

**FCC LISTED, REGISTRATION  
NUMBER: 720267**

Test report No:

**IC LISTED REGISTRATION  
NUMBER IC 4621A-2**

**NIE: 50339RRF.001**

## Test report

### REFERENCE STANDARD:

#### USA FCC Part 27

#### CANADA IC RSS-139, RSS-130

|                                                 |                                                                                                                                                                                                                                                                      |
|-------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Identification of item tested.....:             | LTE MODULE                                                                                                                                                                                                                                                           |
| Trademark .....                                 | TELIT                                                                                                                                                                                                                                                                |
| Model and /or type reference.....:              | LE910-SVL                                                                                                                                                                                                                                                            |
| Other identification of the product .....       | FCC ID: RI7LE910SVL<br>IC: 5131A-LE910SVL                                                                                                                                                                                                                            |
| Final HW version .....                          | 0.0                                                                                                                                                                                                                                                                  |
| Final SW version .....                          | 20.00.032                                                                                                                                                                                                                                                            |
| Features.....                                   | ---                                                                                                                                                                                                                                                                  |
| Manufacturer.....                               | TELIT COMMUNICATIONS SPA<br>Viale Stazione di Prosecco 5/B, 34010 Sgonico (TS). ITALY                                                                                                                                                                                |
| Test method requested, standard.....:           | USA FCC Part 27 10-1-15 Edition.<br>CANADA IC RSS-139 Issue 3, Jul. 2015.<br>CANADA IC RSS-130 Issue 1, Oct. 2013.<br>Measurement Guidance 971168 D01 v02r02 for certification of<br>Licensed Digital Transmitters.<br>ANSI/TIA-603-D (2010).<br>ANSI C63.26 (2015). |
| Summary .....                                   | IN COMPLIANCE                                                                                                                                                                                                                                                        |
| Approved by (name / position & signature) ..... | A. Llamas<br>RF Lab. Manager                                                                                                                                                                                                                                         |
| Date of issue .....                             | 2016-10-03                                                                                                                                                                                                                                                           |
| Report template No.....                         | FDT08_18                                                                                                                                                                                                                                                             |

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## Competences and guarantees

AT4 wireless is a laboratory with a measurement facility in compliance with the requirements of Section 2.948 of the FCC rules and has been added to the list of facilities whose measurements data will be accepted in conjunction with applications for Certification under Parts 15 or 18 of the Commission's Rules. Registration Number: 720267.

AT4 wireless is a laboratory with a measurement site in compliance with the requirements of RSS 212, Issue 1 (Provisional) and has been added to the list of filed sites of the Canadian Certification and Engineering Bureau. Reference File Number: IC 4621A-2.

In order to assure the traceability to other national and international laboratories, AT4 wireless has a calibration and maintenance program for its measurement equipment.

AT4 wireless guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated on the report and, it is based on the knowledge and technical facilities available at AT4 wireless at the time of performance of the test.

AT4 wireless is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

The results presented in this Test Report apply only to the particular item under test established in this document.

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## General conditions

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or competent Authorities.
3. This document is only valid if complete; no partial reproduction can be made without previous written permission of AT4 wireless.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of AT4 wireless and the Accreditation Bodies.

## Uncertainty

Uncertainty (factor  $k=2$ ) was calculated according to the AT4 wireless internal document PODT000.

## Usage of samples

Samples undergoing test have been selected by: **the client**.

Sample S/01 is composed of the following elements:

| Control N° | Description | Model     | Serial N°         | Date of reception |
|------------|-------------|-----------|-------------------|-------------------|
| 50339/001  | LTE module  | LE910-SVL | IMEI: 35365007999 | 2016-07-13        |
| 46047B/14  | Antenna     | ---       | ---               | 2015-05-12        |
| 46047B/18  | Antenna     | ---       | ---               | 2015-05-12        |

1. Sample S/01 has undergone the test(s).  
All radiated tests indicated in appendix A.

Sample S/02 is composed of the following elements:

| Control N° | Description | Model     | Serial N°         | Date of reception |
|------------|-------------|-----------|-------------------|-------------------|
| 50339/001  | LTE module  | LE910-SVL | IMEI: 35365007999 | 2016-07-13        |

1. Sample S/02 has undergone the test(s).  
All conducted tests indicated in appendix A.

## Test sample description

The test sample consists of a wireless LTE Module.

## Identification of the client

TELIT COMMUNICATIONS SPA

Viale Stazione di Prosecco 5/B, 34010 Sgonico (TS). ITALY

## Testing period

The performed test started on 2016-07-13 and finished on 2016-08-01.

The tests have been performed at AT4 wireless.

## Environmental conditions

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

|                               |                              |
|-------------------------------|------------------------------|
| Temperature                   | Min. = 15 °C<br>Max. = 35 °C |
| Relative humidity             | Min. = 20 %<br>Max. = 75 %   |
| Shielding effectiveness       | > 100 dB                     |
| Electric insulation           | > 10 kΩ                      |
| Reference resistance to earth | < 1 Ω                        |

In the semianechoic chamber the following limits were not exceeded during the test.

|                                      |                                                                                             |
|--------------------------------------|---------------------------------------------------------------------------------------------|
| <b>Temperature</b>                   | Min. = 15 °C<br>Max. = 35 °C                                                                |
| <b>Relative humidity</b>             | Min. = 20 %<br>Max. = 75 %                                                                  |
| <b>Air pressure</b>                  | Min. = 860 mbar<br>Max. = 1060 mbar                                                         |
| <b>Shielding effectiveness</b>       | > 100 dB                                                                                    |
| <b>Electric insulation</b>           | > 10 kΩ                                                                                     |
| <b>Reference resistance to earth</b> | < 1 Ω                                                                                       |
| <b>Normal site attenuation (NSA)</b> | < ±4 dB at 10 m distance between item under test and receiver antenna, (30 MHz to 1000 MHz) |
| <b>Field homogeneity</b>             | More than 75% of illuminated surface is between 0 and 6 dB (26 MHz to 1000 MHz).            |

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

|                                      |                                     |
|--------------------------------------|-------------------------------------|
| <b>Temperature</b>                   | Min. = 15 °C<br>Max. = 35 °C        |
| <b>Relative humidity</b>             | Min. = 20 %<br>Max. = 75 %          |
| <b>Air pressure</b>                  | Min. = 860 mbar<br>Max. = 1060 mbar |
| <b>Shielding effectiveness</b>       | > 100 dB                            |
| <b>Electric insulation</b>           | > 10 kΩ                             |
| <b>Reference resistance to earth</b> | < 1 Ω                               |

## Remarks and comments

1: Used instrumentation.

### Conducted Measurements

|    |                                                 | Last Cal. date | Cal. due date |
|----|-------------------------------------------------|----------------|---------------|
| 1. | Spectrum analyser Agilent PSA E4440A            | 2015/10        | 2017/10       |
| 2. | Spectrum analyser Rohde & Schwarz FSW50         | 2015/12        | 2017/12       |
| 3. | Vector signal analyzer Rohde & Schwarz FSQ8     | 2016/06        | 2018/06       |
| 4. | Climatic chamber HERAEUS VM 07/100              | 2016/03        | 2018/03       |
| 5. | DC power supply R&S NGPE 40/40                  | 2014/11        | 2017/11       |
| 6. | Universal Radio communication Tester R&S CMW500 | 2014/07        | 2017/07       |

## Radiated Measurements

|     |                                                                  | Last Cal. date | Cal. due date |
|-----|------------------------------------------------------------------|----------------|---------------|
| 1.  | Semianechoic Absorber Lined Chamber ETS FACT3 200STP             | N.A.           | N.A.          |
| 2.  | BiconicalLog antenna ETS LINDGREN 3142E                          | 2014/03        | 2017/03       |
| 3.  | Multi Device Controller EMCO 2090                                | N.A.           | N.A.          |
| 4.  | Double-ridge Guide Horn antenna 1-18 GHz SCHWARZBECK BBHA 9120 D | 2013/11        | 2016/11       |
| 5.  | Horn antenna 0.8-18 GHz Rohde & Schwarz R&S HF907 (Link antenna) | N.A.           | N.A.          |
| 6.  | EMI Test Receiver Rohde & Schwarz ESU 40                         | 2016/03        | 2018/03       |
| 7.  | Spectrum analyser Rohde & Schwarz FSW50                          | 2015/12        | 2017/12       |
| 8.  | RF pre-amplifier 10 MHz-6 GHz SCHWARZBECK BBV9743                | 2016/04        | 2017/04       |
| 9.  | RF pre-amplifier 1-18 GHz Bonn Elektronik BLMA 0118-1M           | 2016/02        | 2018/02       |
| 10. | Universal Radio communication Tester R&S CMW500                  | 2014/07        | 2017/07       |

## Testing verdicts

|                             |     |
|-----------------------------|-----|
| <b>Not applicable</b> ..... | N/A |
| <b>Pass</b> .....           | P   |
| <b>Fail</b> .....           | F   |
| <b>Not measured</b> .....   | N/M |

| FCC PART 27/IC RSS-139/IC RSS-130/ PARAGRAPH                                                      | VERDICT |   |   |    |
|---------------------------------------------------------------------------------------------------|---------|---|---|----|
|                                                                                                   | NA      | P | F | NM |
| Clause 27.50 / RSS-139 Clause 6.5. / RSS-130 Clause 4.4.: RF output power                         |         | P |   |    |
| Clause 2.1047 / RSS-139 Clause 6.2. / RSS-130 Clause 4.1.: Modulation characteristics             |         | P |   |    |
| Clause 27.54 / RSS-139 Clause 6.4. / RSS-130 Clause 4.3.: Frequency stability                     |         | P |   |    |
| Clause 2.1049: Occupied Bandwidth                                                                 |         | P |   |    |
| Clause 27.53 / RSS-139 Clause 6.6. / RSS-130 Clause 4.6.: Spurious emissions at antenna terminals |         | P |   |    |
| Clause 27.53 / RSS-139 Clause 6.6. / RSS-130 Clause 4.6.: Radiated emissions                      |         | P |   |    |

## Appendix A – Test result for FCC Part 27/IC RSS-139/IC RSS-130

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## TEST RESULTS FOR FCC PART 27 AND IC RSS-139/RSS-130

### TEST CONDITIONS

Power supply (V):

$$V_{\text{nom}} = 3.80 \text{ Vdc}$$

$$V_{\text{max}} = 4.37 \text{ Vdc}$$

$$V_{\text{min}} = 3.23 \text{ Vdc}$$

The subscripts nom, min and max indicate voltage test conditions (nominal, minimum and maximum respectively)

Type of power supply = DC Voltage from external power supply.

Type of antenna = External connectable antenna

### TEST FREQUENCIES:

LTE. QPSK AND 16QAM MODULATION (BAND IV)

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

LTE. QPSK AND 16QAM MODULATION (BAND XIII)

|         | Channel (Frequency, MHz) |               |
|---------|--------------------------|---------------|
|         | BW = 5 MHz               | BW = 10 MHz   |
| Lowest  | 23205 (779.5)            | N/A           |
| Middle  | 23230 (782.0)            | 23230 (782.0) |
| Highest | 23255 (784.5)            | N/A           |

## RF Output Power (conducted and E.I.R.P.)

### SPECIFICATION

FCC §2.1046 and §27.50. RSS-139 Clause 6.5.

Fixed, mobile, and portable (hand-held) stations operating in the 1710-1755 MHz band are limited to 1 watt EIRP (30 dBm). 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.

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

Control stations and mobile stations transmitting in the 746-757 MHz, 776-788 MHz, and 805-806 MHz bands and fixed stations transmitting in the 787-788 MHz and 805-806 MHz bands are limited to 30 watts ERP (44.77 dBm).

RSS-130 Clause 4.4.

The e.i.r.p. shall not exceed 50 watts (46.99 dBm) for mobile equipment or for outdoor fixed subscriber equipment nor shall it exceed 5 watts (36.99 dBm) for portable equipment or for indoor fixed subscriber equipment.

The peak-to-average power ratio (PAPR) of the transmission shall not exceed 13 dB.

### 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 R&S CMW500, selecting maximum transmission power of the EUT and different modes of modulation.

The maximum effective radiated power e.r.p. or the equivalent isotropically radiated power e.i.r.p. are calculated by adding the declared maximum antenna gain (dBd or dBi respectively).

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

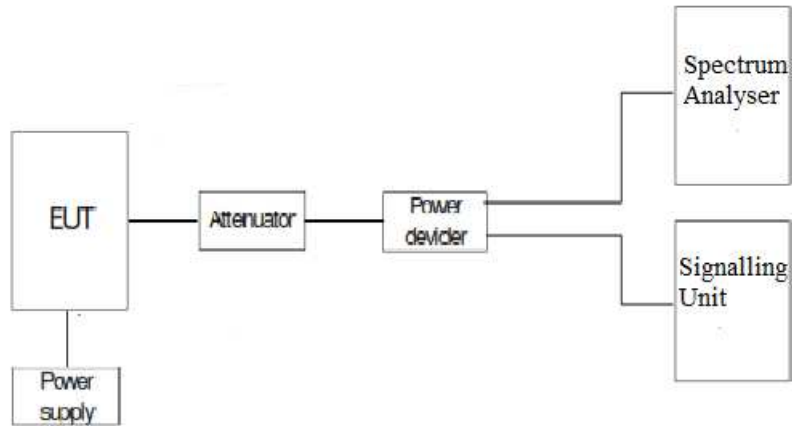
The EUT was controlled via the Universal Radio Communication tester R&S CMW500 selecting maximum transmission power of the EUT and different modes of modulation. The measurement is performed for the highest power levels measured.

### TEST SETUP

Conducted average power.



### Peak-to-average power ratio (PAPR)



### RESULTS

MAXIMUM OUTPUT POWER (CONDUCTED).

LTE. BAND IV.

| BANDWIDTH<br>(MHz) | CHANNEL         | FREQUENCY<br>(MHz) | MODULATION | RB<br>SIZE | RB<br>OFFSET | AVERAGE<br>POWER (dBm) | PAPR (dB) |
|--------------------|-----------------|--------------------|------------|------------|--------------|------------------------|-----------|
| 1.4                | Low<br>19957    | 1710.7             | QPSK       | 1          | 0            | 22.243                 | 4.70      |
|                    |                 |                    |            | 1          | 2            | 22.116                 |           |
|                    |                 |                    |            | 1          | 5            | 22.056                 |           |
|                    |                 |                    |            | 3          | 0            | 22.096                 |           |
|                    |                 |                    |            | 3          | 1            | 22.184                 |           |
|                    |                 |                    |            | 3          | 2            | 22.080                 |           |
|                    |                 |                    |            | 6          | 0            | 21.078                 |           |
|                    |                 |                    | 16-QAM     | 1          | 0            | 21.356                 | 5.50      |
|                    |                 |                    |            | 1          | 2            | 21.331                 |           |
|                    |                 |                    |            | 1          | 5            | 21.298                 |           |
|                    |                 |                    |            | 3          | 0            | 22.141                 |           |
|                    |                 |                    |            | 3          | 1            | 21.212                 |           |
|                    |                 |                    |            | 3          | 2            | 21.247                 |           |
|                    |                 |                    |            | 6          | 0            | 20.165                 |           |
|                    | Middle<br>20175 | 1732.5             | QPSK       | 1          | 0            | 22.192                 | 4.47      |
|                    |                 |                    |            | 1          | 2            | 22.189                 |           |
|                    |                 |                    |            | 1          | 5            | 22.183                 |           |
|                    |                 |                    |            | 3          | 0            | 22.237                 |           |
|                    |                 |                    |            | 3          | 1            | 22.219                 |           |
|                    |                 |                    |            | 3          | 2            | 22.266                 |           |
|                    |                 |                    |            | 6          | 0            | 21.081                 |           |
|                    |                 |                    | 16-QAM     | 1          | 0            | 21.375                 | 5.32      |
|                    |                 |                    |            | 1          | 2            | 21.362                 |           |
|                    |                 |                    |            | 1          | 5            | 21.514                 |           |
|                    |                 |                    |            | 3          | 0            | 21.118                 |           |
|                    |                 |                    |            | 3          | 1            | 21.087                 |           |
|                    |                 |                    |            | 3          | 2            | 21.226                 |           |
|                    |                 |                    |            | 6          | 0            | 20.161                 |           |
|                    | High<br>20393   | 1754.3             | QPSK       | 1          | 0            | 22.272                 | 4.10      |
|                    |                 |                    |            | 1          | 2            | 22.299                 |           |
|                    |                 |                    |            | 1          | 5            | 22.319                 |           |
|                    |                 |                    |            | 3          | 0            | 22.245                 |           |
|                    |                 |                    |            | 3          | 1            | 22.328                 |           |
|                    |                 |                    |            | 3          | 2            | 22.310                 |           |
|                    |                 |                    |            | 6          | 0            | 21.214                 |           |
|                    |                 |                    | 16-QAM     | 1          | 0            | 21.685                 | 4.97      |
|                    |                 |                    |            | 1          | 2            | 21.433                 |           |
|                    |                 |                    |            | 1          | 5            | 21.356                 |           |
|                    |                 |                    |            | 3          | 0            | 21.352                 |           |
|                    |                 |                    |            | 3          | 1            | 21.436                 |           |
|                    |                 |                    |            | 3          | 2            | 21.439                 |           |
|                    |                 |                    |            | 6          | 0            | 20.248                 |           |

| BANDWIDTH<br>(MHz) | CHANNEL         | FREQUENCY<br>(MHz) | MODULATION | RB<br>SIZE | RB<br>OFFSET | AVERAGE<br>POWER (dBm) | PAPR (dB) |
|--------------------|-----------------|--------------------|------------|------------|--------------|------------------------|-----------|
| 3                  | Low<br>19965    | 1711.5             | QPSK       | 1          | 0            | 22.136                 | 5.19      |
|                    |                 |                    |            | 1          | 7            | 22.185                 |           |
|                    |                 |                    |            | 1          | 14           | 22.185                 |           |
|                    |                 |                    |            | 8          | 0            | 21.069                 |           |
|                    |                 |                    |            | 8          | 4            | 21.021                 |           |
|                    |                 |                    |            | 8          | 7            | 21.037                 |           |
|                    |                 |                    |            | 15         | 0            | 21.037                 |           |
|                    |                 |                    | 16-QAM     | 1          | 0            | 21.396                 | 5.93      |
|                    |                 |                    |            | 1          | 7            | 21.424                 |           |
|                    |                 |                    |            | 1          | 14           | 21.308                 |           |
|                    |                 |                    |            | 8          | 0            | 20.240                 |           |
|                    |                 |                    |            | 8          | 4            | 20.113                 |           |
|                    |                 |                    |            | 8          | 7            | 20.106                 |           |
|                    |                 |                    |            | 15         | 0            | 20.187                 |           |
|                    | Middle<br>20175 | 1732.5             | QPSK       | 1          | 0            | 22.172                 | 5.00      |
|                    |                 |                    |            | 1          | 7            | 22.302                 |           |
|                    |                 |                    |            | 1          | 14           | 22.145                 |           |
|                    |                 |                    |            | 8          | 0            | 21.159                 |           |
|                    |                 |                    |            | 8          | 4            | 21.168                 |           |
|                    |                 |                    |            | 8          | 7            | 21.128                 |           |
|                    |                 |                    |            | 15         | 0            | 21.179                 |           |
|                    |                 |                    | 16-QAM     | 1          | 0            | 21.581                 | 5.75      |
|                    |                 |                    |            | 1          | 7            | 21.527                 |           |
|                    |                 |                    |            | 1          | 14           | 21.545                 |           |
|                    |                 |                    |            | 8          | 0            | 20.356                 |           |
|                    |                 |                    |            | 8          | 4            | 20.307                 |           |
|                    |                 |                    |            | 8          | 7            | 20.333                 |           |
|                    |                 |                    |            | 15         | 0            | 20.189                 |           |
|                    | High<br>20385   | 1753.5             | QPSK       | 1          | 0            | 22.376                 | 4.73      |
|                    |                 |                    |            | 1          | 7            | 22.291                 |           |
|                    |                 |                    |            | 1          | 14           | 22.204                 |           |
|                    |                 |                    |            | 8          | 0            | 21.233                 |           |
|                    |                 |                    |            | 8          | 4            | 21.283                 |           |
|                    |                 |                    |            | 8          | 7            | 21.293                 |           |
|                    |                 |                    |            | 15         | 0            | 21.180                 |           |
|                    |                 |                    | 16-QAM     | 1          | 0            | 21.491                 | 5.54      |
|                    |                 |                    |            | 1          | 7            | 21.571                 |           |
|                    |                 |                    |            | 1          | 14           | 21.586                 |           |
|                    |                 |                    |            | 8          | 0            | 20.36                  |           |
|                    |                 |                    |            | 8          | 4            | 20.409                 |           |
|                    |                 |                    |            | 8          | 7            | 20.337                 |           |
|                    |                 |                    |            | 15         | 0            | 20.290                 |           |

| BANDWIDTH<br>(MHz) | CHANNEL         | FREQUENCY<br>(MHz) | MODULATION | RB<br>SIZE | RB<br>OFFSET | AVERAGE<br>POWER (dBm) | PAPR (dB) |
|--------------------|-----------------|--------------------|------------|------------|--------------|------------------------|-----------|
| 5                  | Low<br>19975    | 1712.5             | QPSK       | 1          | 0            | 22.257                 |           |
|                    |                 |                    |            | 1          | 12           | 22.250                 |           |
|                    |                 |                    |            | 1          | 24           | 22.123                 |           |
|                    |                 |                    |            | 12         | 0            | 21.130                 |           |
|                    |                 |                    |            | 12         | 6            | 21.124                 |           |
|                    |                 |                    |            | 12         | 11           | 21.139                 |           |
|                    |                 |                    |            | 25         | 0            | 21.083                 |           |
|                    |                 |                    | 16-QAM     | 1          | 0            | 21.604                 |           |
|                    |                 |                    |            | 1          | 12           | 21.504                 |           |
|                    |                 |                    |            | 1          | 24           | 21.296                 |           |
|                    |                 |                    |            | 12         | 0            | 20.233                 |           |
|                    |                 |                    |            | 12         | 6            | 20.120                 |           |
|                    |                 |                    |            | 12         | 11           | 20.271                 |           |
|                    |                 |                    |            | 25         | 0            | 20.151                 |           |
|                    | Middle<br>20175 | 1732.5             | QPSK       | 1          | 0            | 22.196                 |           |
|                    |                 |                    |            | 1          | 12           | 22.092                 |           |
|                    |                 |                    |            | 1          | 24           | 22.086                 |           |
|                    |                 |                    |            | 12         | 0            | 21.174                 |           |
|                    |                 |                    |            | 12         | 6            | 21.228                 |           |
|                    |                 |                    |            | 12         | 11           | 21.220                 |           |
|                    |                 |                    |            | 25         | 0            | 21.184                 |           |
|                    |                 |                    | 16-QAM     | 1          | 0            | 21.367                 |           |
|                    |                 |                    |            | 1          | 12           | 21.714                 |           |
|                    |                 |                    |            | 1          | 24           | 21.246                 |           |
|                    |                 |                    |            | 12         | 0            | 20.305                 |           |
|                    |                 |                    |            | 12         | 6            | 20.238                 |           |
|                    |                 |                    |            | 12         | 11           | 20.283                 |           |
|                    |                 |                    |            | 25         | 0            | 20.212                 |           |
|                    | High<br>20375   | 1752.5             | QPSK       | 1          | 0            | 22.373                 |           |
|                    |                 |                    |            | 1          | 12           | 22.247                 |           |
|                    |                 |                    |            | 1          | 24           | 22.119                 |           |
|                    |                 |                    |            | 12         | 0            | 21.344                 |           |
|                    |                 |                    |            | 12         | 6            | 21.243                 |           |
|                    |                 |                    |            | 12         | 11           | 21.278                 |           |
|                    |                 |                    |            | 25         | 0            | 21.347                 |           |
|                    |                 |                    | 16-QAM     | 1          | 0            | 21.696                 |           |
|                    |                 |                    |            | 1          | 12           | 21.610                 |           |
|                    |                 |                    |            | 1          | 24           | 21.614                 |           |
|                    |                 |                    |            | 12         | 0            | 20.308                 |           |
|                    |                 |                    |            | 12         | 6            | 20.399                 |           |
|                    |                 |                    |            | 12         | 11           | 20.354                 |           |
|                    |                 |                    |            | 25         | 0            | 20.317                 |           |

| BANDWIDTH<br>(MHz) | CHANNEL         | FREQUENCY<br>(MHz) | MODULATION | RB<br>SIZE | RB<br>OFFSET | AVERAGE<br>POWER (dBm) | PAPR (dB) |
|--------------------|-----------------|--------------------|------------|------------|--------------|------------------------|-----------|
| 10                 | Low<br>20000    | 1715               | QPSK       | 1          | 0            | 22.372                 | 5.00      |
|                    |                 |                    |            | 1          | 24           | 22.209                 |           |
|                    |                 |                    |            | 1          | 49           | 22.130                 |           |
|                    |                 |                    |            | 25         | 0            | 21.193                 |           |
|                    |                 |                    |            | 25         | 12           | 21.152                 |           |
|                    |                 |                    |            | 25         | 24           | 21.036                 |           |
|                    |                 |                    |            | 50         | 0            | 21.095                 |           |
|                    |                 |                    | 16-QAM     | 1          | 0            | 21.607                 | 5.77      |
|                    |                 |                    |            | 1          | 24           | 21.041                 |           |
|                    |                 |                    |            | 1          | 49           | 21.149                 |           |
|                    |                 |                    |            | 25         | 0            | 20.186                 |           |
|                    |                 |                    |            | 25         | 12           | 20.128                 |           |
|                    |                 |                    |            | 25         | 24           | 20.072                 |           |
|                    |                 |                    |            | 50         | 0            | 20.142                 |           |
|                    | Middle<br>20175 | 1732.5             | QPSK       | 1          | 0            | 22.403                 | 4.97      |
|                    |                 |                    |            | 1          | 24           | 22.224                 |           |
|                    |                 |                    |            | 1          | 49           | 22.329                 |           |
|                    |                 |                    |            | 25         | 0            | 21.254                 |           |
|                    |                 |                    |            | 25         | 12           | 21.195                 |           |
|                    |                 |                    |            | 25         | 24           | 21.217                 |           |
|                    |                 |                    |            | 50         | 0            | 21.229                 |           |
|                    |                 |                    | 16-QAM     | 1          | 0            | 21.758                 | 5.75      |
|                    |                 |                    |            | 1          | 24           | 21.443                 |           |
|                    |                 |                    |            | 1          | 49           | 21.556                 |           |
|                    |                 |                    |            | 25         | 0            | 20.340                 |           |
|                    |                 |                    |            | 25         | 12           | 20.245                 |           |
|                    |                 |                    |            | 25         | 24           | 20.230                 |           |
|                    |                 |                    |            | 50         | 0            | 20.269                 |           |
|                    | High<br>20350   | 1750               | QPSK       | 1          | 0            | 22.568                 | 4.60      |
|                    |                 |                    |            | 1          | 24           | 22.316                 |           |
|                    |                 |                    |            | 1          | 49           | 22.277                 |           |
|                    |                 |                    |            | 25         | 0            | 21.354                 |           |
|                    |                 |                    |            | 25         | 12           | 21.238                 |           |
|                    |                 |                    |            | 25         | 24           | 21.245                 |           |
|                    |                 |                    |            | 50         | 0            | 21.295                 |           |
|                    |                 |                    | 16-QAM     | 1          | 0            | 21.785                 | 5.43      |
|                    |                 |                    |            | 1          | 24           | 21.572                 |           |
|                    |                 |                    |            | 1          | 49           | 21.569                 |           |
|                    |                 |                    |            | 25         | 0            | 20.443                 |           |
|                    |                 |                    |            | 25         | 12           | 20.400                 |           |
|                    |                 |                    |            | 25         | 24           | 20.361                 |           |
|                    |                 |                    |            | 50         | 0            | 20.370                 |           |

| BANDWIDTH<br>(MHz) | CHANNEL         | FREQUENCY<br>(MHz) | MODULATION | RB<br>SIZE | RB<br>OFFSET | AVERAGE<br>POWER (dBm) | PAPR (dB) |
|--------------------|-----------------|--------------------|------------|------------|--------------|------------------------|-----------|
| 15                 | Low<br>20025    | 1717.5             | QPSK       | 1          | 0            | 22.665                 | 4.97      |
|                    |                 |                    |            | 1          | 37           | 22.180                 |           |
|                    |                 |                    |            | 1          | 74           | 22.279                 |           |
|                    |                 |                    |            | 36         | 0            | 21.260                 |           |
|                    |                 |                    |            | 36         | 18           | 21.093                 |           |
|                    |                 |                    |            | 36         | 37           | 21.108                 |           |
|                    |                 |                    |            | 75         | 0            | 21.181                 |           |
|                    |                 |                    | 16-QAM     | 1          | 0            | 21.693                 | 5.59      |
|                    |                 |                    |            | 1          | 37           | 21.373                 |           |
|                    |                 |                    |            | 1          | 74           | 21.465                 |           |
|                    |                 |                    |            | 36         | 0            | 20.312                 |           |
|                    |                 |                    |            | 36         | 18           | 20.107                 |           |
|                    |                 |                    |            | 36         | 37           | 20.123                 |           |
|                    |                 |                    |            | 75         | 0            | 20.197                 |           |
|                    | Middle<br>20175 | 1732.5             | QPSK       | 1          | 0            | 22.657                 | 4.87      |
|                    |                 |                    |            | 1          | 37           | 22.273                 |           |
|                    |                 |                    |            | 1          | 74           | 22.454                 |           |
|                    |                 |                    |            | 36         | 0            | 21.329                 |           |
|                    |                 |                    |            | 36         | 18           | 21.207                 |           |
|                    |                 |                    |            | 36         | 37           | 21.255                 |           |
|                    |                 |                    |            | 75         | 0            | 21.257                 |           |
|                    |                 |                    | 16-QAM     | 1          | 0            | 21.724                 | 5.58      |
|                    |                 |                    |            | 1          | 37           | 21.564                 |           |
|                    |                 |                    |            | 1          | 74           | 21.563                 |           |
|                    |                 |                    |            | 36         | 0            | 20.390                 |           |
|                    |                 |                    |            | 36         | 18           | 20.230                 |           |
|                    |                 |                    |            | 36         | 37           | 20.276                 |           |
|                    |                 |                    |            | 75         | 0            | 20.312                 |           |
|                    | High<br>20325   | 1747.5             | QPSK       | 1          | 0            | 22.703                 | 4.50      |
|                    |                 |                    |            | 1          | 37           | 22.432                 |           |
|                    |                 |                    |            | 1          | 74           | 22.302                 |           |
|                    |                 |                    |            | 36         | 0            | 21.489                 |           |
|                    |                 |                    |            | 36         | 18           | 21.346                 |           |
|                    |                 |                    |            | 36         | 37           | 21.295                 |           |
|                    |                 |                    |            | 75         | 0            | 21.357                 |           |
|                    |                 |                    | 16-QAM     | 1          | 0            | 22.888                 | 5.22      |
|                    |                 |                    |            | 1          | 37           | 21.649                 |           |
|                    |                 |                    |            | 1          | 74           | 21.534                 |           |
|                    |                 |                    |            | 36         | 0            | 20.516                 |           |
|                    |                 |                    |            | 36         | 18           | 20.360                 |           |
|                    |                 |                    |            | 36         | 37           | 20.362                 |           |
|                    |                 |                    |            | 75         | 0            | 20.413                 |           |

| BANDWIDTH<br>(MHz) | CHANNEL         | FREQUENCY<br>(MHz) | MODULATION | RB<br>SIZE | RB<br>OFFSET | AVERAGE<br>POWER (dBm) | PAPR (dB) |
|--------------------|-----------------|--------------------|------------|------------|--------------|------------------------|-----------|
| 20                 | Low<br>20050    | 1720               | QPSK       | 1          | 0            | 22.393                 | 4.97      |
|                    |                 |                    |            | 1          | 49           | 21.924                 |           |
|                    |                 |                    |            | 1          | 99           | 22.004                 |           |
|                    |                 |                    |            | 50         | 0            | 21.291                 |           |
|                    |                 |                    |            | 50         | 24           | 21.063                 |           |
|                    |                 |                    |            | 50         | 49           | 21.068                 |           |
|                    |                 |                    |            | 100        | 0            | 21.190                 |           |
|                    |                 |                    |            |            |              |                        |           |
|                    |                 |                    | 16-QAM     | 1          | 0            | 21.670                 | 5.71      |
|                    |                 |                    |            | 1          | 49           | 21.309                 |           |
|                    |                 |                    |            | 1          | 99           | 21.361                 |           |
|                    |                 |                    |            | 50         | 0            | 20.329                 |           |
|                    |                 |                    |            | 50         | 24           | 20.060                 |           |
|                    |                 |                    |            | 50         | 49           | 20.104                 |           |
|                    |                 |                    |            | 100        | 0            | 20.190                 |           |
|                    |                 |                    |            |            |              |                        |           |
|                    | Middle<br>20175 | 1732.5             | QPSK       | 1          | 0            | 22.302                 | 4.89      |
|                    |                 |                    |            | 1          | 49           | 22.041                 |           |
|                    |                 |                    |            | 1          | 99           | 22.080                 |           |
|                    |                 |                    |            | 50         | 0            | 21.301                 |           |
|                    |                 |                    |            | 50         | 24           | 21.092                 |           |
|                    |                 |                    |            | 50         | 49           | 21.157                 |           |
|                    |                 |                    |            | 100        | 0            | 21.244                 |           |
|                    |                 |                    |            |            |              |                        |           |
|                    |                 |                    | 16-QAM     | 1          | 0            | 21.548                 | 5.67      |
|                    |                 |                    |            | 1          | 49           | 21.237                 |           |
|                    |                 |                    |            | 1          | 99           | 21.304                 |           |
|                    |                 |                    |            | 50         | 0            | 20.352                 |           |
|                    |                 |                    |            | 50         | 24           | 20.162                 |           |
|                    |                 |                    |            | 50         | 49           | 20.211                 |           |
|                    |                 |                    |            | 100        | 0            | 20.282                 |           |
|                    |                 |                    |            |            |              |                        |           |
|                    | High<br>20300   | 1745               | QPSK       | 1          | 0            | 22.551                 | 4.71      |
|                    |                 |                    |            | 1          | 49           | 22.127                 |           |
|                    |                 |                    |            | 1          | 99           | 22.125                 |           |
|                    |                 |                    |            | 50         | 0            | 21.470                 |           |
|                    |                 |                    |            | 50         | 24           | 21.255                 |           |
|                    |                 |                    |            | 50         | 49           | 21.265                 |           |
|                    |                 |                    |            | 100        | 0            | 21.374                 |           |
|                    |                 |                    |            |            |              |                        |           |
|                    |                 |                    | 16-QAM     | 1          | 0            | 21.795                 | 5.51      |
|                    |                 |                    |            | 1          | 49           | 21.390                 |           |
|                    |                 |                    |            | 1          | 99           | 21.346                 |           |
|                    |                 |                    |            | 50         | 0            | 20.498                 |           |
|                    |                 |                    |            | 50         | 24           | 20.269                 |           |
|                    |                 |                    |            | 50         | 49           | 20.384                 |           |
|                    |                 |                    |            | 100        | 0            | 20.398                 |           |
|                    |                 |                    |            |            |              |                        |           |

LTE. BAND XIII.

| BANDWIDTH<br>(MHz) | CHANNEL         | FREQUENCY<br>(MHz) | MODULATION | RB<br>SIZE | RB<br>OFFSET | AVERAGE<br>POWER (dBm) | PAPR (dB) |
|--------------------|-----------------|--------------------|------------|------------|--------------|------------------------|-----------|
| 5                  | Low<br>23205    | 779.5 MHz          | QPSK       | 1          | 0            | 22.315                 | 5.54      |
|                    |                 |                    |            | 1          | 12           | 22.212                 |           |
|                    |                 |                    |            | 1          | 24           | 22.175                 |           |
|                    |                 |                    |            | 12         | 0            | 21.650                 |           |
|                    |                 |                    |            | 12         | 6            | 21.125                 |           |
|                    |                 |                    |            | 12         | 11           | 21.165                 |           |
|                    |                 |                    |            | 25         | 0            | 21.212                 |           |
|                    |                 |                    | 16-QAM     | 1          | 0            | 21.500                 | 6.23      |
|                    |                 |                    |            | 1          | 12           | 21.486                 |           |
|                    |                 |                    |            | 1          | 24           | 21.313                 |           |
|                    |                 |                    |            | 12         | 0            | 20.215                 |           |
|                    |                 |                    |            | 12         | 6            | 20.154                 |           |
|                    |                 |                    |            | 12         | 11           | 20.244                 |           |
|                    |                 |                    |            | 25         | 0            | 20.121                 |           |
|                    | Middle<br>23230 | 782 MHz            | QPSK       | 1          | 0            | 22.20                  | 5.63      |
|                    |                 |                    |            | 1          | 12           | 22.263                 |           |
|                    |                 |                    |            | 1          | 24           | 22.173                 |           |
|                    |                 |                    |            | 12         | 0            | 21.25                  |           |
|                    |                 |                    |            | 12         | 6            | 21.237                 |           |
|                    |                 |                    |            | 12         | 11           | 21.231                 |           |
|                    |                 |                    |            | 25         | 0            | 21.237                 |           |
|                    |                 |                    | 16-QAM     | 1          | 0            | 21.460                 | 6.31      |
|                    |                 |                    |            | 1          | 12           | 21.507                 |           |
|                    |                 |                    |            | 1          | 24           | 21.414                 |           |
|                    |                 |                    |            | 12         | 0            | 20.394                 |           |
|                    |                 |                    |            | 12         | 6            | 20.355                 |           |
|                    |                 |                    |            | 12         | 11           | 20.374                 |           |
|                    |                 |                    |            | 25         | 0            | 20.341                 |           |
|                    | High<br>23254   | 784.5 MHz          | QPSK       | 1          | 0            | 22.295                 | 5.54      |
|                    |                 |                    |            | 1          | 12           | 22.194                 |           |
|                    |                 |                    |            | 1          | 24           | 22.184                 |           |
|                    |                 |                    |            | 12         | 0            | 21.645                 |           |
|                    |                 |                    |            | 12         | 6            | 21.325                 |           |
|                    |                 |                    |            | 12         | 11           | 21.120                 |           |
|                    |                 |                    |            | 25         | 0            | 21.203                 |           |
|                    |                 |                    | 16-QAM     | 1          | 0            | 21.452                 | 6.36      |
|                    |                 |                    |            | 1          | 12           | 21.153                 |           |
|                    |                 |                    |            | 1          | 24           | 21.298                 |           |
|                    |                 |                    |            | 12         | 0            | 20.195                 |           |
|                    |                 |                    |            | 12         | 6            | 20.142                 |           |
|                    |                 |                    |            | 12         | 11           | 20.514                 |           |
|                    |                 |                    |            | 25         | 0            | 20.095                 |           |

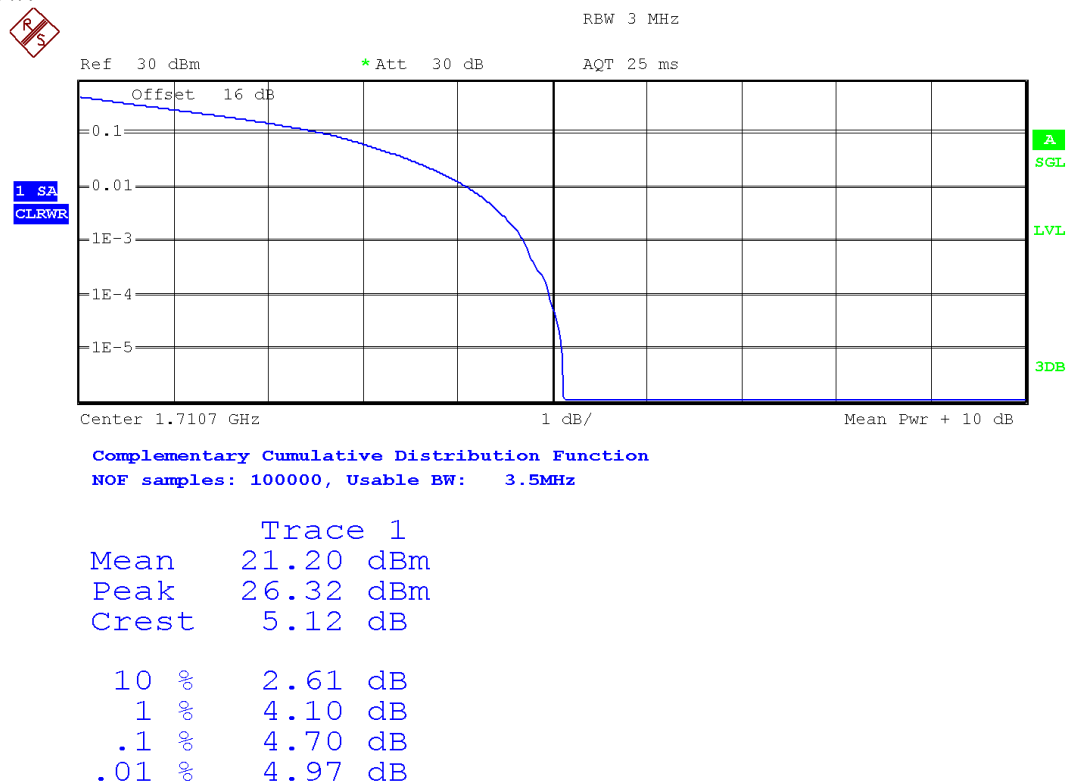
| BANDWIDTH<br>(MHz) | CHANNEL         | FREQUENCY<br>(MHz) | MODULATION | RB<br>SIZE | RB<br>OFFSET | AVERAGE<br>POWER (dBm) | PAPR (dB) |
|--------------------|-----------------|--------------------|------------|------------|--------------|------------------------|-----------|
| 10                 | Middle<br>23230 | 782 MHz            | QPSK       | 1          | 0            | 21.926                 | 5.61      |
|                    |                 |                    |            | 1          | 24           | 22.155                 |           |
|                    |                 |                    |            | 1          | 49           | 21.611                 |           |
|                    |                 |                    |            | 25         | 0            | 21.310                 |           |
|                    |                 |                    |            | 25         | 12           | 21.381                 |           |
|                    |                 |                    |            | 25         | 24           | 21.270                 |           |
|                    |                 |                    |            | 50         | 0            | 21.292                 |           |
|                    |                 |                    | 16-QAM     | 1          | 0            | 21.207                 | 6.38      |
|                    |                 |                    |            | 1          | 24           | 21.398                 |           |
|                    |                 |                    |            | 1          | 49           | 20.859                 |           |
|                    |                 |                    |            | 25         | 0            | 20.435                 |           |
|                    |                 |                    |            | 25         | 12           | 20.386                 |           |
|                    |                 |                    |            | 25         | 24           | 20.391                 |           |
|                    |                 |                    |            | 50         | 0            | 20.384                 |           |

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

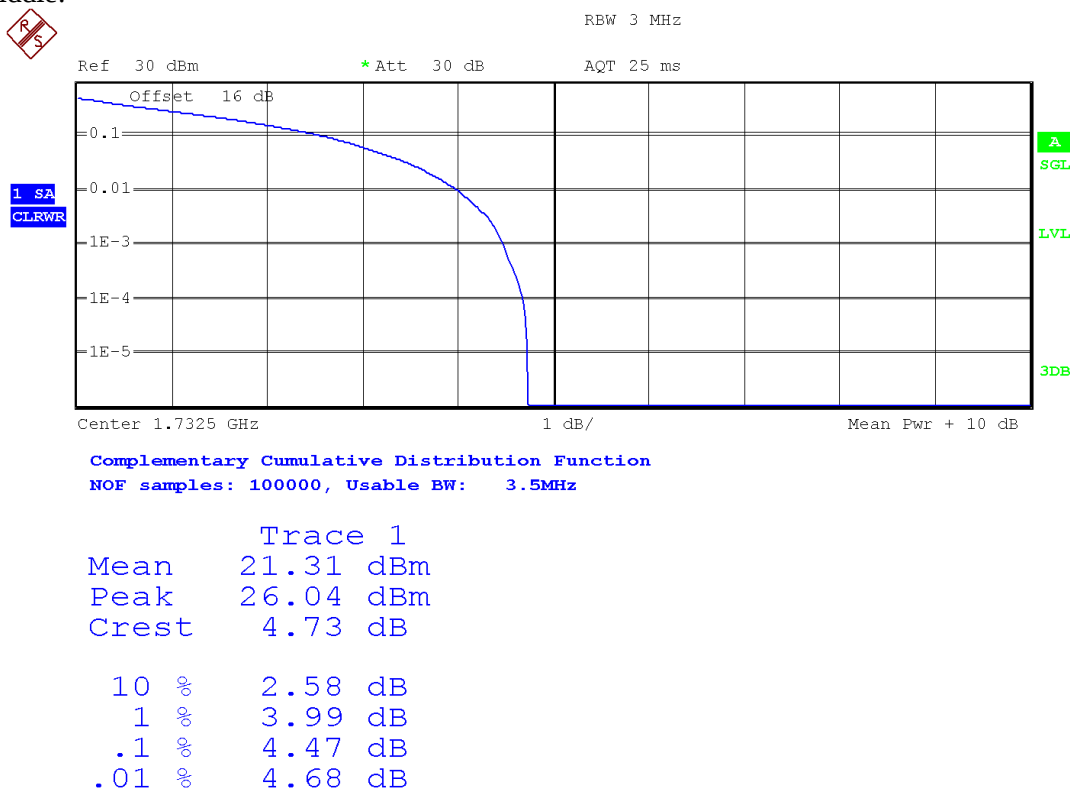
### LTE. BAND IV.

Bandwidth = 1.4 MHz. Modulation QPSK. RB Size: 6. RB Offset: 0.

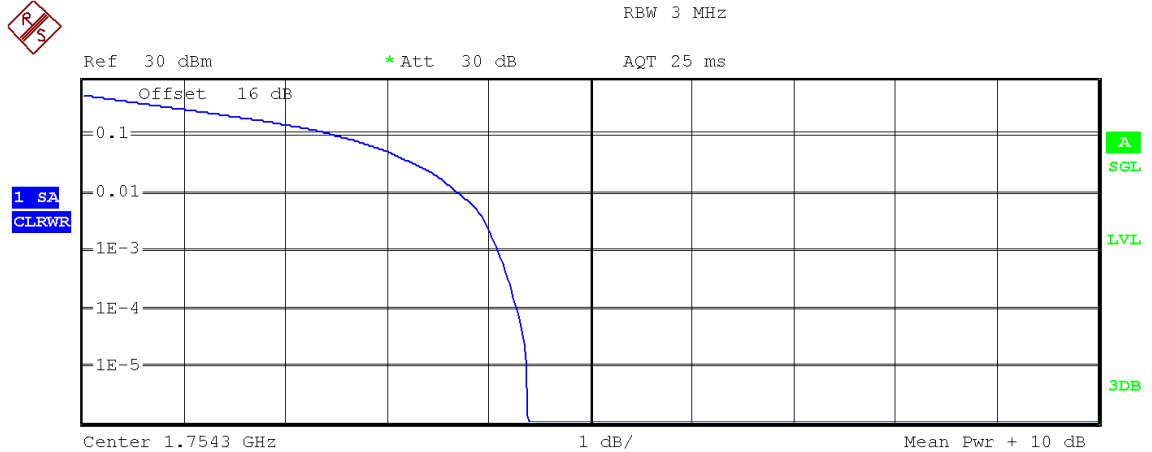
Channel Low:



Channel Middle:



## Channel High:



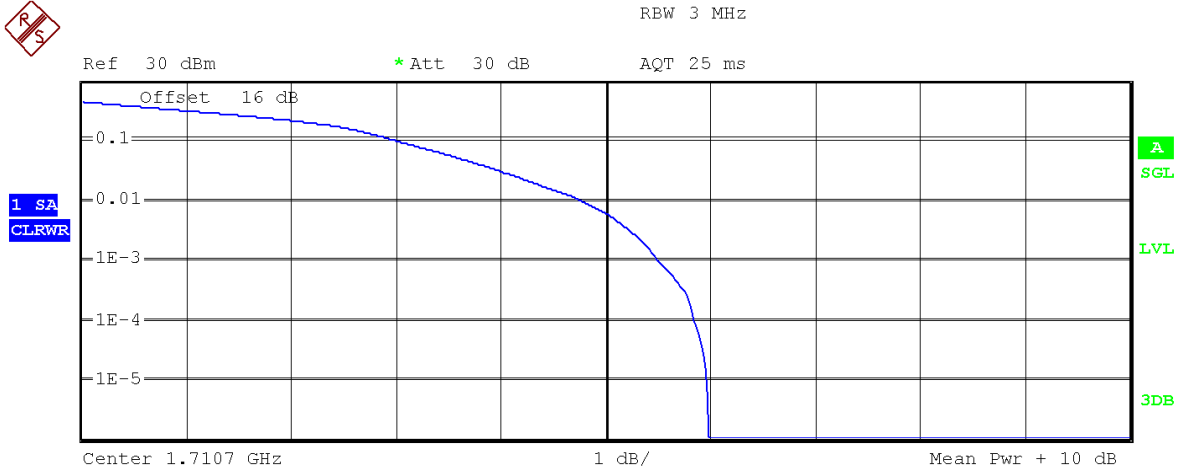
Complementary Cumulative Distribution Function  
NOF samples: 100000, Usable BW: 3.5MHz

Trace 1

|       |           |
|-------|-----------|
| Mean  | 21.37 dBm |
| Peak  | 25.76 dBm |
| Crest | 4.39 dB   |
| 10 %  | 2.52 dB   |
| 1 %   | 3.70 dB   |
| .1 %  | 4.10 dB   |
| .01 % | 4.28 dB   |

Bandwidth = 1.4 MHz. Modulation 16 QAM. RB Size: 6. RB Offset: 0.

## Channel Low:

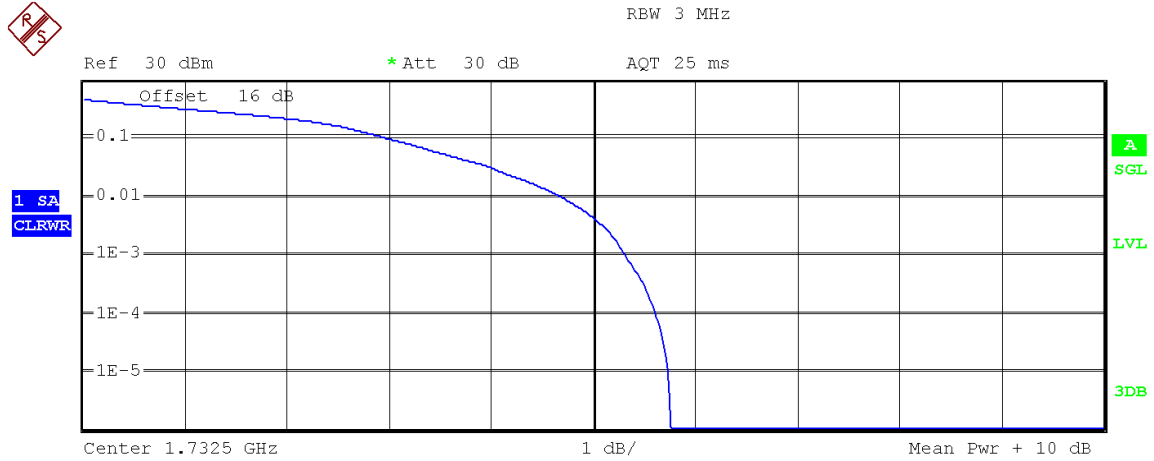


Complementary Cumulative Distribution Function  
NOF samples: 100000, Usable BW: 3.5MHz

Trace 1

|       |           |
|-------|-----------|
| Mean  | 20.27 dBm |
| Peak  | 26.25 dBm |
| Crest | 5.98 dB   |
| 10 %  | 3.01 dB   |
| 1 %   | 4.78 dB   |
| .1 %  | 5.50 dB   |
| .01 % | 5.85 dB   |

## Channel Middle:

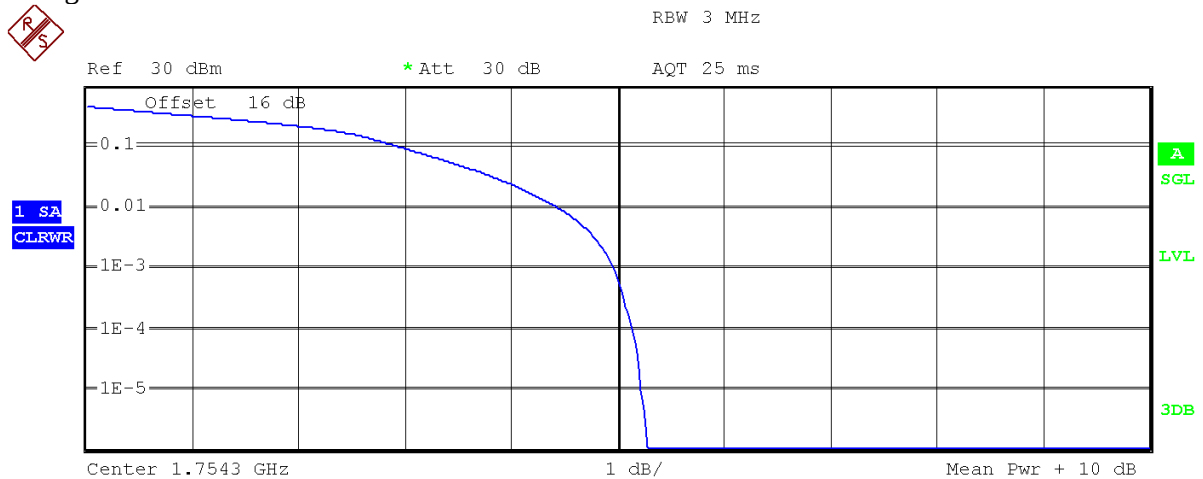


Complementary Cumulative Distribution Function  
NOF samples: 100000, Usable BW: 3.5MHz

Trace 1  
Mean 20.36 dBm  
Peak 26.11 dBm  
Crest 5.75 dB

|       |         |
|-------|---------|
| 10 %  | 3.00 dB |
| 1 %   | 4.68 dB |
| .1 %  | 5.32 dB |
| .01 % | 5.61 dB |

## Channel High:



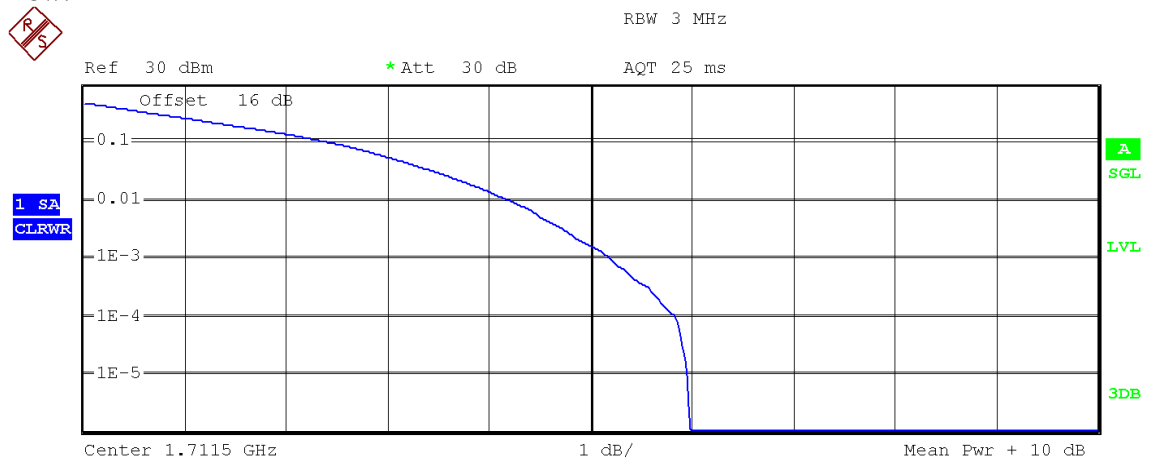
Complementary Cumulative Distribution Function  
NOF samples: 100000, Usable BW: 3.5MHz

Trace 1  
Mean 20.48 dBm  
Peak 25.76 dBm  
Crest 5.28 dB

|       |         |
|-------|---------|
| 10 %  | 2.95 dB |
| 1 %   | 4.44 dB |
| .1 %  | 4.97 dB |
| .01 % | 5.14 dB |

Bandwidth = 3 MHz. Modulation QPSK. RB Size: 15. RB Offset: 0.

Channel Low:

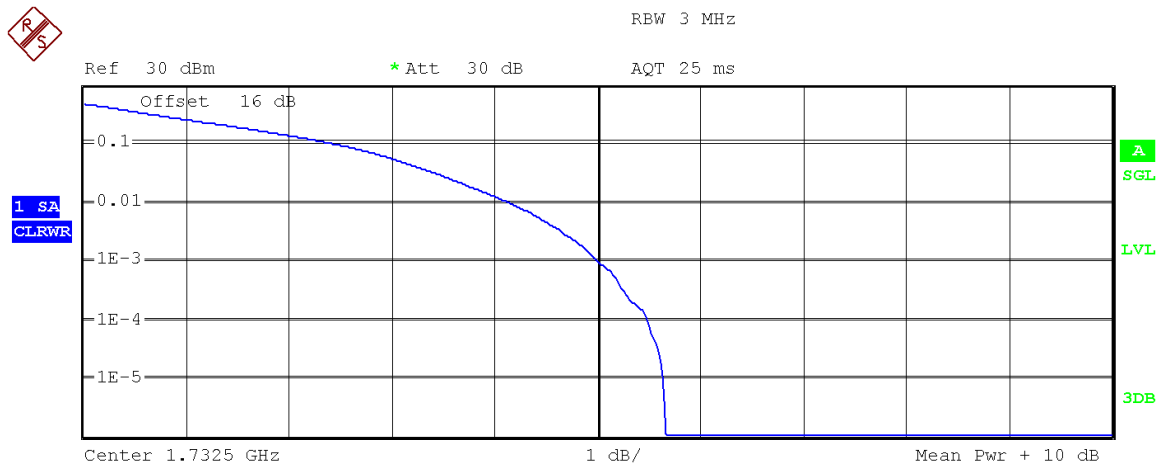


Complementary Cumulative Distribution Function  
NOF samples: 100000, Usable BW: 3.5MHz

Trace 1  
Mean 21.19 dBm  
Peak 27.17 dBm  
Crest 5.97 dB

|       |         |
|-------|---------|
| 10 %  | 2.44 dB |
| 1 %   | 4.20 dB |
| .1 %  | 5.19 dB |
| .01 % | 5.83 dB |

Channel Middle:

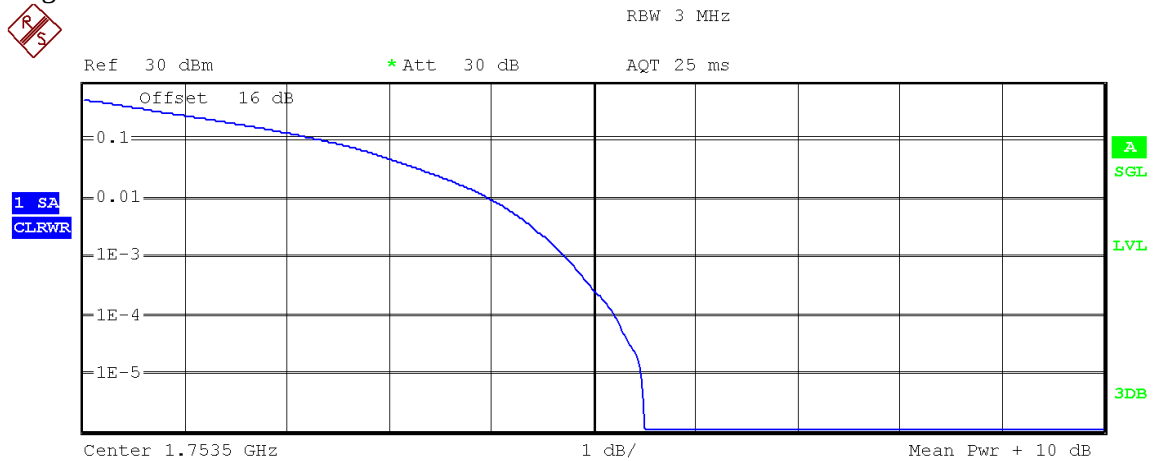


Complementary Cumulative Distribution Function  
NOF samples: 100000, Usable BW: 3.5MHz

Trace 1  
Mean 21.30 dBm  
Peak 26.96 dBm  
Crest 5.66 dB

|       |         |
|-------|---------|
| 10 %  | 2.45 dB |
| 1 %   | 4.13 dB |
| .1 %  | 5.00 dB |
| .01 % | 5.50 dB |

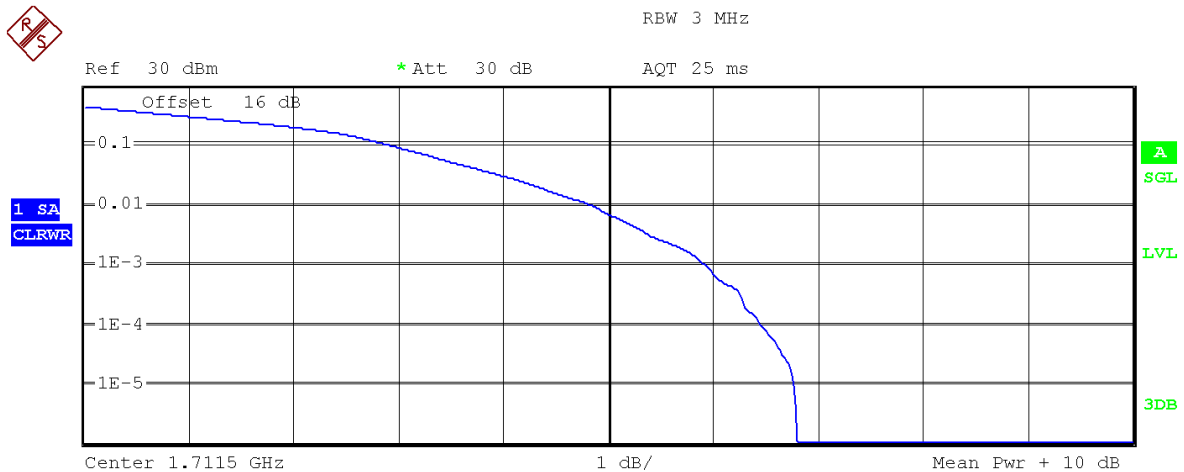
## Channel High:



Complementary Cumulative Distribution Function  
NOF samples: 100000, Usable BW: 3.5MHz

| Trace 1 |       |     |
|---------|-------|-----|
| Mean    | 21.39 | dBm |
| Peak    | 26.89 | dBm |
| Crest   | 5.50  | dB  |
| 10 %    | 2.36  | dB  |
| 1 %     | 3.99  | dB  |
| .1 %    | 4.73  | dB  |
| .01 %   | 5.21  | dB  |

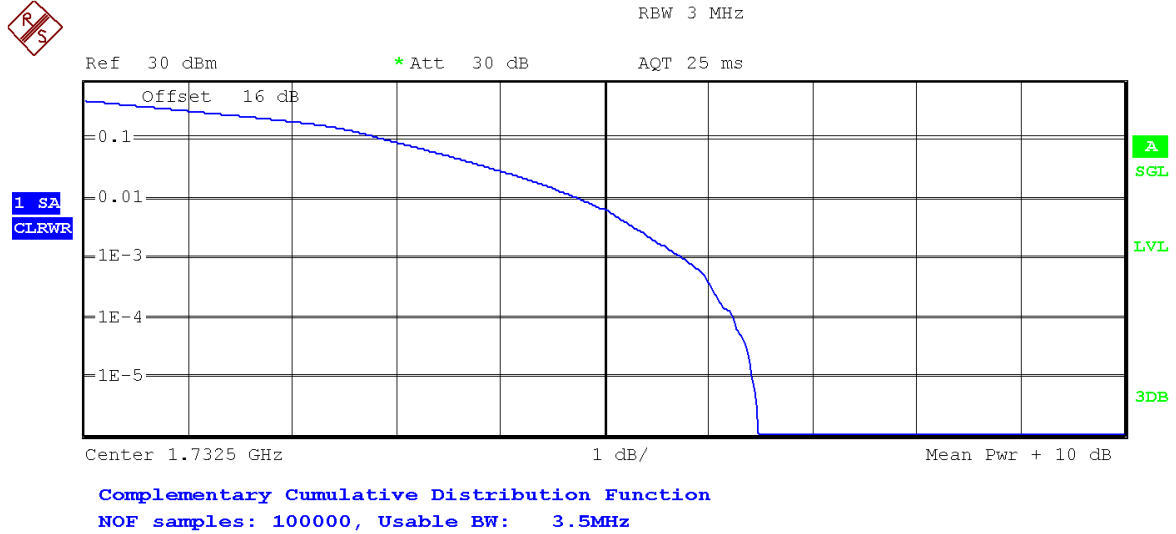
Bandwidth = 3 MHz. Modulation 16 QAM. RB Size: 15. RB Offset: 0.  
Channel Low:



Complementary Cumulative Distribution Function  
NOF samples: 100000, Usable BW: 3.5MHz

| Trace 1 |       |     |
|---------|-------|-----|
| Mean    | 20.23 | dBm |
| Peak    | 27.03 | dBm |
| Crest   | 6.80  | dB  |
| 10 %    | 2.93  | dB  |
| 1 %     | 4.84  | dB  |
| .1 %    | 5.93  | dB  |
| .01 %   | 6.46  | dB  |

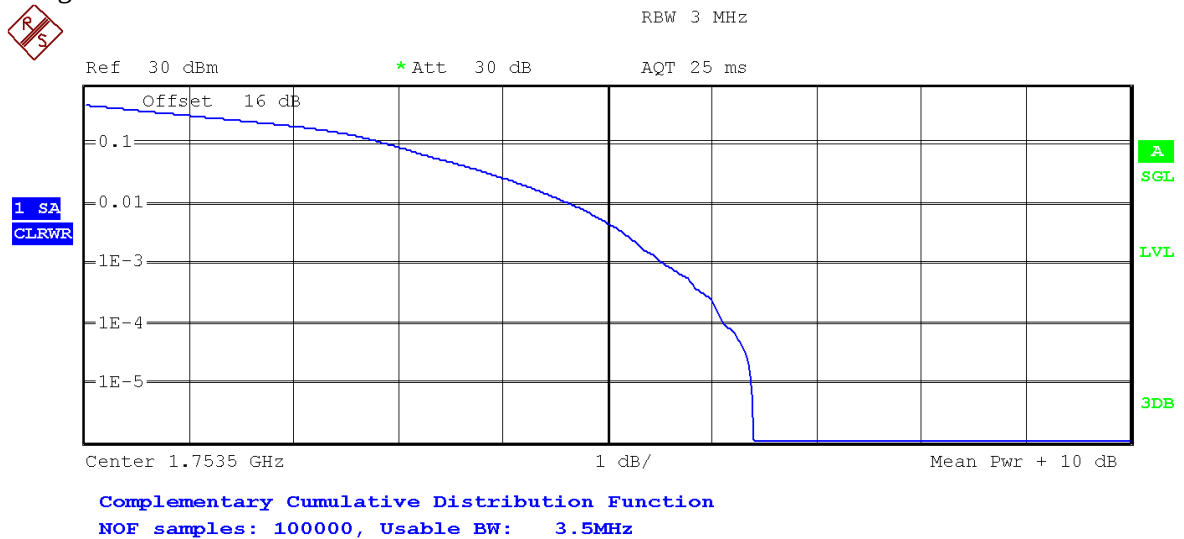
## Channel Middle:



Trace 1  
Mean 20.33 dBm  
Peak 26.82 dBm  
Crest 6.49 dB

|       |         |
|-------|---------|
| 10 %  | 2.92 dB |
| 1 %   | 4.76 dB |
| .1 %  | 5.75 dB |
| .01 % | 6.25 dB |

## Channel High:

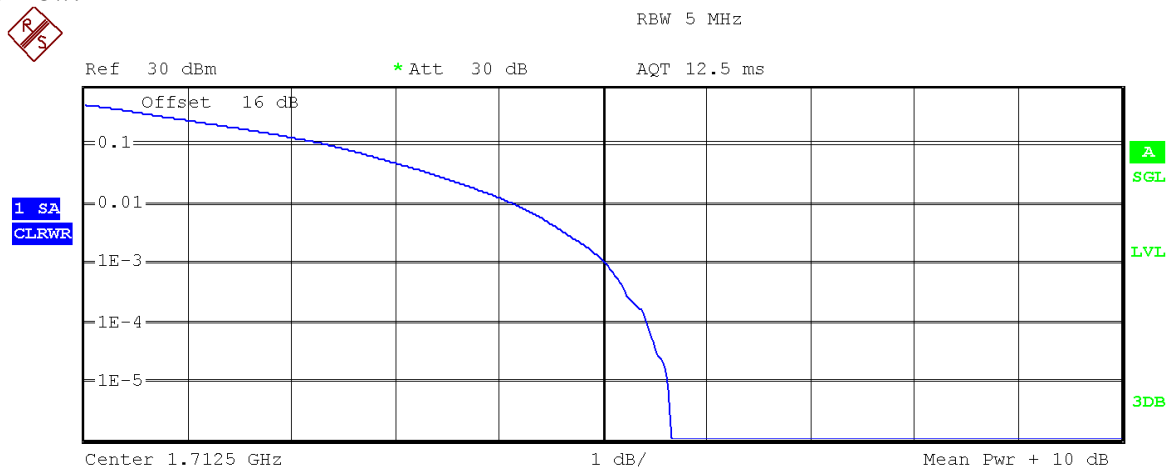


Trace 1  
Mean 20.42 dBm  
Peak 26.82 dBm  
Crest 6.40 dB

|       |         |
|-------|---------|
| 10 %  | 2.92 dB |
| 1 %   | 4.66 dB |
| .1 %  | 5.54 dB |
| .01 % | 6.12 dB |

Bandwidth = 5 MHz. Modulation QPSK. RB Size: 25. RB Offset: 0.

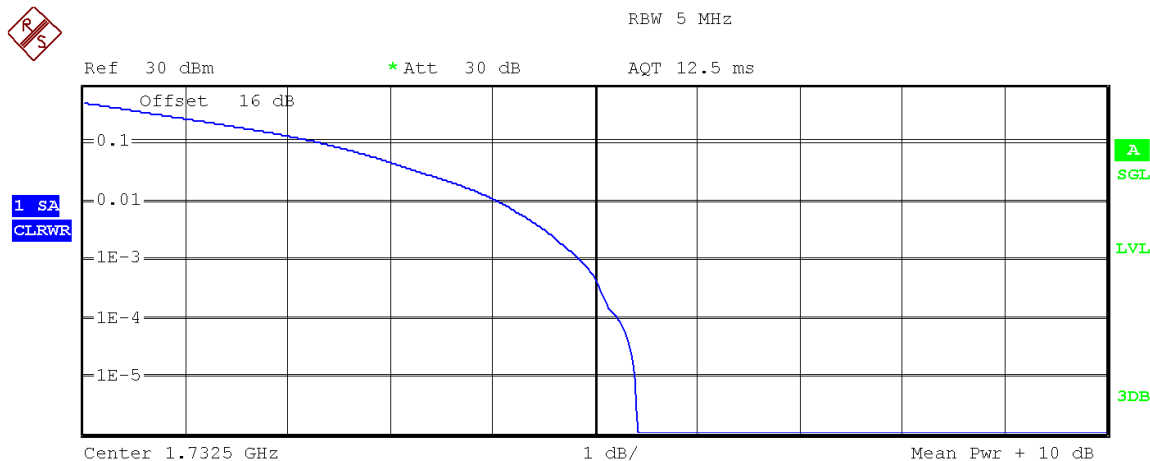
Channel Low:



Complementary Cumulative Distribution Function  
NOF samples: 100000, Usable BW: 7.1MHz

|         |           |
|---------|-----------|
| Trace 1 |           |
| Mean    | 21.16 dBm |
| Peak    | 26.82 dBm |
| Crest   | 5.66 dB   |
| 10 %    | 2.39 dB   |
| 1 %     | 4.15 dB   |
| .1 %    | 5.03 dB   |
| .01 %   | 5.43 dB   |

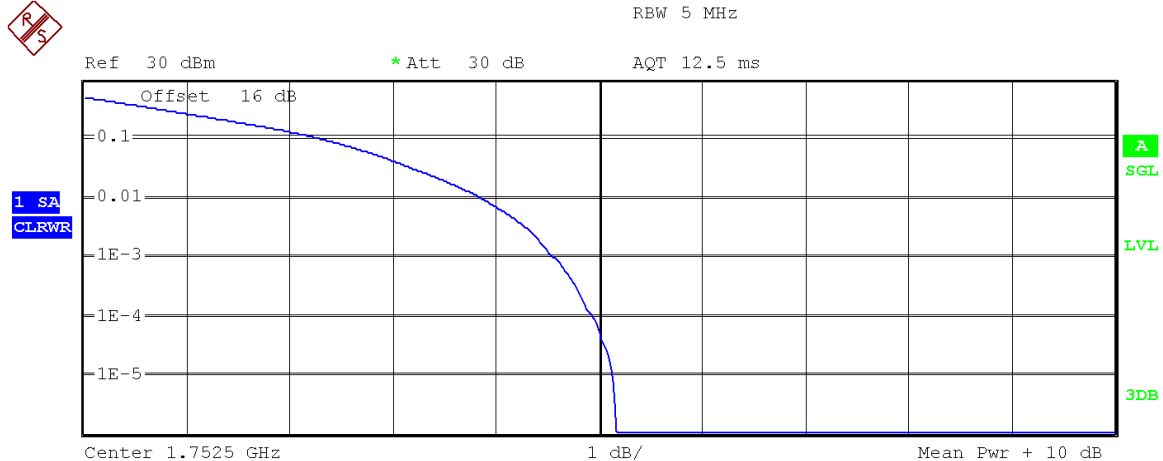
Channel Middle:



Complementary Cumulative Distribution Function  
NOF samples: 100000, Usable BW: 7.1MHz

|         |           |
|---------|-----------|
| Trace 1 |           |
| Mean    | 21.33 dBm |
| Peak    | 26.75 dBm |
| Crest   | 5.41 dB   |
| 10 %    | 2.36 dB   |
| 1 %     | 4.07 dB   |
| .1 %    | 4.86 dB   |
| .01 %   | 5.22 dB   |

## Channel High:



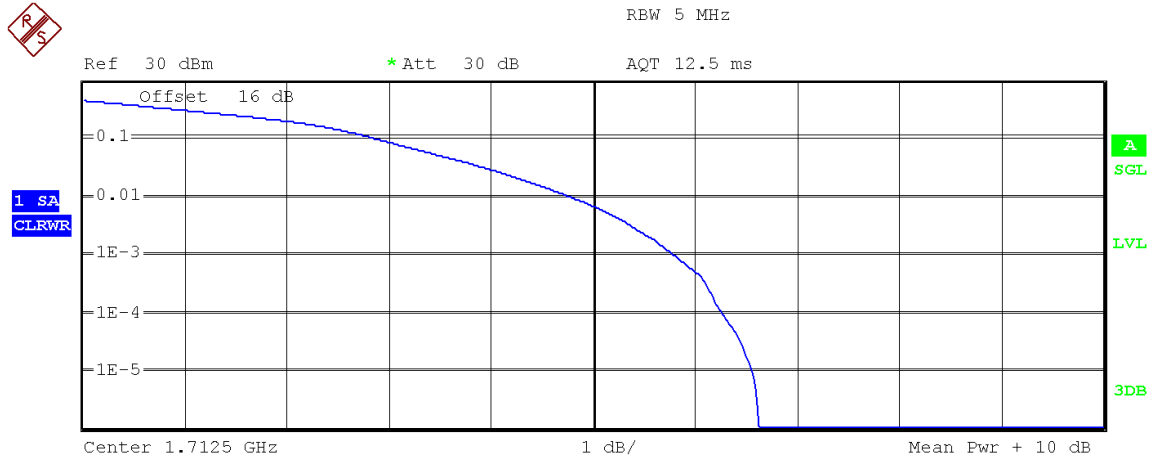
Center 1.7525 GHz 1 dB/

Complementary Cumulative Distribution Function  
NOF samples: 100000, Usable BW: 7.1MHz

| Trace 1 |       |     |
|---------|-------|-----|
| Mean    | 21.37 | dBm |
| Peak    | 26.53 | dBm |
| Crest   | 5.16  | dB  |
| 10 %    | 2.32  | dB  |
| 1 %     | 3.86  | dB  |
| .1 %    | 4.57  | dB  |
| .01 %   | 4.94  | dB  |

Bandwidth = 5 MHz. Modulation 16 QAM. RB Size: 25. RB Offset: 0.

