



RF – TEST REPORT

- FCC Part 15.247, RSS-247 -

Type / Model Name : RR21

Product Description : UHF RFID Reader

Applicant : race result AG

Address : Joseph-von-Fraunhofer-Str. 11

76327 PFINZTAL, GERMANY

Manufacturer : race result AG

Address : Joseph-von-Fraunhofer-Str. 11

76327 PFINZTAL, GERMANY

Test Result according to the standards
listed in clause 1 test standards:

POSITIVE

Test Report No. : **80240901-06 Rev_1**

19. August 2025

Date of issue



Deutsche
Akkreditierungsstelle
D-PL-12030-01-03
D-PL-12030-01-04

FCC ID: SZO-RR21

IC ID: 20465-RR21

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ATTACHMENT A as separate supplement

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

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1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules and Regulations Part 15, Subpart A - General (February 2025)

Part 15, Subpart A, Section 15.31	Measurement standards
Part 15, Subpart A, Section 15.33	Frequency range of radiated measurements
Part 15, Subpart A, Section 15.35	Measurement detector functions and bandwidths

FCC Rules and Regulations Part 15, Subpart C - Intentional Radiators (February 2025)

Part 15, Subpart C, Section 15.203	Antenna requirement
Part 15, Subpart C, Section 15.204	External radio frequency power amplifiers and antenna modifications
Part 15, Subpart C, Section 15.207	Conducted limits
Part 15, Subpart C, Section 15.209	Radiated emission limits, general requirements
Part 15, Subpart C, Section 15.247	Operation within the bands 902 - 928 MHz, 2400 - 2483.5 MHz and 5725 - 5850 MHz

ANSI C63.10: 2013 Testing Unlicensed Wireless Devices

ETSI TR 100 028 V1.3.1: 2001-03, Electromagnetic Compatibility and Radio Spectrum Matters (ERM);
Uncertainties in the Measurement of Mobile Radio Equipment
Characteristics—Part 1 and Part 2

KDB 558074 D01 v05r02 Guidance for compliance measurements on DTS; FHSS and hybrid
system devices operating under Section 15.247 of the FCC rules,
April 2, 2019.

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2 EQUIPMENT UNDER TEST

2.1 Information provided by the Client

Please note, we do not take any responsibility for information provided by the client or his representative which may have an influence on the validity of the test results.

2.2 Sampling

The customer is responsible for the choice of sample. Sample configuration, start-up and operation is carried out by the customer or according to his/her instructions.

2.3 Photo documentation of the EUT – Detailed photos see ATTACHMENT A

2.4 Equipment type

UHF-RFID Reader, FHSS, mobile equipment.

2.5 Short description of the equipment under test (EUT)

The UHF RFID Reader (Ultra High Frequency Radio Frequency Identification) is designed to read information stored on RFID tags. The device is DC powered and managed by an external controller via a CAN Bus (Controller Area Network).

Number of tested samples: 2
Serial number: 250204061 (radiated sample)
250207001 (conducted sample)
SW/FW version: rev105 (ae09bad9)

2.6 Variants of the EUT

There are no variants.

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2.7 Operation frequency and channel plan

The operating frequency is 902 MHz to 928 MHz.

Channel plan:

Channel No.	Frequency (MHZ)	Channel No.	Frequency (MHZ)	Channel No.	Frequency (MHZ)
1	902.75	21	912.75	41	922.75
2	903.25	22	913.25	42	923.25
3	903.75	23	913.75	43	923.75
4	904.25	24	914.25	44	924.25
5	904.75	25	914.75	45	924.75
6	905.25	26	915.25	46	925.25
7	905.75	27	915.75	47	925.75
8	906.25	28	916.25	48	926.25
9	906.75	29	916.75	49	926.75
10	907.25	30	917.25	50	927.25
11	907.75	31	917.75		
12	908.25	32	918.25		
13	908.75	33	918.75		
14	909.25	34	919.25		
15	909.75	35	919.75		
16	910.25	36	920.25		
17	910.75	37	920.75		
18	911.25	38	921.25		
19	911.75	39	921.75		
20	912.25	40	922.25		

Note: the marked frequencies are determined for final testing.

2.8 Antenna

The following antennas shall be used with the EUT:

Number	Characteristic	Model number	Plug	Frequency range (MHz)	Peak Gain (dBi)
1	omni	RR21 internal antenna	PCB	902 - 928	3.7

2.9 Power supply system utilised

Power supply voltage, Vnom : 14.4 V DC

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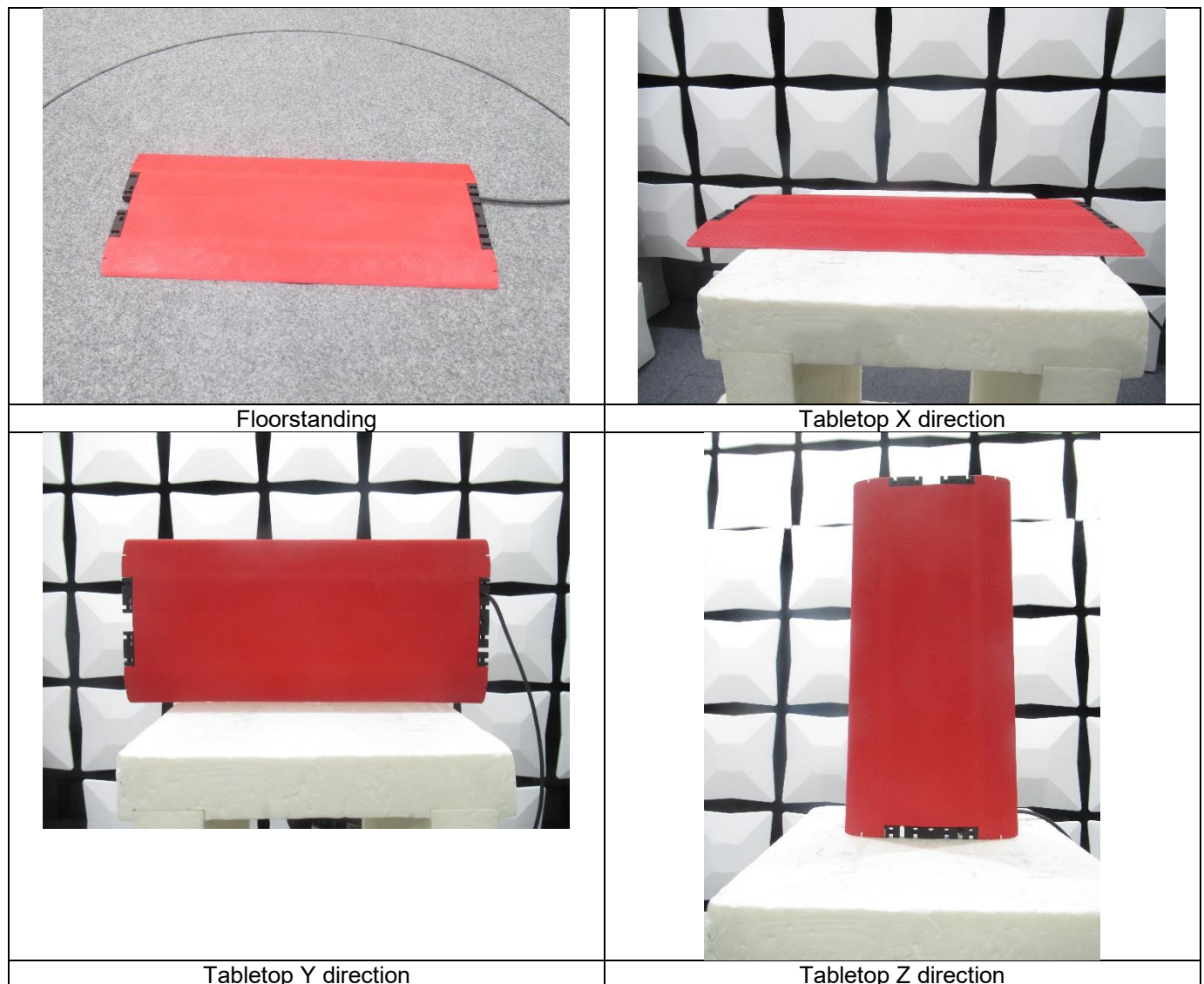
2.10 Peripheral devices and interface cables

The following peripheral devices and interface cables are connected during the measurements:

- | | |
|---------------------------|---|
| - Notebook | Model : <u>Lenovo Thinkpad E14 Gen3</u> |
| - CAN-USB adaptor | Model : <u>Peak IPEH</u> |
| - Laboratory power supply | Model : <u>Hameg HM8143</u> |

2.11 Determination of worst-case conditions for final measurement

Preliminary tests are performed as both floorstanding and tabletop equipment in all three orthogonal axes to locate at which position and at what setting of the EUT produce the maximum of the emissions. For the further measurement the EUT is set in X position as tabletop equipment.



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The tests are carried out in the following frequency band:

902 MHz – 928 MHz

For the final test the following channels and test modes are selected:

Available channel	Tested channels	Power setting	Modulation
1 to 50	1, 25, 50	default	ASK

2.11.1 Test jig

No test jig is used.

2.11.2 Test software

The test software for the EUT provides special test modes TX continuous mode, modulated and unmodulated. The EUT is set with test modulation to transmit data during the tests with a maximum duty cycle (x) from an internal packet generator.

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3 TEST RESULT SUMMARY

FCC Rule Part	RSS Rule Part	Description	Result
15.207(a)	RSS-Gen, 8.8	AC power line conducted emissions	passed
15.247(a)(1)	RSS-247, 5.1(a)	20 dB EBW	passed
-	RSS-Gen, 6.6	99 % Bandwidth	passed
15.247(a)(1)	RSS-247, 5.1(c)	Channel separation	passed
15.247(a)(1)	RSS-247, 5.1(c)	Dwell time	passed
15.247(b)(1)	RSS-247, 5.4(a)	Peak power	passed
15.247(d)	RSS-247, 5.5	Spurious emissions	passed
15.247(d)	RSS-247, 5.5	Out-of-band emission, radiated	passed
15.247(d)	RSS-Gen, 8.10	Emissions in restricted bands	passed
15.247(e)	RSS-247, 5.1(c)	Hopping sequence	Not tested ^{*1}
15.247(a)	RSS-247, 5.1(a)	Receiver input bandwidth	Not tested ^{*2}
15.247(a)	RSS-247, 5.4(a)	Number of hopping channels	passed
15.247(a)	RSS-247, 5.4(a)	Equal hopping frequency use	Not tested ^{*3}
15.203	RSS-247, 5.4(a)	Antenna requirement	passed

- ^{*1} The channel is represented by a pseudo-random hopping sequence hopping through the 50 RF-channels. For detailed information about the hopping sequence, please refer to user manual.
- ^{*2} The receiver bandwidth is equal to the transmitter bandwidth in the 50 hopping channel mode (declared by the manufacturer). For detailed information about the hopping sequence, please refer to user manual.
- ^{*3} The device fulfills the requirement according to FCC Part 15C, Section 15.247(a). The manufacturer declares in the system manual that this function is controlled via software. For detailed information about the hopping sequence, please refer to user manual.

The mentioned new RSS Rule Parts in the above table are related to:
RSS-Gen, Issue 5 + Amendment 1 + Amendment 2, March 2019
RSS-247, Issue 3, August 2023

3.1 Revision history of test report

Test report No	Rev.	Issue Date	Chang80es
80240901-06	0	24 March 2025	Initial test report
80240901-06	1	19 August 2025	section 2.11: clarification of pre-scan positions and justification for measurements as tabletop equipment

The test report with the highest revision number replaces the previous test reports.

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3.2 Final assessment

The equipment under test fulfills the requirements cited in clause 1 test standards.

Date of receipt of test sample : acc. to storage records

Testing commenced on : 12 February 2025

Testing concluded on : 24 March 2025

Checked by:



Klaus Gegenfurtner
I confirm the correctness
and integrity of this
document
2025.08.20 07:54:57
+02'00'

Klaus Gegenfurtner
Teamleader Radio

Tested by:



I am the author of
this document
2025.08.19 18:27:20
+02'00'

Franz-Xaver Schrettenbrunner
Radio Team

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4 TEST ENVIRONMENT

4.1 Address of the test laboratory

CSA Group Bayern GmbH
Ohmstrasse 1-4
94342 STRASSKIRCHEN
GERMANY

4.2 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature: 15 - 35 ° C

Humidity: 30 - 60 %

Atmospheric pressure: 86 - 106 kPa

4.3 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. It is noted that the expanded measurement uncertainty corresponds to the measurement results from the standard measurement uncertainty multiplied by the coverage factor $k = 2$. The true value is located in the corresponding interval with a probability of 95 %. The measurement uncertainty was calculated for all measurements listed in this test report on basis of the ETSI Technical Report TR 100 028 Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 1 and Part 2. The results are documented in the quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Measurement Type	Range	Confidence Level	Calculated Uncertainty
AC power line conducted emissions	0.15 MHz to 30 MHz	95%	± 3.29 dB
EBW and OBW	2400 MHz to 3000 MHz	95%	$\pm 2.5 \times 10^{-7}$
Maximum peak conducted output power	2400 MHz to 3000 MHz	95%	± 0.62 dB
Power spectral density	2400 MHz to 3000 MHz	95%	± 0.62 dB
Conducted Spurious Emissions	9 kHz to 10000 MHz	95%	± 2.15 dB
Conducted Spurious Emissions	10000 MHz to 40000 MHz	95%	± 3.47 dB
Radiated Spurious Emissions	9 kHz to 30 MHz	95%	± 3.53 dB
Radiated Spurious Emissions	30 MHz to 1000 MHz	95%	± 3.71 dB
Radiated Spurious Emissions	1000 MHz to 10000 MHz	95%	± 2.34 dB
Field strength of the fundamental	100 kHz to 100 MHz	95%	± 3.53 dB

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4.4 Conformity Decision Rule

The applied conformity decision rule is based on ILAC G8:09/2019 clause 4.2.1 Binary Statement for Simple Acceptance Rule ($w = 0$).

Details can be found in the procedure CSA_B_V50_29.

4.5 Measurement protocol for FCC and ISED

4.5.1 General information

CSA Group Bayern GmbH is recognized as wireless testing laboratory under the CAB identifier:

FCC: DE 0011
ISED: DE0009

4.5.2 General Standard information

The test methods used comply with ANSI C63.10 - "Testing Unlicensed Wireless Devices".

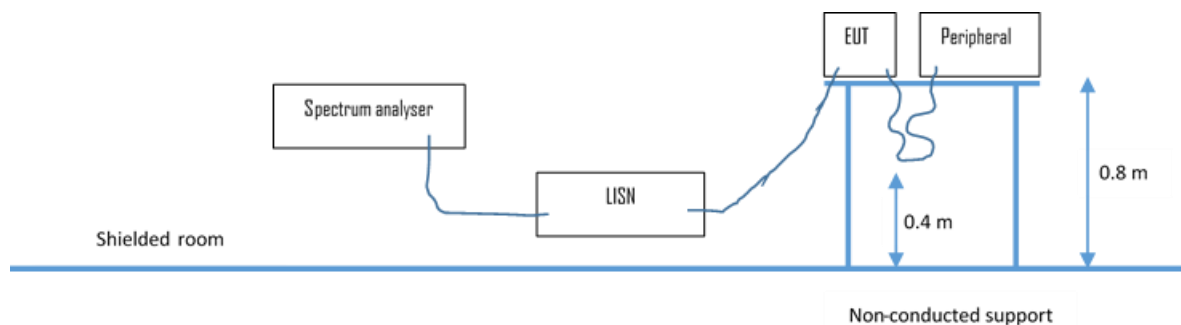
4.5.2.1 Justification

The equipment under test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions.

4.5.3 Details of test procedures

4.5.3.1 Conducted emission

Test setup according ANSI C63.10



The final level, expressed in dB μ V, is arrived at by taking the reading directly from the Spectrum analyser. This level is compared to the limit.

To convert between dB μ V and μ V, the following conversions apply:

$$\text{dB}\mu\text{V} = 20(\log \mu\text{V})$$

$$\mu\text{V} = \text{Inverse log}(\text{dB}\mu\text{V}/20)$$

Conducted emissions on the 50 Hz and/or 60 Hz power interface of the EUT are measured in the frequency range of 150 kHz to 30 MHz. The measurements are performed using a receiver, which has CISPR characteristic bandwidth and quasi-peak detection and a Line Impedance Stabilization Network (LISN) with 50 Ω / 50 μ H (CISPR 16) characteristics. The receiver is protected by means of an impedance matched pulse limiter connected directly to the RF input. Table top equipment is placed on a non-conducting table 80 centimetres above the floor and is positioned 40 centimetres from the vertical ground plane (wall) of the screen room. If the minimum limit margin appears to be less than 20 dB with a peak mode measurement, the emission is re-measured using a tuned receiver with quasi-peak and average detection and recorded on the data sheets.

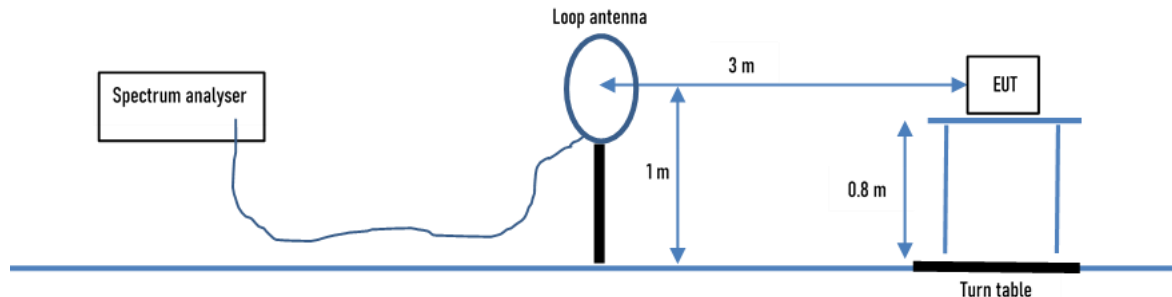
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4.5.3.2 Radiated emission

4.5.3.2.1 OATS1 test site (9 kHz - 30 MHz):

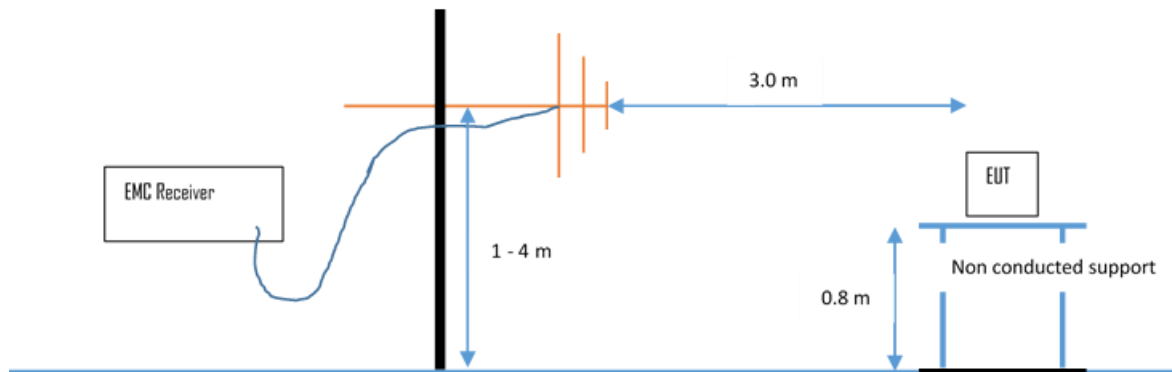
Test setup according ANSI C63.10



Emissions from the EUT are measured in the frequency range of 9 MHz to 30 MHz using a tuned receiver and a calibrated loop antenna. Table top equipment is placed on a 1.0 X 1.5 m non-conducting table 80 centimetres above the ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screened room located outside the test area. The antenna is positioned 3, 10 or 30 metres horizontally from the EUT and is repeated vertically. To locate maximum emissions from the test sample the antenna is varied along the site axis and the EUT is rotated 360 degrees.

4.5.3.2.2 OATS1 test site (30 MHz - 1 GHz):

Test setup according ANSI C63.10.



Spurious emissions from the EUT are measured in the frequency range of 30 MHz to 1000 MHz using a tuned receiver and appropriate broadband linearly polarised antennas. Measurements between 30 MHz and 1000 MHz are made with 120 kHz/6 dB bandwidth and quasi-peak detection. Table top equipment is placed on a 1.0 X 1.5 m non-conducting table 80 centimetres above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screened room located outside the test area. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 metres and the EUT is rotated 360 degrees. The final level in dBµV/m is calculated by taking the reading from the EMI receiver (Level dBµV) and adding the correction factors and cable loss factor (dB). The FCC limit is subtracted from this result in order to provide the limit margin listed in the measurement protocol.

