(dBm)	
			QPSK	16QAM
1.4MHz	1 RB high	848.3	23.06	22.38
		836.5	22.71	22.28
		824.7	23.02	22.47
	1 RB low	848.3	23.04	22.42
		836.5	22.61	22.15
		824.7	23.01	22.38
	50% RB mid	848.3	23.12	22.27
		836.5	22.96	22.00
		824.7	23.20	22.21
	100% RB	848.3	22.02	20.72
		836.5	21.94	21.18
		824.7	22.11	20.94
3MHz	1 RB high	847.5	23.08	22.50
		836.5	22.80	22.31
		825.5	22.81	22.46
	1 RB low	847.5	23.00	22.54
		836.5	22.65	22.15
		825.5	22.97	22.53
	50% RB mid	847.5	22.03	21.21
		836.5	21.98	21.44
		825.5	22.15	21.12
	100% RB	847.5	22.10	21.23
		836.5	21.97	21.41
		825.5	22.16	21.20
5MHz	1 RB high	846.5	22.93	22.42
		836.5	22.71	22.11
		826.5	22.92	22.19
	1 RB low	846.5	22.90	22.41
		836.5	22.63	22.08
		826.5	23.09	22.40
	50% RB mid	846.5	22.04	21.07
		836.5	21.93	21.39
		826.5	21.99	21.08
	100% RB	846.5	22.05	20.98
		836.5	21.88	21.49
		826.5	22.12	21.26
10MHz	1 RB high	844.0	22.97	22.44





		836.5	22.76	22.46
		829.0	22.88	22.30
	1 RB low	844.0	22.99	22.12
		836.5	22.82	22.19
		829.0	23.12	22.49
	50% RB mid	844.0	21.93	20.99
		836.5	21.98	21.47
		829.0	21.96	20.93
	100% RB	844.0	21.93	21.08
		836.5	21.84	21.31
		829.0	21.94	20.91

Note: Expanded measurement uncertainty is  $U = 0.49\text{dB}$ ,  $k = 1.96$



LTE band 7

Bandwidth	RB size/offset	Frequency (MHz)	Power(dBm)	
			QPSK	16QAM
5MHz	1 RB high	2567.5	21.59	21.43
		2535.0	21.91	21.68
		2502.5	21.80	21.70
	1 RB low	2567.5	21.80	21.54
		2535.0	21.91	21.67
		2502.5	21.85	21.56
	50% RB mid	2567.5	20.88	20.93
		2535.0	21.08	21.11
		2502.5	21.00	21.06
	100% RB	2567.5	20.81	20.73
		2535.0	20.98	21.00
		2502.5	20.99	20.92
10MHz	1 RB high	2565.0	21.72	21.33
		2535.0	21.92	21.67
		2505.0	21.84	21.51
	1 RB low	2565.0	21.77	21.40
		2535.0	21.94	21.68
		2505.0	21.89	21.48
	50% RB mid	2565.0	20.90	21.13
		2535.0	21.01	21.17
		2505.0	21.02	20.92
	100% RB	2565.0	20.97	21.20
		2535.0	21.12	21.26
		2505.0	21.00	21.00
15MHz	1 RB high	2562.5	21.74	21.59
		2535.0	22.03	21.75
		2507.5	21.97	21.79
	1 RB low	2562.5	21.87	21.64
		2535.0	21.93	21.71
		2507.5	21.85	21.72
	50% RB mid	2562.5	21.01	20.75
		2535.0	21.04	21.19
		2507.5	21.07	21.07
	100% RB	2562.5	20.87	20.84
		2535.0	21.04	21.14
		2507.5	21.07	21.19



20MHz	1 RB high	2560.0	21.89	21.20
		2535.0	22.04	21.41
		2510.0	22.14	21.72
	1 RB low	2560.0	21.89	21.24
		2535.0	21.87	21.28
		2510.0	22.01	21.55
	50% RB mid	2560.0	20.94	21.03
		2535.0	20.99	21.29
		2510.0	21.05	20.88
	100% RB	2560.0	21.03	21.11
		2535.0	21.09	21.13
		2510.0	21.06	21.02

Note: Expanded measurement uncertainty is  $U = 0.49$  dB,  $k = 1.96$



LTE band 12

Bandwidth	RB size/offset	Frequency (MHz)	Power(dBm)	
			QPSK	16QAM
1.4MHz	1 RB high	715.3	23.02	22.32
		707.5	22.15	21.60
		699.7	22.97	22.17
	1 RB low	715.3	22.91	22.22
		707.5	22.23	21.57
		699.7	22.90	22.23
	50% RB mid	715.3	23.11	22.18
		707.5	22.39	21.59
		699.7	23.06	22.23
	100% RB	715.3	21.98	20.95
		707.5	21.36	20.15
		699.7	22.00	20.74
3MHz	1 RB high	714.5	23.08	22.32
		707.5	22.22	21.74
		700.5	23.05	22.34
	1 RB low	714.5	22.97	22.24
		707.5	22.20	21.69
		700.5	22.99	22.18
	50% RB mid	714.5	21.90	21.00
		707.5	21.42	20.39
		700.5	21.97	21.08
	100% RB	714.5	22.02	21.05
		707.5	21.38	20.35
		700.5	22.01	20.99
5MHz	1 RB high	713.5	22.92	22.37
		707.5	22.48	21.79
		701.5	22.74	22.16
	1 RB low	713.5	22.59	22.07
		707.5	22.24	21.63
		701.5	22.81	22.26
	50% RB mid	713.5	21.91	20.84
		707.5	21.38	20.32
		701.5	21.98	21.02
	100% RB	713.5	21.90	20.73
		707.5	21.26	20.28
		701.5	21.84	21.18



10MHz	1 RB high	711.0	22.88	22.31
		707.5	22.61	22.13
		704.0	22.30	21.75
	1 RB low	711.0	22.96	21.67
		707.5	22.95	22.29
		704.0	22.97	22.26
	50% RB mid	711.0	21.68	21.05
		707.5	21.33	20.56
		704.0	21.70	21.43
	100% RB	711.0	21.70	20.91
		707.5	21.29	20.38
		704.0	21.77	21.25

Note: Expanded measurement uncertainty is  $U = 0.49$  dB,  $k = 1.96$



LTE band 66

Bandwidth	RB size/offset	Frequency (MHz)	Power(dBm)	
			QPSK	16QAM
1.4MHz	1 RB high	1779.3	23.42	22.84
		1745.0	23.22	22.89
		1710.7	23.46	22.98
	1 RB low	1779.3	23.40	22.81
		1745.0	23.19	22.96
		1710.7	23.55	22.75
	50% RB mid	1779.3	23.53	22.82
		1745.0	23.38	22.70
		1710.7	23.73	22.72
	100% RB	1779.3	22.65	21.48
		1745.0	22.27	21.33
		1710.7	22.60	21.56
3MHz	1 RB high	1778.5	23.51	22.73
		1745.0	23.18	22.55
		1711.5	23.47	22.85
	1 RB low	1778.5	23.47	22.75
		1745.0	23.21	22.47
		1711.5	23.53	22.95
	50% RB mid	1778.5	22.62	21.77
		1745.0	22.39	21.65
		1711.5	22.64	21.88
	100% RB	1778.5	22.59	21.70
		1745.0	22.37	21.59
		1711.5	22.65	21.82
5MHz	1 RB high	1777.5	23.44	22.82
		1745.0	23.21	22.85
		1712.5	23.41	22.84
	1 RB low	1777.5	23.47	22.92
		1745.0	23.18	22.93
		1712.5	23.49	22.89
	50% RB mid	1777.5	22.58	21.71
		1745.0	22.36	21.44
		1712.5	22.55	21.71
	100% RB	1777.5	22.61	21.90
		1745.0	22.32	21.65
		1712.5	22.65	21.92
10MHz	1 RB high	1775.0	23.48	22.93



		1745.0	23.51	22.83
		1715.0	23.47	22.90
		1775.0	23.65	22.79
	1 RB low	1745.0	23.34	22.73
		1715.0	23.58	22.84
		1775.0	22.54	21.96
	50% RB mid	1745.0	22.27	21.44
		1715.0	22.55	21.89
		1775.0	22.56	21.70
	100% RB	1745.0	22.38	21.44
		1715.0	22.51	21.65
		1775.0	22.56	21.70
15MHz	1 RB high	1772.5	23.50	22.84
		1745.0	23.37	22.75
		1717.5	23.21	22.93
	1 RB low	1772.5	23.60	22.72
		1745.0	23.27	22.72
		1717.5	23.49	22.95
	50% RB mid	1772.5	22.57	21.63
		1745.0	22.33	21.36
		1717.5	22.49	21.54
	100% RB	1772.5	22.60	21.70
		1745.0	22.30	21.37
		1717.5	22.50	21.65
20MHz	1 RB high	1770.0	23.42	23.00
		1745.0	23.37	22.80
		1720.0	23.20	22.89
	1 RB low	1770.0	23.59	22.83
		1745.0	23.39	22.97
		1720.0	23.56	22.94
	50% RB mid	1770.0	22.45	21.61
		1745.0	22.38	21.46
		1720.0	22.37	21.55
	100% RB	1770.0	22.54	21.73
		1745.0	22.22	21.43
		1720.0	22.43	21.62

Note: Expanded measurement uncertainty is  $U = 0.49\text{dB}$ ,  $k = 1.96$

### A.1.3 Radiated

#### A.1.3.1 Description

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

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

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

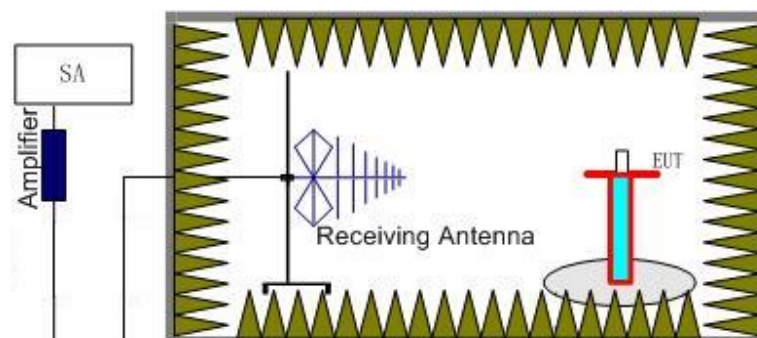
Rule Part 27.50(h)(2) specifies "Mobile stations are limited to 2.0 watts EIRP".

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

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." Rule Part 90.635(b) specifies "The maximum output power of the transmitter for mobile stations is 100 watts (20 dBw)."

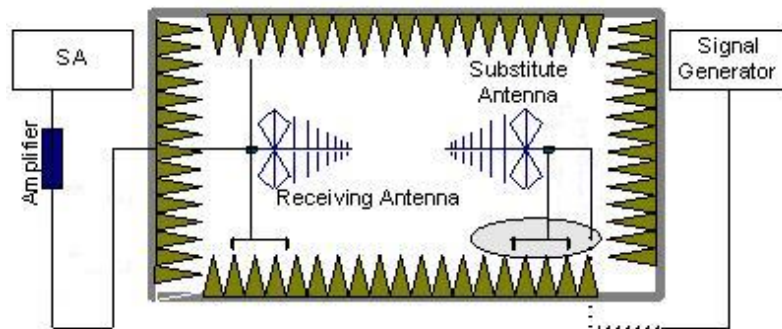
#### A.1.3.2 Method of Measurement

1. For radiated emissions measurements performed at frequencies less than or equal to 1 GHz, EUT was placed on a 80 cm high non-conductive stand at a 3 meter test distance from the receive antenna. For radiated measurements performed at frequencies above 1 GHz, EUT was placed on a 1.5 meter high non-conductive stand at a 3 meter test distance from the receive antenna. Receiving antenna was placed on the antenna mast 3 meters from the EUT. For emission measurements. The receiving antenna shall be varied from 1 m to 4 m in height above the reference ground in a search for the relative positioning that produces the maximum radiated signal level. 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 and adjusts 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(dBi) ( $G_a$ ) 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,  $ERP = EIRP - 2.15dB$ .

**A.1.3.3 Measurement result****LTE Band 2- EIRP Part 24. 232(b)**Limits:  $\leq 33\text{dBm}$  (2W)**LTE Band 2\_1.4MHz\_QPSK**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)+ P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Polarization
1850.70	-15.13	-29.30	8.10	22.28	33.00	H
1880.00	-14.69	-29.40	8.10	22.81	33.00	H
1909.30	-15.22	-29.30	8.10	22.18	33.00	H

**LTE Band 2\_3MHz\_QPSK**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)+ P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Polarization
1851.50	-14.89	-29.30	8.10	22.52	33.00	H
1880.00	-14.79	-29.40	8.10	22.71	33.00	H
1908.50	-15.09	-29.30	8.10	22.31	33.00	H

**LTE Band 2\_5MHz\_QPSK**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)+ P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Polarization
1852.50	-14.99	-29.30	8.10	22.41	33.00	H
1880.00	-14.88	-29.40	8.10	22.62	33.00	H
1907.50	-14.90	-29.30	8.10	22.50	33.00	H

**LTE Band 2\_10MHz\_QPSK**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)+ P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Polarization
1855.00	-15.24	-29.30	8.10	22.16	33.00	H
1880.00	-14.99	-29.40	8.10	22.51	33.00	H
1905.00	-15.19	-29.30	8.10	22.21	33.00	H

**LTE Band 2\_15MHz\_QPSK**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)+ P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Polarization
1857.50	-15.35	-29.30	8.10	22.05	33.00	H
1880.00	-15.05	-29.40	8.10	22.45	33.00	H
1902.50	-15.16	-29.30	8.10	22.24	33.00	H

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

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)+ P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Polarization
1860.00	-15.38	-29.30	8.10	22.02	33.00	H
1880.00	-15.24	-29.40	8.10	22.26	33.00	H
1900.00	-15.23	-29.30	8.10	22.18	33.00	H



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

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)+ P <sub>Ag</sub> (dB)	G <sub>a</sub> Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Polarization
1850.70	-15.38	-29.30	8.10	22.03	33.00	H
1880.00	-15.38	-29.40	8.10	22.12	33.00	H
<b>1909.30</b>	<b>-14.41</b>	<b>-29.30</b>	<b>8.10</b>	<b>22.99</b>	<b>33.00</b>	<b>H</b>

**LTE Band 2\_3MHz\_16QAM**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)+ P <sub>Ag</sub> (dB)	G <sub>a</sub> Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Polarization
1851.50	-15.23	-29.30	8.10	22.17	33.00	H
1880.00	-15.23	-29.40	8.10	22.28	33.00	H
1908.50	-15.24	-29.30	8.10	22.16	33.00	H

**LTE Band 2\_5MHz\_16QAM**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)+ P <sub>Ag</sub> (dB)	G <sub>a</sub> Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Polarization
1852.50	-15.29	-29.30	8.10	22.11	33.00	H
1880.00	-15.47	-29.40	8.10	22.03	33.00	H
1907.50	-15.41	-29.30	8.10	21.99	33.00	H

**LTE Band 2\_10MHz\_16QAM**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)+ P <sub>Ag</sub> (dB)	G <sub>a</sub> Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Polarization
1855.00	-15.38	-29.30	8.10	22.02	33.00	H
1880.00	-15.56	-29.40	8.10	21.94	33.00	H
1905.00	-14.40	-29.30	8.10	23.00	33.00	H

**LTE Band 2\_15MHz\_16QAM**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)+ P <sub>Ag</sub> (dB)	G <sub>a</sub> Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Polarization
1857.50	-15.50	-29.30	8.10	21.90	33.00	H
1880.00	-15.49	-29.40	8.10	22.01	33.00	H
1902.50	-14.51	-29.30	8.10	22.89	33.00	H

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

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)+ P <sub>Ag</sub> (dB)	G <sub>a</sub> Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Polarization
1860.00	-15.50	-29.30	8.10	21.90	33.00	H
1880.00	-15.54	-29.40	8.10	21.96	33.00	H
1900.00	-15.48	-29.30	8.10	21.92	33.00	H

Peak EIRP (dBm)=P<sub>Mea</sub>(-14.41dBm)-(P<sub>cl</sub>+P<sub>Ag</sub>)(-29.30dB)+G<sub>a</sub>(8.10dB) =22.99dBm



**LTE Band 5- ERP Part 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)	Polarization
824.70	-10.18	-33.60	-0.79	2.15	20.48	38.45	V
836.50	-10.47	-33.50	-0.74	2.15	20.14	38.45	V
848.30	-10.51	-33.50	-0.73	2.15	20.11	38.45	V

**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)	Polarization
825.50	-10.30	-33.60	-0.84	2.15	20.31	38.45	V
836.50	-10.47	-33.50	-0.74	2.15	20.15	38.45	V
847.50	-10.58	-33.50	-0.73	2.15	20.03	38.45	V

**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)	Polarization
826.50	-10.04	-33.60	-0.84	2.15	20.57	38.45	V
836.50	-10.37	-33.50	-0.74	2.15	20.24	38.45	V
846.50	-10.44	-33.50	-0.73	2.15	20.17	38.45	V

**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)	Polarization
829.00	-10.45	-33.60	-0.84	2.15	20.16	38.45	V
836.50	-10.74	-33.50	-0.74	2.15	19.87	38.45	V
844.00	-10.60	-33.50	-0.78	2.15	19.96	38.45	V



**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)	Polarization
824.70	-10.18	-33.60	-0.79	2.15	20.48	38.45	V
836.50	-10.47	-33.50	-0.74	2.15	20.15	38.45	V
848.30	-10.07	-33.50	-0.73	2.15	20.55	38.45	V

**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)	Polarization
825.50	-10.11	-33.60	-0.84	2.15	20.50	38.45	V
836.50	-10.30	-33.50	-0.74	2.15	20.31	38.45	V
847.50	-10.28	-33.50	-0.73	2.15	20.33	38.45	V

**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)	Polarization
<b>826.50</b>	<b>-9.96</b>	<b>-33.60</b>	<b>-0.84</b>	<b>2.15</b>	<b>20.65</b>	<b>38.45</b>	<b>V</b>
836.50	-10.47	-33.50	-0.74	2.15	20.15	38.45	V
846.50	-10.31	-33.50	-0.73	2.15	20.31	38.45	V

**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)	Polarization
829.00	-10.33	-33.60	-0.84	2.15	20.28	38.45	V
836.50	-10.65	-33.50	-0.74	2.15	19.96	38.45	V
844.00	-10.42	-33.50	-0.78	2.15	20.15	38.45	V

Peak ERP (dBm)=P<sub>Mea</sub>(-9.96dBm)-(P<sub>ci</sub>+P<sub>Ag</sub>)(-33.60dB)+G<sub>a</sub>(-0.84dB) -2.15dB =20.65dBm

**LTE Band 7- EIRP Part 27.50(h)(2)**Limits:  $\leq 33$  dBm (2W)**LTE Band 7\_5MHz\_QPSK**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>ci</sub> (dB)+ P <sub>Ag</sub> (dB)	G <sub>a</sub> Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Polarization
2502.50	-17.04	-28.70	10.70	22.36	33.00	H
2535.00	-16.59	-28.60	10.70	22.71	33.00	H
2567.50	-16.69	-28.60	10.70	22.61	33.00	H

**LTE Band 7\_10MHz\_QPSK**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>ci</sub> (dB)+ P <sub>Ag</sub> (dB)	G <sub>a</sub> Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Polarization
2505.00	-17.10	-28.70	10.70	22.30	33.00	H
2535.00	-16.43	-28.60	10.70	22.87	33.00	H
<b>2565.00</b>	<b>-16.28</b>	<b>-28.60</b>	<b>10.70</b>	<b>23.02</b>	<b>33.00</b>	<b>H</b>

**LTE Band 7\_15MHz\_QPSK**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>ci</sub> (dB)+ P <sub>Ag</sub> (dB)	G <sub>a</sub> Antenna Gain(dB)	EIRP(dBm)	Limit(dBm)	Polarization
2507.50	-16.88	-28.70	10.70	22.52	33.00	H
2535.00	-16.94	-28.60	10.70	22.36	33.00	H
2562.50	-16.99	-28.60	10.70	22.31	33.00	H

**LTE Band 7\_20MHz\_QPSK**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>ci</sub> (dB)+ P <sub>Ag</sub> (dB)	G <sub>a</sub> Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Polarization
2510.00	-16.89	-28.70	10.70	22.51	33.00	H
2535.00	-16.94	-28.60	10.70	22.36	33.00	H
2560.00	-17.05	-28.60	10.70	22.25	33.00	H



**LTE Band 7\_5MHz\_16QAM**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>ci</sub> (dB)+ P <sub>Ag</sub> (dB)	G <sub>a</sub> Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Polarization
2502.50	-16.89	-28.70	10.70	22.51	33.00	H
2535.00	-17.05	-28.60	10.70	22.26	33.00	H
2567.50	-16.70	-28.60	10.70	22.60	33.00	H

**LTE Band 7\_10MHz\_16QAM**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>ci</sub> (dB)+ P <sub>Ag</sub> (dB)	G <sub>a</sub> Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Polarization
2505.00	-17.00	-28.70	10.70	22.40	33.00	H
2535.00	-16.91	-28.60	10.70	22.39	33.00	H
2565.00	-16.67	-28.60	10.70	22.63	33.00	H

**LTE Band 7\_15MHz\_16QAM**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>ci</sub> (dB)+ P <sub>Ag</sub> (dB)	G <sub>a</sub> Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Polarization
2507.50	-16.91	-28.70	10.70	22.50	33.00	H
2535.00	-17.00	-28.60	10.70	22.30	33.00	H
2562.50	-16.58	-28.60	10.70	22.72	33.00	H

**LTE Band 7\_20MHz\_16QAM**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>ci</sub> (dB)+ P <sub>Ag</sub> (dB)	G <sub>a</sub> Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Polarization
2510.00	-17.02	-28.70	10.70	22.38	33.00	H
2535.00	-16.79	-28.60	10.70	22.51	33.00	H
2560.00	-16.68	-28.60	10.70	22.62	33.00	H

Peak EIRP (dBm)=P<sub>Mea</sub>(-16.28dBm)-(P<sub>ci</sub>+P<sub>Ag</sub>)(-28.60dB)+G<sub>a</sub>(10.70dB) =23.02dBm



**LTE Band 12 - ERP Part 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)	Polarization
699.70	-11.36	-34.80	-0.93	2.15	20.36	34.77	V
707.50	-11.18	-34.70	-0.91	2.15	20.47	34.77	V
715.30	-11.65	-34.70	-0.68	2.15	20.21	34.77	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)	Polarization
700.50	-11.42	-34.80	-0.97	2.15	20.26	34.77	V
707.50	-11.22	-34.70	-0.91	2.15	20.42	34.77	V
714.50	-11.54	-34.70	-0.64	2.15	20.36	34.77	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)	Polarization
701.50	-11.36	-34.80	-0.97	2.15	20.32	34.77	V
707.50	-11.00	-34.70	-0.91	2.15	20.65	34.77	V
713.50	-11.45	-34.70	-0.64	2.15	20.45	34.77	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)	Polarization
704.00	-11.51	-34.80	-0.97	2.15	20.17	34.77	V
707.50	-11.38	-34.70	-0.91	2.15	20.26	34.77	V
711.00	-11.66	-34.70	-0.64	2.15	20.25	34.77	V





**LTE Band 12\_1.4MHz\_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)	Polarization
<b>699.70</b>	<b>-11.02</b>	<b>-34.80</b>	<b>-0.93</b>	<b>2.15</b>	<b>20.70</b>	<b>34.77</b>	<b>V</b>
707.50	-11.29	-34.70	-0.91	2.15	20.35	34.77	V
715.30	-11.62	-34.70	-0.68	2.15	20.25	34.77	V

**LTE Band 12\_3MHz\_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)	Polarization
700.50	-11.01	-34.80	-0.97	2.15	20.67	34.77	V
707.50	-11.10	-34.70	-0.91	2.15	20.54	34.77	V
714.50	-11.58	-34.70	-0.64	2.15	20.32	34.77	V

**LTE Band 12\_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)	Polarization
701.50	-11.56	-34.80	-0.97	2.15	20.13	34.77	V
707.50	-11.31	-34.70	-0.91	2.15	20.33	34.77	V
713.50	-11.76	-34.70	-0.64	2.15	20.15	34.77	V

**LTE Band 12\_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)	Polarization
704.00	-11.45	-34.80	-0.97	2.15	20.24	34.77	V
707.50	-11.19	-34.70	-0.91	2.15	20.46	34.77	V
711.00	-11.34	-34.70	-0.64	2.15	20.57	34.77	V

Peak ERP (dBm)=P<sub>Mea</sub>(-11.02Bm)-(P<sub>cl</sub>+P<sub>Ag</sub>)(-34.80dB)+G<sub>a</sub>(-0.93dB) -2.15dB =20.70dBm



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

**Limits:** ≤30dBm (1W)

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

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>ci</sub> (dB)+ P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Polarization
1710.70	-15.53	-29.60	8.10	22.17	30.00	H
1745.00	-14.81	-29.50	8.10	22.80	30.00	H
<b>1779.30</b>	<b>-14.71</b>	<b>-29.50</b>	<b>8.10</b>	<b>22.90</b>	<b>30.00</b>	<b>H</b>

**LTE Band 66\_3MHz\_QPSK**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>ci</sub> (dB)+ P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Polarization
1711.50	-15.43	-29.60	8.10	22.27	30.00	H
1745.00	-14.80	-29.50	8.10	22.80	30.00	H
1778.50	-14.91	-29.50	8.10	22.70	30.00	H

**LTE Band 66\_5MHz\_QPSK**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>ci</sub> (dB)+ P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Polarization
1712.50	-15.56	-29.60	8.10	22.14	30.00	H
1745.00	-15.12	-29.50	8.10	22.48	30.00	H
1777.50	-14.98	-29.50	8.10	22.62	30.00	H

**LTE Band 66\_10MHz\_QPSK**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>ci</sub> (dB)+ P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Polarization
1715.00	-15.63	-29.60	8.10	22.07	30.00	H
1745.00	-15.28	-29.50	8.10	22.33	30.00	H
1775.00	-15.21	-29.50	8.10	22.39	30.00	H

**LTE Band 66\_15MHz\_QPSK**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>ci</sub> (dB)+ P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Polarization
1717.50	-15.65	-29.60	8.10	22.05	30.00	H
1745.00	-15.43	-29.50	8.10	22.17	30.00	H
1772.53	-15.08	-29.50	8.10	22.52	30.00	H

**LTE Band 66\_20MHz\_QPSK**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>ci</sub> (dB)+ P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Polarization
1720.00	-15.79	-29.60	8.10	21.91	30.00	H
1745.00	-15.60	-29.50	8.10	22.00	30.00	H
1770.00	-15.31	-29.50	8.10	22.29	30.00	H



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

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)+ P <sub>Ag</sub> (dB)	G <sub>a</sub> Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Polarization
1710.70	-15.41	-29.60	8.10	22.29	30.00	H
1745.00	-14.76	-29.50	8.10	22.84	30.00	H
1779.30	-14.80	-29.50	8.10	22.80	30.00	H

**LTE Band 66\_3MHz\_16QAM**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)+ P <sub>Ag</sub> (dB)	G <sub>a</sub> Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Polarization
1711.50	-15.51	-29.60	8.10	22.19	30.00	H
1745.00	-14.86	-29.50	8.10	22.74	30.00	H
1778.50	-14.98	-29.50	8.10	22.62	30.00	H

**LTE Band 66\_5MHz\_16QAM**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)+ P <sub>Ag</sub> (dB)	G <sub>a</sub> Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Polarization
1712.50	-15.74	-29.60	8.10	21.96	30.00	H
1745.00	-15.14	-29.50	8.10	22.46	30.00	H
1777.50	-15.23	-29.50	8.10	22.37	30.00	H

**LTE Band 66\_10MHz\_16QAM**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)+ P <sub>Ag</sub> (dB)	G <sub>a</sub> Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Polarization
1715.00	-15.64	-29.60	8.10	22.06	30.00	H
1745.00	-15.33	-29.50	8.10	22.28	30.00	H
1775.00	-15.44	-29.50	8.10	22.16	30.00	H

**LTE Band 66\_15MHz\_16QAM**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)+ P <sub>Ag</sub> (dB)	G <sub>a</sub> Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Polarization
1717.50	-15.84	-29.60	8.10	21.86	30.00	H
1745.00	-15.47	-29.50	8.10	22.13	30.00	H
1772.53	-15.48	-29.50	8.10	22.12	30.00	H

**LTE Band 66\_20MHz\_16QAM**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)+ P <sub>Ag</sub> (dB)	G <sub>a</sub> Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Polarization
1720.00	-15.94	-29.60	8.10	21.76	30.00	H
1745.00	-15.61	-29.50	8.10	21.99	30.00	H
1770.00	-15.44	-29.50	8.10	22.16	30.00	H

Peak EIRP (dBm)=P<sub>Mea</sub>(-14.71dBm)-(P<sub>cl</sub>+P<sub>Ag</sub>)(-29.50dB)+G<sub>a</sub>(8.10dB) =22.90dBm

**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: The maximum value of expanded measurement uncertainty for this test item is U =

2.72dB(30MHz-3GHz)/3.60dB(3GHz-18GHz)/3.58dB(18GHz-40GHz), k = 2

**Note: Both of Vertical and Horizontal polarizations are evaluated, but only the worst case is recorded in this report.**

## **A.2 FIELD STRENGTH OF SPURIOUS RADIATION**

### **Reference**

FCC: CFR 2.1053, 22.917, 24.238, 27.53.