## Channel Low:

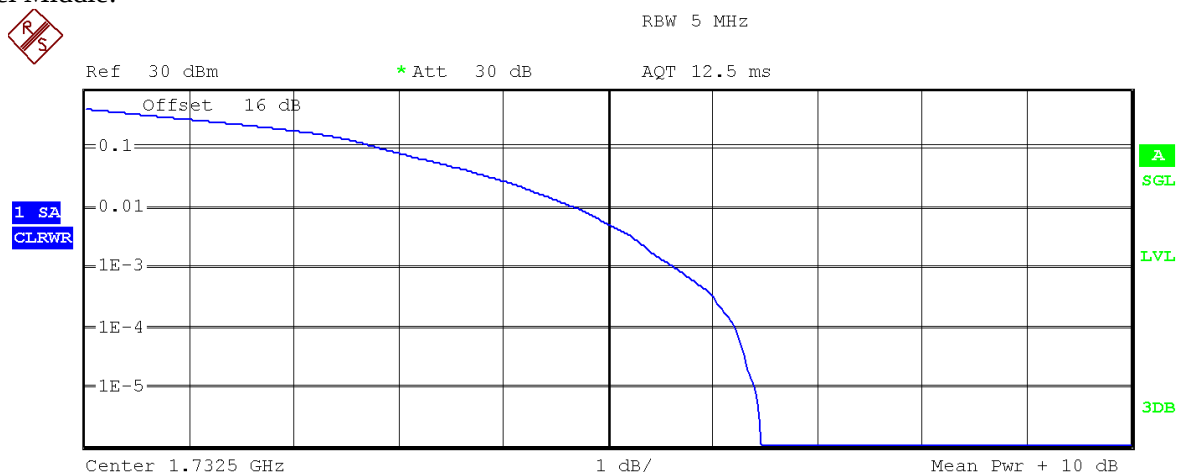


Center 1.7125 GHz 1 dB/

Complementary Cumulative Distribution Function  
NOF samples: 100000, Usable BW: 7.1MHz

| Trace 1 |       |     |
|---------|-------|-----|
| Mean    | 20.19 | dBm |
| Peak    | 26.82 | dBm |
| Crest   | 6.63  | dB  |
| 10 %    | 2.88  | dB  |
| 1 %     | 4.78  | dB  |
| .1 %    | 5.80  | dB  |
| .01 %   | 6.27  | dB  |

## Channel Middle:

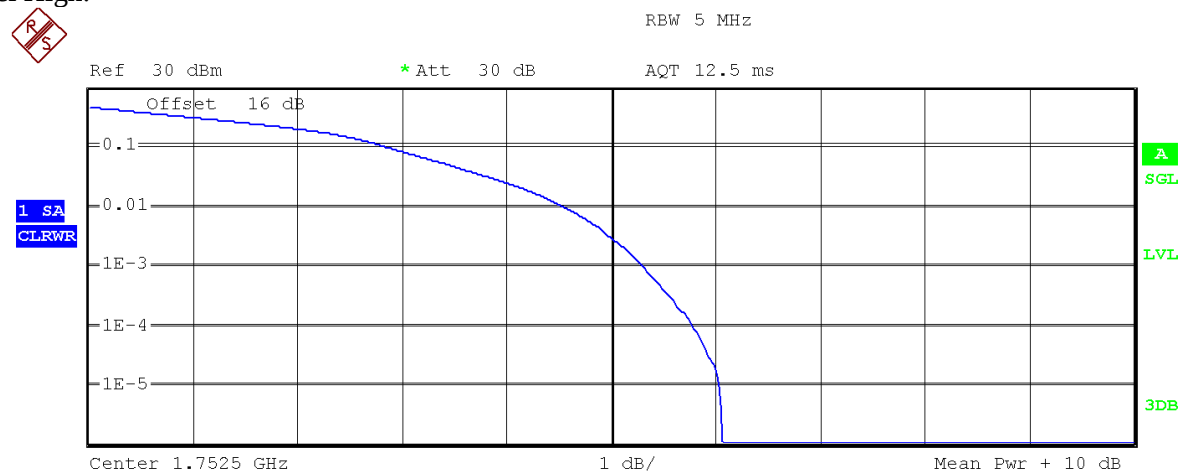


Complementary Cumulative Distribution Function  
NOF samples: 100000, Usable BW: 7.1MHz

Trace 1  
Mean 20.35 dBm  
Peak 26.82 dBm  
Crest 6.47 dB

|       |         |
|-------|---------|
| 10 %  | 2.85 dB |
| 1 %   | 4.71 dB |
| .1 %  | 5.66 dB |
| .01 % | 6.22 dB |

## Channel High:



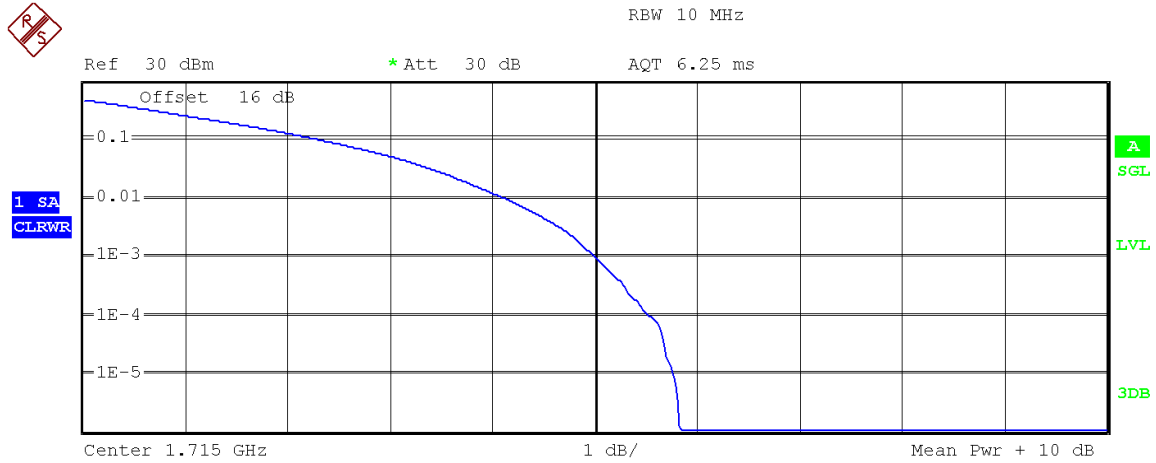
Complementary Cumulative Distribution Function  
NOF samples: 100000, Usable BW: 7.1MHz

Trace 1  
Mean 20.40 dBm  
Peak 26.46 dBm  
Crest 6.06 dB

|       |         |
|-------|---------|
| 10 %  | 2.87 dB |
| 1 %   | 4.54 dB |
| .1 %  | 5.30 dB |
| .01 % | 5.79 dB |

Bandwidth = 10 MHz. Modulation QPSK. RB Size: 50. RB Offset: 0.

Channel Low:

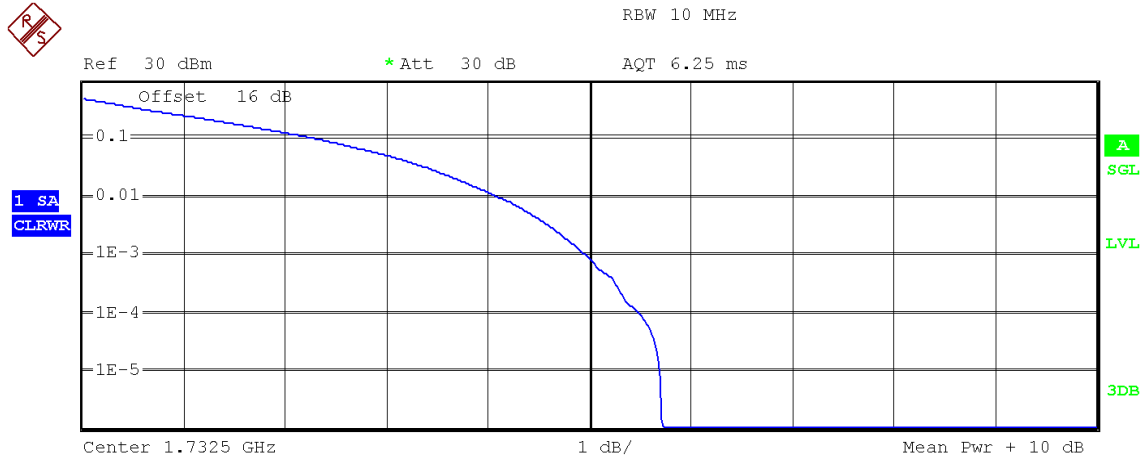


Complementary Cumulative Distribution Function  
NOF samples: 100000, Usable BW: 11.2MHz

Trace 1  
Mean 21.33 dBm  
Peak 27.16 dBm  
Crest 5.83 dB

|       |         |
|-------|---------|
| 10 %  | 2.31 dB |
| 1 %   | 4.12 dB |
| .1 %  | 5.00 dB |
| .01 % | 5.53 dB |

Channel Middle:

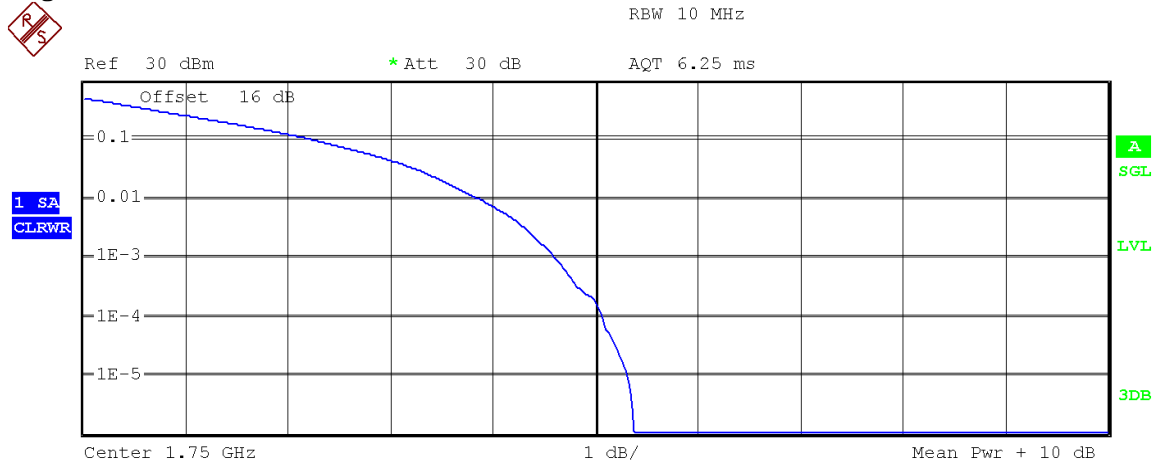


Complementary Cumulative Distribution Function  
NOF samples: 100000, Usable BW: 11.2MHz

Trace 1  
Mean 21.49 dBm  
Peak 27.21 dBm  
Crest 5.72 dB

|       |         |
|-------|---------|
| 10 %  | 2.32 dB |
| 1 %   | 4.10 dB |
| .1 %  | 4.97 dB |
| .01 % | 5.50 dB |

## Channel High:



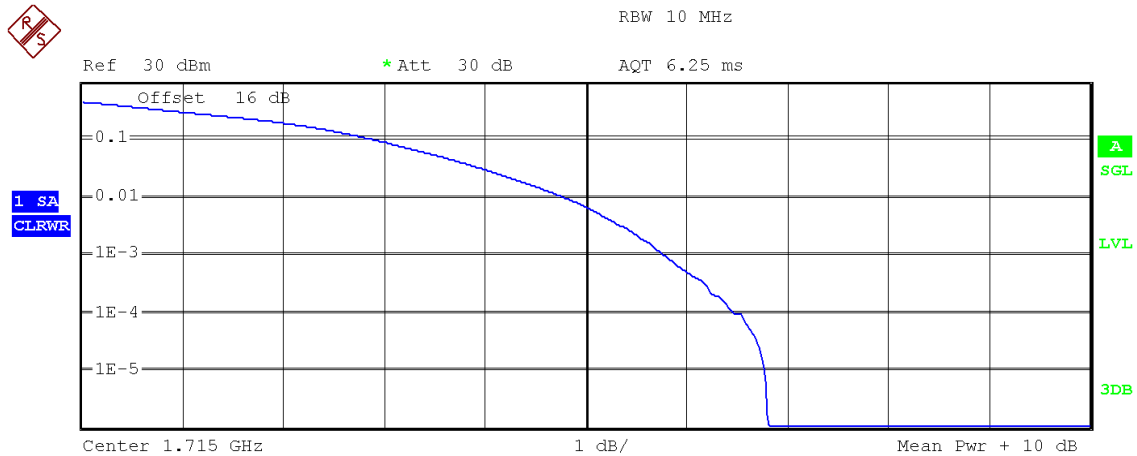
Complementary Cumulative Distribution Function  
NOF samples: 100000, Usable BW: 11.2MHz

Trace 1  
Mean 21.57 dBm  
Peak 26.95 dBm  
Crest 5.38 dB

|       |         |
|-------|---------|
| 10 %  | 2.24 dB |
| 1 %   | 3.86 dB |
| .1 %  | 4.60 dB |
| .01 % | 5.06 dB |

Bandwidth = 10 MHz. Modulation 16 QAM. RB Size: 50. RB Offset: 0.

## Channel Low:

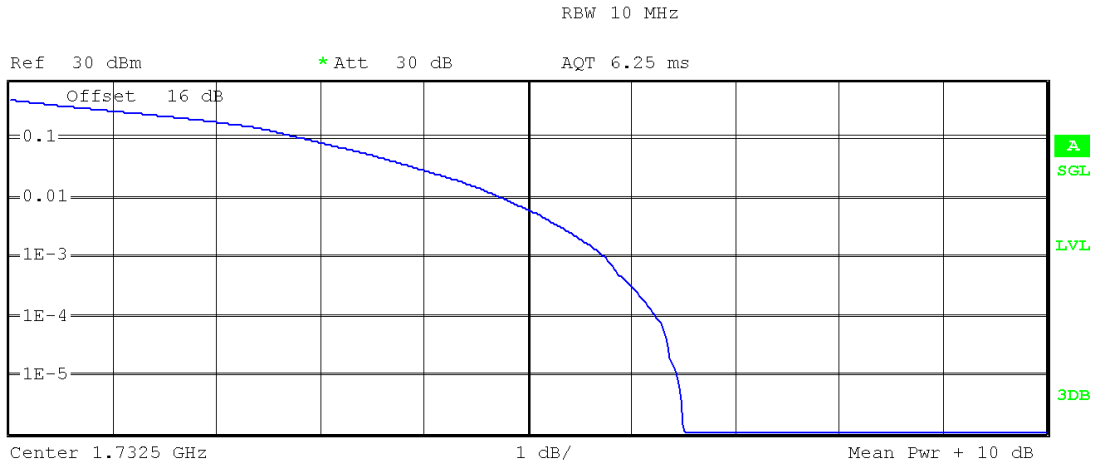


Complementary Cumulative Distribution Function  
NOF samples: 100000, Usable BW: 11.2MHz

Trace 1  
Mean 20.35 dBm  
Peak 27.16 dBm  
Crest 6.81 dB

|       |         |
|-------|---------|
| 10 %  | 2.92 dB |
| 1 %   | 4.79 dB |
| .1 %  | 5.77 dB |
| .01 % | 6.47 dB |

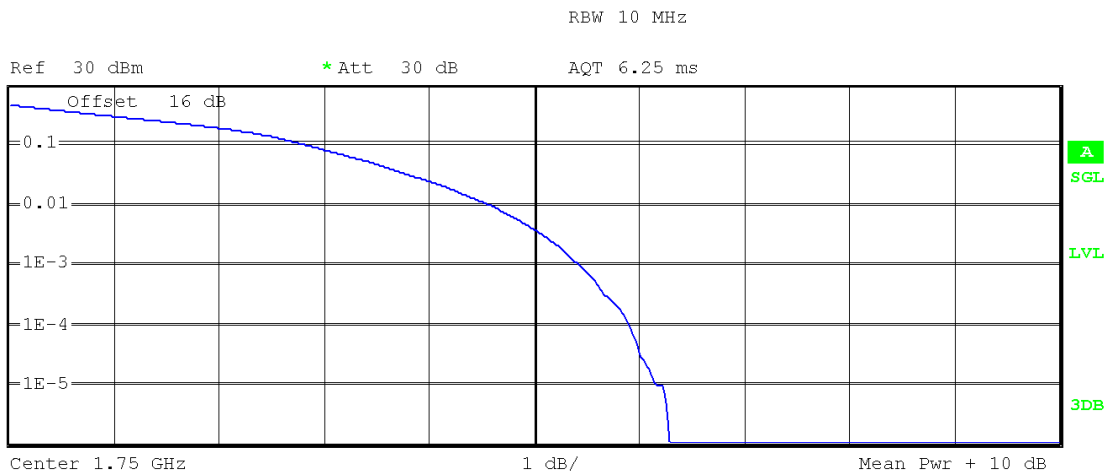
### Channel Middle:



Complementary Cumulative Distribution Function  
NOF samples: 100000, Usable BW: 11.2MHz

| Trace 1 |       |     |  |
|---------|-------|-----|--|
| Mean    | 20.49 | dBm |  |
| Peak    | 27.00 | dBm |  |
| Crest   | 6.51  | dB  |  |
| 10 %    | 2.87  | dB  |  |
| 1 %     | 4.76  | dB  |  |
| .1 %    | 5.75  | dB  |  |
| .01 %   | 6.23  | dB  |  |

### Channel High:

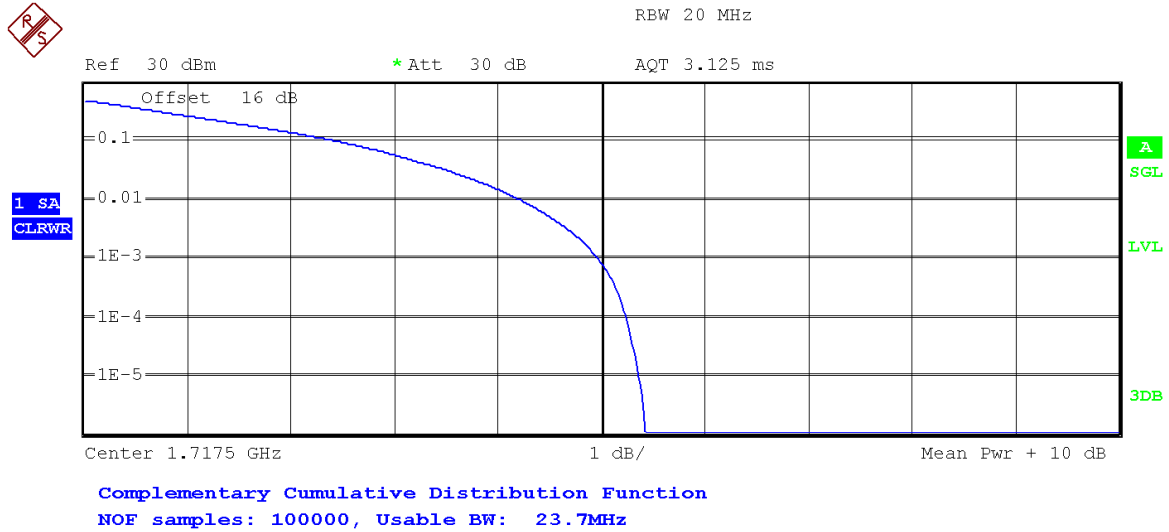


Complementary Cumulative Distribution Function  
NOF samples: 100000, Usable BW: 11.2MHz

| Trace 1 |       |     |  |
|---------|-------|-----|--|
| Mean    | 20.59 | dBm |  |
| Peak    | 26.88 | dBm |  |
| Crest   | 6.29  | dB  |  |
| 10 %    | 2.84  | dB  |  |
| 1 %     | 4.58  | dB  |  |
| .1 %    | 5.43  | dB  |  |
| .01 %   | 5.91  | dB  |  |

Bandwidth = 15 MHz. Modulation QPSK. RB Size: 75. RB Offset: 0.

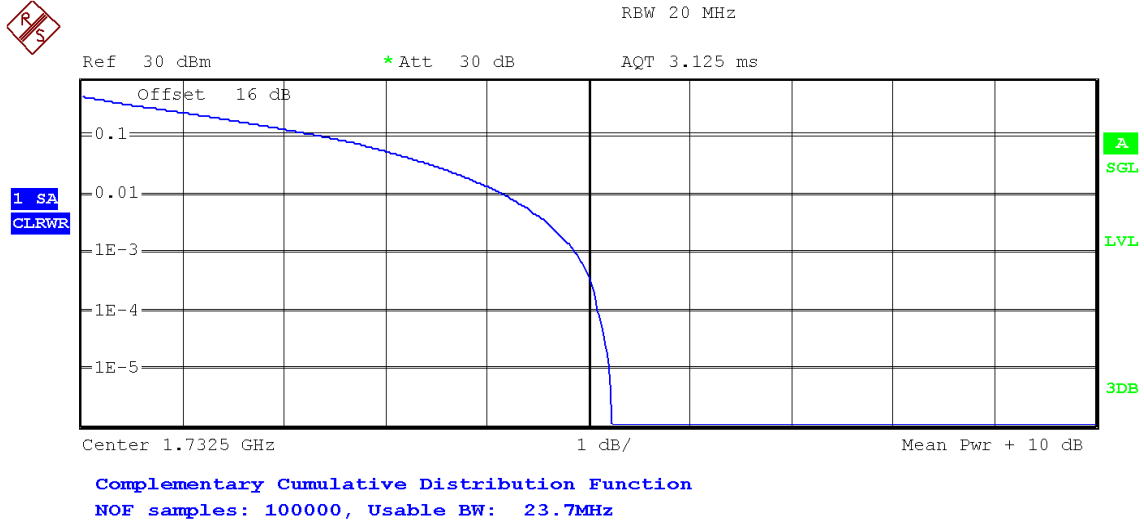
Channel Low:



Trace 1  
Mean 21.36 dBm  
Peak 26.79 dBm  
Crest 5.43 dB

|       |         |
|-------|---------|
| 10 %  | 2.44 dB |
| 1 %   | 4.21 dB |
| .1 %  | 4.97 dB |
| .01 % | 5.24 dB |

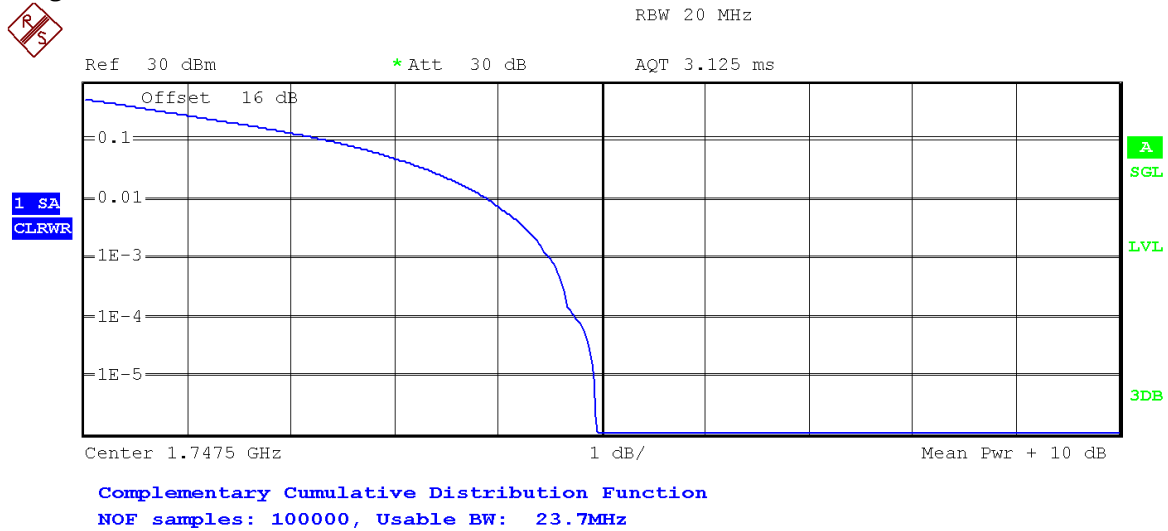
Channel Middle:



Trace 1  
Mean 21.48 dBm  
Peak 26.70 dBm  
Crest 5.23 dB

|       |         |
|-------|---------|
| 10 %  | 2.40 dB |
| 1 %   | 4.17 dB |
| .1 %  | 4.87 dB |
| .01 % | 5.10 dB |

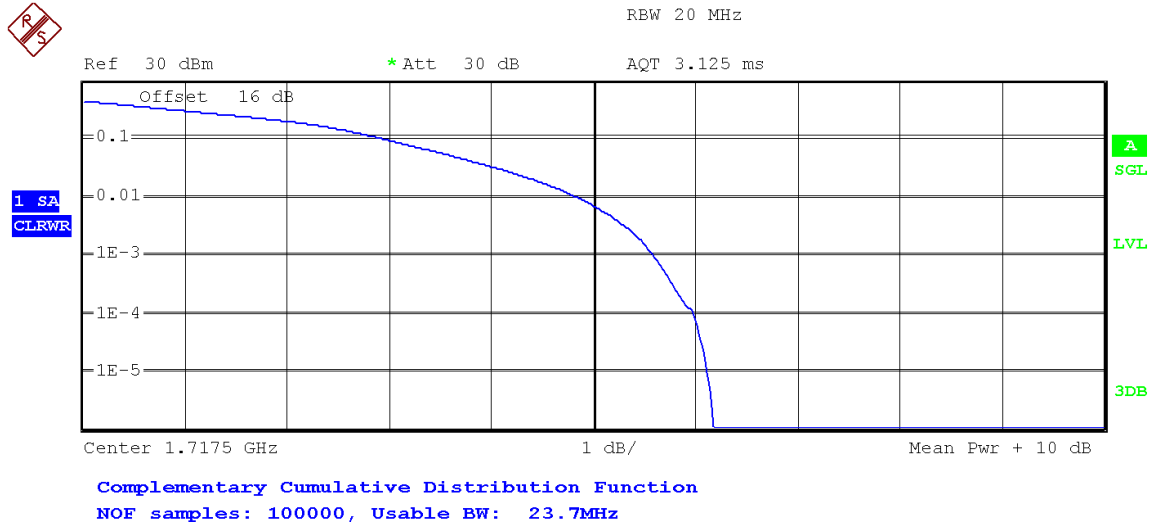
## Channel High:



| Trace 1 |       |     |
|---------|-------|-----|
| Mean    | 21.56 | dBm |
| Peak    | 26.51 | dBm |
| Crest   | 4.95  | dB  |
| 10 %    | 2.37  | dB  |
| 1 %     | 3.91  | dB  |
| .1 %    | 4.50  | dB  |
| .01 %   | 4.74  | dB  |

Bandwidth = 15 MHz. Modulation 16 QAM. RB Size: 75. RB Offset: 0.

## Channel Low:



| Trace 1 |       |     |
|---------|-------|-----|
| Mean    | 20.40 | dBm |
| Peak    | 26.58 | dBm |
| Crest   | 6.18  | dB  |
| 10 %    | 2.95  | dB  |
| 1 %     | 4.84  | dB  |
| .1 %    | 5.59  | dB  |
| .01 %   | 5.98  | dB  |

## Channel Middle:



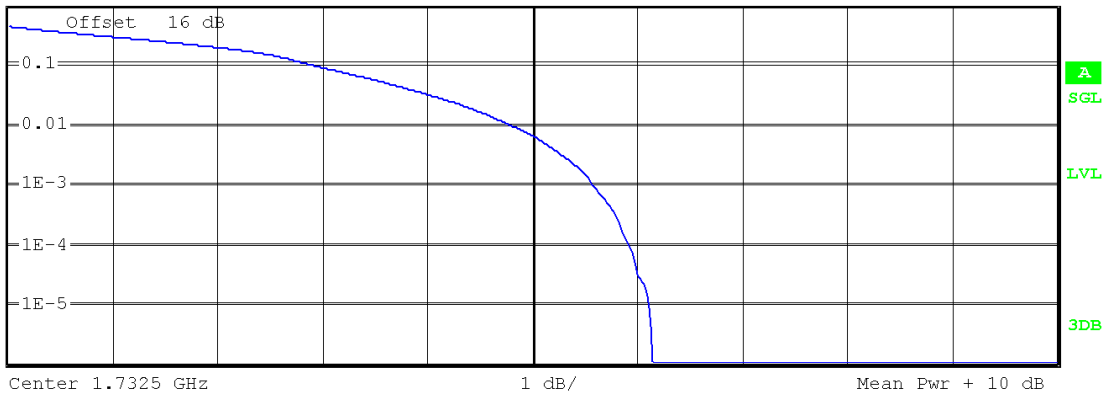
RBW 20 MHz

Ref 30 dBm

\* Att 30 dB

AQT 3.125 ms

1 SA  
CLRWR



Complementary Cumulative Distribution Function  
NOF samples: 100000, Usable BW: 23.7MHz

Trace 1  
Mean 20.49 dBm  
Peak 26.63 dBm  
Crest 6.14 dB

|       |         |
|-------|---------|
| 10 %  | 2.95 dB |
| 1 %   | 4.81 dB |
| .1 %  | 5.58 dB |
| .01 % | 5.93 dB |

## Channel High:



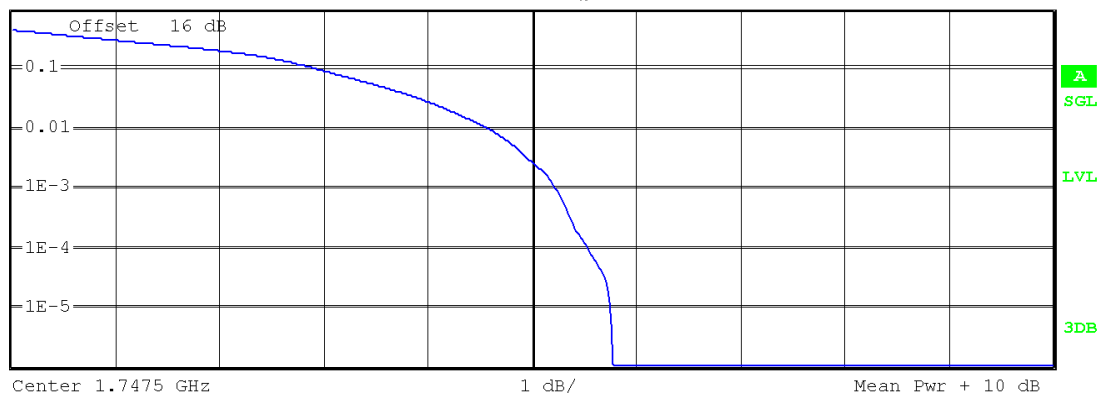
RBW 20 MHz

Ref 30 dBm

\* Att 30 dB

AQT 3.125 ms

1 SA  
CLRWR



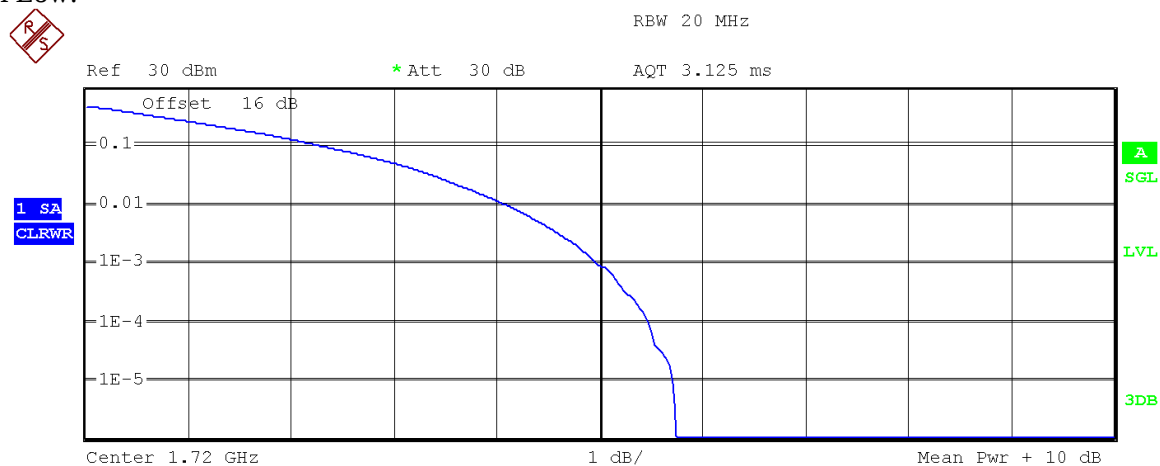
Complementary Cumulative Distribution Function  
NOF samples: 100000, Usable BW: 23.7MHz

Trace 1  
Mean 20.60 dBm  
Peak 26.37 dBm  
Crest 5.77 dB

|       |         |
|-------|---------|
| 10 %  | 2.96 dB |
| 1 %   | 4.58 dB |
| .1 %  | 5.22 dB |
| .01 % | 5.54 dB |

Bandwidth = 20 MHz. Modulation QPSK. RB Size: 100. RB Offset: 0.

Channel Low:

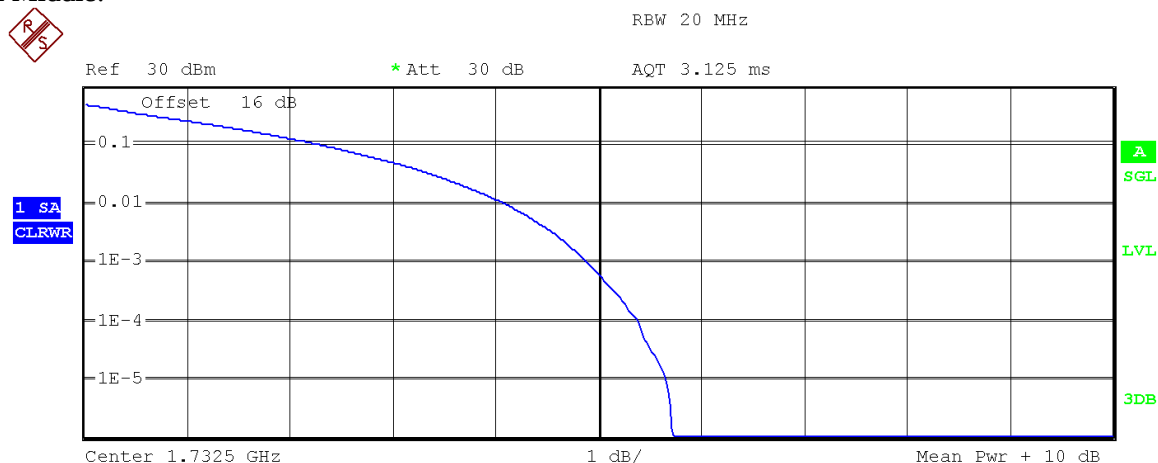


Complementary Cumulative Distribution Function  
NOF samples: 100000, Usable BW: 23.7MHz

Trace 1  
Mean 21.39 dBm  
Peak 27.13 dBm  
Crest 5.74 dB

|       |         |
|-------|---------|
| 10 %  | 2.31 dB |
| 1 %   | 4.09 dB |
| .1 %  | 4.97 dB |
| .01 % | 5.48 dB |

Channel Middle:

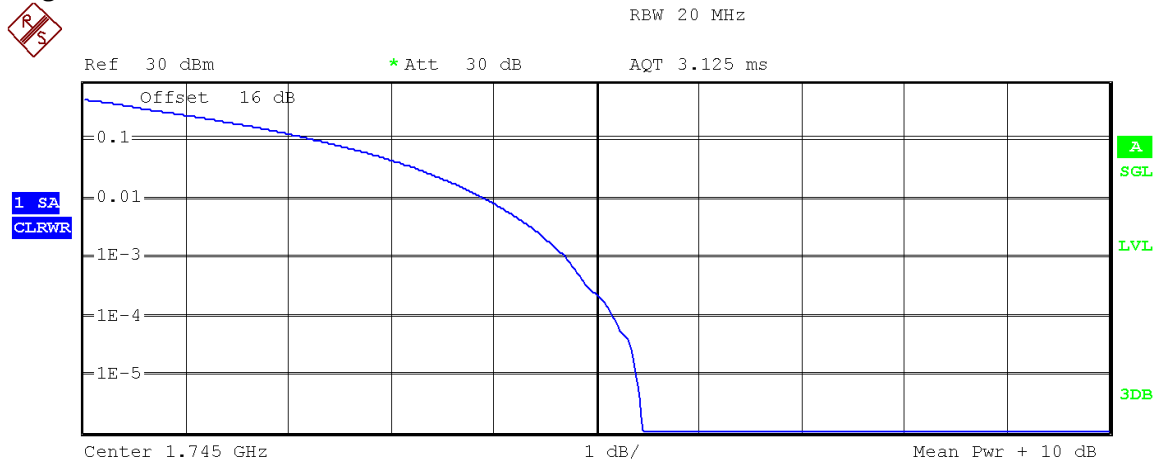


Complementary Cumulative Distribution Function  
NOF samples: 100000, Usable BW: 23.7MHz

Trace 1  
Mean 21.48 dBm  
Peak 27.20 dBm  
Crest 5.72 dB

|       |         |
|-------|---------|
| 10 %  | 2.32 dB |
| 1 %   | 4.10 dB |
| .1 %  | 4.89 dB |
| .01 % | 5.38 dB |

## Channel High:



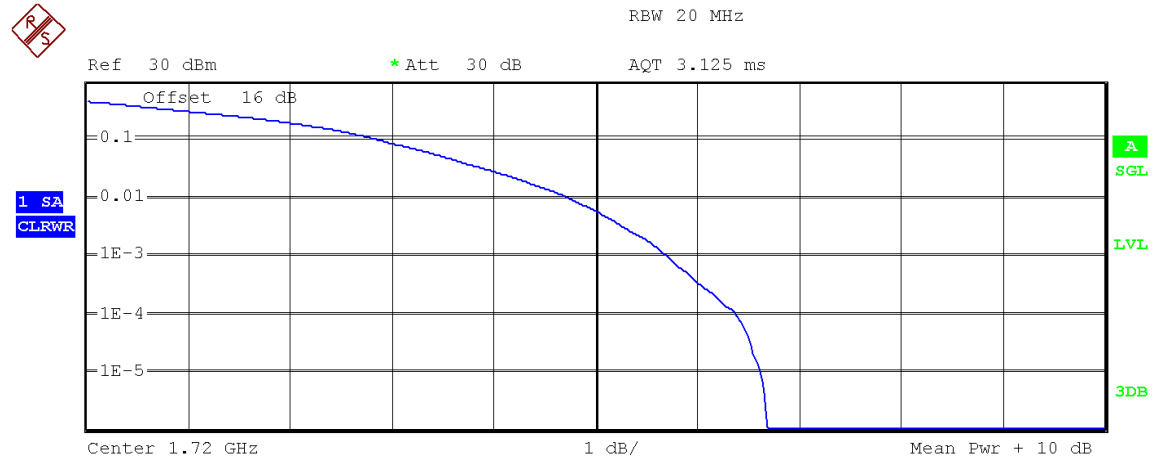
Complementary Cumulative Distribution Function  
NOF samples: 100000, Usable BW: 23.7MHz

Trace 1  
Mean 21.55 dBm  
Peak 27.00 dBm  
Crest 5.45 dB

|       |         |
|-------|---------|
| 10 %  | 2.28 dB |
| 1 %   | 3.93 dB |
| .1 %  | 4.71 dB |
| .01 % | 5.16 dB |

Bandwidth = 20 MHz. Modulation 16 QAM. RB Size: 100. RB Offset: 0.

## Channel Low:

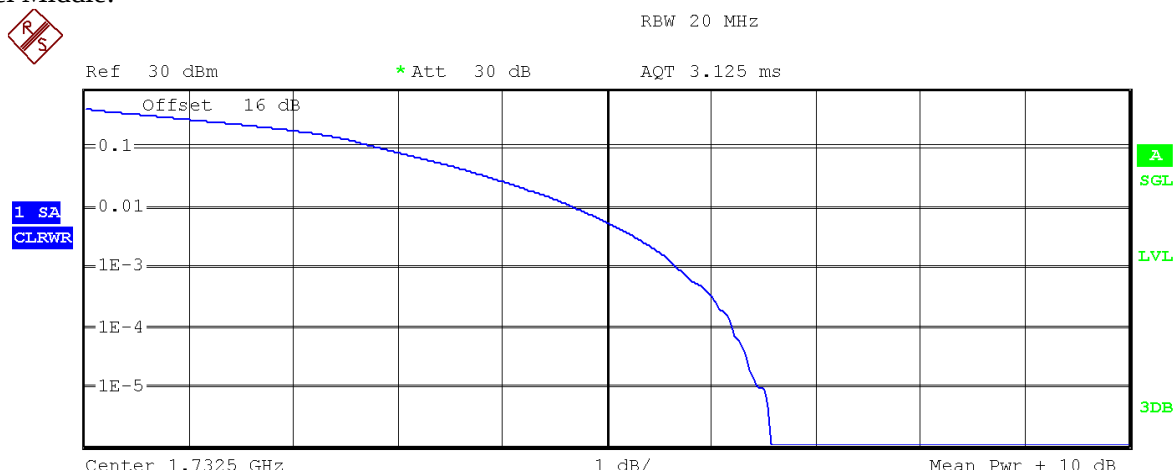


Complementary Cumulative Distribution Function  
NOF samples: 100000, Usable BW: 23.7MHz

Trace 1  
Mean 20.37 dBm  
Peak 27.06 dBm  
Crest 6.69 dB

|       |         |
|-------|---------|
| 10 %  | 2.87 dB |
| 1 %   | 4.73 dB |
| .1 %  | 5.71 dB |
| .01 % | 6.38 dB |

## Channel Middle:

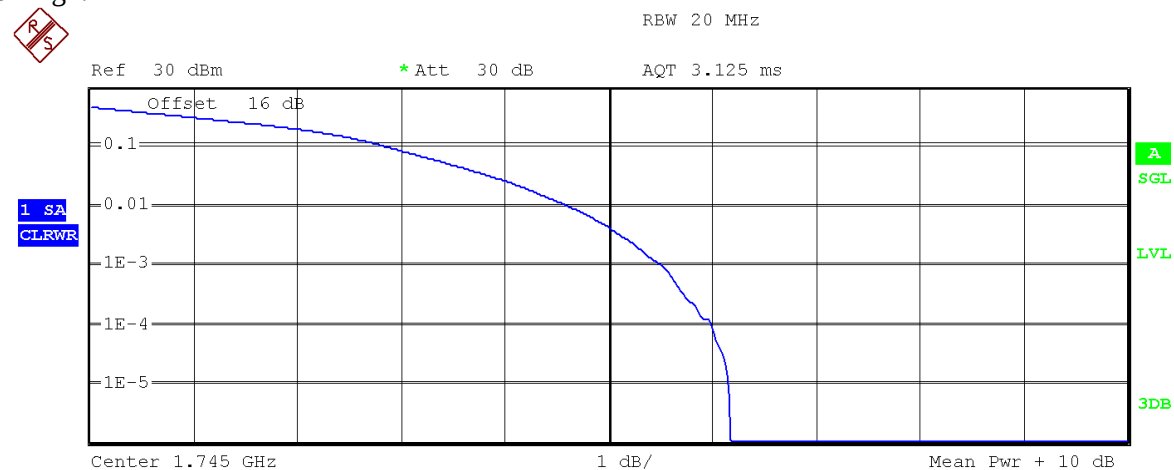


Complementary Cumulative Distribution Function  
NOF samples: 100000, Usable BW: 23.7MHz

Trace 1  
Mean 20.48 dBm  
Peak 27.06 dBm  
Crest 6.58 dB

|       |         |
|-------|---------|
| 10 %  | 2.87 dB |
| 1 %   | 4.71 dB |
| .1 %  | 5.67 dB |
| .01 % | 6.20 dB |

## Channel High:



Complementary Cumulative Distribution Function  
NOF samples: 100000, Usable BW: 23.7MHz

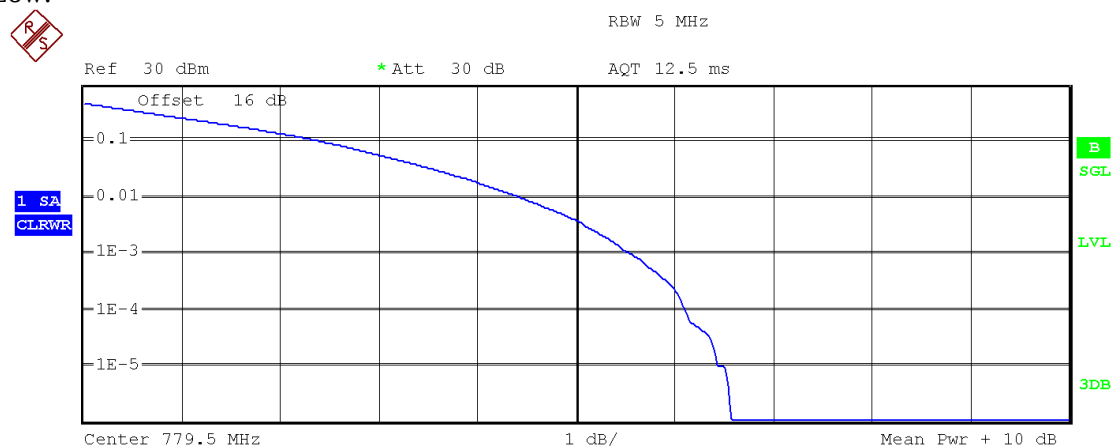
Trace 1  
Mean 20.54 dBm  
Peak 26.72 dBm  
Crest 6.18 dB

|       |         |
|-------|---------|
| 10 %  | 2.87 dB |
| 1 %   | 4.62 dB |
| .1 %  | 5.51 dB |
| .01 % | 5.99 dB |

### LTE. BAND XIII.

Bandwidth = 5 MHz. Modulation QPSK. RB Size: 25. RB Offset: 0.

Channel Low:

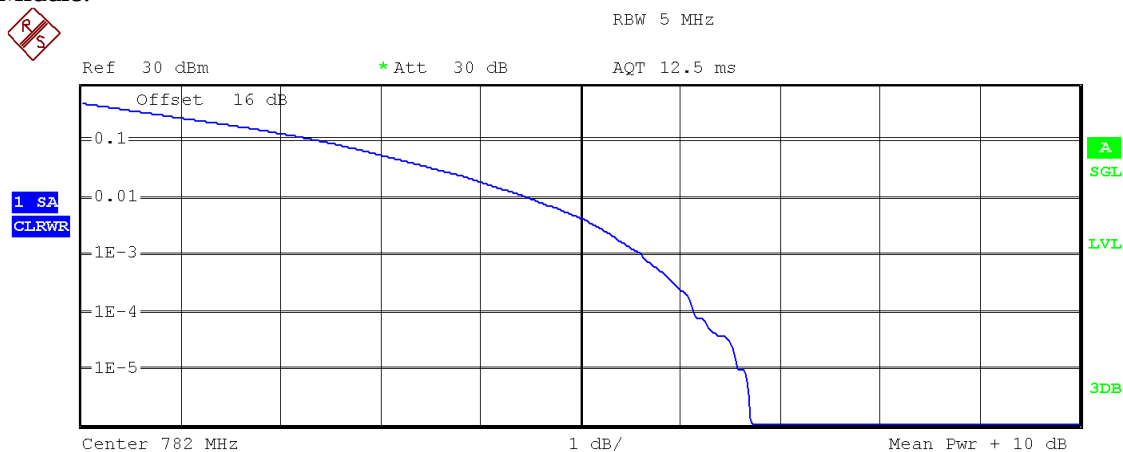


Complementary Cumulative Distribution Function  
NOF samples: 100000, Usable BW: 7.1MHz

Trace 1  
Mean 21.42 dBm  
Peak 28.00 dBm  
Crest 6.57 dB

|       |         |
|-------|---------|
| 10 %  | 2.42 dB |
| 1 %   | 4.44 dB |
| .1 %  | 5.54 dB |
| .01 % | 6.11 dB |

Channel Middle:

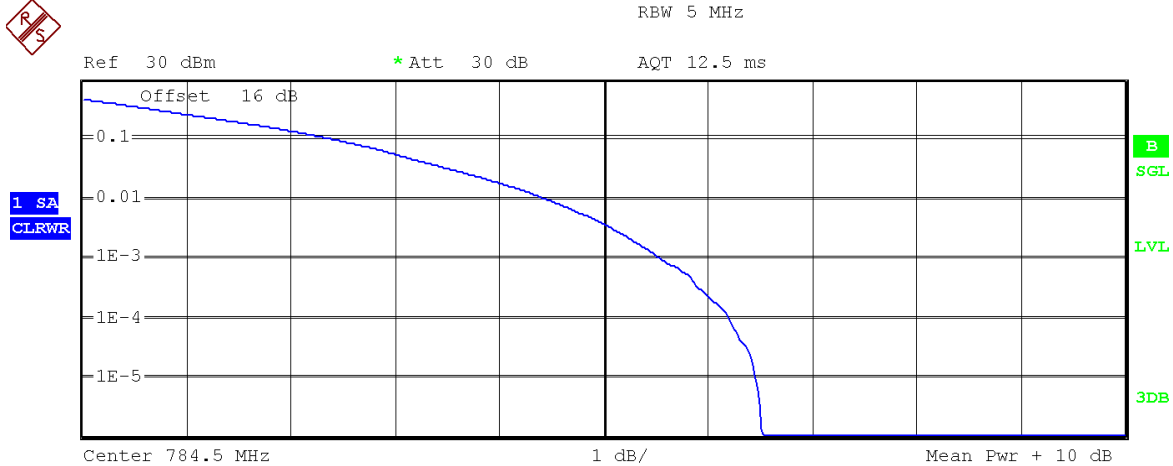


Complementary Cumulative Distribution Function  
NOF samples: 100000, Usable BW: 7.1MHz

Trace 1  
Mean 21.57 dBm  
Peak 28.28 dBm  
Crest 6.71 dB

|       |         |
|-------|---------|
| 10 %  | 2.42 dB |
| 1 %   | 4.49 dB |
| .1 %  | 5.63 dB |
| .01 % | 6.15 dB |

## Channel High:



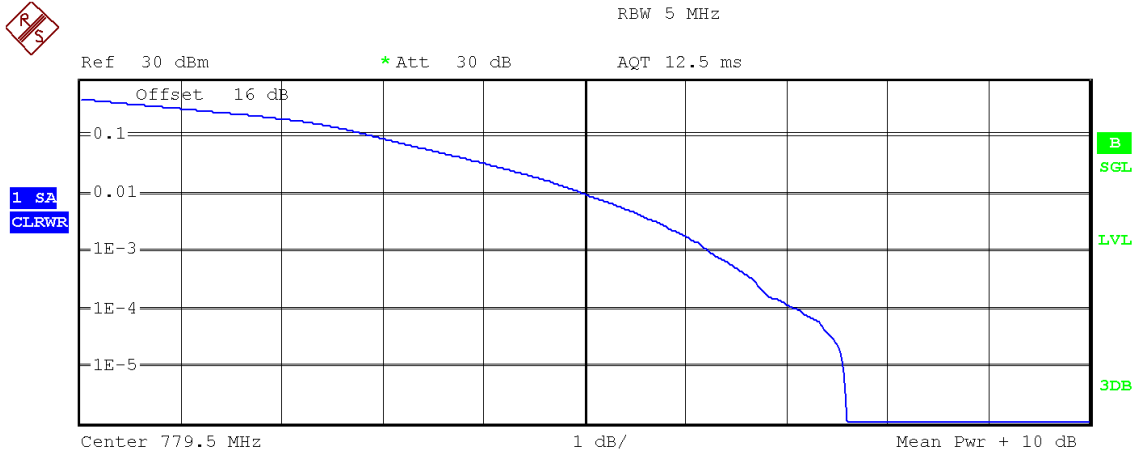
Complementary Cumulative Distribution Function  
NOF samples: 100000, Usable BW: 7.1MHz

Trace 1

|       |           |
|-------|-----------|
| Mean  | 21.48 dBm |
| Peak  | 28.00 dBm |
| Crest | 6.52 dB   |
| 10 %  | 2.42 dB   |
| 1 %   | 4.46 dB   |
| .1 %  | 5.54 dB   |
| .01 % | 6.20 dB   |

Bandwidth = 5 MHz. Modulation 16 QAM. RB Size: 25. RB Offset: 0.

## Channel Low:

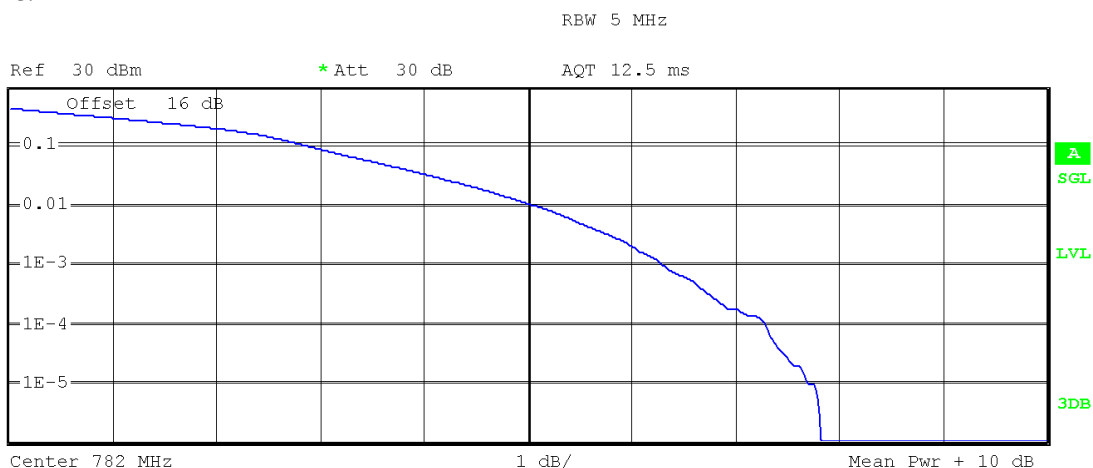


Complementary Cumulative Distribution Function  
NOF samples: 100000, Usable BW: 7.1MHz

Trace 1

|       |           |
|-------|-----------|
| Mean  | 20.54 dBm |
| Peak  | 28.14 dBm |
| Crest | 7.60 dB   |
| 10 %  | 2.92 dB   |
| 1 %   | 5.00 dB   |
| .1 %  | 6.23 dB   |
| .01 % | 7.12 dB   |

## Channel Middle:

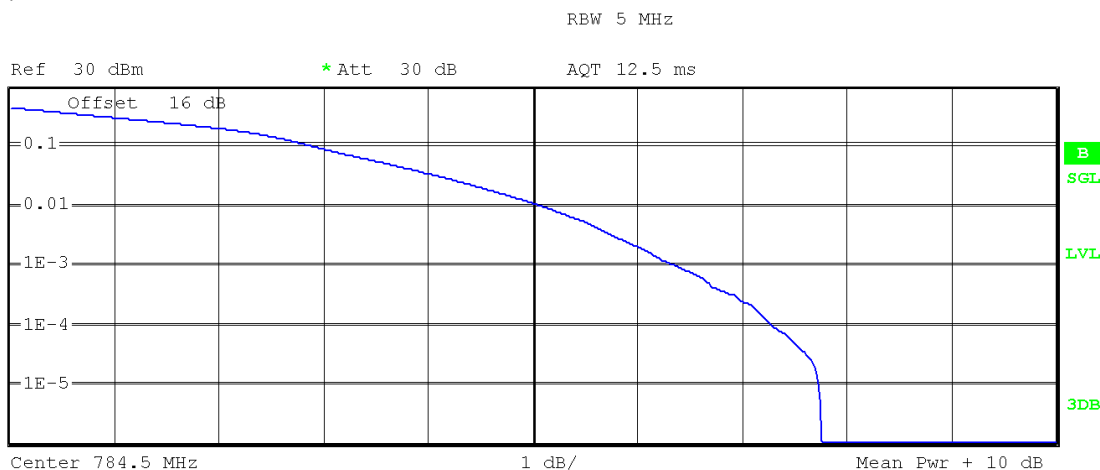


Complementary Cumulative Distribution Function  
NOF samples: 100000, Usable BW: 7.1MHz

Trace 1  
Mean 20.66 dBm  
Peak 28.49 dBm  
Crest 7.83 dB

10 % 2.92 dB  
1 % 5.08 dB  
.1 % 6.31 dB  
.01 % 7.29 dB

## Channel High:



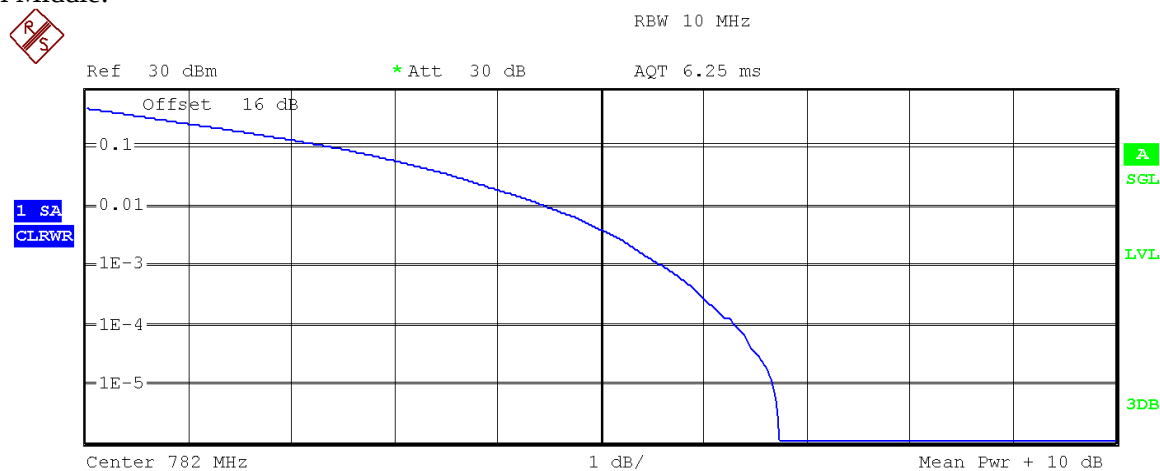
Complementary Cumulative Distribution Function  
NOF samples: 100000, Usable BW: 7.1MHz

Trace 1  
Mean 20.59 dBm  
Peak 28.35 dBm  
Crest 7.76 dB

10 % 2.90 dB  
1 % 5.10 dB  
.1 % 6.36 dB  
.01 % 7.28 dB

Bandwidth = 10 MHz. Modulation QPSK. RB Size: 50. RB Offset: 0.

Channel Middle:



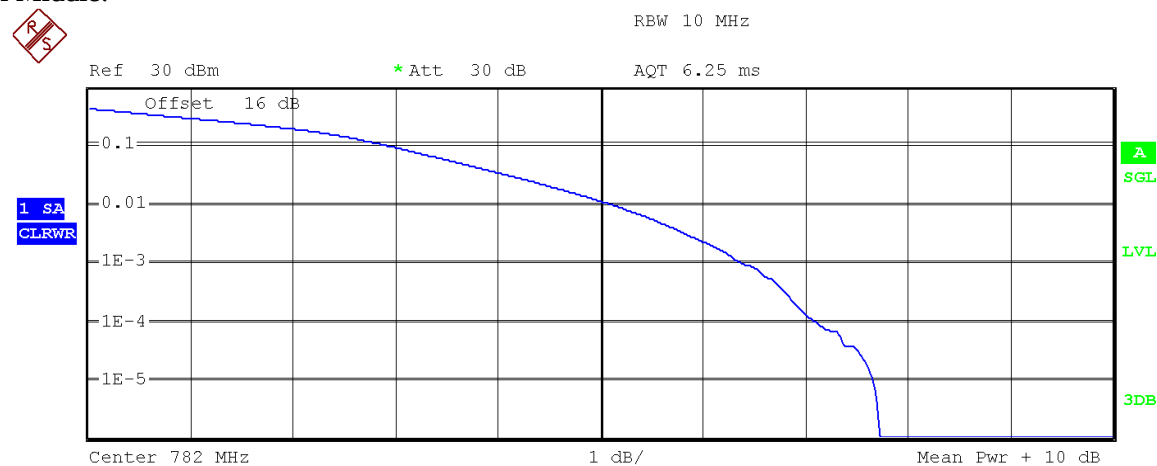
Complementary Cumulative Distribution Function  
NOF samples: 100000, Usable BW: 11.2MHz

Trace 1  
Mean 21.75 dBm  
Peak 28.49 dBm  
Crest 6.74 dB

|       |         |
|-------|---------|
| 10 %  | 2.42 dB |
| 1 %   | 4.49 dB |
| .1 %  | 5.61 dB |
| .01 % | 6.31 dB |

Bandwidth = 10 MHz. Modulation 16 QAM. RB Size: 50. RB Offset: 0.

Channel Middle:



Complementary Cumulative Distribution Function  
NOF samples: 100000, Usable BW: 11.2MHz

Trace 1  
Mean 20.83 dBm  
Peak 28.56 dBm  
Crest 7.73 dB

|       |         |
|-------|---------|
| 10 %  | 2.95 dB |
| 1 %   | 5.13 dB |
| .1 %  | 6.38 dB |
| .01 % | 7.10 dB |

LTE QPSK AND 16QAM MODULATION. BAND IV. Bandwidth = 1.4 MHz

| Channel                                                               | Lowest | Middle | Highest |
|-----------------------------------------------------------------------|--------|--------|---------|
| Maximum declared antenna gain (dBi)                                   | 2.14   | 2.14   | 2.14    |
| Measured maximum average power (dBm) at antenna port                  | 22.24  | 22.27  | 22.33   |
| Maximum effective isotropically radiated average power E.I.R.P. (dBm) | 24.38  | 24.41  | 24.47   |
| Peak-to-average ratio (PAR) (dB)                                      | 5.50   | 5.32   | 4.97    |
| Measurement uncertainty (dB)                                          | <±1.11 |        |         |

LTE QPSK AND 16QAM MODULATION. BAND IV. Bandwidth = 3 MHz

| Channel                                                               | Lowest | Middle | Highest |
|-----------------------------------------------------------------------|--------|--------|---------|
| Maximum declared antenna gain (dBi)                                   | 2.14   | 2.14   | 2.14    |
| Measured maximum average power (dBm) at antenna port                  | 22.19  | 22.30  | 22.38   |
| Maximum effective isotropically radiated average power E.I.R.P. (dBm) | 24.33  | 24.44  | 24.52   |
| Peak-to-average ratio (PAR) (dB)                                      | 5.93   | 5.75   | 5.54    |
| Measurement uncertainty (dB)                                          | <±1.11 |        |         |

LTE QPSK AND 16QAM MODULATION. BAND IV. Bandwidth = 5 MHz

| Channel                                                               | Lowest | Middle | Highest |
|-----------------------------------------------------------------------|--------|--------|---------|
| Maximum declared antenna gain (dBi)                                   | 2.14   | 2.14   | 2.14    |
| Measured maximum average power (dBm) at antenna port                  | 22.26  | 22.20  | 22.37   |
| Maximum effective isotropically radiated average power E.I.R.P. (dBm) | 24.40  | 24.34  | 24.51   |
| Peak-to-average ratio (PAR) (dB)                                      | 5.80   | 5.66   | 5.30    |
| Measurement uncertainty (dB)                                          | ±1.11  |        |         |

LTE QPSK AND 16QAM MODULATION. BAND IV. Bandwidth = 10 MHz

| Channel                                                               | Lowest | Middle | Highest |
|-----------------------------------------------------------------------|--------|--------|---------|
| Maximum declared antenna gain (dBi)                                   | 2.14   | 2.14   | 2.14    |
| Measured maximum average power (dBm) at antenna port                  | 22.37  | 22.40  | 22.57   |
| Maximum effective isotropically radiated average power E.I.R.P. (dBm) | 24.51  | 24.54  | 24.71   |
| Peak-to-average ratio (PAR) (dB)                                      | 5.77   | 5.75   | 5.43    |
| Measurement uncertainty (dB)                                          | ±1.11  |        |         |

LTE QPSK AND 16QAM MODULATION. BAND IV. Bandwidth = 15 MHz

| Channel                                                               | Lowest | Middle | Highest |
|-----------------------------------------------------------------------|--------|--------|---------|
| Maximum declared antenna gain (dBi)                                   | 2.14   | 2.14   | 2.14    |
| Measured maximum average power (dBm) at antenna port                  | 22.67  | 22.66  | 22.89   |
| Maximum effective isotropically radiated average power E.I.R.P. (dBm) | 24.81  | 24.80  | 25.03   |
| Peak-to-average ratio (PAR) (dB)                                      | 5.59   | 5.58   | 5.22    |
| Measurement uncertainty (dB)                                          | ±1.11  |        |         |

LTE QPSK AND 16QAM MODULATION. BAND IV. Bandwidth = 20 MHz

| Channel                                                               | Lowest | Middle | Highest |
|-----------------------------------------------------------------------|--------|--------|---------|
| Maximum declared antenna gain (dBi)                                   | 2.14   | 2.14   | 2.14    |
| Measured maximum average power (dBm) at antenna port                  | 22.39  | 22.30  | 22.55   |
| Maximum effective isotropically radiated average power E.I.R.P. (dBm) | 24.53  | 24.44  | 24.69   |
| Peak-to-average ratio (PAR) (dB)                                      | 5.71   | 5.67   | 5.51    |
| Measurement uncertainty (dB)                                          | <±1.11 |        |         |

LTE QPSK AND 16QAM MODULATION. BAND XIII. Bandwidth = 5 MHz

| Channel                                                           | Lowest | Middle | Highest |
|-------------------------------------------------------------------|--------|--------|---------|
| Maximum declared antenna gain (dBi)                               | 2.14   | 2.14   | 2.14    |
| Measured maximum average power (dBm) at antenna port              | 22.32  | 22.26  | 22.30   |
| Maximum effective isotropic radiated average power E.I.R.P. (dBm) | 24.46  | 24.40  | 24.44   |
| Maximum effective radiated average power E.R.P. (dBm)             | 22.31  | 22.25  | 22.29   |
| Peak-to-average ratio (PAR) (dB)                                  | 6.23   | 6.31   | 6.36    |
| Measurement uncertainty (dB)                                      | <±1.11 |        |         |

LTE QPSK AND 16QAM MODULATION. BAND XIII. Bandwidth = 10 MHz

| Channel                                                           | Middle |
|-------------------------------------------------------------------|--------|
| Maximum declared antenna gain (dBi)                               | 2.14   |
| Measured maximum average power (dBm) at antenna port              | 22.16  |
| Maximum effective isotropic radiated average power E.I.R.P. (dBm) | 24.30  |
| Maximum effective radiated average power E.R.P. (dBm)             | 22.15  |
| Peak-to-average ratio (PAR) (dB)                                  | 6.38   |
| Measurement uncertainty (dB)                                      | <±1.11 |

Verdict: PASS

## Modulation Characteristics

### SPECIFICATION

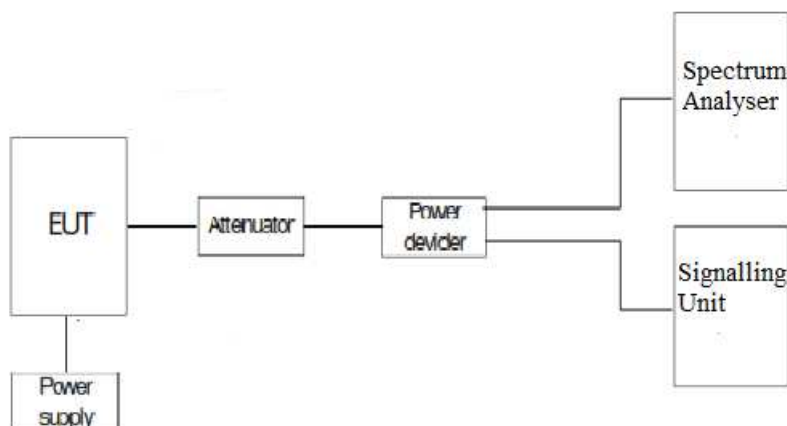
FCC §2.1047.

RSS-139. Clause 6.2. RSS-130. Clause 4.1. The devices shall employ digital modulation techniques.

### 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).

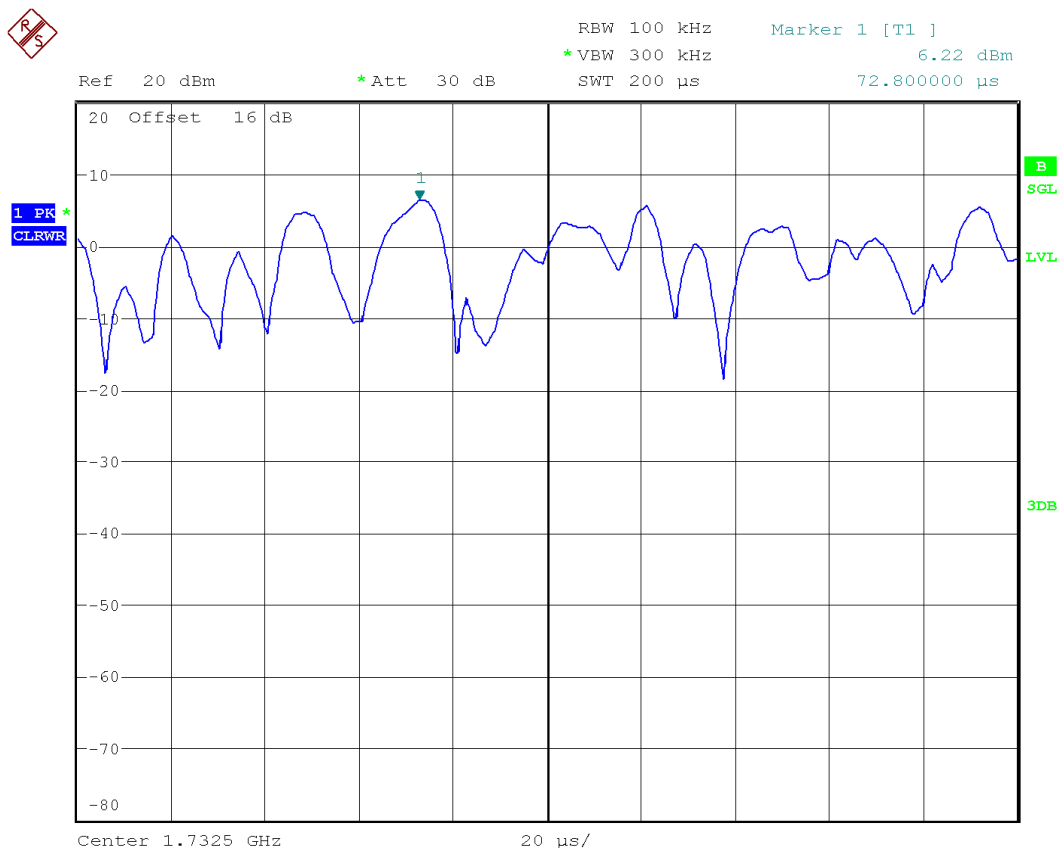
### TEST SETUP



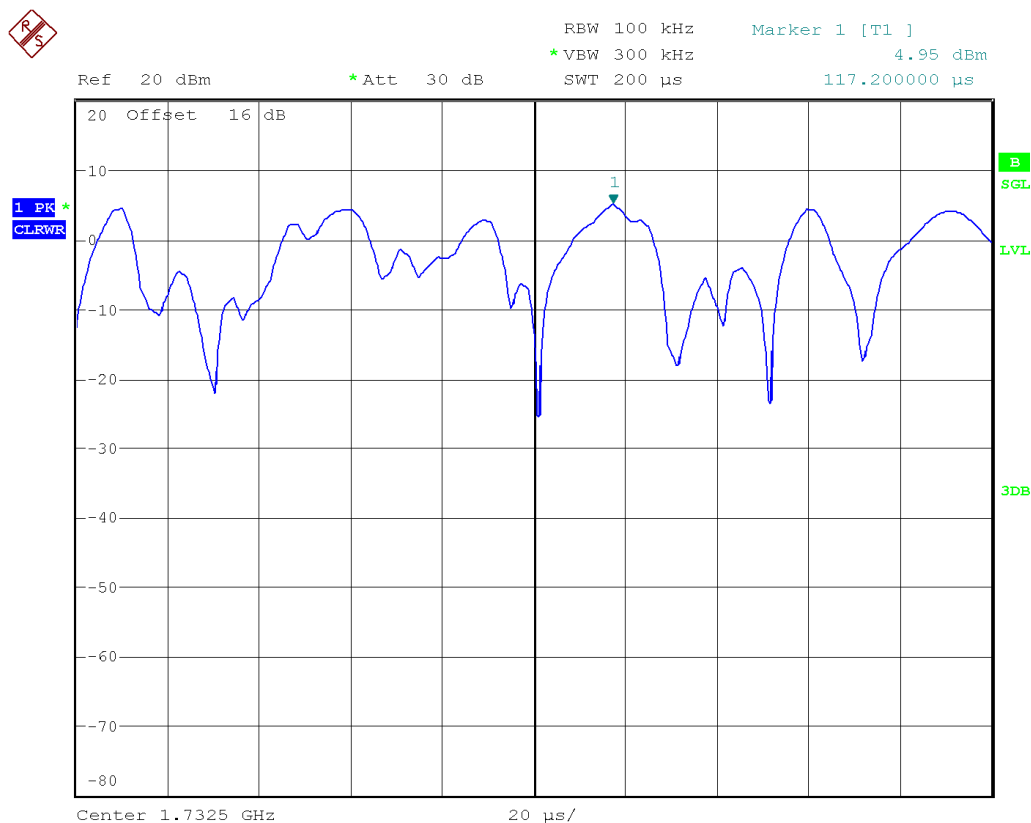
### RESULTS

The following plots show the modulation schemes in the EUT.

