



# TEST REPORT

## No. I22Z61006-WMD02

for

**BLU Products,Inc.**

**Mobile Phone**

**Model Name: B200VL**

**FCC ID: YHLBLUB200VL**

with

**Hardware Version: V1.0**

**Software Version: BLU\_B200VL\_V11.0.02.05.02.02**

**Issued Date: 2022-07-27**

**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.

**Test Laboratory:**

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## **REPORT HISTORY**

| <b>Report Number</b> | <b>Revision</b> | <b>Description</b>      | <b>Issue Date</b> |
|----------------------|-----------------|-------------------------|-------------------|
| I22Z61006-WMD02      | Rev.0           | 1 <sup>st</sup> edition | 2022-07-27        |

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 3: CTTL (BDA)

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

### 1.3. Testing Environment

Normal Temperature: 15-35℃  
Relative Humidity: 20-75%

### 1.4. Project Data

Testing Start Date: 2022-06-02  
Testing End Date: 2022-07-22

### 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: BLU Products, Inc.  
Address /Post: 10814 NW 33rd St # 100 Doral, FL 33172, USA  
Contact: Zeng wei  
Email: zwei@ctasiasz.com  
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Fax: 305.436.8819

### **2.2. Manufacturer Information**

Company Name: BLU Products, Inc.  
Address /Post: 10814 NW 33rd St # 100 Doral, FL 33172, USA  
Contact: Zeng wei  
Email: zwei@ctasiasz.com  
Telephone: 305.715.7171  
Fax: 305.436.8819

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

#### 3.1. About EUT

|                         |                                                |
|-------------------------|------------------------------------------------|
| Description             | Mobile Phone                                   |
| Model Name              | B200VL                                         |
| FCC ID                  | YHLBLUB200VL                                   |
| Antenna                 | Embedded                                       |
| Output power            | 26.86dBm maximum EIRP measured for LTE Band 66 |
| Extreme vol. Limits     | 3.5VDC to 4.35VDC (nominal: 3.8VDC)            |
| Extreme temp. Tolerance | -10°C to +45°C                                 |

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

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

| EUT ID* | IMEI            | HW Version | SW Version                       | Date of receipt |
|---------|-----------------|------------|----------------------------------|-----------------|
| UT38a   | 357173130002521 | V1.0       | BLU_B200VL_<br>V11.0.02.05.02.02 | 2022-05-19      |
| UT52a   | 357173130006129 | V1.0       | BLU_B200VL_<br>V11.0.02.05.02.02 | 2022-06-19      |

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

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

| AE ID*       | Description                           |
|--------------|---------------------------------------|
| AE1          | Battery                               |
| AE1          |                                       |
| Model        | LT25H426271B                          |
| Manufacturer | GUANGDONG FENGHUA NEW ENERGY CO.,LTD. |
| Capacitance  | 1450mAh                               |

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

## **4. Reference Documents**

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

EUT parameters are supplied by the client or manufacturer, which are the bases 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                                                                  | 10-1-20<br>Edition |
| FCC Part 22      | PUBLIC MOBILE SERVICES                                                                            | 10-1-20<br>Edition |
| FCC Part 27      | MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES                                                    | 10-1-20<br>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

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

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

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

|                          |                                                   |
|--------------------------|---------------------------------------------------|
| Temperature              | Min. = 15 °C, Max. = 35 °C                        |
| Relative humidity        | Min. = 20 %, Max. = 75 %                          |
| Shielding effectiveness  | 0.014MHz - 1MHz, >60dB;<br>1MHz - 1000MHz, >90dB. |
| Electrical insulation    | > 2 MΩ                                            |
| Ground system resistance | < 4Ω                                              |

## 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 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 13

| 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 66 (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       |

### 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. |

All the test results are based on normal power.

LTE Band 66 overlaps the entire frequency range of LTE Band 4. Therefore, test data provided in this report covers Band 4 as well as Band 66.

### 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          | 2023-01-17   | 25 months            |
| Spectrum Analyzer                    | FSU        | 200030        | R&S          | 2023-05-25   | 1 year               |
| Climate Chamber                      | SH-242     | 93008556      | ESPEC        | 2023-12-23   | 3 years              |
| Test Receiver                        | E4440A     | MY48250642    | Agilent      | 2023-03-10   | 1 year               |
| Universal Radio Communication Tester | CMW500     | 143008        | R&S          | 2022-12-01   | 1 year               |
| EMI Antenna                          | VULB9163   | 9163-482      | Schwarzbeck  | 2022-11-16   | 1 year               |
| Signal Generator                     | SMF100A    | 101295        | R&S          | 2022-12-23   | 1 year               |
| EMI Antenna                          | 3117       | 00058889      | ETS-Lindgren | 2022-11-07   | 1 year               |
| EMI Antenna                          | LB-7180-NF | J203001300005 | A-INFO       | 2023-02-23   | 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          | 23.56       | 22.77 | 21.77 |
|           |                | 1880.0          | 23.57       | 22.89 | 21.79 |
|           |                | 1850.7          | 23.62       | 22.87 | 21.76 |
|           | 1 RB low       | 1909.3          | 23.57       | 22.90 | 21.89 |
|           |                | 1880.0          | 23.57       | 22.91 | 21.83 |
|           |                | 1850.7          | 23.56       | 22.85 | 21.84 |
|           | 50% RB mid     | 1909.3          | 23.71       | 22.66 | 21.84 |
|           |                | 1880.0          | 23.71       | 22.75 | 21.83 |
|           |                | 1850.7          | 23.75       | 22.78 | 21.86 |
|           | 100% RB        | 1909.3          | 22.70       | 21.83 | 20.67 |
|           |                | 1880.0          | 22.70       | 21.84 | 21.42 |
|           |                | 1850.7          | 22.72       | 21.81 | 20.72 |
| 3MHz      | 1 RB high      | 1908.5          | 24.15       | 23.01 | 21.91 |
|           |                | 1880.0          | 23.69       | 23.02 | 21.95 |
|           |                | 1851.5          | 23.68       | 22.99 | 21.91 |
|           | 1 RB low       | 1908.5          | 23.69       | 23.05 | 21.93 |
|           |                | 1880.0          | 23.70       | 23.05 | 21.91 |
|           |                | 1851.5          | 23.72       | 23.00 | 21.91 |
|           | 50% RB mid     | 1908.5          | 22.83       | 21.86 | 20.85 |
|           |                | 1880.0          | 22.81       | 21.87 | 20.82 |
|           |                | 1851.5          | 22.80       | 21.88 | 20.83 |
|           | 100% RB        | 1908.5          | 22.79       | 21.78 | 20.79 |
|           |                | 1880.0          | 22.75       | 21.78 | 20.75 |

|       |            |        |       |       |       |
|-------|------------|--------|-------|-------|-------|
|       |            | 1851.5 | 22.77 | 21.77 | 20.74 |
| 5MHz  | 1 RB high  | 1907.5 | 24.06 | 22.77 | 21.76 |
|       |            | 1880.0 | 23.55 | 22.99 | 21.83 |
|       |            | 1852.5 | 23.61 | 22.84 | 21.85 |
|       | 1 RB low   | 1907.5 | 23.59 | 22.98 | 21.81 |
|       |            | 1880.0 | 23.59 | 22.91 | 21.84 |
|       |            | 1852.5 | 23.59 | 22.84 | 21.84 |
|       | 50% RB mid | 1907.5 | 22.85 | 21.84 | 20.87 |
|       |            | 1880.0 | 22.83 | 21.85 | 20.83 |
|       |            | 1852.5 | 22.83 | 21.83 | 20.87 |
|       | 100% RB    | 1907.5 | 22.79 | 21.79 | 20.79 |
|       |            | 1880.0 | 22.76 | 21.78 | 20.77 |
|       |            | 1852.5 | 22.81 | 21.82 | 20.84 |
| 10MHz | 1 RB high  | 1905.0 | 24.16 | 23.01 | 21.92 |
|       |            | 1880.0 | 23.66 | 23.04 | 21.86 |
|       |            | 1855.0 | 23.68 | 22.99 | 21.87 |
|       | 1 RB low   | 1905.0 | 24.18 | 22.96 | 21.88 |
|       |            | 1880.0 | 23.68 | 23.04 | 21.89 |
|       |            | 1855.0 | 23.70 | 23.09 | 21.96 |
|       | 50% RB mid | 1905.0 | 22.92 | 21.82 | 20.92 |
|       |            | 1880.0 | 22.83 | 21.82 | 21.12 |
|       |            | 1855.0 | 22.92 | 21.85 | 20.94 |
|       | 100% RB    | 1905.0 | 22.94 | 21.81 | 21.00 |
|       |            | 1880.0 | 22.81 | 21.82 | 20.88 |
|       |            | 1855.0 | 22.98 | 21.89 | 20.87 |
| 15MHz | 1 RB high  | 1902.5 | 24.11 | 23.38 | 22.32 |
|       |            | 1880.0 | 24.11 | 23.40 | 22.33 |
|       |            | 1857.5 | 24.10 | 23.42 | 22.35 |
|       | 1 RB low   | 1902.5 | 24.14 | 23.43 | 22.29 |
|       |            | 1880.0 | 24.14 | 23.44 | 22.35 |
|       |            | 1857.5 | 24.18 | 23.39 | 22.38 |
|       | 50% RB mid | 1902.5 | 23.31 | 22.34 | 21.32 |
|       |            | 1880.0 | 23.28 | 22.32 | 21.29 |
|       |            | 1857.5 | 23.28 | 22.32 | 21.32 |
|       | 100% RB    | 1902.5 | 23.28 | 22.31 | 21.28 |
|       |            | 1880.0 | 23.27 | 22.31 | 21.31 |
|       |            | 1857.5 | 23.27 | 22.31 | 21.28 |
| 20MHz | 1 RB high  | 1900.0 | 24.01 | 23.29 | 22.18 |
|       |            | 1880.0 | 24.02 | 23.32 | 22.19 |
|       |            | 1860.0 | 24.00 | 23.21 | 22.15 |
|       | 1 RB low   | 1900.0 | 24.06 | 23.25 | 22.26 |
|       |            | 1880.0 | 24.06 | 23.22 | 22.24 |
|       |            | 1860.0 | 24.04 | 23.18 | 22.25 |

|  |            |        |       |       |       |
|--|------------|--------|-------|-------|-------|
|  | 50% RB mid | 1900.0 | 23.39 | 22.42 | 21.36 |
|  |            | 1880.0 | 23.35 | 22.40 | 21.36 |
|  |            | 1860.0 | 23.35 | 22.40 | 21.35 |
|  | 100% RB    | 1900.0 | 23.28 | 22.33 | 21.29 |
|  |            | 1880.0 | 23.32 | 22.35 | 21.34 |
|  |            | 1860.0 | 23.28 | 22.31 | 21.31 |

**LTE band 5**

| Bandwidth | RB size/offset | Frequency (MHz) | Power (dBm) |       |       |
|-----------|----------------|-----------------|-------------|-------|-------|
|           |                |                 | QPSK        | 16QAM | 64QAM |
| 1.4MHz    | 1 RB high      | 848.3           | 24.14       | 22.89 | 21.90 |
|           |                | 836.5           | 23.77       | 22.93 | 21.91 |
|           |                | 824.7           | 23.72       | 22.96 | 21.90 |
|           | 1 RB low       | 848.3           | 23.65       | 22.94 | 21.84 |
|           |                | 836.5           | 23.75       | 22.91 | 21.89 |
|           |                | 824.7           | 23.74       | 22.93 | 21.89 |
|           | 50% RB mid     | 848.3           | 23.81       | 22.84 | 21.85 |
|           |                | 836.5           | 23.89       | 22.83 | 21.97 |
|           |                | 824.7           | 23.87       | 22.85 | 21.94 |
|           | 100% RB        | 848.3           | 22.79       | 21.84 | 20.78 |
|           |                | 836.5           | 22.89       | 21.91 | 20.86 |
|           |                | 824.7           | 22.86       | 21.89 | 20.86 |
| 3MHz      | 1 RB high      | 847.5           | 24.17       | 22.91 | 21.86 |
|           |                | 836.5           | 23.79       | 22.98 | 21.92 |
|           |                | 825.5           | 23.76       | 22.96 | 21.89 |
|           | 1 RB low       | 847.5           | 23.72       | 22.88 | 21.82 |
|           |                | 836.5           | 23.80       | 23.07 | 21.86 |
|           |                | 825.5           | 23.79       | 23.07 | 21.96 |
|           | 50% RB mid     | 847.5           | 22.79       | 21.84 | 20.82 |
|           |                | 836.5           | 22.85       | 21.85 | 20.88 |
|           |                | 825.5           | 22.81       | 21.86 | 20.87 |
|           | 100% RB        | 847.5           | 22.75       | 21.75 | 20.76 |
|           |                | 836.5           | 22.80       | 21.79 | 20.85 |
|           |                | 825.5           | 22.84       | 21.81 | 20.82 |
| 5MHz      | 1 RB high      | 846.5           | 24.07       | 22.88 | 21.80 |
|           |                | 836.5           | 23.67       | 22.96 | 21.85 |
|           |                | 826.5           | 23.65       | 22.92 | 21.85 |
|           | 1 RB low       | 846.5           | 23.68       | 22.83 | 21.78 |
|           |                | 836.5           | 23.70       | 22.90 | 21.86 |
|           |                | 826.5           | 23.70       | 22.99 | 21.86 |
|           | 50% RB mid     | 846.5           | 22.80       | 21.76 | 20.84 |
|           |                | 836.5           | 22.87       | 21.82 | 20.89 |
|           |                | 826.5           | 22.83       | 21.78 | 20.88 |
|           | 100% RB        | 846.5           | 22.76       | 21.77 | 20.79 |
|           |                | 836.5           | 22.83       | 21.80 | 20.82 |
|           |                | 826.5           | 22.79       | 21.81 | 20.82 |
| 10MHz     | 1 RB high      | 844.0           | 23.75       | 23.08 | 21.88 |
|           |                | 836.5           | 23.78       | 22.93 | 21.98 |
|           |                | 829.0           | 23.77       | 23.02 | 21.85 |
|           | 1 RB low       | 844.0           | 23.84       | 22.98 | 21.97 |



|  |            |       |       |       |       |
|--|------------|-------|-------|-------|-------|
|  |            | 836.5 | 23.79 | 22.98 | 21.90 |
|  |            | 829.0 | 23.80 | 23.03 | 21.91 |
|  | 50% RB mid | 844.0 | 22.85 | 21.83 | 20.90 |
|  |            | 836.5 | 22.90 | 21.88 | 21.47 |
|  |            | 829.0 | 22.88 | 21.87 | 20.91 |
|  | 100% RB    | 844.0 | 22.86 | 21.86 | 20.89 |
|  |            | 836.5 | 22.92 | 21.90 | 20.90 |
|  |            | 829.0 | 22.86 | 21.83 | 20.87 |

**LTE band 12**

| Bandwidth | RB size/offset | Frequency (MHz) | Power (dBm) |       |       |
|-----------|----------------|-----------------|-------------|-------|-------|
|           |                |                 | QPSK        | 16QAM | 64QAM |
| 1.4MHz    | 1 RB high      | 715.3           | 23.18       | 22.00 | 20.92 |
|           |                | 707.5           | 22.77       | 22.17 | 20.95 |
|           |                | 699.7           | 22.74       | 22.01 | 21.04 |
|           | 1 RB low       | 715.3           | 23.17       | 21.92 | 20.91 |
|           |                | 707.5           | 22.73       | 22.06 | 20.91 |
|           |                | 699.7           | 22.73       | 22.11 | 20.91 |
|           | 50% RB mid     | 715.3           | 22.85       | 21.87 | 20.95 |
|           |                | 707.5           | 22.91       | 21.96 | 21.04 |
|           |                | 699.7           | 22.89       | 21.91 | 21.03 |
|           | 100% RB        | 715.3           | 21.81       | 20.89 | 19.75 |
|           |                | 707.5           | 21.86       | 20.91 | 19.89 |
|           |                | 699.7           | 21.87       | 20.96 | 19.89 |
| 3MHz      | 1 RB high      | 714.5           | 23.24       | 22.25 | 21.32 |
|           |                | 707.5           | 23.29       | 22.59 | 21.52 |
|           |                | 700.5           | 23.25       | 22.29 | 21.39 |
|           | 1 RB low       | 714.5           | 23.24       | 22.37 | 20.98 |
|           |                | 707.5           | 23.25       | 22.53 | 21.12 |
|           |                | 700.5           | 23.08       | 22.20 | 21.33 |
|           | 50% RB mid     | 714.5           | 22.32       | 21.17 | 20.26 |
|           |                | 707.5           | 22.36       | 21.43 | 20.40 |
|           |                | 700.5           | 22.36       | 21.27 | 20.39 |
|           | 100% RB        | 714.5           | 22.28       | 21.23 | 20.17 |
|           |                | 707.5           | 22.33       | 21.23 | 20.28 |
|           |                | 700.5           | 22.32       | 21.23 | 20.30 |
| 5MHz      | 1 RB high      | 713.5           | 23.11       | 22.36 | 21.37 |
|           |                | 707.5           | 23.17       | 22.46 | 21.39 |
|           |                | 701.5           | 23.17       | 22.55 | 21.35 |
|           | 1 RB low       | 713.5           | 23.19       | 22.52 | 21.46 |
|           |                | 707.5           | 23.16       | 22.49 | 21.38 |
|           |                | 701.5           | 23.17       | 22.49 | 21.35 |
|           | 50% RB mid     | 713.5           | 22.35       | 21.33 | 20.36 |
|           |                | 707.5           | 22.44       | 21.43 | 20.41 |
|           |                | 701.5           | 22.38       | 21.38 | 20.39 |
|           | 100% RB        | 713.5           | 22.27       | 21.32 | 20.29 |
|           |                | 707.5           | 22.35       | 21.35 | 20.34 |
|           |                | 701.5           | 22.30       | 21.34 | 20.27 |
| 10MHz     | 1 RB high      | 711.0           | 23.21       | 22.47 | 21.43 |
|           |                | 707.5           | 23.22       | 22.63 | 21.53 |
|           |                | 704.0           | 23.29       | 22.66 | 21.48 |
|           | 1 RB low       | 711.0           | 23.30       | 22.62 | 21.57 |

|  |            |       |       |       |       |
|--|------------|-------|-------|-------|-------|
|  |            | 707.5 | 23.27 | 22.57 | 21.50 |
|  |            | 704.0 | 23.30 | 22.54 | 21.48 |
|  | 50% RB mid | 711.0 | 22.42 | 21.42 | 20.42 |
|  |            | 707.5 | 22.46 | 21.45 | 20.41 |
|  |            | 704.0 | 22.46 | 21.44 | 20.44 |
|  | 100% RB    | 711.0 | 22.33 | 21.32 | 20.36 |
|  |            | 707.5 | 22.47 | 21.46 | 20.46 |
|  |            | 704.0 | 22.43 | 21.44 | 20.42 |

**LTE band 13**

| Bandwidth | RB size/offset | Frequency (MHz) | Power (dBm) |       |       |
|-----------|----------------|-----------------|-------------|-------|-------|
|           |                |                 | QPSK        | 16QAM | 64QAM |
| 5MHz      | 1 RB high      | 784.5           | 23.58       | 22.85 | 21.75 |
|           |                | 782.0           | 23.61       | 22.85 | 21.73 |
|           |                | 779.5           | 23.62       | 22.79 | 21.80 |
|           | 1 RB low       | 784.5           | 23.66       | 23.03 | 21.87 |
|           |                | 782.0           | 23.63       | 22.82 | 21.79 |
|           |                | 779.5           | 23.63       | 22.79 | 21.86 |
|           | 50% RB mid     | 784.5           | 22.79       | 21.75 | 20.85 |
|           |                | 782.0           | 22.79       | 21.76 | 20.83 |
|           |                | 779.5           | 22.79       | 21.76 | 20.84 |
|           | 100% RB        | 784.5           | 22.73       | 21.72 | 20.75 |
|           |                | 782.0           | 22.73       | 21.72 | 20.79 |
|           |                | 779.5           | 22.71       | 21.70 | 20.74 |
| 10MHz     | 1 RB high      | 782.0           | 23.70       | 22.96 | 21.85 |
|           | 1 RB low       | 782.0           | 23.75       | 23.05 | 21.89 |
|           | 50% RB mid     | 782.0           | 22.81       | 21.80 | 20.85 |
|           | 100% RB        | 782.0           | 22.79       | 21.78 | 20.83 |

**LTE band 66**

| Bandwidth | RB size/offset | Frequency (MHz) | Power (dBm) |       |       |
|-----------|----------------|-----------------|-------------|-------|-------|
|           |                |                 | QPSK        | 16QAM | 64QAM |
| 1.4MHz    | 1 RB high      | 1779.3          | 24.01       | 23.23 | 22.20 |
|           |                | 1745.0          | 23.96       | 23.16 | 22.16 |
|           |                | 1710.7          | 24.00       | 23.23 | 22.19 |
|           | 1 RB low       | 1779.3          | 23.99       | 23.14 | 22.22 |
|           |                | 1745.0          | 23.95       | 23.21 | 22.15 |
|           |                | 1710.7          | 24.00       | 23.22 | 22.22 |
|           | 50% RB mid     | 1779.3          | 24.18       | 23.10 | 22.23 |
|           |                | 1745.0          | 24.14       | 23.10 | 22.22 |
|           |                | 1710.7          | 24.16       | 23.13 | 22.32 |
|           | 100% RB        | 1779.3          | 23.13       | 22.21 | 21.17 |
|           |                | 1745.0          | 23.08       | 22.25 | 21.14 |
|           |                | 1710.7          | 23.13       | 22.25 | 21.15 |
| 3MHz      | 1 RB high      | 1778.5          | 24.05       | 23.22 | 22.20 |
|           |                | 1745.0          | 24.01       | 23.23 | 22.24 |
|           |                | 1711.5          | 24.09       | 23.29 | 22.21 |
|           | 1 RB low       | 1778.5          | 24.05       | 23.29 | 22.32 |
|           |                | 1745.0          | 24.02       | 23.20 | 22.17 |
|           |                | 1711.5          | 24.07       | 23.28 | 22.28 |
|           | 50% RB mid     | 1778.5          | 23.12       | 22.21 | 21.20 |
|           |                | 1745.0          | 23.06       | 22.20 | 21.18 |
|           |                | 1711.5          | 23.13       | 22.24 | 21.21 |
|           | 100% RB        | 1778.5          | 23.09       | 22.15 | 21.10 |
|           |                | 1745.0          | 23.05       | 22.08 | 21.09 |
|           |                | 1711.5          | 23.11       | 22.13 | 21.13 |
| 5MHz      | 1 RB high      | 1777.5          | 23.94       | 23.05 | 22.20 |
|           |                | 1745.0          | 23.90       | 23.07 | 22.08 |
|           |                | 1712.5          | 23.96       | 23.19 | 22.20 |
|           | 1 RB low       | 1777.5          | 23.94       | 23.14 | 22.14 |
|           |                | 1745.0          | 23.89       | 23.09 | 22.22 |
|           |                | 1712.5          | 23.97       | 23.23 | 22.10 |
|           | 50% RB mid     | 1777.5          | 23.16       | 22.16 | 21.17 |
|           |                | 1745.0          | 23.08       | 22.13 | 21.16 |
|           |                | 1712.5          | 23.14       | 22.19 | 21.20 |
|           | 100% RB        | 1777.5          | 23.12       | 22.15 | 21.17 |
|           |                | 1745.0          | 23.07       | 22.12 | 21.13 |
|           |                | 1712.5          | 23.11       | 22.19 | 21.15 |
| 10MHz     | 1 RB high      | 1775.0          | 24.05       | 23.27 | 22.19 |
|           |                | 1745.0          | 24.01       | 23.28 | 22.23 |
|           |                | 1715.0          | 24.05       | 23.34 | 22.33 |
|           | 1 RB low       | 1775.0          | 24.06       | 23.23 | 22.29 |

|       |            |        |       |       |       |
|-------|------------|--------|-------|-------|-------|
|       |            | 1745.0 | 24.02 | 23.31 | 22.20 |
|       |            | 1715.0 | 24.07 | 23.25 | 22.23 |
|       | 50% RB mid | 1775.0 | 23.14 | 22.18 | 21.16 |
|       |            | 1745.0 | 23.12 | 22.17 | 21.17 |
|       |            | 1715.0 | 23.15 | 22.21 | 21.22 |
|       | 100% RB    | 1775.0 | 23.20 | 22.25 | 21.24 |
|       |            | 1745.0 | 23.18 | 22.25 | 21.23 |
|       |            | 1715.0 | 23.16 | 22.26 | 21.21 |
| 15MHz | 1 RB high  | 1772.5 | 23.96 | 23.18 | 22.23 |
|       |            | 1745.0 | 23.92 | 23.14 | 22.20 |
|       |            | 1717.5 | 23.97 | 23.16 | 22.21 |
|       | 1 RB low   | 1772.5 | 23.97 | 23.19 | 22.14 |
|       |            | 1745.0 | 24.00 | 23.28 | 22.21 |
|       |            | 1717.5 | 23.99 | 23.20 | 22.20 |
|       | 50% RB mid | 1772.5 | 23.16 | 22.19 | 21.18 |
|       |            | 1745.0 | 23.17 | 22.17 | 21.20 |
|       |            | 1717.5 | 23.16 | 22.18 | 21.18 |
|       | 100% RB    | 1772.5 | 23.16 | 22.22 | 21.20 |
|       |            | 1745.0 | 23.14 | 22.18 | 21.19 |
|       |            | 1717.5 | 23.14 | 22.18 | 21.15 |
| 20MHz | 1 RB high  | 1770.0 | 23.76 | 22.98 | 21.98 |
|       |            | 1745.0 | 23.71 | 22.90 | 21.91 |
|       |            | 1720.0 | 23.82 | 22.99 | 21.98 |
|       | 1 RB low   | 1770.0 | 23.76 | 23.00 | 21.90 |
|       |            | 1745.0 | 23.78 | 23.01 | 22.02 |
|       |            | 1720.0 | 23.81 | 23.11 | 21.99 |
|       | 50% RB mid | 1770.0 | 23.15 | 22.21 | 21.20 |
|       |            | 1745.0 | 23.15 | 22.20 | 21.21 |
|       |            | 1720.0 | 23.14 | 22.18 | 21.20 |
|       | 100% RB    | 1770.0 | 23.08 | 22.13 | 21.12 |
|       |            | 1745.0 | 23.11 | 22.16 | 21.16 |
|       |            | 1720.0 | 23.12 | 22.12 | 21.13 |

### A.1.3 Radiated

#### A.1.3.1 Description

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

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

**LTE Band 5:** Rule Part 22.913(a) specifies "Mobile stations are limited to 2.0 watts EIRP."

**LTE Band 12:** 27.50(c)(10) specifies " Portable stations (hand-held devices) in the 600 MHz uplink band and the 698-746 MHz band, and fixed and mobile stations in the 600 MHz uplink band are limited to 3 watts ERP ".

**LTE Band 13:** 27.50(b)(10) specifies " Portable stations (hand-held devices) transmitting in the 746–757 MHz, 776–788 MHz, and 805–806 MHz bands are limited to 3 watts ERP. ".

**LTE Band 66/4:** Rule Part 27.50(d) specifies "Fixed, mobile, and portable (handheld) stations operating in the 1710–1755 MHz band are limited to 1 watt EIRP."

#### A.1.3.2 Method of Measurement

NAS1 C63.26 chapter 5.2.5.5: when working in decibels (i.e., logarithmic scale), the ERP and EIRP represent the sum of the transmit antenna gain (in dBd or dBi, respectively) and the conducted RF output power (expressed in dB relative to watts or milliwatts).

The relevant equation for determining the maximum ERP or EIRP from the measured RF output power is given in Equation (1) as follows:

$$\text{ERP or EIRP} = P_{\text{Mea}} + G_T$$

Where

|                  |                                                                                                                                 |
|------------------|---------------------------------------------------------------------------------------------------------------------------------|
| ERP or EIRP      | effective radiated power or equivalent isotropically radiated power,<br>respectively                                            |
| $P_{\text{Mea}}$ | (expressed in the same units as $P_{\text{Mea}}$ , e.g., dBm or dBW)<br>measured transmitter output power or PSD, in dBm or dBW |
| $G_T$            | gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP)                                                                    |

#### A.1.3.3 Measurement result

**LTE band 2- EIRP**
**Limits:** ≤33dBm (2W)

Max EIRP: 26.16dBm

| Bandwidth | RB size/offset | Frequency (MHz) | Conducted Power (dBm) |       |       | Radiated Power (dBm)<br>GT = 1.98dBi |       |       |
|-----------|----------------|-----------------|-----------------------|-------|-------|--------------------------------------|-------|-------|
|           |                |                 | QPSK                  | 16QAM | 64QAM | QPSK                                 | 16QAM | 64QAM |
| 1.4MHz    | 1 RB high      | 1909.3          | 23.56                 | 22.77 | 21.77 | 25.54                                | 24.75 | 23.75 |
|           |                | 1880.0          | 23.57                 | 22.89 | 21.79 | 25.55                                | 24.87 | 23.77 |
|           |                | 1850.7          | 23.62                 | 22.87 | 21.76 | 25.60                                | 24.85 | 23.74 |
|           | 1 RB low       | 1909.3          | 23.57                 | 22.9  | 21.89 | 25.55                                | 24.88 | 23.87 |
|           |                | 1880.0          | 23.57                 | 22.91 | 21.83 | 25.55                                | 24.89 | 23.81 |
|           |                | 1850.7          | 23.56                 | 22.85 | 21.84 | 25.54                                | 24.83 | 23.82 |
|           | 50% RB mid     | 1909.3          | 23.71                 | 22.66 | 21.84 | 25.69                                | 24.64 | 23.82 |
|           |                | 1880.0          | 23.71                 | 22.75 | 21.83 | 25.69                                | 24.73 | 23.81 |
|           |                | 1850.7          | 23.75                 | 22.78 | 21.86 | 25.73                                | 24.76 | 23.84 |
|           | 100% RB        | 1909.3          | 22.7                  | 21.83 | 20.67 | 24.68                                | 23.81 | 22.65 |
|           |                | 1880.0          | 22.7                  | 21.84 | 21.42 | 24.68                                | 23.82 | 23.40 |
|           |                | 1850.7          | 22.72                 | 21.81 | 20.72 | 24.70                                | 23.79 | 22.70 |
| 3MHz      | 1 RB high      | 1908.5          | 24.15                 | 23.01 | 21.91 | 26.13                                | 24.99 | 23.89 |
|           |                | 1880.0          | 23.69                 | 23.02 | 21.95 | 25.67                                | 25.00 | 23.93 |
|           |                | 1851.5          | 23.68                 | 22.99 | 21.91 | 25.66                                | 24.97 | 23.89 |
|           | 1 RB low       | 1908.5          | 23.69                 | 23.05 | 21.93 | 25.67                                | 25.03 | 23.91 |
|           |                | 1880.0          | 23.7                  | 23.05 | 21.91 | 25.68                                | 25.03 | 23.89 |
|           |                | 1851.5          | 23.72                 | 23    | 21.91 | 25.70                                | 24.98 | 23.89 |
|           | 50% RB mid     | 1908.5          | 22.83                 | 21.86 | 20.85 | 24.81                                | 23.84 | 22.83 |
|           |                | 1880.0          | 22.81                 | 21.87 | 20.82 | 24.79                                | 23.85 | 22.80 |
|           |                | 1851.5          | 22.8                  | 21.88 | 20.83 | 24.78                                | 23.86 | 22.81 |
|           | 100% RB        | 1908.5          | 22.79                 | 21.78 | 20.79 | 24.77                                | 23.76 | 22.77 |
|           |                | 1880.0          | 22.75                 | 21.78 | 20.75 | 24.73                                | 23.76 | 22.73 |
|           |                | 1851.5          | 22.77                 | 21.77 | 20.74 | 24.75                                | 23.75 | 22.72 |
| 5MHz      | 1 RB high      | 1907.5          | 24.06                 | 22.77 | 21.76 | 26.04                                | 24.75 | 23.74 |
|           |                | 1880.0          | 23.55                 | 22.99 | 21.83 | 25.53                                | 24.97 | 23.81 |
|           |                | 1852.5          | 23.61                 | 22.84 | 21.85 | 25.59                                | 24.82 | 23.83 |
|           | 1 RB low       | 1907.5          | 23.59                 | 22.98 | 21.81 | 25.57                                | 24.96 | 23.79 |
|           |                | 1880.0          | 23.59                 | 22.91 | 21.84 | 25.57                                | 24.89 | 23.82 |
|           |                | 1852.5          | 23.59                 | 22.84 | 21.84 | 25.57                                | 24.82 | 23.82 |
|           | 50% RB mid     | 1907.5          | 22.85                 | 21.84 | 20.87 | 24.83                                | 23.82 | 22.85 |
|           |                | 1880.0          | 22.83                 | 21.85 | 20.83 | 24.81                                | 23.83 | 22.81 |
|           |                | 1852.5          | 22.83                 | 21.83 | 20.87 | 24.81                                | 23.81 | 22.85 |
|           | 100% RB        | 1907.5          | 22.79                 | 21.79 | 20.79 | 24.77                                | 23.77 | 22.77 |
|           |                | 1880.0          | 22.76                 | 21.78 | 20.77 | 24.74                                | 23.76 | 22.75 |
|           |                | 1852.5          | 22.81                 | 21.82 | 20.84 | 24.79                                | 23.80 | 22.82 |



|       |            |        |       |       |       |       |       |       |
|-------|------------|--------|-------|-------|-------|-------|-------|-------|
| 10MHz | 1 RB high  | 1905.0 | 24.16 | 23.01 | 21.92 | 26.14 | 24.99 | 23.90 |
|       |            | 1880.0 | 23.66 | 23.04 | 21.86 | 25.64 | 25.02 | 23.84 |
|       |            | 1855.0 | 23.68 | 22.99 | 21.87 | 25.66 | 24.97 | 23.85 |
|       | 1 RB low   | 1905.0 | 24.18 | 22.96 | 21.88 | 26.16 | 24.94 | 23.86 |
|       |            | 1880.0 | 23.68 | 23.04 | 21.89 | 25.66 | 25.02 | 23.87 |
|       |            | 1855.0 | 23.7  | 23.09 | 21.96 | 25.68 | 25.07 | 23.94 |
|       | 50% RB mid | 1905.0 | 22.92 | 21.82 | 20.92 | 24.90 | 23.80 | 22.90 |
|       |            | 1880.0 | 22.83 | 21.82 | 21.12 | 24.81 | 23.80 | 23.10 |
|       |            | 1855.0 | 22.92 | 21.85 | 20.94 | 24.90 | 23.83 | 22.92 |
|       | 100% RB    | 1905.0 | 22.94 | 21.81 | 21    | 24.92 | 23.79 | 22.98 |
|       |            | 1880.0 | 22.81 | 21.82 | 20.88 | 24.79 | 23.80 | 22.86 |
|       |            | 1855.0 | 22.98 | 21.89 | 20.87 | 24.96 | 23.87 | 22.85 |
| 15MHz | 1 RB high  | 1902.5 | 24.11 | 23.38 | 22.32 | 26.09 | 25.36 | 24.30 |
|       |            | 1880.0 | 24.11 | 23.4  | 22.33 | 26.09 | 25.38 | 24.31 |
|       |            | 1857.5 | 24.1  | 23.42 | 22.35 | 26.08 | 25.40 | 24.33 |
|       | 1 RB low   | 1902.5 | 24.14 | 23.43 | 22.29 | 26.12 | 25.41 | 24.27 |
|       |            | 1880.0 | 24.14 | 23.44 | 22.35 | 26.12 | 25.42 | 24.33 |
|       |            | 1857.5 | 24.18 | 23.39 | 22.38 | 26.16 | 25.37 | 24.36 |
|       | 50% RB mid | 1902.5 | 23.31 | 22.34 | 21.32 | 25.29 | 24.32 | 23.30 |
|       |            | 1880.0 | 23.28 | 22.32 | 21.29 | 25.26 | 24.30 | 23.27 |
|       |            | 1857.5 | 23.28 | 22.32 | 21.32 | 25.26 | 24.30 | 23.30 |
|       | 100% RB    | 1902.5 | 23.28 | 22.31 | 21.28 | 25.26 | 24.29 | 23.26 |
|       |            | 1880.0 | 23.27 | 22.31 | 21.31 | 25.25 | 24.29 | 23.29 |
|       |            | 1857.5 | 23.27 | 22.31 | 21.28 | 25.25 | 24.29 | 23.26 |
| 20MHz | 1 RB high  | 1900.0 | 24.01 | 23.29 | 22.18 | 25.99 | 25.27 | 24.16 |
|       |            | 1880.0 | 24.02 | 23.32 | 22.19 | 26.00 | 25.30 | 24.17 |
|       |            | 1860.0 | 24    | 23.21 | 22.15 | 25.98 | 25.19 | 24.13 |
|       | 1 RB low   | 1900.0 | 24.06 | 23.25 | 22.26 | 26.04 | 25.23 | 24.24 |
|       |            | 1880.0 | 24.06 | 23.22 | 22.24 | 26.04 | 25.20 | 24.22 |
|       |            | 1860.0 | 24.04 | 23.18 | 22.25 | 26.02 | 25.16 | 24.23 |
|       | 50% RB mid | 1900.0 | 23.39 | 22.42 | 21.36 | 25.37 | 24.40 | 23.34 |
|       |            | 1880.0 | 23.35 | 22.4  | 21.36 | 25.33 | 24.38 | 23.34 |
|       |            | 1860.0 | 23.35 | 22.4  | 21.35 | 25.33 | 24.38 | 23.33 |
|       | 100% RB    | 1900.0 | 23.28 | 22.33 | 21.29 | 25.26 | 24.31 | 23.27 |
|       |            | 1880.0 | 23.32 | 22.35 | 21.34 | 25.30 | 24.33 | 23.32 |
|       |            | 1860.0 | 23.28 | 22.31 | 21.31 | 25.26 | 24.29 | 23.29 |

