# TEST REPORT

## No. I20Z60089-WMD01

**for**

**OnePlus Technology (shenzhen) Co., Ltd**

**Smart Phone**

**Model Name: HD1925**

**FCC ID: 2ABZ2-EE143**

**with**

**Hardware Version: 46**

**Software Version:10.0.25.HD61CB**

**Issued Date: 2020-03-10**

**Note:**

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

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:**

**CTTL, Telecommunication Technology Labs, CAICT**

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# REPORT HISTORY

| Report Number | Revision | Description | Issue Date |
|---|---|---|---|
| I20Z60089-WMD01 | Rev.0 | 1st edition | 2020-03-10 |

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

# CONTENTS

# 1. Test Laboratory

## 1.1. Introduction & Accreditation

Telecommunication Technology Labs, CAICT is an ISO/IEC 17025:2005 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. China100191

Location 2: CTTL(Shouxiang)

Address: No. 51 Shouxiang Science Building, Xueyuan Road, Haidian District, Beijing, P. R. China100191

## 1.3. Testing Environment

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

## 1.4. Project data

| | |
|---|---|
| Testing Start Date: | 2019-12-20 |
| Testing End Date: | 2020-03-07 |

## 1.5. Signature

**Dong Yuan**

**(Prepared this test report)**

**Zhou Yu**

**(Reviewed this test report)**

**Zhao Hui Lin**

**Deputy Director of the laboratory**

**(Approved this test report)**

# 2. Client Information

## 2.1. Applicant Information

| | |
|---|---|
| Company Name: | OnePlus Technology (Shenzhen) Co., Ltd |
| Address /Post: | 18C02, 18C03, 18C04 and 18C05, Shum Yip Terra Building, Binhe Avenue North, Futian District, Shenzhen |
| Contact: | Ariel Cheng |
| Email: | ariel.cheng@oneplus.com |
| Telephone: | 13823398081 |

## 2.2. Manufacturer Information

| | |
|---|---|
| Company Name: | OnePlus Technology (Shenzhen) Co., Ltd. |
| Address /Post: | 18C02, 18C03, 18C04 and 18C05, Shum Yip Terra Building, Binhe Avenue North, Futian District, Shenzhen |
| Contact: | Ariel Cheng |
| Email: | ariel.cheng@oneplus.com |
| Telephone: | 13823398081 |

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

## 3.1. About EUT

| | |
|---|---|
| Description | Smart Phone |
| Model Name | HD1925 |
| FCC ID | 2ABZ2-EE143 |
| Antenna | Integrated |
| Output power | 22.48dBm maximum EIRP measured for LTE CA_2A-12A(LTT) |
| Extreme vol. Limits | 3.6VDC to 4.3VDC (nominal: 4VDC) |
| Extreme temp. Tolerance | 0°C to +35°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 |
|---|---|---|---|---|
| UT10a | 990013820110851 | 46 | 10.0.25.HD61CB | 2019-12-18 |
| UT06a | 990013820111363 | 46 | 10.0.25.HD61CB | 2019-12-18 |

*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 |
| AE2 | Battery |

AE1

| | |
|---|---|
| Model | BLP745 |
| Manufacturer | Sunwoda Electronic Co.,Ltd. |
| Capacitance | 4010mAh |

AE2

| | |
|---|---|
| Model | BLP745 |
| Manufacturer | SUNWODA ELECTRONIC INDIA PRIVATE LIMITED |
| Capacitance | 4010mAh |

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

# 4. Reference Documents

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

| Reference | Title | Version |
|---|---|---|
| FCC Part 24 | PERSONAL COMMUNICATIONS SERVICES | 10-1-19 Edition |
| FCC Part 27 | MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES | 10-1-19 Edition |
| ANSI/TIA-603-E | Land Mobile FM or PM Communications Equipment Measurement and Performance Standards | 2016 |
| ANSI/TIA-102.CAAA-E | DIGITAL C4FMCQPSK TRANSCEIVER MEASUREMENT METHODS | 2016 |
| ANSI C63.26 | American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services | 2015 |
| KDB 971168 D01 | MEASUREMENT GUIDANCE FOR CERTIFICATION OF LICENSED DIGITAL TRANSMITTERS | v03r01 |

# 5. LABORATORY ENVIRONMENT

**Fully-anechoic chamber FAC-3** (9 meters×6.5 meters×4 meters) did not exceed following limits along the EMC testing:

| | |
|---|---|
| Temperature | Min. = 15 ˚C, Max. = 35 ˚C |
| Relative humidity | Min. = 15 %, Max. = 75 % |
| Shielding effectiveness | 0.014MHz - 1MHz, >60dB;<br>1MHz - 1000MHz, >90dB. |
| Electrical insulation | > 2 MΩ |
| Ground system resistance | < 4 Ω |
| Site voltage standing-wave ratio ($S_{VSWR}$) | Between 0 and 6 dB, from 1GHz to 18GHz |
| Uniformity of field strength | Between 0 and 6 dB, from 80 to 4000 MHz |

# 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 PowerRatio | 24.232 | 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 PowerRatio | 27.50 | P |

**LTE Band 66**

| 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 PowerRatio | 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 testing was performed 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

| NO. | Description | Type | Series Number | Manufacture | Cal Due Date | Calibration Interval |
|---|---|---|---|---|---|---|
| 1 | Universal Radio Communication Tester | CMW500 | 159082 | R&S | 2020-12-24 | 1 year |
| 2 | Spectrum Analyzer | FSU26 | 200030 | R&S | 2020-06-03 | 1 year |
| 3 | Radio Communication Analyzer | MT8821C | 6201763159 | Anritsu | 2020-07-23 | 1 year |
| 4 | Climate chamber | SH-242 | 93008556 | ESPEC | 2020-12-21 | 3 year |
| 5 | EMI Antenna | VULB9163 | 9163-483 | Schwarzbeck | 2020-09-16 | 1 year |
| 6 | EMI Antenna | 3117 | 00058889 | ETS-Lindgren | 2020-11-18 | 1 year |
| 7 | EMI Antenna | 3117 | 00139065 | ETS-Lindgren | 2020-11-10 | 1 year |
| 8 | EMI Antenna | 9117 | 167 | Schwarzbeck | 2020-05-27 | 1 year |
| 9 | Signal Generator | N5183A | MY49060052 | Agilent | 2020-06-24 | 1 year |
| 10 | Test Receiver | E4440A | MY48250642 | Agilent | 2020-03-18 | 1 year |
| 11 | Power Amplifier | 5S1G4 | 0341863 | AR | / | / |

# ANNEX A: MEASUREMENT RESULTS

## A.1 OUTPUT POWER

### A.1.1 Summary

During the process of testing, the EUT was controlled via Anritsu Radio Communication Analyzer (MT8821C) 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 Description of ERP/EIRP Measurements

ERP and EIRP is determined from conducted RF output power measurements according to KDB 412172 D01 Power approach.
ERP or EIRP = $P_T + G_T – L_C$, ERP = EIRP -2.15, where
$P_T$ = transmitter output power in dBm;
$G_T$ = gain of the transimitting antenna, in dBd(ERP) or dBi(EIRP);
$L_C$ = signal attenuation in the connecting cable between the transmitter and antenna, in dB.
The EIRP of mobile transmitters must not exceed 2 Watts for LTE Band CA_2A-12A;
The ERP of mobile transmitters must not exceed 3 Watts for LTE Band CA_12A-66A;

#### A.1.2.3 Measurement result

**CA_2A-12A**

**UAT**

| Frequency Band | Channel Number | Frequency (MHz) | Test setup | EUT Measured Power (dBm) | $G_T$ | Radiated LTE Band2 |
|---|---|---|---|---|---|---|
| LTE Band2 | 19100 | 1900 | 1RB-Low | 16.89 | -1.5 | 15.39 |
| LTE Band2 | 18700 | 1860 | 50RB-Middle | 16.85 | -1.5 | 15.35 |
| LTE Band12 | 23060 | 704 | 1RB-Low | 20.49 | -1.5 | 18.99 |
| LTE Band12 | 23060 | 704 | 25RB-Middle | 20.48 | -1.5 | 18.98 |

The LTE mode is QPSK_20MHz.

**LAT**

| Frequency Band | Channel Number | Frequency (MHz) | Test setup | EUT Measured Power (dBm) | $G_T$ | Radiated LTE Band2 |
|---|---|---|---|---|---|---|
| LTE Band2 | 18900 | 1880 | 1RB-High | 20.72 | -1 | 19.72 |
| LTE Band2 | 18700 | 1860 | 50RB-Middle | 20.77 | -1 | 19.77 |
| LTE Band12 | 23060 | 704 | 1RB-Low | 23.48 | -1 | 22.48 |
| LTE Band12 | 23095 | 707.5 | 25RB-Middle | 23.09 | -1 | 22.09 |

The LTE mode is QPSK_20MHz.

**CA_12A-66A**

**UAT**

| Frequency Band | Channel Number | Frequency (MHz) | Test setup | EUT Measured Power (dBm) | $G_T$ | Radiated LTE Band2 |
|---|---|---|---|---|---|---|
| LTE Band12 | 23060 | 704 | 1RB-Low | 20.49 | -2.5 | 17.99 |
| LTE Band12 | 23060 | 704 | 25RB-Middle | 20.48 | -2.5 | 17.98 |
| LTE Band66 | 132322 | 1745 | 1RB-Middle | 15.47 | -2.5 | 12.97 |
| LTE Band66 | 132072 | 1720 | 50RB-Middle | 15.46 | -2.5 | 12.96 |

The LTE mode is QPSK_10MHz.

**LAT**

| Frequency Band | Channel Number | Frequency (MHz) | Test setup | EUT Measured Power (dBm) | $G_T$ | Radiated LTE Band2 |
|---|---|---|---|---|---|---|
| LTE Band12 | 23060 | 704 | 1RB-Low | 23.48 | -3.0 | 20.48 |
| LTE Band12 | 23095 | 707.5 | 25RB-Middle | 23.09 | -3.0 | 20.09 |
| LTE Band66 | 132072 | 1720 | 1RB-Middle | 24.13 | -3.0 | 21.13 |
| LTE Band66 | 132072 | 1720 | 50RB-Middle | 23.22 | -3.0 | 20.22 |

The LTE mode is QPSK_10MHz.

## A.2 EMISSION LIMIT

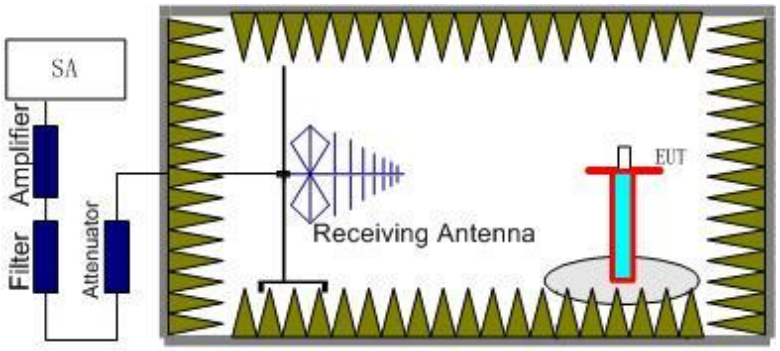
### A.2.1 Measurement Method

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

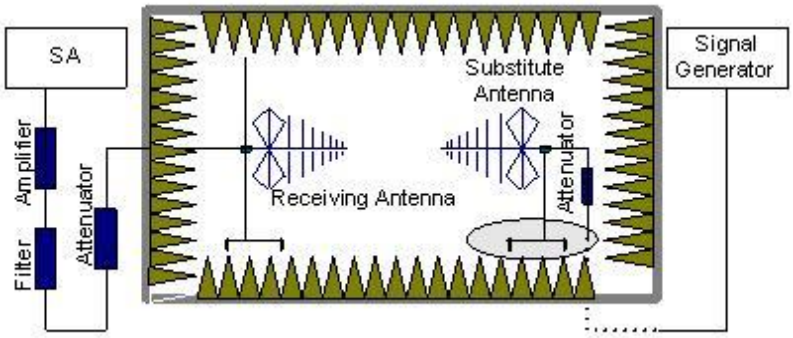
The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier. The resolution bandwidth is set 1MHz. The spectrum was scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and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

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

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




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




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

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

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

### A.2.2 Measurement Limit

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

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

Part 27.53(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.2.3 Measurement Results

Radiated emissions measurements were made only at the upper, middle, and lower carrier frequencies of the LTE Bands 2,12,66. It was decided that measurements at these three carrier frequencies would be sufficient to demonstrate compliance with emissions limits because it was seen that all the significant spurs occur well outside the band and no radiation was seen from a carrier in one block of the LTE Bands 2,12,66 into any of the other blocks. The equipment must still, however, meet emissions requirements with the carrier at all frequencies over which it is capable of operating and it is the manufacturer's responsibility to verify this. The range of evaluated frequency is from 30MHz to 26GHz.

RSE1_S1_CA_LB2-LB12 20M-10M_CH18700_VD_HV_1P

| Frequency (MHz) | SG (dBm) | CableLoss (dB) | AntennaGain (dBi) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polorization |
|---|---|---|---|---|---|---|---|
| 3738.02 | -49.40 | 6.33 | 8.53 | -47.20 | -13.00 | 34.20 | V |
| 5608.02 | -45.69 | 7.24 | 10.58 | -42.35 | -13.00 | 29.35 | V |
| 7477.01 | -51.11 | 8.33 | 12.17 | -47.27 | -13.00 | 34.27 | V |
| 9350.01 | -53.07 | 9.09 | 13.31 | -48.85 | -13.00 | 35.85 | V |
| 11250.01 | -51.50 | 9.70 | 13.15 | -48.05 | -13.00 | 35.05 | H |
| 13201.01 | -48.38 | 10.50 | 13.78 | -45.10 | -13.00 | 32.10 | H |

RSE1_S1_CA_LB2-LB12 20M-10M_CH18900_VD_HV_1P

| Frequency (MHz) | SG (dBm) | CableLoss (dB) | AntennaGain (dBi) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polorization |
|---|---|---|---|---|---|---|---|
| 3778.02 | -45.68 | 6.21 | 8.59 | -43.30 | -13.00 | 30.30 | H |
| 5671.02 | -43.58 | 7.28 | 10.57 | -40.29 | -13.00 | 27.29 | V |
| 7556.01 | -52.09 | 8.16 | 12.24 | -48.01 | -13.00 | 35.01 | V |
| 9448.01 | -49.19 | 9.28 | 13.37 | -45.10 | -13.00 | 32.10 | V |
| 11251.01 | -50.35 | 9.70 | 13.15 | -46.90 | -13.00 | 33.90 | V |
| 13114.01 | -48.02 | 10.87 | 13.66 | -45.23 | -13.00 | 32.23 | H |

RSE1_S1_CA_LB2-LB12 20M-10M_CH19100_VD_HV_1P

| Frequency (MHz) | SG (dBm) | CableLoss (dB) | AntennaGain (dBi) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polorization |
|---|---|---|---|---|---|---|---|
| 3818.02 | -46.12 | 6.08 | 8.65 | -43.55 | -13.00 | 30.55 | H |
| 5731.02 | -49.36 | 7.29 | 10.55 | -46.10 | -13.00 | 33.10 | V |
| 7640.01 | -53.85 | 8.15 | 12.31 | -49.69 | -13.00 | 36.69 | H |
| 9548.01 | -50.52 | 9.37 | 13.35 | -46.54 | -13.00 | 33.54 | V |
| 11415.01 | -50.80 | 10.03 | 13.12 | -47.71 | -13.00 | 34.71 | V |
| 13334.01 | -48.03 | 10.58 | 13.97 | -44.64 | -13.00 | 31.64 | H |

RSE1_S1_CA_LB2-LB12 5M-3M_CH18900_VD_HV_1P

| Frequency (MHz) | SG (dBm) | CableLoss (dB) | AntennaGain (dBi) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polorization |
|---|---|---|---|---|---|---|---|
| 3764.02 | -44.64 | 6.25 | 8.57 | -42.32 | -13.00 | 29.32 | H |
| 5651.02 | -44.50 | 7.27 | 10.57 | -41.20 | -13.00 | 28.20 | H |
| 7534.01 | -51.30 | 8.25 | 12.23 | -47.32 | -13.00 | 34.32 | H |
| 9417.01 | -50.23 | 9.12 | 13.35 | -46.00 | -13.00 | 33.00 | V |
| 11300.01 | -50.60 | 10.00 | 13.14 | -47.46 | -13.00 | 34.46 | V |
| 13152.01 | -48.33 | 10.71 | 13.71 | -45.33 | -13.00 | 32.33 | V |

RSE1_S1_CA_LB12-LB2 10M-20M_CH23095_VD_HV_1P

| Frequency (MHz) | SG (dBm) | CableLoss (dB) | AntennaGain (dBi) | Correction | Peak ERP (dBm) | Limit (dBm) | Margin (dB) | Polorization |
|---|---|---|---|---|---|---|---|---|
| 1410.01 | -60.46 | 3.25 | 5.03 | 2.15 | -60.83 | -13.00 | 47.83 | H |
| 2128.00 | -55.66 | 4.22 | 4.98 | 2.15 | -57.05 | -13.00 | 44.05 | H |
| 2815.00 | -52.52 | 4.93 | 6.67 | 2.15 | -52.93 | -13.00 | 39.93 | H |
| 3551.02 | -55.41 | 5.83 | 8.27 | 2.15 | -55.12 | -13.00 | 42.12 | V |
| 4239.02 | -55.38 | 6.25 | 9.14 | 2.15 | -54.64 | -13.00 | 41.64 | H |
| 4964.01 | -55.59 | 6.67 | 9.86 | 2.15 | -54.55 | -13.00 | 41.55 | H |

