



# TEST REPORT

## No. I21Z60772-WMD02

for

**Shenzhen Tinno Mobile Technology Corp.**

**Smart Phone**

**Model Name: U319AA**

**FCC ID: XD6U319AA**

with

**Hardware Version: V1.0**

**Software Version: U319AAV01.02.10**

**Issued Date: 2021-06-08**

**Note:**

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

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## **REPORT HISTORY**

<b>Report Number</b>	<b>Revision</b>	<b>Description</b>	<b>Issue Date</b>
I21Z60772-WMD02	Rev.0	1 <sup>st</sup> edition	2021-06-08

Note: the latest revision of the test report supersedes all previous version.



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## **1. Test Laboratory**

### **1.1. Introduction & Accreditation**

Telecommunication Technology Labs, CAICT is an ISO/IEC 17025:2017 accredited test laboratory under NATIONAL VOLUNTARY LABORATORY ACCREDITATION PROGRAM (NVLAP) with lab code 600118-0 and is also an FCC accredited test laboratory (CN5017), and ISED accredited test laboratory (CN0066). The detail accreditation scope can be found on NVLAP website.

### **1.2. Testing Location**

Location 1: CTTL (huayuan North Road)

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

Location 2: CTTL(Shouxiang)

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

### 1.3. Testing Environment

Normal Temperature: 15-35°C  
Relative Humidity: 20-75%

### 1.4. Project Data

Testing Start Date: 2021-04-27  
Testing End Date: 2021-06-01

### 1.5. Signature



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



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



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



## **2. Client Information**

### **2.1. Applicant Information**

Company Name: Shenzhen Tinno Mobile Technology Corp.  
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Contact: xiaoping.li  
Email: xiaoping.li@tinno.com  
Telephone: 0755-86095550

### **2.2. Manufacturer Information**

Company Name: Shenzhen Tinno Mobile Technology Corp.  
Address /Post: 4/F, H-3 Building,OCT Eastern Industrial Park. NO.1 XiangShan East Road, Nan Shan District,Shenzhen, P.R.China  
Contact: xiaoping.li  
Email: xiaoping.li@tinno.com  
Telephone: 0755-86095550

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

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

Description	Smart Phone
Model Name	U319AA
FCC ID	XD6U319AA
Antenna	Embedded
Output power	24.96dBm maximum EIRP measured for LTE Band 30
Extreme vol. Limits	3.5VDC to 4.4VDC (nominal: 3.85VDC)
Extreme temp. Tolerance	-10°C to +55°C

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

#### **3.2. Internal Identification of EUT used during the test**

<b>EUT ID*</b>	<b>IMEI</b>	<b>HW Version</b>	<b>SW Version</b>	<b>Date of receipt</b>
UT23a	860999050010224	V1.0	U319AAV01.02.10	2021-04-20
UT36a	864535050003318	V1.0	U319AAV01.02.10	2021-05-13

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

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

<b>AE ID*</b>	<b>Description</b>
AE1	Battery
AE1	
Model	LT25H426271W
Manufacturer	Ningbo Veken Battery Company Limited
Capacitance	2500mAh

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



## **4. Reference Documents**

### **4.1. Documents supplied by applicant**

EUT parameters, referring to Annex A for detailed information, is supplied by the client or manufacturer, which is the basis of testing.

### **4.2. Reference Documents for testing**

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

<b>Reference</b>	<b>Title</b>	<b>Version</b>
FCC Part 24	PERSONAL COMMUNICATIONS SERVICES	10-1-19 Edition
FCC Part 22	PUBLIC MOBILE SERVICES	10-1-19 Edition
FCC Part 27	MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES	10-1-19 Edition
FCC Part 90	PRIVATE LAND MOBILE RADIO SERVICES	10-1-19 Edition
ANSI/TIA-603-E	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards	2016
ANSI C63.26	American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services	2015
KDB 971168 D01	MEASUREMENT GUIDANCE FOR CERTIFICATION OF LICENSED DIGITAL TRANSMITTERS	v03r01



## 5. Laboratory Environment

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

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

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

Temperature	Min. = 15 °C, Max. = 35 °C
Relative humidity	Min. = 15 %, Max. = 75 %
Shielding effectiveness	0.014 MHz - 1 MHz, > 60 dB; 1 MHz - 1000 MHz, > 90 dB.
Electrical insulation	> 2 MΩ
Ground system resistance	< 4 Ω
Normalised site attenuation (NSA)	< ± 4 dB, 3m/10m distance, from 30 to 1000 MHz
Site voltage standing-wave ratio ( $S_{VSWR}$ )	Between 0 and 6 dB, from 1 GHz to 18 GHz
Uniformity of field strength	Between 0 and 6 dB, from 80 to 6000 MHz

**Fully-anechoic chamber FAC-3** (8.6 meters × 6.1 meters × 3.85 meters) did not exceed following limits along the EMC testing:

Temperature	Min. = 15 °C, Max. = 30 °C
Relative humidity	Min. = 35 %, Max. = 60 %
Shielding effectiveness	> 110 dB
Electrical insulation	> 2 MΩ
Ground system resistance	< 1 Ω
Site voltage standing-wave ratio ( $S_{VSWR}$ )	Between 0 and 6 dB, from 1 GHz to 18 GHz
Uniformity of field strength	Between 0 and 6 dB, from 80 to 6000 MHz

## 6. Summary Of Test Result

### LTE Band 2

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

### LTE Band 4

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

### LTE Band 5

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



**LTE Band 12**

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

**LTE Band 14**

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

**LTE Band 30**

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



Terms used in Verdict column

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

Explanation of worst-case configuration

The worst-case scenario for all measurements is based on the conducted output power measurement investigation results. Output power was measured on QPSK, 16QAM and 64QAM modulations. It was found that QPSK was the worst case. All testing was performed using QPSK modulations to represent the worst case unless otherwise stated. The test results shown in the following sections represent the worst case emission.

## 7. Test Equipment Utilized

Description	Type	Series Number	Manufacture	Cal Due Date	Calibration Interval
Wideband Radio Communication Tester	CMW500	159082	R&S	2021-12-17	1 year
Spectrum Analyzer	FSU	200030	R&S	2021-06-01	1 year
Radio Communication Analyzer	MT8821C	6201763159	Anritsu	2021-08-12	1 year
Climate Chamber	SH-242	93008556	ESPEC	2023-12-23	3 years
EMI Antenna	9117	167	Schwarzbeck	2021-08-19	1 year
EMI Antenna	3117	00058889	ETS-Lindgren	2021-09-22	1 year
EMI Antenna	3117	00119024	ETS-Lindgren	2022-04-11	1 year
Test Receiver	E4440A	MY48250642	Agilent	2022-03-04	1 year
Universal Radio Communication Tester	CMW500	143008	R&S	2022-01-01	1 year
EMI Antenna	VULB9163	9163-301	Schwarzbeck	2021-08-04	1 year
Signal Generator	N5183A	MY49060052	Agilent	2021-07-01	1 year

## **Annex A: Measurement Results**

### **A.1 Output Power**

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

During the process of testing, the EUT was controlled via communication tester to ensure max power transmission and proper modulation.

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

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

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

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

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

##### **A.1.2.2 Measurement Result**

#### **LTE band 2**

Bandwidth	RB size/offset	Frequency (MHz)	Power (dBm)		
			QPSK	16QAM	64QAM
1.4MHz	1 RB high	1909.3	23.30	22.46	21.35
		1880.0	23.35	22.57	21.47
		1850.7	23.39	22.68	21.58
	1 RB low	1909.3	23.30	22.49	21.40
		1880.0	23.31	22.60	21.48
		1850.7	23.39	22.48	21.51
	50% RB mid	1909.3	23.46	22.37	21.44
		1880.0	23.48	22.41	21.55
		1850.7	23.50	22.43	21.58
	100% RB	1909.3	22.47	21.43	20.33
		1880.0	22.43	21.46	20.39
		1850.7	22.46	21.59	20.45
3MHz	1 RB high	1908.5	23.45	22.58	21.40
		1880.0	23.44	22.77	21.60
		1851.5	23.46	22.80	21.59
	1 RB low	1908.5	23.43	22.62	21.49
		1880.0	23.42	22.72	21.53
		1851.5	23.48	22.82	21.64
	50% RB mid	1908.5	22.47	21.46	20.45
		1880.0	22.46	21.49	20.47
		1851.5	22.52	21.57	20.50
	100% RB	1908.5	22.46	21.39	20.43

		1880.0	22.46	21.44	20.41
		1851.5	22.50	21.53	20.46
5MHz	1 RB high	1907.5	23.46	22.60	21.47
		1880.0	23.42	22.61	21.61
		1852.5	23.48	22.72	21.61
	1 RB low	1907.5	23.41	22.59	21.48
		1880.0	23.50	22.59	21.57
		1852.5	23.48	22.71	21.59
	50% RB mid	1907.5	22.49	21.40	20.46
		1880.0	22.52	21.50	20.52
		1852.5	22.58	21.58	20.56
	100% RB	1907.5	22.46	21.41	20.40
		1880.0	22.48	21.48	20.45
		1852.5	22.54	21.54	20.52
10MHz	1 RB high	1905.0	23.52	22.69	21.46
		1880.0	23.50	22.71	21.62
		1855.0	23.57	22.79	21.67
	1 RB low	1905.0	23.52	22.77	21.59
		1880.0	23.51	22.76	21.63
		1855.0	23.57	22.88	21.67
	50% RB mid	1905.0	22.59	21.54	20.52
		1880.0	22.61	21.56	20.53
		1855.0	22.63	21.62	20.56
	100% RB	1905.0	22.59	21.52	20.48
		1880.0	22.56	21.56	20.51
		1855.0	22.61	21.60	20.56
15MHz	1 RB high	1902.5	23.62	22.68	21.55
		1880.0	23.62	22.86	21.65
		1857.5	23.65	22.90	21.69
	1 RB low	1902.5	23.66	22.76	21.63
		1880.0	23.63	22.90	21.74
		1857.5	23.69	22.92	21.78
	50% RB mid	1902.5	22.72	21.64	20.61
		1880.0	22.73	21.65	20.62
		1857.5	22.74	21.68	20.66
	100% RB	1902.5	22.71	21.66	20.61
		1880.0	22.71	21.65	20.60
		1857.5	22.73	21.70	20.63
20MHz	1 RB high	1900.0	23.56	22.70	21.58
		1880.0	23.55	22.78	21.63
		1860.0	23.57	22.87	21.70
	1 RB low	1900.0	23.60	22.80	21.62



		1880.0	23.57	22.93	21.77
		1860.0	23.60	22.92	21.76
	50% RB mid	1900.0	22.76	21.72	20.69
		1880.0	22.76	21.77	20.71
		1860.0	22.79	21.75	20.74
	100% RB	1900.0	22.72	21.72	20.68
		1880.0	22.75	21.74	20.70
		1860.0	22.73	21.72	20.68



**LTE band 4**

Bandwidth	RB size/offset	Frequency (MHz)	Power (dBm)		
			QPSK	16QAM	64QAM
1.4MHz	1 RB high	1754.3	23.35	22.52	21.50
		1732.5	23.36	22.70	21.57
		1710.7	23.43	22.65	21.65
	1 RB low	1754.3	23.33	22.59	21.59
		1732.5	23.37	22.61	21.57
		1710.7	23.42	22.71	21.58
	50% RB mid	1754.3	23.49	22.44	21.60
		1732.5	23.51	22.52	21.59
		1710.7	23.57	22.52	21.63
	100% RB	1754.3	22.47	21.55	20.44
		1732.5	22.46	21.59	20.46
		1710.7	22.53	21.59	20.56
3MHz	1 RB high	1753.5	23.36	22.60	21.62
		1732.5	23.40	22.73	21.57
		1711.5	23.46	22.78	21.65
	1 RB low	1753.5	23.39	22.61	21.58
		1732.5	23.41	22.66	21.58
		1711.5	23.47	22.70	21.73
	50% RB mid	1753.5	22.41	21.55	20.51
		1732.5	22.41	21.50	20.52
		1711.5	22.52	21.59	20.57
	100% RB	1753.5	22.43	21.47	20.44
		1732.5	22.44	21.47	20.41
		1711.5	22.51	21.51	20.52
5MHz	1 RB high	1752.5	23.36	22.58	21.51
		1732.5	23.37	22.59	21.61
		1712.5	23.41	22.78	21.67
	1 RB low	1752.5	23.35	22.62	21.54
		1732.5	23.39	22.72	21.60
		1712.5	23.44	22.76	21.75
	50% RB mid	1752.5	22.46	21.51	20.48
		1732.5	22.47	21.49	20.50
		1712.5	22.54	21.56	20.57
	100% RB	1752.5	22.43	21.45	20.46
		1732.5	22.41	21.46	20.44
		1712.5	22.56	21.60	20.51
10MHz	1 RB high	1750.0	23.40	23.24	21.59
		1732.5	23.41	22.74	21.48
		1715.0	23.46	22.79	21.67

	1 RB low	1750.0	23.44	22.74	21.66
		1732.5	23.44	22.70	21.68
		1715.0	23.49	22.74	21.67
	50% RB mid	1750.0	22.47	21.50	20.50
		1732.5	22.49	21.52	20.50
		1715.0	22.53	21.55	20.54
	100% RB	1750.0	22.45	21.46	20.45
		1732.5	22.44	21.50	20.47
		1715.0	22.52	21.54	20.56
15MHz	1 RB high	1747.5	23.36	22.65	21.52
		1732.5	23.37	22.62	21.62
		1717.5	23.39	22.66	21.59
	1 RB low	1747.5	23.35	22.71	21.67
		1732.5	23.41	22.71	21.63
		1717.5	23.44	22.71	21.72
	50% RB mid	1747.5	22.49	21.48	20.50
		1732.5	22.49	21.48	20.47
		1717.5	22.53	21.49	20.52
100% RB	1747.5	22.47	21.48	20.45	
	1732.5	22.46	21.48	20.46	
	1717.5	22.52	21.52	20.52	
20MHz	1 RB high	1745.0	23.43	22.75	21.67
		1732.5	23.44	22.69	21.67
		1720.0	23.44	22.78	21.66
	1 RB low	1745.0	23.53	22.82	21.70
		1732.5	23.50	22.75	21.73
		1720.0	23.55	22.77	21.79
	50% RB mid	1745.0	22.68	21.69	20.68
		1732.5	22.66	21.69	20.68
		1720.0	22.71	21.72	20.70
100% RB	1745.0	22.70	21.70	20.70	
	1732.5	22.65	21.64	20.64	
	1720.0	22.69	21.68	20.66	

**LTE band 5**

Bandwidth	RB size/offset	Frequency (MHz)	Power (dBm)		
			QPSK	16QAM	64QAM
1.4MHz	1 RB high	848.3	23.72	23.03	21.93
		836.5	23.80	23.10	22.00
		824.7	23.85	23.11	22.02
	1 RB low	848.3	23.78	22.89	21.97
		836.5	23.81	23.17	21.94
		824.7	23.85	23.14	22.05
	50% RB mid	848.3	23.90	22.95	21.98
		836.5	23.95	22.99	22.92
		824.7	23.95	23.01	22.06
	100% RB	848.3	22.88	21.94	20.88
		836.5	22.96	22.02	20.93
		824.7	22.96	22.03	20.96
3MHz	1 RB high	847.5	23.71	23.03	21.87
		836.5	23.76	23.03	21.99
		825.5	23.80	22.99	21.96
	1 RB low	847.5	23.74	23.01	21.92
		836.5	23.78	23.10	21.92
		825.5	23.81	23.13	21.94
	50% RB mid	847.5	22.76	21.84	20.83
		836.5	22.81	21.86	20.86
		825.5	22.87	21.94	20.90
	100% RB	847.5	22.77	21.78	20.77
		836.5	22.80	21.83	20.79
		825.5	22.81	21.83	20.82
5MHz	1 RB high	846.5	23.70	22.94	21.90
		836.5	23.74	23.06	21.94
		826.5	23.80	23.05	21.98
	1 RB low	846.5	23.74	23.03	21.92
		836.5	23.76	23.08	21.99
		826.5	23.76	23.10	21.91
	50% RB mid	846.5	22.82	21.79	20.85
		836.5	22.86	21.83	20.88
		826.5	22.89	21.89	20.92
	100% RB	846.5	22.82	21.81	20.81
		836.5	22.85	21.84	20.86
		826.5	22.84	21.86	20.85
10MHz	1 RB high	844.0	23.84	23.04	21.97
		836.5	23.86	23.06	22.01
		829.0	23.89	23.28	22.89



	1 RB low	844.0	23.90	23.16	22.07
		836.5	23.93	23.17	22.12
		829.0	23.93	23.11	22.93
	50% RB mid	844.0	22.94	21.94	20.96
		836.5	22.97	21.98	20.99
		829.0	22.99	21.98	20.96
	100% RB	844.0	22.93	21.95	20.95
		836.5	23.04	22.04	21.03
		829.0	22.96	21.95	20.94

**LTE band 12**

Bandwidth	RB size/offset	Frequency (MHz)	Power (dBm)		
			QPSK	16QAM	64QAM
1.4MHz	1 RB high	715.3	23.93	23.13	22.02
		707.5	23.94	23.06	22.13
		699.7	23.97	23.22	22.01
	1 RB low	715.3	23.91	23.13	21.99
		707.5	23.96	23.14	22.08
		699.7	23.89	23.07	22.04
	50% RB mid	715.3	24.09	23.08	22.12
		707.5	24.05	23.11	22.18
		699.7	24.08	23.07	22.15
	100% RB	715.3	23.05	22.07	21.04
		707.5	23.02	22.13	21.06
		699.7	23.03	22.14	21.06
3MHz	1 RB high	714.5	23.96	23.19	22.10
		707.5	24.00	23.19	22.06
		700.5	24.03	23.27	22.17
	1 RB low	714.5	23.95	23.17	22.09
		707.5	24.02	23.19	22.14
		700.5	23.99	23.26	22.08
	50% RB mid	714.5	23.00	22.04	21.04
		707.5	23.04	22.08	21.11
		700.5	23.05	22.13	21.13
	100% RB	714.5	22.98	21.99	21.02
		707.5	23.03	22.04	21.07
		700.5	23.04	22.05	21.05
5MHz	1 RB high	713.5	24.02	23.16	22.12
		707.5	23.95	23.17	22.07
		701.5	23.98	23.19	22.10
	1 RB low	713.5	23.99	23.19	22.10
		707.5	23.98	23.19	22.12
		701.5	24.01	23.17	22.10
	50% RB mid	713.5	23.07	22.04	21.09
		707.5	23.09	22.11	21.13
		701.5	23.08	22.08	21.10
	100% RB	713.5	23.05	22.04	21.06
		707.5	23.10	22.13	21.14
		701.5	23.01	22.02	21.02
10MHz	1 RB high	711.0	23.96	23.24	22.08
		707.5	23.97	23.12	22.04
		704.0	24.00	23.25	22.11



	1 RB low	711.0	24.04	23.31	22.15
		707.5	24.03	23.28	22.13
		704.0	24.05	23.30	22.21
	50% RB mid	711.0	23.08	22.07	21.12
		707.5	23.11	22.13	21.16
		704.0	23.12	22.08	21.91
	100% RB	711.0	23.00	22.02	21.03
		707.5	23.18	22.19	21.20
		704.0	23.15	22.14	21.20

**LTE band 14**

Bandwidth	RB size/offset	Frequency (MHz)	Power (dBm)		
			QPSK	16QAM	64QAM
5MHz	1 RB high	795.5	22.82	22.05	20.96
		793.0	22.83	22.03	21.00
		790.5	22.85	22.10	20.96
	1 RB low	795.5	22.85	22.04	21.04
		793.0	22.89	22.17	21.05
		790.5	22.86	22.20	21.00
	50% RB mid	795.5	21.97	20.96	19.96
		793.0	21.94	20.96	19.94
		790.5	21.98	20.99	20.00
	100% RB	795.5	21.92	20.93	19.91
		793.0	21.91	20.93	19.88
		790.5	21.94	20.95	19.94
10MHz	1 RB high	793.0	22.86	22.01	21.00
	1 RB low	793.0	22.95	22.13	21.09
	50% RB mid	793.0	21.98	21.03	19.98
	100% RB	793.0	21.97	20.95	19.96

**LTE band 30**

Bandwidth	RB size/offset	Frequency (MHz)	Power (dBm)		
			QPSK	16QAM	64QAM
5MHz	1 RB high	2312.5	23.58	22.86	21.84
		2310.0	23.60	22.88	21.83
		2307.5	23.60	22.77	21.75
	1 RB low	2312.5	23.59	22.86	21.82
		2310.0	23.63	22.91	21.82
		2307.5	23.60	22.80	21.70
	50% RB mid	2312.5	22.75	21.73	20.74
		2310.0	22.73	21.74	20.74
		2307.5	22.73	21.71	20.74
	100% RB	2312.5	22.73	21.71	20.67
		2310.0	22.70	21.72	20.68
		2307.5	22.71	21.70	20.72
10MHz	1 RB high	2310.0	23.03	22.34	21.24
	1 RB low	2310.0	23.08	22.38	21.22
	50% RB mid	2310.0	22.15	21.15	20.14
	100% RB	2310.0	22.12	21.11	20.10





		1880.0	23.31	22.60	21.48	22.58	21.87	20.75
		1850.7	23.39	22.48	21.51	22.66	21.75	20.78
		1909.3	23.46	22.37	21.44	22.73	21.64	20.71
	50% RB mid	1880.0	23.48	22.41	21.55	22.75	21.68	20.82
		1850.7	23.50	22.43	21.58	22.77	21.70	20.85
		1909.3	22.47	21.43	20.33	21.74	20.70	19.60
	100% RB	1880.0	22.43	21.46	20.39	21.70	20.73	19.66
		1850.7	22.46	21.59	20.45	21.73	20.86	19.72
		1908.5	23.45	22.58	21.40	22.72	21.85	20.67
3MHz	1 RB high	1880.0	23.44	22.77	21.60	22.71	22.04	20.87
		1851.5	23.46	22.80	21.59	22.73	22.07	20.86
		1908.5	23.43	22.62	21.49	22.70	21.89	20.76
	1 RB low	1880.0	23.42	22.72	21.53	22.69	21.99	20.80
		1851.5	23.48	22.82	21.64	22.75	22.09	20.91
		1908.5	22.47	21.46	20.45	21.74	20.73	19.72
	50% RB mid	1880.0	22.46	21.49	20.47	21.73	20.76	19.74
		1851.5	22.52	21.57	20.50	21.79	20.84	19.77
		1908.5	22.46	21.39	20.43	21.73	20.66	19.70
	100% RB	1880.0	22.46	21.44	20.41	21.73	20.71	19.68
		1851.5	22.50	21.53	20.46	21.77	20.80	19.73
		1907.5	23.46	22.60	21.47	22.73	21.87	20.74
5MHz	1 RB high	1880.0	23.42	22.61	21.61	22.69	21.88	20.88
		1852.5	23.48	22.72	21.61	22.75	21.99	20.88
		1907.5	23.41	22.59	21.48	22.68	21.86	20.75
	1 RB low	1880.0	23.50	22.59	21.57	22.77	21.86	20.84
		1852.5	23.48	22.71	21.59	22.75	21.98	20.86
		1907.5	22.49	21.40	20.46	21.76	20.67	19.73
	50% RB mid	1880.0	22.52	21.50	20.52	21.79	20.77	19.79
		1852.5	22.58	21.58	20.56	21.85	20.85	19.83
		1907.5	22.46	21.41	20.40	21.73	20.68	19.67
	100% RB	1880.0	22.48	21.48	20.45	21.75	20.75	19.72
		1852.5	22.54	21.54	20.52	21.81	20.81	19.79
		1905.0	23.52	22.69	21.46	22.79	21.96	20.73
10MHz	1 RB high	1880.0	23.50	22.71	21.62	22.77	21.98	20.89
		1855.0	23.57	22.79	21.67	22.84	22.06	20.94
		1905.0	23.52	22.77	21.59	22.79	22.04	20.86
	1 RB low	1880.0	23.51	22.76	21.63	22.78	22.03	20.90
		1855.0	23.57	22.88	21.67	22.84	22.15	20.94
		1905.0	22.59	21.54	20.52	21.86	20.81	19.79
	50% RB mid	1880.0	22.61	21.56	20.53	21.88	20.83	19.80
		1855.0	22.63	21.62	20.56	21.90	20.89	19.83
		1905.0	22.59	21.52	20.48	21.86	20.79	19.75



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		1880.0	22.56	21.56	20.51	21.83	20.83	19.78
		1855.0	22.61	21.60	20.56	21.88	20.87	19.83
15MHz	1 RB high	1902.5	23.62	22.68	21.55	22.89	21.95	20.82
		1880.0	23.62	22.86	21.65	22.89	22.13	20.92
		1857.5	23.65	22.90	21.69	22.92	22.17	20.96
	1 RB low	1902.5	23.66	22.76	21.63	22.93	22.03	20.90
		1880.0	23.63	22.90	21.74	22.90	22.17	21.01
		1857.5	23.69	22.92	21.78	22.96	22.19	21.05
	50% RB mid	1902.5	22.72	21.64	20.61	21.99	20.91	19.88
		1880.0	22.73	21.65	20.62	22.00	20.92	19.89
		1857.5	22.74	21.68	20.66	22.01	20.95	19.93
	100% RB	1902.5	22.71	21.66	20.61	21.98	20.93	19.88
		1880.0	22.71	21.65	20.60	21.98	20.92	19.87
		1857.5	22.73	21.70	20.63	22.00	20.97	19.90
20MHz	1 RB high	1900.0	23.56	22.70	21.58	22.83	21.97	20.85
		1880.0	23.55	22.78	21.63	22.82	22.05	20.90
		1860.0	23.57	22.87	21.70	22.84	22.14	20.97
	1 RB low	1900.0	23.60	22.80	21.62	22.87	22.07	20.89
		1880.0	23.57	22.93	21.77	22.84	22.20	21.04
		1860.0	23.60	22.92	21.76	22.87	22.19	21.03
	50% RB mid	1900.0	22.76	21.72	20.69	22.03	20.99	19.96
		1880.0	22.76	21.77	20.71	22.03	21.04	19.98
		1860.0	22.79	21.75	20.74	22.06	21.02	20.01
	100% RB	1900.0	22.72	21.72	20.68	21.99	20.99	19.95
		1880.0	22.75	21.74	20.70	22.02	21.01	19.97
		1860.0	22.73	21.72	20.68	22.00	20.99	19.95

**LTE Band 4**

Bandwidth	RB size/offset	Frequency (MHz)	Conducted Power(dBm)			EIRP(dBm)(Gt-Lc =-2.13)		
			QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
1.4MHz	1 RB high	1754.3	23.35	22.52	21.50	21.22	20.39	19.37
		1732.5	23.36	22.70	21.57	21.23	20.57	19.44
		1710.7	23.43	22.65	21.65	21.30	20.52	19.52
	1 RB low	1754.3	23.33	22.59	21.59	21.20	20.46	19.46
		1732.5	23.37	22.61	21.57	21.24	20.48	19.44
		1710.7	23.42	22.71	21.58	21.29	20.58	19.45
	50% RB mid	1754.3	23.49	22.44	21.60	21.36	20.31	19.47
		1732.5	23.51	22.52	21.59	21.38	20.39	19.46
		1710.7	23.57	22.52	21.63	21.44	20.39	19.50
100% RB	1754.3	22.47	21.55	20.44	20.34	19.42	18.31	
	1732.5	22.46	21.59	20.46	20.33	19.46	18.33	
	1710.7	22.53	21.59	20.56	20.40	19.46	18.43	
3MHz	1 RB high	1753.5	23.36	22.60	21.62	21.23	20.47	19.49
		1732.5	23.40	22.73	21.57	21.27	20.6	19.44
		1711.5	23.46	22.78	21.65	21.33	20.65	19.52
	1 RB low	1753.5	23.39	22.61	21.58	21.26	20.48	19.45
		1732.5	23.41	22.66	21.58	21.28	20.53	19.45
		1711.5	23.47	22.70	21.73	21.34	20.57	19.60
	50% RB mid	1753.5	22.41	21.55	20.51	20.28	19.42	18.38
		1732.5	22.41	21.50	20.52	20.28	19.37	18.39
		1711.5	22.52	21.59	20.57	20.39	19.46	18.44
100% RB	1753.5	22.43	21.47	20.44	20.30	19.34	18.31	
	1732.5	22.44	21.47	20.41	20.31	19.34	18.28	
	1711.5	22.51	21.51	20.52	20.38	19.38	18.39	
5MHz	1 RB high	1752.5	23.36	22.58	21.51	21.23	20.45	19.38
		1732.5	23.37	22.59	21.61	21.24	20.46	19.48
		1712.5	23.41	22.78	21.67	21.28	20.65	19.54
	1 RB low	1752.5	23.35	22.62	21.54	21.22	20.49	19.41
		1732.5	23.39	22.72	21.60	21.26	20.59	19.47
		1712.5	23.44	22.76	21.75	21.31	20.63	19.62
	50% RB mid	1752.5	22.46	21.51	20.48	20.33	19.38	18.35
		1732.5	22.47	21.49	20.50	20.34	19.36	18.37
		1712.5	22.54	21.56	20.57	20.41	19.43	18.44
100% RB	1752.5	22.43	21.45	20.46	20.3	19.32	18.33	
	1732.5	22.41	21.46	20.44	20.28	19.33	18.31	
	1712.5	22.56	21.60	20.51	20.43	19.47	18.38	
10MHz	1 RB high	1750.0	23.40	23.24	21.59	21.27	21.11	19.46
		1732.5	23.41	22.74	21.48	21.28	20.61	19.35
		1715.0	23.46	22.79	21.67	21.33	20.66	19.54



	1 RB low	1750.0	23.44	22.74	21.66	21.31	20.61	19.53
		1732.5	23.44	22.70	21.68	21.31	20.57	19.55
		1715.0	23.49	22.74	21.67	21.36	20.61	19.54
	50% RB mid	1750.0	22.47	21.50	20.50	20.34	19.37	18.37
		1732.5	22.49	21.52	20.50	20.36	19.39	18.37
		1715.0	22.53	21.55	20.54	20.40	19.42	18.41
	100% RB	1750.0	22.45	21.46	20.45	20.32	19.33	18.32
		1732.5	22.44	21.50	20.47	20.31	19.37	18.34
		1715.0	22.52	21.54	20.56	20.39	19.41	18.43
15MHz	1 RB high	1747.5	23.36	22.65	21.52	21.23	20.52	19.39
		1732.5	23.37	22.62	21.62	21.24	20.49	19.49
		1717.5	23.39	22.66	21.59	21.26	20.53	19.46
	1 RB low	1747.5	23.35	22.71	21.67	21.22	20.58	19.54
		1732.5	23.41	22.71	21.63	21.28	20.58	19.50
		1717.5	23.44	22.71	21.72	21.31	20.58	19.59
	50% RB mid	1747.5	22.49	21.48	20.50	20.36	19.35	18.37
		1732.5	22.49	21.48	20.47	20.36	19.35	18.34
		1717.5	22.53	21.49	20.52	20.40	19.36	18.39
	100% RB	1747.5	22.47	21.48	20.45	20.34	19.35	18.32
		1732.5	22.46	21.48	20.46	20.33	19.35	18.33
		1717.5	22.52	21.52	20.52	20.39	19.39	18.39
20MHz	1 RB high	1745.0	23.43	22.75	21.67	21.30	20.62	19.54
		1732.5	23.44	22.69	21.67	21.31	20.56	19.54
		1720.0	23.44	22.78	21.66	21.31	20.65	19.53
	1 RB low	1745.0	23.53	22.82	21.70	21.40	20.69	19.57
		1732.5	23.50	22.75	21.73	21.37	20.62	19.6
		1720.0	23.55	22.77	21.79	21.42	20.64	19.66
	50% RB mid	1745.0	22.68	21.69	20.68	20.55	19.56	18.55
		1732.5	22.66	21.69	20.68	20.53	19.56	18.55
		1720.0	22.71	21.72	20.70	20.58	19.59	18.57
	100% RB	1745.0	22.70	21.70	20.70	20.57	19.57	18.57
		1732.5	22.65	21.64	20.64	20.52	19.51	18.51
		1720.0	22.69	21.68	20.66	20.56	19.55	18.53

**LTE Band 5**

Bandwidth	RB size/offset	Frequency (MHz)	Conducted Power(dBm)			ERP(dBm)(Gt-Lc =-1.49)		
			QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
1.4MHz	1 RB high	848.3	23.72	23.03	21.93	20.08	19.39	18.29
		836.5	23.80	23.10	22.00	20.16	19.46	18.36
		824.7	23.85	23.11	22.02	20.21	19.47	18.38
	1 RB low	848.3	23.78	22.89	21.97	20.14	19.25	18.33
		836.5	23.81	23.17	21.94	20.17	19.53	18.30
		824.7	23.85	23.14	22.05	20.21	19.50	18.41
	50% RB mid	848.3	23.90	22.95	21.98	20.26	19.31	18.34
		836.5	23.95	22.99	22.92	20.31	19.35	19.28
		824.7	23.95	23.01	22.06	20.31	19.37	18.42
	100% RB	848.3	22.88	21.94	20.88	19.24	18.30	17.24
		836.5	22.96	22.02	20.93	19.32	18.38	17.29
		824.7	22.96	22.03	20.96	19.32	18.39	17.32
3MHz	1 RB high	847.5	23.71	23.03	21.87	20.07	19.39	18.23
		836.5	23.76	23.03	21.99	20.12	19.39	18.35
		825.5	23.80	22.99	21.96	20.16	19.35	18.32
	1 RB low	847.5	23.74	23.01	21.92	20.10	19.37	18.28
		836.5	23.78	23.10	21.92	20.14	19.46	18.28
		825.5	23.81	23.13	21.94	20.17	19.49	18.30
	50% RB mid	847.5	22.76	21.84	20.83	19.12	18.20	17.19
		836.5	22.81	21.86	20.86	19.17	18.22	17.22
		825.5	22.87	21.94	20.90	19.23	18.30	17.26
	100% RB	847.5	22.77	21.78	20.77	19.13	18.14	17.13
		836.5	22.80	21.83	20.79	19.16	18.19	17.15
		825.5	22.81	21.83	20.82	19.17	18.19	17.18
5MHz	1 RB high	846.5	23.70	22.94	21.90	20.06	19.3	18.26
		836.5	23.74	23.06	21.94	20.10	19.42	18.30
		826.5	23.80	23.05	21.98	20.16	19.41	18.34
	1 RB low	846.5	23.74	23.03	21.92	20.10	19.39	18.28
		836.5	23.76	23.08	21.99	20.12	19.44	18.35
		826.5	23.76	23.10	21.91	20.12	19.46	18.27
	50% RB mid	846.5	22.82	21.79	20.85	19.18	18.15	17.21
		836.5	22.86	21.83	20.88	19.22	18.19	17.24
		826.5	22.89	21.89	20.92	19.25	18.25	17.28
	100% RB	846.5	22.82	21.81	20.81	19.18	18.17	17.17
		836.5	22.85	21.84	20.86	19.21	18.20	17.22
		826.5	22.84	21.86	20.85	19.20	18.22	17.21