**LTE band 5- ERP**
**Limits:** ≤38.45dBm (7W)

Max ERP: 20.56dBm

| Bandwidth | RB size/offset | Frequency (MHz) | Conducted Power (dBm) |       |       | Radiated Power (dBm)<br>GT =-1.46dBi |       |       |
|-----------|----------------|-----------------|-----------------------|-------|-------|--------------------------------------|-------|-------|
|           |                |                 | QPSK                  | 16QAM | 64QAM | QPSK                                 | 16QAM | 64QAM |
| 1.4MHz    | 1 RB high      | 848.3           | 24.14                 | 22.89 | 21.9  | 20.53                                | 19.28 | 18.29 |
|           |                | 836.5           | 23.77                 | 22.93 | 21.91 | 20.16                                | 19.32 | 18.30 |
|           |                | 824.7           | 23.72                 | 22.96 | 21.9  | 20.11                                | 19.35 | 18.29 |
|           | 1 RB low       | 848.3           | 23.65                 | 22.94 | 21.84 | 20.04                                | 19.33 | 18.23 |
|           |                | 836.5           | 23.75                 | 22.91 | 21.89 | 20.14                                | 19.30 | 18.28 |
|           |                | 824.7           | 23.74                 | 22.93 | 21.89 | 20.13                                | 19.32 | 18.28 |
|           | 50% RB mid     | 848.3           | 23.81                 | 22.84 | 21.85 | 20.20                                | 19.23 | 18.24 |
|           |                | 836.5           | 23.89                 | 22.83 | 21.97 | 20.28                                | 19.22 | 18.36 |
|           |                | 824.7           | 23.87                 | 22.85 | 21.94 | 20.26                                | 19.24 | 18.33 |
|           | 100% RB        | 848.3           | 22.79                 | 21.84 | 20.78 | 19.18                                | 18.23 | 17.17 |
|           |                | 836.5           | 22.89                 | 21.91 | 20.86 | 19.28                                | 18.30 | 17.25 |
|           |                | 824.7           | 22.86                 | 21.89 | 20.86 | 19.25                                | 18.28 | 17.25 |
| 3MHz      | 1 RB high      | 847.5           | 24.17                 | 22.91 | 21.86 | 20.56                                | 19.30 | 18.25 |
|           |                | 836.5           | 23.79                 | 22.98 | 21.92 | 20.18                                | 19.37 | 18.31 |
|           |                | 825.5           | 23.76                 | 22.96 | 21.89 | 20.15                                | 19.35 | 18.28 |
|           | 1 RB low       | 847.5           | 23.72                 | 22.88 | 21.82 | 20.11                                | 19.27 | 18.21 |
|           |                | 836.5           | 23.8                  | 23.07 | 21.86 | 20.19                                | 19.46 | 18.25 |
|           |                | 825.5           | 23.79                 | 23.07 | 21.96 | 20.18                                | 19.46 | 18.35 |
|           | 50% RB mid     | 847.5           | 22.79                 | 21.84 | 20.82 | 19.18                                | 18.23 | 17.21 |
|           |                | 836.5           | 22.85                 | 21.85 | 20.88 | 19.24                                | 18.24 | 17.27 |
|           |                | 825.5           | 22.81                 | 21.86 | 20.87 | 19.20                                | 18.25 | 17.26 |
|           | 100% RB        | 847.5           | 22.75                 | 21.75 | 20.76 | 19.14                                | 18.14 | 17.15 |
|           |                | 836.5           | 22.8                  | 21.79 | 20.85 | 19.19                                | 18.18 | 17.24 |
|           |                | 825.5           | 22.84                 | 21.81 | 20.82 | 19.23                                | 18.20 | 17.21 |
| 5MHz      | 1 RB high      | 846.5           | 24.07                 | 22.88 | 21.8  | 20.46                                | 19.27 | 18.19 |
|           |                | 836.5           | 23.67                 | 22.96 | 21.85 | 20.06                                | 19.35 | 18.24 |
|           |                | 826.5           | 23.65                 | 22.92 | 21.85 | 20.04                                | 19.31 | 18.24 |
|           | 1 RB low       | 846.5           | 23.68                 | 22.83 | 21.78 | 20.07                                | 19.22 | 18.17 |
|           |                | 836.5           | 23.7                  | 22.9  | 21.86 | 20.09                                | 19.29 | 18.25 |
|           |                | 826.5           | 23.7                  | 22.99 | 21.86 | 20.09                                | 19.38 | 18.25 |
|           | 50% RB mid     | 846.5           | 22.8                  | 21.76 | 20.84 | 19.19                                | 18.15 | 17.23 |
|           |                | 836.5           | 22.87                 | 21.82 | 20.89 | 19.26                                | 18.21 | 17.28 |
|           |                | 826.5           | 22.83                 | 21.78 | 20.88 | 19.22                                | 18.17 | 17.27 |
|           | 100% RB        | 846.5           | 22.76                 | 21.77 | 20.79 | 19.15                                | 18.16 | 17.18 |
|           |                | 836.5           | 22.83                 | 21.8  | 20.82 | 19.22                                | 18.19 | 17.21 |
|           |                | 826.5           | 22.79                 | 21.81 | 20.82 | 19.18                                | 18.20 | 17.21 |

|       |            |       |       |       |       |       |       |       |
|-------|------------|-------|-------|-------|-------|-------|-------|-------|
| 10MHz | 1 RB high  | 844   | 23.75 | 23.08 | 21.88 | 20.14 | 19.47 | 18.27 |
|       |            | 836.5 | 23.78 | 22.93 | 21.98 | 20.17 | 19.32 | 18.37 |
|       |            | 829   | 23.77 | 23.02 | 21.85 | 20.16 | 19.41 | 18.24 |
|       | 1 RB low   | 844   | 23.84 | 22.98 | 21.97 | 20.23 | 19.37 | 18.36 |
|       |            | 836.5 | 23.79 | 22.98 | 21.9  | 20.18 | 19.37 | 18.29 |
|       |            | 829   | 23.8  | 23.03 | 21.91 | 20.19 | 19.42 | 18.30 |
|       | 50% RB mid | 844   | 22.85 | 21.83 | 20.9  | 19.24 | 18.22 | 17.29 |
|       |            | 836.5 | 22.9  | 21.88 | 21.47 | 19.29 | 18.27 | 17.86 |
|       |            | 829   | 22.88 | 21.87 | 20.91 | 19.27 | 18.26 | 17.30 |
|       | 100% RB    | 844   | 22.86 | 21.86 | 20.89 | 19.25 | 18.25 | 17.28 |
|       |            | 836.5 | 22.92 | 21.9  | 20.9  | 19.31 | 18.29 | 17.29 |
|       |            | 829   | 22.86 | 21.83 | 20.87 | 19.25 | 18.22 | 17.26 |

**LTE band 12- EIRP**
**Limits:** ≤34.77dBm (3W)

Max ERP: 20.16dBm

| Bandwidth | RB size/offset | Frequency (MHz) | Conducted Power (dBm) |       |       | Radiated Power (dBm)<br>GT = -0.99dB |       |       |
|-----------|----------------|-----------------|-----------------------|-------|-------|--------------------------------------|-------|-------|
|           |                |                 | QPSK                  | 16QAM | 64QAM | QPSK                                 | 16QAM | 64QAM |
| 1.4MHz    | 1 RB high      | 715.3           | 23.18                 | 22    | 20.92 | 20.04                                | 18.86 | 17.78 |
|           |                | 707.5           | 22.77                 | 22.17 | 20.95 | 19.63                                | 19.03 | 17.81 |
|           |                | 699.7           | 22.74                 | 22.01 | 21.04 | 19.60                                | 18.87 | 17.90 |
|           | 1 RB low       | 715.3           | 23.17                 | 21.92 | 20.91 | 20.03                                | 18.78 | 17.77 |
|           |                | 707.5           | 22.73                 | 22.06 | 20.91 | 19.59                                | 18.92 | 17.77 |
|           |                | 699.7           | 22.73                 | 22.11 | 20.91 | 19.59                                | 18.97 | 17.77 |
|           | 50% RB mid     | 715.3           | 22.85                 | 21.87 | 20.95 | 19.71                                | 18.73 | 17.81 |
|           |                | 707.5           | 22.91                 | 21.96 | 21.04 | 19.77                                | 18.82 | 17.90 |
|           |                | 699.7           | 22.89                 | 21.91 | 21.03 | 19.75                                | 18.77 | 17.89 |
|           | 100% RB        | 715.3           | 21.81                 | 20.89 | 19.75 | 18.67                                | 17.75 | 16.61 |
|           |                | 707.5           | 21.86                 | 20.91 | 19.89 | 18.72                                | 17.77 | 16.75 |
|           |                | 699.7           | 21.87                 | 20.96 | 19.89 | 18.73                                | 17.82 | 16.75 |
| 3MHz      | 1 RB high      | 714.5           | 23.24                 | 22.25 | 21.32 | 20.10                                | 19.11 | 18.18 |
|           |                | 707.5           | 23.29                 | 22.59 | 21.52 | 20.15                                | 19.45 | 18.38 |
|           |                | 700.5           | 23.25                 | 22.29 | 21.39 | 20.11                                | 19.15 | 18.25 |
|           | 1 RB low       | 714.5           | 23.24                 | 22.37 | 20.98 | 20.10                                | 19.23 | 17.84 |
|           |                | 707.5           | 23.25                 | 22.53 | 21.12 | 20.11                                | 19.39 | 17.98 |
|           |                | 700.5           | 23.08                 | 22.2  | 21.33 | 19.94                                | 19.06 | 18.19 |
|           | 50% RB mid     | 714.5           | 22.32                 | 21.17 | 20.26 | 19.18                                | 18.03 | 17.12 |
|           |                | 707.5           | 22.36                 | 21.43 | 20.4  | 19.22                                | 18.29 | 17.26 |
|           |                | 700.5           | 22.36                 | 21.27 | 20.39 | 19.22                                | 18.13 | 17.25 |
|           | 100% RB        | 714.5           | 22.28                 | 21.23 | 20.17 | 19.14                                | 18.09 | 17.03 |
|           |                | 707.5           | 22.33                 | 21.23 | 20.28 | 19.19                                | 18.09 | 17.14 |
|           |                | 700.5           | 22.32                 | 21.23 | 20.3  | 19.18                                | 18.09 | 17.16 |
| 5MHz      | 1 RB high      | 713.5           | 23.11                 | 22.36 | 21.37 | 19.97                                | 19.22 | 18.23 |
|           |                | 707.5           | 23.17                 | 22.46 | 21.39 | 20.03                                | 19.32 | 18.25 |
|           |                | 701.5           | 23.17                 | 22.55 | 21.35 | 20.03                                | 19.41 | 18.21 |
|           | 1 RB low       | 713.5           | 23.19                 | 22.52 | 21.46 | 20.05                                | 19.38 | 18.32 |
|           |                | 707.5           | 23.16                 | 22.49 | 21.38 | 20.02                                | 19.35 | 18.24 |
|           |                | 701.5           | 23.17                 | 22.49 | 21.35 | 20.03                                | 19.35 | 18.21 |
|           | 50% RB mid     | 713.5           | 22.35                 | 21.33 | 20.36 | 19.21                                | 18.19 | 17.22 |
|           |                | 707.5           | 22.44                 | 21.43 | 20.41 | 19.30                                | 18.29 | 17.27 |
|           |                | 701.5           | 22.38                 | 21.38 | 20.39 | 19.24                                | 18.24 | 17.25 |
|           | 100% RB        | 713.5           | 22.27                 | 21.32 | 20.29 | 19.13                                | 18.18 | 17.15 |
|           |                | 707.5           | 22.35                 | 21.35 | 20.34 | 19.21                                | 18.21 | 17.20 |
|           |                | 701.5           | 22.3                  | 21.34 | 20.27 | 19.16                                | 18.20 | 17.13 |

|       |            |       |       |       |       |       |       |       |
|-------|------------|-------|-------|-------|-------|-------|-------|-------|
| 10MHz | 1 RB high  | 711   | 23.21 | 22.47 | 21.43 | 20.07 | 19.33 | 18.29 |
|       |            | 707.5 | 23.22 | 22.63 | 21.53 | 20.08 | 19.49 | 18.39 |
|       |            | 704   | 23.29 | 22.66 | 21.48 | 20.15 | 19.52 | 18.34 |
|       | 1 RB low   | 711   | 23.3  | 22.62 | 21.57 | 20.16 | 19.48 | 18.43 |
|       |            | 707.5 | 23.27 | 22.57 | 21.5  | 20.13 | 19.43 | 18.36 |
|       |            | 704   | 23.3  | 22.54 | 21.48 | 20.16 | 19.40 | 18.34 |
|       | 50% RB mid | 711   | 22.42 | 21.42 | 20.42 | 19.28 | 18.28 | 17.28 |
|       |            | 707.5 | 22.46 | 21.45 | 20.41 | 19.32 | 18.31 | 17.27 |
|       |            | 704   | 22.46 | 21.44 | 20.44 | 19.32 | 18.30 | 17.30 |
|       | 100% RB    | 711   | 22.33 | 21.32 | 20.36 | 19.19 | 18.18 | 17.22 |
|       |            | 707.5 | 22.47 | 21.46 | 20.46 | 19.33 | 18.32 | 17.32 |
|       |            | 704   | 22.43 | 21.44 | 20.42 | 19.29 | 18.30 | 17.28 |

**LTE band 13- EIRP**
**Limits:** ≤34.77dBm (3W)

Max ERP: 20.44dBm

| Bandwidth | RB size/offset | Frequency (MHz) | Conducted Power (dBm) |       |       | Radiated Power (dBm)<br>GT = -1.16dB |       |       |
|-----------|----------------|-----------------|-----------------------|-------|-------|--------------------------------------|-------|-------|
|           |                |                 | QPSK                  | 16QAM | 64QAM | QPSK                                 | 16QAM | 64QAM |
| 5MHz      | 1 RB high      | 784.5           | 23.58                 | 22.85 | 21.75 | 20.27                                | 19.54 | 18.44 |
|           |                | 782             | 23.61                 | 22.85 | 21.73 | 20.30                                | 19.54 | 18.42 |
|           |                | 779.5           | 23.62                 | 22.79 | 21.8  | 20.31                                | 19.48 | 18.49 |
|           | 1 RB low       | 784.5           | 23.66                 | 23.03 | 21.87 | 20.35                                | 19.72 | 18.56 |
|           |                | 782             | 23.63                 | 22.82 | 21.79 | 20.32                                | 19.51 | 18.48 |
|           |                | 779.5           | 23.63                 | 22.79 | 21.86 | 20.32                                | 19.48 | 18.55 |
|           | 50% RB mid     | 784.5           | 22.79                 | 21.75 | 20.85 | 19.48                                | 18.44 | 17.54 |
|           |                | 782             | 22.79                 | 21.76 | 20.83 | 19.48                                | 18.45 | 17.52 |
|           |                | 779.5           | 22.79                 | 21.76 | 20.84 | 19.48                                | 18.45 | 17.53 |
|           | 100% RB        | 784.5           | 22.73                 | 21.72 | 20.75 | 19.42                                | 18.41 | 17.44 |
|           |                | 782             | 22.73                 | 21.72 | 20.79 | 19.42                                | 18.41 | 17.48 |
|           |                | 779.5           | 22.71                 | 21.7  | 20.74 | 19.40                                | 18.39 | 17.43 |
| 10MHz     | 1 RB high      | 782             | 23.7                  | 22.96 | 21.85 | 20.39                                | 19.65 | 18.54 |
|           | 1 RB low       | 782             | 23.75                 | 23.05 | 21.89 | 20.44                                | 19.74 | 18.58 |
|           | 50% RB mid     | 782             | 22.81                 | 21.8  | 20.85 | 19.50                                | 18.49 | 17.54 |
|           | 100% RB        | 782             | 22.79                 | 21.78 | 20.83 | 19.48                                | 18.47 | 17.52 |

**LTE band 66- EIRP**
**Limits:** ≤30.00dBm (1W)

Max ERP: 26.86dBm

| Bandwidth | RB size/offset | Frequency (MHz) | Conducted Power (dBm) |       |       | Radiated Power (dBm)<br>GT = 2.68dBi |       |       |
|-----------|----------------|-----------------|-----------------------|-------|-------|--------------------------------------|-------|-------|
|           |                |                 | QPSK                  | 16QAM | 64QAM | QPSK                                 | 16QAM | 64QAM |
| 1.4MHz    | 1 RB high      | 1754.3          | 24.01                 | 23.23 | 22.2  | 26.69                                | 25.91 | 24.88 |
|           |                | 1732.5          | 23.96                 | 23.16 | 22.16 | 26.64                                | 25.84 | 24.84 |
|           |                | 1710.7          | 24                    | 23.23 | 22.19 | 26.68                                | 25.91 | 24.87 |
|           | 1 RB low       | 1754.3          | 23.99                 | 23.14 | 22.22 | 26.67                                | 25.82 | 24.90 |
|           |                | 1732.5          | 23.95                 | 23.21 | 22.15 | 26.63                                | 25.89 | 24.83 |
|           |                | 1710.7          | 24                    | 23.22 | 22.22 | 26.68                                | 25.90 | 24.90 |
|           | 50% RB mid     | 1754.3          | 24.18                 | 23.1  | 22.23 | 26.86                                | 25.78 | 24.91 |
|           |                | 1732.5          | 24.14                 | 23.1  | 22.22 | 26.82                                | 25.78 | 24.90 |
|           |                | 1710.7          | 24.16                 | 23.13 | 22.32 | 26.84                                | 25.81 | 25.00 |
|           | 100% RB        | 1754.3          | 23.13                 | 22.21 | 21.17 | 25.81                                | 24.89 | 23.85 |
|           |                | 1732.5          | 23.08                 | 22.25 | 21.14 | 25.76                                | 24.93 | 23.82 |
|           |                | 1710.7          | 23.13                 | 22.25 | 21.15 | 25.81                                | 24.93 | 23.83 |
| 3MHz      | 1 RB high      | 1753.5          | 24.05                 | 23.22 | 22.2  | 26.73                                | 25.90 | 24.88 |
|           |                | 1732.5          | 24.01                 | 23.23 | 22.24 | 26.69                                | 25.91 | 24.92 |
|           |                | 1711.5          | 24.09                 | 23.29 | 22.21 | 26.77                                | 25.97 | 24.89 |
|           | 1 RB low       | 1753.5          | 24.05                 | 23.29 | 22.32 | 26.73                                | 25.97 | 25.00 |
|           |                | 1732.5          | 24.02                 | 23.2  | 22.17 | 26.70                                | 25.88 | 24.85 |
|           |                | 1711.5          | 24.07                 | 23.28 | 22.28 | 26.75                                | 25.96 | 24.96 |
|           | 50% RB mid     | 1753.5          | 23.12                 | 22.21 | 21.2  | 25.80                                | 24.89 | 23.88 |
|           |                | 1732.5          | 23.06                 | 22.2  | 21.18 | 25.74                                | 24.88 | 23.86 |
|           |                | 1711.5          | 23.13                 | 22.24 | 21.21 | 25.81                                | 24.92 | 23.89 |
|           | 100% RB        | 1753.5          | 23.09                 | 22.15 | 21.1  | 25.77                                | 24.83 | 23.78 |
|           |                | 1732.5          | 23.05                 | 22.08 | 21.09 | 25.73                                | 24.76 | 23.77 |
|           |                | 1711.5          | 23.11                 | 22.13 | 21.13 | 25.79                                | 24.81 | 23.81 |
| 5MHz      | 1 RB high      | 1752.5          | 23.94                 | 23.05 | 22.2  | 26.62                                | 25.73 | 24.88 |
|           |                | 1732.5          | 23.9                  | 23.07 | 22.08 | 26.58                                | 25.75 | 24.76 |
|           |                | 1712.5          | 23.96                 | 23.19 | 22.2  | 26.64                                | 25.87 | 24.88 |
|           | 1 RB low       | 1752.5          | 23.94                 | 23.14 | 22.14 | 26.62                                | 25.82 | 24.82 |
|           |                | 1732.5          | 23.89                 | 23.09 | 22.22 | 26.57                                | 25.77 | 24.90 |
|           |                | 1712.5          | 23.97                 | 23.23 | 22.1  | 26.65                                | 25.91 | 24.78 |
|           | 50% RB mid     | 1752.5          | 23.16                 | 22.16 | 21.17 | 25.84                                | 24.84 | 23.85 |
|           |                | 1732.5          | 23.08                 | 22.13 | 21.16 | 25.76                                | 24.81 | 23.84 |
|           |                | 1712.5          | 23.14                 | 22.19 | 21.2  | 25.82                                | 24.87 | 23.88 |
|           | 100% RB        | 1752.5          | 23.12                 | 22.15 | 21.17 | 25.80                                | 24.83 | 23.85 |
|           |                | 1732.5          | 23.07                 | 22.12 | 21.13 | 25.75                                | 24.80 | 23.81 |
|           |                | 1712.5          | 23.11                 | 22.19 | 21.15 | 25.79                                | 24.87 | 23.83 |

|       |            |        |       |       |       |       |       |       |
|-------|------------|--------|-------|-------|-------|-------|-------|-------|
| 10MHz | 1 RB high  | 1750   | 24.05 | 23.27 | 22.19 | 26.73 | 25.95 | 24.87 |
|       |            | 1732.5 | 24.01 | 23.28 | 22.23 | 26.69 | 25.96 | 24.91 |
|       |            | 1715   | 24.05 | 23.34 | 22.33 | 26.73 | 26.02 | 25.01 |
|       | 1 RB low   | 1750   | 24.06 | 23.23 | 22.29 | 26.74 | 25.91 | 24.97 |
|       |            | 1732.5 | 24.02 | 23.31 | 22.2  | 26.70 | 25.99 | 24.88 |
|       |            | 1715   | 24.07 | 23.25 | 22.23 | 26.75 | 25.93 | 24.91 |
|       | 50% RB mid | 1750   | 23.14 | 22.18 | 21.16 | 25.82 | 24.86 | 23.84 |
|       |            | 1732.5 | 23.12 | 22.17 | 21.17 | 25.80 | 24.85 | 23.85 |
|       |            | 1715   | 23.15 | 22.21 | 21.22 | 25.83 | 24.89 | 23.90 |
|       | 100% RB    | 1750   | 23.2  | 22.25 | 21.24 | 25.88 | 24.93 | 23.92 |
|       |            | 1732.5 | 23.18 | 22.25 | 21.23 | 25.86 | 24.93 | 23.91 |
|       |            | 1715   | 23.16 | 22.26 | 21.21 | 25.84 | 24.94 | 23.89 |
| 15MHz | 1 RB high  | 1747.5 | 23.96 | 23.18 | 22.23 | 26.64 | 25.86 | 24.91 |
|       |            | 1732.5 | 23.92 | 23.14 | 22.2  | 26.60 | 25.82 | 24.88 |
|       |            | 1717.5 | 23.97 | 23.16 | 22.21 | 26.65 | 25.84 | 24.89 |
|       | 1 RB low   | 1747.5 | 23.97 | 23.19 | 22.14 | 26.65 | 25.87 | 24.82 |
|       |            | 1732.5 | 24    | 23.28 | 22.21 | 26.68 | 25.96 | 24.89 |
|       |            | 1717.5 | 23.99 | 23.2  | 22.2  | 26.67 | 25.88 | 24.88 |
|       | 50% RB mid | 1747.5 | 23.16 | 22.19 | 21.18 | 25.84 | 24.87 | 23.86 |
|       |            | 1732.5 | 23.17 | 22.17 | 21.2  | 25.85 | 24.85 | 23.88 |
|       |            | 1717.5 | 23.16 | 22.18 | 21.18 | 25.84 | 24.86 | 23.86 |
|       | 100% RB    | 1747.5 | 23.16 | 22.22 | 21.2  | 25.84 | 24.90 | 23.88 |
|       |            | 1732.5 | 23.14 | 22.18 | 21.19 | 25.82 | 24.86 | 23.87 |
|       |            | 1717.5 | 23.14 | 22.18 | 21.15 | 25.82 | 24.86 | 23.83 |
| 20MHz | 1 RB high  | 1745   | 23.76 | 22.98 | 21.98 | 26.44 | 25.66 | 24.66 |
|       |            | 1732.5 | 23.71 | 22.9  | 21.91 | 26.39 | 25.58 | 24.59 |
|       |            | 1720   | 23.82 | 22.99 | 21.98 | 26.50 | 25.67 | 24.66 |
|       | 1 RB low   | 1745   | 23.76 | 23    | 21.9  | 26.44 | 25.68 | 24.58 |
|       |            | 1732.5 | 23.78 | 23.01 | 22.02 | 26.46 | 25.69 | 24.70 |
|       |            | 1720   | 23.81 | 23.11 | 21.99 | 26.49 | 25.79 | 24.67 |
|       | 50% RB mid | 1745   | 23.15 | 22.21 | 21.2  | 25.83 | 24.89 | 23.88 |
|       |            | 1732.5 | 23.15 | 22.2  | 21.21 | 25.83 | 24.88 | 23.89 |
|       |            | 1720   | 23.14 | 22.18 | 21.2  | 25.82 | 24.86 | 23.88 |
|       | 100% RB    | 1745   | 23.08 | 22.13 | 21.12 | 25.76 | 24.81 | 23.80 |
|       |            | 1732.5 | 23.11 | 22.16 | 21.16 | 25.79 | 24.84 | 23.84 |
|       |            | 1720   | 23.12 | 22.12 | 21.13 | 25.80 | 24.80 | 23.81 |



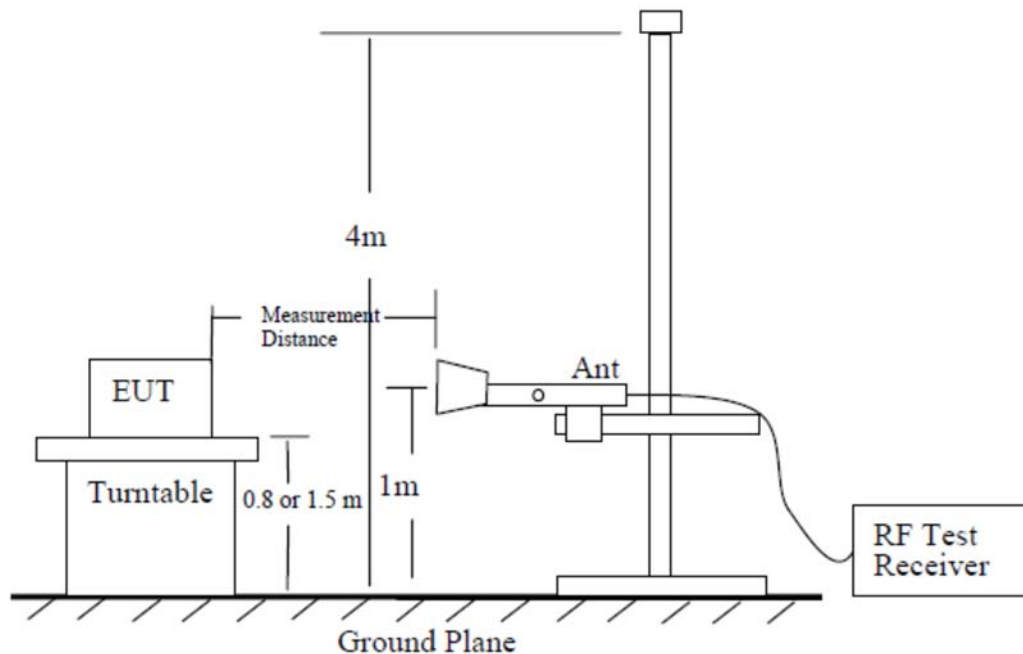
## **A.2 Emission Limit**

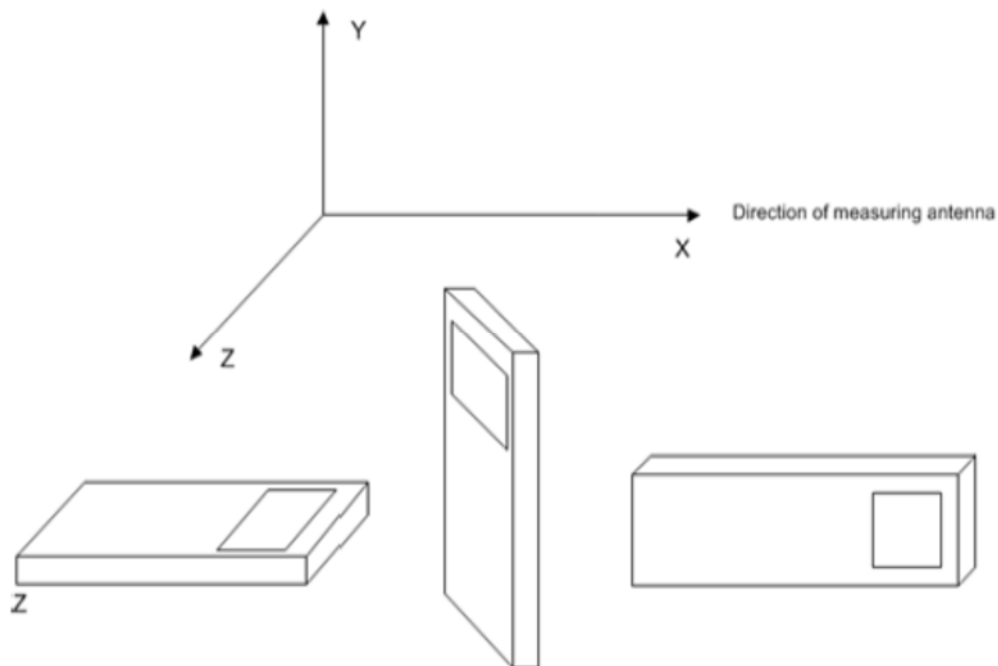
The measurements procedures in C63.26 are used.

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

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

Using the test configuration as follow, measure the radiated emissions directly from the EUT and convert the measured field strength or received power to ERP or EIRP, as required, for comparison to the applicable limits.





The emission characteristics of the EUT can be identified from the pre-scan measurement information.

Exploratory radiated measurements (pre-scans) may be performed to determine the general EUT radiated emissions characteristics and, when necessary, the EUT-to-measurement antenna orientation that produces the maximum emission amplitude. Pre-scans shall only be used to determine the emission frequencies (i.e., not amplitude levels). The information garnered from a pre-scan can then be used to perform final compliance measurements using either the substitution or direct field strength method.

For radiated emissions measurements performed at frequencies less than or equal to 1 GHz, the EUT shall be placed on a RF-transparent table or support at a nominal height of 80 cm above the reference ground plane. Radiated measurements shall be made with the measurement antenna positioned in both horizontal and vertical polarization. The measurement antenna shall be varied from 1 m to 4 m in height above the reference ground in a search for the relative positioning that produces the maximum radiated signal level (i.e., field strength or received power). When orienting the measurement antenna in vertical polarization, the minimum height of the lowest element of the antenna shall clear the site reference ground plane by at least 25 cm.

The radiated emission measurements of all non-harmonic and harmonics of the transmit frequency through the 10th harmonic were measured with peak detector.

For radiated measurements performed at frequencies above 1 GHz, the EUT shall be placed on an RF transparent table or support at a nominal height of 1.5 m above the ground plane. When maximizing the emissions from the EUT for measurement, the EUT and its transmitting antenna(s) shall be rotated through 360°. For each mode of operation to be tested, the frequency spectrum (based on findings from exploratory measurements) shall be monitored. Final measurements shall be performed for the worst case combination(s) of variable technical parameters that result in the maximum measured emission amplitude, record the frequency and amplitude of the highest fundamental emission (if applicable), and the frequency and amplitude data for the six highest-amplitude spurious emissions.

### A.2.2 Measurement Limit

**FDD Band 2:** 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 5:** 22.917(a) specifies " Out of band emissions. 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:** 27.53(g) specifies " 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 13:** 27.53(f) specifies " For operations in the 746-758 MHz, 775-788 MHz, and 805-806 MHz bands, emissions in the band 1559-1610 MHz shall be limited to  $-70$  dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and  $-80$  dBW EIRP for discrete emissions of less than 700 Hz bandwidth. ".

