**DEKRA Testing and Certification, S.A.U.**
Parque Tecnológico de Andalucía,
c/ Severo Ochoa nº 2 · 29590 Campanillas · Málaga · España
C.I.F. A29507456

ISED CABid: ES1909
Lab. Company Number: 4621A

Test Report No:
75461RRF.003

# Test Report
## USA FCC Part 27
## CANADA RSS-130, RSS-139

| | |
|---|---|
| (*) Identification of item tested | LTE Cat 1bis module |
| (*) Trademark | Sequans Communications |
| (*) Model and /or type reference | GC02S1-NA2 |
| Other identification of the product | FCC ID: 2AAGMGC02SA<br>IC: 12732A-GC02SA |
| (*) Features | 4G LTE module<br>HW version: Rev1<br>SW version: LR9.0.1.1-59215 |
| Applicant | SEQUANS COMMUNICATIONS<br>55 Boulevard Charles de Gaulle, 92700 Colombes, France |
| Test method requested, standard | USA FCC Part 27 (10-1-21 Edition).<br>CANADA RSS-130 Issue 2, February 2019.<br>CANADA RSS-139 Issue 4 September 2022, Amendment October 2022.<br>CANADA RSS-Gen Issue 5, April 2018.<br>ANSI C63.26-2015.<br>KDB 971168 D01 Power Meas License Digital Systems v03r01, April 2018. |
| Summary | IN COMPLIANCE |
| Approved by (name / position & signature) | José Manuel Gómez Galván<br>EMC Consumer & RF<br>Lab. Manager<br>Firmado digitalmente por 53680346W JOSE MANUEL GOMEZ (C:A29507456) Fecha: 2023.11.09 15:09:55 +01'00' |
| Date of issue | 2023-11-08 |
| Report template No. | FDT08_24<br>(*) "Data provided by the client" |

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# Uncertainty

Uncertainty (factor k=2) was calculated according to the DEKRA Testing and Certification S.A.U. internal document PODT000.

# Data provided by the client

The following data has been provided by the client:

1. Information relating to the description of the sample ("Identification of the item tested", "Trademark", "Model and/or type reference tested").

2. The sample model is GC02S1-NA2. The Calliope 2 GC02S1 modules are based on Sequans's second-generation Calliope 2 silicon and delivers optimized 4G LTE Cat 1 connectivity for IoT, M2M and consumer devices such as wearables and hearables that require voice support and speed higher than LTE-M.

DEKRA Testing and Certification S.A.U. declines any responsibility with respect to the information provided by the client and that may affect the validity of results.

# Usage of samples

Samples undergoing test have been selected by: The client.

- Sample S/01 is composed of the following elements:

| Control Nº | Description | Model | Serial Nº | Date of reception |
|---|---|---|---|---|
| 75461B/005 * | LTE Cat 1bis module | GC02S1-NA2 | C2E230509001024 | 21-07-2023 |
| 75461B/008 | Antenna Cable | - | - | 21-07-2023 |
| 75461B/004 ** | LTE Cat 1bis module | GC02S1-NA2 | C2E230509001008 | 21-07-2023 |

Sample S/01 has undergone the following test(s): The conducted tests indicated in Appendix A.

* : Element used in the RF Output Power test of all bands and the other conducted tests, but:

- the Occupied Bandwidth and PAPR tests of LTE Band 66.
- the Spurious Emissions at Antenna Terminals at Block Edges of LTE Band 12.
- the PAPR test in LTE Band 13.

** : Element used in the tests:

- the Occupied Bandwidth and PAPR tests of LTE Band 66.
- the Spurious Emissions at Antenna Terminals at Block Edges of LTE Band 12.
- the PAPR test in LTE Band 13.

- Sample S/02 is composed of the following elements:

| Control Nº | Description | Model | Serial Nº | Date of reception |
|---|---|---|---|---|
| 75461B/006 | LTE Cat 1bis module | GC02S1-NA2 | - | 21-07-2023 |
| 75461B/001 | Antenna | OmniLOG 90200 | 20200100252 | 21-07-2023 |
| 75461B/012 | Antenna Cable | - | - | 21-07-2023 |

Sample S/02 has undergone the following test(s): The radiated tests indicated in Appendix A.

# Test sample description

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Ports……: | Port name and description | Cable | | | | | |
| | | Specified max length [m] | Attached during test | Shielded | Coupled to patient(3) | | |
| | USB | | ☒ | ☐ | ☐ | | |
| Supplementary information to the ports……: | - | | | | | | |
| Rated power supply ..... : | Voltage and Frequency | Reference poles | | | | | |
| | | L1 | L2 | L3 | N | PE | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | ☐ | AC: | ☐ | ☐ | ☐ | ☐ | ☐ |
| | ☒ | DC: 3.2 to 5.5 V | | | | | |
| Rated Power..... : | - | | | | | | |
| Clock frequencies..... : | - | | | | | | |
| Other parameters ..... : | - | | | | | | |
| Software version..... : | LR9.0.1.1-59215 | | | | | | |
| Hardware version ..... : | Rev1 | | | | | | |
| Dimensions in cm (W x H x D) ... : | 21 x 1.8 x 19.5 mm | | | | | | |
| Mounting position ..... : | ☒ | Table top equipment | | | | | |
| | ☐ | Wall/Ceiling mounted equipment | | | | | |
| | ☐ | Floor standing equipment | | | | | |
| | ☐ | Hand-held equipment | | | | | |
| | ☐ | Other: | | | | | |
| Modules/parts..... : | Module/parts of test item | | Type | | Manufacturer | | |
| | - | | - | | - | | |
| Accessories (not part of the test item) ..... : | Description | | Type | | Manufacturer | | |
| | USB Cables | | USB | | - | | |
| | Antennas | | Antenna | | - | | |
| Documents as provided by the applicant ..... : | Description | | File name | | Issue date | | |
| | - | | - | | - | | |

(3) Only for Medical Equipment

## Identification of the client

SEQUANS COMMUNICATIONS
55 Boulevard Charles de Gaulle, 92700, Colombes, France

## Testing period and place

| | |
|---|---|
| **Test Location** | DEKRA Testing and Certification S.A.U. |
| **Date (start)** | 2023-08-16 |
| **Date (finish)** | 2023-10-09 |

## Document history

| Report number | Date | Description |
|---|---|---|
| 75461RRF.003 | 2023-11-08 | First release. |

## Environmental conditions

In the control chamber, the following limits were not exceeded during the test:

| | |
|---|---|
| **Temperature** | Min. = 15 ºC<br>Max. = 35 ºC |
| **Relative humidity** | Min. = 20 %<br>Max. = 75 % |

In the semi-anechoic chamber, the following limits were not exceeded during the test:

| | |
|---|---|
| **Temperature** | Min. = 15 ºC<br>Max. = 35 ºC |
| **Relative humidity** | Min. = 20 %<br>Max. = 75 % |

In the chamber for conducted measurements, the following limits were not exceeded during the test:

| | |
|---|---|
| **Temperature** | Min. = 15 ºC<br>Max. = 35 ºC |
| **Relative humidity** | Min. = 20 %<br>Max. = 75 % |

## Remarks and comments

The tests have been performed by the technical personnel: Antonio Maireles, Sergio Carrasco, Pablo Redondo, Rafael Fernández, Fernando Chito, Francisco López, Carmen Vázquez, Ireneo Bibang.

Used instrumentation:

| Control No. | Equipment | Next Calibration |
|---|---|---|
| 8002 | Climatic Chamber BINDER MK 56 | 2024-03 |
| 7794 | Signal and Spectrum Analyzer 10 Hz - 40 GHz ROHDE AND SCHWARZ FSV40 | 2025-04 |
| 6157 | Signal and Spectrum Analyzer 10 Hz - 40 GHz ROHDE AND SCHWARZ FSV40 | 2023-10 |
| 9229 | Wideband Radio Communication Tester ROHDE AND SCHWARZ CMW500 | 2024-06 |
| 6794 | Shielded Room ETS LINDGREN S101 | N/A |
| 7798 | EMC/RF Testing SW ROHDE AND SCHWARZ WMS32 | N/A |
| 6791 | Semianechoic Absorber Lined Chamber ETS LINDGREN FACT 3 200 STP | N/A |
| 6792 | Shielded Room ETS LINDGREN S101 | N/A |
| 6143 | Biconical/Log Antenna 30 MHz - 6 GHz ETS LINDGREN 3142E | 2023-10 |
| 7006 | Horn Antenna 1-18 GHz SCHWARZBECK MESS-ELEKTRONIK BBHA 9120 D | 2024-06 |
| 6144 | RF Preamplifier 40 dB, 10 MHz - 6 GHz BONN ELEKTRONIK BLNA 0160-01N | 2024-07 |
| 3783 | RF Preamplifier G>30dB, 1-18GHz BONN ELEKTRONIK BLMA 0118-3A | 2023-12 |
| 7817 | EMI Test Receiver 2 Hz - 44 GHz, ROHDE AND SCHWARZ ESW44 | 2023-12 |

| Control No. | Equipment | Next Calibration |
|---|---|---|
| 6667 | Wideband Radio Communication Tester ROHDE AND SCHWARZ CMW500 | N/A |
| 9227 | Wideband Radio Communication Tester ROHDE AND SCHWARZ CMW500 | 2024-07 |
| 7760 | Digital Multimeter FLUKE 175 | 2023-11 |
| 4848 | EMC/RF Testing SW ROHDE AND SCHWARZ EMC32 | N/A |

# Testing verdicts

| | |
|---|---|
| Not applicable: | N/A |
| Pass: | P |
| Fail: | F |
| Not measured: | N/M |

# Summary

**LTE Cat 1bis Bands 4, 12, 13, 17, 66.**

| FCC PART 27 / RSS-130, RSS-139, RSS-Gen PARAGRAPH | | |
|---|---|---|
| **Requirement – Test case** | **Verdict** | **Remark** |
| FCC 27.50 / RSS-130 4.6, RSS-139 5.5: RF Output Power | P | |
| FCC 2.1047 / RSS-130 4.2, RSS-139 5.3: Modulation Characteristics | P | |
| FCC 27.54 / RSS-130 4.5, RSS-139 5.4: Frequency Stability | P | |
| FCC 2.1049 / RSS-130 4.5, RSS-Gen 6.7: Occupied Bandwidth | P | |
| FCC 27.53 / RSS-130 4.7, RSS-139 5.6: Spurious Emissions at Antenna Terminals | P | |
| FCC 27.53 / RSS-130 4.7, RSS-139 5.6: Spurious Emissions at Antenna Terminals at Block Edges | P | |
| FCC 27.53 / RSS-130 4.7, RSS-139 5.6: Radiated Emissions | P | |
| Supplementary information and remarks:<br>None. | | |

# **Appendix A:** Test results for FCC 27 / RSS-130, RSS-139, RSS-Gen: LTE Cat 1bis Bands 4, 12, 13, 17, 66

# INDEX

# TEST CONDITIONS

(*): Declared by the Applicant.

POWER SUPPLY (*):

Vnominal: 5 Vdc
Vminimum: 3.2 Vdc
Vmaximum: 5.5 Vdc

Type of Power Supply: DC External.

ANTENNA (*):

| Low Bands | Gain (dBi) | Type of Antenna |
|---|---|---|
| LTE Cat 1bis Band 12 | +2 | External (OmniLOG 90200) |
| LTE Cat 1bis Band 12 | +1.1 | Internal (FR01-S4-210) |
| LTE Cat 1bis Band 13 | +2 | External (OmniLOG 90200) |
| LTE Cat 1bis Band 13 | +1.1 | Internal (FR01-S4-210) |
| LTE Cat 1bis Band 17 | +2 | External (OmniLOG 90200) |
| LTE Cat 1bis Band 17 | +1.1 | Internal (FR01-S4-210) |
| High Bands | Gain (dBi) | Type of Antenna |
| LTE Cat 1bis Band 4 | +2 | External (OmniLOG 90200) |
| LTE Cat 1bis Band 4 | +2.4 | Internal (FR01-S4-210) |
| LTE Cat 1bis Band 66 | +2 | External (OmniLOG 90200) |
| LTE Cat 1bis Band 66 | +2.4 | Internal (FR01-S4-210) |

Note: Pre-scan determines that external antenna is the worst case in terms of radiated spurious emissions.

TEST FREQUENCIES:

LTE Cat 1bis Band 4. QPSK and 16QAM:

| | Channel per BW=(Frequency, MHz) | | | | | |
|---|---|---|---|---|---|---|
| | BW = 1.4 MHz | BW = 3 MHz | BW = 5 MHz | BW = 10 MHz | BW = 15 MHz | BW = 20 MHz |
| Low | 19957 (1710.7) | 19965 (1711.5) | 19975 (1712.5) | 20000 (1715.0) | 20025 (1717.5) | 20050 (1720.0) |
| Middle | 20175 (1732.5) | 20175 (1732.5) | 20175 (1732.5) | 20175 (1732.5) | 20175 (1732.5) | 20175 (1732.5) |
| High | 20393 (1754.3) | 20385 (1753.5) | 20375 (1752.5) | 20350 (1750.0) | 20325 (1747.5) | 20300 (1745.0) |

NOTE: LTE Cat 1bis Band 4 is completely included in LTE Cat 1bis Band 66, so the channels of LTE Cat 1bis Band 66 were tested to give conformity to the assigned block.

LTE Cat 1bis Band 12. QPSK and 16QAM:

| | Channel (Frequency, MHz) | | | |
|---|---|---|---|---|
| | BW = 1.4 MHz | BW = 3 MHz | BW = 5 MHz | BW = 10 MHz |
| Low | 23017 (699.7) | 23025 (700.5) | 23035 (701.5) | 23060 (704.0) |
| Middle | 23095 (707.5) | 23095 (707.5) | 23095 (707.5) | 23095 (707.5) |
| High | 23173 (715.3) | 23165 (714.5) | 23155 (713.5) | 23130 (711.0) |

LTE Cat 1bis Band 13. QPSK and 16QAM:

| | Channel (Frequency, MHz) | |
|---|---|---|
| | BW = 5 MHz | BW = 10 MHz |
| Low | 23205 (779.5) | |
| Middle | 23230 (782.0) | 23230 (782.0) |
| High | 23255 (784.5) | |

LTE Cat 1bis Band 17. QPSK and 16QAM:

| | Channel (Frequency, MHz) | |
|---|---|---|
| | BW = 5 MHz | BW = 10 MHz |
| Low | 23755 (706.5) | 23780 (709) |
| Middle | 23790 (710) | 23790 (710) |
| High | 23825 (713.5) | 23800 (711) |

NOTE: LTE Cat 1bis Band 17 is completely included in LTE Cat 1bis Band 12, so the channels of LTE Cat 1bis Band 12 were tested to give conformity to the assigned block.

LTE Cat 1bis Band 66. QPSK and 16QAM:

| | Channel per BW=(Frequency, MHz) | | | | | |
|---|---|---|---|---|---|---|
| | BW = 1.4 MHz | BW = 3 MHz | BW = 5 MHz | BW = 10 MHz | BW = 15 MHz | BW = 20 MHz |
| Low | 131979 (1710.7) | 131987 (1711.5) | 131997 (1712.5) | 132022 (1715.0) | 132047 (1717.5) | 132072 (1720.0) |
| Middle | 132322 (1745) | 132322 (1745) | 132322 (1745) | 132322 (1745) | 132322 (1745) | 132322 (1745) |
| High | 132665 (1779.3) | 132657 (1778.5) | 132647 (1777.5) | 132622 (1775) | 132597 (1772.5) | 132572 (1770) |

# RF Output Power

***Limits***

**1. LTE Cat 1bis Band 12.** FCC §27.50 (c) (10) / RSS-130 Clause 4.6.

FCC §27.50 (c) (10):

> 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.

RSS-130 Clause 4.6:

> 4.6.1 General
> The transmitter output power shall be measured in terms of average power. In addition, the peak-to-average power ratio (PAPR) of the transmitter shall not exceed 13 dB for more than 0.1% of the time and shall use a signal corresponding to the High PAPR during periods of continuous transmission.
>
> 4.6.3 Frequency bands 698-756 MHz and 777-787 MHz
> The e.r.p. shall not exceed 30 watts for mobile equipment and outdoor fixed subscriber equipment. The e.r.p. shall not exceed 3 watts for portable equipment and indoor fixed subscriber equipment.

**2. LTE Cat 1bis Band 13.** FCC §27.50 (b) (10) / RSS-130 Clause 4.6.

FCC §27.50 (b) (10):

> Portable stations (hand-held devices) transmitting in the 746-757 MHz, 776-788 MHz, and 805-806 MHz bands are limited to 3 watts ERP.

RSS-130 Clause 4.6:

> 4.6.1 General
> The transmitter output power shall be measured in terms of average power. In addition, the peak-to-average power ratio (PAPR) of the transmitter shall not exceed 13 dB for more than 0.1% of the time and shall use a signal corresponding to the High PAPR during periods of continuous transmission.
>
> 4.6.3 Frequency bands 698-756 MHz and 777-787 MHz
> The e.r.p. shall not exceed 30 watts for mobile equipment and outdoor fixed subscriber equipment. The e.r.p. shall not exceed 3 watts for portable equipment and indoor fixed subscriber equipment.

**3. LTE Cat 1bis Band 66.** FCC §27.50 (d) / RSS-139 5.5.

FCC §27.50 (d):

> (4) Fixed, mobile, and portable (hand-held) stations operating in the 1710-1755 MHz band and mobile and portable stations operating in the 1695-1710 MHz and 1755-1780 MHz bands are limited to 1 watt EIRP. Fixed stations operating in the 1710-1755 MHz band are limited to a maximum antenna height of 10 meters above ground. Mobile and portable stations operating in these bands must employ a means for limiting power to the minimum necessary for successful communications.
>
> (5) In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

RSS-139 5.5:

> The maximum output power of the equipment shall comply with the limits specified below. In the tables, maximum power refers to the equivalent isotropically radiated power (e.i.r.p.) or total radiated power (TRP), measured in terms of average values.
>
> The limits in this RSS are specified for the purpose of certification and may not apply to all deployment scenarios. Consult SRSP-513 and SRSP-519 for more details on the bands 2110-2180 MHz and 2180-2200 MHz respectively.

| Table 3: Maximum power of equipment in the band 1710-1780 MHz | |
|---|---|
| **Equipment type** | **Maximum power** |
| Fixed station and base station | 30 dBm e.i.r.p./channel bandwidth |
| Subscriber equipment | 30 dBm e.i.r.p./channel bandwidth |

In addition, the peak to average power ratio (PAPR) of the equipment shall not exceed 13 dB for more than 0.1% of the time, using a signal that corresponds to the highest PAPR during periods of continuous transmission.

***Method***

The conducted RF output power measurements were made at the RF output terminals of the EUT using the power meter of the Universal Radio Communication tester CMW500, selecting maximum transmission power of the EUT and different modes of modulation.

The peak-to-average power ratio (PAPR) is measured using an attenuator, power splitter and spectrum analyser with a Complementary Cumulative Distribution Function implemented.

The maximum equivalent isotropically radiated power (e.i.r.p.) is calculated by adding the declared maximum antenna gain (dBi).

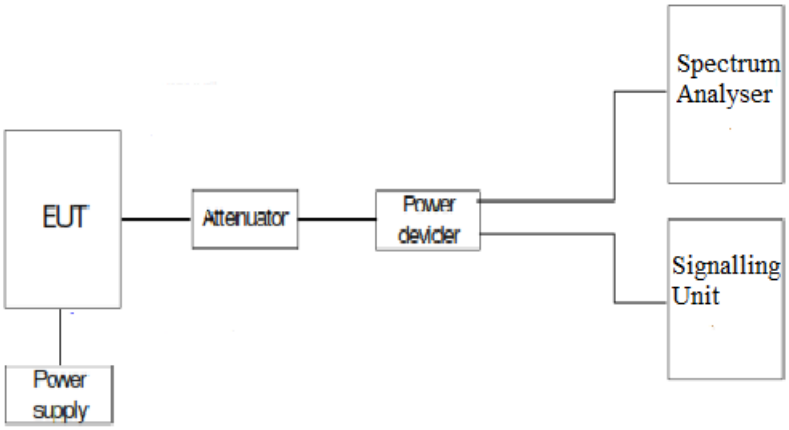
The maximum effective radiated power e.r.p. is calculated from the maximum equivalent isotropically radiated power (e.i.r.p.) by subtracting 2.15 dB:

E.R.P. = E.I.R.P. - 2.15 dB

***Test Setup***

1. CONDUCTED AVERAGE POWER:


2. PEAK-TO-AVERAGE POWER RATIO (PAPR) and Conducted Average power:



***Results***

## 1. CONDUCTED AVERAGE POWER:

LTE Cat 1bis Band 12:

Worst-case of RF Power is BW=10 MHz, High Channel, QPSK, RB Size=1, RB Offset=24.

| BANDWIDTH (MHz) | CHANNEL | FREQUENCY (MHz) | MODULATION | RB SIZE | RB OFFSET | AVERAGE POWER (dBm) |
|---|---|---|---|---|---|---|
| 10 | Low 23060 | 704 MHz | QPSK | 1 | 0 | 22.31 |
| | | | | 1 | 24 | 22.19 |
| | | | | 1 | 49 | 22.3 |
| | | | | 25 | 0 | 21.14 |
| | | | | 25 | 12 | 21.12 |
| | | | | 25 | 24 | 21.24 |
| | | | | 50 | 0 | 21.21 |
| | | | 16-QAM | 1 | 0 | 21.43 |
| | | | | 1 | 24 | 21.31 |
| | | | | 1 | 49 | 21.44 |
| | | | | 25 | 0 | 20.05 |
| | | | | 25 | 12 | 20.03 |
| | | | | 25 | 24 | 20.17 |
| | | | | 50 | 0 | 22.06 |
| | Middle 23095 | 707.5 MHz | QPSK | 1 | 0 | 22.24 |
| | | | | 1 | 24 | 22.4 |
| | | | | 1 | 49 | 22.49 |
| | | | | 25 | 0 | 21.12 |
| | | | | 25 | 12 | 21.28 |
| | | | | 25 | 24 | 21.37 |
| | | | | 50 | 0 | 21.32 |
| | | | 16-QAM | 1 | 0 | 21.29 |
| | | | | 1 | 24 | 21.48 |
| | | | | 1 | 49 | 21.58 |
| | | | | 25 | 0 | 20.02 |
| | | | | 25 | 12 | 20.2 |
| | | | | 25 | 24 | 20.3 |
| | | | | 50 | 0 | 22.41 |
| | High 23130 | 711 MHz | QPSK | 1 | 0 | 22.68 |
| | | | | 1 | 24 | 22.93 |
| | | | | 1 | 49 | 22.19 |
| | | | | 25 | 0 | 21.65 |
| | | | | 25 | 12 | 21.75 |
| | | | | 25 | 24 | 21.44 |
| | | | | 50 | 0 | 21.28 |
| | | | 16-QAM | 1 | 0 | 21.59 |
| | | | | 1 | 24 | 21.94 |
| | | | | 1 | 49 | 21.24 |
| | | | | 25 | 0 | 20.51 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | 25 | 12 | 20.63 |
| | | | | 25 | 24 | 20.29 |
| | | | | 50 | 0 | 22.49 |