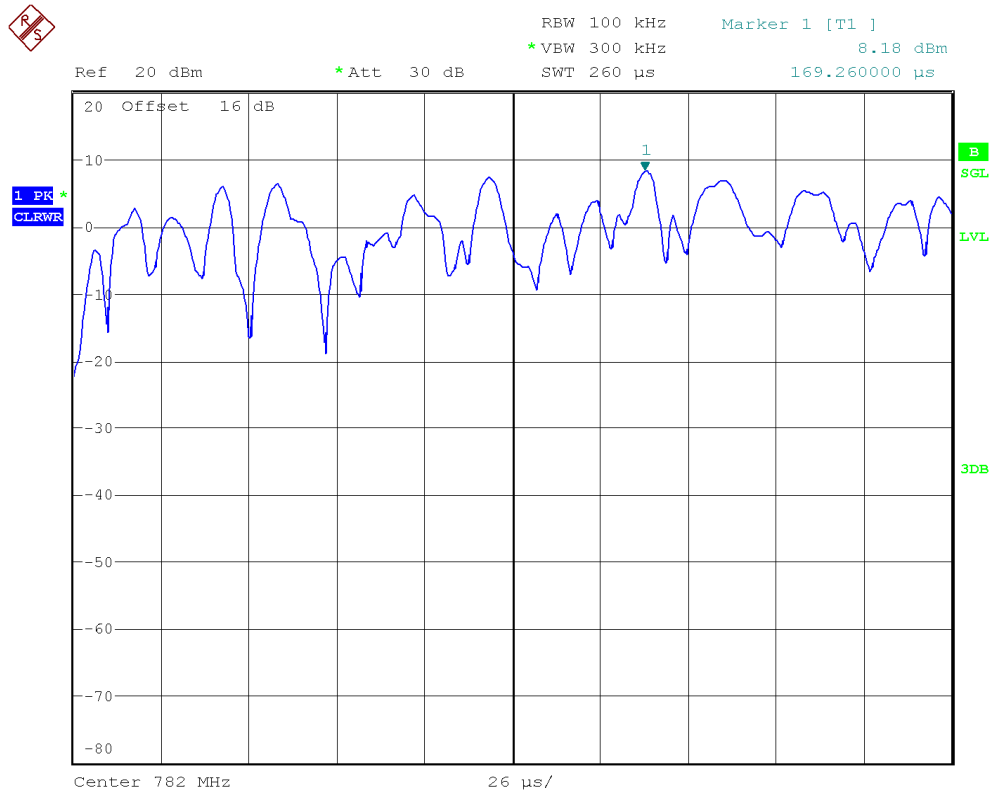
## LTE MODULATION. QPSK. Band IV



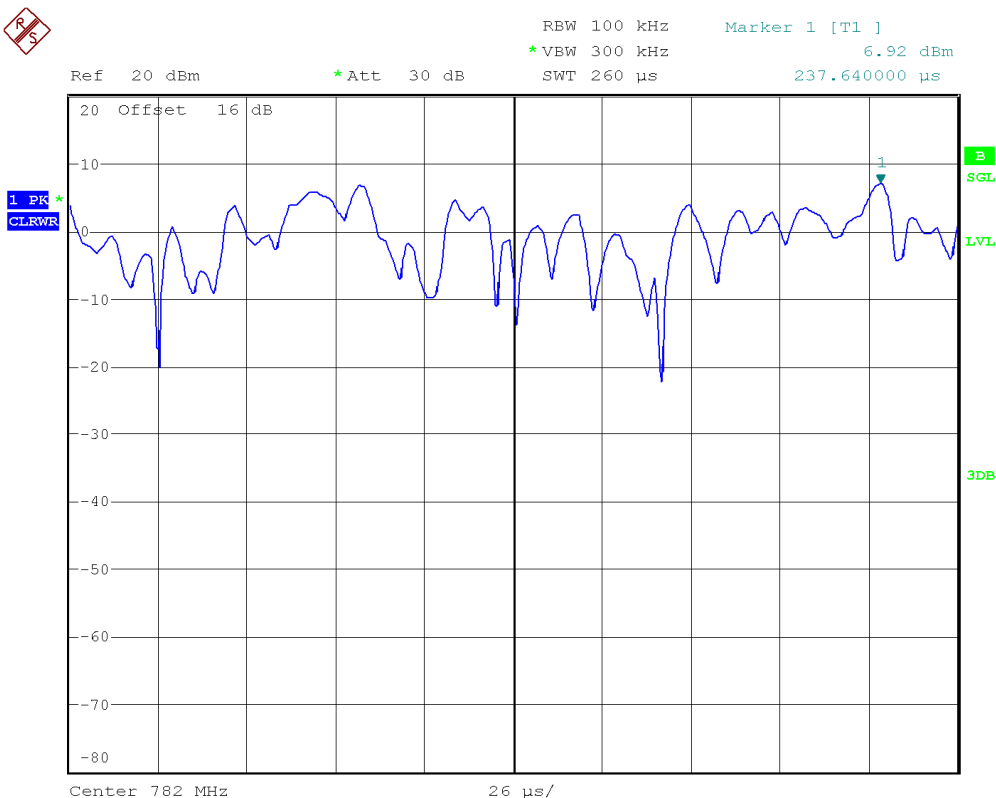
## LTE MODULATION. 16QAM. Band IV



## LTE MODULATION. QPSK. Band XIII



## LTE MODULATION. 16QAM. Band XIII



## Frequency Stability

### SPECIFICATION

FCC §2.1055 and §27.54.

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

RSS-139 Clause 6.4.

The frequency stability shall be sufficient to ensure that the occupied bandwidth stays within the operating frequency block when tested to the temperature and supply voltage variations

RSS-130. Clause 4.3.

The applicant shall ensure frequency stability by showing that  $f_L$  minus the frequency offset and  $f_H$  plus the frequency offset shall be within the frequency range in which the equipment is designed to operate.

### METHOD

The frequency tolerance measurements over temperature variations were made over the temperature range of  $-30^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$ . The EUT was placed inside a climatic chamber and the temperature was raised hourly in  $10^{\circ}\text{C}$  steps from  $-30^{\circ}\text{C}$  up to  $+50^{\circ}\text{C}$ .

The supply voltage was varied between 85% and 115% of nominal voltage.

The EUT was set in “call mode” in 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.

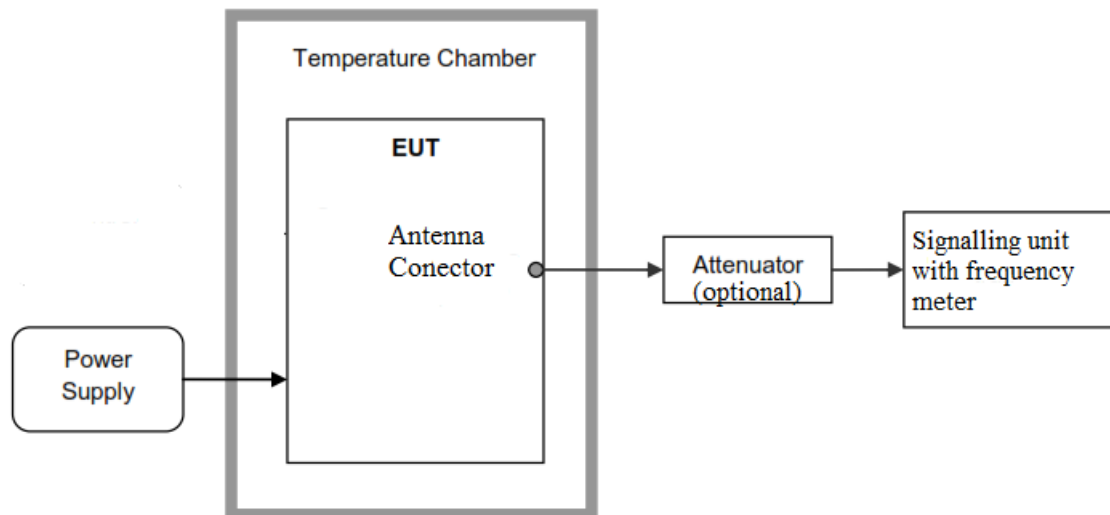
For LTE mode the QPSK modulation was used for the test as it is the worst case for conducted power.

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  $f_L$  and  $f_H$  respectively. The worst-case frequency offset determined in the above methods is added or subtracted from the values of  $f_L$  and  $f_H$  to check that the resulting frequencies remain within the band.

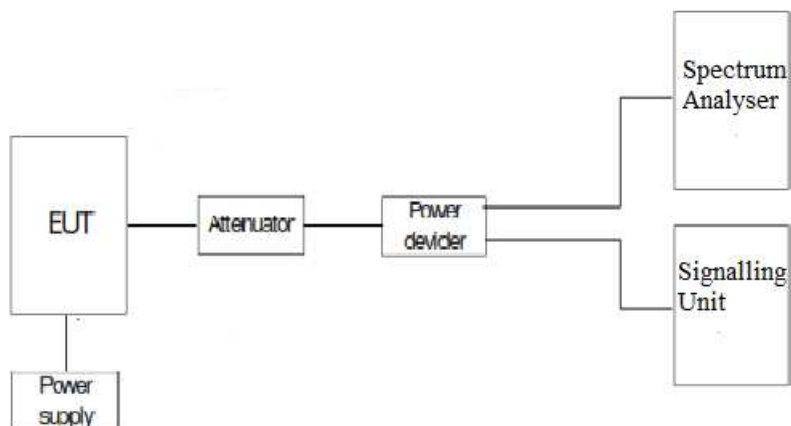
The reference point measurements were made at the RF output terminals of the EUT using an attenuator, power splitter and spectrum analyser. The EUT was controlled via the Universal Radio Communication tester R&S CMW500 selecting maximum transmission power of the EUT and different modes of modulation.

## TEST SETUP

Frequency tolerance.



Reference points  $f_L$  and  $f_H$ .



## RESULTS

Frequency stability over temperature variations.

LTE QPSK MODULATION. BW = 1.4 MHz. (Band IV)

| Temperature (°C) | Frequency Error (Hz) | Frequency Error (ppm) | Frequency Error (%) |
|------------------|----------------------|-----------------------|---------------------|
| +50              | 5.56                 | 0.003209235           | 0.000000320924      |
| +40              | -14.98               | -0.008646465          | -0.000000864646     |
| +30              | -14.13               | -0.008155844          | -0.000000815584     |
| +20              | -13.99               | -0.008075036          | -0.000000807504     |
| +10              | -11.74               | -0.006776335          | -0.000000677633     |
| 0                | 13.03                | 0.007520924           | 0.000000752092      |
| -10              | -10.59               | -0.006112554          | -0.000000611255     |
| -20              | -11.39               | -0.006574315          | -0.000000657431     |
| -30              | -13.89               | -0.008017316          | -0.000000801732     |

LTE QPSK MODULATION. BW = 3 MHz. (Band IV)

| Temperature (°C) | Frequency Error (Hz) | Frequency Error (ppm) | Frequency Error (%) |
|------------------|----------------------|-----------------------|---------------------|
| +50              | -8.10                | -0.004675325          | -0.000000467532     |
| +40              | -14.53               | -0.008386724          | -0.000000838672     |
| +30              | -12.02               | -0.006937951          | -0.000000693795     |
| +20              | -11.97               | -0.006909091          | -0.000000690909     |
| +10              | -10.49               | -0.006054834          | -0.000000605483     |
| 0                | -12.33               | -0.007116883          | -0.000000711688     |
| -10              | -14.12               | -0.008150072          | -0.000000815007     |
| -20              | -15.15               | -0.008744589          | -0.000000874459     |
| -30              | -18.18               | -0.010493506          | -0.000001049351     |

LTE QPSK MODULATION. BW = 5 MHz. (Band IV)

| Temperature (°C) | Frequency Error (Hz) | Frequency Error (ppm) | Frequency Error (%) |
|------------------|----------------------|-----------------------|---------------------|
| +50              | -9.80                | -0.005656566          | -0.000000565657     |
| +40              | -13.53               | -0.007809524          | -0.000000780952     |
| +30              | -13.83               | -0.007982684          | -0.000000798268     |
| +20              | -11.67               | -0.006735931          | -0.000000673593     |
| +10              | -13.12               | -0.007572872          | -0.000000757287     |
| 0                | -12.70               | -0.007330447          | -0.000000733045     |
| -10              | -13.90               | -0.008023088          | -0.000000802309     |
| -20              | -10.60               | -0.006118326          | -0.000000611833     |
| -30              | -13.69               | -0.007901876          | -0.000000790188     |

LTE QPSK MODULATION. BW = 10 MHz. (Band IV)

| Temperature (°C) | Frequency Error (Hz) | Frequency Error (ppm) | Frequency Error (%) |
|------------------|----------------------|-----------------------|---------------------|
| +50              | -10.41               | -0.006008658          | -0.000000600866     |
| +40              | -13.99               | -0.008075036          | -0.000000807504     |
| +30              | -15.16               | -0.008750361          | -0.000000875036     |
| +20              | -11.17               | -0.006447330          | -0.000000644733     |
| +10              | 12.06                | 0.006961039           | 0.000000696104      |
| 0                | -13.48               | -0.007780664          | -0.000000778066     |
| -10              | -12.03               | -0.006943723          | -0.000000694372     |
| -20              | -14.35               | -0.008282828          | -0.000000828283     |
| -30              | -12.82               | -0.007399711          | -0.000000739971     |

LTE QPSK MODULATION. BW = 15 MHz. (Band IV)

| Temperature (°C) | Frequency Error (Hz) | Frequency Error (ppm) | Frequency Error (%) |
|------------------|----------------------|-----------------------|---------------------|
| +50              | -12.50               | -0.007215007          | -0.000000721501     |
| +40              | 10.73                | 0.006193362           | 0.000000619336      |
| +30              | -10.67               | -0.00615873           | -0.000000615873     |
| +20              | -16.09               | -0.009287157          | -0.000000928716     |
| +10              | 10.53                | 0.006077922           | 0.000000607792      |
| 0                | -12.97               | -0.007486291          | -0.000000748629     |
| -10              | 9.18                 | 0.005298701           | 0.000000529870      |
| -20              | -10.56               | -0.006095238          | -0.000000609524     |
| -30              | -13.00               | -0.007503608          | -0.000000750361     |

LTE QPSK MODULATION. BW = 20 MHz. (Band IV)

| Temperature (°C) | Frequency Error (Hz) | Frequency Error (ppm) | Frequency Error (%) |
|------------------|----------------------|-----------------------|---------------------|
| +50              | -13.63               | -0.007867244          | -0.000000786724     |
| +40              | -11.93               | -0.006886003          | -0.000000688600     |
| +30              | -13.05               | -0.007532468          | -0.000000753247     |
| +20              | -11.59               | -0.006689755          | -0.000000668975     |
| +10              | -12.96               | -0.007480519          | -0.000000748052     |
| 0                | -13.70               | -0.007907648          | -0.000000790765     |
| -10              | -14.95               | -0.008629149          | -0.000000862915     |
| -20              | -12.83               | -0.007405483          | -0.000000740548     |
| -30              | -11.36               | -0.006556999          | -0.000000655700     |

LTE QPSK MODULATION. BW = 5 MHz. (Band XIII)

| Temperature (°C) | Frequency Error (Hz) | Frequency Error (ppm) | Frequency Error (%) |
|------------------|----------------------|-----------------------|---------------------|
| +50              | 6.65                 | 0.008503836           | 0.000000850384      |
| +40              | 9.40                 | 0.012020460           | 0.000001202046      |
| +30              | 6.78                 | 0.008670077           | 0.000000867008      |
| +20              | -7.28                | -0.009309463          | -0.000000930946     |
| +10              | 6.59                 | 0.008427110           | 0.000000842711      |
| 0                | 7.72                 | 0.009872123           | 0.000000987212      |
| -10              | 6.35                 | 0.008120205           | 0.000000812020      |
| -20              | 7.11                 | 0.009092072           | 0.000000909207      |
| -30              | 8.18                 | 0.010460358           | 0.000001046036      |

LTE QPSK MODULATION. BW = 10 MHz. (Band XIII)

| Temperature (°C) | Frequency Error (Hz) | Frequency Error (ppm) | Frequency Error (%) |
|------------------|----------------------|-----------------------|---------------------|
| +50              | -7.22                | -0.009232737          | -0.000000923274     |
| +40              | 7.65                 | 0.009782609           | 0.000000978261      |
| +30              | 7.98                 | 0.010204604           | 0.000001020460      |
| +20              | 7.08                 | 0.009053708           | 0.000000905371      |
| +10              | 6.67                 | 0.008529412           | 0.000000852941      |
| 0                | 5.91                 | 0.007557545           | 0.000000755754      |
| -10              | -7.04                | -0.009002558          | -0.000000900256     |
| -20              | -4.94                | -0.006317136          | -0.000000631714     |
| -30              | 7.10                 | 0.009079284           | 0.000000907928      |

Frequency stability over voltage variations.

LTE QPSK MODULATION. BW = 1.4 MHz (Band IV)

| Battery Supply voltage | Voltage (V) | Frequency Error (Hz) | Frequency Error (ppm) | Frequency Error (%) |
|------------------------|-------------|----------------------|-----------------------|---------------------|
| Vmax                   | 4.37        | 5.12                 | 0.002955267           | 0.000000295527      |
| Vmin                   | 3.23        | -1.49                | -0.000860029          | -0.000000086003     |

LTE QPSK MODULATION. BW = 3 MHz (Band IV)

| Battery Supply voltage | Voltage (V) | Frequency Error (Hz) | Frequency Error (ppm) | Frequency Error (%) |
|------------------------|-------------|----------------------|-----------------------|---------------------|
| Vmax                   | 4.37        | 5.44                 | 0.003139971           | 0.000000313997      |
| Vmin                   | 3.23        | -11.43               | -0.006597403          | -0.000000659740     |

LTE QPSK MODULATION. BW = 5 MHz (Band IV)

| Battery Supply voltage | Voltage (V) | Frequency Error (Hz) | Frequency Error (ppm) | Frequency Error (%) |
|------------------------|-------------|----------------------|-----------------------|---------------------|
| Vmax                   | 4.37        | -5.82                | -0.003359307          | -0.000000335931     |
| Vmin                   | 3.23        | -3.19                | -0.001841270          | -0.000000184127     |

LTE QPSK MODULATION. BW = 10 MHz (Band IV)

| Battery Supply voltage | Voltage (V) | Frequency Error (Hz) | Frequency Error (ppm) | Frequency Error (%) |
|------------------------|-------------|----------------------|-----------------------|---------------------|
| Vmax                   | 4.37        | -1.00                | -0.000577201          | -0.000000057720     |
| Vmin                   | 3.23        | -12.06               | -0.006961039          | -0.000000696104     |

LTE QPSK MODULATION. BW = 15 MHz (Band IV)

| Battery Supply voltage | Voltage (V) | Frequency Error (Hz) | Frequency Error (ppm) | Frequency Error (%) |
|------------------------|-------------|----------------------|-----------------------|---------------------|
| Vmax                   | 4.37        | 1.73                 | 0.000998557           | 0.000000099856      |
| Vmin                   | 3.23        | -8.43                | -0.004865801          | -0.000000486580     |

LTE QPSK MODULATION. BW = 20 MHz (Band IV)

| Battery Supply voltage | Voltage (V) | Frequency Error (Hz) | Frequency Error (ppm) | Frequency Error (%) |
|------------------------|-------------|----------------------|-----------------------|---------------------|
| Vmax                   | 4.37        | -2.68                | -0.001546898          | -0.000000154690     |
| Vmin                   | 3.23        | -9.86                | -0.005691198          | -0.000000569120     |

LTE QPSK MODULATION. BW = 5 MHz (Band XIII)

| Battery Supply voltage | Voltage (V) | Frequency Error (Hz) | Frequency Error (ppm) | Frequency Error (%) |
|------------------------|-------------|----------------------|-----------------------|---------------------|
| Vmax                   | 4.37        | 0.77                 | 0.000984655           | 0.000000098465      |
| Vmin                   | 3.23        | 0.29                 | 0.000370844           | 0.000000037084      |

LTE QPSK MODULATION. BW = 10 MHz (Band XIII)

| Battery Supply voltage | Voltage (V) | Frequency Error (Hz) | Frequency Error (ppm) | Frequency Error (%) |
|------------------------|-------------|----------------------|-----------------------|---------------------|
| Vmax                   | 4.37        | -0.34                | -0.000434783          | -0.000000043478     |
| Vmin                   | 3.23        | -2.55                | -0.003260870          | -0.000000326087     |

Reference points established at the applicable unwanted emissions limit (worst case):

|             | LTE QPSK MODULATION.<br>BW = 1.4 MHz<br>(Band IV) | LTE QPSK MODULATION.<br>BW = 3 MHz<br>(Band IV) | LTE QPSK MODULATION.<br>BW = 5 MHz<br>(Band IV) | LTE QPSK MODULATION.<br>BW = 10 MHz<br>(Band IV) | LTE QPSK MODULATION.<br>BW = 15 MHz<br>(Band IV) | LTE QPSK MODULATION.<br>BW = 20 MHz<br>(Band IV) |
|-------------|---------------------------------------------------|-------------------------------------------------|-------------------------------------------------|--------------------------------------------------|--------------------------------------------------|--------------------------------------------------|
| $f_L$ (MHz) | 1710.0547                                         | 1710.0199                                       | 1710.0043                                       | 1710.0587                                        | 1710.0608                                        | 1710.3233                                        |
| $f_H$ (MHz) | 1754.9558                                         | 1754.9920                                       | 1754.9864                                       | 1754.9579                                        | 1754.9362                                        | 1754.7158                                        |

|             | LTE QPSK MODULATION.<br>BW = 5 MHz<br>(Band XIII) | LTE QPSK MODULATION.<br>BW = 10 MHz<br>(Band XIII) |
|-------------|---------------------------------------------------|----------------------------------------------------|
| $f_L$ (MHz) | 777.0467                                          | 777.2333                                           |
| $f_H$ (MHz) | 786.9514                                          | 786.7470                                           |

Reference points  $f_L$  and  $f_H$  with the worst-case frequency offsets added or subtracted:

|                | LTE QPSK<br>MODULATION.<br>BW = 1.4 MHz<br>(Band IV) | LTE QPSK<br>MODULATION.<br>BW = 3 MHz (Band<br>IV) | LTE QPSK<br>MODULATION.<br>BW = 5 MHz (Band<br>IV) | LTE QPSK<br>MODULATION.<br>BW = 10 MHz<br>(Band IV) | LTE QPSK<br>MODULATION.<br>BW = 15 MHz<br>(Band IV) | LTE QPSK<br>MODULATION.<br>BW = 20 MHz<br>(Band IV) |
|----------------|------------------------------------------------------|----------------------------------------------------|----------------------------------------------------|-----------------------------------------------------|-----------------------------------------------------|-----------------------------------------------------|
| $f_L$<br>(MHz) | 1710.05468                                           | 1710.01988                                         | 1710.00429                                         | 1710.05868                                          | 1710.06078                                          | 1710.32329                                          |
| $f_H$<br>(MHz) | 1754.95581                                           | 1754.99201                                         | 1754.98641                                         | 1754.95791                                          | 1754.93621                                          | 1754.71581                                          |

|             | LTE QPSK<br>MODULATION.<br>BW = 5 MHz<br>(Band XIII) | LTE QPSK<br>MODULATION.<br>BW = 10 MHz<br>(Band XIII) |
|-------------|------------------------------------------------------|-------------------------------------------------------|
| $f_L$ (MHz) | 777.04669                                            | 777.23330                                             |
| $f_H$ (MHz) | 786.95141                                            | 786.74701                                             |

The reference frequency points stay within the authorized blocks.

Verdict: PASS

## Occupied Bandwidth

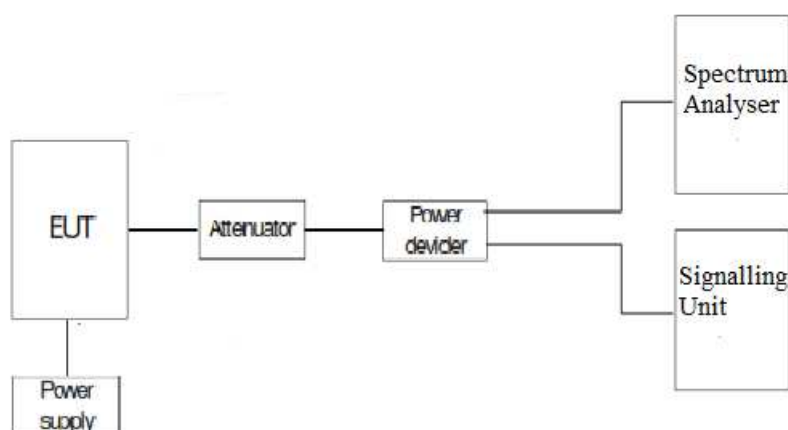
### SPECIFICATION

§2.1049

### 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

LTE QPSK MODULATION. BW = 1.4 MHz (Band IV)

| Channel                       | Lowest | Middle | Highest |
|-------------------------------|--------|--------|---------|
| 99% Occupied bandwidth (MHz)  | 1.1045 | 1.1127 | 1.1028  |
| -26 dBc bandwidth (MHz)       | 1.369  | 1.364  | 1.408   |
| Measurement uncertainty (kHz) | <±4.67 |        |         |

LTE 16QAM MODULATION. BW = 1.4 MHz (Band IV)

| Channel                       | Lowest | Middle | Highest |
|-------------------------------|--------|--------|---------|
| 99% Occupied bandwidth (MHz)  | 1.1076 | 1.1024 | 1.1071  |
| -26 dBc bandwidth (MHz)       | 1.357  | 1.351  | 1.362   |
| Measurement uncertainty (kHz) | <±4.67 |        |         |

LTE QPSK MODULATION. BW = 3 MHz (Band IV)

| Channel                       | Lowest  | Middle | Highest |
|-------------------------------|---------|--------|---------|
| 99% Occupied bandwidth (MHz)  | 2.7617  | 2.7605 | 2.7526  |
| -26 dBc bandwidth (MHz)       | 3.135   | 3.150  | 3.194   |
| Measurement uncertainty (kHz) | <±10.00 |        |         |

LTE 16QAM MODULATION. BW = 3 MHz (Band IV)

| Channel                       | Lowest  | Middle | Highest |
|-------------------------------|---------|--------|---------|
| 99% Occupied bandwidth (MHz)  | 2.7819  | 2.7663 | 2.7555  |
| -26 dBc bandwidth (MHz)       | 3.137   | 3.188  | 3.165   |
| Measurement uncertainty (kHz) | <±10.00 |        |         |

LTE QPSK MODULATION. BW = 5 MHz (Band IV)

| Channel                       | Lowest  | Middle | Highest |
|-------------------------------|---------|--------|---------|
| 99% Occupied bandwidth (MHz)  | 4.5189  | 4.5193 | 4.5134  |
| -26 dBc bandwidth (MHz)       | 5.143   | 5.123  | 5.169   |
| Measurement uncertainty (kHz) | <±16.67 |        |         |

LTE 16QAM MODULATION. BW = 5 MHz (Band IV)

| Channel                       | Lowest  | Middle | Highest |
|-------------------------------|---------|--------|---------|
| 99% Occupied bandwidth (MHz)  | 4.5253  | 4.5108 | 4.5227  |
| -26 dBc bandwidth (MHz)       | 5.133   | 5.097  | 5.095   |
| Measurement uncertainty (kHz) | <±16.67 |        |         |

LTE QPSK MODULATION. BW = 10 MHz (Band IV)

| Channel                       | Lowest  | Middle | Highest |
|-------------------------------|---------|--------|---------|
| 99% Occupied bandwidth (MHz)  | 9.0585  | 9.1017 | 9.1011  |
| -26 dBc bandwidth (MHz)       | 10.615  | 10.686 | 10.606  |
| Measurement uncertainty (kHz) | <±33.33 |        |         |

LTE 16QAM MODULATION. BW = 10 MHz (Band IV)

| Channel                       | Lowest  | Middle | Highest |
|-------------------------------|---------|--------|---------|
| 99% Occupied bandwidth (MHz)  | 9.0585  | 9.1017 | 9.1011  |
| -26 dBc bandwidth (MHz)       | 10.615  | 10.686 | 10.606  |
| Measurement uncertainty (kHz) | <±33.33 |        |         |

LTE QPSK MODULATION. BW = 15 MHz (Band IV)

| Channel                       | Lowest  | Middle  | Highest |
|-------------------------------|---------|---------|---------|
| 99% Occupied bandwidth (MHz)  | 13.4575 | 13.5338 | 13.4785 |
| -26 dBc bandwidth (MHz)       | 15.886  | 16.067  | 16.033  |
| Measurement uncertainty (kHz) | <±50.00 |         |         |

LTE 16QAM MODULATION. BW = 15 MHz (Band IV)

| Channel                       | Lowest  | Middle  | Highest |
|-------------------------------|---------|---------|---------|
| 99% Occupied bandwidth (MHz)  | 13.5070 | 13.5508 | 13.5387 |
| -26 dBc bandwidth (MHz)       | 15.857  | 15.772  | 15.889  |
| Measurement uncertainty (kHz) | <±50.00 |         |         |

LTE QPSK MODULATION. BW = 20 MHz (Band IV)

| Channel                       | Lowest  | Middle  | Highest |
|-------------------------------|---------|---------|---------|
| 99% Occupied bandwidth (MHz)  | 17.8664 | 17.9697 | 17.9244 |
| -26 dBc bandwidth (MHz)       | 19.934  | 20.542  | 20.164  |
| Measurement uncertainty (kHz) | <±66.67 |         |         |

LTE 16QAM MODULATION. BW = 20 MHz (IV)

| Channel                       | Lowest  | Middle  | Highest |
|-------------------------------|---------|---------|---------|
| 99% Occupied bandwidth (MHz)  | 17.9082 | 17.9462 | 17.9655 |
| -26 dBc bandwidth (MHz)       | 20.206  | 20.338  | 20.272  |
| Measurement uncertainty (kHz) | <±66.67 |         |         |

LTE QPSK MODULATION. BW = 5 MHz (Band XIII)

| Channel                       | Lowest  | Middle | Highest |
|-------------------------------|---------|--------|---------|
| 99% Occupied bandwidth (MHz)  | 4.5098  | 4.5303 | 4.5087  |
| -26 dBc bandwidth (MHz)       | 5.103   | 5.118  | 5.056   |
| Measurement uncertainty (kHz) | <±16.67 |        |         |

LTE 16QAM MODULATION. BW = 5 MHz (Band XIII)

| Channel                       | Lowest  | Middle | Highest |
|-------------------------------|---------|--------|---------|
| 99% Occupied bandwidth (MHz)  | 4.5122  | 4.5046 | 4.5388  |
| -26 dBc bandwidth (MHz)       | 5.141   | 5.056  | 5.140   |
| Measurement uncertainty (kHz) | <±16.67 |        |         |

LTE QPSK MODULATION. BW = 10 MHz (Band XIII)

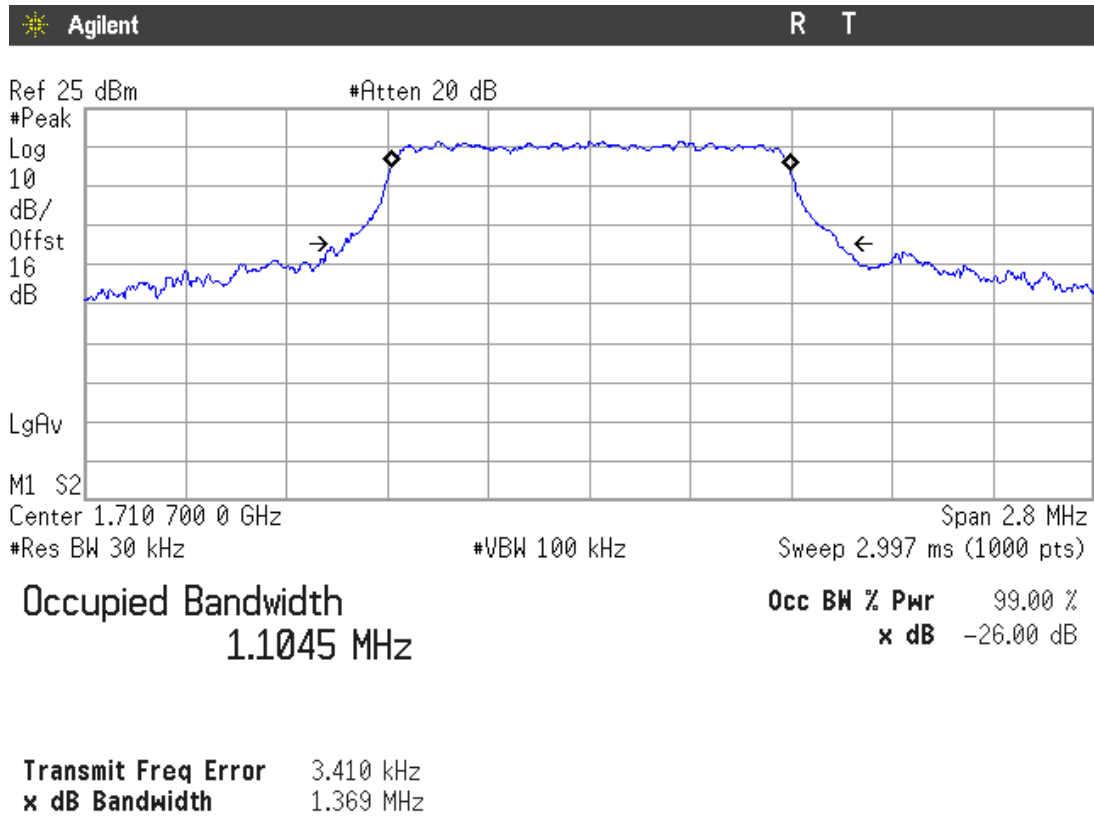
| Channel                       | Lowest  | Middle | Highest |
|-------------------------------|---------|--------|---------|
| 99% Occupied bandwidth (MHz)  | N/A     | 9.0655 | N/A     |
| -26 dBc bandwidth (MHz)       | N/A     | 10.484 | N/A     |
| Measurement uncertainty (kHz) | <±33.33 |        |         |

LTE 16QAM MODULATION. BW = 10 MHz (Band XIII)

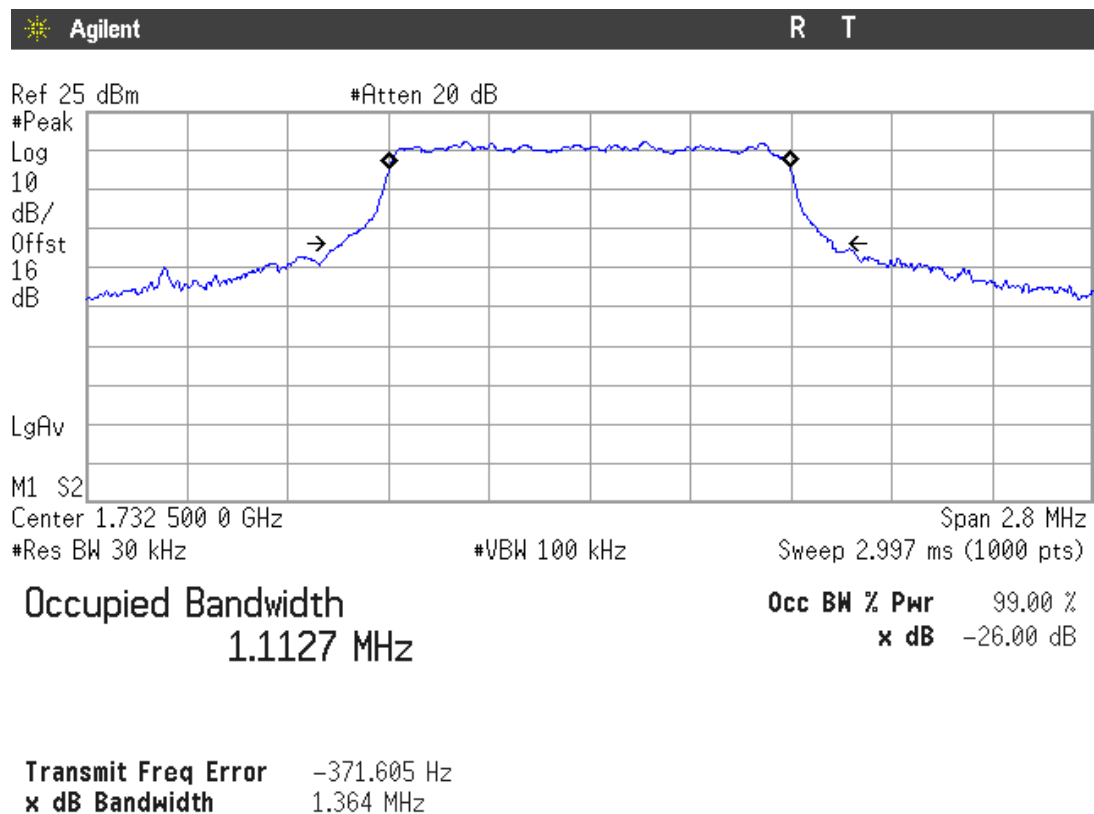
| Channel                       | Lowest  | Middle | Highest |
|-------------------------------|---------|--------|---------|
| 99% Occupied bandwidth (MHz)  | N/A     | 9.0650 | N/A     |
| -26 dBc bandwidth (MHz)       | N/A     | 10.550 | N/A     |
| Measurement uncertainty (kHz) | <±33.33 |        |         |