RSE1_S1_CA_LB12-LB2 3M-5M_CH23095_VD_HV_1P

| Frequency (MHz) | SG (dBm) | CableLoss (dB) | AntennaGain (dBi) | Correction | Peak ERP (dBm) | Limit (dBm) | Margin (dB) | Polorization |
|---|---|---|---|---|---|---|---|---|
| 1419.01 | -60.14 | 3.26 | 5.08 | 2.15 | -60.47 | -13.00 | 47.47 | H |
| 2126.00 | -54.04 | 4.22 | 4.98 | 2.15 | -55.43 | -13.00 | 42.43 | V |
| 2837.00 | -52.06 | 4.95 | 6.71 | 2.15 | -52.45 | -13.00 | 39.45 | V |
| 3532.02 | -55.74 | 5.64 | 8.24 | 2.15 | -55.29 | -13.00 | 42.29 | V |
| 4259.02 | -56.47 | 6.23 | 9.16 | 2.15 | -55.69 | -13.00 | 42.69 | H |
| 4948.01 | -54.51 | 6.69 | 9.85 | 2.15 | -53.50 | -13.00 | 40.50 | V |

RSE1_S1_CA_LB12-LB66 10M-20M_CH23095_VD_HV_1P

| Frequency (MHz) | SG (dBm) | CableLoss (dB) | AntennaGain (dBi) | Correction | Peak ERP (dBm) | Limit (dBm) | Margin (dB) | Polorization |
|---|---|---|---|---|---|---|---|---|
| 1404.01 | -60.60 | 3.24 | 5.00 | 2.15 | -60.99 | -13.00 | 47.99 | H |
| 2136.00 | -45.93 | 4.23 | 5.01 | 2.15 | -47.30 | -13.00 | 34.30 | H |
| 2819.00 | -52.64 | 4.94 | 6.67 | 2.15 | -53.06 | -13.00 | 40.06 | H |
| 3524.02 | -56.44 | 5.56 | 8.23 | 2.15 | -55.92 | -13.00 | 42.92 | H |
| 4256.02 | -56.25 | 6.23 | 9.16 | 2.15 | -55.47 | -13.00 | 42.47 | H |
| 4956.01 | -55.05 | 6.68 | 9.86 | 2.15 | -54.02 | -13.00 | 41.02 | H |

RSE1_S1_CA_LB12-LB66 1.4M-5M_CH23095_VD_HV_1P

| Frequency (MHz) | SG (dBm) | CableLoss (dB) | AntennaGain (dBi) | Correction | Peak ERP (dBm) | Limit (dBm) | Margin (dB) | Polorization |
|---|---|---|---|---|---|---|---|---|
| 1424.01 | -60.98 | 3.27 | 5.10 | 2.15 | -61.30 | -13.00 | 48.30 | V |
| 2108.00 | -55.74 | 4.20 | 4.92 | 2.15 | -57.17 | -13.00 | 44.17 | V |
| 2843.00 | -52.96 | 4.96 | 6.72 | 2.15 | -53.35 | -13.00 | 40.35 | V |
| 3544.02 | -55.72 | 5.76 | 8.26 | 2.15 | -55.37 | -13.00 | 42.37 | V |
| 4250.02 | -56.52 | 6.24 | 9.15 | 2.15 | -55.76 | -13.00 | 42.76 | H |
| 4964.01 | -55.96 | 6.67 | 9.86 | 2.15 | -54.92 | -13.00 | 41.92 | V |

RSE1_S1_CA_LB66-LB12 20M-10M_CH132322_VD_HV_1P

| Frequency (MHz) | SG (dBm) | CableLoss (dB) | AntennaGain (dBi) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polorization |
|---|---|---|---|---|---|---|---|
| 3508.02 | -50.90 | 5.53 | 8.21 | -48.22 | -13.00 | 35.22 | H |
| 5266.02 | -47.32 | 6.99 | 10.27 | -44.04 | -13.00 | 31.04 | H |
| 7016.01 | -44.30 | 8.28 | 11.62 | -40.96 | -13.00 | 27.96 | V |
| 8774.01 | -50.21 | 8.58 | 13.05 | -45.74 | -13.00 | 32.74 | H |
| 10444.01 | -51.36 | 9.74 | 13.08 | -48.02 | -13.00 | 35.02 | H |
| 12174.01 | -49.30 | 10.13 | 13.07 | -46.36 | -13.00 | 33.36 | V |

RSE1_S1_CA_LB66-LB12 1.4M-5M_CH131979_VD_HV_1P

| Frequency (MHz) | SG (dBm) | CableLoss (dB) | AntennaGain (dBi) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polorization |
|---|---|---|---|---|---|---|---|
| 3422.02 | -51.77 | 5.38 | 8.01 | -49.14 | -13.00 | 36.14 | H |
| 5138.02 | -44.66 | 6.86 | 10.09 | -41.43 | -13.00 | 28.43 | H |
| 6848.01 | -46.52 | 7.83 | 11.42 | -42.93 | -13.00 | 29.93 | V |
| 8560.01 | -51.87 | 8.56 | 13.01 | -47.42 | -13.00 | 34.42 | H |
| 10294.01 | -52.18 | 9.62 | 13.02 | -48.78 | -13.00 | 35.78 | H |
| 12013.01 | -49.04 | 10.09 | 13.01 | -46.12 | -13.00 | 33.12 | V |

RSE1_S1_CA_LB66-LB12 1.4M-5M_CH132322_VD_HV_1P

| Frequency (MHz) | SG (dBm) | CableLoss (dB) | AntennaGain (dBi) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polorization |
|---|---|---|---|---|---|---|---|
| 3491.02 | -51.60 | 5.50 | 8.18 | -48.92 | -13.00 | 35.92 | V |
| 5241.02 | -43.86 | 7.00 | 10.24 | -40.62 | -13.00 | 27.62 | H |
| 6986.01 | -46.39 | 8.19 | 11.58 | -43.00 | -13.00 | 30.00 | V |
| 8731.01 | -49.00 | 8.45 | 13.05 | -44.40 | -13.00 | 31.40 | H |
| 10517.01 | -51.24 | 9.59 | 13.10 | -47.73 | -13.00 | 34.73 | H |
| 12217.01 | -49.08 | 10.05 | 13.09 | -46.04 | -13.00 | 33.04 | V |

RSE1_S1_CA_LB66-LB12 1.4M-5M_CH132665_VD_HV_1P

| Frequency (MHz) | SG (dBm) | CableLoss (dB) | AntennaGain (dBi) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polorization |
|---|---|---|---|---|---|---|---|
| 3559.02 | -52.96 | 5.92 | 8.28 | -50.60 | -13.00 | 37.60 | V |
| 5342.02 | -47.86 | 6.95 | 10.38 | -44.43 | -13.00 | 31.43 | V |
| 7122.01 | -43.52 | 8.16 | 11.75 | -39.93 | -13.00 | 26.93 | V |
| 8903.01 | -49.19 | 8.86 | 13.08 | -44.97 | -13.00 | 31.97 | H |
| 10709.01 | -50.99 | 9.33 | 13.14 | -47.18 | -13.00 | 34.18 | V |
| 12477.01 | -48.69 | 10.23 | 13.19 | -45.73 | -13.00 | 32.73 | H |

Note: The maximum value of expanded measurement uncertainty for this test item is $U$ = 4.2 dB, $k$ = 2.

## A.3 FREQUENCY STABILITY

### A.3.1 Method of Measurement

In order to measure the carrier frequency under the condition of AFC lock, it is necessary to make measurements with the EUT in a “call mode”. This is accomplished with the use of Anritsu MT8821C Radio Communication Analyzer.

1. Measure the carrier frequency at room temperature.
2. Subject the EUT to overnight soak at -30℃.
3. With the EUT, powered via nominal voltage, connected to the MT8821C, and in a simulated call on middle channel for LTE band 2,12,66, 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℃ increments from -30℃ to +50℃. 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℃.
7. With the EUT, powered via nominal voltage, connected to the MT8821C 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 ℃increments from -30℃ to +50℃. Allow at least 1.5 hours at each temperature, unpowered, before making measurements.
9. At all temperature levels hold the temperature to +/- 0.5℃ 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 between 3.6VDC and 4.3VDC, with a nominal voltage of 4VDC. 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@CA_2A-12A@20MHz+10MHz bandwidth**

**Frequency Error vs Temperature**

| Temperature(℃) | Voltage(V) | $F_L$(MHz) | $F_H$(MHz) | Offset(Hz) | Frequency error(ppm) |
|---|---|---|---|---|---|
| 20 | 4 | 1850.925 | 1909.200 | 6.2 | 0.0033 |
| 50 | | | | 5.9 | 0.0031 |
| 40 | | | | -3.3 | 0.0018 |
| 30 | | | | 5.5 | 0.0029 |
| 10 | | | | 0.9 | 0.0005 |
| 0 | | | | -3.9 | 0.0021 |
| -10 | | | | -3.3 | 0.0018 |
| -20 | | | | -5.1 | 0.0027 |
| -30 | | | | | |

**Frequency Error vs Voltage**

| Voltage(V) | Temperature(℃) | $F_L$(MHz) | $F_H$(MHz) | Offset(Hz) | Frequency error(ppm) |
|---|---|---|---|---|---|
| 3.6 | 20 | 1850.925 | 1909.200 | -7.8 | 0.0041 |
| 4.3 | | | | -0.4 | 0.0002 |

**LTE Band 12@CA_2A-12A@20MHz+10MHz bandwidth**

**Frequency Error vs Temperature**

| Temperature(℃) | Voltage(V) | $F_L$(MHz) | $F_H$(MHz) | Offset(Hz) | Frequency error(ppm) |
|---|---|---|---|---|---|
| 20 | 4 | 699.490 | 715.510 | 7.4 | 0.0105 |
| 50 | | | | 3.5 | 0.0049 |
| 40 | | | | 2.2 | 0.0031 |
| 30 | | | | 6.9 | 0.0098 |
| 10 | | | | 1.7 | 0.0024 |
| 0 | | | | -0.1 | 0.0001 |
| -10 | | | | 5.9 | 0.0083 |
| -20 | | | | 6.5 | 0.0092 |
| -30 | | | | | |

**Frequency Error vs Voltage**

| Voltage(V) | Temperature(℃) | $F_L$(MHz) | $F_H$(MHz) | Offset(Hz) | Frequency error(ppm) |
|---|---|---|---|---|---|
| 3.6 | 20 | 699.490 | 715.510 | -3.1 | 0.0044 |
| 4.3 | | | | 10.3 | 0.0146 |

**LTE Band 12@CA_12A-66A@10MHz+20MHz bandwidth**

**Frequency Error vs Temperature**

| Temperature(℃) | Voltage(V) | $F_L$(MHz) | $F_H$(MHz) | Offset(Hz) | Frequency error(ppm) |
|---|---|---|---|---|---|
| 20 | 4 | 699.477 | 715.520 | -8.5 | 0.0120 |
| 50 | | | | -7.3 | 0.0103 |
| 40 | | | | 0.5 | 0.0007 |
| 30 | | | | -7.9 | 0.0112 |
| 10 | | | | -6.3 | -0.0089 |
| 0 | | | | -8.6 | 0.0122 |
| -10 | | | | -8.1 | 0.0114 |
| -20 | | | | -3.6 | 0.0051 |
| -30 | | | | | |

**Frequency Error vs Voltage**

| Voltage(V) | Temperature(℃) | $F_L$(MHz) | $F_H$(MHz) | Offset(Hz) | Frequency error(ppm) |
|---|---|---|---|---|---|
| 3.6 | 20 | 699.477 | 715.520 | -3.8 | 0.0054 |
| 4.3 | | | | -4.4 | 0.0062 |

**LTE Band 66@CA_12A-66A@10MHz+20MHz bandwidth**

**Frequency Error vs Temperature**

| Temperature(℃) | Voltage(V) | $F_L$(MHz) | $F_H$(MHz) | Offset(Hz) | Frequency error(ppm) |
|---|---|---|---|---|---|
| 20 | 4 | 1710.825 | 1779.175 | 0.9 | 0.0005 |
| 50 | | | | -0.6 | 0.0003 |
| 40 | | | | 6.6 | 0.0038 |
| 30 | | | | -1.4 | 0.0008 |
| 10 | | | | -4.2 | 0.0024 |
| 0 | | | | -8.3 | 0.0048 |
| -10 | | | | -13.4 | 0.0077 |
| -20 | | | | -4.4 | 0.0025 |
| -30 | | | | | |

**Frequency Error vs Voltage**

| Voltage(V) | Temperature(℃) | $F_L$(MHz) | $F_H$(MHz) | Offset(Hz) | Frequency error(ppm) |
|---|---|---|---|---|---|
| 3.6 | 20 | 1710.825 | 1779.175 | -6.1 | 0.0035 |
| 4.3 | | | | -9.2 | 0.0053 |

## A.4 OCCUPIED BANDWIDTH

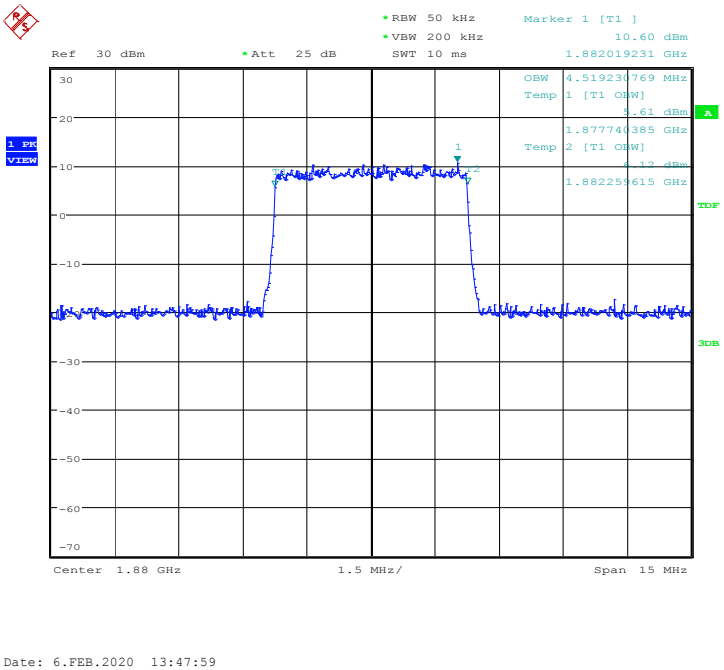
Occupied bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at mid frequency. The table below lists the measured 99% BW. Spectrum analyzer plots are included on the following pages.
The measurement method is from ANSI C63.26:
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 ≥ 3 × 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@CA_2A-12A

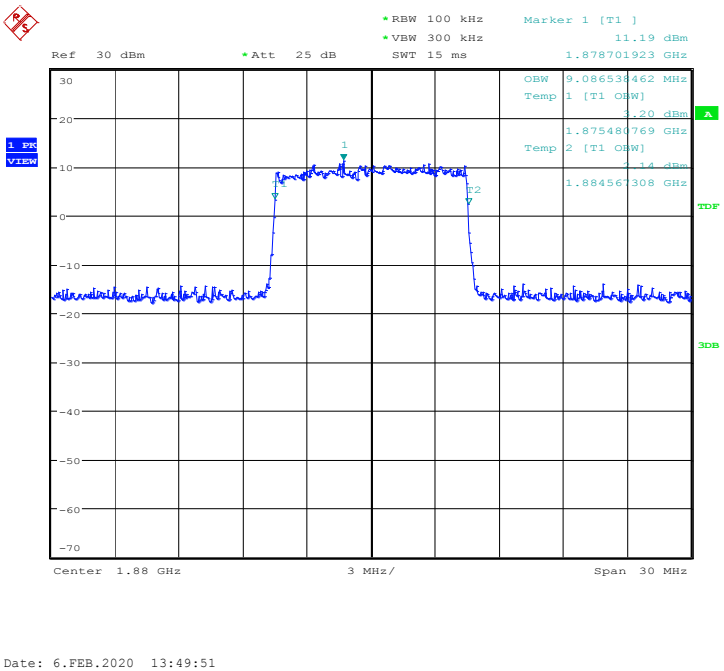
### LTE band 2, Occupied Bandwidth(QPSK)

| Frequency (MHz) | Occupied Bandwidth (99%) (kHz) | | |
|---|---|---|---|
| 1880.0 | @5MHz | @10MHz | @15MHz |
| | 4519.23 | 9086.54 | 13485.58 |

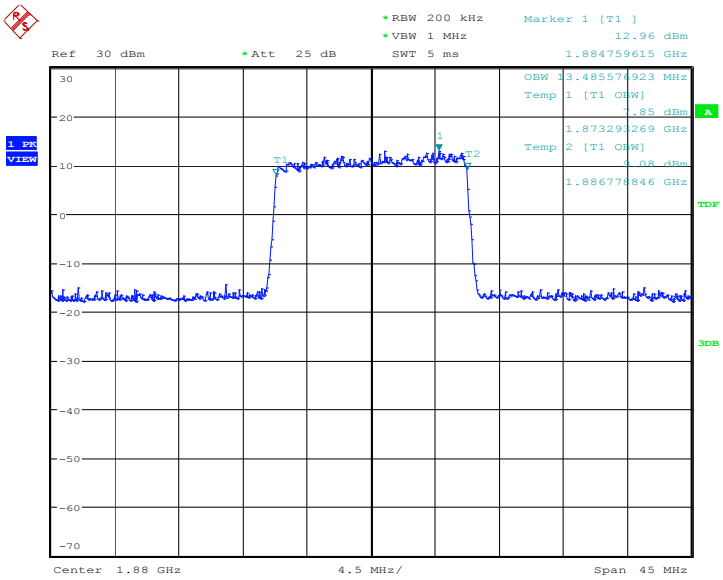
### LTE band 2, 5MHz Bandwidth (99% BW)




