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

Test Report No:
75755RRF.005A1

# Test Report
## USA FCC Part 90

| | |
|---|---|
| (*) Identification of item tested | nRF91 |
| (*) Trademark | nRF91 |
| (*) Model and /or type reference | nRF9161 |
| Other identification of the product | FCC ID: 2ANPO00nRF9161<br>IC: 24529-NRF9161 |
| (*) Features | LTE Cat-M1, LTE NB1&NB2<br>HW version: nRF9161 LACA A0A<br>SW version: mfw_nrf91x1_2.0.0-77.beta |
| Applicant | NORDIC SEMICONDUCTOR ASA<br>Otto Nielsens Veg 12, 7052 Trondheim, Norway |
| Test method requested, standard | USA FCC Part 90 (10-1-21 Edition).<br>ANSI C63.26-2015.<br>KDB 971168 D01 Power Meas License Digital Systems v03r01, April. 2018. |
| Summary | IN COMPLIANCE |
| Approved by (name / position & signature) | José Manuel Gómez Galván<br>EMC Consumer & RF<br>Lab. Manager<br>  Firmado digitalmente por 53680346W JOSE MANUEL GOMEZ (C:A29507456) |
| Date of issue | 2023-11-30 |
| Report template No | FDT08_24<br>(*) "Data provided by the client" |

# Index

Competences and guarantees ..... 3
General conditions ..... 3
Uncertainty ..... 3
Data provided by the client ..... 3
Usage of samples ..... 4
Test sample description ..... 4
Identification of the client ..... 5
Testing period and place ..... 5
Document history ..... 5
Environmental conditions ..... 5
Remarks and comments ..... 6
Testing verdicts ..... 7
Summary ..... 7
Appendix A: Test results for FCC 90: LTE Cat-M1 Band 26 ..... 8
Appendix B: Test results for FCC 90: LTE Cat NB1 Band 26 ..... 39

# Competences and guarantees

DEKRA Testing and Certification is a testing laboratory accredited by the National Accreditation Body (ENAC - Entidad Nacional de Acreditación) to perform the tests indicated in the Certificate No. 51/LE 147.

DEKRA Testing and Certification is an FCC-recognized accredited testing laboratory with appropriate scope of accreditation that covers the performed tests in this report.

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

DEKRA Testing and Certification 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 DEKRA Testing and Certification at the time of performance of the test.

DEKRA Testing and Certification 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 DEKRA Testing and Certification S.A.U.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of DEKRA Testing and Certification S.A.U. and the Accreditation Bodies.

# Uncertainty

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

# Data provided by the client

The following data has been provided by the client:

1. Information relating to the description of the sample ("Identification of the item tested", "Trademark", "Model and/or type reference tested").
2. The sample model nRF9161 is a Development Kit that has nRF9161 IOT Module and GPS. The nRF9161 is capable of LTE Cat-M1, Cat-NB1&NB2 and GPS. The Development kit contains antennas for cellular and GPS.

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

# Usage of samples

Samples undergoing test have been selected by: The client.

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

| Control Nº | Description | Model | Serial Nº | Date of reception |
|---|---|---|---|---|
| 75755B/005 | nRF91 | nRF9161 | 359746166778998 | 11-05-2023 |
| 75755B/007 | USB Cable | - | - | 11-05-2023 |

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

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

| Control Nº | Description | Model | Serial Nº | Date of reception |
|---|---|---|---|---|
| 75755B/003 | nRF91 | nRF9161 | 359746166783618 | 11-05-2023 |
| 75755B/007 | USB Cable | - | - | 11-05-2023 |
| 75755B/011 | Antenna Cable SMA | - | - | 11-05-2023 |

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

# Test sample description

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Ports……: | Port name and description | Cable | | | | | |
| | | Specified max length [m] | Attached during test | Shielded | Coupled to patient(3) | | |
| | LTE RF | 2 | ☒ | ☒ | ☐ | | |
| | GPS | 2 | ☐ | ☐ | ☐ | | |
| Supplementary information to the ports……: | - | | | | | | |
| Rated power supply ..... : | Voltage and Frequency | | | Reference poles | | | |
| | | | | L1 | L2 | L3 | N | PE |
| | ☐ | AC: | | ☐ | ☐ | ☐ | ☒ | ☐ |
| | ☐ | AC: | | ☐ | ☐ | ☐ | ☒ | ☐ |
| | ☒ | DC: 3.0-5.5V | | | | | | |
| | ☐ | DC: | | | | | | |
| Rated Power..... : | 1W | | | | | | | |
| Clock frequencies..... : | 32kHz, 32MHz | | | | | | | |
| Other parameters ..... : | - | | | | | | | |
| Software version..... : | mfw_nrf91x1_2.0.0-77.beta | | | | | | | |
| Hardware version ..... : | nRF9161 LACA A0A | | | | | | | |
| Dimensions in cm (W x H x D) ... : | 155x64x9mm | | | | | | | |
| Mounting position ..... : | ☒ | Table top equipment | | | | | | |
| | ☐ | Wall/Ceiling mounted equipment | | | | | | |
| | ☐ | Floor standing equipment | | | | | | |
| | ☐ | Hand-held equipment | | | | | | |
| | ☐ | Other: | | | | | | |

| | | | |
|---|---|---|---|
| Modules/parts..... : | Module/parts of test item | Type | Manufacturer |
| | - | - | - |
| Accessories (not part of the test item) ..... : | Description | Type | Manufacturer |
| | - | - | - |
| Documents as provided by the applicant..... : | Description | File name | Issue date |
| | - | - | - |

(3) Only for Medical Equipment

## Identification of the client

NORDIC SEMICONDUCTOR ASA

Otto Nielsens Vei 12, 7052 Trondheim, Norway

## Testing period and place

| | |
|---|---|
| **Test Location** | DEKRA Testing and Certification S.A.U. |
| **Date (start)** | 2023-05-15 |
| **Date (finish)** | 2023-08-10 |

## Document history

| Report number | Date | Description |
|---|---|---|
| 75755RRF.005 | 2023-11-301 | First release. |
| 75755RRF.005A1 | 2023-11-27 | Second release. Minor typos corrected. This release cancels and replaces 75755RRF.005. |

## Environmental conditions

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

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

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

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

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

| | |
|---|---|
| **Temperature** | Min. = 15 ºC<br>Max. = 35 ºC |

| | |
|---|---|
| **Relative humidity** | Min. = 20 %<br>Max. = 75 % |

## Remarks and comments

The tests have been performed by the technical personnel: Rafael Fernández, Sergio Carrasco, Alberto Agüera, Valentín Andarias, Carmen Vázquez, Ireneo Bibang, Pablo Redondo.

