



# TEST REPORT

No. I22N00716-RF-LTE

for

**HMD Global Oy**

**Smart Phone**

**Model Name: TA-1413**

**FCC ID: 2AJOTTA-1413**

with

**Hardware Version: V01**

**Software Version: 00WW\_0\_017**

**Issued Date: 2022-04-24**

**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>
I22N00716-RF-LTE	Rev.0	1st edition	2022-04-24



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## 1. SUMMARY OF TEST REPORT

### 1.1. Test Items

Description	Smart Phone
Model Name	TA-1413
Applicant's name	HMD Global Oy
Manufacturer's Name	HMD Global Oy

### 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

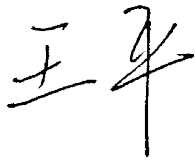
Address: Building G, Shenzhen International Innovation Center, No.1006 Shennan Road, Futian District, Shenzhen, Guangdong, P. R. China 518000

### 1.5. Project Data

Testing Start Date: 2022-03-21

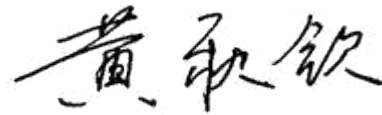
Testing End Date: 2022-04-24

### 1.6. Signature



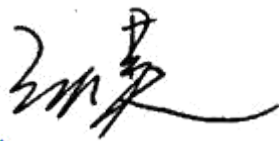
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## **2. CLIENT INFORMATION**

### **2.1. Applicant Information**

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### **2.2. Manufacturer Information**

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

#### **(AE)**

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

Description	Smart Phone
Model Name	TA-1413
FCC ID	2AJOTTA-1413
Frequency Bands	LTE Bands 2,4,5,7,12,13,17,66
Antenna	Integrated
Extreme vol. Limits	3.60V to 4.35V (nominal: 3.80V)
Extreme temp. Tolerance	-10°C to +55°C
Condition of EUT as received	No abnormality in appearance

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

#### **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>
UT09aa	355400570002629	V01	00WW_0_017	2022-03-21
UT01aa	355400570002843	V01	00WW_0_017	2022-03-21

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

UT01aa is used for conduction test, UT09aa 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

Model	GH6581
Manufacturer	Shenzhen Aerospace Electronic CO.,Ltd.
Capacity	4850mAh
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 Smart Phone with integrated antenna. It consists of normal options: Battery, Charger USB Cable and headset. Manual and specifications of the EUT were provided to fulfill 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 for Compliance Testing of Transmitters Used in Licensed Radio Services	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. = 20 %, 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. = 20 %, 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

NOTE: As the frequency band range of LTE Band 12(699-716MHz) overlaps the range of LTE Band 17(704-716MHz), LTE Band 66(1710-1780MHz) overlaps the range of LTE Band 4(1710-1755MHz). The channel bandwidth and other perating parameters for LTE Band 17 are fully supported by LTE Band 12, the channel bandwidth and other perating parameters for LTE Band 4 are fully supported by LTE Band 66 and the miximum output power of LTE Band 12 is larger than the LTE Band 17, the miximum output power of LTE Band 66 is larger than the LTE Band 4, we just need to test all the cases of LTE Band 12, LTE Band 66.

### 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 13**

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	2022-11-24
2	BiLog Antenna	3142E	ETS-Lindgren	0224831	2024-05-27
3	Horn Antenna	3117	ETS-Lindgren	00066577	2023-04-02
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	2022-11-24
10	Fully Anechoic Chamber	FACT3-2.0	ETS-Lindgren	1285	2023-05-29
11	Spectrum Analyzer	FSV40	R&S	101192	2023-01-12
12	Universal Radio Communication Tester	CMW500	R&S	152499	2022-07-15
13	Universal Radio Communication Tester	CMW500	R&S	129146	2023-04-24
14	Spectrum Analyzer	FSW	R&S	102197	2022.11.24
15	Temperature Chamber	SH-241	ESPEC	92007516	2022-10-15
16	DC Power Supply	U3606A	Agilent Technologies	MY50450012	2022-11-13

### 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	1RB-High (5)	1909.3 (19193)	23.27	22.33
		1880 (18900)	23.18	22.05
		1850.7 (18607)	23.03	22.74
	1RB-Middle (3)	1909.3 (19193)	23.26	22.24
		1880 (18900)	23.04	22.11
		1850.7 (18607)	22.99	22.76
	1RB-Low (0)	1909.3 (19193)	23.20	22.31
		1880 (18900)	23.16	22.15
		1850.7 (18607)	22.98	22.66
	3RB-High (3)	1909.3 (19193)	23.33	22.49
		1880 (18900)	23.01	22.21

		1850.7 (18607)	23.16	22.38	
	3RB-Middle (1)	1909.3 (19193)	23.33	22.50	
		1880 (18900)	23.08	21.98	
		1850.7 (18607)	23.13	22.44	
	3RB-Low (0)	1909.3 (19193)	23.32	22.54	
		1880 (18900)	23.17	21.97	
		1850.7 (18607)	23.07	22.39	
	6RB (0)	1909.3 (19193)	22.30	21.23	
		1880 (18900)	22.06	21.02	
		1850.7 (18607)	22.11	20.86	
	3MHz	1RB-High (14)	1908.5 (19185)	23.25	22.40
			1880 (18900)	23.00	22.06
1851.5 (18615)			22.98	22.63	
1RB-Middle (7)		1908.5 (19185)	23.28	22.39	
		1880 (18900)	22.99	22.14	
		1851.5 (18615)	22.89	22.68	
1RB-Low (0)		1908.5 (19185)	23.09	22.23	
		1880 (18900)	23.05	21.67	
		1851.5 (18615)	23.00	22.66	
8RB-High (7)		1908.5 (19185)	22.34	21.44	
		1880 (18900)	22.12	21.40	

		1851.5 (18615)	22.09	21.21	
	8RB-Middle (4)	1908.5 (19185)	22.38	21.43	
		1880 (18900)	22.05	21.44	
		1851.5 (18615)	22.14	21.29	
	8RB-Low (0)	1908.5 (19185)	22.26	21.69	
		1880 (18900)	22.00	21.12	
		1851.5 (18615)	22.13	21.28	
	15RB (0)	1908.5 (19185)	22.33	21.47	
		1880 (18900)	22.03	21.10	
		1851.5 (18615)	22.17	21.24	
	5MHz	1RB-High (24)	1907.5 (19175)	23.24	22.29
			1880 (18900)	22.97	22.12
1852.5 (18625)			23.06	22.15	
1RB-Middle (12)		1907.5 (19175)	23.19	22.23	
		1880 (18900)	22.96	22.15	
		1852.5 (18625)	23.00	22.15	
1RB-Low (0)		1907.5 (19175)	23.22	22.20	
		1880 (18900)	22.97	22.16	
		1852.5 (18625)	23.05	22.21	
12RB-High (13)		1907.5 (19175)	22.38	21.43	
		1880 (18900)	22.01	21.44	



	12RB-Middle (6)	1852.5 (18625)	22.13	21.15	
		1907.5 (19175)	22.28	21.63	
		1880 (18900)	22.09	21.15	
		1852.5 (18625)	22.05	21.10	
	12RB-Low (0)	1907.5 (19175)	22.21	21.65	
		1880 (18900)	22.13	21.16	
		1852.5 (18625)	22.10	21.19	
	25RB (0)	1907.5 (19175)	22.21	21.51	
		1880 (18900)	21.99	21.35	
		1852.5 (18625)	22.12	21.06	
	10MHz	1RB-High (49)	1905 (19150)	23.34	22.90
			1880 (18900)	23.12	22.65
1855 (18650)			23.06	22.48	
1RB-Middle (24)		1905 (19150)	23.14	22.64	
		1880 (18900)	23.05	22.59	
		1855 (18650)	23.10	22.56	
1RB-Low (0)		1905 (19150)	23.11	22.54	
		1880 (18900)	23.09	22.63	
		1855 (18650)	23.11	22.61	
25RB-High (25)		1905 (19150)	22.31	21.55	
		1880 (18900)	22.17	21.13	

		1855 (18650)	22.11	21.34	
	25RB-Middle (12)	1905 (19150)	22.23	21.59	
		1880 (18900)	22.02	21.13	
		1855 (18650)	22.06	21.40	
	25RB-Low (0)	1905 (19150)	22.25	21.17	
		1880 (18900)	22.02	21.09	
		1855 (18650)	22.16	21.06	
	50RB (0)	1905 (19150)	22.14	21.58	
		1880 (18900)	22.03	21.18	
		1855 (18650)	22.03	21.51	
	15MHz	1RB-High (74)	1902.5 (19125)	23.25	22.79
			1880 (18900)	23.08	22.78
1857.5 (18675)			22.98	22.58	
1RB-Middle (37)		1902.5 (19125)	22.95	22.69	
		1880 (18900)	22.97	22.69	
		1857.5 (18675)	22.99	22.62	
1RB-Low (0)		1902.5 (19125)	23.01	22.68	
		1880 (18900)	23.07	22.65	
		1857.5 (18675)	22.98	22.70	
36RB-High (38)		1902.5 (19125)	22.21	21.54	
		1880 (18900)	22.14	21.04	

		1857.5 (18675)	22.05	21.06	
	36RB-Middle (19)	1902.5 (19125)	22.21	21.24	
		1880 (18900)	22.09	21.09	
		1857.5 (18675)	22.15	21.47	
	36RB-Low (0)	1902.5 (19125)	22.12	21.15	
		1880 (18900)	22.07	21.12	
		1857.5 (18675)	22.13	21.46	
	75RB (0)	1902.5 (19125)	22.18	21.31	
		1880 (18900)	22.11	21.17	
		1857.5 (18675)	22.06	21.55	
	20MHz	1RB-High (99)	1900 (19100)	23.26	22.42
			1880 (18900)	23.30	22.28
1860 (18700)			23.07	22.13	
1RB-Middle (50)		1900 (19100)	22.92	22.12	
		1880 (18900)	23.01	21.97	
		1860 (18700)	22.98	22.05	
1RB-Low (0)		1900 (19100)	22.98	22.17	
		1880 (18900)	23.12	22.15	
		1860 (18700)	23.06	22.10	
50RB-High (50)		1900 (19100)	22.26	21.61	
		1880 (18900)	22.20	21.22	

	50RB-Middle (25)	1860 (18700)	22.14	21.46	
		1900 (19100)	22.08	21.20	
		1880 (18900)	22.08	21.22	
	50RB-Low (0)	1860 (18700)	22.08	21.16	
		1900 (19100)	22.14	21.18	
		1880 (18900)	22.19	21.19	
	100RB (0)	1860 (18700)	22.08	21.48	
		1900 (19100)	22.17	21.22	
		1880 (18900)	22.08	21.17	
			1860 (18700)	22.11	21.10

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

#### LTE band 5

Bandwidth	RB size(offset)	Frequency (MHz)	Power(dBm)	
			QPSK	16QAM
1.4MHz	1RB-High (5)	848.3 (20643)	23.29	22.78
		836.5 (20525)	23.25	22.70
		824.7 (20407)	23.27	22.77
	1RB-Middle (3)	848.3 (20643)	23.28	22.87
		836.5 (20525)	23.28	22.74
		824.7 (20407)	23.25	22.89
	1RB-Low (0)	848.3 (20643)	23.23	22.62
		836.5 (20525)	23.26	22.86
		824.7 (20407)	23.28	22.81

	3RB-High (3)	848.3 (20643)	23.40	22.83
		836.5 (20525)	23.36	22.57
		824.7 (20407)	23.33	22.69
	3RB-Middle (1)	848.3 (20643)	23.45	22.85
		836.5 (20525)	23.45	22.55
		824.7 (20407)	23.47	22.61
	3RB-Low (0)	848.3 (20643)	23.39	22.43
		836.5 (20525)	23.41	22.54
		824.7 (20407)	23.34	22.62
	6RB (0)	848.3 (20643)	22.71	21.40
		836.5 (20525)	22.29	21.48
		824.7 (20407)	22.39	21.55
3MHz	1RB-High (14)	847.5 (20635)	23.26	22.88
		836.5 (20525)	23.29	22.72
		825.5 (20415)	23.40	22.76
	1RB-Middle (7)	847.5 (20635)	23.28	22.85
		836.5 (20525)	23.29	22.68
		825.5 (20415)	23.23	22.66
	1RB-Low (0)	847.5 (20635)	23.21	22.83
		836.5 (20525)	23.20	22.75
		825.5 (20415)	23.31	22.24

	8RB-High (7)	847.5 (20635)	22.60	21.76
		836.5 (20525)	22.28	21.86
		825.5 (20415)	22.71	21.93
	8RB-Middle (4)	847.5 (20635)	22.34	21.81
		836.5 (20525)	22.28	21.84
		825.5 (20415)	22.38	21.89
	8RB-Low (0)	847.5 (20635)	22.36	21.82
		836.5 (20525)	22.69	21.81
		825.5 (20415)	22.40	21.91
	15RB (0)	847.5 (20635)	22.36	21.85
		836.5 (20525)	22.39	21.77
		825.5 (20415)	22.33	21.83
5MHz	1RB-High (24)	846.5 (20625)	23.32	22.81
		836.5 (20525)	23.25	22.82
		826.5 (20425)	23.35	22.44
	1RB-Middle (12)	846.5 (20625)	23.31	22.88
		836.5 (20525)	23.27	22.80
		826.5 (20425)	23.29	22.69
	1RB-Low (0)	846.5 (20625)	23.35	22.85
		836.5 (20525)	23.22	22.21
		826.5 (20425)	23.21	22.34

	12RB-High (13)	846.5 (20625)	22.42	21.72
		836.5 (20525)	22.31	21.82
		826.5 (20425)	22.70	21.88
	12RB-Middle (6)	846.5 (20625)	22.37	21.78
		836.5 (20525)	22.36	21.76
		826.5 (20425)	22.82	21.87
	12RB-Low (0)	846.5 (20625)	22.37	21.78
		836.5 (20525)	22.75	21.78
		826.5 (20425)	22.40	21.80
	25RB (0)	846.5 (20625)	22.29	21.70
		836.5 (20525)	22.38	21.91
		826.5 (20425)	22.86	21.94
10MHz	1RB-High (49)	844 (20600)	23.36	22.68
		836.5 (20525)	23.46	22.79
		829 (20450)	23.53	22.91
	1RB-Middle (24)	844 (20600)	23.20	22.68
		836.5 (20525)	23.37	22.72
		829 (20450)	23.46	22.86
	1RB-Low (0)	844 (20600)	23.25	22.87
		836.5 (20525)	23.43	22.87
		829 (20450)	23.40	22.75

	25RB-High (25)	844 (20600)	22.47	21.78
		836.5 (20525)	22.42	21.92
		829 (20450)	22.55	21.79
	25RB-Middle (12)	844 (20600)	22.77	21.70
		836.5 (20525)	22.42	21.95
		829 (20450)	22.45	21.45
	25RB-Low (0)	844 (20600)	22.38	21.25
		836.5 (20525)	22.78	21.95
		829 (20450)	22.87	21.77
	50RB (0)	844 (20600)	22.77	21.79
		836.5 (20525)	22.38	21.75
		829 (20450)	22.46	21.45

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	1RB-High (24)	2567.5 (21425)	22.14	21.69
		2535 (21100)	22.16	21.72
		2502.5 (20775)	22.41	22.00
	1RB-Middle (12)	2567.5 (21425)	22.08	21.70
		2535 (21100)	22.21	21.89
		2502.5 (20775)	22.35	21.94
	1RB-Low (0)	2567.5 (21425)	22.01	21.76



		2535 (21100)	22.13	21.96
		2502.5 (20775)	22.40	21.93
		2567.5 (21425)	21.22	20.40
	12RB-High (13)	2535 (21100)	21.31	20.43
		2502.5 (20775)	21.52	20.67
		2567.5 (21425)	21.31	20.41
	12RB-Middle (6)	2535 (21100)	21.35	20.48
		2502.5 (20775)	21.58	20.72
		2567.5 (21425)	21.19	20.47
	12RB-Low (0)	2535 (21100)	21.30	20.48
		2502.5 (20775)	21.42	20.56
		2567.5 (21425)	21.22	20.57
	25RB (0)	2535 (21100)	21.34	20.41
		2502.5 (20775)	21.53	20.81
		2565 (21400)	22.11	21.70
10MHz	1RB-High (49)	2535 (21100)	22.20	22.11
		2505 (20800)	22.38	22.21
		2565 (21400)	22.09	21.70
	1RB-Middle (24)	2535 (21100)	22.22	21.92
		2505 (20800)	22.39	22.12
		2565 (21400)	22.11	21.68
	1RB-Low (0)	2565 (21400)	22.11	21.68

		2535 (21100)	22.19	21.88
		2505 (20800)	22.32	22.10
	25RB-High (25)	2565 (21400)	21.25	20.34
		2535 (21100)	21.26	20.40
		2505 (20800)	21.61	20.63
	25RB-Middle (12)	2565 (21400)	21.24	20.39
		2535 (21100)	21.38	20.43
		2505 (20800)	21.58	20.63
	25RB-Low (0)	2565 (21400)	21.19	20.32
		2535 (21100)	21.38	20.41
		2505 (20800)	21.50	20.58
	50RB (0)	2565 (21400)	21.23	20.35
		2535 (21100)	21.23	20.45
		2505 (20800)	21.53	20.71
	15MHz	1RB-High (74)	2562.5 (21375)	22.12
2535 (21100)			22.15	21.74
2507.5 (20825)			22.39	21.93
1RB-Middle (37)		2562.5 (21375)	22.05	22.10
		2535 (21100)	22.13	21.74
		2507.5 (20825)	22.32	21.85
1RB-Low (0)		2562.5 (21375)	22.02	22.07

		2535 (21100)	22.16	21.73
		2507.5 (20825)	22.29	22.21
		2562.5 (21375)	21.30	20.46
	36RB-High (38)	2535 (21100)	21.27	20.61
		2507.5 (20825)	21.65	20.62
		2562.5 (21375)	21.28	20.35
	36RB-Middle (19)	2535 (21100)	21.29	20.64
		2507.5 (20825)	21.50	20.69
		2562.5 (21375)	21.10	20.30
	36RB-Low (0)	2535 (21100)	21.27	20.53
		2507.5 (20825)	21.57	20.64
		2562.5 (21375)	21.18	20.52
	75RB (0)	2535 (21100)	21.32	20.50
		2507.5 (20825)	21.50	20.75
		2560 (21350)	22.21	21.63
20MHz	1RB-High (99)	2535 (21100)	22.37	21.72
		2510 (20850)	22.35	21.68
		2560 (21350)	22.03	21.46
	1RB-Middle (50)	2535 (21100)	22.22	21.51
		2510 (20850)	22.32	21.62
		2560 (21350)	21.94	21.47
	1RB-Low (0)	2560 (21350)	21.94	21.47

		2535 (21100)	22.20	21.56
		2510 (20850)	22.34	21.84
		2560 (21350)	21.19	20.43
	50RB-High (50)	2535 (21100)	21.28	20.43
		2510 (20850)	21.55	20.65
		2560 (21350)	21.17	20.25
	50RB-Middle (25)	2535 (21100)	21.23	20.43
		2510 (20850)	21.43	20.70
		2560 (21350)	21.16	20.34
	50RB-Low (0)	2535 (21100)	21.15	20.36
		2510 (20850)	21.50	20.61
		2560 (21350)	21.20	20.40
	100RB (0)	2535 (21100)	21.38	20.40
		2510 (20850)	21.52	20.61
		2560 (21350)	21.20	20.40

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

#### LTE band 12

Bandwidth	RB size(offset)	Frequency (MHz)	Power(dBm)	
			QPSK	16QAM
1.4MHz	1RB-High (5)	715.3	23.62	22.84
		707.5	23.33	22.63
		699.7	23.59	22.70
	1RB-Middle (3)	715.3	23.64	22.81
		707.5	23.33	22.66

		699.7	23.59	22.68
	1RB-Low (0)	715.3	23.64	22.73
		707.5	23.34	22.63
		699.7	23.59	22.72
	3RB-High (3)	715.3	23.83	22.97
		707.5	23.40	22.58
		699.7	23.81	22.99
	3RB-Middle (1)	715.3	23.77	22.98
		707.5	23.38	22.74
		699.7	23.73	22.83
	3RB-Low (0)	715.3	23.76	22.83
		707.5	23.41	22.58
		699.7	23.72	22.88
	6RB (0)	715.3	22.78	21.52
		707.5	22.37	21.19
699.7		22.77	21.55	
3MHz	1RB-High (14)	714.5	23.66	22.71
		707.5	23.19	22.67
		700.5	23.63	22.79
	1RB-Middle (7)	714.5	23.67	22.66
		707.5	23.23	22.72

		700.5	23.59	22.64	
	1RB-Low (0)	714.5	23.61	22.65	
		707.5	23.27	22.62	
		700.5	23.55	22.75	
	8RB-High (7)	714.5	22.69	21.93	
		707.5	22.43	21.52	
		700.5	22.83	21.90	
	8RB-Middle (4)	714.5	22.71	21.79	
		707.5	22.30	21.43	
		700.5	22.73	21.85	
	8RB-Low (0)	714.5	22.78	21.69	
		707.5	22.41	21.83	
		700.5	22.71	21.76	
	15RB (0)	714.5	22.84	21.80	
		707.5	22.24	21.55	
		700.5	22.71	21.82	
	5MHz	1RB-High (24)	713.5	23.78	22.79
			707.5	23.30	22.62
701.5			23.26	22.49	
1RB-Middle (12)		713.5	23.72	22.81	
		707.5	23.22	22.74	

		701.5	23.58	22.69	
	1RB-Low (0)	713.5	23.72	22.89	
		707.5	23.24	22.76	
		701.5	23.58	22.69	
	12RB-High (13)	713.5	22.77	21.76	
		707.5	22.40	21.38	
		701.5	22.73	21.76	
	12RB-Middle (6)	713.5	22.79	21.79	
		707.5	22.32	21.32	
		701.5	22.81	21.80	
	12RB-Low (0)	713.5	22.68	21.77	
		707.5	22.32	21.74	
		701.5	22.72	21.70	
	25RB (0)	713.5	22.83	21.67	
		707.5	22.61	21.72	
		701.5	22.73	21.79	
	10MHz	1RB-High (49)	711	23.80	22.81
			707.5	23.77	22.74
704			23.35	22.39	
1RB-Middle (24)		711	23.21	22.79	
		707.5	23.28	22.41	

		704	23.28	22.41
	1RB-Low (0)	711	23.27	22.30
		707.5	23.58	22.73
		704	23.66	22.64
	25RB-High (25)	711	22.85	21.89
		707.5	22.88	21.97
		704	22.30	21.97
	25RB-Middle (12)	711	22.76	21.95
		707.5	22.34	21.41
		704	22.47	21.61
	25RB-Low (0)	711	22.51	21.55
		707.5	22.35	21.98
		704	22.84	21.93
	50RB (0)	711	22.76	21.78
		707.5	22.37	21.49
		704	22.49	21.38

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

#### LTE band 13

Bandwidth	RB size(offset)	Frequency (MHz)	Power(dBm)	
			QPSK	16QAM
5MHz	1RB-High (24)	784.5 (23255)	23.41	22.74
		782 (23230)	23.34	22.33
		779.5 (23205)	23.32	22.47



	1RB-Middle (12)	784.5 (23255)	23.41	22.78
		782 (23230)	23.31	22.56
		779.5 (23205)	23.37	22.15
	1RB-Low (0)	784.5 (23255)	23.35	22.93
		782 (23230)	23.23	22.21
		779.5 (23205)	23.39	22.39
	12RB-High (13)	784.5 (23255)	22.45	21.38
		782 (23230)	22.40	21.52
		779.5 (23205)	22.31	21.48
	12RB-Middle (6)	784.5 (23255)	22.25	21.57
		782 (23230)	22.57	21.55
		779.5 (23205)	22.39	21.54
	12RB-Low (0)	784.5 (23255)	22.46	21.51
		782 (23230)	22.33	21.56
		779.5 (23205)	22.48	21.40
25RB (0)	784.5 (23255)	22.22	21.47	
	782 (23230)	22.47	21.67	
	779.5 (23205)	22.30	21.71	
10MHz	1RB-High (49)	782 (23230)	23.32	22.38
	1RB-Middle (24)	782 (23230)	23.34	22.51
	1RB-Low (0)	782 (23230)	23.39	22.39

	25RB-High (25)	782 (23230)	22.31	21.76
	25RB-Middle (12)	782 (23230)	22.50	21.73
	25RB-Low (0)	782 (23230)	22.37	21.71
	50RB (0)	782 (23230)	22.52	21.55

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

**LTE band 66**

Bandwidth	RB size(offset)	Frequency (MHz)	Power(dBm)	
			QPSK	16QAM
1.4MHz	1RB-High (5)	1779.3 (132665)	23.14	22.66
		1745 (132322)	23.01	22.64
		1710.7 (131979)	23.01	22.67
	1RB-Middle (3)	1779.3 (132665)	23.02	22.75
		1745 (132322)	23.04	22.64
		1710.7 (131979)	22.95	22.74
	1RB-Low (0)	1779.3 (132665)	23.08	22.72
		1745 (132322)	23.05	22.19
		1710.7 (131979)	22.99	22.77
	3RB-High (3)	1779.3 (132665)	23.20	22.47
		1745 (132322)	23.13	22.36
		1710.7 (131979)	23.12	22.29
	3RB-Middle (1)	1779.3 (132665)	23.21	22.48
		1745 (132322)	23.21	22.39
		1710.7 (131979)	23.17	22.38

	3RB-Low (0)	1779.3 (132665)	23.24	22.39
		1745 (132322)	23.16	22.32
		1710.7 (131979)	23.21	22.37
	6RB (0)	1779.3 (132665)	22.23	21.19
		1745 (132322)	22.03	20.89
		1710.7 (131979)	22.11	20.80
3MHz	1RB-High (14)	1778.5 (132657)	23.18	22.18
		1745 (132322)	23.05	22.20
		1711.5 (131987)	22.89	22.54
	1RB-Middle (7)	1778.5 (132657)	23.13	22.26
		1745 (132322)	23.11	22.17
		1711.5 (131987)	23.00	22.73
	1RB-Low (0)	1778.5 (132657)	23.18	22.17
		1745 (132322)	23.01	22.18
		1711.5 (131987)	22.92	22.71
	8RB-High (7)	1778.5 (132657)	22.21	21.47
		1745 (132322)	22.05	21.28
		1711.5 (131987)	22.15	21.16
	8RB-Middle (4)	1778.5 (132657)	22.23	21.48
		1745 (132322)	22.12	21.26
		1711.5 (131987)	22.15	21.25

	8RB-Low (0)	1778.5 (132657)	22.20	21.34
		1745 (132322)	22.12	21.19
		1711.5 (131987)	22.09	21.30
	15RB (0)	1778.5 (132657)	22.21	21.38
		1745 (132322)	22.09	21.27
		1711.5 (131987)	22.16	21.22
5MHz	1RB-High (24)	1777.5 (132647)	23.16	22.70
		1745 (132322)	22.88	22.65
		1712.5 (131997)	22.92	22.03
	1RB-Middle (12)	1777.5 (132647)	23.19	22.78
		1745 (132322)	22.96	22.61
		1712.5 (131997)	22.86	22.01
	1RB-Low (0)	1777.5 (132647)	23.17	22.79
		1745 (132322)	22.98	22.58
		1712.5 (131997)	22.90	22.04
	12RB-High (13)	1777.5 (132647)	22.24	21.29
		1745 (132322)	22.02	21.57
		1712.5 (131997)	22.12	21.19
	12RB-Middle (6)	1777.5 (132647)	22.09	21.28
		1745 (132322)	22.11	21.15
		1712.5 (131997)	22.11	21.09

	12RB-Low (0)	1777.5 (132647)	22.19	21.22
		1745 (132322)	22.04	21.05
		1712.5 (131997)	22.15	21.16
	25RB (0)	1777.5 (132647)	22.17	21.02
		1745 (132322)	22.11	21.05
		1712.5 (131997)	22.11	21.04
10MHz	1RB-High (49)	1775 (132622)	23.13	22.19
		1745 (132322)	23.03	22.09
		1715 (132022)	23.10	22.63
	1RB-Middle (24)	1775 (132622)	23.10	22.22
		1745 (132322)	23.09	22.14
		1715 (132022)	23.03	22.66
	1RB-Low (0)	1775 (132622)	23.14	22.11
		1745 (132322)	23.04	22.85
		1715 (132022)	23.07	22.73
	25RB-High (25)	1775 (132622)	22.12	21.38
		1745 (132322)	22.10	21.43
		1715 (132022)	22.13	21.45
	25RB-Middle (12)	1775 (132622)	22.16	21.45
		1745 (132322)	22.01	21.09
		1715 (132022)	22.04	21.43

	25RB-Low (0)	1775 (132622)	22.13	21.33
		1745 (132322)	22.08	21.05
		1715 (132022)	22.12	21.02
	50RB (0)	1775 (132622)	22.17	21.29
		1745 (132322)	22.07	21.17
		1715 (132022)	22.02	21.42
15MHz	1RB-High (74)	1772.5 (132597)	22.96	22.76
		1745 (132322)	23.04	22.66
		1717.5 (132047)	22.87	22.72
	1RB-Middle (37)	1772.5 (132597)	23.00	22.75
		1745 (132322)	23.00	22.68
		1717.5 (132047)	22.83	22.55
	1RB-Low (0)	1772.5 (132597)	22.98	22.69
		1745 (132322)	23.16	22.88
		1717.5 (132047)	23.00	22.64
	36RB-High (38)	1772.5 (132597)	22.19	21.26
		1745 (132322)	21.96	20.99
		1717.5 (132047)	21.93	21.04
	36RB-Middle (19)	1772.5 (132597)	22.14	21.08
		1745 (132322)	22.10	21.05
		1717.5 (132047)	21.96	21.38

	36RB-Low (0)	1772.5 (132597)	22.16	21.15
		1745 (132322)	22.12	21.08
		1717.5 (132047)	22.00	21.48
	75RB (0)	1772.5 (132597)	22.22	21.17
		1745 (132322)	22.06	21.08
		1717.5 (132047)	22.02	21.40
20MHz	1RB-High (99)	1770 (132572)	23.08	22.29
		1745 (132322)	22.92	22.67
		1720 (132072)	22.95	22.54
	1RB-Middle (50)	1770 (132572)	23.15	21.94
		1745 (132322)	23.01	22.54
		1720 (132072)	22.87	22.57
	1RB-Low (0)	1770 (132572)	23.12	22.17
		1745 (132322)	23.03	22.64
		1720 (132072)	22.95	22.61
	50RB-High (50)	1770 (132572)	22.19	21.19
		1745 (132322)	22.09	21.07
		1720 (132072)	22.19	21.19
	50RB-Middle (25)	1770 (132572)	22.12	21.12
		1745 (132322)	22.10	21.15
		1720 (132072)	22.06	21.00

	50RB-Low (0)	1770 (132572)	22.11	21.19
		1745 (132322)	22.07	21.15
		1720 (132072)	22.02	21.41
	100RB (0)	1770 (132572)	22.20	21.23
		1745 (132322)	22.15	21.15
		1720 (132072)	21.96	21.02

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."

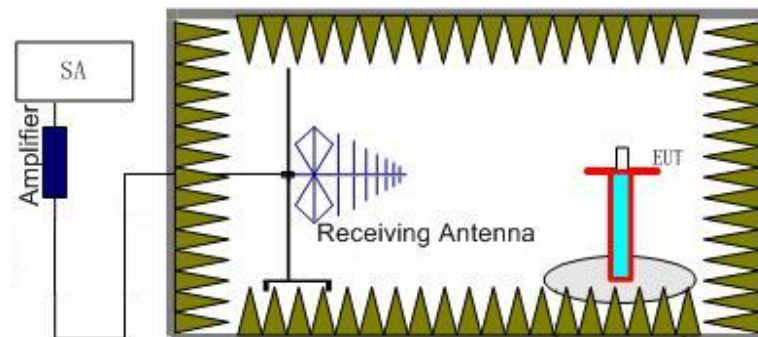
Rule Part 27.50(d) specifies "Fixed, mobile, and portable (handheld) stations operating in the 1710–1755 MHz band are limited to 1 watt EIRP".

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

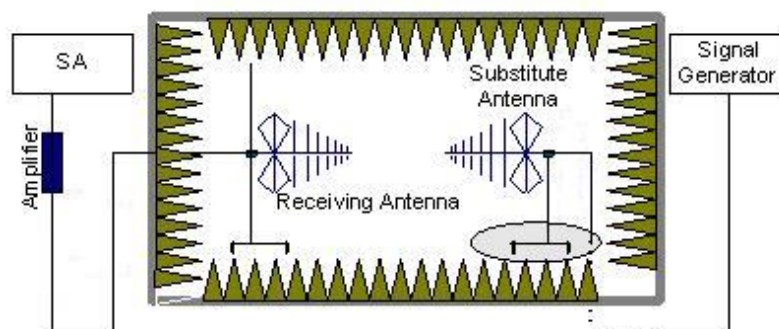
Rule Part 27.50(c) specifies "Portable stations (hand-held de-vices) are limited to 3 watts ERP".

#### 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: ≤33dBm (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	-14.84	-29.30	8.10	22.57	33.00	H
<b>1880.00</b>	<b>-14.60</b>	<b>-29.40</b>	<b>8.10</b>	<b>22.90</b>	<b>33.00</b>	<b>H</b>
1909.30	-14.71	-29.30	8.10	22.69	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	-14.90	-29.30	8.10	22.50	33.00	H
1880.00	-14.80	-29.40	8.10	22.70	33.00	H
1908.50	-14.80	-29.30	8.10	22.60	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	-14.94	-29.30	8.10	22.46	33.00	H
1880.00	-14.76	-29.40	8.10	22.74	33.00	H
1907.50	-14.78	-29.30	8.10	22.62	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	-15.01	-29.30	8.10	22.40	33.00	H
1880.00	-14.84	-29.40	8.10	22.66	33.00	H
1905.00	-14.85	-29.30	8.10	22.55	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	-14.96	-29.30	8.10	22.44	33.00	H
1880.00	-14.93	-29.40	8.10	22.57	33.00	H
1902.50	-14.89	-29.30	8.10	22.52	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	-15.04	-29.30	8.10	22.36	33.00	H
1880.00	-14.88	-29.40	8.10	22.62	33.00	H
1900.00	-14.87	-29.30	8.10	22.53	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)	Ga Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Polarization
1850.70	-14.95	-29.30	8.10	22.46	33.00	H
1880.00	-14.78	-29.40	8.10	22.72	33.00	H
1909.30	-14.78	-29.30	8.10	22.62	33.00	H

**LTE Band 2\_3MHz\_16QAM**

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	-15.04	-29.30	8.10	22.36	33.00	H
1880.00	-14.94	-29.40	8.10	22.56	33.00	H
1908.50	-14.89	-29.30	8.10	22.51	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)	Ga Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Polarization
1852.50	-14.93	-29.30	8.10	22.48	33.00	H
1880.00	-14.78	-29.40	8.10	22.72	33.00	H
1907.50	-14.81	-29.30	8.10	22.59	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)	Ga Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Polarization
1855.00	-14.95	-29.30	8.10	22.45	33.00	H
1880.00	-14.85	-29.40	8.10	22.65	33.00	H
1905.00	-14.89	-29.30	8.10	22.51	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)	Ga Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Polarization
1857.50	-15.01	-29.30	8.10	22.39	33.00	H
1880.00	-14.95	-29.40	8.10	22.55	33.00	H
1902.50	-14.95	-29.30	8.10	22.45	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)	Ga Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Polarization
1860.00	-15.11	-29.30	8.10	22.30	33.00	H
1880.00	-15.01	-29.40	8.10	22.50	33.00	H
1900.00	-15.04	-29.30	8.10	22.36	33.00	H

Peak EIRP (dBm)=P<sub>Mea</sub>(-14.60dBm)-(P<sub>cl</sub>+P<sub>Ag</sub>)(-29.40dB)+G<sub>a</sub>(8.10dB) =22.90dBm

**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	-9.42	-33.60	-0.79	2.15	21.24	38.45	V
836.50	-9.31	-33.50	-0.74	2.15	21.30	38.45	V
<b>848.30</b>	<b>-9.26</b>	<b>-33.50</b>	<b>-0.73</b>	<b>2.15</b>	<b>21.36</b>	<b>38.45</b>	<b>V</b>

**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	-9.46	-33.60	-0.84	2.15	21.15	38.45	V
836.50	-9.35	-33.50	-0.74	2.15	21.27	38.45	V
847.50	-9.36	-33.50	-0.73	2.15	21.26	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	-9.58	-33.60	-0.84	2.15	21.03	38.45	V
836.50	-9.47	-33.50	-0.74	2.15	21.15	38.45	V
846.50	-9.43	-33.50	-0.73	2.15	21.19	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	-9.63	-33.60	-0.84	2.15	20.98	38.45	V
836.50	-9.56	-33.50	-0.74	2.15	21.05	38.45	V
844.00	-9.42	-33.50	-0.78	2.15	21.15	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	-9.60	-33.60	-0.79	2.15	21.06	38.45	V
836.50	-9.46	-33.50	-0.74	2.15	21.15	38.45	V
848.30	-9.38	-33.50	-0.73	2.15	21.24	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	-9.62	-33.60	-0.84	2.15	20.99	38.45	V
836.50	-9.49	-33.50	-0.74	2.15	21.12	38.45	V
847.50	-9.43	-33.50	-0.73	2.15	21.19	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
826.50	-9.60	-33.60	-0.84	2.15	21.01	38.45	V
836.50	-9.40	-33.50	-0.74	2.15	21.21	38.45	V
846.50	-9.47	-33.50	-0.73	2.15	21.15	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	-9.72	-33.60	-0.84	2.15	20.89	38.45	V
836.50	-9.63	-33.50	-0.74	2.15	20.98	38.45	V
844.00	-9.51	-33.50	-0.78	2.15	21.06	38.45	V

Peak ERP (dBm)=P<sub>Mea</sub>(-9.26dBm)-(P<sub>ci</sub>+P<sub>Ag</sub>)(-33.50dB)+G<sub>a</sub>(-0.73dB) -2.15dB =21.36dBm

**LTE Band 7- EIRP Part 27.50(h)(2)****Limits:** ≤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	-16.79	-28.70	10.70	22.61	33.00	H
2535.00	-16.65	-28.60	10.70	22.66	33.00	H
2567.50	-16.50	-28.60	10.70	22.80	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	-16.41	-28.60	10.70	22.89	33.00	H
2565.00	-16.57	-28.60	10.70	22.73	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	-16.80	-28.60	10.70	22.50	33.00	H
2562.50	-16.68	-28.60	10.70	22.62	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	-16.71	-28.60	10.70	22.59	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	-10.72	-34.80	-0.93	2.15	21.00	34.77	V
707.50	-10.34	-34.70	-0.91	2.15	21.30	34.77	V
715.30	-10.75	-34.70	-0.68	2.15	21.11	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	-10.56	-34.80	-0.97	2.15	21.12	34.77	V
707.50	-10.37	-34.70	-0.91	2.15	21.28	34.77	V
714.50	-11.00	-34.70	-0.64	2.15	20.91	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	-10.87	-34.80	-0.97	2.15	20.81	34.77	V
707.50	-10.42	-34.70	-0.91	2.15	21.22	34.77	V
713.50	-10.94	-34.70	-0.64	2.15	20.97	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	-10.75	-34.80	-0.97	2.15	20.93	34.77	V
<b>707.50</b>	<b>-10.32</b>	<b>-34.70</b>	<b>-0.91</b>	<b>2.15</b>	<b>21.32</b>	<b>34.77</b>	<b>V</b>
711.00	-10.93	-34.70	-0.64	2.15	20.98	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
699.70	-10.82	-34.80	-0.93	2.15	20.90	34.77	V
707.50	-10.54	-34.70	-0.91	2.15	21.10	34.77	V
715.30	-10.82	-34.70	-0.68	2.15	21.05	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	-10.79	-34.80	-0.97	2.15	20.89	34.77	V
707.50	-10.37	-34.70	-0.91	2.15	21.28	34.77	V
714.50	-10.92	-34.70	-0.64	2.15	20.99	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	-10.85	-34.80	-0.97	2.15	20.83	34.77	V
707.50	-10.51	-34.70	-0.91	2.15	21.13	34.77	V
713.50	-10.99	-34.70	-0.64	2.15	20.92	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	-10.80	-34.80	-0.97	2.15	20.88	34.77	V
707.50	-10.62	-34.70	-0.91	2.15	21.02	34.77	V
711.00	-10.97	-34.70	-0.64	2.15	20.94	34.77	V

Peak ERP (dBm)=P<sub>Mea</sub>(-10.32Bm)-(P<sub>cl</sub>+P<sub>Ag</sub>)(-34.70dB)+G<sub>a</sub>(-0.91dB) -2.15dB =21.32dBm



**LTE Band 13 - ERP Part 27.50(c)(10)**

**Limits:** ≤34.77dBm (3W)

**LTE Band 13\_5MHz\_QPSK**

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
779.50	-10.52	-34.00	-0.08	2.15	21.25	34.77	V
<b>782.00</b>	<b>-10.36</b>	<b>-34.00</b>	<b>-0.13</b>	<b>2.15</b>	<b>21.36</b>	<b>34.77</b>	<b>V</b>
784.50	-10.39	-34.00	-0.13	2.15	21.33	34.77	V

**LTE Band 13\_10MHz\_QPSK**

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
782.00	-10.47	-34.00	-0.13	2.15	21.25	34.77	V

**LTE Band 13\_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
779.50	-10.56	-34.00	-0.08	2.15	21.21	34.77	V
782.00	-10.56	-34.00	-0.13	2.15	21.16	34.77	V
784.50	-10.46	-34.00	-0.13	2.15	21.26	34.77	V

**LTE Band 13\_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
782.00	-10.48	-34.00	-0.13	2.15	21.24	34.77	V

Peak ERP (dBm)=P<sub>Mea</sub>(-10.36dBm)-(P<sub>cl</sub>+P<sub>Ag</sub>)(-34.00dB)+G<sub>a</sub>(-0.13dB) -2.15dB =21.36dBm

**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>cl</sub> (dB)+ P <sub>Ag</sub> (dB)	Ga Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Polarization
1710.70	-15.01	-29.60	8.10	22.69	30.00	H
1745.00	-14.69	-29.50	8.10	22.91	30.00	H
<b>1779.30</b>	<b>-14.57</b>	<b>-29.50</b>	<b>8.10</b>	<b>23.03</b>	<b>30.00</b>	<b>H</b>

**LTE Band 66\_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
1711.50	-15.21	-29.60	8.10	22.49	30.00	H
1745.00	-14.91	-29.50	8.10	22.69	30.00	H
1778.50	-14.77	-29.50	8.10	22.83	30.00	H

**LTE Band 66\_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
1712.50	-15.19	-29.60	8.10	22.51	30.00	H
1745.00	-14.75	-29.50	8.10	22.85	30.00	H
1777.50	-14.91	-29.50	8.10	22.69	30.00	H

**LTE Band 66\_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
1715.00	-15.35	-29.60	8.10	22.35	30.00	H
1745.00	-14.91	-29.50	8.10	22.69	30.00	H
1775.00	-15.03	-29.50	8.10	22.57	30.00	H

**LTE Band 66\_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
1717.50	-15.36	-29.60	8.10	22.34	30.00	H
1745.00	-15.03	-29.50	8.10	22.57	30.00	H
1772.53	-15.12	-29.50	8.10	22.48	30.00	H

**LTE Band 66\_20MHz\_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
1720.00	-15.40	-29.60	8.10	22.30	30.00	H
1745.00	-15.20	-29.50	8.10	22.40	30.00	H
1770.00	-15.24	-29.50	8.10	22.37	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)	Ga Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Polarization
1710.70	-15.17	-29.60	8.10	22.53	30.00	H
1745.00	-14.81	-29.50	8.10	22.80	30.00	H
1779.30	-14.71	-29.50	8.10	22.90	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)	Ga Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Polarization
1711.50	-15.23	-29.60	8.10	22.47	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\_16QAM**

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
1712.50	-15.43	-29.60	8.10	22.27	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\_16QAM**

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
1715.00	-15.45	-29.60	8.10	22.25	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\_16QAM**

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
1717.50	-15.44	-29.60	8.10	22.26	30.00	H
1745.00	-15.23	-29.50	8.10	22.37	30.00	H
1772.53	-15.08	-29.50	8.10	22.52	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)	Ga Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Polarization
1720.00	-15.50	-29.60	8.10	22.20	30.00	H
1745.00	-15.30	-29.50	8.10	22.30	30.00	H
1770.00	-15.21	-29.50	8.10	22.39	30.00	H

Peak EIRP (dBm)=P<sub>Mea</sub>(-14.57dBm)-(P<sub>cl</sub>+P<sub>Ag</sub>)(-29.50dB)+G<sub>a</sub>(8.10dB) =23.03dBm

**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.

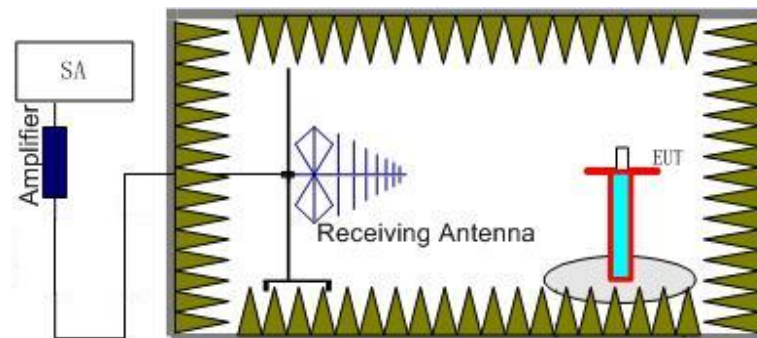
### **A.2.1 Measurement Method**

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

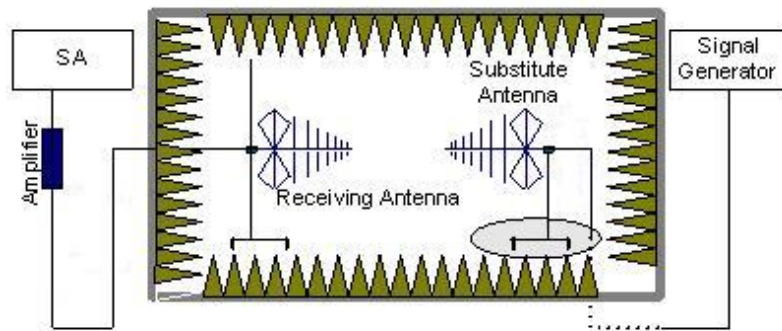
The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier. The resolution bandwidth is set 1MHz as outlined in Part 22.917, 24.238, 27.53(h) . The spectrum was scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of the LTE Bands 2,4,5,7,12,17,66.

