**AT4 wireless, S.A.U.**
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c/ Severo Ochoa nº 2 · 29590 Campanillas · Málaga · España
*www.at4wireless.com* · C.I.F. A29 507 456

FCC LISTED, REGISTRATION NUMBER: 720267

IC LISTED REGISTRATION NUMBER IC 4621A-2

Test report No:

**NIE: 45355RRF.004**

# Test report
# REFERENCE STANDARD: USA FCC Part 22 & Part 24 & Part 27 CANADA IC RSS-132, RSS-133, CANADA IC RSS-139, RSS-130

| | |
|---|---|
| **Identificación del objeto ensayado.....:**<br>Identification of item tested | Multiprotocol router for the Internet of Things |
| **Marca .....:**<br>Trademark | Libelium |
| **Modelo y/o referencia tipo .....:**<br>Model and /or type reference | Meshlium 4G 802.15.4 AP 900 US |
| **Other identification of the product .....:** | Libelium's product FCC ID: XKM-MESHLIUM-V1<br>Libelium's product IC: 8472A-MESHLIUMV1<br>Chipsets FCC ID: RI7LE910NA, OUR-XBEEPRO, MCQ-XB900HP and TK4WLE600VX<br>Chipsets IC: 5131A-LE910NA, 4214A-XBEEPRO and 1846A-XB900HP. |
| **Final HW version .....:** | 1.0 |
| **Final SW version .....:** | 1.0 |
| **IMEI TAC .....:** | 35894205 |
| **Características .....:**<br>Features | Can communicate with 2G, 3G and 4G/LTE networks. Also equipped with a short-range 802.15.4 module (2.4 GHz ISM band), a long-range RF 900 radio (900 MHz ISM band) and a 802.11a/b/g/n/ac module (2.4 GHz ISM bands). Includes a GNSS (GPS) receiver. USA and Canada version, AT&T. Includes 2 cellular antennas for diversity gain. Contains these radios: WLE600VX, XBee-PRO 802.15.4, LE910 NAG and XBee-PRO 900HP |
| **Fabricante .....:**<br>Manufacturer | LIBELIUM COMUNICACIONES DISTRIBUIDAS S.L<br>C/ Escatrón 16 (Edificio Libelium), CP: 50014, Zaragoza (SPAIN) |
| **Método de ensayo solicitado, norma.....:**<br>Test method requested, standard | USA FCC Part 22 10-1-15 Edition.<br>USA FCC Part 24 10-1-15 Edition.<br>USA FCC Part 27 10-1-15 Edition.<br>CANADA IC RSS-132 Issue 3, Jan. 2013.<br>CANADA IC RSS-133 Issue 6, Jan. 2013.<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 Licensed Digital Transmitters.<br>ANSI/TIA-603-D (2010). |

| | |
|---|---|
| | ANSI C63.26 (2015). |
| **Resultado.....:**<br>Summary | IN COMPLIANCE |
| **Aprobado por (nombre / cargo y firma) .....:**<br>Approved by (name / position & signature) | A. Llamas<br>RF Lab. Manager |
| **Fecha de realización .....:**<br>Date of issue | 2016-10-04 |
| **Formato de informe No. .....:**<br>Report template No | FDT08_18 |

Firmado digitalmente por ALEJANDRO LLAMAS RODRIGUEZ
Fecha: 2016.10.04 17:39:53 +02'00'

# Index

# 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 conjuction 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-1.

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 Nº | Description | Model | Serial Nº | Date of reception |
|---|---|---|---|---|
| 48668/008 | Multiprotocol router for the Internet of Things | Meshlium 4G 802.15.4 AP 900 US | --- | 2016-06-06 |
| 48668/045 | Antenna 2.4 GHz | --- | --- | 2016-06-06 |
| 48668/047 | Antenna 2.4 GHz | --- | --- | 2016-06-06 |
| 48668/053 | Antenna 900 MHz | --- | --- | 2016-06-06 |
| 48668/068 | Antenna 4G GPS | --- | --- | 2016-06-06 |
| 48668/069 | Antenna 4G GPS | --- | --- | 2016-06-06 |
| 48668/070 | Antenna 4G GPS | --- | --- | 2016-06-06 |
| 48668/028 | Ethernet crossover cable | --- | --- | 2016-06-06 |
| 48668/035 | Ethernet cable | --- | --- | 2016-06-06 |
| 48668/018 | AC/DC Adapter | SAW24-120-2000 | --- | 2016-06-06 |
| 48668/020 | POE | --- | --- | 2016-06-06 |

1. Sample S/01 has undergone the test(s).

   All tests indicated in appendix A, B and C.

# Test sample description

The test sample consists of a central node of a Waspmote Plug & Sense! network. It gathers all the data and sends it to the cloud. Meshlium can be deployed outdoors and is quickly configured with its graphic interface.

# Identification of the client

LIBELIUM COMUNICACIONES DISTRIBUIDAS S.L.

C/ Escatrón 16 (Edificio Libelium), CP: 50014, Zaragoza (SPAIN)

# Testing period

The performed test started on 2016-06-06 and finished on 2016-06-09.

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 ºC<br>Max. = 35 ºC |
| **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.

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

# Remarks and comments

1: Test not requested. Only radiated spurious emissions tests were requested.

2: Used instrumentation.

| | | 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. | Broadband Horn antenna 18-40 GHz Schwarbeck BBHA 9170 | 2014/03 | 2017/03 |
| 6. | EMI Test Receiver R&S 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 | 2015/09 | 2016/09 |
| 9. | RF pre-amplifier 1-18 GHz BONN ELEKTRONIK BLMA 0118-3A | 2016/02 | 2018/02 |
| 10. | RF pre-amplifier 18-40 GHz BONN ELEKTRONIK BLMA 1840-1M | 2015/12 | 2017/12 |
| 11. | Universal Radio communication Tester R&S CMW500 | 2014/07 | 2017/07 |

# Testing verdicts

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

| FCC PART 22/IC RSS-132 PARAGRAPH | VERDICT | | | |
|---|---|---|---|---|
| | **NA** | **P** | **F** | **NM** |
| Clause 22.913/RSS-132 Clause 5.4: RF output power | | | | NM[1] |
| Clause 2.1047/RSS-132 Clause 5.2: Modulation characteristics | | | | NM[1] |
| Clause 22.355/RSS-132 Clause 5.3: Frequency stability | | | | NM[1] |
| Clause 2.1049: Occupied Bandwidth | | | | NM[1] |
| Clause 22.917/RSS-132 Clause 5.5: Spurious emissions at antenna terminals | | | | NM[1] |
| Clause 22.917/RSS-132 Clause 5.5: Radiated emissions | | P | | |

1: See section “Remarks and comments”.

| FCC PART 24/IC RSS-133 PARAGRAPH | VERDICT | | | |
|---|---|---|---|---|
| | **NA** | **P** | **F** | **NM** |
| Clause 24.232/RSS-133 Clause 6.4: RF output power | | | | NM[1] |
| Clause 2.1047/RSS-133 Clause 6.2: Modulation characteristics | | | | NM[1] |
| Clause 24.235/RSS-133 Clause 6.3: Frequency stability | | | | NM[1] |
| Clause 2.1049: Occupied Bandwidth | | | | NM[1] |
| Clause 24.238/RSS-133 Clause 6.5: Spurious emissions at antenna terminals | | | | NM[1] |
| Clause 24.238/RSS-133 Clause 6.5: Radiated emissions | | P | | |

1: See section “Remarks and comments”.

| 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 | | | | NM[1] |
| Clause 2.1047 / RSS-139 Clause 6.2. / RSS-130 Clause 4.1.: Modulation characteristics | | | | NM[1] |
| Clause 27.54 / RSS-139 Clause 6.4. / RSS-130 Clause 4.3.: Frequency stability | | | | NM[1] |
| Clause 2.1049: Occupied Bandwidth | | | | NM[1] |
| Clause 27.53 / RSS-139 Clause 6.6. / RSS-130 Clause 4.6.: Spurious emissions at antenna terminals | | | | NM[1] |
| Clause 27.53 / RSS-139 Clause 6.6. / RSS-130 Clause 4.6.: Radiated emissions | | P | | |

1: See section “Remarks and comments”.

# **Appendix A –** Test result for FCC Part 22/IC RSS-132

# INDEX

# TEST RESULTS FOR FCC PART 22 AND IC RSS-132

## TEST CONDITIONS

Power supply (V):

Vnominal = 115 Vac

Vmax = N/A

Vmin = N/A

The subscripts nom, min and max indicate voltage test conditions (nominal, minimum and maximum respectively, as declared by the applicant).

N/A: Not Applicable.

Type of power supply = AC/DC adapter.

Type of antenna = External attachable antennae.

TEST FREQUENCIES:

GPRS AND EDGE MODULATION

Lowest channel (128): 824.2 MHz

Middle channel (190): 836.6 MHz

Highest channel (251): 848.8 MHz

WCDMA AND HSUPA MODULATION

Lowest channel (4132): 826.4 MHz

Middle channel (4182): 836.4 MHz

Highest channel (4233): 846.6 MHz

LTE. QPSK AND 16QAM MODULATION (BAND V)

| | Channel (Frequency, MHz) | | | |
|---|---|---|---|---|
| | BW = 1.4 MHz | BW = 3 MHz | BW = 5 MHz | BW = 10 MHz |
| Lowest | 20407 (824.70) | 20415 (825.50) | 20425 (826.50) | 20450 (829.00) |
| Middle | 20525 (836.50) | 20525 (836.50) | 20525 (836.50) | 20525 (836.50) |
| Highest | 20643 (848.30) | 20635 (847.50) | 20625 (846.50) | 20600 (844.00) |

## Radiated emissions

SPECIFICATION

FCC § 22.917

RSS-132. Clause 5.5.

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 1.5 meter high 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. The radiated emissions were measured with peak detector and 1 MHz bandwidth.

Highest detected emissions are substituted by the Substitution method, in accordance with the ANSI/TIA/EIA-603-D.

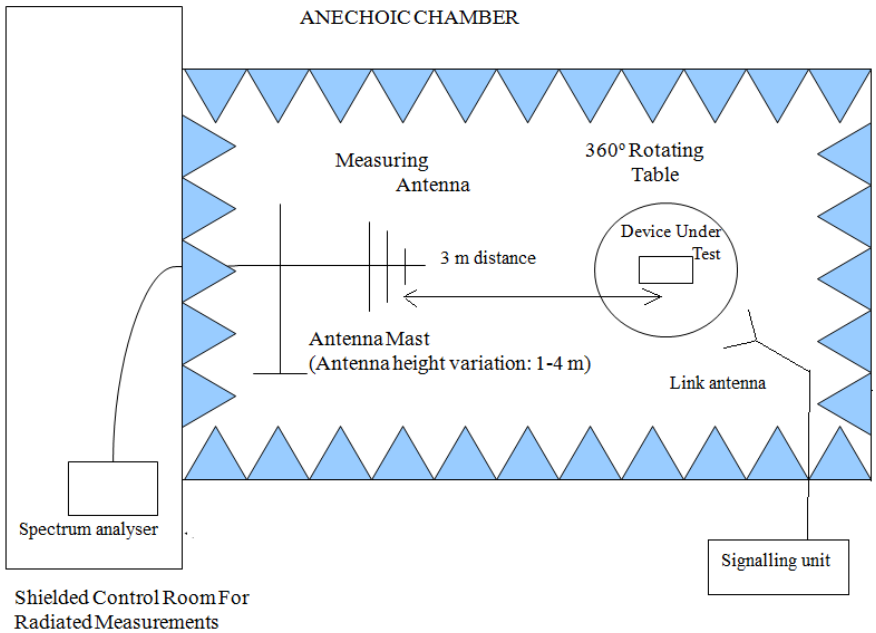
Measurement Limit**:**

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 Po transmitting power. the specified minimum attenuation becomes 43+10log (Po) and the level in dBm relative Po becomes:

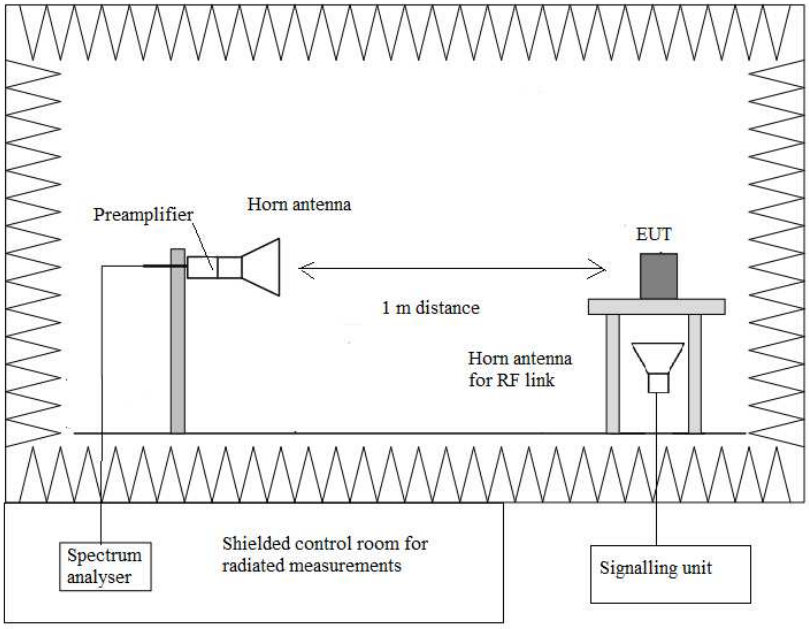
Po (dBm) – [43 + 10 log (Po in mwatts) - 30] = - 13 dBm

TEST SETUP

Radiated measurements below 1 GHz.



Radiated measurements above 1 GHz.




RESULTS

**GPRS AND EDGE MODULATION**

A preliminary scan determined the GPRS modulation as the worst case. The following tables and plots show the results for GPRS modulation.

1. CHANNEL: LOWEST

**Frequency range 30 MHz-1000 MHz**.
No spurious signals were found in all the range.

**Frequency range 1 GHz-10 GHz**.

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) |
|---|---|---|---|---|---|---|
| 1648.15 | -5.64 | Vertical | -23.81 | 1.90 | 8.63 | -17.07 |
| 2472.55 | -15.95 | Vertical | -33.71 | 2.10 | 10.66 | -25.15 |
| 3296.66 | -21.25 | Vertical | -37.33 | 2.50 | 11.43 | -28.39 |
| 4120.75 | -39.26 | Vertical | -39.26 | 2.82 | 11.93 | -44.60 |
| 4945.45 | -46.61 | Vertical | -58.45 | 3.15 | 11.52 | -50.07 |

2. CHANNEL: MIDDLE

**Frequency range 30 MHz-1000 MHz**.
No spurious signals were found in all the range.

**Frequency range 1 GHz-10 GHz**.

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) |
|---|---|---|---|---|---|---|
| 1673.05 | -11.47 | Vertical | -29.61 | 1.95 | 8.72 | -22.83 |
| 2509.75 | -15.01 | Vertical | -32.71 | 2.10 | 10.70 | -24.11 |
| 3346.45 | -20.15 | Vertical | -36.24 | 2.50 | 11.52 | -27.22 |
| 4182.85 | -39.59 | Vertical | -53.79 | 2.88 | 11.89 | -44.78 |

3. CHANNEL: HIGHEST

**Frequency range 30 MHz-1000 MHz**.
No spurious signals were found in all the range.

**Frequency range 1 GHz-10 GHz**.

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) |
|---|---|---|---|---|---|---|
| 1697.35 | -17.25 | Vertical | -35.36 | 1.99 | 8.81 | -28.54 |
| 2546.35 | -20.29 | Vertical | -37.89 | 2.10 | 10.72 | -29.27 |
| 3394.75 | -34.76 | Vertical | -50.88 | 2.50 | 11.61 | -41.77 |
| 4244.05 | -42.22 | Vertical | -56.21 | 2.90 | 11.85 | -47.26 |

**WCDMA AND HSUPA MODULATION**

A preliminary scan determined the WCDMA modulation as the worst case. The following tables and plots show the results for WCDMA modulation.

1. CHANNEL: LOWEST

**Frequency range 30 MHz-1000 MHz**.
No spurious signals were found in all the range.

**Frequency range 1 GHz-10 GHz**.

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) |
|---|---|---|---|---|---|---|
| 1650.55 | -16.43 | Vertical | -34.60 | 1.90 | 8.64 | -27.86 |
| 2475.55 | -16.66 | Vertical | -34.41 | 2.10 | 10.66 | -25.85 |
| 3300.55 | -32.24 | Vertical | -48.31 | 2.50 | 11.44 | -39.37 |
| 4126.15 | -48.13 | Vertical | -62.56 | 2.83 | 11.92 | -53.46 |
| 4958.00 | -53.41 | Horizontal | -65.06 | 3.18 | 11.46 | -56.56 |

2. CHANNEL: MIDDLE

**Frequency range 30 MHz-1000 MHz**.
No spurious signals were found in all the range.

**Frequency range 1 GHz-10 GHz**.

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) |
|---|---|---|---|---|---|---|
| 1675.15 | -22.51 | Vertical | -40.65 | 1.95 | 8.73 | -33.87 |
| 2513.05 | -23.05 | Vertical | -40.75 | 2.10 | 10.71 | -32.15 |
| 3348.55 | -32.28 | Vertical | -48.38 | 2.50 | 11.53 | -39.35 |
| 4186.45 | -51.56 | Vertical | -65.74 | 2.89 | 11.89 | -56.74 |

3. CHANNEL: HIGHEST

**Frequency range 30 MHz-1000 MHz**.
No spurious signals were found in all the range.

**Frequency range 1 GHz-10 GHz**.
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) |
|---|---|---|---|---|---|---|
| 1690.45 | -24.63 | Vertical | -42.74 | 1.98 | 8.79 | -35.94 |
| 2535.85 | -24.15 | Vertical | -41.77 | 2.10 | 10.71 | -33.16 |
| 3380.95 | -38.17 | Vertical | -54.29 | 2.50 | 11.59 | -45.20 |
| 4226.65 | -49.03 | Vertical | -63.07 | 2.90 | 11.86 | -54.11 |
| 4983.85 | -53.41 | Horizontal | -65.06 | 3.18 | 11.46 | -56.78 |

**LTE QPSK AND 16QAM MODULATION. Band V. BW = 1.4 MHz, 3 MHz, 5 MHz and 10 MHz.**

A preliminary scan determined the QPSK 1.4 MHz bandwidth RB=1, Offset 0 as the worst case.

The following plots show the results for this configuration.

1. CHANNEL: LOWEST

**Frequency range 30 MHz-1000 MHz**.
No spurious signals were found in all the range.

**Frequency range 1 GHz-10 GHz**.

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) |
|---|---|---|---|---|---|---|
| 1648.45 | -13.19 | Vertical | -31.36 | 1.90 | 8.63 | -24.62 |
| 2472.55 | -14.41 | Vertical | -32.17 | 2.10 | 10.66 | -23.61 |
| 3296.95 | -30.29 | Vertical | -46.37 | 2.50 | 11.43 | -37.43 |
| 4121.35 | -43.63 | Vertical | -58.08 | 2.82 | 11.93 | -48.97 |

2. CHANNEL: MIDDLE

**Frequency range 30 MHz-1000 MHz**.
No spurious signals were found in all the range.

**Frequency range 1 GHz-10 GHz**.
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) |
|---|---|---|---|---|---|---|
| 1671.85 | -15.51 | Vertical | -33.65 | 1.94 | 8.72 | -26.88 |
| 2579.95 | -17.37 | Vertical | -35.07 | 2.10 | 10.70 | -26.47 |
| 3344.05 | -26.67 | Vertical | -42.77 | 2.50 | 11.52 | -33.75 |
| 4179.85 | -41.74 | Vertical | -55.95 | 2.88 | 11.89 | -46.94 |

3. CHANNEL: HIGHEST

**Frequency range 30 MHz-1000 MHz**.
No spurious signals were found in all the range.

**Frequency range 1 GHz-10 GHz**.
Substitution method data

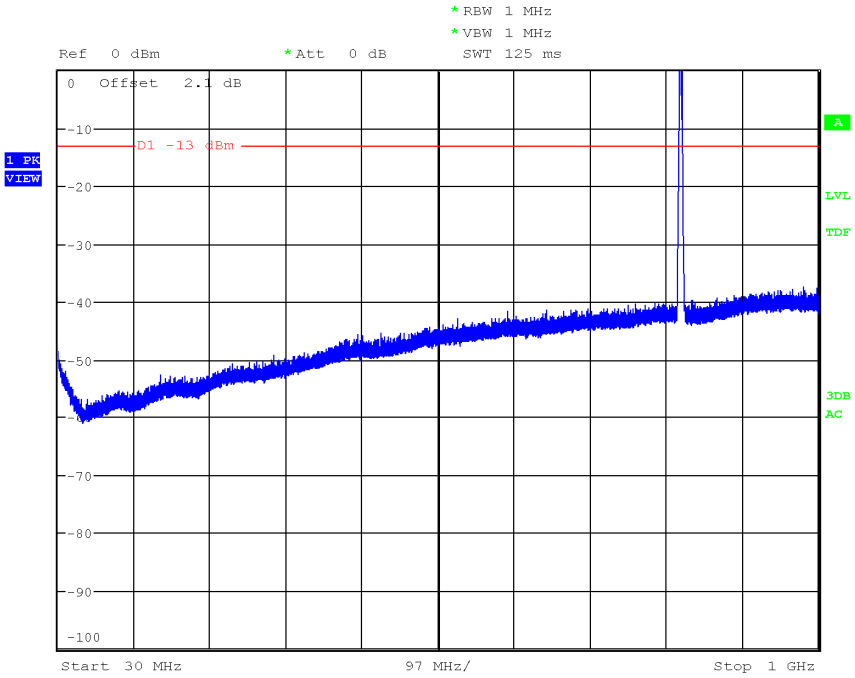
| Frequency (MHz) | Instrument reading (dBm) | Polarization | (1) Generator output (dBm) | (2) Cable loss (dB) | (3) Substitution antenna gain Gi (respect to isotropic radiator) (dB) | E.I.R.P. (dBm) = (1) – (2) + (3) |
|---|---|---|---|---|---|---|
| 1695.55 | -21.12 | Vertical | -39.23 | 1.99 | 8.80 | -32.42 |
| 2543.35 | -20.44 | Vertical | -38.05 | 2.10 | 10.72 | -29.43 |
| 3391.45 | -37.73 | Vertical | -53.85 | 2.50 | 11.60 | -44.75 |
| 4239.25 | -45.55 | Vertical | -59.56 | 2.90 | 11.86 | -50.60 |

Verdict: PASS

FREQUENCY RANGE 30 MHz-1000 MHz.