Used instrumentation:

| Control No. | Equipment | Model | Manufacturer | Next Calibration |
|---|---|---|---|---|
| 6794 | Shielded Room | S101 | ETS LINDGREN | N/A |
| 9229 | Wideband Radio Communication Tester | CMW500 | ROHDE AND SCHWARZ | 2024-06 |
| 7794 | Signal and Spectrum Analyzer 10 Hz - 40 GHz | FSV40 | ROHDE AND SCHWARZ | 2025-04 |
| 2215 | Power Divider DC-25 GHz | 5333-104 | PICOSECOND PULSE LABS | 2024-07 |
| 8002 | TEMPERATURE CHAMBER MK56 BINDER | MK 56 | BINDER | 2024-04 |
| 5880 | DC POWER SUPPLY 30V/5A | U8002A | KEYSIGHT TECHNOLOGY | N/A |
| 5850 | DIGITAL MULTIMETER | 179 | DIGITAL MULTIMETER | 2023-11 |
| 6791 | SEMIANECHOIC ABSORBER LINED | FACT 3 200 STP | ETS LINDGREN | N/A |
| 6792 | SHIELDED ROOM | S101 | ETS LINDGREN | N/A |
| 6143 | Biconical/Log Antenna 30 MHz - 6 GHz | 3142E | ETS LINDGREN | 2023-10 |
| 6496 | HORN ANTENNA 1-18GHz | BBHA 9120 D | SCHWARZBECK | 2023-08 |
| 7817 | EMI TEST RECEIVER 2Hz-44GHz | ESW44 | ROHDE AND SCHWARZ | 2023-12 |
| 3783 | PRE-AMPLIFIER G>30dB 1GHz-18GHz | BLMA 0118-3A | BONN ELEKTRONIK | 2023-12 |
| 8912 | Wideband Radio Communication Tester | CMW500 | ROHDE AND SCHWARZ | 2023-09 |
| 7798 | EMC/RF MEASUREMENT SOFTWARE | WMS32 | ROHDE AND SCHWARZ | N/A |
| 4848 | SOFTWARE FOR EMC/RF TESTING | EMC32 | ROHDE AND SCHWARZ | N/A |

# Testing verdicts

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

# Summary

## Appendix A: LTE Cat-M1 Band 26.

| FCC PART 90 | | |
|---|---|---|
| **Requirement – Test case** | **Verdict** | **Remark** |
| FCC 90.635 (b): RF output power | P | |
| FCC 2.1047: Modulation characteristics | P | |
| FCC 90.213: Frequency stability | P | |
| FCC 2.1049: Occupied Bandwidth | P | |
| FCC 90.691: Spurious emissions at antenna terminals | P | |
| FCC 90.691: Spurious emissions at antenna terminals (Emission mask requirements for EA-based systems) | P | |
| FCC 90.691: Radiated emissions | P | |
| Supplementary information and remarks: None. | | |

## Appendix B: LTE Cat NB1 Band 26.

| FCC PART 90 | | |
|---|---|---|
| **Requirement – Test case** | **Verdict** | **Remark** |
| FCC 90.635 (b): RF output power | P | |
| FCC 2.1047: Modulation characteristics | P | |
| FCC 90.213: Frequency stability | P | |
| FCC 2.1049: Occupied Bandwidth | P | |
| FCC 90.691: Spurious emissions at antenna terminals | P | |
| FCC 90.691: Spurious emissions at antenna terminals (Emission mask requirements for EA-based systems) | P | |
| FCC 90.691: Radiated emissions | P | |
| Supplementary information and remarks: None. | | |

# Appendix A: Test results for FCC 90: LTE Cat-M1 Band 26

# INDEX

TEST CONDITIONS ..... 10
RF Output Power ..... 11
Frequency Stability ..... 14
Modulation Characteristics ..... 18
Occupied Bandwidth ..... 20
Spurious emissions at antenna terminals ..... 25
Spurious Emissions at Antenna Terminals at Block Edges ..... 29
Radiated Emissions ..... 33

# TEST CONDITIONS

(*): Declared by the Applicant.

POWER SUPPLY (*):

| | |
|---|---|
| Vnormal: | 5 Vdc. |
| Vmin | 3 Vdc |
| Vmax | 5.5 Vdc |
| Type of Power Supply: | Internal DC. |

ANTENNA (*):

| Bands | Gain (dBi) | Type |
|---|---|---|
| LTE 26 | +2.7 | SMD |

TEST FREQUENCIES:

LTE Cat-M1 Band 26. Sub-band 814-824 MHz. QPSK and 16QAM:

| | Channel (Frequency, MHz) | | | | |
|---|---|---|---|---|---|
| | BW=1.4 MHz | BW=3 MHz | BW=5 MHz | BW=10 MHz | BW=15 MHz |
| Low | 26697 (814.7) | 26705 (815.5) | 26715 (816.5) | N/A | N/A |
| Middle | 26740 (819) | 26740 (819) | 26740 (819) | 26740 (819) | N/A |
| High | 26783 (823.3) | 26775 (822.5) | 26765 (821.5) | N/A | N/A |

LTE Cat-M1 Band 26. Cross-rule Channel (824 MHz). QPSK and 16QAM:

| Channel (Frequency, MHz) | | | | |
|---|---|---|---|---|
| BW=1.4 MHz | BW=3 MHz | BW=5 MHz | BW=10 MHz | BW=15 MHz |
| 26790 (824) | 26790 (824) | 26790 (824) | 26790 (824) | 26790 (824) |

# RF Output Power

***Limits***

FCC §90.635 (b): The maximum output power of the transmitter for mobile stations is 100 Watts (20 dBW).

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

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

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

***Test Setup***

***Results***

**CONDUCTED AVERAGE POWER:**

Measurements required on one frequency near top channel and one frequency near bottom channel, according to FCC § 15.31 (m).