**FDD Band 66/4:** 27.53(h) specifies "AWS emission limits—(1) General protection levels. Except as otherwise specified below, for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least  $43 + 10 \log_{10}(P)$  dB"

### A.2.3 Measurement Results

Radiated emissions measurements were made only at the upper, middle, and lower carrier frequencies of the LTE Bands. It was decided that measurements at these three carrier frequencies would be sufficient to demonstrate compliance with emissions limits because it was seen that all the significant spurs occur well outside the band and no radiation was seen from a carrier in one block of the LTE Bands 2/5/12/13/66 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) | P <sub>Mea</sub> (dBm) | Path Loss(dB) | Antenna Gain(dBi) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|---------------|-------------------|-----------------|-------------|-------------|--------------|
| 3702.02         | -56.14                 | 6.42          | 8.48              | -54.08          | -13.00      | 41.08       | H            |
| 5552.02         | -51.80                 | 7.18          | 10.59             | -48.39          | -13.00      | 35.39       | V            |
| 7403.01         | -52.82                 | 8.13          | 12.08             | -48.87          | -13.00      | 35.87       | V            |
| 9256.01         | -48.27                 | 9.05          | 13.25             | -44.07          | -13.00      | 31.07       | H            |
| 11056.01        | -49.27                 | 9.92          | 13.19             | -46.00          | -13.00      | 33.00       | V            |
| 13002.01        | -46.10                 | 10.48         | 13.50             | -43.08          | -13.00      | 30.08       | V            |

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

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | Path Loss(dB) | Antenna Gain(dBi) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|---------------|-------------------|-----------------|-------------|-------------|--------------|
| 3760.02         | -51.89                 | 6.26          | 8.56              | -49.59          | -13.00      | 36.59       | V            |
| 5642.02         | -49.79                 | 7.27          | 10.57             | -46.49          | -13.00      | 33.49       | H            |
| 7481.01         | -53.77                 | 8.34          | 12.18             | -49.93          | -13.00      | 36.93       | V            |
| 9404.01         | -48.95                 | 9.06          | 13.34             | -44.67          | -13.00      | 31.67       | H            |
| 11291.01        | -48.92                 | 9.94          | 13.14             | -45.72          | -13.00      | 32.72       | V            |
| 13116.01        | -44.11                 | 10.87         | 13.66             | -41.32          | -13.00      | 28.32       | V            |

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

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | Path Loss(dB) | Antenna Gain(dBi) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|---------------|-------------------|-----------------|-------------|-------------|--------------|
| 3819.02         | -54.52                 | 6.08          | 8.65              | -51.95          | -13.00      | 38.95       | H            |
| 5730.02         | -50.34                 | 7.29          | 10.55             | -47.08          | -13.00      | 34.08       | H            |
| 7639.01         | -52.97                 | 8.15          | 12.31             | -48.81          | -13.00      | 35.81       | H            |
| 9551.01         | -45.91                 | 9.36          | 13.35             | -41.92          | -13.00      | 28.92       | H            |
| 11484.01        | -48.48                 | 9.85          | 13.10             | -45.23          | -13.00      | 32.23       | V            |
| 13388.01        | -43.46                 | 10.57         | 14.04             | -39.99          | -13.00      | 26.99       | V            |

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

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | Path Loss(dB) | Antenna Gain(dBi) | Correction (dB) | Peak ERP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|---------------|-------------------|-----------------|----------------|-------------|-------------|--------------|
| 1636.01         | -53.40                 | 3.56          | 5.26              | 2.15            | -53.85         | -13.00      | 40.85       | H            |
| 2474.00         | -41.35                 | 4.60          | 6.02              | 2.15            | -42.08         | -13.00      | 29.08       | V            |
| 3284.02         | -61.49                 | 5.28          | 7.68              | 2.15            | -61.24         | -13.00      | 48.24       | H            |
| 4135.02         | -56.10                 | 6.06          | 9.04              | 2.15            | -55.27         | -13.00      | 42.27       | V            |
| 4954.01         | -57.65                 | 6.68          | 9.85              | 2.15            | -56.63         | -13.00      | 43.63       | V            |
| 5787.01         | -57.07                 | 7.21          | 10.54             | 2.15            | -55.89         | -13.00      | 42.89       | H            |

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

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | Path Loss(dB) | Antenna Gain(dBi) | Correction (dB) | Peak ERP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|---------------|-------------------|-----------------|----------------|-------------|-------------|--------------|
| 1662.01         | -54.46                 | 3.57          | 5.21              | 2.15            | -54.97         | -13.00      | 41.97       | H            |
| 2510.00         | -37.62                 | 4.63          | 6.12              | 2.15            | -38.28         | -13.00      | 25.28       | H            |
| 3350.02         | -60.41                 | 5.32          | 7.84              | 2.15            | -60.04         | -13.00      | 47.04       | V            |
| 4195.02         | -57.30                 | 6.19          | 9.10              | 2.15            | -56.54         | -13.00      | 43.54       | H            |
| 5028.01         | -57.87                 | 6.57          | 9.94              | 2.15            | -56.65         | -13.00      | 43.65       | V            |
| 5852.01         | -56.84                 | 7.24          | 10.53             | 2.15            | -55.70         | -13.00      | 42.70       | V            |

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

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | Path Loss(dB) | Antenna Gain(dBi) | Correction (dB) | Peak ERP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|---------------|-------------------|-----------------|----------------|-------------|-------------|--------------|
| 1697.01         | -52.06                 | 3.60          | 5.15              | 2.15            | -52.66         | -13.00      | 39.66       | V            |
| 2545.00         | -39.90                 | 4.66          | 6.18              | 2.15            | -40.53         | -13.00      | 27.53       | H            |
| 3395.02         | -60.10                 | 5.36          | 7.95              | 2.15            | -59.66         | -13.00      | 46.66       | V            |
| 4244.02         | -57.79                 | 6.25          | 9.14              | 2.15            | -57.05         | -13.00      | 44.05       | V            |
| 5086.01         | -56.81                 | 6.73          | 10.02             | 2.15            | -55.67         | -13.00      | 42.67       | H            |
| 5926.01         | -56.70                 | 7.47          | 10.51             | 2.15            | -55.81         | -13.00      | 42.81       | V            |

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

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | Path Loss(dB) | Antenna Gain(dBi) | Correction (dB) | Peak ERP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|---------------|-------------------|-----------------|----------------|-------------|-------------|--------------|
| 1330.01         | -56.18                 | 3.15          | 4.62              | 2.15            | -56.86         | -13.00      | 43.86       | H            |
| 2001.00         | -48.89                 | 4.06          | 4.60              | 2.15            | -50.50         | -13.00      | 37.50       | H            |
| 2681.00         | -44.87                 | 4.77          | 6.43              | 2.15            | -45.36         | -13.00      | 32.36       | H            |
| 3347.02         | -60.47                 | 5.32          | 7.83              | 2.15            | -60.11         | -13.00      | 47.11       | V            |
| 4019.02         | -58.56                 | 6.05          | 8.92              | 2.15            | -57.84         | -13.00      | 44.84       | V            |
| 4686.02         | -57.99                 | 6.49          | 9.59              | 2.15            | -57.04         | -13.00      | 44.04       | V            |

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

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | Path Loss(dB) | Antenna Gain(dBi) | Correction (dB) | Peak ERP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|---------------|-------------------|-----------------|----------------|-------------|-------------|--------------|
| 1427.01         | -55.48                 | 3.27          | 5.12              | 2.15            | -55.78         | -13.00      | 42.78       | H            |
| 2113.00         | -49.67                 | 4.20          | 4.94              | 2.15            | -51.08         | -13.00      | 38.08       | H            |
| 2823.00         | -45.37                 | 4.95          | 6.68              | 2.15            | -45.79         | -13.00      | 32.79       | H            |
| 3549.02         | -57.79                 | 5.81          | 8.27              | 2.15            | -57.48         | -13.00      | 44.48       | V            |
| 4236.02         | -56.83                 | 6.25          | 9.14              | 2.15            | -56.09         | -13.00      | 43.09       | H            |
| 4967.01         | -57.26                 | 6.66          | 9.87              | 2.15            | -56.20         | -13.00      | 43.20       | V            |

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

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | Path Loss(dB) | Antenna Gain(dBi) | Correction (dB) | Peak ERP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|---------------|-------------------|-----------------|----------------|-------------|-------------|--------------|
| 1430.01         | -55.13                 | 3.28          | 5.14              | 2.15            | -55.42         | -13.00      | 42.42       | H            |
| 2148.00         | -48.56                 | 4.24          | 5.04              | 2.15            | -49.91         | -13.00      | 36.91       | H            |
| 2863.00         | -45.51                 | 4.96          | 6.75              | 2.15            | -45.87         | -13.00      | 32.87       | H            |
| 3565.02         | -57.90                 | 5.98          | 8.29              | 2.15            | -57.74         | -13.00      | 44.74       | V            |
| 4304.02         | -57.92                 | 6.19          | 9.20              | 2.15            | -57.06         | -13.00      | 44.06       | V            |
| 5011.01         | -57.19                 | 6.58          | 9.92              | 2.15            | -56.00         | -13.00      | 43.00       | V            |

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

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | Path Loss(dB) | Antenna Gain(dBi) | Correction (dB) | Peak ERP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|---------------|-------------------|-----------------|----------------|-------------|-------------|--------------|
| 1559.81         | -67.01                 | 3.47          | 5.39              | 0.00            | -67.24         | -40.00      | 27.24       | H            |
| 2336.22         | -48.62                 | 4.44          | 5.61              | 2.15            | -49.60         | -13.00      | 36.60       | H            |
| 3120.02         | -59.45                 | 5.39          | 7.29              | 2.15            | -59.70         | -13.00      | 46.70       | V            |
| 3896.02         | -59.24                 | 6.11          | 8.75              | 2.15            | -58.75         | -13.00      | 45.75       | V            |
| 4681.02         | -59.07                 | 6.49          | 9.58              | 2.15            | -58.13         | -13.00      | 45.13       | V            |
| 5454.51         | -57.56                 | 6.89          | 10.54             | 2.15            | -56.06         | -13.00      | 43.06       | V            |

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

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | Path Loss(dB) | Antenna Gain(dBi) | Correction (dB) | Peak ERP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|---------------|-------------------|-----------------|----------------|-------------|-------------|--------------|
| 1564.30         | -66.84                 | 3.48          | 5.38              | 0.00            | -67.09         | -40.00      | 27.09       | H            |
| 2344.62         | -49.26                 | 4.45          | 5.63              | 2.15            | -50.23         | -13.00      | 37.23       | V            |
| 3129.02         | -59.27                 | 5.40          | 7.31              | 2.15            | -59.51         | -13.00      | 46.51       | V            |
| 3905.02         | -59.53                 | 6.11          | 8.77              | 2.15            | -59.02         | -13.00      | 46.02       | V            |
| 4687.52         | -58.86                 | 6.49          | 9.59              | 2.15            | -57.91         | -13.00      | 44.91       | V            |
| 5476.51         | -58.11                 | 6.97          | 10.57             | 2.15            | -56.66         | -13.00      | 43.66       | V            |

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

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | Path Loss(dB) | Antenna Gain(dBi) | Correction (dB) | Peak ERP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|---------------|-------------------|-----------------|----------------|-------------|-------------|--------------|
| 1569.40         | -66.84                 | 3.48          | 5.38              | 0.00            | -67.09         | -40.00      | 27.09       | H            |
| 2341.74         | -48.51                 | 4.45          | 5.63              | 2.15            | -49.48         | -13.00      | 36.48       | H            |
| 3125.02         | -59.48                 | 5.40          | 7.30              | 2.15            | -59.73         | -13.00      | 46.73       | V            |
| 3922.02         | -59.26                 | 6.12          | 8.79              | 2.15            | -58.74         | -13.00      | 45.74       | V            |
| 4721.02         | -58.19                 | 6.52          | 9.62              | 2.15            | -57.24         | -13.00      | 44.24       | V            |
| 5502.01         | -57.05                 | 7.07          | 10.60             | 2.15            | -55.67         | -13.00      | 42.67       | V            |

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

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | Path Loss(dB) | Antenna Gain(dBi) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|---------------|-------------------|-----------------|-------------|-------------|--------------|
| 3422.02         | -60.54                 | 5.38          | 8.01              | -57.91          | -13.00      | 44.91       | H            |
| 5131.02         | -66.35                 | 6.85          | 10.08             | -63.12          | -13.00      | 50.12       | V            |
| 6842.01         | -56.95                 | 7.84          | 11.41             | -53.38          | -13.00      | 40.38       | V            |
| 8553.01         | -52.12                 | 8.58          | 13.01             | -47.69          | -13.00      | 34.69       | V            |
| 10268.01        | -61.11                 | 9.53          | 13.01             | -57.63          | -13.00      | 44.63       | V            |
| 11998.01        | -58.45                 | 10.06         | 13.00             | -55.51          | -13.00      | 42.51       | V            |

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

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | Path Loss(dB) | Antenna Gain(dBi) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|---------------|-------------------|-----------------|-------------|-------------|--------------|
| 3490.02         | -64.77                 | 5.50          | 8.18              | -62.09          | -13.00      | 49.09       | H            |
| 5235.02         | -69.46                 | 7.00          | 10.23             | -66.23          | -13.00      | 53.23       | H            |
| 6981.01         | -57.09                 | 8.15          | 11.58             | -53.66          | -13.00      | 40.66       | H            |
| 8726.01         | -61.02                 | 8.44          | 13.05             | -56.41          | -13.00      | 43.41       | H            |
| 10453.01        | -60.35                 | 9.72          | 13.08             | -56.99          | -13.00      | 43.99       | V            |
| 12252.01        | -58.51                 | 10.03         | 13.10             | -55.44          | -13.00      | 42.44       | V            |

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

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | Path Loss(dB) | Antenna Gain(dBi) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|---------------|-------------------|-----------------|-------------|-------------|--------------|
| 3559.02         | -60.91                 | 5.92          | 8.28              | -58.55          | -13.00      | 45.55       | V            |
| 5340.02         | -66.58                 | 6.96          | 10.38             | -63.16          | -13.00      | 50.16       | V            |
| 7118.01         | -52.88                 | 8.16          | 11.74             | -49.30          | -13.00      | 36.30       | H            |
| 8899.01         | -58.37                 | 8.84          | 13.08             | -54.13          | -13.00      | 41.13       | V            |
| 10679.01        | -60.52                 | 9.30          | 13.14             | -56.68          | -13.00      | 43.68       | V            |
| 12407.01        | -58.50                 | 10.42         | 13.16             | -55.76          | -13.00      | 42.76       | V            |

Sample: 3559.02 MHz

Power (EIRP) = P<sub>Mea</sub> - P<sub>pl</sub> + G<sub>a</sub>

Power (-58.55dBm) = P<sub>Mea</sub> (-60.91dBm) - P<sub>pl</sub> (5.92dB) + G<sub>a</sub> (8.28 dBi)

Note: Expanded measurement uncertainty

| Frequency range | Expanded measurement uncertainty |
|-----------------|----------------------------------|
| 30MHz-1GHz      | 5.76dB, k=2                      |
| 1GHz-18GHz      | 4.69dB, k=2                      |
| 18GHz-40GHz     | 3.37dB, k=2                      |

Note: The measurement results showed here are worst cases



## **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 +50°C to -30°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              | 3.8        | 1850.865             | 1909.199             |            |                      |
| 50              |            |                      |                      | -6.84      | 0.0036               |
| 40              |            |                      |                      | -4.12      | 0.0022               |
| 30              |            |                      |                      | -4.96      | 0.0026               |
| 10              |            |                      |                      | -6.72      | 0.0036               |
| 0               |            |                      |                      | -5.79      | 0.0031               |
| -10             |            |                      |                      | -3.68      | 0.0020               |
| -20             |            |                      |                      | -6.49      | 0.0035               |
| -30             |            |                      |                      | -4.25      | 0.0023               |

##### 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              | 1850.865             | 1909.199             | -2.89      | 0.0015               |
| 4.35       |                 |                      |                      | -63.46     | 0.0338               |

#### 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              | 3.8        | 824.417              | 848.583              |            |                      |
| 50              |            |                      |                      | -1.03      | 0.0012               |
| 40              |            |                      |                      | -0.80      | 0.0010               |
| 30              |            |                      |                      | -0.33      | 0.0004               |
| 10              |            |                      |                      | -3.15      | 0.0038               |
| 0               |            |                      |                      | -1.72      | 0.0021               |
| -10             |            |                      |                      | -1.69      | 0.0020               |
| -20             |            |                      |                      | -2.65      | 0.0032               |
| -30             |            |                      |                      | -0.94      | 0.0011               |

##### 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              | 1.67       | 0.0020               |
| 4.35       |                 |                      |                      | -0.19      | 0.0002               |

### 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              | 3.8        | 699.481              | 715.519              |            |                      |
| 50              |            |                      |                      | 2.65       | 0.0037               |
| 40              |            |                      |                      | 2.36       | 0.0033               |
| 30              |            |                      |                      | 4.45       | 0.0063               |
| 10              |            |                      |                      | 0.99       | 0.0014               |
| 0               |            |                      |                      | 1.03       | 0.0015               |
| -10             |            |                      |                      | -1.75      | 0.0025               |
| -20             |            |                      |                      | 3.56       | 0.0050               |
| -30             |            |                      |                      | 0.59       | 0.0008               |

#### 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              | 699.481              | 715.519              | 2.03       | 0.0029               |
| 4.35       |                 |                      |                      | 0.90       | 0.0013               |

### LTE Band 13, 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              | 3.8        | 777.481              | 786.519              |            |                      |
| 50              |            |                      |                      | -6.41      | 0.0082               |
| 40              |            |                      |                      | 1.30       | 0.0017               |
| 30              |            |                      |                      | 1.16       | 0.0015               |
| 10              |            |                      |                      | -3.09      | 0.0040               |
| 0               |            |                      |                      | 2.49       | 0.0032               |
| -10             |            |                      |                      | 1.83       | 0.0023               |
| -20             |            |                      |                      | 1.97       | 0.0025               |
| -30             |            |                      |                      | -1.72      | 0.0022               |

#### 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              | 777.481              | 786.519              | 0.92       | 0.0012               |
| 4.35       |                 |                      |                      | 0.47       | 0.0006               |

**LTE Band 66, 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              | 3.8        | 1710.833             | 1779.199             |            |                      |
| 50              |            |                      |                      | 7.97       | 0.0046               |
| 40              |            |                      |                      | 3.32       | 0.0019               |
| 30              |            |                      |                      | 3.76       | 0.0022               |
| 10              |            |                      |                      | 5.55       | 0.0032               |
| 0               |            |                      |                      | 5.56       | 0.0032               |
| -10             |            |                      |                      | 8.14       | 0.0047               |
| -20             |            |                      |                      | 9.30       | 0.0053               |
| -30             |            |                      |                      | 8.85       | 0.0051               |

**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             | 1779.199             | 7.04       | 0.0040               |
| 4.35       |                 |                      |                      | 7.47       | 0.0043               |

#### **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.

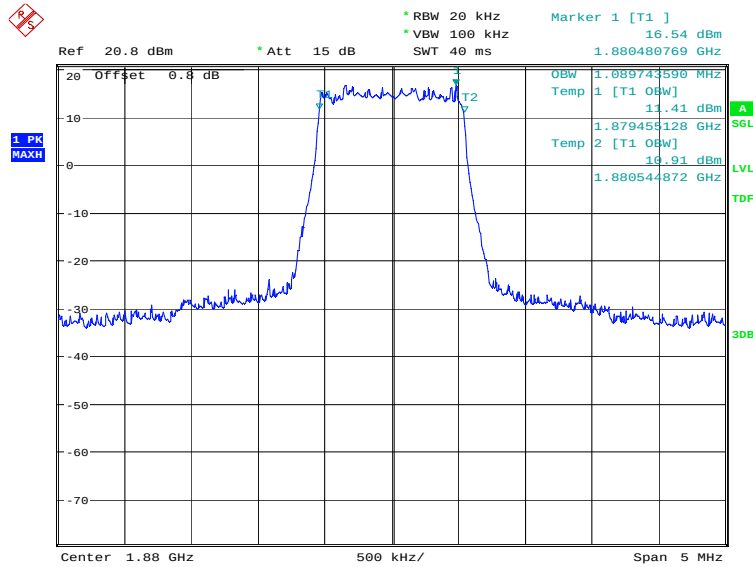
The measurement method is from ANSI C63.26:

- 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  $\geq 3 \times \text{RBW}$ .
- 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%)

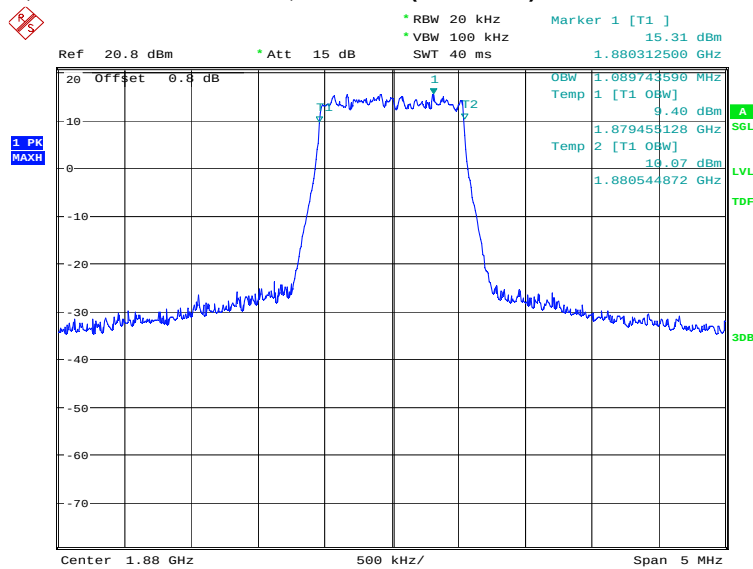
| Frequency(MHz) | Occupied Bandwidth (99%)(kHz) |         |
|----------------|-------------------------------|---------|
| 1880.0         | QPSK                          | 16QAM   |
|                | 1089.74                       | 1089.74 |

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



Date: 2.JUN.2022 11:17:28

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

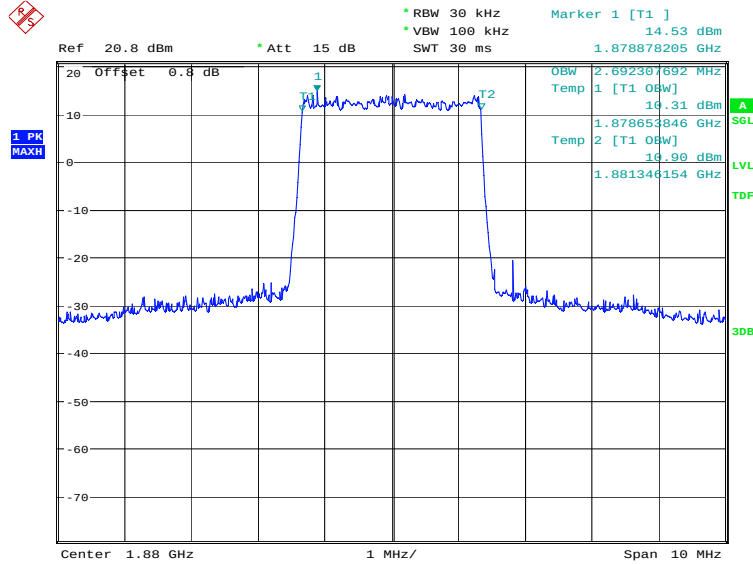


Date: 2.JUN.2022 11:18:07

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

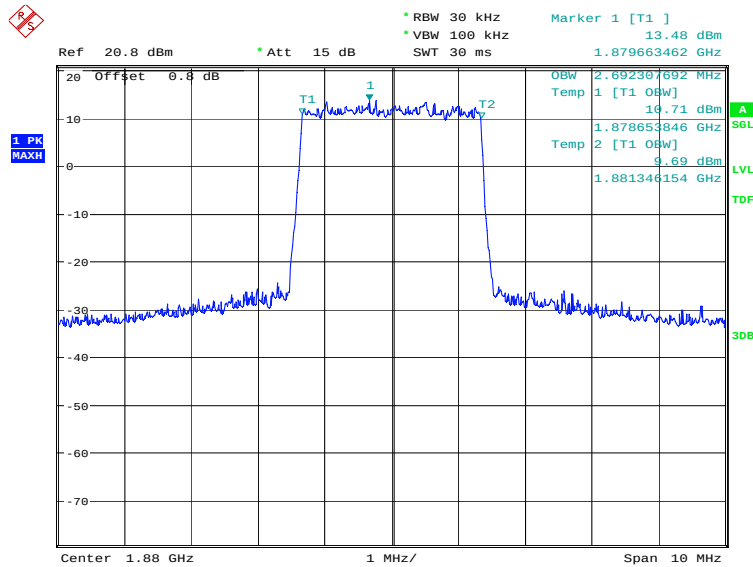
| Frequency(MHz) | Occupied Bandwidth (99%)(kHz) |         |
|----------------|-------------------------------|---------|
| 1880.0         | QPSK                          | 16QAM   |
|                | 2692.31                       | 2692.31 |

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



Date: 2.JUN.2022 11:18:48

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

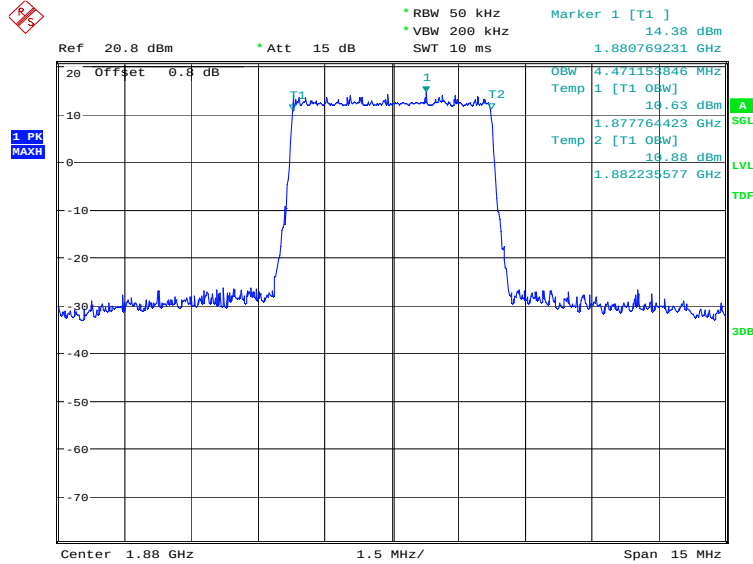


Date: 2.JUN.2022 11:19:27

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

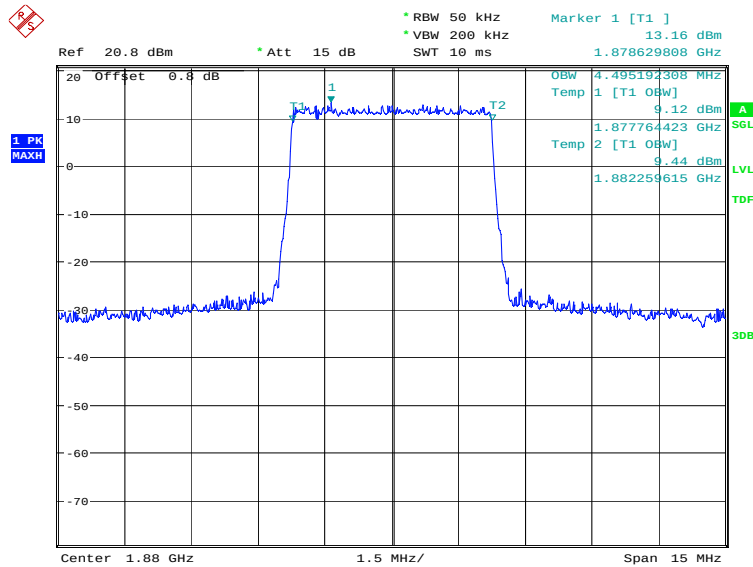
| Frequency(MHz) | Occupied Bandwidth (99%)(kHz) |         |
|----------------|-------------------------------|---------|
| 1880.0         | QPSK                          | 16QAM   |
|                | 4471.15                       | 4495.19 |

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



Date: 2.JUN.2022 11:20:08

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



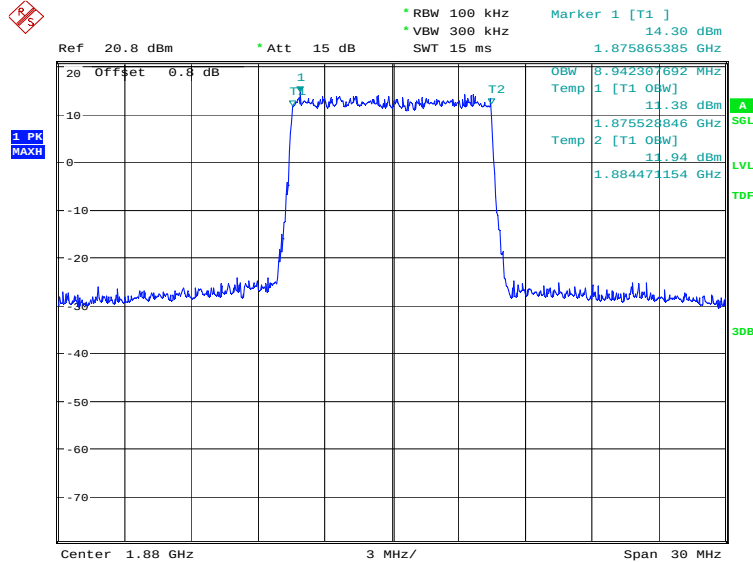
Date: 2.JUN.2022 11:20:47



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

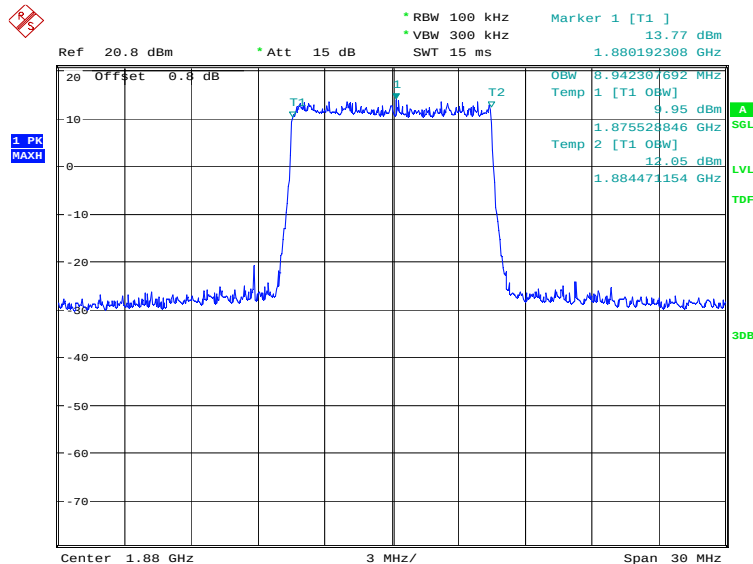
| Frequency(MHz) | Occupied Bandwidth (99%)(kHz) |         |
|----------------|-------------------------------|---------|
| 1880.0         | QPSK                          | 16QAM   |
|                | 8942.31                       | 8942.31 |

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



Date: 2.JUN.2022 11:21:28

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

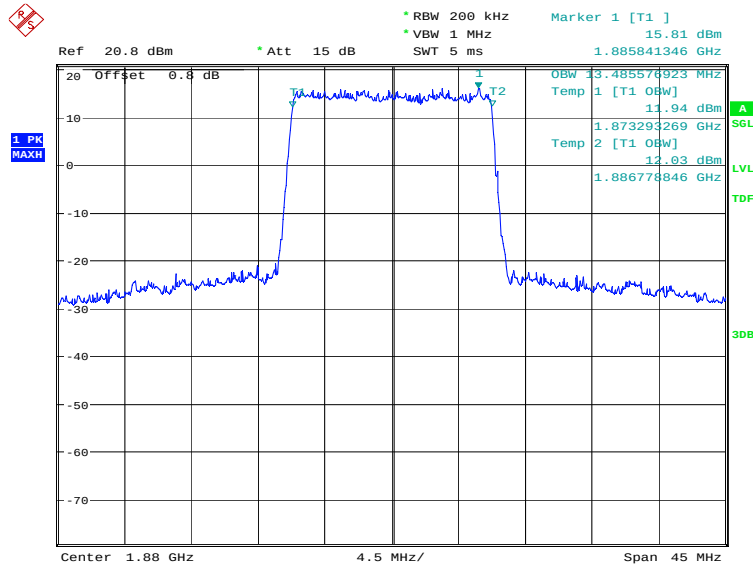


Date: 2.JUN.2022 11:22:08

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

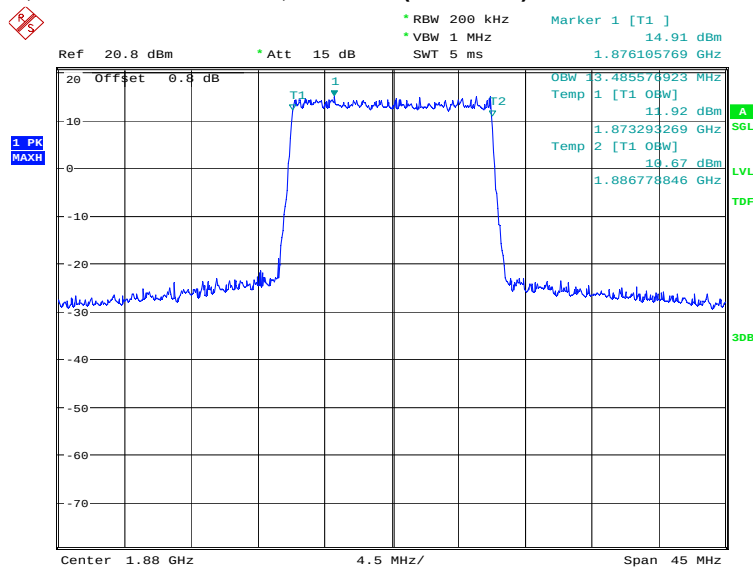
| Frequency(MHz) | Occupied Bandwidth (99%)(kHz) |          |
|----------------|-------------------------------|----------|
| 1880.0         | QPSK                          | 16QAM    |
|                | 13485.58                      | 13485.58 |

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



Date: 2. JUN. 2022 11:22:49

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

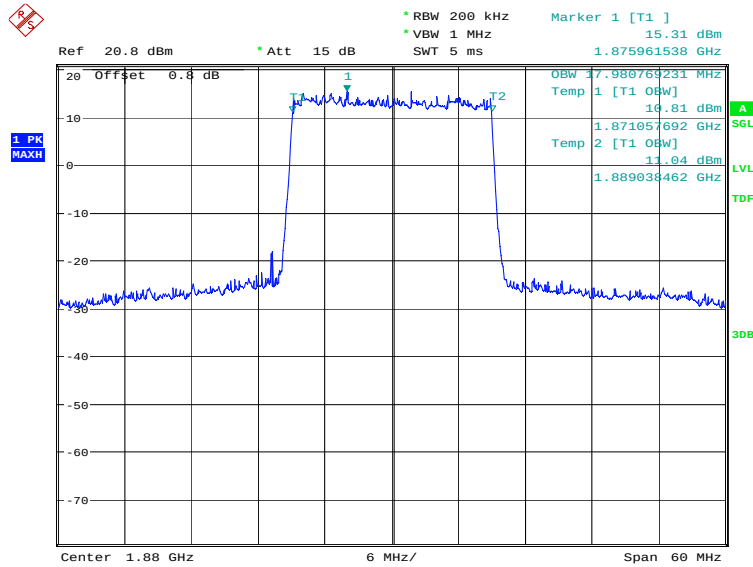


Date: 2. JUN. 2022 11:23:28

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

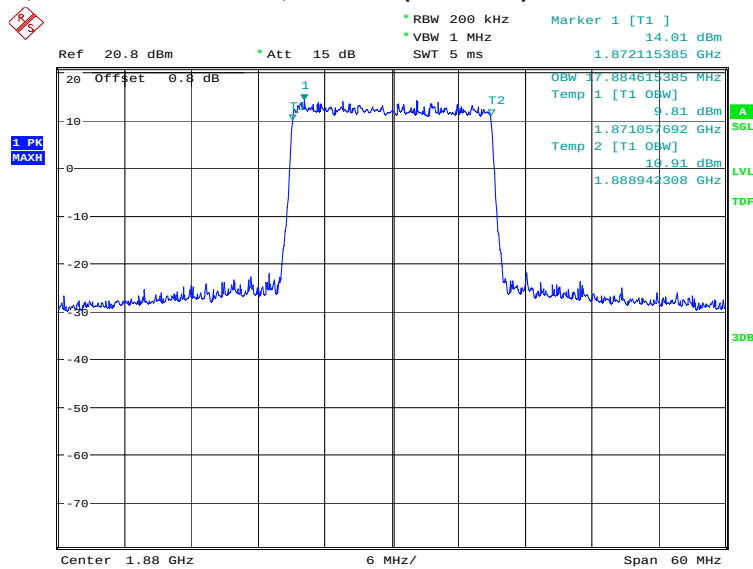
| Frequency(MHz) | Occupied Bandwidth (99%)(kHz) |          |
|----------------|-------------------------------|----------|
| 1880.0         | QPSK                          | 16QAM    |
|                | 17980.77                      | 17884.62 |

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



Date: 2.JUN.2022 11:24:09

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

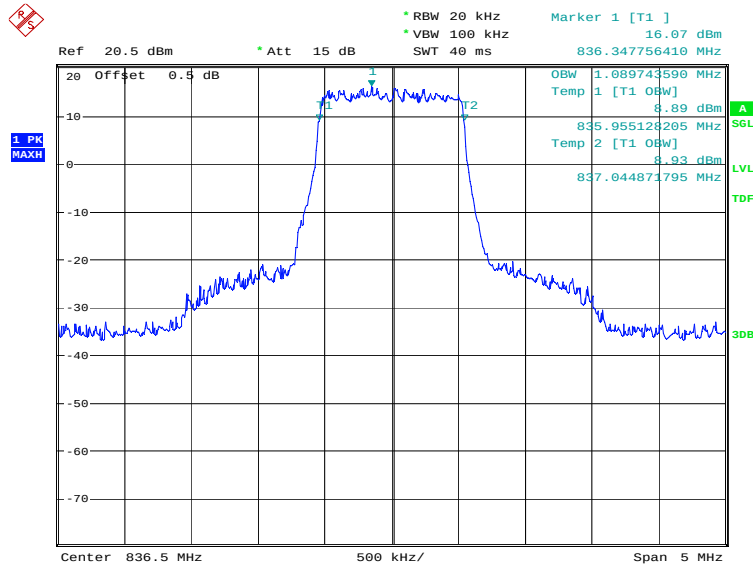


Date: 2.JUN.2022 11:24:48

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

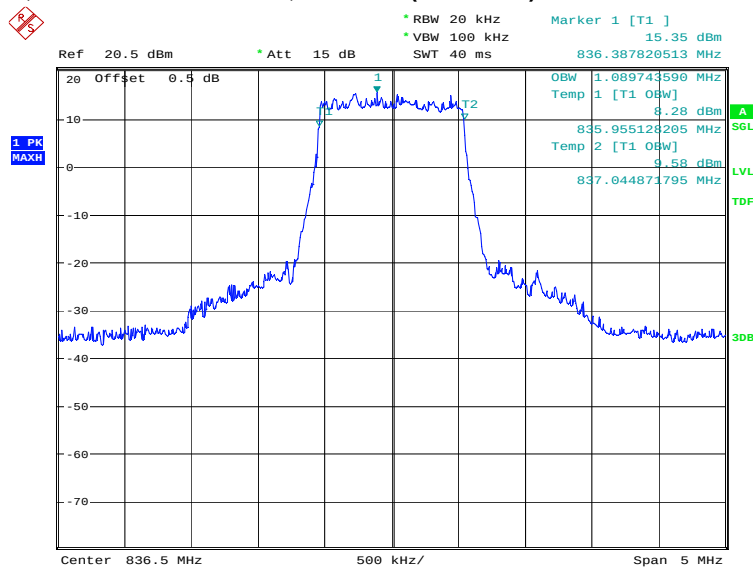
| Frequency(MHz) | Occupied Bandwidth (99%)(kHz) |         |
|----------------|-------------------------------|---------|
| 836.5          | QPSK                          | 16QAM   |
|                | 1089.74                       | 1089.74 |

