

# Test Report

HELEM2111000483-3



## INTENTIONAL RADIATOR TESTS ACCORDING TO FCC PART 15 C AND ISED CANADA REQUIREMENTS

Equipment Under Test: SRD repeater for temperature probes

Model: Repeater

Manufacturer: Quanturi Oy  
Lars Sonckin kaari 10  
FI-02600 Espoo  
FINLAND

Customer: Quanturi Oy  
Lars Sonckin kaari 10  
FI-02600 Espoo  
FINLAND

FCC Rule Part: 15.247  
IC Rule Part: RSS-247, Issue 2, 2017

KDB: RSS-GEN Issue 5 Amendment 2, 2021  
558074 D01 15.247 Meas Guidance v05r02  
Guidance for Compliance Measurements on Digital Transmission Systems,  
Frequency Hopping Spread Spectrum System, and Hybrid System Devices  
Operating Under §15.247 of the FCC rules (April 2, 2019)

Date: 20 October 2022

Issued by:

A handwritten signature in blue ink, appearing to read 'R. Repo'.

Rauno Repo  
Senior EMC Specialist

Date: 20 October 2022

Checked by:

A handwritten signature in blue ink, appearing to read 'Henri Mäki'.

Henri Mäki  
Testing Engineer

## TABLE OF CONTENTS

|                                                                          |    |
|--------------------------------------------------------------------------|----|
| TABLE OF CONTENTS .....                                                  | 2  |
| GENERAL REMARKS.....                                                     | 3  |
| Disclaimer .....                                                         | 3  |
| RELEASE HISTORY .....                                                    | 4  |
| PRODUCT DESCRIPTION .....                                                | 5  |
| Equipment Under Test .....                                               | 5  |
| General Description.....                                                 | 5  |
| Ratings and declarations .....                                           | 5  |
| Power Supply .....                                                       | 5  |
| Mechanical Size of the EUT .....                                         | 5  |
| SUMMARY OF TESTING.....                                                  | 6  |
| EUT Test Conditions during Testing .....                                 | 6  |
| Test Facility .....                                                      | 7  |
| TEST RESULTS.....                                                        | 8  |
| Antenna Requirement .....                                                | 8  |
| Conducted Emissions In The Frequency Range 150 kHz - 30 MHz.....         | 9  |
| Maximum Peak Conducted Output Power .....                                | 11 |
| Transmitter Radiated Spurious Emissions 9 kHz - 10 GHz .....             | 13 |
| Transmitter Band Edge Measurement and Conducted Spurious Emissions ..... | 16 |
| 6 dB Bandwidth of the Channel.....                                       | 21 |
| Power Spectral Density .....                                             | 23 |
| 99% Occupied Bandwidth .....                                             | 25 |
| Duty cycle correction factor, Transmit time in 100 ms .....              | 27 |
| TEST EQUIPMENT .....                                                     | 28 |

## GENERAL REMARKS

### Disclaimer

*This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at <http://www.sgs.com/en/Terms-and-Conditions.aspx> and, for electronic format documents, subject to Terms and Conditions for Electronic Documents at <http://www.sgs.com/en/Terms-and-Conditions/Terms-e-Document.aspx>*

*Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.*

*Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 30 days only.*

**RELEASE HISTORY**

| Version | Changes               | Issued           |
|---------|-----------------------|------------------|
| 1.0     | Initial release       | 14 February 2022 |
| 1.1     | Type errors corrected | 20 October 2022  |

## PRODUCT DESCRIPTION

### Equipment Under Test

Equipment Under Test: SRD repeater for temperature probes  
Model: Repeater  
Trademark: **Quanturi**  
Serial no: -  
FCC ID: -  
IC: -  
Radio module or chip: ON Semiconductor AX8052F143-D

### General Description

Repeater forwards all messages that are transmitted by the probes or base station.

### Classification

|                                              |                                     |
|----------------------------------------------|-------------------------------------|
| Fixed device                                 | <input type="checkbox"/>            |
| Mobile Device (Human body distance > 20cm)   | <input checked="" type="checkbox"/> |
| Portable Device (Human body distance < 20cm) | <input type="checkbox"/>            |

### Modifications Incorporated in the EUT

No modifications.

### Ratings and declarations

|                                  |                                                                                                                     |
|----------------------------------|---------------------------------------------------------------------------------------------------------------------|
| Operating Frequency Range (OFR): | 902 - 928 MHz                                                                                                       |
| Modulation:                      | FSK                                                                                                                 |
| Antenna type:                    | Direct connect antenna by Siretta, model Delta 22B.<br>Antenna is positioned inside the plastic cabinet of the EUT. |
| Antenna gain:                    | +3 dBi                                                                                                              |

### Power Supply

Power supply: TDC Power Products Co., Ltd. Model No: SA9A-120-2100W  
-Input: 100-120 V ~60 Hz 1 A  
-Output: 12.0 VDC 2.1 A

Conducted tests from the antenna port were performed using laboratory power supply.

### Mechanical Size of the EUT

|                |              |                |
|----------------|--------------|----------------|
| Height: 330 mm | Width: 60 mm | Length: 155 mm |
|----------------|--------------|----------------|

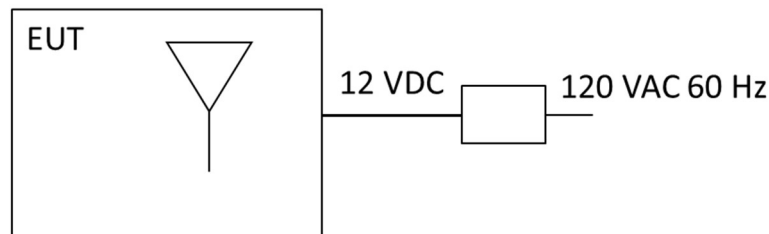
### SUMMARY OF TESTING

| Test Specification                   | Description of Test                                                        | Result |
|--------------------------------------|----------------------------------------------------------------------------|--------|
| §15.203                              | Antenna requirement                                                        | PASS   |
| §15.207(a) / RSS-GEN 8.8             | Conducted Emissions on Power Supply Lines                                  | PASS   |
| §15.247(b)(3) / RSS-247 5.4(d)       | Maximum Peak Conducted Output Power                                        | PASS   |
| §15.247(a)(2) / RSS-247 5.2(a)       | 6 dB Bandwidth                                                             | PASS   |
| §15.247(e) / RSS-247 5.2(b)          | Power Spectral Density                                                     | PASS   |
| RSS-GEN 6.7                          | 99% Occupied Bandwidth                                                     | PASS   |
| §15.247(d) / RSS-247 5.5             | 100 kHz Bandwidth of Frequency Band Edges and Conducted Spurious Emissions | PASS   |
| §15.209(a), §15.247(d) / RSS-247 5.5 | Radiated Emissions Within the Restricted Bands                             | PASS   |

The decision rule applied for the tests results stated in this test report is according to the requirements of section 1.3 of ANSI C63.10-2013.

### EUT Test Conditions during Testing

The EUT was in modulated transmit mode with maximum power during the tests. Radiated tests were made with low, mid and high frequencies and the worst-case results are presented (927 MHz). Measurements were performed in actual usage position.



**Figure 1:** Test setup block diagram

**Table 1:** Test frequencies

| Channel | Frequency (MHz) |
|---------|-----------------|
| Low     | 903             |
| Mid     | 915             |
| High    | 927             |

**Test Facility**

|                                                                                                            |                                                                                                                                                                                                                   |
|------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Testing Laboratory / address:<br>FCC designation number: <b>FI0002</b><br>ISED CAB identifier: <b>T004</b> | SGS Fimko Ltd<br>Takomotie 8<br>FI-00380, HELSINKI<br>FINLAND                                                                                                                                                     |
| Test Site:                                                                                                 | <input type="checkbox"/> K10LAB, ISED Canada registration number: <b>8708A-1</b><br><input checked="" type="checkbox"/> K5LAB, ISED Canada registration number: <b>8708A-2</b><br><input type="checkbox"/> T10LAB |

**TEST RESULTS****Antenna Requirement**

**Standard:** FCC Rule §15.203  
**Tested by:** RRE  
**Date:** 11 February 2022

**FCC Rule: 15.203**

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

| Specification | Requirement (at least one of the following shall be applied)                                                                                                                                                                                                                                                            | Conclusion  |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| §15.203       | <ol style="list-style-type: none"><li>1. Permanently attached antenna</li><li>2. Unique coupling to the intentional radiator</li><li>3. Professionally installed radio. The installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.</li></ol> | <b>PASS</b> |
| Note          | Option 1 is used                                                                                                                                                                                                                                                                                                        |             |

## Conducted Emissions In The Frequency Range 150 kHz - 30 MHz

### Conducted Emissions In The Frequency Range 150 kHz - 30 MHz

**Standard:** ANSI C63.10 (2013)  
**Tested by:** RRE  
**Date:** 26 November 2021  
**Temperature:**  $23 \pm 3$  °C  
**Humidity:** 20 - 75 % RH  
**Measurement uncertainty:**  $\pm 2.9$  dB Level of confidence 95 % (k = 2)

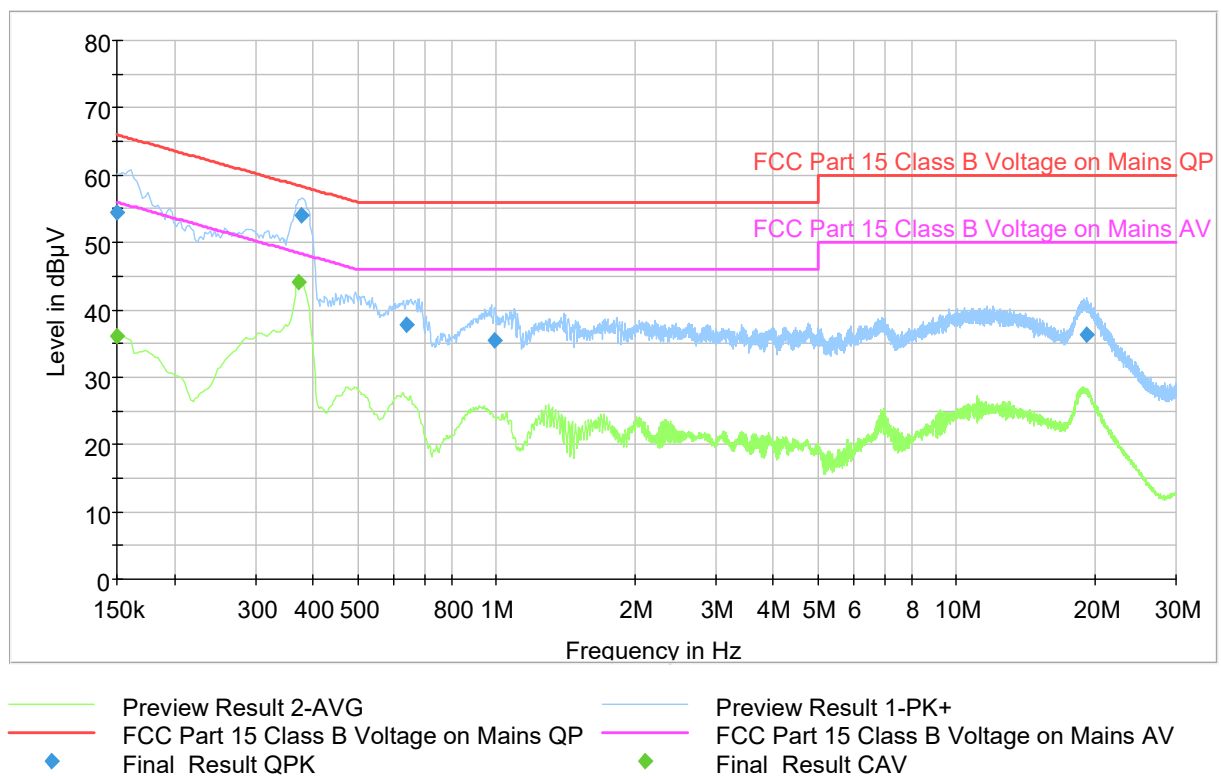
**FCC Rule: 15.207 (a)**  
**RSS-GEN 8.8**