### **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:  
Power (EIRP)= $P_{Mea} - P_{pl} + G_a$
5. This value is EIRP since the measurement is calibrated using an antenna of known gain (unit: dBi) and known input power.
6. ERP can be calculated from EIRP by subtracting the gain of the dipole,  $ERP = EIRP - 2.15dB$ .

### A.2.2 Measurement Results

Radiated emissions measurements were made only at the upper, middle, and lower carrier frequencies of the LTE Bands 2,4,5,7,12,17,66. 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 2,4,5,7,12,17,66 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
17170.00	-42.65	2.90	14.50	-31.05	-13.00	H
17368.13	-43.54	3.20	14.50	-32.24	-13.00	H
17418.13	-42.41	2.90	14.50	-30.81	-13.00	H
17621.88	-39.81	3.30	12.80	-30.31	-13.00	H
17762.50	-40.29	3.60	12.80	-31.09	-13.00	H
17975.00	-37.98	3.20	12.80	-28.38	-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
17208.13	-43.21	2.90	14.50	-31.61	-13.00	H
17298.13	-43.20	3.20	14.50	-31.90	-13.00	H
17453.13	-41.48	2.90	14.50	-29.88	-13.00	H
17616.88	-39.18	3.30	12.80	-29.68	-13.00	H
17818.13	-39.98	3.60	12.80	-30.78	-13.00	H
17960.63	-37.88	3.20	12.80	-28.28	-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
16960.00	-45.06	2.90	16.50	-31.46	-13.00	H
17164.38	-43.63	2.90	14.50	-32.03	-13.00	H
17399.38	-42.75	2.90	14.50	-31.15	-13.00	H
17593.75	-38.79	3.30	12.80	-29.29	-13.00	H
17760.00	-40.88	3.60	12.80	-31.68	-13.00	H
17998.75	-37.66	3.20	12.80	-28.06	-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
16986.25	-45.74	2.90	16.50	-32.14	-13.00	H
17209.38	-43.88	2.90	14.50	-32.28	-13.00	H
17521.25	-40.52	2.90	12.80	-30.62	-13.00	H
17591.25	-40.43	3.30	12.80	-30.93	-13.00	H
17800.63	-40.64	3.60	12.80	-31.44	-13.00	H
17968.13	-38.89	3.20	12.80	-29.29	-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
16956.25	-45.80	2.90	16.50	-32.20	-13.00	H
17273.75	-43.00	3.20	14.50	-31.70	-13.00	H
17425.63	-41.78	2.90	14.50	-30.18	-13.00	H
17591.25	-40.20	3.30	12.80	-30.70	-13.00	H
17768.75	-40.17	3.60	12.80	-30.97	-13.00	H
17976.88	-37.89	3.20	12.80	-28.29	-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
16936.25	-44.62	2.90	16.50	-31.02	-13.00	H
17278.75	-43.51	3.20	14.50	-32.21	-13.00	H
17517.50	-40.41	2.90	12.80	-30.51	-13.00	H
17573.13	-39.17	3.30	12.80	-29.67	-13.00	H
17771.88	-40.53	3.60	12.80	-31.33	-13.00	H
17925.63	-38.65	3.20	12.80	-29.05	-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
7126.13	-52.64	1.90	12.00	-44.69	-13.00	H
9104.88	-51.66	2.20	11.60	-44.41	-13.00	H
9307.88	-50.77	2.00	11.60	-43.32	-13.00	H
9471.75	-51.39	2.10	11.60	-44.04	-13.00	V
9743.25	-50.84	2.20	11.20	-43.99	-13.00	H
9800.88	-50.94	2.30	11.20	-44.19	-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
8739.38	-53.12	2.00	12.00	-45.27	-13.00	V
9102.00	-51.47	2.20	11.60	-44.22	-13.00	H
9298.75	-50.38	2.00	11.60	-42.93	-13.00	H
9474.00	-51.23	2.10	11.60	-43.88	-13.00	V
9735.50	-51.40	2.20	11.20	-44.55	-13.00	H
9780.25	-51.40	2.30	11.20	-44.65	-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
7332.38	-52.52	1.70	12.00	-44.37	-13.00	V
9098.25	-50.76	2.20	11.60	-43.51	-13.00	H
9299.13	-51.19	2.00	11.60	-43.74	-13.00	H
9473.50	-51.36	2.10	11.60	-44.01	-13.00	V
9713.25	-51.04	2.20	11.20	-44.19	-13.00	H
9793.63	-51.45	2.30	11.20	-44.70	-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
8511.75	-52.83	2.10	12.00	-45.08	-13.00	H
9097.75	-51.65	2.20	11.60	-44.40	-13.00	H
9222.50	-50.77	2.10	11.60	-43.42	-13.00	H
9476.63	-50.61	2.10	11.60	-43.26	-13.00	V
9745.63	-51.25	2.20	11.20	-44.40	-13.00	H
9792.50	-50.50	2.30	11.20	-43.75	-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
8424.75	-52.06	1.80	11.30	-44.71	-13.00	H
9107.50	-51.93	2.10	11.60	-44.58	-13.00	H
9302.13	-50.55	2.00	11.60	-43.10	-13.00	H
9473.00	-51.41	2.10	11.60	-44.06	-13.00	V
9744.50	-51.13	2.20	11.20	-44.28	-13.00	H
9790.75	-50.57	2.30	11.20	-43.82	-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
7272.00	-53.06	1.90	12.00	-45.11	-13.00	V
9098.88	-51.76	2.20	11.60	-44.51	-13.00	H
9229.75	-50.81	2.10	11.60	-43.46	-13.00	H
9473.50	-50.83	2.10	11.60	-43.48	-13.00	V
9732.13	-51.38	2.20	11.20	-44.53	-13.00	H
9794.25	-51.38	2.30	11.20	-44.63	-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
16983.13	-56.04	2.90	16.50	-42.44	-25.00	H
17368.13	-54.06	3.20	14.50	-42.76	-25.00	H
17524.38	-50.93	2.90	12.80	-41.03	-25.00	H
17591.88	-50.64	3.30	12.80	-41.14	-25.00	H
17840.00	-50.48	3.60	12.80	-41.28	-25.00	H
17985.00	-48.77	3.20	12.80	-39.17	-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
16981.25	-56.08	2.90	16.50	-42.48	-25.00	H
17296.88	-54.07	3.20	14.50	-42.77	-25.00	H
17525.00	-51.05	2.90	12.80	-41.15	-25.00	H
17574.38	-50.63	3.30	12.80	-41.13	-25.00	H
17839.38	-50.57	3.60	12.80	-41.37	-25.00	H
17980.63	-48.83	3.20	12.80	-39.23	-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
16981.88	-55.98	2.90	16.50	-42.38	-25.00	H
17298.13	-54.03	3.20	14.50	-42.73	-25.00	H
17456.88	-52.69	2.90	14.50	-41.09	-25.00	H
17594.38	-50.54	3.30	12.80	-41.04	-25.00	H
17840.00	-50.54	3.60	12.80	-41.34	-25.00	H
17999.38	-48.70	3.20	12.80	-39.10	-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
16983.75	-54.82	2.90	16.50	-41.22	-25.00	H
17277.50	-52.57	3.20	14.50	-41.27	-25.00	H
17521.25	-49.59	2.90	12.80	-39.69	-25.00	H
17572.50	-49.01	3.30	12.80	-39.51	-25.00	H
17840.00	-48.86	3.60	12.80	-39.66	-25.00	H
17993.75	-47.18	3.20	12.80	-37.58	-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
16984.38	-55.98	2.90	16.50	-42.38	-25.00	H
17301.88	-54.02	3.20	14.50	-42.72	-25.00	H
17523.75	-50.89	2.90	12.80	-40.99	-25.00	H
17618.75	-50.55	3.30	12.80	-41.05	-25.00	H
17838.75	-50.59	3.60	12.80	-41.39	-25.00	H
17980.00	-48.66	3.20	12.80	-39.06	-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
16983.75	-56.01	2.90	16.50	-42.41	-25.00	H
17296.25	-54.01	3.20	14.50	-42.71	-25.00	H
17523.13	-50.87	2.90	12.80	-40.97	-25.00	H
17616.88	-50.51	3.30	12.80	-41.01	-25.00	H
17838.75	-50.59	3.60	12.80	-41.39	-25.00	H
17981.88	-48.74	3.20	12.80	-39.14	-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
3496.13	-52.32	1.10	11.50	-44.07	-13.00	V
9105.13	-52.05	2.20	11.60	-44.80	-13.00	H
9304.00	-50.55	2.00	11.60	-43.10	-13.00	H
9472.00	-51.01	2.10	11.60	-43.66	-13.00	V
9735.00	-50.86	2.20	11.20	-44.01	-13.00	H
9782.00	-51.48	2.30	11.20	-44.73	-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
3535.13	-50.66	1.10	12.20	-41.71	-13.00	V
8703.38	-52.63	2.00	12.00	-44.78	-13.00	H
9298.13	-50.43	2.00	11.60	-42.98	-13.00	H
9371.75	-51.68	2.00	11.60	-44.23	-13.00	V
9768.13	-51.56	2.30	11.20	-44.81	-13.00	H
9789.38	-51.04	2.30	11.20	-44.29	-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
3574.13	-51.43	1.10	12.20	-42.48	-13.00	V
9102.38	-52.19	2.20	11.60	-44.94	-13.00	H
9227.50	-51.11	2.10	11.60	-43.76	-13.00	H
9473.88	-51.33	2.10	11.60	-43.98	-13.00	V
9758.00	-51.03	2.20	11.20	-44.18	-13.00	H
9801.38	-51.31	2.30	11.20	-44.56	-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
3496.13	-51.80	1.10	11.50	-43.55	-13.00	V
7203.00	-52.43	1.80	12.00	-44.38	-13.00	V
9225.88	-50.96	2.10	11.60	-43.61	-13.00	H
9475.38	-50.76	2.10	11.60	-43.41	-13.00	V
9734.75	-51.49	2.20	11.20	-44.64	-13.00	H
9794.88	-51.49	2.30	11.20	-44.74	-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
3535.13	-50.74	1.10	12.20	-41.79	-13.00	V
8424.00	-51.41	1.80	11.30	-44.06	-13.00	H
9218.63	-50.99	2.10	11.60	-43.64	-13.00	H
9473.13	-51.20	2.10	11.60	-43.85	-13.00	V
9728.88	-51.00	2.20	11.20	-44.15	-13.00	H
9785.13	-51.40	2.30	11.20	-44.65	-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
2859.50	-50.97	1.00	10.70	-43.42	-13.00	V
3574.50	-51.92	1.10	12.20	-42.97	-13.00	V
9292.75	-50.22	2.00	11.60	-42.77	-13.00	H
9475.75	-51.53	2.10	11.60	-44.18	-13.00	V
9747.13	-51.07	2.20	11.20	-44.22	-13.00	H
9794.88	-50.86	2.30	11.20	-44.11	-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 13, 5 MHz, QPSK, Channel 23205**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain(dBi)	Peak ERP(dBm)	Limit(dBm)	Polarization
1566.50	-59.11	0.70	8.10	-53.86	-40.00	V
9094.50	-51.72	2.20	11.60	-44.47	-13.00	H
9296.25	-50.68	2.00	11.60	-43.23	-13.00	H
9471.63	-50.54	2.10	11.60	-43.19	-13.00	V
9749.38	-50.50	2.20	11.20	-43.65	-13.00	H
9785.13	-51.03	2.30	11.20	-44.28	-13.00	H

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

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain(dBi)	Peak ERP(dBm)	Limit(dBm)	Polarization
1574.50	-59.43	0.70	8.10	-54.18	-40.00	V
8371.88	-52.06	1.80	11.30	-44.71	-13.00	H
9302.38	-50.84	2.00	11.60	-43.39	-13.00	H
9473.13	-51.13	2.10	11.60	-43.78	-13.00	V
9743.75	-50.50	2.20	11.20	-43.65	-13.00	H
9788.13	-51.40	2.30	11.20	-44.65	-13.00	H

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

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain(dBi)	Peak ERP(dBm)	Limit(dBm)	Polarization
1565.50	-59.23	0.70	8.10	-53.98	-40.00	V
9102.88	-51.68	2.20	11.60	-44.43	-13.00	H
9221.13	-50.67	2.10	11.60	-43.32	-13.00	H
9475.63	-51.31	2.10	11.60	-43.96	-13.00	V
9719.25	-51.03	2.20	11.20	-44.18	-13.00	H
9810.13	-51.10	2.30	11.20	-44.35	-13.00	H





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

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain(dBi)	Peak ERP(dBm)	Limit(dBm)	Polarization
1565.00	-58.34	0.70	8.10	-53.09	-40.00	H
9098.50	-51.77	2.20	11.60	-44.52	-13.00	H
9301.50	-50.57	2.00	11.60	-43.12	-13.00	H
9470.25	-50.46	2.10	11.60	-43.11	-13.00	V
9730.25	-51.08	2.20	11.20	-44.23	-13.00	H
9797.00	-51.07	2.30	11.20	-44.32	-13.00	H

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

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain(dBi)	Peak ERP(dBm)	Limit(dBm)	Polarization
1571.50	-58.73	0.70	8.10	-53.48	-40.00	H
8455.13	-51.88	1.80	11.30	-44.53	-13.00	H
9297.50	-50.74	2.00	11.60	-43.29	-13.00	H
9471.00	-51.20	2.10	11.60	-43.85	-13.00	V
9715.00	-50.95	2.20	11.20	-44.10	-13.00	H
9807.38	-51.33	2.30	11.20	-44.58	-13.00	H

**LTE Band 13, 5 MHz, 16QAM, Channel 23255**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain(dBi)	Peak ERP(dBm)	Limit(dBm)	Polarization
1563.50	-59.41	0.70	8.10	-54.16	-40.00	V
9099.88	-51.95	2.20	11.60	-44.70	-13.00	H
9301.88	-51.04	2.00	11.60	-43.59	-13.00	H
9474.38	-50.97	2.10	11.60	-43.62	-13.00	V
9736.00	-51.17	2.20	11.20	-44.32	-13.00	H
9790.00	-51.19	2.30	11.20	-44.44	-13.00	H

Note: The maximum value of expanded measurement uncertainty for this test item is  $U = 2.87\text{dB}(30\text{MHz}-3\text{GHz})/3.35\text{dB}(3\text{GHz}-18\text{GHz})/2.68\text{dB}(18\text{GHz}-40\text{GHz})$ ,  $k = 2$

**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
16988.13	-45.68	2.90	16.50	-32.08	-13.00	H
17214.38	-44.18	2.90	14.50	-32.58	-13.00	H
17505.63	-40.68	2.90	12.80	-30.78	-13.00	H
17575.00	-40.19	3.30	12.80	-30.69	-13.00	H
17838.75	-40.23	3.60	12.80	-31.03	-13.00	H
17941.88	-38.13	3.20	12.80	-28.53	-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
16983.75	-45.79	2.90	16.50	-32.19	-13.00	H
17170.63	-44.30	2.90	14.50	-32.70	-13.00	H
17521.88	-40.69	2.90	12.80	-30.79	-13.00	H
17578.13	-40.50	3.30	12.80	-31.00	-13.00	H
17808.75	-40.53	3.60	12.80	-31.33	-13.00	H
17983.13	-38.40	3.20	12.80	-28.80	-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
16950.63	-45.79	2.90	16.50	-32.19	-13.00	H
17257.50	-43.62	3.20	14.50	-32.32	-13.00	H
17491.88	-42.59	2.90	14.50	-30.99	-13.00	H
17611.88	-39.96	3.30	12.80	-30.46	-13.00	H
17840.00	-40.52	3.60	12.80	-31.32	-13.00	H
17920.00	-38.60	3.20	12.80	-29.00	-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
16934.38	-45.79	2.90	16.50	-32.19	-13.00	H
17283.75	-43.56	3.20	14.50	-32.26	-13.00	H
17502.50	-40.48	2.90	12.80	-30.58	-13.00	H
17543.75	-40.13	2.90	12.80	-30.23	-13.00	H
17690.63	-40.78	3.30	12.80	-31.28	-13.00	H
17976.25	-39.08	3.20	12.80	-29.48	-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
16934.38	-45.90	2.90	16.50	-32.30	-13.00	H
17285.00	-43.65	3.20	14.50	-32.35	-13.00	H
17400.63	-42.45	2.90	14.50	-30.85	-13.00	H
17576.88	-40.22	3.30	12.80	-30.72	-13.00	H
17772.50	-40.61	3.60	12.80	-31.41	-13.00	H
17928.75	-37.84	3.20	12.80	-28.24	-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
16946.88	-45.45	2.90	16.50	-31.85	-13.00	H
17367.50	-43.56	3.20	14.50	-32.26	-13.00	H
17518.75	-40.65	2.90	12.80	-30.75	-13.00	H
17530.63	-40.55	2.90	12.80	-30.65	-13.00	H
17821.88	-40.33	3.60	12.80	-31.13	-13.00	H
17998.75	-38.10	3.20	12.80	-28.50	-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 -10°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 -10°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 -10°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 3.60V and 4.35V, with a nominal voltage of 3.80V. 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 -5.56% and +12.6 %. For the purposes of measuring frequency stability these voltage limits are to be used.

### A.3.3 Measurement results

#### LTE Band 2, 3MHz bandwidth (worst case of all bandwidths)

##### Frequency Error vs Voltage

Voltage (V)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
3.60	19	-13	0.010	0.007
3.80	14	-13	0.008	0.007
4.35	18	28	0.009	0.015

##### Frequency Error vs Temperature

Temperature (°C)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
-10	-10	25	0.005	0.013
0	13	-8	0.007	0.004
10	-8	-16	0.004	0.008
20	-9	9	0.005	0.005
30	29	-5	0.015	0.003
40	-14	12	0.008	0.006
50	-4	-14	0.002	0.007

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

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

##### Frequency Error vs Voltage

Voltage (V)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
3.60	-6	6	0.007	0.007
3.80	-16	-17	0.019	0.021
4.35	19	16	0.023	0.019

##### Frequency Error vs Temperature

Temperature (°C)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
-10	26	30	0.032	0.035
0	8	22	0.010	0.026
10	-8	1	0.010	0.002
20	-18	6	0.021	0.008
30	-19	13	0.023	0.015
40	-3	11	0.004	0.013
50	18	4	0.022	0.005

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
3.60	-10	5	0.004	0.002
3.80	12	1	0.005	0.001
4.35	15	7	0.006	0.003

**Frequency Error vs Temperature**

Temperature (°C)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
-10	28	-15	0.011	0.006
0	18	5	0.007	0.002
10	5	-18	0.002	0.007
20	12	19	0.005	0.007
30	26	-10	0.010	0.004
40	-14	9	0.006	0.004
50	17	-2	0.007	0.001

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

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

**Frequency Error vs Voltage**

Voltage (V)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
3.60	-17	-10	0.024	0.014
3.80	16	-15	0.022	0.021
4.35	30	23	0.042	0.033

**Frequency Error vs Temperature**

Temperature (°C)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
-10	-14	12	0.019	0.017
0	25	21	0.035	0.030
10	-18	-16	0.026	0.023
20	-14	-19	0.020	0.027
30	10	4	0.014	0.005
40	7	0	0.010	0.000
50	2	27	0.002	0.038

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



**LTE Band 13, 5MHz bandwidth (worst case of all bandwidths)**

**Frequency Error vs Voltage**

Voltage (V)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
3.60	21	1	0.027	0.001
3.80	-14	-19	0.018	0.025
4.35	-12	0	0.015	0.000

**Frequency Error vs Temperature**

Temperature (°C)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
-10	26	18	0.034	0.022
0	14	3	0.017	0.004
10	4	-17	0.005	0.022
20	-12	6	0.015	0.008
30	-18	4	0.023	0.005
40	-6	-5	0.007	0.006
50	-17	-13	0.022	0.016

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
3.60	-4	12	0.003	0.007
3.80	-10	19	0.005	0.011
4.35	7	-13	0.004	0.007

**Frequency Error vs Temperature**

Temperature (°C)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
-10	-8	8	0.005	0.005
0	1	5	0.001	0.003
10	13	-9	0.007	0.005
20	10	14	0.006	0.008
30	-2	-3	0.001	0.002
40	11	-6	0.006	0.004
50	24	10	0.014	0.006

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

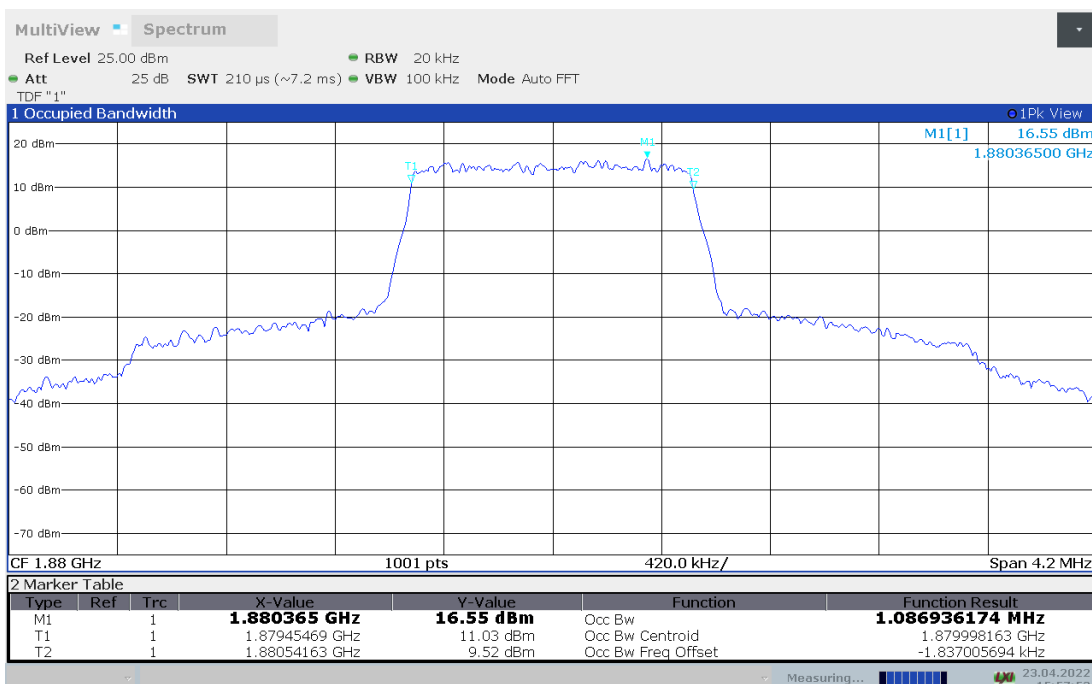
Occupied bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequencies of the US Cellular/PCS frequency bands. The table below lists the measured 99% BW. Spectrum analyzer plots are included on the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

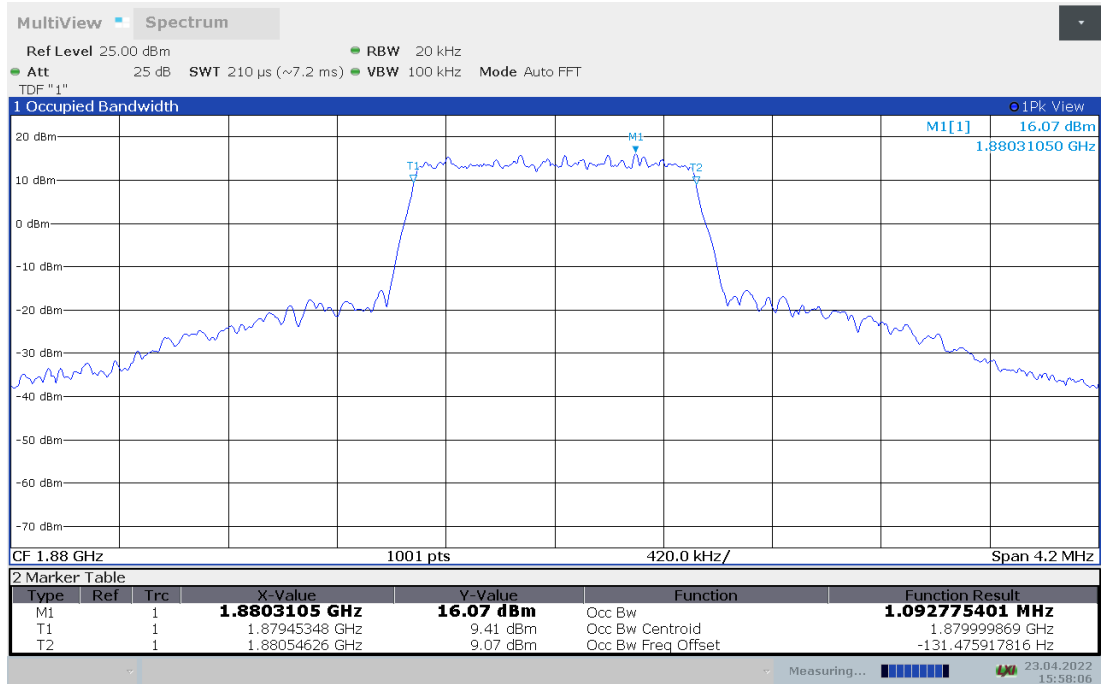
Frequency (MHz)	Occupied Bandwidth (99%)(MHz)	
	QPSK	16QAM
1880	1.087	1.093

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





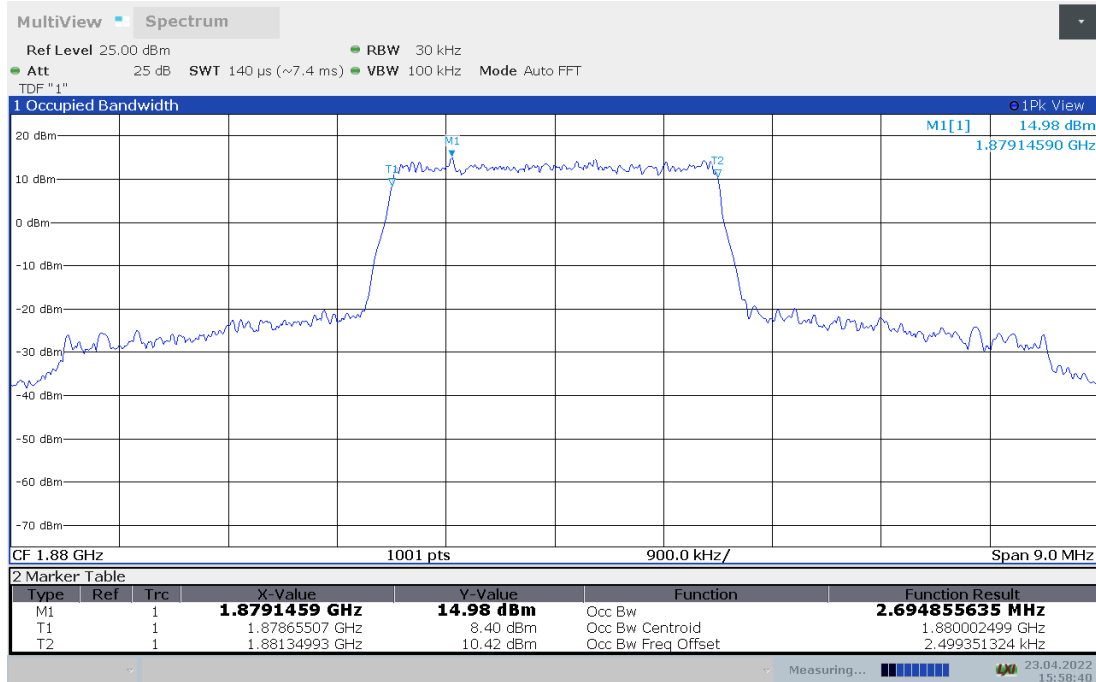
**LTE band 2 , 1.4MHz Bandwidth,16QAM (99% BW)**



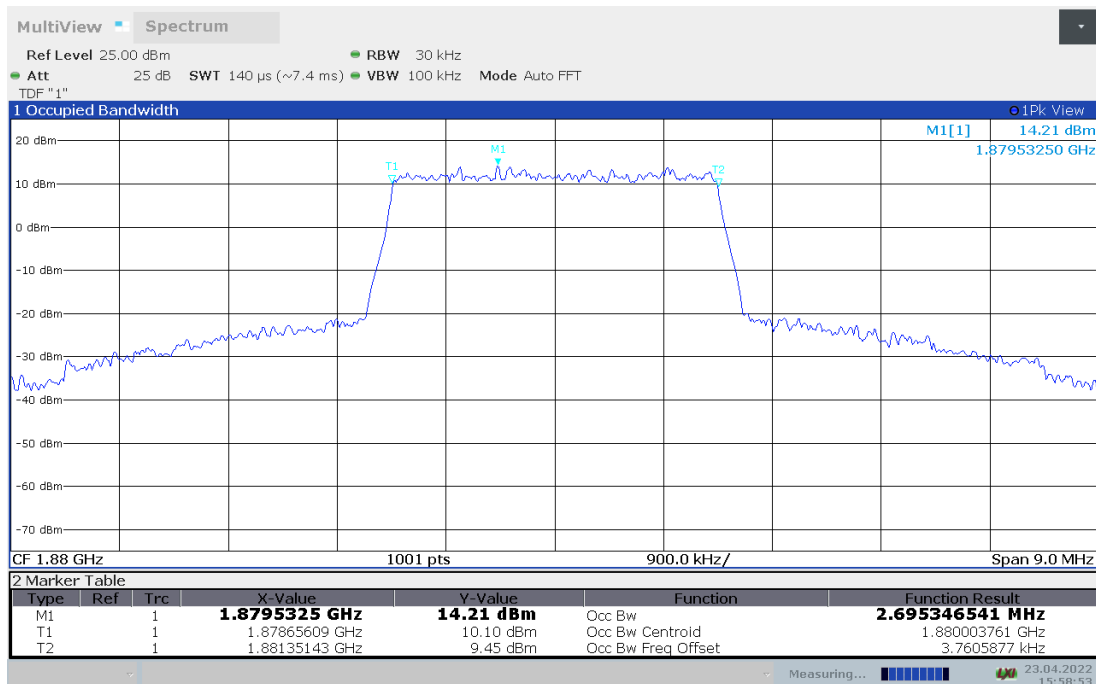
**LTE band 2, 3MHz (99% BW)**

Frequency (MHz)	Occupied Bandwidth (99%)(MHz)	
	QPSK	16QAM
1880	2.695	2.695

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



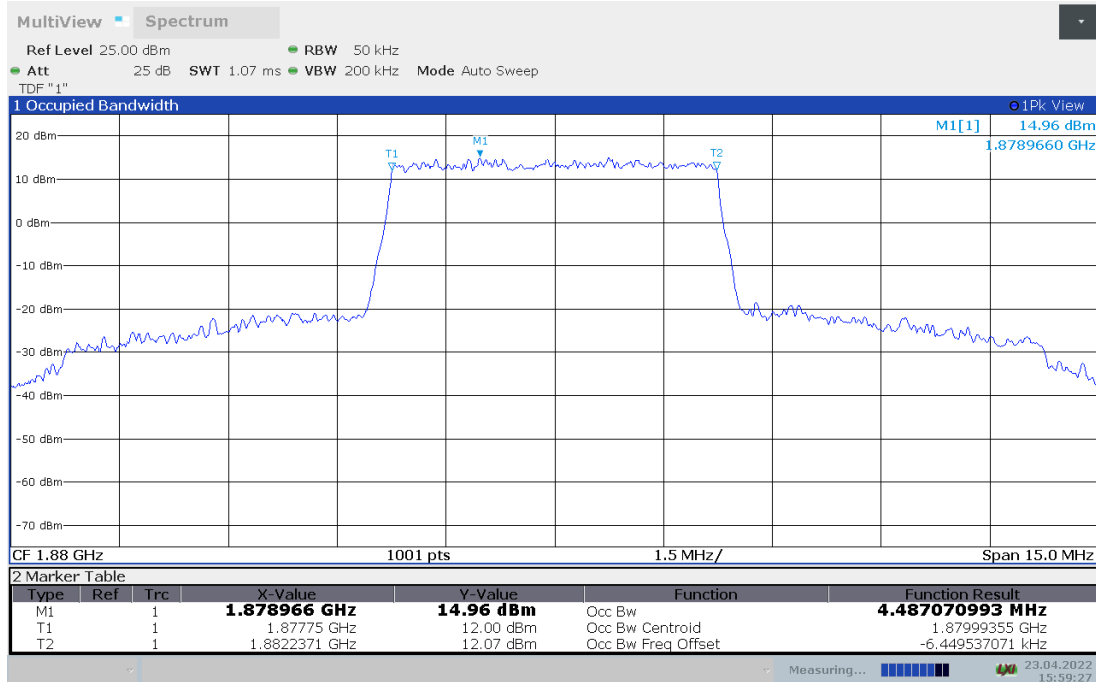
**LTE band 2 , 3MHz Bandwidth,16QAM (99% BW)**



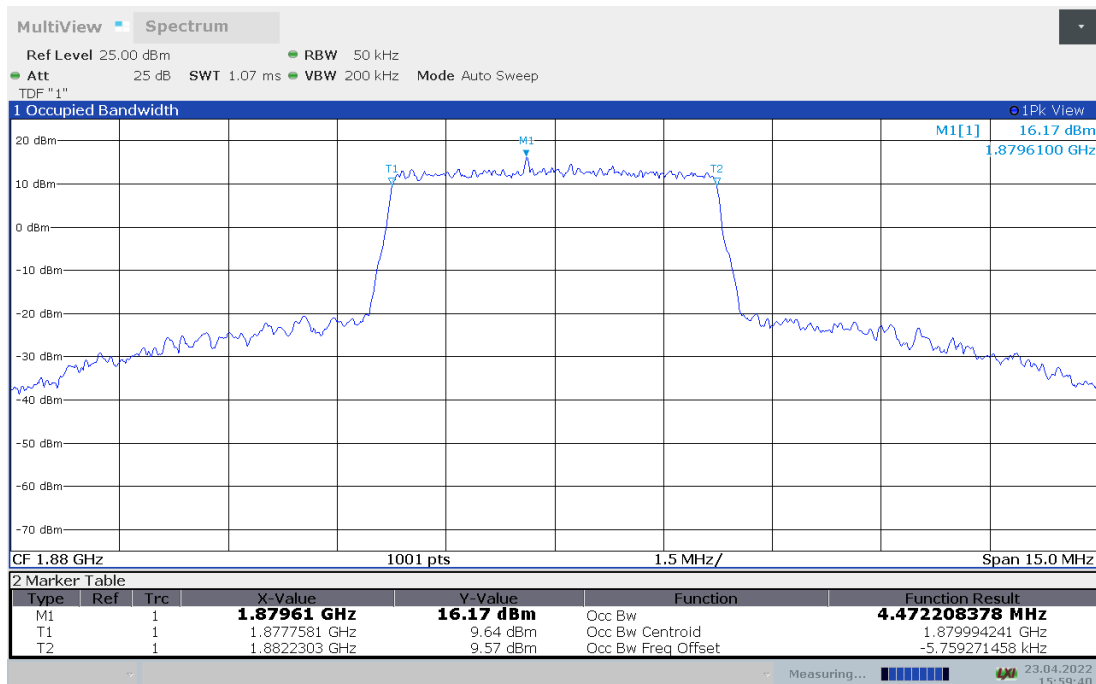
**LTE band 2, 5MHz (99% BW)**

Frequency (MHz)	Occupied Bandwidth (99%)(MHz)	
	QPSK	16QAM
1880	4.487	4.472

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



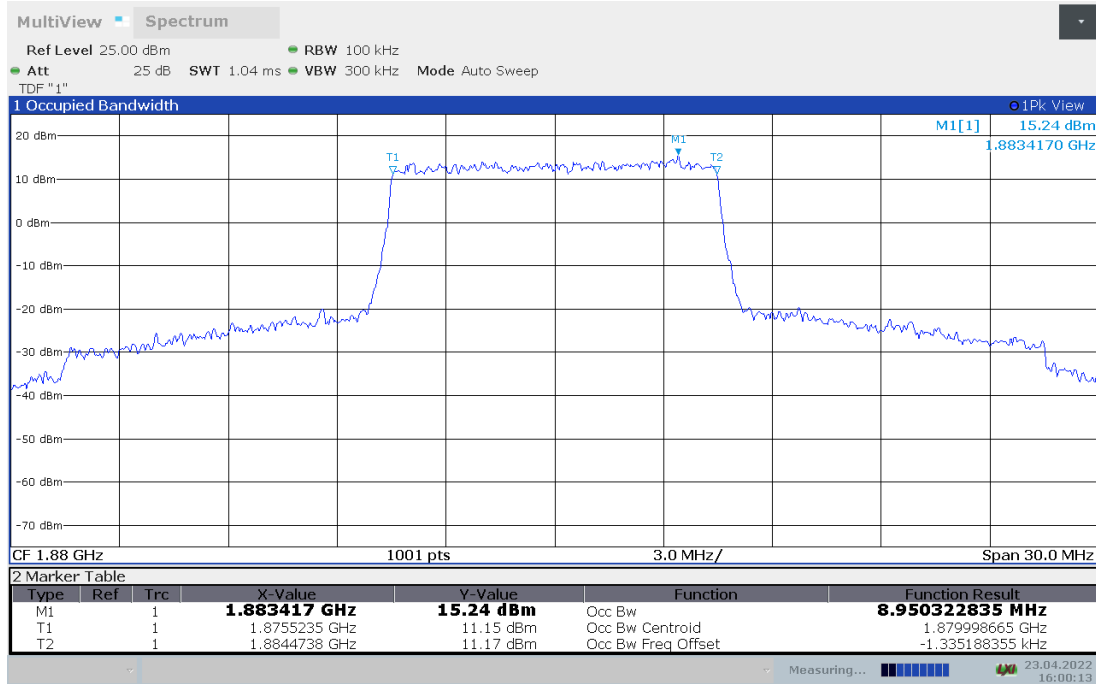
**LTE band 2 , 5MHz Bandwidth,16QAM (99% BW)**



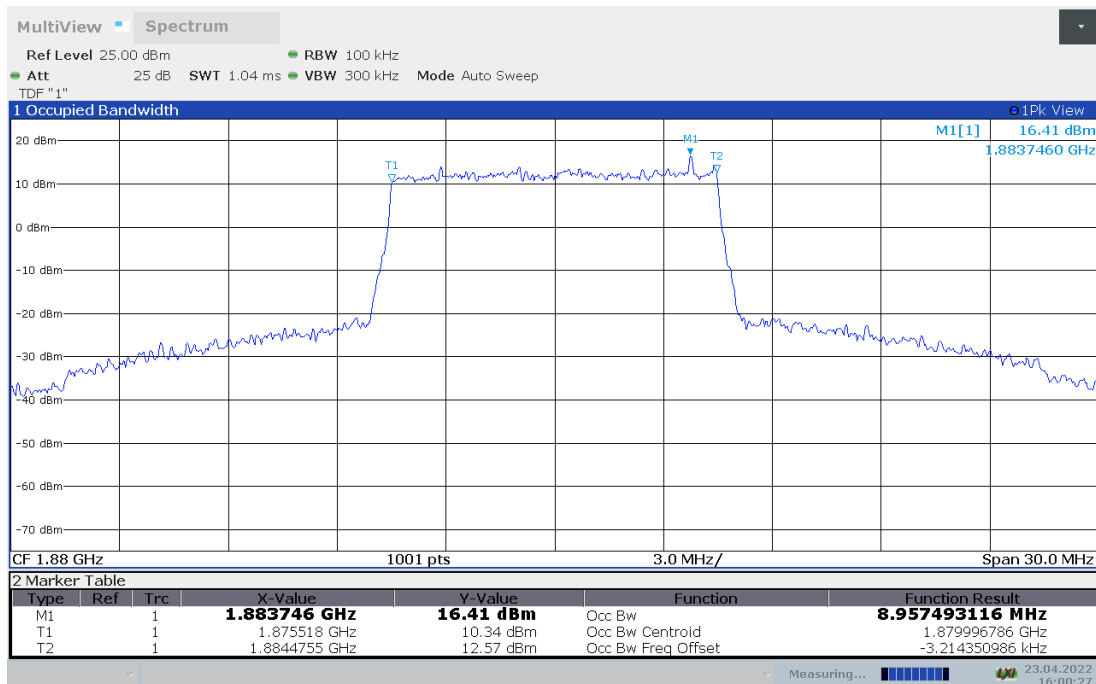
**LTE band 2, 10MHz (99% BW)**

Frequency (MHz)	Occupied Bandwidth (99%)(MHz)	
	QPSK	16QAM
1880	8.950	8.957

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



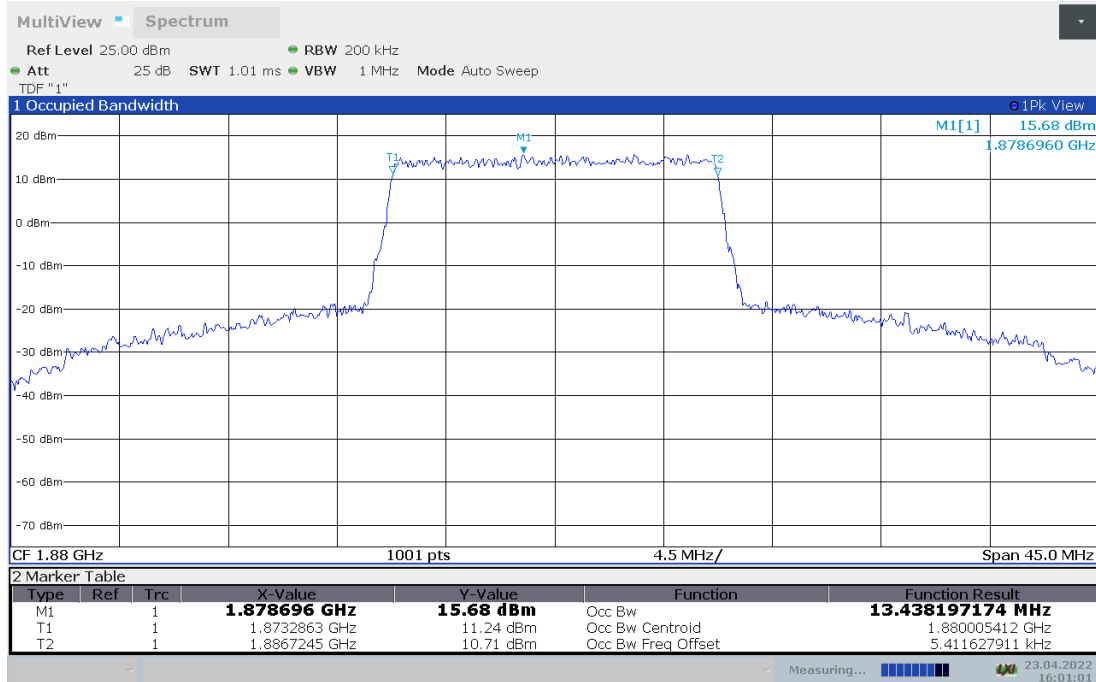
**LTE band 2 , 10MHz Bandwidth,16QAM (99% BW)**