BW=10 MHz. QPSK:

| MAX POWER | QPSK COND. POWER AVG (dBm) | ANTENNA GAIN (dBi) | RAD. POWER AVG EIRP(dBm) | RAD. POWER AVG ERP(dBm) |
|---|---|---|---|---|
| LOW | 22.31 | 2 | 24.31 | 22.16 |
| MIDDLE | 22.49 | 2 | 24.49 | 22.34 |
| HIGH | 22.93 | 2 | 24.93 | 22.78 |
| MAX: | 22.93 | | 24.93 | 22.78 |

BW=10 MHz. 16QAM:

| MAX POWER | 16QAM COND. POWER AVG (dBm) | ANTENNA GAIN (dBi) | RAD. POWER AVG EIRP(dBm) | RAD. POWER AVG ERP(dBm) |
|---|---|---|---|---|
| LOW | 22.06 | 2 | 24.06 | 21.91 |
| MIDDLE | 22.41 | 2 | 24.41 | 22.26 |
| HIGH | 22.49 | 2 | 24.49 | 22.34 |
| MAX: | 22.49 | | 24.49 | 22.34 |

LTE Cat 1bis Band 13:

Worst-case of RF Power is BW=5 MHz, Low Channel, QPSK, RB Size=1, RB Offset=12.

| BANDWIDTH (MHz) | CHANNEL | FREQUENCY (MHz) | MODULATION | RB SIZE | RB OFFSET | AVERAGE POWER (dBm) |
|---|---|---|---|---|---|---|
| 5 | Low 23205 | 779.5 | QPSK | 1 | 0 | 22.77 |
| | | | | 1 | 12 | 23.23 |
| | | | | 1 | 24 | 23.22 |
| | | | | 12 | 0 | 21.97 |
| | | | | 12 | 6 | 22.15 |
| | | | | 12 | 11 | 22.24 |
| | | | | 25 | 0 | 22.12 |
| | | | 16-QAM | 1 | 0 | 21.86 |
| | | | | 1 | 12 | 22.35 |
| | | | | 1 | 24 | 22.32 |
| | | | | 12 | 0 | 20.84 |
| | | | | 12 | 6 | 20.99 |
| | | | | 12 | 11 | 21.12 |
| | | | | 25 | 0 | 21.06 |
| | High 23255 | 784.5 | QPSK | 1 | 0 | 22.71 |
| | | | | 1 | 12 | 22.63 |
| | | | | 1 | 24 | 22.82 |
| | | | | 12 | 0 | 21.53 |
| | | | | 12 | 6 | 21.51 |
| | | | | 12 | 11 | 21.54 |
| | | | | 25 | 0 | 21.51 |
| | | | 16-QAM | 1 | 0 | 21.67 |
| | | | | 1 | 12 | 21.56 |
| | | | | 1 | 24 | 21.83 |
| | | | | 12 | 0 | 20.43 |
| | | | | 12 | 6 | 20.42 |
| | | | | 12 | 11 | 20.5 |
| | | | | 25 | 0 | 20.51 |

BW=5 MHz. QPSK:

| MAX POWER | QPSK COND. POWER AVG (dBm) | ANTENNA GAIN (dBi) | RAD. POWER AVG EIRP(dBm) | RAD. POWER AVG ERP(dBm) |
|---|---|---|---|---|
| LOW | 23.23 | 2 | 25.23 | 23.08 |
| HIGH | 22.82 | 2 | 24.82 | 22.67 |
| MAX: | 23.23 | | 25.23 | 23.08 |

BW=5 MHz. 16QAM:

| MAX POWER | 16QAM COND. POWER AVG (dBm) | ANTENNA GAIN (dBi) | RAD. POWER AVG EIRP(dBm) | RAD. POWER AVG ERP(dBm) |
|---|---|---|---|---|
| LOW | 22.35 | 2 | 24.35 | 22.2 |
| HIGH | 21.83 | 2 | 23.83 | 21.68 |
| MAX: | 22.35 | | 24.35 | 22.2 |

LTE Cat 1bis Band 66:

Worst-case of RF Power is BW=5 MHz, Low Channel, QPSK, RB Size=1, RB Offset=0.

| BANDWIDTH (MHz) | CHANNEL | FREQUENCY (MHz) | MODULATION | RB SIZE | RB OFFSET | AVERAGE POWER (dBm) |
|---|---|---|---|---|---|---|
| 5 | Low 131997 | 1712.5 | QPSK | 1 | 0 | 22.94 |
| | | | | 1 | 12 | 22.86 |
| | | | | 1 | 24 | 22.79 |
| | | | | 12 | 0 | 21.78 |
| | | | | 12 | 6 | 21.74 |
| | | | | 12 | 11 | 21.69 |
| | | | | 25 | 0 | 21.69 |
| | | | 16-QAM | 1 | 0 | 21.75 |
| | | | | 1 | 12 | 21.69 |
| | | | | 1 | 24 | 21.64 |
| | | | | 12 | 0 | 20.68 |
| | | | | 12 | 6 | 20.63 |
| | | | | 12 | 11 | 20.65 |
| | | | | 25 | 0 | 20.68 |
| | Middle 132322 | 1745 | QPSK | 1 | 0 | 22.61 |
| | | | | 1 | 12 | 22.6 |
| | | | | 1 | 24 | 22.64 |
| | | | | 12 | 0 | 21.6 |
| | | | | 12 | 6 | 21.58 |
| | | | | 12 | 11 | 21.64 |
| | | | | 25 | 0 | 21.61 |
| | | | 16-QAM | 1 | 0 | 21.66 |
| | | | | 1 | 12 | 21.67 |
| | | | | 1 | 24 | 21.75 |
| | | | | 12 | 0 | 20.63 |
| | | | | 12 | 6 | 20.59 |
| | | | | 12 | 11 | 20.66 |
| | | | | 25 | 0 | 20.67 |
| | High 132647 | 1777.5 | QPSK | 1 | 0 | 22.14 |
| | | | | 1 | 12 | 22.13 |
| | | | | 1 | 24 | 22.02 |
| | | | | 12 | 0 | 21.1 |
| | | | | 12 | 6 | 21.08 |
| | | | | 12 | 11 | 21.12 |
| | | | | 25 | 0 | 21.07 |
| | | | 16-QAM | 1 | 0 | 21.24 |
| | | | | 1 | 12 | 21.23 |
| | | | | 1 | 24 | 21.19 |
| | | | | 12 | 0 | 20.05 |
| | | | | 12 | 6 | 20.07 |
| | | | | 12 | 11 | 20.1 |
| | | | | 25 | 0 | 20.09 |

BW=5 MHz. QPSK:

| MAX POWER | QPSK COND. POWER AVG (dBm) | ANTENNA GAIN (dBi) | RAD. POWER AVG EIRP(dBm) | RAD. POWER AVG ERP(dBm) |
|---|---|---|---|---|
| LOW | 22.94 | 2 | 24.94 | 22.79 |
| MIDDLE | 22.64 | 2 | 24.64 | 22.49 |
| HIGH | 22.14 | 2 | 24.14 | 21.99 |
| MAX: | 22.94 | | 24.94 | 22.79 |

BW=5 MHz. 16QAM:

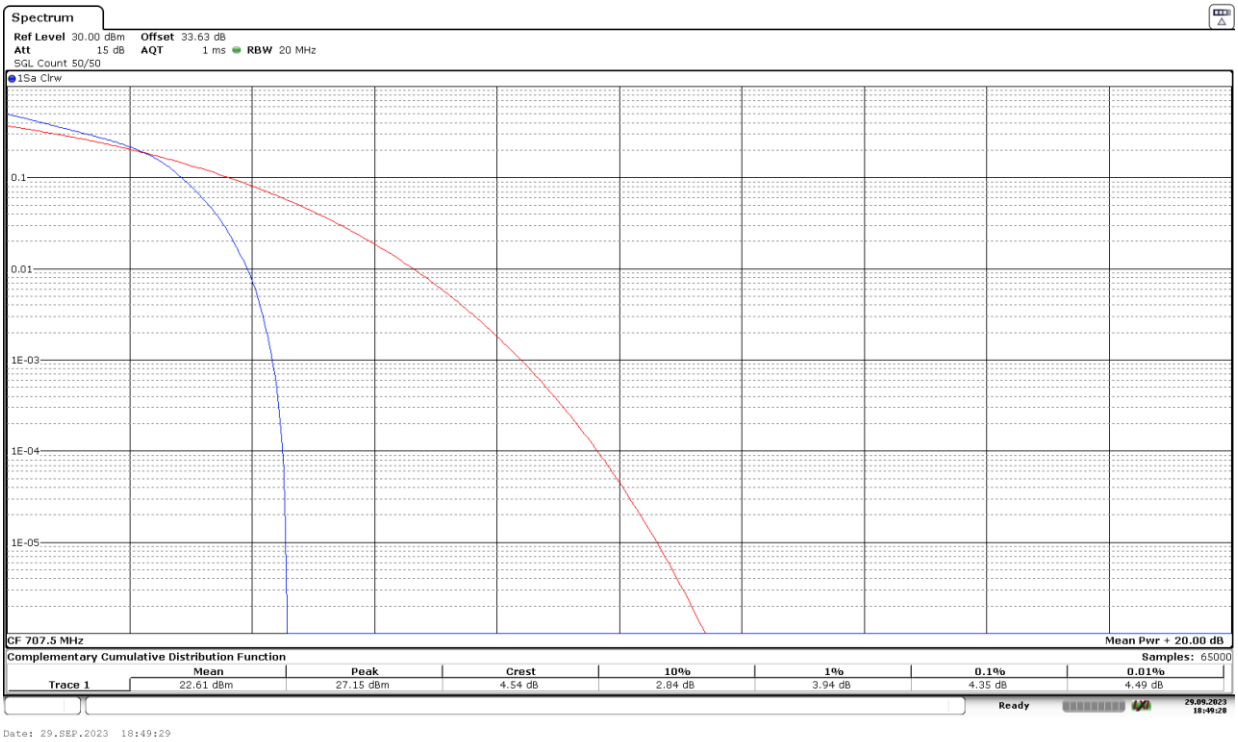
| MAX POWER | 16QAM COND. POWER AVG (dBm) | ANTENNA GAIN (dBi) | RAD. POWER AVG EIRP(dBm) | RAD. POWER AVG ERP(dBm) |
|---|---|---|---|---|
| LOW | 21.75 | 2 | 23.75 | 21.6 |
| MIDDLE | 21.75 | 2 | 23.75 | 21.6 |
| HIGH | 21.24 | 2 | 23.24 | 21.09 |
| MAX: | 21.75 | | 23.75 | 21.6 |

## 2. PEAK-TO-AVERAGE POWER RATIO (PAPR)

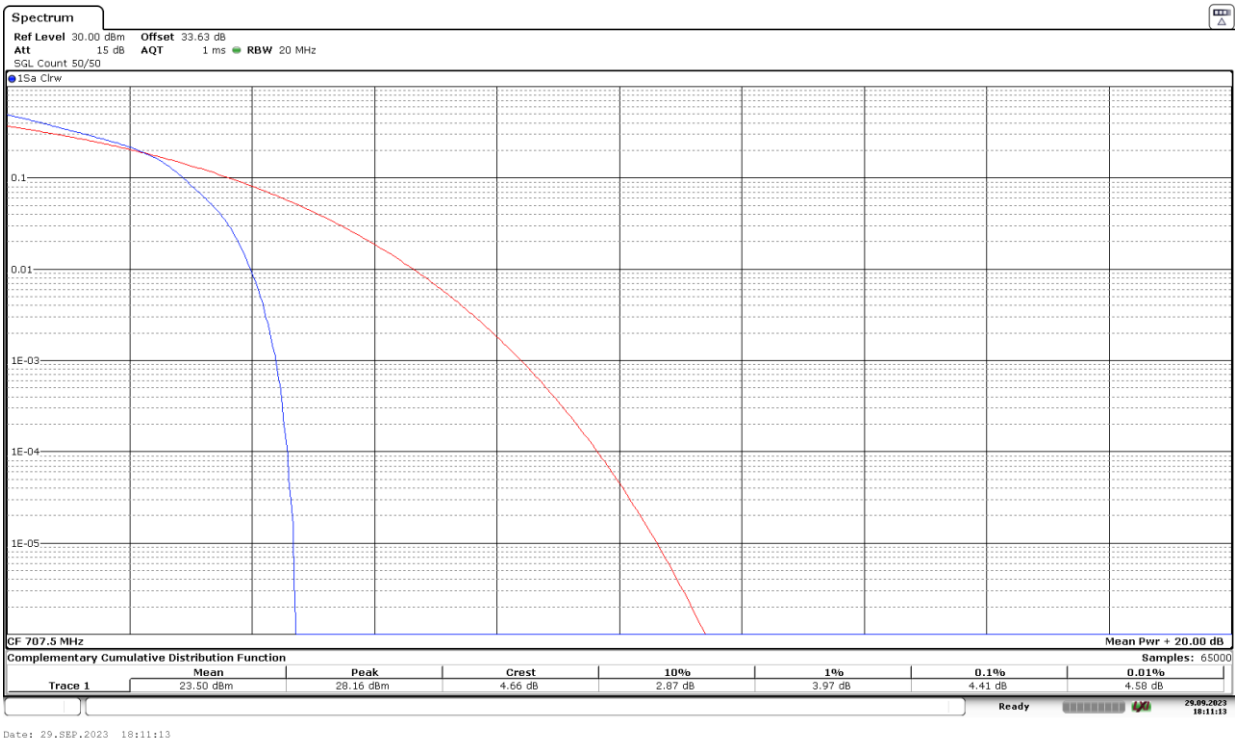
LTE Cat 1bis Band 12:

Worst-case of PAPR is BW=10 MHz, High Channel, 16QAM, RB Size=25, RB Offset=0.

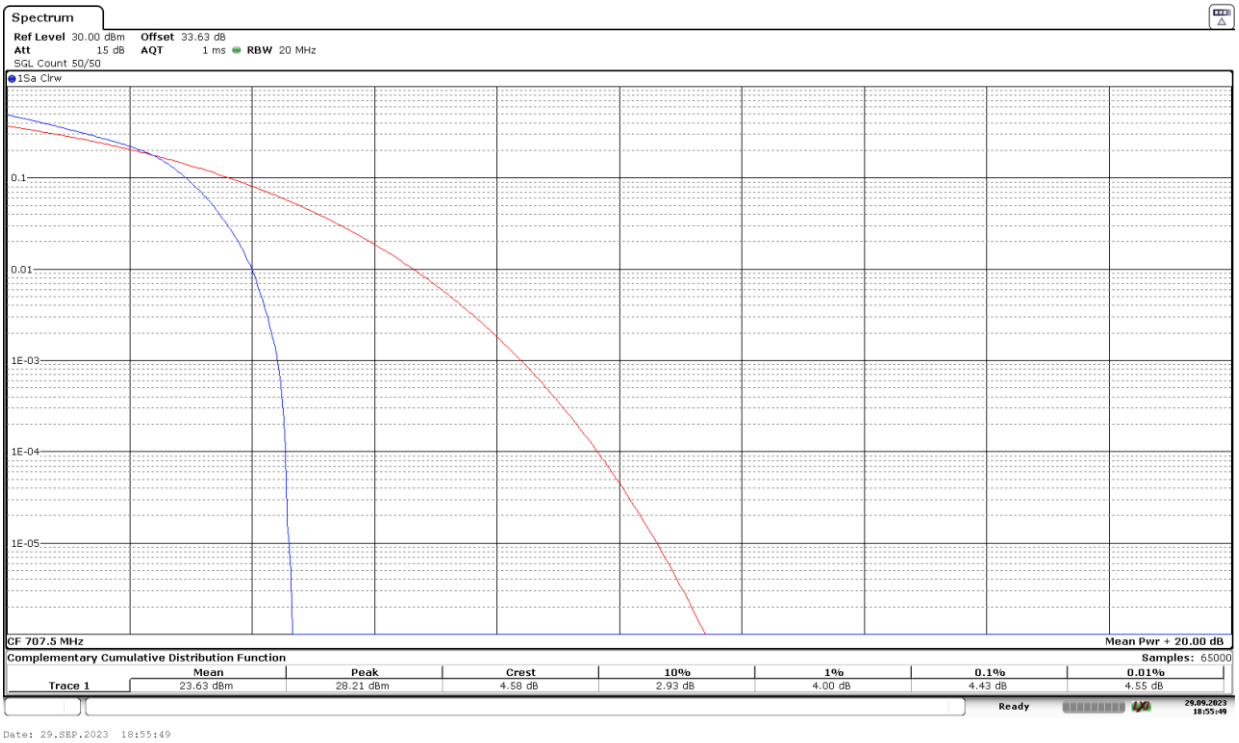
Low Channel:




Middle Channel:



High Channel:




| 16QAM | Low | Middle | High |
|---|---|---|---|
| PAPR (dB) | 4.35 | 4.41 | 4.43 |

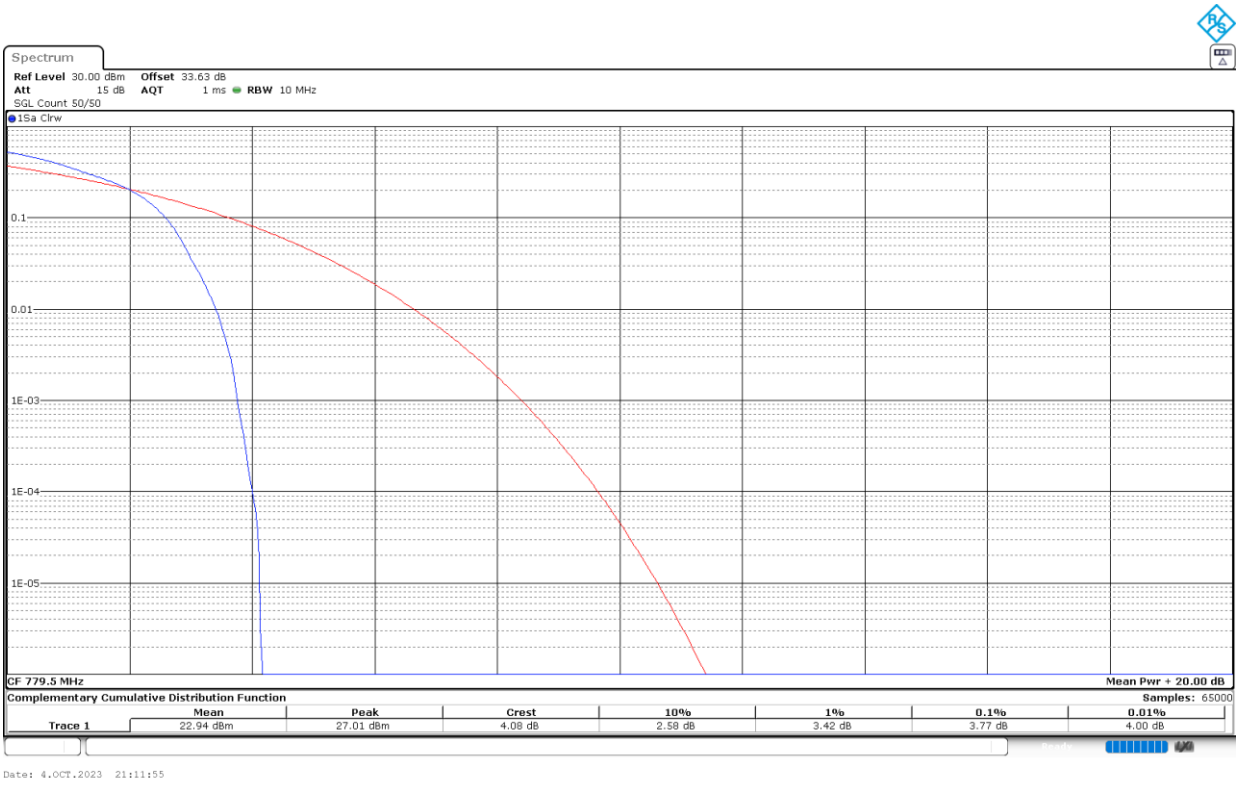
***Verdict***

Pass

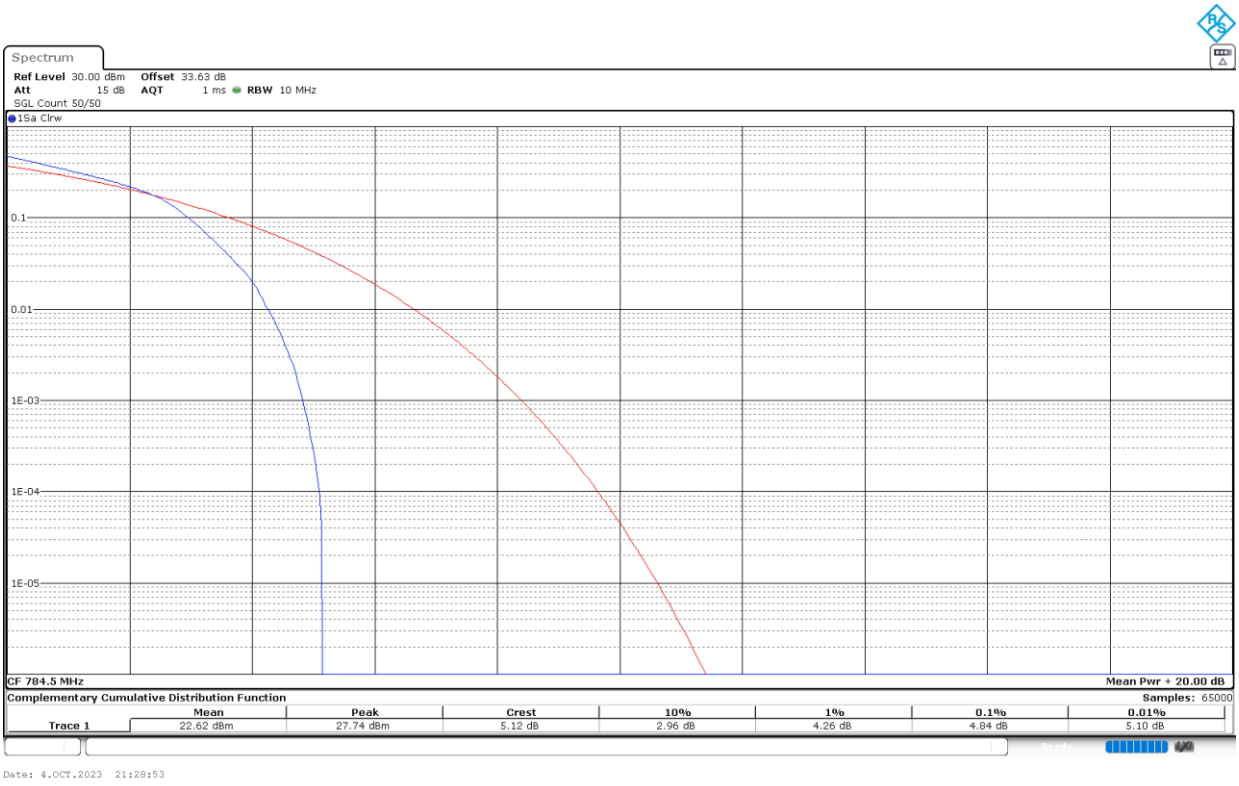
LTE Cat 1bis Band 13:

Worst-case of PAPR is BW= 5 MHz, High Channel, 16QAM, RB Size=12, RB Offset=0.