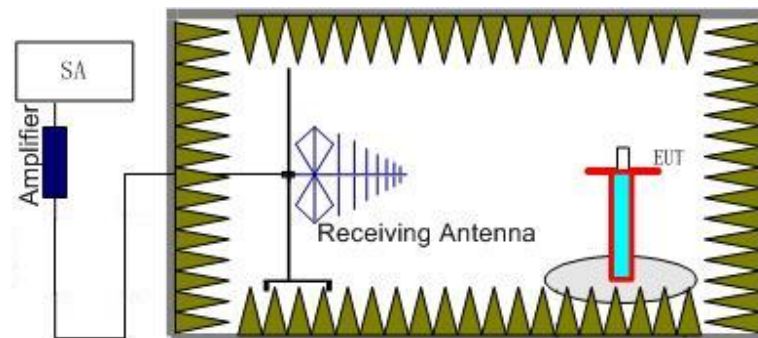
### **A.2.1 Measurement Method**

This measurement is carried out in fully-anechoic chamber FAC-3.

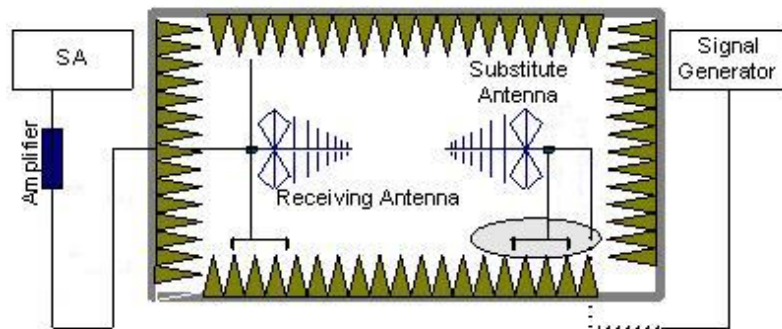
The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier. The resolution bandwidth is set 1MHz as outlined in Part 22.917, 24.238, 27.53(h) and 90.691. The spectrum was scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of the LTE Bands 2,5,7,12,13, 66.

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

1. For radiated emissions measurements performed at frequencies less than or equal to 1 GHz, EUT was placed on a 80 cm high non-conductive stand at a 3 meter test distance from the receive antenna. For radiated measurements performed at frequencies above 1 GHz, EUT was placed on a 1.5 meter high non-conductive stand at a 3 meter test distance from the receive antenna. Receiving antenna was placed on the antenna mast 3 meters from the EUT. For emission measurements. The receiving antenna shall be varied from 1 m to 4 m in height above the reference ground in a search for the relative positioning that produces the maximum radiated signal level. 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, 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 and adjusts 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(dBi) ( $G_a$ ) 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:

$$\text{Power (EIRP)} = P_{Mea} - P_{pl} + G_a$$

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,  $ERP = EIRP - 2.15\text{dB}$ .

### A.2.2 Measurement Results

Radiated emissions measurements were made only at the upper, middle, and lower carrier frequencies of the LTE Bands 2,5,7,12, 66. 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 2,5,7,12, 66 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.

Only worst case result is given below.

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

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain(dBi)	Peak EIRP(dBm)	Limit(dBm)	Polarization
16969.05	-45.28	2.90	16.50	-31.68	-13.00	H
17329.05	-42.68	3.20	14.50	-31.38	-13.00	H
17512.38	-40.44	2.90	12.80	-30.54	-13.00	H
17601.43	-39.54	3.30	12.80	-30.04	-13.00	H
17812.38	-40.05	3.60	12.80	-30.85	-13.00	H
17979.05	-37.76	3.20	12.80	-28.16	-13.00	H

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

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain(dBi)	Peak EIRP(dBm)	Limit(dBm)	Polarization
3759.00	-42.19	1.10	12.20	-31.09	-13.00	H
16995.24	-44.83	2.90	16.50	-31.23	-13.00	H
17450.48	-41.14	2.90	14.50	-29.54	-13.00	H
17575.24	-39.09	3.30	12.80	-29.59	-13.00	H
17836.67	-40.22	3.60	12.80	-31.02	-13.00	H
17936.67	-38.14	3.20	12.80	-28.54	-13.00	H

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

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain(dBi)	Peak EIRP(dBm)	Limit(dBm)	Polarization
3817.50	-38.93	1.20	12.20	-27.93	-13.00	H
16985.71	-44.64	2.90	16.50	-31.04	-13.00	H
17453.81	-41.72	2.90	14.50	-30.12	-13.00	H
17543.81	-39.85	2.90	12.80	-29.95	-13.00	H
17839.05	-40.39	3.60	12.80	-31.19	-13.00	H
17960.48	-38.07	3.20	12.80	-28.47	-13.00	H

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

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain(dBi)	Peak EIRP(dBm)	Limit(dBm)	Polarization
16990.95	-45.00	2.90	16.50	-31.40	-13.00	H
17355.24	-43.09	3.20	14.50	-31.79	-13.00	H
17449.05	-42.20	2.90	14.50	-30.60	-13.00	H
17570.95	-40.46	3.30	12.80	-30.96	-13.00	H
17801.90	-39.87	3.60	12.80	-30.67	-13.00	H
17997.62	-38.02	3.20	12.80	-28.42	-13.00	H

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

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain(dBi)	Peak EIRP(dBm)	Limit(dBm)	Polarization
3759.00	-41.64	1.10	12.20	-30.54	-13.00	H
17301.43	-42.56	3.20	14.50	-31.26	-13.00	H
17462.38	-42.01	2.90	14.50	-30.41	-13.00	H
17563.33	-38.83	3.30	12.80	-29.33	-13.00	H
17825.24	-40.32	3.60	12.80	-31.12	-13.00	H
17936.67	-38.35	3.20	12.80	-28.75	-13.00	H

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

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain(dBi)	Peak EIRP(dBm)	Limit(dBm)	Polarization
3817.50	-38.61	1.20	12.20	-27.61	-13.00	H
17182.86	-43.44	2.90	14.50	-31.84	-13.00	H
17458.10	-41.71	2.90	14.50	-30.11	-13.00	H
17573.81	-39.88	3.30	12.80	-30.38	-13.00	H
17779.05	-40.33	3.60	12.80	-31.13	-13.00	H
17940.95	-37.67	3.20	12.80	-28.07	-13.00	H

Note: The maximum value of expanded measurement uncertainty for this test item is  $U = 2.72\text{dB}(30\text{MHz}-3\text{GHz})/3.60\text{dB}(3\text{GHz}-18\text{GHz})/3.58\text{dB}(18\text{GHz}-40\text{GHz})$ ,  $k = 2$

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

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain(dBi)	Peak ERP(dBm)	Limit(dBm)	Polarization
8724.00	-52.14	2.00	12.00	-44.29	-13.00	V
9101.38	-51.08	2.20	11.60	-43.83	-13.00	H
9302.50	-50.33	2.00	11.60	-42.88	-13.00	H
9475.88	-50.81	2.10	11.60	-43.46	-13.00	V
9737.88	-50.82	2.20	11.20	-43.97	-13.00	H
9795.13	-51.13	2.30	11.20	-44.38	-13.00	H

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

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain(dBi)	Peak ERP(dBm)	Limit(dBm)	Polarization
8452.88	-51.21	1.80	11.30	-43.86	-13.00	H
9101.75	-51.47	2.20	11.60	-44.22	-13.00	H
9296.13	-50.54	2.00	11.60	-43.09	-13.00	H
9473.75	-50.33	2.10	11.60	-42.98	-13.00	V
9665.38	-50.90	2.10	11.20	-43.95	-13.00	H
9808.25	-50.79	2.30	11.20	-44.04	-13.00	H

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

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain(dBi)	Peak ERP(dBm)	Limit(dBm)	Polarization
3391.50	-51.70	1.10	11.50	-43.45	-13.00	V
9103.38	-51.23	2.20	11.60	-43.98	-13.00	H
9300.13	-50.14	2.00	11.60	-42.69	-13.00	H
9476.75	-50.86	2.10	11.60	-43.51	-13.00	V
9722.63	-51.00	2.20	11.20	-44.15	-13.00	H
9800.63	-51.03	2.30	11.20	-44.28	-13.00	H





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

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain(dBi)	Peak ERP(dBm)	Limit(dBm)	Polarization
7123.50	-51.38	1.90	12.00	-43.43	-13.00	H
7324.50	-52.69	1.70	12.00	-44.54	-13.00	H
9105.25	-51.42	2.20	11.60	-44.17	-13.00	H
9224.38	-50.44	2.10	11.60	-43.09	-13.00	H
9470.38	-50.53	2.10	11.60	-43.18	-13.00	V
9760.88	-51.07	2.20	11.20	-44.22	-13.00	H

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

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain(dBi)	Peak ERP(dBm)	Limit(dBm)	Polarization
8411.25	-51.54	1.80	11.30	-44.19	-13.00	H
9093.25	-51.24	2.20	11.60	-43.99	-13.00	H
9304.63	-50.75	2.00	11.60	-43.30	-13.00	H
9475.25	-50.94	2.10	11.60	-43.59	-13.00	V
9744.13	-50.60	2.20	11.20	-43.75	-13.00	H
9784.63	-51.07	2.30	11.20	-44.32	-13.00	H

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

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain(dBi)	Peak ERP(dBm)	Limit(dBm)	Polarization
3391.50	-51.64	1.10	11.50	-43.39	-13.00	V
9105.25	-50.76	2.20	11.60	-43.51	-13.00	H
9299.50	-49.77	2.00	11.60	-42.32	-13.00	H
9473.63	-50.74	2.10	11.60	-43.39	-13.00	V
9736.75	-50.43	2.20	11.20	-43.58	-13.00	H
9795.00	-50.59	2.30	11.20	-43.84	-13.00	H

Note: The maximum value of expanded measurement uncertainty for this test item is  $U = 2.72\text{dB}(30\text{MHz}-3\text{GHz})/3.60\text{dB}(3\text{GHz}-18\text{GHz})/3.58\text{dB}(18\text{GHz}-40\text{GHz})$ ,  $k = 2$

**LTE Band 7, 5 MHz, QPSK, Channel 20775**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain(dBi)	Peak EIRP(dBm)	Limit(dBm)	Polarization
12501.90	-41.90	2.60	13.80	-30.70	-25.00	H
16983.33	-54.91	2.90	16.50	-41.31	-25.00	H
17454.76	-51.57	2.90	14.50	-39.97	-25.00	H
17618.10	-49.50	3.30	12.80	-40.00	-25.00	H
17837.62	-49.79	3.60	12.80	-40.59	-25.00	H
17990.00	-47.58	3.20	12.80	-37.98	-25.00	H

**LTE Band 7, 5 MHz, QPSK, Channel 21100**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain(dBi)	Peak EIRP(dBm)	Limit(dBm)	Polarization
12664.76	-39.62	2.60	13.80	-28.42	-25.00	H
16935.71	-54.83	2.90	16.50	-41.23	-25.00	H
17458.10	-51.70	2.90	14.50	-40.10	-25.00	H
17580.95	-49.24	3.30	12.80	-39.74	-25.00	H
17840.00	-49.15	3.60	12.80	-39.95	-25.00	H
17990.00	-47.56	3.20	12.80	-37.96	-25.00	H

**LTE Band 7, 5 MHz, QPSK, Channel 21425**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain(dBi)	Peak EIRP(dBm)	Limit(dBm)	Polarization
12826.67	-41.65	2.70	13.80	-30.55	-25.00	H
16939.05	-54.58	2.90	16.50	-40.98	-25.00	H
17513.33	-50.13	2.90	12.80	-40.23	-25.00	H
17593.81	-49.73	3.30	12.80	-40.23	-25.00	H
17840.00	-49.83	3.60	12.80	-40.63	-25.00	H
17983.81	-47.56	3.20	12.80	-37.96	-25.00	H

**LTE Band 7, 5 MHz, 16QAM, Channel 20775**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain(dBi)	Peak EIRP(dBm)	Limit(dBm)	Polarization
12501.90	-44.79	2.60	13.80	-33.59	-25.00	H
16939.05	-54.57	2.90	16.50	-40.97	-25.00	H
17369.05	-53.13	3.20	14.50	-41.83	-25.00	H
17436.67	-51.97	2.90	14.50	-40.37	-25.00	H
17593.81	-49.77	3.30	12.80	-40.27	-25.00	H
17836.19	-49.98	3.60	12.80	-40.78	-25.00	H

**LTE Band 7, 5 MHz, 16QAM, Channel 21100**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain(dBi)	Peak EIRP(dBm)	Limit(dBm)	Polarization
12664.76	-41.39	2.60	13.80	-30.19	-25.00	H
16952.86	-55.10	2.90	16.50	-41.50	-25.00	H
17504.29	-49.76	2.90	12.80	-39.86	-25.00	H
17619.05	-49.61	3.30	12.80	-40.11	-25.00	H
17839.05	-49.84	3.60	12.80	-40.64	-25.00	H
17977.14	-47.71	3.20	12.80	-38.11	-25.00	H

**LTE Band 7, 5 MHz, 16QAM, Channel 21425**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain(dBi)	Peak EIRP(dBm)	Limit(dBm)	Polarization
12826.67	-41.62	2.70	13.80	-30.52	-25.00	H
16961.90	-54.53	2.90	16.50	-40.93	-25.00	H
17454.76	-51.79	2.90	14.50	-40.19	-25.00	H
17619.05	-49.73	3.30	12.80	-40.23	-25.00	H
17839.52	-49.54	3.60	12.80	-40.34	-25.00	H
17982.38	-47.68	3.20	12.80	-38.08	-25.00	H

Note: The maximum value of expanded measurement uncertainty for this test item is  $U = 2.72\text{dB}(30\text{MHz}-3\text{GHz})/3.60\text{dB}(3\text{GHz}-18\text{GHz})/3.58\text{dB}(18\text{GHz}-40\text{GHz})$ ,  $k = 2$

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

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain(dBi)	Peak ERP(dBm)	Limit(dBm)	Polarization
2797.00	-47.45	1.00	10.70	-39.90	-13.00	H
3495.75	-47.82	1.10	11.50	-39.57	-13.00	H
4195.88	-41.56	1.20	12.40	-32.51	-13.00	H
9222.00	-50.03	2.10	11.60	-42.68	-13.00	H
9422.25	-50.45	2.10	11.60	-43.10	-13.00	H
9794.63	-50.51	2.30	11.20	-43.76	-13.00	H

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

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain(dBi)	Peak ERP(dBm)	Limit(dBm)	Polarization
2828.00	-50.02	1.00	10.70	-42.47	-13.00	H
4242.38	-43.91	1.20	12.40	-34.86	-13.00	H
9301.38	-50.45	2.00	11.60	-43.00	-13.00	H
9475.25	-51.20	2.10	11.60	-43.85	-13.00	V
9740.63	-50.68	2.20	11.20	-43.83	-13.00	H
9805.38	-50.67	2.30	11.20	-43.92	-13.00	H

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

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain(dBi)	Peak ERP(dBm)	Limit(dBm)	Polarization
2860.50	-50.32	1.00	10.70	-42.77	-13.00	H
4289.25	-46.42	1.20	12.40	-37.37	-13.00	H
9096.00	-50.61	2.20	11.60	-43.36	-13.00	H
9295.75	-50.03	2.00	11.60	-42.58	-13.00	H
9468.13	-50.99	2.10	11.60	-43.64	-13.00	V
9733.38	-50.94	2.20	11.20	-44.09	-13.00	H



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

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain(dBi)	Peak ERP(dBm)	Limit(dBm)	Polarization
2797.00	-46.55	1.00	10.70	-39.00	-13.00	H
3495.75	-46.84	1.10	11.50	-38.59	-13.00	H
4195.50	-40.61	1.20	12.40	-31.56	-13.00	H
9224.63	-50.36	2.10	11.60	-43.01	-13.00	H
9474.50	-50.91	2.10	11.60	-43.56	-13.00	V
9745.00	-50.82	2.20	11.20	-43.97	-13.00	H

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

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain(dBi)	Peak ERP(dBm)	Limit(dBm)	Polarization
2828.50	-49.79	1.00	10.70	-42.24	-13.00	H
3535.50	-52.20	1.10	12.20	-43.25	-13.00	H
4242.38	-44.16	1.20	12.40	-35.11	-13.00	V
9099.13	-51.44	2.20	11.60	-44.19	-13.00	H
9225.00	-50.04	2.10	11.60	-42.69	-13.00	H
9738.13	-50.51	2.20	11.20	-43.66	-13.00	H

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

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain(dBi)	Peak ERP(dBm)	Limit(dBm)	Polarization
4289.25	-50.21	1.20	12.40	-41.16	-13.00	V
7191.75	-52.42	1.80	12.00	-44.37	-13.00	H
9098.63	-51.41	2.20	11.60	-44.16	-13.00	H
9294.63	-50.42	2.00	11.60	-42.97	-13.00	H
9473.75	-50.74	2.10	11.60	-43.39	-13.00	V
9728.00	-50.37	2.20	11.20	-43.52	-13.00	H

Note: The maximum value of expanded measurement uncertainty for this test item is  $U = 2.72\text{dB}(30\text{MHz}-3\text{GHz})/3.60\text{dB}(3\text{GHz}-18\text{GHz})/3.58\text{dB}(18\text{GHz}-40\text{GHz})$ ,  $k = 2$

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

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain(dBi)	Peak EIRP(dBm)	Limit(dBm)	Polarization
16992.38	-44.71	2.90	16.50	-31.11	-13.00	H
17236.67	-43.31	3.20	14.50	-32.01	-13.00	H
17458.10	-41.80	2.90	14.50	-30.20	-13.00	H
17620.00	-39.66	3.30	12.80	-30.16	-13.00	H
17769.05	-39.98	3.60	12.80	-30.78	-13.00	H
17978.10	-37.60	3.20	12.80	-28.00	-13.00	H

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

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain(dBi)	Peak EIRP(dBm)	Limit(dBm)	Polarization
16974.76	-44.82	2.90	16.50	-31.22	-13.00	H
17305.24	-43.10	3.20	14.50	-31.80	-13.00	H
17512.38	-40.66	2.90	12.80	-30.76	-13.00	H
17625.24	-39.30	3.30	12.80	-29.80	-13.00	H
17815.71	-39.10	3.60	12.80	-29.90	-13.00	H
17933.81	-37.64	3.20	12.80	-28.04	-13.00	H

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

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain(dBi)	Peak EIRP(dBm)	Limit(dBm)	Polarization
16978.10	-44.59	2.90	16.50	-30.99	-13.00	H
17299.05	-43.15	3.20	14.50	-31.85	-13.00	H
17450.95	-41.59	2.90	14.50	-29.99	-13.00	H
17581.90	-39.19	3.30	12.80	-29.69	-13.00	H
17787.14	-38.93	3.60	12.80	-29.73	-13.00	H
17955.71	-37.98	3.20	12.80	-28.38	-13.00	H



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

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain(dBi)	Peak EIRP(dBm)	Limit(dBm)	Polarization
16940.48	-44.91	2.90	16.50	-31.31	-13.00	H
17280.48	-42.87	3.20	14.50	-31.57	-13.00	H
17384.76	-41.18	3.20	14.50	-29.88	-13.00	H
17624.29	-39.43	3.30	12.80	-29.93	-13.00	H
17773.33	-39.50	3.60	12.80	-30.30	-13.00	H
17921.43	-38.11	3.20	12.80	-28.51	-13.00	H

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

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain(dBi)	Peak EIRP(dBm)	Limit(dBm)	Polarization
17016.67	-43.21	2.90	14.50	-31.61	-13.00	H
17182.38	-43.37	2.90	14.50	-31.77	-13.00	H
17489.05	-41.46	2.90	14.50	-29.86	-13.00	H
17583.81	-39.85	3.30	12.80	-30.35	-13.00	H
17762.86	-39.57	3.60	12.80	-30.37	-13.00	H
18000.00	-31.09	3.20	6.20	-28.09	-13.00	H

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

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain(dBi)	Peak EIRP(dBm)	Limit(dBm)	Polarization
16987.62	-45.24	2.90	16.50	-31.64	-13.00	H
17181.90	-43.78	2.90	14.50	-32.18	-13.00	H
17440.48	-41.94	2.90	14.50	-30.34	-13.00	H
17572.38	-39.52	3.30	12.80	-30.02	-13.00	H
17772.38	-40.00	3.60	12.80	-30.80	-13.00	H
17932.38	-38.21	3.20	12.80	-28.61	-13.00	H

Note: The maximum value of expanded measurement uncertainty for this test item is  $U = 2.72\text{dB}(30\text{MHz}-3\text{GHz})/3.60\text{dB}(3\text{GHz}-18\text{GHz})/3.58\text{dB}(18\text{GHz}-40\text{GHz})$ ,  $k = 2$



### **A.3 FREQUENCY STABILITY**

#### **Reference**

FCC: CFR Part 2.1055, 22.355, 24.235, 27.54.

#### **A.3.1 Method of Measurement**

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

1. Measure the carrier frequency at room temperature.
2. Subject the EUT to overnight soak at 0°C.
3. With the EUT, powered via nominal voltage, connected to the CMW500 and in a simulated call on middle channel, 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 +50°C to 0°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 3.5V and 4.4V, with a nominal voltage of 3.85V. 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	26	14	0.014	0.007
3.85	15	21	0.008	0.011
4.4	8	8	0.004	0.004

**Frequency Error vs Temperature**

Temperature (°C)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
0	33	20	0.018	0.011
10	26	15	0.014	0.008
20	24	26	0.013	0.014
30	19	24	0.010	0.013
40	17	18	0.009	0.010
50	31	23	0.016	0.012

 Expanded measurement uncertainty is 10 Hz,  $k = 2$ 
**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	16	13	0.019	0.016
3.85	24	24	0.029	0.029
4.4	17	20	0.020	0.024

**Frequency Error vs Temperature**

Temperature (°C)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
0	26	31	0.031	0.037
10	15	25	0.018	0.030
20	17	14	0.020	0.017
30	13	26	0.016	0.031
40	21	27	0.025	0.032
50	18	19	0.022	0.023

 Expanded measurement uncertainty is 10Hz,  $k = 2$



**LTE Band 7, 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	12	9	0.005	0.004
3.85	8	7	0.003	0.003
4.4	11	10	0.004	0.004

**Frequency Error vs Temperature**

Temperature (°C)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
0	20	13	0.008	0.005
10	15	7	0.006	0.003
20	14	18	0.006	0.007
30	17	7	0.007	0.003
40	9	15	0.004	0.006
50	6	11	0.002	0.004

Expanded measurement uncertainty is 10 Hz,  $k = 2$

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

**Frequency Error vs Voltage**

Voltage (V)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
3.5	22	17	0.031	0.024
3.85	15	14	0.021	0.020
4.4	7	9	0.010	0.013

**Frequency Error vs Temperature**

Temperature (°C)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
0	13	13	0.018	0.018
10	11	18	0.016	0.025
20	14	7	0.020	0.010
30	12	14	0.017	0.020
40	20	21	0.028	0.030
50	16	8	0.023	0.011

Expanded measurement uncertainty is 10Hz,  $k = 2$

**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	31	29	0.018	0.017
3.85	28	18	0.016	0.010
4.4	22	30	0.013	0.017

**Frequency Error vs Temperature**

Temperature (°C)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
0	26	30	0.015	0.017
10	25	25	0.014	0.014
20	17	17	0.010	0.010
30	22	29	0.013	0.017
40	29	26	0.017	0.015
50	31	33	0.018	0.019

Expanded measurement uncertainty is 10Hz, k = 2



### A.4 OCCUPIED BANDWIDTH

#### Reference

FCC: CFR Part 2.1049, 22.917, 24.238, 27.53.