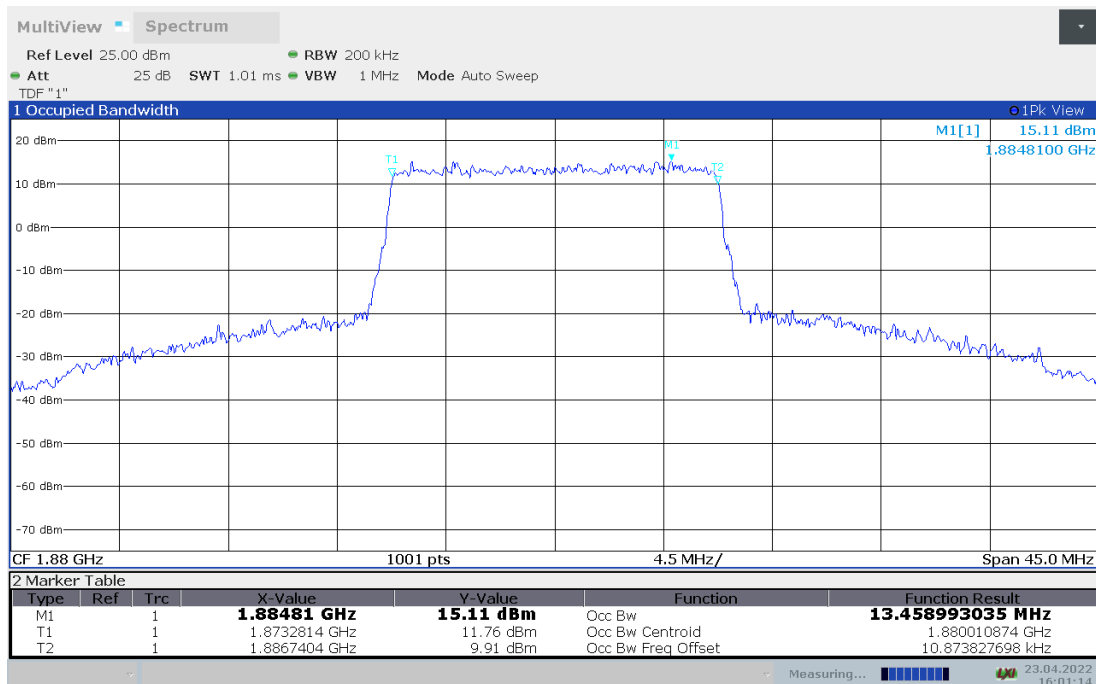
**LTE band 2, 15MHz (99% BW)**

Frequency (MHz)	Occupied Bandwidth (99%)(MHz)	
	QPSK	16QAM
1880	13.438	13.459

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



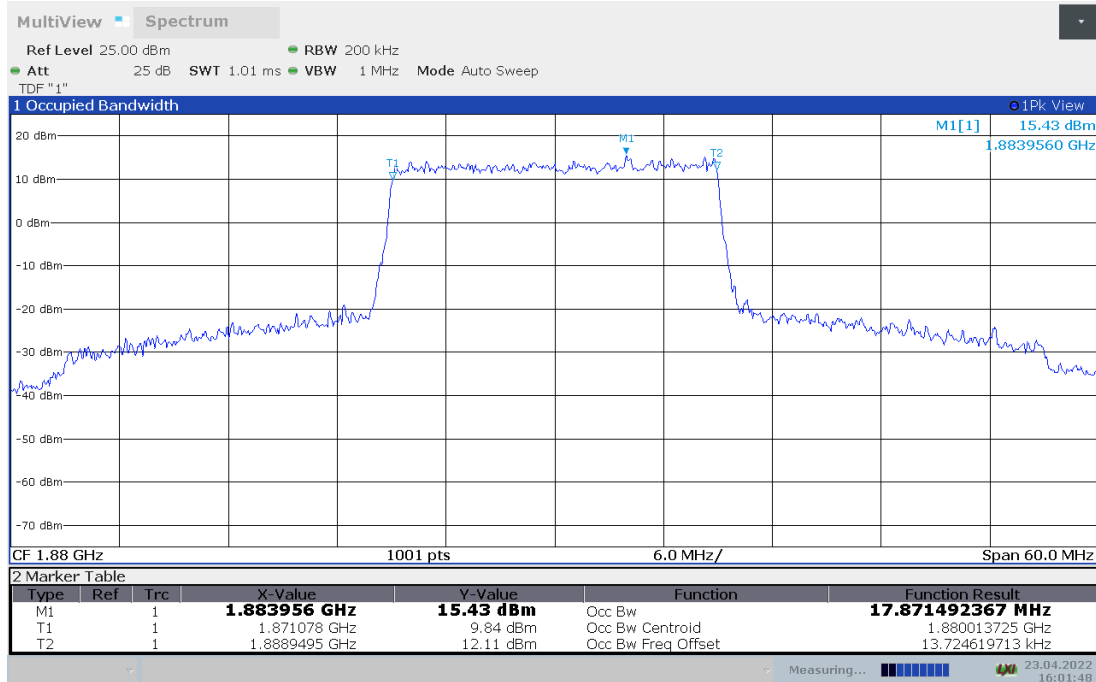
**LTE band 2 , 15MHz Bandwidth,16QAM (99% BW)**



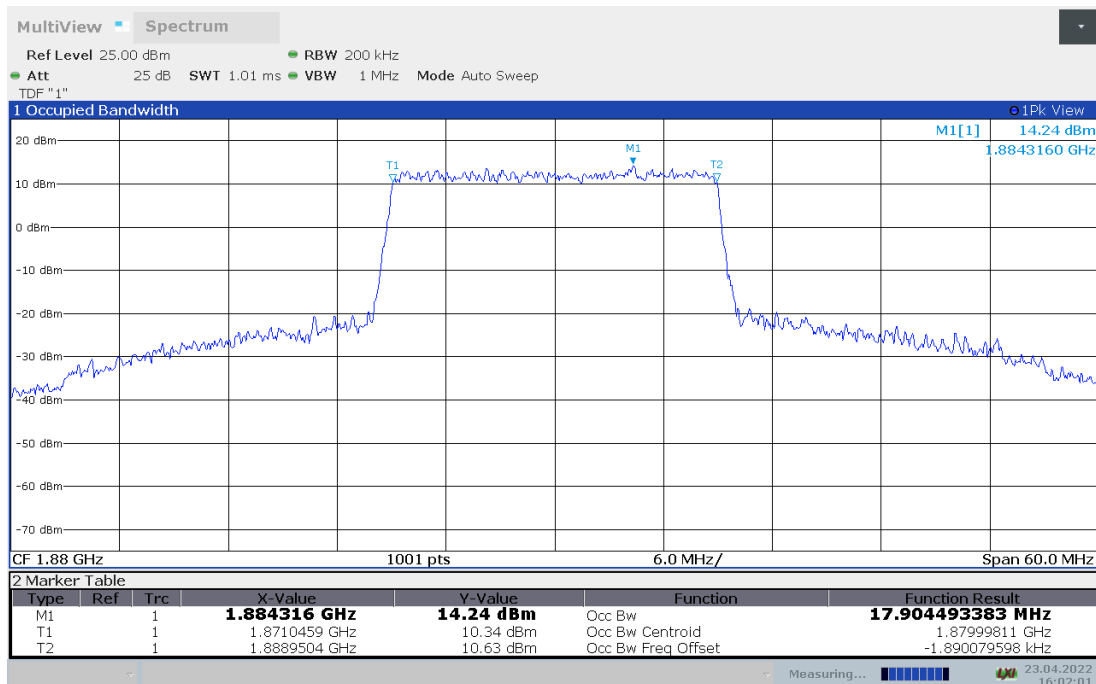
**LTE band 2, 20MHz (99% BW)**

Frequency (MHz)	Occupied Bandwidth (99%)(MHz)	
	QPSK	16QAM
1880	17.871	17.904

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



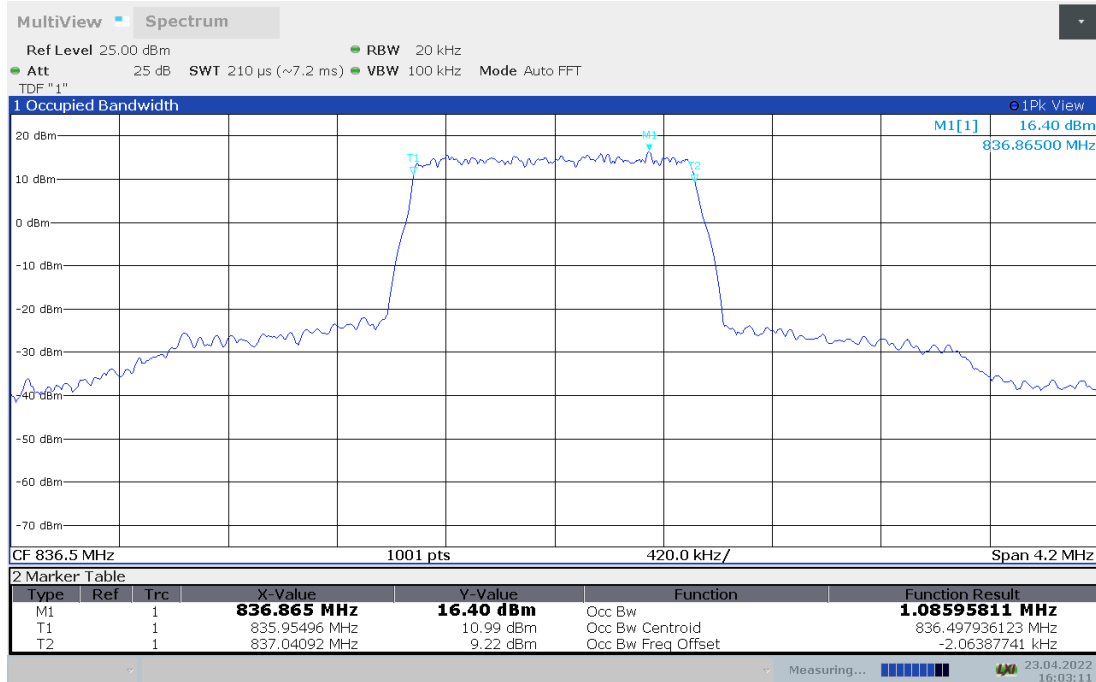
**LTE band 2 , 20MHz Bandwidth,16QAM (99% BW)**



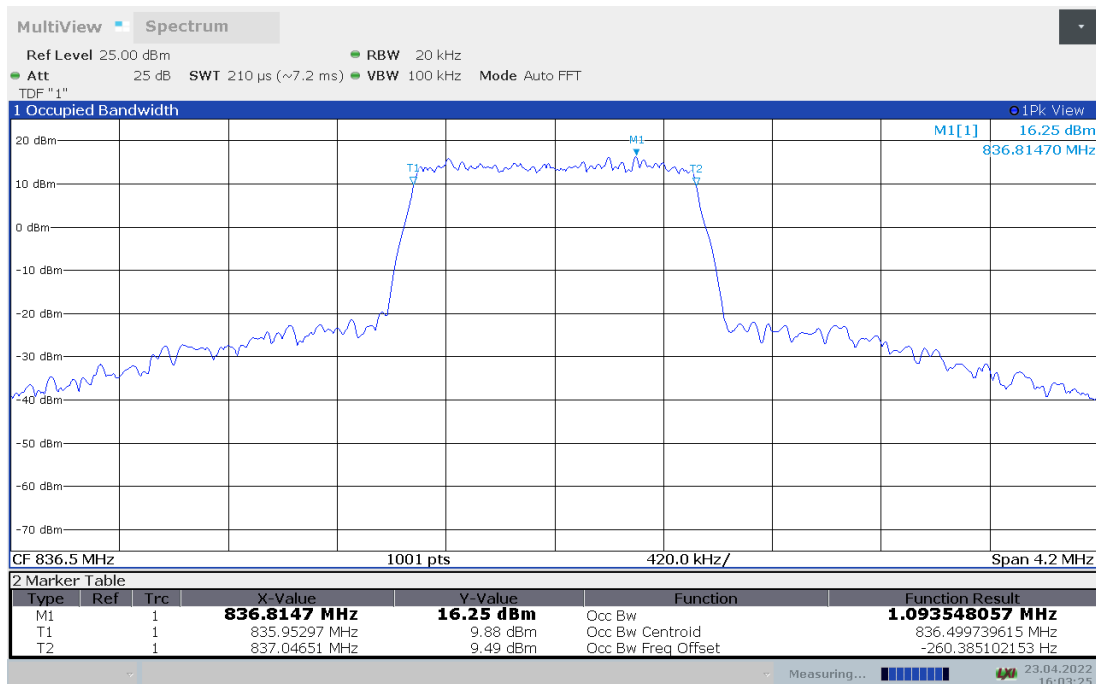
**LTE band 5, 1.4MHz (99% BW)**

Frequency (MHz)	Occupied Bandwidth (99%)(MHz)	
	QPSK	16QAM
836.5	1.086	1.094

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



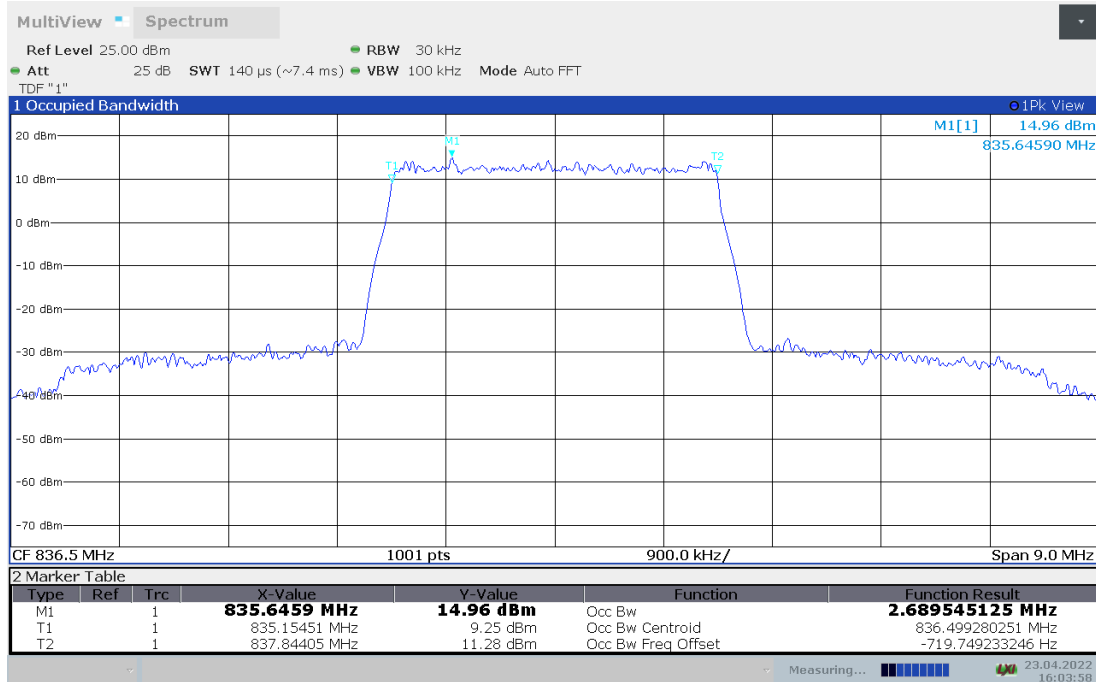
**LTE band 5 , 1.4MHz Bandwidth,16QAM (99% BW)**



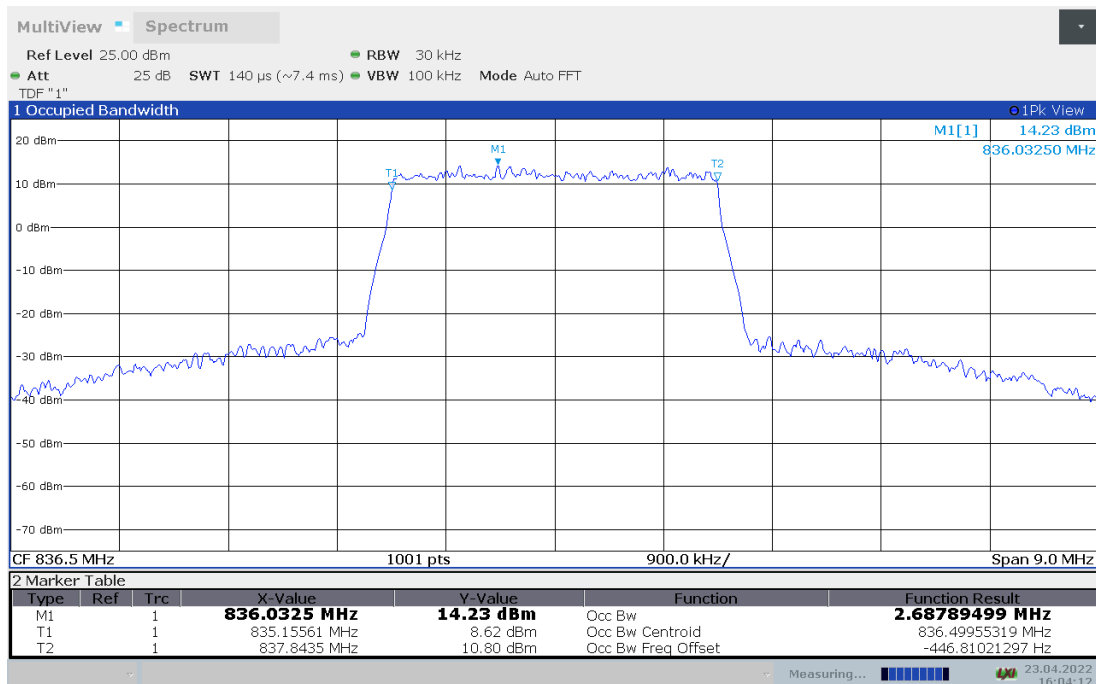
**LTE band 5, 3MHz (99% BW)**

Frequency (MHz)	Occupied Bandwidth (99%)(MHz)	
	QPSK	16QAM
836.5	2.690	2.688

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



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

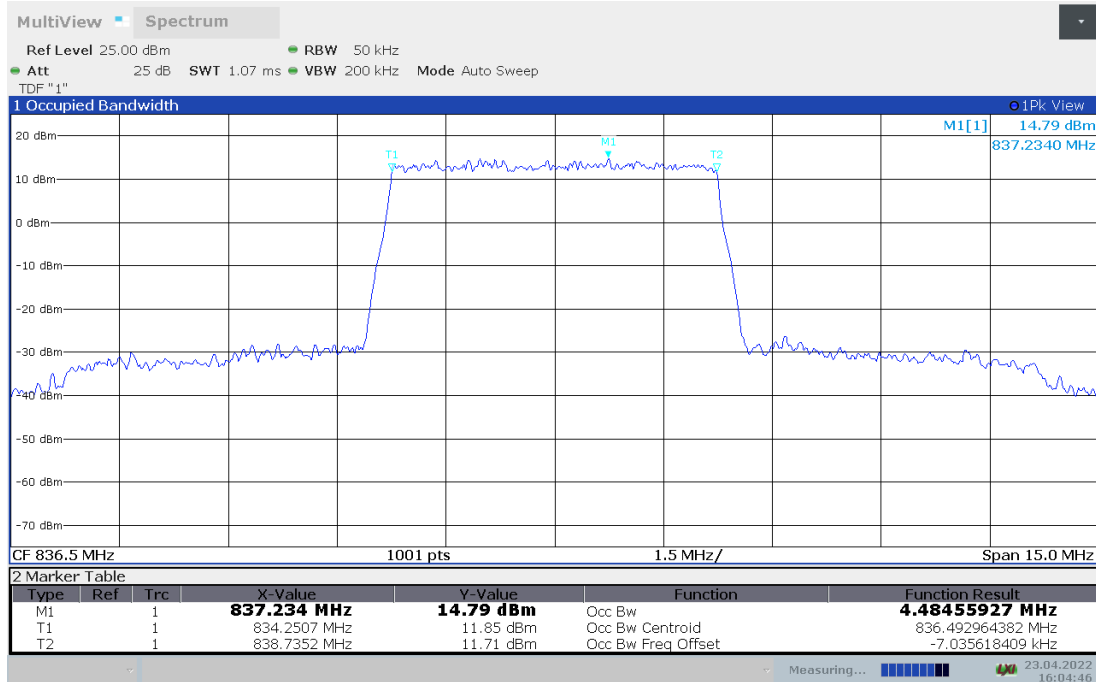




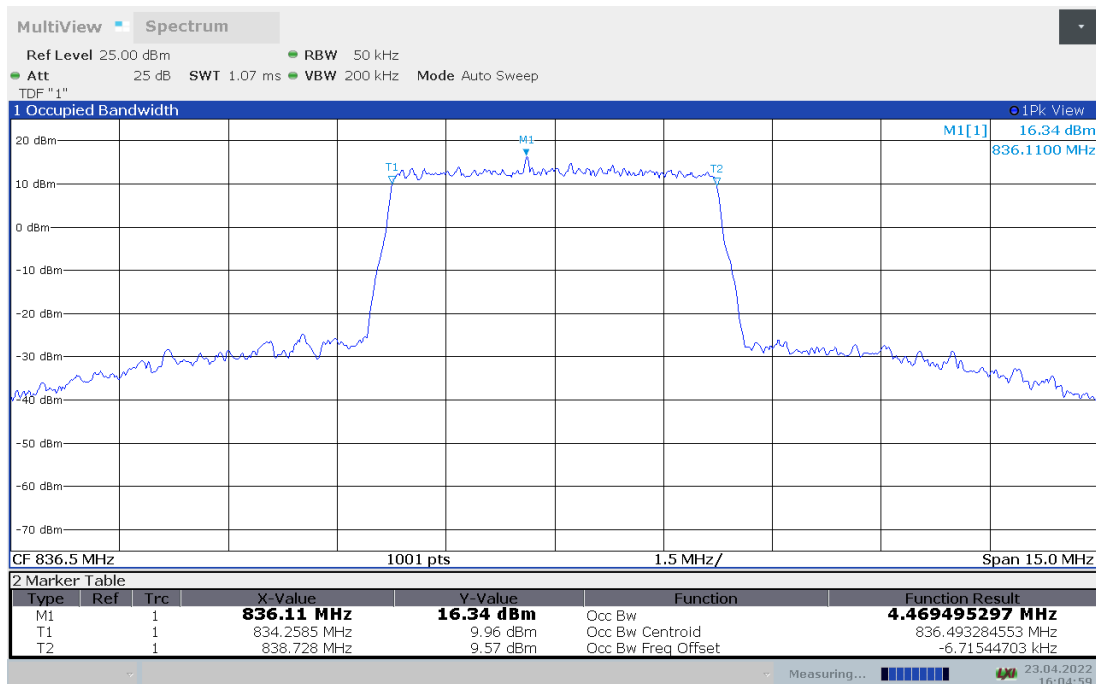
**LTE band 5, 5MHz (99% BW)**

Frequency (MHz)	Occupied Bandwidth (99%)(MHz)	
	QPSK	16QAM
836.5	4.485	4.469

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



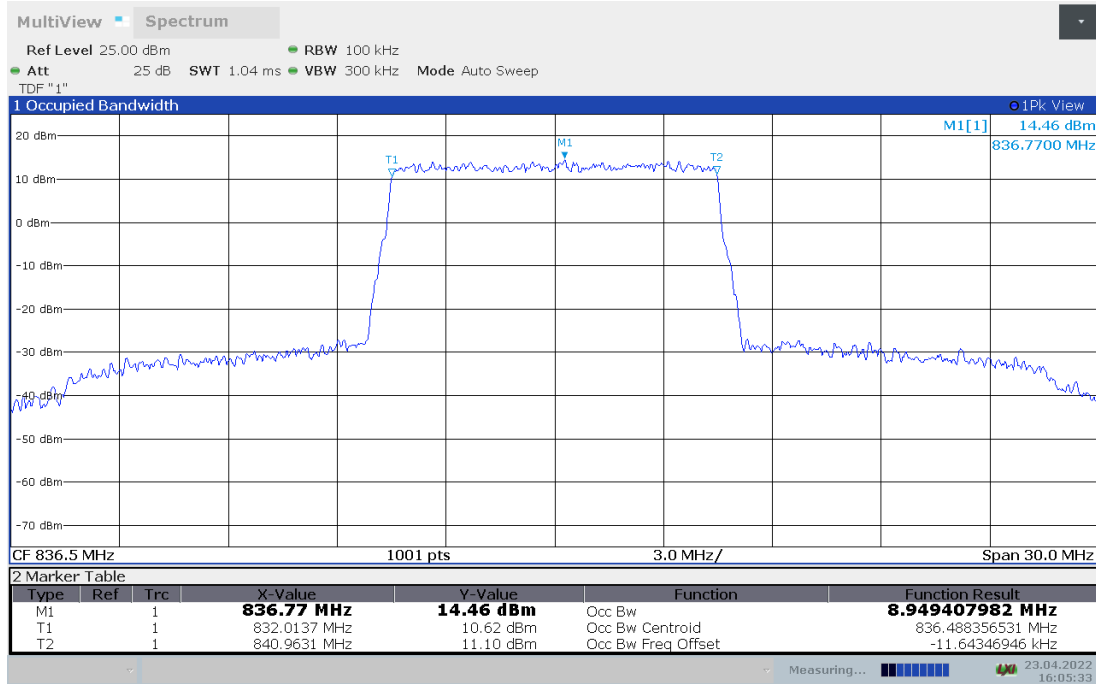
**LTE band 5 , 5MHz Bandwidth,16QAM (99% BW)**



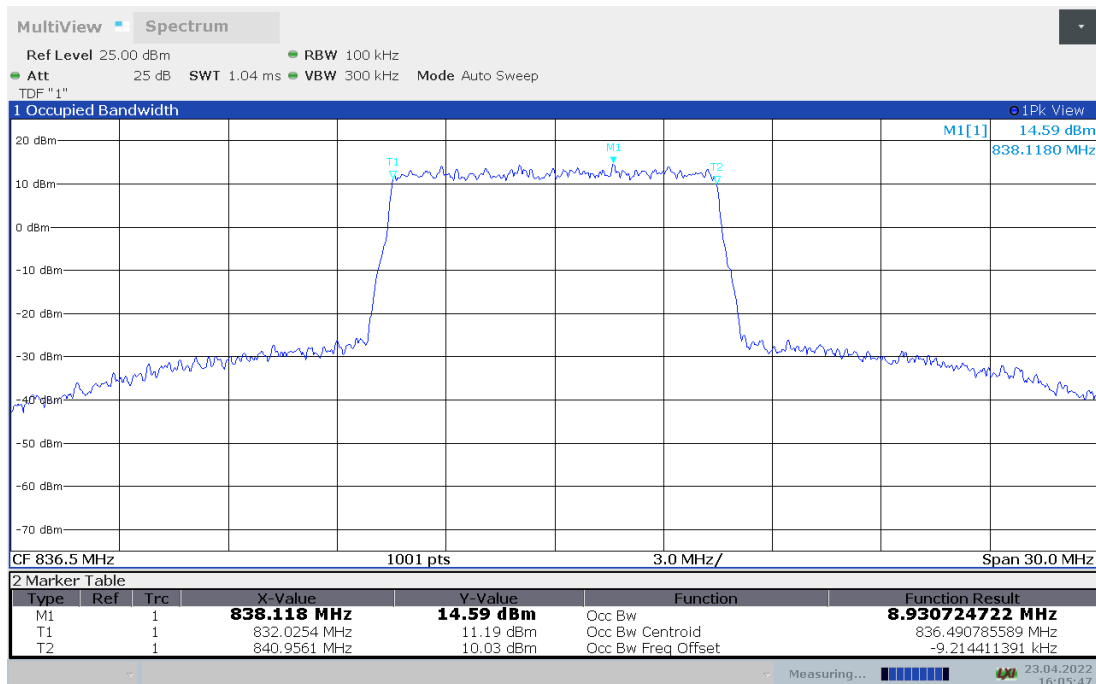
**LTE band 5, 10MHz (99% BW)**

Frequency (MHz)	Occupied Bandwidth (99%)(MHz)	
	QPSK	16QAM
836.5	8.949	8.931

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



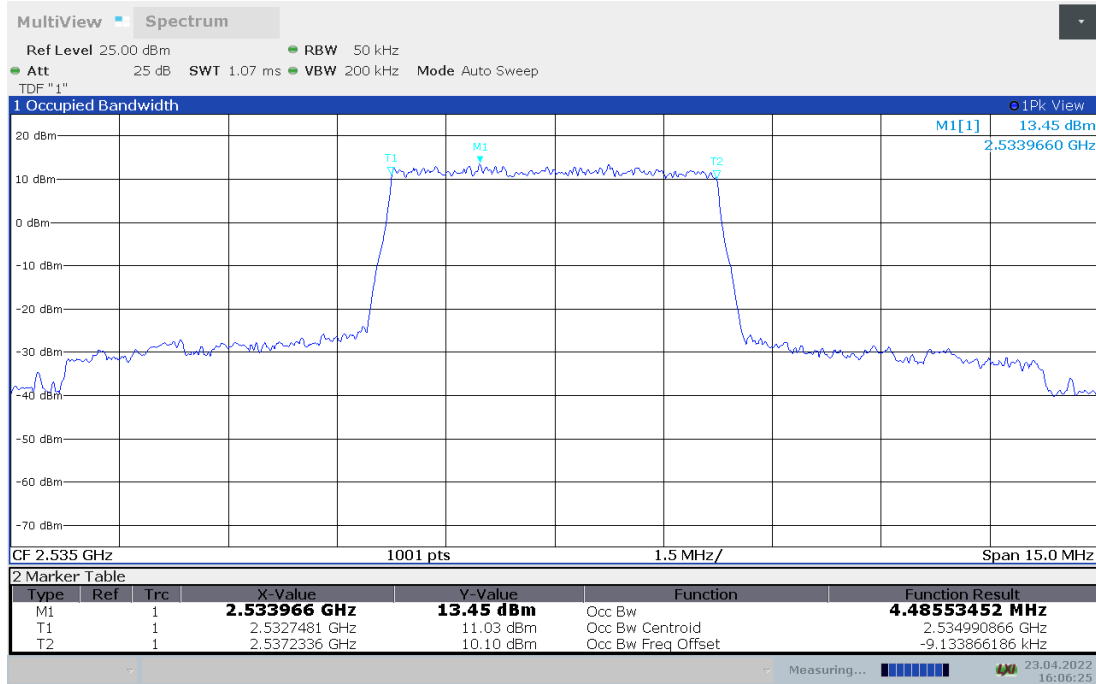
**LTE band 5 , 10MHz Bandwidth,16QAM (99% BW)**



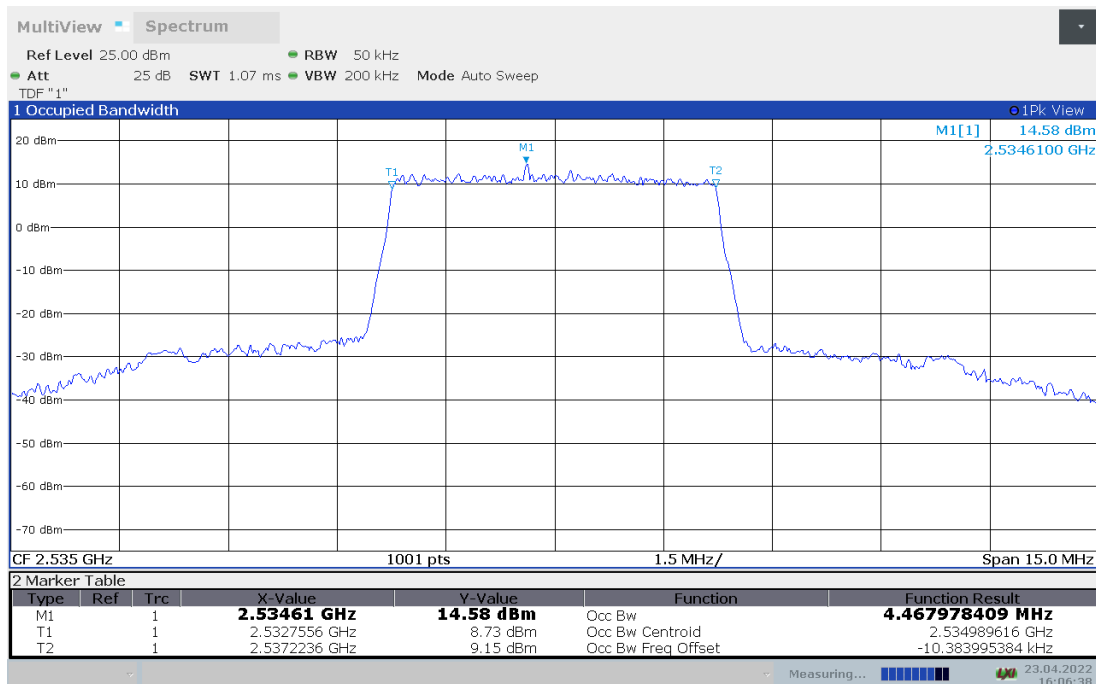
**LTE band 7, 5MHz (99% BW)**

Frequency (MHz)	Occupied Bandwidth (99%)(MHz)	
	QPSK	16QAM
2535	4.486	4.468

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



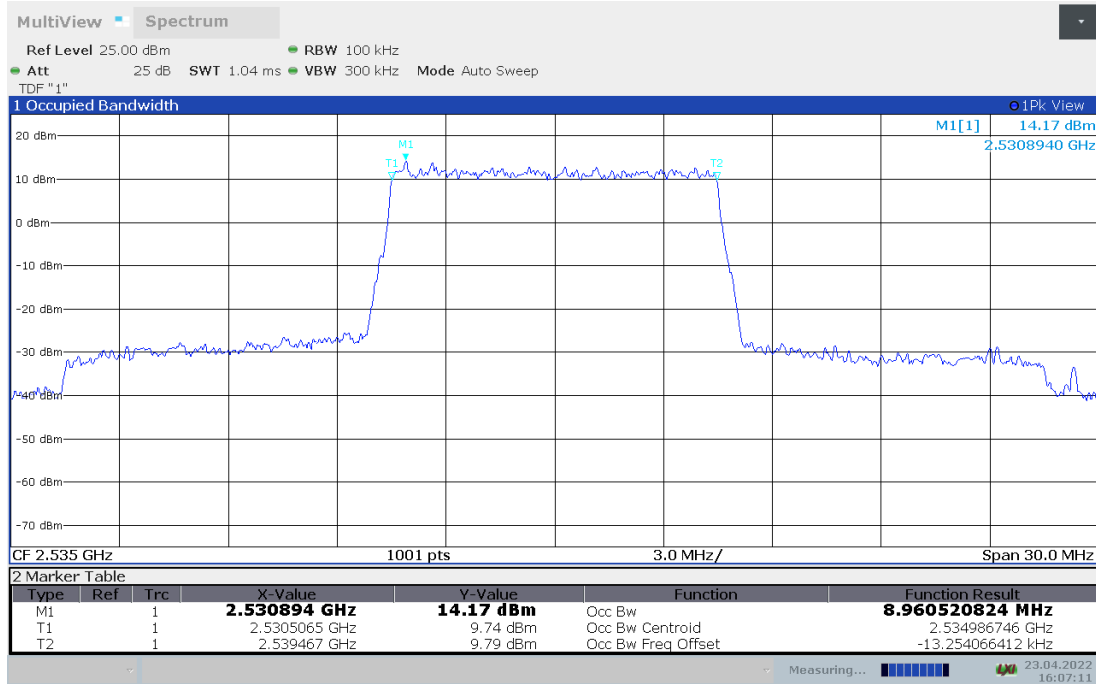
**LTE band 7 , 5MHz Bandwidth,16QAM (99% BW)**



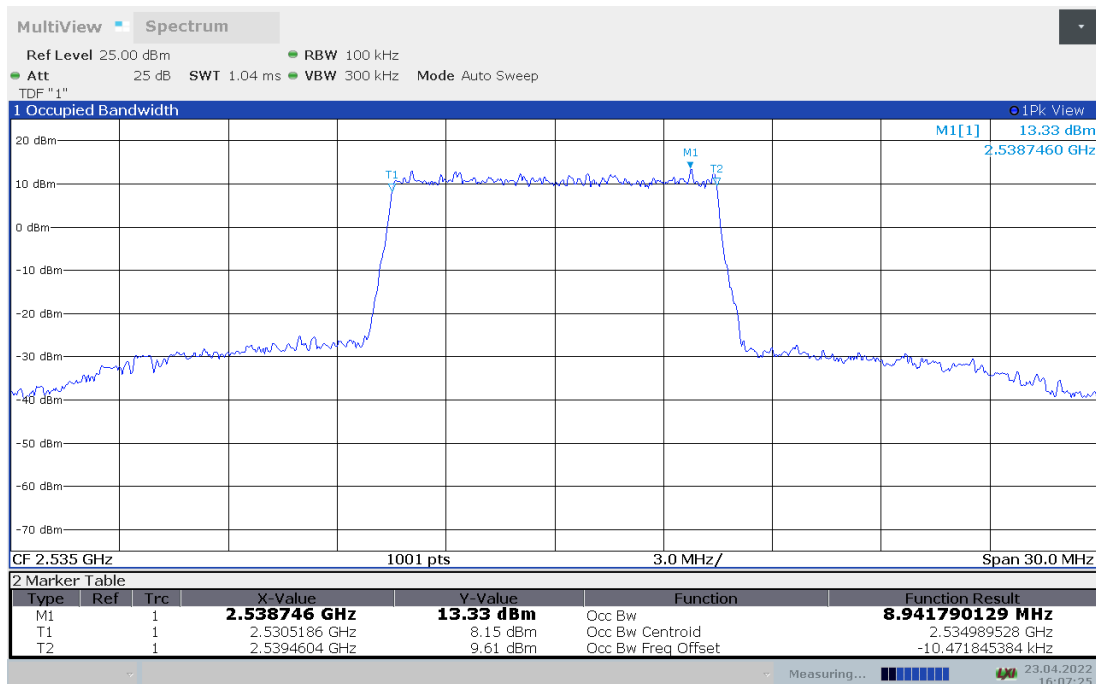
**LTE band 7, 10MHz (99% BW)**

Frequency (MHz)	Occupied Bandwidth (99%)(MHz)	
	QPSK	16QAM
2535	8.961	8.942

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



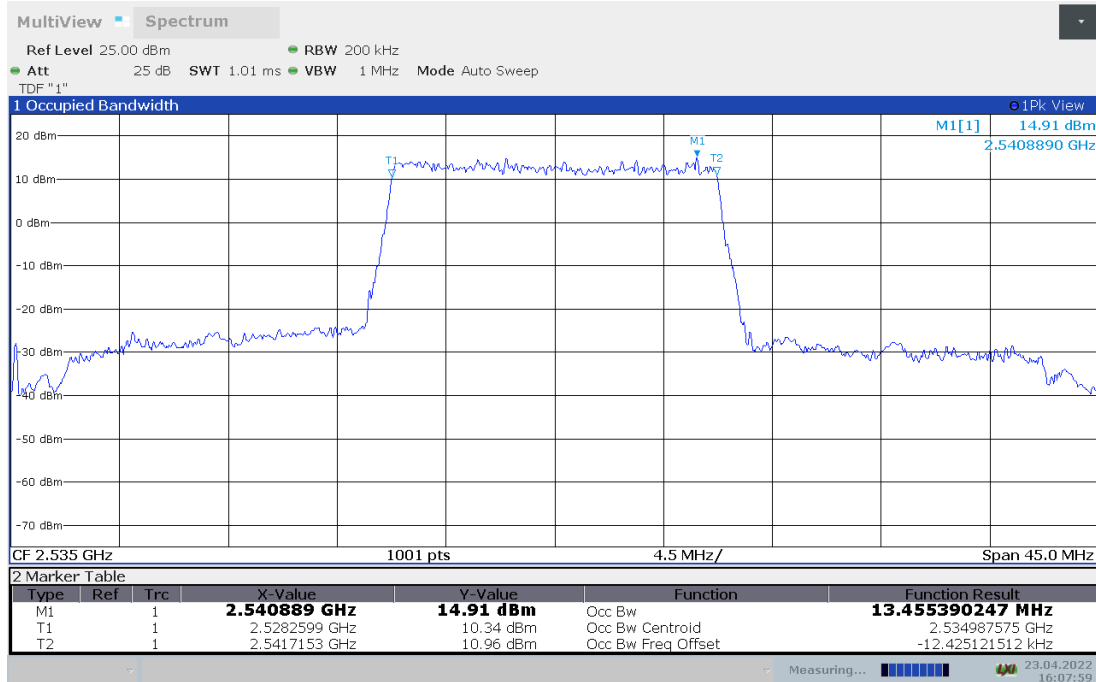
**LTE band 7 , 10MHz Bandwidth,16QAM (99% BW)**



