TESTING LABORATORY
CERTIFICATE#4323.01

# FCC PART 22H, PART 24E, PART 27

# TEST REPORT

For

## Quanzhou Tesunho Electronics Co., Ltd

2#, 5F E-19# Phase 2 Xunmei, Quanzhou, Fujian, China

**FCC ID: 2AKS9TM991**

| **Report Type:** | **Product Type:** |
|---|---|
| Original Report | Mobile PoC Radio |

| | |
|---|---|
| **Test Engineer:** | Winnie Yang |
| **Report Number:** | RXM191125050-00A |
| **Report Date:** | 2019-12-26 |
| **Reviewed By:** | Oscar Ye<br>EMC Manager |
| **Prepared By:** | Bay Area Compliance Laboratories Corp. (Kunshan)<br>No.248 Chenghu Road, Kunshan, Jiangsu province, China<br>Tel: +86-0512-86175000<br>Fax: +86-0512-88934268<br>www.baclcorp.com.cn |

# TABLE OF CONTENTS

# GENERAL INFORMATION

## Product Description for Equipment under Test (EUT)

| | |
|---|---|
| Applicant | Quanzhou Tesunho Electronics Co., Ltd |
| Tested Model | TM991 |
| Series Model | TM993, TM995 |
| Product Type | Mobile PoC Radio |
| Power Supply | DC 13.8V |
| RF Function | WCDMA, LTE |
| Operating Band/Frequency | WCDMA Band II: 1850-1910 MHz(TX), 1930-1990MHz(RX)<br>WCDMA Band V: 824-849 MHz(TX), 869-894 MHz(RX)<br>LTE Band 2: 1850-1910 MHz(TX), 1930-1990MHz(RX)<br>LTE Band 4: 1710-1755 MHz(TX), 2110-2155MHz(RX)<br>LTE Band 5: 824-849 MHz(TX), 869-894 MHz(RX)<br>LTE Band 12: 699-716 MHz(TX), 729-746 MHz(RX)<br>LTE Band 17: 704-716 MHz(TX), 734-746 MHz(RX) |
| Power Class | WCDMA/LTE: Class 3 |
| Modulation Type | WCDMA/LTE: QPSK,16QAM |
| Antenna Type | WCDMA/LTE: Monopole Antenna |
| Maximum Antenna Gain | WCDMA Band II: 0.0dBi<br>WCDMA Band V: 0.0dBi<br>LTE Band2: 0.0dBi<br>LTE Band4: 0.0dBi<br>LTE Band5: 0.0dBi<br>LTE Band12: 0.0dBi<br>LTE Band17: 0.0dBi |

**All measurement and test data in this report was gathered from production sample serial number: 20191125050. (Assigned by the BACL. The EUT supplied by the applicant was received on 2019-11-25)*

## Objective

This type approval report is prepared on behalf of *Quanzhou Tesunho Electronics Co., Ltd* in accordance with Part 2, Part 22-Subpart H, Part 24-Subpart E and Part 27 of the Federal Communication Commissions' rules.

The objective is to determine the compliance of EUT with FCC rules for output power, modulation characteristic, occupied bandwidth, and spurious emission at antenna terminal, spurious radiated emission, frequency stability, and band edge.

## Related Submittal(s)/Grant(s)

No related submittal(s).

## Test Methodology

All tests and measurements indicated in this document were performed in accordance with the Code of Federal Regulations Title 47 Part 2, Sub-Part J as well as the following parts:

Part 22 Subpart H - Public Mobile Services
Part 24 Subpart E - Personal Communication Services
Part 27 – Miscellaneous wireless communications services

Applicable Standards: TIA/EIA 603-D.

All radiated and conducted emissions measurements were performed at Bay Area Compliance Laboratories Corp. (Kunshan). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

## Measurement Uncertainty

| Item | | Uncertainty |
|---|---|---|
| AC Power Lines Conducted Emissions | | 3.19dB |
| RF conducted test with spectrum | | 0.9dB |
| RF Output Power with Power meter | | 0.5dB |
| Radiated emission | 30MHz~1GHz | 5.91dB |
| | 1GHz~6GHz | 4.68dB |
| | 6GHz~18GHz | 4.92dB |
| | 18GHz~40GHz | 5.21dB |
| Occupied Bandwidth | | 0.5kHz |
| Temperature | | 1.0℃ |
| Humidity | | 6% |

Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

## Test Facility

The test site used by Bay Area Compliance Laboratories Corp. (Kunshan) to collect test data is located on the No.248 Chenghu Road, Kunshan, Jiangsu province, China.

Bay Area Compliance Laboratories Corp. (Kunshan) Lab is accredited to ISO/IEC 17025 by A2LA (Lab code: 4323.01) and the FCC designation No. CN1185 under the FCC KDB 974614 D01 and CAB identifier CN0004 under the ISED requirement. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2014.

# SYSTEM TEST CONFIGURATION

## Justification

The EUT was configured for testing according to TIA/EIA-603-D.

The final qualification test was performed with the EUT operating at normal mode.

## Channel List

| Mode | | Channel | | Frequency (MHz) |
|---|---|---|---|---|
| WCDMA Band II | | Low | 9262 | 1852.4 |
| | | Middle | 9400 | 1880.0 |
| | | High | 9538 | 1907.6 |
| WCDMA Band V | | Low | 4132 | 826.4 |
| | | Middle | 4183 | 836.6 |
| | | High | 4233 | 846.6 |
| LTE Band 2 | 1.4M | Low | 18607 | 1850.7 |
| | | Middle | 18900 | 1880.0 |
| | | High | 19193 | 1909.3 |
| | 3M | Low | 18615 | 1851.5 |
| | | Middle | 18900 | 1880.0 |
| | | High | 19185 | 1908.5 |
| | 5M | Low | 18625 | 1852.5 |
| | | Middle | 18900 | 1880.0 |
| | | High | 19175 | 1907.5 |
| | 10M | Low | 18650 | 1855.0 |
| | | Middle | 18900 | 1880.0 |
| | | High | 19150 | 1905.0 |
| | 15M | Low | 18675 | 1857.5 |
| | | Middle | 18900 | 1880.0 |
| | | High | 19125 | 1902.5 |
| | 20M | Low | 18700 | 1860.0 |
| | | Middle | 18900 | 1880.0 |
| | | High | 19100 | 1900.0 |

| Mode | | Channel | | Frequency (MHz) |
|---|---|---|---|---|
| LTE Band 4 | 1.4M | Low | 19957 | 1710.7 |
| | | Middle | 20175 | 1732.5 |
| | | High | 20393 | 1754.3 |
| | 3M | Low | 19965 | 1711.5 |
| | | Middle | 20175 | 1732.5 |
| | | High | 20385 | 1753.5 |
| | 5M | Low | 19975 | 1712.5 |
| | | Middle | 20175 | 1732.5 |
| | | High | 20375 | 1752.5 |
| | 10M | Low | 20000 | 1715.0 |
| | | Middle | 20175 | 1732.5 |
| | | High | 20350 | 1750.0 |
| | 15M | Low | 20025 | 1717.5 |
| | | Middle | 20175 | 1732.5 |
| | | High | 20325 | 1747.5 |
| | 20M | Low | 20050 | 1720.0 |
| | | Middle | 20175 | 1732.5 |
| | | High | 20300 | 1745.0 |
| LTE Band 5 | 1.4M | Low | 20407 | 824.7 |
| | | Middle | 20525 | 836.5 |
| | | High | 20643 | 848.3 |
| | 3M | Low | 20415 | 825.5 |
| | | Middle | 20525 | 836.5 |
| | | High | 20635 | 847.5 |
| | 5M | Low | 20425 | 826.5 |
| | | Middle | 20525 | 836.5 |
| | | High | 20625 | 846.5 |
| | 10M | Low | 20450 | 829.0 |
| | | Middle | 20525 | 836.5 |
| | | High | 20600 | 844.0 |
| LTE Band 12 | 1.4M | Low | 23017 | 699.7 |
| | | Middle | 23095 | 707.5 |
| | | High | 23173 | 715.3 |
| | 3M | Low | 23025 | 700.5 |
| | | Middle | 23095 | 707.5 |
| | | High | 23165 | 714.5 |
| | 5M | Low | 23035 | 701.5 |
| | | Middle | 23095 | 707.5 |
| | | High | 23155 | 713.5 |
| | 10M | Low | 23060 | 704.0 |
| | | Middle | 23095 | 707.5 |
| | | High | 23130 | 711.0 |

| Mode | | Channel | | Frequency (MHz) |
|---|---|---|---|---|
| LTE Band 17 | 5M | Low | 23755 | 706.5 |
| | | Middle | 23790 | 710.0 |
| | | High | 23825 | 713.5 |
| | 10M | Low | 23780 | 709.0 |
| | | Middle | 23790 | 710.0 |
| | | High | 23800 | 711.0 |

## Equipment Modifications

No modifications were made to the EUT.

## Support Equipment List and Details

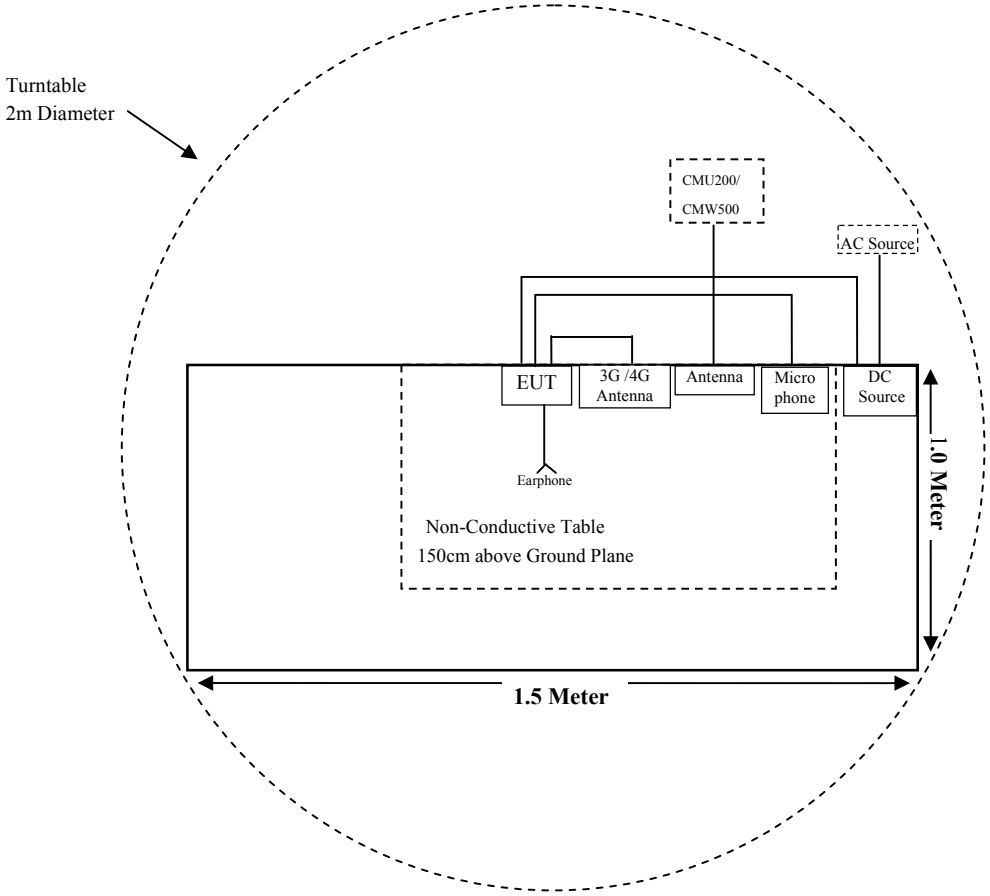
| Manufacturer | Description | Model | Serial Number |
|---|---|---|---|
| Rohde & Schwarz | Universal Radio Communication Test | CMU200 | 100184 |
| Rohde & Schwarz | Wideband Radio Communication Tester | CMW500 | 104478 |
| ZHAOXIN | DC Power Supply | RXN-605D | DC002 |
| Aihuaxin technology | Antenna | / | / |

## External I/O Cable

| Cable Description | Length (m) | From Port | To |
|---|---|---|---|
| Data Cable | 1.5 | EUT | DC Source |
| Power Cable | 1.0 | DC Source | AC Source |

## Block Diagram of Test Setup

For Radiated Emissions (Below 1GHz & Above 1GHz):



# SUMMARY OF TEST RESULTS

| FCC Rules | Description of Test | Result |
|---|---|---|
| §1.1310 & §2.1091 | Maximum Permissible Exposure (MPE) | Compliant |
| §2.1046; § 22.913 (a);§ 24.232 (c); § 27.50 (c)(d); | RF Output Power | Compliant |
| § 2.1047 | Modulation Characteristics | Not Applicable |
| § 2.1049; § 22.905; § 22.917; § 24.238; §27.53; | Occupied Bandwidth | Compliant |
| § 2.1051; § 22.917 (a); § 24.238 (a); §27.53; | Spurious Emissions at Antenna Terminal | Compliant |
| § 2.1053; § 22.917 (a); § 24.238 (a); §27.53 (g) (h); | Spurious Radiated Emissions | Compliant |
| § 22.917 (a); § 24.238 (a); §27.53 (g) (h); | Band Edge | Compliant |
| § 2.1055; § 22.355; § 24.235; §27.54; | Frequency Stability | Compliant |

# TEST EQUIPMENT LIST

| Manufacturer | Description | Model | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|
| **Radiated Emission Test（Chamber 1#）** | | | | | |
| Rohde & Schwarz | EMI Test Receiver | ESCI | 100195 | 2019-11-30 | 2020-11-29 |
| HP | Signal Generator | HP 8341B | 2624A00116 | 2019-11-30 | 2020-11-29 |
| Sunol Sciences | Broadband Antenna | JB3 | A090413-1 | 2016-12-26 | 2019-12-25 |
| Sunol Sciences | Broadband Antenna | JB3 | A090314-2 | 2019-01-09 | 2022-01-08 |
| Sonoma Instrunent | Pre-amplifier | 310N | 171205 | 2019-08-14 | 2020-08-13 |
| Rohde & Schwarz | Auto Test Software | EMC32 | 100361 | / | / |
| MICRO-COAX | Coaxial Cable | Cable-6 | 006 | 2019-08-15 | 2020-08-14 |
| MICRO-COAX | Coaxial Cable | Cable-8 | 008 | 2019-08-15 | 2020-08-14 |
| MICRO-COAX | Coaxial Cable | Cable-9 | 009 | 2019-08-15 | 2020-08-14 |
| MICRO-COAX | Coaxial Cable | Cable-10 | 010 | 2019-08-15 | 2020-08-14 |
| Rohde & Schwarz | Universal Radio Communication Test | CMU200 | 110605 | 2019-11-30 | 2020-11-29 |
| Rohde & Schwarz | Wideband Radio Communication Tester | CMW500 | 104478 | 2019-08-05 | 2020-08-04 |
| **Radiated Emission Test（Chamber 2#）** | | | | | |
| HP | Signal Generator | HP 8341B | 2624A00116 | 2019-11-30 | 2020-11-29 |
| Rohde & Schwarz | EMI Test Receiver | ESU40 | 100207 | 2019-05-30 | 2020-05-29 |
| ETS-LINDGREN | Horn Antenna | 3115 | 9207-3900 | 2017-07-15 | 2020-07-14 |
| ETS-LINDGREN | Horn Antenna | 3115 | 6229 | 2019-12-12 | 2020-12-11 |
| ETS-LINDGREN | Horn Antenna | 3116 | 00084159 | 2019-12-12 | 2020-12-11 |
| ETS-LINDGREN | Horn Antenna | 3116 | 2516 | 2019-12-12 | 2020-12-11 |
| A.H.Systems, inc | Amplifier | 2641-1 | 491 | 2019-02-20 | 2020-02-19 |
| SELECTOR | Amplifier | EM18G40G | 060726 | 2019-03-22 | 2020-03-21 |
| Rohde & Schwarz | Auto Test Software | EMC32 | 100361 | / | / |
| MICRO-COAX | Coaxial Cable | Cable-6 | 006 | 2019-08-15 | 2020-08-14 |
| MICRO-COAX | Coaxial Cable | Cable-11 | 011 | 2019-08-15 | 2020-08-14 |
| MICRO-COAX | Coaxial Cable | Cable-12 | 012 | 2019-08-15 | 2020-08-14 |
| MICRO-COAX | Coaxial Cable | Cable-13 | 013 | 2019-08-15 | 2020-08-14 |
| MICRO-COAX | Coaxial Cable | Cable-16 | 016 | 2019-08-15 | 2020-08-14 |
| Rohde & Schwarz | Universal Radio Communication Test | CMU200 | 110605 | 2019-11-30 | 2020-11-29 |
| Rohde & Schwarz | Wideband Radio Communication Tester | CMW500 | 104478 | 2019-08-05 | 2020-08-04 |

| Manufacturer | Description | Model | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|
| **RF Conducted Test** | | | | | |
| Rohde & Schwarz | Signal Analyzer | FSIQ26 | 836131/009 | 2019-11-30 | 2020-11-29 |
| Rohde & Schwarz | Universal Radio Communication Test | CMU200 | 110605 | 2019-11-30 | 2020-11-29 |
| Rohde & Schwarz | Wideband Radio Communication Tester | CMW500 | 104478 | 2019-08-05 | 2020-08-04 |
| Mini-Ciruits | Power Splitter | ZFRSC-14-S+ | SF019411452 | 2019-11-10 | 2020-11-09 |
| BACL | Temperature & Humidity Chamber | BTH-150 | 30023 | 2019-12-20 | 2020-12-19 |
| Quanzhou Tesunho | RF Cable | Quanzhou Tesunho C01 | C01 | Each Time | / |

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Kunshan) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

# FCC §1.1310 & §2.1091 - MAXIMUM PERMISSIBLE EXPOSURE (MPE)

## Applicable Standard

According to subpart subpart 1.1310 and 2.1091 systems operating under the provisions of this section shall be operated in a manner that ensures the public is not exposed to RF energy level in excess of the communication guidelines.

| Limits for General Population/Uncontrolled Exposure | | | | |
|---|---|---|---|---|
| **Frequency Range (MHz)** | **Electric Field Strength (V/m)** | **Magnetic Field Strength (A/m)** | **Power Density ($mW/cm^2$)** | **Averaging Time (minutes)** |
| 0.3-1.34 | 614 | 1.63 | *(100) | 30 |
| 1.34-30 | 824/f | 2.19/f | *(180/$f^2$) | 30 |
| 30-300 | 27.5 | 0.073 | 0.2 | 30 |
| 300-1500 | / | | f/1500 | 30 |
| 1500-100,000 | / | | 1.0 | 30 |

f = frequency in MHz; * = Plane-wave equivalent power density

## Calculated Formulary:

Predication of MPE limit at a given distance

$S = PG/4\pi R^2$ = power density (in appropriate units, e.g. $mW/cm^2$);
P = power input to the antenna (in appropriate units, e.g., mW);
G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain;
R = distance to the center of radiation of the antenna (appropriate units, e.g., cm);

## Calculated Data (worst case):

| Mode | Frequency Range (MHz) | Antenna Gain | | Target Output Power | | Evaluation Distance (cm) | Power Density ($mW/cm^2$) | MPE Limit ($mW/cm^2$) |
|---|---|---|---|---|---|---|---|---|
| | | (dBi) | (numeric) | (dBm) | (mW) | | | |
| WCDMA Band II | 1850.0-1910.0 | 0.0 | 1.00 | 22.00 | 158.49 | 20 | 0.0315 | 1.00 |
| WCDMA Band V | 824.0-849.0 | 0.0 | 1.00 | 23.00 | 199.53 | 20 | 0.0397 | 0.55 |
| FDD (Band 2) | 1850.0-1910.0 | 0.0 | 1.00 | 22.00 | 158.49 | 20 | 0.0315 | 1.00 |
| FDD (Band 4) | 1710.0-1755.0 | 0.0 | 1.00 | 22.50 | 177.83 | 20 | 0.0354 | 1.00 |
| FDD (Band 5) | 824.0-849.0 | 0.0 | 1.00 | 23.00 | 199.53 | 20 | 0.0397 | 0.55 |
| FDD (Band 12) | 699.0-716.0 | 0.0 | 1.00 | 23.50 | 223.87 | 20 | 0.0445 | 0.47 |
| FDD (Band 17) | 704.0-716.0 | 0.0 | 1.00 | 23.50 | 223.87 | 20 | 0.0445 | 0.47 |

**Note1**: The target output power was declared by the manufacturer.
**Note2:** Conclusion: The device meets MPE at distance 20cm.

# FCC §2.1047 - MODULATION CHARACTERISTIC

According to FCC § 2.1047(d), Part 22H & 24E, Part 27 there is no specific requirement for digital modulation, therefore modulation characteristic is not presented.

# FCC §2.1046; § 22.913 (a); § 24.232 (c); §27.50 (c) (d); - RF OUTPUT POWER

## Applicable Standards

According to FCC §2.1046 and §22.913 (a), the ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 watts (38.45dBm).

According to FCC §2.1046 and §24.232 (c), mobile and portable stations are limited to 2 watts (33dBm) EIRP and the equipment must employ a means for limiting power to the minimum necessary for successful communications.

According to §27.50(d), the maximum EIRP must not exceed 1Watts (30dBm) for 1710-1755MHz.

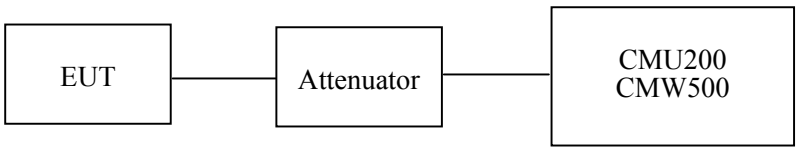
According to §27.50(c), Portable stations (hand-held devices) in the 600 MHz uplink band and the 698-746 MHz band, and fixed and mobile stations in the 600 MHz uplink band are limited to 3 watts ERP..

The peak-to-average power ratio (PAPR) of the transmitter output power must not exceed 13 dB.

## Test Procedure

**Conducted method:**

The RF output of the transmitter was connected to the CMU200 through sufficient attenuation.




**Radiated Output Power:**

The measurements procedures specified in ANSI/TIA-603-D were applied.

a) Connect the equipment as illustrated. Mount the equipment with the manufacturer specified antenna in a vertical orientation on a manufacturer specified mounting surface located on a non-conducting rotating platform of a RF anechoic chamber (preferred) or a standard radiation site.

b) Key the transmitter, then rotate the EUT 360o azimuthally and record spectrum analyzer power level (LVL) measurements at angular increments that are sufficiently small to permit resolution of all peaks. If a standard radiation test site is used, raise and lower the test antenna to obtain a maximum reading at each angular increment. (Note: several batteries may be needed to offset the effect of battery voltage droop, which should not exceed 5% of the manufactured specified battery voltage during transmission).

c) Replace the transmitter under test with a vertically polarized half-wave dipole (or an antenna whose gain is known relative to an ideal half-wave dipole). The center of the antenna should be at the same location as the center of the antenna under test.

d) Connect the antenna to a signal generator with a known output power and record the path loss (in dB) as LOSS. If a standard radiation test site is used,raise and lower the test antenna to obtain a maximum reading.
LOSS = Generator Output Power (dBm) – Analyzer reading (dBm)

e) Determine the effective radiated output power at each angular position from the readings in steps b) and d) using the following equation:
ERP (dBm) = LVL (dBm) + LOSS (dB)

f) The maximum ERP is the maximum value determined in the preceding step.
(Note: Effective Isotropic Radiated Power (EIRP) can be computed using the following:
EIRP (dBm ) = ERP (dBm) + 2.15 (dB)

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 23.2 ℃ |
| **Relative Humidity:** | 51 % |
| **ATM Pressure:** | 101.3 kPa |

*The testing was performed by Winnie Yang on 2019-12-24.*

### Conducted Power:

**WCDMA Band V**

| Mode | Test Condition | Test Mode | 3GPP Sub Test | Average Output Power (dBm) | | |
|---|---|---|---|---|---|---|
| | | | | Low Frequency | Middle Frequency | High Frequency |
| WCDMA (Band V) | Normal | Rel 99 | 1 | 22.63 | 22.35 | 22.51 |
| | | HSDPA | 1 | 22.02 | 21.70 | 21.84 |
| | | | 2 | 21.87 | 21.71 | 21.89 |
| | | | 3 | 21.47 | 21.25 | 21.28 |
| | | | 4 | 21.00 | 20.88 | 20.95 |
| | | HSUPA | 1 | 21.62 | 21.28 | 21.38 |
| | | | 2 | 21.38 | 21.17 | 21.40 |
| | | | 3 | 21.29 | 21.11 | 21.34 |
| | | | 4 | 20.89 | 20.73 | 20.99 |
| | | | 5 | 20.37 | 20.42 | 20.48 |
| | | HSPA+ | 1 | 21.94 | 21.91 | 21.90 |

**WCDMA Band II**

| Mode | Test Condition | Test Mode | 3GPP Sub Test | Average Output Power (dBm) | | |
|---|---|---|---|---|---|---|
| | | | | Low Frequency | Middle Frequency | High Frequency |
| WCDMA (Band II) | Normal | Rel 99 | 1 | 21.68 | 21.86 | 21.52 |
| | | HSDPA | 1 | 21.25 | 21.21 | 20.86 |
| | | | 2 | 20.94 | 21.09 | 21.01 |
| | | | 3 | 20.89 | 20.76 | 20.37 |
| | | | 4 | 20.45 | 20.28 | 19.85 |
| | | HSUPA | 1 | 20.93 | 20.72 | 20.37 |
| | | | 2 | 20.63 | 20.71 | 20.26 |
| | | | 3 | 20.28 | 20.38 | 20.38 |
| | | | 4 | 20.28 | 20.37 | 19.91 |
| | | | 5 | 20.12 | 20.26 | 19.80 |
| | | HSPA+ | 1 | 21.14 | 21.39 | 20.99 |

**Maximum Output Power:**

**LTE Band 2**

| Test Bandwidth | Test Modulation | Resource Block & RB offset | Low Channel (dBm) | Middle Channel (dBm) | High Channel (dBm) |
|---|---|---|---|---|---|
| 1.4M | QPSK | 1#0 | 21.21 | 21.34 | 21.41 |
| | | 1#3 | 20.52 | 20.53 | 20.79 |
| | | 1#5 | 21.13 | 20.62 | 20.45 |
| | | 3#0 | 20.63 | 21.05 | 20.68 |
| | | 3#1 | 21.11 | 20.65 | 21.30 |
| | | 3#3 | 20.77 | 20.90 | 21.48 |
| | | 6#0 | 20.27 | 21.26 | 20.45 |
| | 16-QAM | 1#0 | 20.23 | 20.90 | 21.49 |
| | | 1#3 | 20.65 | 21.13 | 20.59 |
| | | 1#5 | 20.79 | 21.12 | 21.54 |
| | | 3#0 | 20.83 | 21.32 | 20.91 |
| | | 3#1 | 20.66 | 20.83 | 21.33 |
| | | 3#3 | 20.73 | 20.70 | 20.92 |
| | | 6#0 | 21.05 | 21.11 | 21.39 |
| 3M | QPSK | 1#0 | 21.15 | 21.09 | 21.26 |
| | | 1#7 | 20.92 | 20.60 | 20.95 |
| | | 1#14 | 20.78 | 20.51 | 21.12 |
| | | 8#0 | 20.18 | 20.45 | 20.37 |
| | | 8#4 | 21.10 | 20.67 | 20.64 |
| | | 8#7 | 20.35 | 20.12 | 20.40 |
| | | 15#0 | 20.49 | 20.77 | 21.20 |
| | 16-QAM | 1#0 | 20.21 | 20.52 | 20.59 |
| | | 1#7 | 20.95 | 20.98 | 20.28 |
| | | 1#14 | 20.37 | 20.29 | 20.97 |
| | | 8#0 | 20.42 | 20.35 | 21.11 |
| | | 8#4 | 20.44 | 20.99 | 20.78 |
| | | 8#7 | 20.60 | 20.21 | 20.92 |
| | | 15#0 | 20.70 | 20.45 | 20.56 |

| Test Bandwidth | Test Modulation | Resource Block & RB offset | Low Channel (dBm) | Middle Channel (dBm) | High Channel (dBm) |
|---|---|---|---|---|---|
| 5M | QPSK | 1#0 | 21.22 | 21.06 | 21.19 |
| | | 1#12 | 20.46 | 20.94 | 21.09 |
| | | 1#24 | 21.18 | 20.90 | 21.07 |
| | | 12#0 | 21.22 | 20.20 | 20.57 |
| | | 12#6 | 20.54 | 20.99 | 20.74 |
| | | 12#11 | 20.91 | 20.29 | 20.99 |
| | | 25#0 | 20.86 | 20.95 | 20.32 |
| | 16-QAM | 1#0 | 21.05 | 21.03 | 20.89 |
| | | 1#12 | 20.47 | 20.55 | 20.85 |
| | | 1#24 | 20.98 | 20.60 | 20.95 |
| | | 12#0 | 20.56 | 20.80 | 20.66 |
| | | 12#6 | 20.77 | 20.75 | 20.21 |
| | | 12#11 | 21.22 | 20.44 | 21.16 |
| | | 25#0 | 20.40 | 20.48 | 20.54 |
| 10M | QPSK | 1#0 | 21.35 | 21.27 | 21.46 |
| | | 1#24 | 21.17 | 20.73 | 21.42 |
| | | 1#49 | 20.61 | 20.33 | 20.62 |
| | | 25#0 | 20.62 | 20.72 | 21.22 |
| | | 25#12 | 20.45 | 20.71 | 20.94 |
| | | 25#24 | 21.12 | 20.85 | 20.86 |
| | | 50#0 | 20.70 | 20.96 | 21.33 |
| | 16-QAM | 1#0 | 20.69 | 20.44 | 21.01 |
| | | 1#24 | 20.41 | 20.80 | 20.49 |
| | | 1#49 | 20.97 | 20.66 | 20.91 |
| | | 25#0 | 21.27 | 20.67 | 21.28 |
| | | 25#12 | 21.20 | 20.97 | 21.22 |
| | | 25#24 | 20.84 | 21.17 | 20.86 |
| | | 50#0 | 21.14 | 20.33 | 20.95 |

| Test Bandwidth | Test Modulation | Resource Block & RB offset | Low Channel (dBm) | Middle Channel (dBm) | High Channel (dBm) |
|---|---|---|---|---|---|
| 15M | QPSK | 1#0 | 21.17 | 21.24 | 21.08 |
| | | 1#37 | 20.27 | 20.95 | 20.93 |
| | | 1#74 | 20.76 | 20.56 | 20.57 |
| | | 36#0 | 21.06 | 20.63 | 20.39 |
| | | 36#17 | 20.73 | 20.89 | 20.49 |
| | | 36#35 | 21.16 | 21.24 | 20.94 |
| | | 75#0 | 21.05 | 21.07 | 20.28 |
| | 16-QAM | 1#0 | 20.26 | 21.24 | 20.42 |
| | | 1#37 | 20.93 | 20.97 | 21.02 |
| | | 1#74 | 20.21 | 21.13 | 20.20 |
| | | 36#0 | 20.46 | 21.22 | 21.02 |
| | | 36#17 | 21.13 | 21.16 | 21.01 |
| | | 36#35 | 21.08 | 20.64 | 20.25 |
| | | 75#0 | 20.83 | 20.85 | 20.62 |
| 20M | QPSK | 1#0 | 21.29 | 21.34 | 21.18 |
| | | 1#49 | 20.86 | 20.73 | 20.48 |
| | | 1#99 | 20.31 | 20.35 | 20.39 |
| | | 50#0 | 20.72 | 20.72 | 20.96 |
| | | 50#24 | 21.06 | 20.82 | 20.22 |
| | | 50#49 | 20.85 | 20.77 | 20.35 |
| | | 100#0 | 20.42 | 20.53 | 20.39 |
| | 16-QAM | 1#0 | 20.72 | 20.93 | 20.86 |
| | | 1#49 | 21.17 | 21.11 | 20.63 |
| | | 1#99 | 20.34 | 20.86 | 20.85 |
| | | 50#0 | 21.21 | 20.49 | 20.39 |
| | | 50#24 | 21.17 | 20.79 | 21.14 |
| | | 50#49 | 20.61 | 21.29 | 21.14 |
| | | 100#0 | 21.03 | 20.49 | 20.84 |

**LTE Band 4**

| Test Bandwidth | Test Modulation | Resource Block & RB offset | Low Channel (dBm) | Middle Channel (dBm) | High Channel (dBm) |
|---|---|---|---|---|---|
| 1.4M | QPSK | 1#0 | 21.52 | 21.43 | 21.36 |
| | | 1#3 | 21.12 | 20.43 | 20.70 |
| | | 1#5 | 21.36 | 20.50 | 21.30 |
| | | 3#0 | 21.36 | 20.86 | 21.29 |
| | | 3#1 | 20.77 | 20.84 | 21.35 |
| | | 3#3 | 21.10 | 20.67 | 20.78 |
| | | 6#0 | 21.07 | 20.72 | 20.89 |
| | 16-QAM | 1#0 | 20.66 | 20.87 | 20.76 |
| | | 1#3 | 21.17 | 20.73 | 21.08 |
| | | 1#5 | 21.32 | 21.22 | 20.97 |
| | | 3#0 | 21.22 | 21.07 | 20.55 |
| | | 3#1 | 21.50 | 21.31 | 20.88 |
| | | 3#3 | 20.58 | 20.44 | 21.05 |
| | | 6#0 | 21.41 | 20.55 | 20.81 |
| 3M | QPSK | 1#0 | 21.14 | 21.07 | 21.18 |
| | | 1#7 | 20.31 | 20.10 | 20.27 |
| | | 1#14 | 20.46 | 20.78 | 20.59 |
| | | 8#0 | 20.84 | 20.70 | 20.85 |
| | | 8#4 | 20.89 | 21.02 | 20.63 |
| | | 8#7 | 20.21 | 20.46 | 20.39 |
| | | 15#0 | 20.36 | 21.05 | 20.90 |
| | 16-QAM | 1#0 | 21.08 | 20.56 | 20.24 |
| | | 1#7 | 20.63 | 21.05 | 20.47 |
| | | 1#14 | 21.11 | 20.42 | 21.10 |
| | | 8#0 | 21.06 | 20.31 | 21.07 |
| | | 8#4 | 20.67 | 20.34 | 20.79 |
| | | 8#7 | 20.67 | 20.25 | 20.30 |
| | | 15#0 | 20.67 | 21.03 | 20.49 |

| Test Bandwidth | Test Modulation | Resource Block & RB offset | Low Channel (dBm) | Middle Channel (dBm) | High Channel (dBm) |
|---|---|---|---|---|---|
| 5M | QPSK | 1#0 | 21.85 | 21.76 | 21.51 |
| | | 1#12 | 21.50 | 21.46 | 20.81 |
| | | 1#24 | 20.98 | 20.91 | 21.49 |
| | | 12#0 | 21.18 | 20.94 | 21.29 |
| | | 12#6 | 21.37 | 21.33 | 21.27 |
| | | 12#11 | 21.15 | 21.29 | 21.28 |
| | | 25#0 | 21.66 | 20.81 | 21.51 |
| | 16-QAM | 1#0 | 21.27 | 21.71 | 20.75 |
| | | 1#12 | 21.05 | 20.91 | 21.38 |
| | | 1#24 | 21.48 | 20.92 | 20.68 |
| | | 12#0 | 21.20 | 21.74 | 21.46 |
| | | 12#6 | 21.62 | 21.38 | 20.76 |
| | | 12#11 | 21.55 | 21.42 | 21.01 |
| | | 25#0 | 21.09 | 21.42 | 20.97 |
| 10M | QPSK | 1#0 | 21.96 | 21.68 | 21.38 |
| | | 1#24 | 21.45 | 21.55 | 20.86 |
| | | 1#49 | 21.72 | 21.02 | 20.86 |
| | | 25#0 | 21.89 | 21.52 | 21.11 |
| | | 25#12 | 21.73 | 20.77 | 20.44 |
| | | 25#24 | 21.53 | 21.09 | 21.20 |
| | | 50#0 | 21.86 | 21.17 | 20.62 |
| | 16-QAM | 1#0 | 21.44 | 21.05 | 21.23 |
| | | 1#24 | 21.12 | 21.01 | 20.79 |
| | | 1#49 | 21.28 | 21.57 | 21.28 |
| | | 25#0 | 21.04 | 21.42 | 21.10 |
| | | 25#12 | 21.91 | 20.74 | 21.26 |
| | | 25#24 | 21.50 | 21.05 | 20.95 |
| | | 50#0 | 21.71 | 21.44 | 21.05 |

| Test Bandwidth | Test Modulation | Resource Block & RB offset | Low Channel (dBm) | Middle Channel (dBm) | High Channel (dBm) |
|---|---|---|---|---|---|
| 15M | QPSK | 1#0 | 21.74 | 22.06 | 22.13 |
| | | 1#37 | 21.33 | 21.51 | 21.48 |
| | | 1#74 | 21.35 | 21.65 | 21.36 |
| | | 36#0 | 21.59 | 21.25 | 21.85 |
| | | 36#17 | 21.26 | 21.31 | 21.53 |
| | | 36#35 | 21.39 | 21.68 | 21.28 |
| | | 75#0 | 21.69 | 21.88 | 21.96 |
| | 16-QAM | 1#0 | 21.11 | 21.37 | 21.90 |
| | | 1#37 | 20.82 | 21.41 | 21.61 |
| | | 1#74 | 21.24 | 22.00 | 22.11 |
| | | 36#0 | 21.73 | 21.22 | 22.11 |
| | | 36#17 | 21.14 | 21.41 | 21.88 |
| | | 36#35 | 21.64 | 21.35 | 21.13 |
| | | 75#0 | 21.28 | 21.12 | 21.26 |
| 20M | QPSK | 1#0 | 21.86 | 21.91 | 21.81 |
| | | 1#49 | 21.56 | 21.44 | 21.27 |
| | | 1#99 | 21.29 | 21.16 | 21.08 |
| | | 50#0 | 21.68 | 21.50 | 21.32 |
| | | 50#24 | 21.78 | 21.76 | 20.99 |
| | | 50#49 | 21.04 | 21.64 | 21.23 |
| | | 100#0 | 21.21 | 21.50 | 20.96 |
| | 16-QAM | 1#0 | 20.88 | 21.83 | 21.11 |
| | | 1#49 | 21.02 | 21.08 | 21.69 |
| | | 1#99 | 21.38 | 21.40 | 21.19 |
| | | 50#0 | 21.38 | 21.43 | 21.71 |
| | | 50#24 | 21.27 | 21.84 | 21.40 |
| | | 50#49 | 21.84 | 21.06 | 21.49 |
| | | 100#0 | 21.08 | 21.76 | 21.01 |

**LTE Band 5**

| Test Bandwidth | Test Modulation | Resource Block & RB offset | Low Channel (dBm) | Middle Channel (dBm) | High Channel (dBm) |
|---|---|---|---|---|---|
| 1.4M | QPSK | 1#0 | 22.25 | 22.36 | 22.41 |
| | | 1#3 | 22.05 | 22.35 | 21.79 |
| | | 1#5 | 21.56 | 21.64 | 21.53 |
| | | 3#0 | 21.41 | 22.11 | 21.92 |
| | | 3#1 | 21.89 | 22.21 | 22.40 |
| | | 3#3 | 22.09 | 22.05 | 22.20 |
| | | 6#0 | 21.29 | 21.64 | 21.93 |
| | 16-QAM | 1#0 | 21.71 | 22.16 | 21.95 |
| | | 1#3 | 22.17 | 21.80 | 21.59 |
| | | 1#5 | 22.06 | 22.28 | 21.60 |
| | | 3#0 | 21.54 | 21.99 | 21.57 |
| | | 3#1 | 22.02 | 22.25 | 21.52 |
| | | 3#3 | 21.72 | 22.19 | 22.24 |
| | | 6#0 | 22.17 | 21.64 | 22.40 |
| 3M | QPSK | 1#0 | 21.32 | 21.44 | 21.52 |
| | | 1#7 | 20.64 | 20.67 | 20.91 |
| | | 1#14 | 21.07 | 20.87 | 20.64 |
| | | 8#0 | 20.53 | 21.28 | 21.18 |
| | | 8#4 | 20.46 | 21.39 | 21.47 |
| | | 8#7 | 20.89 | 20.48 | 20.91 |
| | | 15#0 | 21.16 | 20.99 | 20.89 |
| | 16-QAM | 1#0 | 21.20 | 20.63 | 21.25 |
| | | 1#7 | 21.18 | 21.43 | 21.46 |
| | | 1#14 | 21.16 | 21.04 | 21.23 |
| | | 8#0 | 20.85 | 21.36 | 21.03 |
| | | 8#4 | 20.85 | 20.60 | 20.66 |
| | | 8#7 | 20.60 | 20.65 | 20.82 |
| | | 15#0 | 20.45 | 21.34 | 20.93 |

| Test Bandwidth | Test Modulation | Resource Block & RB offset | Low Channel (dBm) | Middle Channel (dBm) | High Channel (dBm) |
|---|---|---|---|---|---|
| 5M | QPSK | 1#0 | 22.15 | 21.98 | 21.67 |
| | | 1#12 | 21.98 | 21.33 | 21.28 |
| | | 1#24 | 21.20 | 21.48 | 21.01 |
| | | 12#0 | 21.86 | 21.63 | 20.71 |
| | | 12#6 | 21.96 | 21.38 | 21.14 |
| | | 12#11 | 21.48 | 21.39 | 21.04 |
| | | 25#0 | 21.47 | 21.16 | 20.76 |
| | 16-QAM | 1#0 | 21.28 | 21.23 | 21.61 |
| | | 1#12 | 21.21 | 21.49 | 21.64 |
| | | 1#24 | 21.49 | 21.31 | 20.72 |
| | | 12#0 | 21.54 | 21.09 | 20.84 |
| | | 12#6 | 21.72 | 21.56 | 20.95 |
| | | 12#11 | 21.47 | 21.37 | 21.12 |
| | | 25#0 | 21.36 | 21.53 | 20.76 |
| 10M | QPSK | 1#0 | 22.43 | 22.23 | 22.16 |
| | | 1#24 | 22.31 | 21.47 | 21.19 |
| | | 1#49 | 21.97 | 21.47 | 21.82 |
| | | 25#0 | 21.58 | 22.11 | 21.65 |
| | | 25#12 | 21.76 | 22.11 | 21.97 |
| | | 25#24 | 21.90 | 21.98 | 22.14 |
| | | 50#0 | 21.87 | 21.35 | 22.01 |
| | 16-QAM | 1#0 | 22.08 | 21.33 | 21.33 |
| | | 1#24 | 22.34 | 21.34 | 21.38 |
| | | 1#49 | 21.58 | 21.47 | 21.94 |
| | | 25#0 | 22.33 | 21.68 | 21.76 |
| | | 25#12 | 21.62 | 22.10 | 21.44 |
| | | 25#24 | 21.79 | 21.35 | 21.62 |
| | | 50#0 | 21.43 | 22.14 | 21.74 |

**LTE Band 12**

| Test Bandwidth | Test Modulation | Resource Block & RB offset | Low Channel (dBm) | Middle Channel (dBm) | High Channel (dBm) |
|---|---|---|---|---|---|
| 1.4M | QPSK | 1#0 | 23.41 | 23.36 | 23.19 |
| | | 1#3 | 23.18 | 22.98 | 22.94 |
| | | 1#5 | 23.14 | 23.01 | 22.91 |
| | | 3#0 | 22.92 | 22.96 | 22.89 |
| | | 3#1 | 23.17 | 23.18 | 22.96 |
| | | 3#3 | 23.09 | 23.25 | 22.95 |
| | | 6#0 | 22.81 | 22.98 | 22.67 |
| | 16-QAM | 1#0 | 22.47 | 22.68 | 22.32 |
| | | 1#3 | 22.08 | 22.28 | 22.11 |
| | | 1#5 | 22.23 | 22.37 | 22.02 |
| | | 3#0 | 22.23 | 22.29 | 22.01 |
| | | 3#1 | 22.34 | 22.48 | 22.09 |
| | | 3#3 | 22.28 | 22.56 | 21.92 |
| | | 6#0 | 22.05 | 22.36 | 21.71 |
| 3M | QPSK | 1#0 | 23.16 | 23.27 | 22.96 |
| | | 1#7 | 22.92 | 22.91 | 22.74 |
| | | 1#14 | 22.89 | 22.99 | 22.75 |
| | | 8#0 | 22.88 | 22.81 | 22.57 |
| | | 8#4 | 22.89 | 22.91 | 22.66 |
| | | 8#7 | 23.00 | 23.15 | 22.60 |
| | | 15#0 | 22.80 | 22.89 | 22.38 |
| | 16-QAM | 1#0 | 22.48 | 22.60 | 22.03 |
| | | 1#7 | 22.11 | 22.33 | 21.66 |
| | | 1#14 | 22.16 | 22.37 | 21.64 |
| | | 8#0 | 22.16 | 22.37 | 21.68 |
| | | 8#4 | 22.16 | 22.30 | 21.71 |
| | | 8#7 | 22.33 | 22.49 | 21.70 |
| | | 15#0 | 22.01 | 22.29 | 21.31 |

| Test Bandwidth | Test Modulation | Resource Block & RB offset | Low Channel (dBm) | Middle Channel (dBm) | High Channel (dBm) |
|---|---|---|---|---|---|
| 5M | QPSK | 1#0 | 22.76 | 23.11 | 23.02 |
| | | 1#12 | 22.38 | 22.73 | 22.73 |
| | | 1#24 | 22.37 | 22.88 | 22.79 |
| | | 12#0 | 22.51 | 22.75 | 22.79 |
| | | 12#6 | 22.53 | 22.94 | 22.78 |
| | | 12#11 | 22.50 | 22.74 | 22.64 |
| | | 25#0 | 22.18 | 22.38 | 22.41 |
| | 16-QAM | 1#0 | 22.35 | 22.93 | 22.56 |
| | | 1#12 | 22.01 | 22.73 | 22.25 |
| | | 1#24 | 22.03 | 22.58 | 22.22 |
| | | 12#0 | 21.95 | 22.59 | 22.16 |
| | | 12#6 | 22.07 | 22.57 | 22.22 |
| | | 12#11 | 21.97 | 22.56 | 22.35 |
| | | 25#0 | 21.76 | 22.20 | 21.97 |
| 10M | QPSK | 1#0 | 23.03 | 23.15 | 23.36 |
| | | 1#24 | 22.67 | 22.79 | 23.09 |
| | | 1#49 | 22.69 | 22.75 | 23.07 |
| | | 25#0 | 22.53 | 22.67 | 23.01 |
| | | 25#12 | 22.72 | 23.01 | 23.22 |
| | | 25#24 | 22.67 | 22.85 | 23.08 |
| | | 50#0 | 22.35 | 22.50 | 22.87 |
| | 16-QAM | 1#0 | 22.59 | 22.76 | 22.90 |
| | | 1#24 | 22.19 | 22.51 | 22.67 |
| | | 1#49 | 22.21 | 22.36 | 22.58 |
| | | 25#0 | 22.13 | 22.49 | 22.42 |
| | | 25#12 | 22.37 | 22.52 | 22.61 |
| | | 25#24 | 22.30 | 22.51 | 22.58 |
| | | 50#0 | 21.97 | 22.15 | 22.19 |

**LTE Band 17**

| Test Bandwidth | Test Modulation | Resource Block & RB offset | Low Channel (dBm) | Middle Channel (dBm) | High Channel (dBm) |
|---|---|---|---|---|---|
| 5M | QPSK | 1#0 | 22.41 | 22.62 | 23.14 |
| | | 1#12 | 22.04 | 22.23 | 22.86 |
| | | 1#24 | 22.16 | 22.26 | 22.89 |
| | | 12#0 | 22.04 | 22.19 | 22.86 |
| | | 12#6 | 22.25 | 22.40 | 22.77 |
| | | 12#11 | 22.29 | 22.29 | 23.04 |
| | | 25#0 | 22.08 | 21.99 | 22.79 |
| | 16-QAM | 1#0 | 22.35 | 22.93 | 22.56 |
| | | 1#12 | 22.13 | 22.71 | 22.23 |
| | | 1#24 | 21.96 | 22.65 | 22.21 |
| | | 12#0 | 21.97 | 22.43 | 22.28 |
| | | 12#6 | 22.11 | 22.80 | 22.38 |
| | | 12#11 | 22.13 | 22.80 | 22.24 |
| | | 25#0 | 21.86 | 22.49 | 21.97 |
| 10M | QPSK | 1#0 | 22.26 | 22.13 | 21.95 |
| | | 1#24 | 22.01 | 21.87 | 21.65 |
| | | 1#49 | 21.91 | 21.88 | 21.65 |
| | | 25#0 | 21.99 | 21.66 | 21.67 |
| | | 25#12 | 22.10 | 22.00 | 21.69 |
| | | 25#24 | 22.07 | 21.97 | 21.67 |
| | | 50#0 | 21.72 | 21.77 | 21.40 |
| | 16-QAM | 1#0 | 22.59 | 22.76 | 22.90 |
| | | 1#24 | 22.32 | 22.53 | 22.68 |
| | | 1#49 | 22.28 | 22.47 | 22.60 |
| | | 25#0 | 22.34 | 22.43 | 22.56 |
| | | 25#12 | 22.26 | 22.44 | 22.80 |
| | | 25#24 | 22.46 | 22.50 | 22.79 |
| | | 50#0 | 22.08 | 22.21 | 22.52 |

**Peak-to-average ratio (PAR):**

**WCDMA Band V:**

| Mode | Channel | PAR (dB) | Limit (dB) |
|---|---|---|---|
| WCDMA (Rel 99) | Low | 3.31 | ≤ 13 |
| | Middle | 3.40 | ≤ 13 |
| | High | 3.35 | ≤ 13 |
| WCDMA (HSDPA) | Low | 2.73 | ≤ 13 |
| | Middle | 2.76 | ≤ 13 |
| | High | 2.70 | ≤ 13 |
| WCDMA (HSUPA) | Low | 2.83 | ≤ 13 |
| | Middle | 2.73 | ≤ 13 |
| | High | 2.83 | ≤ 13 |
| WCDMA (HSPA+) | Low | 2.59 | ≤ 13 |
| | Middle | 2.51 | ≤ 13 |
| | High | 2.61 | ≤ 13 |

**WCDMA Band II**

| Mode | Channel | PAR (dB) | Limit (dB) |
|---|---|---|---|
| WCDMA (Rel 99) | Low | 2.72 | ≤ 13 |
| | Middle | 2.75 | ≤ 13 |
| | High | 2.84 | ≤ 13 |
| WCDMA (HSDPA) | Low | 2.57 | ≤ 13 |
| | Middle | 2.51 | ≤ 13 |
| | High | 2.51 | ≤ 13 |
| WCDMA (HSUPA) | Low | 2.61 | ≤ 13 |
| | Middle | 2.54 | ≤ 13 |
| | High | 2.46 | ≤ 13 |
| WCDMA (HSPA+) | Low | 2.52 | ≤ 13 |
| | Middle | 2.44 | ≤ 13 |
| | High | 2.52 | ≤ 13 |

**LTE Band 2**

| Test Modulation | | Test Bandwidth | Low Channel (dB) | Middle Channel (dB) | High Channel (dB) | Limit (dB) |
|---|---|---|---|---|---|---|
| QPSK | 1 RB | 20M | 3.57 | 3.73 | 3.62 | 13 |
| | 100 RB | | 5.60 | 5.77 | 5.64 | 13 |
| 16-QAM | 1 RB | 20M | 4.43 | 4.61 | 4.53 | 13 |
| | 100 RB | | 6.46 | 6.58 | 6.59 | 13 |

**LTE Band 4**

| Test Modulation | | Test Bandwidth | Low Channel (dB) | Middle Channel (dB) | High Channel (dB) | Limit(dB) |
|---|---|---|---|---|---|---|
| QPSK | 1 RB | 20M | 3.52 | 3.63 | 3.41 | 13 |
| | 100 RB | | 5.58 | 5.61 | 5.41 | 13 |
| 16-QAM | 1 RB | 20M | 4.27 | 4.51 | 4.37 | 13 |
| | 100 RB | | 6.29 | 6.51 | 6.30 | 13 |

**LTE Band 5**

| Test Modulation | | Test Bandwidth | Low Channel (dB) | Middle Channel (dB) | High Channel (dB) | Limit(dB) |
|---|---|---|---|---|---|---|
| QPSK | 1 RB | 10M | 3.37 | 3.64 | 3.62 | 13 |
| | 50 RB | | 5.35 | 5.71 | 5.58 | 13 |
| 16-QAM | 1 RB | 10M | 4.61 | 4.73 | 4.66 | 13 |
| | 50 RB | | 6.53 | 6.71 | 6.60 | 13 |

**LTE Band 12**

| Test Modulation | | Test Bandwidth | Low Channel (dB) | Middle Channel (dB) | High Channel (dB) | Limit(dB) |
|---|---|---|---|---|---|---|
| QPSK | 1 RB | 10M | 3.34 | 3.67 | 3.62 | 13 |
| | 50 RB | | 5.38 | 5.62 | 5.54 | 13 |
| 16-QAM | 1 RB | 10M | 4.41 | 4.73 | 4.62 | 13 |
| | 50 RB | | 6.47 | 6.72 | 6.67 | 13 |

**LTE Band 17**

| Test Modulation | | Test Bandwidth | Low Channel (dB) | Middle Channel (dB) | High Channel (dB) | Limit(dB) |
|---|---|---|---|---|---|---|
| QPSK | 1 RB | 10M | 3.32 | 3.51 | 3.54 | 13 |
| | 50 RB | | 5.42 | 5.45 | 5.61 | 13 |
| 16-QAM | 1 RB | 10M | 4.26 | 4.71 | 4.57 | 13 |
| | 50 RB | | 6.28 | 6.80 | 6.50 | 13 |

***ERP &EIRP***

**WCDMA Mode**

| Frequency (MHz) | Polar (H/V) | Receiver Reading (dBμV) | Substituted Method | | | Absolute Level (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|
| | | | Submitted Level (dBm) | Cable loss (dB) | Antenna Gain (dBd/dBi) | | | |
| WCDMA Band V, Middle Channel | | | | | | | | |
| 836.60 | H | 88.68 | 23.22 | 0.63 | -1.14 | 21.45 | 38.45 | 17.00 |
| 836.60 | V | 91.27 | 22.35 | 0.63 | -1.14 | 20.58 | 38.45 | 17.87 |
| WCDMA Band II, Middle Channel | | | | | | | | |
| 1880.00 | H | 88.92 | 15.88 | 0.85 | 8.81 | 23.84 | 33.00 | 9.16 |
| 1880.00 | V | 86.12 | 13.30 | 0.85 | 8.81 | 21.26 | 33.00 | 11.74 |

**Note:**
All above data were tested with no amplifier
Absolute Level = Submitted Level - Cable loss + Antenna Gain
Margin = Limit- Absolute Level

**LTE Band 2**

| Frequency (MHz) | Polar (H/V) | Receiver Reading (dBμV) | Substituted Method | | | Absolute Level (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|
| | | | Submitted Level (dBm) | Cable loss (dB) | Antenna Gain (dBd/dBi) | | | |
| **QPSK 1.4M BW Middle Channel** | | | | | | | | |
| 1880.00 | H | 90.91 | 17.87 | 0.85 | 8.81 | 25.83 | 33.00 | 7.17 |
| 1880.00 | V | 88.02 | 15.20 | 0.85 | 8.81 | 23.16 | 33.00 | 9.84 |
| **16-QAM 1.4M BW Middle Channel** | | | | | | | | |
| 1880.00 | H | 90.75 | 17.71 | 0.85 | 8.81 | 25.67 | 33.00 | 7.33 |
| 1880.00 | V | 87.89 | 15.07 | 0.85 | 8.81 | 23.03 | 33.00 | 9.97 |
| **QPSK 3M BW Middle Channel** | | | | | | | | |
| 1880.00 | H | 90.78 | 17.74 | 0.85 | 8.81 | 25.70 | 33.00 | 7.30 |
| 1880.00 | V | 87.92 | 15.10 | 0.85 | 8.81 | 23.06 | 33.00 | 9.94 |
| **16-QAM 3M BW Middle Channel** | | | | | | | | |
| 1880.00 | H | 90.62 | 17.58 | 0.85 | 8.81 | 25.54 | 33.00 | 7.46 |
| 1880.00 | V | 87.61 | 14.79 | 0.85 | 8.81 | 22.75 | 33.00 | 10.25 |
| **QPSK 5M BW Middle Channel** | | | | | | | | |
| 1880.00 | H | 90.71 | 17.67 | 0.85 | 8.81 | 25.63 | 33.00 | 7.37 |
| 1880.00 | V | 87.58 | 14.76 | 0.85 | 8.81 | 22.72 | 33.00 | 10.28 |
| **16-QAM 5M BW Middle Channel** | | | | | | | | |
| 1880.00 | H | 90.53 | 17.49 | 0.85 | 8.81 | 25.45 | 33.00 | 7.55 |
| 1880.00 | V | 87.43 | 14.61 | 0.85 | 8.81 | 22.57 | 33.00 | 10.43 |

| Frequency (MHz) | Polar (H/V) | Receiver Reading (dBμV) | Substituted Method | | | Absolute Level (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|
| | | | Submitted Level (dBm) | Cable loss (dB) | Antenna Gain (dBd/dBi) | | | |
| **QPSK 10M BW Middle Channel** | | | | | | | | |
| 1880.00 | H | 90.58 | 17.54 | 0.85 | 8.81 | 25.50 | 33.00 | 7.50 |
| 1880.00 | V | 87.39 | 14.57 | 0.85 | 8.81 | 22.53 | 33.00 | 10.47 |
| **16-QAM 10M BW Middle Channel** | | | | | | | | |
| 1880.00 | H | 90.41 | 17.37 | 0.85 | 8.81 | 25.33 | 33.00 | 7.67 |
| 1880.00 | V | 87.29 | 14.47 | 0.85 | 8.81 | 22.43 | 33.00 | 10.57 |
| **QPSK 15M BW Middle Channel** | | | | | | | | |
| 1880.00 | H | 90.36 | 17.32 | 0.85 | 8.81 | 25.28 | 33.00 | 7.72 |
| 1880.00 | V | 87.12 | 14.30 | 0.85 | 8.81 | 22.26 | 33.00 | 10.74 |
| **16-QAM 15M BW Middle Channel** | | | | | | | | |
| 1880.00 | H | 90.27 | 17.23 | 0.85 | 8.81 | 25.19 | 33.00 | 7.81 |
| 1880.00 | V | 87.06 | 14.24 | 0.85 | 8.81 | 22.20 | 33.00 | 10.80 |
| **QPSK 20M BW Middle Channel** | | | | | | | | |
| 1880.00 | H | 90.17 | 17.13 | 0.85 | 8.81 | 25.09 | 33.00 | 7.91 |
| 1880.00 | V | 86.92 | 14.10 | 0.85 | 8.81 | 22.06 | 33.00 | 10.94 |
| **16-QAM 20M BW Middle Channel** | | | | | | | | |
| 1880.00 | H | 90.03 | 16.99 | 0.85 | 8.81 | 24.95 | 33.00 | 8.05 |
| 1880.00 | V | 86.89 | 14.07 | 0.85 | 8.81 | 22.03 | 33.00 | 10.97 |

**LTE Band 4**

| Frequency (MHz) | Polar (H/V) | Receiver Reading (dBμV) | Substituted Method | | | Absolute Level (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|
| | | | Submitted Level (dBm) | Cable loss (dB) | Antenna Gain (dBd/dBi) | | | |
| **QPSK 1.4M BW Middle Channel** | | | | | | | | |
| 1732.50 | H | 89.93 | 15.87 | 0.84 | 8.57 | 23.60 | 30.00 | 6.40 |
| 1732.50 | V | 87.01 | 13.37 | 0.84 | 8.57 | 21.10 | 30.00 | 8.90 |
| **16-QAM 1.4M BW Middle Channel** | | | | | | | | |
| 1732.50 | H | 89.73 | 15.67 | 0.84 | 8.57 | 23.40 | 30.00 | 6.60 |
| 1732.50 | V | 86.87 | 13.23 | 0.84 | 8.57 | 20.96 | 30.00 | 9.04 |
| **QPSK 3M BW Middle Channel** | | | | | | | | |
| 1732.50 | H | 89.64 | 15.58 | 0.84 | 8.57 | 23.31 | 30.00 | 6.69 |
| 1732.50 | V | 86.89 | 13.25 | 0.84 | 8.57 | 20.98 | 30.00 | 9.02 |
| **16-QAM 3M BW Middle Channel** | | | | | | | | |
| 1732.50 | H | 89.61 | 15.55 | 0.84 | 8.57 | 23.28 | 30.00 | 6.72 |
| 1732.50 | V | 86.70 | 13.06 | 0.84 | 8.57 | 20.79 | 30.00 | 9.21 |
| **QPSK 5M BW Middle Channel** | | | | | | | | |
| 1732.50 | H | 89.51 | 15.45 | 0.84 | 8.57 | 23.18 | 30.00 | 6.82 |
| 1732.50 | V | 86.59 | 12.95 | 0.84 | 8.57 | 20.68 | 30.00 | 9.32 |
| **16-QAM 5M BW Middle Channel** | | | | | | | | |
| 1732.50 | H | 89.49 | 15.43 | 0.84 | 8.57 | 23.16 | 30.00 | 6.84 |
| 1732.50 | V | 86.58 | 12.94 | 0.84 | 8.57 | 20.67 | 30.00 | 9.33 |

| Frequency (MHz) | Polar (H/V) | Receiver Reading (dBμV) | Substituted Method | | | Absolute Level (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|
| | | | Submitted Level (dBm) | Cable loss (dB) | Antenna Gain (dBd/dBi) | | | |
| **QPSK 10M BW Middle Channel** | | | | | | | | |
| 1732.50 | H | 89.43 | 15.37 | 0.84 | 8.57 | 23.10 | 30.00 | 6.90 |
| 1732.50 | V | 86.42 | 12.78 | 0.84 | 8.57 | 20.51 | 30.00 | 9.49 |
| **16-QAM 10M BW Middle Channel** | | | | | | | | |
| 1732.50 | H | 89.36 | 15.30 | 0.84 | 8.57 | 23.03 | 30.00 | 6.97 |
| 1732.50 | V | 86.44 | 12.80 | 0.84 | 8.57 | 20.53 | 30.00 | 9.47 |
| **QPSK 15M BW Middle Channel** | | | | | | | | |
| 1732.50 | H | 89.33 | 15.27 | 0.84 | 8.57 | 23.00 | 30.00 | 7.00 |
| 1732.50 | V | 86.31 | 12.67 | 0.84 | 8.57 | 20.40 | 30.00 | 9.60 |
| **16-QAM 15M BW Middle Channel** | | | | | | | | |
| 1732.50 | H | 89.17 | 15.11 | 0.84 | 8.57 | 22.84 | 30.00 | 7.16 |
| 1732.50 | V | 86.27 | 12.63 | 0.84 | 8.57 | 20.36 | 30.00 | 9.64 |
| **QPSK 20M BW Middle Channel** | | | | | | | | |
| 1732.50 | H | 89.18 | 15.12 | 0.84 | 8.57 | 22.85 | 30.00 | 7.15 |
| 1732.50 | V | 86.14 | 12.50 | 0.84 | 8.57 | 20.23 | 30.00 | 9.77 |
| **16-QAM 20M BW Middle Channel** | | | | | | | | |
| 1732.50 | H | 89.03 | 14.97 | 0.84 | 8.57 | 22.70 | 30.00 | 7.30 |
| 1732.50 | V | 86.07 | 12.43 | 0.84 | 8.57 | 20.16 | 30.00 | 9.84 |

**LTE Band 5**

| Frequency (MHz) | Polar (H/V) | Receiver Reading (dBμV) | Substituted Method | | | Absolute Level (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|
| | | | Submitted Level (dBm) | Cable loss (dB) | Antenna Gain (dBd/dBi) | | | |
| **QPSK 1.4M BW Middle Channel** | | | | | | | | |
| 836.50 | H | 88.87 | 23.40 | 0.63 | -1.14 | 21.63 | 38.45 | 16.82 |
| 836.50 | V | 91.75 | 22.83 | 0.63 | -1.14 | 21.06 | 38.45 | 17.39 |
| **16-QAM 1.4M BW Middle Channel** | | | | | | | | |
| 836.50 | H | 88.76 | 23.29 | 0.63 | -1.14 | 21.52 | 38.45 | 16.93 |
| 836.50 | V | 91.66 | 22.74 | 0.63 | -1.14 | 20.97 | 38.45 | 17.48 |
| **QPSK 3M BW Middle Channel** | | | | | | | | |
| 836.50 | H | 88.63 | 23.16 | 0.63 | -1.14 | 21.39 | 38.45 | 17.06 |
| 836.50 | V | 91.53 | 22.61 | 0.63 | -1.14 | 20.84 | 38.45 | 17.61 |
| **16-QAM 3M BW Middle Channel** | | | | | | | | |
| 836.50 | H | 88.64 | 23.17 | 0.63 | -1.14 | 21.40 | 38.45 | 17.05 |
| 836.50 | V | 91.39 | 22.47 | 0.63 | -1.14 | 20.70 | 38.45 | 17.75 |
| **QPSK 5M BW Middle Channel** | | | | | | | | |
| 836.50 | H | 88.52 | 23.05 | 0.63 | -1.14 | 21.28 | 38.45 | 17.17 |
| 836.50 | V | 91.22 | 22.30 | 0.63 | -1.14 | 20.53 | 38.45 | 17.92 |
| **16-QAM 5M BW Middle Channel** | | | | | | | | |
| 836.50 | H | 88.53 | 23.06 | 0.63 | -1.14 | 21.29 | 38.45 | 17.16 |
| 836.50 | V | 91.09 | 22.17 | 0.63 | -1.14 | 20.40 | 38.45 | 18.05 |
| **QPSK 10M BW Middle Channel** | | | | | | | | |
| 836.50 | H | 88.37 | 22.90 | 0.63 | -1.14 | 21.13 | 38.45 | 17.32 |
| 836.50 | V | 90.96 | 22.04 | 0.63 | -1.14 | 20.27 | 38.45 | 18.18 |
| **16-QAM 10M BW Middle Channel** | | | | | | | | |
| 836.50 | H | 88.25 | 22.78 | 0.63 | -1.14 | 21.01 | 38.45 | 17.32 |
| 836.50 | V | 90.83 | 21.91 | 0.63 | -1.14 | 20.14 | 38.45 | 18.18 |

**LTE Band 12**

| Frequency (MHz) | Polar (H/V) | Receiver Reading (dBμV) | Substituted Method | | | Absolute Level (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|
| | | | Submitted Level (dBm) | Cable loss (dB) | Antenna Gain (dBd/dBi) | | | |
| **QPSK 1.4M BW Middle Channel** | | | | | | | | |
| 707.50 | H | 90.11 | 25.98 | 0.62 | -1.71 | 23.65 | 34.77 | 11.12 |
| 707.50 | V | 87.07 | 24.33 | 0.62 | -1.71 | 22.00 | 34.77 | 12.77 |
| **16-QAM 1.4M BW Middle Channel** | | | | | | | | |
| 707.50 | H | 90.02 | 25.89 | 0.62 | -1.71 | 23.56 | 34.77 | 11.21 |
| 707.50 | V | 86.96 | 24.22 | 0.62 | -1.71 | 21.89 | 34.77 | 12.88 |
| **QPSK 3M BW Middle Channel** | | | | | | | | |
| 707.50 | H | 89.93 | 25.80 | 0.62 | -1.71 | 23.47 | 34.77 | 11.30 |
| 707.50 | V | 86.83 | 24.09 | 0.62 | -1.71 | 21.76 | 34.77 | 13.01 |
| **16-QAM 3M BW Middle Channel** | | | | | | | | |
| 707.50 | H | 89.82 | 25.69 | 0.62 | -1.71 | 23.36 | 34.77 | 11.41 |
| 707.50 | V | 86.72 | 23.98 | 0.62 | -1.71 | 21.65 | 34.77 | 13.12 |
| **QPSK 5M BW Middle Channel** | | | | | | | | |
| 707.50 | H | 89.78 | 25.65 | 0.62 | -1.71 | 23.32 | 34.77 | 11.45 |
| 707.50 | V | 86.73 | 23.99 | 0.62 | -1.71 | 21.66 | 34.77 | 13.11 |
| **16-QAM 5M BW Middle Channel** | | | | | | | | |
| 707.50 | H | 89.71 | 25.58 | 0.62 | -1.71 | 23.25 | 34.77 | 11.52 |
| 707.50 | V | 86.54 | 23.80 | 0.62 | -1.71 | 21.47 | 34.77 | 13.30 |
| **QPSK 10M BW Middle Channel** | | | | | | | | |
| 707.50 | H | 89.63 | 25.50 | 0.62 | -1.71 | 23.17 | 34.77 | 11.60 |
| 707.50 | V | 86.59 | 23.85 | 0.62 | -1.71 | 21.52 | 34.77 | 13.25 |
| **16-QAM 10M BW Middle Channel** | | | | | | | | |
| 707.50 | H | 89.62 | 25.49 | 0.62 | -1.71 | 23.16 | 34.77 | 11.61 |
| 707.50 | V | 86.37 | 23.63 | 0.62 | -1.71 | 21.30 | 34.77 | 13.47 |

**LTE Band 17**

| Frequency (MHz) | Polar (H/V) | Receiver Reading (dBμV) | Substituted Method | | | Absolute Level (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|
| | | | Submitted Level (dBm) | Cable loss (dB) | Antenna Gain (dBd/dBi) | | | |
| **QPSK 5M BW Middle Channel** | | | | | | | | |
| 710.00 | H | 89.72 | 25.55 | 0.62 | -1.7 | 23.23 | 34.77 | 11.54 |
| 710.00 | V | 86.64 | 24.03 | 0.62 | -1.7 | 21.71 | 34.77 | 13.06 |
| **16-QAM 5M BW Middle Channel** | | | | | | | | |
| 710.00 | H | 89.63 | 25.46 | 0.62 | -1.7 | 23.14 | 34.77 | 11.63 |
| 710.00 | V | 86.51 | 23.90 | 0.62 | -1.7 | 21.58 | 34.77 | 13.19 |
| **QPSK 10M BW Middle Channel** | | | | | | | | |
| 710.00 | H | 89.6 | 25.43 | 0.62 | -1.7 | 23.11 | 34.77 | 11.66 |
| 710.00 | V | 86.33 | 23.72 | 0.62 | -1.7 | 21.40 | 34.77 | 13.37 |
| **16-QAM 10M BW Middle Channel** | | | | | | | | |
| 710.00 | H | 89.48 | 25.31 | 0.62 | -1.7 | 22.99 | 34.77 | 11.78 |
| 710.00 | V | 86.15 | 23.54 | 0.62 | -1.7 | 21.22 | 34.77 | 13.55 |

**Note:**
All above data were tested with no amplifier
Absolute Level = Submitted Level - Cable loss + Antenna Gain
Margin = Limit- Absolute Level

# FCC §2.1049, §22.917, §22.905 & §24.238; §27.53- OCCUPIED BANDWIDTH

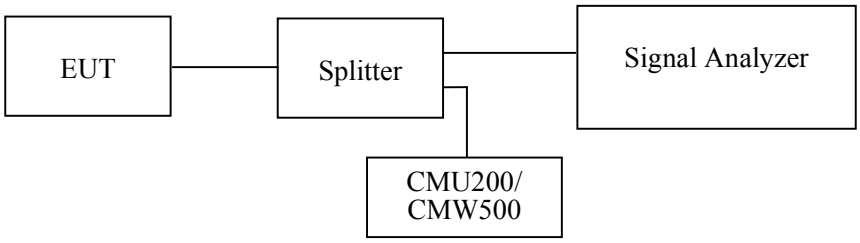
## Applicable Standards

FCC 47 §2.1049, §22.917, §22.905 & §24.238 and §27.53.