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



Date: 2.JUN.2022 11:25:30

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

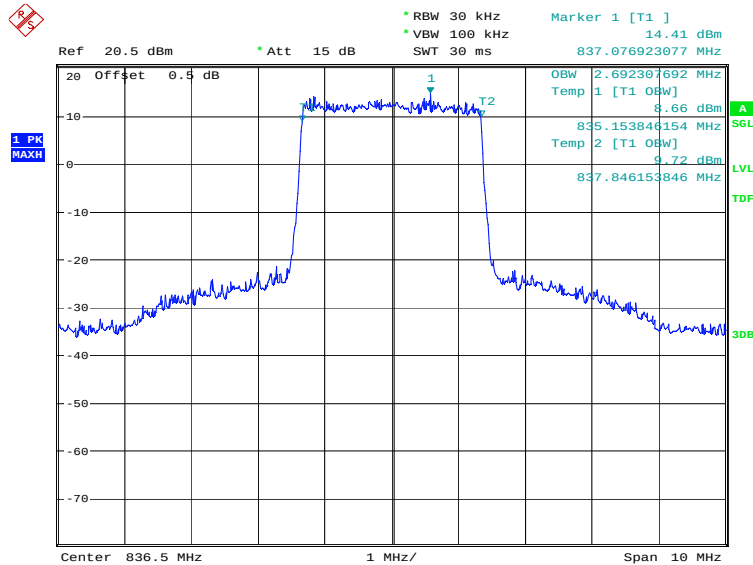


Date: 2.JUN.2022 11:26:10

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

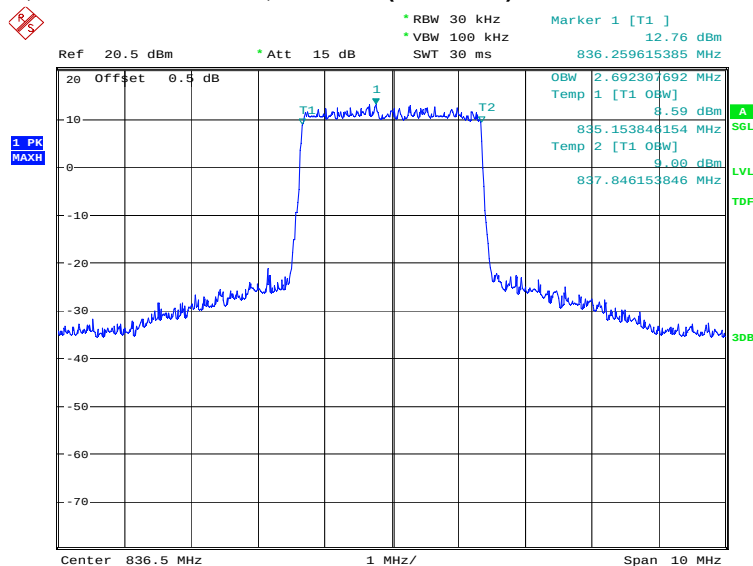
| Frequency(MHz) | Occupied Bandwidth (99%)(kHz) |         |
|----------------|-------------------------------|---------|
| 836.5          | QPSK                          | 16QAM   |
|                | 2692.31                       | 2692.31 |

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



Date: 2.JUN.2022 11:26:51

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

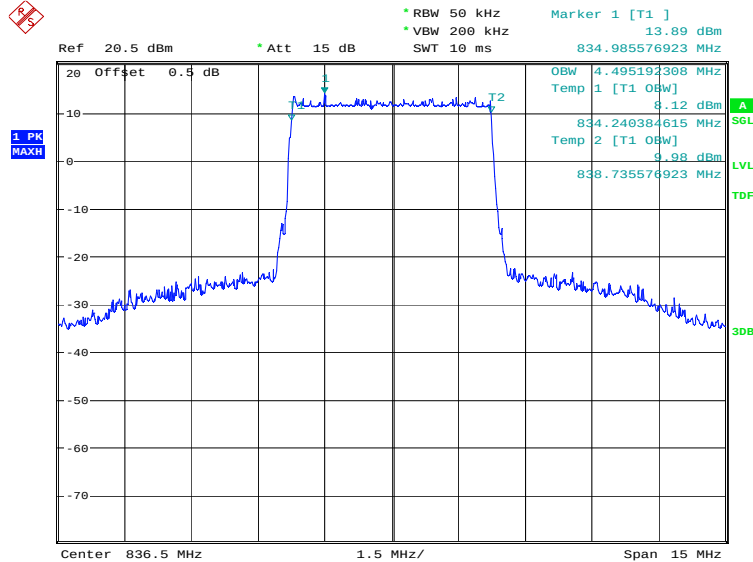


Date: 2.JUN.2022 11:27:30

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

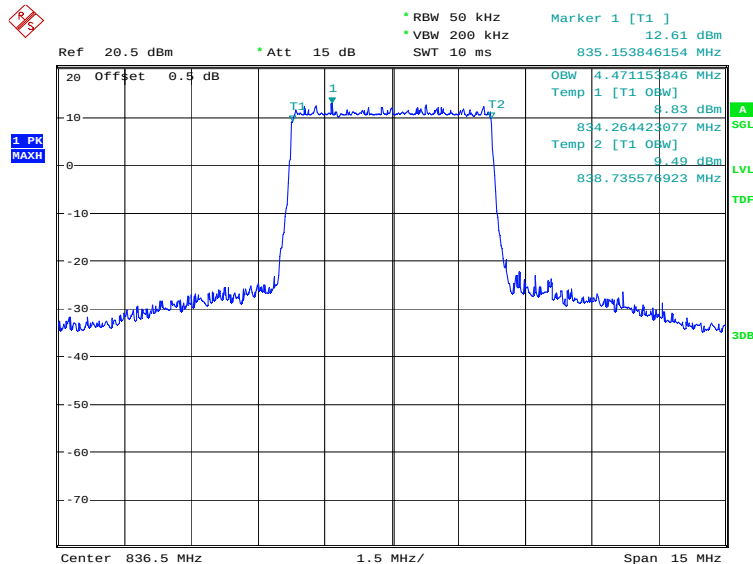
| Frequency(MHz) | Occupied Bandwidth (99%)(kHz) |         |
|----------------|-------------------------------|---------|
| 836.5          | QPSK                          | 16QAM   |
|                | 4495.19                       | 4471.15 |

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



Date: 2.JUN.2022 11:28:11

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

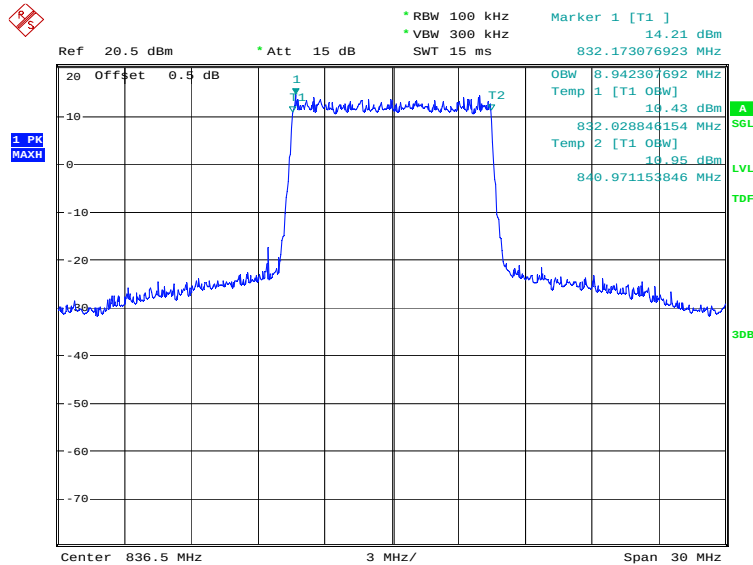


Date: 2.JUN.2022 11:28:50

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

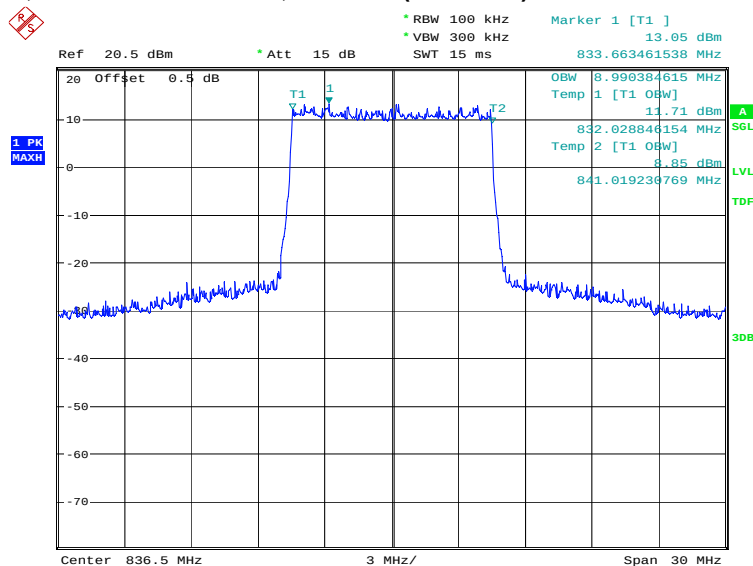
| Frequency(MHz) | Occupied Bandwidth (99%)(kHz) |         |
|----------------|-------------------------------|---------|
| 836.5          | QPSK                          | 16QAM   |
|                | 8942.31                       | 8990.38 |

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



Date: 2.JUN.2022 11:29:31

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

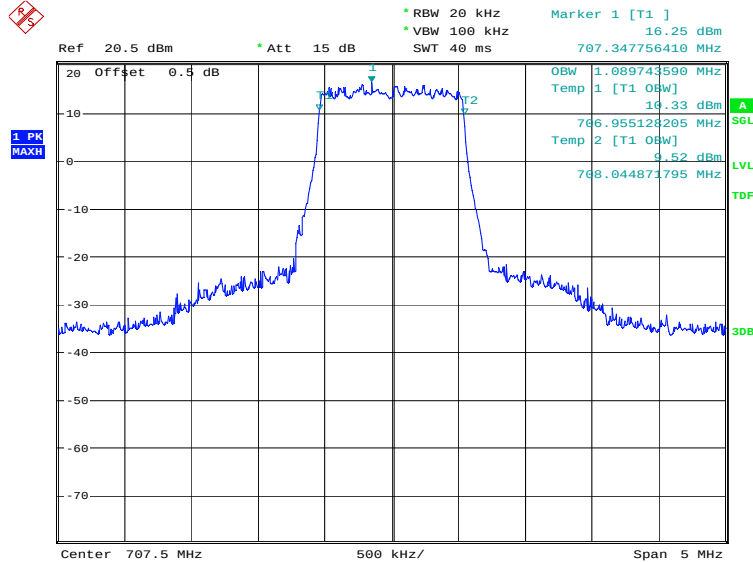


Date: 2.JUN.2022 11:30:11

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

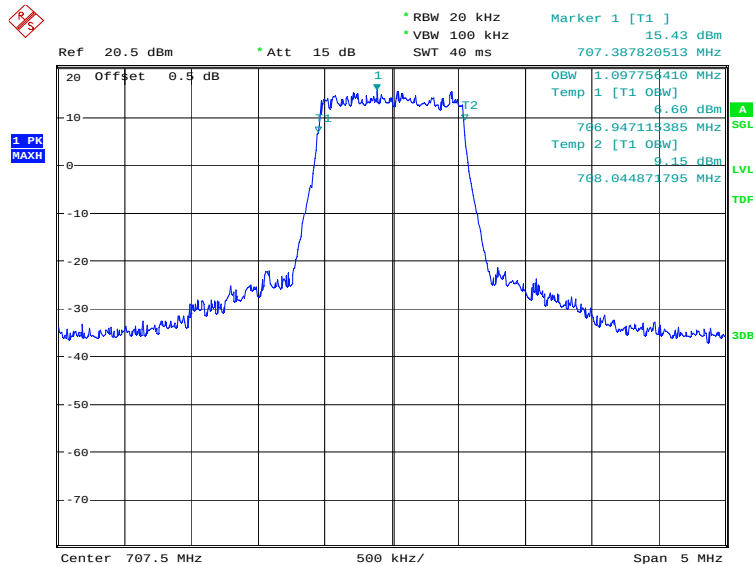
| Frequency(MHz) | Occupied Bandwidth (99%)(kHz) |         |
|----------------|-------------------------------|---------|
| 707.5          | QPSK                          | 16QAM   |
|                | 1089.74                       | 1097.76 |

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



Date: 2.JUN.2022 11:30:53

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



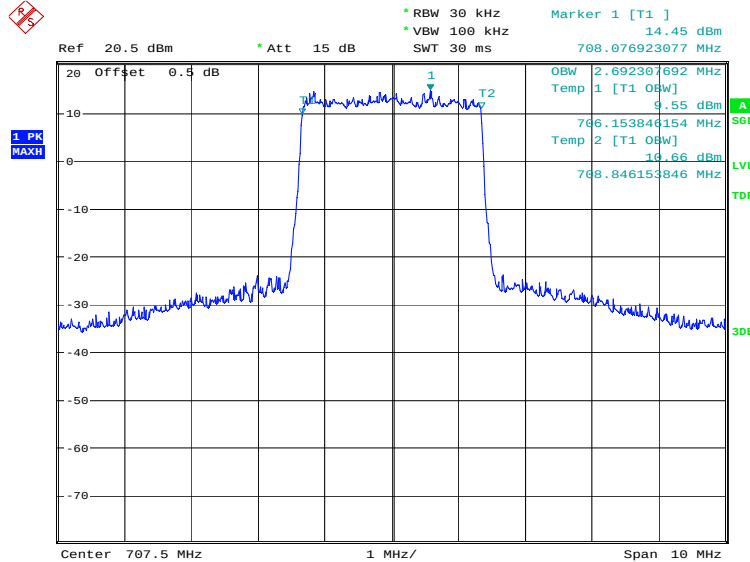
Date: 2.JUN.2022 11:31:32



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

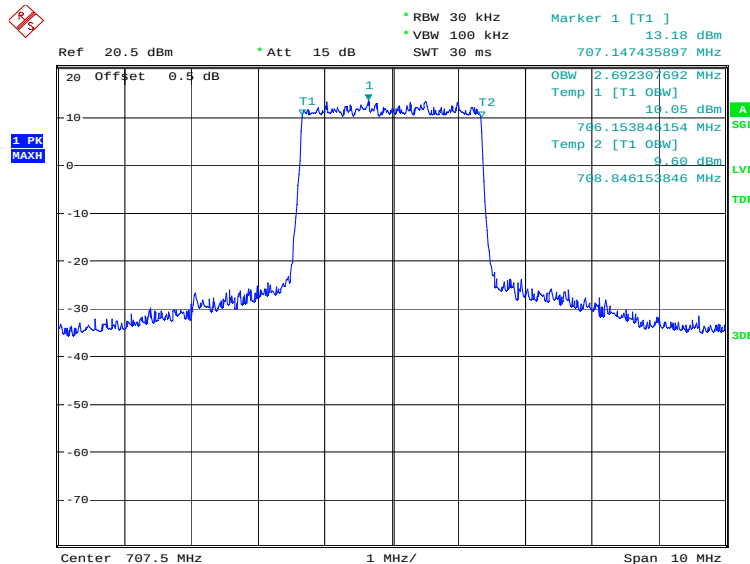
| Frequency(MHz) | Occupied Bandwidth (99%)(kHz) |         |
|----------------|-------------------------------|---------|
| 707.5          | QPSK                          | 16QAM   |
|                | 2692.31                       | 2692.31 |

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



Date: 2.JUN.2022 11:32:13

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

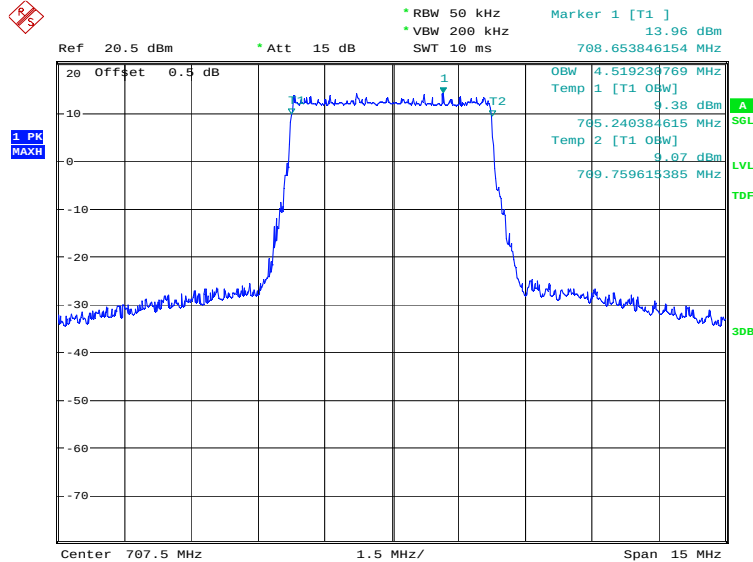


Date: 2.JUN.2022 11:32:53

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

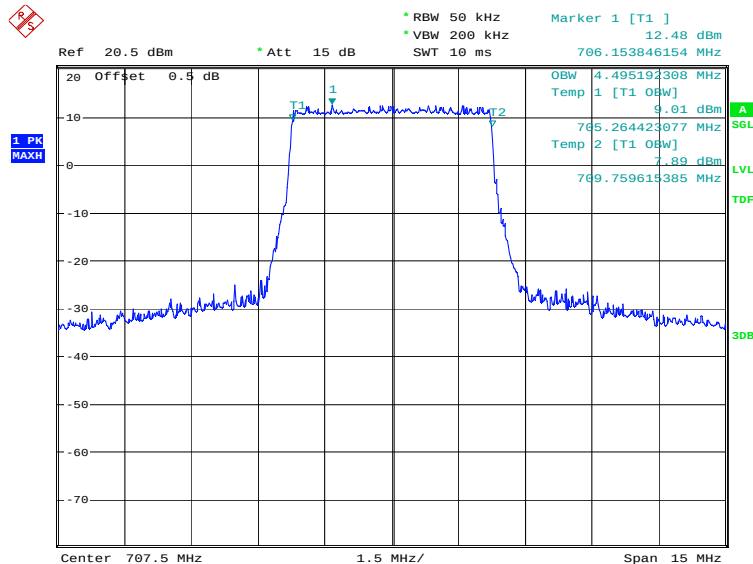
| Frequency(MHz) | Occupied Bandwidth (99%)(kHz) |         |
|----------------|-------------------------------|---------|
| 707.5          | QPSK                          | 16QAM   |
|                | 4519.23                       | 4495.19 |

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



Date: 2.JUN.2022 11:33:34

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

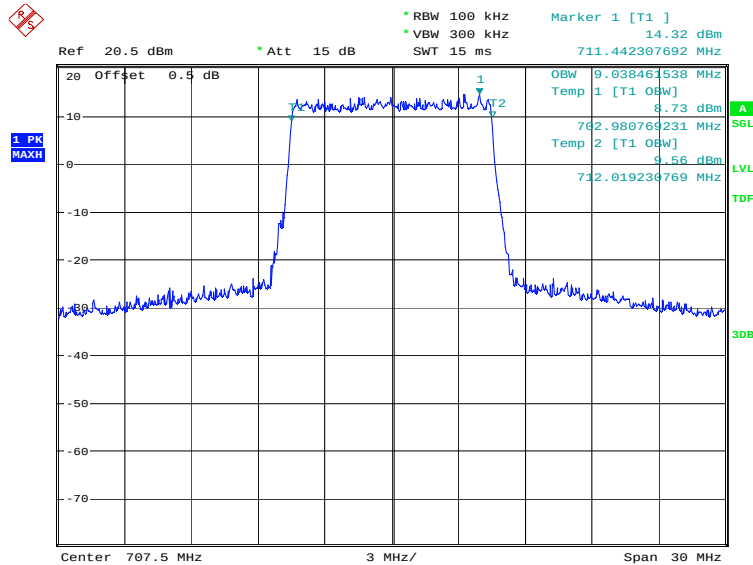


Date: 2.JUN.2022 11:34:13

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

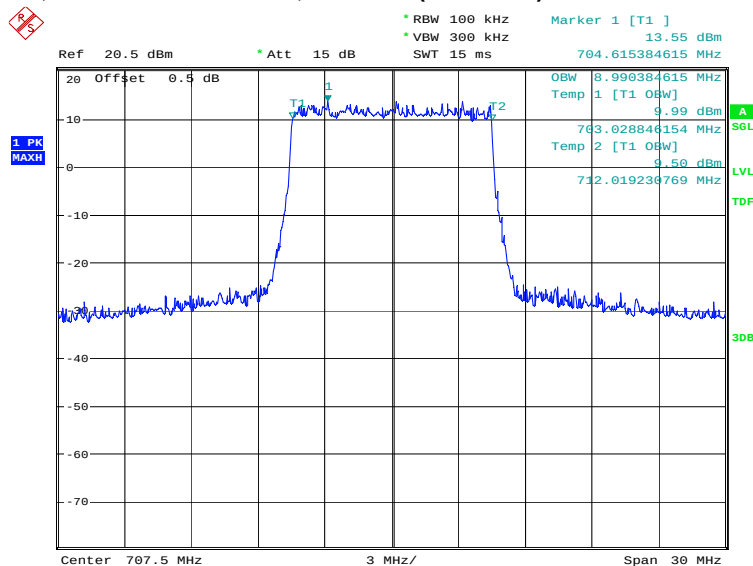
| Frequency(MHz) | Occupied Bandwidth (99%)(kHz) |         |
|----------------|-------------------------------|---------|
| 707.5          | QPSK                          | 16QAM   |
|                | 9038.46                       | 8990.38 |

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



Date: 2.JUN.2022 11:34:54

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

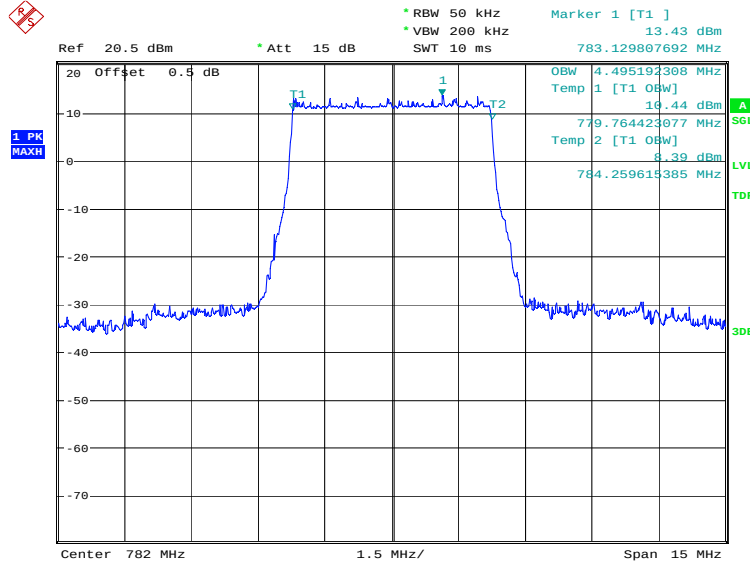


Date: 2.JUN.2022 11:35:33

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

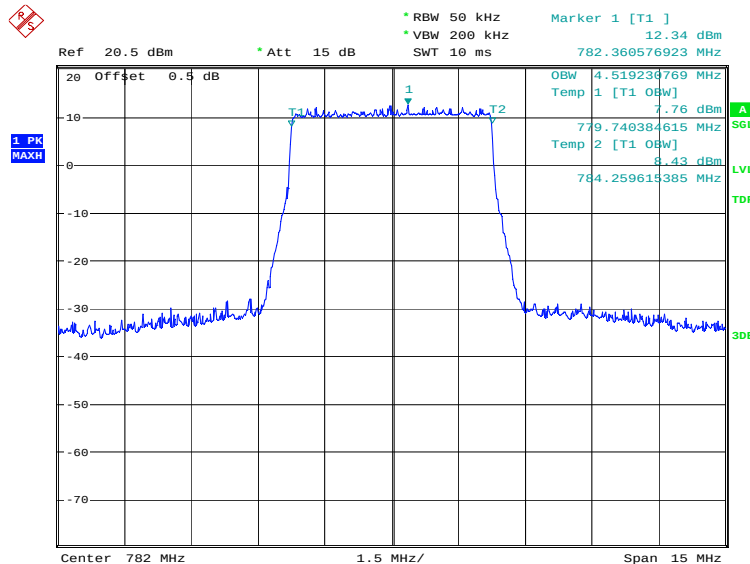
| Frequency(MHz) | Occupied Bandwidth (99%)(kHz) |         |
|----------------|-------------------------------|---------|
| 782.0          | QPSK                          | 16QAM   |
|                | 4495.19                       | 4519.23 |

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



Date: 2.JUN.2022 11:36:15

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

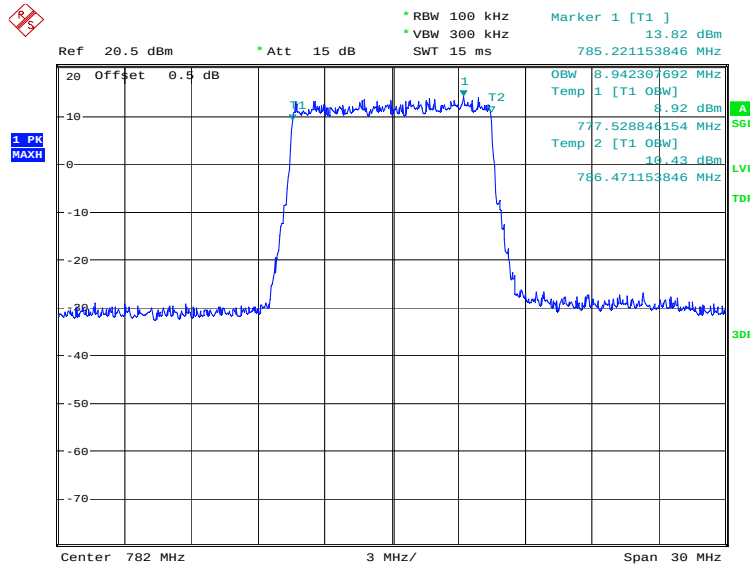


Date: 2.JUN.2022 11:36:55

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

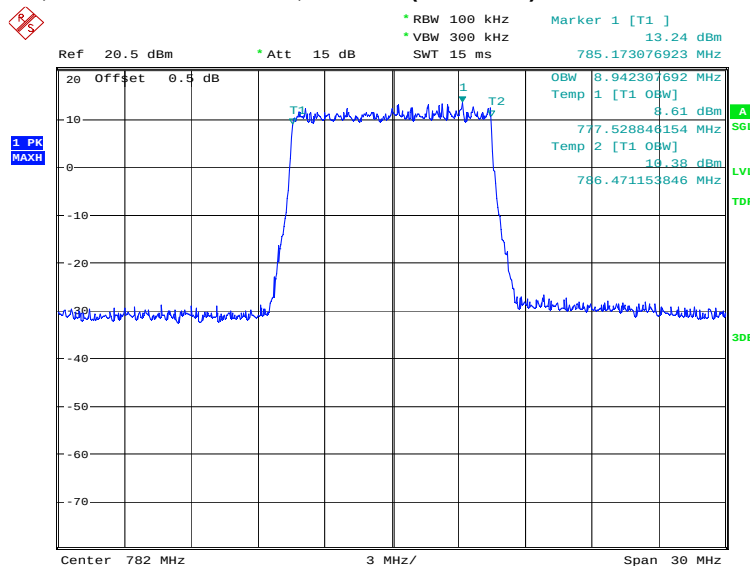
| Frequency(MHz) | Occupied Bandwidth (99%)(kHz) |         |
|----------------|-------------------------------|---------|
| 782.0          | QPSK                          | 16QAM   |
|                | 8942.31                       | 8942.31 |

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



Date: 2.JUN.2022 11:37:36

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

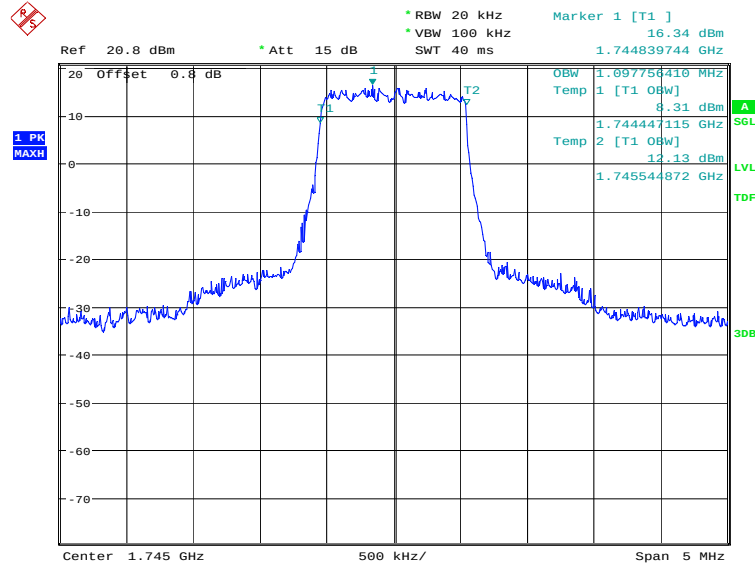


Date: 2.JUN.2022 11:38:15

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

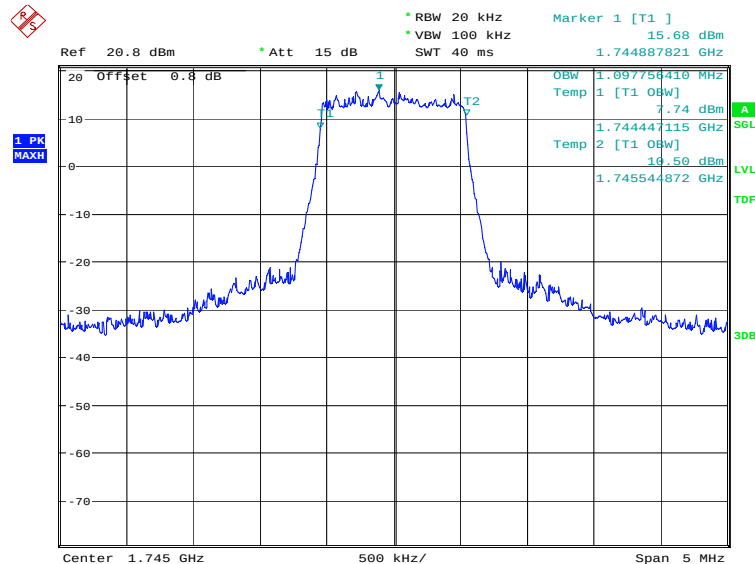
| Frequency(MHz) | Occupied Bandwidth (99%)(kHz) |         |
|----------------|-------------------------------|---------|
| 1745.0         | QPSK                          | 16QAM   |
|                | 1097.76                       | 1097.76 |

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



Date: 2.JUN.2022 11:38:57

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

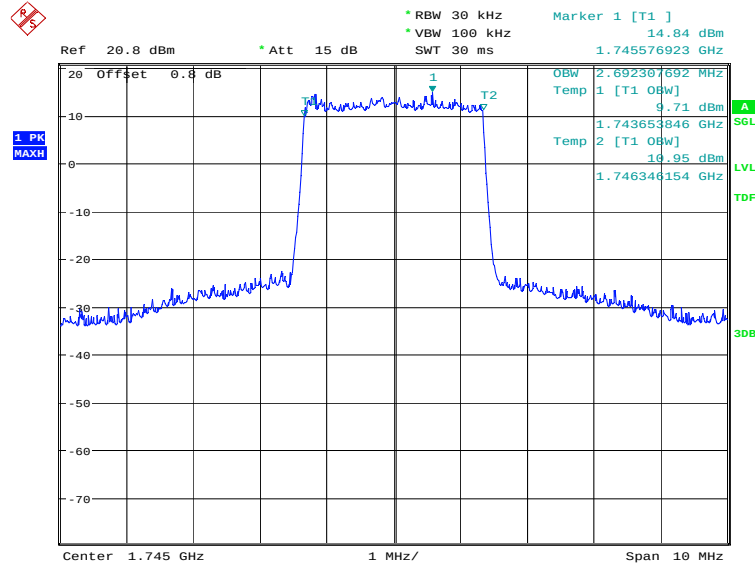


Date: 2.JUN.2022 11:39:35

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

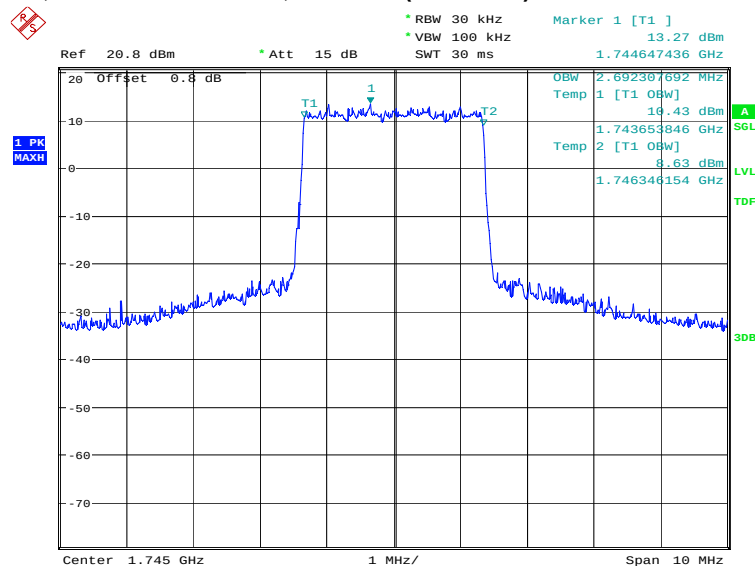
| Frequency(MHz) | Occupied Bandwidth (99%)(kHz) |         |
|----------------|-------------------------------|---------|
| 1745.0         | QPSK                          | 16QAM   |
|                | 2692.31                       | 2692.31 |

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



Date: 2.JUN.2022 11:40:15

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

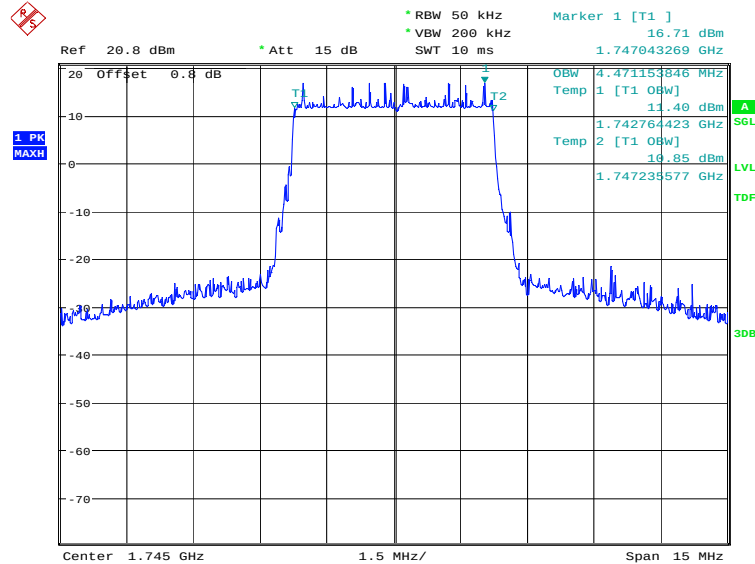


Date: 2.JUN.2022 11:40:54

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

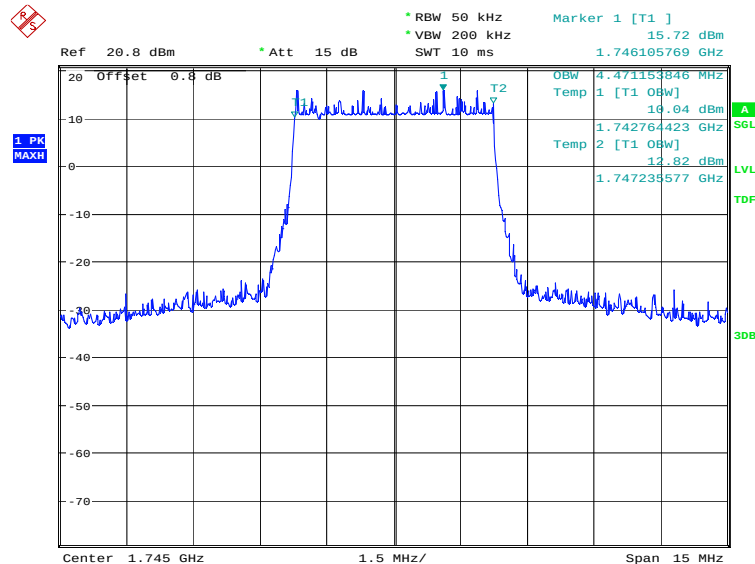
| Frequency(MHz) | Occupied Bandwidth (99%)(kHz) |         |
|----------------|-------------------------------|---------|
| 1745.0         | QPSK                          | 16QAM   |
|                | 4471.15                       | 4471.15 |