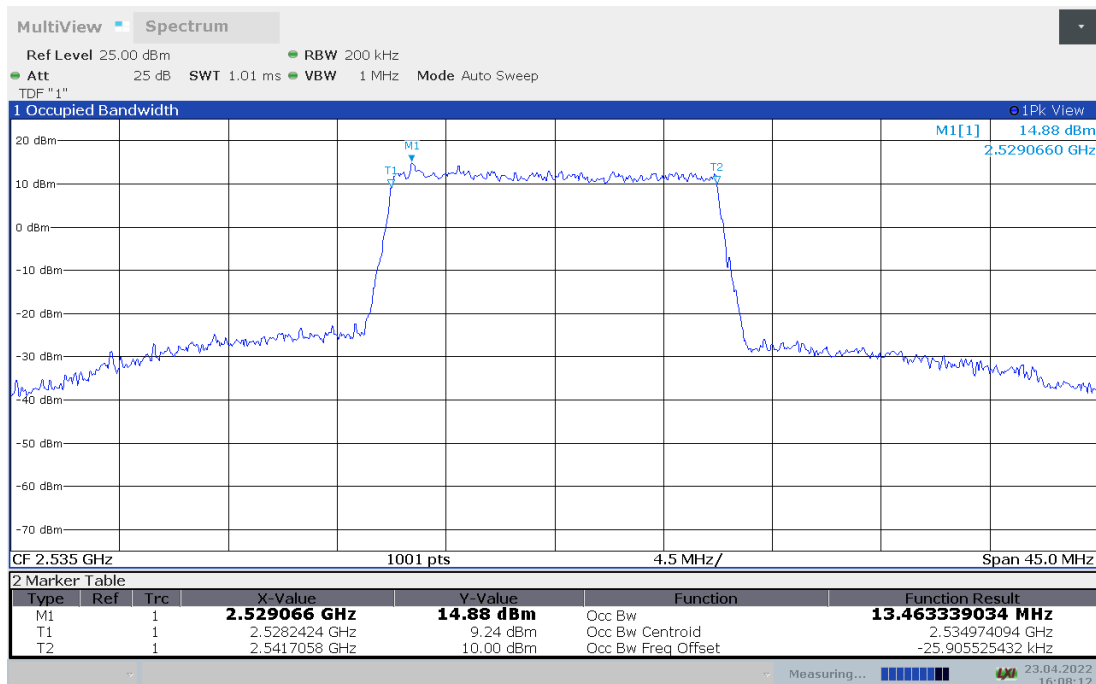
**LTE band 7, 15MHz (99% BW)**

Frequency (MHz)	Occupied Bandwidth (99%)(MHz)	
	QPSK	16QAM
2535	13.455	13.463

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



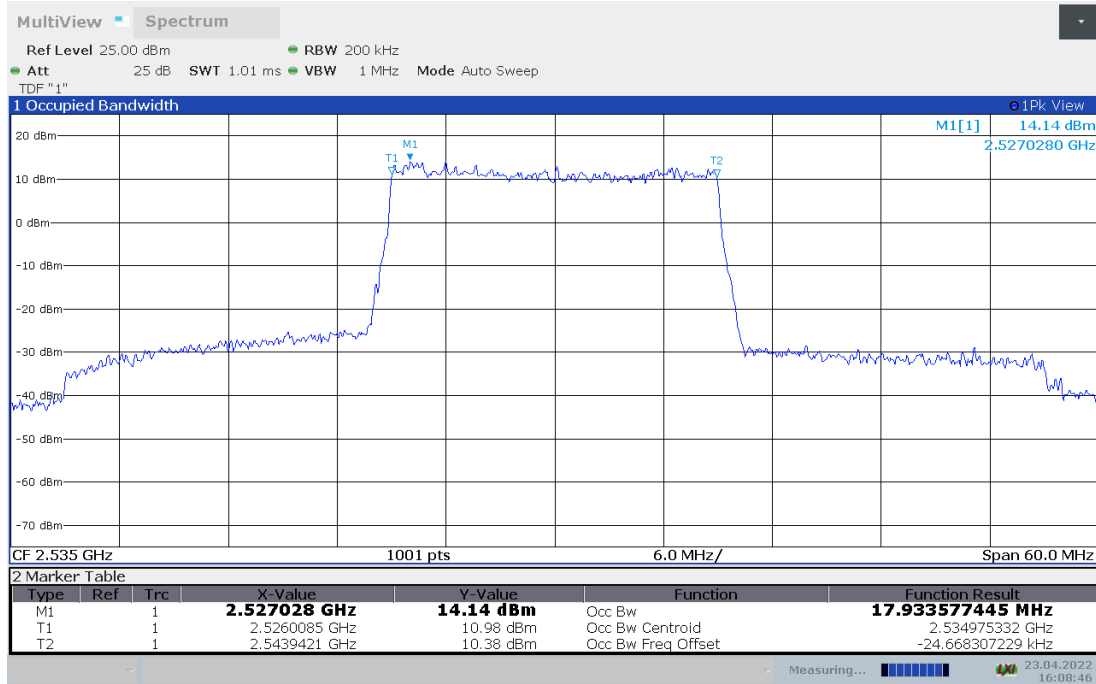
**LTE band 7 , 15MHz Bandwidth,16QAM (99% BW)**



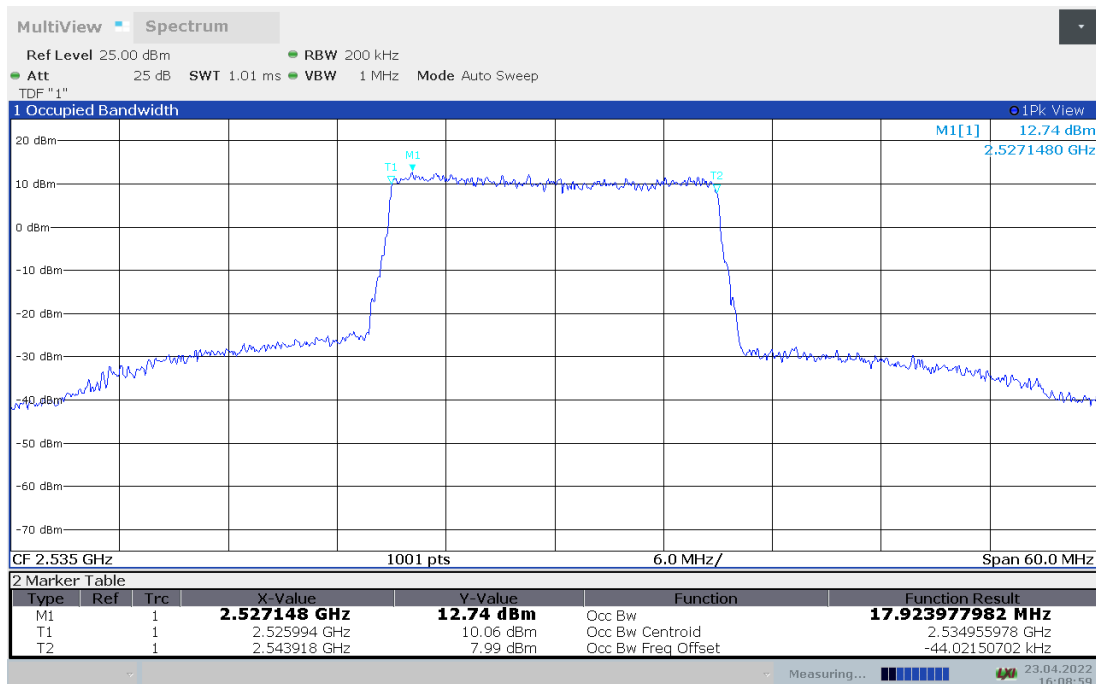
**LTE band 7, 20MHz (99% BW)**

Frequency (MHz)	Occupied Bandwidth (99%)(MHz)	
	QPSK	16QAM
2535	17.934	17.924

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



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

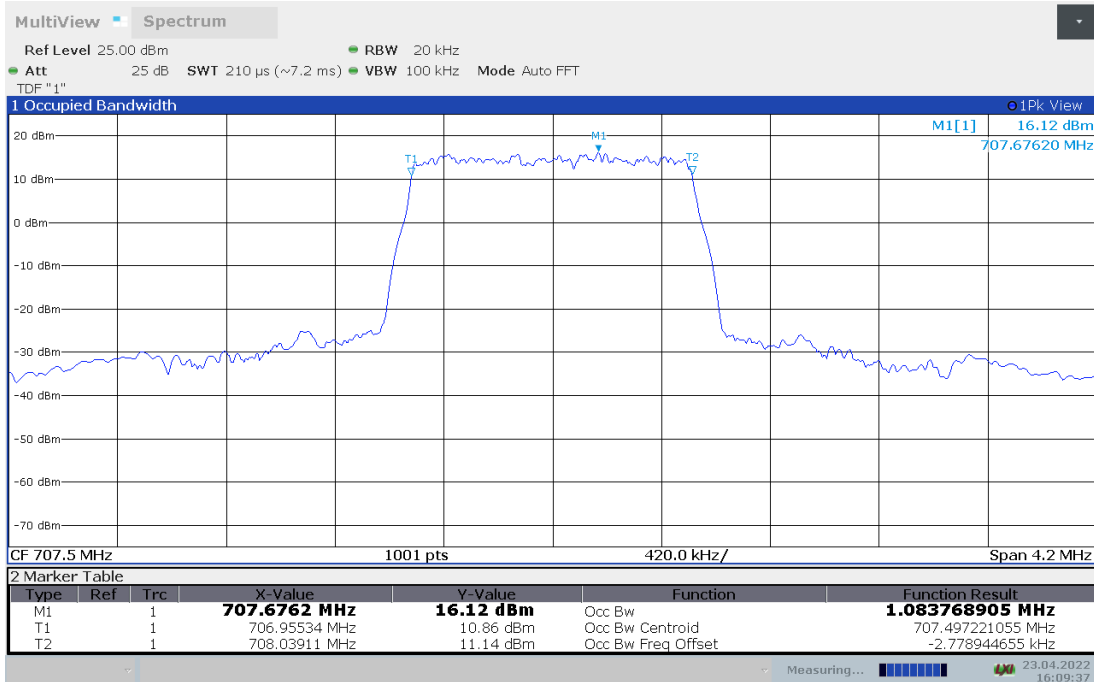


Note: Expanded measurement uncertainty is  $U = 3428\text{Hz}$ ,  $k = 2$

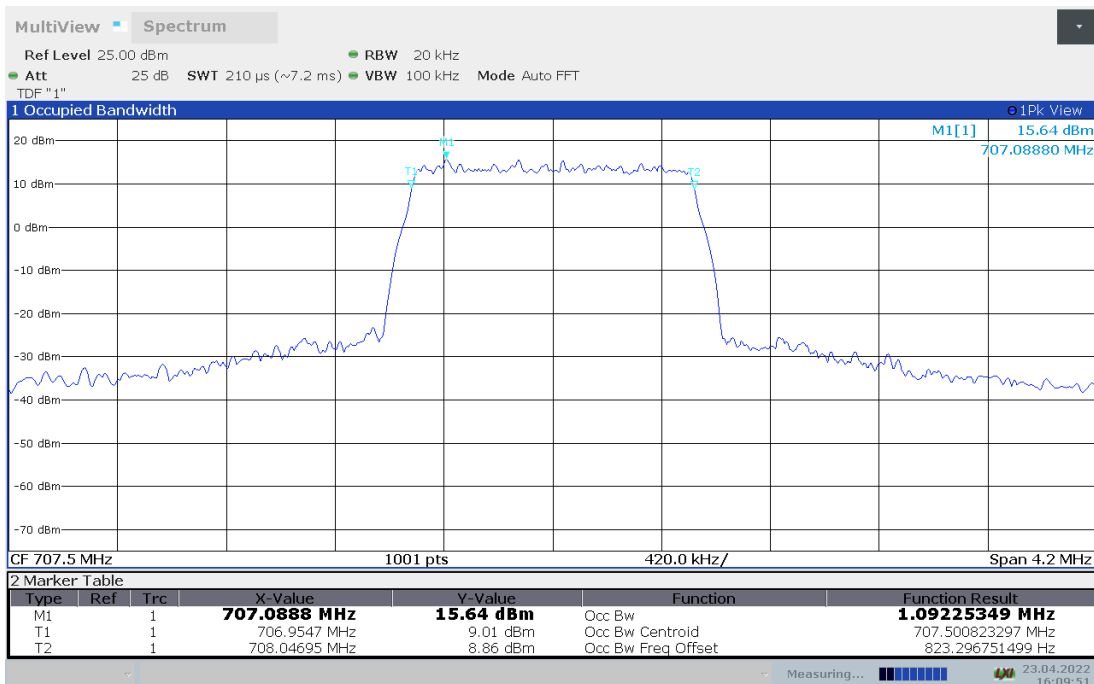
**LTE band 12, 1.4MHz (99% BW)**

Frequency (MHz)	Occupied Bandwidth (99%)(MHz)	
	QPSK	16QAM
707.5	1.084	1.092

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



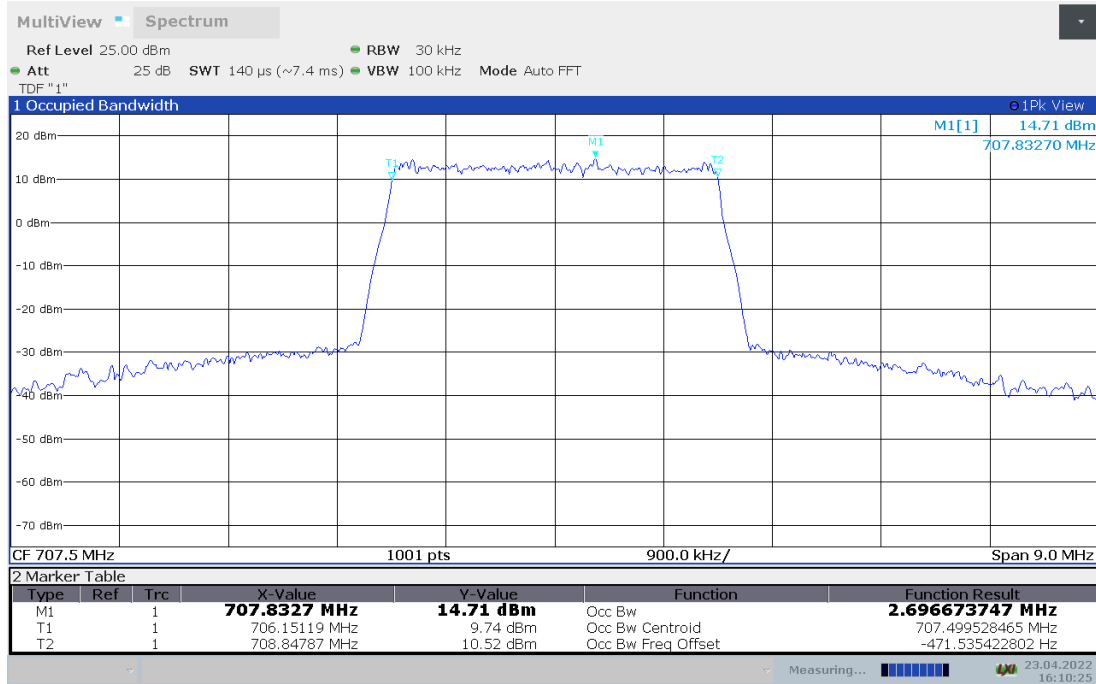
**LTE band 12 , 1.4MHz Bandwidth,16QAM (99% BW)**



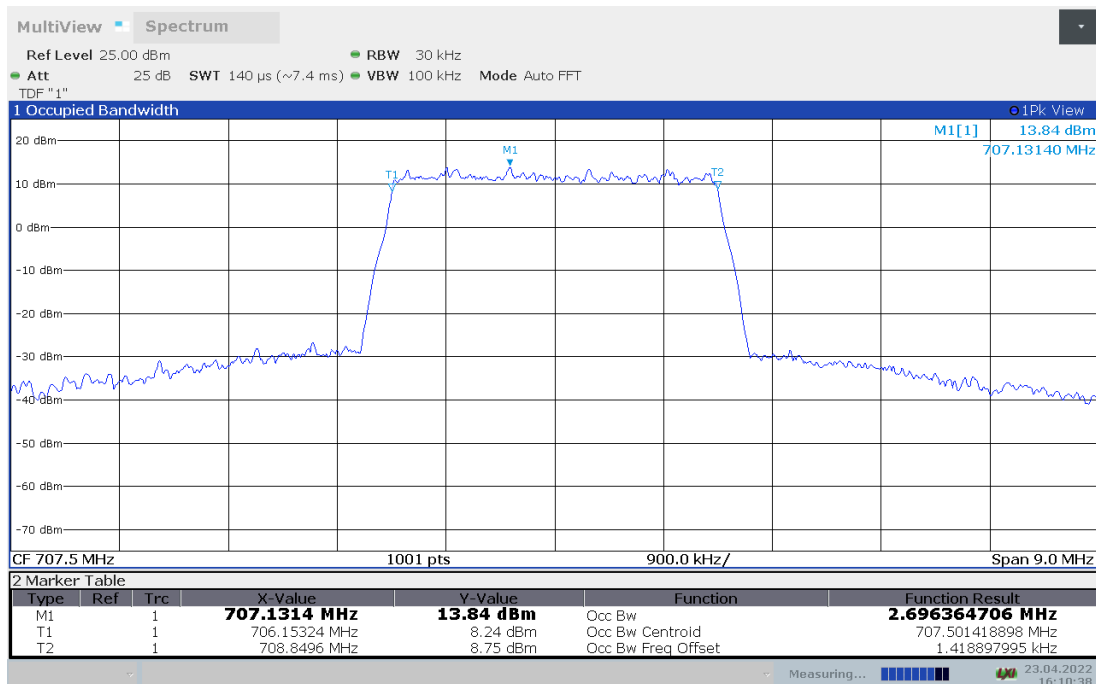
**LTE band 12, 3MHz (99% BW)**

Frequency (MHz)	Occupied Bandwidth (99%)(MHz)	
	QPSK	16QAM
707.5	2.697	2.696

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



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

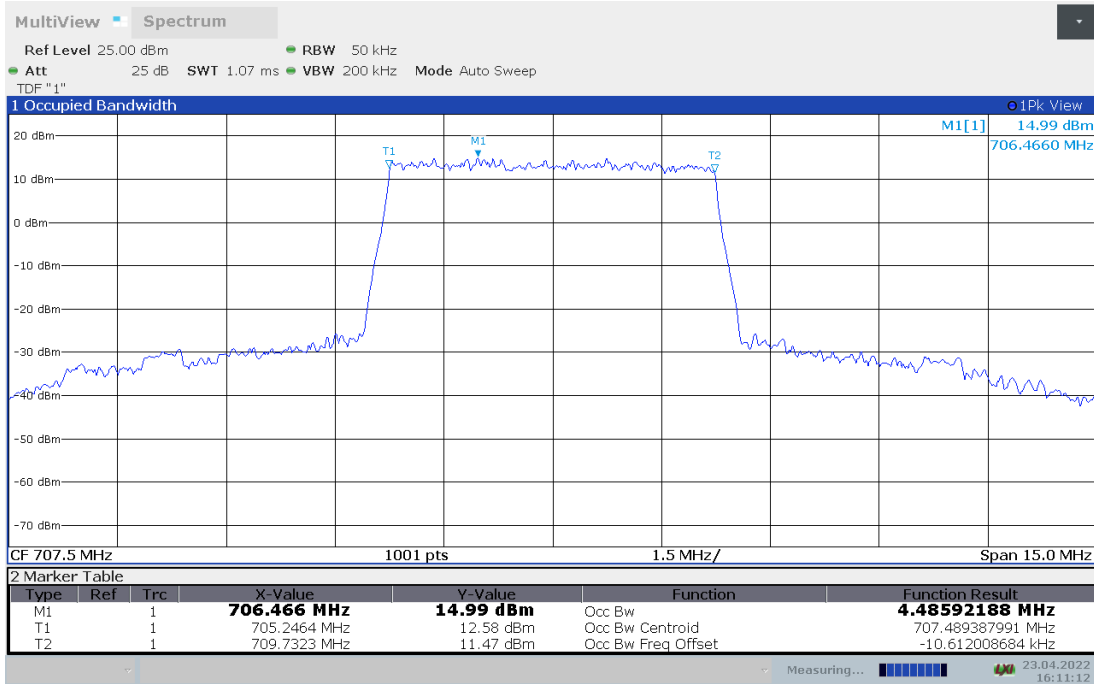




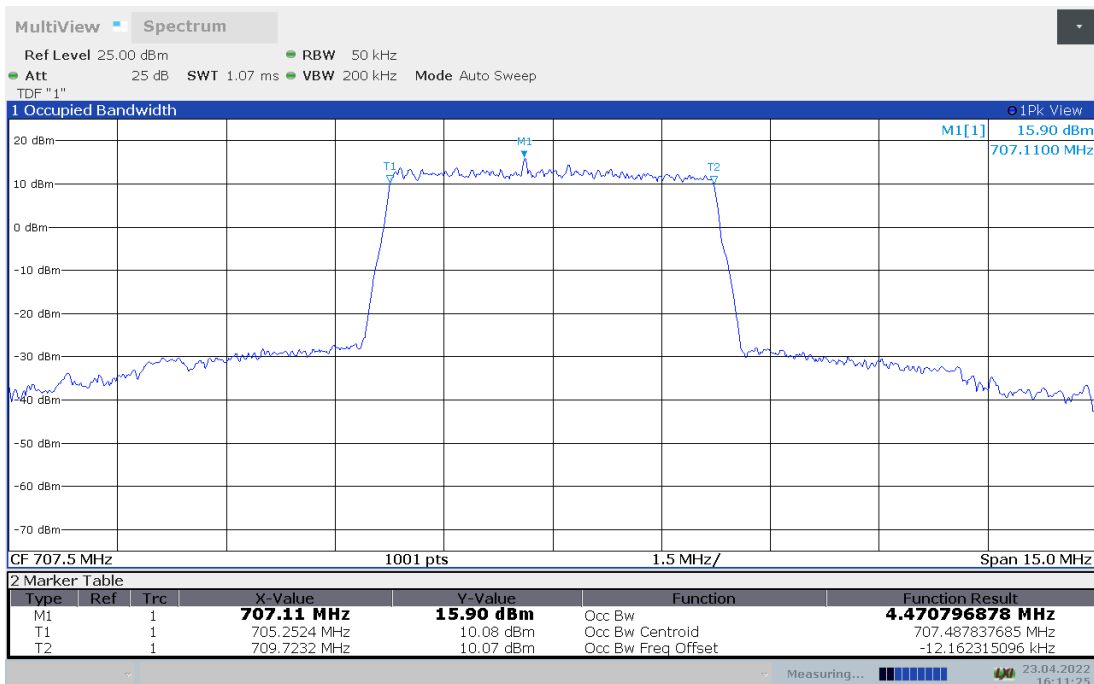
**LTE band 12, 5MHz (99% BW)**

Frequency (MHz)	Occupied Bandwidth (99%)(MHz)	
	QPSK	16QAM
707.5	4.486	4.471

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



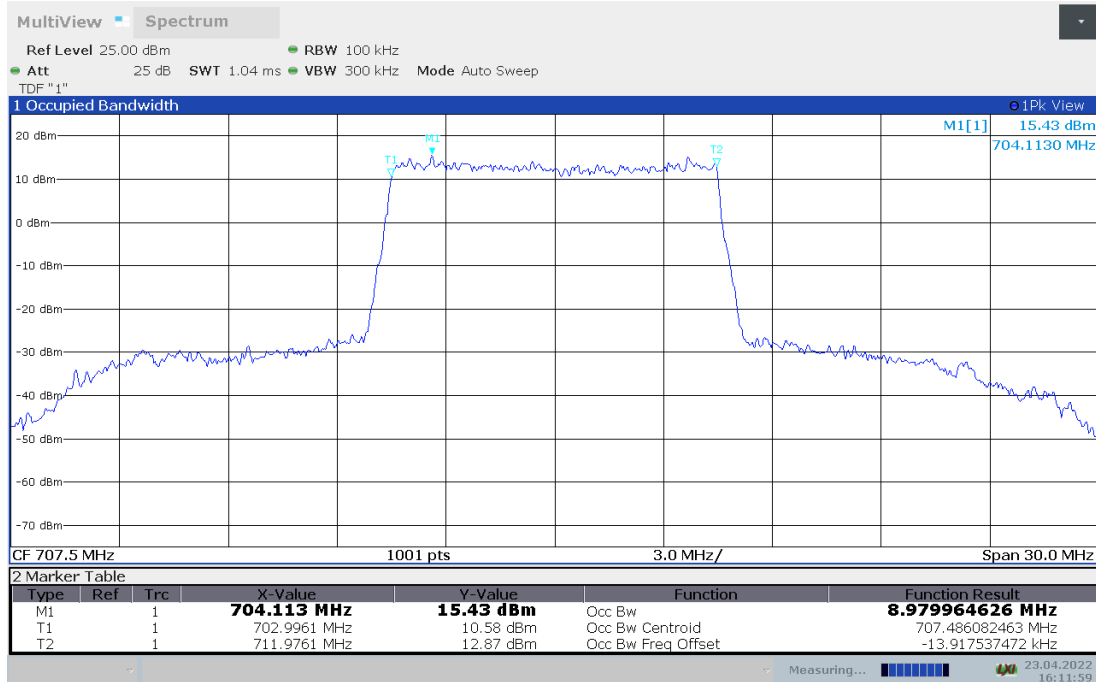
**LTE band 12 , 5MHz Bandwidth,16QAM (99% BW)**



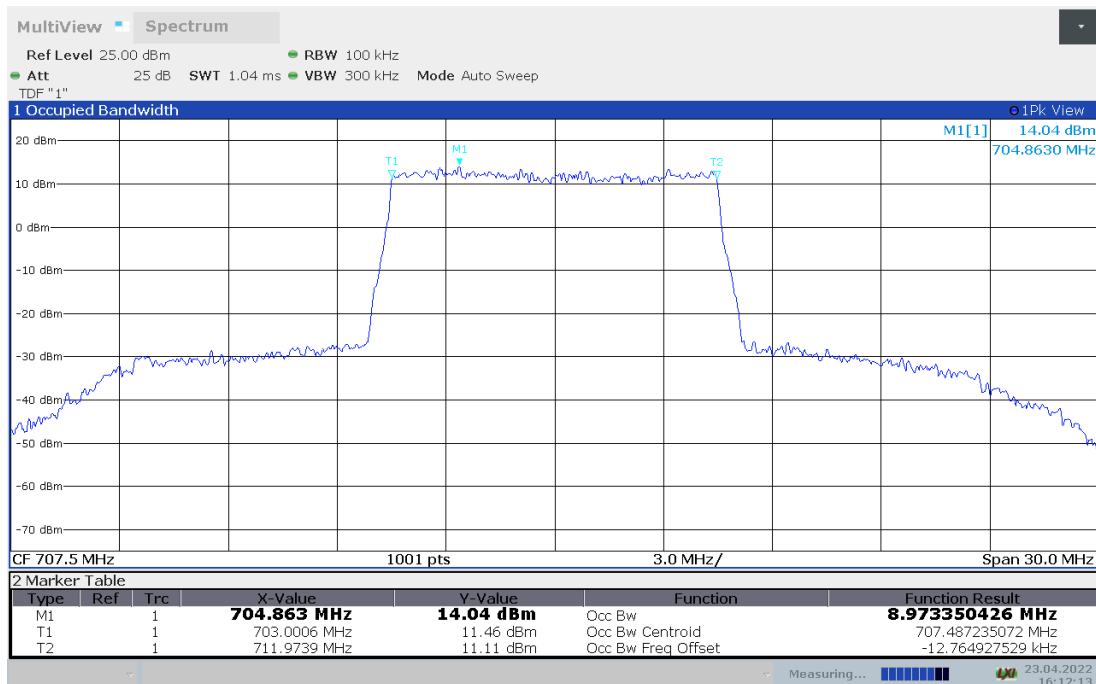
**LTE band 12, 10MHz (99% BW)**

Frequency (MHz)	Occupied Bandwidth (99%)(MHz)	
	QPSK	16QAM
707.5	8.980	8.973

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



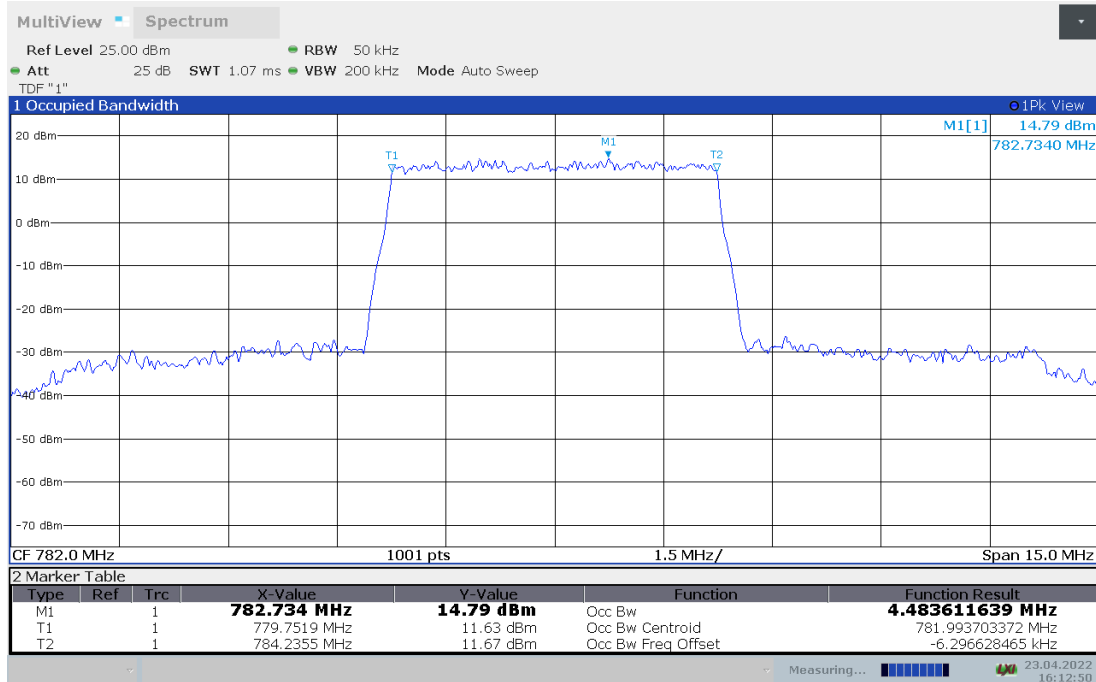
**LTE band 12 , 10MHz Bandwidth,16QAM (99% BW)**



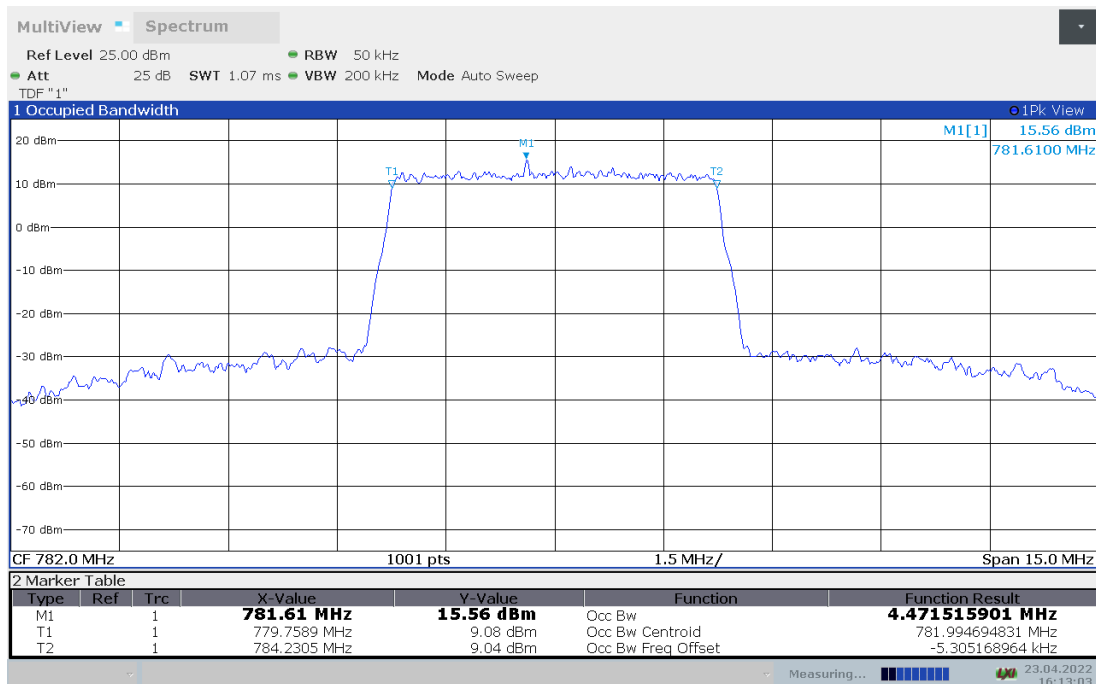
**LTE band 13, 5MHz (99% BW)**

Frequency (MHz)	Occupied Bandwidth (99%)(MHz)	
	QPSK	16QAM
782	4.484	4.472

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



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

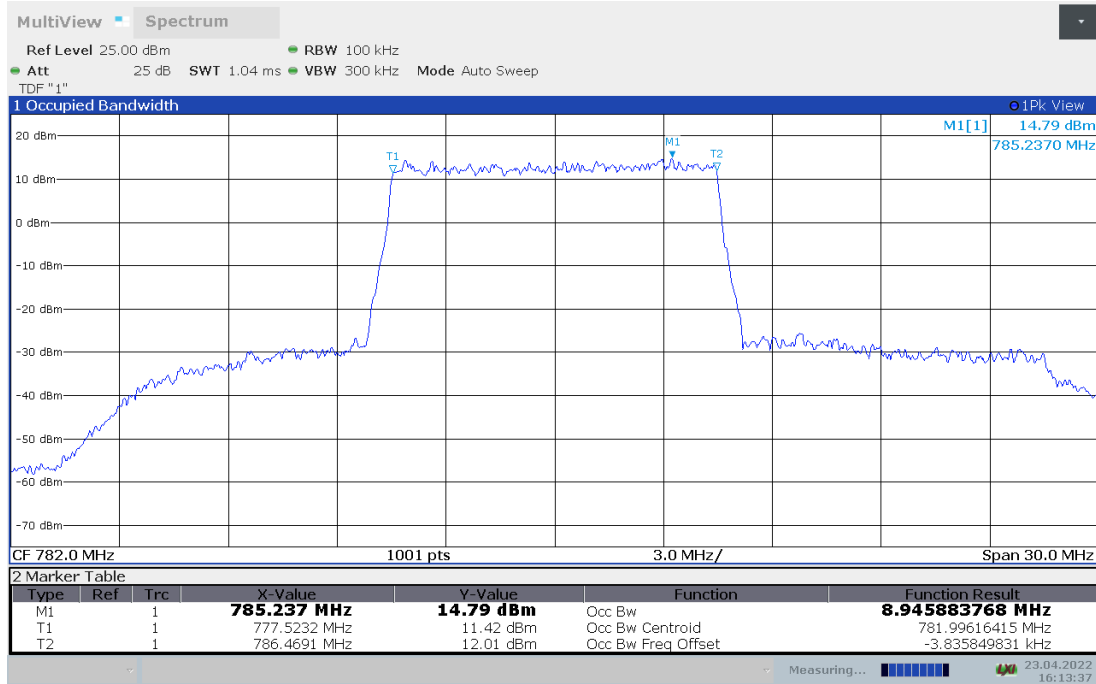




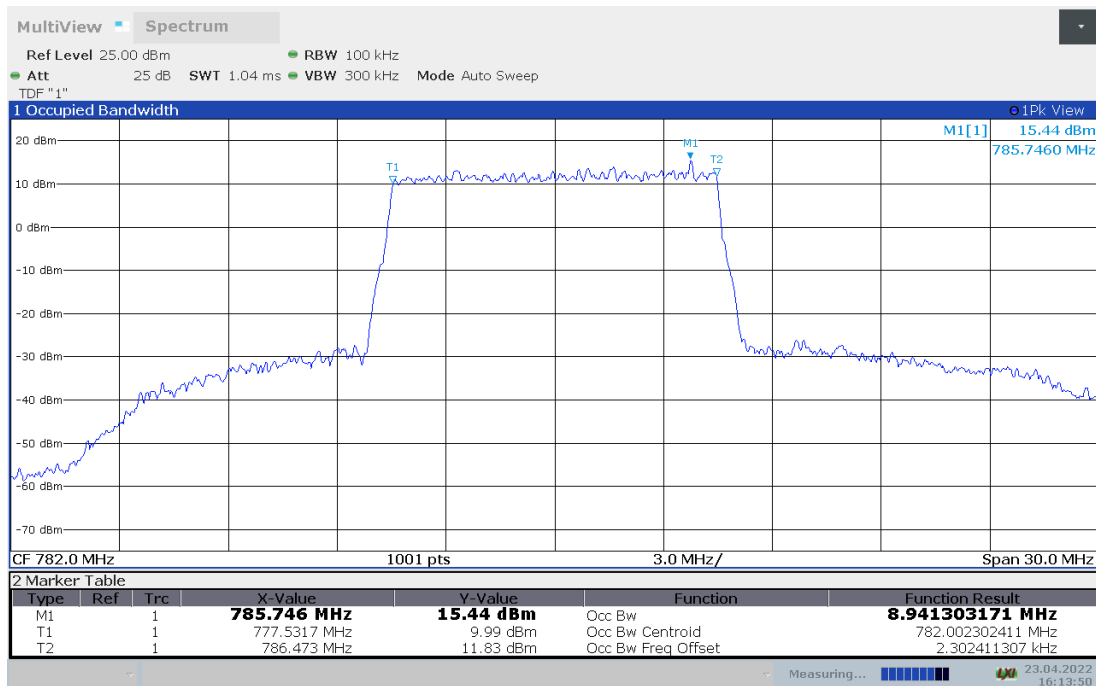
### LTE band 13, 10MHz (99% BW)

Frequency (MHz)	Occupied Bandwidth (99%)(MHz)	
	QPSK	16QAM
782	8.946	8.941

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



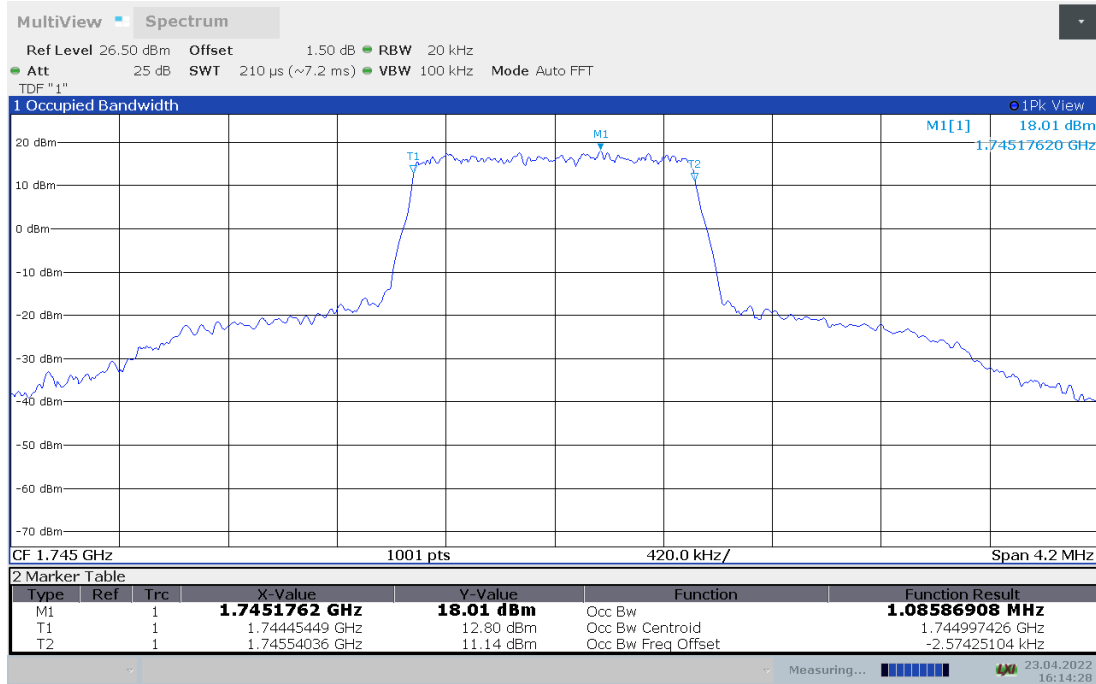
### LTE band 13 , 10MHz Bandwidth,16QAM (99% BW)



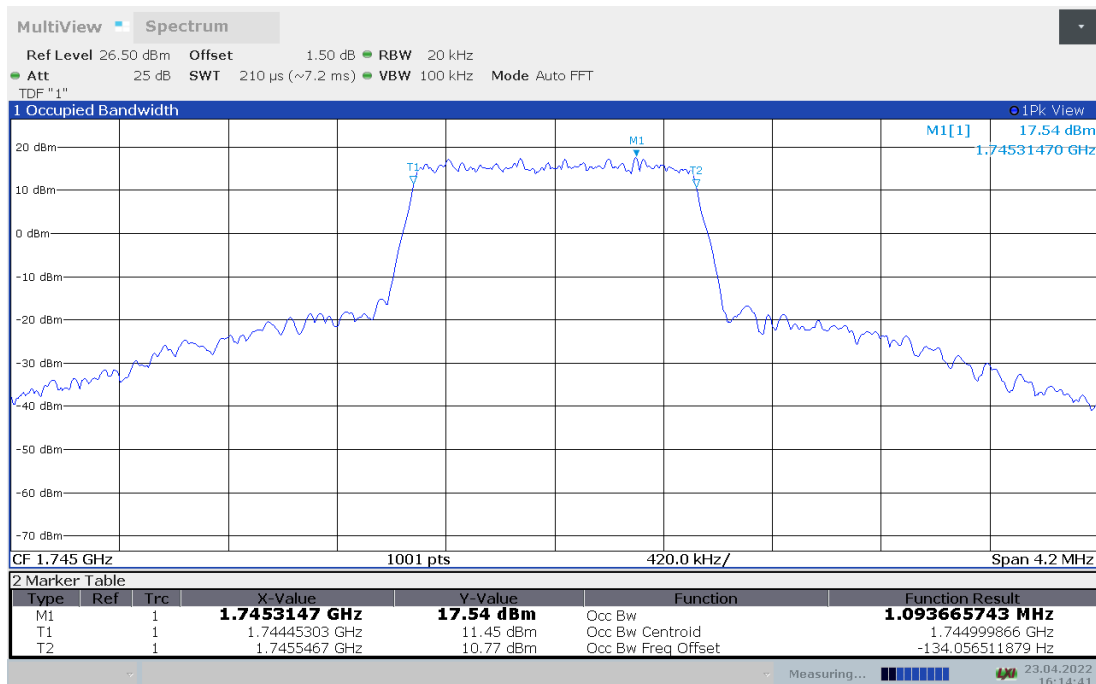
**LTE band 66, 1.4MHz (99% BW)**

Frequency (MHz)	Occupied Bandwidth (99%)(MHz)	
	QPSK	16QAM
1745	1.086	1.094

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



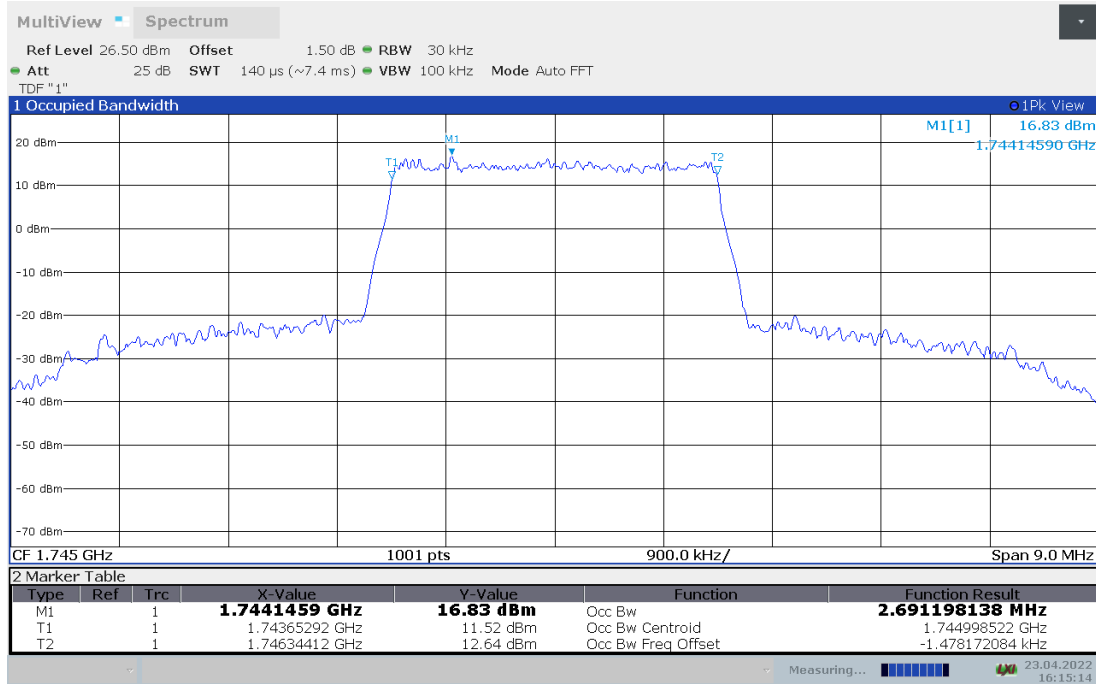
**LTE band 66 , 1.4MHz Bandwidth,16QAM (99% BW)**



