

Test Report

Report Number:

F241004E17

Equipment under Test (EUT):

Steering unit for welding inverters

Einschub TPS/i Touch G3

Applicant:

Fronius International GmbH

Manufacturer:

Fronius International GmbH



Deutsche
Akkreditierungsstelle
D-PL-17186-01-00

References

- [1] **ANSI C63.10-2020 + Cor. 1-2023 + C63.10a-2024 + Errata to C63.10a-2024***, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
*Remark: This standard is not in accreditation scope of the laboratory yet
- [2] **FCC CFR 47 Part 15**, Radio Frequency Devices
- [3] **558074 D01 15.247 Meas Guidance v05r02 (April 2019)**, GUIDANCE FOR COMPLIANCE MEASUREMENTS ON DIGITAL TRANSMISSION SYSTEM, FREQUENCY HOPPING SPREAD SPECTRUM SYSTEM, AND HYBRID SYSTEM DEVICES OPERATING UNDER SECTION 15.247 OF THE FCC RULES
- [4] **RSS-247, Issue 4 (2025-07)** Digital Transmission Systems, Frequency Hopping Systems and Licence-Exempt Local Area Network Devices in 902-928 MHz, 2400-2483.5 MHz, 5150-5350 MHz, and 5470-5895 MHz bands
- [5] **RSS-Gen, Issue 5 Amendment 2 (2021-02)** General Requirements for Compliance of Radio Apparatus

Test Result

The requirements of the tests performed as shown in the overview (clause 4) were fulfilled by the equipment under test. The complete test results are presented in the following.

“Passed” indicates that the equipment under test conforms with the relevant limits of the testing standard without taking any measurement uncertainty into account as stated in [1]. However, the measurement uncertainty is calculated and shown in this test report.

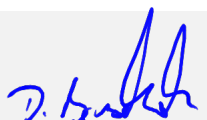
Tested by:



Paul Neufeld
01.10.2025

Signature

Tested by:



Daniel BRUSCHINSKI
01.10.2025

Signature

Tested and
written by:



Paul Neufeld
01.10.2025

Signature

Reviewed and
approved by:



Bernd STEINER
01.10.2025

Signature

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The test results herein refer only to the tested sample. PHOENIX TESTLAB GmbH is not responsible for any generalisations or conclusions drawn from these test results concerning further samples. Any modification of the tested samples is prohibited and leads to the invalidity of this test report. Each page necessarily contains the PHOENIX TESTLAB Logo and the TEST REPORT NUMBER.

Contents:	Page
1 Identification	5
1.1 Applicant.....	5
1.2 Manufacturer	5
1.3 Test Laboratory	5
1.4 EUT (Equipment under Test)	6
1.5 Technical Data of Equipment	7
1.6 Dates	9
2 Operational States	10
2.1 Description of the function of the EUT	10
3 Additional Information	11
4 Overview.....	12
5 Results.....	13
5.1 Test setups.....	13
5.2 DTS bandwidth.....	21
5.3 Occupied bandwidth – power bandwidth (99 %).....	23
5.4 DTS fundamental emission output power	25
5.5 DTS maximum power spectral density.....	28
5.6 DTS band-edge emission measurements.....	31
5.7 DTS band-edge emission measurements.....	33
5.8 Radiated emissions	35
5.9 AC power-line conducted emissions	44
6 Measurement Uncertainties	46
7 Test Equipment used for Tests	47
8 Test site Verification.....	48
9 Report History.....	48
10 List of Annexes	48

1 Identification

1.1 Applicant

Name:	Fronius International GmbH
Address:	Günter-Fronius-Straße 1, 4600 Wels-Thalheim
Country:	Austria
Name for contact purposes:	Mr. Jan HERNDLER
Phone:	+43-7242-241-0
eMail address:	herndler.jan@fronius.com
Applicant represented during the test by the following person:	Partly: Mr. Jan HERNDLER

1.2 Manufacturer

Name:	Fronius International GmbH
Address:	Fronius Strasse 5, 4642 Sattledt
Country:	Austria
Name for contact purposes:	Mr. Jan HERNDLER
Phone:	+43-7242-241-0
eMail address:	herndler.jan@fronius.com
Manufacturer represented during the test by the following person:	Partly: Mr. Jan HERNDLER

1.3 Test Laboratory

The tests were carried out by: **PHOENIX TESTLAB GmbH**
Königswinkel 10
32825 Blomberg
Germany

accredited by Deutsche Akkreditierungsstelle GmbH (DAkkS) according to DIN EN ISO/IEC 17025:2018. The accreditation is only valid for the scope of accreditation listed in the annex of the certificate D-PL-17186-01-00. FCC Test Firm Designation Number DE0004, FCC Test Firm Registration Number 469623, CAB Identifier DE0003 and ISED# 3469A.

1.4 EUT (Equipment under Test)

Test object: *	Steering unit for welding inverters
Model name: *	Einschub TPS/i Touch G3
Model number: *	43,0001,1785
Order number: *	-
FCC ID: *	QKWMCU3
IC certification number: *	12270A-MCU3
PMN: *	Einschub TPS/i Touch G3
HVIN: *	V0.3B
FVIN: *	N/A

* Declared by the applicant

	EUT number		
	1	2	3
Serial number: *	N/A (MCU 3 Radio Sample 4)	36-05-100-066346-0002	-
PCB identifier: *	MCU3	MCU3	-
Hardware version: *	V0.3B	V0.3B	-
Software version: *	V4.3.10	V4.3.10	-

* Declared by the applicant

Two EUTs were used for the tests. In the overview (chapter 4) is shown which EUT was used for each test case.

Note: PHOENIX TESTLAB GmbH does not take samples. The samples used for tests are provided exclusively by the applicant.

1.5 Technical Data of Equipment

General EUT data			
Power supply EUT: *	DC		
Supply voltage EUT: *	$U_{nom} = 24 \text{ V}_{DC}$	$U_{min} = 21.6 \text{ V}_{DC}$	$U_{max} = 26.4 \text{ V}_{DC}$
Temperature range: *	-20 °C to +65 °C		
Lowest / highest internal clock frequency: *	20 kHz / 2480 MHz		

* Declared by the applicant

Ports / Connectors				
Identification	Connector		Length during test	Shielding (Yes / No)
	EUT	Ancillary		
DC mains	Customized	4 mm laboratory plug	≤ 3 m	No
Ethernet *	HSD	RJ45	≤ 5 m	Yes (CAT6)
Speednet *	HSD	RJ45	-	Yes (CAT6)
USB *	USB-A	-	-	Yes

* Declared by the applicant

IEEE 802.11 frequencies			
20 MHz		40 MHz	
Channel 1	2412 MHz	-	-
Channel 2	2417 MHz	-	-
Channel 3	2422 MHz	Channel 3	2422 MHz
Channel 4	2427 MHz	Channel 4	2427 MHz
Channel 5	2432 MHz	Channel 5	2432 MHz
Channel 6	2437 MHz	Channel 6	2437 MHz
Channel 7	2442 MHz	Channel 7	2442 MHz
Channel 8	2447 MHz	Channel 8	2447 MHz
Channel 9	2452 MHz	Channel 9	2452 MHz
Channel 10	2457 MHz	-	-
Channel 11	2462 MHz	-	-

IEEE 802.11 radio mode				
Fulfills radio specification: *1	IEEE 802.11 b IEEE 802.11 g IEEE 802.11 n (20 MHz) IEEE 802.11 n (40 MHz) IEEE 802.11 ax (20 MHz) IEEE 802.11 ax (40 MHz)			
Radio chip: *1	muRata LBEE5PL2DL			
Antenna type: *1	Dipole antenna			
Antenna name: *1	TAOGLAS FXP831.07.0100C			
Antenna gain: *2	Peak: 3.28 dBi			
Antenna connector: *1	-			
Supply voltage WLAN module: *1	U _{nom} =	3.3 V _{DC}	U _{min} =	3.14 V _{DC} U _{max} = 3.46 V _{DC}
Type of modulation: *1	IEEE 802.11b	DSSS (1 Mbps DSSS (2 Mbps DSSS (5.5/11 Mbps	BPSK) DQPSK) CCK)	
	IEEE 802.11g	OFDM (6/9 Mbps OFDM (12 / 18 Mbps OFDM (24/36 Mbps OFDM (48/54 Mbps	BPSK) QPSK) 16-QAM) 64-QAM)	
	IEEE 802.11n 20 MHz (Spatial Stream: 1)	MCS0 MCS1/2 MCS3/4 MCS5/6/7	OFDM (7 Mbps OFDM (14 – 22 Mbps OFDM (28 – 43 Mbps OFDM (58 - 72 Mbps	BPSK) QPSK) 16-QAM) 64-QAM)
	IEEE 802.11n 40 MHz (Spatial Stream: 2)	MCS0 MCS1/2 MCS3/4 MCS5/6/7	OFDM (15 Mbps OFDM (30 / 45 Mbps OFDM (60 – 90 Mbps OFDM (120 - 150Mbps	BPSK) QPSK) 16-QAM) 64-QAM)
	IEEE 802.11 ax20 (Spatial Stream: 1)	MCS0 MCS1/2 MCS3/4 MCS5/6/7 MCS8/9 MCS10/11	OFDM (up to 8.6 Mbps OFDM (up to 25.8 Mbps OFDM (up to 51.6 Mbps OFDM (up to 77.4 Mbps OFDM (up to 103.2 Mbps OFDM (up to 143.4 Mbps	BPSK) QPSK) 16-QAM) 64-QAM) 256-QAM) 1024-QAM)
	IEEE 802.11 ax20 (Spatial Stream: 2)	MCS0 MCS1/2 MCS3/4 MCS5/6/7 MCS8/9 MCS10/11	OFDM (up to 17.2 Mbps OFDM (up to 51.6 Mbps OFDM (up to 103.2 Mbps OFDM (up to 154.9 Mbps OFDM (up to 206.5 Mbps OFDM (up to 286.8 Mbps	BPSK) QPSK) 16-QAM) 64-QAM) 256-QAM) 1024-QAM)
	IEEE 802.11 ax40 (Spatial Stream: 1)	MCS0 MCS1/2 MCS3/4 MCS5/6/7 MCS8/9 MCS10/11	OFDM (up to 17.2 Mbps OFDM (up to 51.6 Mbps OFDM (up to 103.2 Mbps OFDM (up to 172.1 Mbps OFDM (up to 229.4 Mbps OFDM (up to 286.8 Mbps	BPSK) QPSK) 16-QAM) 64-QAM) 256-QAM) 1024-QAM)

