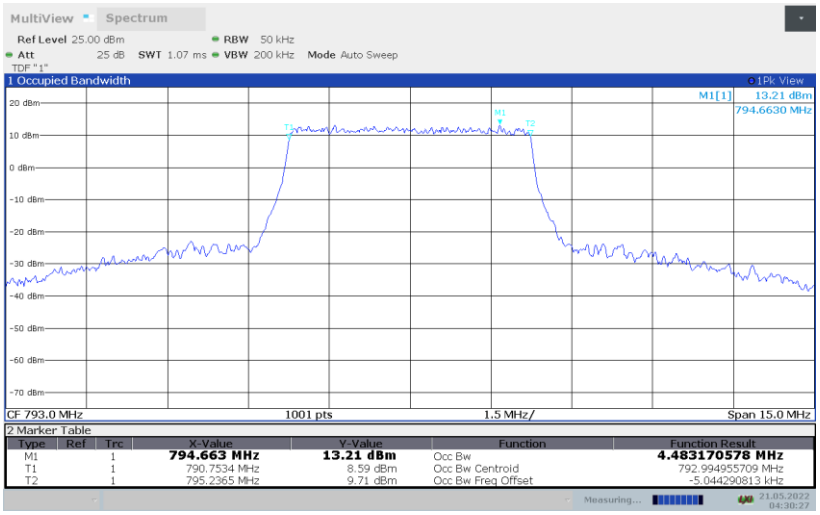
**LTE band 14,5MHz Bandwidth, 64QAM (99% BW)**

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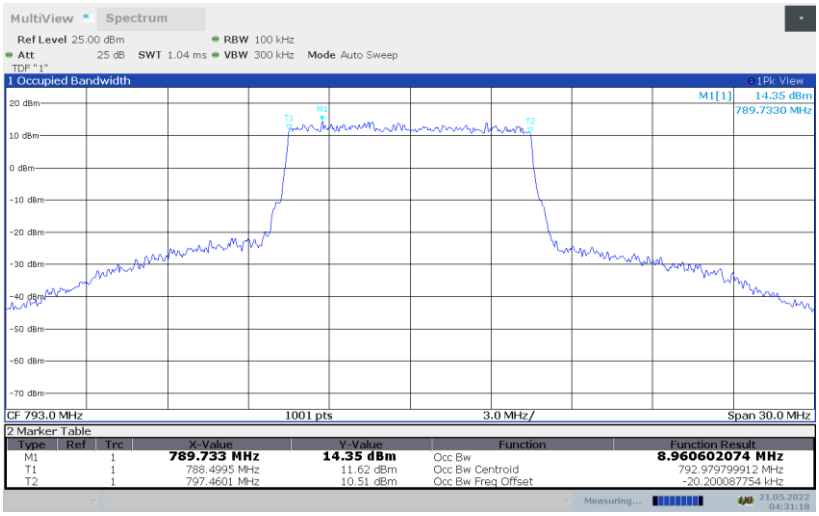
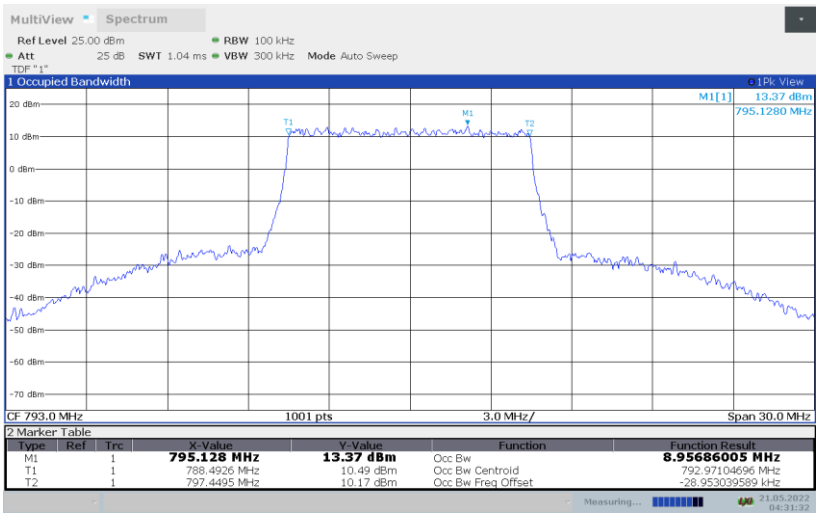
**LTE band 14,10MHz (99% BW)**

| Frequency(MHz) | Occupied Bandwidth (99% BW)(MHz) | | |
|---|---|---|---|
| 793 | QPSK | 16QAM | 64QAM |
| | 8.961 | 8.957 | 8.958 |

**LTE band 14,10MHz Bandwidth, QPSK (99% BW)**




**LTE band 14,10MHz Bandwidth, 16QAM (99% BW)**

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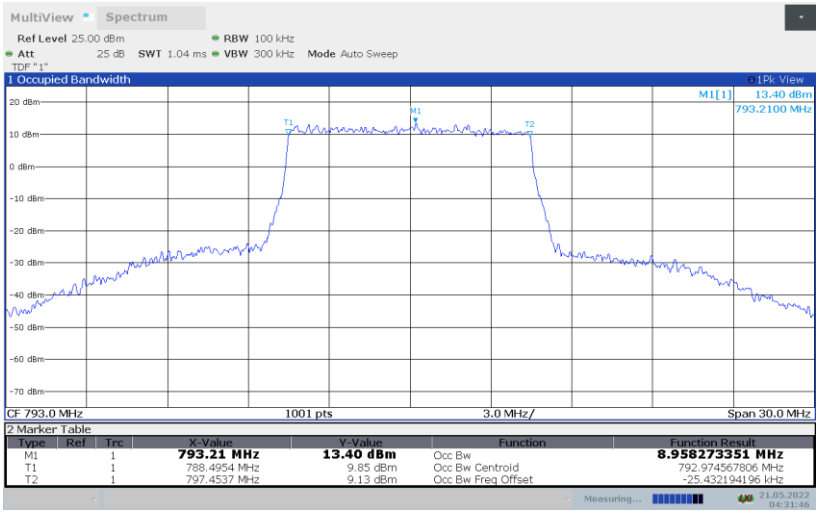
**LTE band 14,10MHz Bandwidth, 64QAM (99% BW)**

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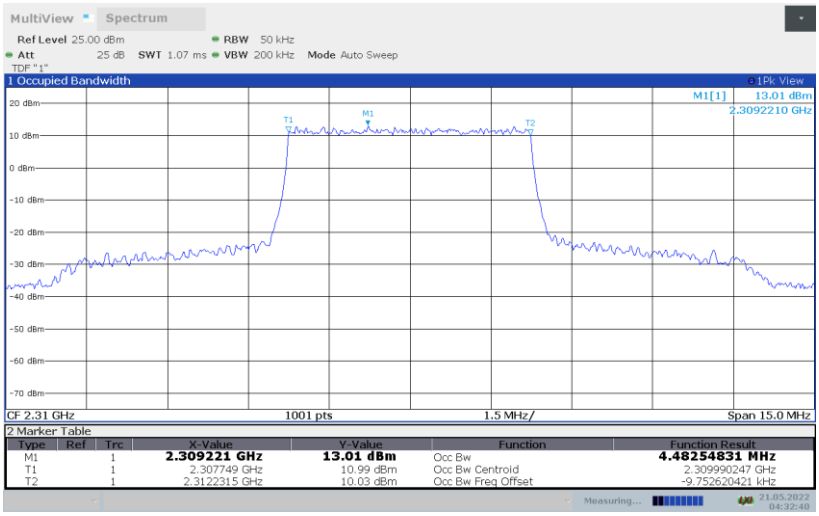
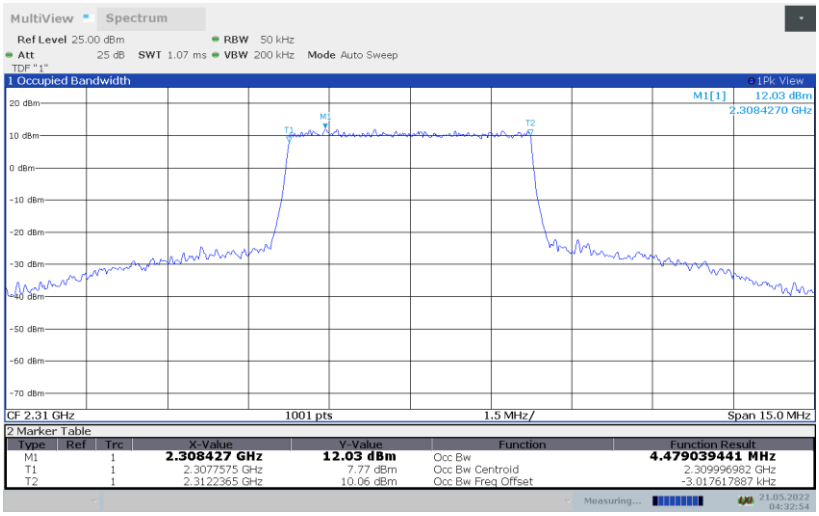
**LTE band 30,5MHz (99% BW)**

| Frequency(MHz) | Occupied Bandwidth (99% BW)(MHz) | | |
|---|---|---|---|
| 2310 | QPSK | 16QAM | 64QAM |
| | 4.483 | 4.479 | 4.481 |

**LTE band 30,5MHz Bandwidth, QPSK (99% BW)**




**LTE band 30,5MHz Bandwidth,16QAM (99% BW)**




**LTE band 30,5MHz Bandwidth,64QAM (99% BW)**

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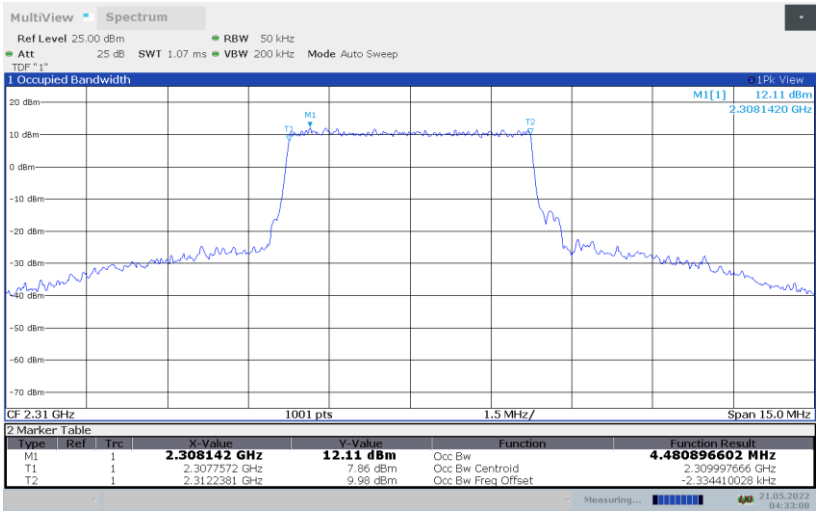


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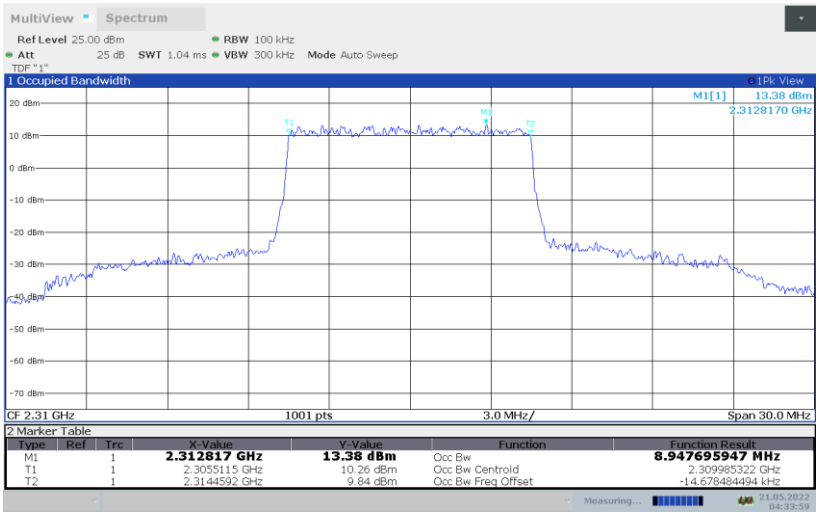
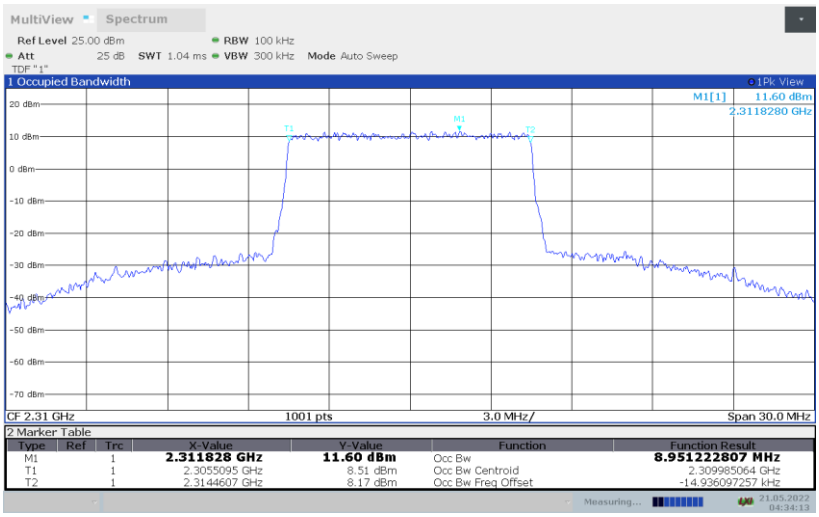
**LTE band 30,10MHz (99% BW)**

| Frequency(MHz) | Occupied Bandwidth (99% BW)(MHz) | | |
|---|---|---|---|
| 2310 | QPSK | 16QAM | 64QAM |
| | 8.948 | 8.951 | 8.956 |

**LTE band 30,10MHz Bandwidth, QPSK (99% BW)**




**LTE band 30,10MHz Bandwidth, 16QAM (99% BW)**

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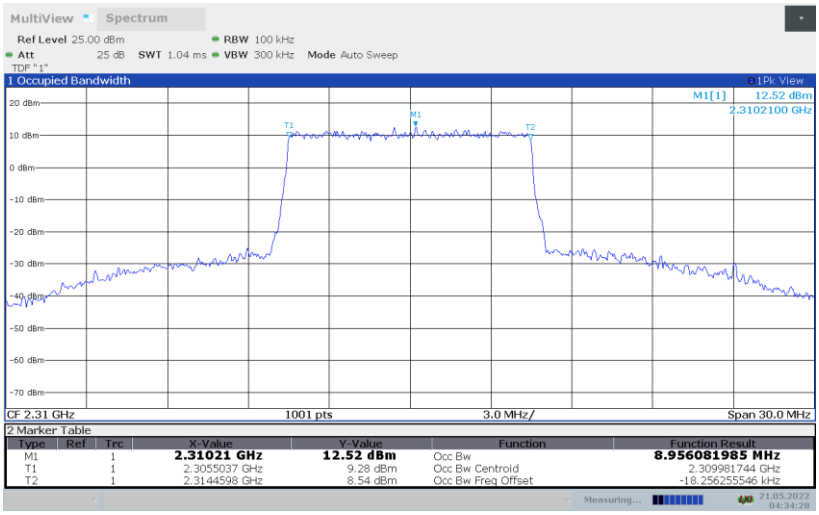
**LTE band 30,10MHz Bandwidth, 64QAM (99% BW)**




Note: Expanded measurement uncertainty is $U$ = 3428 Hz, $k$ = 2

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## A.5 EMISSION BANDWIDTH

**Reference**

FCC: CFR Part 2.1049, 22.917, 24.238, 27.53, 90.535.

**A.5.1 Measurement Procedure**

The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be set wide enough to capture all modulation products including the emission skirts (i.e., two to five times the OBW).

b) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1 to 5 % of the anticipated OBW, and the VBW shall be at least 3 times the RBW.

c) Set the reference level of the instrument as required to keep the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope must be at least 10log (OBW / RBW) below the reference level.

d) Set the detection mode to peak, and the trace mode to max hold.

e) Use the 26dB bandwidth function of the spectrum analyzer and report the measured bandwidth.

**A.5.2Emission Bandwidth Results**

Similar to conducted emissions; Emission bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequencies. Table below lists the measured -26dBc BW. Spectrum analyzer plots are included on the following pages.