## LTE QPSK MODULATION. BW = 1.4 MHz (Band IV)

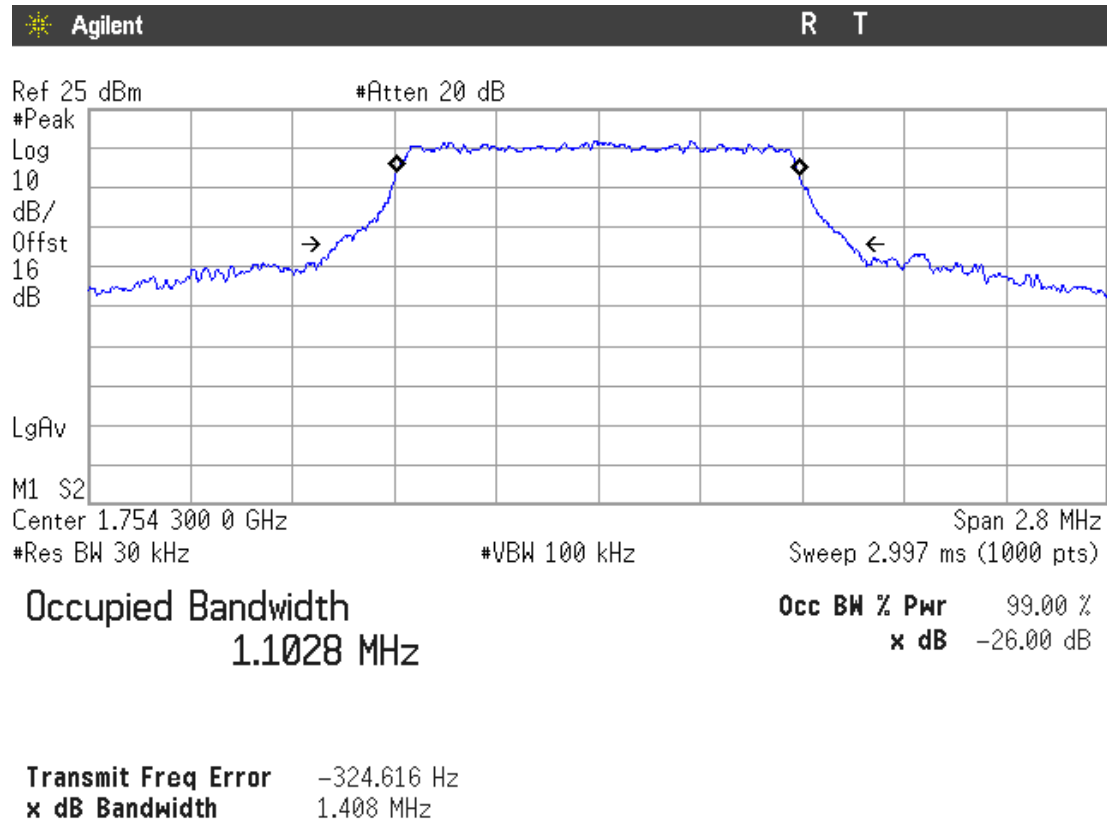
### Lowest Channel



### Middle Channel

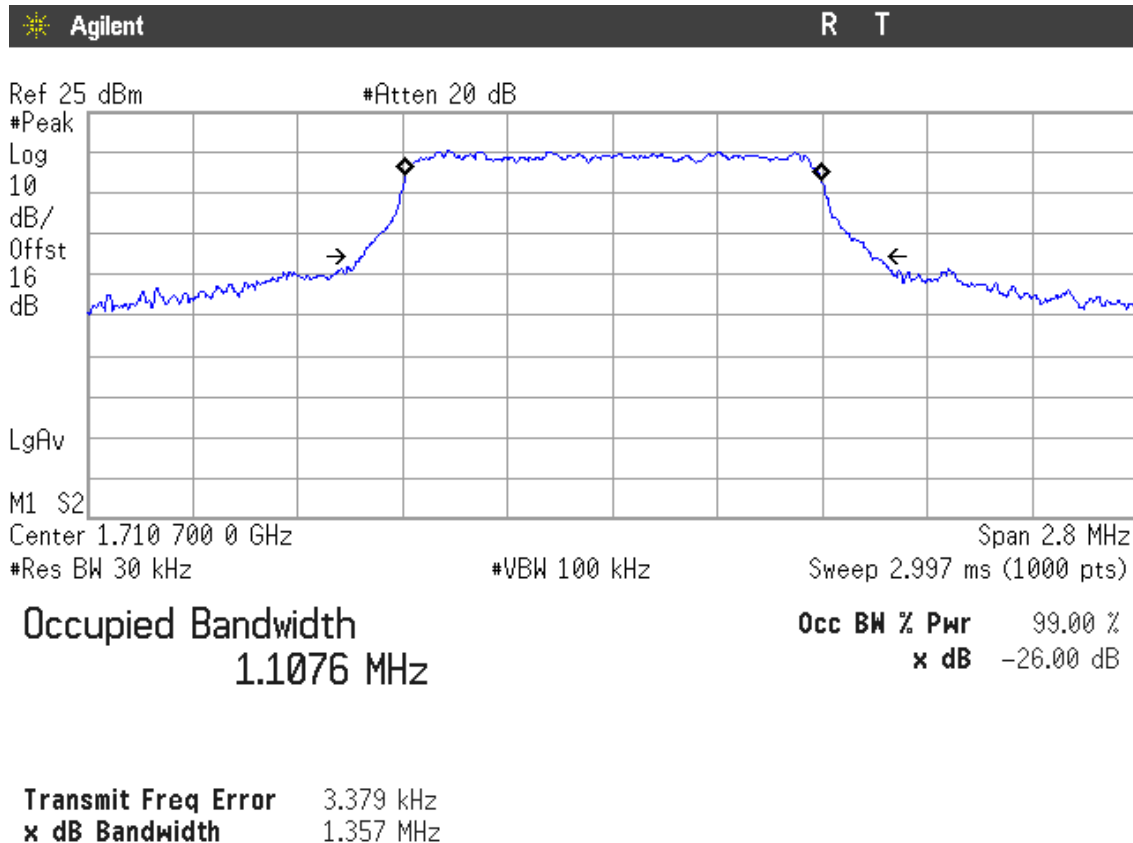


## Highest Channel

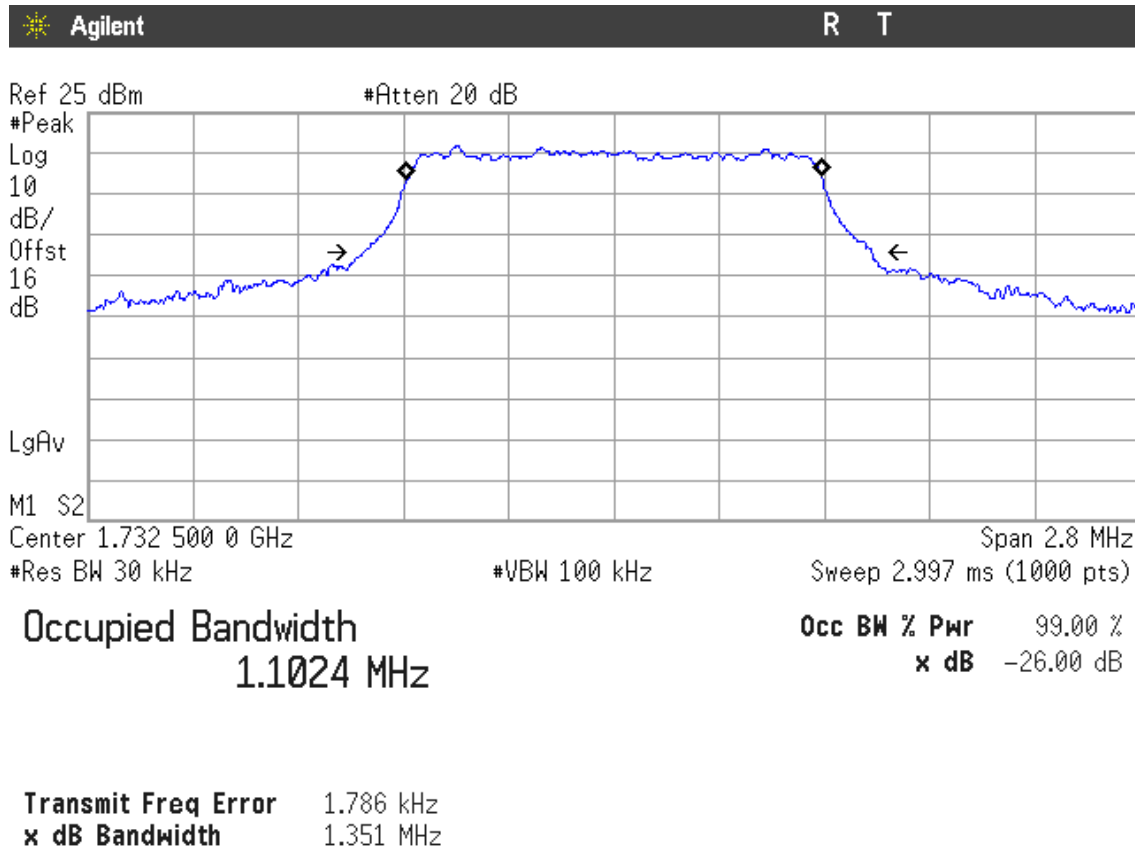


## LTE 16QAM MODULATION. BW = 1.4 MHz (Band IV)

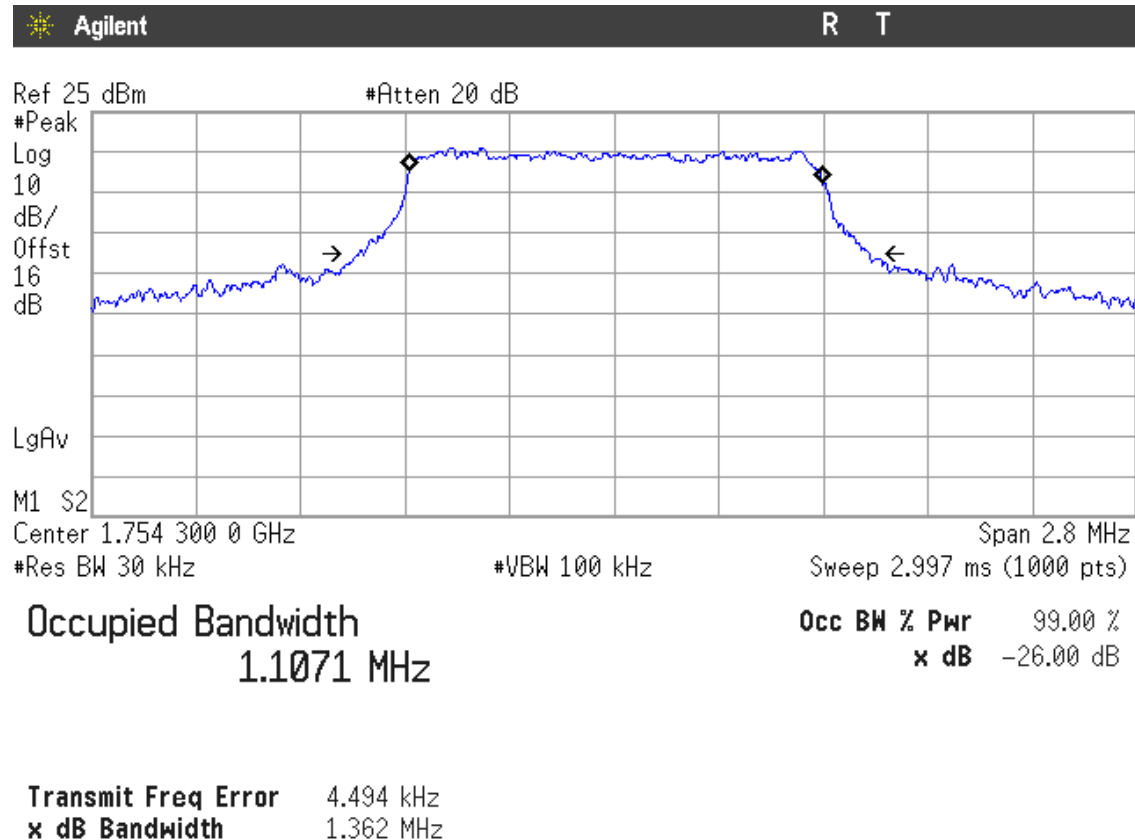
### Lowest Channel



## Middle Channel

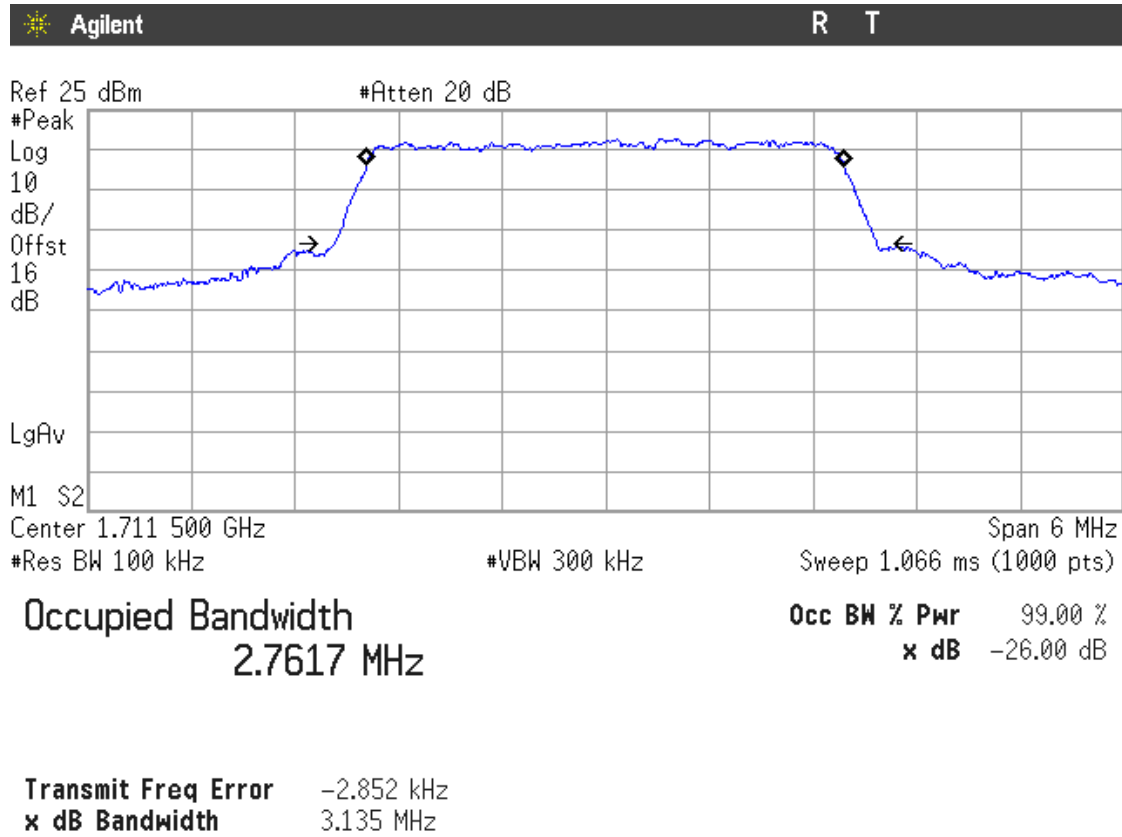


## Highest Channel

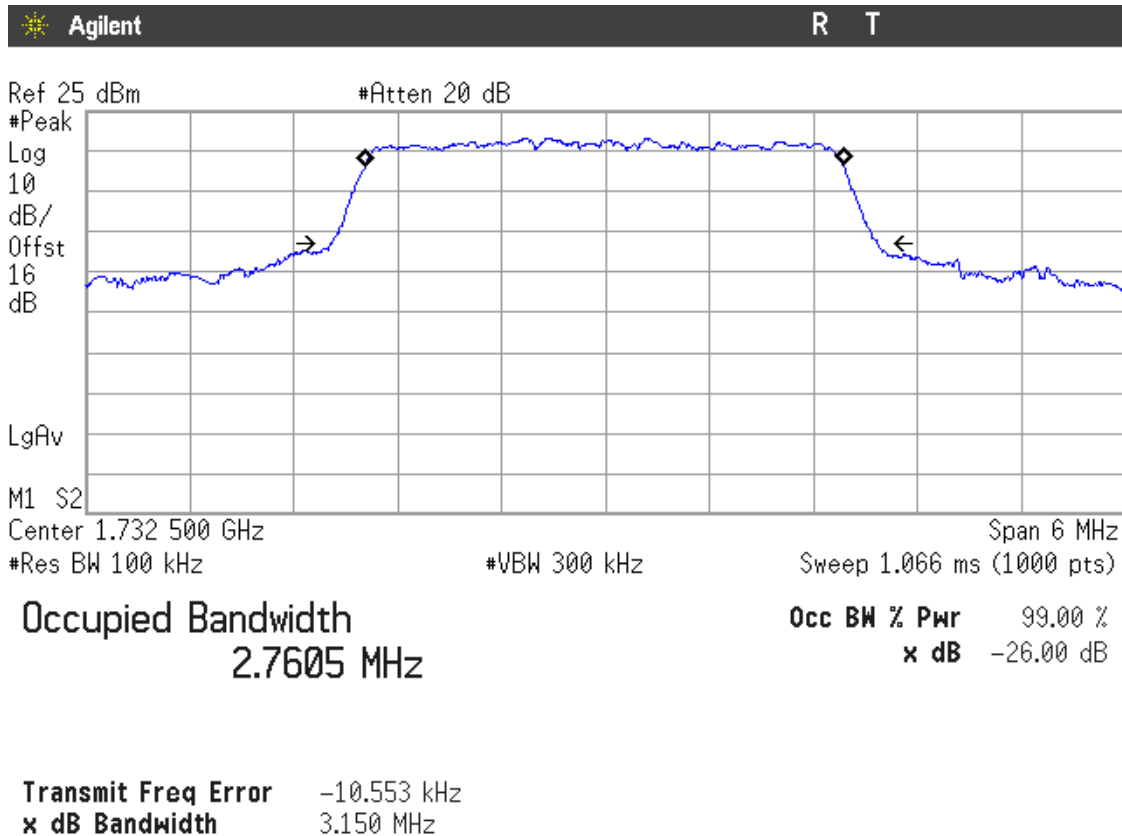


## LTE QPSK MODULATION. BW = 3 MHz (Band IV)

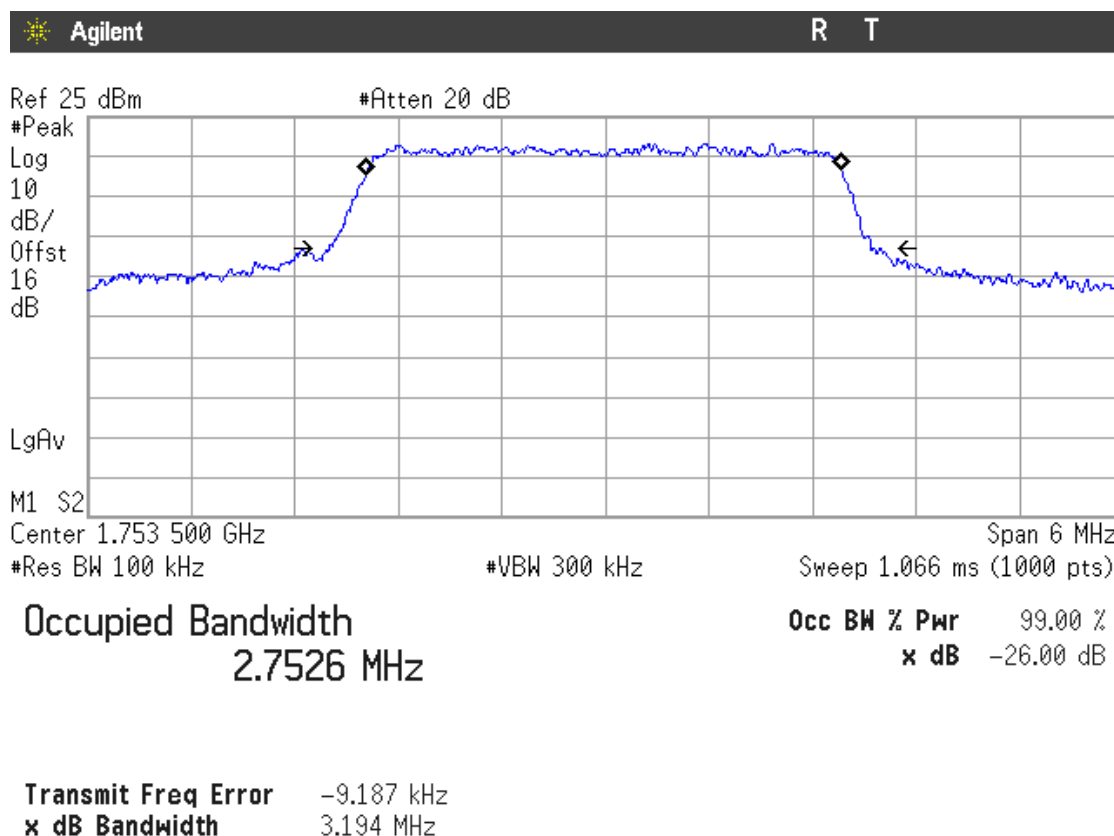
### Lowest Channel



### Middle Channel

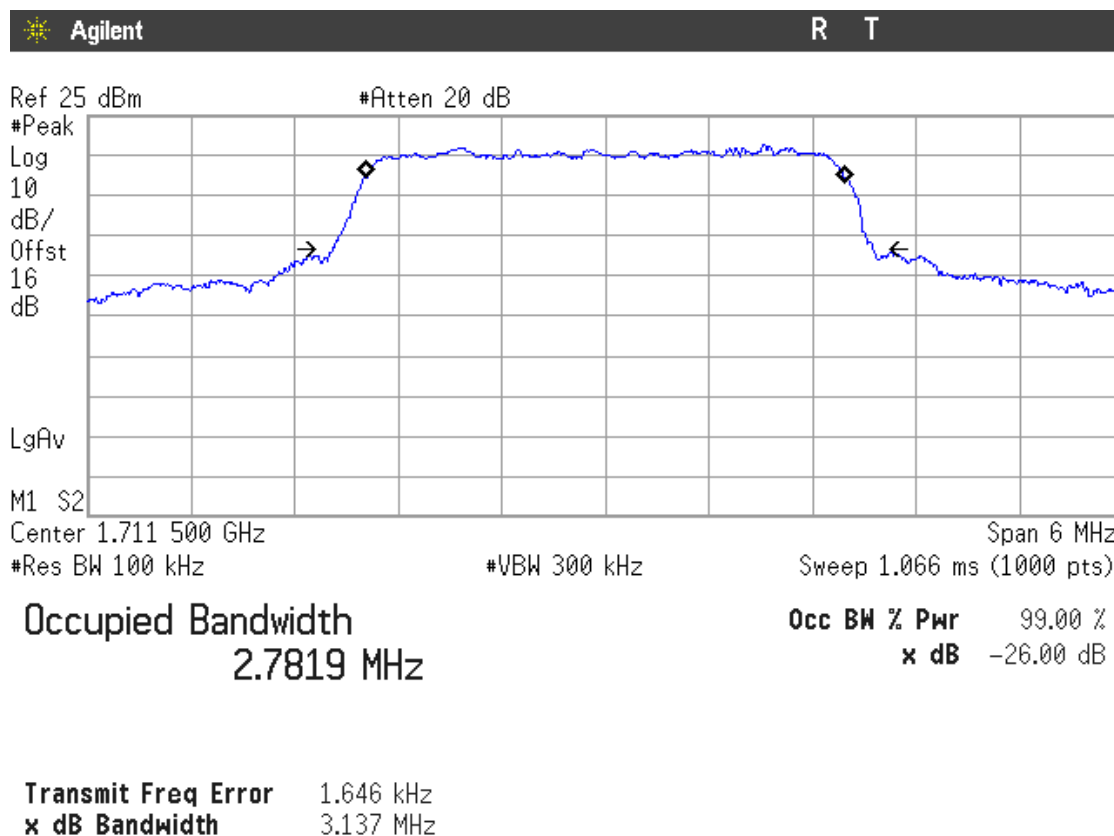


## Highest Channel

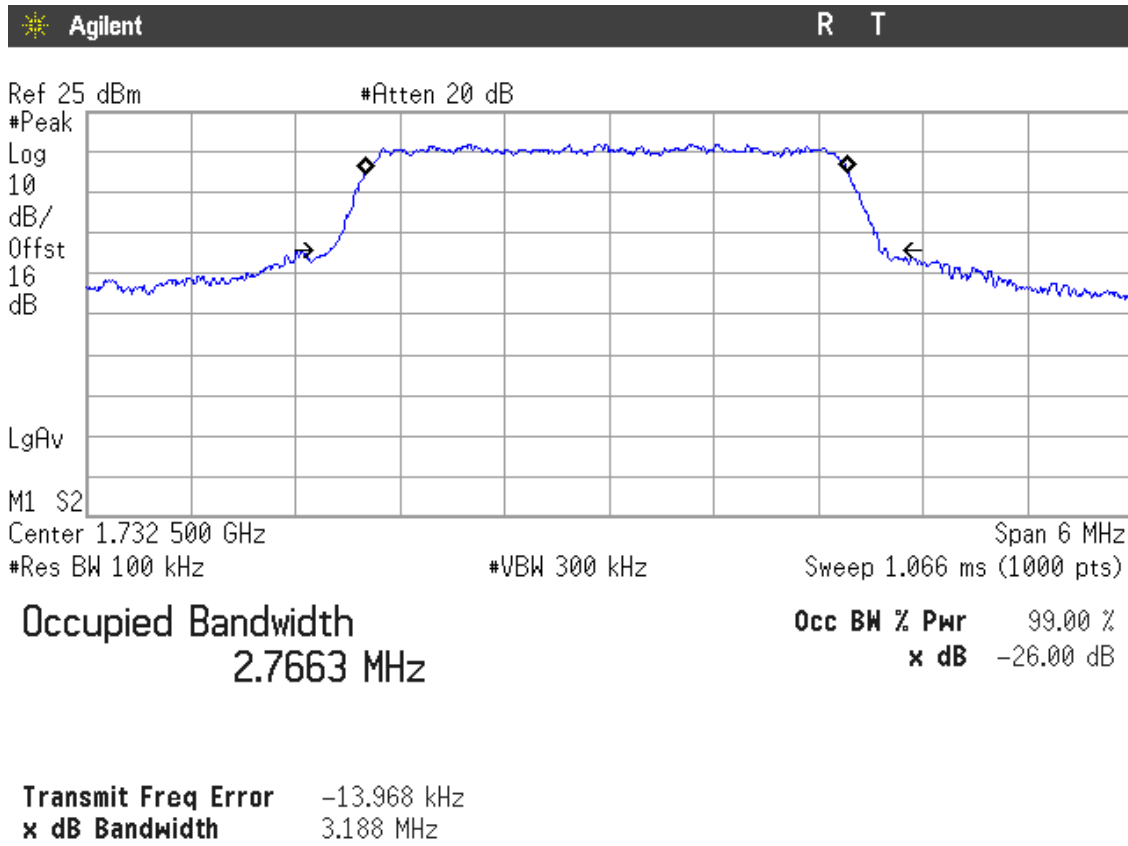


## LTE 16QAM MODULATION. BW = 3 MHz (Band IV)

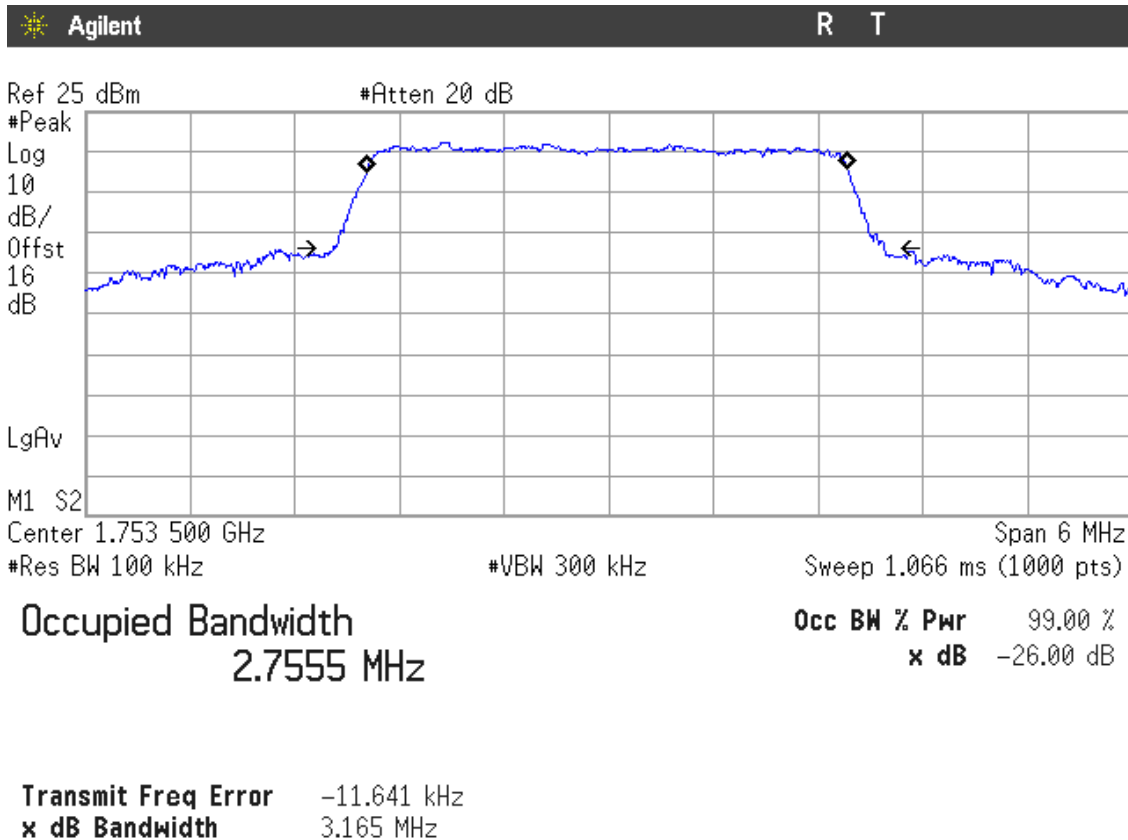
### Lowest Channel



## Middle Channel

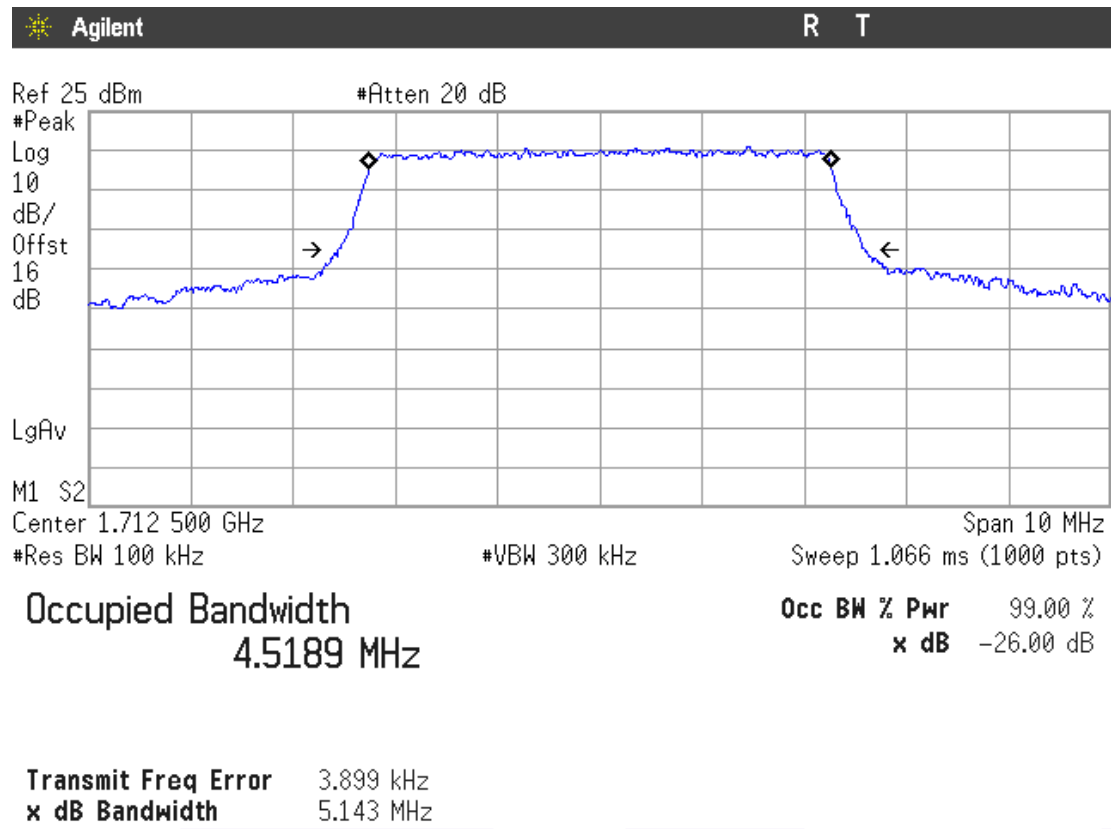


## Highest Channel

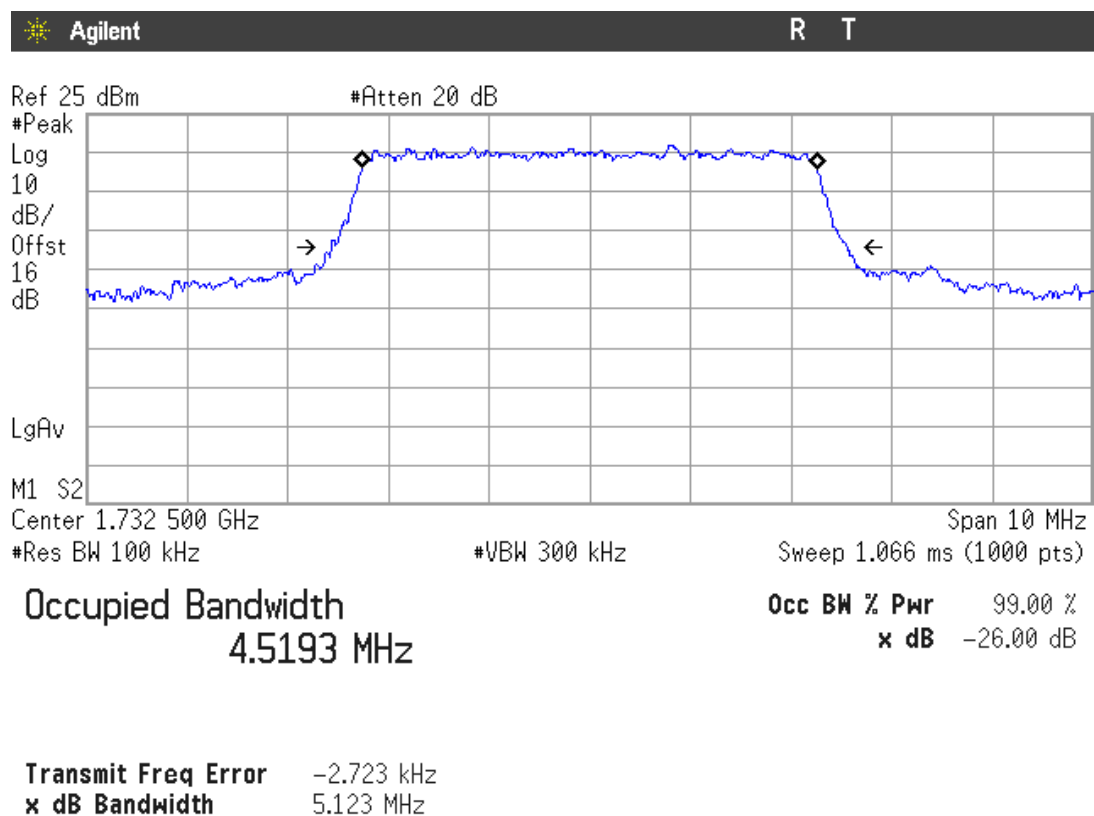


## LTE QPSK MODULATION. BW = 5 MHz (Band IV)

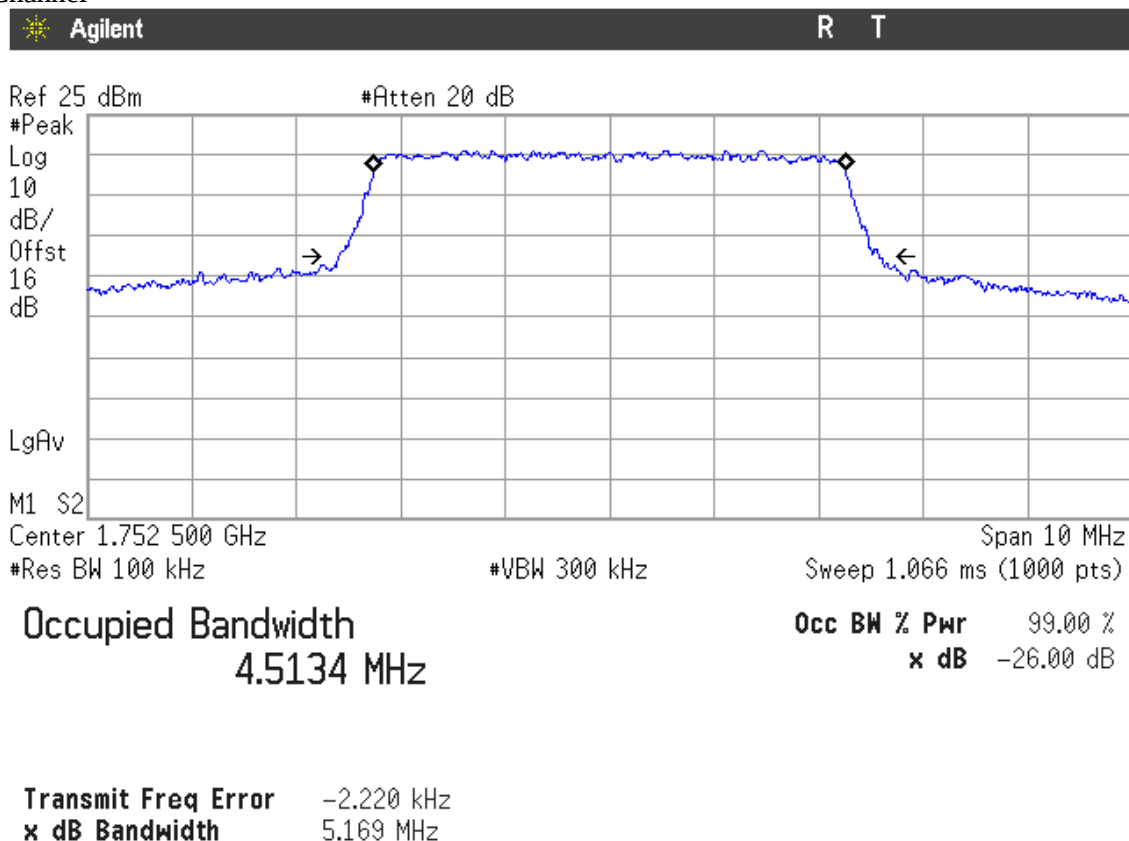
### Lowest Channel



### Middle Channel

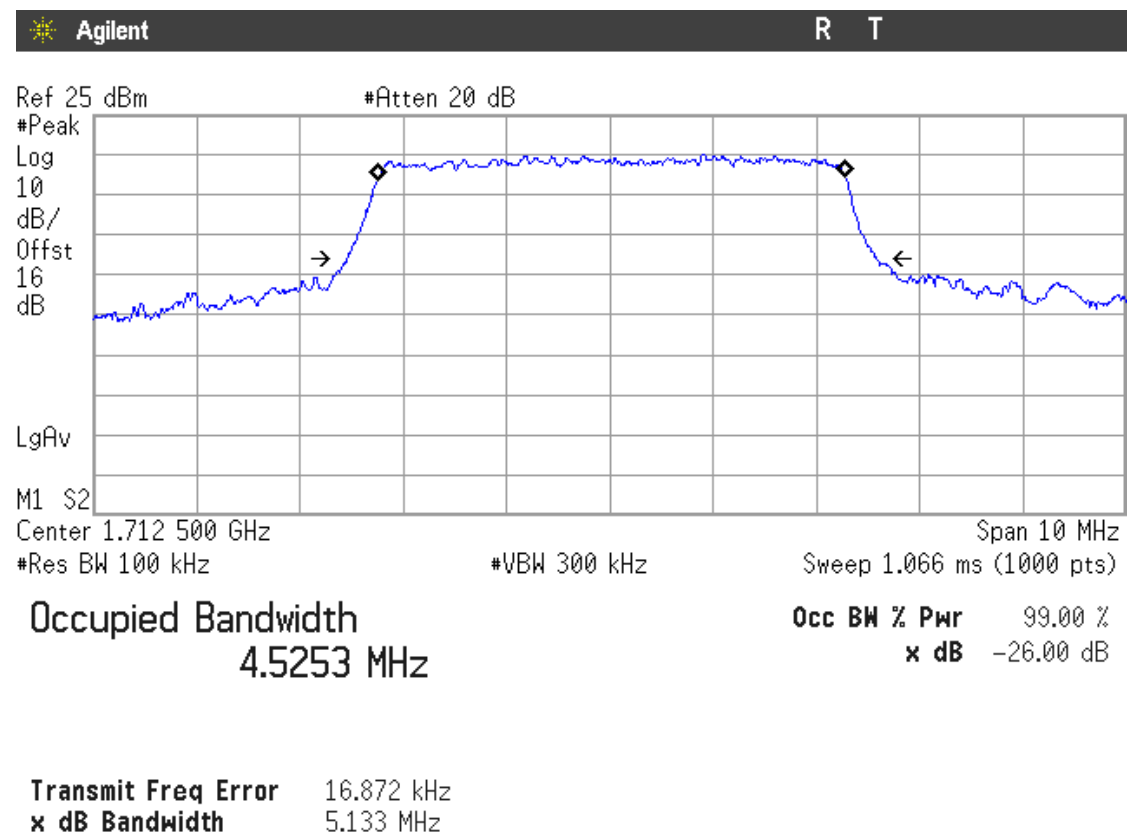


## Highest Channel

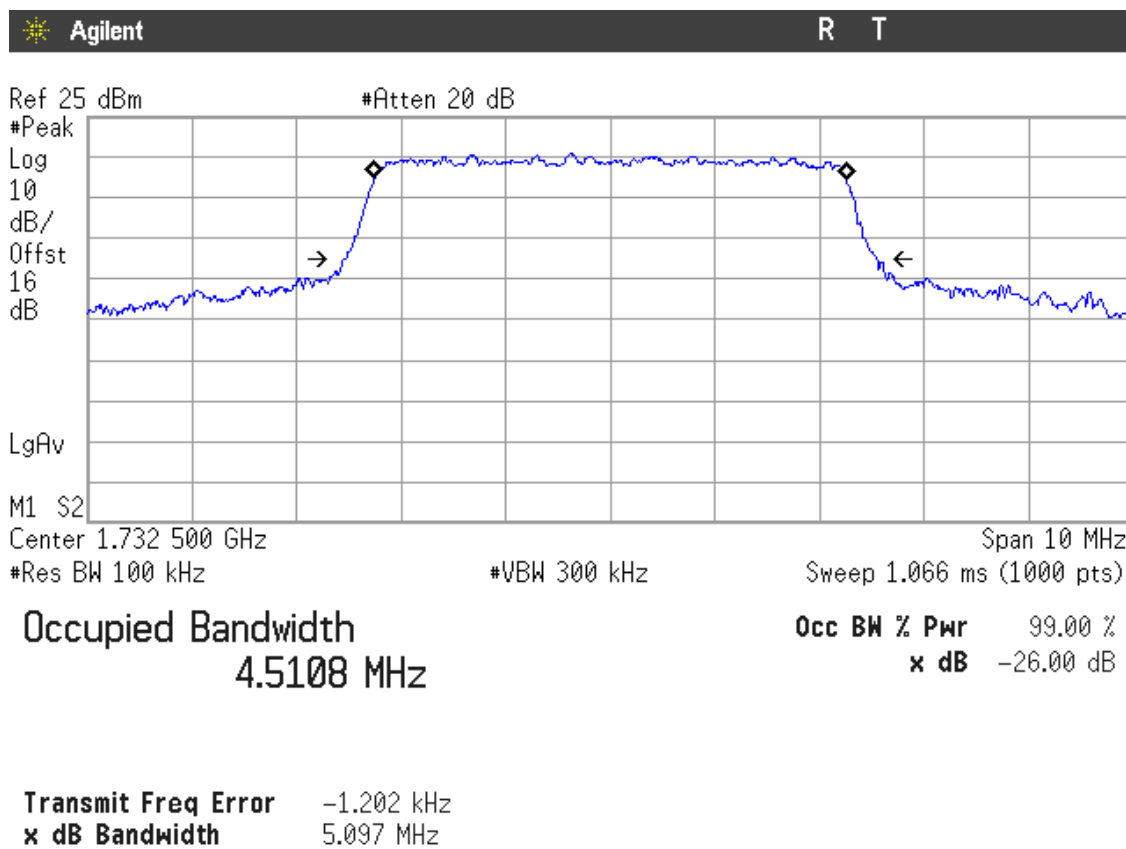


## LTE 16QAM MODULATION. BW = 5 MHz (Band IV)

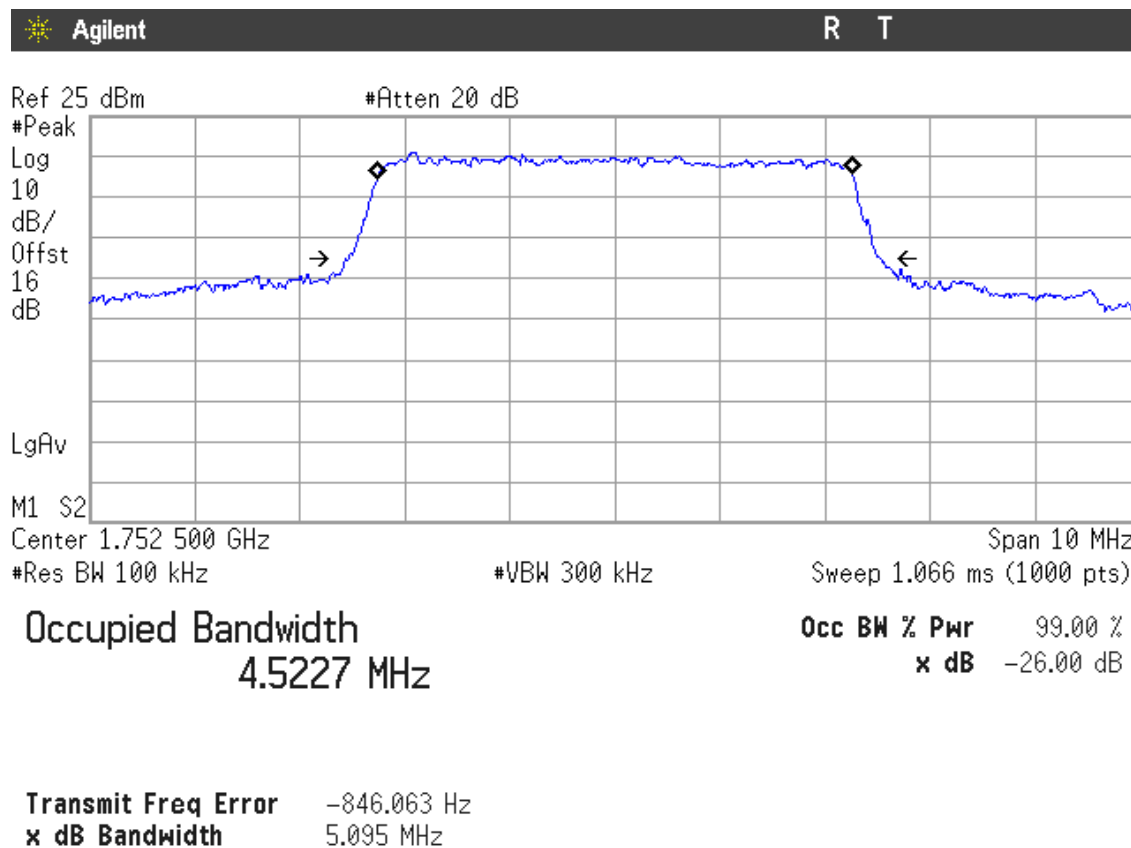
### Lowest Channel



## Middle Channel

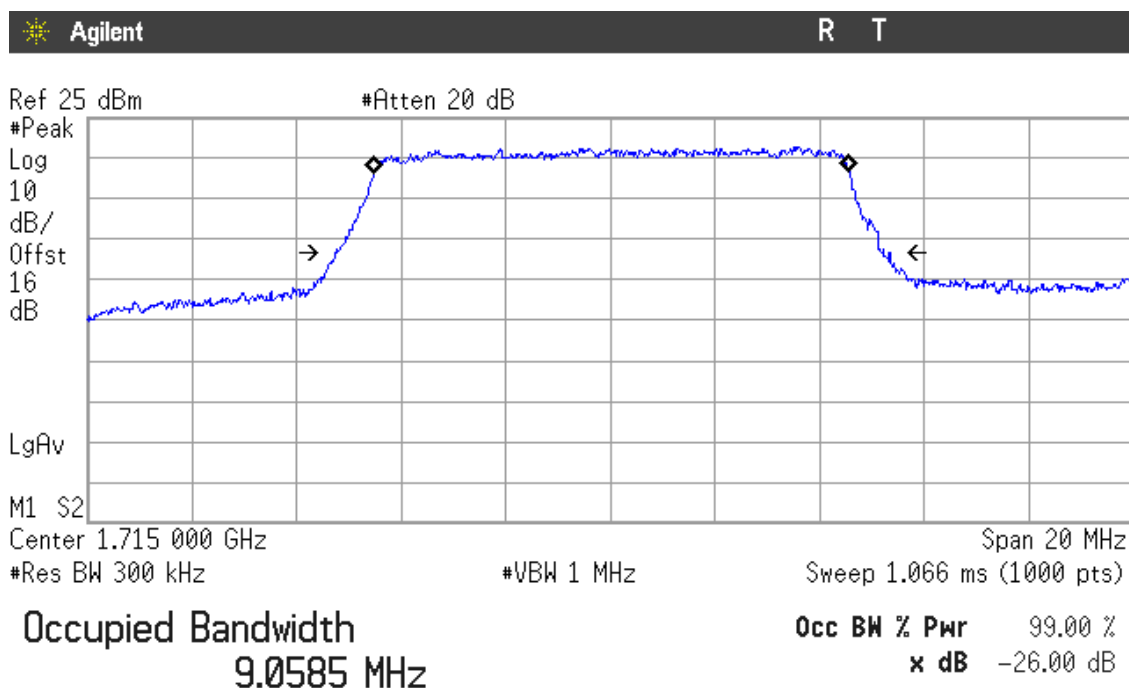


## Highest Channel



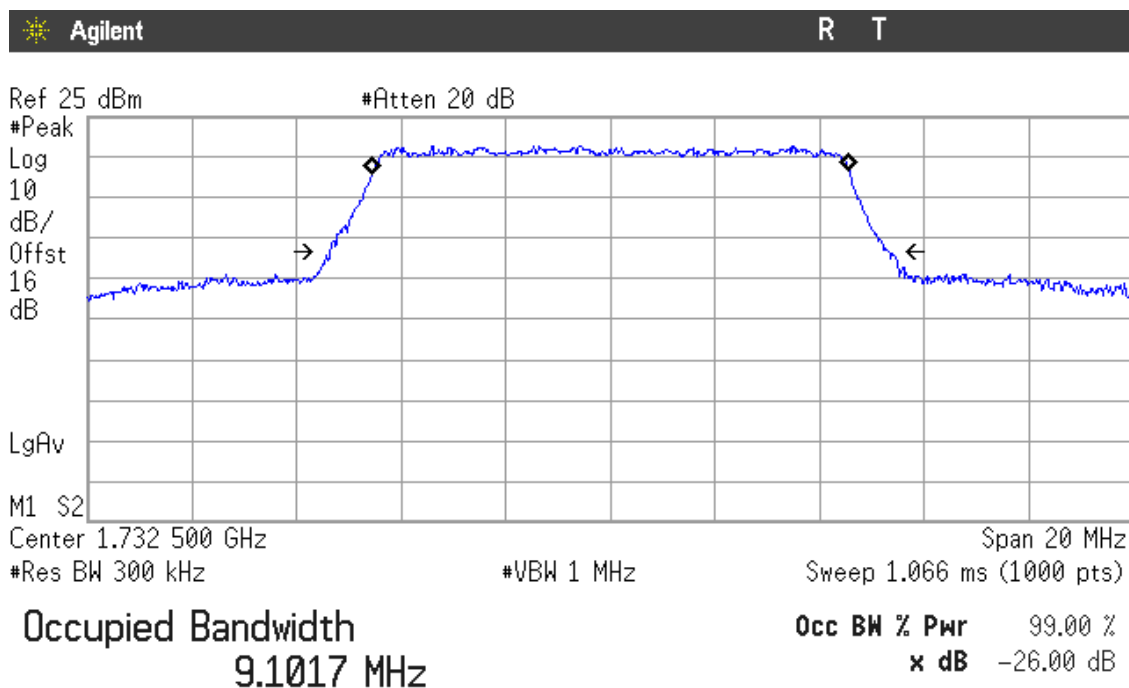
## LTE QPSK MODULATION. BW = 10 MHz (Band IV)

### Lowest Channel



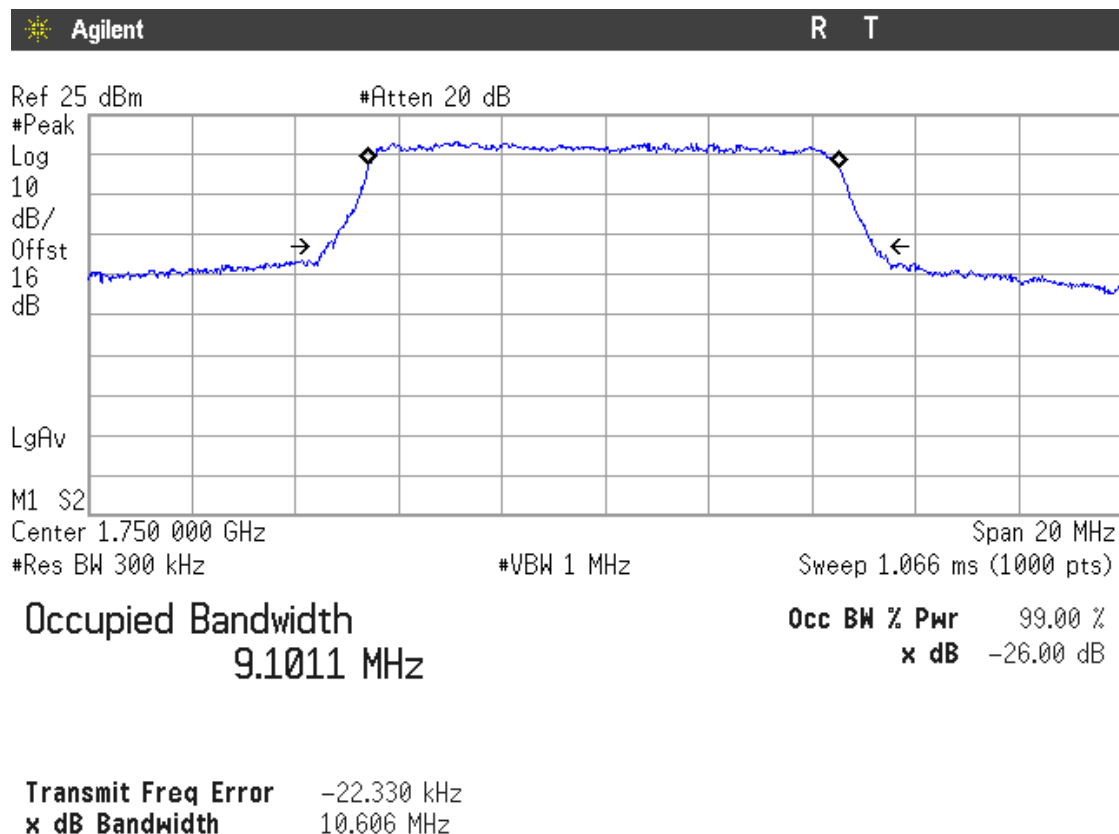
Transmit Freq Error 23.122 kHz  
x dB Bandwidth 10.615 MHz

### Middle Channel



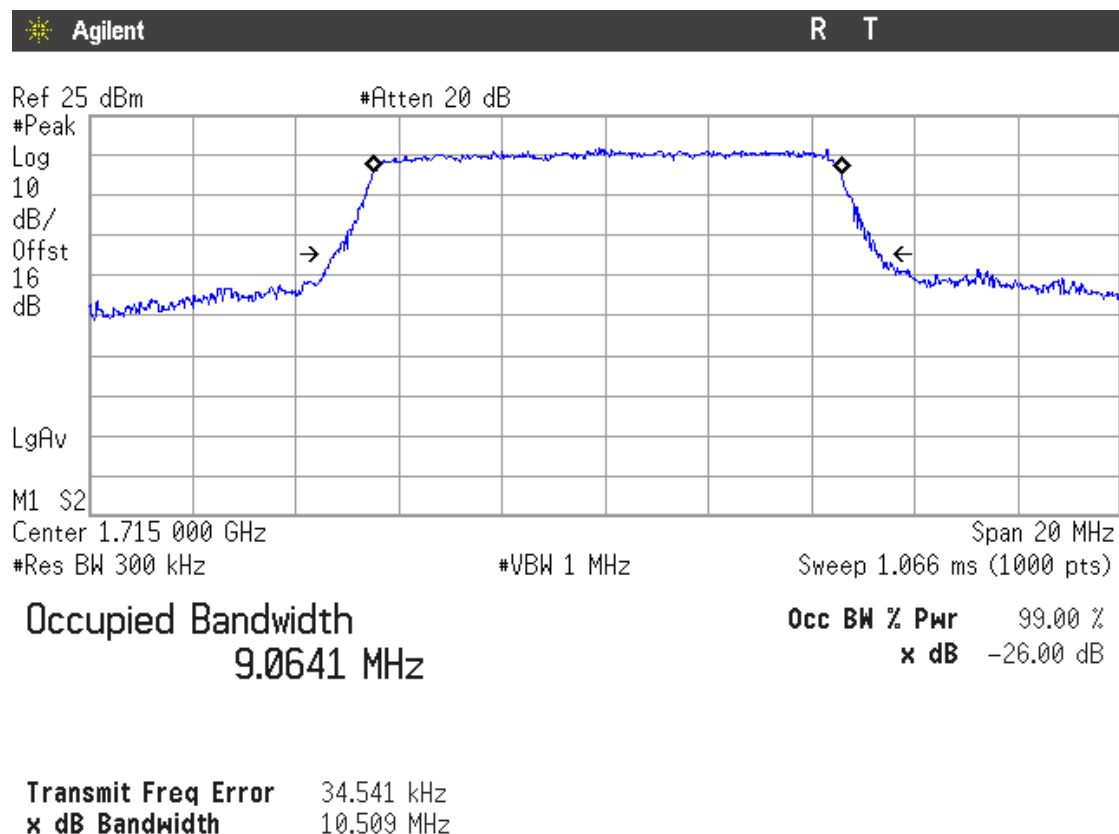
Transmit Freq Error 2.276 kHz  
x dB Bandwidth 10.686 MHz