Conducted disturbance voltage was measured with an artificial main network from 150 kHz to 30 MHz with 4.5 kHz steps and a resolution bandwidth of 9 kHz. Measurements were carried out with peak and average detectors.

| Frequency of emission (MHz) | Conducted limit (dBμV) |           |
|-----------------------------|------------------------|-----------|
|                             | Quasi-peak             | Average   |
| 0.15-0.5                    | 66 to 56*              | 56 to 46* |
| 0.5-5                       | 56                     | 46        |
| 5-30                        | 60                     | 50        |

\*Decreases with the logarithm of the frequency.

Full Spectrum



**Figure 2:** The measured curves with peak- and average detector (TX 903 MHz)

## Conducted Emissions In The Frequency Range 150 kHz - 30 MHz

### Final measurements from the worst frequencies

**Table 2:** Final measurement results

| Frequency (MHz) | QuasiPeak (dBμV) | CAverage (dBμV) | Limit (dBμV) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line | Corr. (dB) |
|-----------------|------------------|-----------------|--------------|-------------|-----------------|-----------------|------|------------|
| 0.150000        | ---              | 36.20           | 56.00        | 19.80       | 15x1000         | 9.000           | N    | 9.7        |
| 0.150000        | 54.54            | ---             | 66.00        | 11.46       | 15x1000         | 9.000           | L1   | 9.7        |
| 0.371750        | ---              | 44.11           | 48.46        | 4.35        | 15x1000         | 9.000           | L1   | 9.7        |
| 0.378500        | 53.94            | ---             | 58.31        | 4.37        | 15x1000         | 9.000           | L1   | 9.7        |
| 0.640000        | 37.86            | ---             | 56.00        | 18.14       | 15x1000         | 9.000           | L1   | 9.7        |
| 0.990750        | 35.48            | ---             | 56.00        | 20.52       | 15x1000         | 9.000           | N    | 9.8        |
| 19.153750       | 36.21            | ---             | 60.00        | 23.79       | 15x1000         | 9.000           | N    | 10.5       |

The correction factor in the final result table contains the sum of the transducers (transient limiter + cables).

The result value is the measured value corrected with the correction factor.

## Maximum Peak Conducted Output Power

### Maximum Peak Conducted Output Power

**Standard:** ANSI C63.10 (2013)  
**Tested by:** RRE  
**Date:** 24 February 2022  
**Temperature:**  $23 \pm 3$  °C  
**Humidity:** 20 - 75 % RH  
**Measurement uncertainty:**  $\pm 2.87$  dB Level of confidence 95 % (k = 2)

**FCC Rule: 15.247(b)(3)**  
**RSS-247 5.4(d)**

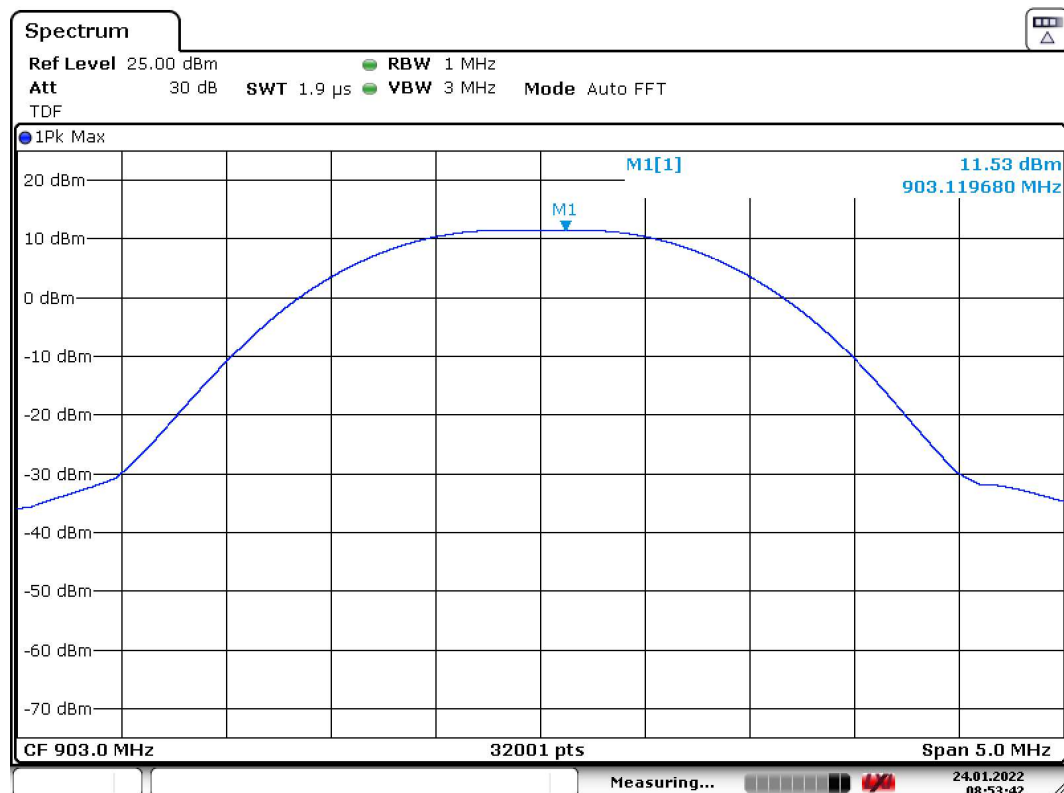
For systems using digital modulation in the 902-928 MHz bands the limit is 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power.

Measured values are peak values.

#### Results:

**Table 3:** Maximum conducted output power

| Channel | Conducted Power [dBm] | Limit [dBm] | Margin [dBm] | Result |
|---------|-----------------------|-------------|--------------|--------|
| Low     | 11.53                 | 30          | 18.47        | PASS   |
| Mid     | 11.77                 | 30          | 18.23        | PASS   |
| High    | 11.88                 | 30          | 18.12        | PASS   |