IEEE 802.11 radio mode (cont.)			
Type of modulation: *1	IEEE 802.11 ax40 (Spatial Stream: 2)	MCS0 MCS1/2 MCS3/4 MCS5/6/7 MCS8/9 MCS10/11	OFDM (up to 34.4 Mbps BPSK) OFDM (up to 103.2 Mbps QPSK) OFDM (up to 206.5 Mbps 16-QAM) OFDM (up to 344.1 Mbps 64-QAM) OFDM (up to 458.8 Mbps 256-QAM) OFDM (up to 573.5 Mbps 1024-QAM)
Operating frequency range: *1	IEEE 802.11b		2412 – 2462 MHz
	IEEE 802.11g		2412 – 2462 MHz
	IEEE 802.11n 20 MHz		2412 – 2462 MHz
	IEEE 802.11n 40 MHz		2422 – 2452 MHz
	IEEE 802.11ax 20 MHz		2412 – 2462 MHz
	IEEE 802.11ax 40 MHz		2422 – 2452 MHz
Number of channels: *1	IEEE 802.11b		11 (5 MHz channel spacing)
	IEEE 802.11g		11 (5 MHz channel spacing)
	IEEE 802.11n 20 MHz		11 (5 MHz channel spacing)
	IEEE 802.11n 40 MHz		9 (5 MHz channel spacing)
	IEEE 802.11ax 20 MHz		11 (5 MHz channel spacing)
	IEEE 802.11ax 40 MHz		9 (5 MHz channel spacing)

*1 based on the data sheet "Type 2DL Wi-Fi® + Bluetooth® Module"

*2 based on the antenna data sheet "FXP831" by TAOGlas provided by the applicant

1.5.1 Ancillary Equipment / Equipment used for testing

Equipment used for testing	
AC adapter *	PHOENIX CONTACT MINI-PS.100-240AC/24DC/1.3
Test notebook *	Fujitsu Lifebook U759

* Provided by the laboratory

1.6 Dates

Date of receipt of test sample:	02.12.2024
Start of test:	26.03.2025
End of test:	25.09.2025

2 Operational States

2.1 Description of the function of the EUT

The EUT is a steering unit for welding inverters. WLAN is used for data communication.

2.1.1 Operation modes

An ethernet connection to the test notebook was established and the test modes were set in a terminal session.

Operation mode #	Radio technology	Frequency [MHz]	Channel / Band	Modulation / Mode	Data rate	Power setting
1	IEEE 802.11 b	2412	1	BPSK	1 Mbps	"15 dBm"
2	IEEE 802.11 b	2437	6	BPSK	1 Mbps	"15 dBm"
3	IEEE 802.11 b	2462	11	BPSK	1 Mbps	"15 dBm"
4	IEEE 802.11 b	2412	1	BPSK	2 Mbps	"15 dBm"
5	IEEE 802.11 b	2437	6	BPSK	2 Mbps	"15 dBm"
6	IEEE 802.11 b	2462	11	BPSK	2 Mbps	"15 dBm"
7	IEEE 802.11 g	2412	1	BPSK	6 Mbps	"14 dBm"
8	IEEE 802.11 g	2437	6	BPSK	6 Mbps	"14 dBm"
9	IEEE 802.11 g	2462	11	BPSK	6 Mbps	"14 dBm"
10	IEEE 802.11 g	2412	1	BPSK	24 Mbps	"14 dBm"
11	IEEE 802.11 g	2437	6	BPSK	24 Mbps	"14 dBm"
12	IEEE 802.11 g	2462	11	BPSK	24 Mbps	"14 dBm"
13	IEEE 802.11 n20	2412	1	64-QAM	MCS6	"12 dBm"
14	IEEE 802.11 n20	2437	6	64-QAM	MCS6	"12 dBm"
15	IEEE 802.11 n20	2462	11	64-QAM	MCS6	"12 dBm"
16	IEEE 802.11 n40	2422	3	64-QAM	MCS6	"12 dBm"
17	IEEE 802.11 n40	2437	6	64-QAM	MCS6	"12 dBm"
18	IEEE 802.11 n40	2452	9	64-QAM	MCS6	"12 dBm"
19	IEEE 802.11 ax20	2412	1	64-QAM	MCS6	"12 dBm"
20	IEEE 802.11 ax20	2437	6	64-QAM	MCS6	"12 dBm"
21	IEEE 802.11 ax20	2462	11	64-QAM	MCS6	"12 dBm"
22	IEEE 802.11 ax20-RU26 "Low"	2412	1	64-QAM	MCS6	"8 dBm"
23	IEEE 802.11 ax20-RU26 "Low"	2437	6	64-QAM	MCS6	"8 dBm"
24	IEEE 802.11 ax20-RU26 "Low"	2462	11	64-QAM	MCS6	"8 dBm"
25	IEEE 802.11 ax20-RU52 "Mid"	2412	1	64-QAM	MCS6	"8 dBm"
26	IEEE 802.11 ax20-RU52 "Mid"	2437	6	64-QAM	MCS6	"8 dBm"
27	IEEE 802.11 ax20-RU52 "Mid"	2462	11	64-QAM	MCS6	"8 dBm"
28	IEEE 802.11 ax20-RU26 "High"	2412	1	64-QAM	MCS6	"8 dBm"
29	IEEE 802.11 ax20-RU26 "High"	2437	6	64-QAM	MCS6	"8 dBm"
30	IEEE 802.11 ax20-RU26 "High"	2462	11	64-QAM	MCS6	"8 dBm"
31	IEEE 802.11 ax20-full RU	2412	1	64-QAM	MCS6	"8 dBm"
32	IEEE 802.11 ax20-full RU	2437	6	64-QAM	MCS6	"8 dBm"

33	IEEE 802.11 ax20-full RU	2462	11	64-QAM	MCS6	"8 dBm"
34	IEEE 802.11 ax40	2422	3	64-QAM	MCS6	"8.5 dBm"
35	IEEE 802.11 ax40	2437	6	64-QAM	MCS6	"8.5 dBm"
36	IEEE 802.11 ax40	2452	9	64-QAM	MCS6	"8.5 dBm"
37	IEEE 802.11 ax40-RU26 "Low"	2422	3	64-QAM	MCS6	"10 dBm"
38	IEEE 802.11 ax40-RU26 "Low"	2437	6	64-QAM	MCS6	"10 dBm"
39	IEEE 802.11 ax40-RU26 "Low"	2452	9	64-QAM	MCS6	"8 dBm"
40	IEEE 802.11 ax40-RU26 "Low"	2452	9	64-QAM	MCS6	"10 dBm"
41	IEEE 802.11 ax40-RU26 "Mid"	2422	3	BPSK	MCS0	"10 dBm"
42	IEEE 802.11 ax40-RU52 "Mid"	2422	3	64-QAM	MCS6	"10 dBm"
43	IEEE 802.11 ax40-RU52 "Mid"	2437	6	64-QAM	MCS6	"10 dBm"
44	IEEE 802.11 ax40-RU52 "Mid"	2452	9	64-QAM	MCS6	"10 dBm"
45	IEEE 802.11 ax40-RU26 "High"	2422	3	64-QAM	MCS6	"10 dBm"
46	IEEE 802.11 ax40-RU26 "High"	2437	6	64-QAM	MCS6	"10 dBm"
47	IEEE 802.11 ax40-RU26 "High"	2452	9	64-QAM	MCS6	"10 dBm"
48	IEEE 802.11 ax40-full RU"	2422	3	64-QAM	MCS6	"10 dBm"
49	IEEE 802.11 ax40-full RU"	2437	6	64-QAM	MCS6	"10 dBm"
50	IEEE 802.11 ax40-full RU"	2452	9	64-QAM	MCS6	"10 dBm"

3 Additional Information

The EUT was not labeled as required by FCC / IC.

This test report contains the WLAN results only.

4 Overview

Application	Frequency range [MHz]	FCC 47 CFR Part 15 section [2]	RSS-247 [4] RSS-Gen [5]	Tested EUT	Status
Maximum peak conducted output power	2400.0 - 2483.5	15.247 (b) (3), (4)	6.3.2 [4]	2	Passed
Maximum conducted output power	2400.0 - 2483.5	15.247 (b) (3), (4)	6.3.2 [4]	2	Passed
DTS Bandwidth / 99% Bandwidth	2400.0 - 2483.5	15.247 (a) (2)	6.3.1 [4]	2	Passed
Peak Power Spectral Density	2400.0 - 2483.5	15.247 (e)	6.3.1 [4]	2	Passed
Average Power Spectral Density	2400.0 - 2483.5	15.247 (e)	6.3.1 [4]	2	Passed
Band edge compliance	2400.0 - 2483.5	15.247 (d) 15.205 (a) 15.209 (a)	6.6 [4]	1, 2	Passed * ¹
Maximum unwanted emissions	0.009 – 26500 * ^{2 3}	15.247 (d) 15.205 (a) 15.209 (a)	8.9 [5]	1	Passed * ^{2 3}
Antenna Requirement	-	15.203 15.247 (b)	6.8 [5] 6.5 (c) (ii) [4]	-	-
Conducted emissions on supply line	0.15 – 30	15.207 (a)	8.8 [5]	1	Passed

*¹: Only the worst-case modes as conducted pretests have shown were tested radiated

*²: Only the worst-case data rate as pretests have shown was tested

*³ As declared by the applicant the highest radio frequency is 2.462 GHz.