## Highest Channel

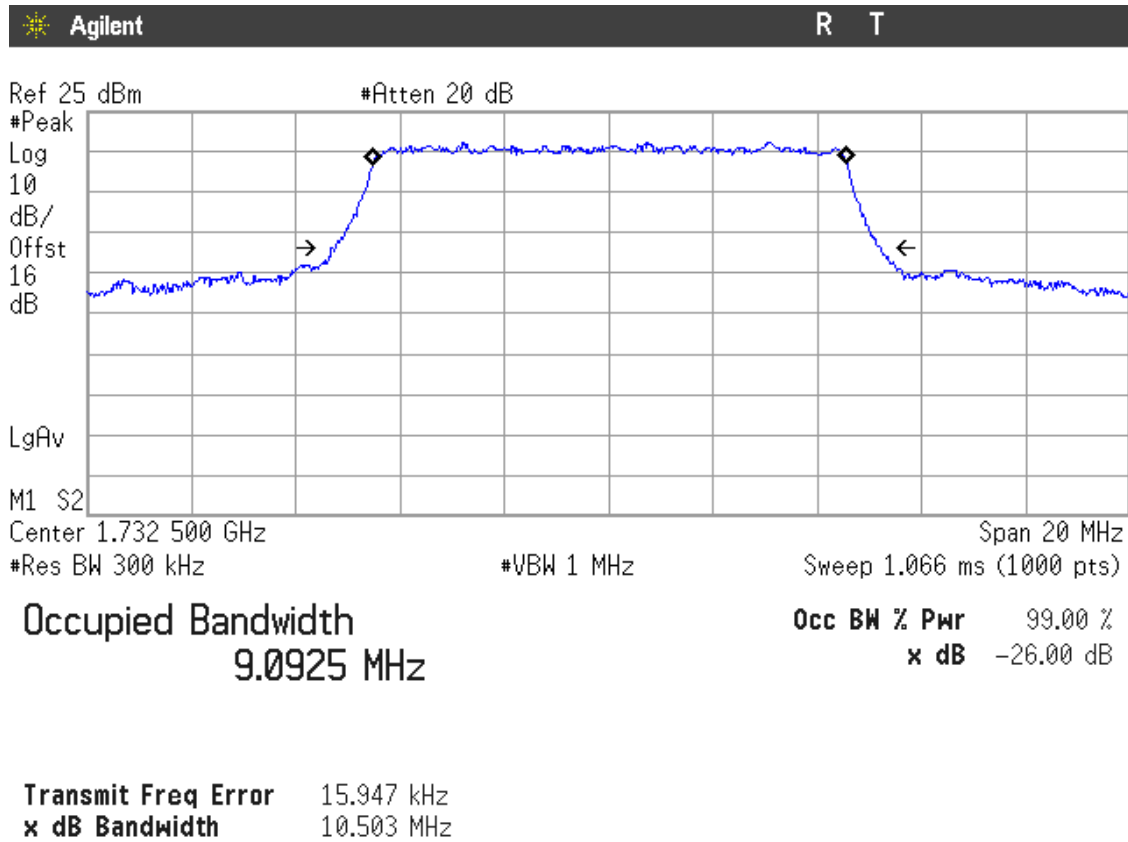


## LTE 16QAM MODULATION. BW = 10 MHz (Band IV)

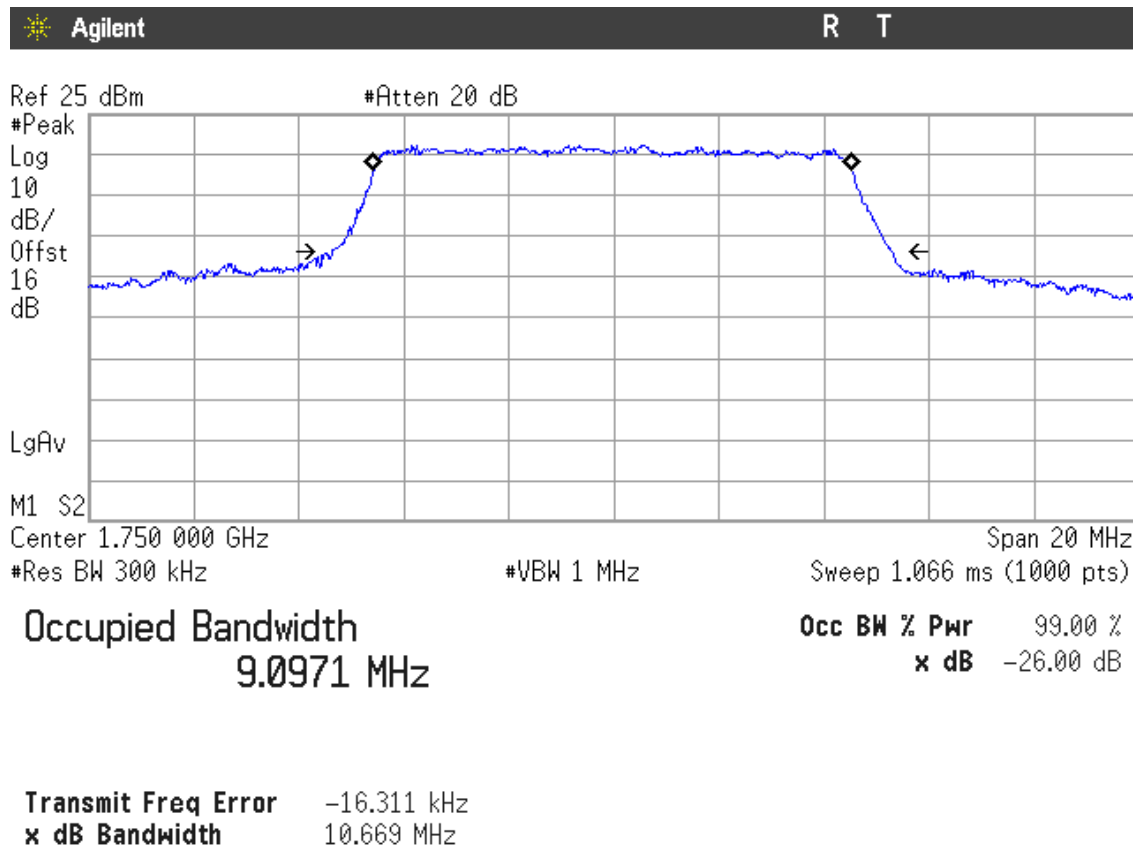
### Lowest Channel



## Middle Channel

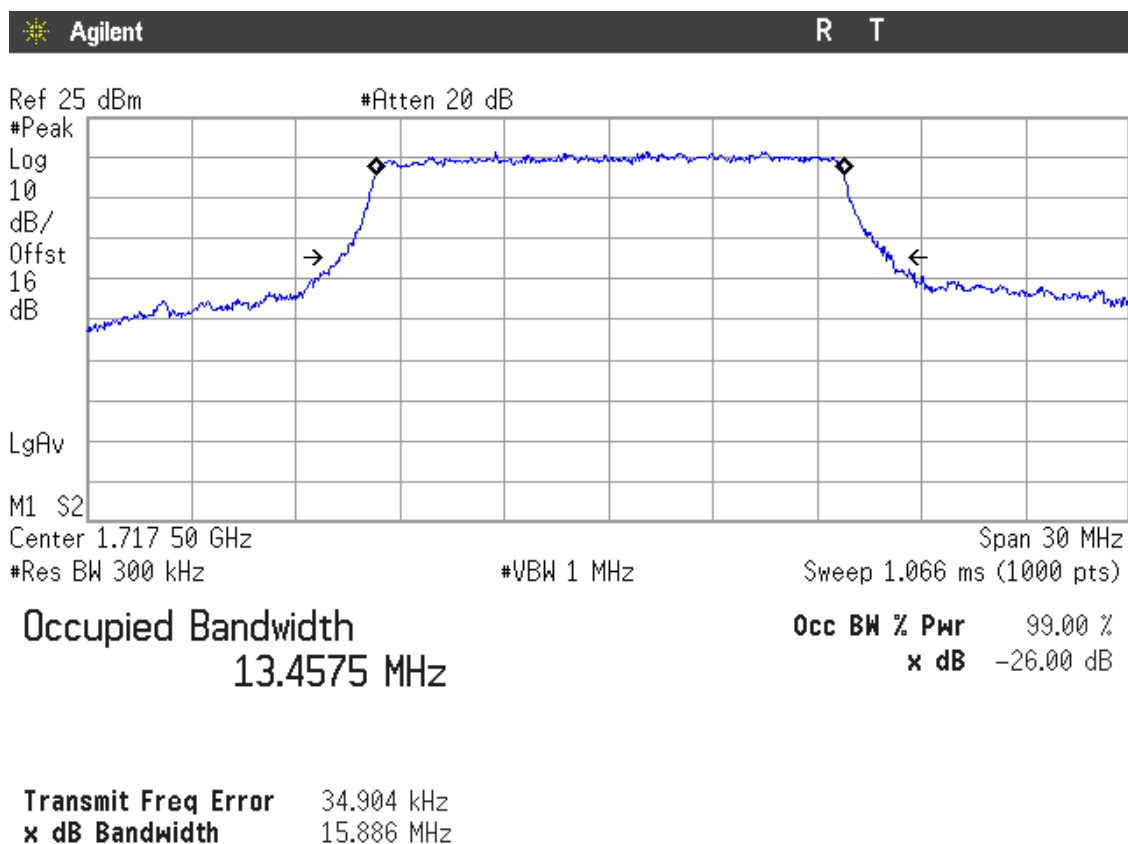


## Highest Channel

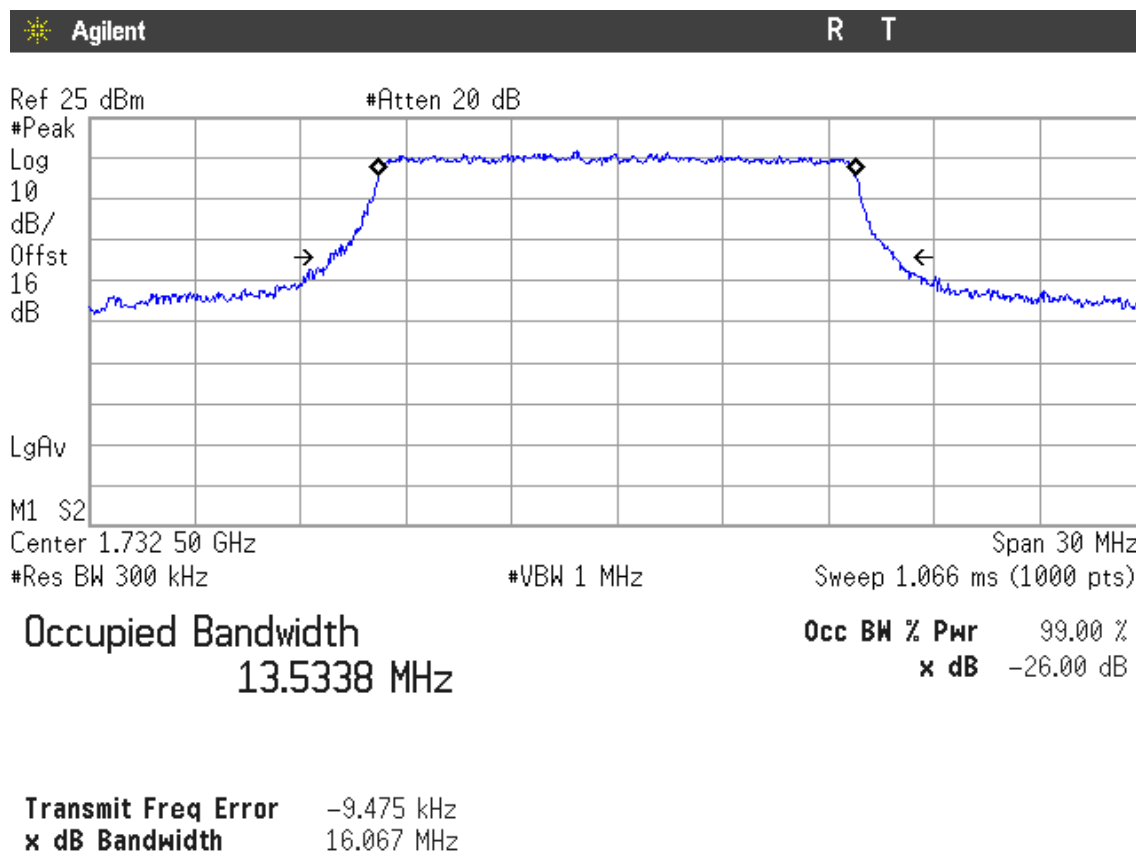


## LTE QPSK MODULATION. BW = 15 MHz (Band IV)

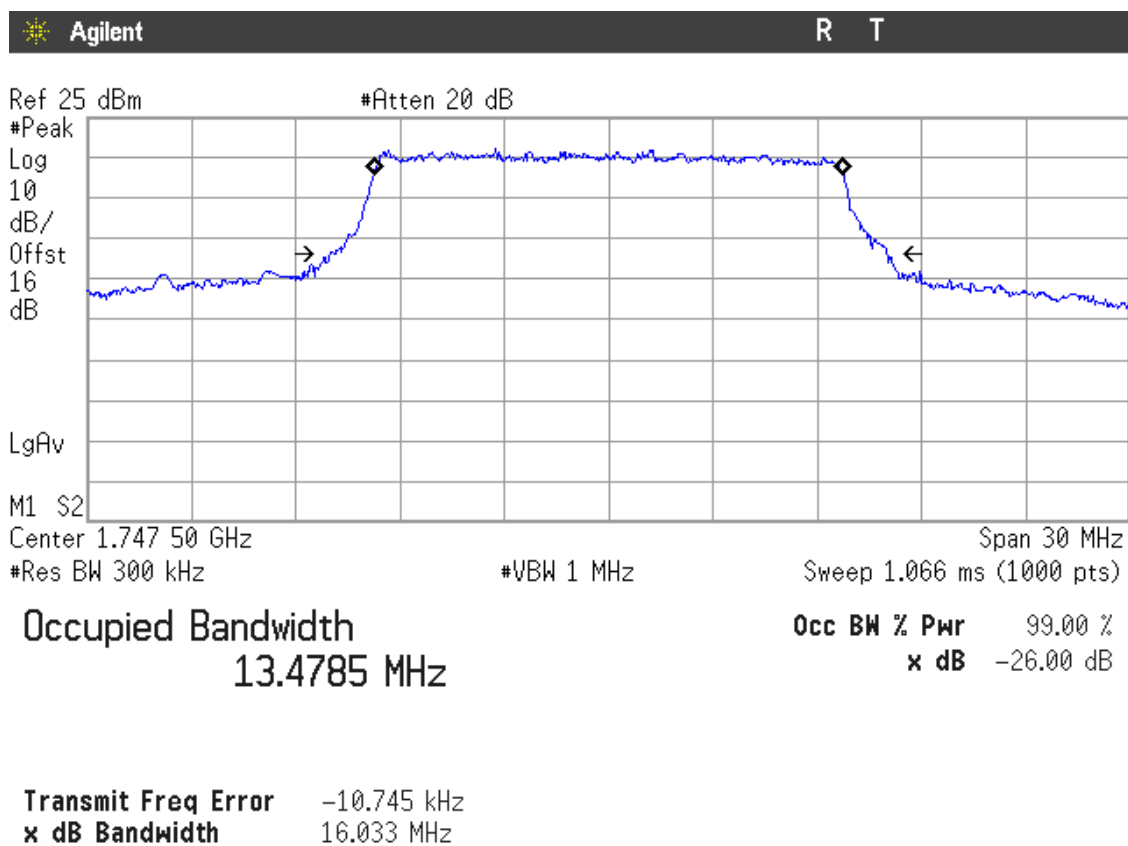
### Lowest Channel



### Middle Channel

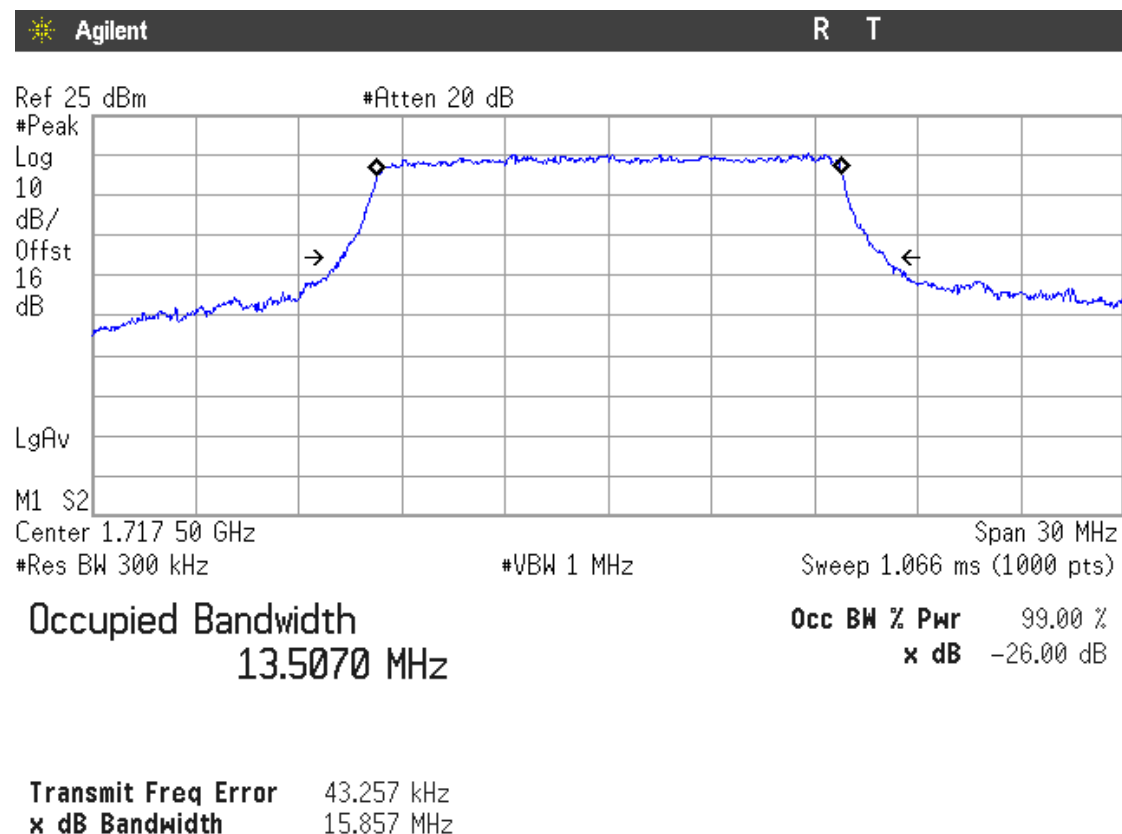


## Highest Channel

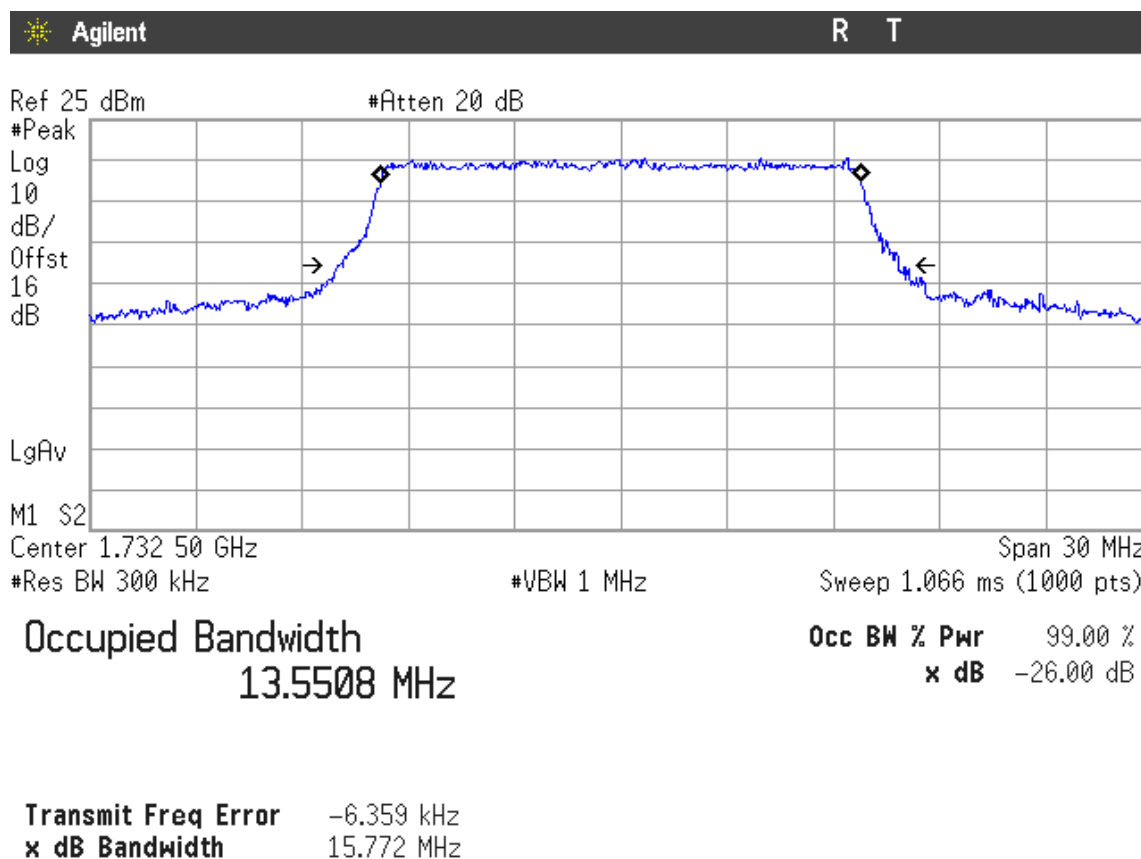


## LTE 16QAM MODULATION. BW = 15 MHz (Band IV)

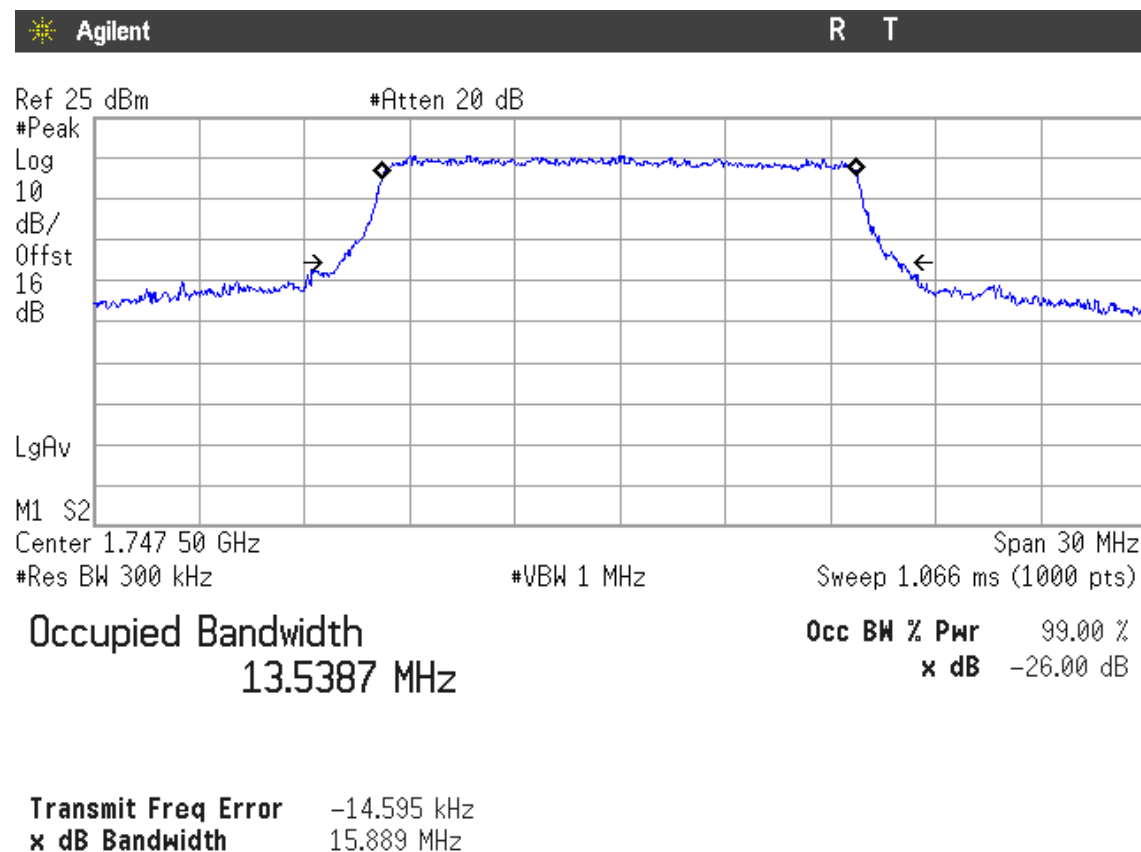
### Lowest Channel



## Middle Channel

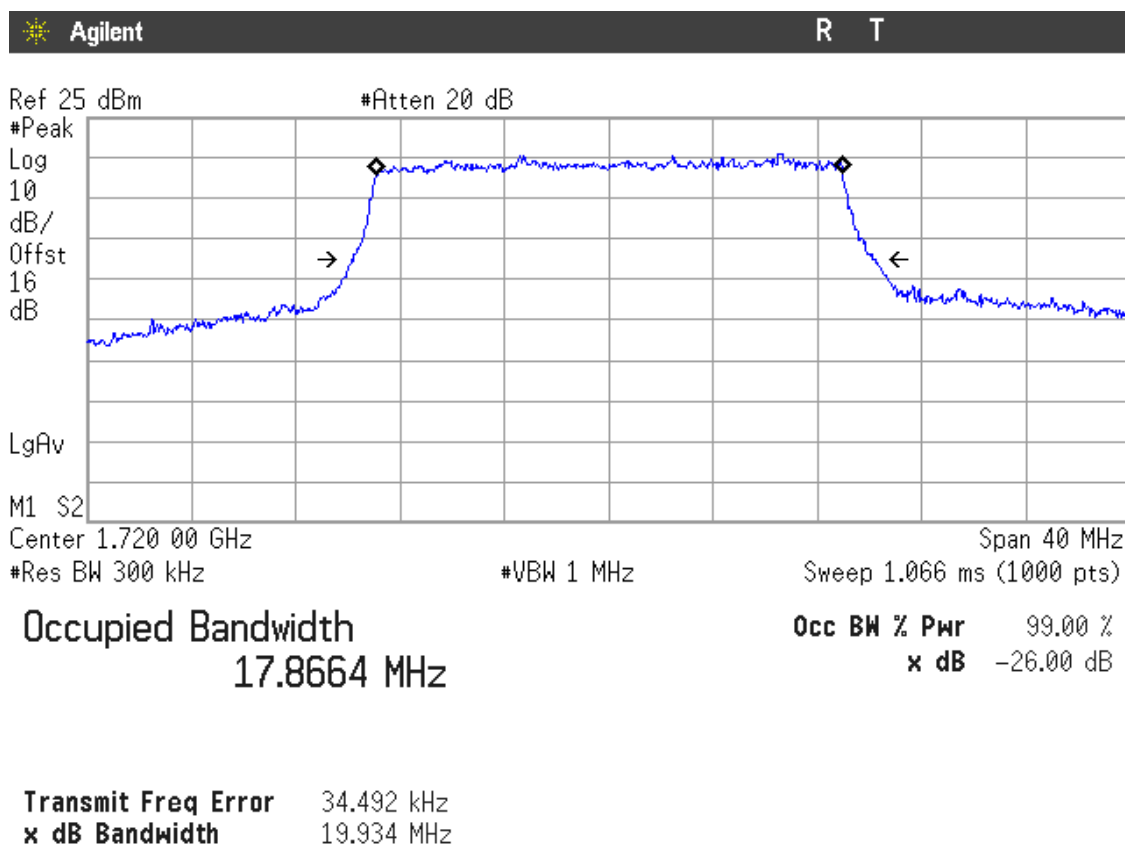


## Highest Channel

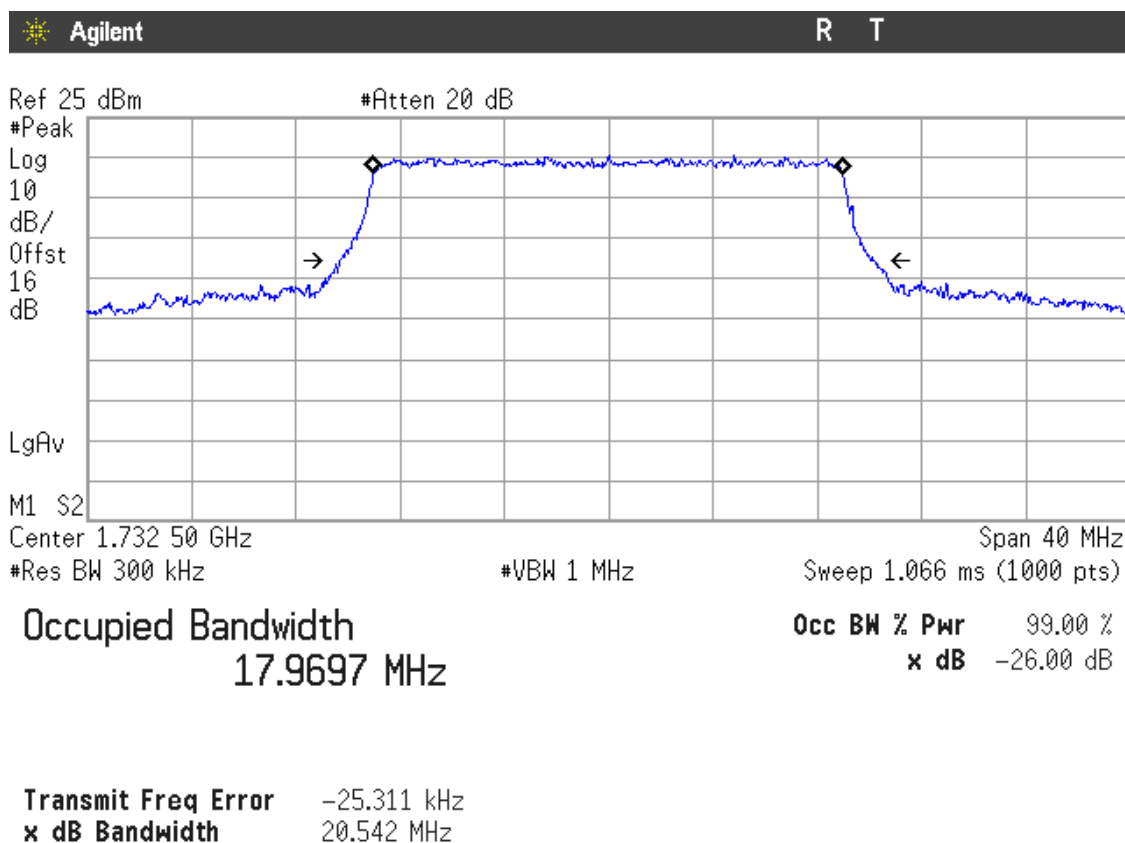


## LTE QPSK MODULATION. BW = 20 MHz (Band IV)

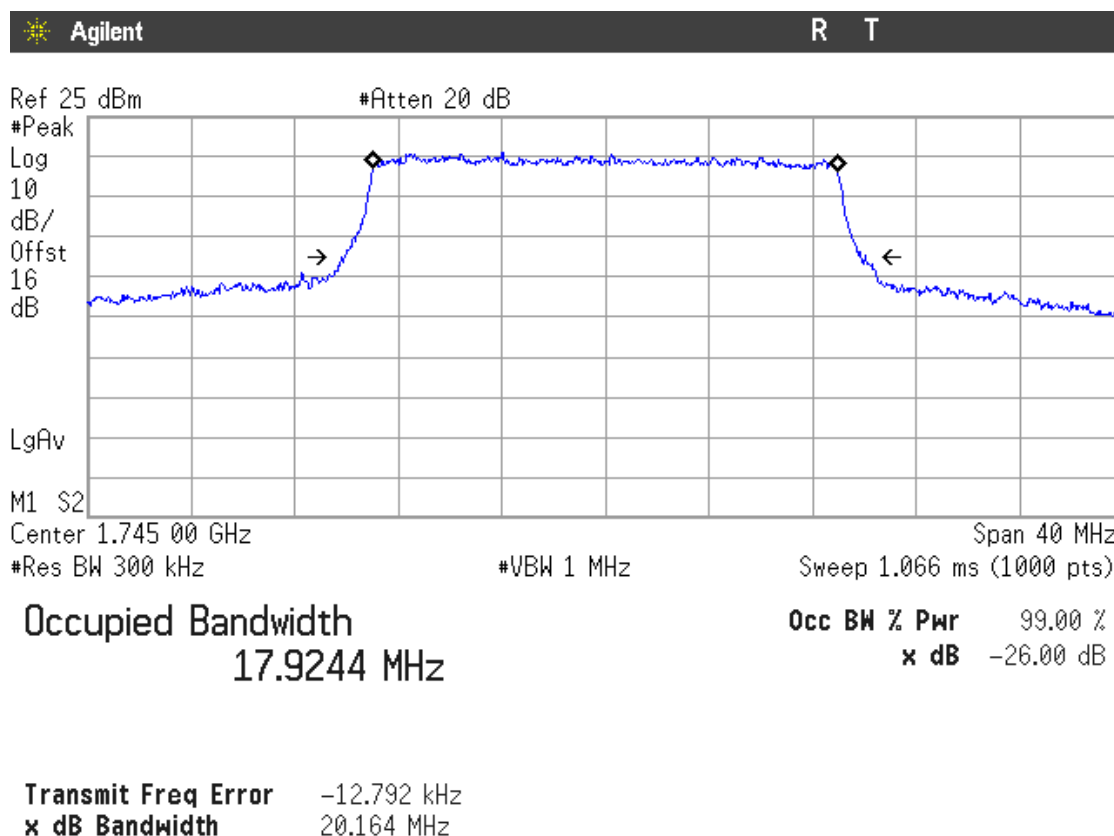
### Lowest Channel



### Middle Channel

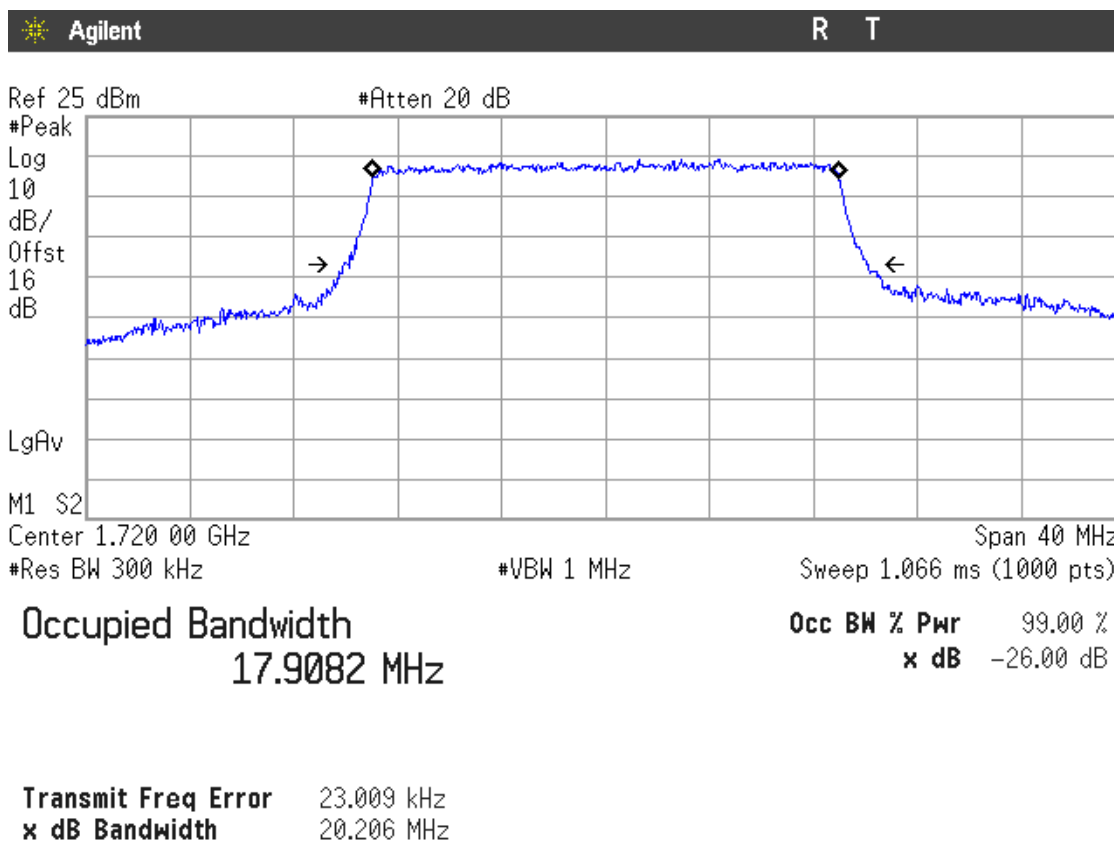


## Highest Channel

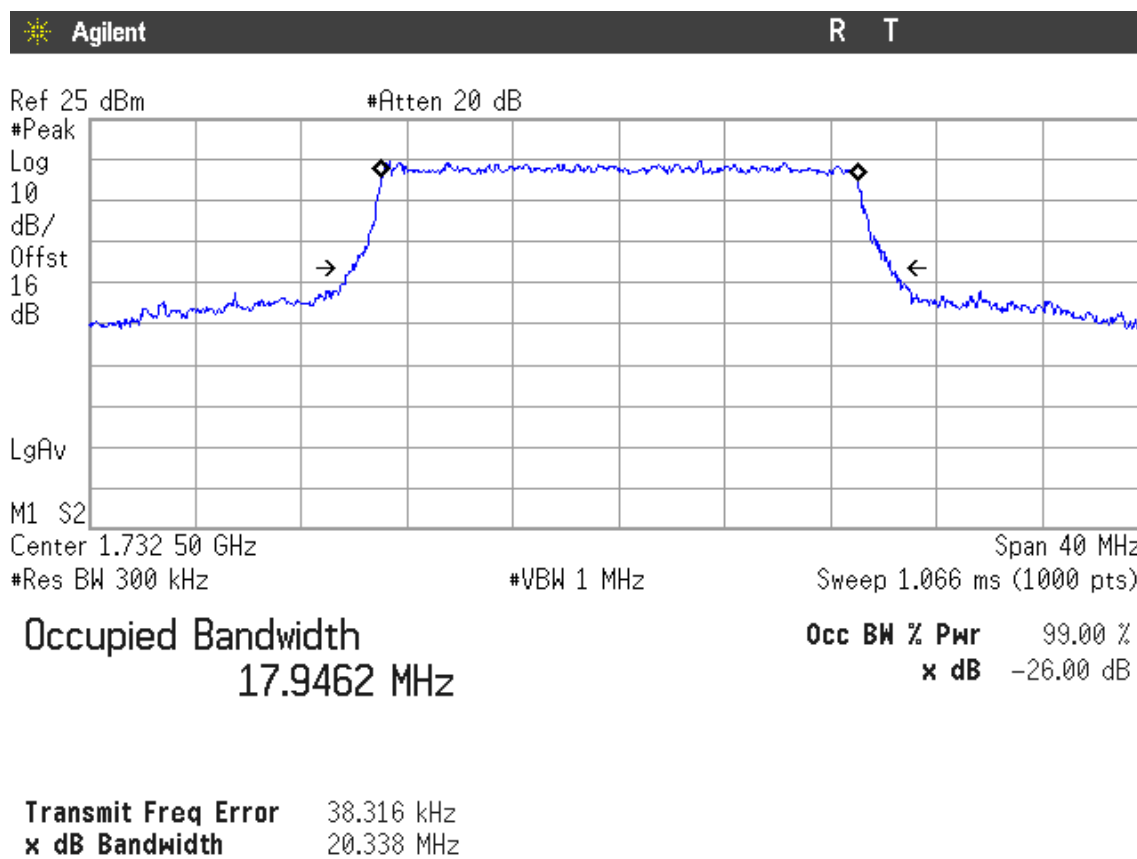


## LTE 16QAM MODULATION. BW = 20 MHz (Band IV)

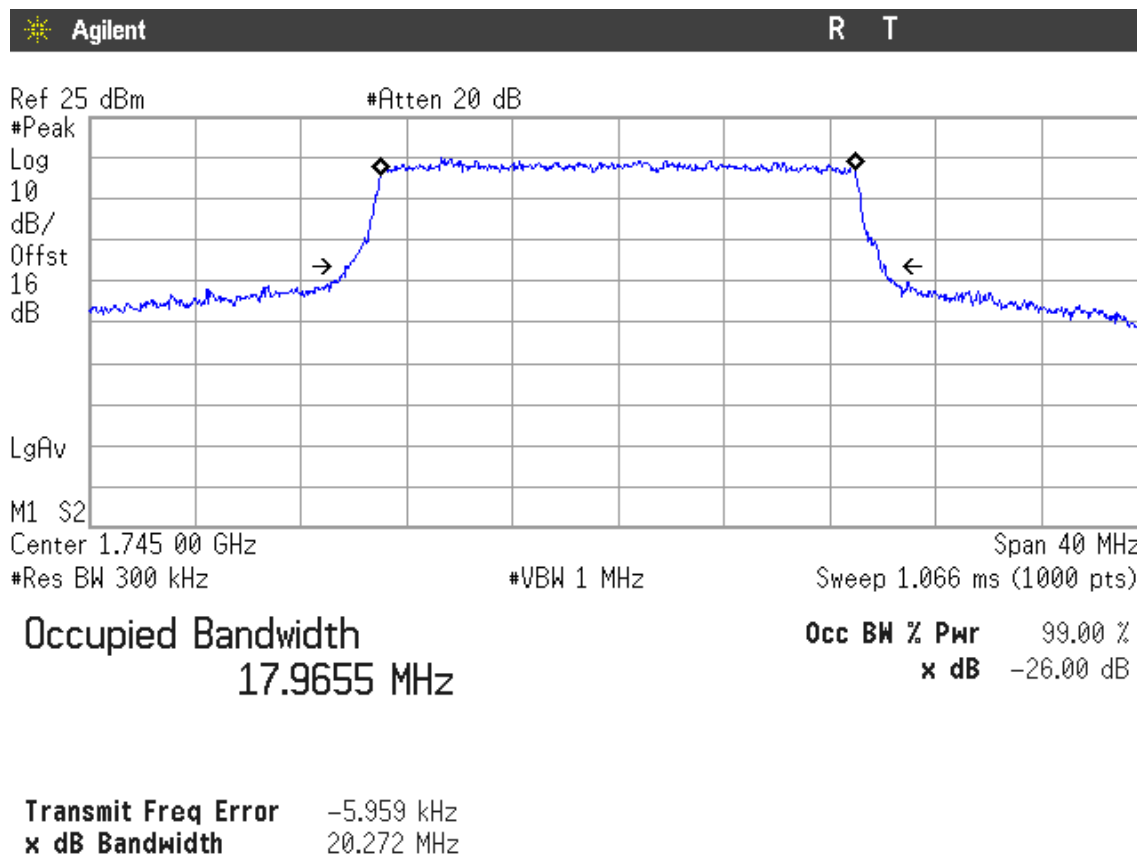
### Lowest Channel



## Middle Channel

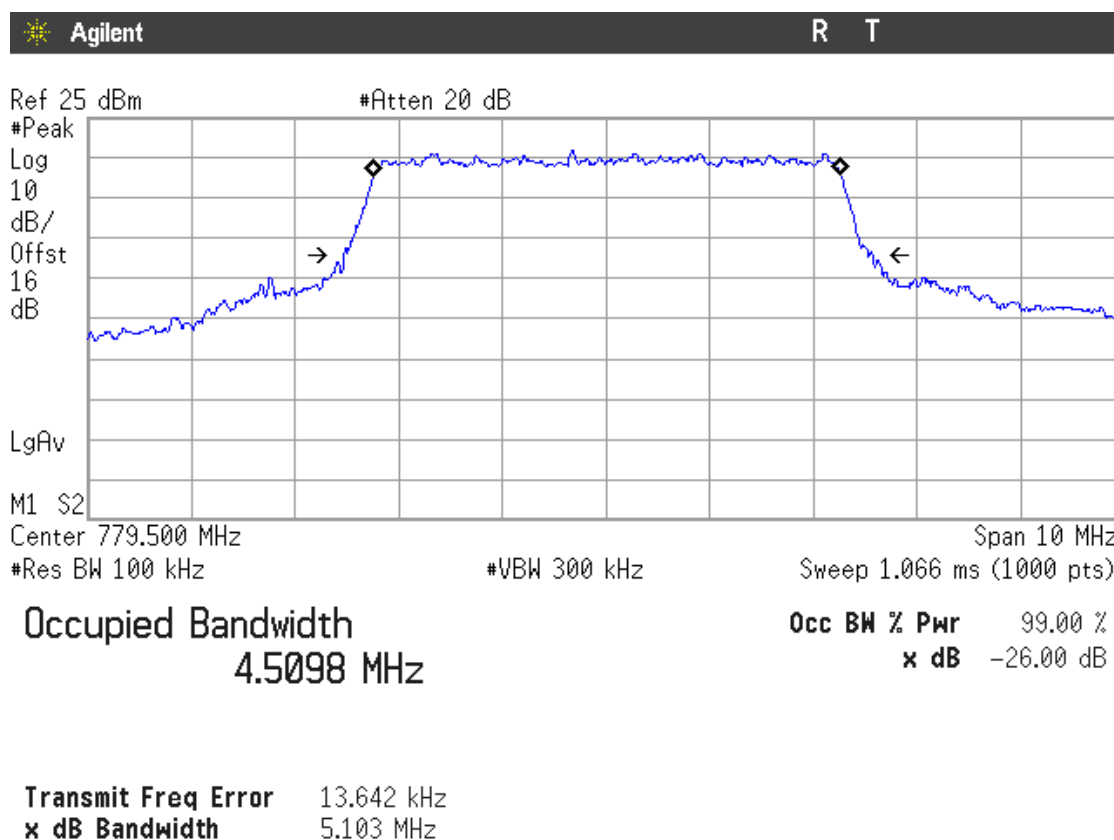


## Highest Channel

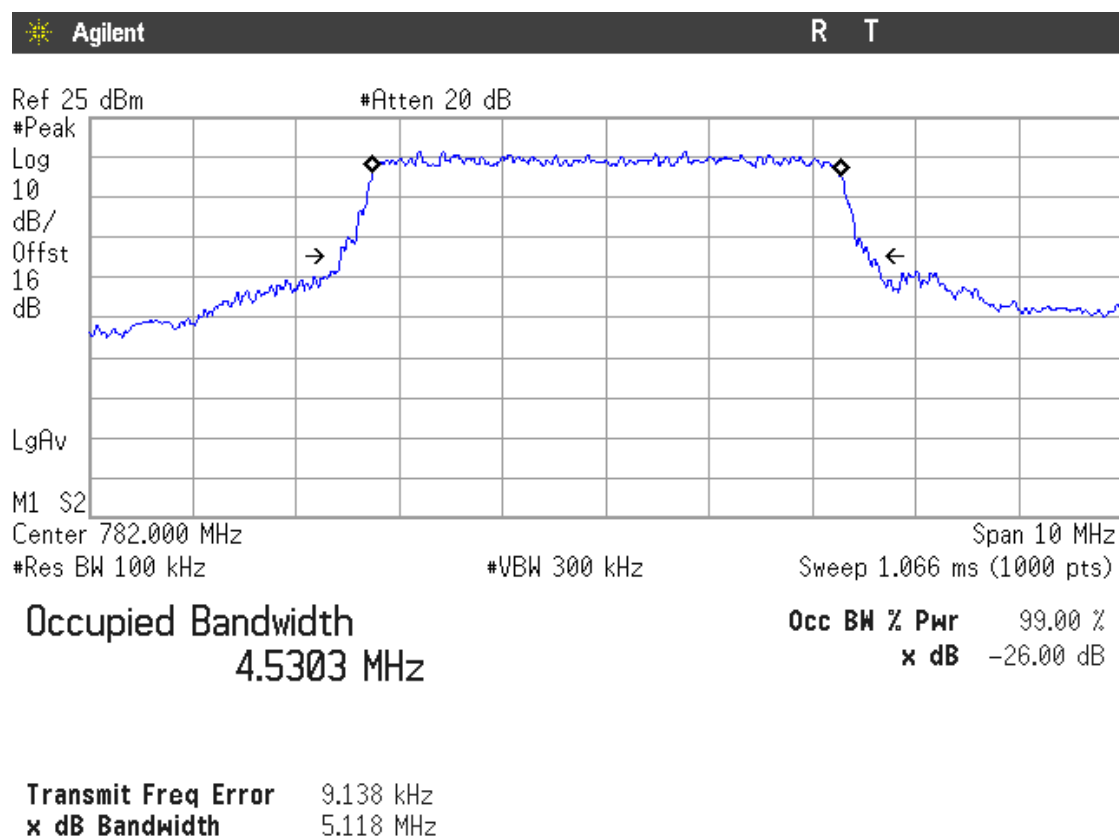


## LTE QPSK MODULATION. BW = 5 MHz (Band XIII)

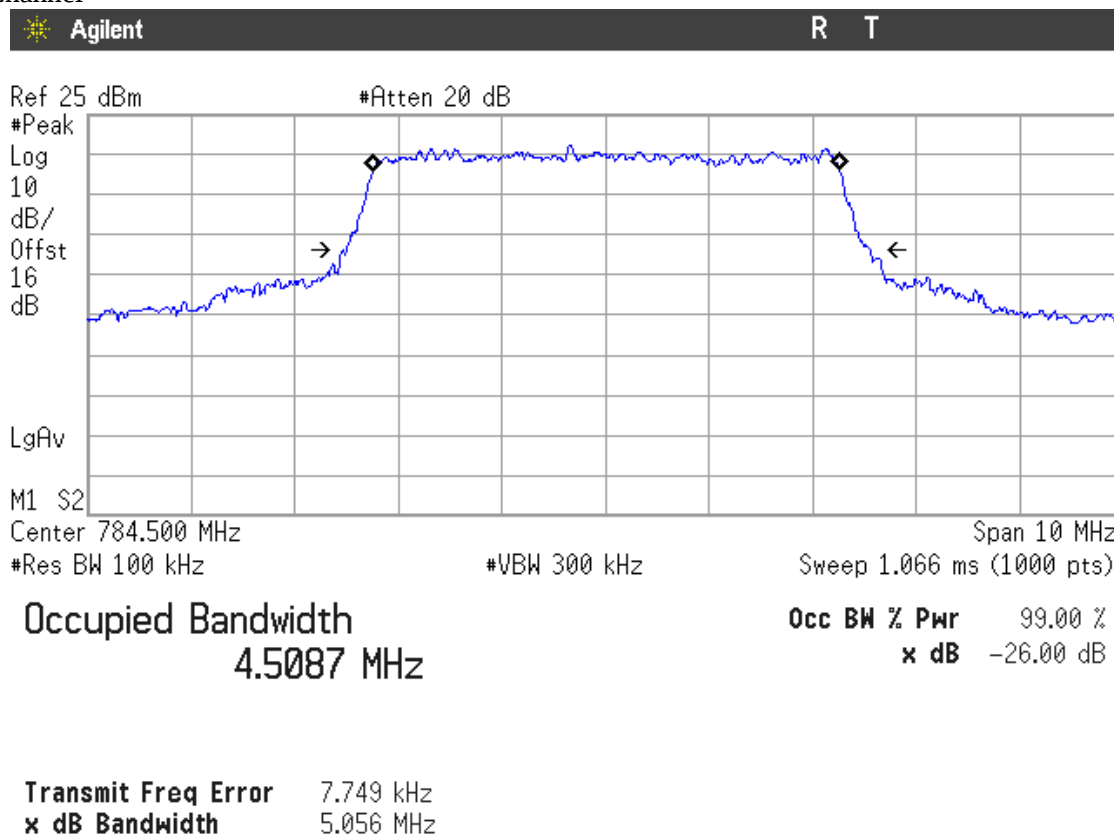
### Lowest Channel



### Middle Channel

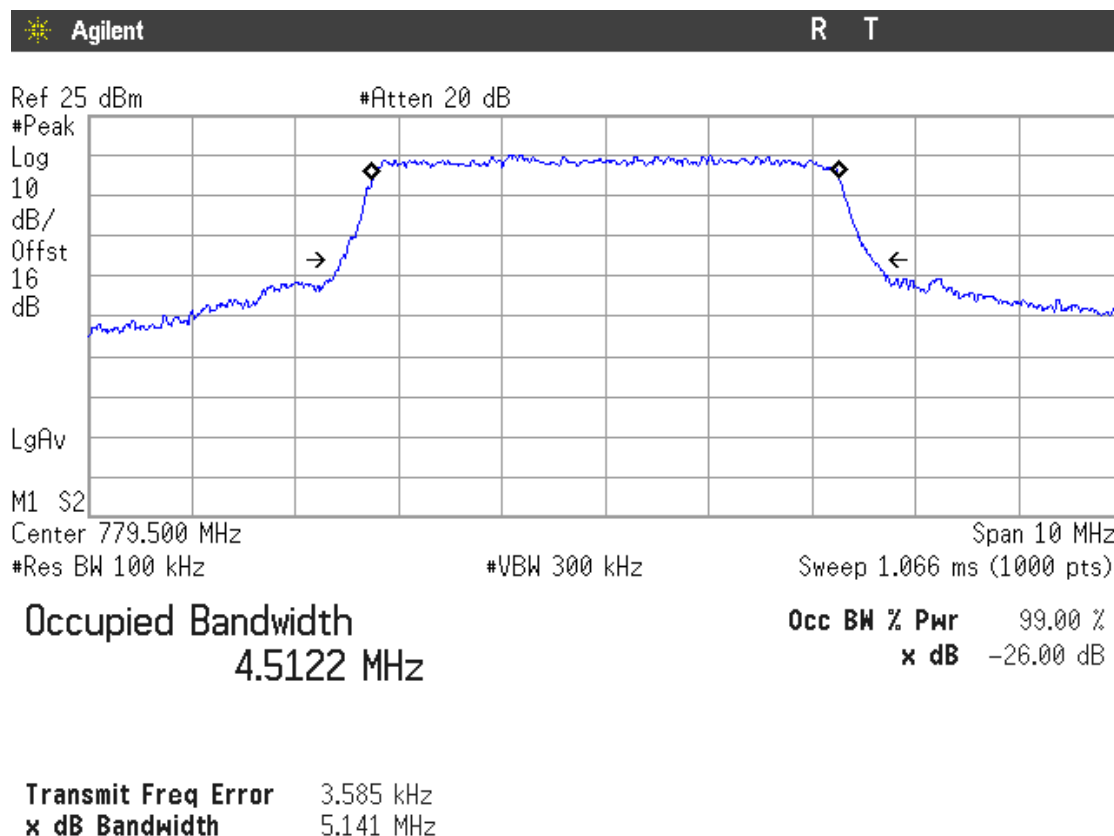


## Highest Channel

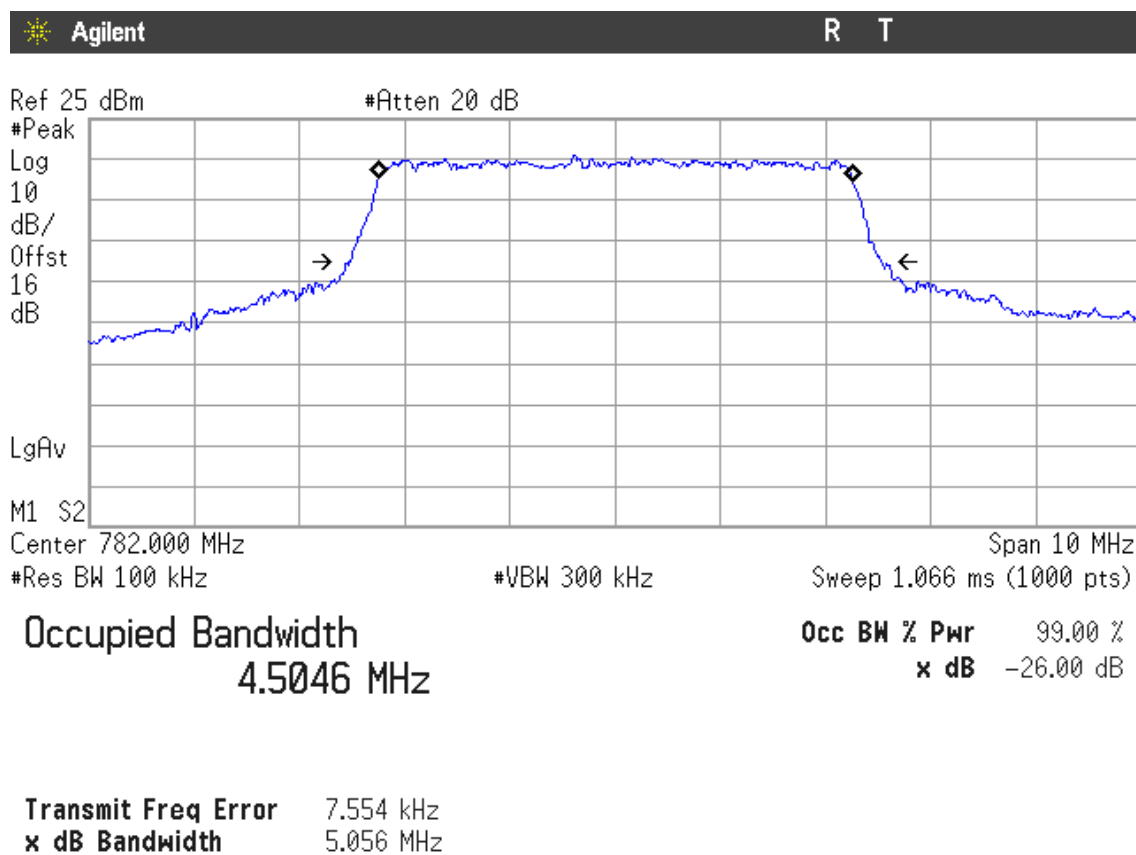


## LTE 16QAM MODULATION. BW = 5 MHz (Band XIII)

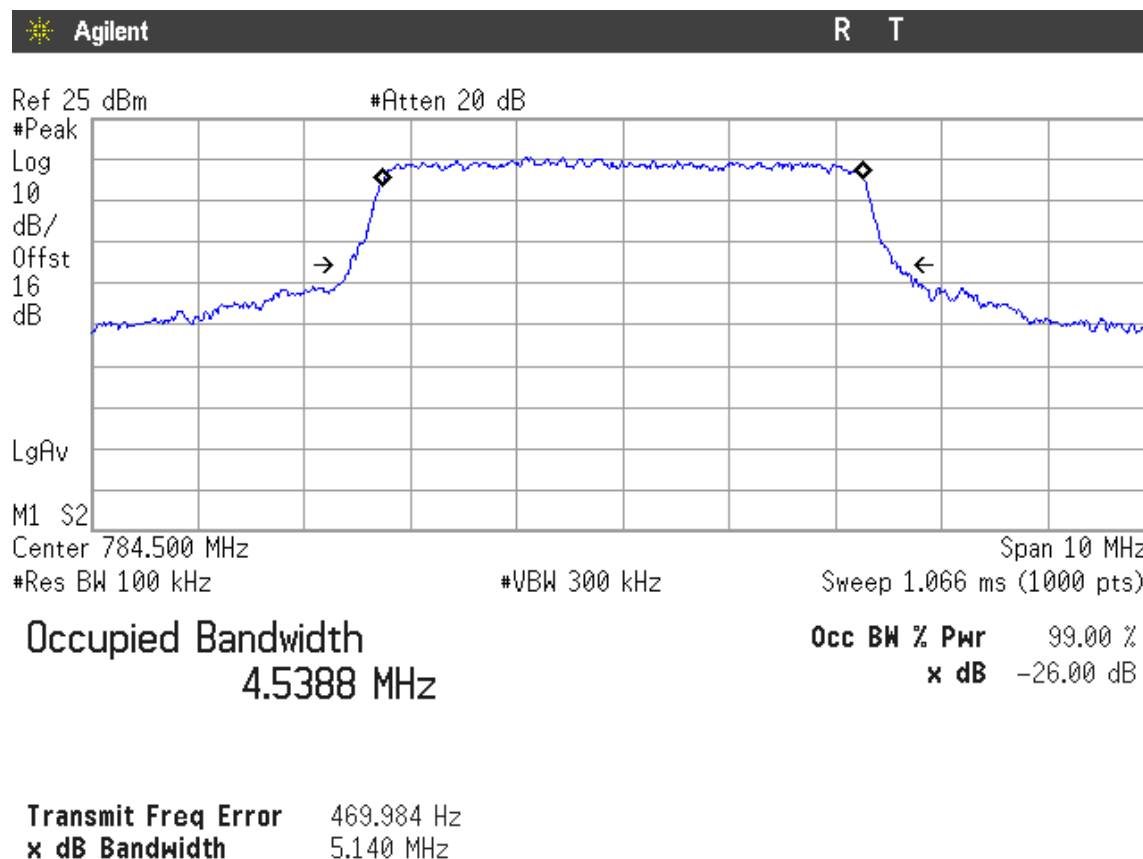
### Lowest Channel



## Middle Channel

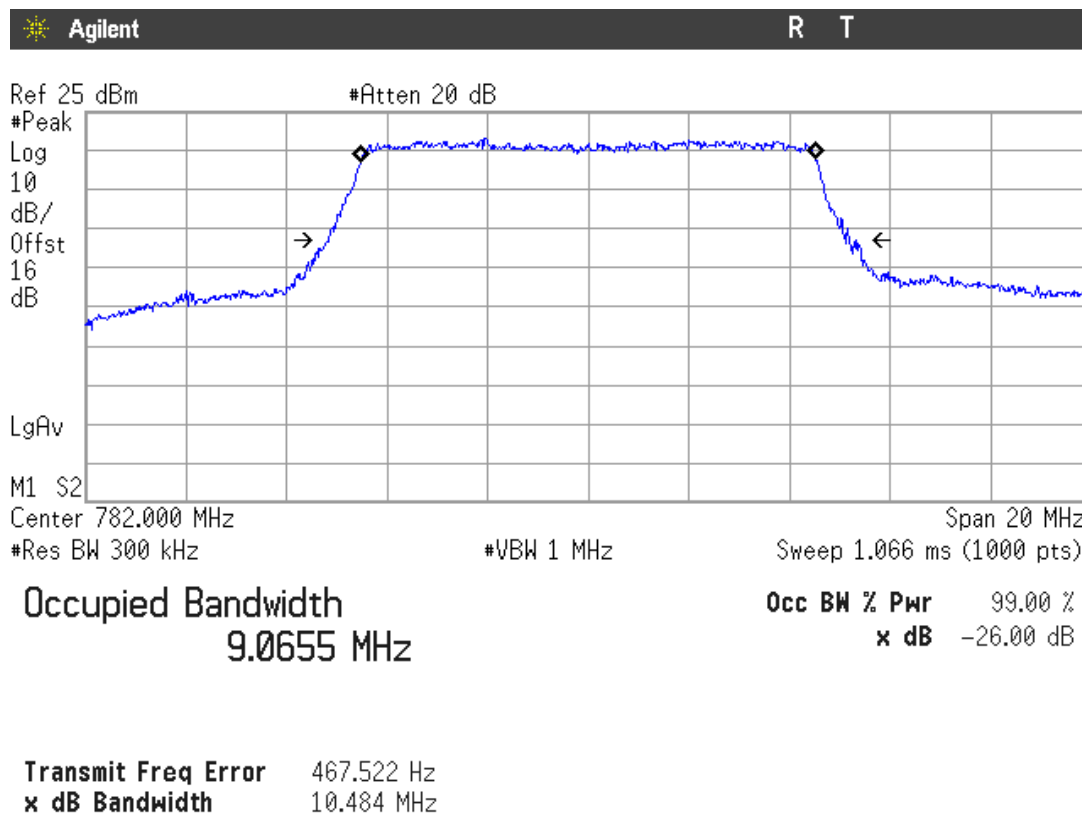


## Highest Channel



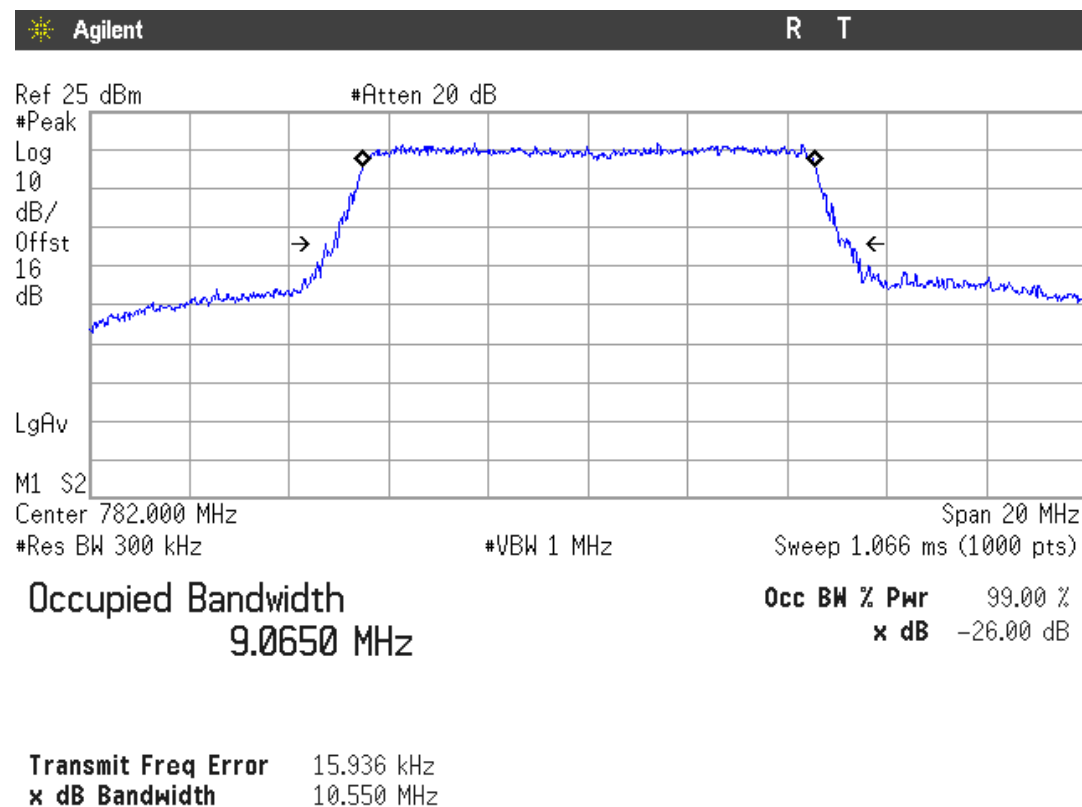
## LTE QPSK MODULATION. BW = 10 MHz (Band XIII)

### Middle Channel



## LTE 16QAM MODULATION. BW = 10 MHz (Band XIII)

### Middle Channel



## Spurious emissions at antenna terminals

### SPECIFICATION

LTE BAND IV. FCC §2.1051 and §27.53 (h). RSS-139 Clause 6.6.

According to specification, the power of emissions shall be attenuated below the transmitter power (P) by a factor of at least  $43 + 10 \log (P)$  dB. P in watts.

LTE BAND XIII. FCC §2.1051 and §27.53 (c). RSS-130 Clause 4.6.

On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least  $43 + 10 \log (P)$  dB.

On all frequencies between 763-775 MHz and 793-806 MHz, by a factor not less than  $65 + 10 \log (P)$  dB in a 6.25 kHz band segment, for mobile and portable stations.

At  $P_o$  transmitting power, the specified minimum attenuation becomes  $43 + 10 \log (P_o)$ , and the level in dBm relative  $P_o$  becomes:

$$P_o \text{ (dBm)} - [43 + 10 \log (P_o \text{ in mwatts}) - 30] = -13 \text{ dBm.}$$

At  $P_o$  transmitting power, the specified minimum attenuation becomes  $65 + 10 \log (P_o)$ , and the level in dBm relative  $P_o$  becomes:

$$P_o \text{ (dBm)} - [65 + 10 \log (P_o \text{ in mwatts}) - 30] = -35 \text{ dBm.}$$

### METHOD

The EUT RF output connector was connected to a spectrum analyser and to the Universal Radio Communication tester R&S CMW500 (selecting maximum transmission power of the EUT and different modes of modulation) using a 50 ohm attenuator and a power splitter.

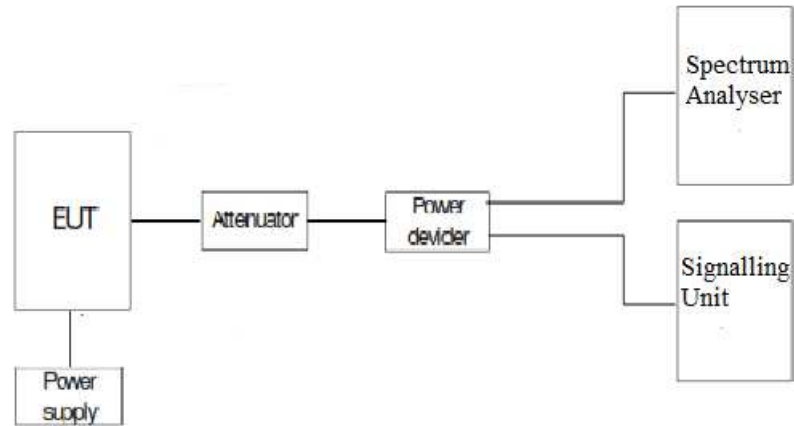
The spectrum was investigated from 9 kHz to 18 GHz for LTE Band IV.

The spectrum was investigated from 9 kHz to 8 GHz, from 763 MHz to 775 MHz and from 793 MHz to 806 MHz for LTE Band XIII.

The reading of the spectrum analyser is corrected with the attenuation loss of connection between output terminal of EUT and input of the spectrum analyser.

For LTE mode the configuration of Resource Blocks and modulation which is the worst case for conducted power was used.

## TEST SETUP



## RESULTS (see plots in next pages)

LTE QPSK MODULATION. BW = 1.4 MHz. Band IV

### 1. CHANNEL: LOWEST

No spurious signals were found at less than 20dB respect to the limit in all the range.

### 2. CHANNEL: MIDDLE

No spurious signals were found at less than 20dB respect to the limit in all the range.

### 3. CHANNEL: HIGHEST

No spurious signals were found at less than 20dB respect to the limit in all the range.

LTE QPSK MODULATION. BW = 3 MHz. Band IV

### 1. CHANNEL: LOWEST

No spurious signals were found at less than 20dB respect to the limit in all the range.

### 2. CHANNEL: MIDDLE

No spurious signals were found at less than 20dB respect to the limit in all the range.

### 3. CHANNEL: HIGHEST

No spurious signals were found at less than 20dB respect to the limit in all the range.

#### LTE QPSK MODULATION. BW = 5 MHz. Band IV

##### 1. CHANNEL: LOWEST

No spurious signals were found at less than 20dB respect to the limit in all the range.

##### 2. CHANNEL: MIDDLE

No spurious signals were found at less than 20dB respect to the limit in all the range.

##### 3. CHANNEL: HIGHEST

No spurious signals were found at less than 20dB respect to the limit in all the range.

#### LTE QPSK MODULATION. BW = 10 MHz. Band IV

##### 1. CHANNEL: LOWEST

No spurious signals were found at less than 20dB respect to the limit in all the range.

##### 2. CHANNEL: MIDDLE

No spurious signals were found at less than 20dB respect to the limit in all the range.

##### 3. CHANNEL: HIGHEST

No spurious signals were found at less than 20dB respect to the limit in all the range.

#### LTE QPSK MODULATION. BW = 15 MHz. Band IV

No spurious signals were found at less than 20dB respect to the limit in all the range.

##### 2. CHANNEL: MIDDLE

No spurious signals were found at less than 20dB respect to the limit in all the range.

##### 3. CHANNEL: HIGHEST

No spurious signals were found at less than 20dB respect to the limit in all the range.

#### LTE QPSK MODULATION. BW = 20 MHz. Band IV

##### 1. CHANNEL: LOWEST

No spurious signals were found at less than 20dB respect to the limit in all the range.

##### 2. CHANNEL: MIDDLE

No spurious signals were found at less than 20dB respect to the limit in all the range.

##### 3. CHANNEL: HIGHEST

No spurious signals were found at less than 20dB respect to the limit in all the range.

## LTE QPSK MODULATION. BW = 5 MHz. Band XIII

### 1. CHANNEL: LOWEST

Spurious signals found closest to the limit in all the range:

| Frequency (MHz) | Level (dBm) | Limit (dBm) |
|-----------------|-------------|-------------|
| 773.00700       | -47.75      | -35.00      |
| 774.95020       | -45.58      | -35.00      |

### 2. CHANNEL: MIDDLE

No spurious signals were found at less than 20dB respect to the limit in all the range.

### 3. CHANNEL: HIGHEST

No spurious signals were found at less than 20dB respect to the limit in all the range.

## LTE QPSK MODULATION. BW = 10 MHz. Band XIII

### 1. CHANNEL: MIDDLE

Spurious signals found closest to the limit in all the range:

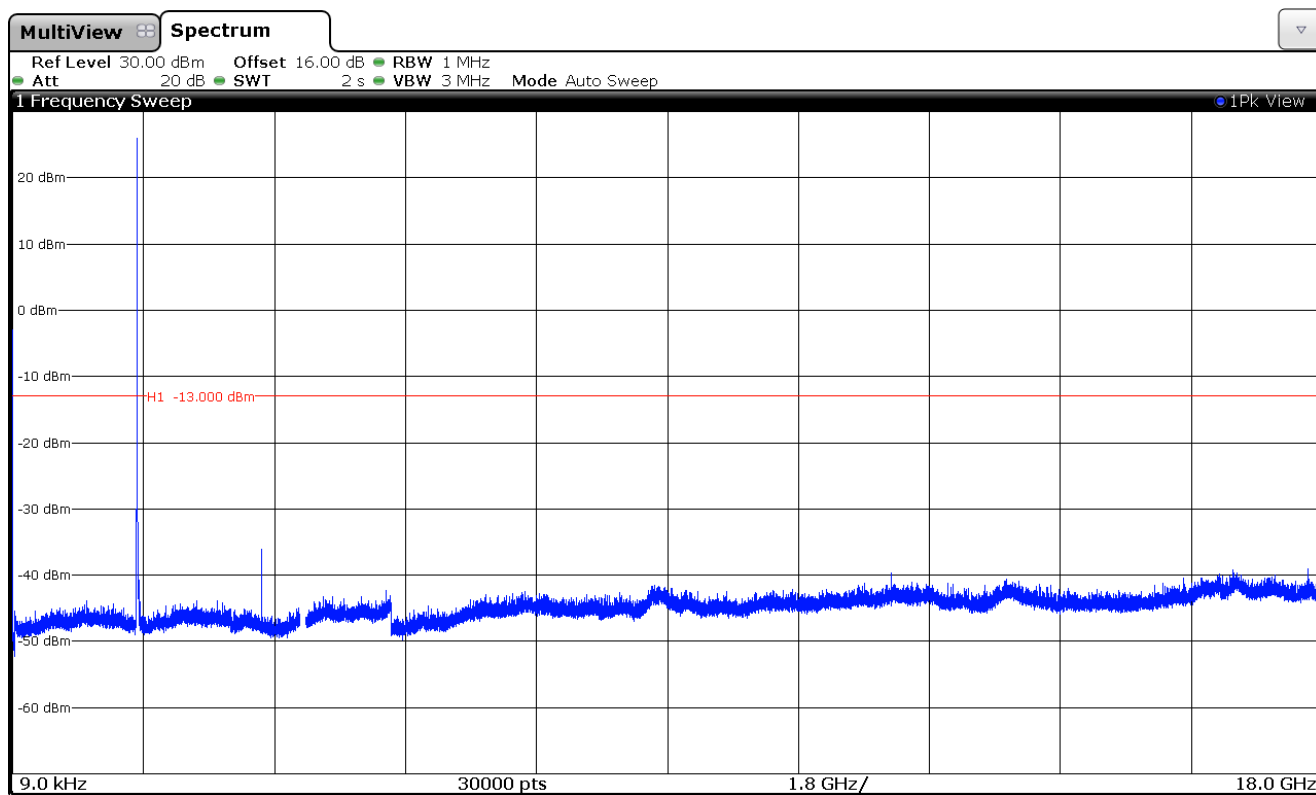
| Frequency (MHz) | Level (dBm) | Limit (dBm) |
|-----------------|-------------|-------------|
| 773.13180       | -46.43      | -35.00      |
| 774.97380       | -47.04      | -35.00      |
| 794.40032       | -43.39      | -35.00      |
| 794.53812       | -43.62      | -35.00      |

Measurement uncertainty =  $< \pm 1.20$  dB.

Verdict: PASS

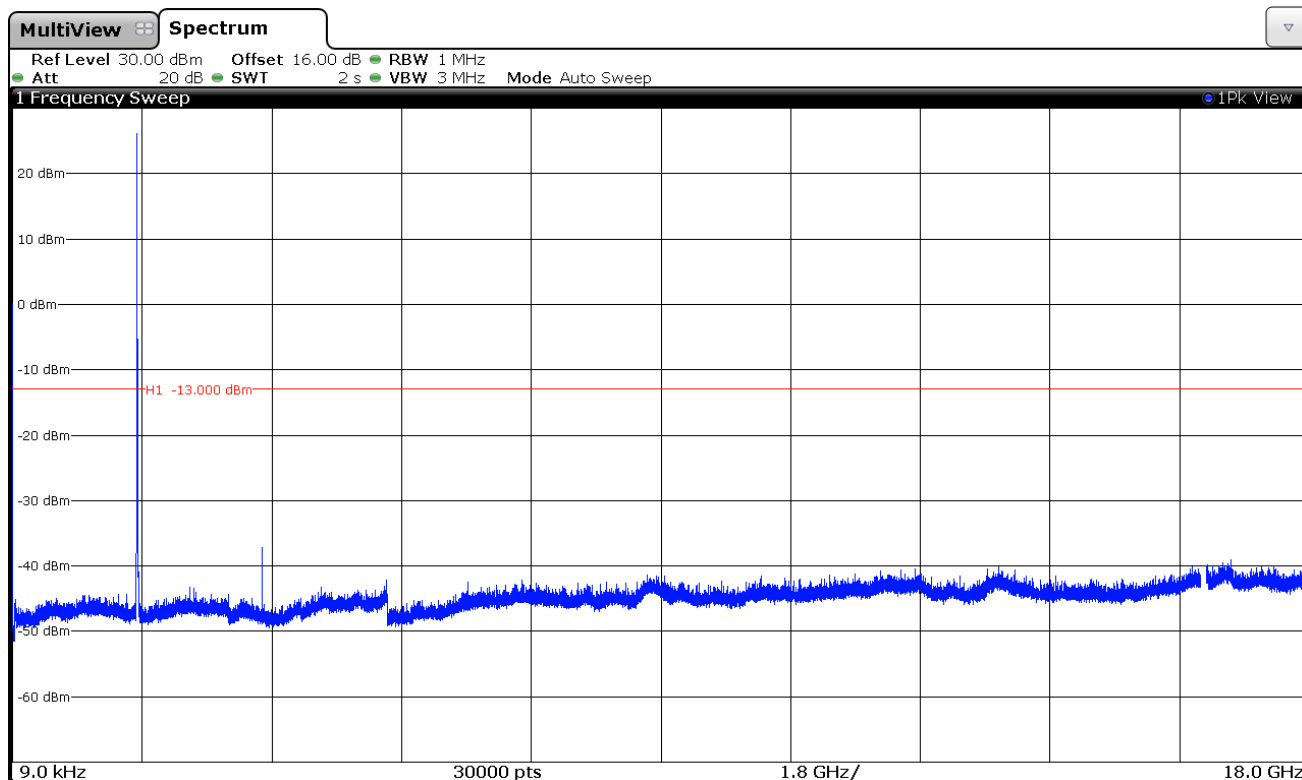
## LTE QPSK MODULATION. BW = 1.4 MHz (Band IV)

### 1. CHANNEL: LOWEST



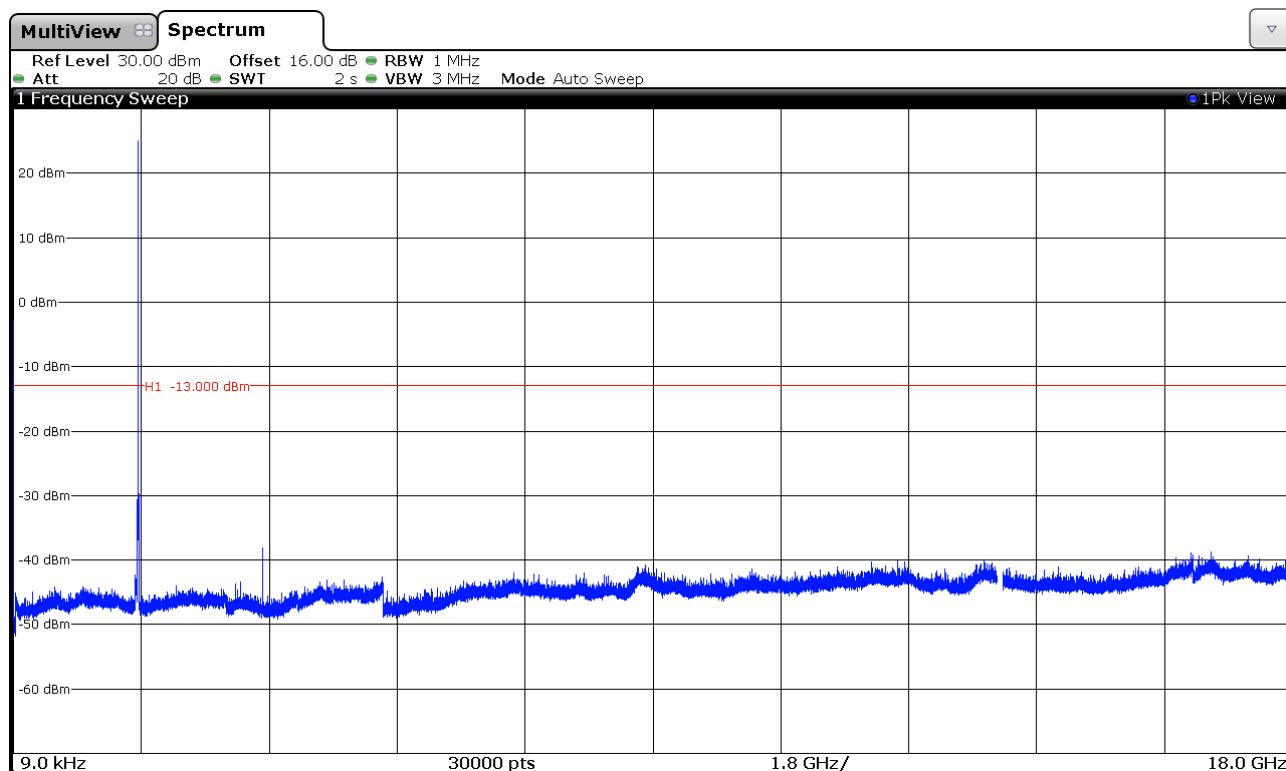
Note: The peak above the limit is the carrier frequency.

### 2. CHANNEL: MIDDLE



Note: The peak above the limit is the carrier frequency.

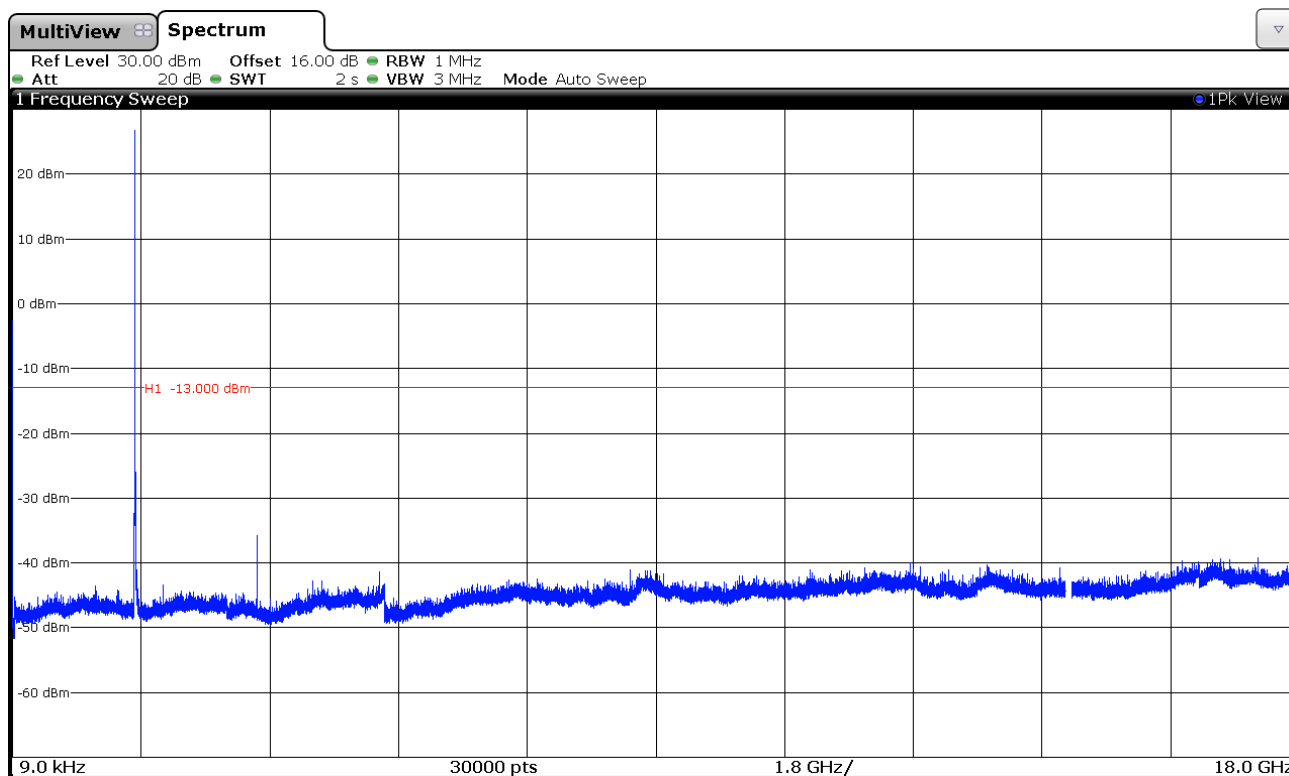
### 3. CHANNEL: HIGHEST



Note: The peak above the limit is the carrier frequency.

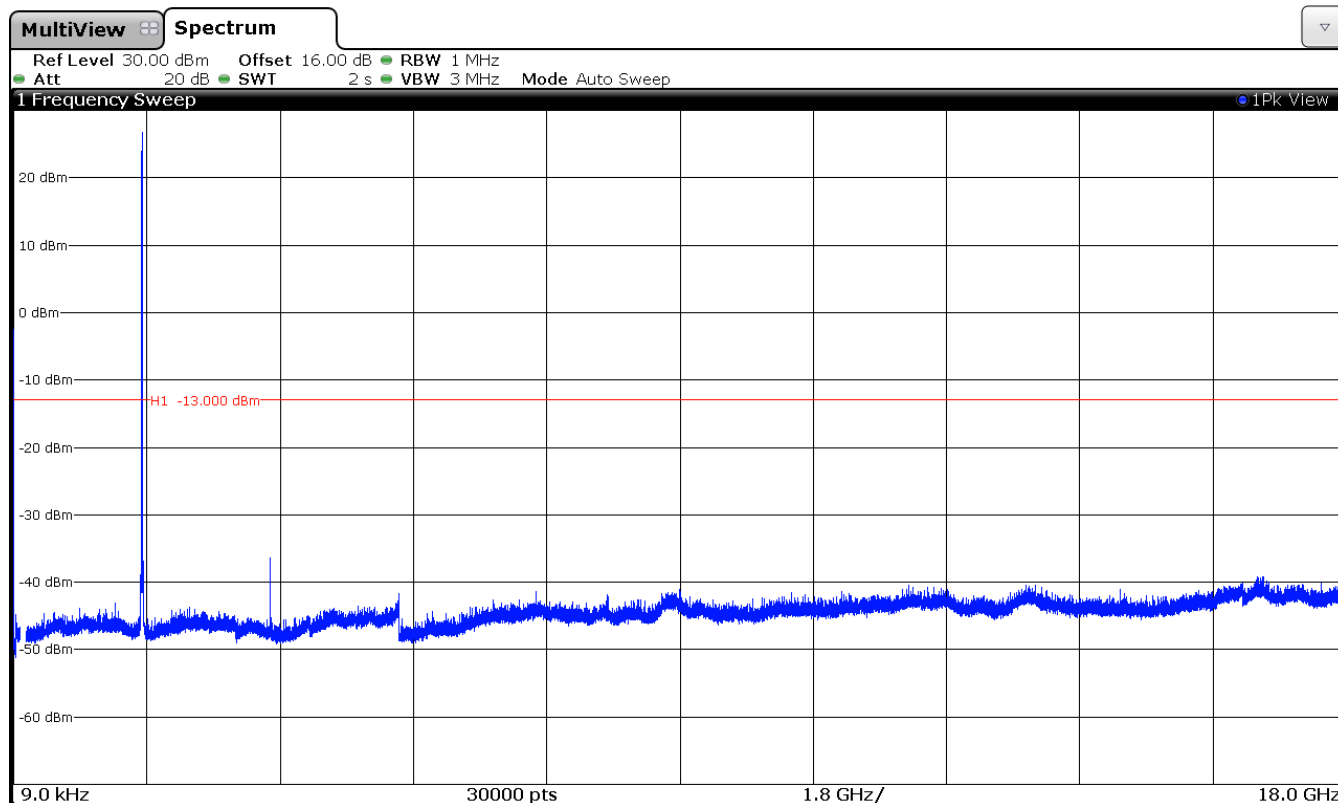
### LTE QPSK MODULATION. BW = 3 MHz (Band IV)

#### 1. CHANNEL: LOWEST



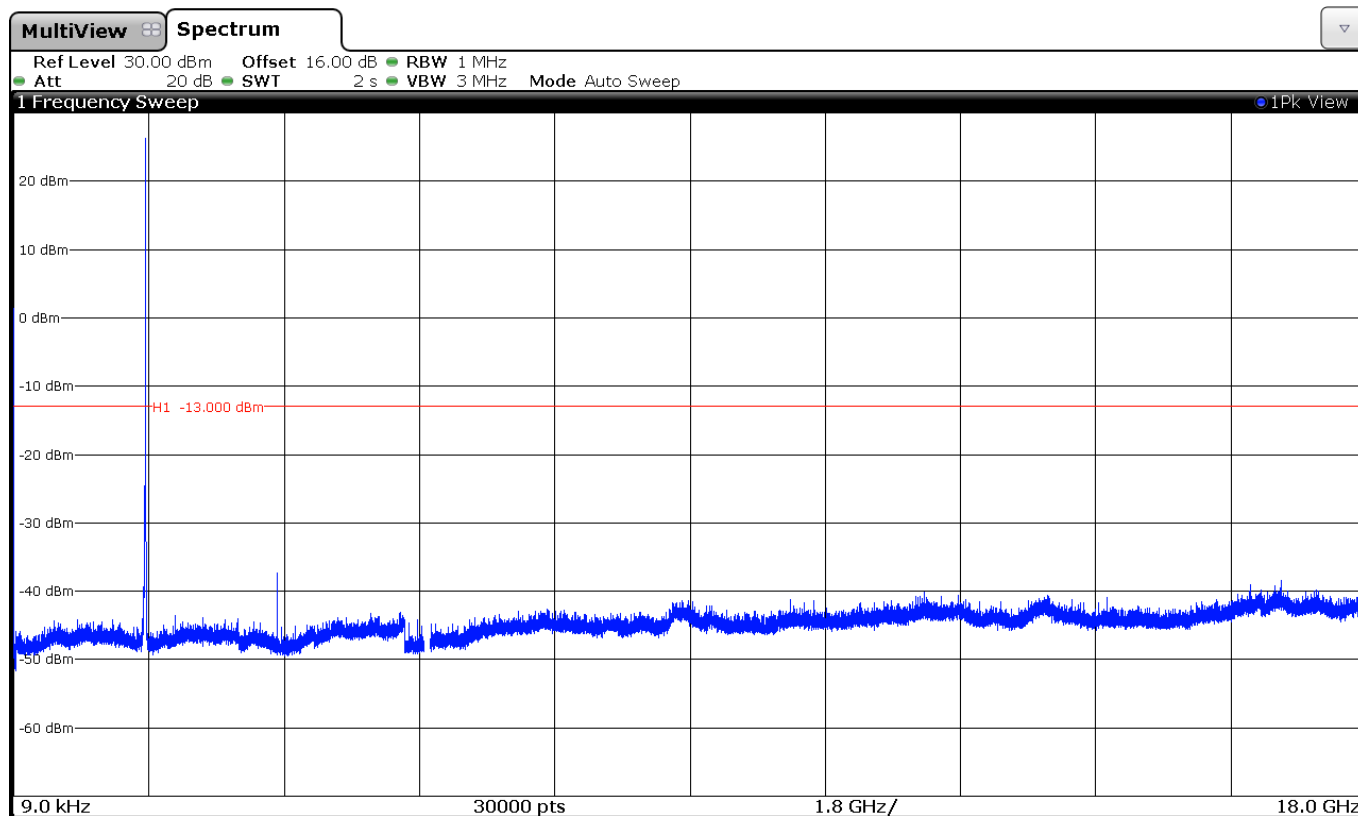
Note: The peak above the limit is the carrier frequency.

## 2. CHANNEL: MIDDLE



Note: The peak above the limit is the carrier frequency.

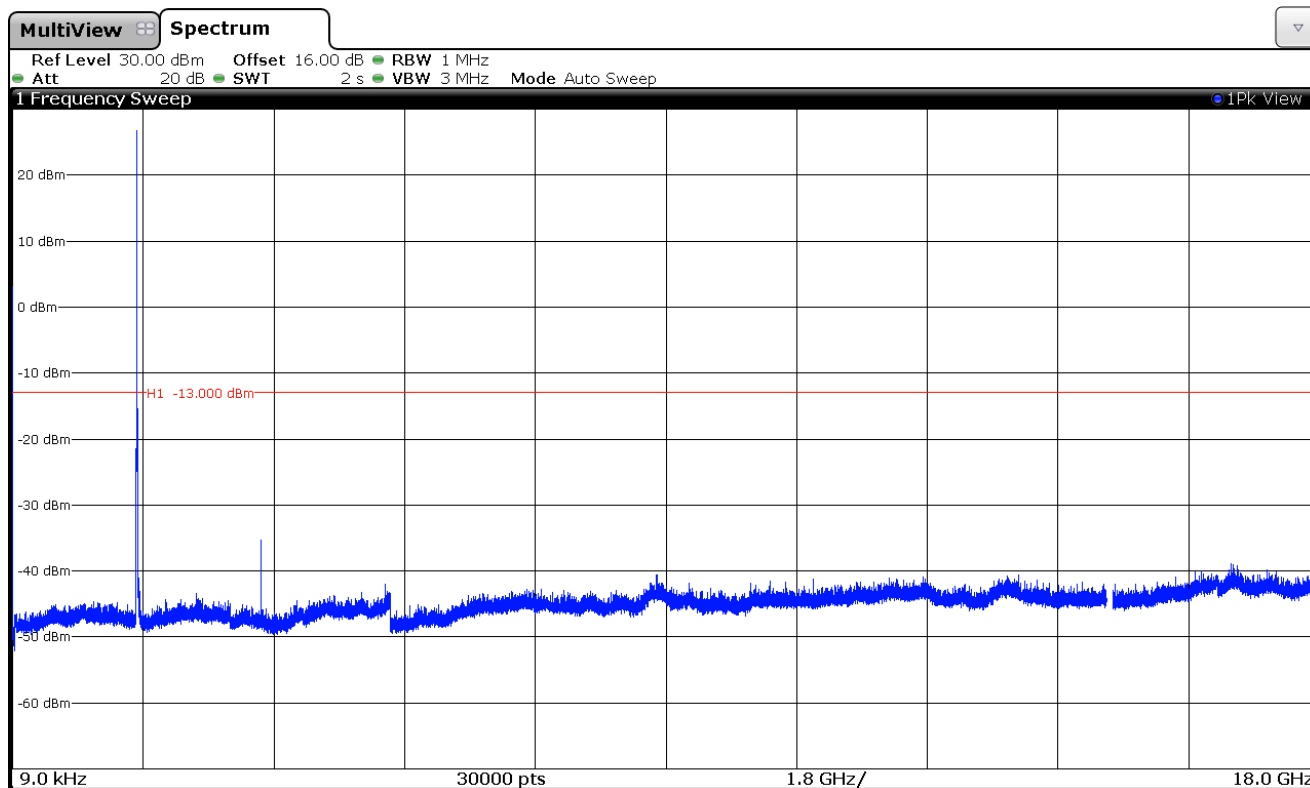
## 3. CHANNEL: HIGHEST



Note: The peak above the limit is the carrier frequency.

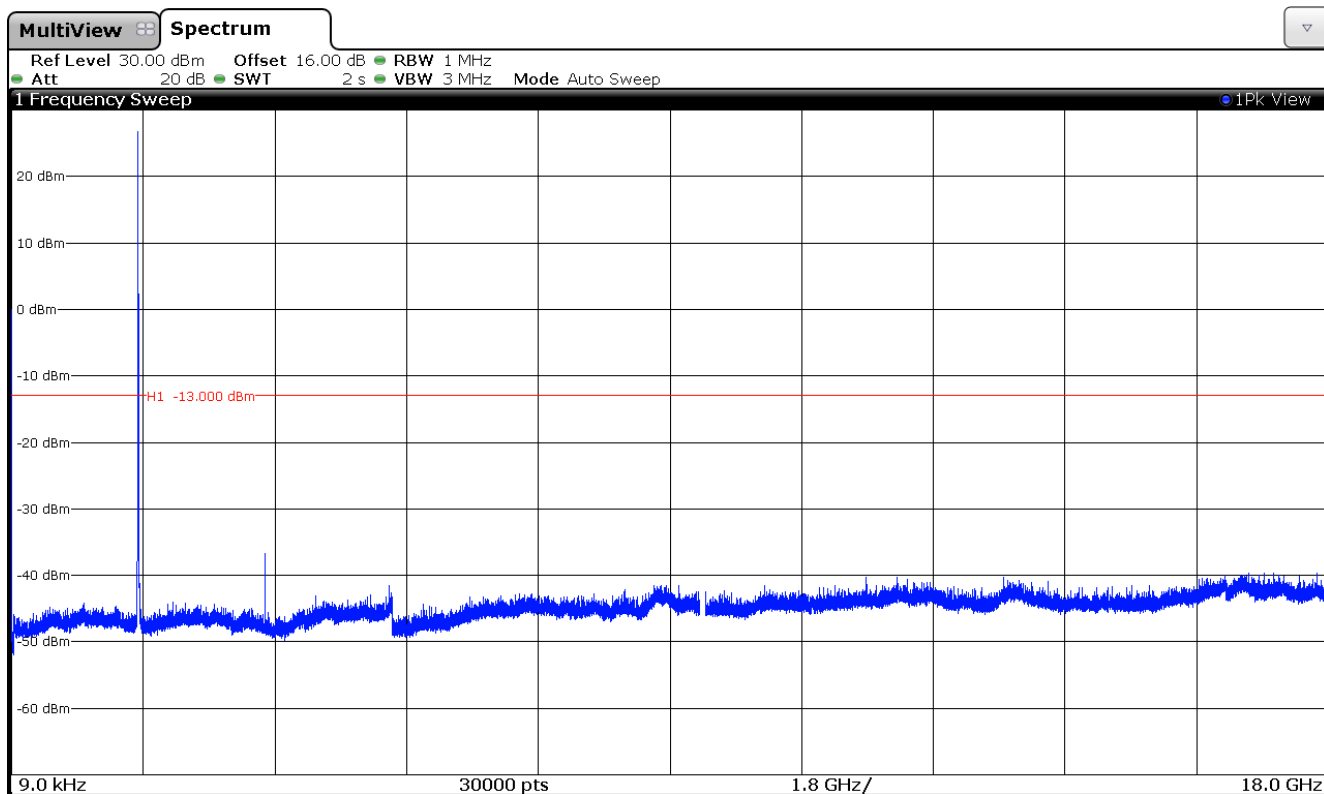
## LTE QPSK MODULATION. BW = 5 MHz (Band IV)

### 1. CHANNEL: LOWEST



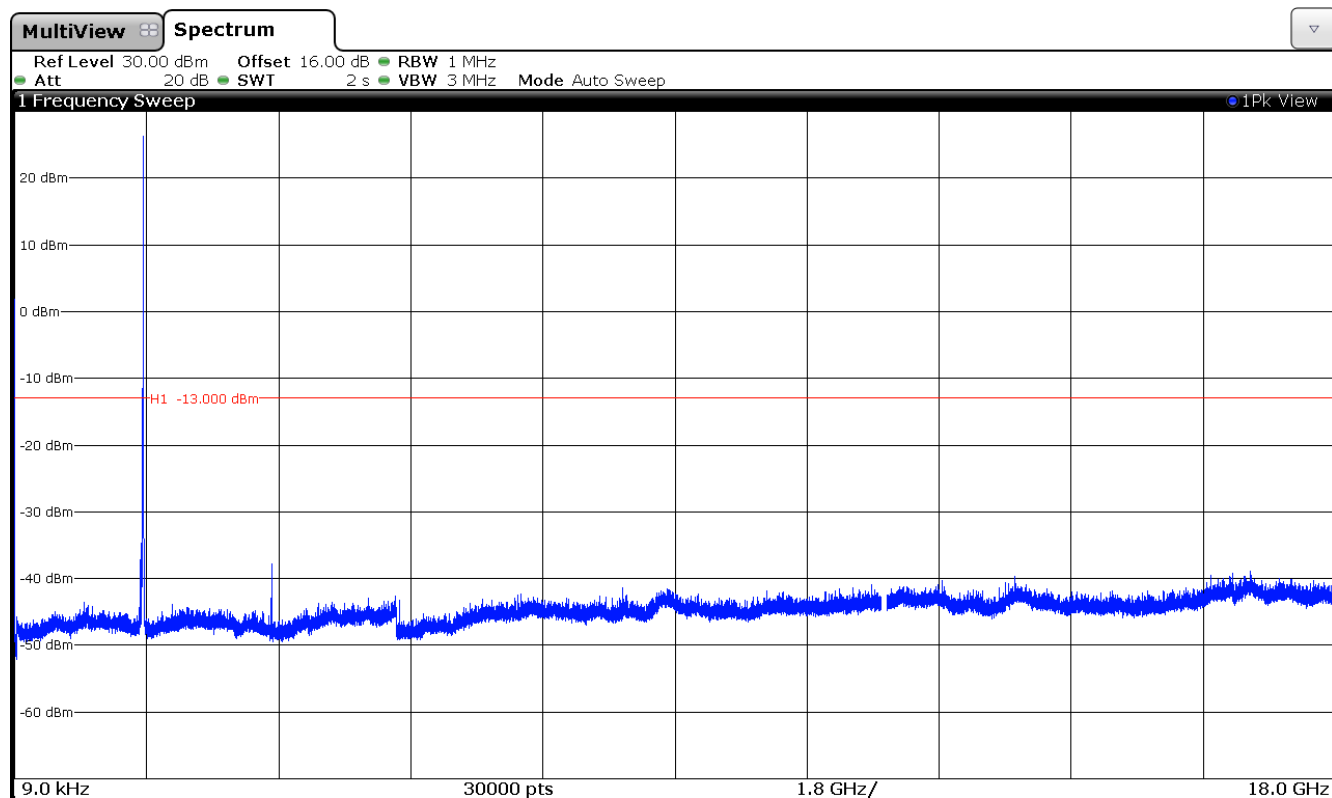
Note: The peak above the limit is the carrier frequency.

### 2. CHANNEL: MIDDLE



Note: The peak above the limit is the carrier frequency.

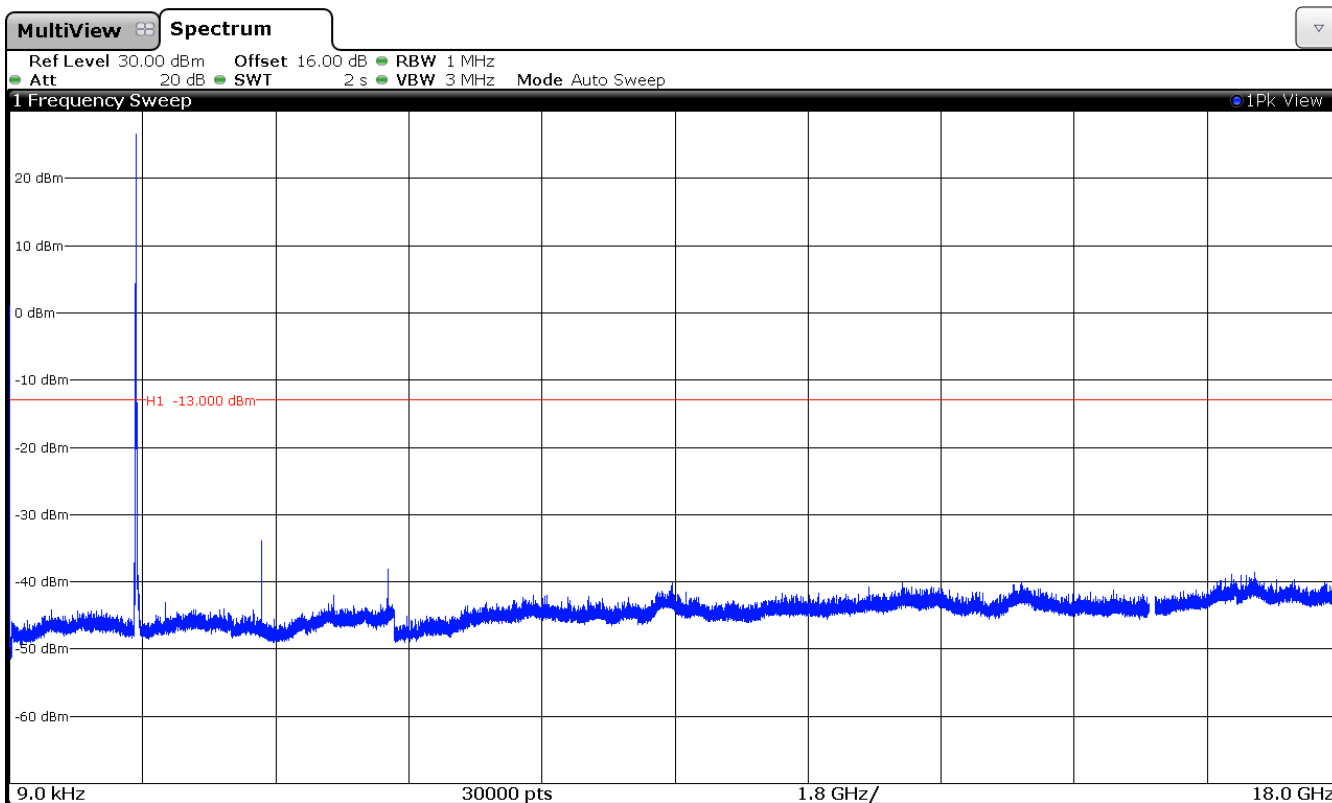
### 3. CHANNEL: HIGHEST



Note: The peak above the limit is the carrier frequency.

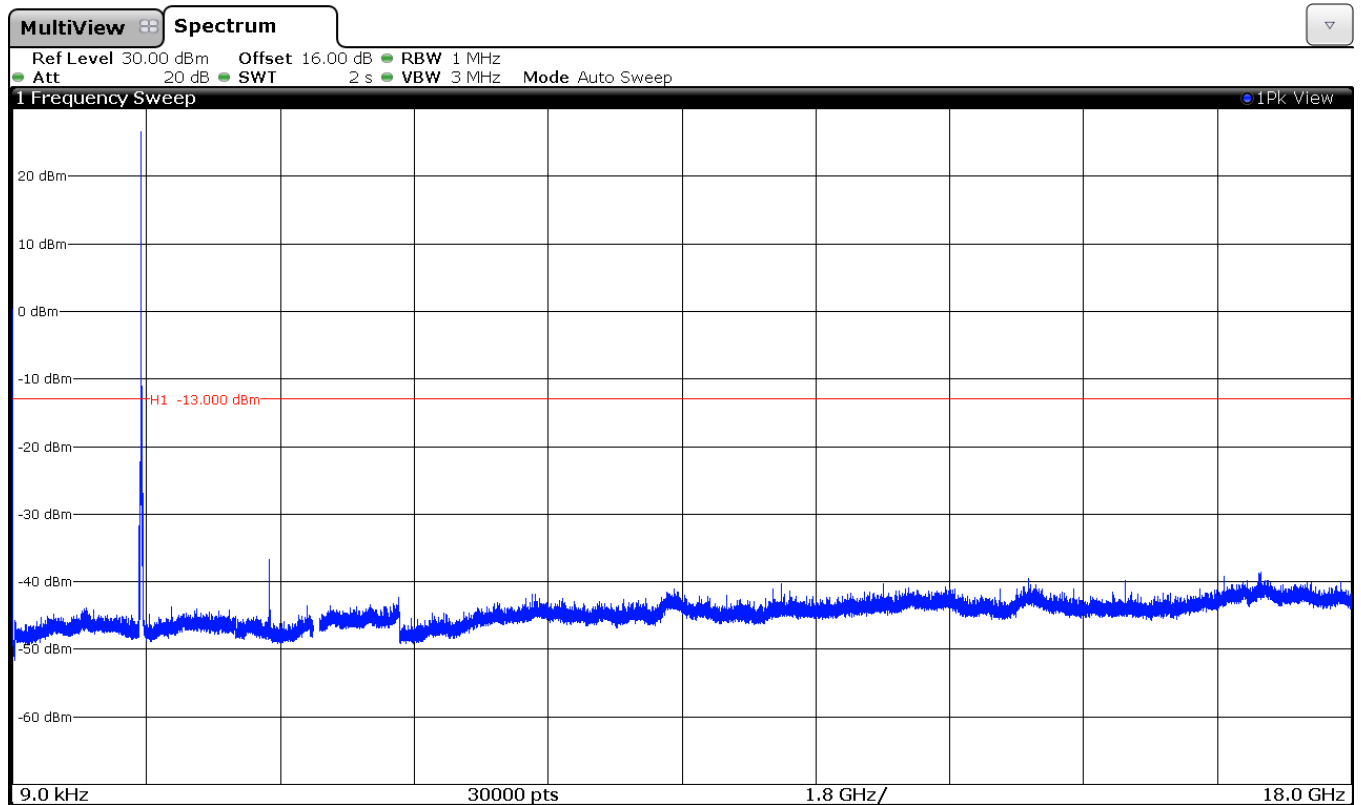
LTE QPSK MODULATION. BW = 10 MHz (Band IV)

### 1. CHANNEL: LOWEST



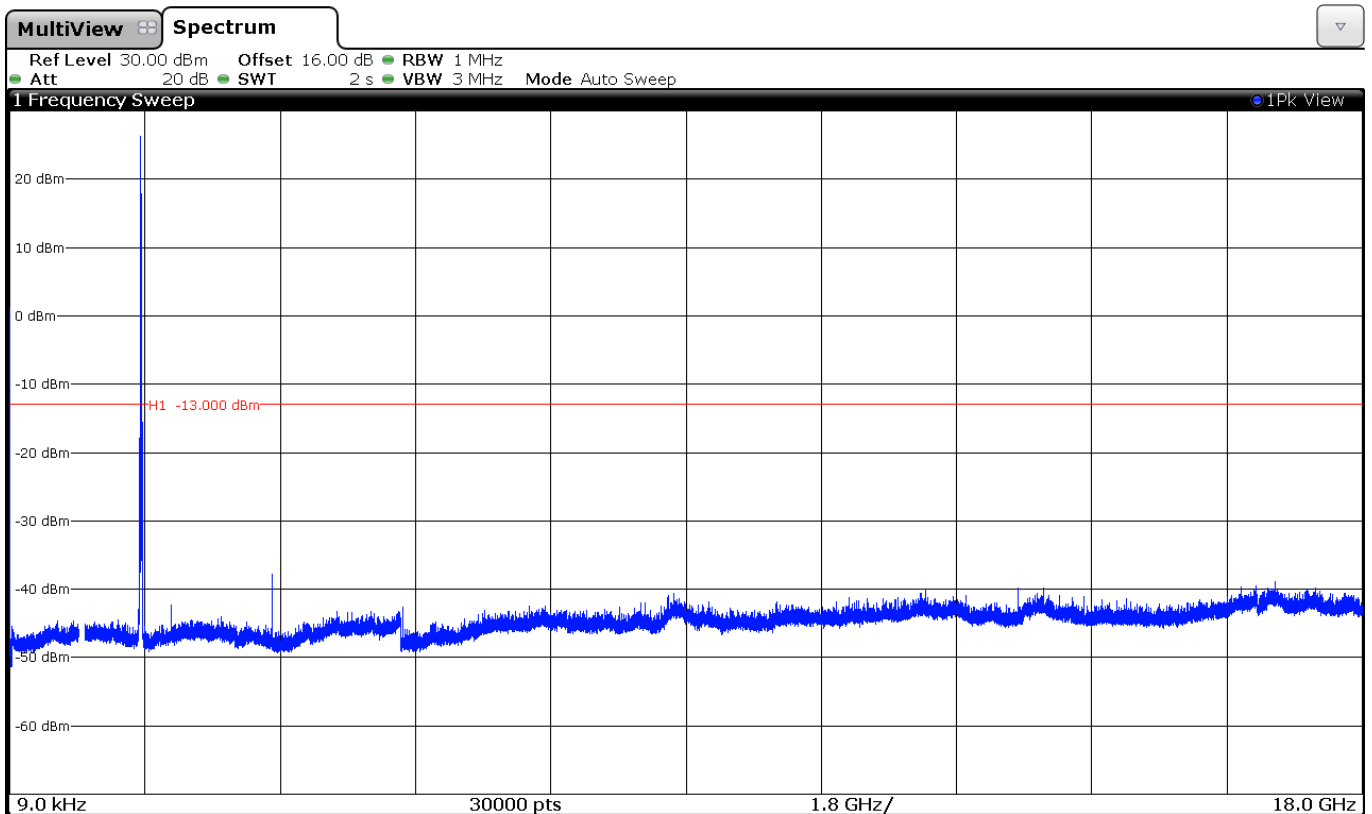
Note: The peak above the limit is the carrier frequency.

## 2. CHANNEL: MIDDLE



Note: The peak above the limit is the carrier frequency.

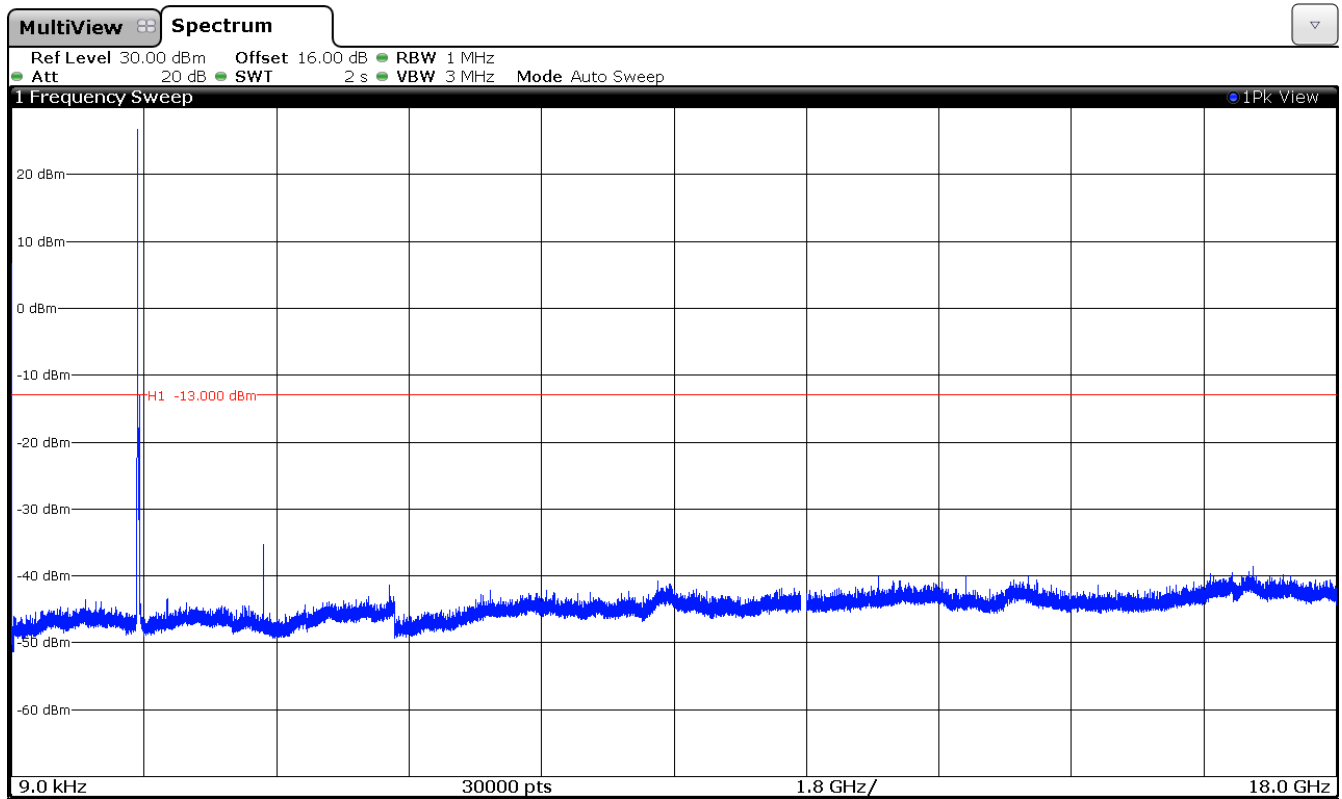
## 3. CHANNEL: HIGHEST



Note: The peak above the limit is the carrier frequency.

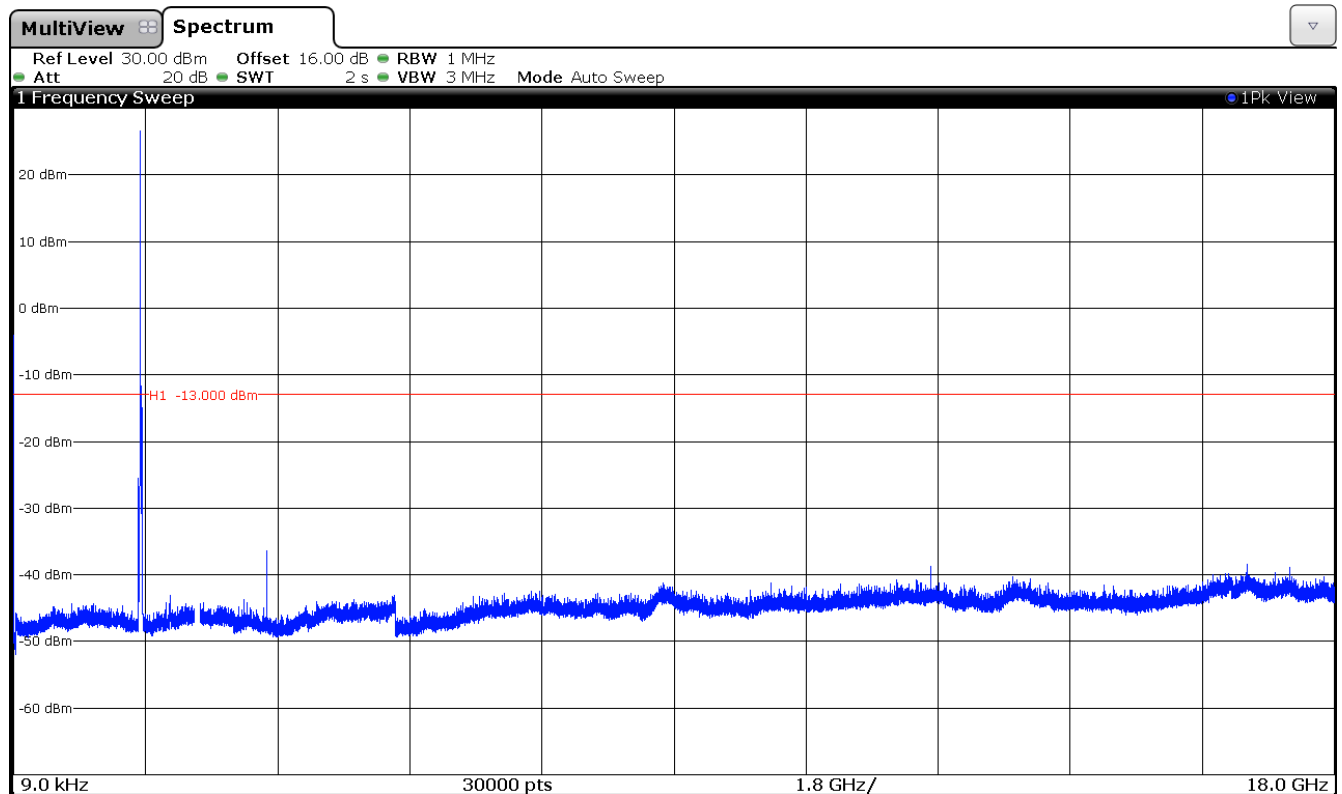
## LTE QPSK MODULATION. BW = 15 MHz (Band IV)

### 1. CHANNEL: LOWEST



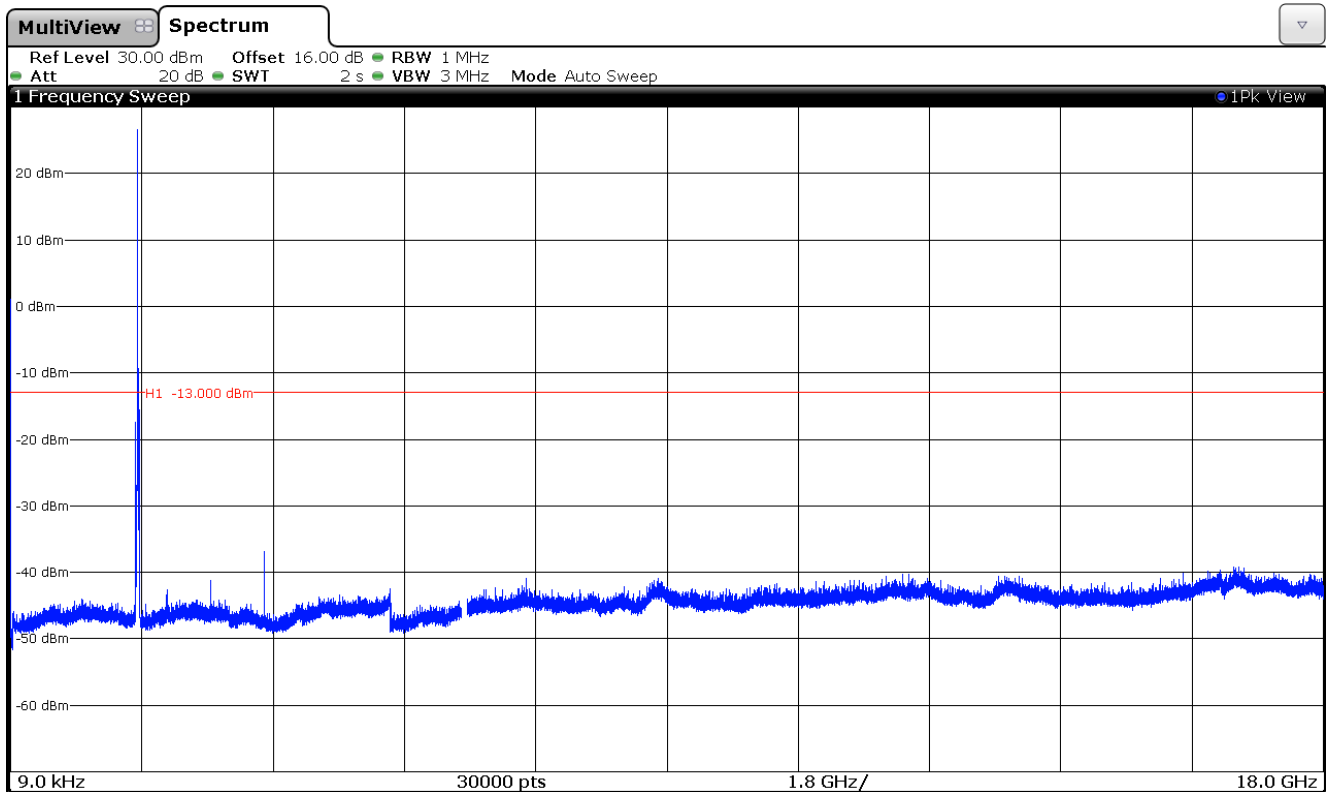
Note: The peak above the limit is the carrier frequency.

### 2. CHANNEL: MIDDLE



Note: The peak above the limit is the carrier frequency.

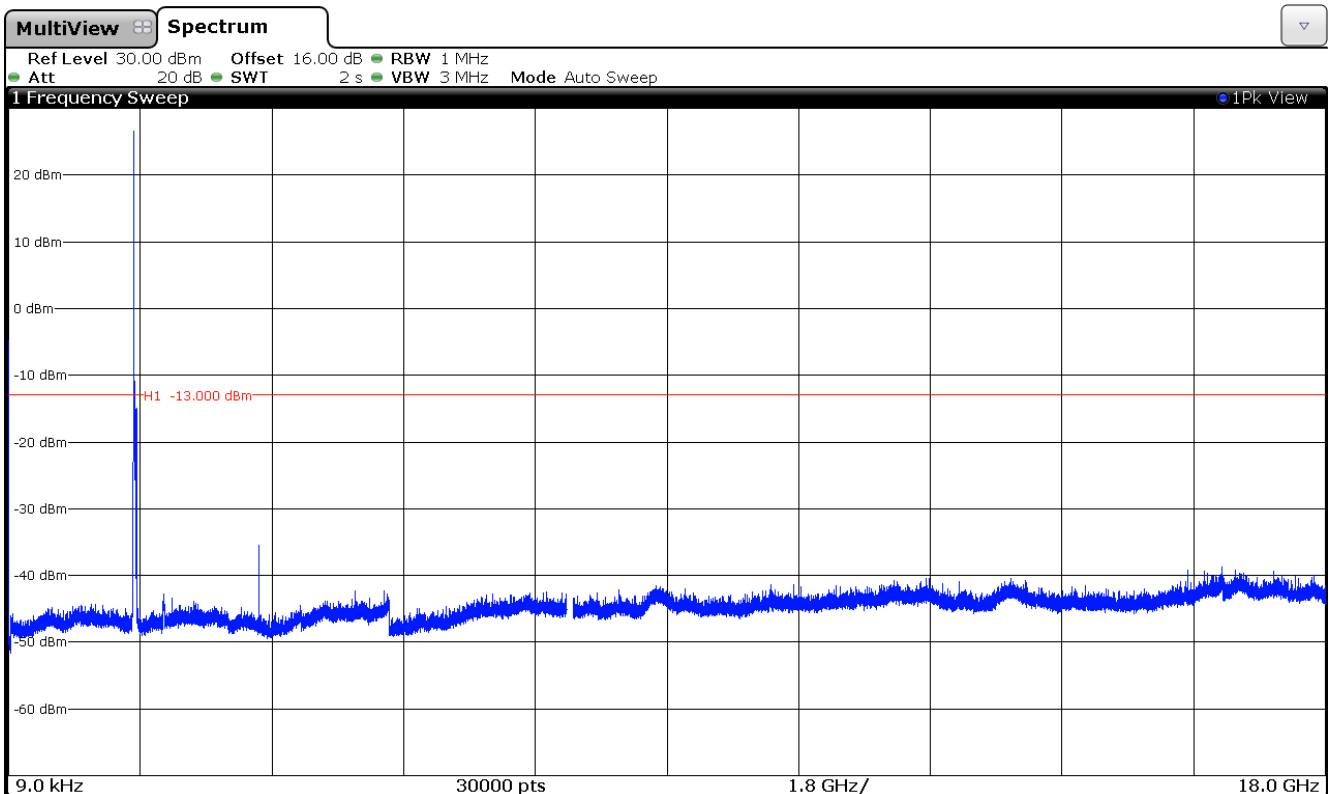
### 3. CHANNEL: HIGHEST



Note: The peak above the limit is the carrier frequency.