**Figure 3:** Conducted power, Channel LOW

## Maximum Peak Conducted Output Power

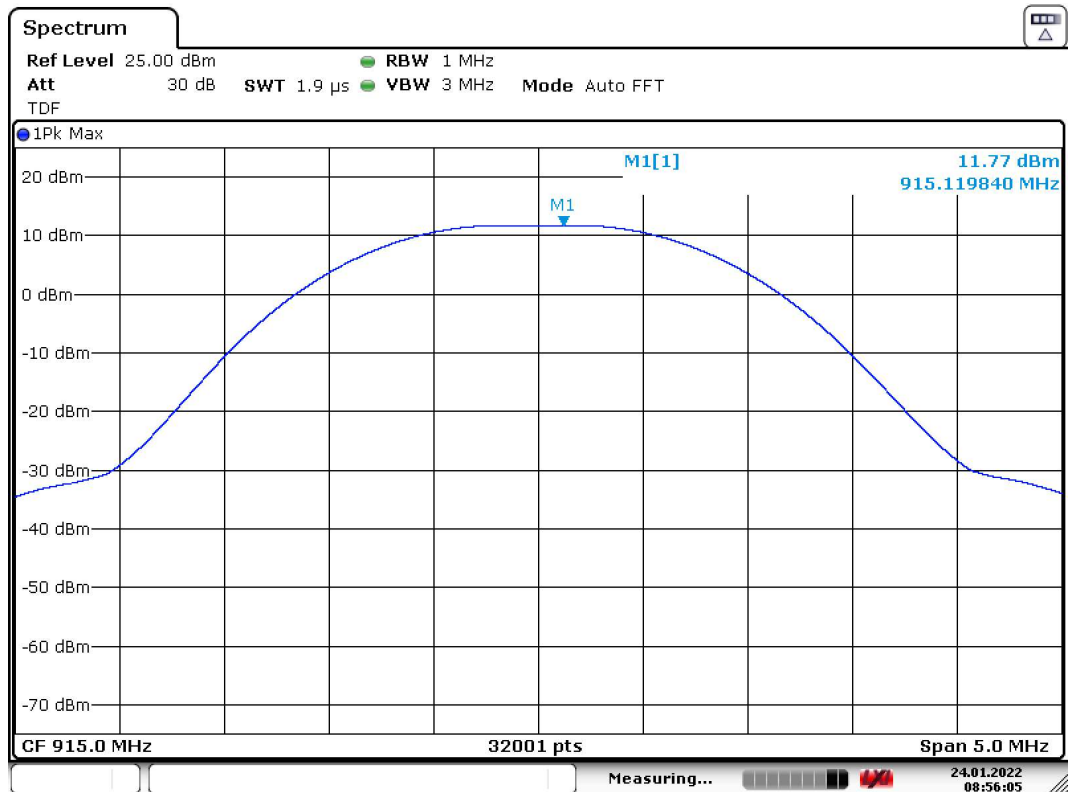


Figure 4: Conducted power, Channel MID

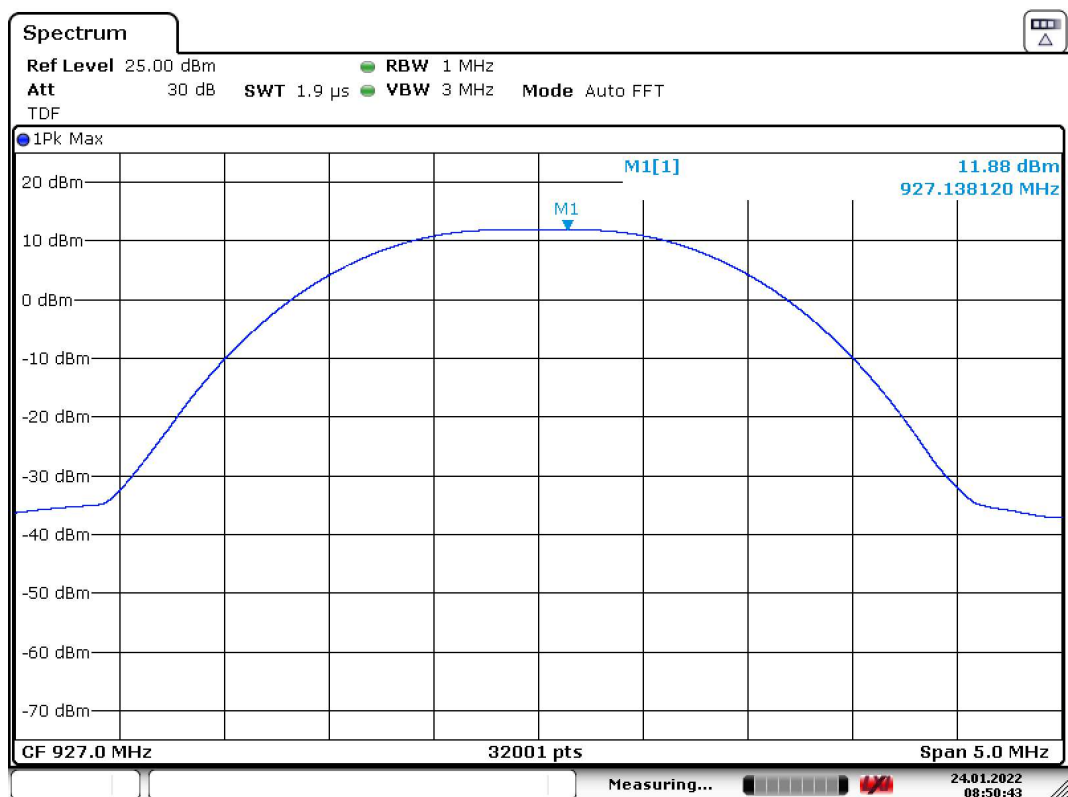


Figure 5: Conducted power, Channel HIGH

## Transmitter Radiated Spurious Emissions 9 kHz - 10 GHz

### Transmitter Radiated Spurious Emissions 9 kHz - 10 GHz

**Standard:** ANSI C63.10 (2013)  
**Tested by:** RRE  
**Date:** 8 December 2021, 9 February 2022  
**Temperature:**  $23 \pm 3$  °C  
**Humidity:** 20 - 75 % RH  
**Measurement uncertainty:**  $\pm 4.51$  dB Level of confidence 95 % (k = 2)

**FCC Rule: 15.247(d), 15.209(a)**

#### RSS-247 5.5

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).

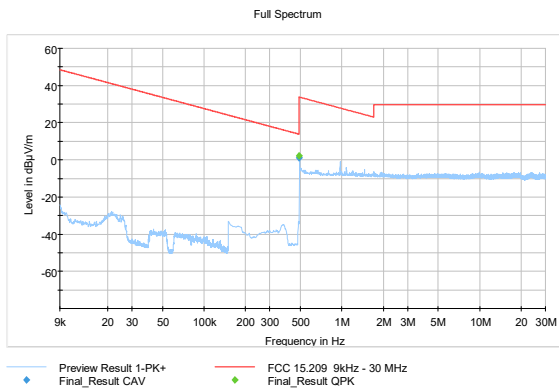
The correction factor in the final result table contains the sum of the transducers (antenna + amplifier + cables).

Peak values of emissions below 1000 MHz measured for reference as well as transmitter fundamental.

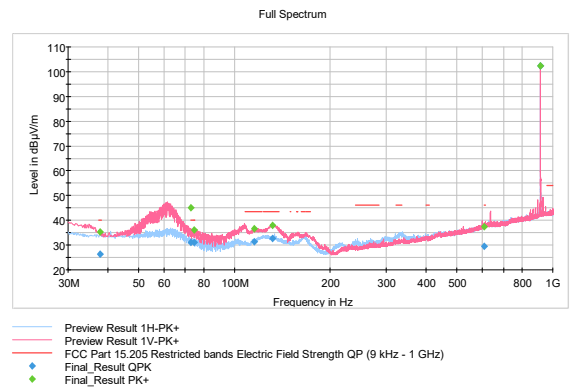
| Frequency range [MHz] | Limit [ $\mu\text{V/m}$ ] | Limit [dB $\mu\text{V/m}$ ] | Detector   |
|-----------------------|---------------------------|-----------------------------|------------|
| 0.009-0.490           | 2400/F(kHz)               | 48.5-13.8                   | Quasi-peak |
| 0.490-1.705           | 24000/F(kHz)              | 33.8-22.97                  | Quasi-peak |
| 1.705-30.0            | 30                        | 29.54                       | Quasi-peak |
| 30 - 80               | 100                       | 40.0                        | Quasi-peak |
| 88 - 216              | 150                       | 43.5                        | Quasi-peak |
| 216 - 960             | 200                       | 46.0                        | Quasi-peak |
| 960 - 1000            | 500                       | 53.9                        | Quasi-peak |
| Above 1000            | 500                       | 53.9                        | Average    |
| Above 1000            | 5000                      | 73.9                        | Peak       |

## Transmitter Radiated Spurious Emissions 9 kHz - 10 GHz

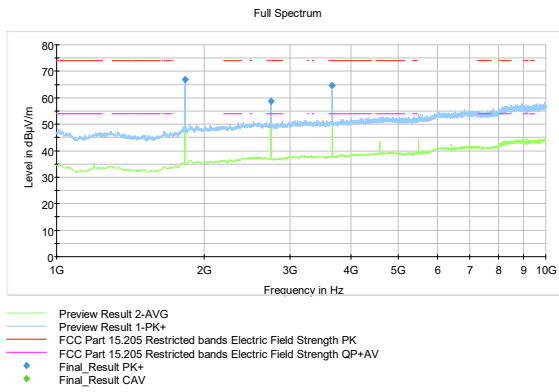
### Results MID channel



**Figure 6:** MID channel (9 kHz – 30 MHz)



**Figure 7:** MID channel (30 MHz – 1000 MHz)



**Figure 8:** MID channel (1 GHz – 10 GHz)

## Transmitter Radiated Spurious Emissions 9 kHz - 10 GHz

**Table 4:** Peak results MID channel

| Frequency (MHz) | MaxPeak (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|--------------|
| 37.755000       | 35.22            | 40.00          | 4.78        | 15x1000         | 120.000         | 100.0       | V   | 126.0         | 26.7         |
| 72.825000       | 44.96            | 82.44**        | 37.48       | 15x1000         | 120.000         | 121.0       | V   | 314.0         | 25.5         |
| 74.795000       | 35.98            | 82.44**        | 46.48       | 15x1000         | 120.000         | 142.0       | V   | 343.0         | 24.8         |
| 115.235000      | 36.75            | 43.52          | 6.77        | 15x1000         | 120.000         | 105.0       | V   | 86.0          | 25.4         |
| 131.425000      | 38.07            | 43.52          | 5.45        | 15x1000         | 120.000         | 117.0       | V   | 121.0         | 27.1         |
| 608.595000      | 37.46            | 46.02          | 8.56        | 15x1000         | 120.000         | 307.0       | V   | 139.0         | 37.0         |
| 915.125000*     | 102.44           | ---            | ---         | 15x1000         | 120.000         | 108.0       | V   | 56.0          | 41.7         |
| 1830.225000     | 66.81            | 82.44**        | 15.63       | 15x1000         | 1000.000        | 121.0       | V   | 144.0         | 12.1         |
| 2744.775000     | 58.66            | 74.00          | 15.34       | 15x1000         | 1000.000        | 162.0       | V   | 131.0         | 14.2         |
| 3660.425000     | 64.70            | 74.00          | 9.30        | 15x1000         | 1000.000        | 245.0       | H   | 114.0         | 15.4         |

\*Fundamental frequency

\*\*Limit is 20 dB less than the fundamental peak value

**Table 5:** Average results MID channel

| Frequency (MHz) | Average (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|--------------|
| 0.491000        | 1.05             | 33.78          | 32.73       | 15x1000         | 9.000           | 190.0       | V   | 0.0           | -20.2        |
| 2744.775000*    | 38.61            | 74.00          | 15.34       | 15x1000         | 1000.000        | 162.0       | V   | 131.0         | 14.2         |
| 3660.425000*    | 44.65            | 74.00          | 9.30        | 15x1000         | 1000.000        | 245.0       | H   | 114.0         | 15.4         |

\* Average values for the harmonics are calculated from the peak results using duty cycle correction factor (look at section "Duty cycle correction factor, Transmit time in 100 ms").

**Table 6:** Quasi-peak results MID channel

| Frequency (MHz) | QuasiPeak (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|--------------|
| 0.491000        | 2.29               | 33.78          | 31.49       | 15x1000         | 9.000           | 190.0       | V   | 0.0           | -20.2        |
| 37.755000       | 26.24              | 40.00          | 13.76       | 15x1000         | 120.000         | 100.0       | V   | 126.0         | 26.7         |
| 72.825000       | 31.19              | ---            | ---         | 15x1000         | 120.000         | 121.0       | V   | 314.0         | 25.5         |
| 74.795000       | 31.15              | ---            | ---         | 15x1000         | 120.000         | 142.0       | V   | 343.0         | 24.8         |
| 115.235000      | 31.30              | 43.52          | 12.22       | 15x1000         | 120.000         | 105.0       | V   | 86.0          | 25.4         |
| 131.425000      | 32.74              | 43.52          | 10.78       | 15x1000         | 120.000         | 117.0       | V   | 121.0         | 27.1         |
| 608.595000      | 29.46              | 46.02          | 16.56       | 15x1000         | 120.000         | 307.0       | V   | 139.0         | 37.0         |

## Transmitter Band Edge Measurement and Conducted Spurious Emissions

### Transmitter Band Edge Measurement and Conducted Spurious Emissions

**Standard:** ANSI C63.10 (2013)  
**Tested by:** RRE  
**Date:** 24 January 2022  
**Temperature:**  $23 \pm 3$  °C  
**Humidity:** 20 - 75 % RH  
**Measurement uncertainty:**  $\pm 2.87$  dB Level of confidence 95 % ( $k = 2$ )

**FCC Rule: 15.247(d), 15.209(a)**

#### RSS-247 5.5

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

**Table 7:** Band edge attenuation

| Band Edge Attenuation |                 |
|-----------------------|-----------------|
| Lower Band Edge       | Upper Band Edge |
| -43.68 dBc            | -50.36 dBc      |
| Limit: -20 dBc        |                 |