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10MHz	1 RB high	844.0	23.84	23.04	21.97	20.20	19.40	18.33
		836.5	23.86	23.06	22.01	20.22	19.42	18.37
		829.0	23.89	23.28	22.89	20.25	19.64	19.25
	1 RB low	844.0	23.90	23.16	22.07	20.26	19.52	18.43
		836.5	23.93	23.17	22.12	20.29	19.53	18.48
		829.0	23.93	23.11	22.93	20.29	19.47	19.29
	50% RB mid	844.0	22.94	21.94	20.96	19.30	18.30	17.32
		836.5	22.97	21.98	20.99	19.33	18.34	17.35
		829.0	22.99	21.98	20.96	19.35	18.34	17.32
	100% RB	844.0	22.93	21.95	20.95	19.29	18.31	17.31
		836.5	23.04	22.04	21.03	19.40	18.40	17.39
		829.0	22.96	21.95	20.94	19.32	18.31	17.30

**LTE Band 12**

Bandwidth	RB size/offset	Frequency (MHz)	Conducted Power(dBm)			ERP(dBm)(Gt-Lc =-2)		
			QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
1.4MHz	1 RB high	715.3	23.93	23.13	22.02	19.78	18.98	17.87
		707.5	23.94	23.06	22.13	19.79	18.91	17.98
		699.7	23.97	23.22	22.01	19.82	19.07	17.86
	1 RB low	715.3	23.91	23.13	21.99	19.76	18.98	17.84
		707.5	23.96	23.14	22.08	19.81	18.99	17.93
		699.7	23.89	23.07	22.04	19.74	18.92	17.89
	50% RB mid	715.3	24.09	23.08	22.12	19.94	18.93	17.97
		707.5	24.05	23.11	22.18	19.90	18.96	18.03
		699.7	24.08	23.07	22.15	19.93	18.92	18.00
	100% RB	715.3	23.05	22.07	21.04	18.90	17.92	16.89
		707.5	23.02	22.13	21.06	18.87	17.98	16.91
		699.7	23.03	22.14	21.06	18.88	17.99	16.91
3MHz	1 RB high	714.5	23.96	23.19	22.10	19.81	19.04	17.95
		707.5	24.00	23.19	22.06	19.85	19.04	17.91
		700.5	24.03	23.27	22.17	19.88	19.12	18.02
	1 RB low	714.5	23.95	23.17	22.09	19.80	19.02	17.94
		707.5	24.02	23.19	22.14	19.87	19.04	17.99
		700.5	23.99	23.26	22.08	19.84	19.11	17.93
	50% RB mid	714.5	23.00	22.04	21.04	18.85	17.89	16.89
		707.5	23.04	22.08	21.11	18.89	17.93	16.96
		700.5	23.05	22.13	21.13	18.90	17.98	16.98
	100% RB	714.5	22.98	21.99	21.02	18.83	17.84	16.87
		707.5	23.03	22.04	21.07	18.88	17.89	16.92
		700.5	23.04	22.05	21.05	18.89	17.90	16.90
5MHz	1 RB high	713.5	24.02	23.16	22.12	19.87	19.01	17.97
		707.5	23.95	23.17	22.07	19.80	19.02	17.92
		701.5	23.98	23.19	22.10	19.83	19.04	17.95
	1 RB low	713.5	23.99	23.19	22.10	19.84	19.04	17.95
		707.5	23.98	23.19	22.12	19.83	19.04	17.97
		701.5	24.01	23.17	22.10	19.86	19.02	17.95
	50% RB mid	713.5	23.07	22.04	21.09	18.92	17.89	16.94
		707.5	23.09	22.11	21.13	18.94	17.96	16.98
		701.5	23.08	22.08	21.10	18.93	17.93	16.95
	100% RB	713.5	23.05	22.04	21.06	18.90	17.89	16.91
		707.5	23.10	22.13	21.14	18.95	17.98	16.99
		701.5	23.01	22.02	21.02	18.86	17.87	16.87
10MHz	1 RB high	711.0	23.96	23.24	22.08	19.81	19.09	17.93
		707.5	23.97	23.12	22.04	19.82	18.97	17.89
		704.0	24.00	23.25	22.11	19.85	19.10	17.96





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	1 RB low	711.0	24.04	23.31	22.15	19.89	19.16	18.00
		707.5	24.03	23.28	22.13	19.88	19.13	17.98
		704.0	24.05	23.30	22.21	19.90	19.15	18.06
	50% RB mid	711.0	23.08	22.07	21.12	18.93	17.92	16.97
		707.5	23.11	22.13	21.16	18.96	17.98	17.01
		704.0	23.12	22.08	21.91	18.97	17.93	17.76
	100% RB	711.0	23.00	22.02	21.03	18.85	17.87	16.88
		707.5	23.18	22.19	21.20	19.03	18.04	17.05
		704.0	23.15	22.14	21.20	19.00	17.99	17.05

**LTE Band 14**

Bandwidth	RB size/offset	Frequency (MHz)	Conducted Power(dBm)			ERP(dBm)(Gt-Lc =-2.3)		
			QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
5MHz	1 RB high	795.5	22.82	22.05	20.96	18.37	17.6	16.51
		793.0	22.83	22.03	21.00	18.38	17.58	16.55
		790.5	22.85	22.10	20.96	18.40	17.65	16.51
	1 RB low	795.5	22.85	22.04	21.04	18.40	17.59	16.59
		793.0	22.89	22.17	21.05	18.44	17.72	16.60
		790.5	22.86	22.20	21.00	18.41	17.75	16.55
	50% RB mid	795.5	21.97	20.96	19.96	17.52	16.51	15.51
		793.0	21.94	20.96	19.94	17.49	16.51	15.49
		790.5	21.98	20.99	20.00	17.53	16.54	15.55
	100% RB	795.5	21.92	20.93	19.91	17.47	16.48	15.46
		793.0	21.91	20.93	19.88	17.46	16.48	15.43
		790.5	21.94	20.95	19.94	17.49	16.5	15.49
10MHz	1 RB high	793.0	22.86	22.01	21.00	18.41	17.56	16.55
	1 RB low	793.0	22.95	22.13	21.09	18.50	17.68	16.64
	50% RB mid	793.0	21.98	21.03	19.98	17.53	16.58	15.53
	100% RB	793.0	21.97	20.95	19.96	17.52	16.50	15.51

**LTE Band 30**

Bandwidth	RB size/offset	Frequency (MHz)	Conducted Power(dBm)			EIRP(dBm)(Gt-Lc =1.33)		
			QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
5MHz	1 RB high	2312.5	23.58	22.86	21.84	24.91	24.19	23.17
		2310.0	23.60	22.88	21.83	24.93	24.21	23.16
		2307.5	23.60	22.77	21.75	24.93	24.1	23.08
	1 RB low	2312.5	23.59	22.86	21.82	24.92	24.19	23.15
		2310.0	23.63	22.91	21.82	24.96	24.24	23.15
		2307.5	23.60	22.80	21.70	24.93	24.13	23.03
	50% RB mid	2312.5	22.75	21.73	20.74	24.08	23.06	22.07
		2310.0	22.73	21.74	20.74	24.06	23.07	22.07
		2307.5	22.73	21.71	20.74	24.06	23.04	22.07
	100% RB	2312.5	22.73	21.71	20.67	24.06	23.04	22.00
		2310.0	22.70	21.72	20.68	24.03	23.05	22.01
		2307.5	22.71	21.70	20.72	24.04	23.03	22.05
10MHz	1 RB high	2310.0	23.03	22.34	21.24	24.36	23.67	22.57
	1 RB low	2310.0	23.08	22.38	21.22	24.41	23.71	22.55
	50% RB mid	2310.0	22.15	21.15	20.14	23.48	22.48	21.47
	100% RB	2310.0	22.12	21.11	20.10	23.45	22.44	21.43

## **A.2 Emission Limit**

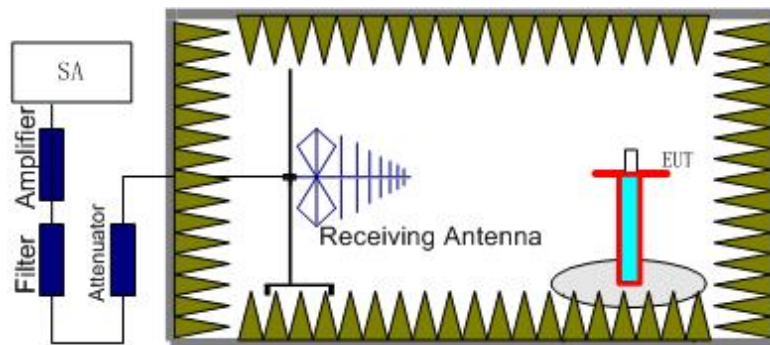
### **A.2.1 Measurement Method**

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

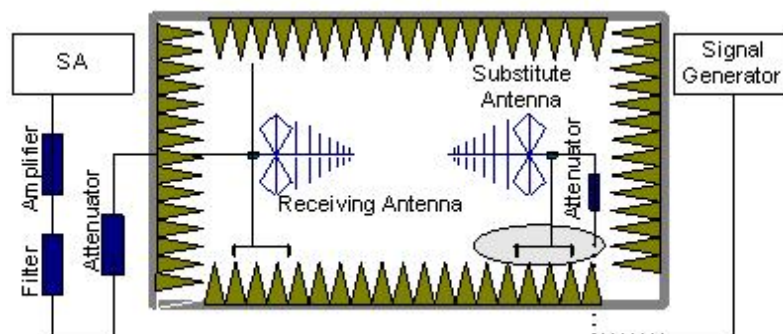
The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier. The resolution bandwidth is set 1MHz. The spectrum was scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and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

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

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



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



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

4. The Path loss ( $P_{pl}$ ) between the Signal Source with the Substitution Antenna and the Substitution Antenna Gain ( $G_a$ ) should be recorded after test.

An amplifier should be connected in for the test.

The Path loss ( $P_{pl}$ ) is the summation of the cable loss and the gain of the amplifier.

The measurement results are obtained as described below:

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

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

### A.2.2 Measurement Limit

FDD Band 2: Part 24.238 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.

FDD Band 4: 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.

FDD Band 5 (824MHz~849MHz): Part 22.917 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.

FDD Band 12: 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.

FDD Band 14: Part 90.543 states that for operations in the 758–768 MHz and the 788–798 MHz bands, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power ( $P$ ) within the licensed band(s) of operation, measured in watts, in accordance with the following: (1) On all frequencies between 769–775 MHz and 799–805 MHz, by a factor not less than  $76 + 10 \log(P)$  dB in a 6.25 kHz band segment, for base and fixed stations. (2) On all frequencies

between 769–775 MHz and 799–805 MHz, by a factor not less than  $65 + 10 \log (P)$  dB in a 6.25 kHz band segment, for mobile and portable stations. (3) On any frequency between 775–788 MHz, above 805 MHz, and below 758 MHz, by at least  $43 + 10 \log (P)$  dB. (4) Compliance with the provisions of paragraphs (e)(1) and (2) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment. (5) Compliance with the provisions of paragraph (e) (3) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of 30 kHz may be employed.

FDD Band 30: Part 27.53(a) states for mobile and portable stations operating in the 2305–2315 MHz and 2350–2360 MHz bands: By a factor of not less than:  $43 + 10 \log (P)$  dB on all frequencies between 2305 and 2320 MHz and on all frequencies between 2345 and 2360 MHz that are outside the licensed band(s) of operation, not less than  $55 + 10 \log (P)$  dB on all frequencies between 2320 and 2324 MHz and on all frequencies between 2341 and 2345 MHz, not less than  $61 + 10 \log (P)$  dB on all frequencies between 2324 and 2328 MHz and on all frequencies between 2337 and 2341 MHz, and not less than  $67 + 10 \log (P)$  dB on all frequencies between 2328 and 2337MHz; By a factor of not less than  $43 + 10 \log (P)$  dB on all frequencies between 2300 and 2305 MHz,  $55 + 10 \log (P)$  dB on all frequencies between 2296 and 2300MHz,  $61 + 10 \log (P)$  dB on all frequencies between 2292 and 2296 MHz,  $67 + 10 \log (P)$  dB on all frequencies between 2288 and 2292 MHz, and  $70 + 10 \log (P)$  dB below 2288 MHz; By a factor of not less than  $43 + 10 \log (P)$  dB on all frequencies between 2360 and 2365 MHz, and not less than  $70 + 10 \log (P)$  dB above 2365 MHz.

### **A.2.3 Measurement Results**

Radiated emissions measurements were made only at the upper, middle, and lower carrier frequencies of each LTE Band. 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 each LTE Band into any of the other blocks. The equipment must still, however, meet emissions requirements with the carrier at all frequencies over which it is capable of operating and it is the manufacturer's responsibility to verify this. The range of evaluated frequency is from 30MHz to 26GHz.

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

Frequency (MHz)	SG (dBm)	CableLoss (dB)	AntennaGain (dBi)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3702.02	-52.87	6.42	8.48	-50.81	-13.00	37.81	H
5553.02	-44.14	7.18	10.59	-40.73	-13.00	27.73	H
7409.01	-48.65	8.14	12.09	-44.70	-13.00	31.70	V
9259.01	-29.06	9.06	13.26	-24.86	-13.00	11.86	H
11105.01	-36.70	9.81	13.18	-33.33	-13.00	20.33	V
12956.01	-31.70	10.48	13.47	-28.71	-13.00	15.71	V

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

Frequency (MHz)	SG (dBm)	CableLoss (dB)	AntennaGain (dBi)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3760.02	-52.78	6.26	8.56	-50.48	-13.00	37.48	V
5641.02	-45.15	7.27	10.57	-41.85	-13.00	28.85	H
7526.01	-46.34	8.28	12.22	-42.40	-13.00	29.40	V
9407.01	-30.42	9.07	13.34	-26.15	-13.00	13.15	H
11281.01	-39.61	9.88	13.14	-36.35	-13.00	23.35	V
13167.01	-34.58	10.64	13.73	-31.49	-13.00	18.49	H

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

Frequency (MHz)	SG (dBm)	CableLoss (dB)	AntennaGain (dBi)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3819.02	-54.75	6.08	8.65	-52.18	-13.00	39.18	V
5728.02	-46.73	7.30	10.55	-43.48	-13.00	30.48	H
7644.01	-41.81	8.17	12.32	-37.66	-13.00	24.66	V
9547.01	-32.08	9.37	13.35	-28.10	-13.00	15.10	H
11457.01	-38.37	9.92	13.11	-35.18	-13.00	22.18	V
13371.01	-30.25	10.57	14.02	-26.80	-13.00	13.80	H

**LTE Band 4, 1.4MHz, QPSK, Channel 19957**

Frequency (MHz)	SG (dBm)	CableLoss (dB)	AntennaGain (dBi)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3422.02	-67.00	5.38	8.01	-64.37	-13.00	51.37	H
5135.02	-53.85	6.86	10.09	-50.62	-13.00	37.62	H
6849.01	-54.12	7.83	11.42	-50.53	-13.00	37.53	V
8560.01	-32.72	8.56	13.01	-28.27	-13.00	15.27	V
10282.01	-45.75	9.58	13.01	-42.32	-13.00	29.32	V
11976.01	-48.75	10.16	13.00	-45.91	-13.00	32.91	V

**LTE Band 4, 1.4MHz, QPSK, Channel 20175**

Frequency (MHz)	SG (dBm)	CableLoss (dB)	AntennaGain (dBi)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3501.02	-67.20	5.52	8.20	-64.52	-13.00	51.52	H
5202.02	-56.33	6.96	10.18	-53.11	-13.00	40.11	H
6936.01	-60.87	7.80	11.52	-57.15	-13.00	44.15	H
8669.01	-39.86	8.40	13.03	-35.23	-13.00	22.23	V
10411.01	-51.54	9.78	13.06	-48.26	-13.00	35.26	V
12128.01	-56.27	10.27	13.05	-53.49	-13.00	40.49	V

**LTE Band 4, 1.4MHz, QPSK, Channel 20393**

Frequency (MHz)	SG (dBm)	CableLoss (dB)	AntennaGain (dBi)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3509.02	-66.50	5.54	8.21	-63.83	-13.00	50.83	H
5267.02	-50.45	6.99	10.27	-47.17	-13.00	34.17	H
7022.01	-57.35	8.27	11.63	-53.99	-13.00	40.99	H
8778.01	-34.85	8.59	13.06	-30.38	-13.00	17.38	V
10544.01	-47.71	9.49	13.11	-44.09	-13.00	31.09	V
12282.01	-49.65	10.01	13.11	-46.55	-13.00	33.55	V

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

Frequency (MHz)	SG (dBm)	CableLoss (dB)	AntennaGain (dBi)	Correction	Peak ERP (dBm)	Limit (dBm)	Margin (dB)	Polorization
1650.01	-53.13	3.57	5.23	2.15	-53.62	-13.00	40.62	H
2474.00	-37.78	4.60	6.02	2.15	-38.51	-13.00	25.51	H
3302.02	-55.38	5.29	7.72	2.15	-55.10	-13.00	42.10	V
4116.02	-54.94	6.04	9.02	2.15	-54.11	-13.00	41.11	H
4946.01	-54.59	6.70	9.85	2.15	-53.59	-13.00	40.59	V
5779.01	-53.82	7.22	10.54	2.15	-52.65	-13.00	39.65	H

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

Frequency (MHz)	SG (dBm)	CableLoss (dB)	AntennaGain (dBi)	Correction	Peak ERP (dBm)	Limit (dBm)	Margin (dB)	Polorization
1673.01	-53.65	3.58	5.19	2.15	-54.19	-13.00	41.19	H
2510.00	-35.45	4.63	6.12	2.15	-36.11	-13.00	23.11	H
3355.02	-54.64	5.32	7.85	2.15	-54.26	-13.00	41.26	V
4176.02	-54.39	6.15	9.08	2.15	-53.61	-13.00	40.61	V
5009.01	-49.50	6.59	9.91	2.15	-48.33	-13.00	35.33	H
5849.01	-53.28	7.23	10.53	2.15	-52.13	-13.00	39.13	V

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

Frequency (MHz)	SG (dBm)	CableLoss (dB)	AntennaGain (dBi)	Correction	Peak ERP (dBm)	Limit (dBm)	Margin (dB)	Polorization
1697.01	-49.16	3.60	5.15	2.15	-49.76	-13.00	36.76	H
2545.00	-35.16	4.66	6.18	2.15	-35.79	-13.00	22.79	H
3381.02	-55.73	5.35	7.91	2.15	-55.32	-13.00	42.32	V
4245.02	-55.14	6.24	9.15	2.15	-54.38	-13.00	41.38	H
5094.01	-54.15	6.76	10.03	2.15	-53.03	-13.00	40.03	V
5935.01	-52.83	7.47	10.51	2.15	-51.94	-13.00	38.94	H



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

Frequency (MHz)	SG (dBm)	CableLoss (dB)	AntennaGain (dBi)	Correction	Peak ERP (dBm)	Limit (dBm)	Margin (dB)	Polorization
1400.01	-57.70	3.24	4.98	2.15	-58.11	-13.00	45.11	H
2099.00	-40.15	4.19	4.90	2.15	-41.59	-13.00	28.59	H
2807.00	-50.34	4.92	6.65	2.15	-50.76	-13.00	37.76	V
3503.02	-54.56	5.53	8.20	2.15	-54.04	-13.00	41.04	H
4194.02	-54.40	6.19	9.09	2.15	-53.65	-13.00	40.65	H
4904.01	-54.19	6.73	9.80	2.15	-53.27	-13.00	40.27	V

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

Frequency (MHz)	SG (dBm)	CableLoss (dB)	AntennaGain (dBi)	Correction	Peak ERP (dBm)	Limit (dBm)	Margin (dB)	Polorization
1415.01	-55.72	3.25	5.06	2.15	-56.06	-13.00	43.06	V
2123.00	-35.80	4.21	4.97	2.15	-37.19	-13.00	24.19	H
2821.00	-52.25	4.94	6.68	2.15	-52.66	-13.00	39.66	H
3529.02	-54.66	5.61	8.24	2.15	-54.18	-13.00	41.18	H
4257.02	-54.35	6.23	9.16	2.15	-53.57	-13.00	40.57	V
4949.01	-54.53	6.69	9.85	2.15	-53.52	-13.00	40.52	V

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

Frequency (MHz)	SG (dBm)	CableLoss (dB)	AntennaGain (dBi)	Correction	Peak ERP (dBm)	Limit (dBm)	Margin (dB)	Polorization
1431.01	-54.75	3.28	5.14	2.15	-55.04	-13.00	42.04	V
2146.00	-34.23	4.24	5.04	2.15	-35.58	-13.00	22.58	H
2871.00	-52.64	4.97	6.77	2.15	-52.99	-13.00	39.99	V
3582.02	-53.35	6.15	8.31	2.15	-53.34	-13.00	40.34	V
4296.02	-54.29	6.20	9.20	2.15	-53.44	-13.00	40.44	H
5000.01	-53.23	6.60	9.90	2.15	-52.08	-13.00	39.08	V

**LTE Band 14, 5MHz, QPSK, Channel 23305**

Frequency (MHz)	SG (dBm)	CableLoss (dB)	AntennaGain (dBi)	Correction	Peak ERP (dBm)	Limit (dBm)	Margin (dB)	Polorization
1584.01	-60.58	3.50	5.35	2.15	-60.88	-13.00	47.88	H
2370.00	-48.80	4.48	5.71	2.15	-49.72	-13.00	36.72	H
3153.02	-53.49	5.36	7.37	2.15	-53.63	-13.00	40.63	V
3940.02	-54.95	6.11	8.82	2.15	-54.39	-13.00	41.39	V
4739.02	-54.33	6.55	9.64	2.15	-53.39	-13.00	40.39	H
5546.01	-54.25	7.18	10.59	2.15	-52.99	-13.00	39.99	H

**LTE Band 14, 5MHz, QPSK, Channel 23330**

Frequency (MHz)	SG (dBm)	CableLoss (dB)	AntennaGain (dBi)	Correction	Peak ERP (dBm)	Limit (dBm)	Margin (dB)	Polorization
1589.01	-55.54	3.51	5.34	2.15	-55.86	-13.00	42.86	H
2380.00	-45.88	4.49	5.74	2.15	-46.78	-13.00	33.78	H
3184.02	-52.88	5.32	7.44	2.15	-52.91	-13.00	39.91	V
3971.02	-55.00	6.09	8.86	2.15	-54.38	-13.00	41.38	H
4765.01	-54.61	6.60	9.67	2.15	-53.69	-13.00	40.69	H
5551.01	-54.00	7.18	10.59	2.15	-52.74	-13.00	39.74	V

**LTE Band 14, 5MHz, QPSK, Channel 23355**

Frequency (MHz)	SG (dBm)	CableLoss (dB)	AntennaGain (dBi)	Correction	Peak ERP (dBm)	Limit (dBm)	Margin (dB)	Polorization
1591.01	-58.21	3.51	5.34	2.15	-58.53	-13.00	45.53	H
2387.00	-36.39	4.50	5.76	2.15	-37.28	-13.00	24.28	H
3189.02	-53.34	5.32	7.45	2.15	-53.36	-13.00	40.36	V
3986.02	-54.96	6.08	8.88	2.15	-54.31	-13.00	41.31	V
4785.01	-54.24	6.64	9.69	2.15	-53.34	-13.00	40.34	V
5567.01	-54.26	7.20	10.59	2.15	-53.02	-13.00	40.02	H

**LTE Band 30, 5MHz, QPSK, Channel 27685**

Frequency (MHz)	SG (dBm)	CableLoss (dB)	AntennaGain (dBi)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
4619.02	-65.89	6.45	9.52	-62.82	-40.00	22.82	V
6927.01	-62.96	7.74	11.51	-59.19	-40.00	19.19	V
9237.01	-56.07	9.01	13.24	-51.84	-40.00	11.84	H
11548.01	-59.51	9.81	13.09	-56.23	-40.00	16.23	V
13863.01	-57.40	10.73	14.42	-53.71	-40.00	13.71	H
16155.00	-53.63	11.79	13.67	-51.75	-40.00	11.75	H

**LTE Band 30, 5MHz, QPSK, Channel 27710**

Frequency (MHz)	SG (dBm)	CableLoss (dB)	AntennaGain (dBi)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
4627.02	-65.57	6.45	9.53	-62.49	-40.00	22.49	V
6937.01	-63.98	7.81	11.52	-60.27	-40.00	20.27	H
9245.01	-56.14	9.03	13.25	-51.92	-40.00	11.92	H
11559.01	-59.71	9.80	13.09	-56.42	-40.00	16.42	V
13877.01	-56.65	10.76	14.43	-52.98	-40.00	12.98	V
16159.00	-53.68	11.78	13.67	-51.79	-40.00	11.79	H

**LTE Band 30, 5MHz, QPSK, Channel 27735**

Frequency (MHz)	SG (dBm)	CableLoss (dB)	AntennaGain (dBi)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
4629.02	-65.87	6.45	9.53	-62.79	-40.00	22.79	V
6941.01	-62.93	7.84	11.53	-59.24	-40.00	19.24	V
9254.01	-55.99	9.05	13.25	-51.79	-40.00	11.79	H
11573.01	-59.09	9.80	13.09	-55.80	-40.00	15.80	H
13888.01	-56.93	10.78	14.43	-53.28	-40.00	13.28	V
16188.00	-53.89	11.74	13.66	-51.97	-40.00	11.97	H

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

## **A.3 Frequency Stability**

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

Frequency stability is a measure of the frequency drift due to temperature and supply voltage variations, with reference to the frequency measured at +20 °C and rated supply voltage. Two reference points are established at the applicable unwanted emissions limit using a RBW equal to the RBW required by the unwanted emissions specification of the applicable regulatory standard. These reference points measured using the lowest and highest channel of operation shall be identified as  $F_L$  and  $F_H$  respectively.

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 CMW500.

1. Measure the carrier frequency at room temperature.
2. Subject the EUT to overnight soak at -30°C.
3. With the EUT, powered via nominal voltage, connected to the CMW500, and in a simulated call on middle channel for each LTE band, 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 -30°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 center 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 -30°C to +50°C. Allow at least 1.5 hours at each temperature, unpowered, before making measurements.
9. At all temperature levels hold the temperature to +/- 0.5°C during the measurement procedure.

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 the lower, higher and nominal voltage. Operation above or below these voltage limits is prohibited by transceiver software in order to prevent improper operation as well as to protect components from overstress.

### A.3.2 Measurement results

#### LTE Band 2, 20MHz bandwidth QPSK (worst case of all bandwidths)

##### Frequency Error vs Temperature

Temperature(°C)	Voltage(V)	F <sub>L</sub> (MHz)	F <sub>H</sub> (MHz)	Offset(Hz)	Frequency error(ppm)
20	3.85	1850.833	1909.199		
50				0.47	0.0003
40				-3.00	0.0016
30				1.53	0.0008
10				-1.69	0.0009
0				0.04	0.0000
-10				-0.19	0.0001
-20				-1.47	0.0008
-30				-2.73	0.0015

##### Frequency Error vs Voltage

Voltage(V)	Temperature(°C)	F <sub>L</sub> (MHz)	F <sub>H</sub> (MHz)	Offset(Hz)	Frequency error(ppm)
3.5	20	1850.833	1909.199	-6.39	0.0034
4.4				2.02	0.0011

#### LTE Band 4, 20MHz bandwidth QPSK (worst case of all bandwidths)

##### Frequency Error vs Temperature

Temperature(°C)	Voltage(V)	F <sub>L</sub> (MHz)	F <sub>H</sub> (MHz)	Offset(Hz)	Frequency error(ppm)
20	3.85	1710.833	1754.199		
50				2.93	0.0017
40				4.21	0.0024
30				3.66	0.0021
10				6.74	0.0039
0				6.41	0.0037
-10				6.79	0.0039
-20				6.21	0.0036
-30				6.92	0.0040

##### Frequency Error vs Voltage

Voltage(V)	Temperature(°C)	F <sub>L</sub> (MHz)	F <sub>H</sub> (MHz)	Offset(Hz)	Frequency error(ppm)
3.5	20	1710.833	1754.199	9.91	0.0057
4.4				3.49	0.0020

**LTE Band 5, 10MHz bandwidth QPSK (worst case of all bandwidths)**
**Frequency Error vs Temperature**

Temperature(°C)	Voltage(V)	F <sub>L</sub> (MHz)	F <sub>H</sub> (MHz)	Offset(Hz)	Frequency error(ppm)
20	3.85	824.417	848.583		
50				-3.58	0.0043
40				-0.01	0.0000
30				-2.36	0.0028
10				-2.10	0.0025
0				-0.24	0.0003
-10				1.32	0.0016
-20				-4.11	0.0049
-30				0.36	0.0004

**Frequency Error vs Voltage**

Voltage(V)	Temperature(°C)	F <sub>L</sub> (MHz)	F <sub>H</sub> (MHz)	Offset(Hz)	Frequency error(ppm)
3.5	20	824.417	848.583	-6.04	0.0072
4.4				-7.45	0.0089

**LTE Band 12, 10MHz bandwidth QPSK (worst case of all bandwidths)**
**Frequency Error vs Temperature**

Temperature(°C)	Voltage(V)	F <sub>L</sub> (MHz)	F <sub>H</sub> (MHz)	Offset(Hz)	Frequency error(ppm)
20	3.85	699.465	715.519		
50				1.04	0.0015
40				-4.25	0.0060
30				-0.59	0.0008
10				-4.43	0.0063
0				-0.64	0.0009
-10				-4.32	0.0061
-20				-0.62	0.0009
-30				-4.71	0.0067

**Frequency Error vs Voltage**

Voltage(V)	Temperature(°C)	F <sub>L</sub> (MHz)	F <sub>H</sub> (MHz)	Offset(Hz)	Frequency error(ppm)
3.5	20	699.465	715.519	-4.32	0.0061
4.4				-1.86	0.0026

**LTE Band 14, 10MHz bandwidth QPSK (worst case of all bandwidths)**
**Frequency Error vs Temperature**

Temperature(°C)	Voltage(V)	F <sub>L</sub> (MHz)	F <sub>H</sub> (MHz)	Offset(Hz)	Frequency error(ppm)
20	3.85	788.476	797.514		
50				3.00	0.0038
40				4.82	0.0061
30				3.99	0.0050
10				-3.56	0.0045
0				-0.13	0.0002
-10				2.26	0.0028
-20				1.75	0.0022
-30				4.58	0.0058

**Frequency Error vs Voltage**

Voltage(V)	Temperature(°C)	F <sub>L</sub> (MHz)	F <sub>H</sub> (MHz)	Offset(Hz)	Frequency error(ppm)
3.5	20	788.476	797.514	-0.01	0.0000
4.4				2.86	0.0036

**LTE Band 30, 10MHz bandwidth QPSK (worst case of all bandwidths)**
**Frequency Error vs Temperature**

Temperature(°C)	Voltage(V)	F <sub>L</sub> (MHz)	F <sub>H</sub> (MHz)	Offset(Hz)	Frequency error(ppm)
20	3.85	2305.417	2314.599		
50				0.07	0.0000
40				-1.44	0.0006
30				-1.67	0.0007
10				-0.54	0.0002
0				3.19	0.0014
-10				2.35	0.0010
-20				-1.14	0.0005
-30				-0.93	0.0004

**Frequency Error vs Voltage**

Voltage(V)	Temperature(°C)	F <sub>L</sub> (MHz)	F <sub>H</sub> (MHz)	Offset(Hz)	Frequency error(ppm)
3.5	20	2305.417	2314.599	3.29	0.0014
4.4				0.27	0.0001

#### **A.4 Occupied Bandwidth**

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

The measurement method is from ANSI C63.26:

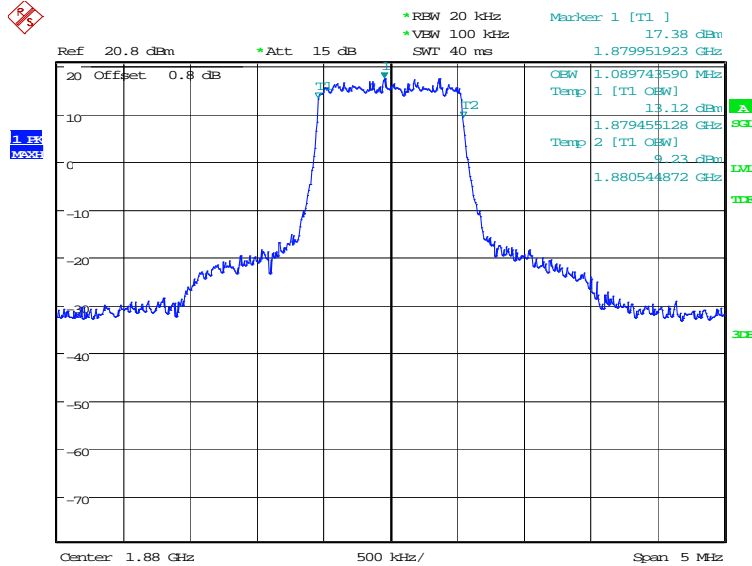
- a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be set wide enough to capture all modulation products including the emission skirts.
- b) The nominal IF filter 3 dB bandwidth (RBW) shall be in the range of 1% to 5% of the anticipated OBW, and the VBW shall be set  $\geq 3 \times$  RBW.
- c) Set the reference level of the instrument as required to prevent the signal amplitude from exceeding the maximum spectrum analyzer input mixer level for linear operation.
- d) Set the detection mode to peak, and the trace mode to max-hold.