Therefore, the radiated emission measurement must be carried out up to 10th of the highest radio clock frequency in this case 26.5 GHz.

5 Results

5.1 Test setups

5.1.1 Radiated: 9 kHz to 30 MHz

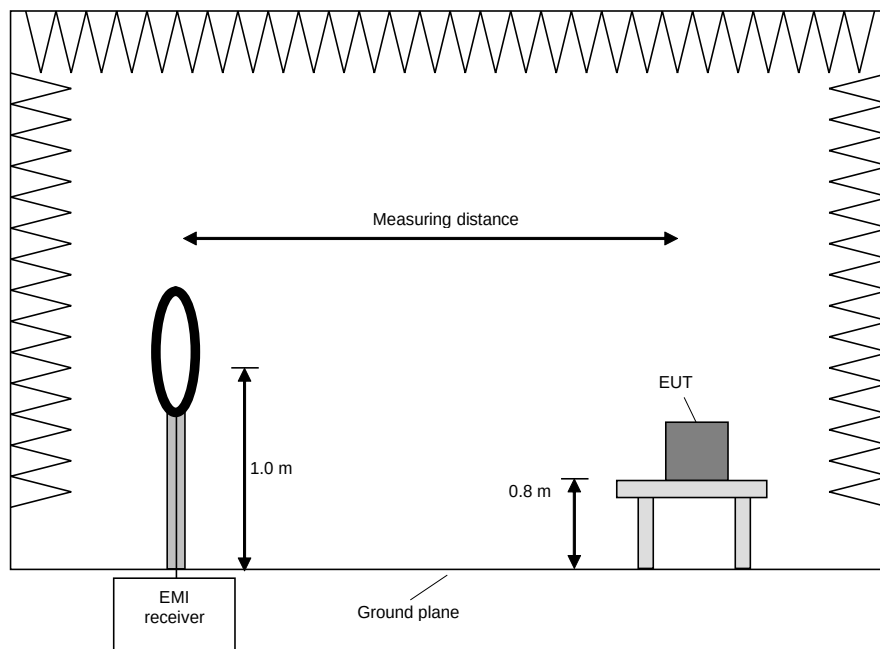
5.1.1.1 Preliminary measurement 9 kHz to 30 MHz

In the first stage a preliminary measurement is performed in a semi-anechoic chamber at a measuring distance of 3 meters. Table-top devices are set up on a non-conducting support with a size of 1 m by 1.5 m and a height of 80 cm. Floor-standing devices are placed directly on the turntable / ground plane. The setup of the equipment under test is in accordance with [1].

The frequency range 9 kHz to 30 MHz is monitored with an EMI receiver while the system and its cables are manipulated to find out the configuration with the maximum emission levels if applicable. The EMI receiver is set to MAX hold mode. The EUT and the measuring antenna are rotated around their vertical axis to find the maximum emission levels.

The resolution bandwidth of the EMI receiver is set to the following values:

Frequency range	Resolution bandwidth
9 kHz to 150 kHz	200 Hz
150 kHz to 30 MHz	9 kHz



Procedure preliminary measurement:

Pre-scans are performed in the frequency range 9 kHz to 150 kHz and 150 kHz to 30 MHz.

The following procedure is used:

- 1) Monitor the frequency range with the measuring antenna facing the EUT and an EUT / turntable azimuth of 0°.
- 2) Manipulate the system cables to produce the maximum levels of emissions.

- 3) Rotate the EUT by 360 ° to maximize the detected signals.
- 4) Measure the frequencies of the highest detected emissions with a lower span and resolution bandwidth to increase the accuracy and note the frequency values.
- 5) If the EUT is portable or ceiling mounted, repeat steps 1 to 4 with other orientations (x,y,z) of the EUT.
- 6) Rotate the measuring antenna and repeat steps 1 to 5.

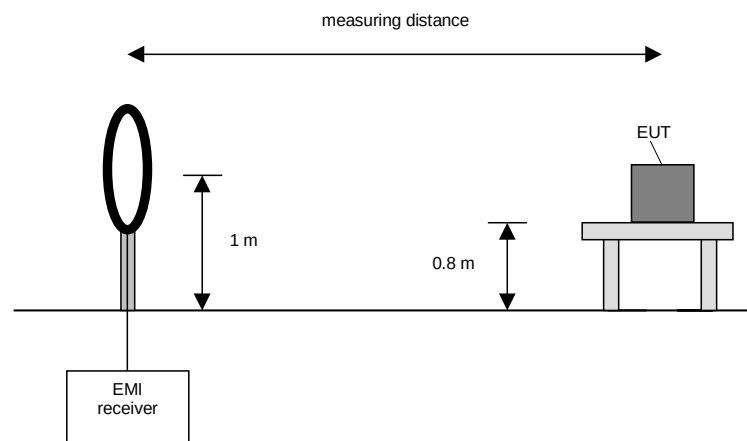
5.1.1.2 Final measurement 9 kHz to 30 MHz

In the second stage a final measurement is performed on an open area test site with no conducting ground plane at a measuring distance of 3 m, 10 m, or 30 m. If the standard requires larger measuring distances for a given frequency, the results are extrapolated according to section 15.31 (f) (2) [2]. The final measurement is performed with an EMI receiver set to Quasi-Peak detector, except for the frequency bands 9 kHz to 90 kHz and 110 kHz to 490 kHz where an Average detector is used according section 15.209 (d) [2].

At the frequencies, which were detected during the preliminary measurements, the final measurement is performed while rotating the EUT and the measuring antenna in the range of 0 ° to 360 ° around their vertical axis until the maximum level value is found.

The resolution bandwidth of the EMI receiver is set to the following values:

Frequency range	Resolution bandwidth	Measuring time
9 kHz to 150 kHz	200 Hz	1 s
150 kHz to 30 MHz	9 kHz	1 s



Procedure final measurement:

The following procedure is used:

- 1) Monitor the selected frequencies from the preliminary measurement with the measuring antenna facing the EUT and an EUT azimuth of 0 °.
- 2) Rotate the EUT by 360 ° to maximize the detected signals.
- 3) Rotate the measuring antenna and repeat steps 1 to 2 until the maximum value is found and note it.
- 4) If the EUT is portable or ceiling mounted, repeat steps 1 to 3 with other orientations (x,y,z) of the EUT.

5.1.2 Radiated: 30 MHz to 1 GHz

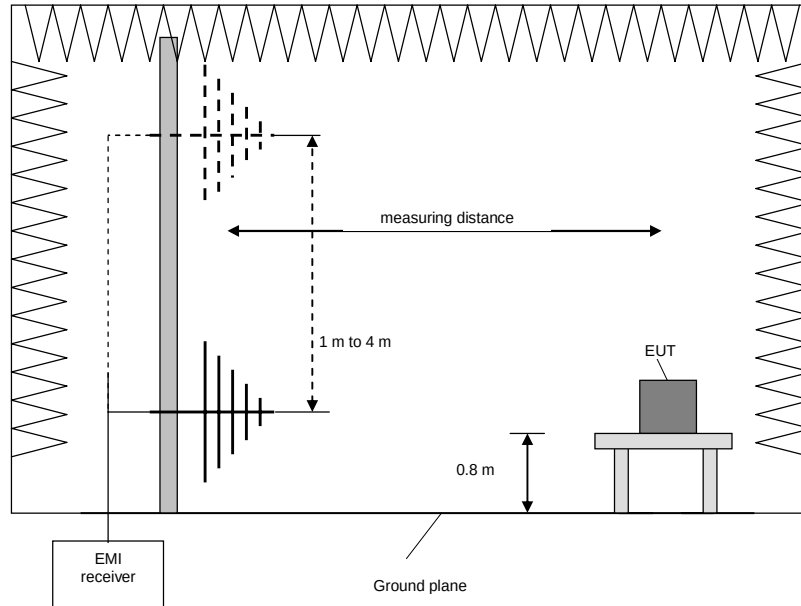
5.1.2.1 Preliminary and final measurement 30 MHz to 1 GHz

The preliminary and final measurements are performed in a semi-anechoic chamber with a metal ground plane at a measuring distance of 3 meters. Table-top devices are set up on a non-conducting support with a size of 1 m by 1.5 m and a height of 80 cm. Floor-standing devices are placed directly on the turntable / ground plane. The setup of the equipment under test is in accordance with [1].

During the tests the EUT is rotated in the range of 0 ° to 360 °, the measuring antenna is set to horizontal and vertical polarization and raised and lowered in the range from 1 m to 4 m to find the maximum level of emissions.