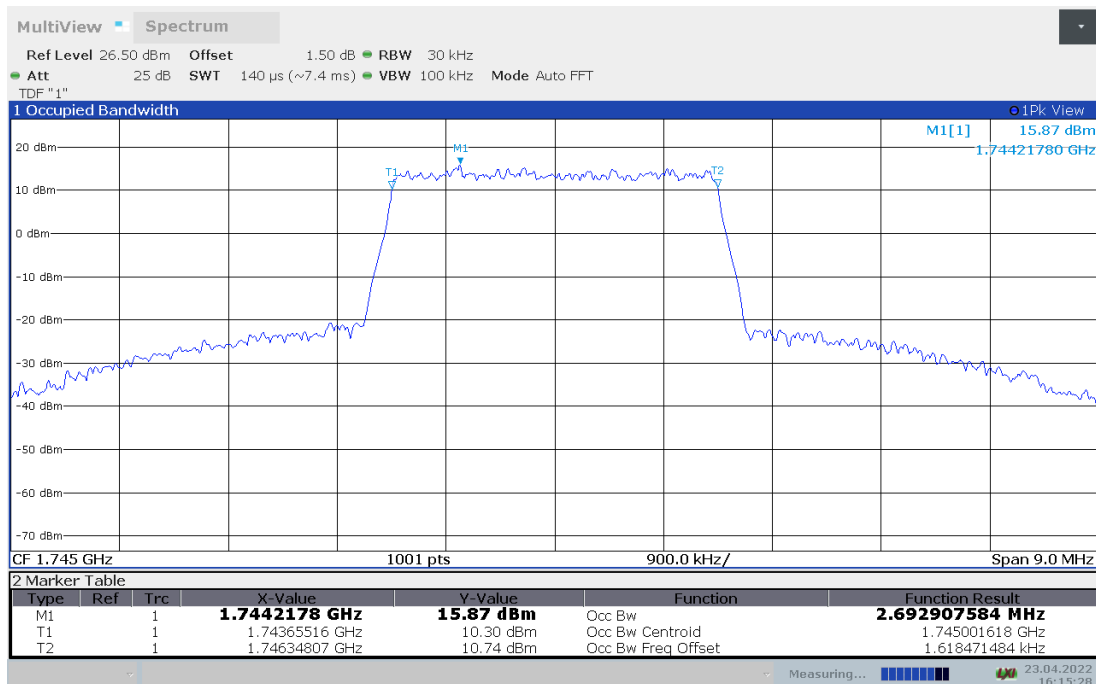
**LTE band 66, 3MHz (99% BW)**

Frequency (MHz)	Occupied Bandwidth (99%)(MHz)	
	QPSK	16QAM
1745	2.691	2.693

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



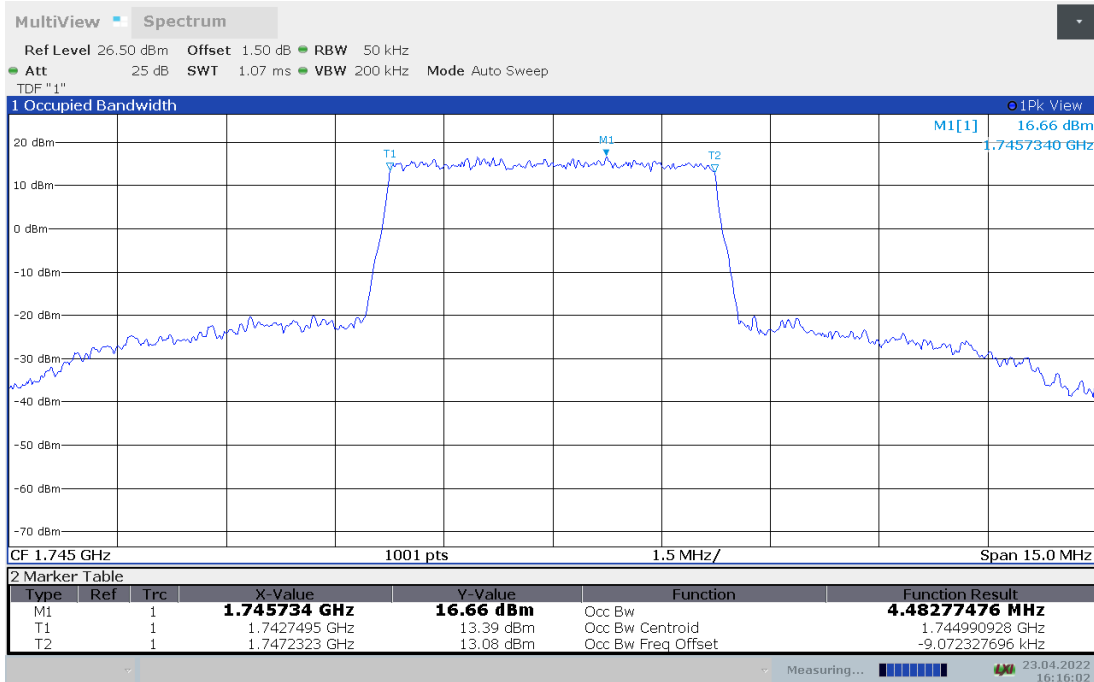
**LTE band 66 , 3MHz Bandwidth,16QAM (99% BW)**



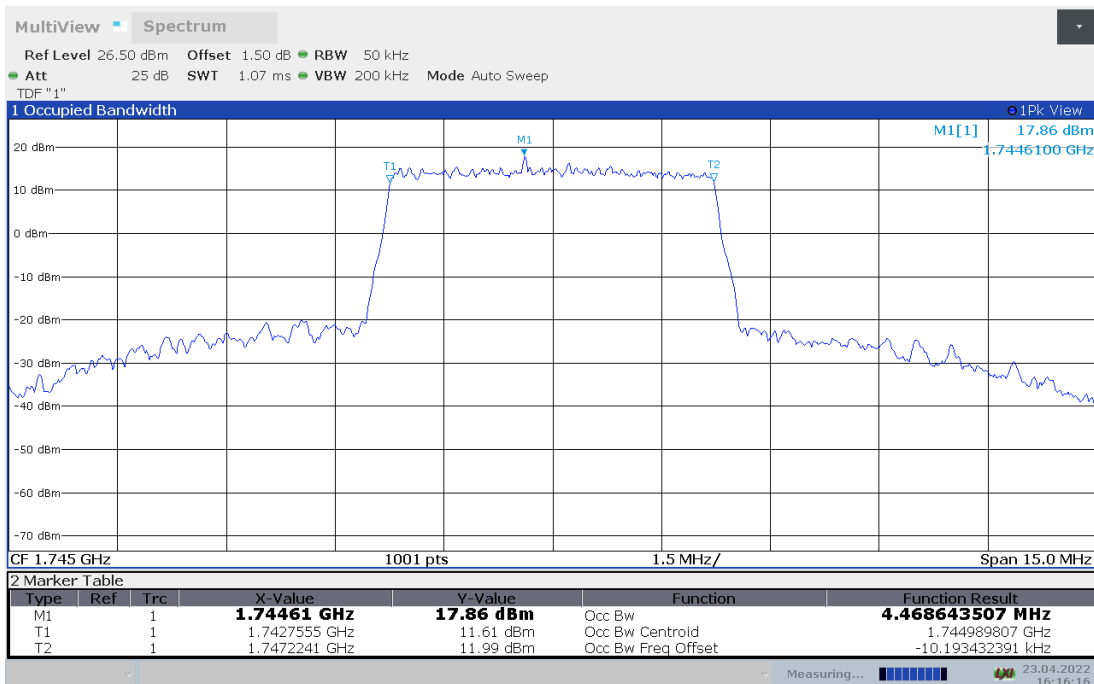
**LTE band 66, 5MHz (99% BW)**

Frequency (MHz)	Occupied Bandwidth (99%)(MHz)	
	QPSK	16QAM
1745	4.483	4.469

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



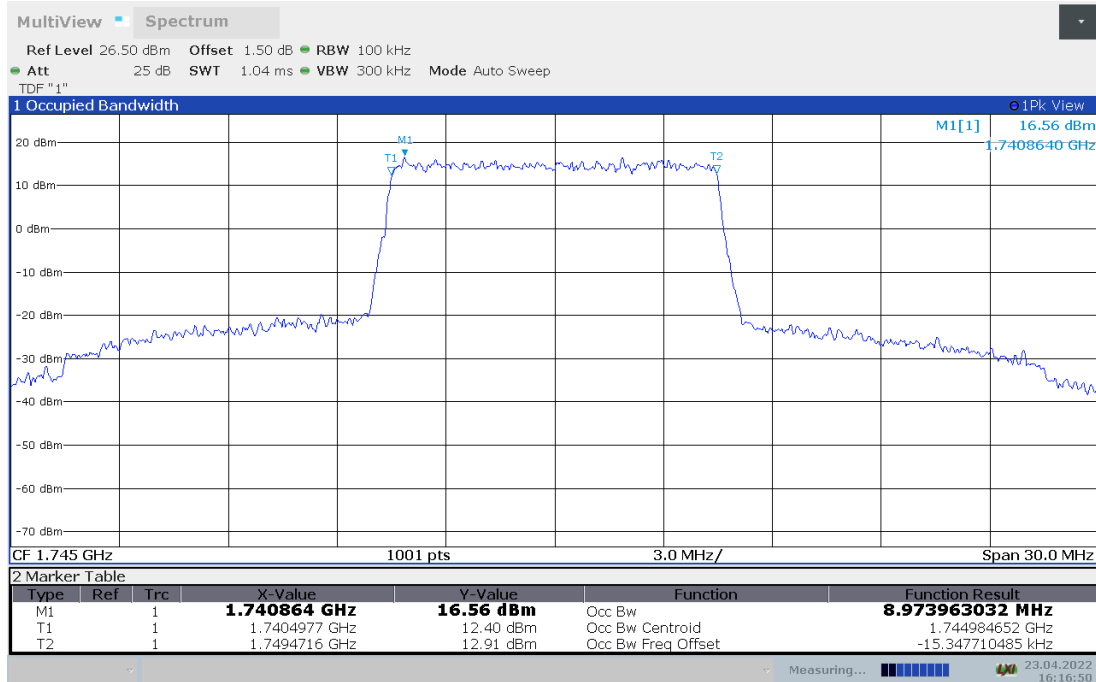
**LTE band 66 , 5MHz Bandwidth,16QAM (99% BW)**



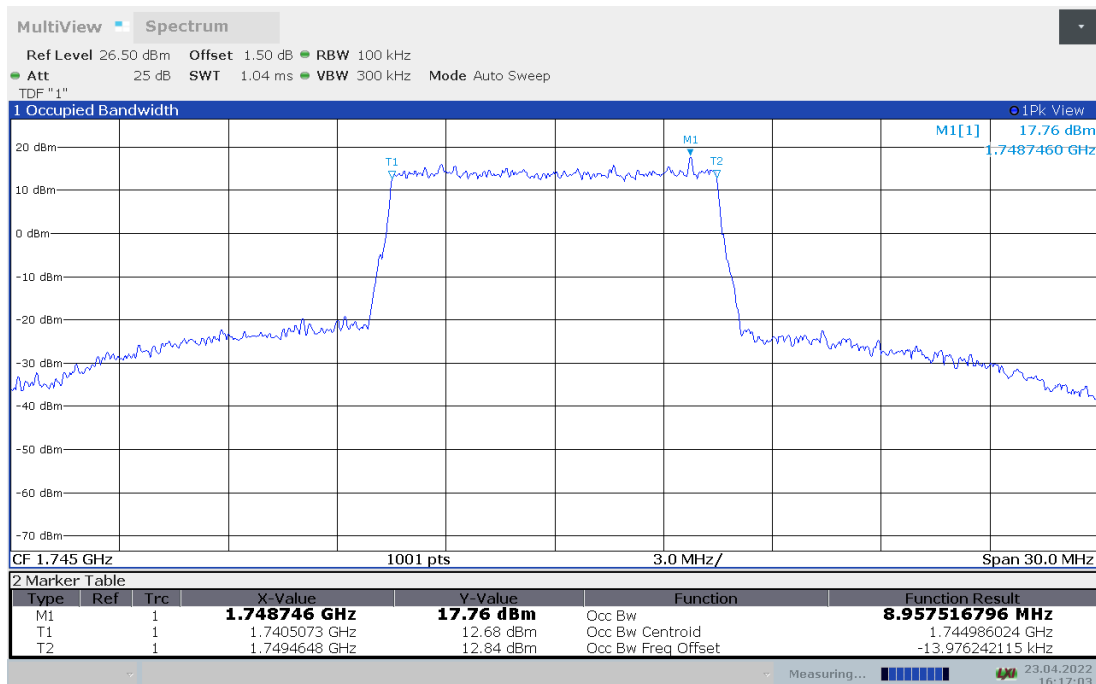
**LTE band 66, 10MHz (99% BW)**

Frequency (MHz)	Occupied Bandwidth (99%)(MHz)	
	QPSK	16QAM
1745	8.974	8.958

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



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

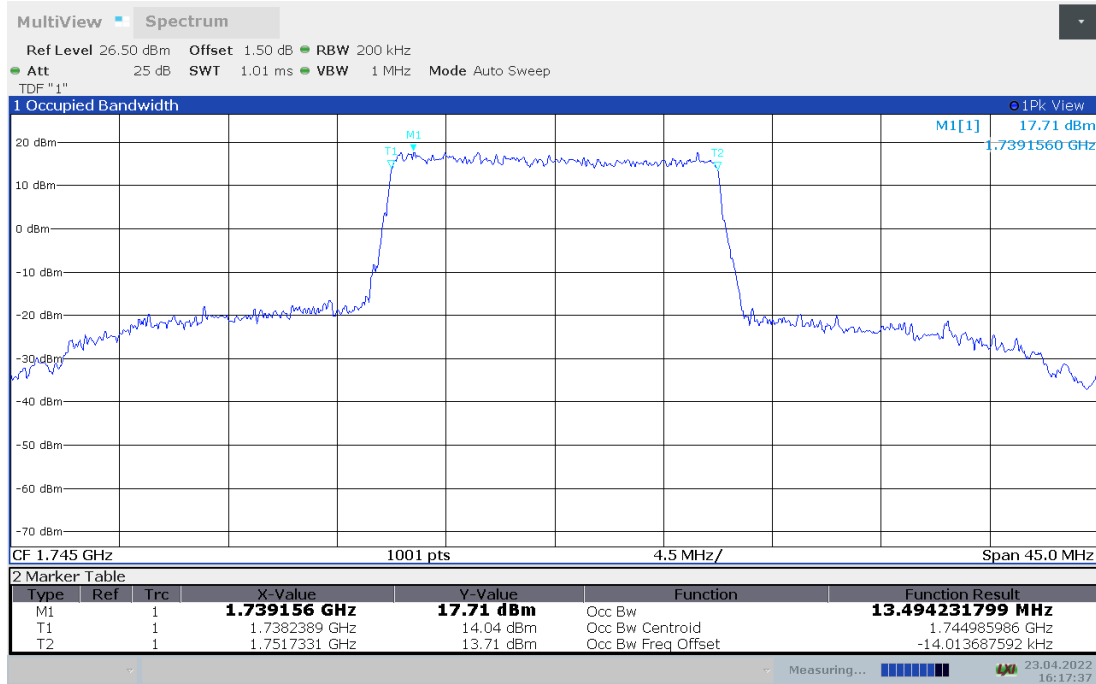




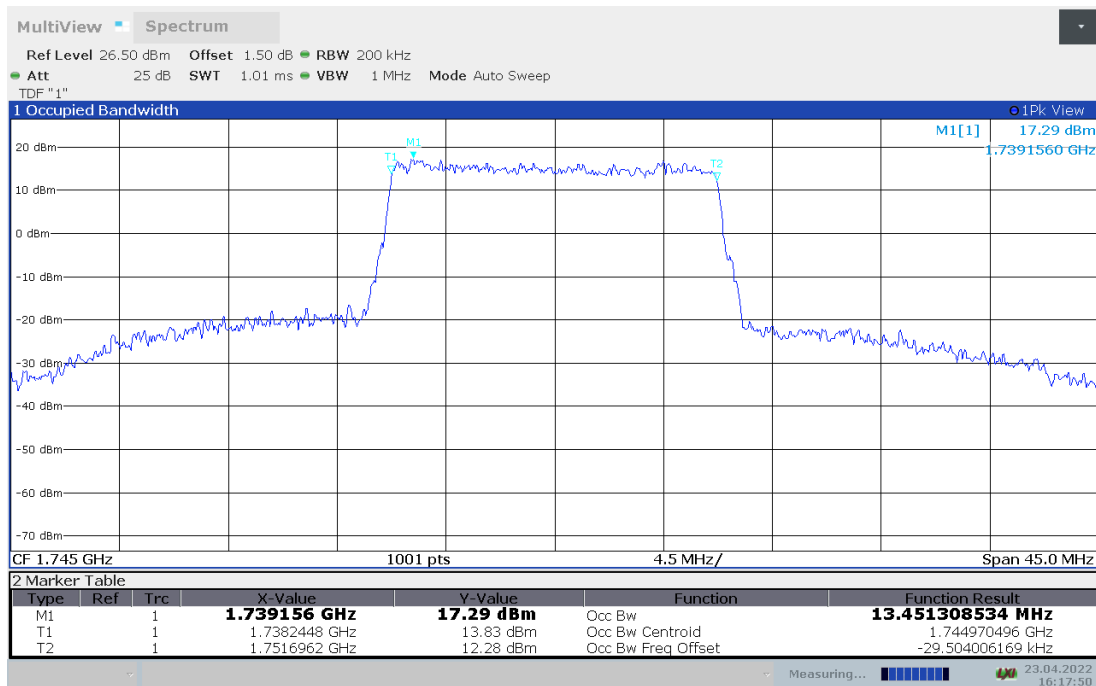
**LTE band 66, 15MHz (99% BW)**

Frequency (MHz)	Occupied Bandwidth (99%)(MHz)	
	QPSK	16QAM
1745	13.494	13.451

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



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

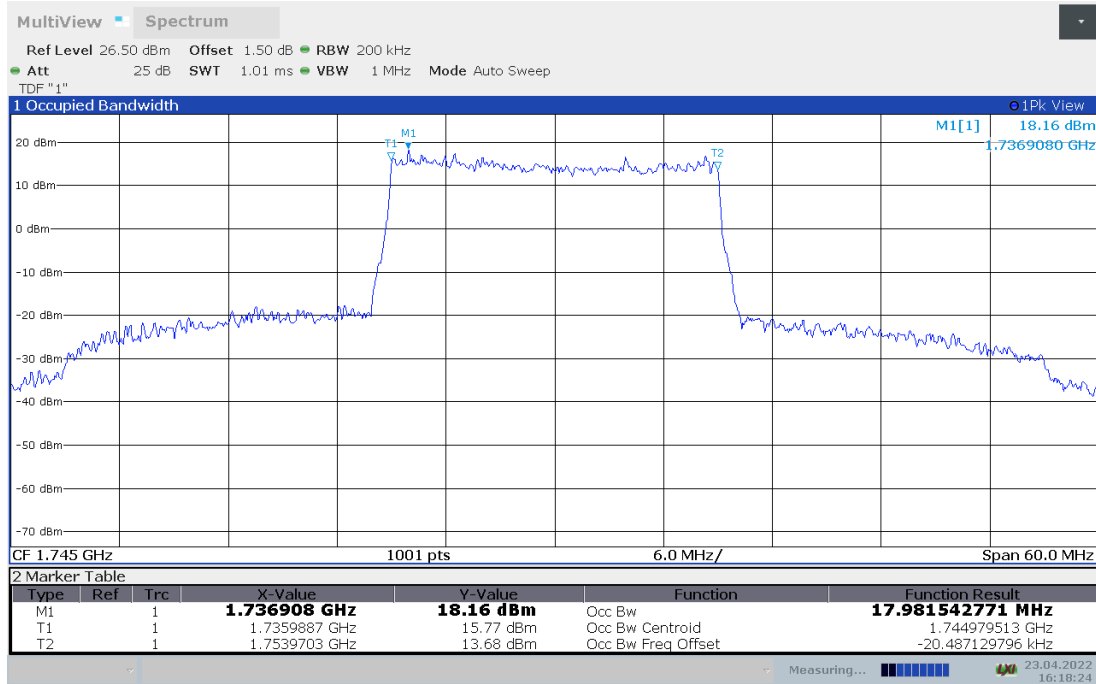




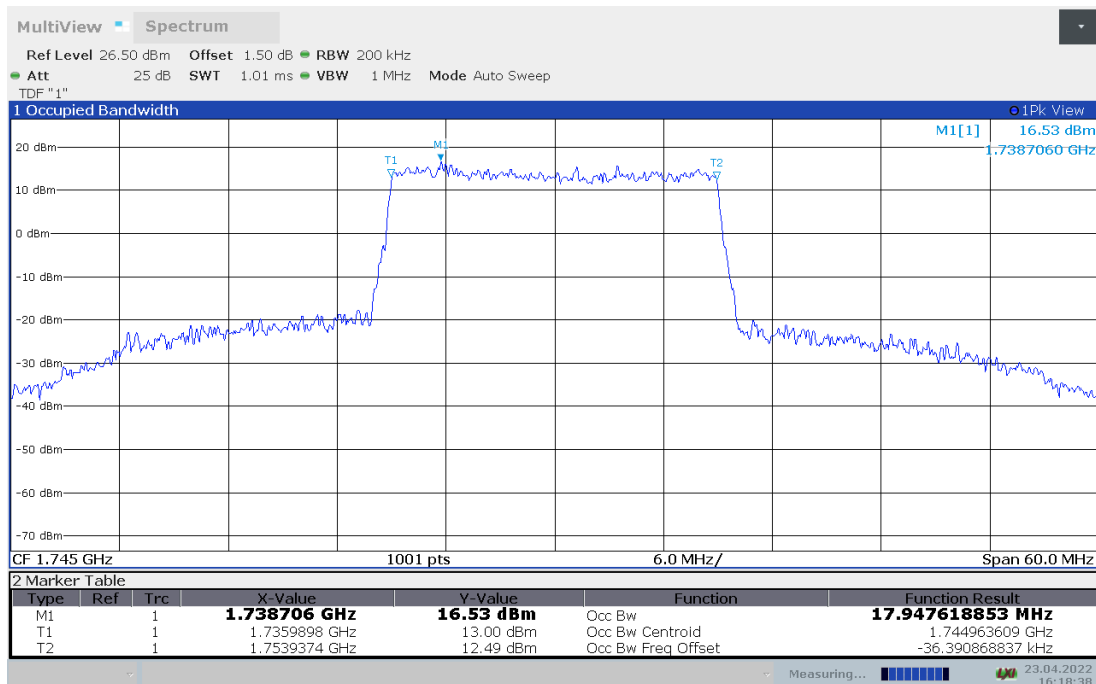
**LTE band 66, 20MHz (99% BW)**

Frequency (MHz)	Occupied Bandwidth (99%)(MHz)	
	QPSK	16QAM
1745	17.982	17.948

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



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



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.

- a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be set wide enough to capture all modulation products including the emission skirts (i.e., two to five times the OBW).
- b) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1 to 5 % of the anticipated OBW, and the VBW shall be at least 3 times the RBW.
- c) Set the reference level of the instrument as required to keep the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope must be at least 10log (OBW / RBW) below the reference level.
- d) Set the detection mode to peak, and the trace mode to max hold.
- e) Use the 26dB bandwidth function of the spectrum analyzer and report the measured bandwidth.

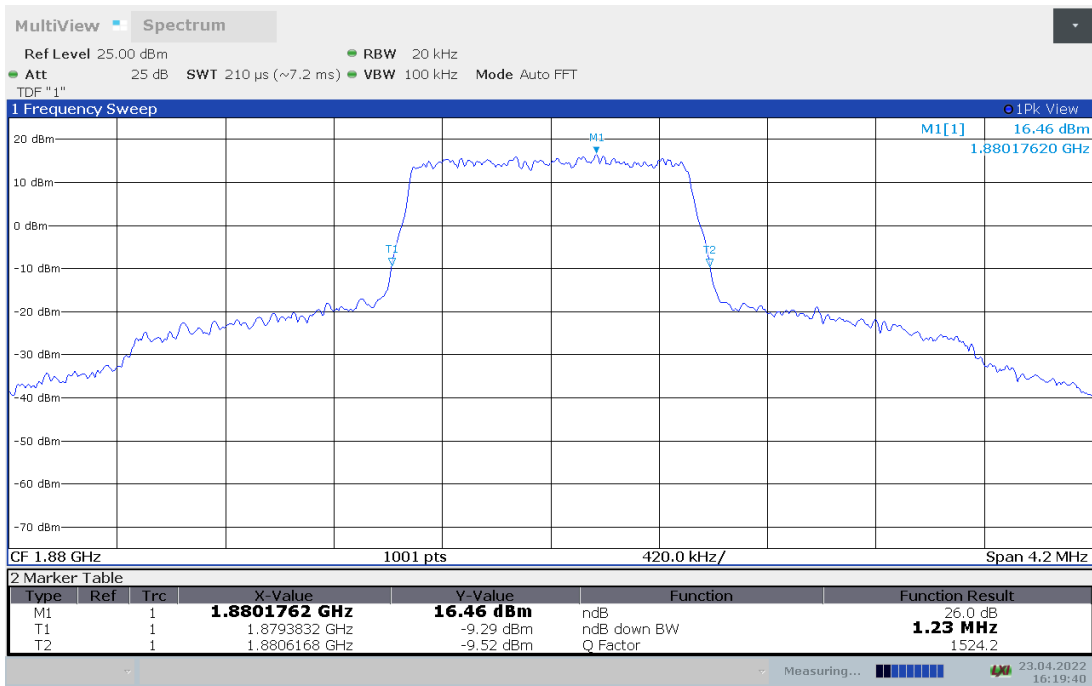
**A.5.2 Emission Bandwidth Results**

Similar to conducted emissions; Emission 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. Table below lists the measured -26dBc BW. Spectrum analyzer plots are included on the following pages.

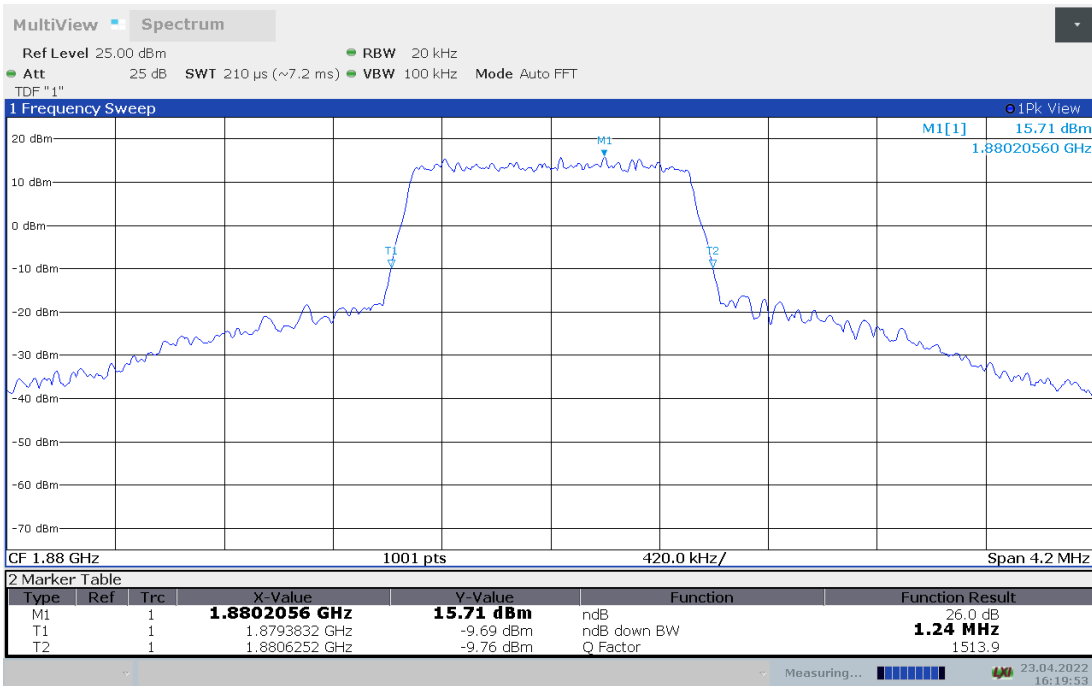
**LTE band 2, 1.4MHz (-26dBc BW)**

Frequency(MHz)	Emission Bandwidth (-26dBc)(MHz)	
	QPSK	16QAM
1880	1.23	1.24

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



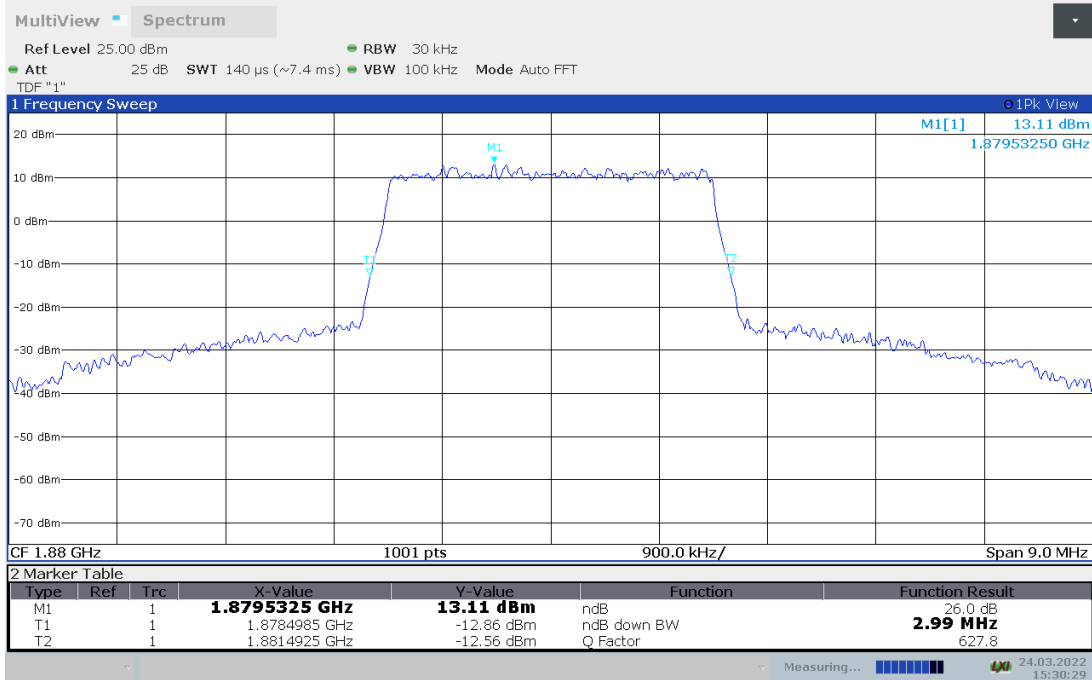
**LTE band 2 , 1.4MHz Bandwidth,16QAM (-26dBc BW)**



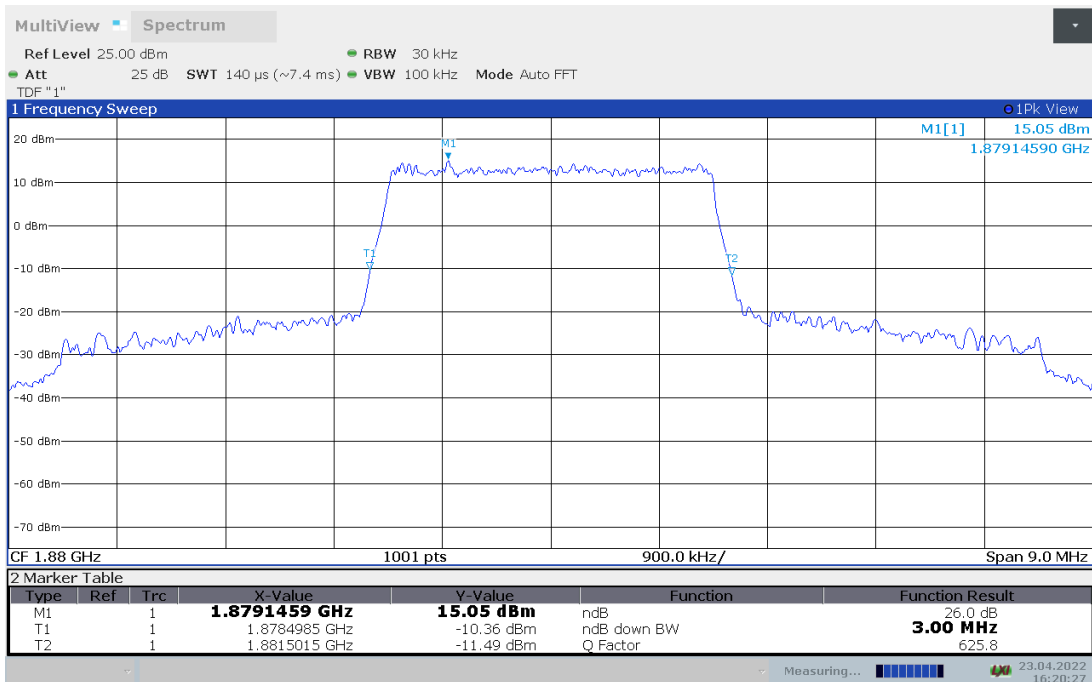
**LTE band 2, 3MHz (-26dBc BW)**

Frequency(MHz)	Emission Bandwidth (-26dBc)(MHz)	
	QPSK	16QAM
1880	2.99	3.00

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



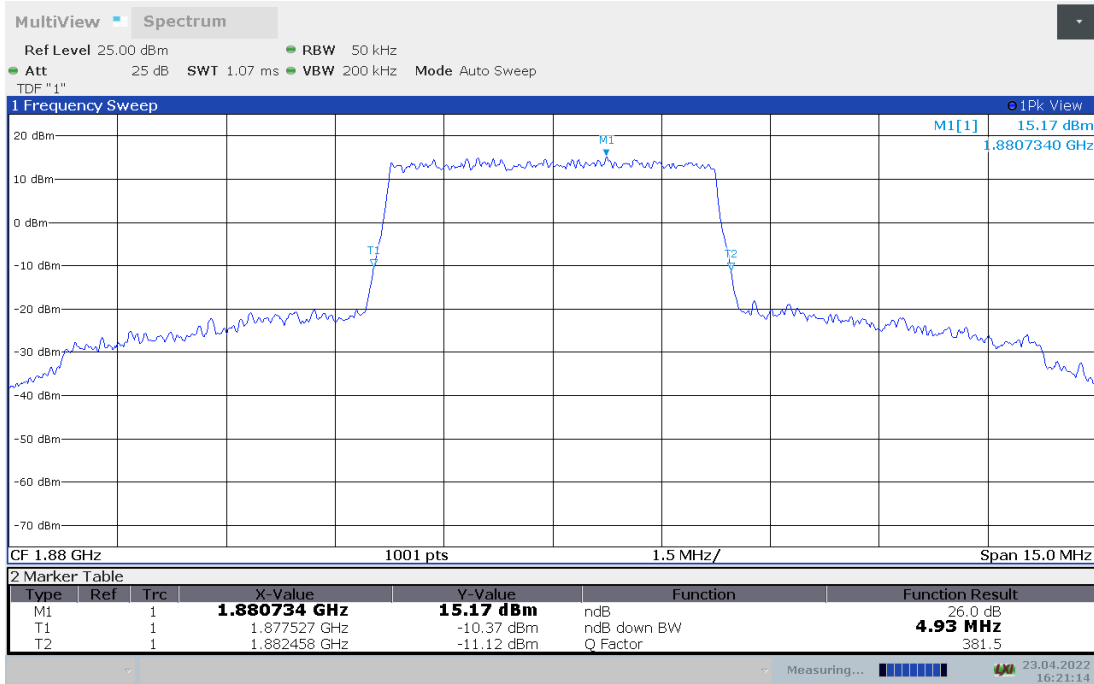
**LTE band 2 , 3MHz Bandwidth,16QAM (-26dBc BW)**



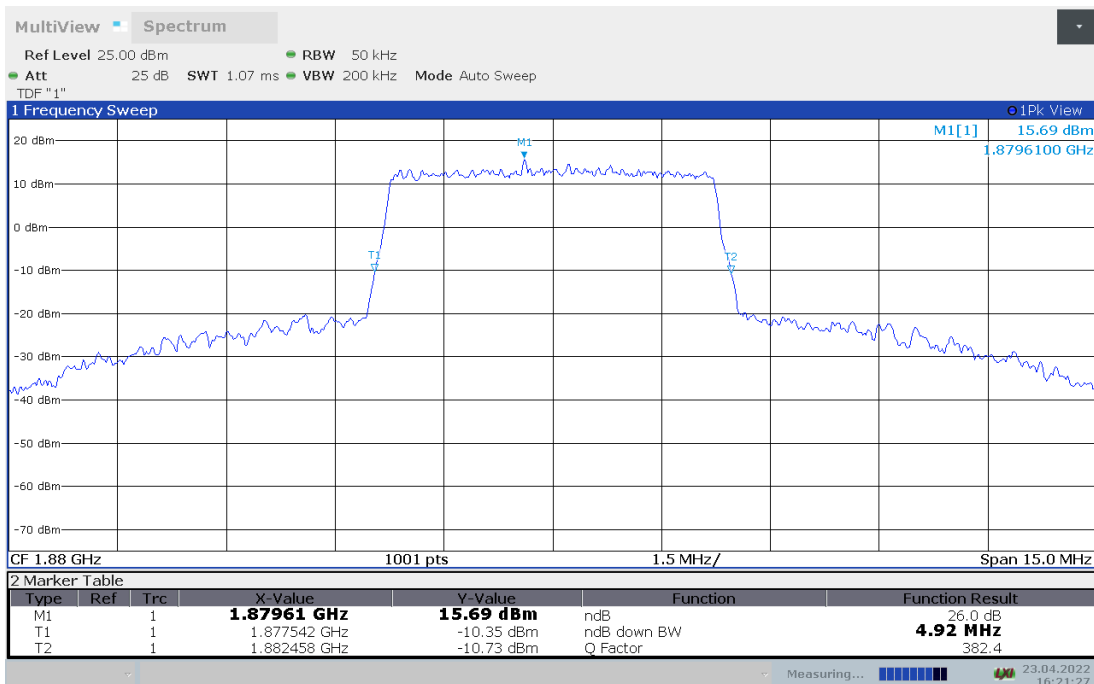
**LTE band 2, 5MHz (-26dBc BW)**

Frequency(MHz)	Emission Bandwidth (-26dBc)(MHz)	
	QPSK	16QAM
1880	4.93	4.92

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



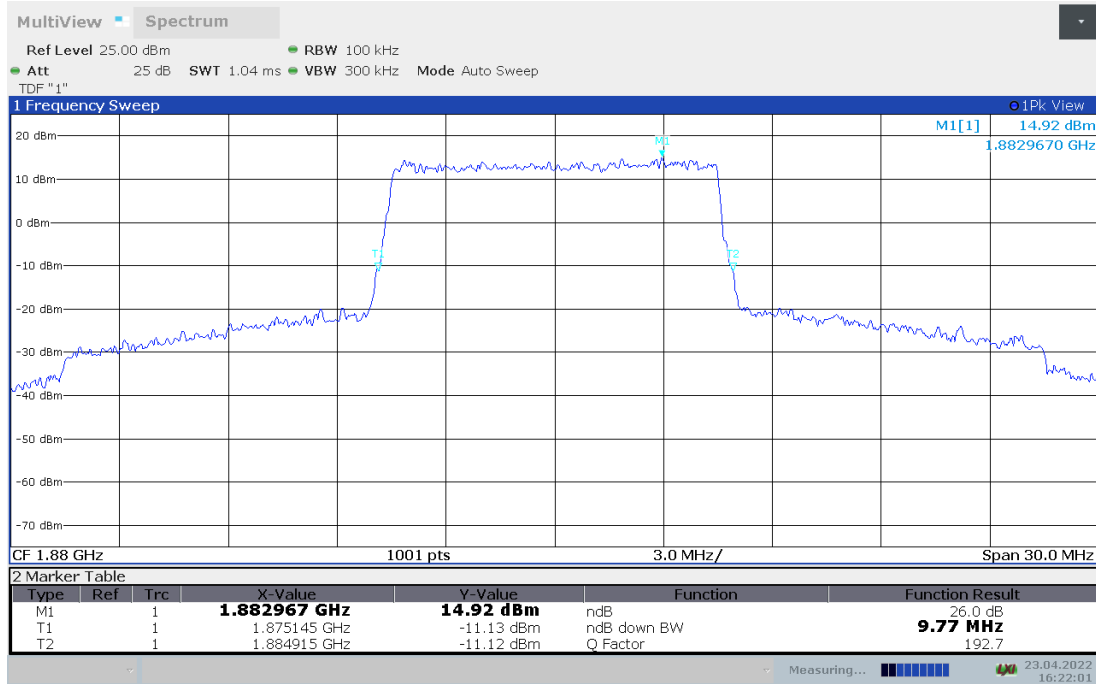
**LTE band 2 , 5MHz Bandwidth,16QAM (-26dBc BW)**



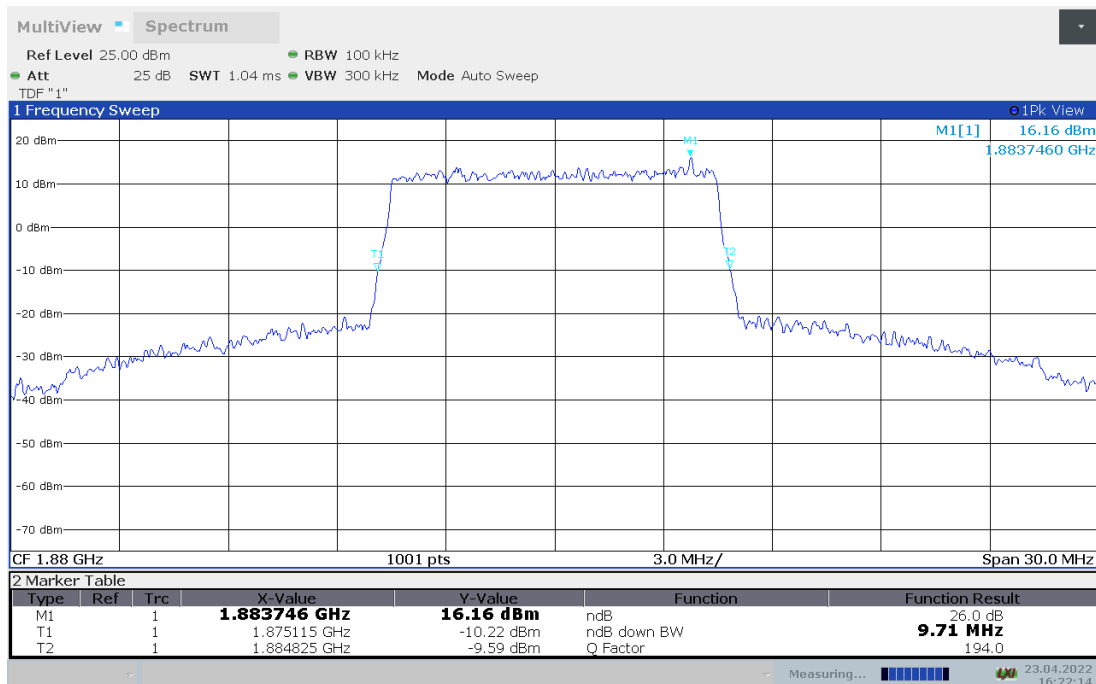
**LTE band 2, 10MHz (-26dBc BW)**

Frequency(MHz)	Emission Bandwidth (-26dBc)(MHz)	
	QPSK	16QAM
1880	9.77	9.71

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



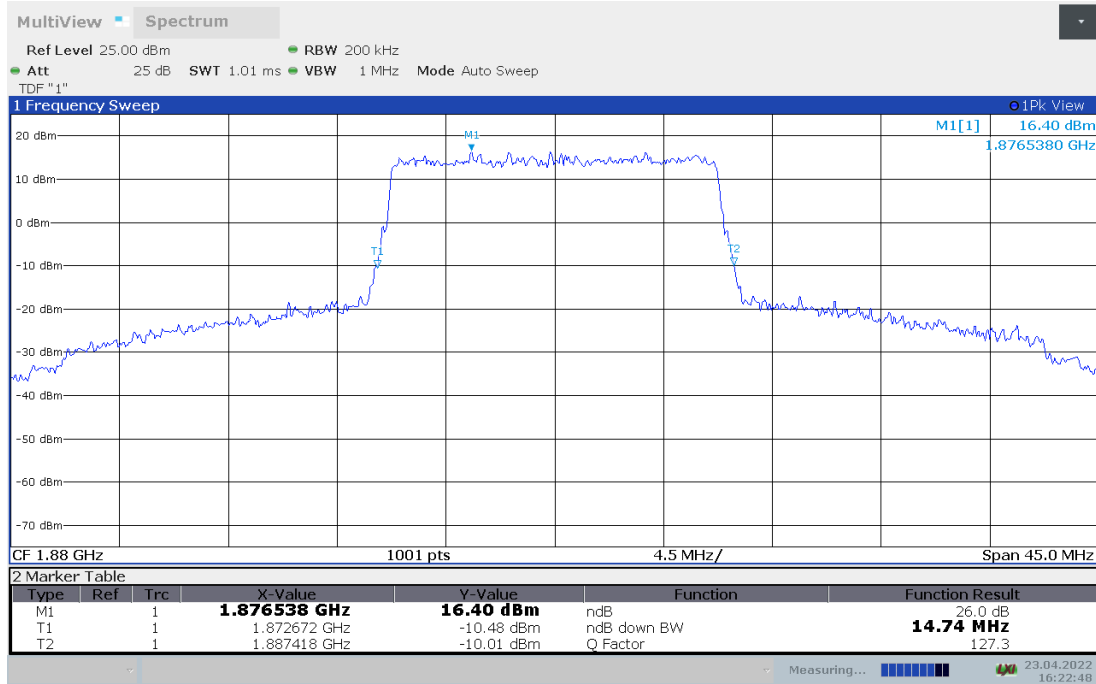
**LTE band 2 , 10MHz Bandwidth,16QAM (-26dBc BW)**