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



Date: 2.JUN.2022 11:41:34

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



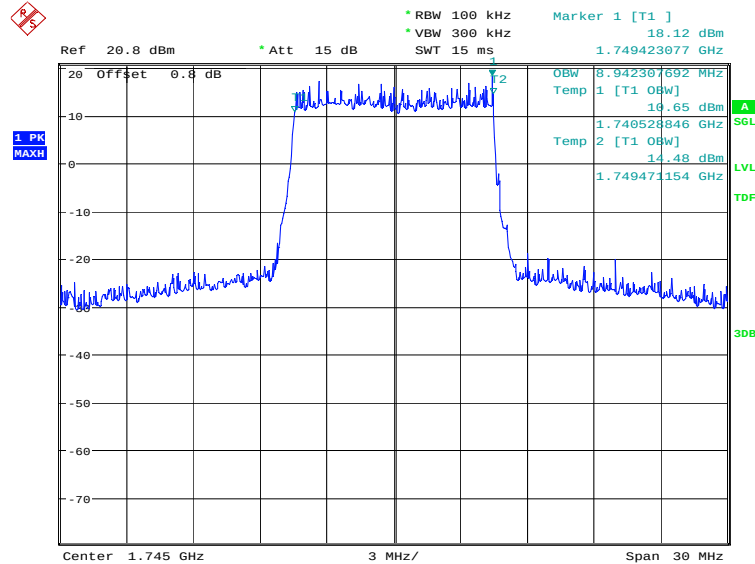
Date: 2.JUN.2022 11:42:13



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

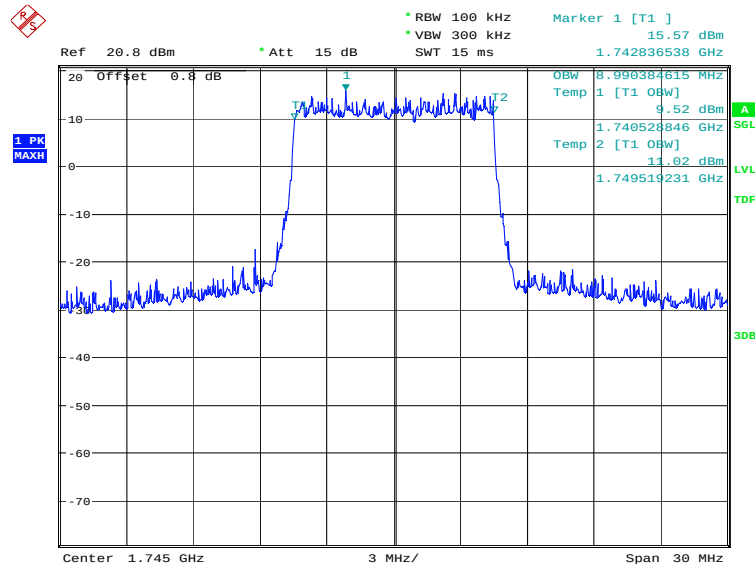
| Frequency(MHz) | Occupied Bandwidth (99%)(kHz) |         |
|----------------|-------------------------------|---------|
| 1745.0         | QPSK                          | 16QAM   |
|                | 8942.31                       | 8990.38 |

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



Date: 2.JUN.2022 11:42:53

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

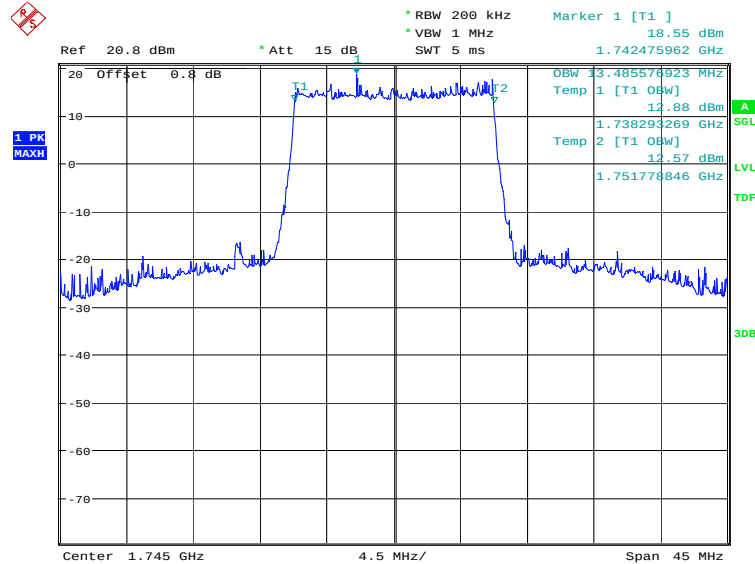


Date: 2.JUN.2022 11:43:31

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

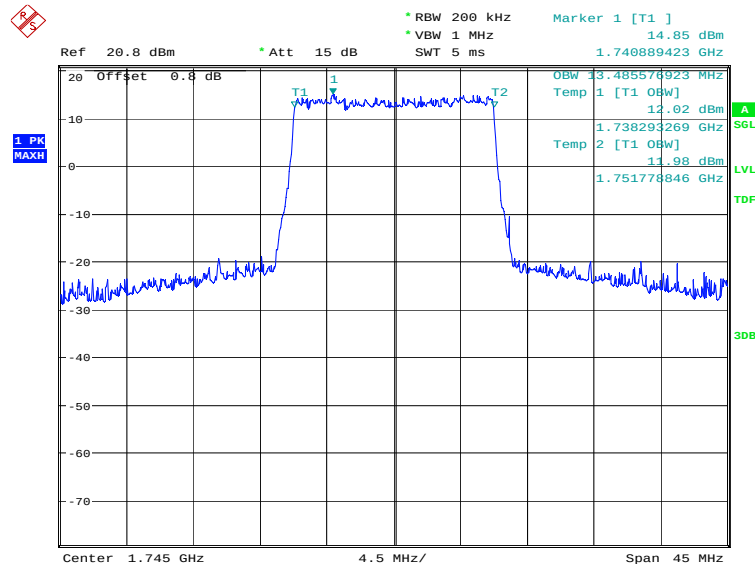
| Frequency(MHz) | Occupied Bandwidth (99%)(kHz) |          |
|----------------|-------------------------------|----------|
| 1745.0         | QPSK                          | 16QAM    |
|                | 13485.58                      | 13485.58 |

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



Date: 2.JUN.2022 11:44:11

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

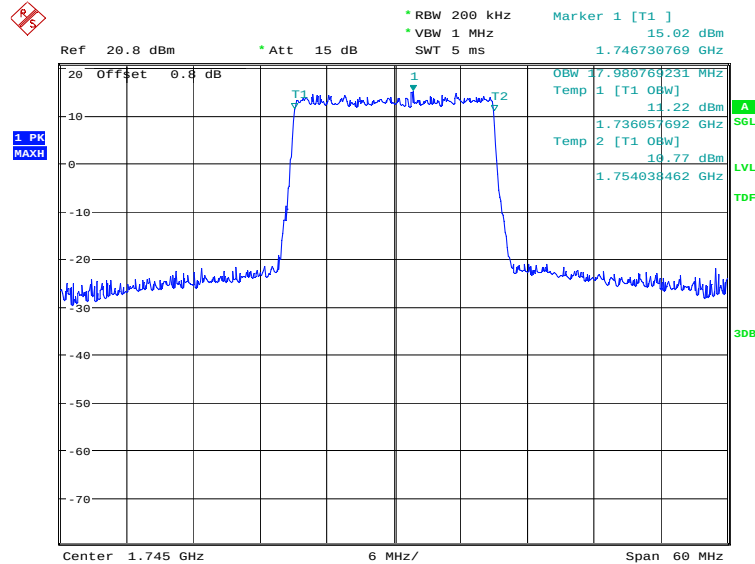


Date: 2.JUN.2022 11:44:50

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

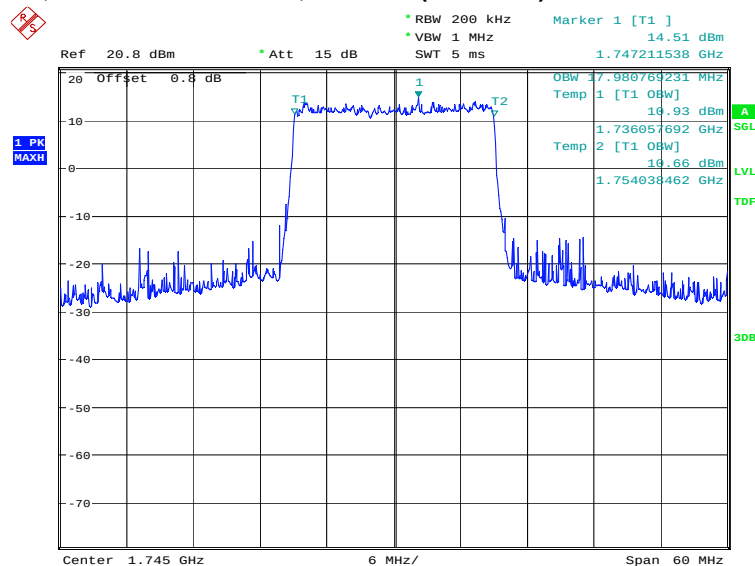
| Frequency(MHz) | Occupied Bandwidth (99%)(kHz) |          |
|----------------|-------------------------------|----------|
| 1745.0         | QPSK                          | 16QAM    |
|                | 17980.77                      | 17980.77 |

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



Date: 2.JUN.2022 11:45:30

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



Date: 2.JUN.2022 11:46:08

## **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.

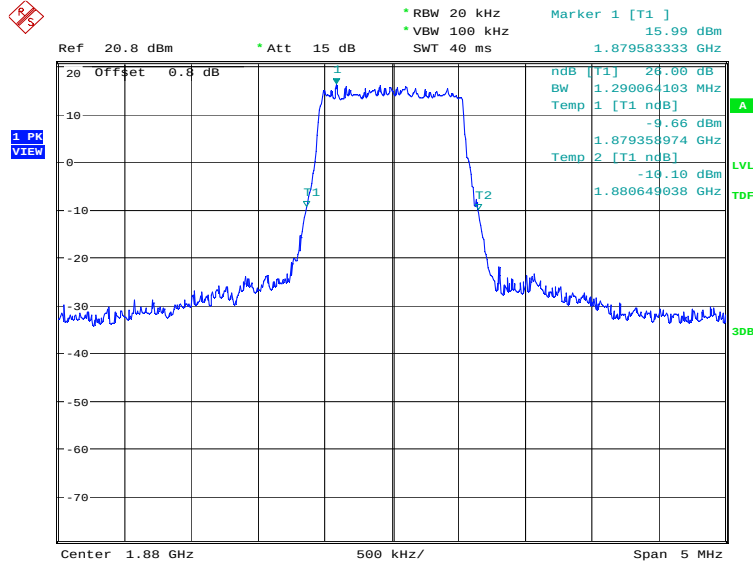
The measurement method is from ANSI C63.26:

- 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  $\geq 3 \times \text{RBW}$ .
- 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)

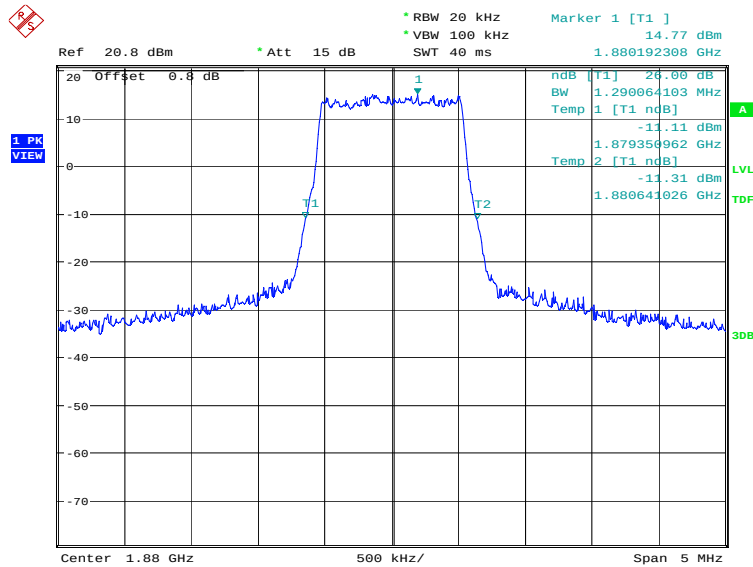
| Frequency(MHz) | Emission Bandwidth (-26dBc)(kHz) |         |
|----------------|----------------------------------|---------|
| 1880.0         | QPSK                             | 16QAM   |
|                | 1290.06                          | 1290.06 |

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



Date: 2.JUN.2022 11:47:24

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

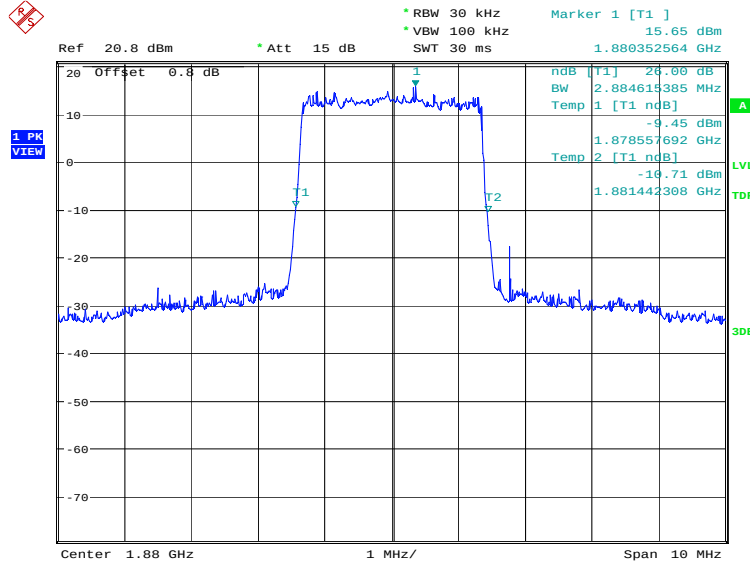


Date: 2.JUN.2022 11:48:03

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

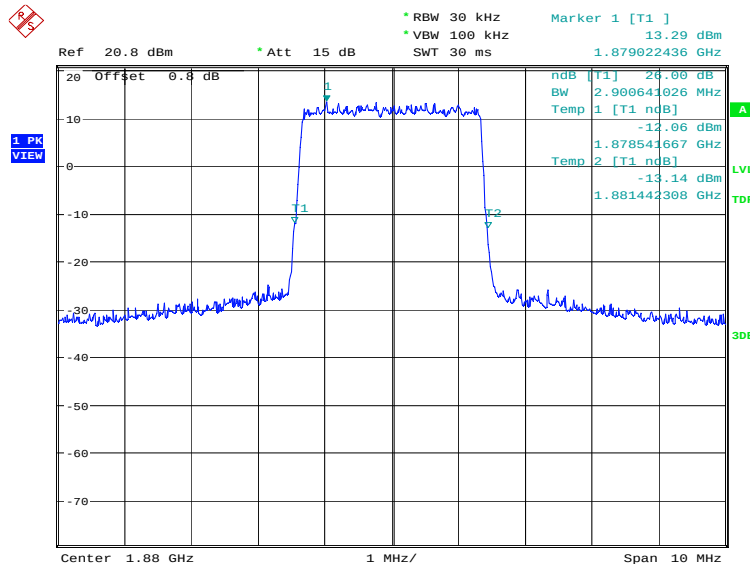
| Frequency(MHz) | Emission Bandwidth (-26dBc)(kHz) |         |
|----------------|----------------------------------|---------|
| 1880.0         | QPSK                             | 16QAM   |
|                | 2884.62                          | 2900.64 |

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



Date: 2.JUN.2022 11:48:44

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

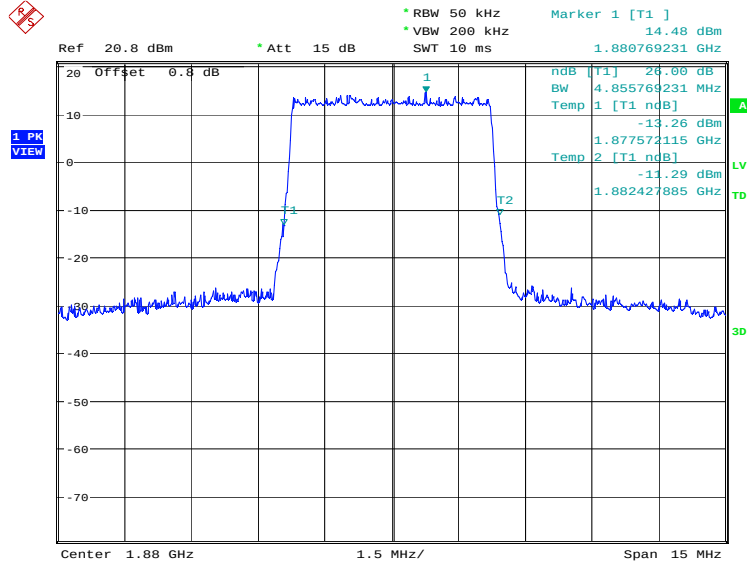


Date: 2.JUN.2022 11:49:23

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

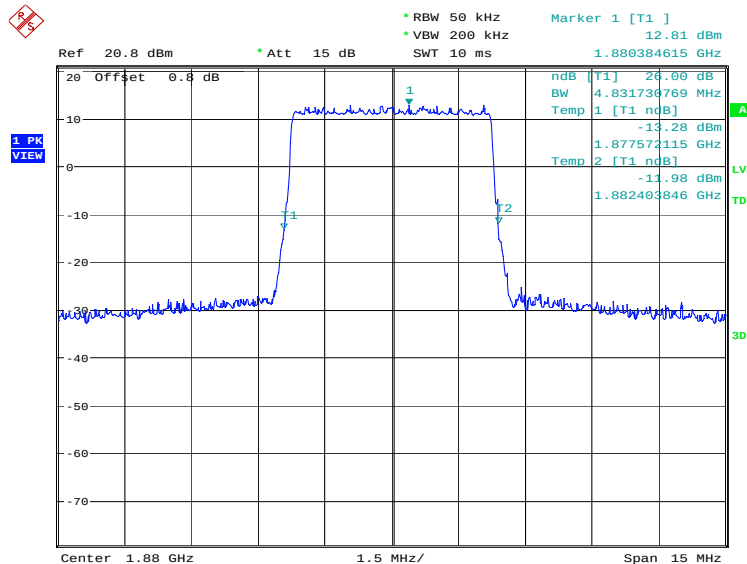
| Frequency(MHz) | Emission Bandwidth (-26dBc)(kHz) |         |
|----------------|----------------------------------|---------|
| 1880.0         | QPSK                             | 16QAM   |
|                | 4855.77                          | 4831.73 |

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



Date: 2.JUN.2022 11:50:04

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

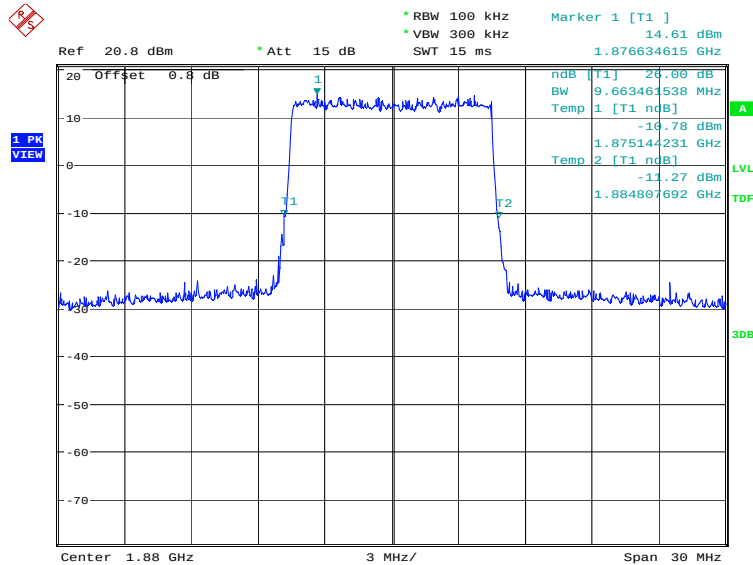


Date: 2.JUN.2022 11:50:43

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

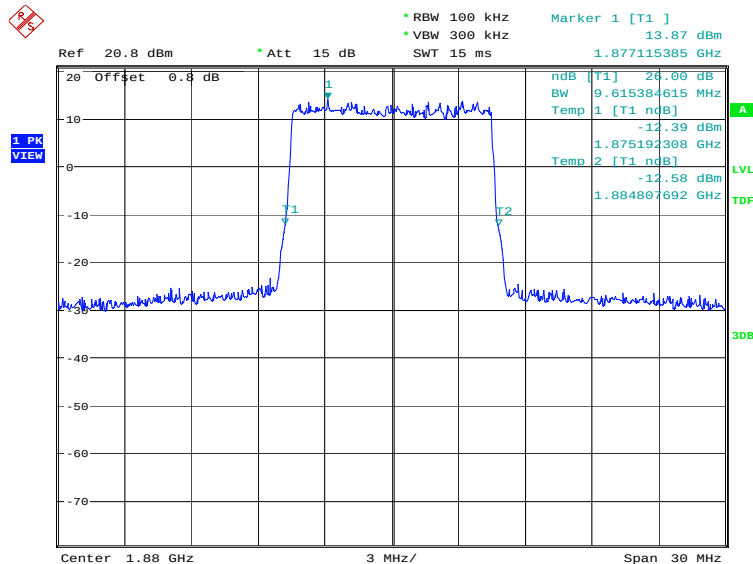
| Frequency(MHz) | Emission Bandwidth (-26dBc)(kHz) |         |
|----------------|----------------------------------|---------|
| 1880.0         | QPSK                             | 16QAM   |
|                | 9663.46                          | 9615.38 |

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



Date: 2.JUN.2022 11:51:23

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



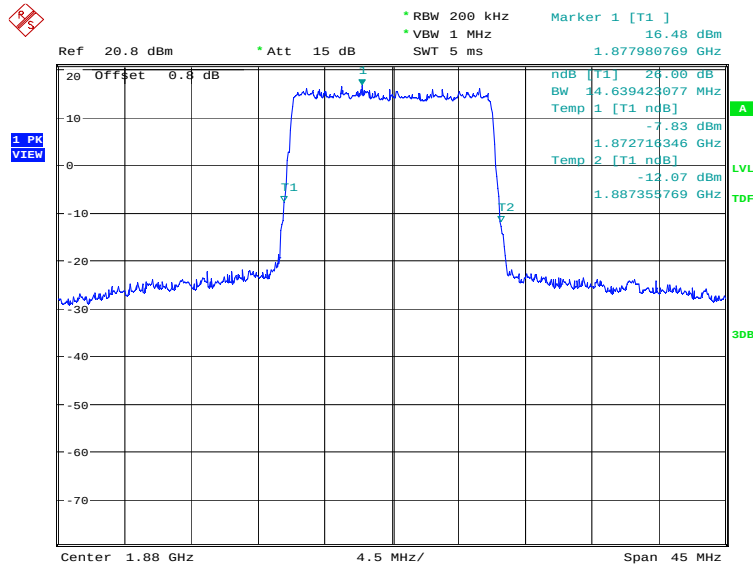
Date: 2.JUN.2022 11:52:02



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

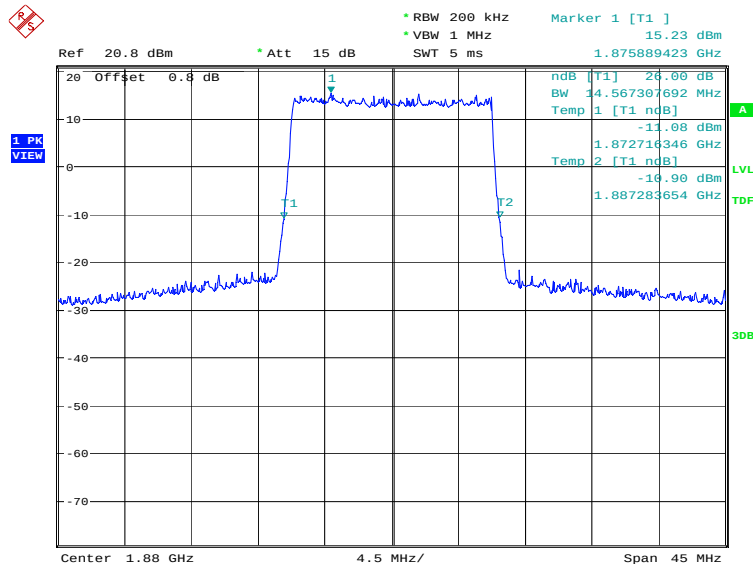
| Frequency(MHz) | Emission Bandwidth (-26dBc)(kHz) |          |
|----------------|----------------------------------|----------|
| 1880.0         | QPSK                             | 16QAM    |
|                | 14639.42                         | 14567.31 |

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



Date: 2. JUN.2022 11:52:43

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

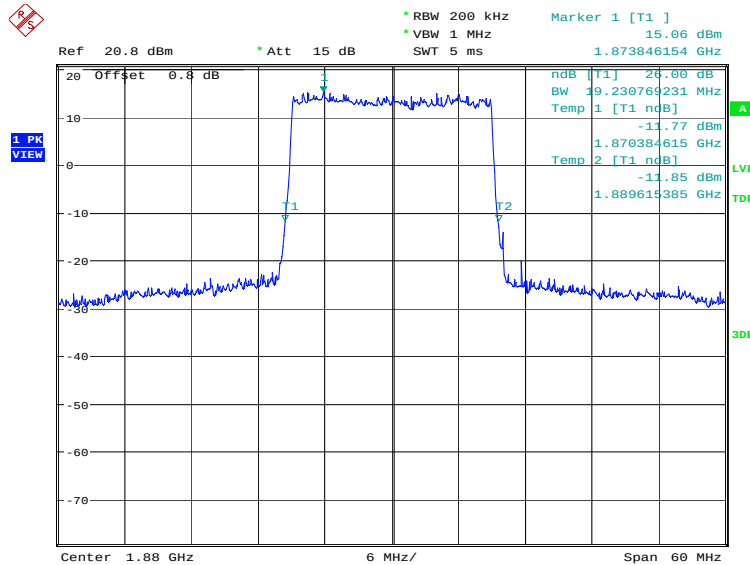


Date: 2. JUN.2022 11:53:22

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

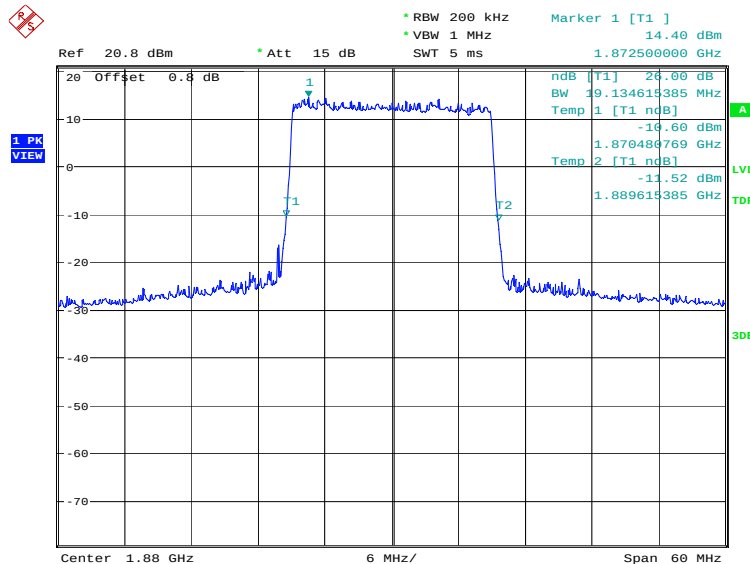
| Frequency(MHz) | Emission Bandwidth (-26dBc)(kHz) |          |
|----------------|----------------------------------|----------|
| 1880.0         | QPSK                             | 16QAM    |
|                | 19230.77                         | 19134.62 |

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



Date: 2. JUN.2022 11:54:03

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

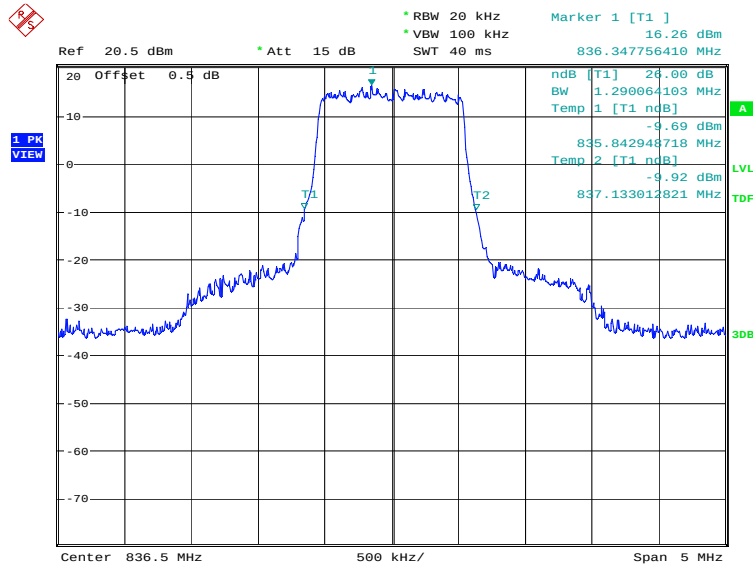


Date: 2. JUN.2022 11:54:42

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

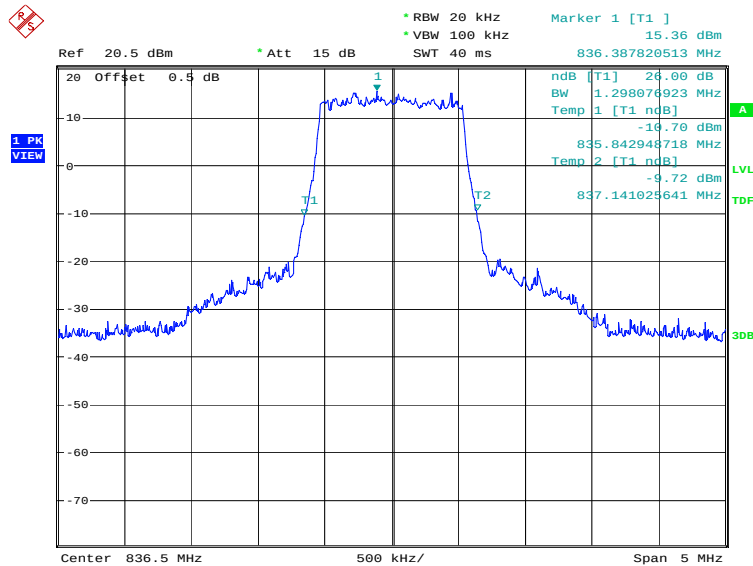
| Frequency(MHz) | Emission Bandwidth (-26dBc)(kHz) |         |
|----------------|----------------------------------|---------|
| 836.5          | QPSK                             | 16QAM   |
|                | 1290.06                          | 1298.08 |

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



Date: 2.JUN.2022 11:55:24

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

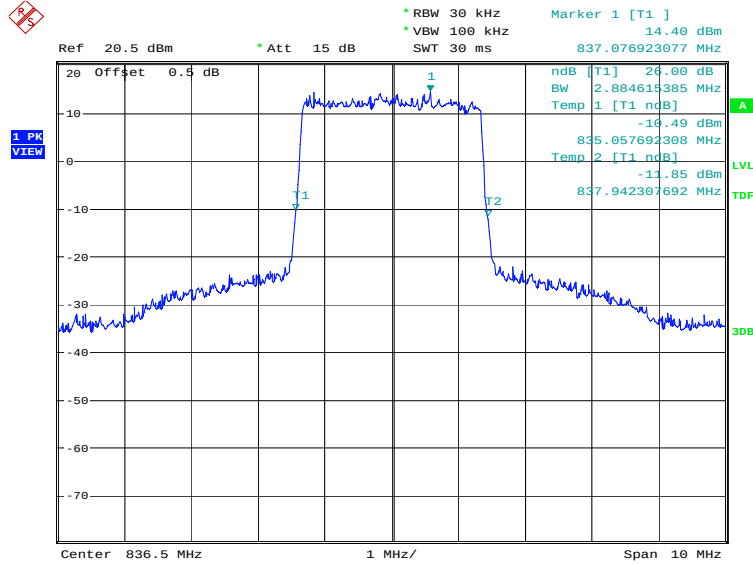


Date: 2.JUN.2022 11:56:03

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

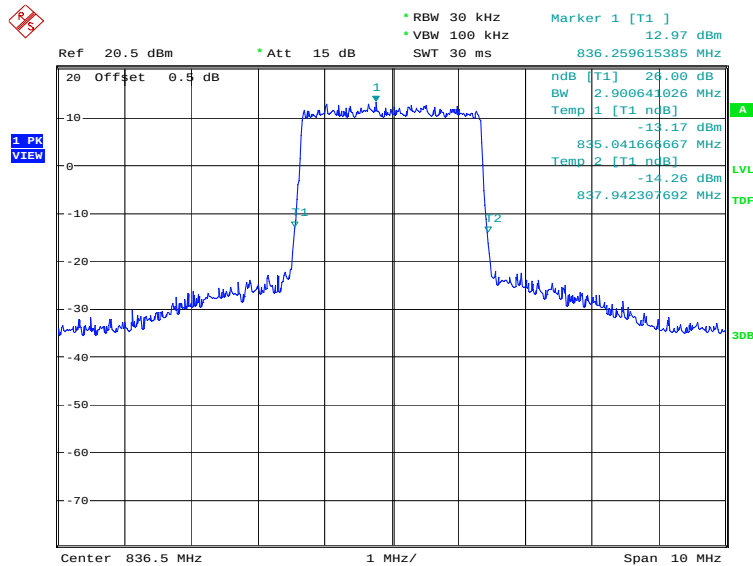
| Frequency(MHz) | Emission Bandwidth (-26dBc)(kHz) |         |
|----------------|----------------------------------|---------|
| 836.5          | QPSK                             | 16QAM   |
|                | 2884.62                          | 2900.64 |

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



Date: 2.JUN.2022 11:56:44

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

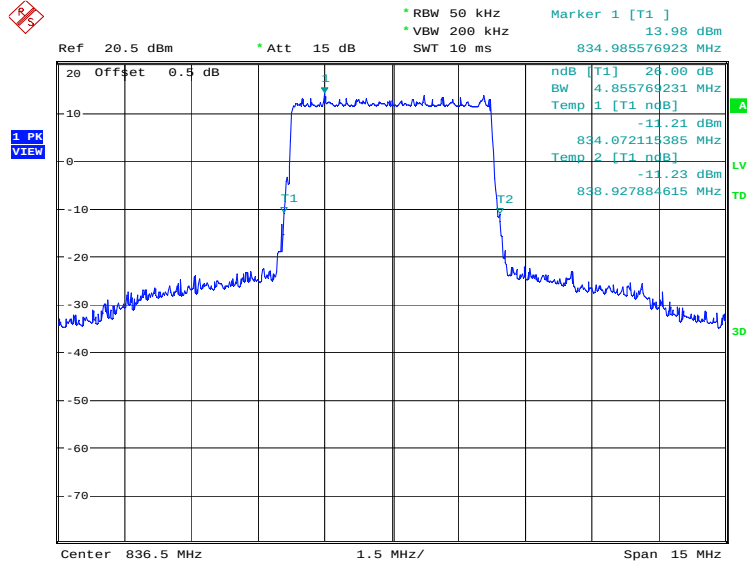


Date: 2.JUN.2022 11:57:23

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

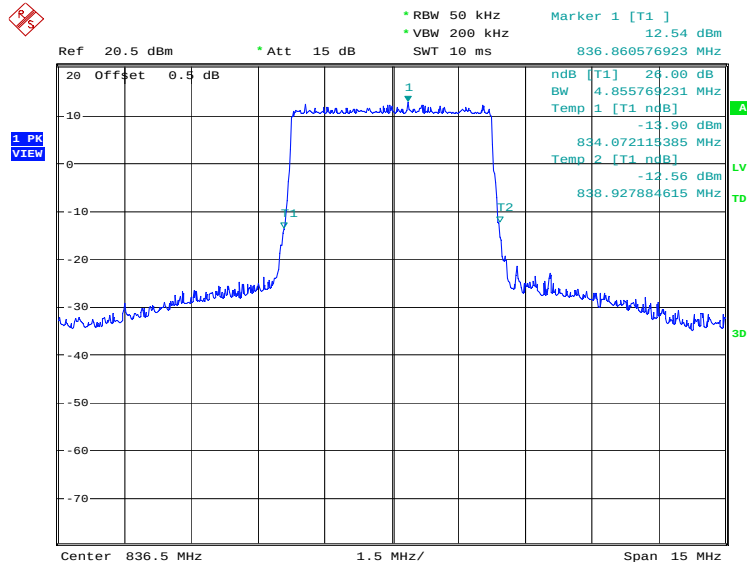
| Frequency(MHz) | Emission Bandwidth (-26dBc)(kHz) |         |
|----------------|----------------------------------|---------|
| 836.5          | QPSK                             | 16QAM   |
|                | 4855.77                          | 4855.77 |