The resolution bandwidth of the EMI receiver is set to the following values:

Test	Frequency range	Step-size	Resolution bandwidth	Measuring time	Detector
Preliminary measurement	30 MHz to 1 GHz	30 kHz	120 kHz	-	Peak Average
Frequency peak search	± 120 kHz	10 kHz	120 kHz	1 s	Peak
Final measurement	30 MHz to 1 GHz	-	120 kHz	1 s	QuasiPeak



Procedure preliminary measurement:

The following procedure is used:

- 1) Set the measuring antenna to 1 m height.
- 2) Monitor the frequency range at horizontal polarization of the measuring antenna and an EUT / turntable azimuth of 0 °.
- 3) Rotate the EUT by 360° to maximize the detected signals.
- 4) Repeat steps 2 to 3 with the vertical polarization of the measuring antenna.
- 5) Increase the height of the measuring antenna for 0.5 m and repeat steps 2 to 4 until the final height of 4 m is reached.
- 6) The highest values for each frequency are saved by the software, including the measuring antenna height and polarization and the turntable azimuth for that value.

Procedure final measurement:

The following procedure is used:

- 1) Select the highest frequency peaks (lowest margin to the limit) for the final measurement.
- 2) The software determines the exact peak frequencies by doing a partial scan with reduced step size of the pre-scan of the selected peaks.
- 3) If the EUT is portable or ceiling mounted, find the worst-case EUT orientation (x,y,z) for the final test.
- 4) The worst-case measuring antenna height is found via varying the height by +/- 0.5 m from the value obtained in the preliminary measurement while monitoring the emission level.
- 5) The worst-case turntable position is found via varying the turntable azimuth by +/- 30° from the value obtained in the preliminary measurement while monitoring the emission level.
- 6) The final measurement is performed at the worst-case measuring antenna height and the worst-case turntable azimuth.
- 7) Steps 2 to 6 are repeated for each frequency peak selected in step 1.

5.1.3 Radiated: 1 GHz to 40 GHz

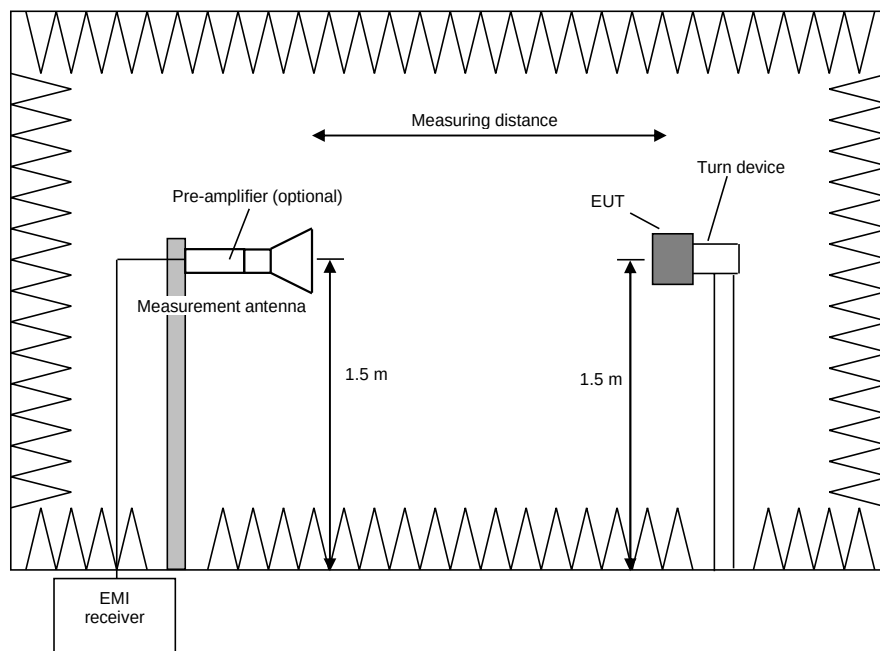
5.1.3.1 Preliminary and final measurement 1 GHz to 40 GHz

The preliminary and final measurements are performed in a fully anechoic chamber at a measuring distance of 3 meters. Table-top devices are set up on a non-conducting turn device at the height of 1.5 m. The setup of the equipment under test is in accordance with [1].

During the tests the EUT is rotated in the range of 0 ° to 360 ° and the measuring antenna is set to horizontal and vertical polarization to find the maximum level of emissions. After these steps, the measurement is repeated after reorientating the EUT in 30 ° steps. Alternatively, a test setup with a height scan from 1 m to 4 m and the EUT in nominal position at a height of 1.5 m is used.

The resolution bandwidth of the EMI receiver is set to the following values:

Test	Frequency range	Step-size	Resolution bandwidth	Measuring time	Detector
Preliminary measurement	1 GHz - 40 GHz	250 kHz	1 MHz	-	Peak Average
Final measurement	1 GHz - 40 GHz	-	1 MHz	100 ms	Peak Average



Procedure preliminary measurement:

The following procedure is used:

- 1) Monitor the frequency range at horizontal polarisation of the measuring antenna and an EUT / turntable azimuth of 0 °.
- 2) Rotate the EUT by 360° to maximize the detected signals.
- 3) Repeat steps 1 to 2 with the vertical polarisation of the measuring antenna.
- 4) Repeat steps 1 to 3 with the EUT reorientated by an angle of 30° (60°, 90°, 120° and 150°), according to 6.6.5.4 in [1].
- 5) The highest values for each frequency are saved by the software, including the measuring antenna polarization, the turntable azimuth and the turn device elevation for that value.

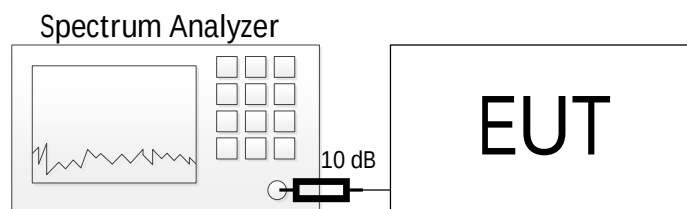
Procedure final measurement:

The following procedure is used:

- 1) Set the turntable and the turn device to the position which leads to the highest emission for the first frequency identified in the preliminary measurements.
- 2) Set the measurement antenna to the polarisation which leads to the highest emission for the first frequency identified in the preliminary measurements.
- 3) Set the spectrum analyser to EMI mode with Peak and Average detector activated.
- 4) The worst-case turntable position is found via varying the turntable azimuth by +/- 30° from the value obtained in the preliminary measurement while monitoring the emission level.
- 5) The final measurement is performed at the worst-case turntable azimuth.
- 6) Repeat steps 1 to 5 for each frequency detected during the preliminary measurements.

5.1.5 Conducted: Antenna port

Test setup (conducted)		
Used	Antenna connector	Comment
☐	Temporary antenna connector	As provided by the applicant
☒	Normal antenna connector	-



The 10 dB external attenuation are considered in all relevant plots

5.2 DTS bandwidth

5.2.1 Test setup (DTS bandwidth)

Test setup (DTS bandwidth)			
Used	Setup	See sub-clause	Comment
☐	Radiated: 1 GHz to 40 GHz	5.1.3	-
☒	Conducted: Antenna port	5.1.5	-

5.2.2 Test method (DTS bandwidth)

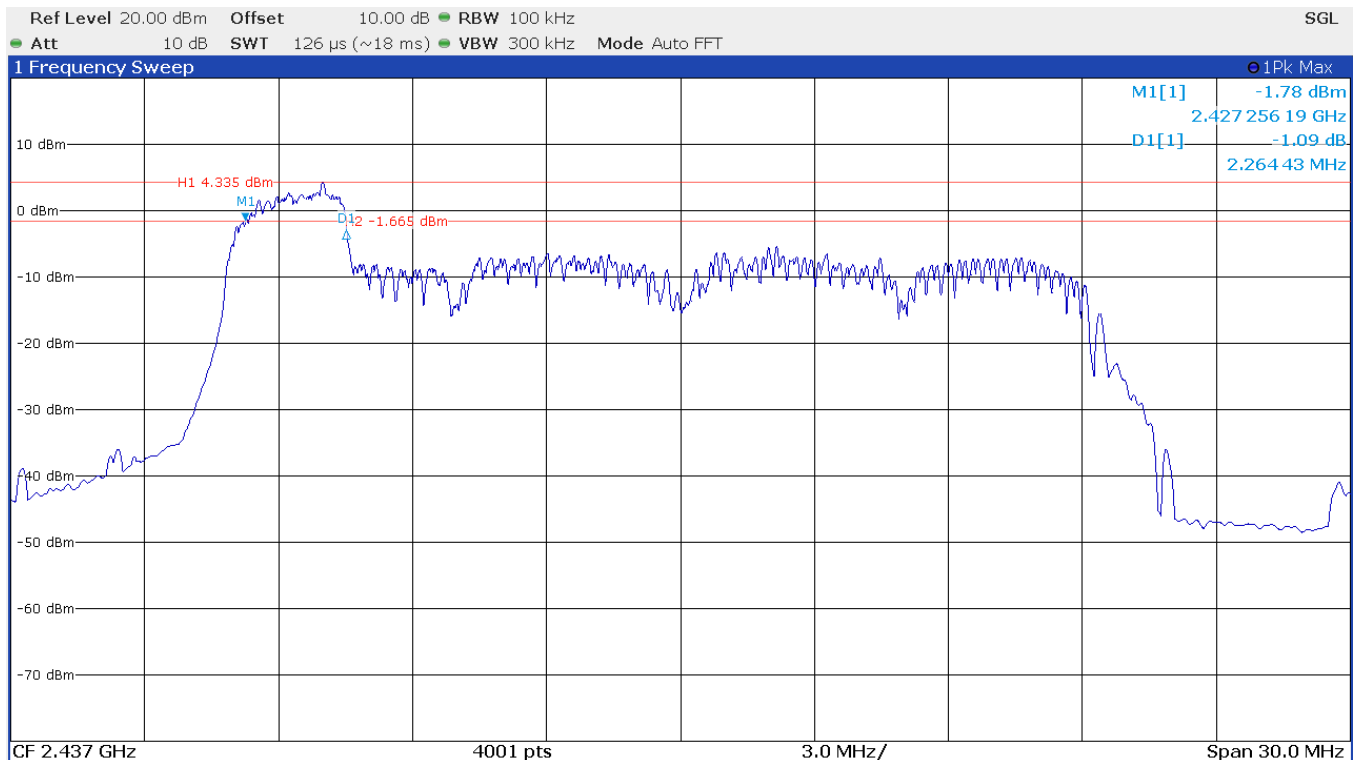
Test method (DTS bandwidth)				
Used	Sub-Clause [1]	Name of method	Applicability	Comment
☒	11.8.1	Option 1	No limitations	-
☐	11.8.2	Option 2	No limitations	6 dB down function

5.2.3 Test results (DTS bandwidth)

Ambient temperature:	22 °C - 23 °C
Relative humidity:	41 % - 61 %

Date:	19.09.2025 / 23.09.2025
Tested by:	P. NEUFELD

Worst case plot (operation mode 23):



The result table is presented on the following page.