## Test Procedure

The RF output of the transmitter was connected to the simulator and the spectrum analyzer through sufficient attenuation.

The resolution bandwidth of the spectrum analyzer was set at100 kHz (WCDMA), 20kHz for LTE 1.4 MHz , 100 kHz for LTE & 3 MHz 5 MHz &10 MHz, 200 kHz for LTE 15 MHz &20 MHz, and the 26 dB & 99% bandwidth was recorded.




## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 23.5~24.9 ℃ |
| **Relative Humidity:** | 50~53 % |
| **ATM Pressure:** | 101.6~103.7 kPa |

*The testing was performed by Winnie Yang from 2019-12-11 to 2019-12-18.*

*EUT operation mode: Transmitting*

*Test Result: Compliant.*

**WCDMA Band V**

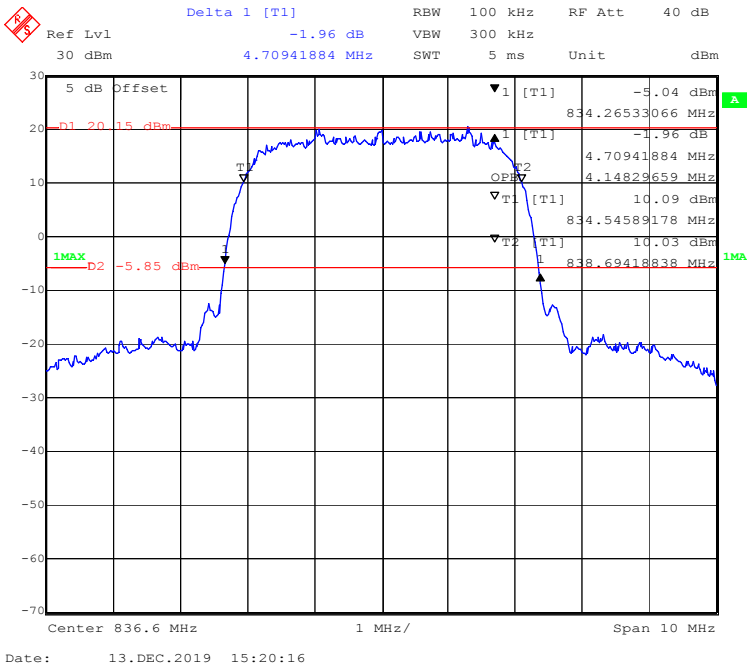
| Mode | Frequency (MHz) | 26 dB Emission Bandwidth (MHz) | 99% Occupied Bandwidth (MHz) |
|---|---|---|---|
| WCDMA (Rel 99) | 836.6 | 4.709 | 4.148 |
| WCDMA (HSDPA) | 836.6 | 4.729 | 4.148 |
| WCDMA (HSUPA) | 836.6 | 4.729 | 4.128 |
| WCDMA (HSPA+) | 836.6 | 4.729 | 4.148 |

**WCDMA Band II**

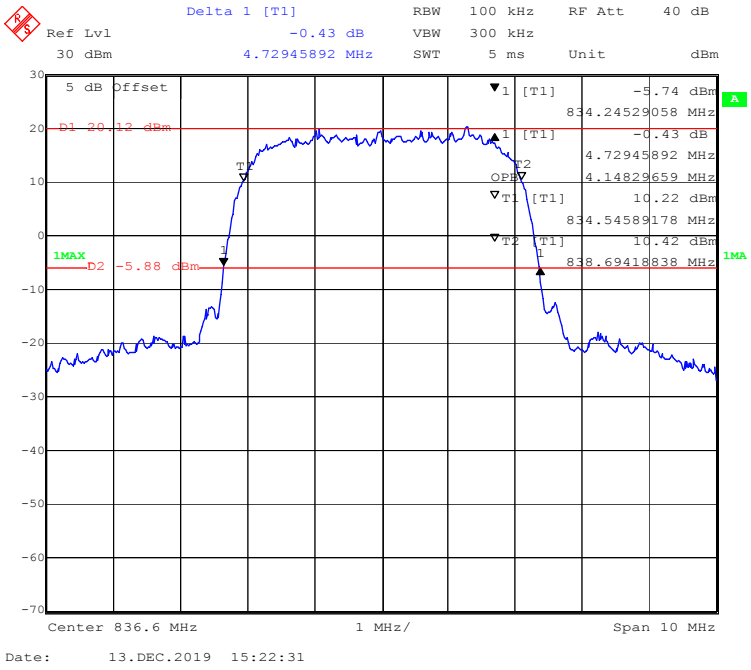
| Mode | Frequency (MHz) | 26 dB Emission Bandwidth (MHz) | 99% Occupied Bandwidth (MHz) |
|---|---|---|---|
| WCDMA (Rel 99) | 1880 | 4.729 | 4.128 |
| WCDMA (HSDPA) | 1880 | 4.729 | 4.148 |
| WCDMA (HSUPA) | 1880 | 4.729 | 4.148 |
| WCDMA (HSPA+) | 1880 | 4.709 | 4.148 |

## WCDMA Band V

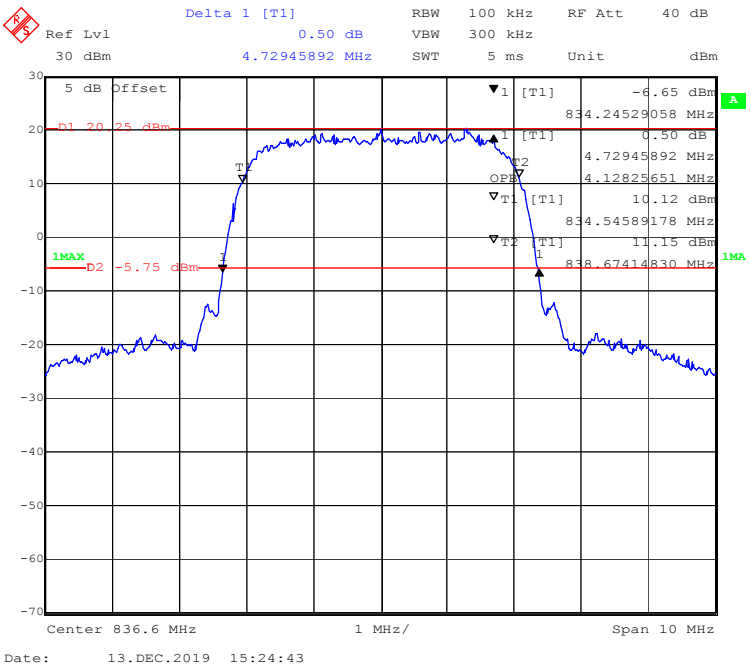
### 99% Occupied & 26 dB Emissions Bandwidth for WCDMA (Rel 99) Mode



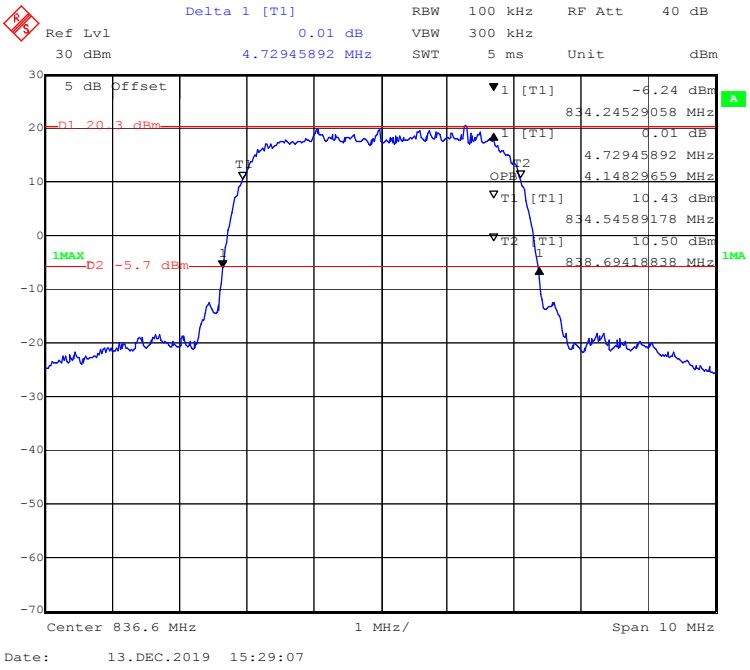

### 99% Occupied & 26 dB Emissions Bandwidth for WCDMA (HSDPA) Mode



## 99% Occupied & 26 dB Emissions Bandwidth for WCDMA (HSUPA) Mode

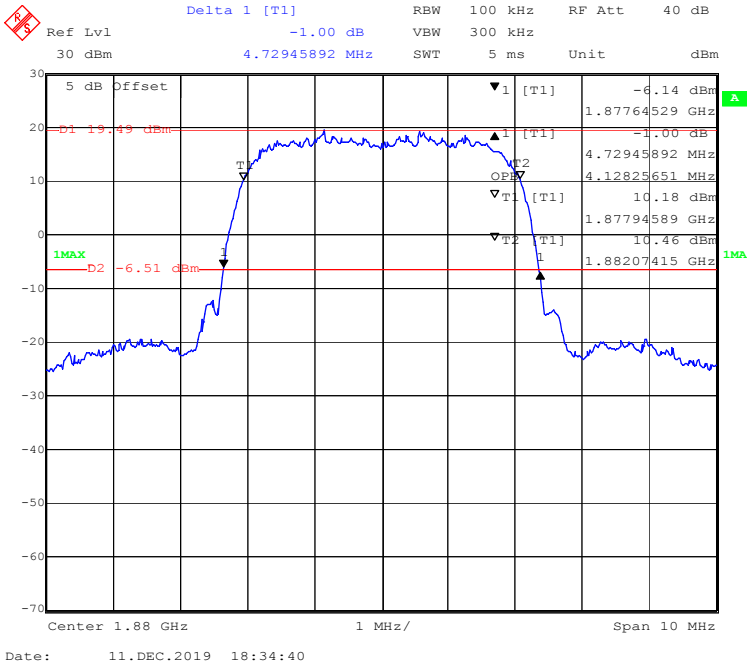



## 99% Occupied & 26 dB Emissions Bandwidth for WCDMA (HSPA+) Mode

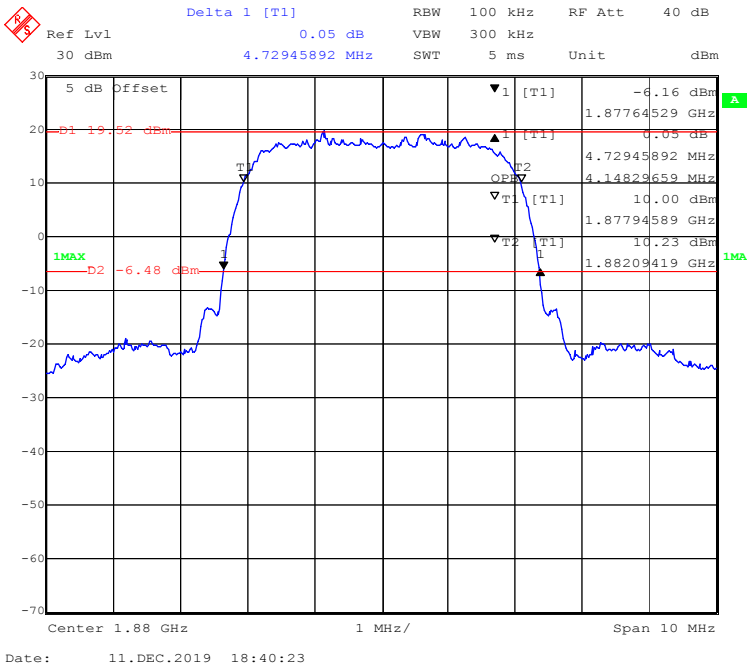


## WCDMA Band II

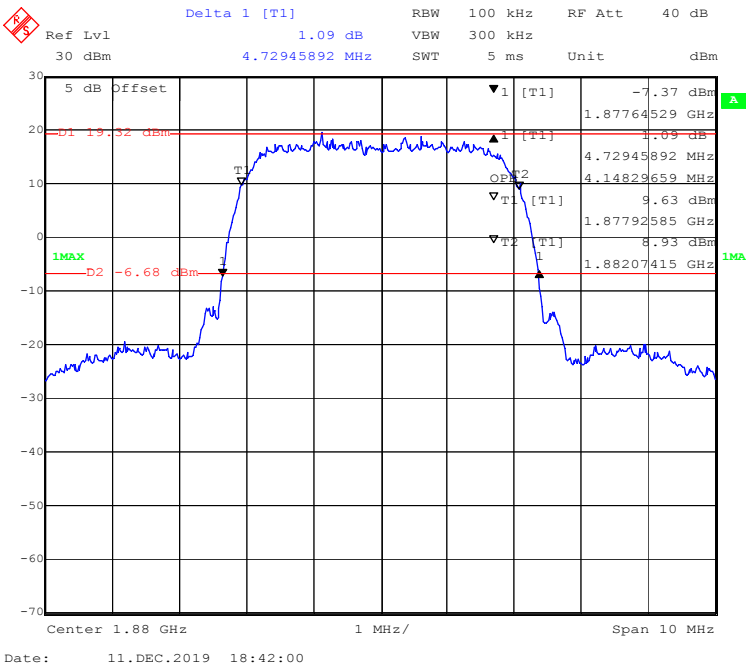
### 99% Occupied & 26 dB Emissions Bandwidth for WCDMA (Rel 99) Mode



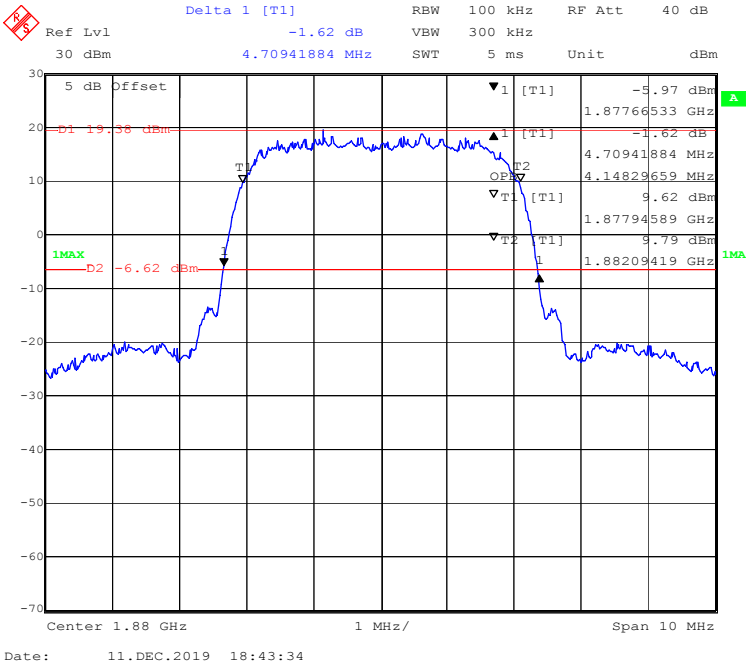

### 99% Occupied & 26 dB Emissions Bandwidth for WCDMA (HSDPA) Mode



## 99% Occupied & 26 dB Emissions Bandwidth for WCDMA (HSUPA) Mode



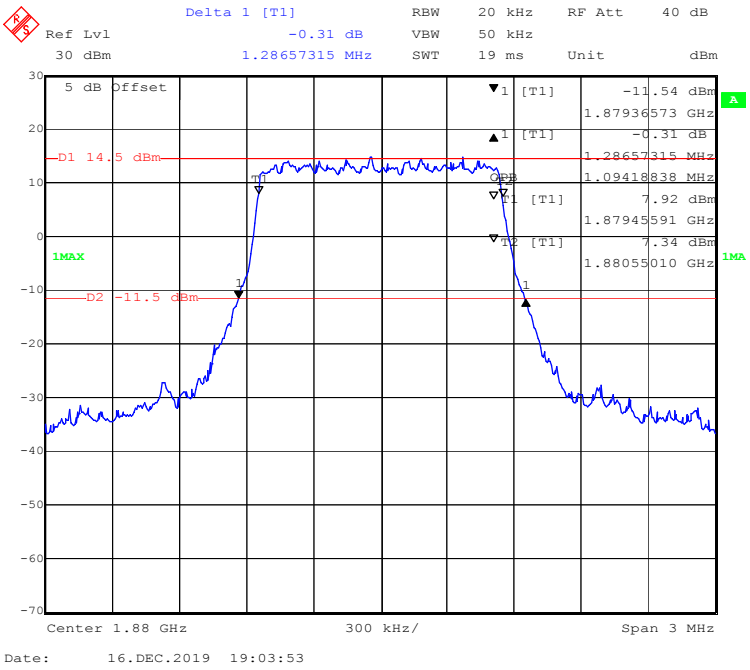

## 99% Occupied & 26 dB Emissions Bandwidth for WCDMA (HSPA+) Mode



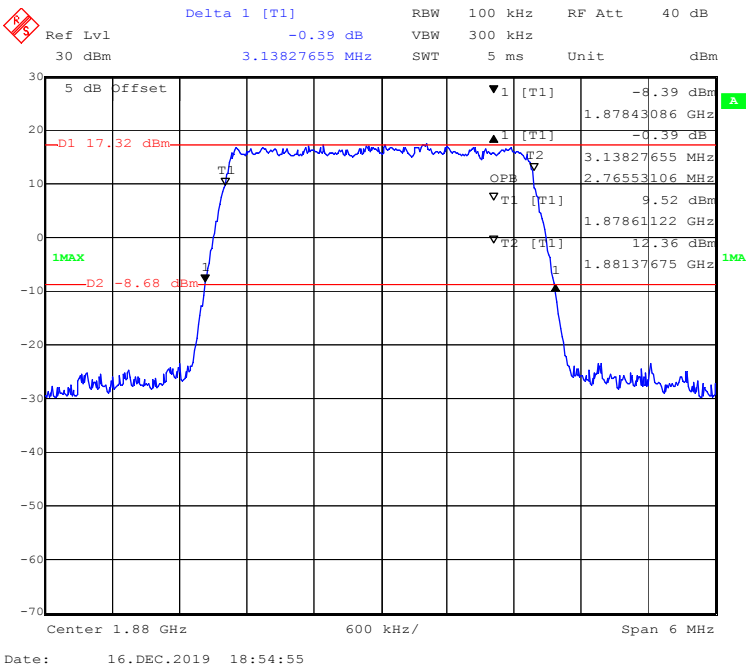
## LTE Band 2:

| Test Modulation | Test Bandwidth | Test Channel | 26 dB Bandwidth | 99% Occupied Bandwidth |
|---|---|---|---|---|
| | | | MHz | MHz |
| QPSK | 1.4M | Middle | 1.287 | 1.094 |
| | 3M | | 3.138 | 2.766 |
| | 5M | | 5.090 | 4.549 |
| | 10M | | 9.820 | 8.978 |
| | 15M | | 14.729 | 13.467 |
| | 20M | | 19.238 | 17.956 |
| 16-QAM | 1.4M | Middle | 1.305 | 1.100 |
| | 3M | | 3.126 | 2.766 |
| | 5M | | 5.090 | 4.549 |
| | 10M | | 9.860 | 8.978 |
| | 15M | | 14.729 | 13.527 |
| | 20M | | 19.238 | 17.960 |

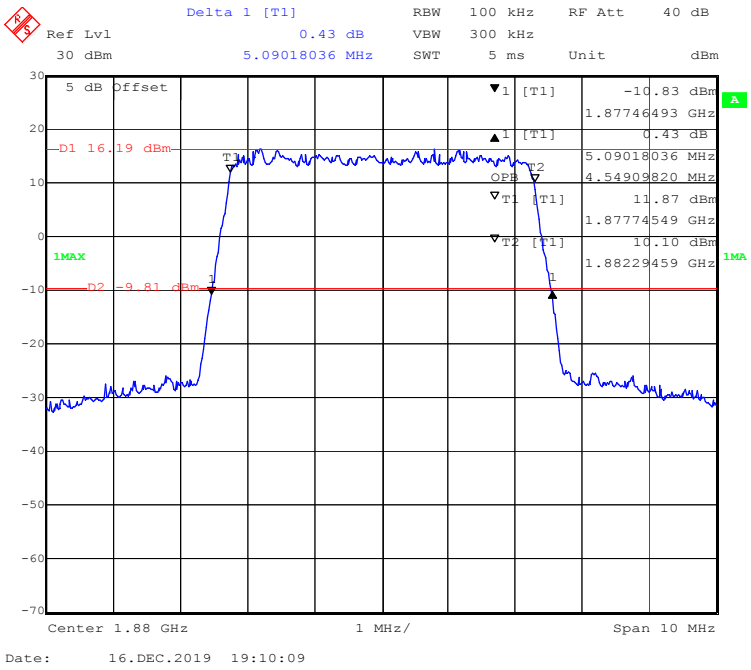
## QPSK (1.4 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel



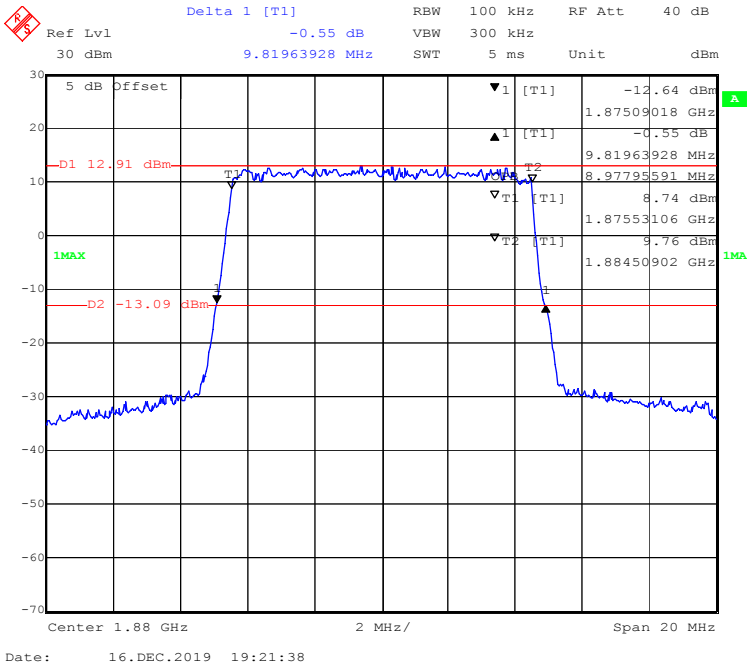

## QPSK (3 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel



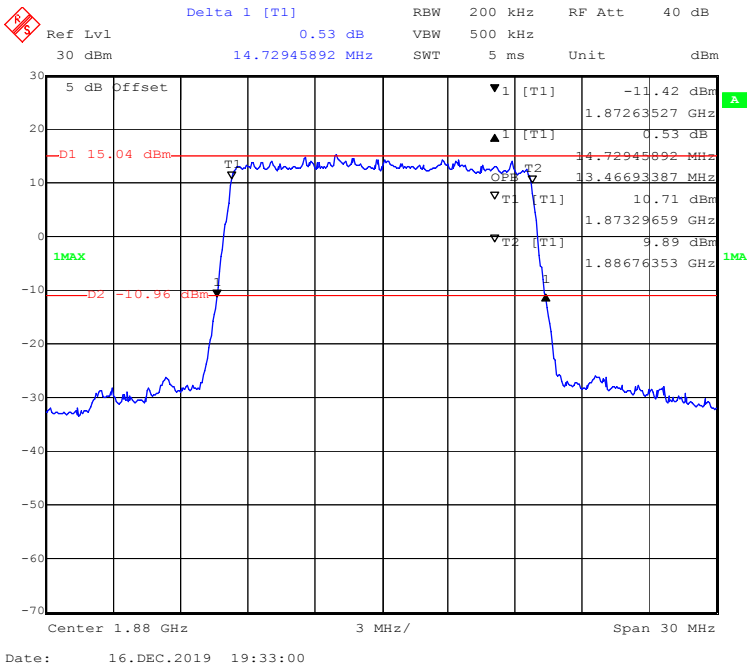
## QPSK (5 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel



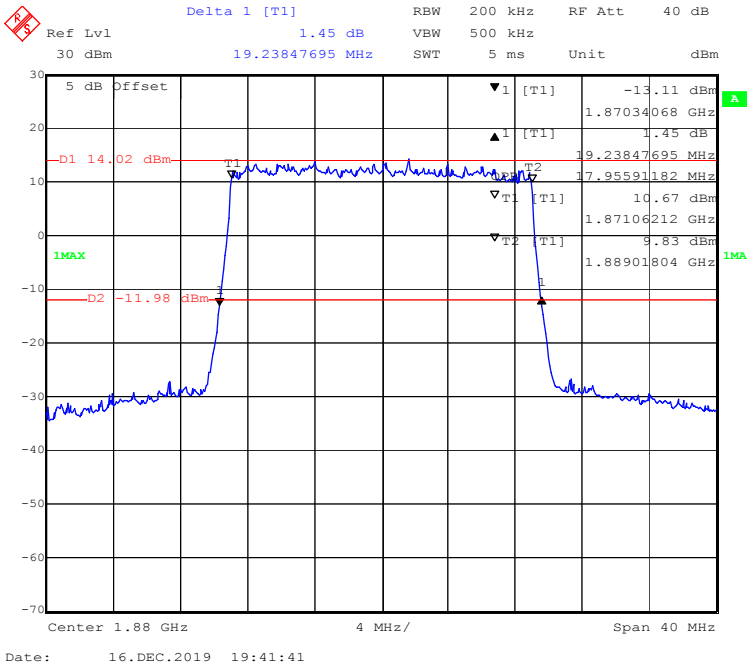

## QPSK (10MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel



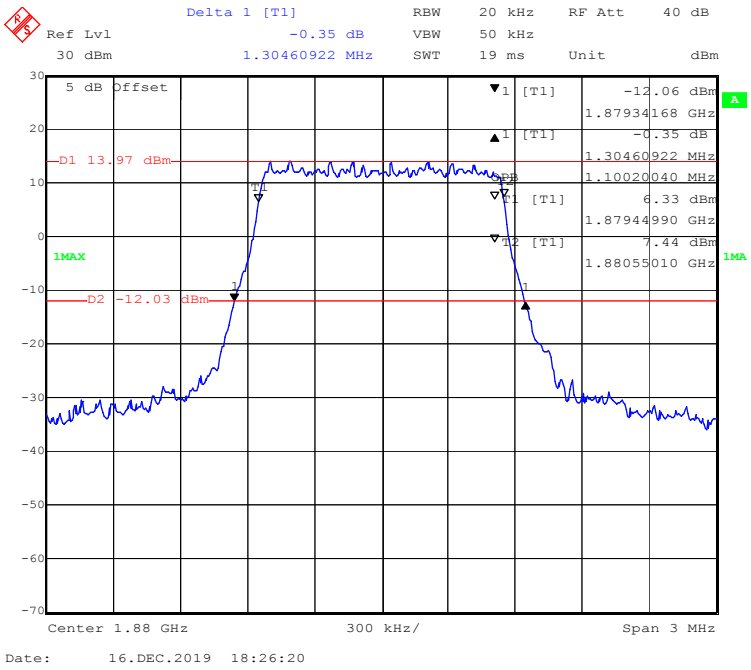
## QPSK (15 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel



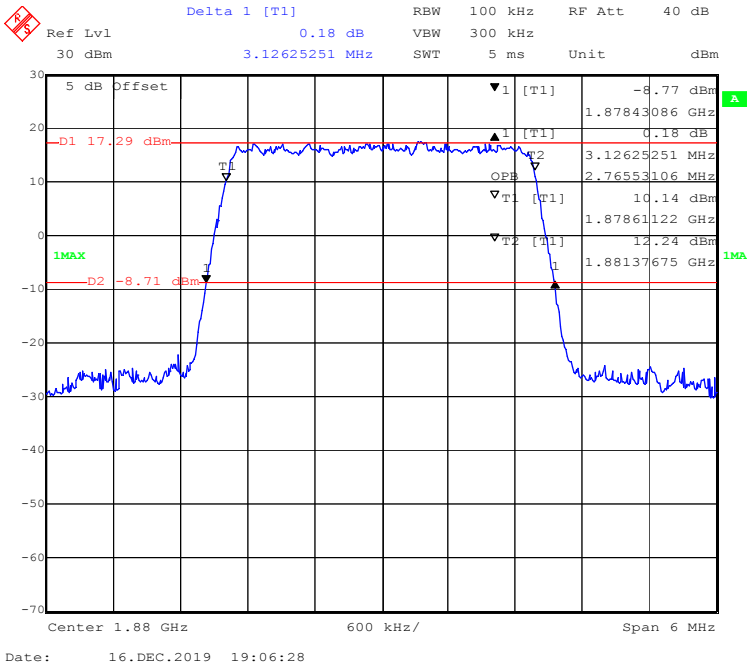

## QPSK (20 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel



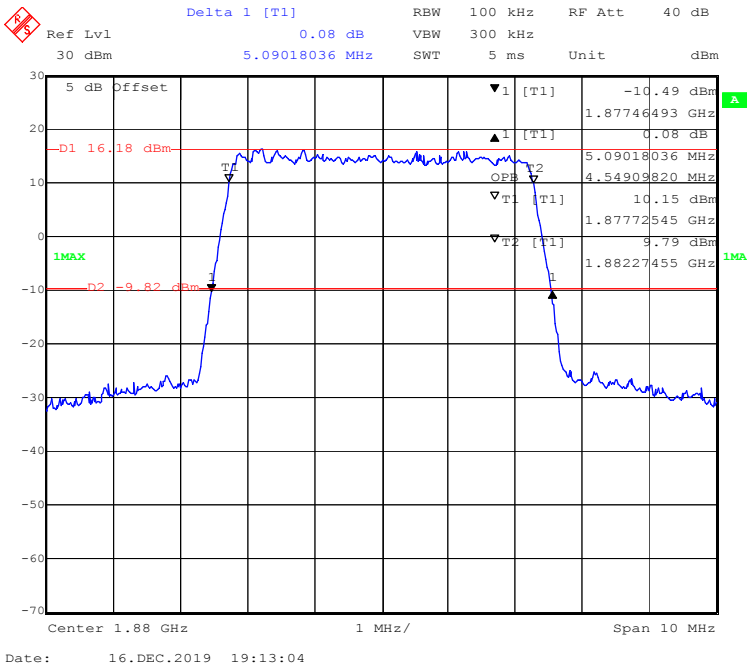
## 16-QAM (1.4 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel



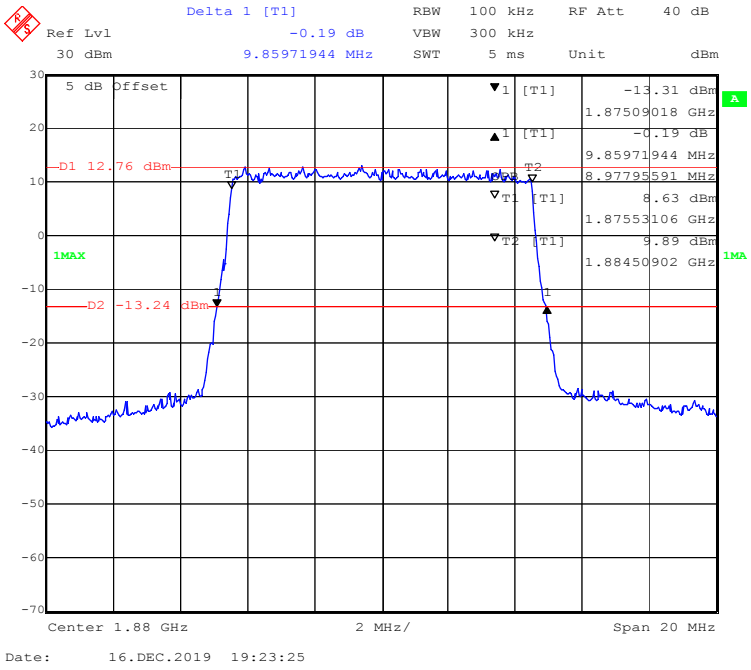

## 16-QAM (3 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel



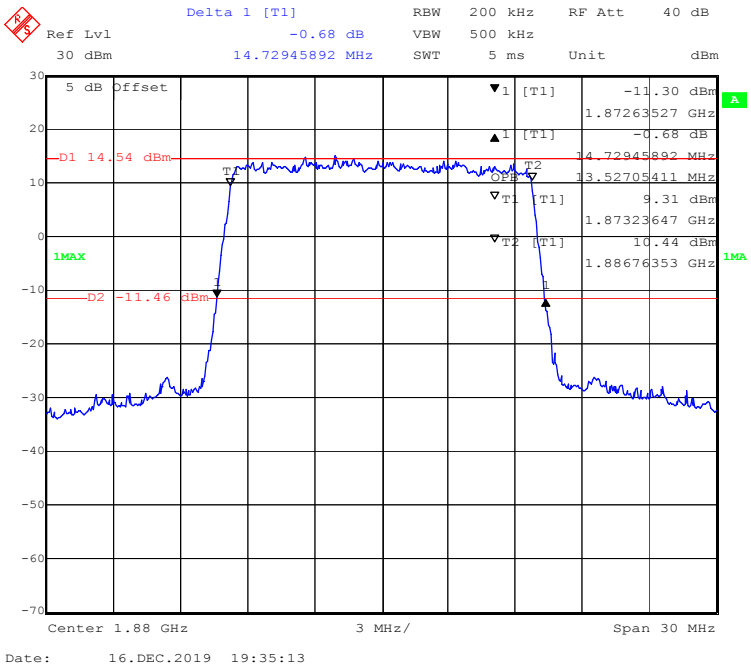
## 16-QAM (5 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel



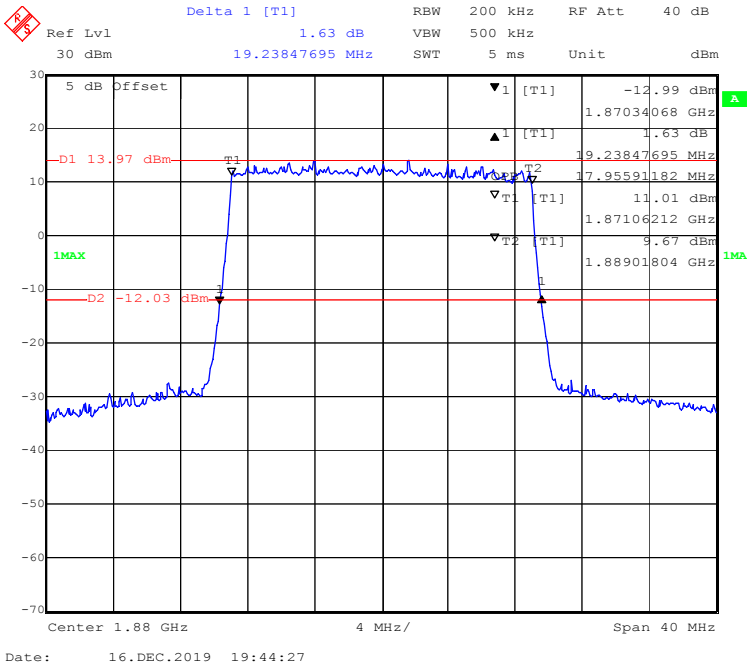

## 16-QAM (10 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel



## 16-QAM (15 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel



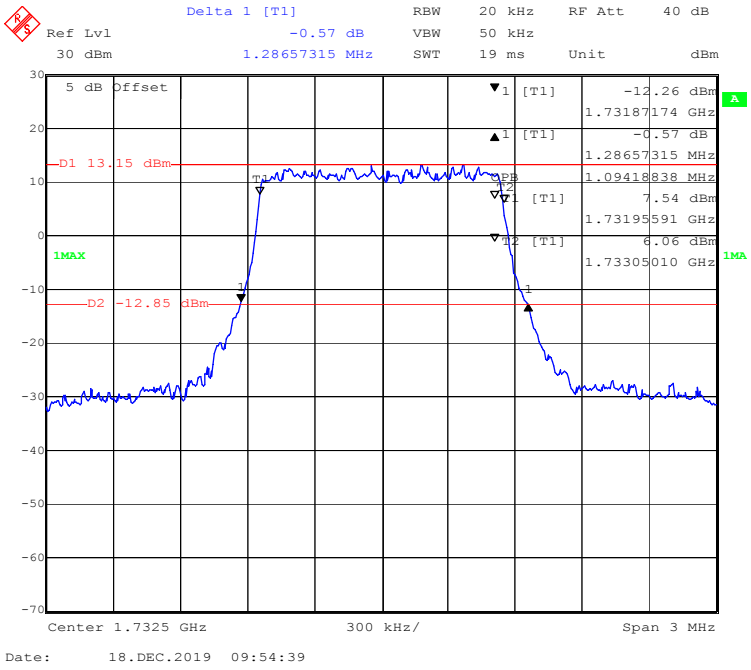

## 16-QAM (20 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel



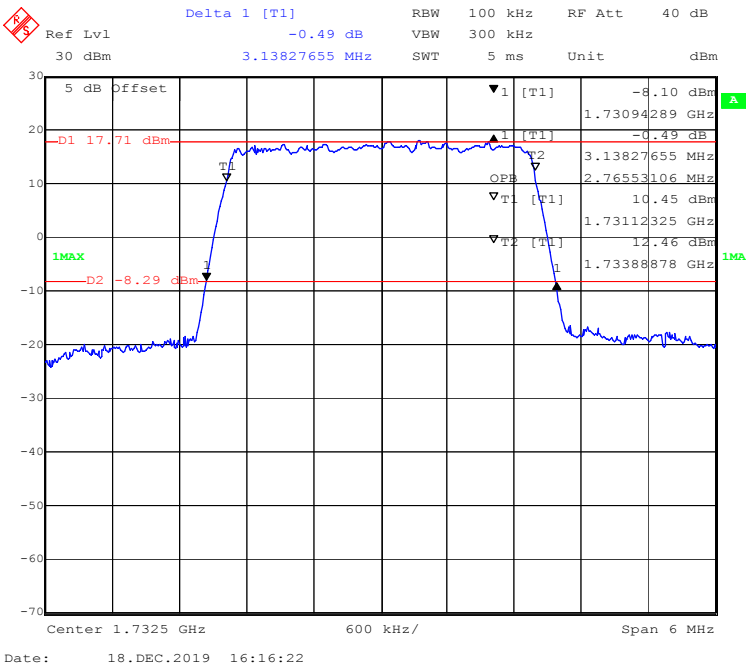
## LTE Band 4:

| Test Modulation | Test Bandwidth | Test Channel | 26 dB Bandwidth | 99% Occupied Bandwidth |
|---|---|---|---|---|
| | | | MHz | MHz |
| QPSK | 1.4M | Middle | 1.287 | 1.094 |
| | 3M | | 3.138 | 2.766 |
| | 5M | | 5.050 | 4.549 |
| | 10M | | 9.860 | 8.938 |
| | 15M | | 14.669 | 13.467 |
| | 20M | | 19.158 | 17.876 |
| 16-QAM | 1.4M | Middle | 1.305 | 1.100 |
| | 3M | | 3.138 | 2.766 |
| | 5M | | 5.050 | 4.549 |
| | 10M | | 9.780 | 8.938 |
| | 15M | | 14.790 | 13.467 |
| | 20M | | 19.078 | 17.876 |

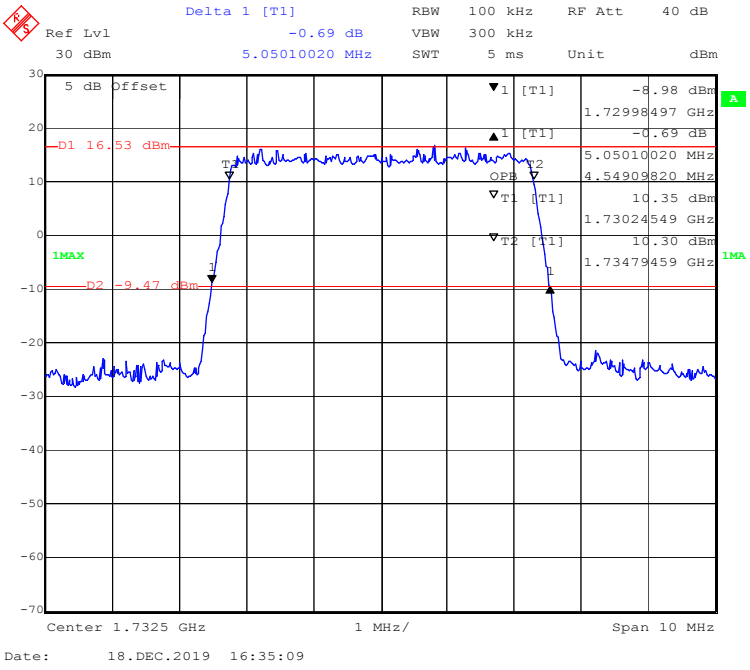
**QPSK (1.4 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel**



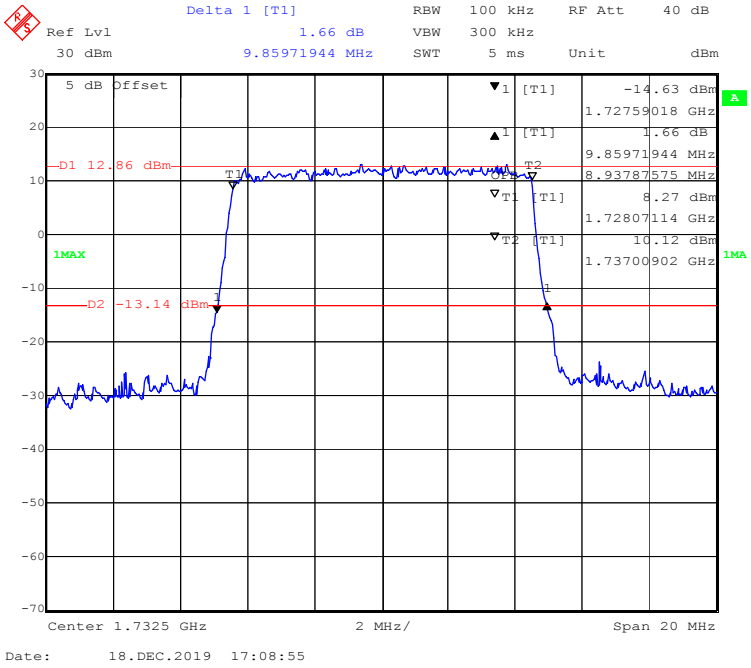
## QPSK (3 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel



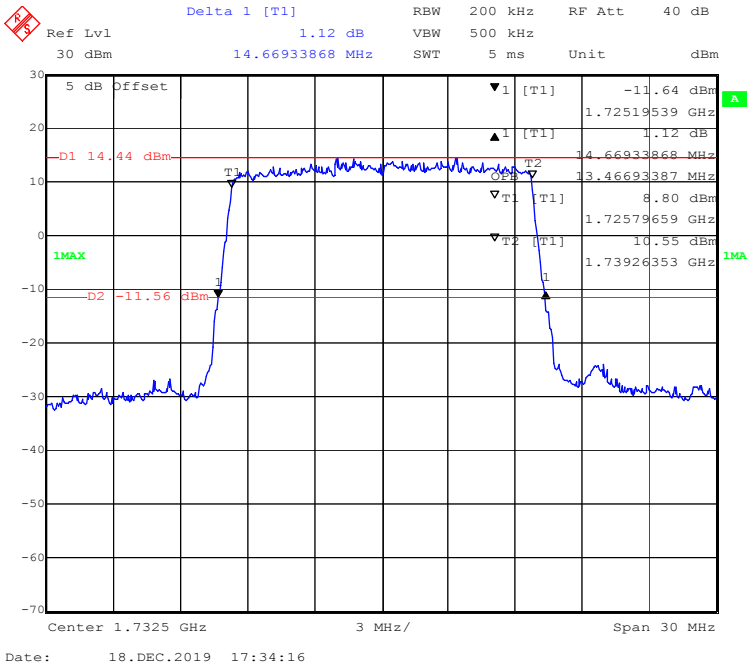

## QPSK (5MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel



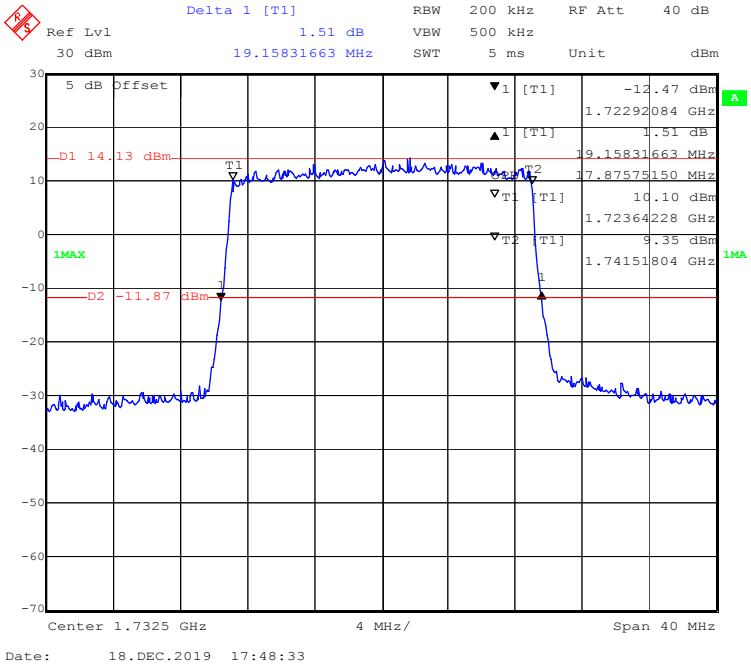
## QPSK (10 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel



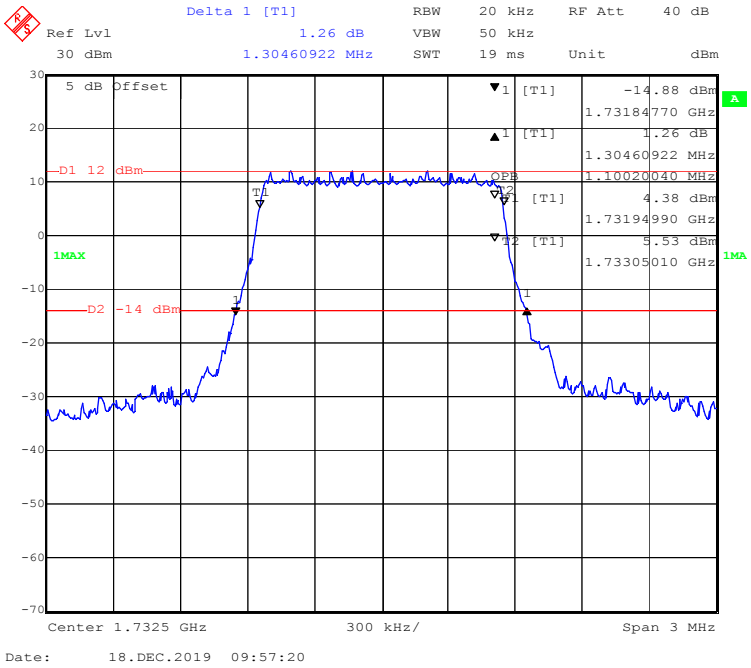

## QPSK (15 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel



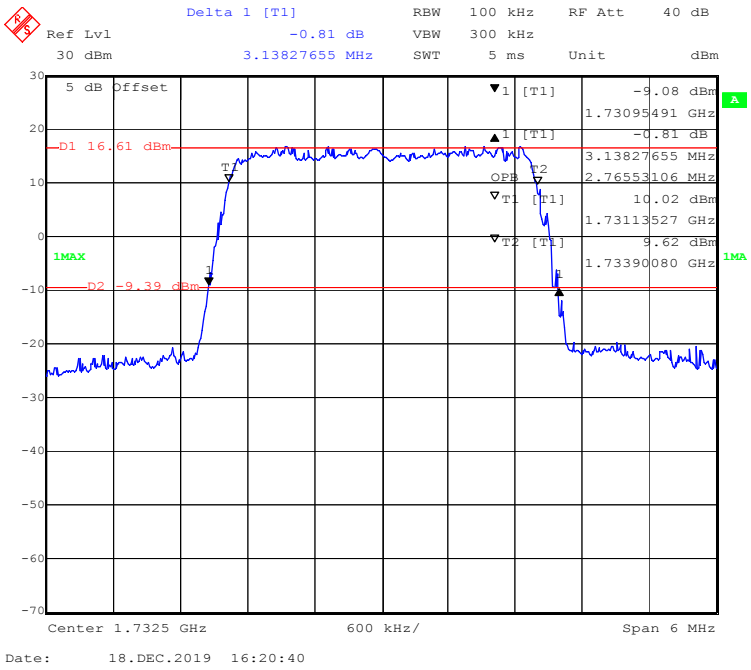
**QPSK (20 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel**



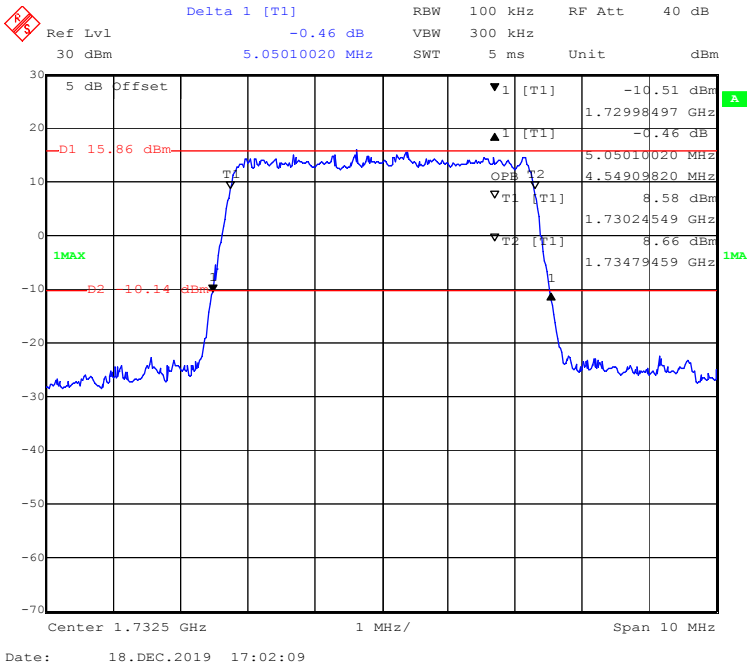

**16-QAM (1.4 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel**



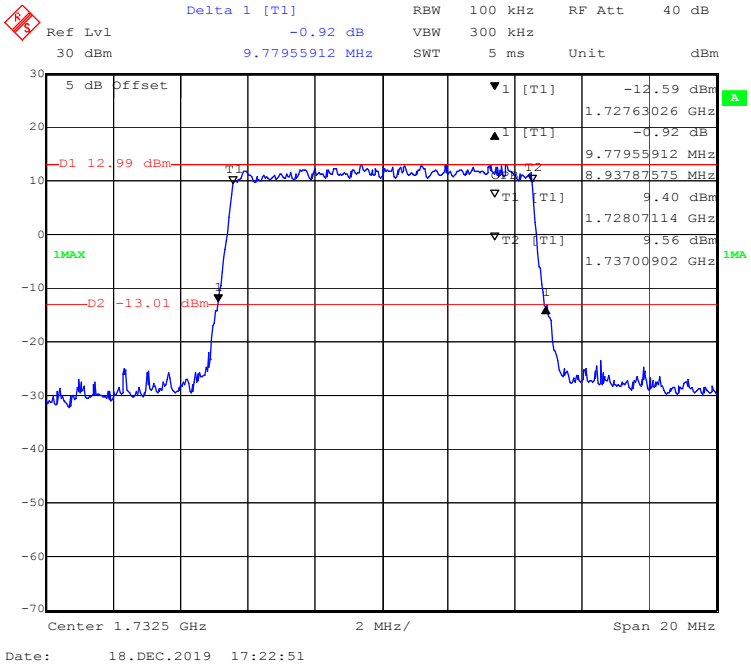
## 16-QAM (3 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel



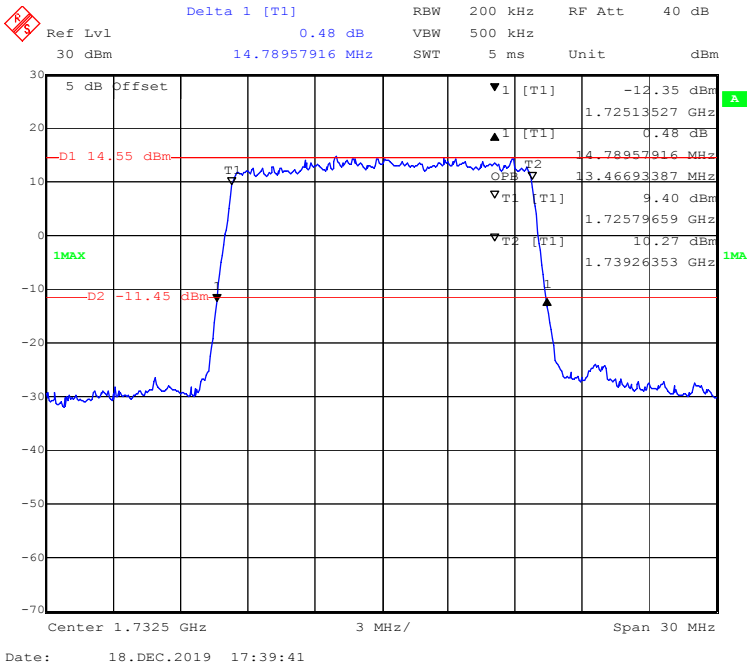

## 16-QAM (5 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel



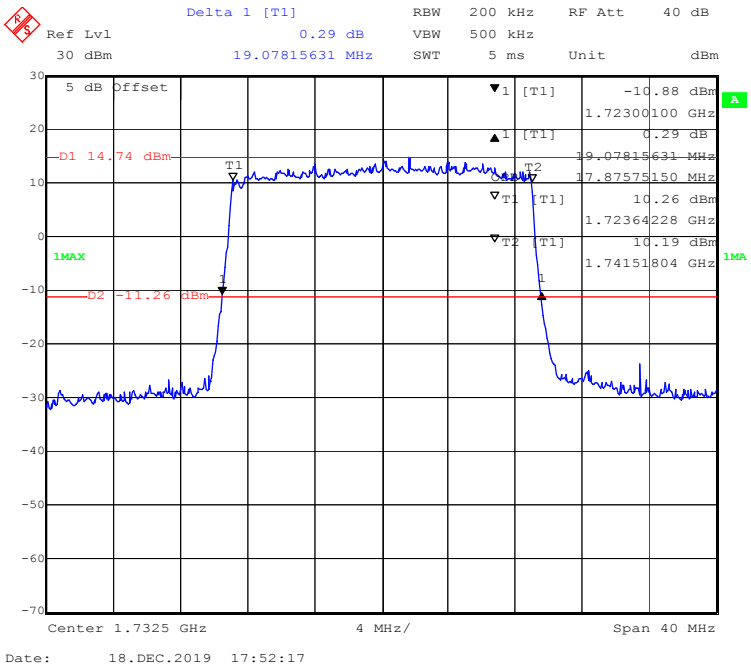
## 16-QAM (10 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel




## 16-QAM (15 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel



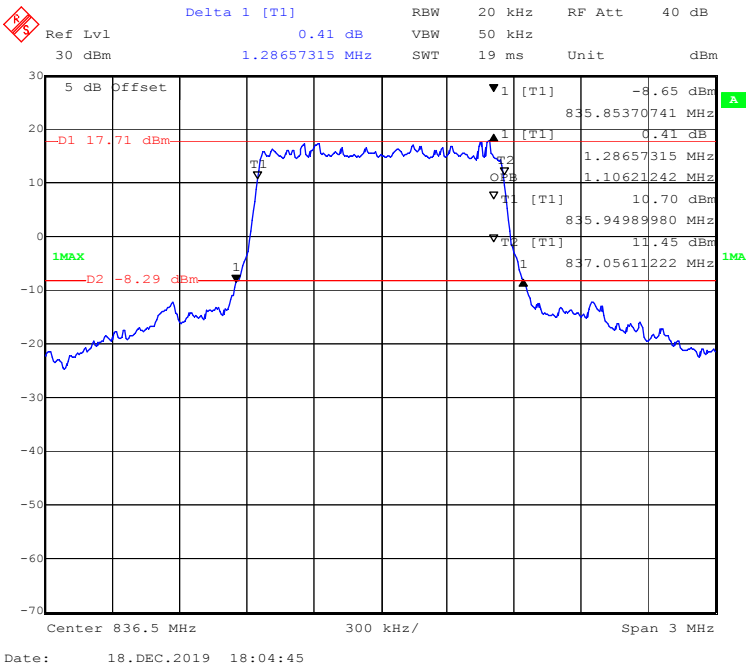
## 16-QAM (20 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel



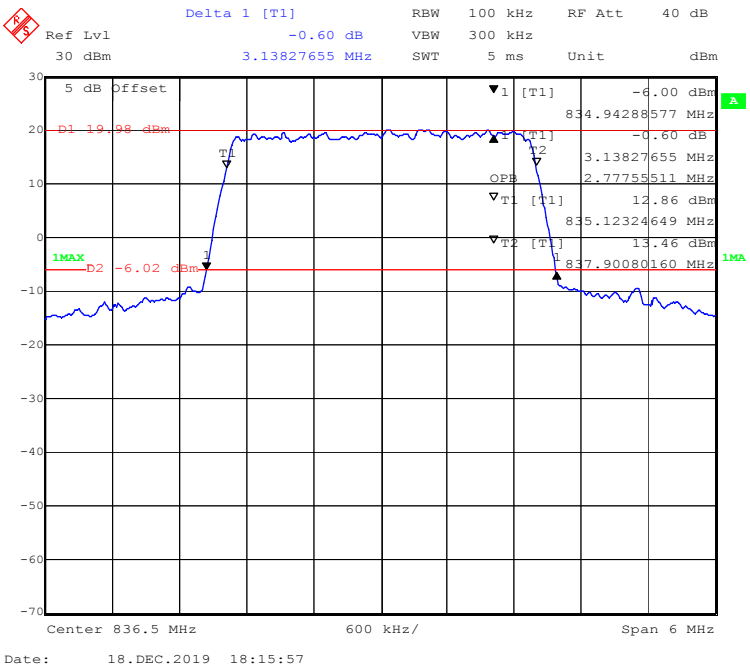
## LTE Band 5:

| Test Modulation | Test Bandwidth | Test Channel | 26 dB Bandwidth | 99% Occupied Bandwidth |
|---|---|---|---|---|
| | | | MHz | MHz |
| QPSK | 1.4M | Middle | 1.287 | 1.106 |
| | 3M | | 3.138 | 2.778 |
| | 5M | | 5.090 | 4.549 |
| | 10M | | 9.900 | 9.018 |
| 16-QAM | 1.4M | Middle | 1.293 | 1.094 |
| | 3M | | 3.126 | 2.778 |
| | 5M | | 5.070 | 4.549 |
| | 10M | | 9.820 | 9.018 |

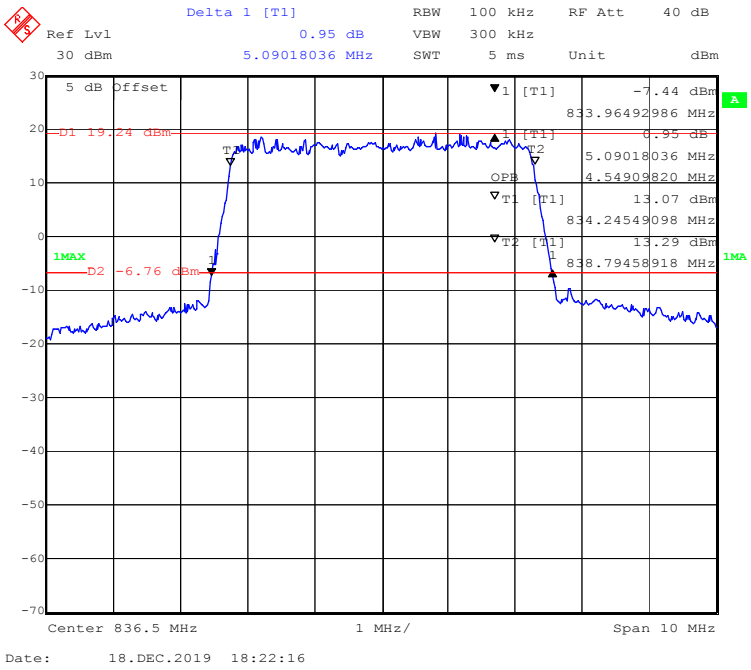
## QPSK (1.4 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel



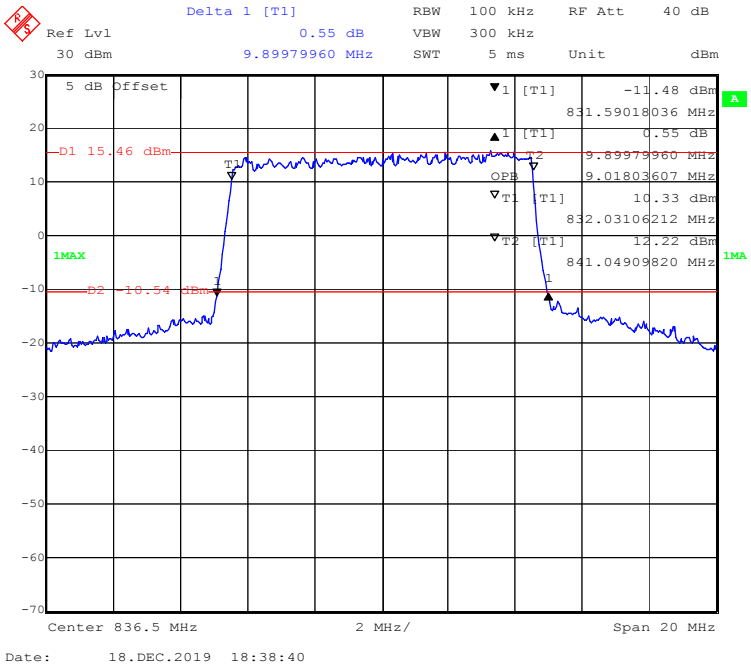

## QPSK (3 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel



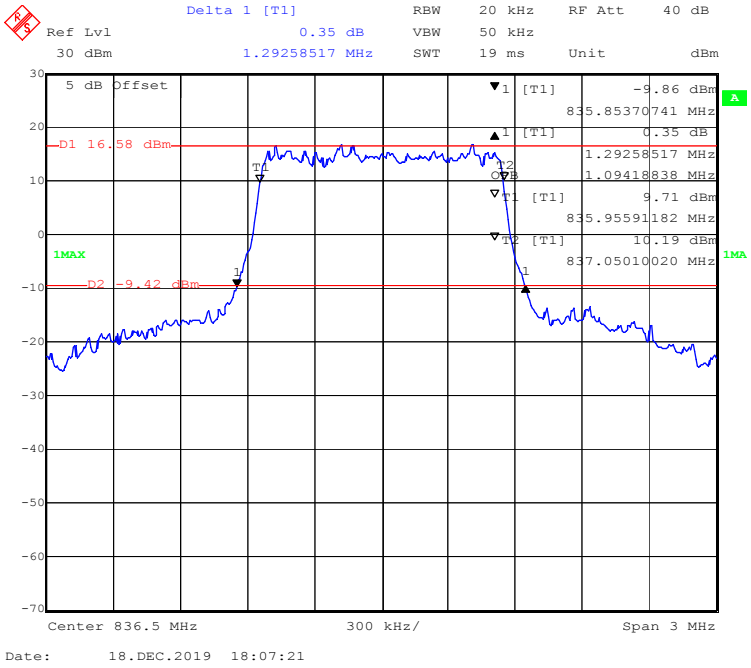
## QPSK (5 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel



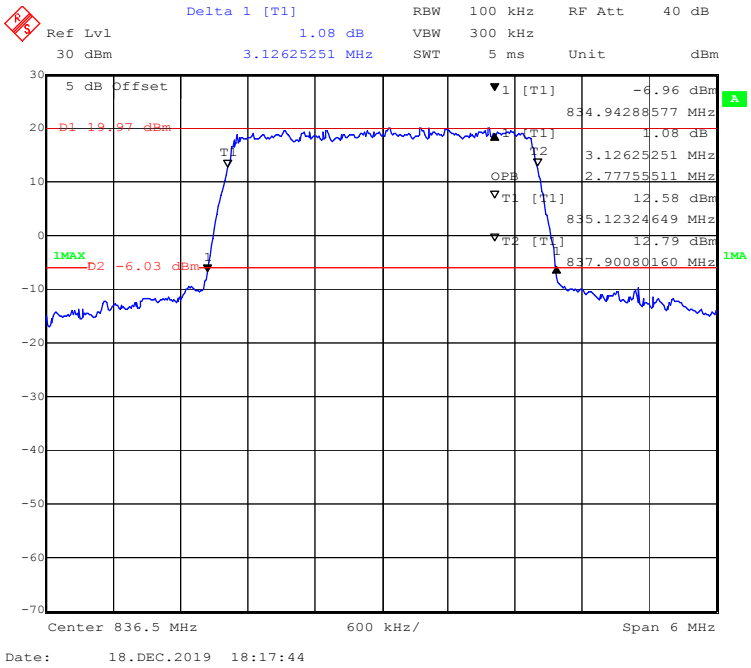

## QPSK (10MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel



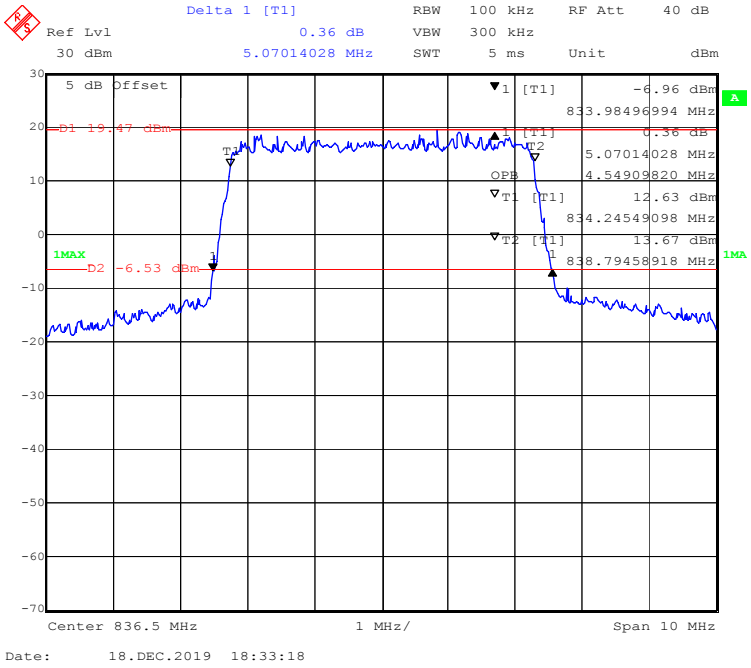
**16-QAM (1.4 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel**



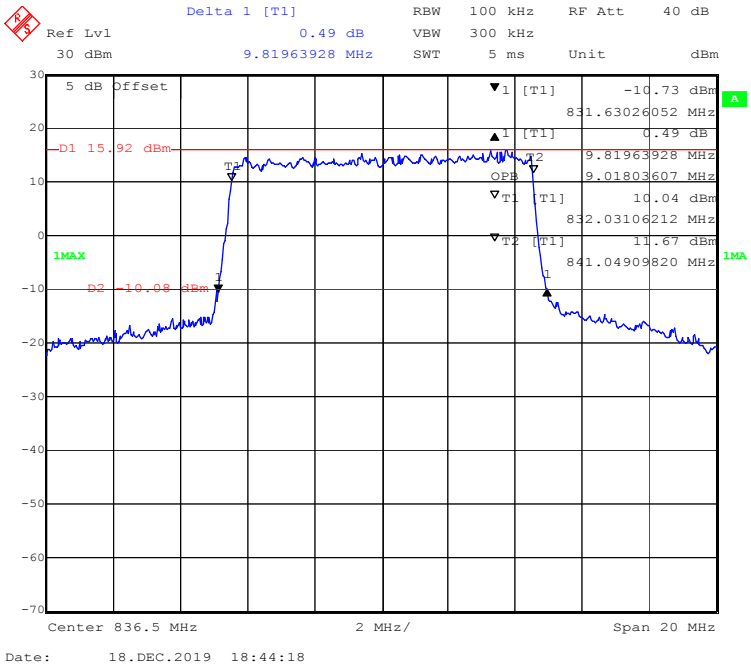

**16-QAM (3 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel**



## 16-QAM (5 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel



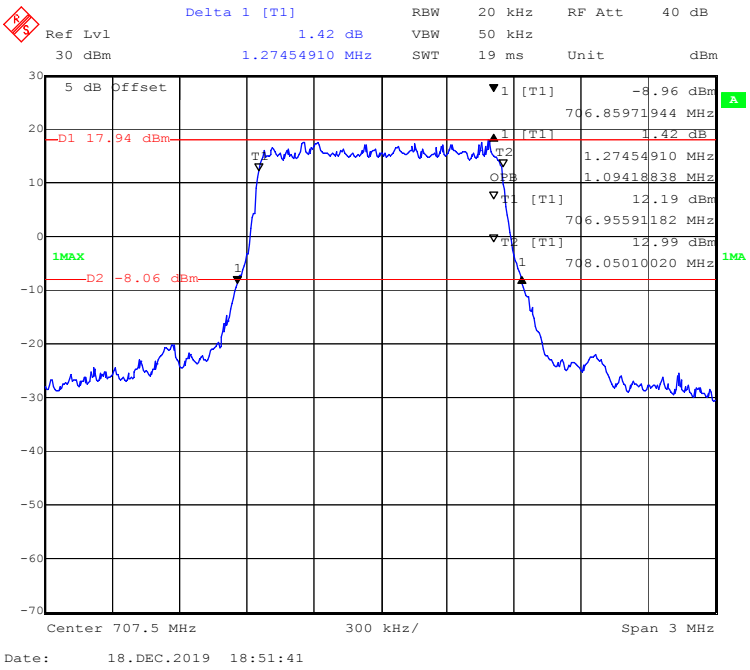

## 16-QAM (10 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel



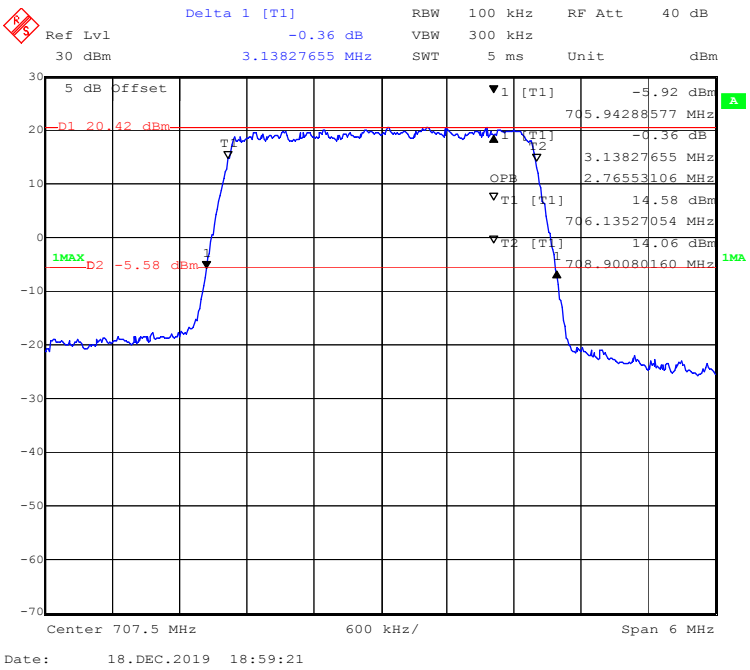
**LTE Band 12:**

| Test Modulation | Test Bandwidth | Test Channel | 26 dB Bandwidth | 99% Occupied Bandwidth |
|---|---|---|---|---|
| | | | MHz | MHz |
| QPSK | 1.4M | Middle | 1.275 | 1.094 |
| | 3M | | 3.138 | 2.766 |
| | 5M | | 5.070 | 4.569 |
| | 10M | | 9.860 | 9.018 |
| 16-QAM | 1.4M | Middle | 1.275 | 1.100 |
| | 3M | | 3.126 | 2.766 |
| | 5M | | 5.070 | 4.549 |
| | 10M | | 9.820 | 9.018 |

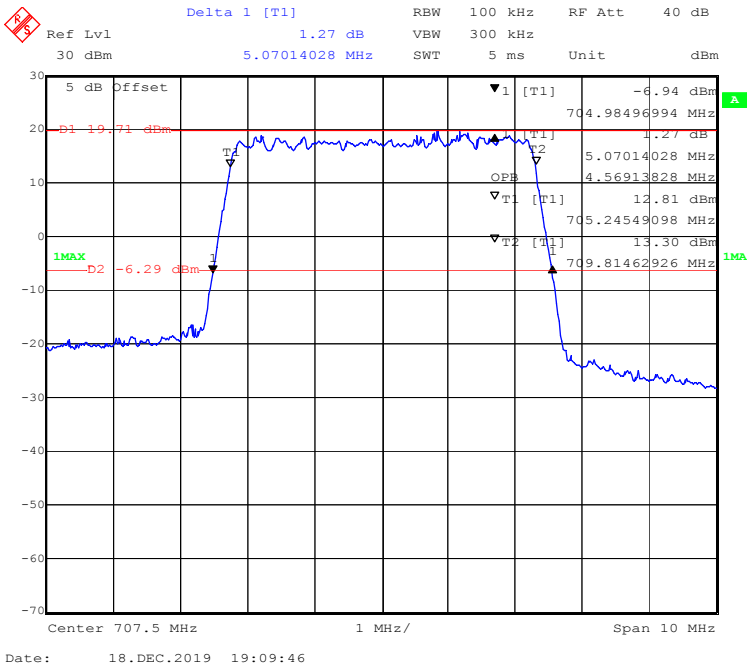
## QPSK (1.4 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel



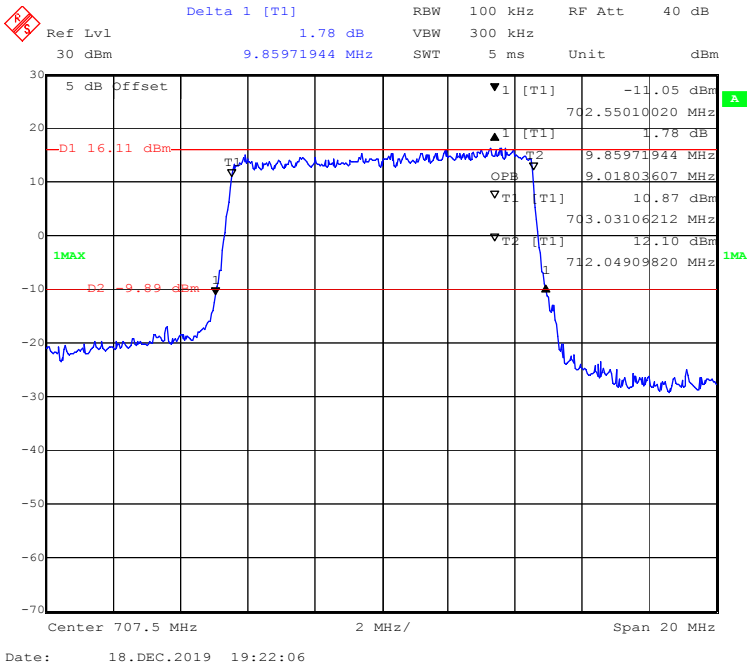

## QPSK (3 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel



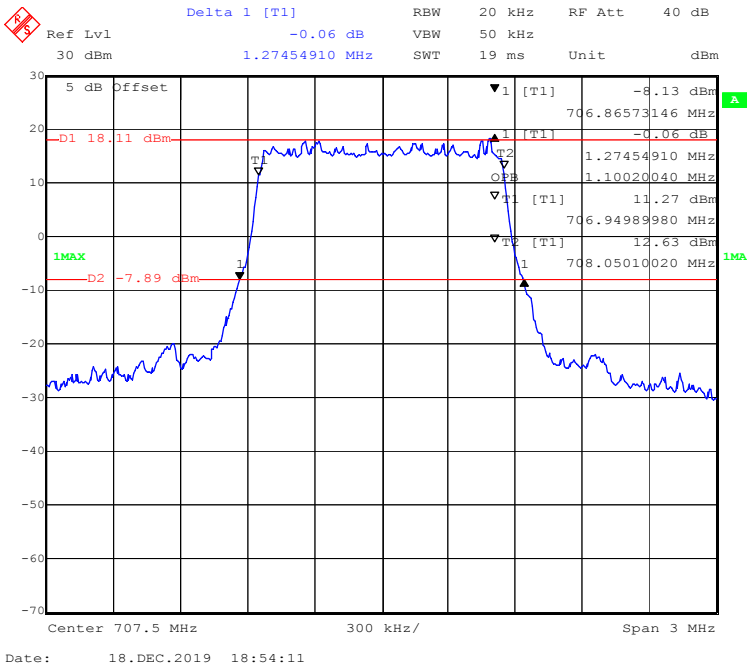
## QPSK (5 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel



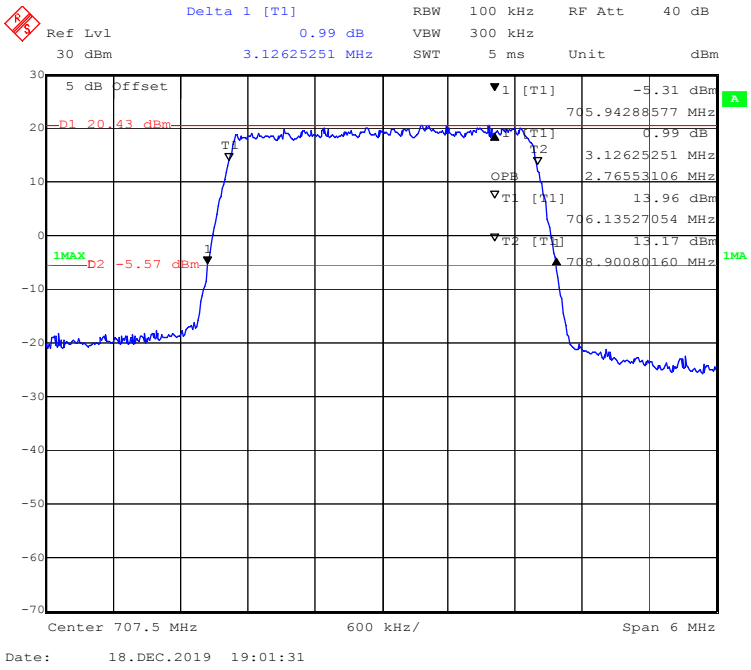

## QPSK (10MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel



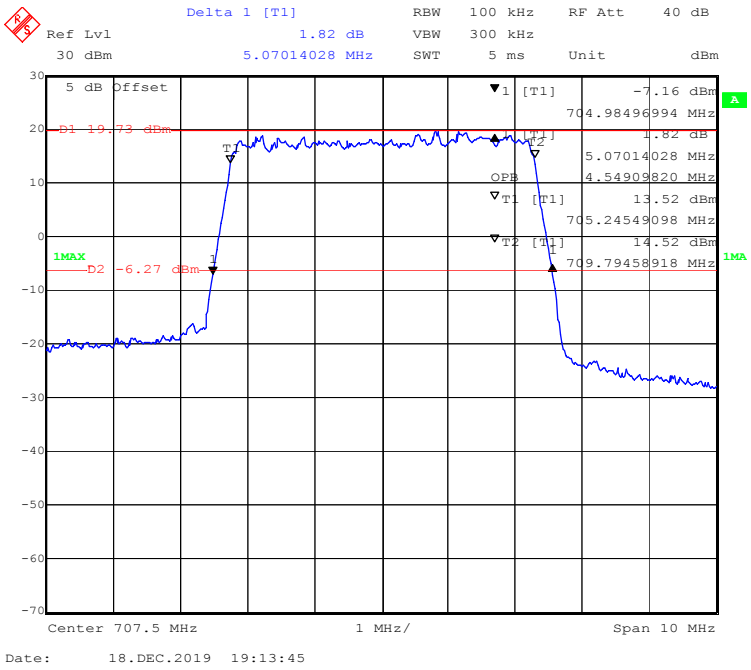
## 16-QAM (1.4 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel



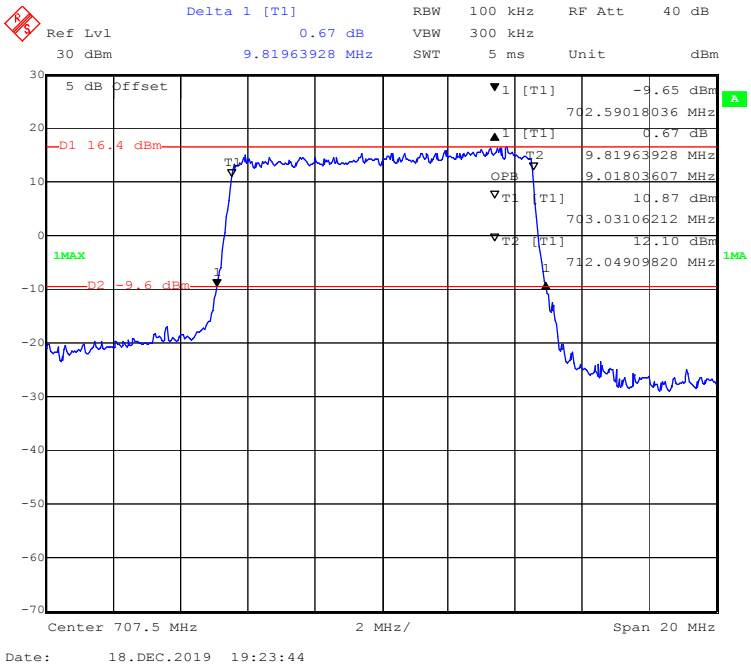

## 16-QAM (3 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel



## 16-QAM (5 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel



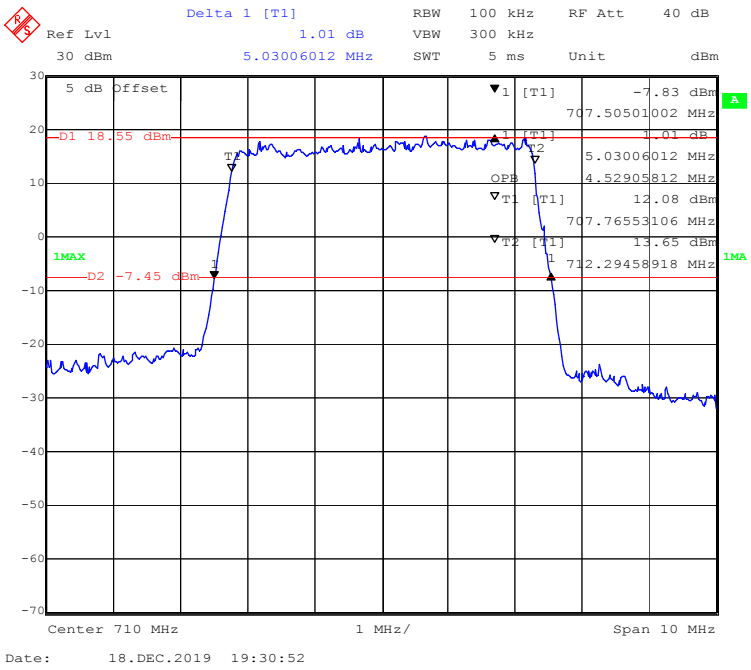

## 16-QAM (10 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel



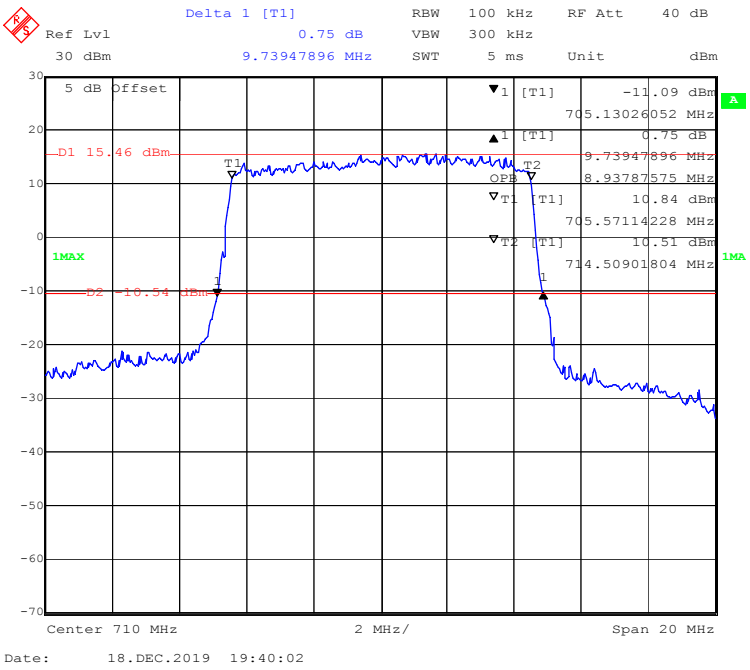
## LTE Band 17:

| Test Modulation | Test Bandwidth | Test Channel | 26 dB Bandwidth | 99% Occupied Bandwidth |
|---|---|---|---|---|
| | | | MHz | MHz |
| QPSK | 5M | Middle | 5.030 | 4.529 |
| | 10M | | 9.739 | 8.938 |
| 16-QAM | 5M | Middle | 5.030 | 4.529 |
| | 10M | | 9.780 | 8.938 |

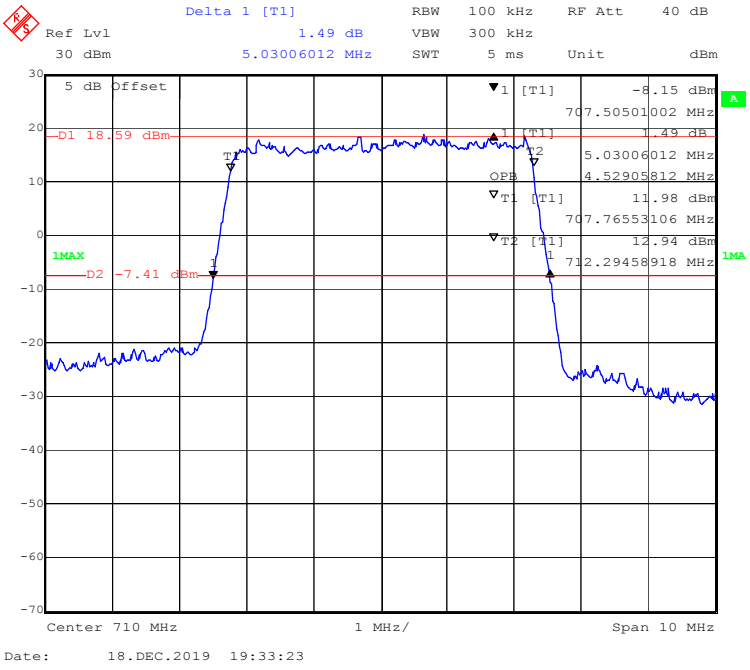
**QPSK (5 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel**



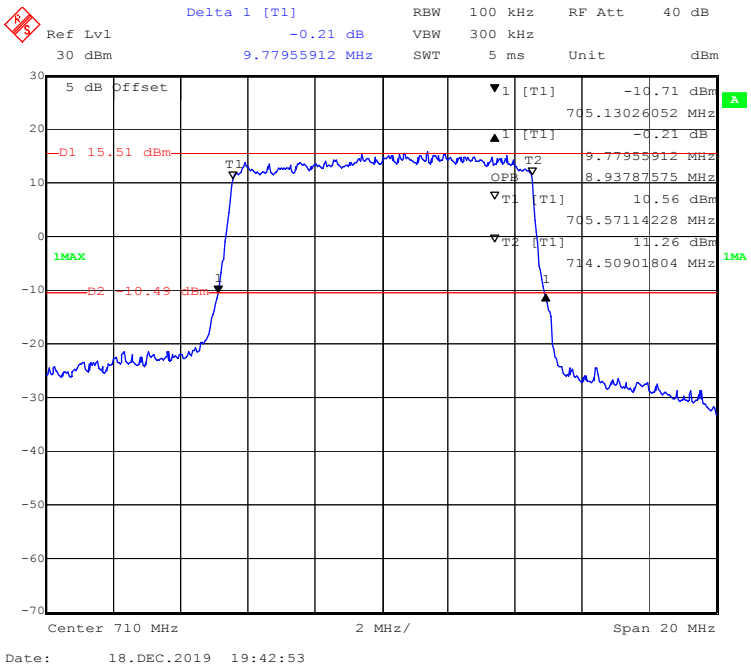
## QPSK (10 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel




## 16-QAM (5MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel



## 16-QAM (10 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel



# FCC § 2.1051; § 22.917 (a); § 24.238 (a); §27.53(g) (h) - SPURIOUS EMISSIONS AT ANTENNA TERMINALS

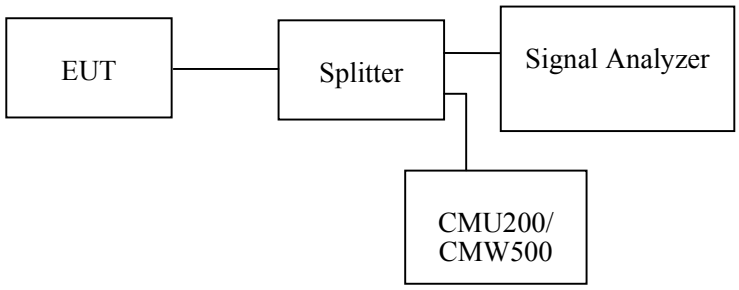
## Applicable Standards

FCC §2.1051, §22.917(a) and §24.238(a) and §27.53 (g) (h).

The spectrum was to be investigated to the tenth harmonics of the highest fundamental frequency as specified in § 2.1051.

## Test Procedure

The RF output of the transceiver was connected to a spectrum analyzer and simulator through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 100 kHz for below 1GHz & 1MHz for above 1GHz. sufficient scans were taken to show any out of band emissions up to 10$^{th}$ harmonic.




## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 23.2-23.5 ℃ |
| **Relative Humidity:** | 51-53 % |
| **ATM Pressure:** | 101.1-103. 3 kPa |

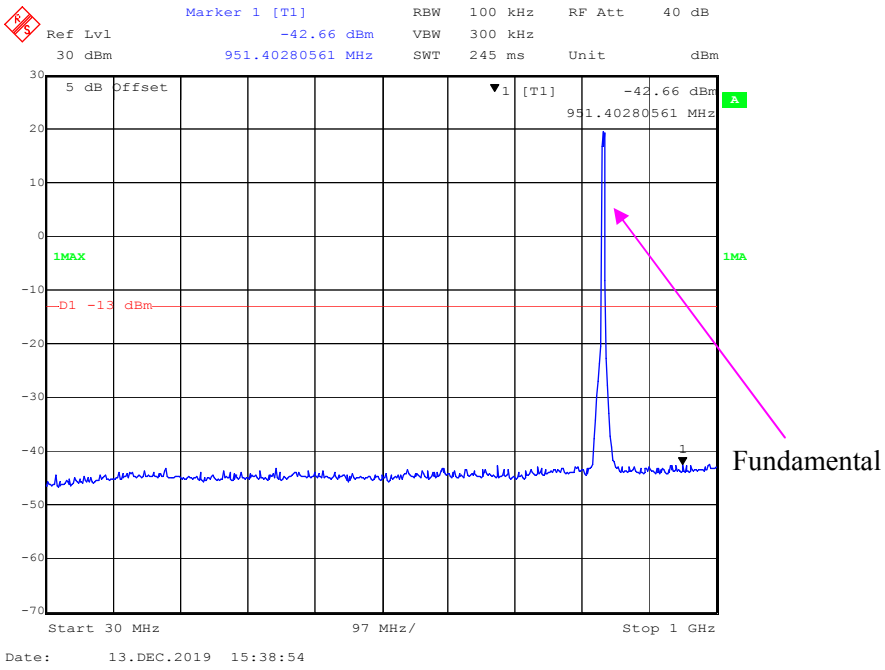
*The testing was performed by Winnie Yang from 2019-12-11 to 2019-12-26.*

*EUT operation mode: Transmitting*

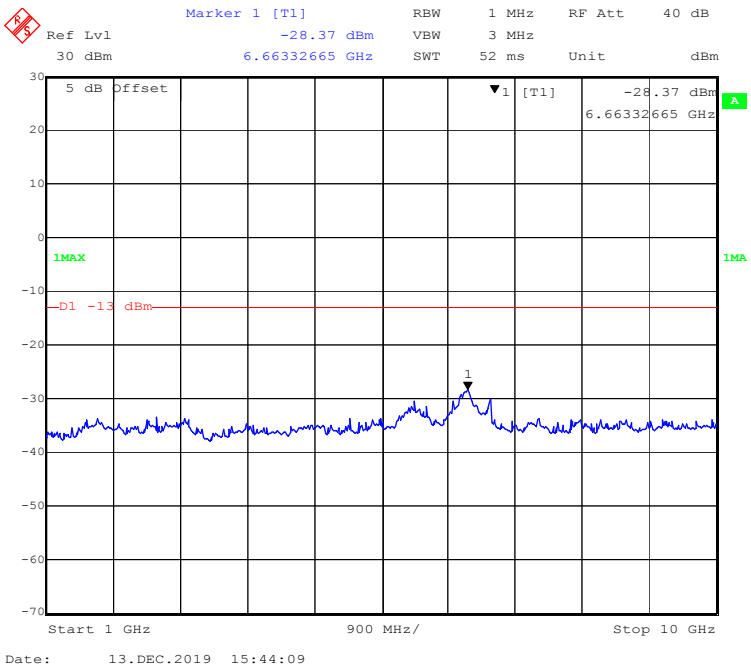
*Test Result: Compliant.*

## WCDMA Band V:

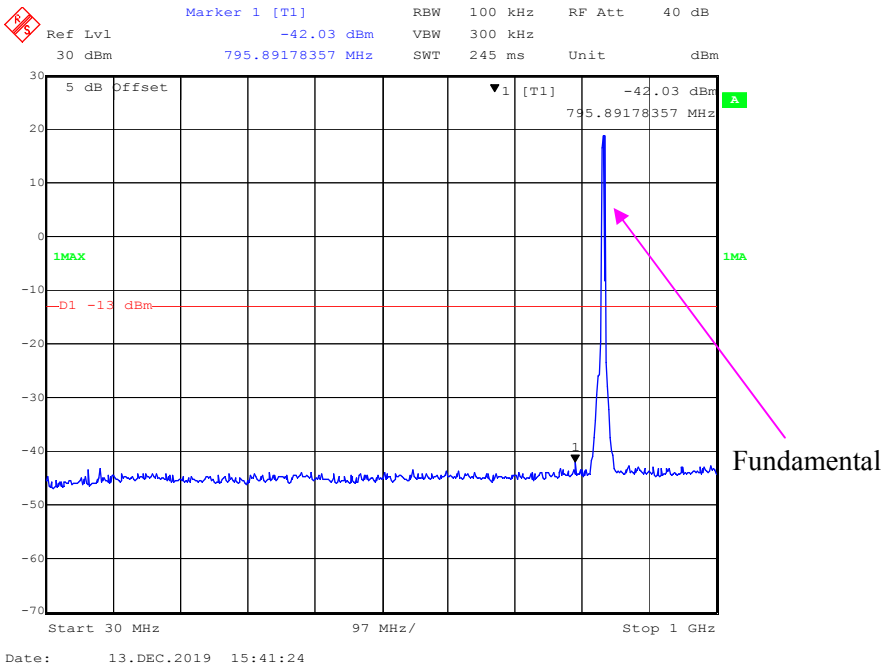
### 30 MHz – 1GHz WCDMA (Rel 99) Mode, Middle channel




### 1 GHz – 10 GHz WCDMA (Rel 99) Mode, Middle channel

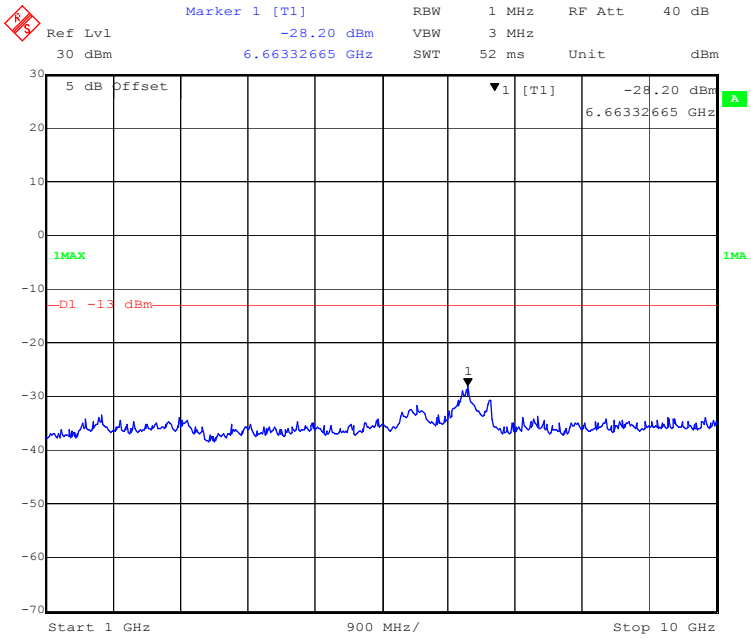


## 30 MHz – 1GHz WCDMA (HSDPA) Mode, Middle channel



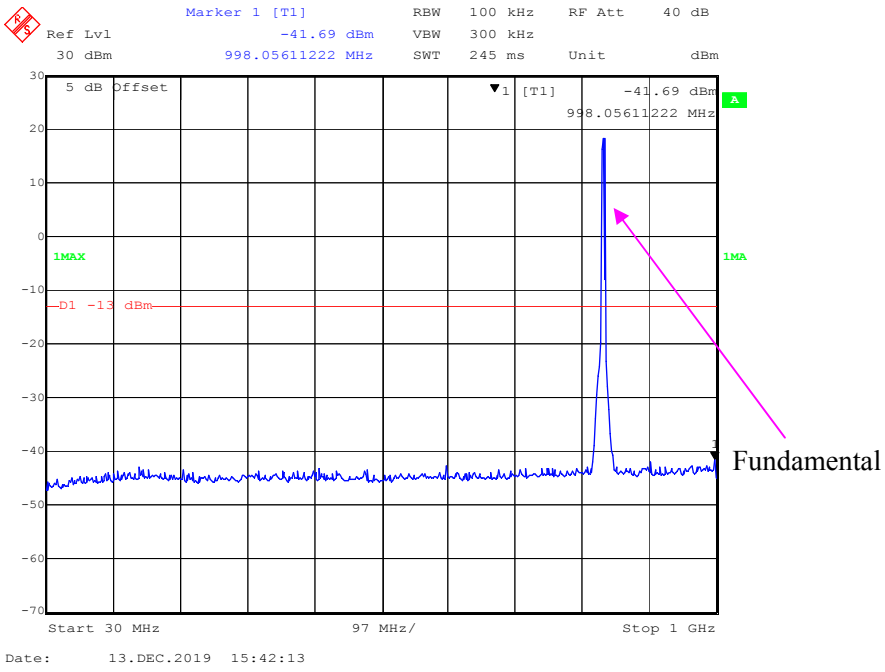

Date: 13.DEC.2019 15:41:24

## 1 GHz – 10 GHz WCDMA (HSDPA) Mode, Middle channel



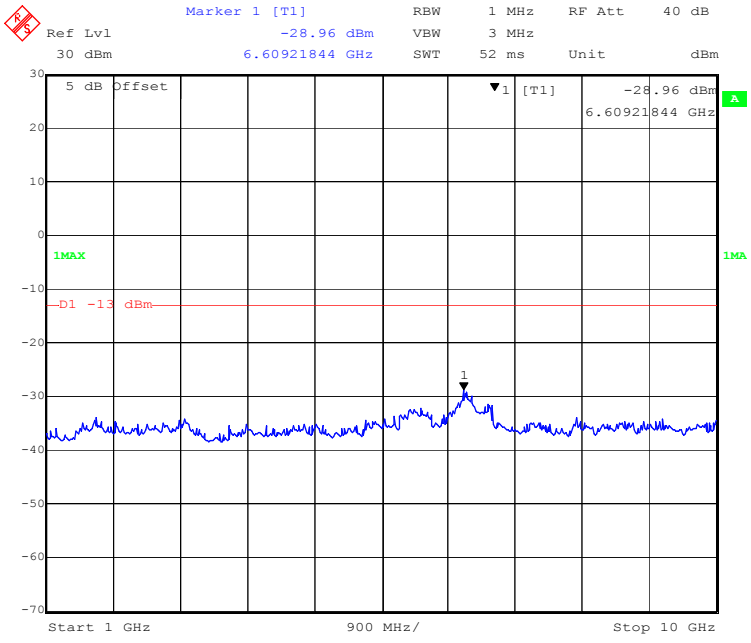

Date: 13.DEC.2019 15:44:29

## 30 MHz – 1GHz WCDMA (HSUPA) Mode, Middle channel



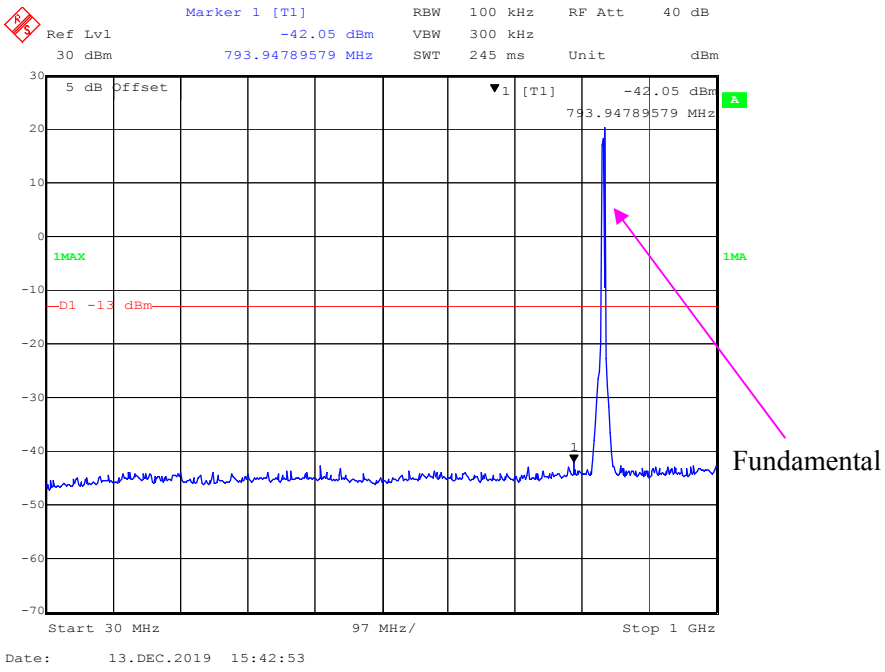

Date: 13.DEC.2019 15:42:13

## 1 GHz – 10 GHz WCDMA (HSUPA) Mode, Middle channel



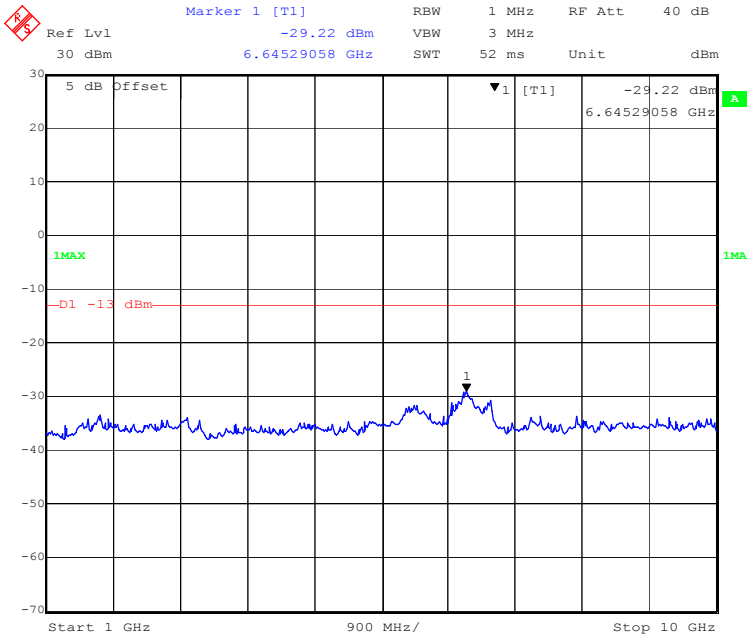

Date: 13.DEC.2019 15:44:45

**30 MHz – 1GHz WCDMA (HSPA+) Mode, Middle channel**




Date: 13.DEC.2019 15:42:53

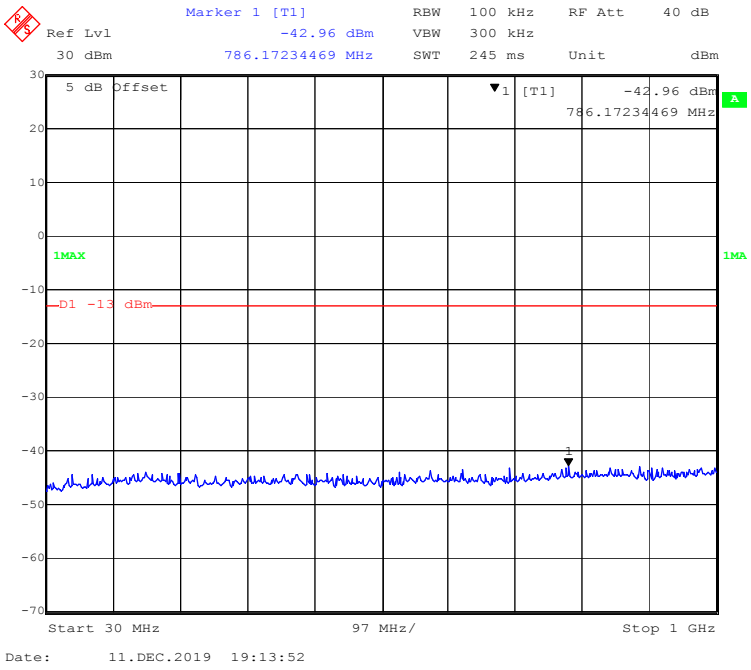
**1 GHz – 10 GHz WCDMA (HSPA+) Mode, Middle channel**