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



Date: 2.JUN.2022 11:58:03

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

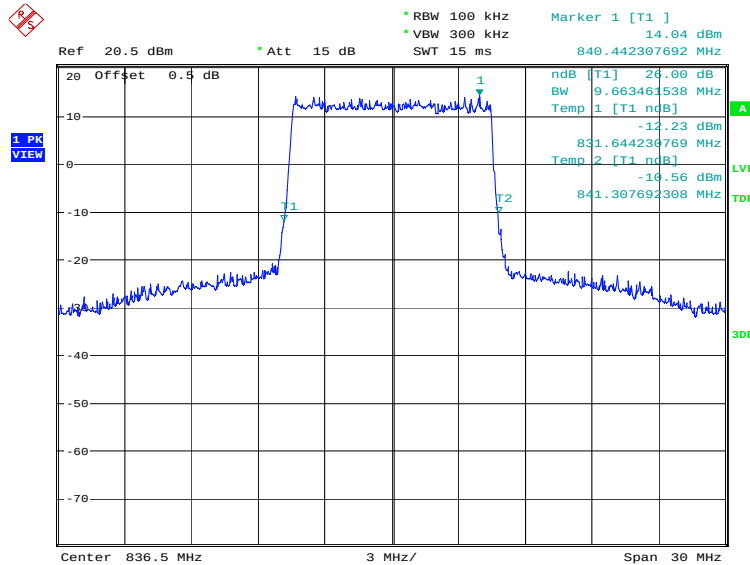


Date: 2.JUN.2022 11:58:42

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

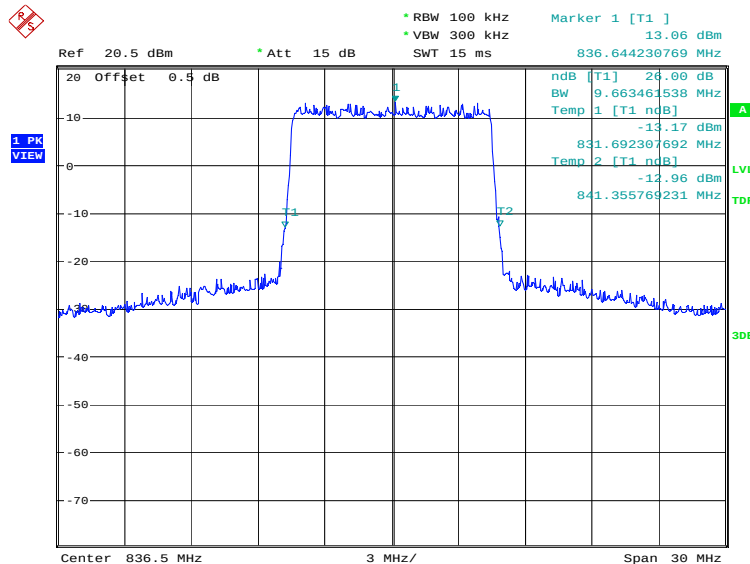
| Frequency(MHz) | Emission Bandwidth (-26dBc)(kHz) |         |
|----------------|----------------------------------|---------|
| 836.5          | QPSK                             | 16QAM   |
|                | 9663.46                          | 9663.46 |

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



Date: 2. JUN.2022 11:59:23

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

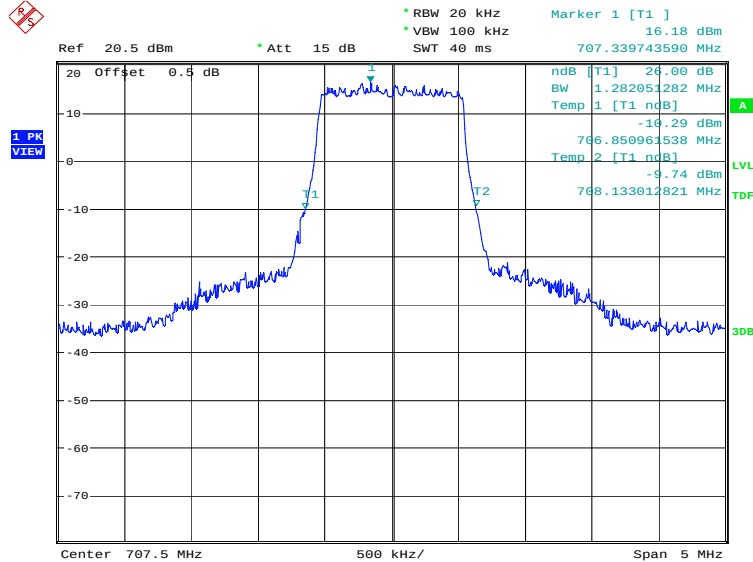


Date: 2. JUN.2022 12:00:02

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

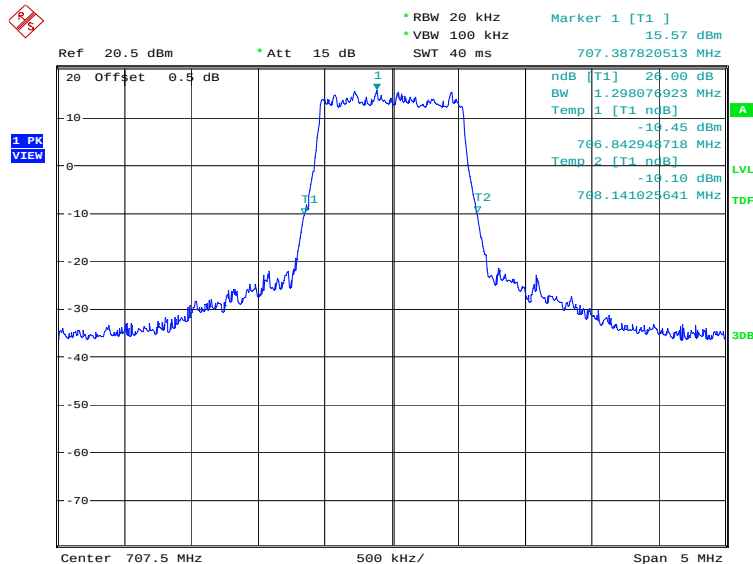
| Frequency(MHz) | Emission Bandwidth (-26dBc)(kHz) |         |
|----------------|----------------------------------|---------|
| 707.5          | QPSK                             | 16QAM   |
|                | 1282.05                          | 1298.08 |

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



Date: 2.JUN.2022 12:00:44

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

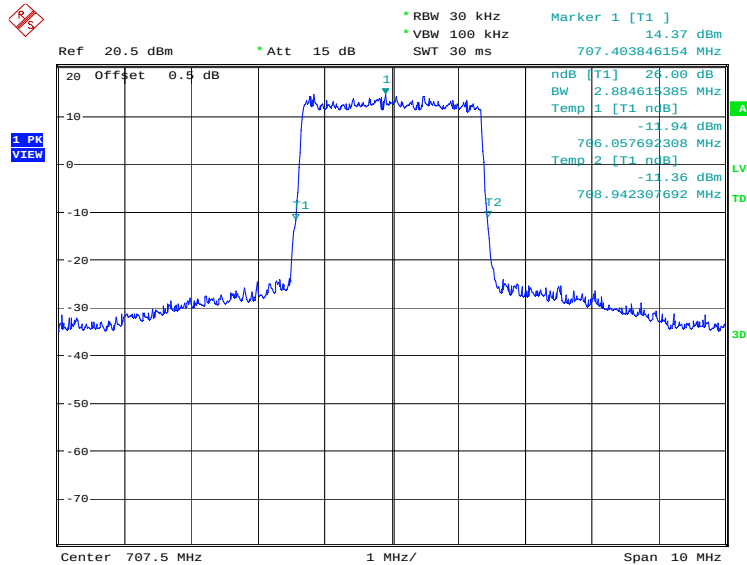


Date: 2.JUN.2022 12:01:23

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

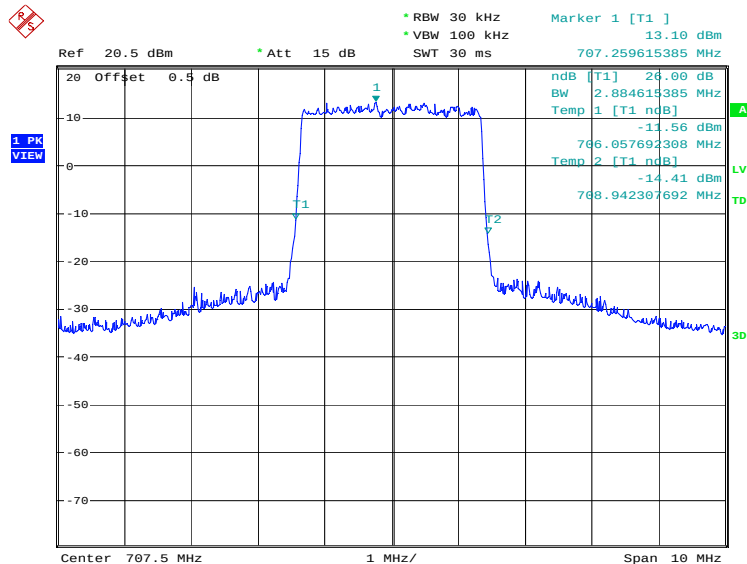
| Frequency(MHz) | Emission Bandwidth (-26dBc)(kHz) |         |
|----------------|----------------------------------|---------|
| 707.5          | QPSK                             | 16QAM   |
|                | 2884.62                          | 2884.62 |

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



Date: 2.JUN.2022 12:02:04

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



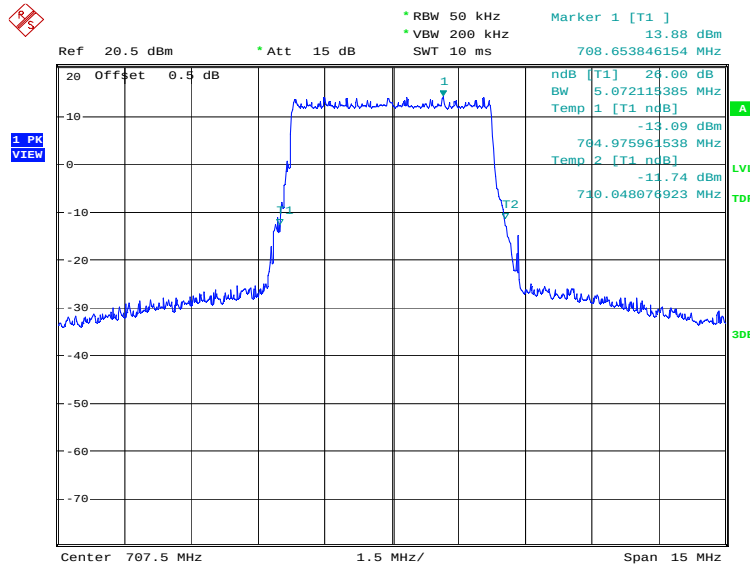
Date: 2.JUN.2022 12:02:43



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

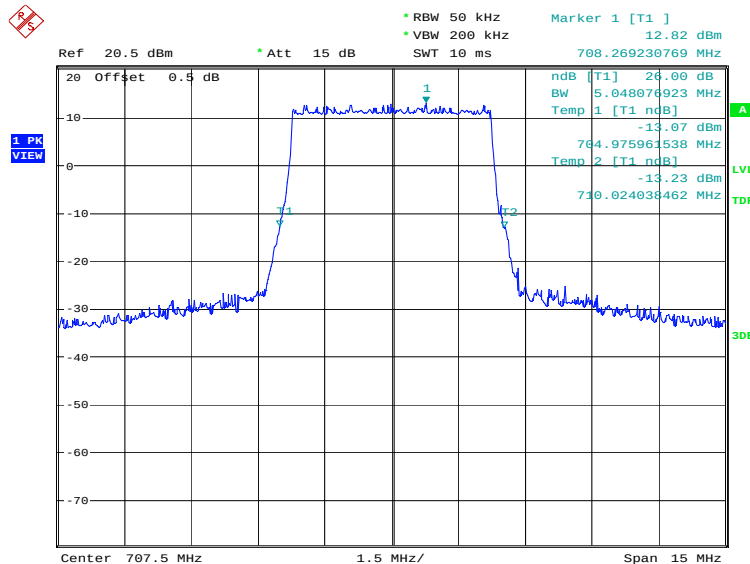
| Frequency(MHz) | Emission Bandwidth (-26dBc)(kHz) |         |
|----------------|----------------------------------|---------|
| 707.5          | QPSK                             | 16QAM   |
|                | 5072.12                          | 5048.08 |

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



Date: 2.JUN.2022 12:03:24

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

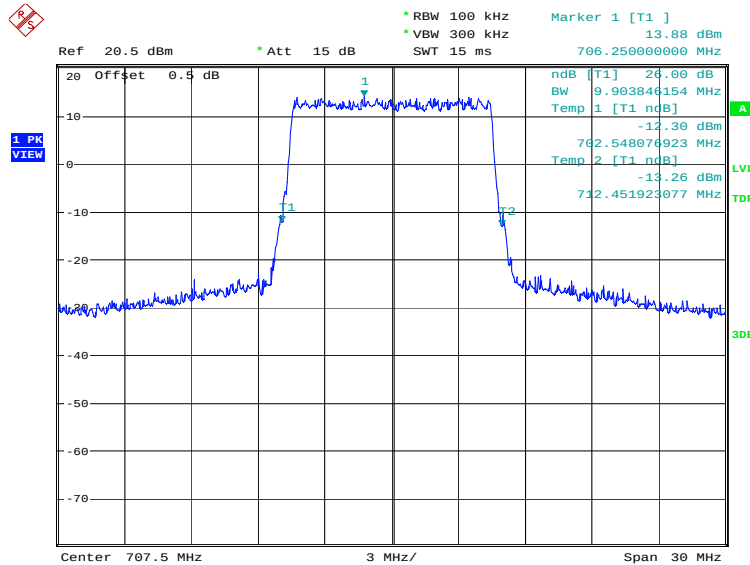


Date: 2.JUN.2022 12:04:03

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

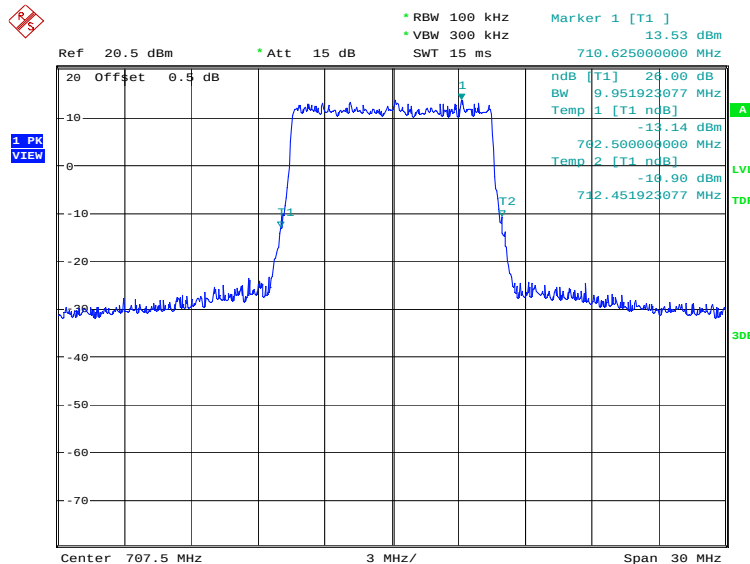
| Frequency(MHz) | Emission Bandwidth (-26dBc)(kHz) |         |
|----------------|----------------------------------|---------|
| 707.5          | QPSK                             | 16QAM   |
|                | 9903.85                          | 9951.92 |

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



Date: 2. JUN. 2022 12:04:43

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

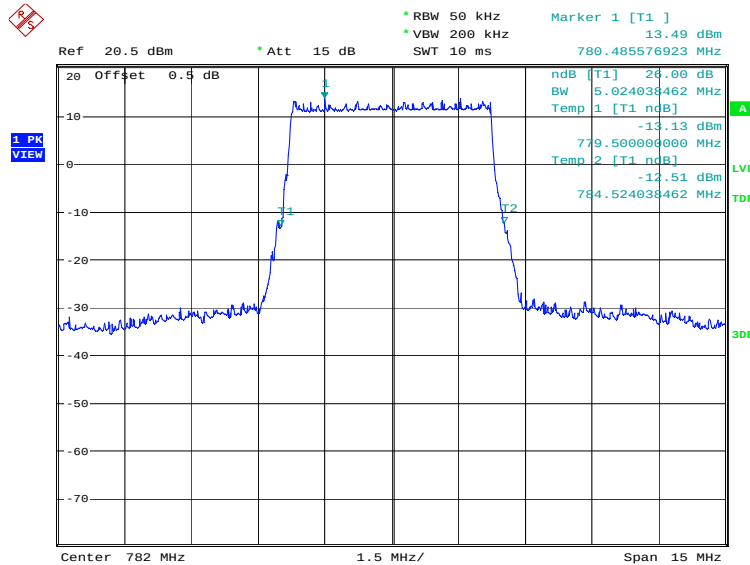


Date: 2. JUN. 2022 12:05:22

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

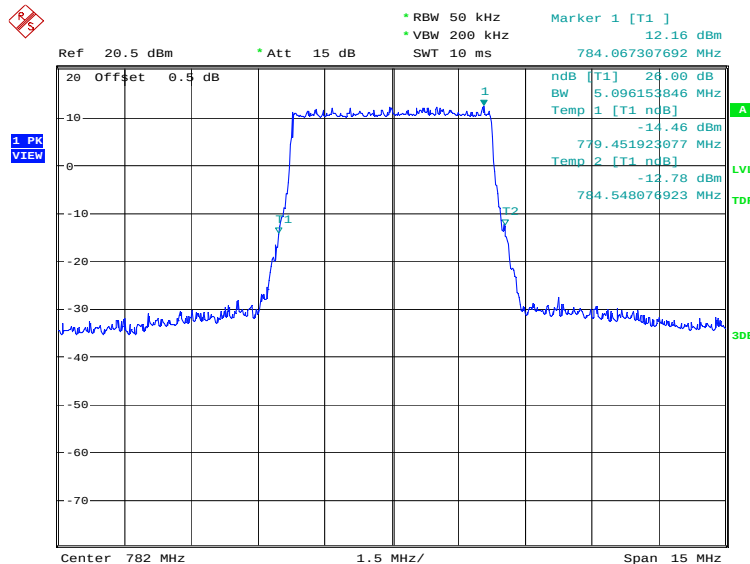
| Frequency(MHz) | Emission Bandwidth (-26dBc)(kHz) |         |
|----------------|----------------------------------|---------|
| 782.0          | QPSK                             | 16QAM   |
|                | 5024.04                          | 5096.15 |

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



Date: 2. JUN.2022 12:06:04

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

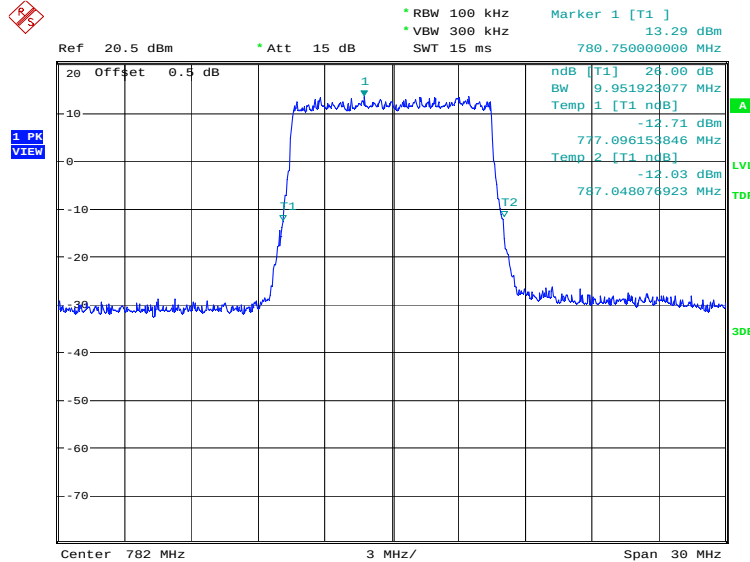


Date: 2. JUN.2022 12:06:44

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

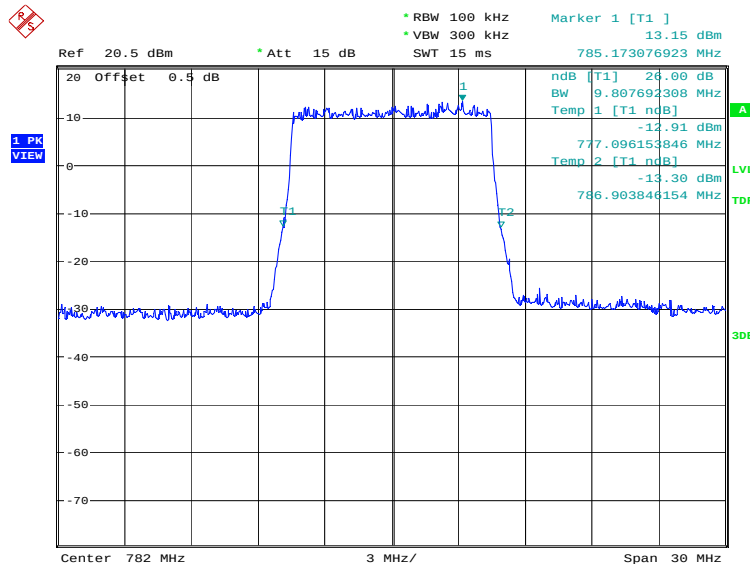
| Frequency(MHz) | Emission Bandwidth (-26dBc)(kHz) |         |
|----------------|----------------------------------|---------|
| 782.0          | QPSK                             | 16QAM   |
|                | 9951.92                          | 9807.69 |

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



Date: 2.JUN.2022 12:07:24

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

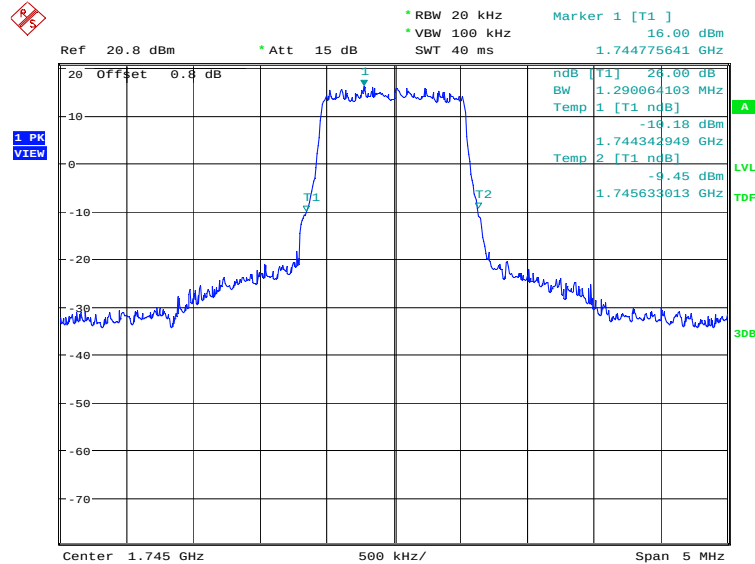


Date: 2.JUN.2022 12:08:04

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

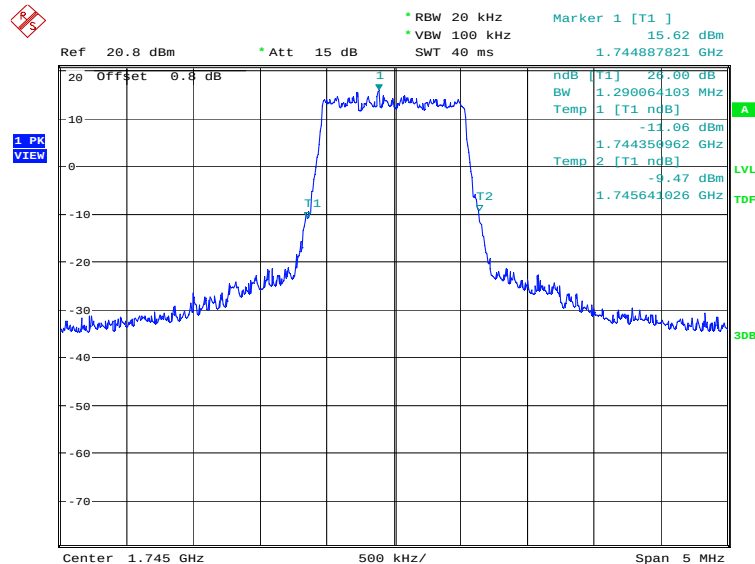
| Frequency(MHz) | Emission Bandwidth (-26dBc)(kHz) |         |
|----------------|----------------------------------|---------|
| 1745.0         | QPSK                             | 16QAM   |
|                | 1290.06                          | 1290.06 |

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



Date: 2.JUN.2022 12:08:46

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

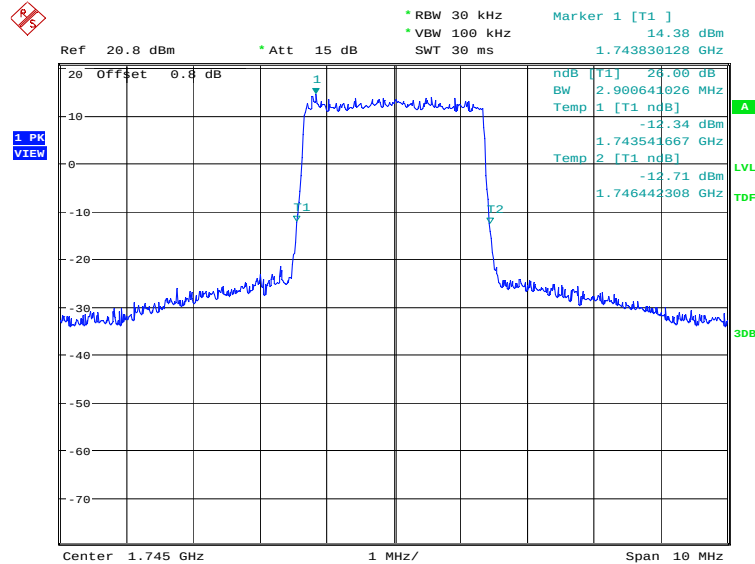


Date: 2.JUN.2022 12:09:25

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

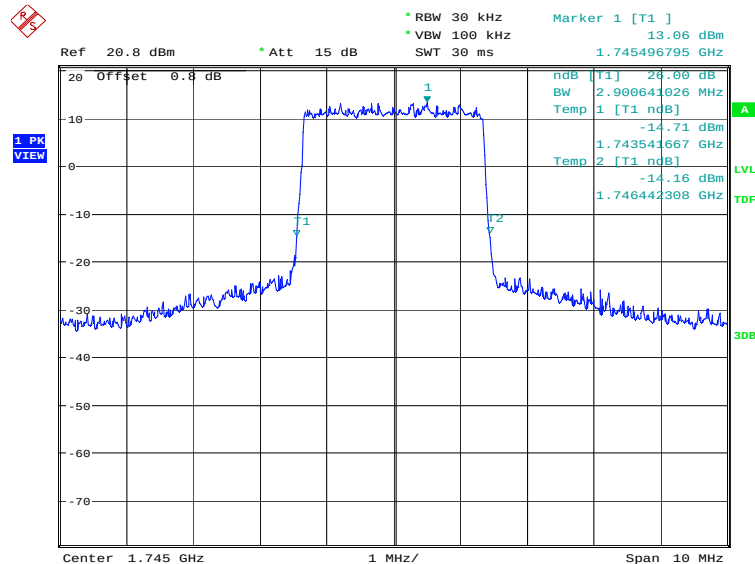
| Frequency(MHz) | Emission Bandwidth (-26dBc)(kHz) |         |
|----------------|----------------------------------|---------|
| 1745.0         | QPSK                             | 16QAM   |
|                | 2900.64                          | 2900.64 |

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



Date: 2.JUN.2022 12:10:06

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

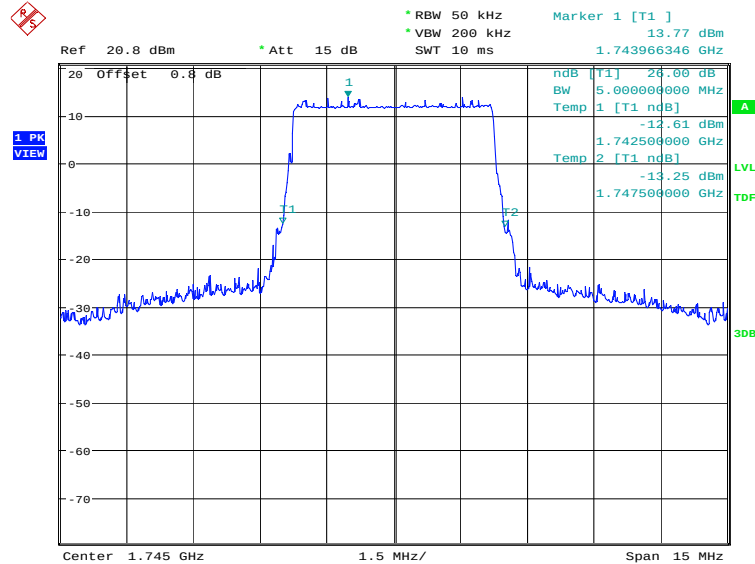


Date: 2.JUN.2022 12:10:45

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

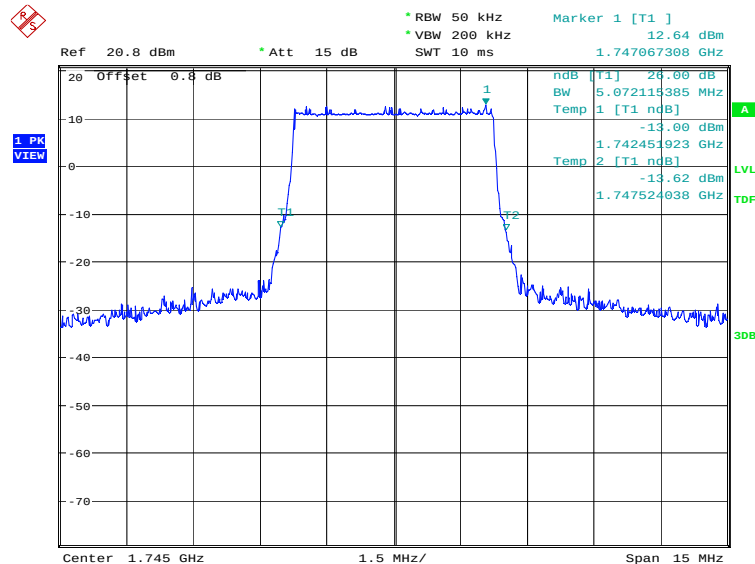
| Frequency(MHz) | Emission Bandwidth (-26dBc)(kHz) |         |
|----------------|----------------------------------|---------|
| 1745.0         | QPSK                             | 16QAM   |
|                | 5000.00                          | 5072.12 |

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



Date: 2.JUN.2022 12:11:26

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

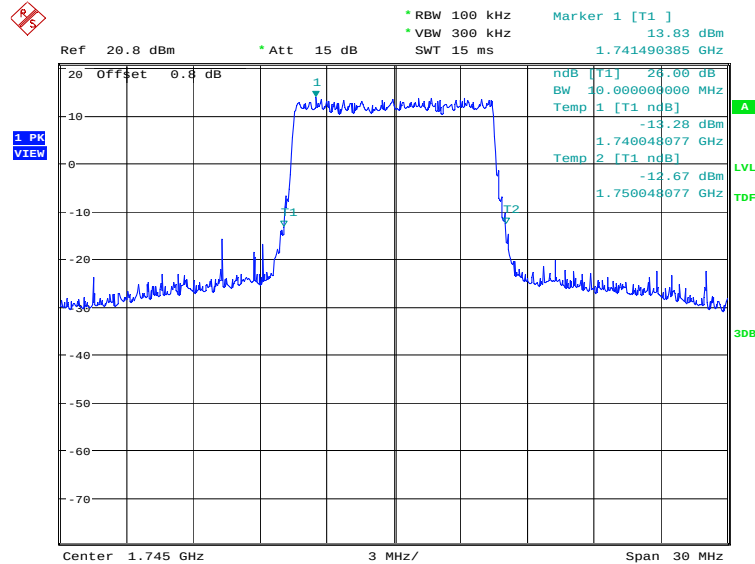


Date: 2.JUN.2022 12:12:05

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

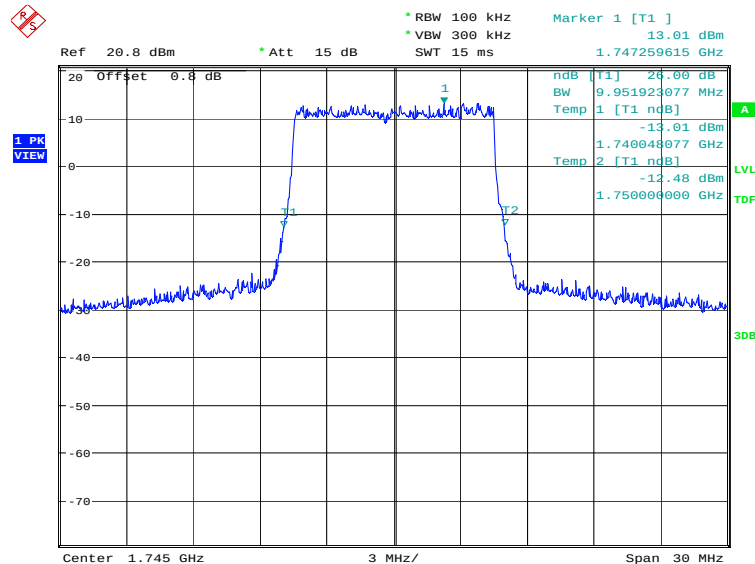
| Frequency(MHz) | Emission Bandwidth (-26dBc)(kHz) |         |
|----------------|----------------------------------|---------|
| 1745.0         | QPSK                             | 16QAM   |
|                | 10000.00                         | 9951.92 |

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



Date: 2.JUN.2022 12:12:46

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



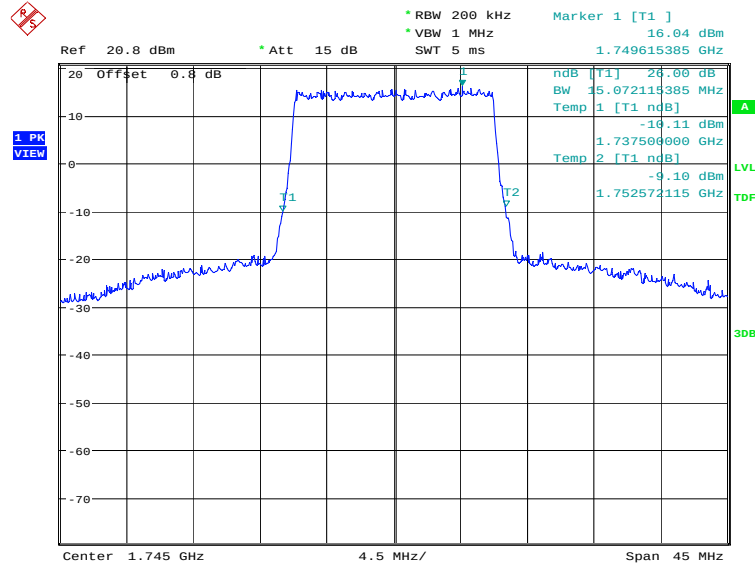
Date: 2.JUN.2022 12:13:25



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

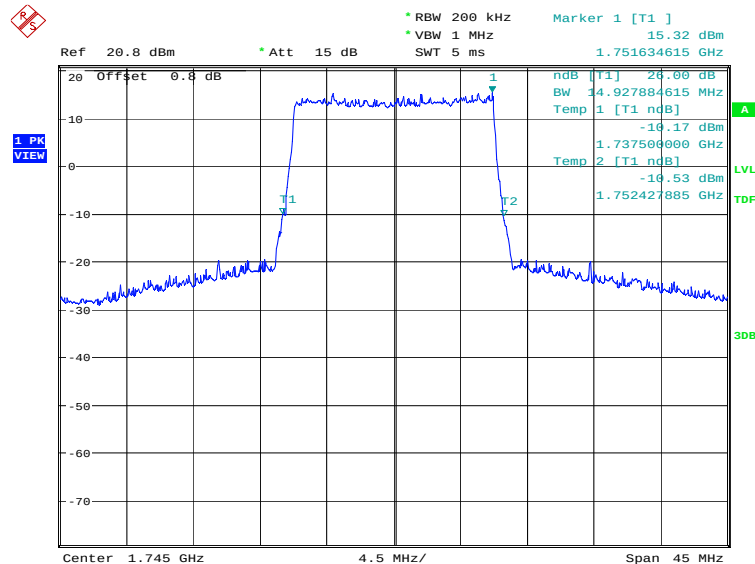
| Frequency(MHz) | Emission Bandwidth (-26dBc)(kHz) |          |
|----------------|----------------------------------|----------|
| 1745.0         | QPSK                             | 16QAM    |
|                | 15072.12                         | 14927.88 |