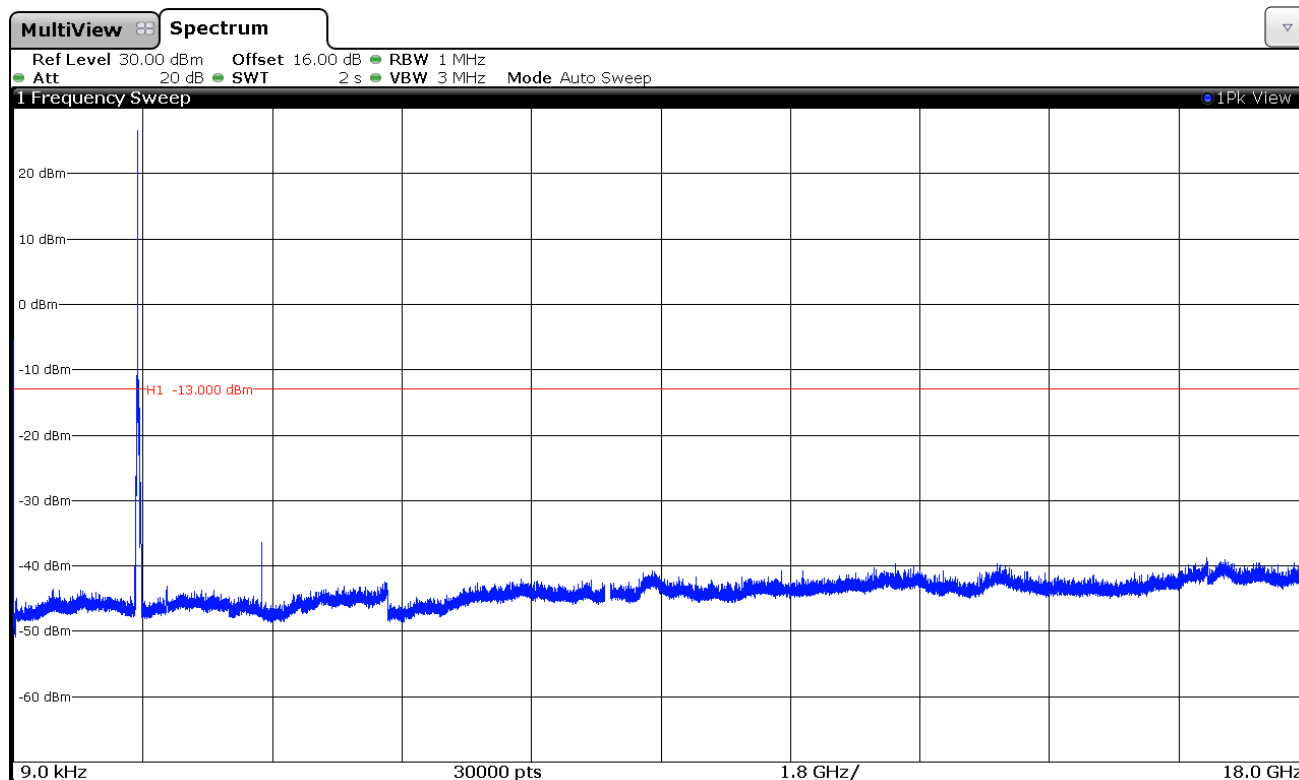
LTE QPSK MODULATION. BW = 20 MHz (Band IV)

### 1. CHANNEL: LOWEST



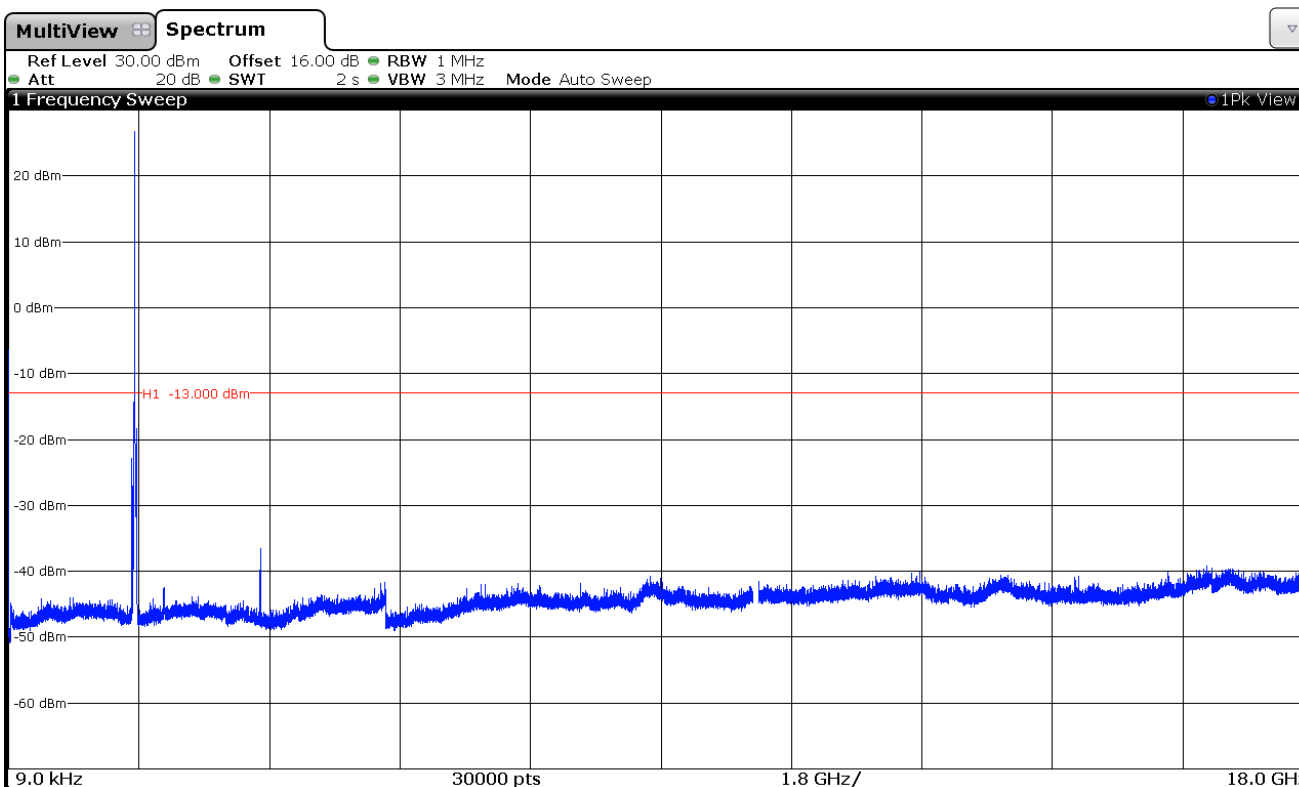
Note: The peak above the limit is the carrier frequency.

## 2. CHANNEL: MIDDLE



Note: The peak above the limit is the carrier frequency.

## 3. CHANNEL: HIGHEST

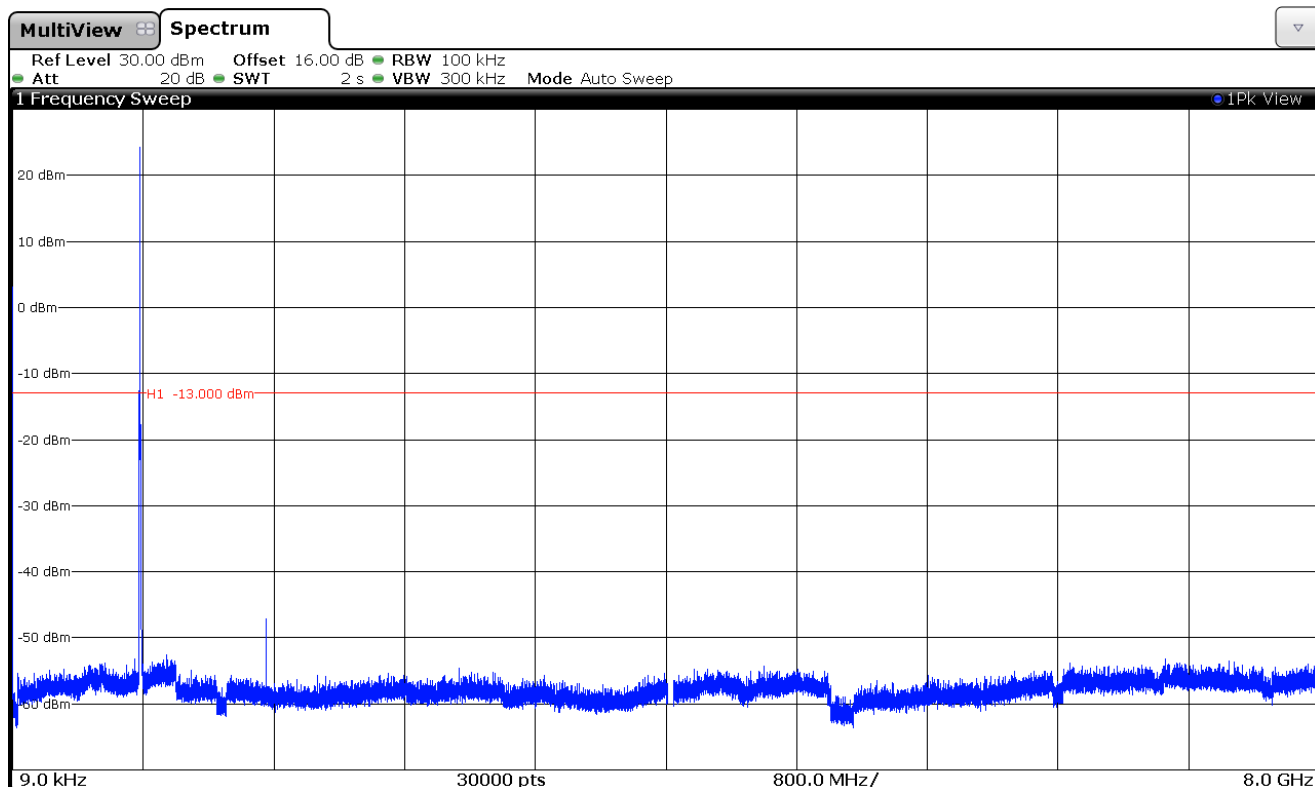


Note: The peak above the limit is the carrier frequency.

## LTE QPSK MODULATION. BW = 5 MHz (Band XIII)

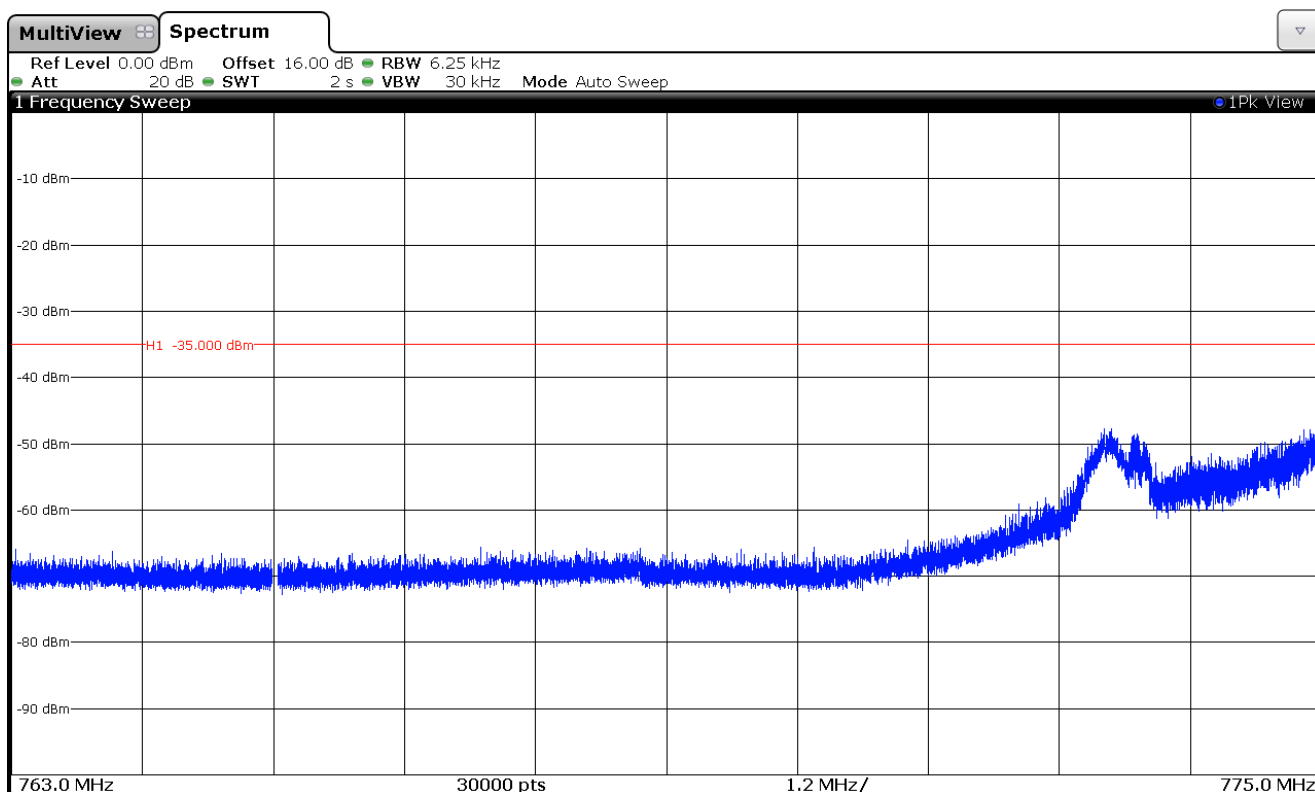
### 1. CHANNEL: LOWEST

Range 9 kHz – 8 GHz

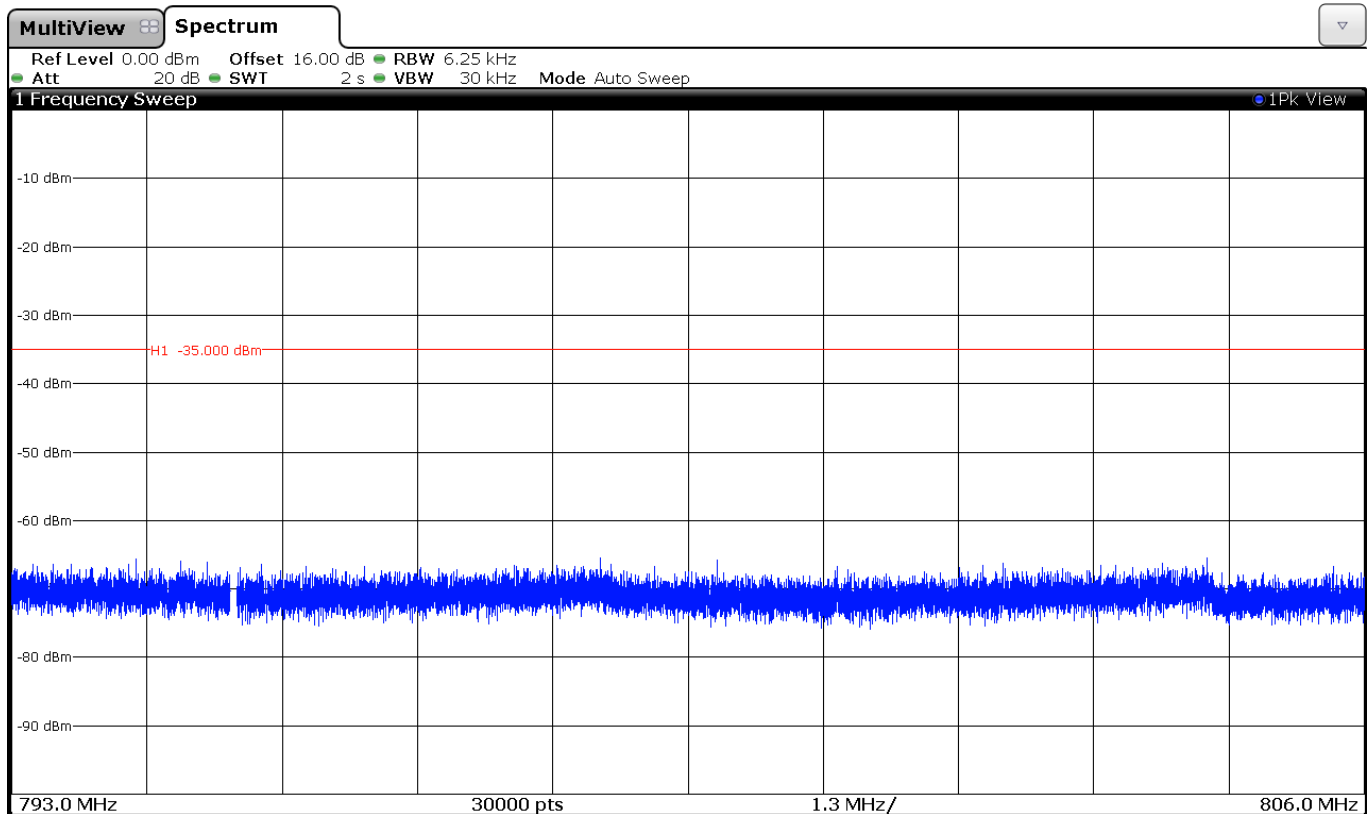


Note: The peak above the limit is the carrier frequency.

Range 763 MHz - 775 MHz

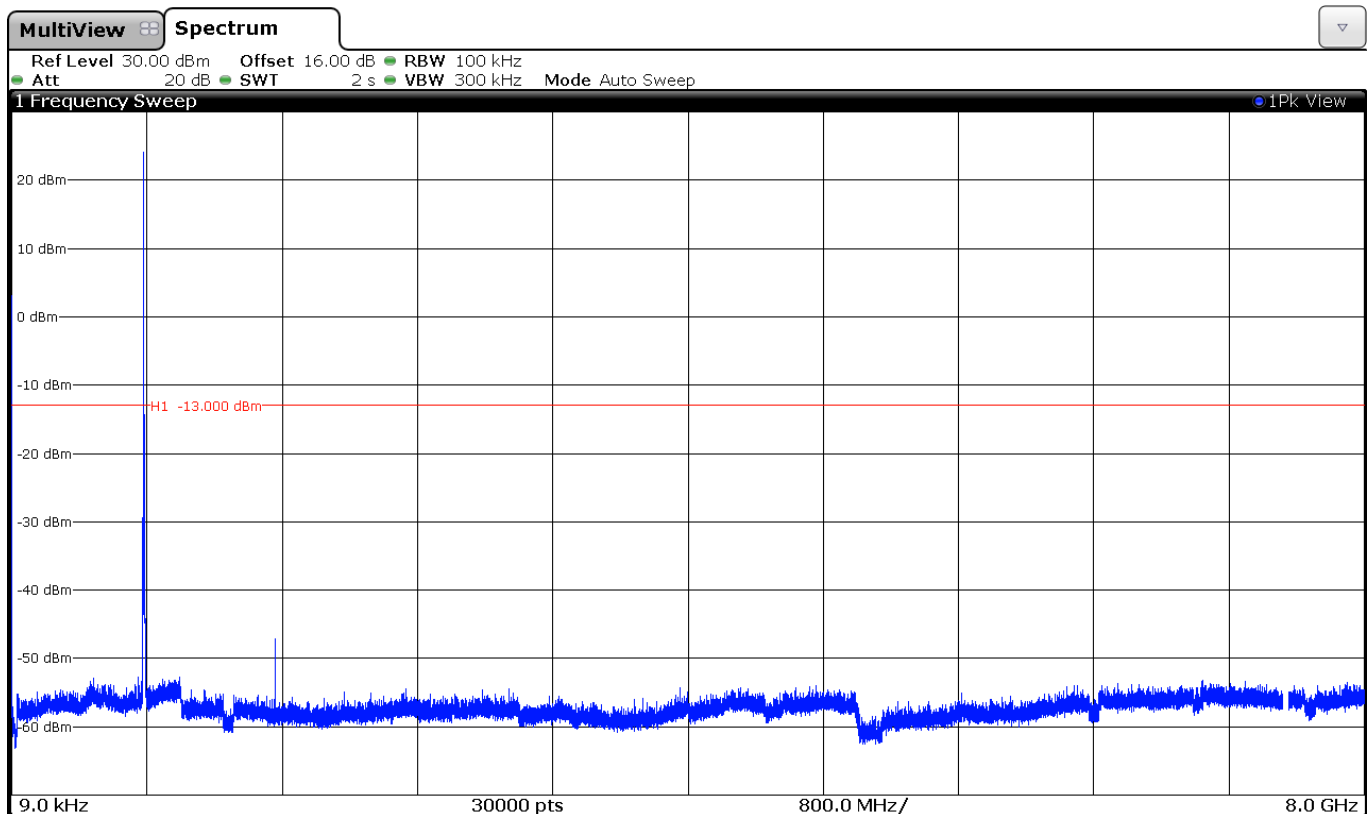


## Range 793 MHz - 806 MHz



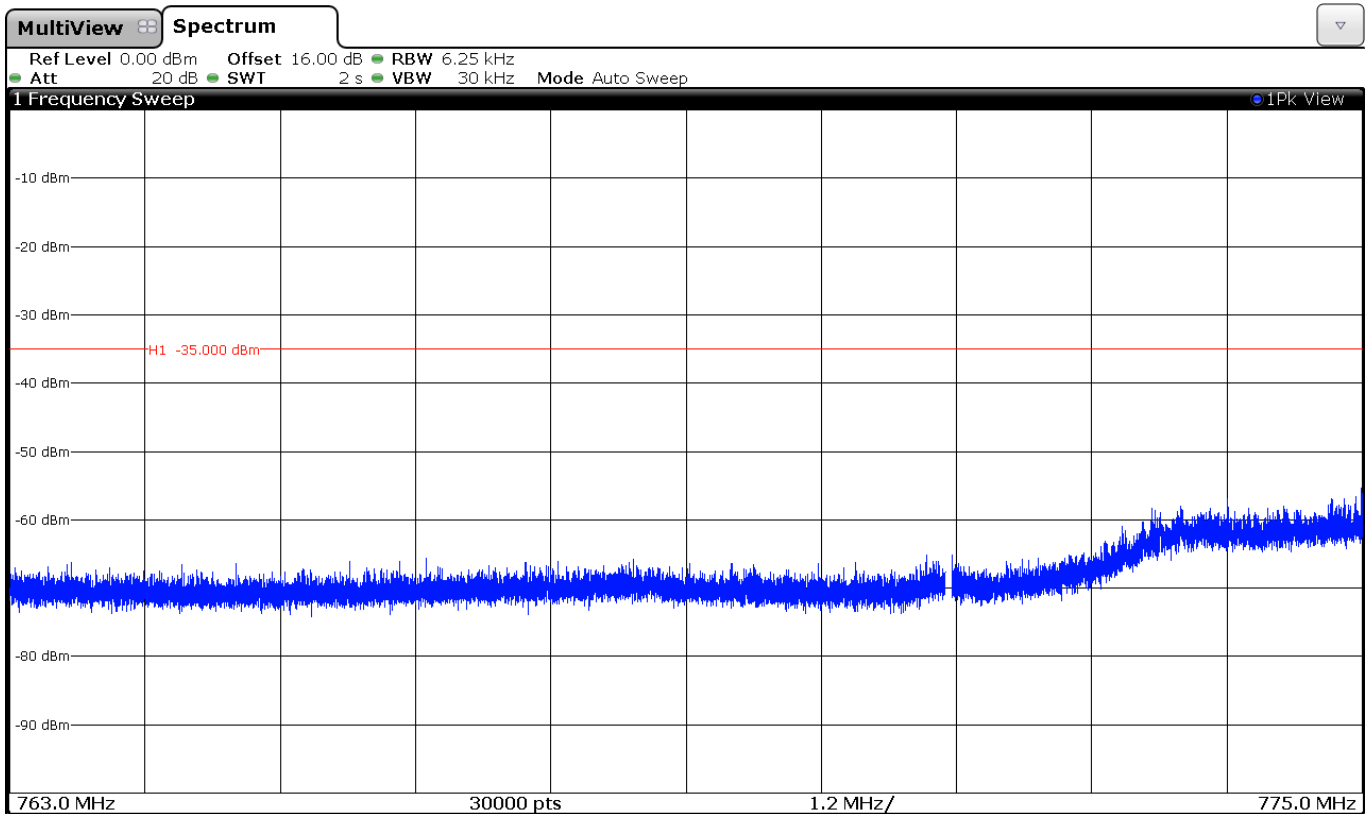
## 2. CHANNEL: MIDDLE

### Range 9 kHz – 8 GHz

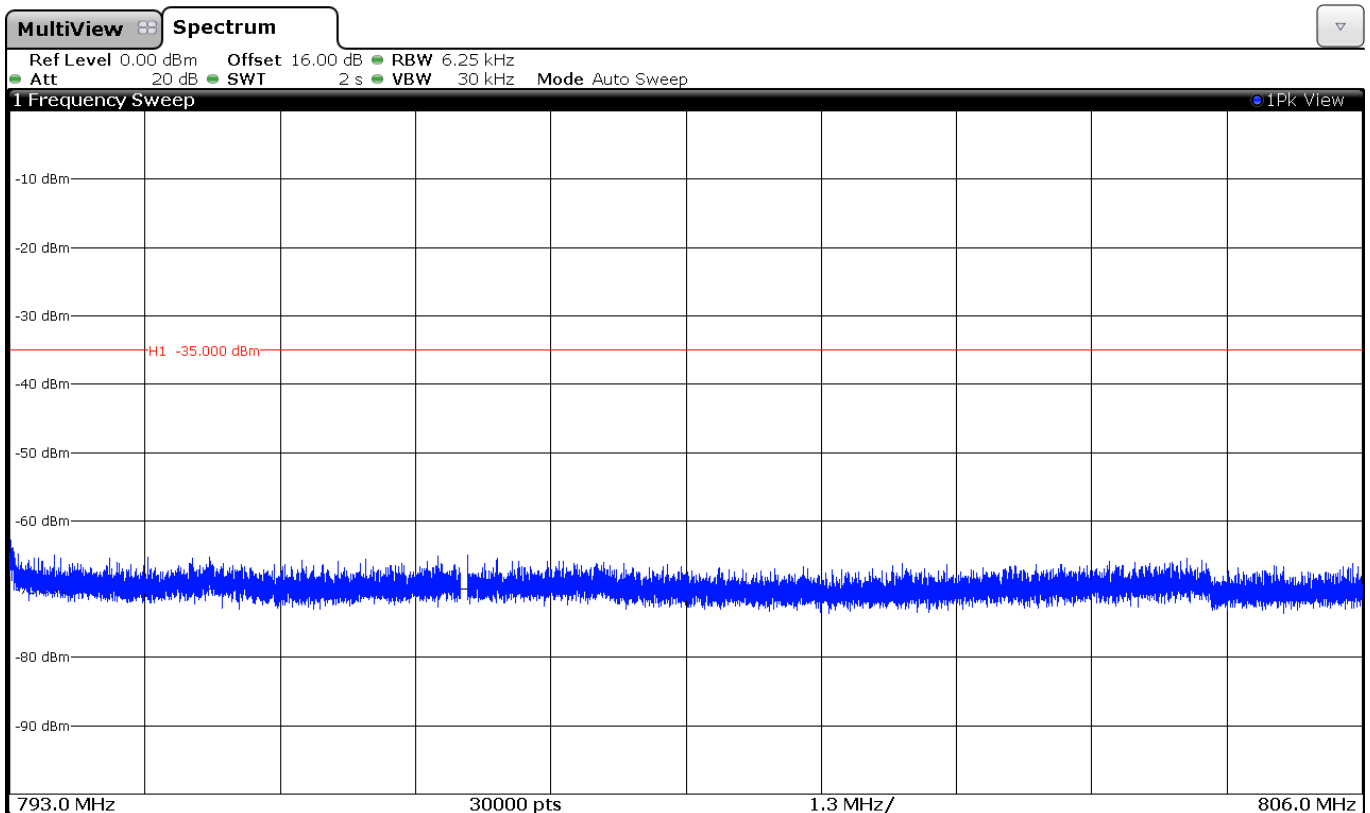


Note: The peak above the limit is the carrier frequency.

## Range 763 MHz - 775 MHz

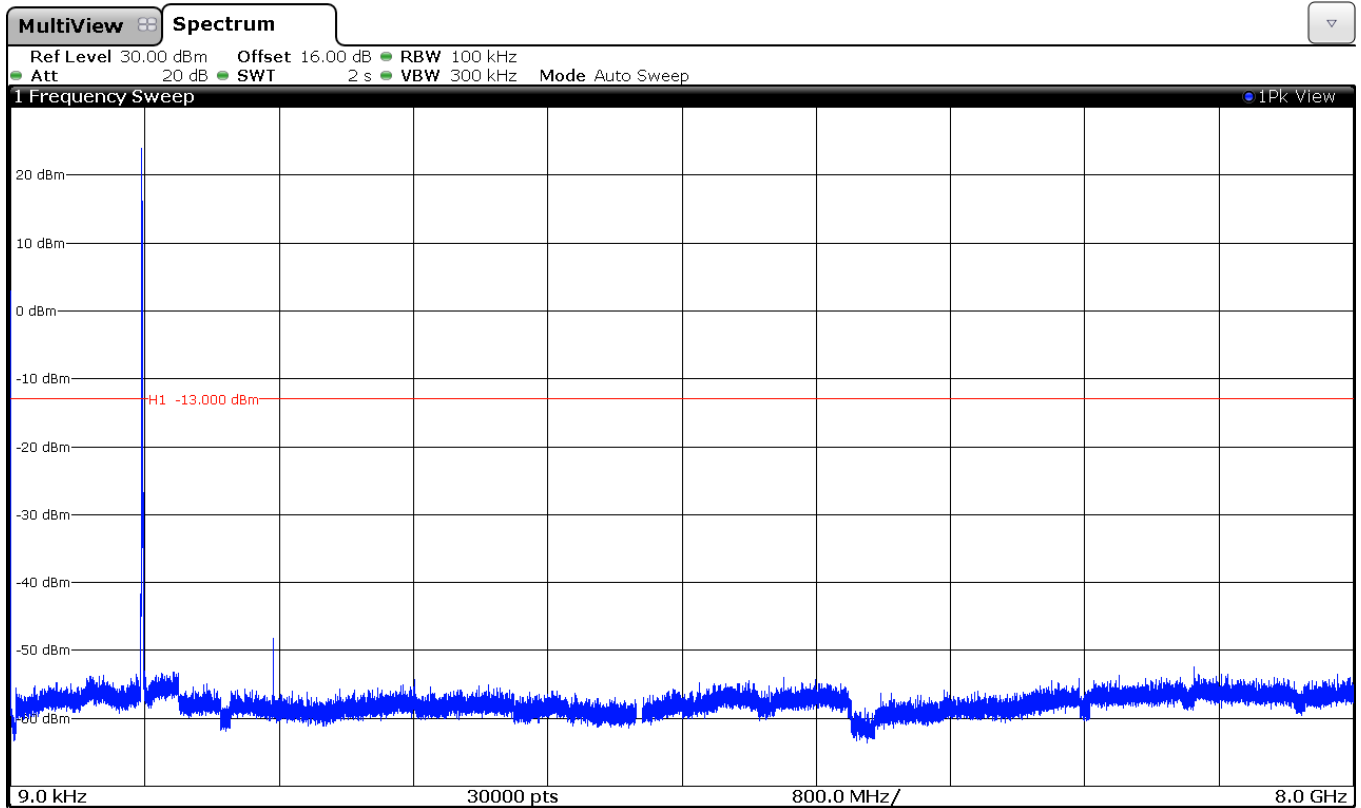


## Range 793 MHz - 806 MHz



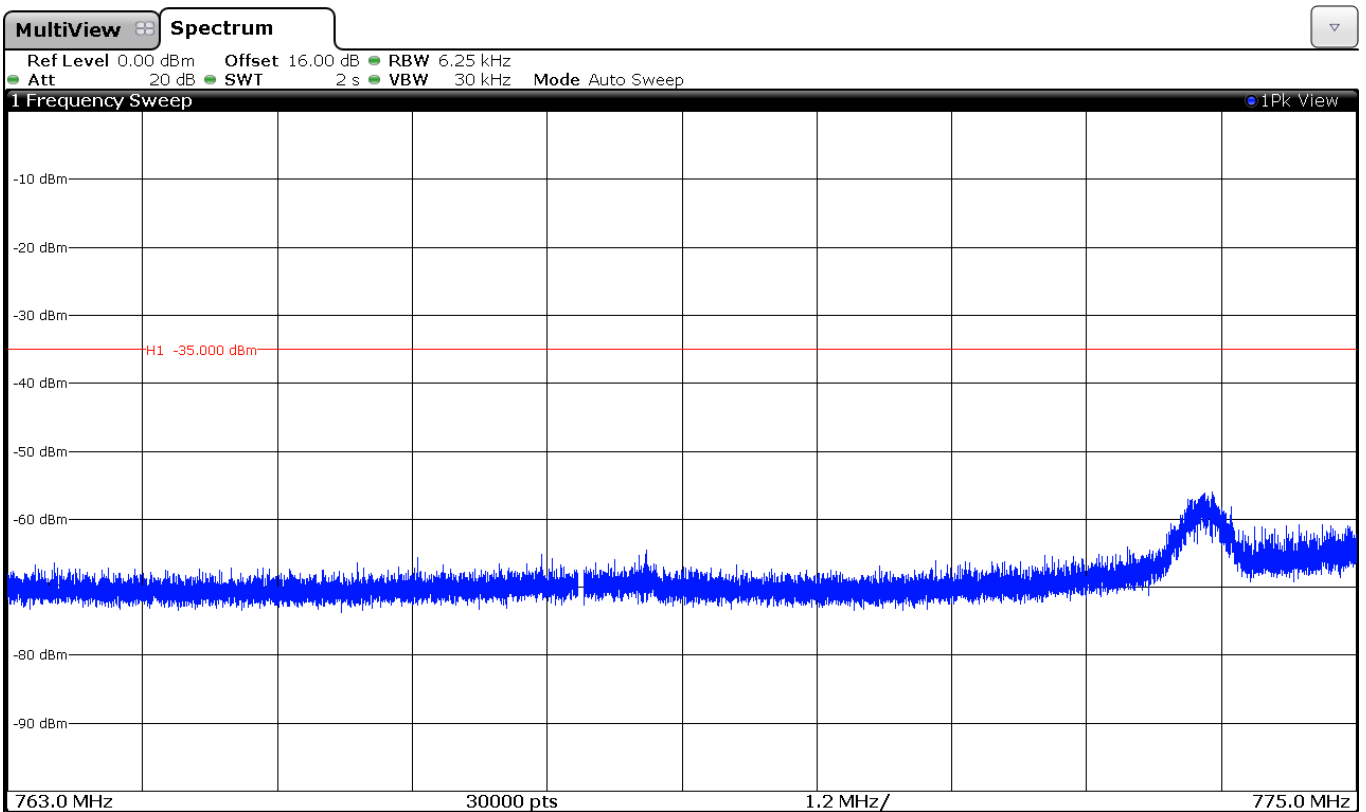
### 3. CHANNEL: HIGHEST

Range 9 kHz – 8 GHz

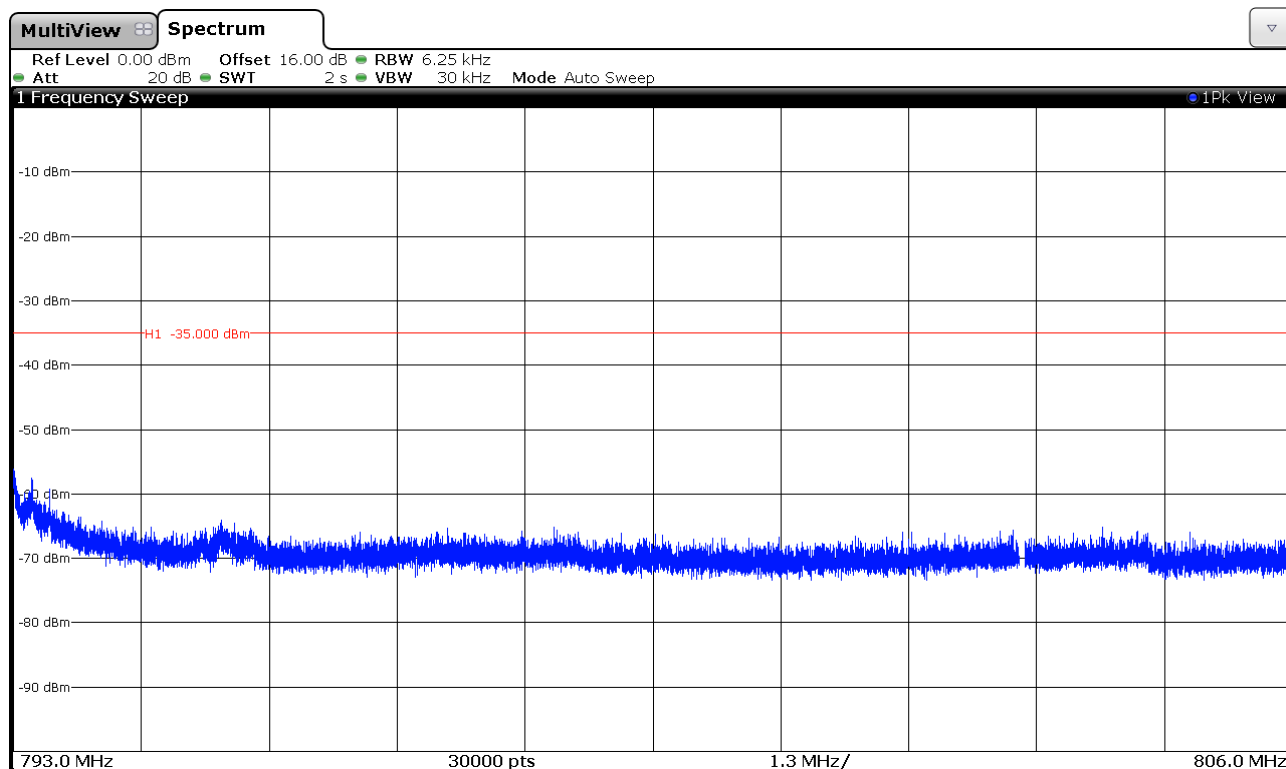


Note: The peak above the limit is the carrier frequency.

Range 763 MHz - 775 MHz



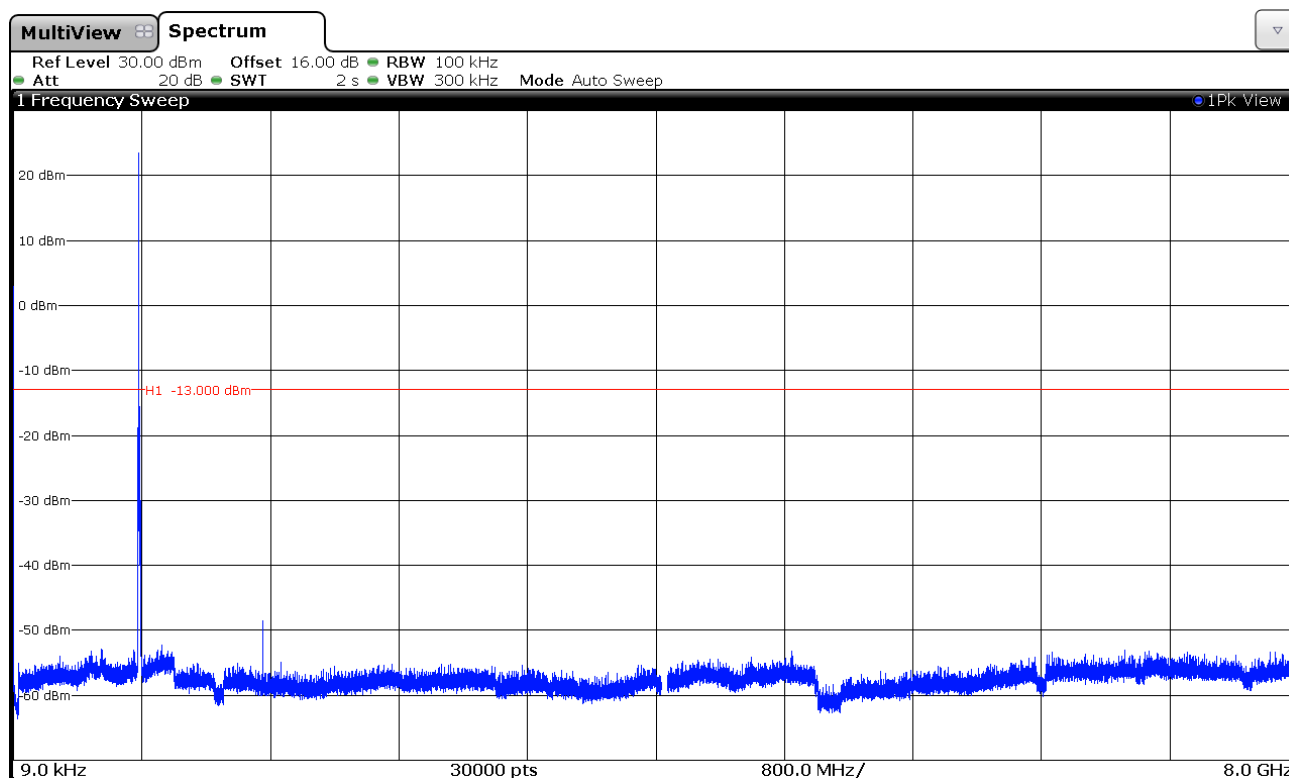
## Range 793 MHz - 806 MHz



## LTE QPSK MODULATION. BW = 10 MHz (Band XIII)

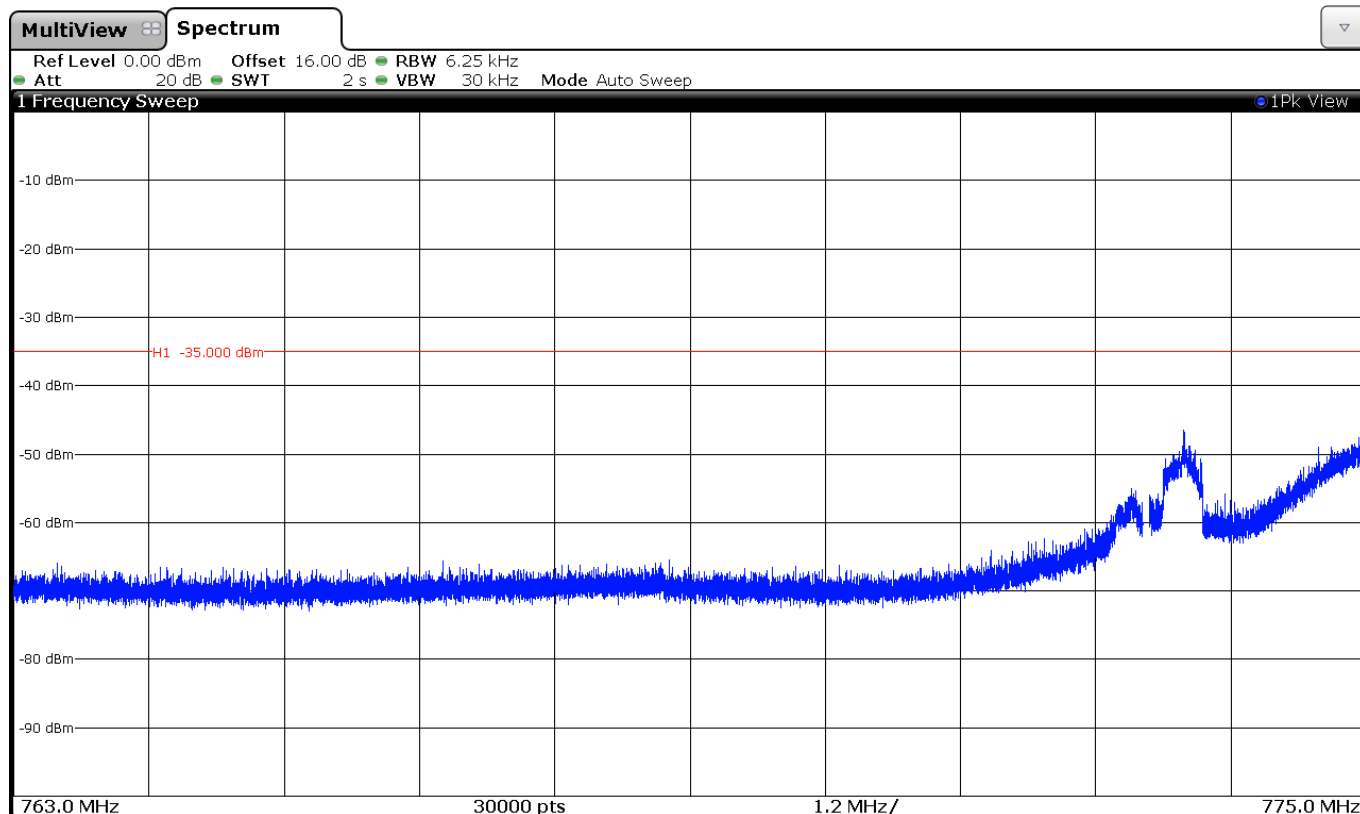
### 1. CHANNEL: MIDDLE

## Range 9 kHz – 8 GHz

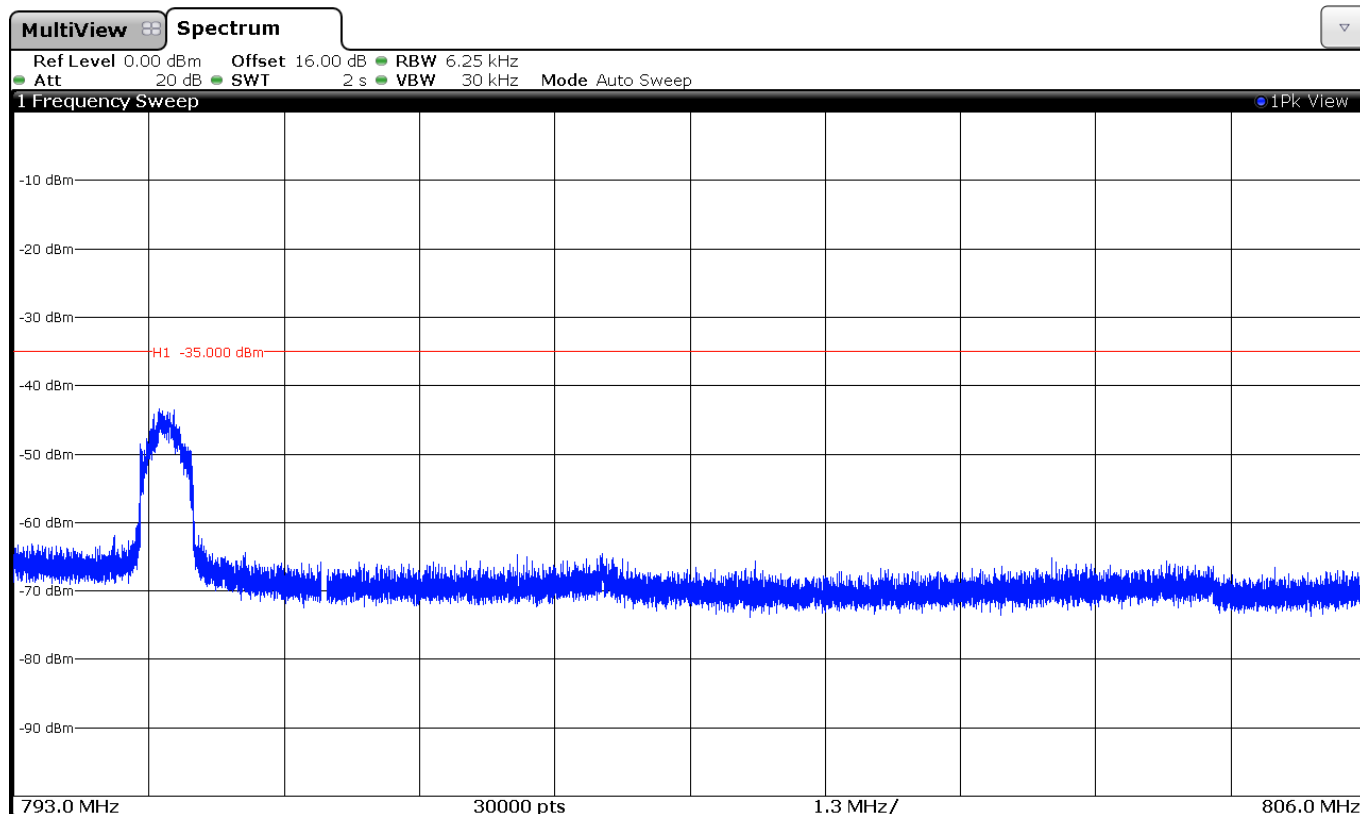


Note: The peak above the limit is the carrier frequency.

## Range 763 MHz - 775 MHz



## Range 793 MHz - 806 MHz



## Spurious emissions at antenna terminals at Block Edges

### SPECIFICATION

FCC §2.1051 and §27.53(c) (h). RSS-139 Clause 6.6. RSS-130 Clause 4.6.

According to specification, the power of emissions shall be attenuated below the transmitter power (P) by a factor of at least  $43 + 10 \log (P)$  dB. P in watts.

At  $P_o$  transmitting power, the specified minimum attenuation becomes  $43+10\log (P_o)$ . and the level in dBm relative  $P_o$  becomes:

$P_o \text{ (dBm)} - [43 + 10 \log (P_o \text{ in mwatts}) - 30] = -13 \text{ dBm}$

### METHOD

The EUT RF output connector was connected to a spectrum analyser and to the Universal Radio Communication tester R&S CMW500 (selecting maximum transmission power of the EUT and different modes of modulation) using a 50 ohm attenuator and a power splitter.

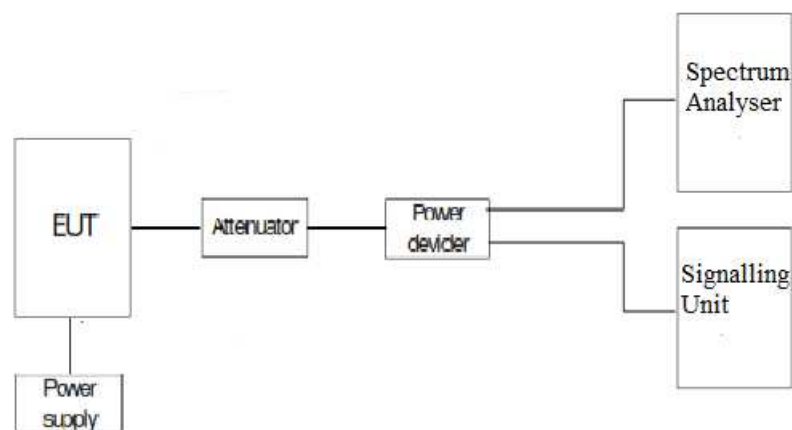
The reading of the spectrum analyser is corrected with the attenuation loss of connection between output terminal of EUT and input of the spectrum analyser.

For LTE mode the configuration of modulation which is the worst case for conducted power was used.

For LTE Band IV, as indicated in FCC part 27.53 (h) (3)/RSS-139 Clause 6.6., in the 1 MHz bands immediately outside and adjacent to the licensee's frequency block or band, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

For LTE Band XIII, as indicated in FCC part 27.53 (c) (5) /RSS-130 Clause 4.6., in the 100 kHz bands immediately outside and adjacent to the licensee's frequency block or band, a resolution bandwidth of 30 kHz may be employed.

### TEST SETUP



RESULTS (see plots in next pages)

| LTE QPSK MODULATION<br>(Channels in Band IV):                     | RB=1,<br>Offset=0,<br>BW=1.4<br>MHz | RB=1 ,<br>Offset =0,<br>BW = 3<br>MHz | RB=1 ,<br>Offset =0,<br>BW = 5<br>MHz | RB=1 ,<br>Offset =0,<br>BW = 10<br>MHz | RB=1 ,<br>Offset =0,<br>BW = 15<br>MHz | RB=1 ,<br>Offset =0,<br>BW = 20<br>MHz |
|-------------------------------------------------------------------|-------------------------------------|---------------------------------------|---------------------------------------|----------------------------------------|----------------------------------------|----------------------------------------|
| Maximum measured level at lowest Block Edge at antenna port (dBm) | -19.26                              | -15.84                                | -14.67                                | -13.23                                 | -14.95                                 | -17.39                                 |

| LTE QPSK MODULATION:<br>(Channels in Band IV):                    | RB= All,<br>Offset=0,<br>BW=1.4<br>MHz | RB= All,<br>Offset =0,<br>BW = 3<br>MHz | RB= All,<br>Offset =0,<br>BW = 5<br>MHz | RB= All,<br>Offset =0,<br>BW = 10<br>MHz | RB= All,<br>Offset =0,<br>BW = 15<br>MHz | RB= All,<br>Offset =0,<br>BW = 20<br>MHz |
|-------------------------------------------------------------------|----------------------------------------|-----------------------------------------|-----------------------------------------|------------------------------------------|------------------------------------------|------------------------------------------|
| Maximum measured level at lowest Block Edge at antenna port (dBm) | -24.43                                 | -25.00                                  | -25.64                                  | -26.56                                   | -28.07                                   | -29.44                                   |

| LTE QPSK MODULATION:<br>(Channels in Band IV):                     | RB= 1,<br>Offset=Max,<br>BW=1.4<br>MHz | RB= 1,<br>Offset=Max,<br>BW = 3<br>MHz | RB= 1,<br>Offset=Max,<br>BW = 5<br>MHz | RB= 1,<br>Offset=Max,<br>BW = 10<br>MHz | RB= 1,<br>Offset=Max,<br>BW = 15<br>MHz | RB= 1,<br>Offset=Max,<br>BW = 20<br>MHz |
|--------------------------------------------------------------------|----------------------------------------|----------------------------------------|----------------------------------------|-----------------------------------------|-----------------------------------------|-----------------------------------------|
| Maximum measured level at highest Block Edge at antenna port (dBm) | -18.57                                 | -15.09                                 | -14.00                                 | -13.34                                  | -15.32                                  | -16.33                                  |

| LTE QPSK MODULATION:<br>(Channels in Band IV):                     | RB= All,<br>Offset=0,<br>BW=1.4<br>MHz | RB= All,<br>Offset =0,<br>BW = 3<br>MHz | RB= All,<br>Offset =0,<br>BW = 5<br>MHz | RB= All,<br>Offset =0,<br>BW = 10<br>MHz | RB= All,<br>Offset =0,<br>BW = 15<br>MHz | RB= All,<br>Offset =0,<br>BW = 20<br>MHz |
|--------------------------------------------------------------------|----------------------------------------|-----------------------------------------|-----------------------------------------|------------------------------------------|------------------------------------------|------------------------------------------|
| Maximum measured level at highest Block Edge at antenna port (dBm) | -23.28                                 | -23.32                                  | -23.84                                  | -23.96                                   | -24.93                                   | -26.07                                   |

|                                                                      |                                    |                                     |
|----------------------------------------------------------------------|------------------------------------|-------------------------------------|
| LTE QPSK MODULATION<br>(Channels in Band XIII):                      | RB=1 ,<br>Offset =0,<br>BW = 5 MHz | RB=1 ,<br>Offset =0,<br>BW = 10 MHz |
| Maximum measured level at lowest Block<br>Edge at antenna port (dBm) | -14.49                             | -15.99                              |

|                                                                      |                                      |                                       |
|----------------------------------------------------------------------|--------------------------------------|---------------------------------------|
| LTE QPSK MODULATION:<br>(Channels in Band XIII):                     | RB= All,<br>Offset =0,<br>BW = 5 MHz | RB= All,<br>Offset =0,<br>BW = 10 MHz |
| Maximum measured level at lowest Block<br>Edge at antenna port (dBm) | -25.61                               | -28.70                                |

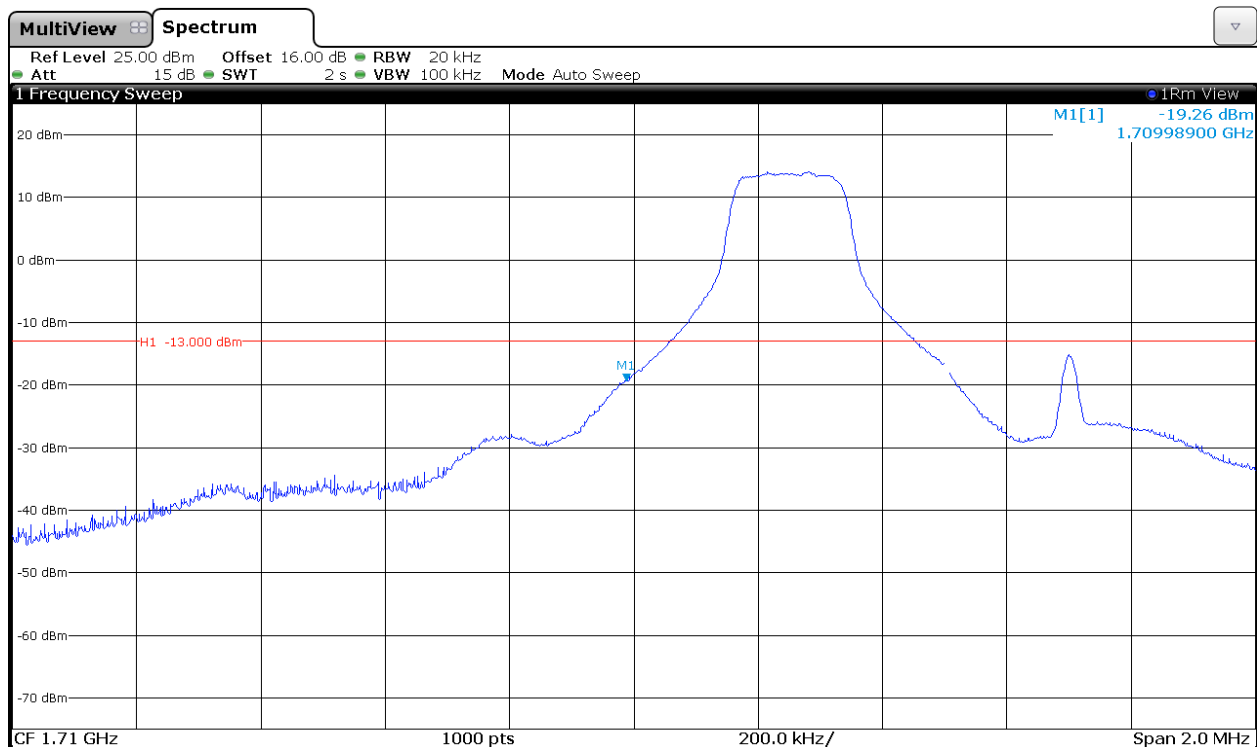
|                                                                       |                                     |                                      |
|-----------------------------------------------------------------------|-------------------------------------|--------------------------------------|
| LTE QPSK MODULATION:<br>(Channels in Band XIII):                      | RB= 1,<br>Offset=Max,<br>BW = 5 MHz | RB= 1,<br>Offset=Max,<br>BW = 10 MHz |
| Maximum measured level at highest Block<br>Edge at antenna port (dBm) | -14.60                              | -16.35                               |

|                                                                       |                                      |                                       |
|-----------------------------------------------------------------------|--------------------------------------|---------------------------------------|
| LTE QPSK MODULATION:<br>(Channels in Band XIII):                      | RB= All,<br>Offset =0,<br>BW = 5 MHz | RB= All,<br>Offset =0,<br>BW = 10 MHz |
| Maximum measured level at highest Block<br>Edge at antenna port (dBm) | -24.49                               | -28.43                                |

Measurement uncertainty =  $\leq \pm 1.20$  dB.

LTE QPSK MODULATION. RB = 1, Offset = 0, BW = 1.4 MHz (Band IV)

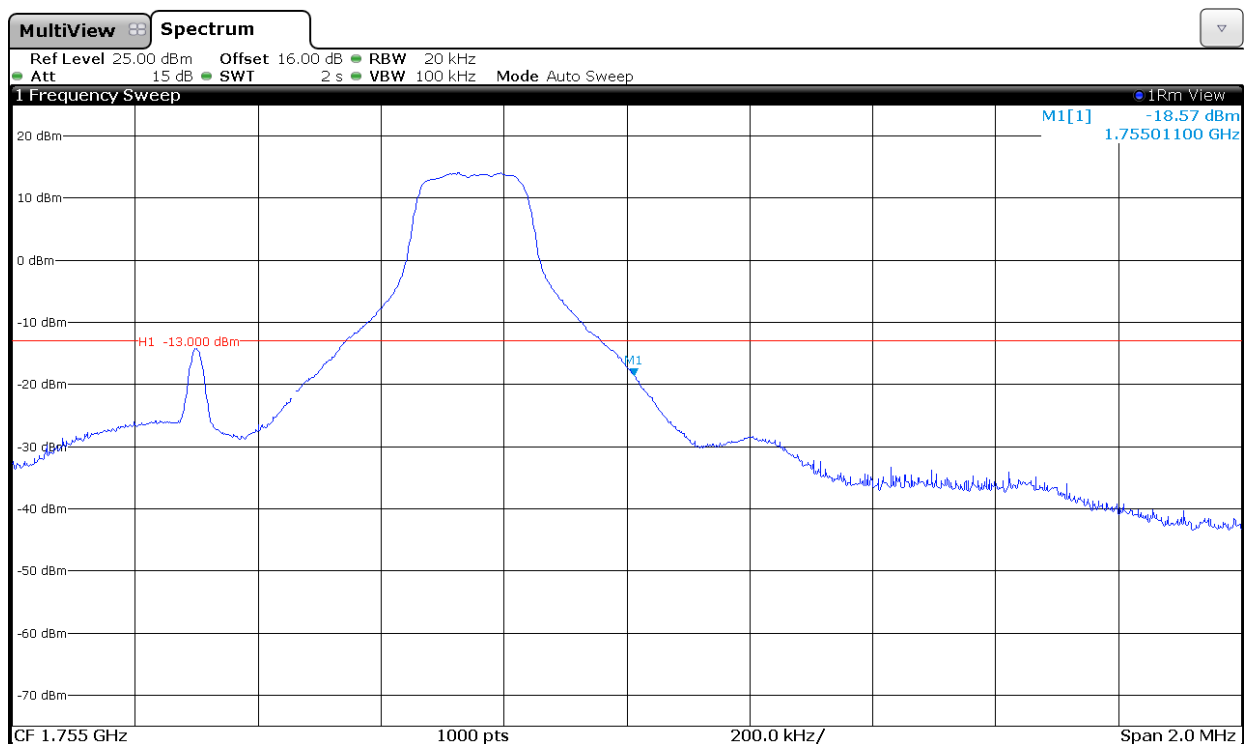
CHANNEL LOWEST



NOTE: The equipment transmits at the maximum output power

LTE QPSK MODULATION. RB = 1, Offset = Max, BW = 1.4 MHz (Band IV)

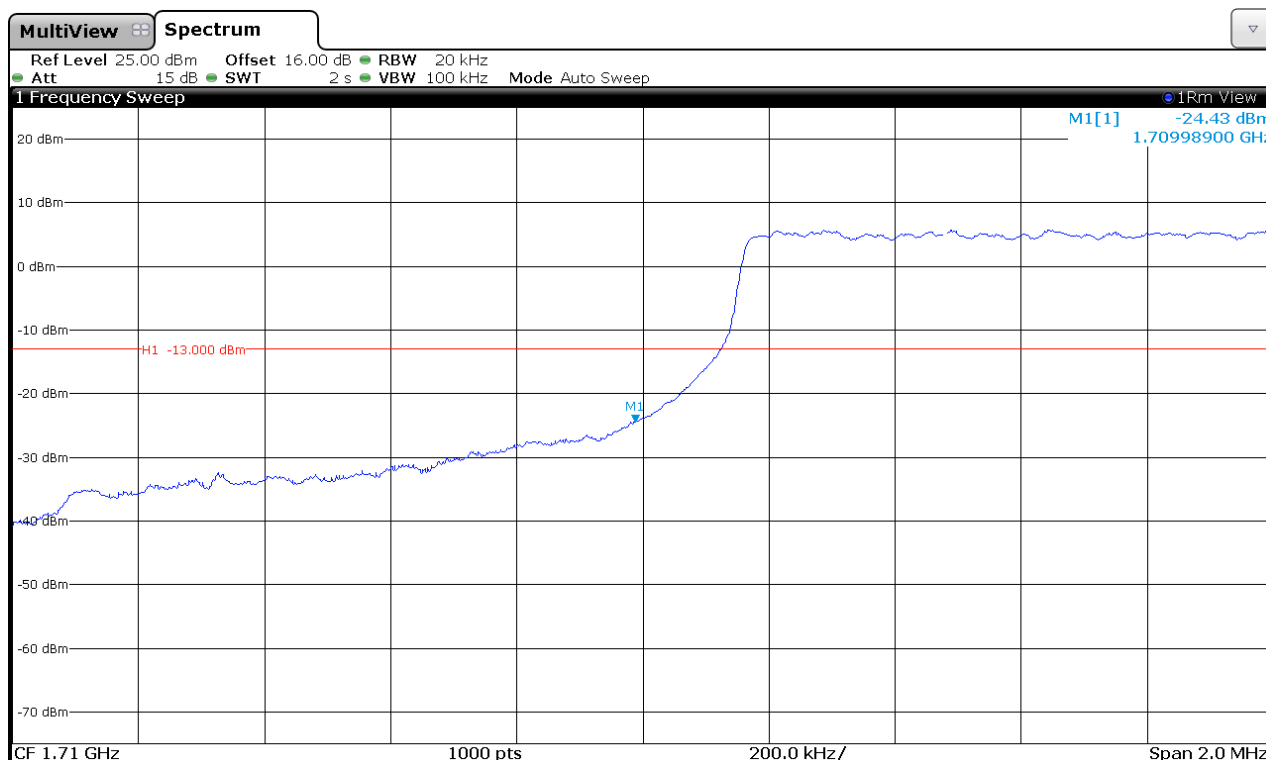
CHANNEL HIGHEST



NOTE: The equipment transmits at the maximum output power

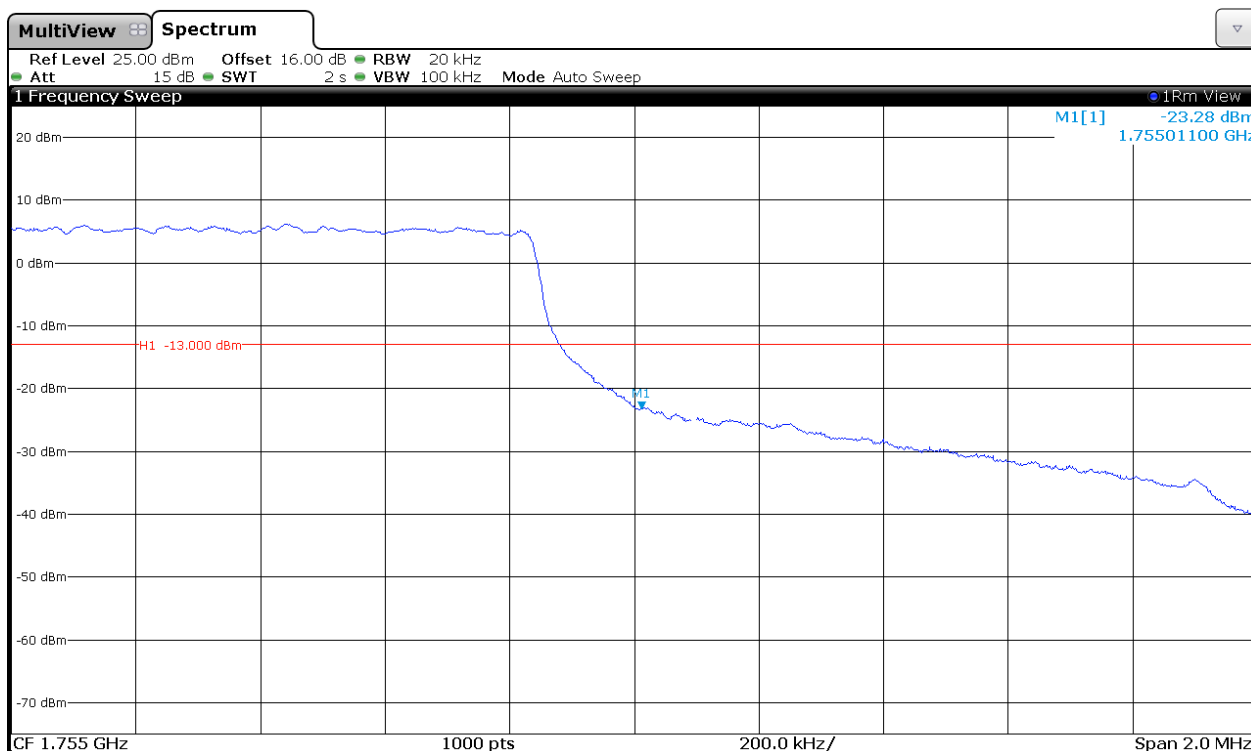
LTE QPSK MODULATION. RB = All, Offset = 0, BW = 1.4 MHz (Band IV)

CHANNEL LOWEST



NOTE: The equipment transmits at the maximum output power

CHANNEL HIGHEST

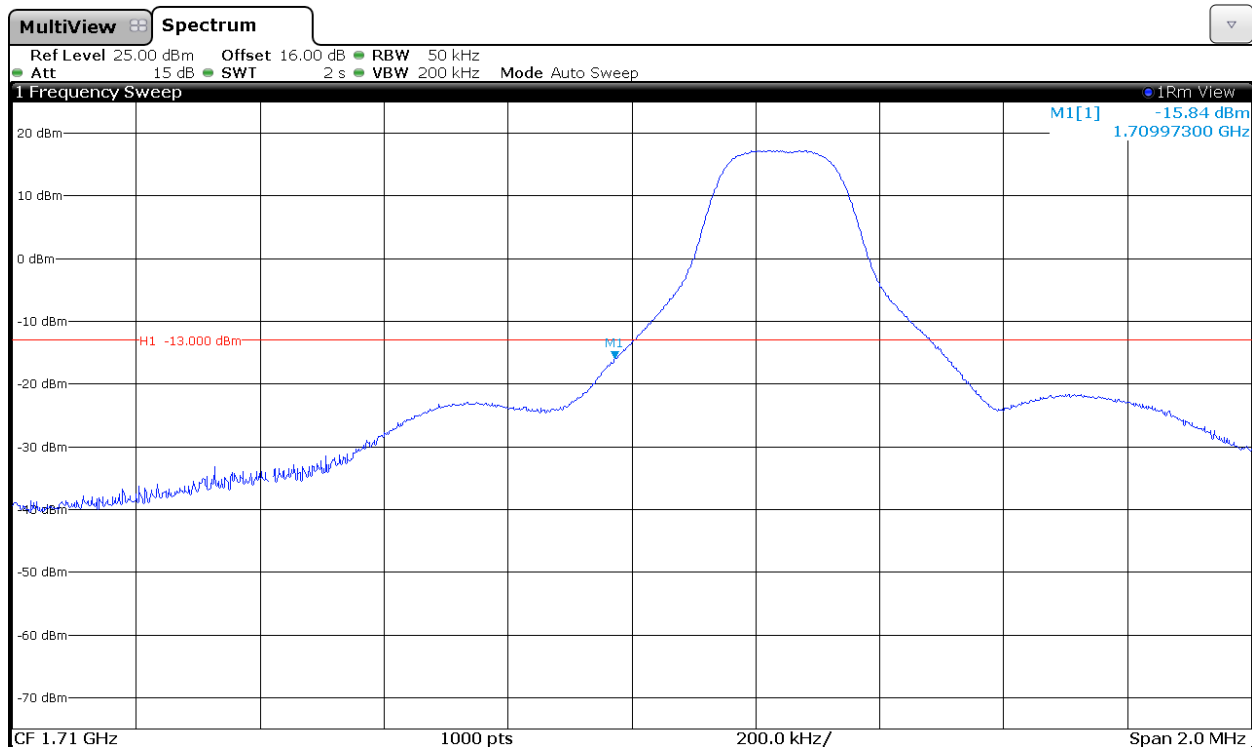


NOTE: The equipment transmits at the maximum output power

Verdict: PASS

LTE QPSK MODULATION. RB = 1, Offset = 0, BW = 3 MHz (Band IV)

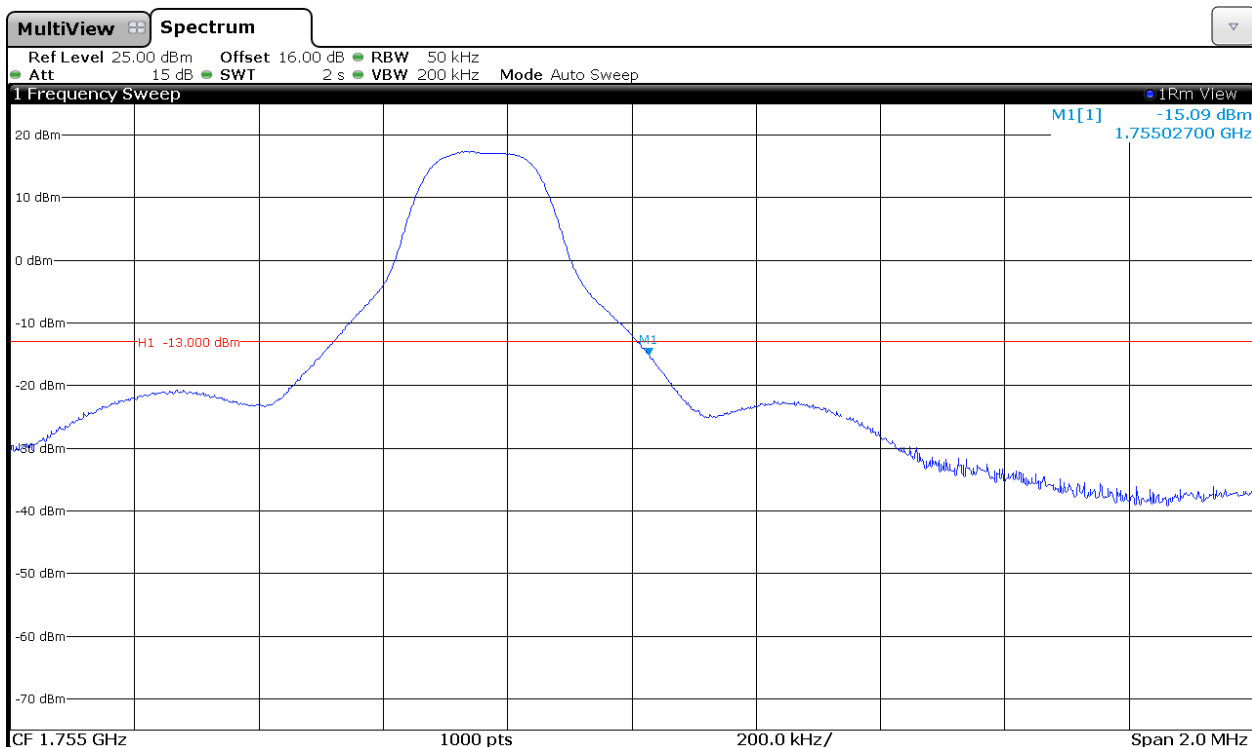
CHANNEL LOWEST



NOTE: The equipment transmits at the maximum output power

LTE QPSK MODULATION. RB = 1, Offset = Max, BW = 3 MHz (Band IV)