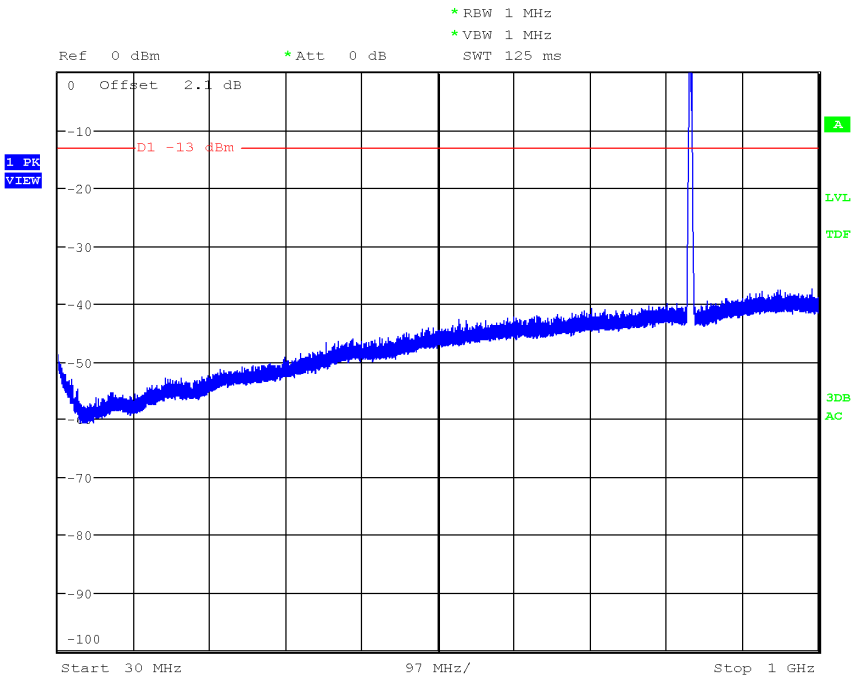
**GPRS MODULATION**

CHANNEL: LOWEST



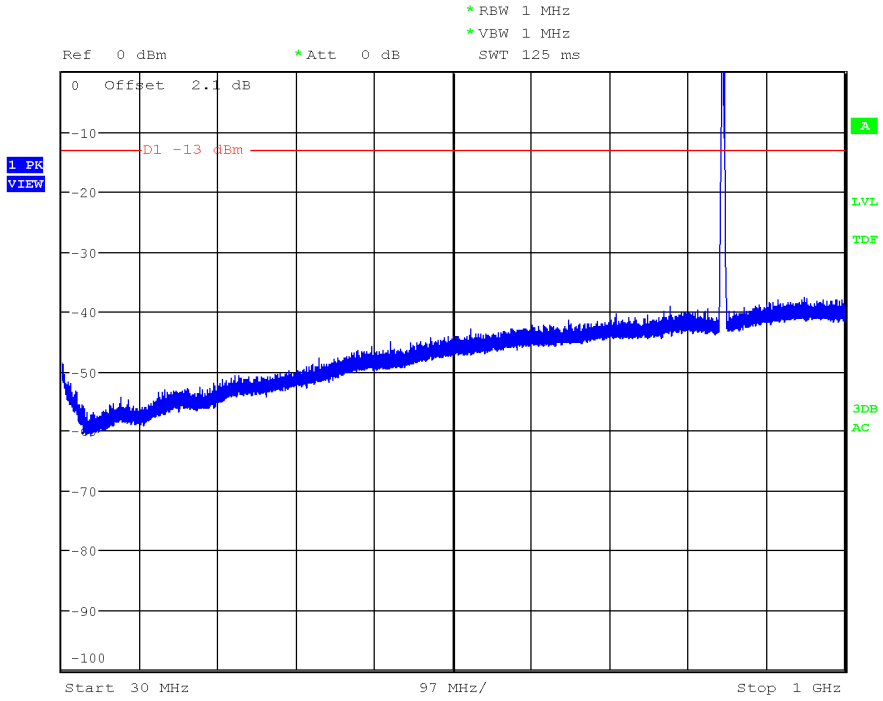

Note: The peak above the limit is the carrier frequency.

CHANNEL: MIDDLE




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

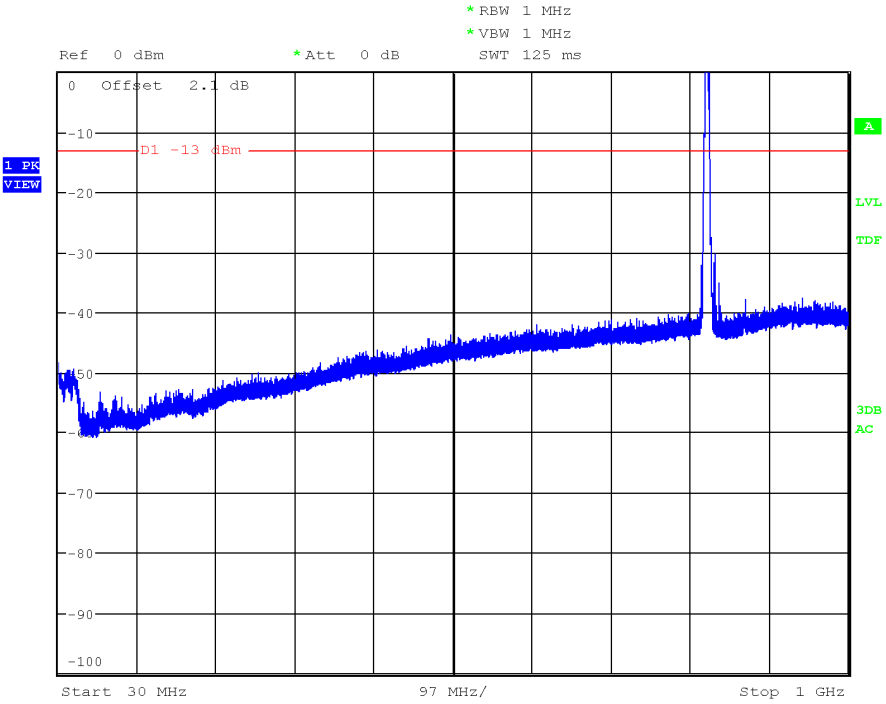
CHANNEL: HIGHEST




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

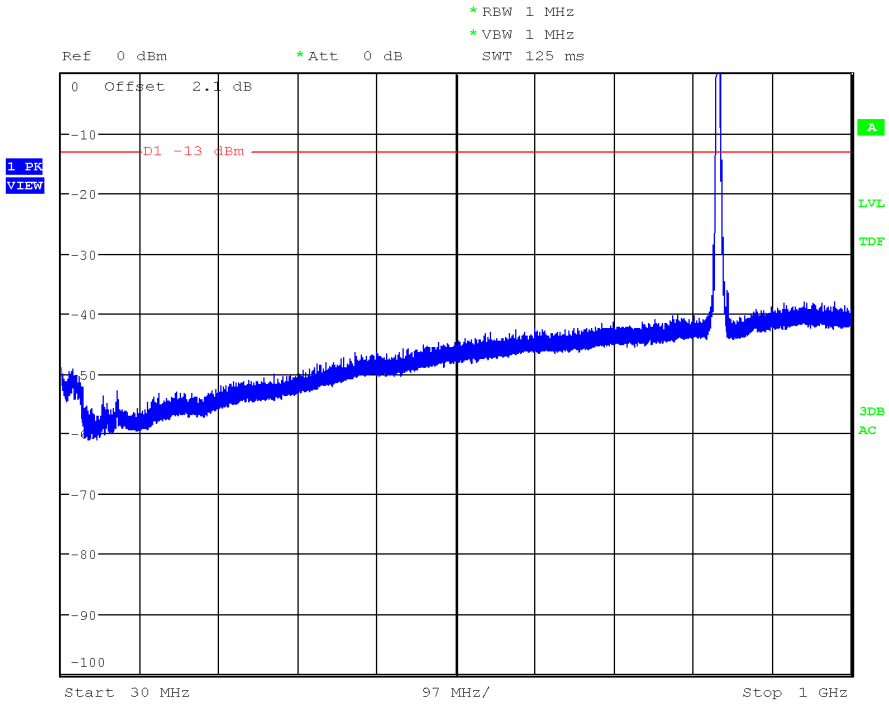
**WCDMA MODULATION**

CHANNEL: LOWEST



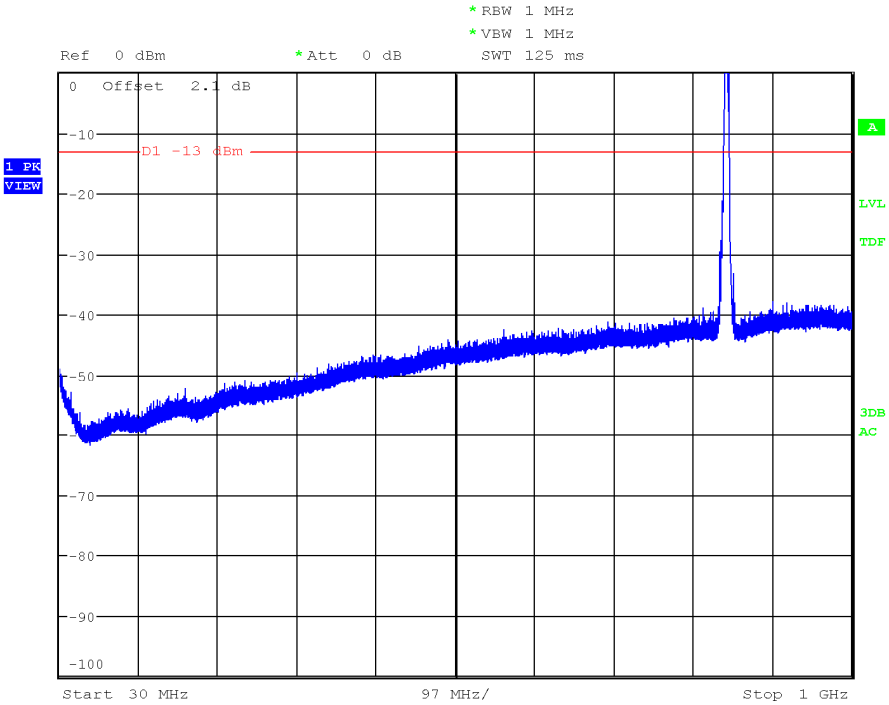

Note: The peak above the limit is the carrier frequency.

CHANNEL: MIDDLE




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

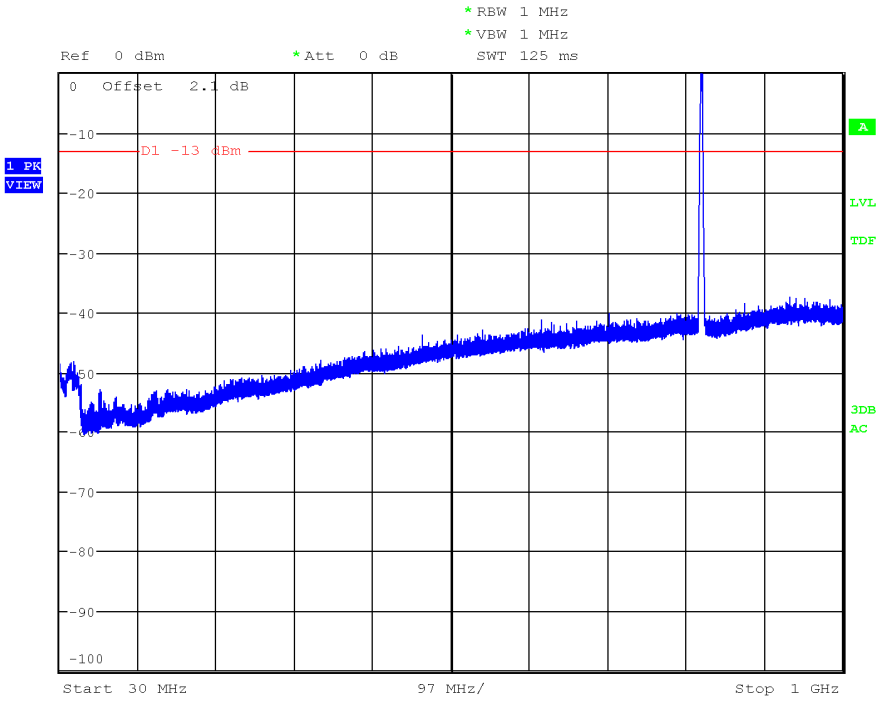
CHANNEL: HIGHEST




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

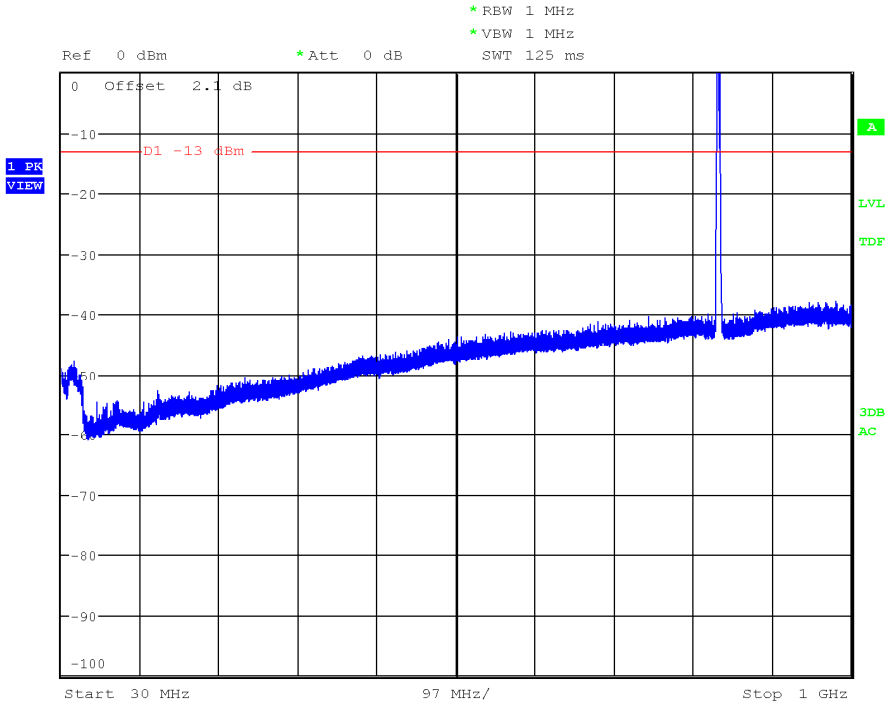
**LTE QPSK MODULATION. BW=1.4 MHz. Band V**

CHANNEL: LOWEST



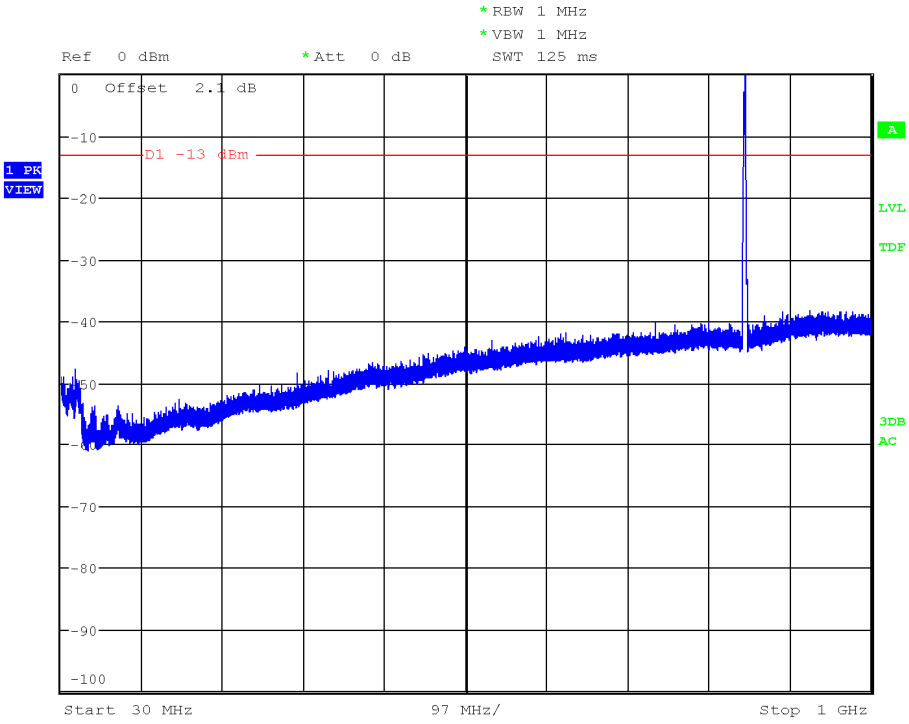

Note: The peak above the limit is the carrier frequency.

CHANNEL: MIDDLE




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

CHANNEL: HIGHEST

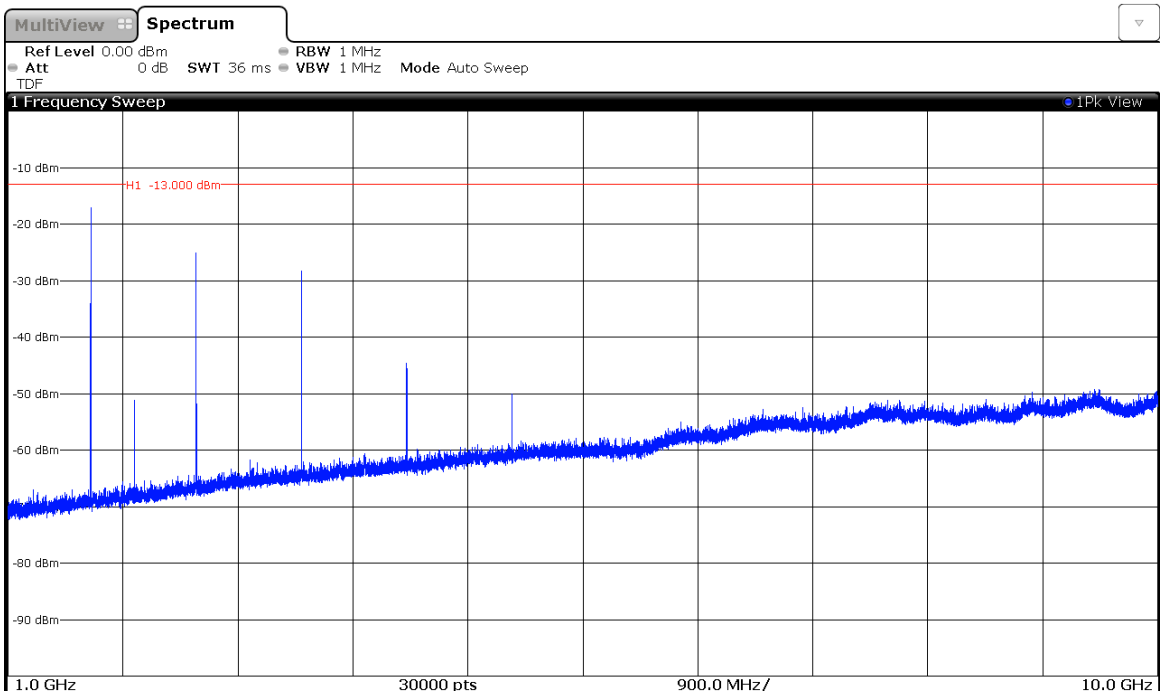



Note: The peak above the limit is the carrier frequency.

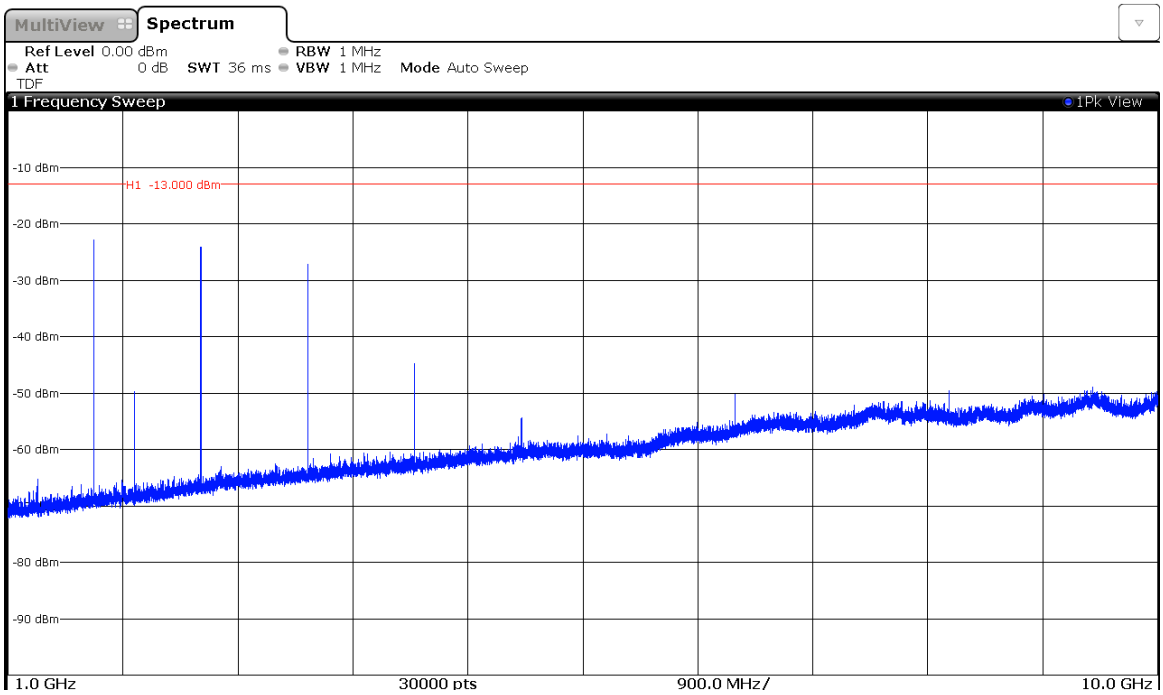
FREQUENCY RANGE 1 GHz to 10 GHz.