Low Channel:




High Channel:



| 16QAM | Low | High |
|---|---|---|
| PAPR (dB) | 3.77 | 4.84 |

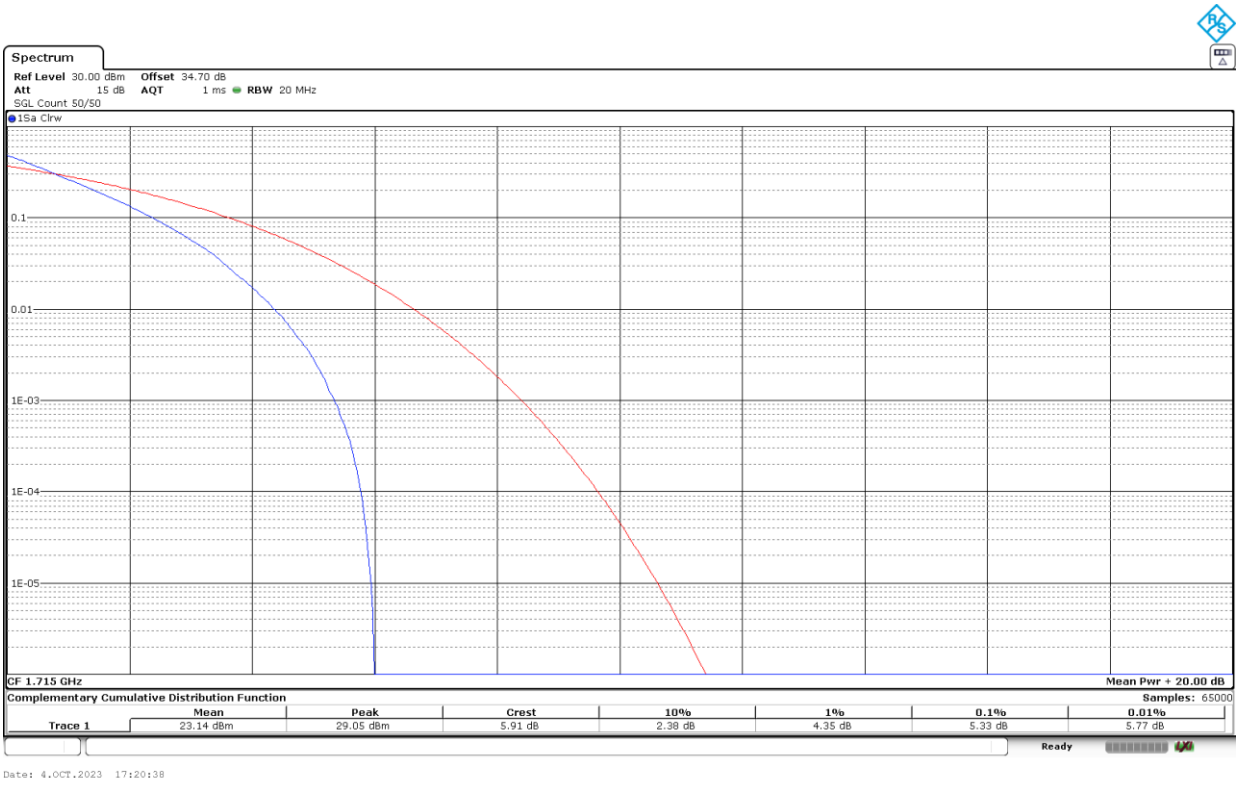
***Verdict***

Pass

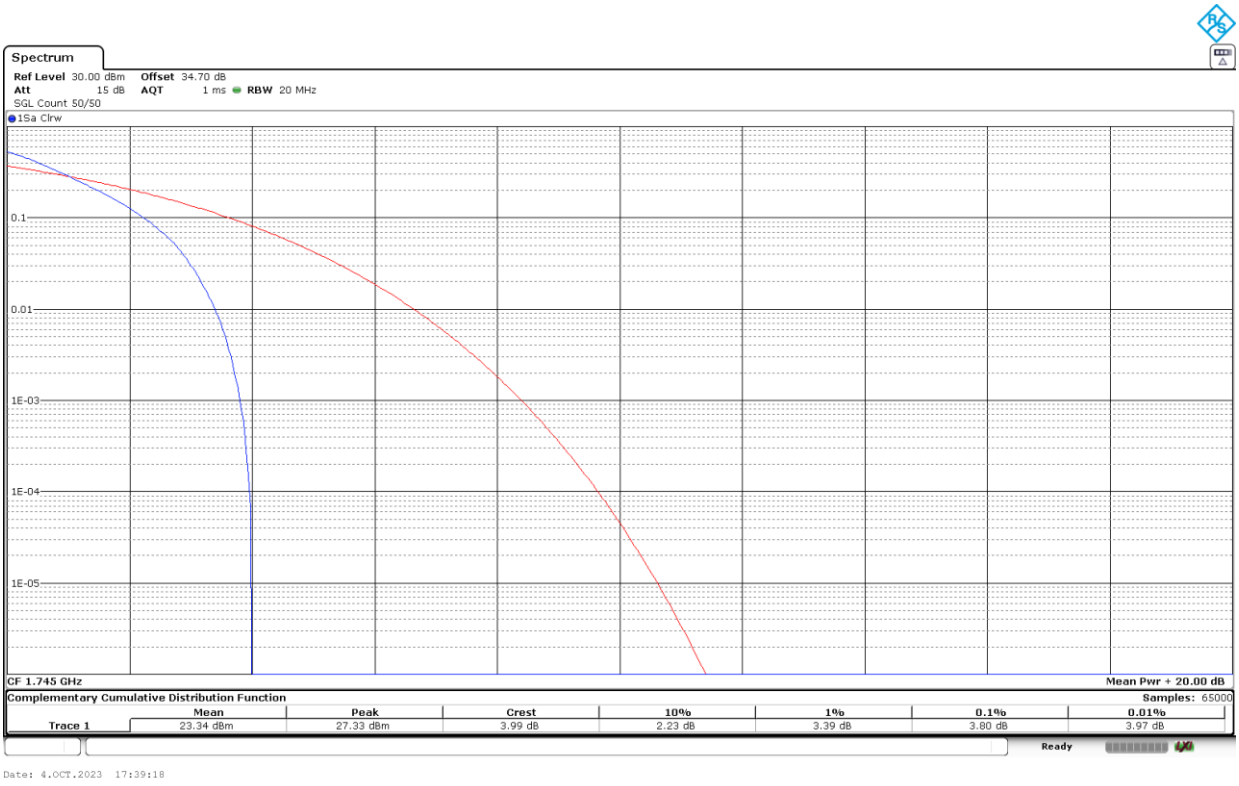
LTE Cat 1bis Band 66:

Worst-case of PAPR is BW= 10 MHz, Low Channel, QPSK, RB Size=50, RB Offset=0.

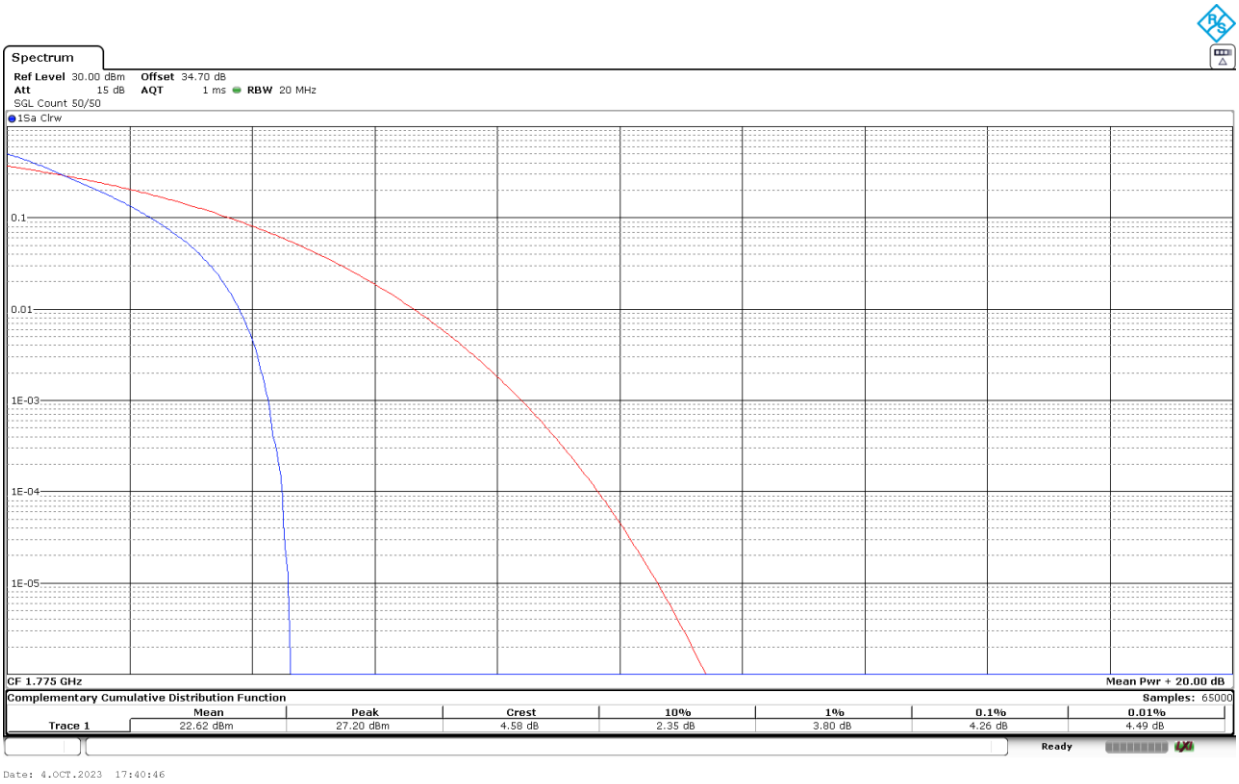
Low Channel:




Middle Channel:



High Channel:




| QPSK | Low | Middle | High |
|---|---|---|---|
| PAPR (dB) | 5.33 | 3.80 | 4.26 |

***Verdict***

Pass

# Frequency Stability

***Limits***

**1. LTE Cat 1bis Bands 12, 13.**

* FCC §27.54: The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

* FCC § 2.1055:

(a) The frequency stability shall be measured with variation of ambient temperature as follows:

(1) From -30° to +50° centigrade for all equipment except that specified in paragraphs (a) (2) and (3) of this section.

(b) Frequency measurements shall be made at the extremes of the specified temperature range and at intervals of not more than 10° centigrade through the range. A period of time sufficient to stabilize all of the components of the oscillator circuit at each temperature level shall be allowed prior to frequency measurement. The short term transient effects on the frequency of the transmitter due to keying (except for broadcast transmitters) and any heating element cycling normally occurring at each ambient temperature level also shall be shown. Only the portion or portions of the transmitter containing the frequency determining and stabilizing circuitry need be subjected to the temperature variation test.

(c) The frequency stability shall be measured with variation of primary supply voltage as follows:

(1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

(2) For hand carried, battery powered equipment, reduce primary supply voltage to the battery operating end point which shall be specified by the manufacturer.

(3) The supply voltage shall be measured at the input to the cable normally provided with the equipment, or at the power supply terminals if cables are not normally provided. Effects on frequency of transmitter keying (except for broadcast transmitters) and any heating element cycling at the nominal supply voltage and at each extreme also shall be shown.

* RSS-130, 4.5:

For equipment that is capable of transmitting numerous channels simultaneously for different applications (e.g. LTE and narrowband – Internet of Things (IoT)), the occupied bandwidth shall be the bandwidth representing the sum of the occupied bandwidths of these channels.

The frequency stability shall be sufficient to ensure that the occupied bandwidth remains within each frequency block range when tested at the temperature and supply voltage variations specified in RSS-Gen.

**2. LTE Cat 1bis Band 66.**

* FCC §27.54: The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

* FCC § 2.1055:

(a) The frequency stability shall be measured with variation of ambient temperature as follows:

(1) From -30° to +50° centigrade for all equipment except that specified in paragraphs (a) (2) and (3) of this section.

(b) Frequency measurements shall be made at the extremes of the specified temperature range and at intervals of not more than 10° centigrade through the range. A period of time sufficient to stabilize all of the components of the oscillator circuit at each temperature level shall be allowed prior to frequency measurement. The short term transient effects on the frequency of the transmitter due to keying (except for broadcast transmitters) and any heating element cycling normally occurring at each ambient temperature level also shall be shown. Only the portion or portions of the transmitter containing the frequency determining and stabilizing circuitry need be subjected to the temperature variation test.

(c) The frequency stability shall be measured with variation of primary supply voltage as follows:

(1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

(2) For hand carried, battery powered equipment, reduce primary supply voltage to the battery operating end point which shall be specified by the manufacturer.

(3) The supply voltage shall be measured at the input to the cable normally provided with the equipment, or at the power supply terminals if cables are not normally provided. Effects on frequency of transmitter keying (except for broadcast transmitters) and any heating element cycling at the nominal supply voltage and at each extreme also shall be shown.

* RSS-139, 5.4:

The frequency stability shall be sufficient to ensure that the occupied bandwidth stays within the operating frequency block or frequency block group when tested to the temperature and supply voltage variations specified in RSS-Gen.

***Method***

The frequency tolerance measurements over temperature variations were made over the temperature range of –30ºC to +50ºC. The EUT was placed inside a climatic chamber and the temperature was raised hourly in 10ºC steps from –30ºC up to +50ºC.
The supply voltage was varied between 85% and 115% of nominal voltage.

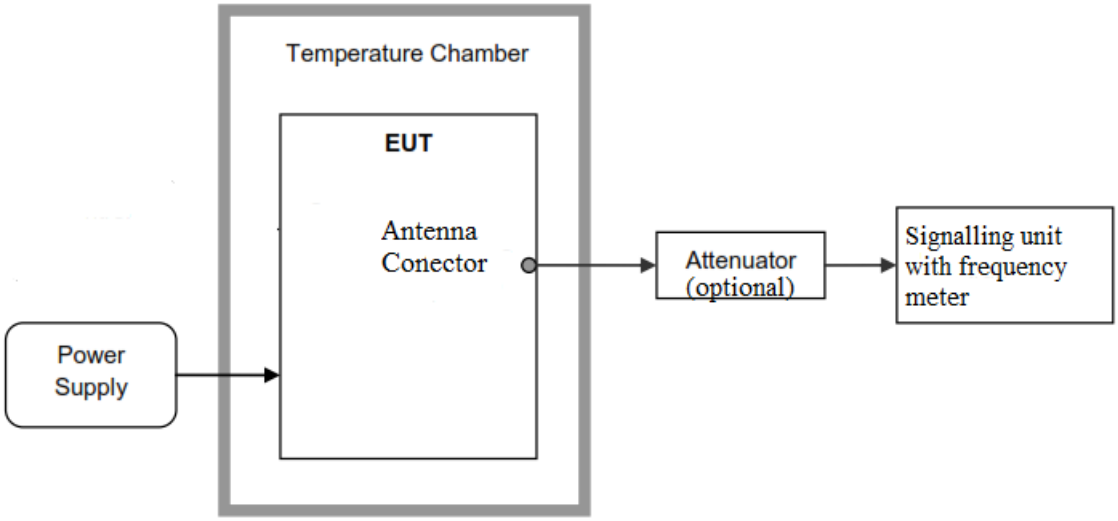
The EUT was set in “Radio Resource Control (RRC) mode” on the middle channel using the Universal Radio Communication tester R&S CMW500 and the maximum frequency error was measured using the built-in calibrated frequency meter.
The worst case LTE mode for conducted power was used for the test.

In order to check that the frequency stability is sufficient such that the fundamental emissions stay within the authorized bands of operation, a reference point is established at the applicable unwanted emissions limit using a RBW equal to the RBW required by the unwanted emissions specification of the applicable regulatory standard. These reference points measured using the lowest and highest channel of operation are identified as fL and fH respectively. The worst-case frequency offset determined in the above methods is added or subtracted from the values of fL and fH to check that the resulting frequencies remain within the band.

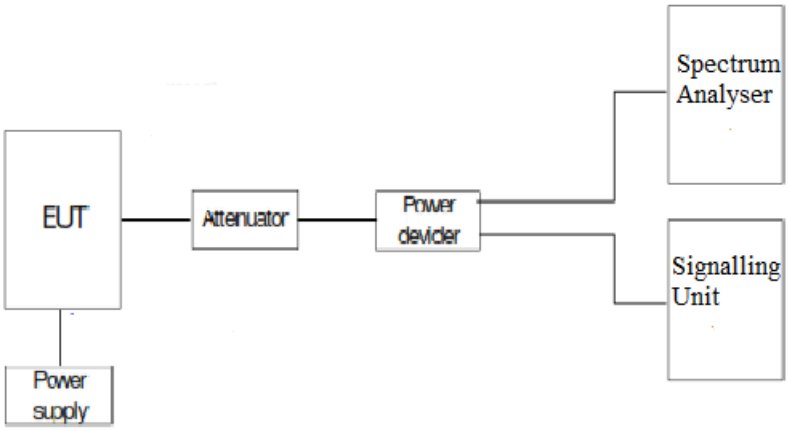
The reference point measurements were made at the RF output terminals of the EUT using an attenuator, power splitter and spectrum analyser. The EUT was controlled via the Universal Radio Communication tester R&S CMW500 selecting maximum transmission power of the EUT and different modes of modulation.

***Test Setup***

Frequency tolerance:




Reference points *f*L and *f*H:



***Results***

## 1. FREQUENCY TOLERANCE:

- **Frequency stability over temperature variations:**

**LTE Cat 1bis Band 12:**

The worst case modulation in terms of Frequency Stability is BW=5 MHz, QPSK.

| Temperature (ºC) | Frequency Error (Hz) | Frequency Error (ppm) |
|---|---|---|
| +50 | 6.31 | 0.008918728 |
| +40 | 4.85 | 0.006855124 |
| +30 | 5.4 | 0.007632509 |
| +20 | 3.41 | 0.004819788 |
| +10 | 2.81 | 0.003971731 |
| 0 | 3.07 | 0.004339223 |
| -10 | 0.99 | 0.001399293 |
| -20 | 2.59 | 0.003660777 |
| -30 | 2.98 | 0.004212014 |

**LTE Cat 1bis Band 13:**

The worst case modulation in terms of Frequency Stability is BW=5 MHz, QPSK.

| Temperature (ºC) | Frequency Error (Hz) | Frequency Error (ppm) |
|---|---|---|
| +50 | 3.87 | 0.004948849 |
| +40 | 4.22 | 0.005396419 |
| +30 | 4.16 | 0.005319693 |
| +20 | 2.19 | 0.002800512 |
| +10 | 3.56 | 0.00455243 |
| 0 | 1.81 | 0.002314578 |
| -10 | 4.4 | 0.005626598 |
| -20 | 5.08 | 0.006496164 |
| -30 | 5.2 | 0.006649616 |

**LTE Cat 1bis Band 66:**

The worst case modulation in terms of Frequency Stability is BW=5 MHz, QPSK.

| Temperature (ºC) | Frequency Error (Hz) | Frequency Error (ppm) |
|---|---|---|
| +50 | -1.92 | -0.001100287 |
| +40 | -2.15 | -0.001232092 |
| +30 | 2.02 | 0.001157593 |
| +20 | 0.4 | 0.000229226 |
| +10 | -0.18 | -0.000103152 |
| 0 | 0.71 | 0.000406877 |
| -10 | -0.87 | -0.000498567 |
| -20 | -1.32 | -0.000756447 |
| -30 | 3.33 | 0.001908309 |

- **Frequency stability over voltage variations:**

**LTE Cat 1bis Band 12:**

The worst case modulation in terms of Frequency Stability is BW=5 MHz, QPSK.

| Supply voltage | Voltage (V) | Frequency Error (Hz) | Frequency Error (ppm) |
|---|---|---|---|
| Vmax | 5.5 | 3.63 | 0.005130742 |
| Vmin | 3.2 | 4.6 | 0.006501767 |

**LTE Cat 1bis Band 13:**

The worst case modulation in terms of Frequency Stability is BW=5 MHz, QPSK.

| Supply voltage | Voltage (V) | Frequency Error (Hz) | Frequency Error (ppm) |
|---|---|---|---|
| Vmax | 5.5 | 2.08 | 0.002659847 |
| Vmin | 3.2 | 4.17 | 0.005332481 |

**LTE Cat 1bis Band 66:**

The worst case modulation in terms of Frequency Stability is BW=5 MHz, QPSK.

| Supply voltage | Voltage (V) | Frequency Error (Hz) | Frequency Error (ppm) |
|---|---|---|---|
| Vmax | 5.5 | -0.2 | -0.000114613 |
| Vmin | 3.2 | -0.1 | -5.73066E-05 |

## 2. REFERENCE FREQUENCY POINTS fL AND fH:

The worst-case frequency offsets added or subtracted per band and bandwidth:

**LTE Cat 1bis Band 12:** BW=5 MHz. QPSK.

| | |
|---|---|
| *f*L (MHz) | 699.0179 |
| *f*H (MHz) | 715.9907 |

**LTE Cat 1bis Band 13:** BW=5 MHz. QPSK.

| | |
|---|---|
| *f*L (MHz) | 777.0515 |
| *f*H (MHz) | 786.9600 |

**LTE Cat 1bis Band 66:** BW=5 MHz. QPSK.

| | |
|---|---|
| *f*L (MHz) | 1710.0642 |
| *f*H (MHz) | 1779.8963 |

The reference frequency points fL and fH stay within the authorized blocks for the band above.

Measurement uncertainty (Hz): <±207.77

***Verdict***

PASS

# Modulation Characteristics

***Limits***

**1. LTE Cat 1bis Bands 12, 13.**

* FCC §2.1047 Measurements required: Modulation characteristics.

* RSS-130 4.2: Equipment certified under this standard shall employ digital modulation.

**2. LTE Cat 1bis Band 66.**

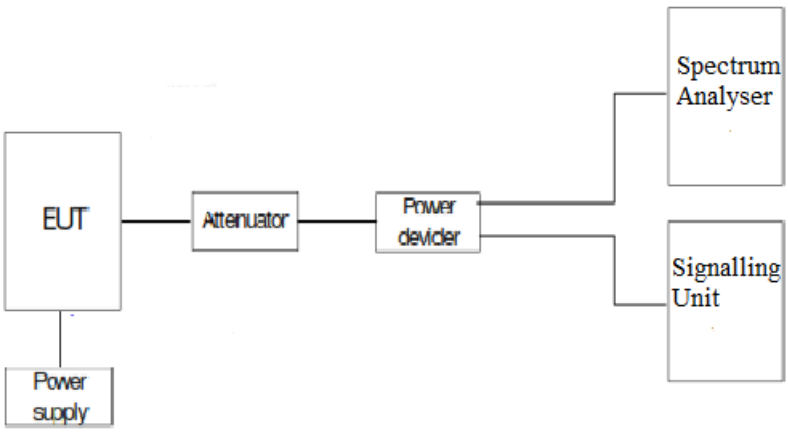
* FCC §2.1047 Measurements required: Modulation characteristics.

* RSS-139 5.3: Devices may use any type of modulation technique. The type of modulation shall be documented in the test report.

***Method***

For LTE the EUT operates with QPSK and 16QAM modulation modes in which the information is digitised and coded into a bit stream. The RF transmission is multiplexed using *Orthogonal Frequency Division Multiplexing (OFDM)* using different possible arrangement of subcarriers (Resource Blocks RB).