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

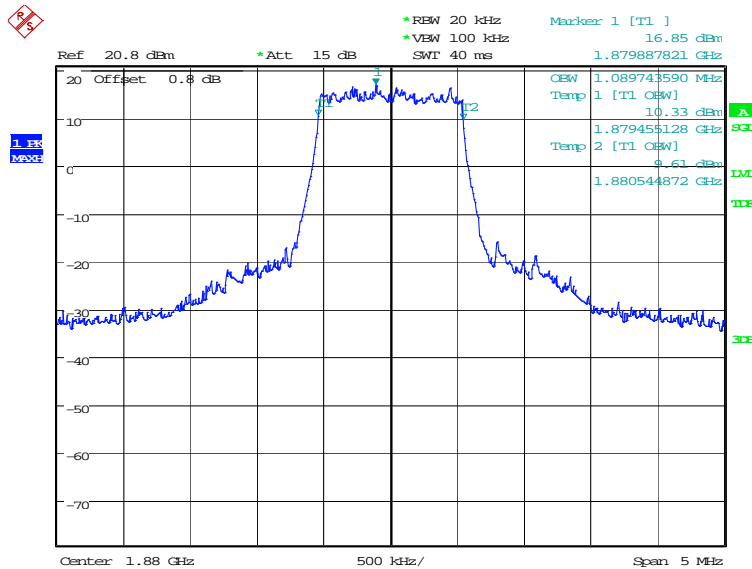
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
1880.0	QPSK	16QAM
	1089.74	1089.74

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



Date: 27.APR.2021 16:56:21

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

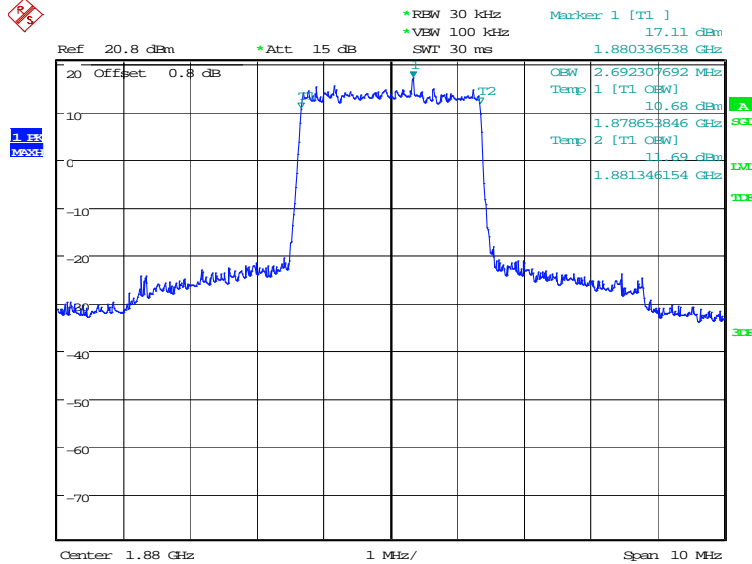


Date: 27.APR.2021 16:57:00

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

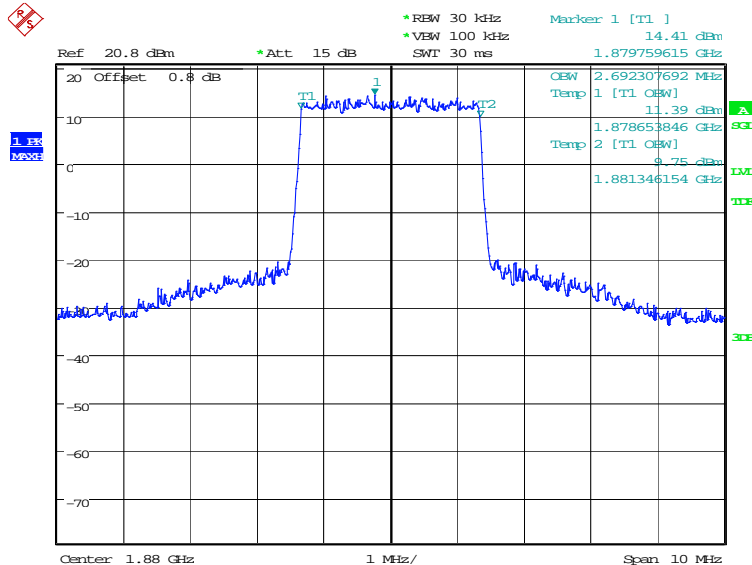
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
1880.0	QPSK	16QAM
	2692.31	2692.31

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



Date: 27.APR.2021 16:58:29

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

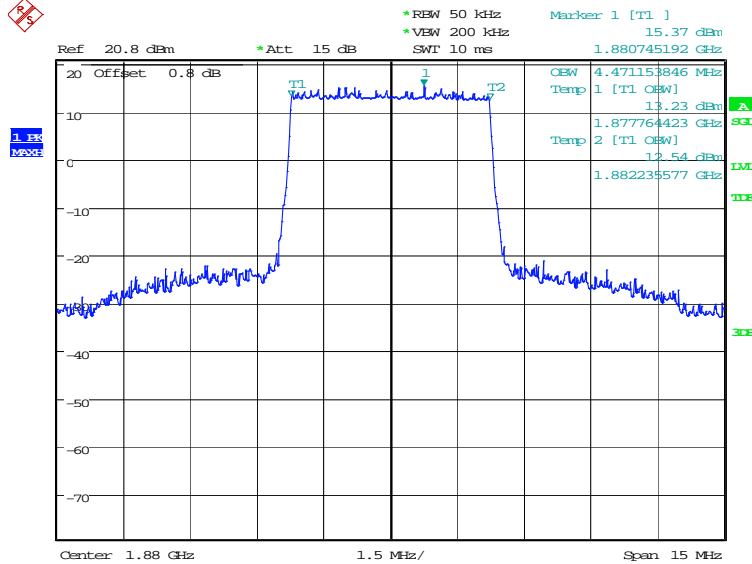


Date: 27.APR.2021 16:59:08

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

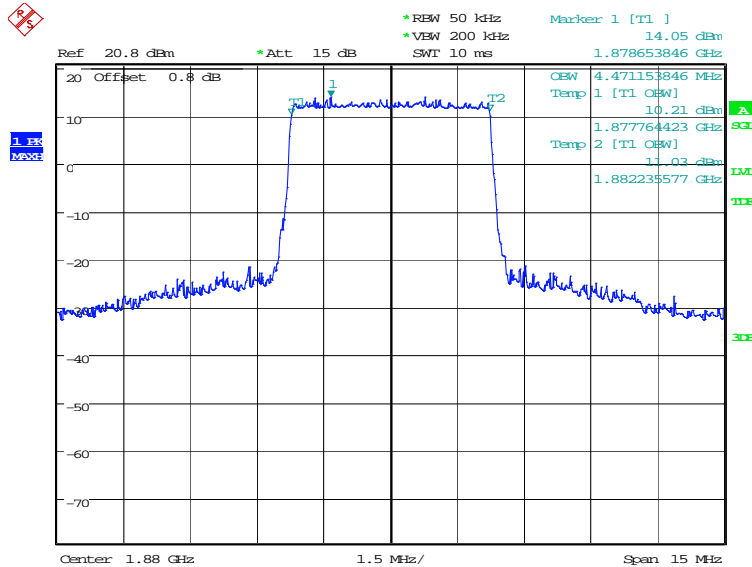
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
1880.0	QPSK	16QAM
	4471.15	4471.15

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



Date: 27.APR.2021 17:00:37

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

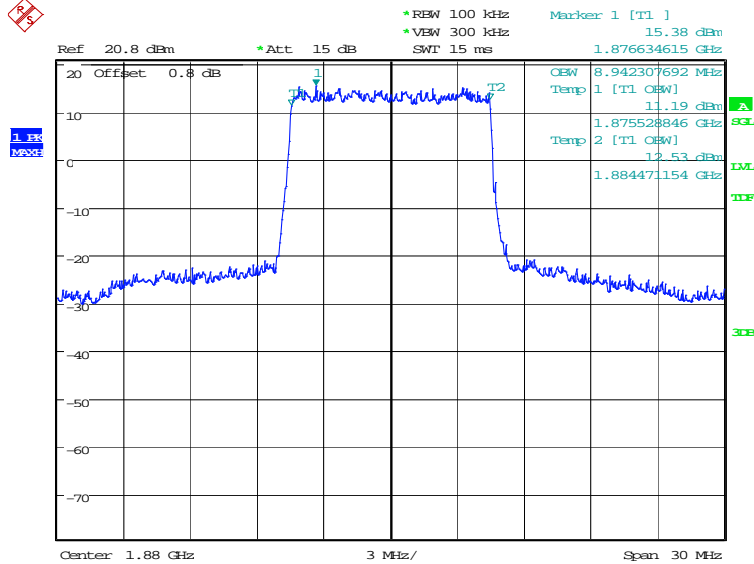


Date: 27.APR.2021 17:01:16

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

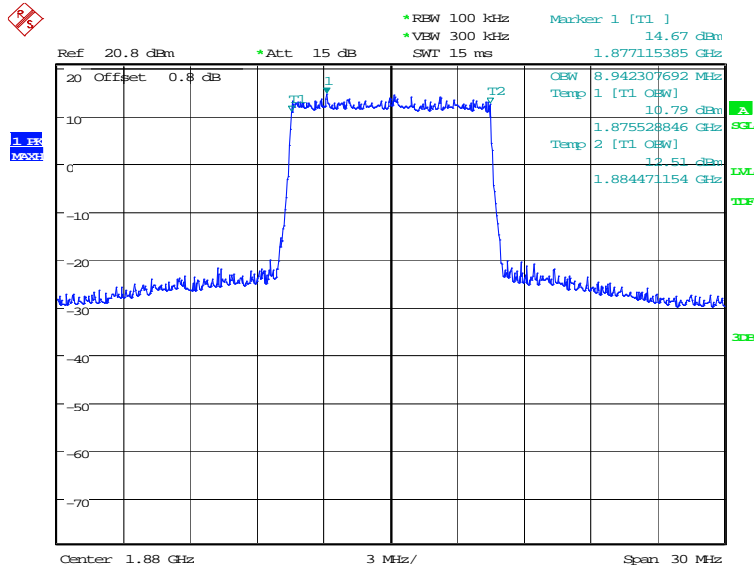
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
1880.0	QPSK	16QAM
	8942.31	8942.31

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



Date: 27.APR.2021 17:02:44

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

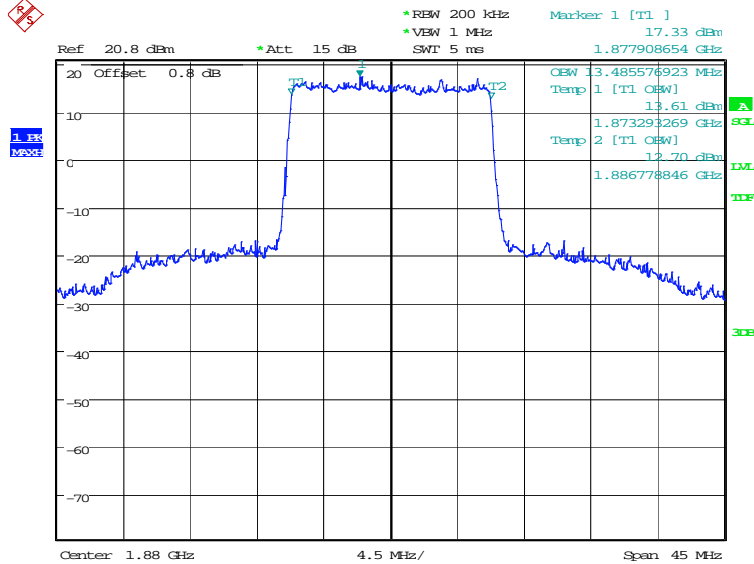


Date: 27.APR.2021 17:03:24

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

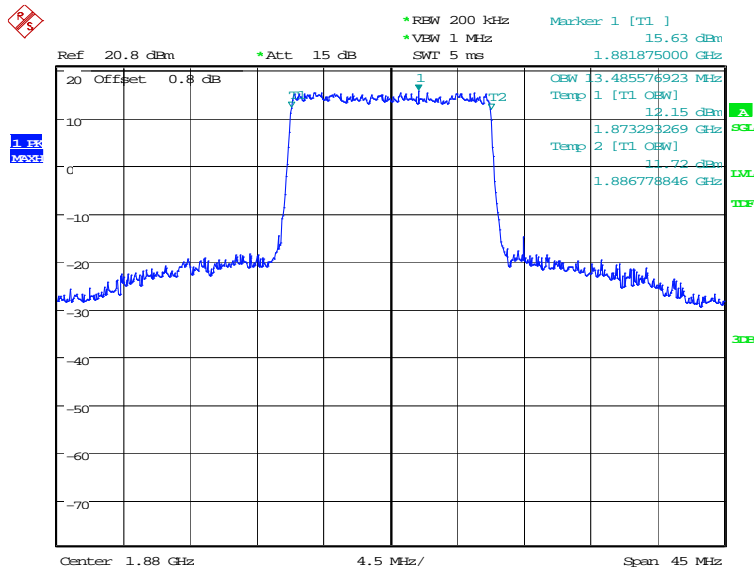
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
1880.0	QPSK	16QAM
	13485.58	13485.58

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



Date: 27.APR.2021 17:04:52

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

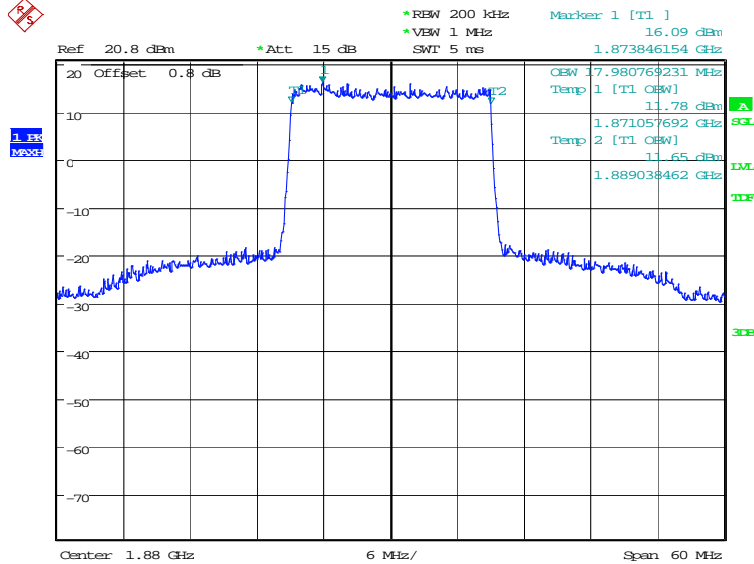


Date: 27.APR.2021 17:05:32

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

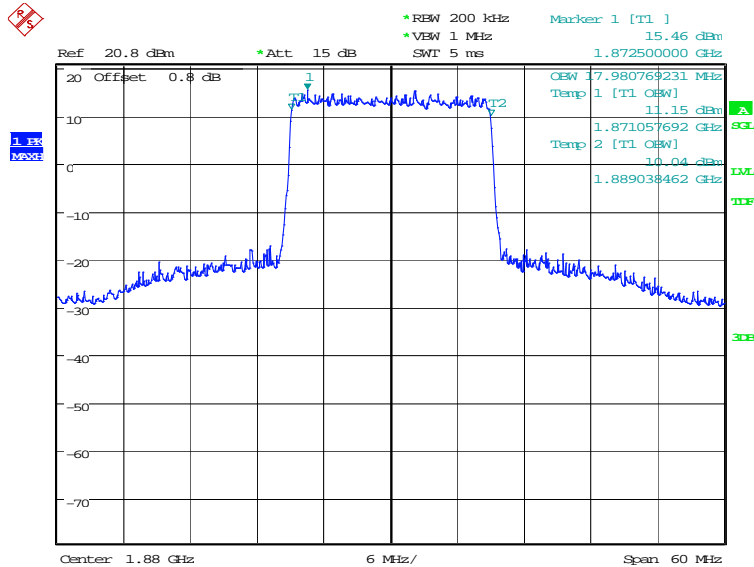
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
1880.0	QPSK	16QAM
	17980.77	17980.77

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



Date: 27.APR.2021 17:07:00

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

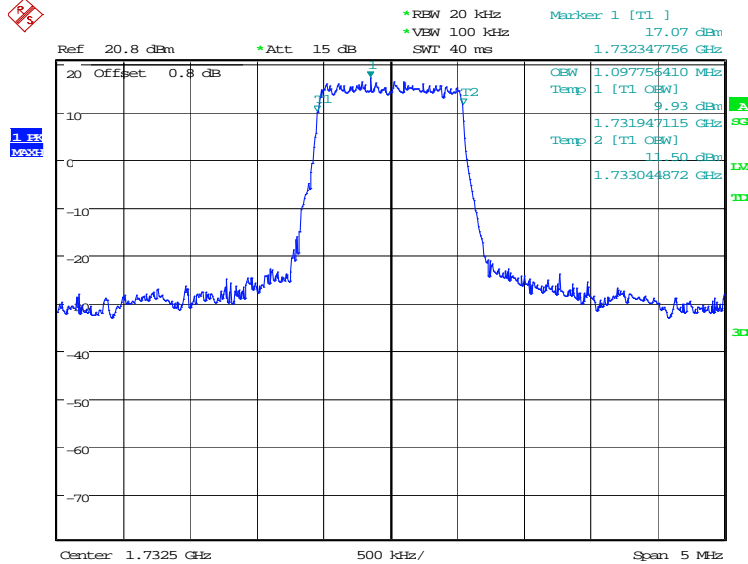


Date: 27.APR.2021 17:07:40

**LTE band 4, 1.4MHz (99%)**

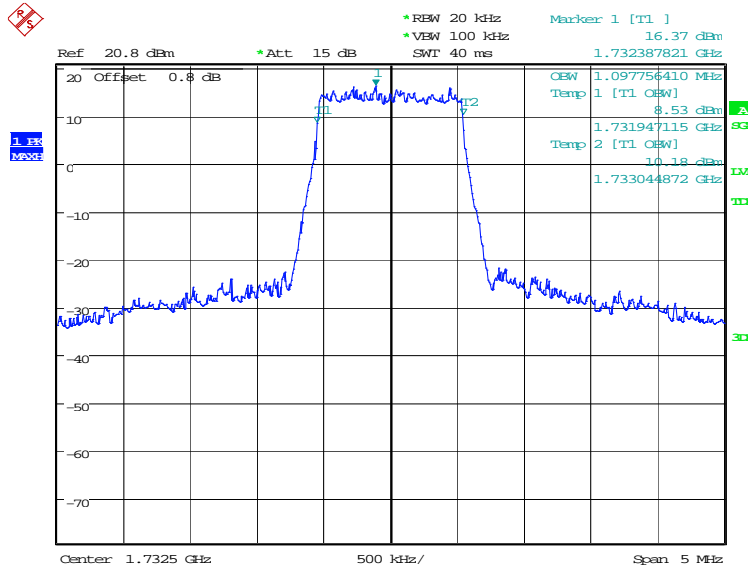
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
1732.5	QPSK	16QAM
	1097.76	1097.76

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



Date: 27.APR.2021 17:09:09

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

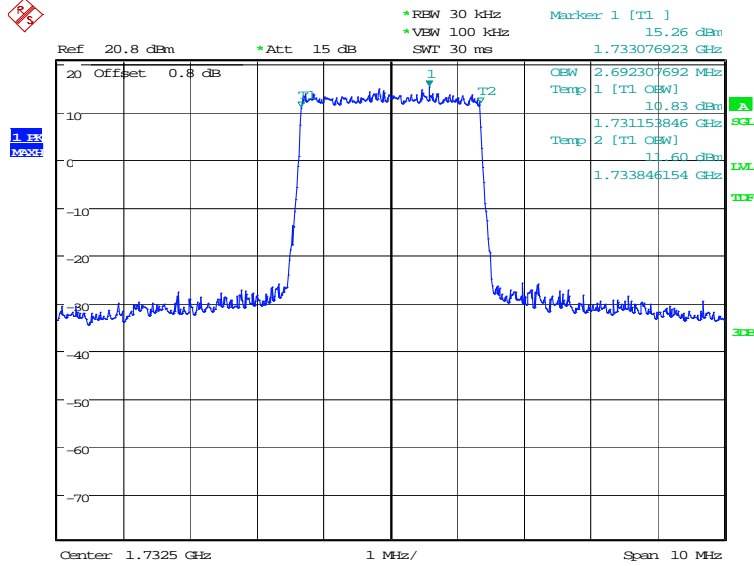


Date: 27.APR.2021 17:09:49

**LTE band 4, 3MHz (99%)**

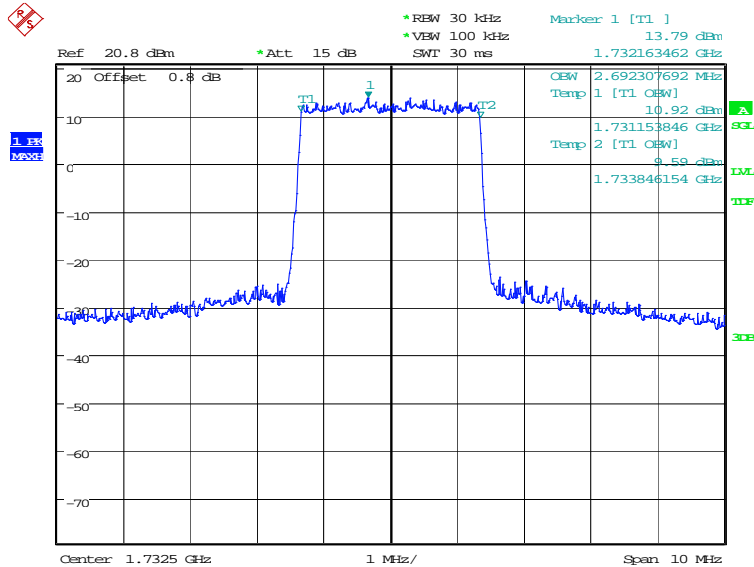
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
1732.5	QPSK	16QAM
	2692.31	2692.31

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



Date: 27.APR.2021 17:11:17

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



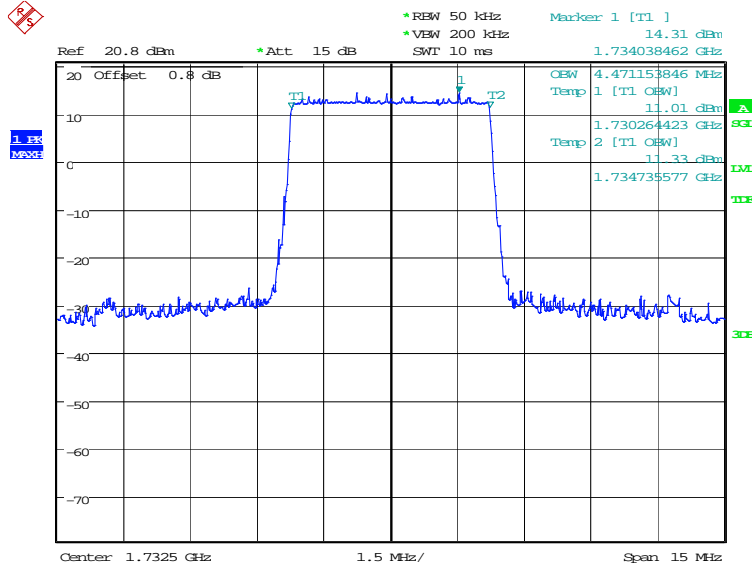
Date: 27.APR.2021 17:11:57



### LTE band 4, 5MHz (99%)

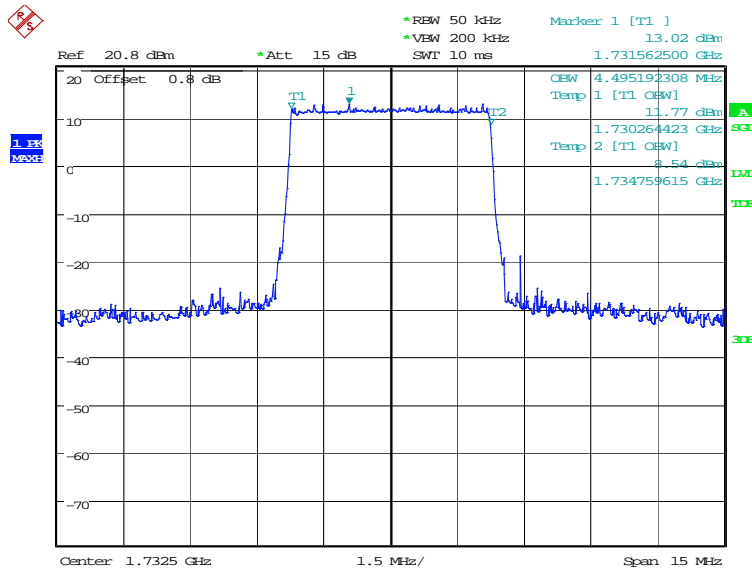
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
1732.5	QPSK	16QAM
	4471.15	4495.19

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



Date: 27.APR.2021 17:13:25

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

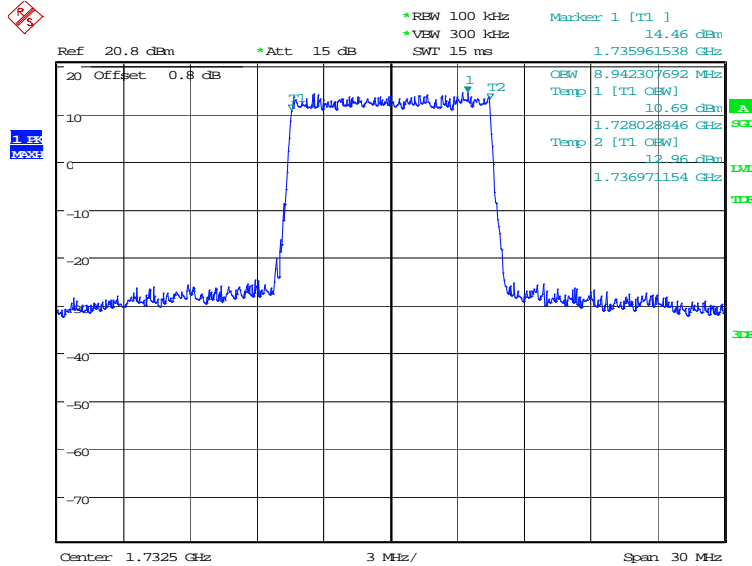


Date: 27.APR.2021 17:14:05

**LTE band 4, 10MHz (99%)**

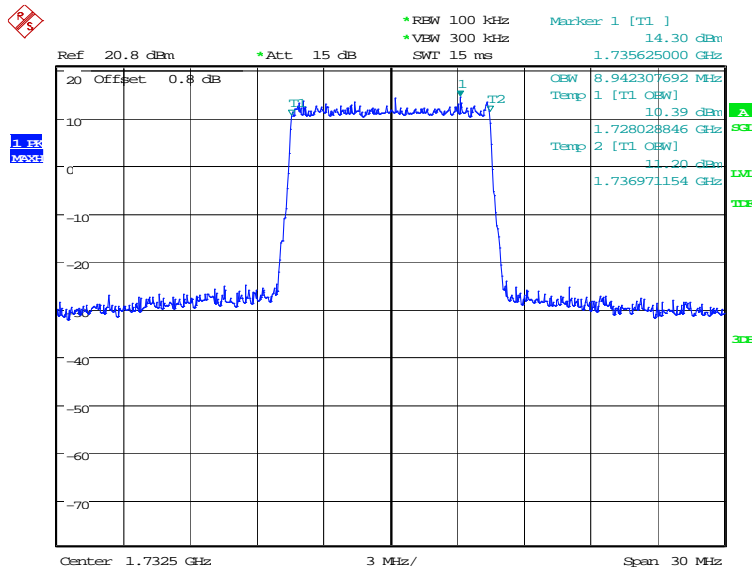
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
1732.5	QPSK	16QAM
	8942.31	8942.31

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



Date: 27.APR.2021 17:15:33

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

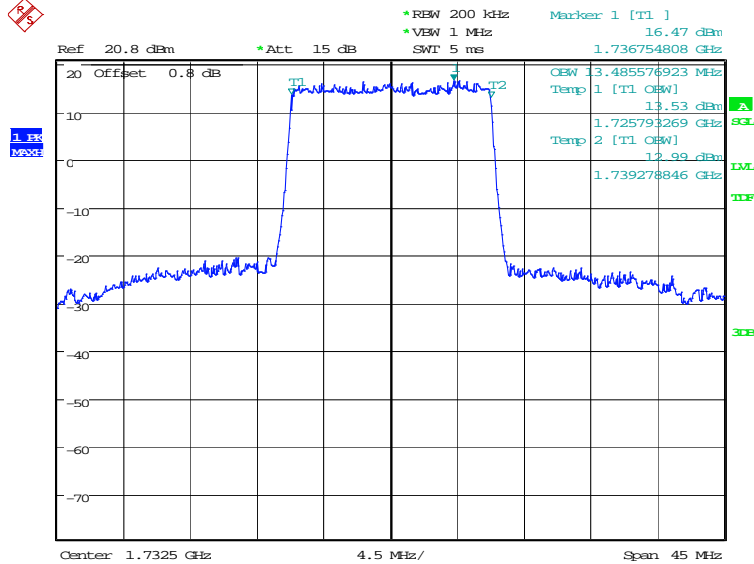


Date: 27.APR.2021 17:16:13

### LTE band 4, 15MHz (99%)

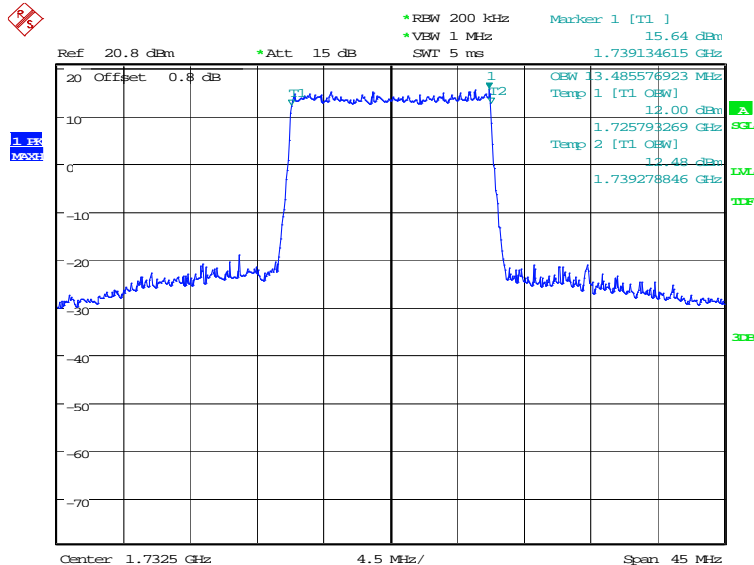
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
1732.5	QPSK	16QAM
	13485.58	13485.58

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



Date: 27.APR.2021 17:17:41

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

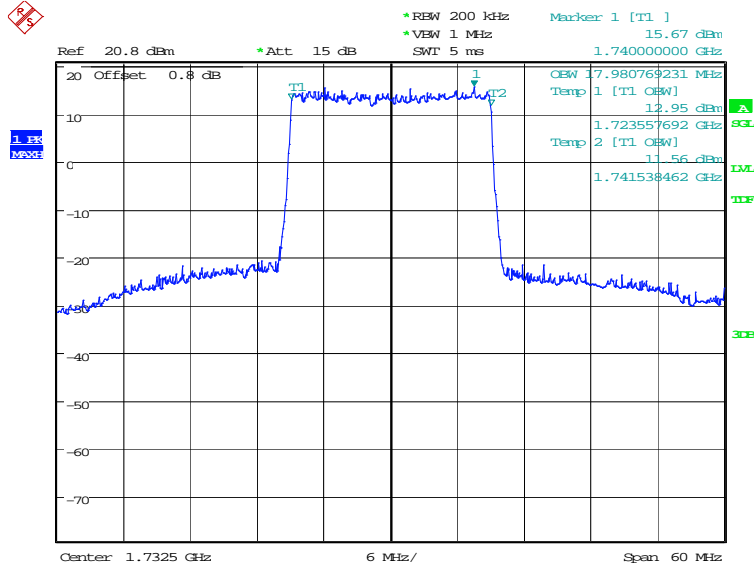


Date: 27.APR.2021 17:18:21

**LTE band 4, 20MHz (99%)**

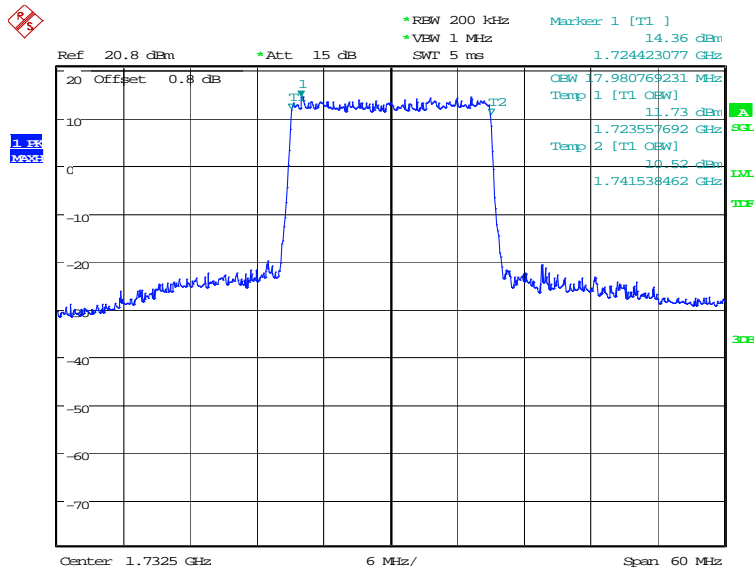
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
1732.5	QPSK	16QAM
	17980.77	17980.77