**GPRS MODULATION**

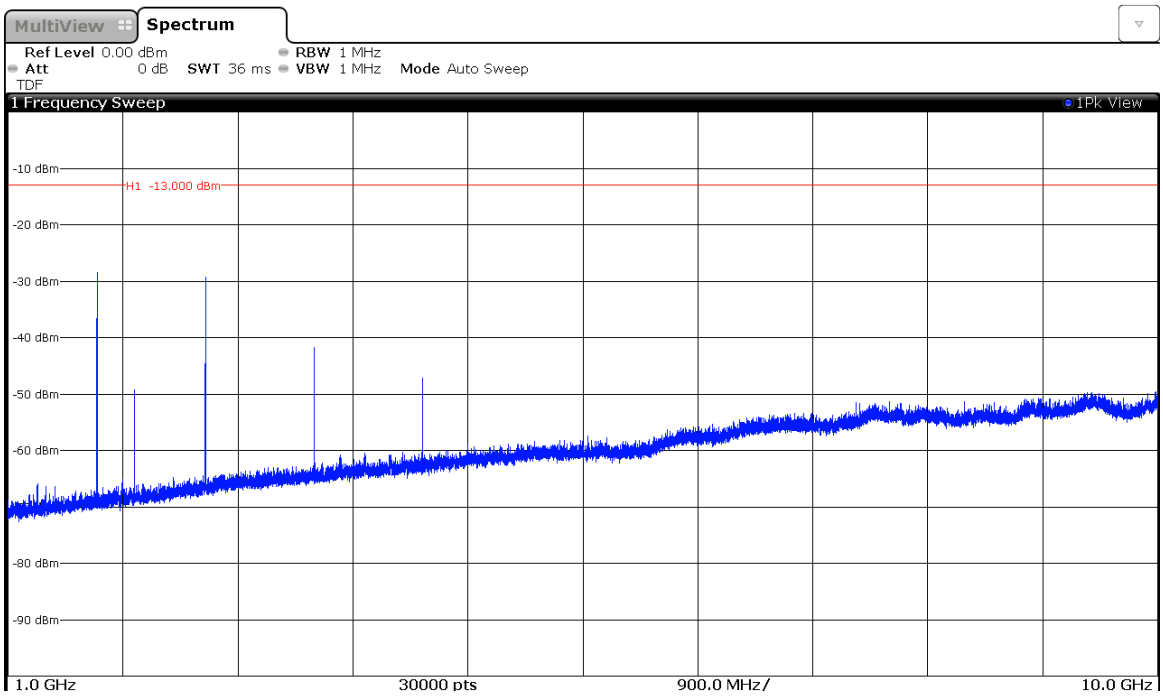
CHANNEL: LOWEST




CHANNEL: MIDDLE

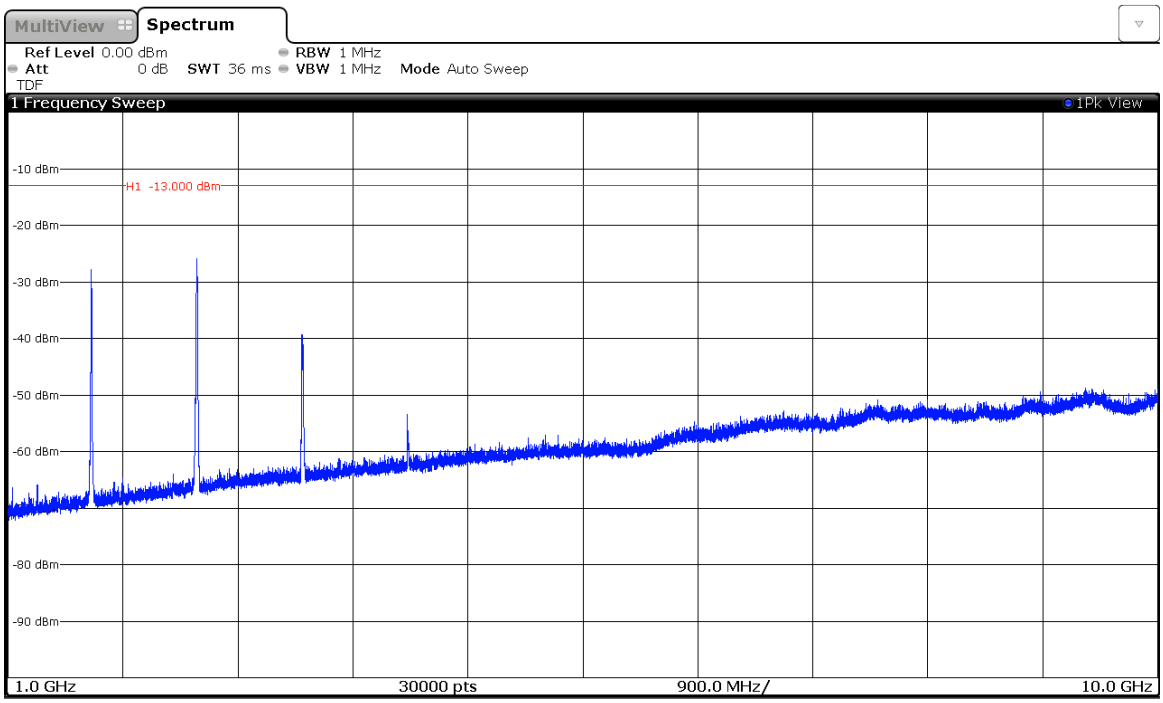


CHANNEL: HIGHEST

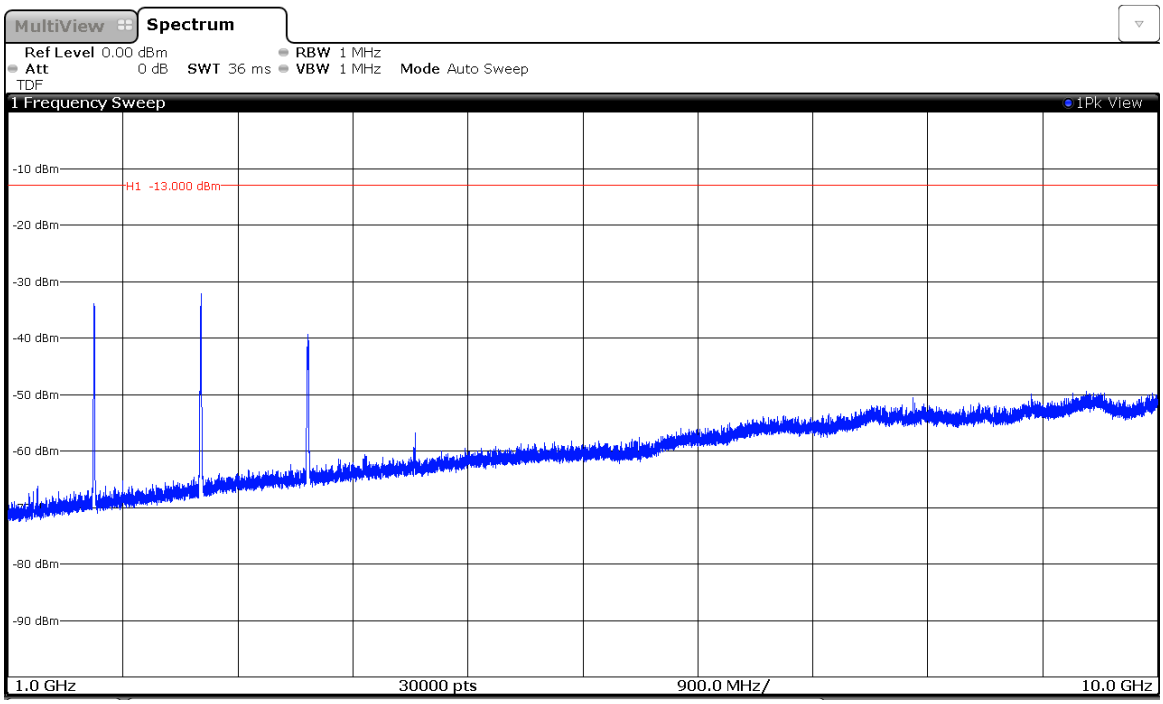



## WCDMA MODULATION

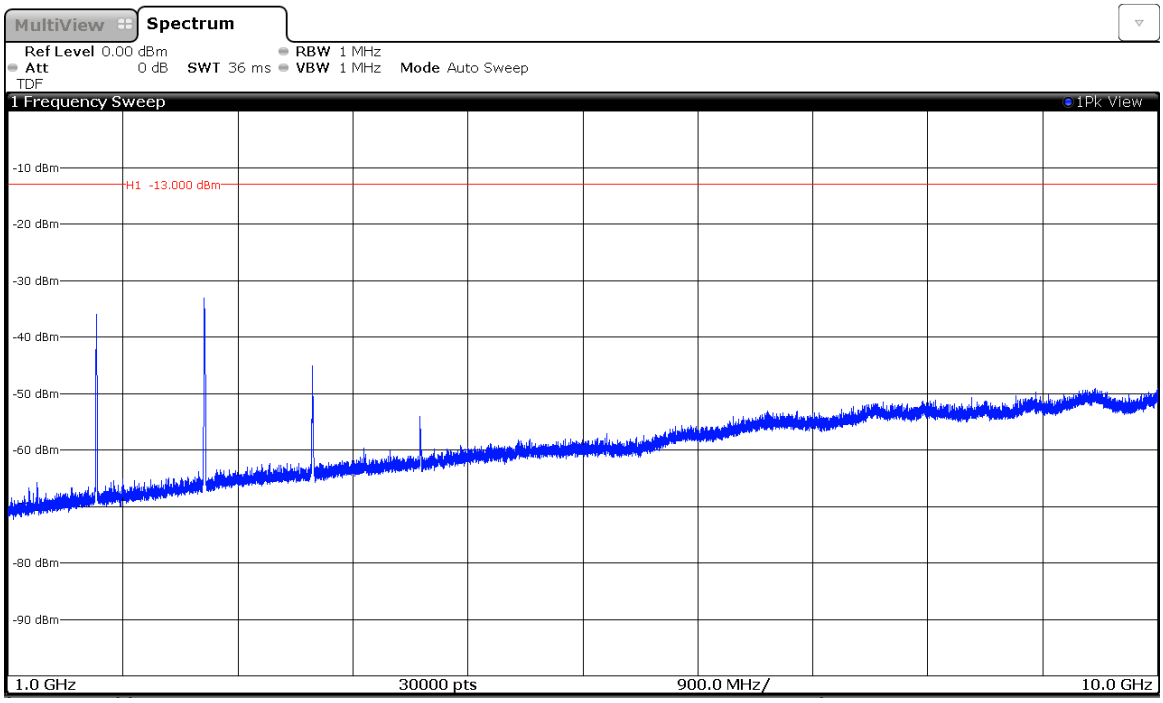
CHANNEL: LOWEST



CHANNEL: MIDDLE

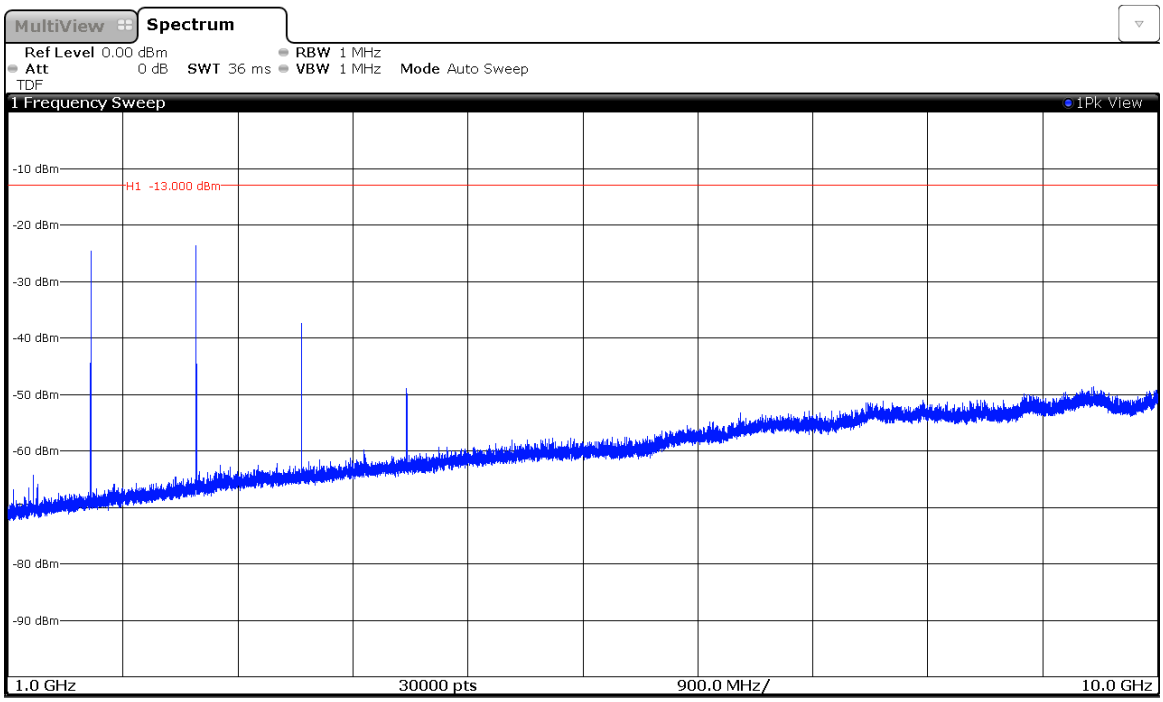



CHANNEL: HIGHEST

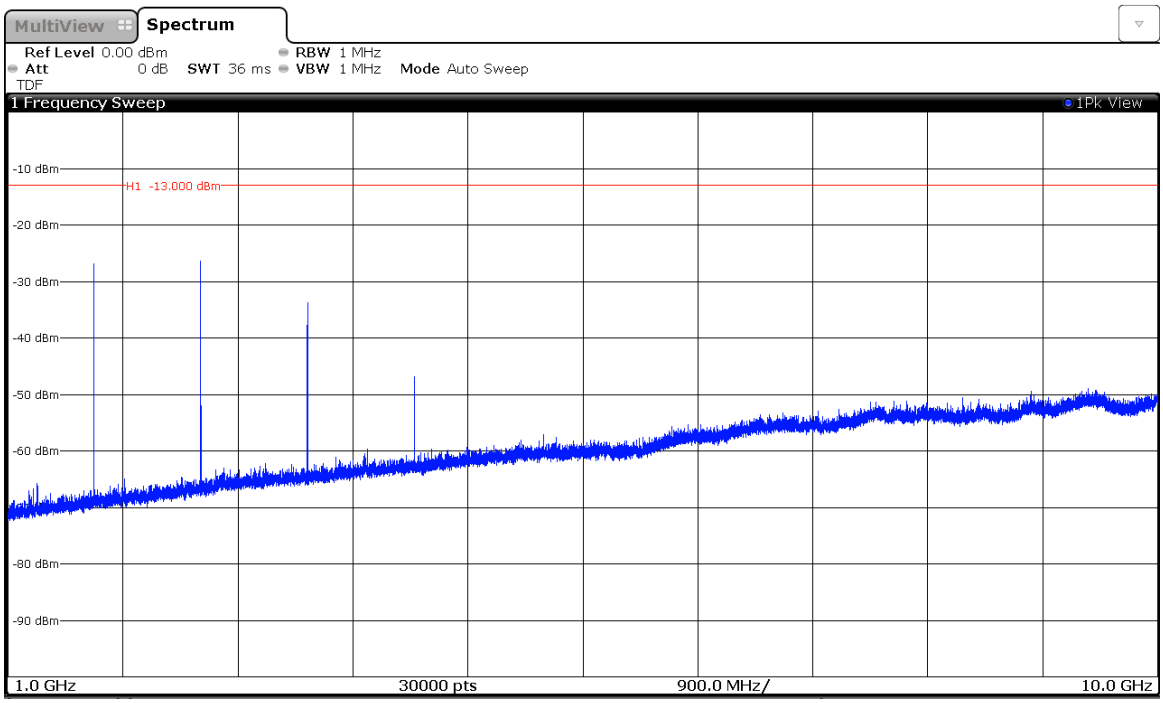


## LTE QPSK MODULATION. BW=1.4 MHz. Band V

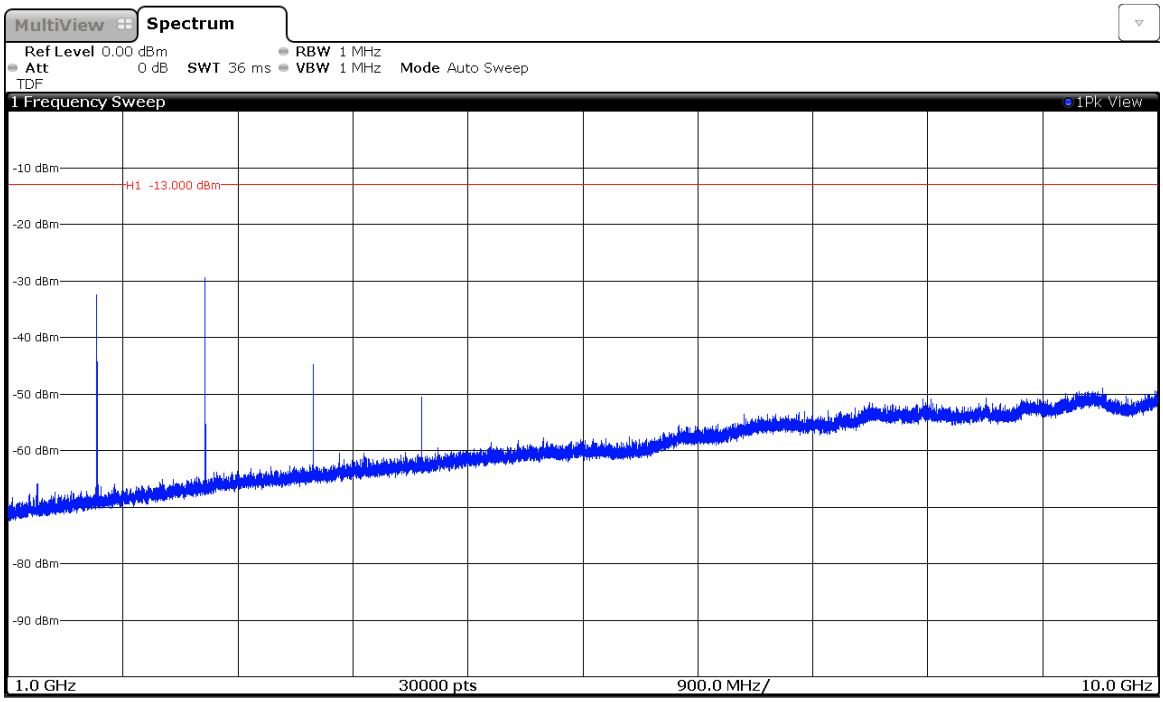
CHANNEL: LOWEST




CHANNEL: MIDDLE



CHANNEL: HIGHEST



# **Appendix B –** Test result for FCC Part 24/IC RSS-133

# INDEX

# TEST RESULTS FOR FCC PART 24 AND IC RSS-133

## TEST CONDITIONS

Power supply (V):

Vnominal = 115 Vac

Vmax = N/A

Vmin = N/A

The subscripts nom, min and max indicate voltage test conditions (nominal, minimum and maximum respectively, as declared by the applicant).

N/A: Not Applicable.

Type of power supply = AC/DC adapter.

Type of antenna = External attachable antennae.

TEST FREQUENCIES:

GPRS AND EDGE MODULATION

Lowest channel (512): 1850.2 MHz

Middle channel (662): 1880.2 MHz

Highest channel (810): 1909.8 MHz

WCDMA AND HSUPA MODULATION

Lowest channel (9262): 1852.4 MHz

Middle channel (9400): 1880.0 MHz

Highest channel (9538): 1907.6 MHz

LTE. QPSK AND 16QAM MODULATION (BAND II)

| | Channel (Frequency, MHz) | | | | | |
|---|---|---|---|---|---|---|
| | BW = 1.4 MHz | BW = 3 MHz | BW = 5 MHz | BW = 10 MHz | BW = 15 MHz | BW = 20 MHz |
| Lowest | 18607 (1850.70) | 18615 (1851.50) | 18625 (1852.50) | 18650 (1855.00) | 18675 (1857.50) | 18700 (1860.00) |
| Middle | 18900 (1880.00) | 18900 (1880.00) | 18900 (1880.00) | 18900 (1880.00) | 18900 (1880.00) | 18900 (1880.00) |
| Highest | 19193 (1909.30) | 19185 (1908.50) | 19175 (1907.50) | 19150 (1905.00) | 19125 (1902.50) | 19100 (1900.00) |

# Radiated emissions

SPECIFICATION

FCC § 24.238

RSS-133. Clause 6.5.

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 1.5 meter high 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. The radiated emissions were measured with peak detector and 1 MHz bandwidth.

Highest detected emissions are substituted by the Substitution method, in accordance with the ANSI/TIA/EIA-603-D.