#### A.4.1 Occupied Bandwidth Results

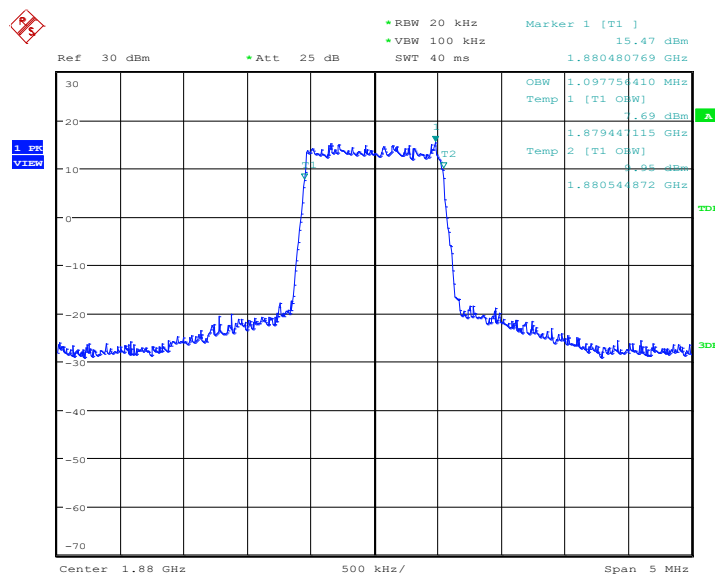
Occupied bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequencies of the US Cellular/PCS frequency bands. The table below lists the measured 99% BW. Spectrum analyzer plots are included on the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

- The 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).
- 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.
- 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.
- Set the detection mode to peak, and the trace mode to max hold.
- Use the 99 % power bandwidth function of the spectrum analyzer and report the measured bandwidth.

#### LTE band 2, 1.4MHz (99% BW)

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

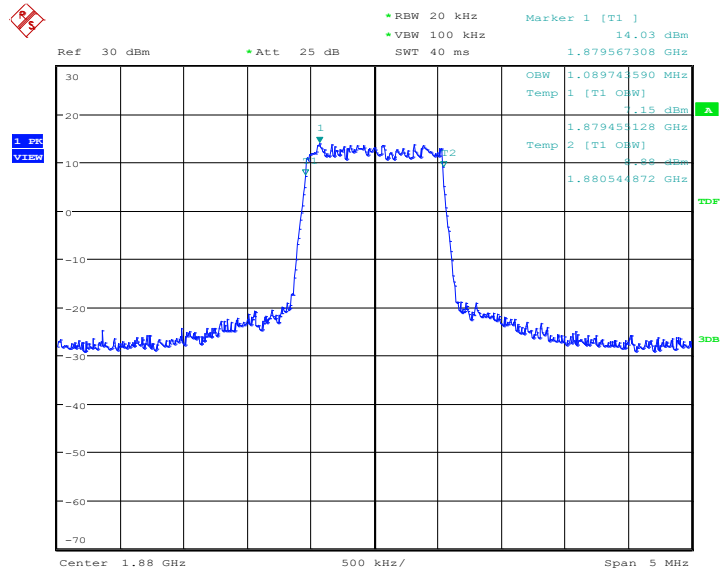
#### LTE band 2, 1.4MHz Bandwidth, QPSK (99% BW)



Date: 27.MAY.2021 12:10:14



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

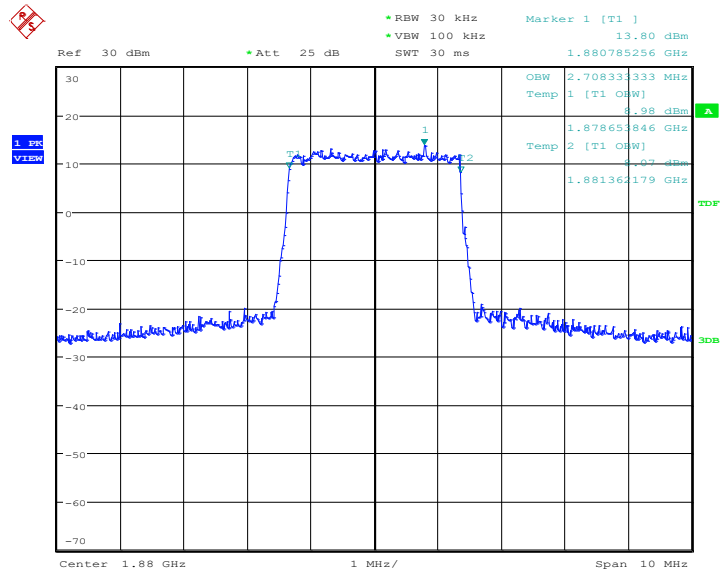


Date: 27.MAY.2021 12:10:28

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

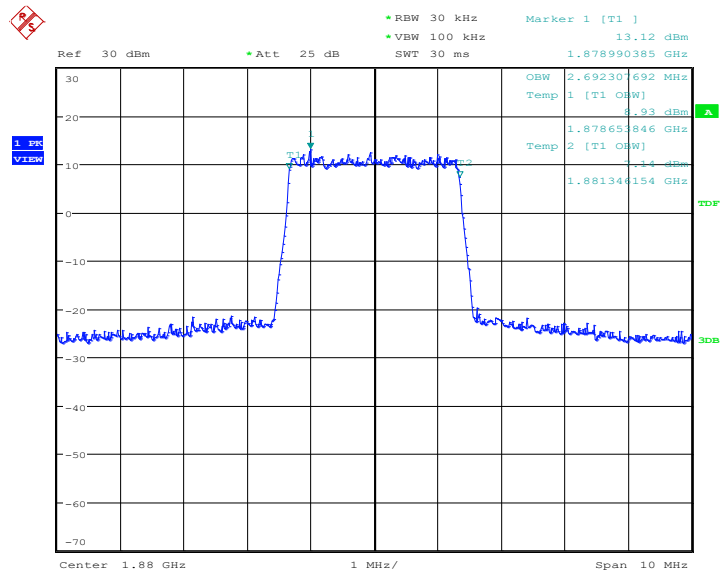
Frequency(MHz)	Occupied Bandwidth (99% BW)( kHz)	
1880.0	QPSK	16QAM
	2708.33	2692.31

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



Date: 27.MAY.2021 12:12:32

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



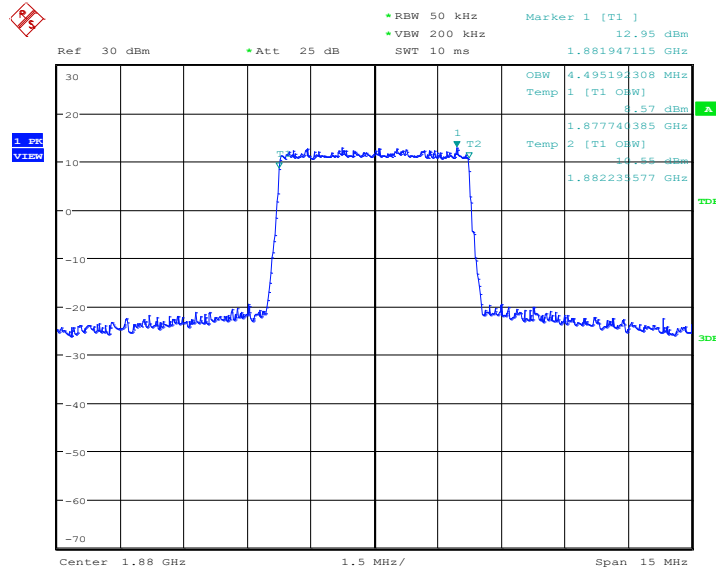
Date: 27.MAY.2021 12:12:45



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

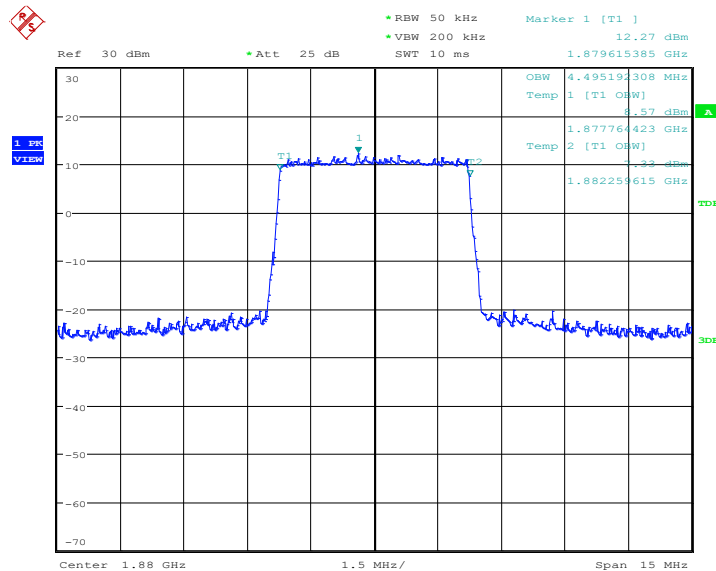
Frequency(MHz)	Occupied Bandwidth (99% BW)( kHz)	
	1880.0	QPSK
4495.19		4495.19

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



Date: 27.MAY.2021 12:14:49

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

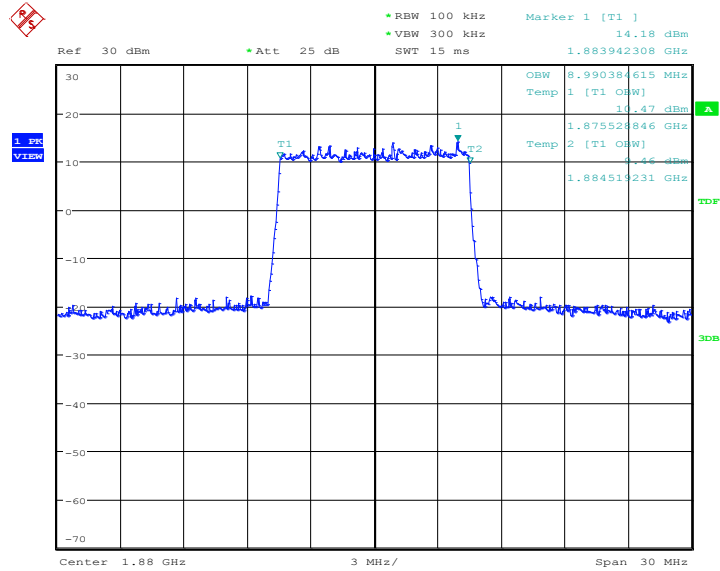


Date: 27.MAY.2021 12:15:03

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

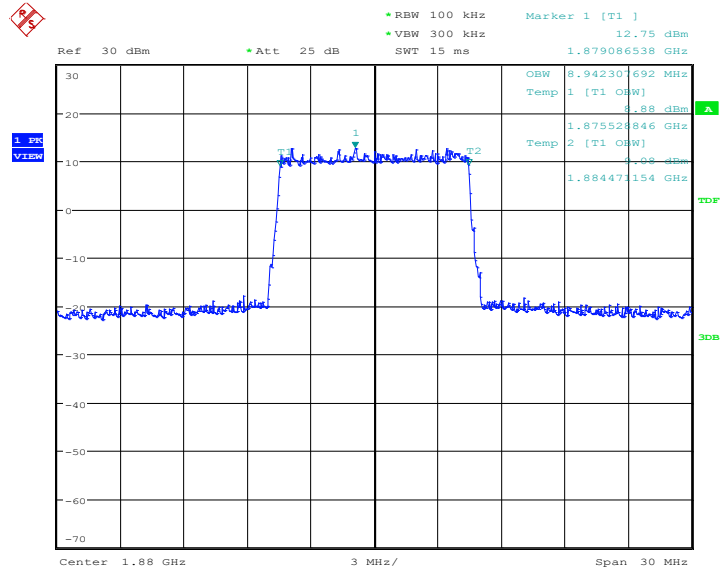
Frequency(MHz)	Occupied Bandwidth (99% BW)( kHz)	
1880.0	QPSK	16QAM
	8990.38	8942.31

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



Date: 27.MAY.2021 12:17:07

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



Date: 27.MAY.2021 12:17:21

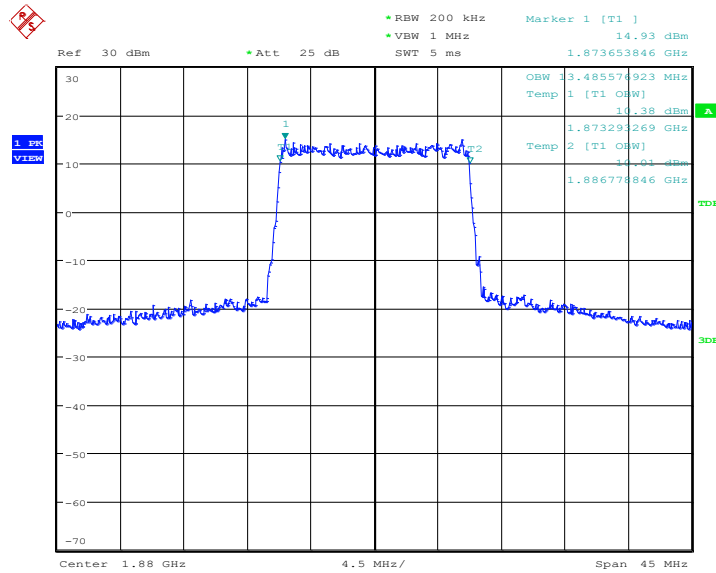




**LTE band 2, 15MHz (99% BW)**

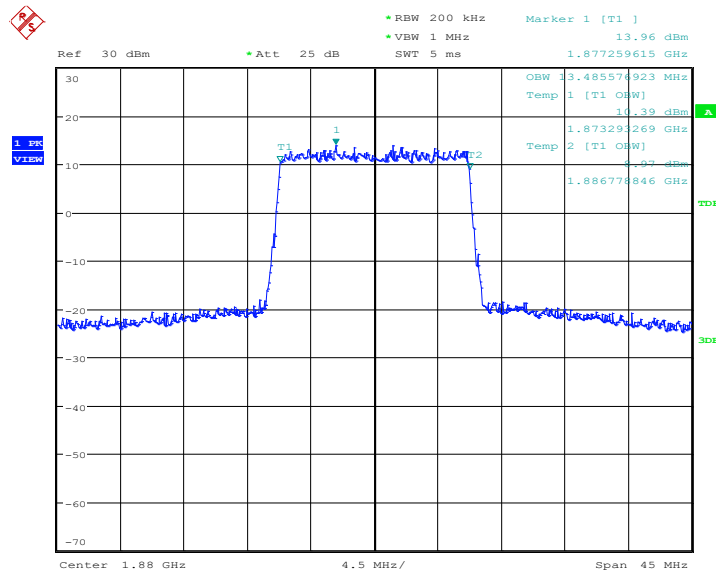
Frequency(MHz)	Occupied Bandwidth (99% BW)( kHz)	
	1880.0	QPSK
	13485.58	13485.58

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



Date: 27.MAY.2021 12:19:25

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



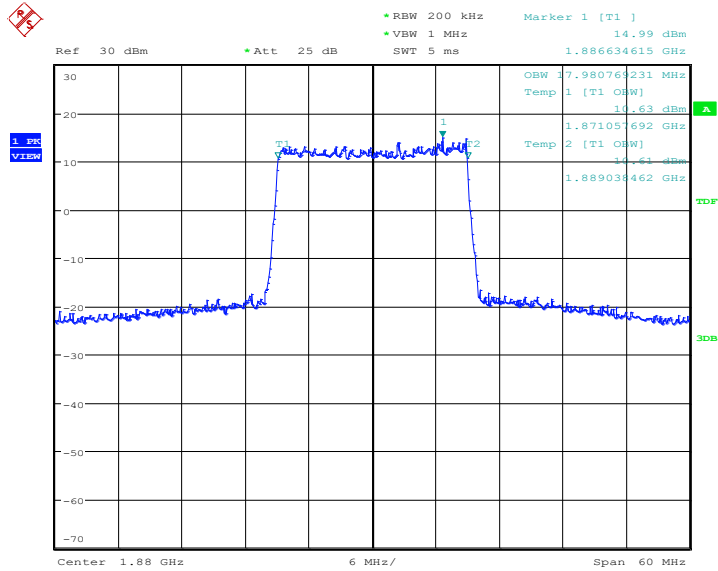
Date: 27.MAY.2021 12:19:39



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

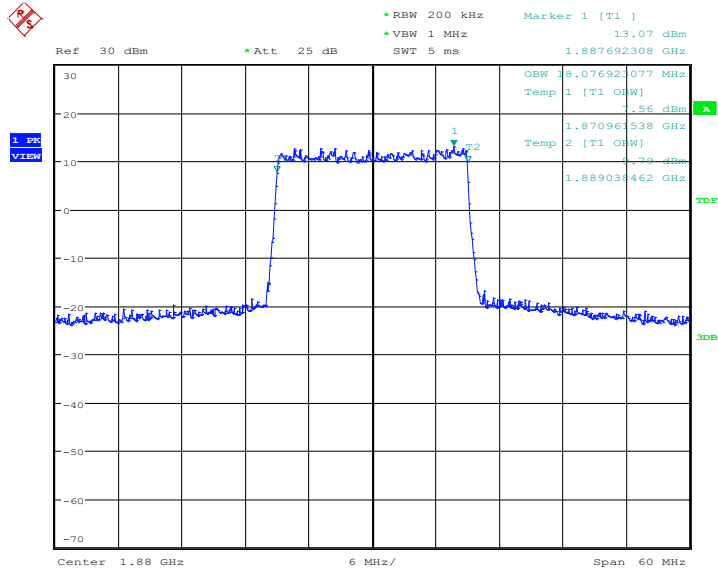
Frequency(MHz)	Occupied Bandwidth (99% BW)( kHz)	
1880.0	QPSK	16QAM
	17980.77	18076.92

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



Date: 27.MAY.2021 12:21:43

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

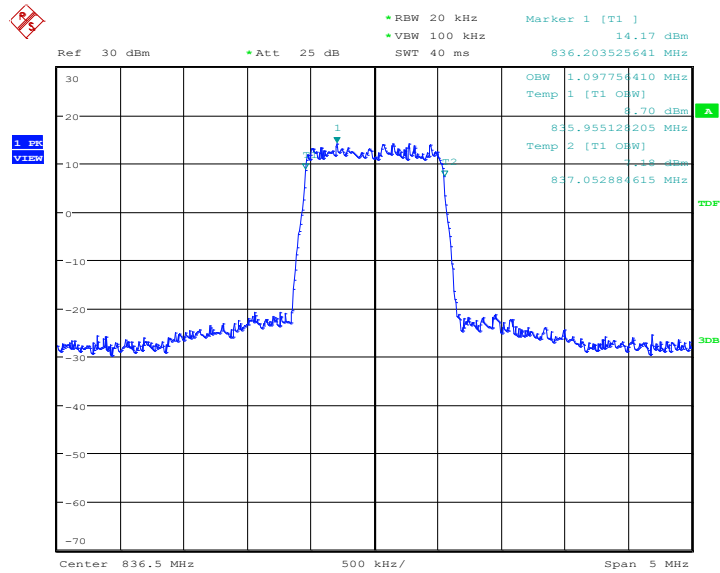


Date: 27.MAY.2021 12:21:57

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

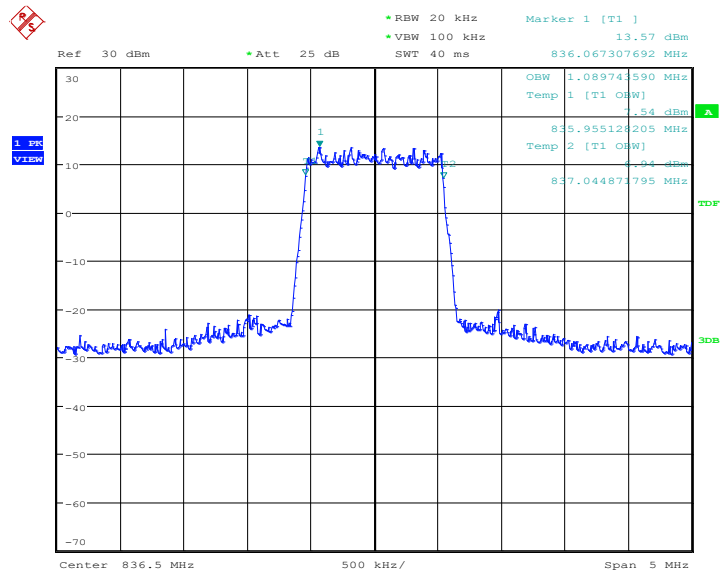
Frequency(MHz)	Occupied Bandwidth (99% BW)( kHz)	
	836.5	QPSK
1097.76		1089.74

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



Date: 27.MAY.2021 12:01:01

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



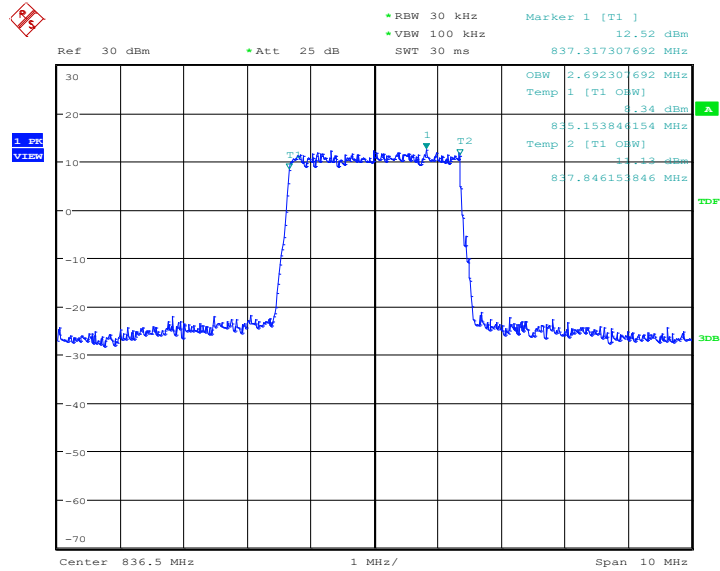
Date: 27.MAY.2021 12:01:15



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

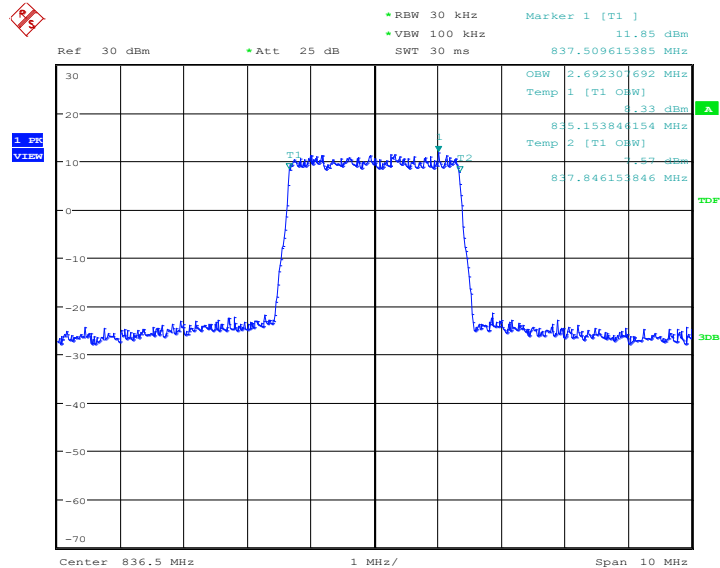
Frequency(MHz)	Occupied Bandwidth (99% BW)( kHz)	
	836.5	QPSK
2692.31		2692.31

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



Date: 27.MAY.2021 12:03:19

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

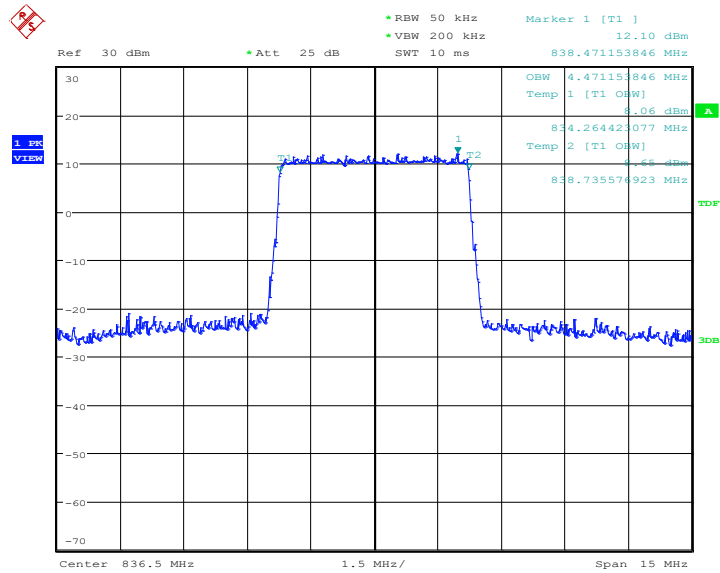


Date: 27.MAY.2021 12:03:33

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

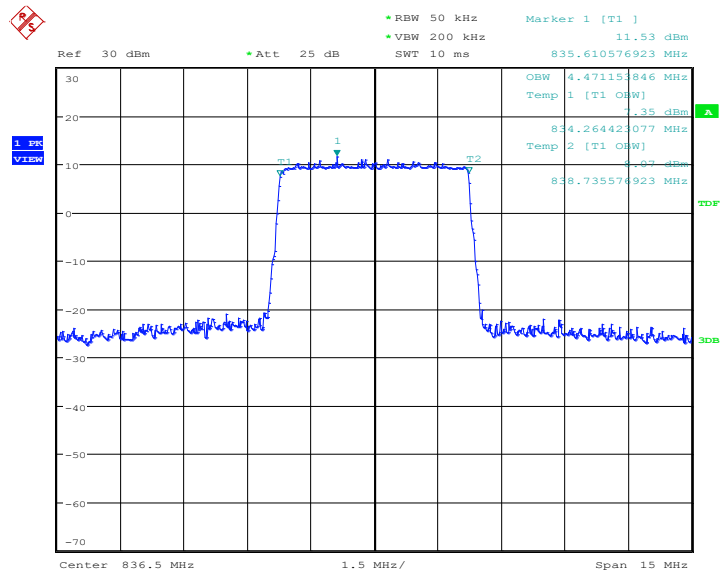
Frequency(MHz)	Occupied Bandwidth (99% BW)( kHz)	
836.5	QPSK	16QAM
	4471.15	4471.15