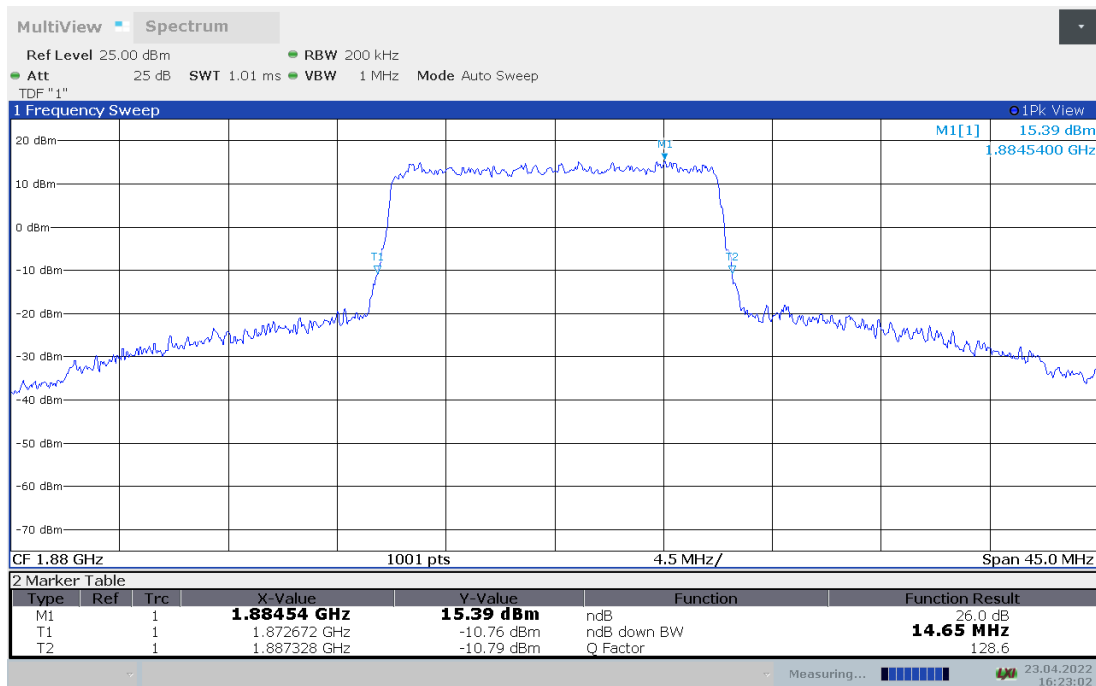
**LTE band 2, 15MHz (-26dBc BW)**

Frequency(MHz)	Emission Bandwidth (-26dBc)(MHz)	
	QPSK	16QAM
1880	14.74	14.65

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



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

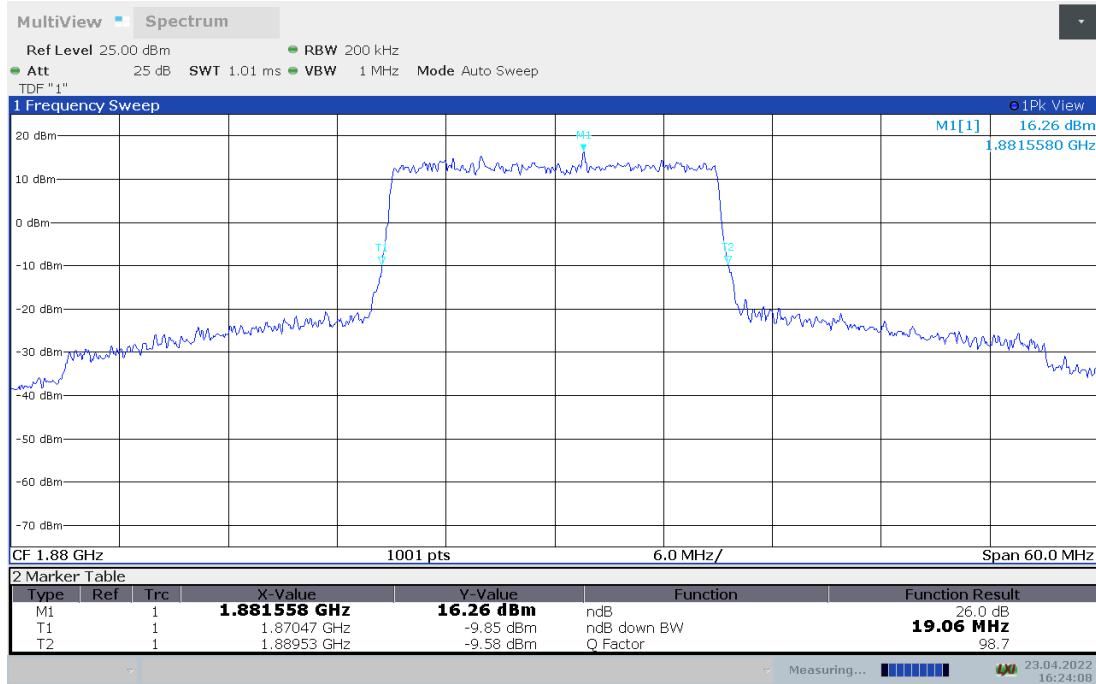




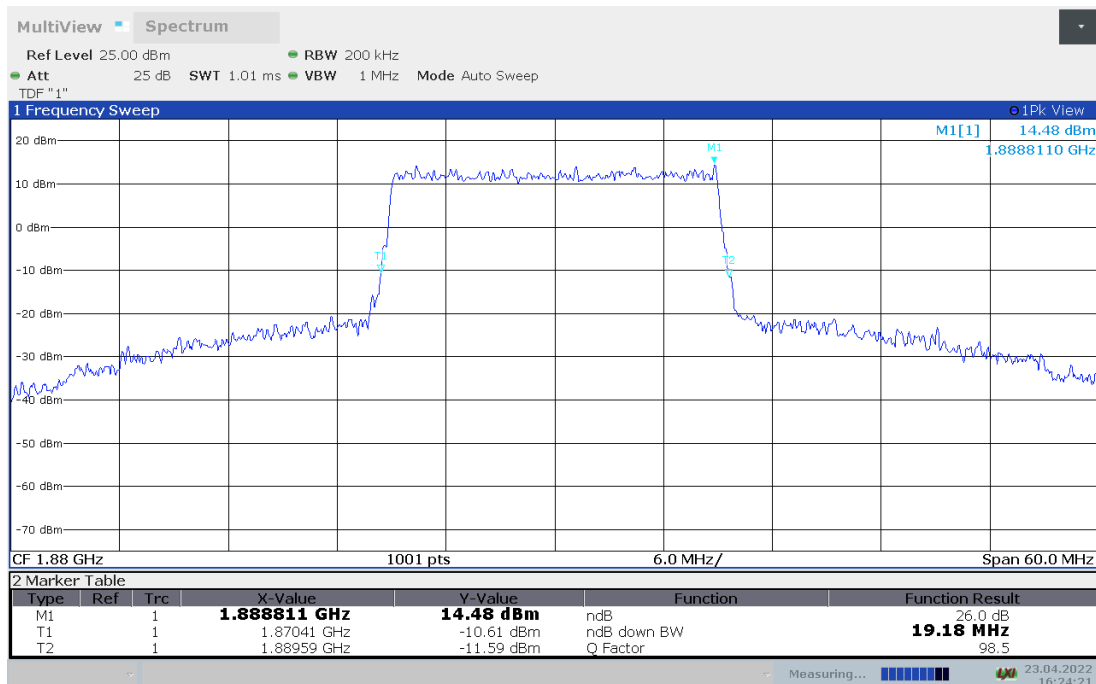
**LTE band 2, 20MHz (-26dBc BW)**

Frequency(MHz)	Emission Bandwidth (-26dBc)(MHz)	
	QPSK	16QAM
1880	19.06	19.18

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



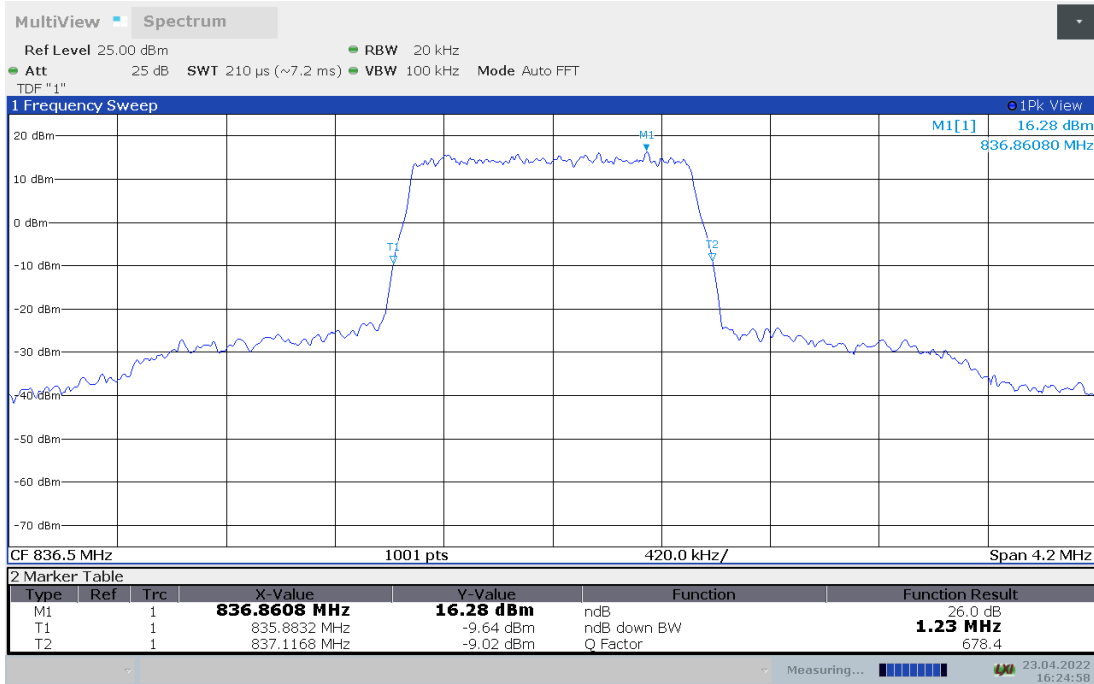
**LTE band 2 , 20MHz Bandwidth,16QAM (-26dBc BW)**



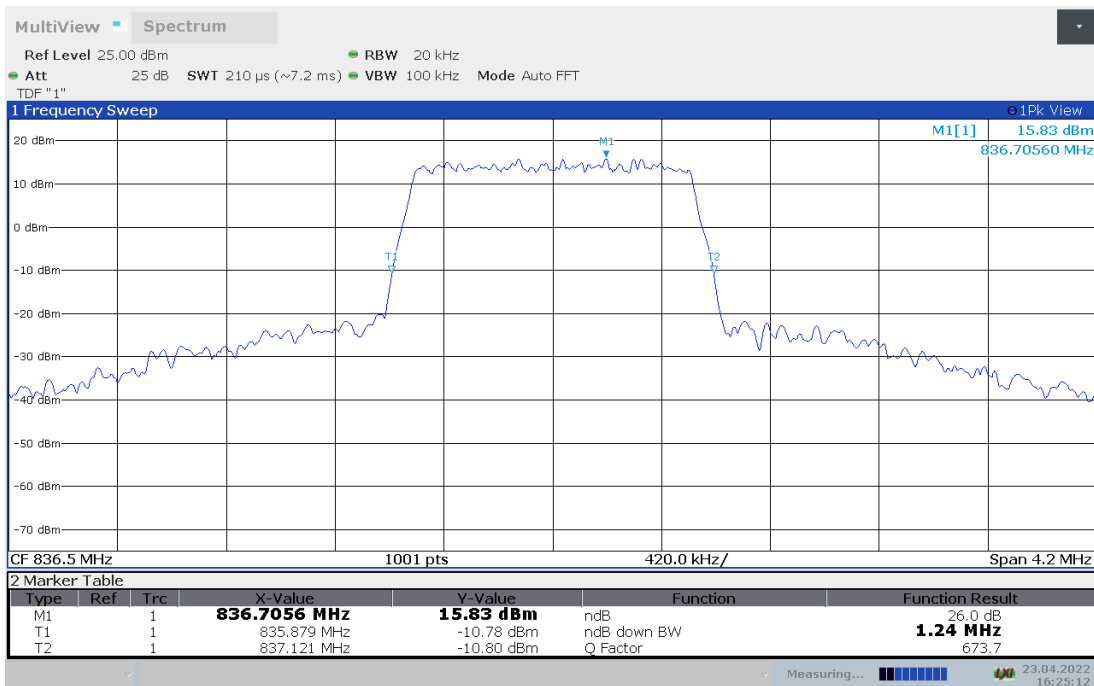
**LTE band 5, 1.4MHz (-26dBc BW)**

Frequency(MHz)	Emission Bandwidth (-26dBc)(MHz)	
	QPSK	16QAM
836.5	1.23	1.24

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



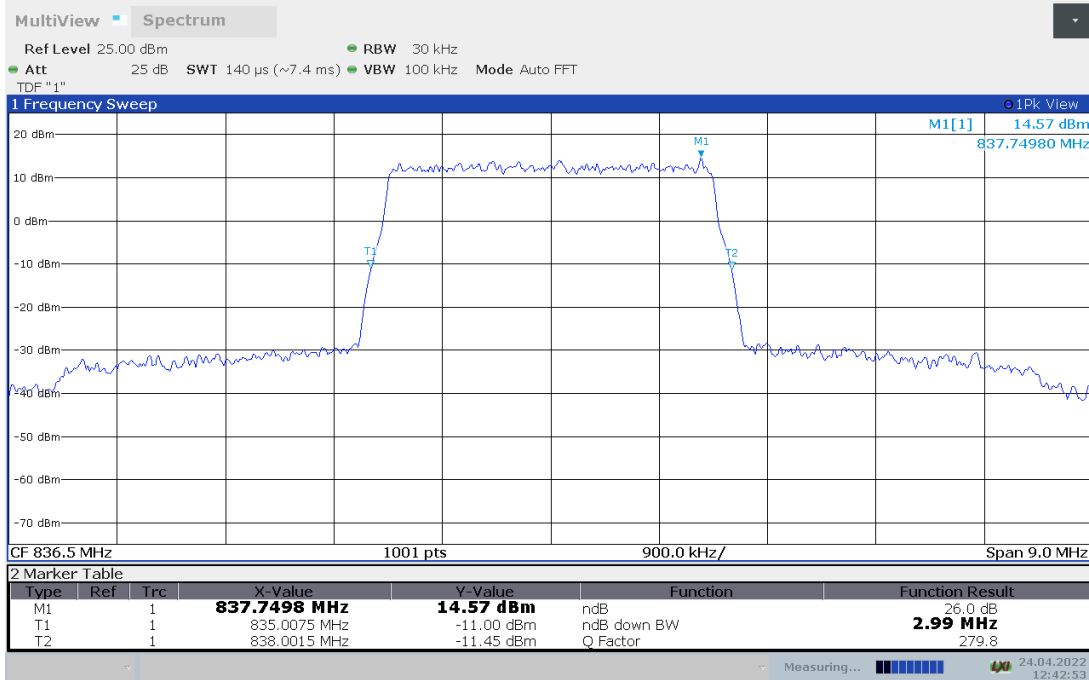
**LTE band 5 , 1.4MHz Bandwidth,16QAM (-26dBc BW)**



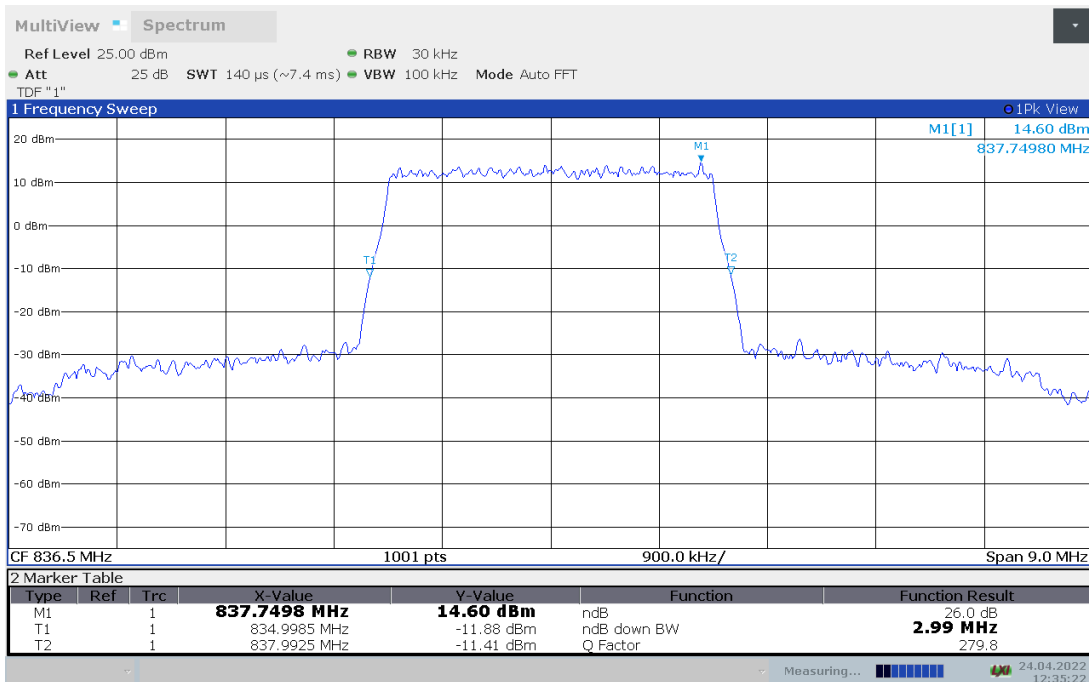
**LTE band 5, 3MHz (-26dBc BW)**

Frequency(MHz)	Emission Bandwidth (-26dBc)(MHz)	
	QPSK	16QAM
836.5	2.99	2.99

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



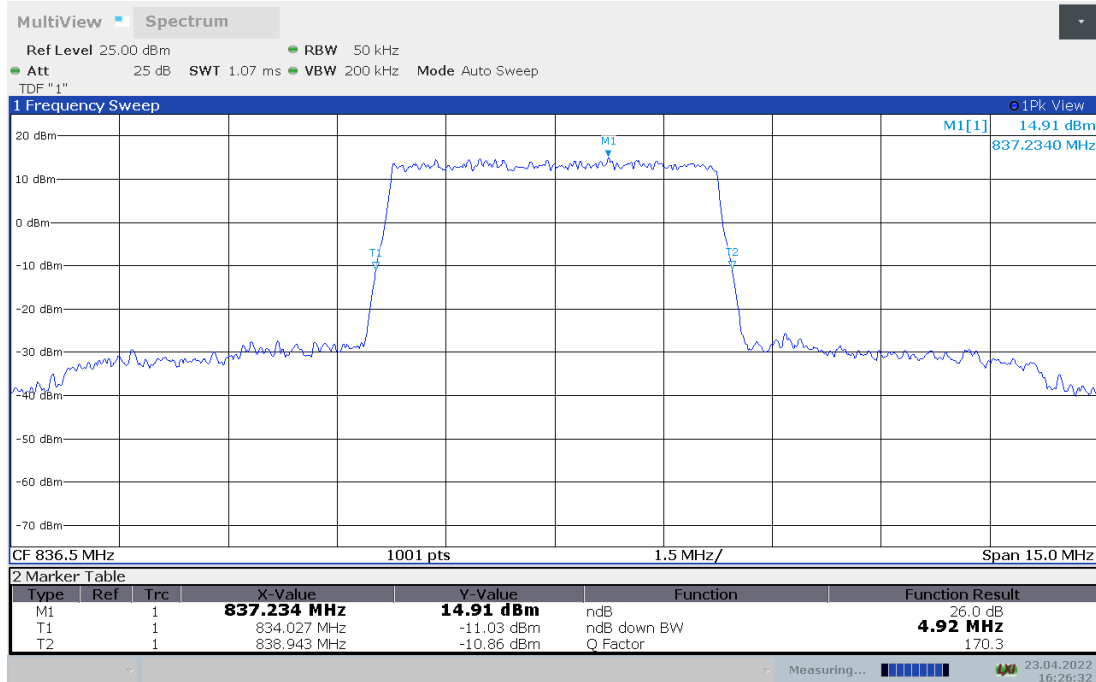
**LTE band 5 , 3MHz Bandwidth,16QAM (-26dBc BW)**



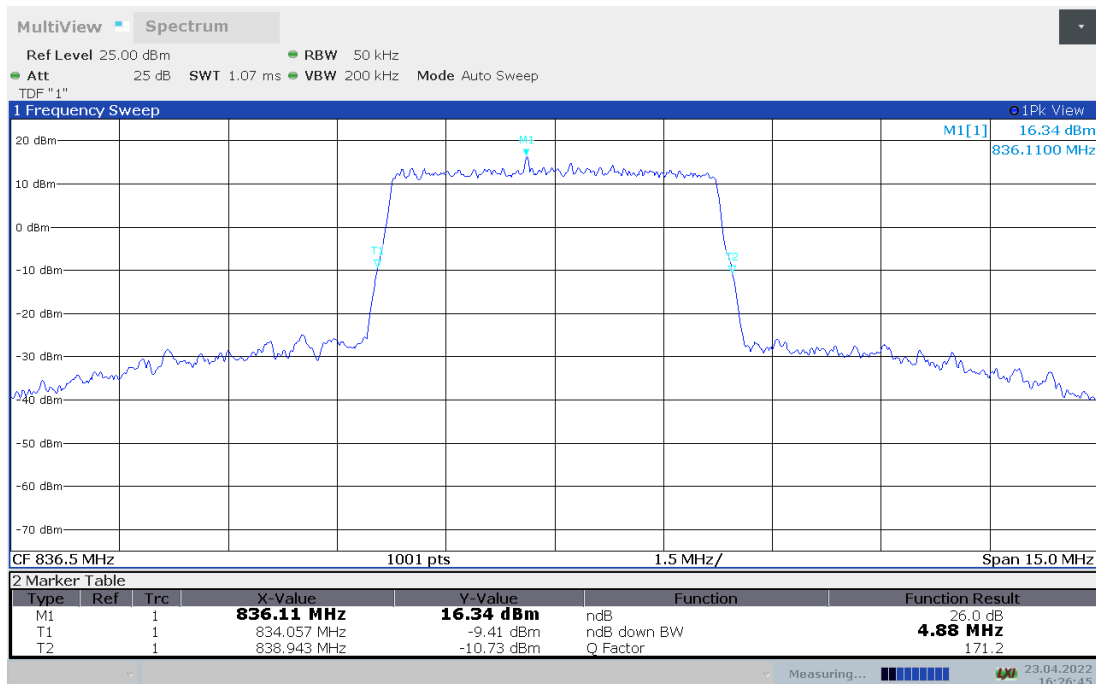
**LTE band 5, 5MHz (-26dBc BW)**

Frequency(MHz)	Emission Bandwidth (-26dBc)(MHz)	
	QPSK	16QAM
836.5	4.92	4.88

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



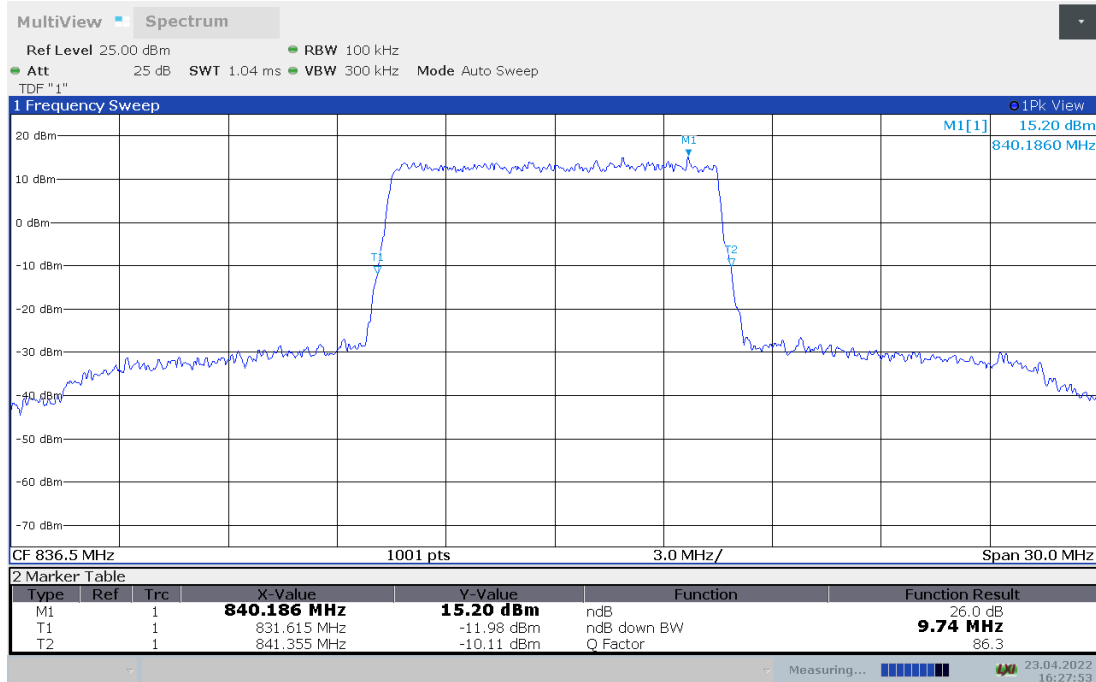
**LTE band 5 , 5MHz Bandwidth,16QAM (-26dBc BW)**



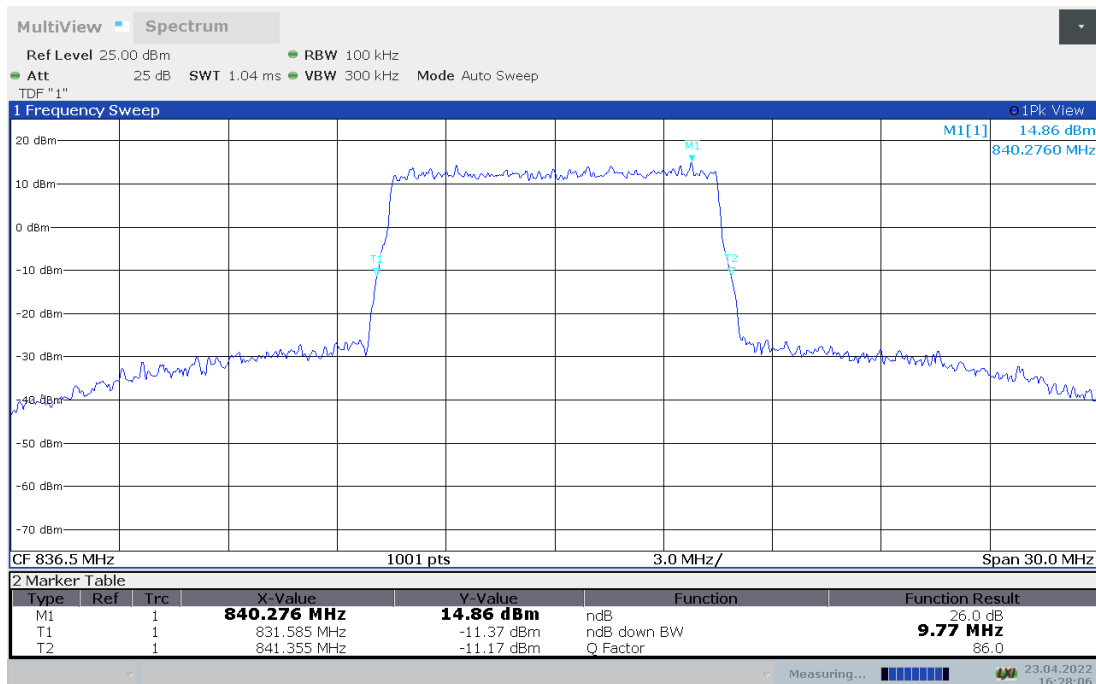
**LTE band 5, 10MHz (-26dBc BW)**

Frequency(MHz)	Emission Bandwidth (-26dBc)(MHz)	
	QPSK	16QAM
836.5	9.74	9.77

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



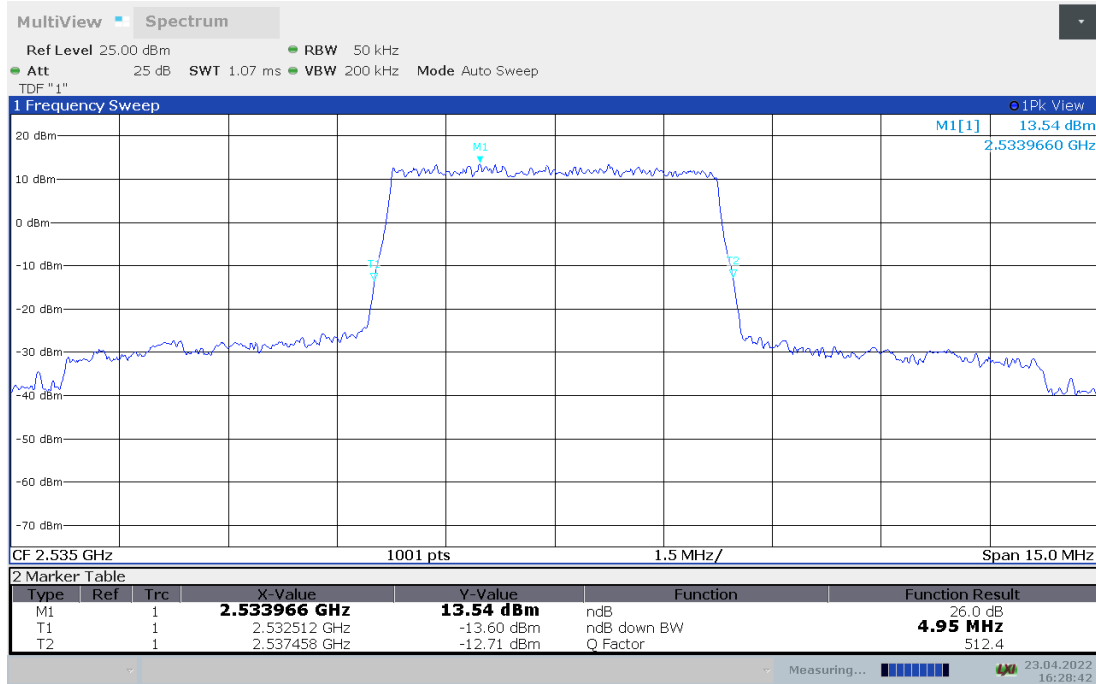
**LTE band 5 , 10MHz Bandwidth,16QAM (-26dBc BW)**



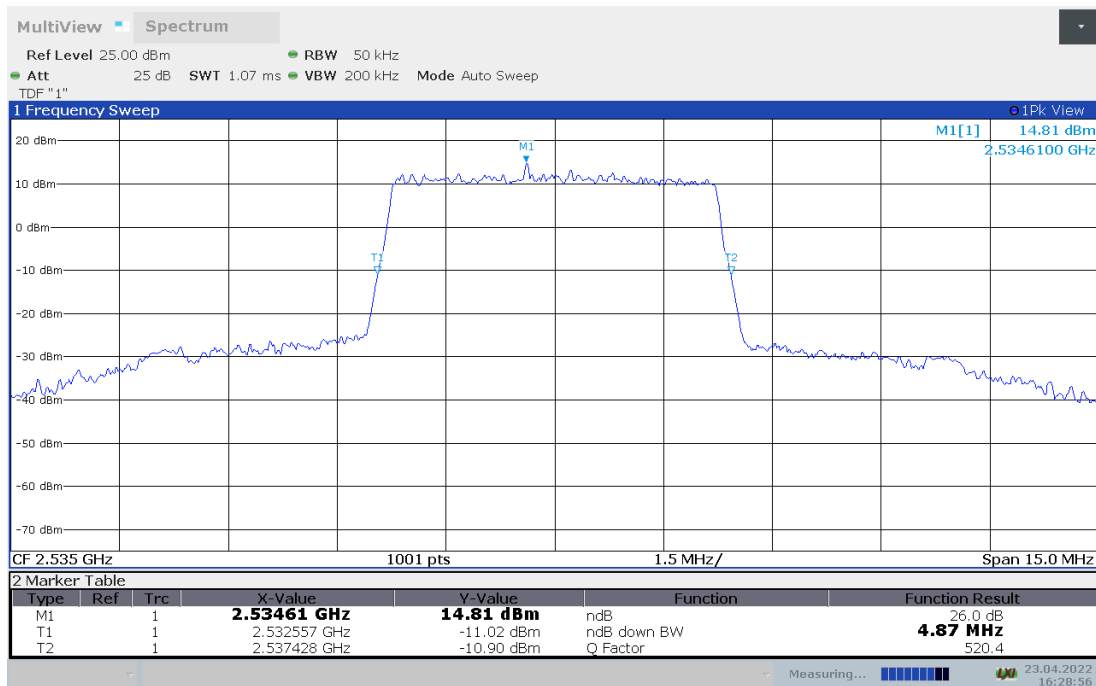
**LTE band 7, 5MHz (-26dBc BW)**

Frequency(MHz)	Emission Bandwidth (-26dBc)(MHz)	
	QPSK	16QAM
2535	4.95	4.87

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



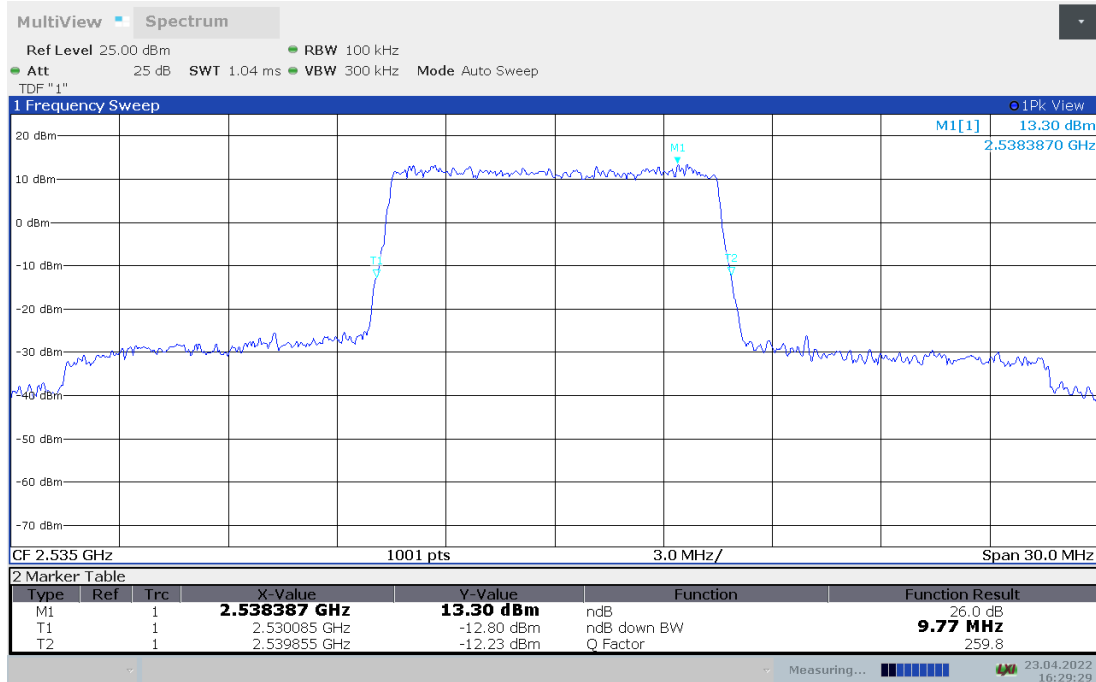
**LTE band 7 , 5MHz Bandwidth,16QAM (-26dBc BW)**



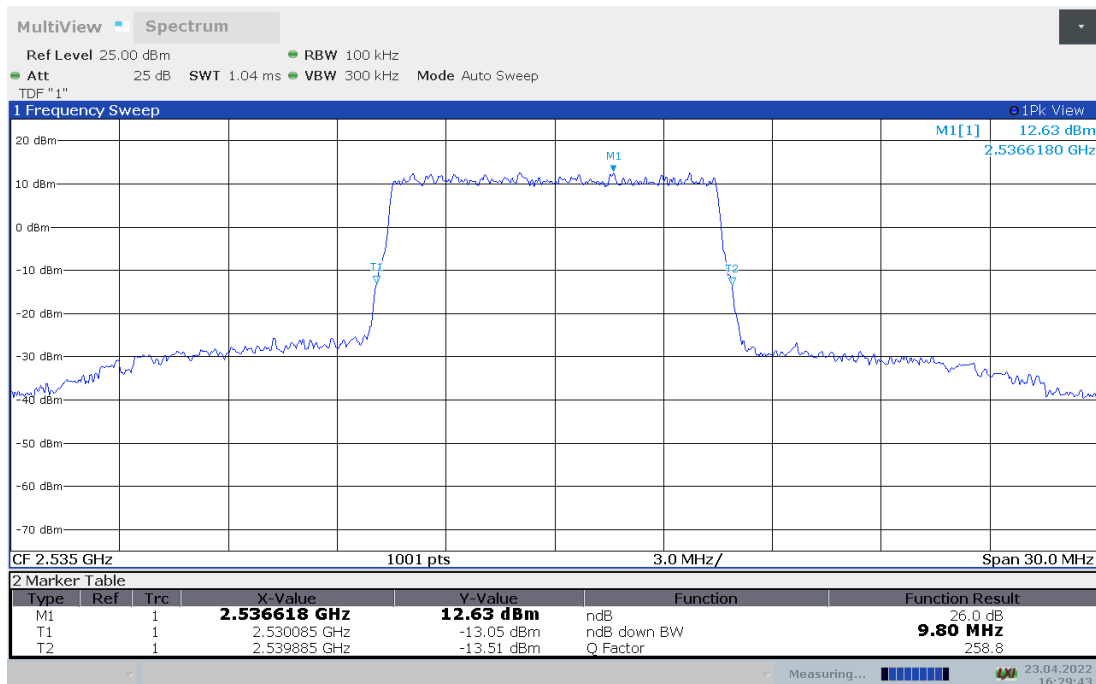
**LTE band 7, 10MHz (-26dBc BW)**

Frequency(MHz)	Emission Bandwidth (-26dBc)(MHz)	
	QPSK	16QAM
2535	9.77	9.80

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



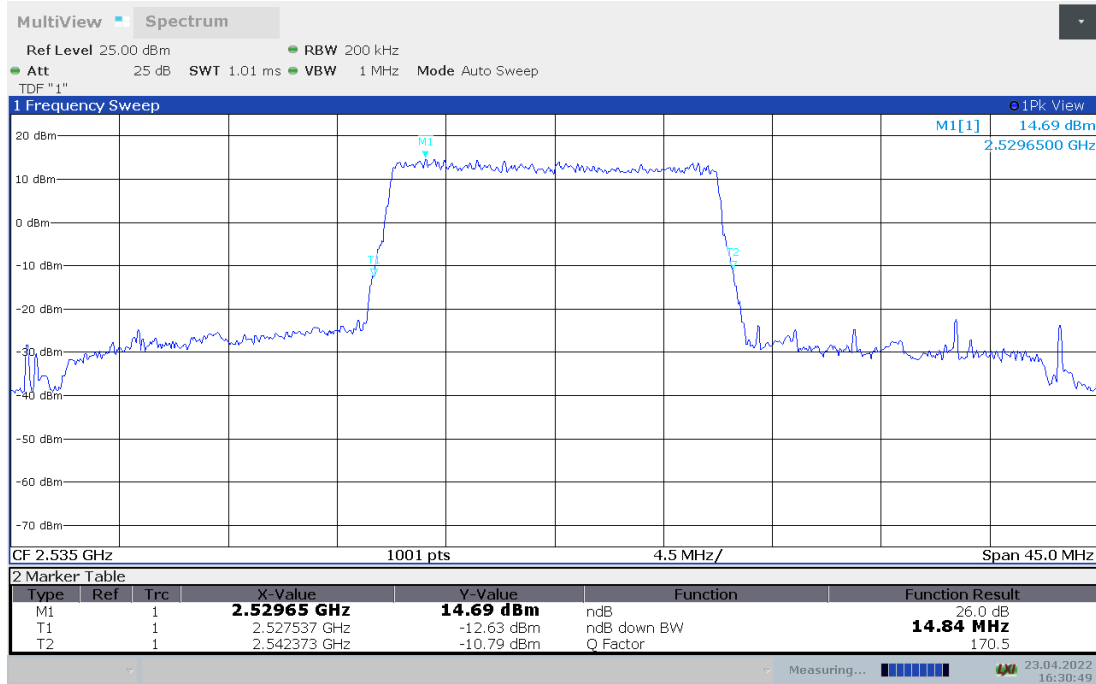
**LTE band 7 , 10MHz Bandwidth,16QAM (-26dBc BW)**