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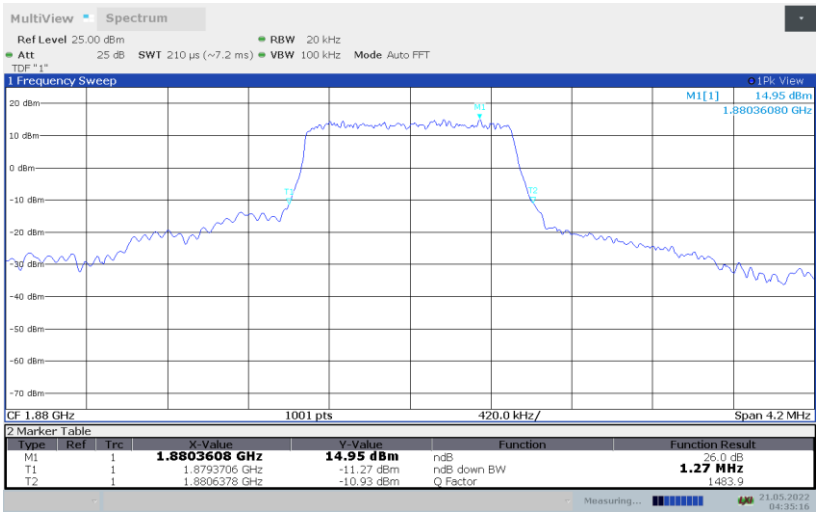
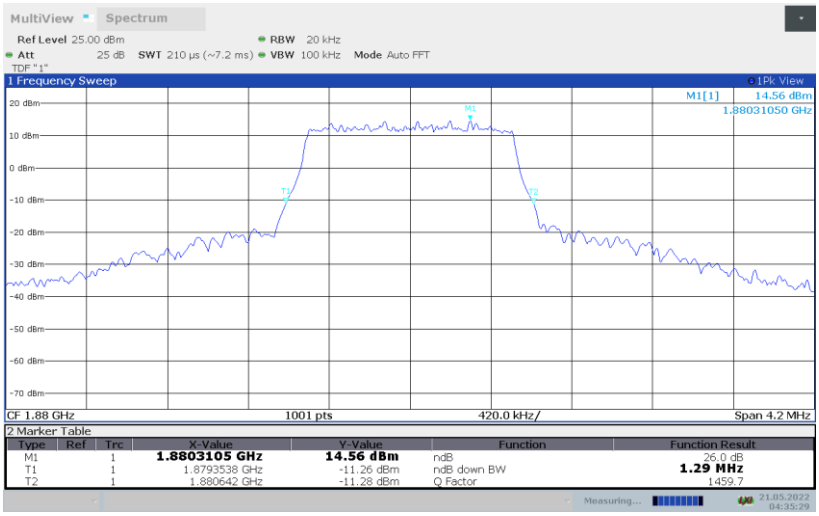
**LTE band 2, 1.4MHz (-26dBc BW)**

| Frequency(MHz) | Emission Bandwidth (-26dBc BW)(MHz) | | |
|---|---|---|---|
| 1880.0 | QPSK | 16QAM | 64QAM |
| | 1.27 | 1.29 | 1.28 |

**LTE band 2, 1.4MHz Bandwidth, QPSK (-26dBc BW)**




**LTE band 2, 1.4MHz Bandwidth, 16QAM (-26dBc BW)**

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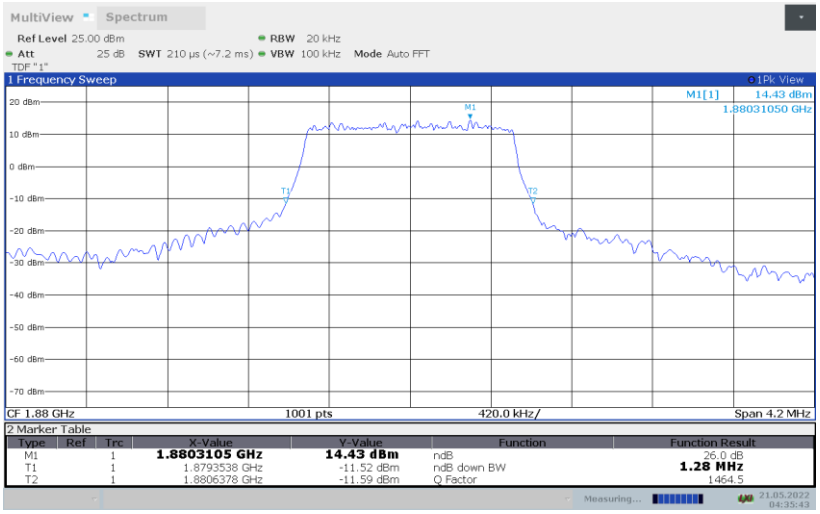
**LTE band 2, 1.4MHz Bandwidth, 64QAM (-26dBc BW)**

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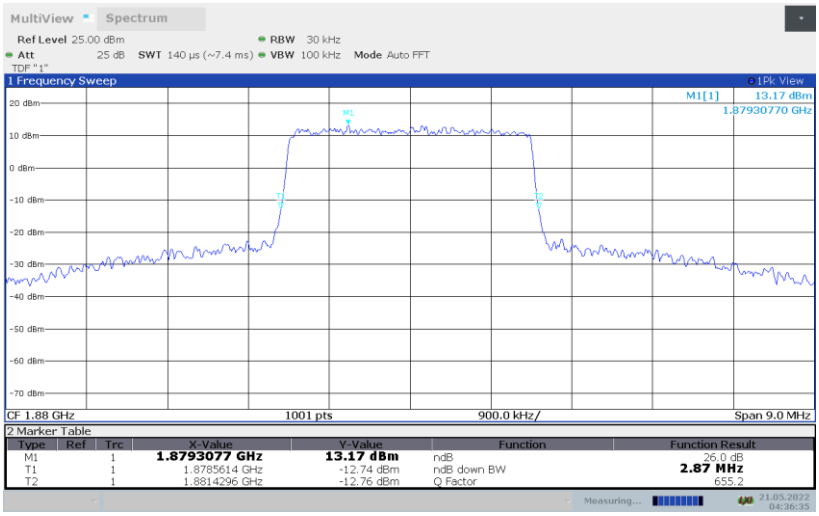
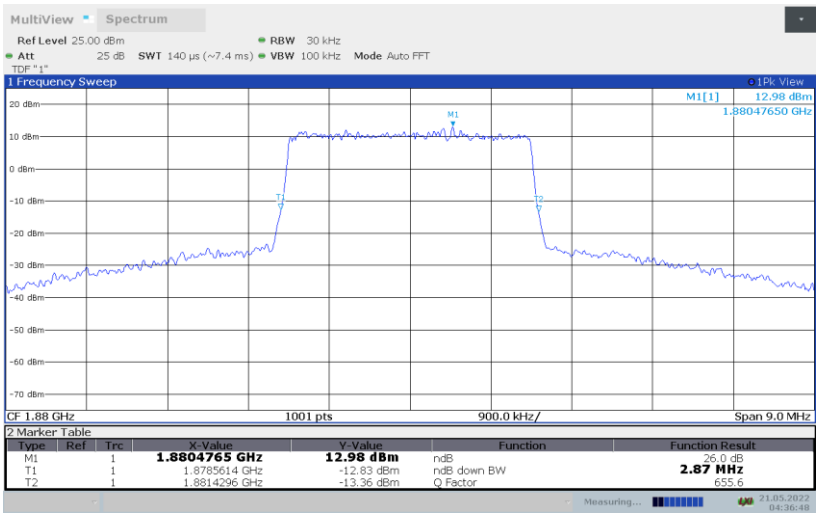
**LTE band 2, 3MHz (-26dBc BW)**

| Frequency(MHz) | Emission Bandwidth (-26dBc BW)(MHz) | | |
|---|---|---|---|
| 1880.0 | QPSK | 16QAM | 64QAM |
| | 2.87 | 2.87 | 2.87 |

**LTE band 2, 3MHz Bandwidth, QPSK (-26dBc BW)**




**LTE band 2, 3MHz Bandwidth, 16QAM (-26dBc BW)**

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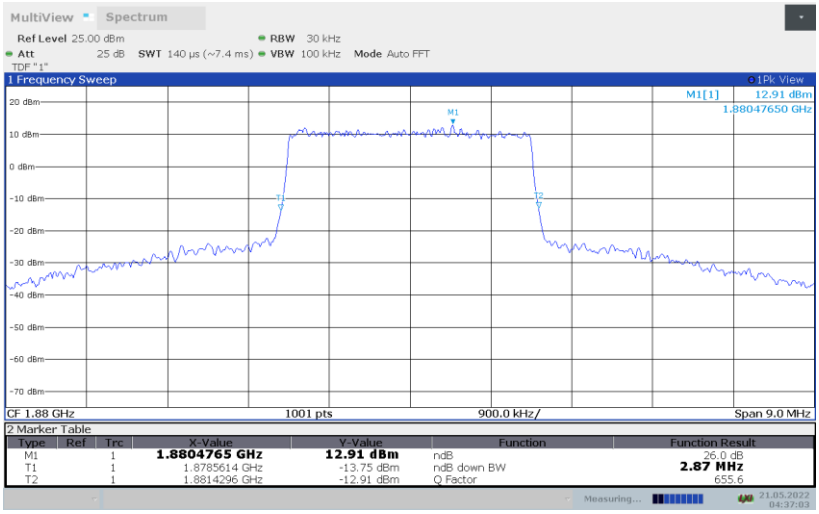
**LTE band 2, 3MHz Bandwidth, 64QAM (-26dBc BW)**

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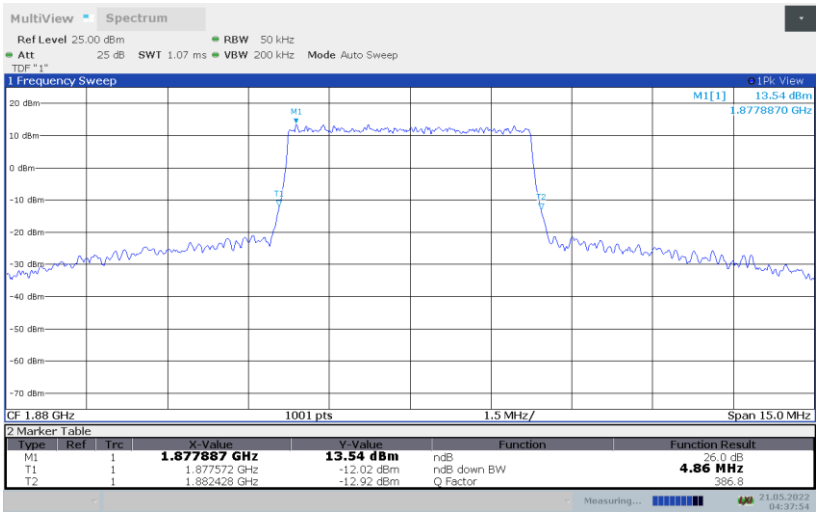
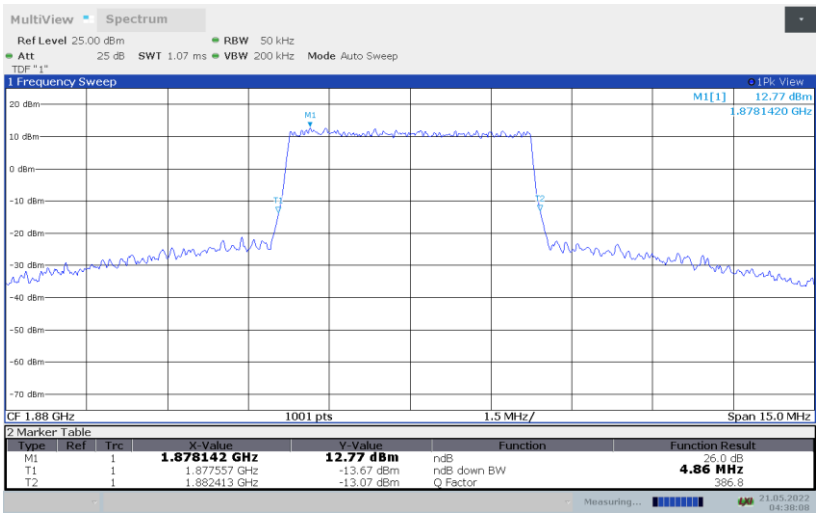
**LTE band 2, 5MHz (-26dBc BW)**

| Frequency(MHz) | Emission Bandwidth (-26dBc BW)(MHz) | | |
|---|---|---|---|
| 1880.0 | QPSK | 16QAM | 64QAM |
| | 4.86 | 4.86 | 4.84 |

**LTE band 2, 5MHz Bandwidth, QPSK (-26dBc BW)**




**LTE band 2, 5MHz Bandwidth,16QAM (-26dBc BW)**

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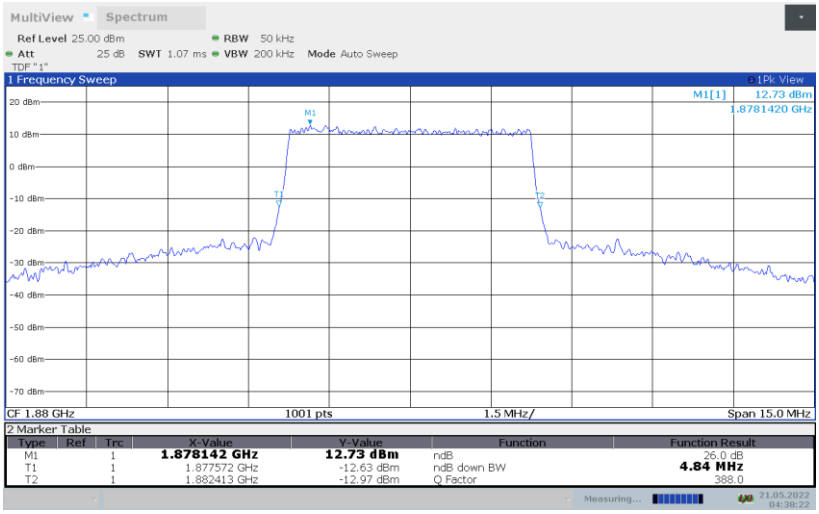
**LTE band 2, 5MHz Bandwidth,64QAM (-26dBc BW)**

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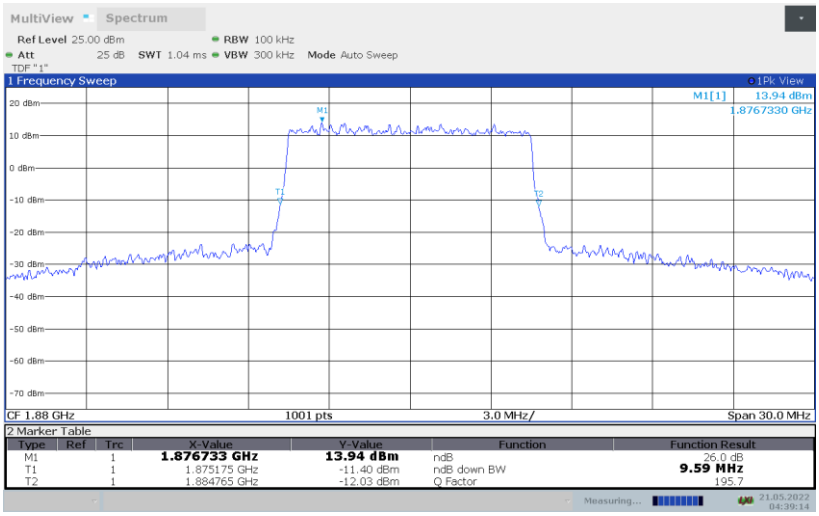
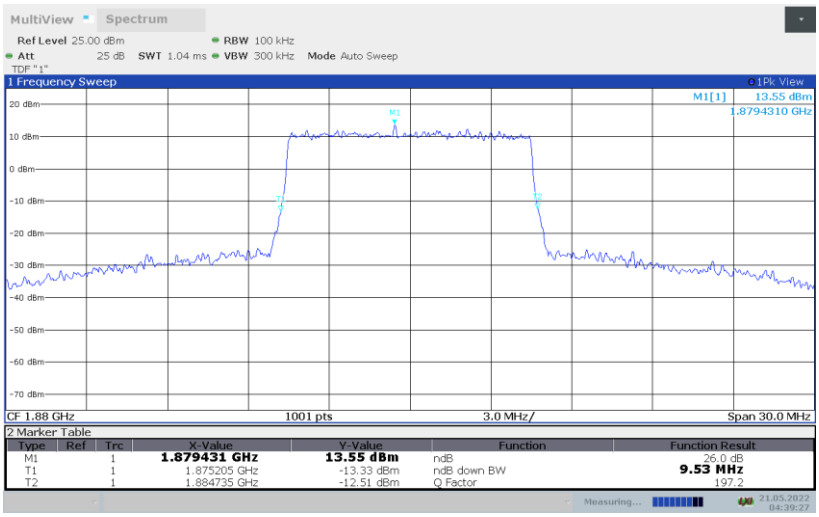
**LTE band 2, 10MHz (-26dBc BW)**

| Frequency(MHz) | Emission Bandwidth (-26dBc BW)(MHz) | | |
|---|---|---|---|
| 1880.0 | QPSK | 16QAM | 64QAM |
| | 9.59 | 9.53 | 9.59 |

**LTE band 2, 10MHz Bandwidth, QPSK (-26dBc BW)**




**LTE band 2, 10MHz Bandwidth, 16QAM (-26dBc BW)**

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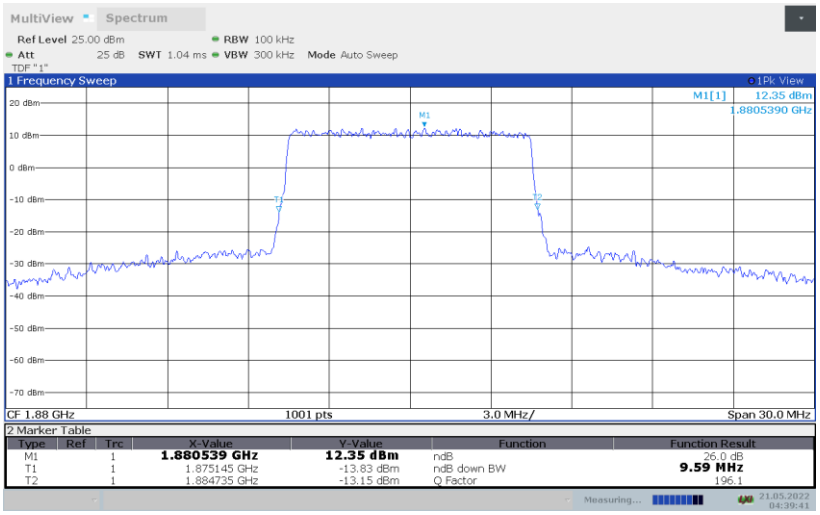
**LTE band 2, 10MHz Bandwidth, 64QAM (-26dBc BW)**