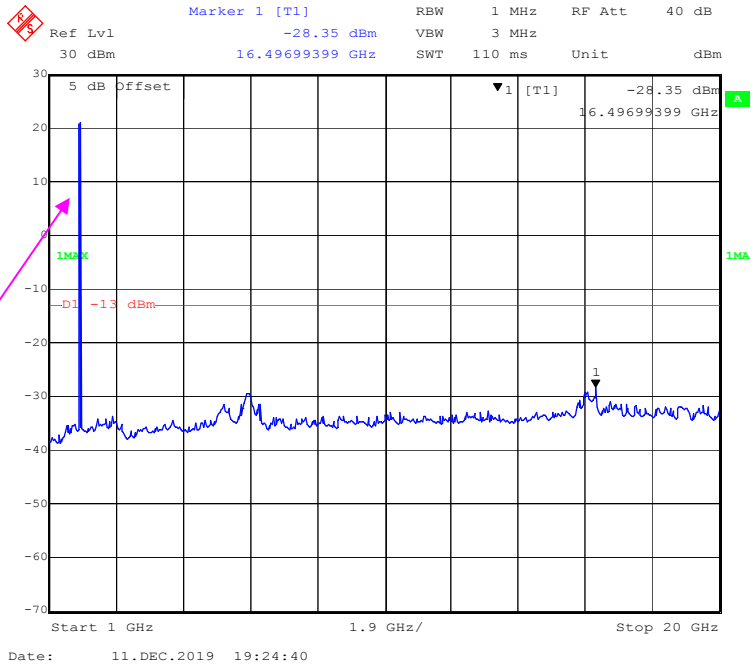

Date: 13.DEC.2019 15:45:06

## WCDMA Band II:

### 30 MHz – 1GHz WCDMA (Rel 99) Mode, Middle channel

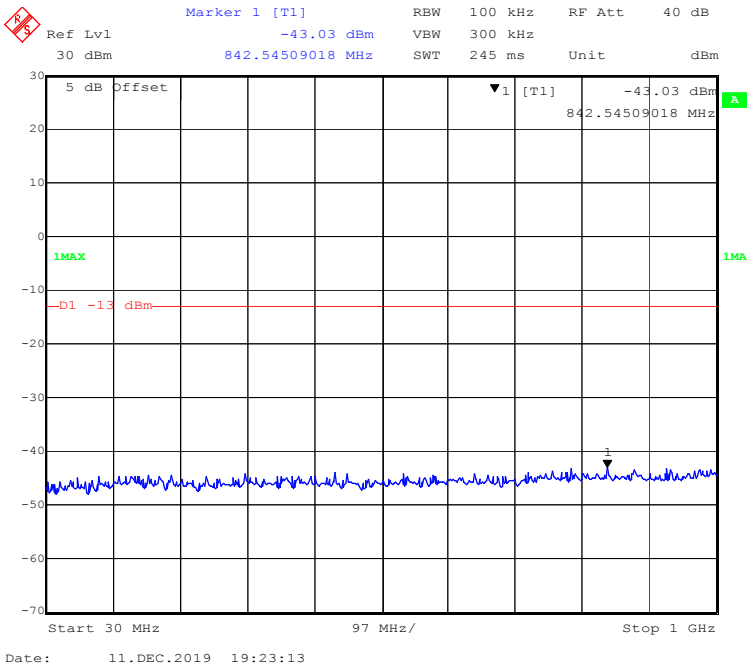



### 1 GHz – 20 GHz WCDMA (Rel 99) Mode, Middle channel

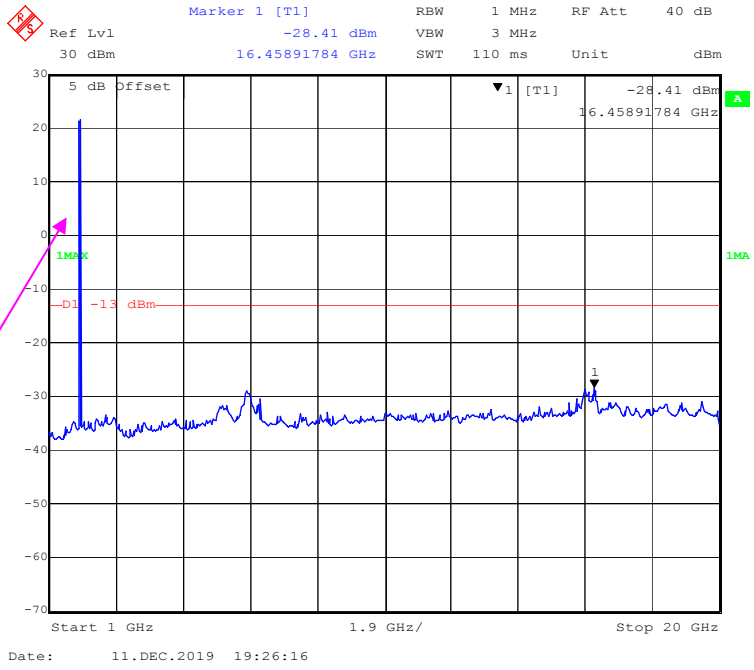



Fundamental

## 30 MHz – 1GHz WCDMA (HSDPA) Mode, Middle channel

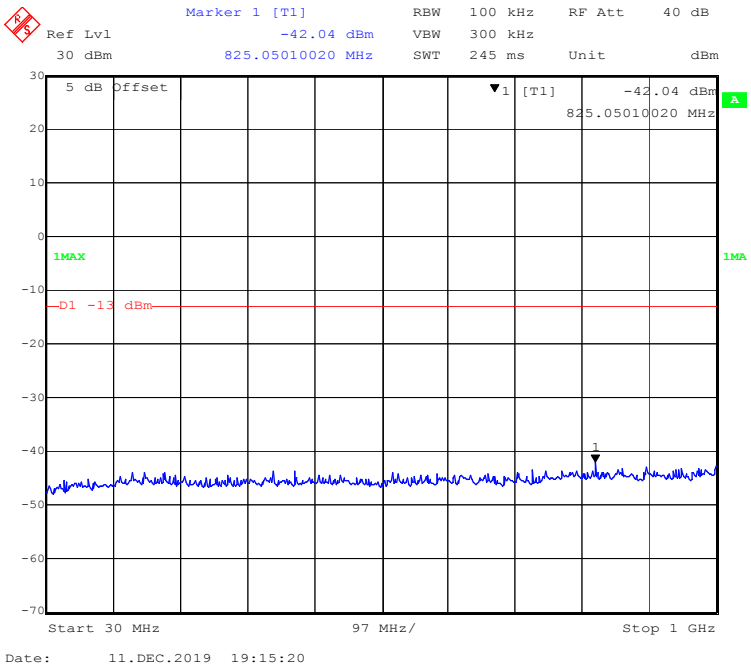



## 1 GHz – 20 GHz WCDMA (HSDPA) Mode, Middle channel

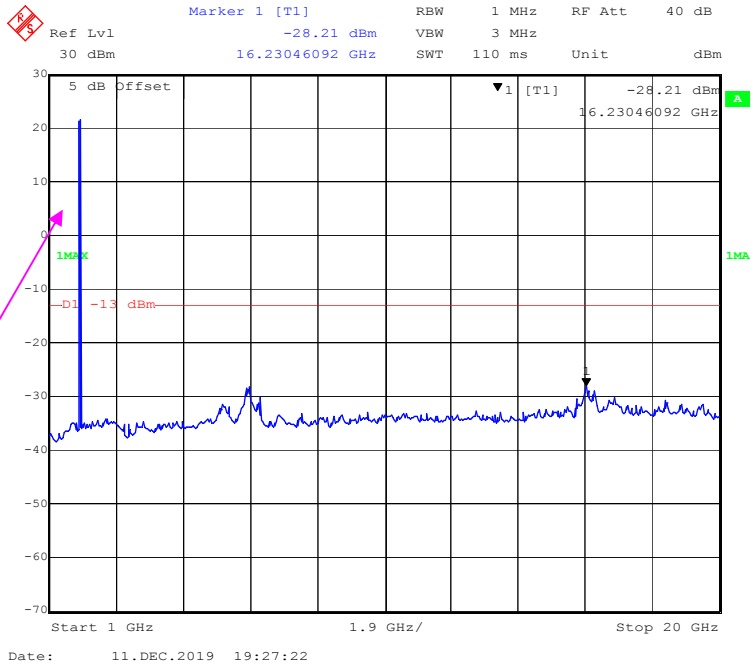



Fundamental

## 30 MHz – 1GHz WCDMA (HSUPA) Mode, Middle channel

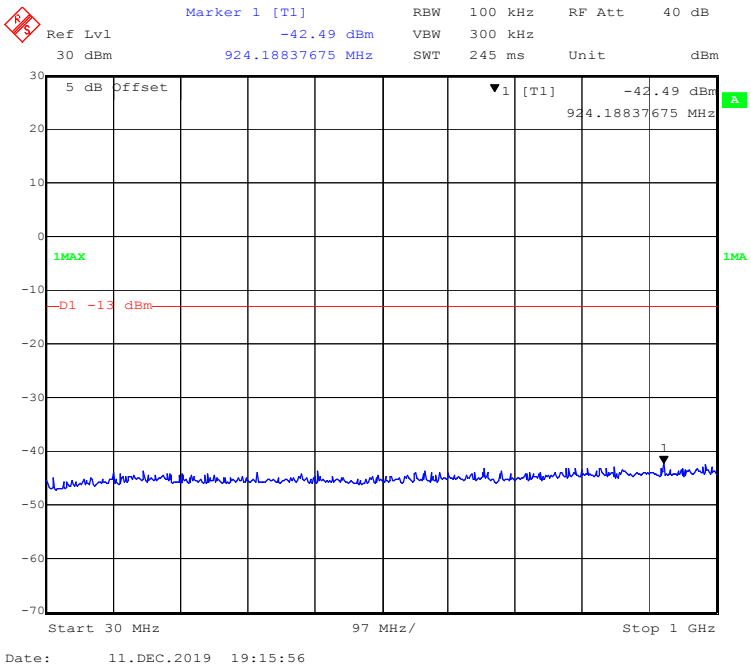



## 1 GHz – 20 GHz WCDMA (HSUPA) Mode, Middle channel

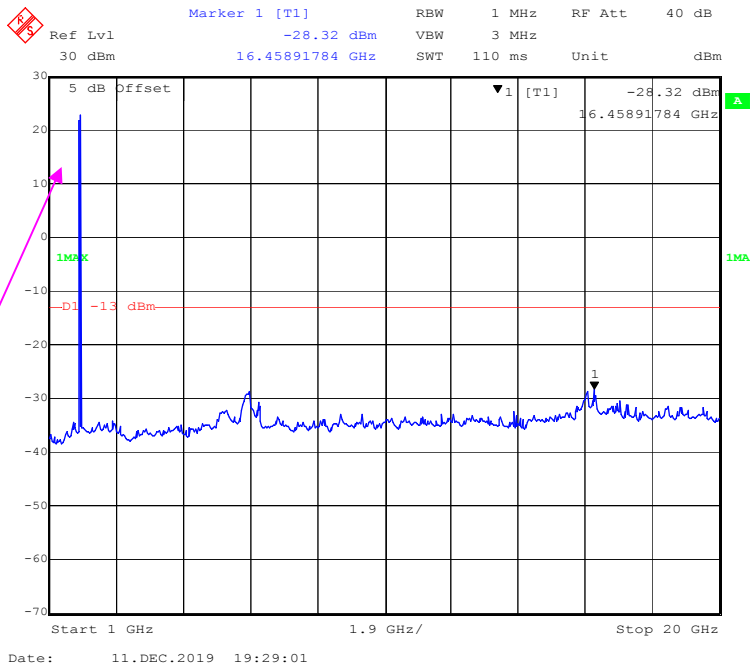



Fundamental

**30 MHz – 1GHz WCDMA (HSPA+) Mode, Middle channel**



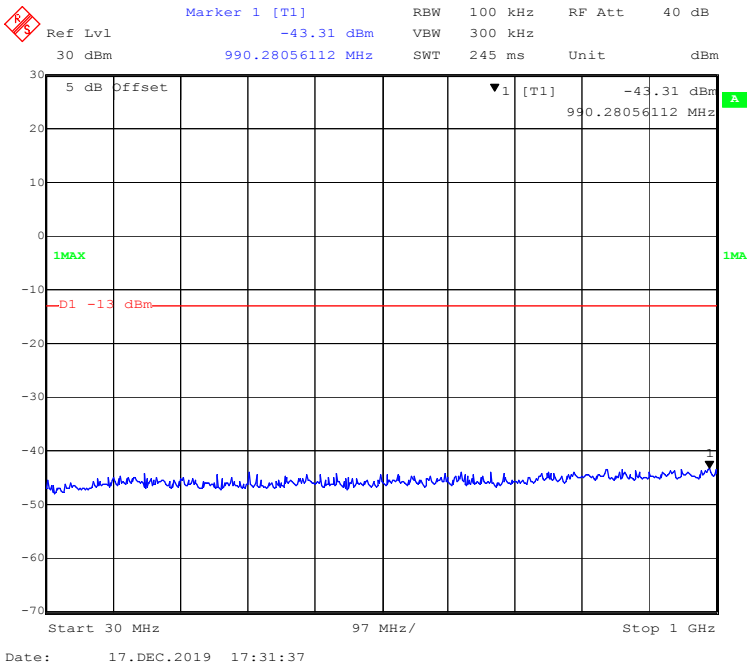

**1 GHz – 20 GHz WCDMA (HSPA+) Mode, Middle channel**



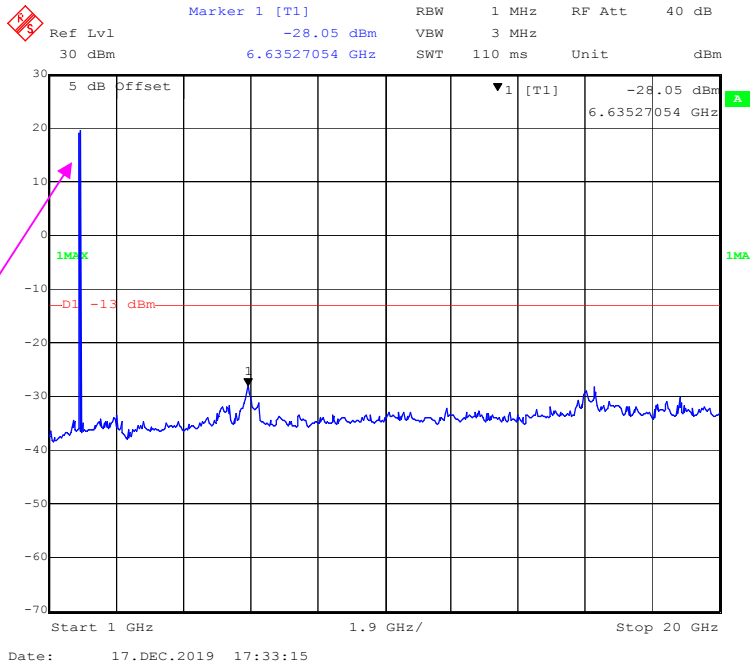

Fundamental

## LTE Band 2:

### 30 MHz - 1 GHz (1.4 MHz, QPSK, Middle Channel)

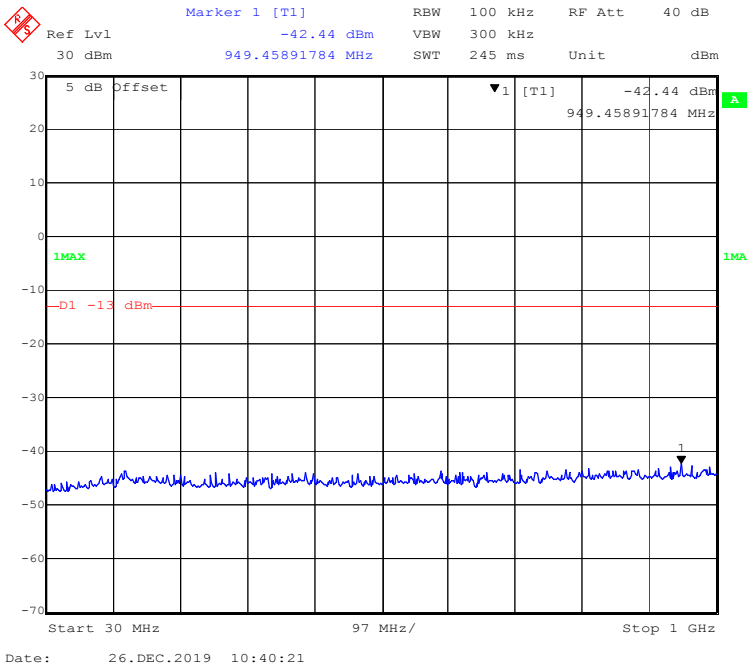



### 1 GHz – 20 GHz (1.4 MHz, QPSK, Middle Channel)

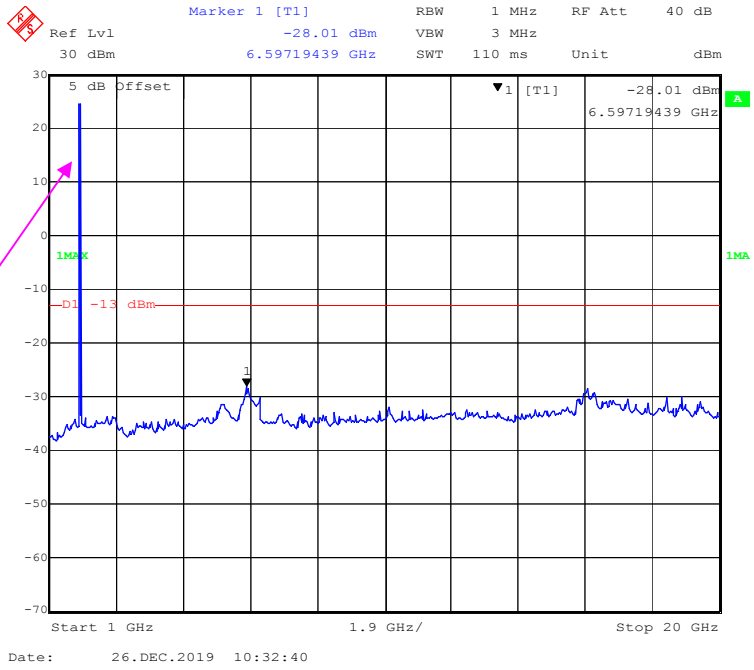



Fundamental

## 30 MHz - 1 GHz (1.4 MHz, 16-QAM, Middle Channel)

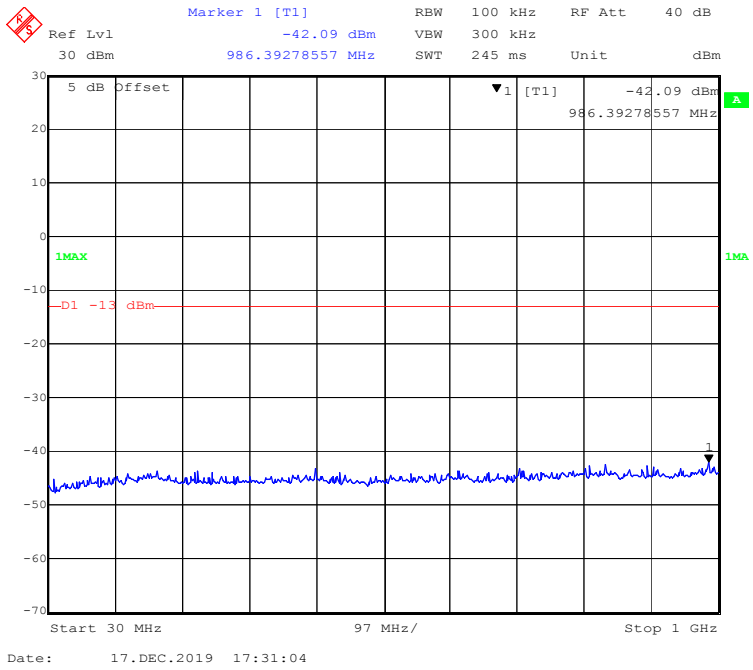



## 1 GHz – 20 GHz (1.4 MHz, 16-QAM, Middle Channel)

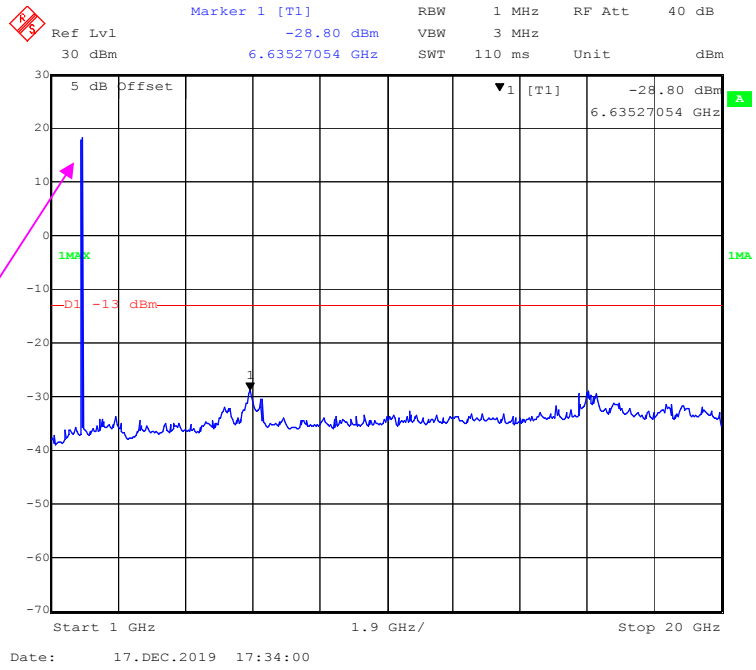



Fundamental

## 30 MHz - 1 GHz (3 MHz, QPSK, Middle Channel)

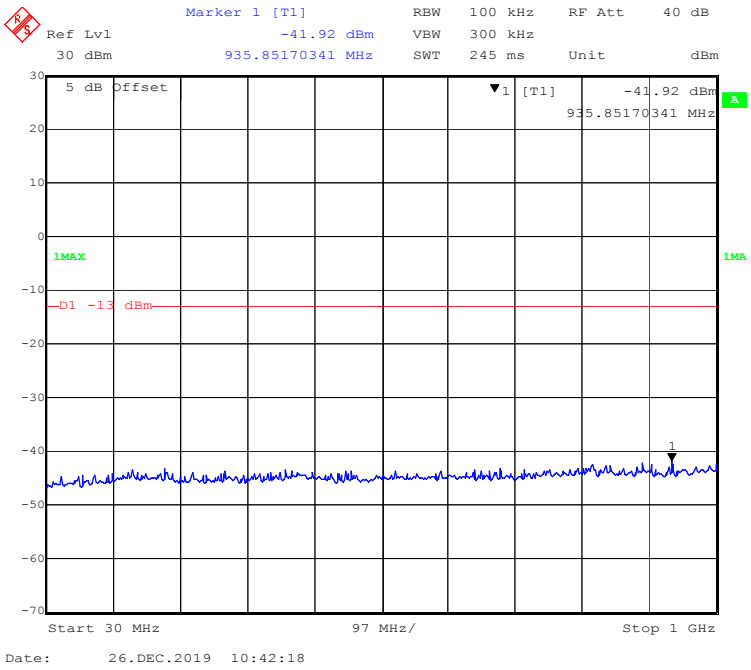



## 1 GHz – 20 GHz (3 MHz, QPSK, Middle Channel)

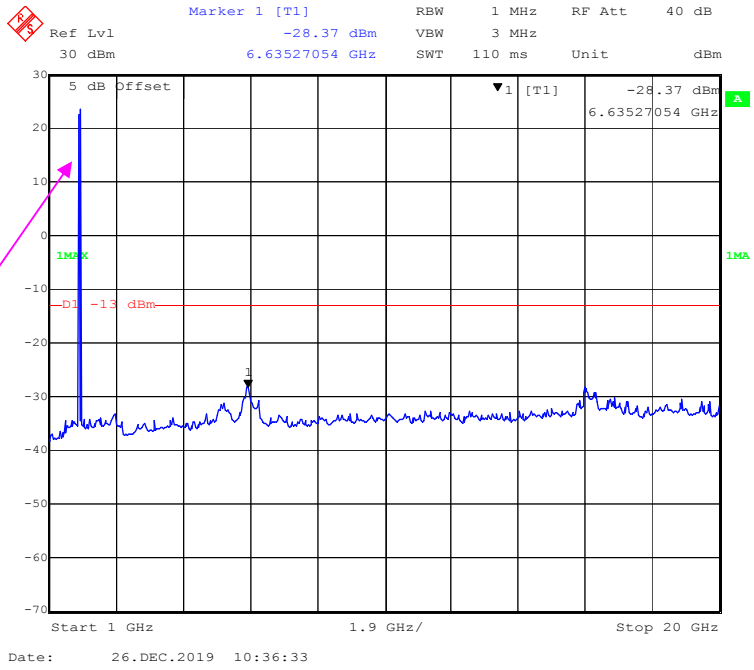



Fundamental

**30 MHz - 1 GHz (3 MHz, 16-QAM, Middle Channel)**

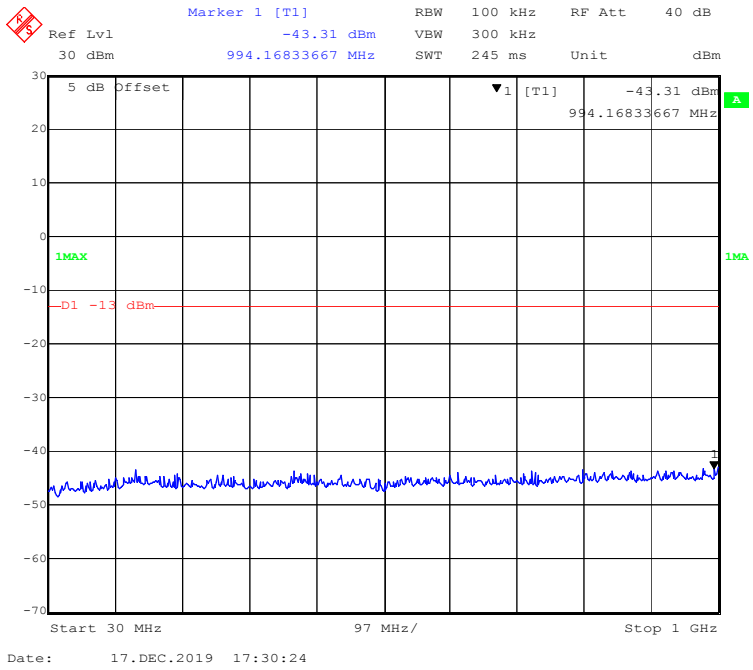



**1 GHz – 20 GHz (3 MHz, 16-QAM, Middle Channel)**

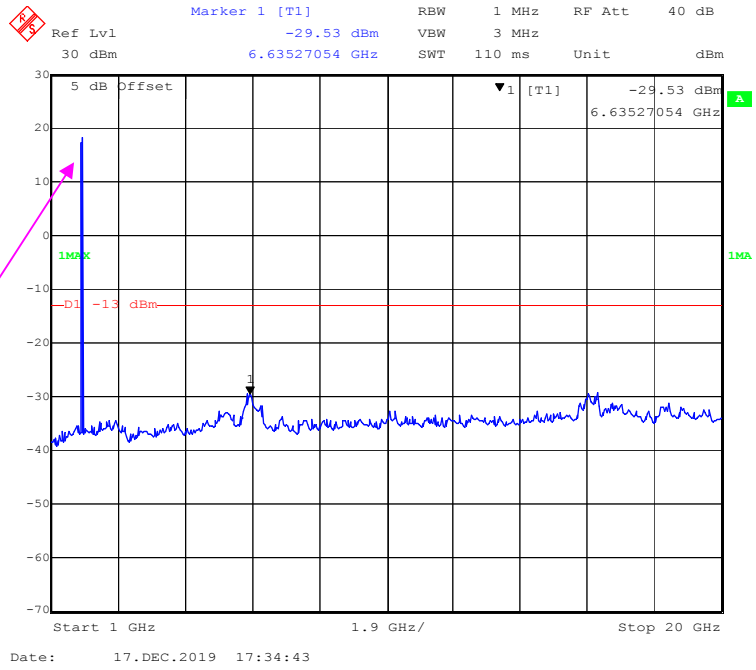



Fundamental

## 30 MHz - 1 GHz (5 MHz, QPSK, Middle Channel)

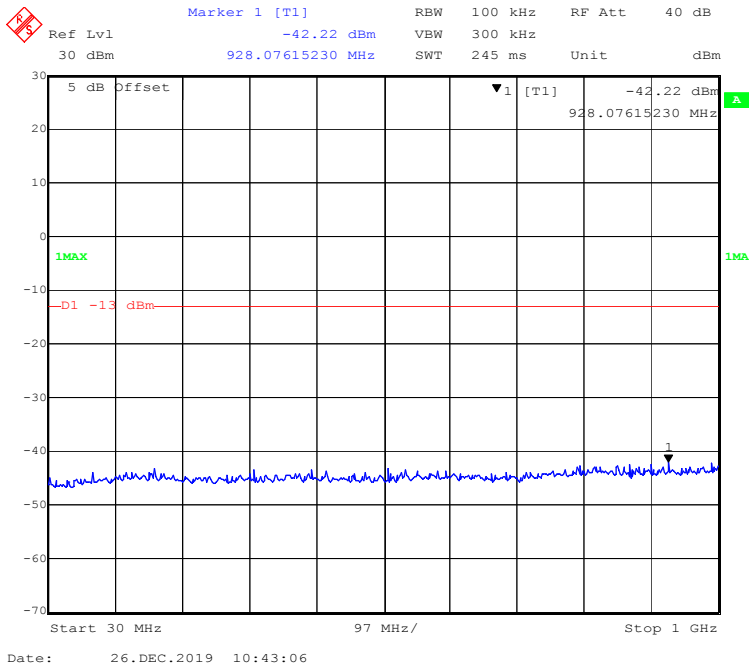



## 1 GHz – 20 GHz (5 MHz, QPSK, Middle Channel)

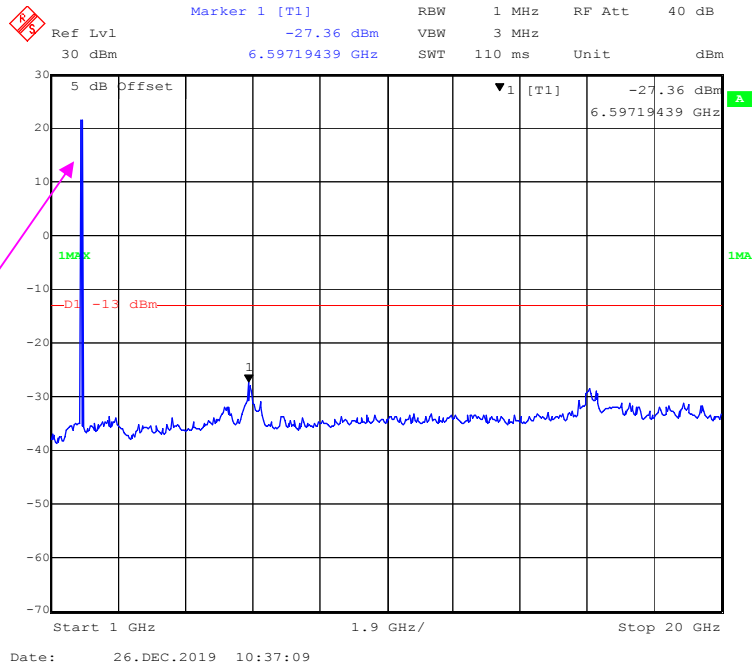



Fundamental

## 30 MHz - 1 GHz (5 MHz, 16-QAM, Middle Channel)

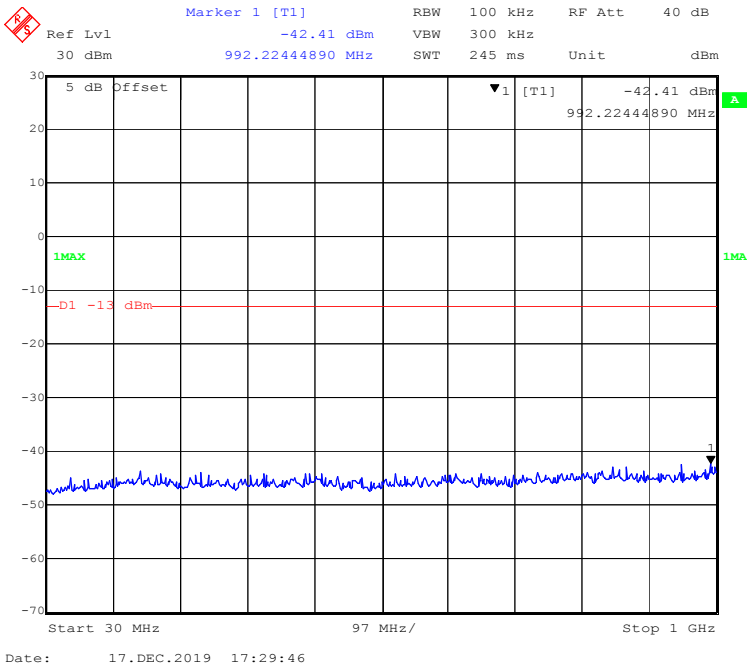



## 1 GHz – 20 GHz (5 MHz, 16-QAM, Middle Channel)

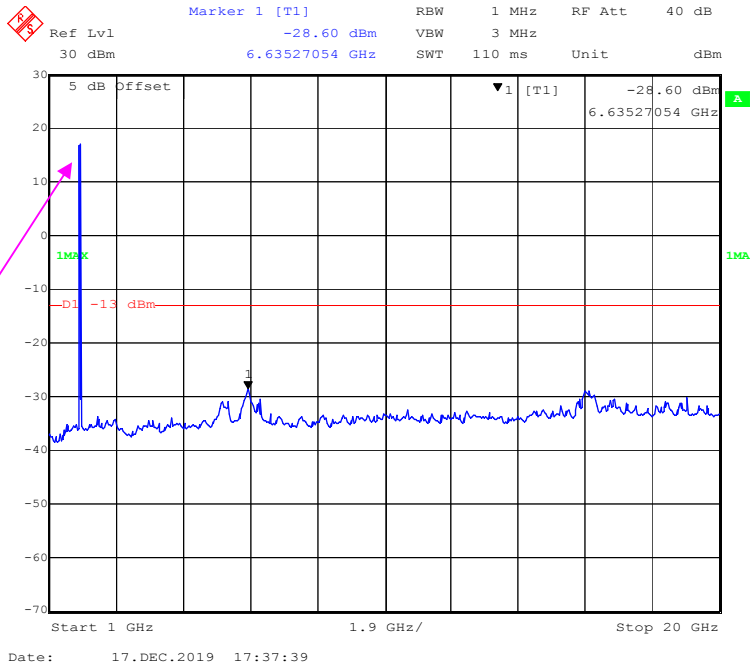



Fundamental

## 30 MHz - 1 GHz (10 MHz, QPSK, Middle Channel)

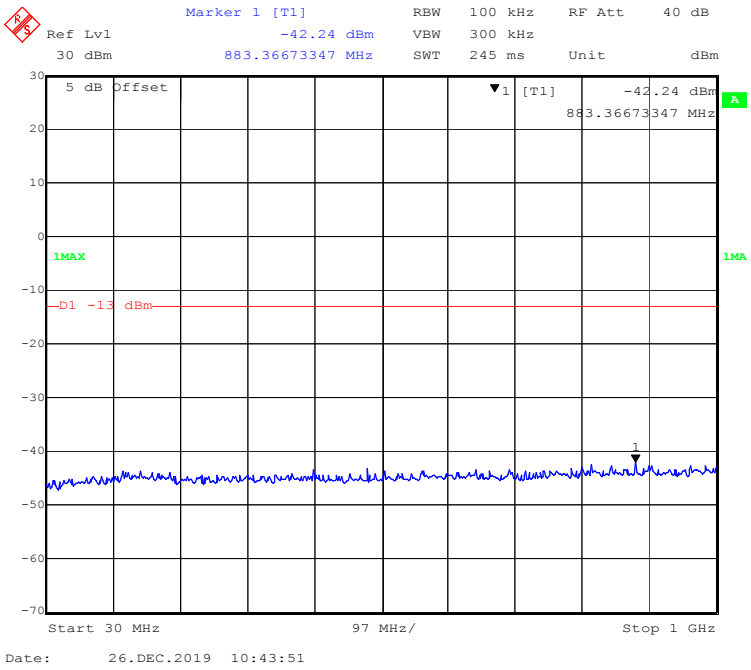



## 1 GHz – 20 GHz (10 MHz, QPSK, Middle Channel)

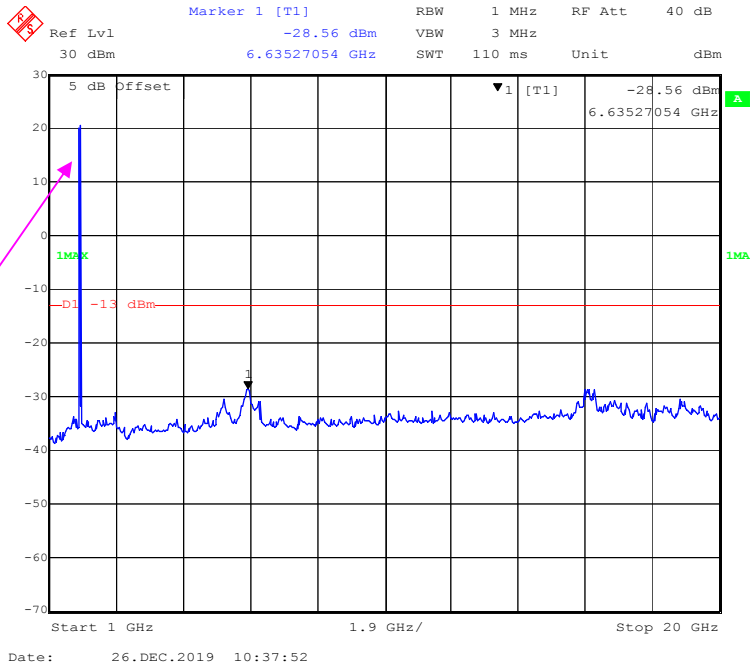



Fundamental

## 30 MHz - 1 GHz (10 MHz, 16-QAM, Middle Channel)

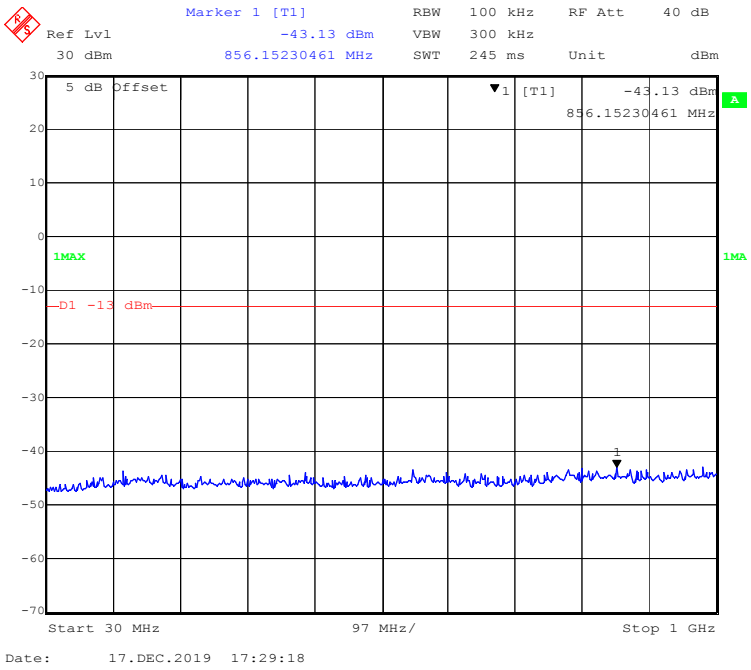



## 1 GHz – 20 GHz (10 MHz, 16-QAM, Middle Channel)

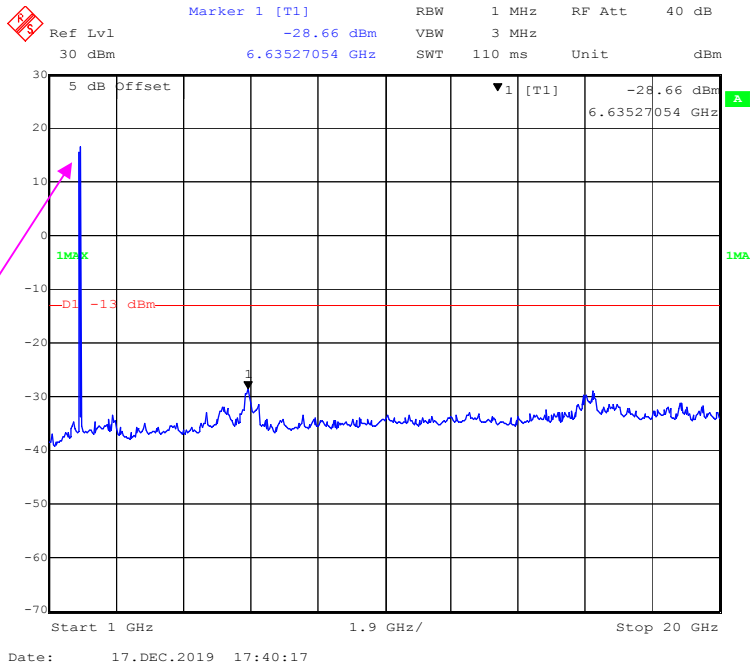



Fundamental

## 30 MHz - 1 GHz (15 MHz, QPSK, Middle Channel)

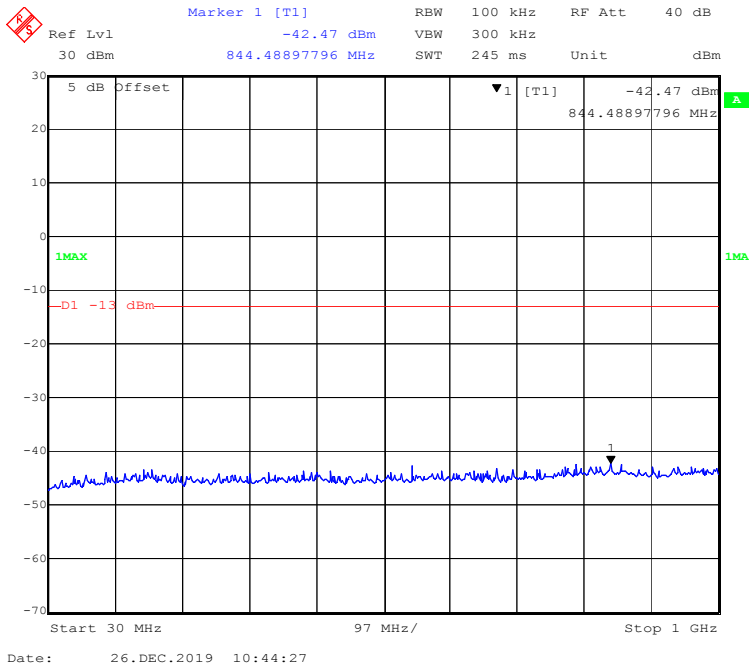



## 1 GHz – 20 GHz (15 MHz, QPSK, Middle Channel)

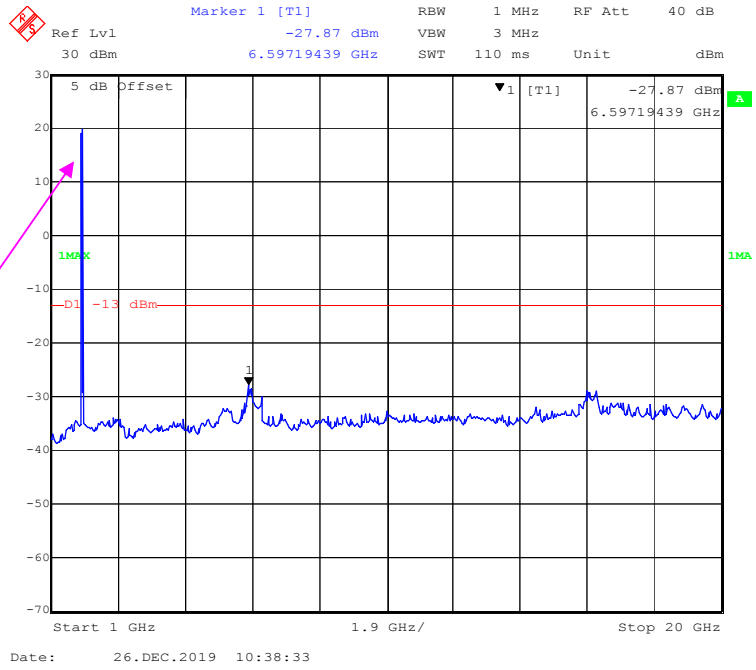



Fundamental

## 30 MHz - 1 GHz (15 MHz, 16-QAM, Middle Channel)

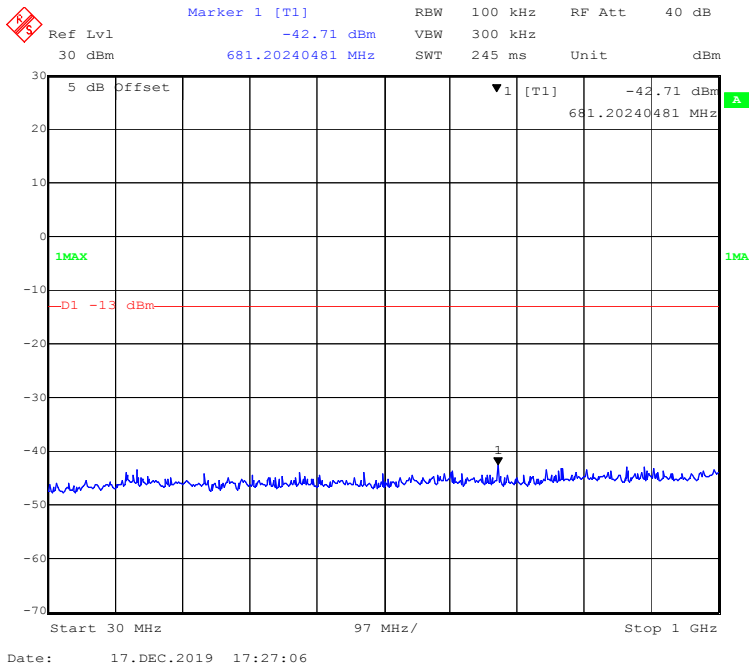



## 1 GHz – 20 GHz (15 MHz, 16-QAM, Middle Channel)

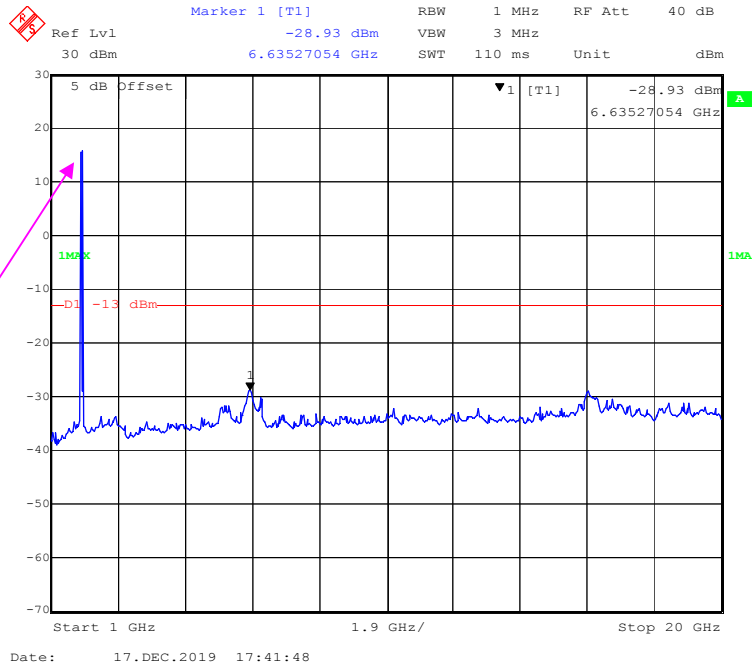



Fundamental

## 30 MHz - 1 GHz (20 MHz, QPSK, Middle Channel)

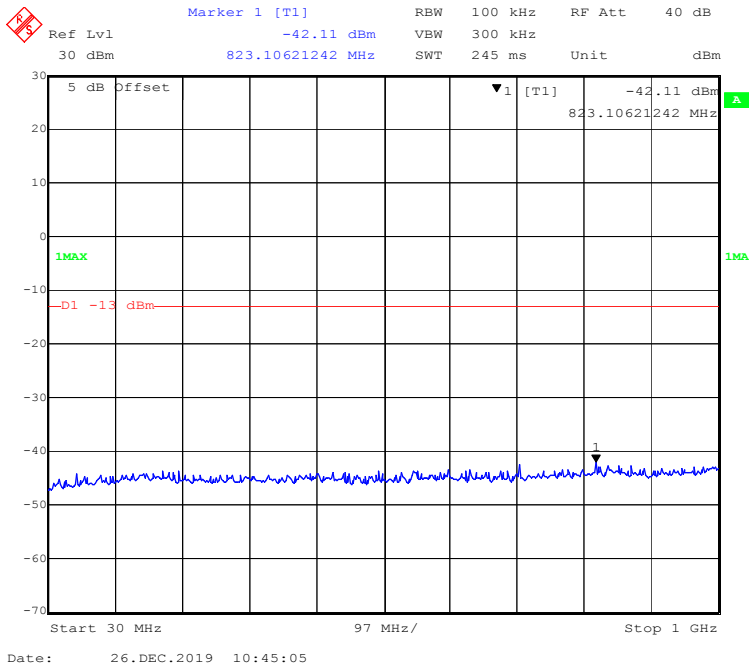



## 1 GHz – 20 GHz (20 MHz, QPSK, Middle Channel)

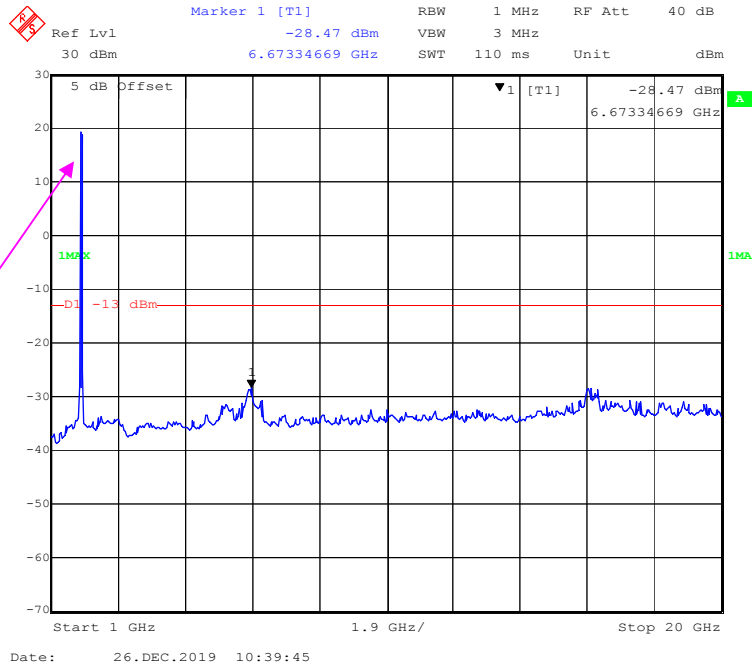



Fundamental

## 30 MHz - 1 GHz (20 MHz, 16-QAM, Middle Channel)



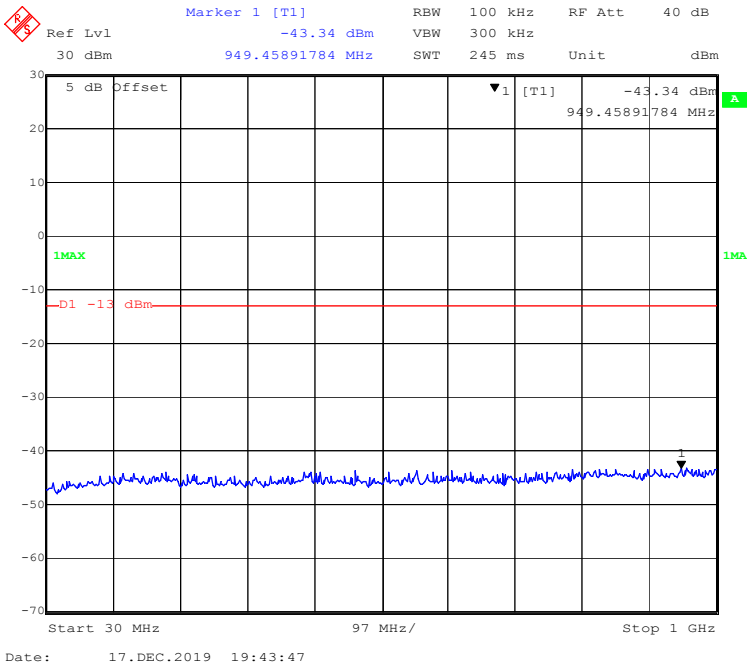

## 1 GHz – 20 GHz (20 MHz, 16-QAM, Middle Channel)



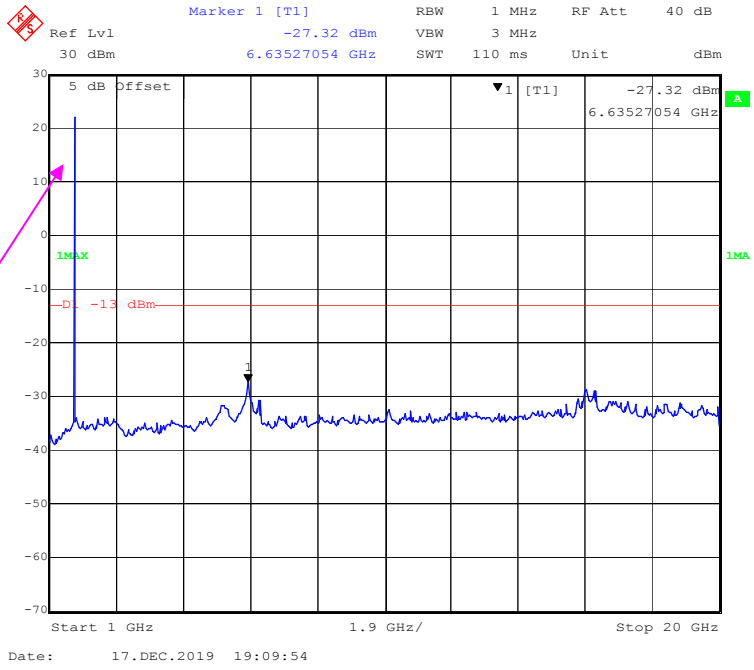

Fundamental

## LTE Band 4:

### 30 MHz - 1 GHz (1.4 MHz, QPSK, Middle Channel)

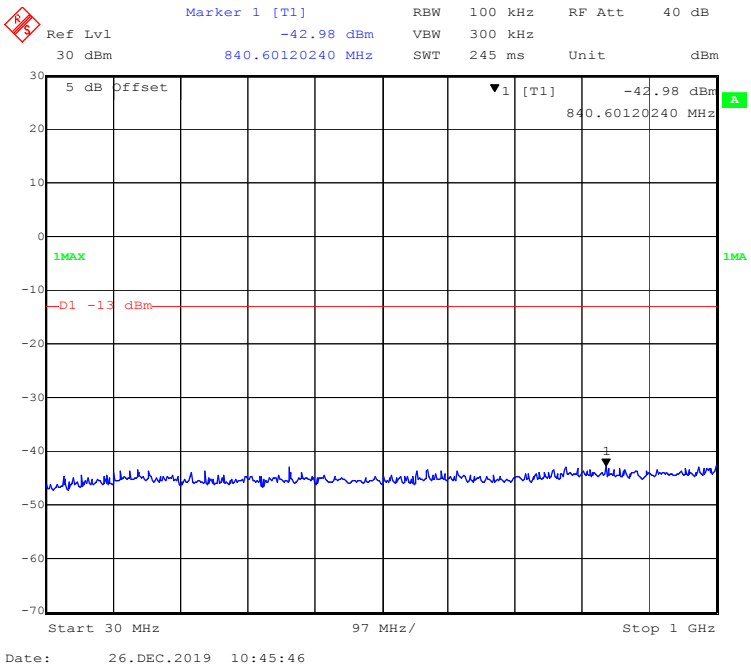



### 1 GHz – 20 GHz (1.4 MHz, QPSK, Middle Channel)

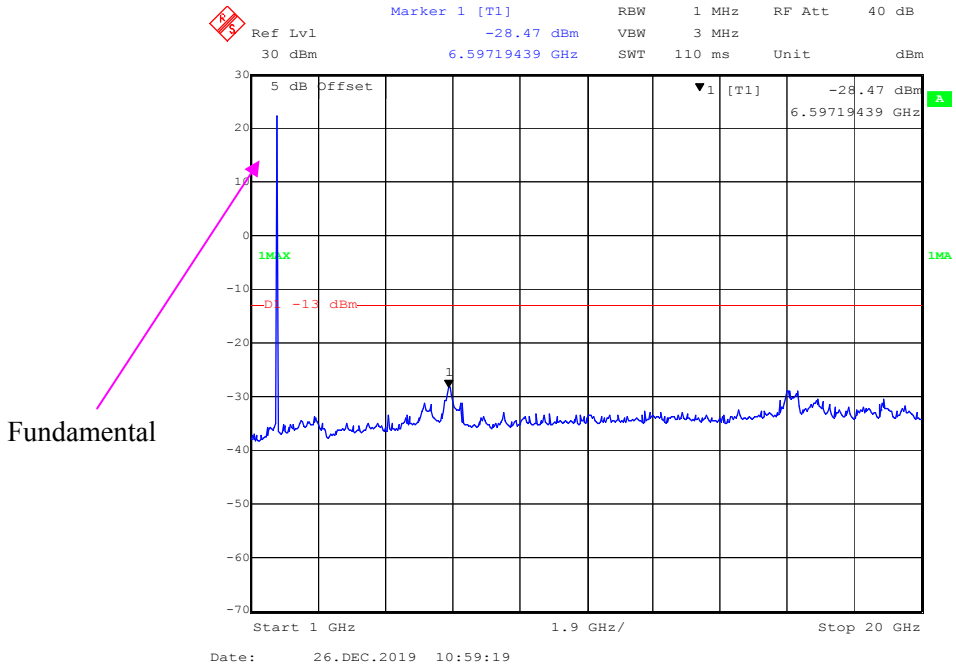



Fundamental

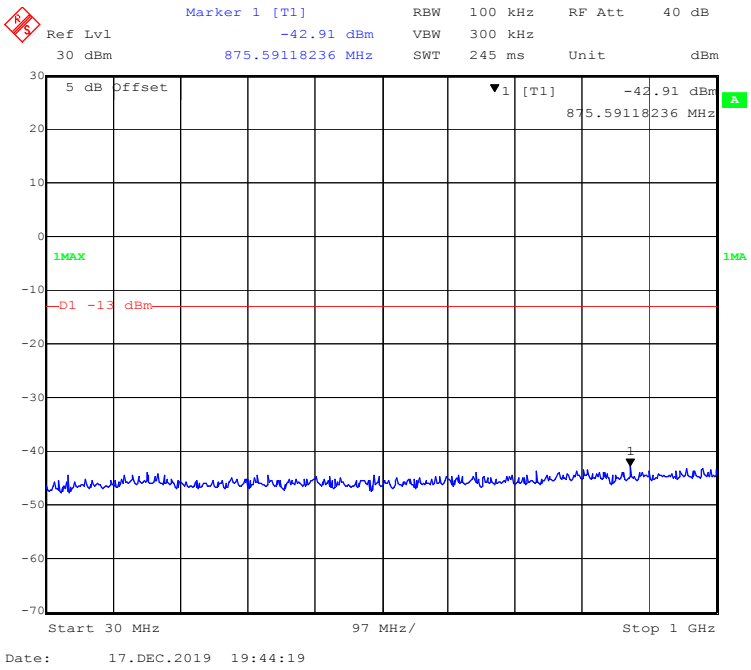
## 30 MHz - 1 GHz (1.4 MHz, 16-QAM, Middle Channel)



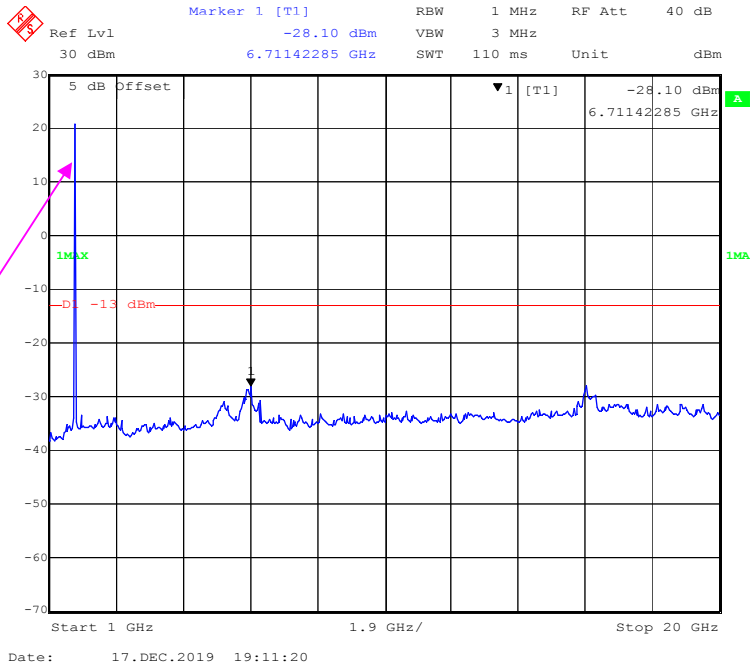

## 1 GHz – 20 GHz (1.4 MHz, 16-QAM, Middle Channel)



## 30 MHz - 1 GHz (3 MHz, QPSK, Middle Channel)

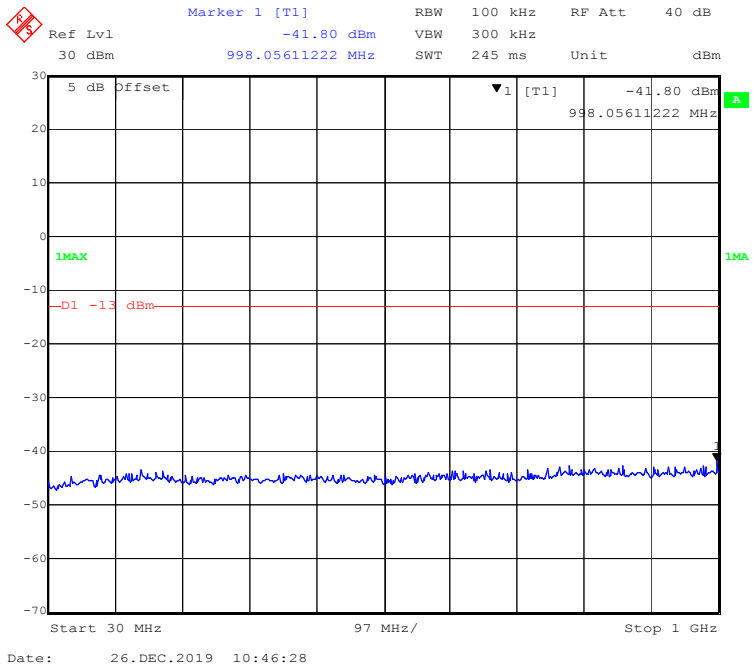



## 1 GHz – 20 GHz (3 MHz, QPSK, Middle Channel)

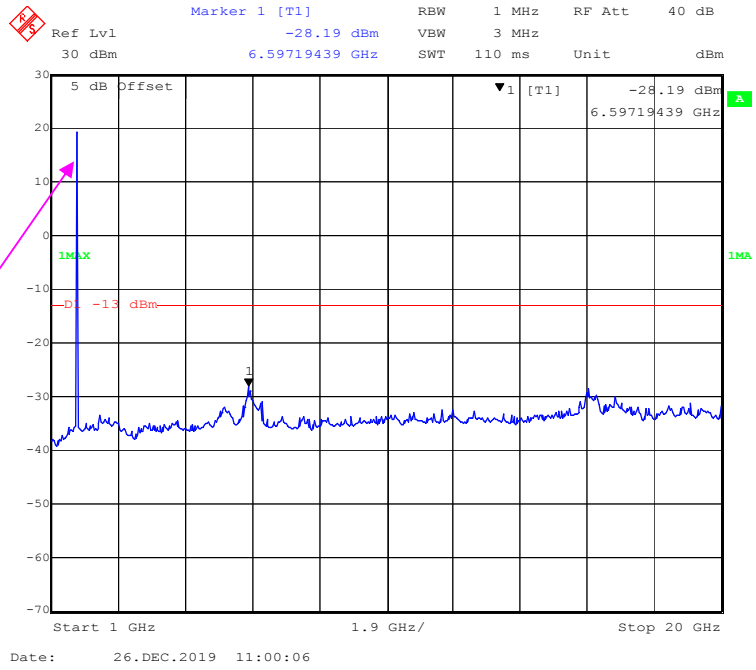



Fundamental

## 30 MHz - 1 GHz (3 MHz, 16-QAM, Middle Channel)

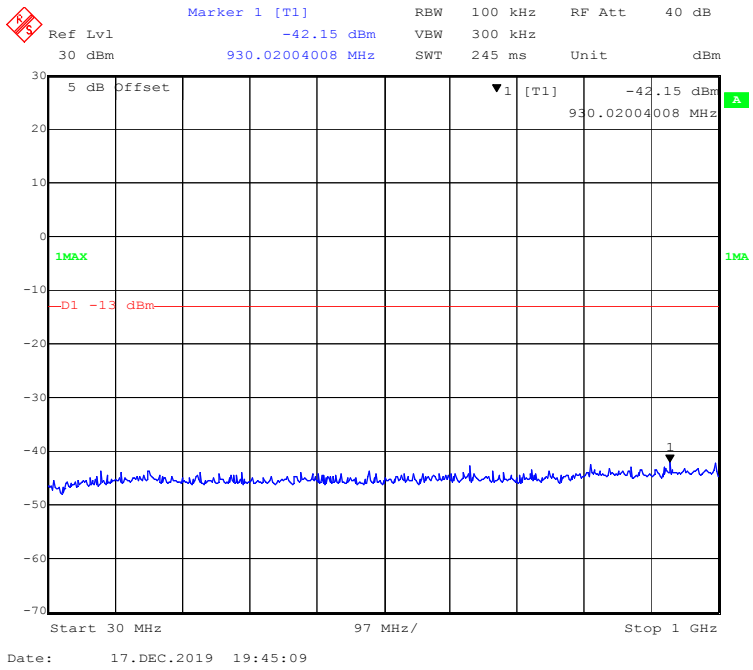



## 1 GHz – 20 GHz (3 MHz, 16-QAM, Middle Channel)

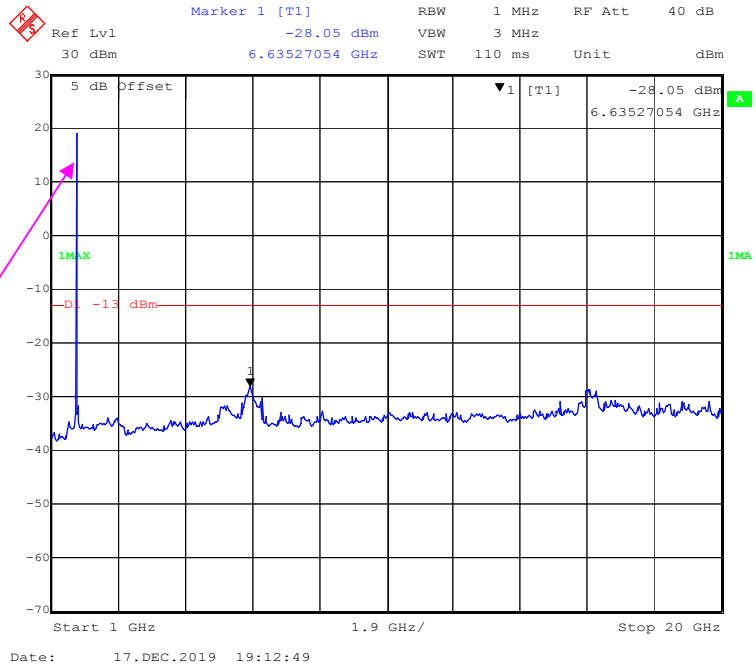



Fundamental

## 30 MHz - 1 GHz (5 MHz, QPSK, Middle Channel)

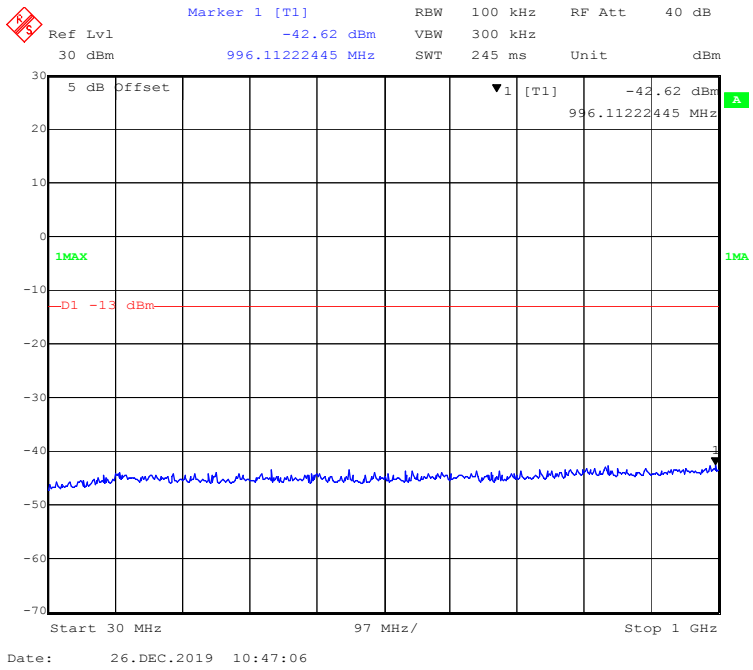



## 1 GHz – 20 GHz (5 MHz, QPSK, Middle Channel)

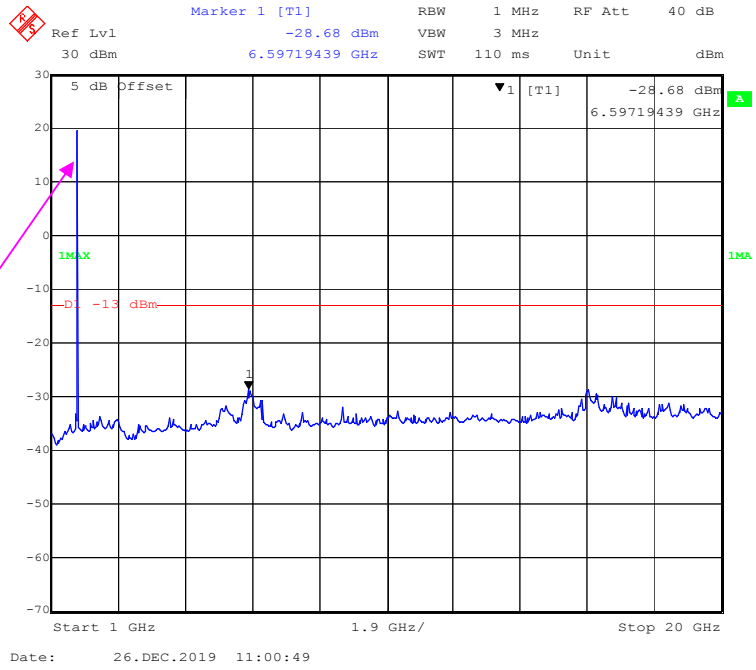



Fundamental

## 30 MHz - 1 GHz (5 MHz, 16-QAM, Middle Channel)

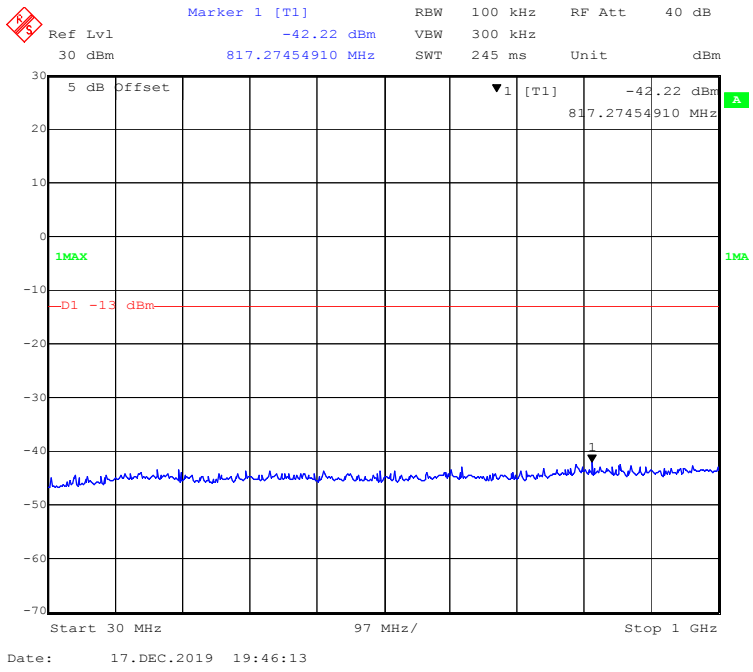



## 1 GHz – 20 GHz (5 MHz, 16-QAM, Middle Channel)

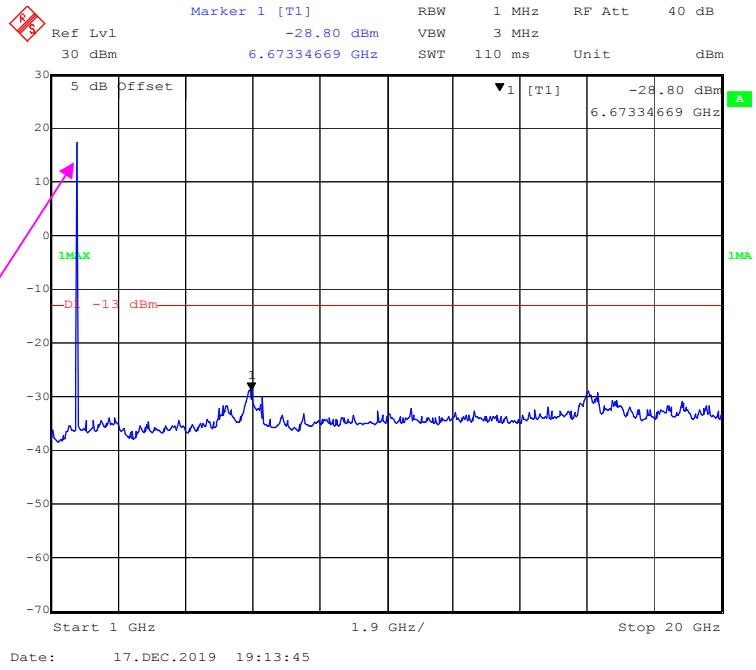



Fundamental

## 30 MHz - 1 GHz (10 MHz, QPSK, Middle Channel)

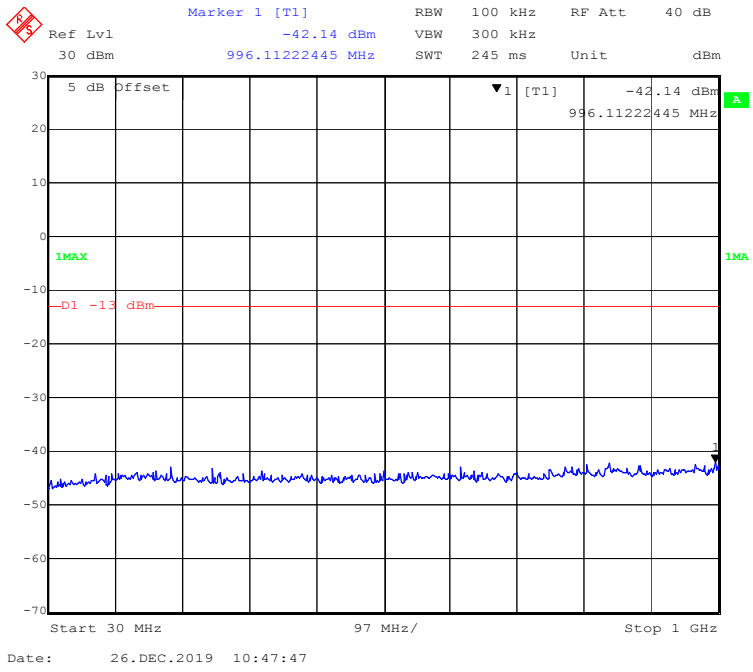



## 1 GHz – 20 GHz (10 MHz, QPSK, Middle Channel)

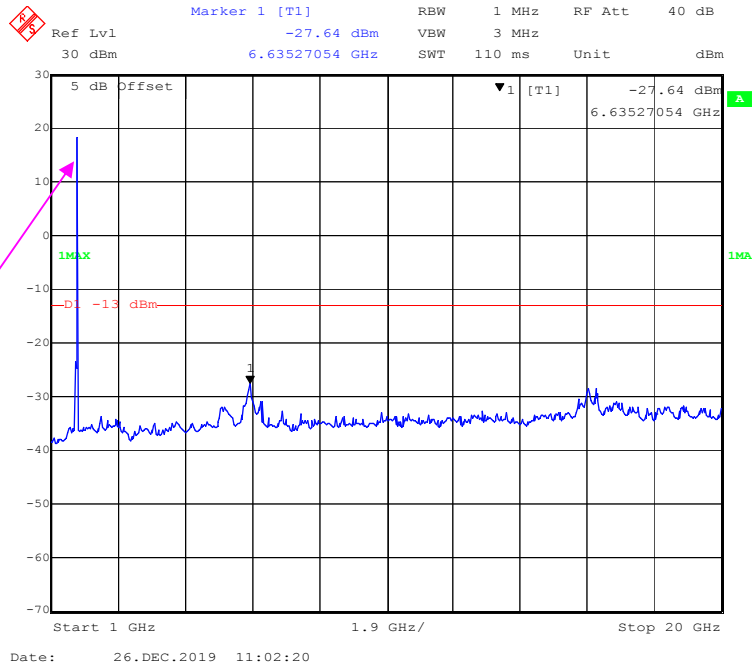



Fundamental

## 30 MHz - 1 GHz (10 MHz, 16-QAM, Middle Channel)

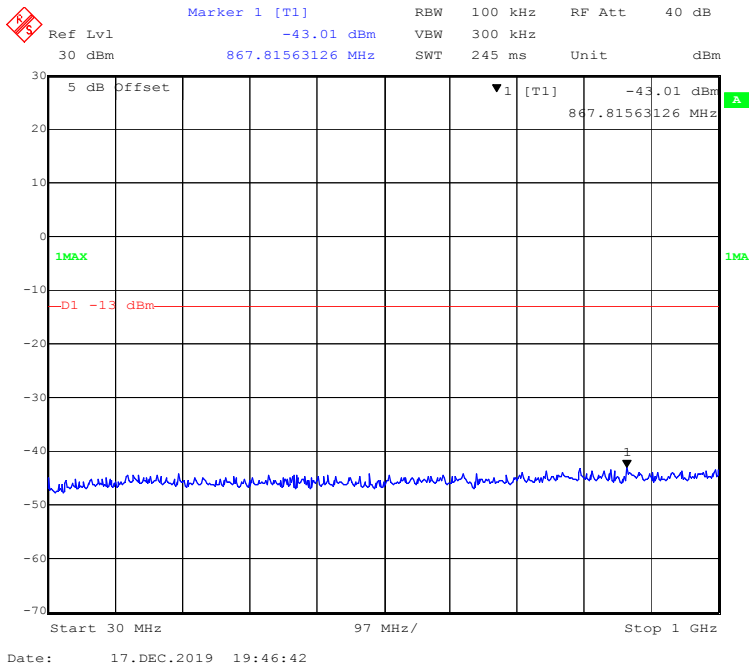



## 1 GHz – 20 GHz (10 MHz, 16-QAM, Middle Channel)

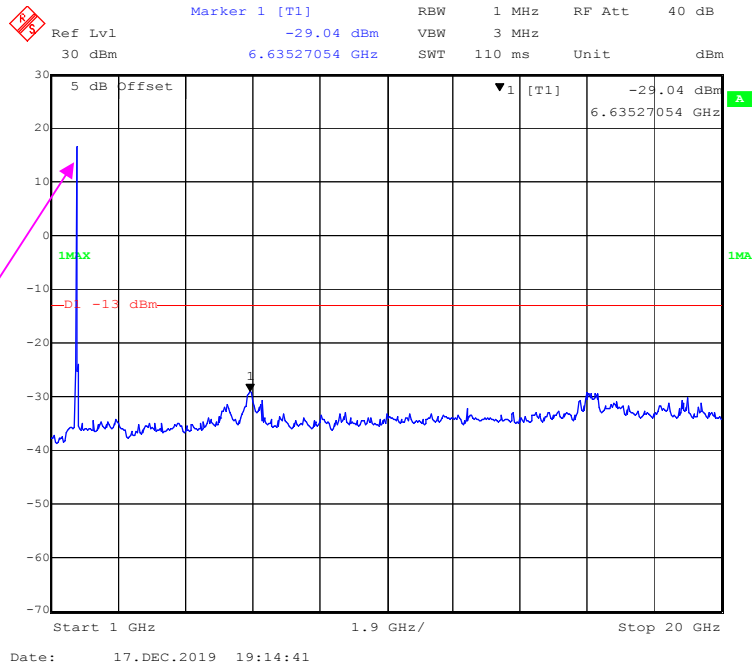



Fundamental

## 30 MHz - 1 GHz (15 MHz, QPSK, Middle Channel)

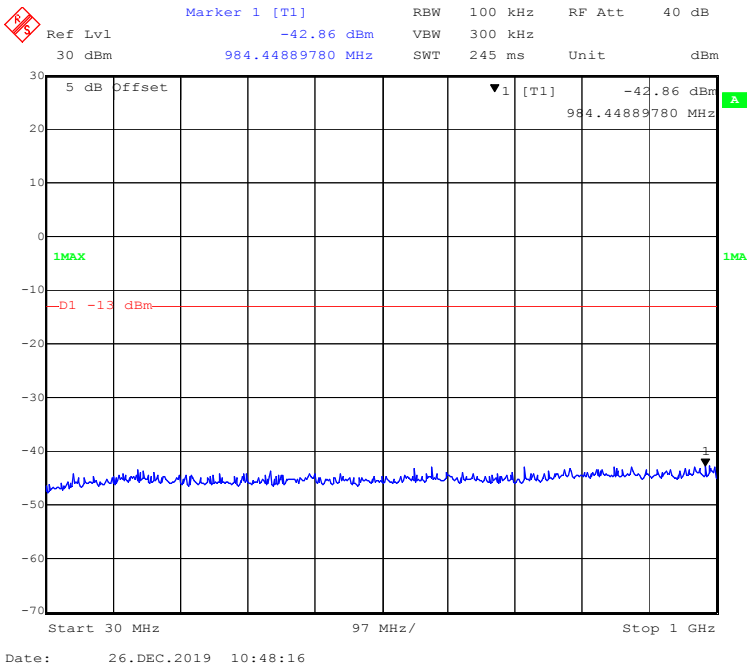



## 1 GHz – 20 GHz (15 MHz, QPSK, Middle Channel)

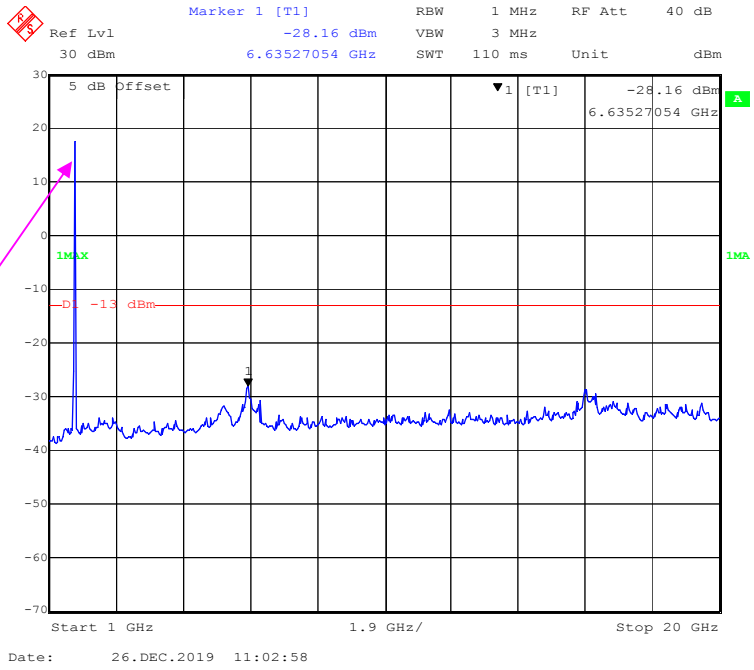



Fundamental

## 30 MHz - 1 GHz (15 MHz, 16-QAM, Middle Channel)

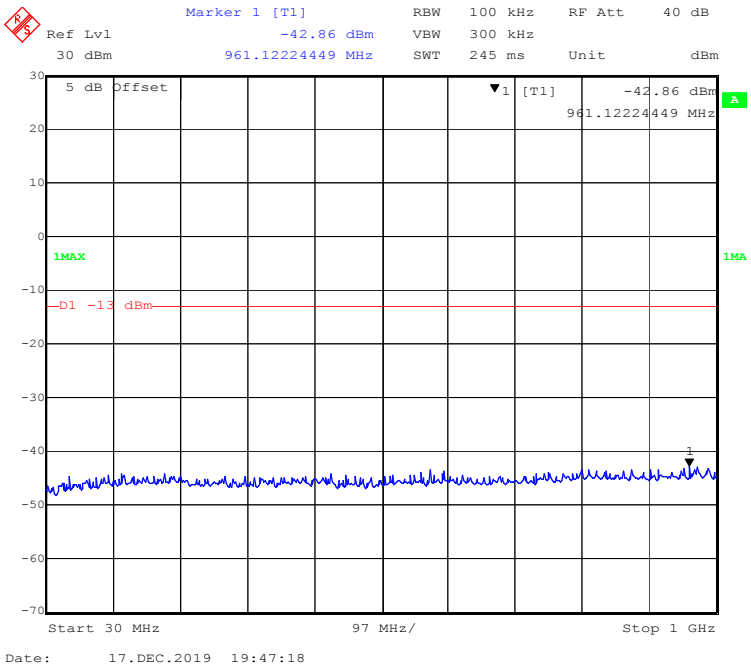



## 1 GHz – 20 GHz (15 MHz, 16-QAM, Middle Channel)

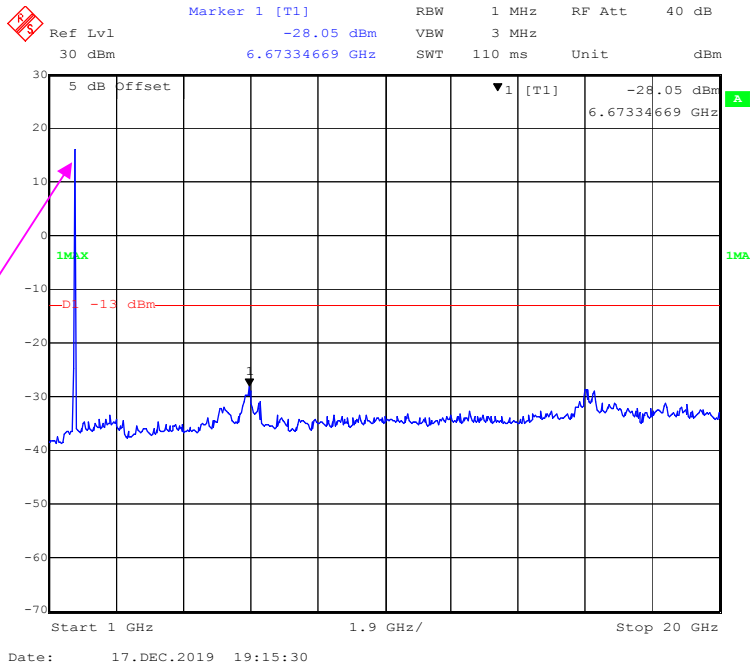



Fundamental

## 30 MHz - 1 GHz (20 MHz, QPSK, Middle Channel)

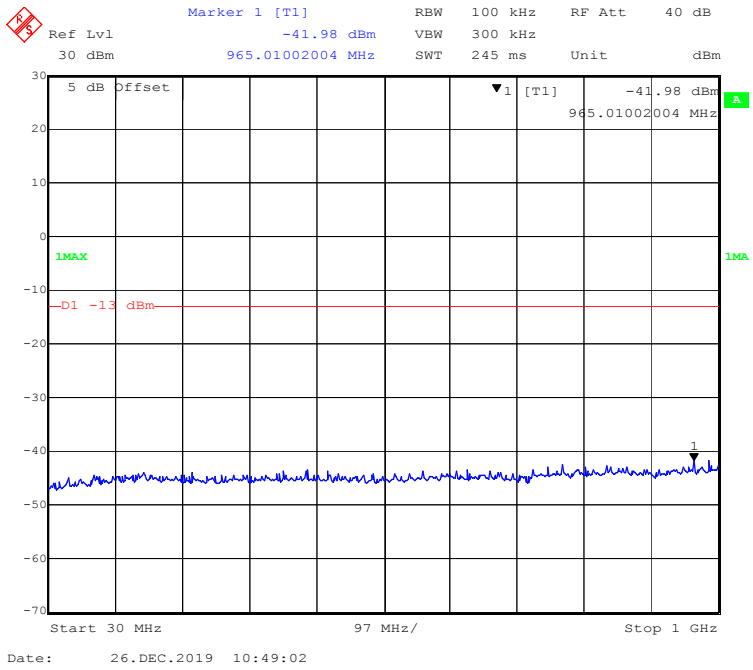



## 1 GHz – 20 GHz (20 MHz, QPSK, Middle Channel)

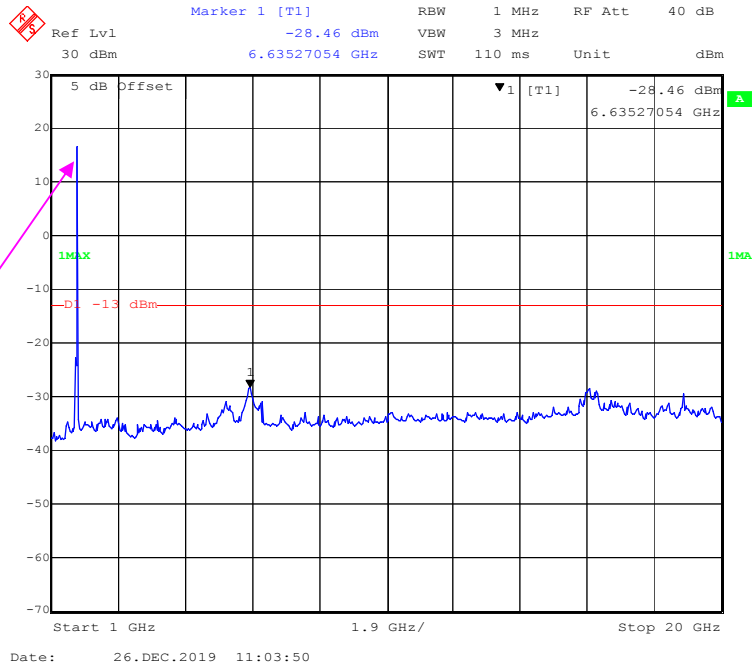



Fundamental

## 30 MHz - 1 GHz (20 MHz, 16-QAM, Middle Channel)



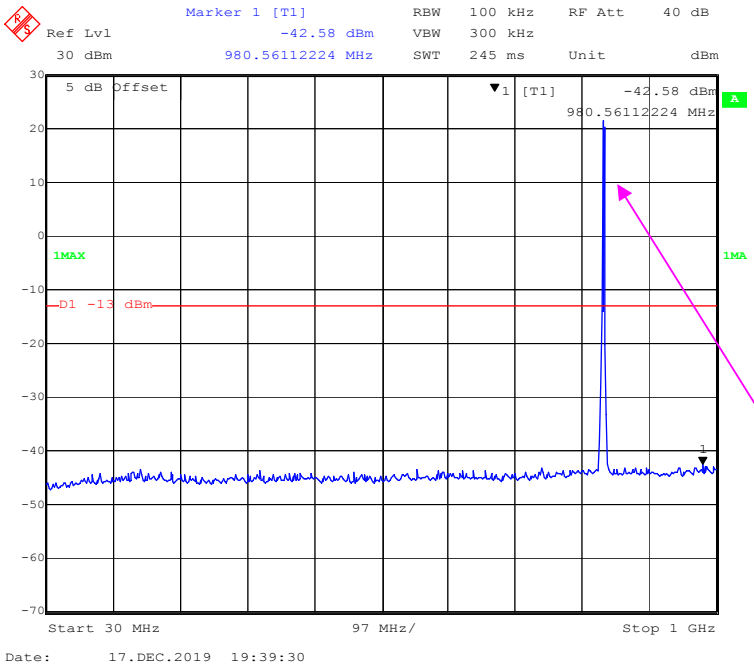

## 1 GHz – 20 GHz (20 MHz, 16-QAM, Middle Channel)



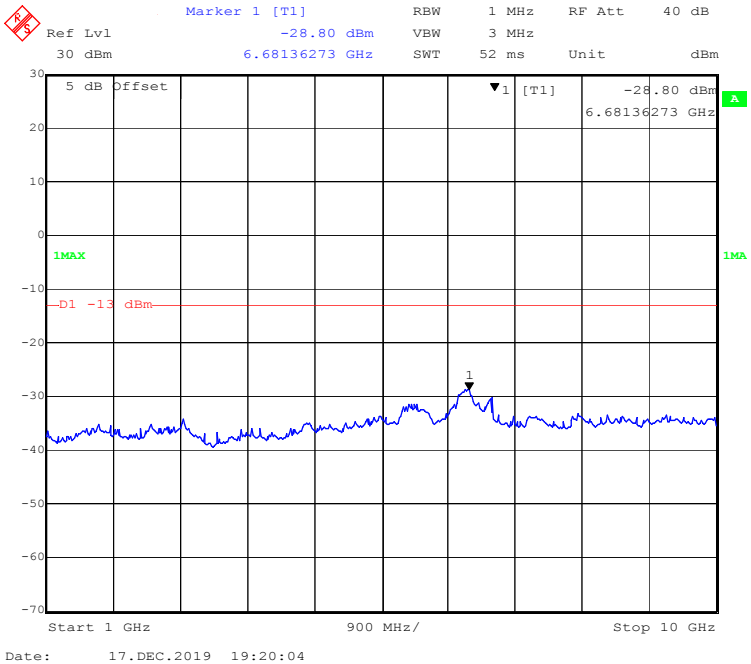

Fundamental

## LTE Band 5:

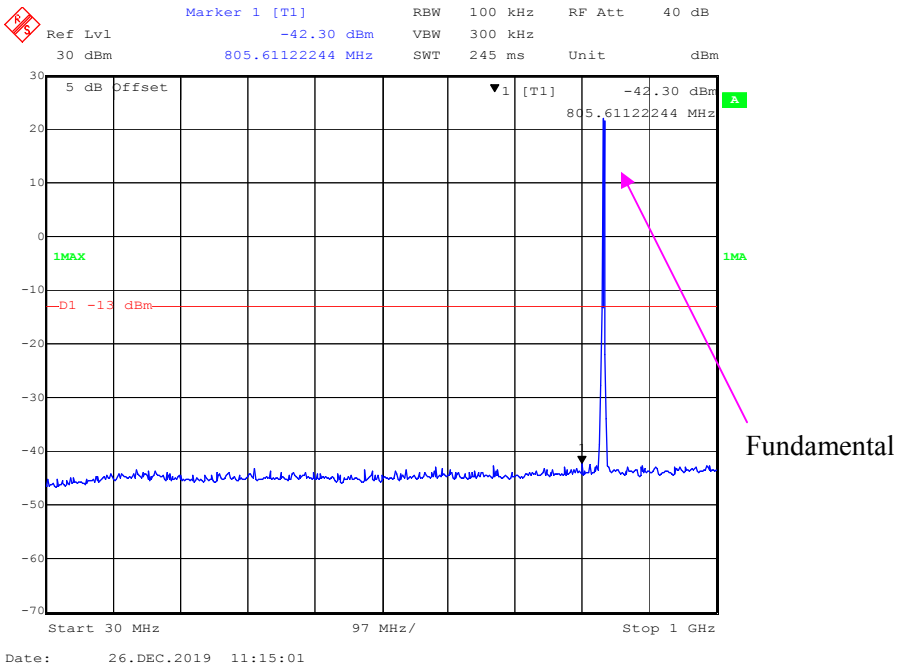
### 30 MHz - 1 GHz (1.4 MHz, QPSK, Middle Channel)