***Test Setup***

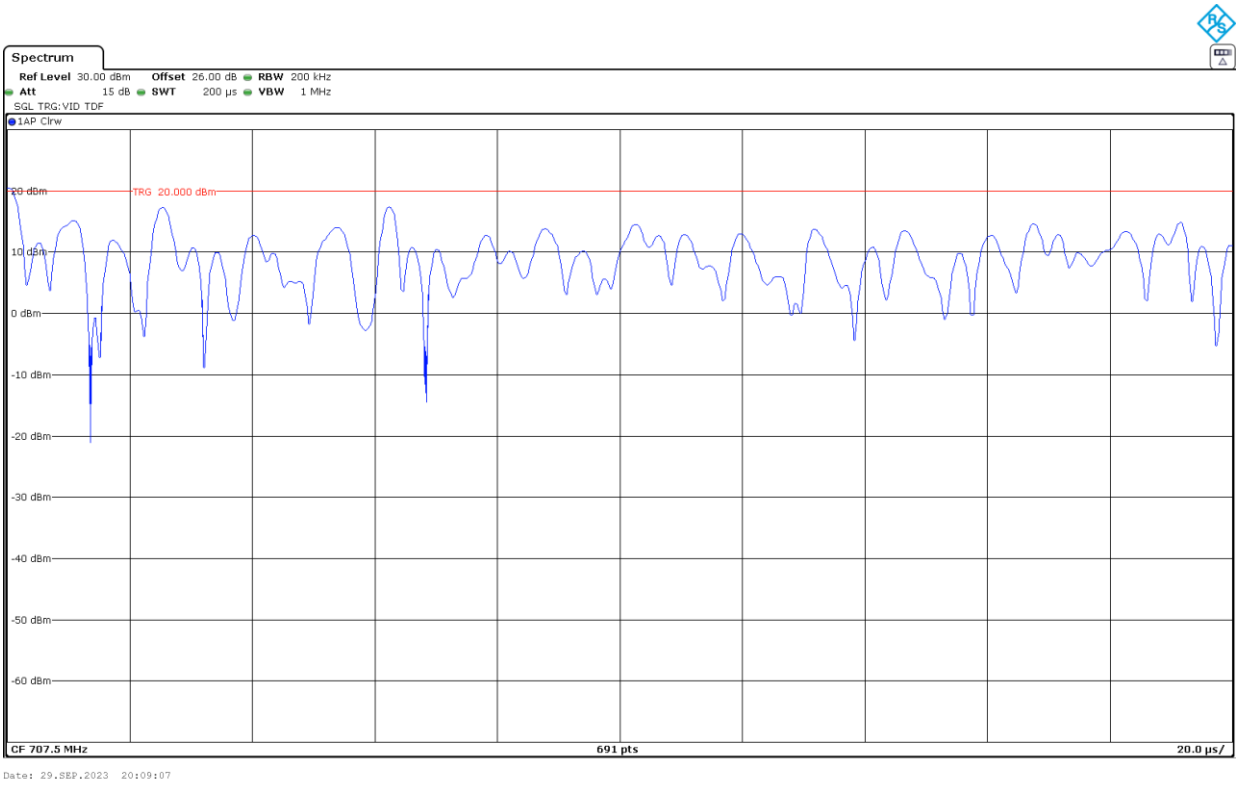


### *Results*

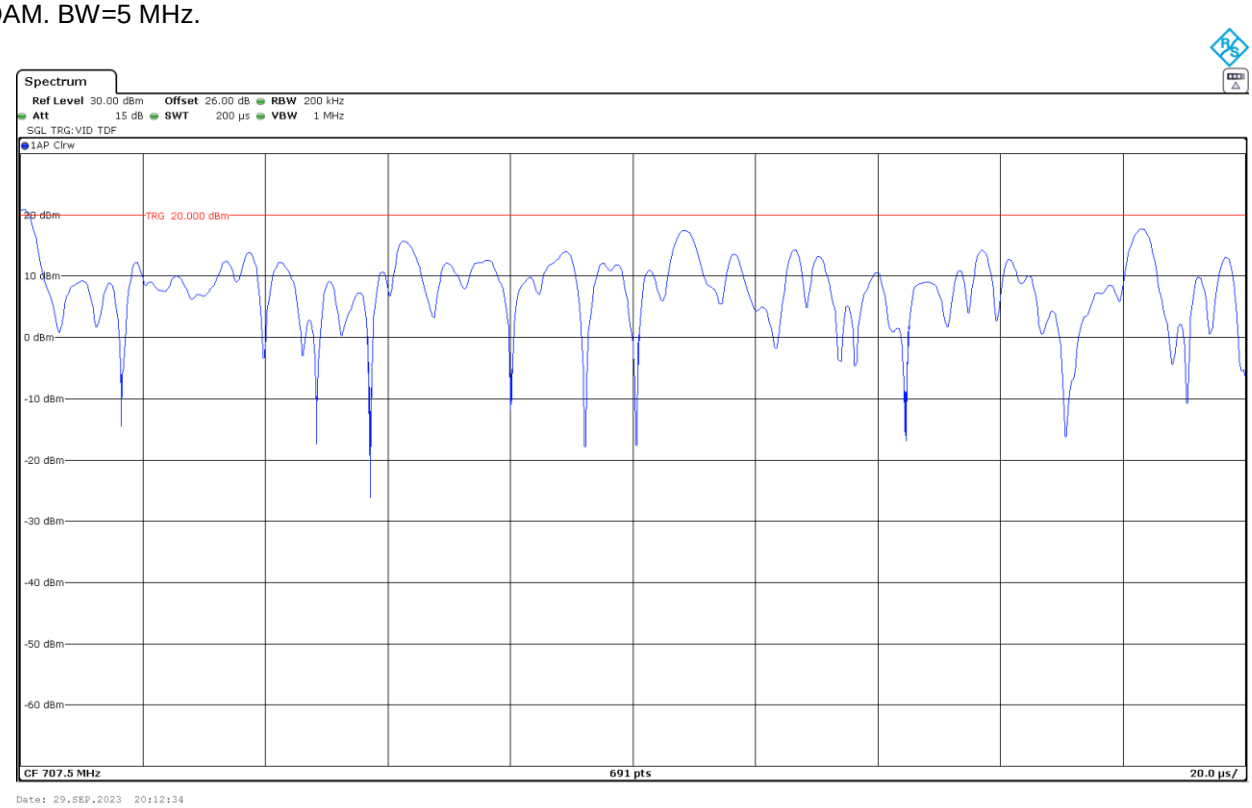
The following plots show the modulation schemes in the EUT.

**LTE Cat 1bis Band 12:**

QPSK. BW=5 MHz.

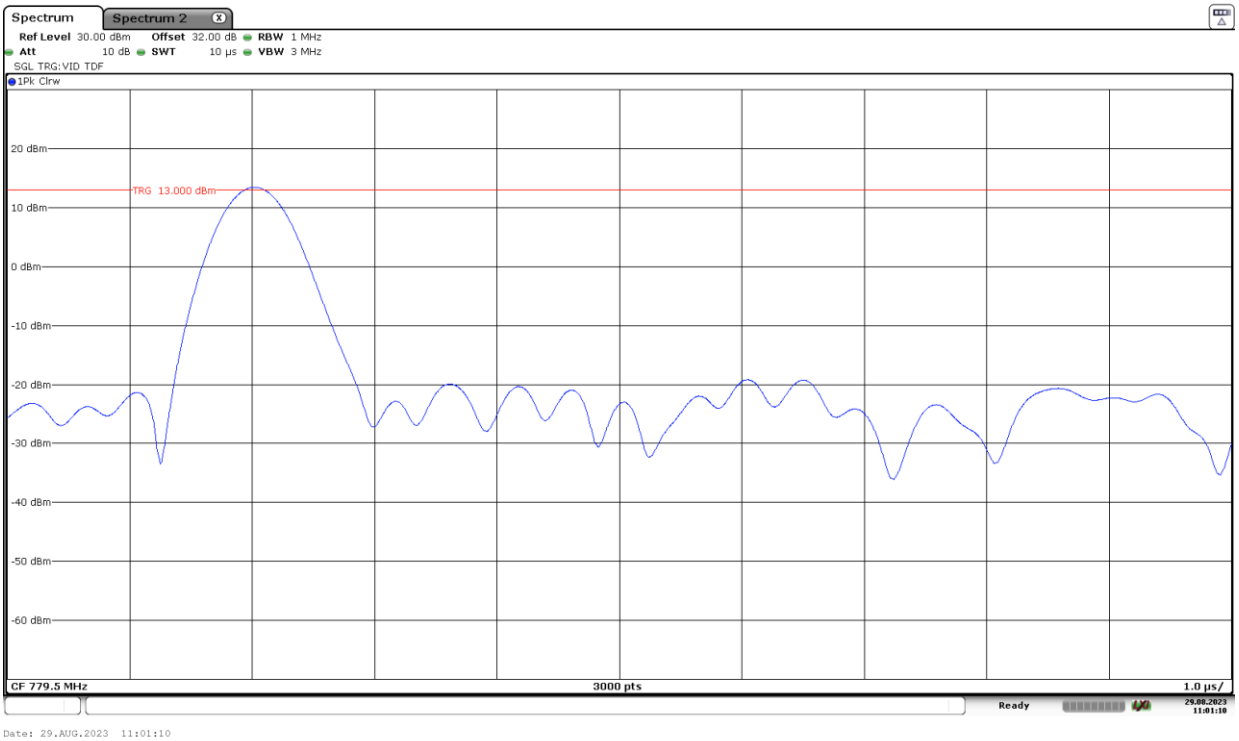



16QAM. BW=5 MHz.

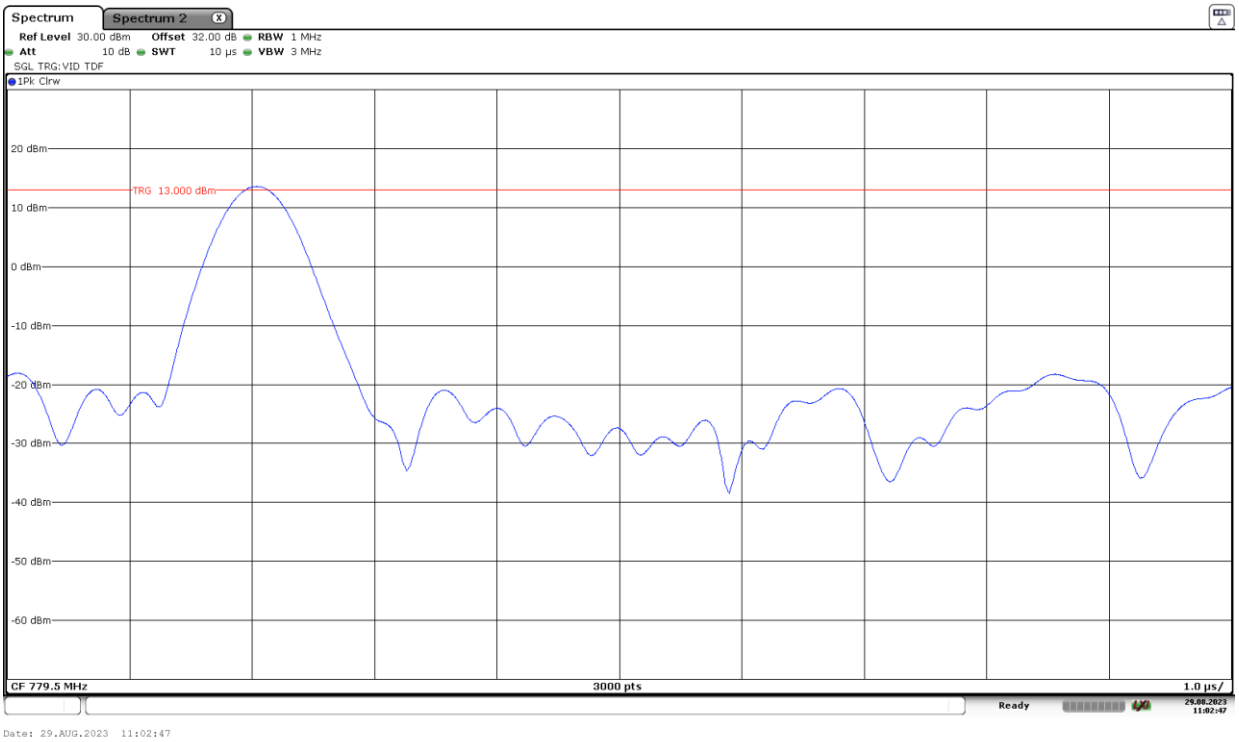


## LTE Cat 1bis Band 13:

QPSK. BW=5 MHz.

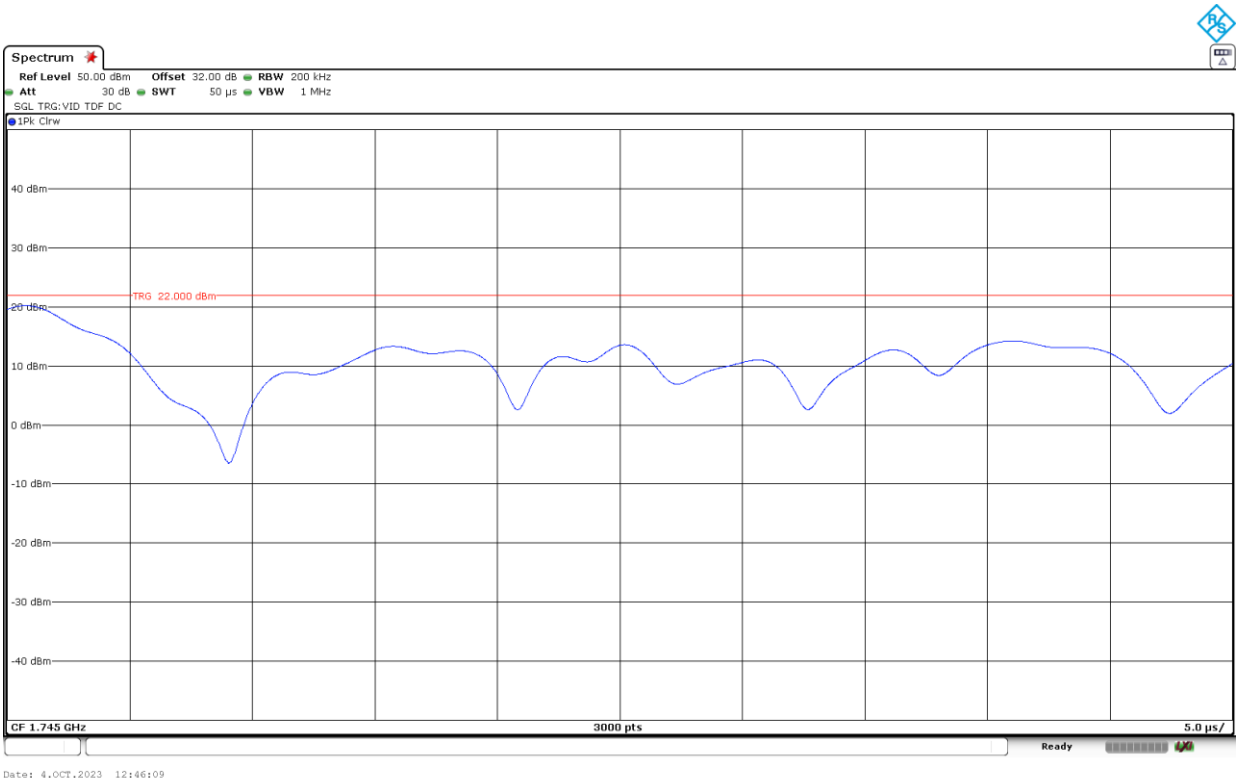



16QAM. BW=5 MHz.

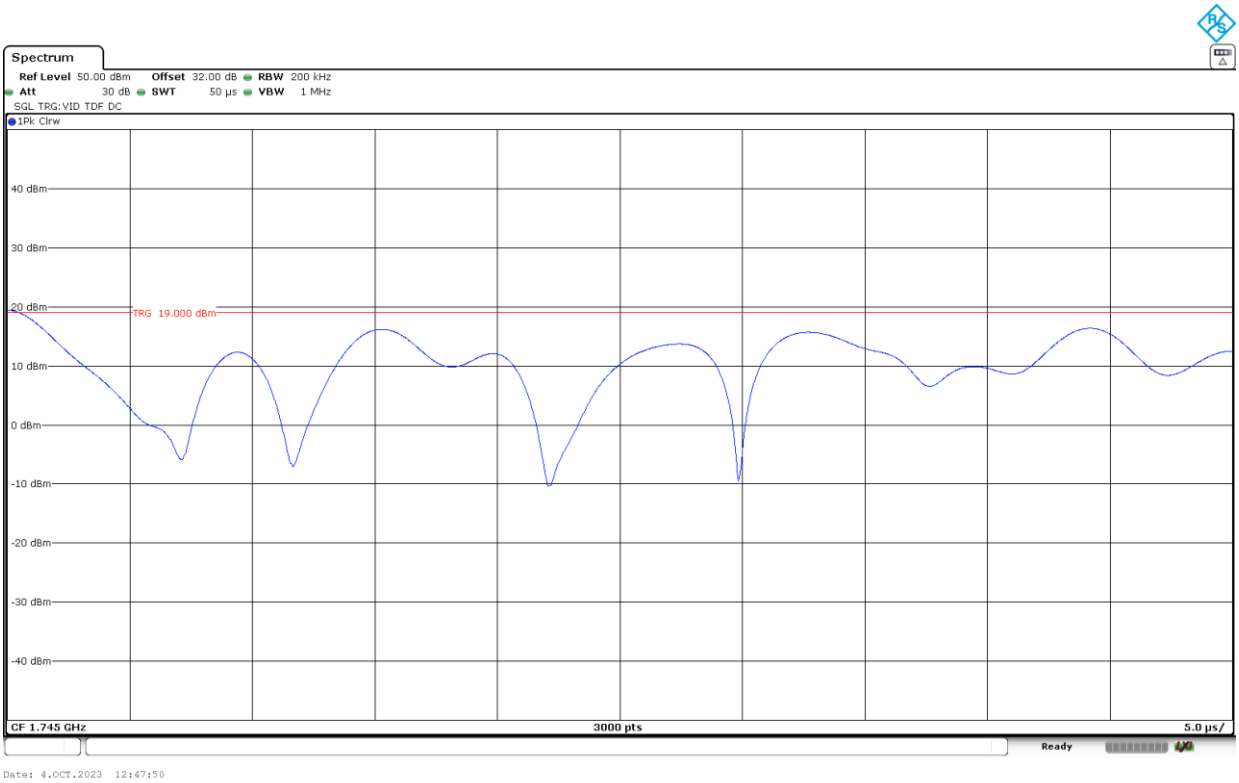


## LTE Cat 1bis Band 66:

QPSK. BW=5 MHz.




16QAM. BW=5 MHz.



# Occupied Bandwidth

***Limits***

**1. LTE Cat 1bis Bands 12, 13, 66.**

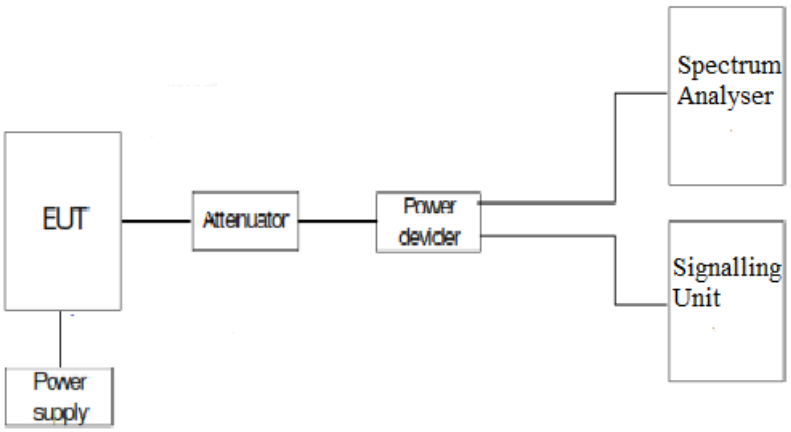
* FCC §2.1049: Measurements required: Occupied bandwidth.

* RSS-Gen 6.7: Occupied bandwidth (or 99% emission bandwidth).

***Method***

The occupied bandwidth measurement was performed at the output terminals of the EUT using an attenuator, power splitter and spectrum analyser. The EUT was controlled via the Universal Radio Communication tester R&S CMW500 selecting maximum transmission power of the EUT and different modes of modulation. The 99% occupied bandwidth and the -26 dBc bandwidth were measured directly using the built-in bandwidth measuring option of spectrum analyser.

***Test Setup***




***Results***

The worst case of occupied bandwidth corresponds to Resource Blocks (RB) Size All regardless either the Narrow Band or the Bandwidth selected.

**LTE Cat 1bis Band 12:**

LTE Cat 1bis Band 12. BW=5 MHz. QPSK. RB Size All.

| Channel | Low | Middle | High |
|---|---|---|---|
| 99% Occupied Bandwidth (MHz) | 4.573 | 4.580 | 4.583 |
| -26 dBc Bandwidth (MHz) | 5.676 | 5.738 | 5.669 |
| Measurement uncertainty (kHz) | <±3.75 | | |

LTE Cat 1bis Band 12. BW=5 MHz. 16QAM. RB Size All.

| Channel | Low | Middle | High |
|---|---|---|---|
| 99% Occupied Bandwidth (MHz) | 4.590 | 4.593 | 4.570 |
| -26 dBc Bandwidth (MHz) | 5.697 | 6.901 | 5.676 |
| Measurement uncertainty (kHz) | <±3.75 | | |

LTE Cat 1bis Band 12. BW=10 MHz. QPSK. RB Size All.