## Transmitter Band Edge Measurement and Conducted Spurious Emissions

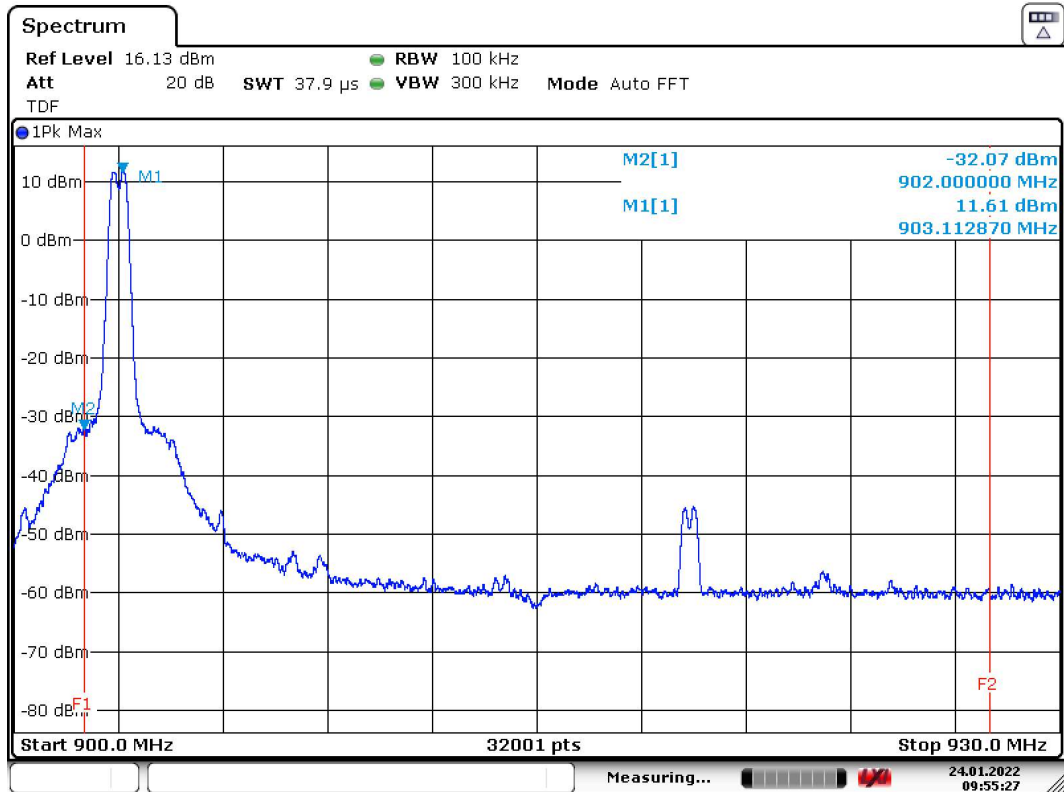


Figure 9: Lower Band Edge

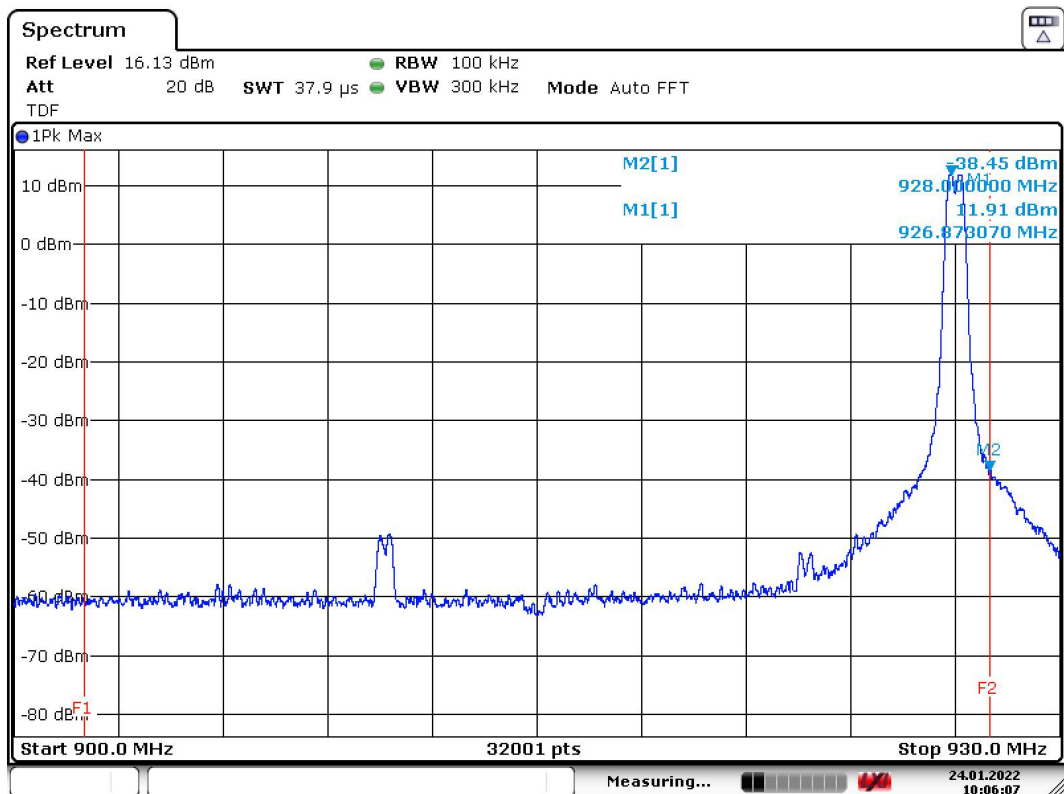
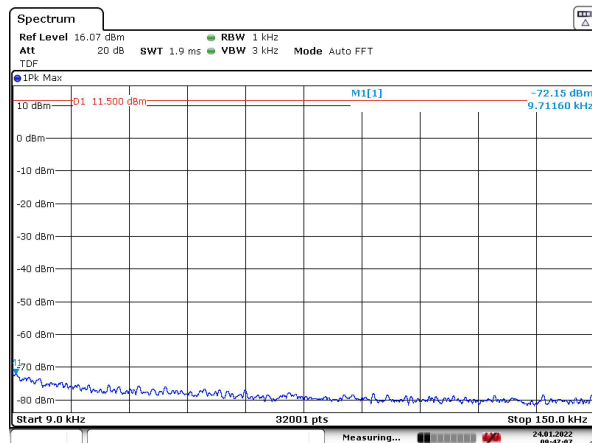


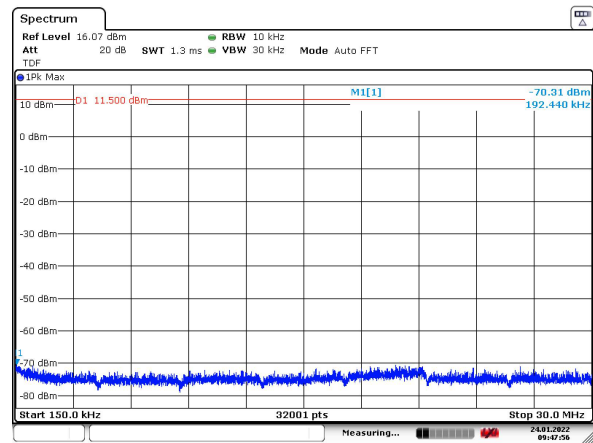
Figure 10: Upper Band Edge

## Transmitter Band Edge Measurement and Conducted Spurious Emissions

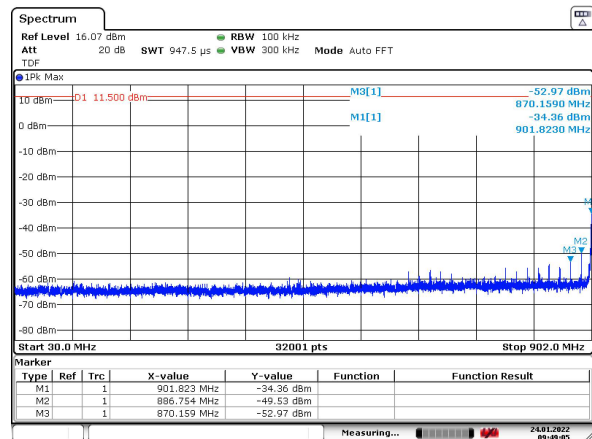
### Conducted spurious emissions results LOW channel



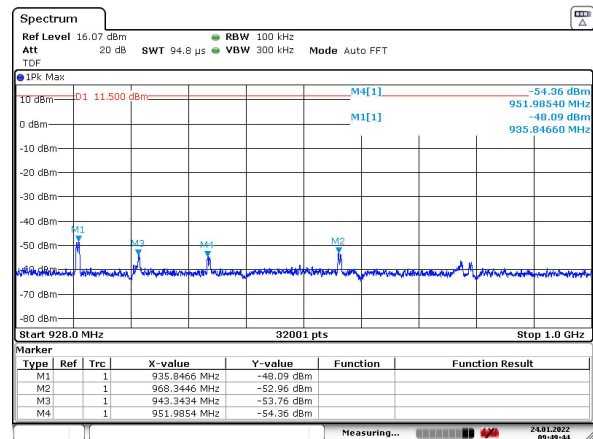
**Figure 11:** Conducted spurious emissions 9-150 kHz LOW channel



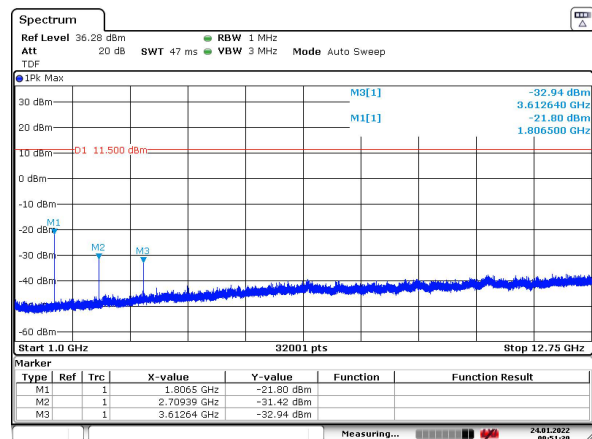
**Figure 12:** Conducted spurious emissions 150 kHz – 30 MHz LOW channel



**Figure 13:** Conducted spurious emissions 30 MHz – 902 MHz LOW channel



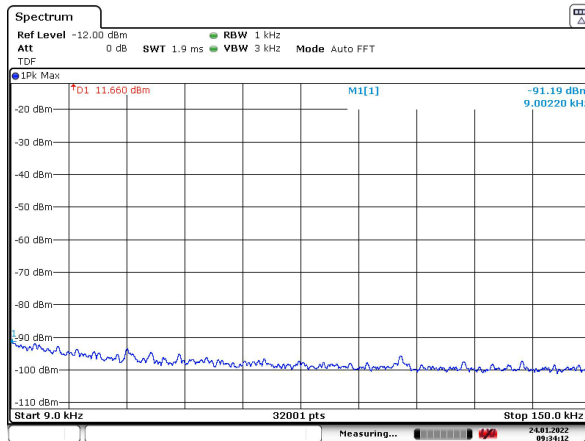
**Figure 14:** Conducted spurious emissions 928 MHz – 1 GHz LOW channel