The resolution bandwidth setting:

30 MHz – 1000 MHz: RBW: 120 kHz

Example:

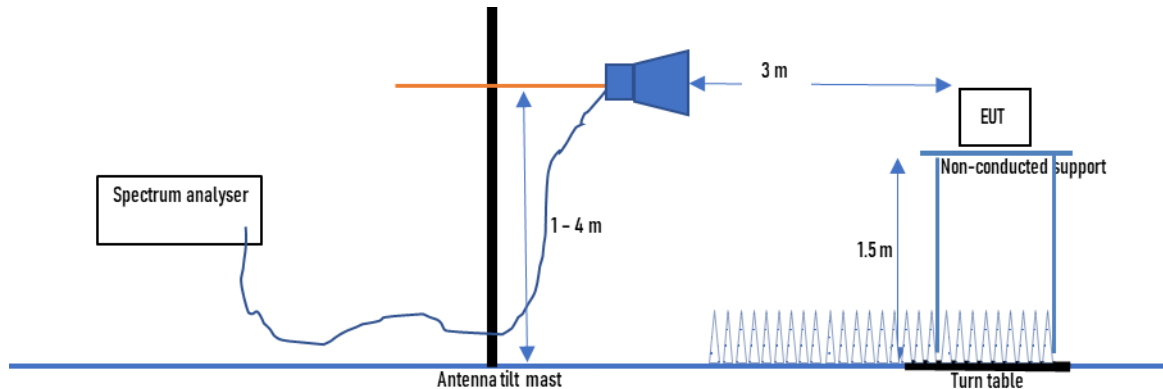
Frequency (MHz)	Level (dBµV)	+	Factor (dB)	=	Level (dBµV/m)	-	Limit (dBµV/m)	=	Delta (dB)
719.0	75.0	+	32.6	=	107.6	-	110.0	=	-2.4

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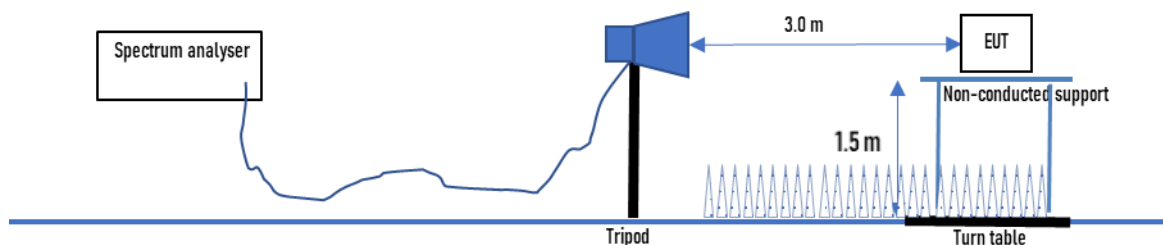
4.5.3.2.3 Anechoic chamber 1 (1000 MHz – 18000 MHz)

Test setup according ANSI C63.10.



Radiated emissions from the EUT are measured in the frequency range 1 GHz up to 18 GHz as specified in 47 CFR Part 15, Subpart A, Section 15.33, using a spectrum analyser and appropriate linearly polarized antennas. Table top equipment is placed on a non-conducting table, 1.5 metre above the ground plane. The turntable is fully covered with the appropriate absorber (Type VHP-12). Any controlling device is positioned such that it does not significantly influence the measurement results. Interconnecting cables that hang closer than 40 cm to the ground plane are folded back and forth in the center, forming a bundle 30 cm to 40 cm long. Measurements are made in three orientations of the EUT and the horizontal and vertical polarization planes of measurement antenna in a fully anechoic room. The measurement antenna is adjusted and the EUT orientated to permit the measurement of the maximum emission from the EUT. The conditions determined as worst-case will then be used for the final measurements.

4.5.3.2.4 Anechoic chamber 1 (18 GHz – 40 GHz)



Emissions from the EUT are measured in the frequency range 18 GHz up to 40 GHz as specified in 47 CFR Part 15, Subpart A, Section 15.33, using a spectrum analyser and appropriate linearly polarized antennas. Table top equipment is placed on a non-conducting table, 1.5 metre above the ground plane. The turntable is fully covered with the appropriate absorber (Type VHP-12). Any controlling device is positioned such that it does not significantly influence the measurement results. Interconnecting cables that hang closer than 40 cm to the ground plane are folded back and forth in the center, forming a bundle 30 cm to 40 cm long. Measurements are made in three orientations of the EUT and the horizontal and vertical polarization planes of measurement antenna in a fully anechoic room. The measurement antenna is adjusted and the EUT orientated to permit the measurement of the maximum emission from the EUT. The conditions determined as worst-case will then be used for the final measurements. Where appropriate, the test distance may be reduced in order to detect emissions under better uncertainty. The limits are adopted.

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5 TEST CONDITIONS AND RESULTS

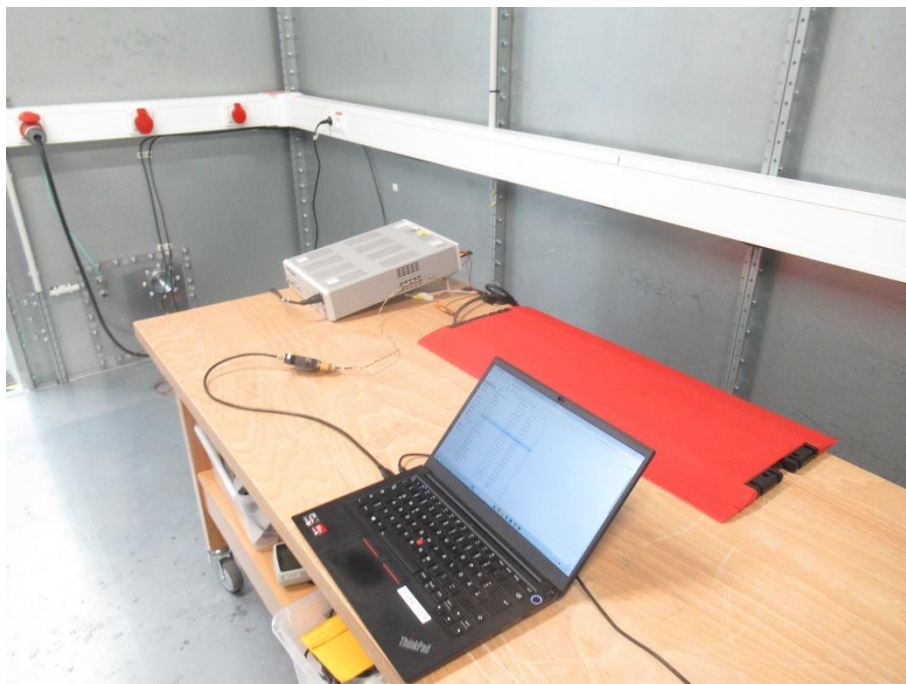
5.1 AC power line conducted emissions

For test instruments and accessories used see section 6 Part A 4.

5.1.1 Description of the test location

Test location: Shielded Room SR2

5.1.2 Photo documentation of the test set-up



5.1.3 Applicable standard

According to FCC Part 15, Section 15.207(a):

Except as shown in paragraphs (b) and (c) of this Section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the given limits.

5.1.4 Description of Measurement

The measurements are performed following the procedures set out in ANSI C63.10 described under item 4.4.3. If the minimum limit margin appears to be less than 20 dB with a peak mode measurement, the emissions are re-measured using a tuned receiver with quasi-peak and average detection and recorded on the data sheets.

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5.1.5 Test result

Frequency range: 0.15 MHz - 30 MHz

Min. limit margin -23.62dB at 19.998 MHz

Limit according to FCC Part 15, Section 15.207(a):

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

The requirements are **FULFILLED**.

Remarks: For detailed test result please refer to following test protocols.
Hameg HM8143 power supply is used (see clause 2.10).

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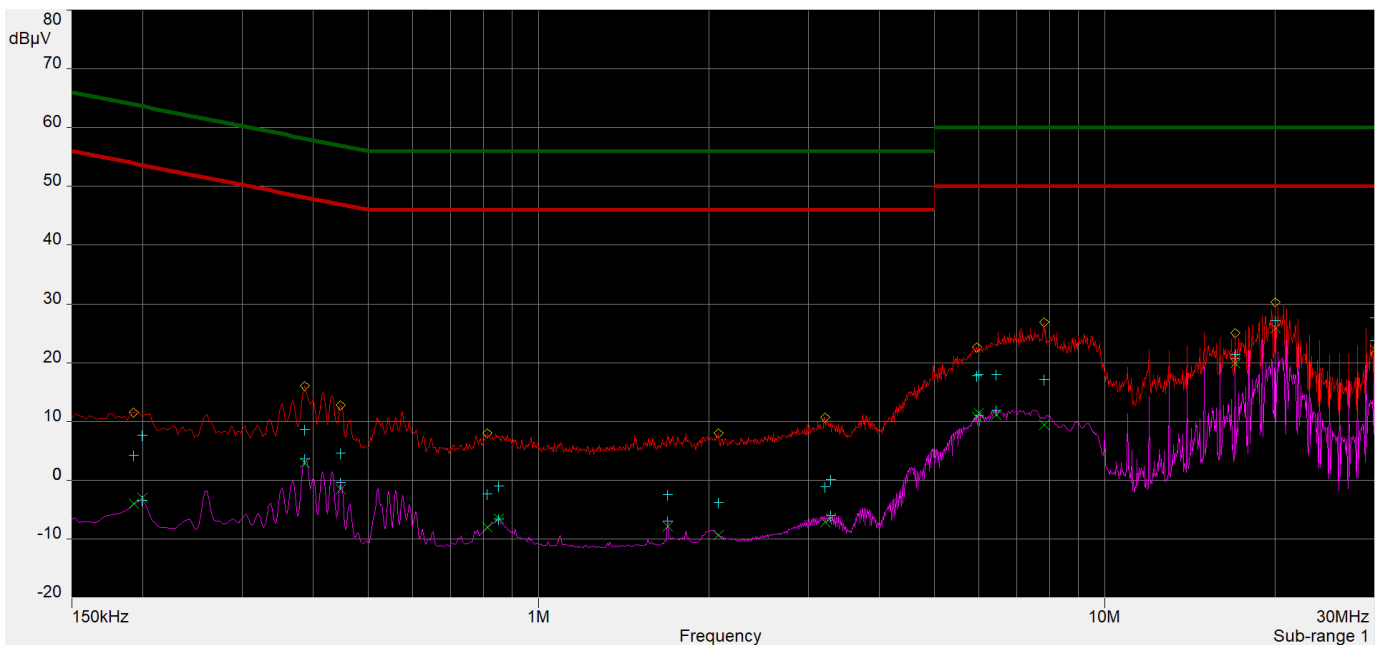
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5.1.6 Test protocol

Phase 1

Frequency (Hz)	QuasiPeak (dBμV)	QP Margin	QP Limit (dBμV)	CISPR AV (dBμV)	CISPR AV Margin	AV Limit (dBμV)	RBW (Hz)	Correction (dB)
191.093 k	4.24	-59.77	64.01	-3.88	-57.9	54.01	9000	0.33
197.611 k	7.71	-56.02	63.73	-2.91	-56.63	53.73	9000	0.31
384.361 k	8.65	-49.55	58.19	3.02	-45.17	48.19	9000	0.19
445.111 k	4.56	-52.41	56.97	-1.44	-48.41	46.97	9000	0.19
809.611 k	-2.39	-58.39	56	-7.92	-53.92	46	9000	0.2
847.861 k	-1.04	-57.04	56	-6.52	-52.52	46	9000	0.2
1.689 M	-2.4	-58.4	56	-7.79	-53.79	46	9000	0.26
2.074 M	-3.84	-59.84	56	-9.24	-55.24	46	9000	0.28
3.201 M	-1.15	-57.15	56	-7.09	-53.09	46	9000	0.32
3.282 M	0.11	-55.89	56	-6.33	-52.33	46	9000	0.32
5.951 M	17.75	-42.25	60	10.82	-39.18	50	9000	0.26
6 M	17.96	-42.04	60	11.37	-38.63	50	9000	0.26
6.428 M	17.99	-42.01	60	11.23	-38.77	50	9000	0.24
7.805 M	17.12	-42.88	60	9.51	-40.49	50	9000	0.2
16.998 M	21.41	-38.59	60	20.01	-29.99	50	9000	0.41
19.998 M	27.14	-32.86	60	25.99	-24.01	50	9000	0.5
29.996 M	23.72	-36.28	60	22.27	-27.73	50	9000	0.73



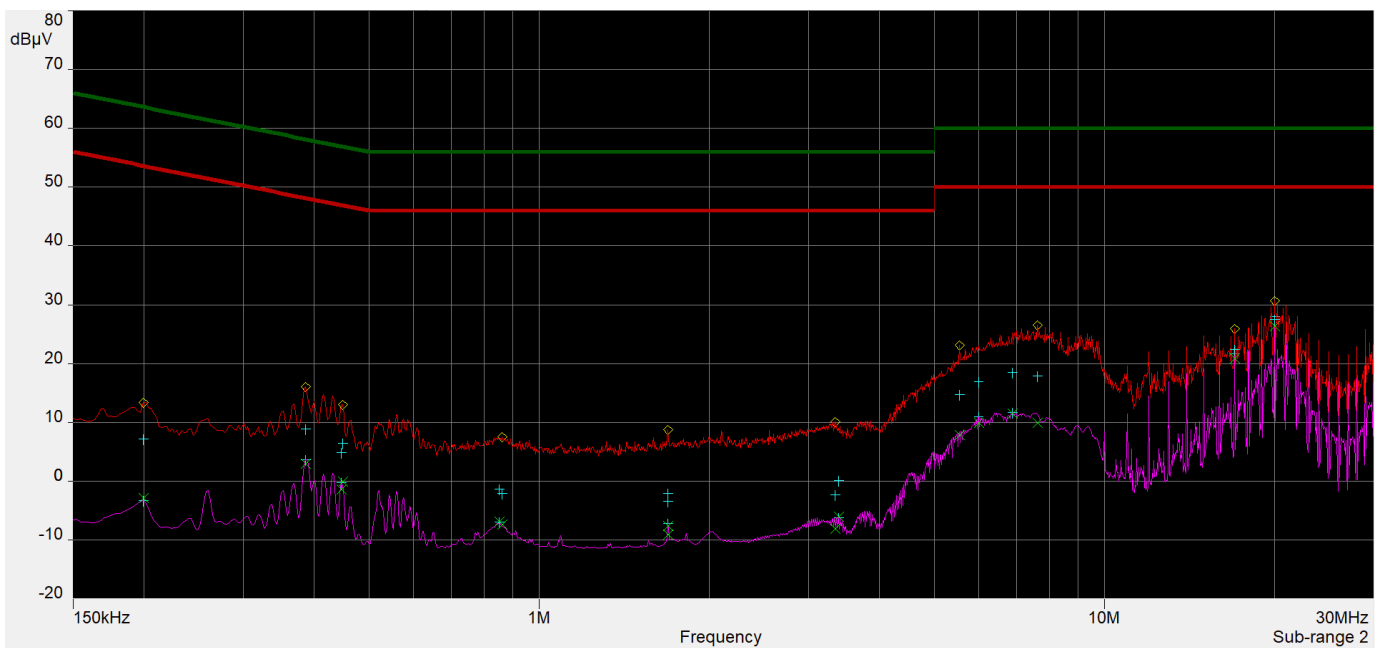
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Neutral

Frequency (Hz)	QuasiPeak (dBµV)	QP Margin	QP Limit (dBµV)	CISPR AV (dBµV)	CISPR AV Margin	AV Limit (dBµV)	RBW (Hz)	Correction (dB)
197.611 k	7.19	-56.54	63.73	-2.78	-56.51	53.73	9000	0.31
384.361 k	8.83	-49.36	58.19	3.05	-45.15	48.19	9000	0.19
445.111 k	4.85	-52.12	56.97	-1.31	-48.28	46.97	9000	0.19
447.361 k	6.45	-50.48	56.93	0.01	-46.92	46.93	9000	0.19
847.861 k	-1.38	-57.38	56	-6.78	-52.78	46	9000	0.2
859.111 k	-2.14	-58.14	56	-7.37	-53.37	46	9000	0.2
1.687 M	-3.45	-59.45	56	-8.98	-54.98	46	9000	0.25
1.689 M	-2.12	-58.12	56	-7.54	-53.54	46	9000	0.26
3.343 M	-2.37	-58.37	56	-8.02	-54.02	46	9000	0.32
3.384 M	0.15	-55.85	56	-5.94	-51.94	46	9000	0.32
5.546 M	14.76	-45.24	60	7.86	-42.14	50	9000	0.28
5.998 M	16.97	-43.03	60	9.94	-40.06	50	9000	0.26
6.88 M	18.45	-41.55	60	11.52	-38.48	50	9000	0.22
7.623 M	17.88	-42.12	60	10.01	-39.99	50	9000	0.2
16.998 M	22.35	-37.65	60	20.96	-29.04	50	9000	0.41
19.998 M	27.55	-32.45	60	26.38	-23.62	50	9000	0.5



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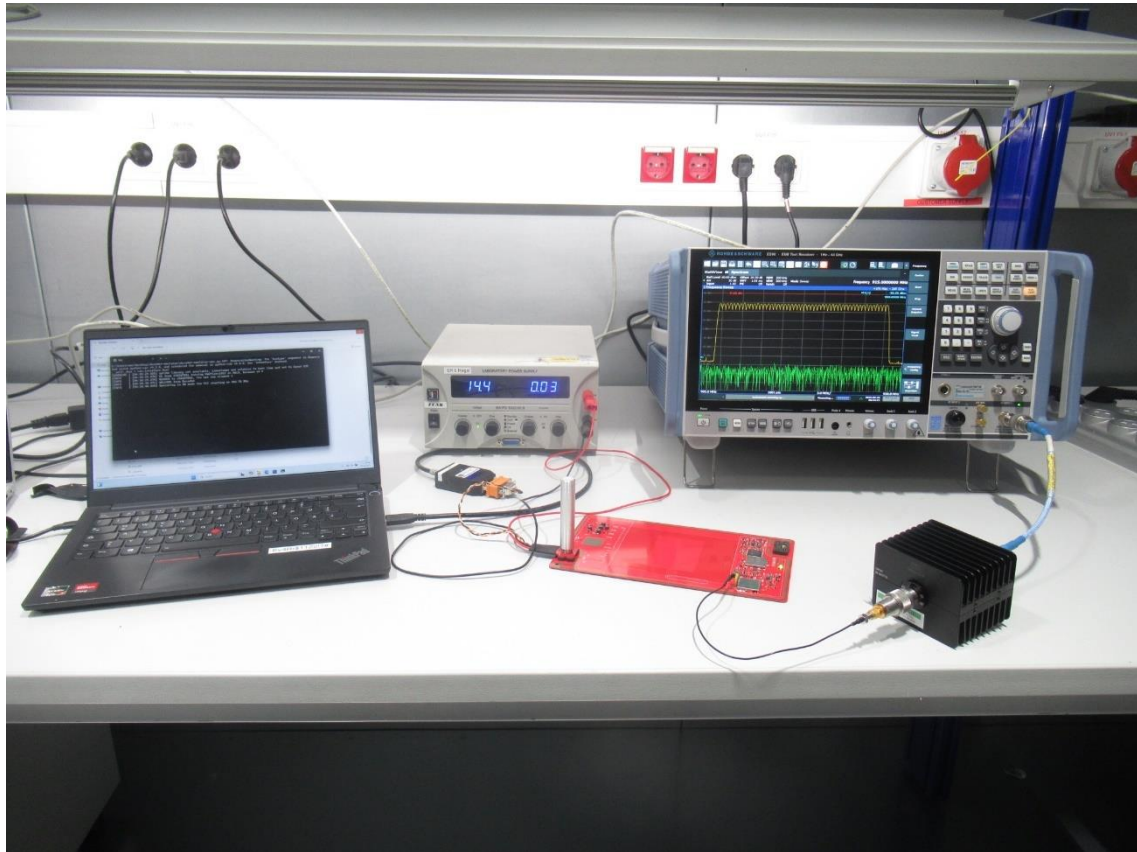
5.2 Emission bandwidth

For test instruments and accessories used see section 6 Part **MB**.

5.2.1 Description of the test location

Test location: Shielded Room SR6

5.2.2 Photo documentation of the test set-up



5.2.3 Applicable standard

According to FCC Part 15C, Section 15.247(a):
Frequency hopping systems shall have hopping carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

5.2.4 Description of Measurement

The method of measurement is used set out in ANSI C63.10, 7.8.6.

Analyser settings:

RBW: 2 kHz, VBW: 5 kHz, Sweep time: auto, Detector: Peak, Trace mode: Max hold

FCC ID: SZO-RR21
IC ID: 20465-RR21
5.2.5 Test result

Channel No.	-20 dB Bandwidth below peak (kHz)
1	166.6
25	167.6
50	166.8

There is no bandwidth limit according to FCC Part15C, Section 15.247(a).

Remarks: For detailed test results please see the following test protocols.