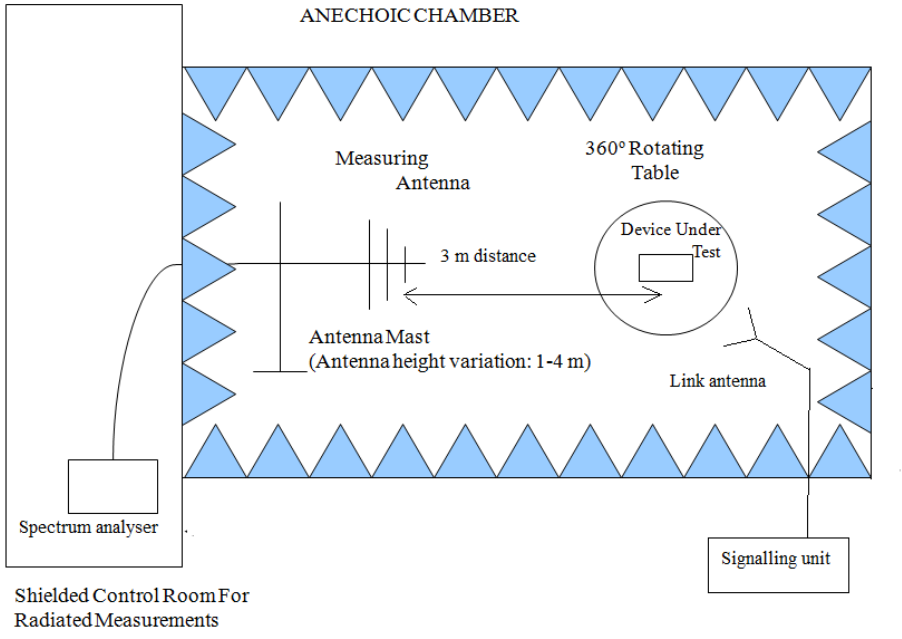
Measurement Limit**:**

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 Po transmitting power. the specified minimum attenuation becomes 43+10log (Po) and the level in dBm relative Po becomes:

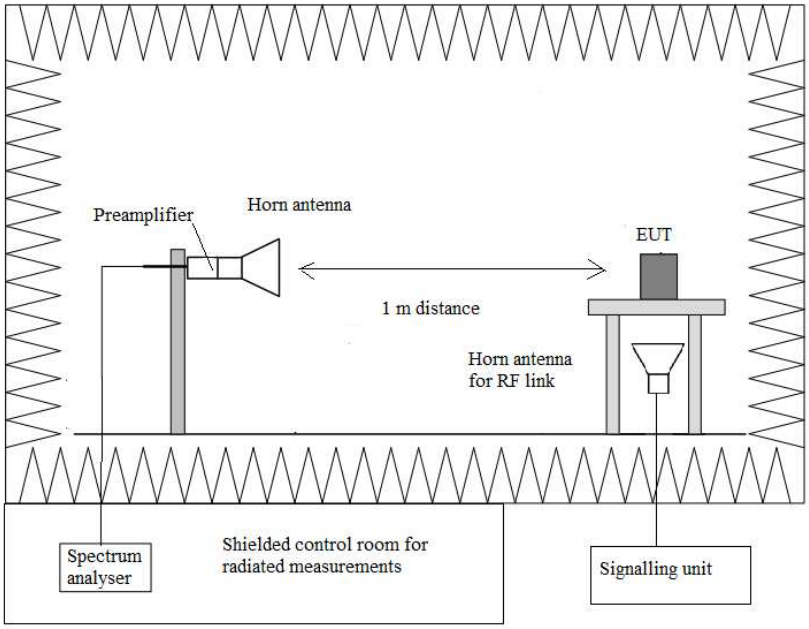
Po (dBm) – [43 + 10 log (Po in mwatts) - 30] = - 13 dBm

TEST SETUP

Radiated measurements below 1 GHz.



Radiated measurements above 1 GHz.




RESULTS

**GPRS AND EDGE MODULATION**

A preliminary scan determined the GPRS modulation as the worst case. The following plots show the results for GPRS modulation.

1. CHANNEL: LOWEST

**Frequency range 30 MHz-1000 MHz**.
No spurious signals were found in all the range.

**Frequency range 1 GHz-20 GHz**.

| 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) |
|---|---|---|---|---|---|---|
| 3700.25 | -38.54 | Vertical | -54.10 | 2.70 | 11.88 | -44.92 |

2. CHANNEL: MIDDLE

**Frequency range 30 MHz-1000 MHz**.
No spurious signals were found in all the range.

**Frequency range 1 GHz-20 GHz**.

| 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) |
|---|---|---|---|---|---|---|
| 3760.25 | -36.29 | Vertical | -51.73 | 2.70 | 11.90 | -42.53 |

3. CHANNEL: HIGHEST

**Frequency range 30 MHz-1000 MHz**.
No spurious signals were found in all the range.

**Frequency range 1 GHz-20 GHz**.

| 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) |
|---|---|---|---|---|---|---|
| 3819.25 | -40.00 | Vertical | -55.32 | 2.70 | 11.93 | -46.09 |
| 7638.75 | -48.94 | Horizontal | -51.81 | 4.12 | 10.62 | -45.32 |

Verdict: PASS

**WCDMA AND HSUPA MODULATION**

A preliminary scan determined the WCDMA modulation as the worst case. The following tables and plots show the results for WCDMA modulation.

1. CHANNEL: LOWEST

**Frequency range 30 MHz-1000 MHz**.
No spurious signals were found in all the range.

**Frequency range 1 GHz-20 GHz**.

| 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) |
|---|---|---|---|---|---|---|
| 3707.25 | -39.71 | Vertical | -55.26 | 2.70 | 11.88 | -46.08 |
| 4994.25 | -53.29 | Vertical | -65.55 | 3.19 | 12.09 | -56.65 |

2. CHANNEL: MIDDLE

**Frequency range 30 MHz-1000 MHz**.
No spurious signals were found in all the range.

**Frequency range 1 GHz-20 GHz**.

| 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) |
|---|---|---|---|---|---|---|
| 3762.25 | -42.75 | Vertical | -58.18 | 2.70 | 11.90 | -48.98 |
| 4984.75 | -52.53 | Vertical | -64.81 | 3.18 | 12.08 | -55.91 |

3. CHANNEL: HIGHEST

**Frequency range 30 MHz-1000 MHz**.
No spurious signals were found in all the range.

**Frequency range 1 GHz-20 GHz**.

| 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) |
|---|---|---|---|---|---|---|
| 3812.75 | -42.79 | Vertical | -58.13 | 2.70 | 11.93 | -48.90 |
| 4989.25 | -52.06 | Vertical | -64.33 | 3.19 | 12.09 | -55.43 |

Verdict: PASS

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

A preliminary scan determined the QPSK 20 MHz bandwidth RB=1, Offset 0 as the worst case.
The following tables and plots show the results for this configuration.

1. CHANNEL: LOWEST

**Frequency range 30 MHz-1000 MHz**.
No spurious signals were found in all the range.

**Frequency range 1 GHz-20 GHz**.

| 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) |
|---|---|---|---|---|---|---|
| 3701.75 | -35.24 | Vertical | -50.80 | 2.70 | 11.88 | -41.62 |
| 5552.25 | -46.25 | Horizontal | -58.08 | 3.52 | 12.76 | -48.84 |

2. CHANNEL: MIDDLE

**Frequency range 30 MHz-1000 MHz**.
No spurious signals were found in all the range.

**Frequency range 1 GHz-20 GHz**.

| 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) |
|---|---|---|---|---|---|---|
| 3760.25 | -37.39 | Vertical | -52.83 | 2.70 | 11.90 | -43.63 |
| 5640.25 | -47.16 | Horizontal | -59.06 | 3.40 | 12.87 | -49.59 |

3. CHANNEL: HIGHEST

**Frequency range 30 MHz-1000 MHz**.
No spurious signals were found in all the range.

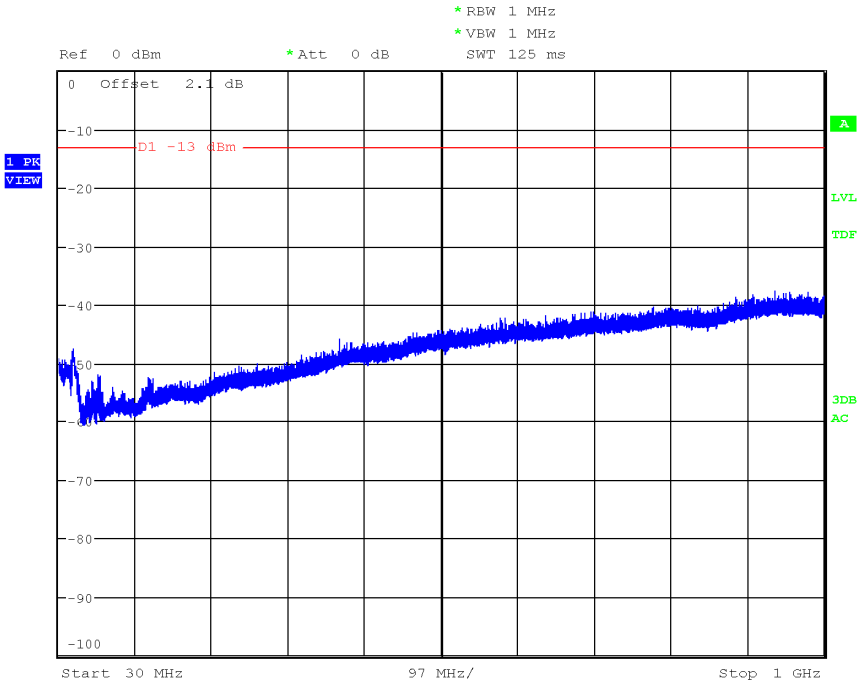
**Frequency range 1 GHz-20 GHz**.

| 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) |
|---|---|---|---|---|---|---|
| 3818.75 | -41.91 | Vertical | -57.23 | 2.70 | 11.93 | -48.00 |
| 5728.25 | -45.24 | Vertical | -56.80 | 3.67 | 12.97 | -47.50 |
| 7637.75 | -51.59 | Vertical | -54.46 | 4.12 | 10.62 | -47.97 |

Verdict: PASS

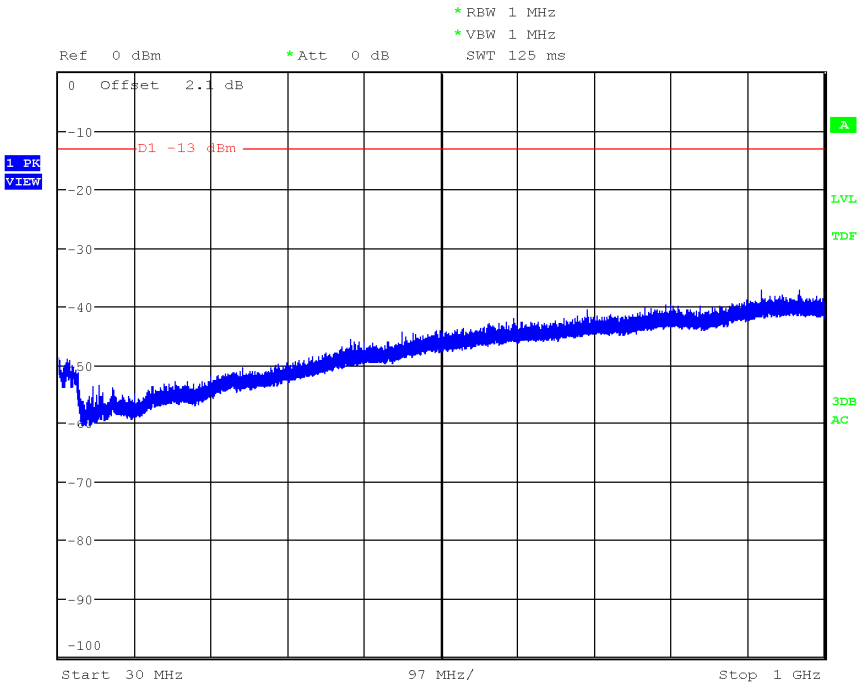
FREQUENCY RANGE 30 MHz-1000 MHz.

**GPRS MODULATION**



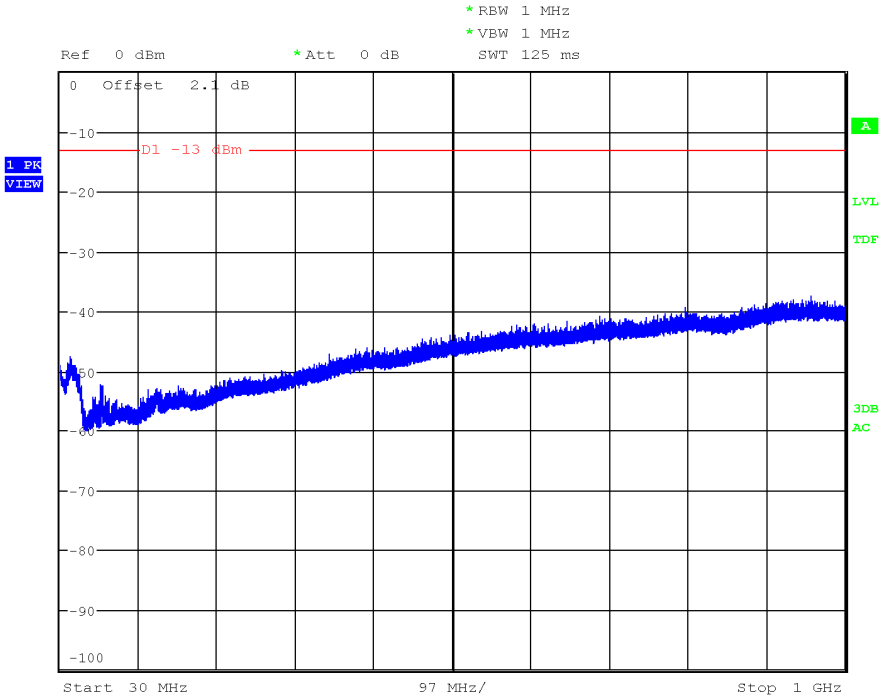

(This plot is valid for all three channels)

**WCDMA MODULATION**




(This plot is valid for all three channels)

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

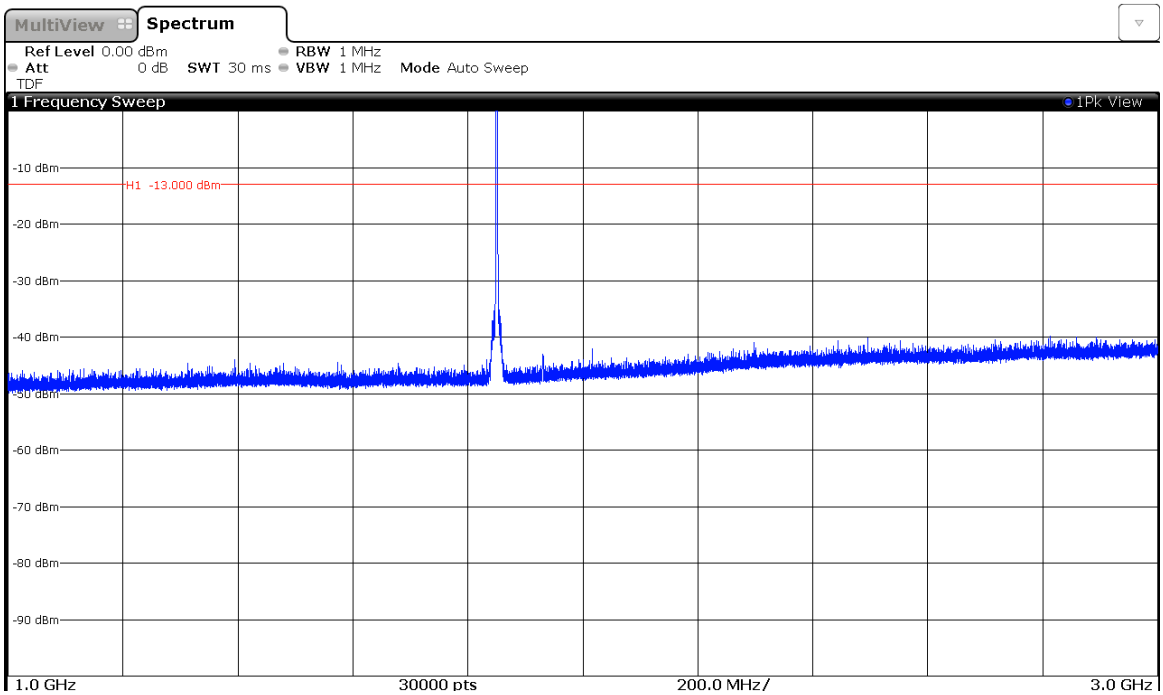



(This plot is valid for all three channels)

FREQUENCY RANGE 1 GHz to 3 GHz.

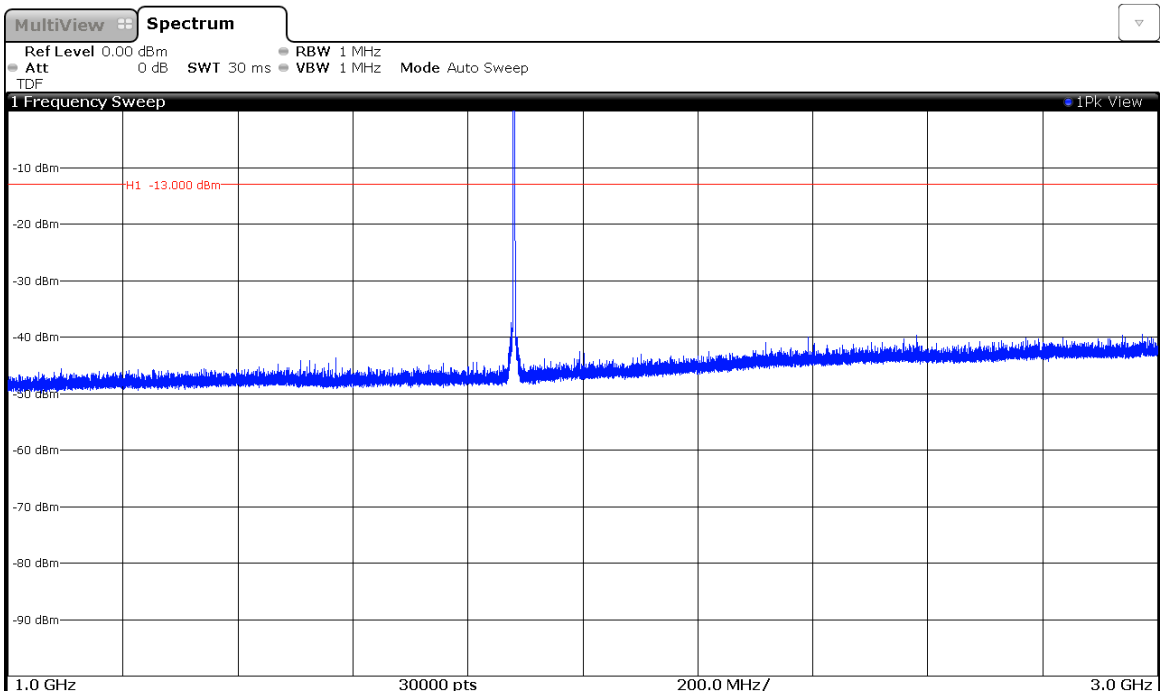
**GPRS MODULATION**

CHANNEL: LOWEST



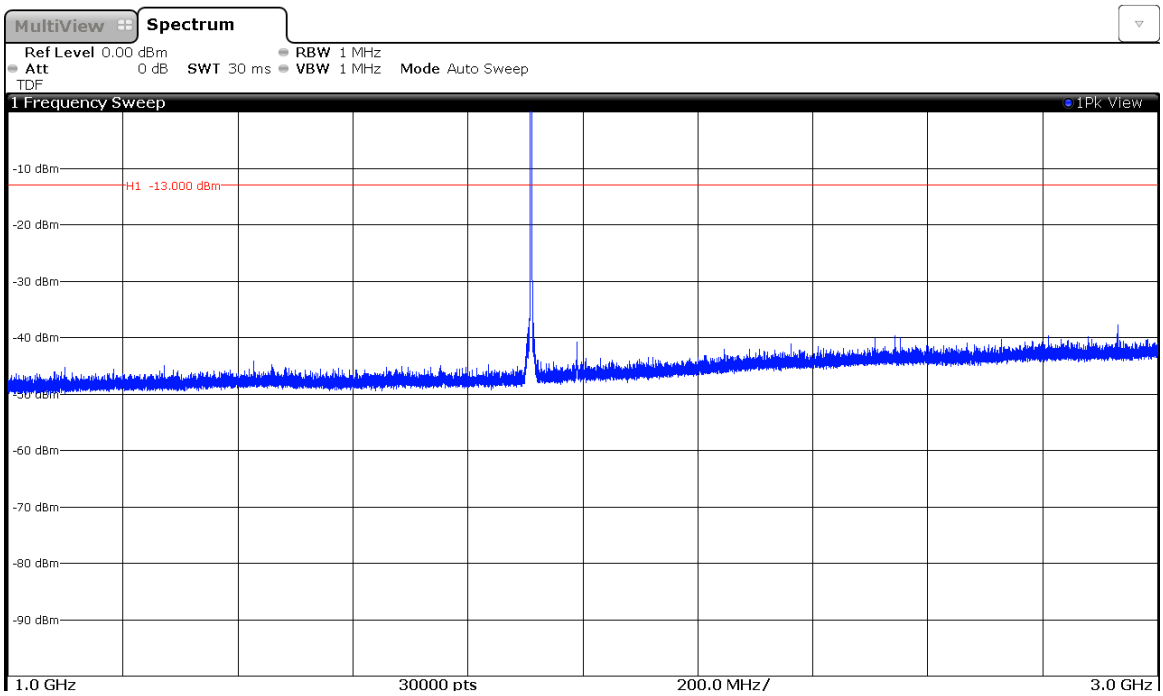

Note: The peak above the limit is the carrier frequency.