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



Date: 27.MAY.2021 12:05:37

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



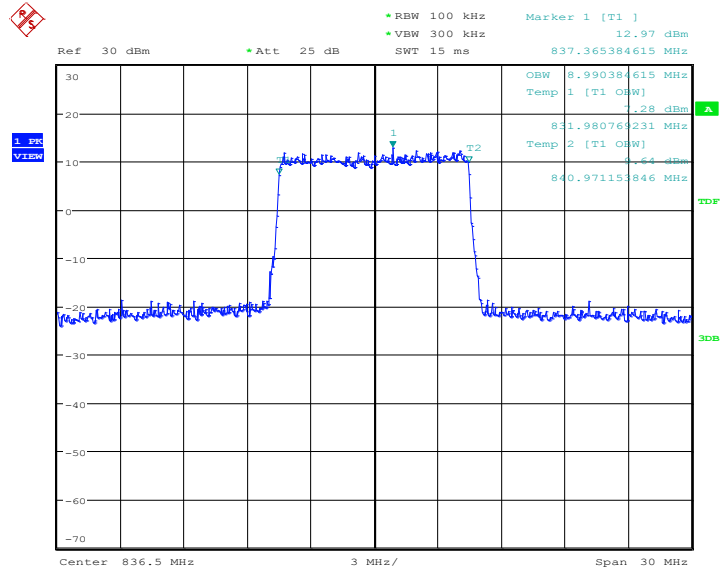
Date: 27.MAY.2021 12:05:50



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

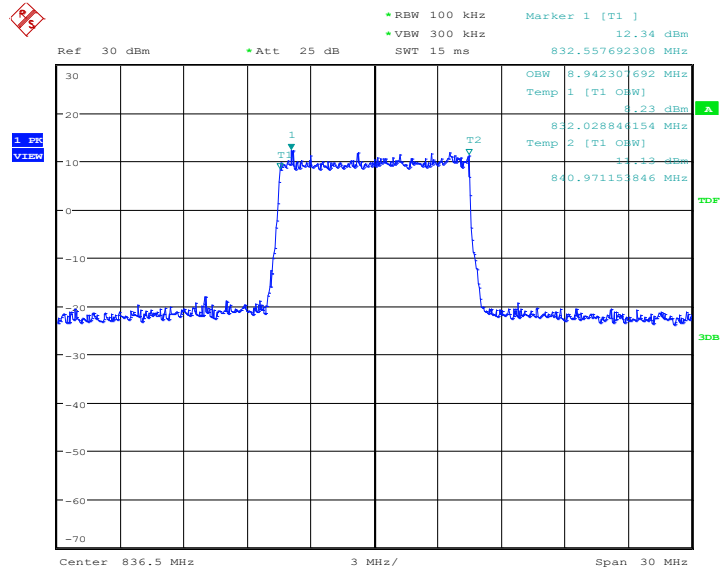
Frequency(MHz)	Occupied Bandwidth (99% BW)( kHz)	
836.5	QPSK	16QAM
	8990.38	8942.31

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



Date: 27.MAY.2021 12:07:54

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

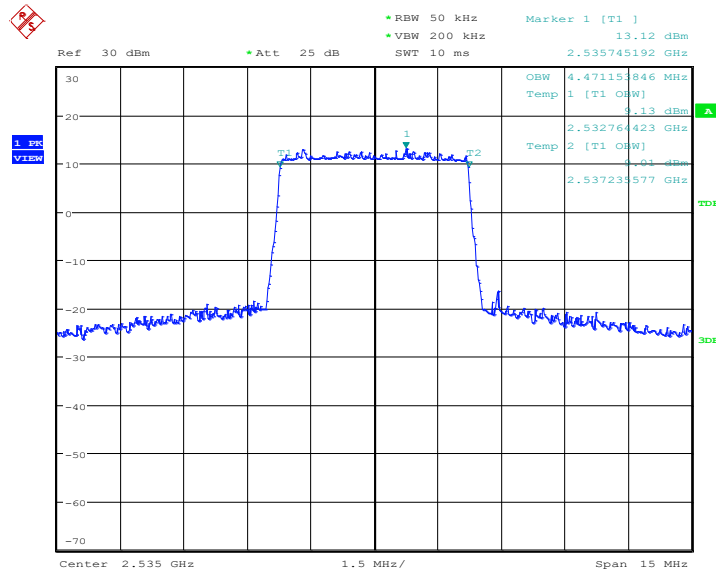


Date: 27.MAY.2021 12:08:08

**LTE band 7, 5MHz (99% BW)**

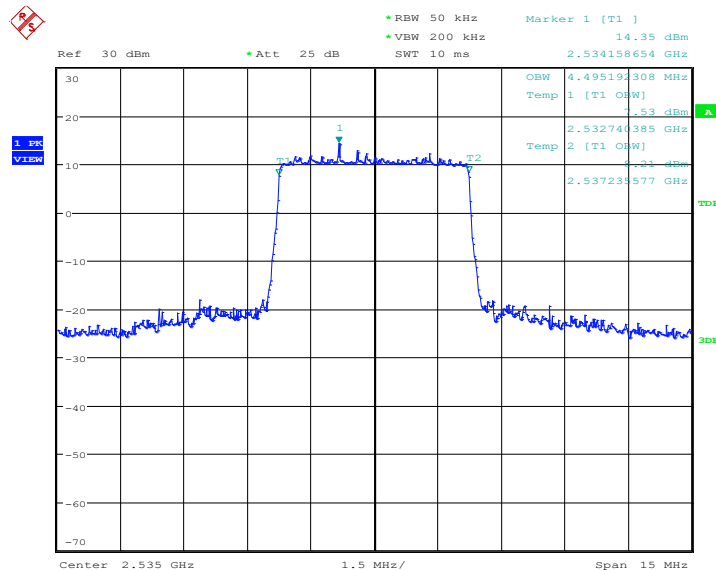
Frequency(MHz)	Occupied Bandwidth (99% BW)( kHz)	
2535.0	QPSK	16QAM
	4471.15	4495.19

**LTE band 7, 5MHz Bandwidth, QPSK (99% BW)**



Date: 27.MAY.2021 11:51:47

**LTE band 7, 5MHz Bandwidth,16QAM (99% BW)**



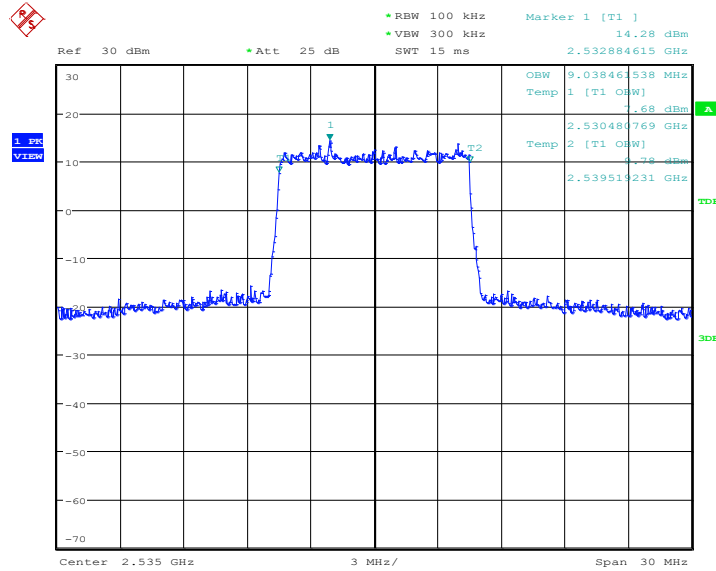
Date: 27.MAY.2021 11:52:01



**LTE band 7, 10MHz (99% BW)**

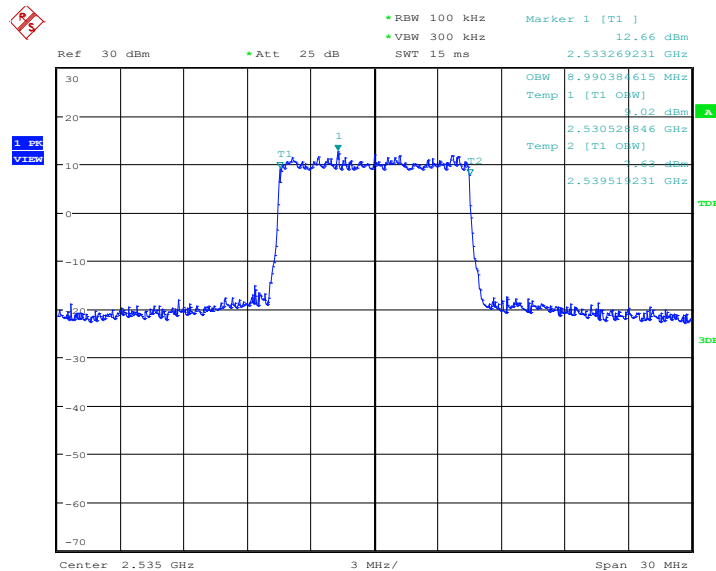
Frequency(MHz)	Occupied Bandwidth (99% BW)( kHz)	
2535.0	QPSK	16QAM
	9038.46	8990.38

**LTE band 7, 10MHz Bandwidth, QPSK (99% BW)**



Date: 27.MAY.2021 11:54:05

**LTE band 7, 10MHz Bandwidth, 16QAM (99% BW)**



Date: 27.MAY.2021 11:54:19

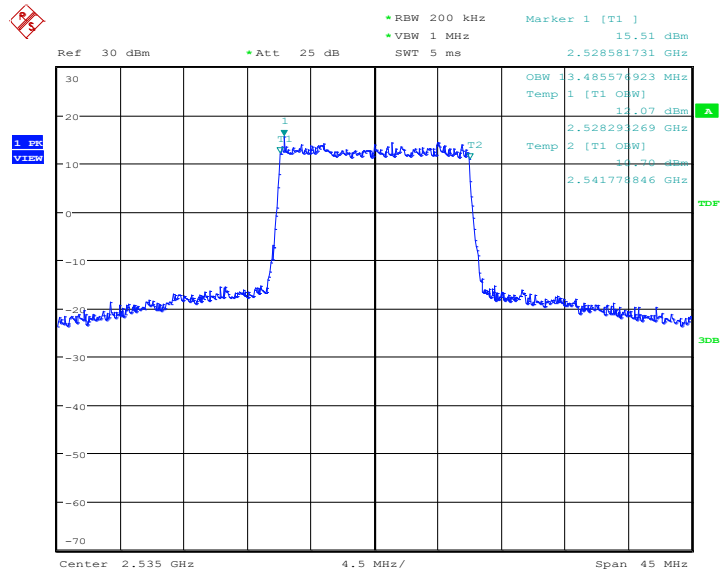




**LTE band 7, 15MHz (99% BW)**

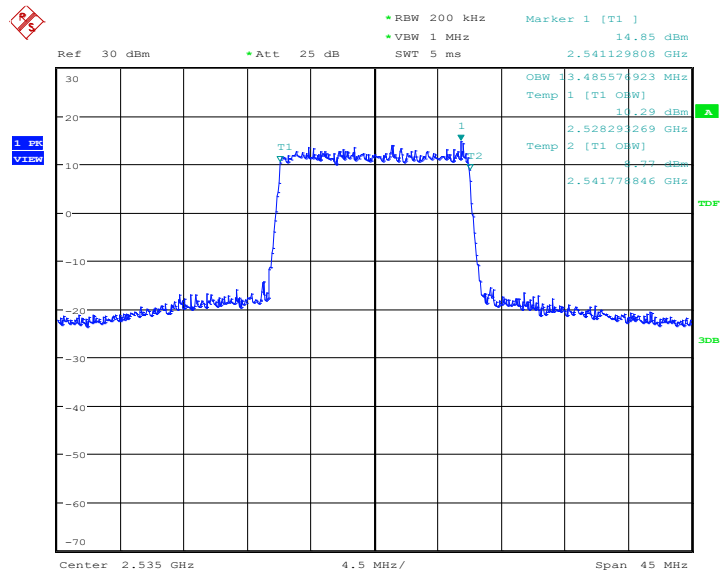
Frequency(MHz)	Occupied Bandwidth (99% BW)( kHz)	
2535.0	QPSK	16QAM
	13485.58	13485.58

**LTE band 7, 15MHz Bandwidth, QPSK (99% BW)**



Date: 27.MAY.2021 11:56:23

**LTE band 7, 15MHz Bandwidth, 16QAM (99% BW)**

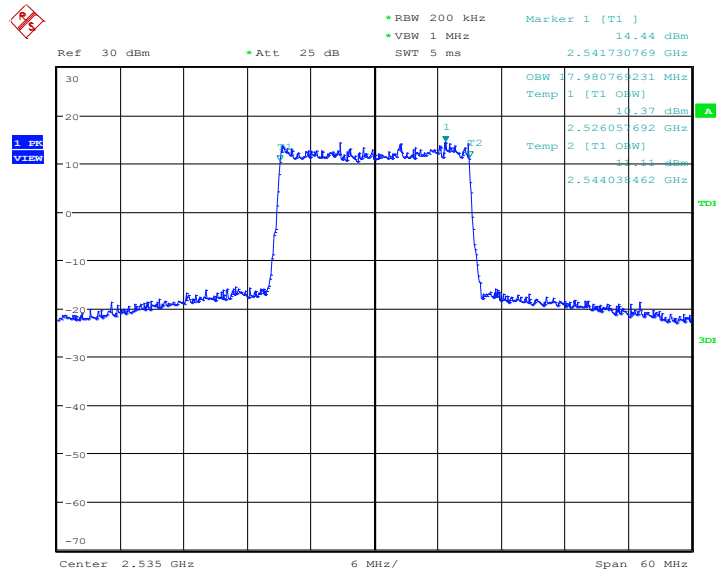


Date: 27.MAY.2021 11:56:37

**LTE band 7, 20MHz (99% BW)**

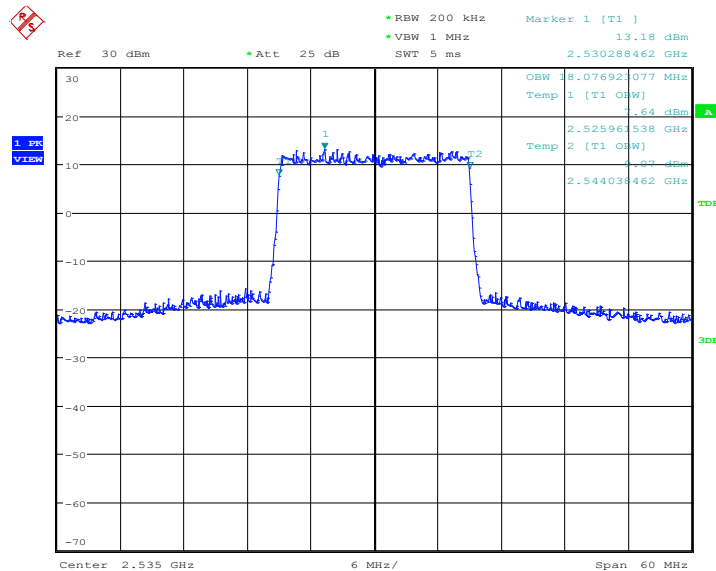
Frequency(MHz)	Occupied Bandwidth (99% BW)( kHz)	
2535.0	QPSK	16QAM
	17980.77	18076.92

**LTE band 7, 20MHz Bandwidth, QPSK (99% BW)**



Date: 27.MAY.2021 11:58:41

**LTE band 7, 20MHz Bandwidth, 16QAM (99% BW)**



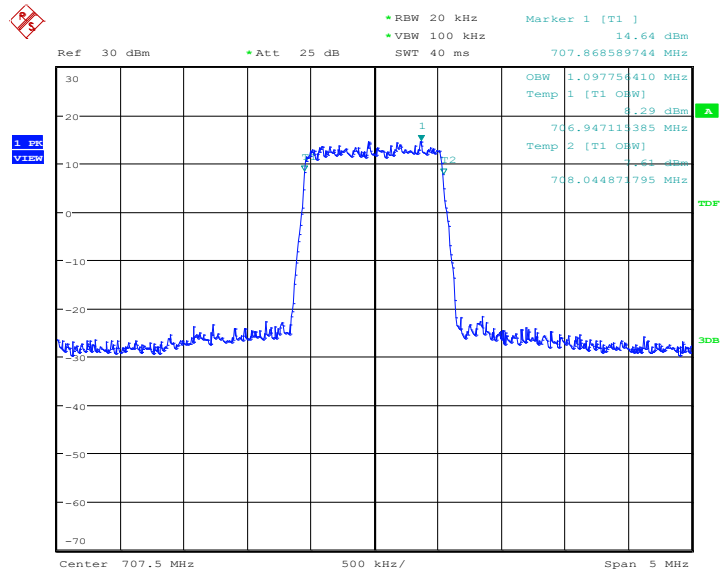
Date: 27.MAY.2021 11:58:55

Note: Expanded measurement uncertainty is  $U = 3428\text{Hz}$ ,  $k = 2$

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

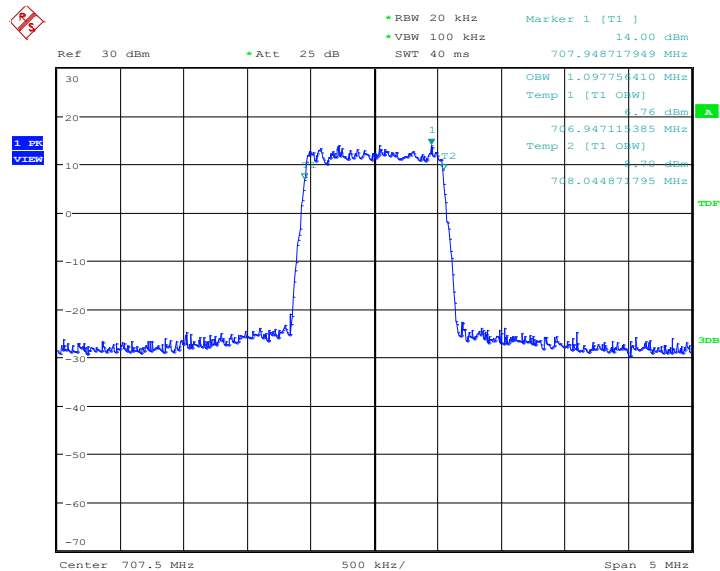
Frequency(MHz)	Occupied Bandwidth (99% BW)( kHz)	
707.5	QPSK	16QAM
	1097.76	1097.76

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



Date: 27.MAY.2021 12:37:54

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



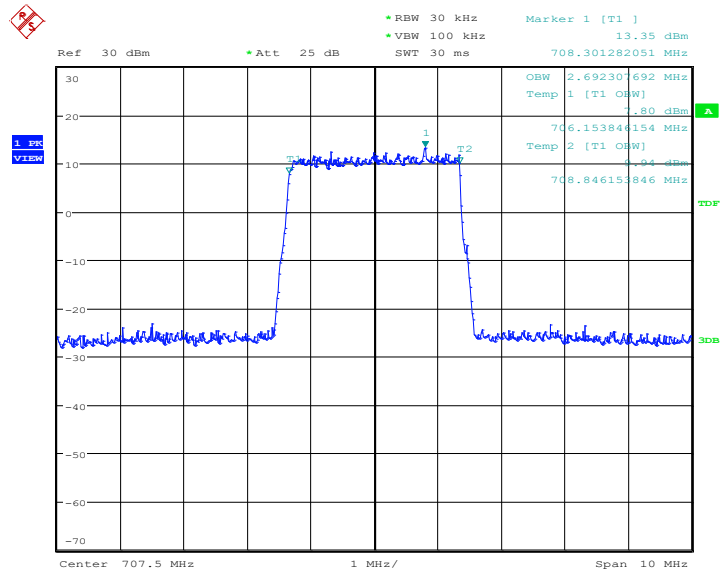
Date: 27.MAY.2021 12:38:08



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

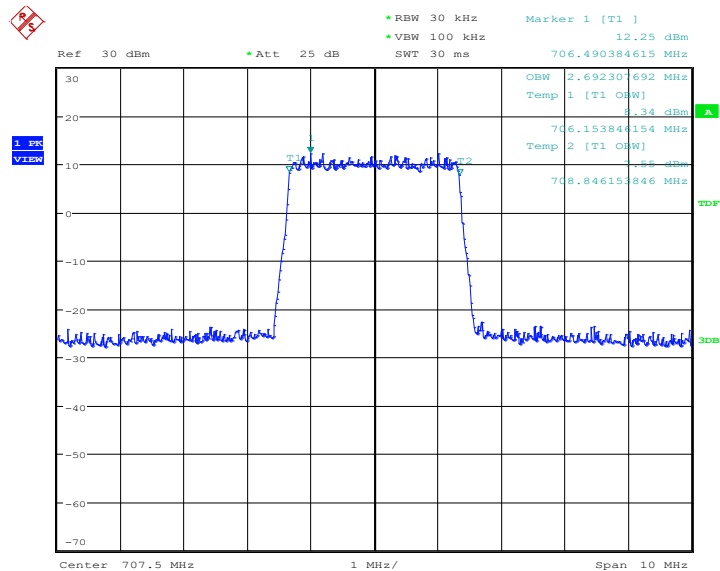
Frequency(MHz)	Occupied Bandwidth (99% BW)( kHz)	
707.5	QPSK	16QAM
	2692.31	2692.31

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



Date: 27.MAY.2021 12:40:12

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



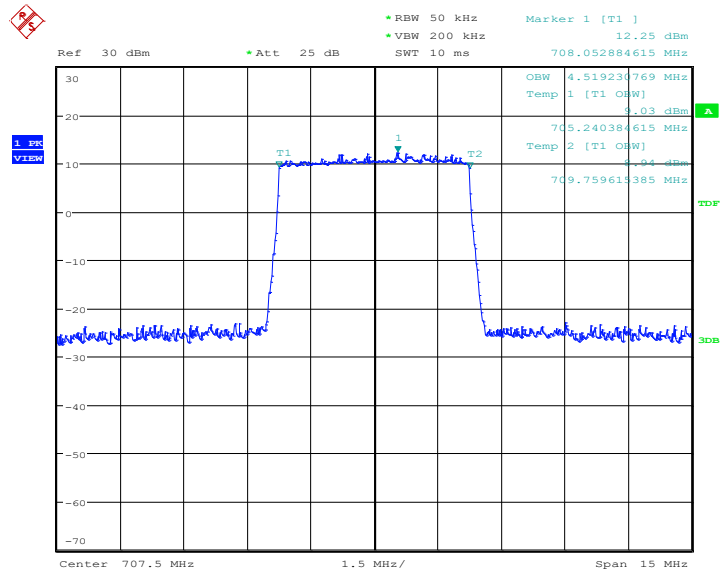
Date: 27.MAY.2021 12:40:26



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

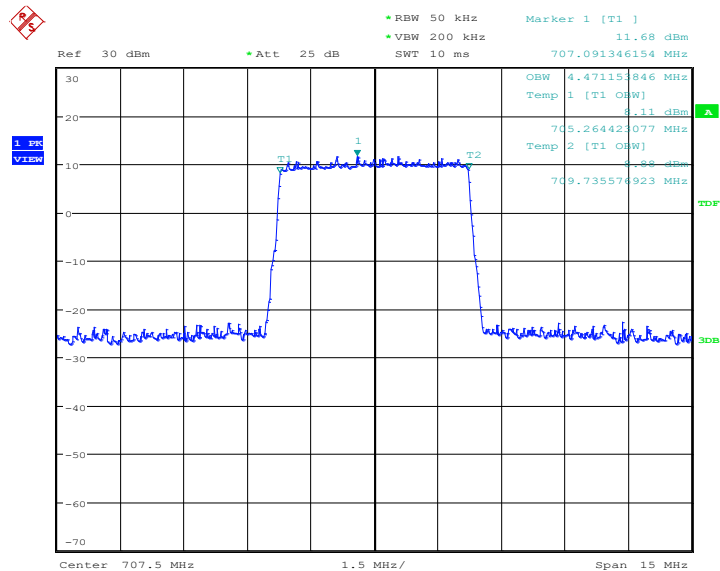
Frequency(MHz)	Occupied Bandwidth (99% BW)( kHz)	
707.5	QPSK	16QAM
	4519.23	4471.15

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



Date: 27.MAY.2021 12:42:30

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



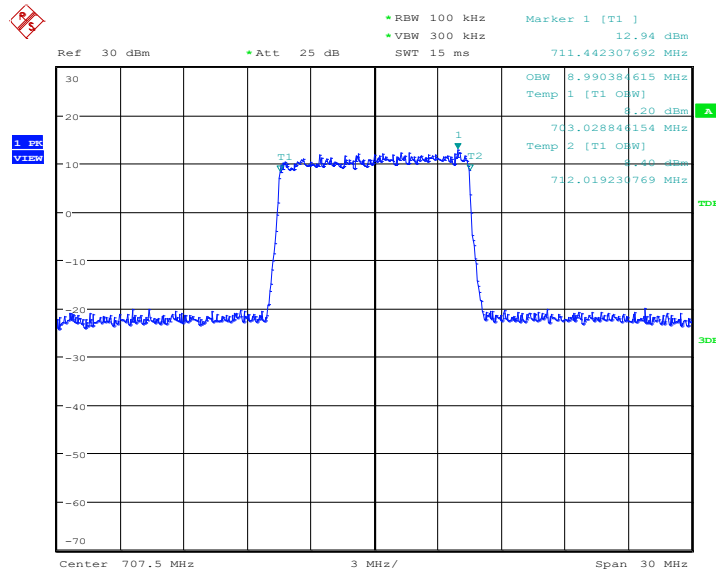
Date: 27.MAY.2021 12:42:43



LTE band 12, 10MHz (99% BW)