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

FCC ID: SZO-RR21

IC ID: 20465-RR21

5.2.6 Test protocols EBW

CH 1



CH 25



FCC ID: SZO-RR21

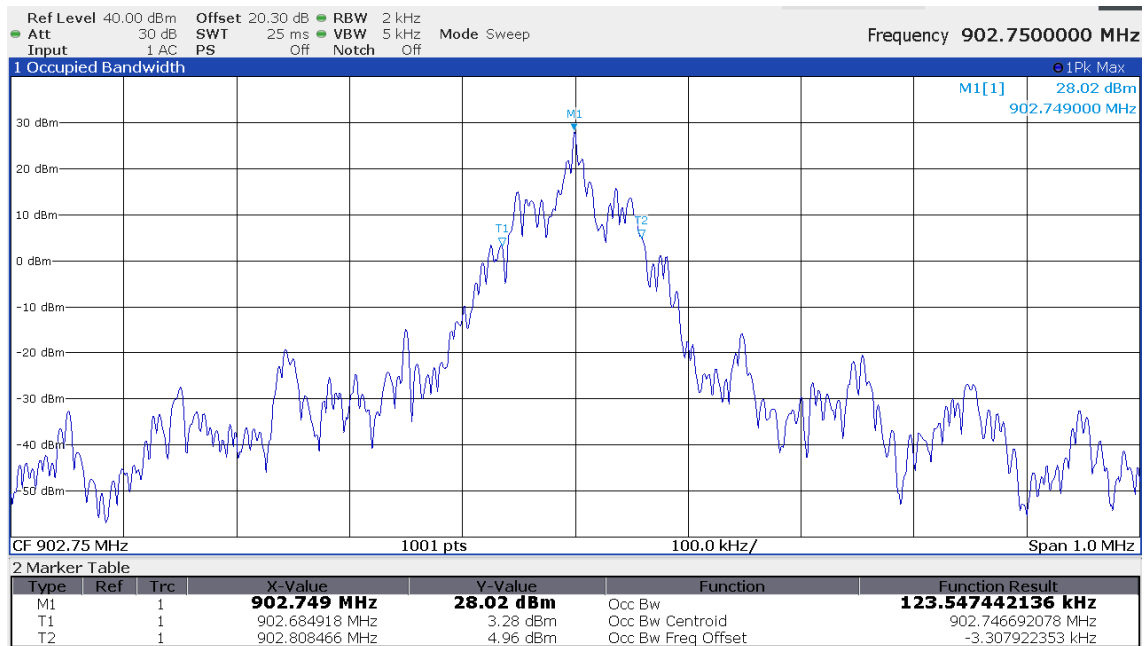
IC ID: 20465-RR21

CH 50



5.2.7 Test protocols OBW

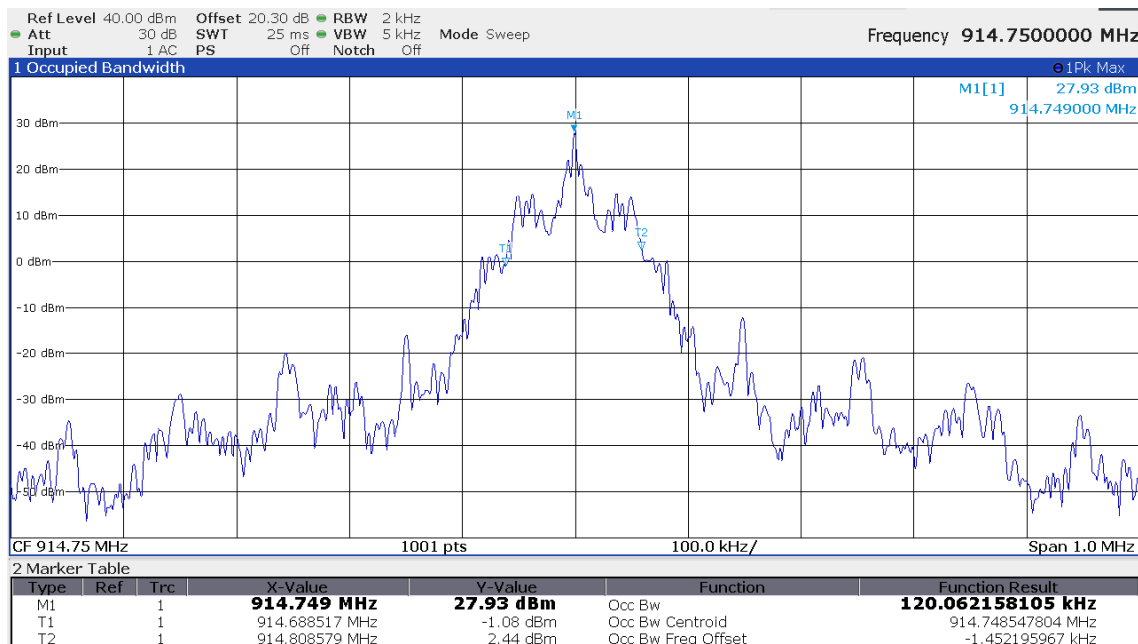
CH 1



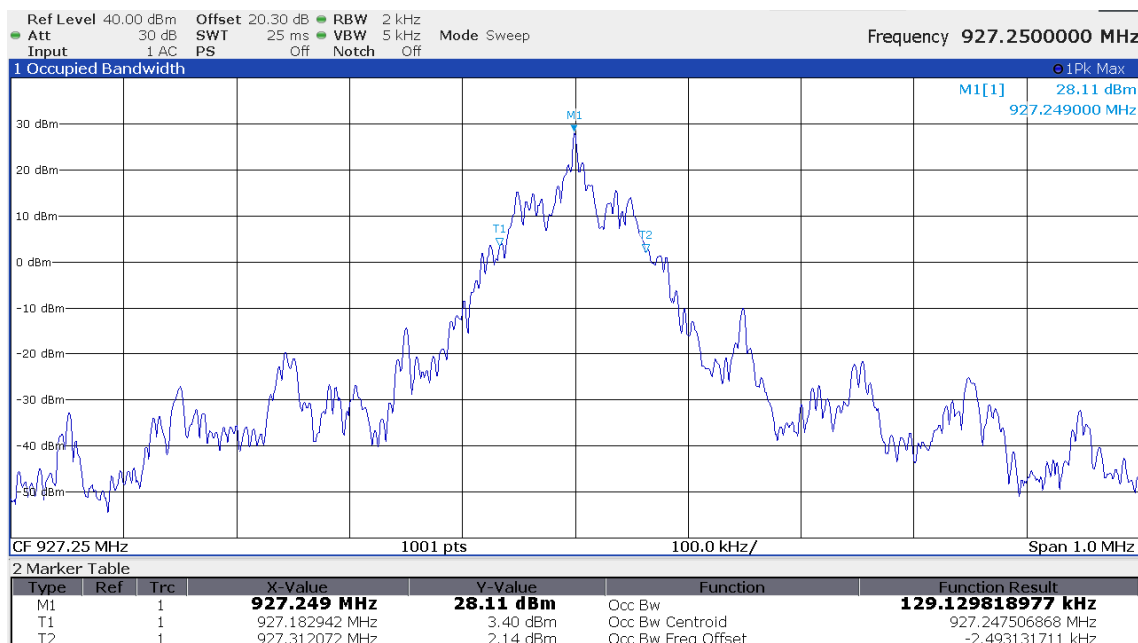
FCC ID: SZO-RR21

IC ID: 20465-RR21

CH 25



CH 50



FCC ID: SZO-RR21

IC ID: 20465-RR21

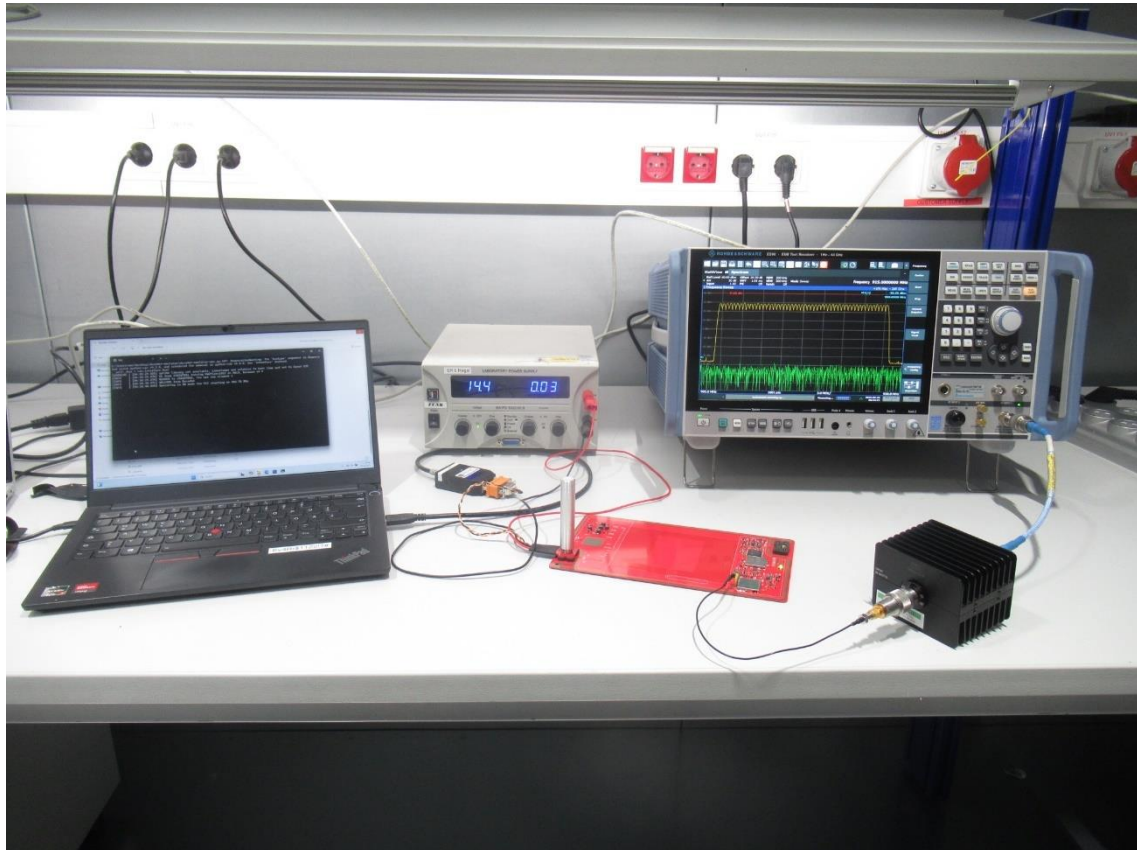
5.3 Maximum peak output power

For test instruments and accessories used see section 6 Part **CPC 2**.

5.3.1 Description of the test location

Test location: Shielded Room SR6

5.3.2 Photo documentation of the test set-up



5.3.3 Applicable standard

According to FCC Part 15C, Section 15.247(b)(1):

The maximum peak output power of an intentional radiator shall not exceed the limit defined in dependency of the channel separation and of the number of hopping channels.

According to AS/NZS 4268:2017, Appendix A, Table 1, Row 45

Maximum radiated power should be 4 W (36 dBm).

5.3.4 Description of Measurement

A spectrum analyser is connected to the output of the transmitter via a suitable attenuator while EUT is operating in transmit mode using the assigned frequency according to ANSI C63.10, 7.8.5. The correction factor takes the cable loss into account.

Analyser settings:

RBW: 100 kHz, VBW $\geq$ RBW, Detector: Max peak, Trace: Max hold, Sweep time: auto

FCC ID: SZO-RR21
IC ID: 20465-RR21
5.3.5 Test result

Conducted power

Channel	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Delta (dB)
1	902.75	29.3	30.0	-0.7
25	914.75	29.1	30.0	-0.9
50	927.25	29.1	30.0	-0.9

EIRP

Channel	Frequency (MHz)	Peak Power (dBm)	Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)
1	902.75	29.3	3.7	33.0	36.0	-3.0
25	914.75	29.1	3.7	32.8	36.0	-3.2
50	927.25	29.1	3.7	32.8	36.0	-3.2

Peak Power Limit according to FCC Part 15C, Section 15.247(b)(2):

Frequency (MHz)	Channel separation	Hop Channels	Peak power limit	
			(dBm)	(Watt)
902 -928	-	≥ 50	30	1

Peak Power Limit according to FCC Part 15C, Section 15.247(b)(4):

Frequency (MHz)	Channel separation	Hop Channels	Peak power limit	
			(dBm)	(Watt)
920 -928	-	≥ 50	36	4

The requirements are **FULFILLED**.

Remarks: None.

FCC ID: SZO-RR21

IC ID: 20465-RR21

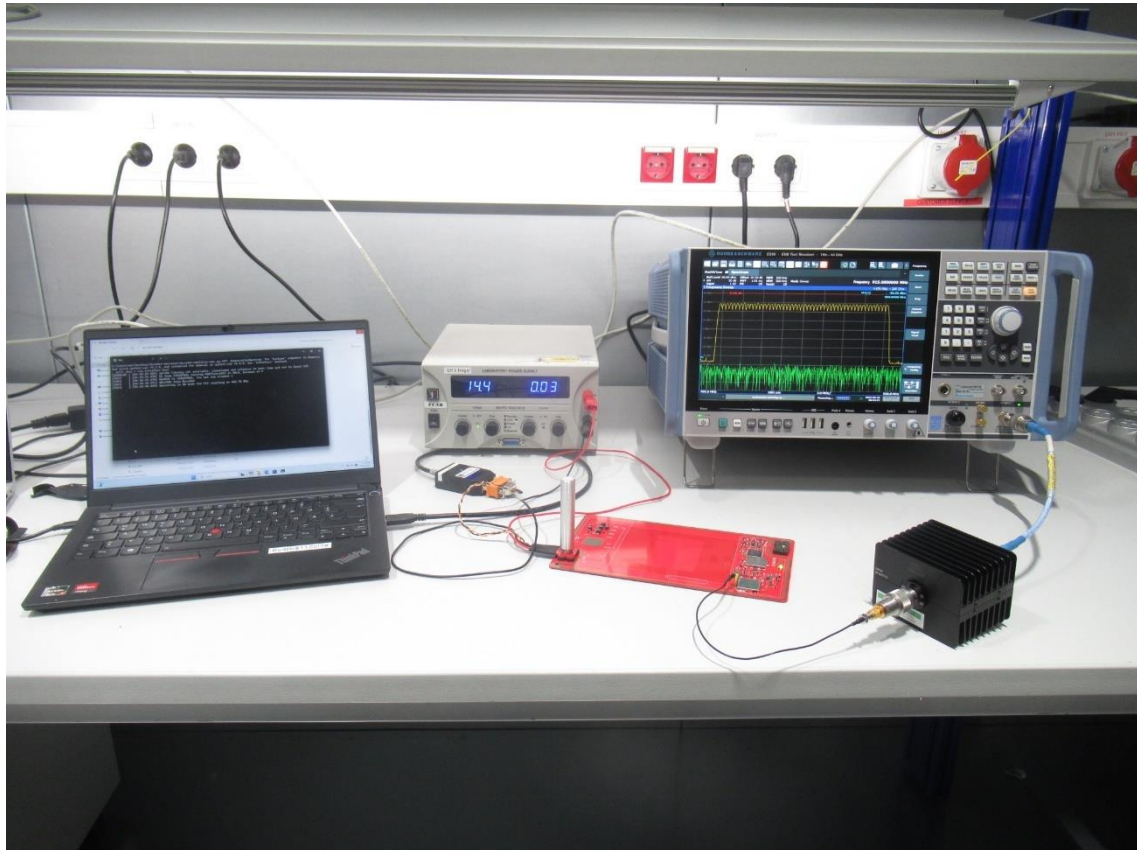
5.4 Spurious emissions conducted

For test instruments and accessories used see section 6 Part **SEC 1-3**.

5.4.1 Description of the test location

Test location: Shielded Room SR6

5.4.2 Photo documentation of the test set-up



5.4.3 Applicable standard

According to FCC Part 15C, Section 15.247(d):

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 § 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c)).

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

FCC ID: SZO-RR21**IC ID: 20465-RR21****5.4.4 Description of Measurement**

A spectrum analyser is connected to the output of the transmitter via a suitable attenuator while EUT is operating in transmit mode using the assigned frequency according to ANSI C63.10, 7.8.8.

Spectrum analyser settings:

RBW: 100 kHz, VBW: 300 kHz, Detector: Max peak, Trace: Max hold, Sweep: auto

5.4.5 Test result

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 § 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c)).

The requirements are **FULFILLED**.

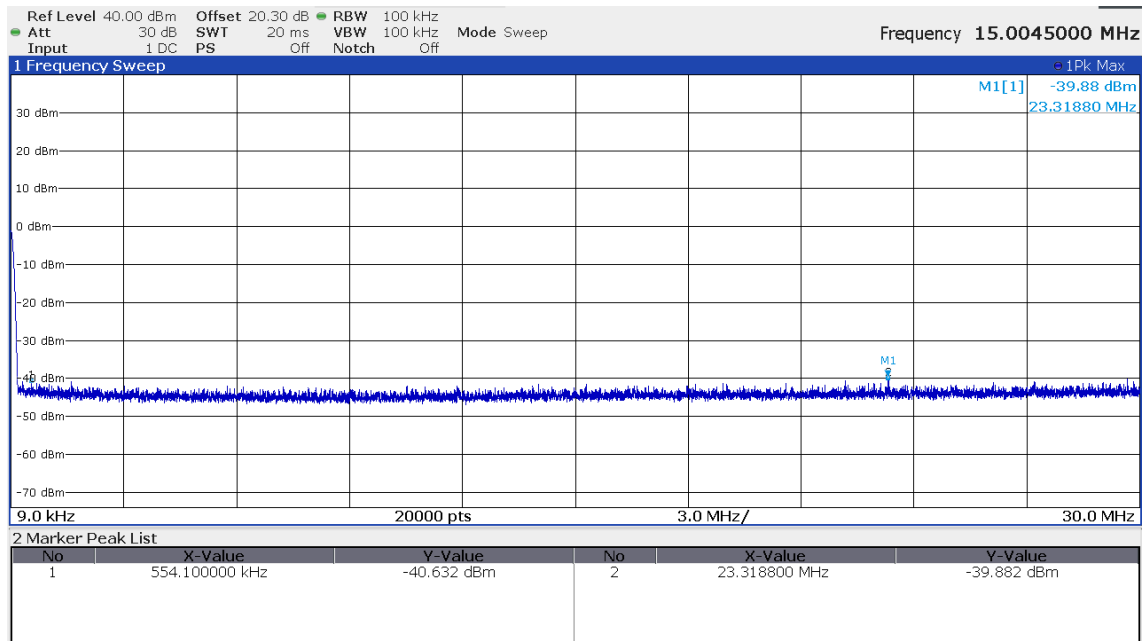
Remarks: For detailed test results please see the following test protocols.