CHANNEL: MIDDLE



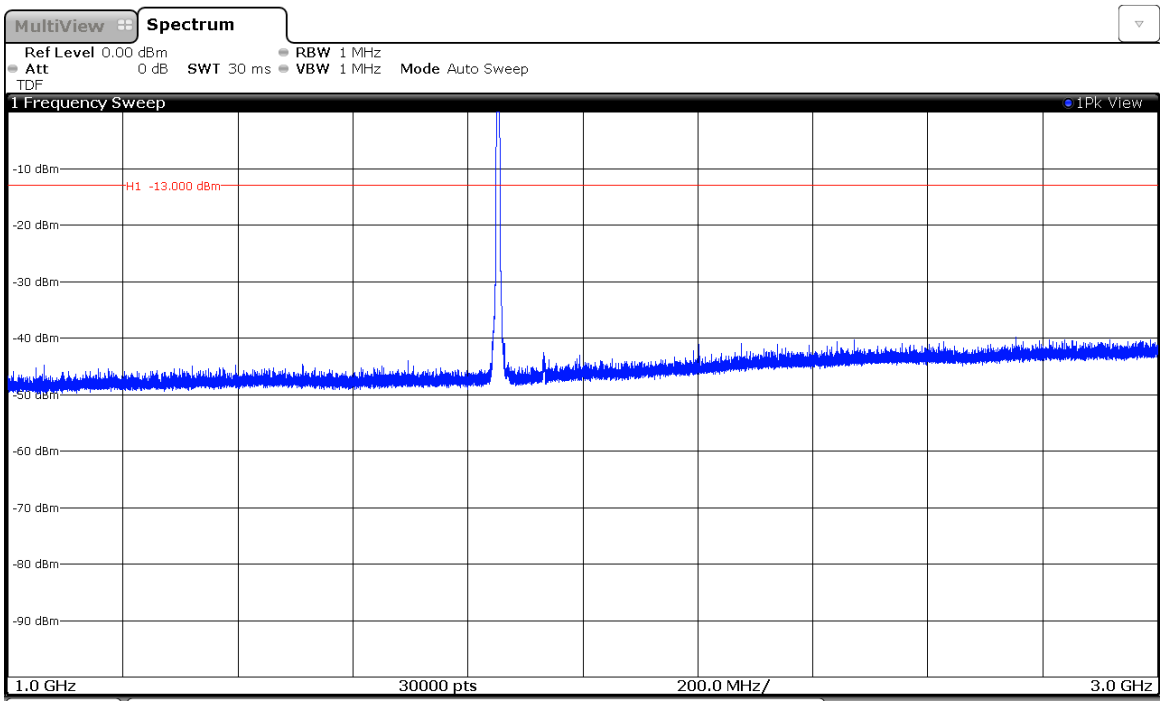

Note: The peak above the limit is the carrier frequency.

CHANNEL: HIGHEST



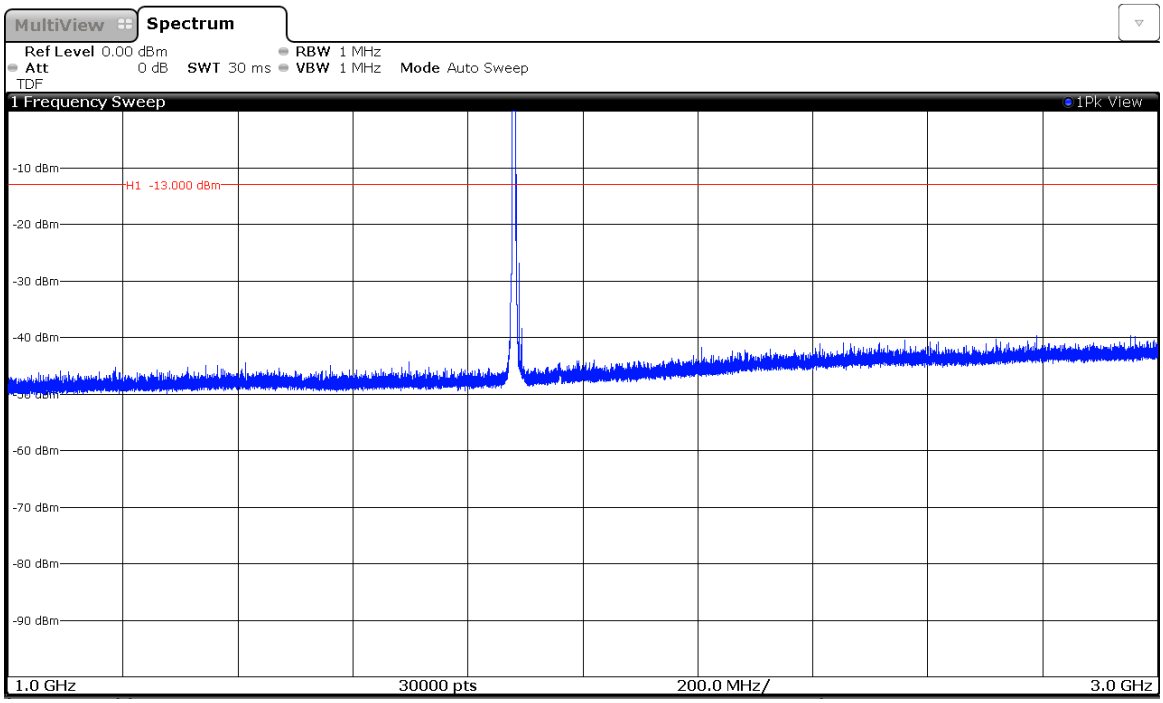

Note: The peak above the limit is the carrier frequency.

**WCDMA MODULATION**
CHANNEL: LOWEST



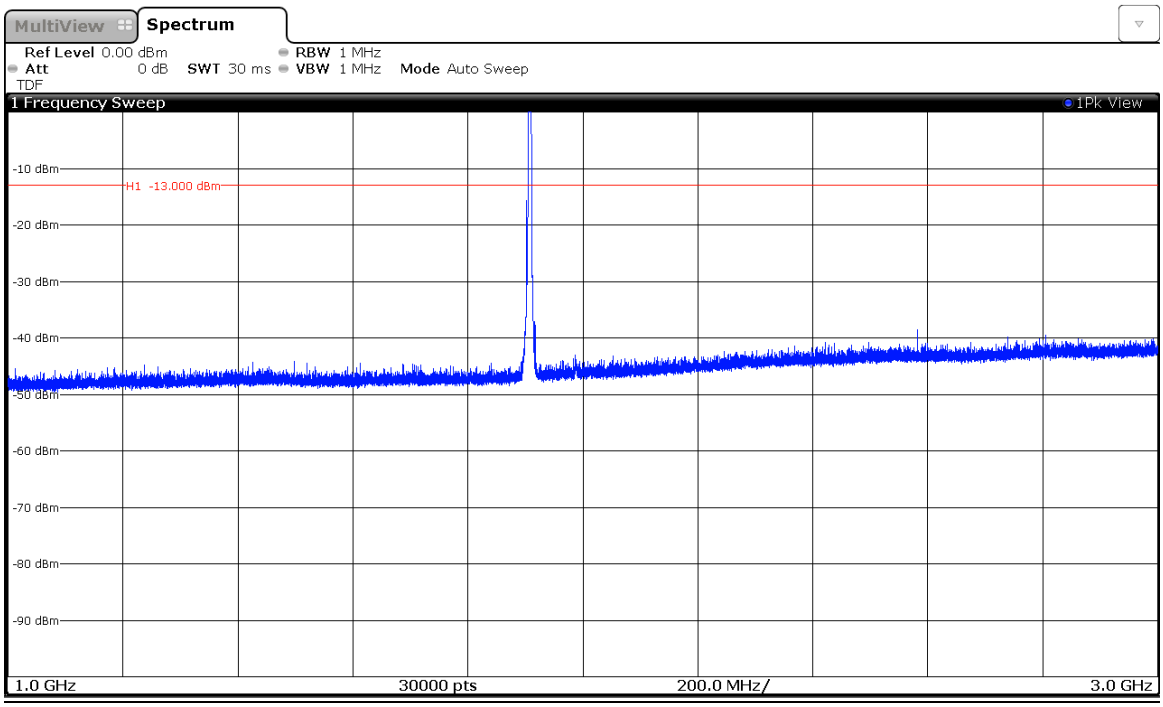

Note: The peak above the limit is the carrier frequency.

CHANNEL: MIDDLE




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

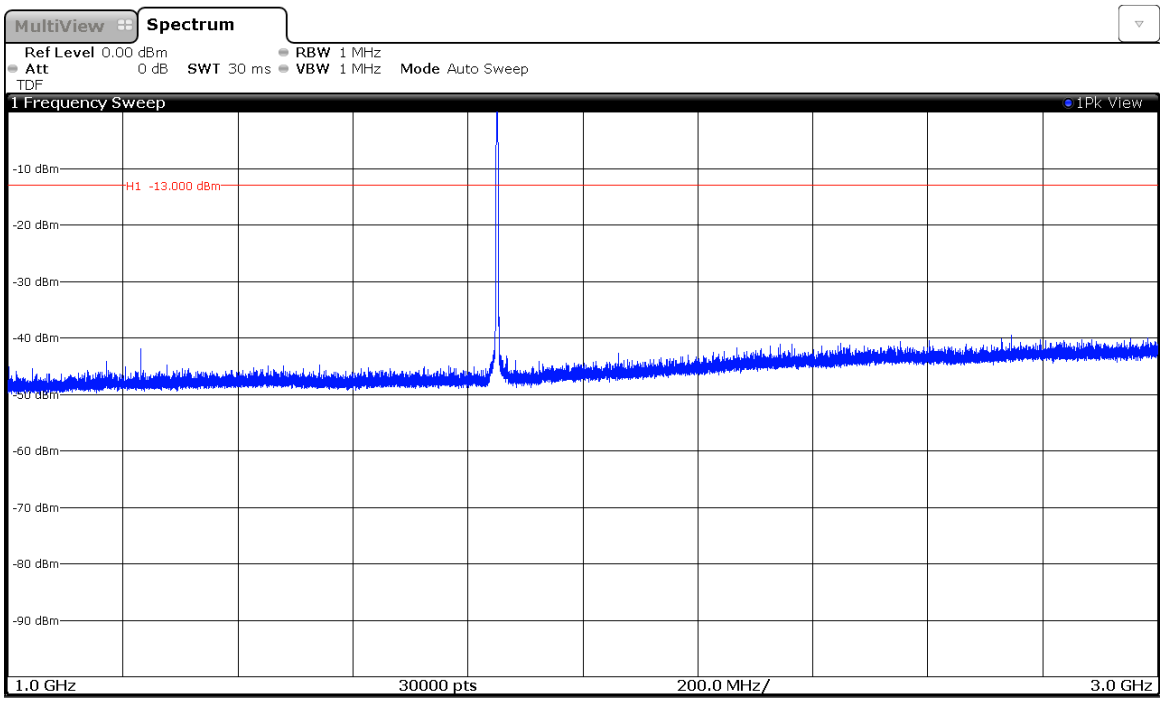
CHANNEL: HIGHEST




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

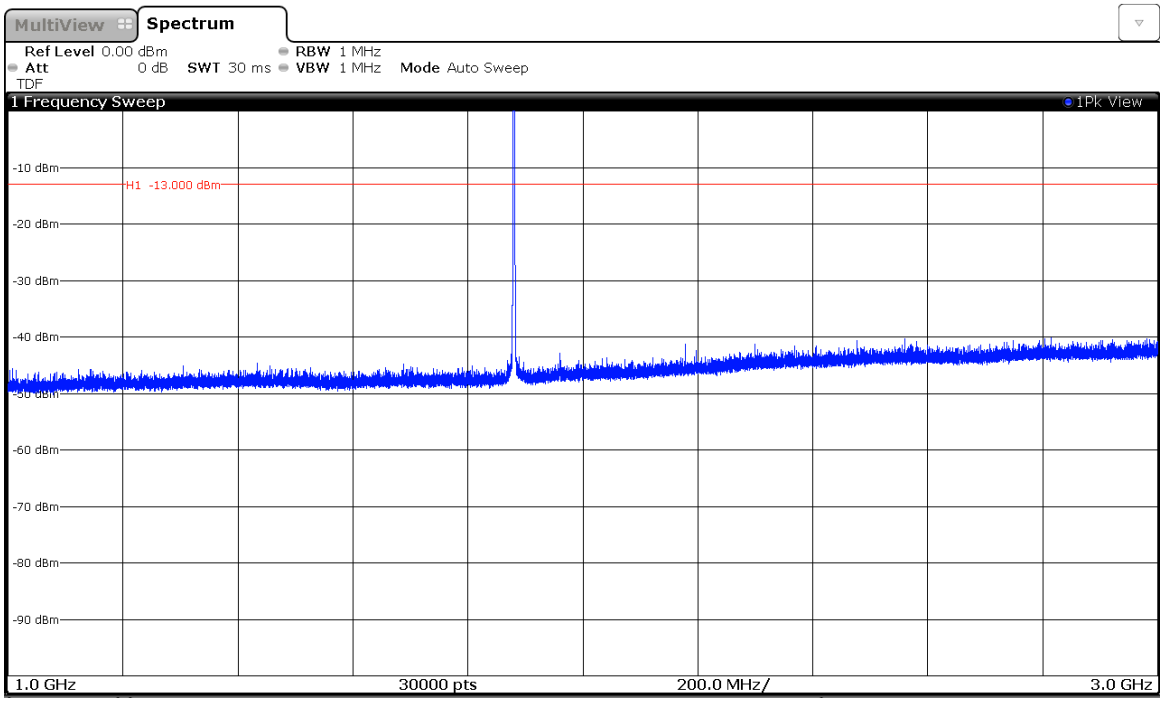
## LTE QPSK MODULATION. BW=20 MHz. Band II

CHANNEL: LOWEST



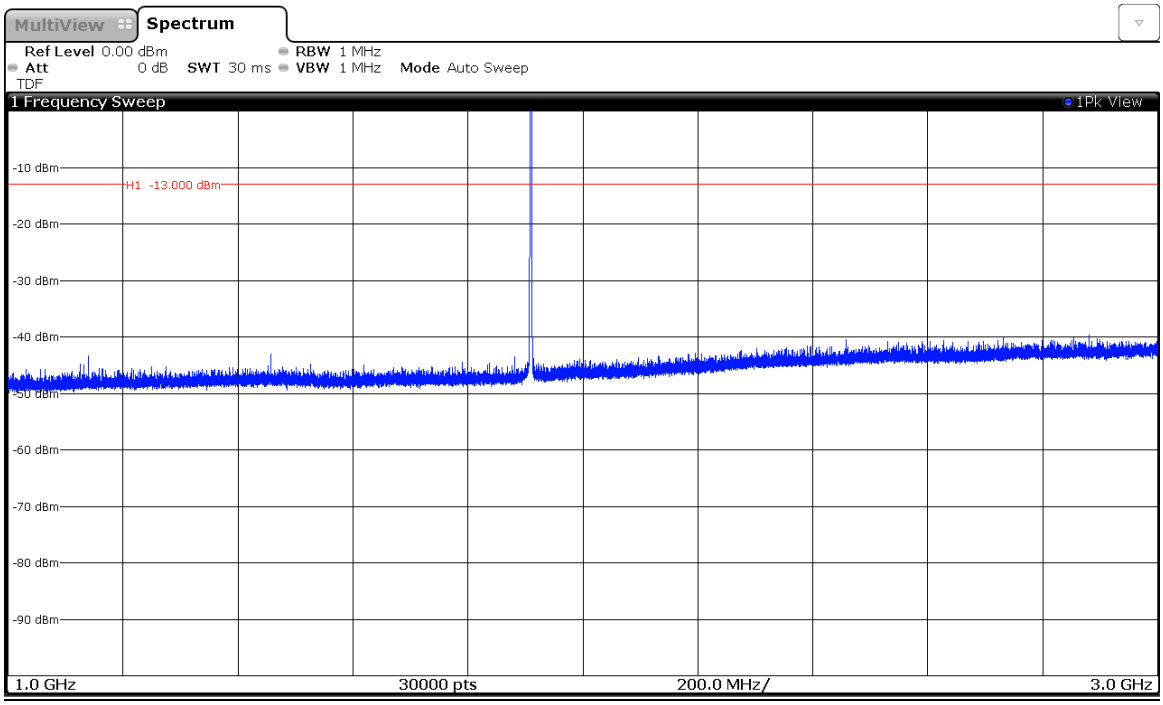

Note: The peak above the limit is the carrier frequency.

CHANNEL: MIDDLE




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

CHANNEL: HIGHEST

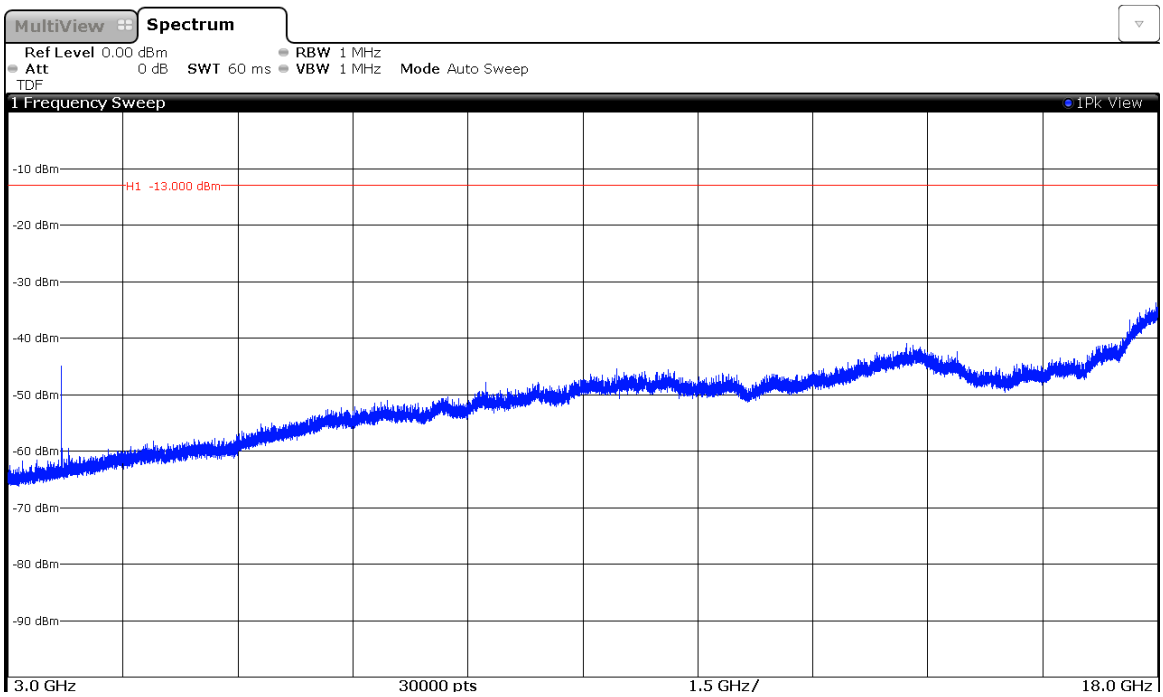



Note: The peak above the limit is the carrier frequency.

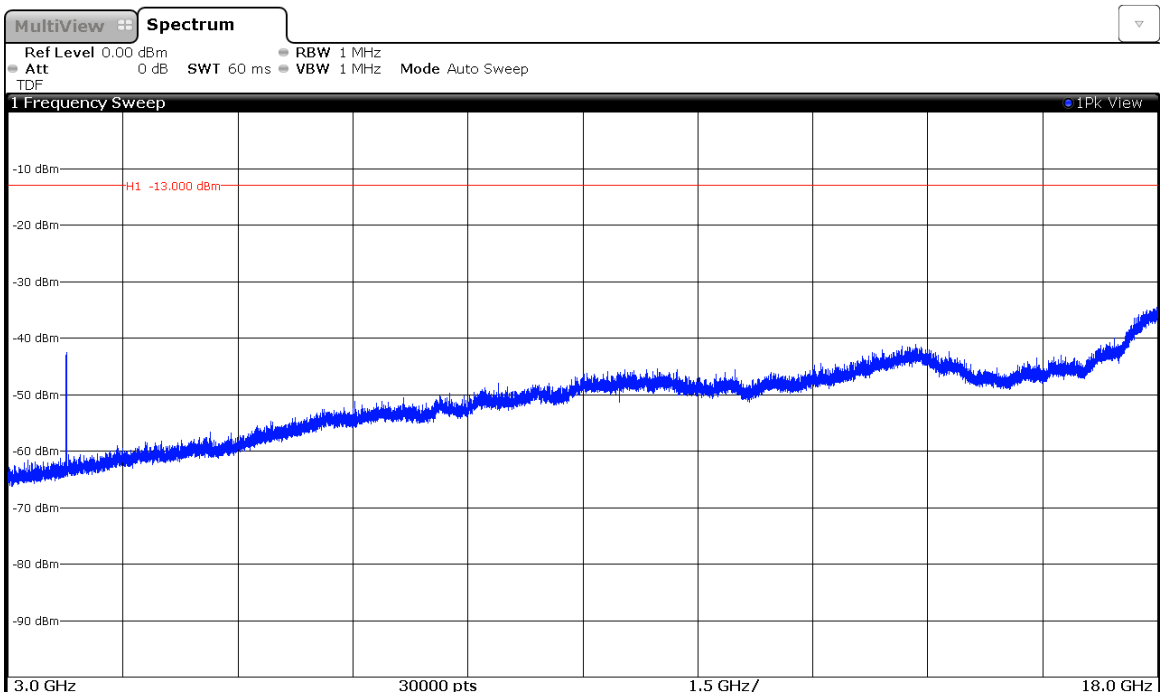
FREQUENCY RANGE 3 GHz to 18 GHz.