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



Date: 27.APR.2021 17:19:49

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

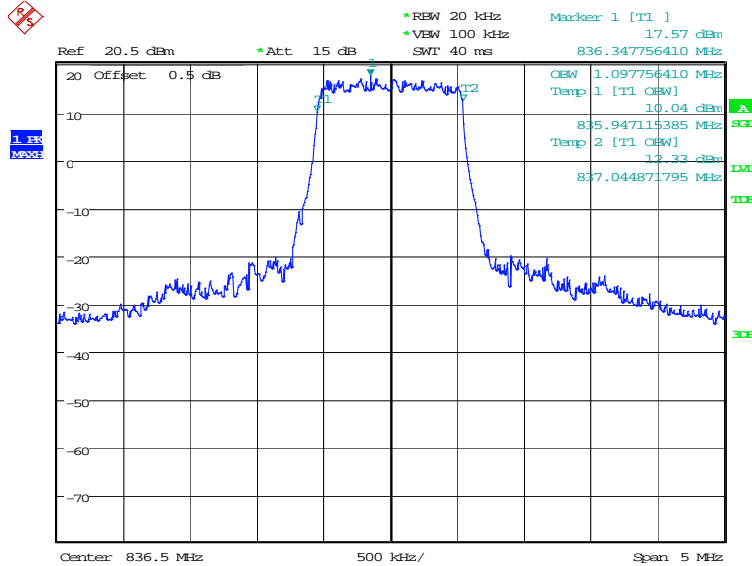


Date: 27.APR.2021 17:20:29

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

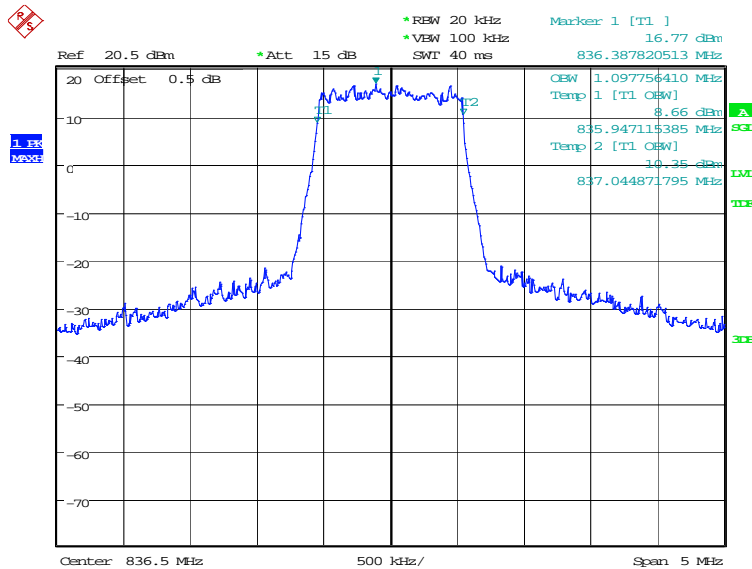
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
836.5	QPSK	16QAM
	1097.76	1097.76

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



Date: 27.APR.2021 17:21:58

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

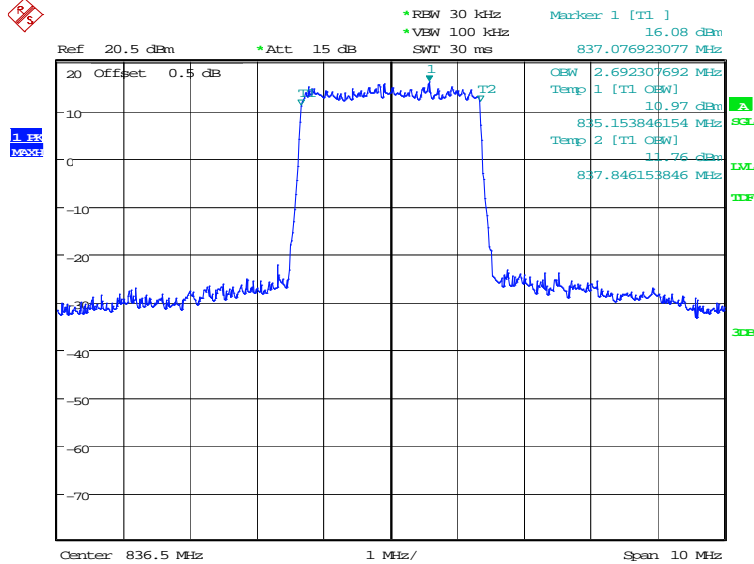


Date: 27.APR.2021 17:22:38

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

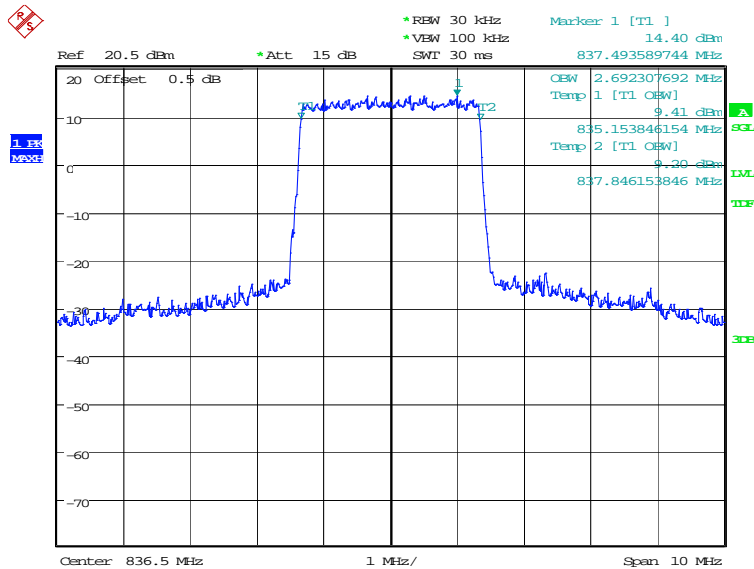
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
836.5	QPSK	16QAM
	2692.31	2692.31

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



Date: 27.APR.2021 17:24:06

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

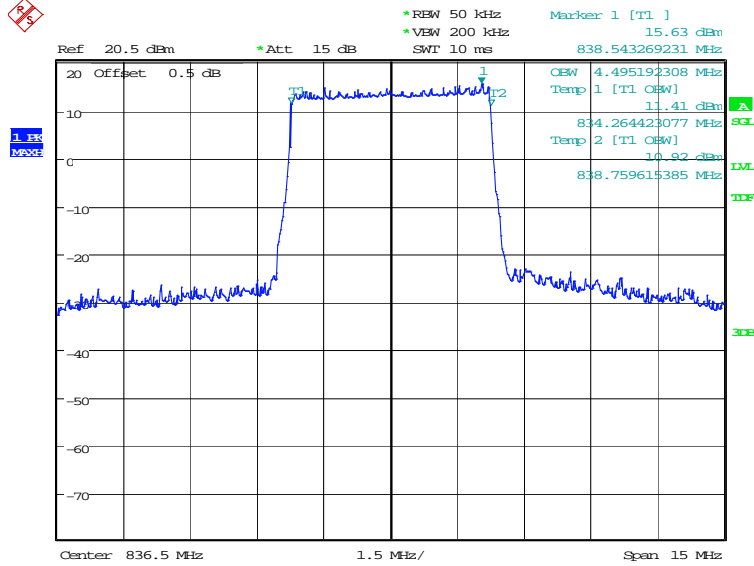


Date: 27.APR.2021 17:24:46

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

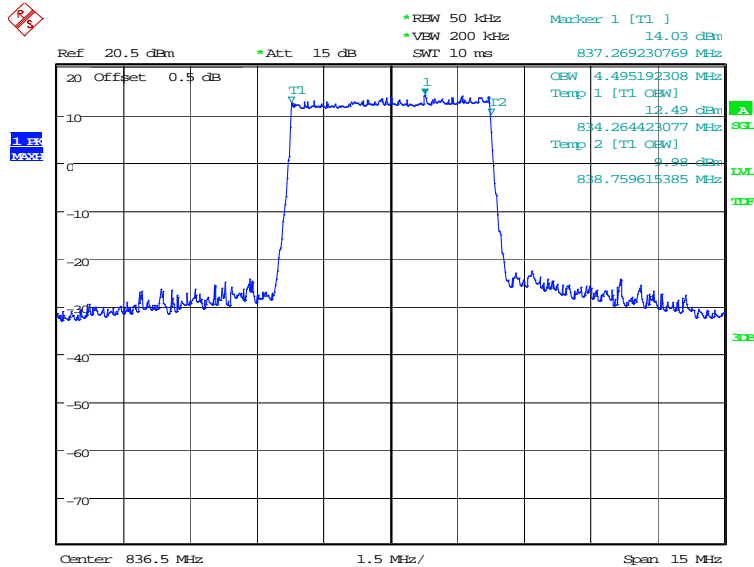
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
836.5	QPSK	16QAM
	4495.19	4495.19

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



Date: 27.APR.2021 17:26:14

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

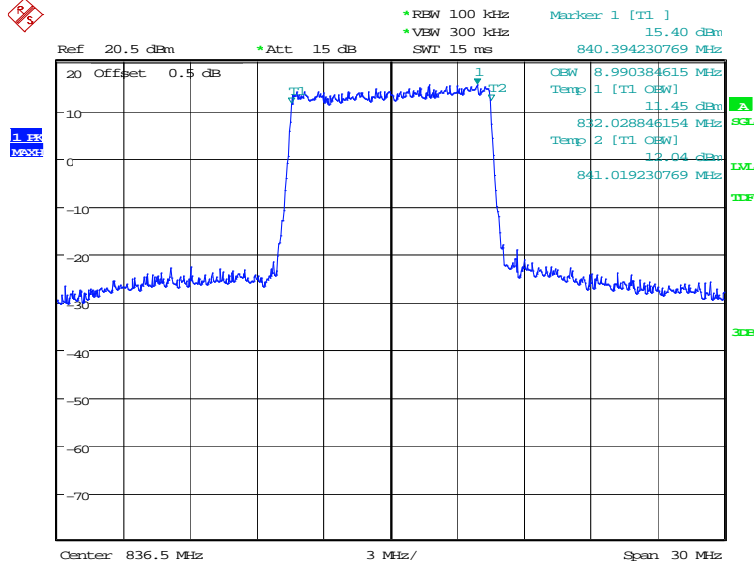


Date: 27.APR.2021 17:26:54

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

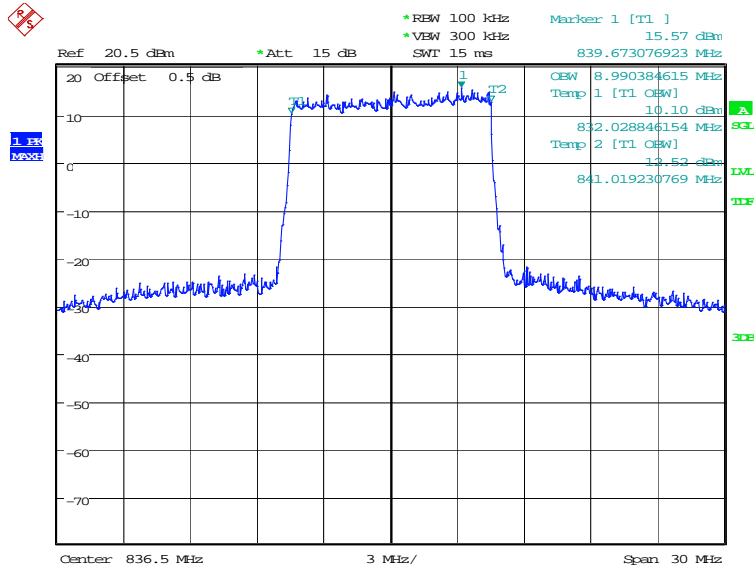
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
836.5	QPSK	16QAM
	8990.38	8990.38

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



Date: 27.APR.2021 17:28:22

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



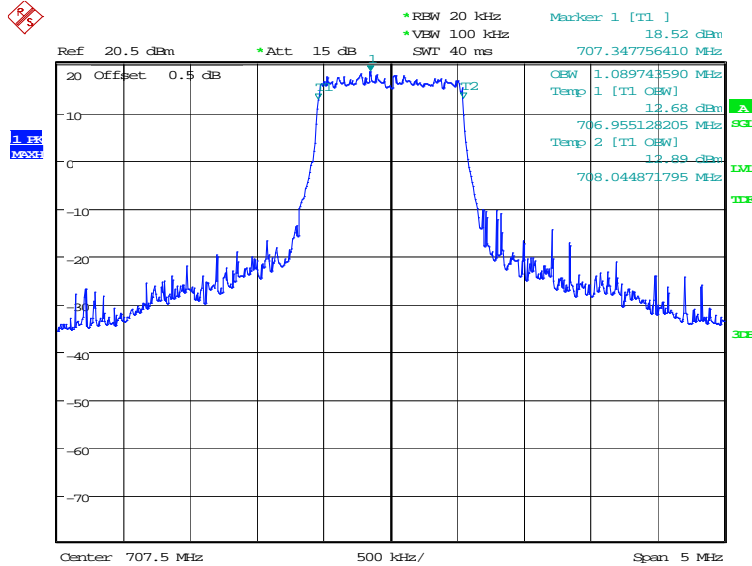
Date: 27.APR.2021 17:29:02



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

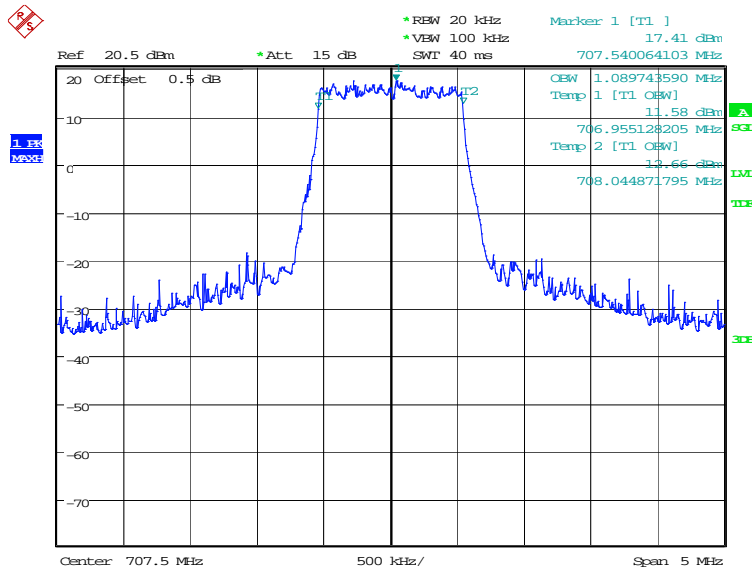
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
707.5	QPSK	16QAM
	1089.74	1089.74

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



Date: 27.APR.2021 17:30:32

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

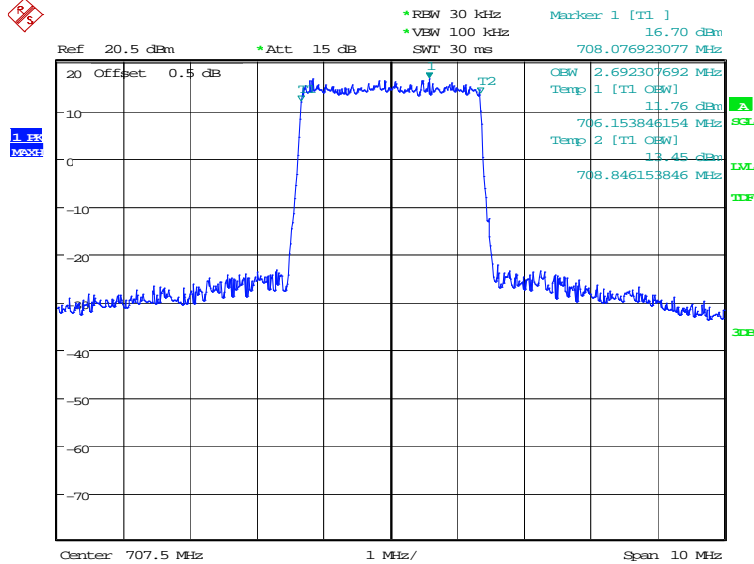


Date: 27.APR.2021 17:31:11

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

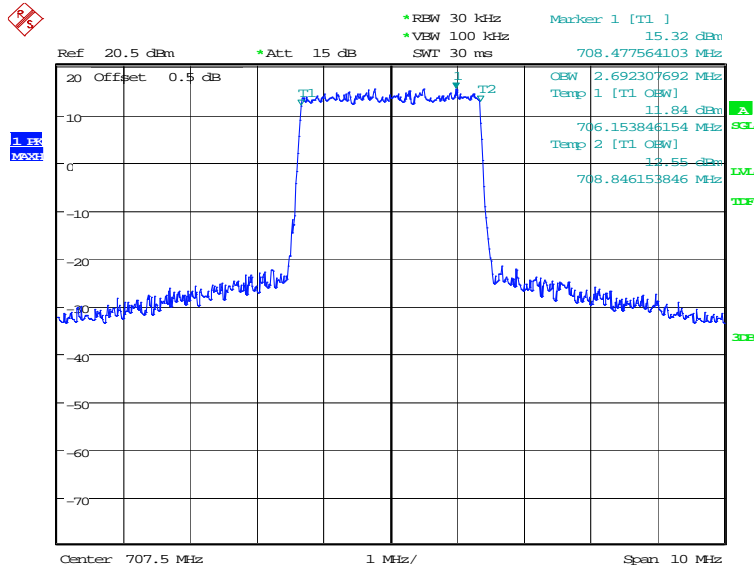
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
707.5	QPSK	16QAM
	2692.31	2692.31

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



Date: 27.APR.2021 17:32:40

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

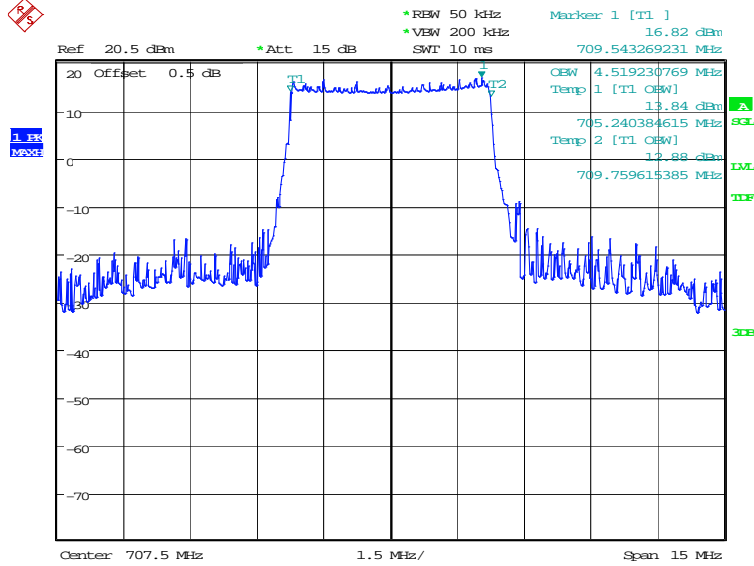


Date: 27.APR.2021 17:33:19

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

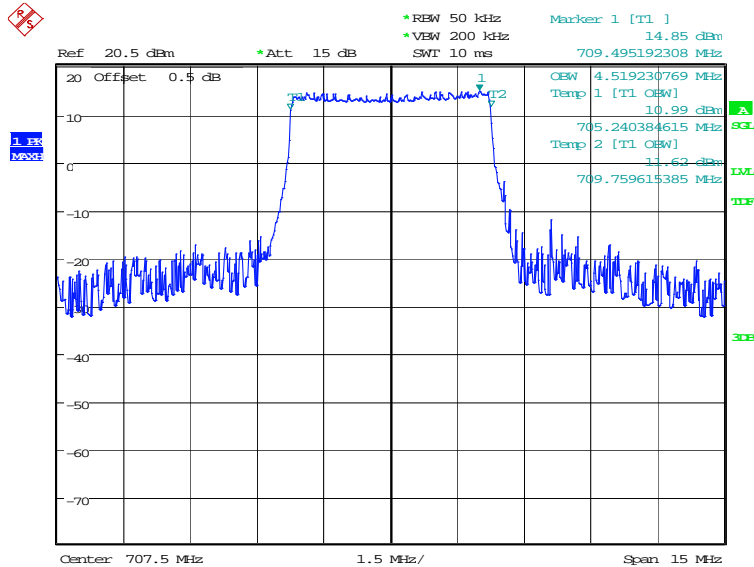
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
707.5	QPSK	16QAM
	4519.23	4519.23

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



Date: 27.APR.2021 17:34:48

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

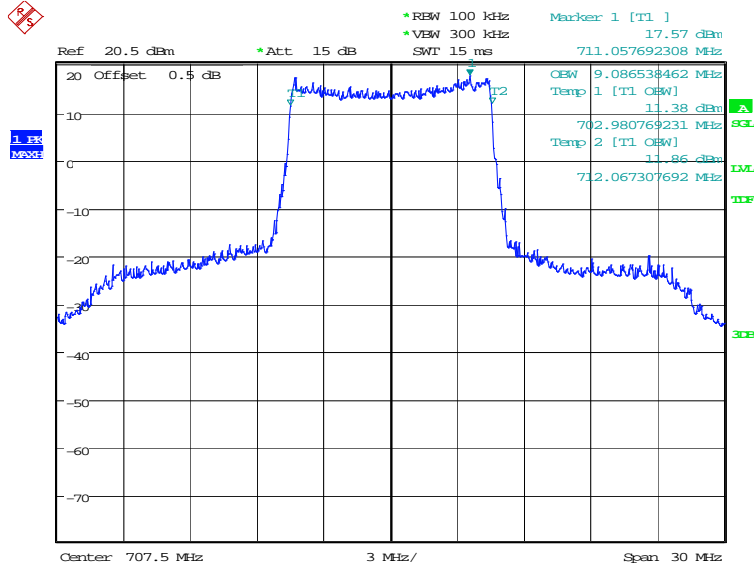


Date: 27.APR.2021 17:35:28

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

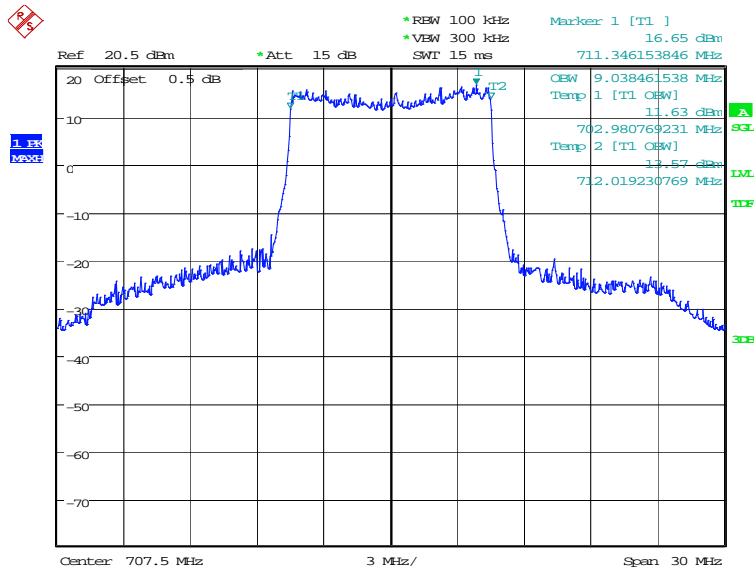
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
707.5	QPSK	16QAM
	9086.54	9038.46

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



Date: 27.APR.2021 17:36:56

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

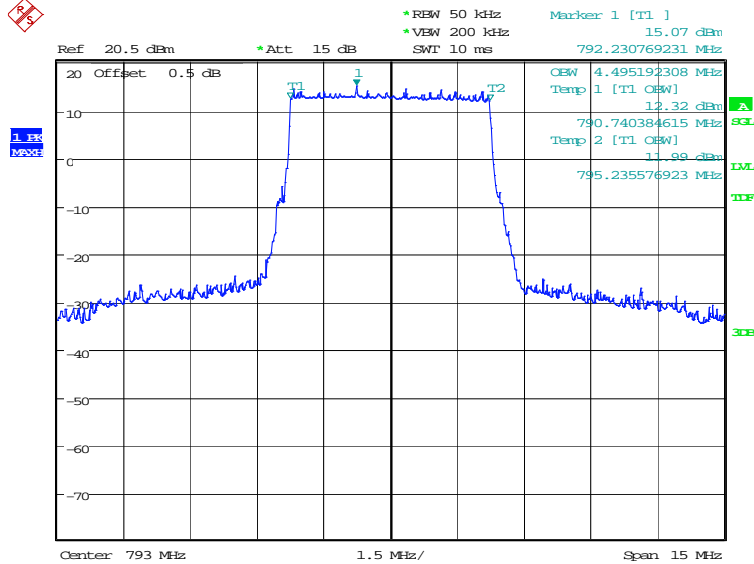


Date: 27.APR.2021 17:37:36

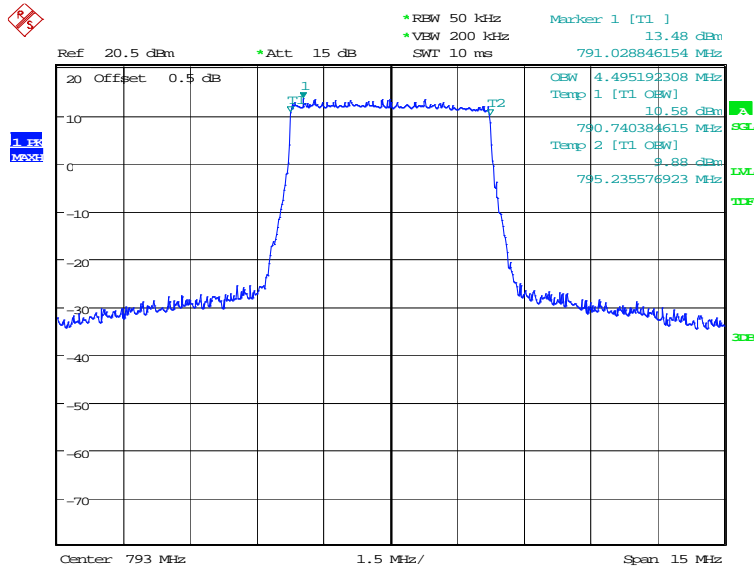
**LTE band 14, 5MHz (99%)**

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

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



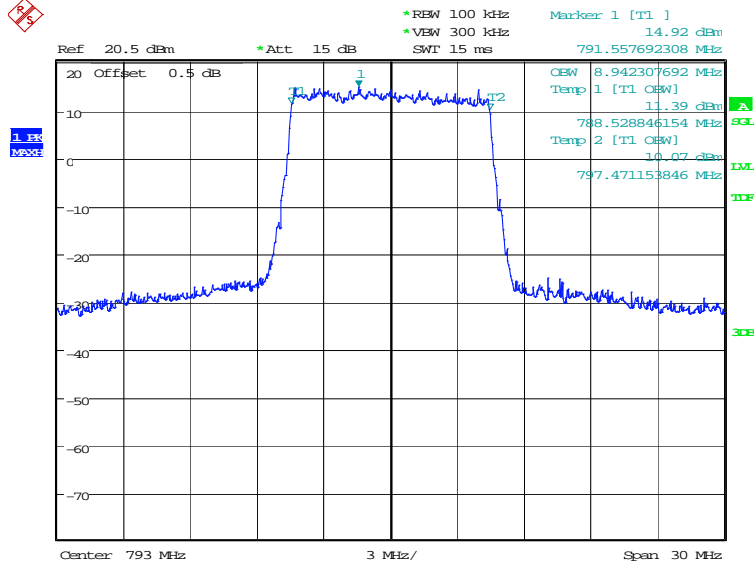
**LTE band 14, 5MHz Bandwidth, 16QAM (99% BW)**



**LTE band 14, 10MHz (99%)**

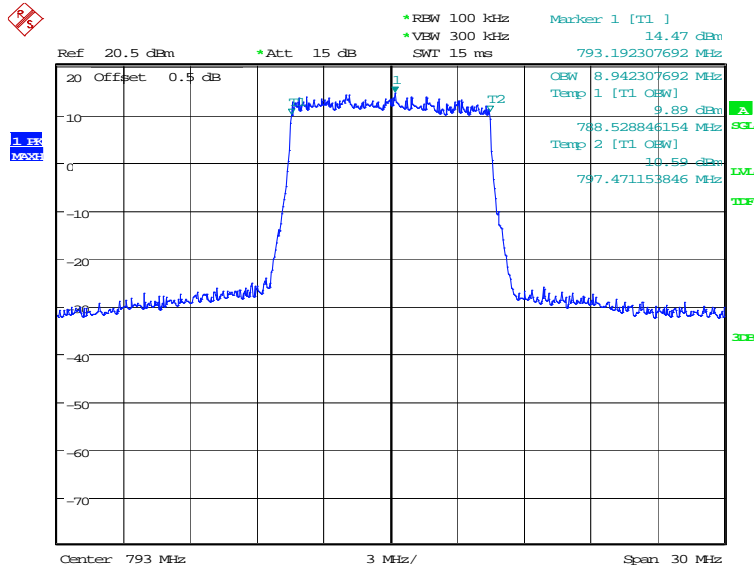
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
793.0	QPSK	16QAM
	8942.31	8942.31

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



Date: 27.APR.2021 17:41:14

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

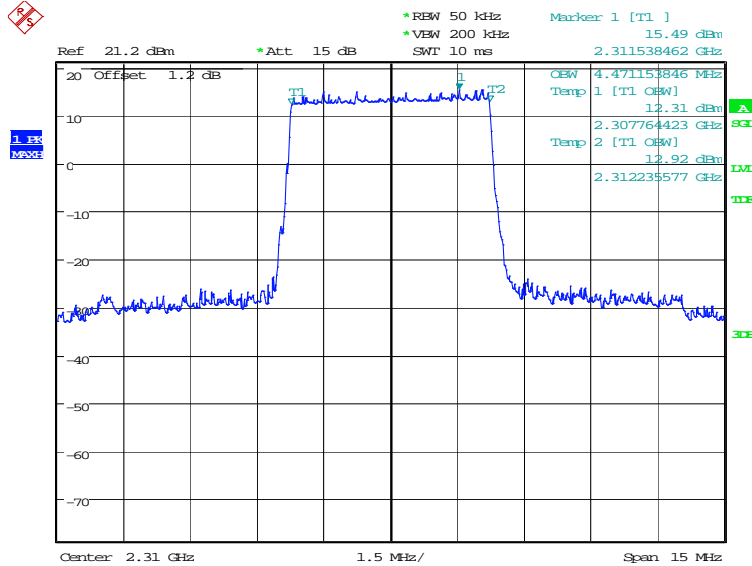


Date: 27.APR.2021 17:41:53

**LTE band 30, 5MHz (99%)**

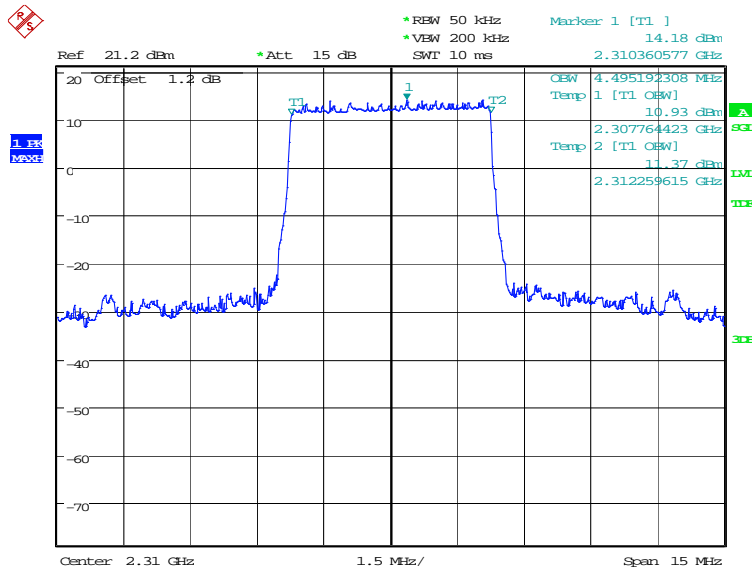
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
2310.0	QPSK	16QAM
	4471.15	4495.19

**LTE band 30, 5MHz Bandwidth, QPSK (99% BW)**



Date: 27.APR.2021 17:43:23

**LTE band 30, 5MHz Bandwidth, 16QAM (99% BW)**

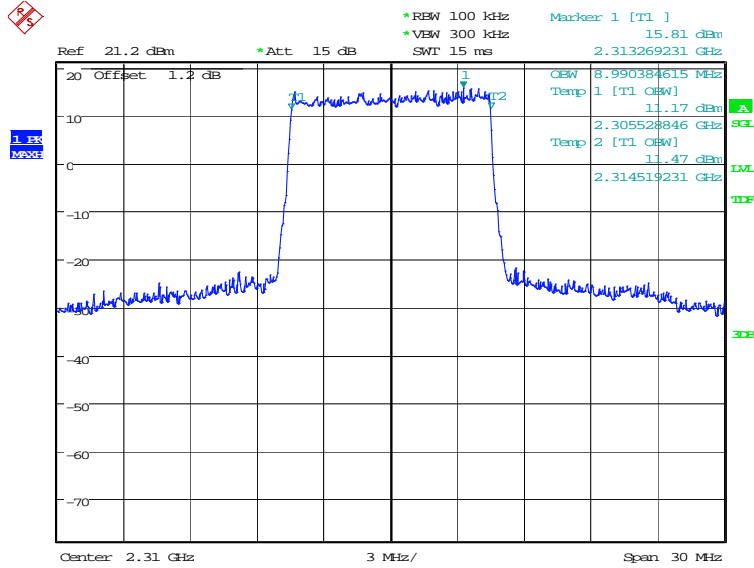


Date: 27.APR.2021 17:44:03

**LTE band 30, 10MHz (99%)**

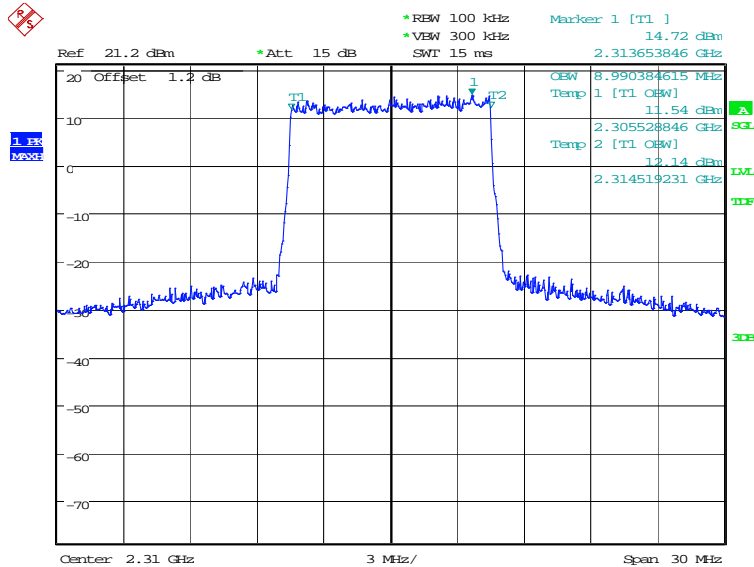
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
2310.0	QPSK	16QAM
	8990.38	8990.38

**LTE band 30, 10MHz Bandwidth, QPSK (99% BW)**



Date: 27.APR.2021 17:45:31

**LTE band 30, 10MHz Bandwidth, 16QAM (99% BW)**



Date: 27.APR.2021 17:46:11



## **A.5 Emission Bandwidth**

The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power. Table below lists the measured -26dBc BW. Spectrum analyzer plots are included on the following pages.