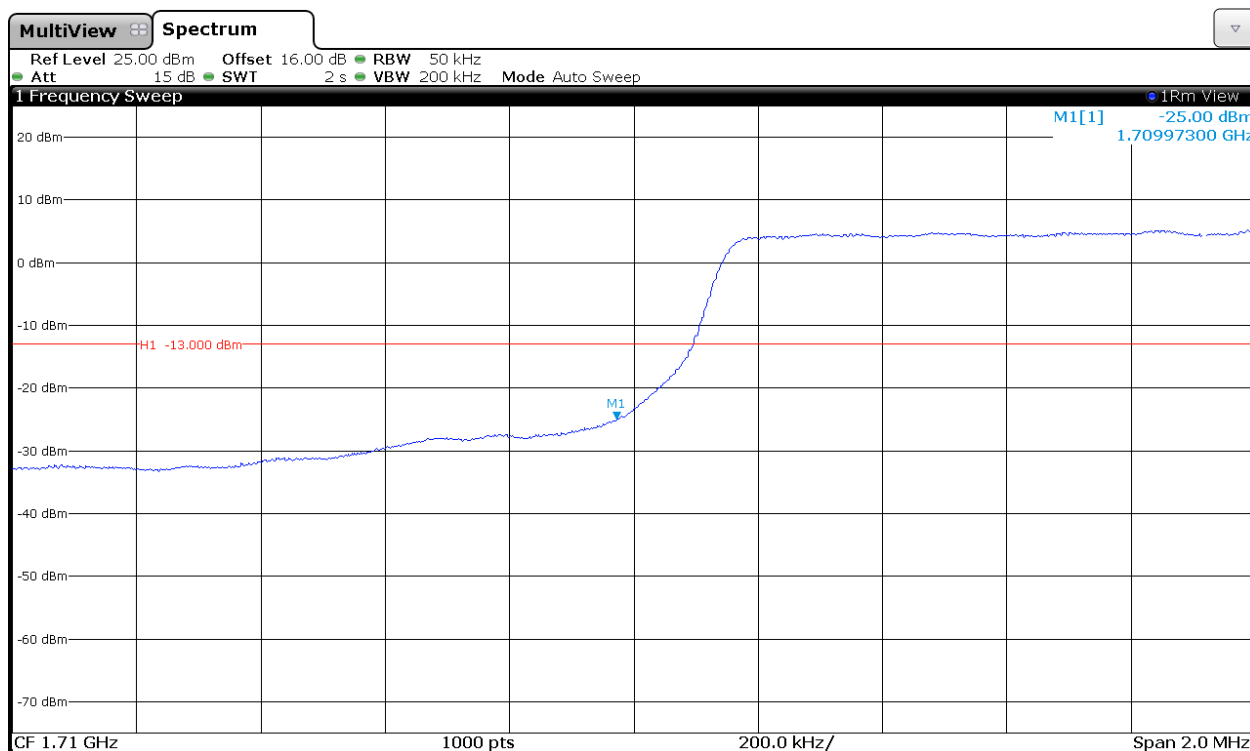
CHANNEL HIGHEST



NOTE: The equipment transmits at the maximum output power

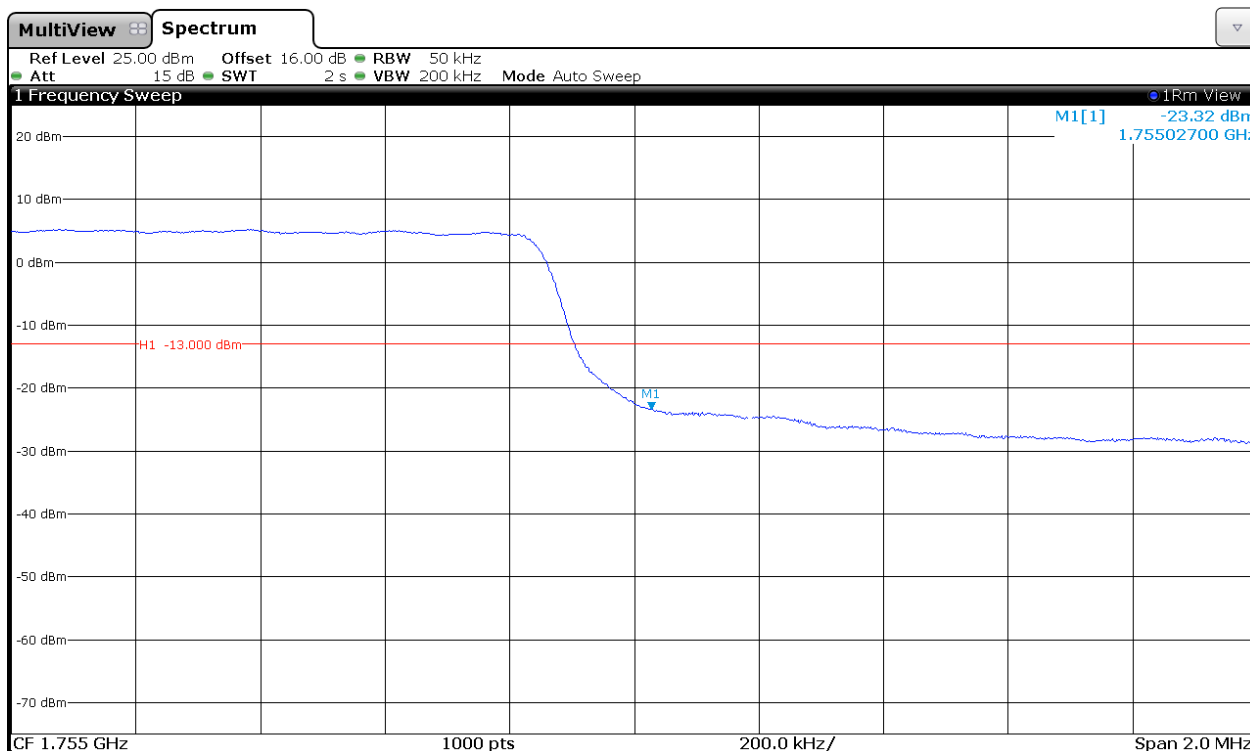
LTE QPSK MODULATION. RB = All, Offset = 0, BW = 3 MHz (Band IV)

CHANNEL LOWEST



NOTE: The equipment transmits at the maximum output power

CHANNEL HIGHEST

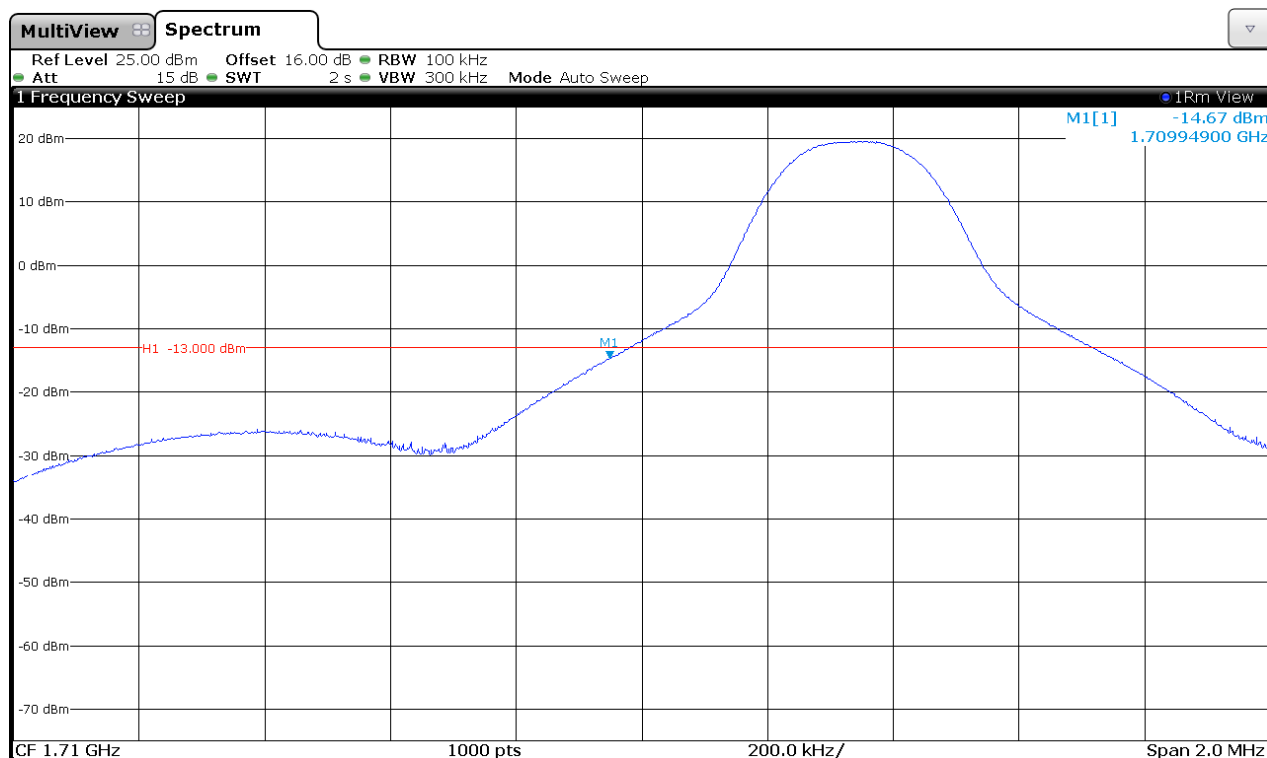


NOTE: The equipment transmits at the maximum output power

Verdict: PASS

LTE QPSK MODULATION. RB = 1, Offset = 0, BW = 5 MHz (Band IV)

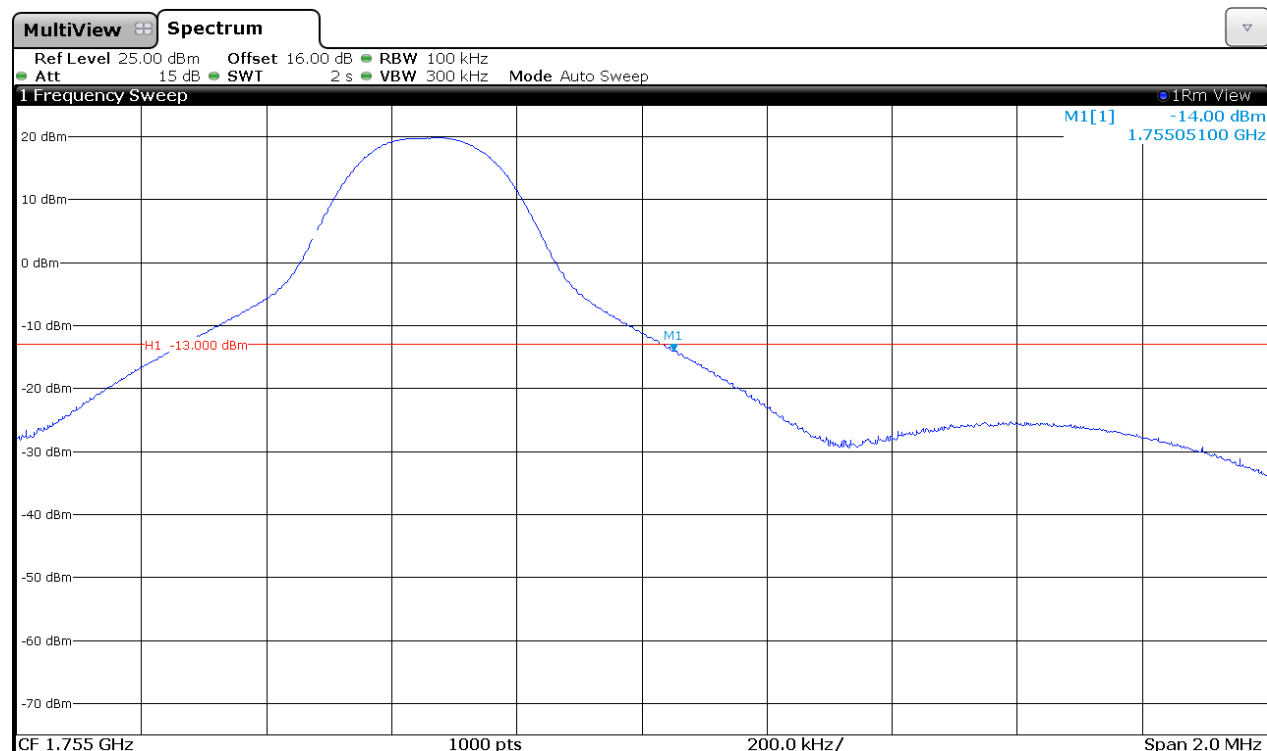
CHANNEL LOWEST



NOTE: The equipment transmits at the maximum output power

LTE QPSK MODULATION. RB = 1, Offset = Max, BW = 5 MHz (Band IV)

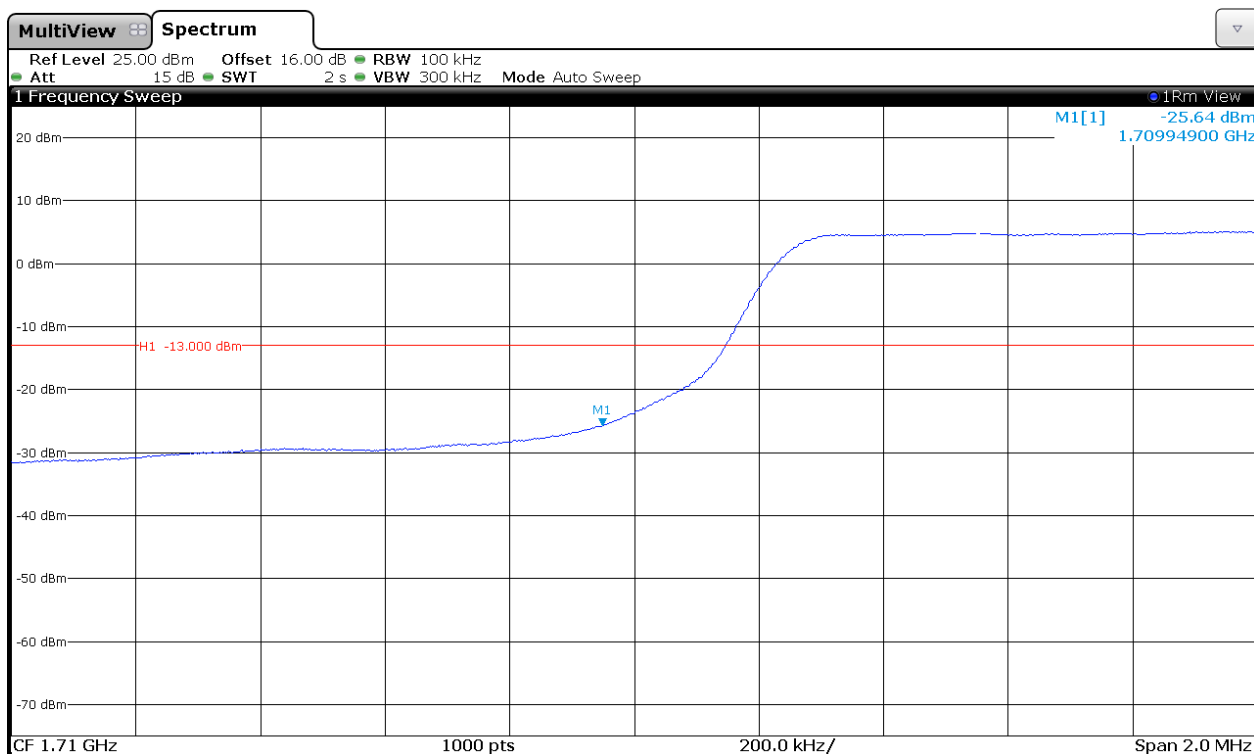
CHANNEL HIGHEST



NOTE: The equipment transmits at the maximum output power

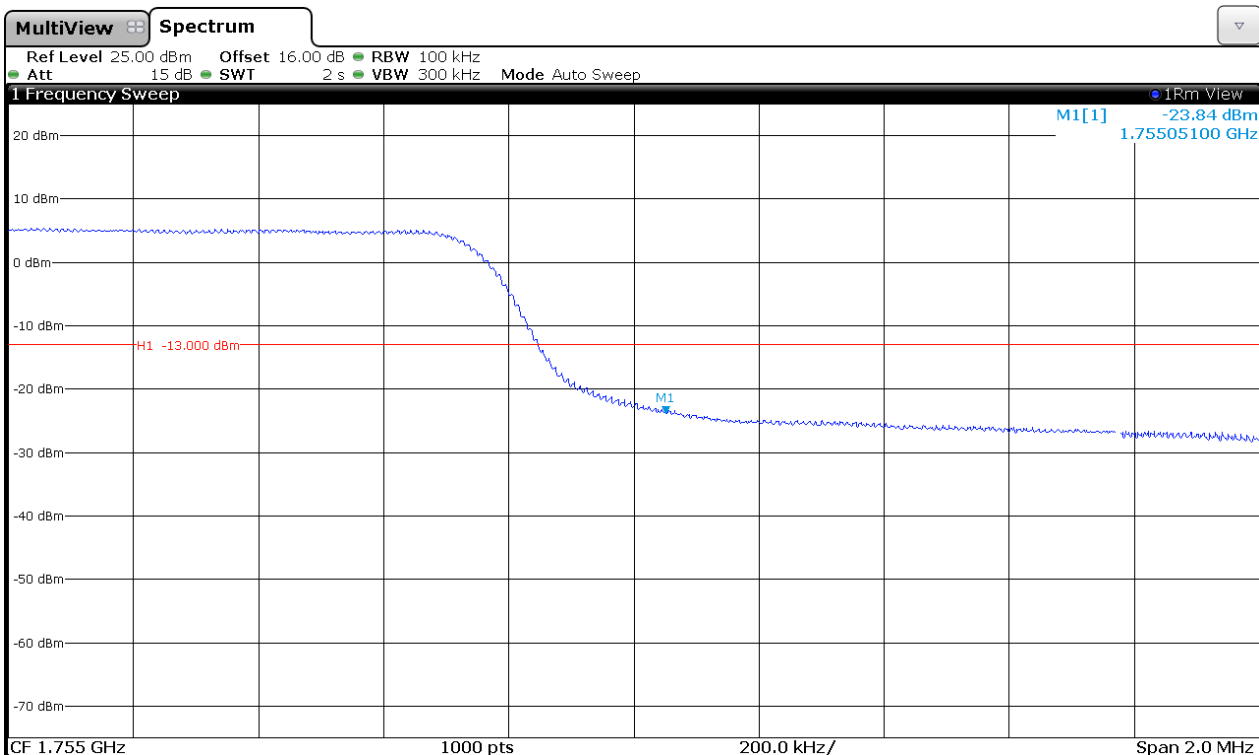
LTE QPSK MODULATION. RB = All, Offset = 0, BW = 5 MHz (Band IV)

CHANNEL LOWEST



NOTE: The equipment transmits at the maximum output power

CHANNEL HIGHEST

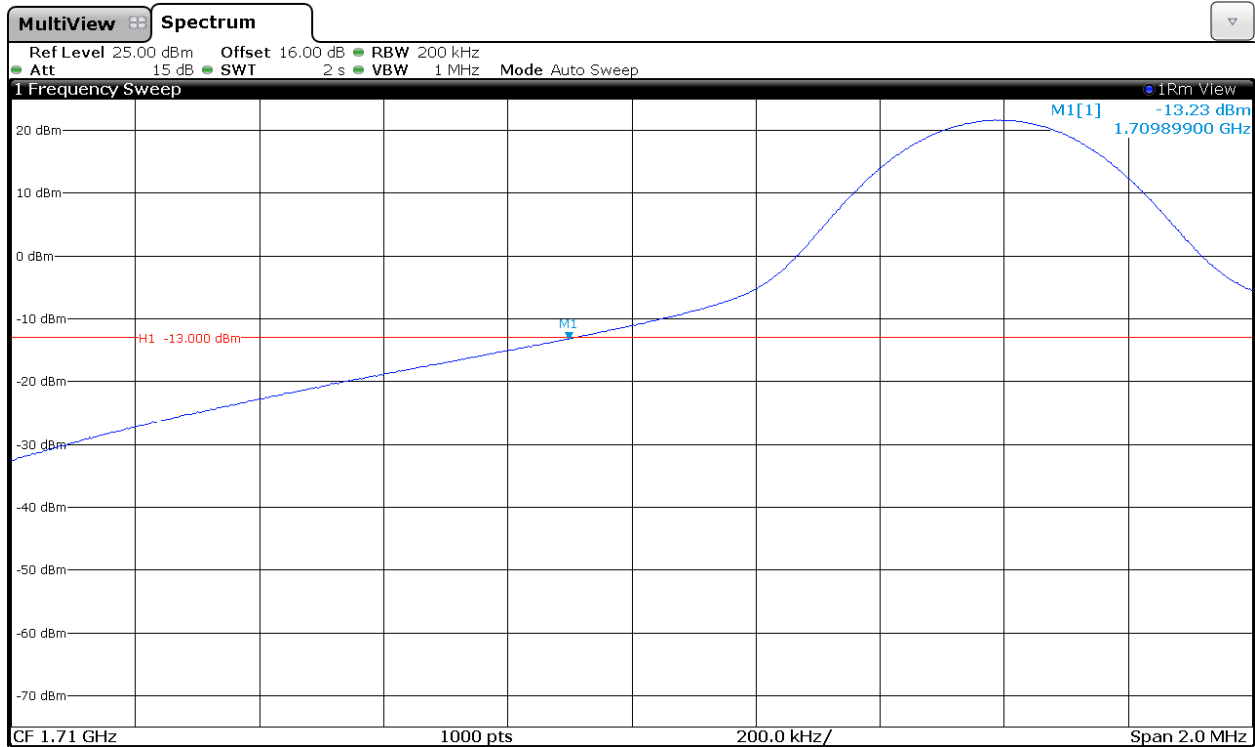


NOTE: The equipment transmits at the maximum output power

Verdict: PASS

LTE QPSK MODULATION. RB = 1, Offset = 0, BW = 10 MHz (Band IV)

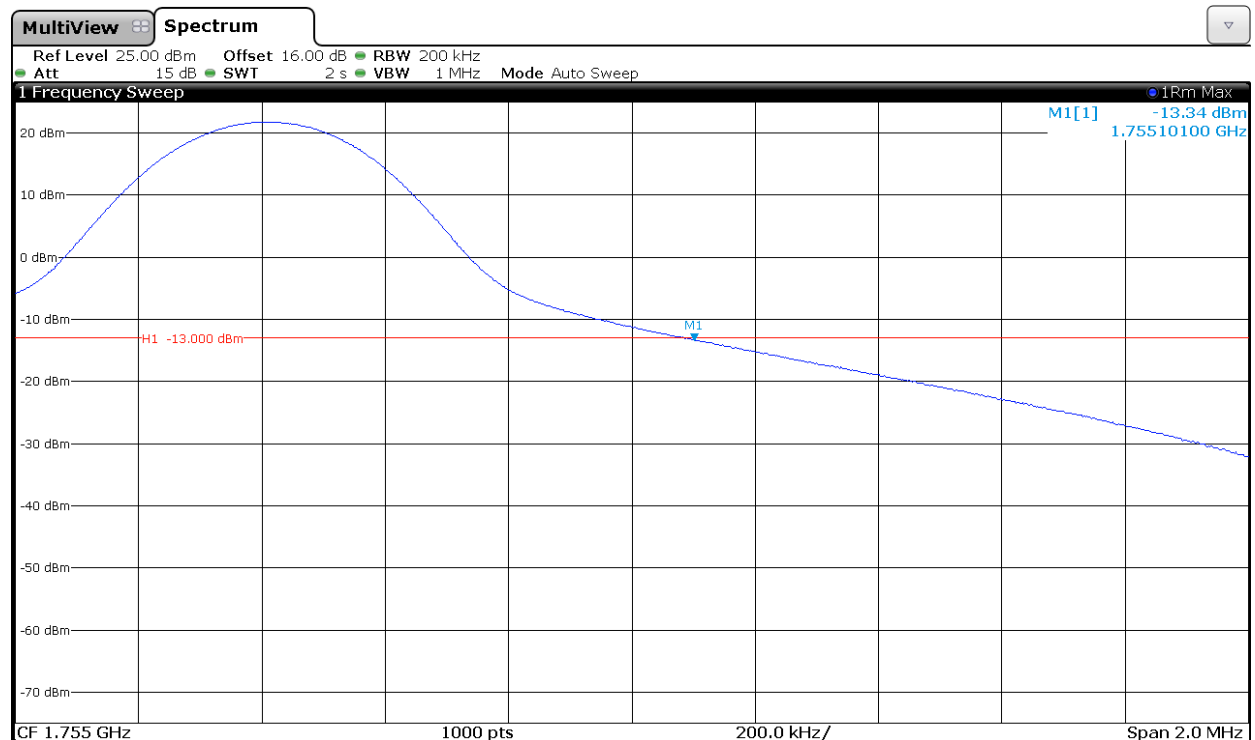
CHANNEL LOWEST



NOTE: The equipment transmits at the maximum output power

LTE QPSK MODULATION. RB = 1, Offset = Max, BW = 10 MHz (Band IV)

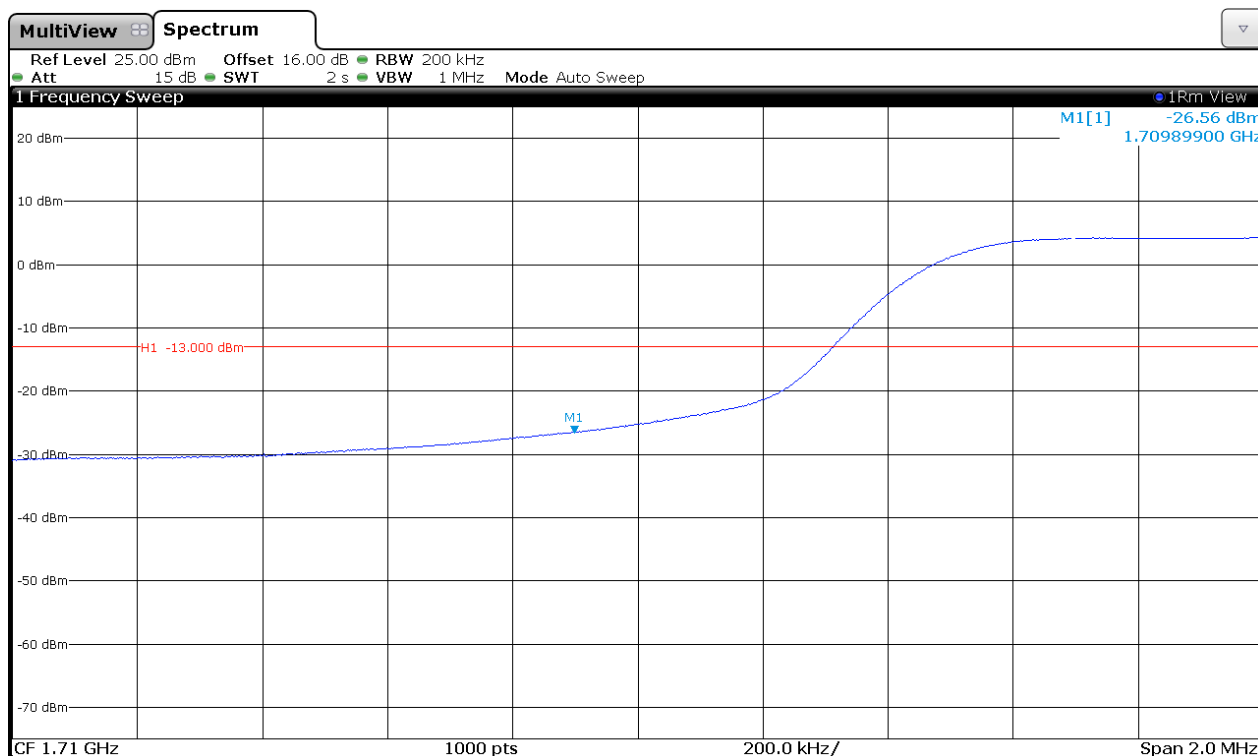
CHANNEL HIGHEST



NOTE: The equipment transmits at the maximum output power

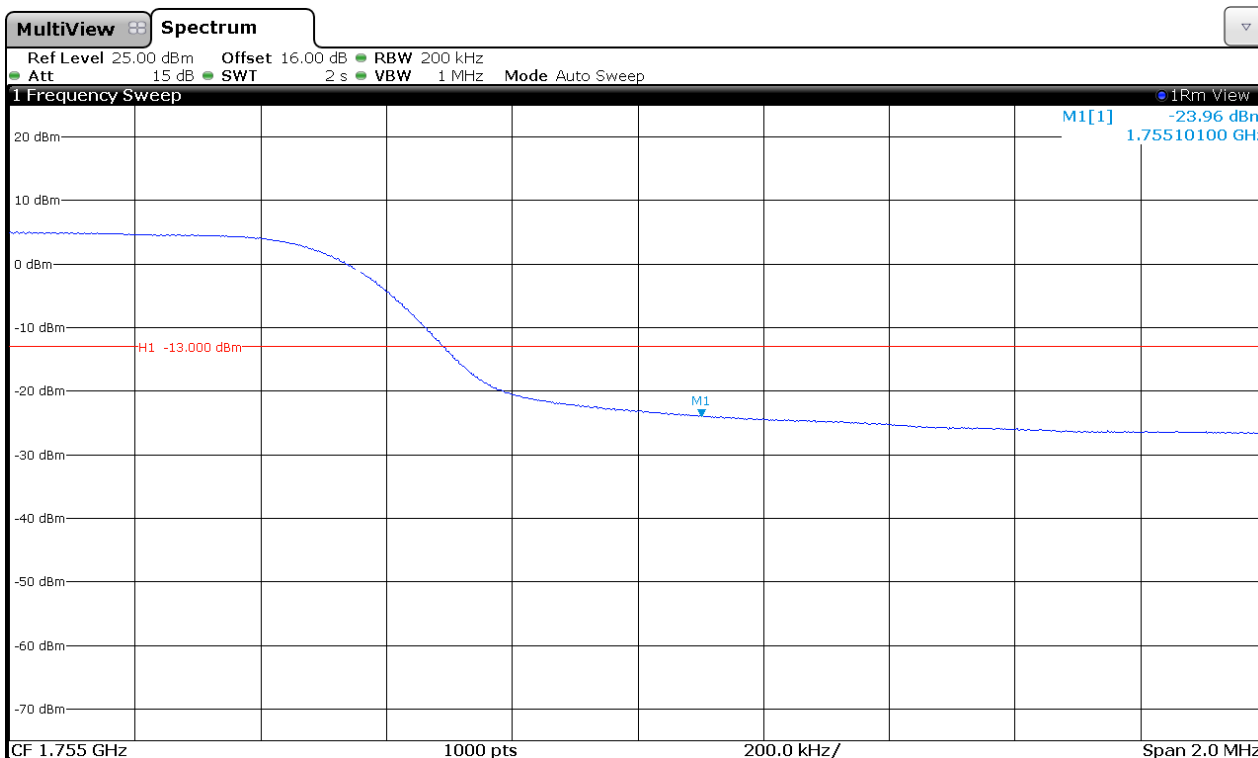
LTE QPSK MODULATION. RB = All, Offset = 0, BW = 10 MHz (Band IV)

CHANNEL LOWEST



NOTE: The equipment transmits at the maximum output power

CHANNEL HIGHEST

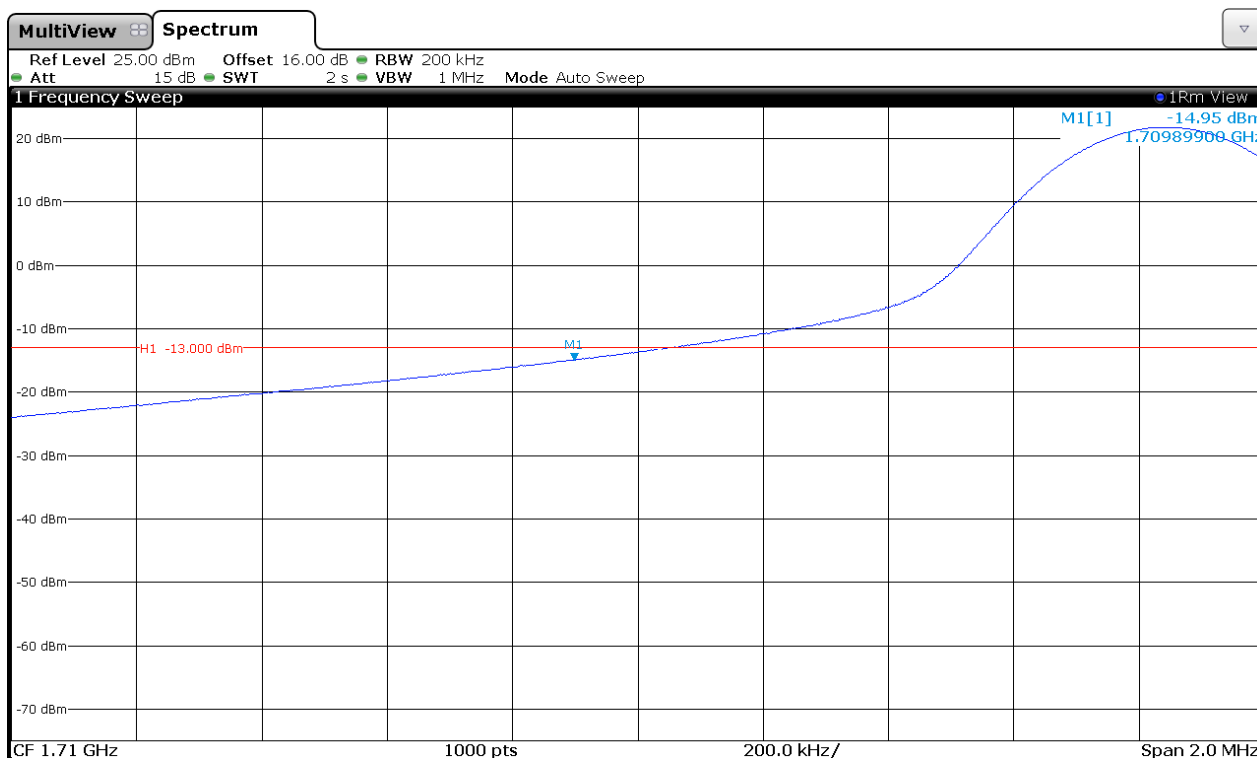


NOTE: The equipment transmits at the maximum output power

Verdict: PASS

LTE QPSK MODULATION. RB = 1, Offset = 0, BW = 15 MHz (Band IV)

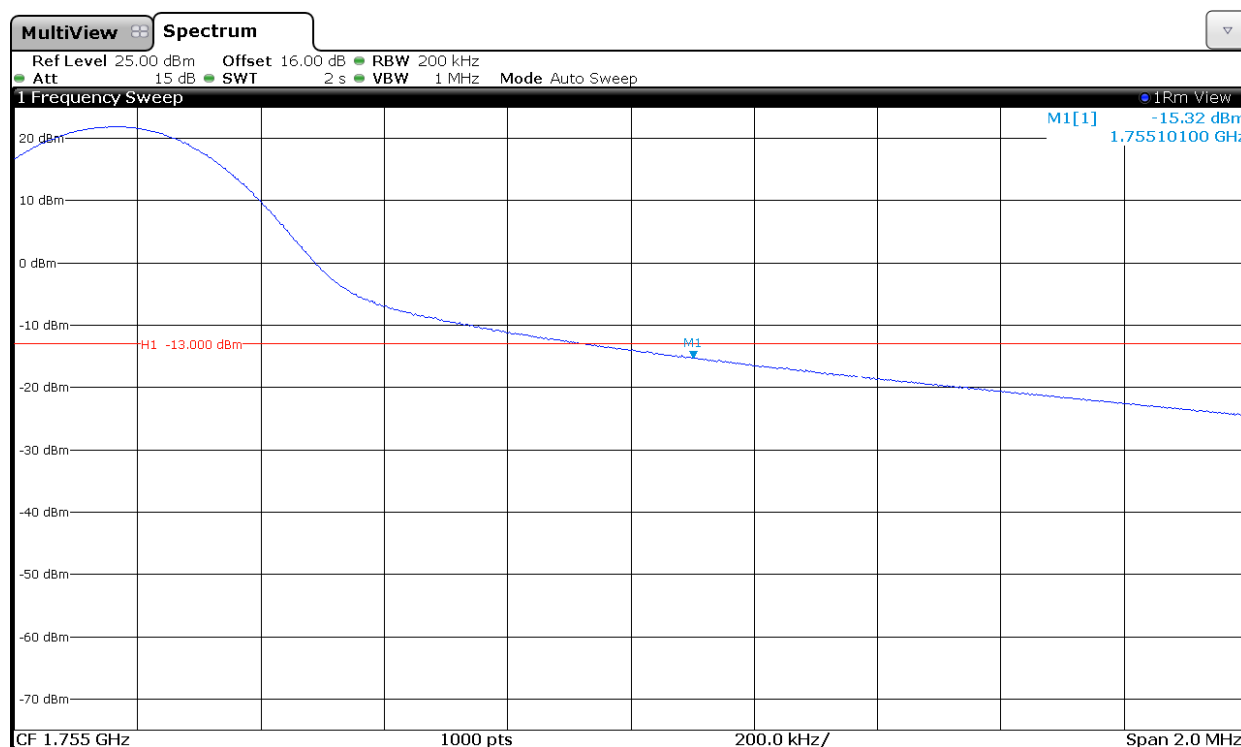
CHANNEL LOWEST



NOTE: The equipment transmits at the maximum output power

LTE QPSK MODULATION. RB = 1, Offset = Max, BW = 15 MHz (Band IV)

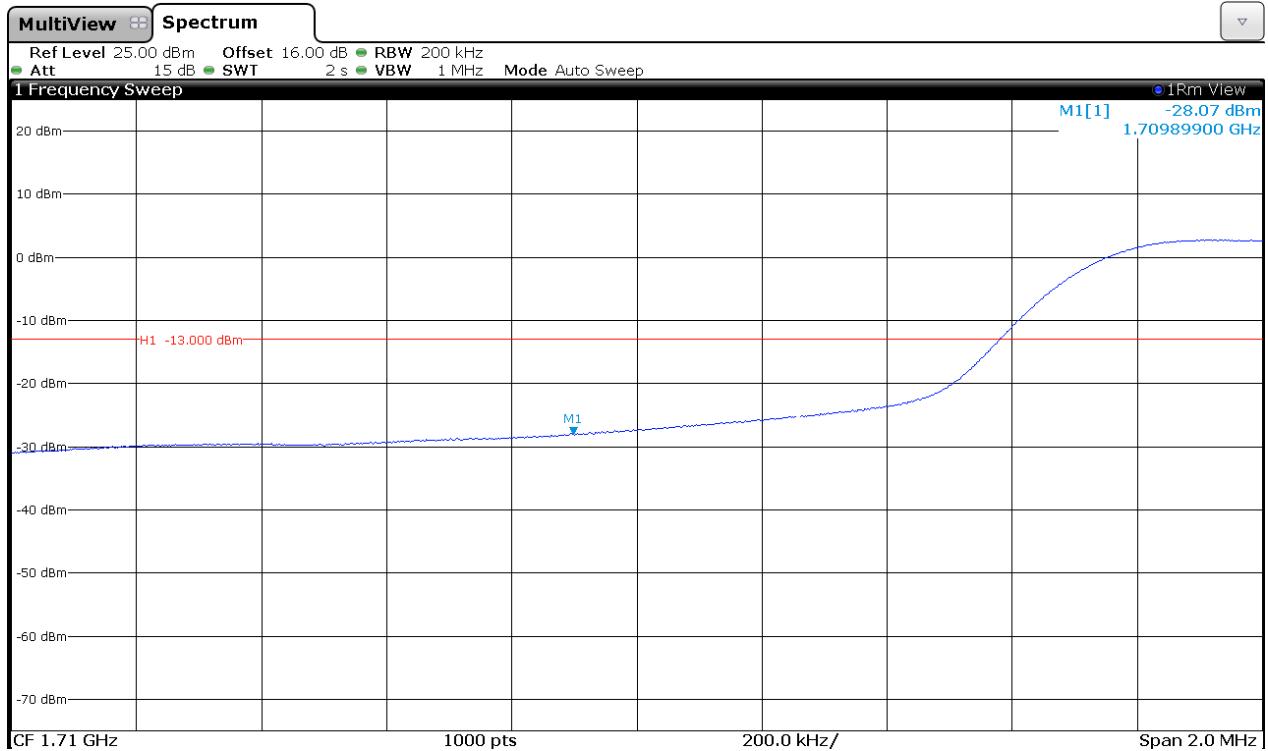
CHANNEL HIGHEST



NOTE: The equipment transmits at the maximum output power

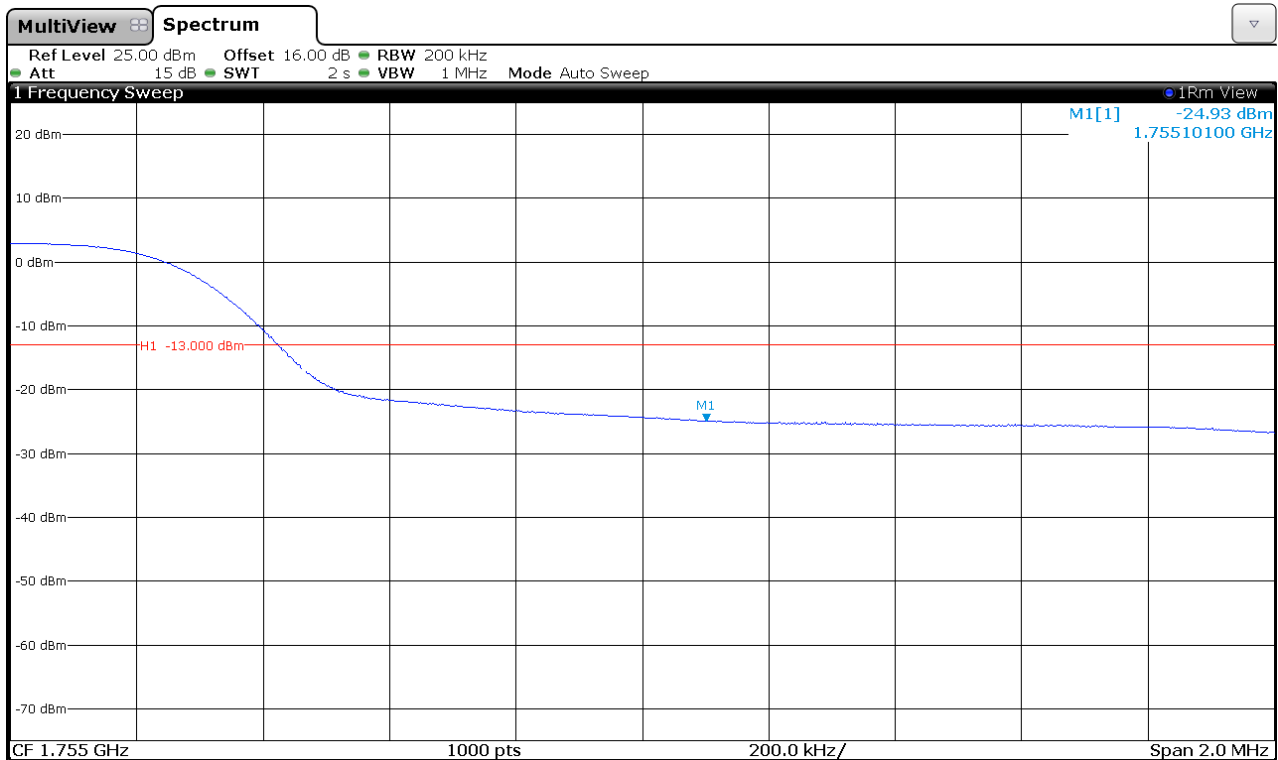
LTE QPSK MODULATION. RB = All, Offset = 0, BW = 15 MHz (Band IV)

CHANNEL LOWEST



NOTE: The equipment transmits at the maximum output power

CHANNEL HIGHEST

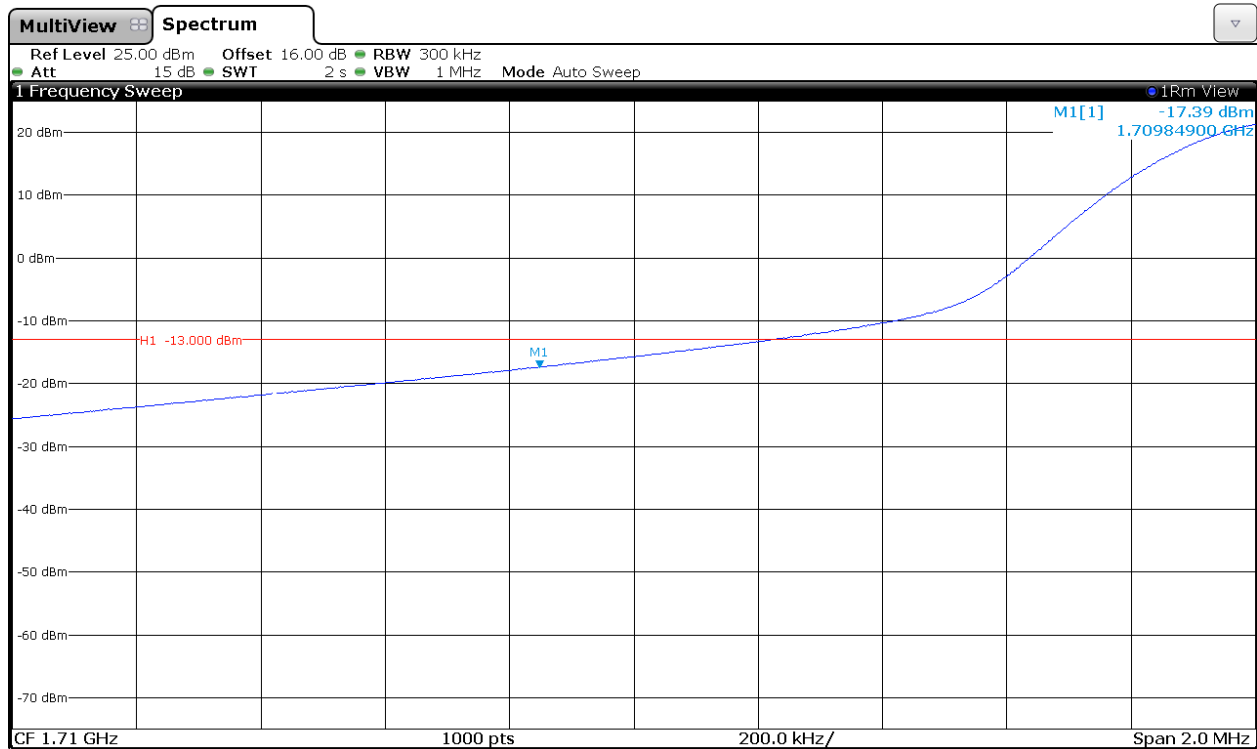


NOTE: The equipment transmits at the maximum output power

Verdict: PASS

LTE QPSK MODULATION. RB = 1, Offset = 0, BW = 20 MHz (Band IV)

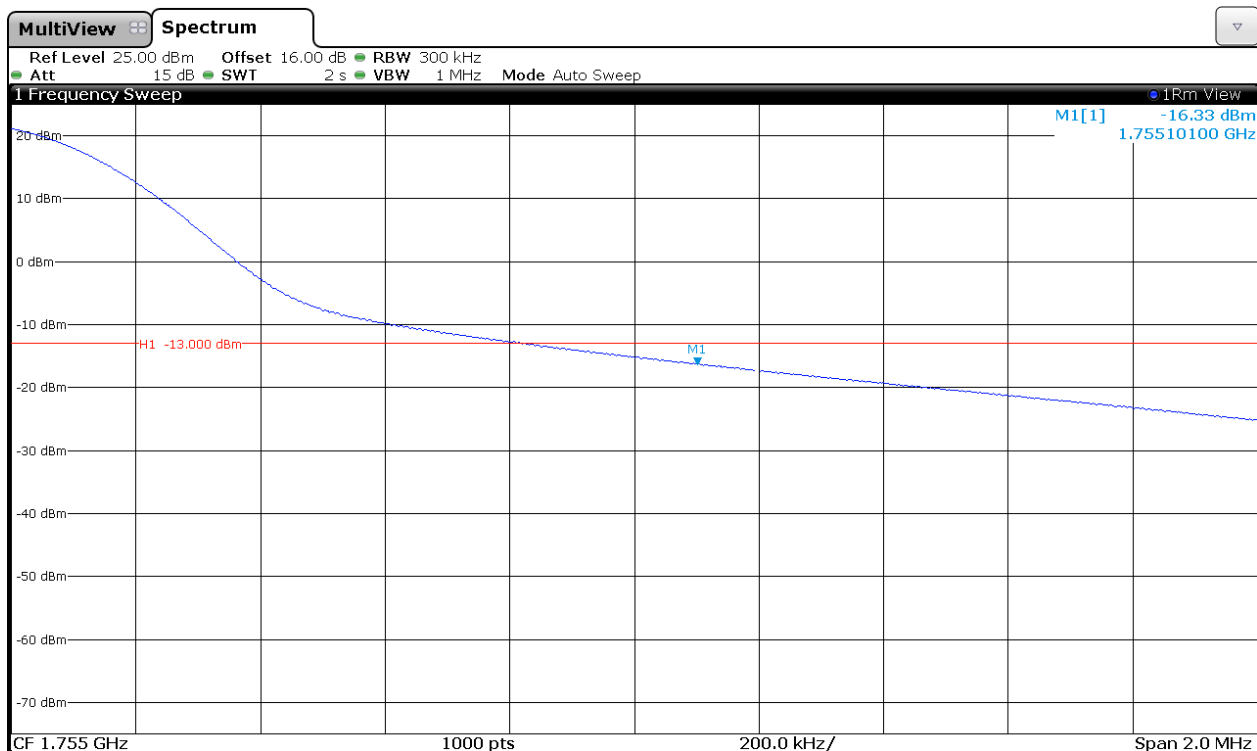
CHANNEL LOWEST



NOTE: The equipment transmits at the maximum output power

LTE QPSK MODULATION. RB = 1, Offset = Max, BW = 20 MHz (Band IV)

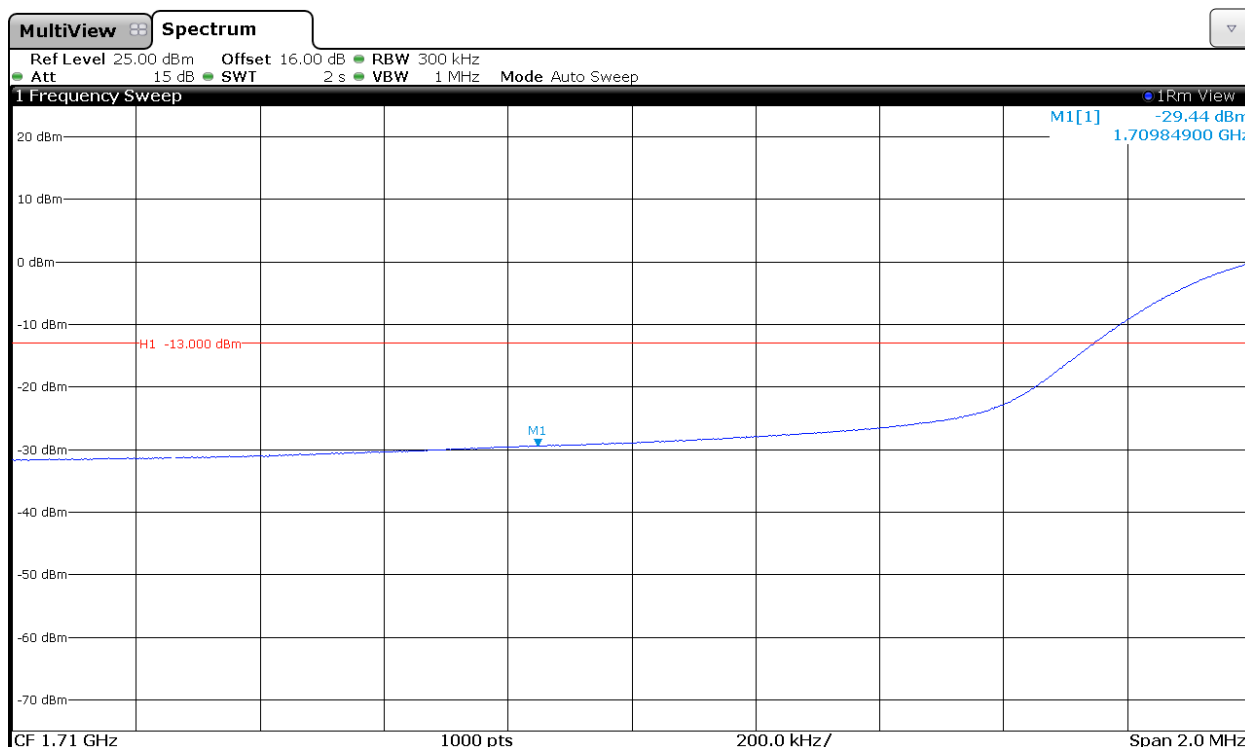
CHANNEL HIGHEST



NOTE: The equipment transmits at the maximum output power

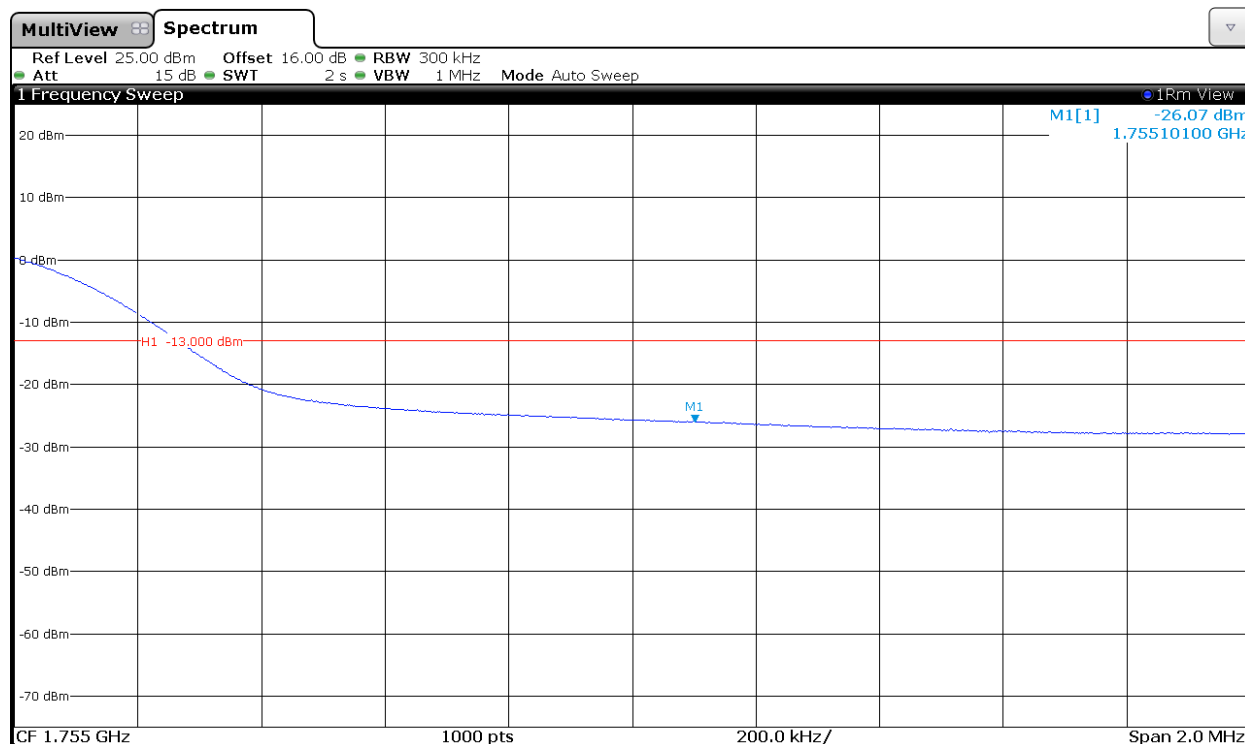
LTE QPSK MODULATION. RB = All, Offset = 0, BW = 20 MHz (Band IV)

CHANNEL LOWEST



NOTE: The equipment transmits at the maximum output power

CHANNEL HIGHEST

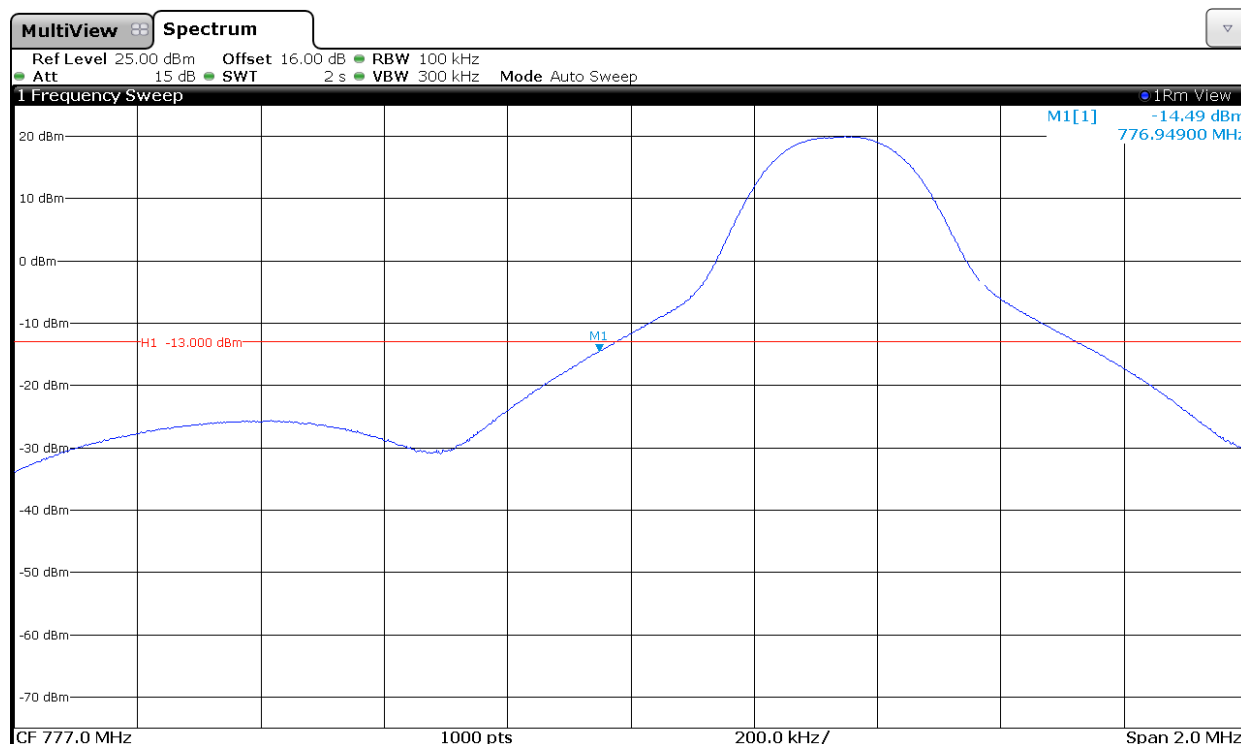


NOTE: The equipment transmits at the maximum output power

Verdict: PASS

LTE QPSK MODULATION. RB = 1, Offset = 0, BW = 5 MHz (Band XIII)

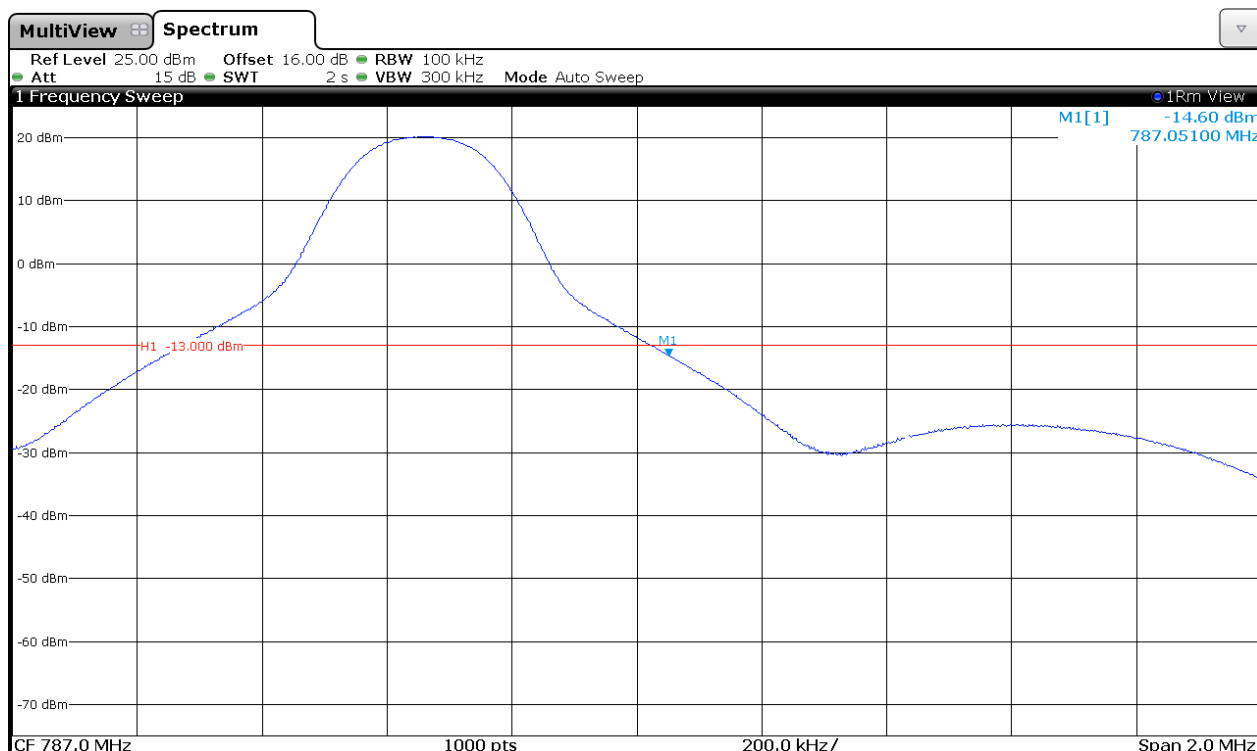
CHANNEL LOWEST



NOTE: The equipment transmits at the maximum output power

LTE QPSK MODULATION. RB = 1, Offset = Max, BW = 5 MHz (Band XIII)

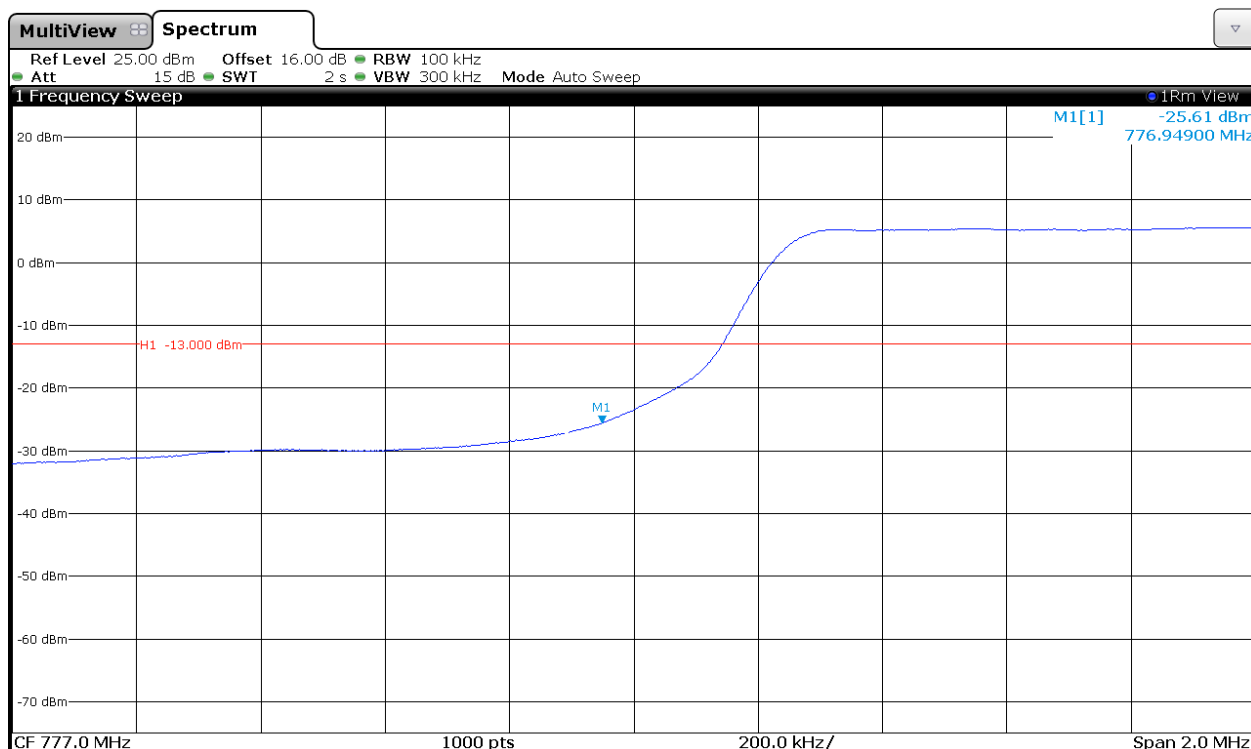
CHANNEL HIGHEST



NOTE: The equipment transmits at the maximum output power

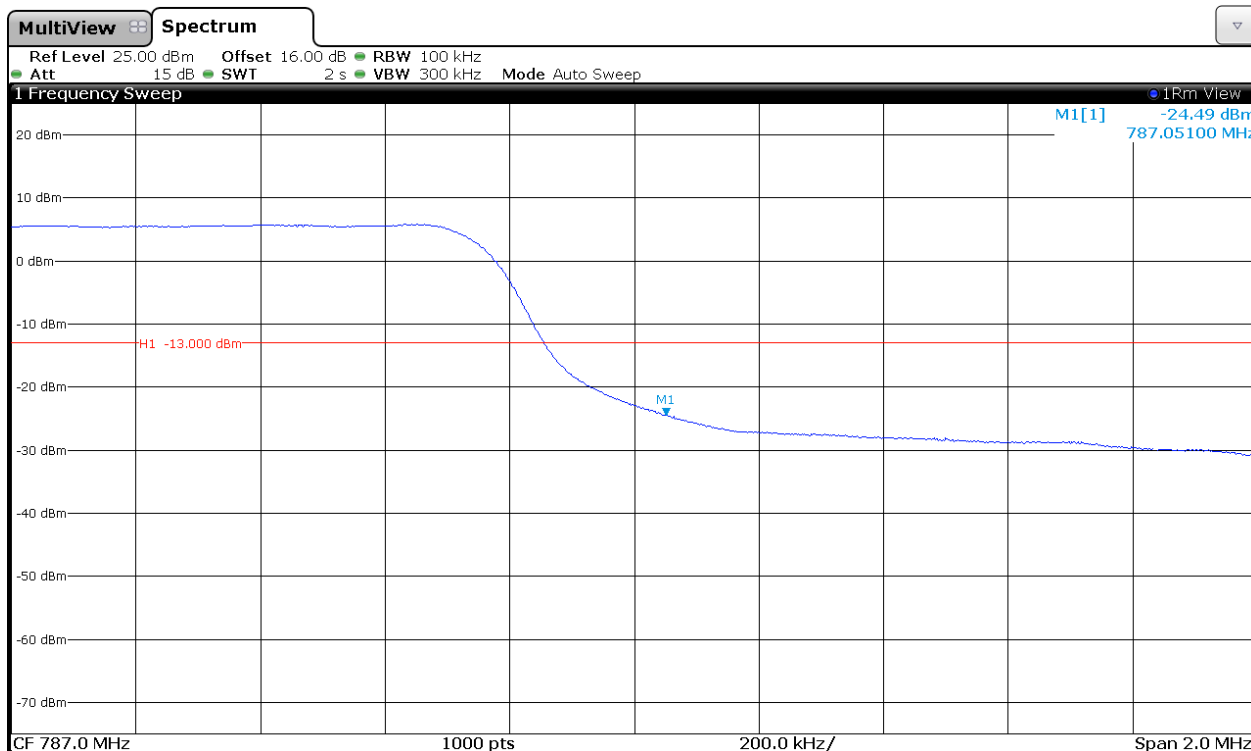
LTE QPSK MODULATION. RB = All, Offset = 0, BW = 5 MHz (Band XIII)

CHANNEL LOWEST



NOTE: The equipment transmits at the maximum output power

CHANNEL HIGHEST

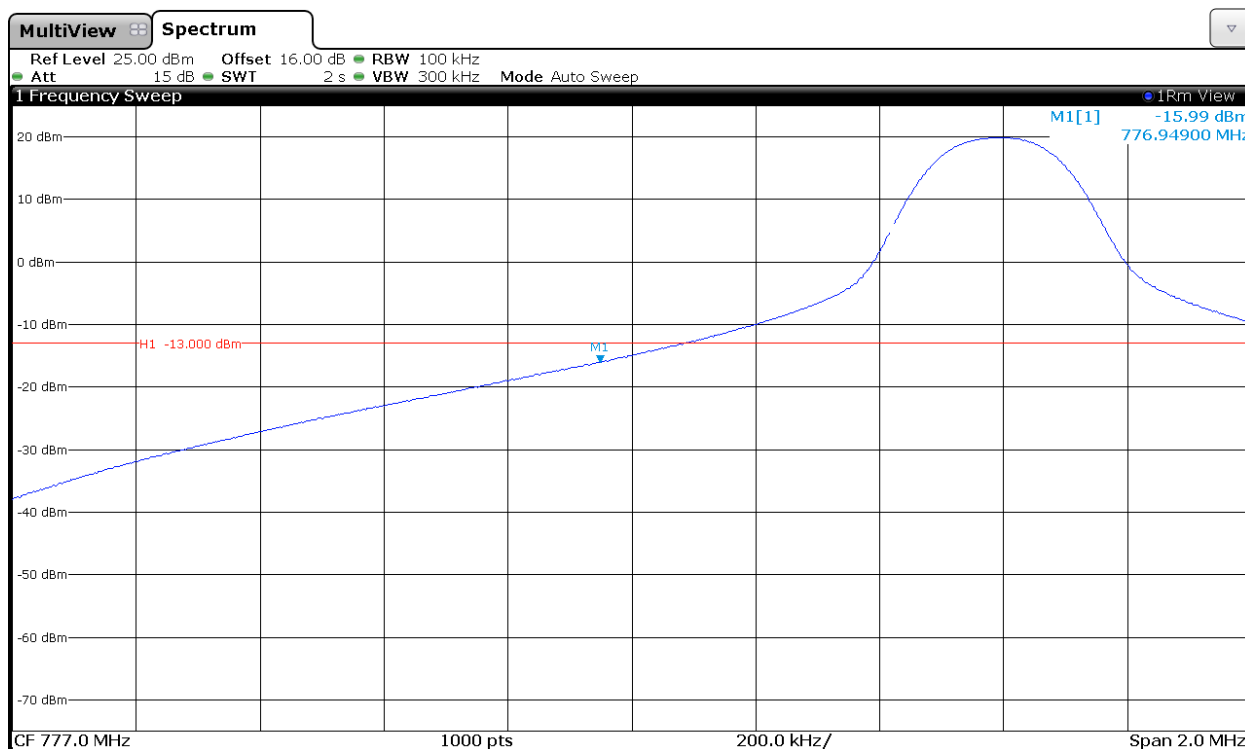


NOTE: The equipment transmits at the maximum output power

Verdict: PASS

LTE QPSK MODULATION. RB = 1, Offset = 0, BW = 10 MHz (Band XIII)

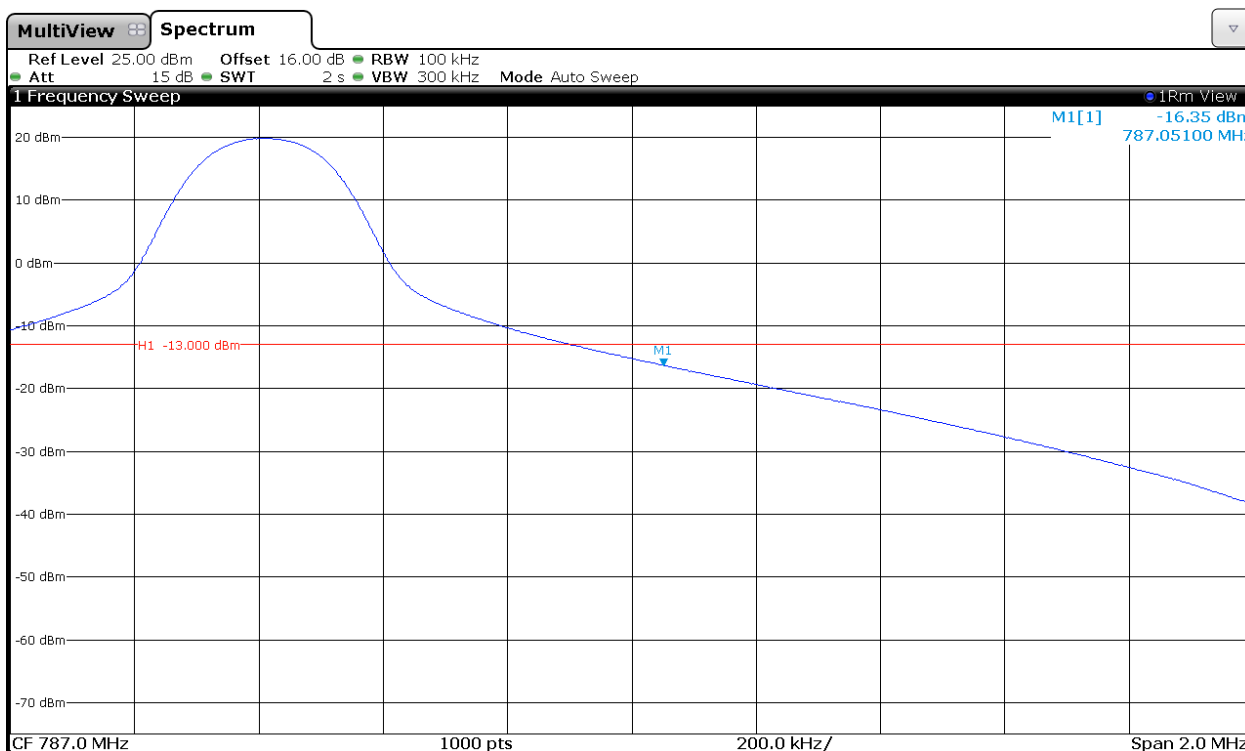
LOW FREQUENCY SECTION



NOTE: The equipment transmits at the maximum output power

LTE QPSK MODULATION. RB = 1, Offset = Max, BW = 10 MHz (Band XIII)

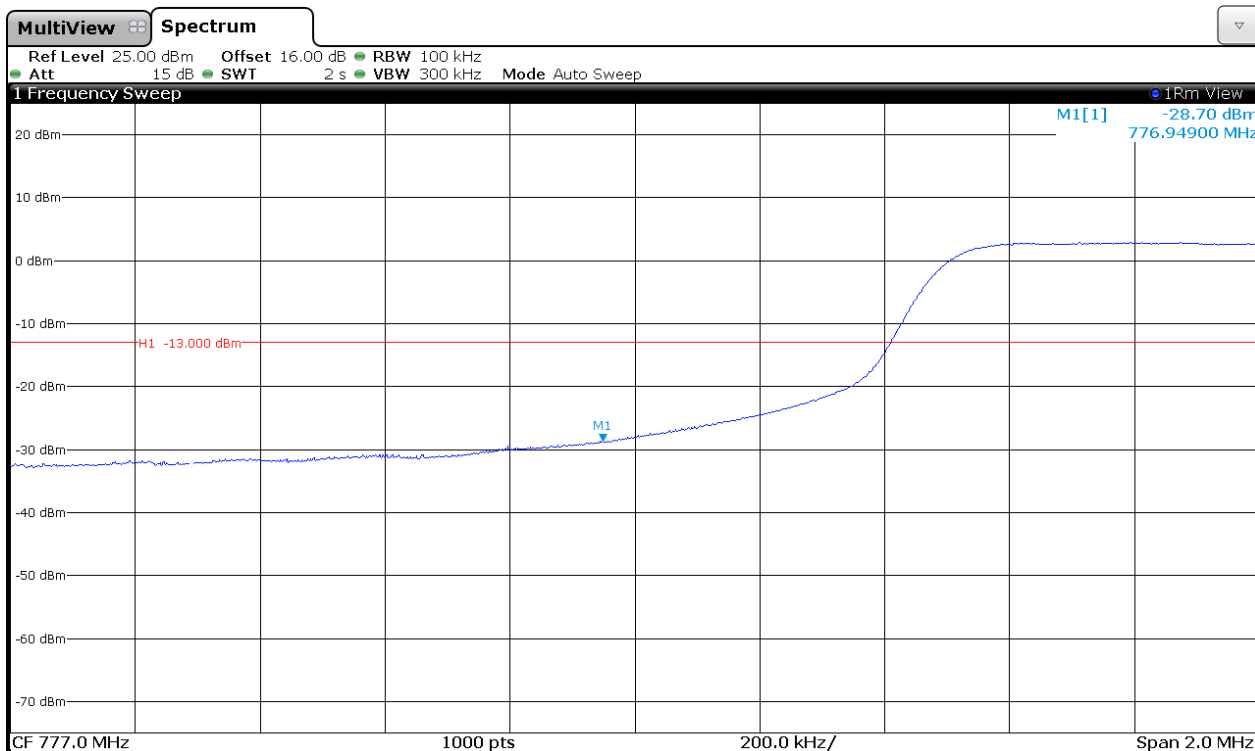
HIGH FREQUENCY SECTION



NOTE: The equipment transmits at the maximum output power

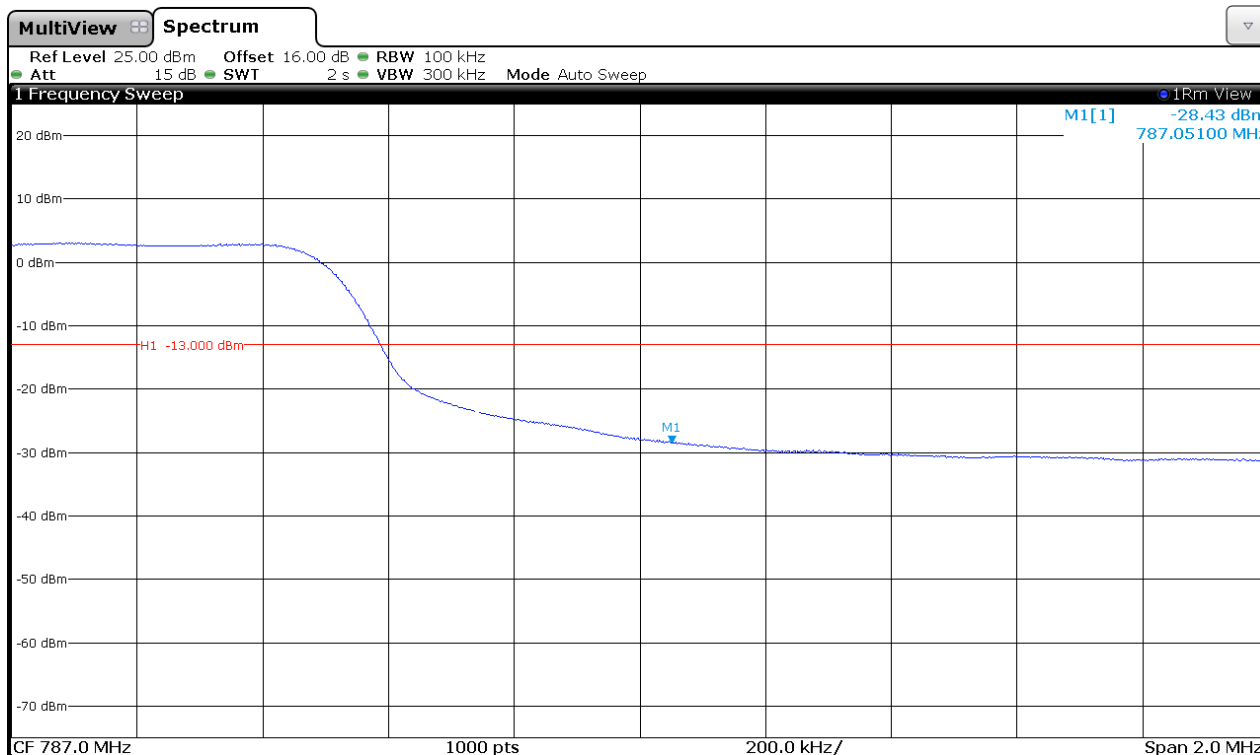
LTE QPSK MODULATION. RB = All, Offset = 0, BW = 10 MHz (Band XIII)

### LOW FREQUENCY SECTION



NOTE: The equipment transmits at the maximum output power

### HIGH FREQUENCY SECTION



NOTE: The equipment transmits at the maximum output power

Verdict: PASS

## Radiated emissions

### SPECIFICATION

FCC §2.1051 and §27.53(c) (f) (h). RSS-139 Clause 6.6. RSS-130 Clause 4.6.