LTE Cat-M1 Band 26. Sub-band 814-824 MHz:

Worst-case of RF Power is BW=10 MHz, Middle Channel, 16QAM, RB Size=3, RB Offset=1, Narrow Band=0.

| BANDWIDTH (MHz) | CHANNEL | FREQUENCY (MHz) | MODULATION | RB SIZE | RB OFFSET | AVERAGE POWER (dBm) |
|---|---|---|---|---|---|---|
| 10 | Middle 26740 | 819 | QPSK | 1 | 0 | 22.49 |
| | | | | 1 | 2 | 22.51 |
| | | | | 1 | 5 | 22.52 |
| | | | | 3 | 0 | 22.5 |
| | | | | 3 | 1 | 22.51 |
| | | | | 3 | 3 | 22.51 |
| | | | | 6 | 0 | 21.47 |
| | | | 16QAM | 1 | 0 | 22.44 |
| | | | | 1 | 2 | 22.47 |
| | | | | 1 | 5 | 22.47 |
| | | | | 3 | 0 | 22.78 |
| | | | | 3 | 1 | 22.79 |
| | | | | 3 | 3 | 22.65 |
| | | | | 5 | 0 | 21.67 |

BW=10 MHz. QPSK:

| MAX POWER | QPSK COND. POWER AVG (dBm) | ANTENNA GAIN (dBi) | RAD. POWER AVG EIRP(dBm) |
|---|---|---|---|
| MIDDLE | 22.52 | 2.7 | 25.22 |
| MAX: | 22.52 | | 25.22 |

BW=10 MHz. 16QAM:

| MAX POWER | 16QAM COND. POWER AVG (dBm) | ANTENNA GAIN (dBi) | RAD. POWER AVG EIRP(dBm) |
|---|---|---|---|
| MIDDLE | 22.79 | 2.7 | 25.49 |
| MAX: | 22.79 | | 25.49 |

LTE Cat-M1 Band 26. Cross-rule Channel 824 MHz:

Worst-case of RF Power is BW=15 MHz, Middle Channel, 16QAM, RB Size=1, RB Offset=0, Narrow Band=5.

| BANDWIDTH (MHz) | CHANNEL | FREQUENCY (MHz) | MODULATION | RB SIZE | RB OFFSET | AVERAGE POWER (dBm) |
|---|---|---|---|---|---|---|
| 15 | Middle 26790 | 824 | QPSK | 1 | 0 | 22.64 |
| | | | | 1 | 2 | 22.58 |
| | | | | 1 | 5 | 22.58 |
| | | | | 3 | 0 | 22.65 |
| | | | | 3 | 1 | 22.65 |
| | | | | 3 | 3 | 22.65 |
| | | | | 6 | 0 | 22.67 |
| | | | 16QAM | 1 | 0 | 23.27 |
| | | | | 1 | 2 | 23.14 |
| | | | | 1 | 5 | 23.13 |
| | | | | 3 | 0 | 22.86 |
| | | | | 3 | 1 | 22.85 |
| | | | | 3 | 3 | 22.85 |
| | | | | 5 | 0 | 22.72 |

BW=10 MHz. QPSK:

| MAX POWER | QPSK COND. POWER AVG (dBm) | ANTENNA GAIN (dBi) | RAD. POWER AVG EIRP(dBm) |
|---|---|---|---|
| MIDDLE | 22.67 | 2.7 | 25.37 |
| MAX: | 22.67 | | 25.37 |

BW=10 MHz. 16QAM:

| MAX POWER | 16QAM COND. POWER AVG (dBm) | ANTENNA GAIN (dBi) | RAD. POWER AVG EIRP(dBm) |
|---|---|---|---|
| MIDDLE | 23.27 | 2.7 | 25.97 |
| MAX: | 23.27 | | 25.97 |

Measurement uncertainty (dB) <±1.11

***Verdict***

Pass

# Frequency Stability

***Limits***

FCC § 90.213: Frequency stability.

The applicant shall ensure frequency stability by showing that fL minus the frequency offset and fH 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 –30ºC to +50ºC. The EUT was placed inside a climatic chamber and the temperature was raised hourly in 10ºC steps from –30ºC up to +50ºC.
The supply voltage was varied between 85% and 115% of nominal voltage.

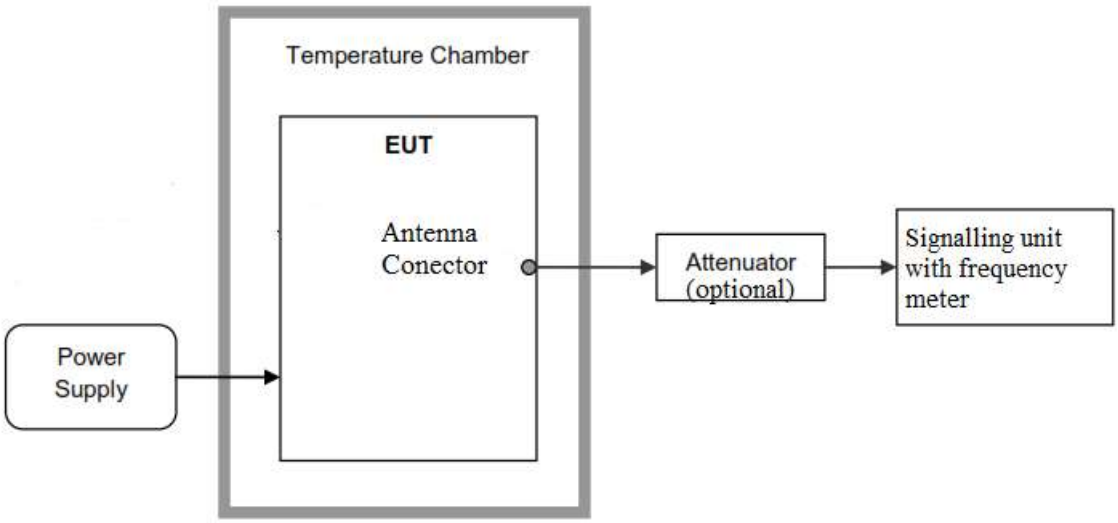
The EUT was set in “Radio Resource Control (RRC) mode” in the middle channel using the Universal Radio Communication tester R&S CMW500 and the maximum frequency error was measured using the built-in calibrated frequency meter.
The worst case LTE mode for conducted power was used for the test.

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

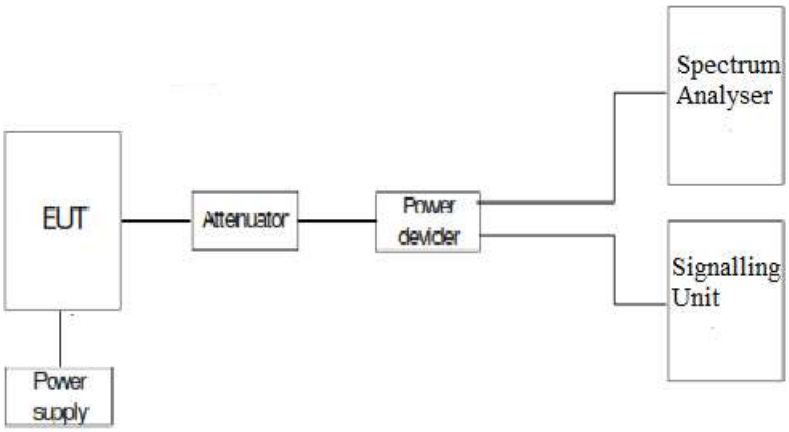
The reference point measurements were made at the RF output terminals of the EUT using an attenuator. power splitter and spectrum analyser. The EUT was controlled via the Universal Radio Communication tester R&S CMW500 selecting maximum transmission power of the EUT and different modes of modulation.