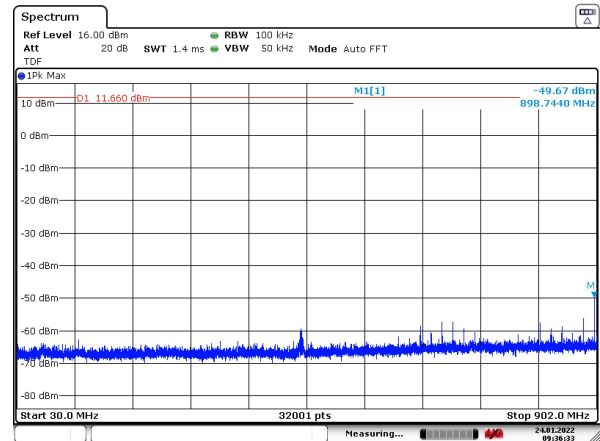
**Figure 15:** Conducted spurious emissions 1 GHz – 12.75 GHz LOW channel

## Transmitter Band Edge Measurement and Conducted Spurious Emissions

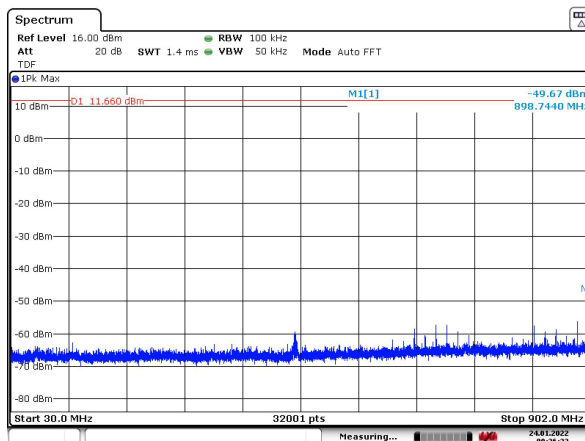
### Conducted spurious emissions results MID channel



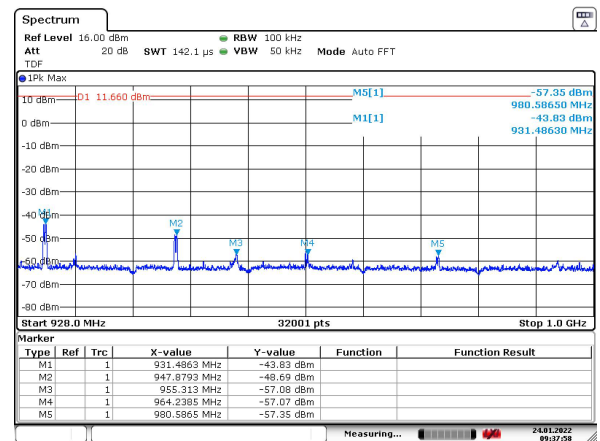
**Figure 16:** Conducted spurious emissions  
9-150 kHz MID channel



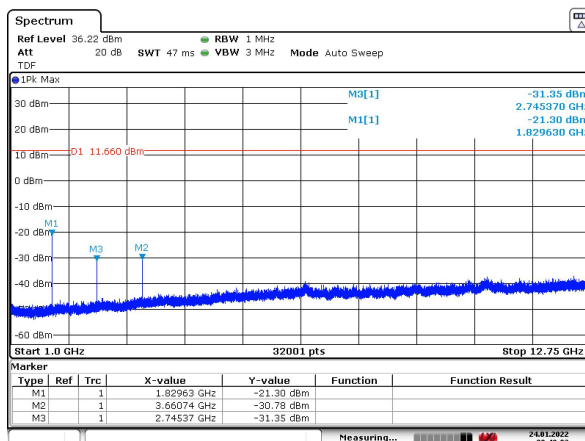
**Figure 17:** Conducted spurious emissions  
150 kHz – 30 MHz MID channel



**Figure 18:** Conducted spurious emissions  
30 MHz – 902 MHz MID channel



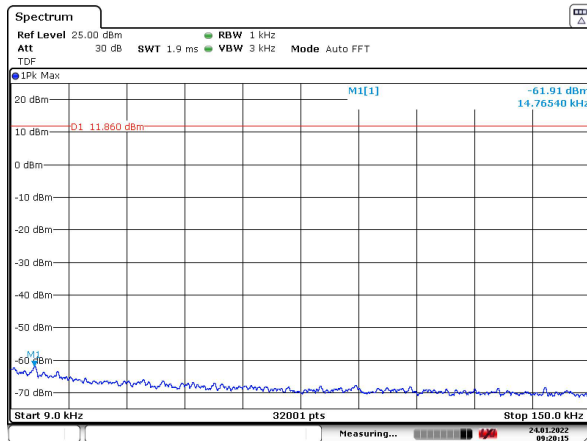
**Figure 19:** Conducted spurious emissions  
928 MHz – 1 GHz MID channel



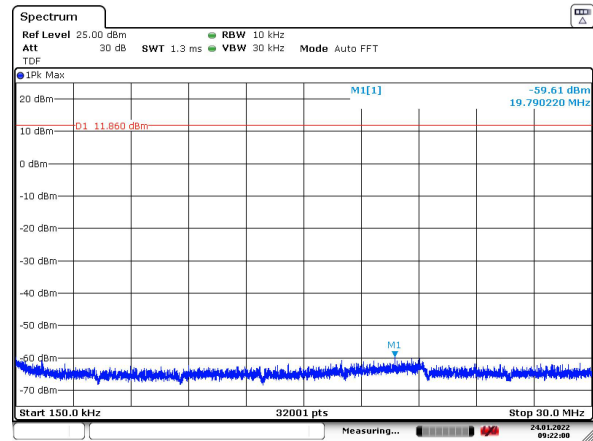
**Figure 20:** Conducted spurious emissions  
1 GHz – 12.75 GHz MID channel

## Transmitter Band Edge Measurement and Conducted Spurious Emissions

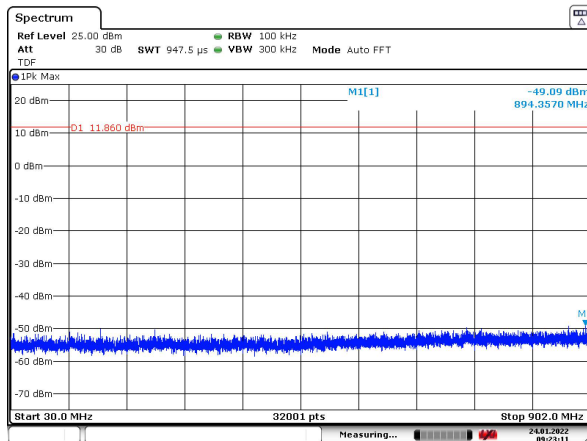
### Conducted spurious emissions results HIGH channel



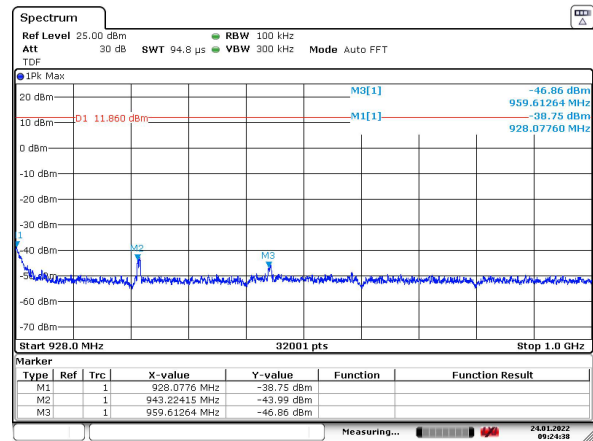
**Figure 21:** Conducted spurious emissions 9-150 kHz HIGH channel



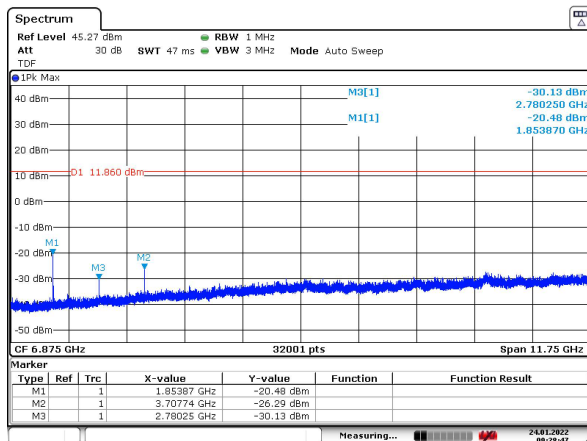
**Figure 22:** Conducted spurious emissions 150 kHz – 30 MHz HIGH channel



**Figure 23:** Conducted spurious emissions 30 MHz – 902 MHz HIGH channel



**Figure 24:** Conducted spurious emissions 928 MHz – 1 GHz HIGH channel



**Figure 25:** Conducted spurious emissions 1 GHz – 12.75 GHz HIGH channel

### 6 dB Bandwidth of the Channel

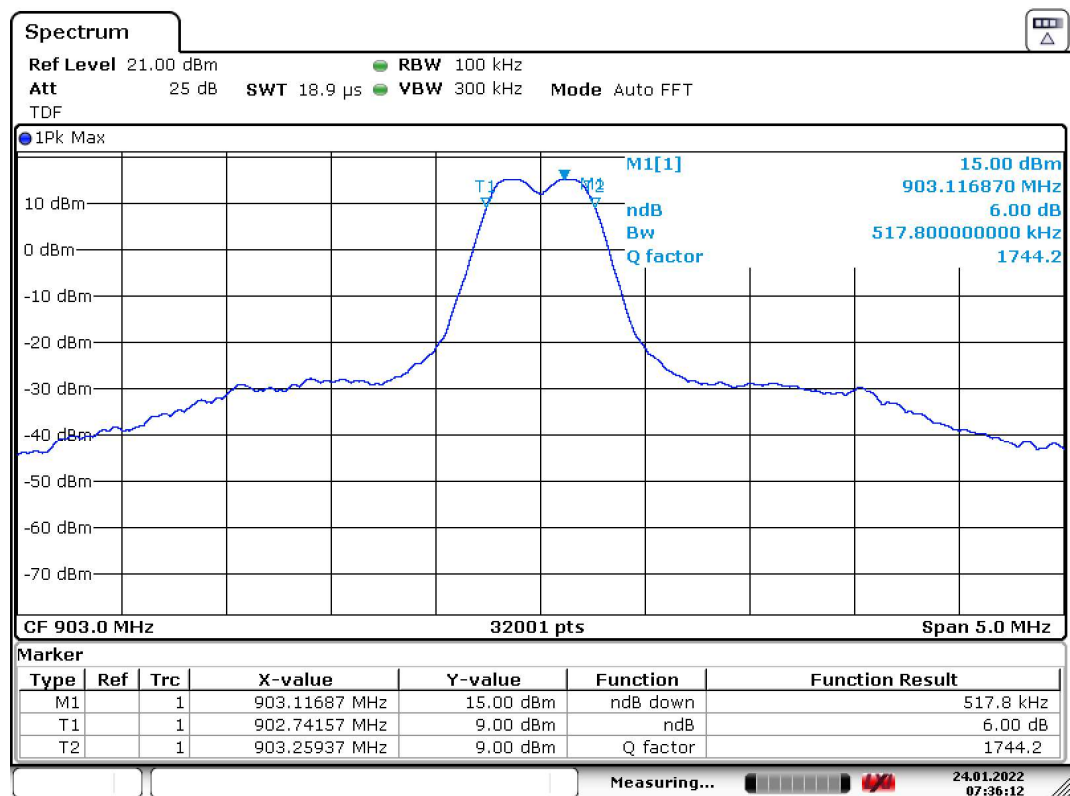
**Standard:** ANSI C63.10 (2013)  
**Tested by:** RRE  
**Date:** 24 January 2022  
**Temperature:**  $23 \pm 3$  °C  
**Humidity:** 20 - 75 % RH