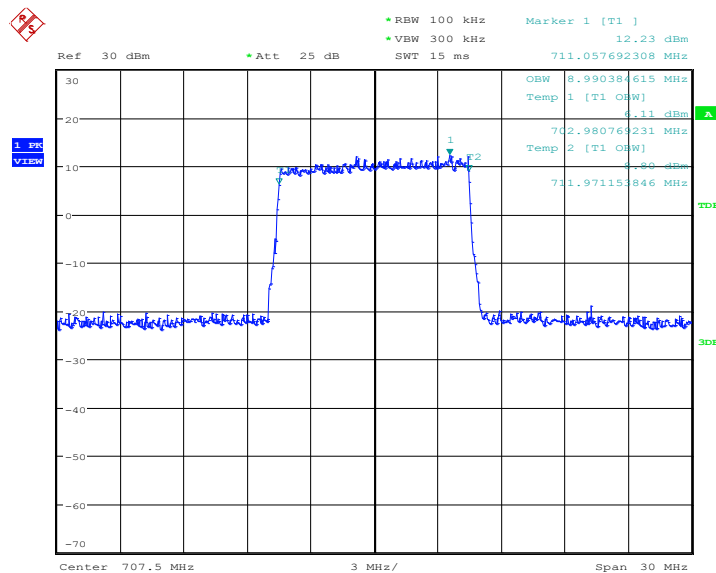
Frequency(MHz)	Occupied Bandwidth (99% BW)( kHz)	
707.5	QPSK	16QAM
	8990.38	8990.38

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



Date: 27.MAY.2021 12:44:47

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



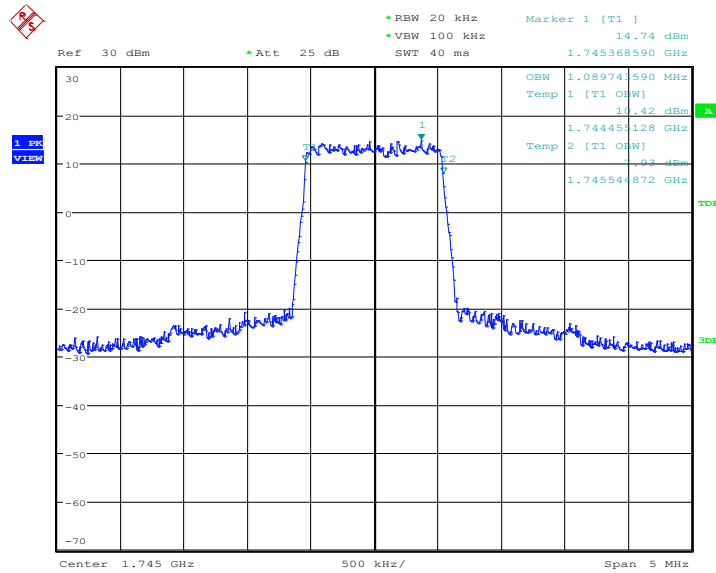
Date: 27.MAY.2021 12:45:01



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

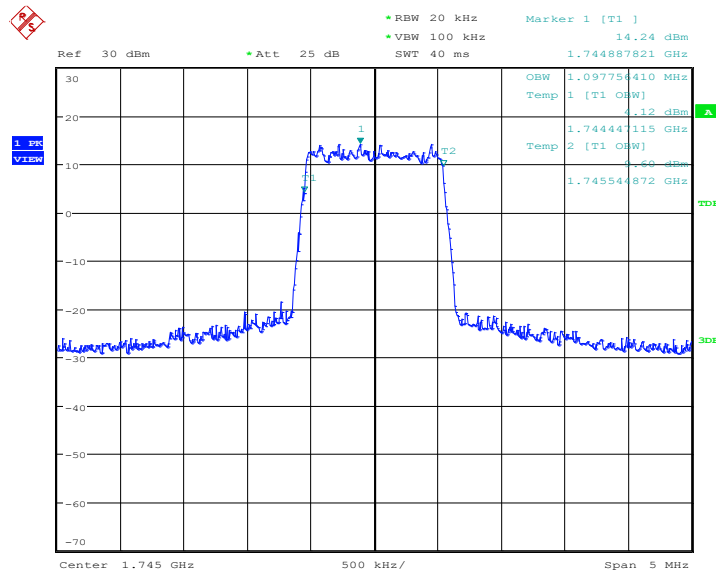
Frequency(MHz)	Occupied Bandwidth (99% BW)( kHz)	
1745.0	QPSK	16QAM
	1089.74	1097.76

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



Date: 27.MAY.2021 12:51:49

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



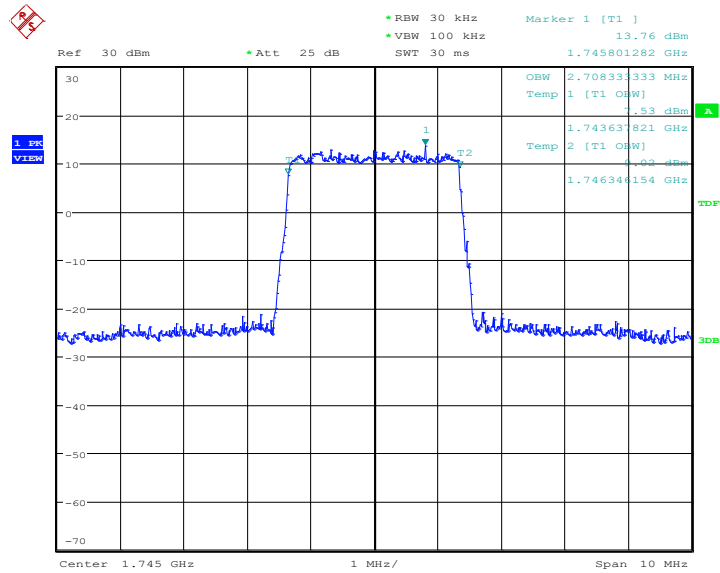
Date: 27.MAY.2021 12:52:02



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

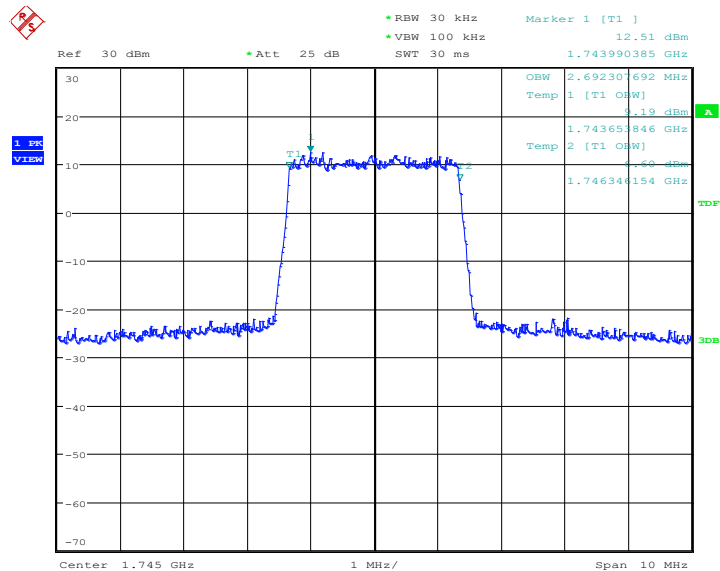
Frequency(MHz)	Occupied Bandwidth (99% BW)( kHz)	
1745.0	QPSK	16QAM
	2708.33	2692.31

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



Date: 27.MAY.2021 12:54:06

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



Date: 27.MAY.2021 12:54:20

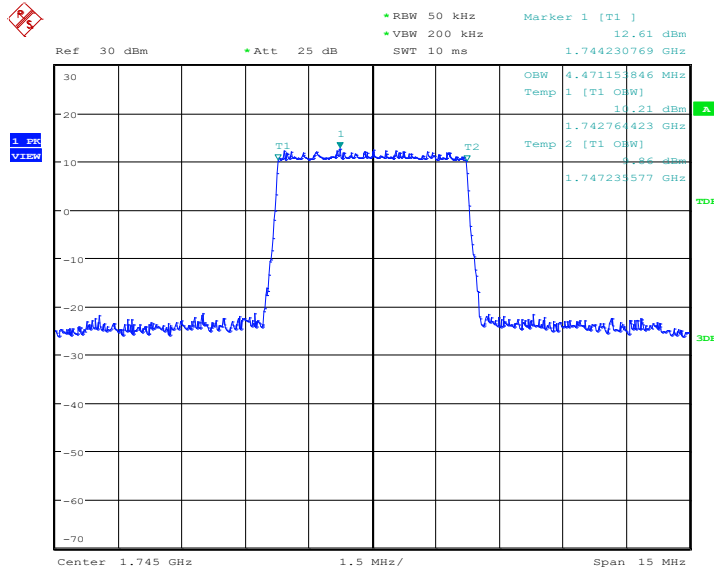




**LTE band 66, 5MHz (99% BW)**

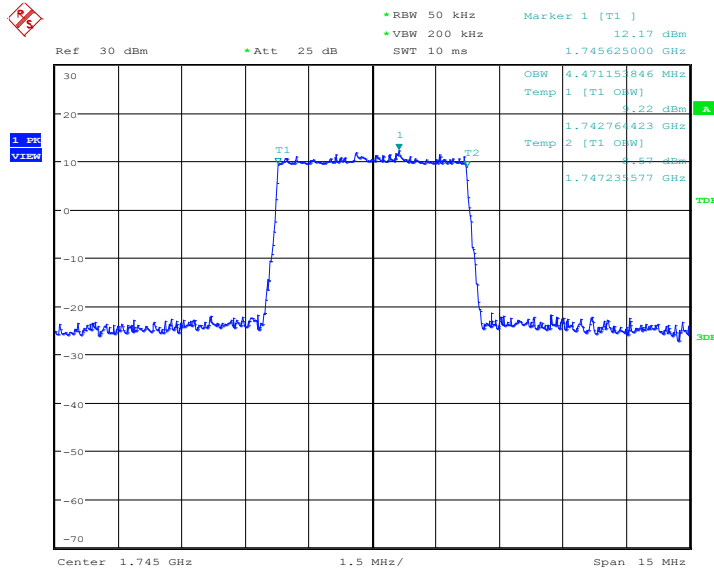
Frequency(MHz)	Occupied Bandwidth (99% BW)( kHz)	
1745.0	QPSK	16QAM
	4471.15	4471.15

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



Date: 27.MAY.2021 12:56:24

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



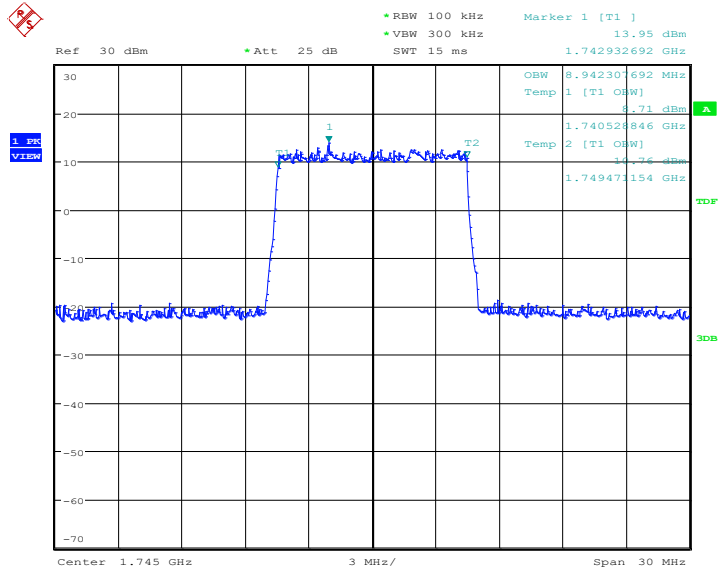
Date: 27.MAY.2021 12:56:38



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

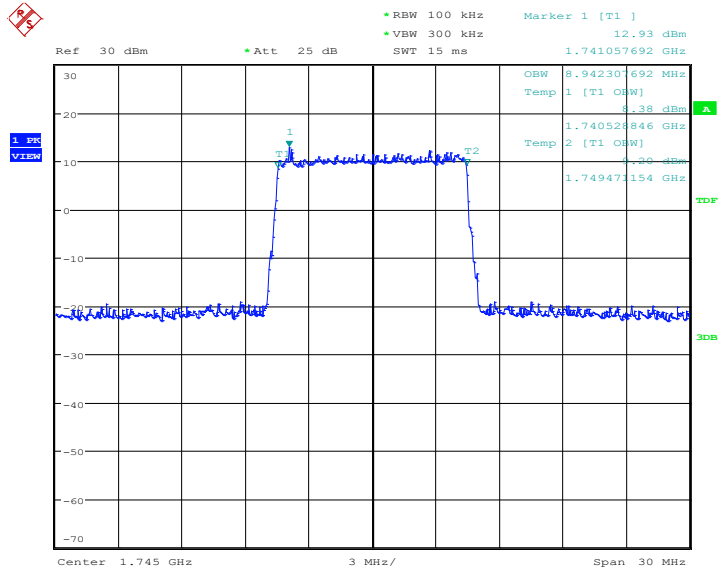
Frequency(MHz)	Occupied Bandwidth (99% BW)( kHz)	
	1745.0	QPSK
8942.31		8942.31

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



Date: 27.MAY.2021 12:58:42

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



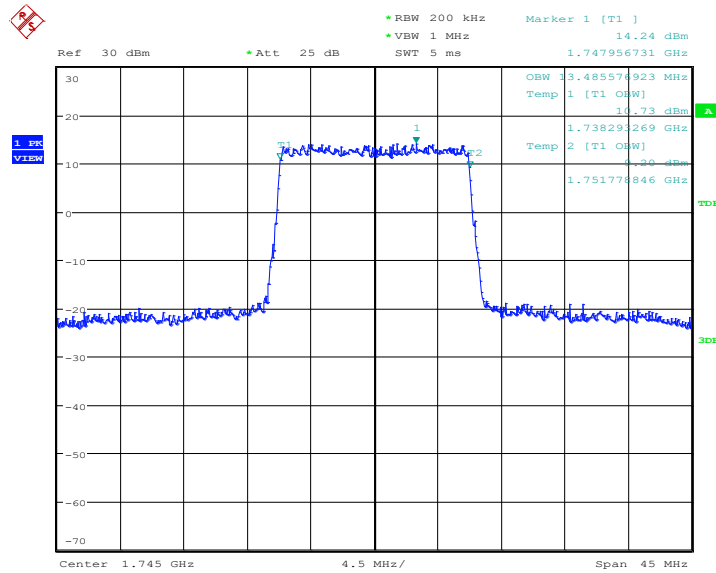
Date: 27.MAY.2021 12:58:56



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

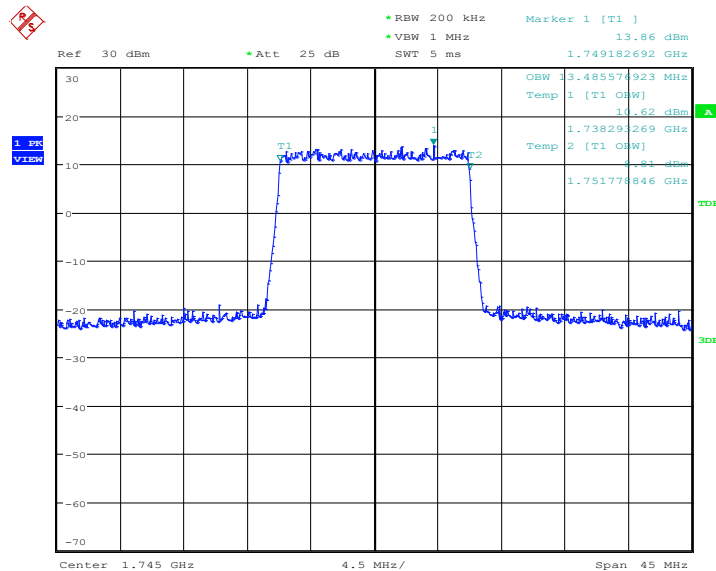
Frequency(MHz)	Occupied Bandwidth (99% BW)( kHz)	
	1745.0	QPSK
	13485.58	13485.58

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



Date: 27.MAY.2021 13:01:00

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

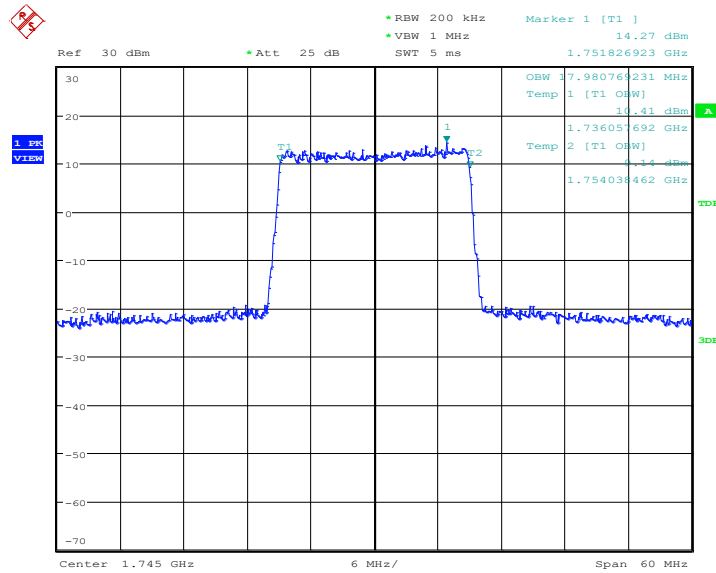


Date: 27.MAY.2021 13:01:13

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

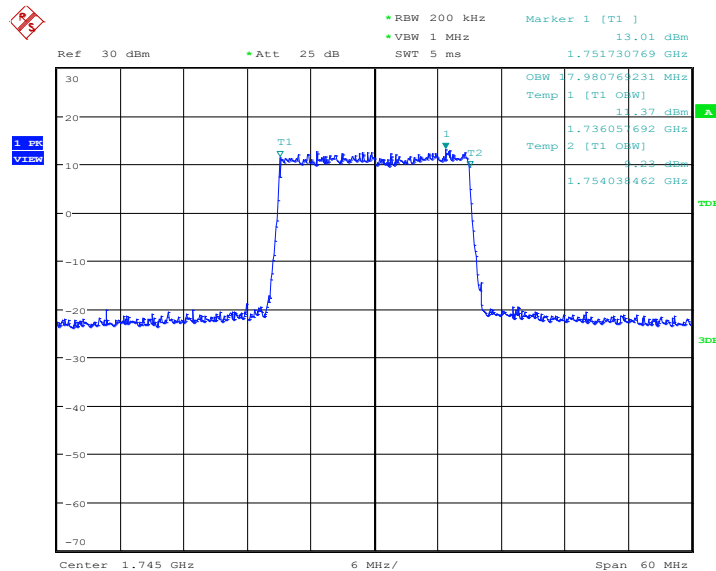
Frequency(MHz)	Occupied Bandwidth (99% BW)( kHz)	
1745.0	QPSK	16QAM
	17980.77	17980.77

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



Date: 27.MAY.2021 13:03:18

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



Date: 27.MAY.2021 13:03:31

Note: Expanded measurement uncertainty is  $U = 3428 \text{ Hz}$ ,  $k = 2$

## A.5 EMISSION BANDWIDTH

### Reference

FCC: CFR Part 2.1049, 22.917, 24.238, 27.53.

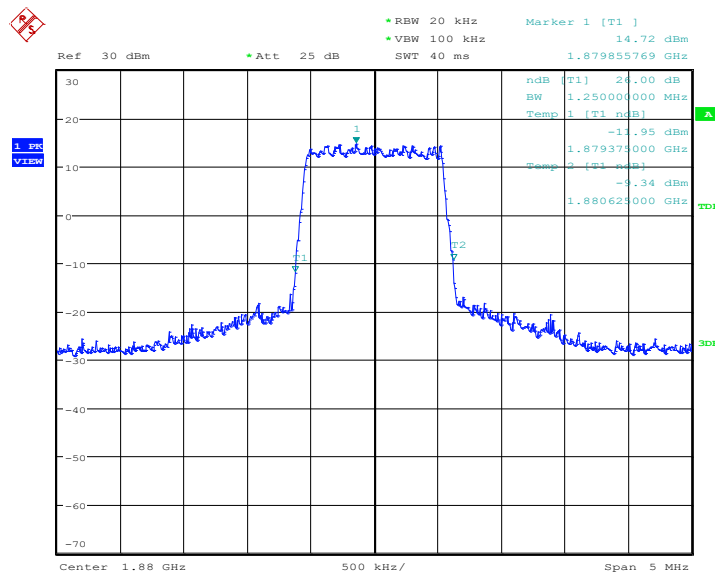
### A.5.1 Emission Bandwidth Results

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 BW)

Frequency(MHz)	Emission Bandwidth (-26dBc BW)( kHz)	
1880.0	QPSK	16QAM
	1250.00	1241.99

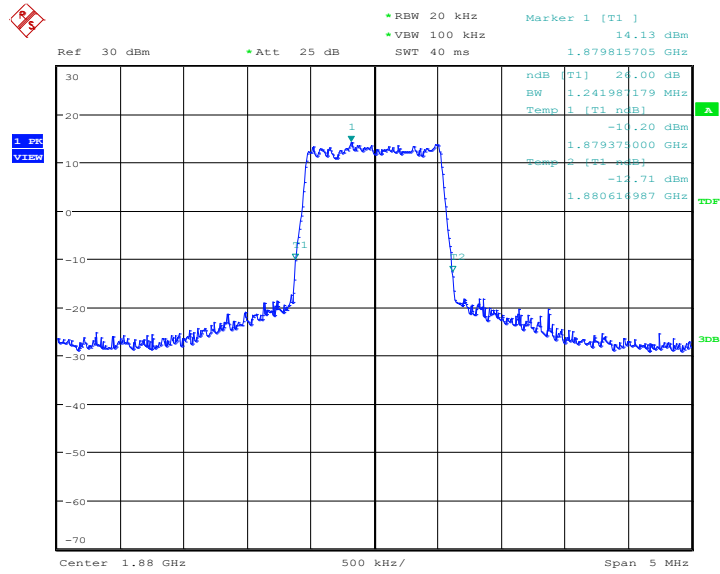
#### LTE band 2, 1.4MHz Bandwidth, QPSK (-26dBc BW)



Date: 27.MAY.2021 12:11:22



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



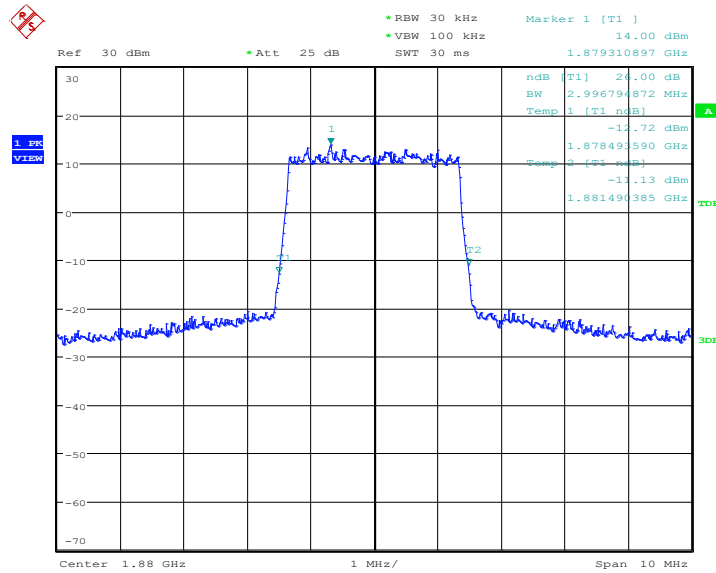
Date: 27.MAY.2021 12:11:37



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

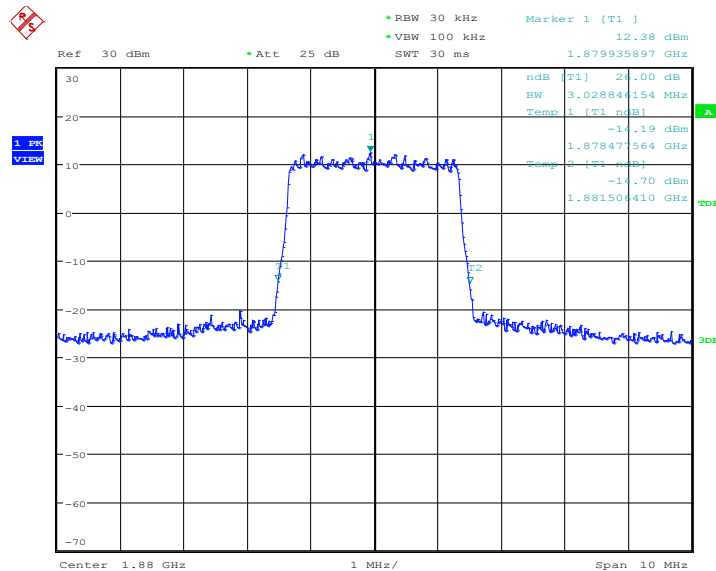
Frequency(MHz)	Emission Bandwidth (-26dBc BW)( kHz)	
1880.0	QPSK	16QAM
	2996.79	3028.85