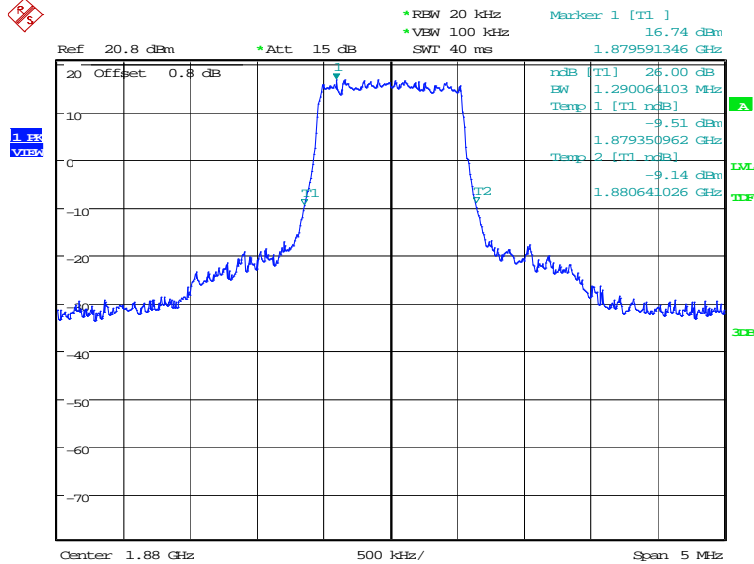
The measurement method is from ANSI C63.26:

- a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The span range for the spectrum analyzer shall be wide enough to see sufficient roll off of the signal to make the measurement.
- b) The nominal RBW shall be in the range of 1% to 5% of the anticipated OBW, and the VBW shall be set  $\geq 3 \times$  RBW.
- c) Set the reference level of the instrument as required to prevent the signal amplitude from exceeding the maximum spectrum analyzer input mixer level for linear operation.
- d) The dynamic range of the spectrum analyzer at the selected RBW shall be more than 10 dB below the target “-X dB” requirement, i.e., if the requirement calls for measuring the -26 dB OBW, the spectrum analyzer noise floor at the selected RBW shall be at least 36 dB below the reference level.
- e) Set spectrum analyzer detection mode to peak, and the trace mode to max hold.

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

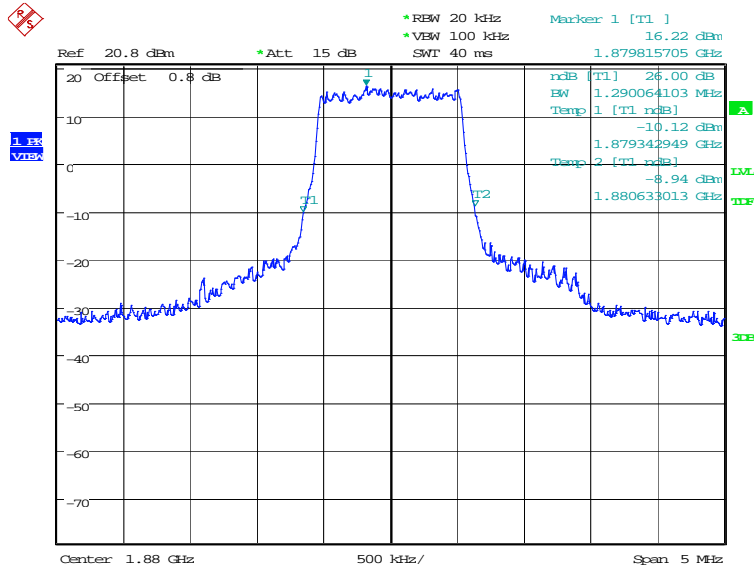
Frequency(MHz)	Emission Bandwidth (-26dBc)(kHz)	
1880.0	QPSK	16QAM
	1290.06	1290.06

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



Date: 27.APR.2021 17:47:27

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

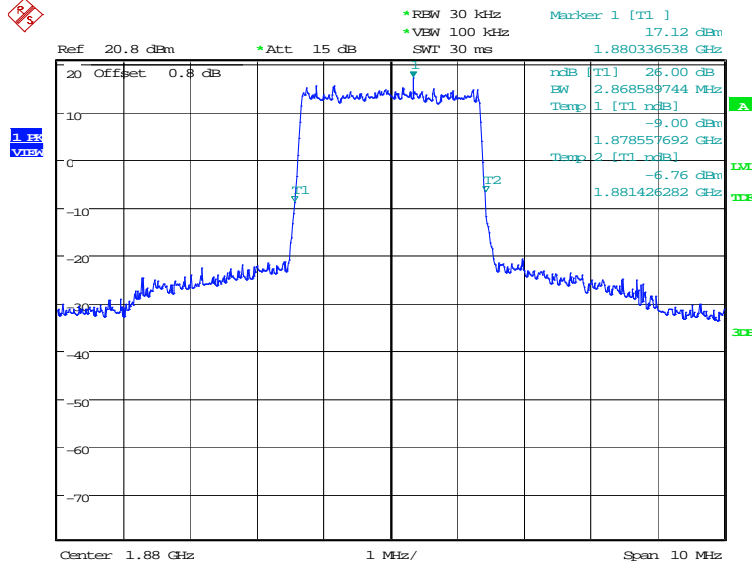


Date: 27.APR.2021 17:48:06

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

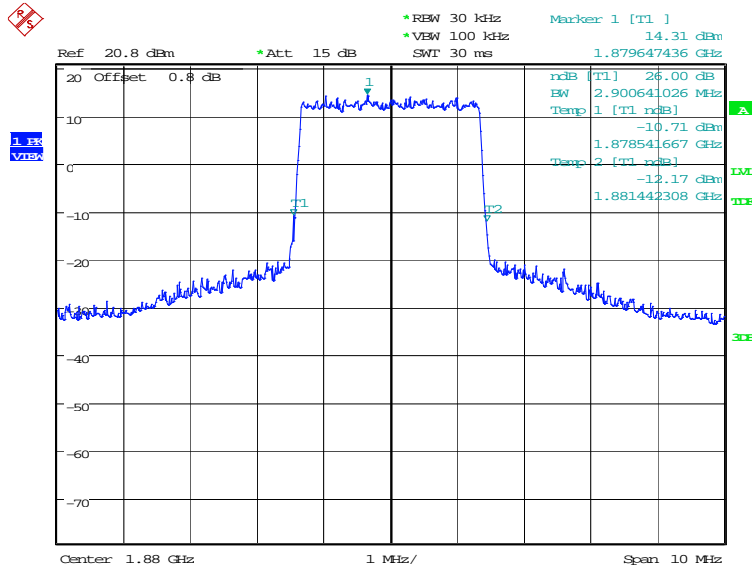
Frequency(MHz)	Emission Bandwidth (-26dBc)(kHz)	
	1880.0	QPSK
	2868.59	2900.64

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



Date: 27.APR.2021 17:49:35

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

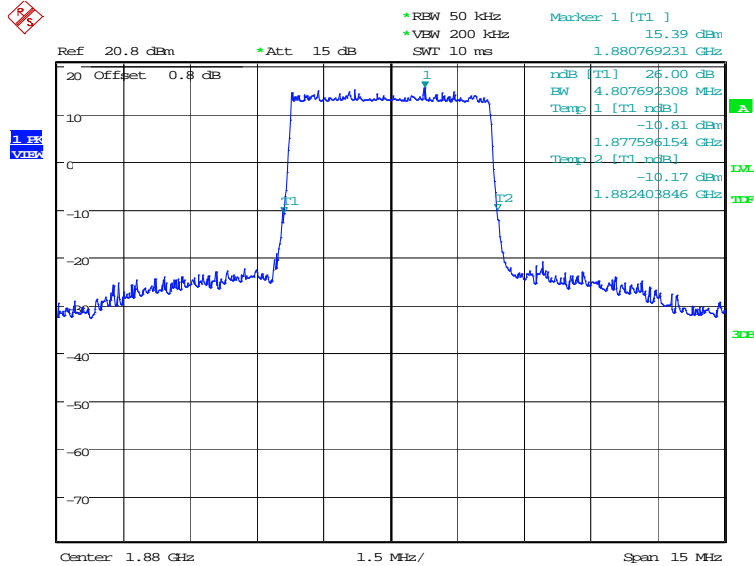


Date: 27.APR.2021 17:50:15

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

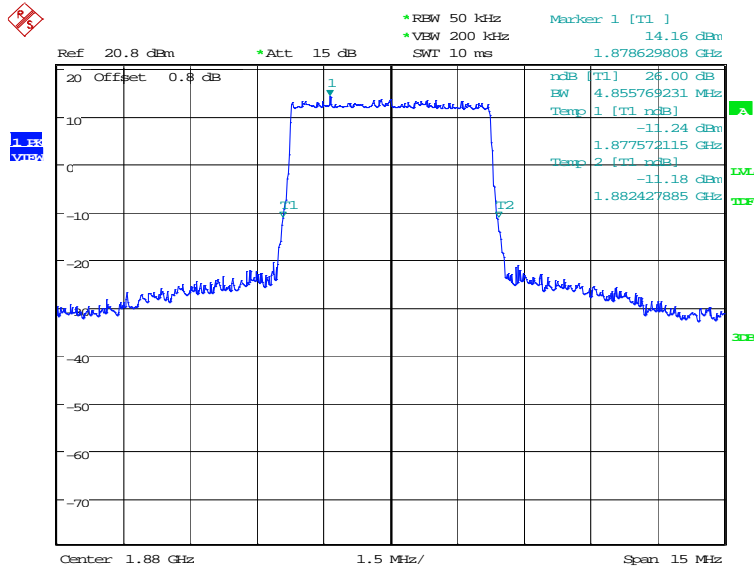
Frequency(MHz)	Emission Bandwidth (-26dBc)(kHz)	
1880.0	QPSK	16QAM
	4807.69	4855.77

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



Date: 27.APR.2021 17:51:44

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

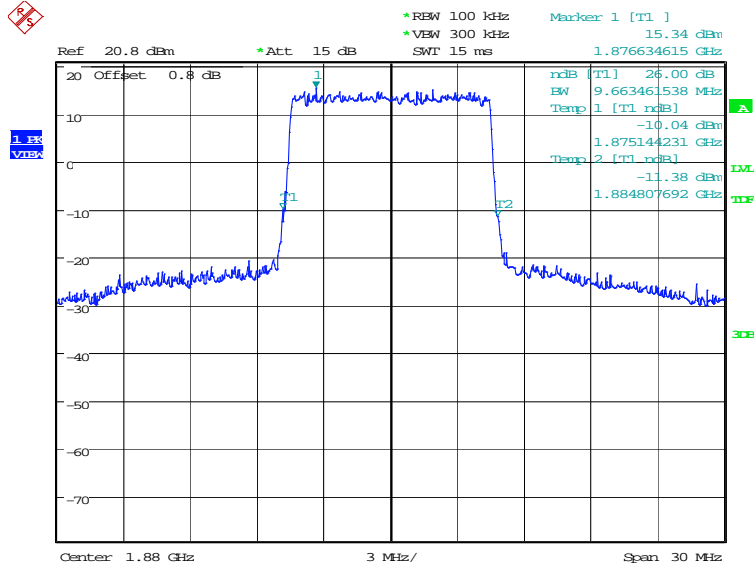


Date: 27.APR.2021 17:52:24

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

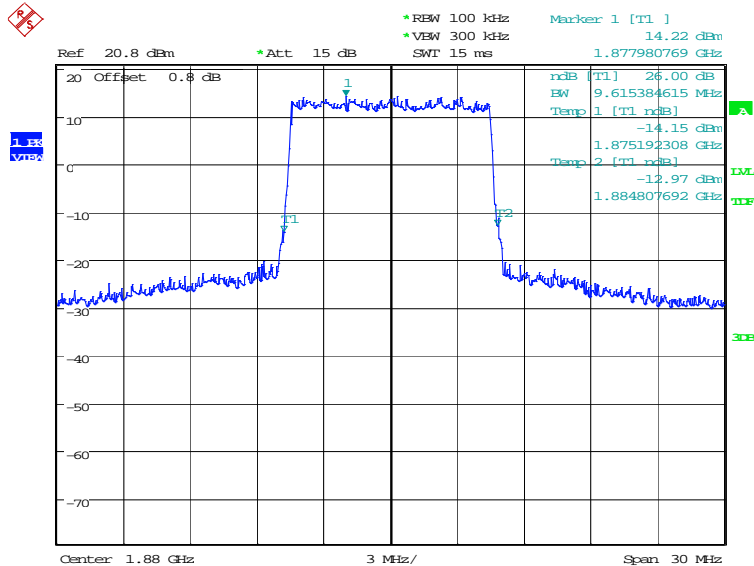
Frequency(MHz)	Emission Bandwidth (-26dBc)(kHz)	
1880.0	QPSK	16QAM
	9663.46	9615.38

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



Date: 27.APR.2021 17:53:53

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

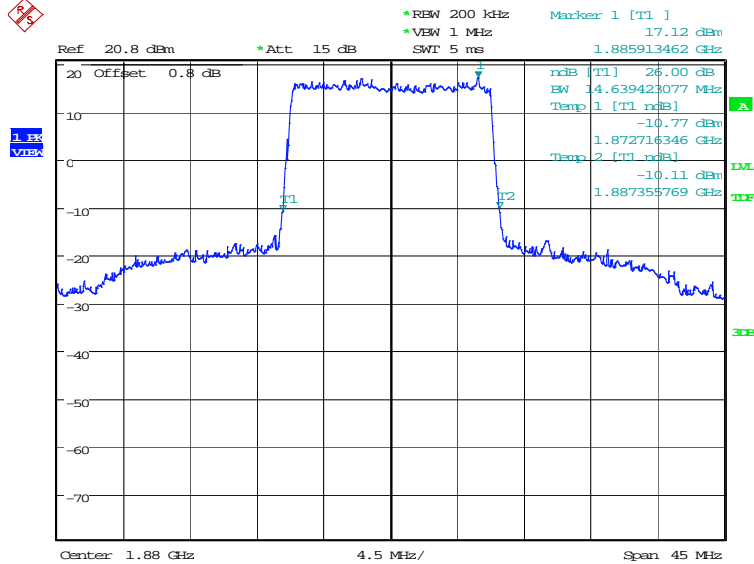


Date: 27.APR.2021 17:54:33

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

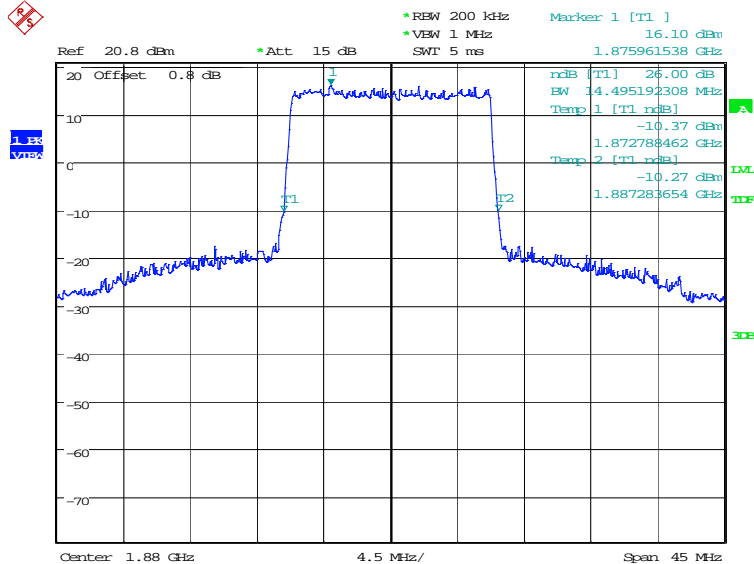
Frequency(MHz)	Emission Bandwidth (-26dBc)(kHz)	
1880.0	QPSK	16QAM
	14639.42	14495.19

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



Date: 27.APR.2021 17:56:02

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

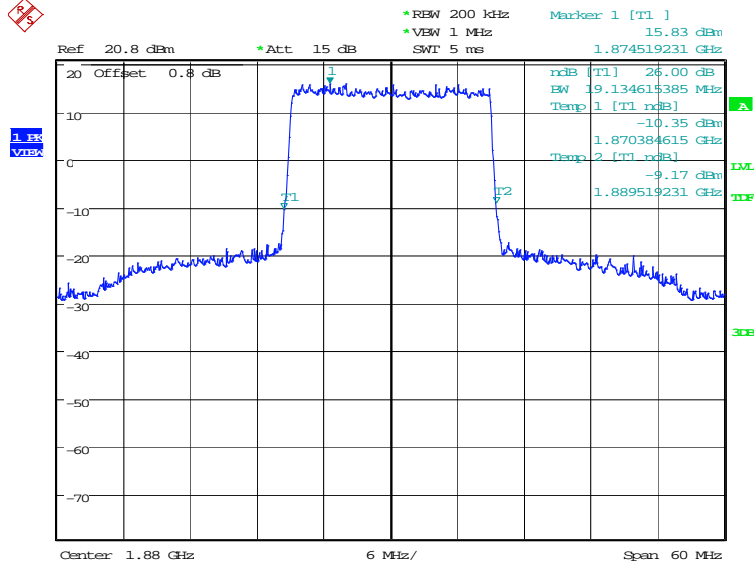


Date: 27.APR.2021 17:56:42

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

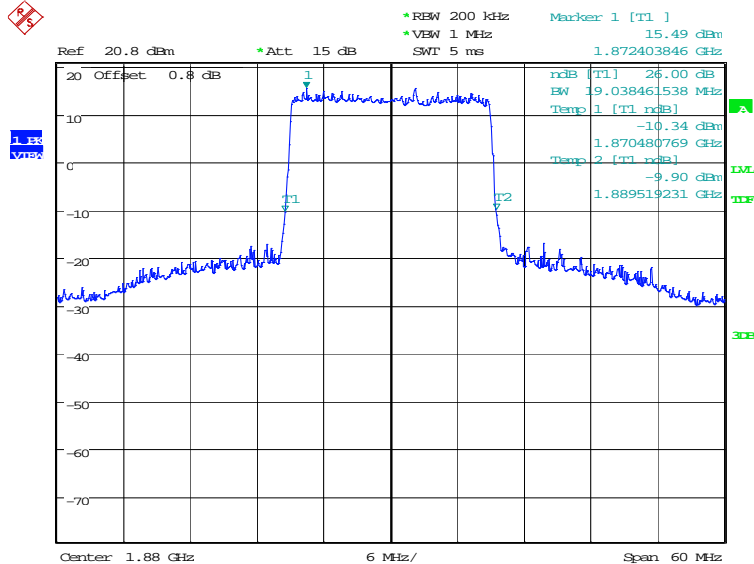
Frequency(MHz)	Emission Bandwidth (-26dBc)(kHz)	
1880.0	QPSK	16QAM
	19134.62	19038.46

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



Date: 27.APR.2021 17:58:11

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

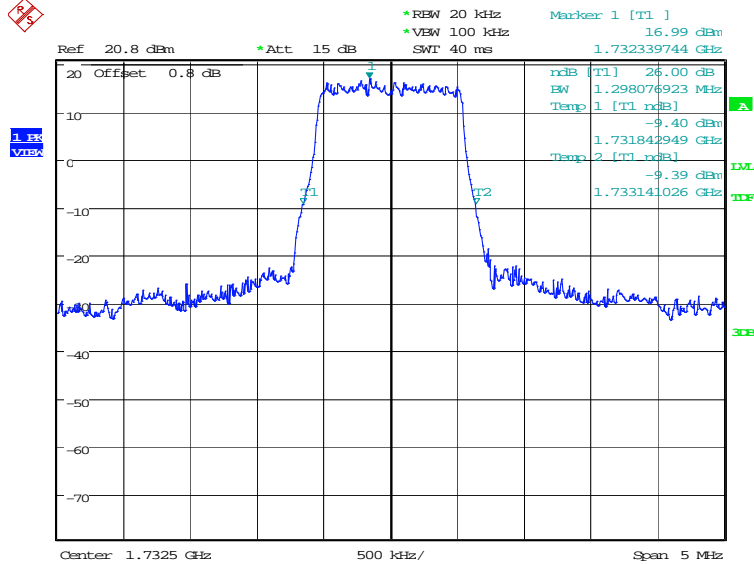


Date: 27.APR.2021 17:58:51

**LTE band 4, 1.4MHz (-26dBc)**

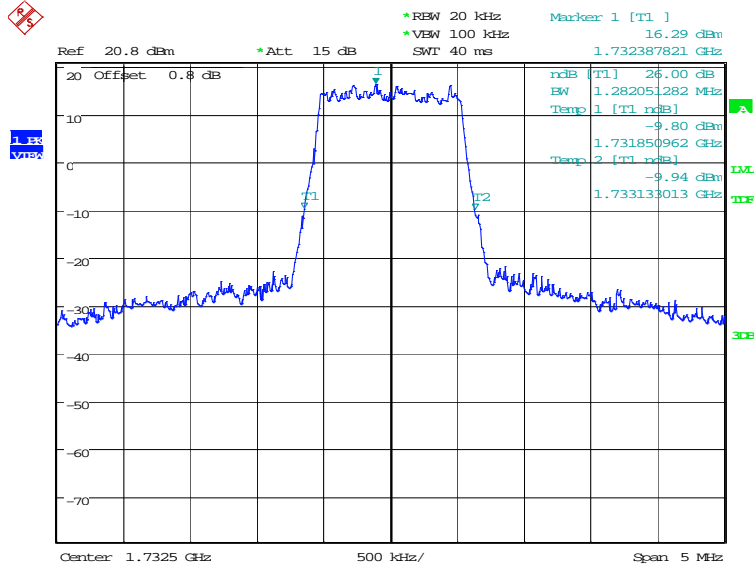
Frequency(MHz)	Emission Bandwidth (-26dBc)(kHz)	
1732.5	QPSK	16QAM
	1298.08	1282.05

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



Date: 27.APR.2021 18:00:21

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



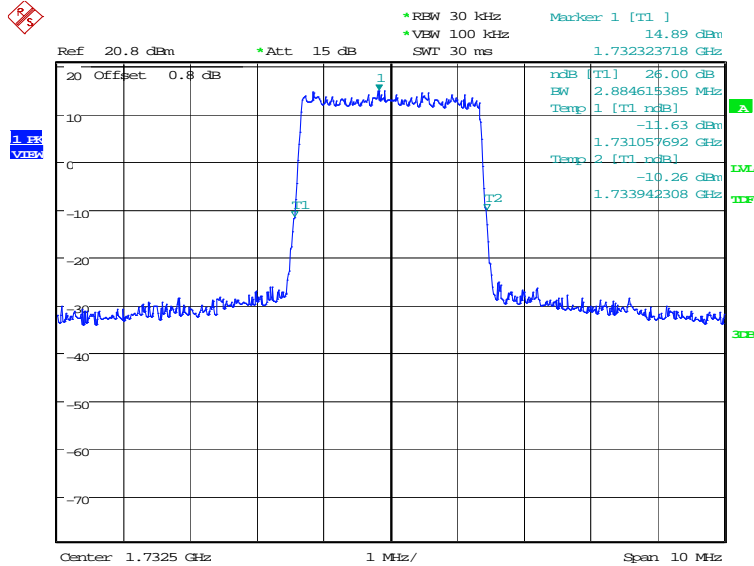
Date: 27.APR.2021 18:01:01



### LTE band 4, 3MHz (-26dBc)

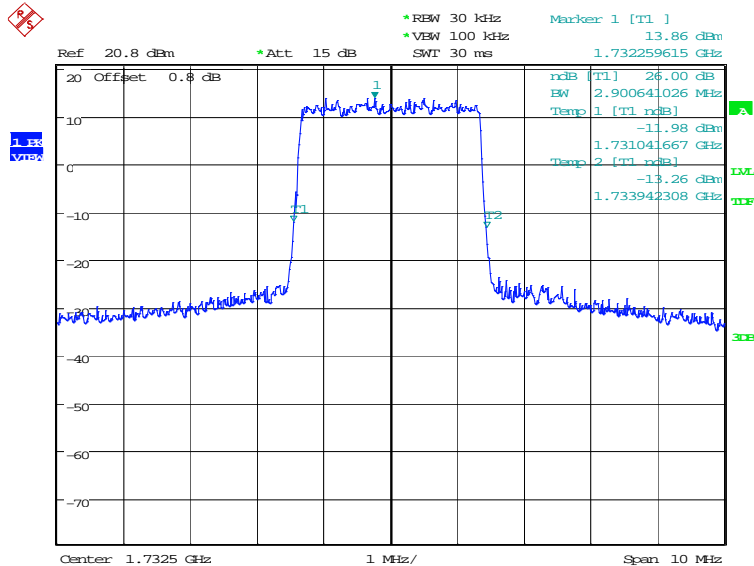
Frequency(MHz)	Emission Bandwidth (-26dBc)(kHz)	
1732.5	QPSK	16QAM
	2884.62	2900.64

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



Date: 27.APR.2021 18:02:30

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

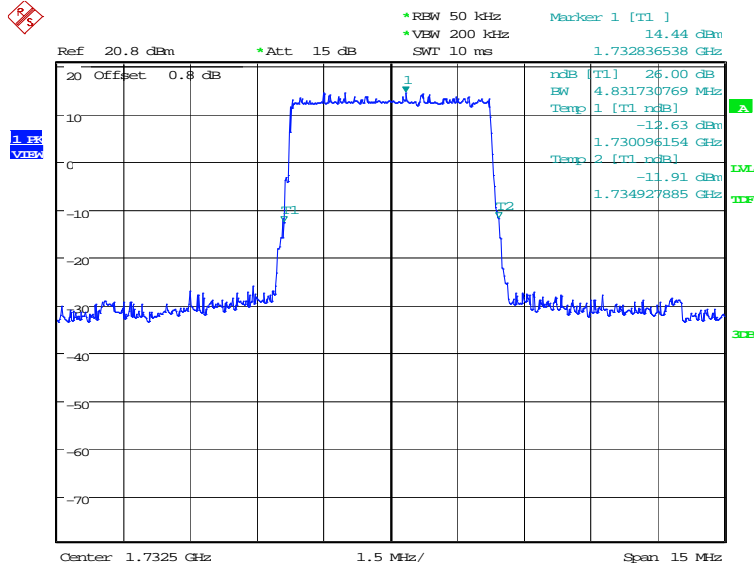


Date: 27.APR.2021 18:03:10

**LTE band 4, 5MHz (-26dBc)**

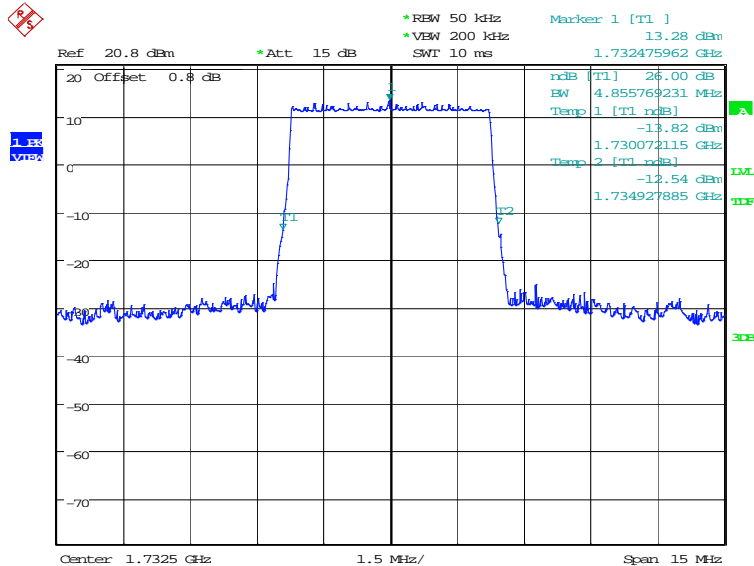
Frequency(MHz)	Emission Bandwidth (-26dBc)(kHz)	
1732.5	QPSK	16QAM
	4831.73	4855.77

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



Date: 27.APR.2021 18:04:39

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

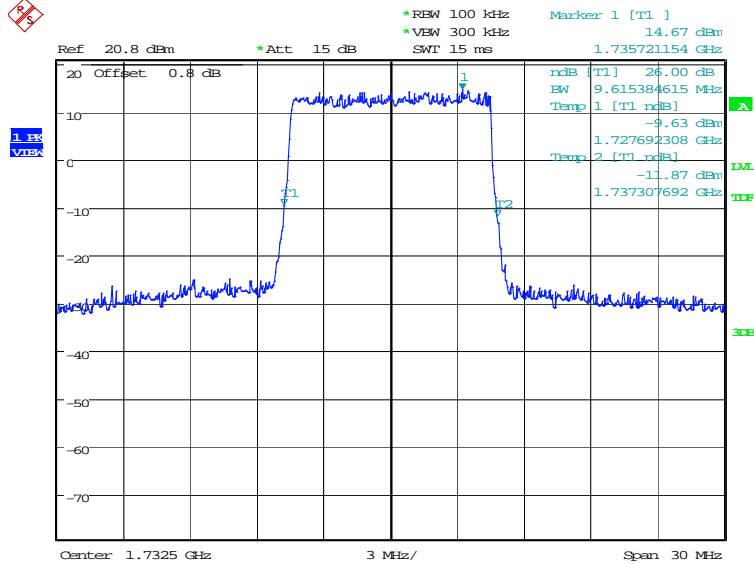


Date: 27.APR.2021 18:05:19

**LTE band 4, 10MHz (-26dBc)**

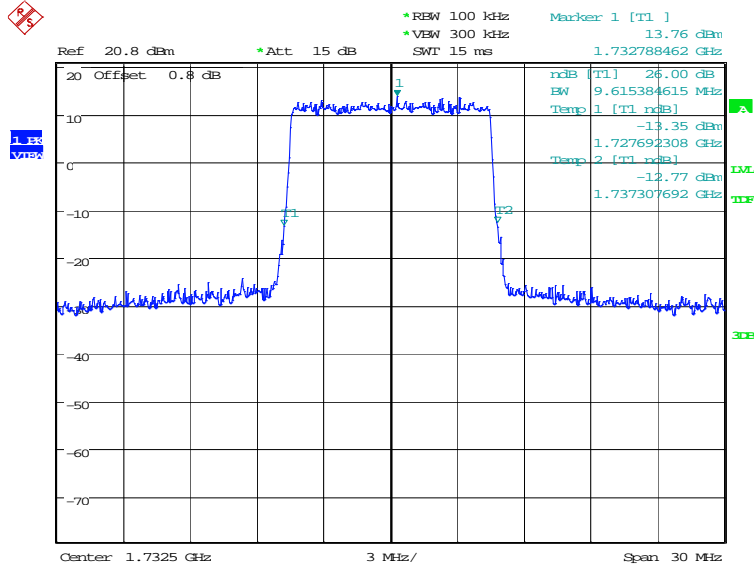
Frequency(MHz)	Emission Bandwidth (-26dBc)(kHz)	
1732.5	QPSK	16QAM
	9615.38	9615.38

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



Date: 27.APR.2021 18:06:48

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

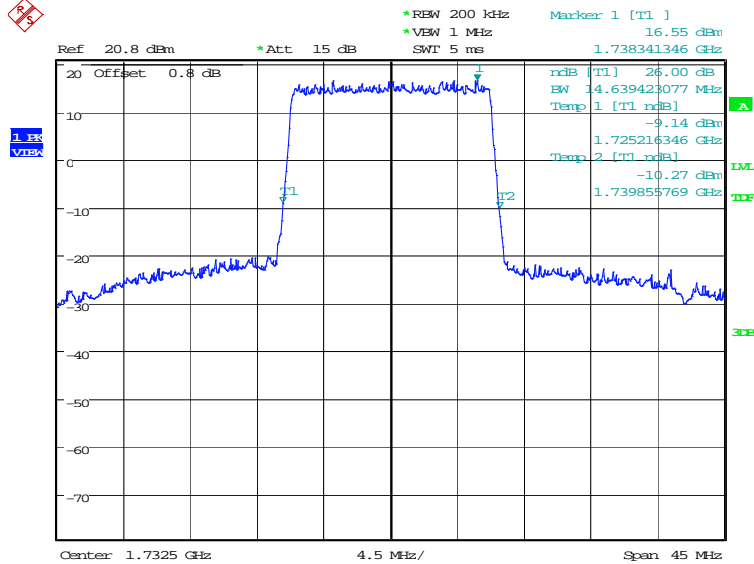


Date: 27.APR.2021 18:07:28

**LTE band 4, 15MHz (-26dBc)**

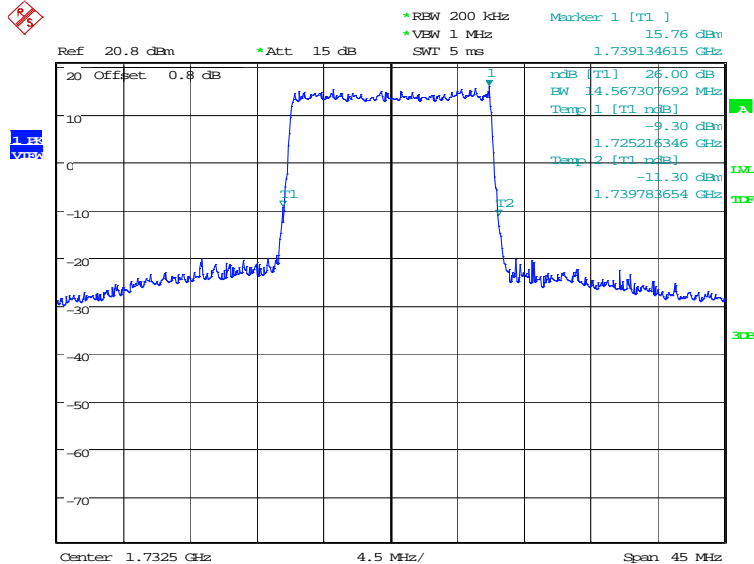
Frequency(MHz)	Emission Bandwidth (-26dBc)(kHz)	
1732.5	QPSK	16QAM
	14639.42	14567.31