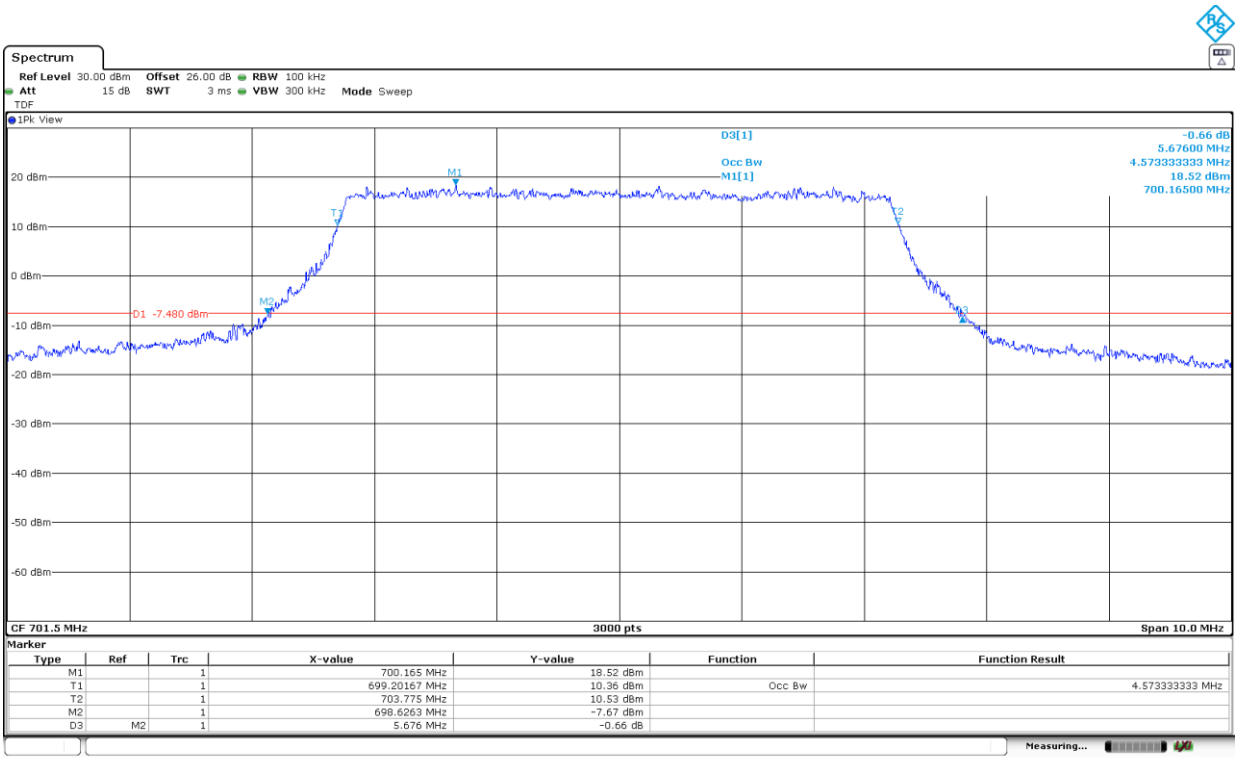
| Channel | Low | Middle | High |
|---|---|---|---|
| 99% Occupied Bandwidth (MHz) | 9.160 | 9.160 | 9.120 |
| -26 dBc Bandwidth (MHz) | 12.118 | 12.097 | 11.874 |
| Measurement uncertainty (kHz) | <±3.75 | | |

LTE Cat 1bis Band 12. BW=10 MHz. 16QAM. RB Size All.

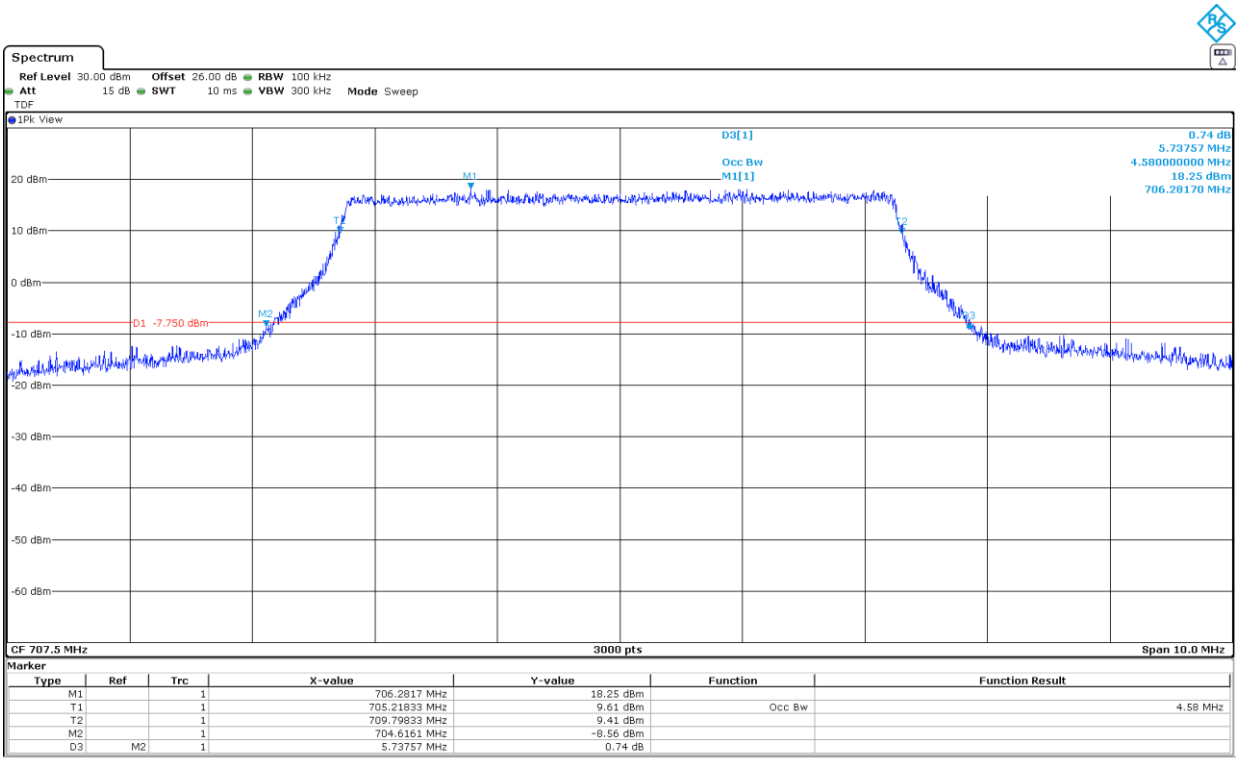
| Channel | Low | Middle | High |
|---|---|---|---|
| 99% Occupied Bandwidth (MHz) | 5.495 | 5.460 | 5.205 |
| -26 dBc Bandwidth (MHz) | 10.100 | 10.279 | 9.642 |
| Measurement uncertainty (kHz) | <±3.75 | | |

LTE Cat 1bis Band 12. BW=5 MHz. QPSK. RB Size All.

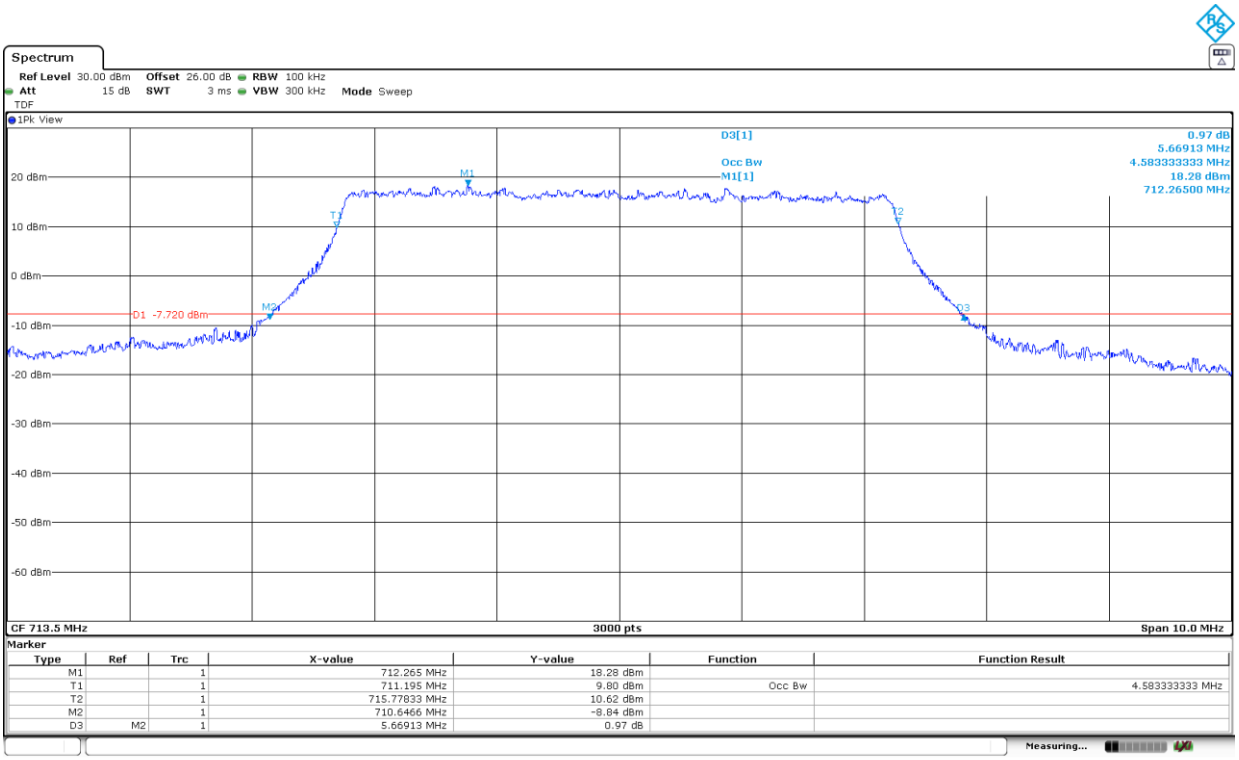
Low Channel:




Middle Channel:

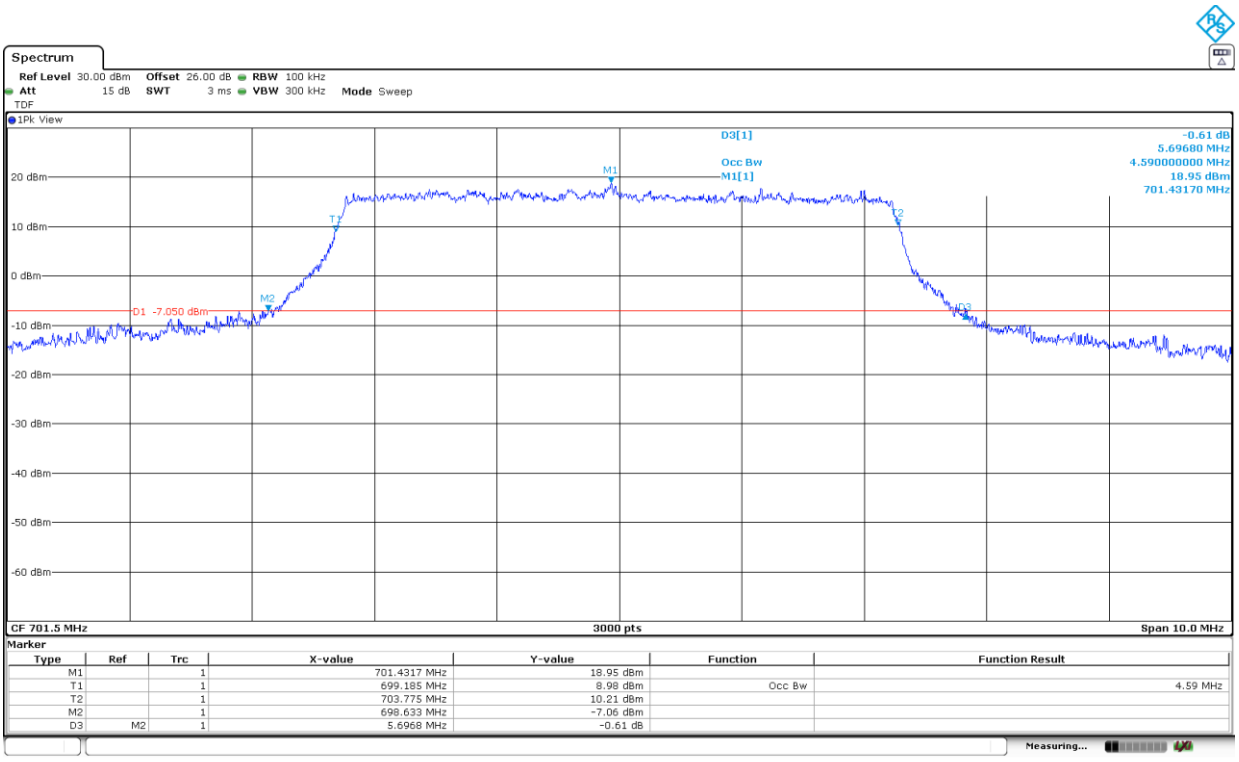


High Channel:

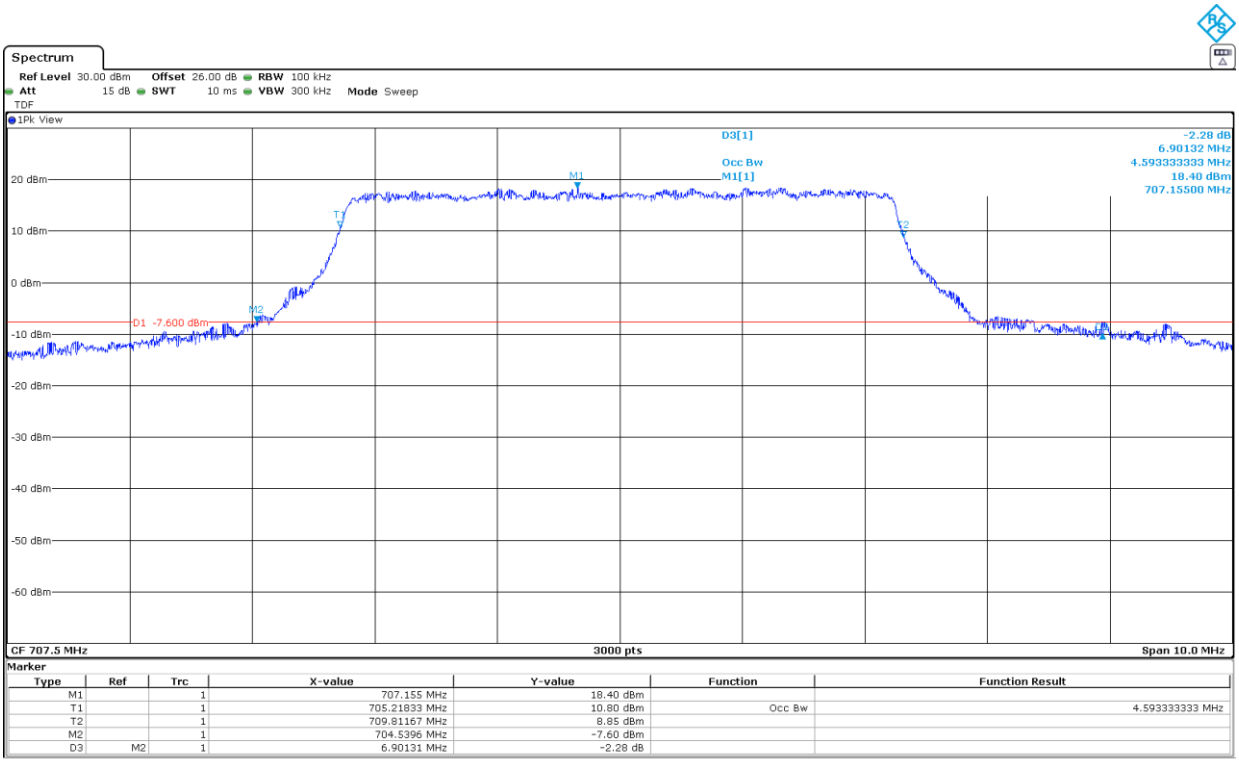


LTE Cat 1bis Band 12. BW=5 MHz. 16QAM. RB Size All.

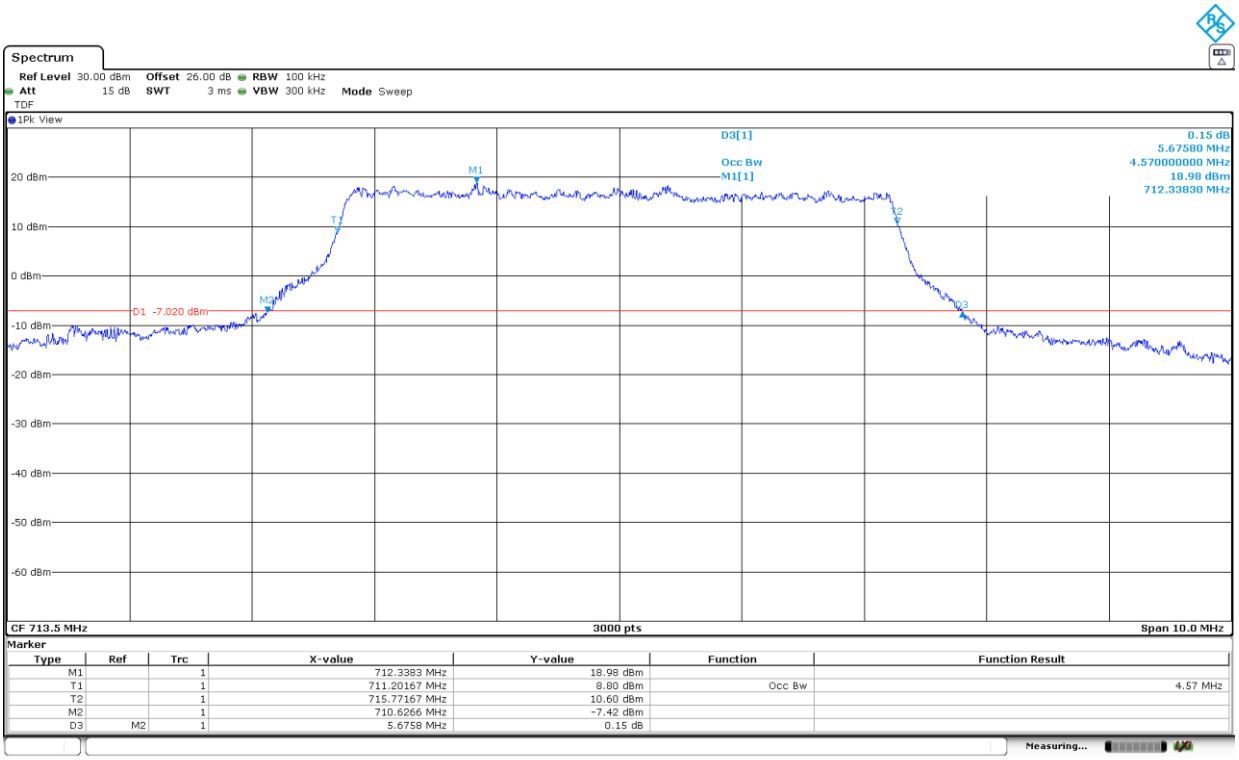
Low Channel:




Middle Channel:

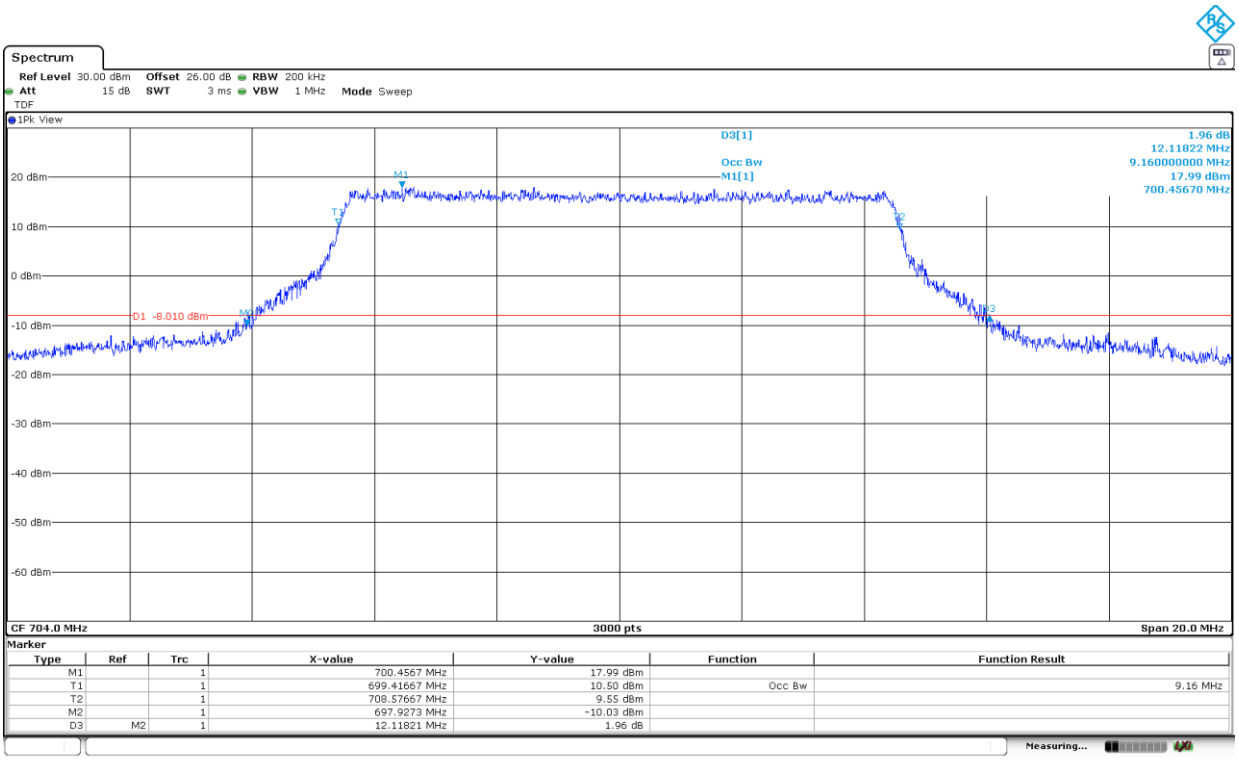


High Channel:

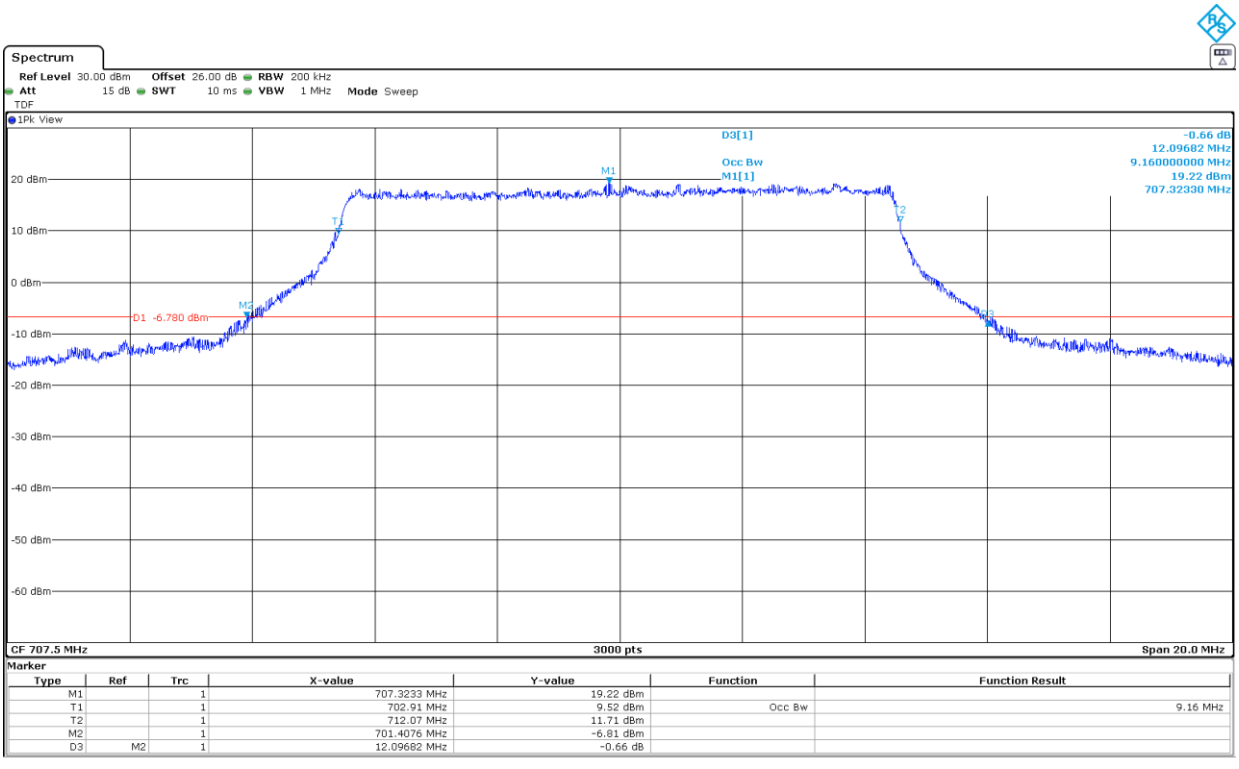


LTE Cat 1bis Band 12. BW=10 MHz. QPSK. RB Size All.