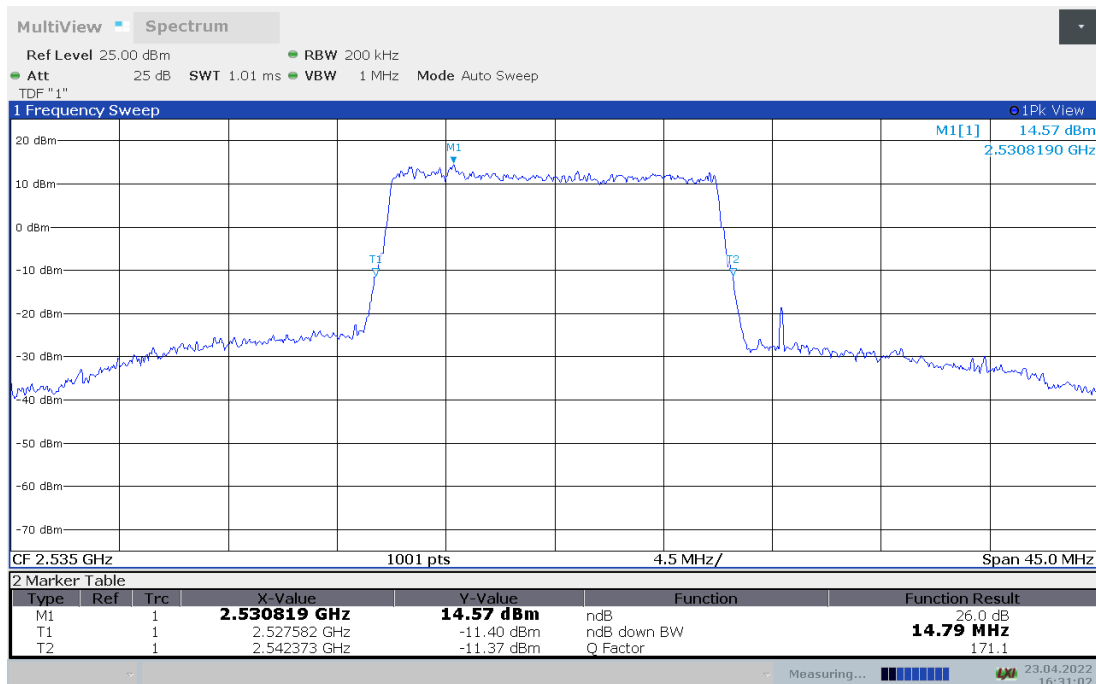
**LTE band 7, 15MHz (-26dBc BW)**

Frequency(MHz)	Emission Bandwidth (-26dBc)(MHz)	
	QPSK	16QAM
2535	14.84	14.79

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



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

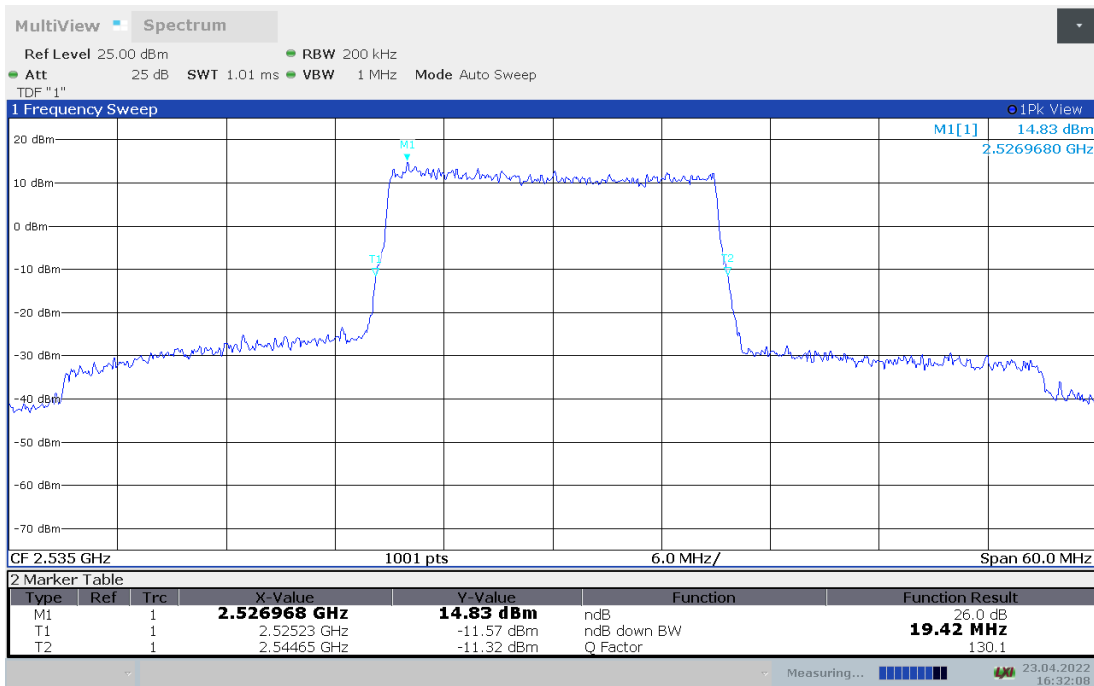




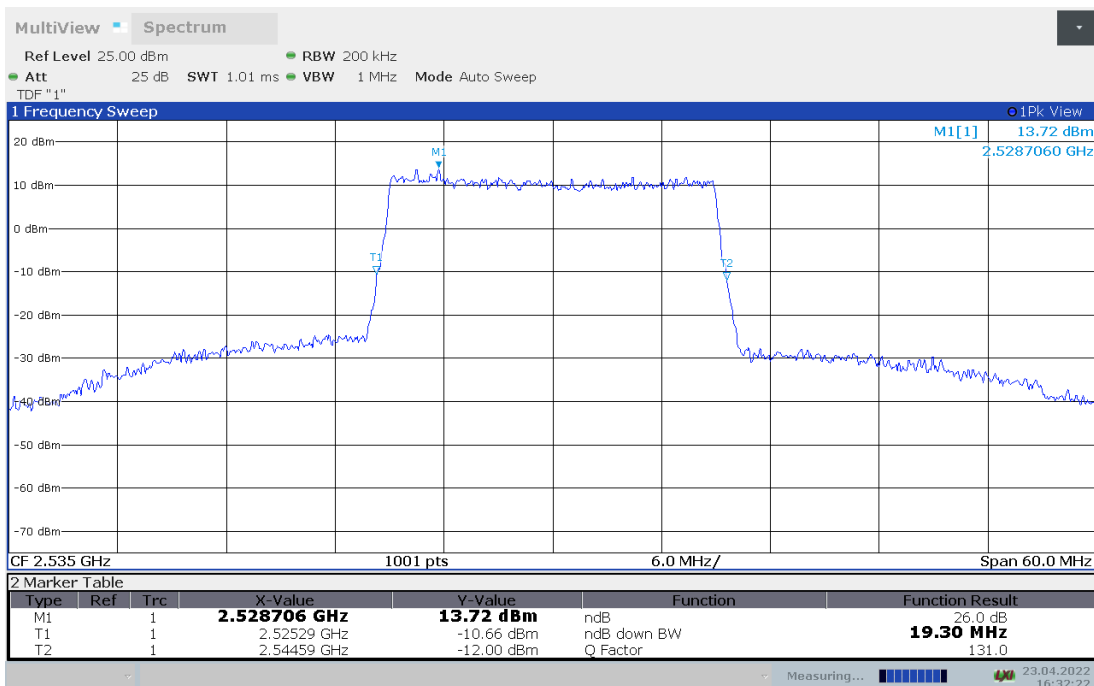
**LTE band 7, 20MHz (-26dBc BW)**

Frequency(MHz)	Emission Bandwidth (-26dBc)(MHz)	
	QPSK	16QAM
2535	19.42	19.30

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



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

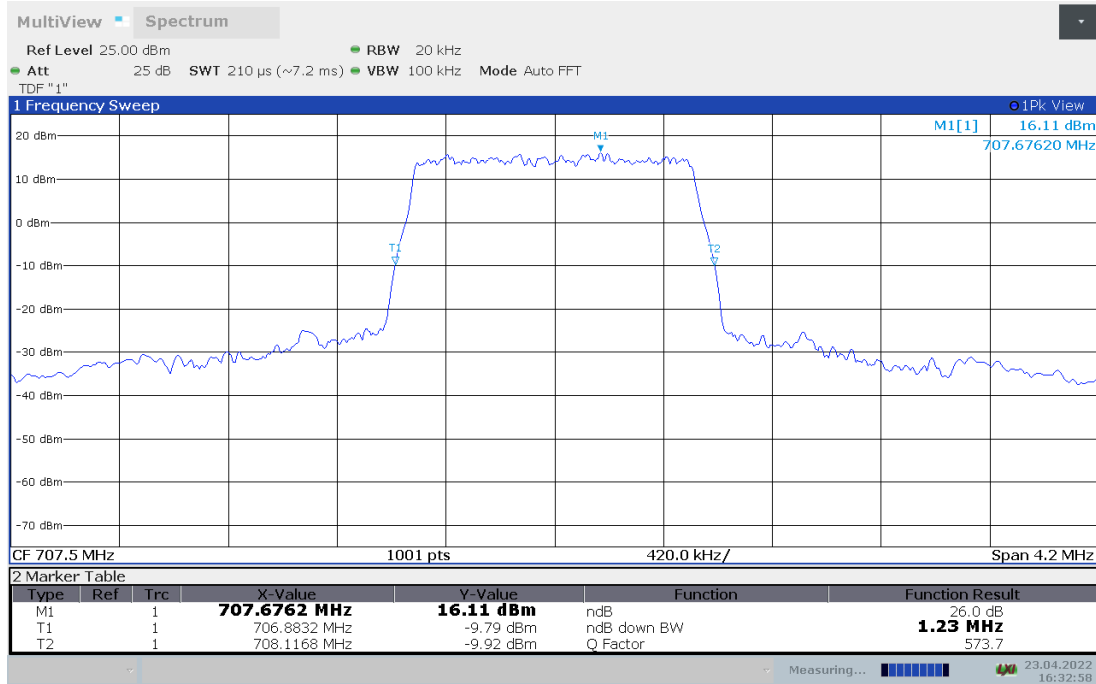


Note: Expanded measurement uncertainty is  $U = 3428\text{Hz}$ ,  $k = 2$

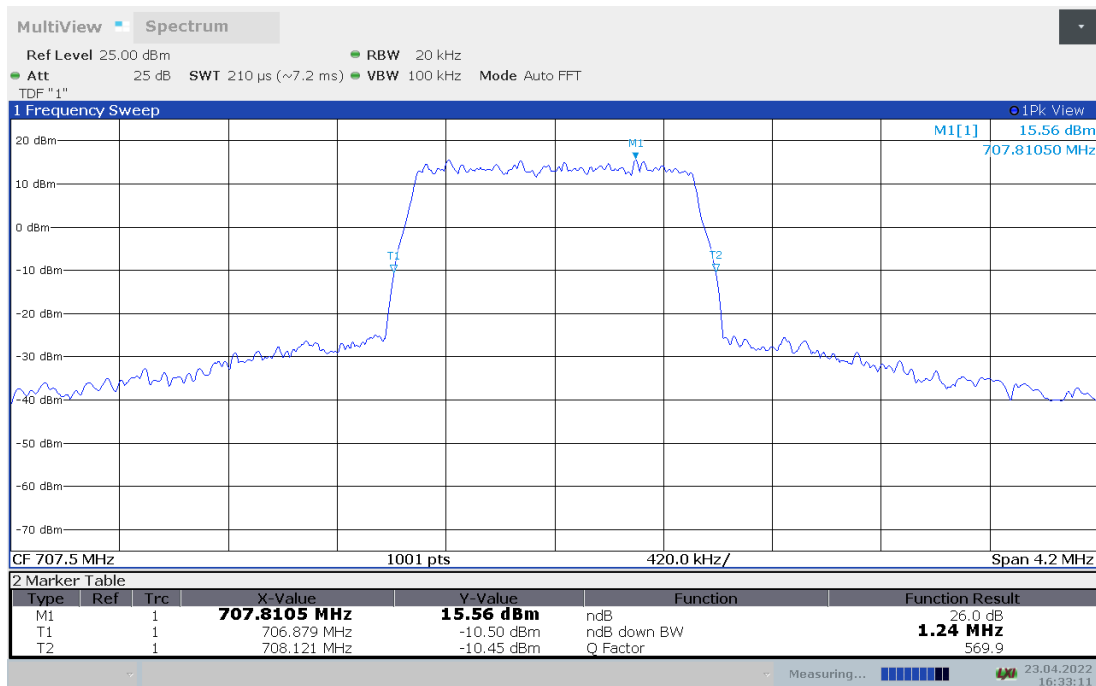
**LTE band 12, 1.4MHz (-26dBc BW)**

Frequency(MHz)	Emission Bandwidth (-26dBc)(MHz)	
	QPSK	16QAM
707.5	1.23	1.24

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



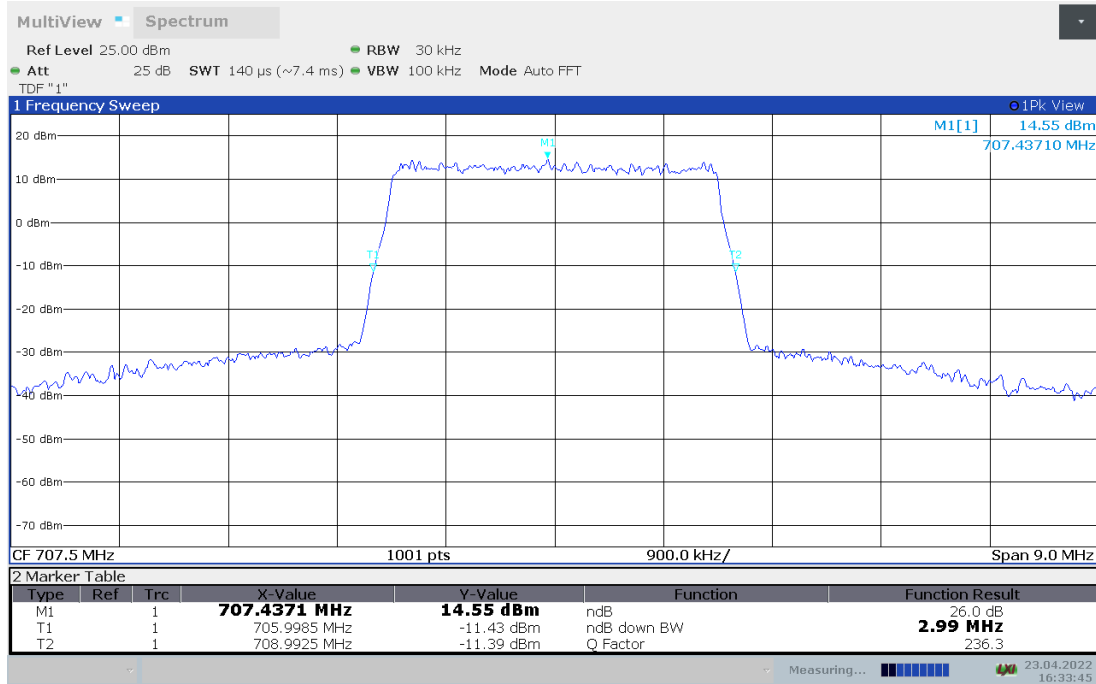
**LTE band 12 , 1.4MHz Bandwidth,16QAM (-26dBc BW)**



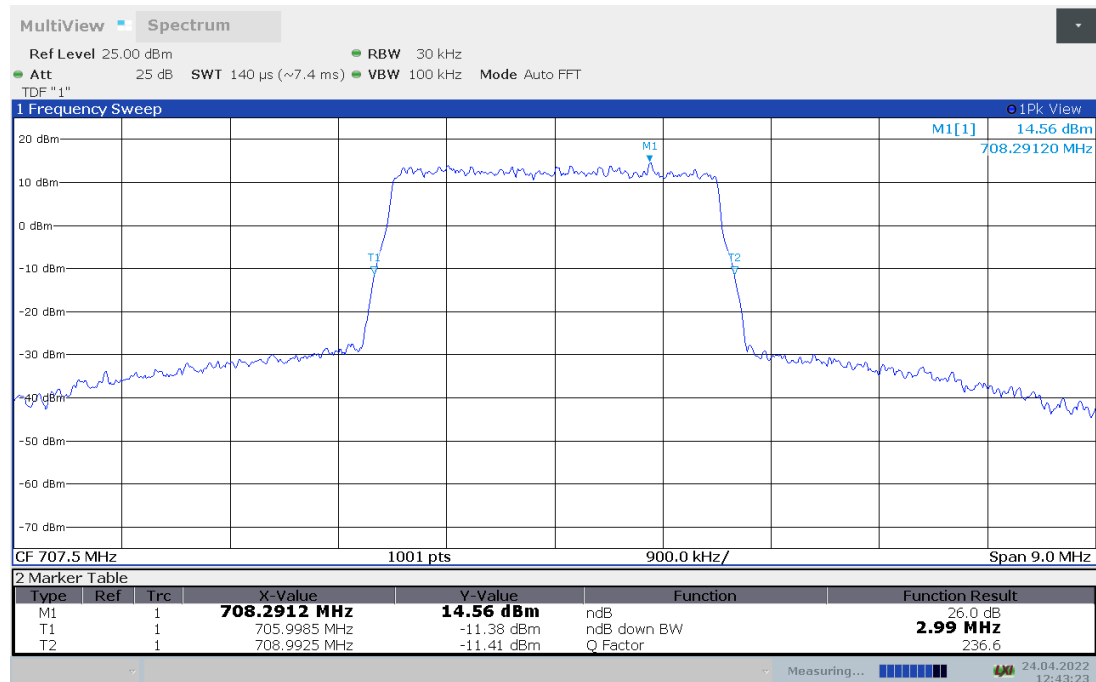
**LTE band 12, 3MHz (-26dBc BW)**

Frequency(MHz)	Emission Bandwidth (-26dBc)(MHz)	
	QPSK	16QAM
707.5	2.99	2.99

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



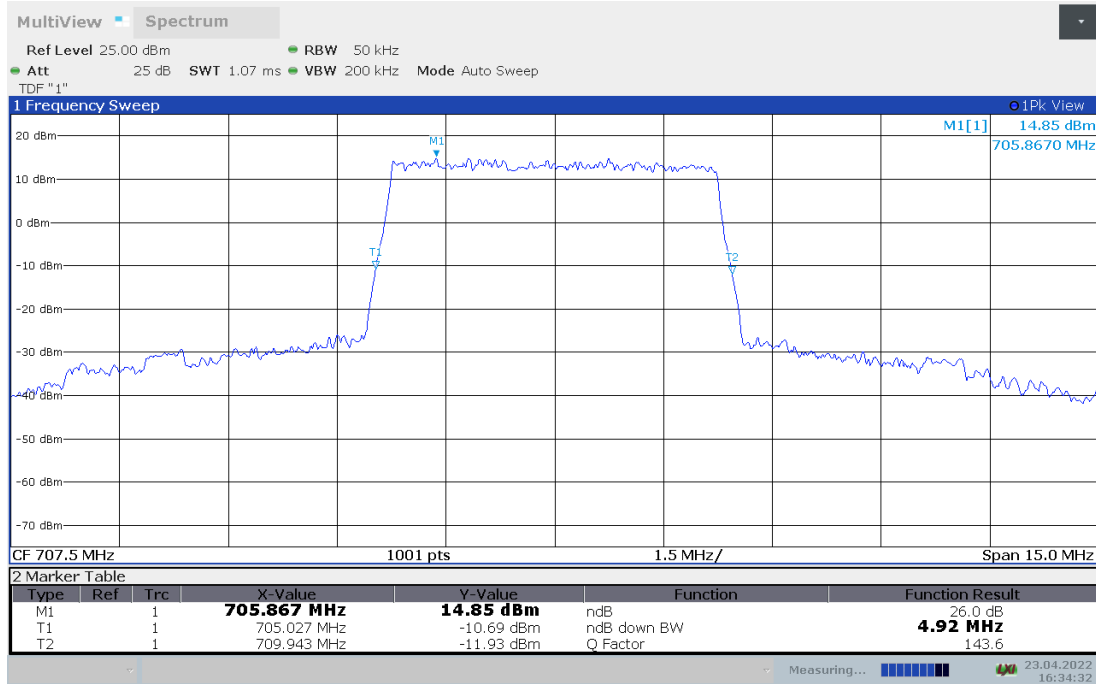
**LTE band 12 , 3MHz Bandwidth,16QAM (-26dBc BW)**



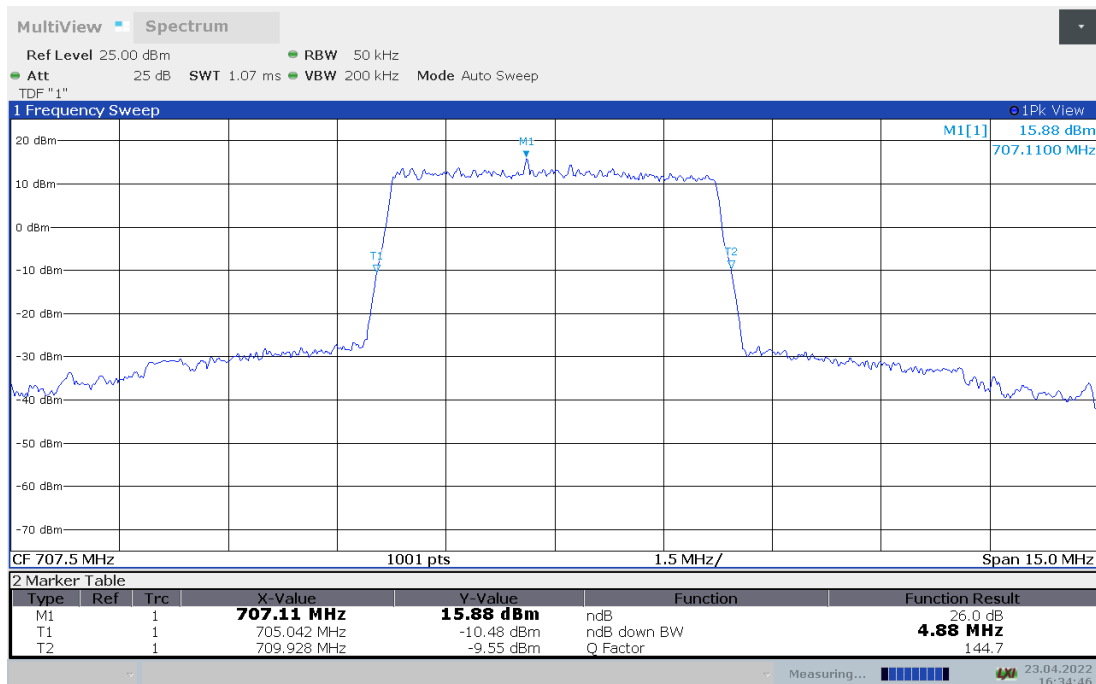
**LTE band 12, 5MHz (-26dBc BW)**

Frequency(MHz)	Emission Bandwidth (-26dBc)(MHz)	
	QPSK	16QAM
707.5	4.92	4.88

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



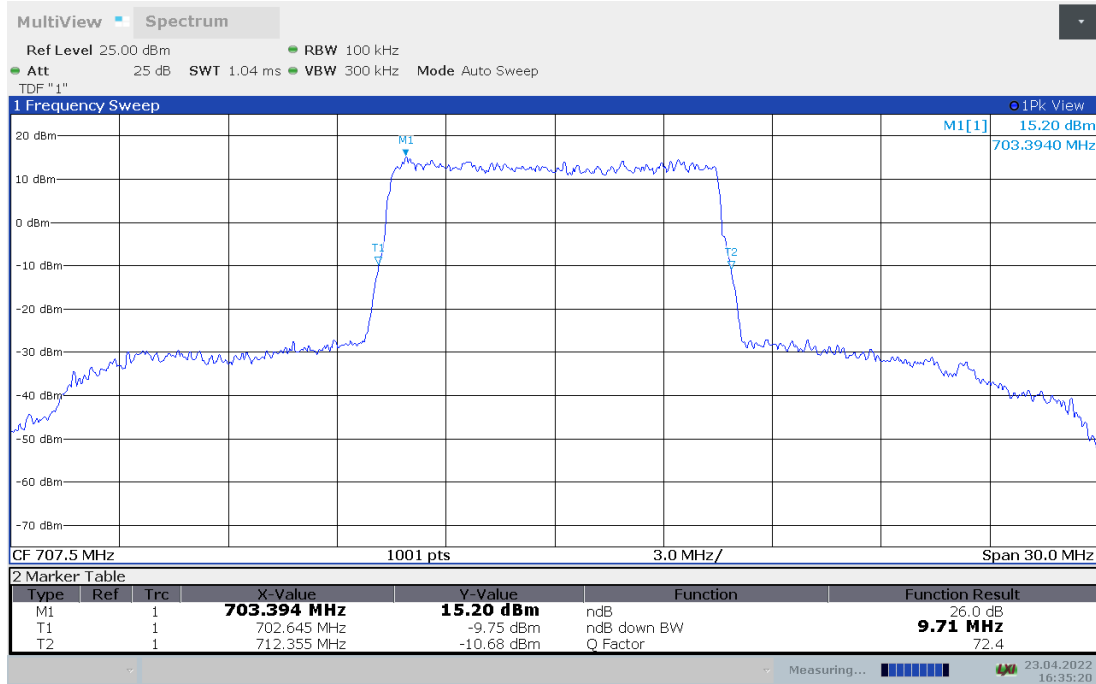
**LTE band 12 , 5MHz Bandwidth,16QAM (-26dBc BW)**



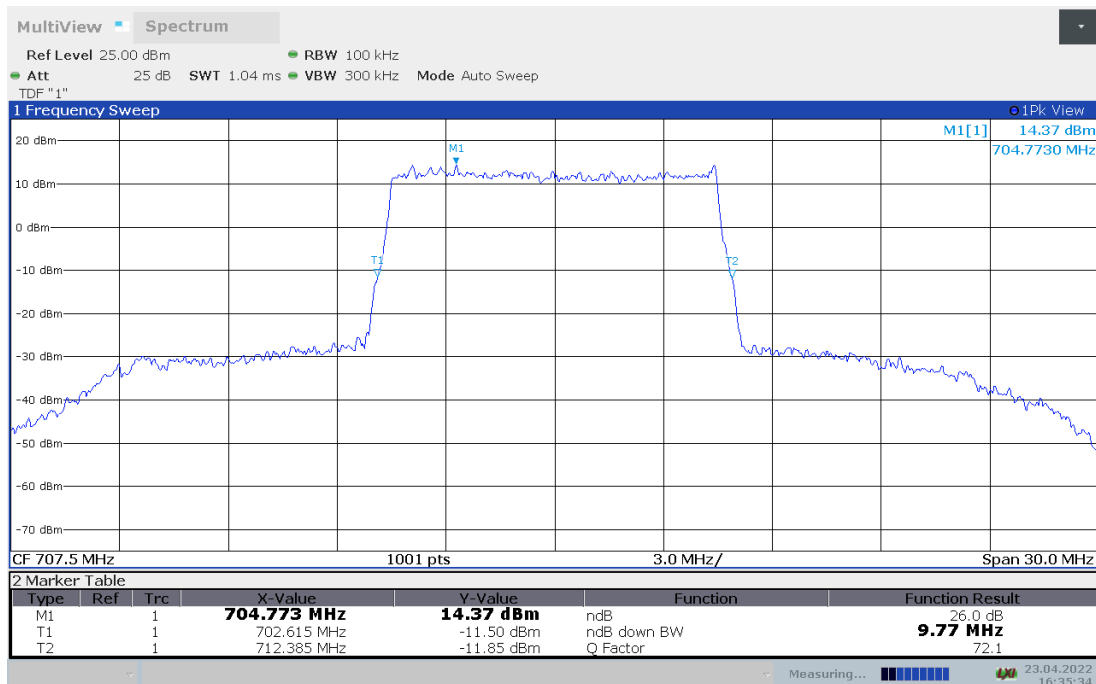
**LTE band 12, 10MHz (-26dBc BW)**

Frequency(MHz)	Emission Bandwidth (-26dBc)(MHz)	
	QPSK	16QAM
707.5	9.71	9.77

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



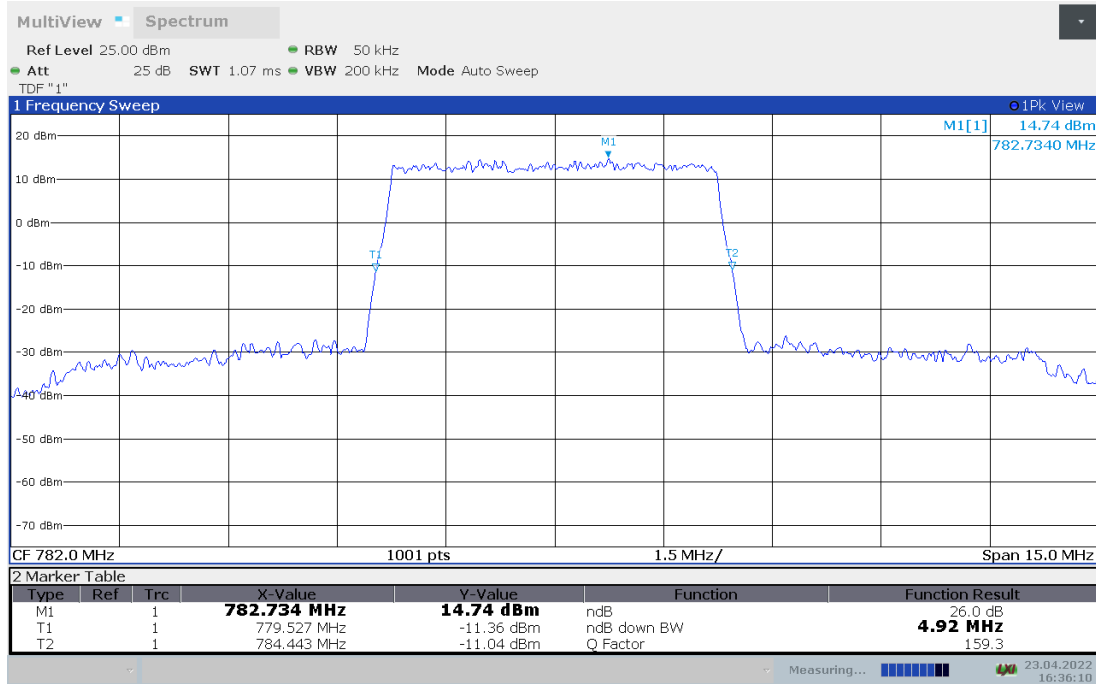
**LTE band 12 , 10MHz Bandwidth,16QAM (-26dBc BW)**



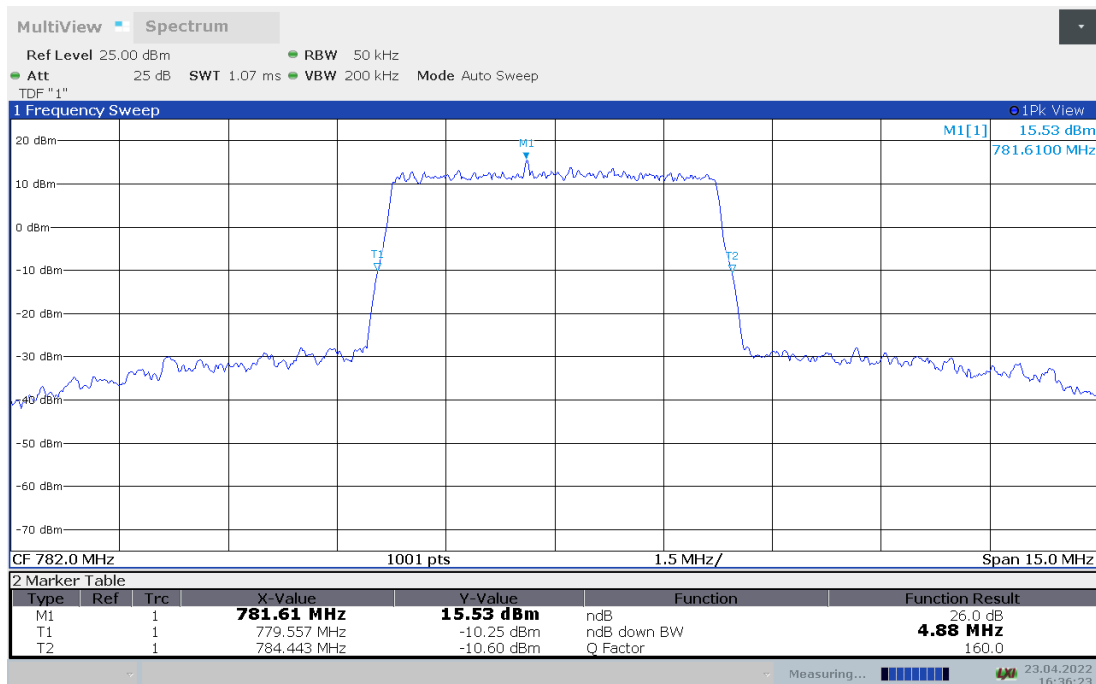
**LTE band 13, 5MHz (-26dBc BW)**

Frequency(MHz)	Emission Bandwidth (-26dBc)(MHz)	
	QPSK	16QAM
782	4.92	4.88

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



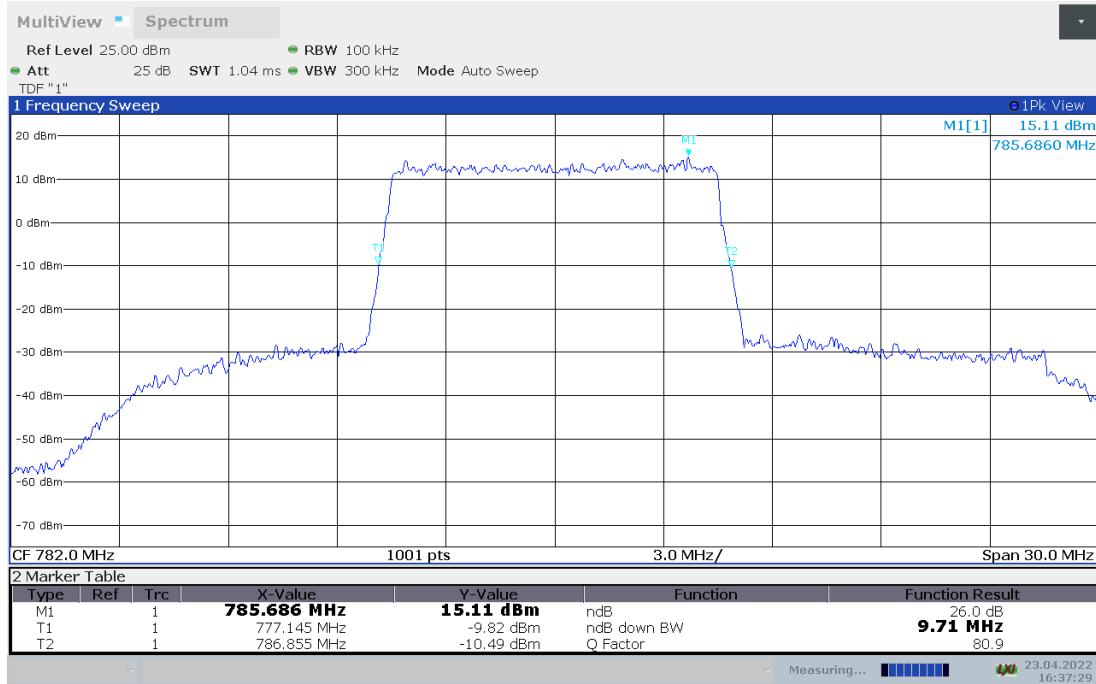
**LTE band 13 , 5MHz Bandwidth,16QAM (-26dBc BW)**



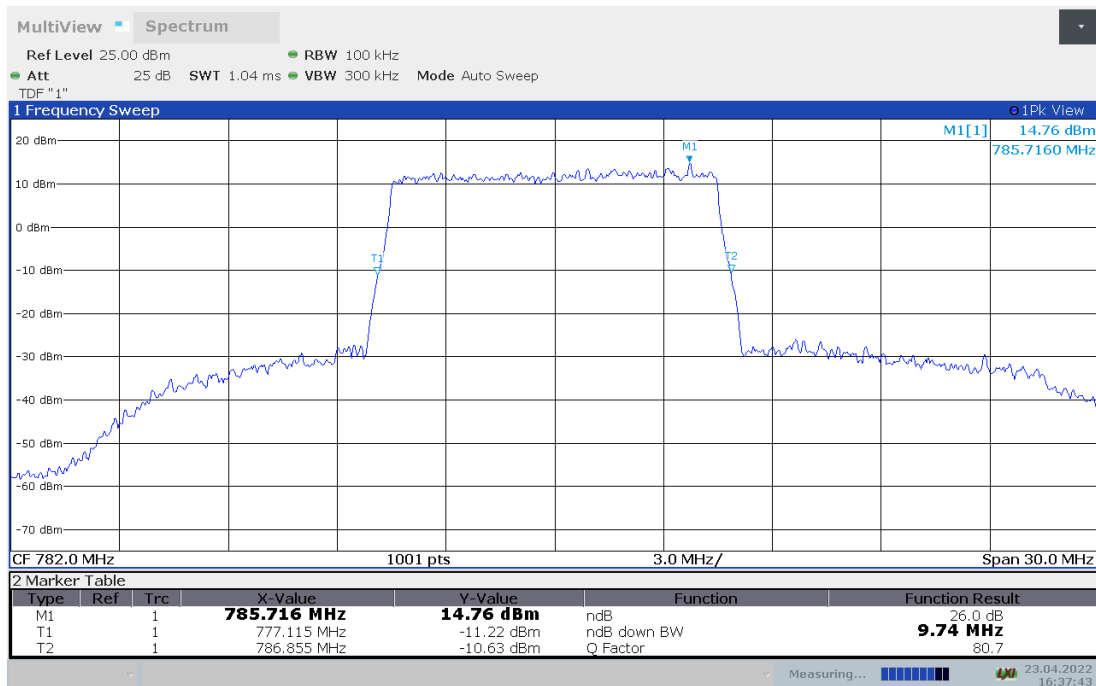
**LTE band 13, 10MHz (-26dBc BW)**

Frequency(MHz)	Emission Bandwidth (-26dBc)(MHz)	
	QPSK	16QAM
782	9.71	9.74

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



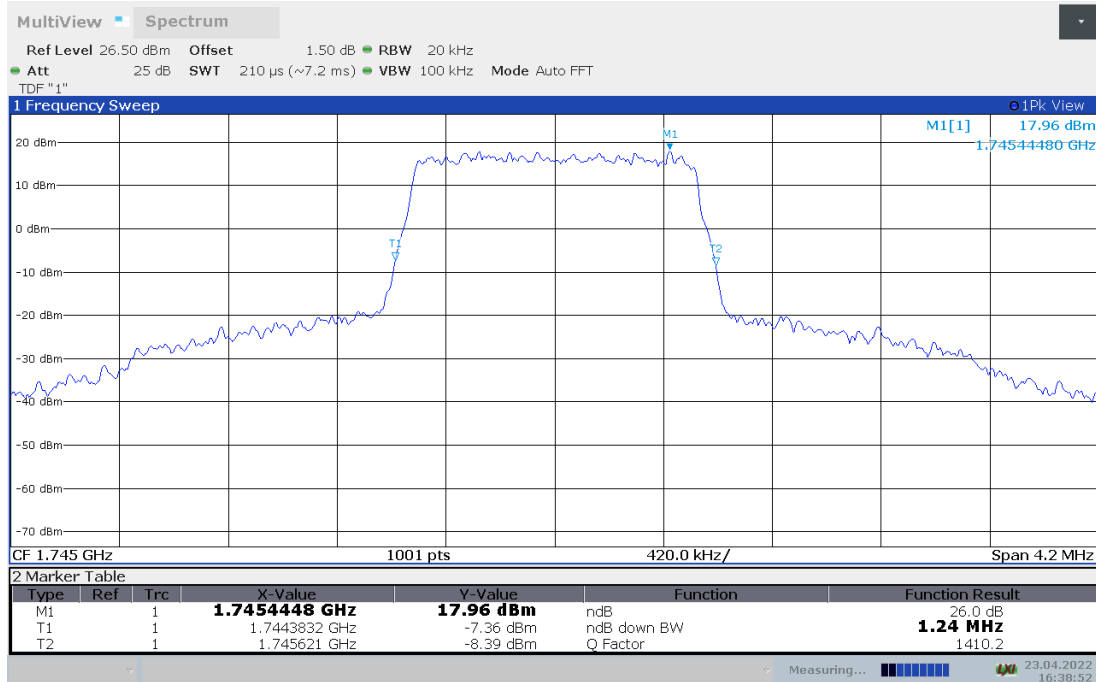
**LTE band 13 , 10MHz Bandwidth,16QAM (-26dBc BW)**



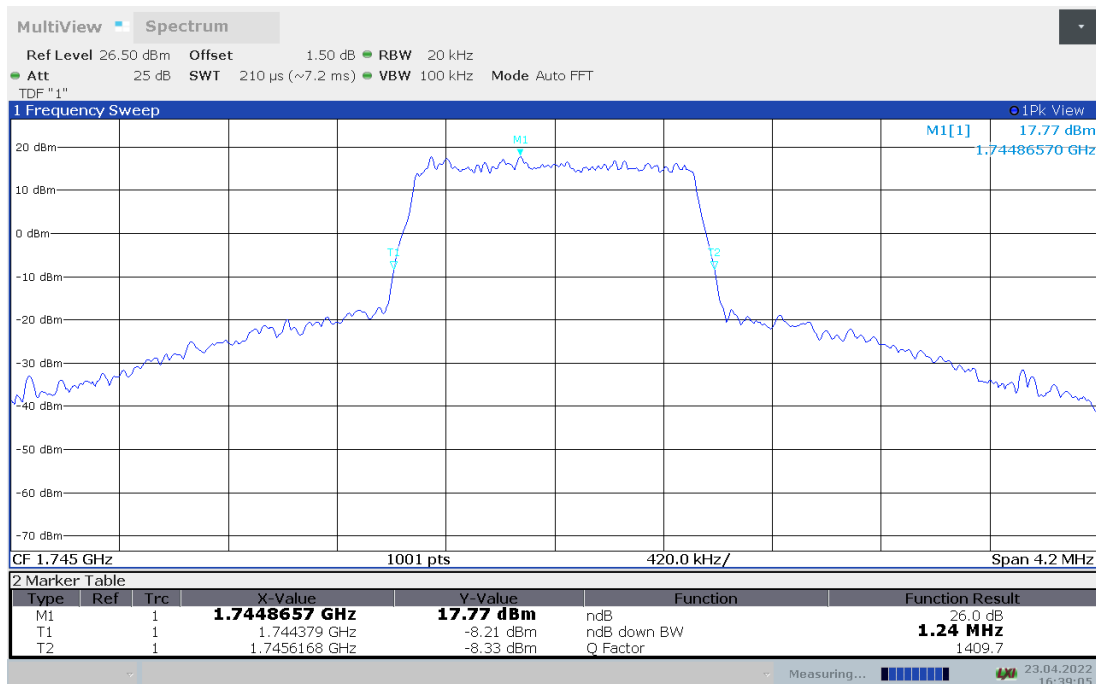
**LTE band 66, 1.4MHz (-26dBc BW)**

Frequency(MHz)	Emission Bandwidth (-26dBc)(MHz)	
	QPSK	16QAM
1745	1.24	1.24

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



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

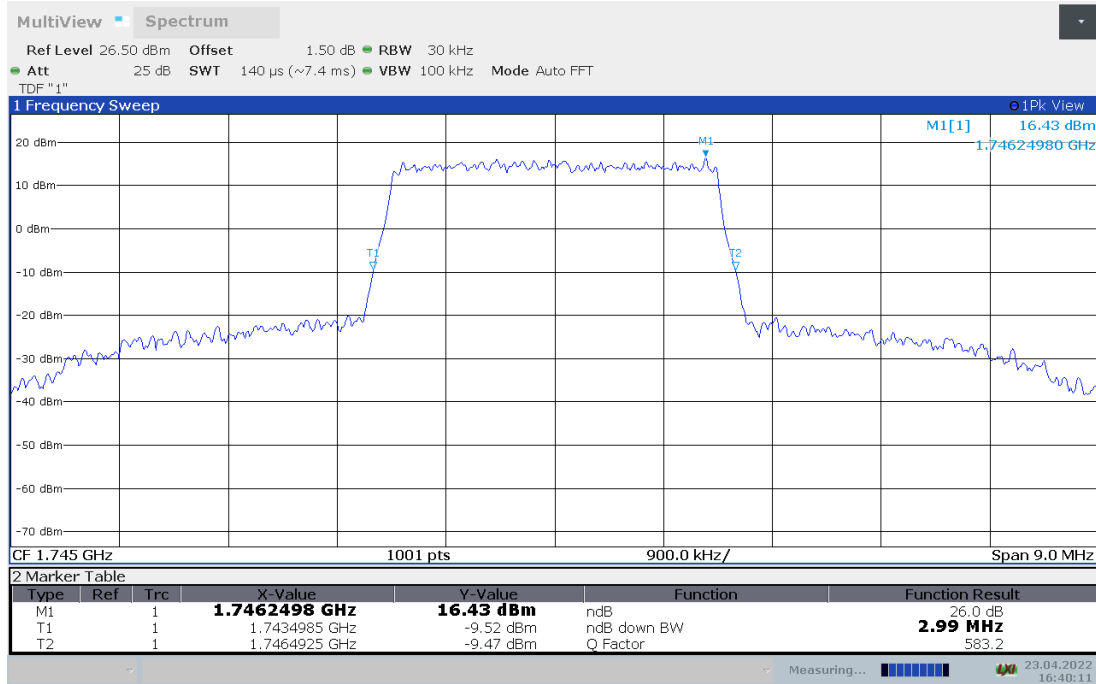




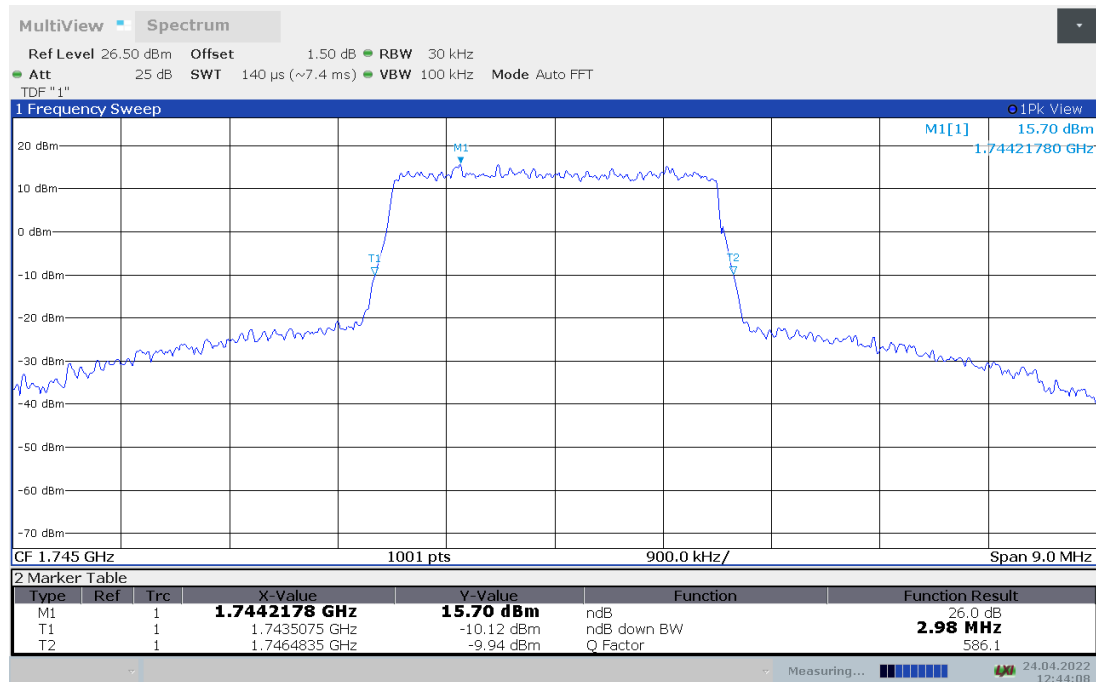
**LTE band 66, 3MHz (-26dBc BW)**

Frequency(MHz)	Emission Bandwidth (-26dBc)(MHz)	
	QPSK	16QAM
1745	2.99	2.98

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



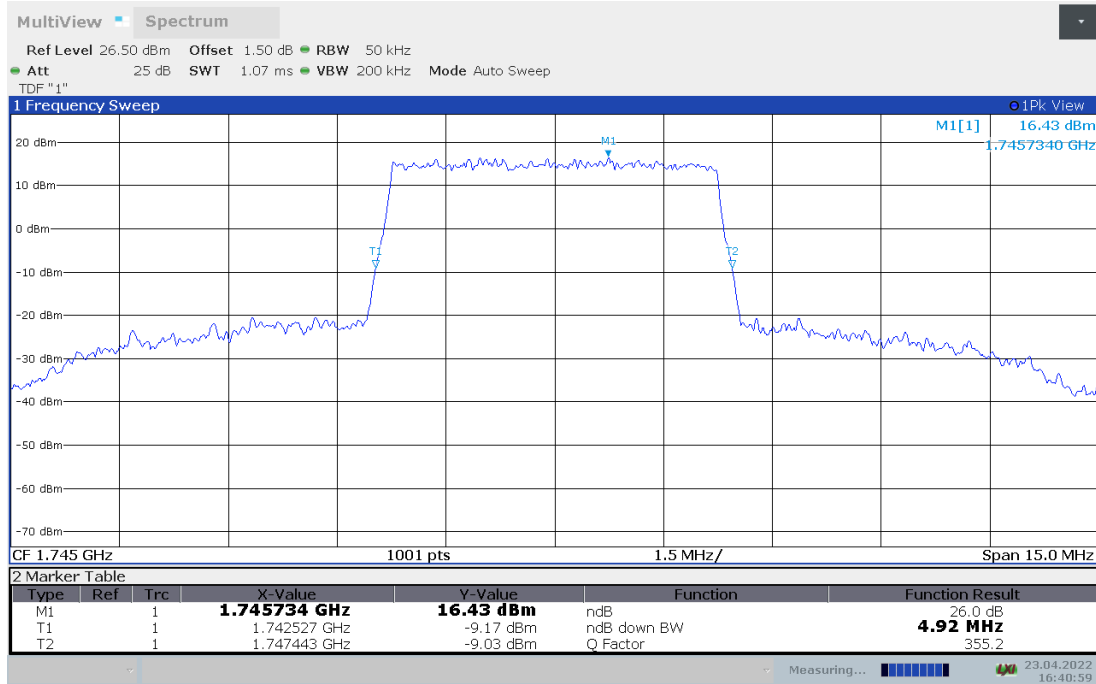
**LTE band 66 , 3MHz Bandwidth,16QAM (-26dBc BW)**