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



Date: 27.APR.2021 18:08:57

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

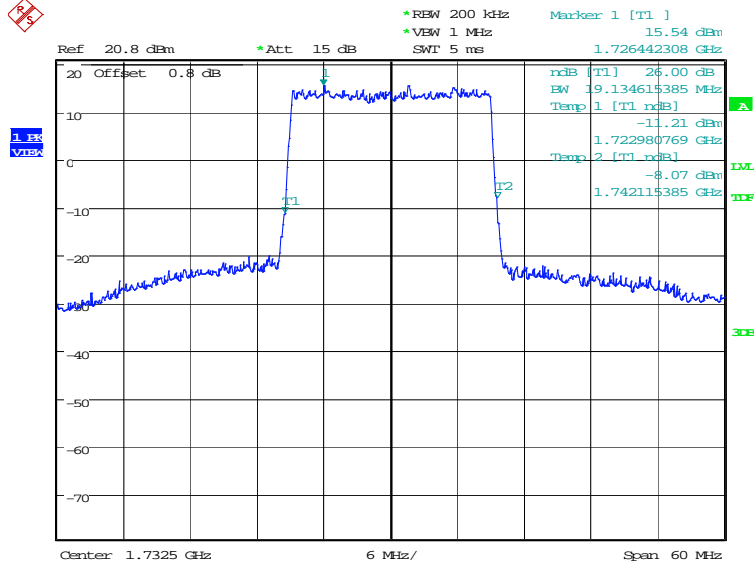


Date: 27.APR.2021 18:09:37

**LTE band 4, 20MHz (-26dBc)**

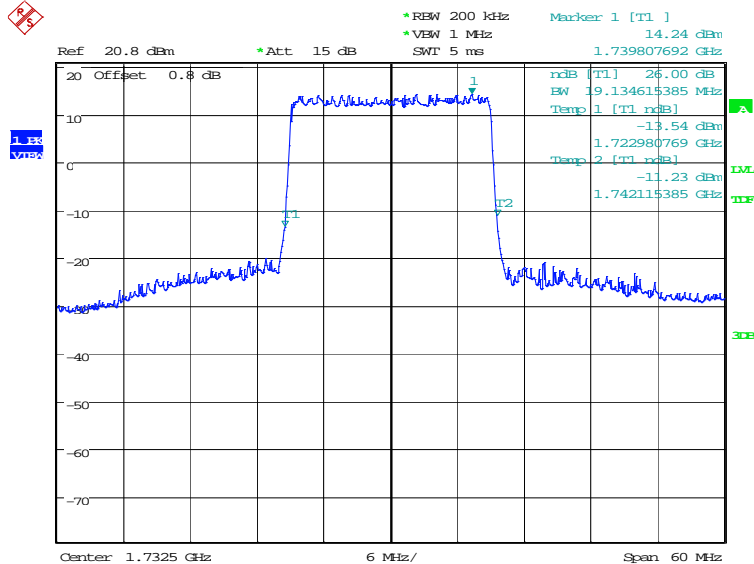
Frequency(MHz)	Emission Bandwidth (-26dBc)(kHz)	
	1732.5	QPSK
	19134.62	19134.62

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



Date: 27.APR.2021 18:11:06

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

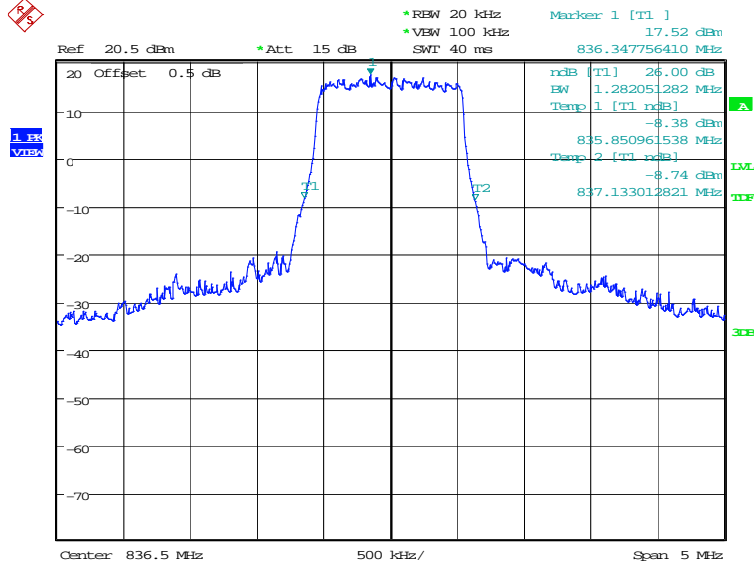


Date: 27.APR.2021 18:11:46

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

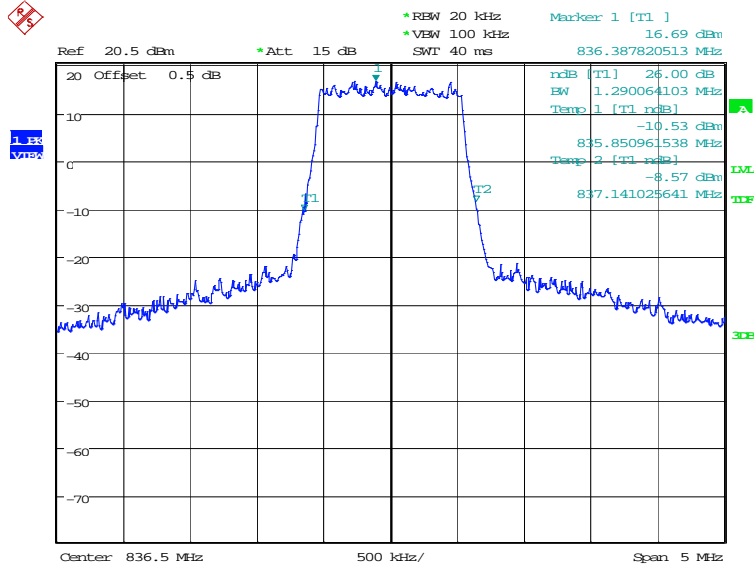
Frequency(MHz)	Emission Bandwidth (-26dBc)(kHz)	
	836.5	QPSK
	1282.05	1290.06

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



Date: 27.APR.2021 18:13:17

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

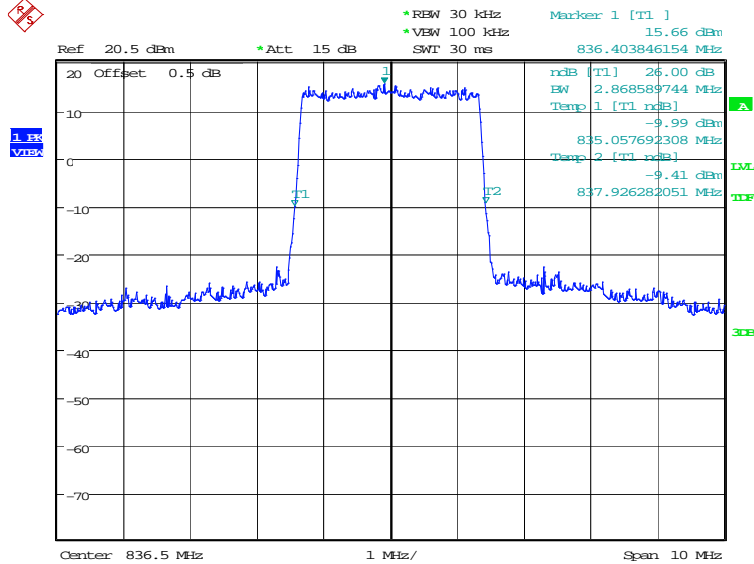


Date: 27.APR.2021 18:13:56

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

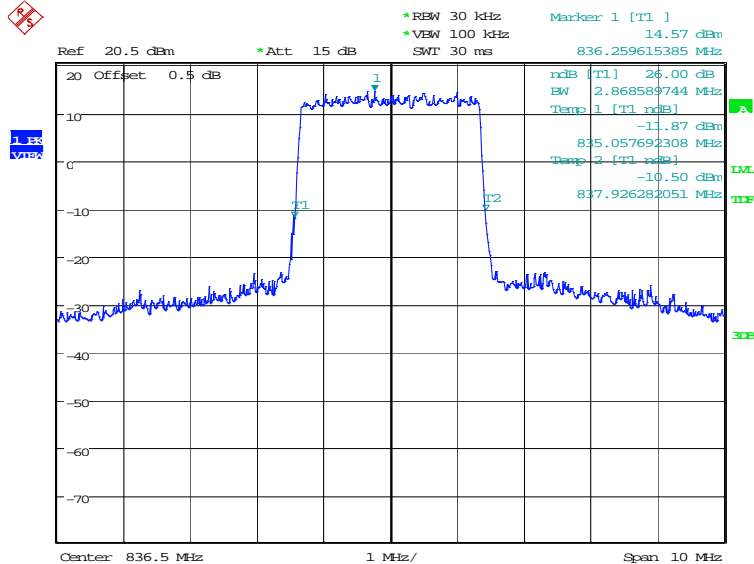
Frequency(MHz)	Emission Bandwidth (-26dBc)(kHz)	
836.5	QPSK	16QAM
	2868.59	2868.59

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



Date: 27.APR.2021 18:15:26

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

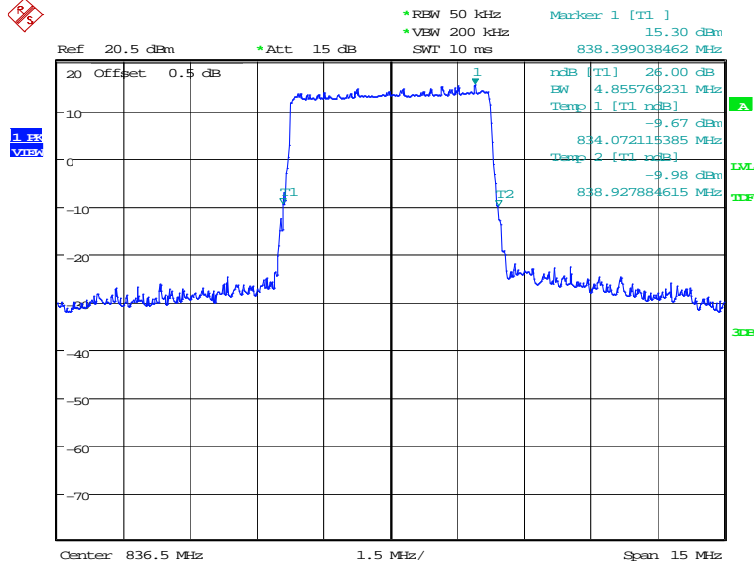


Date: 27.APR.2021 18:16:06

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

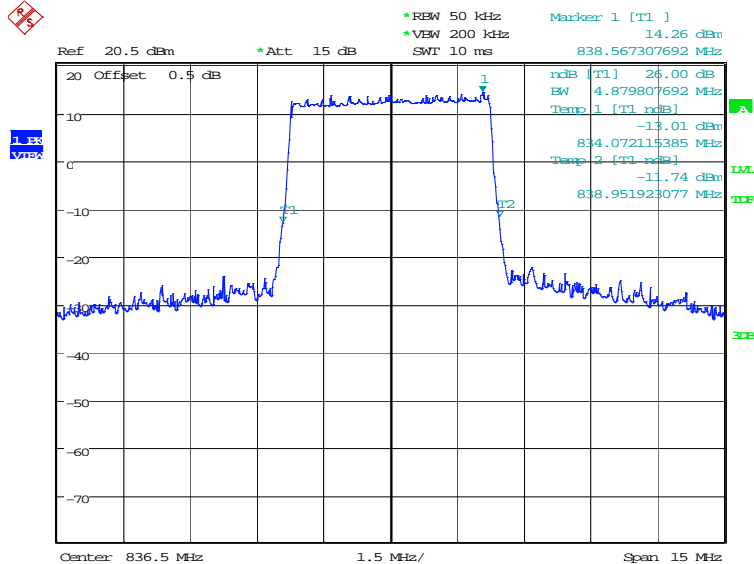
Frequency(MHz)	Emission Bandwidth (-26dBc)(kHz)	
836.5	QPSK	16QAM
	4855.77	4879.81

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



Date: 27.APR.2021 18:17:35

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



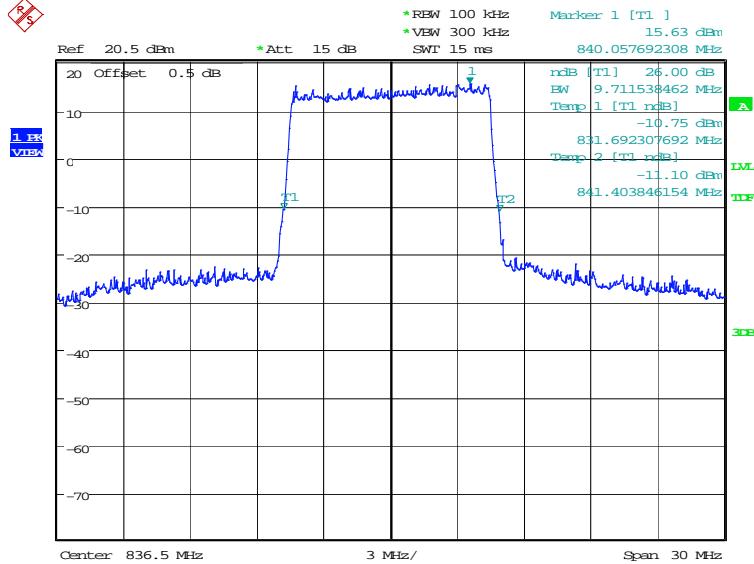
Date: 27.APR.2021 18:18:15



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

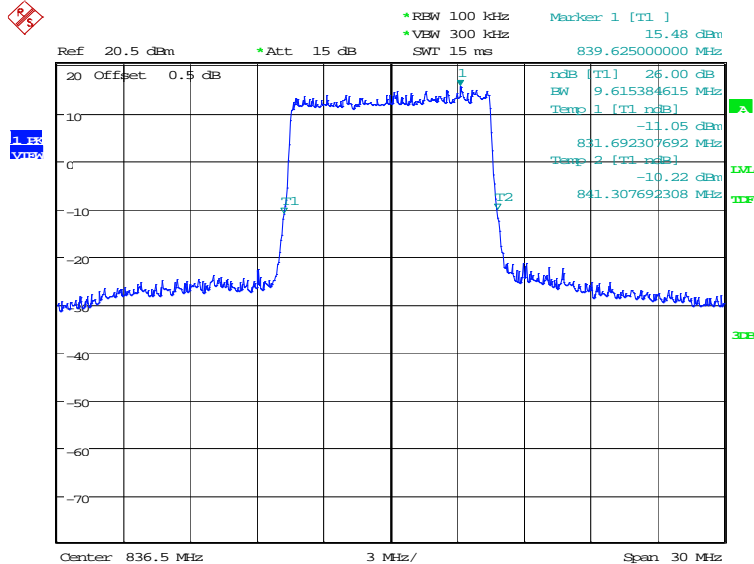
Frequency(MHz)	Emission Bandwidth (-26dBc)(kHz)	
836.5	QPSK	16QAM
	9711.54	9615.38

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



Date: 27.APR.2021 18:19:44

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

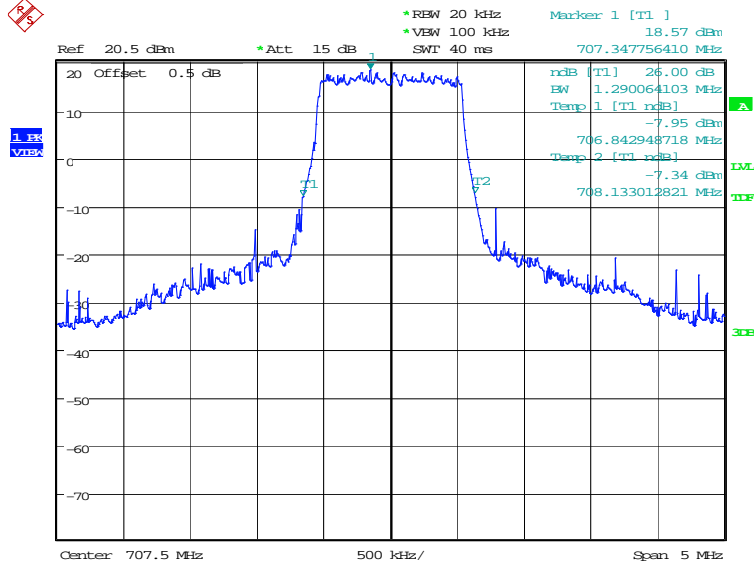


Date: 27.APR.2021 18:20:24

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

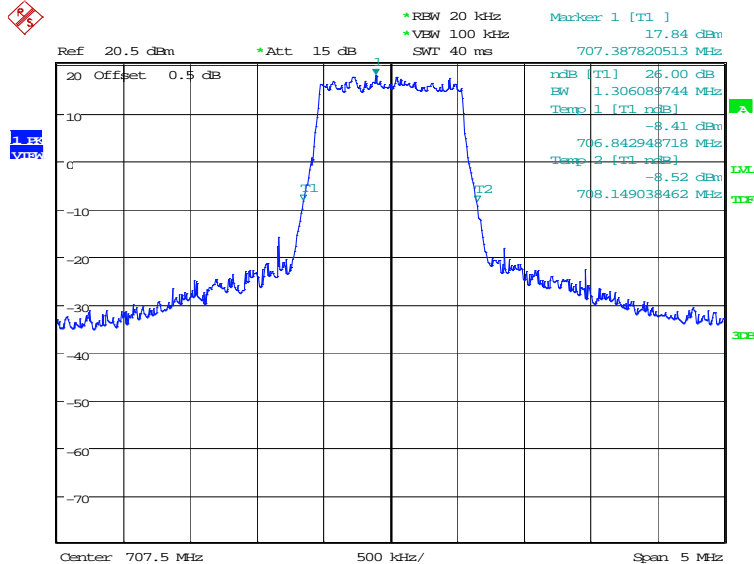
Frequency(MHz)	Emission Bandwidth (-26dBc)(kHz)	
707.5	QPSK	16QAM
	1290.06	1306.09

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



Date: 27.APR.2021 18:21:53

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

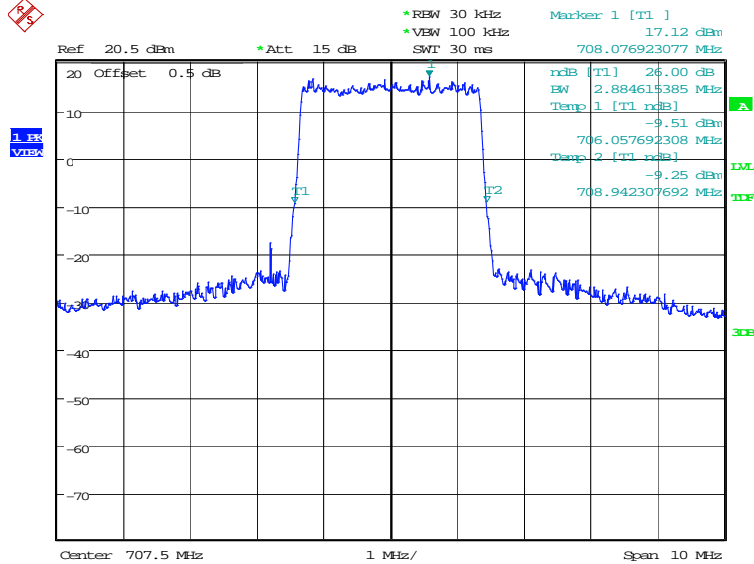


Date: 27.APR.2021 18:22:33

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

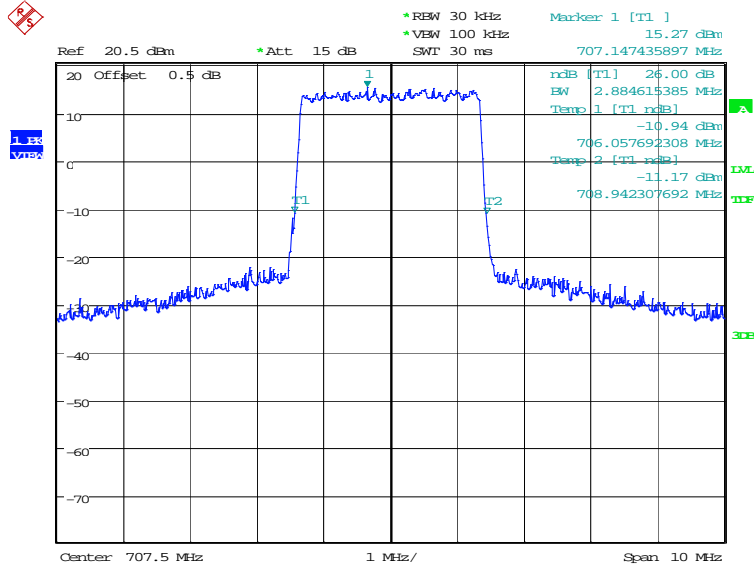
Frequency(MHz)	Emission Bandwidth (-26dBc)(kHz)	
707.5	QPSK	16QAM
	2884.62	2884.62

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



Date: 27.APR.2021 18:24:02

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

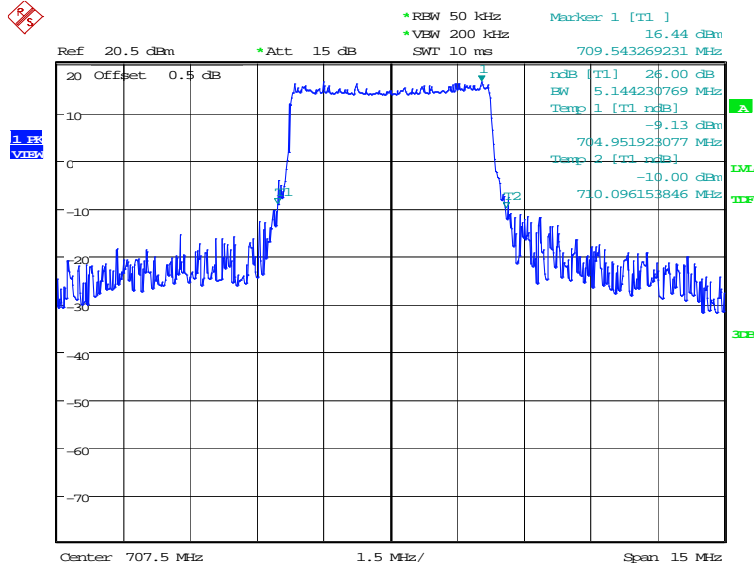


Date: 27.APR.2021 18:24:41

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

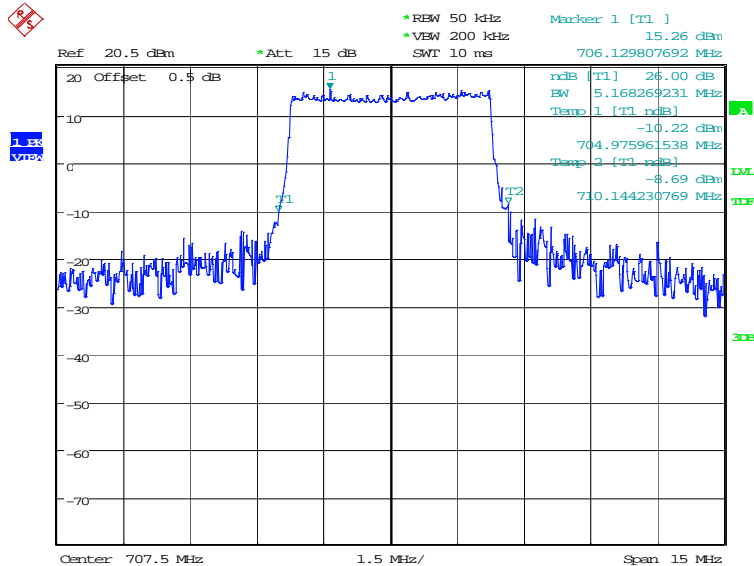
Frequency(MHz)	Emission Bandwidth (-26dBc)(kHz)	
707.5	QPSK	16QAM
	5144.23	5168.27

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



Date: 27.APR.2021 18:26:10

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

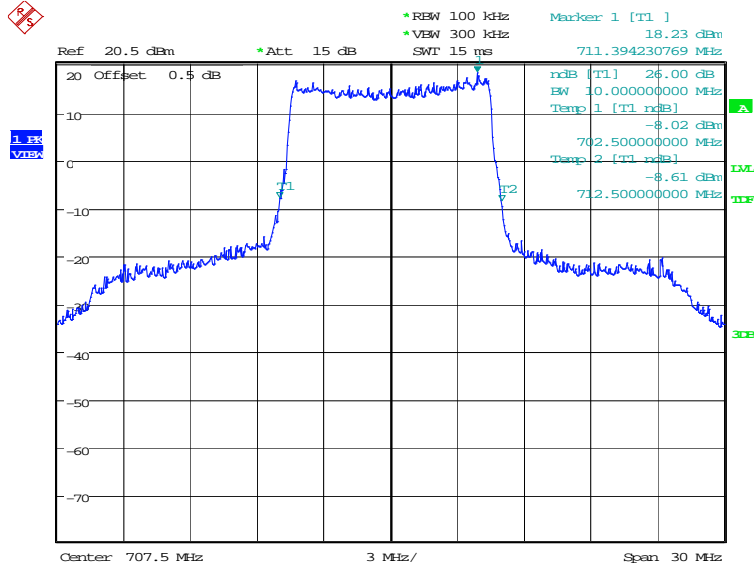


Date: 27.APR.2021 18:26:49

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

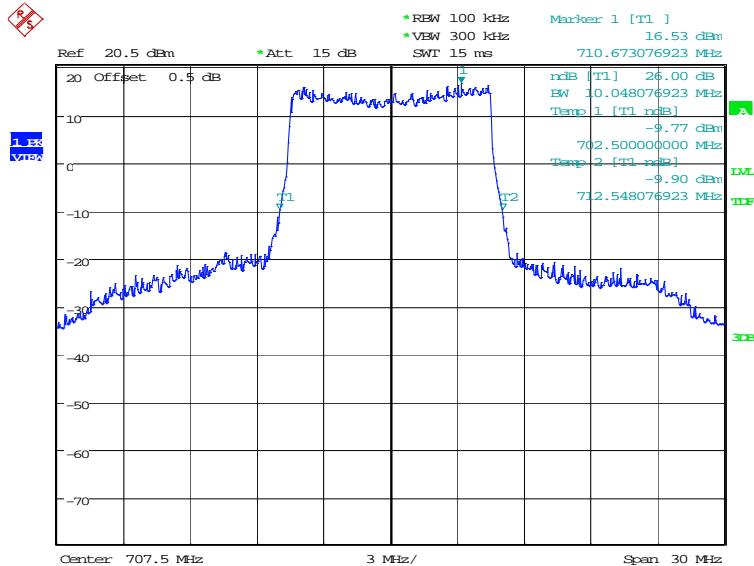
Frequency(MHz)	Emission Bandwidth (-26dBc)(kHz)	
707.5	QPSK	16QAM
	10000.00	10048.08

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



Date: 27.APR.2021 18:28:18

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

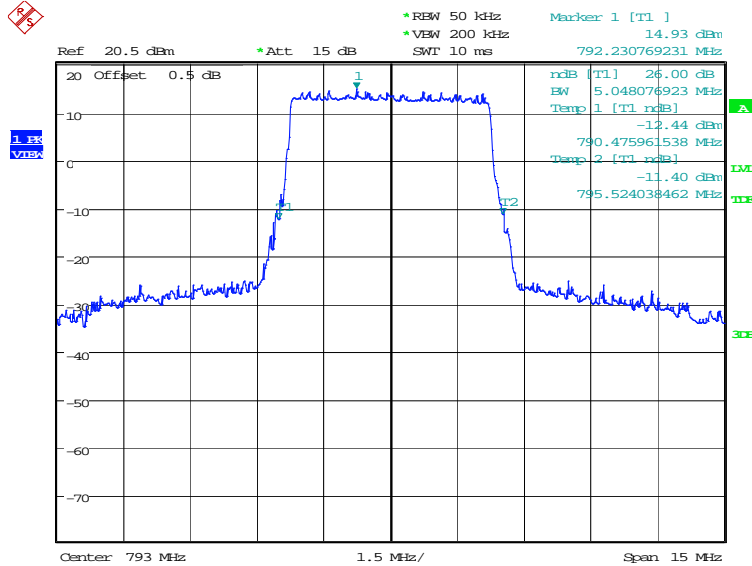


Date: 27.APR.2021 18:28:58

### LTE band 14, 5MHz (-26dBc)

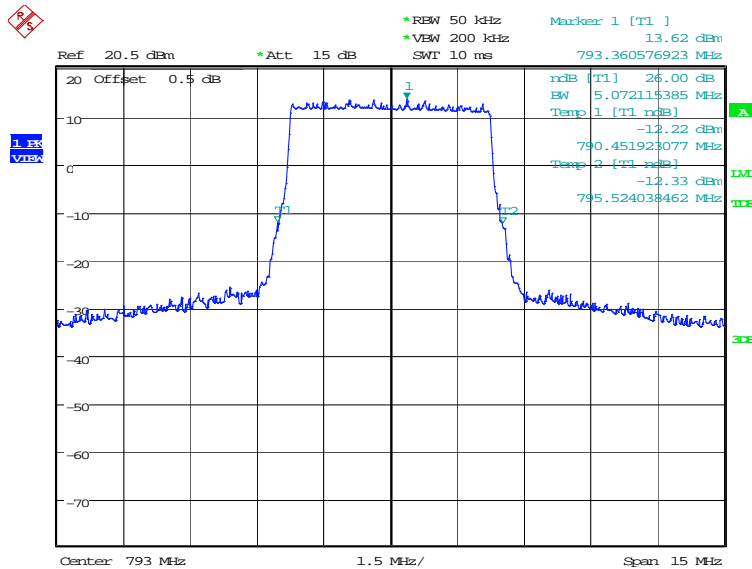
Frequency(MHz)	Emission Bandwidth (-26dBc)(kHz)	
793.0	QPSK	16QAM
	5048.08	5072.12

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



Date: 27.APR.2021 18:30:28

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

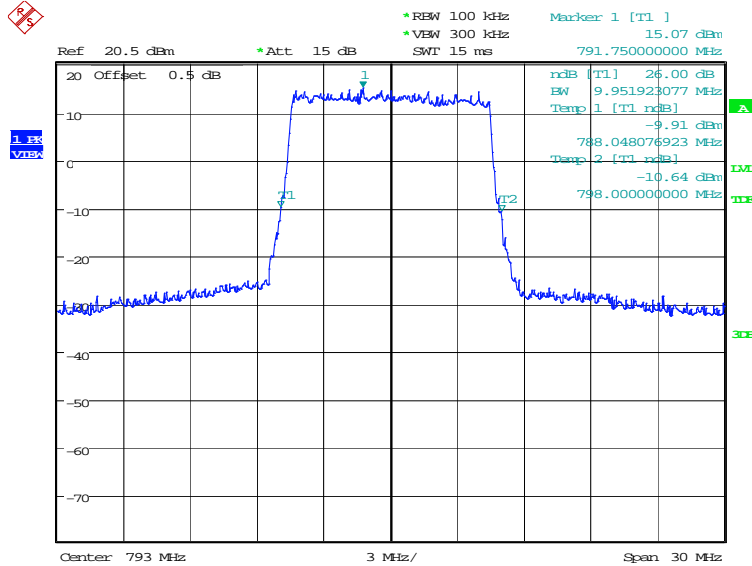


Date: 27.APR.2021 18:31:08

**LTE band 14, 10MHz (-26dBc)**

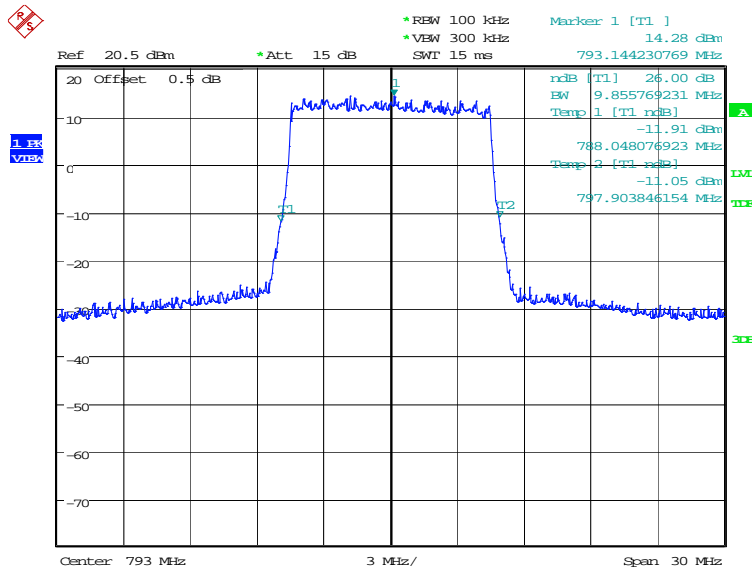
Frequency(MHz)	Emission Bandwidth (-26dBc)(kHz)	
793.0	QPSK	16QAM
	9951.92	9855.77