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



Date: 27.MAY.2021 12:13:39

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

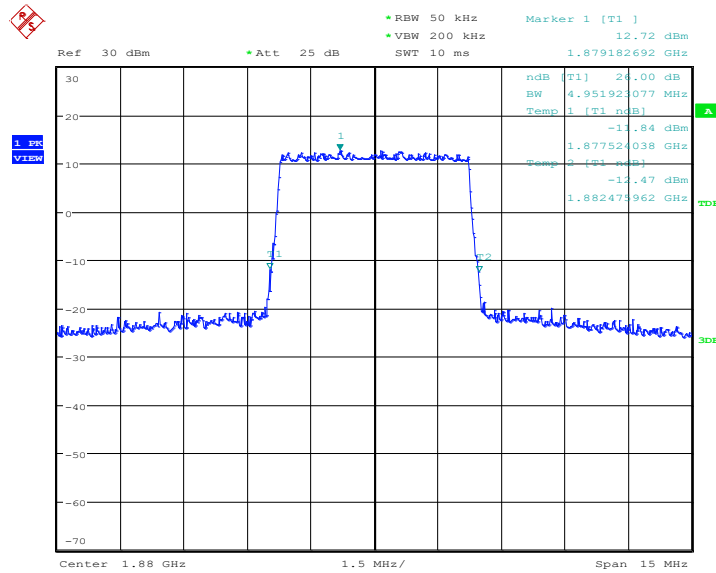


Date: 27.MAY.2021 12:13:55

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

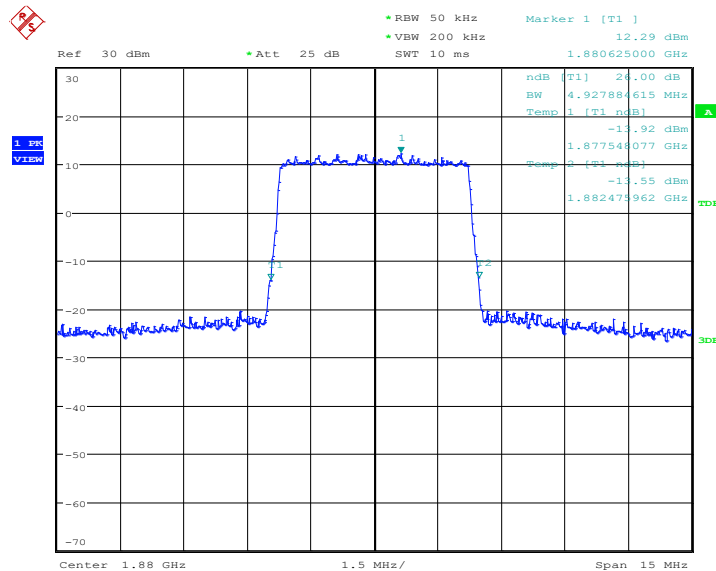
Frequency(MHz)	Emission Bandwidth (-26dBc BW)( kHz)	
	1880.0	QPSK
4951.92		4927.88

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



Date: 27.MAY.2021 12:15:57

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



Date: 27.MAY.2021 12:16:13

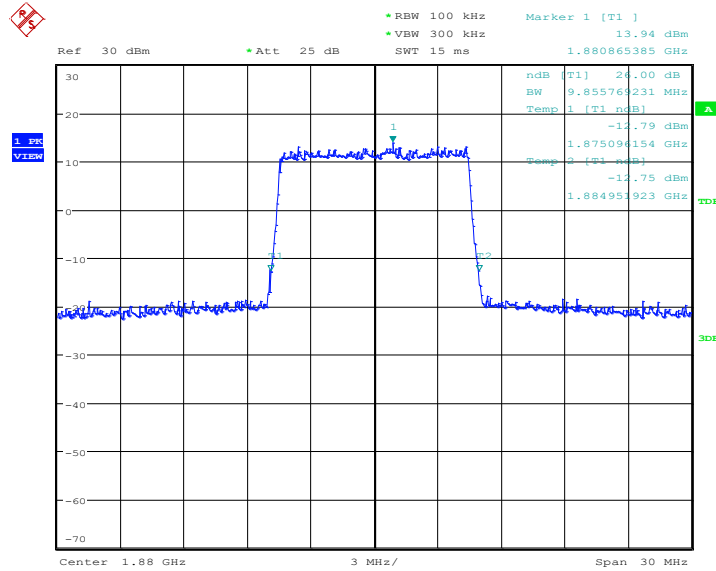




**LTE band 2, 10MHz (-26dBc BW)**

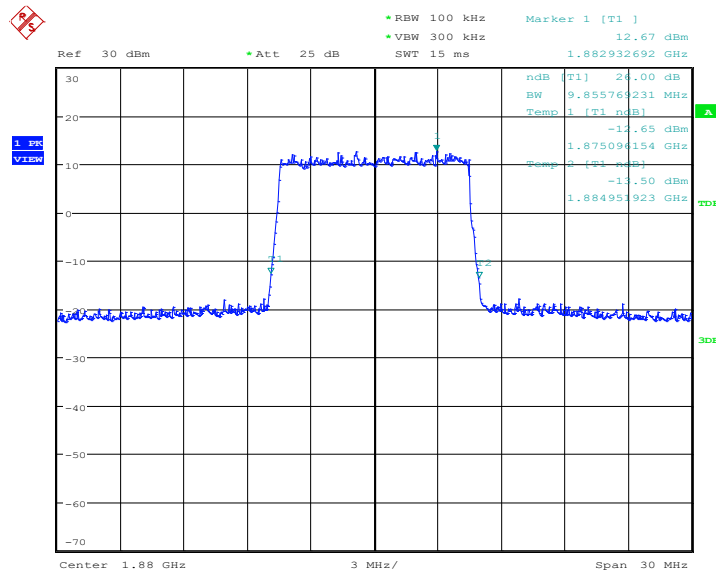
Frequency(MHz)	Emission Bandwidth (-26dBc BW)( kHz)	
1880.0	QPSK	16QAM
	9855.77	9855.77

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



Date: 27.MAY.2021 12:18:15

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



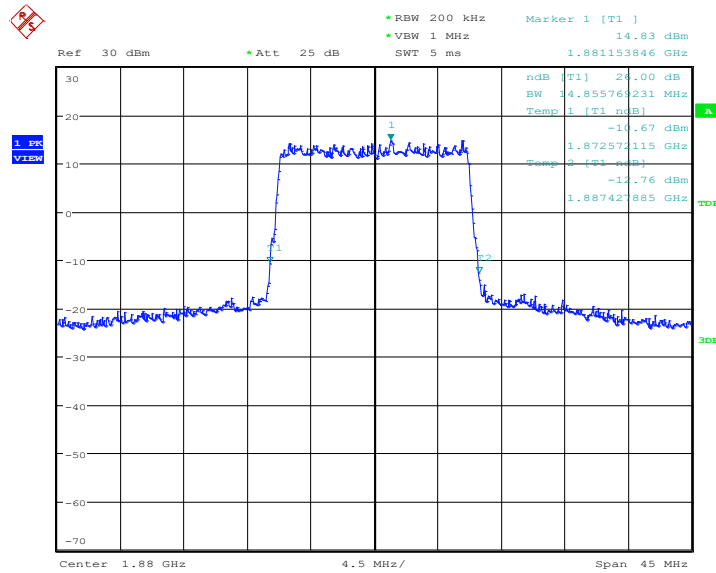
Date: 27.MAY.2021 12:18:31



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

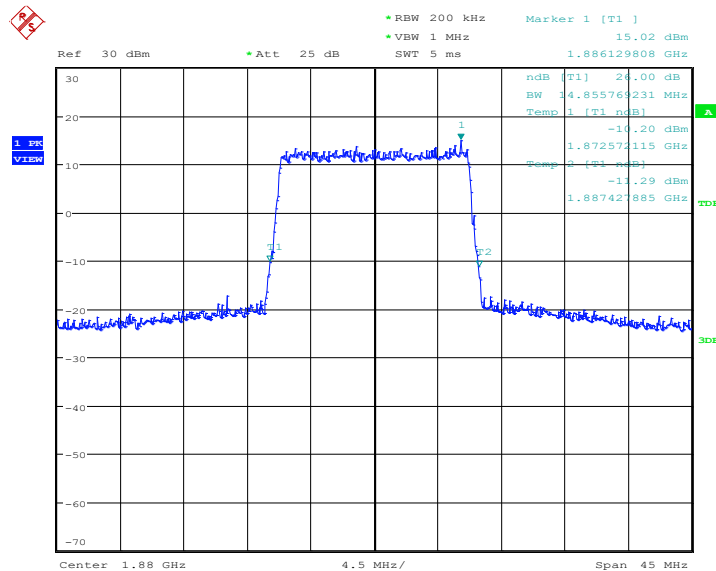
Frequency(MHz)	Emission Bandwidth (-26dBc BW)( kHz)	
	1880.0	QPSK
14855.77		14855.77

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



Date: 27.MAY.2021 12:20:33

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



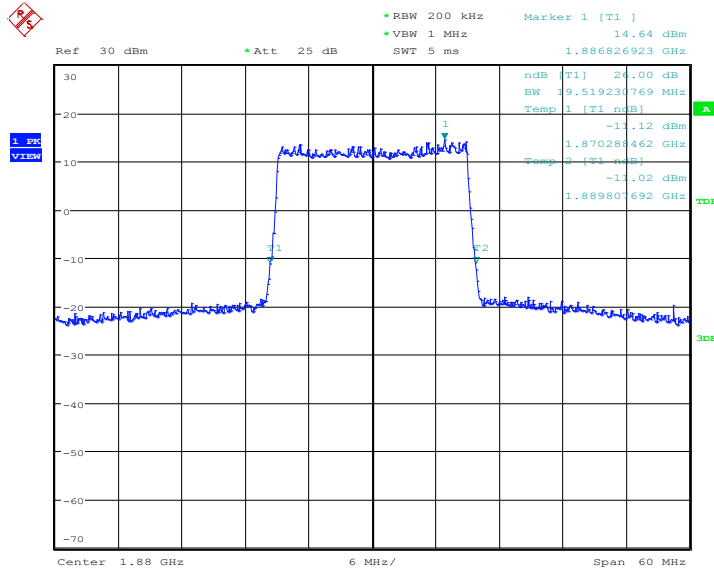
Date: 27.MAY.2021 12:20:49



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

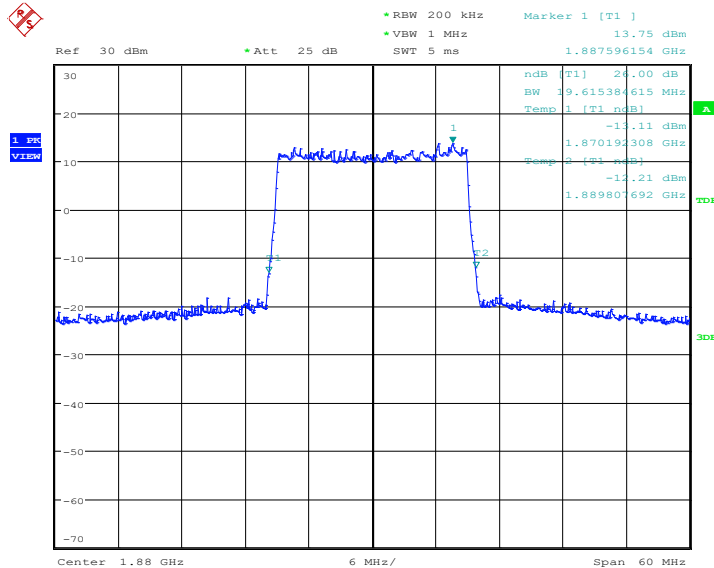
Frequency(MHz)	Emission Bandwidth (-26dBc BW)( kHz)	
	1880.0	QPSK
	19519.23	19615.38

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



Date: 27.MAY.2021 12:22:51

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

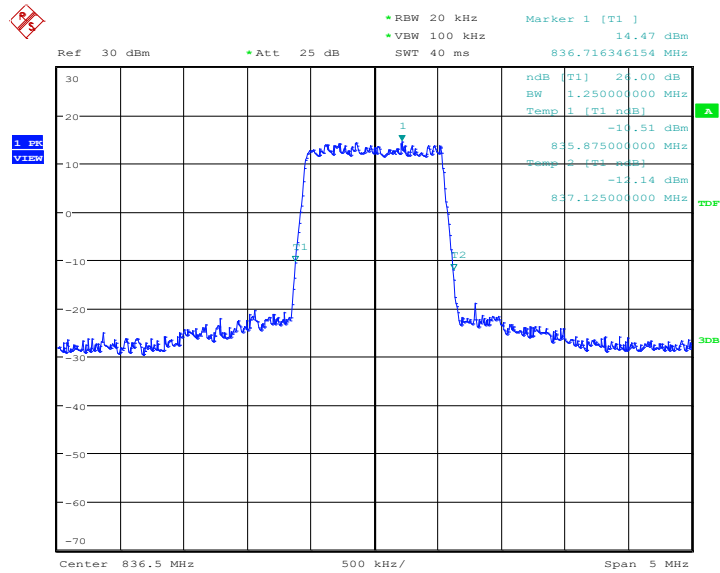


Date: 27.MAY.2021 12:23:07

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

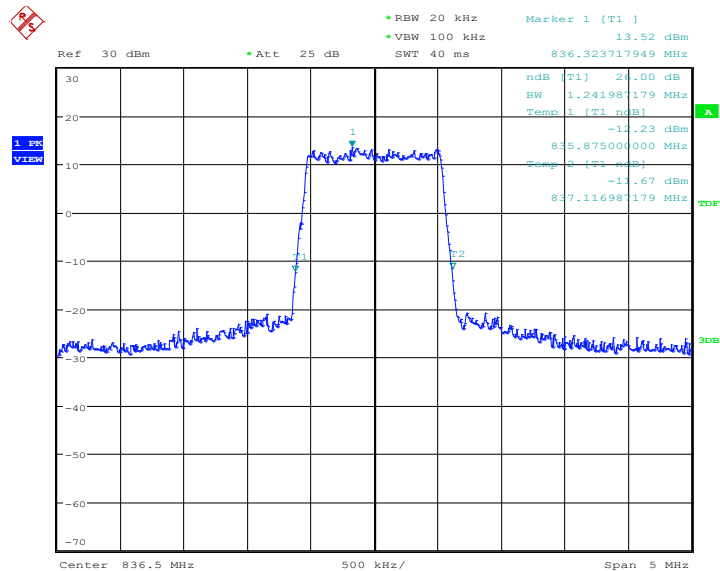
Frequency(MHz)	Emission Bandwidth (-26dBc BW)( kHz)	
836.5	QPSK	16QAM
	1250.00	1241.99

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



Date: 27.MAY.2021 12:02:09

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

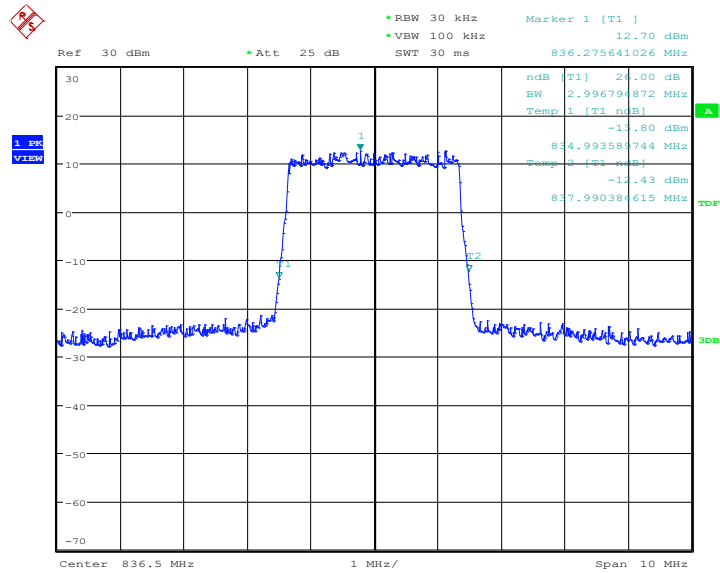


Date: 27.MAY.2021 12:02:25

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

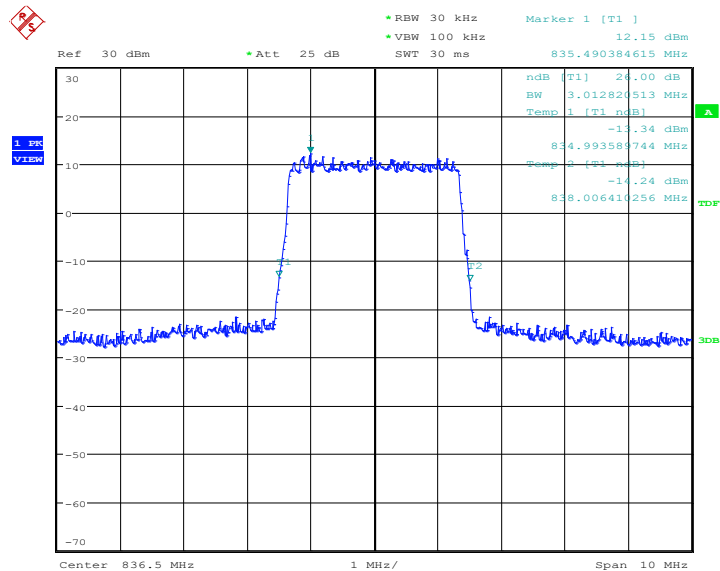
Frequency(MHz)	Emission Bandwidth (-26dBc BW)( kHz)	
	836.5	QPSK
2996.79		3012.82

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



Date: 27.MAY.2021 12:04:27

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



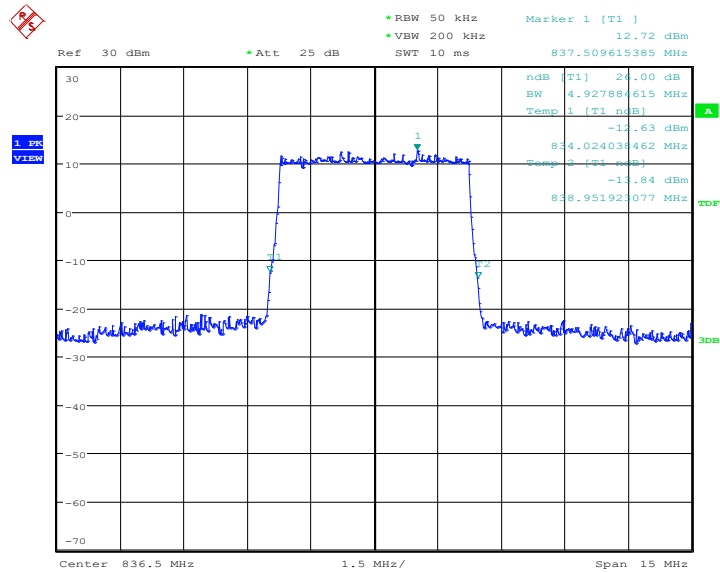
Date: 27.MAY.2021 12:04:42



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

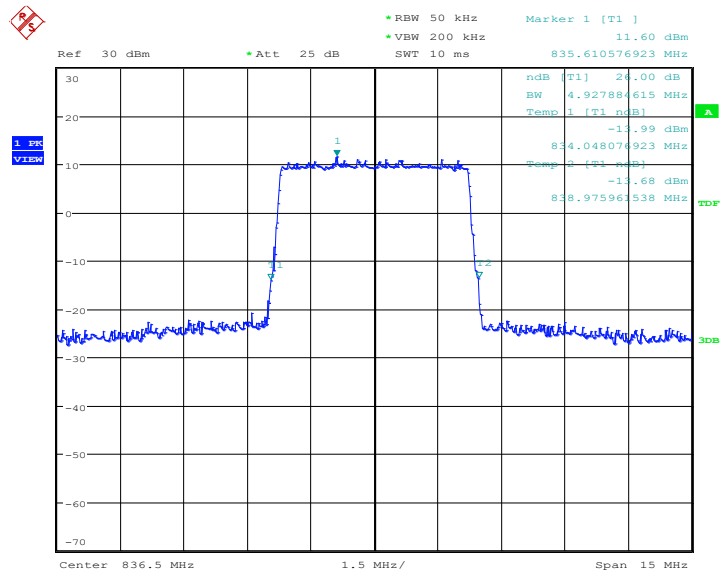
Frequency(MHz)	Emission Bandwidth (-26dBc BW)( kHz)	
	836.5	QPSK
4927.88		4927.88

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



Date: 27.MAY.2021 12:06:45

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



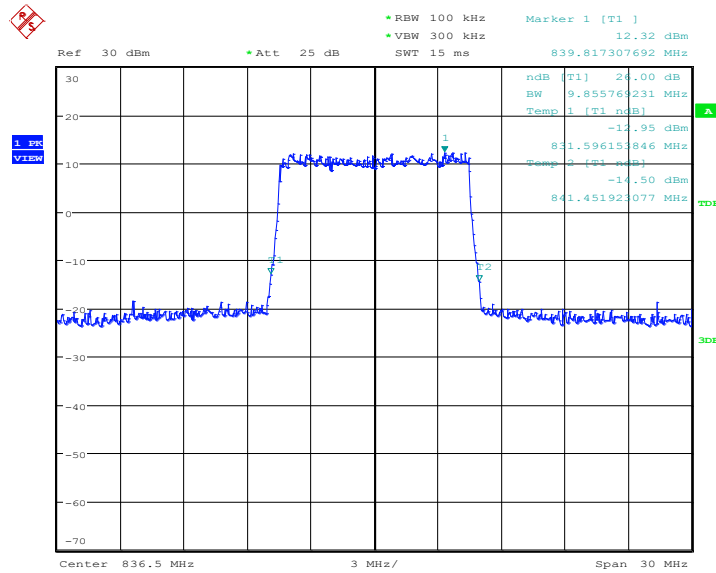
Date: 27.MAY.2021 12:07:00



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

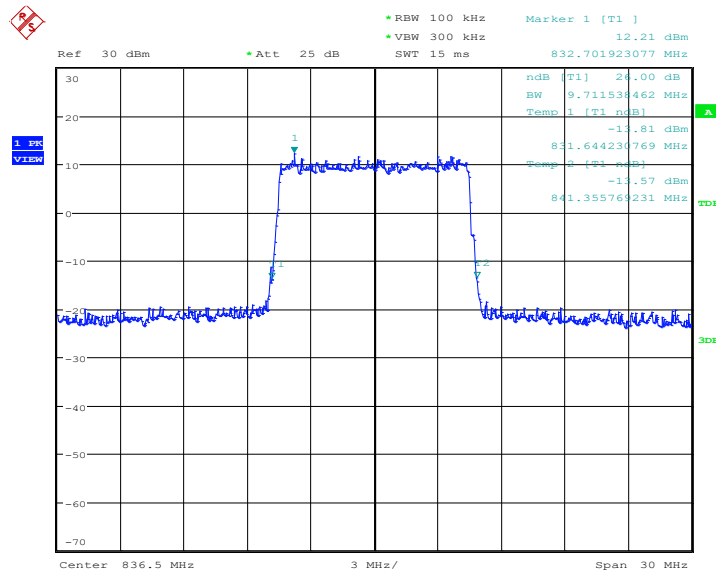
Frequency(MHz)	Emission Bandwidth (-26dBc BW)( kHz)	
	836.5	QPSK
9855.77		9711.54

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



Date: 27.MAY.2021 12:09:02

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

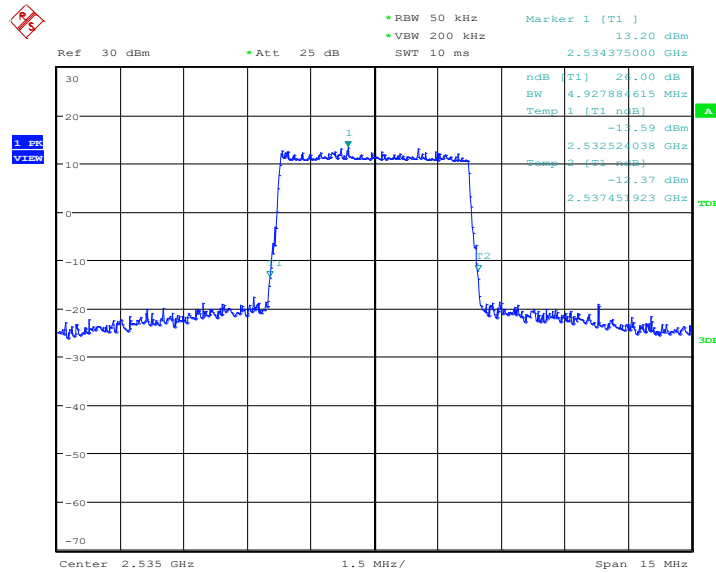


Date: 27.MAY.2021 12:09:18

**LTE band 7, 5MHz (-26dBc BW)**

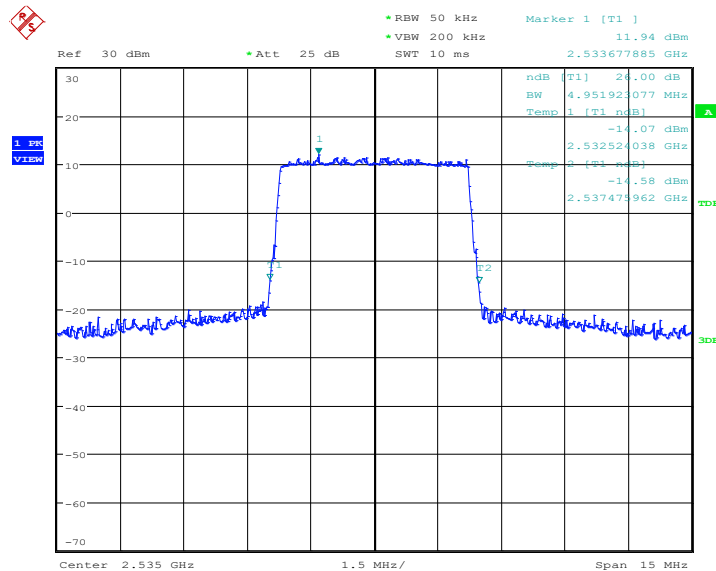
Frequency(MHz)	Emission Bandwidth (-26dBc BW)( kHz)	
2535.0	QPSK	16QAM
	4927.88	4951.92