### 1 GHz – 10 GHz (1.4 MHz, QPSK, Middle Channel)

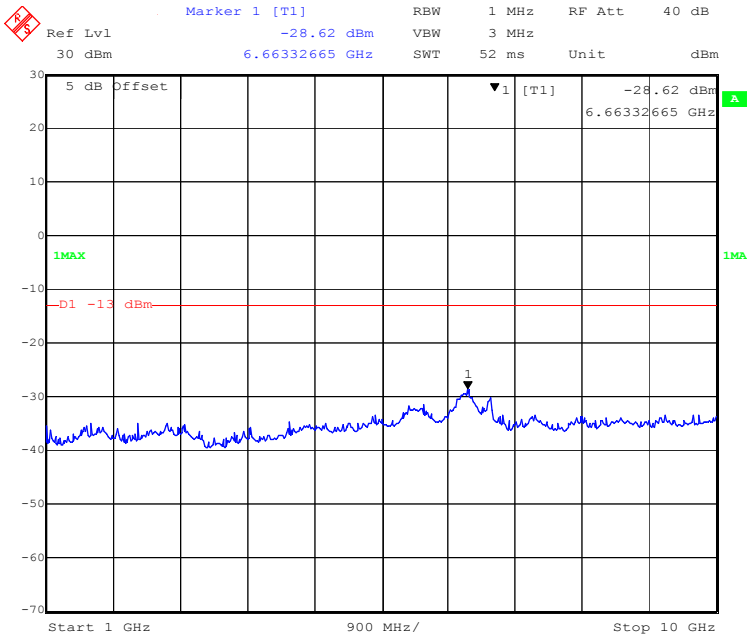


## 30 MHz - 1 GHz (1.4 MHz, 16-QAM, Middle Channel)



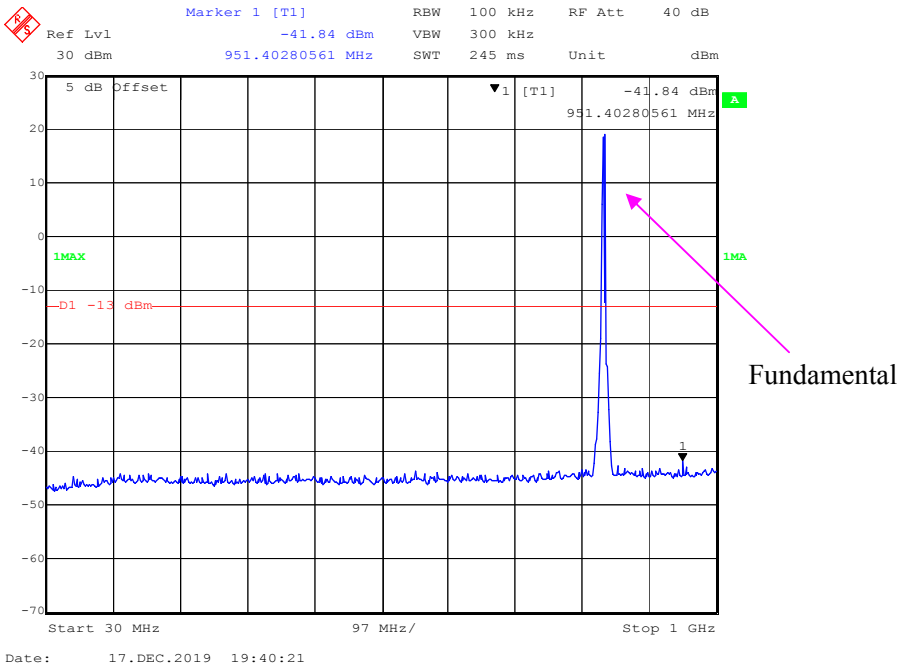

Date: 26.DEC.2019 11:15:01

## 1 GHz – 10 GHz (1.4 MHz, 16-QAM, Middle Channel)



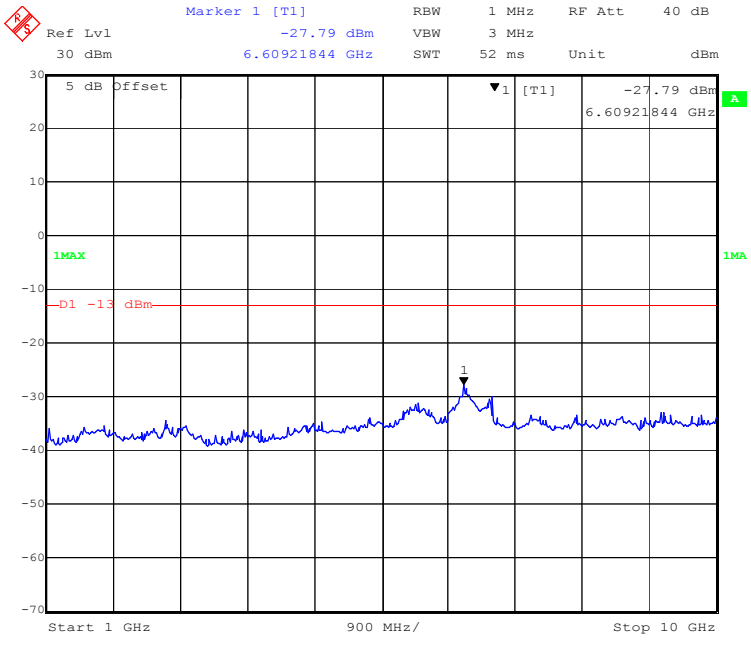

Date: 26.DEC.2019 11:06:12

## 30 MHz - 1 GHz (3 MHz, QPSK, Middle Channel)



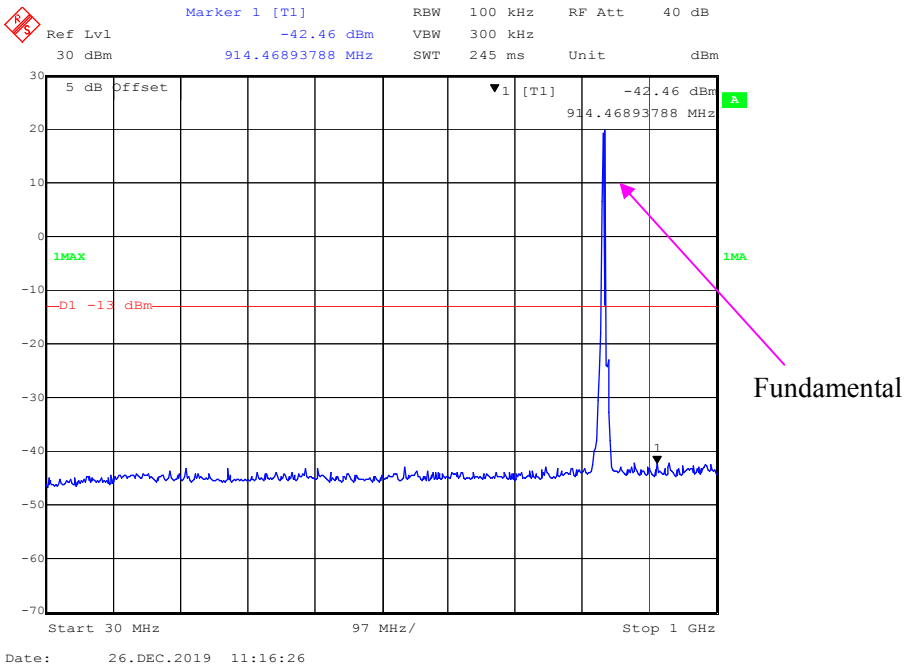

Date: 17.DEC.2019 19:40:21

## 1 GHz – 10 GHz (3 MHz, QPSK, Middle Channel)



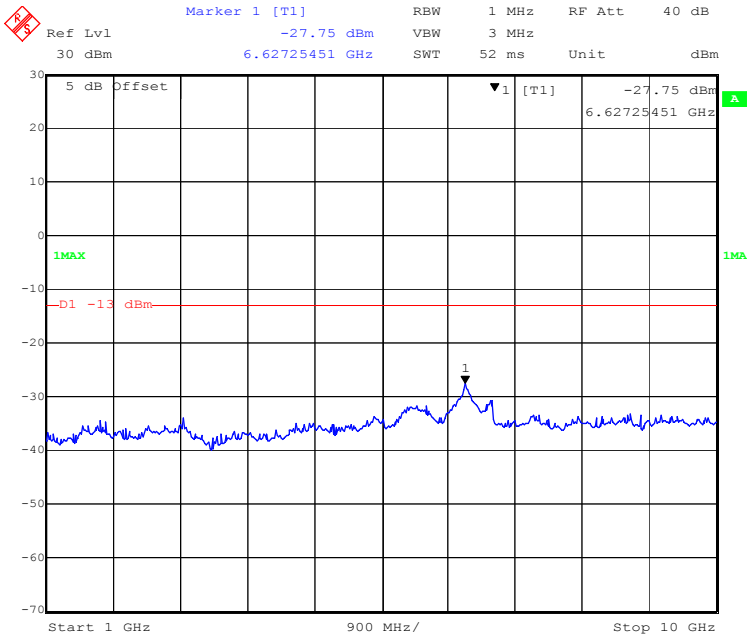

Date: 17.DEC.2019 19:21:12

## 30 MHz - 1 GHz (3 MHz, 16-QAM, Middle Channel)



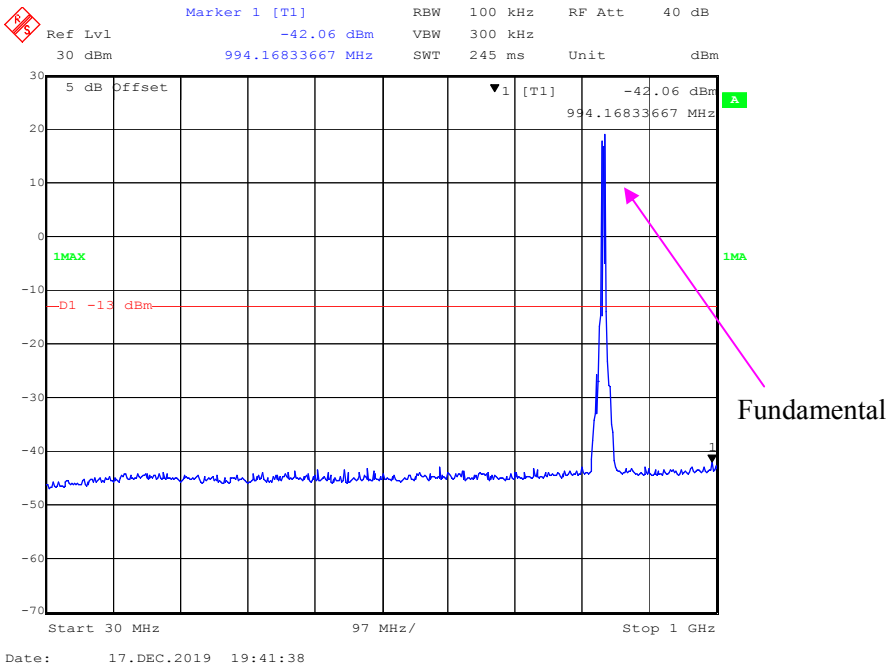

Date: 26.DEC.2019 11:16:26

## 1 GHz – 10 GHz (3 MHz, 16-QAM, Middle Channel)

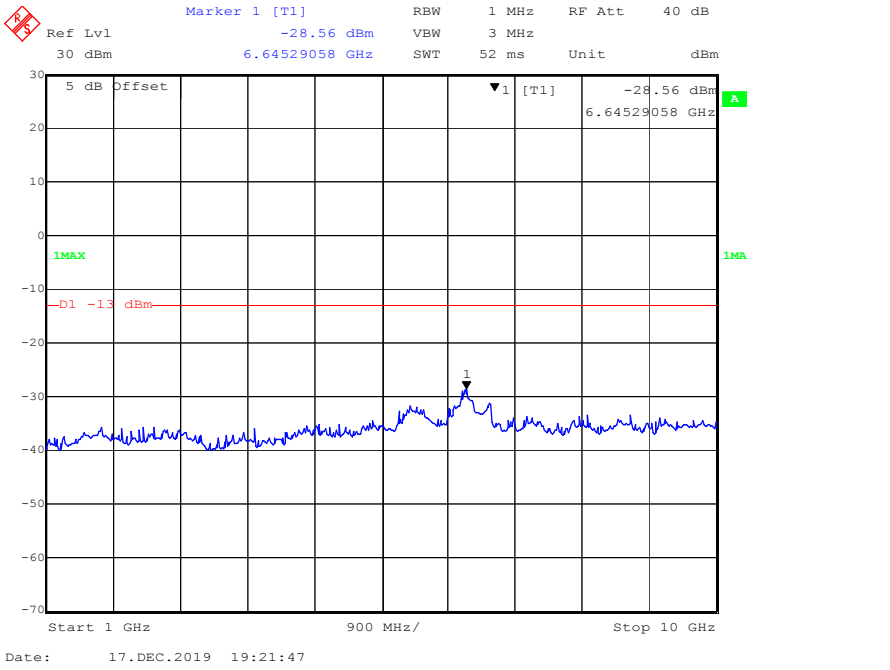



Date: 26.DEC.2019 11:07:10

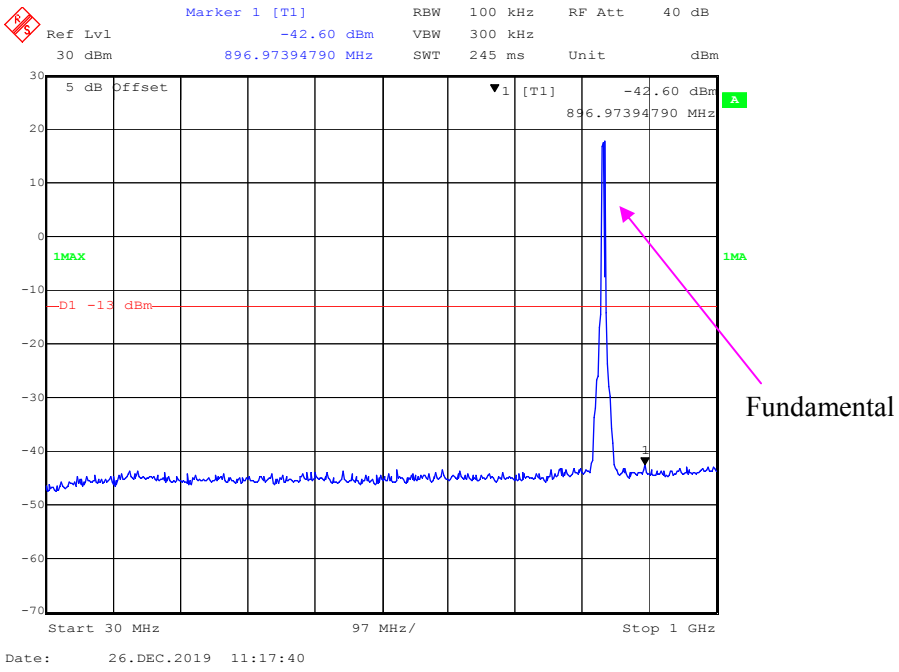
## 30 MHz - 1 GHz (5 MHz, QPSK, Middle Channel)




## 1 GHz – 10 GHz (5 MHz, QPSK, Middle Channel)

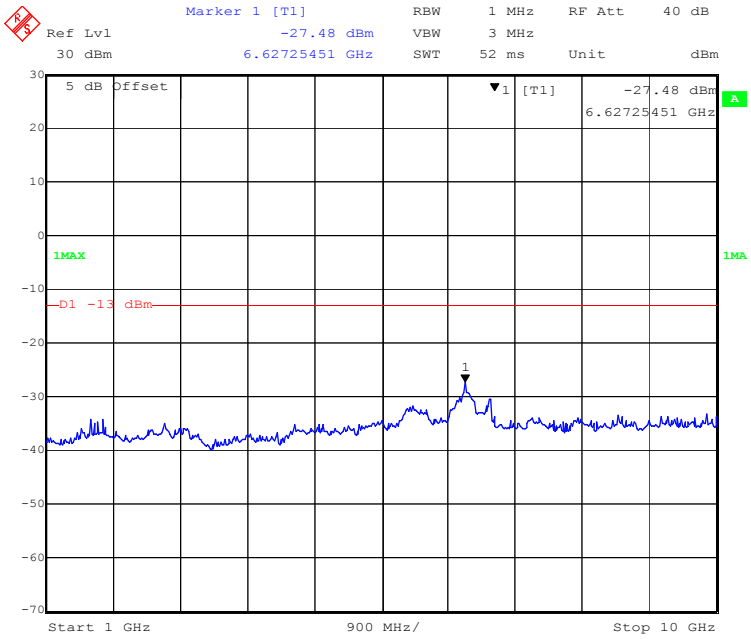


## 30 MHz - 1 GHz (5 MHz, 16-QAM, Middle Channel)



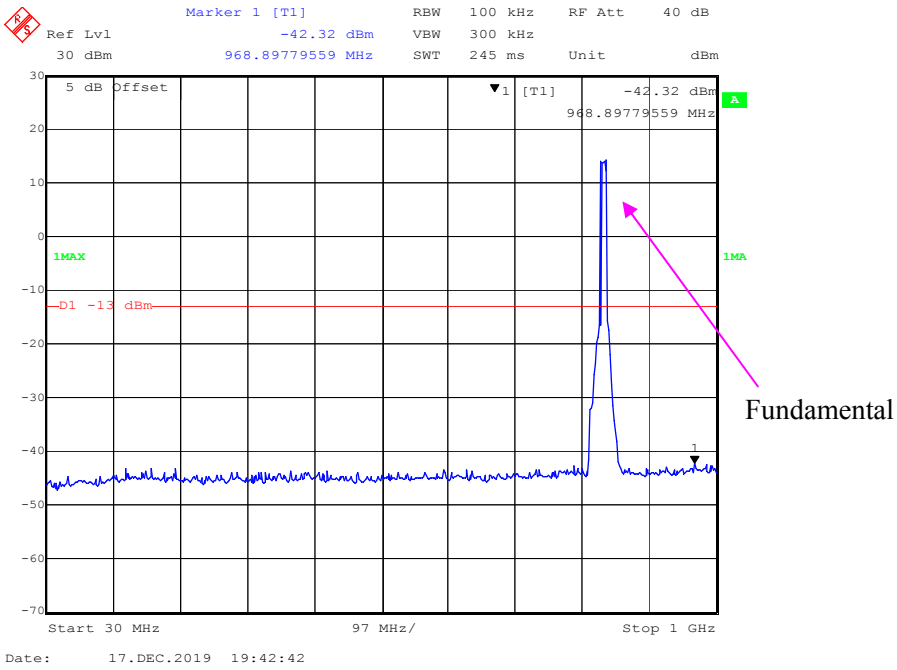

Date: 26.DEC.2019 11:17:40

## 1 GHz – 10 GHz (5 MHz, 16-QAM, Middle Channel)

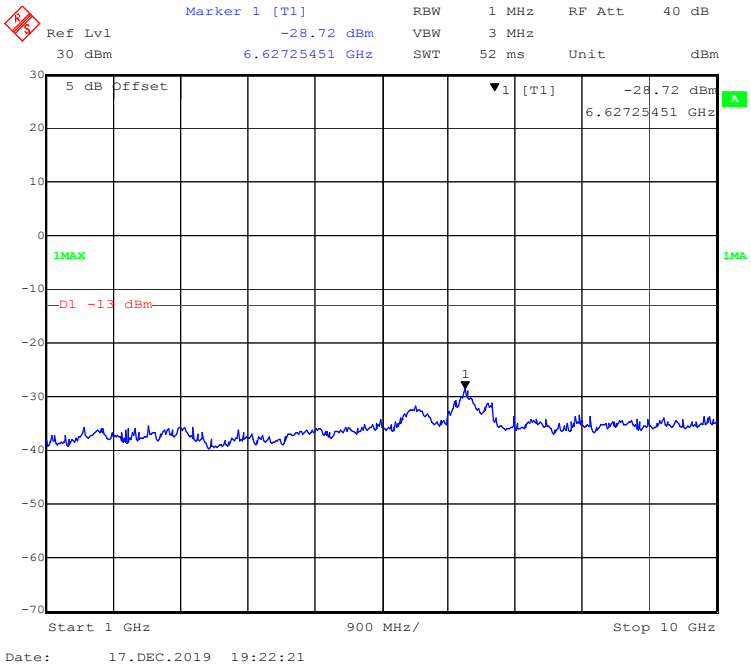



Date: 26.DEC.2019 11:07:35

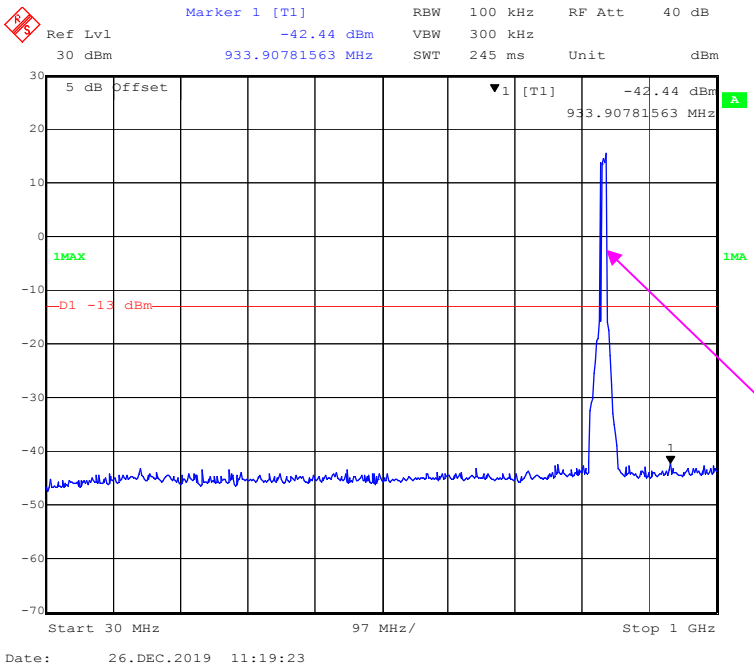
## 30 MHz - 1 GHz (10 MHz, QPSK, Middle Channel)



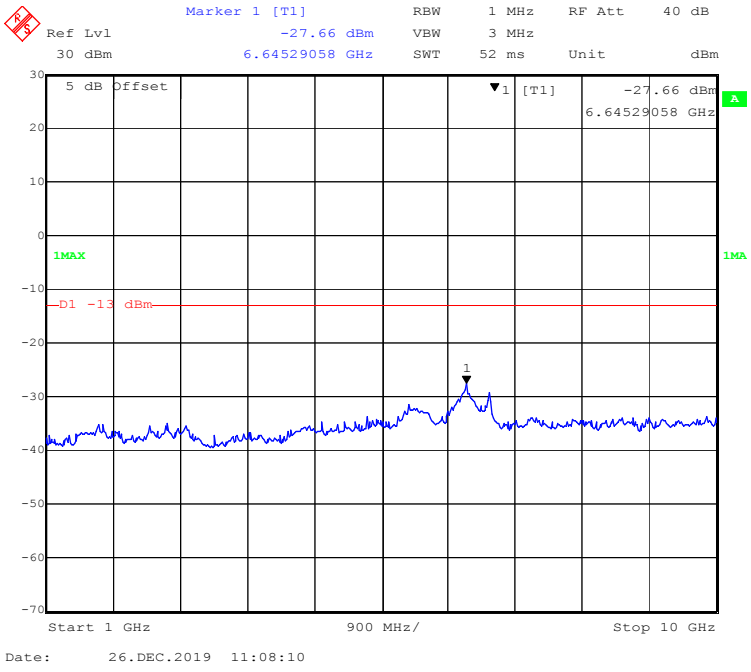

## 1 GHz – 10 GHz (10 MHz, QPSK, Middle Channel)



## 30 MHz - 1 GHz (10 MHz, 16-QAM, Middle Channel)

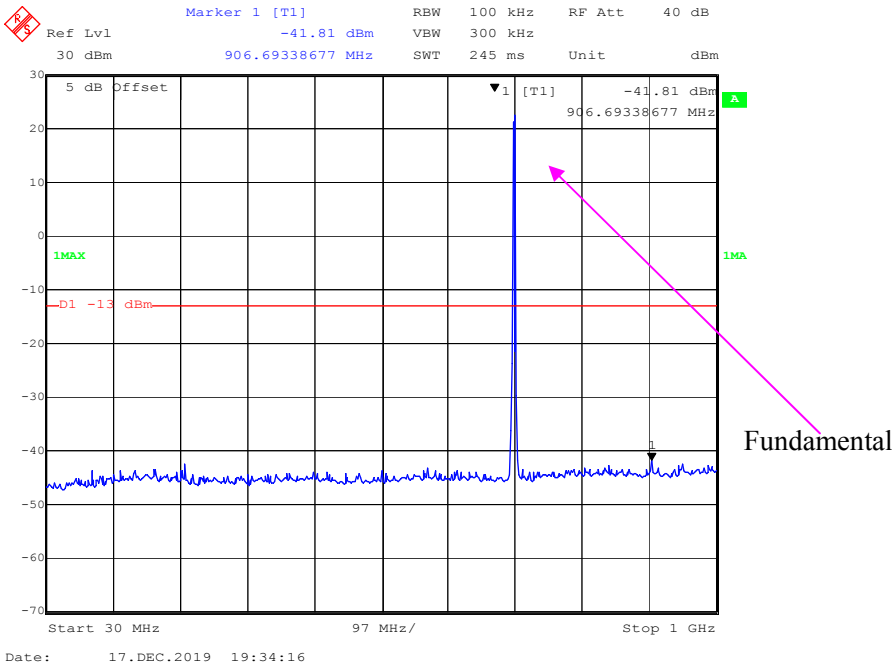



## 1 GHz – 10 GHz (10 MHz, 16-QAM, Middle Channel)

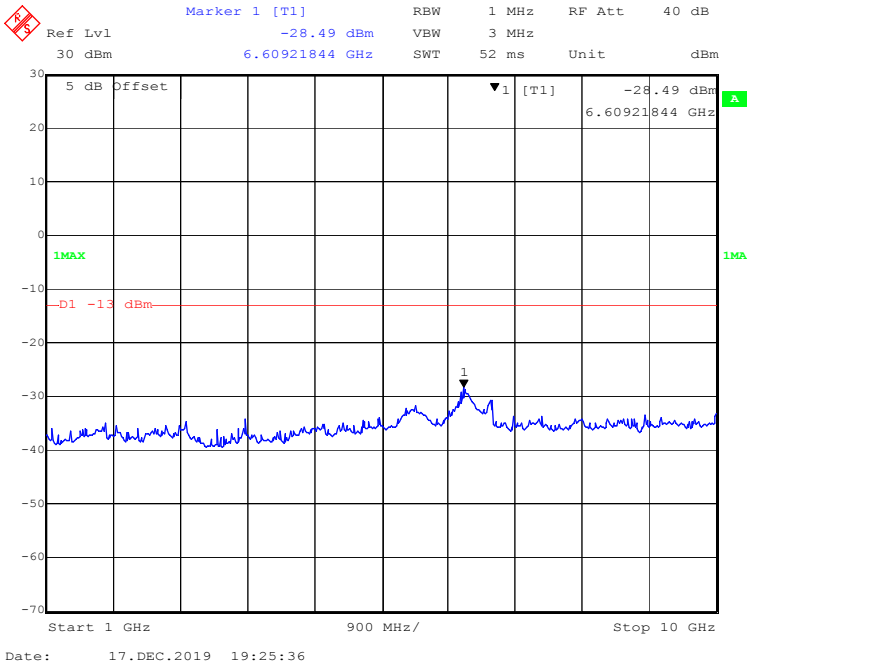


## LTE Band 12:

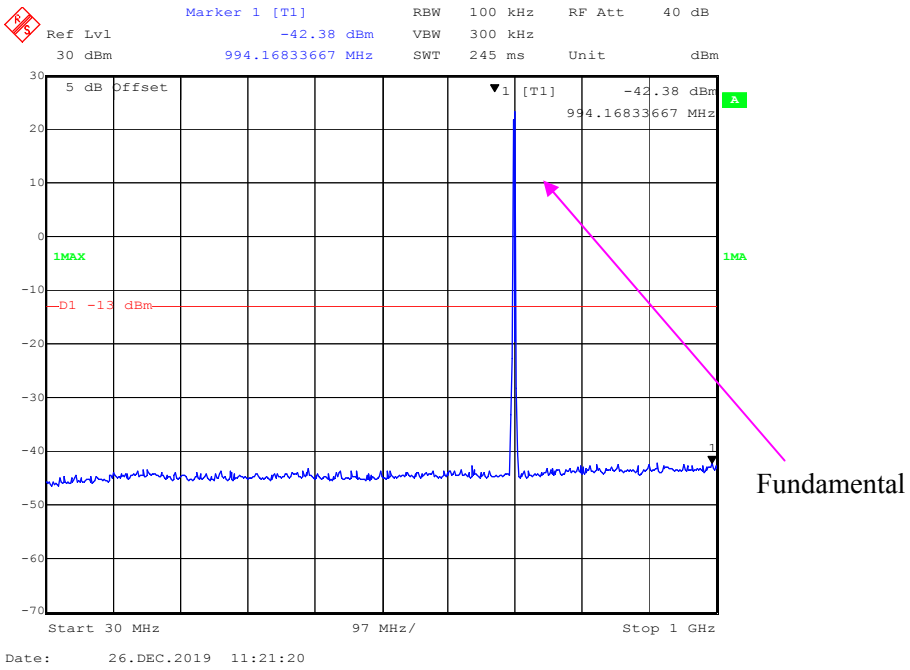
### 30 MHz - 1 GHz (1.4 MHz, QPSK, Middle Channel)




### 1 GHz – 10 GHz (1.4 MHz, QPSK, Middle Channel)



## 30 MHz - 1 GHz (1.4 MHz, 16-QAM, Middle Channel)

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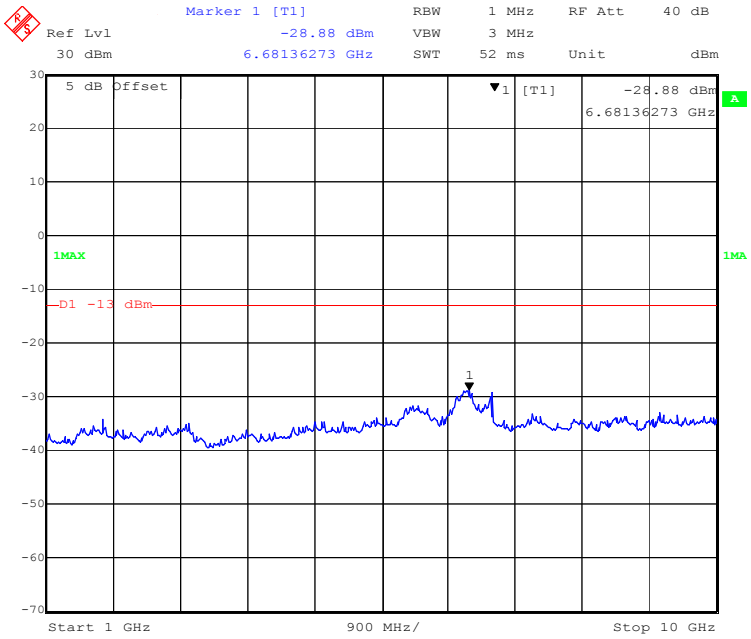
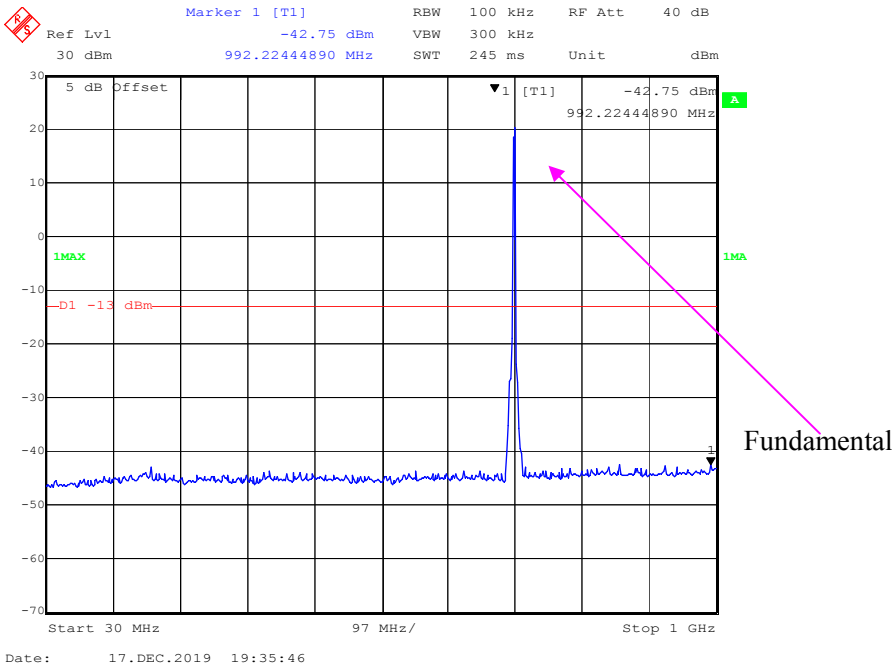
## 1 GHz – 10 GHz (1.4 MHz, 16-QAM, Middle Channel)



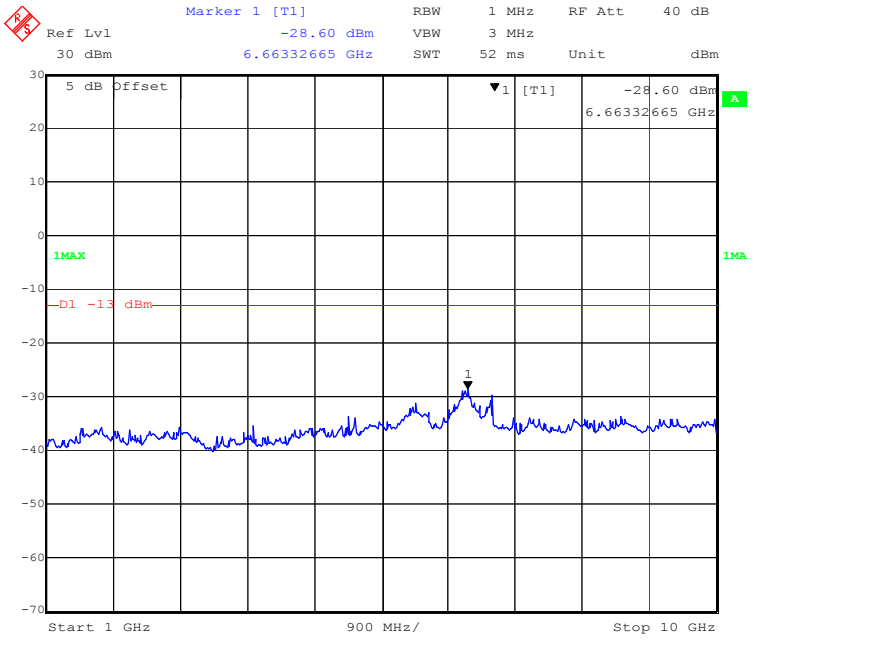

Date: 26.DEC.2019 11:09:23

## 30 MHz - 1 GHz (3 MHz, QPSK, Middle Channel)




Date: 17.DEC.2019 19:35:46

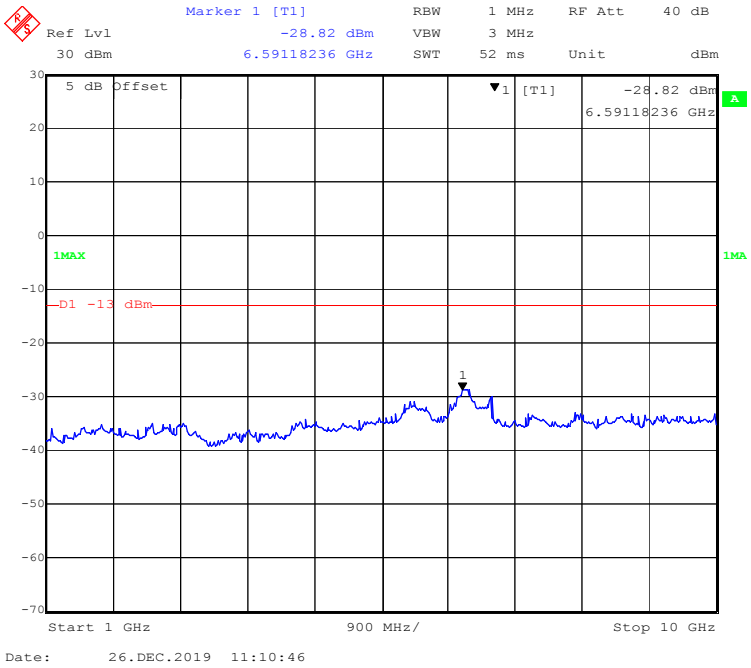
## 1 GHz – 10 GHz (3 MHz, QPSK, Middle Channel)



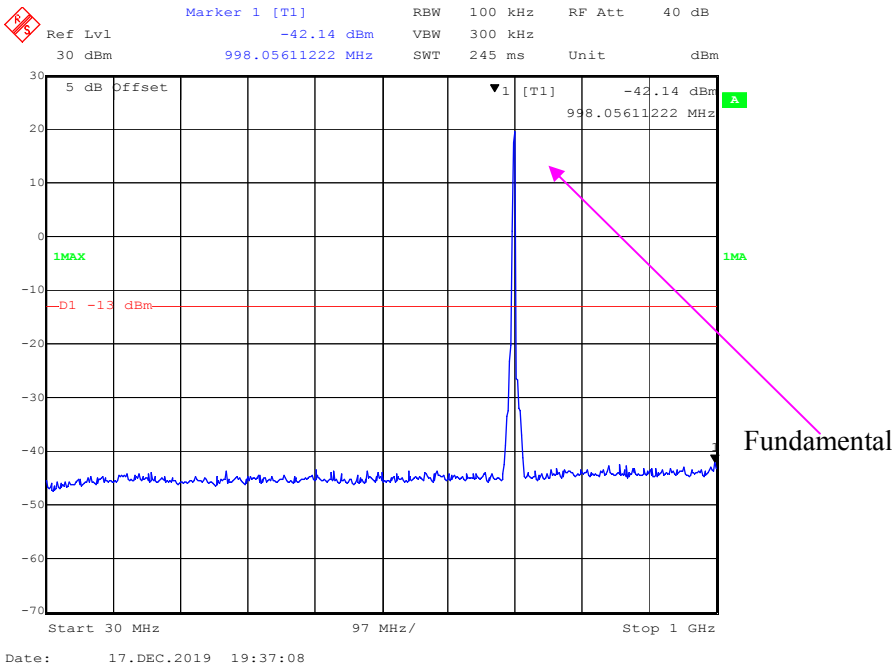

Date: 17.DEC.2019 19:24:53

## 30 MHz - 1 GHz (3 MHz, 16-QAM, Middle Channel)

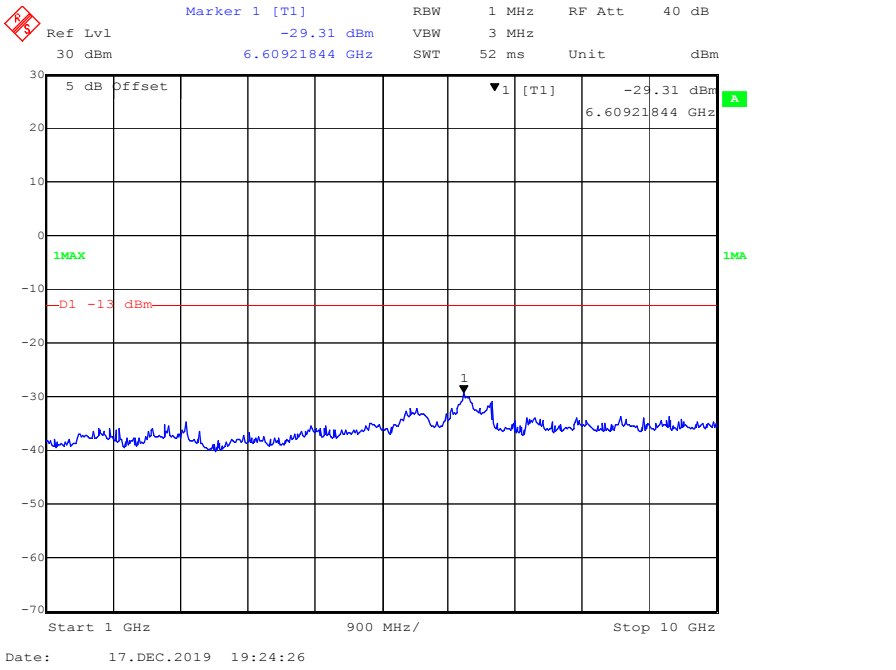

## 1 GHz – 10 GHz (3 MHz, 16-QAM, Middle Channel)



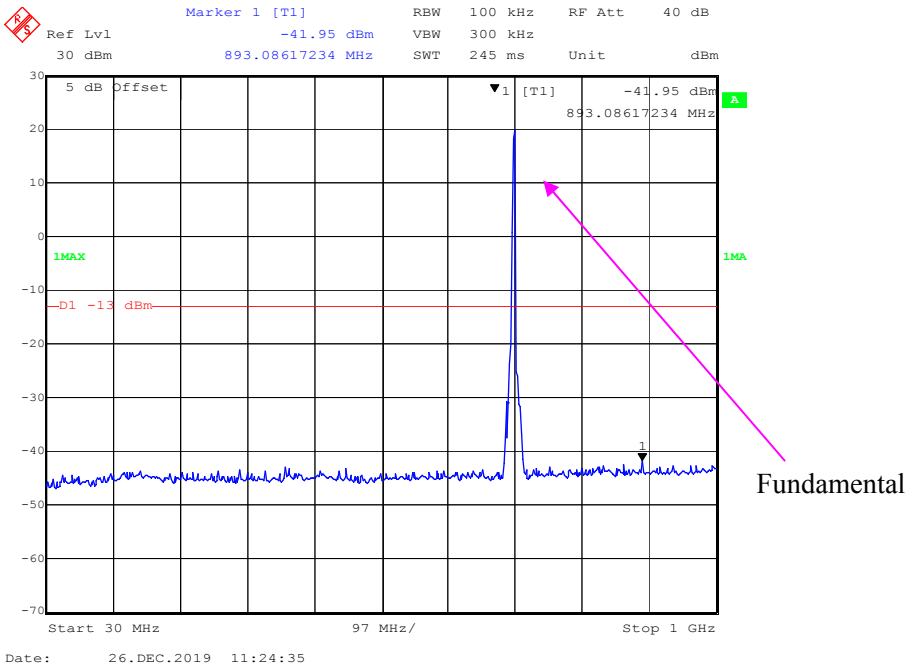
## 30 MHz - 1 GHz (5 MHz, QPSK, Middle Channel)



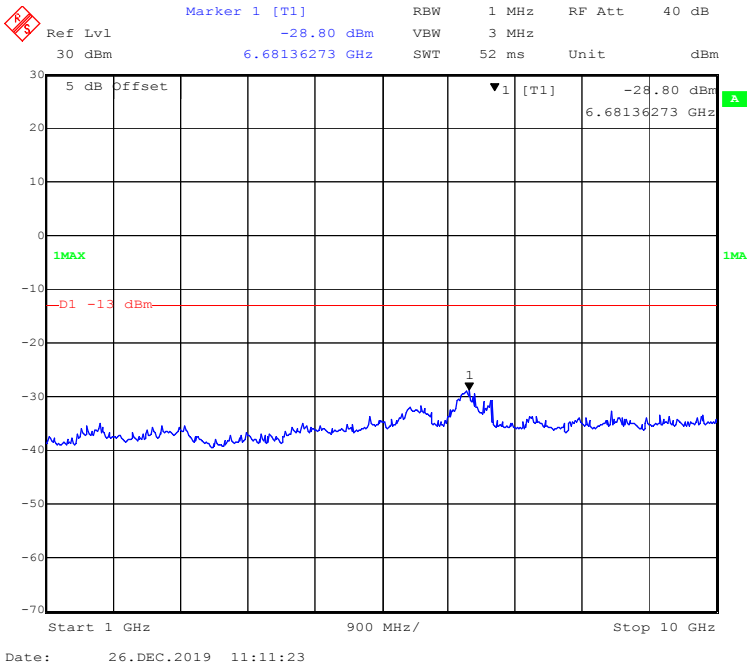

## 1 GHz – 10 GHz (5 MHz, QPSK, Middle Channel)



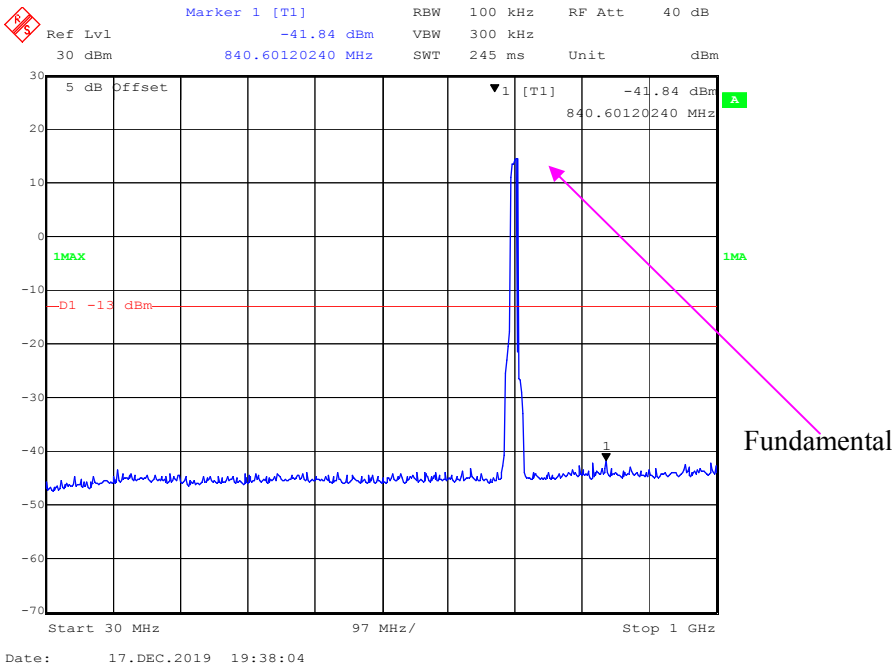
## 30 MHz - 1 GHz (5 MHz, 16-QAM, Middle Channel)



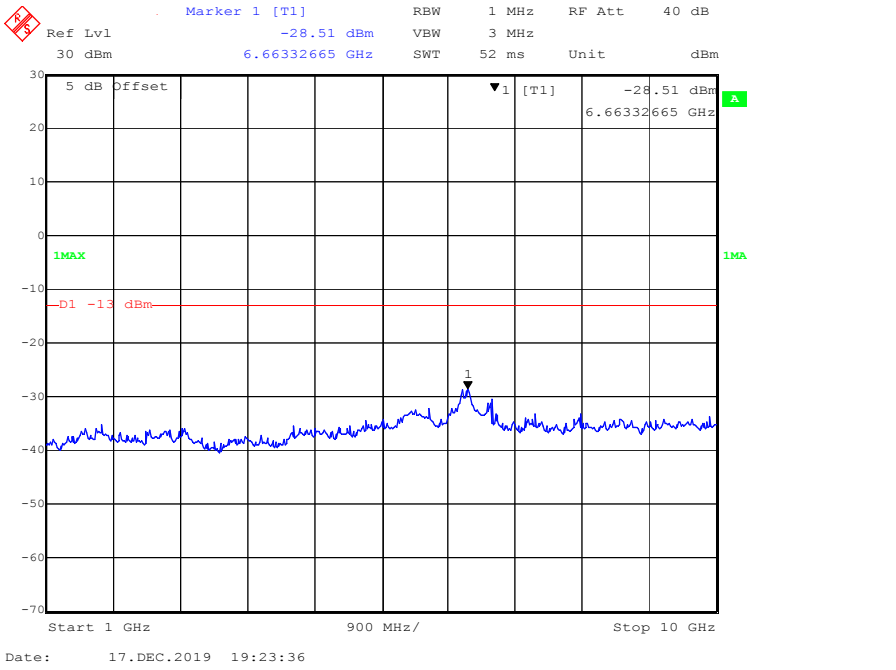

## 1 GHz – 10 GHz (5 MHz, 16-QAM, Middle Channel)



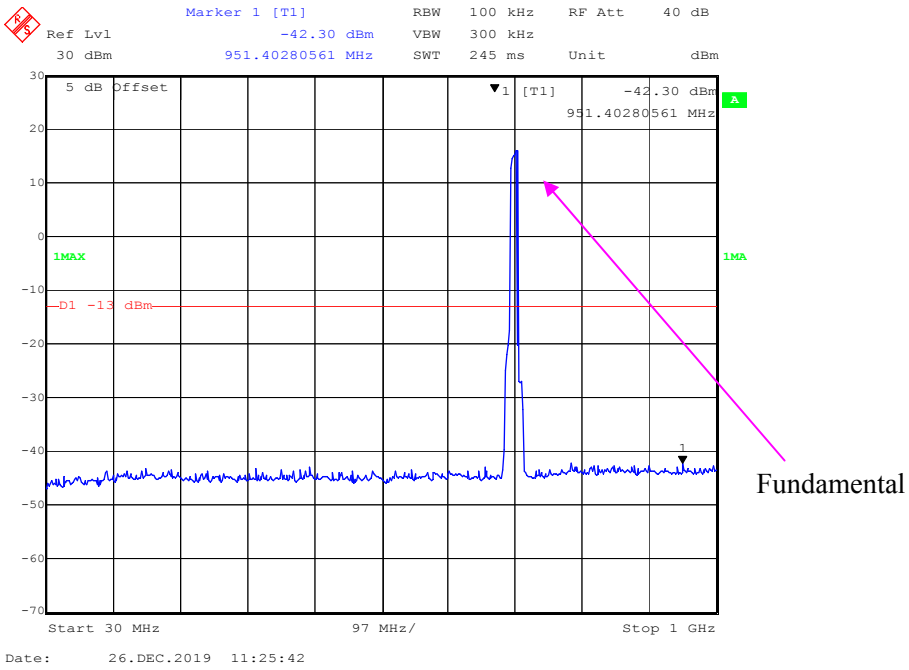
## 30 MHz - 1 GHz (10 MHz, QPSK, Middle Channel)



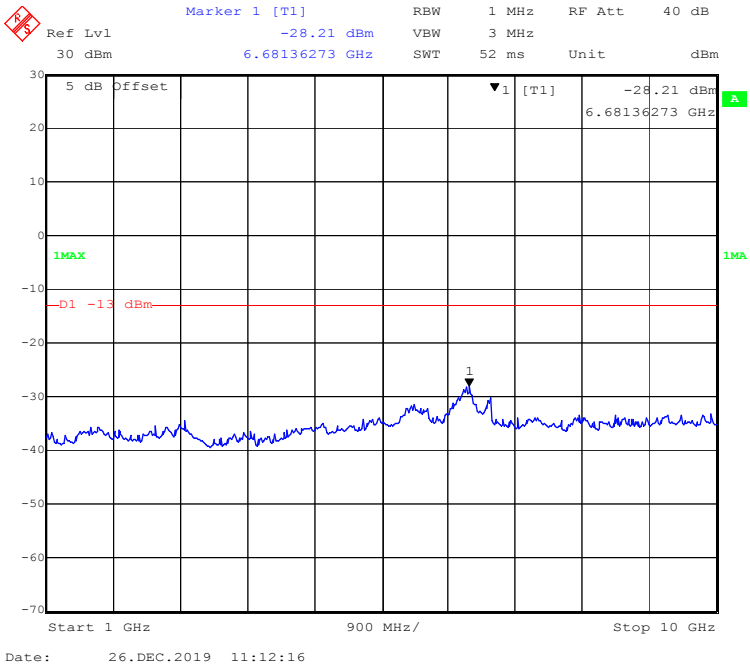

## 1 GHz – 10 GHz (10 MHz, QPSK, Middle Channel)



## 30 MHz - 1 GHz (10 MHz, 16-QAM, Middle Channel)

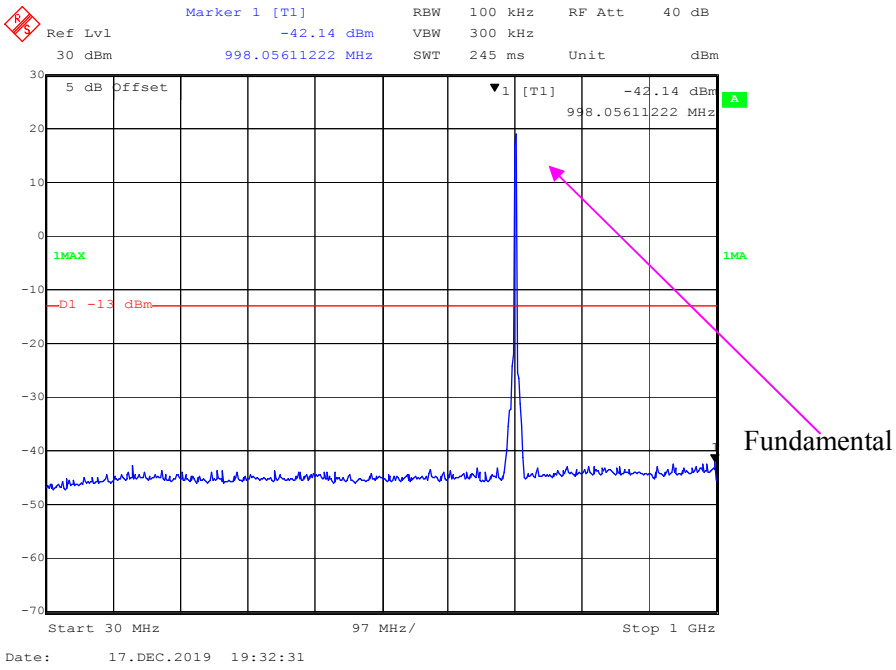



## 1 GHz – 10 GHz (10 MHz, 16-QAM, Middle Channel)

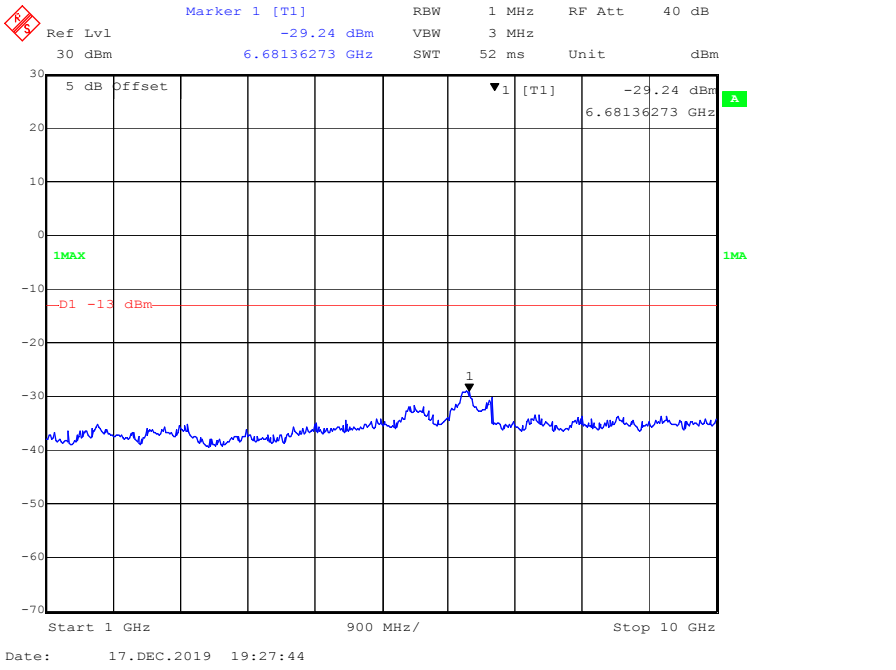


## LTE Band 17:

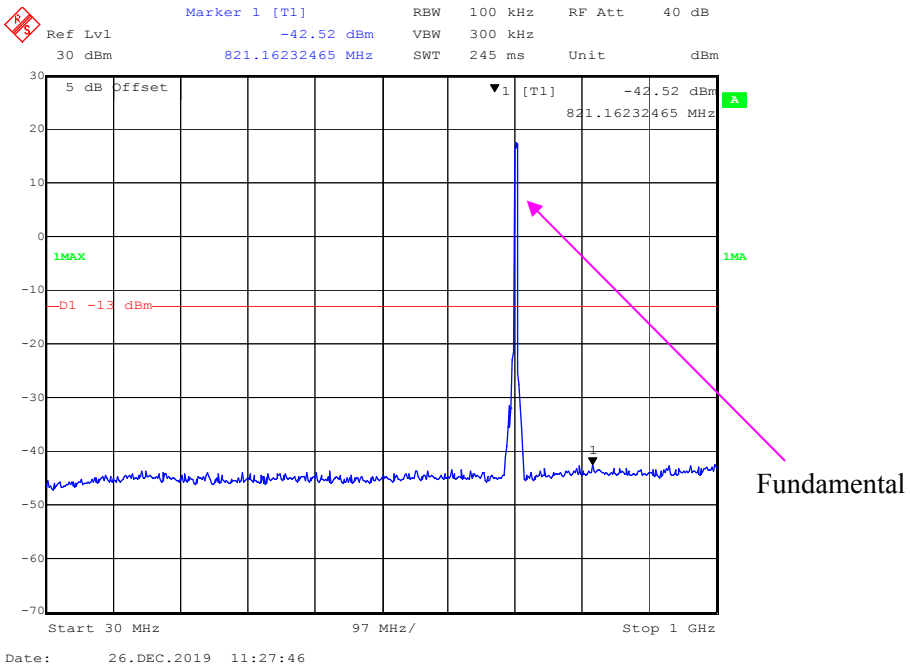
### 30 MHz - 1 GHz (5 MHz, QPSK, Middle Channel)



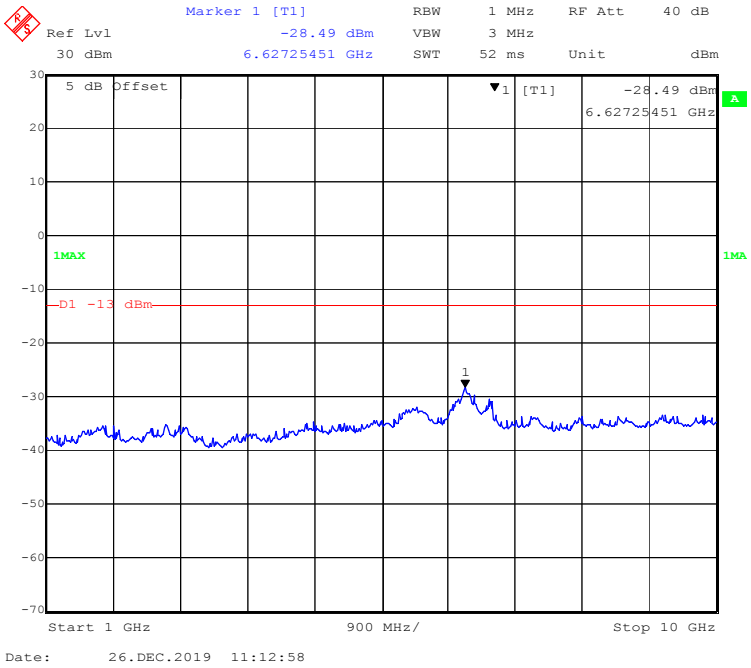

### 1 GHz – 10 GHz (5 MHz, QPSK, Middle Channel)



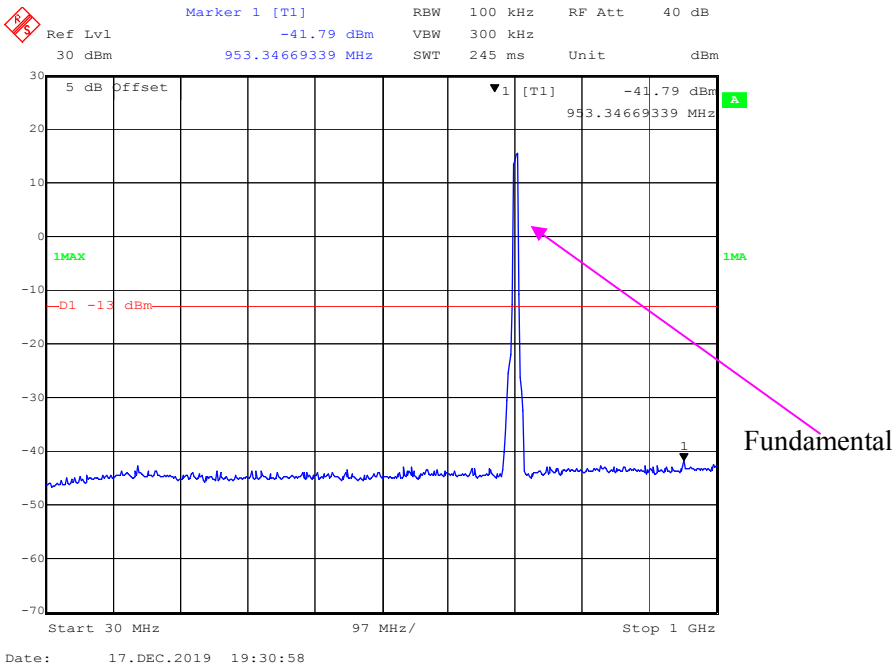
## 30 MHz - 1 GHz (5 MHz, 16-QAM, Middle Channel)



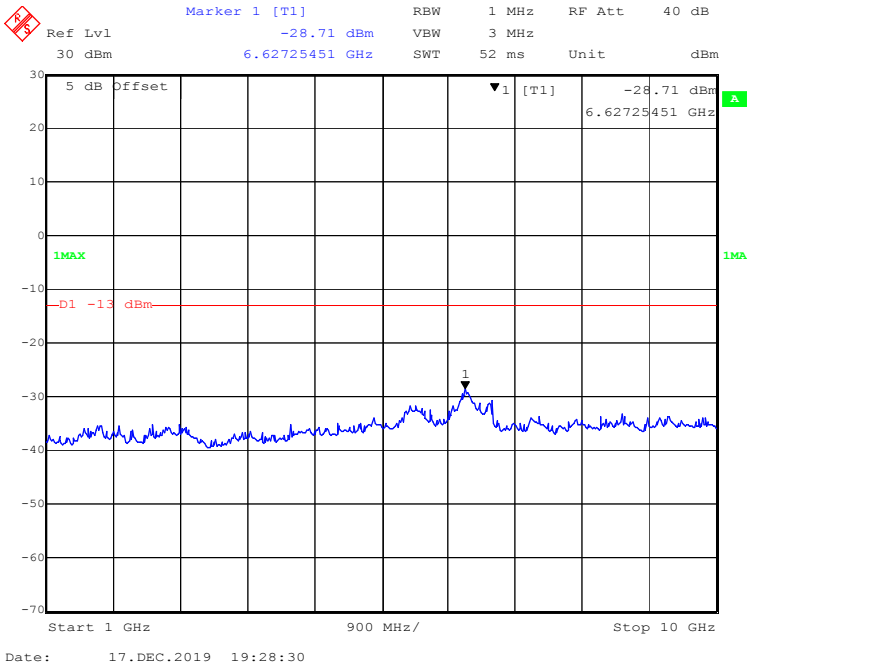

## 1 GHz – 10 GHz (5 MHz, 16-QAM, Middle Channel)



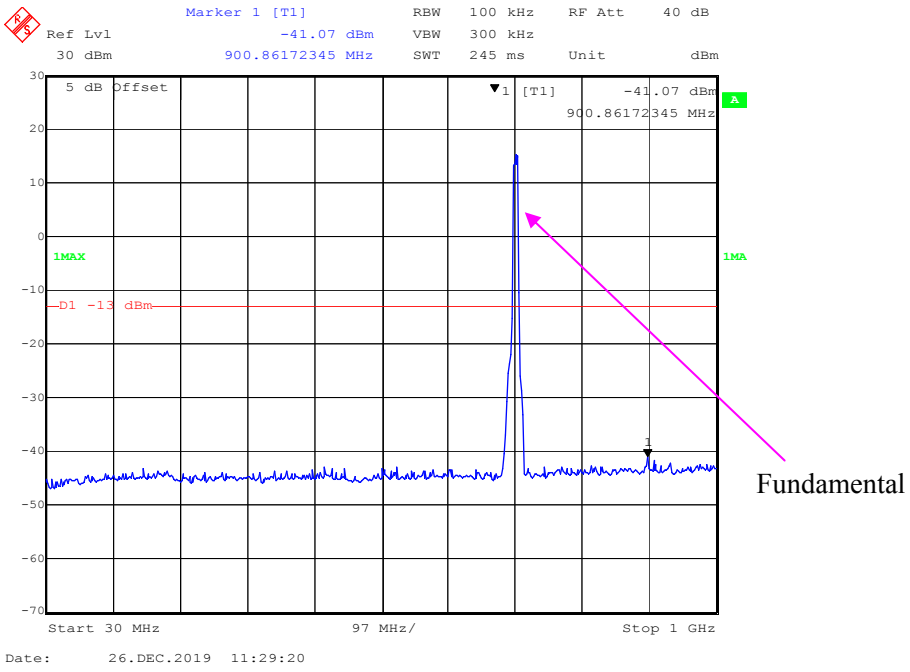
## 30 MHz - 1 GHz (10 MHz, QPSK, Middle Channel)




## 1 GHz – 10 GHz (10 MHz, QPSK, Middle Channel)

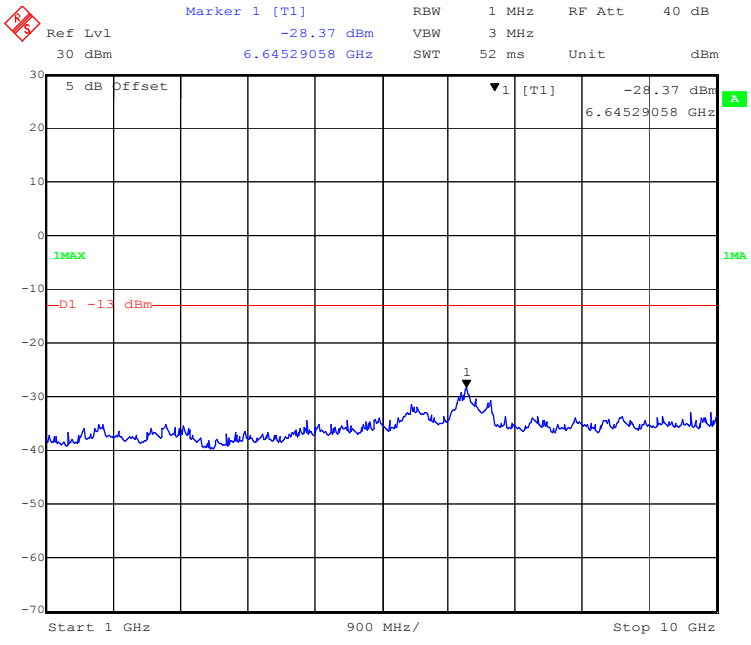


## 30 MHz - 1 GHz (10 MHz, 16-QAM, Middle Channel)




Date: 26.DEC.2019 11:29:20

## 1 GHz – 10 GHz (10 MHz, 16-QAM, Middle Channel)

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# FCC § 2.1053; § 22.917 (a); § 24.238 (a); §27.53 (g) (h) - SPURIOUS RADIATED EMISSIONS

## Applicable Standards

FCC § 2.1053, §22.917(a) and § 24.238(a) and § 27.53(g) (h)

22.917 (a) 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.