FCC ID: SZO-RR21

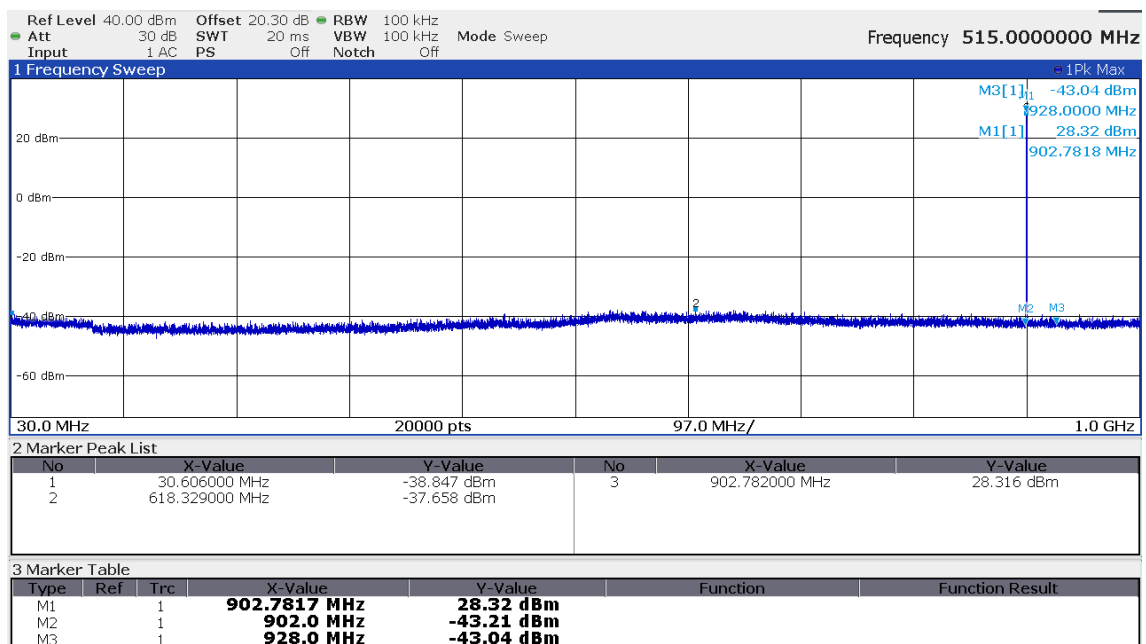
IC ID: 20465-RR21

5.4.6 Test protocol

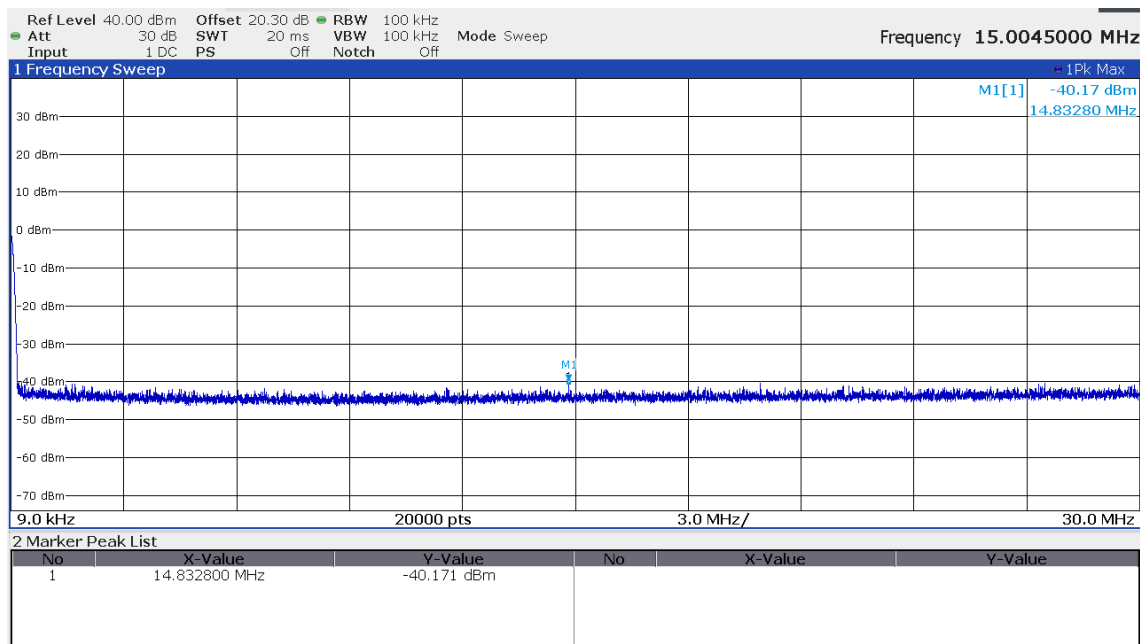
CH1, 9 kHz – 30 MHz



CH1, 30 MHz – 1000 MHz



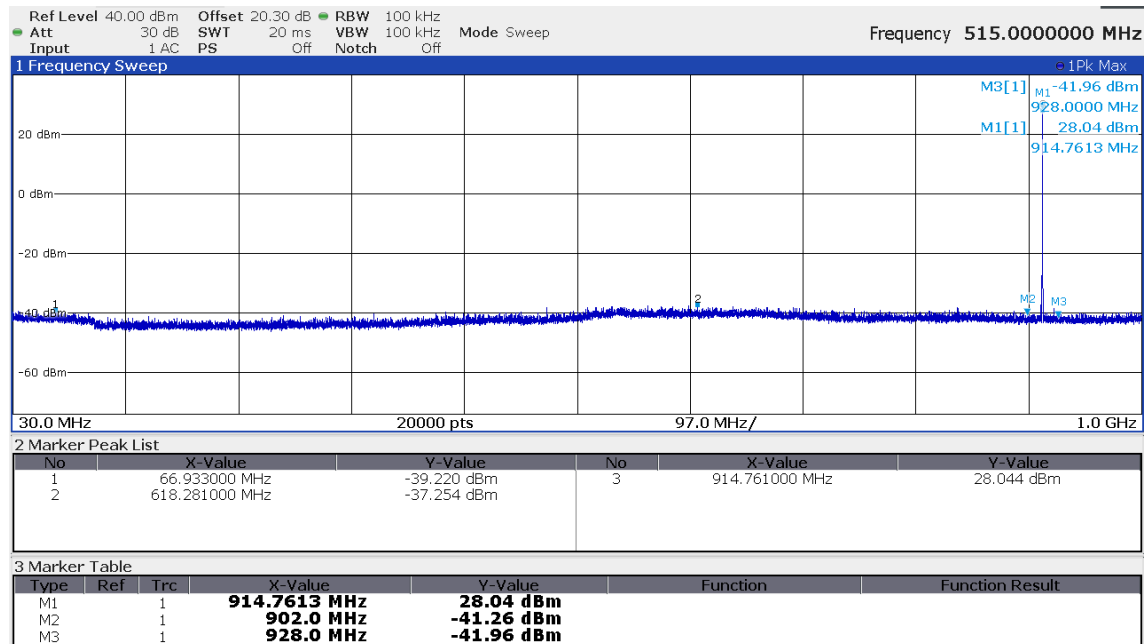
FCC ID: SZO-RR21
IC ID: 20465-RR21
CH1, 1 GHz – 10 GHz

CH25, 9 kHz – 30 MHz


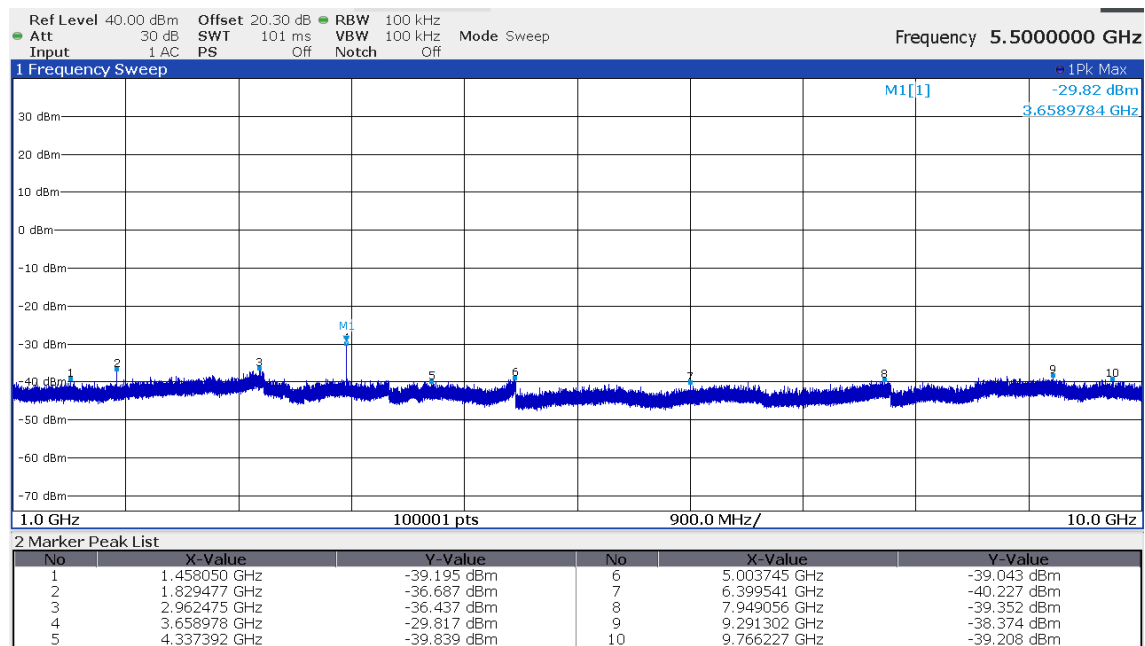
FCC ID: SZO-RR21

IC ID: 20465-RR21

CH25, 30 MHz – 1000 MHz



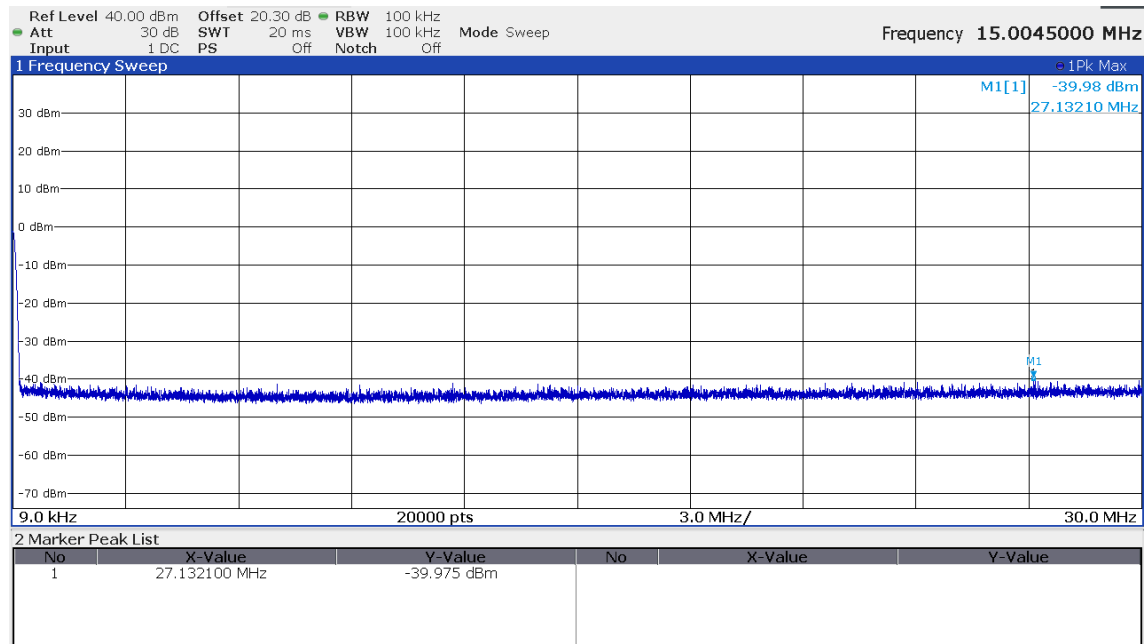
CH25, 1 GHz – 10 GHz



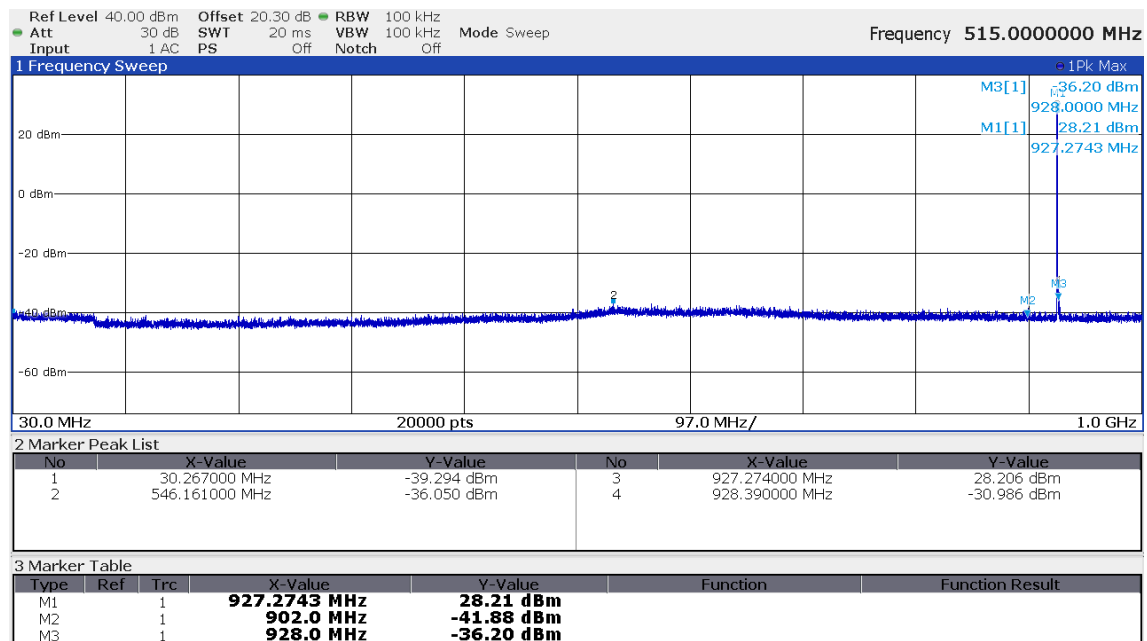
FCC ID: SZO-RR21

IC ID: 20465-RR21

CH50, 9 kHz – 30 MHz



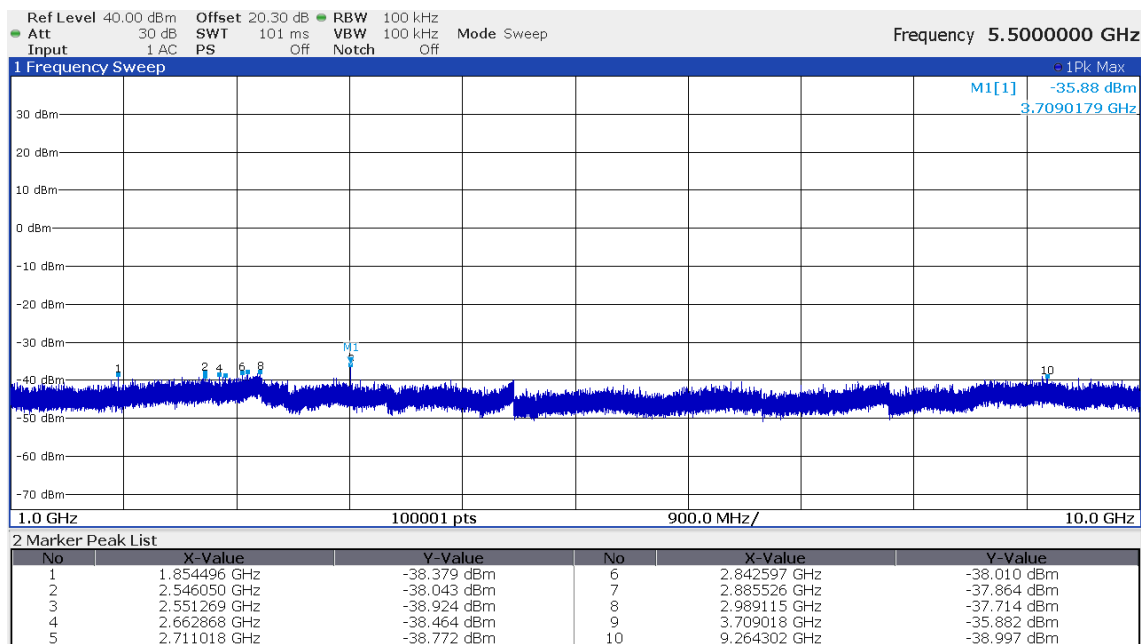
CH50, 30 MHz – 1000 MHz



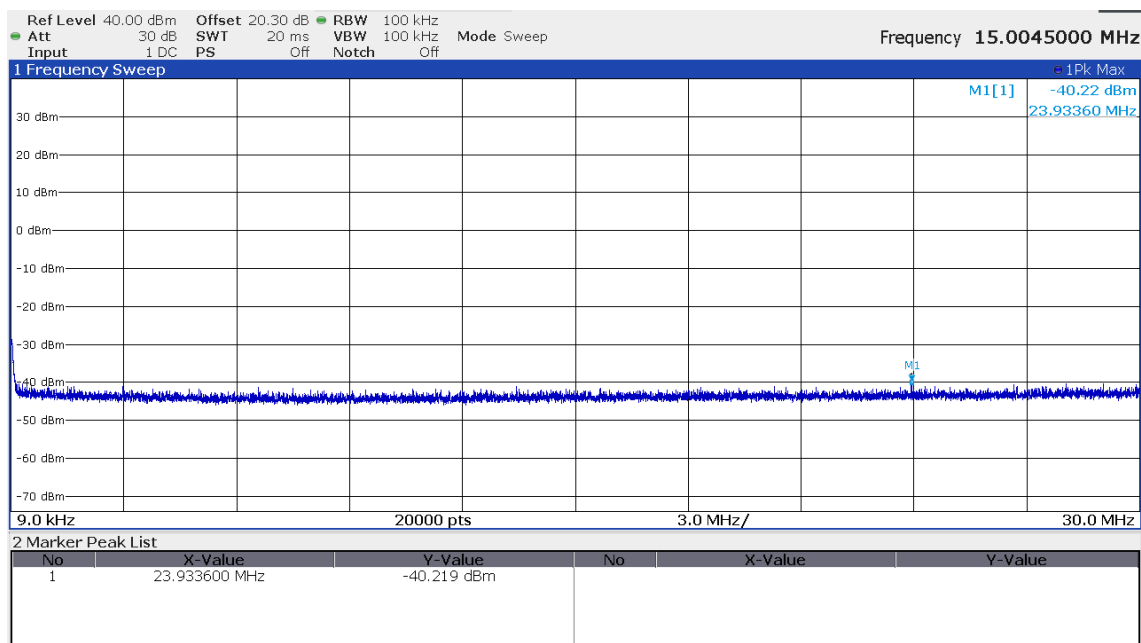
FCC ID: SZO-RR21

IC ID: 20465-RR21

CH50, 1 GHz – 10 GHz



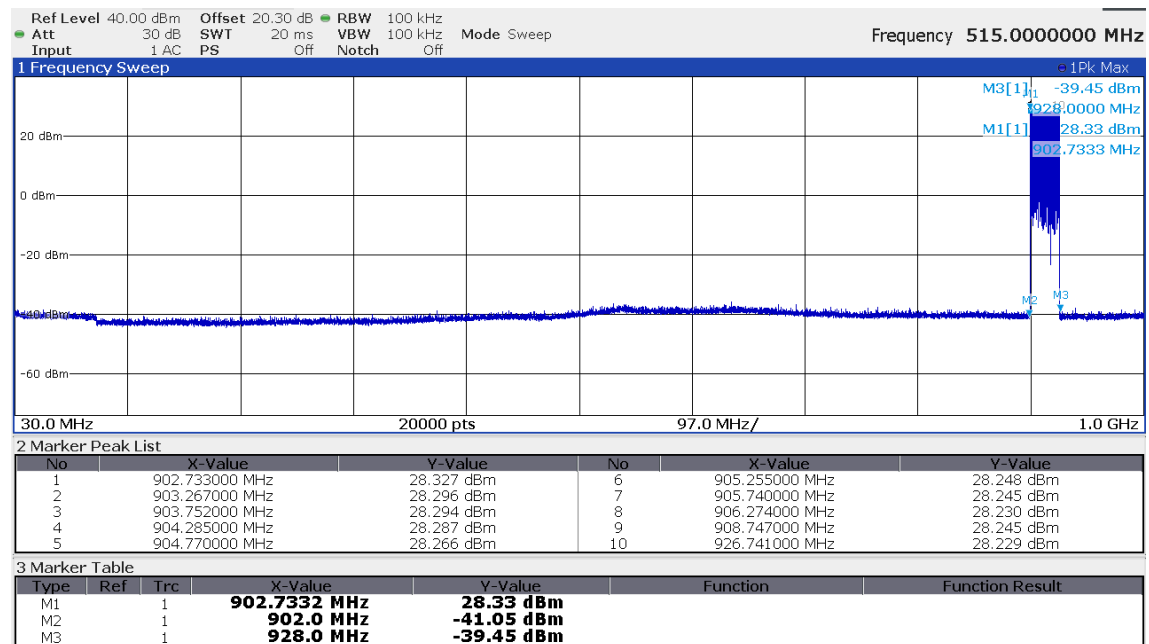
hopping, 9 kHz – 30 MHz



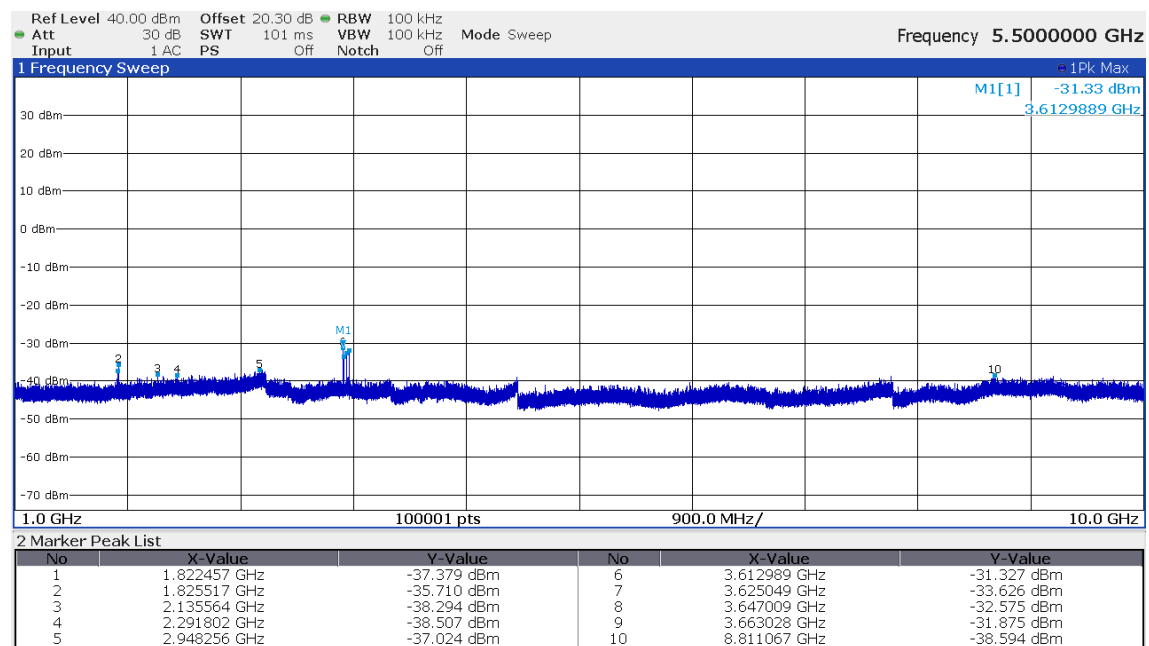
FCC ID: SZO-RR21

IC ID: 20465-RR21

hopping, 30 MHz – 1000 MHz



hopping, 1 GHz – 10 GHz



FCC ID: SZO-RR21

IC ID: 20465-RR21

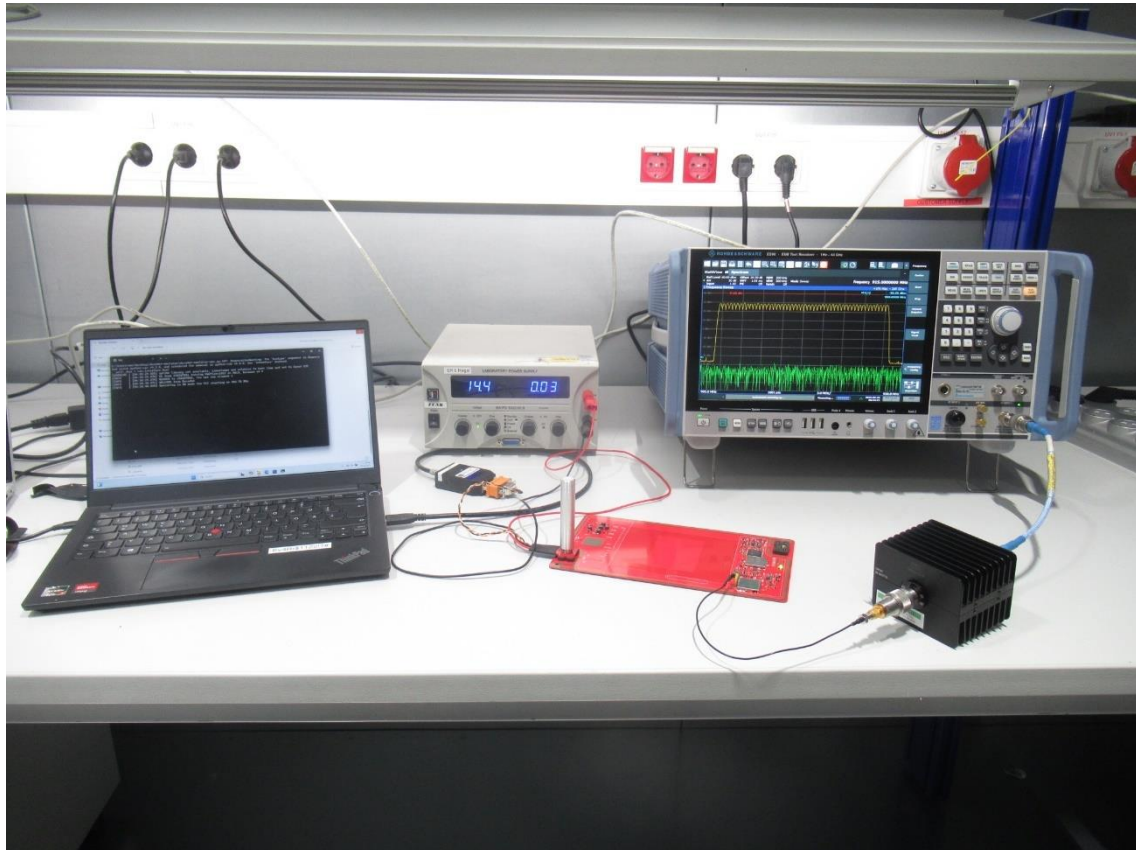
5.5 Band edge compliance

For test instruments and accessories used see section 6 Part **SEC 1-3**.

5.5.1 Description of the test location

Test location: Shielded Room SR6

5.5.2 Photo documentation of the test set-up



5.5.3 Applicable standard

According to FCC Part 15C, Section 15.247(d):

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 § 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c)).

According to ANSI C63.10, 7.8.6:

For band-edge measurements, use the band-edge procedure in 6.10. Band-edge measurements shall be tested both on single channels, and with the EUT hopping.

FCC ID: SZO-RR21

IC ID: 20465-RR21

5.5.4 Description of Measurement

A spectrum analyser is connected to the output of the transmitter via a suitable attenuator while EUT was operating in transmit mode at the assigned frequency according ANSI C63.10, 6.10.

Spectrum analyser settings:

RBW: 100 kHz, VBW: 300 kHz, Detector: Max peak, Trace: Max hold, Sweep: auto

5.5.5 Test result

Peak-Limit according to FCC Part 15C, Section 15.247(d):

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 § 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c)).

The requirements are **FULFILLED**.

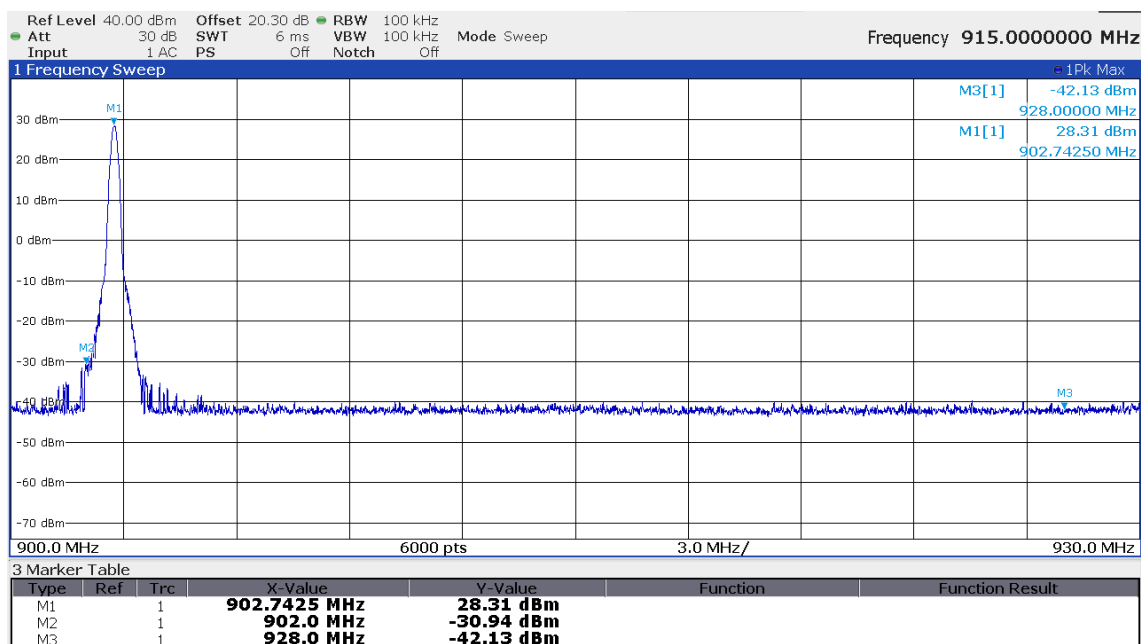
Remarks: For detailed test results please see the following test protocols.

FCC ID: SZO-RR21

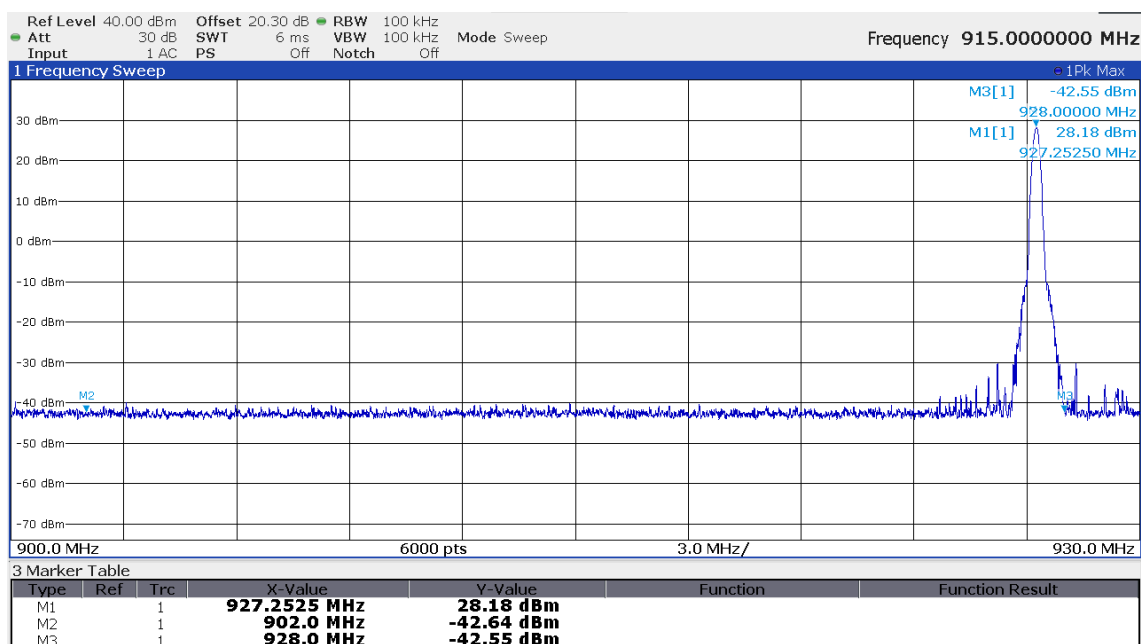
IC ID: 20465-RR21

5.5.6 Test protocol

CH 1



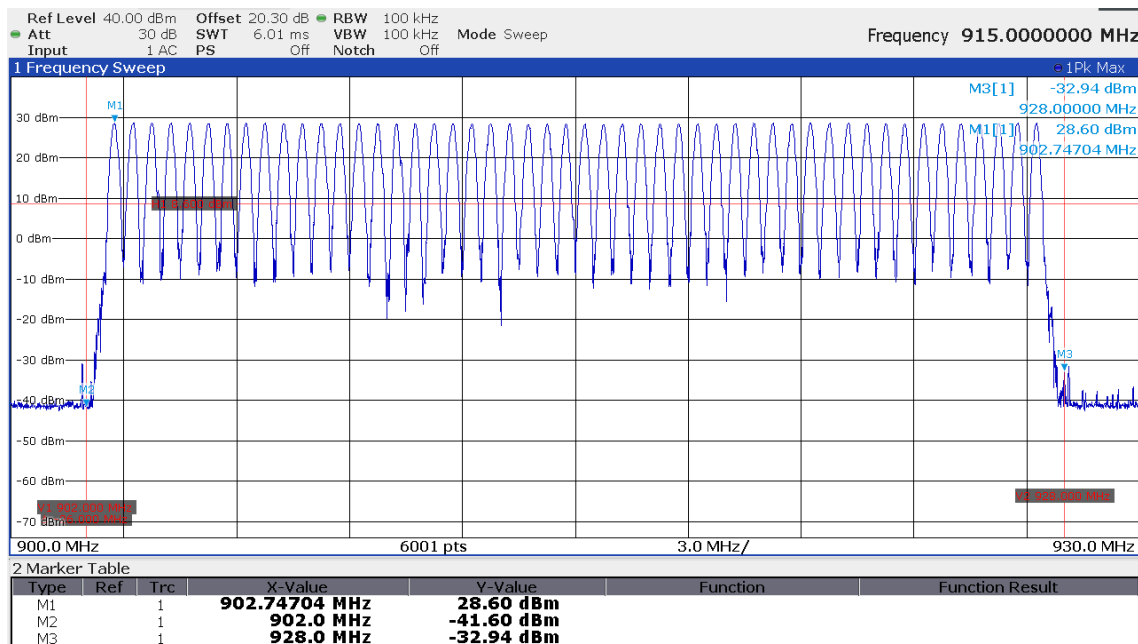
CH 50



FCC ID: SZO-RR21

IC ID: 20465-RR21

Hopping mode



The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

FCC ID: SZO-RR21

IC ID: 20465-RR21

5.6 Spurious emissions radiated

For test instruments and accessories used see section 6 Part **SER 1, SER 2, SER 3.**

5.6.1 Description of the test location

Test location: Semi-anechoic chamber SAC2 / Fully anechoic room FAR1
Test distance: 3 m

5.6.2 Photo documentation of the test set-up

Test setup 9 kHz – 30 MHz



The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

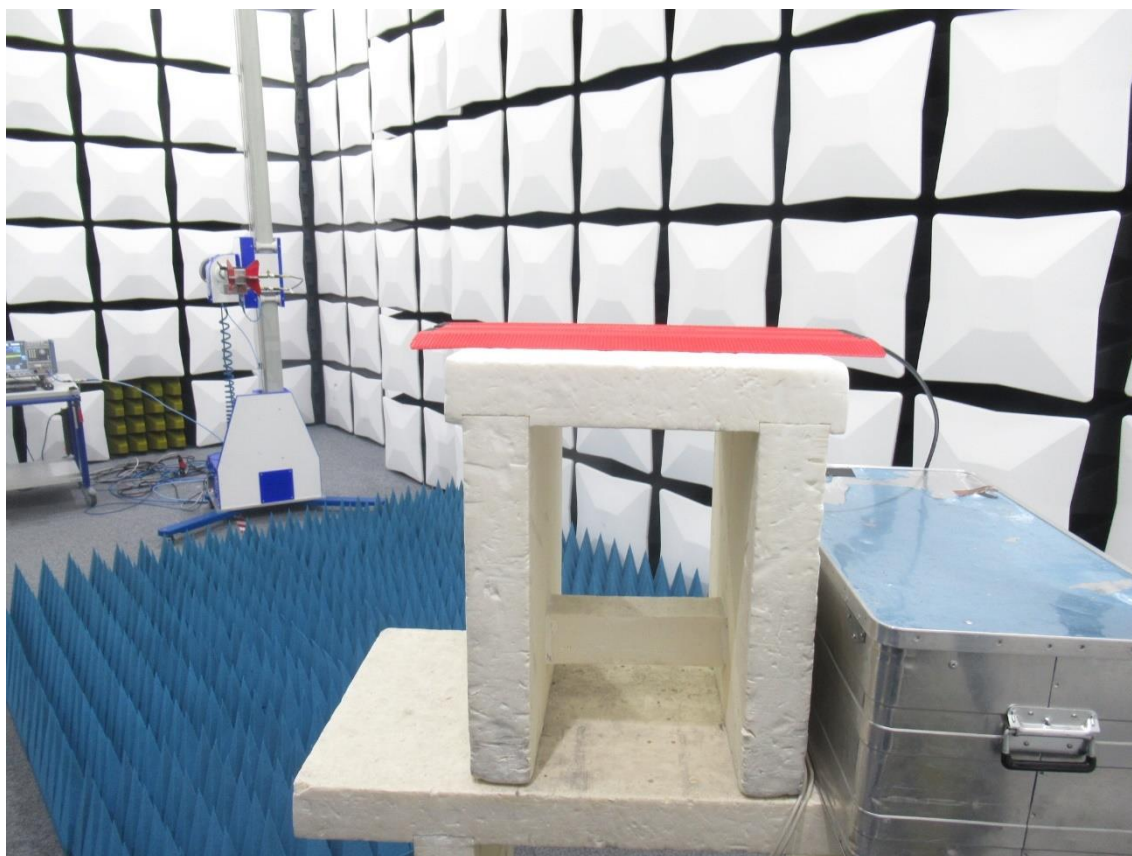
FCC ID: SZO-RR21

IC ID: 20465-RR21

Test setup 30 MHz – 1000 MHz



Test setup 1 – 10 GHz



The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

FCC ID: SZO-RR21**IC ID: 20465-RR21****5.6.3 Applicable standard**

According to FCC Part 15, Section 15.205(a):

In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limit specified in Section 15.209(a).

5.6.4 Description of Measurement

The restricted bands are measured radiated. The span of the spectrum analyser was set wide enough to capture the restricted band and measure the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products which fall outside of the authorized band of operation.

Receiver settings:

$f < 1 \text{ MHz}$:	RBW: 120 kHz	Meas. Time: 100 ms	Detector function: Quasi-Peak
$f > 1 \text{ MHz}$:	RBW: 1 MHz	Meas. Time: 100 ms	Detector function: Peak

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

FCC ID: SZO-RR21
IC ID: 20465-RR21
5.6.5 Test result
 $f < 1000 \text{ MHz}$

f (MHz)	Level AV@3m (dB μ V)	Ant. factor (dB/m)	Field strength AV@3m dB(μ V/m)	Distance corr. 3m to 30m / 300m (dB)	Corrected level AV@30m dB(μ V/m)	Limit AV@30m dB(μ V/m)	Delta (dB)
0.2918	-9.9	20.0	11.1	-80.0	-68.9	18.3	-87.2
5.0	-25.4	20.0	-5.4	-40.0	-45.4	29.5	-74.9
10.0	-24.3	20.0	-4.3	-40.0	-44.3	29.5	-73.8
15.0	-25.3	20.0	-5.3	-40.0	-45.3	29.5	-74.8
20.0	-25.6	20.0	-5.6	-40.0	-45.6	29.5	-75.1
25.0	-23.9	20.0	-3.9	-40.0	-43.9	29.5	-73.4

f (MHz)	Level AV@3m (dB μ V)	Ant. factor (dB/m)	Field strength AV@3m dB(μ A/m)	Distance corr. 3m to 30m / 300m (dB)	Corrected level AV@30m dB(μ A/m)	Limit AV@30m dB(μ A/m)	Delta (dB)
0.2918	-9.9	20.0	-40.4	-80.0	-120.4	-33.2	-87.2
5.0	-25.4	20.0	-56.9	-40.0	-96.9	-21.9	-75.0
10.0	-24.3	20.0	-55.8	-40.0	-95.8	-21.9	-73.9
15.0	-25.3	20.0	-56.8	-40.0	-96.8	-21.9	-74.9
20.0	-25.6	20.0	-57.1	-40.0	-97.1	-21.9	-75.2
25.0	-23.9	20.0	-55.4	-40.0	-95.4	-21.9	-73.5

Note: Only noise values recorded in the frequency range $< 30 \text{ MHz}$.