***Test Setup***

1. Frequency Tolerance:




2. Reference Frequency Points fL and fH:



***Results***

**LTE Cat-M1 Band 26. Sub-band 814-824 MHz:**

The worst case modulation in terms of Frequency Stability is BW=10 MHz, QPSK.

**1. Frequency Tolerance:**

- **Frequency Stability over Temperature Variations:**

| Temperature (ºC) | Frequency Error (Hz) | Frequency Error (ppm) |
|---|---|---|
| 85 | 0.11 | 0,00013431 |
| 80 | 5.42 | 0,006617827 |
| 70 | -6.84 | -0,008351648 |
| 60 | 2.-35 | 0,002869353 |
| +50 | -0.11 | -0.00013431 |
| +40 | -7.84 | -0.00957265 |
| +30 | 4.55 | 0.005555556 |
| +20 | -4.78 | -0.005836386 |
| +10 | -3.39 | -0.004139194 |
| 0 | -1.47 | -0.001794872 |
| -10 | -4.11 | -0.005018315 |
| -20 | -7.7 | -0.009401709 |
| -30 | 2.25 | 0.002747253 |
| -40 | -4.15 | -0,005067155 |

- **Frequency Stability over Voltage Variations.**

| Battery Supply voltage | Voltage (V) | Frequency Error (Hz) | Frequency Error (ppm) |
|---|---|---|---|
| Vmax | 5.5 | 2.33 | 0.00284493 |
| Vmin (*) | 3 | 1.2 | 0.001465201 |

(*): Operating end point specified by the manufacturer.

**2. Reference Frequency Points fL and fH:**

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

| | |
|---|---|
| *f*L (MHz) | 814.00414 |
| *f*H (MHz) | 823.98607 |

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

Measurement uncertainty (Hz) <± 249.55

***Results***

PASS

# Modulation Characteristics

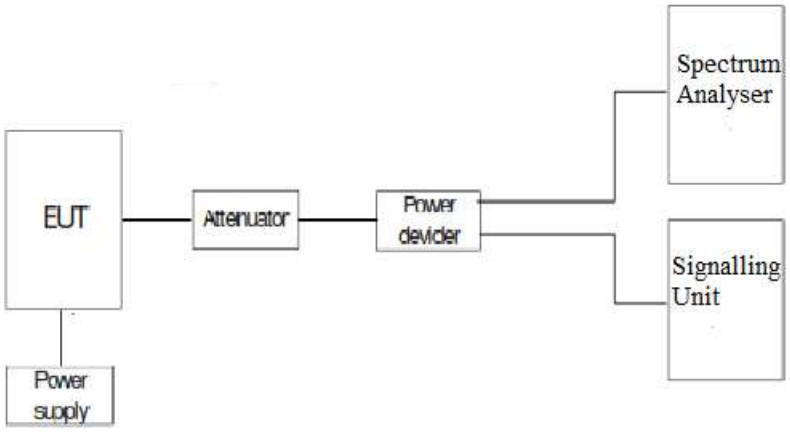
### *Limits*

FCC §2.1047 Measurements required: Modulation characteristics.