24.238 (a) 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.

(g) 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.

(h) 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 log10 (P) dB.

## Test Procedure

The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load which was also placed on the turntable.

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis.

The frequency range up to tenth harmonic of the fundamental frequency was investigated.

Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

Spurious emissions in dB = 10 lg (TX pwr in Watts/0.001) – the absolute level

Spurious attenuation limit in dB = 43 + 10 $\text{Log}_{10}$ (power out in Watts)

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 23.2 ℃ |
| **Relative Humidity:** | 51 % |
| **ATM Pressure:** | 101.3 kPa |

*The testing was performed by Winnie Yang on 2019-12-24.*

*Test mode: Transmitting (Pre-scan with low, middle and high channels, and the worse case data as below)*

**30 MHz ~ 10 GHz:**

**WCDMA Band V**

| Frequency (MHz) | Receiver Reading (dBμV) | Turntable Angle Degree | Rx Antenna | | Substituted | | | Absolute Level (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Height (cm) | Polar (H/V) | Submitted Level (dBm) | Cable Loss (dB) | Antenna Gain (dBd/dBi) | | | |
| WCDMA Mode, Middle channel | | | | | | | | | | |
| 128.11 | 58.12 | 234 | 200 | H | -54.33 | 0.35 | -6.11 | -60.79 | -13.00 | 47.79 |
| 128.11 | 44.16 | 217 | 100 | V | -61.95 | 0.35 | -6.11 | -68.41 | -13.00 | 55.41 |
| 1673.20 | 25.90 | 174 | 100 | H | -79.63 | 0.84 | 8.48 | -71.99 | -13.00 | 58.99 |
| 1673.20 | 26.97 | 21 | 200 | V | -78.56 | 0.84 | 8.48 | -70.92 | -13.00 | 57.92 |
| 2509.80 | 25.92 | 319 | 100 | H | -76.03 | 0.89 | 10.09 | -66.83 | -13.00 | 53.83 |
| 2509.80 | 28.52 | 27 | 200 | V | -73.43 | 0.89 | 10.09 | -64.23 | -13.00 | 51.23 |

**30 MHz ~ 20 GHz:**

**WCDMA Band II**

| Frequency (MHz) | Receiver Reading (dBμV) | Turntable Angle Degree | Rx Antenna | | Substituted | | | Absolute Level (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Height (cm) | Polar (H/V) | Submitted Level (dBm) | Cable Loss (dB) | Antenna Gain (dBd/dBi) | | | |
| WCDMA Mode, Middle channel | | | | | | | | | | |
| 127.66 | 58.33 | 11 | 200 | H | -54.15 | 0.35 | -6.11 | -60.61 | -13.00 | 47.61 |
| 127.66 | 44.58 | 292 | 200 | V | -61.51 | 0.35 | -6.11 | -67.97 | -13.00 | 54.97 |
| 3760.00 | 27.06 | 175 | 100 | H | -70.92 | 0.95 | 9.74 | -62.13 | -13.00 | 49.13 |
| 3760.00 | 25.91 | 78 | 100 | V | -72.07 | 0.95 | 9.74 | -63.28 | -13.00 | 50.28 |
| 5640.00 | 25.12 | 139 | 200 | H | -68.73 | 1.15 | 10.47 | -59.41 | -13.00 | 46.41 |
| 5640.00 | 26.57 | 128 | 200 | V | -67.28 | 1.15 | 10.47 | -57.96 | -13.00 | 44.96 |

**Note:**
1) Antenna gain is dBd for frequency below 1GHz and dBi for frequency above 1GHz
2) Absolute Level (dBm) = Submitted Level (dBm) - Cable loss (dB) + Antenna Gain (dBd/dBi)
3) Margin (dB) = Limit (dBm) - Absolute Level (dBm)

*Test mode: Transmitting (Pre-scan with all the bandwidth, and worse case as below)*

**30 MHz ~ 20 GHz:**
**LTE Band 2:**

| Frequency (MHz) | Receiver Reading (dBµV) | Turntable Angle Degree | Rx Antenna | | Substituted | | | Absolute Level (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Height (cm) | Polar (H/V) | Submitted Level (dBm) | Cable Loss (dB) | Antenna Gain (dBd/dBi) | | | |
| QPSK 1.4MHz Bandwidth Middle Channel | | | | | | | | | | |
| 128.56 | 61.18 | 324 | 200 | H | -51.25 | 0.35 | -6.11 | -57.71 | -13.00 | 44.71 |
| 128.56 | 47.27 | 133 | 100 | V | -58.86 | 0.35 | -6.11 | -65.32 | -13.00 | 52.32 |
| 3760.00 | 27.78 | 268 | 200 | H | -70.20 | 0.95 | 9.74 | -61.41 | -13.00 | 48.41 |
| 3760.00 | 26.83 | 349 | 200 | V | -71.15 | 0.95 | 9.74 | -62.36 | -13.00 | 49.36 |
| 5640.00 | 25.74 | 204 | 100 | H | -68.11 | 1.15 | 10.47 | -58.79 | -13.00 | 45.79 |
| 5640.00 | 26.26 | 221 | 200 | V | -67.59 | 1.15 | 10.47 | -58.27 | -13.00 | 45.27 |
| 16-QAM 1.4MHz Bandwidth Middle Channel | | | | | | | | | | |
| 128.11 | 61.29 | 272 | 100 | H | -51.16 | 0.35 | -6.11 | -57.62 | -13.00 | 44.62 |
| 128.11 | 46.56 | 76 | 200 | V | -59.55 | 0.35 | -6.11 | -66.01 | -13.00 | 53.01 |
| 3760.00 | 26.98 | 51 | 100 | H | -71.00 | 0.95 | 9.74 | -62.21 | -13.00 | 49.21 |
| 3760.00 | 27.55 | 106 | 100 | V | -70.43 | 0.95 | 9.74 | -61.64 | -13.00 | 48.64 |
| 5640.00 | 24.86 | 113 | 100 | H | -68.99 | 1.15 | 10.47 | -59.67 | -13.00 | 46.67 |
| 5640.00 | 25.66 | 102 | 200 | V | -68.19 | 1.15 | 10.47 | -58.87 | -13.00 | 45.87 |

**30 MHz ~ 20 GHz:**
**LTE Band 4:**

| Frequency (MHz) | Receiver Reading (dBµV) | Turntable Angle Degree | Rx Antenna | | Substituted | | | Absolute Level (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Height (cm) | Polar (H/V) | Submitted Level (dBm) | Cable Loss (dB) | Antenna Gain (dBd/dBi) | | | |
| QPSK 1.4MHz Bandwidth Middle Channel | | | | | | | | | | |
| 128.11 | 60.00 | 323 | 100 | H | -52.45 | 0.35 | -6.11 | -58.91 | -13.00 | 45.91 |
| 128.11 | 46.33 | 226 | 200 | V | -59.78 | 0.35 | -6.11 | -66.24 | -13.00 | 53.24 |
| 3465.00 | 25.66 | 228 | 100 | H | -73.15 | 0.93 | 9.87 | -64.21 | -13.00 | 51.21 |
| 3465.00 | 26.58 | 226 | 200 | V | -72.23 | 0.93 | 9.87 | -63.29 | -13.00 | 50.29 |
| 5197.50 | 26.22 | 270 | 100 | H | -69.51 | 1.10 | 10.30 | -60.31 | -13.00 | 47.31 |
| 5197.50 | 27.14 | 287 | 100 | V | -68.59 | 1.10 | 10.30 | -59.39 | -13.00 | 46.39 |
| 16-QAM 1.4MHz Bandwidth Middle Channel | | | | | | | | | | |
| 127.67 | 60.92 | 250 | 100 | H | -51.56 | 0.35 | -6.11 | -58.02 | -13.00 | 45.02 |
| 127.67 | 46.56 | 196 | 100 | V | -59.53 | 0.35 | -6.11 | -65.99 | -13.00 | 52.99 |
| 3465.00 | 25.34 | 275 | 200 | H | -73.47 | 0.93 | 9.87 | -64.53 | -13.00 | 51.53 |
| 3465.00 | 26.26 | 287 | 200 | V | -72.55 | 0.93 | 9.87 | -63.61 | -13.00 | 50.61 |
| 5197.50 | 26.81 | 152 | 100 | H | -68.92 | 1.10 | 10.30 | -59.72 | -13.00 | 46.72 |
| 5197.50 | 26.57 | 216 | 100 | V | -69.16 | 1.10 | 10.30 | -59.96 | -13.00 | 46.96 |

**30 MHz ~ 10 GHz:**
**LTE Band 5:**

| Frequency (MHz) | Receiver Reading (dBµV) | Turntable Angle Degree | Rx Antenna | | Substituted | | | Absolute Level (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Height (cm) | Polar (H/V) | Submitted Level (dBm) | Cable Loss (dB) | Antenna Gain (dBd/dBi) | | | |
| QPSK 1.4MHz Bandwidth Middle Channel | | | | | | | | | | |
| 150.54 | 62.32 | 209 | 200 | H | -48.92 | 0.37 | -6.15 | -55.44 | -13.00 | 42.44 |
| 150.54 | 51.67 | 63 | 100 | V | -55.54 | 0.37 | -6.15 | -62.06 | -13.00 | 49.06 |
| 1673.00 | 26.46 | 31 | 200 | H | -79.07 | 0.84 | 8.48 | -71.43 | -13.00 | 58.43 |
| 1673.00 | 27.78 | 163 | 100 | V | -77.75 | 0.84 | 8.48 | -70.11 | -13.00 | 57.11 |
| 2509.50 | 26.46 | 218 | 100 | H | -75.49 | 0.89 | 10.09 | -66.29 | -13.00 | 53.29 |
| 2509.50 | 28.89 | 124 | 200 | V | -73.06 | 0.89 | 10.09 | -63.86 | -13.00 | 50.86 |
| 16-QAM 1.4MHz Bandwidth Middle Channel | | | | | | | | | | |
| 150.54 | 61.90 | 144 | 100 | H | -49.34 | 0.37 | -6.15 | -55.86 | -13.00 | 42.86 |
| 150.54 | 51.14 | 177 | 200 | V | -56.07 | 0.37 | -6.15 | -62.59 | -13.00 | 49.59 |
| 1673.00 | 27.07 | 30 | 100 | H | -78.46 | 0.84 | 8.48 | -70.82 | -13.00 | 57.82 |
| 1673.00 | 28.63 | 99 | 200 | V | -76.90 | 0.84 | 8.48 | -69.26 | -13.00 | 56.26 |
| 2509.50 | 26.98 | 303 | 200 | H | -74.97 | 0.89 | 10.09 | -65.77 | -13.00 | 52.77 |
| 2509.50 | 28.78 | 78 | 100 | V | -73.17 | 0.89 | 10.09 | -63.97 | -13.00 | 50.97 |

**30 MHz ~ 10 GHz:**
**LTE Band 12:**

| Frequency (MHz) | Receiver Reading (dBµV) | Turntable Angle Degree | Rx Antenna | | Substituted | | | Absolute Level (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Height (cm) | Polar (H/V) | Submitted Level (dBm) | Cable Loss (dB) | Antenna Gain (dBd/dBi) | | | |
| QPSK 1.4MHz Bandwidth Middle Channel | | | | | | | | | | |
| 150.54 | 61.49 | 183 | 100 | H | -49.75 | 0.37 | -6.15 | -56.27 | -13.00 | 43.27 |
| 150.54 | 51.53 | 5 | 100 | V | -55.68 | 0.37 | -6.15 | -62.20 | -13.00 | 49.2 |
| 1415.00 | 27.63 | 13 | 100 | H | -79.43 | 0.82 | 7.96 | -72.29 | -13.00 | 59.29 |
| 1415.00 | 27.99 | 157 | 100 | V | -79.07 | 0.82 | 7.96 | -71.93 | -13.00 | 58.93 |
| 2122.50 | 26.64 | 349 | 100 | H | -75.92 | 0.86 | 9.27 | -67.51 | -13.00 | 54.51 |
| 2122.50 | 27.79 | 354 | 200 | V | -74.77 | 0.86 | 9.27 | -66.36 | -13.00 | 53.36 |
| 16-QAM 1.4MHz Bandwidth Middle Channel | | | | | | | | | | |
| 150.54 | 62.04 | 212 | 100 | H | -49.20 | 0.37 | -6.15 | -55.72 | -13.00 | 42.72 |
| 150.54 | 50.82 | 268 | 100 | V | -56.39 | 0.37 | -6.15 | -62.91 | -13.00 | 49.91 |
| 1415.00 | 26.89 | 142 | 200 | H | -80.17 | 0.82 | 7.96 | -73.03 | -13.00 | 60.03 |
| 1415.00 | 27.36 | 123 | 200 | V | -79.70 | 0.82 | 7.96 | -72.56 | -13.00 | 59.56 |
| 2122.50 | 27.56 | 127 | 200 | H | -75.00 | 0.86 | 9.27 | -66.59 | -13.00 | 53.59 |
| 2122.50 | 28.22 | 69 | 200 | V | -74.34 | 0.86 | 9.27 | -65.93 | -13.00 | 52.93 |

**30 MHz ~ 10 GHz:**
**LTE Band 17:**

| Frequency (MHz) | Receiver Reading (dBμV) | Turntable Angle Degree | Rx Antenna | | Substituted | | | Absolute Level (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Height (cm) | Polar (H/V) | Submitted Level (dBm) | Cable Loss (dB) | Antenna Gain (dBd/dBi) | | | |
| QPSK 5MHz Bandwidth Middle Channel | | | | | | | | | | |
| 151.07 | 62.14 | 62 | 200 | H | -49.07 | 0.37 | -6.15 | -55.59 | -13.00 | 42.59 |
| 151.07 | 48.90 | 4 | 200 | V | -58.33 | 0.37 | -6.15 | -64.85 | -13.00 | 51.85 |
| 1420.00 | 26.22 | 301 | 100 | H | -80.84 | 0.82 | 7.98 | -73.68 | -13.00 | 60.68 |
| 1420.00 | 26.99 | 132 | 200 | V | -80.07 | 0.82 | 7.98 | -72.91 | -13.00 | 59.91 |
| 2130.00 | 26.60 | 175 | 100 | H | -75.95 | 0.86 | 9.29 | -67.52 | -13.00 | 54.52 |
| 2130.00 | 27.94 | 347 | 200 | V | -74.61 | 0.86 | 9.29 | -66.18 | -13.00 | 53.18 |
| 16-QAM 5MHz Bandwidth Middle Channel | | | | | | | | | | |
| 151.07 | 62.38 | 112 | 100 | H | -48.83 | 0.37 | -6.15 | -55.35 | -13.00 | 42.35 |
| 151.07 | 52.39 | 311 | 200 | V | -54.84 | 0.37 | -6.15 | -61.36 | -13.00 | 48.36 |
| 1420.00 | 26.05 | 134 | 100 | H | -81.01 | 0.82 | 7.98 | -73.85 | -13.00 | 60.85 |
| 1420.00 | 26.94 | 111 | 200 | V | -80.12 | 0.82 | 7.98 | -72.96 | -13.00 | 59.96 |
| 2130.00 | 27.71 | 94 | 200 | H | -74.84 | 0.86 | 9.29 | -66.41 | -13.00 | 53.41 |
| 2130.00 | 28.09 | 129 | 100 | V | -74.46 | 0.86 | 9.29 | -66.03 | -13.00 | 53.03 |

**Note:**
1) Antenna gain is dBd for frequency below 1GHz and dBi for frequency above 1GHz
2) Absolute Level (dBm) = Submitted Level (dBm) - Cable loss (dB) + Antenna Gain (dBd/dBi)
3) Margin (dB) = Limit (dBm) - Absolute Level (dBm)

# FCC § 22.917 (a); § 24.238 (a); §27.53 (g )(h) - BAND EDGES

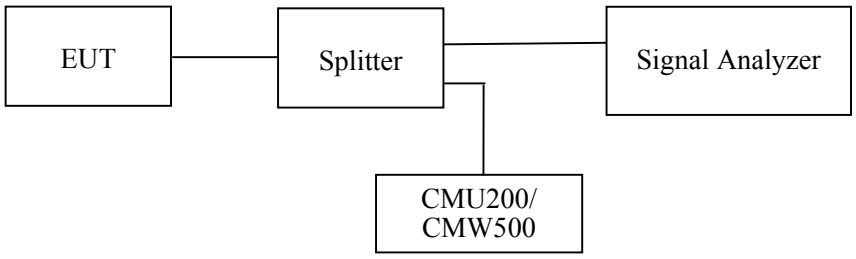
## Applicable Standards

According to § 22.917(a), the power of any emissions 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 §24.238(a), the power of any emissions 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 FCC §27.53 (g) (h), 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.
For mobile digital stations, the attenuation factor shall be not less than 40 + 10 log (P) dB on all frequencies between the channel edge and 5 megahertz from the channel edge, 43 + 10 log (P) dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and 55 + 10 log (P) dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less that 43 + 10 log (P) dB on all frequencies between 2490.5 MHz and 2496 MHz and 55 + 10 log (P) dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.
FCC §2.1051.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 1 MHz or less, but at least one percent of the emission bandwidth of the fundamental emission of the transmitter, provided the measured energy is integrated over a 1 MHz bandwidth.

## Test Procedure

The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.

The center of the spectrum analyzer was set to block edge frequency.




## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 23.5~25.3 ℃ |
| **Relative Humidity:** | 50~53 % |
| **ATM Pressure:** | 102.7~103.3 kPa |

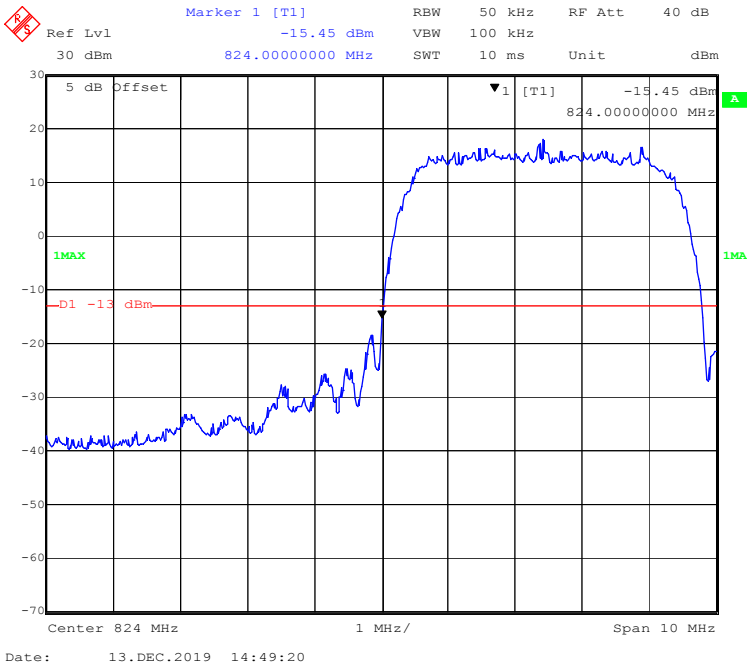
*The testing was performed by Winnie Yang from 2019-12-11 to 2019-12-22.*

*EUT operation mode: Transmitting*

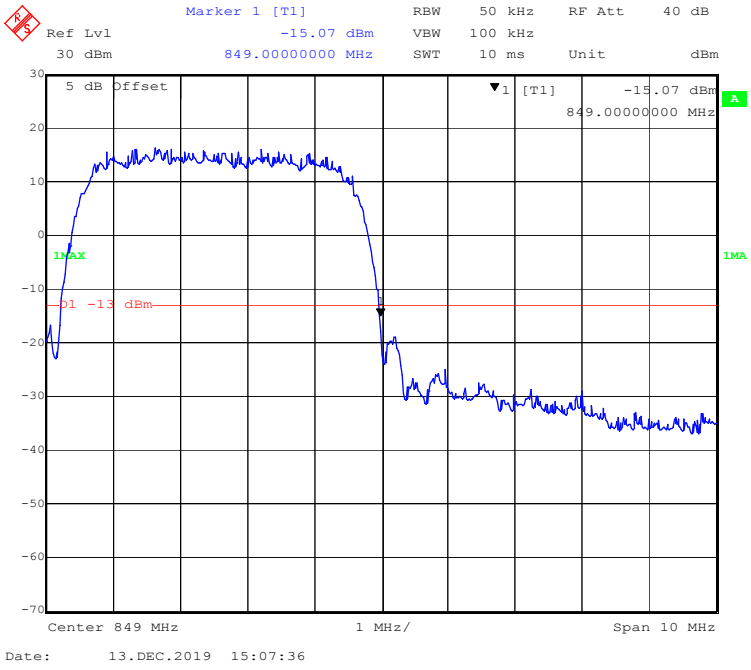
*Test Result: Compliant.*

## WCDMA Band V

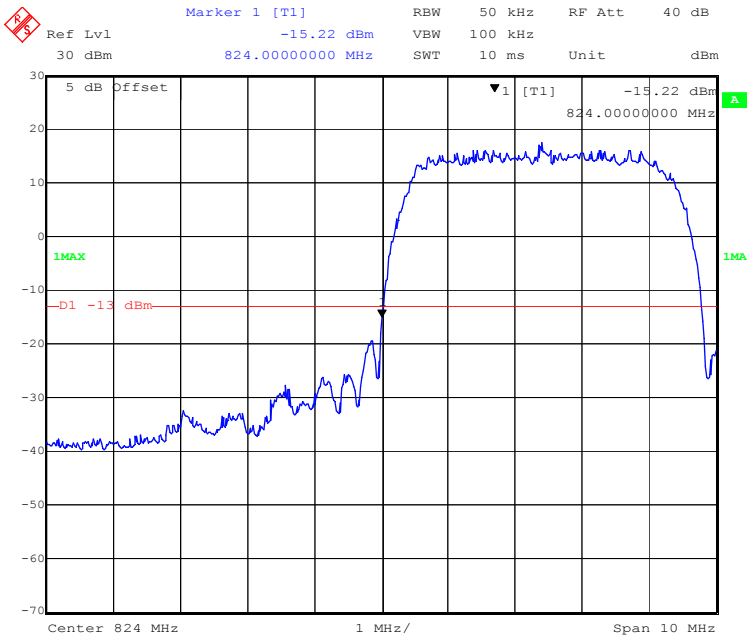
### WCDMA (Rel 99) Mode, Left Band Edge



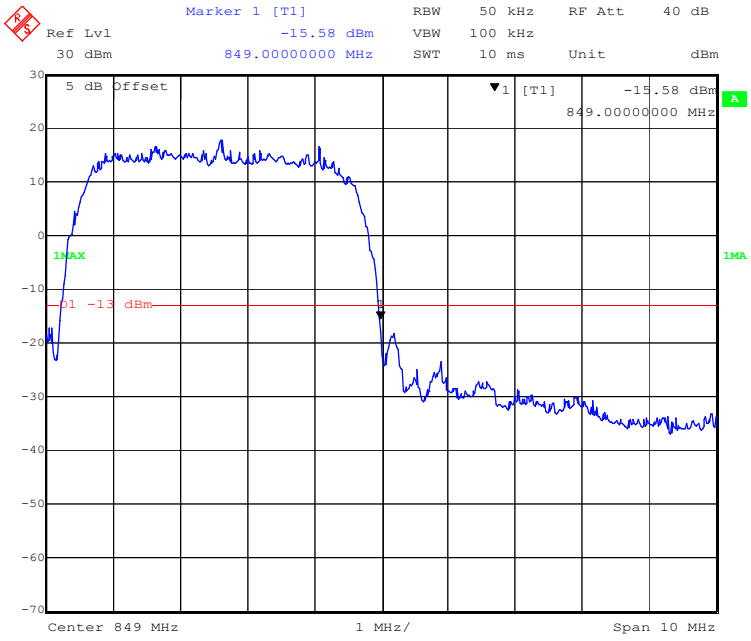

### WCDMA (Rel 99) Mode, Right Band Edge



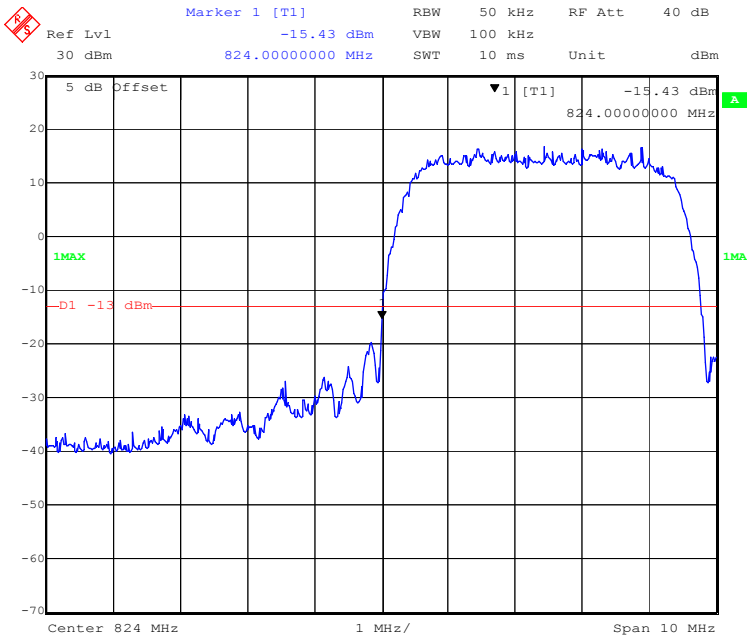
## WCDMA (HSDPA) Mode, Left Band Edge



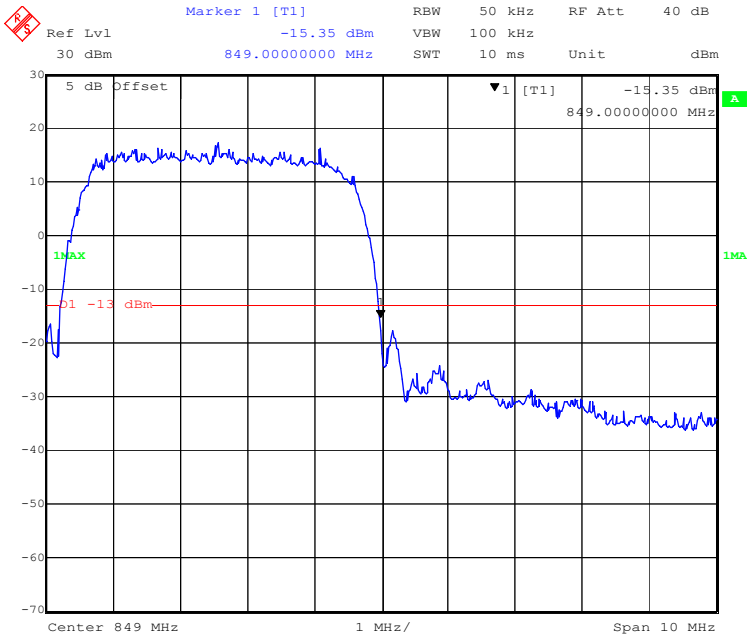

## WCDMA (HSDPA) Mode, Right Band Edge



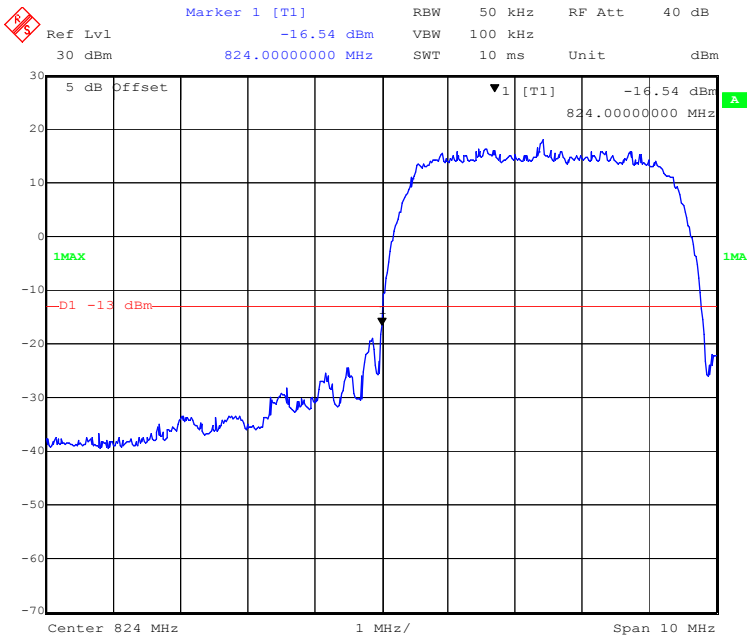
## WCDMA (HSUPA) Mode, Left Band Edge




## WCDMA (HSUPA) Mode, Right Band Edge

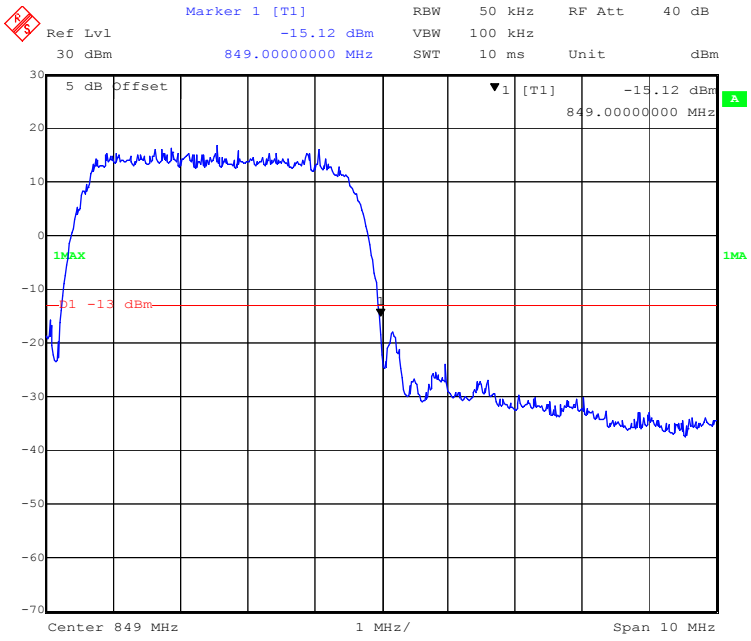


## WCDMA (HSPA+) Mode, Left Band Edge




Date: 13.DEC.2019 14:57:21

## WCDMA (HSPA+) Mode, Right Band Edge

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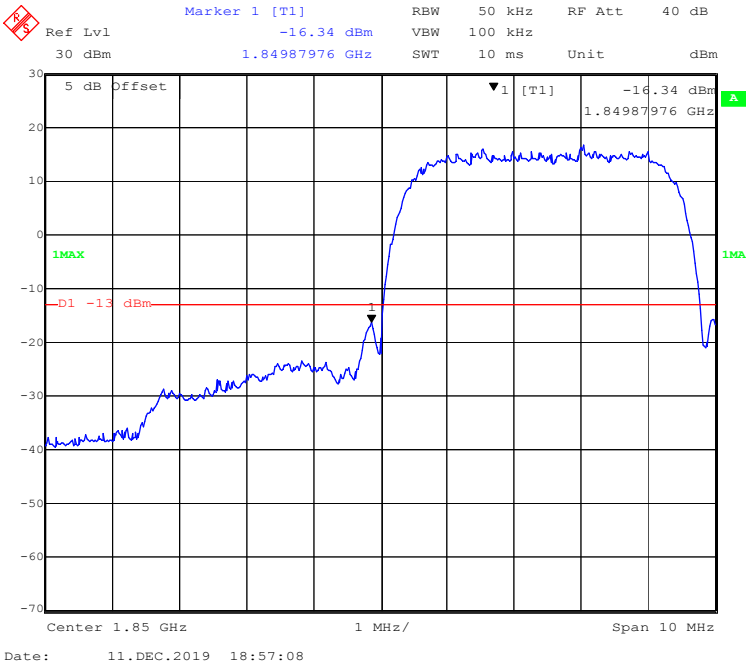
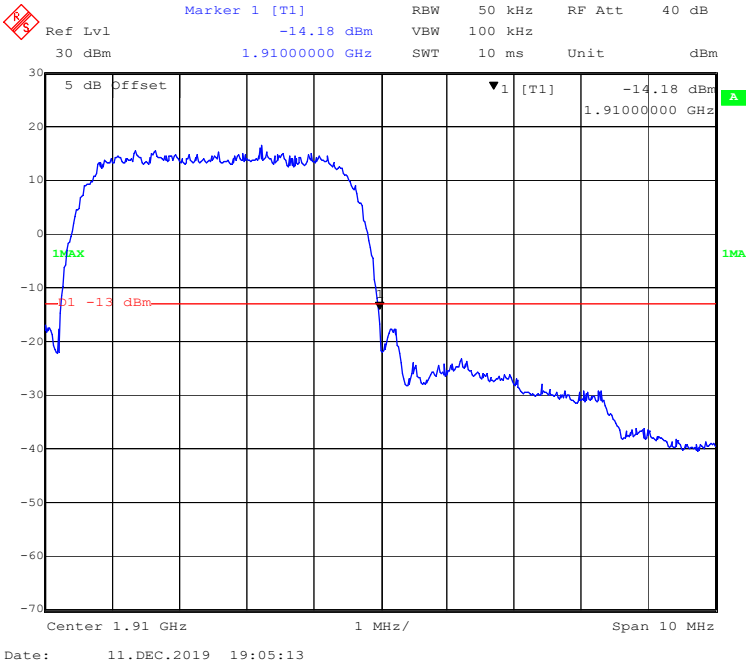
## WCDMA Band II

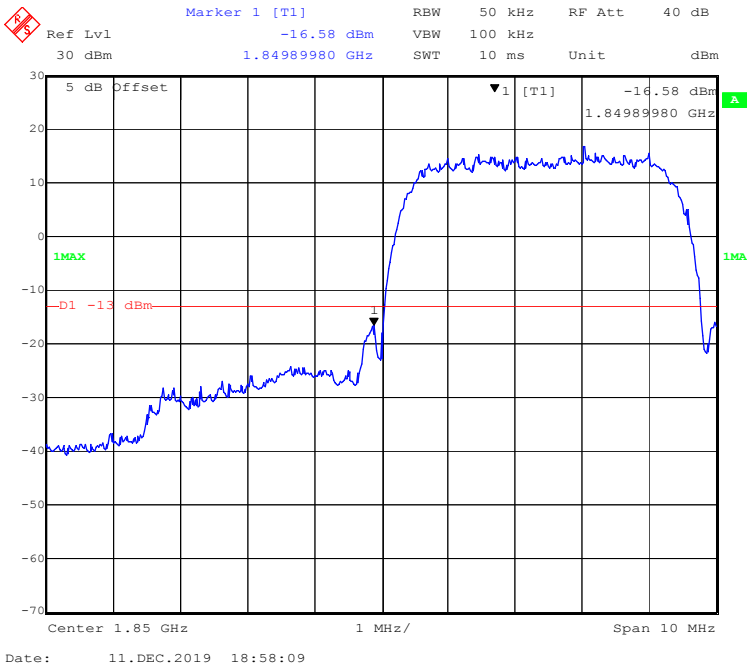
### WCDMA (Rel 99) Mode, Left Band Edge



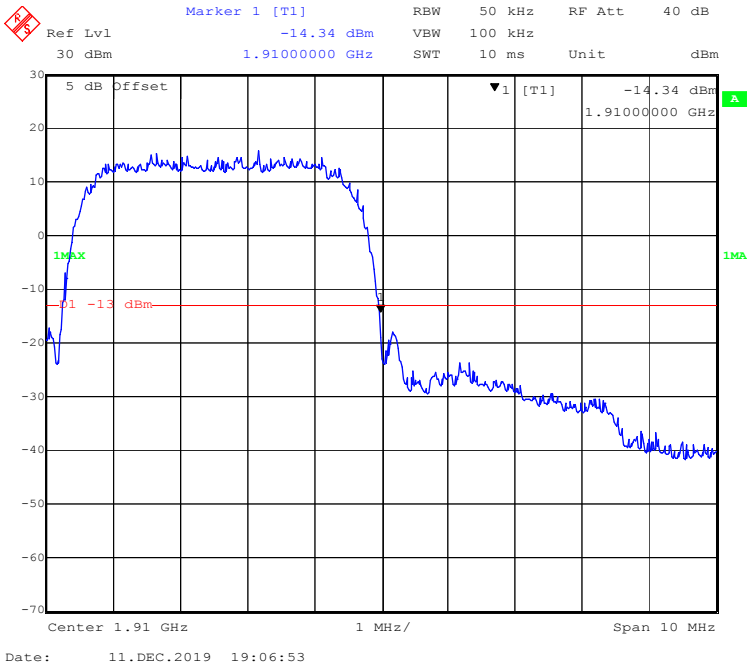

### WCDMA (Rel 99) Mode, Right Band Edge



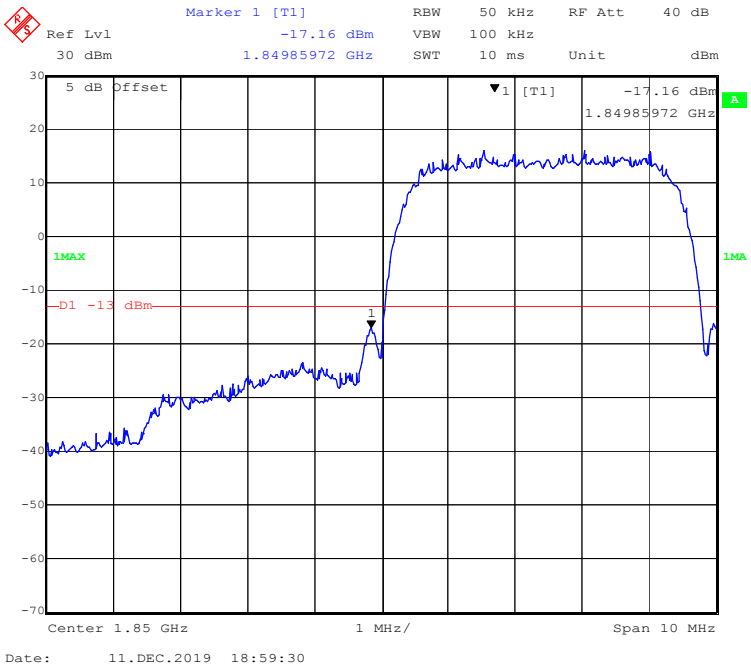
## WCDMA (HSDPA) Mode, Left Band Edge



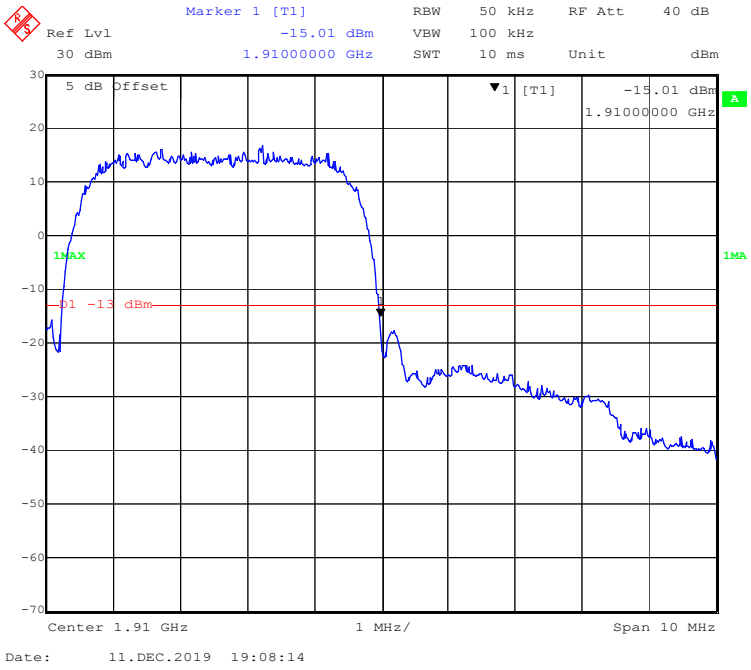

## WCDMA (HSDPA) Mode, Right Band Edge



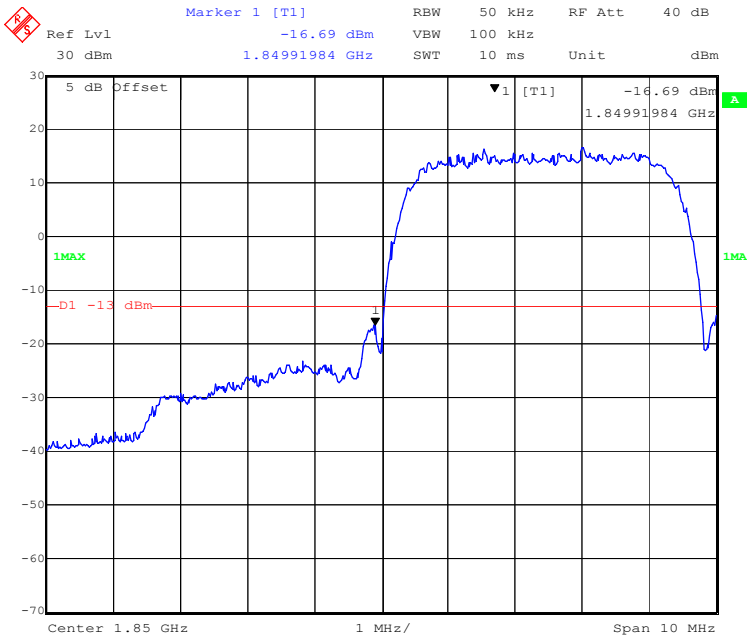
## WCDMA (HSUPA) Mode, Left Band Edge



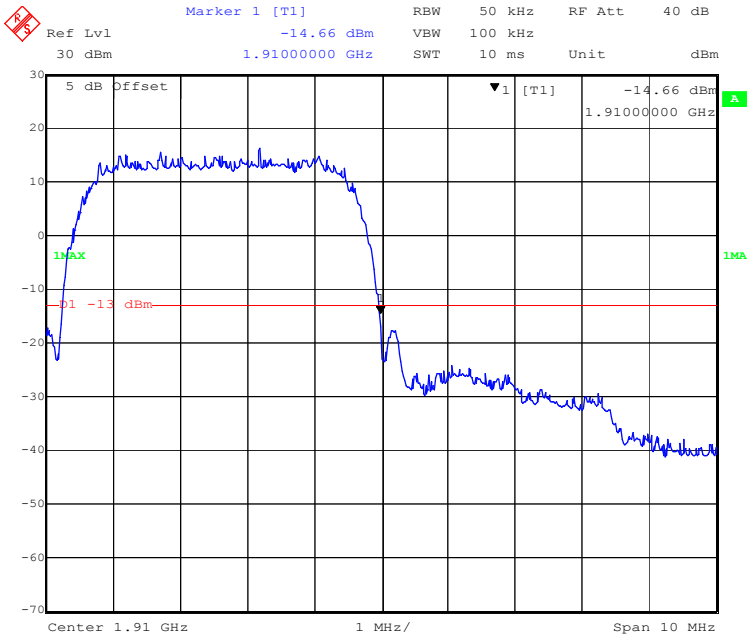

## WCDMA (HSUPA) Mode, Right Band Edge



## WCDMA (HSPA+) Mode, Left Band Edge

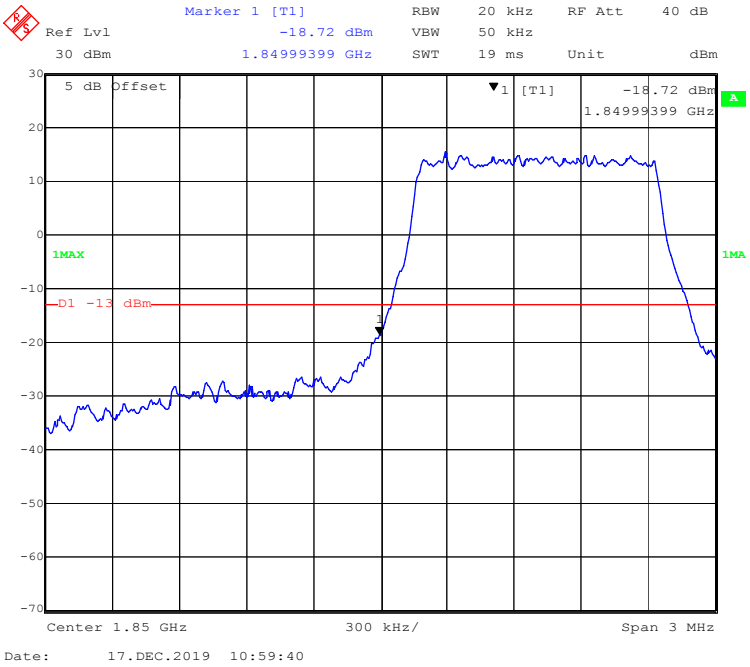



## WCDMA (HSPA+) Mode, Right Band Edge

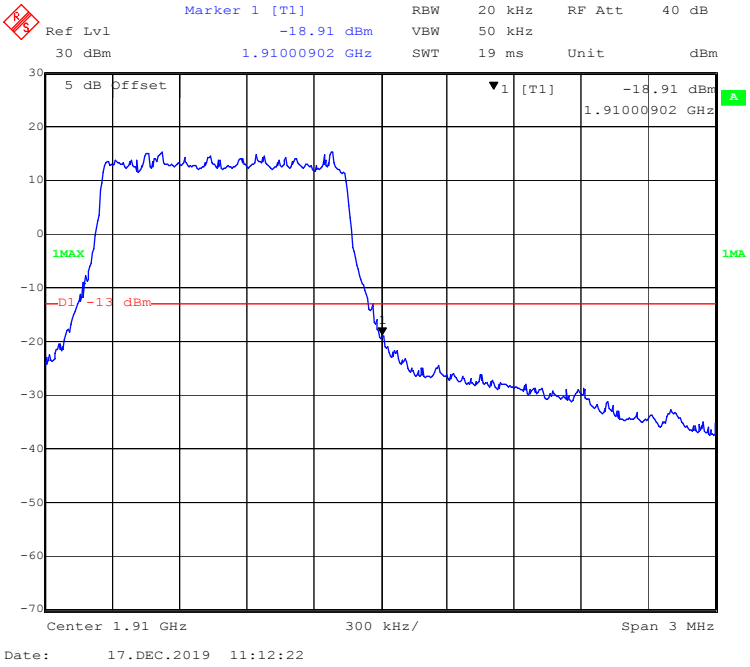


## LTE Band 2:

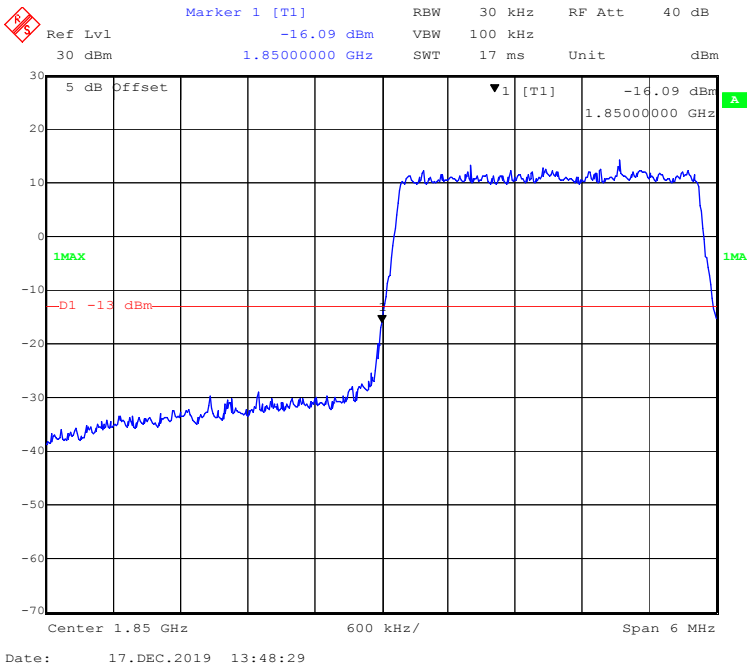
### QPSK (1.4 MHz, FULL RB) - Left Band Edge



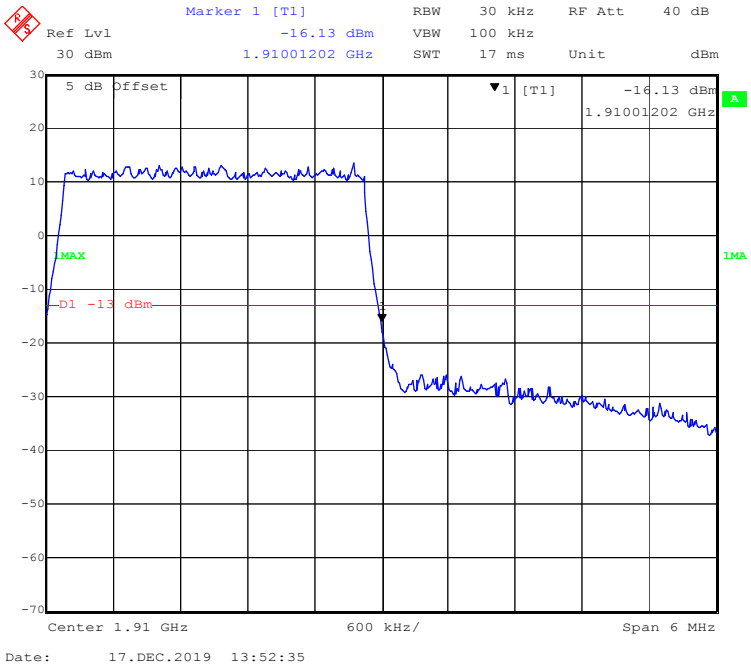

### QPSK (1.4 MHz, FULL RB) - Right Band Edge



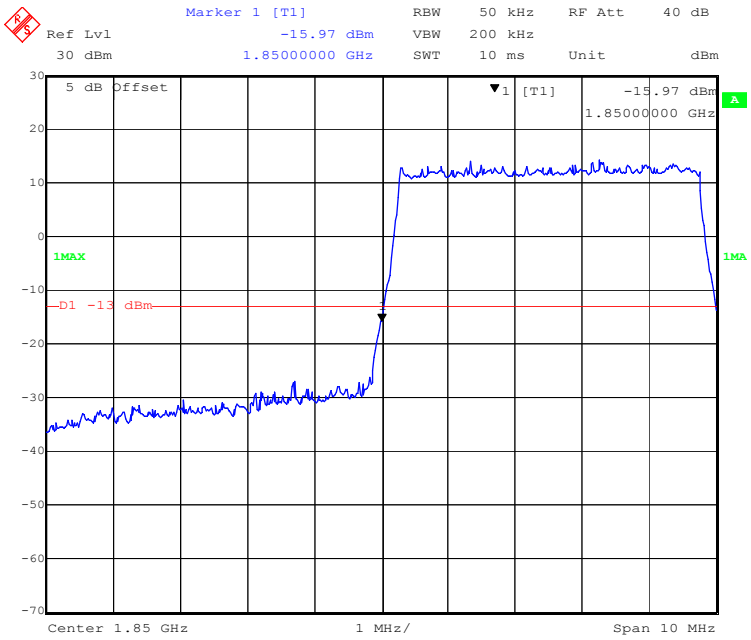
## QPSK (3 MHz, FULL RB) - Left Band Edge



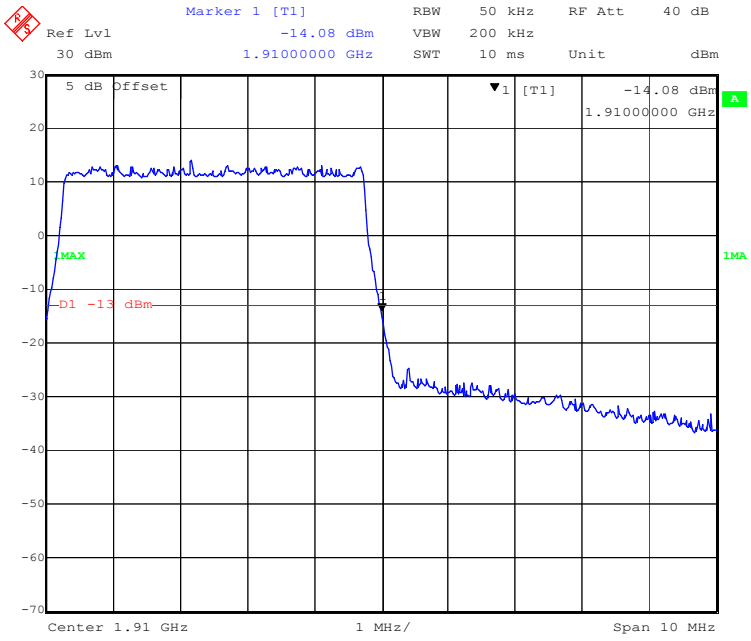

## QPSK (3 MHz, FULL RB) - Right Band Edge



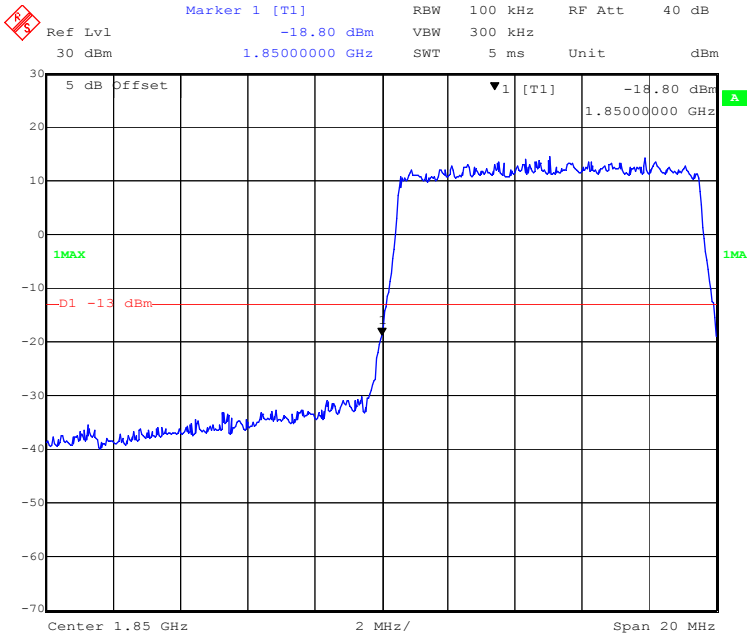
## QPSK (5 MHz, FULL RB) - Left Band Edge



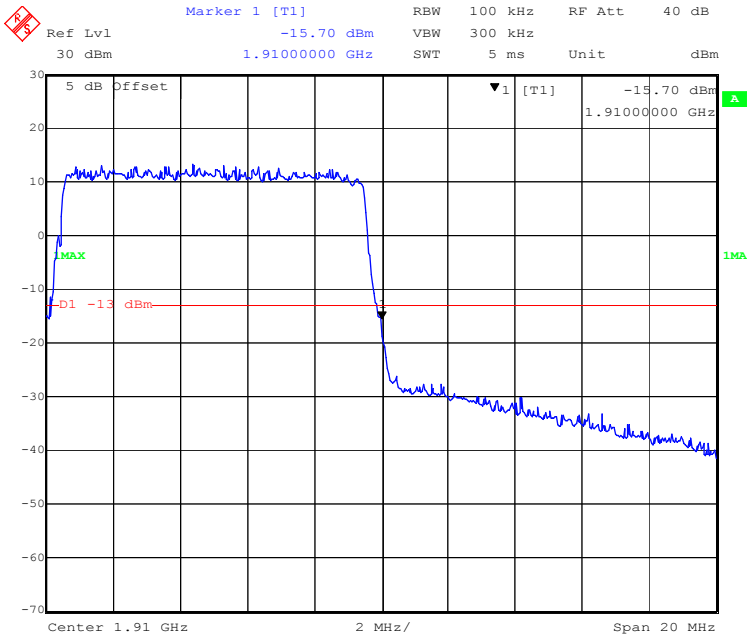

## QPSK (5 MHz, FULL RB) - Right Band Edge



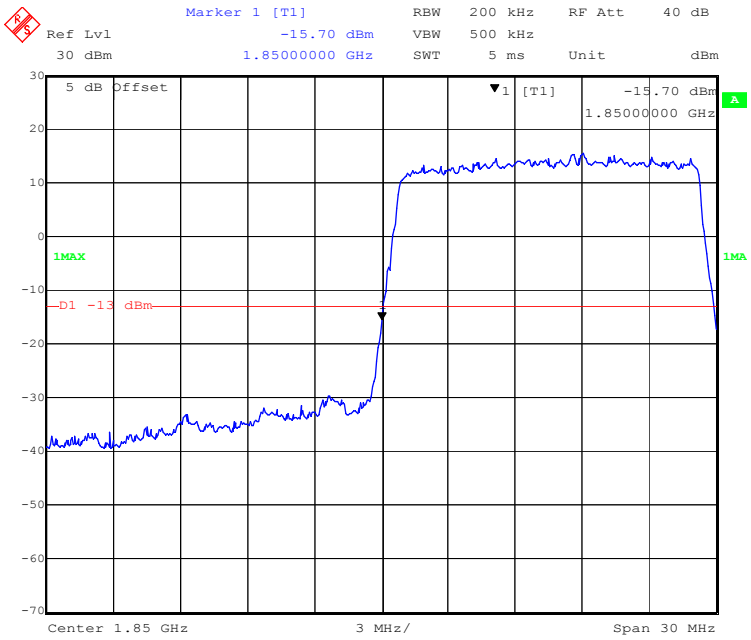
## QPSK (10 MHz, FULL RB) - Left Band Edge



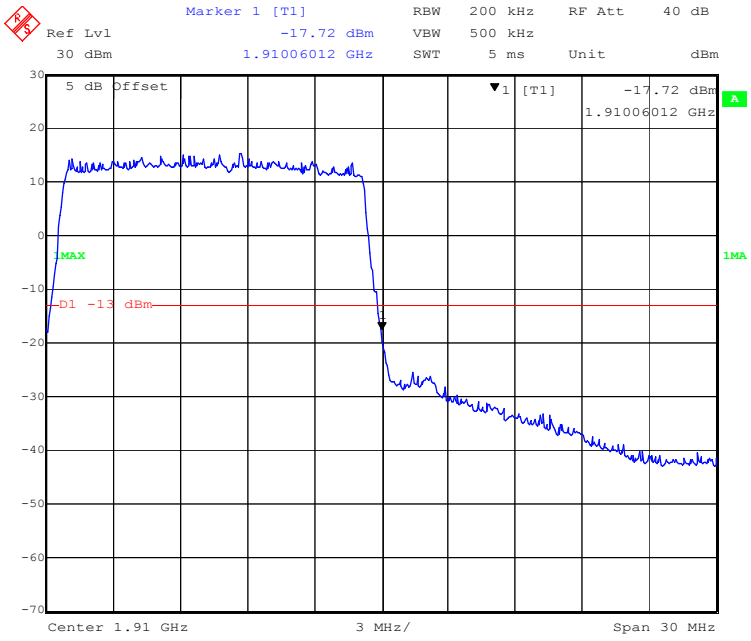

## QPSK (10 MHz, FULL RB) - Right Band Edge



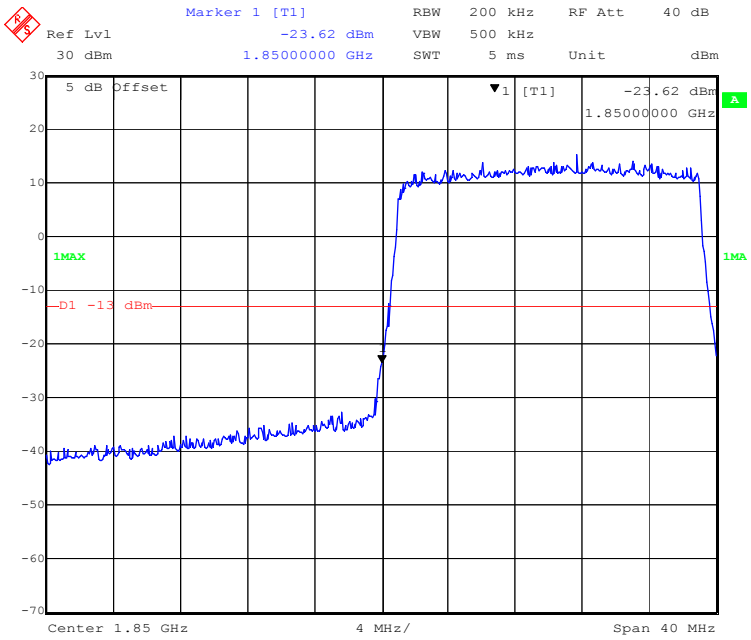
## QPSK (15 MHz, FULL RB) - Left Band Edge



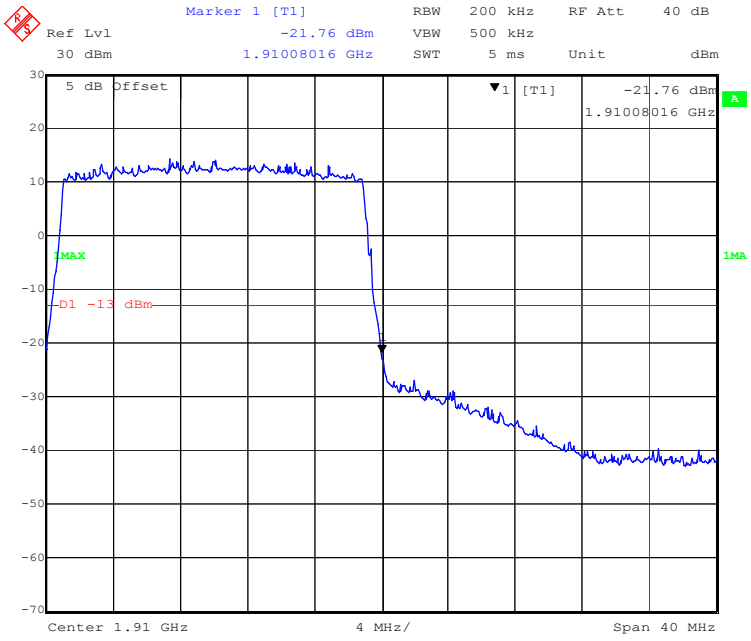

## QPSK (15 MHz, FULL RB) - Right Band Edge



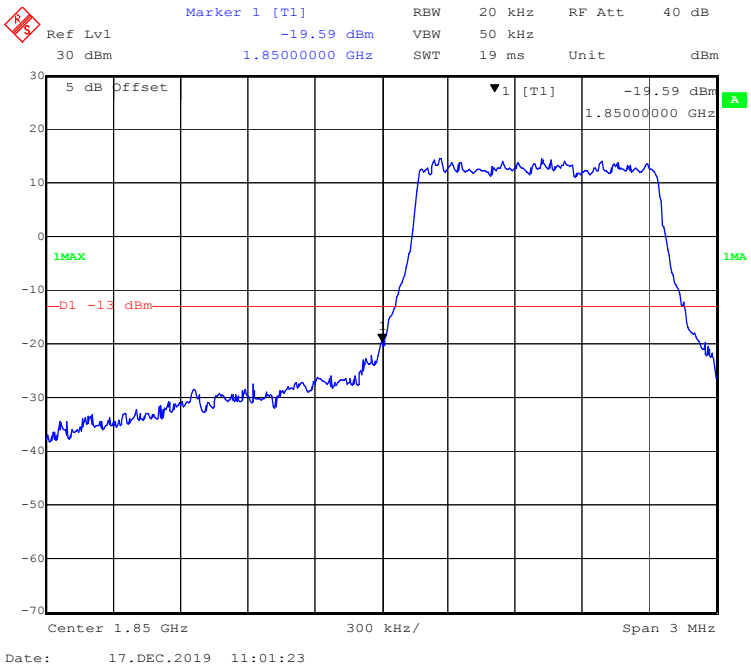
## QPSK (20 MHz, FULL RB) - Left Band Edge