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



Date: 2.JUN.2022 12:14:06

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

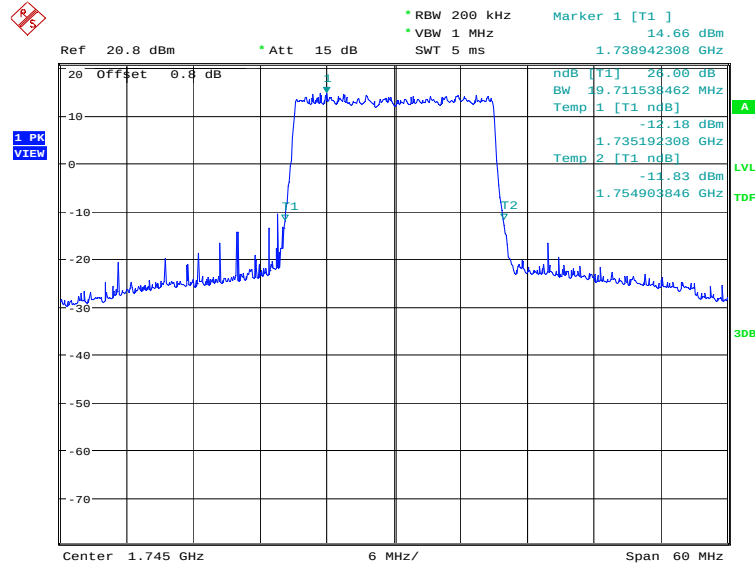


Date: 2.JUN.2022 12:14:45

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

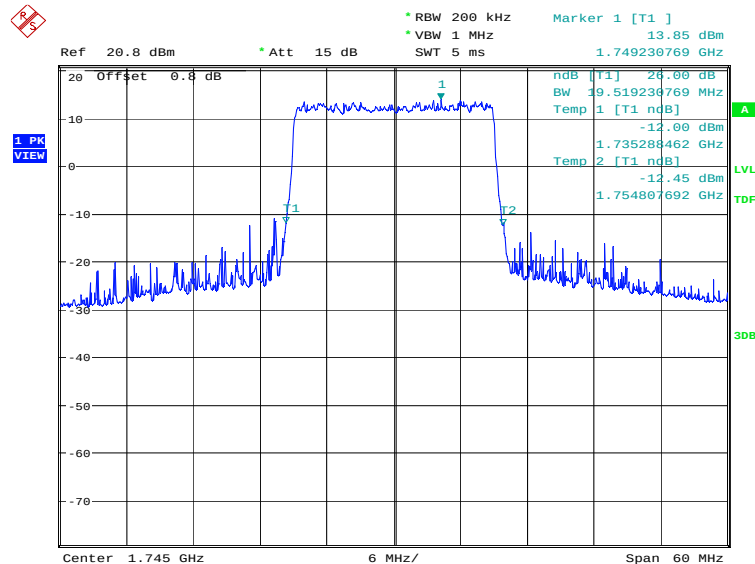
| Frequency(MHz) | Emission Bandwidth (-26dBc)(kHz) |          |
|----------------|----------------------------------|----------|
| 1745.0         | QPSK                             | 16QAM    |
|                | 19711.54                         | 19519.23 |

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



Date: 2.JUN.2022 12:15:26

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



Date: 2.JUN.2022 12:16:05

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

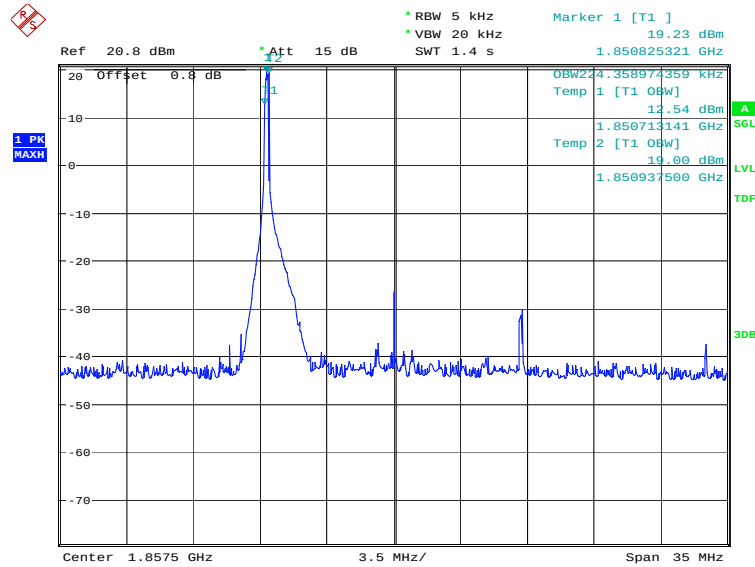
Part 27.53(g) states for operations in the 600 MHz band and the 698–746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least  $43 + 10 \log(P)$  dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

## A.6.2 Measurement result

Only the worst case result is given below

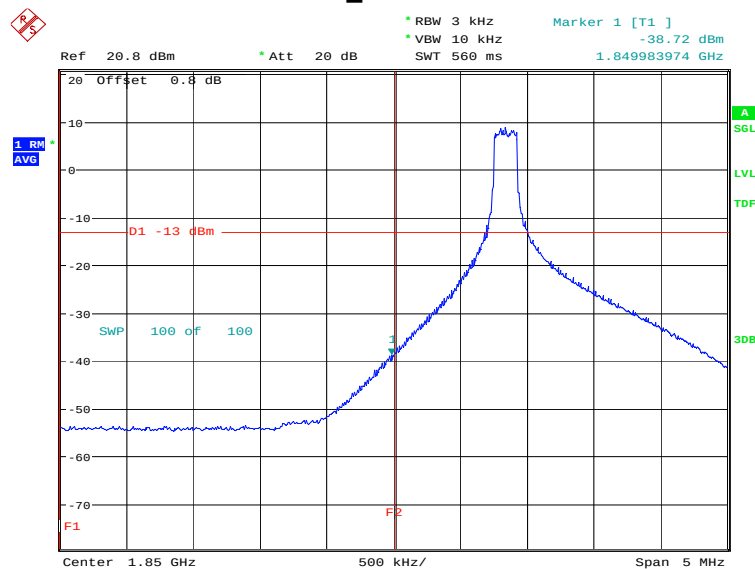
LTE band 2

OBW: 1RB-low\_offset



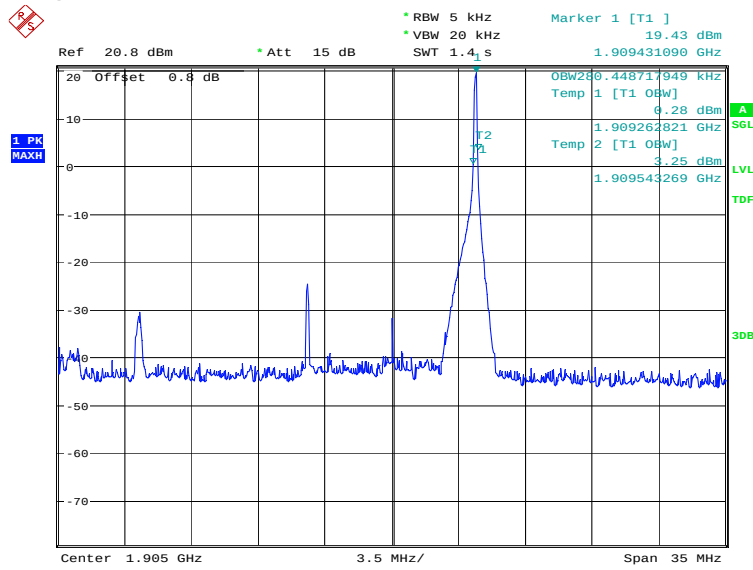
Date: 23.JUN.2022 17:08:44

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



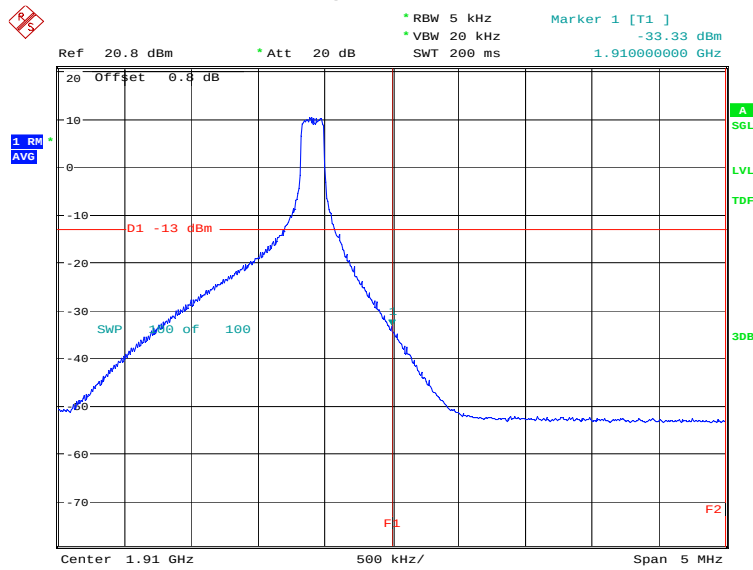
Date: 23.JUN.2022 17:09:57

## OBW: 1RB-high\_offset



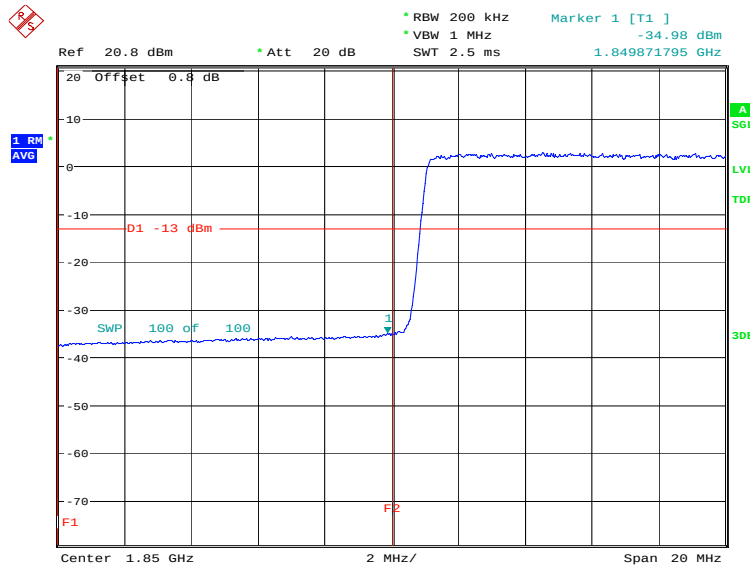
Date: 23.JUN.2022 17:11:15

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



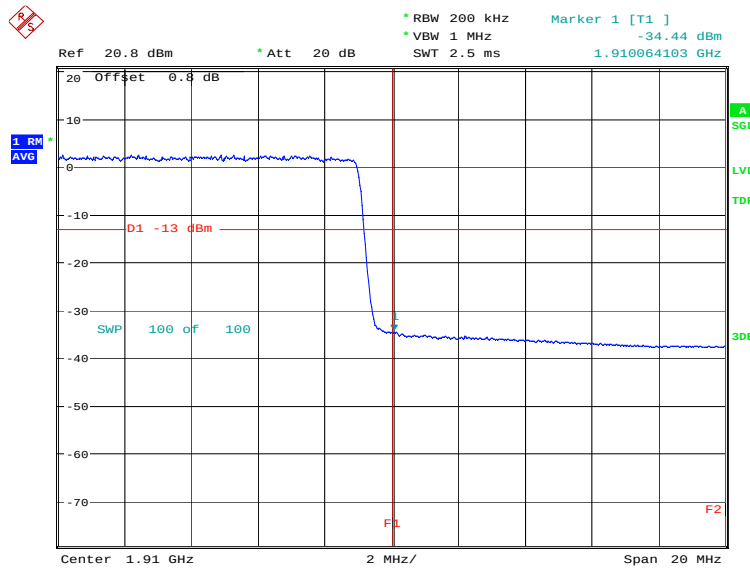
Date: 23.JUN.2022 17:12:28

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



Date: 2.JUN.2022 12:17:19

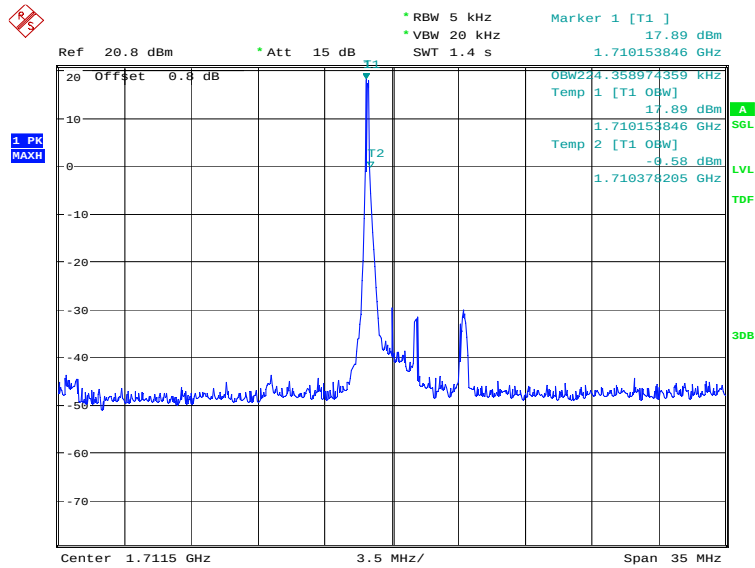
## HIGH BAND EDGE BLOCK-20MHz-100%RB



Date: 2.JUN.2022 12:18:42

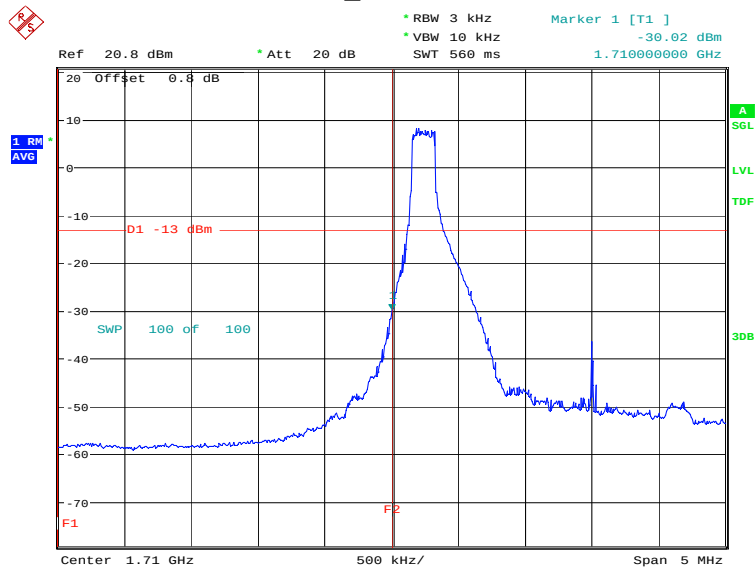
## LTE band 4

### OBW: 1RB-low\_offset



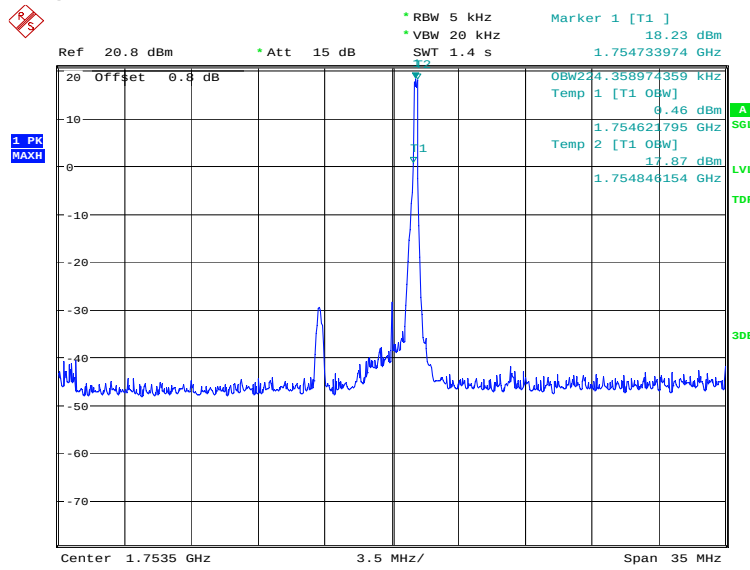
Date: 23.JUN.2022 17:13:47

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



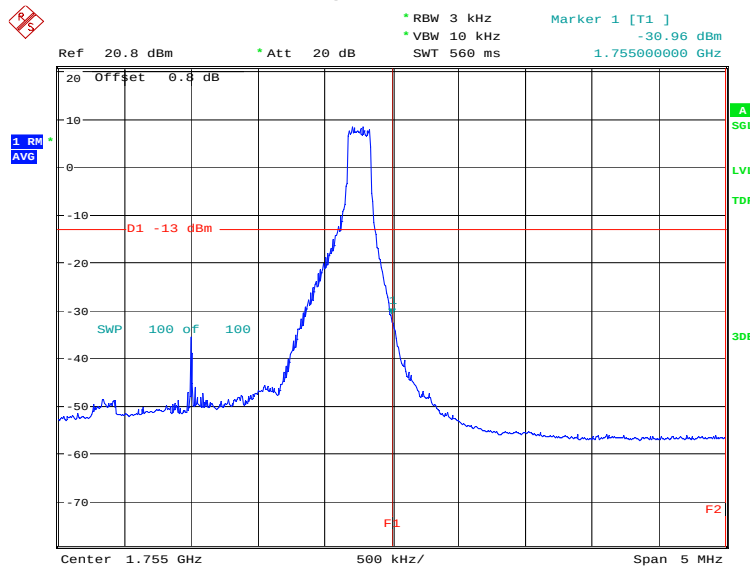
Date: 23.JUN.2022 17:15:00

## OBW: 1RB-high\_offset



Date: 23.JUN.2022 17:17:48

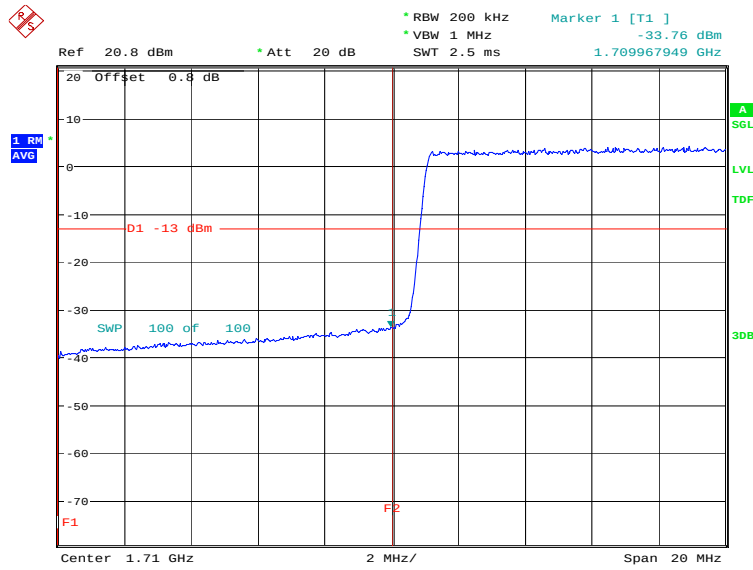
## HIGH BAND EDGE BLOCK-1RB-high\_offset



Date: 23.JUN.2022 17:19:01

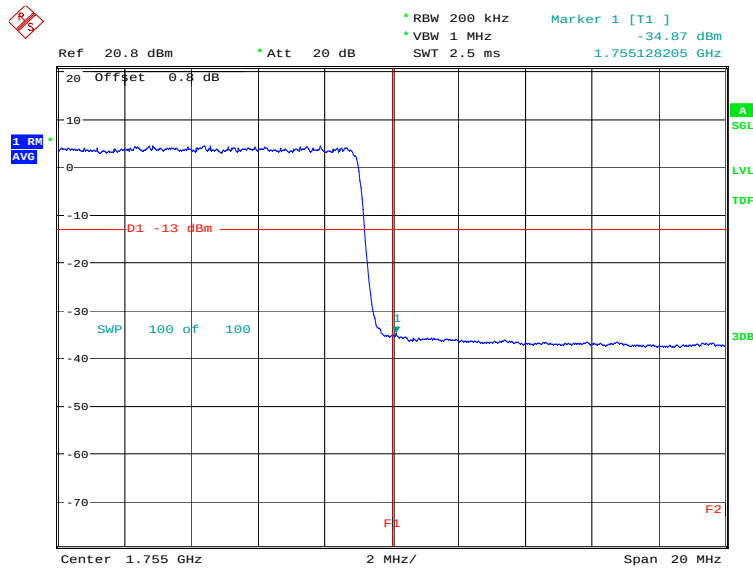


## LOW BAND EDGE BLOCK-20MHz-100%RB



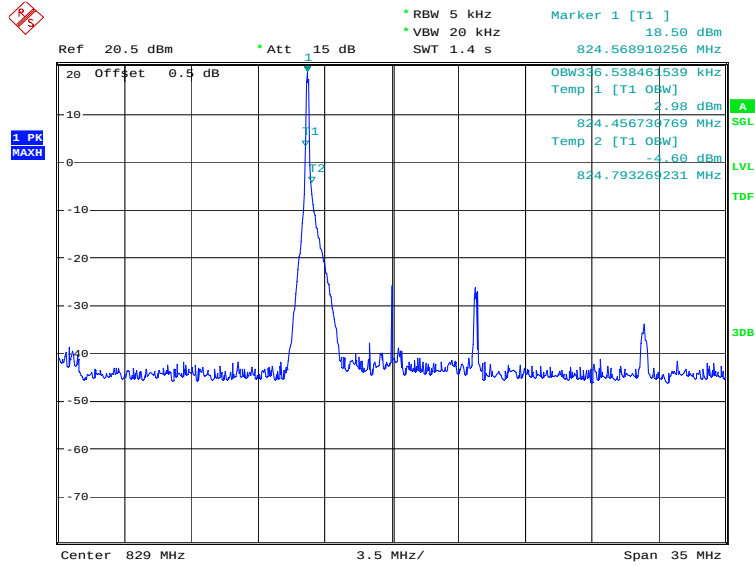
Date: 23.JUN.2022 17:15:35

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



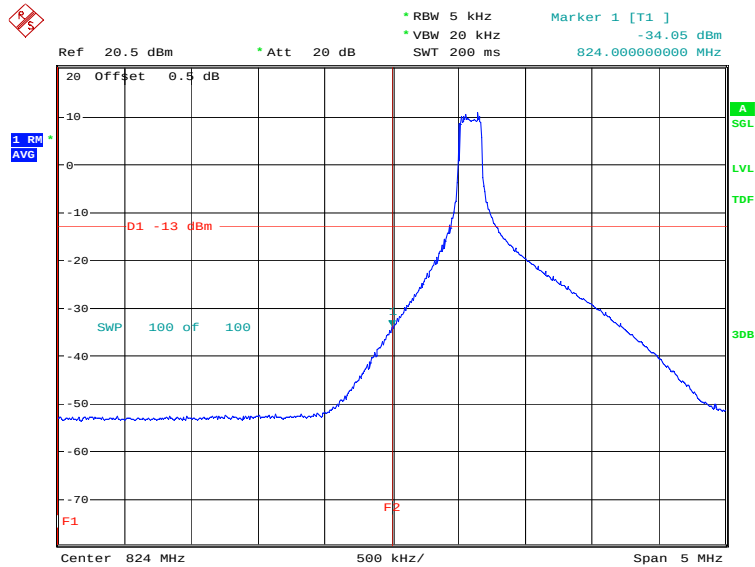
Date: 23.JUN.2022 17:19:36

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



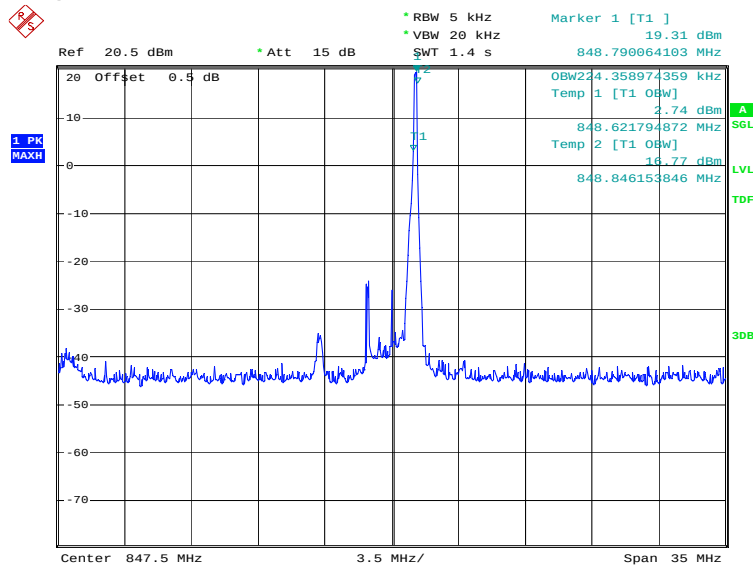
Date: 23.JUN.2022 17:21:50

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



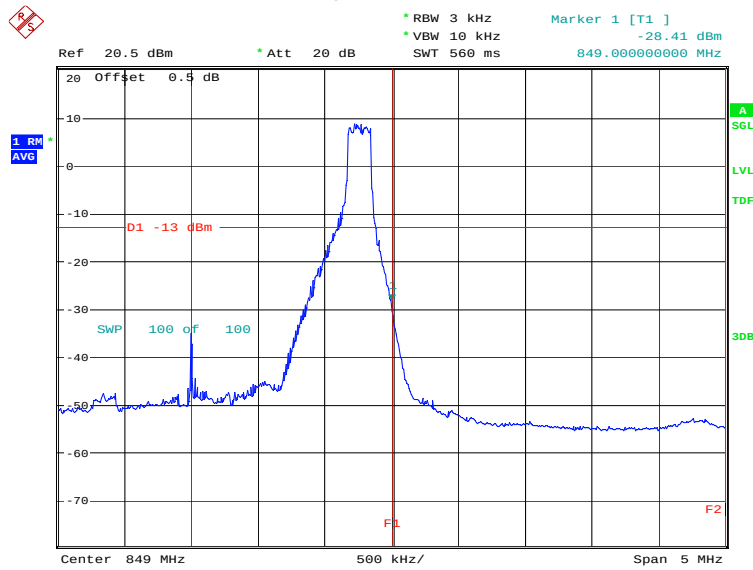
Date: 23.JUN.2022 17:23:03

## OBW: 1RB-high\_offset



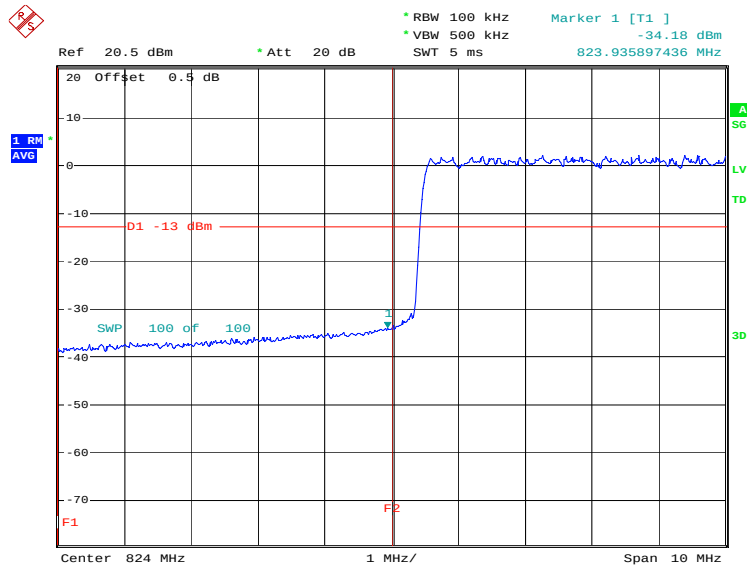
Date: 23.JUN.2022 17:24:24

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



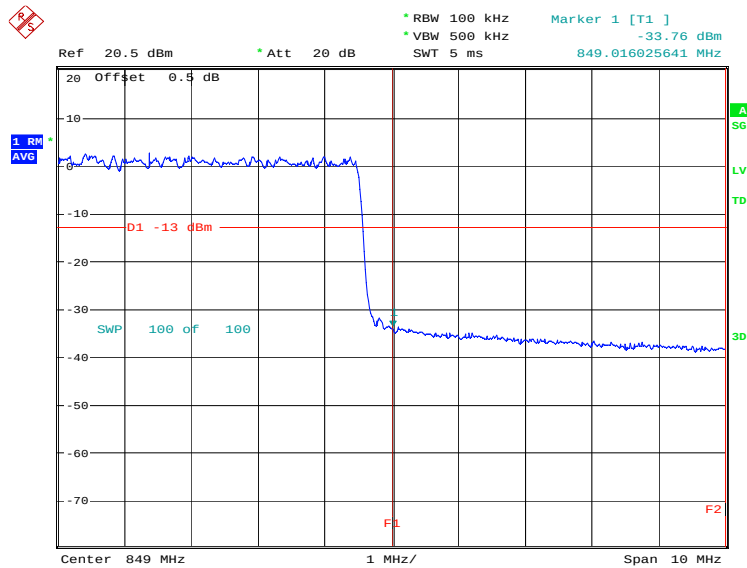
Date: 23.JUN.2022 17:25:38

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



Date: 2.JUN.2022 12:20:49

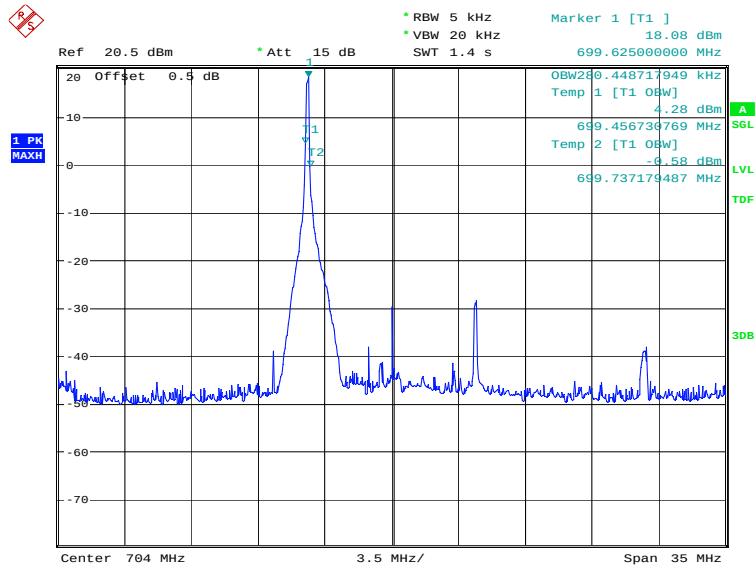
## HIGH BAND EDGE BLOCK-10MHz-100%RB



Date: 2.JUN.2022 12:22:12

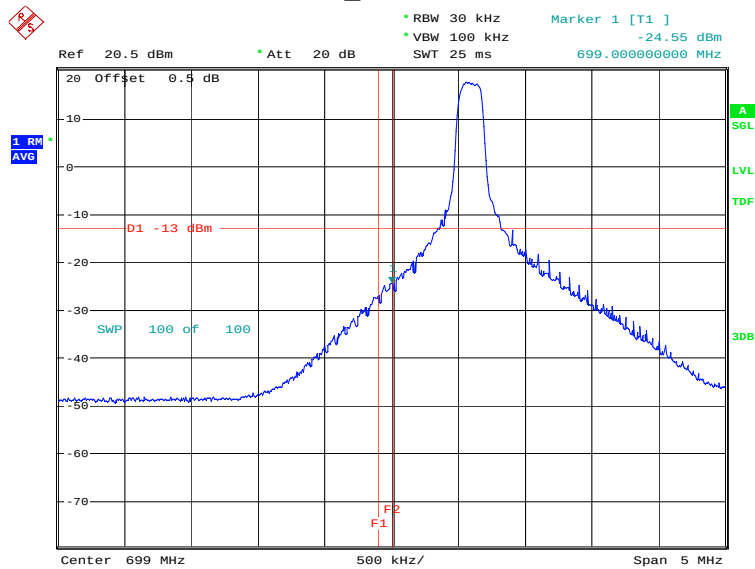
## LTE band 12

### OBW: 1RB-low\_offset



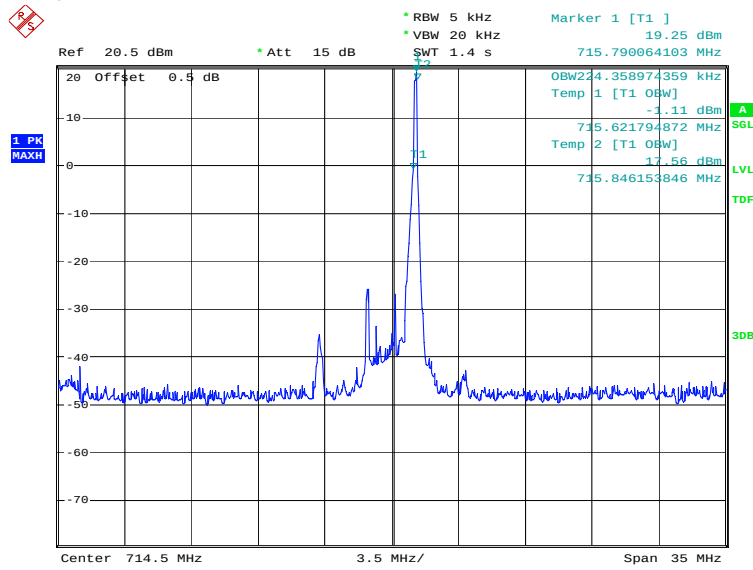
Date: 23.JUN.2022 17:26:16

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



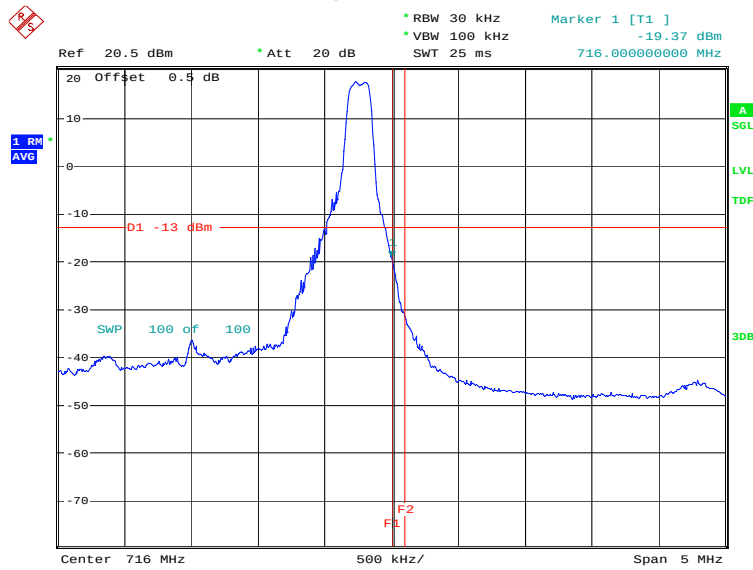
Date: 23.JUN.2022 17:26:35

## OBW: 1RB-high\_offset



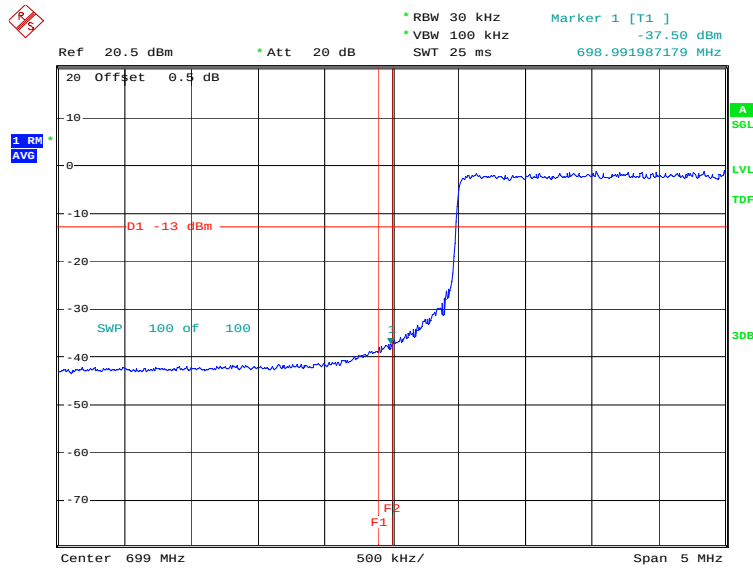
Date: 23.JUN.2022 17:27:52

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



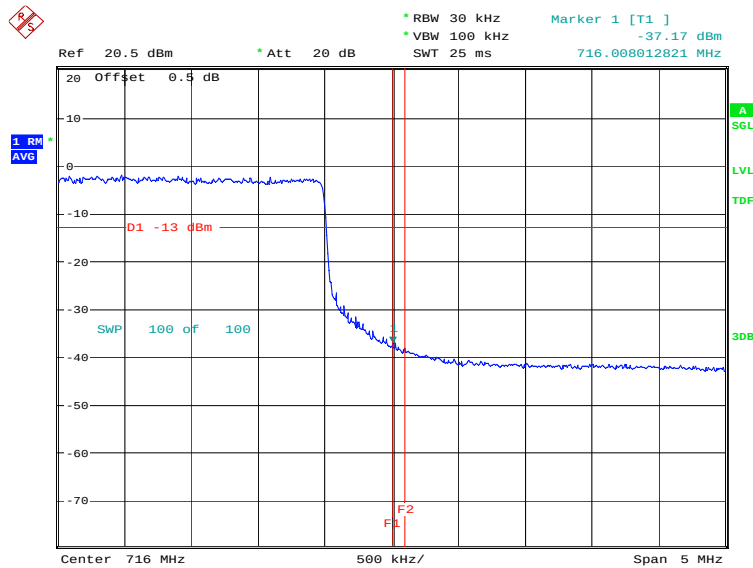
Date: 23.JUN.2022 17:28:10

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



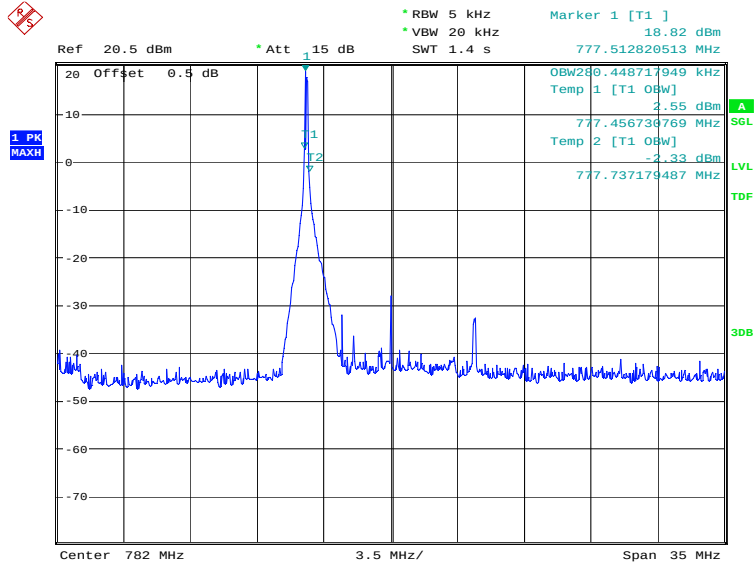
Date: 2.JUN.2022 12:23:38

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



Date: 2.JUN.2022 12:25:01

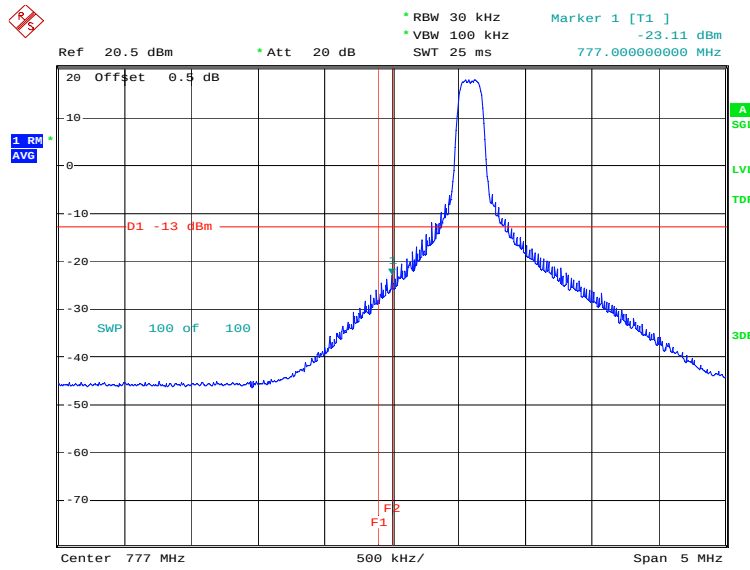
**LTE band 13**  
**OBW: 1RB-low\_offset**