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



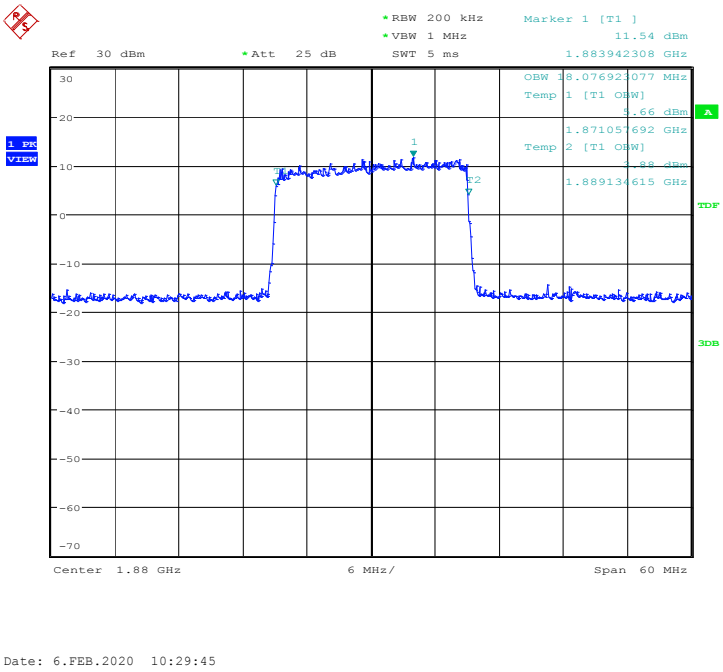
## LTE band 2, 15MHz Bandwidth (99% BW)



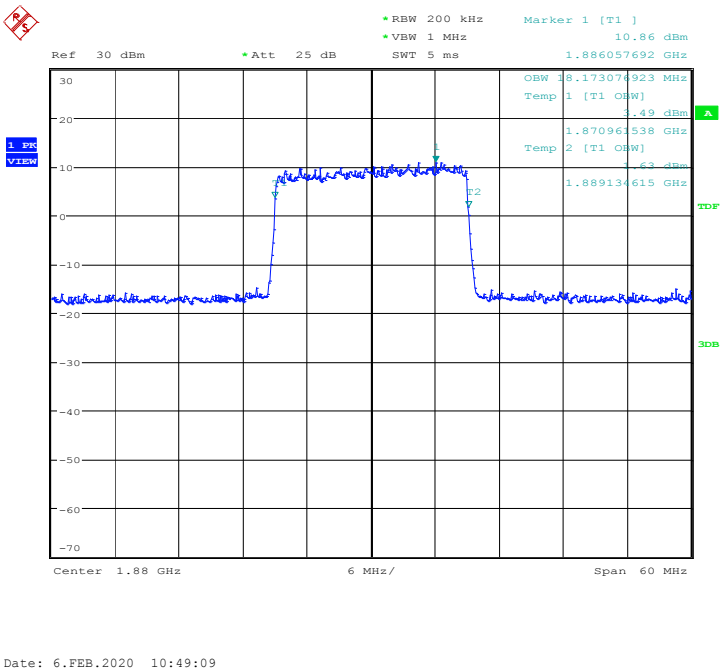
### LTE band 2, 20MHz Occupied Bandwidth

| Frequency (MHz) | Occupied Bandwidth (99%) (kHz) | | |
|---|---|---|---|
| 1880.0 | QPSK | 16QAM | 64QAM |
| | 18076.92 | 18173.08 | 18173.08 |

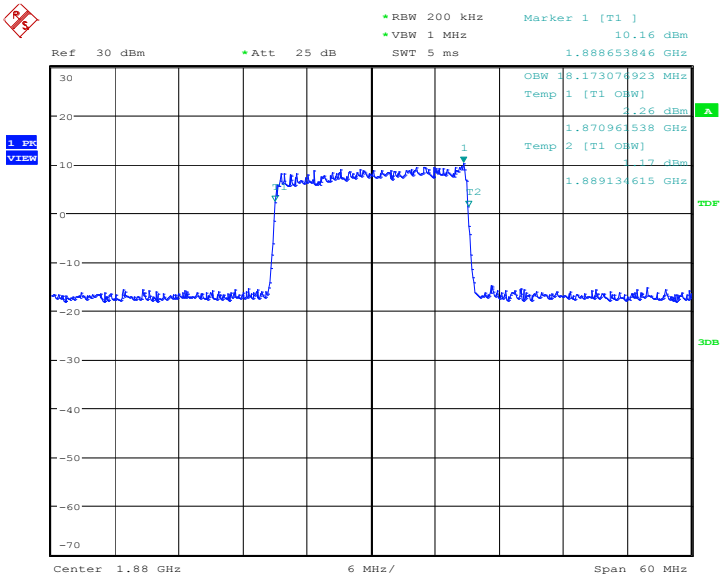
### LTE band 2, 20MHz Bandwidth, QPSK (99% BW)




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



## LTE band 2, 20MHz Bandwidth, 64QAM (99% BW)



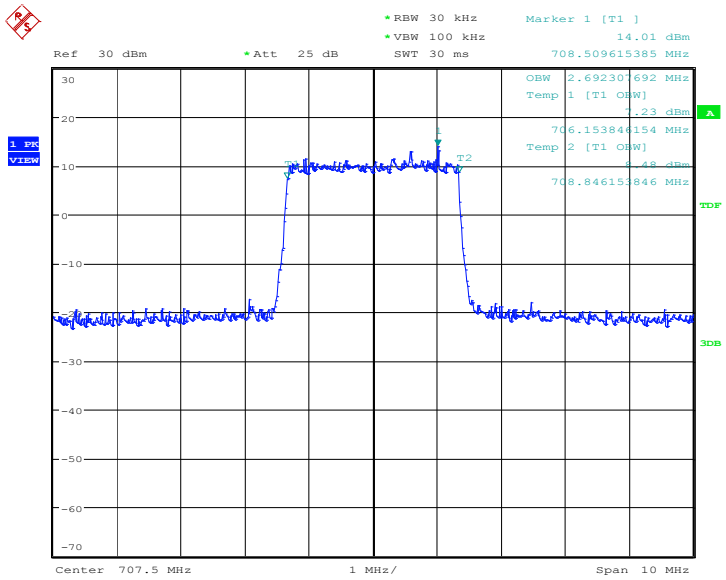

Date: 6.FEB.2020 10:55:34

## LTE Band 12@CA_2A-12A

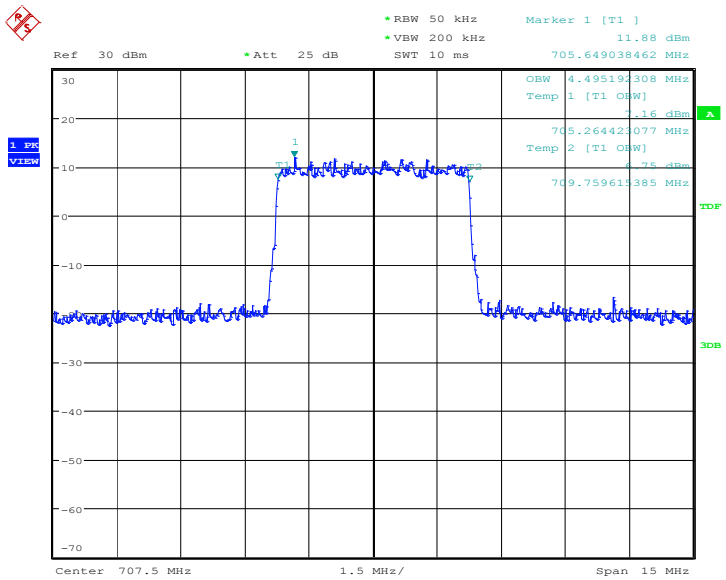
### LTE band 12, Occupied Bandwidth(QPSK)

| Frequency (MHz) | Occupied Bandwidth (99%) (kHz) | |
|---|---|---|
| 707.5 | @3MHz | @5MHz |
| | 2692.31 | 4495.19 |

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



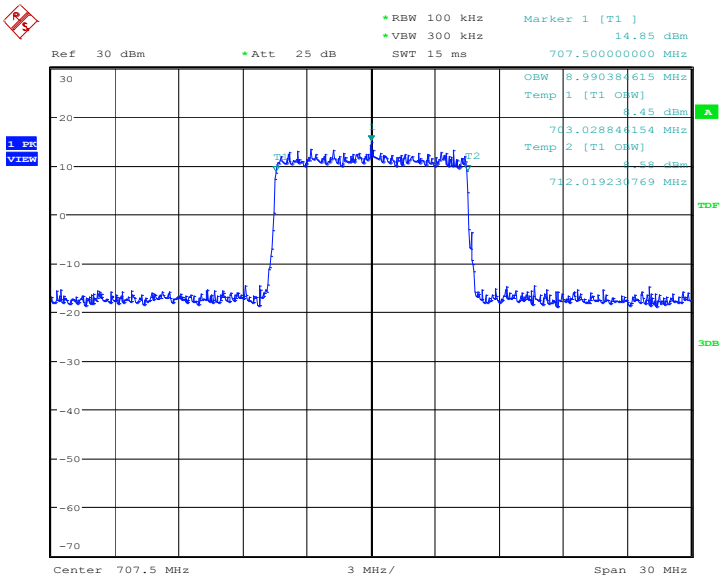

### LTE band 12, 5MHz Bandwidth (99% BW)



## LTE band 12, 10MHz Occupied Bandwidth

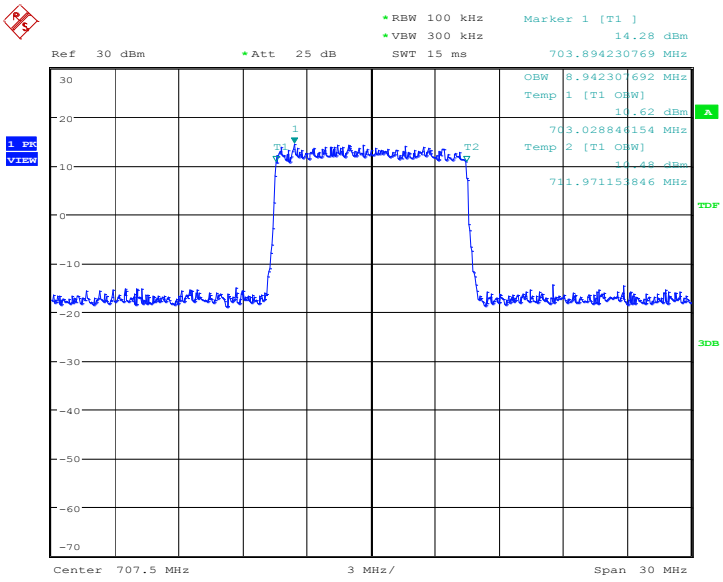
| Frequency (MHz) | Occupied Bandwidth (99%) (kHz) | | |
|---|---|---|---|
| 707.5 | QPSK | 16QAM | 64QAM |
| | 8990.38 | 8942.31 | 9038.46 |

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



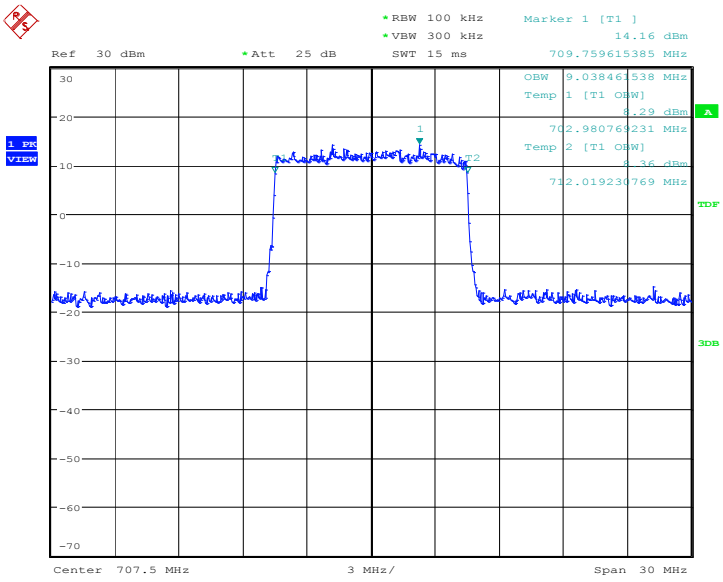

Date: 6.FEB.2020 10:38:40

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




Date: 6.FEB.2020 10:46:18

## LTE band 12, 10MHz Bandwidth, 64QAM (99% BW)



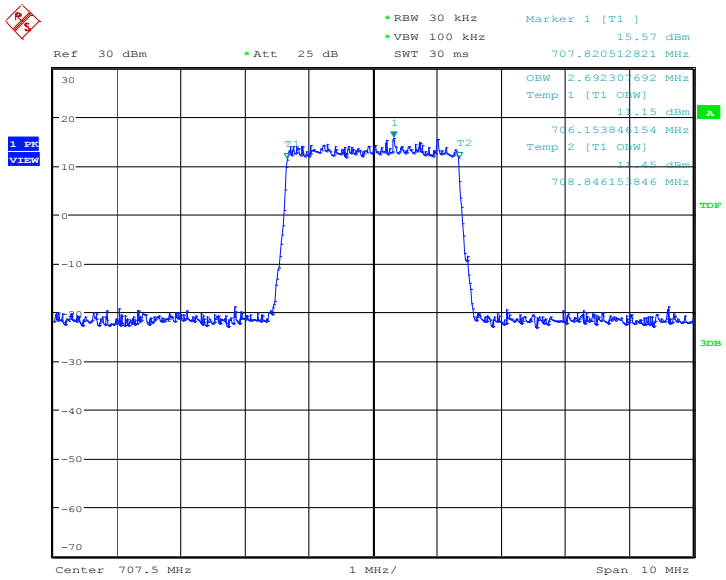

Date: 6.FEB.2020 10:57:06

## LTE Band 12@CA_12A-66A

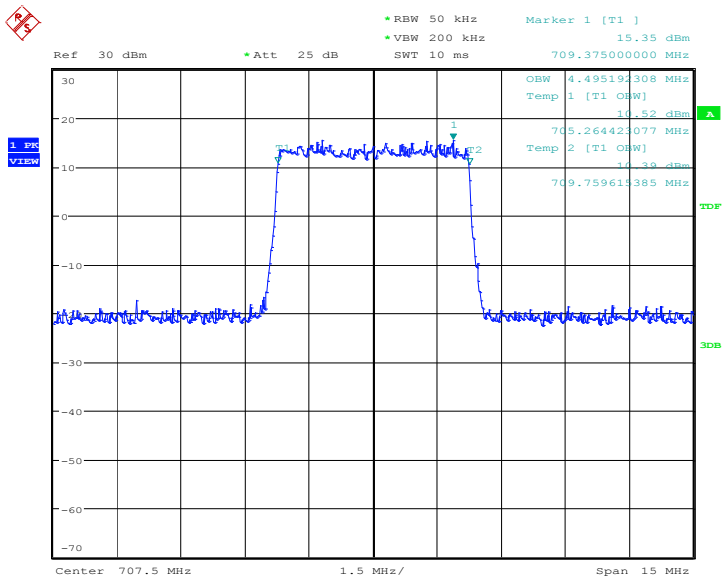
### LTE band 12, Occupied Bandwidth(QPSK)

| Frequency (MHz) | Occupied Bandwidth (99%) (kHz) | |
|---|---|---|
| 707.5 | @3MHz | @5MHz |
| | 2692.31 | 4495.19 |

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



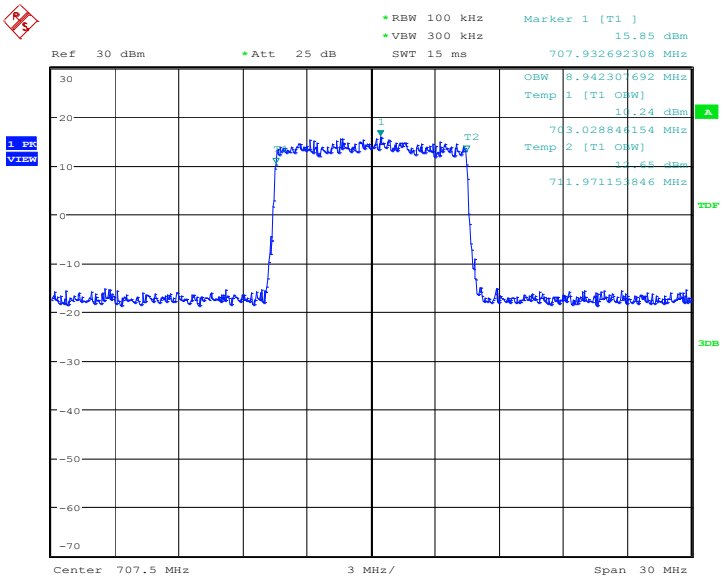

### LTE band 12, 5MHz Bandwidth (99% BW)



## LTE band 12, 10MHz Occupied Bandwidth

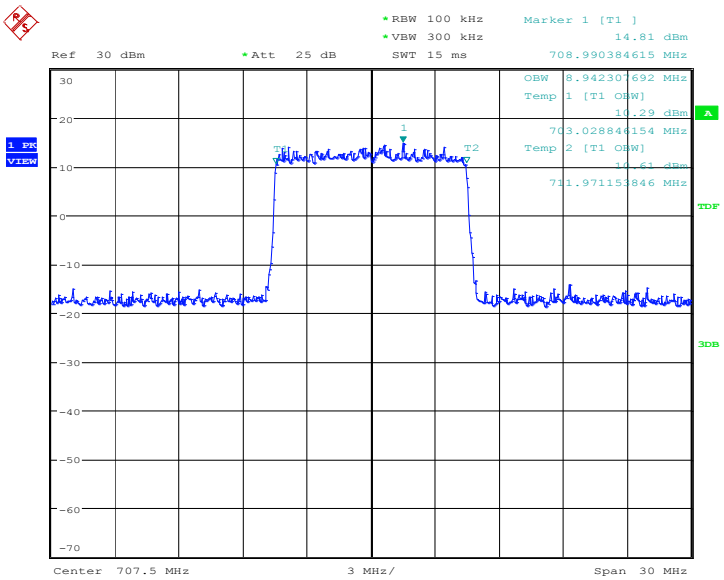
| Frequency (MHz) | Occupied Bandwidth (99%) (kHz) | | |
|---|---|---|---|
| 707.5 | QPSK | 16QAM | 64QAM |
| | 8942.31 | 8942.31 | 8990.38 |