According to specification, the power of emissions shall be attenuated below the transmitter power (P) by a factor of at least  $43 + 10 \log (P)$  dB. P in watts.

At  $P_o$  transmitting power, the specified minimum attenuation becomes  $43+10\log (P_o)$ . and the level in dBm relative  $P_o$  becomes:

$$P_o \text{ (dBm)} - [43 + 10 \log (P_o \text{ in mwatts}) - 30] = -13 \text{ dBm}$$

For operations in the 746-758 MHz, 775-788 MHz, and 805-806 MHz bands, emissions in the band 1559-1610 MHz shall be limited to  $-70$  dBW ( $-40$  dBm)/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and  $-80$  dBW ( $-50$  dBm) EIRP for discrete emissions of less than 700 Hz bandwidth.

### METHOD

The measurement was performed with the EUT inside an anechoic chamber. The spectrum was scanned from 30 MHz to at least the 10th harmonic of the highest frequency generated within the equipment.

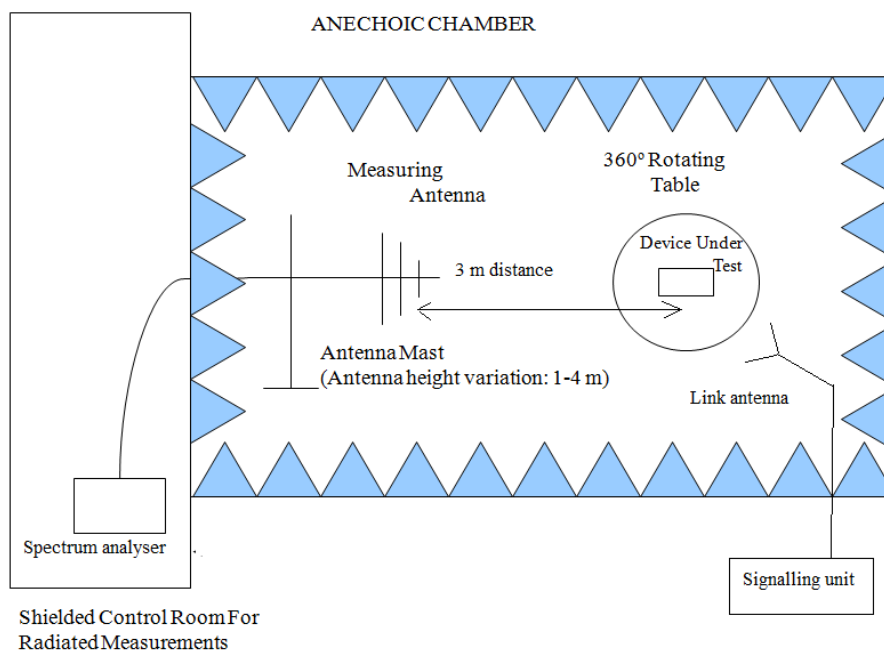
The EUT was placed on a non-conductive stand at a 3 meter distance from the measuring antenna for measurements below 1 GHz and at 1 m distance for measurements above 1 GHz.

Detected emissions were maximized at each frequency by rotating the EUT and adjusting the measuring antenna height and polarization. The maximum meter reading was recorded.

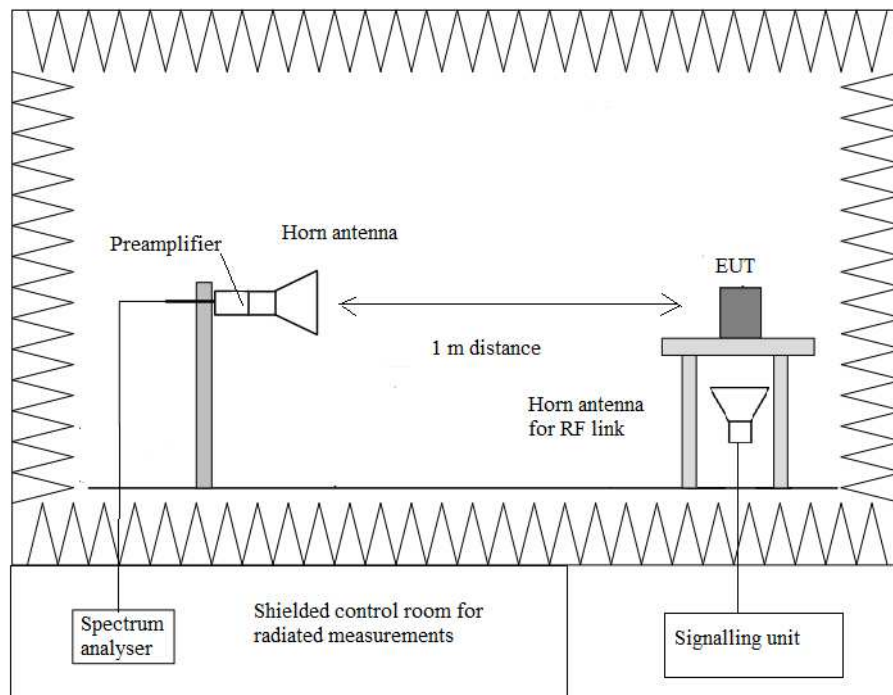
Each detected emission is substituted by the Substitution method, in accordance with the ANSI/TIA-603-D: 2010.

### TEST SETUP

Radiated measurements below 1 GHz.



## Radiated measurements above 1 GHz.



## RESULTS

LTE QPSK AND 16QAM MODULATION. Band IV. BW = 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz and 20 MHz.

A preliminary scan determined the QPSK 1.4 MHz bandwidth as the worst case. The configuration of Resource Blocks which is the worst case for conducted power was used.

The following tables and plots show the results for this configuration.

### 1. CHANNEL: LOWEST

#### Frequency range 30 MHz-1000 MHz.

No radiated spurious signals were detected.

#### Frequency range 1 GHz-18 GHz.

Spurious signals closest to limit.

#### Substitution method data

| Frequency (MHz) | Instrument reading (dBm) | Polarization | (1) Generator output (dBm) | (2) Cable loss (dB) | (3) Substitution antenna gain $G_i$ (respect to isotropic radiator) (dB) | E.I.R.P. (dBm) = (1) – (2) + (3) |
|-----------------|--------------------------|--------------|----------------------------|---------------------|--------------------------------------------------------------------------|----------------------------------|
| 6843.25         | -36.29                   | V            | -42.91                     | 1.87                | 10.15                                                                    | -34.63                           |
| 8553.75         | -42.32                   | V            | -46.76                     | 2.11                | 11.02                                                                    | -37.85                           |
| 11975.75        | -46.08                   | V            | -46.35                     | 2.53                | 12.25                                                                    | -36.63                           |
| 13686.25        | -47.56                   | V            | -44.81                     | 2.72                | 12.35                                                                    | -35.18                           |
| 15396.75        | -40.95                   | V            | -39.29                     | 2.90                | 15.80                                                                    | -26.39                           |
| 17107.75        | -52.09                   | V            | -46.10                     | 3.09                | 13.17                                                                    | -36.02                           |

### 2. CHANNEL: MIDDLE

#### Frequency range 30 MHz-1000 MHz.

No radiated spurious signals were detected.

#### Frequency range 1 GHz-18 GHz.

Spurious signals closest to limit.

#### Substitution method data

| Frequency (MHz) | Instrument reading (dBm) | Polarization | (1) Generator output (dBm) | (2) Cable loss (dB) | (3) Substitution antenna gain $G_i$ (respect to isotropic radiator) (dB) | E.I.R.P. (dBm) = (1) – (2) + (3) |
|-----------------|--------------------------|--------------|----------------------------|---------------------|--------------------------------------------------------------------------|----------------------------------|
| 6930.25         | -40.73                   | V            | -46.79                     | 1.88                | 9.95                                                                     | -38.72                           |
| 8662.75         | -37.15                   | V            | -41.39                     | 2.13                | 11.07                                                                    | -32.45                           |
| 10395.25        | -44.75                   | V            | -44.44                     | 2.34                | 10.18                                                                    | -36.60                           |
| 12127.75        | -42.60                   | V            | -43.17                     | 2.55                | 12.53                                                                    | -33.19                           |
| 13859.75        | -42.60                   | V            | -39.10                     | 2.74                | 12.21                                                                    | -29.63                           |
| 15593.25        | -43.60                   | V            | -43.17                     | 2.92                | 16.44                                                                    | -29.65                           |

### 3. CHANNEL: HIGHEST

#### Frequency range 30 MHz-1000 MHz.

No radiated spurious signals were detected.

## Frequency range 1 GHz-18 GHz.

Spurious signals closest to limit.

### Substitution method data

| Frequency (MHz) | Instrument reading (dBm) | Polarization | (1) Generator output (dBm) | (2) Cable loss (dB) | (3) Substitution antenna gain Gi (respect to isotropic radiator) (dB) | E.I.R.P. (dBm) = (1) – (2) + (3) |
|-----------------|--------------------------|--------------|----------------------------|---------------------|-----------------------------------------------------------------------|----------------------------------|
| 7017.25         | -38.66                   | V            | -44.27                     | 1.89                | 9.83                                                                  | -36.33                           |
| 8772.25         | -37.59                   | V            | -41.63                     | 2.14                | 11.11                                                                 | -32.66                           |
| 10526.25        | -40.23                   | V            | -39.56                     | 2.36                | 10.13                                                                 | -31.79                           |
| 12280.75        | -44.19                   | V            | -45.04                     | 2.57                | 12.80                                                                 | -34.81                           |
| 14034.75        | -32.13                   | V            | -27.90                     | 2.76                | 12.09                                                                 | -18.57                           |
| 15789.75        | -51.37                   | V            | -51.35                     | 2.94                | 16.51                                                                 | -37.78                           |

LTE QPSK AND 16QAM MODULATION. Band XIII. BW = 5 MHz and 10 MHz.

A preliminary scan determined the QPSK 5 MHz bandwidth as the worst case. The configuration of Resource Blocks which is the worst case for conducted power was used.

The following tables and plots show the results for this configuration.

### 1. CHANNEL: LOWEST

#### Frequency range 30 MHz-1000 MHz.

No radiated spurious signals were detected.

#### Frequency range 1 GHz-8 GHz.

Spurious signals closest to limit.

### Substitution method data

| Frequency (MHz) | Instrument reading (dBm) | Polarization | (1) Generator output (dBm) | (2) Cable loss (dB) | (3) Substitution antenna gain Gi (respect to isotropic radiator) (dB) | E.I.R.P. (dBm) = (1) – (2) + (3) |
|-----------------|--------------------------|--------------|----------------------------|---------------------|-----------------------------------------------------------------------|----------------------------------|
| 1554.75         | -51.09                   | V            | -70.29                     | 0.79                | 8.31                                                                  | -62.77                           |
| 2331.98         | -52.24                   | H            | -71.20                     | 1.04                | 10.44                                                                 | -61.80                           |
| 3886.68         | -51.55                   | V            | -68.02                     | 1.39                | 11.96                                                                 | -57.45                           |
| 4676.98         | -47.51                   | V            | -61.64                     | 1.52                | 11.63                                                                 | -51.53                           |
| 5942.12         | -62.67                   | V            | -73.21                     | 1.78                | 11.53                                                                 | -63.46                           |
| 7662.48         | -71.27                   | V            | -67.12                     | 2.01                | 7.25                                                                  | -61.88                           |

#### Frequency range 1559 MHz-1610 MHz. RBW = 1 kHz

No radiated spurious signals were detected.

#### Frequency range 1559 MHz-1610 MHz. RBW = 1 MHz

No radiated spurious signals were detected.

### 2. CHANNEL: MIDDLE

#### Frequency range 30 MHz-1000 MHz.

No radiated spurious signals were detected.

### Frequency range 1 GHz-8 GHz.

Spurious signals closest to limit.

#### Substitution method data

| Frequency (MHz) | Instrument reading (dBm) | Polarization | (1) Generator output (dBm) | (2) Cable loss (dB) | (3) Substitution antenna gain Gi (respect to isotropic radiator) (dB) | E.I.R.P. (dBm) = (1) – (2) + (3) |
|-----------------|--------------------------|--------------|----------------------------|---------------------|-----------------------------------------------------------------------|----------------------------------|
| 1559.65         | -48.28                   | V            | -67.49                     | 0.79                | 8.33                                                                  | -59.95                           |
| 2339.45         | -41.61                   | V            | -60.56                     | 1.04                | 10.45                                                                 | -51.15                           |
| 3119.25         | -61.71                   | V            | -78.97                     | 1.22                | 11.13                                                                 | -69.06                           |
| 4691.92         | -55.38                   | V            | -69.47                     | 1.52                | 11.62                                                                 | -59.37                           |
| 5940.95         | -62.47                   | V            | -72.89                     | 1.78                | 11.49                                                                 | -63.18                           |

### Frequency range 1559 MHz-1610 MHz. RBW = 1 kHz

Spurious signals closest to limit.

#### Substitution method data

| Frequency (MHz) | Instrument reading (dBm) | Polarization | (1) Generator output (dBm) | (2) Cable loss (dB) | (3) Substitution antenna gain Gi (respect to isotropic radiator) (dB) | E.I.R.P. (dBm) = (1) – (2) + (3) |
|-----------------|--------------------------|--------------|----------------------------|---------------------|-----------------------------------------------------------------------|----------------------------------|
| 1559.6486       | -61.88                   | V            | -81.08                     | 0.79                | 8.31                                                                  | -73.56                           |

### Frequency range 1559 MHz-1610 MHz. RBW = 1 MHz

Spurious signals closest to limit.

#### Substitution method data

| Frequency (MHz) | Instrument reading (dBm) | Polarization | (1) Generator output (dBm) | (2) Cable loss (dB) | (3) Substitution antenna gain Gi (respect to isotropic radiator) (dB) | E.I.R.P. (dBm) = (1) – (2) + (3) |
|-----------------|--------------------------|--------------|----------------------------|---------------------|-----------------------------------------------------------------------|----------------------------------|
| 1559.534        | -41.62                   | V            | -60.82                     | 0.79                | 8.31                                                                  | -53.30                           |

### 3. CHANNEL: HIGHEST

### Frequency range 30 MHz-1000 MHz.

No radiated spurious signals were detected.

### Frequency range 1 GHz-8 GHz.

Spurious signals closest to limit.

#### Substitution method data

| Frequency (MHz) | Instrument reading (dBm) | Polarization | (1) Generator output (dBm) | (2) Cable loss (dB) | (3) Substitution antenna gain Gi (respect to isotropic radiator) (dB) | E.I.R.P. (dBm) = (1) – (2) + (3) |
|-----------------|--------------------------|--------------|----------------------------|---------------------|-----------------------------------------------------------------------|----------------------------------|
| 1564.55         | -49.57                   | V            | -68.78                     | 0.79                | 8.35                                                                  | -61.22                           |
| 2347.15         | -41.07                   | H            | -60.01                     | 1.04                | 10.47                                                                 | -50.58                           |
| 3911.88         | -57.41                   | V            | -73.83                     | 1.39                | 11.97                                                                 | -63.25                           |
| 4707.08         | -53.47                   | V            | -67.52                     | 1.53                | 11.62                                                                 | -57.43                           |
| 7629.35         | -71.27                   | H            | -67.12                     | 2.01                | 7.25                                                                  | -61.88                           |

**Frequency range 1559 MHz-1610 MHz. RBW = 1 kHz**

Spurious signals closest to limit.

Substitution method data

| Frequency (MHz) | Instrument reading (dBm) | Polarization | (1) Generator output (dBm) | (2) Cable loss (dB) | (3) Substitution antenna gain $G_i$ (respect to isotropic radiator) (dB) | E.I.R.P. (dBm) = (1) – (2) + (3) |
|-----------------|--------------------------|--------------|----------------------------|---------------------|--------------------------------------------------------------------------|----------------------------------|
| 1564.6959       | -64.75                   | V            | -83.96                     | 0.79                | 8.33                                                                     | -76.42                           |

**Frequency range 1559 MHz-1610 MHz. RBW = 1 MHz**

Spurious signals closest to limit.

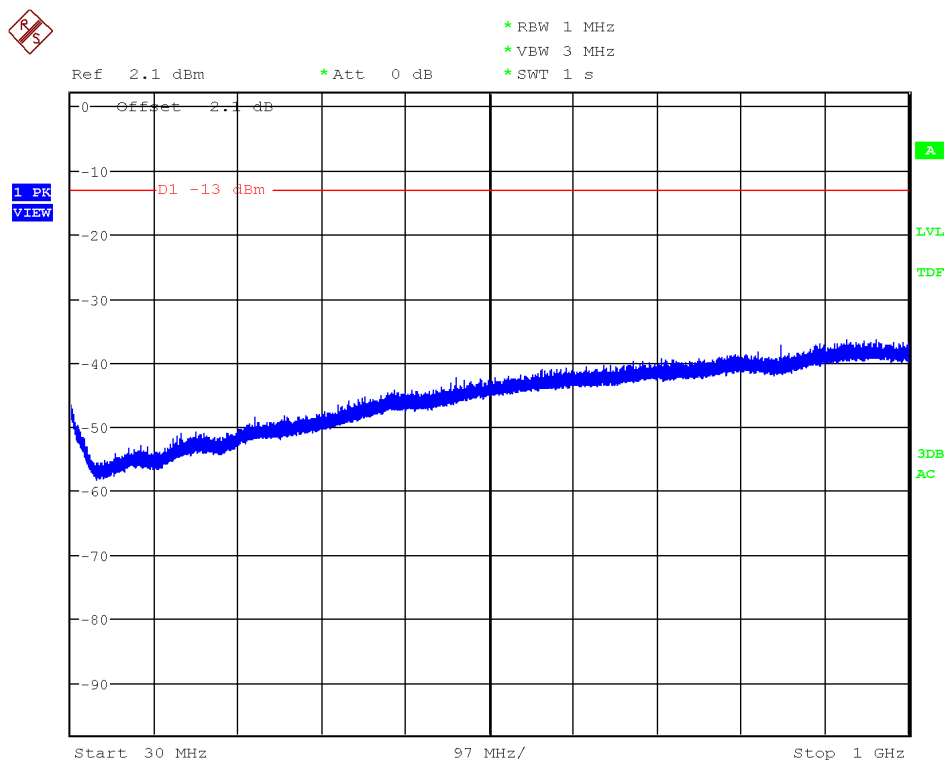
Substitution method data

| Frequency (MHz) | Instrument reading (dBm) | Polarization | (1) Generator output (dBm) | (2) Cable loss (dB) | (3) Substitution antenna gain $G_i$ (respect to isotropic radiator) (dB) | E.I.R.P. (dBm) = (1) – (2) + (3) |
|-----------------|--------------------------|--------------|----------------------------|---------------------|--------------------------------------------------------------------------|----------------------------------|
| 1564.8166       | -45.38                   | V            | -64.59                     | 0.79                | 8.33                                                                     | -57.05                           |

Verdict: PASS

## FREQUENCY RANGE 30 MHz-1000 MHz.

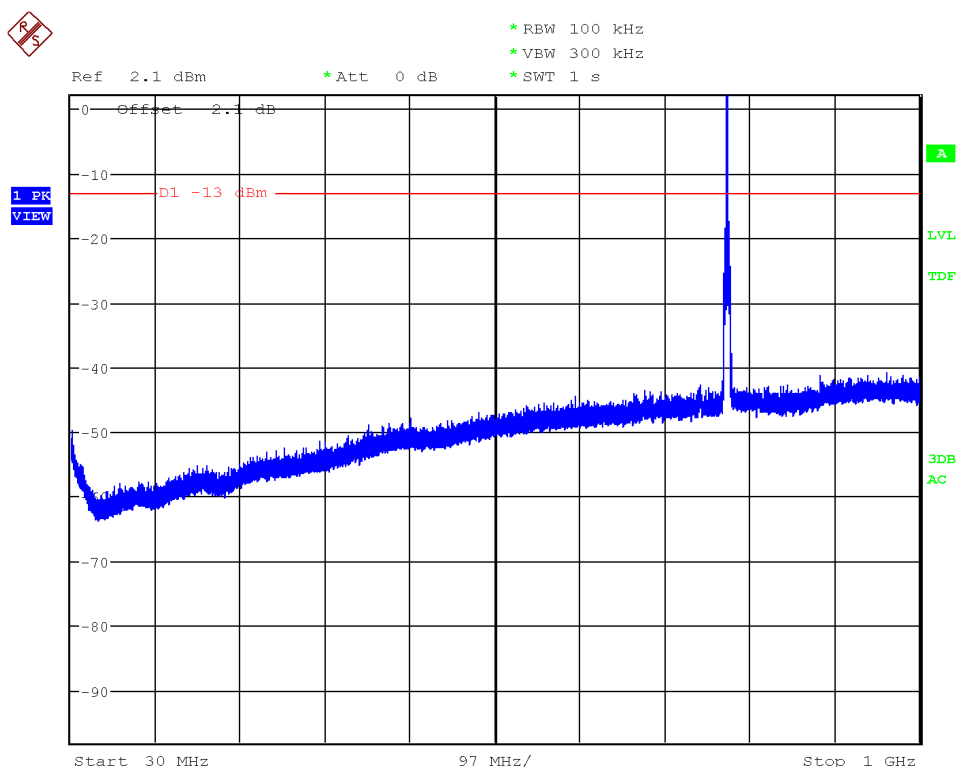
### **LTE QPSK MODULATION. BW=1.4 MHz. Band IV**



(This plot is valid for all three channels)

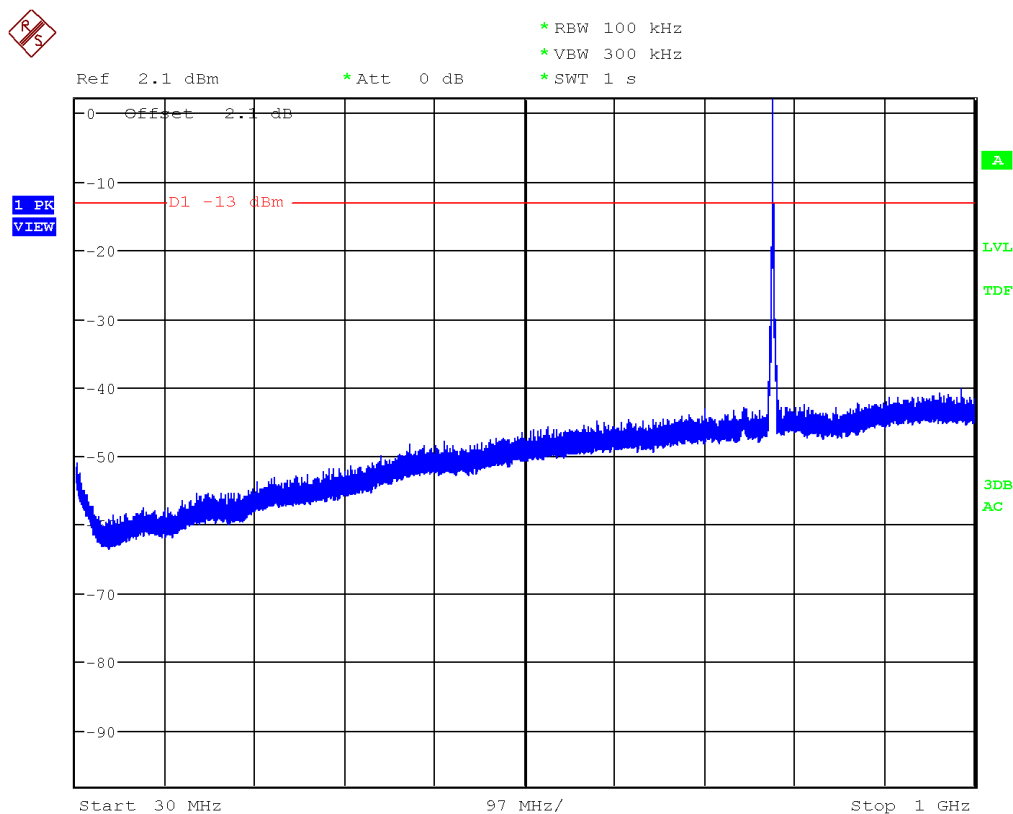
### **LTE QPSK MODULATION. BW=5 MHz. Band XIII**

CHANNEL: LOWEST



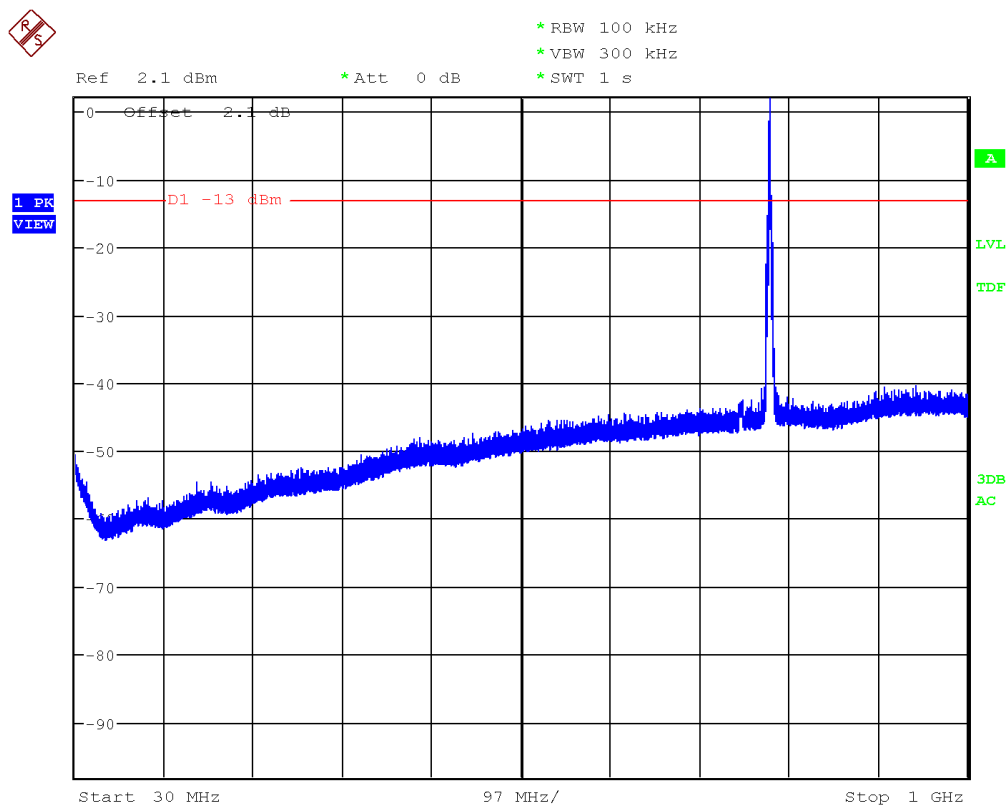
Note: The peak above the limit is the carrier frequency.

## CHANNEL: MIDDLE



Note: The peak above the limit is the carrier frequency.

## CHANNEL: HIGHEST

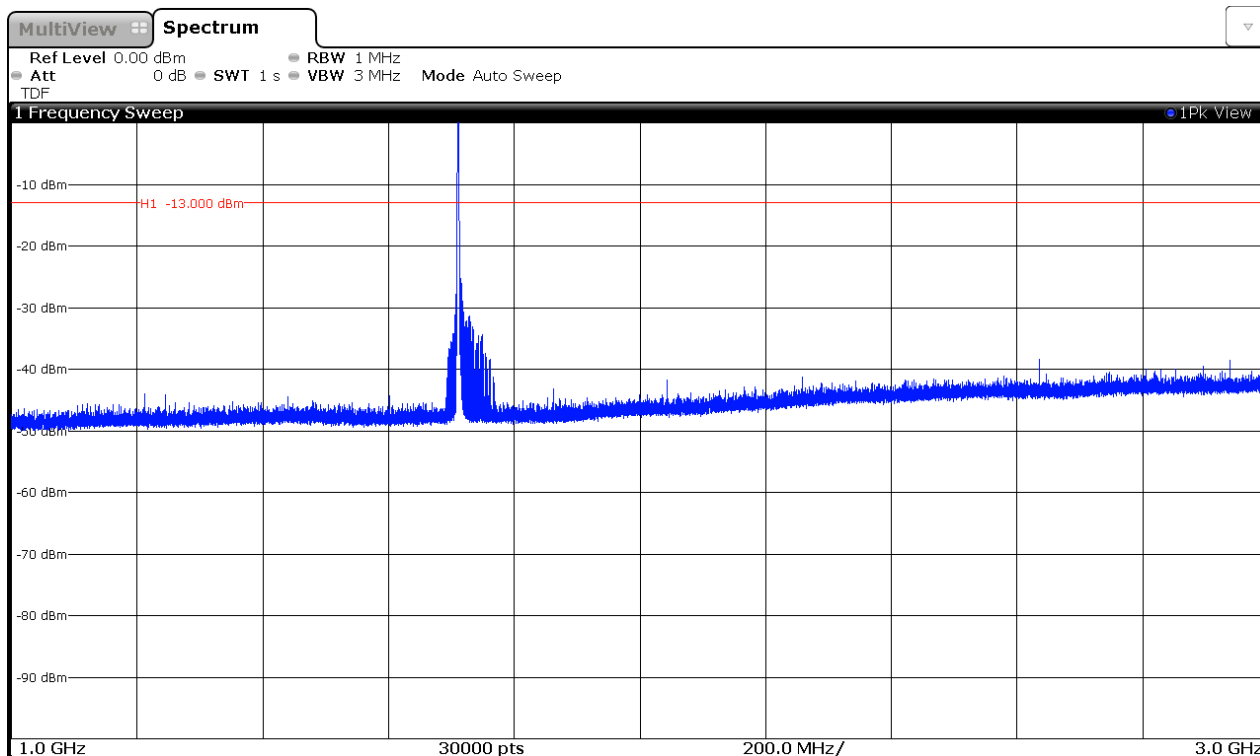


Note: The peak above the limit is the carrier frequency.

## FREQUENCY RANGE 1 GHz to 3 GHz.

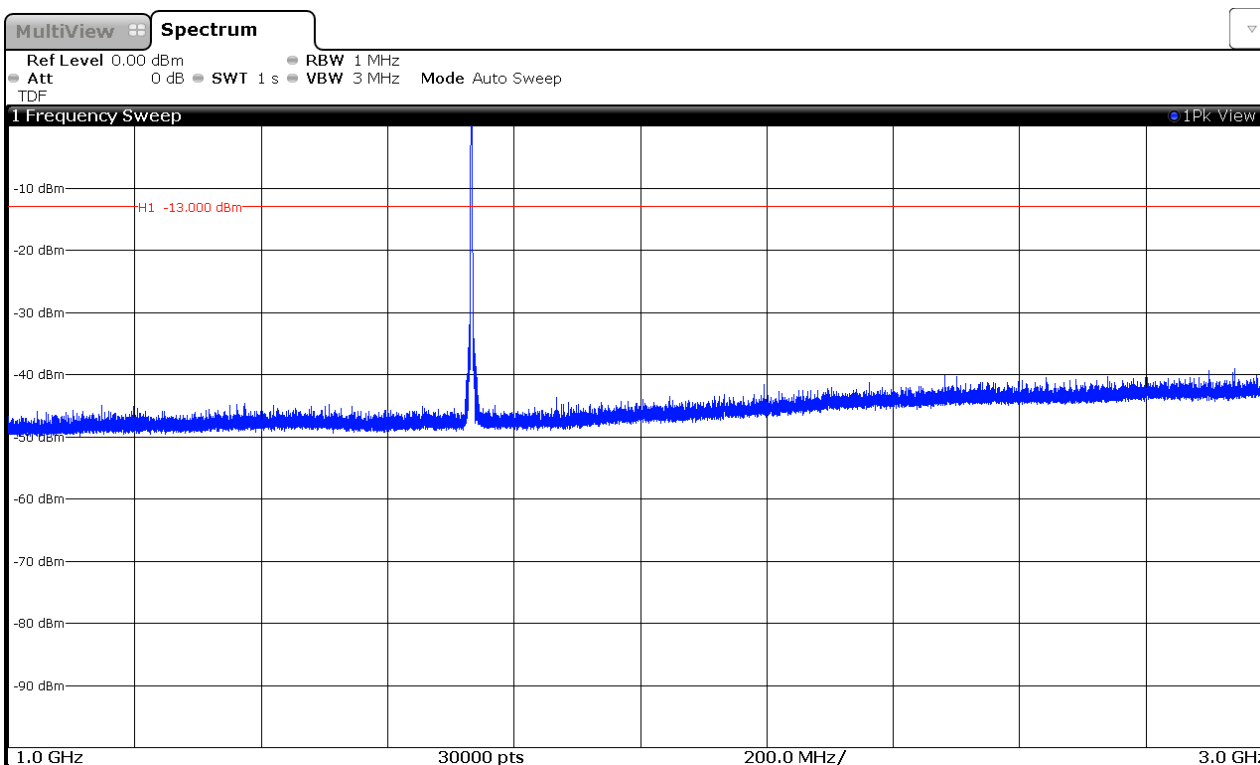
### **LTE QPSK MODULATION. BW=1.4 MHz. Band IV**

#### **CHANNEL: LOWEST**



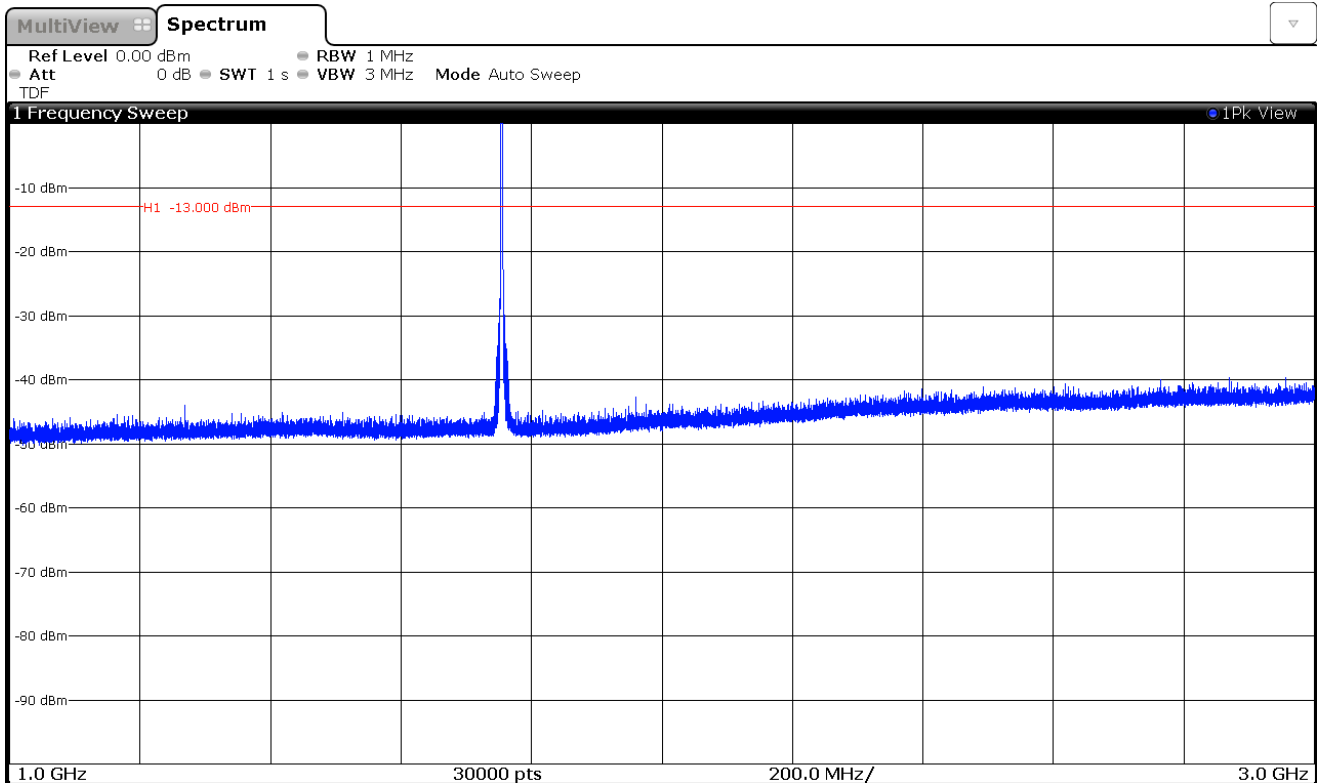
Note: The peak above the limit is the carrier frequency.

#### **CHANNEL: MIDDLE**



Note: The peak above the limit is the carrier frequency.

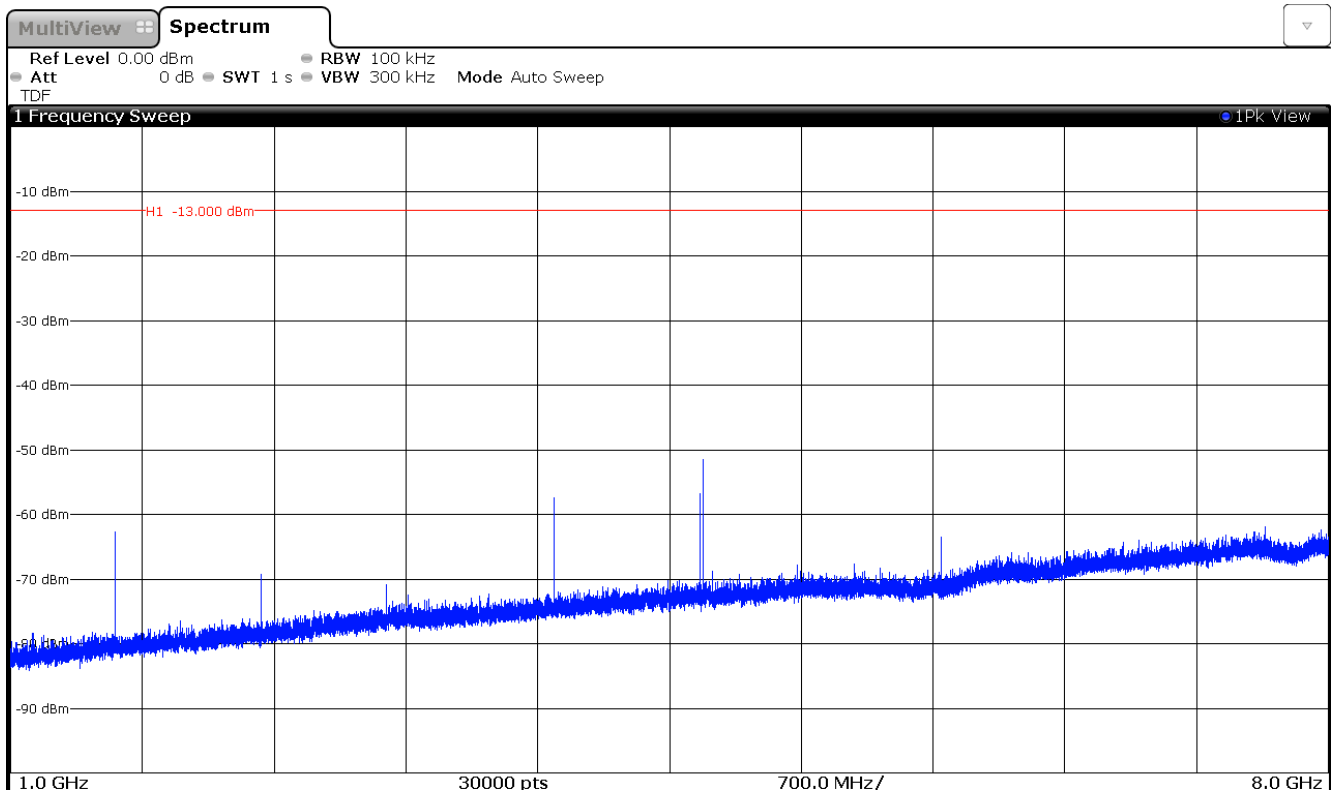
## CHANNEL: HIGHEST



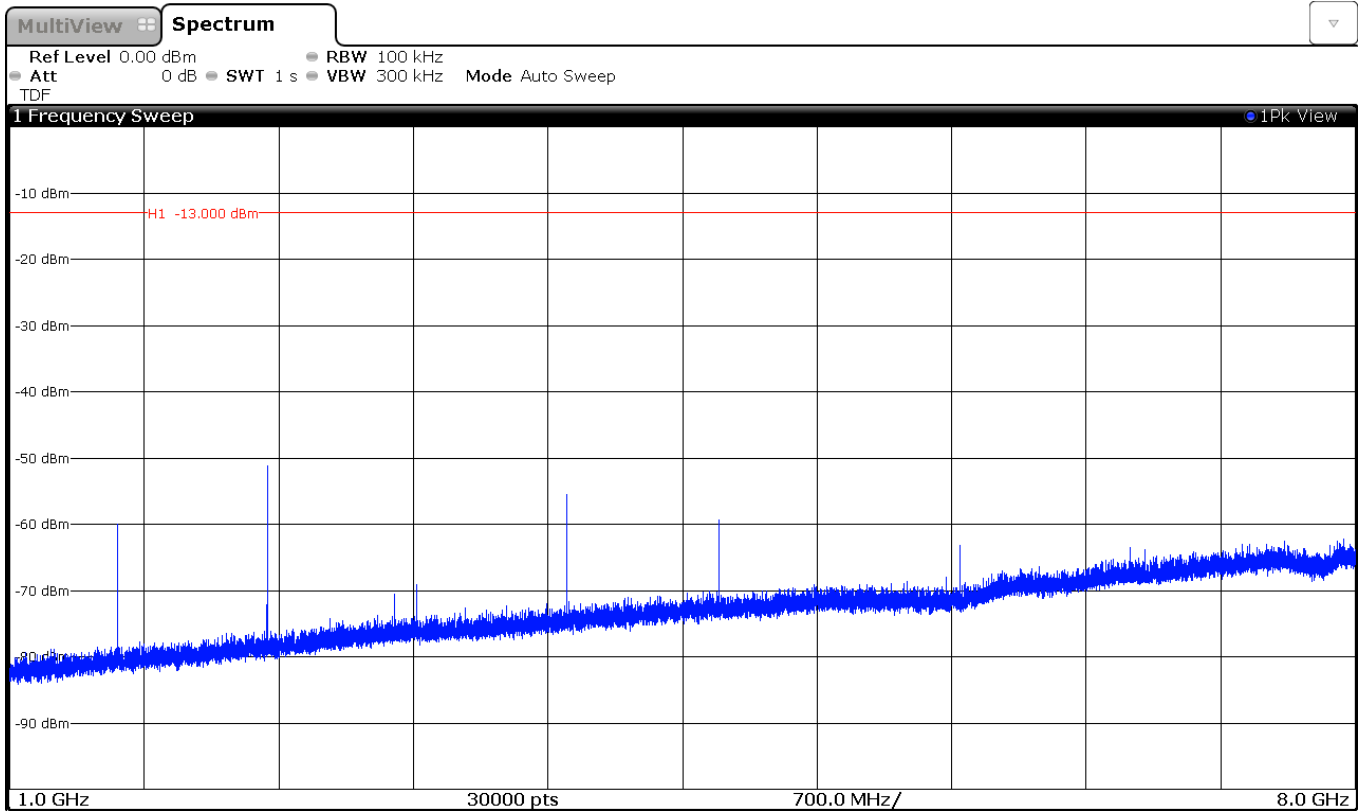
Note: The peak above the limit is the carrier frequency.

## LTE QPSK MODULATION. BW=5 MHz. Band XIII. Range 1 GHz to 8 GHz.

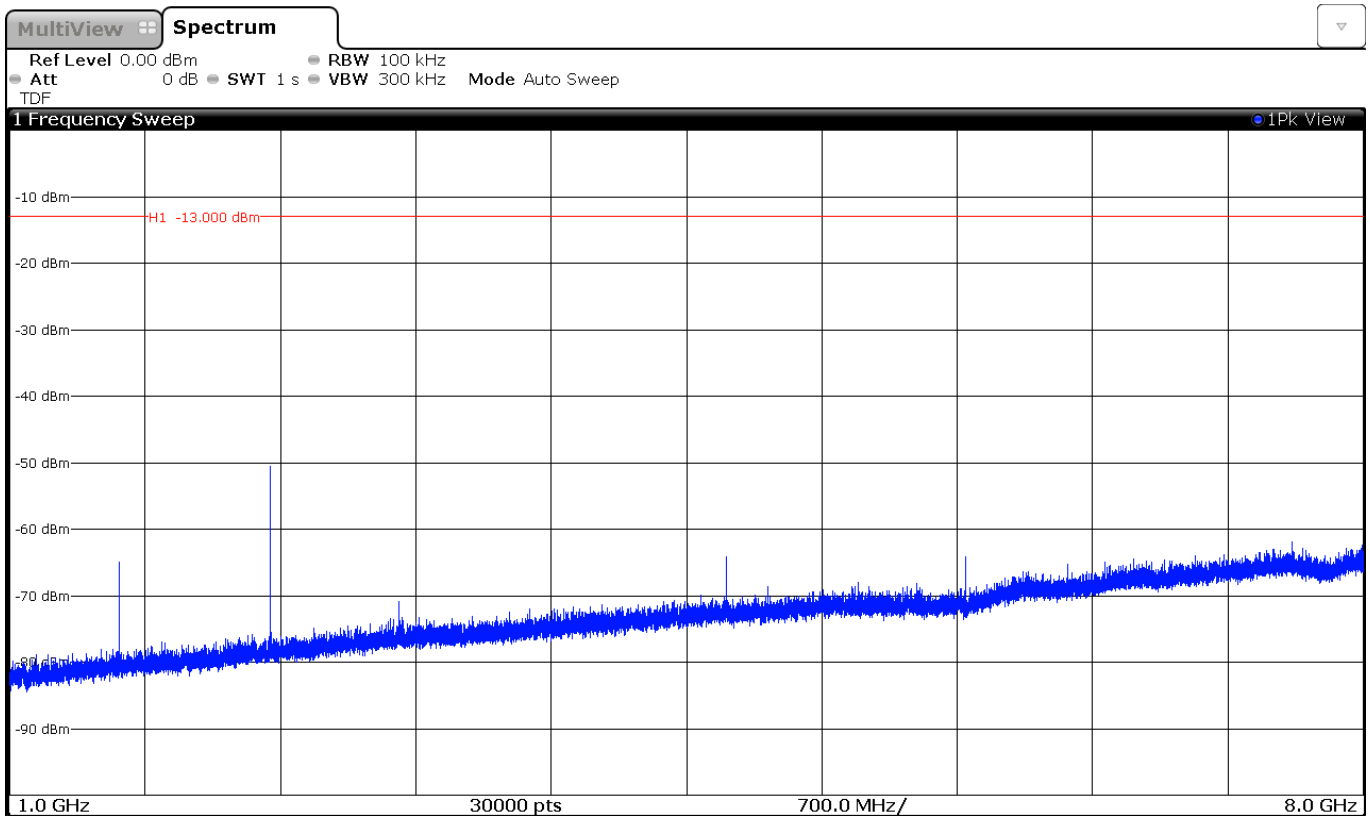
### CHANNEL: LOWEST



## CHANNEL: MIDDLE



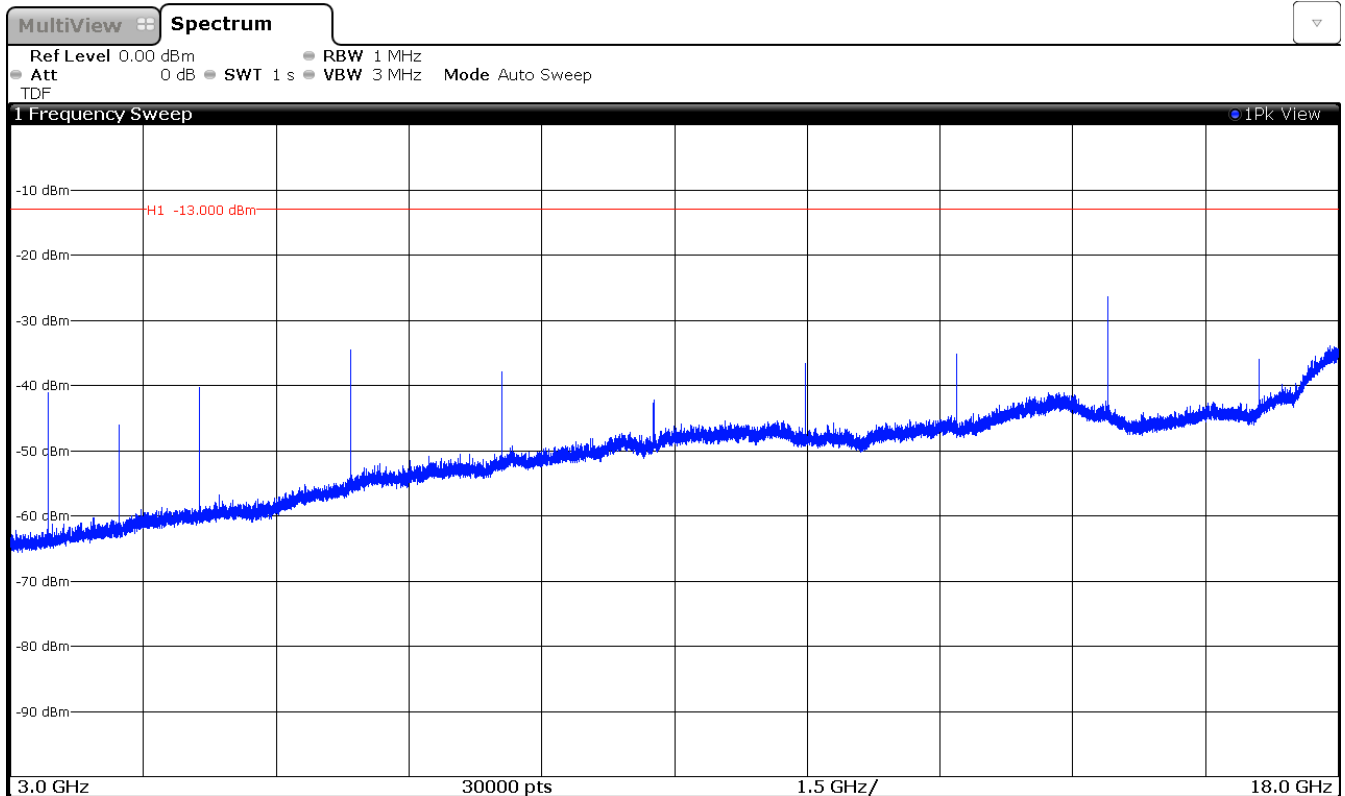
## CHANNEL: HIGHEST



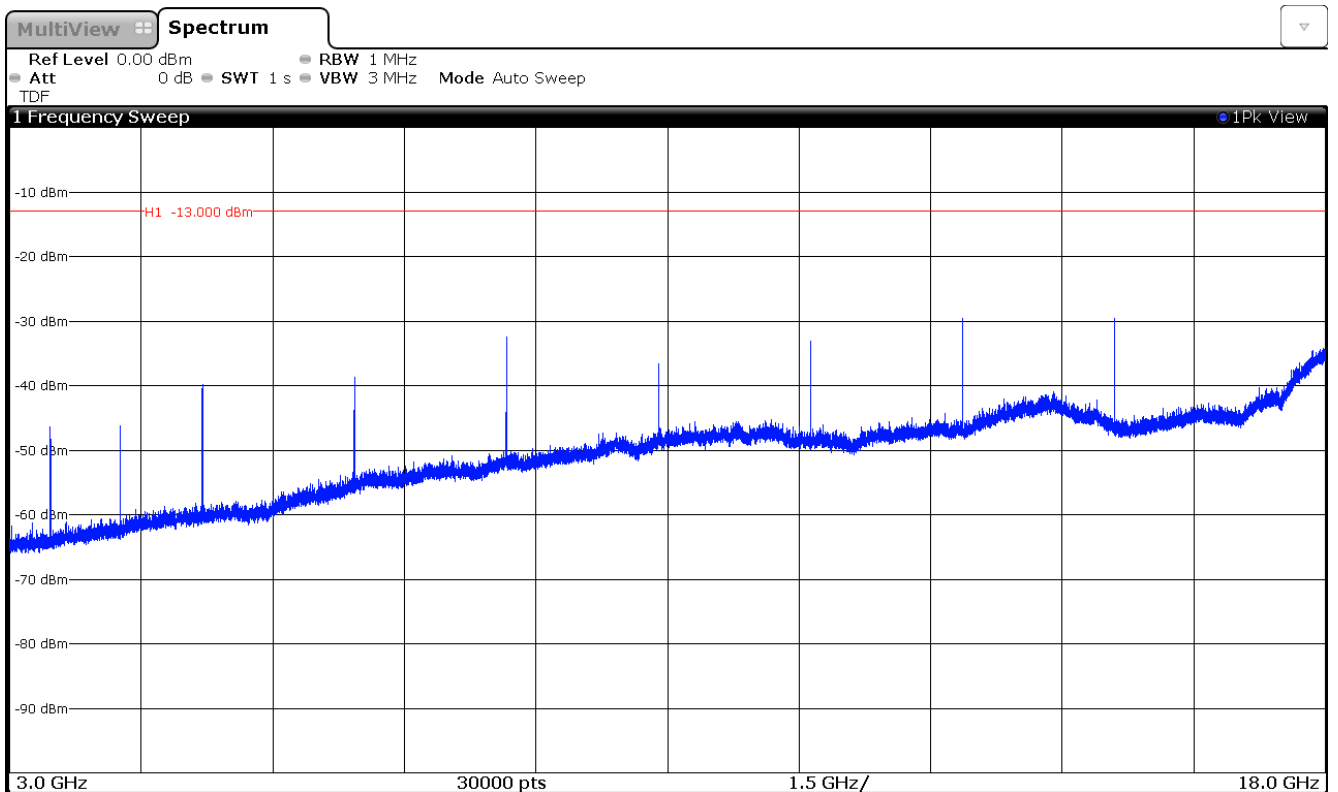
FREQUENCY RANGE 3 GHz to 18 GHz.

**LTE QPSK MODULATION. BW=1.4 MHz. Band IV**

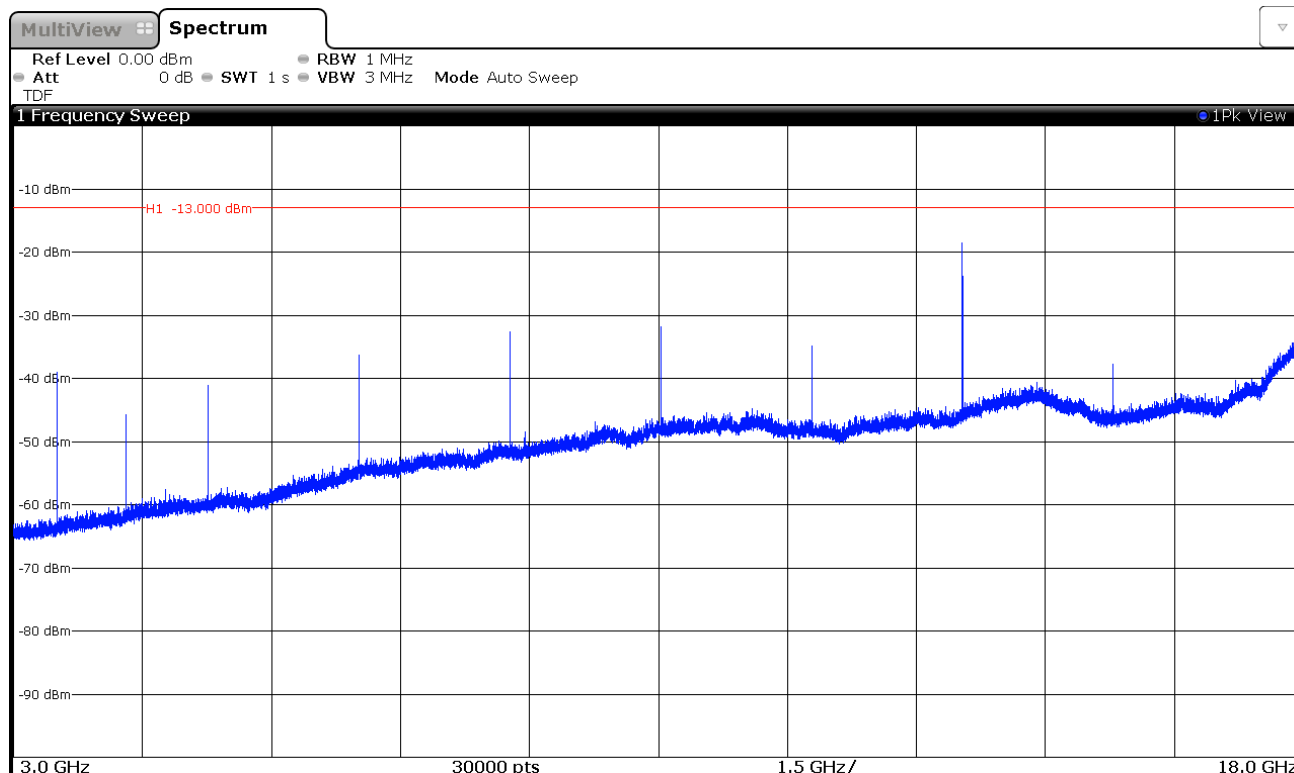
**CHANNEL: LOWEST**



**CHANNEL: MIDDLE**



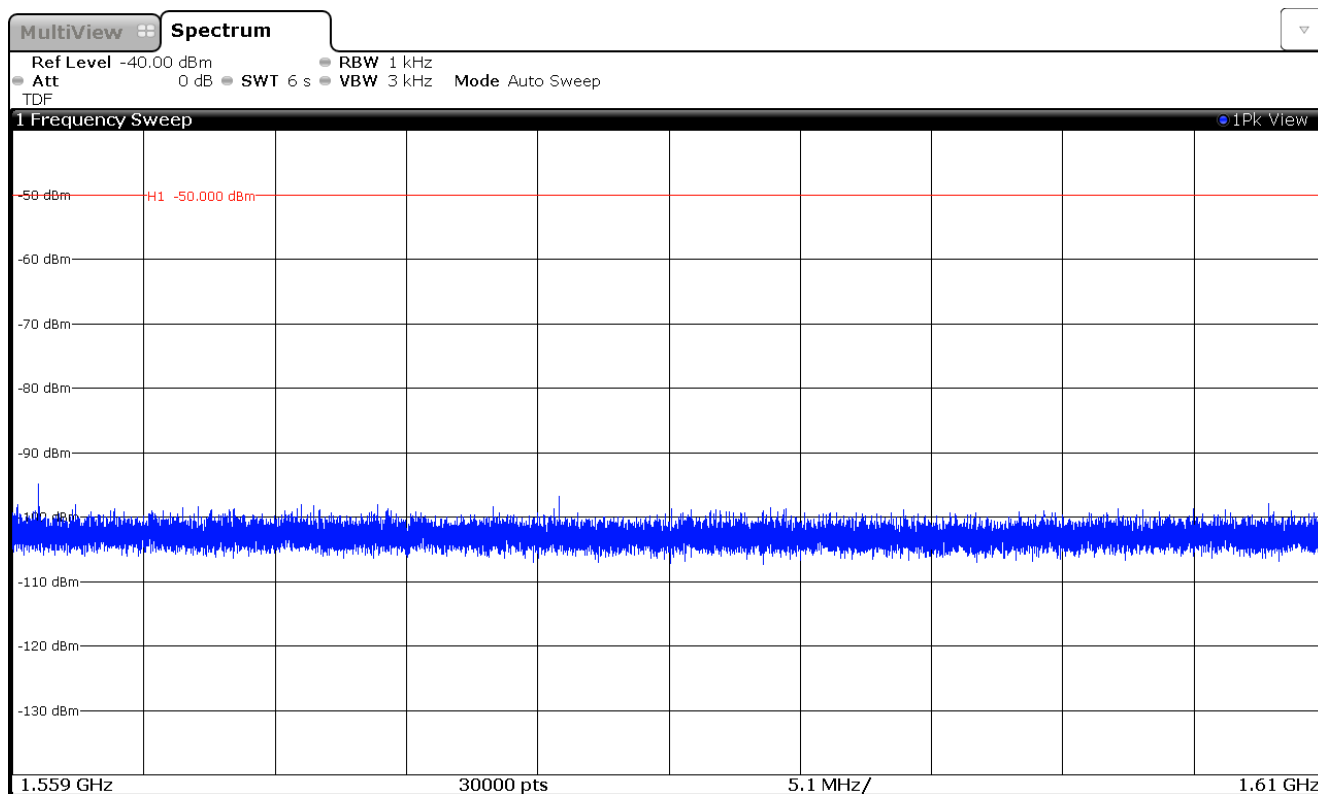
## CHANNEL: HIGHEST

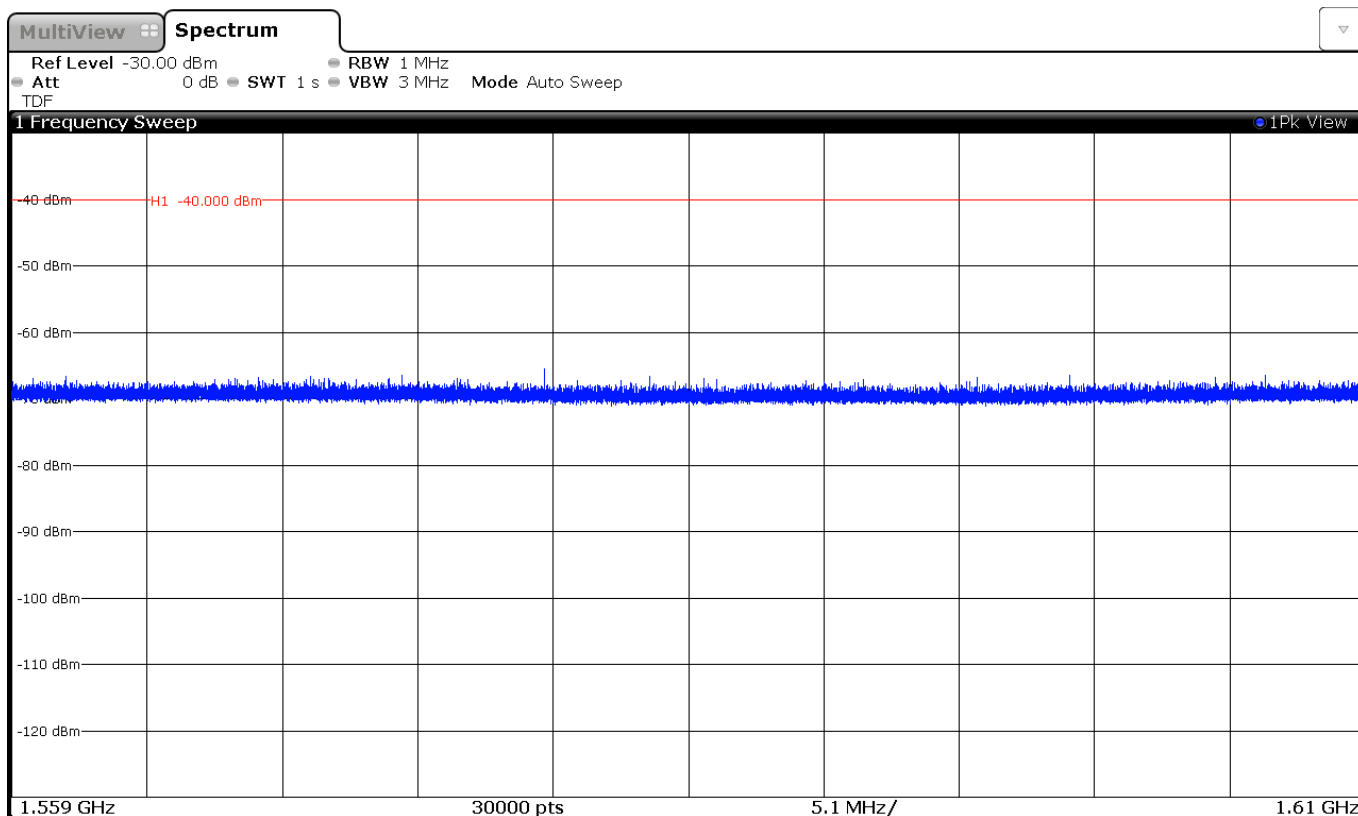


## FREQUENCY RANGE 1559 MHz to 1610 MHz.

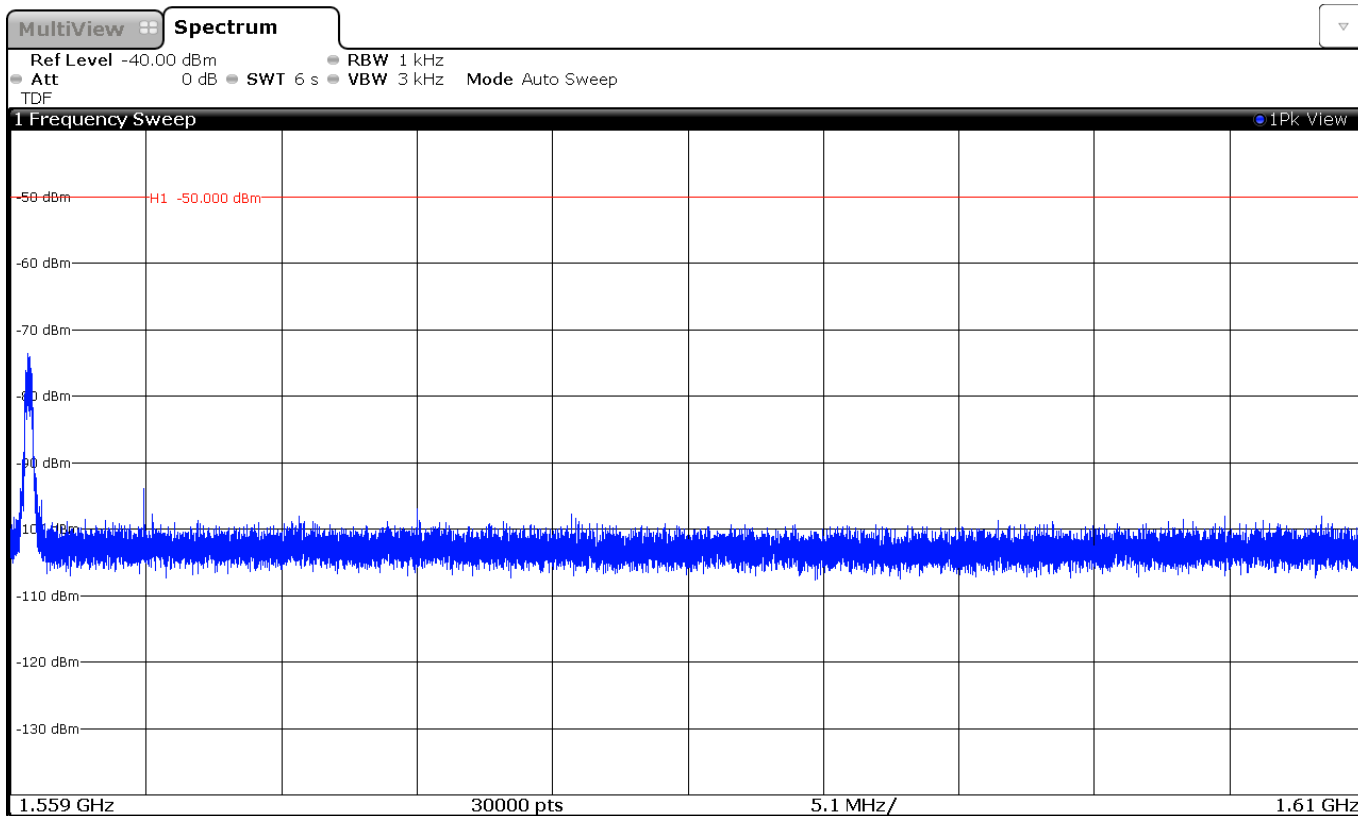
## LTE QPSK MODULATION. BW=5 MHz. Band XIII

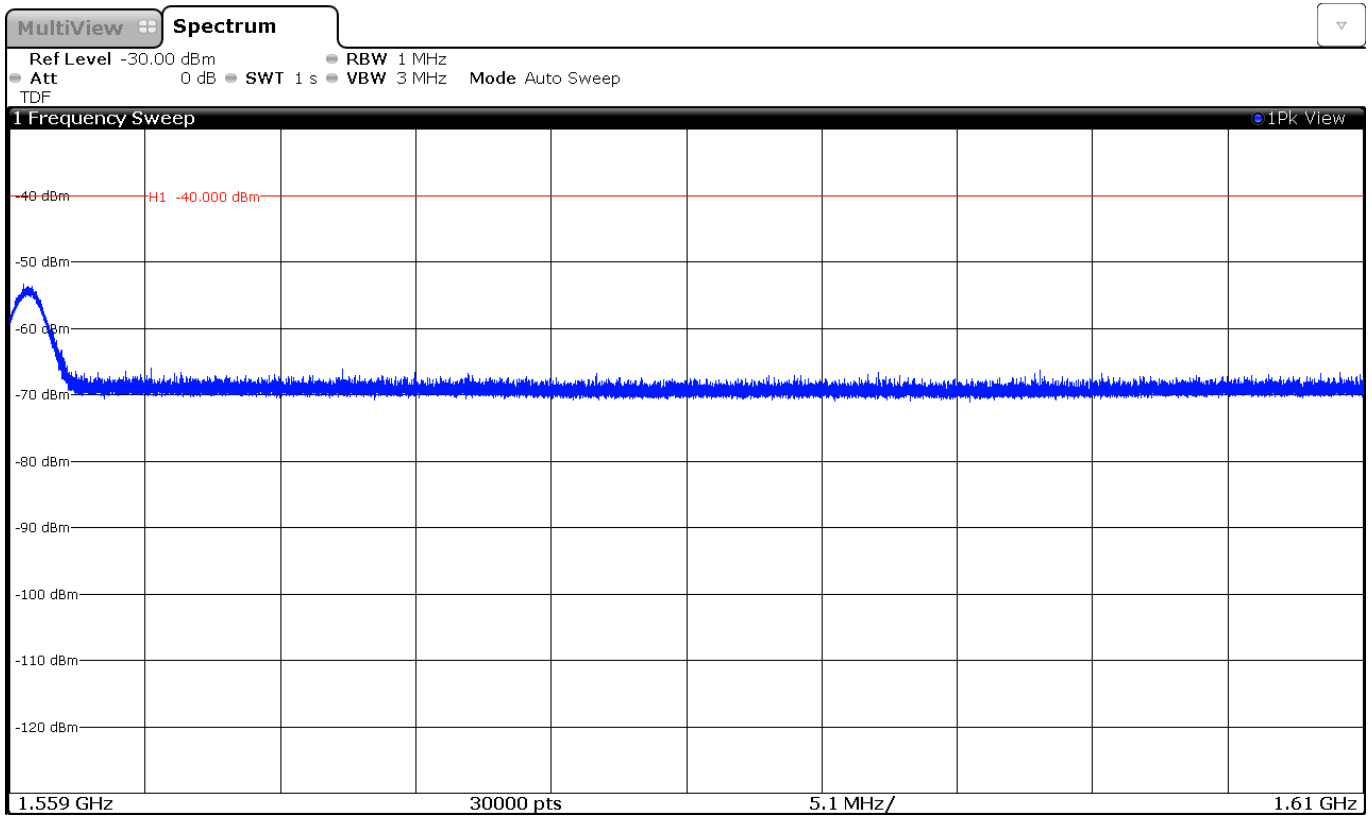
## CHANNEL: LOWEST





## CHANNEL: MIDDLE





## CHANNEL: HIGHEST