### *Method*

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

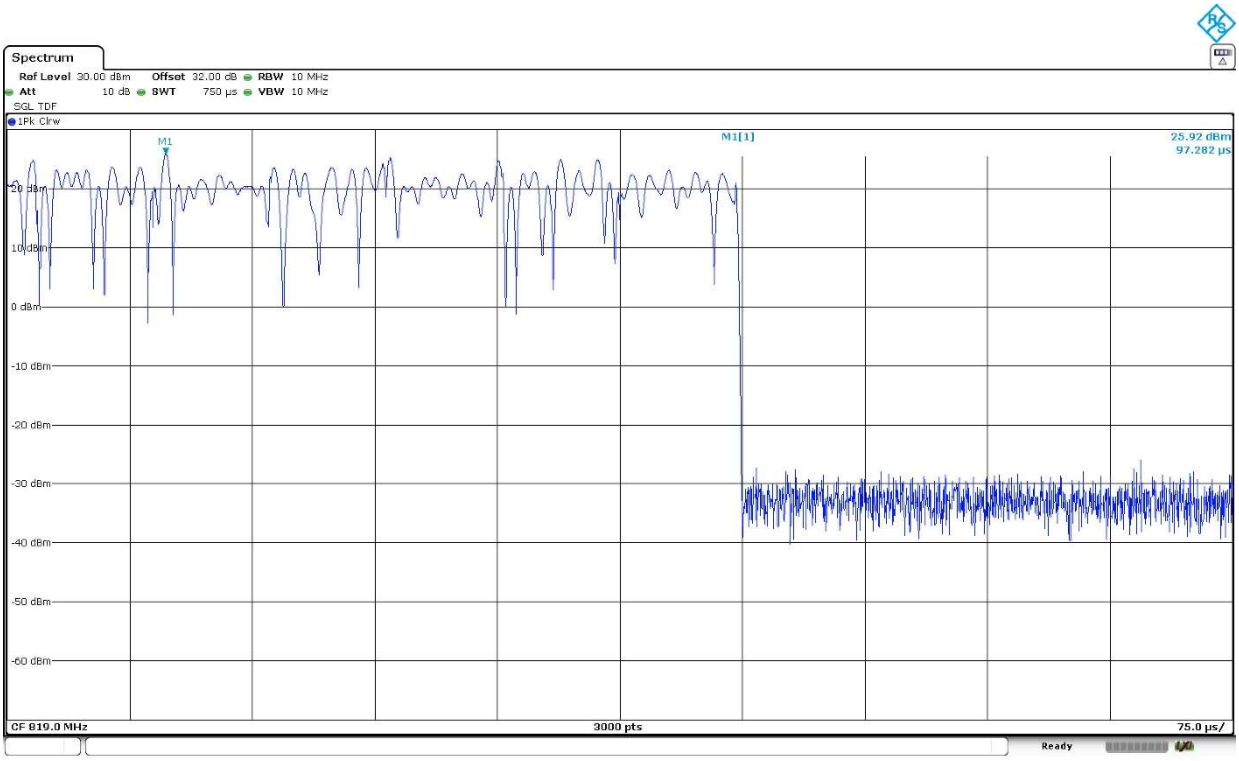
### *Test Setup*



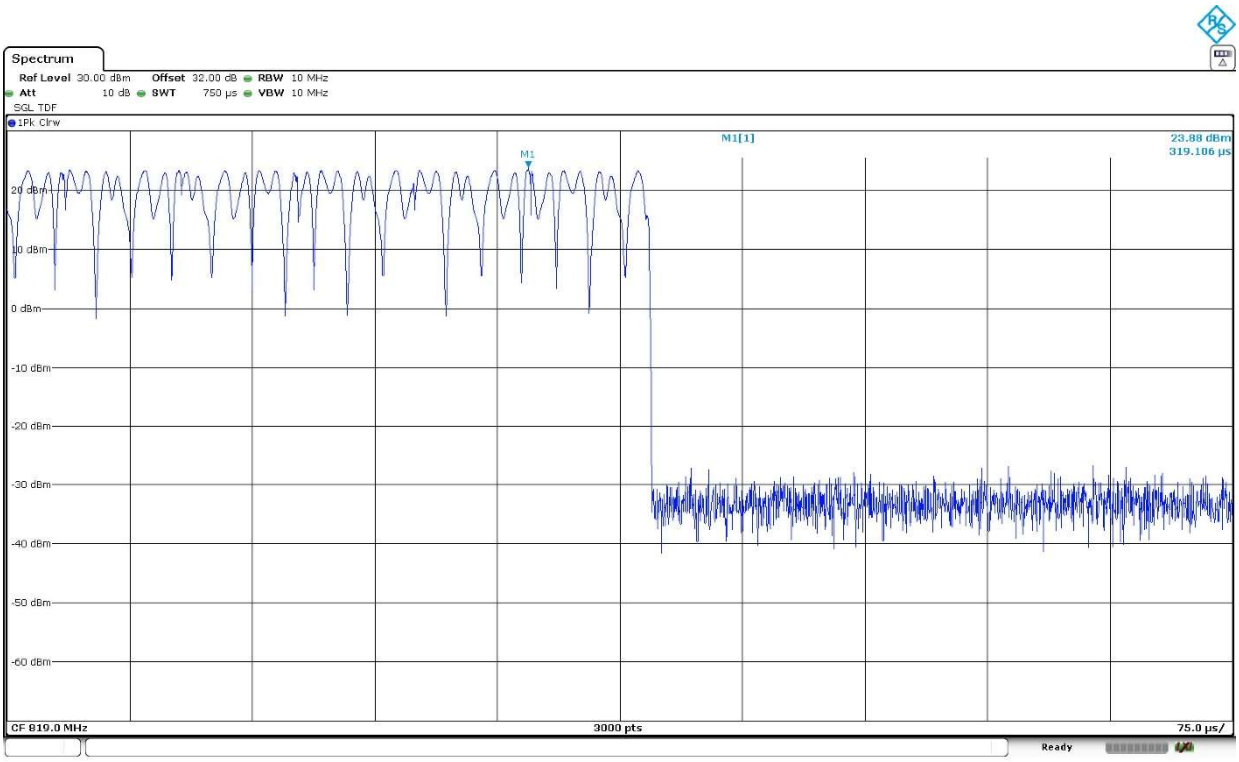
### *Results*

The following plots show the modulation schemes in the EUT.

**LTE Cat-M1 Band 26. Sub-band 814-824 MHz**: BW = 10 MHz. QPSK.




**LTE Cat-M1 Band 26. Sub-band 814-824 MHz**: BW = 10 MHz. 16QAM.



# Occupied Bandwidth

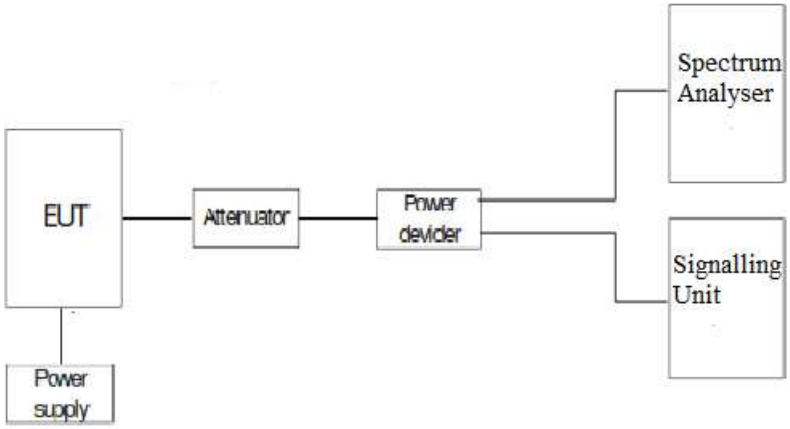
***Limits***

FCC §2.1049. Measurements required: Occupied bandwidth.

***Method***

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

***Test Setup***



***Results***

**LTE Bands**: The worst case of Occupied Bandwidth corresponds to all Resource Blocks (RB) with Offset 0, regardless the nominal bandwidth selected.

**LTE Cat-M1 Band 26. Sub-band 814-824 MHz:**

LTE Cat-M1 Band 26. Sub-band 814-824 MHz. BW = 1.4 MHz. QPSK. RB Size = All.

| | Low Channel | High Channel |
|---|---|---|
| 99% Occupied Bandwidth (MHz) | 1.11330 | 1.10820 |
| -26 dBc Bandwidth (MHz) | 1.44714 | 1.38989 |
| Measurement uncertainty (kHz) | <±4.67 | |

LTE Cat-M1 Band 26. Sub-band 814-824 MHz. BW = 1.4 MHz. 16QAM. RB Size = All.

| | Low Channel | High Channel |
|---|---|---|
| 99% Occupied Bandwidth (MHz) | 0.94440 | 0.94470 |
| -26 dBc Bandwidth (MHz) | 1.29412 | 1.28234 |
| Measurement uncertainty (kHz) | <±4.67 | |

**LTE Cat-M1 Band 26. Cross-rule Channel 824 MHz:**

LTE Cat-M1 Band 26. Cross-rule Channel 824 MHz. BW = 1.4 MHz. QPSK. RB Size = All.