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



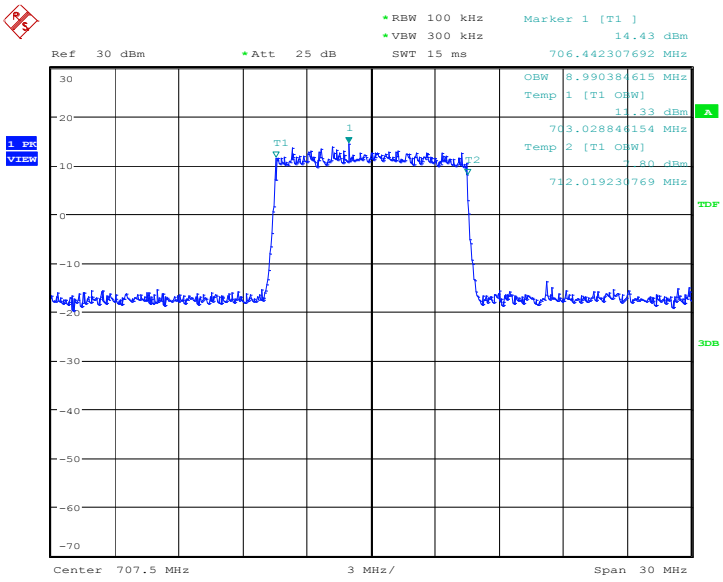

Date: 6.FEB.2020 12:39:57

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




Date: 6.FEB.2020 12:46:24

## LTE band 12, 10MHz Bandwidth, 64QAM (99% BW)



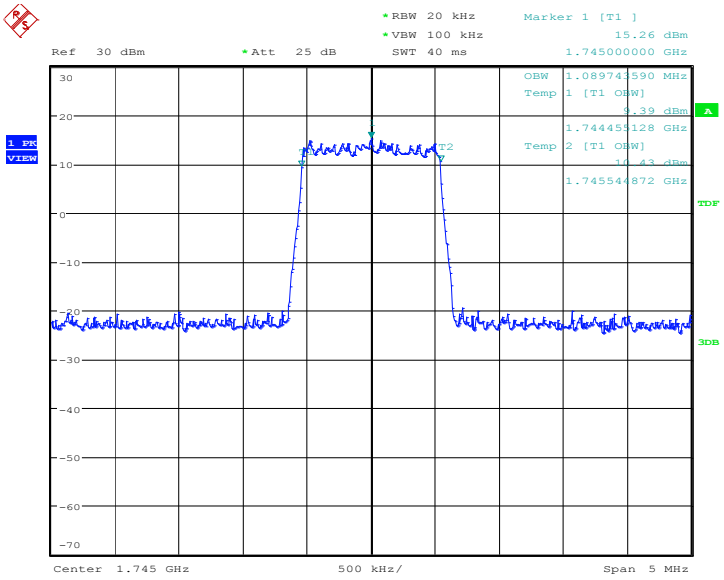

Date: 6.FEB.2020 12:50:08

**LTE Band 66@CA_12A-66A**

**LTE band 66, Occupied Bandwidth(QPSK)**

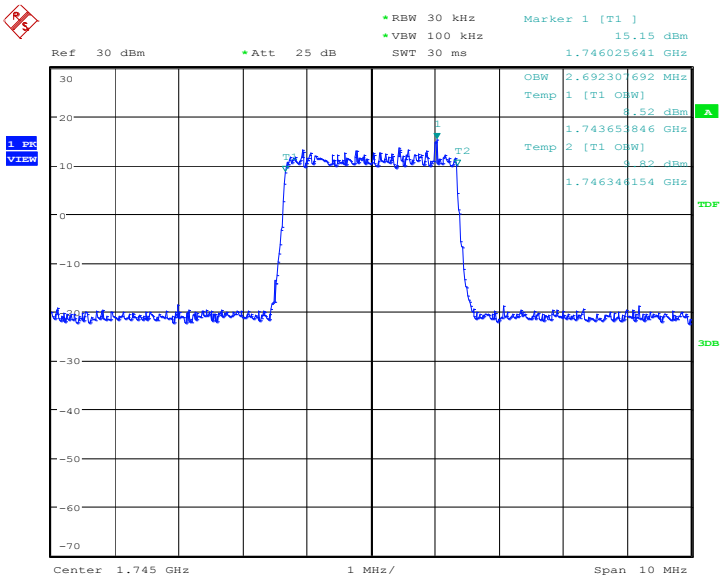
| Frequency (MHz) | Occupied Bandwidth (99%) (kHz) | | | | |
|---|---|---|---|---|---|
| 1745.0 | @1.4MHz | @3MHz | @5MHz | @10MHz | @15MHz |
| | 1089.74 | 2692.31 | 4471.15 | 9038.46 | 13485.58 |

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



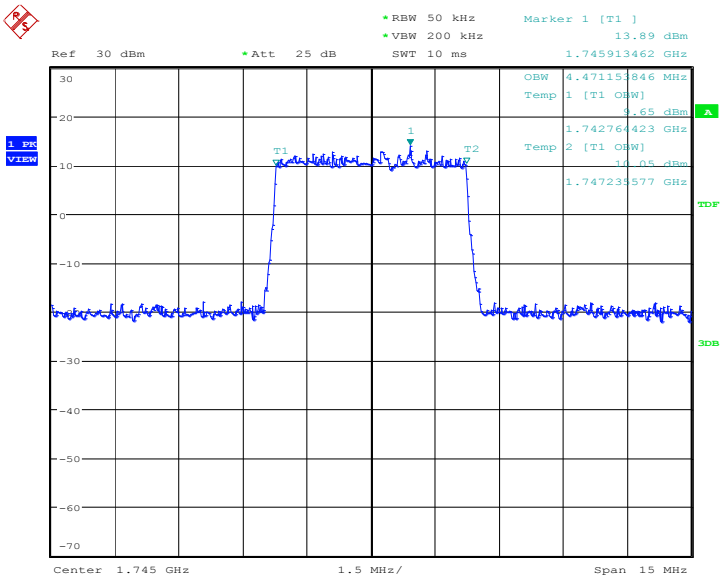

Date: 6.FEB.2020 14:07:36

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



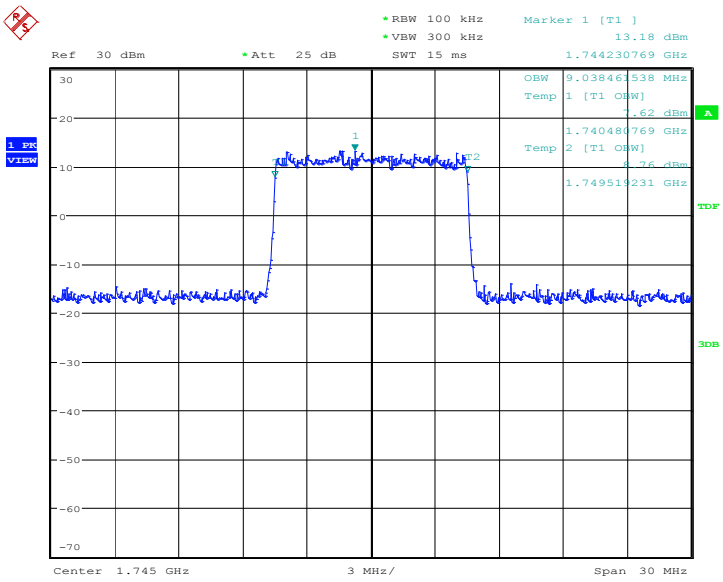

Date: 6.FEB.2020 14:09:09

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



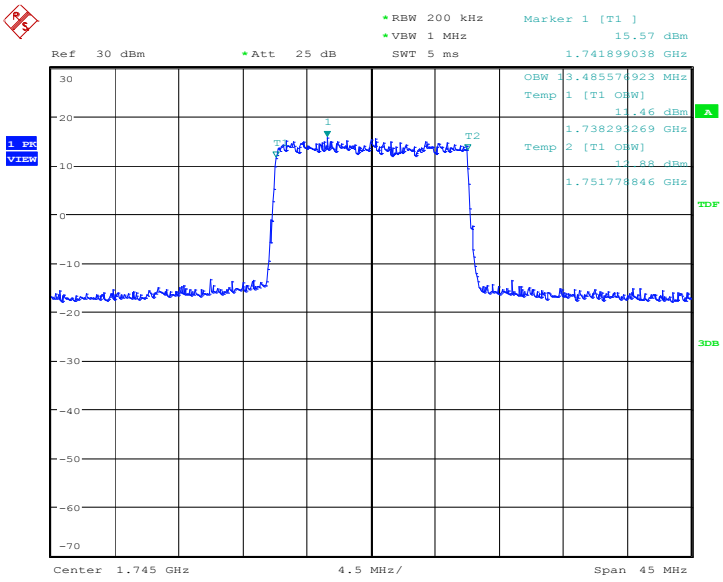

Date: 6.FEB.2020 14:10:35

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




Date: 6.FEB.2020 14:11:55

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

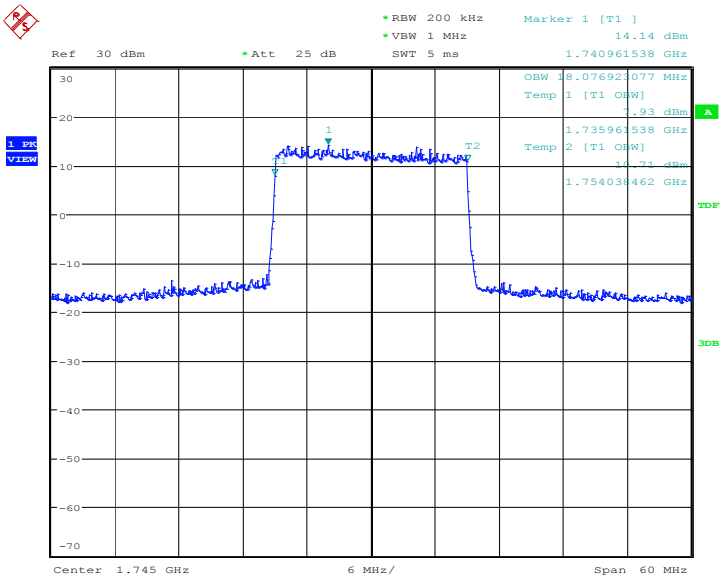



Date: 6.FEB.2020 14:13:57

## LTE band 66, 20MHz Occupied Bandwidth

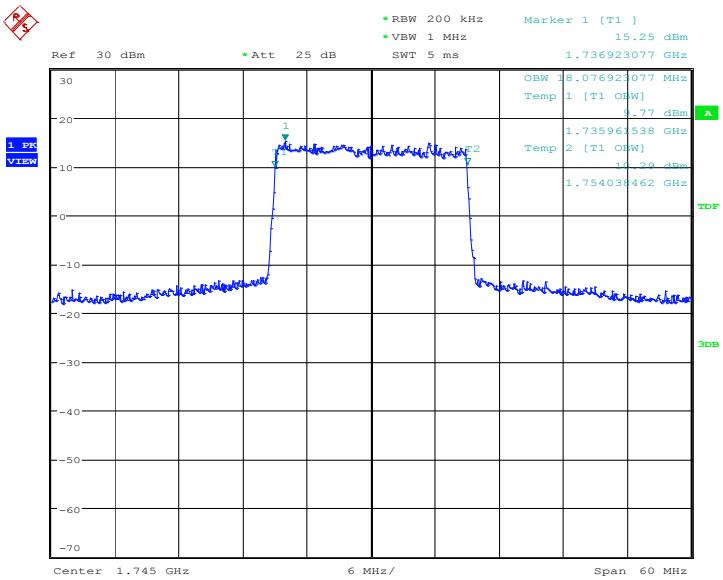
| Frequency (MHz) | Occupied Bandwidth (99%) (kHz) | | |
|---|---|---|---|
| 1745.0 | QPSK | 16QAM | 64QAM |
| | 18076.92 | 18076.92 | 18076.92 |

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



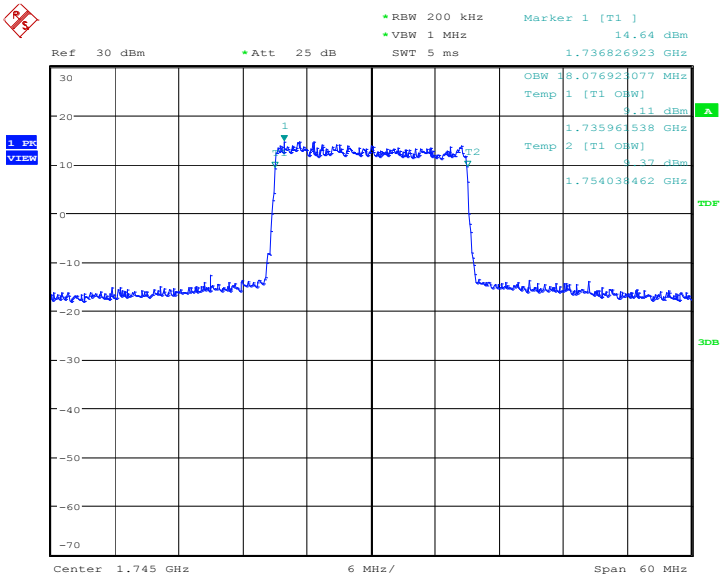

Date: 6.FEB.2020 12:41:37

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




Date: 6.FEB.2020 12:44:17

## LTE band 66, 20MHz Bandwidth, 64QAM (99% BW)




Date: 6.FEB.2020 12:51:43

## A.5 EMISSION BANDWIDTH

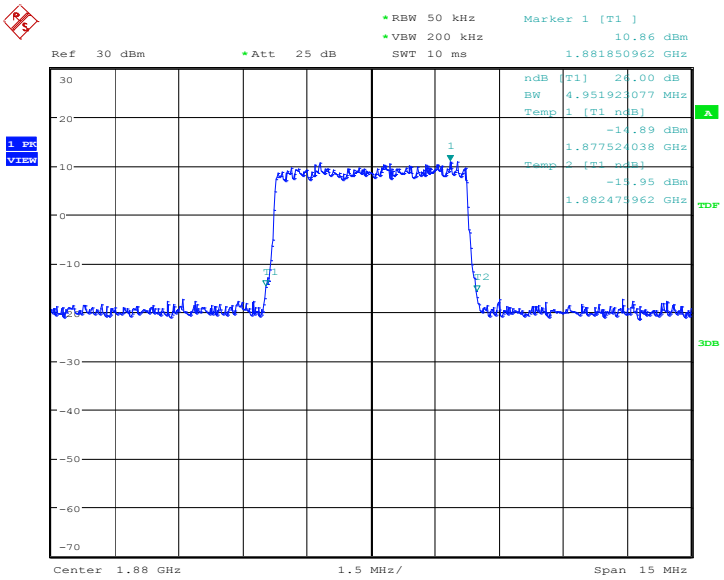
The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power. Table below lists the measured -26dBc BW. Spectrum 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 ≥ 3 × 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@CA_2A-12A

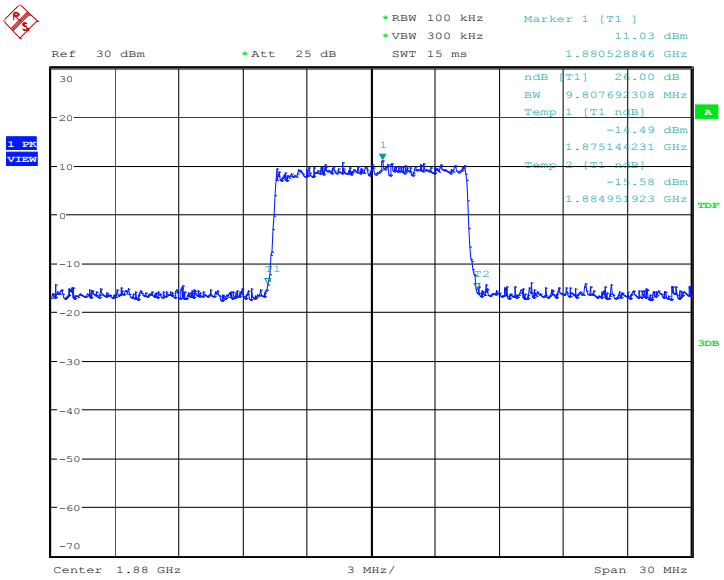
### LTE band 2, Emission Bandwidth(QPSK)

| Frequency (MHz) | Emission Bandwidth (-26dBc BW) (kHz) | | |
|---|---|---|---|
| 1880.0 | @5MHz | @10MHz | @15MHz |
| | 4951.92 | 9807.69 | 14711.54 |