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



Date: 27.APR.2021 18:32:36

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

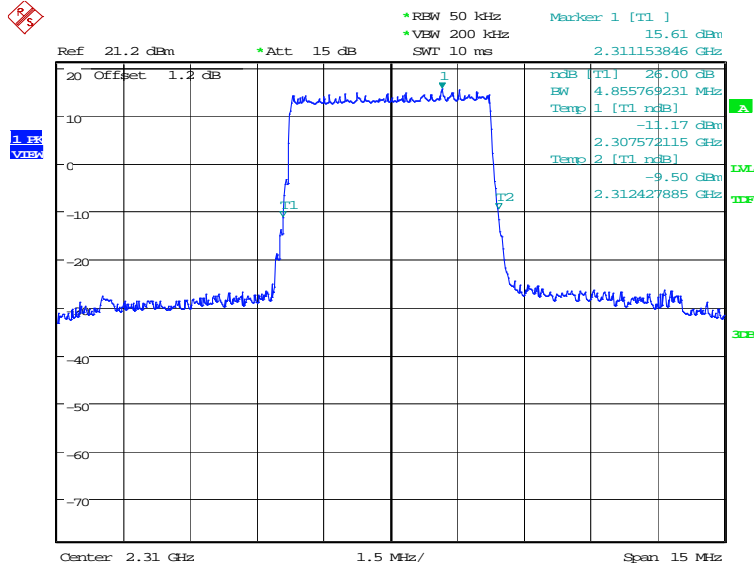


Date: 27.APR.2021 18:33:16

**LTE band 30, 5MHz (-26dBc)**

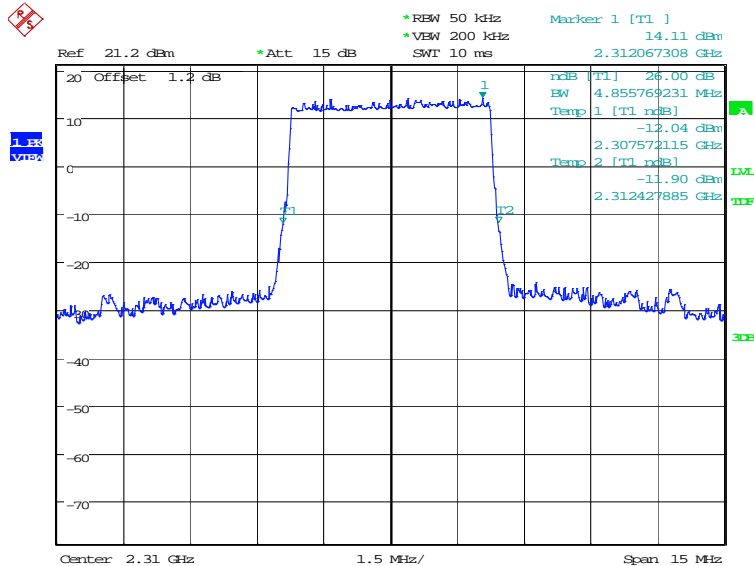
Frequency(MHz)	Emission Bandwidth (-26dBc)(kHz)	
2310.0	QPSK	16QAM
	4855.77	4855.77

**LTE band 30, 5MHz Bandwidth, QPSK (-26dBc BW)**



Date: 27.APR.2021 18:34:46

**LTE band 30, 5MHz Bandwidth, 16QAM (-26dBc BW)**



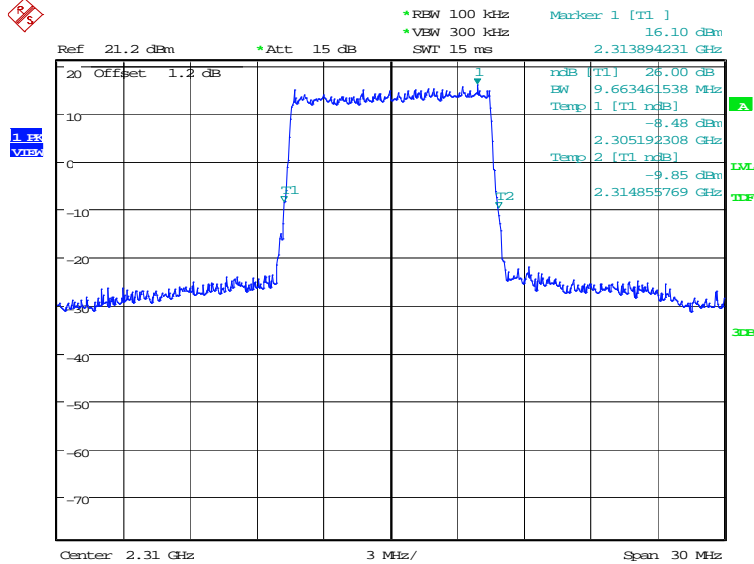
Date: 27.APR.2021 18:35:25



### LTE band 30, 10MHz (-26dBc)

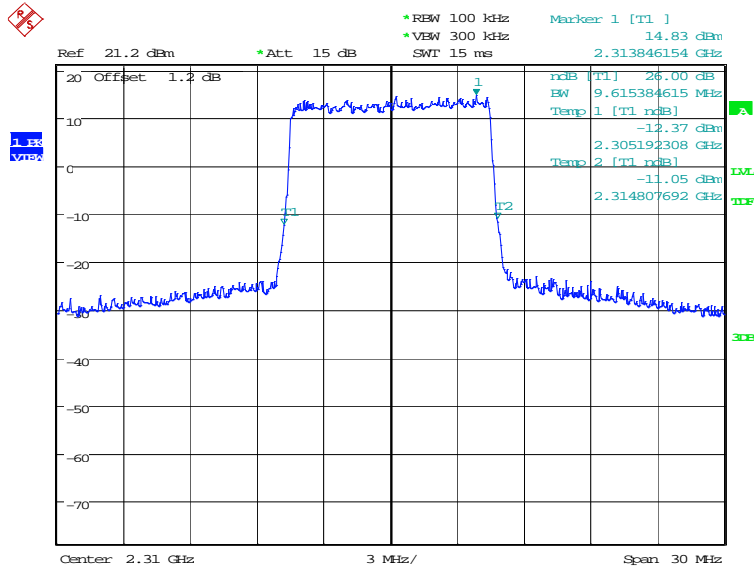
Frequency(MHz)	Emission Bandwidth (-26dBc)(kHz)	
2310.0	QPSK	16QAM
	9663.46	9615.38

### LTE band 30, 10MHz Bandwidth, QPSK (-26dBc BW)



Date: 27.APR.2021 18:36:54

### LTE band 30, 10MHz Bandwidth, 16QAM (-26dBc BW)



Date: 27.APR.2021 18:37:34

## **A.6 Band Edge Compliance**

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

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

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.

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

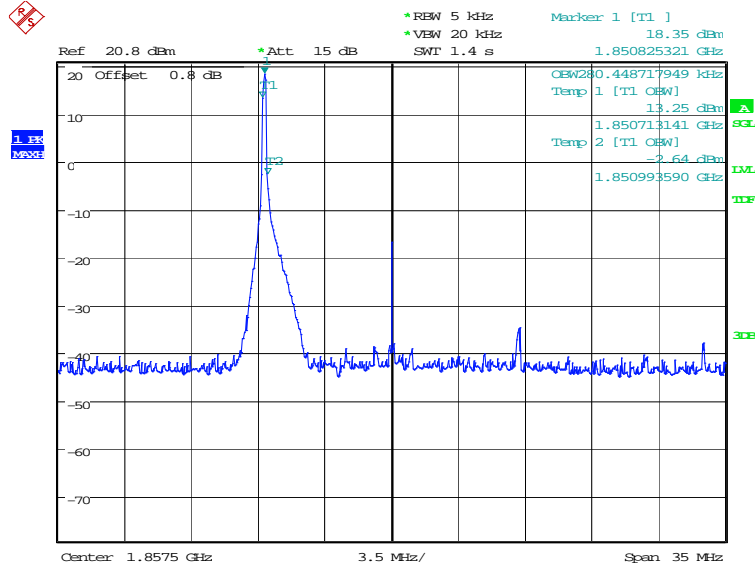
Part 90.543 states that for operations in the 758–768 MHz and the 788–798 MHz bands, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the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

### A.6.2 Measurement result

Only the worst case result is given below

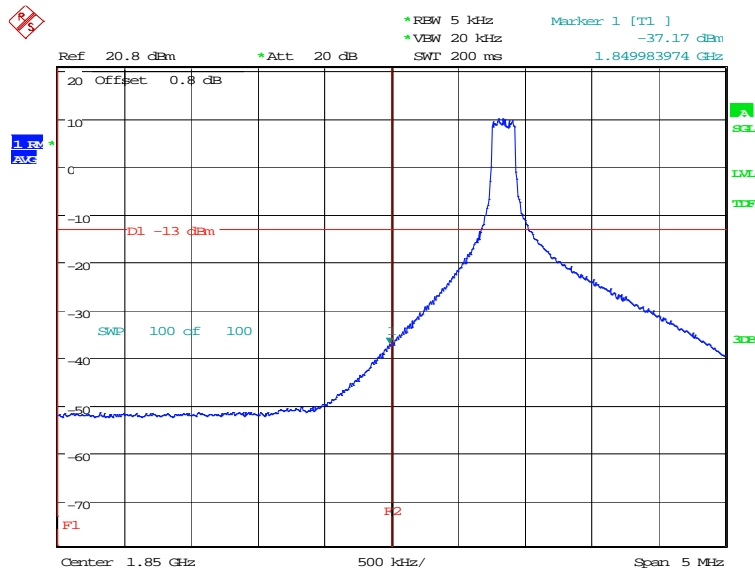
LTE band 2

OBW: 1RB-low\_offset



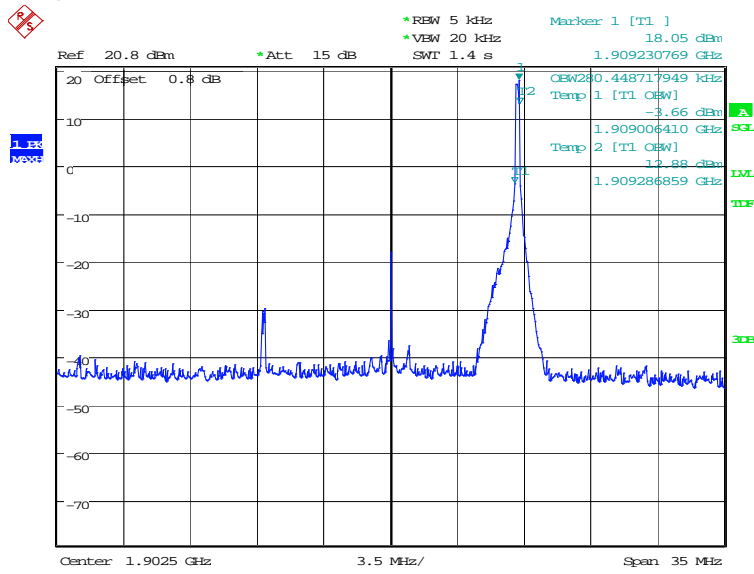
Date: 26.MAY.2021 14:14:06

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



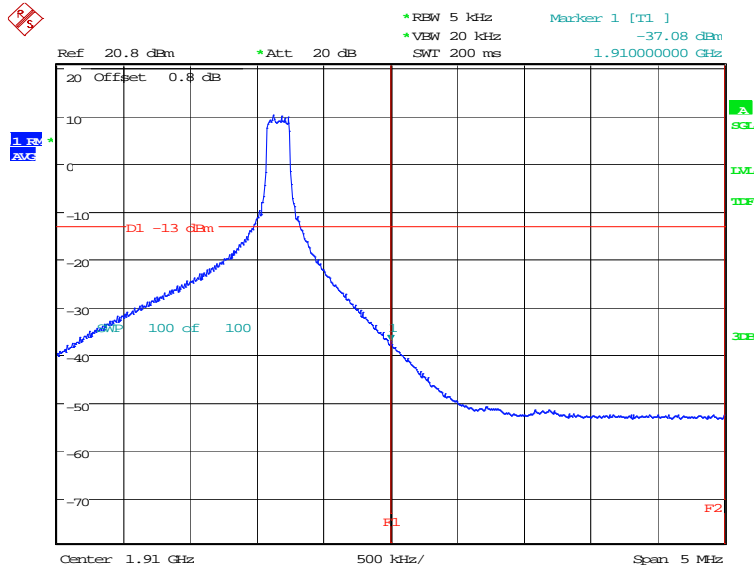
Date: 26.MAY.2021 14:15:20

### OBW: 1RB-high\_offset



Date: 26.MAY.2021 14:15:55

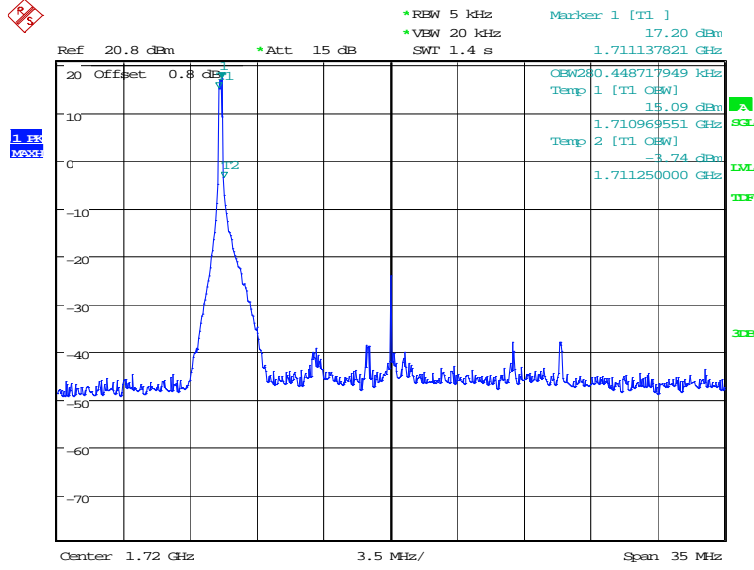
### HIGH BAND EDGE BLOCK-1RB-high\_offset



Date: 26.MAY.2021 14:17:09

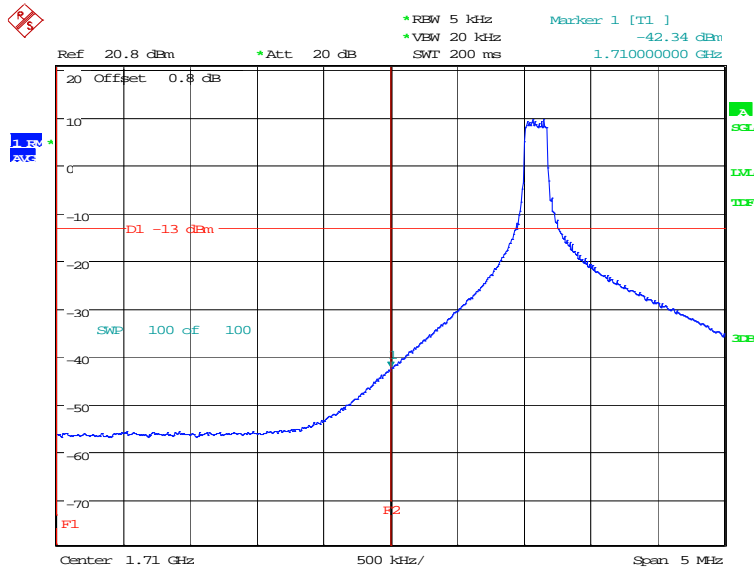


**LTE band 4**  
**OBW: 1RB-low\_offset**



Date: 26.MAY.2021 14:17:52

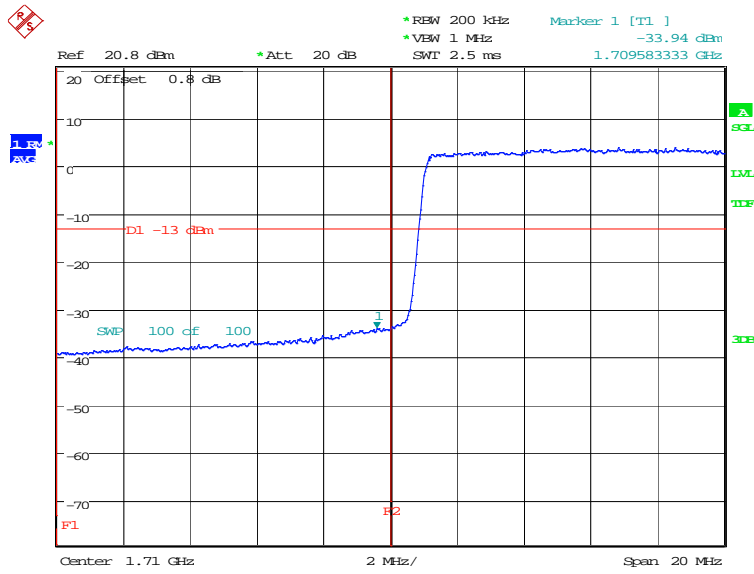
**LOW BAND EDGE BLOCK-1RB-low\_offset**



Date: 26.MAY.2021 14:19:06

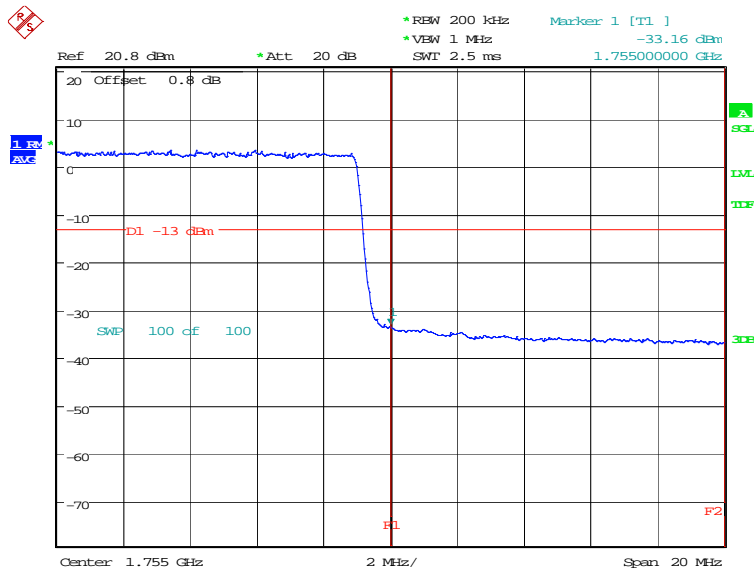


### LOW BAND EDGE BLOCK-20MHz-100%RB



Date: 27.APR.2021 18:41:42

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

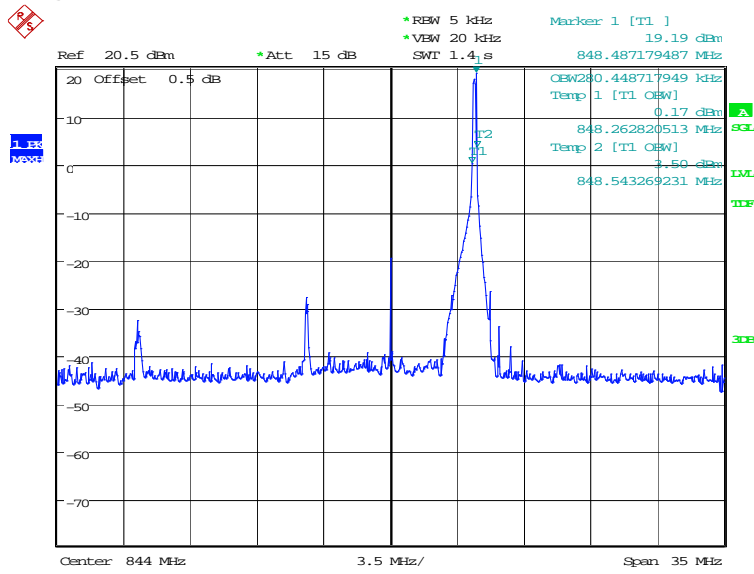


Date: 27.APR.2021 18:43:12



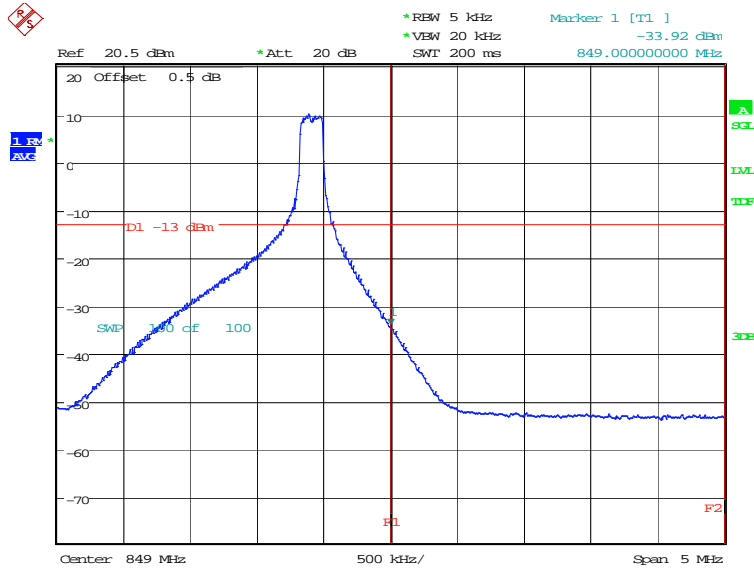


### OBW: 1RB-high\_offset



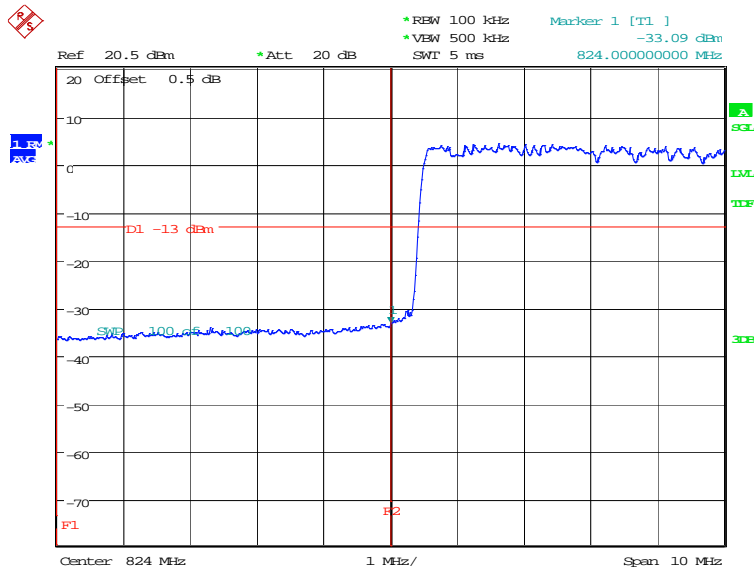
Date: 26.MAY.2021 14:24:00

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



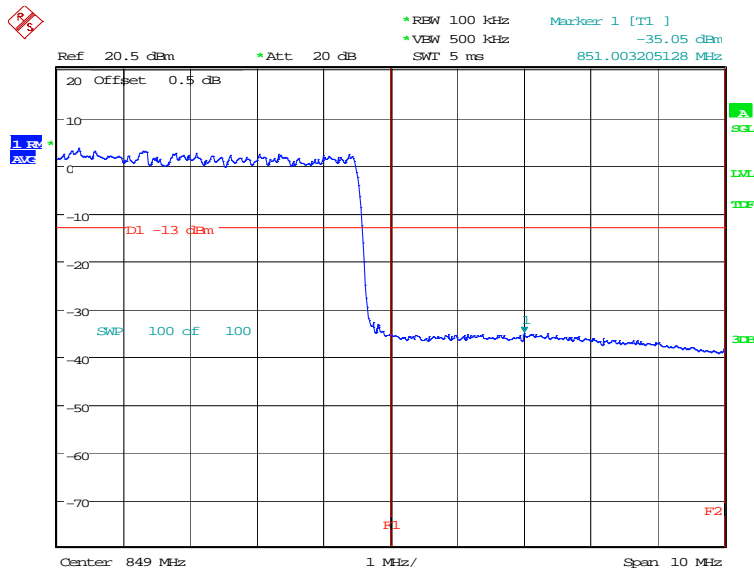
Date: 26.MAY.2021 14:25:13

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



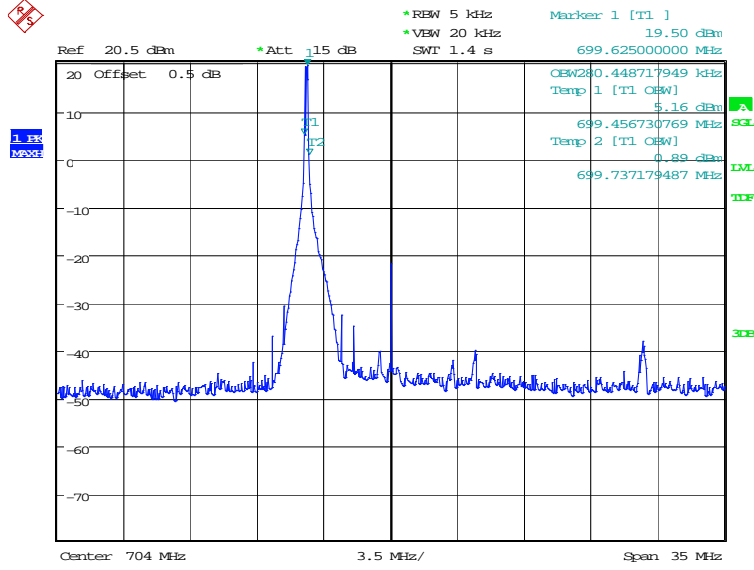
Date: 27.APR.2021 18:45:22

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



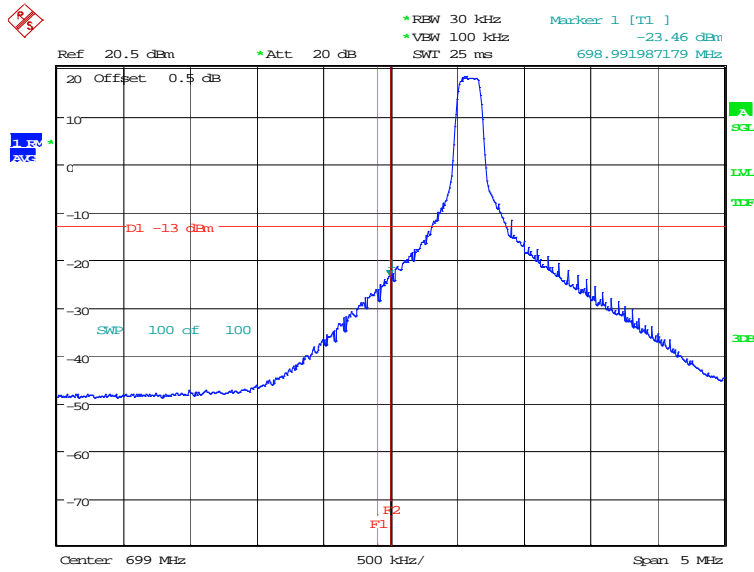
Date: 27.APR.2021 18:46:52

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



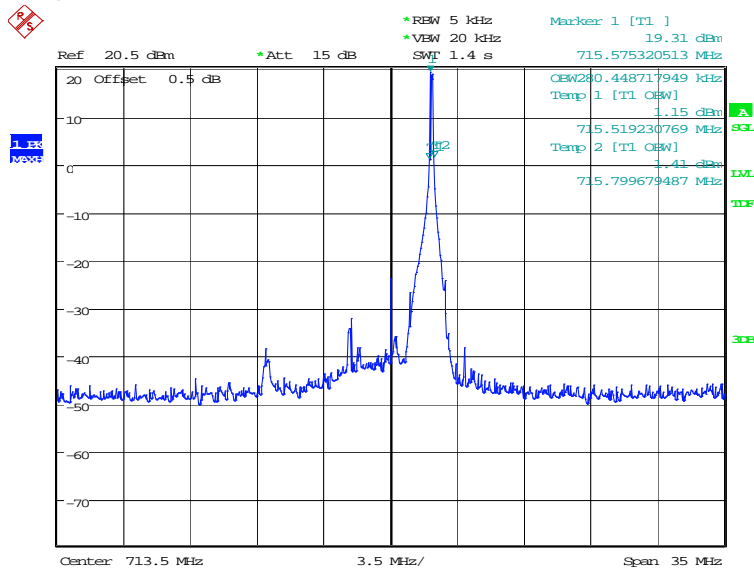
Date: 26.MAY.2021 14:25:50

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



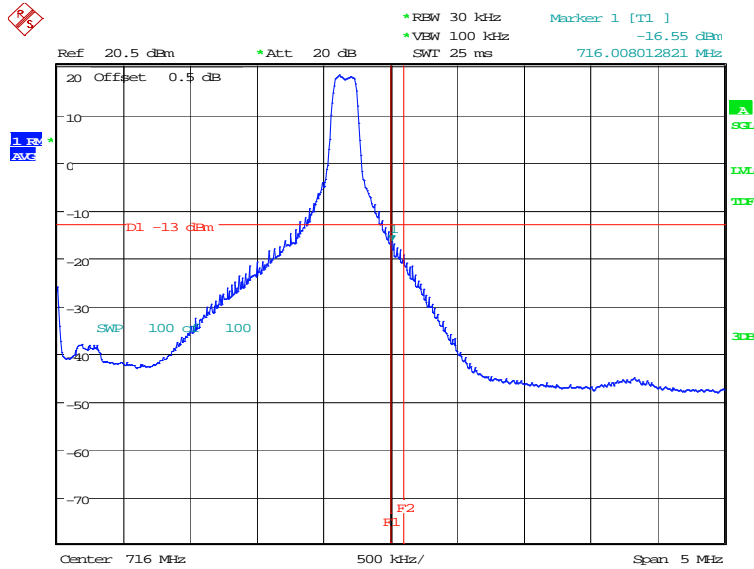
Date: 26.MAY.2021 14:26:09

### OBW: 1RB-high\_offset



Date: 26.MAY.2021 14:27:23

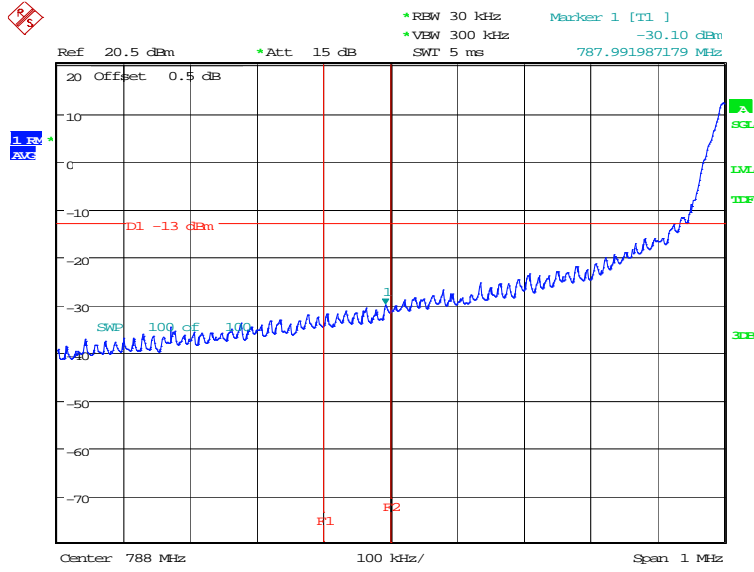
### HIGH BAND EDGE BLOCK-1RB-high\_offset