## GPRS MODULATION

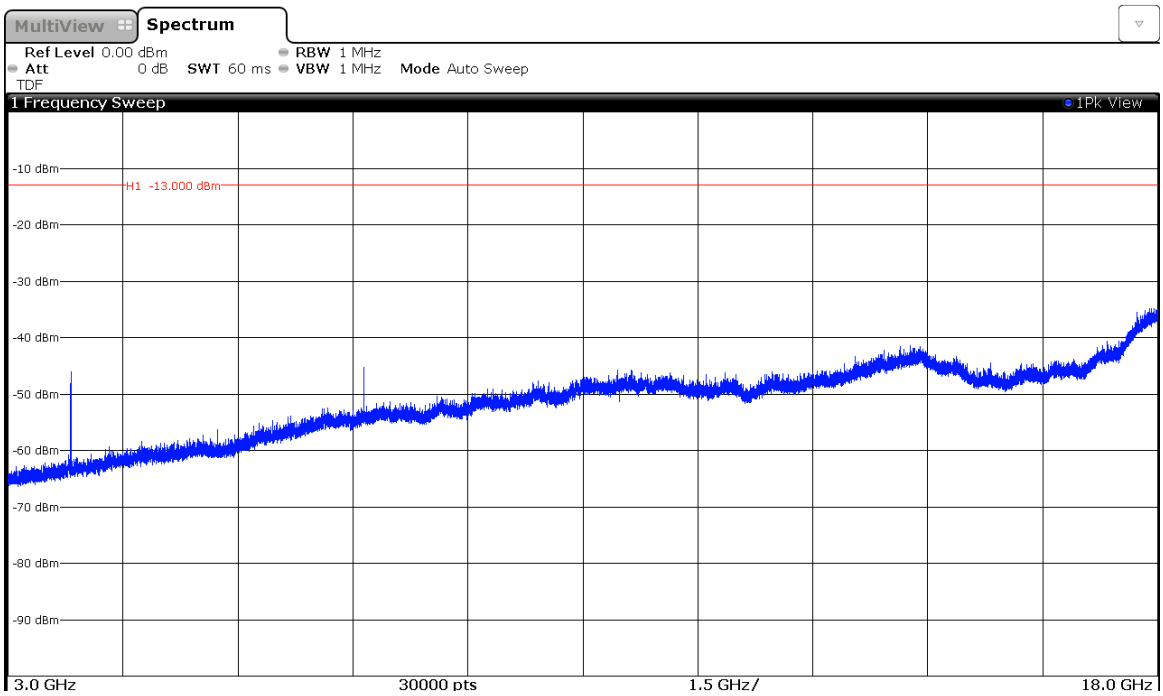
CHANNEL: LOWEST




CHANNEL: MIDDLE

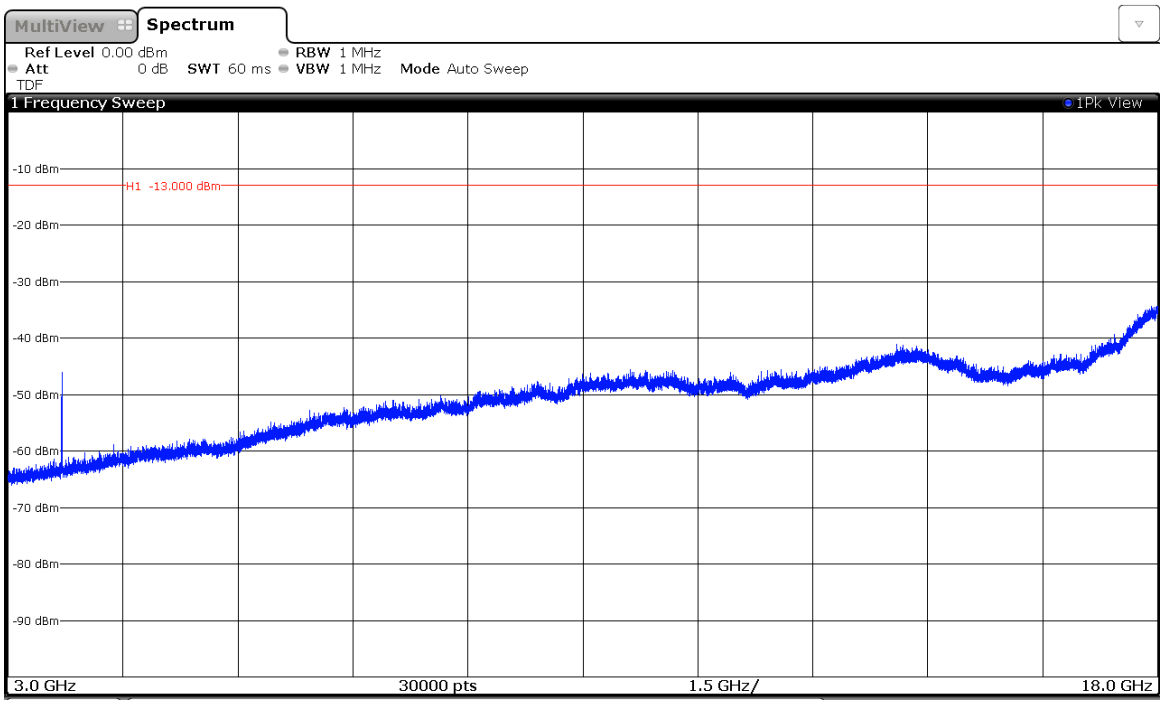


CHANNEL: HIGHEST

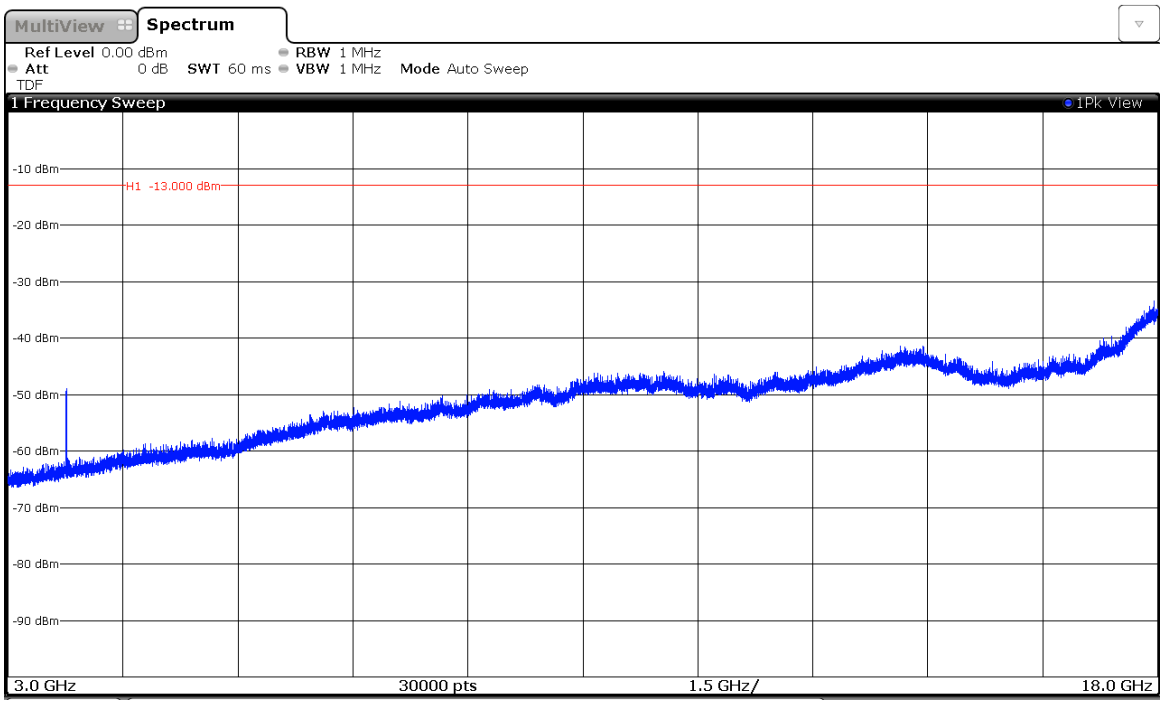



## WCDMA MODULATION

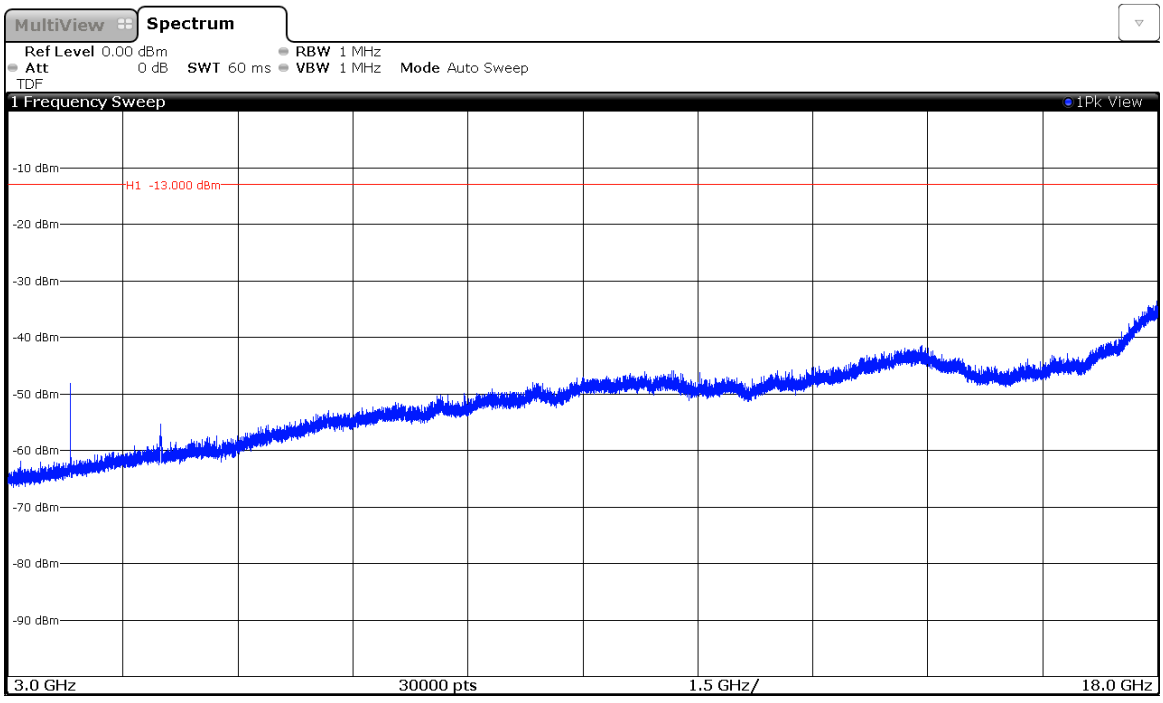
CHANNEL: LOWEST



CHANNEL: MIDDLE

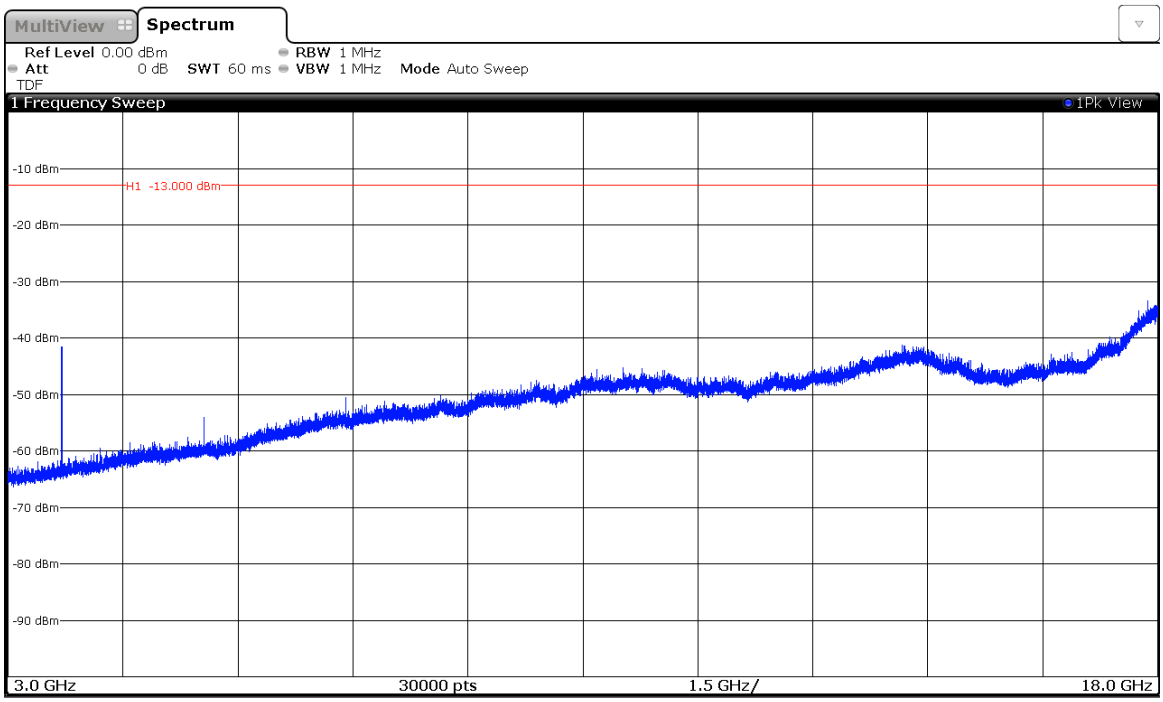



CHANNEL: HIGHEST

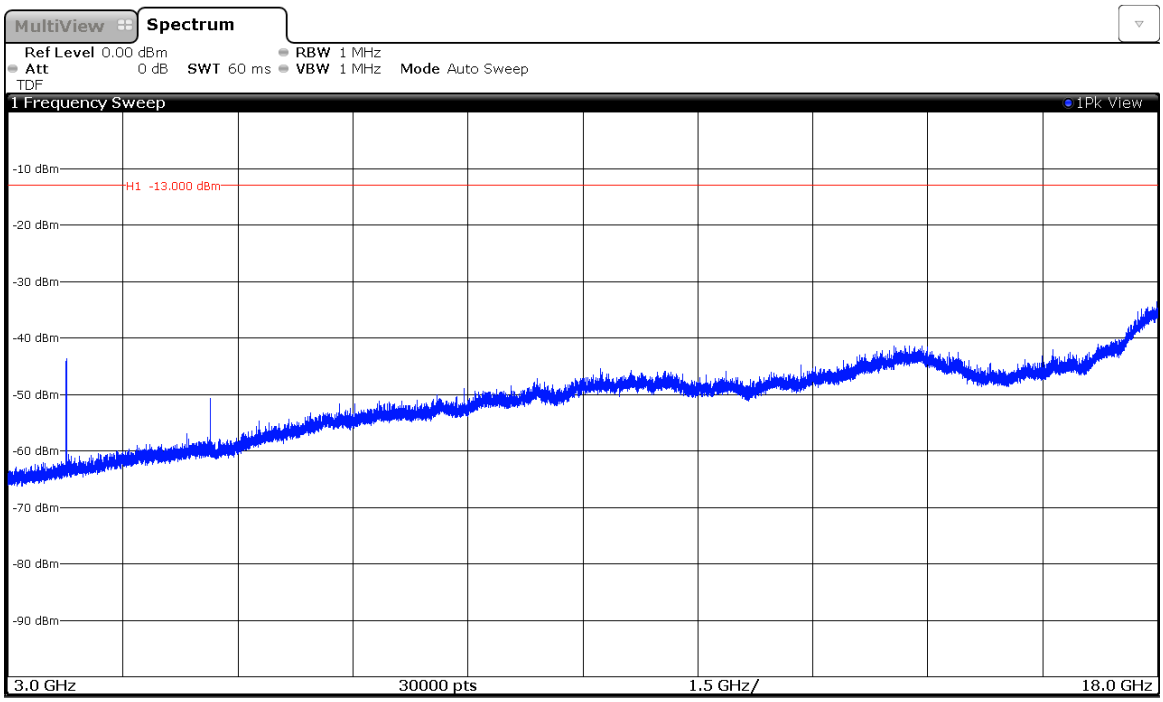


## LTE QPSK MODULATION. BW=20 MHz. Band II

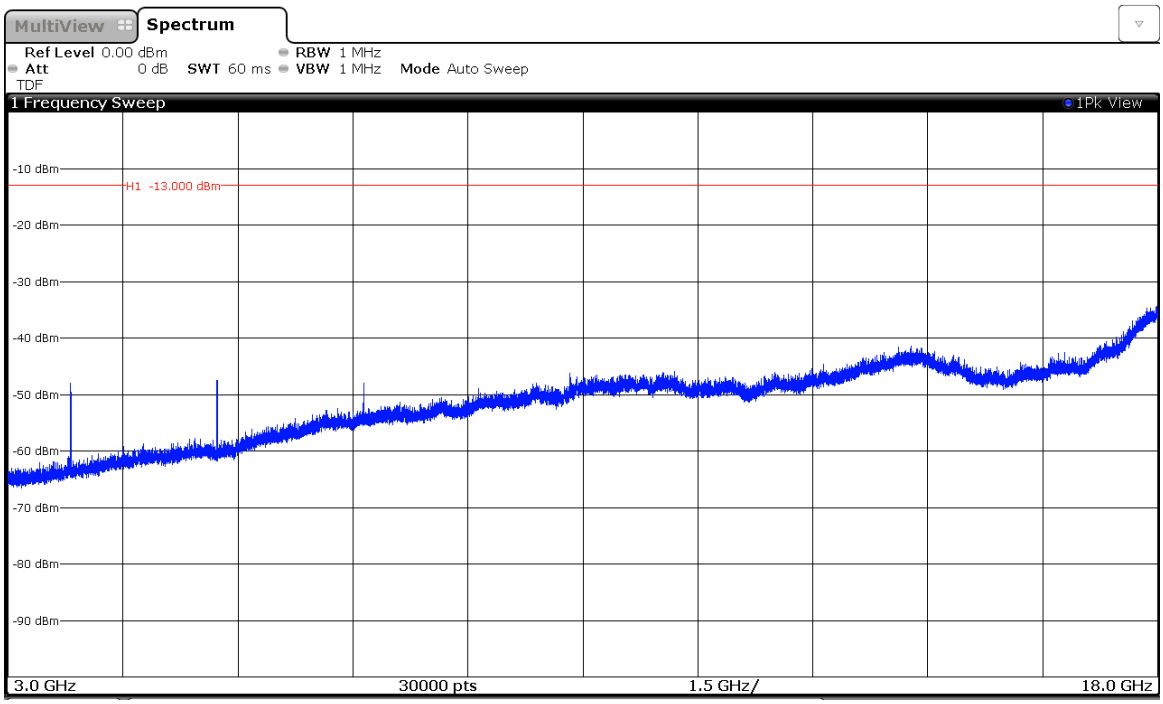
CHANNEL: LOWEST




CHANNEL: MIDDLE

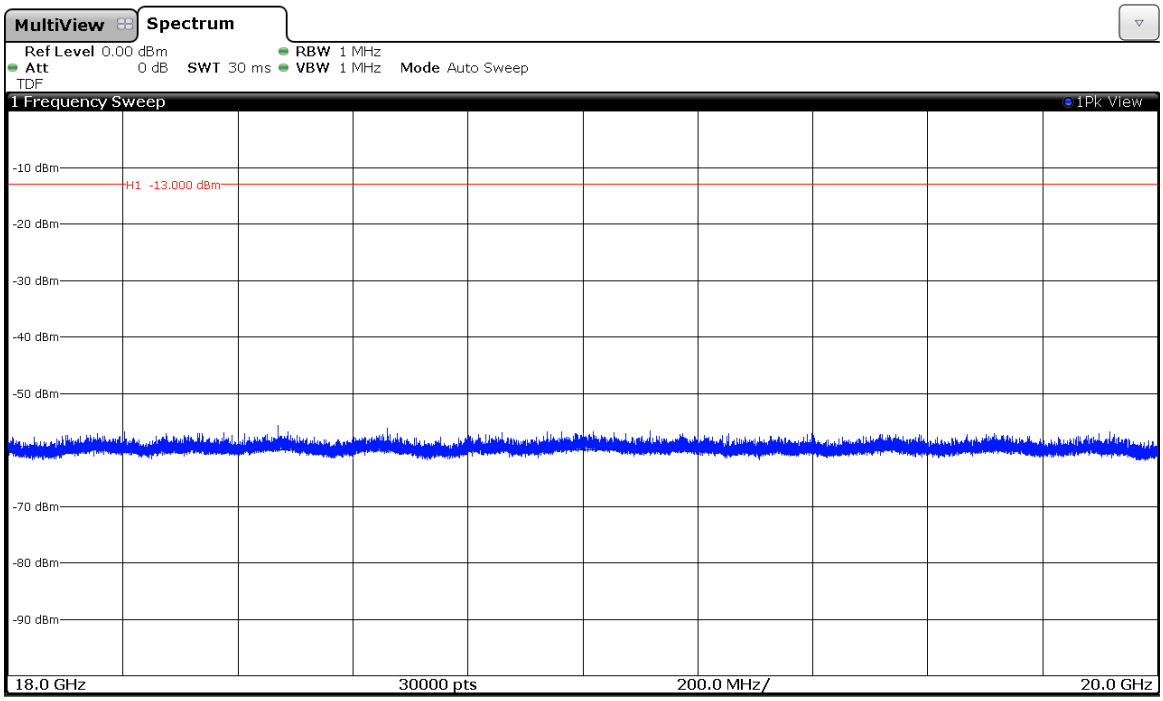


CHANNEL: HIGHEST



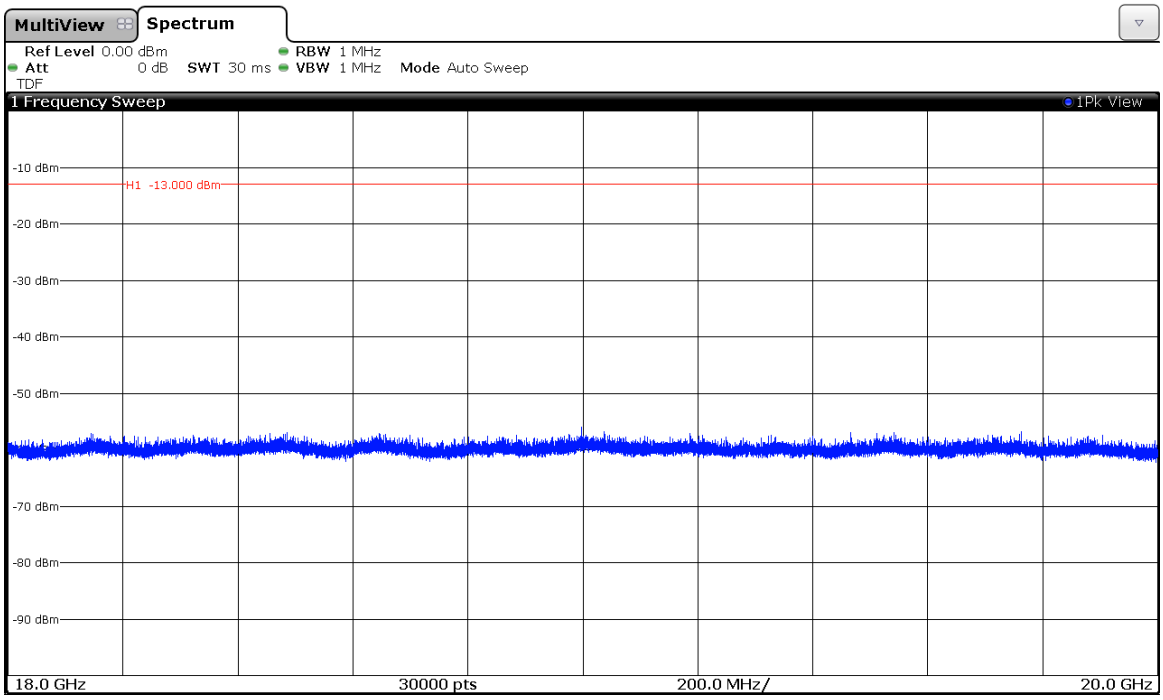
FREQUENCY RANGE 18 GHz TO 20 GHz.