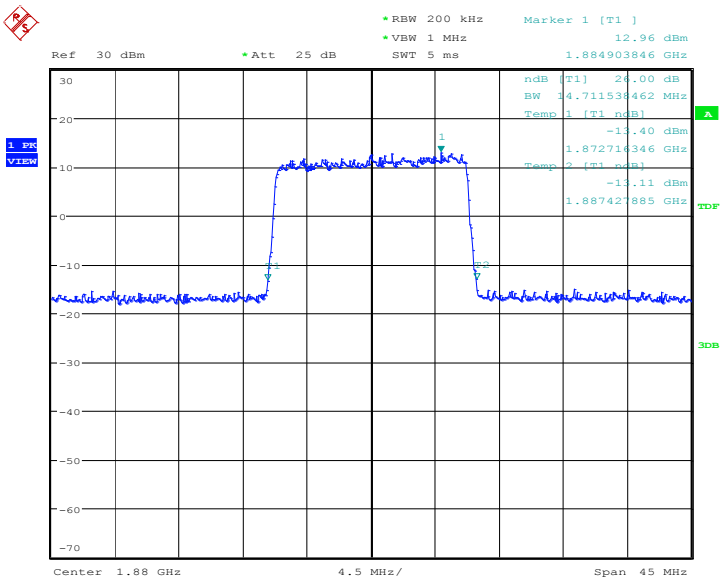
### LTE band 2, 5MHz Bandwidth (-26dBc BW)




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



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

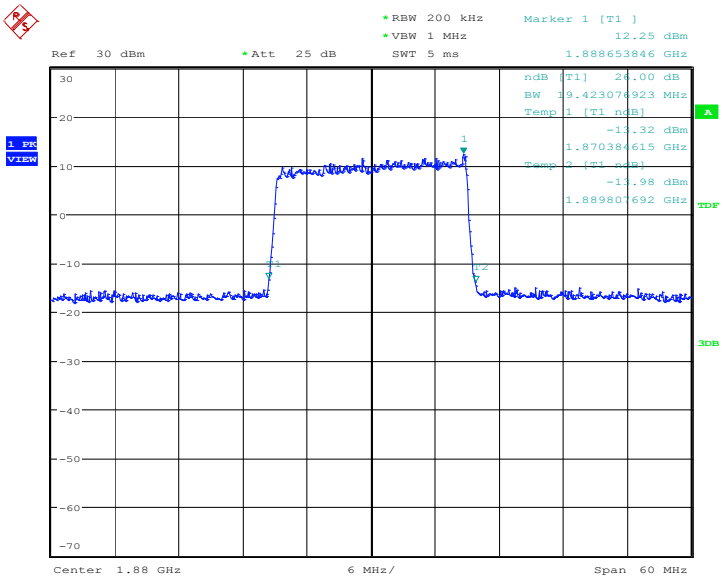



Date: 6.FEB.2020 13:52:11

### LTE band 2, 20MHz Emission Bandwidth

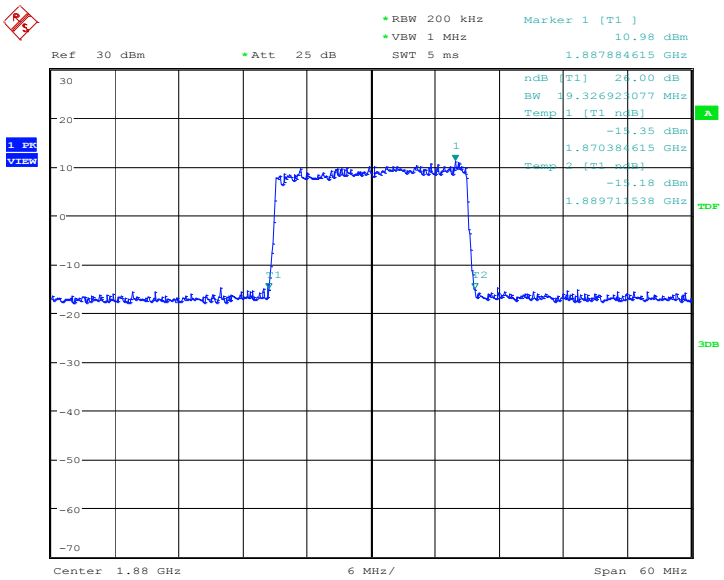
| Frequency (MHz) | Emission Bandwidth (-26dBc BW) (kHz) | | |
|---|---|---|---|
| 1880.0 | QPSK | 16QAM | 64QAM |
| | 19423.08 | 19326.92 | 19615.38 |

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



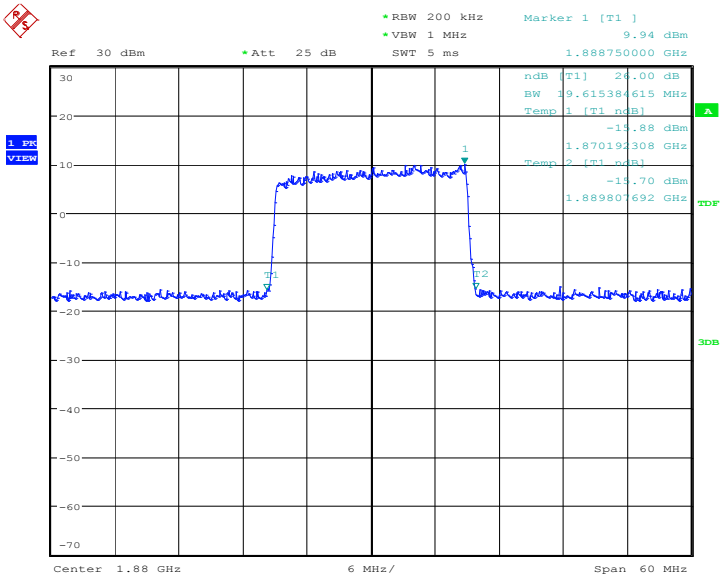

Date: 6.FEB.2020 10:30:25

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




Date: 6.FEB.2020 10:49:35

## LTE band 2, 20MHz Bandwidth, 64QAM (-26dBc BW)



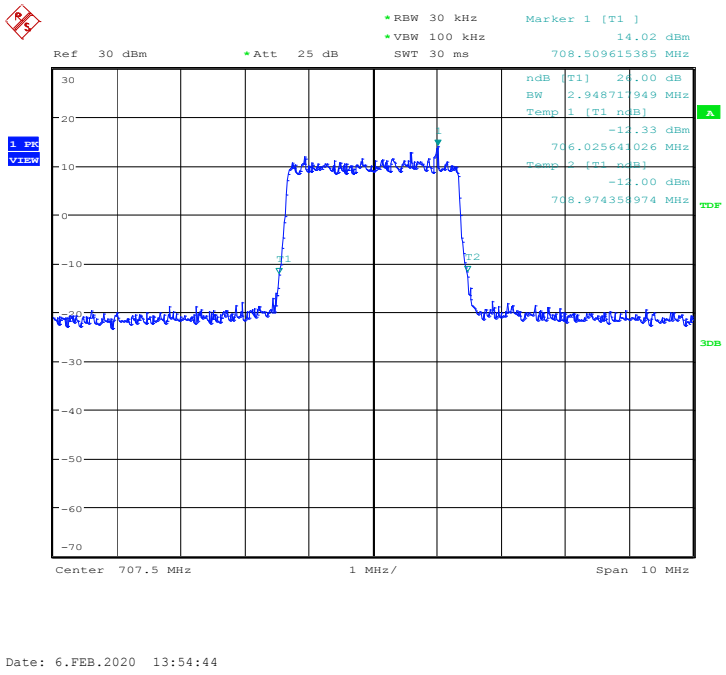

Date: 6.FEB.2020 10:55:56

## LTE Band 12@CA_2A-12A

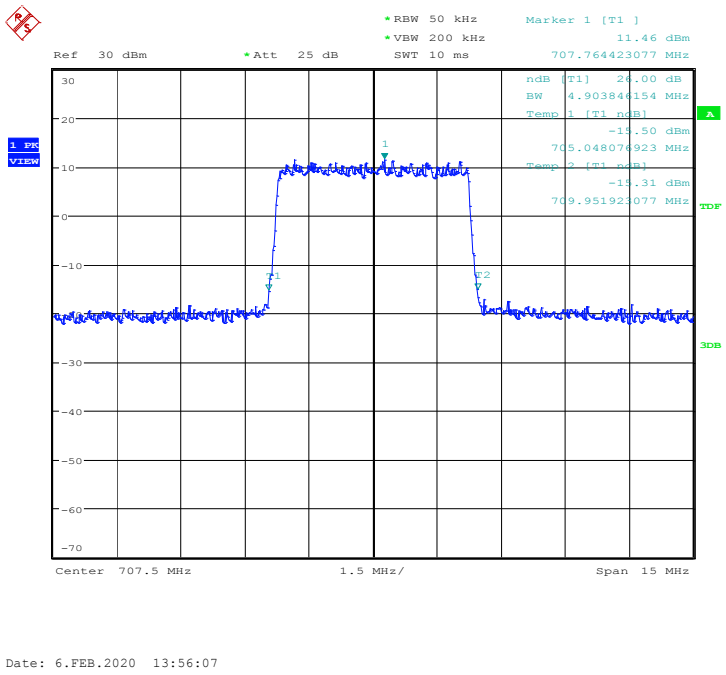
### LTE band 12, Emission Bandwidth(QPSK)

| Frequency (MHz) | Emission Bandwidth (-26dBc BW) (kHz) | |
|---|---|---|
| 707.5 | @3MHz | @5MHz |
| | 2948.72 | 4903.85 |

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



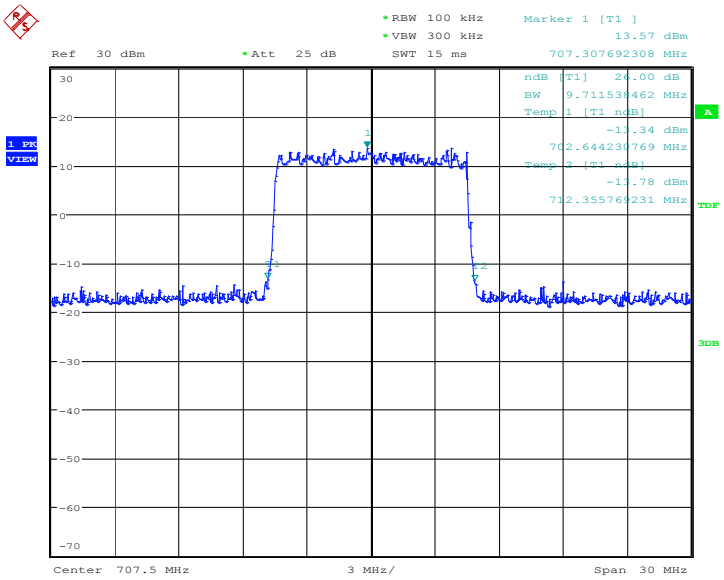

### LTE band 12, 5MHz Bandwidth (-26dBc BW)



## LTE band 12, 10MHz Emission Bandwidth

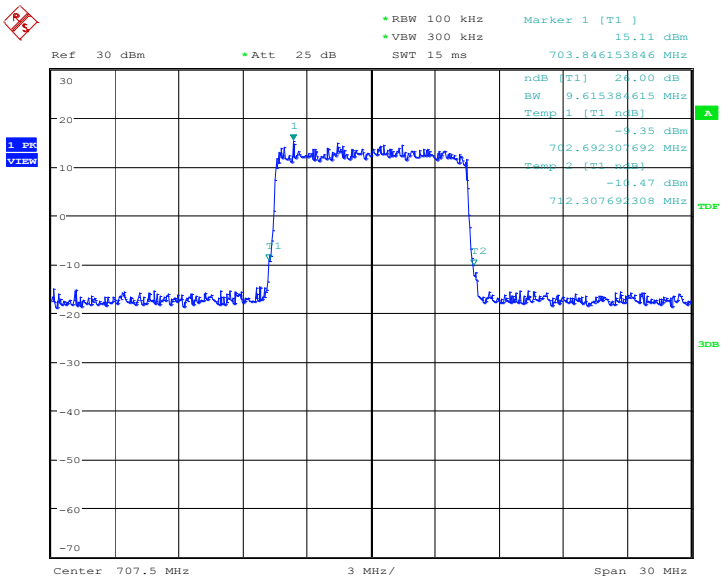
| Frequency (MHz) | Emission Bandwidth (-26dBc BW) (kHz) | | |
|---|---|---|---|
| 707.5 | QPSK | 16QAM | 64QAM |
| | 9711.54 | 9615.38 | 9711.54 |

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



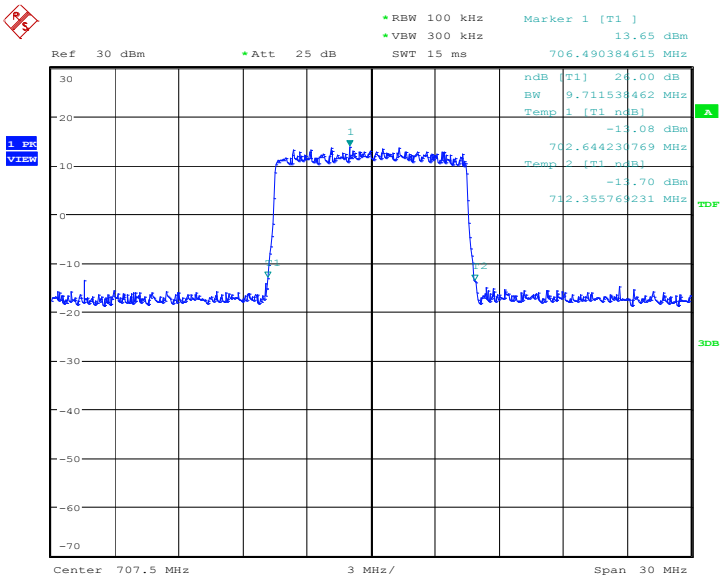

Date: 6.FEB.2020 10:39:05

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




Date: 6.FEB.2020 10:47:12

## LTE band 12, 10MHz Bandwidth, 64QAM (-26dBc BW)



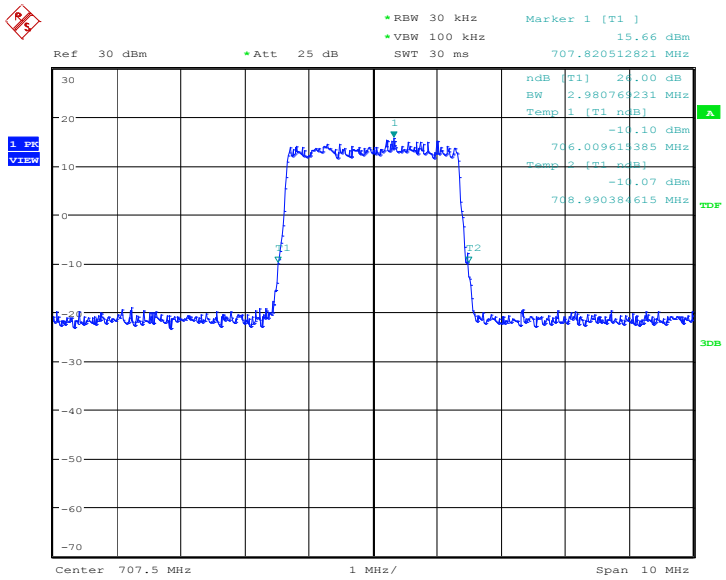

Date: 6.FEB.2020 10:59:03

## LTE Band 12@CA_12A-66A

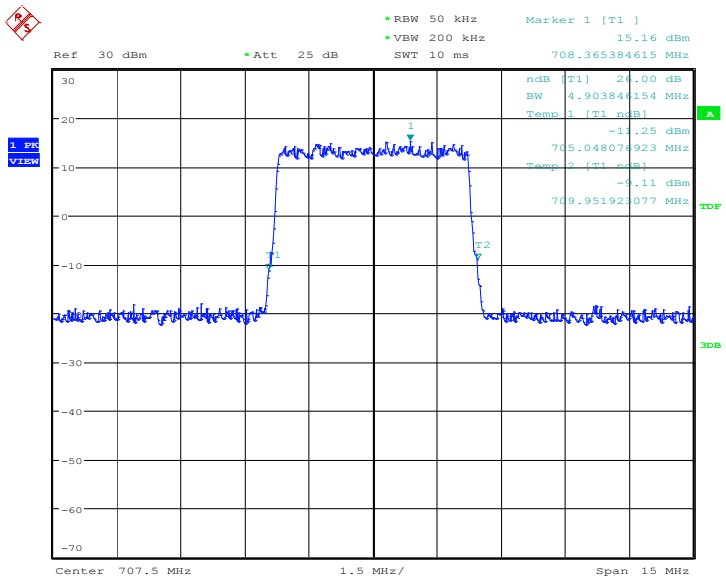
### LTE band 12, Emission Bandwidth(QPSK)

| Frequency (MHz) | Emission Bandwidth (-26dBc BW) (kHz) | |
|---|---|---|
| 707.5 | @3MHz | @5MHz |
| | 2980.77 | 4903.85 |