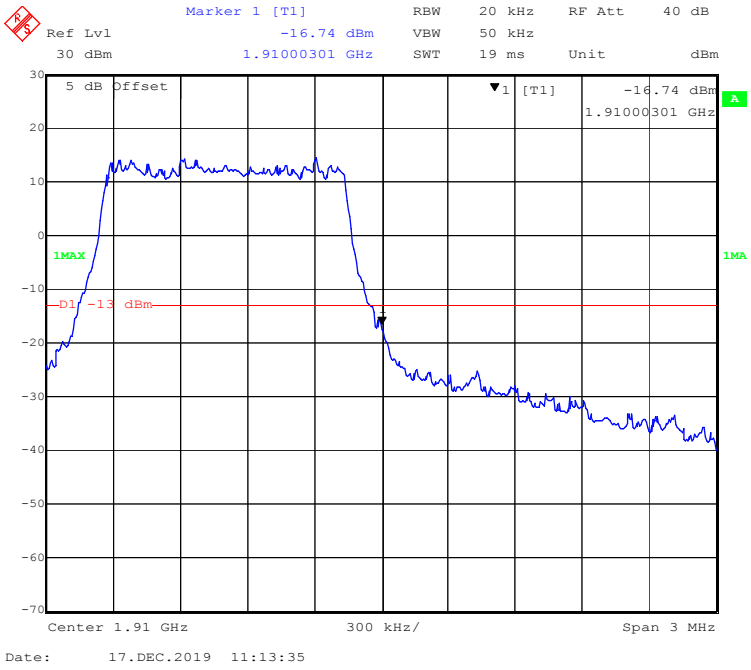

## QPSK (20 MHz, FULL RB) - Right Band Edge



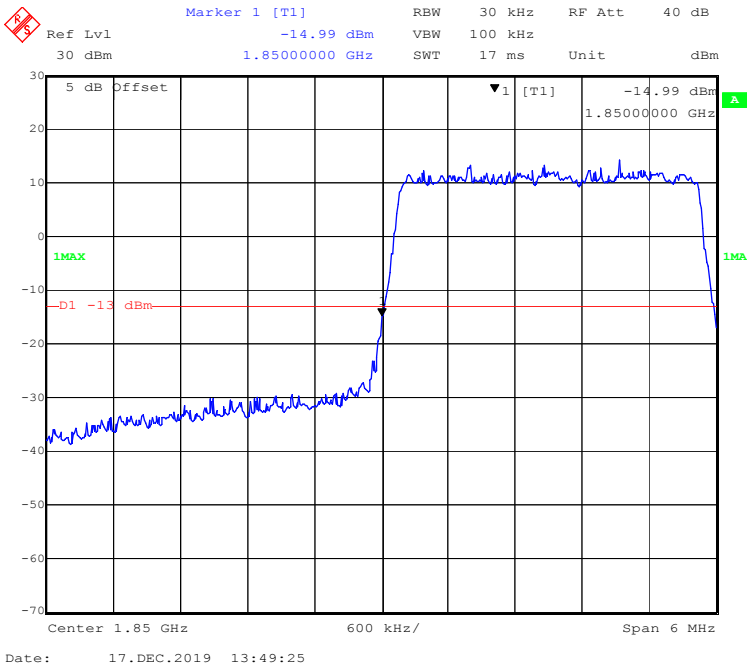
## 16-QAM (1.4 MHz, FULL RB) - Left Band Edge



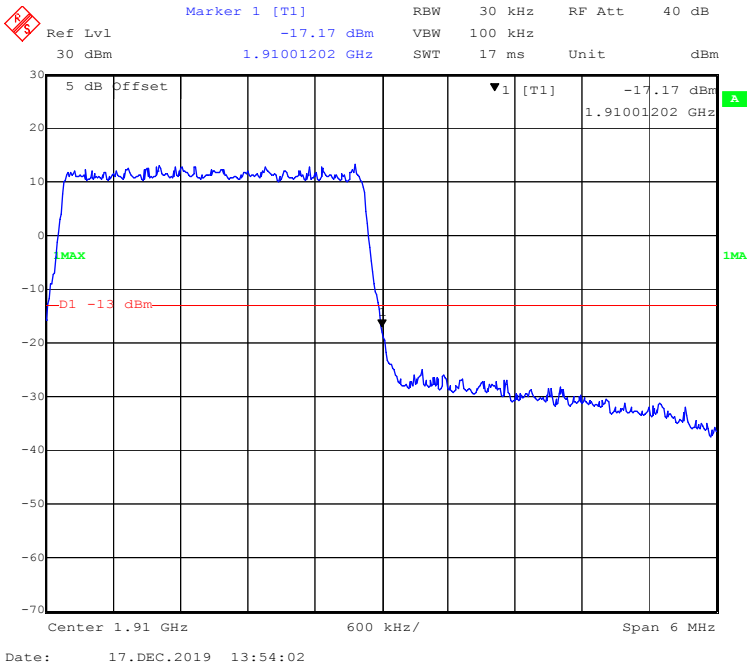

## 16-QAM (1.4 MHz, FULL RB) - Right Band Edge



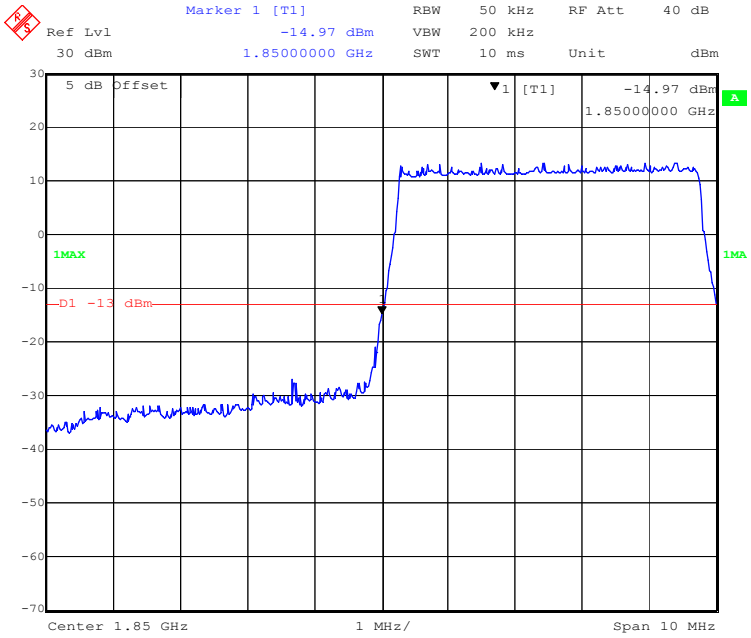
## 16-QAM (3 MHz, FULL RB) - Left Band Edge




## 16-QAM (3 MHz, FULL RB) - Right Band Edge

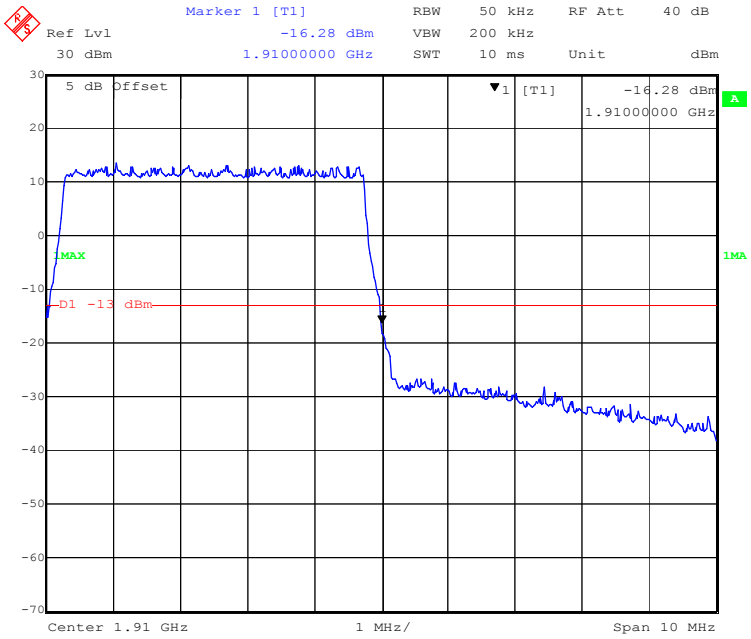


## 16-QAM (5 MHz, FULL RB) - Left Band Edge



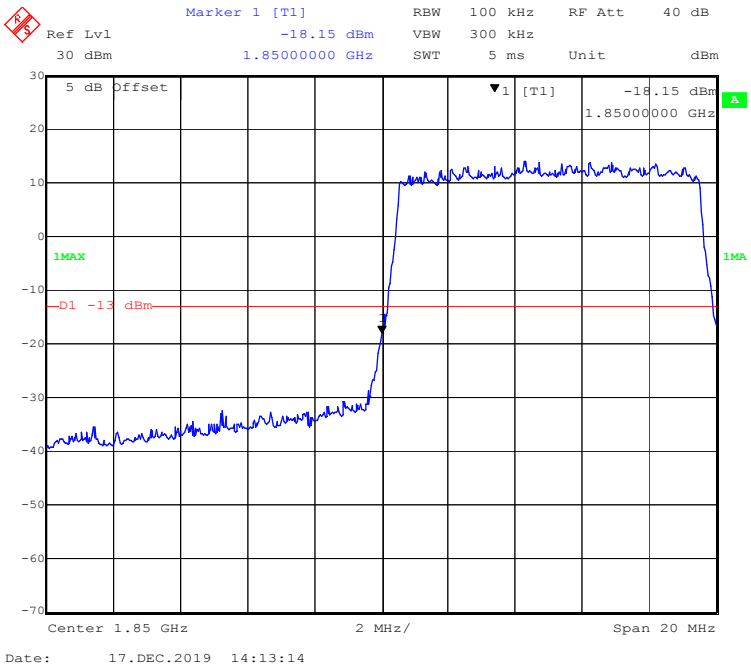

Date: 17.DEC.2019 14:07:36

## 16-QAM (5 MHz, FULL RB) - Right Band Edge

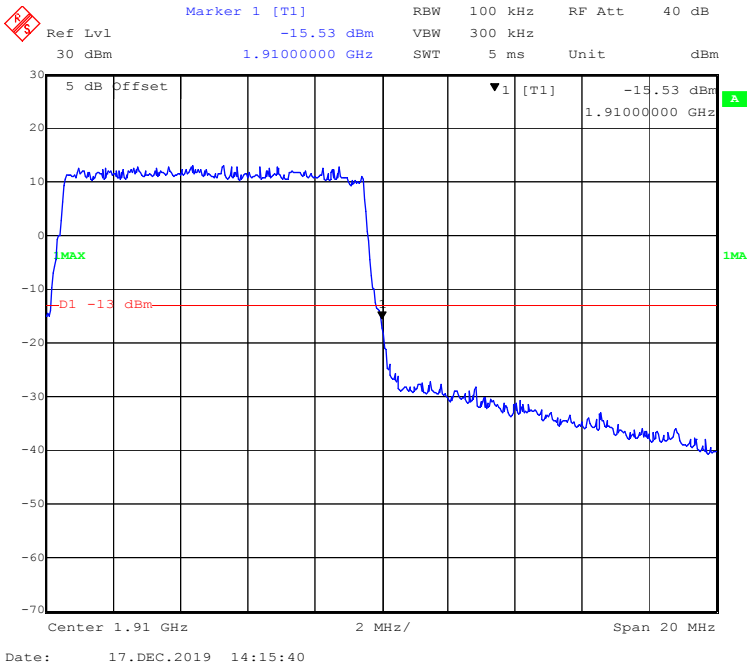



Date: 17.DEC.2019 14:04:39

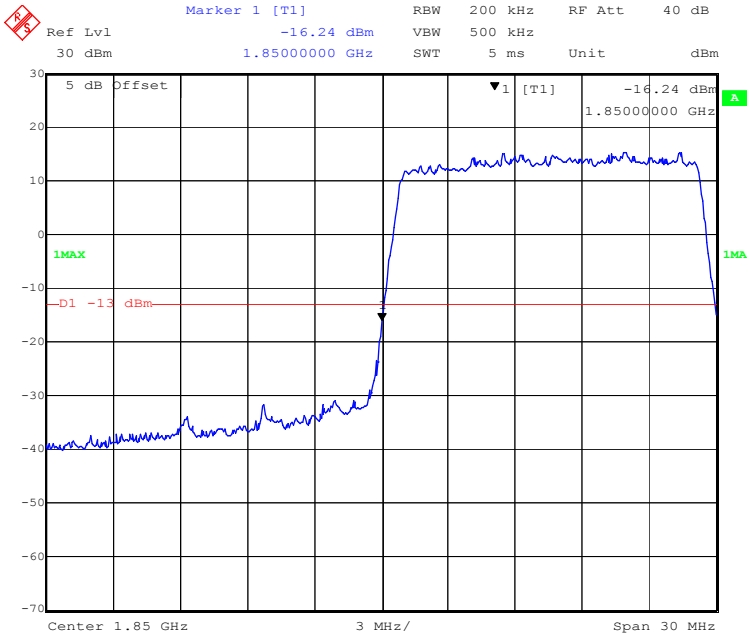
## 16-QAM (10 MHz, FULL RB) - Left Band Edge




## 16-QAM (10 MHz, FULL RB) - Right Band Edge

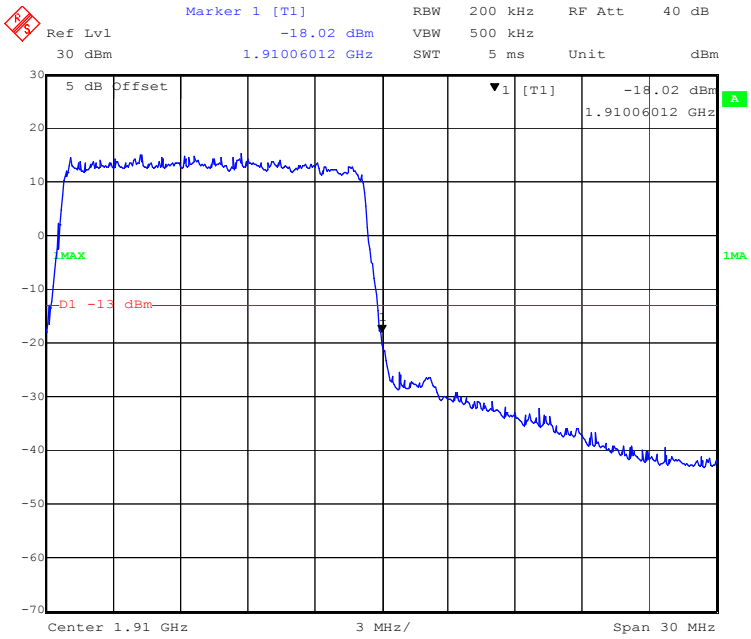


## 16-QAM (15 MHz, FULL RB) - Left Band Edge



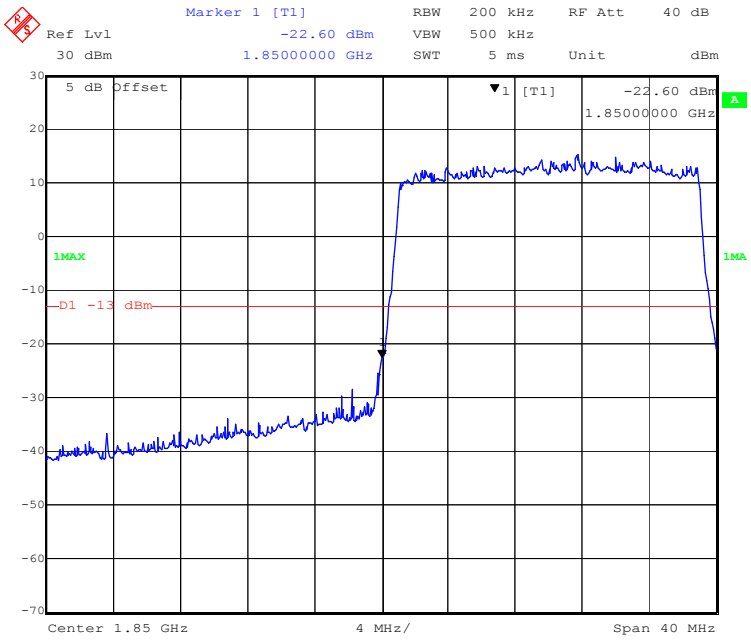

Date: 17.DEC.2019 16:51:51

## 16-QAM (15 MHz, FULL RB) - Right Band Edge

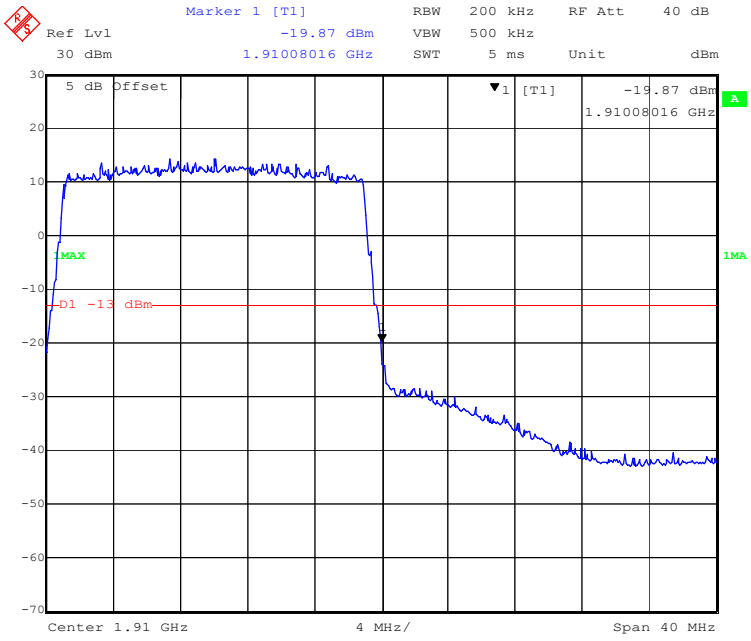



Date: 17.DEC.2019 16:54:57

## 16-QAM (20 MHz, FULL RB) - Left Band Edge

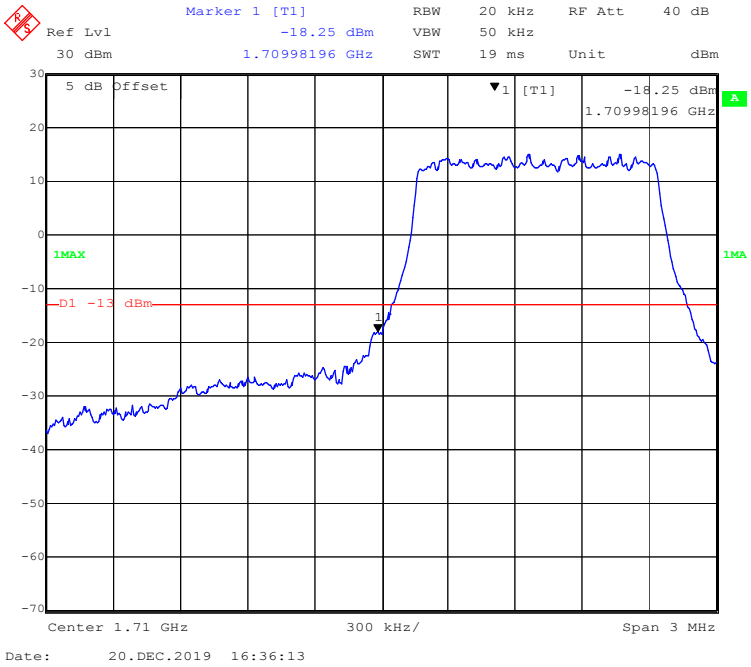



## 16-QAM (20 MHz, FULL RB) - Right Band Edge

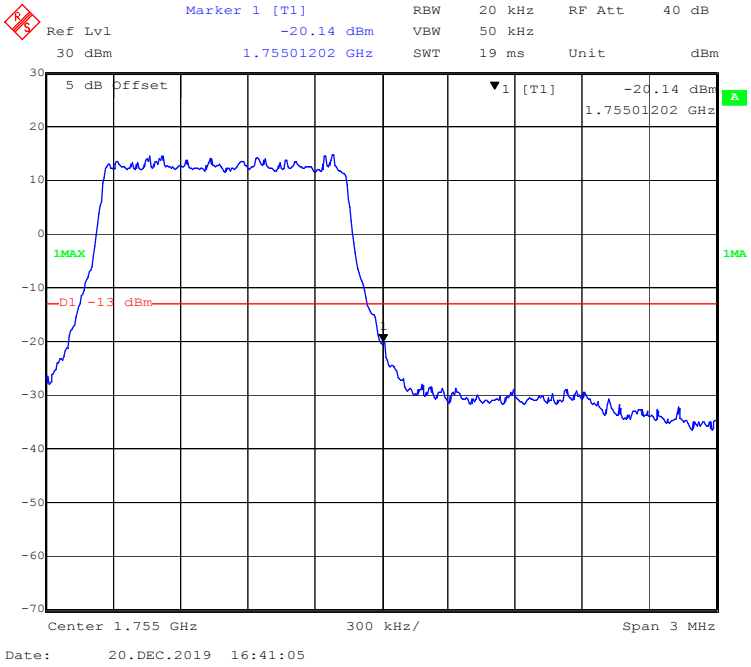


## LTE Band 4:

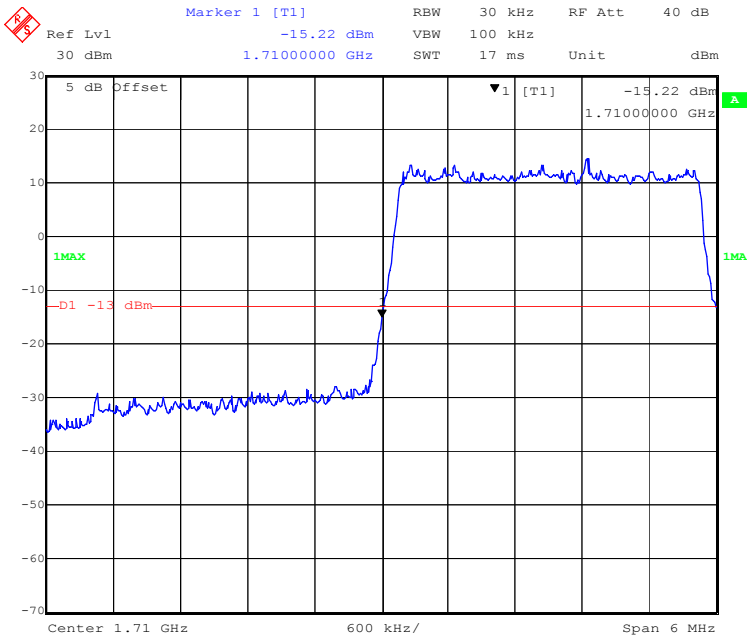
### QPSK (1.4 MHz, FULL RB) - Left Band Edge



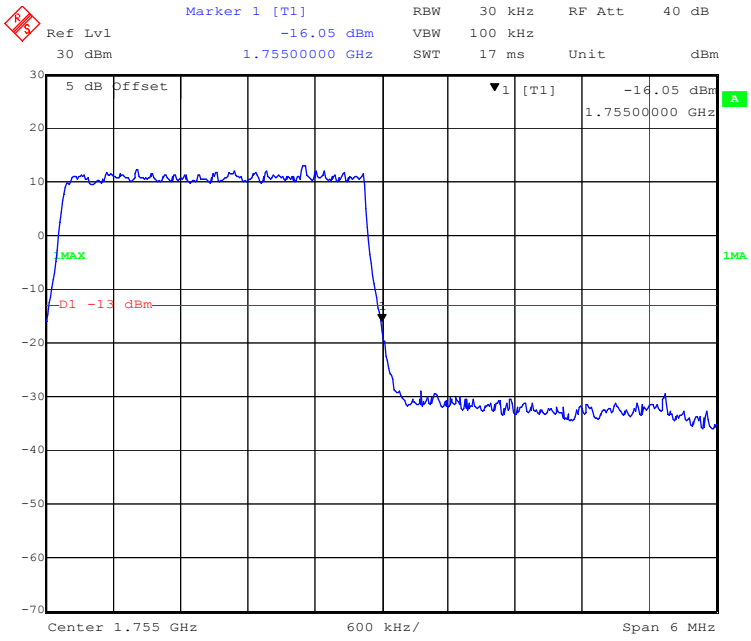

### QPSK (1.4 MHz, FULL RB) - Right Band Edge



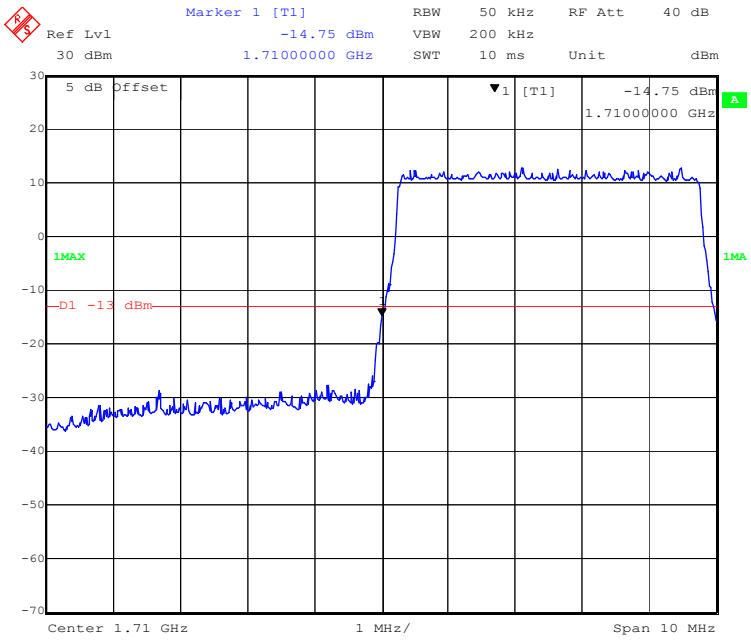
## QPSK (3 MHz, FULL RB) - Left Band Edge



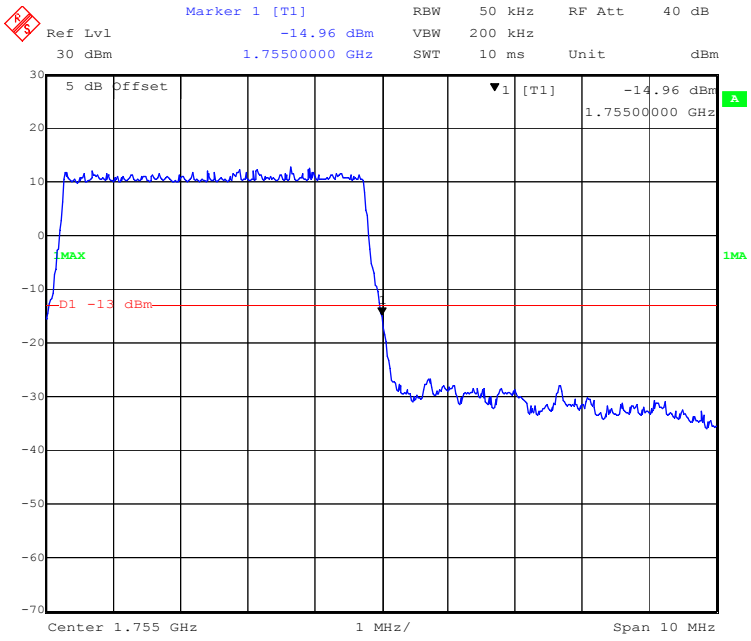

## QPSK (3 MHz, FULL RB) - Right Band Edge



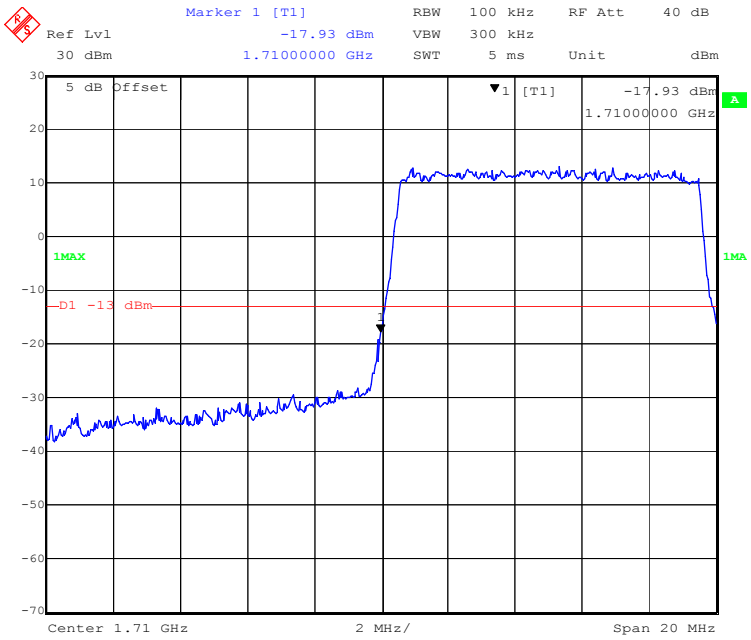
## QPSK (5 MHz, FULL RB) - Left Band Edge



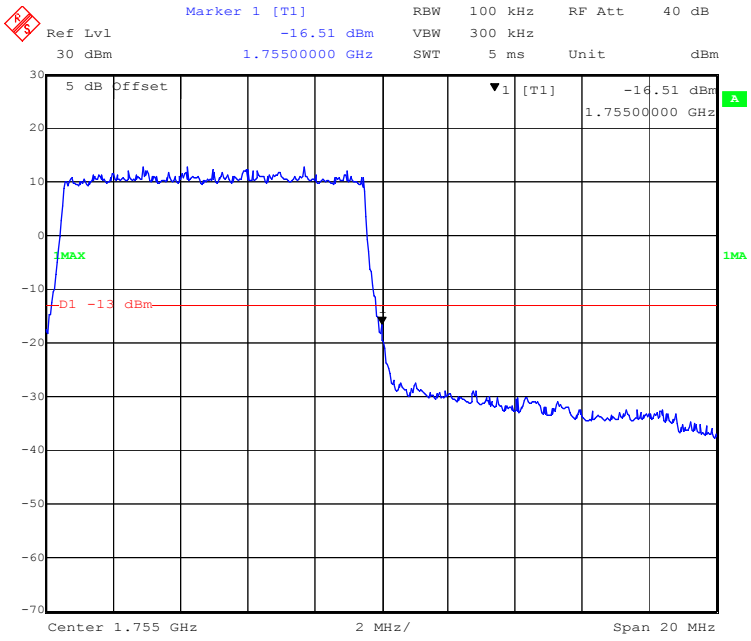

## QPSK (5 MHz, FULL RB) - Right Band Edge



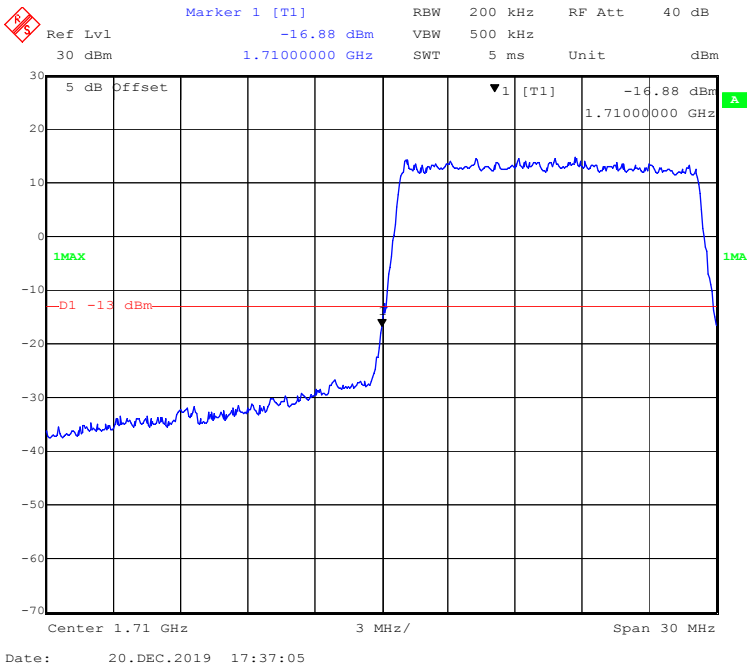
## QPSK (10 MHz, FULL RB) - Left Band Edge



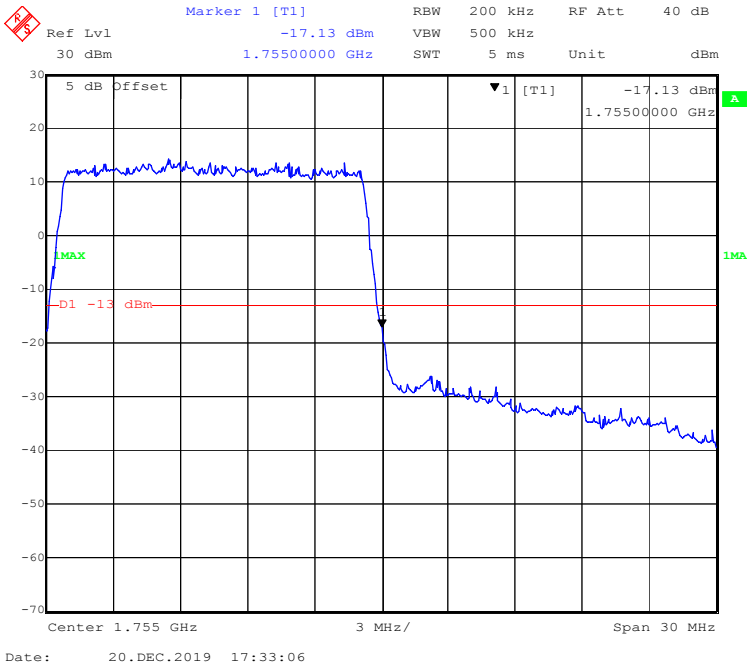

## QPSK (10 MHz, FULL RB) - Right Band Edge



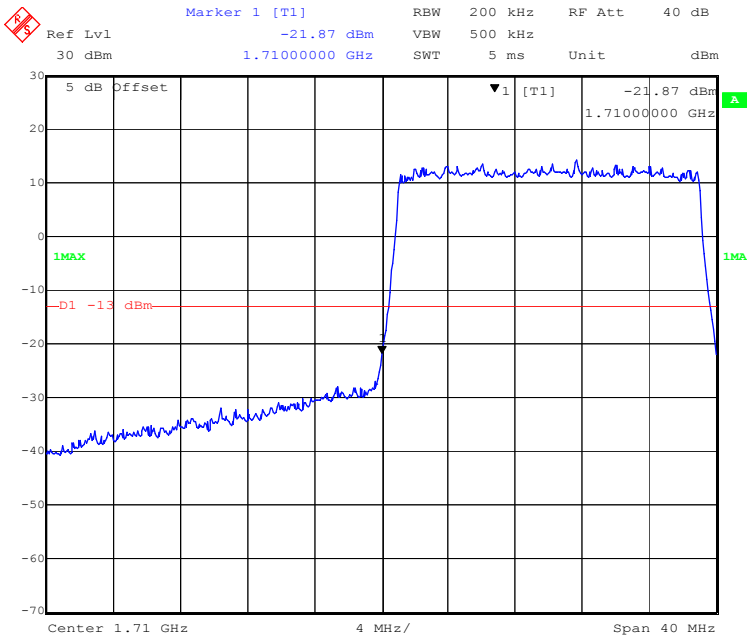
## QPSK (15 MHz, FULL RB) - Left Band Edge



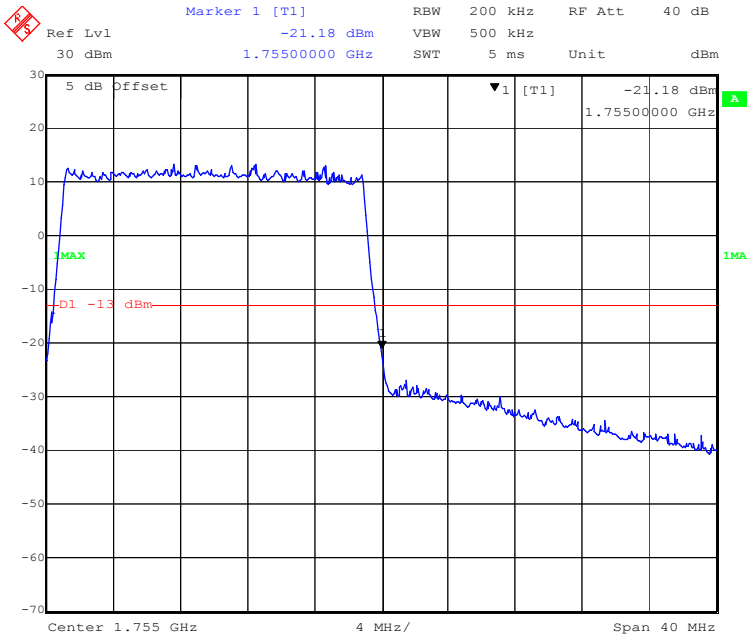

## QPSK (15 MHz, FULL RB) - Right Band Edge



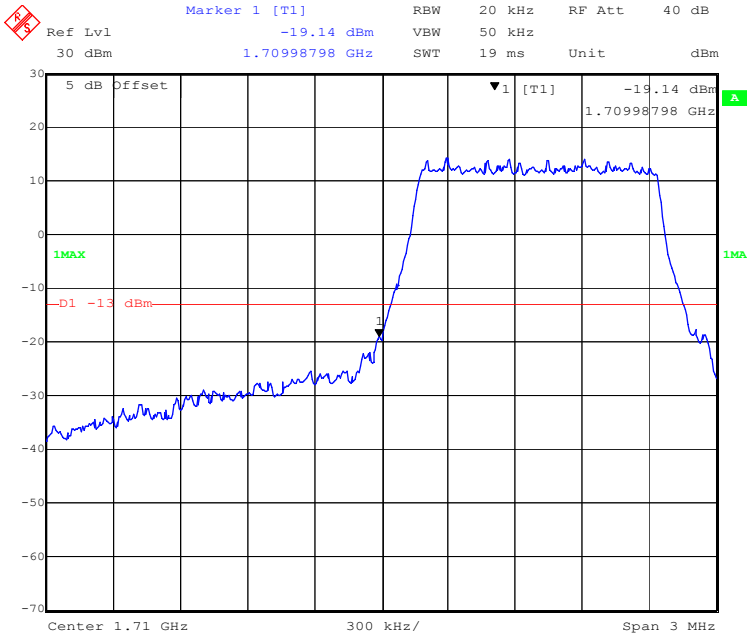
## QPSK (20 MHz, FULL RB) - Left Band Edge



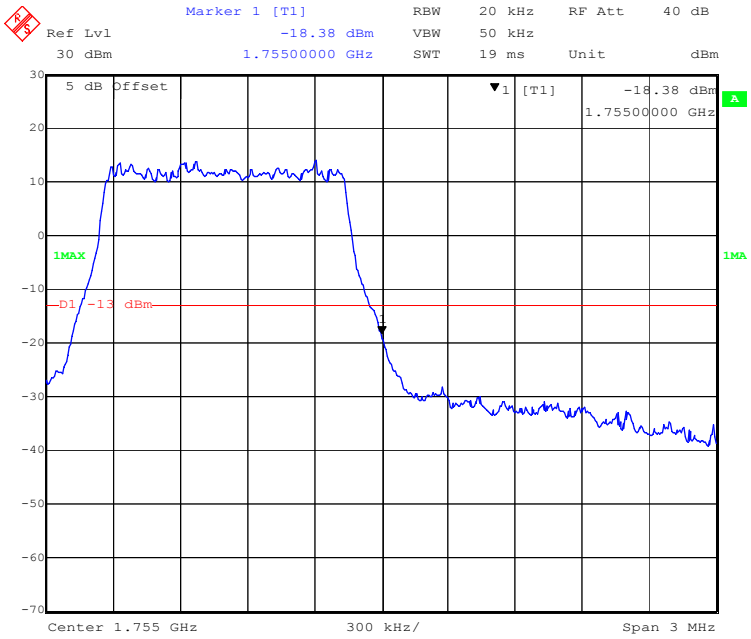

## QPSK (20 MHz, FULL RB) - Right Band Edge



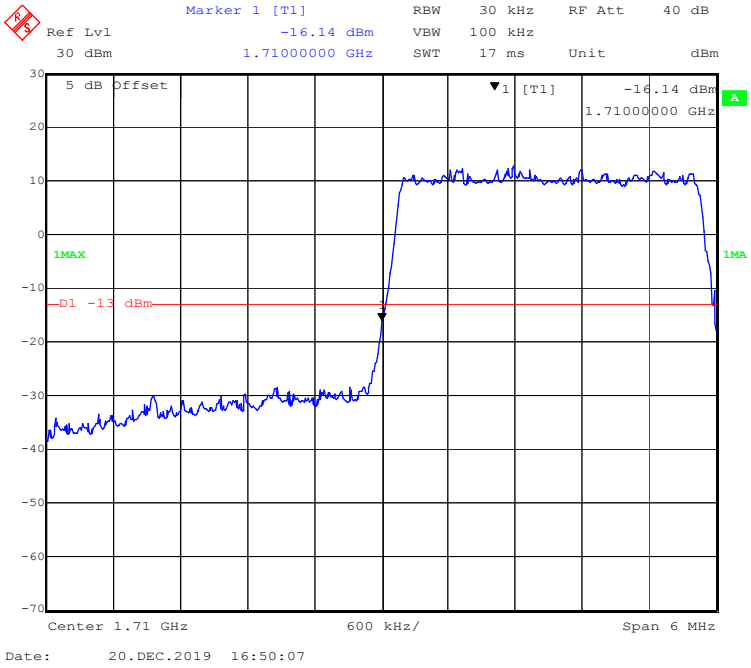
## 16-QAM (1.4 MHz, FULL RB) - Left Band Edge



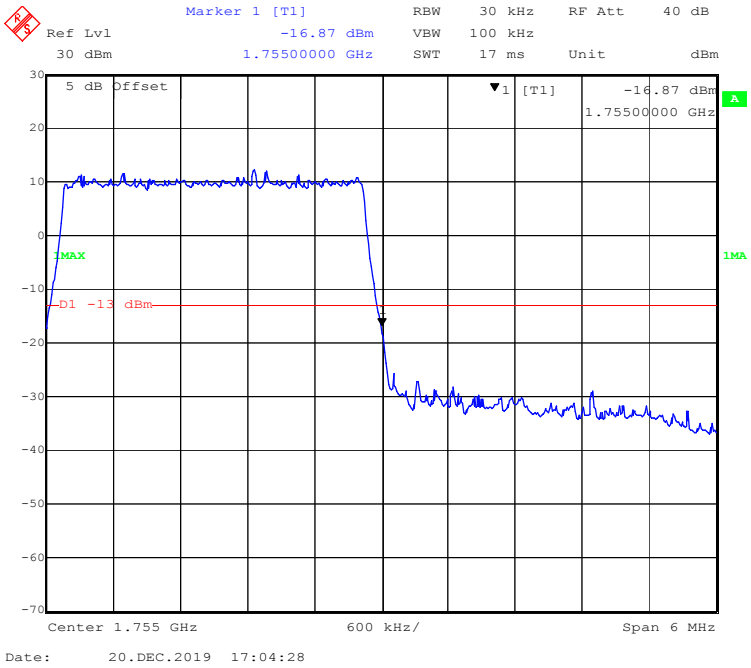

## 16-QAM (1.4 MHz, FULL RB) - Right Band Edge



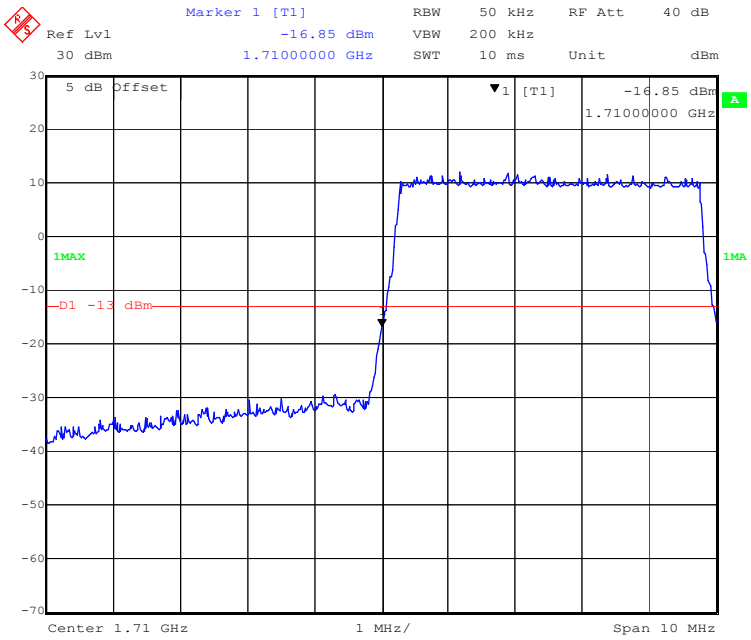
## 16-QAM (3 MHz, FULL RB) - Left Band Edge



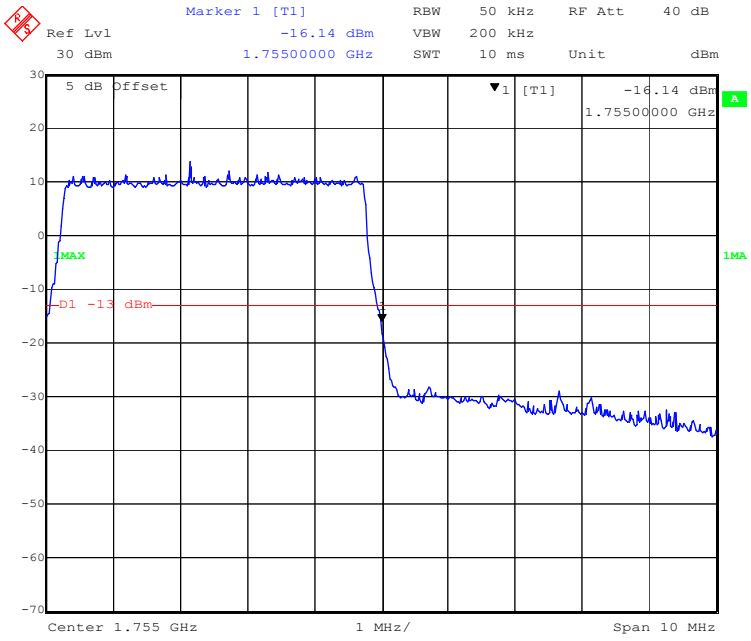

## 16-QAM (3 MHz, FULL RB) - Right Band Edge



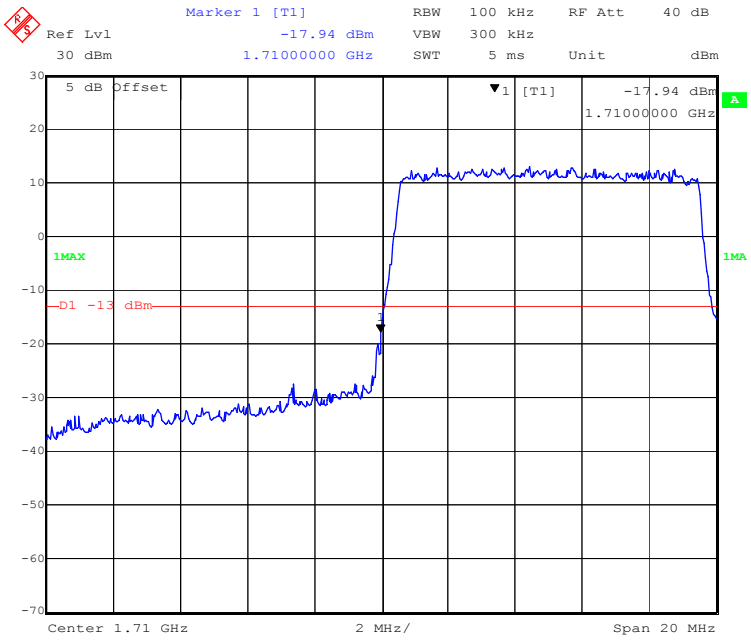
## 16-QAM (5 MHz, FULL RB) - Left Band Edge



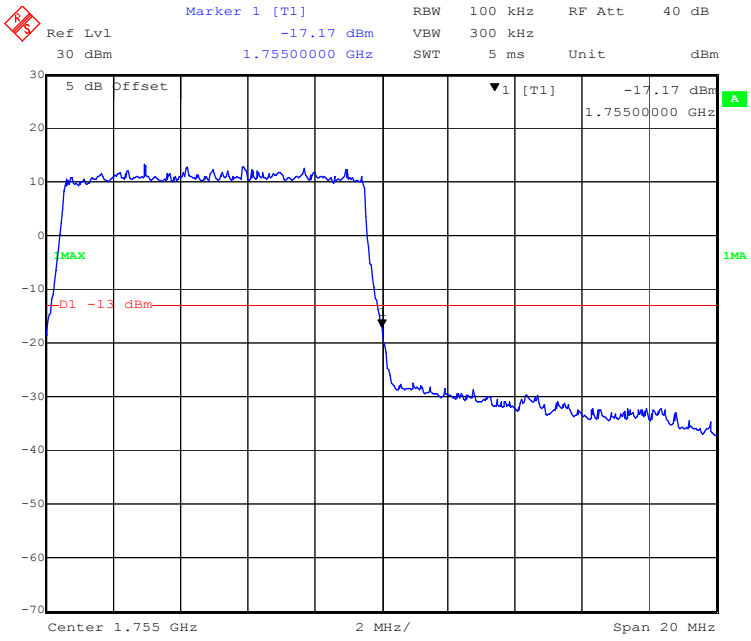

## 16-QAM (5 MHz, FULL RB) - Right Band Edge



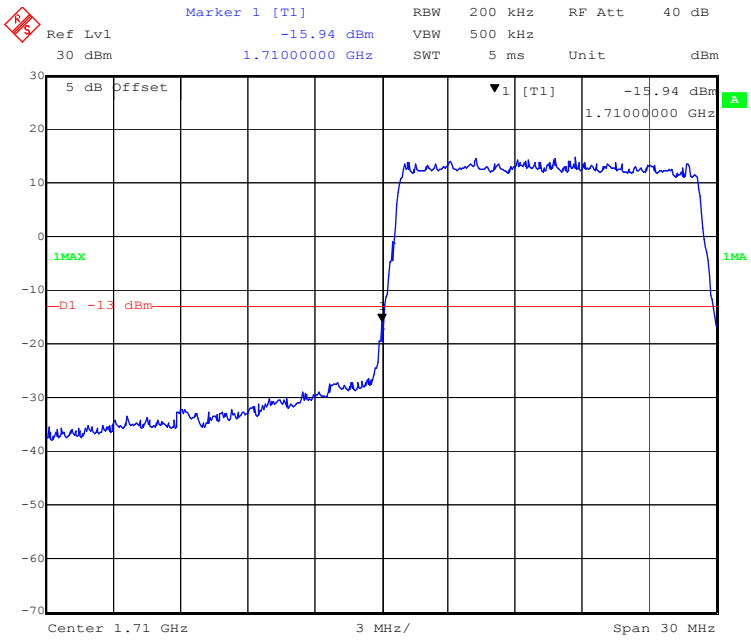
## 16-QAM (10 MHz, FULL RB) - Left Band Edge



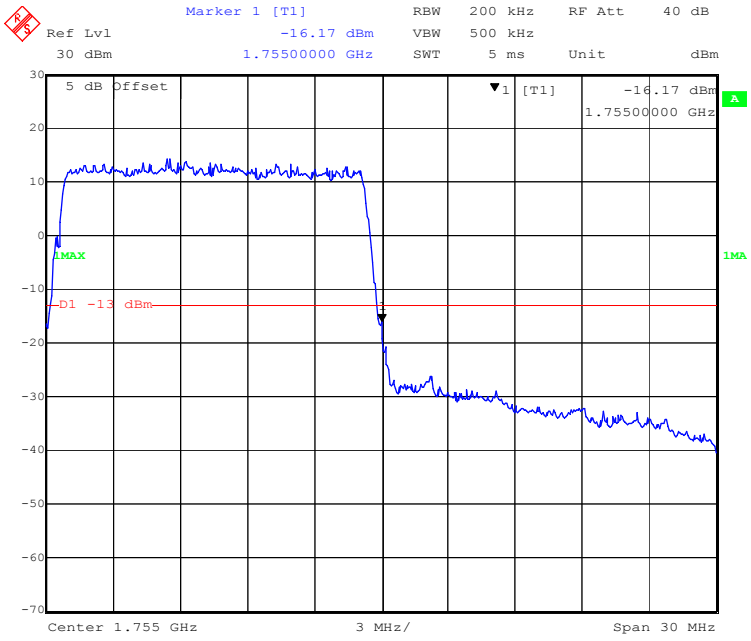

## 16-QAM (10 MHz, FULL RB) - Right Band Edge



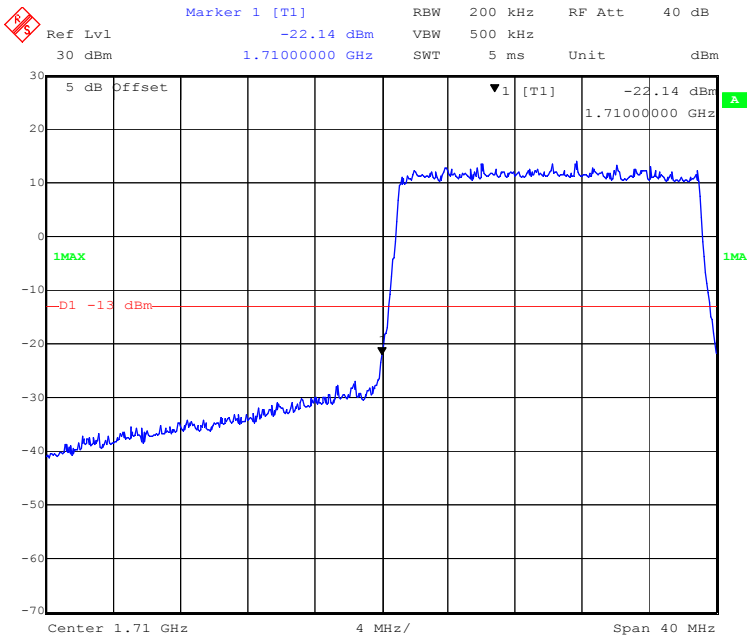
## 16-QAM (15 MHz, FULL RB) - Left Band Edge




## 16-QAM (15 MHz, FULL RB) - Right Band Edge

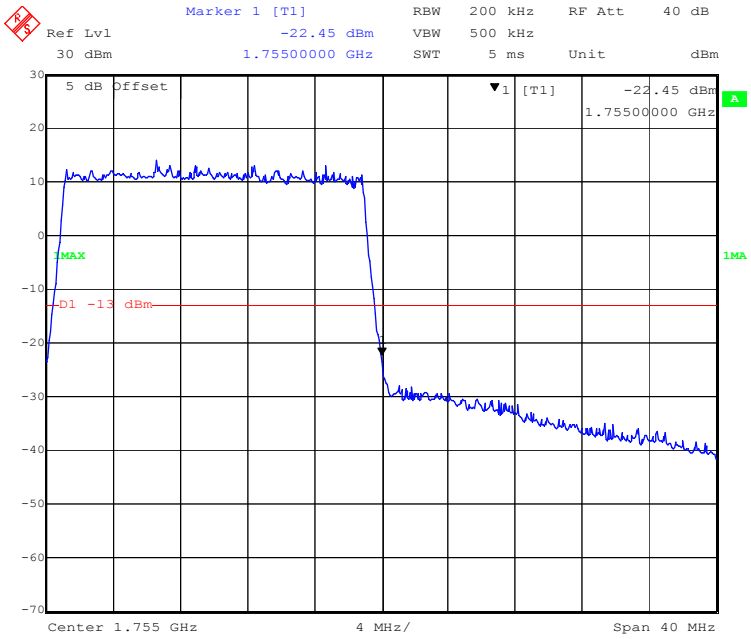


## 16-QAM (20 MHz, FULL RB) - Left Band Edge




Date: 20.DEC.2019 17:42:15

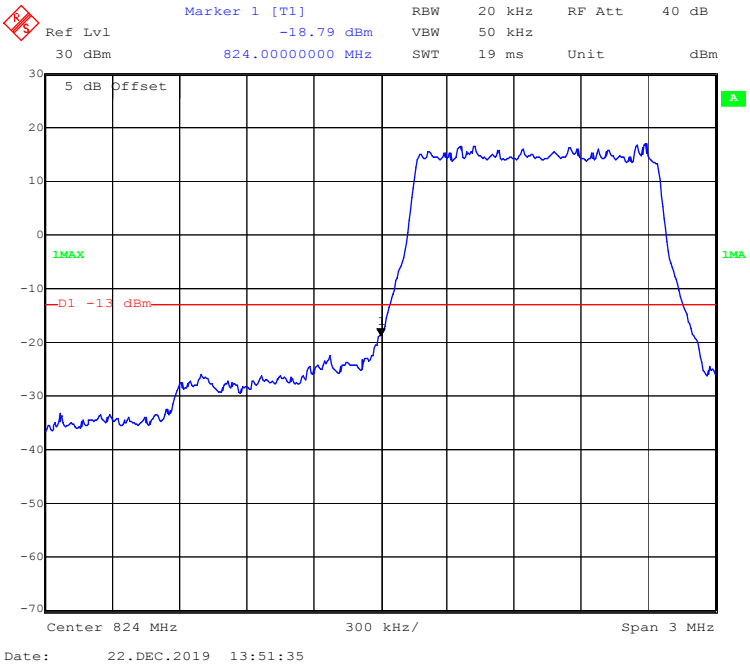
## 16-QAM (20 MHz, FULL RB) - Right Band Edge



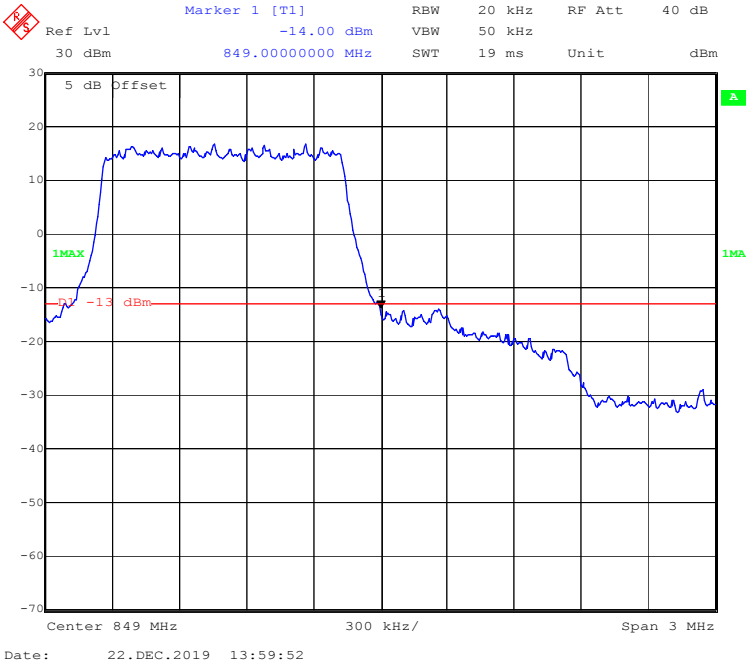

Date: 20.DEC.2019 17:45:51

## LTE Band 5:

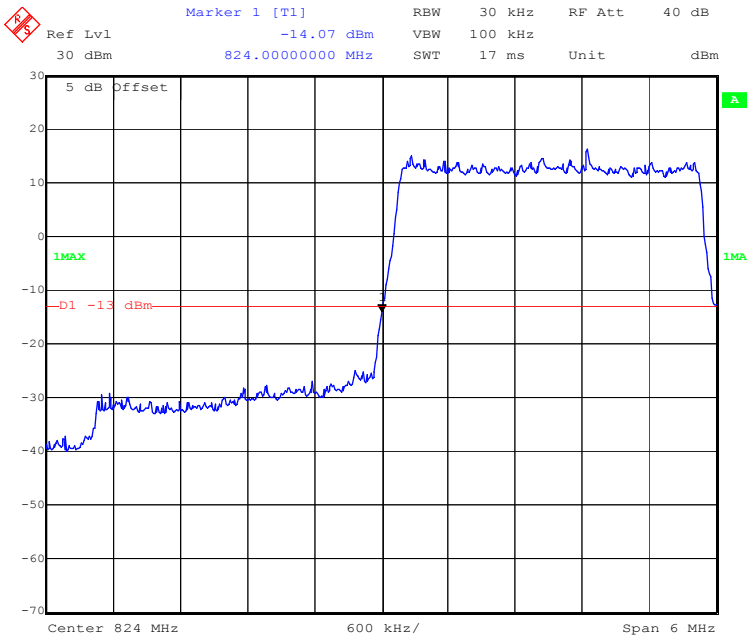
### QPSK (1.4 MHz, FULL RB) - Left Band Edge



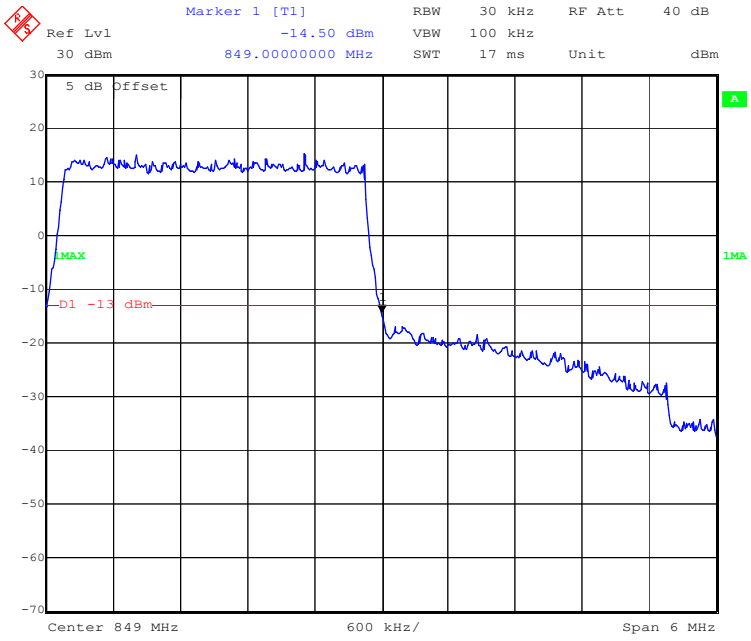

### QPSK (1.4 MHz, FULL RB) - Right Band Edge



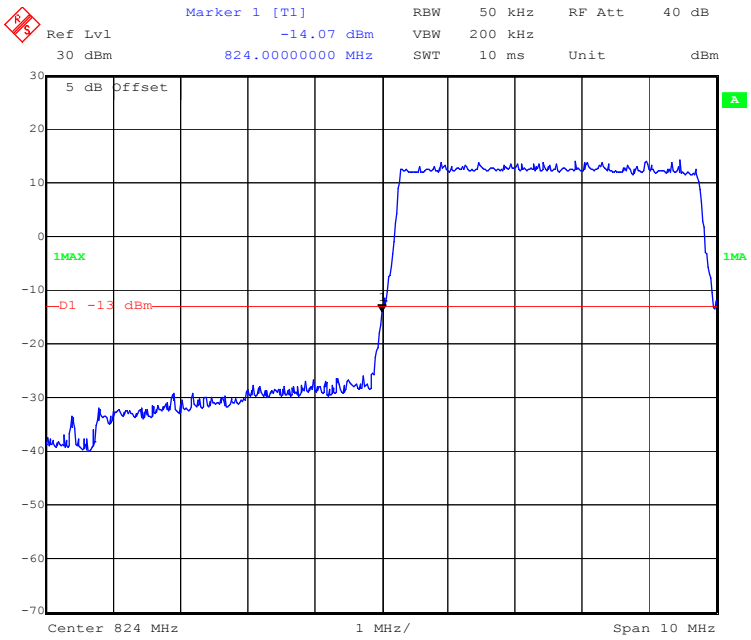
## QPSK (3 MHz, FULL RB) - Left Band Edge



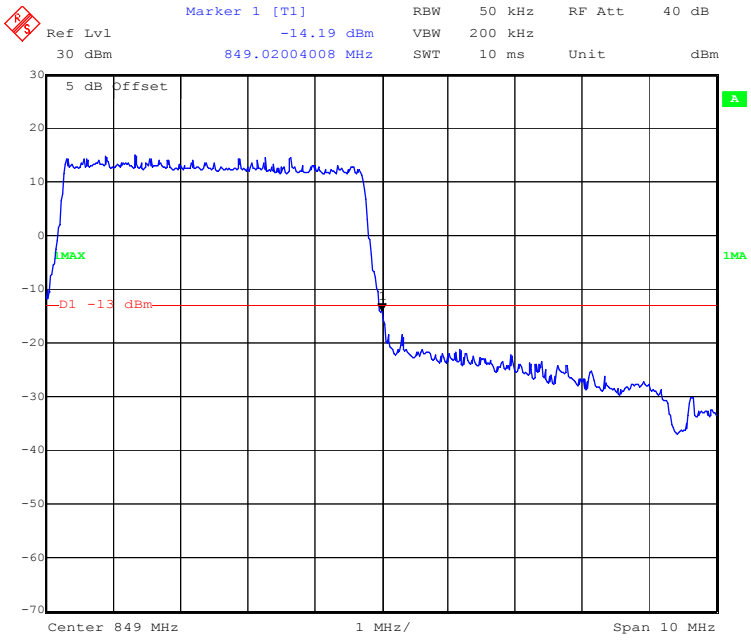

## QPSK (3 MHz, FULL RB) - Right Band Edge



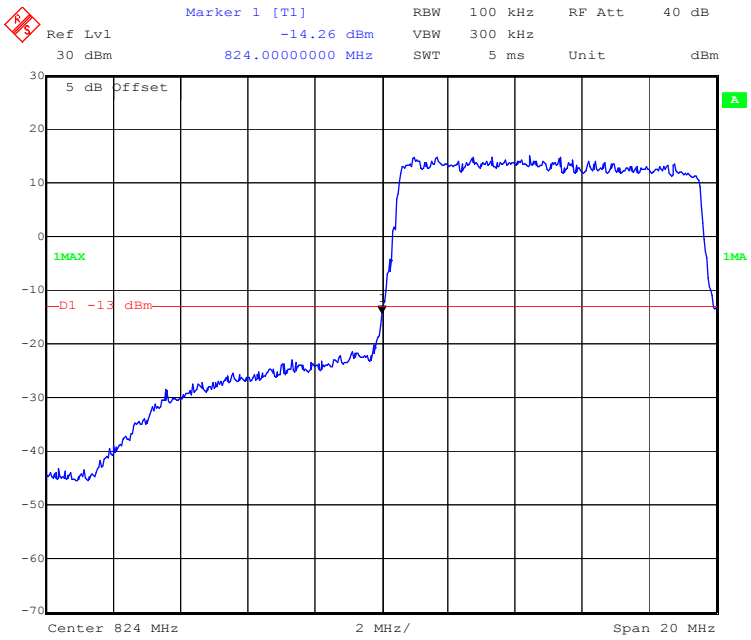
## QPSK (5 MHz, FULL RB) - Left Band Edge