## GPRS MODULATION



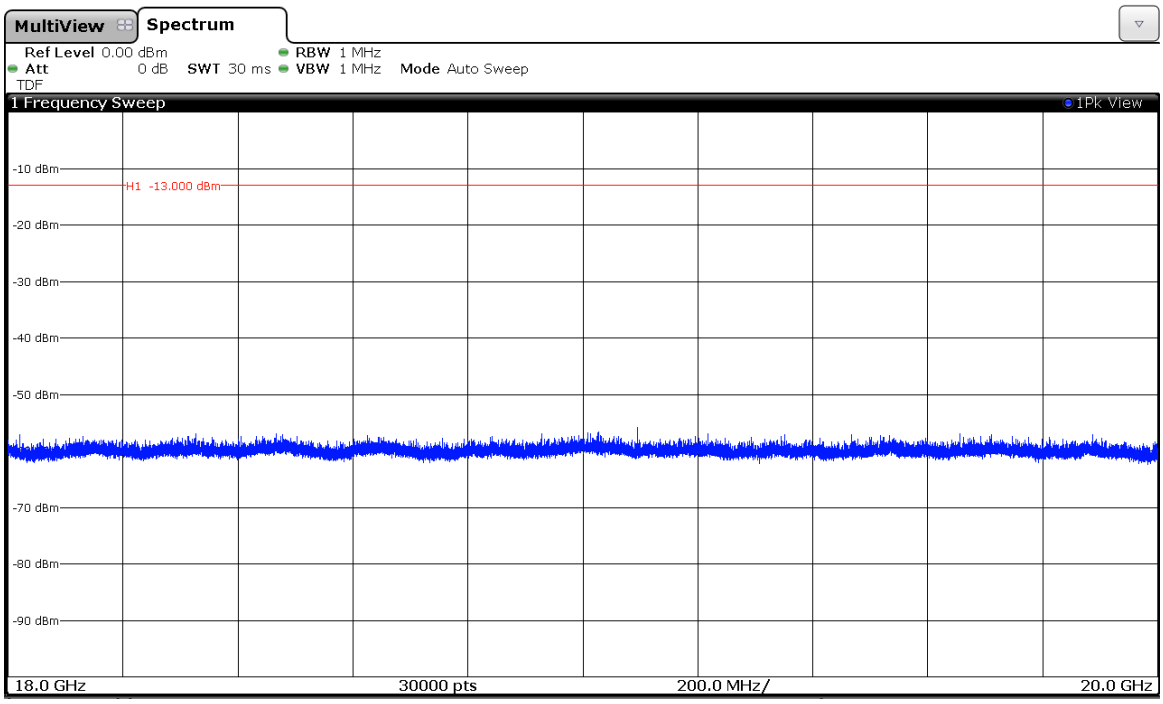

(This plot is valid for all three channels)

## WCDMA MODULATION




(This plot is valid for all three channels)

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




(This plot is valid for all three channels)

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

# INDEX

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

## TEST CONDITIONS

Power supply (V):

Vnominal = 115 Vac

Vmax = N/A

Vmin = N/A

The subscripts nom, min and max indicate voltage test conditions (nominal, minimum and maximum respectively, as declared by the applicant).

N/A: Not Applicable.

Type of power supply = AC/DC adapter.

Type of antenna = External attachable antennae.

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 (1710.70) | 19965 (1711.50) | 19975 (1712.50) | 20000 (1715.00) | 20025 (1717.50) | 20050 (1720.00) |
| Middle | 20175 (1732.50) | 20175 (1732.50) | 20175 (1732.50) | 20175 (1732.50) | 20175 (1732.50) | 20175 (1732.50) |
| Highest | 20350 (1754.30) | 20385 (1753.50) | 20375 (1752.50) | 20350 (1750.00) | 20325 (1747.50) | 20300 (1745.00) |

LTE. QPSK AND 16QAM MODULATION (BAND XVII)

| | Channel (Frequency, MHz) | |
|---|---|---|
| | BW = 5 MHz | BW = 10 MHz |
| Lowest | 23755 (706.50) | 23780 (709.00) |
| Middle | 23790 (710.00) | 23790 (710.00) |
| Highest | 23825 (713.50) | 23800 (711.00) |

# Radiated emissions

SPECIFICATION

FCC §2.1051 and §27.53(g) (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.

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 1.5 meter high 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. The radiated emissions were measured with peak detector and 1 MHz bandwidth.

Highest detected emissions are substituted by the Substitution method, in accordance with the ANSI/TIA/EIA-603-D.

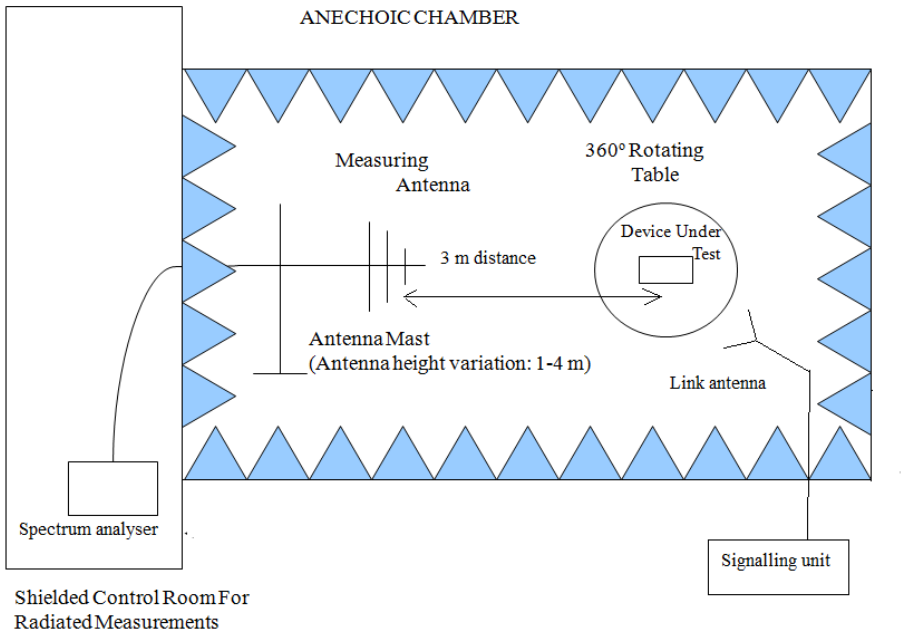
Measurement Limit**:**

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 Po transmitting power. the specified minimum attenuation becomes 43+10log (Po) and the level in dBm relative Po becomes:

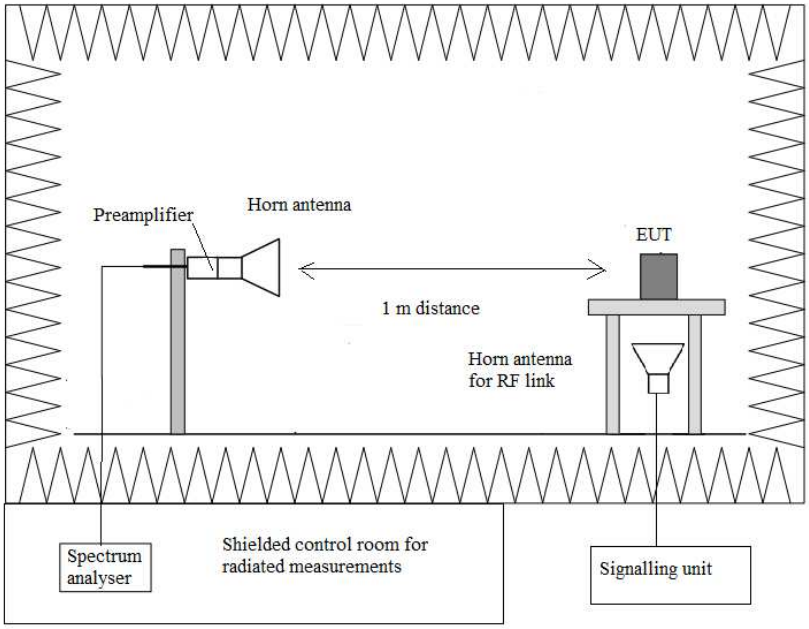
Po (dBm) – [43 + 10 log (Po in mwatts) - 30] = - 13 dBm

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 RB=1, Offset 0 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 spurious signals were found in all the range.

**Frequency range 1 GHz-18 GHz**.

| 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) |
|---|---|---|---|---|---|---|
| 3142.25 | -29.42 | Vertical | -45.51 | 2.40 | 11.16 | -36.75 |
| 5132.25 | -48.92 | Horizontal | -60.67 | 3.24 | 11.82 | -52.09 |
| 6843.25 | -48.70 | Vertical | -53.34 | 3.84 | 10.14 | -47.04 |

2. CHANNEL: MIDDLE

**Frequency range 30 MHz-1000 MHz**.
No spurious signals were found in all the range.

**Frequency range 1 GHz-18 GHz**.

| 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) |
|---|---|---|---|---|---|---|
| 3464.75 | -38.71 | Vertical | -54.87 | 2.50 | 11.74 | -45.63 |
| 5197.75 | -43.76 | Horizontal | -55.62 | 3.20 | 11.97 | -46.85 |
| 6930.25 | -49.16 | Vertical | -53.20 | 3.90 | 9.95 | -47.15 |

3. CHANNEL: HIGHEST

**Frequency range 30 MHz-1000 MHz**.
No spurious signals were found in all the range.

**Frequency range 1 GHz-18 GHz**.

| 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) |
|---|---|---|---|---|---|---|
| 3508.75 | -35.21 | Vertical | -51.36 | 2.51 | 11.80 | -42.07 |
| 5262.75 | -48.97 | Horizontal | -60.87 | 3.23 | 12.13 | -51.97 |
| 7017.75 | -48.60 | Vertical | -52.20 | 3.90 | 9.83 | -46.27 |

Verdict: PASS

**LTE QPSK AND 16QAM MODULATION. Band XVII. BW = 5 MHz, 10 MHz, 15 MHz and 20 MHz.**

A preliminary scan determined the QPSK 5 MHz bandwidth RB=1, Offset 0 as the worst case.

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

1. CHANNEL: LOWEST

**Frequency range 30 MHz-1000 MHz**.
No spurious signals were found in all the range.

**Frequency range 1 GHz-10 GHz**.

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) |
|---|---|---|---|---|---|---|
| 1413.25 | -16.93 | Vertical | -35.18 | 1.50 | 7.63 | -29.05 |
| 2119.75 | -20.17 | Vertical | -38.49 | 1.90 | 10.09 | -30.30 |
| 2826.85 | -23.13 | Vertical | -39.73 | 2.30 | 10.83 | -31.20 |
| 3533.35 | -35.94 | Vertical | -52.02 | 2.53 | 11.81 | -42.74 |
| 4240.15 | -52.13 | Vertical | -66.13 | 2.90 | 11.86 | -57.17 |

2. CHANNEL: MIDDLE

**Frequency range 30 MHz-1000 MHz**.
No spurious signals were found in all the range.

**Frequency range 1 GHz-10 GHz**.

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) |
|---|---|---|---|---|---|---|
| 1420.45 | -17.33 | Vertical | -35.60 | 1.50 | 7.67 | -29.43 |
| 2130.25 | -22.80 | Vertical | -41.11 | 1.90 | 10.11 | -32.90 |
| 2840.35 | -28.75 | Vertical | -45.32 | 2.30 | 10.84 | -36.78 |
| 3550.75 | -38.64 | Vertical | -54.66 | 2.55 | 11.82 | -45.39 |
| 4261.15 | -49.88 | Vertical | -63.81 | 2.90 | 11.84 | -54.87 |

3. CHANNEL: HIGHEST

**Frequency range 30 MHz-1000 MHz**.
No spurious signals were found in all the range.

**Frequency range 1 GHz-10 GHz**.

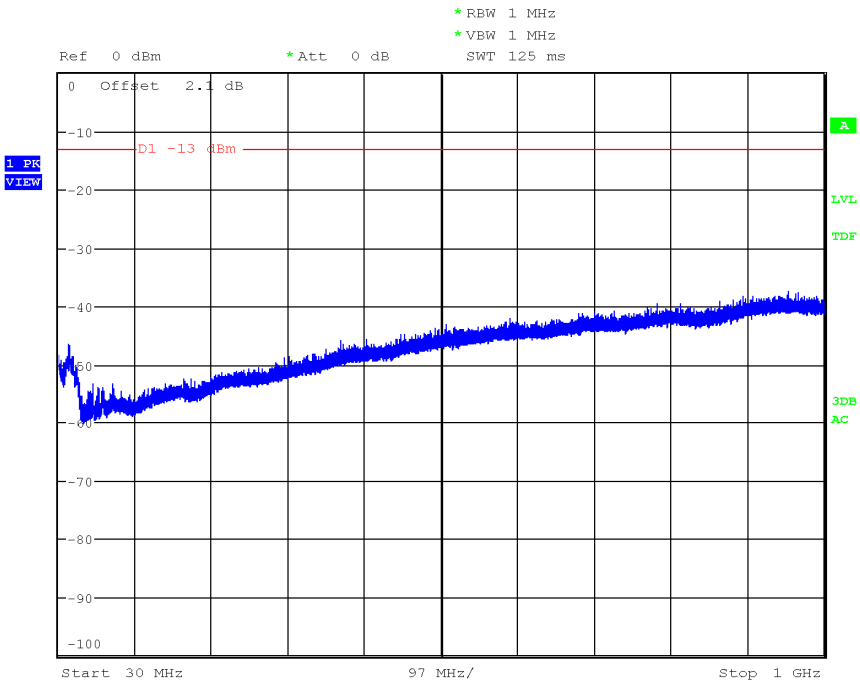
Substitution method data

| 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) |
|---|---|---|---|---|---|---|
| 1427.35 | -16.41 | Vertical | -34.72 | 1.50 | 7.71 | -28.51 |
| 2140.75 | -22.07 | Vertical | -40.38 | 1.90 | 10.13 | -32.15 |
| 2854.75 | -27.31 | Vertical | -43.83 | 2.30 | 10.84 | -35.29 |
| 3568.45 | -36.08 | Vertical | -52.05 | 2.57 | 11.83 | -42.79 |
| 4282.45 | -51.88 | Vertical | -65.75 | 2.90 | 11.83 | -56.82 |

Verdict: PASS

FREQUENCY RANGE 30 MHz-1000 MHz.

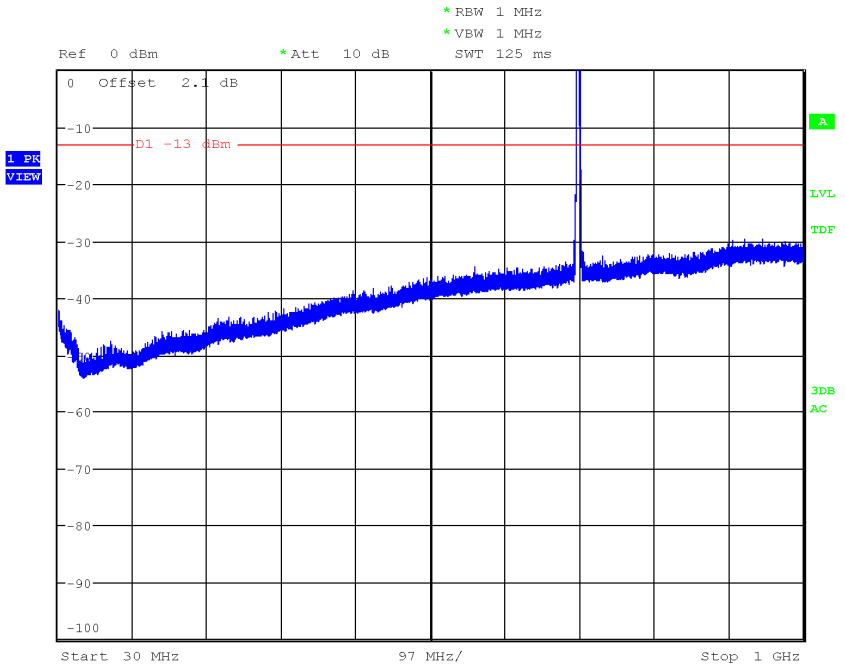
**LTE QPSK MODULATION. BW=1.4 MHz. Band IV**




(This plot is valid for all three channels)

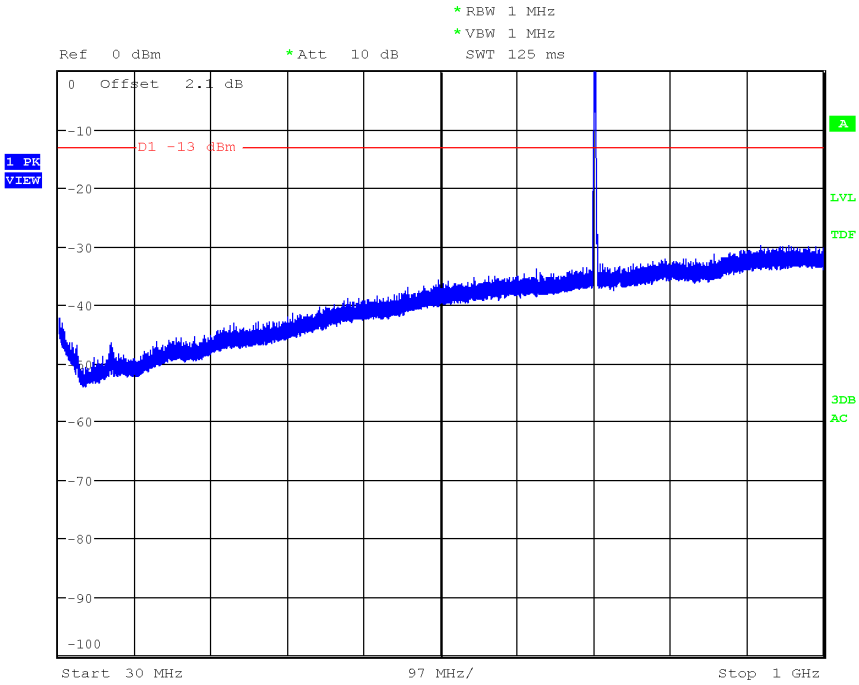
**LTE QPSK MODULATION. BW=5 MHz. Band XVII**

CHANNEL: LOWEST



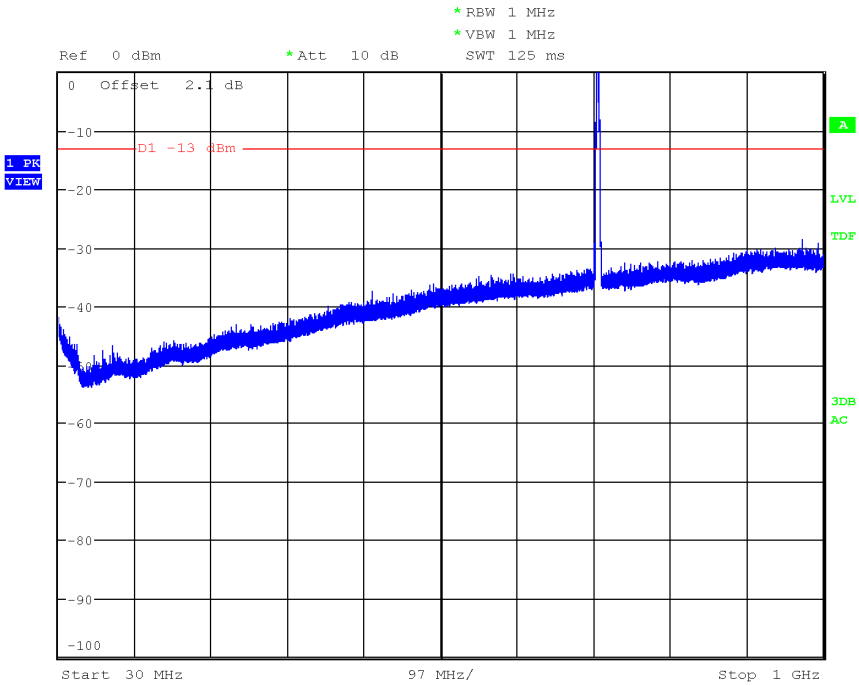

Note: The peak above the limit is the carrier frequency.