**FCC Rule:** 15.247(a)(2)  
**RSS-247 5.2(a)**

### Results

**Table 8:** 6 dB bandwidth test results

| Channel | 6 dB BW [kHz] | Minimum limit [kHz] |
|---------|---------------|---------------------|
| Low     | 517.8         | 500                 |
| Mid     | 518.6         |                     |
| High    | 518.1         |                     |



**Figure 26:** 6 dB bandwidth, channel LOW

## 6 dB Bandwidth of the Channel

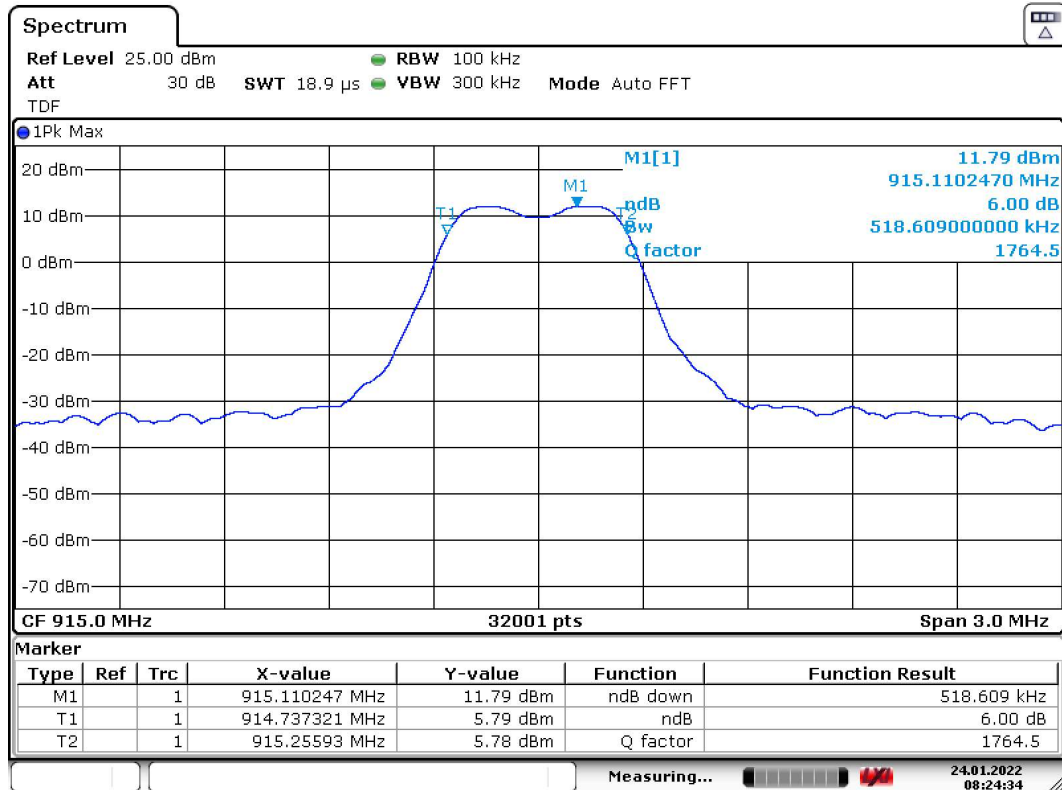


Figure 27: 6 dB bandwidth, channel MID

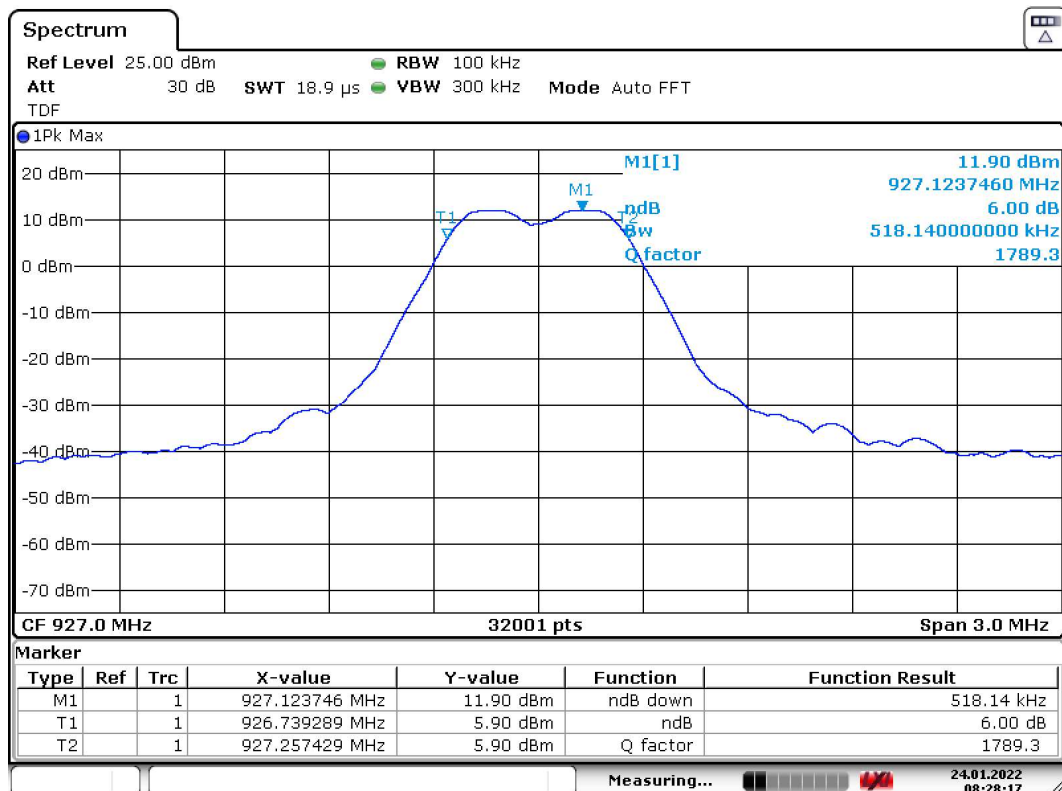


Figure 28: 6 dB bandwidth, channel HIGH

### Power Spectral Density

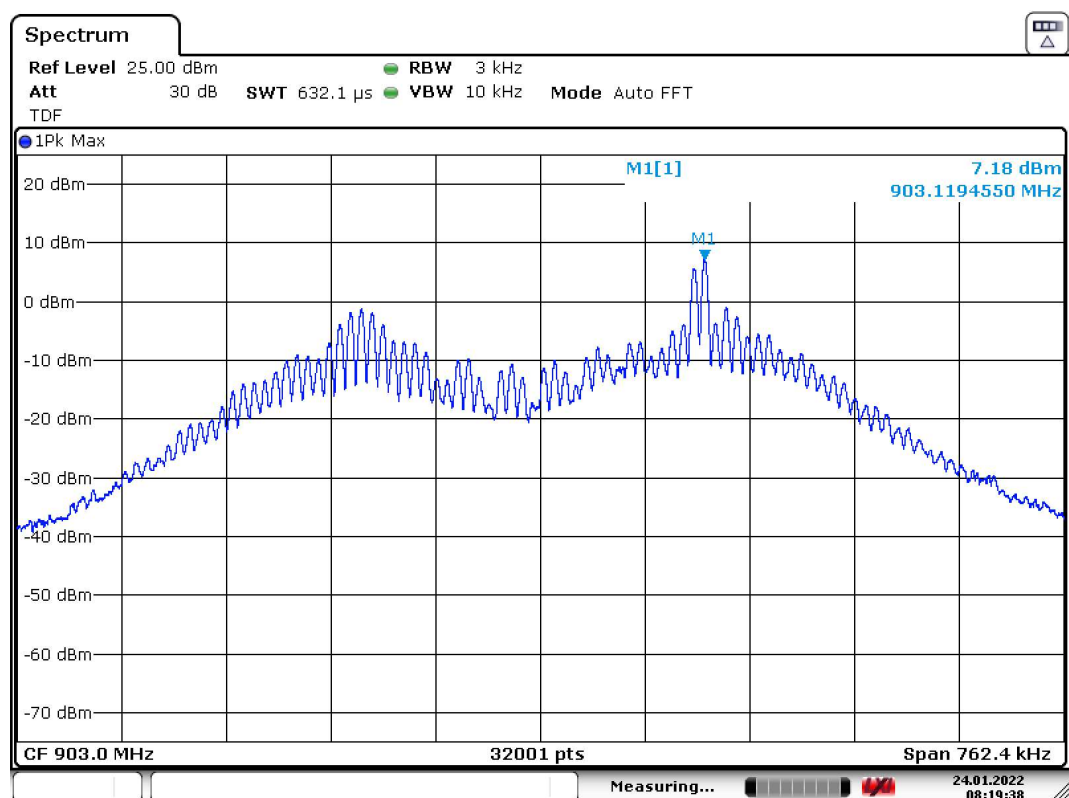
**Standard:** ANSI C63.10 (2013)  
**Tested by:** RRE  
**Date:** 24 January 2022  
**Temperature:**  $23 \pm 3$  °C  
**Humidity:** 20 - 75 % RH

**FCC Rule:** 15.247(e)  
**RSS-247 5.2(b)**

### Results

**Table 9:** Power spectral density test results

| Channel | PSD dBm/3 kHz | Maximum limit [dBm/3kHz] |
|---------|---------------|--------------------------|
| Low     | 7.18          | +8.00                    |
| Mid     | 6.36          |                          |
| High    | 7.61          |                          |