Operation mode #	DTS bandwidth [MHz]	Minimum DTS bandwidth Limit [MHz]
4	9.763	0.500
5	9.793	0.500
6	9.778	0.500
7	16.547	0.500
8	16.547	0.500
9	16.556	0.500
13	17.746	0.500
14	17.736	0.500
15	17.736	0.500
16	36.511	0.500
17	36.511	0.500
18	36.511	0.500
19	18.875	0.500
20	18.865	0.500
21	18.875	0.500
22	2.819	0.500
23	2.264	0.500
24	2.782	0.500
34	37.531	0.500
35	37.851	0.500
36	37.711	0.500
37	3.059	0.500
38	3.179	0.500
40	3.299	0.500

Test result: Passed

Test equipment (please refer to chapter 7 for details)
1

5.3 Occupied bandwidth – power bandwidth (99 %)

5.3.1 Test Setup (Occupied bandwidth – power bandwidth (99 %))

Test setup (Occupied bandwidth – power bandwidth (99 %))			
Used	Setup	See sub-clause	Comment
☐	Radiated: 1 GHz to 40 GHz	5.1.3	-
☒	Conducted: Antenna port	5.1.5	-

5.3.2 Test method (Occupied bandwidth – power bandwidth (99 %))

Test method (Occupied bandwidth – power bandwidth (99%))				
Used	Sub-Clause [1]	Name of method	Applicability	Comment
☐	6.9.2	Relative measurement procedure	-	n-dB down
☒	6.9.3	Power bandwidth (99%)	*1	99 % power function

*1 See RSS-GEN Issue 5 (2018-05) sub-clause 6.7 for details.

5.3.3 Test results (Occupied bandwidth – power bandwidth (99 %))

Ambient temperature:	22 °C - 23 °C
Relative humidity:	40 % - 61 %

Date:	19.09.2025 / 23.09.2025
Tested by:	P. NEUFELD

Worst case plot (operation mode 46):



The result table is presented on the following page.

Operation mode #	99% bandwidth [MHz]
1	13.321
2	13.333
3	13.331
4	13.361
5	13.375
6	13.370
10	16.546
11	16.548
12	16.550
13	17.719
14	17.719
15	17.719
16	36.221
17	36.217
18	36.233
19	18.787
20	18.790
21	18.789
25	17.594
26	17.718
27	17.263
28	18.155
29	18.381
30	18.675
31	18.844
32	19.668
33	19.520
34	37.569
35	37.563
36	37.561
42	21.564
43	21.885
44	21.640
45	39.521
46	39.652
47	38.778
48	37.614
49	38.202
50	38.188

Test result: Passed

Test equipment (please refer to chapter 7 for details)
1

5.4 DTS fundamental emission output power

5.4.1 Test setup (DTS fundamental emission output power)

Test setup (DTS fundamental emission output power)			
Used	Setup	See sub-clause	Comment
☐	Radiated: 1 GHz to 40 GHz	5.1.3	-
☒	Conducted: Antenna port	5.1.5	-

5.4.2 Test method (DTS fundamental emission output power)

Test method (Maximum conducted (average) output power)				
Used	Sub-Clause [1]	Name of method	Applicability	Comment
☒	11.9.2.2.2	Method AVGSA-1	D ≥ 98 %	-
☐	11.9.2.2.3	Method AVGSA-1A (alternative)	D ≥ 98 %	-
☐	11.9.2.2.4	Method AVGSA-2	Constant D (±2 %)	-
☐	11.9.2.2.5	Method AVGSA-2A (alternative)	Constant D (±2 %)	-
☐	11.9.2.2.6	Method AVGSA-3A	-	-
☐	11.9.2.2.7	Method AVGSA-3A (alternative)	-	-
☐	11.9.2.3.1	Method AVGPM	Constant D (±2 %)	-
☐	11.9.2.3.2	Method AVGPM-G	-	-

The test results are presented on the following pages.

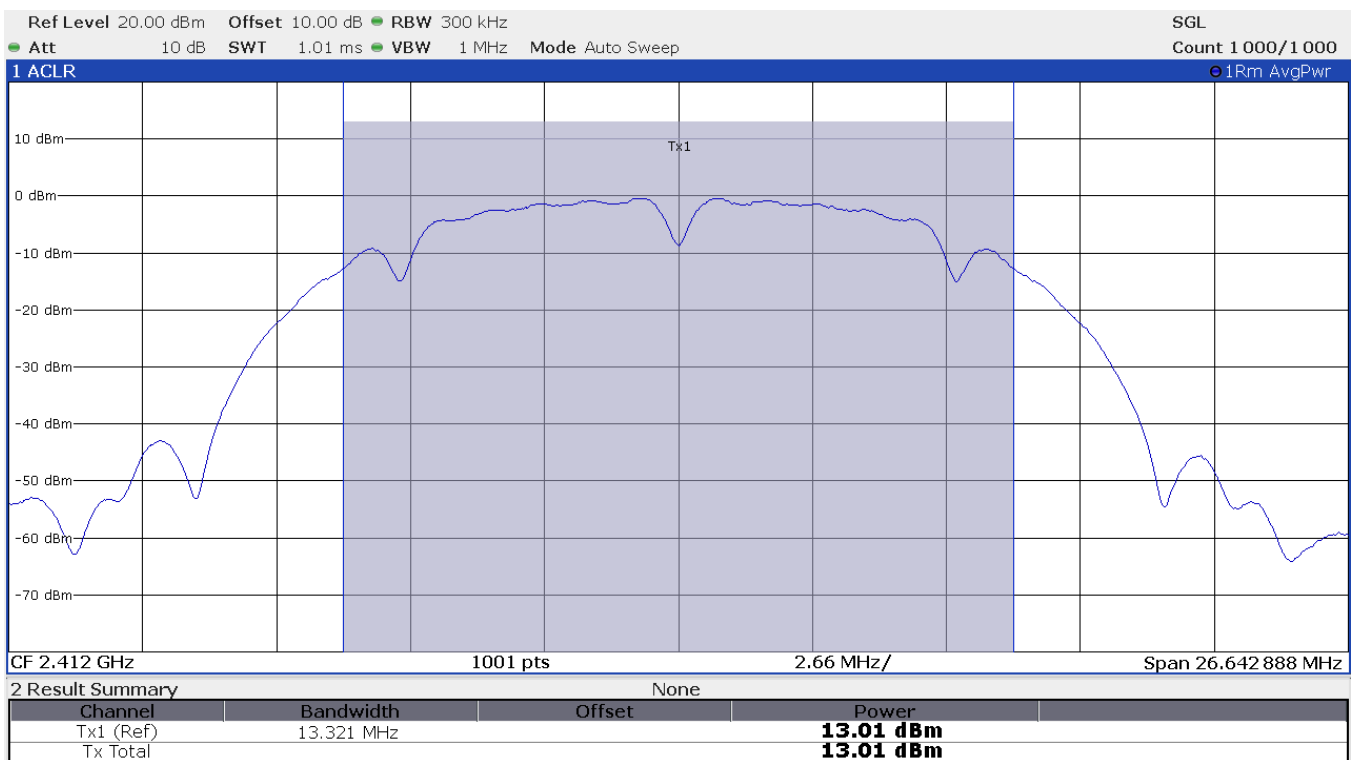
5.4.3 Test results (DTS fundamental emission output power)

5.4.3.1 Maximum conducted (average) output power

Ambient temperature:	22 °C - 23 °C
Relative humidity:	41 % - 61 %

Date:	19.09.2025 / 23.09.2025
Tested by:	P. NEUFELD

Worst case plot (operation mode 1):



Remark: The external attenuation was accounted for by the offset at the spectrum analyzer.

The result table is presented on the following page.