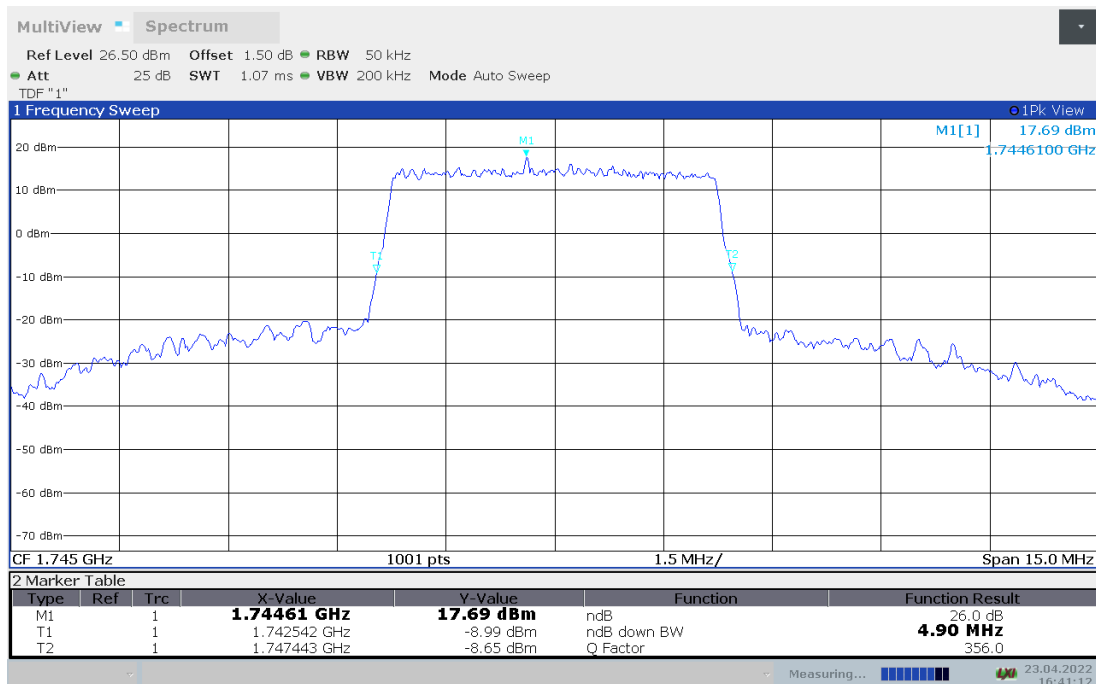
**LTE band 66, 5MHz (-26dBc BW)**

Frequency(MHz)	Emission Bandwidth (-26dBc)(MHz)	
	QPSK	16QAM
1745	4.92	4.90

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



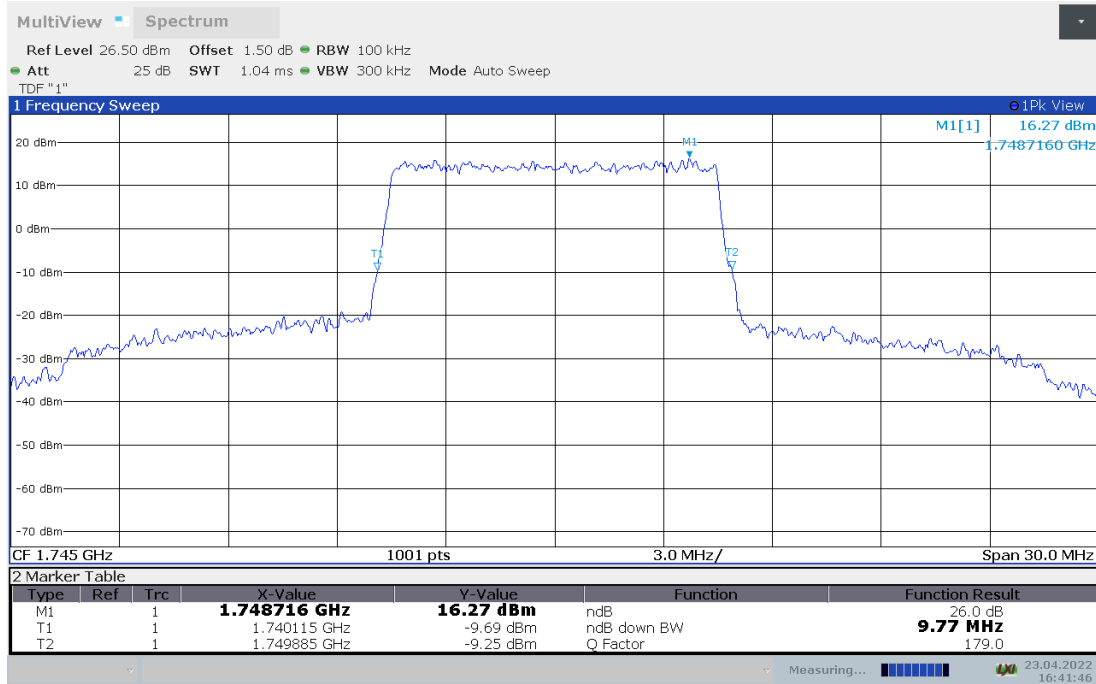
**LTE band 66 , 5MHz Bandwidth,16QAM (-26dBc BW)**



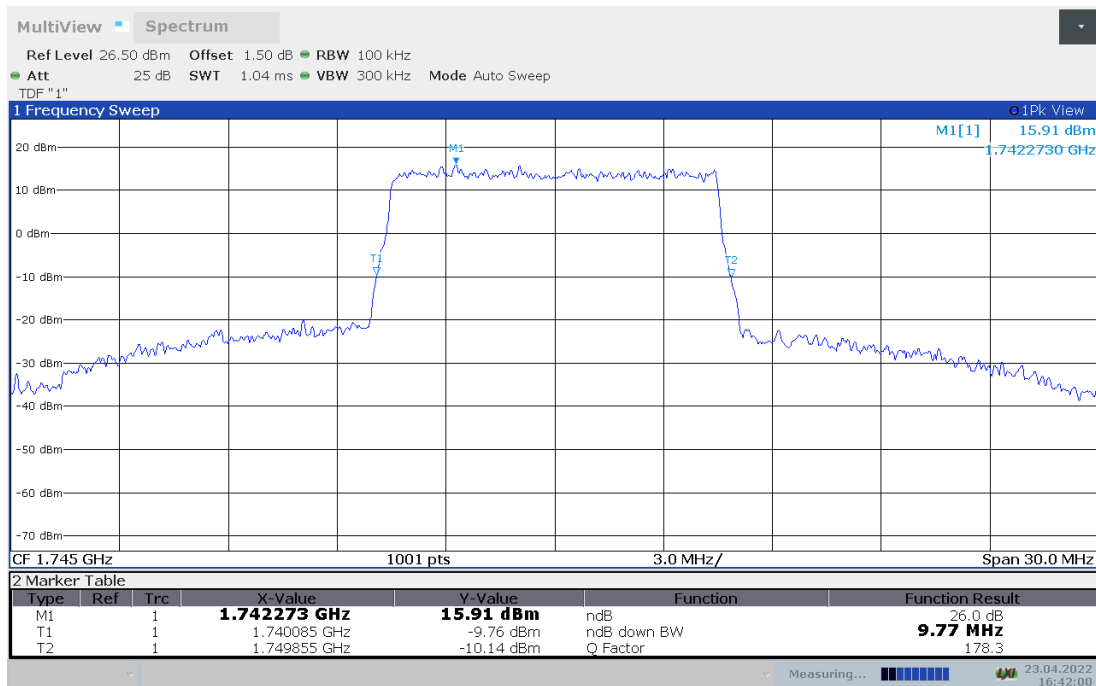
**LTE band 66, 10MHz (-26dBc BW)**

Frequency(MHz)	Emission Bandwidth (-26dBc)(MHz)	
	QPSK	16QAM
1745	9.77	9.77

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



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

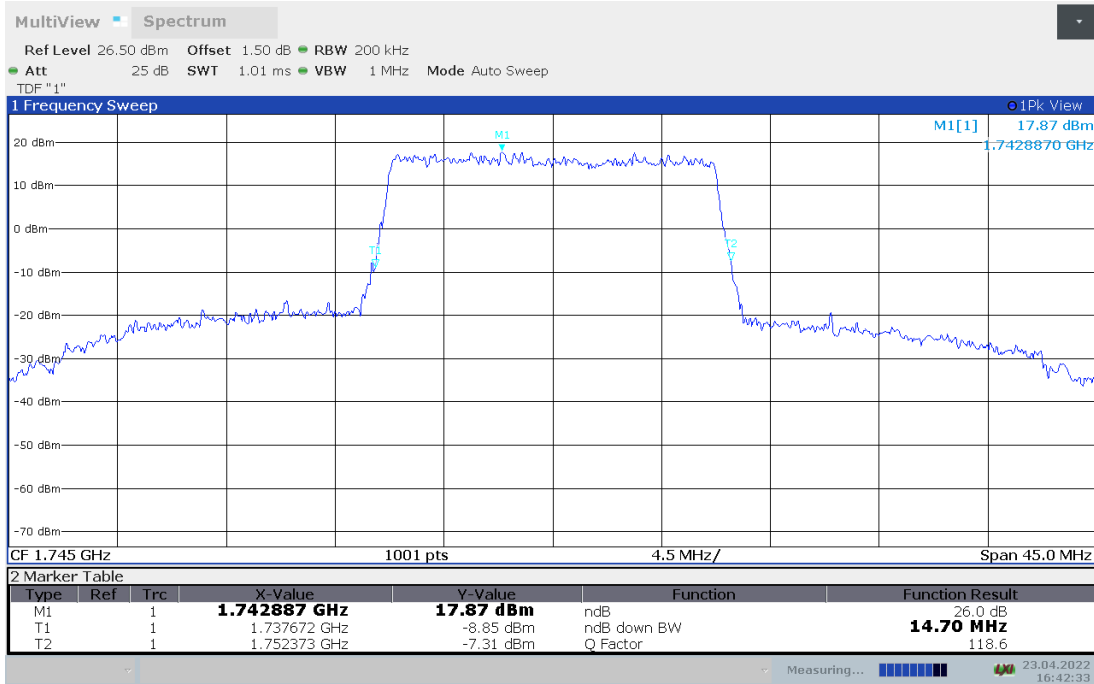




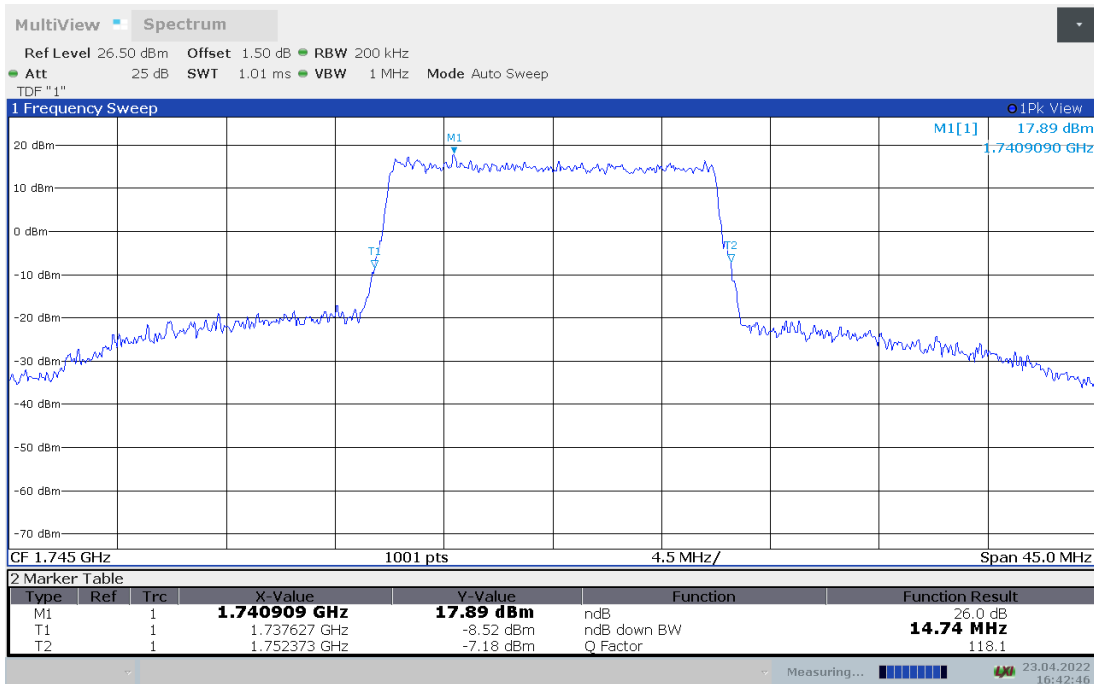
**LTE band 66, 15MHz (-26dBc BW)**

Frequency(MHz)	Emission Bandwidth (-26dBc)(MHz)	
	QPSK	16QAM
1745	14.70	14.74

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



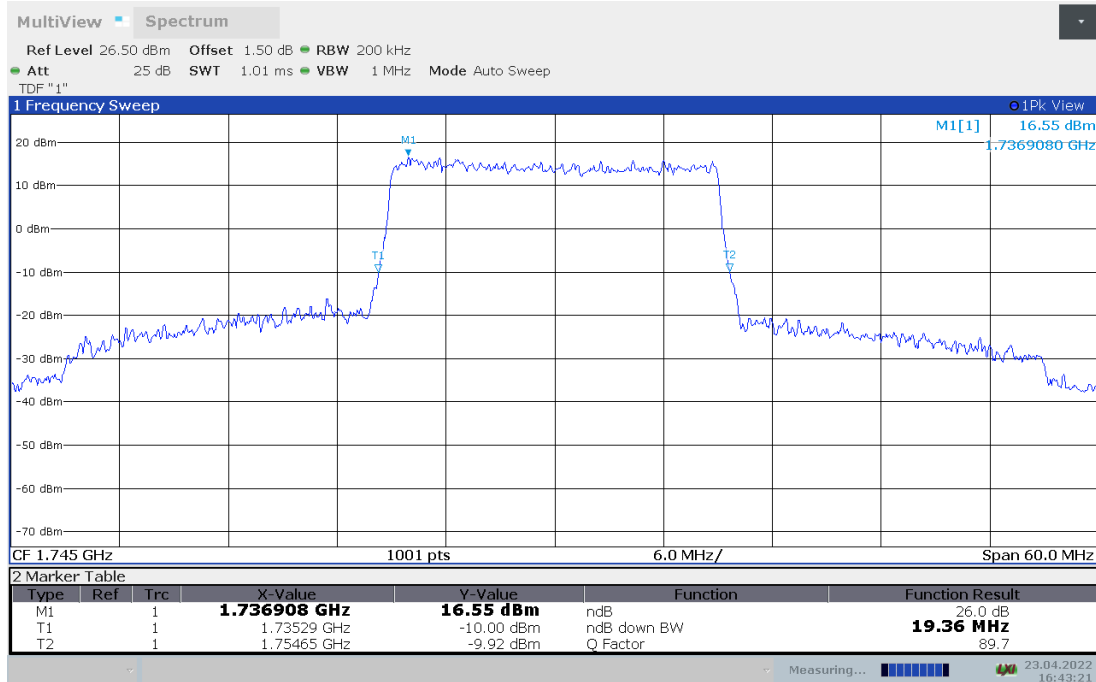
**LTE band 66 , 15MHz Bandwidth,16QAM (-26dBc BW)**



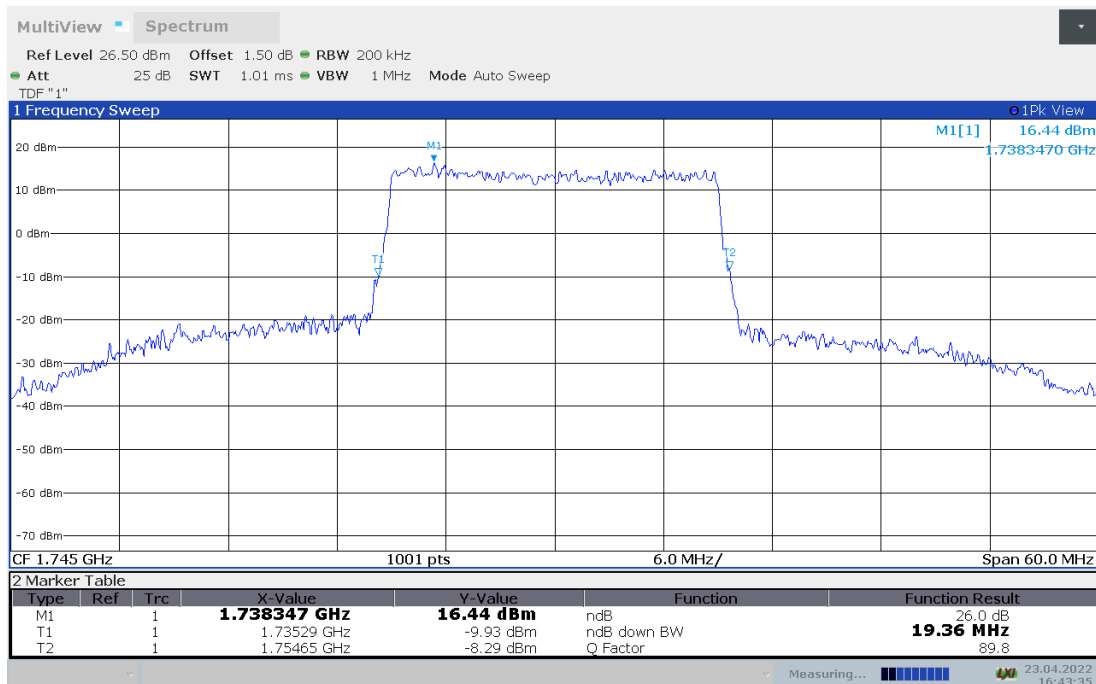
**LTE band 66, 20MHz (-26dBc BW)**

Frequency(MHz)	Emission Bandwidth (-26dBc)(MHz)	
	QPSK	16QAM
1745	19.36	19.36

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



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



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**

Part 22.917 For operations in the 824–849MHz band, the FCC limit is  $43 + 10 \log(P)$  dB below the transmitter power(P) in a 100kHz bandwidth. However, in the 1MHz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

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

Part 27.53(m) specifies for mobile digital stations, the attenuation factor shall be not less than  $40 + 10 \log(P)$  dB on all frequencies between the channel edge and 5 megahertz from the channel edge,  $43 + 10 \log(P)$  dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and  $55 + 10 \log(P)$  dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less than  $43 + 10 \log(P)$  dB on all frequencies between 2490.5 MHz and 2496 MHz and  $55 + 10 \log(P)$  dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees. Part 27.53(g) states for operations in the 600 MHz band and the 698–746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least  $43 + 10 \log(P)$  dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

### **A.6.2 Measurement Procedure**

The testing follows ANSI C63.26

- a) The EUT was connected to spectrum analyzer and system simulator via a power divider.
- b) The band edges of low and high channels for the highest RF powers were measured.
- c) Set RBW  $\geq$  1% EBW in the 1MHz band immediately outside and adjacent to the band edge.
- d) Set spectrum analyzer with RMS detector.
- e) The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
- f) Checked that all the results comply with the emission limit line.

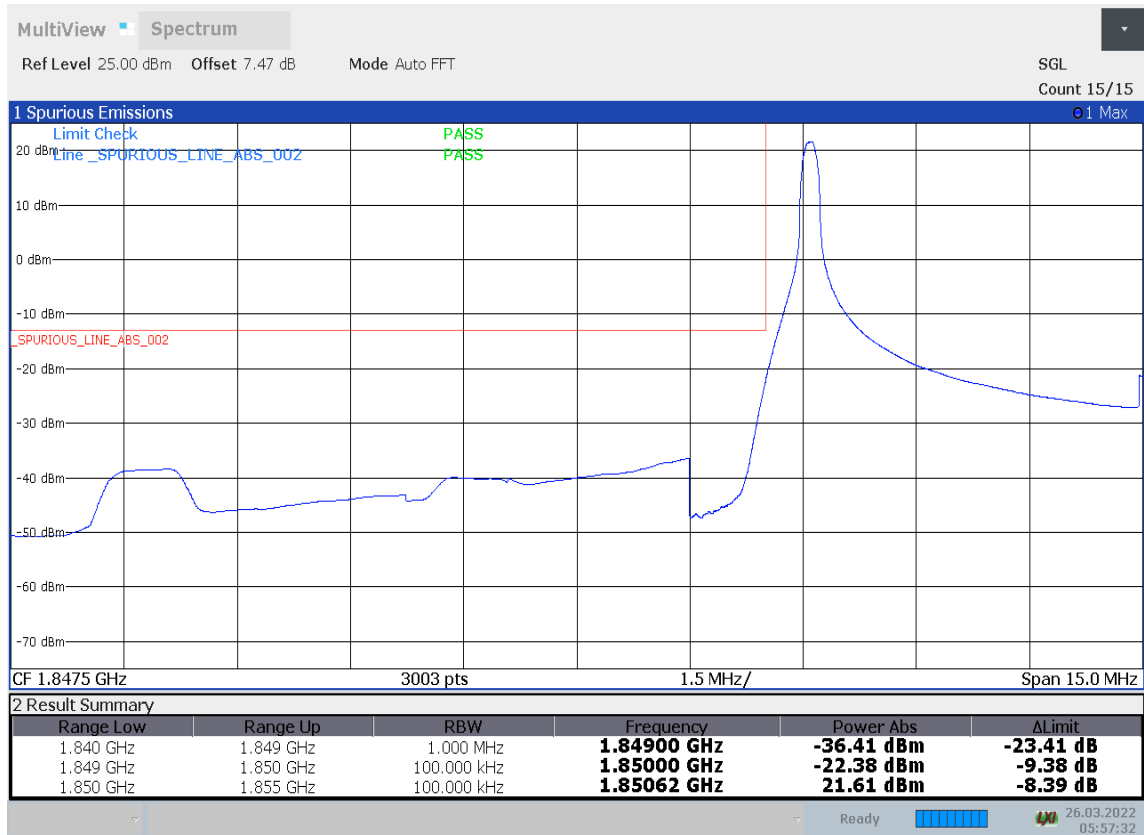
### **A.6.3 Measurement result**

**Only worst case result is given below**

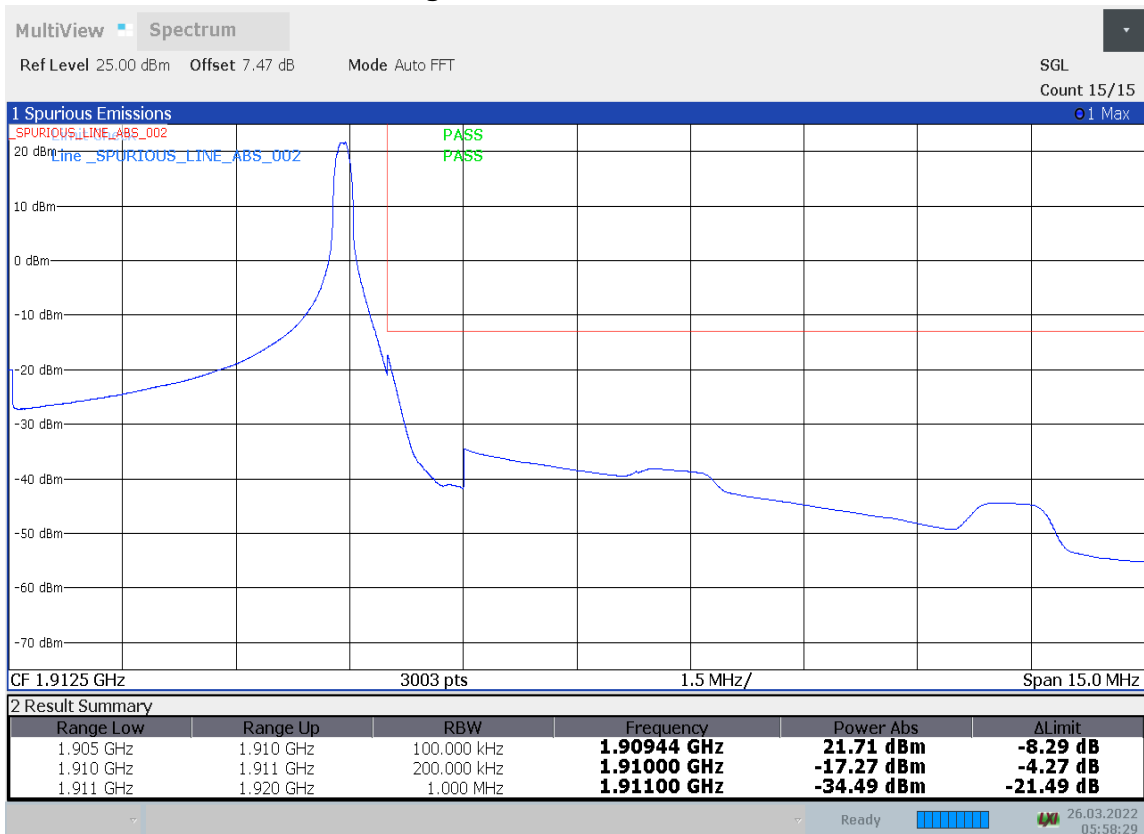


## LTE band 2

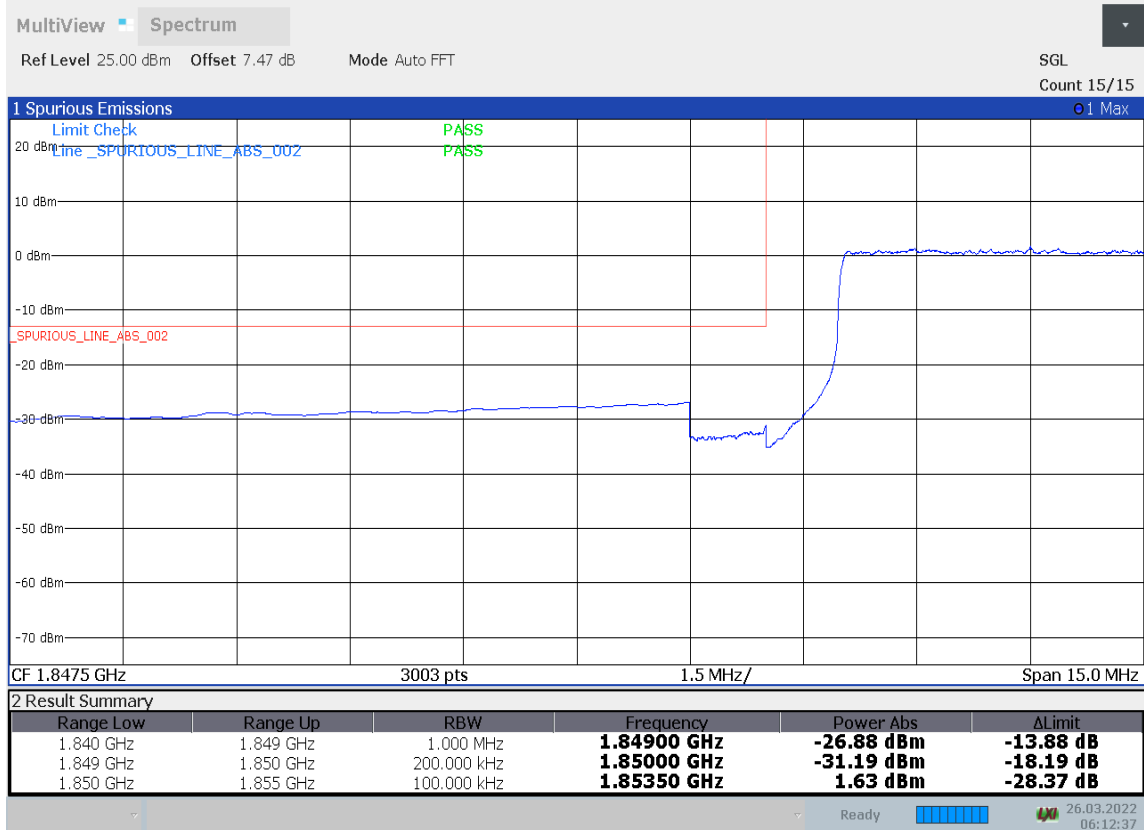
### LOW BAND EDGE BLOCK-1RB-low\_offset



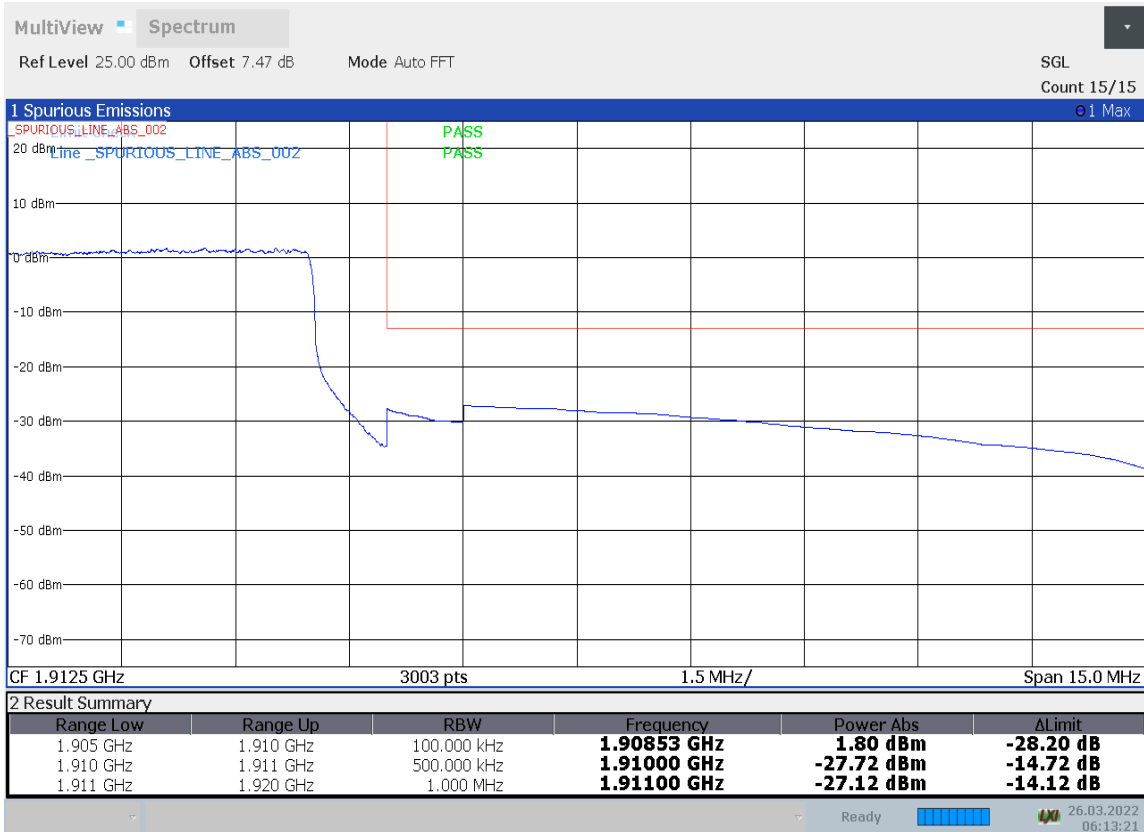
### HIGH BAND EDGE BLOCK-1RB-high\_offset



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



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

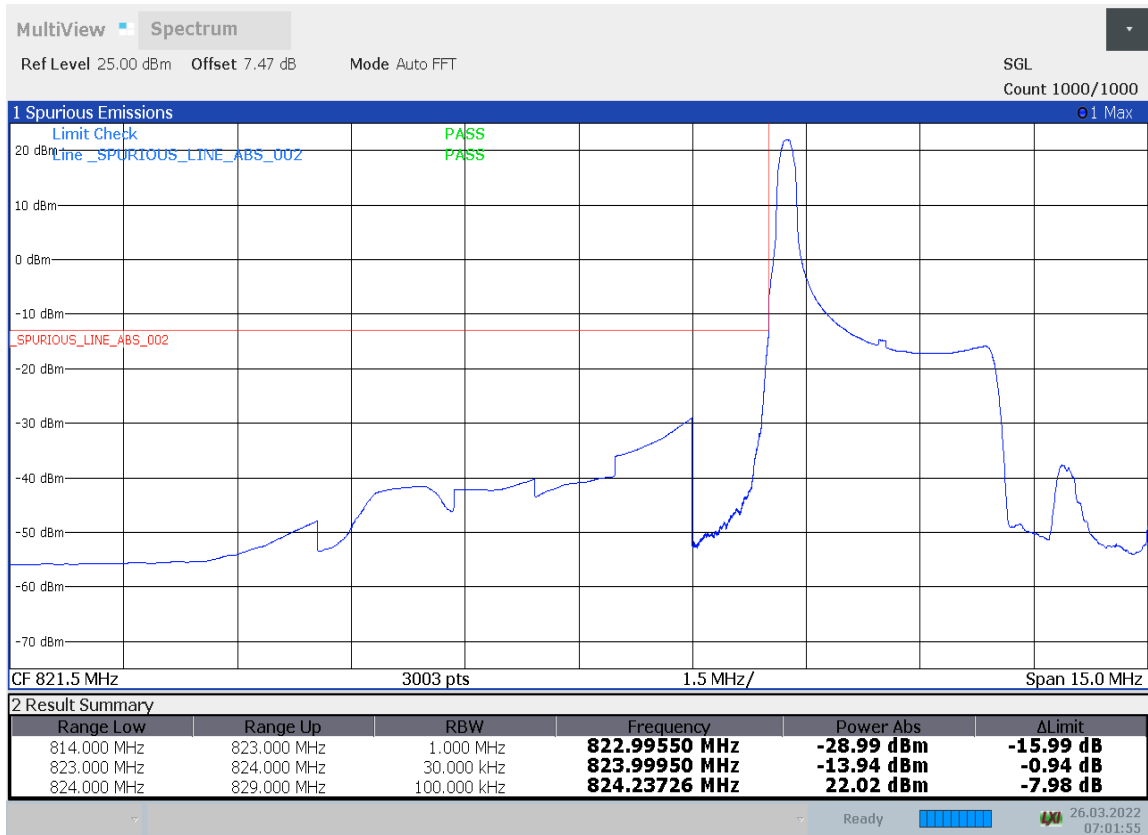




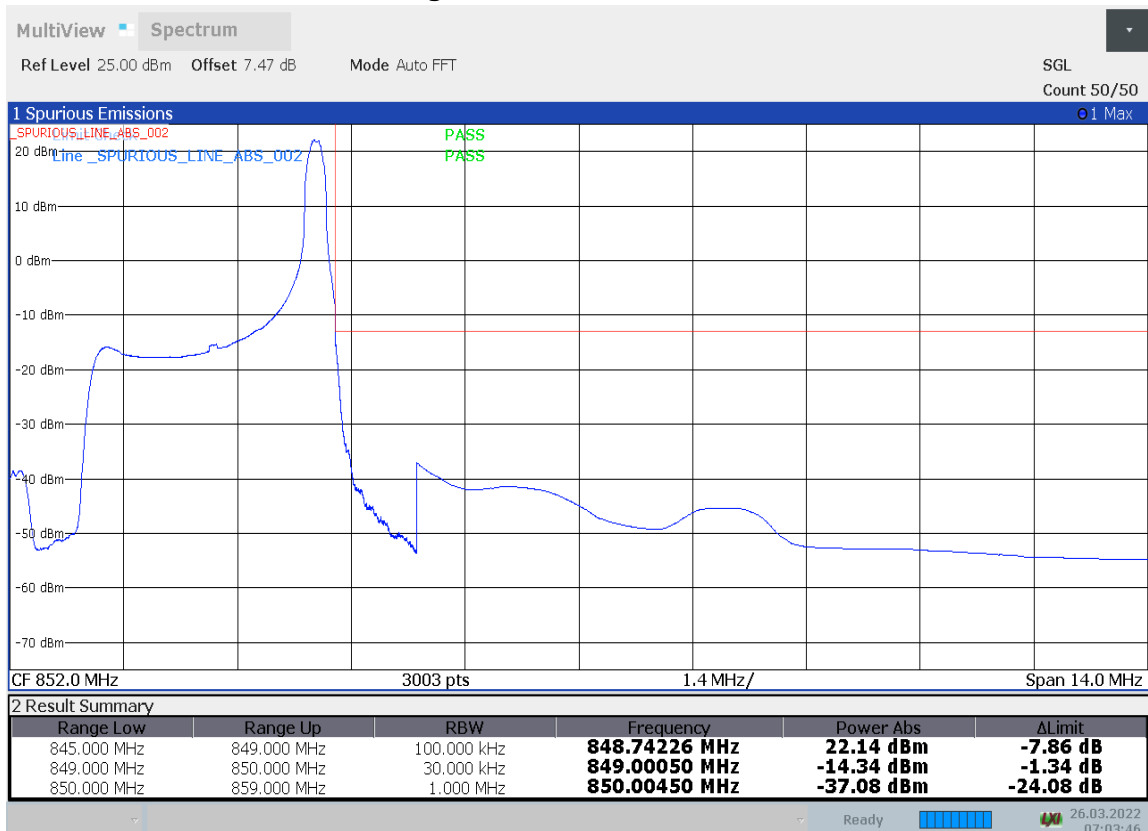


LTE band 5

LOW BAND EDGE BLOCK-1RB-low\_offset

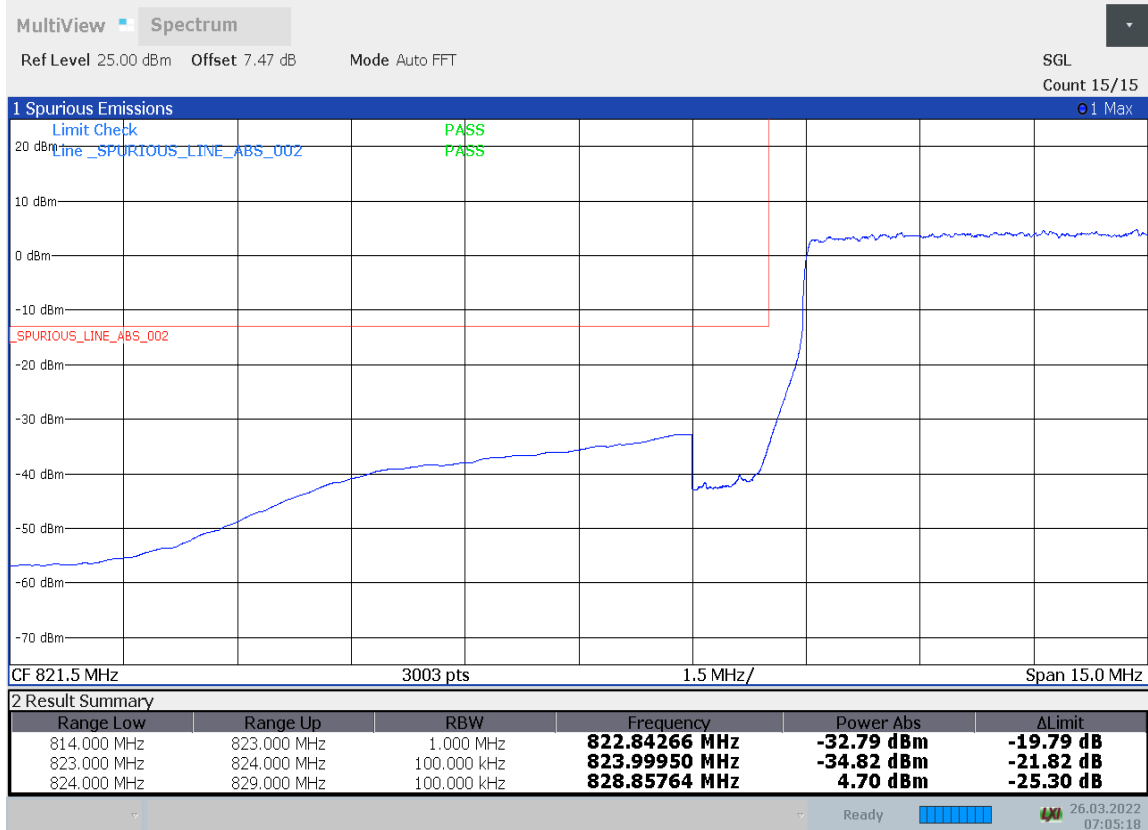


HIGH BAND EDGE BLOCK-1RB-high\_offset





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



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