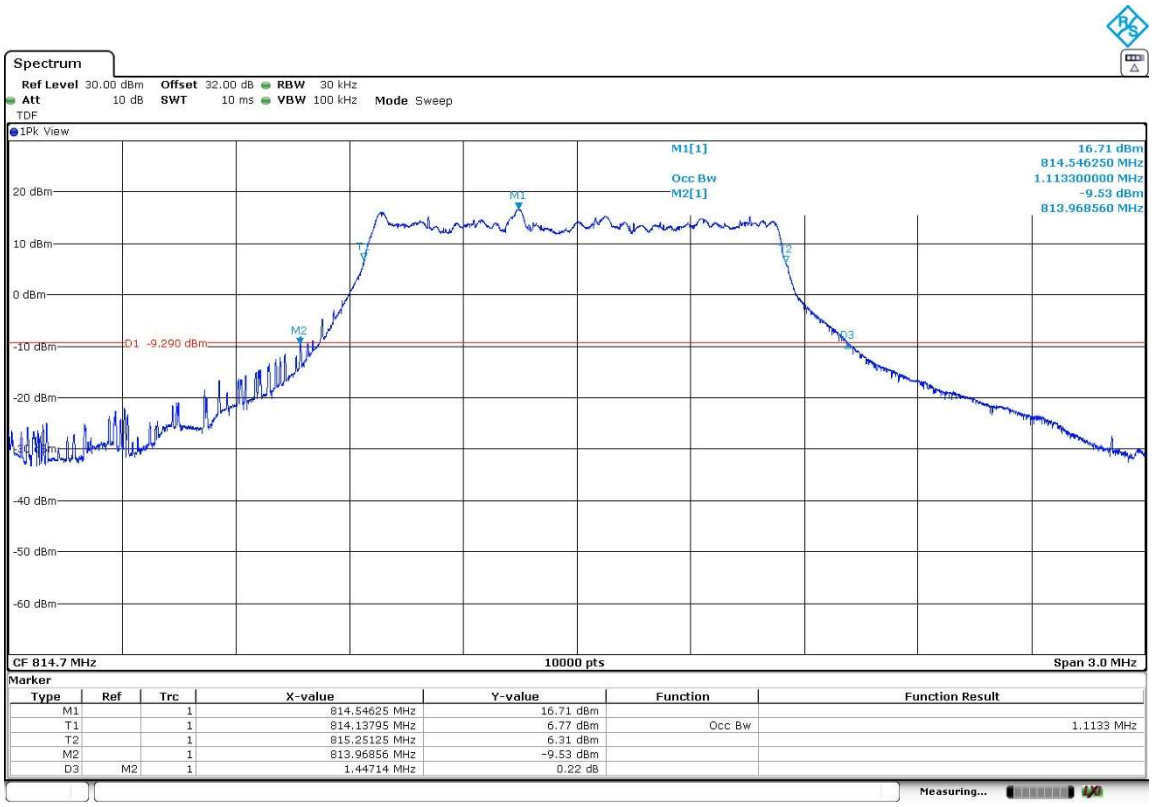
| | Single Channel |
|---|---|
| 99% Occupied Bandwidth (MHz) | 1.10910 |
| -26 dBc Bandwidth (MHz) | 1.38705 |
| Measurement uncertainty (kHz) | <±4.67 |

LTE Cat-M1 Band 26. Cross-rule Channel 824 MHz. BW = 1.4 MHz. 16QAM. RB Size = All.

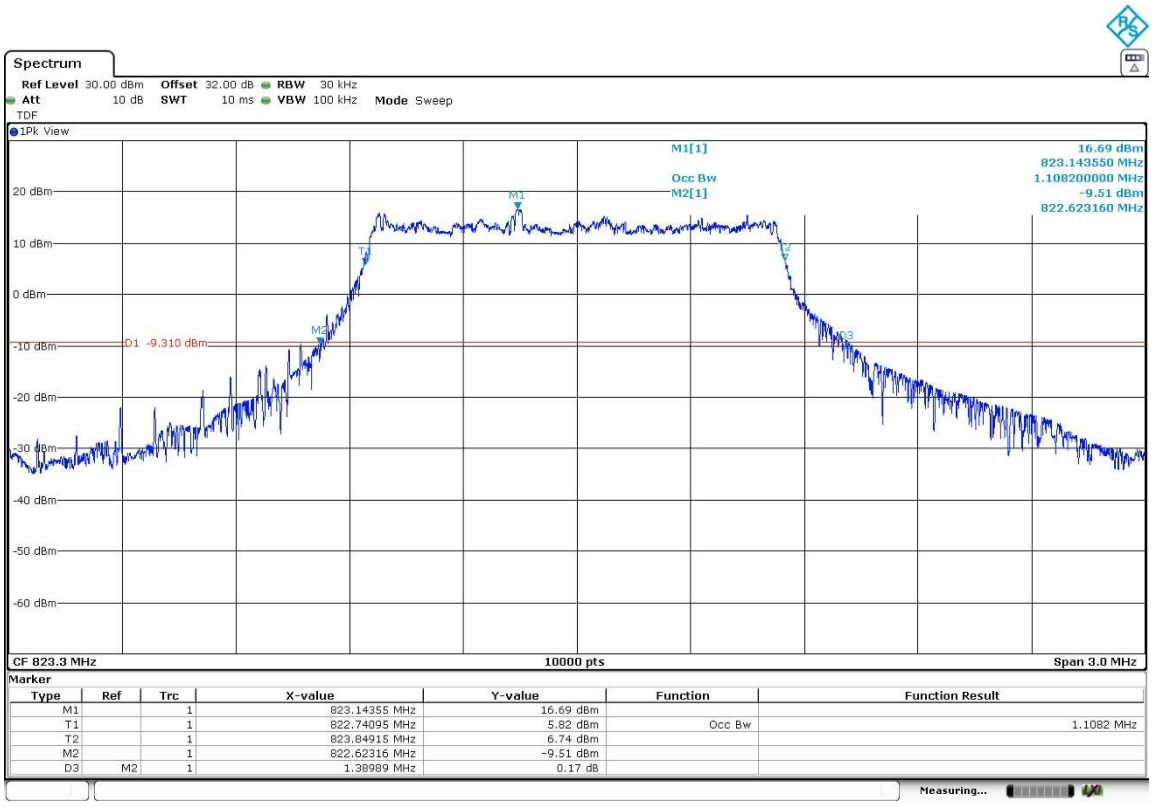
| | Single Channel |
|---|---|
| 99% Occupied Bandwidth (MHz) | 0.94530 |
| -26 dBc Bandwidth (MHz) | 1.29517 |
| Measurement uncertainty (kHz) | <±4.67 |

LTE Cat-M1 Band 26. Sub-band 814-824 MHz. BW = 1.4 MHz. QPSK.