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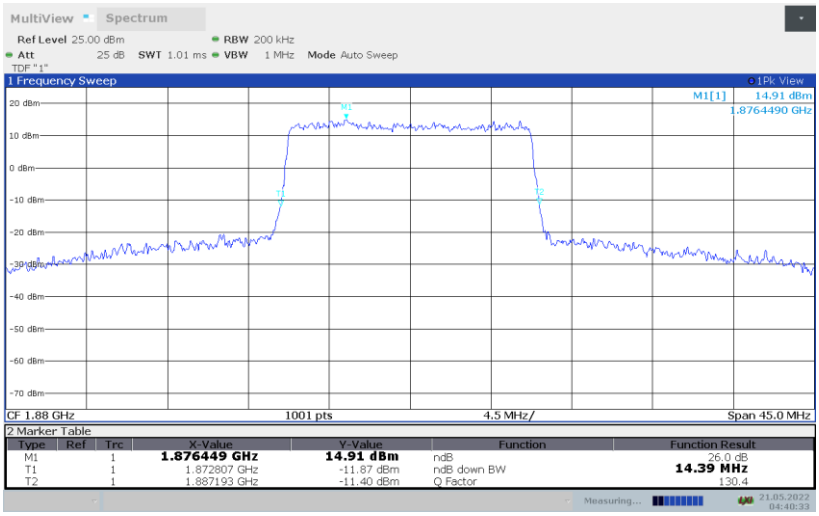
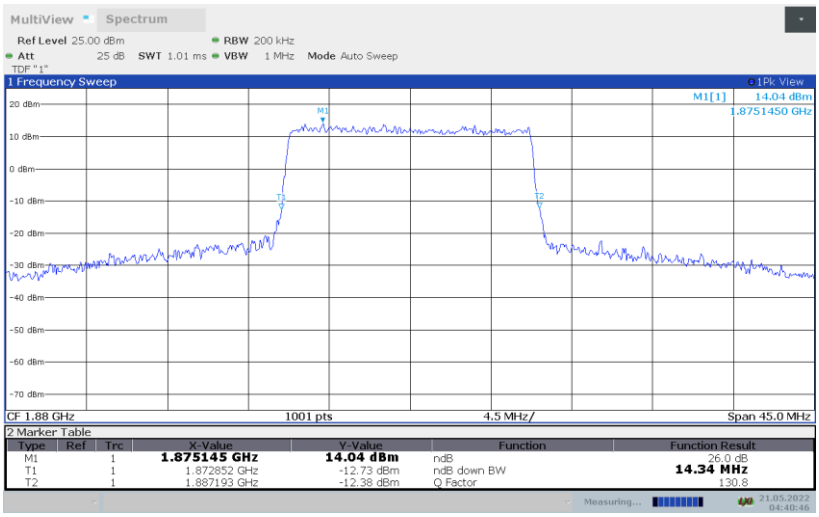
**LTE band 2, 15MHz (-26dBc BW)**

| Frequency(MHz) | Emission Bandwidth (-26dBc BW)(MHz) | | |
|---|---|---|---|
| 1880.0 | QPSK | 16QAM | 64QAM |
| | 14.39 | 14.34 | 14.39 |

**LTE band 2, 15MHz Bandwidth, QPSK (-26dBc BW)**




**LTE band 2, 15MHz Bandwidth, 16QAM (-26dBc BW)**

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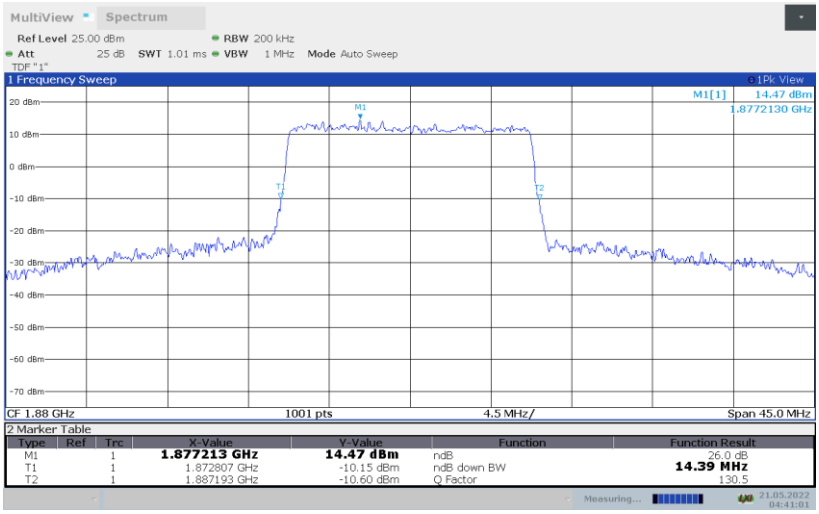
**LTE band 2, 15MHz Bandwidth, 64QAM (-26dBc BW)**

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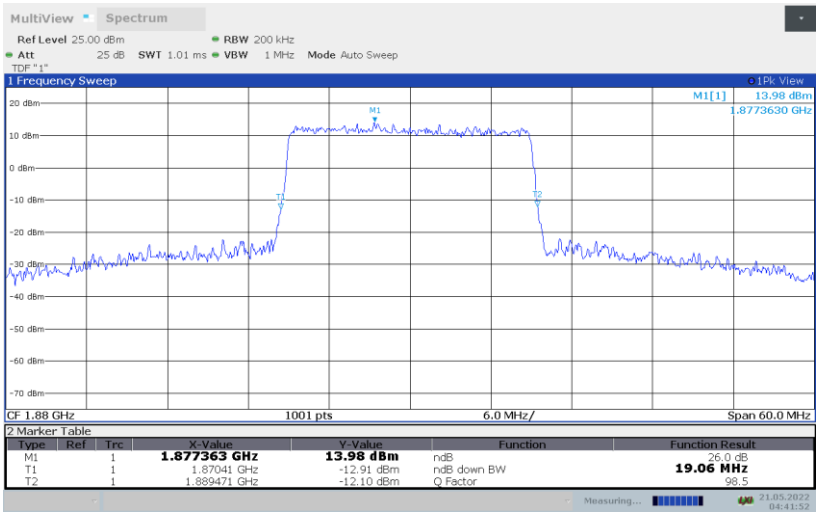
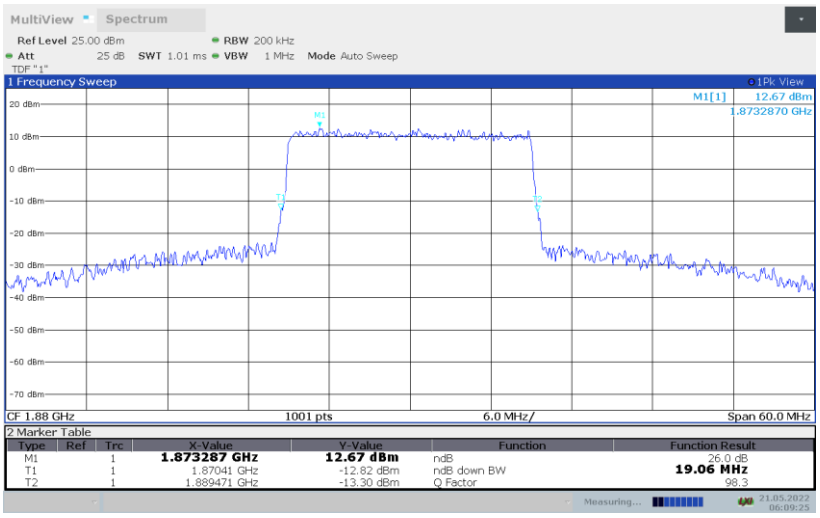
**LTE band 2, 20MHz (-26dBc BW)**

| Frequency(MHz) | Emission Bandwidth (-26dBc BW)(MHz) | | |
|---|---|---|---|
| 1880.0 | QPSK | 16QAM | 64QAM |
| | 19.06 | 19.06 | 19.00 |

**LTE band 2, 20MHz Bandwidth, QPSK (-26dBc BW)**




**LTE band 2, 20MHz Bandwidth, 16QAM (-26dBc BW)**

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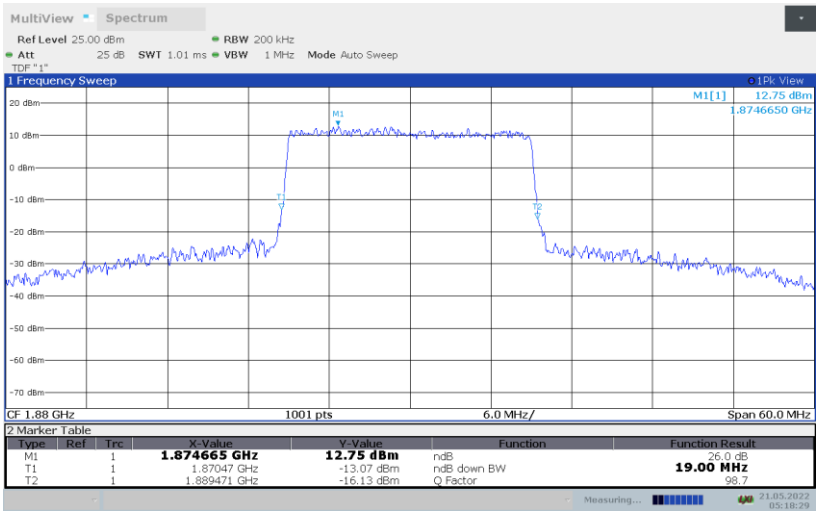
**LTE band 2, 20MHz Bandwidth, 64QAM (-26dBc BW)**

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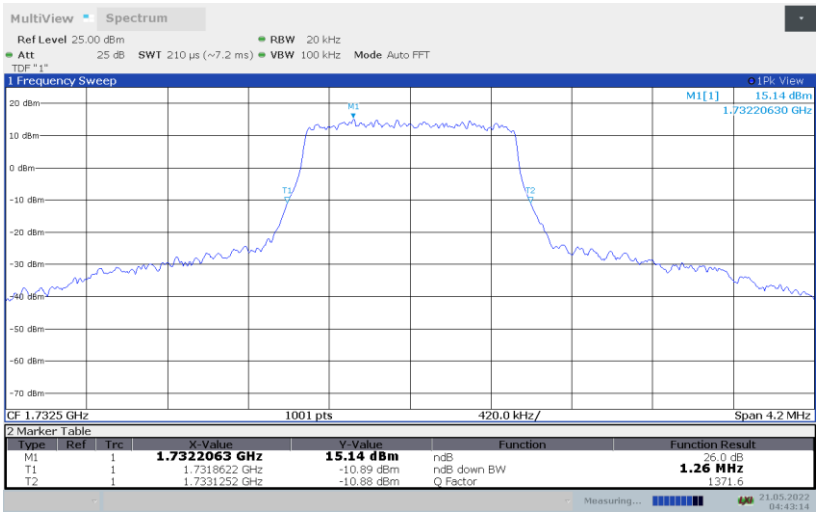
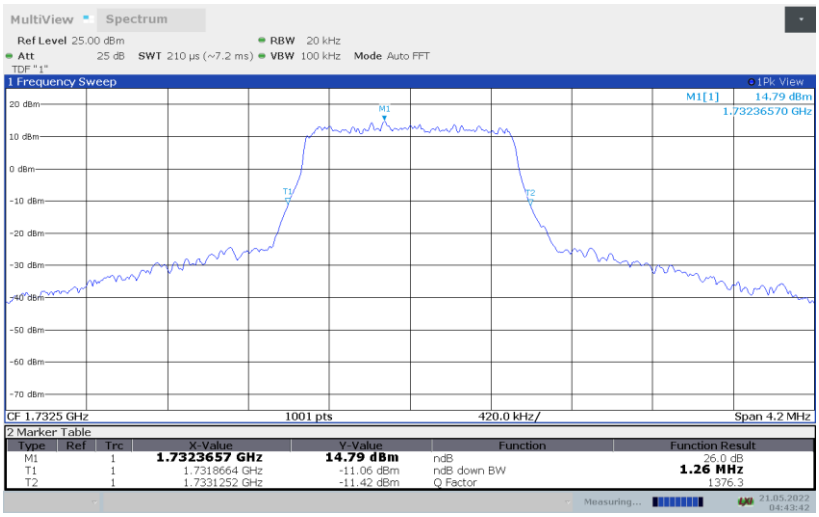
**LTE band 4, 1.4MHz (-26dBc BW)**

| Frequency(MHz) | Emission Bandwidth (-26dBc BW)(MHz) | | |
|---|---|---|---|
| 1732.5 | QPSK | 16QAM | 64QAM |
| | 1.26 | 1.26 | 1.26 |

**LTE band 4, 1.4MHz Bandwidth, QPSK (-26dBc BW)**




**LTE band 4, 1.4MHz Bandwidth, 16QAM (-26dBc BW)**

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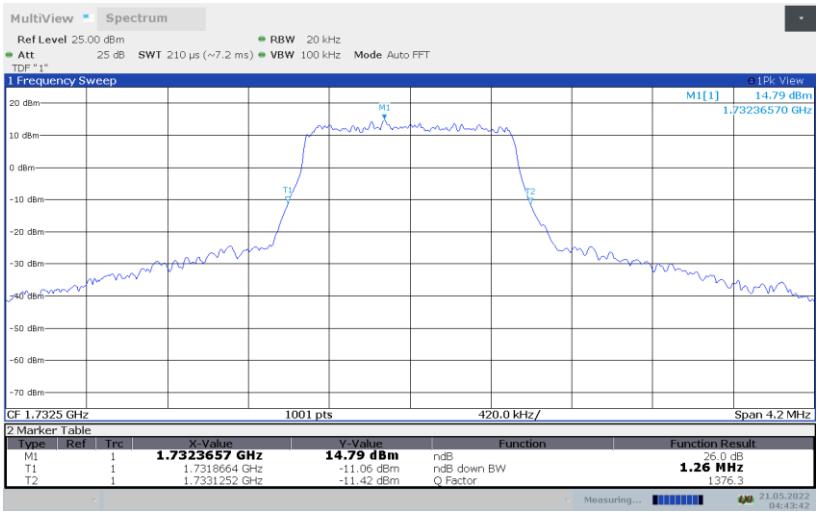
**LTE band 4, 1.4MHz Bandwidth, 64QAM (-26dBc BW)**

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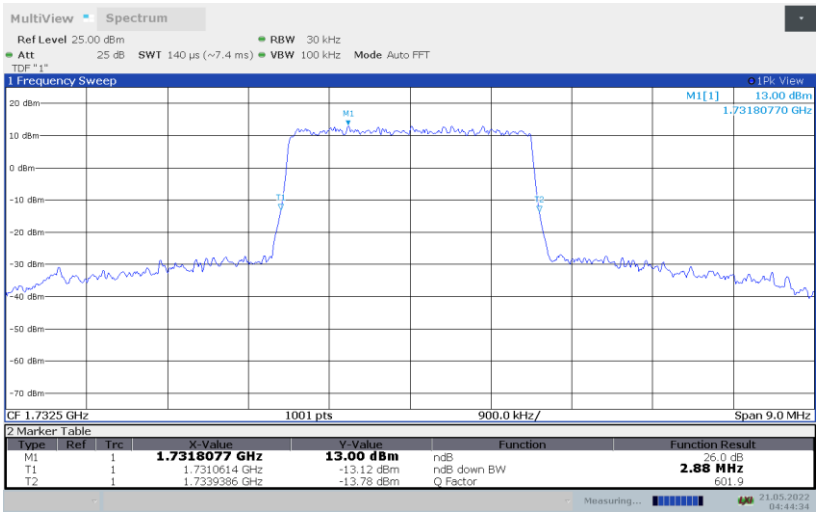
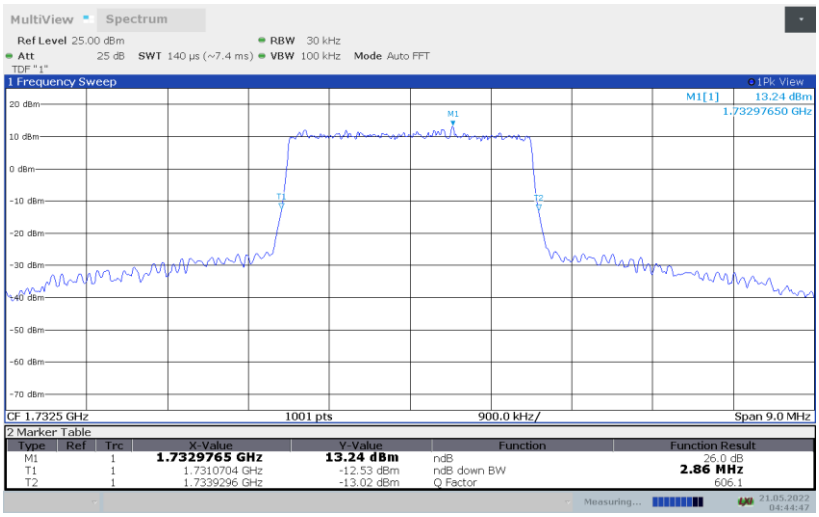
**LTE band 4, 3MHz (-26dBc BW)**

| Frequency(MHz) | Emission Bandwidth (-26dBc BW)(MHz) | | |
|---|---|---|---|
| 1732.5 | QPSK | 16QAM | 64QAM |
| | 2.88 | 2.86 | 2.86 |

**LTE band 4, 3MHz Bandwidth, QPSK (-26dBc BW)**




**LTE band 4, 3MHz Bandwidth, 16QAM (-26dBc BW)**

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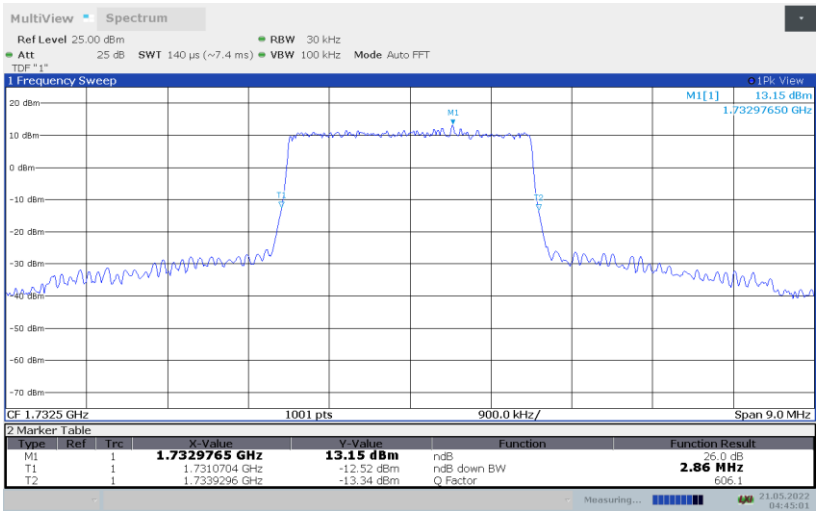
**LTE band 4, 3MHz Bandwidth, 64QAM (-26dBc BW)**