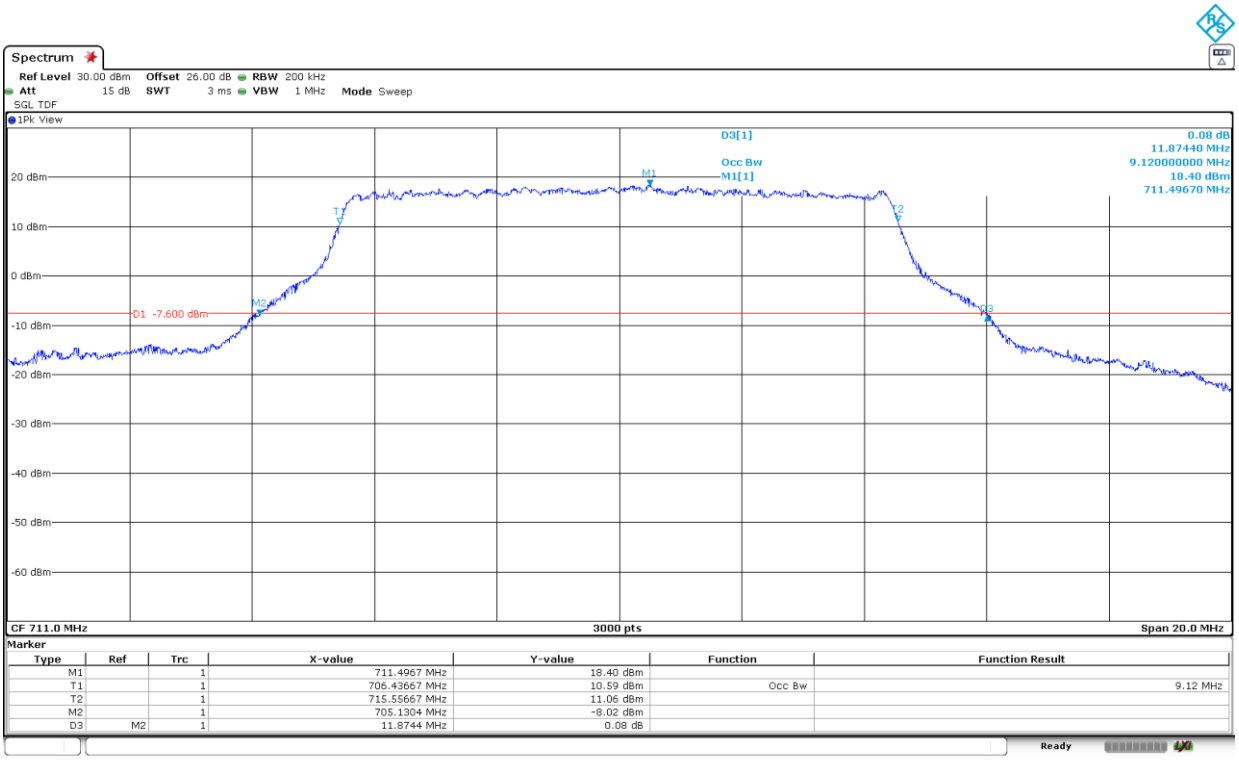
Low Channel:




Middle Channel:

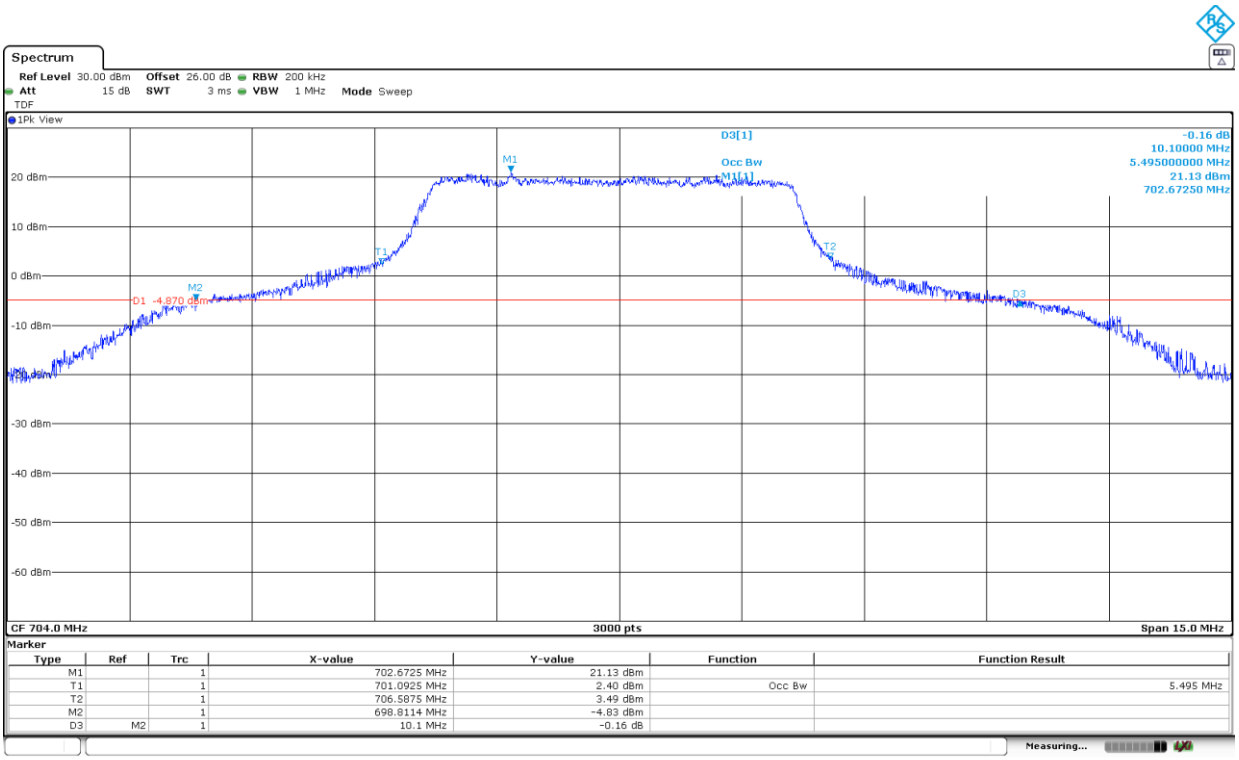


High Channel:

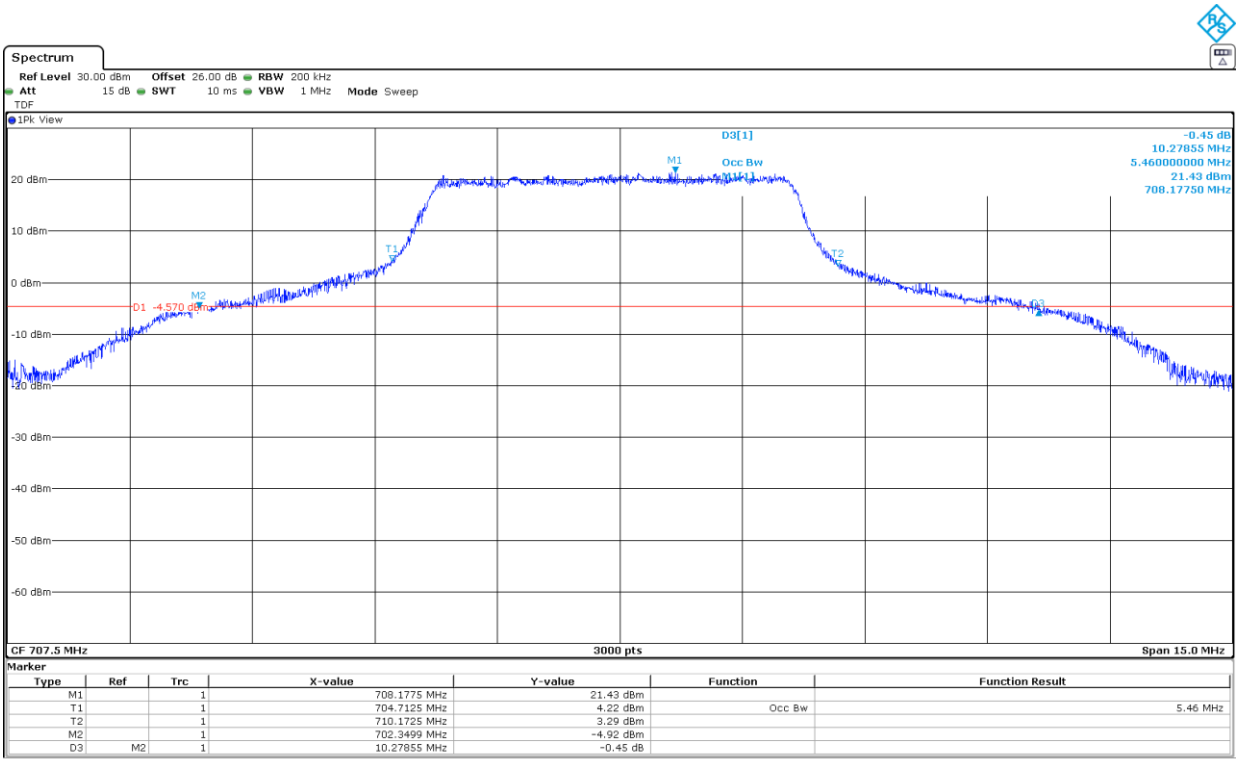


LTE Cat 1bis Band 12. BW=10 MHz. 16QAM. RB Size All.

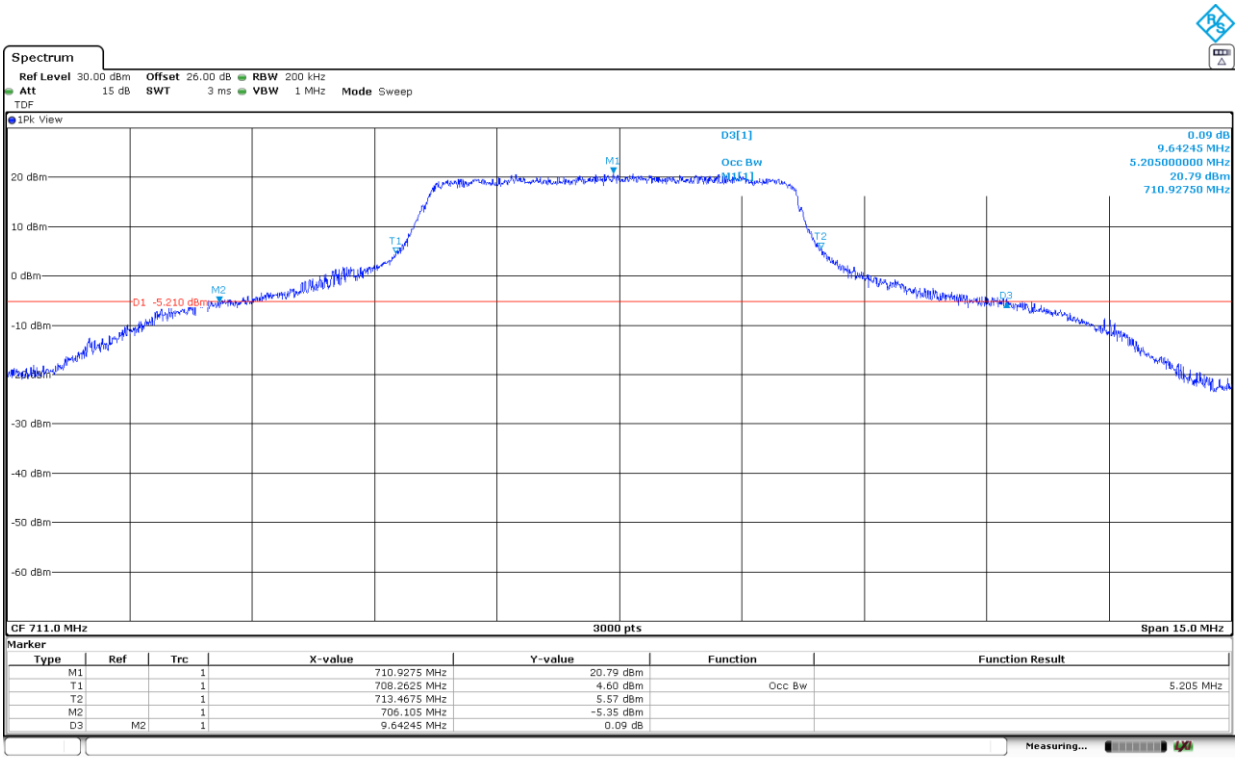
Low Channel:




Middle Channel:



High Channel:



**LTE Cat 1bis Band 13:**

LTE Cat 1bis Band 13. BW=5 MHz. QPSK. RB Size All.

| Channel | Low | High |
|---|---|---|
| 99% Occupied Bandwidth (MHz) | 4.560 | 4.570 |
| -26 dBc Bandwidth (MHz) | 5.564 | 5.663 |
| Measurement uncertainty (kHz) | <±3.75 | |

LTE Cat 1bis Band 13. BW=5 MHz. 16QAM. RB Size All.

| Channel | Low | High |
|---|---|---|
| 99% Occupied Bandwidth (MHz) | 4.540 | 4.570 |
| -26 dBc Bandwidth (MHz) | 5.581 | 5.710 |
| Measurement uncertainty (kHz) | <±3.75 | |

LTE Cat 1bis Band 13. BW=10 MHz. QPSK. RB Size All.

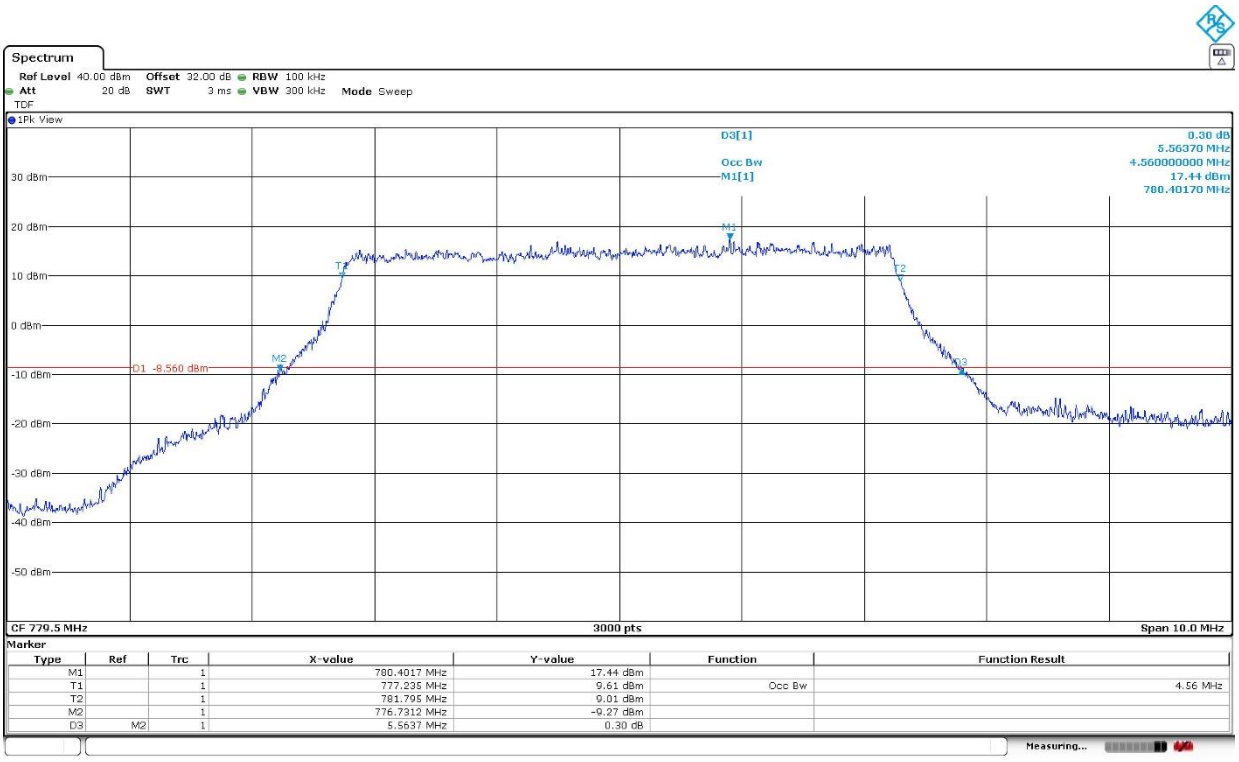
| Channel | Middle |
|---|---|
| 99% Occupied Bandwidth (MHz) | 9.240 |
| -26 dBc Bandwidth (MHz) | 11.803 |
| Measurement uncertainty (kHz) | <±3.75 |

LTE Cat 1bis Band 13. BW=10 MHz. 16QAM. RB Size All.

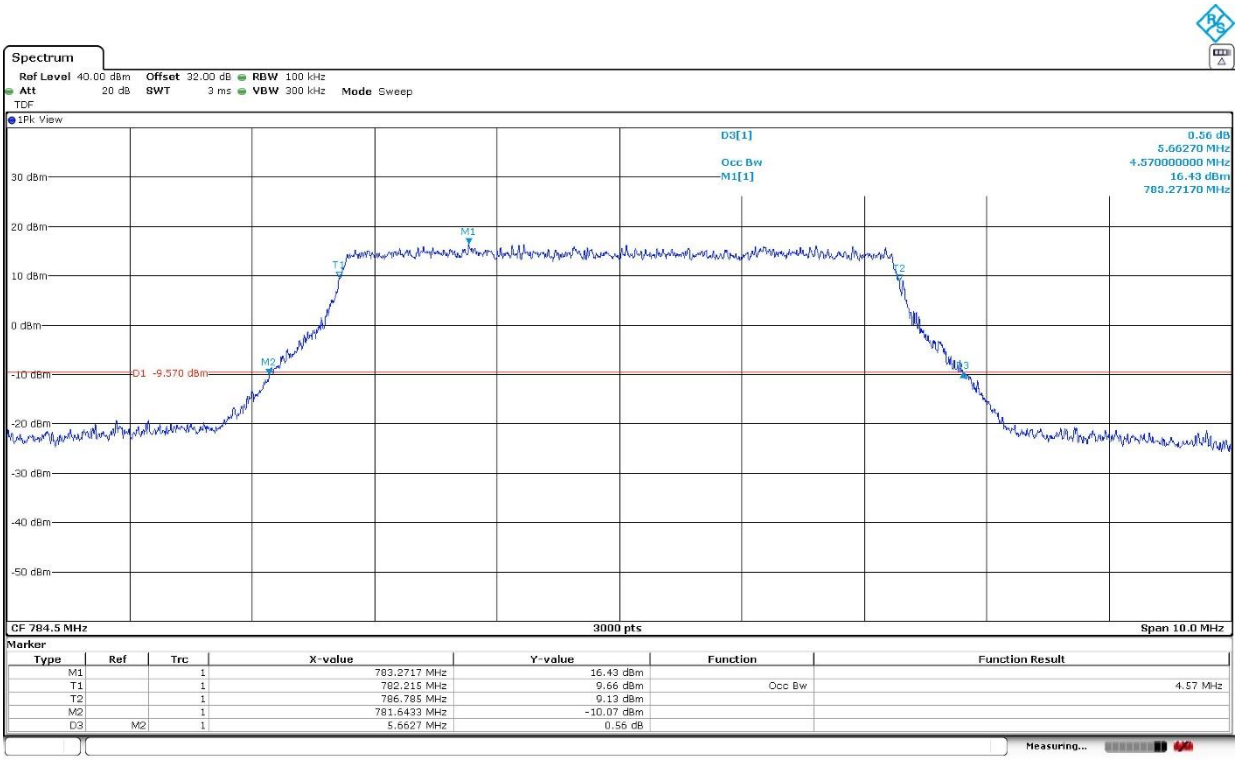
| Channel | Middle |
|---|---|
| 99% Occupied Bandwidth (MHz) | 6.047 |
| -26 dBc Bandwidth (MHz) | 10.850 |
| Measurement uncertainty (kHz) | <±3.75 |

LTE Cat 1bis Band 13. BW=5 MHz. QPSK. RB Size All.