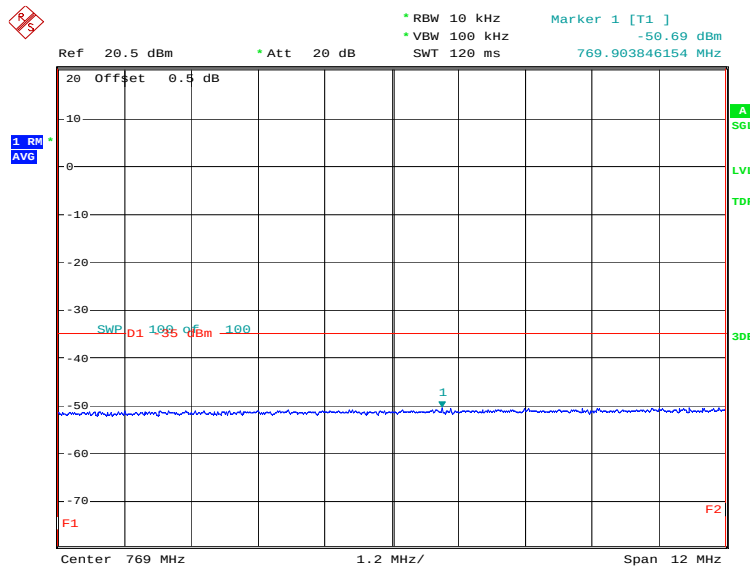
Date: 23.JUN.2022 17:28:49



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

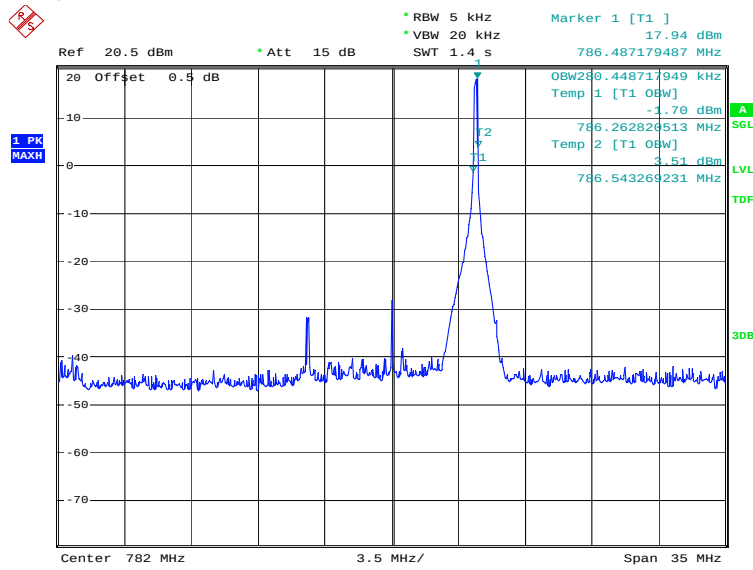


Date: 23.JUN.2022 17:29:07



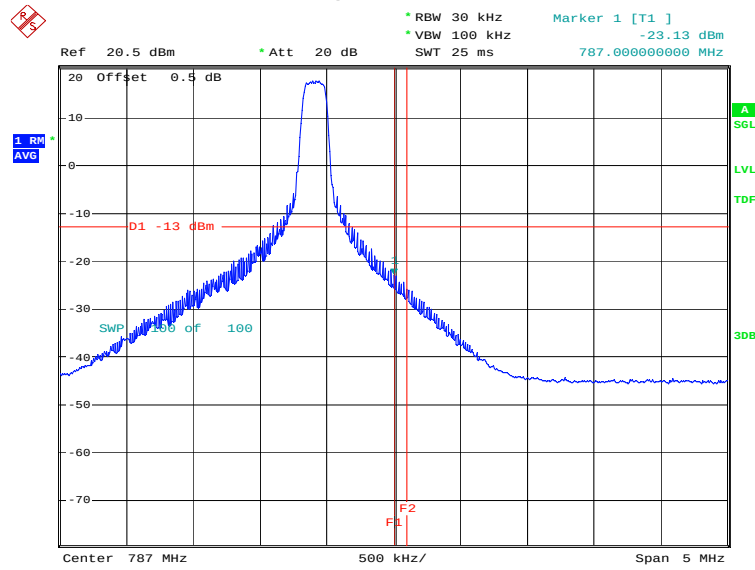
Date: 23.JUN.2022 17:29:45

# OBW: 1RB-high\_offset

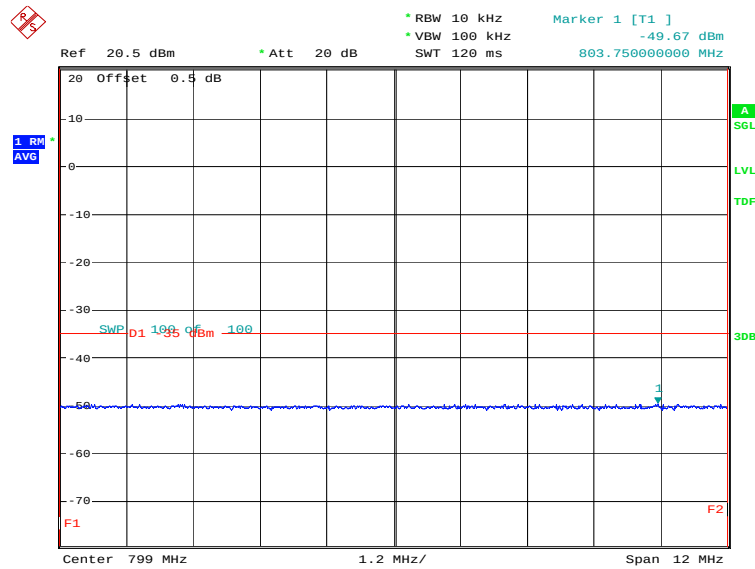


Date: 23.JUN.2022 17:30:19

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

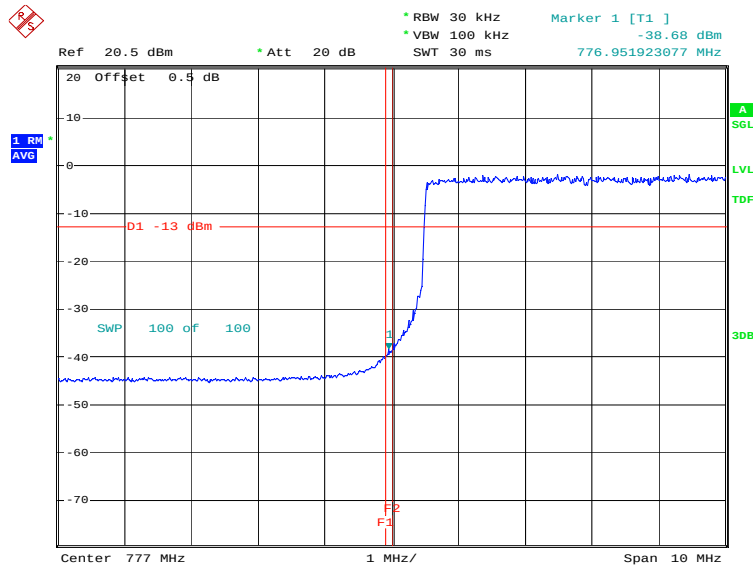


Date: 23.JUN.2022 17:30:37

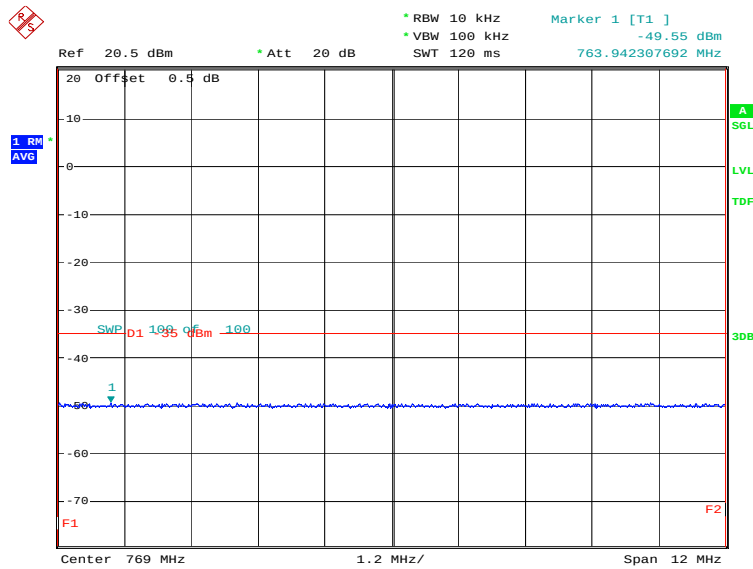


Date: 23.JUN.2022 17:31:15

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

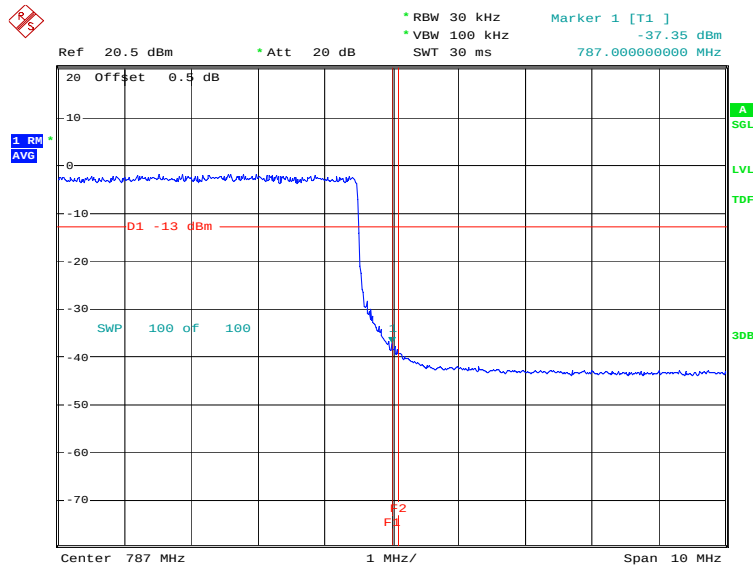


Date: 2.JUN.2022 12:26:25

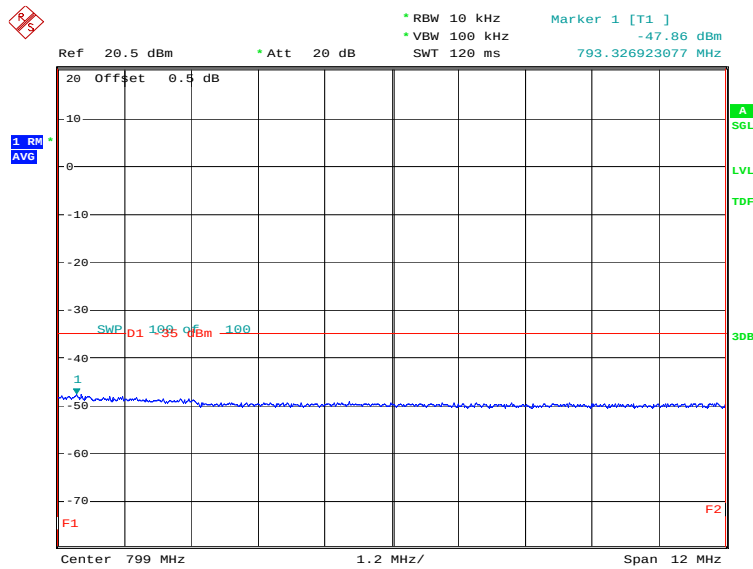


Date: 2.JUN.2022 12:27:03

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



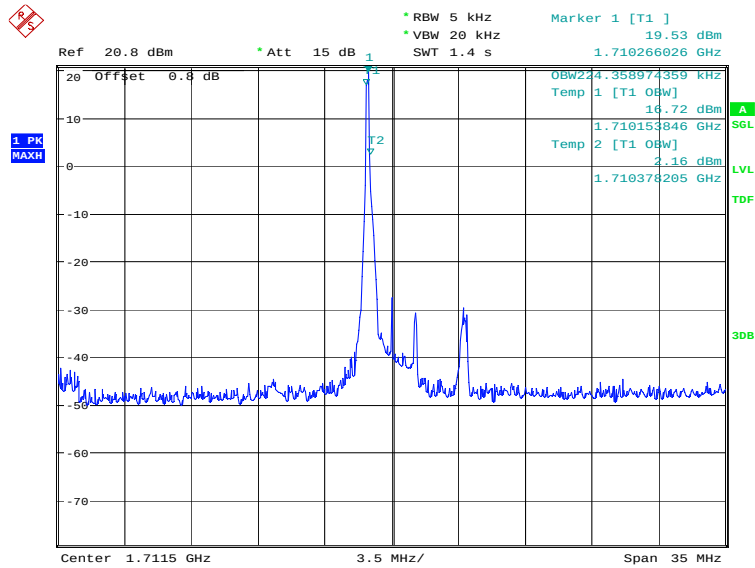
Date: 2.JUN.2022 12:28:26



Date: 2.JUN.2022 12:29:04

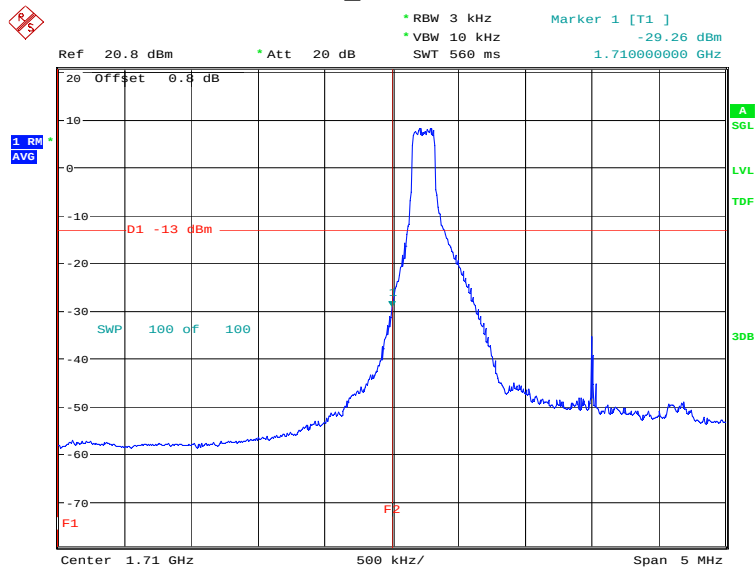
## LTE band 66

### OBW: 1RB-low\_offset



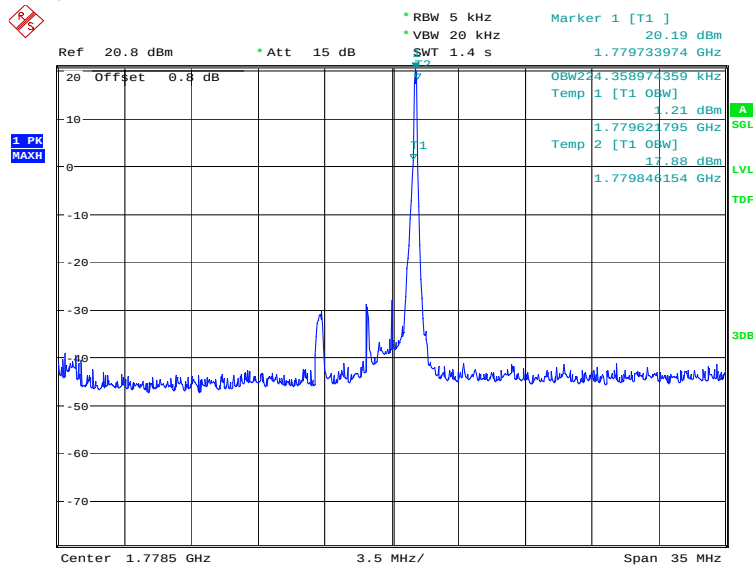
Date: 23.JUN.2022 17:32:35

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



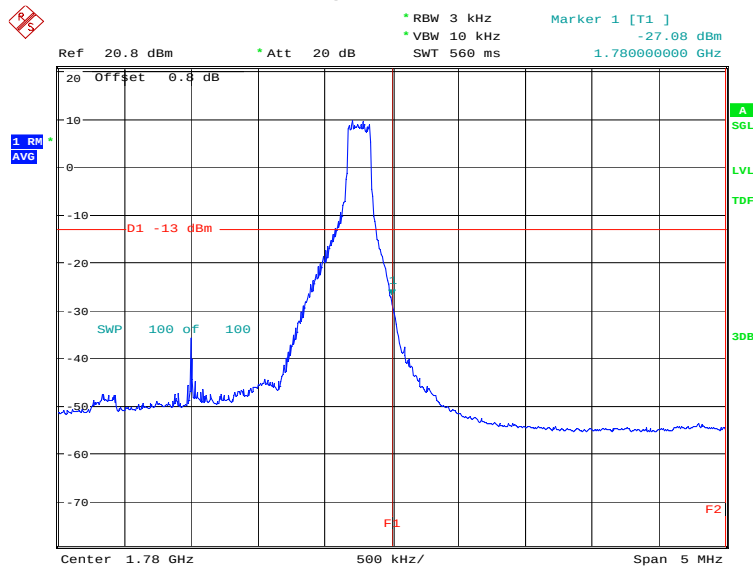
Date: 23.JUN.2022 17:33:48

## OBW: 1RB-high\_offset



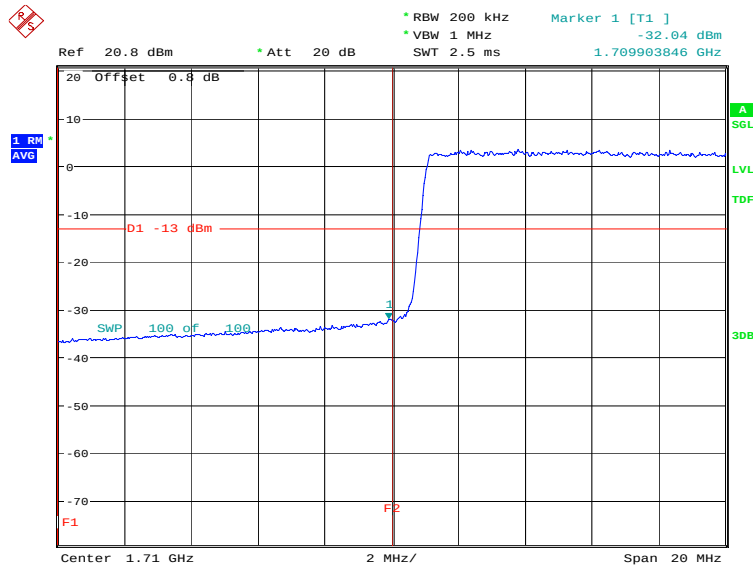
Date: 23.JUN.2022 17:34:23

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



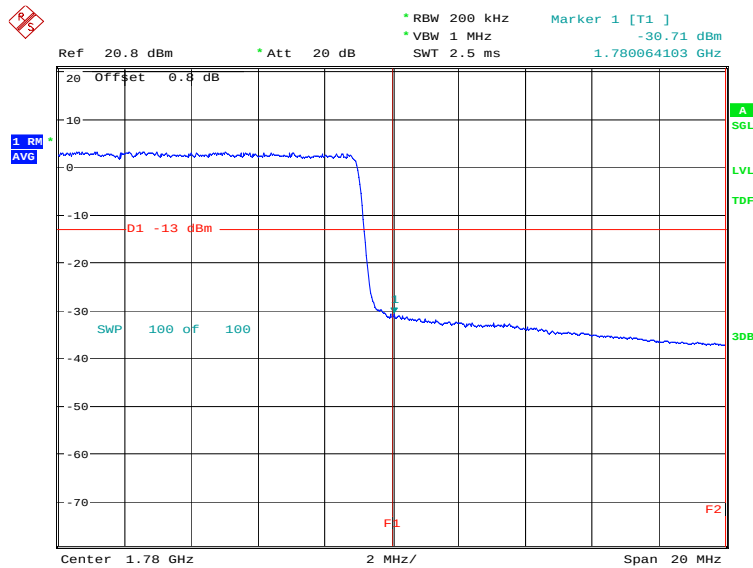
Date: 23.JUN.2022 17:35:36

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



Date: 2.JUN.2022 12:30:31

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



Date: 2.JUN.2022 12:31:54



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

Part 27.53(f) states for operations in the 746–758 MHz, 775–788 MHz, and 805–806 MHz bands, emissions in the band 1559–1610 MHz shall be limited to -70dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals.

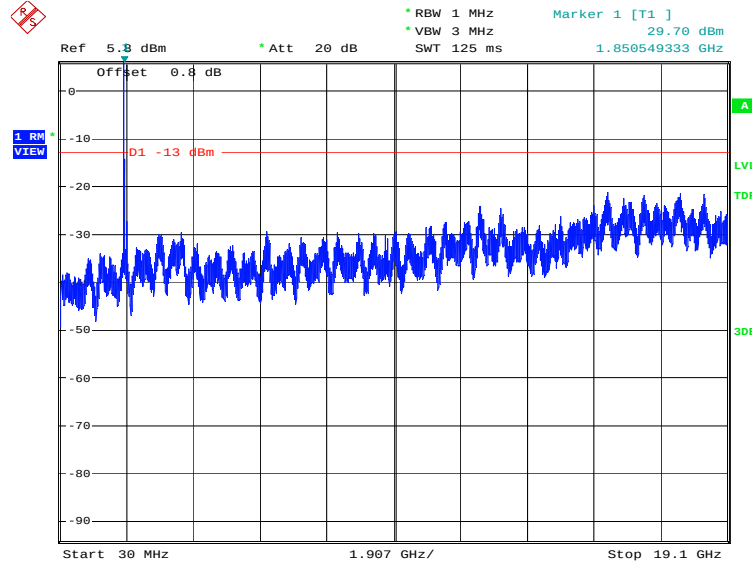
Part 27.53(g) states for operations in the 600 MHz band and the 698–746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least  $43 + 10 \log(P)$  dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

### A. 7.3 Measurement result

Only the worst case result is given below

LTE band 2: 30MHz – 19.1GHz

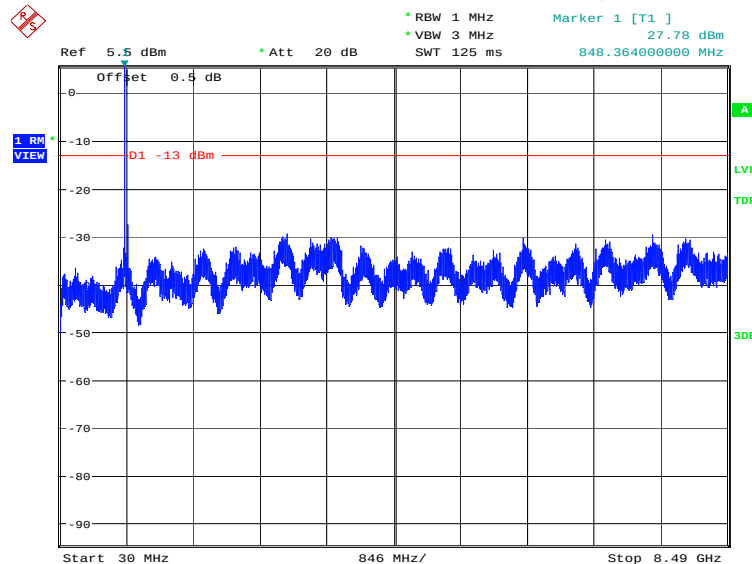
NOTE: peak above the limit line is the carrier frequency.



Date: 23.JUN.2022 17:36:54

LTE band 5: 30MHz – 8.49GHz

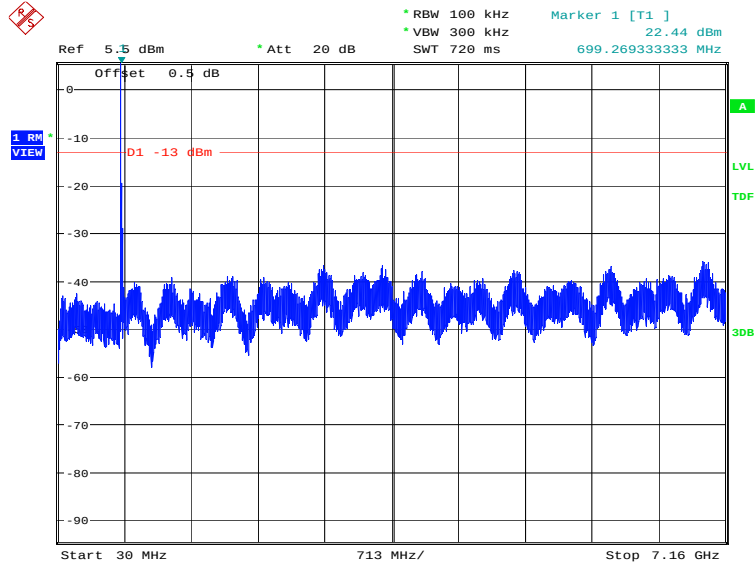
NOTE: peak above the limit line is the carrier frequency.



Date: 23.JUN.2022 17:38:17

### LTE band 12: 30MHz – 7.16GHz

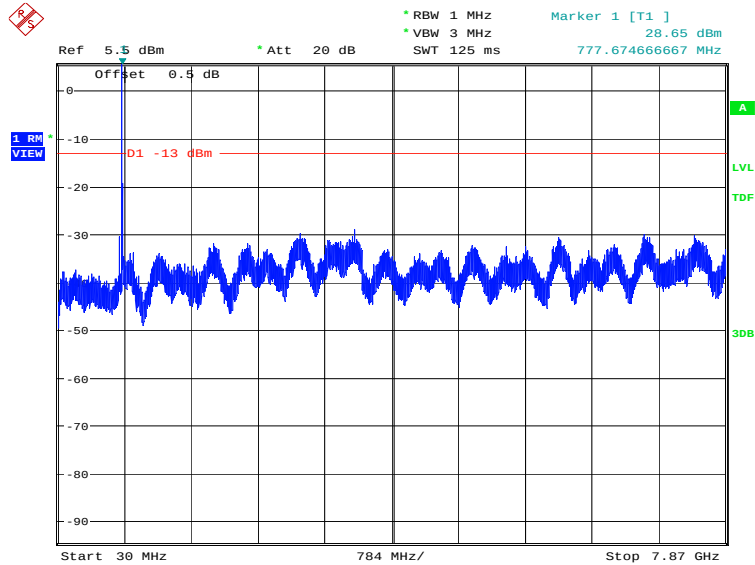
NOTE: peak above the limit line is the carrier frequency.



Date: 23.JUN.2022 17:39:00

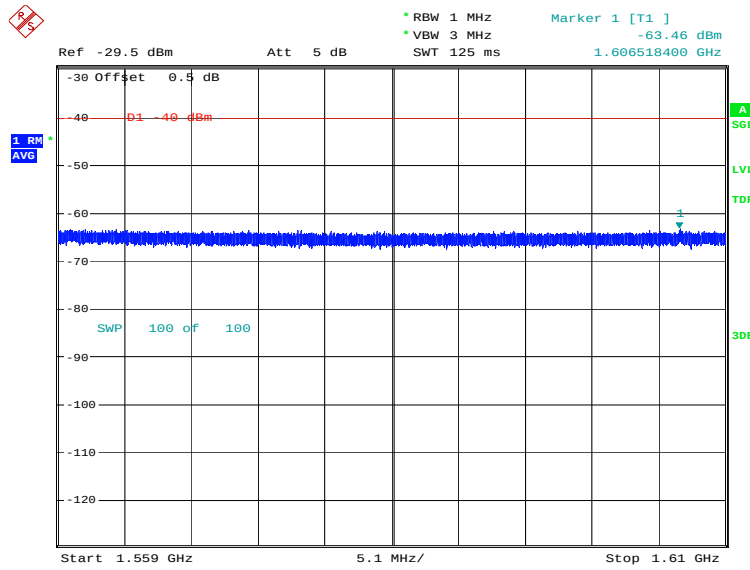
### LTE band 13: 30MHz – 7.87GHz

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



Date: 23.JUN.2022 17:39:40

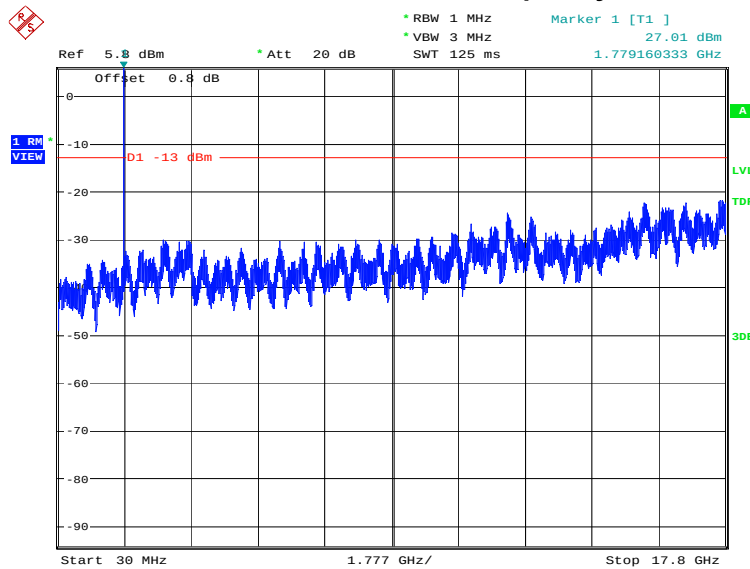
### LTE band 13: 1559MHz – 1610MHz



Date: 23.JUN.2022 17:40:13

### LTE band 66: 30MHz – 17.8GHz

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



Date: 23.JUN.2022 17:40:56

## **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 |
|                | 6.89     | 7.37  | 7.56  |

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

| Frequency(MHz) | PAPR(dB) |       |       |
|----------------|----------|-------|-------|
| 707.5          | QPSK     | 16QAM | 64QAM |
|                | 5.77     | 6.54  | 6.70  |

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

| Frequency(MHz) | PAPR(dB) |       |       |
|----------------|----------|-------|-------|
| 782.0          | QPSK     | 16QAM | 64QAM |
|                | 5.71     | 6.47  | 6.73  |

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

| Frequency(MHz) | PAPR(dB) |       |       |
|----------------|----------|-------|-------|
| 1745.0         | QPSK     | 16QAM | 64QAM |
|                | 6.79     | 7.44  | 7.44  |

## Annex B: Accreditation Certificate

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |
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| <p>United States Department of Commerce<br/>National Institute of Standards and Technology</p> <div style="display: flex; justify-content: space-around; align-items: center;"><div style="font-size: 2em; font-weight: bold; letter-spacing: 0.5em;">NVLAP<sup>®</sup></div><div style="text-align: center;"></div></div> <hr style="border: 1px solid black;"/> <p style="font-size: 1.2em; font-weight: bold;">Certificate of Accreditation to ISO/IEC 17025:2017</p> <hr style="border: 1px solid black;"/> <p>NVLAP LAB CODE: 600118-0</p> <p style="font-weight: bold; text-align: center;">Telecommunication Technology Labs, CAICT</p> <p style="text-align: center;">Beijing<br/>China</p> <p style="text-align: center;"><i>is accredited by the National Voluntary Laboratory Accreditation Program for specific services,<br/>listed on the Scope of Accreditation, for:</i></p> <p style="font-weight: bold; text-align: center;">Electromagnetic Compatibility &amp; Telecommunications</p> <p style="text-align: center;"><i>This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017.<br/>This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality<br/>management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).</i></p> <div style="display: flex; justify-content: space-between; align-items: flex-end; padding-top: 20px;"><div style="width: 40%; text-align: center;"><hr style="border: 0.5px solid black;"/><p>2021-09-29 through 2022-09-30<br/><i>Effective Dates</i></p></div><div style="width: 15%; text-align: center;"></div><div style="width: 40%; text-align: center;"><div style="font-size: 1.5em; font-family: cursive; color: blue;">Dana S. Laman</div><hr style="border: 0.5px solid black;"/><p><i>For the National Voluntary Laboratory Accreditation Program</i></p></div></div> |  |
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\*\*\*END OF REPORT\*\*\*