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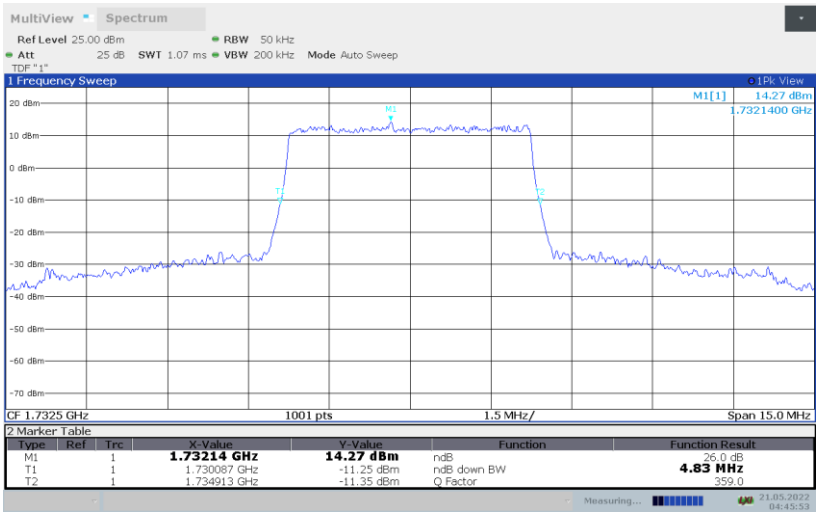
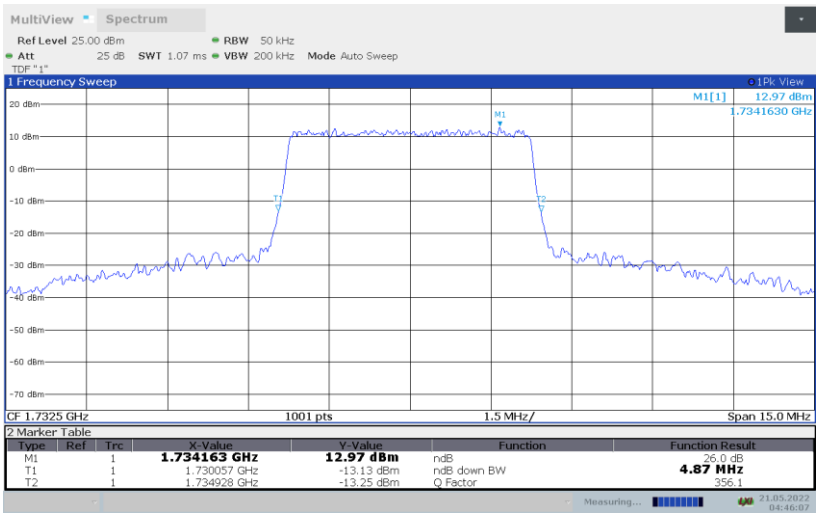
**LTE band 4, 5MHz (-26dBc BW)**

| Frequency(MHz) | Emission Bandwidth (-26dBc BW)(MHz) | | |
|---|---|---|---|
| 1732.5 | QPSK | 16QAM | 64QAM |
| | 4.83 | 4.87 | 4.87 |

**LTE band 4, 5MHz Bandwidth, QPSK (-26dBc BW)**




**LTE band 4, 5MHz Bandwidth,16QAM (-26dBc BW)**

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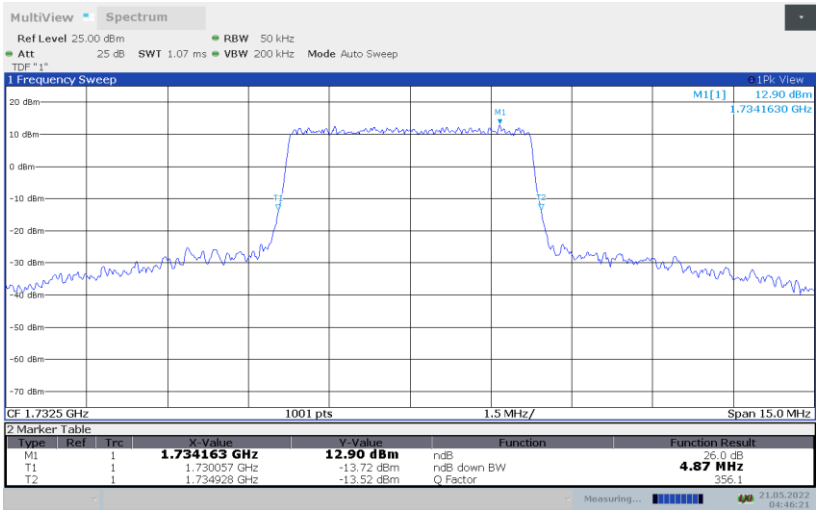
**LTE band 4, 5MHz Bandwidth,64QAM (-26dBc BW)**

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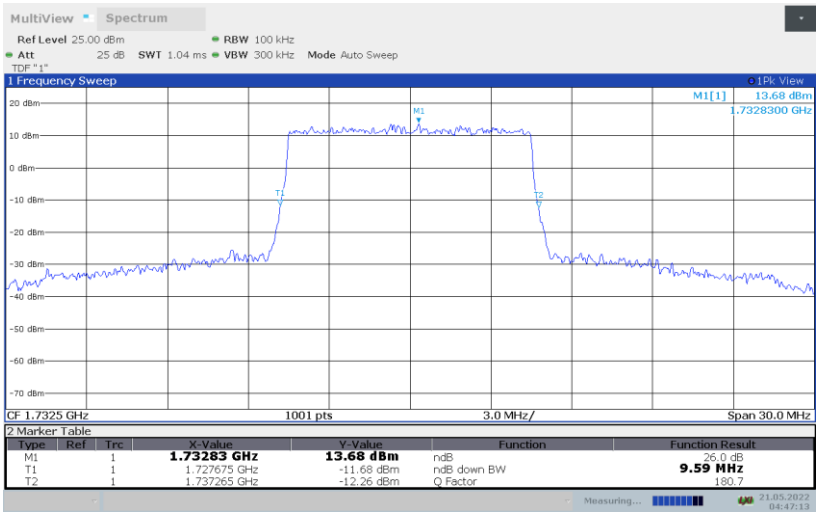
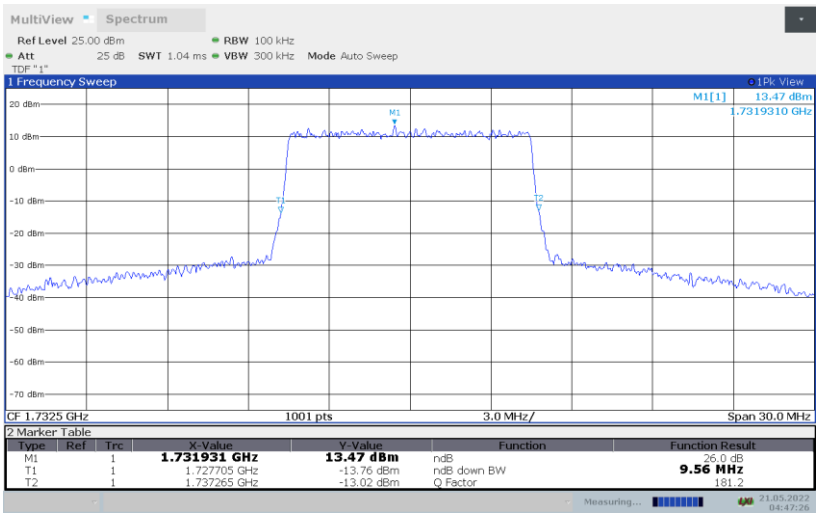
**LTE band 4, 10MHz (-26dBc BW)**

| Frequency(MHz) | Emission Bandwidth (-26dBc BW)(MHz) | | |
|---|---|---|---|
| 1732.5 | QPSK | 16QAM | 64QAM |
| | 9.59 | 9.56 | 9.59 |

**LTE band 4, 10MHz Bandwidth, QPSK (-26dBc BW)**




**LTE band 4, 10MHz Bandwidth, 16QAM (-26dBc BW)**

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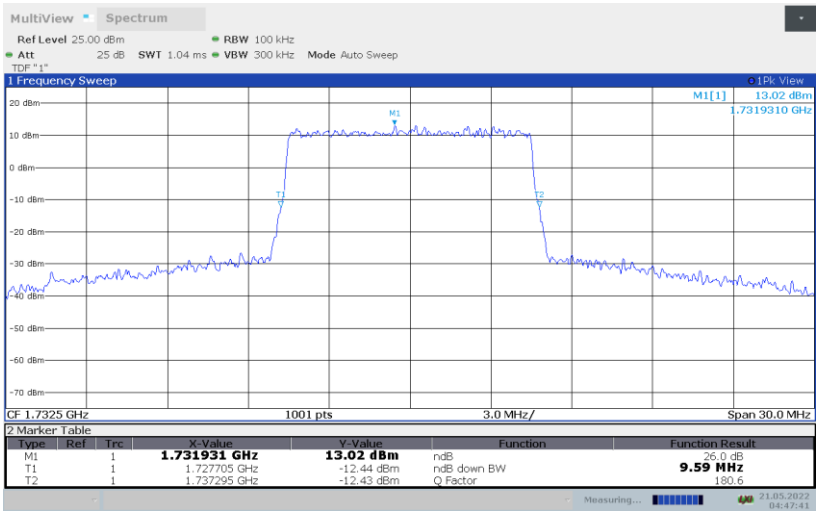
**LTE band 4, 10MHz Bandwidth, 64QAM (-26dBc BW)**

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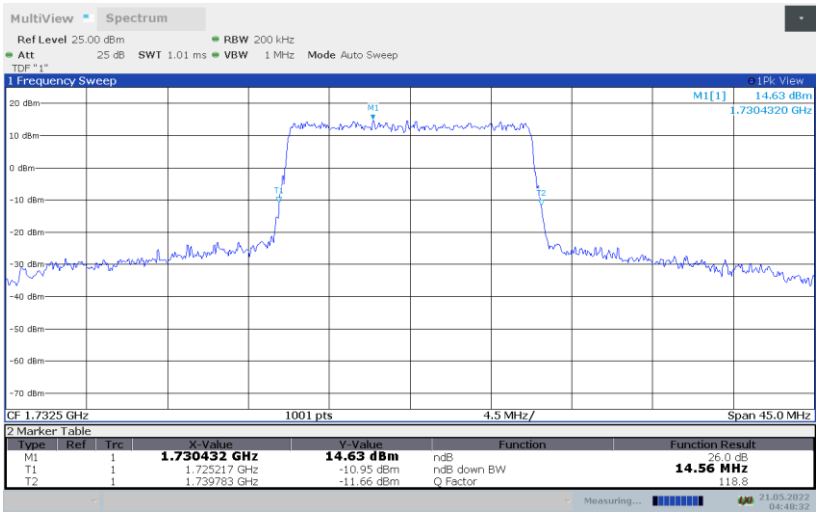
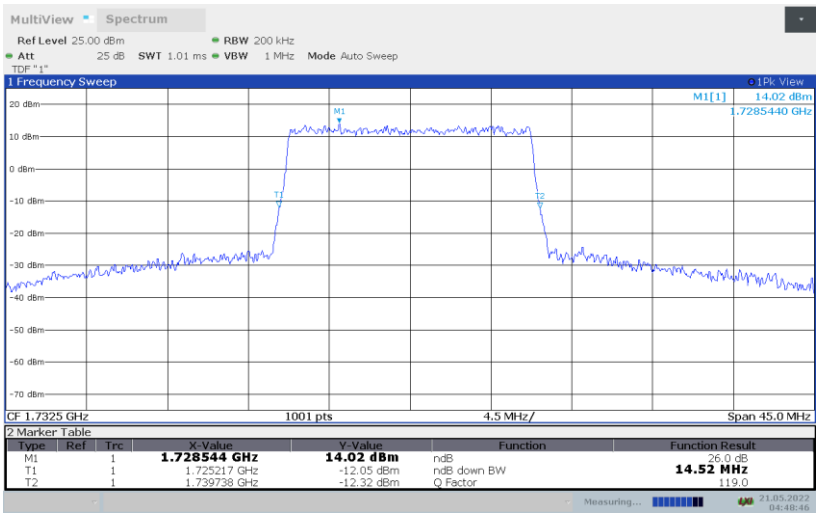
**LTE band 4, 15MHz (-26dBc BW)**

| Frequency(MHz) | Emission Bandwidth (-26dBc BW)(MHz) | | |
|---|---|---|---|
| 1732.5 | QPSK | 16QAM | 64QAM |
| | 14.56 | 14.52 | 14.48 |

**LTE band 4, 15MHz Bandwidth, QPSK (-26dBc BW)**




**LTE band 4, 15MHz Bandwidth, 16QAM (-26dBc BW)**

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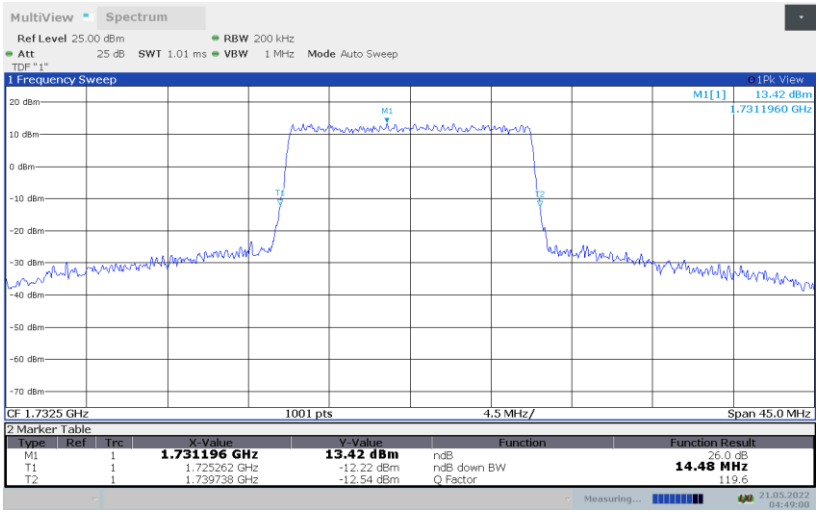
**LTE band 4, 15MHz Bandwidth, 64QAM (-26dBc BW)**

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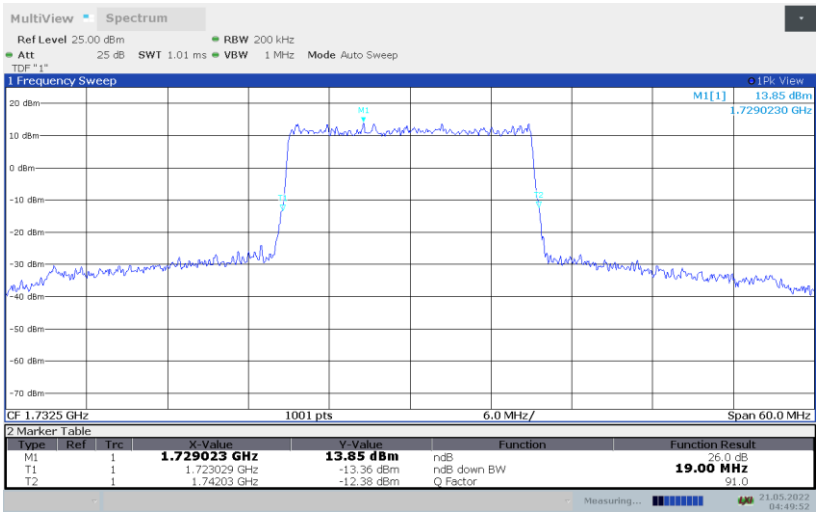
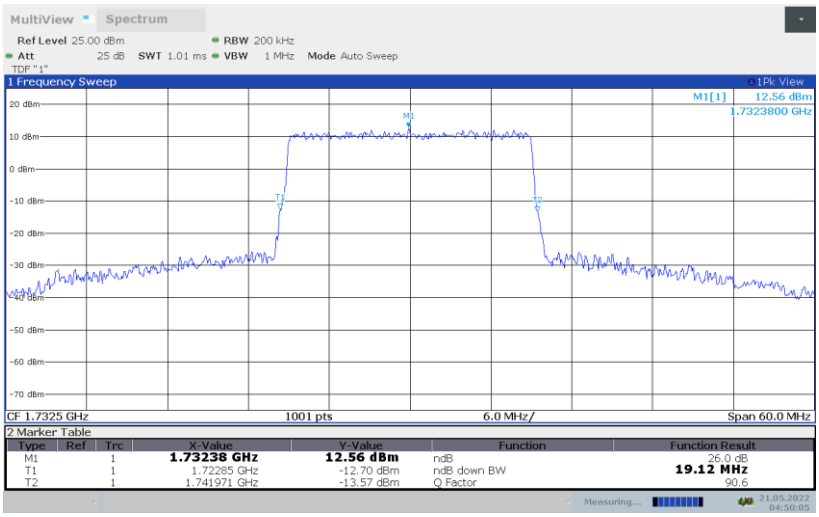
**LTE band 4, 20MHz (-26dBc BW)**

| Frequency(MHz) | Emission Bandwidth (-26dBc BW)(MHz) | | |
|---|---|---|---|
| 1732.5 | QPSK | 16QAM | 64QAM |
| | 19.00 | 19.12 | 19.00 |

**LTE band 4, 20MHz Bandwidth, QPSK (-26dBc BW)**




**LTE band 4, 20MHz Bandwidth, 16QAM (-26dBc BW)**

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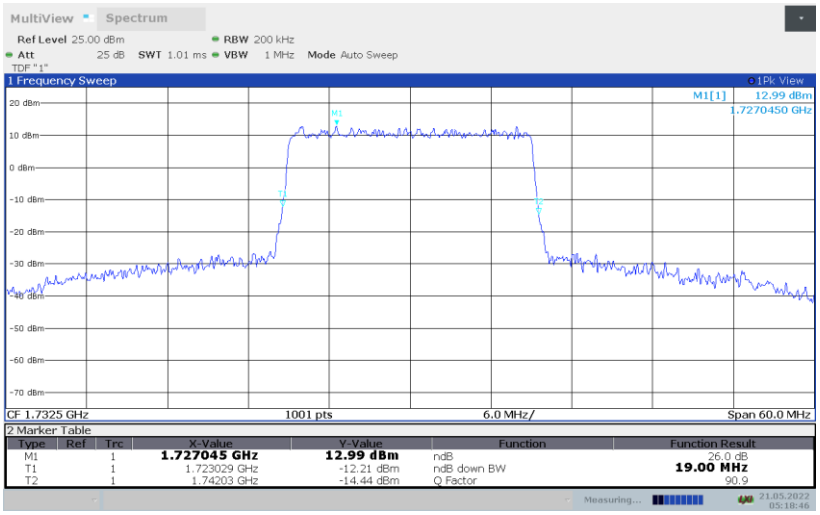
**LTE band 4, 20MHz Bandwidth, 64QAM (-26dBc BW)**

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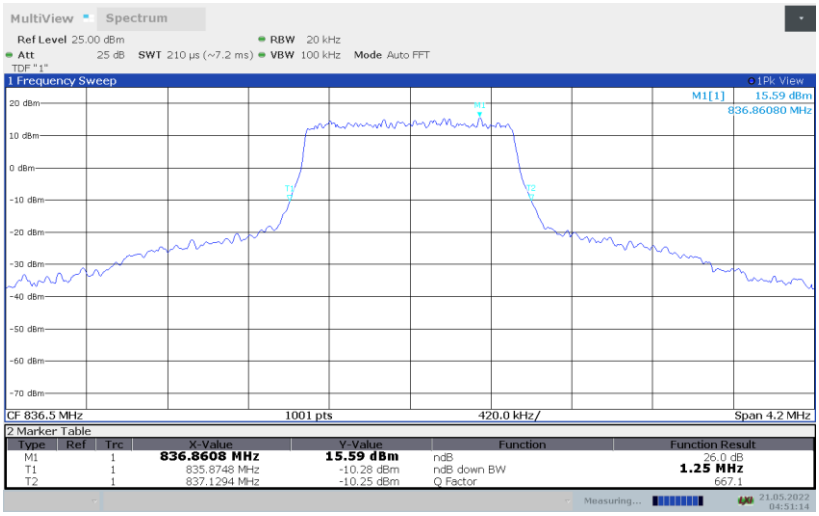
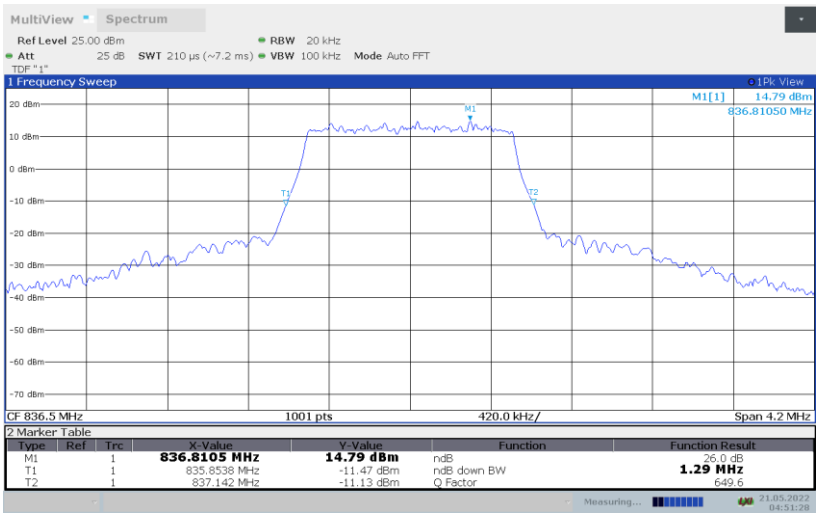
**LTE band 5, 1.4MHz (-26dBc BW)**

| Frequency(MHz) | Emission Bandwidth (-26dBc BW)(MHz) | | |
|---|---|---|---|
| 836.5 | QPSK | 16QAM | 64QAM |
| | 1.25 | 1.29 | 1.28 |

**LTE band 5, 1.4MHz Bandwidth, QPSK (-26dBc BW)**




**LTE band 5, 1.4MHz Bandwidth,16QAM (-26dBc BW)**

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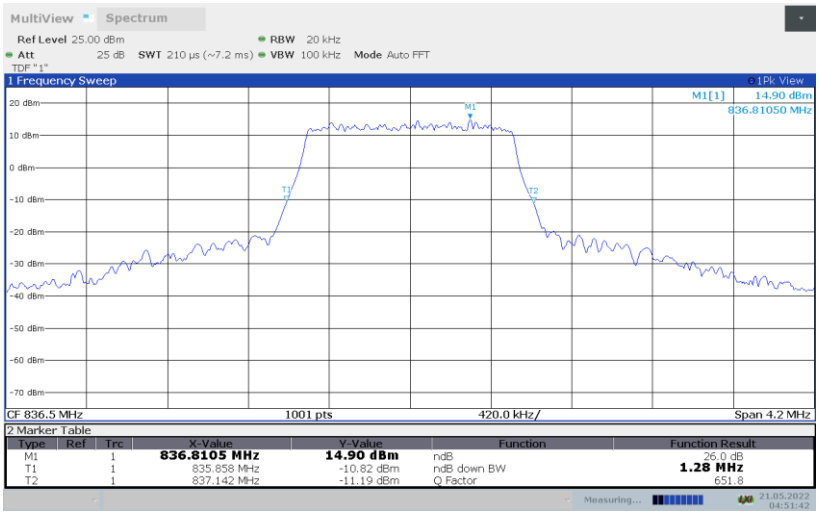
**LTE band 5, 1.4MHz Bandwidth,64QAM (-26dBc BW)**

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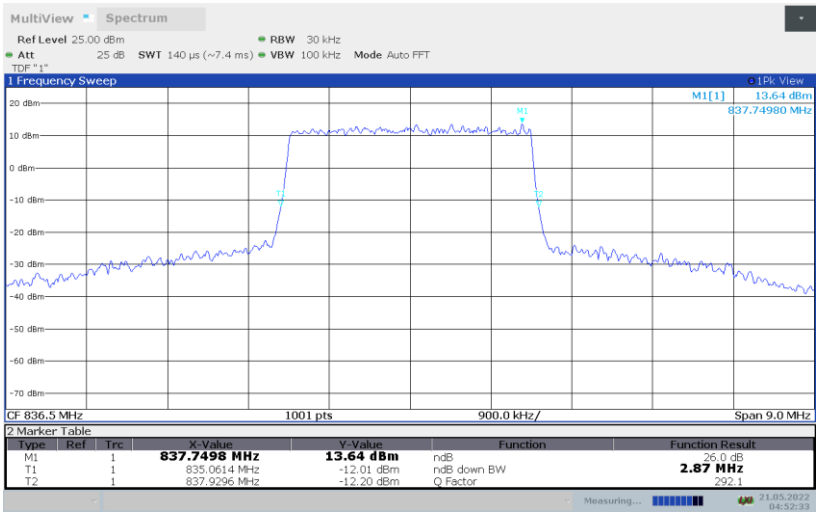
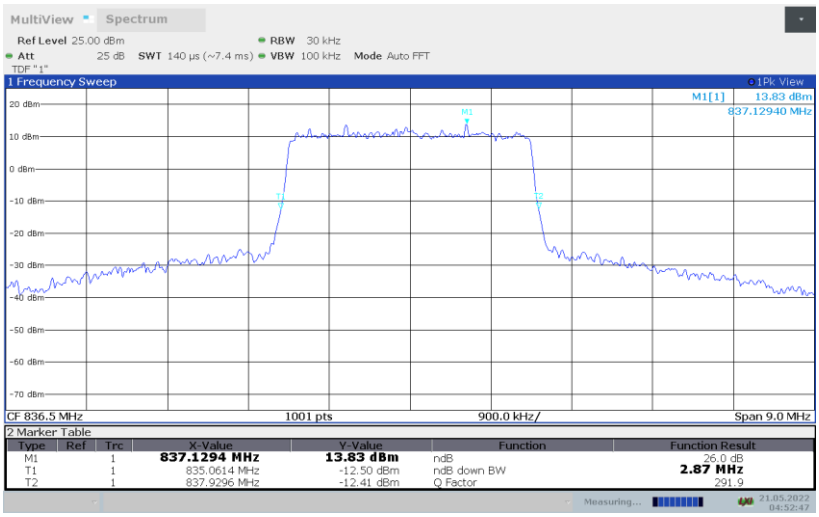
**LTE band 5, 3MHz (-26dBc BW)**

| Frequency(MHz) | Emission Bandwidth (-26dBc BW)(MHz) | | |
|---|---|---|---|
| 836.5 | QPSK | 16QAM | 64QAM |
| | 2.87 | 2.87 | 2.87 |

**LTE band 5, 3MHz Bandwidth, QPSK (-26dBc BW)**




**LTE band 5, 3MHz Bandwidth, 16QAM (-26dBc BW)**

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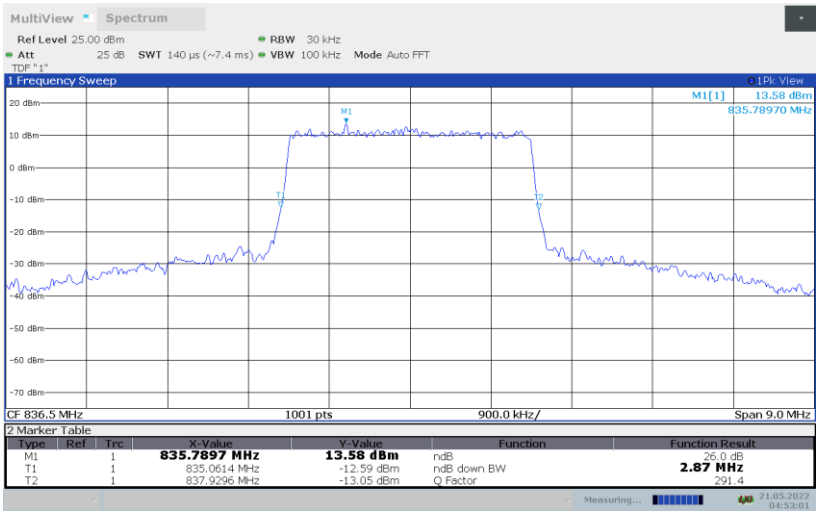
**LTE band 5, 3MHz Bandwidth, 64QAM (-26dBc BW)**

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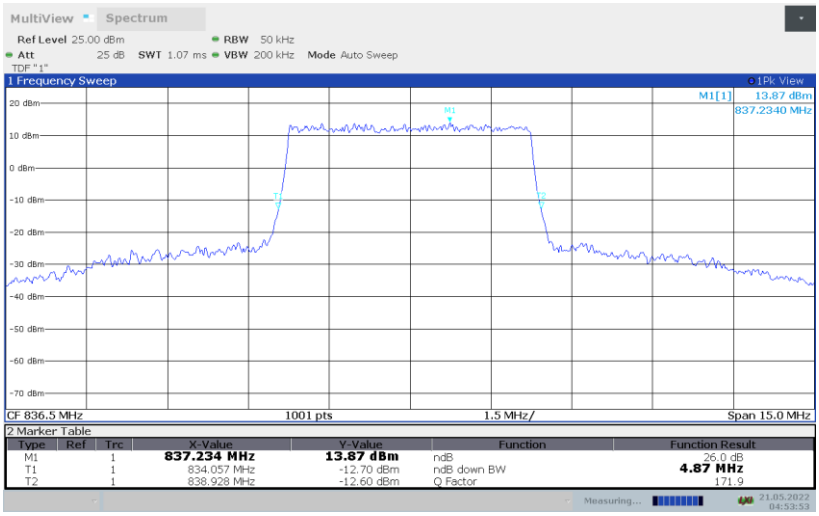
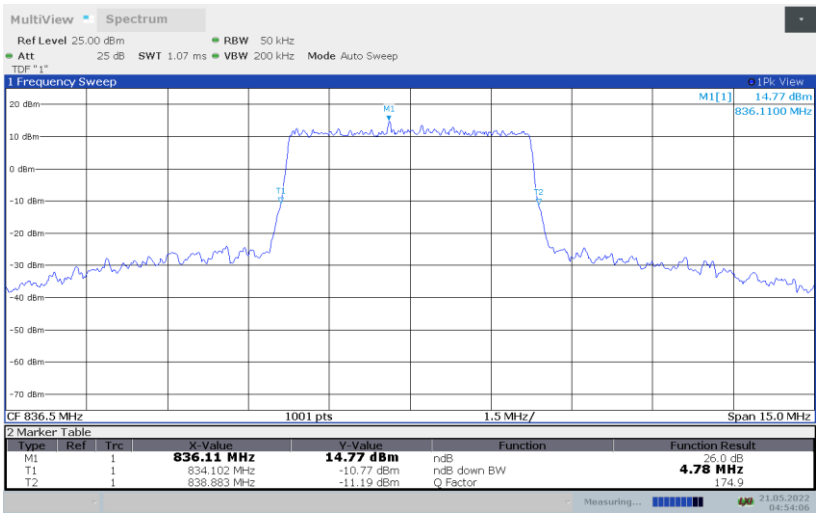
**LTE band 5, 5MHz (-26dBc BW)**

| Frequency(MHz) | Emission Bandwidth (-26dBc BW)(MHz) | | |
|---|---|---|---|
| 836.5 | QPSK | 16QAM | 64QAM |
| | 4.87 | 4.78 | 4.79 |

**LTE band 5, 5MHz Bandwidth, QPSK (-26dBc BW)**




**LTE band 5, 5MHz Bandwidth, 16QAM (-26dBc BW)**

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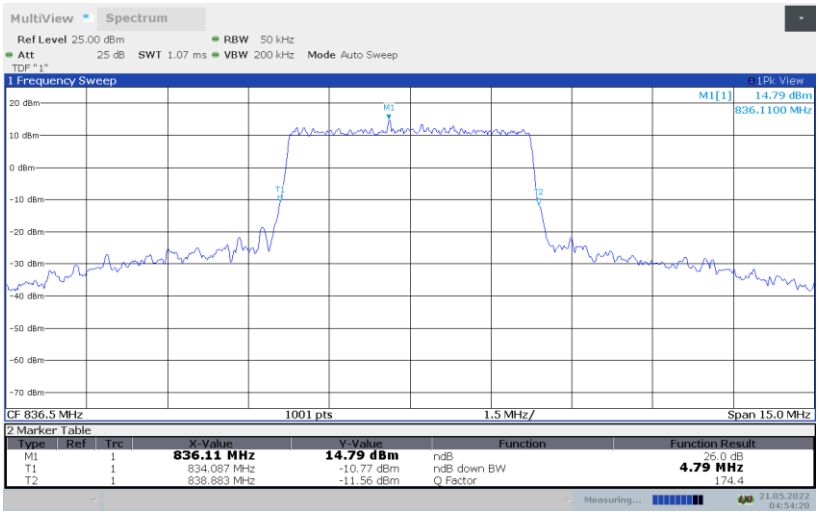
**LTE band 5, 5MHz Bandwidth, 64QAM (-26dBc BW)**

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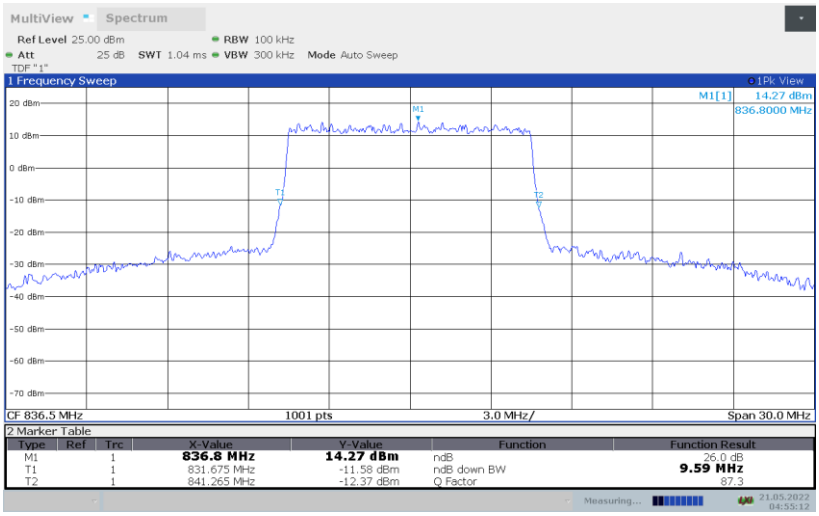
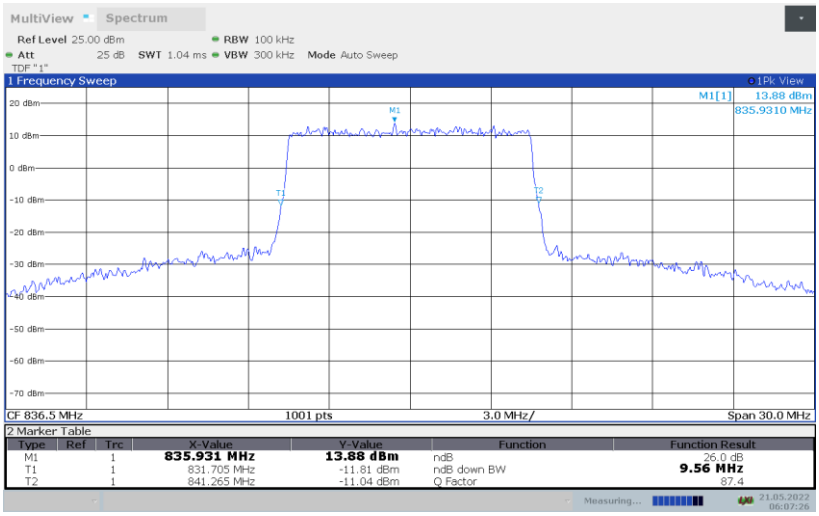
**LTE band 5, 10MHz (-26dBc BW)**

| Frequency(MHz) | Emission Bandwidth (-26dBc BW)(MHz) | | |
|---|---|---|---|
| 836.5 | QPSK | 16QAM | 64QAM |
| | 9.59 | 9.56 | 9.59 |

**LTE band 5, 10MHz Bandwidth, QPSK (-26dBc BW)**




**LTE band 5, 10MHz Bandwidth, 16QAM (-26dBc BW)**

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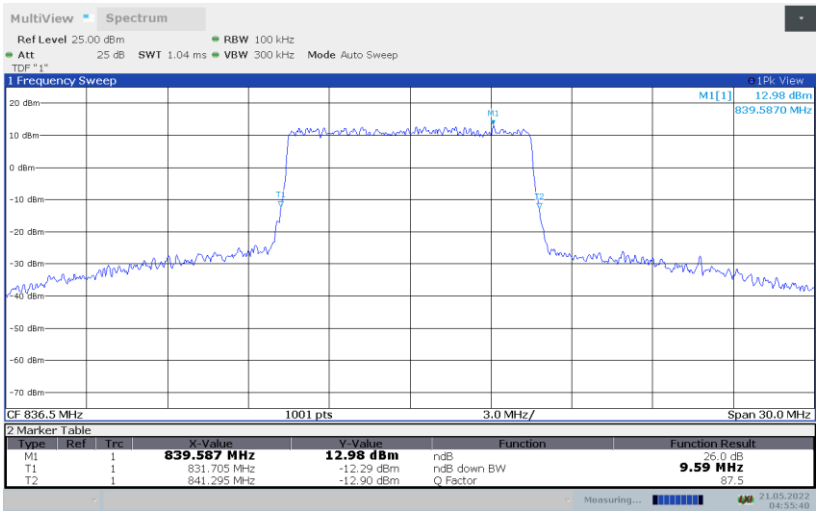
**LTE band 5, 10MHz Bandwidth, 64QAM (-26dBc BW)**




Note: Expanded measurement uncertainty is $U$ = 3428Hz, $k$ = 2

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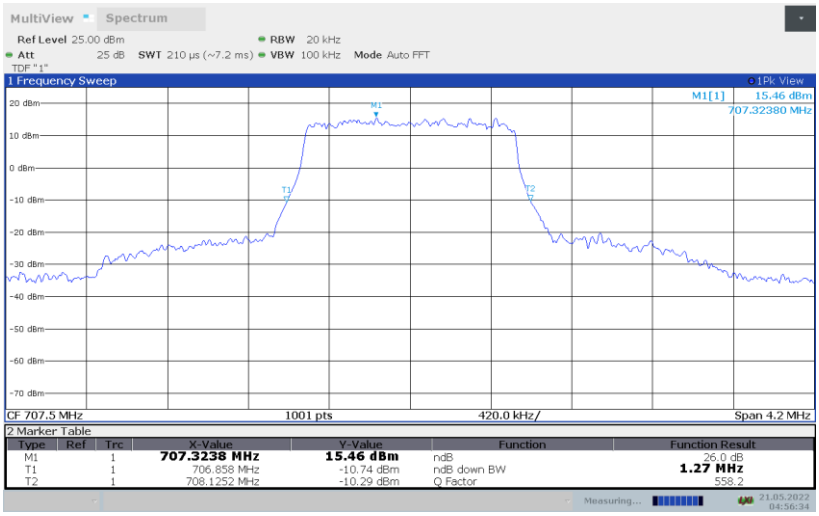
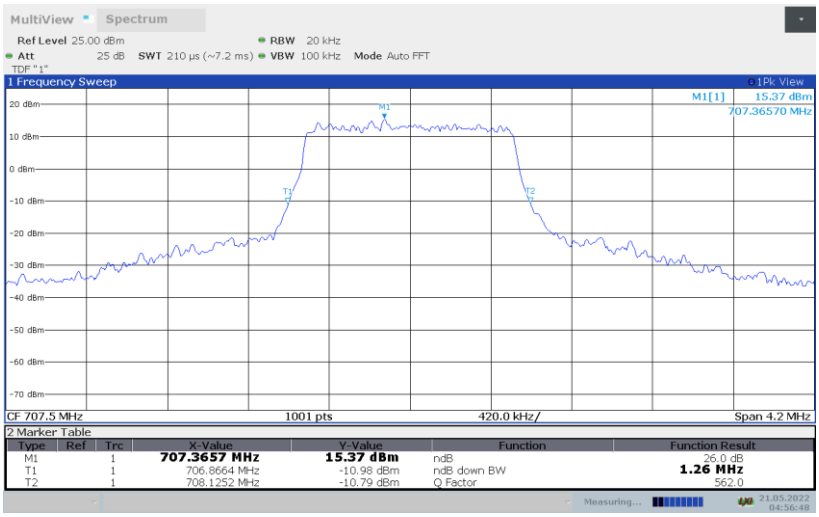
**LTE band 12, 1.4MHz (-26dBc BW)**

| Frequency(MHz) | Emission Bandwidth (-26dBc BW)(MHz) | | |
|---|---|---|---|
| 707.5 | QPSK | 16QAM | 64QAM |
| | 1.27 | 1.26 | 1.25 |

**LTE band 12, 1.4MHz Bandwidth, QPSK (-26dBc BW)**




**LTE band 12, 1.4MHz Bandwidth, 16QAM (-26dBc BW)**

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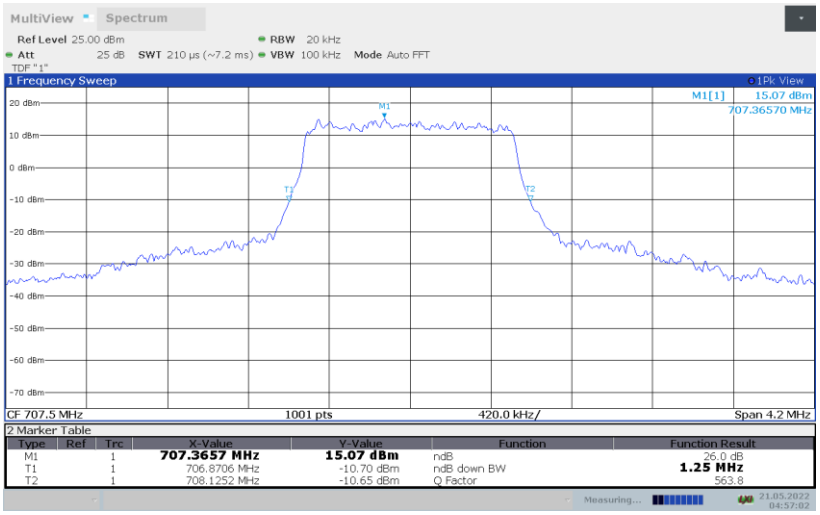
**LTE band 12, 1.4MHz Bandwidth, 64QAM (-26dBc BW)**

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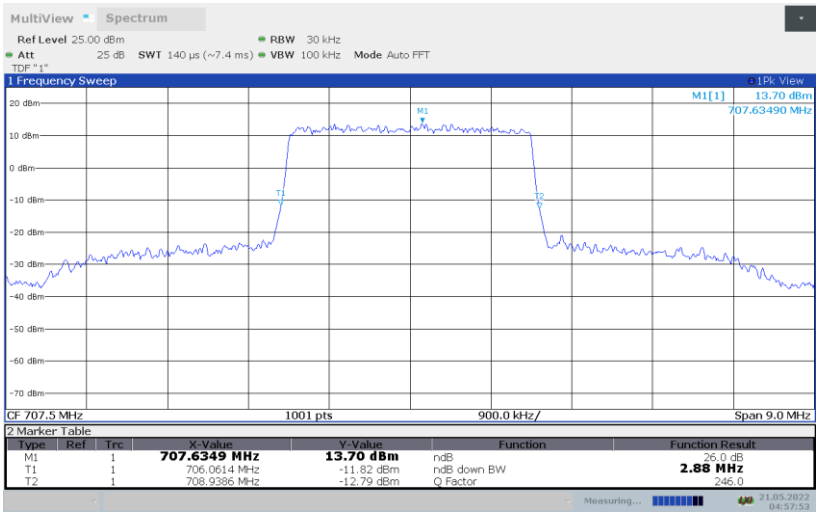
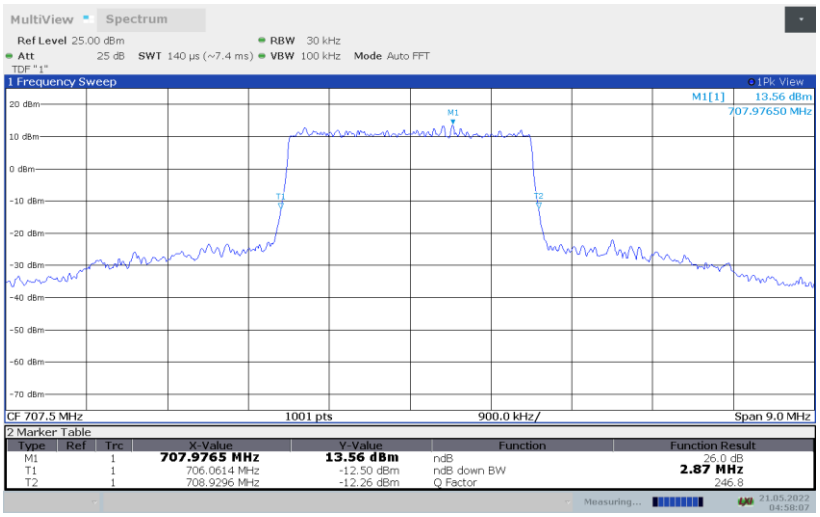
**LTE band 12, 3MHz (-26dBc BW)**

| Frequency(MHz) | Emission Bandwidth (-26dBc BW)(MHz) | | |
|---|---|---|---|
| 707.5 | QPSK | 16QAM | 64QAM |
| | 2.88 | 2.87 | 2.87 |

**LTE band 12, 3MHz Bandwidth, QPSK (-26dBc BW)**




**LTE band 12, 3MHz Bandwidth, 16QAM (-26dBc BW)**

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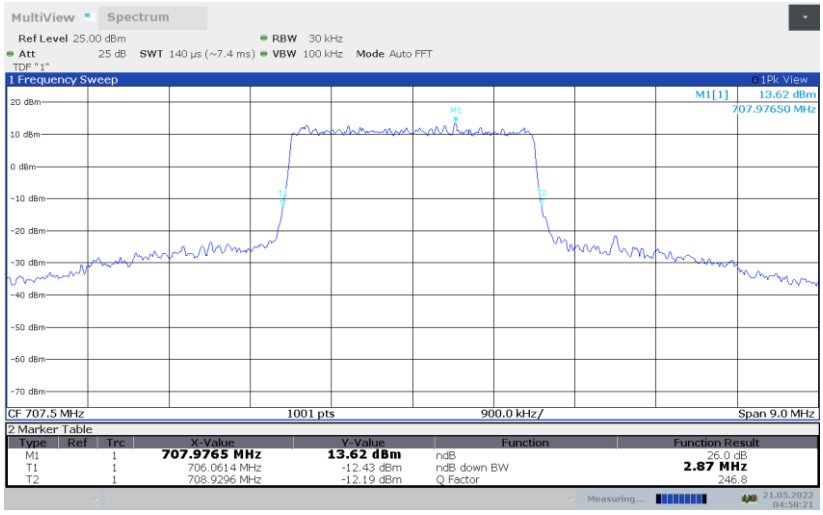
**LTE band 12, 3MHz Bandwidth, 64QAM (-26dBc BW)**

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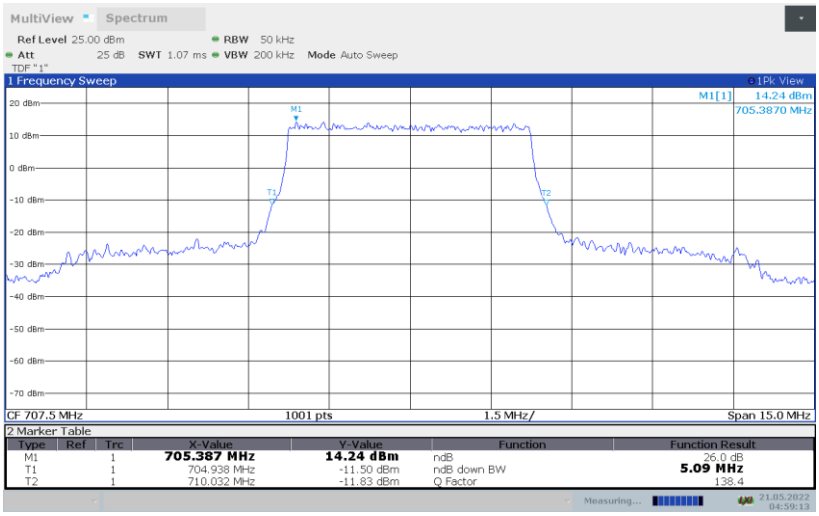
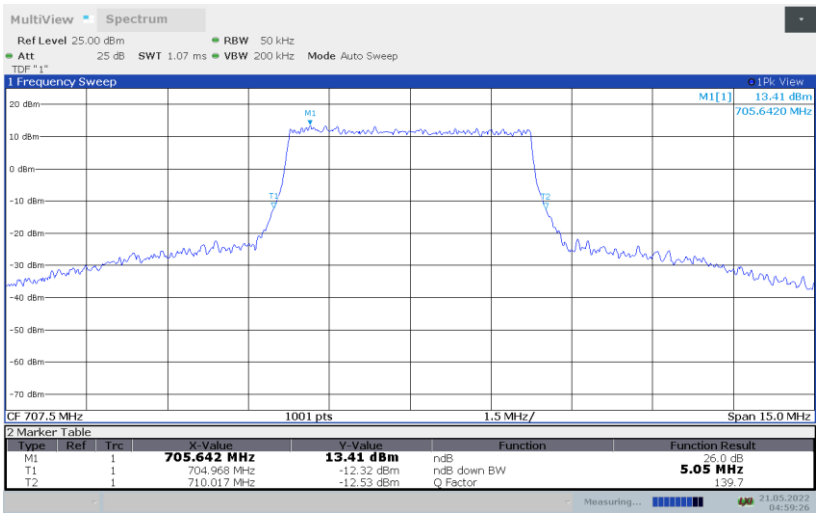
**LTE band 12, 5MHz (-26dBc BW)**

| Frequency(MHz) | Emission Bandwidth (-26dBc BW)(MHz) | | |
|---|---|---|---|
| 707.5 | QPSK | 16QAM | 64QAM |
| | 5.09 | 5.05 | 5.05 |

**LTE band 12, 5MHz Bandwidth, QPSK (-26dBc BW)**




**LTE band 12, 5MHz Bandwidth,16QAM (-26dBc BW)**

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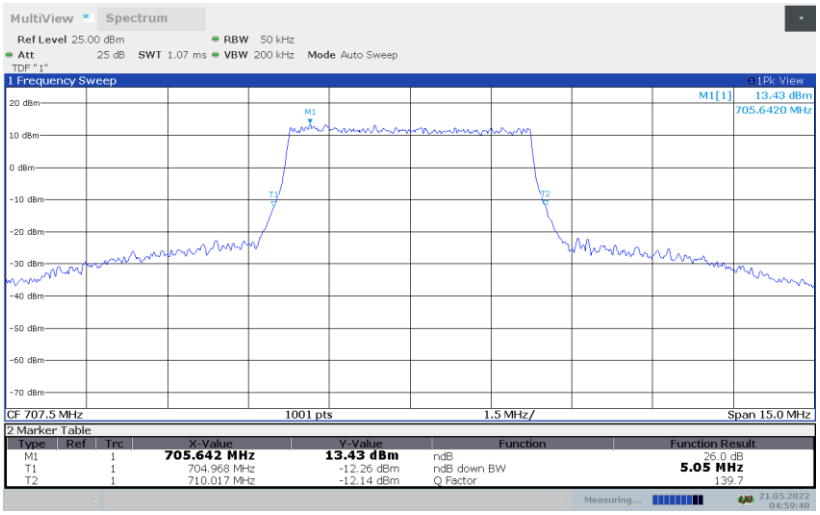
**LTE band 12, 5MHz Bandwidth,64QAM (-26dBc BW)**

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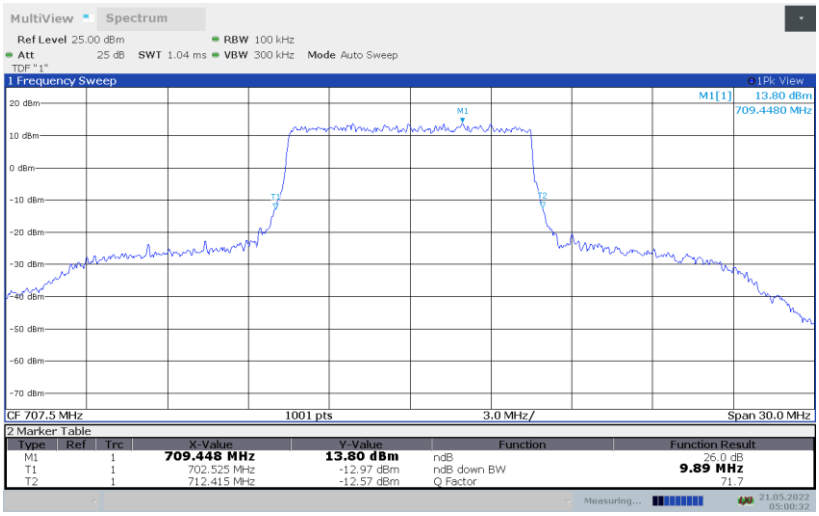
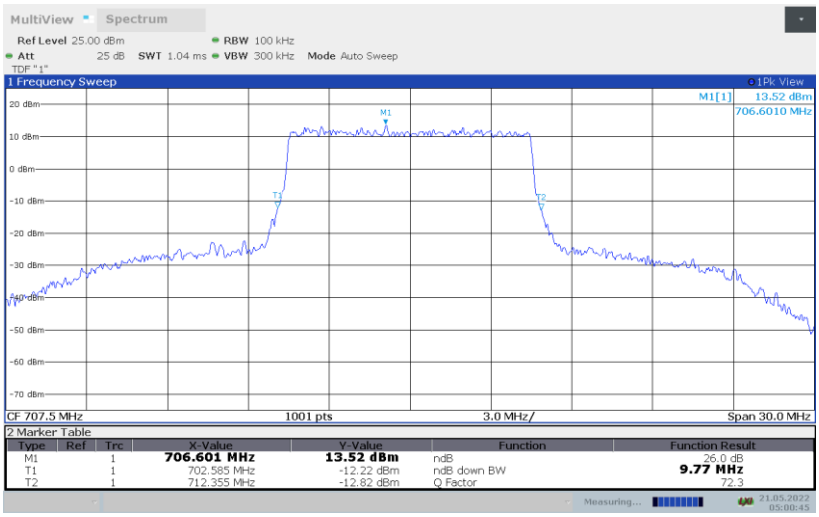
**LTE band 12, 10MHz (-26dBc BW)**

| Frequency(MHz) | Emission Bandwidth (-26dBc BW)(MHz) | | |
|---|---|---|---|
| 707.5 | QPSK | 16QAM | 64QAM |
| | 9.89 | 9.77 | 9.71 |

**LTE band 12, 10MHz Bandwidth, QPSK (-26dBc BW)**




**LTE band 12, 10MHz Bandwidth, 16QAM (-26dBc BW)**

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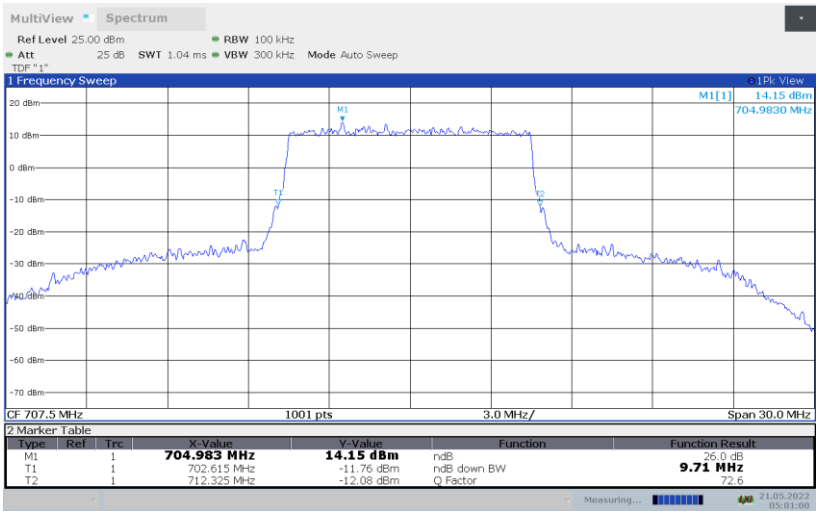
**LTE band 12, 10MHz Bandwidth, 64QAM (-26dBc BW)**

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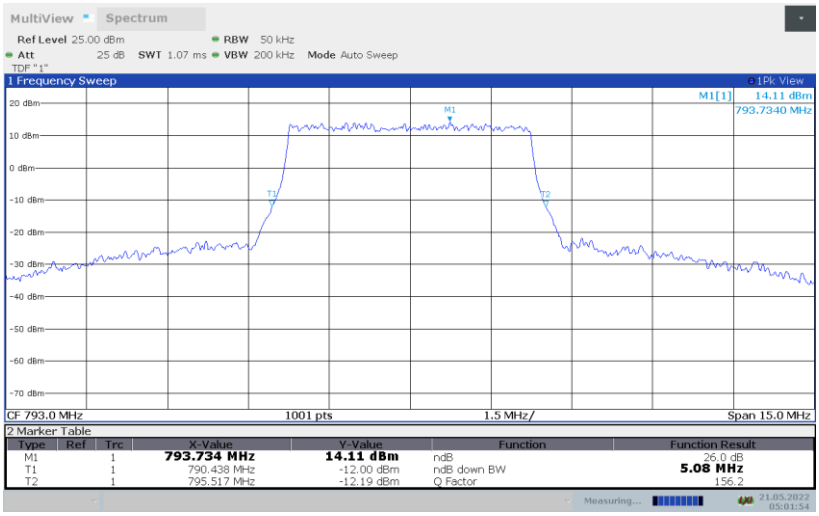
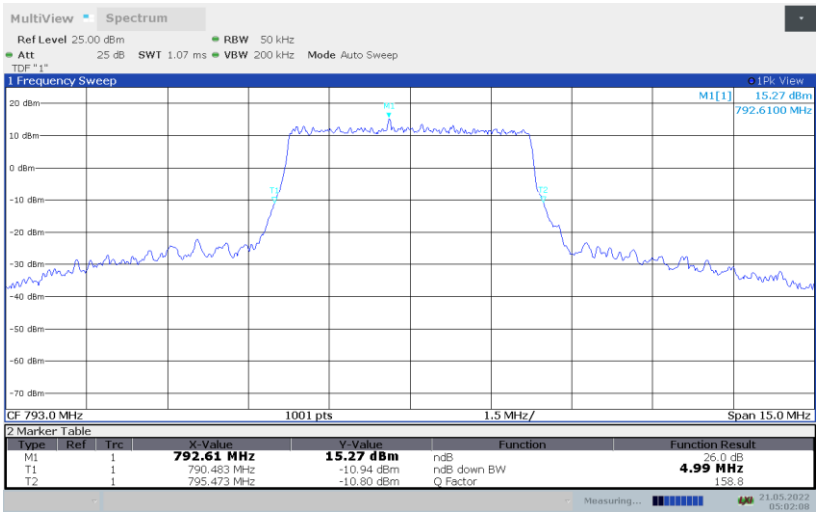
**LTE band 14,5MHz (-26dBc BW)**

| Frequency(MHz) | Emission Bandwidth (-26dBc BW)(MHz) | | |
|---|---|---|---|
| 793 | QPSK | 16QAM | 64QAM |
| | 5.08 | 4.99 | 4.99 |

**LTE band 14,5MHz Bandwidth, QPSK (-26dBc BW)**




**LTE band 14,5MHz Bandwidth, 16QAM (-26dBc BW)**

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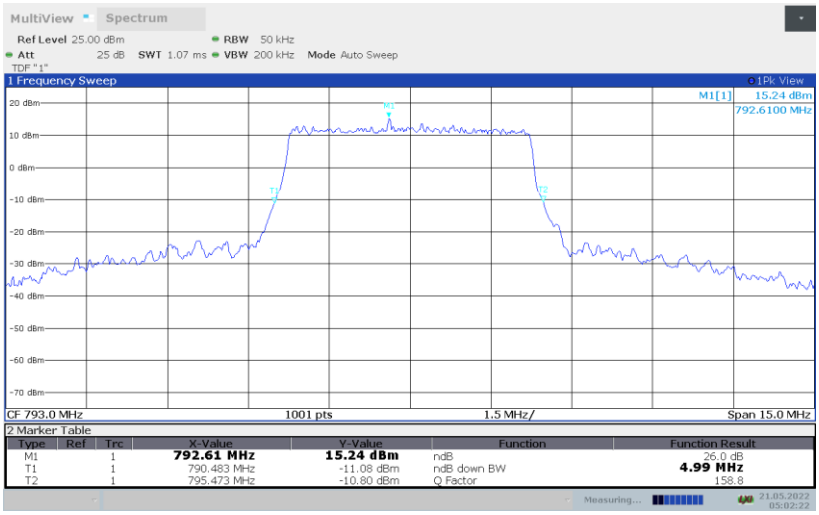
**LTE band 14,5MHz Bandwidth, 64QAM (-26dBc BW)**

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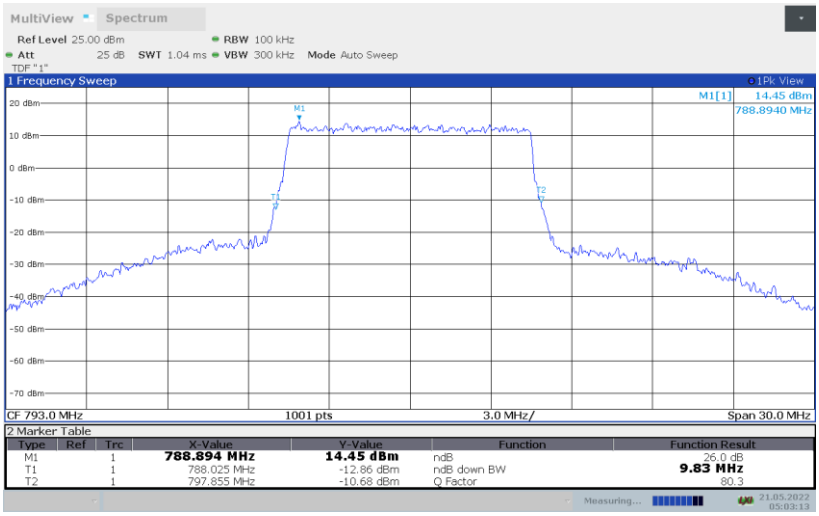
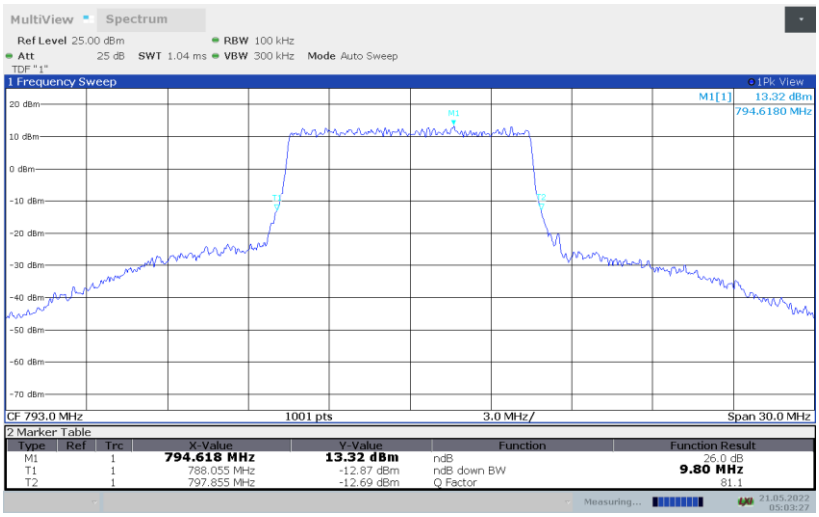
**LTE band 14,10MHz (-26dBc BW)**

| Frequency(MHz) | Emission Bandwidth (-26dBc BW)(MHz) | | |
|---|---|---|---|
| 793 | QPSK | 16QAM | 64QAM |
| | 9.83 | 9.80 | 9.71 |

**LTE band 14,10MHz Bandwidth, QPSK (-26dBc BW)**




**LTE band 14,10MHz Bandwidth, 16QAM (-26dBc BW)**

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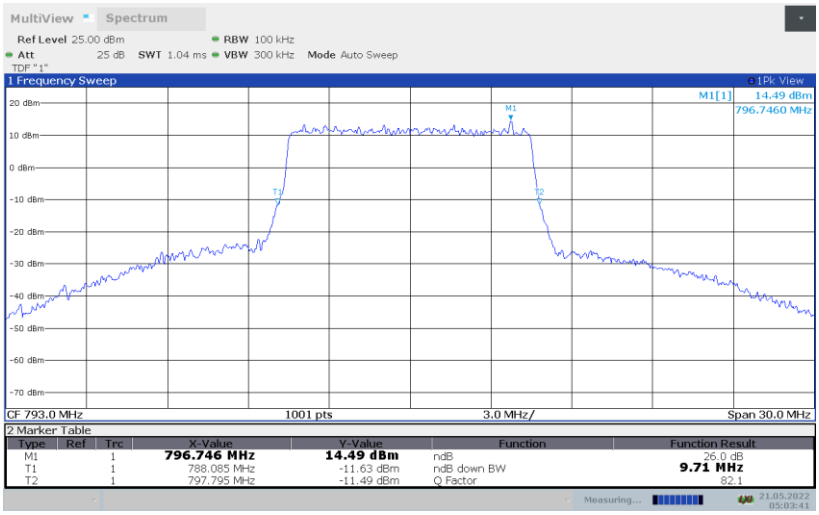
**LTE band 14,10MHz Bandwidth, 64QAM (-26dBc BW)**

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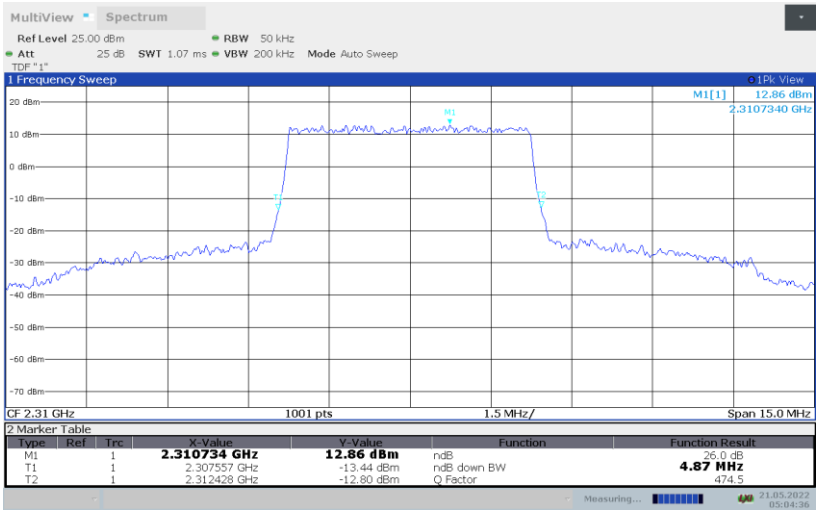
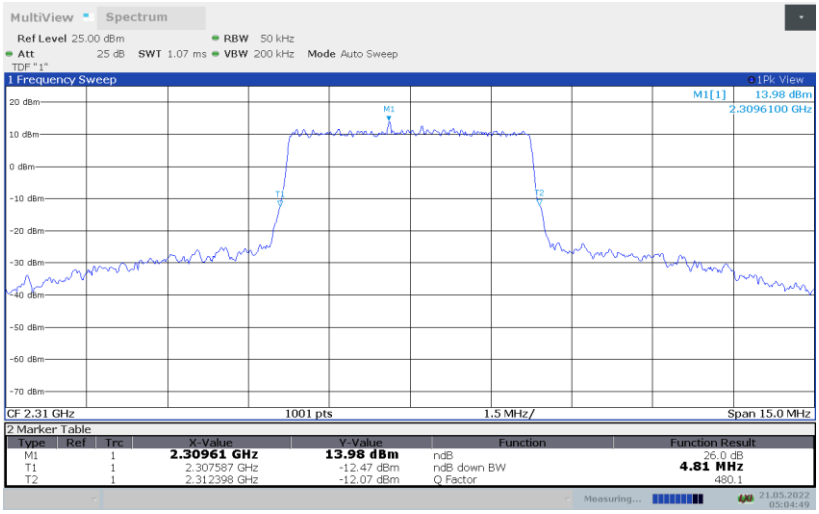
**LTE band 30,5MHz (-26dBc BW)**

| Frequency(MHz) | Emission Bandwidth (-26dBc BW)(MHz) | | |
|---|---|---|---|
| 2310 | QPSK | 16QAM | 64QAM |
| | 4.87 | 4.81 | 4.79 |

**LTE band 30,5MHz Bandwidth, QPSK (-26dBc BW)**




**LTE band 30,5MHz Bandwidth,16QAM (-26dBc BW)**

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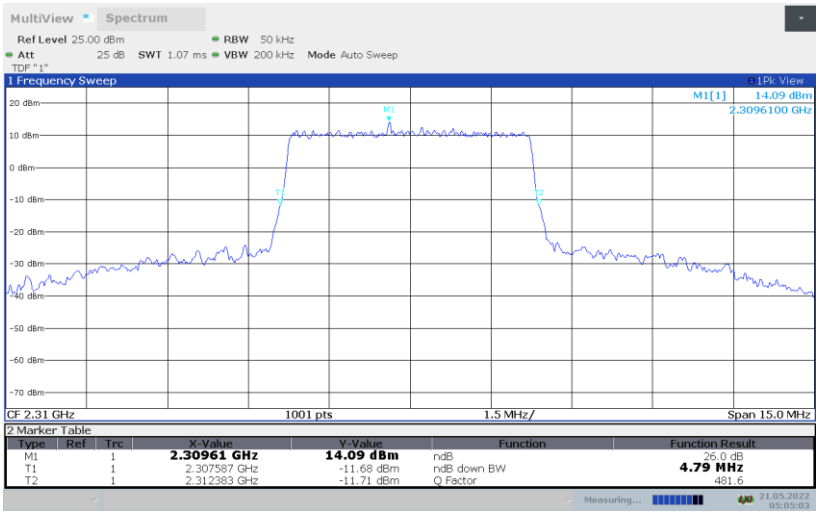
**LTE band 30,5MHz Bandwidth,64QAM (-26dBc BW)**