Result table conducted (average) output power:

Operation mode	Result [dBm]	Limit [dBm]	Antenna gain [dBi]	e.i.r.p. [dBm]	Limit e.i.r.p. [dBm]
1	13.0	30.0	3.3	16.3	36.0
2	13.0	30.0	3.3	16.3	36.0
3	12.9	30.0	3.3	16.2	36.0
4	13.0	30.0	3.3	16.3	36.0
5	12.9	30.0	3.3	16.2	36.0
6	12.8	30.0	3.3	16.1	36.0
10	11.7	30.0	3.3	15.0	36.0
11	11.9	30.0	3.3	15.2	36.0
12	11.7	30.0	3.3	15.0	36.0
13	10.3	30.0	3.3	13.6	36.0
14	10.3	30.0	3.3	13.6	36.0
15	10.1	30.0	3.3	13.4	36.0
16	10.5	30.0	3.3	13.8	36.0
17	10.4	30.0	3.3	13.7	36.0
18	10.3	30.0	3.3	13.6	36.0
19	10.5	30.0	3.3	13.8	36.0
20	10.5	30.0	3.3	13.8	36.0
21	10.3	30.0	3.3	13.6	36.0
25	7.6	30.0	3.3	10.9	36.0
26	7.5	30.0	3.3	10.8	36.0
27	7.3	30.0	3.3	10.6	36.0
34	6.6	30.0	3.3	9.9	36.0
35	6.7	30.0	3.3	10.0	36.0
36	6.6	30.0	3.3	9.9	36.0
42	9.7	30.0	3.3	13.0	36.0
43	9.6	30.0	3.3	12.9	36.0
44	9.6	30.0	3.3	12.9	36.0

Test result: Passed

Test equipment (please refer to chapter 7 for details)
1

5.5 DTS maximum power spectral density

5.5.1 Test setup (DTS maximum PSD level in the fundamental emission)

Test setup (DTS maximum power spectral density)			
Used	Setup	See sub-clause	Comment
☐	Radiated: 1 GHz to 40 GHz	5.1.3	-
☒	Conducted: Antenna port	5.1.5	-

5.5.2 Test method (DTS maximum PSD level in the fundamental emission)

Test method (Maximum <i>average</i> power spectral density level in the fundamental emission)				
Used	Sub-Clause [1]	Name of method	Applicability	Comment
☒	11.10.3	Method AVGPSD-1	D ≥ 98%	-
☐	11.10.4	Method AVGPSD-1A (alternative)	D ≥ 98%	-
☐	11.10.5	Method AVGPSD-2	Constant D (±2%)	-
☐	11.10.6	Method AVGPSD-2A (alternative)	Constant D (±2%)	-
☐	11.10.7	Method AVGPSD-3	No limitations	-
☐	11.10.8	Method AVGPSD-3A (alternative)	No limitations	-

The test results are presented on the following pages.

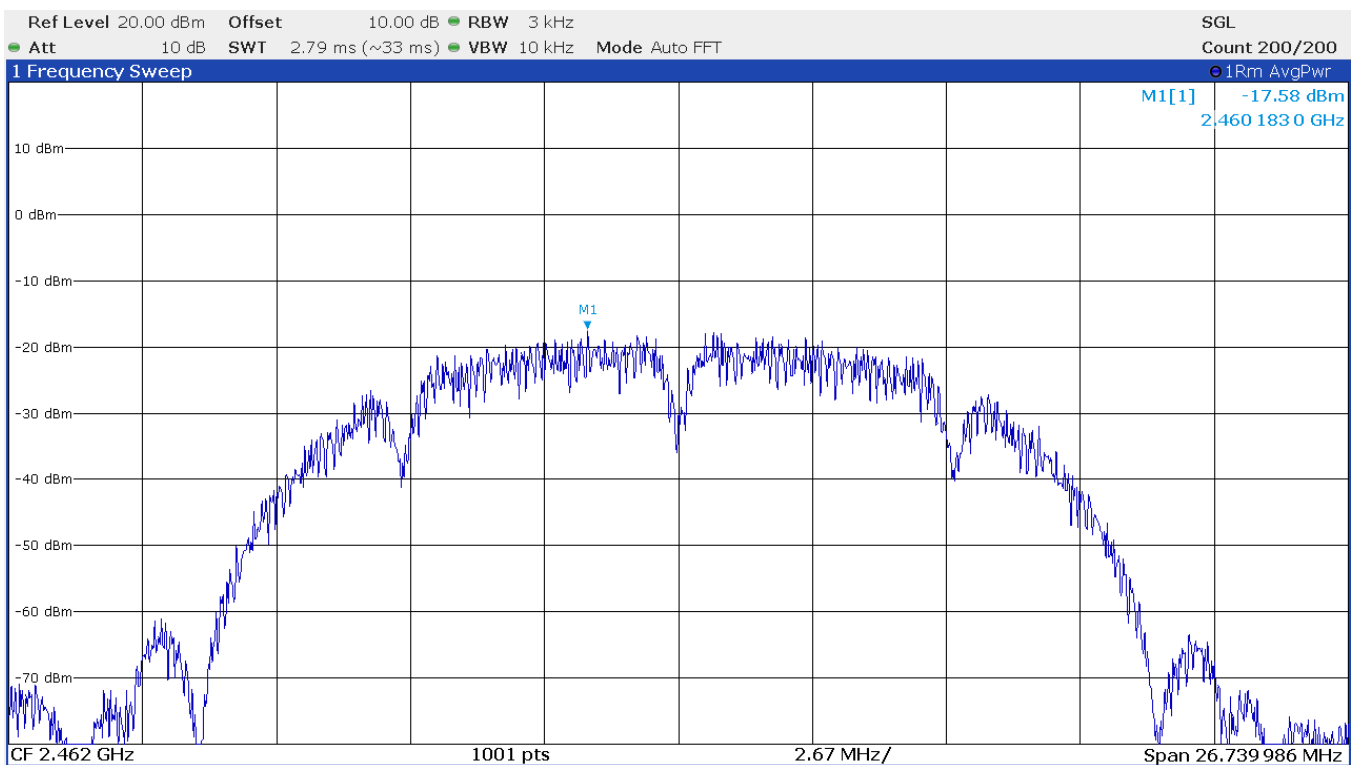
5.5.3 Test results (DTS maximum PSD level in the fundamental emission)

Ambient temperature:	22 °C - 23 °C
Relative humidity:	41 % - 61 %

Date:	19.09.2025 / 23.09.2025
Tested by:	P. NEUFELD

5.5.3.1 Maximum average PSD

Worst case plot (operation mode 6):



Remark: The external attenuation was accounted for by the offset at the spectrum analyzer.

The result table is presented on the following page.

Result table average PSD:

Operation mode	Result [dBm/3 kHz]	Limit [dBm/3 kHz]
4	-17.8	8.0
5	-17.6	8.0
6	-17.6	8.0
10	-22.6	8.0
11	-22.4	8.0
12	-22.6	8.0
13	-23.7	8.0
14	-23.7	8.0
15	-23.9	8.0
16	-26.5	8.0
17	-26.6	8.0
18	-26.8	8.0
19	-20.5	8.0
20	-20.6	8.0
21	-20.7	8.0
28	-19.9	8.0
29	-20.1	8.0
30	-20.3	8.0
34	-33.4	8.0
35	-33.1	8.0
36	-33.3	8.0
45	-19.3	8.0
46	-19.8	8.0
47	-19.4	8.0

Test result: Passed

Test equipment (please refer to chapter 7 for details)
1

5.6 DTS band-edge emission measurements

5.6.1 Test setup (Band edge – unrestricted bands)

Test setup (Band edge – unrestricted bands)			
Used	Setup	See sub-clause	Comment
☐	Radiated: 1 GHz to 40 GHz	5.1.3	-
☒	Conducted: Antenna port	5.1.5	-

5.6.2 Test method (Band edge – unrestricted bands)

Test method (Band edge – unrestricted bands)				
Used	Sub-Clause [1]	Name of method	Applicability	Comment
☐	11.11.	20 dBc (Peak)	Peak power	*1
☒	11.11.	30 dBc (Average)	RMS power	*2

*1 As declared in "47 CFR 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

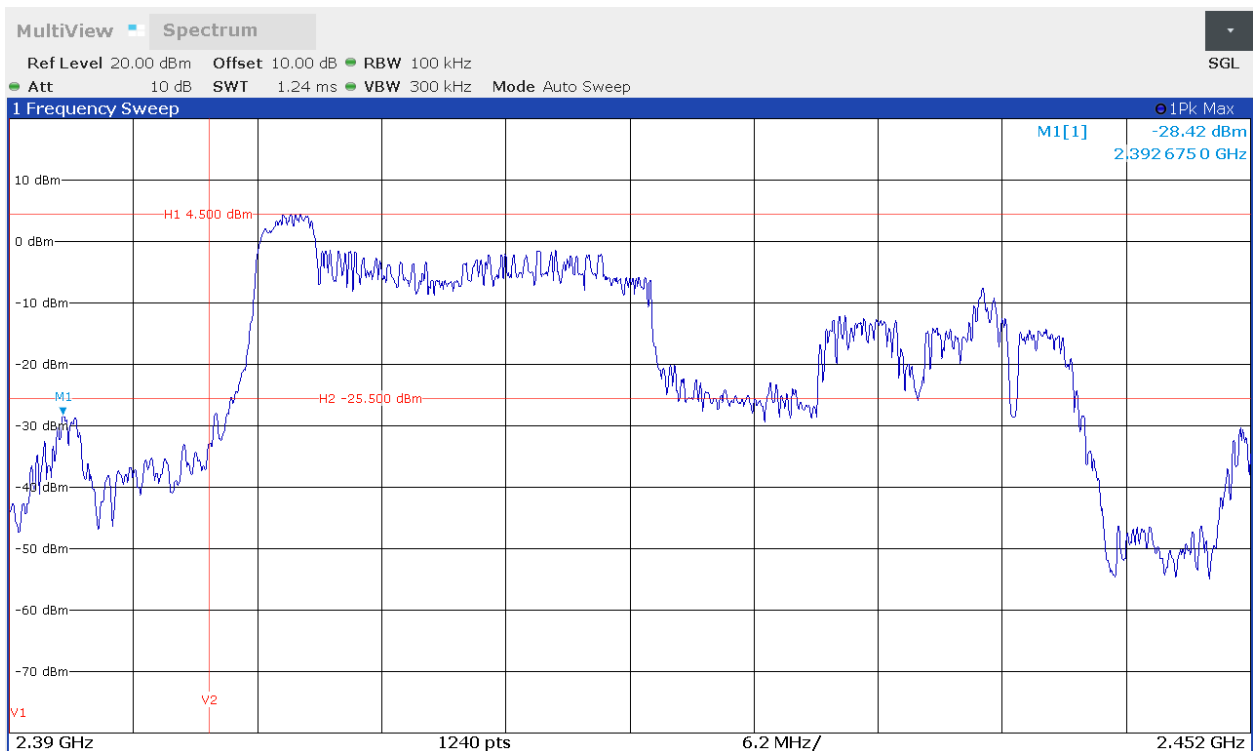
*2 If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