**Figure 29:** Power spectral density, channel LOW

## Power Spectral Density

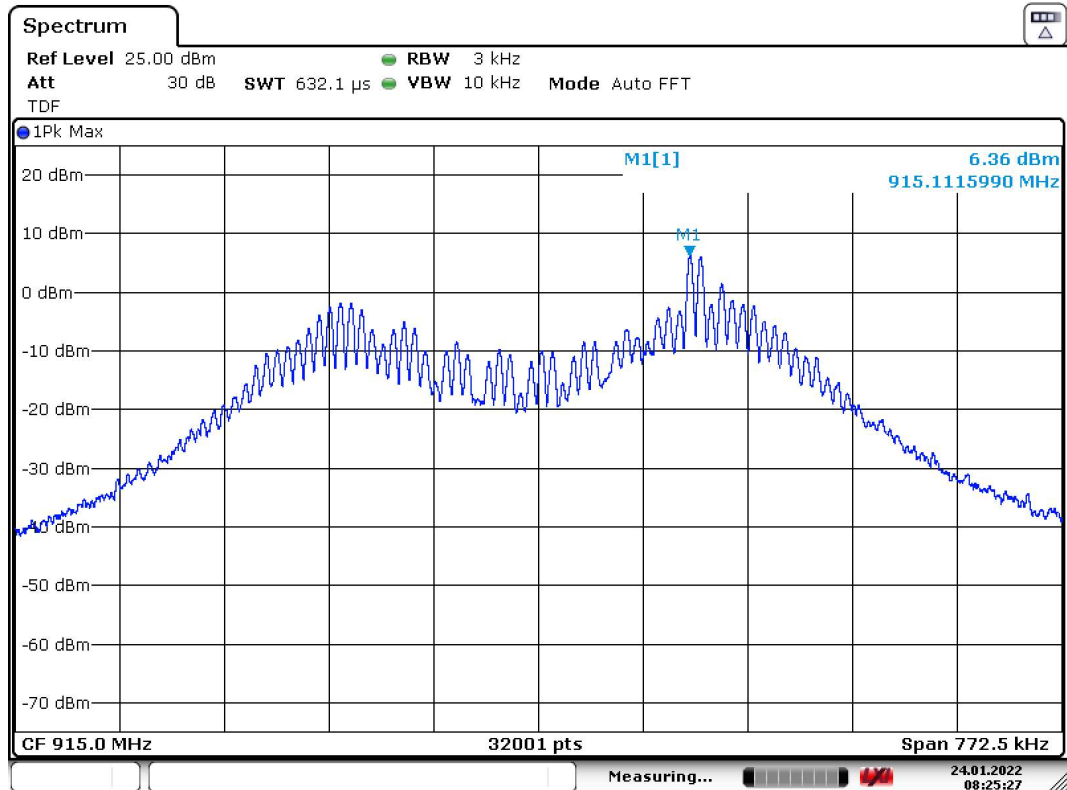


Figure 30: Power spectral density, channel MID

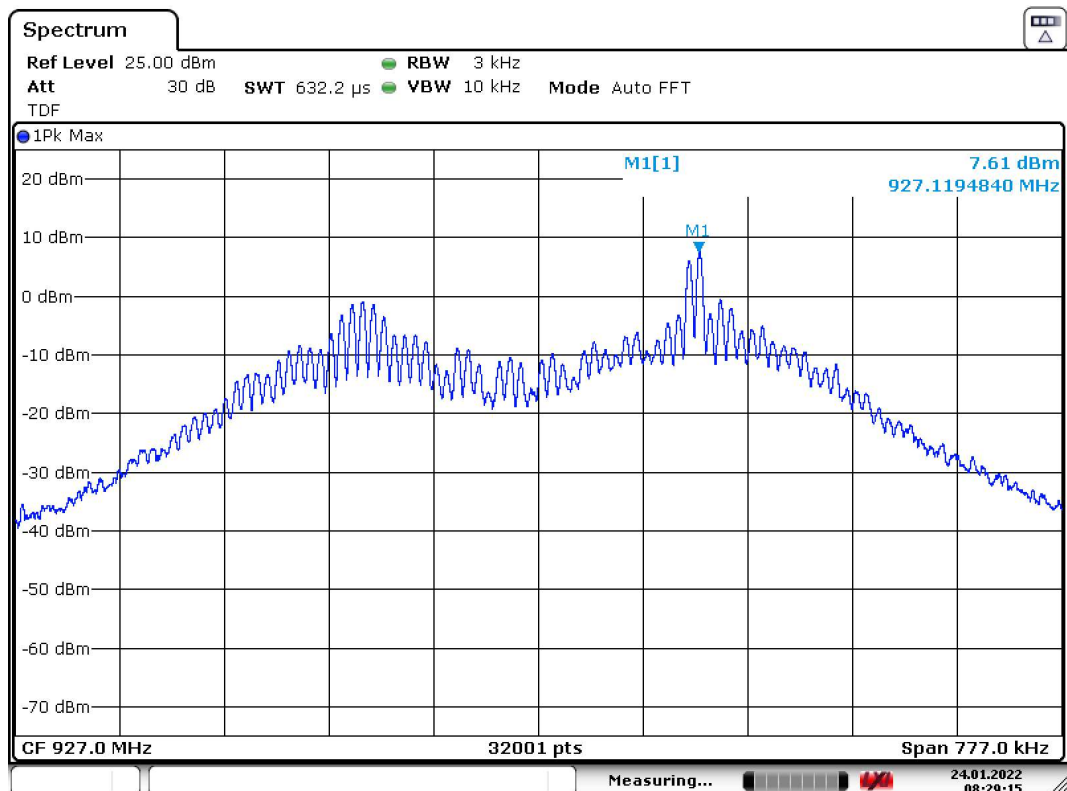


Figure 31: Power spectral density, channel HIGH

## 99% Occupied Bandwidth

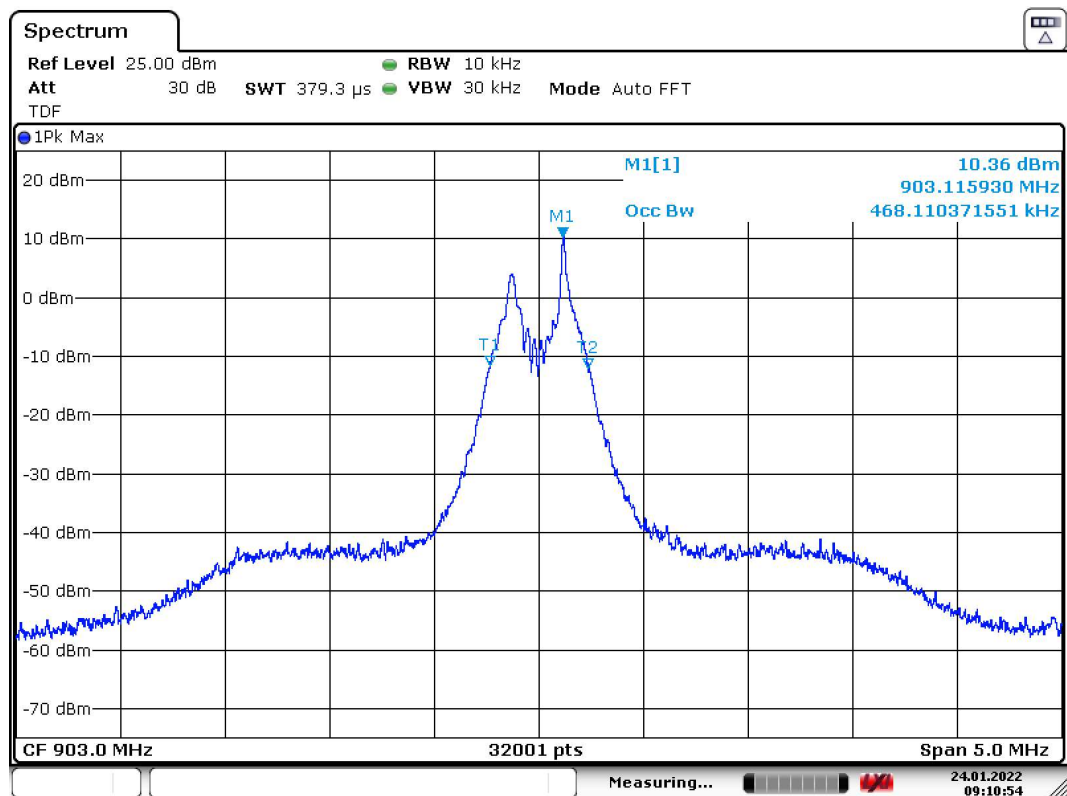
**Standard:** RSS-GEN (2019)  
**Tested by:** RRE  
**Date:** 24 January 2022  
**Temperature:** 23 ± 3 °C  
**Humidity:** 20 - 75 % RH

### RSS-GEN 6.6

## Results

**Table 10:** 99% occupied bandwidth test results

| Channel | Limit | 99 % BW [kHz] | Result |
|---------|-------|---------------|--------|
| Low     | -     | 468.110371551 | PASS   |
| Mid     | -     | 452.485859827 | PASS   |
| High    | -     | 472.953970188 | PASS   |