Low Channel:

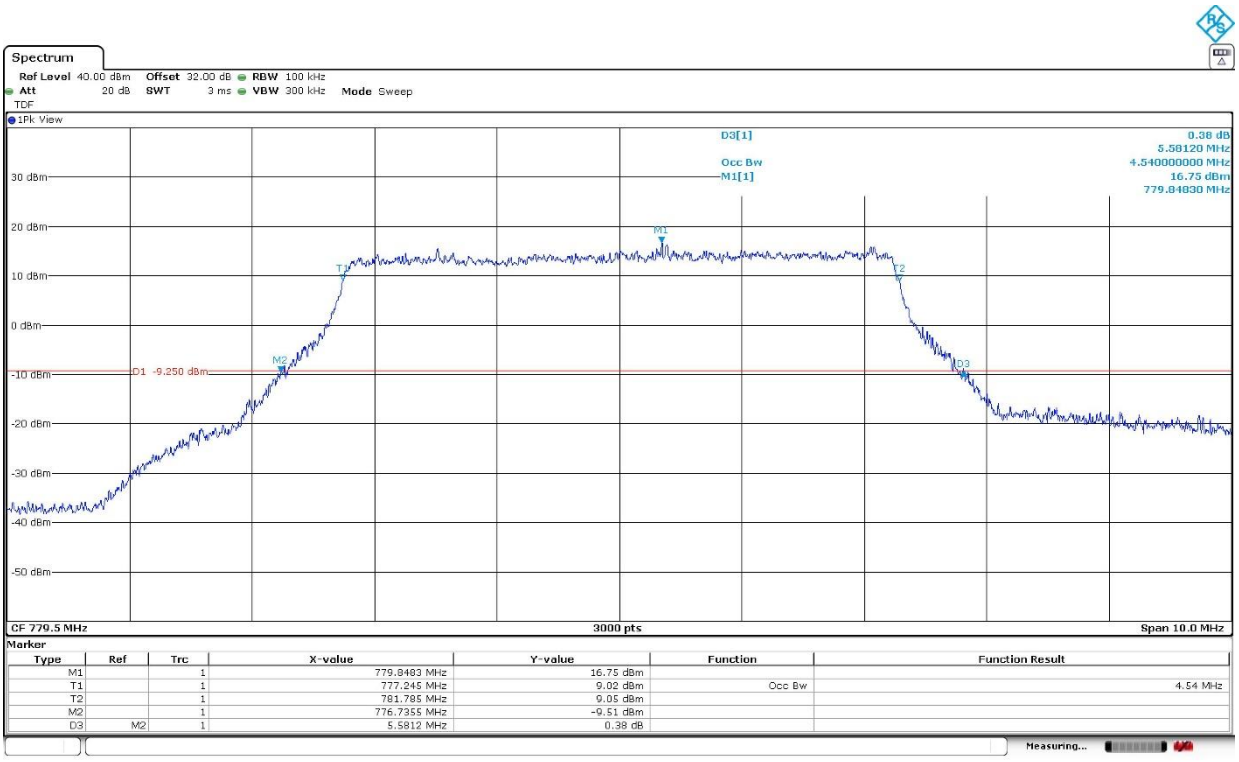



High Channel:

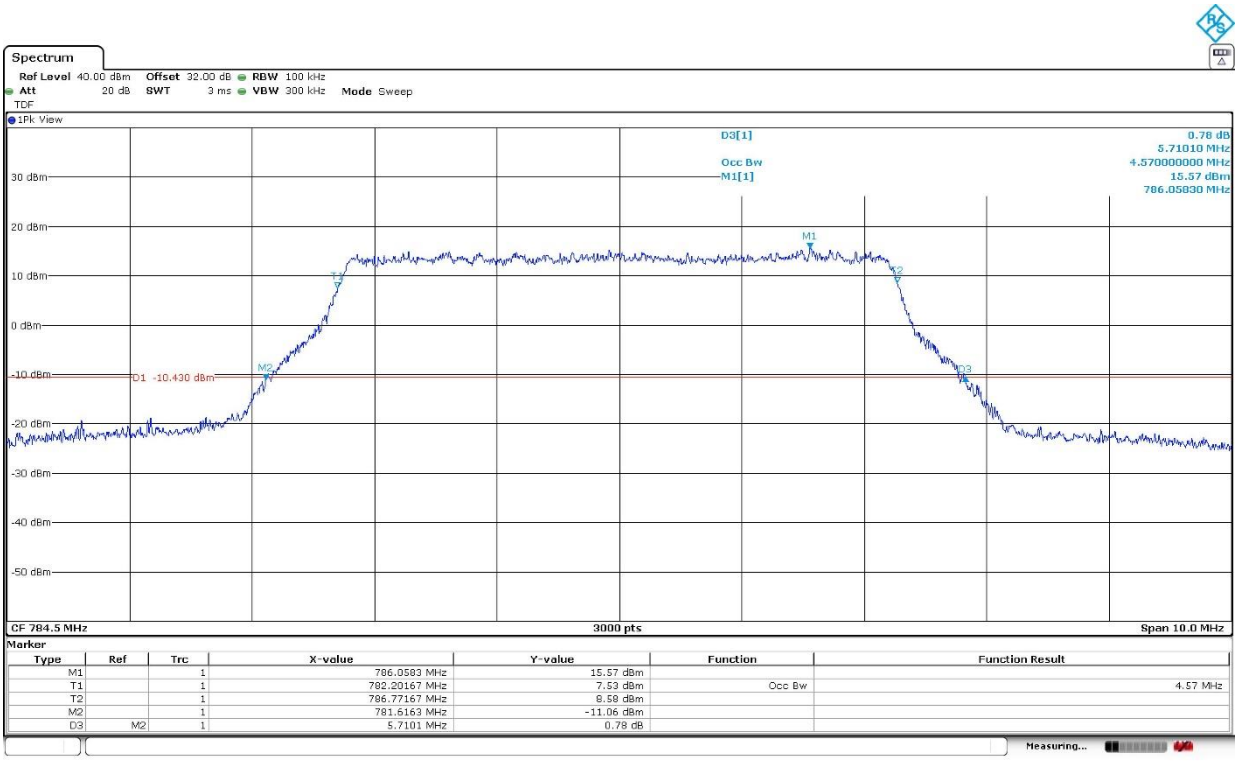


LTE Cat 1bis Band 13. BW=5 MHz. 16QAM. RB Size All.

Low Channel:

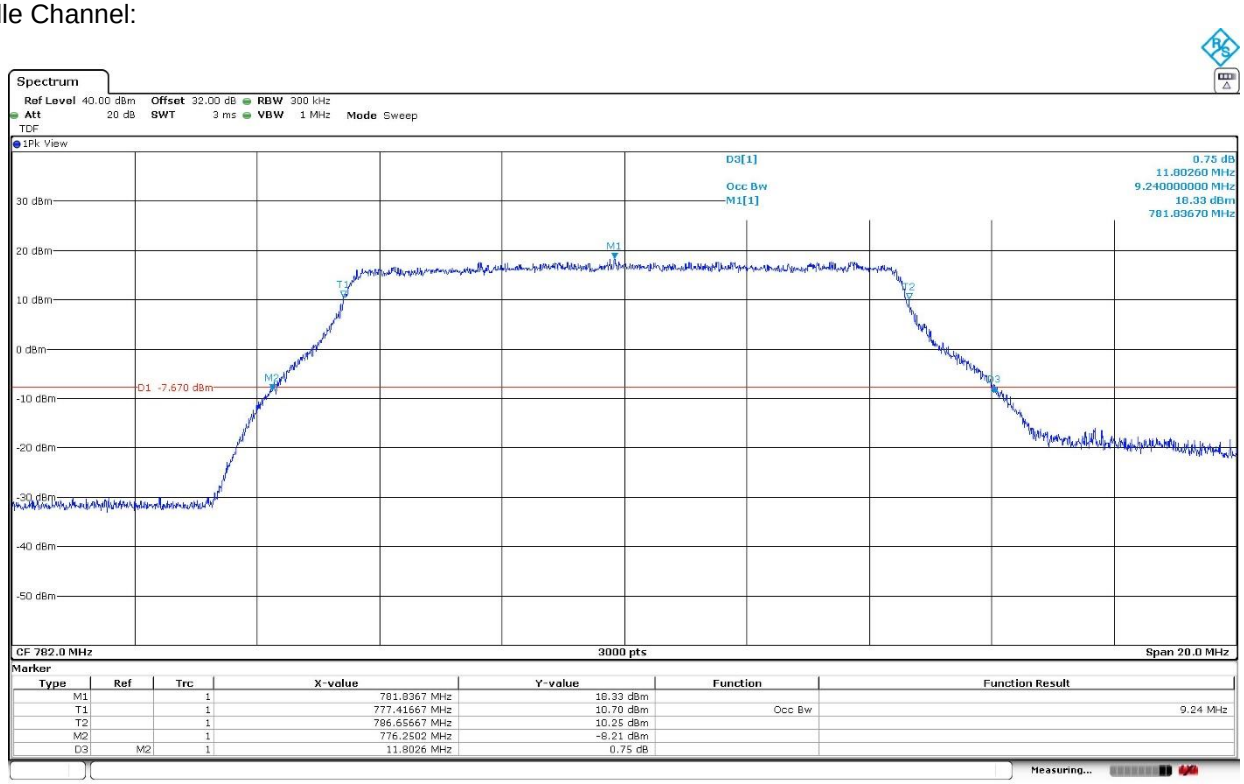



High Channel:



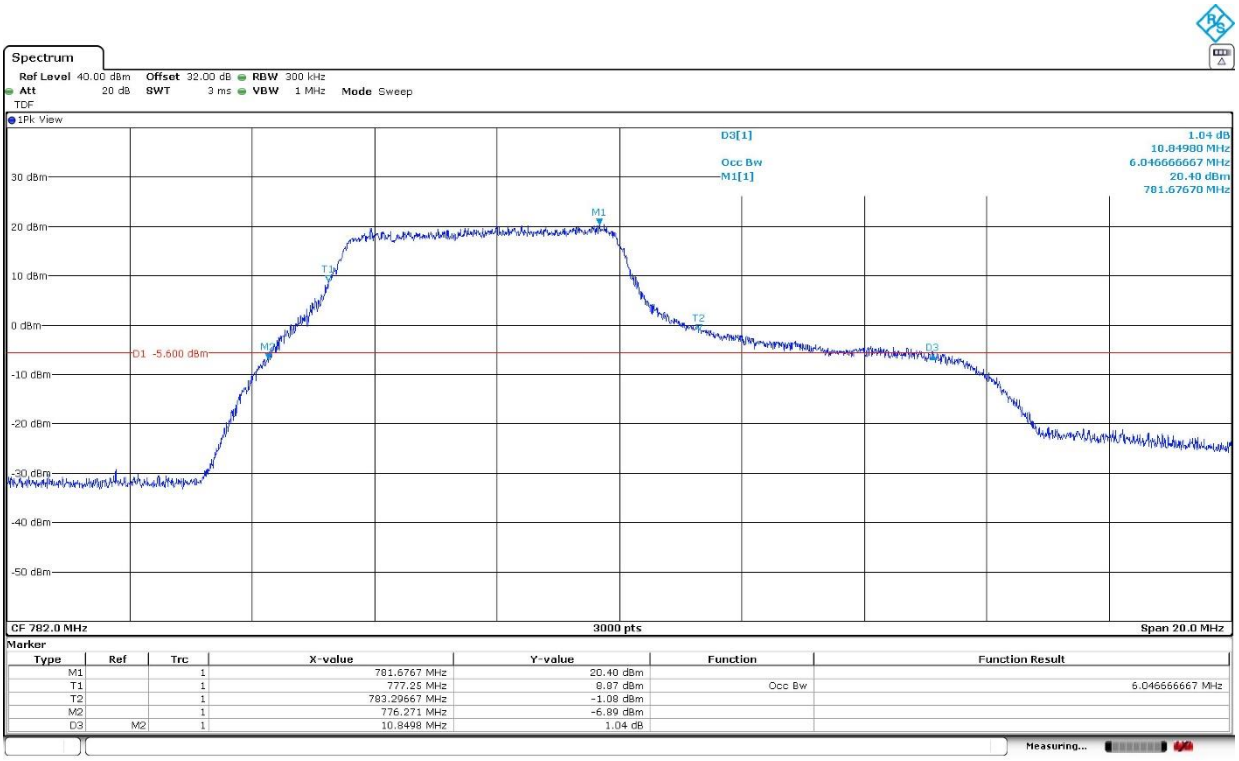
LTE Cat 1bis Band 13. BW=10 MHz. QPSK. RB Size All.

Middle Channel:




LTE Cat 1bis Band 13. BW=10 MHz. 16QAM. RB Size All.

Middle Channel:



**LTE Cat 1bis Band 66:**

LTE Cat 1bis Band 66. BW=5 MHz. QPSK. RB Size All.

| Channel | Low | Middle | High |
|---|---|---|---|
| 99% Occupied Bandwidth (MHz) | 4.590 | 4.610 | 4.600 |
| -26 dBc Bandwidth (MHz) | 5.652 | 5.779 | 5.764 |
| Measurement uncertainty (kHz) | <±3.75 | | |

LTE Cat 1bis Band 66. BW=5 MHz. 16QAM. RB Size All.

| Channel | Low | Middle | High |
|---|---|---|---|
| 99% Occupied Bandwidth (MHz) | 4.560 | 4.580 | 4.570 |
| -26 dBc Bandwidth (MHz) | 5.702 | 5.809 | 5.665 |
| Measurement uncertainty (kHz) | <±3.75 | | |

LTE Cat 1bis Band 66. BW=10 MHz. QPSK. RB Size All.

| Channel | Low | Middle | High |
|---|---|---|---|
| 99% Occupied Bandwidth (MHz) | 9.135 | 9.165 | 9.120 |
| -26 dBc Bandwidth (MHz) | 11.996 | 12.167 | 11.948 |
| Measurement uncertainty (kHz) | <±3.75 | | |

LTE Cat 1bis Band 66. BW=10 MHz. 16QAM. RB Size All.

| Channel | Low | Middle | High |
|---|---|---|---|
| 99% Occupied Bandwidth (MHz) | 5.55 | 5.55 | 5.415 |
| -26 dBc Bandwidth (MHz) | 10.552 | 10.831 | 9.713 |
| Measurement uncertainty (kHz) | <±3.75 | | |

LTE Cat 1bis Band 66. BW=15 MHz. QPSK. RB Size All.

| Channel | Low | Middle | High |
|---|---|---|---|
| 99% Occupied Bandwidth (MHz) | 13.620 | 13.650 | 13.590 |
| -26 dBc Bandwidth (MHz) | 15.971 | 16.297 | 15.939 |
| Measurement uncertainty (kHz) | <±3.75 | | |

LTE Cat 1bis Band 66. BW=15 MHz. 16QAM. RB Size All.

| Channel | Low | Middle | High |
|---|---|---|---|
| 99% Occupied Bandwidth (MHz) | 6.060 | 6.300 | 6.600 |
| -26 dBc Bandwidth (MHz) | 11.089 | 11.861 | 11.029 |
| Measurement uncertainty (kHz) | <±3.75 | | |

LTE Cat 1bis Band 66. BW=20 MHz. QPSK. RB Size All.

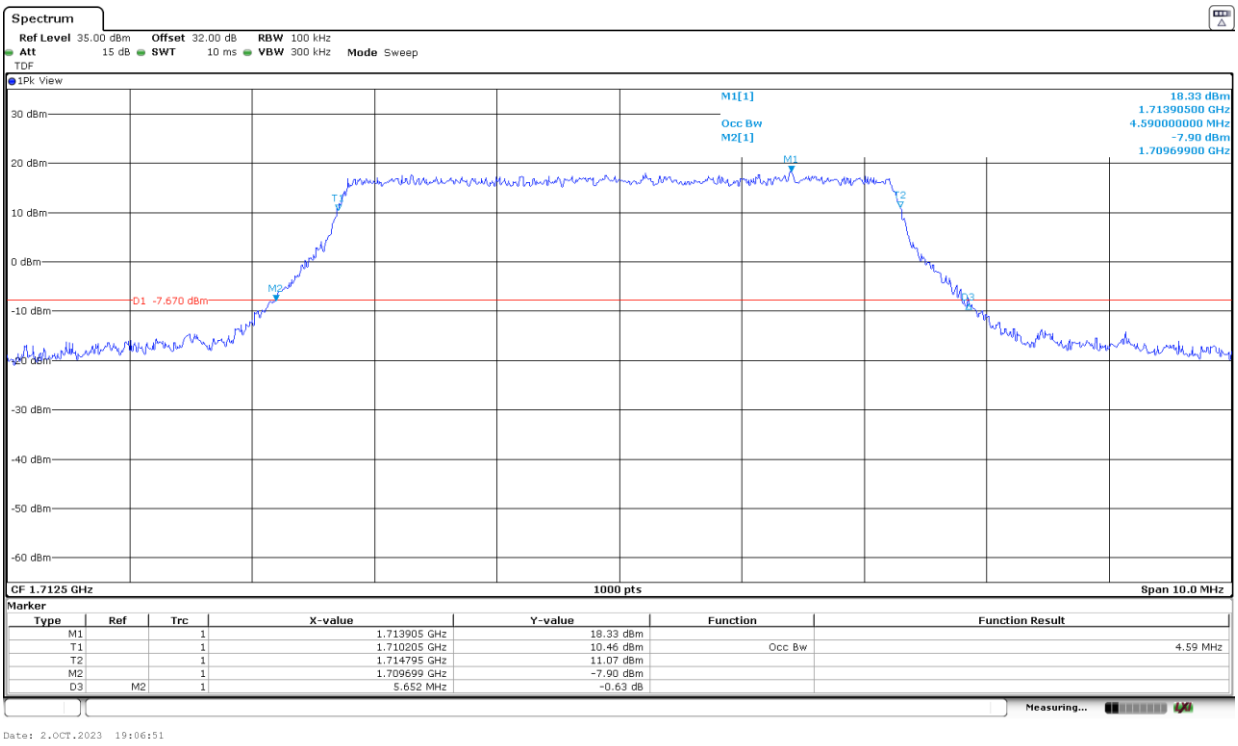
| Channel | Low | Middle | High |
|---|---|---|---|
| 99% Occupied Bandwidth (MHz) | 18.040 | 18.080 | 18.000 |
| -26 dBc Bandwidth (MHz) | 20.632 | 20.832 | 20.685 |
| Measurement uncertainty (kHz) | <±3.75 | | |

LTE Cat 1bis Band 66. BW=20 MHz. 16QAM. RB Size All.

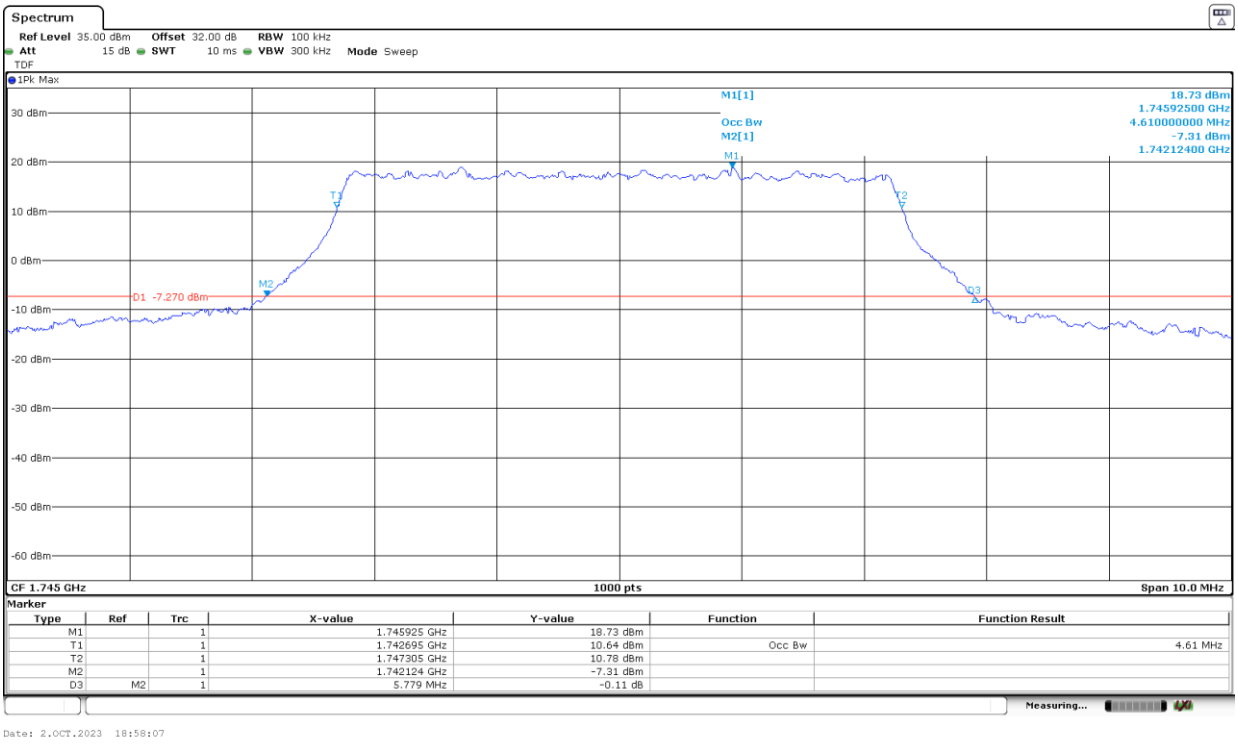
| Channel | Low | Middle | High |
|---|---|---|---|
| 99% Occupied Bandwidth (MHz) | 6.520 | 6.640 | 6.880 |
| -26 dBc Bandwidth (MHz) | 11.380 | 11.705 | 11.406 |
| Measurement uncertainty (kHz) | <±3.75 | | |

LTE Cat 1bis Band 66. BW=5 MHz. QPSK. RB Size All.

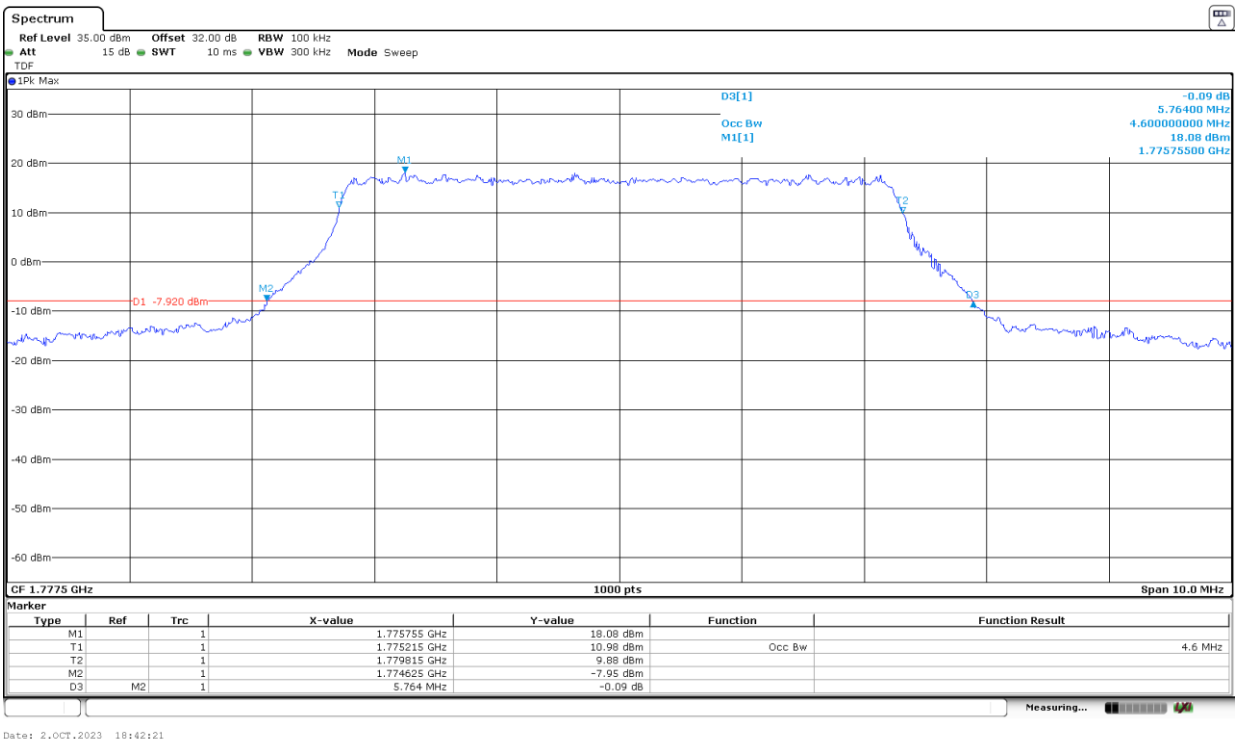
Low Channel:




Middle Channel:

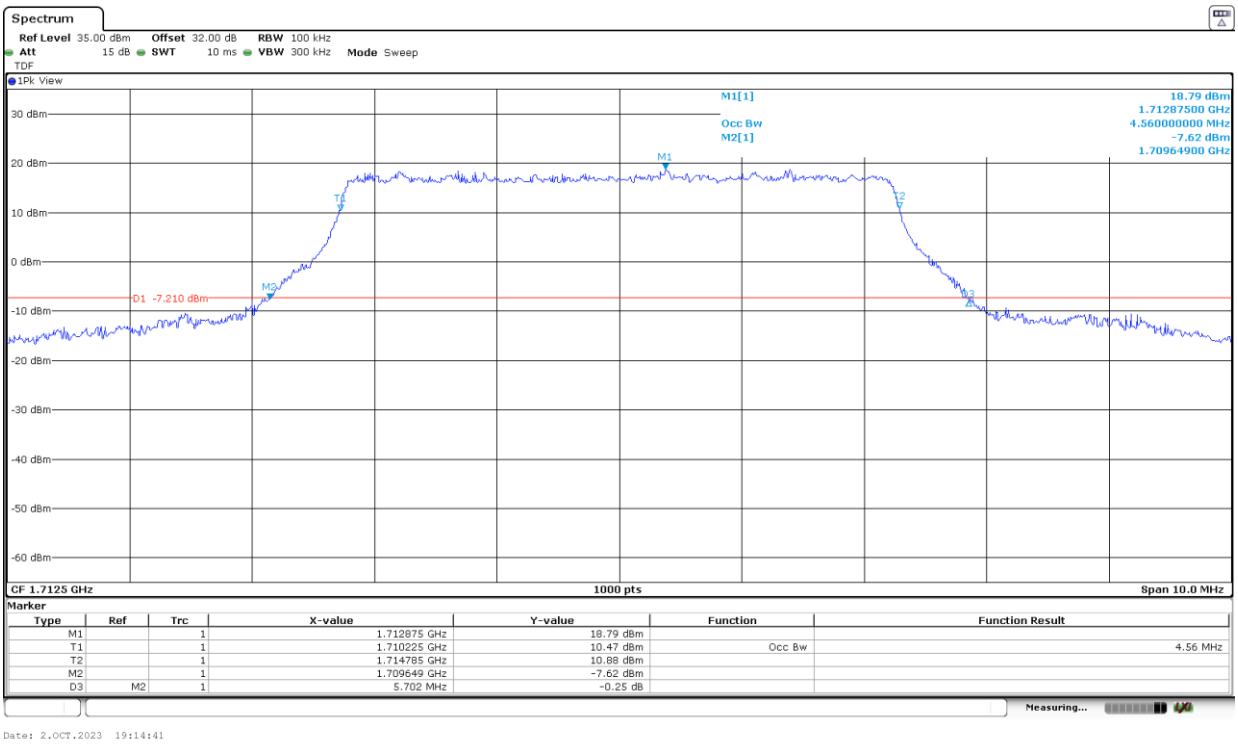


High Channel:

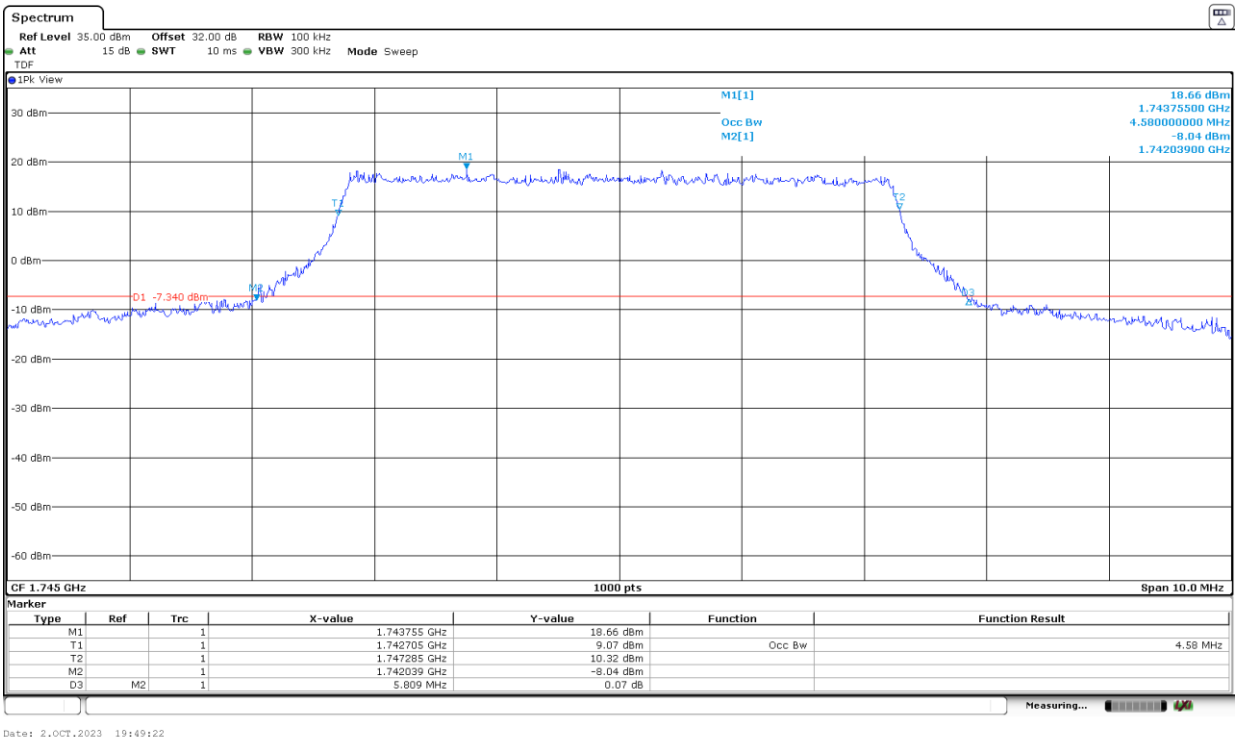


LTE Cat 1bis Band 66. BW=5 MHz. 16QAM. RB Size All.

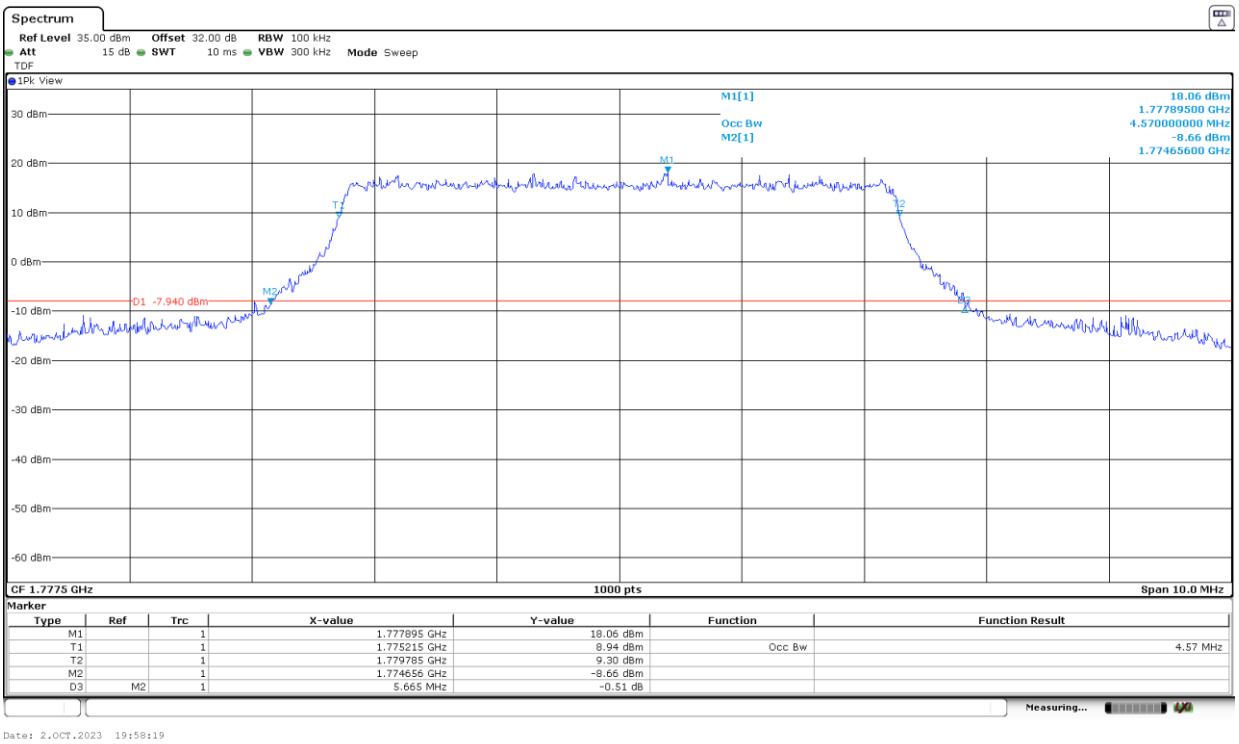
Low Channel:




Middle Channel:

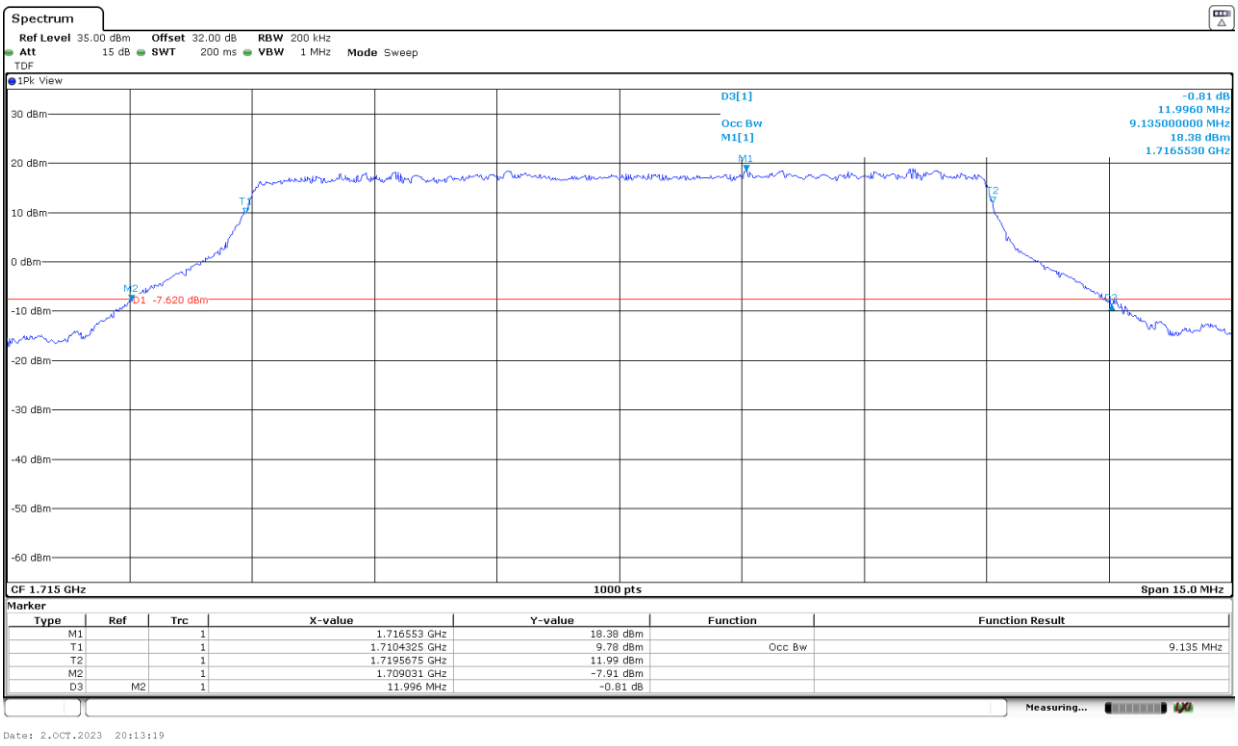


High Channel:

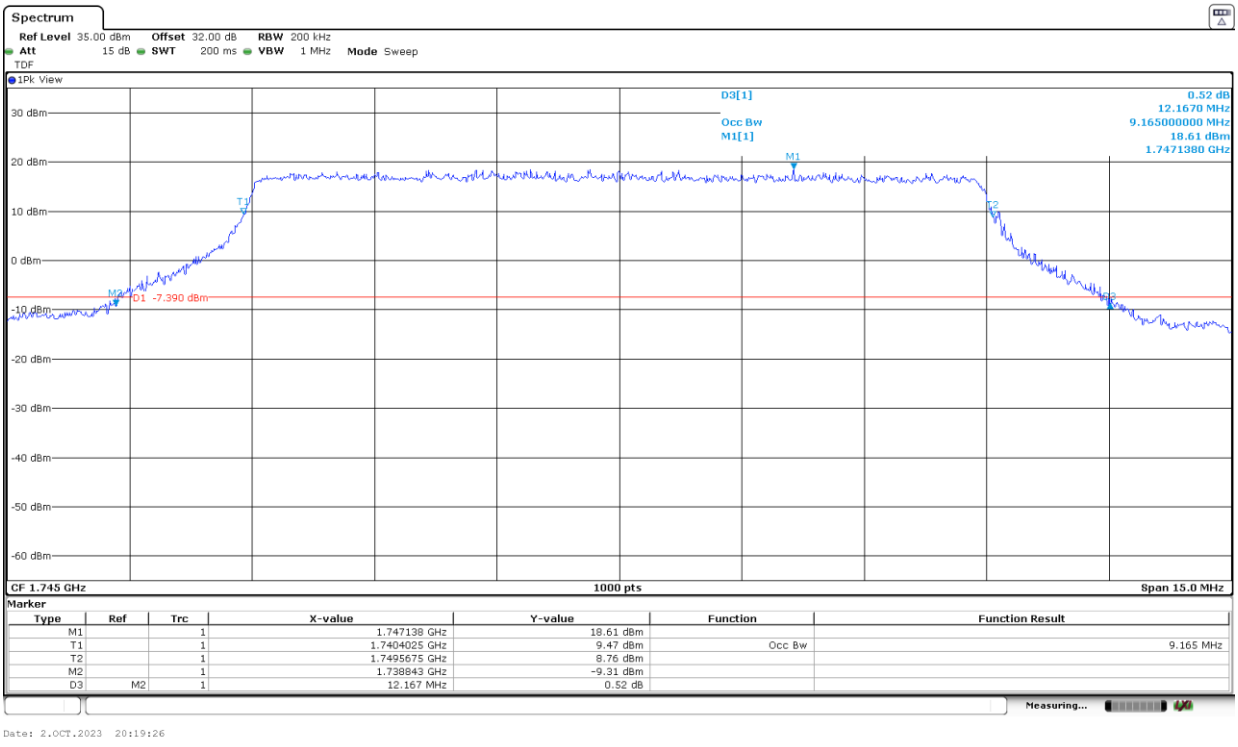


LTE Cat 1bis Band 66. BW=10 MHz. QPSK. RB Size All.

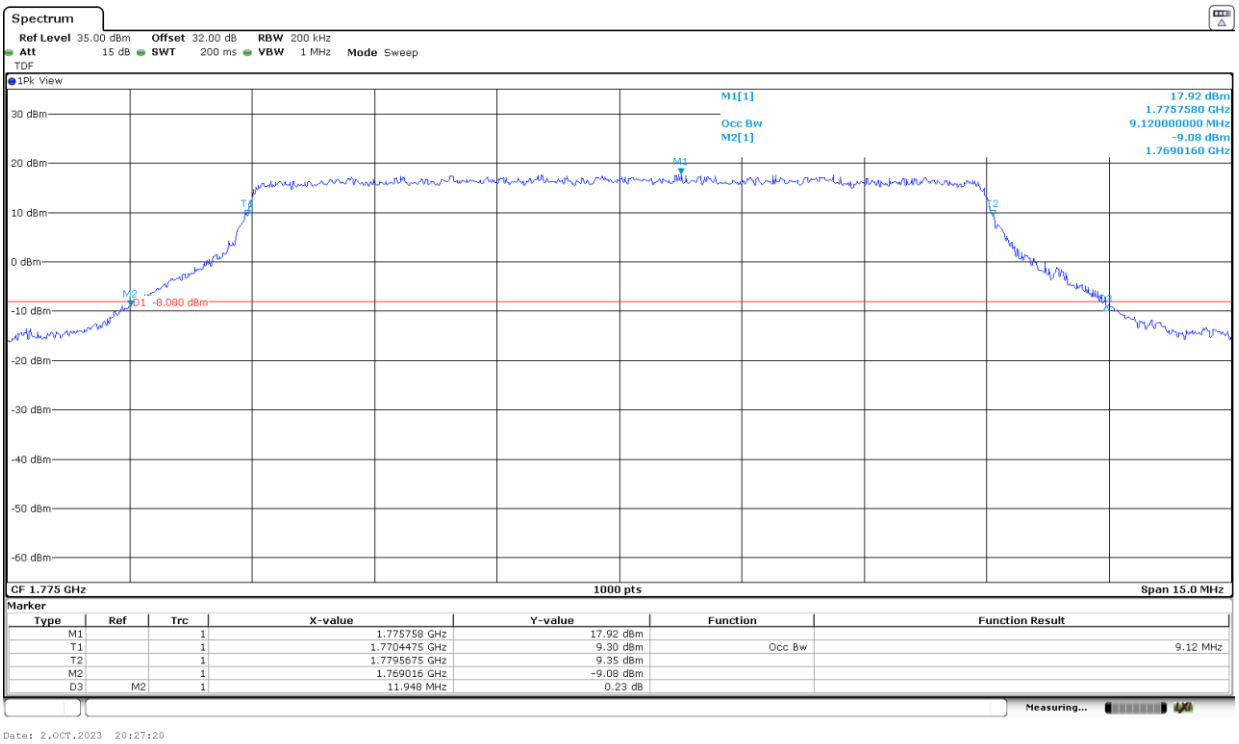
Low Channel:




Middle Channel:

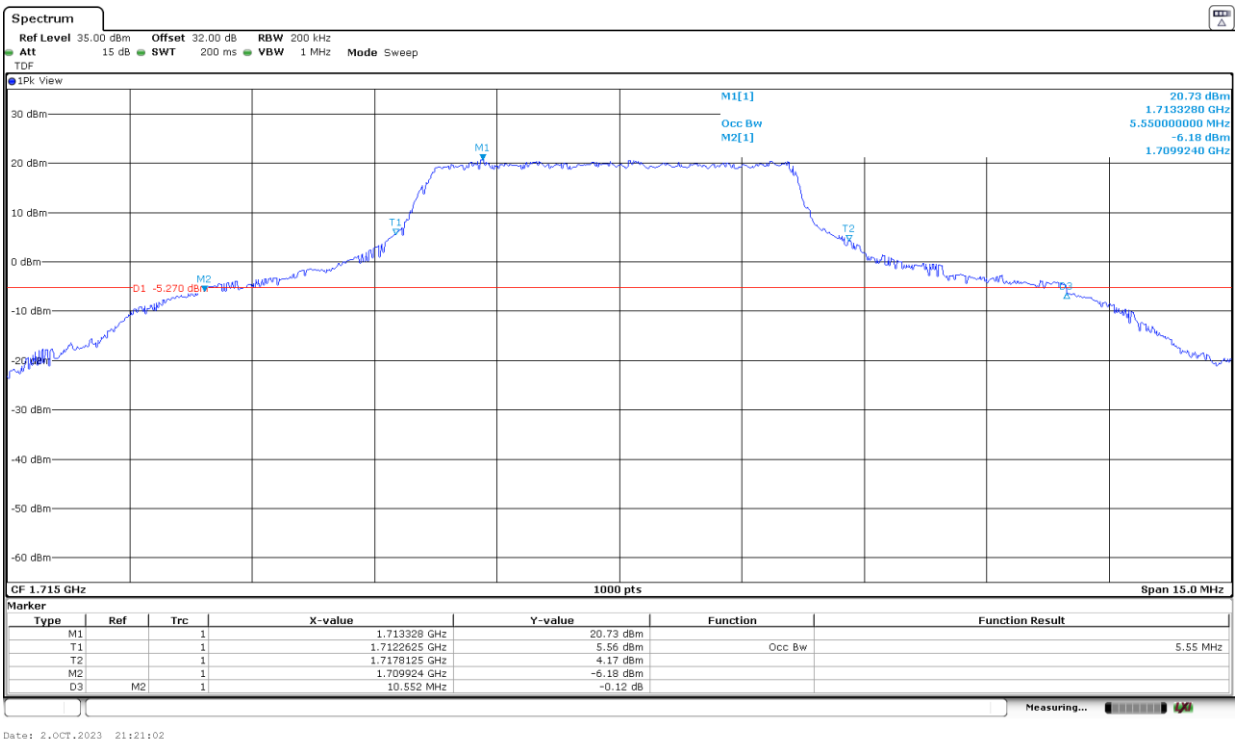


High Channel:

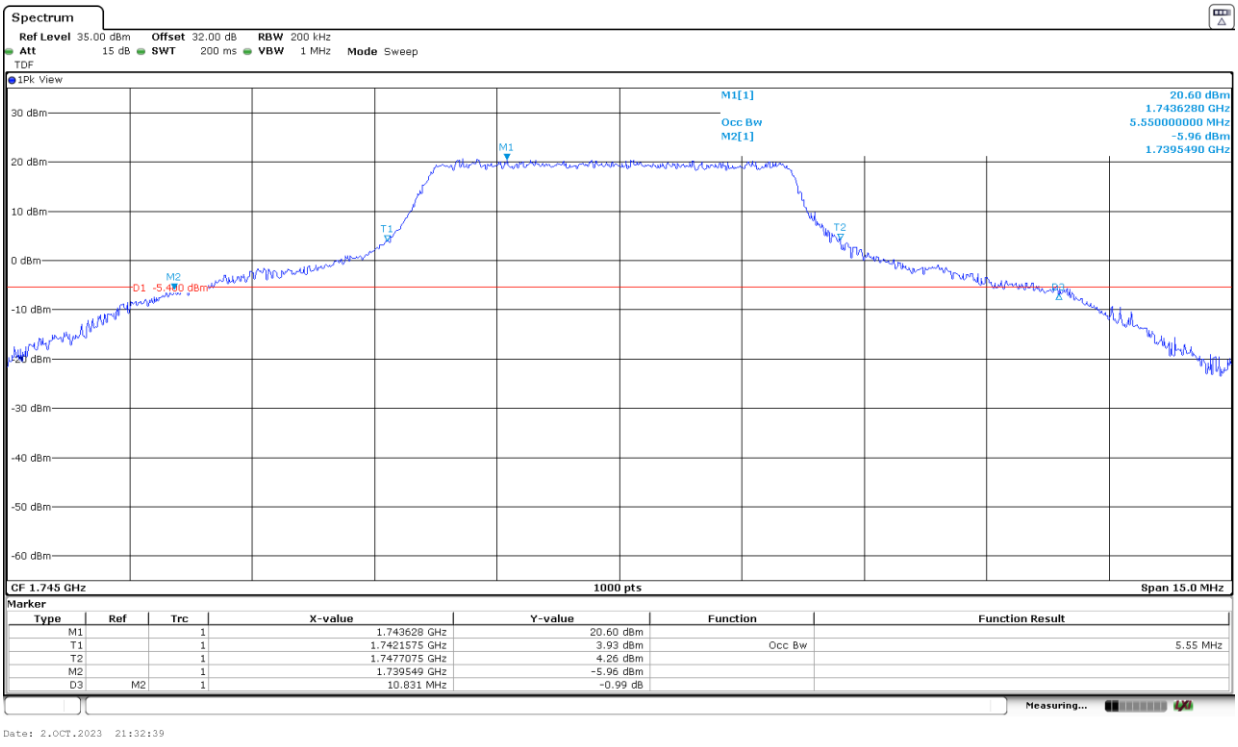


LTE Cat 1bis Band 66. BW=10 MHz. 16QAM. RB Size All.

Low Channel:




Middle Channel:



High Channel: