Test Report

HELEM2111000438-8

FINAS
Finnish Accreditation Service
T004 (EN ISO/IEC 17025)

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

Equipment Under Test:	Base station 4G with 915 MHz SRD
Model:	Base Station 4G
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 RSS-GEN Issue 5 Amendment 2, 2021
KDB:	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:	21 November 2022	Date:	21 November 2022
Issued by:	Rauno Repo Senior EMC Specialist	Checked by:	Henri Mäki Testing Engineer

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GENERAL REMARKS

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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	21 November 2022

PRODUCT DESCRIPTION

Equipment Under Test

EUT information	
Trademark	Quanturi
Model	Base Station 4G
Type	Base Station 4G with 915 MHz SRD
Serial number	-
Power supply	Powered with an external AC/DC 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
EUT Highest operation freq.	SRD radio 927 MHz
Hardware Version (if any)	-
Software Version (if any)	-
Cellular radio module:	QUECTEL EG21-G
FCC ID:	XMR201906EG21G
IC:	10224A-201906EG21G
Cellular antenna:	Teltonika 003R-00296 +5 dBi
SRD radio module:	ON Semiconductor AX8052F143-D
FCC ID:	-
IC:	-
SRD antenna:	Siretta Delta 22B (installed inside the enclosure) +3 dBi
Mechanical size of the EUT (mm)	Height: 330 mm Width: 60 mm Length: 155 mm
Parallel models	-

General Description

Base Station receives data from the probes or/and then forward it to the cloud through the 4G connection and then reply to the probes. According to the manufacturer 4G or SRD are not operating at the same time. This test report contains the tests for SRD radio.

Classification

Fixed device	☐
Mobile Device (Human body distance > 20cm)	☒
Portable Device (Human body distance < 20cm)	☐

Modifications Incorporated in the EUT

No modifications. Wurth ferrite 74271131 was on the power cable about 20 cm from the EUT.

Ratings and declarations

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

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**[1)]
§15.247(b)(3) / RSS-247 5.4(d)	Maximum Peak Conducted Output Power	**PASS**[1)]
§15.247(a)(2) / RSS-247 5.2(a)	6 dB Bandwidth	**PASS**[1)]
§15.247(e) / RSS-247 5.2(b)	Power Spectral Density	**PASS**[1)]
RSS-GEN 6.7	99% Occupied Bandwidth	**PASS**[1)]
§15.247(d) / RSS-247 5.5	100 kHz Bandwidth of Frequency Band Edges and Conducted Spurious Emissions	**PASS**[1)]
§15.209(a), §15.247(d) / RSS-247 5.5	Radiated Emissions Within the Restricted Bands	**PASS**

[1)] Antenna port measurements were made with Repeater unit with the same SRD-circuit (identical). The test results for the Repeater unit are presented in Test Report HELEM2111000483-3.

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 continuous modulated transmit mode during all the tests. The EUT was configured into the wanted channel using software provided by the manufacturer.

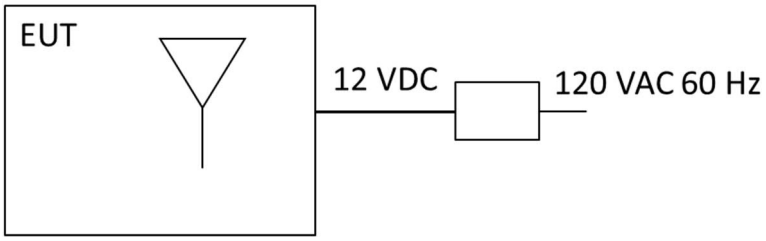


Figure 1: Test setup block diagram

Table 1: Test frequencies and settings

Channel	Frequency (MHz)
Low	903
Mid	915
High	927

Test Facility

Testing Laboratory / address: FCC designation number: FI0002 ISED CAB identifier: T004	SGS Fimko Ltd Takomotie 8 FI-00380, HELSINKI FINLAND
Test Site:	☐ K10LAB, ISED Canada registration number: 8708A-1 ☒ K5LAB, ISED Canada registration number: 8708A-2 ☐ T10LAB

TEST RESULTS

Antenna Requirement

Standard: FCC Rule §15.203
Tested by: RRE
Date: 15 November 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	1. Permanently attached antenna 2. Unique coupling to the intentional radiator 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.	**PASS**
Note	Option 1 is used	

Conducted Emissions In The Frequency Range 150 kHz - 30 MHz

Standard:	ANSI C63.10	(2013)
Tested by:	RRE	
Date:	18 November 2022	
Temperature:	23 ± 3 °C	
Humidity:	20 - 75 % RH	
Measurement uncertainty:	± 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.

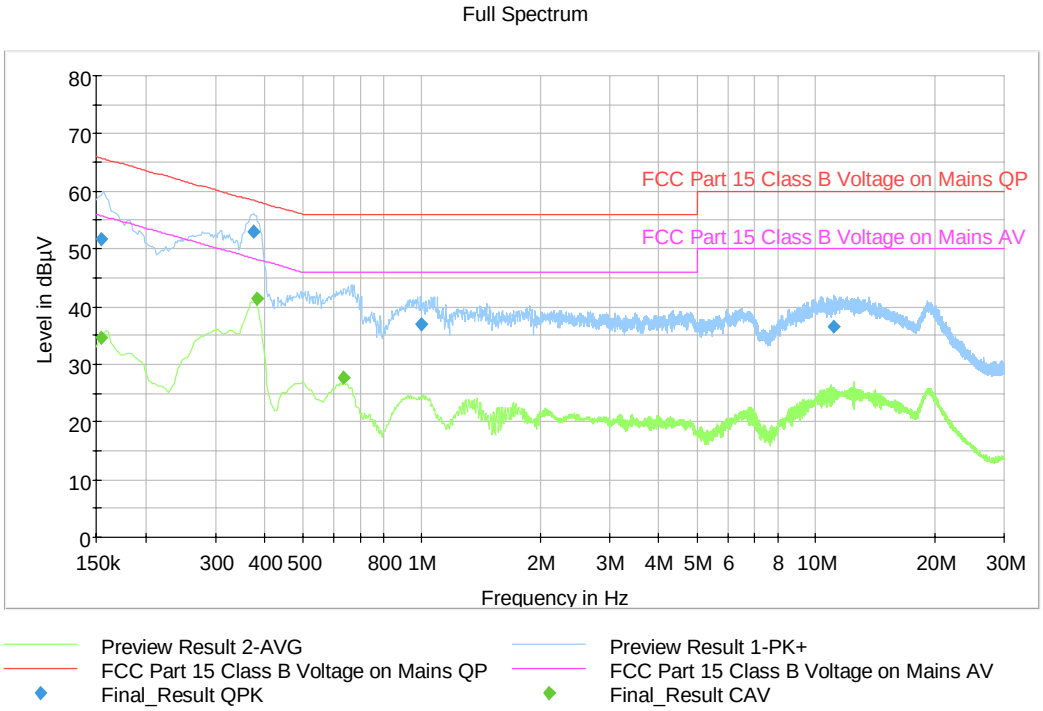


Figure 2: The measured curves with peak- and average detector (TX 915 MHz)

Final measurements from the worst frequencies

Table 2: Final results

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.154000	---	34.72	55.78	21.06	15x1000.0	9.000	N	9.7
0.154000	51.76	---	65.78	14.02	15x1000.0	9.000	L1	9.7
0.374000	52.95	---	58.41	5.46	15x1000.0	9.000	L1	9.7
0.382500	---	41.31	48.23	6.92	15x1000.0	9.000	N	9.7
0.635000	---	27.62	46.00	18.38	15x1000.0	9.000	L1	9.7
0.996750	36.89	---	56.00	19.11	15x1000.0	9.000	N	9.8
11.132500	36.42	---	60.00	23.58	15x1000.0	9.000	N	10.3

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

Standard:	ANSI C63.10	(2013)
Tested by:	RRE	
Date:	24 February 2022	
Temperature:	23 ± 3 °C	
Humidity:	20 - 75 % RH	
Measurement uncertainty:	± 2.87dB	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

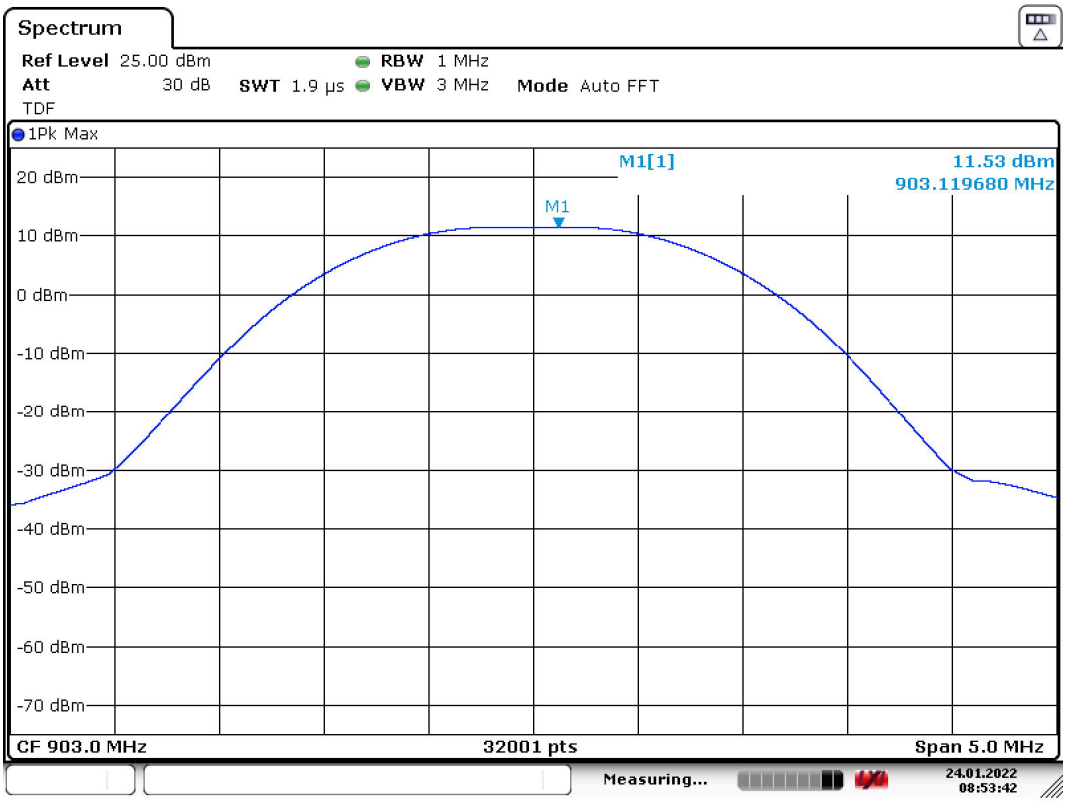


Figure 3: Conducted power, Channel LOW

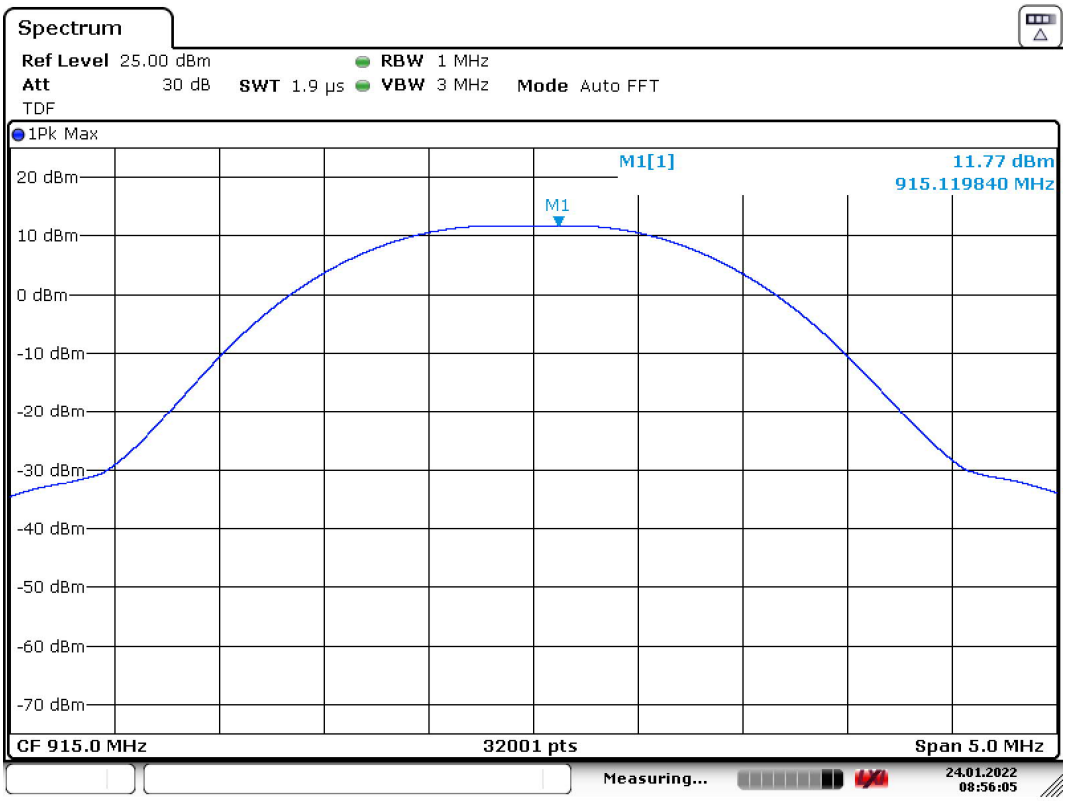


Figure 4: Conducted power, Channel MID

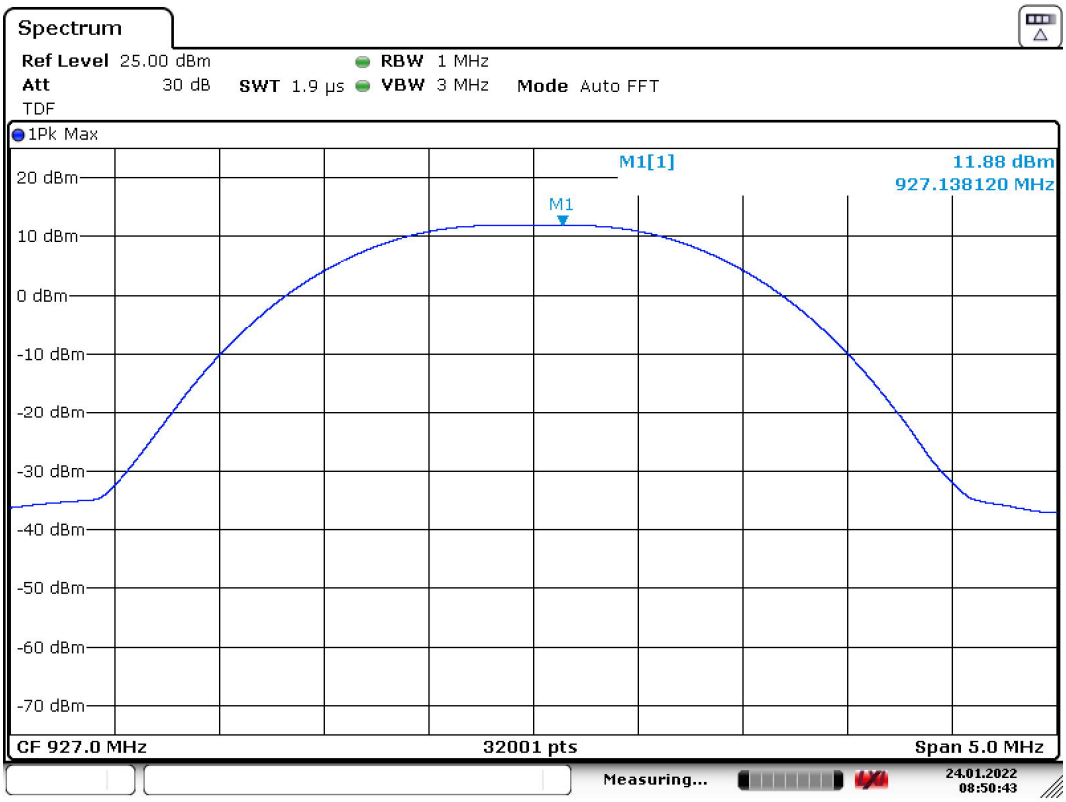


Figure 5: Conducted power, Channel HIGH

Transmitter Radiated Spurious Emissions 9 kHz - 10 GHz

Standard:	ANSI C63.10	(2013)
Tested by:	RRE	
Date:	11 November 2022 14 November 2022	
Temperature:	23 ± 3 °C	
Humidity:	20 - 75 % RH	
Measurement uncertainty:	± 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).

The EUT was tested in its usage position. Emission Peak values below 1000 MHz and transmitter fundamentals are only for informative purpose.

Frequency range [MHz]	Limit [µV/m]	Limit [dBµV/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

Results LOW channel

Figure 6: LOW channel (9 kHz – 30 MHz)

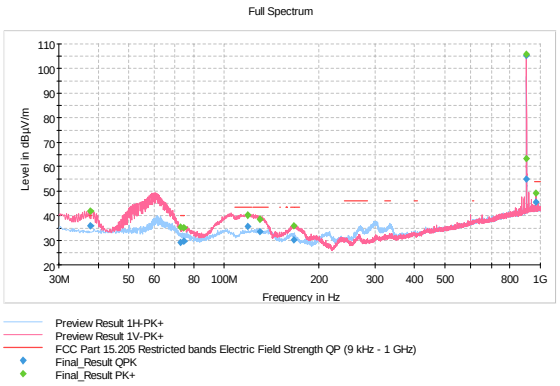


Figure 7: LOW channel (30 MHz – 1000 MHz)

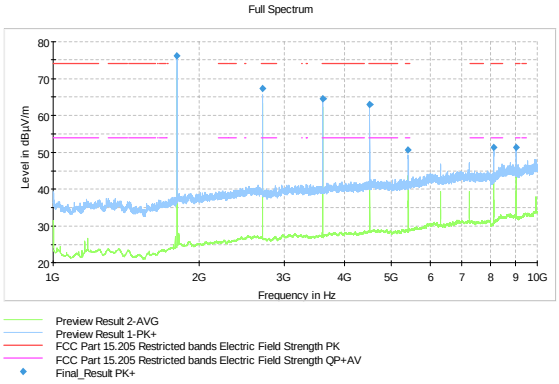


Figure 8: LOW channel (1 GHz – 10 GHz)

Table 4: Peak results LOW channel

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
902.860000	105.67	**	---	15x1000.0	120.000	111.0	V	6.0	41.4
1805.800000	76.05	85.67 *	9.62	15x1000.0	1000.000	194.0	V	213.0	2.4
2709.400000	67.27	74.00	6.73	15x1000.0	1000.000	155.0	V	248.0	3.9
3611.200000	64.53	74.00	9.47	15x1000.0	1000.000	183.0	V	28.0	5.1
4515.600000	62.86	74.00	11.14	15x1000.0	1000.000	193.0	H	300.0	6.0
5418.600000	50.69	74.00	23.31	15x1000.0	1000.000	173.0	V	346.0	7.5
8125.600000	51.26	74.00	22.74	15x1000.0	1000.000	210.0	V	24.0	11.2
9028.800000	51.36	74.00	22.64	15x1000.0	1000.000	134.0	V	26.0	13.2

* -20 dBc

**Fundamental frequency

Table 5: Average results LOW channel

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2709.400000	47.22**	54.00	6.78	15x1000.0	1000.000	155.0	V	248.0	3.9
3611.200000	44.48**	54.00	9.52	15x1000.0	1000.000	183.0	V	28.0	5.1
4515.600000	42.81**	54.00	11.19	15x1000.0	1000.000	193.0	H	300.0	6.0
5418.600000	30.64**	54.00	23.36	15x1000.0	1000.000	173.0	V	346.0	7.5
8125.600000	31.21**	54.00	22.79	15x1000.0	1000.000	210.0	V	24.0	11.2
9028.800000	31.31**	54.00	22.69	15x1000.0	1000.000	134.0	V	26.0	13.2

*Antenna angle in degrees

**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 LOW channel

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
0.502250	6.21	33.59	27.38	15x1000.0	9.000	90.0*	V	194.0	-20.4
1.006250	-1.52	27.57	29.09	15x1000.0	9.000	90.0*	V	170.0	-20.5
37.805000	36.08	40.00	3.92	15x1000.0	120.000	105.0	V	154.0	26.7
73.075000	29.23	40.00	10.77	15x1000.0	120.000	130.0	V	299.0	25.4
74.555000	29.82	40.00	10.18	15x1000.0	120.000	105.0	V	275.0	24.9
118.815000	35.92	43.52	7.60	15x1000.0	120.000	111.0	V	83.0	25.7
130.015000	33.73	43.52	9.79	15x1000.0	120.000	121.0	V	61.0	26.8
166.085000	30.21	43.52	13.31	15x1000.0	120.000	117.0	V	87.0	28.2
968.585000	45.50	53.98	8.48	15x1000.0	120.000	105.0	V	86.0	42.2

*Antenna angle in degrees

Results MID channel

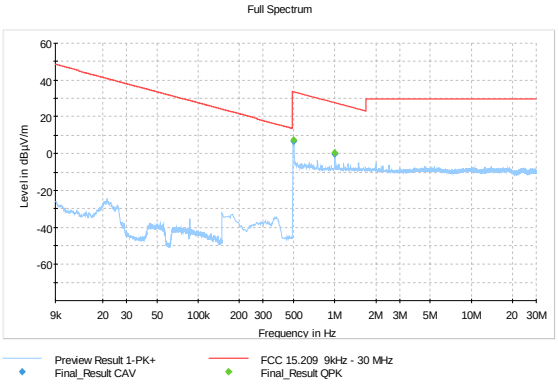


Figure 9: MID channel (9 kHz – 30 MHz)

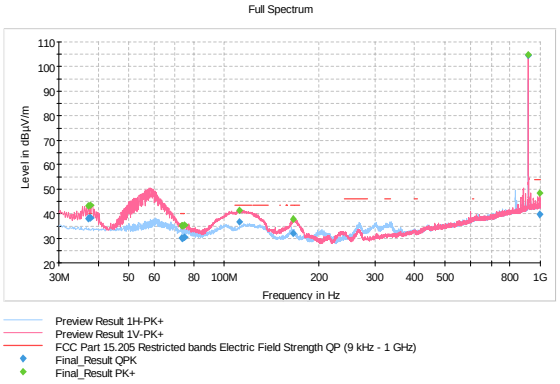


Figure 10: MID channel (30 MHz – 1000 MHz)

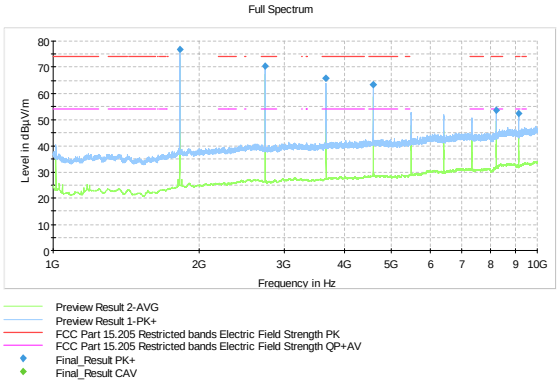


Figure 11: MID channel (1 GHz – 4 GHz)

Table 7: 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)
914.875000	104.79	**	---	15x1000.0	120.000	108.0	V	307.0	41.6
1829.600000	76.81	84.79*	7.98	15x1000.0	1000.000	194.0	V	149.0	2.3
2744.600000	70.41	74.00	3.59	15x1000.0	1000.000	152.0	V	249.0	4.2
3659.400000	65.76	74.00	8.24	15x1000.0	1000.000	189.0	V	139.0	5.2
4575.800000	63.51	74.00	10.49	15x1000.0	1000.000	117.0	H	328.0	6.5
8236.000000	53.61	74.00	20.39	15x1000.0	1000.000	195.0	V	44.0	11.3
9151.200000	52.20	74.00	21.80	15x1000.0	1000.000	184.0	V	184.0	13.2

* -20 dBc

**Fundamental frequency

Table 8: 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)
2744.600000	50.36**	54.00	3.64	15x1000.0	1000.000	152.0	V	249.0	4.2
3659.400000	45.71**	54.00	8.29	15x1000.0	1000.000	189.0	V	139.0	5.2
4575.800000	43.46**	54.00	10.54	15x1000.0	1000.000	117.0	H	328.0	6.5
8236.000000	33.56**	54.00	20.44	15x1000.0	1000.000	195.0	V	44.0	11.3
9151.200000	32.15**	54.00	21.85	15x1000.0	1000.000	184.0	V	184.0	13.2

*Antenna angle in degrees

**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 9: 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)
0.500000	7.63	33.63	26.00	15x1000.0	9.000	90.0*	V	161.0	-20.4
1.001750	0.49	27.61	27.12	15x1000.0	9.000	90.0*	V	183.0	-20.5
37.795000	38.48	40.00	1.52	15x1000.0	120.000	123.0	V	91.0	26.7
73.515000	30.29	40.00	9.71	15x1000.0	120.000	124.0	V	328.0	25.2
73.975000	30.06	40.00	9.94	15x1000.0	120.000	120.0	V	45.0	25.1
74.995000	30.61	40.00	9.39	15x1000.0	120.000	105.0	V	6.0	24.8
111.565000	36.84	43.52	6.68	15x1000.0	120.000	114.0	V	212.0	25.1
165.045000	32.05	43.52	11.47	15x1000.0	120.000	111.0	V	143.0	28.2
994.765000	39.90	53.98	14.08	15x1000.0	120.000	108.0	V	7.0	42.3

*Antenna angle in degrees

Results HIGH channel

Figure 12: HIGH channel (9 kHz – 30 MHz)

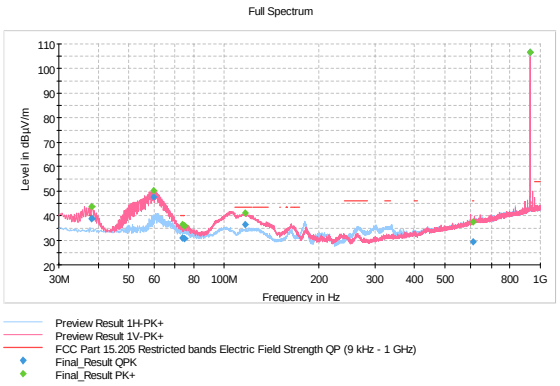


Figure 13: HIGH channel (30 MHz – 1000 MHz)

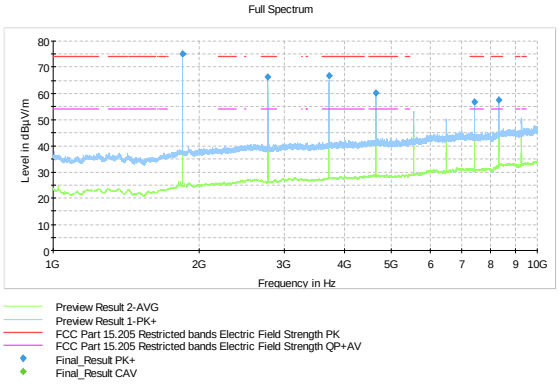


Figure 14: HIGH channel (1 GHz – 4 GHz)

Table 10: Peak results HIGH channel

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
927.125000	106.68	**	---	15x1000.0	120.000	111.0	V	3.0	41.9
1854.200000	74.93	86.68*	11.75	15x1000.0	1000.000	243.0	V	208.0	2.8
2780.600000	66.31	74.00	7.69	15x1000.0	1000.000	152.0	V	246.0	3.7
3708.600000	66.86	74.00	7.14	15x1000.0	1000.000	147.0	V	126.0	5.7
4635.600000	60.11	74.00	13.89	15x1000.0	1000.000	157.0	H	187.0	6.5
7417.000000	56.83	74.00	17.17	15x1000.0	1000.000	137.0	V	39.0	10.4
8342.000000	57.52	74.00	16.48	15x1000.0	1000.000	162.0	V	47.0	11.7

* -20 dBc

**Fundamental frequency

Table 11: Average results HIGH channel

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2780.600000	46.26**	54.00	7.74	15x1000.0	1000.000	152.0	V	246.0	3.7
3708.600000	46.81**	54.00	7.19	15x1000.0	1000.000	147.0	V	126.0	5.7
4635.600000	40.06**	54.00	13.94	15x1000.0	1000.000	157.0	H	187.0	6.5
7417.000000	36.78**	54.00	17.22	15x1000.0	1000.000	137.0	V	39.0	10.4
8342.000000	37.47**	54.00	16.53	15x1000.0	1000.000	162.0	V	47.0	11.7

*Antenna angle in degrees

**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 12: Quasi-peak results HIGH channel

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
0.502250	7.17	33.59	26.42	15x1000.0	9.000	90.0*	V	172.0	-20.4
1.000000	-0.68	27.62	28.30	15x1000.0	9.000	90.0*	V	167.0	-20.5
74.035000	30.99	40.00	9.01	15x1000.0	120.000	111.0	V	139.0	25.1
75.095000	30.93	40.00	9.07	15x1000.0	120.000	108.0	V	75.0	24.8
116.285000	36.61	43.52	6.91	15x1000.0	120.000	100.0	V	149.0	25.5
612.065000	29.49	46.02	16.53	15x1000.0	120.000	120.0	H	225.0	37.1

*Antenna angle in degrees

Radiated lower and upper band edge results

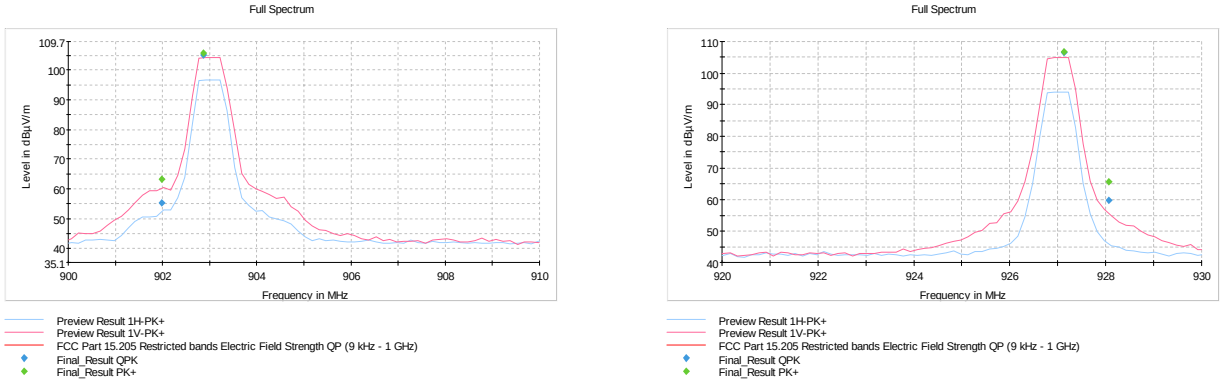


Figure 15: Radiated lower and upper band edge results

Table 13: Peak results Radiated lower and upper band edge results

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
901.980000	63.32	85.67*	22.35	15x1000.0	120.000	111.0	V	13.0	41.4
902.860000	105.67	**	---	15x1000.0	120.000	111.0	V	6.0	41.4
927.125000	106.68	**	---	15x1000.0	120.000	111.0	V	3.0	41.9
928.060000	65.65	86.68*	21.03	15x1000.0	120.000	111.0	V	137.0	41.9

* -20 dBc

**Fundamental frequency

Transmitter Band Edge Measurement and Conducted Spurious Emissions

Standard:	ANSI C63.10	(2013)
Tested by:	RRE	
Date:	24 January 2022	
Temperature:	23 ± 3 °C	
Humidity:	20 - 75 % RH	
Measurement uncertainty:	± 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 14: Band edge attenuation

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

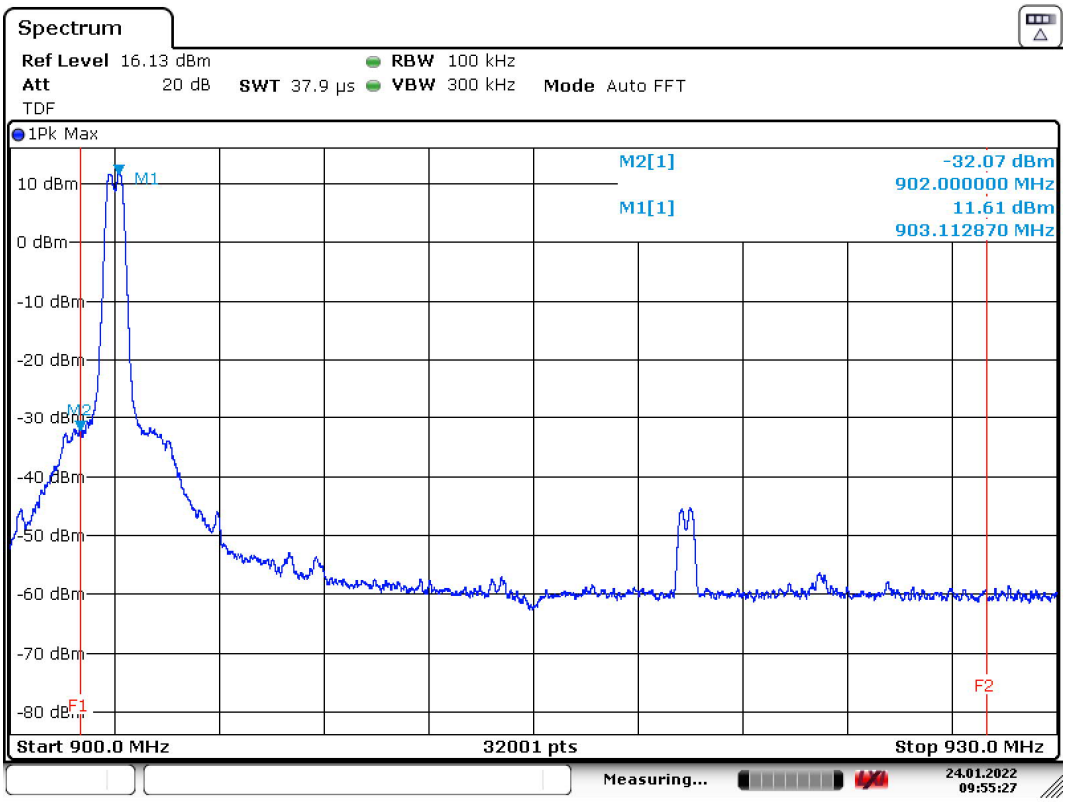


Figure 16: Lower Band Edge

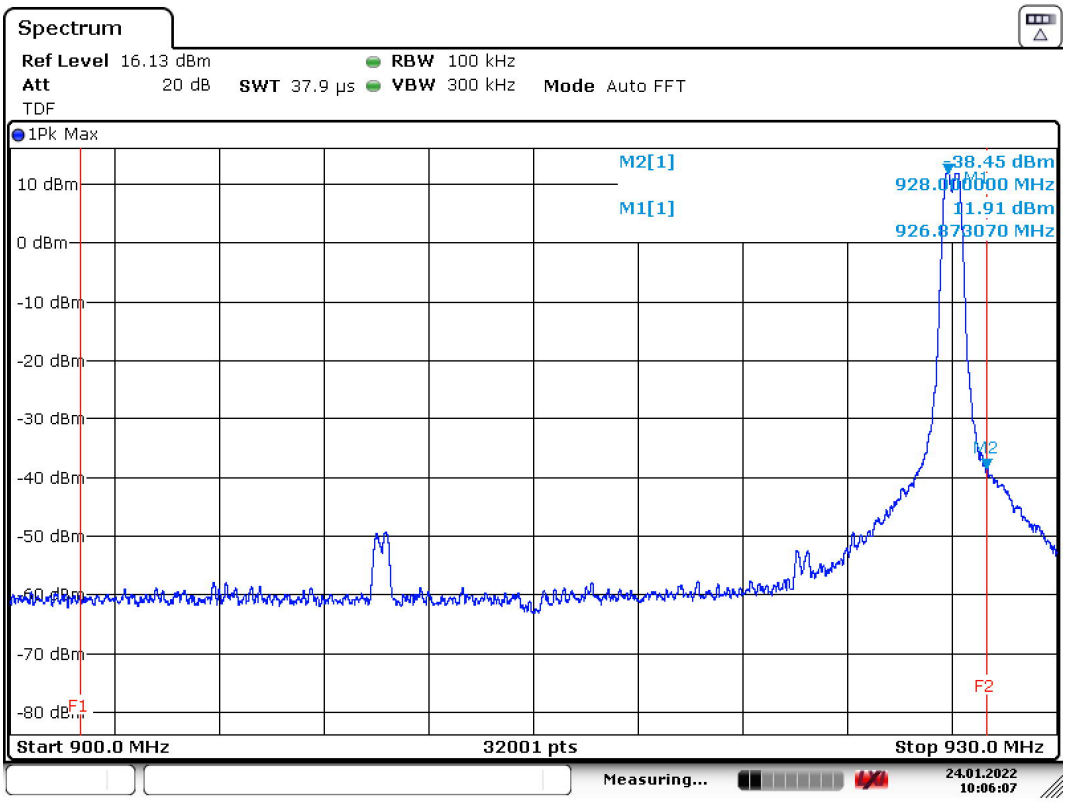


Figure 17: Upper Band Edge

Conducted spurious emissions results LOW channel

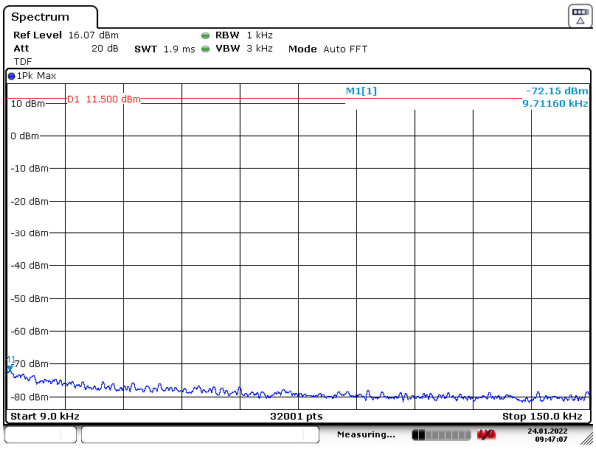


Figure 18: Conducted spurious emissions 9-150 kHz LOW channel

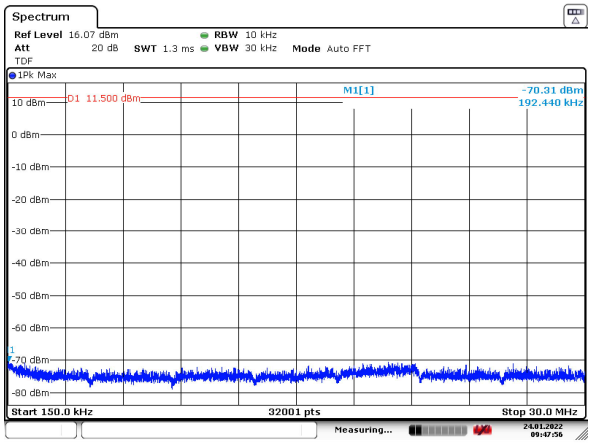


Figure 19: Conducted spurious emissions 150 kHz – 30 MHz LOW channel

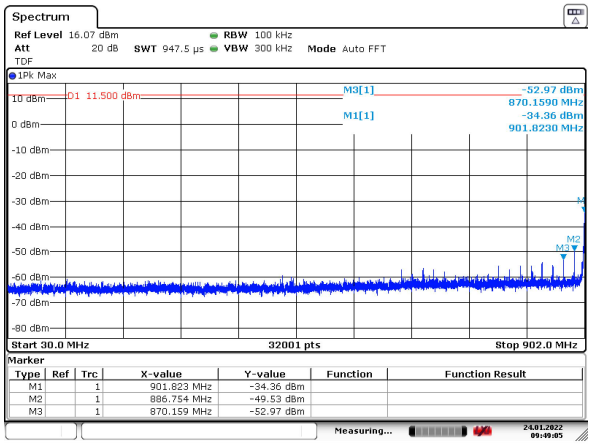


Figure 20: Conducted spurious emissions 30 MHz – 902 MHz LOW channel

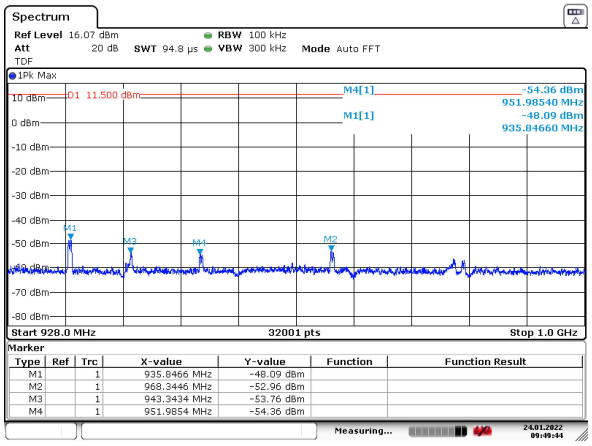


Figure 21: Conducted spurious emissions 928 MHz – 1 GHz LOW channel

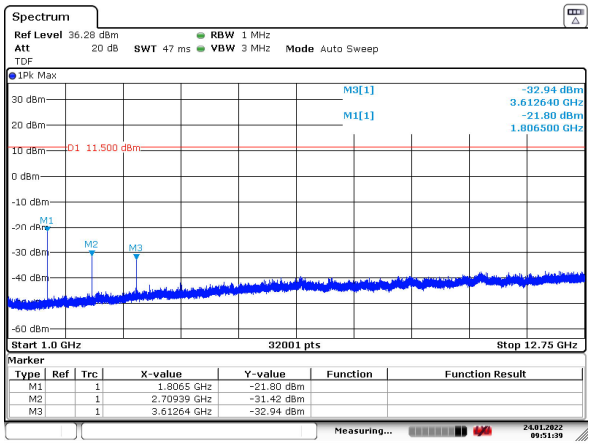


Figure 22: Conducted spurious emissions 1 GHz – 12.75 GHz LOW channel

Conducted spurious emissions results MID channel

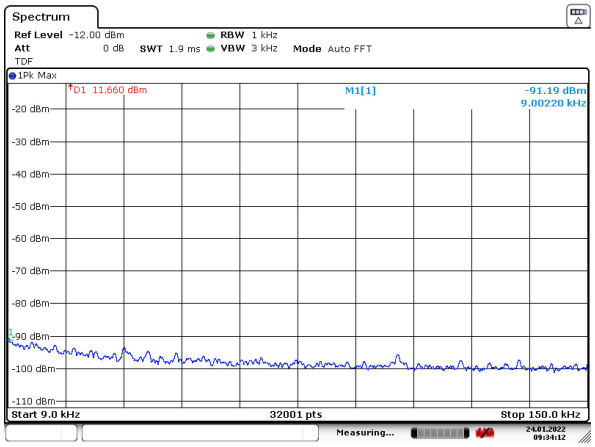


Figure 23: Conducted spurious emissions 9-150 kHz MID channel

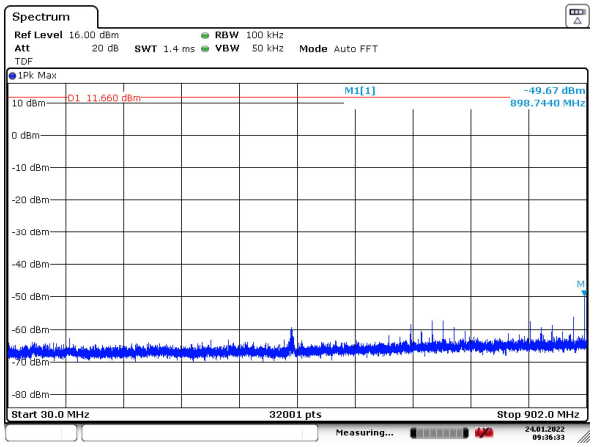


Figure 24: Conducted spurious emissions 150 kHz – 30 MHz MID channel

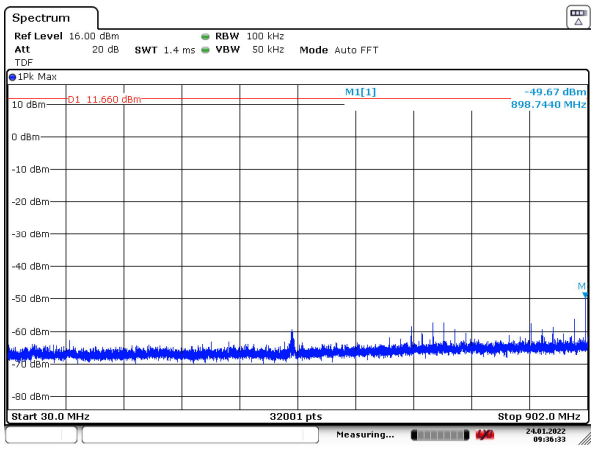


Figure 25: Conducted spurious emissions 30 MHz – 902 MHz MID channel

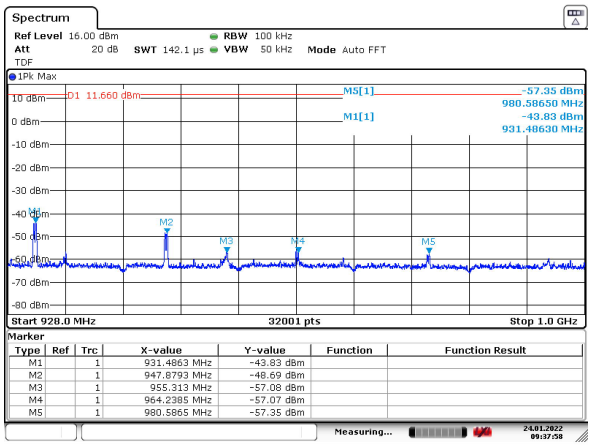


Figure 26: Conducted spurious emissions 928 MHz – 1 GHz MID channel

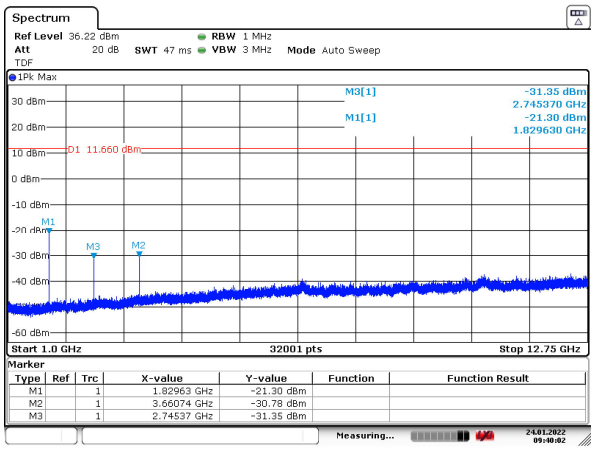


Figure 27: Conducted spurious emissions 1 GHz – 12.75 GHz MID channel

Conducted spurious emissions results HIGH channel

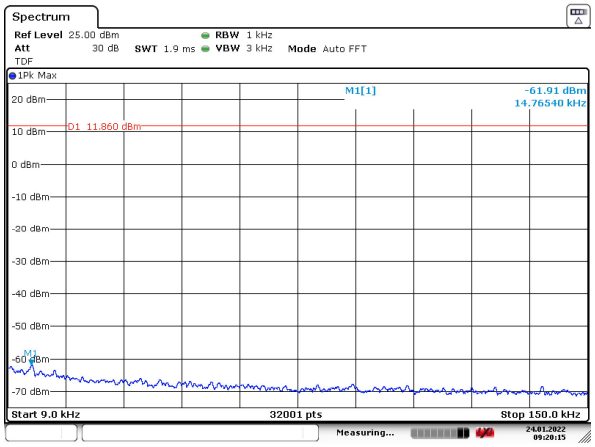


Figure 28: Conducted spurious emissions 9-150 kHz HIGH channel

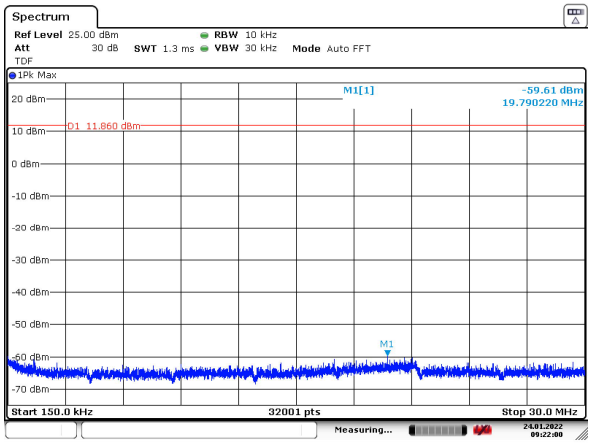


Figure 29: Conducted spurious emissions 150 kHz – 30 MHz HIGH channel

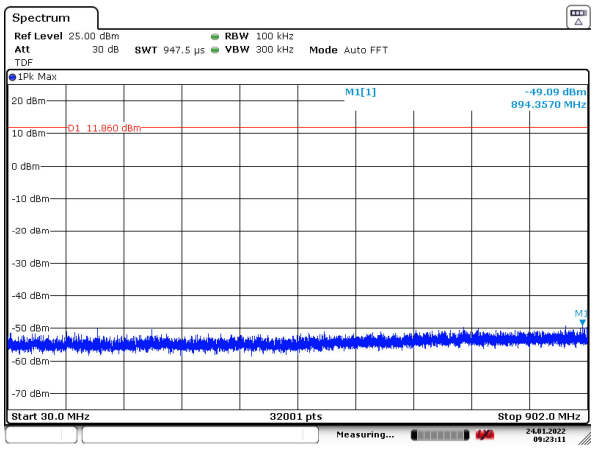


Figure 30: Conducted spurious emissions 30 MHz – 902 MHz HIGH channel

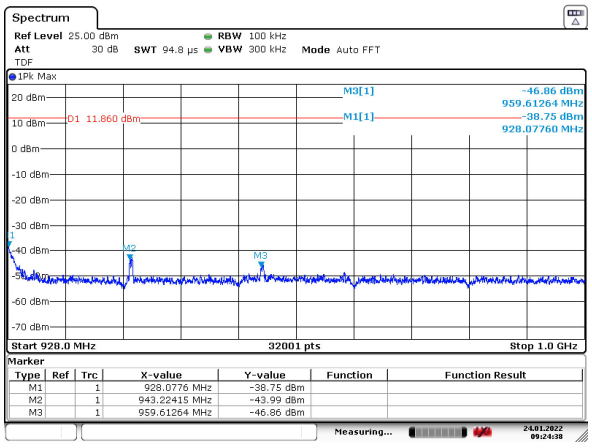


Figure 31: Conducted spurious emissions 928 MHz – 1 GHz HIGH channel

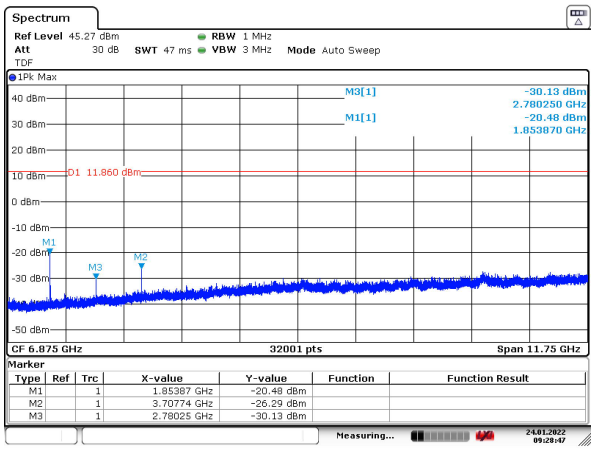


Figure 32: Conducted spurious emissions 1 GHz – 12.75 GHz HIGH channel

6 dB Bandwidth of the Channel

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

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

Results

Table 15: 6 dB bandwidth test results

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

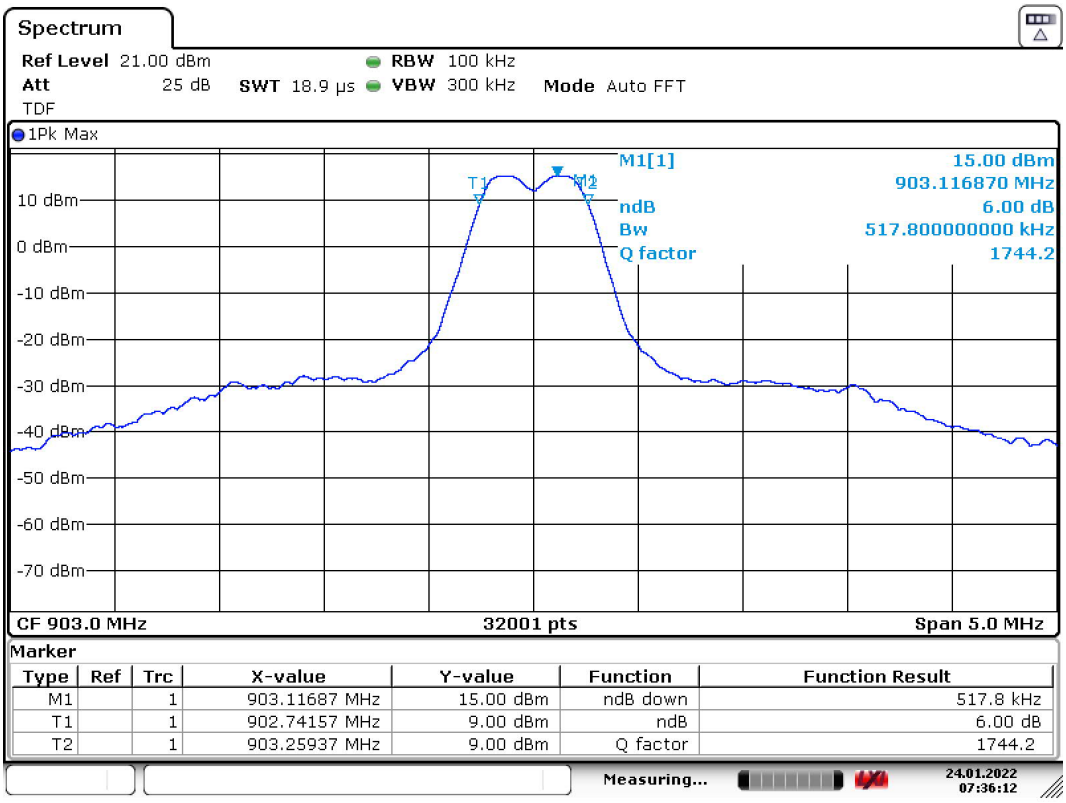


Figure 33: 6 dB bandwidth, channel LOW

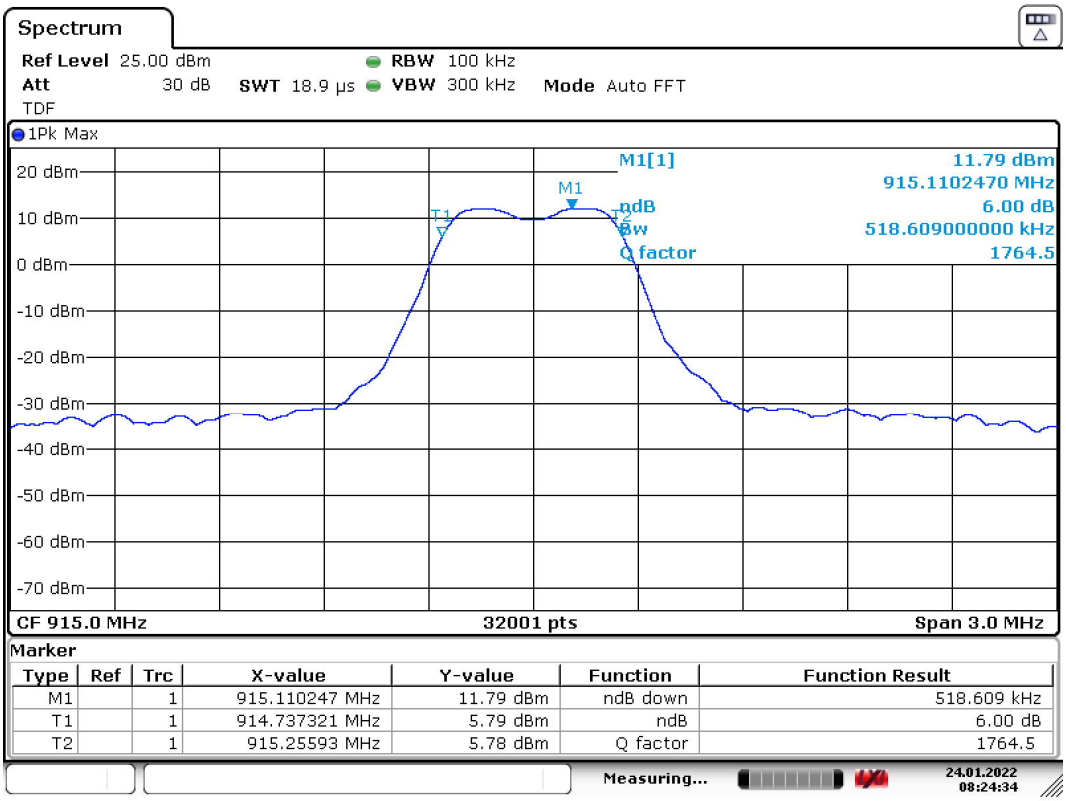


Figure 34: 6 dB bandwidth, channel MID

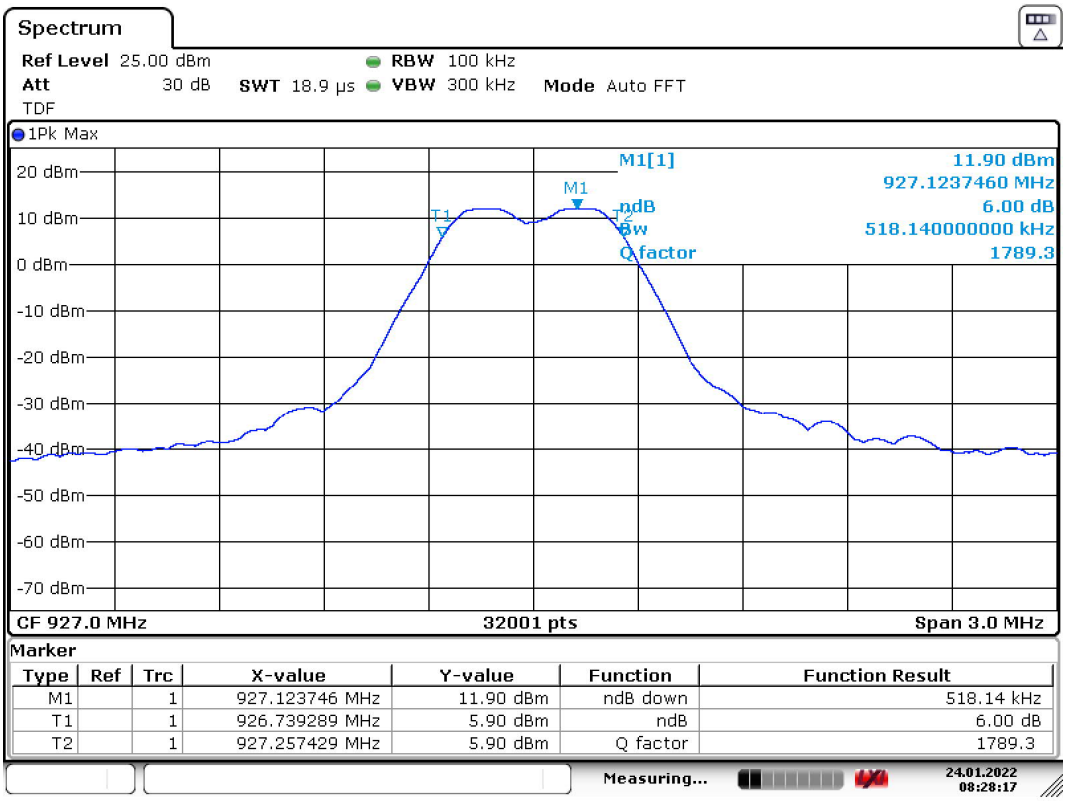


Figure 35: 6 dB bandwidth, channel HIGH

Power Spectral Density

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

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

Results

Table 16: 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	

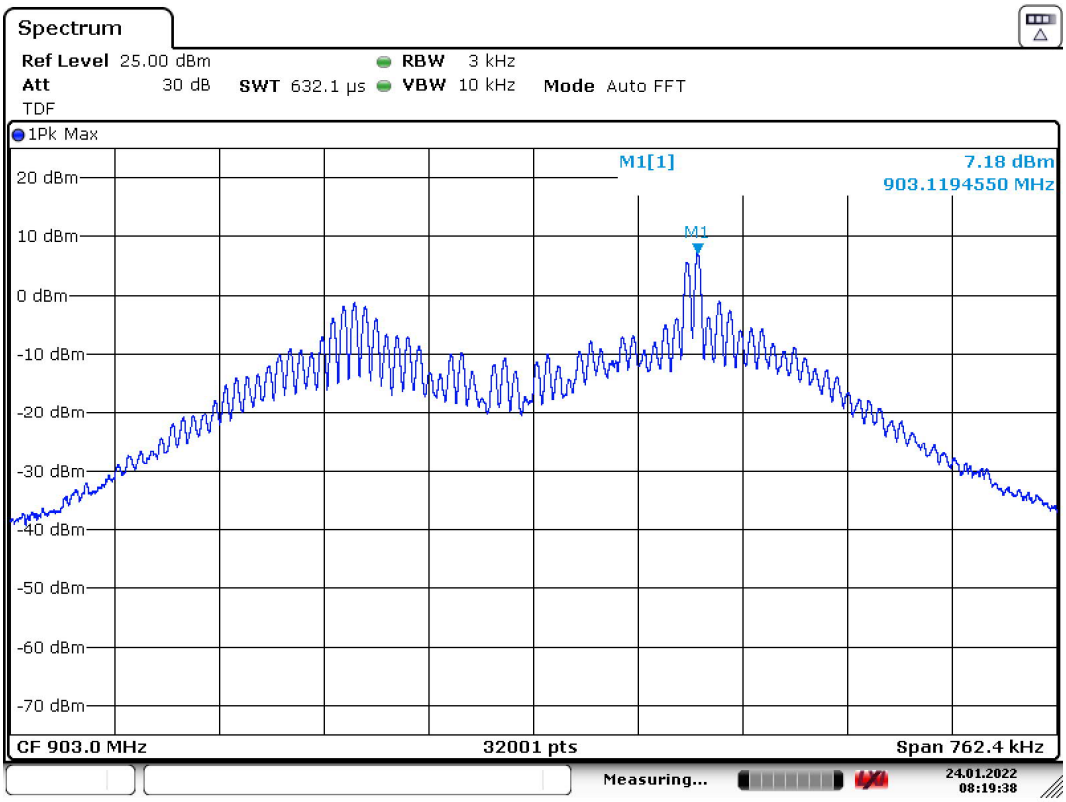


Figure 36: Power spectral density, channel LOW

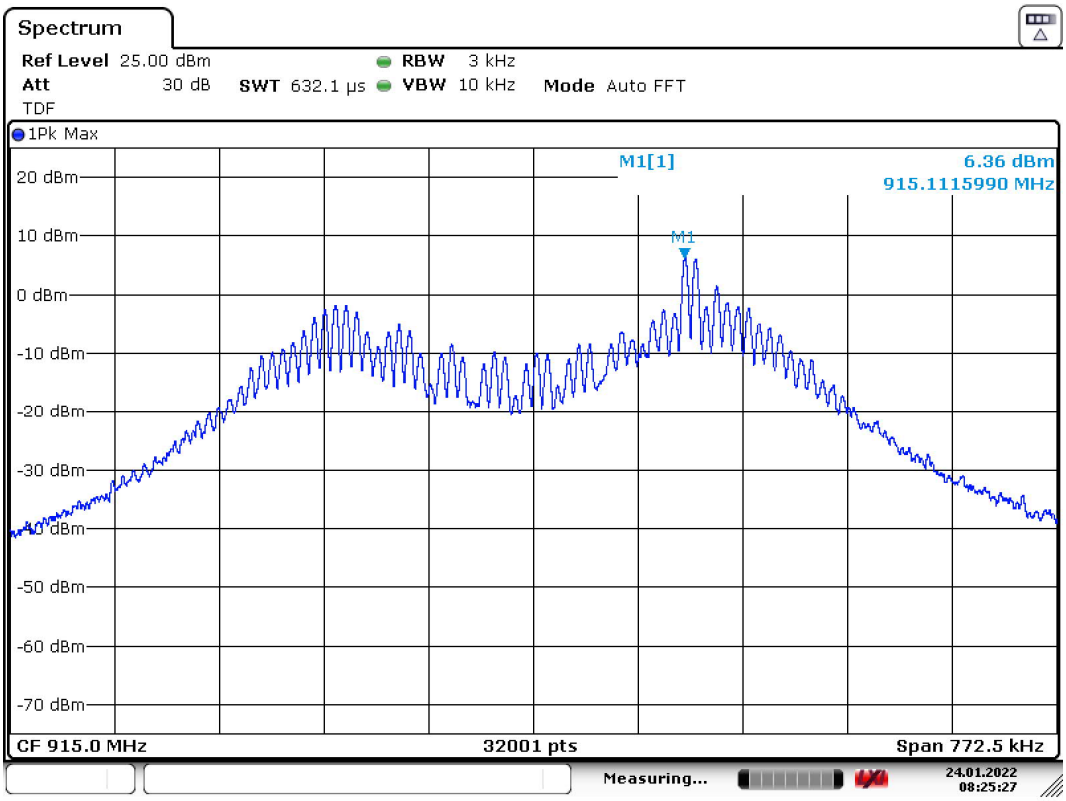


Figure 37: Power spectral density, channel MID

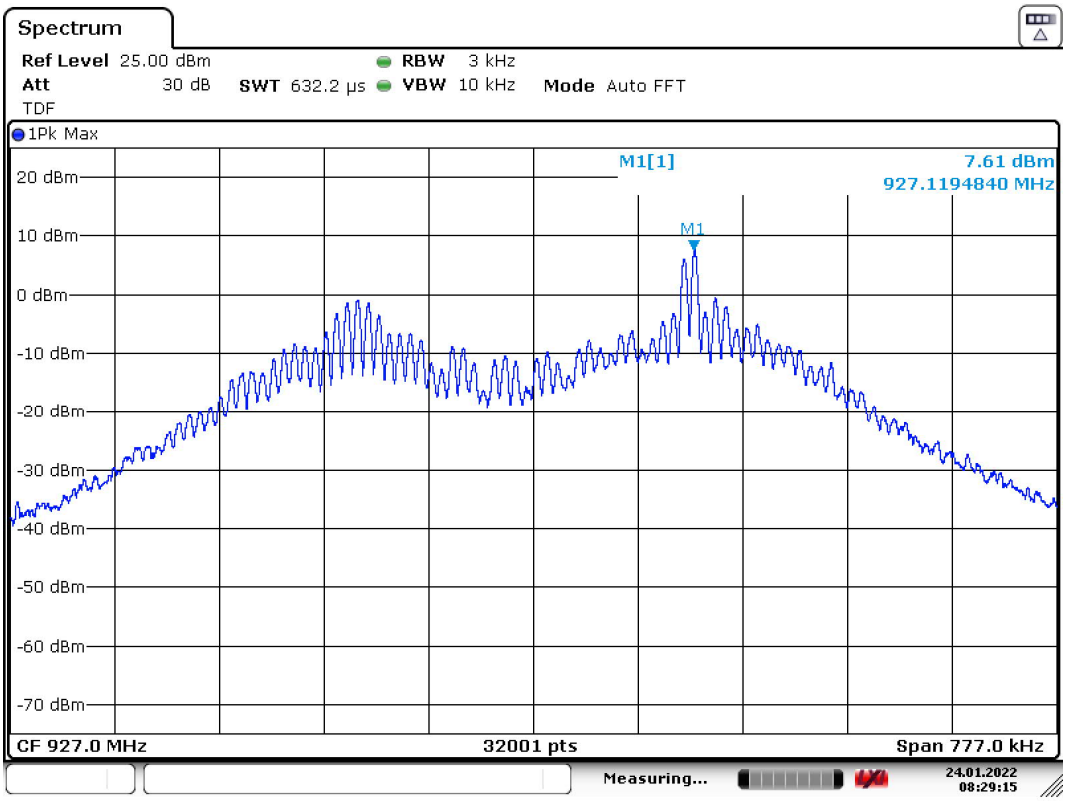


Figure 38: Power spectral density, channel HIGH

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 17: 99% occupied bandwidth test results

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

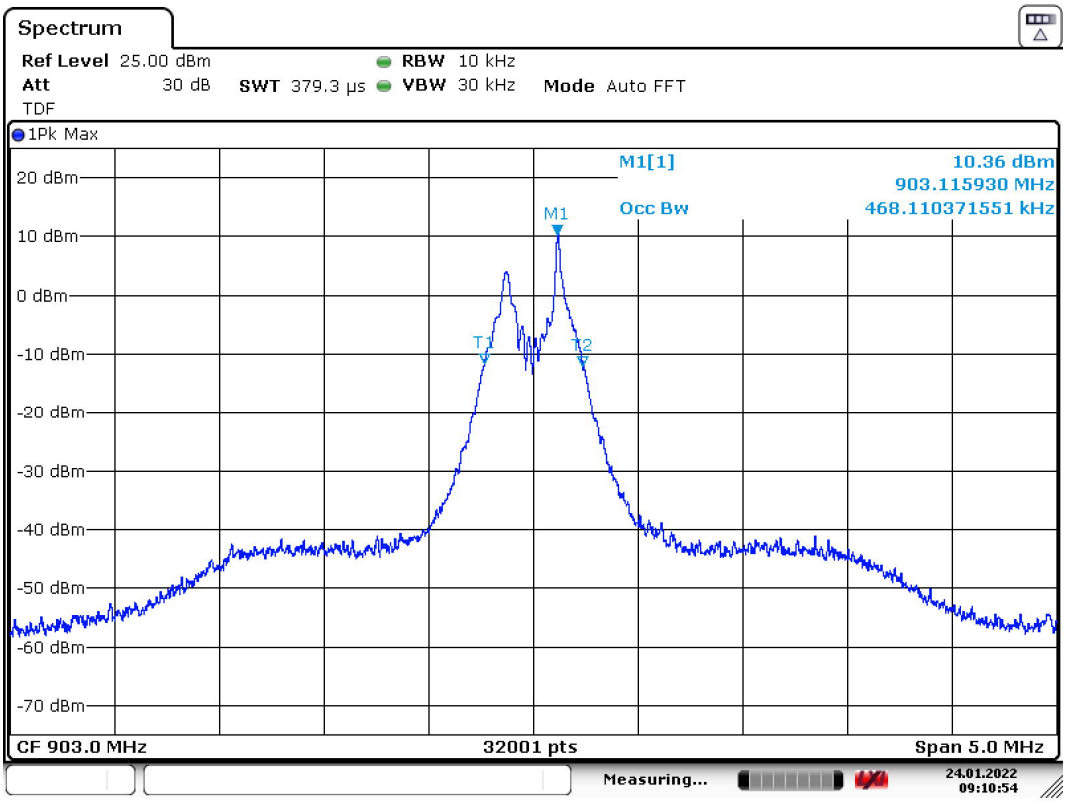


Figure 39: 99% OBW, channel LOW

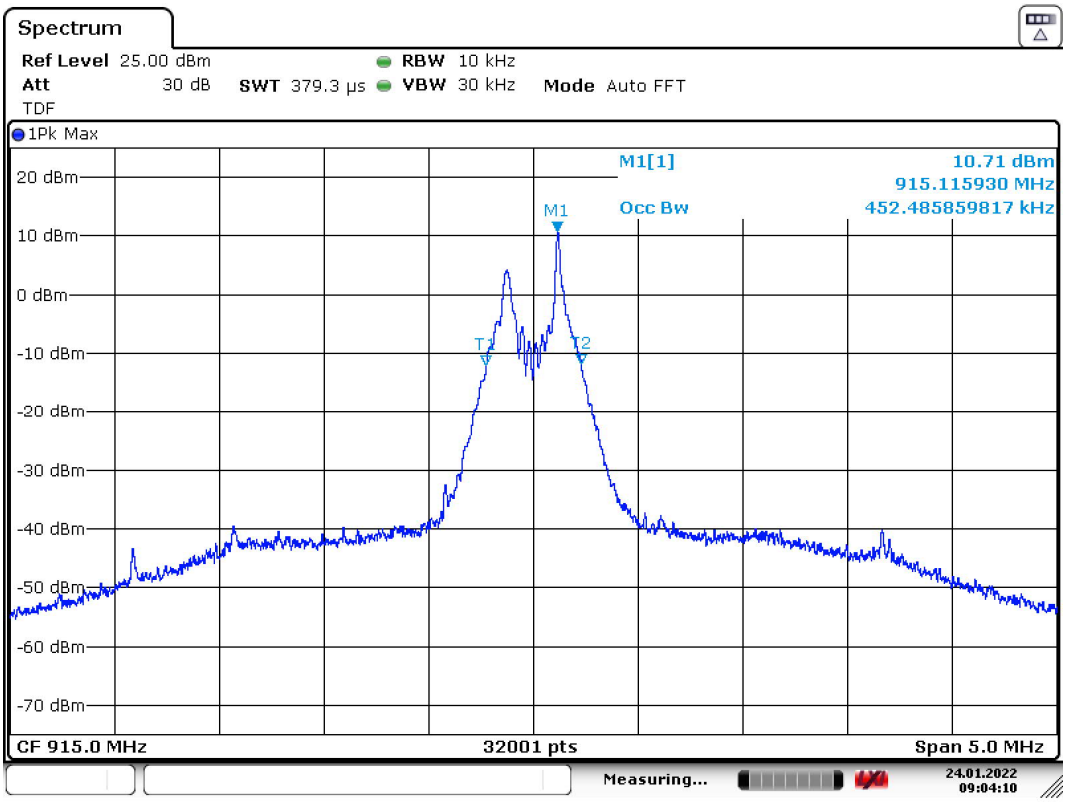


Figure 40: 99% OBW, channel MID

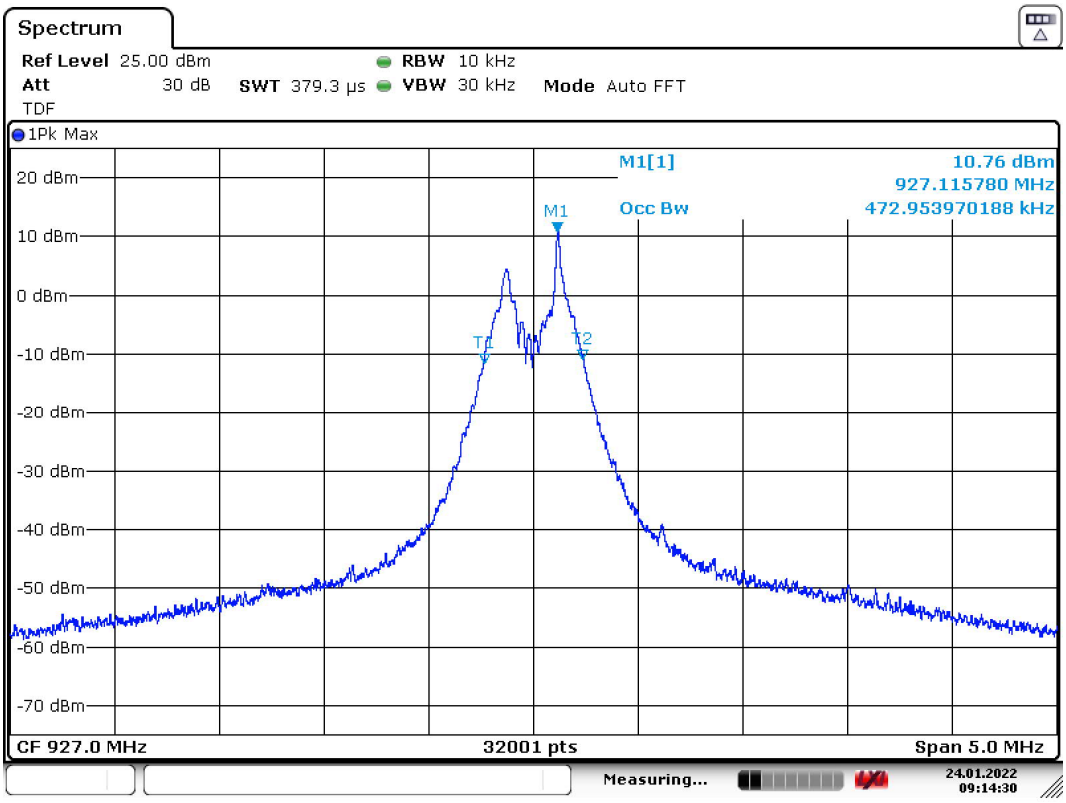


Figure 41: 99% OBW, channel HIGH

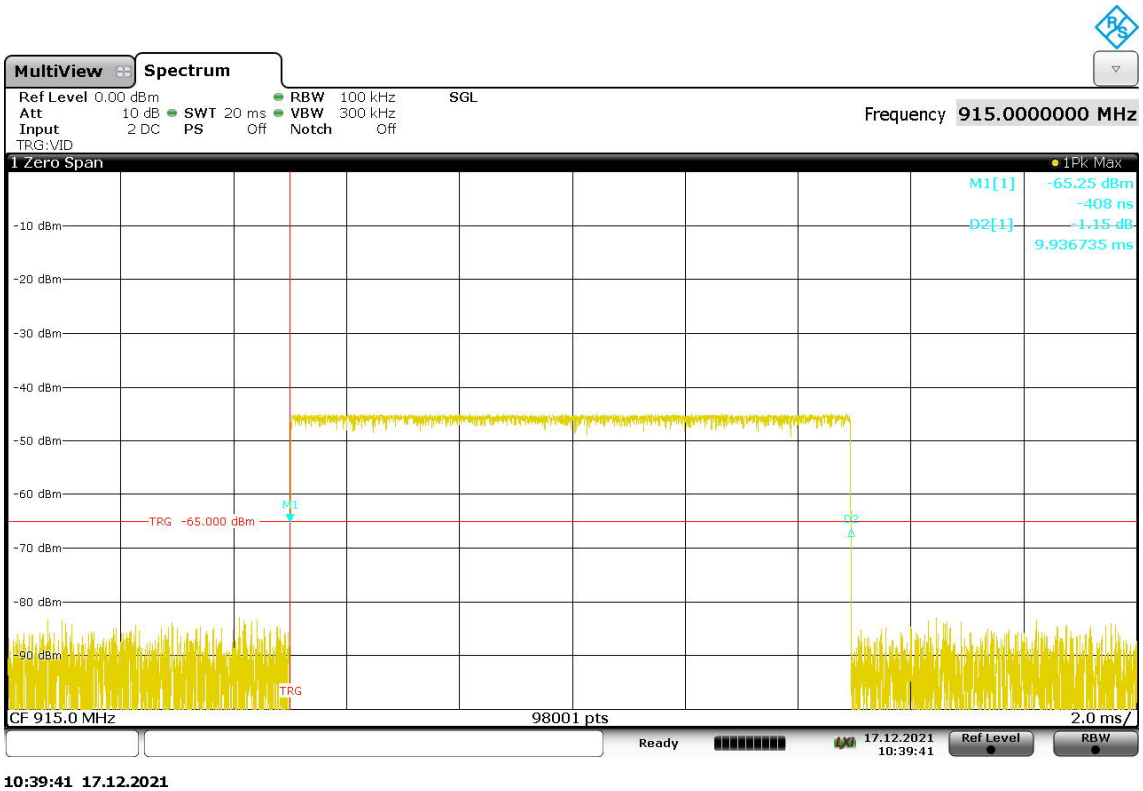
Duty cycle correction factor, Transmit time in 100 ms

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*log(Tocc/100)=20*log(1*9.936735 /100) = -20.05 dB



10:39:41 17.12.2021

Figure 42. 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	2022-06-20	2023-06-20
LISN	ROHDE & SCHWARZ	ENV216	inv:9611	2022-02-02	2023-02-02
TEMPERATURE/ HUMIDITY SENSOR	EDS	OW-ENV-TH, K5 SAC	inv:10517	2022-10-27	2023-10-27

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	NCR
RF PREAMPLIFIER	CIAO	CA118-3123	inv:10278	2021-10-05	2022-10-05
				2022-09-21	2023-09-21
TEMPERATURE/ HUMIDITY SENSOR	EDS	OW-ENV-TH, K5 SAC	inv:10517	2021-10-22	2022-10-22
				2022-10-27	2023-10-27
ANTENNA	EMCO	3117, emi 1-18GHz	inv:7293	2020-03-11	2022-03-11
				2022-06-16	2024-06-16
TURNTABLE	MATURO	DS430 UPGRADED	inv:10182	NCR	NCR
MAST & TURNTABLE CONTROLLER	MATURO	NCD	inv:10183	NCR	NCR
ANTENNA MAST	MATURO	TAM 4.0E	inv:10181	NCR	NCR
ATTENUATOR	PASTERNACK	PE 7004-4 (4dB)	inv:10126	2021-03-26	2022-03-26
				2021-03-30	2023-03-30
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
				2022-06-20	2023-06-20
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
ANTENNA	SCHWARZBECK	VULB 9168	inv:10682	2022-07-26	2024-07-26
FILTER	WAINWRIGHT	HP, WHKX1.0/15G-10SS	inv:8267	2021-01-29	2023-01-29

NCR = No calibration required

END OF REPORT