**Figure 32:** 99% OBW, channel LOW

## 99% Occupied Bandwidth

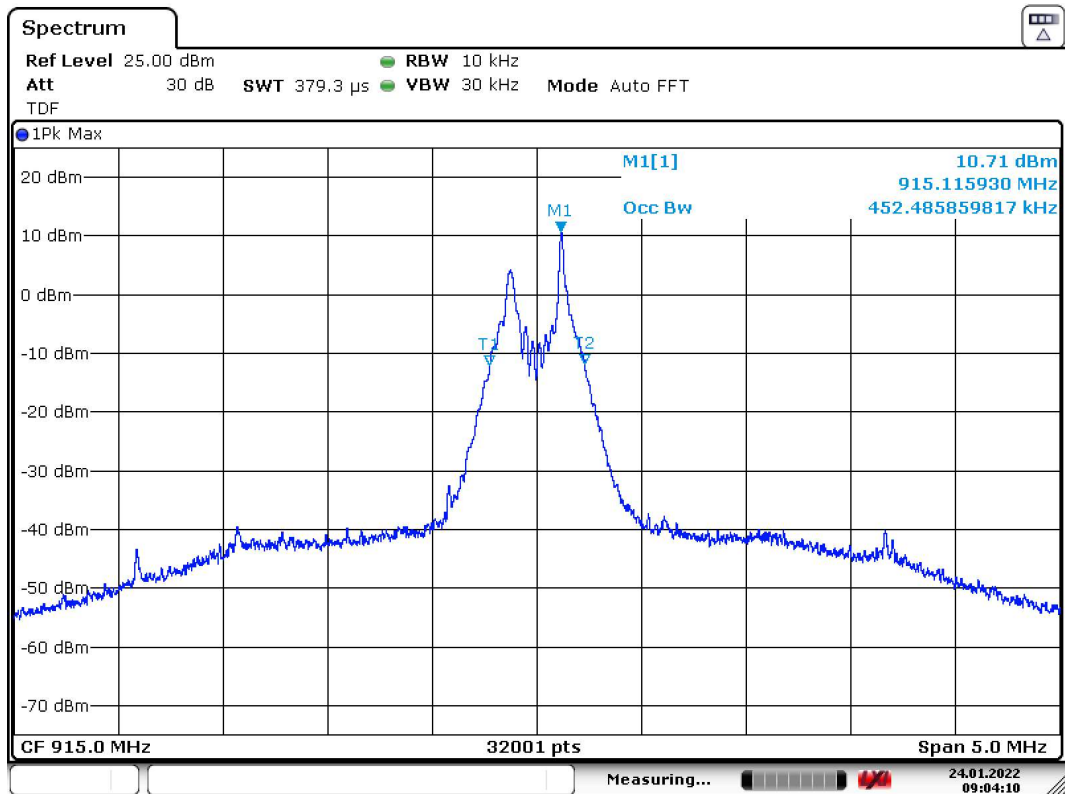


Figure 33: 99% OBW, channel MID

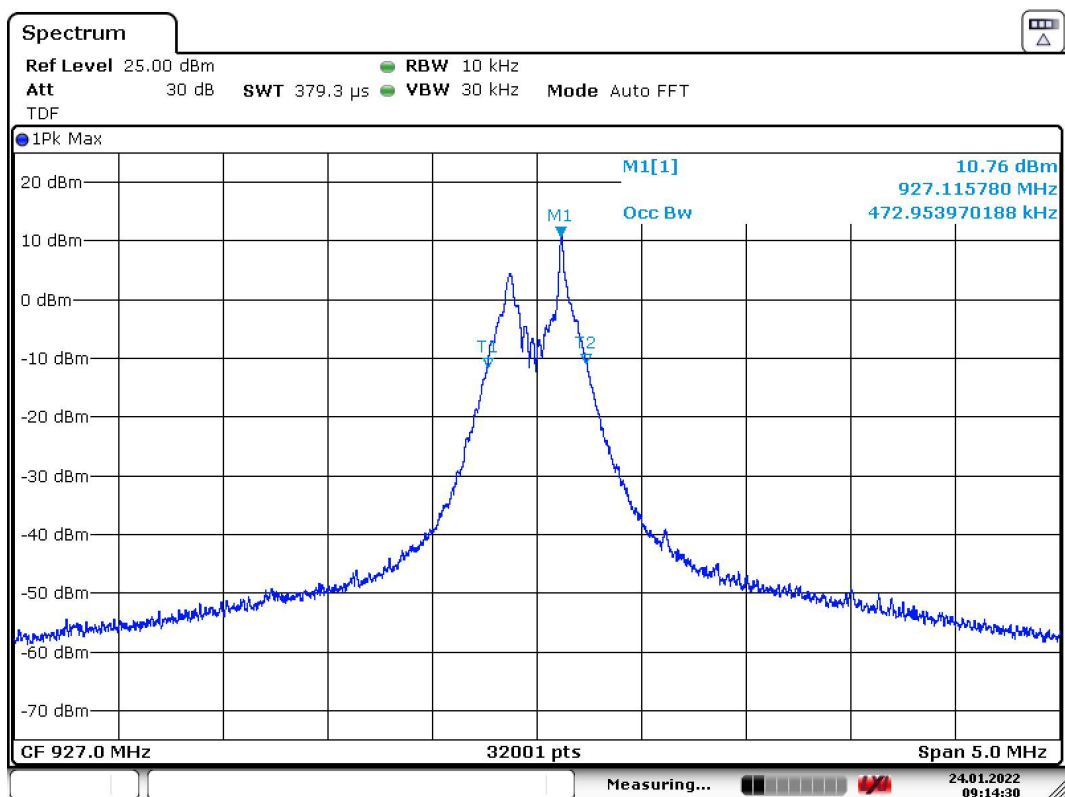


Figure 34: 99% OBW, channel HIGH

## Duty cycle correction factor, Transmit time in 100 ms

**Standard:** ANSI C63.10 (2013)  
**Tested by:** RRE  
**Date:** 17 December 2021  
**Temperature:** 23 ± 3 °C  
**Humidity:** 20 - 75 % RH

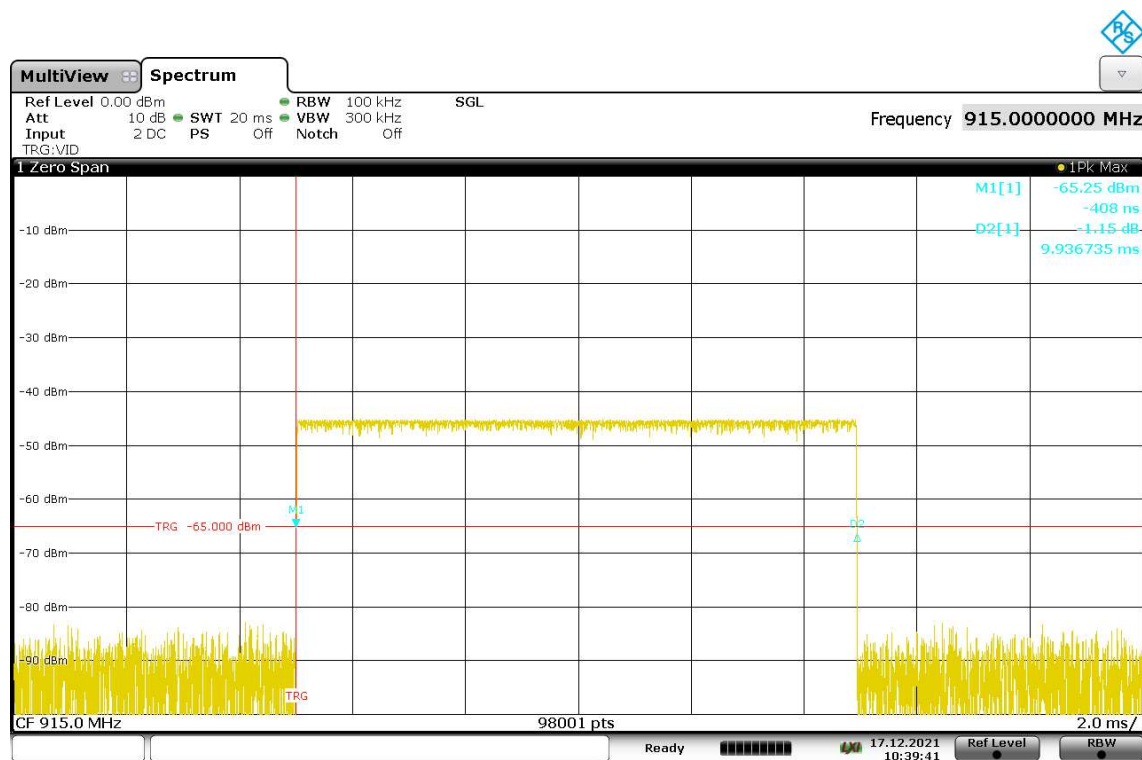
Spectrum analyzer with zero span was used to investigate spectrum.

15.35(c) Unless otherwise specified, e.g. § 15.255(b), when the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value. The exact method of calculating the average field strength shall be submitted with any application for certification or shall be retained in the measurement data file for equipment subject to notification or verification.

Pulses / 100 ms = 1

Length of one pulse = 9.936735 ms

Duty Cycle Correction Factor =  $20 \cdot \log(\text{Tocc}/100) = 20 \cdot \log(1 \cdot 9.936735 / 100) = -20.05 \text{ dB}$



10:39:41 17.12.2021

Figure 35. Pulse length

**TEST EQUIPMENT****Conducted Emissions**

| Equipment                       | Manufacturer    | Type              | Inv or serial | Prev Calib | Next Calib |
|---------------------------------|-----------------|-------------------|---------------|------------|------------|
| TEST SOFTWARE                   | ROHDE & SCHWARZ | EMC-32            | -             | NCR        | NCR        |
| EMI TEST RECEIVER               | ROHDE & SCHWARZ | ESW26             | inv:10679     | 2021-06-21 | 2022-06-21 |
| LISN                            | ROHDE & SCHWARZ | ENV216            | inv:9611      | 2022-02-02 | 2023-02-02 |
| TEMPERATURE/<br>HUMIDITY SENSOR | EDS             | OW-ENV-TH, K5 SAC | inv:10517     | 2021-10-22 | 2022-10-22 |

**RF-Test Equipment**

| Equipment                       | Manufacturer    | Type                 | Inv or serial | Prev Calib | Next Calib |
|---------------------------------|-----------------|----------------------|---------------|------------|------------|
| ATTENUATOR                      | HUBER&SUHNER    | 6810.17.B (10dB)     | inv:10390     | 2021-01-25 | 2023-01-25 |
| ATTENUATOR                      | INMET           | 10 dB, DC-40 GHz     | inv:10347     | 2021-04-20 | 2023-04-20 |
| ANTENNA                         | A.H. SYSTEMS    | SAS-200/518          | inv:7873      | NCR        | NCR        |
| SPECTRUM ANALYZER               | AGILENT         | E7405A, monitoring   | inv:9746      | 2020-02-17 | 2022-02-17 |
| RF PREAMPLIFIER                 | CIAO            | CA118-3123           | inv:10278     | 2021-10-05 | 2022-10-05 |
| TEMPERATURE/<br>HUMIDITY SENSOR | EDS             | OW-ENV-TH, K5 SAC    | inv:10517     | 2021-10-22 | 2022-10-22 |
| ANTENNA                         | EMCO            | 3117, emi 1-18GHz    | inv:7293      | 2020-03-11 | 2022-03-11 |
| TURNTABLE                       | MATURO          | DS430 UPGRADED       | inv:10182     | NCR        | NCR        |
| MAST & TURNTABLE<br>CONTROLLER  | MATURO          | NCD                  | inv:10183     | NCR        | NCR        |
| ANTENNA MAST                    | MATURO          | TAM 4.0E             | inv:10181     | NCR        | NCR        |
| ATTENUATOR                      | PASTERNAK       | PE 7004-4 (4dB)      | inv:10126     | 2021-03-26 | 2022-03-26 |
| GPS REFERENCE                   | PENDELUM        | GPS-88               | inv:8032      | NCR        | NCR        |
| TEST SOFTWARE                   | ROHDE & SCHWARZ | EMC-32               | -             | NCR        | NCR        |
| EMI TEST RECEIVER               | ROHDE & SCHWARZ | ESW26                | inv:10679     | 2021-06-21 | 2022-06-21 |
| SPECTRUM ANALYZER               | ROHDE & SCHWARZ | FSV40                | inv:9093      | 2021-12-06 | 2022-12-06 |
| ANTENNA                         | SCHWARZBECK     | VULB 9168            | inv:8911      | 2020-11-04 | 2022-11-04 |
| FILTER                          | WAINWRIGHT      | HP, WHKX1.0/15G-10SS | inv:8267      | 2021-01-29 | 2023-01-29 |

NCR = No calibration required

**END OF REPORT**