**LTE band 7, 5MHz Bandwidth, QPSK (-26dBc BW)**



Date: 27.MAY.2021 11:52:55

**LTE band 7, 5MHz Bandwidth,16QAM (-26dBc BW)**



Date: 27.MAY.2021 11:53:11

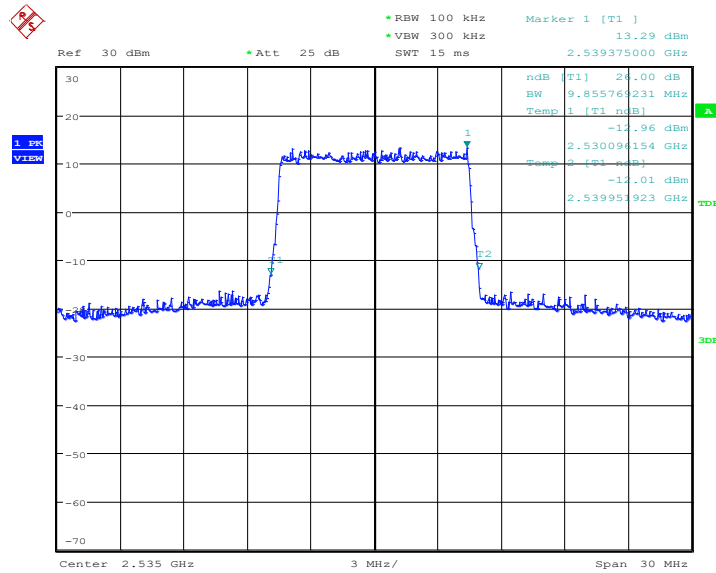




**LTE band 7, 10MHz (-26dBc BW)**

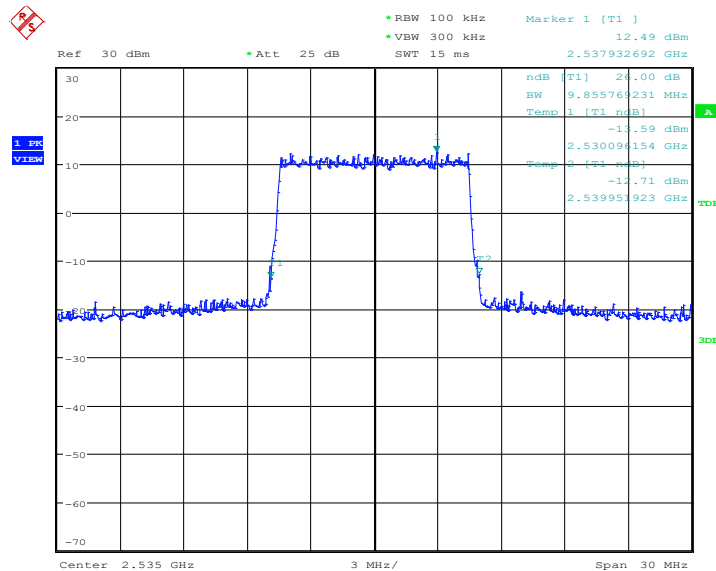
Frequency(MHz)	Emission Bandwidth (-26dBc BW)( kHz)	
2535.0	QPSK	16QAM
	9855.77	9855.77

**LTE band 7, 10MHz Bandwidth, QPSK (-26dBc BW)**



Date: 27.MAY.2021 11:55:13

**LTE band 7, 10MHz Bandwidth, 16QAM (-26dBc BW)**

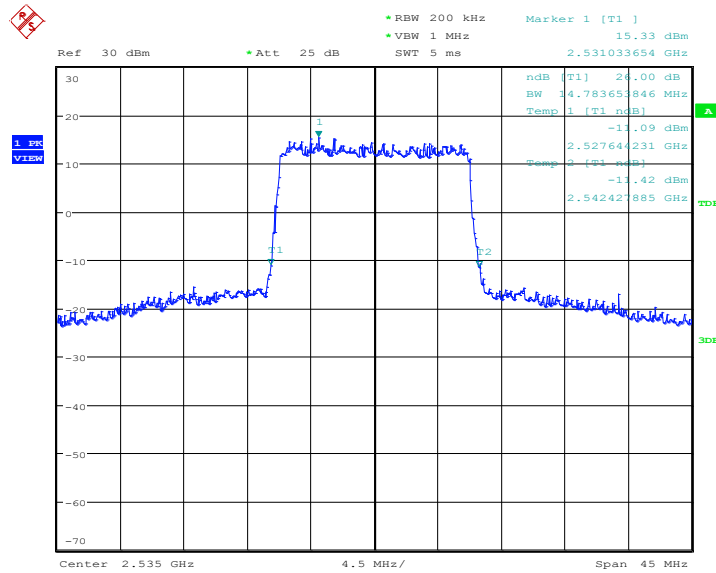


Date: 27.MAY.2021 11:55:29

**LTE band 7, 15MHz (-26dBc BW)**

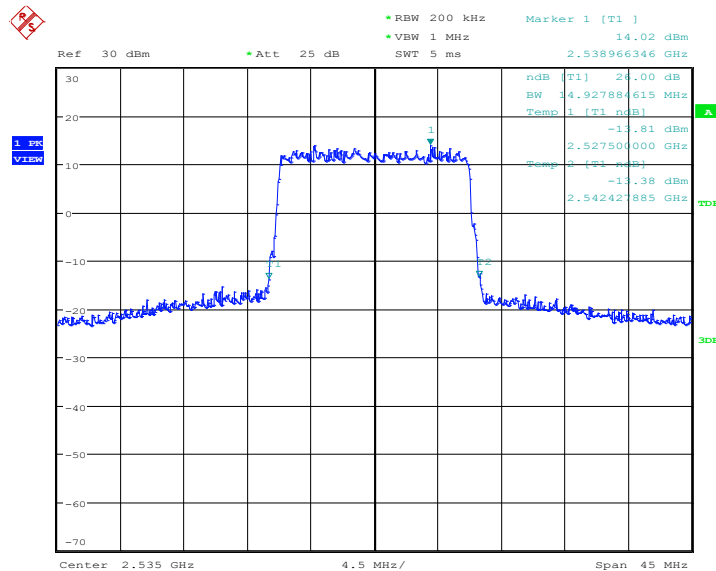
Frequency(MHz)	Emission Bandwidth (-26dBc BW)( kHz)	
2535.0	QPSK	16QAM
	14783.65	14927.88

**LTE band 7, 15MHz Bandwidth, QPSK (-26dBc BW)**



Date: 27.MAY.2021 11:57:31

**LTE band 7, 15MHz Bandwidth, 16QAM (-26dBc BW)**

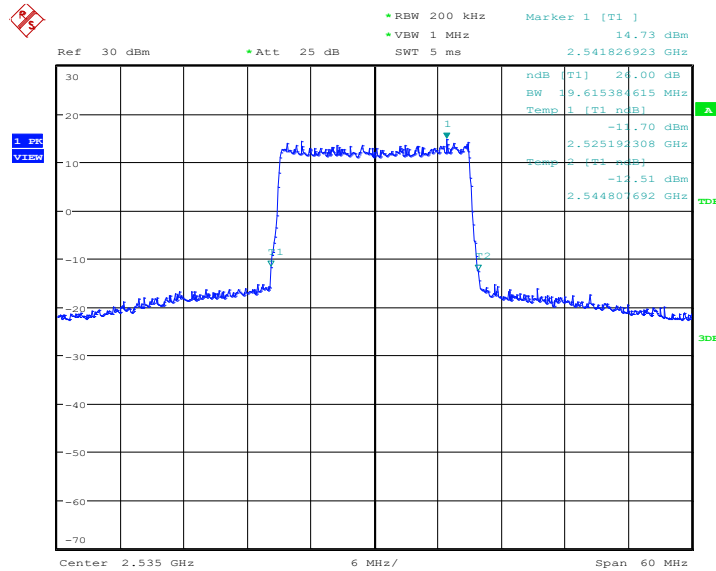


Date: 27.MAY.2021 11:57:47

**LTE band 7, 20MHz (-26dBc BW)**

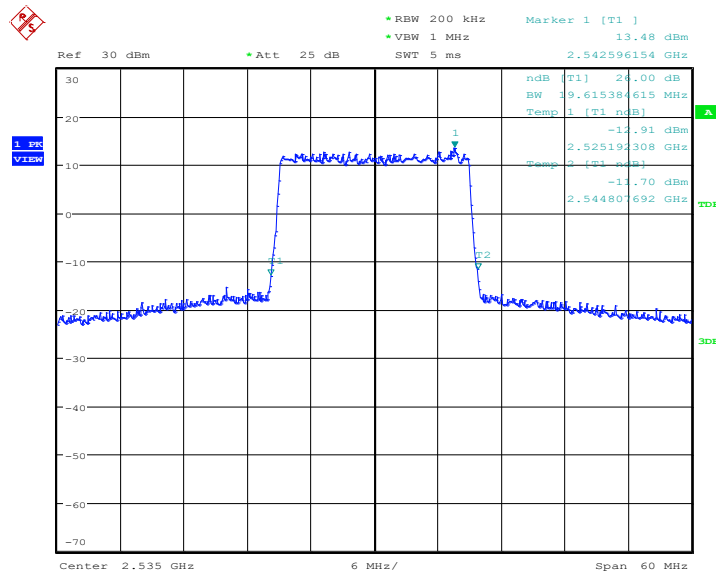
Frequency(MHz)	Emission Bandwidth (-26dBc BW)( kHz)	
2535.0	QPSK	16QAM
	19615.38	19615.38

**LTE band 7, 20MHz Bandwidth, QPSK (-26dBc BW)**



Date: 27.MAY.2021 11:59:49

**LTE band 7, 20MHz Bandwidth, 16QAM (-26dBc BW)**



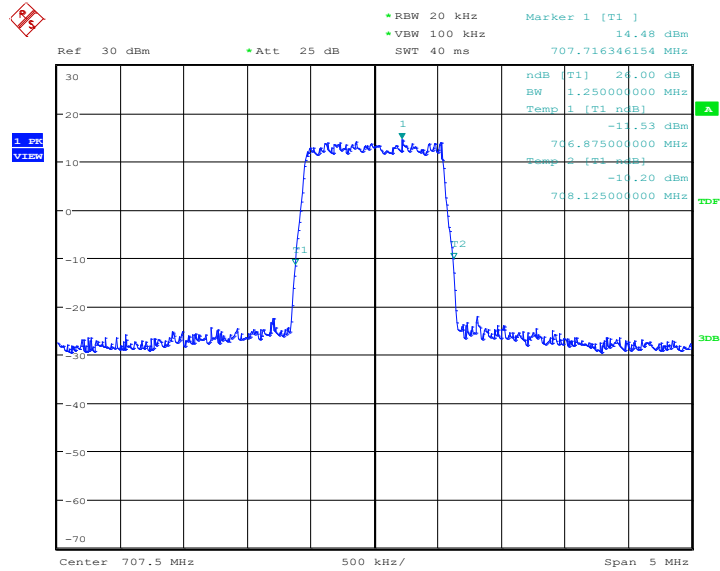
Date: 27.MAY.2021 12:00:05

Note: Expanded measurement uncertainty is  $U = 3428\text{Hz}$ ,  $k = 2$

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

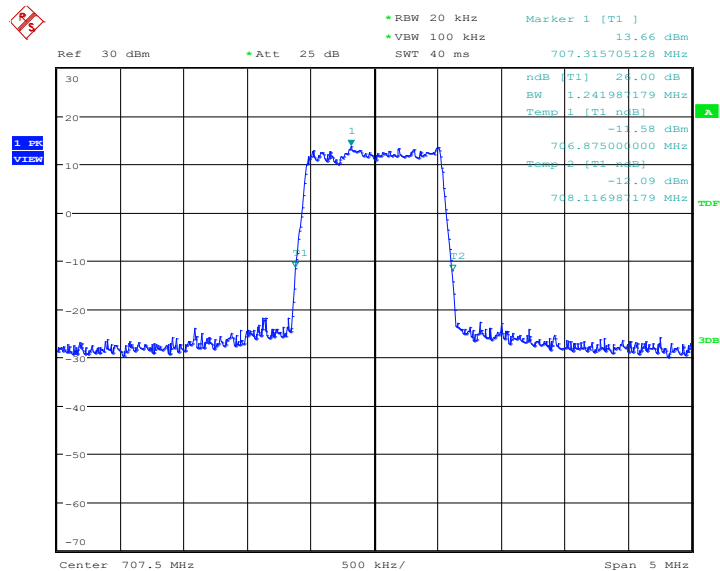
Frequency(MHz)	Emission Bandwidth (-26dBc BW)( kHz)	
707.5	QPSK	16QAM
	1250.00	1241.99

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



Date: 27.MAY.2021 12:39:02

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

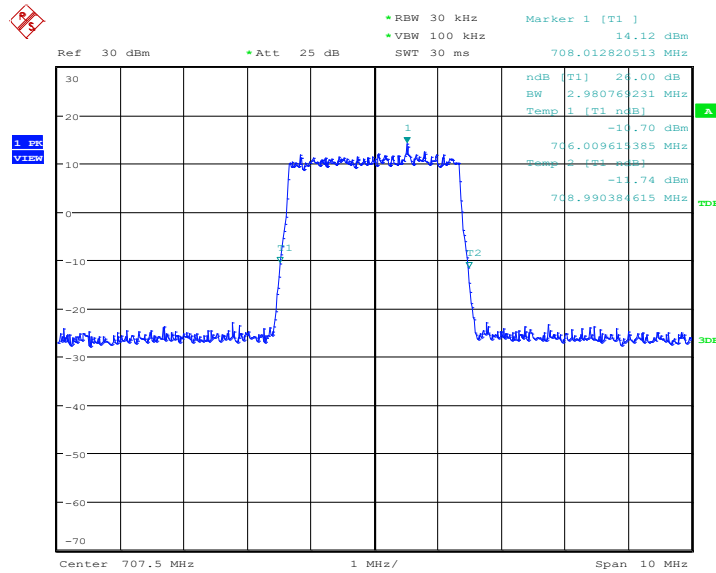


Date: 27.MAY.2021 12:39:18

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

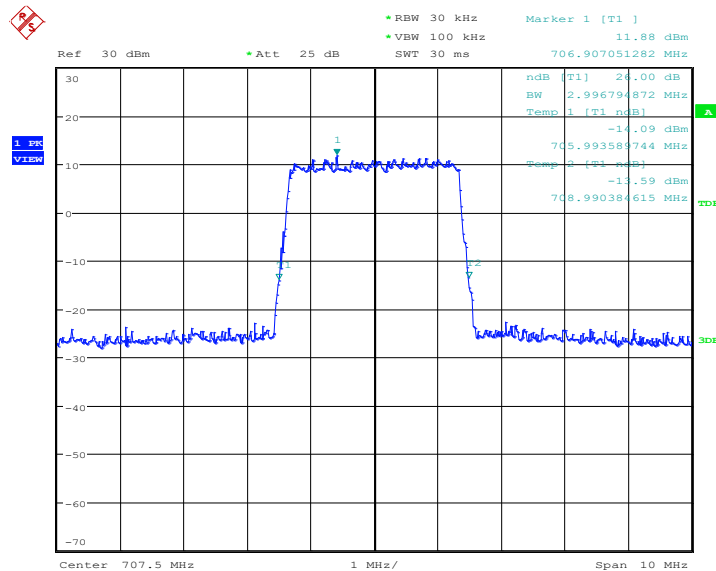
Frequency(MHz)	Emission Bandwidth (-26dBc BW)( kHz)	
707.5	QPSK	16QAM
	2980.77	2996.79

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



Date: 27.MAY.2021 12:41:20

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



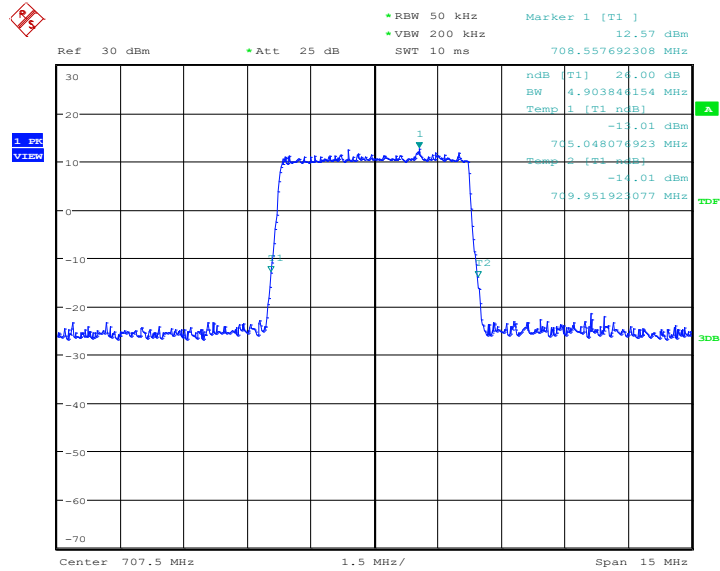
Date: 27.MAY.2021 12:41:35



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

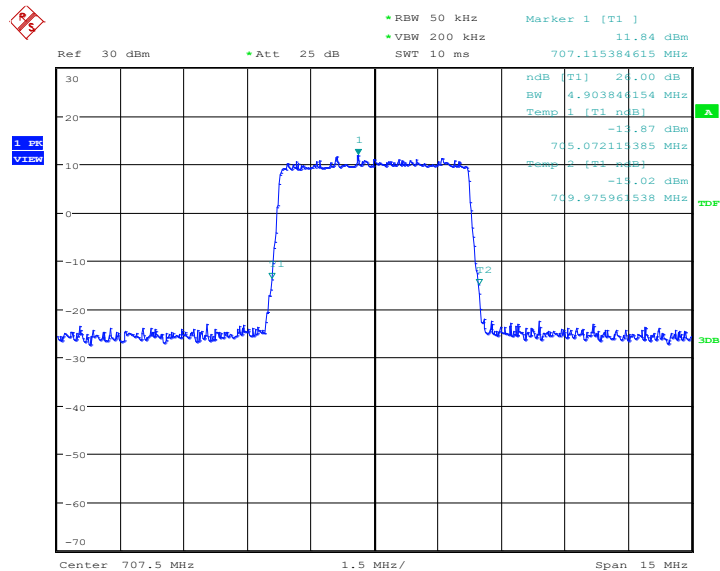
Frequency(MHz)	Emission Bandwidth (-26dBc BW)( kHz)	
707.5	QPSK	16QAM
	4903.85	4903.85

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



Date: 27.MAY.2021 12:43:37

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



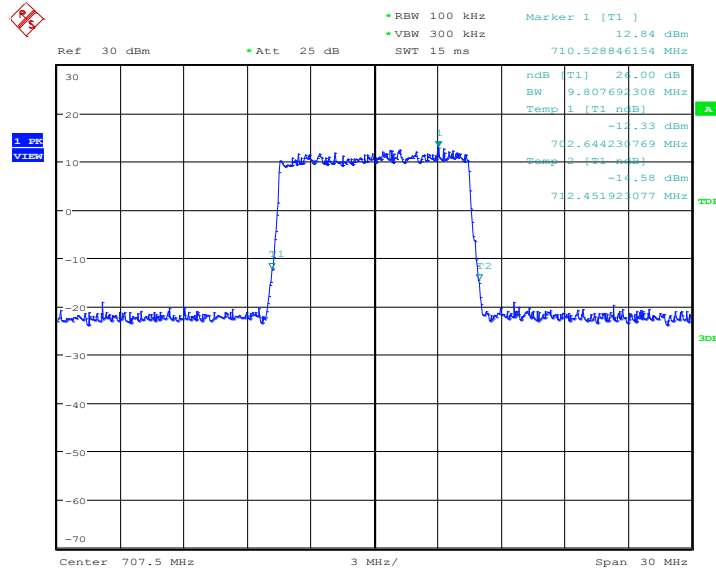
Date: 27.MAY.2021 12:43:53



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

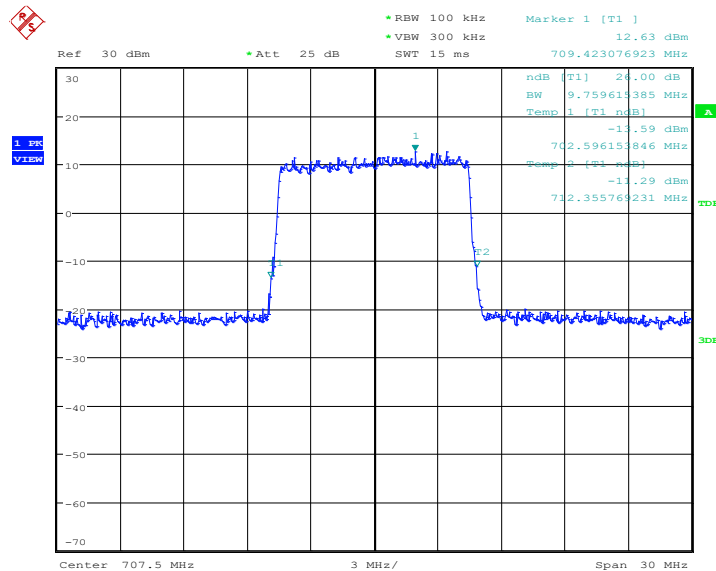
Frequency(MHz)	Emission Bandwidth (-26dBc BW)( kHz)	
707.5	QPSK	16QAM
	9807.69	9759.62

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



Date: 27.MAY.2021 12:45:55

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



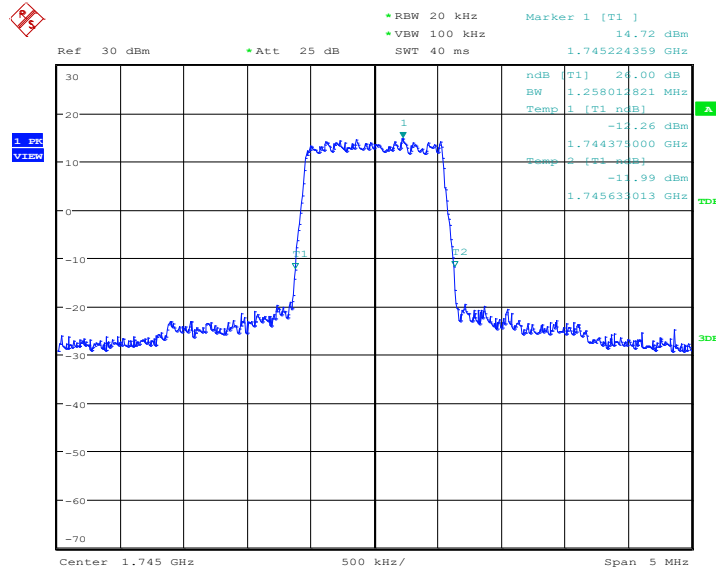
Date: 27.MAY.2021 12:46:11



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

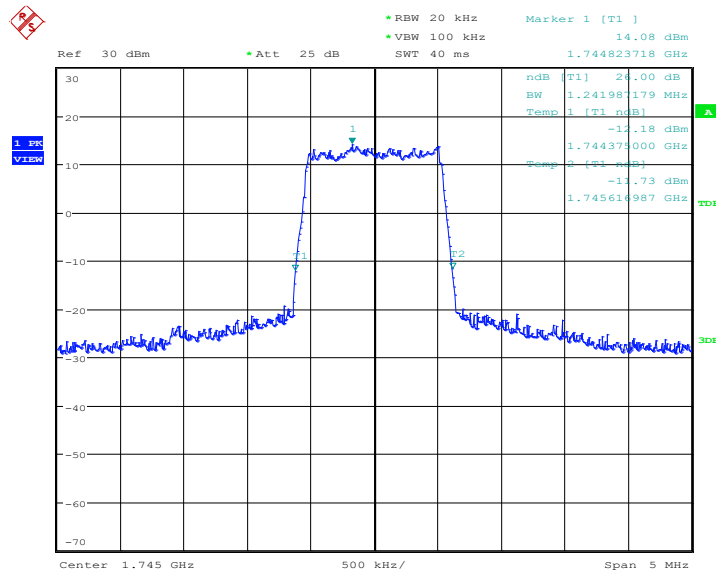
Frequency(MHz)	Emission Bandwidth (-26dBc BW)( kHz)	
1745.0	QPSK	16QAM
	1258.01	1241.99

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



Date: 27.MAY.2021 12:52:56

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



Date: 27.MAY.2021 12:53:12

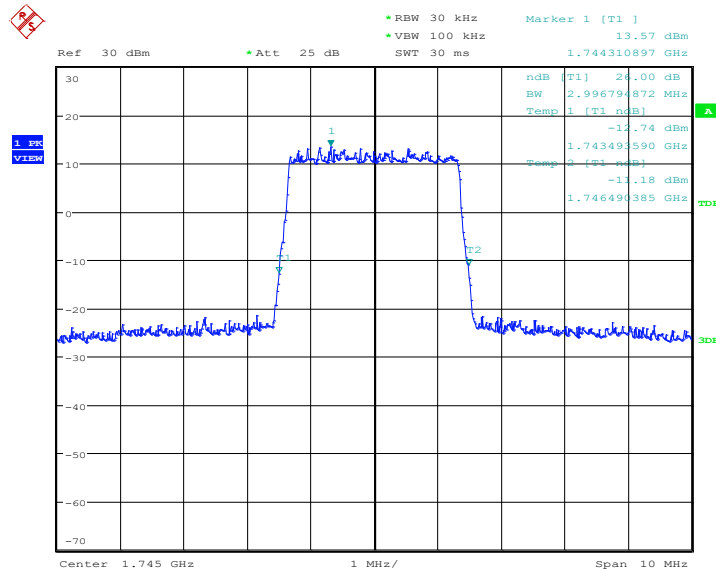




**LTE band 66, 3MHz (-26dBc BW)**

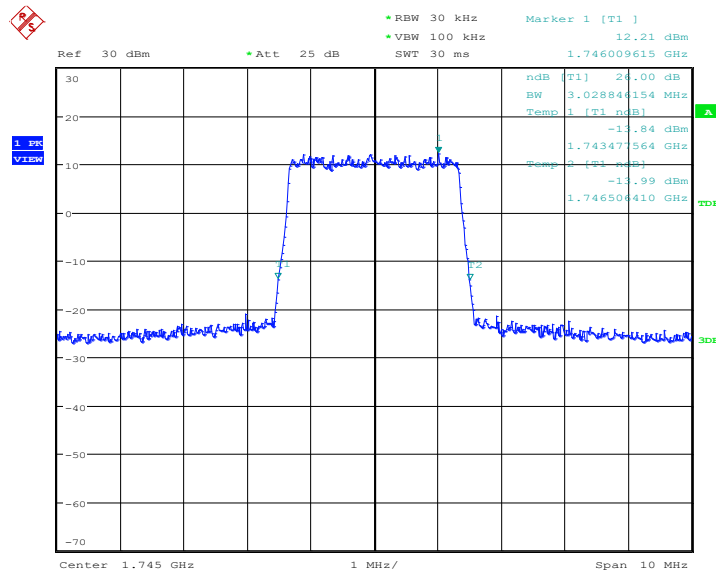
Frequency(MHz)	Emission Bandwidth (-26dBc BW)( kHz)	
1745.0	QPSK	16QAM
	2996.79	3028.85