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



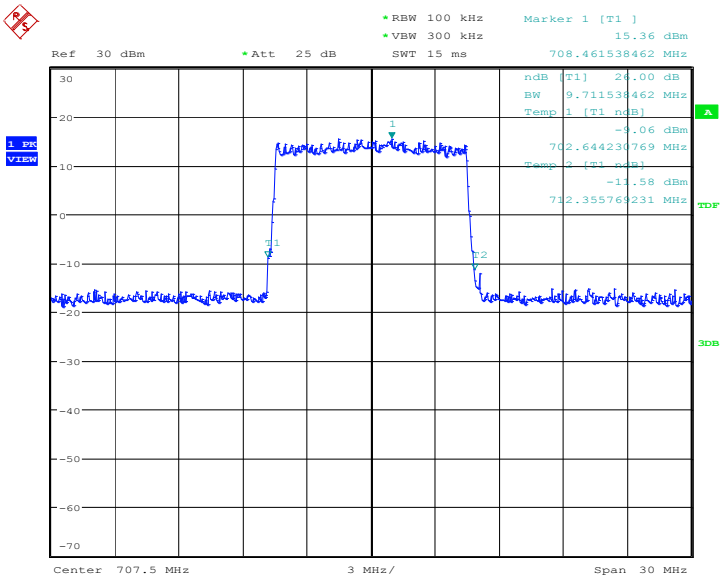

### LTE band 12, 5MHz Bandwidth (-26dBc BW)



## LTE band 12, 10MHz Emission Bandwidth

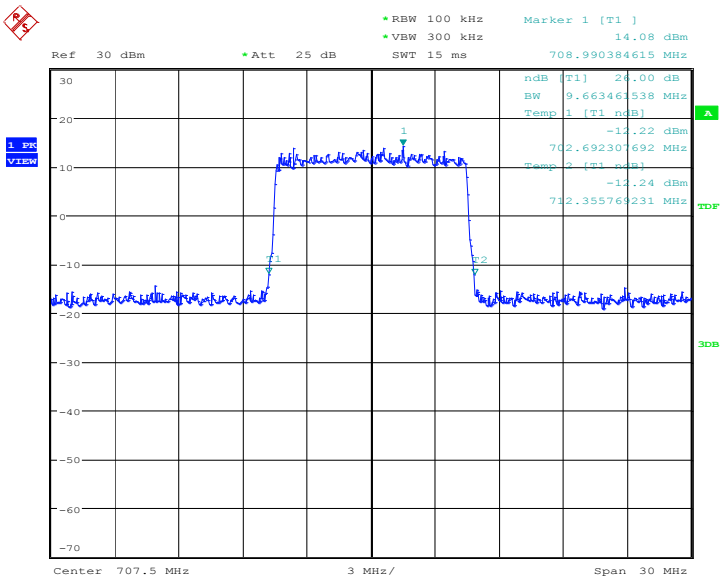
| Frequency (MHz) | Emission Bandwidth (-26dBc BW) (kHz) | | |
|---|---|---|---|
| 707.5 | QPSK | 16QAM | 64QAM |
| | 9711.54 | 9663.46 | 9663.46 |

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



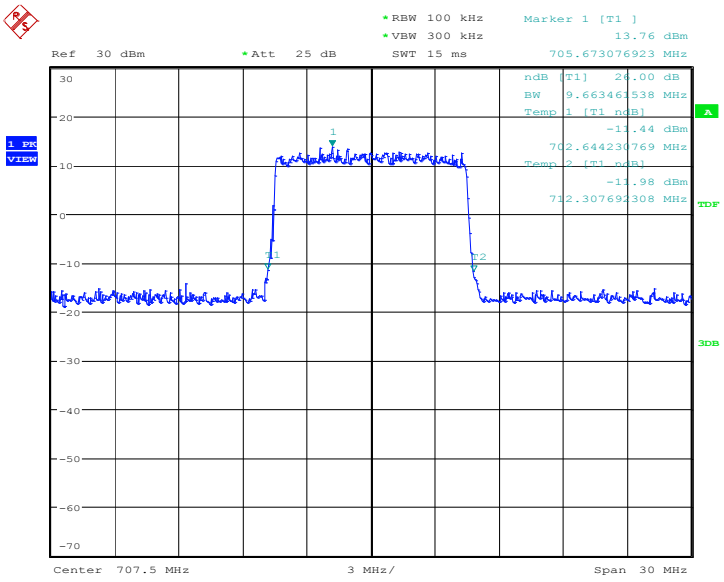

Date: 6.FEB.2020 12:40:17

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




Date: 6.FEB.2020 12:46:45

## LTE band 12, 10MHz Bandwidth, 64QAM (-26dBc BW)

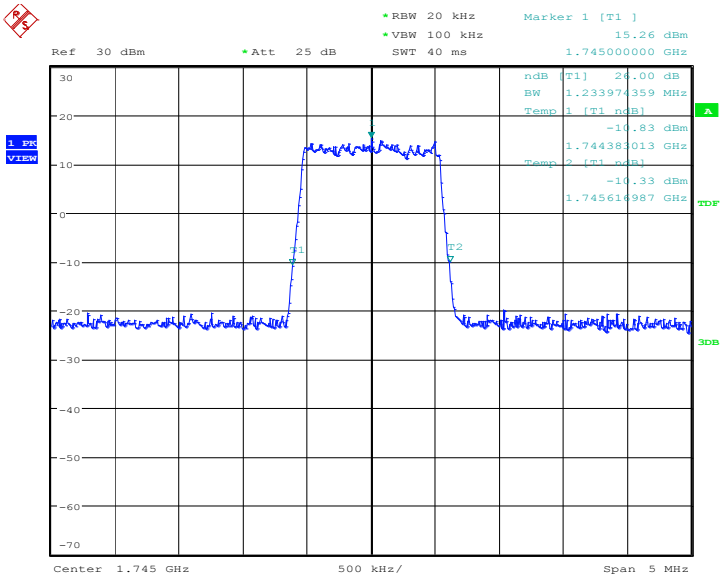


**LTE Band 66@CA_12A-66A**

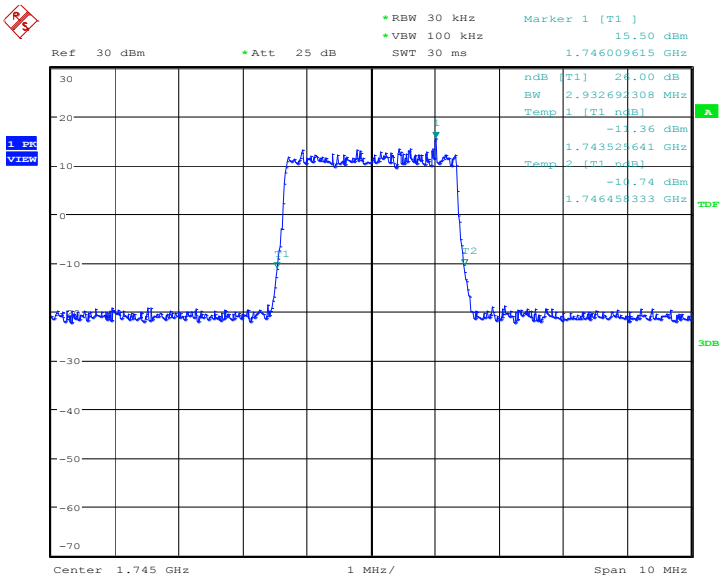
**LTE band 66, Emission Bandwidth(QPSK)**

| Frequency (MHz) | Emission Bandwidth (-26dBc BW) (kHz) | | | | |
|---|---|---|---|---|---|
| 1745.0 | @1.4MHz | @3MHz | @5MHz | @10MHz | @15MHz |
| | 1233.97 | 2932.69 | 4927.88 | 9615.38 | 14639.42 |

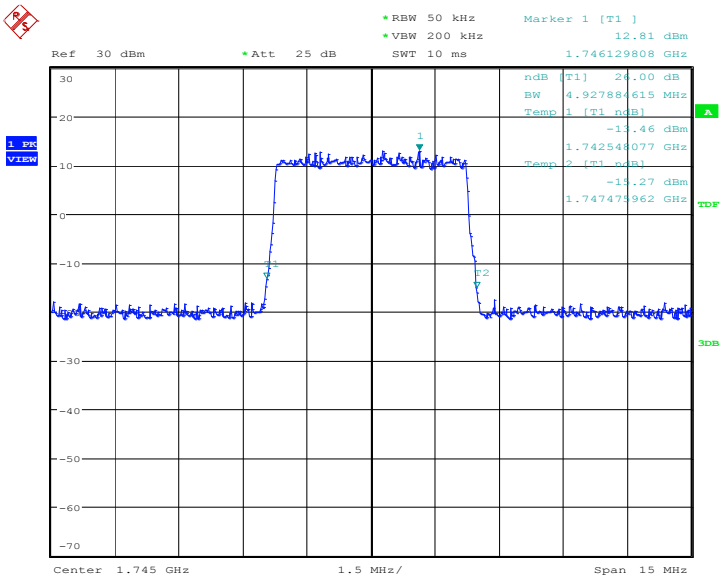
**LTE band 66, 1.4MHz Bandwidth (-26dBc BW)**




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

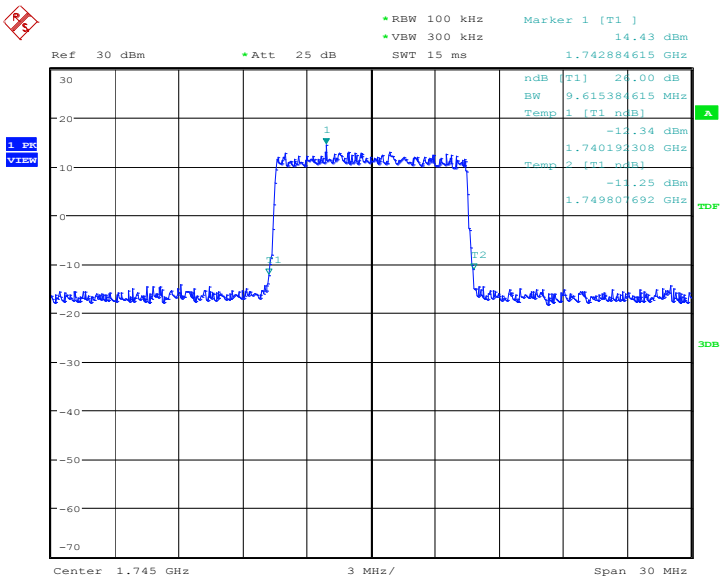


## LTE band 66, 5MHz Bandwidth (-26dBc BW)



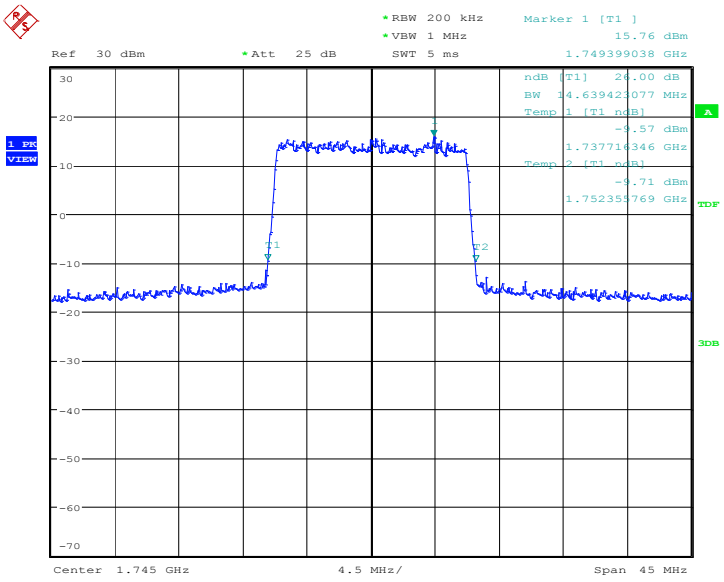

Date: 6.FEB.2020 14:10:57

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




Date: 6.FEB.2020 14:12:16

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

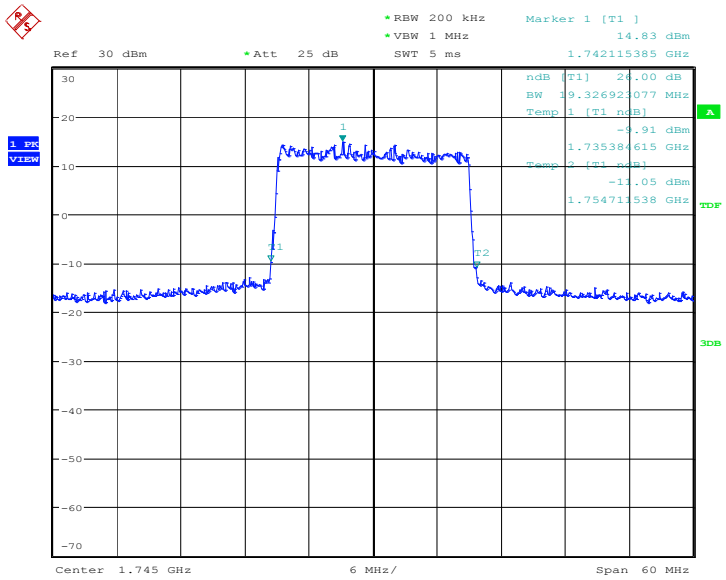



Date: 6.FEB.2020 14:14:19

## LTE band 66, 20MHz Emission Bandwidth

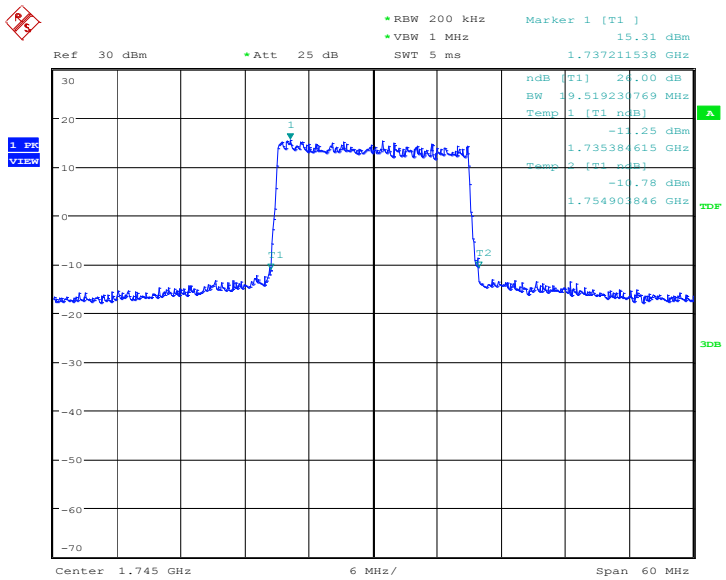
| Frequency (MHz) | Emission Bandwidth (-26dBc BW) (kHz) | | |
|---|---|---|---|
| 1745.0 | QPSK | 16QAM | 64QAM |
| | 19326.92 | 19519.23 | 19519.23 |

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



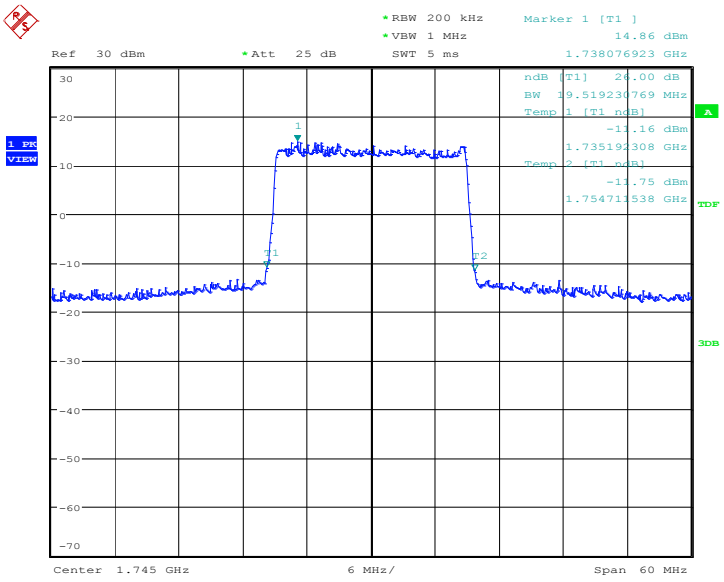

Date: 6.FEB.2020 12:42:04

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




Date: 6.FEB.2020 12:44:38

## LTE band 66, 20MHz Bandwidth, 64QAM (-26dBc BW)



## A.6 BAND EDGE COMPLIANCE

### A.6.1 Measurement limit

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.