5.6.3 Test results (Band edge – unrestricted bands)

Ambient temperature:	22 °C - 23 °C
Relative humidity:	41 % - 61 %

Date:	19.09.2025 / 23.09.2025
Tested by:	P. NEUFELD

Worst case plot lower band edge (operation mode 37):



Result table lower band edge:

Mode	Frequency [MHz]	Reference [dB(μV/m)]	Limit [dB(μV/m)]	Unrestricted band emission [dB(μV/m)]	Margin [dB]
4	2399.417	2.1	-27.9	-49.1	21.2
7	2399.487	-1.8	-31.8	-39.1	7.3
13	2399.740	-2.6	-32.6	-47.9	15.3
16	2391.975	-4.7	-34.7	-50.2	15.5
19	2399.333	-3.6	-33.6	-50.1	16.5
22	2399.649	4.1	-25.9	-32.3	6.4
34	2395.025	-8.4	-38.4	-49.7	11.3
37	2392.675	4.5	-25.5	-28.4	2.9

Test result: Passed

Test equipment (please refer to chapter 7 for details)
1

5.7 DTS band-edge emission measurements

5.7.1 Test setup (Band edge – restricted bands)

Test setup (Band edge – restricted bands)			
Used	Setup	See sub-clause	Comment
☒	Radiated: 1 GHz to 40 GHz	5.1.3	-
☐	Conducted: Antenna port	5.1.5	-

5.7.2 Test method (Band edge – restricted bands)

Test method (Band edge – restricted bands)				
Used	Sub-Clause [1]	Name of method	Applicability	Comment
☒	11.12.1	Standard method	No limitations	-
☐	11.12.3.1	Marker-delta method	-	See 6.10.6 [3] 2 MHz from band
☐	11.12.3.2	Integration method	-	2 MHz from band

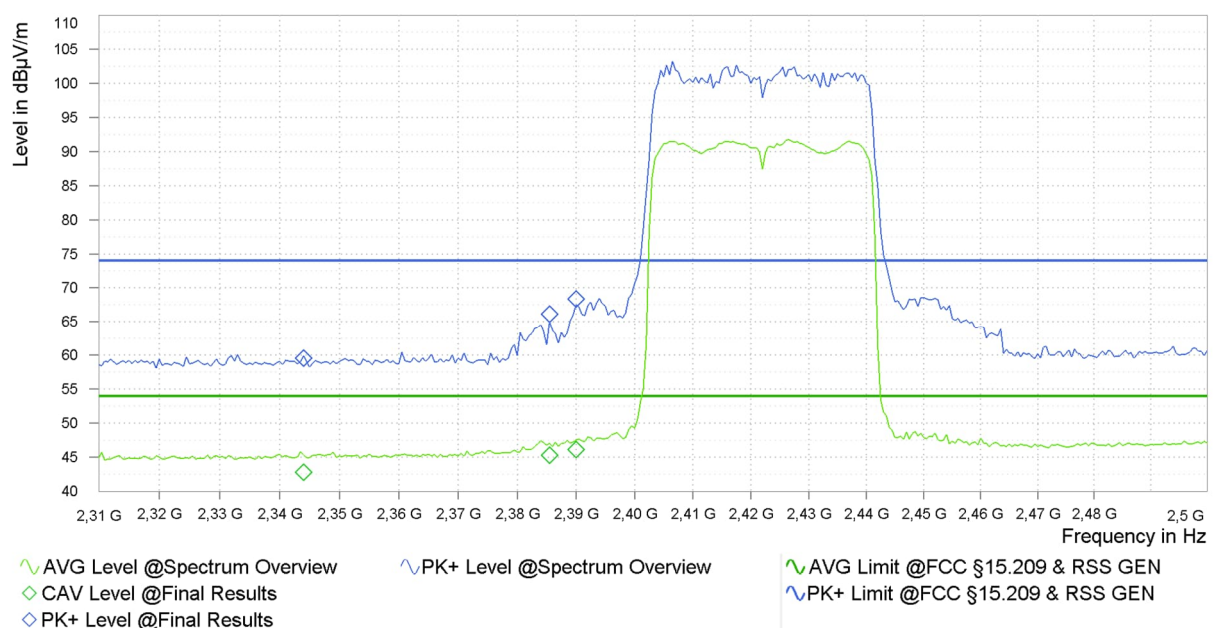
Only the worst cases as pre-tests have shown were tested.

5.7.3 Test results (Band edge – restricted bands) - radiated

Ambient temperature:	22 °C
Relative humidity:	29 % - 35 %

Date:	26.03.2025 / 25.09.2025
Tested by:	P. NEUFELD / D. BRUSCHINSKI

Worst case plot lower band edge (operation mode 48):

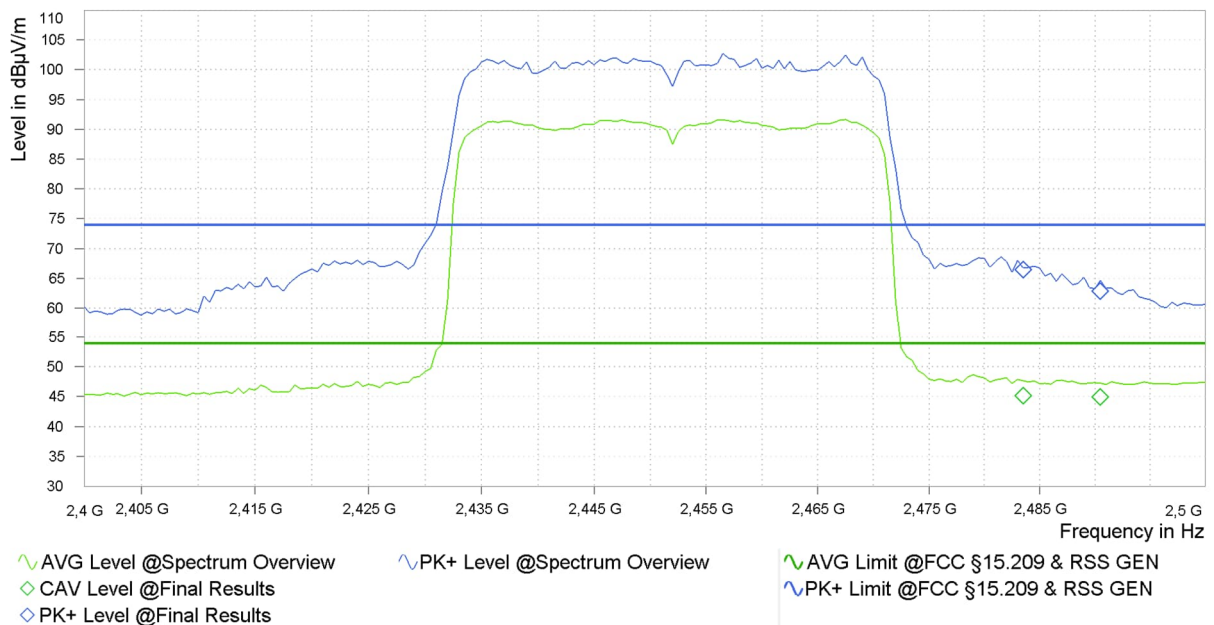


Result tables lower band edge:

Operation mode 48:

Frequency [MHz]	PK Level [dBμV/m]	PK Limit [dBμV/m]	PK Margin [dB]	AV Level [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Correction [dB/m]	Pol.	Elevation [deg]	Azimuth [deg]	Antenna Height [m]
2344.000	59.55	74.00	14.45	42.75	54.00	11.25	34.49	H	81	12	1.50
2385.500	66.15	74.00	7.85	45.24	54.00	8.76	34.46	V	33	308	1.50
2390.000	68.39	74.00	5.61	46.09	54.00	7.91	34.46	V	18	320	1.50

Worst case plot upper band edge (operation mode 50)



Result tables upper band edge:

Operation mode 50:

Frequency [MHz]	PK Level [dBμV/m]	PK Limit [dBμV/m]	PK Margin [dB]	AV Level [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Correction [dB/m]	Pol.	Elevation [deg]	Azimuth [deg]	Antenna Height [m]
2483.500	66.47	74.00	7.53	45.17	54.00	8.83	34.55	V	351	250	1.50
2490.500	62.82	74.00	11.18	44.90	54.00	9.10	34.57	H	78	258	1.50

Test result: Passed

Test equipment (please refer to chapter 7 for details)
2 - 10

5.8 Radiated emissions

5.8.1 Test setup (Maximum unwanted emissions)

Test setup (Maximum unwanted emissions)			
Used	Setup	See sub-clause	Comment
☒	Radiated: 9 kHz to 30 MHz / 30 MHz to 1 GHz / 1 GHz to 40 GHz	5.1.1 / 5.1.2 / 5.1.3	-
☐	Conducted: Antenna port	5.1.4	-

5.8.2 Test method (Maximum unwanted emissions)

☒ Test method (radiated) see sub-clause 5.1.1 to 5.1.3 as described herein

5.8.3 Test results (Maximum unwanted emissions)

5.8.3.1 Test results preliminary measurement 9 kHz to 30 MHz

Ambient temperature:	22°C	Date:	27.08.2025 / 28.03.2025
Relative humidity:	35 %	Tested by:	P. NEUFELD

Position of EUT: For tests for f between 9 kHz to 30 MHz, the EUT was set-up on a table with a height of 80 cm. The distance between EUT and antenna was 3 m.