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



Date: 27.MAY.2021 12:55:14

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



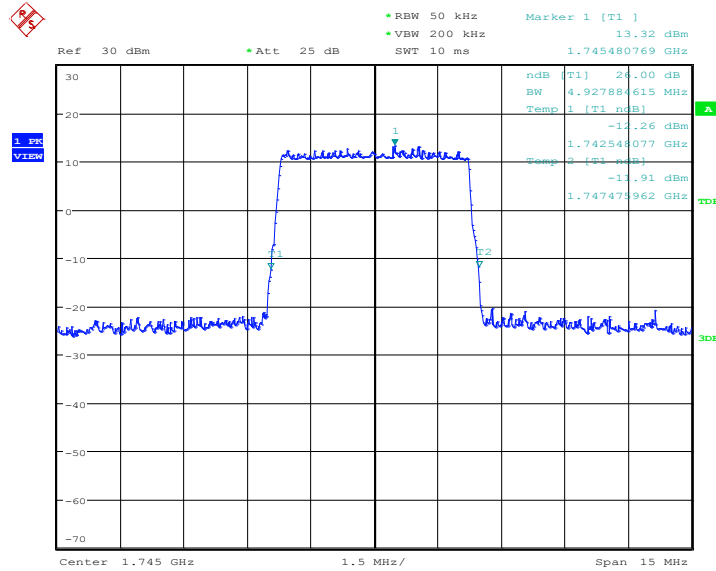
Date: 27.MAY.2021 12:55:30



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

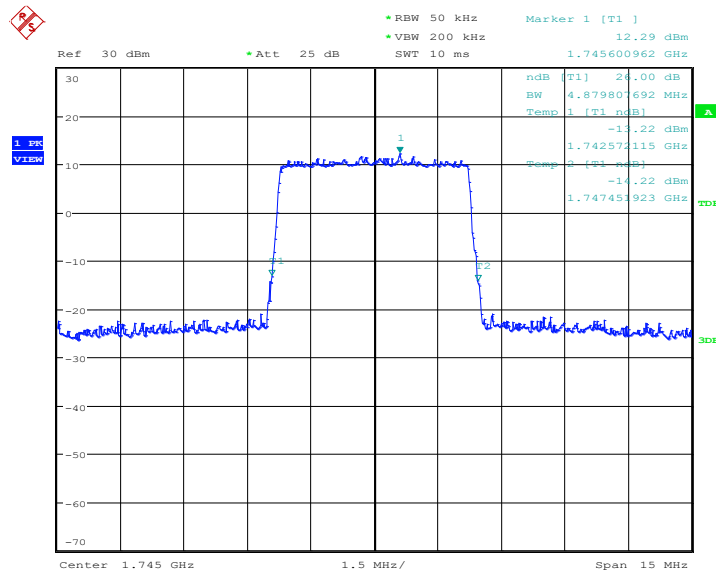
Frequency(MHz)	Emission Bandwidth (-26dBc BW)( kHz)	
	1745.0	QPSK
4927.88		4879.81

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



Date: 27.MAY.2021 12:57:32

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



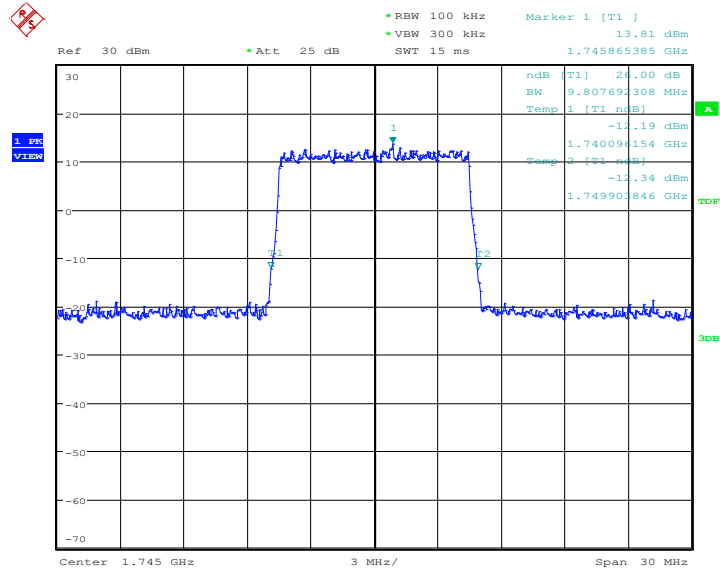
Date: 27.MAY.2021 12:57:48



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

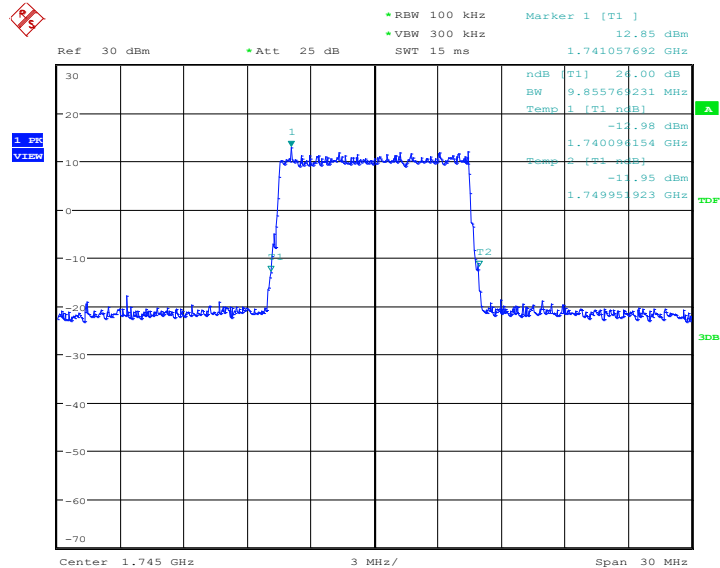
Frequency(MHz)	Emission Bandwidth (-26dBc BW)( kHz)	
1745.0	QPSK	16QAM
	9807.69	9855.77

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



Date: 27.MAY.2021 12:59:50

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



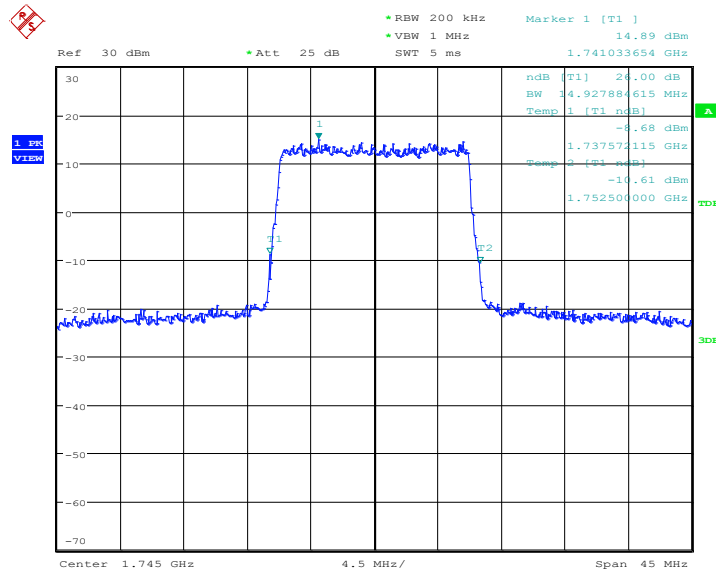
Date: 27.MAY.2021 13:00:05



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

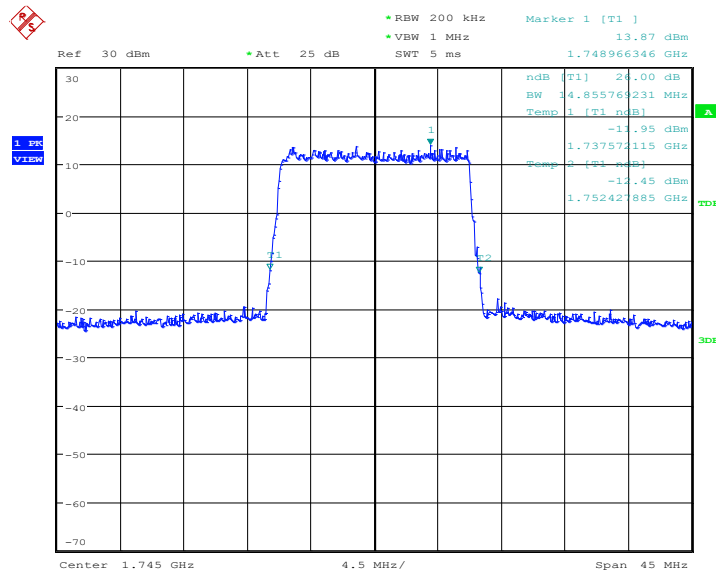
Frequency(MHz)	Emission Bandwidth (-26dBc BW)( kHz)	
	1745.0	QPSK
	14927.88	14855.77

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



Date: 27.MAY.2021 13:02:08

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



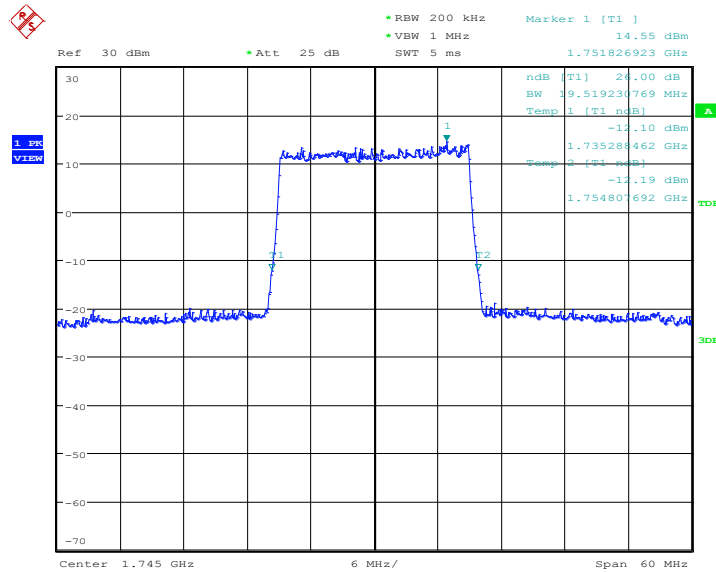
Date: 27.MAY.2021 13:02:23



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

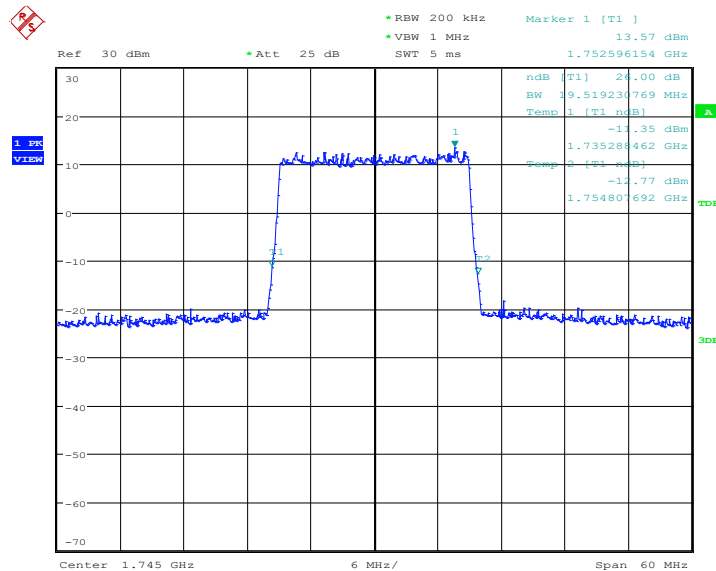
Frequency(MHz)	Emission Bandwidth (-26dBc BW)( kHz)	
	1745.0	QPSK
	19519.23	19519.23

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



Date: 27.MAY.2021 13:04:26

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



Date: 27.MAY.2021 13:04:41

Note: Expanded measurement uncertainty is  $U = 3428 \text{ Hz}$ ,  $k = 2$

## A.6 BAND EDGE COMPLIANCE

### Reference

FCC: CFR Part 2.1051, 22.917, 24.238, 27.53.

### A.6.1 Measurement limit

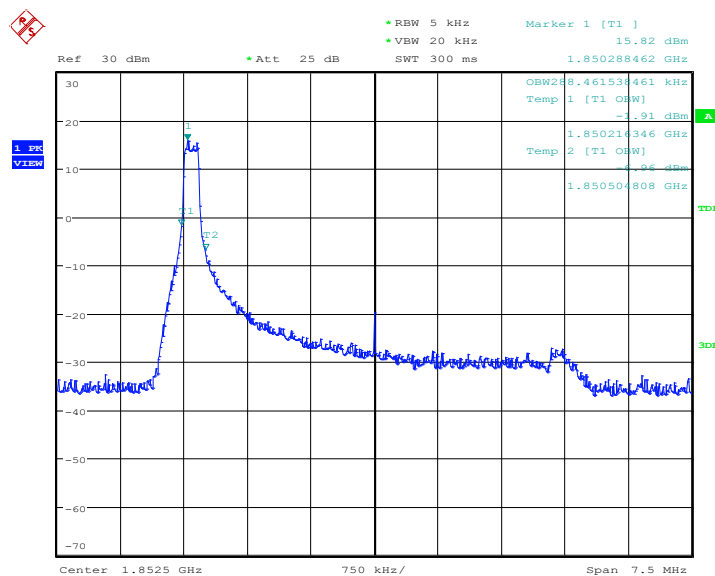
On any frequency outside frequency band of the US Cellular/PCS spectrum, the power of any emission shall be attenuated below the transmitter power (P, in Watts) by at least  $43+10\text{Log}(P)$  dB. For all power levels +30 dBm to 0 dBm, this becomes a constant specification limit of -13 dBm. A relaxation 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.

### A.6.2 Measurement result

Only worst case result is given below

LTE band 2

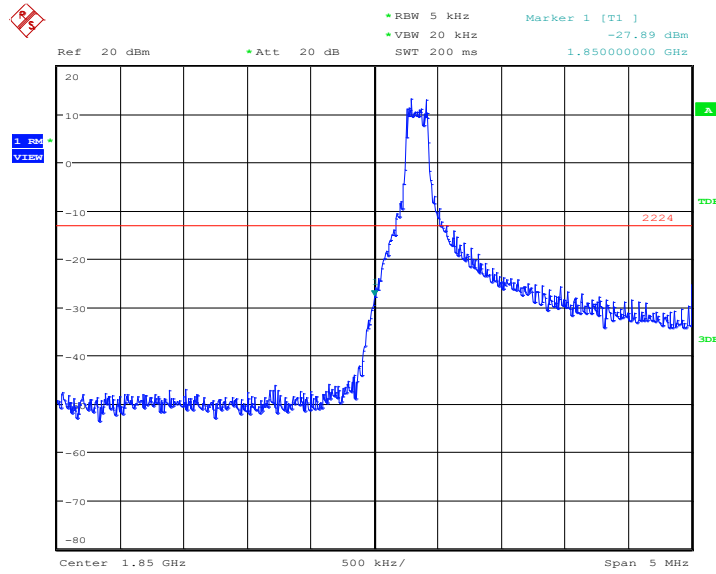
OBW: 1RB-low\_offset



Date: 27.MAY.2021 14:24:18

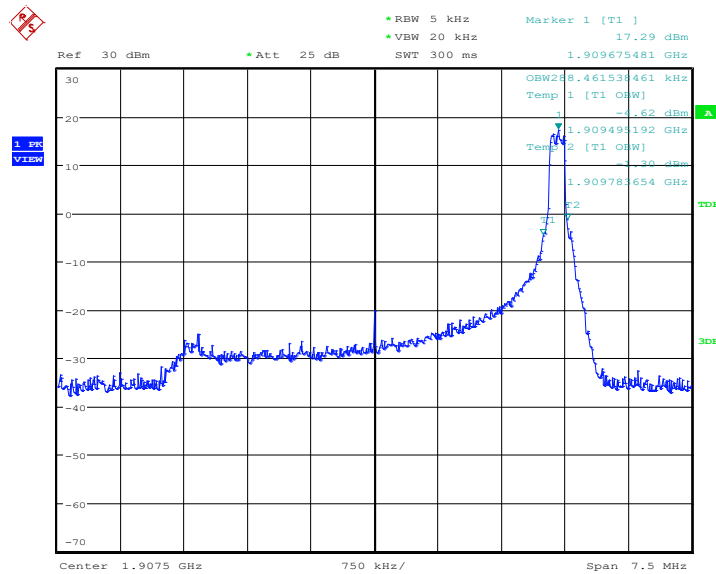


### LOW BAND EDGE BLOCK-1RB-low\_offset



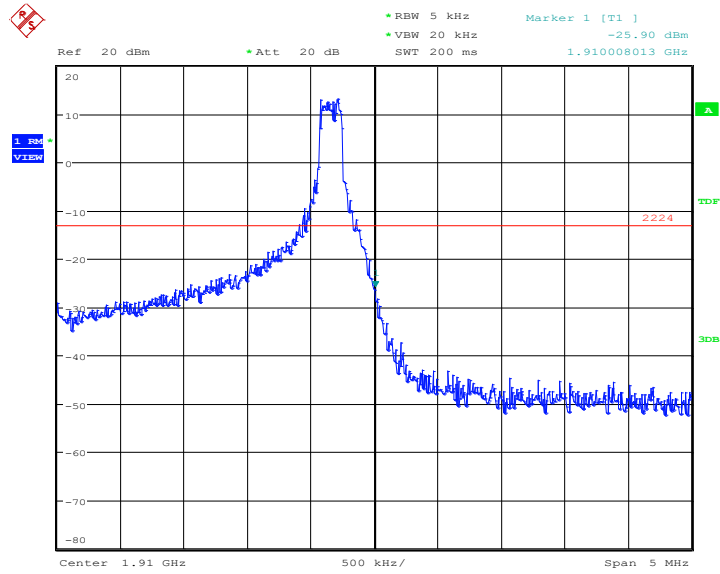
Date: 27.MAY.2021 14:25:02

### OBW: 1RB-high\_offset



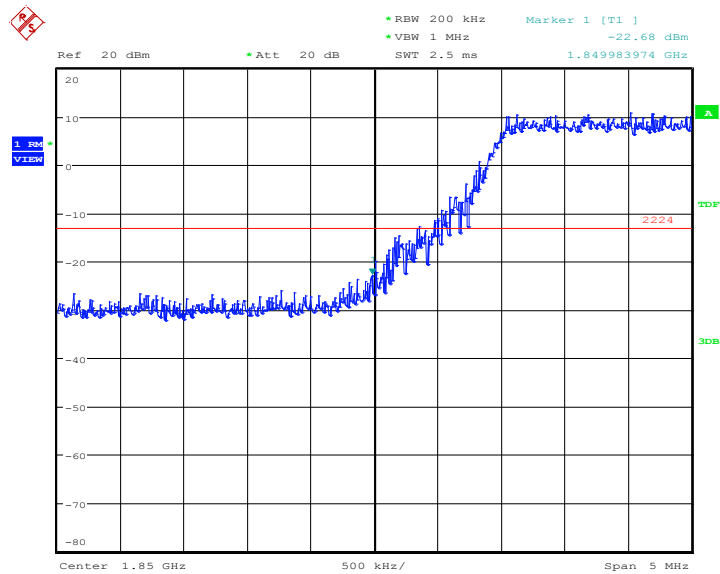
Date: 27.MAY.2021 14:13:52

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



Date: 27.MAY.2021 14:14:36

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

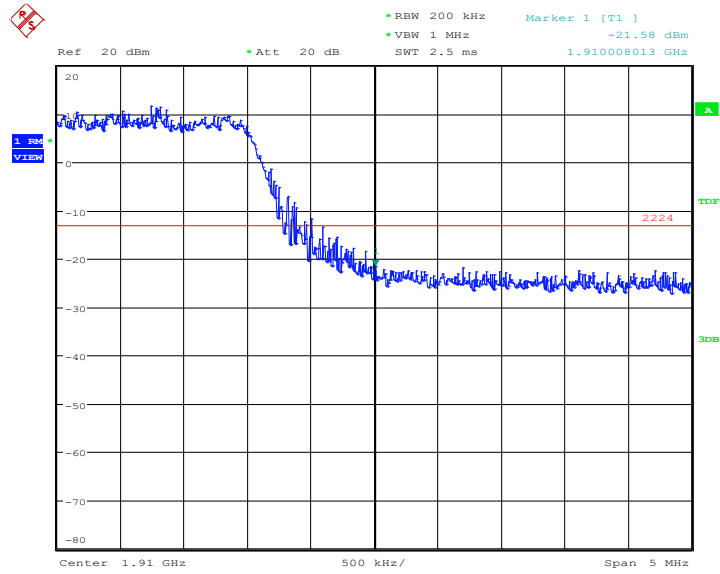


Date: 27.MAY.2021 14:32:55



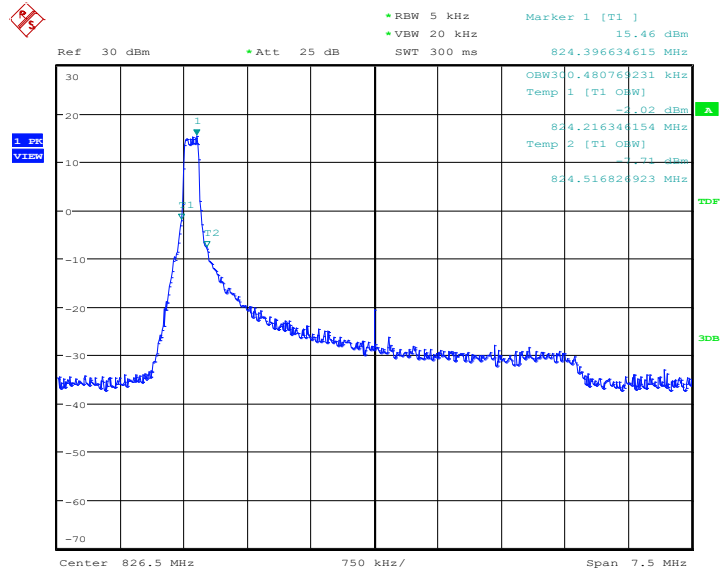


### HIGH BAND EDGE BLOCK-20MHz-100%RB



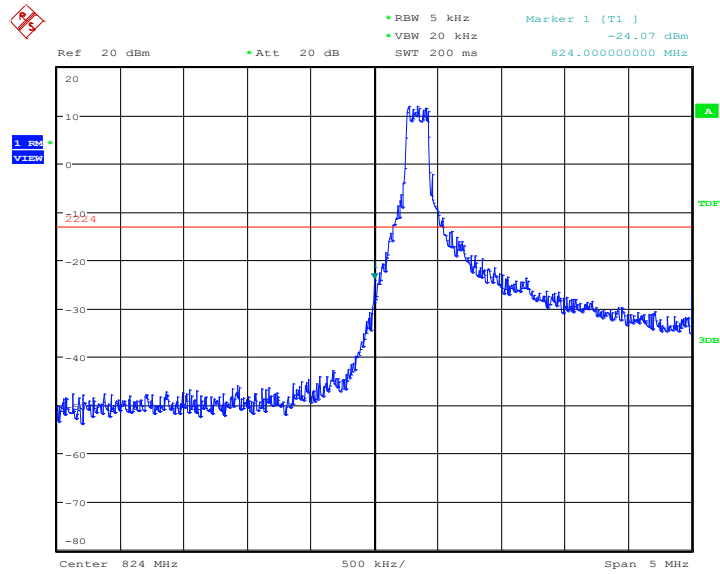
Date: 27.MAY.2021 14:33:41

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



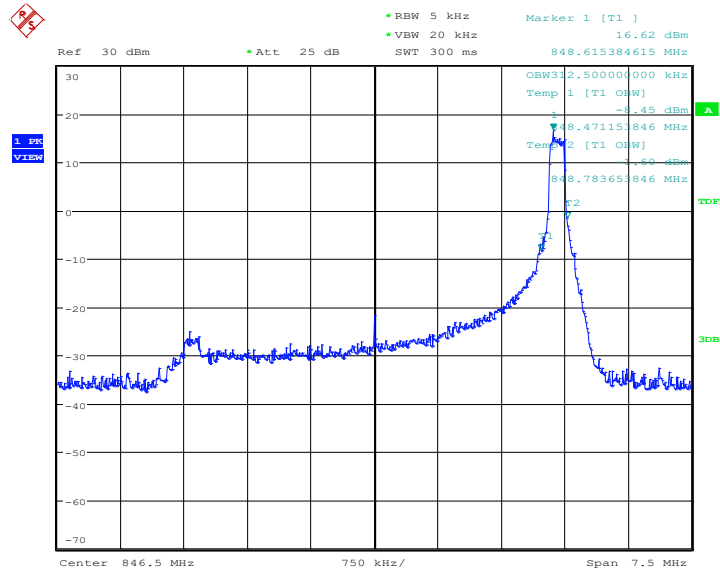
Date: 27.MAY.2021 14:22:38

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



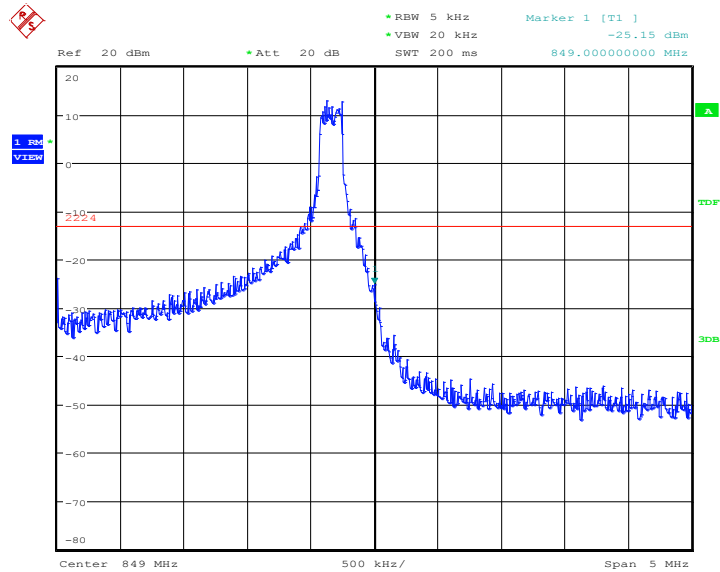
Date: 27.MAY.2021 14:23:22

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



Date: 27.MAY.2021 14:12:12

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



Date: 27.MAY.2021 14:12:56