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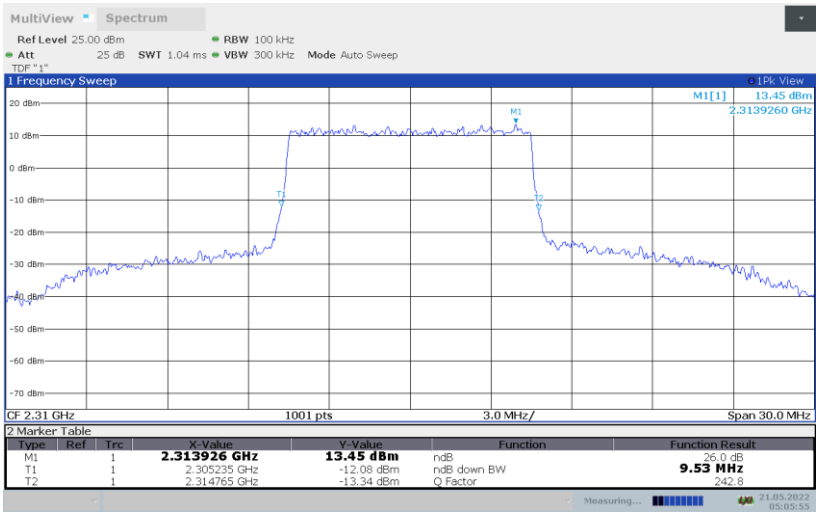
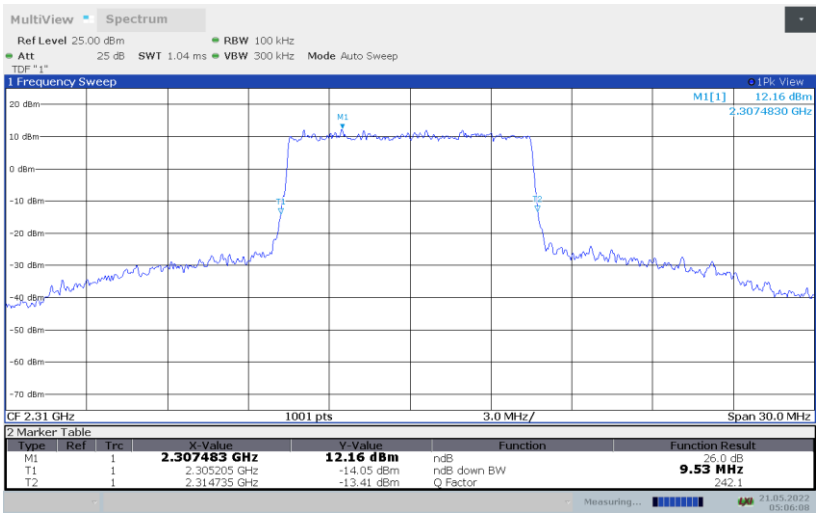
**LTE band 30,10MHz (-26dBc BW)**

| Frequency(MHz) | Emission Bandwidth (-26dBc BW)(MHz) | | |
|---|---|---|---|
| 2310 | QPSK | 16QAM | 64QAM |
| | 9.53 | 9.53 | 9.560 |

**LTE band 30,10MHz Bandwidth, QPSK (-26dBc BW)**




**LTE band 30,10MHz Bandwidth, 16QAM (-26dBc BW)**

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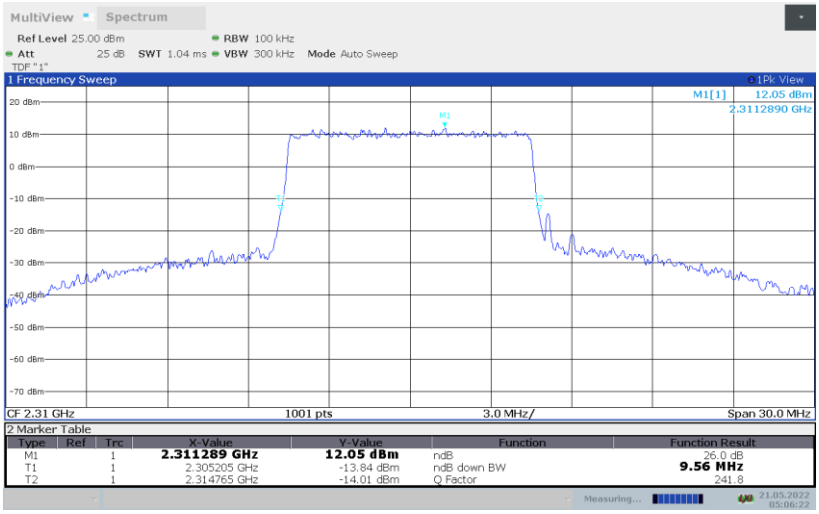
**LTE band 30,10MHz Bandwidth, 64QAM (-26dBc BW)**




Note: Expanded measurement uncertainty is $U$ = 3428 Hz, $k$ = 2

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## A.6 BAND EDGE COMPLIANCE

**Reference**

FCC: CFR Part 2.1051, 22.917, 24.238, 27.53, 90.535.

**A.6.1 Measurement limit**

Part 22.917 For operations in the 824–849MHz band, the FCC limit is 43 +10 log (P)dB below the transmitter power(P) in a 100kHz bandwidth. However, in the 1MHz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

Part 24.238 and Part 27.53(h) specify that the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

Part 27.53(a) states for mobile and portable stations operating in the 2305–2315 MHz and 2350–2360 MHz bands: By a factor of not less than: 43 +10 log (P) dB on all frequencies between 2305 and 2320 MHz and on all frequencies between 2345 and 2360 MHz that are outside the licensed band(s) of operation, not less than 55 + 10 log (P) dB on all frequencies between 2320 and 2324 MHz and on all frequencies between 2341 and 2345 MHz, not less than 61 + 10 log (P) dB on all frequencies between 2324 and 2328 MHz and on all frequencies between 2337 and 2341 MHz, and not less than 67 + 10 log (P) dB onall frequencies between 2328 and 2337MHz; By a factor of not less than 43 + 10 log (P) dB on all frequencies between 2300 and 2305 MHz, 55 + 10 log (P) dB on all frequencies between 2296 and 2300MHz, 61 + 10 log (P) dB on all frequencies between 2292 and 2296 MHz, 67 + 10 log (P) dB on all frequencies between 2288 and 2292 MHz, and 70 + 10 log (P) dB below 2288 MHz; By a factor of not less than 43 + 10 log (P) dB on all frequencies between 2360 and 2365 MHz, and not less than 70 + 10 log (P) dB above 2365 MHz.

Part 27.53(m) specifies for mobile digital stations, the attenuation factor shall be not less than 40+ 10 log (P) dB on all frequencies between the channel edge and 5 megahertz from the channel edge, 43 + 10 log (P) dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and 55 + 10 log (P) dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less that 43 + 10log (P) dB on all frequencies between 2490.5 MHz and 2496 MHz and 55 + 10 log (P) dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

Part 27.53(g) states for operations in the 600 MHz band and the 698–746 MHz band, the power of any emission outside a licensee’s frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 +10 log (P) dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee’s frequency block, a resolution bandwidth of at least 30 kHz may be employed.

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**A.6.2Measurement Procedure**

The testing follows ANSI C63.26

a) The EUT was connected to spectrum analyzer and system simulator via a power divider.

b) The band edges of low and high channels for the highest RF powers were measured.

c) Set RBW >= 1% EBW in the 1MHz band immediately outside and adjacent to the band edge.

d) Set spectrum analyzer with RMS detector.

e) The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

f) Checked that all the results comply with the emission limit line.

**A.6.3 Measurement result**

**Only worst case result is given below**

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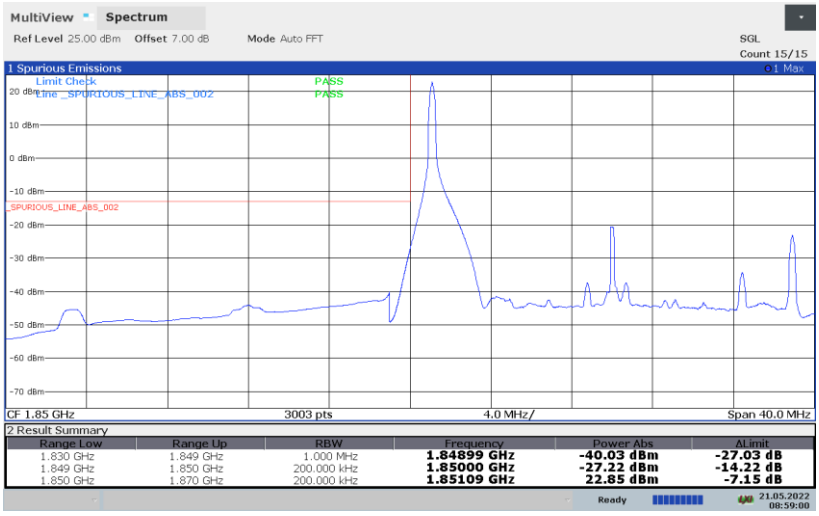
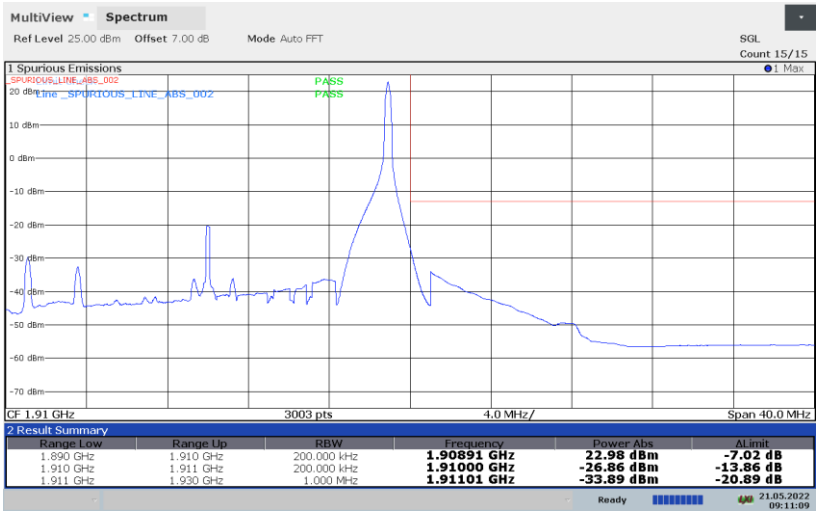
**LTE band 2**

**LOW BAND EDGE BLOCK-1RB-low_offset**




**HIGH BAND EDGE BLOCK-1RB-high_offset**

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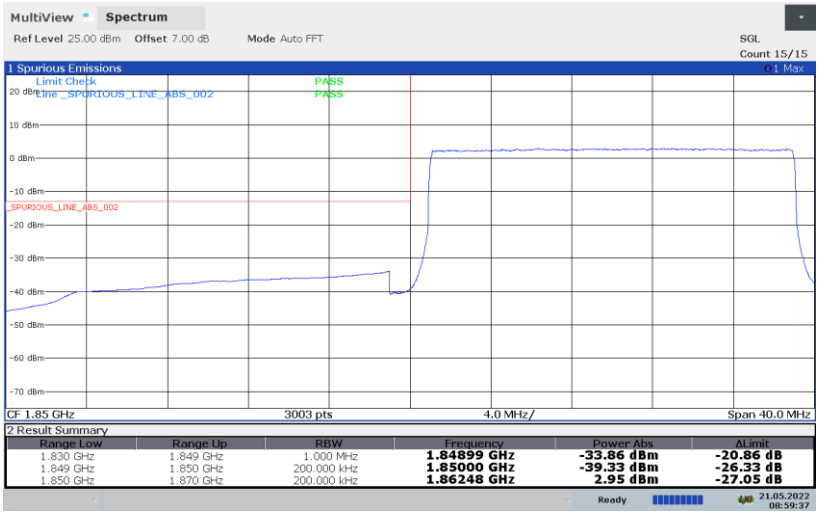
**LOW BAND EDGE BLOCK-20MHz-100%RB**




**HIGH BAND EDGE BLOCK-20MHz-100%RB**

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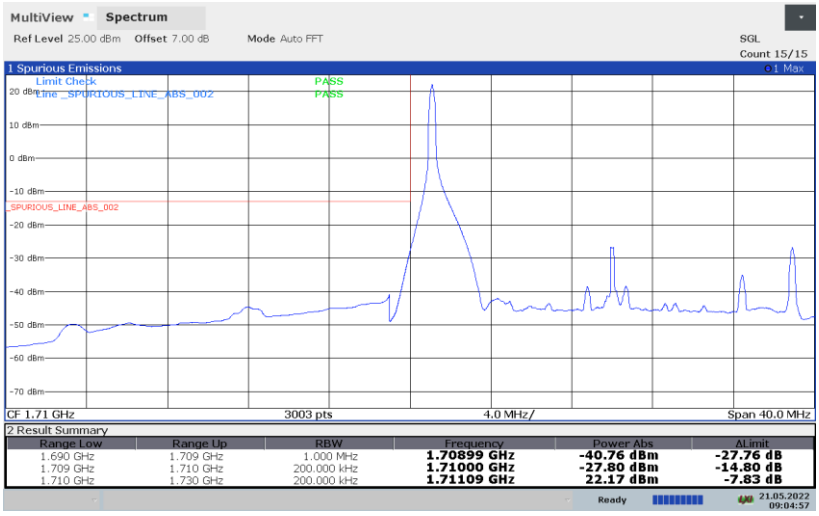
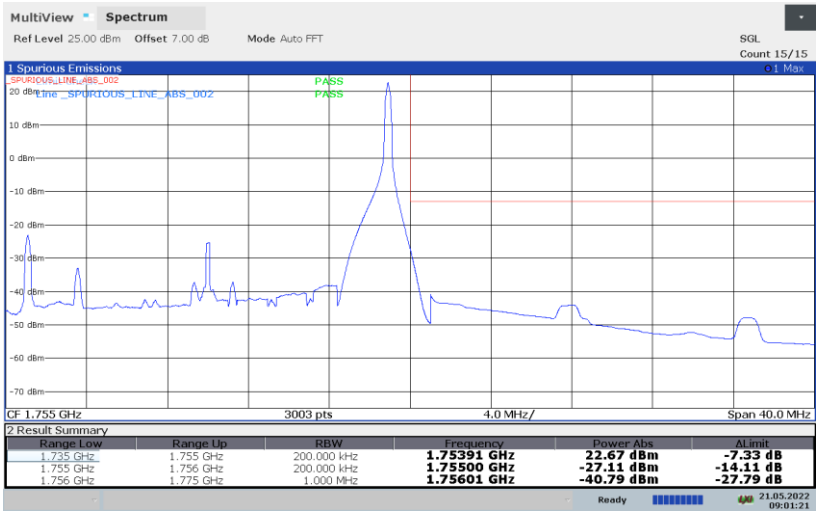
**LTE band 4**

**LOW BAND EDGE BLOCK-1RB-low_offset**




**HIGH BAND EDGE BLOCK-1RB-high_offset**

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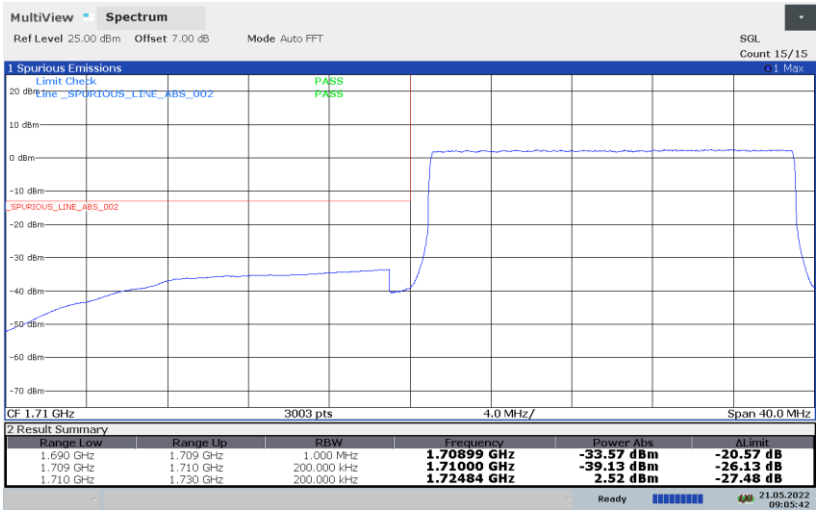
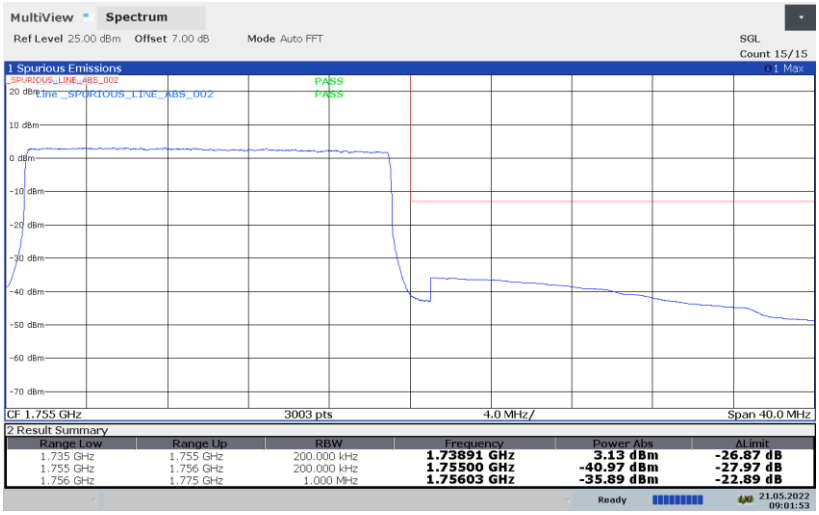
**LOW BAND EDGE BLOCK-20MHz-100%RB**




**HIGH BAND EDGE BLOCK-20MHz-100%RB**

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