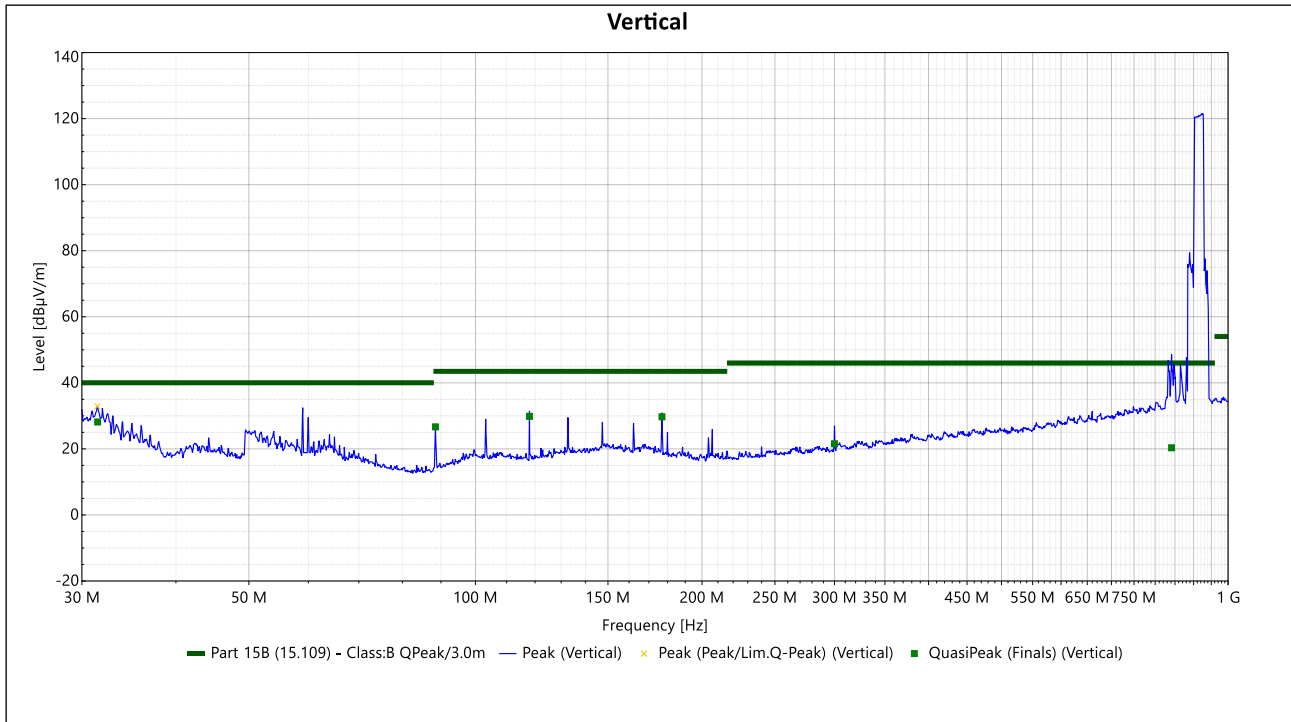
The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

FCC ID: SZO-RR21

IC ID: 20465-RR21

Vertical

Frequency (Hz)	QuasiPeak (dBµV/m)	QP Margin	QP Limit (dBµV/m)	angle	height	polarization	RBW (Hz)	Correction (dB)
31.48 M	28.15	-11.85	40	24	1	Vertical	120000	15.26
88.494 M	26.67	-16.83	43.5	28	1.28	Vertical	120000	13
117.977 M	29.86	-13.64	43.5	54	1	Vertical	120000	16.65
176.966 M	29.7	-13.8	43.5	69	1	Vertical	120000	18.52
299.951 M	21.55	-24.45	46	39	1.59	Vertical	120000	19.63
841.277 M	20.33	-25.67	46	144	3.62	Vertical	120000	30.06



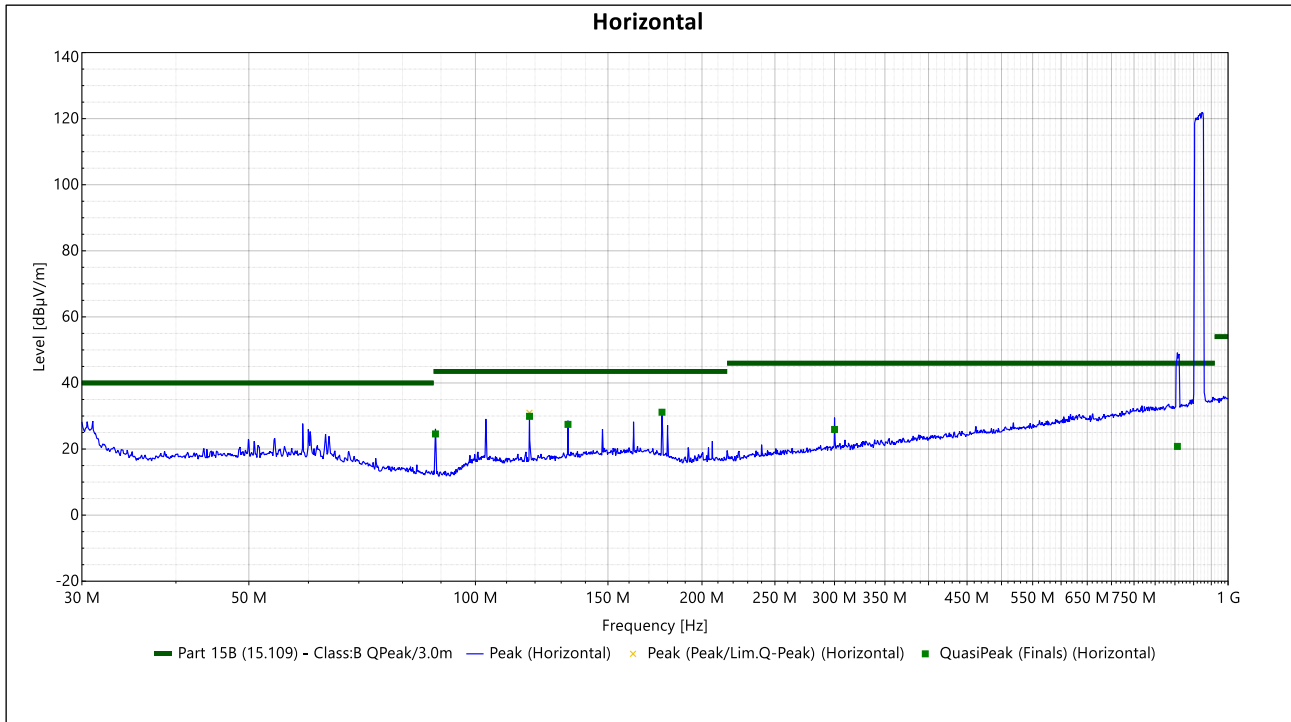
The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

FCC ID: SZO-RR21

IC ID: 20465-RR21

Horizontal

Frequency (Hz)	QuasiPeak (dBμV/m)	QP Margin	QP Limit (dBμV/m)	angle	height	polarization	RBW (Hz)	Correction (dB)
88.489 M	24.58	-18.92	43.5	0	1.99	Horizontal	120000	12.4
117.998 M	29.91	-13.59	43.5	341	2.72	Horizontal	120000	16.58
132.736 M	27.47	-16.03	43.5	352	3.21	Horizontal	120000	17.82
176.959 M	31.15	-12.35	43.5	171	1.79	Horizontal	120000	17.88
300.03 M	25.93	-20.07	46	0	1.18	Horizontal	120000	20.16
856.415 M	20.8	-25.2	46	278	1.59	Horizontal	120000	30.66



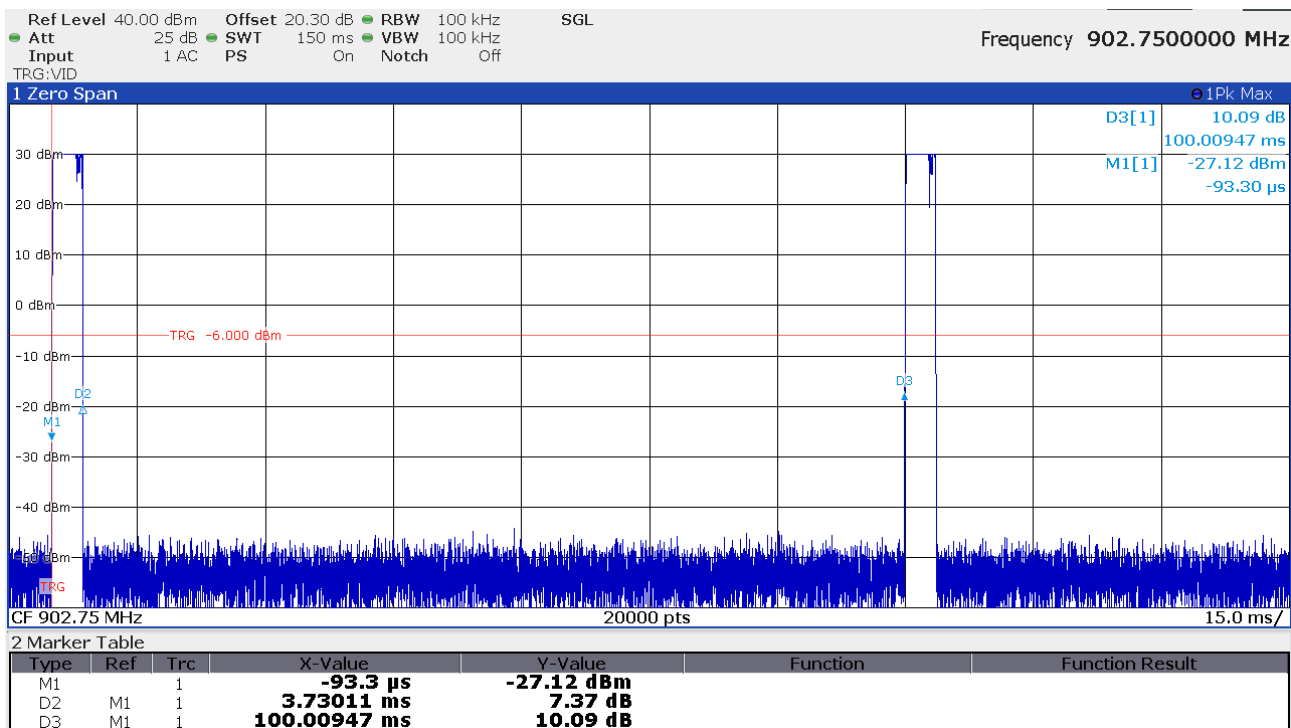
The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

FCC ID: SZO-RR21

IC ID: 20465-RR21

f > 1000 MHz

Duty cycle consideration:



The duty cycle is independent of the used channel:

$$\Delta = 3.73 \text{ ms} / 100 \text{ ms} = 3.73 \%$$

According to ANSI C63.10 section 7.5, the average value of pulsed emissions can be corrected with a correction factor of δ (dB) = $20\log(\Delta)$.

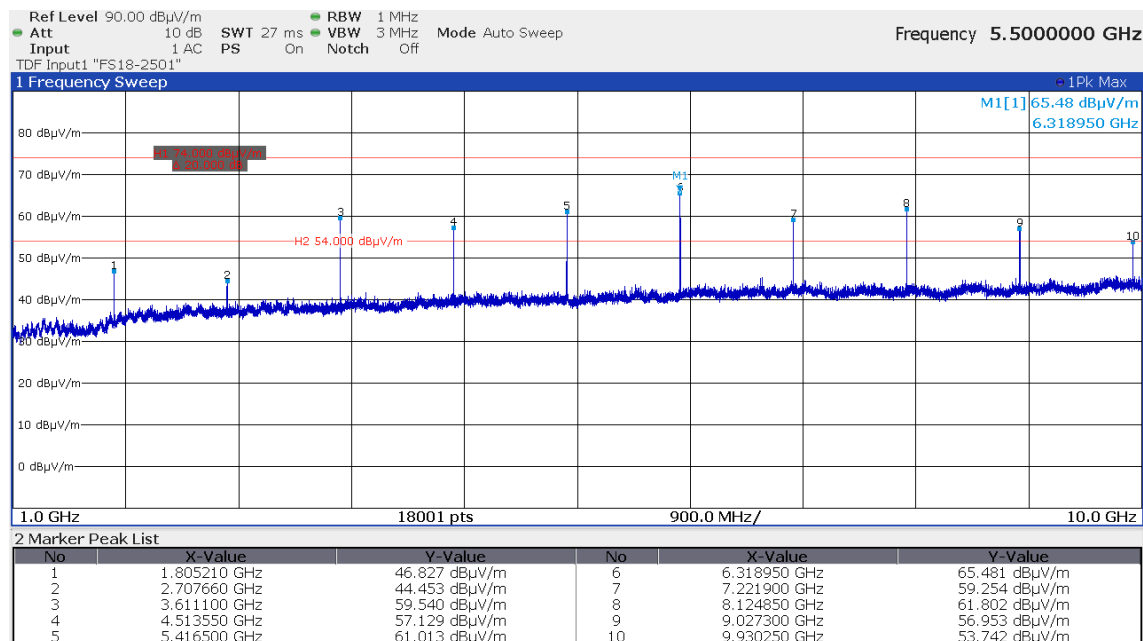
$$\delta = 20\log(0.0373) = -28.6 \text{ dB}$$

This correction factor is applied to the peak measurements for 1 GHz to 10 GHz.

FCC ID: SZO-RR21

IC ID: 20465-RR21

ch1, horizontal



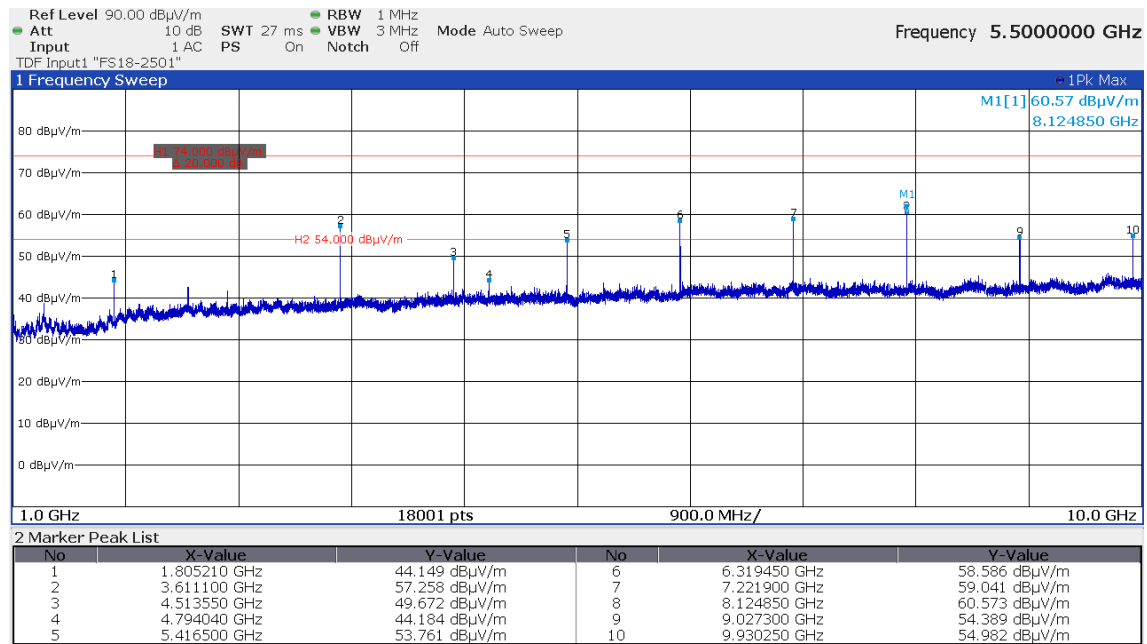
MP	Peak value (dBμV/m)	δ (dB)	AV value (dBμV/m)	AV limit (dBμV/m)	result
3	59.5	-28.6	30.9	54.0	passed
4	57.1	-28.6	28.5	54.0	passed
5	61.0	-28.6	32.4	54.0	passed
6	65.5	-28.6	36.9	54.0	passed
7	59.3	-28.6	30.7	54.0	passed
8	61.8	-28.6	21.8	54.0	passed
9	57.0	-28.6	28.4	54.0	passed

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

FCC ID: SZO-RR21

IC ID: 20465-RR21

ch1, vertical

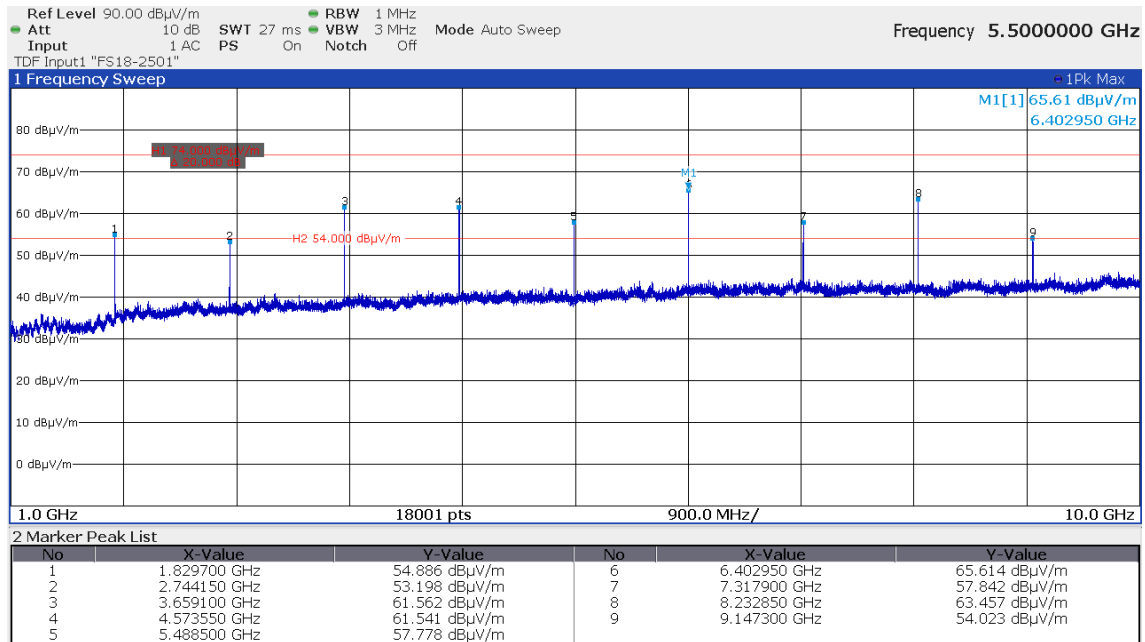


MP	Peak value (dBμV/m)	δ (dB)	AV value (dBμV/m)	AV limit (dBμV/m)	result
2	57.3	-28.6	28.7	54.0	passed
6	58.6	-28.6	30.0	54.0	passed
7	59.0	-28.6	30.4	54.0	passed
8	60.6	-28.6	32.0	54.0	passed
9	54.4	-28.6	25.8	54.0	passed
10	55.0	-28.6	26.6	54.0	passed

FCC ID: SZO-RR21

IC ID: 20465-RR21

ch25, horizontal

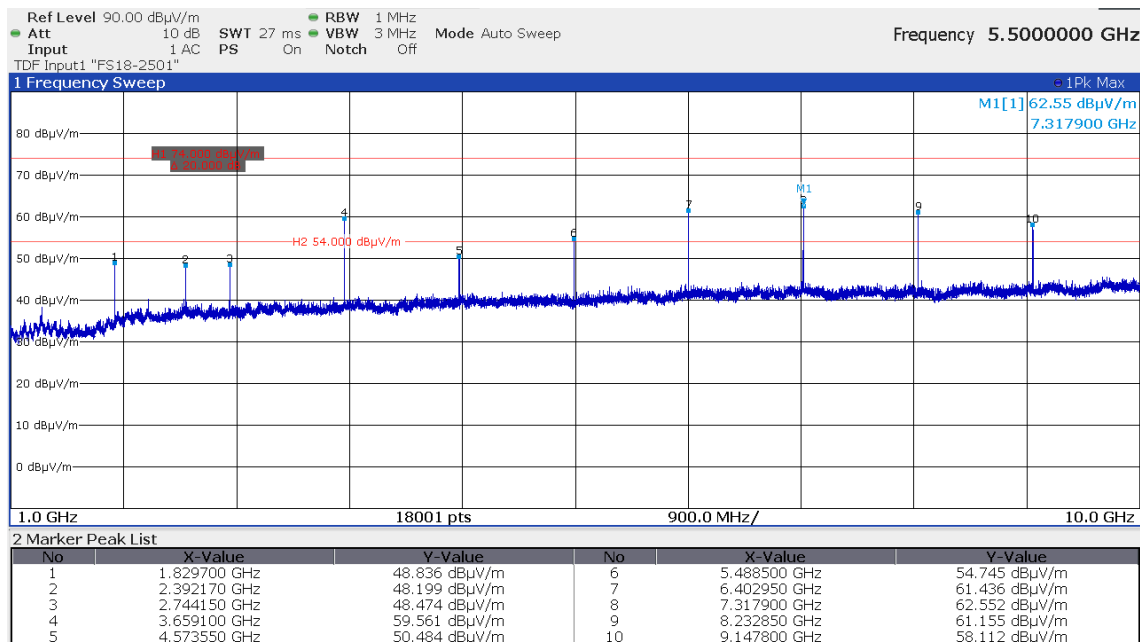


MP	Peak value (dBμV/m)	δ (dB)	AV value (dBμV/m)	AV limit (dBμV/m)	result
1	54.9	-28.6	26.3	54.0	passed
3	61.6	-28.6	33.0	54.0	passed
4	61.5	-28.6	32.9	54.0	passed
5	57.8	-28.6	29.2	54.0	passed
6	65.6	-28.6	37.0	54.0	passed
7	57.8	-28.6	29.2	54.0	passed
8	63.5	-28.6	34.9	54.0	passed
9	54.0	-28.6	25.4	54.0	passed

FCC ID: SZO-RR21

IC ID: 20465-RR21

ch25, vertical



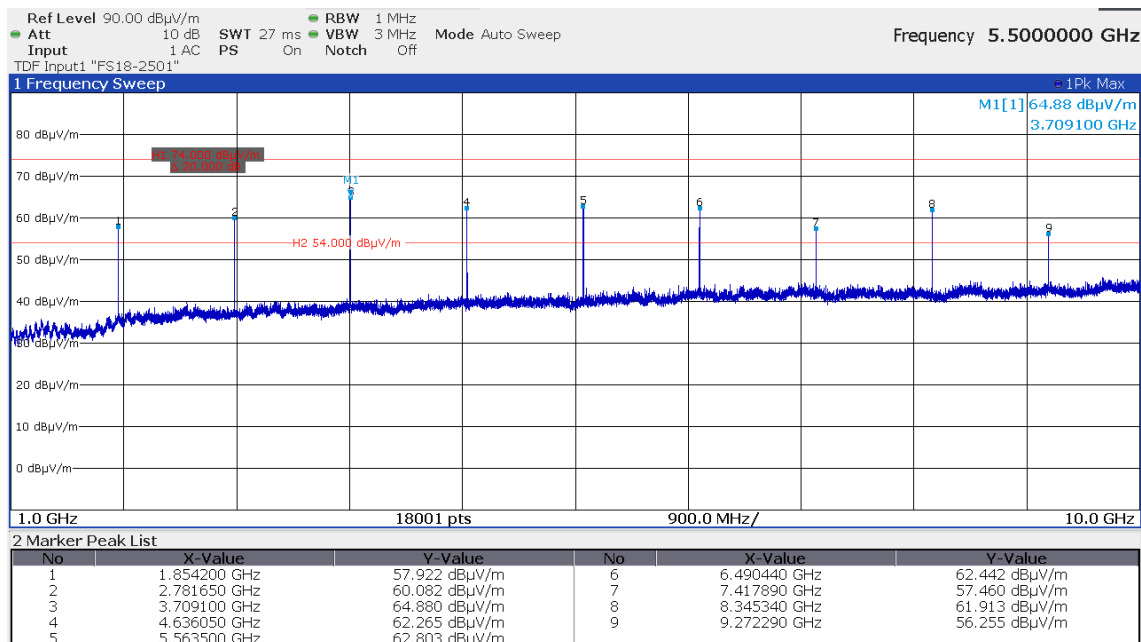
MP	Peak value (dBμV/m)	δ (dB)	AV value (dBμV/m)	AV limit (dBμV/m)	result
4	59.6	-28.6	31.0	54.0	passed
6	54.7	-28.6	26.1	54.0	passed
7	61.4	-28.6	32.8	54.0	passed
8	62.6	-28.6	34.0	54.0	passed
9	61.2	-28.6	32.6	54.0	passed
10	58.1	-28.6	29.5	54.0	passed

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

FCC ID: SZO-RR21

IC ID: 20465-RR21

ch50, horizontal



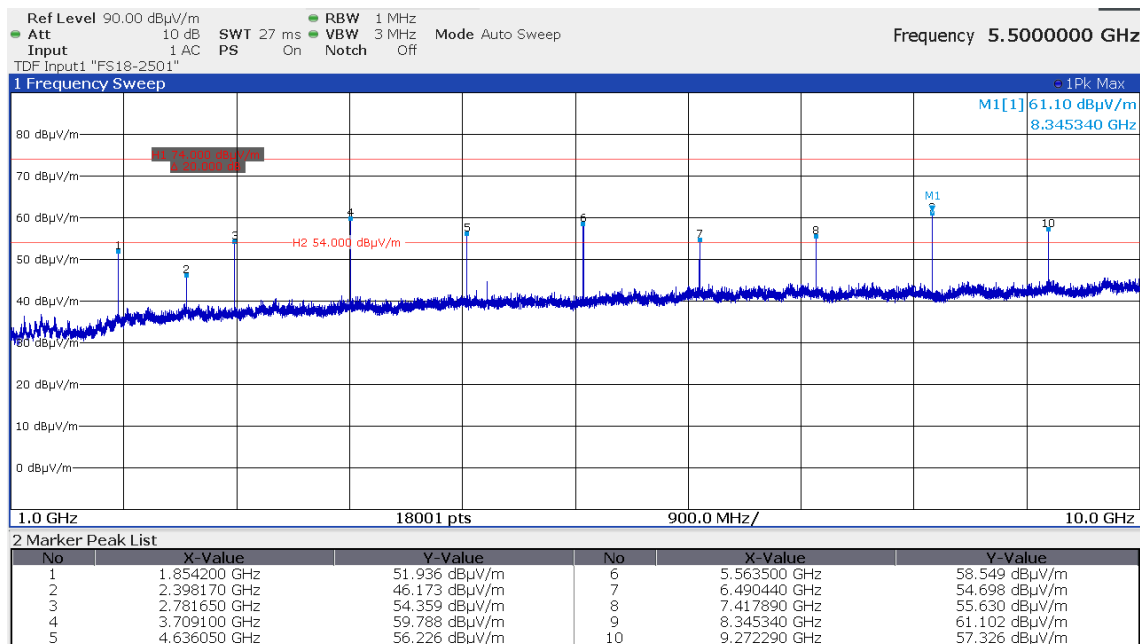
MP	Peak value (dBμV/m)	δ (dB)	AV value (dBμV/m)	AV limit (dBμV/m)	result
1	57.9	-28.6	29.3	54.0	passed
2	60.1	-28.6	31.5	54.0	passed
3	64.9	-28.6	36.3	54.0	passed
4	62.3	-28.6	33.7	54.0	passed
5	62.8	-28.6	34.2	54.0	passed
6	62.4	-28.6	33.8	54.0	passed
7	57.5	-28.6	28.9	54.0	passed
8	61.9	-28.6	33.3	54.0	passed
9	56.3	-28.6	27.7	54.0	passed

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

FCC ID: SZO-RR21

IC ID: 20465-RR21

ch50, vertical



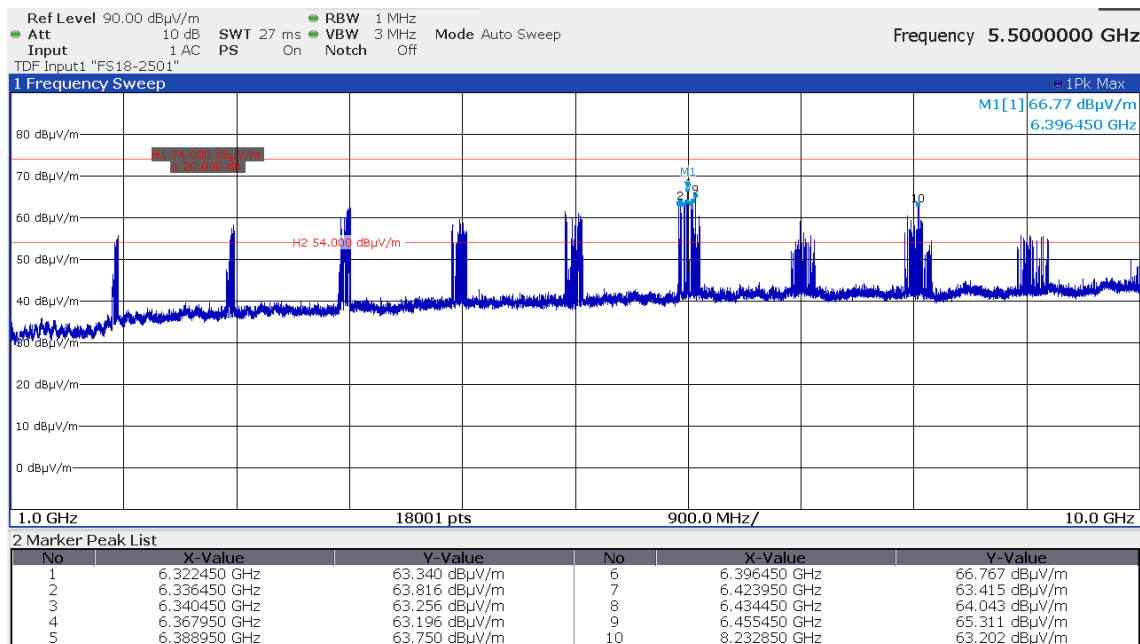
MP	Peak value (dBμV/m)	δ (dB)	AV value (dBμV/m)	AV limit (dBμV/m)	result
3	54.4	-28.6	25.8	54.0	passed
4	59.8	-28.6	31.2	54.0	passed
5	56.2	-28.6	27.6	54.0	passed
6	58.5	-28.6	29.9	54.0	passed
7	54.7	-28.6	26.1	54.0	passed
8	55.6	-28.6	27.0	54.0	passed
9	61.1	-28.6	32.5	54.0	passed
10	57.3	-28.6	28.7	54.0	passed

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

FCC ID: SZO-RR21

IC ID: 20465-RR21

hopping mode, horizontal



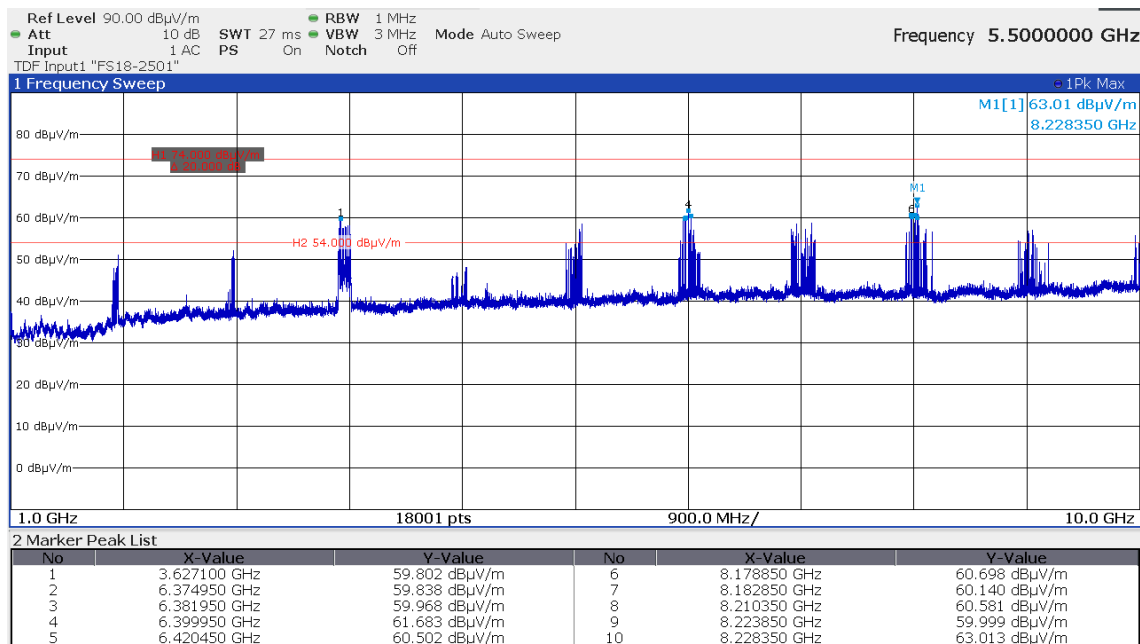
Only the highest measurement point M1 is regarded. All other peak values are below M1 and fulfill the requirement.

MP	Peak value (dBμV/m)	δ (dB)	AV value (dBμV/m)	AV limit (dBμV/m)	result
M1	66.8	-28.6	38.2	54.0	passed

FCC ID: SZO-RR21

IC ID: 20465-RR21

hopping mode, vertical



Only the highest measurement point M1 is regarded. All other peak values are below M1 and fulfill the requirement.

MP	Peak value (dBμV/m)	δ (dB)	AV value (dBμV/m)	AV limit (dBμV/m)	result
M1	63.0	-28.6	34.4	54.0	passed

FCC ID: SZO-RR21
IC ID: 20465-RR21

Radiated limits according to FCC Part 15 Section 15.209(a) for spurious emissions which fall in restricted bands:

Frequency (MHz)	Field strength of spurious emissions		Measurement distance (metres)
	($\mu\text{V/m}$)	dB($\mu\text{V/m}$)	
0.009-0.490	2400/F (kHz)		300
0.490-1.705	24000/F (kHz)		30
1.705-30	30	29.5	30
30-88	100	40	3
88-216	150	43.5	3
216-960	200	46	3
Above 960	500	54	3

Restricted bands of operation:

The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209

MHz	MHz	MHz	GHz
0.090 – 0.110	16.42 – 16.423	399.9 – 410	4.5 – 5.15
0.495 – 0.505	16.69475 – 16.69525	608 – 614	5.35 – 5.46
2.1735 – 2.1905	16.80425 – 16.80475	960 – 1240	7.25 – 7.75
4.125 – 4.128	25.5 – 25.67	1300 – 1427	8.025 – 8.5
4.17725 – 4.17775	37.5 – 38.25	1435 – 1626.5	9.0 – 9.2
4.20725 – 4.20775	73 – 74.6	1645.5 – 1646.5	9.3 – 9.5
6.215 – 6.218	74.8 – 75.2	1660 – 1710	10.6 – 12.7
6.26775 – 6.26825	108 – 121.94	1718.8 – 1722.2	13.25 – 13.4
6.31175 – 6.31225	123 – 138	2200 – 2300	14.47 – 14.5
8.291 – 8.294	149.9 – 150.05	2310 – 2390	15.35 – 16.2
8.362 – 8.366	156.52475 – 156.52525	2483.5 – 2500	17.7 – 21.4
8.37625 – 8.38675	156.7 – 156.9	2690 – 2900	22.01 – 23.12
8.41425 – 8.41475	162.0125 – 167.17	3260 – 3267	23.6 – 24.0
12.29 – 12.293	167.72 – 173.2	3332 – 3339	31.2 – 31.8
12.51975 – 12.52025	240 – 285	3345.8 – 3358	36.43 – 36.5
12.57675 – 12.57725	322 – 335.4	3600 – 4400	Above 38.6

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

FCC ID: SZO-RR21
IC ID: 20465-RR21

RSS-Gen, Table 6 – Restricted Frequency Bands

MHz	MHz	MHz	GHz
0.090 - 0.110	12.57675 - 12.57725	399.9 - 410	7.250 - 7.750
0.495 - 0.505	13.36 - 13.41	608 - 614	8.025 - 8.500
2.1735 - 2.1905	16.42 - 16.423	960 - 1427	9.0 - 9.2
3.020 - 3.026	16.69475 - 16.69525	1435 - 1626.5	9.3 - 9.5
4.125 - 4.128	16.80425 - 16.80475	1645.5 - 1646.5	10.6 - 12.7
4.17725 - 4.17775	25.5 - 25.67	1660 - 1710	13.25 - 13.4
4.20725 - 4.20775	37.5 - 38.25	1718.8 - 1722.2	14.47 - 14.5
5.677 - 5.683	73 - 74.6	2200 - 2300	15.35 - 16.2
6.215 - 6.218	74.8 - 75.2	2310 - 2390	17.7 - 21.4
6.26775 - 6.26825	108 - 138	2483.5 - 2500	22.01 - 23.12
6.31175 - 6.31225	149.9 - 150.05	2655 - 2900	23.6 - 24.0
8.291 - 8.294	156.52475 - 156.52525	3260 - 3267	31.2 - 31.8
8.362 - 8.366	156.7 - 156.9	3332 - 3339	36.43 - 36.5
8.37625 - 8.38675	162.0125 - 167.17	3345.8 - 3358	Above 38.6
8.41425 - 8.41475	167.72 - 173.2	3500 - 4400	
12.29 - 12.293	240 - 285	4500 - 5150	
12.51975 - 12.52025	322 - 335.4	5350 - 5460	

The requirements are **FULFILLED**.

Remarks: The measurement was performed up to the 10th harmonic. Only the worst-case plots are listed.

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

FCC ID: SZO-RR21

IC ID: 20465-RR21

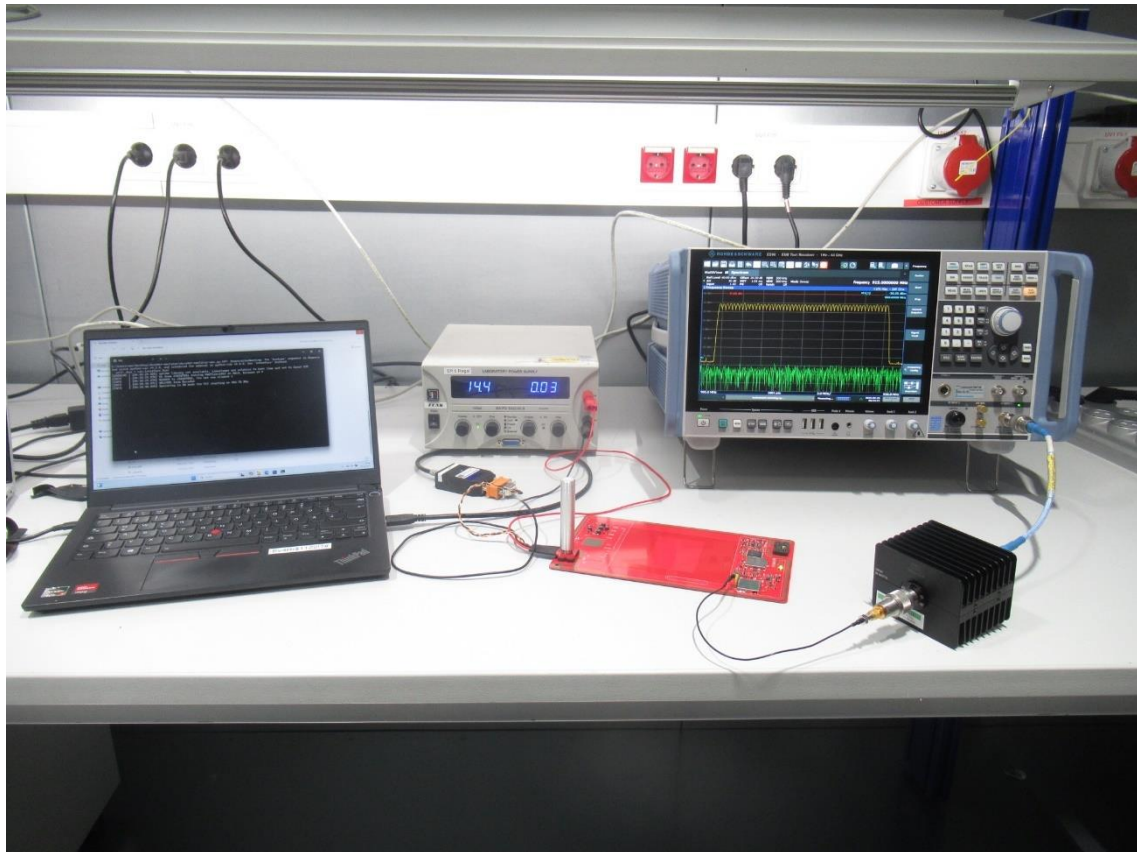
5.7 Dwell time

For test instruments and accessories used see section 6 Part DC.

5.7.1 Description of the test location

Test location: Shielded Room SR6

5.7.2 Photo documentation of the test set-up



5.7.3 Applicable standard

According to FCC Part 15, Section 15.247(a):
In Section 15.247(a)(1i)(1ii) and (1iii) are dwell times defined for the special frequency ranges should not exceed by a frequency hopping system.

5.7.4 Description of Measurement

The measurement was done using a spectrum analyser in time domain function and able to store the maximum time of a period. This time period has been stored an added up the appropriate time intervals the hopping system has applied this channel.

FCC ID: SZO-RR21
IC ID: 20465-RR21
5.7.5 Test result

Channel frequency (MHz)	Number of Bursts (per 20s)	Duration of 1 burst (ms)	Dwell time (ms)
914.75	5	6.08	30.40

Requirement according to FCC Part15C, Section 15.247(a):

Frequency (MHz)	Hopping channels	time of one period (s)	Limit dwell time, AV (ms)
902-928	≥ 50	20	< 400

The requirements are **FULFILLED**.

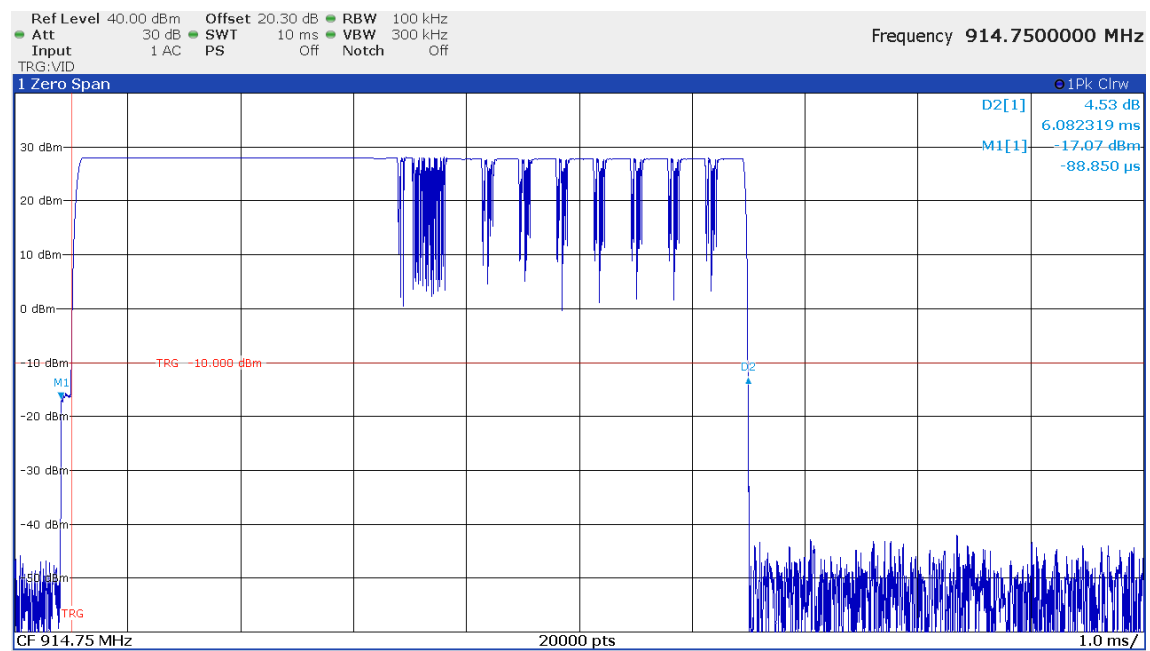
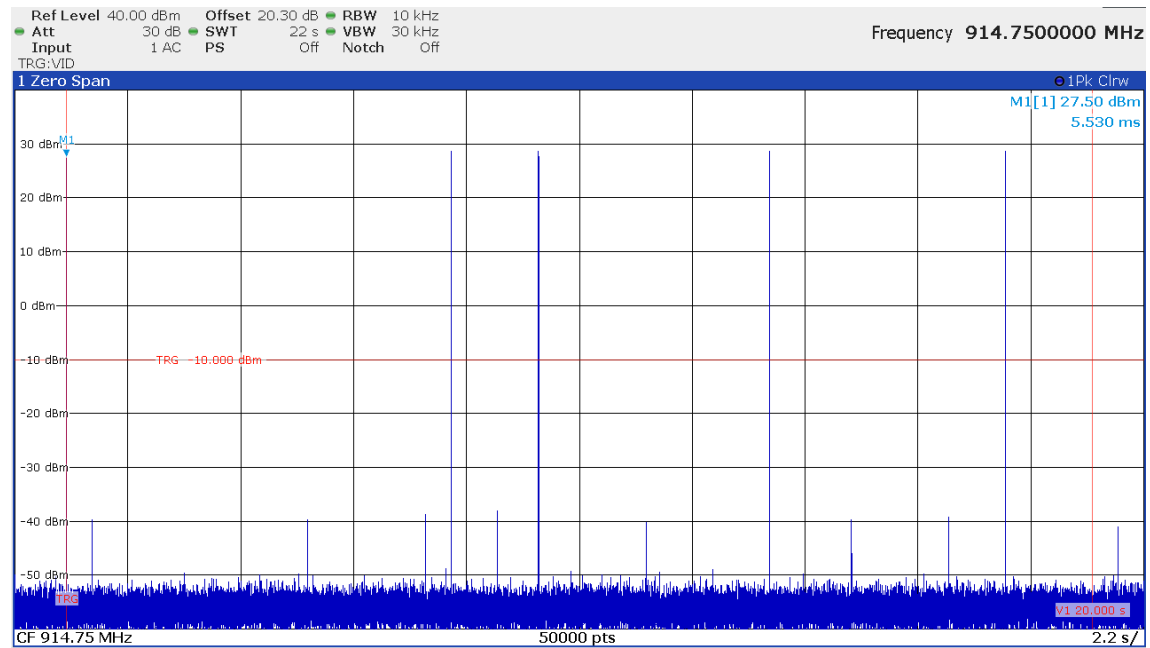
Remarks: For detailed test results please see the following test protocols.

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

FCC ID: SZO-RR21

IC ID: 20465-RR21

5.7.6 Test protocol



The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

FCC ID: SZO-RR21

IC ID: 20465-RR21

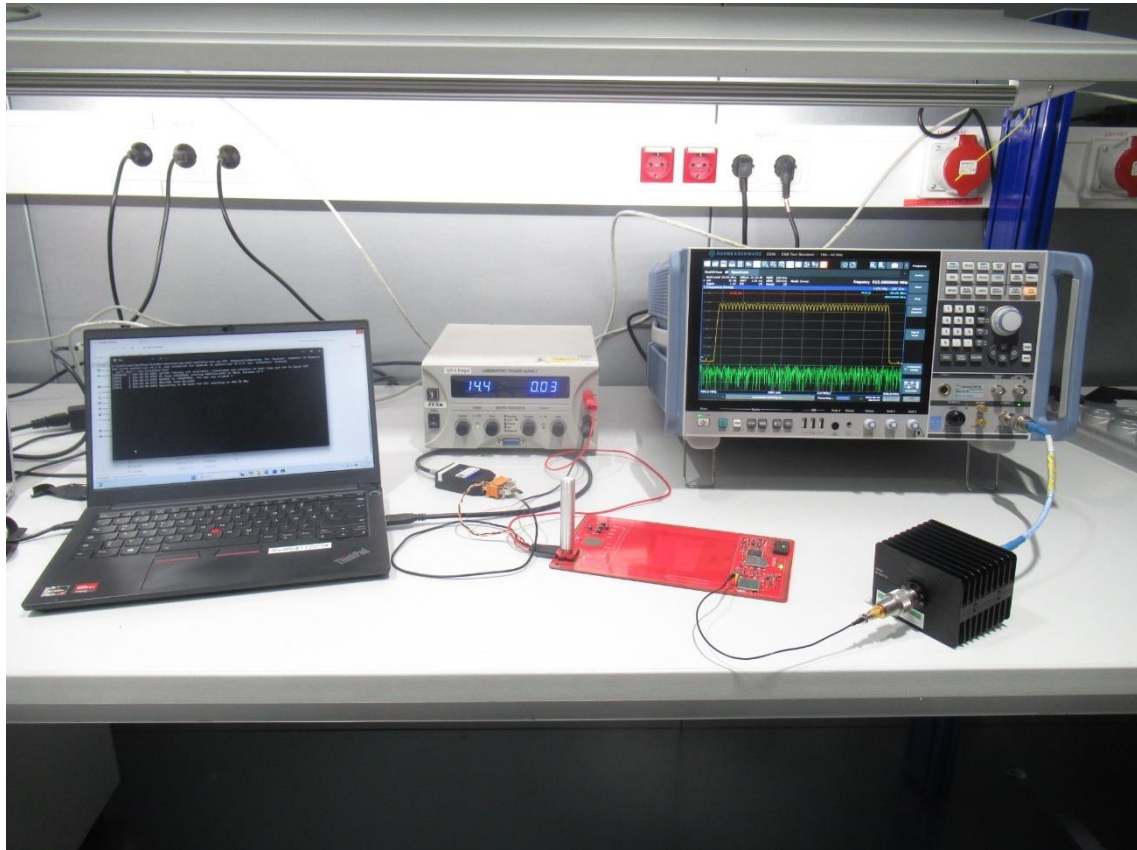
5.8 Carrier frequency separation

For test instruments and accessories used see section 6 Part **MB**.

5.8.1 Description of the test location

Test location: Shielded Room SR6

5.8.2 Photo documentation of the test set-up



5.8.3 Applicable standard

According to FCC Part 15, Section 15.247(a)(1):
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

5.8.4 Description of Measurement

The method of measurement is used set out in ANSI C63.10, 7.8.2.

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

FCC ID: SZO-RR21
IC ID: 20465-RR21
5.8.5 Test result

The separation is identical for all frequencies listed in the channel table, e. g. channel 1 and channel 2:

Channel 1 (MHz)	Channel 2 (MHz)	Hopping channels	Separation (kHz)	Limit
914.25	914.75	50	500	25 kHz/ 20 dB BW

Limit according to FCC Part 15C, Section 15.247(a):

Frequency (MHz)	Hopping channels	Limit channel separation
All systems	50	> 25 kHz or 20 dB bandwidth, whichever is greater

The requirements are **FULFILLED**.

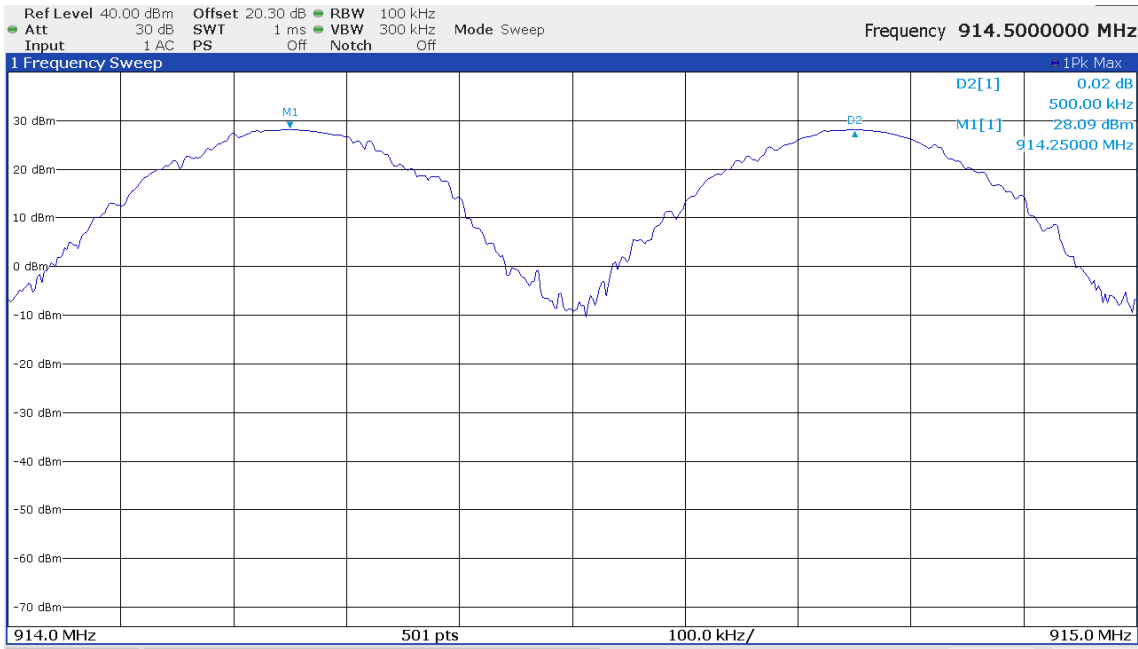
Remarks: For detailed test results please see the following test protocols.

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

FCC ID: SZO-RR21

IC ID: 20465-RR21

5.8.6 Test protocol



FCC ID: SZO-RR21

IC ID: 20465-RR21

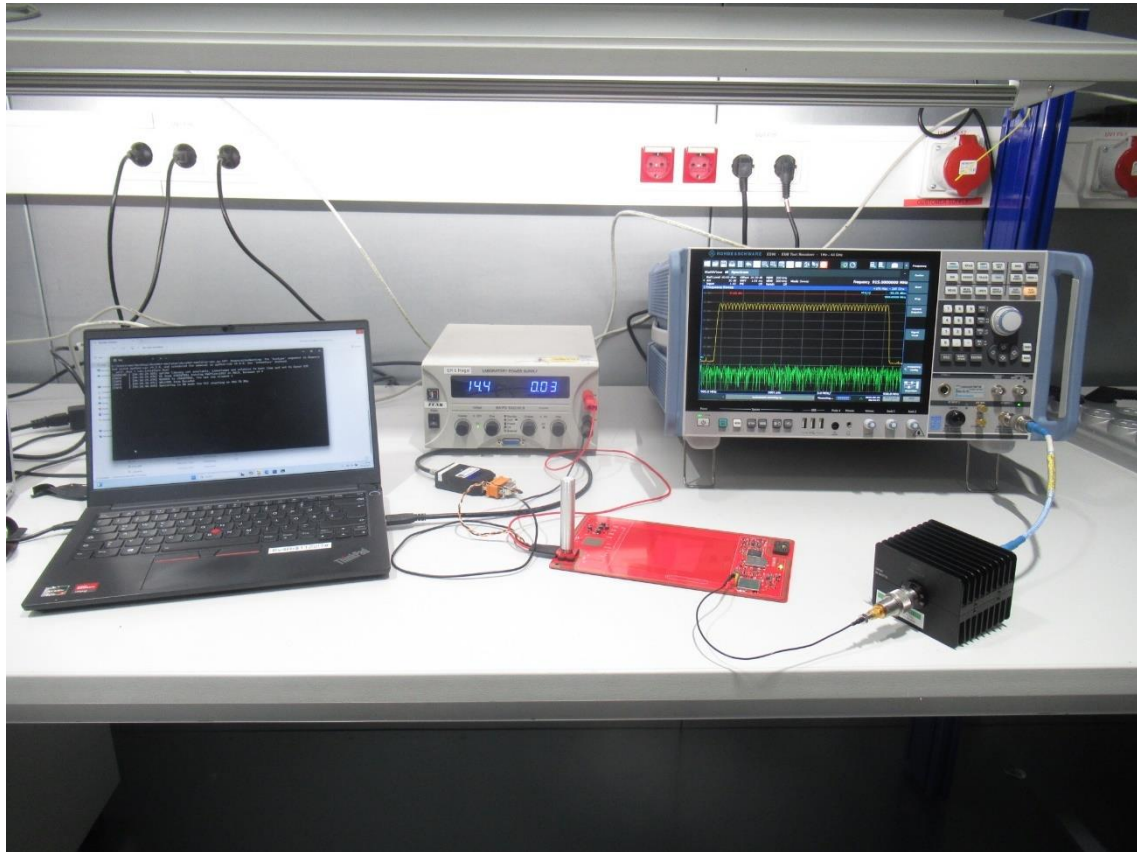
5.9 Number of hopping channels

For test instruments and accessories used see section 6 Part **MB**.

5.9.1 Description of the test location

Test location: Shielded Room SR6

5.9.2 Photo documentation of the test set-up



5.9.3 Applicable standard

According to FCC Part 15, Section 15.247(a)(1)(i):

For frequency hopping systems operating in the 902-928 MHz band: If the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies.

According to AS/NZS 4268:2017, Appendix A, Table 1, Row 45

Permitted operating frequency band (lower limit exclusive, upper limit inclusive) is 920 MHz to 926 MHz.

5.9.4 Description of Measurement

The method of measurement is used set out in ANSI C63.10, 7.8.3.

FCC ID: SZO-RR21
IC ID: 20465-RR21
5.9.5 Test result

regulation	Hopping channel frequency range	Number of all available hopping channels
FCC	902 MHz – 928 MHz	50

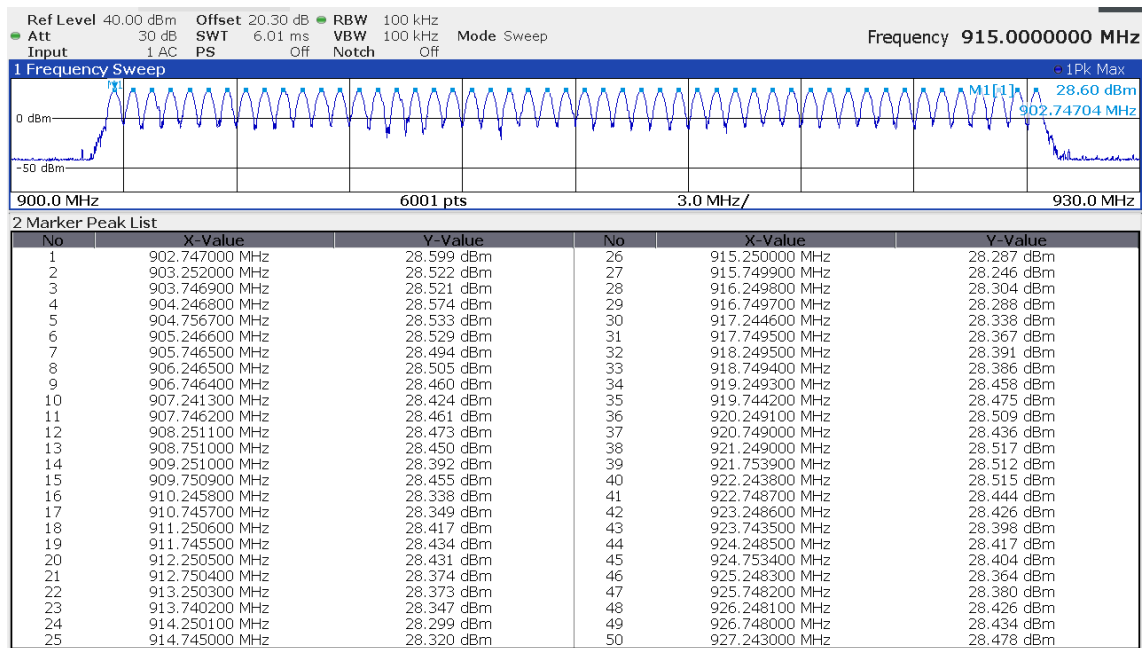
Limit according to FCC Part 15C, Section 15.247(1):

Frequency range (MHz)	LIMIT (Quantity of Hopping Channels)			
	20dB Bandwidth < 250kHz	20dB Bandwidth > 250kHz	20dB Bandwidth < 1 MHz	20dB Bandwidth > 1MHz
902 - 928	50	25	---	---

The requirements are **FULFILLED**.

Remarks: For detailed test results please see the following test protocols.

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

FCC ID: SZO-RR21
IC ID: 20465-RR21
5.9.6 Test protocol


The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

FCC ID: SZO-RR21

IC ID: 20465-RR21

5.10 Antenna application

5.10.1 Applicable standard

According to FCC Part 15C, Section 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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit that broken antennas can be replaced by the user, but the use of a standard antenna jack is prohibited.

The EUT has an integrated chip antenna; special tools are needed for replacing the antenna that prevents manipulation by a user. No external power amplifier can be connected. The requirements of part 15.203 and 15.204 are met.

5.10.2 Antenna requirements

According to FCC Part 15C, Section 15.247 (b)(4):

The conducted output power limit specified in paragraph (b) of 15.247 is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from intentional radiator shall be reduced below the stated values in paragraph (b)(1), (b)(2) and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Remarks: None.

FCC ID: SZO-RR21
IC ID: 20465-RR21

6 USED TEST EQUIPMENT AND ACCESSORIES

All test instruments used are calibrated and verified regularly. The calibration history is available on request.

Test ID	Model Type	Equipment No.	Next Calib.	Last Calib.	Next Verif.	Last Verif.
CPC2	HM 8143	02-02/50-10-016				
	SF104/11N/11N/300MM	02-02/50-13-008				
	18N50W-20dB	02-02/50-16-031	04/09/2025	04/03/2025		
	ESW44	09-16/03-24-001	16/12/2025	16/12/2024		
DC	HM 8143	02-02/50-10-016				
	SF104/11N/11N/300MM	02-02/50-13-008				
	18N50W-20dB	02-02/50-16-031	04/09/2025	04/03/2025		
	ESW44	09-16/03-24-001	16/12/2025	16/12/2024		
MB	HM 8143	02-02/50-10-016				
	SF104/11N/11N/300MM	02-02/50-13-008				
	18N50W-20dB	02-02/50-16-031	04/09/2025	04/03/2025		
	ESW44	09-16/03-24-001	16/12/2025	16/12/2024		
SEC 1-3	HM 8143	02-02/50-10-016				
	SF104/11N/11N/300MM	02-02/50-13-008				
	18N50W-20dB	02-02/50-16-031	04/09/2025	04/03/2025		
	ESW44	09-16/03-24-001	16/12/2025	16/12/2024		
SER 1	ESR7	09-02/03-21-004	05/08/2025	05/08/2024		
	HFH2-Z2E	09-02/24-21-001	05/08/2025	05/08/2024		
	KK-7.8F-2XNM_4.0M	09-02/50-21-018				
	KK-7.8F-2XNM_4.5M	09-02/50-21-023				
	KK-7.8F-2XNM_9.5M	09-02/50-21-025				
	KK-SF526S-2X11N-10.0M	09-02/50-25-002				
SER 2	ESR7	09-02/03-21-004	05/08/2025	05/08/2024		
	BBV 9743 B	09-02/17-21-002	17/12/2025	17/12/2024		
	VULB9168	09-02/24-22-003	06/08/2025	06/08/2024	12/08/2025	12/08/2024
	KK-7.8F-2XNM_4.0M	09-02/50-21-018				
	KK-7.8F-2XNM_4.5M	09-02/50-21-023				
	KK-7.8F-2XNM_9.5M	09-02/50-21-025				
	50F-003 N 3dB	09-02/50-22-002				
	CDB-10K-18-50V-NMF-I	09-02/50-22-031	17/07/2025	17/07/2024		
	KK-SF526S-2X11N-10.0M	09-02/50-25-002				
	BAT-EMC 2024.0.12.0	09-02/68-21-002				
SER 3	ESW26	02-02/03-17-002	16/04/2025	16/04/2024		
	AMF-6D-01002000-22-10P	02-02/17-15-004				
	3117	02-02/24-20-007	20/11/2025	20/11/2024		
	BAM 4.5-P	02-02/50-17-024				
	KK-SF106-2X11N-6,5M	02-02/50-18-016				
	0_5 Meter DC-18GHz	09-16/50-23-003				

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