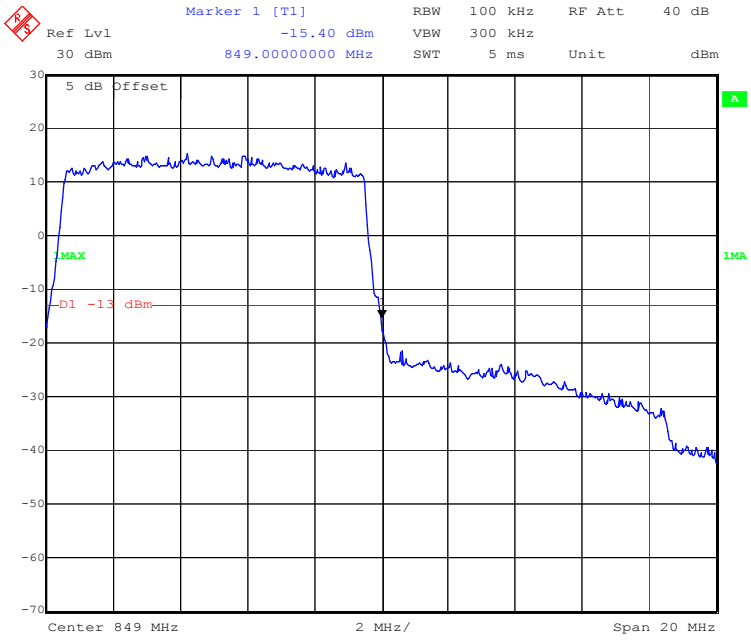

## QPSK (5 MHz, FULL RB) - Right Band Edge



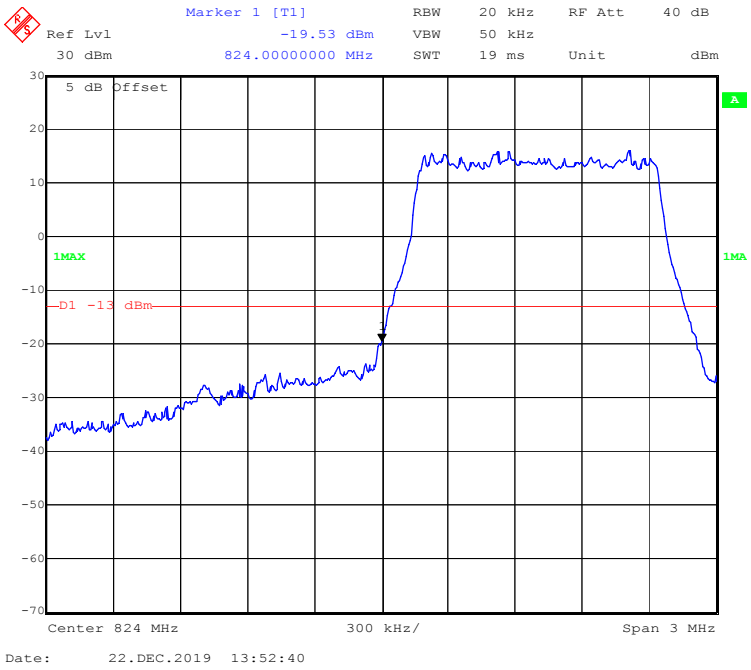
## QPSK (10 MHz, FULL RB) - Left Band Edge



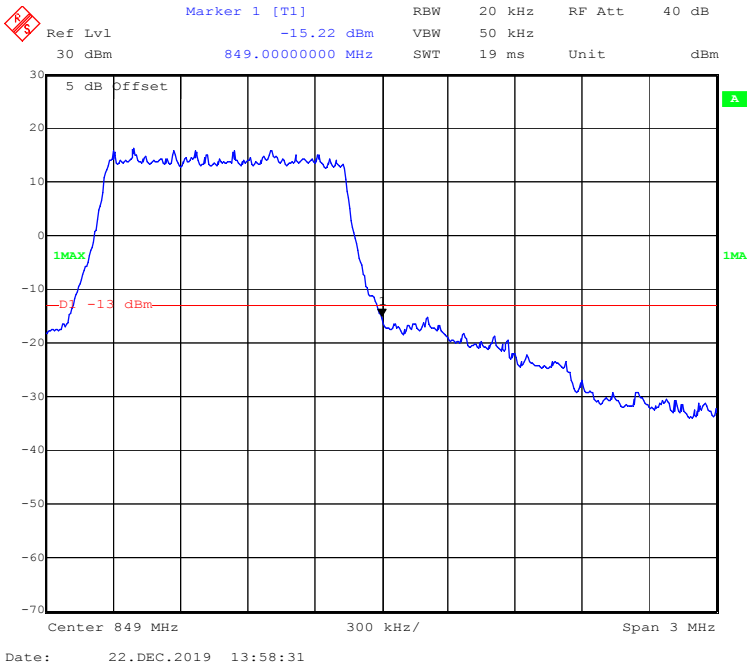

## QPSK (10 MHz, FULL RB) - Right Band Edge



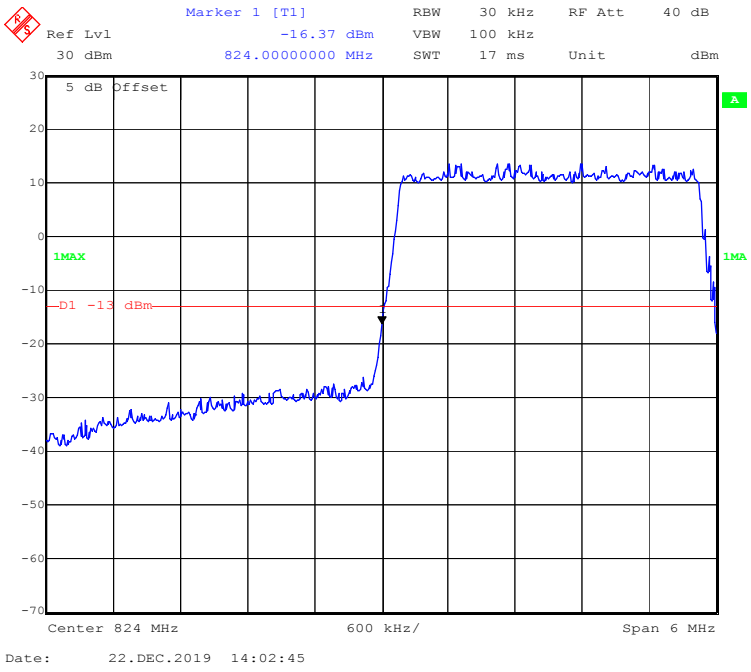
## 16-QAM (1.4 MHz, FULL RB) - Left Band Edge



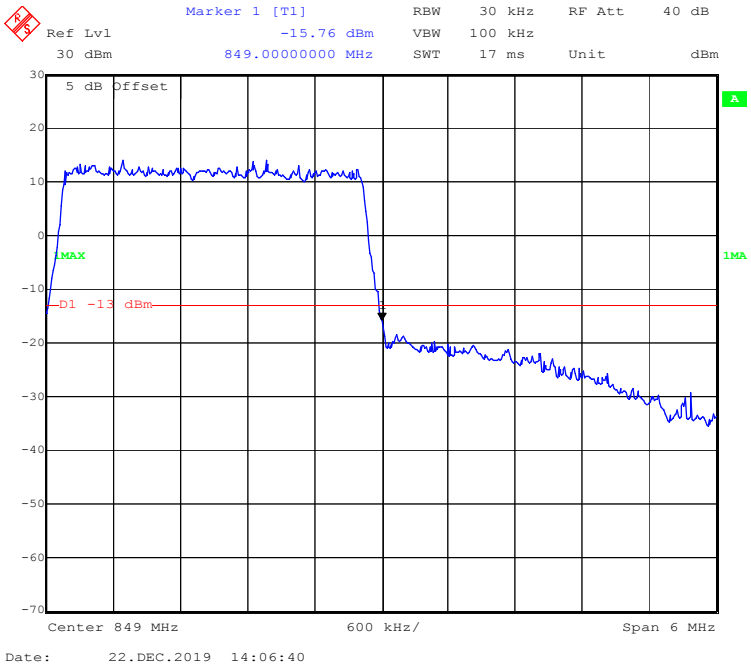

## 16-QAM (1.4 MHz, FULL RB) - Right Band Edge



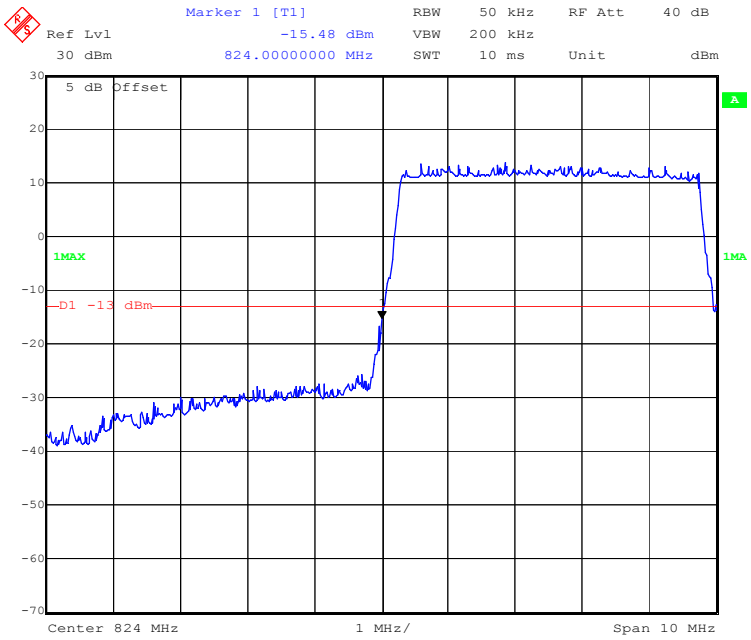
## 16-QAM (3 MHz, FULL RB) - Left Band Edge



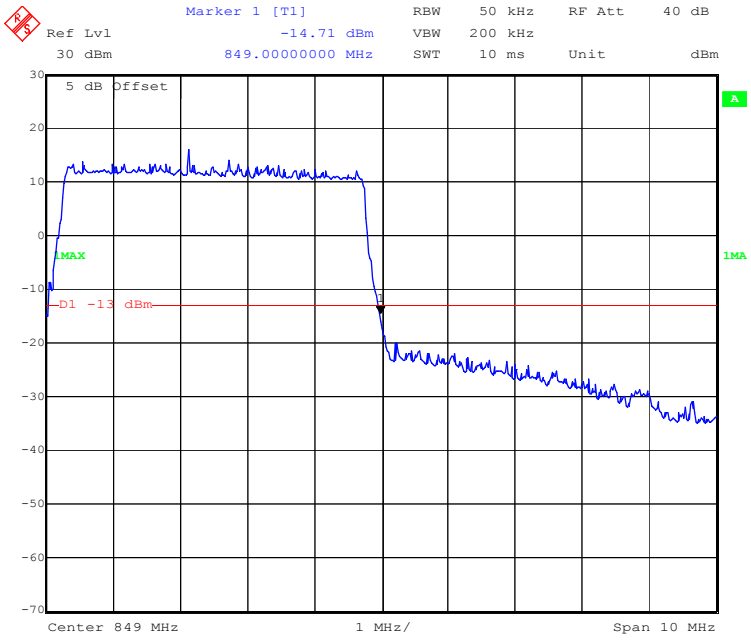

## 16-QAM (3 MHz, FULL RB) - Right Band Edge



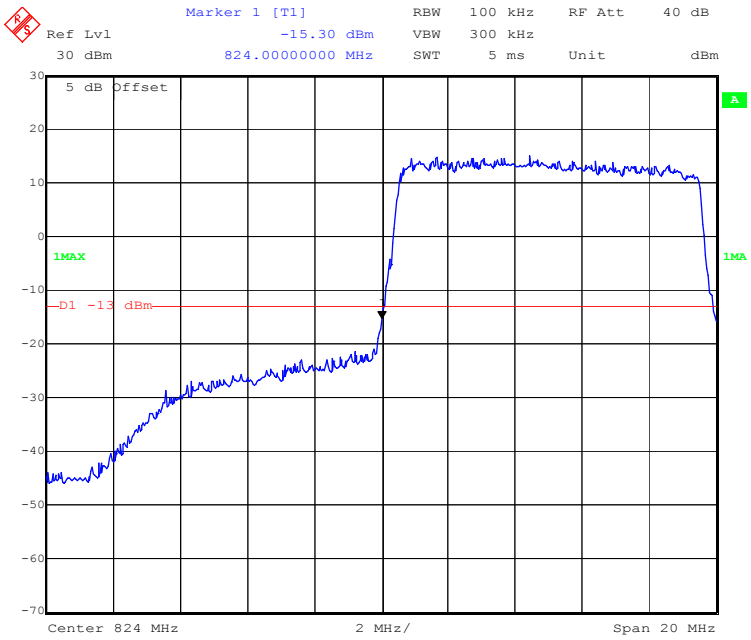
## 16-QAM (5 MHz, FULL RB) - Left Band Edge



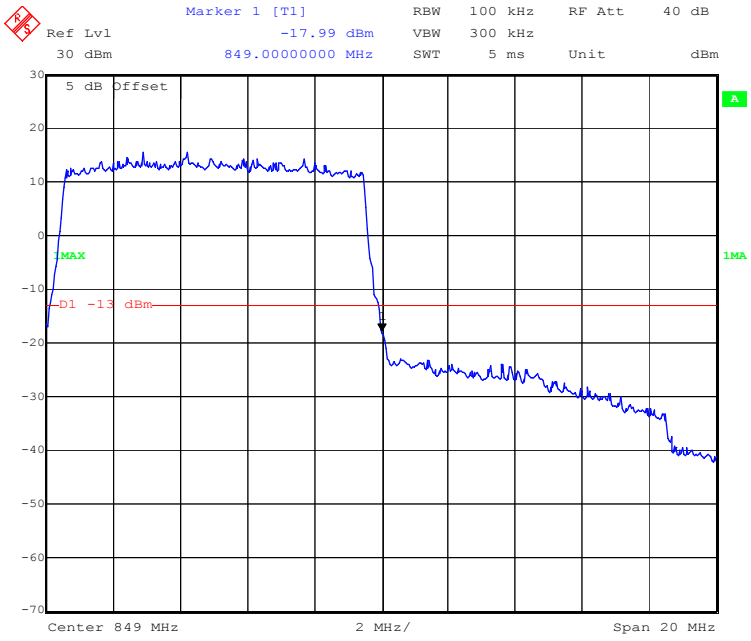

## 16-QAM (5 MHz, FULL RB) - Right Band Edge



## 16-QAM (10 MHz, FULL RB) - Left Band Edge

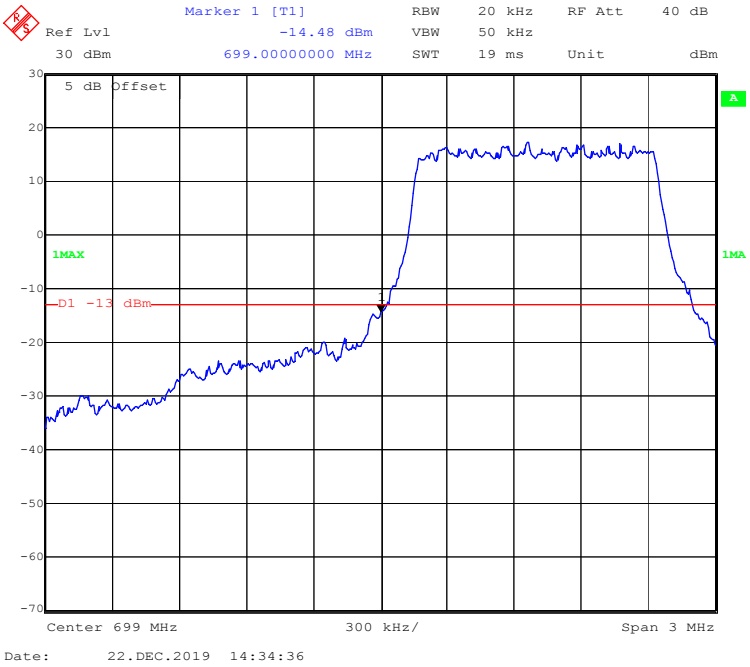



## 16-QAM (10 MHz, FULL RB) - Right Band Edge

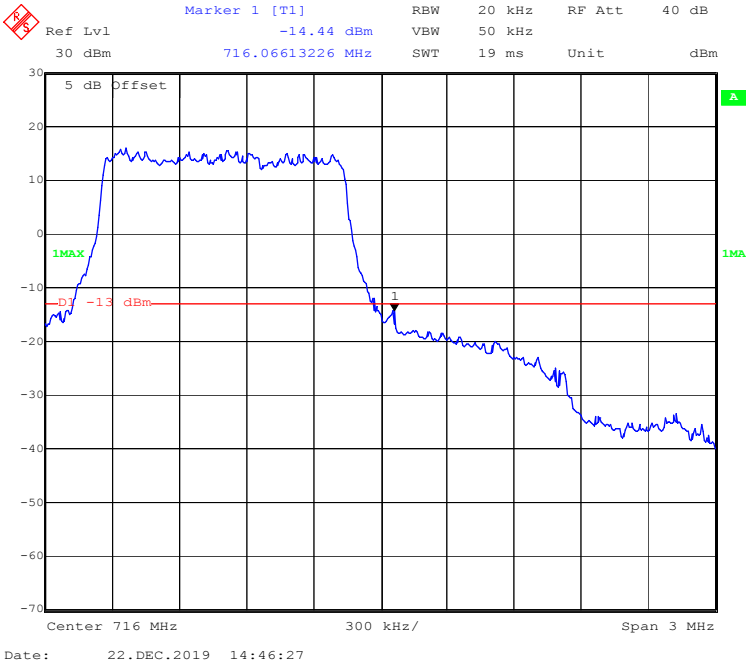


## LTE Band 12:

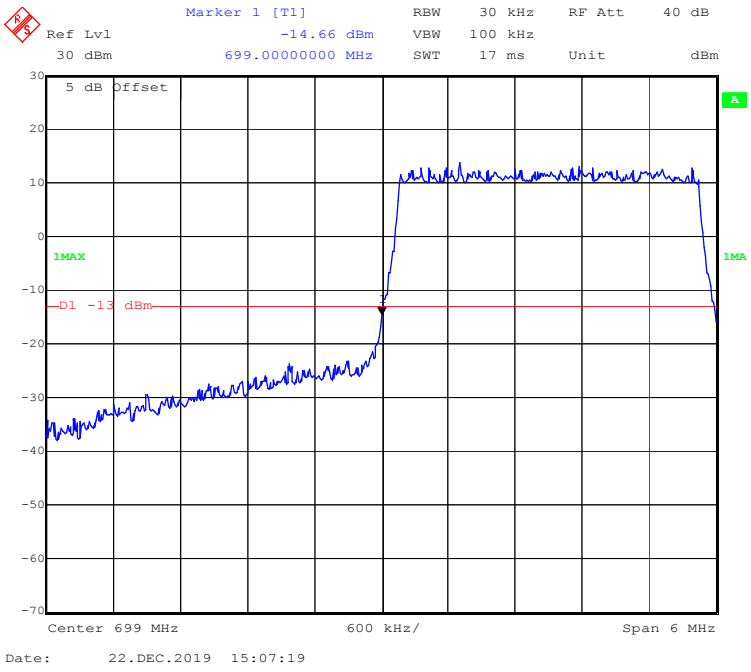
### QPSK (1.4 MHz, FULL RB) - Left Band Edge



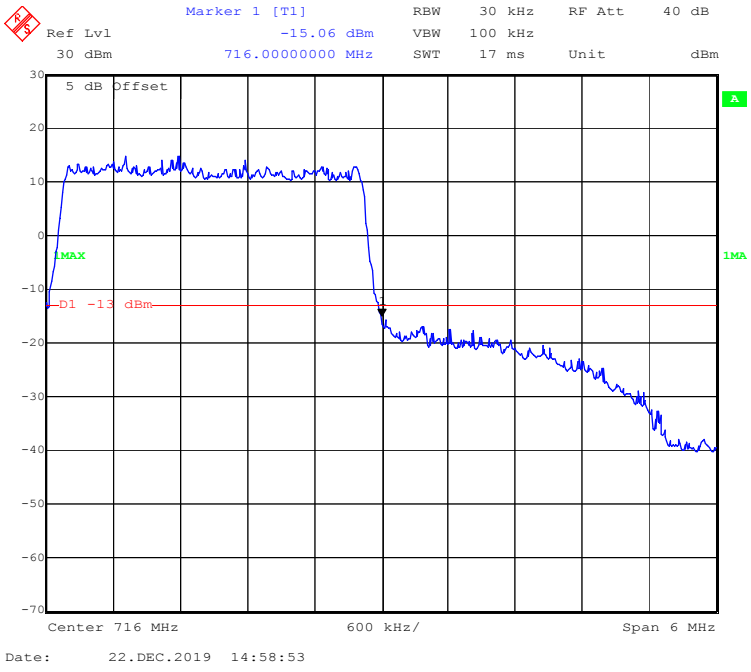

### QPSK (1.4 MHz, FULL RB) - Right Band Edge



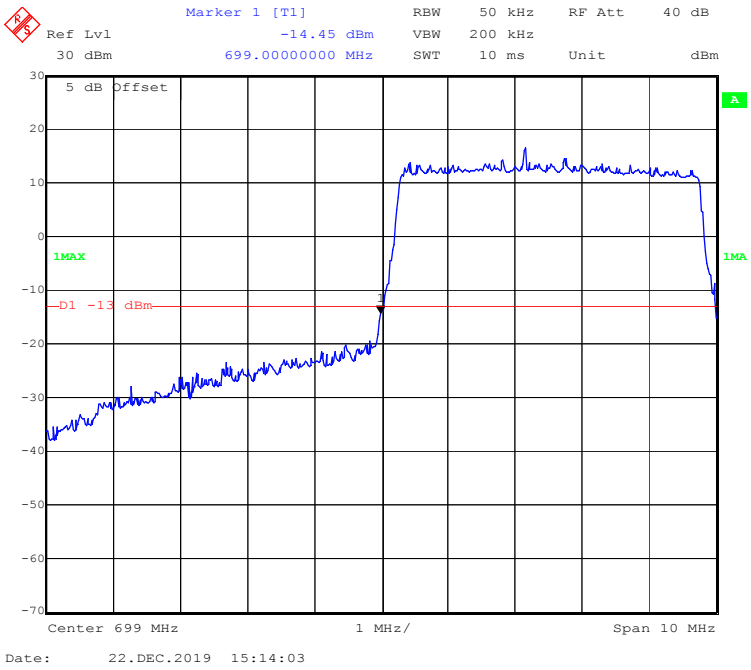
## QPSK (3 MHz, FULL RB) - Left Band Edge



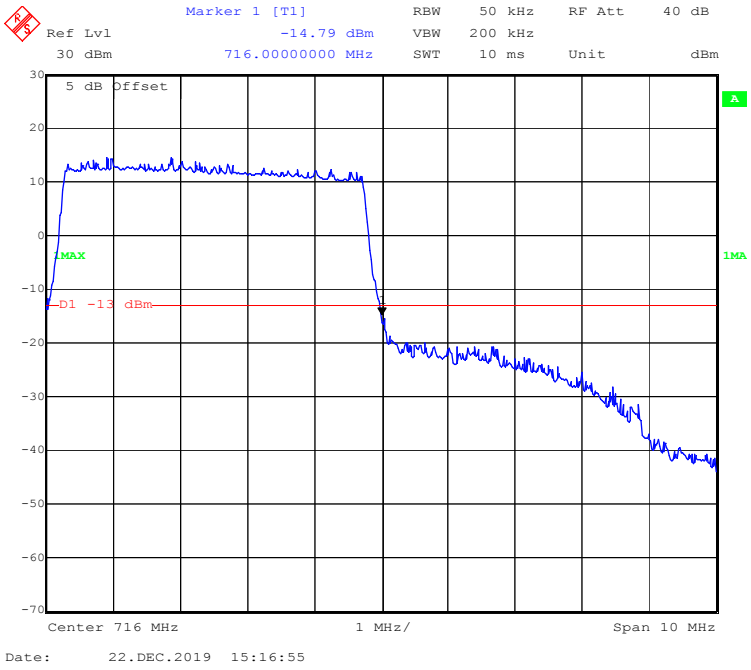

## QPSK (3 MHz, FULL RB) - Right Band Edge



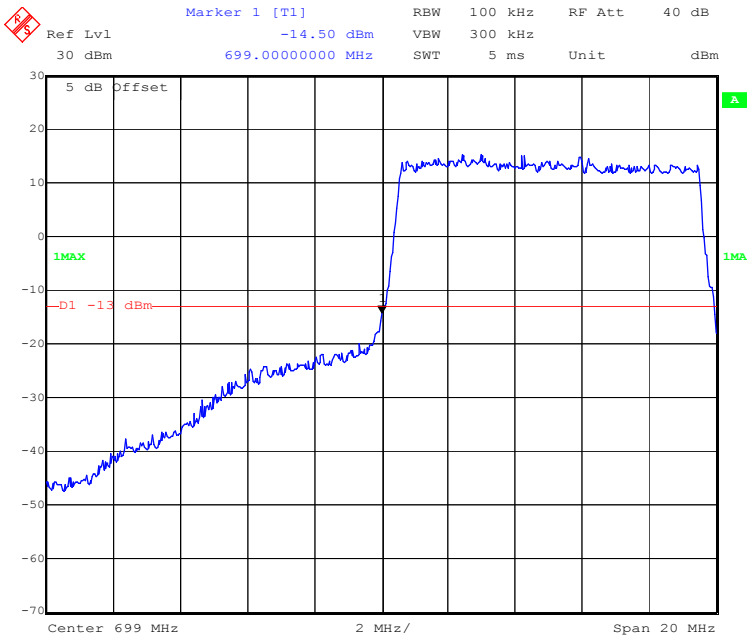
## QPSK (5 MHz, FULL RB) - Left Band Edge



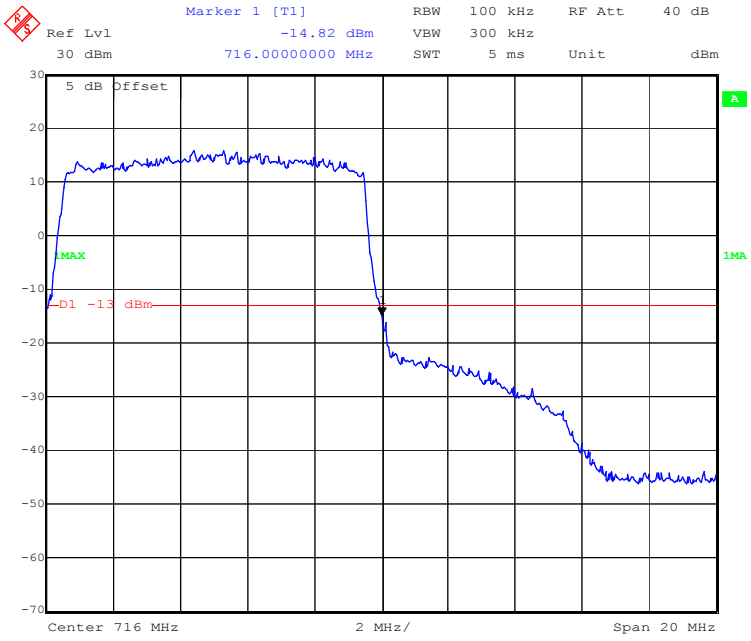

## QPSK (5 MHz, FULL RB) - Right Band Edge



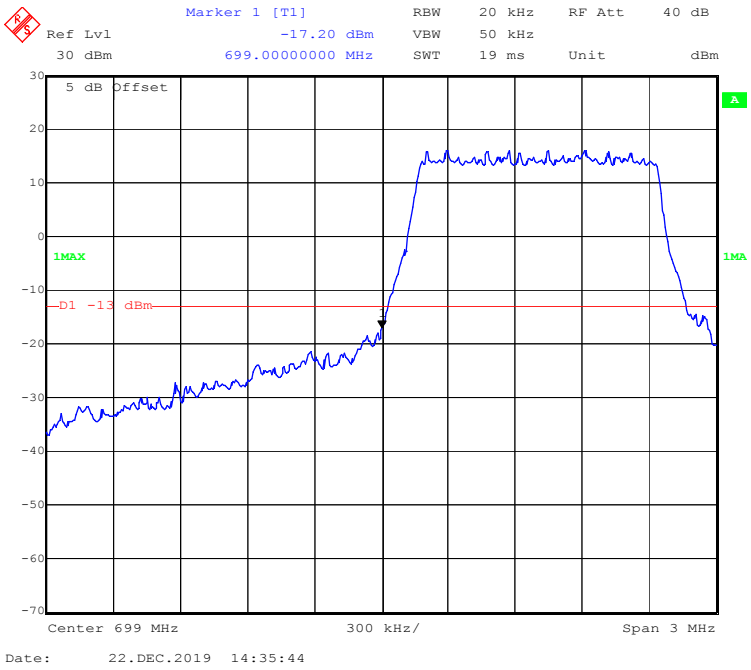
## QPSK (10 MHz, FULL RB) - Left Band Edge



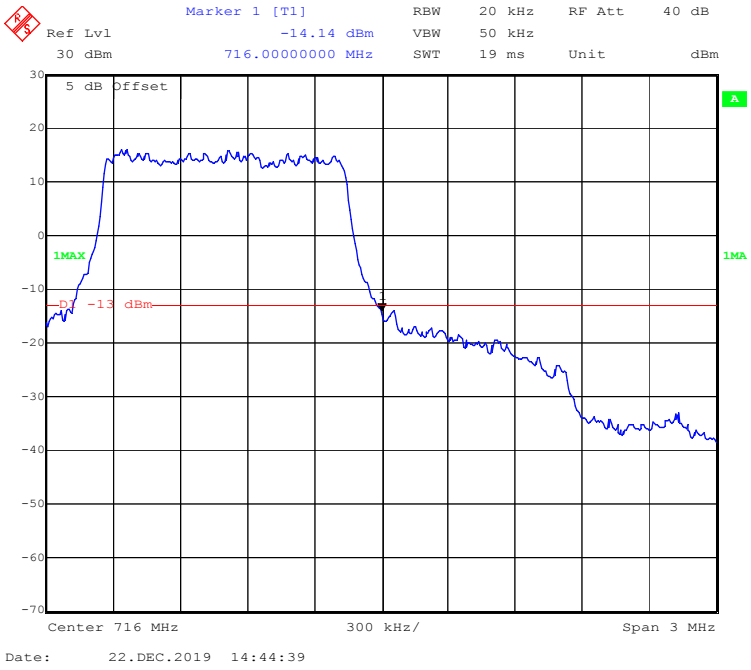

## QPSK (10 MHz, FULL RB) - Right Band Edge



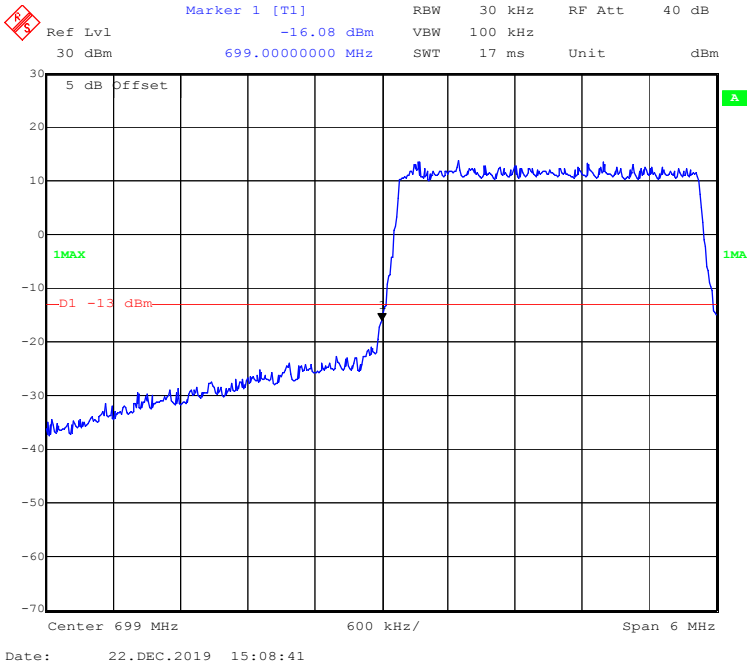
## 16-QAM (1.4 MHz, FULL RB) - Left Band Edge



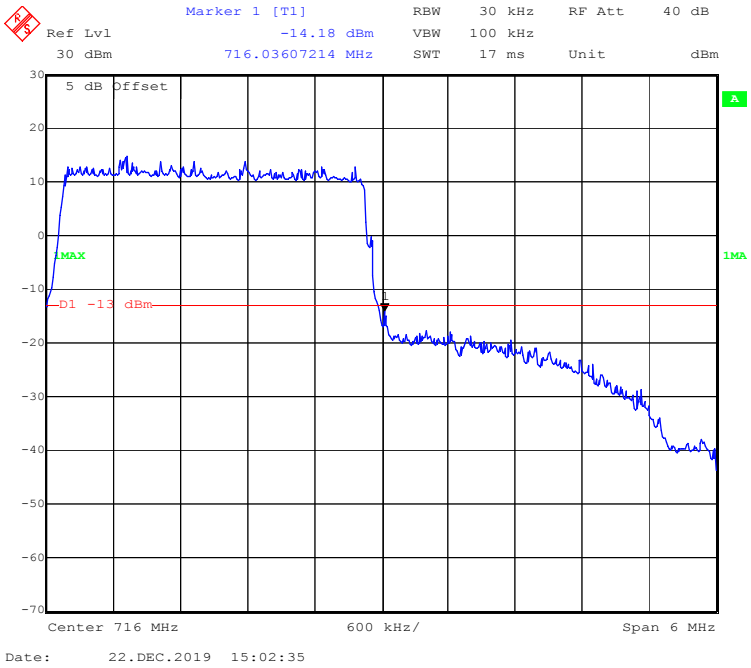

## 16-QAM (1.4 MHz, FULL RB) - Right Band Edge



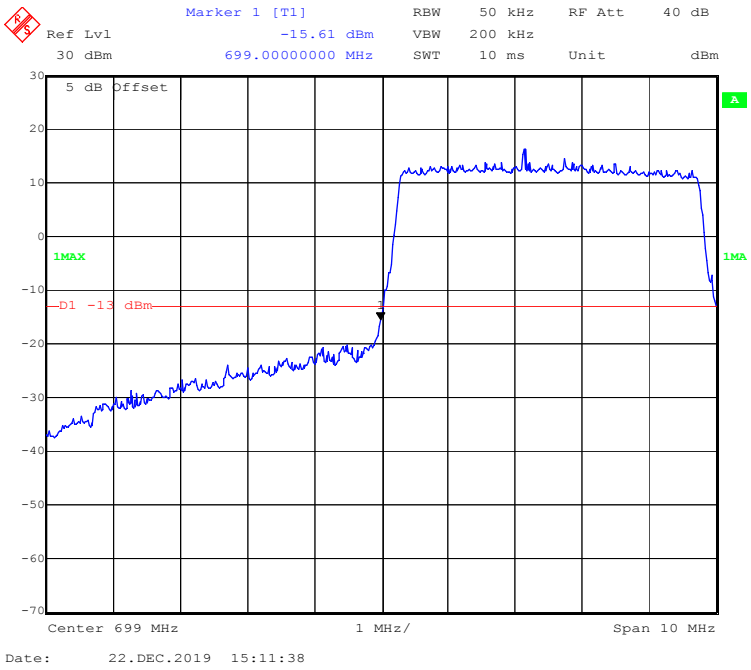
## 16-QAM (3 MHz, FULL RB) - Left Band Edge



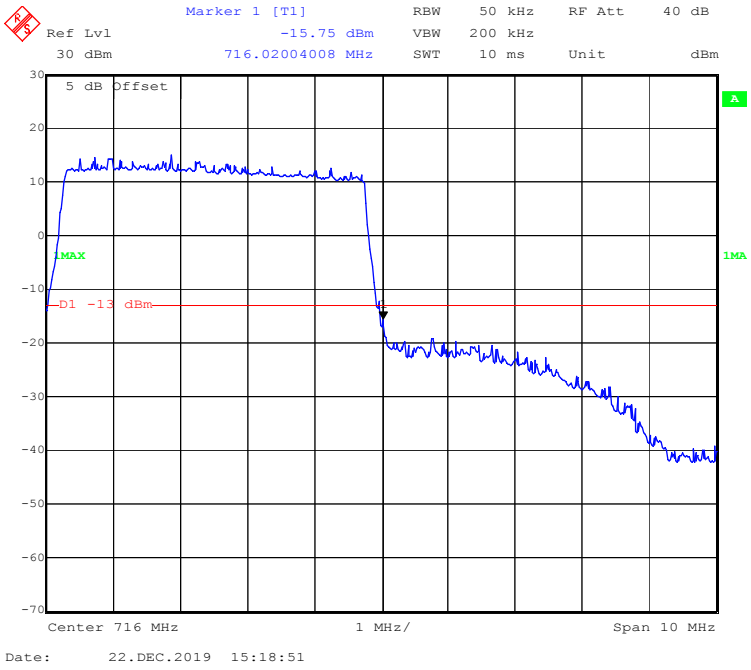

## 16-QAM (3 MHz, FULL RB) - Right Band Edge



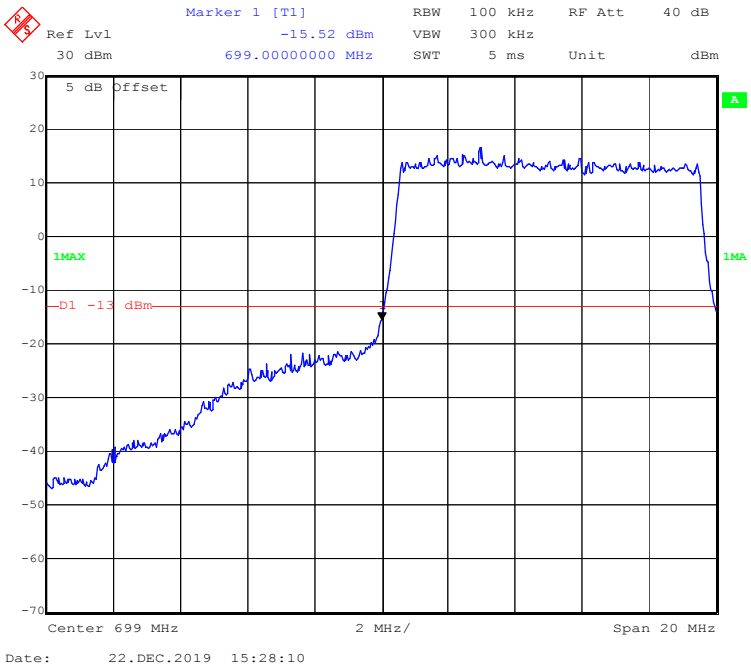
## 16-QAM (5 MHz, FULL RB) - Left Band Edge



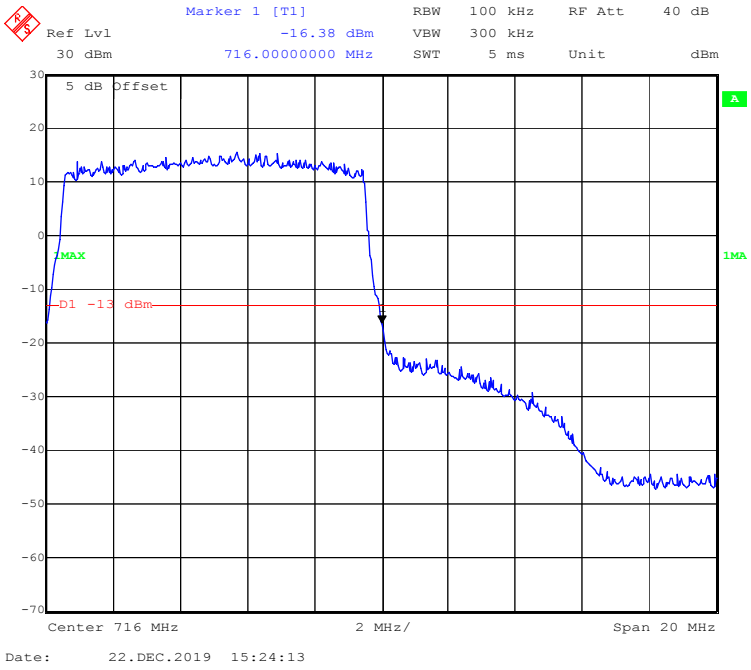

## 16-QAM (5 MHz, FULL RB) - Right Band Edge



## 16-QAM (10 MHz, FULL RB) - Left Band Edge

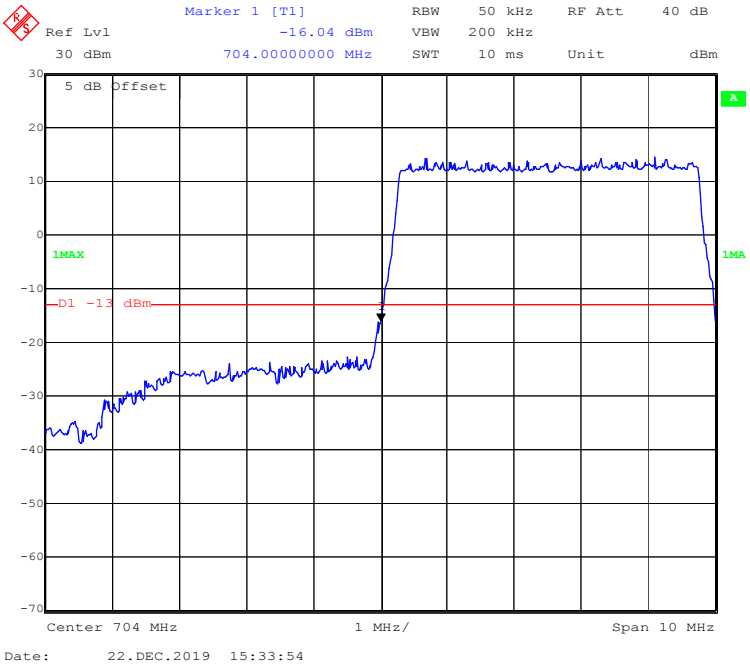



## 16-QAM (10 MHz, FULL RB) - Right Band Edge

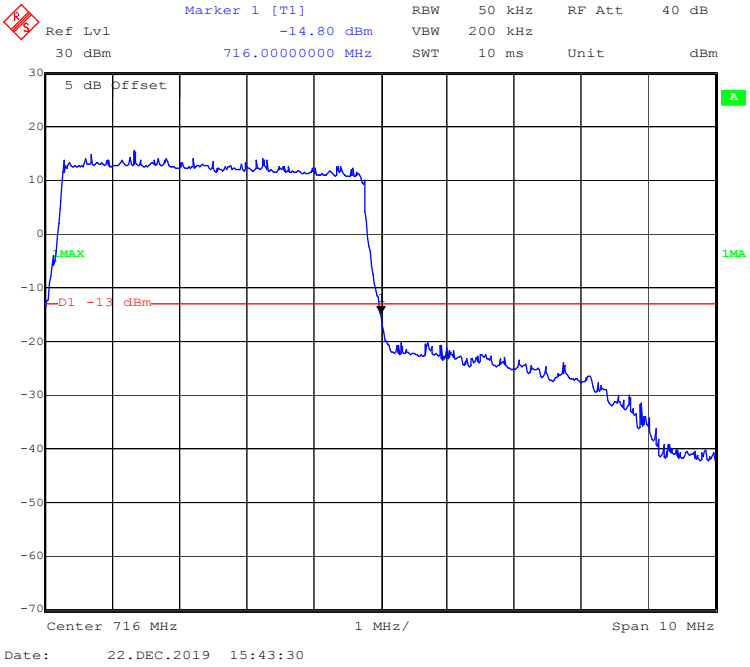


## LTE Band 17:

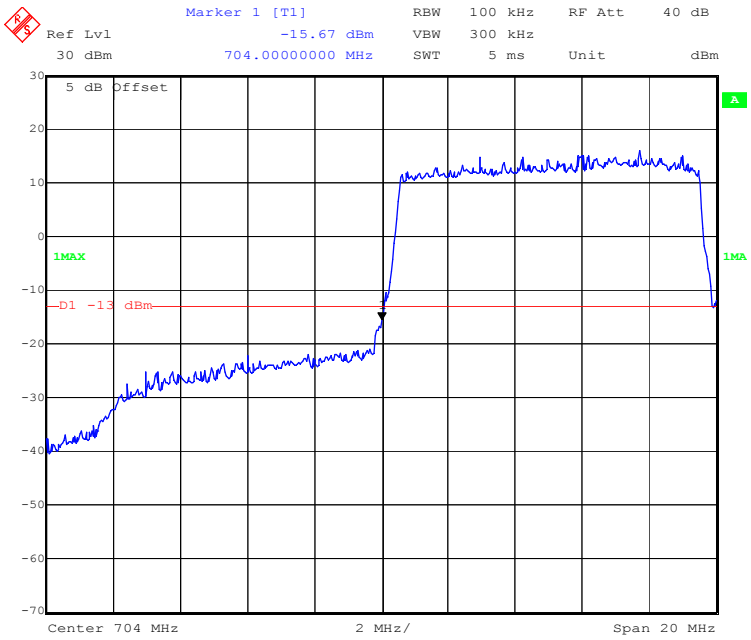
### QPSK (5 MHz, FULL RB) - Left Band Edge



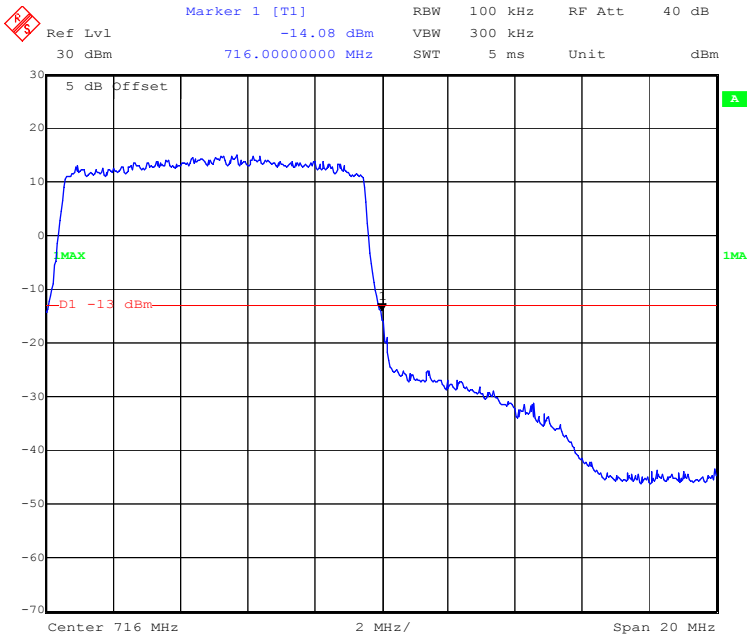

### QPSK (5 MHz, FULL RB) - Right Band Edge



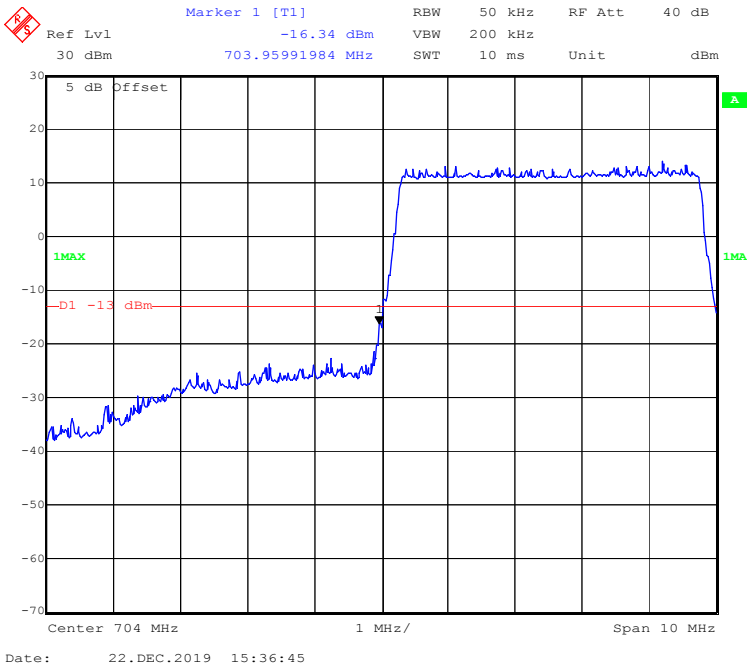
## QPSK (10 MHz, FULL RB) - Left Band Edge



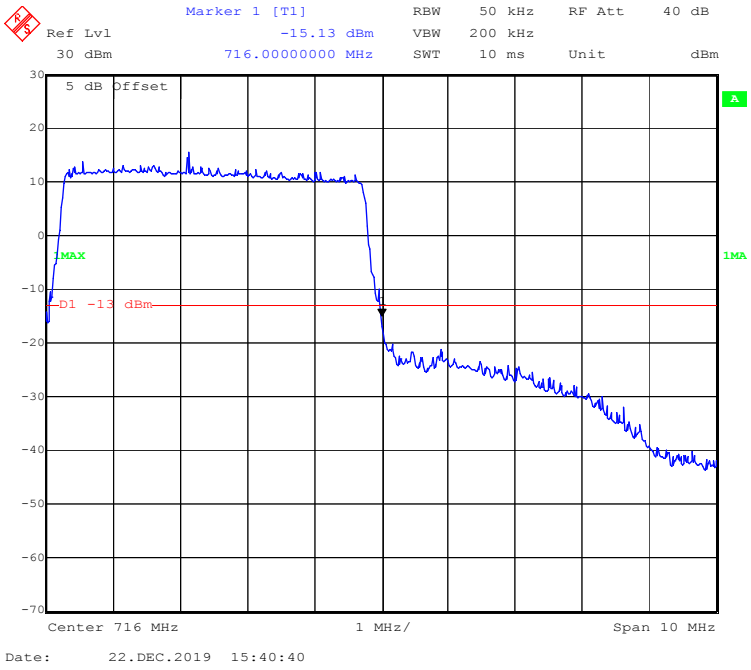

## QPSK (10 MHz, FULL RB) - Right Band Edge



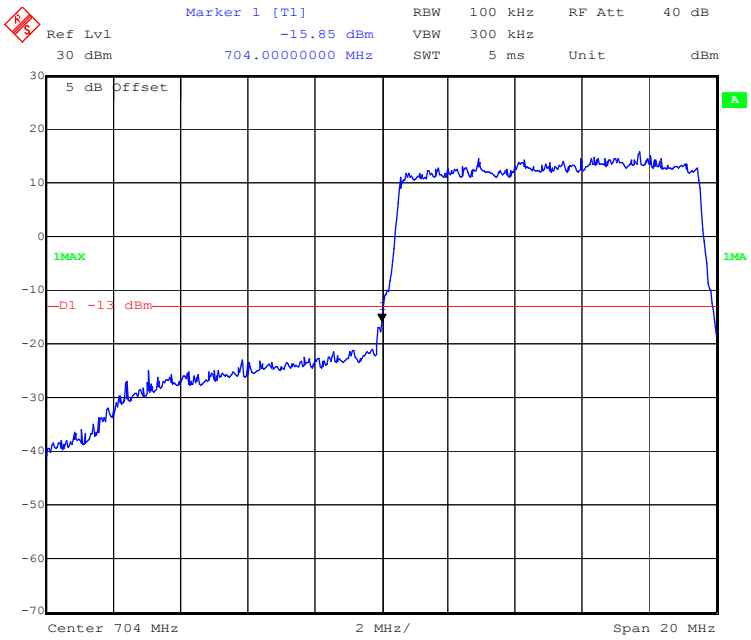
## 16-QAM (5 MHz, FULL RB) - Left Band Edge



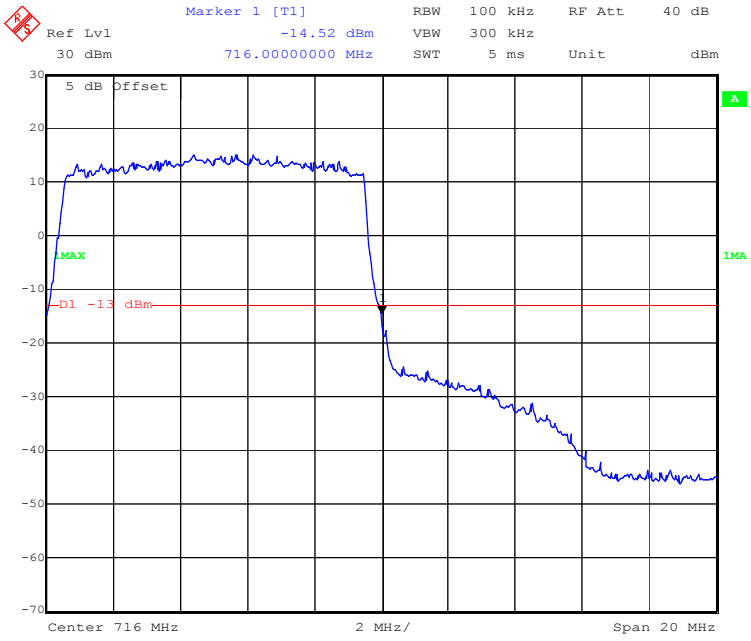

## 16-QAM (5 MHz, FULL RB) - Right Band Edge



## 16-QAM (10 MHz, FULL RB) - Left Band Edge




## 16-QAM (10 MHz, FULL RB) - Right Band Edge



# FCC § 2.1055; § 22.355; § 24.235; §27.54- FREQUENCY STABILITY

## Applicable Standards

FCC § 2.1055, §22.355, §24.235 and §27.54.

According to FCC §2.1055, the frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

According to §22.355, the carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances given in Table below:

**Frequency Tolerance for Transmitters in the Public Mobile Services**

| Frequency Range (MHz) | Base, fixed (ppm) | Mobile > 3 watts (ppm) | Mobile ≤ 3 watts (ppm) |
|---|---|---|---|
| 25 to 50 | 20.0 | 20.0 | 50.0 |
| 50 to 450 | 5.0 | 5.0 | 50.0 |
| 450 to 512 | 2.5 | 5.0 | 5.0 |
| 821 to 896 | 1.5 | 2.5 | 2.5 |
| 928 to 929. | 5.0 | N/A | N/A |
| 929 to 960. | 1.5 | N/A | N/A |
| 2110 to 2220 | 10.0 | N/A | N/A |

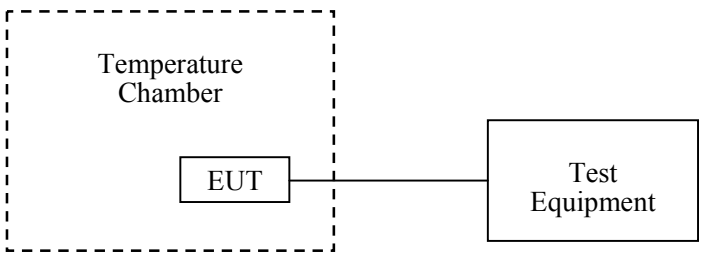
According to §24.235, the frequency stability shall be sufficient to ensure that the fundamental emissions stays within the authorized frequency block.

## Test Procedure

Frequency Stability vs. Temperature: The equipment under test was connected to an external DC power supply and the RF output was connected to communication test set via feed-through attenuators. The EUT was placed inside the temperature chamber. The DC leads and RF output cable exited the chamber through an opening made for the purpose.

After the temperature stabilized for approximately 20 minutes, the frequency output was recorded from the communication test set.

Frequency Stability vs. Voltage: For hand carried, battery powered equipment; reduce primary supply voltage to the battery operating end point which shall be specified by the manufacturer.



## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 23.2 ℃ |
| **Relative Humidity:** | 51 % |
| **ATM Pressure:** | 101.3 kPa |

*The testing was performed by Winnie Yang on 2019-12-26.*

*EUT operation mode: Transmitting*

*Test Result: Compliant.*

### WCDMA Band V:

| Middle Channel, $f_o$ = 836.6 MHz | | | | |
|---|---|---|---|---|
| **Temperature (℃)** | **Power Supplied ($V_{DC}$)** | **Frequency Error (Hz)** | **Frequency Error (ppm)** | **Limit (ppm)** |
| -30 | 13.8 | 12 | 0.0143 | 2.5 |
| -20 | | 11 | 0.0131 | 2.5 |
| -10 | | 11 | 0.0131 | 2.5 |
| 0 | | 10 | 0.0120 | 2.5 |
| 10 | | 9 | 0.0108 | 2.5 |
| 20 | | 8 | 0.0096 | 2.5 |
| 30 | | 8 | 0.0096 | 2.5 |
| 40 | | 10 | 0.0120 | 2.5 |
| 50 | | 12 | 0.0143 | 2.5 |
| 25 | V min.= 12.4 | 8 | 0.0096 | 2.5 |
| 25 | V max.= 15.2 | 9 | 0.0108 | 2.5 |

**WCDMA Band II:**

| Middle Channel, $f_o$ =1880.0 MHz | | | | |
|---|---|---|---|---|
| **Temperature (℃)** | **Power Supplied ($V_{DC}$)** | **Frequency Error (Hz)** | **Frequency Error (ppm)** | **Result** |
| -30 | 13.8 | 12 | 0.0064 | Pass |
| -20 | | 11 | 0.0059 | Pass |
| -10 | | 10 | 0.0053 | Pass |
| 0 | | 9 | 0.0048 | Pass |
| 10 | | 8 | 0.0043 | Pass |
| 20 | | 7 | 0.0037 | Pass |
| 30 | | 7 | 0.0037 | Pass |
| 40 | | 9 | 0.0048 | Pass |
| 50 | | 11 | 0.0059 | Pass |
| 25 | V min.= 12.4 | 8 | 0.0043 | Pass |
| 25 | V max.= 15.2 | 7 | 0.0037 | Pass |

## LTE Band 2:

| $f_o$ =1880.0 MHz (QPSK) | | | | |
|---|---|---|---|---|
| **Temperature (℃)** | **Power Supplied ($V_{DC}$)** | **Frequency Error (Hz)** | **Frequency Error (ppm)** | **Result** |
| -30 | 13.8 | 12 | 0.0064 | Pass |
| -20 | | 11 | 0.0059 | Pass |
| -10 | | 10 | 0.0053 | Pass |
| 0 | | 9 | 0.0048 | Pass |
| 10 | | 9 | 0.0048 | Pass |
| 20 | | 8 | 0.0043 | Pass |
| 30 | | 7 | 0.0037 | Pass |
| 40 | | 9 | 0.0048 | Pass |
| 50 | | 11 | 0.0059 | Pass |
| 25 | V min.= 12.4 | 9 | 0.0048 | Pass |
| 25 | V max.= 15.2 | 11 | 0.0059 | Pass |

| $f_o$ =1880.0 MHz (16-QAM) | | | | |
|---|---|---|---|---|
| **Temperature (℃)** | **Power Supplied ($V_{DC}$)** | **Frequency Error (Hz)** | **Frequency Error (ppm)** | **Result** |
| -30 | 13.8 | 12 | 0.0064 | Pass |
| -20 | | 11 | 0.0059 | Pass |
| -10 | | 10 | 0.0053 | Pass |
| 0 | | 10 | 0.0053 | Pass |
| 10 | | 9 | 0.0048 | Pass |
| 20 | | 8 | 0.0043 | Pass |
| 30 | | 7 | 0.0037 | Pass |
| 40 | | 9 | 0.0048 | Pass |
| 50 | | 11 | 0.0059 | Pass |
| 25 | V min.= 12.4 | 7 | 0.0037 | Pass |
| 25 | V max.= 15.2 | 8 | 0.0043 | Pass |

## LTE Band 4:

| Low Channel & High Channel (QPSK) | | | | | |
|---|---|---|---|---|---|
| **Temperature** | **Power Supplied** | **$F_L$** | **$F_H$** | **$F_L$ Limit** | **$F_H$ Limit** |
| **(℃)** | **($V_{DC}$)** | **(MHz)** | **(MHz)** | **(MHz)** | **(MHz)** |
| -30 | 13.8 | 1710.0473 | 1754.9486 | 1710 | 1755 |
| -20 | | 1710.0484 | 1754.9455 | 1710 | 1755 |
| -10 | | 1710.0495 | 1754.9480 | 1710 | 1755 |
| 0 | | 1710.0410 | 1754.9417 | 1710 | 1755 |
| 10 | | 1710.0472 | 1754.9495 | 1710 | 1755 |
| 20 | | 1710.0409 | 1754.9428 | 1710 | 1755 |
| 30 | | 1710.0449 | 1754.9441 | 1710 | 1755 |
| 40 | | 1710.0480 | 1754.9429 | 1710 | 1755 |
| 50 | | 1710.0494 | 1754.9444 | 1710 | 1755 |
| 25 | V min.= 12.4 | 1710.0404 | 1754.9428 | 1710 | 1755 |
| 25 | V max.= 15.2 | 1710.0435 | 1754.9425 | 1710 | 1755 |

| Low Channel & High Channel (16-QAM) | | | | | |
|---|---|---|---|---|---|
| **Temperature** | **Power Supplied** | **$F_L$** | **$F_H$** | **$F_L$ Limit** | **$F_H$ Limit** |
| **(℃)** | **($V_{DC}$)** | **(MHz)** | **(MHz)** | **(MHz)** | **(MHz)** |
| -30 | 13.8 | 1710.0451 | 1754.9405 | 1710 | 1755 |
| -20 | | 1710.0413 | 1754.9423 | 1710 | 1755 |
| -10 | | 1710.0444 | 1754.9497 | 1710 | 1755 |
| 0 | | 1710.0490 | 1754.9439 | 1710 | 1755 |
| 10 | | 1710.0454 | 1754.9479 | 1710 | 1755 |
| 20 | | 1710.0471 | 1754.9403 | 1710 | 1755 |
| 30 | | 1710.0436 | 1754.9427 | 1710 | 1755 |
| 40 | | 1710.0478 | 1754.9450 | 1710 | 1755 |
| 50 | | 1710.0419 | 1754.9470 | 1710 | 1755 |
| 25 | V min.= 12.4 | 1710.0443 | 1754.9448 | 1710 | 1755 |
| 25 | V max.= 15.2 | 1710.0447 | 1754.9409 | 1710 | 1755 |

## LTE Band 5:

| Middle Channel, $f_o$ =836.5 MHz (QPSK) | | | | |
|---|---|---|---|---|
| **Temperature (℃)** | **Power Supplied ($V_{DC}$)** | **Frequency Error (Hz)** | **Frequency Error (ppm)** | **Limit (ppm)** |
| -30 | 13.8 | 12 | 0.0143 | 2.5 |
| -20 | | 11 | 0.0132 | 2.5 |
| -10 | | 10 | 0.0120 | 2.5 |
| 0 | | 10 | 0.0120 | 2.5 |
| 10 | | 9 | 0.0108 | 2.5 |
| 20 | | 8 | 0.0096 | 2.5 |
| 30 | | 8 | 0.0096 | 2.5 |
| 40 | | 9 | 0.0108 | 2.5 |
| 50 | | 11 | 0.0132 | 2.5 |
| 25 | V min.=12.4 | 10 | 0.0120 | 2.5 |
| 25 | V max.= 15.2 | 9 | 0.0108 | 2.5 |

| Middle Channel, $f_o$ =836.5 MHz(16-QAM) | | | | |
|---|---|---|---|---|
| **Temperature (℃)** | **Power Supplied ($V_{DC}$)** | **Frequency Error (Hz)** | **Frequency Error (ppm)** | **Limit (ppm)** |
| -30 | 13.8 | 11 | 0.0132 | 2.5 |
| -20 | | 11 | 0.0132 | 2.5 |
| -10 | | 10 | 0.0120 | 2.5 |
| 0 | | 9 | 0.0108 | 2.5 |
| 10 | | 8 | 0.0096 | 2.5 |
| 20 | | 7 | 0.0084 | 2.5 |
| 30 | | 7 | 0.0084 | 2.5 |
| 40 | | 8 | 0.0096 | 2.5 |
| 50 | | 10 | 0.0120 | 2.5 |
| 25 | V min.= 12.4 | 9 | 0.0108 | 2.5 |
| 25 | V max.= 15.2 | 10 | 0.0120 | 2.5 |

## LTE Band 12:

| Low Channel & High Channel (QPSK) | | | | | |
|---|---|---|---|---|---|
| Temperature | Power Supplied | $F_L$ | $F_H$ | $F_L$ Limit | $F_H$ Limit |
| (℃) | ($V_{DC}$) | (MHz) | (MHz) | (MHz) | (MHz) |
| -30 | 13.8 | 699.0154 | 715.9784 | 699 | 716 |
| -20 | | 699.0146 | 715.9865 | 699 | 716 |
| -10 | | 699.0197 | 715.9762 | 699 | 716 |
| 0 | | 699.0219 | 715.9744 | 699 | 716 |
| 10 | | 699.0129 | 715.9701 | 699 | 716 |
| 20 | | 699.0120 | 715.9718 | 699 | 716 |
| 30 | | 699.0221 | 715.9701 | 699 | 716 |
| 40 | | 699.0138 | 715.9762 | 699 | 716 |
| 50 | | 699.0195 | 715.9722 | 699 | 716 |
| 25 | V min.= 12.4 | 699.0195 | 715.9886 | 699 | 716 |
| 25 | V max.= 15.2 | 699.0110 | 715.9754 | 699 | 716 |

| Low Channel & High Channel (16-QAM) | | | | | |
|---|---|---|---|---|---|
| Temperature | Power Supplied | $F_L$ | $F_H$ | $F_L$ Limit | $F_H$ Limit |
| (℃) | ($V_{DC}$) | (MHz) | (MHz) | (MHz) | (MHz) |
| -30 | 13.8 | 699.0200 | 715.9713 | 699 | 716 |
| -20 | | 699.0188 | 715.9885 | 699 | 716 |
| -10 | | 699.0233 | 715.9745 | 699 | 716 |
| 0 | | 699.0117 | 715.9801 | 699 | 716 |
| 10 | | 699.0190 | 715.9769 | 699 | 716 |
| 20 | | 699.0146 | 715.9742 | 699 | 716 |
| 30 | | 699.0193 | 715.9868 | 699 | 716 |
| 40 | | 699.0253 | 715.9716 | 699 | 716 |
| 50 | | 699.0253 | 715.9780 | 699 | 716 |
| 25 | V min.= 12.4 | 699.0150 | 715.9769 | 699 | 716 |
| 25 | V max.= 15.2 | 699.0131 | 715.9709 | 699 | 716 |

**LTE Band 17:**

| Low Channel & High Channel (QPSK) | | | | | |
|---|---|---|---|---|---|
| **Temperature** | **Power Supplied** | **$F_L$** | **$F_H$** | **$F_L$ Limit** | **$F_H$ Limit** |
| **(℃)** | **($V_{DC}$)** | **(MHz)** | **(MHz)** | **(MHz)** | **(MHz)** |
| -30 | 13.8 | 704.0121 | 715.9791 | 704 | 716 |
| -20 | | 704.0190 | 715.9877 | 704 | 716 |
| -10 | | 704.0153 | 715.9765 | 704 | 716 |
| 0 | | 704.0152 | 715.9709 | 704 | 716 |
| 10 | | 704.0187 | 715.9725 | 704 | 716 |
| 20 | | 704.0200 | 715.9723 | 704 | 716 |
| 30 | | 704.0115 | 715.9717 | 704 | 716 |
| 40 | | 704.0130 | 715.9751 | 704 | 716 |
| 50 | | 704.0154 | 715.9736 | 704 | 716 |
| 25 | V min.= 12.4 | 704.0195 | 715.9816 | 704 | 716 |
| 25 | V max.= 15.2 | 704.0180 | 715.9758 | 704 | 716 |

| Low Channel & High Channel (16-QAM) | | | | | |
|---|---|---|---|---|---|
| **Temperature** | **Power Supplied** | **$F_L$** | **$F_H$** | **$F_L$ Limit** | **$F_H$ Limit** |
| **(℃)** | **($V_{DC}$)** | **(MHz)** | **(MHz)** | **(MHz)** | **(MHz)** |
| -30 | 13.8 | 704.0102 | 715.9757 | 704 | 716 |
| -20 | | 704.0196 | 715.9826 | 704 | 716 |
| -10 | | 704.0163 | 715.9731 | 704 | 716 |
| 0 | | 704.0179 | 715.9872 | 704 | 716 |
| 10 | | 704.0154 | 715.9755 | 704 | 716 |
| 20 | | 704.0197 | 715.9773 | 704 | 716 |
| 30 | | 704.0160 | 715.9826 | 704 | 716 |
| 40 | | 704.0133 | 715.9762 | 704 | 716 |
| 50 | | 704.0145 | 715.9722 | 704 | 716 |
| 25 | V min.= 12.4 | 704.0113 | 715.9712 | 704 | 716 |
| 25 | V max.= 15.2 | 704.0181 | 715.9714 | 704 | 716 |

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