Low Channel:

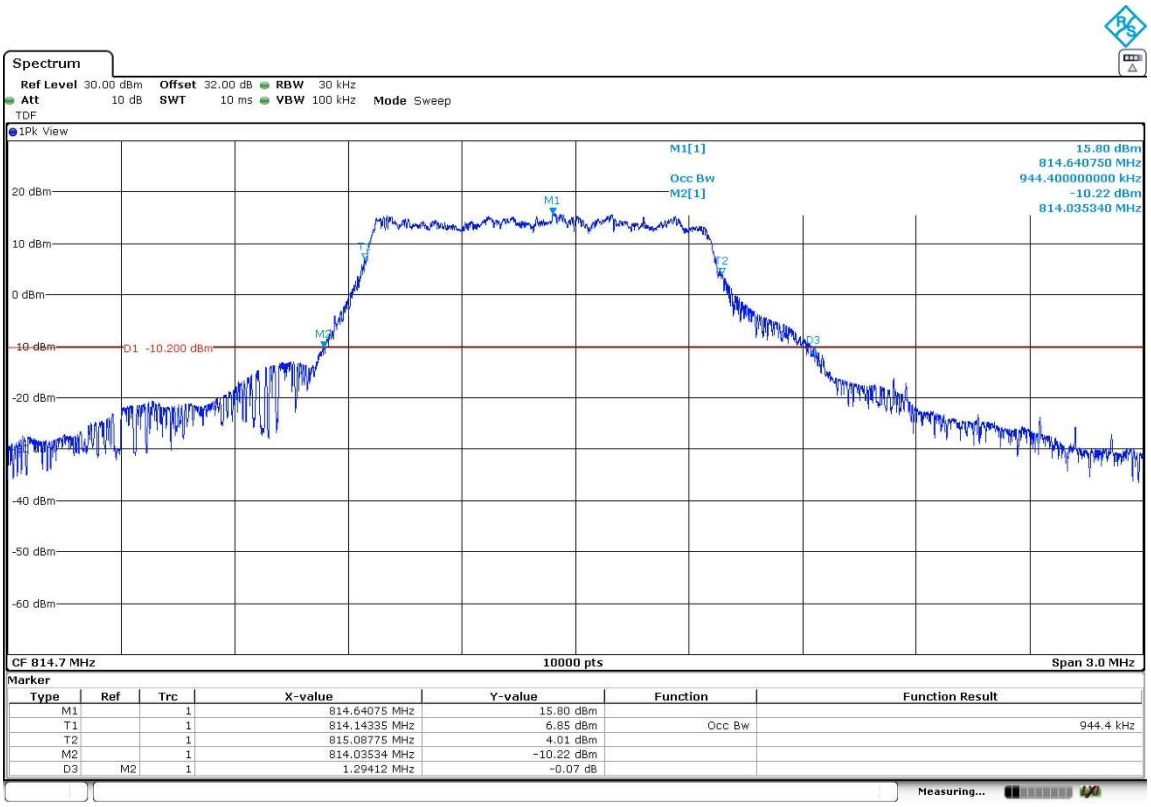



High Channel:

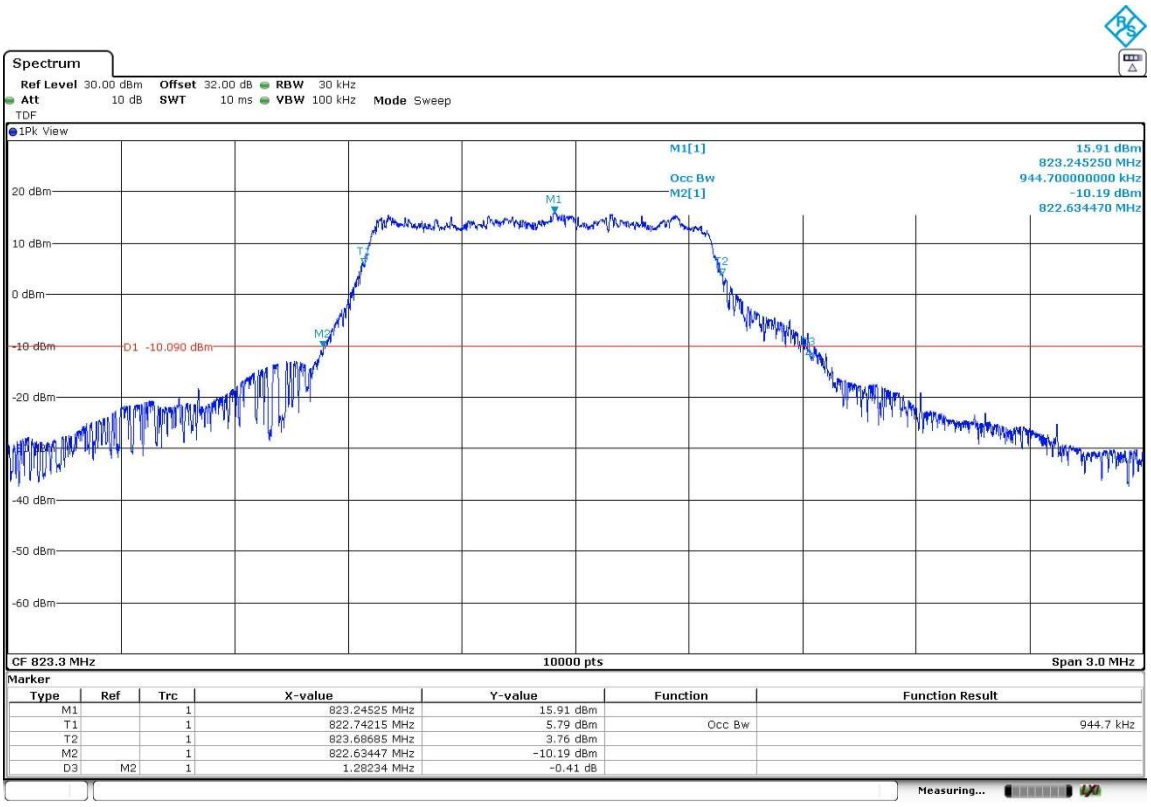


LTE Cat-M1 Band 26. Sub-band 814-824 MHz. BW = 1.4 MHz. 16QAM.

Low Channel:

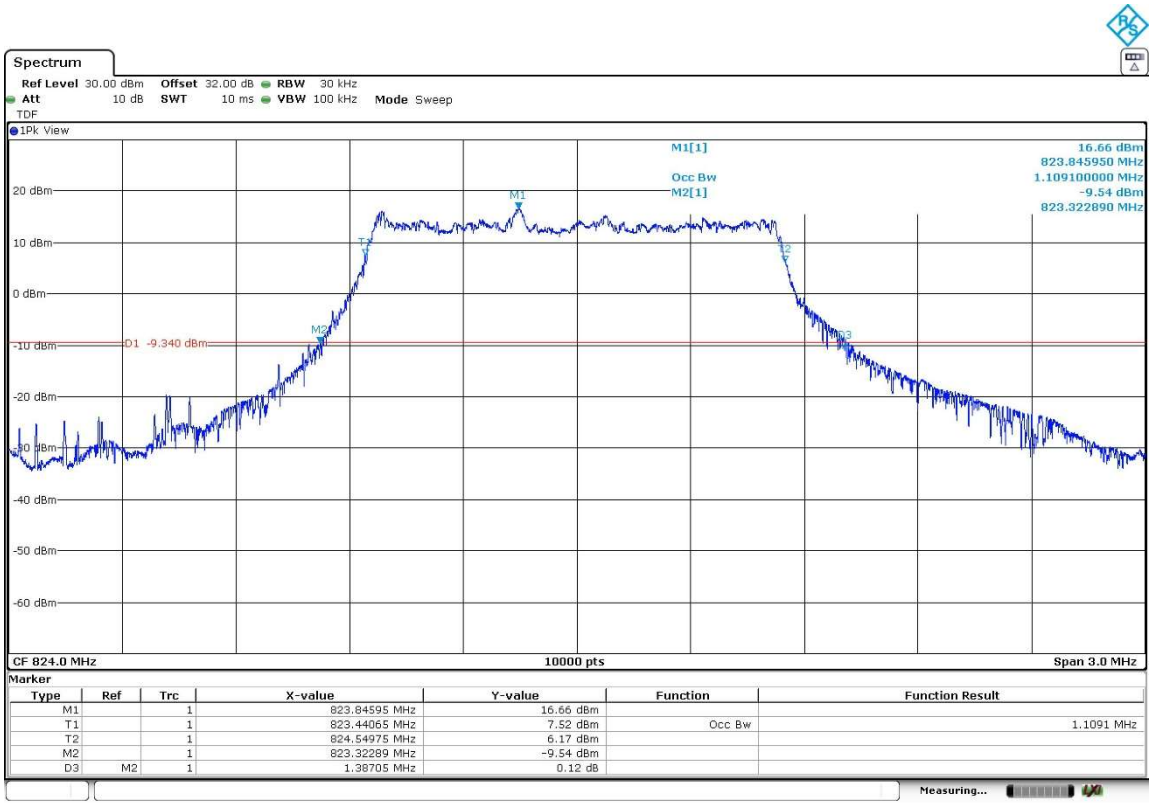



High Channel:



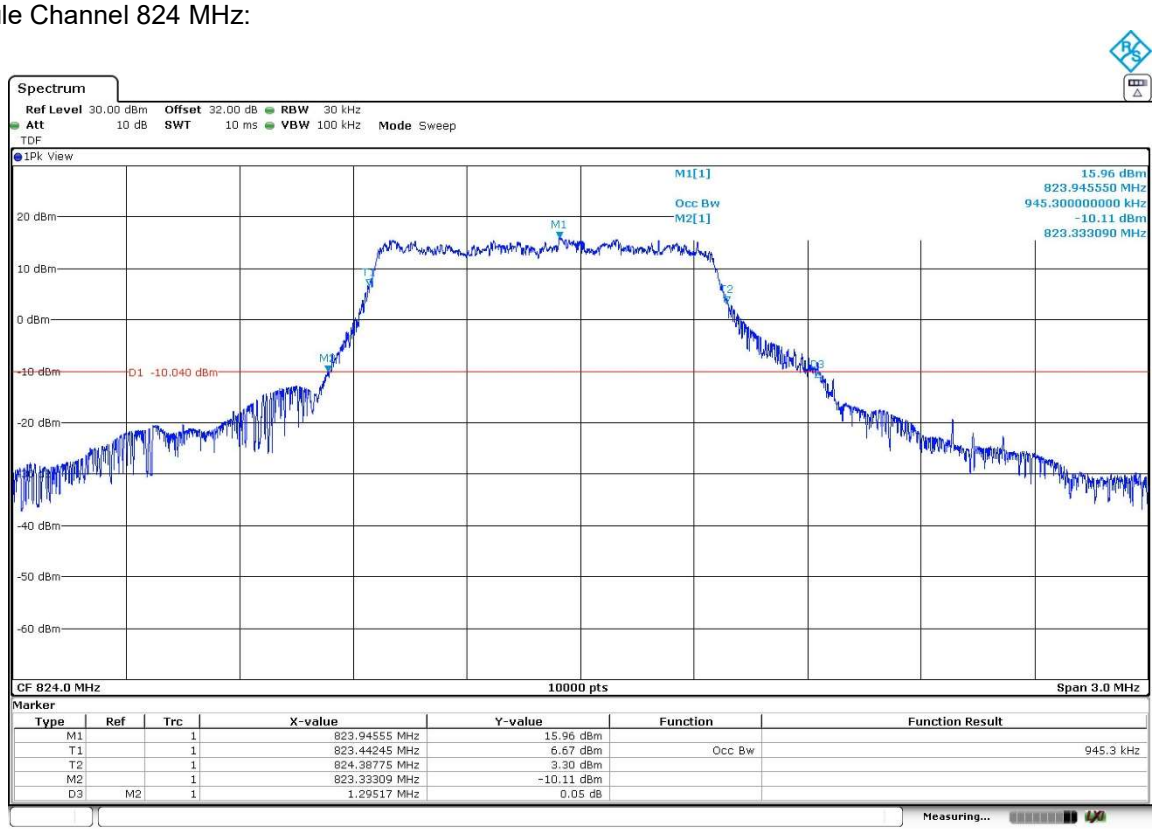
LTE Cat-M1 Band 26. Cross-rule Channel 824 MHz. BW = 1.4 MHz. QPSK.

Cross-rule Channel 824 MHz:




LTE Cat-M1 Band 26. Cross-rule Channel 824 MHz. BW = 1.4 MHz. 16QAM.

Cross-rule Channel 824 MHz:



# Spurious emissions at antenna terminals

***Limits***

FCC §2.1051. Measurements required: Spurious emissions at antenna terminals.

FCC §90.543 (e) (2) (3) & (5):

> (e) For operations in the 758-768 MHz and the 788-798 MHz bands, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:
>
> > (2) On all frequencies between 769-775 MHz and 799-805 MHz, by a factor not less than 65 + 10 log (P) dB in a 6.25 kHz band segment, for mobile and portable stations.
> >
> > (3) On any frequency between 775-788 MHz, above 805 MHz, and below 758 MHz, by at least 43 + 10 log (P) dB.
> >
> > (5) Compliance with the provisions of paragraph (e)(3) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of 30 kHz may be employed.

FCC §90.691:

> (a) Out-of-band emission requirement shall apply only to the “outer” channels included in an EA license and to spectrum adjacent to interior channels used by incumbent licensees. The emission limits are as follows:
>
> > (1) For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 116 Log10(f/6.1) decibels or 50 + 10 Log10(P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz.
> >
> > (2) For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 43 + 10Log10(P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.
>
> (b) When an emission outside of the authorized bandwidth causes harmful interference, the Commission may, at its discretion, require greater attenuation than specified in this section.

***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 divider.
The spectrum was investigated from 9 kHz to 18 GHz for 3G Band IV and from 9 kHz to 8 GHz for LTE Band 13.
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.

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