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

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

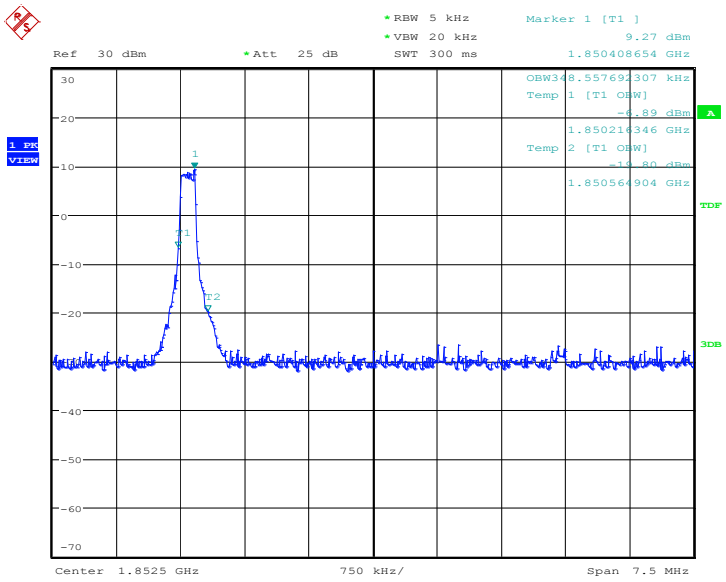
Part 27.53(g) states for operations in the 600 MHz band and the 698–746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) 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**