Date: 26.MAY.2021 14:27:42

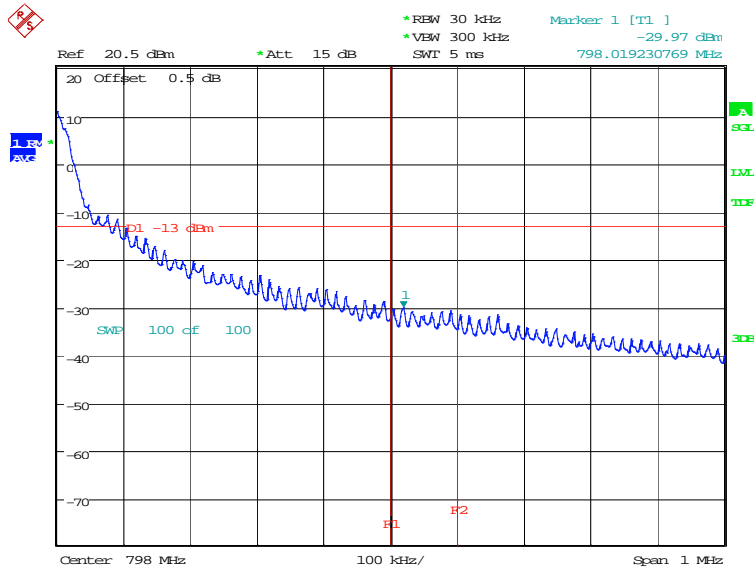


LTE band 14  
LOW BAND EDGE BLOCK-1RB-low\_offset



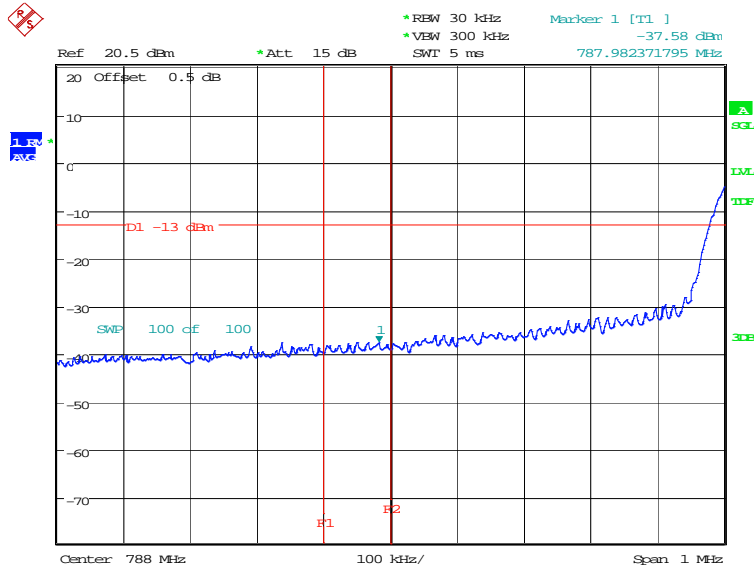
Date: 26.MAY.2021 14:46:27

HIGH BAND EDGE BLOCK-1RB-high\_offset



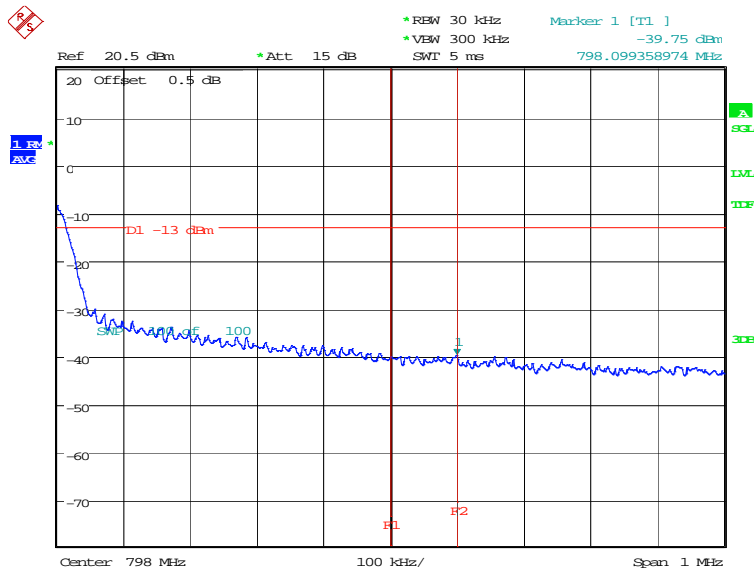
Date: 26.MAY.2021 14:47:02

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



Date: 27.APR.2021 19:08:24

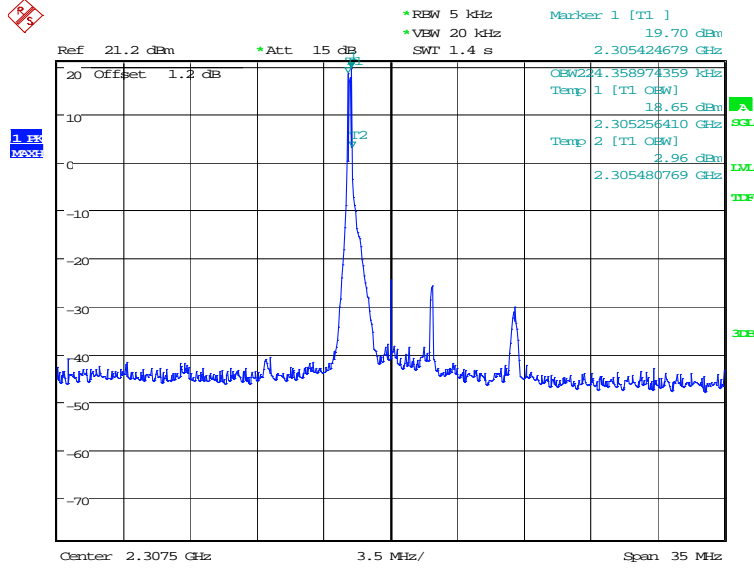
### HIGH BAND EDGE BLOCK-10MHz-100%RB



Date: 27.APR.2021 19:09:55

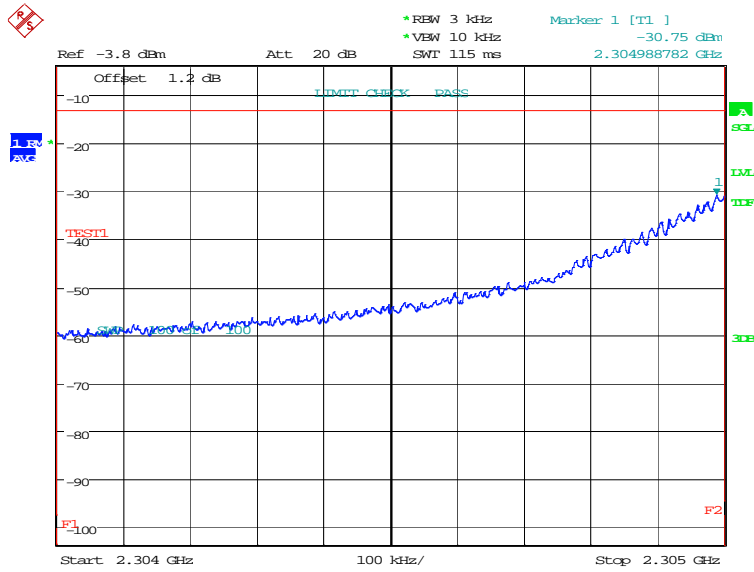


**LTE band 30**  
**OBW: 1RB-low\_offset**

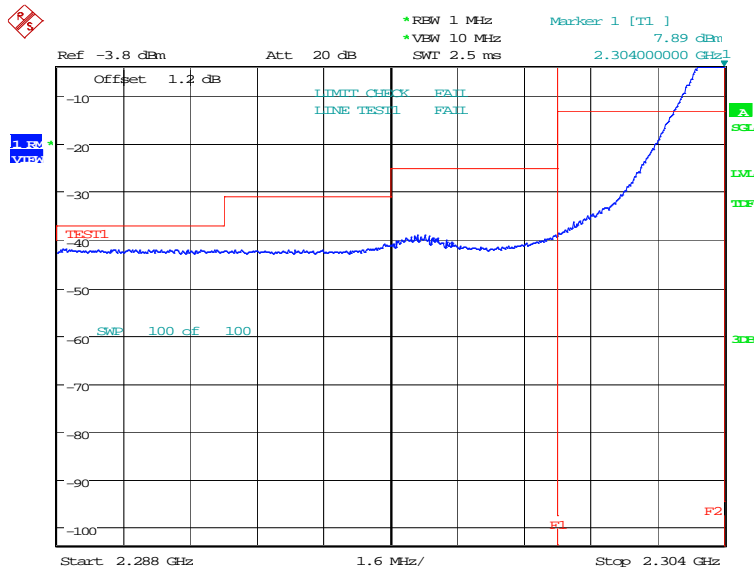


Date: 26.MAY.2021 14:28:18

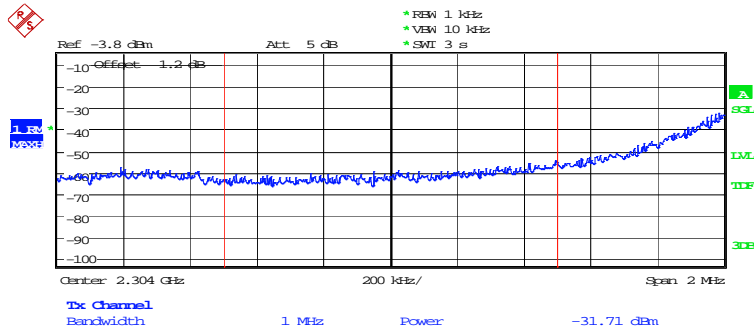
**LOW BAND EDGE BLOCK-1RB-low\_offset**



Date: 26.MAY.2021 14:29:47

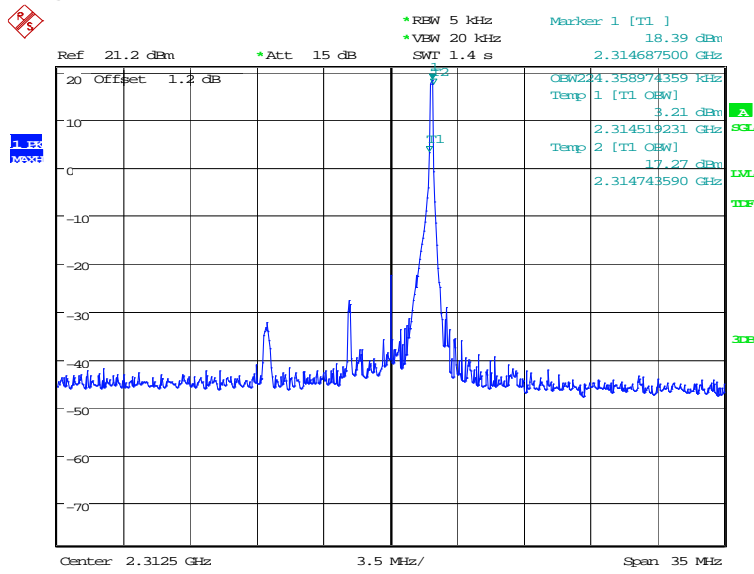


Date: 26.MAY.2021 14:31:38



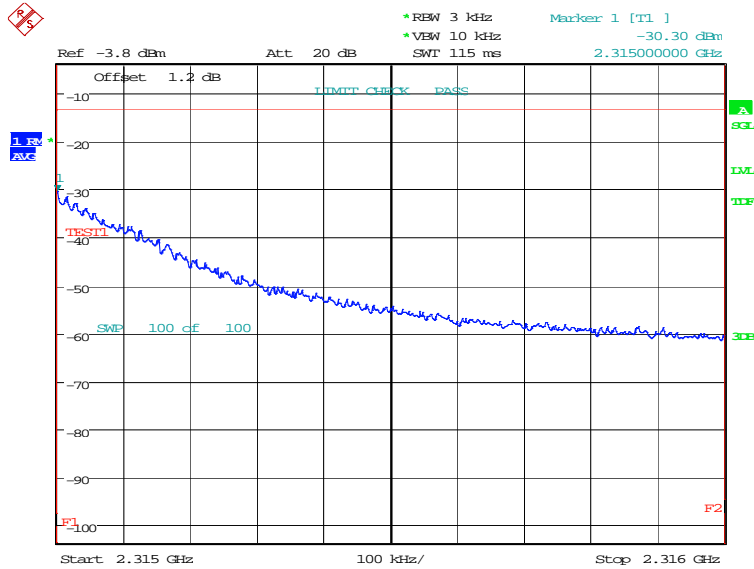
Date: 26.MAY.2021 14:31:55

### OBW: 1RB-high\_offset

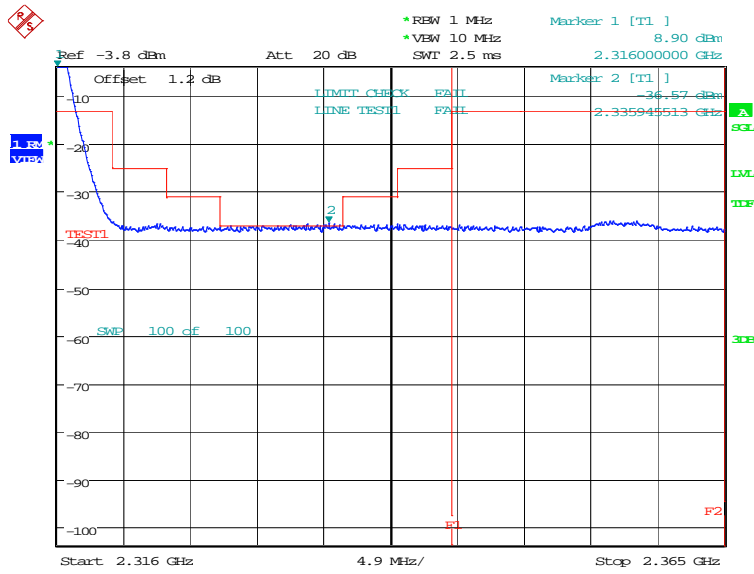


Date: 26.MAY.2021 14:32:29

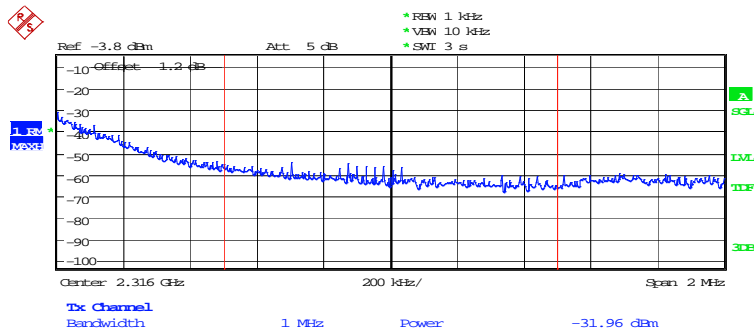
### HIGH BAND EDGE BLOCK-1RB-high\_offset



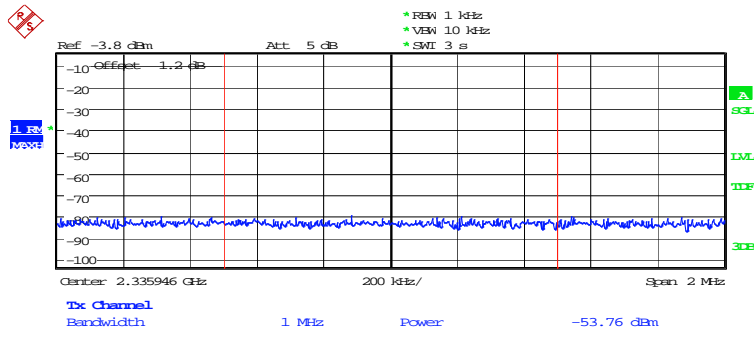
Date: 26.MAY.2021 14:33:58



Date: 26.MAY.2021 14:35:57

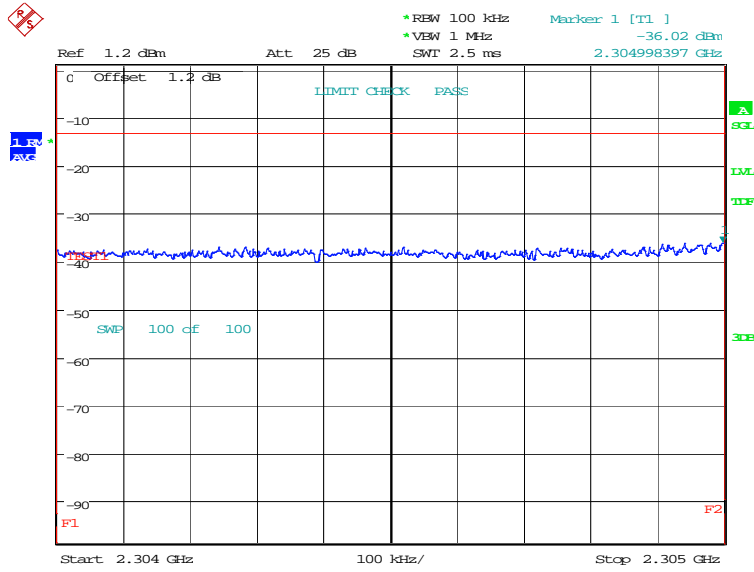


Date: 26.MAY.2021 14:36:14

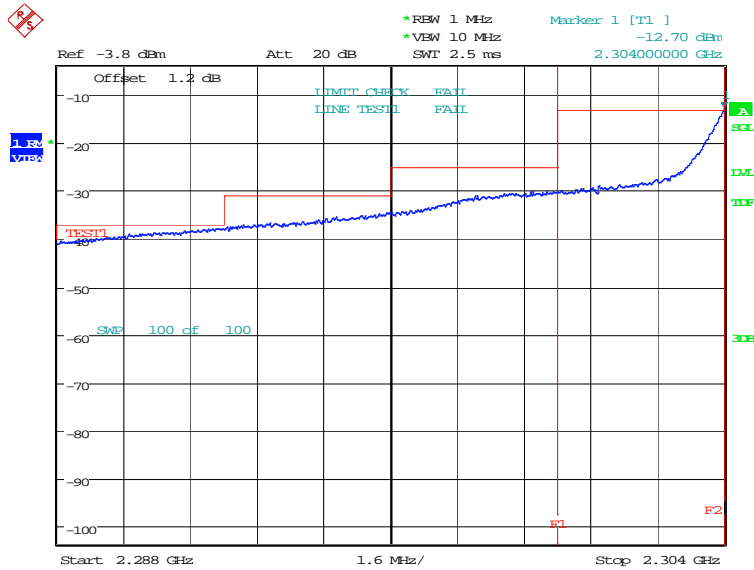


Date: 26.MAY.2021 14:36:28

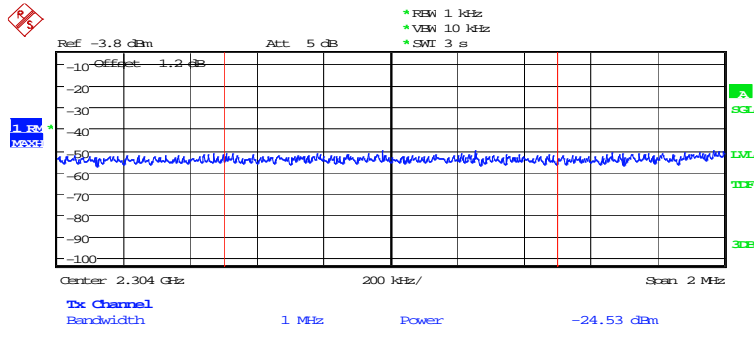
### LOW BAND EDGE BLOCK-10MHz-100%RB



Date: 27.APR.2021 18:52:47

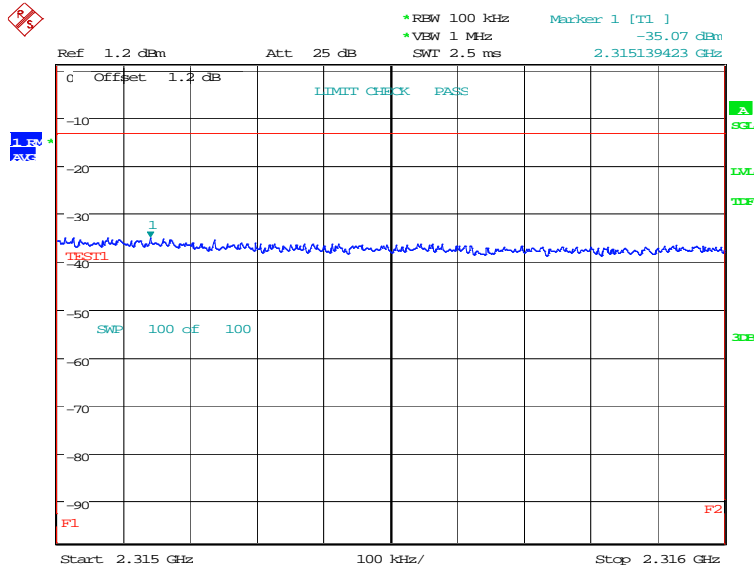


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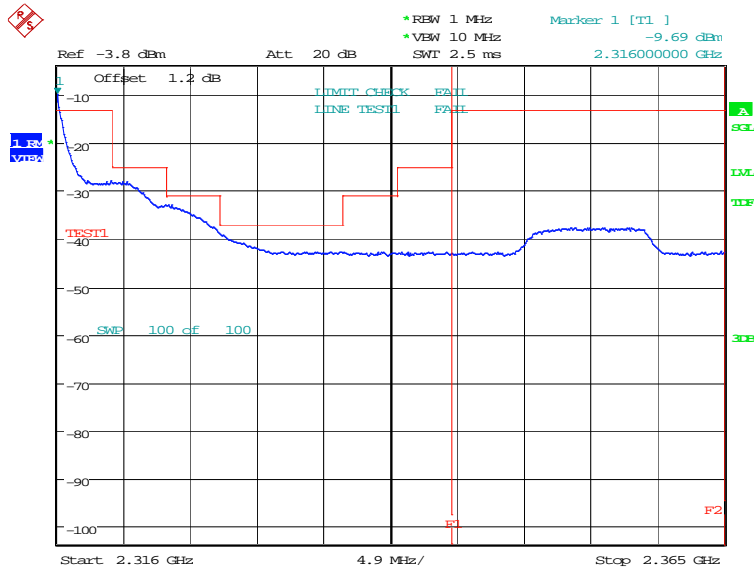


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### HIGH BAND EDGE BLOCK-10MHz-100%RB



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Date: 27.APR.2021 18:59:44





## **A.7 Conducted Spurious Emission**

### **A.7.1 Measurement Method**

The following steps outline the procedure used to measure the conducted emissions from the EUT.

1. In measuring unwanted emissions, the spectrum shall be investigated from 30 MHz or the lowest radio frequency signal generated in the equipment, whichever is lower, without going below 9 kHz, up to at least the frequency given below:
  - (a) If the equipment operates below 10 GHz: to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.
  - (b) If the equipment operates at or above 10 GHz: to the fifth harmonic of the highest fundamental frequency or to 100 GHz, whichever is lower.
2. Determine EUT transmit frequencies: below outlines the band edge frequencies pertinent to conducted emissions testing.
3. The number of sweep points of spectrum analyzer is greater than  $2 \times \text{span/RBW}$ .

### **A. 7.2 Measurement Limit**

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

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.

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

Part 90.543 states that for operations in the 758–768 MHz and the 788–798 MHz bands, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in

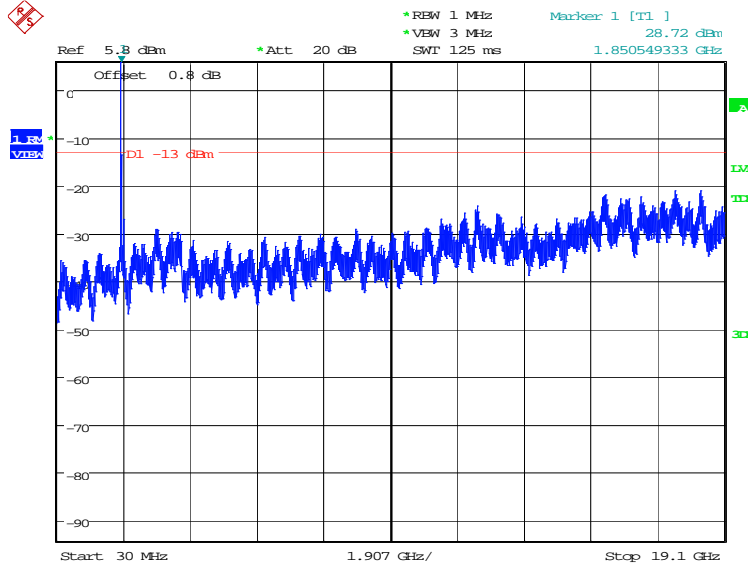
accordance with the following: (1) On all frequencies between 769–775 MHz and 799–805 MHz, by a factor not less than  $76 + 10 \log (P)$  dB in a 6.25 kHz band segment, for base and fixed stations. (2) On all frequencies between 769–775 MHz and 799–805 MHz, by a factor not less than  $65 + 10 \log (P)$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

### A. 7.3 Measurement result

Only the worst case result is given below

#### LTE band 2: 30MHz – 19.1GHz

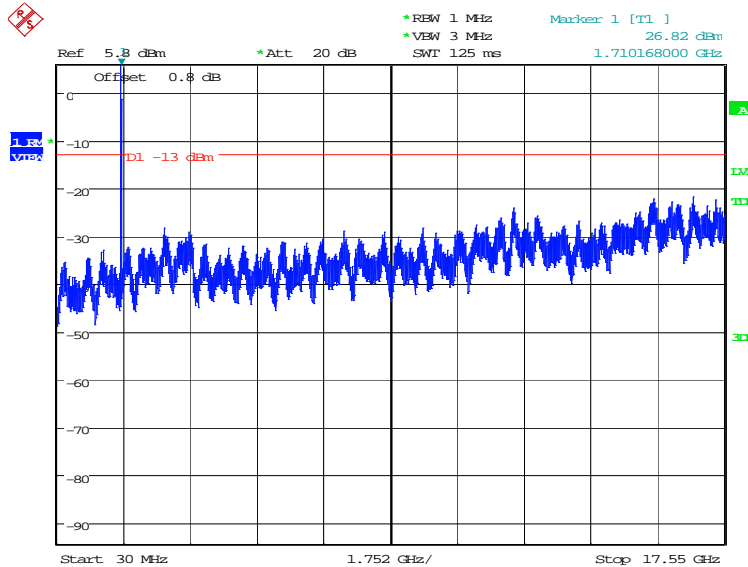
NOTE: peak above the limit line is the carrier frequency.



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#### LTE band 4: 30MHz – 17.55GHz

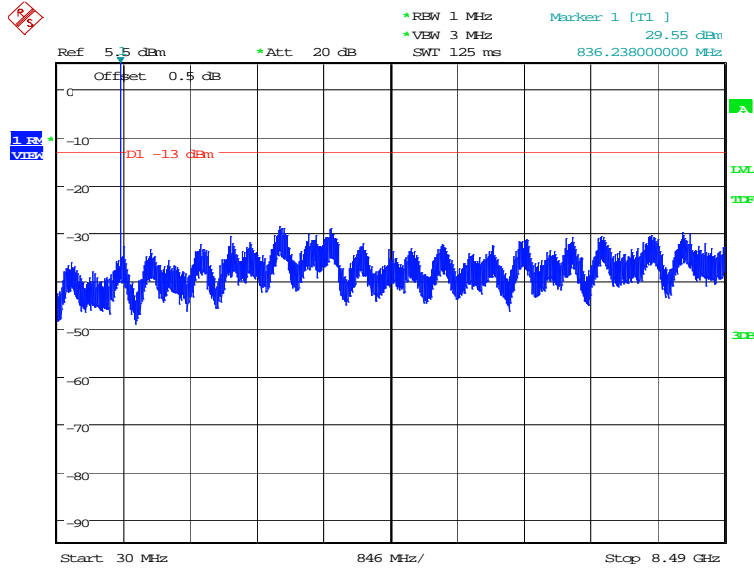
NOTE: peak above the limit line is the carrier frequency.



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**LTE band 5: 30MHz – 8.49GHz**

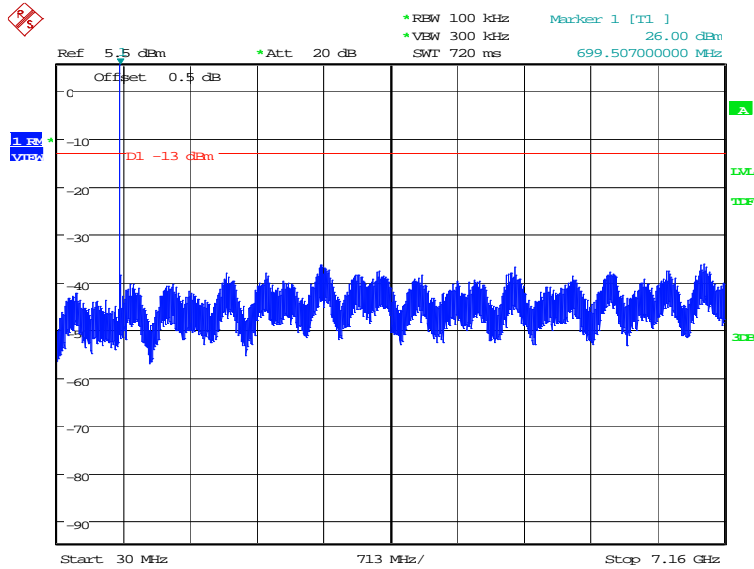
**NOTE: peak above the limit line is the carrier frequency.**



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**LTE band 12: 30MHz – 7.16GHz**

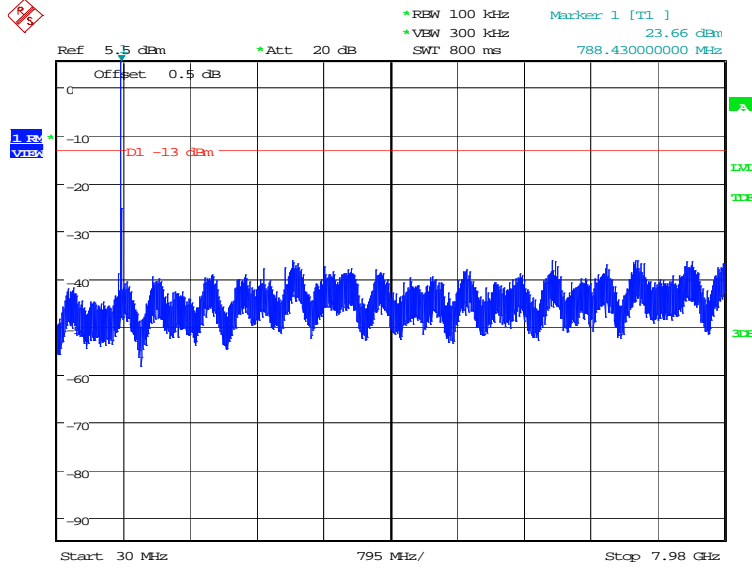
**NOTE: peak above the limit line is the carrier frequency.**



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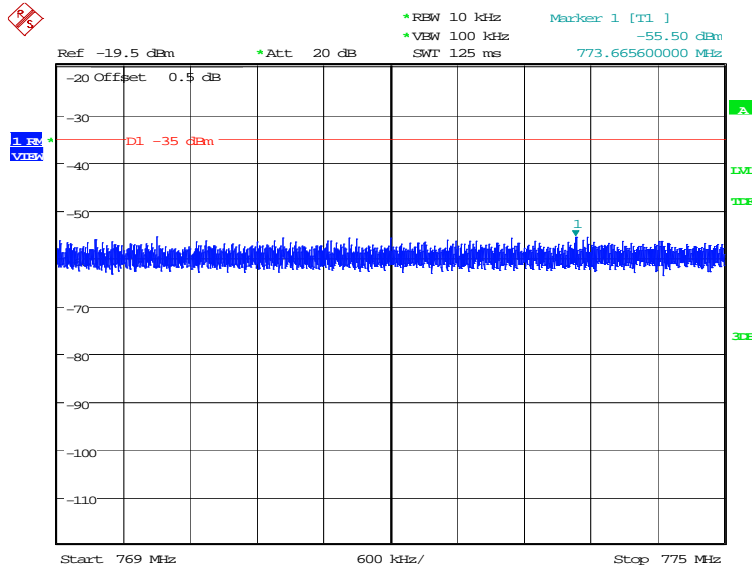
**LTE band 14: 30MHz – 7.98GHz**

**NOTE: peak above the limit line is the carrier frequency.**



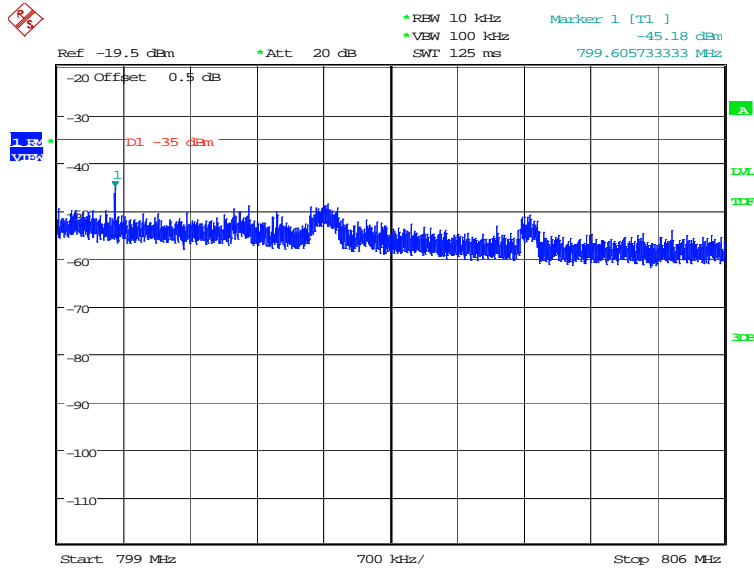
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**LTE band 14: 769MHz~775MHz**



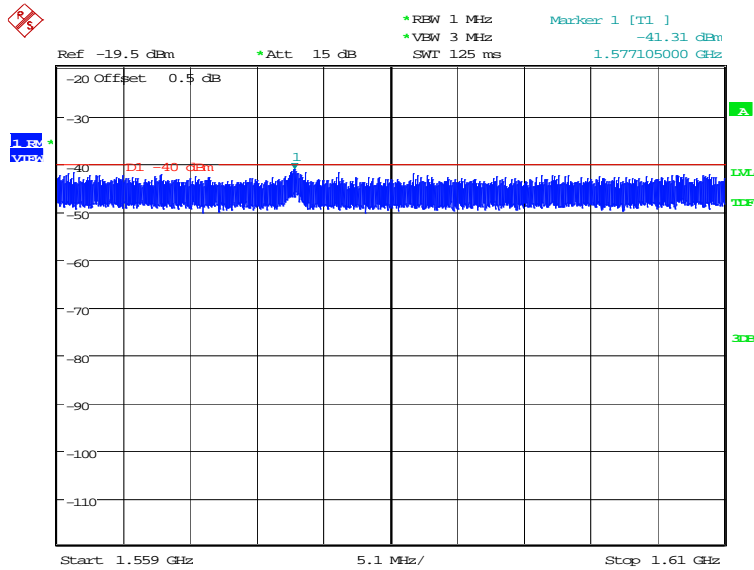
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### LTE band 14: 799MHz~806MHz



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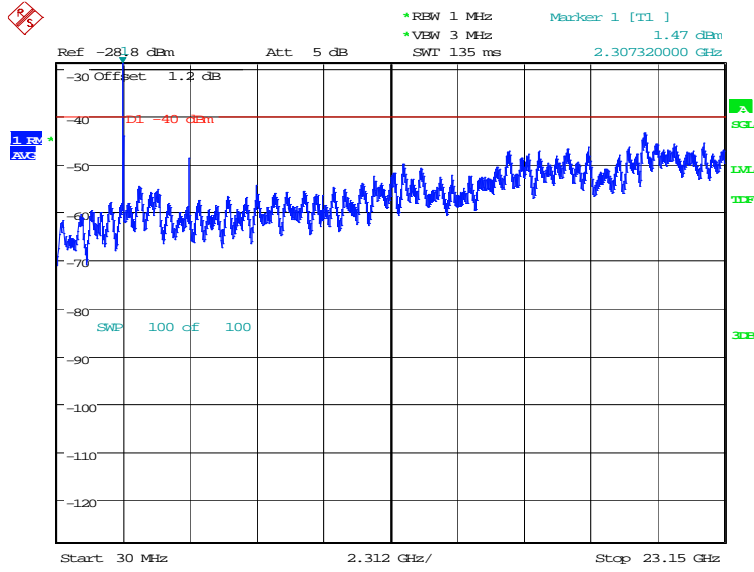
### LTE band 14: 1559MHz~1610MHz



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**LTE band 30: 30MHz – 23.15GHz**

**NOTE: peak above the limit line is the carrier frequency.**



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## **A.8 Peak-to-Average Power Ratio**

The peak-to-average ratio (PAR) of the transmission may not exceed 13 dB

- a) Refer to instrument's analyzer instruction manual for details on how to use the power statistics/CCDF function;
- b) Set resolution/measurement bandwidth  $\geq$  signal's occupied bandwidth;
- c) Set the number of counts to a value that stabilizes the measured CCDF curve;
- d) Record the maximum PAPR level associated with a probability of 0.1%.

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

Frequency (MHz)	PAPR (dB)		
1880.0	QPSK	16QAM	64QAM
	6.79	7.31	7.56

### **LTE band 4, 20MHz**

Frequency (MHz)	PAPR (dB)		
1732.5	QPSK	16QAM	64QAM
	6.67	7.21	7.54

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

Frequency (MHz)	PAPR (dB)		
707.5	QPSK	16QAM	64QAM
	5.71	6.47	6.92

### **LTE band 30, 10MHz**

Frequency (MHz)	PAPR (dB)		
2310.0	QPSK	16QAM	64QAM
	5.83	6.54	6.76

## Annex B: Accreditation Certificate

<p>United States Department of Commerce National Institute of Standards and Technology</p>  	
<hr/> <p><b>Certificate of Accreditation to ISO/IEC 17025:2017</b></p> <hr/>	
<p>NVLAP LAB CODE: 600118-0</p>	
<p><b>Telecommunication Technology Labs, CAICT</b> Beijing China</p>	
<p><i>is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:</i></p>	
<p><b>Electromagnetic Compatibility &amp; Telecommunications</b></p>	
<p><i>This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).</i></p>	
<hr/> <p>2020-09-29 through 2021-09-30 Effective Dates</p>	  <hr/> <p>For the National Voluntary Laboratory Accreditation Program</p>

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