CHANNEL: MIDDLE




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

CHANNEL: HIGHEST



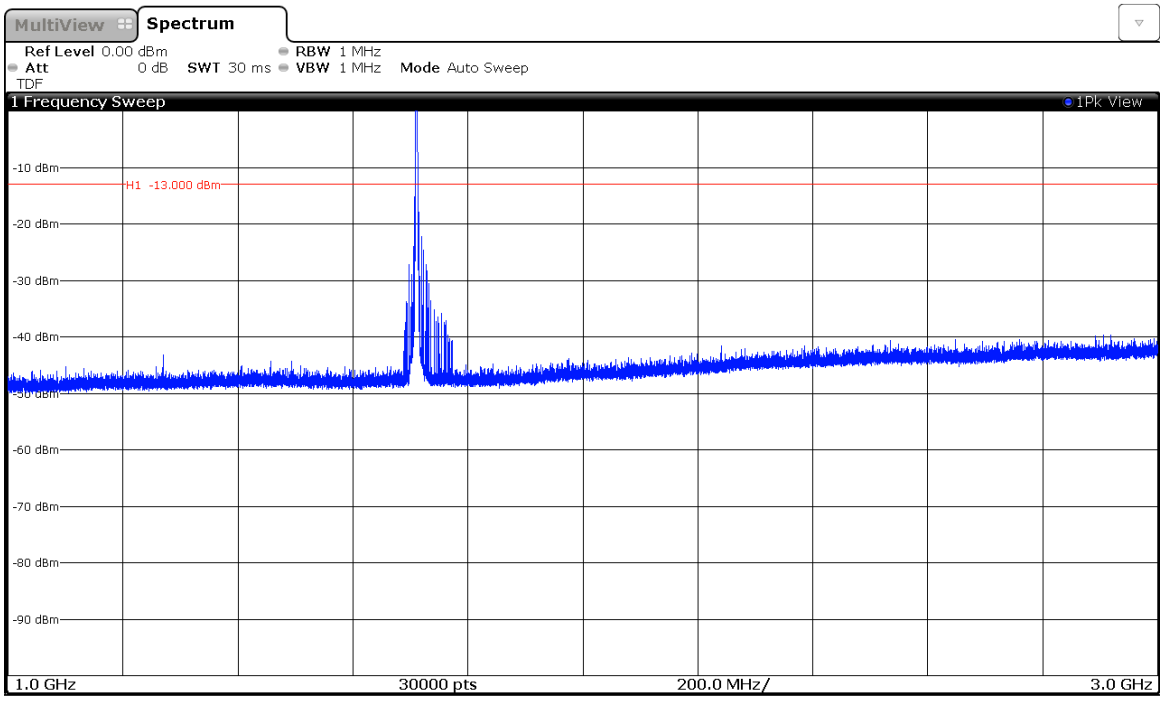

Note: The peak above the limit is the carrier frequency.

FREQUENCY RANGE 1 GHz to 3 GHz.

**LTE QPSK MODULATION.**

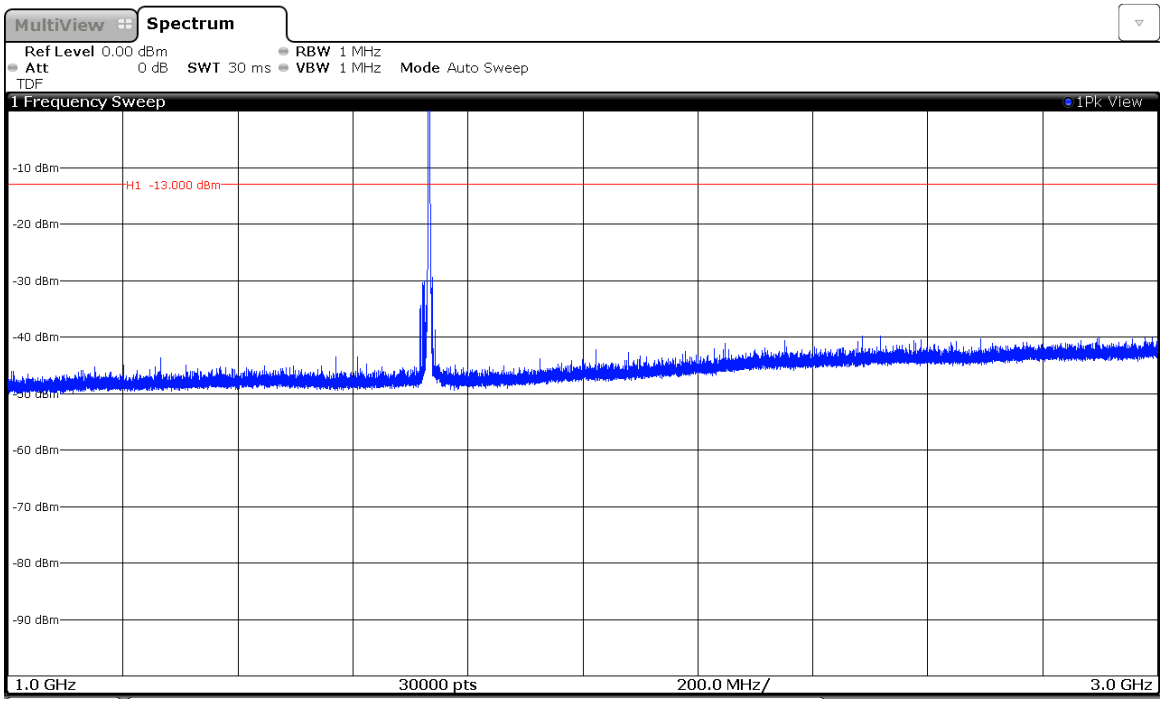
**BW=1.4 MHz. Band IV**

CHANNEL: LOWEST



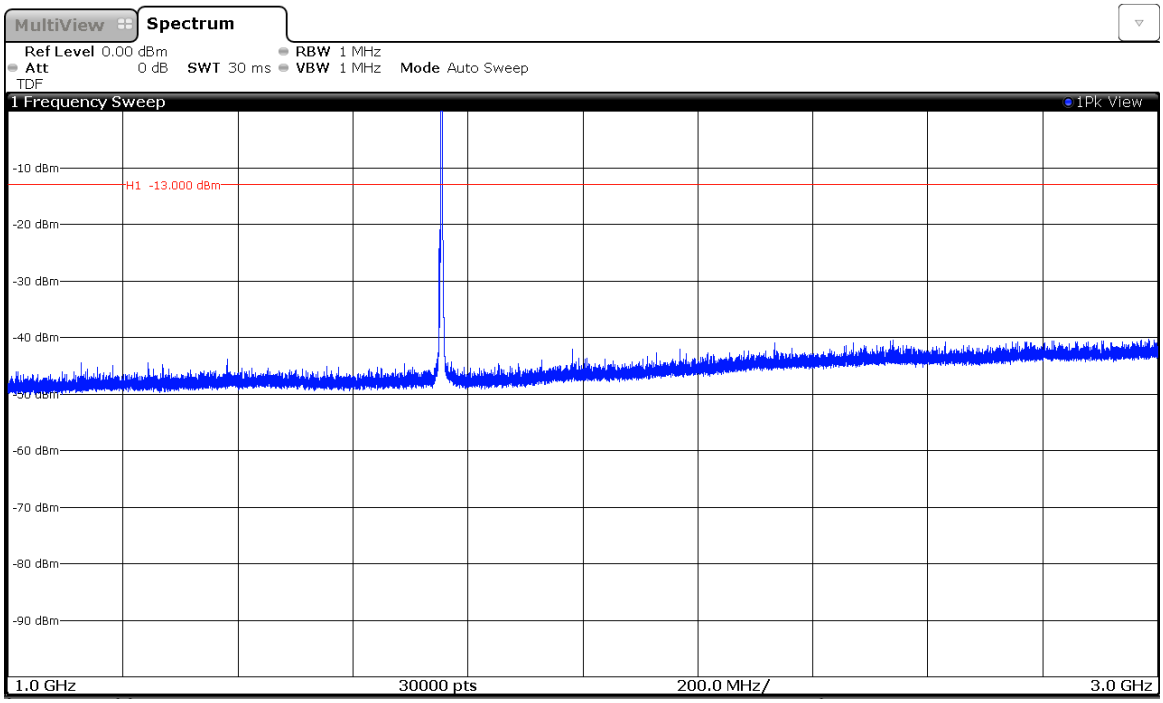

Note: The peak above the limit is the carrier frequency.

CHANNEL: MIDDLE




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

CHANNEL: HIGHEST

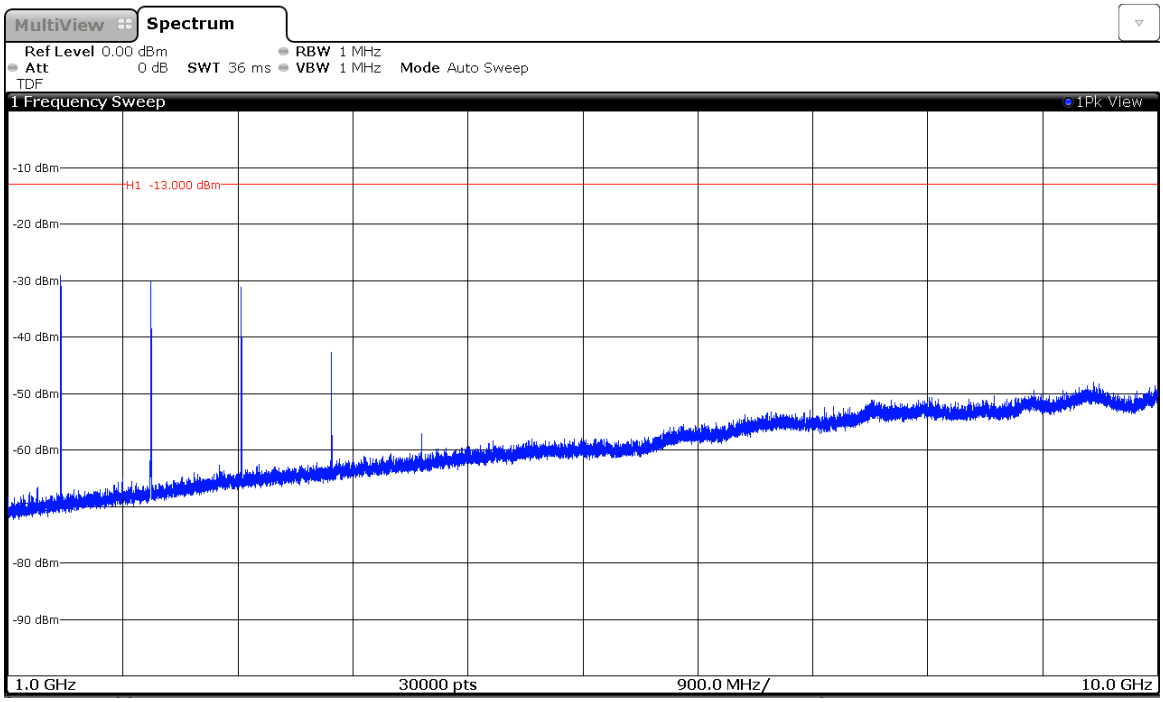



Note: The peak above the limit is the carrier frequency.

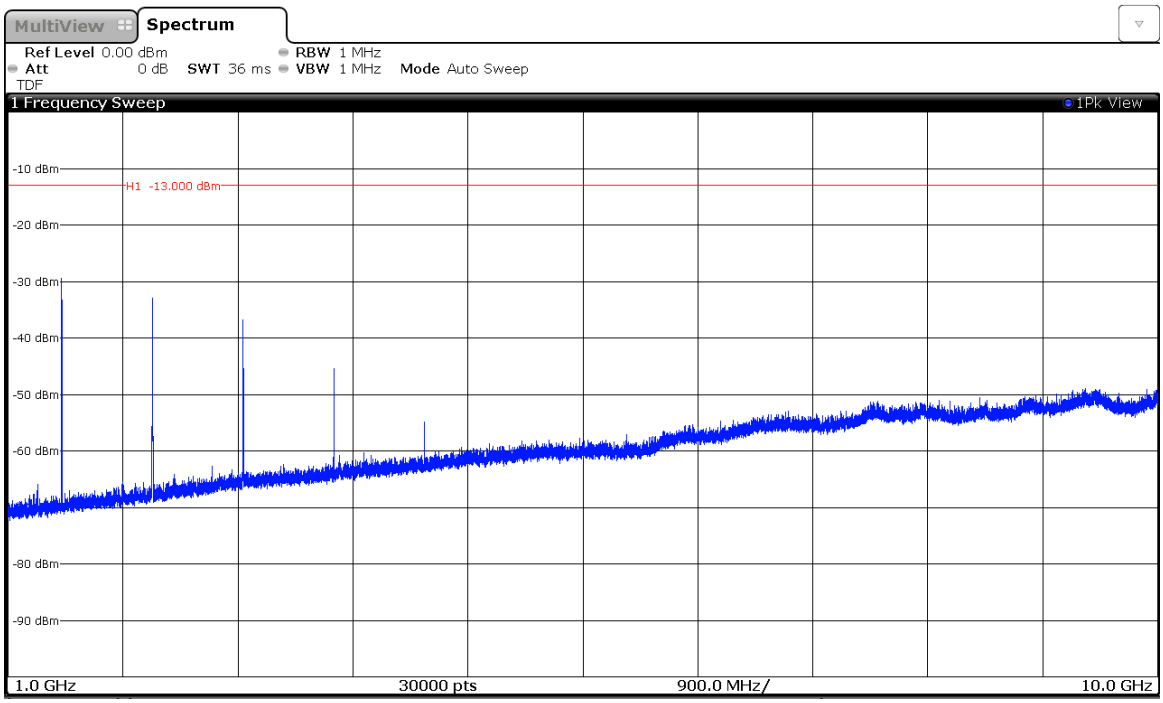
FREQUENCY RANGE 1 GHz to 10 GHz

**LTE QPSK MODULATION. BW=5 MHz. Band XVII**

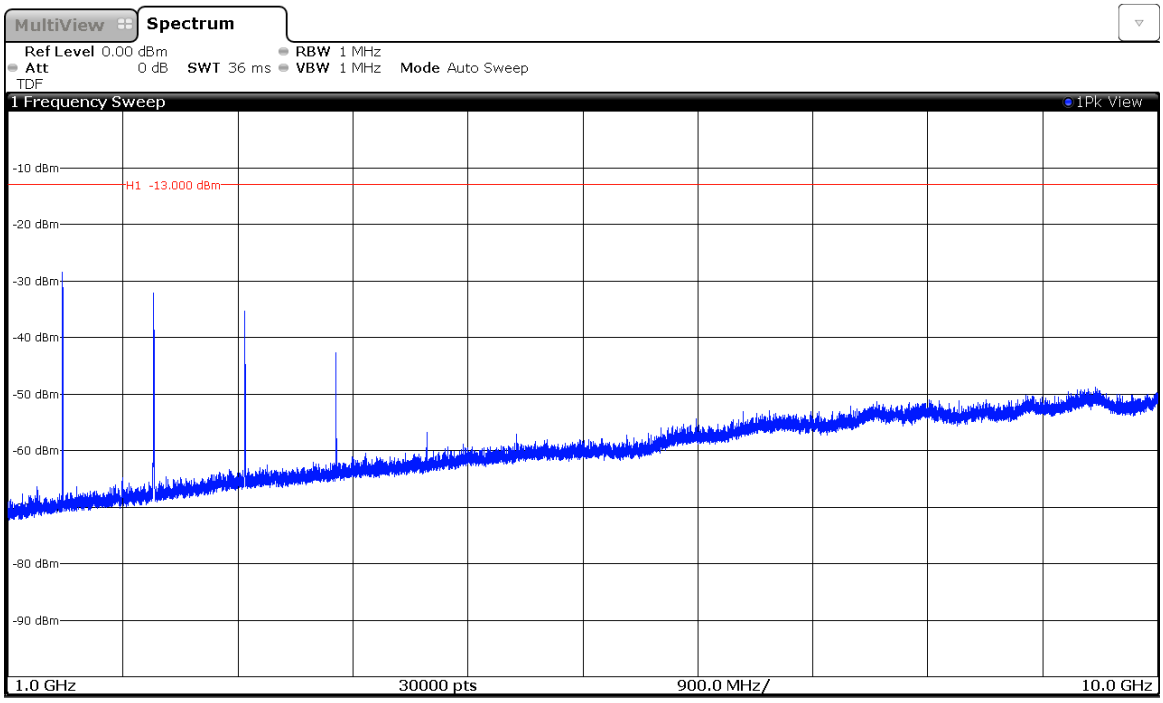
CHANNEL: LOWEST




CHANNEL: MIDDLE



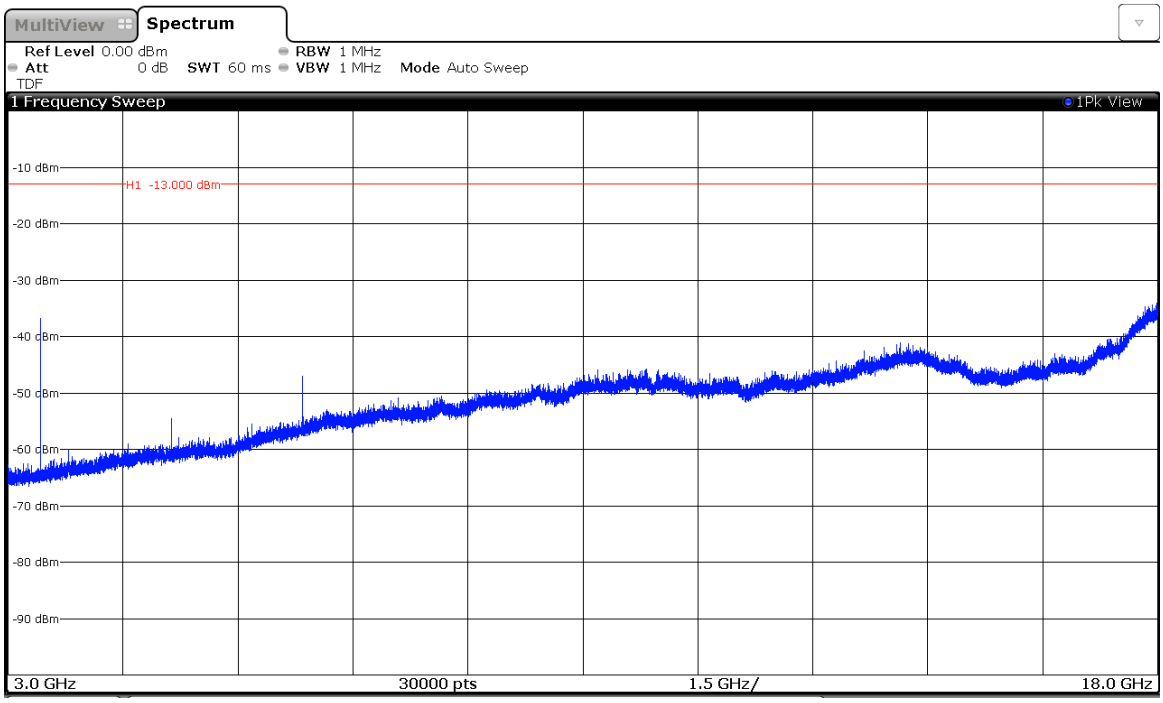
CHANNEL: HIGHEST



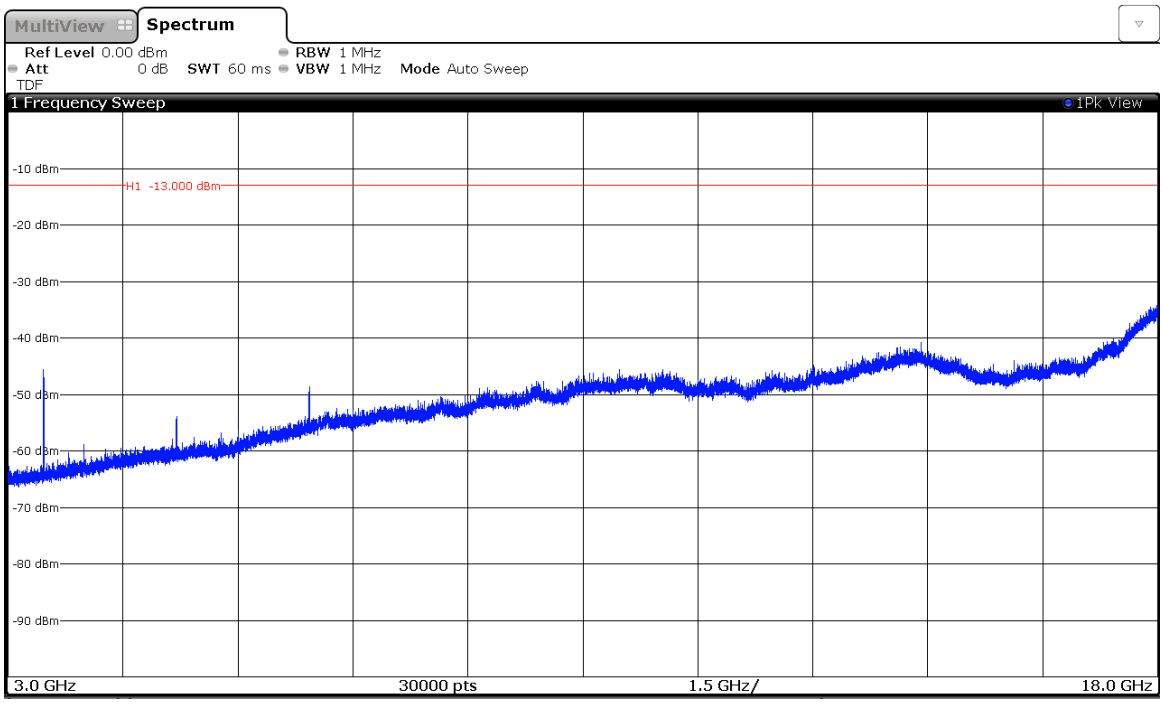

FREQUENCY RANGE 3 GHz to 18 GHz.

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

CHANNEL: LOWEST



CHANNEL: MIDDLE




CHANNEL: HIGHEST