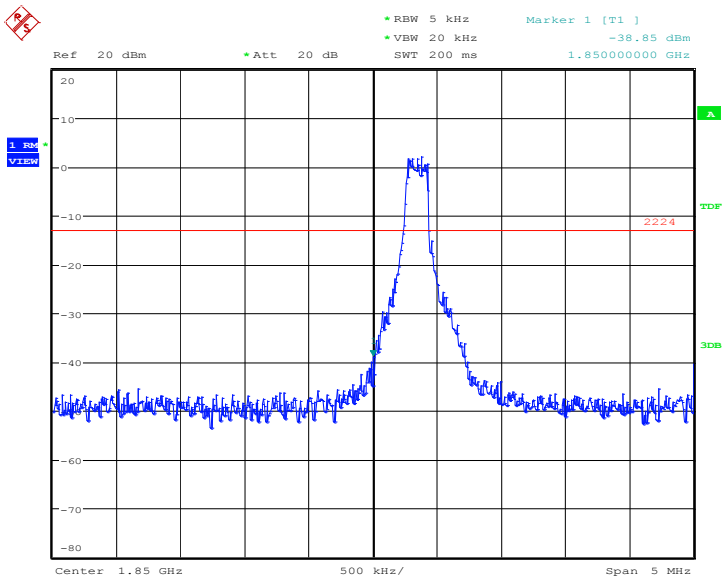
**LTE band 2@CA_2A-12A**

**OBW: 1RB-low_offset**



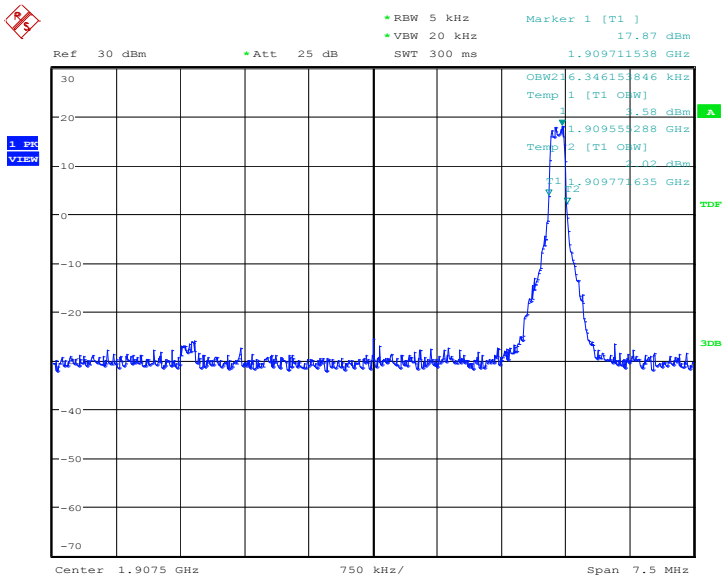

Date: 7.MAR.2020 16:02:15

**LOW BAND EDGE BLOCK-1RB-low_offset**



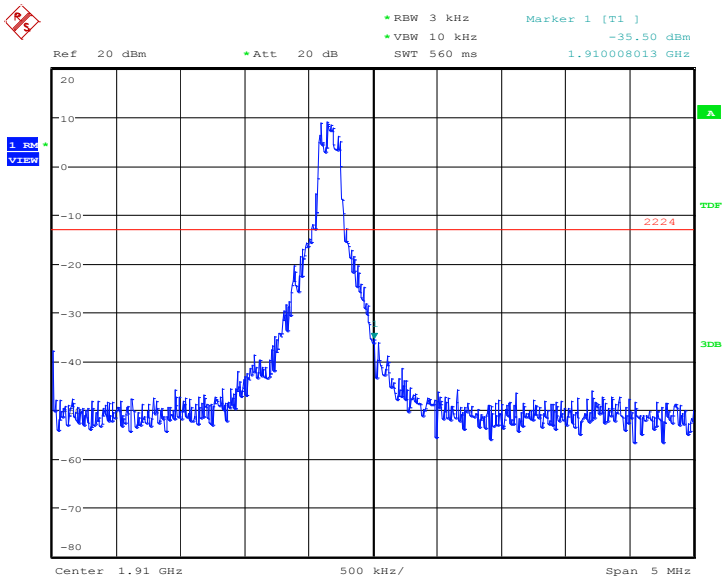

Date: 7.MAR.2020 16:02:25

## OBW: 1RB-high_offset



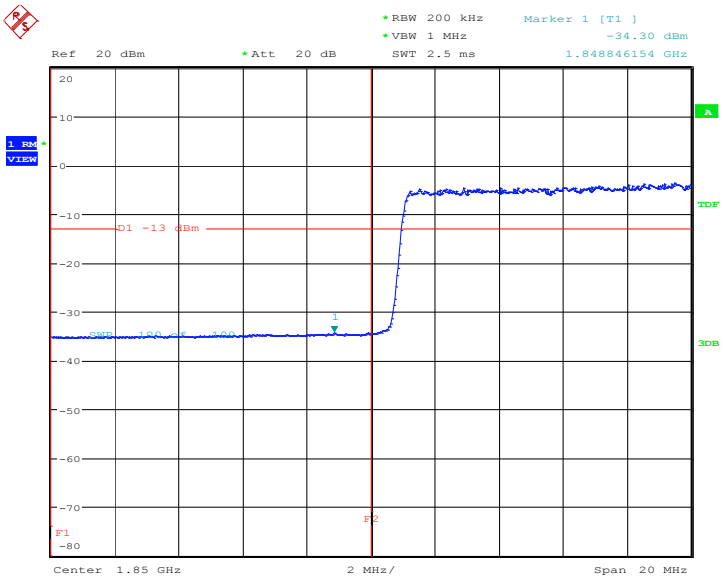

Date: 7.MAR.2020 15:58:13

## HIGH BAND EDGE BLOCK-1RB-high_offset



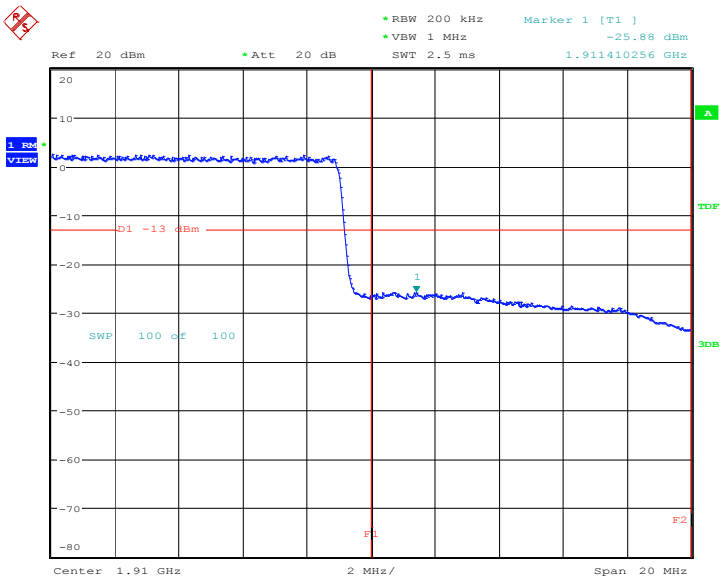

Date: 7.MAR.2020 15:58:20

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




Date: 6.FEB.2020 11:18:02

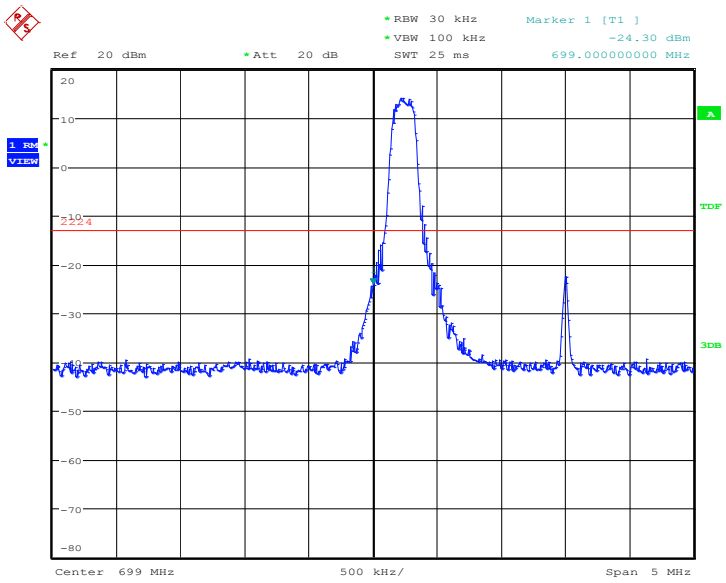
## HIGH BAND EDGE BLOCK-20MHz-100%RB




Date: 6.FEB.2020 11:21:21

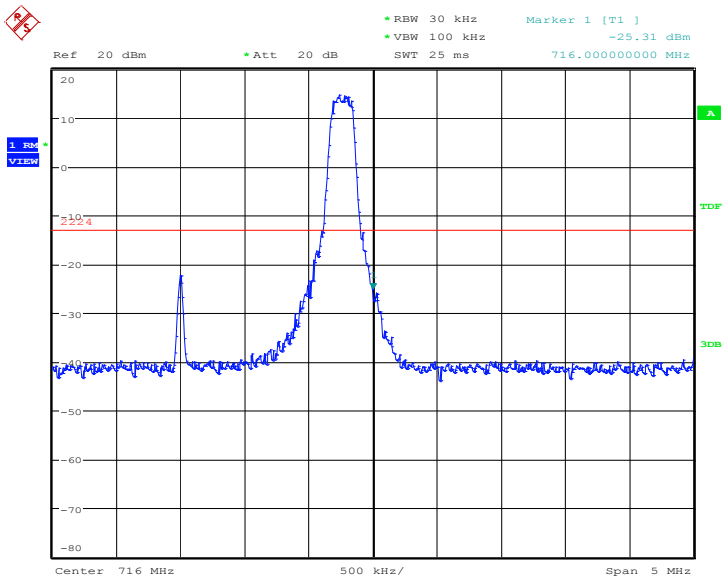
**LTE band 12@CA_2A-12A**

**LOW BAND EDGE BLOCK-1RB-low_offset**



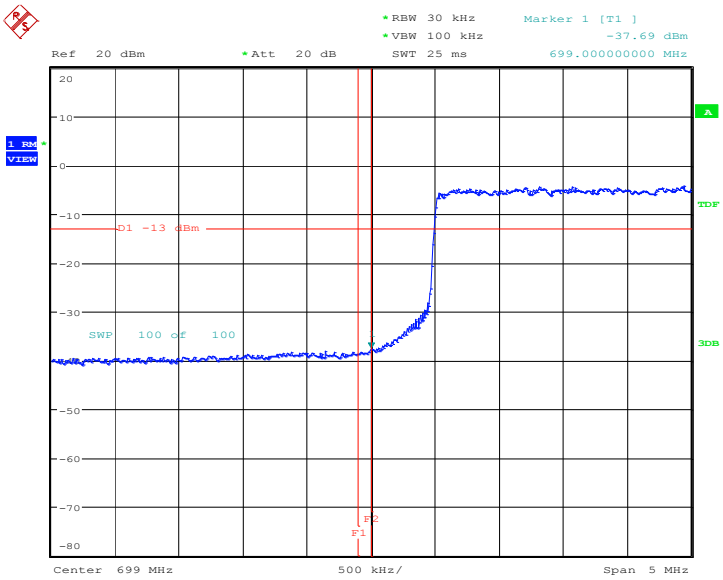

Date: 7.MAR.2020 16:10:45

**HIGH BAND EDGE BLOCK-1RB-high_offset**



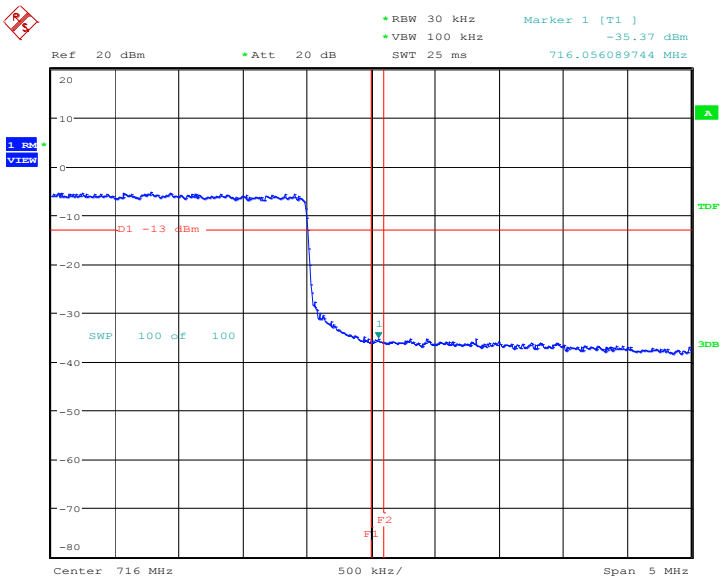

Date: 7.MAR.2020 15:47:38

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




Date: 6.FEB.2020 11:27:29

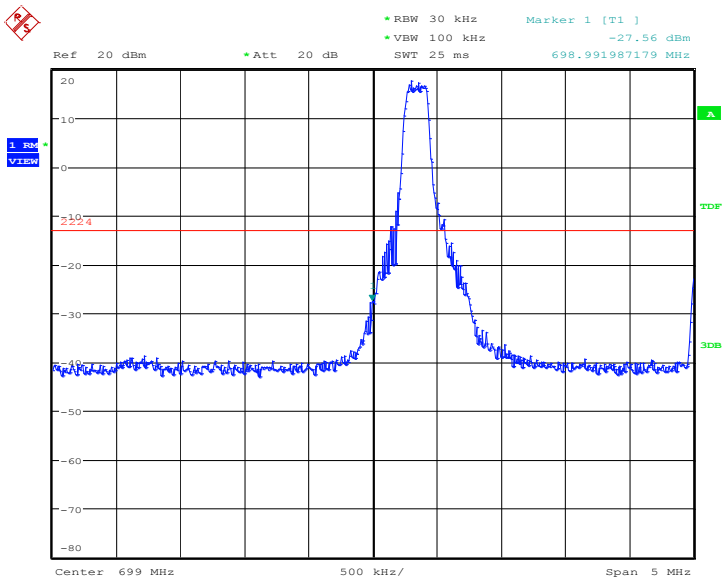
## HIGH BAND EDGE BLOCK-20MHz-100%RB



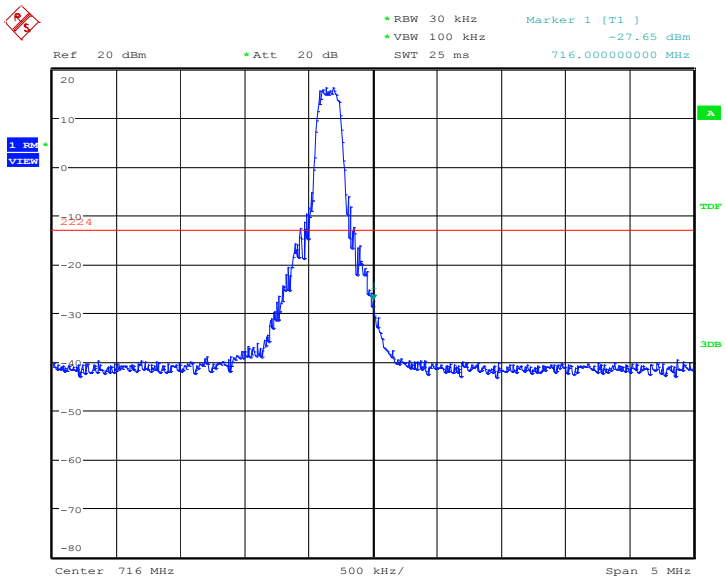

Date: 6.FEB.2020 11:30:41

**LTE band 12@CA_12A-66A**

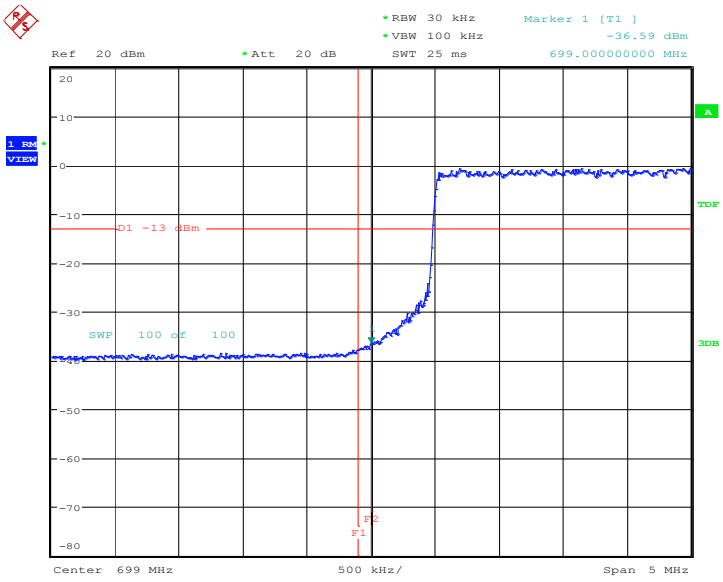
**LOW BAND EDGE BLOCK-1RB-low_offset**




**HIGH BAND EDGE BLOCK-1RB-high_offset**

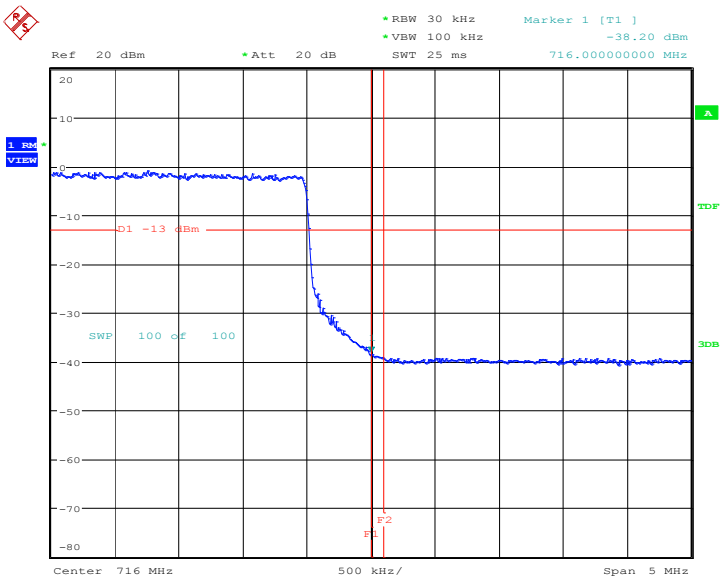


## LOW BAND EDGE BLOCK-20MHz-100%RB




Date: 6.FEB.2020 11:52:34

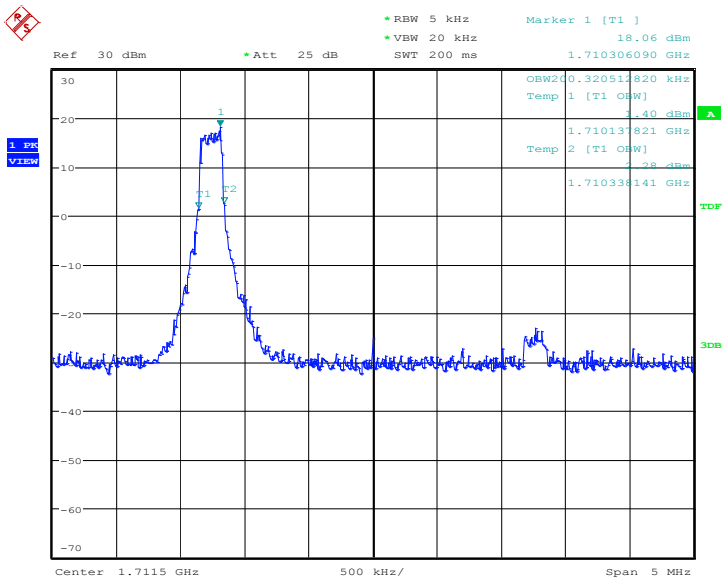
## HIGH BAND EDGE BLOCK-20MHz-100%RB




Date: 6.FEB.2020 11:50:42

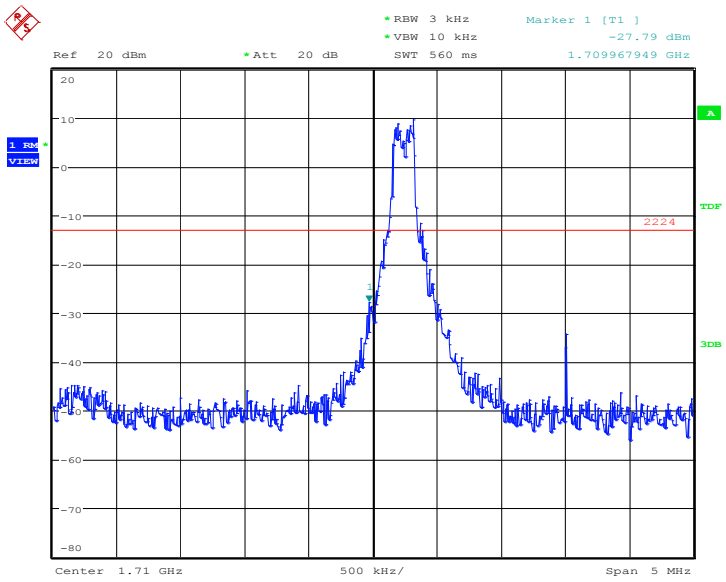
**LTE band 66@CA_12A-66A**

**OBW: 1RB-low_offset**



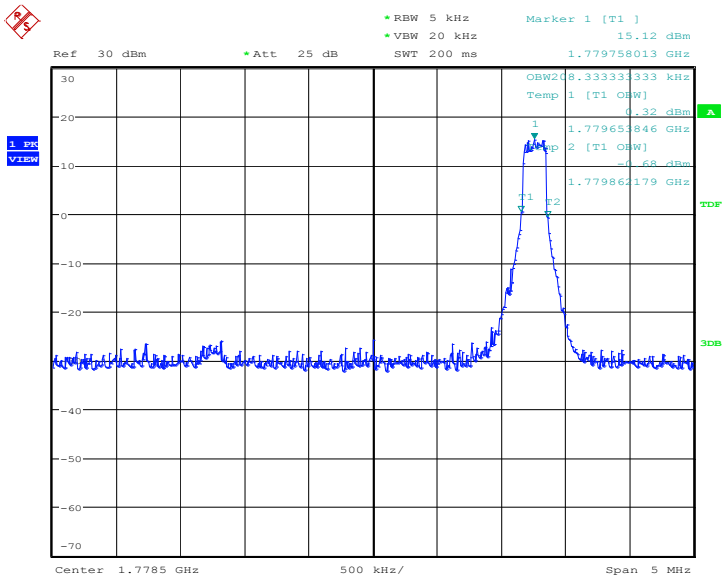

Date: 7.MAR.2020 16:43:38

**LOW BAND EDGE BLOCK-1RB-low_offset**

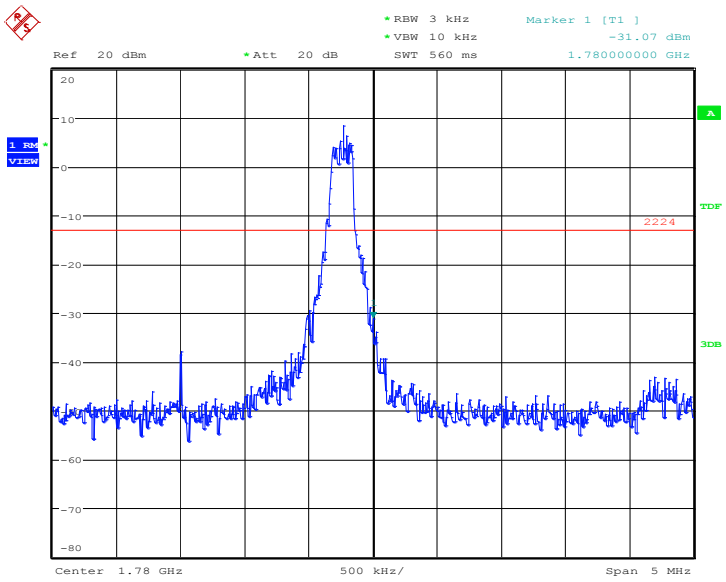



Date: 7.MAR.2020 16:43:45

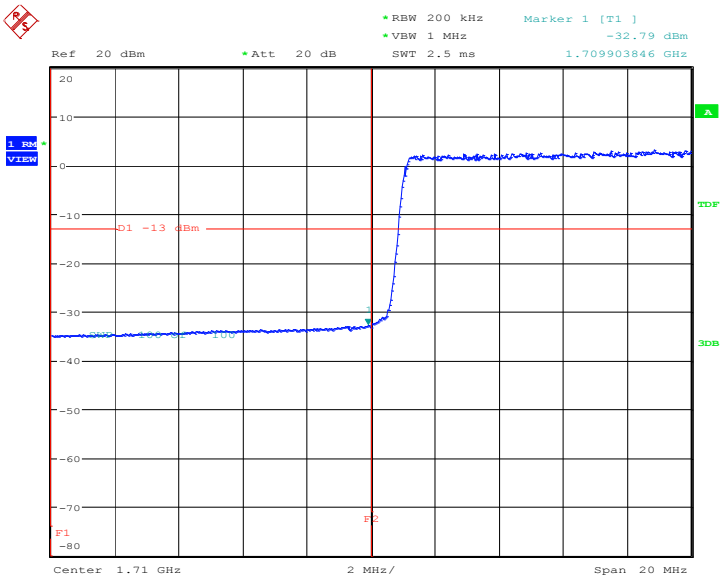
## OBW: 1RB-high_offset




## HIGH BAND EDGE BLOCK-1RB-high_offset

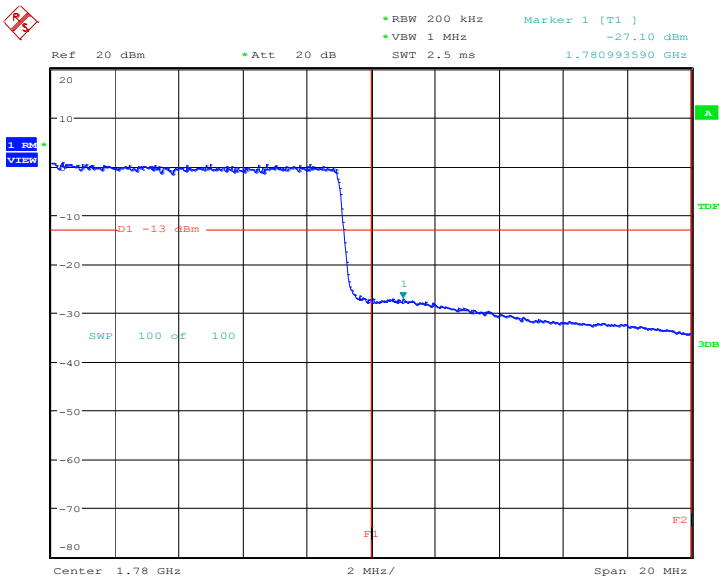


## LOW BAND EDGE BLOCK-20MHz-100%RB




Date: 6.FEB.2020 12:12:23

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

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## A.7 CONDUCTED SPURIOUS EMISSION

### A.7.1 Measurement Method

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

1. Determine frequency range for measurements: From CFR 2.1057 the spectrum should be investigated from the lowest radio frequency generated in the equipment up to at least the 10th harmonic of the carrier frequency. For the mobile station equipment tested, this equates to a frequency range of 13 MHz to 9 GHz, data taken from 10 MHz to 25 GHz.
2. Determine EUT transmit frequencies below outlines the band edge frequencies pertinent to conducted emissions testing.
3. The number of sweep points of spectrum analyzer is set to 30001 which is greater than span/RBW.

### A. 7.2 Measurement Limit

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

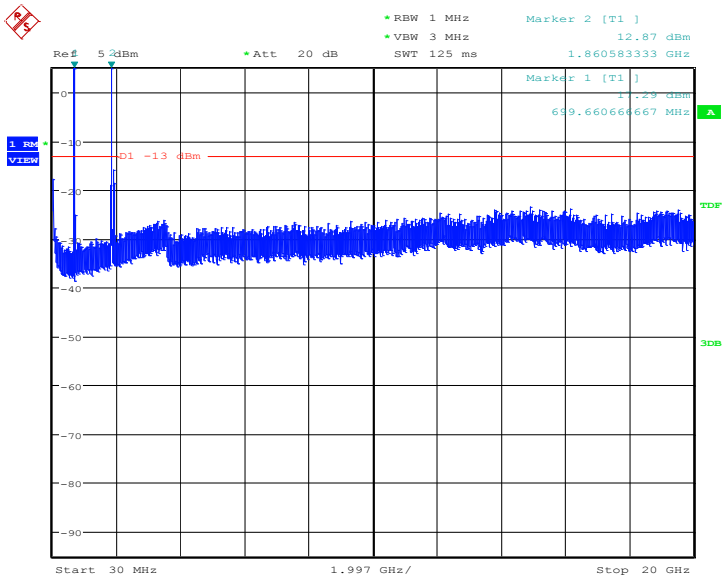
The specification that emissions shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm.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

Part 27.53(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

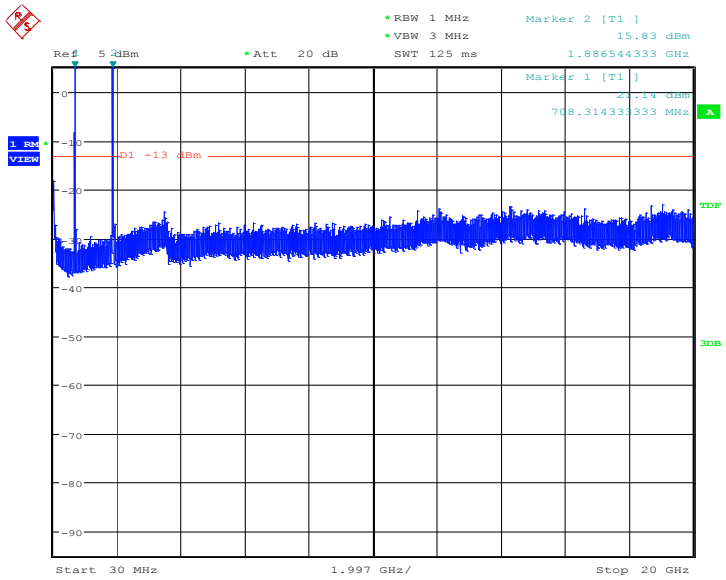
**Only worst case result is given below**

### CA_2A-12A@ CH18700_50RB-Middle+CH23060_1RB-Low



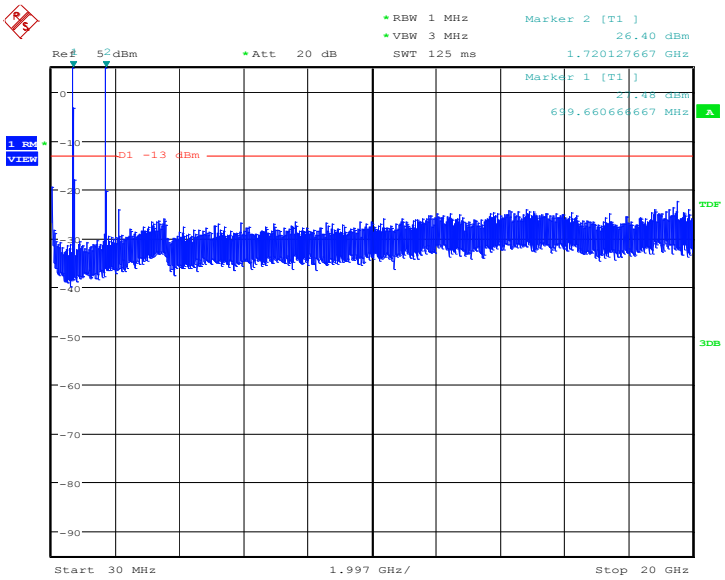

Date: 7.MAR.2020 17:30:17

### CA_2A-12A@20MHz+10MHz bandwidth



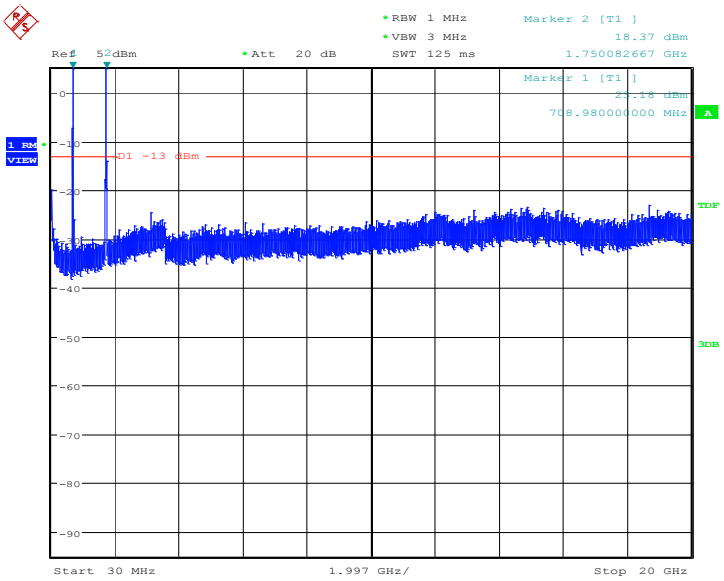

Date: 6.FEB.2020 13:29:40

## CA_12A-66A @CH23060_1RB-Low+CH132072_1RB-Middle




Date: 7.MAR.2020 17:24:41

## CA_12A-66A@10MHz+20MHz bandwidth




Date: 6.FEB.2020 13:24:06

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

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

a) Refer to instrument's analyzer instruction manual for details on how to use the power statistics/CCDF function;

b) Set resolution/measurement bandwidth ⩾ signal's occupied bandwidth;

c) Set the number of counts to a value that stabilizes the measured CCDF curve;

d) Set the measurement interval to 1ms;

e) Record the maximum PAPR level associated with a probability of 0.1%.

### A.8.1 Measurement limit

not exceed 13 dB

### A.8.2 Measurement results

**CA_2A-12A@20MHz+10MHz bandwidth**

**LTE band 2, 20MHz**

| Frequency (MHz) | PAPR (dB) | | |
|---|---|---|---|
| 1880.0 | QPSK | 16QAM | 64QAM |
| | 7.56 | 7.88 | 7.88 |

**LTE band 12, 10MHz**

| Frequency (MHz) | PAPR (dB) | | |
|---|---|---|---|
| 707.5 | QPSK | 16QAM | 64QAM |
| | 5.77 | 6.47 | 6.79 |

**CA_12A-66A@10MHz+20MHz bandwidth**

**LTE band 12, 10MHz**

| Frequency (MHz) | PAPR (dB) | | |
|---|---|---|---|
| 707.5 | QPSK | 16QAM | 64QAM |
| | 5.83 | 6.44 | 6.70 |

**LTE band 66, 20MHz**

| Frequency (MHz) | PAPR (dB) | | |
|---|---|---|---|
| 1745.0 | QPSK | 16QAM | 64QAM |
| | 7.28 | 7.63 | 7.79 |

# ANNEX B: Accreditation Certificate

United States Department of Commerce
National Institute of Standards and Technology

NVLAP®

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

**NVLAP LAB CODE: 600118-0**

**Telecommunication Technology Labs, CAICT**
Beijing
China

*is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:*

**Electromagnetic Compatibility & Telecommunications**

*This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).*

2019-09-26 through 2020-09-30
*Effective Dates*

*For the National Voluntary Laboratory Accreditation Program*

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