Cable guide: For detail information of test set-up and the cable guide refer to the pictures in the annex A in the test report.

Test record: The measurement value was already corrected by 40 dB/decade as described in 47 CFR 15.31(f)(2) regarding to the measurement distance as requested in 47 CFR 15.209(a)

Remark: Only the nominal position and the worst-case data rate as pretests have shown was tested.

Calculations:

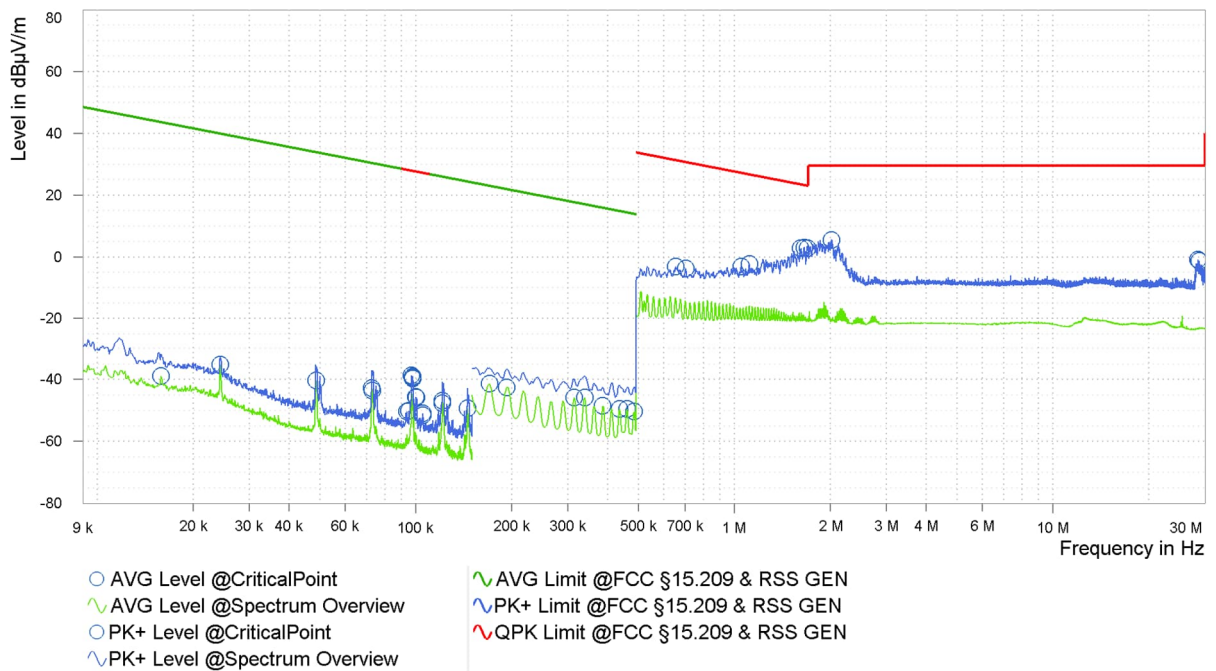
Result @ norm. dist. [dBμV/m] = Reading [dBμV] + AF [dB/m] + Distance corr. fact. [dBμV/m]

Result @ norm. dist. [dBμA/m] = Result @ norm. dist. [dBμV/m] – 20 x log₁₀ (377 Ω)

Margin [dB] = Limit [dB(μV|μA)/m] - Result [dB(μV|μA)/m]

Worst case plot:

Spurious emissions from 9 kHz to 30 MHz (operation mode 3):



Remark: No emissions closer than 20 dB to the limit, so no final measurement will be carried out.

Test result: Passed

Test equipment (please refer to chapter 7 for details)

3 - 5, 7 - 9, 11

5.8.3.2 Test results (30 MHz – 1 GHz)

Ambient temperature:	22 °C
Relative humidity:	35 %

Date:	27.03.2025 / 28.03.2025
Tested by:	P. NEUFELD

Position of EUT: For tests for f between 30 MHz to 1 GHz, the EUT was set-up on a table with a height of 80 cm. The distance between EUT and antenna was 3 m.

Cable guide: For detail information of test set-up and the cable guide refer to the pictures in the annex A in the test report.

Test record: Plots for each frequency range are submitted below.

Remark: Only the nominal position and the worst-case data rate as tests have shown was tested.

Calculations:

Result [dBμV/m] = Reading [dBμV] + Correction [dB/m]

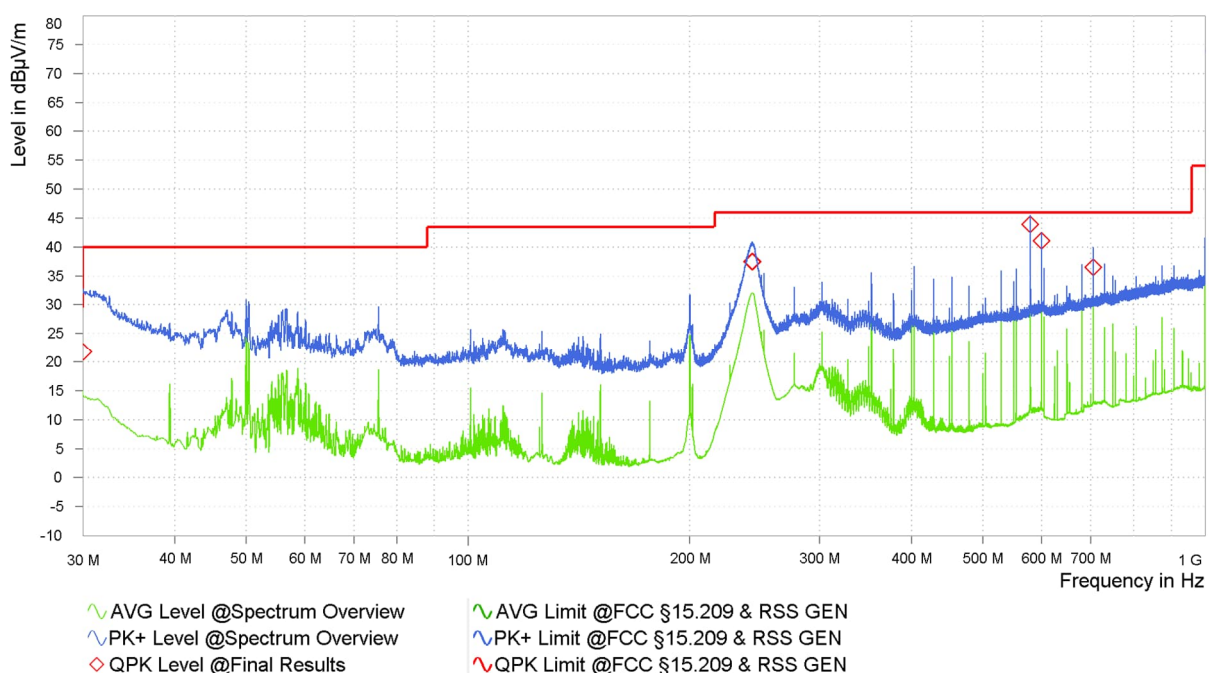
Correction [dB/m] = AF [dB/m] + Cable attenuation [dB] + optional preamp gain [dB]

Margin [dB] = Limit [dBμV/m] - Result [dBμV/m]

The measured points and the limit line in the following diagram refer to the standard measurement of the emitted interference in compliance with the above-mentioned standard. The measured points marked with “◇” are the measured results of the standard subsequent measurement in a semi-anechoic chamber.

Worst case plot:

Spurious emissions from 30 MHz to 1 GHz (operation mode 2):



Result tables:

Operation mode 1:

Frequency [MHz]	Result (QP) [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Correction [dB/m]	Polarization (H/V)	Azimuth [deg]	Antenna height [m]
31.310	22.07	40.00	17.93	25.84	V	10	1.01
242.680	37.49	46.00	8.51	16.99	H	-6	1.00
243.040	37.53	46.00	8.47	16.99	H	-11	1.00
579.610	43.82	46.00	2.18	25.47	H	156	1.03
600.010	40.92	46.00	5.08	25.76	H	207	1.01
705.610	38.27	46.00	7.73	27.20	V	61	1.34

Operation mode 2:

Frequency [MHz]	Result (QP) [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Correction [dB/m]	Polarization (H/V)	Azimuth [deg]	Antenna height [m]
30.040	21.79	40.00	18.21	26.63	V	-15	1.00
242.780	37.49	46.00	8.51	16.99	H	-11	1.00
243.490	37.50	46.00	8.50	17.00	H	-7	1.00
579.610	43.93	46.00	2.07	25.47	H	156	1.03
600.010	41.06	46.00	4.94	25.76	H	207	1.01
705.610	36.53	46.00	9.47	27.20	H	156	1.00

Operation mode 3:

Frequency [MHz]	Result (QP) [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Correction [dB/m]	Polarization (H/V)	Azimuth [deg]	Antenna height [m]
30.550	20.98	40.00	19.02	26.32	V	-15	1.00
243.010	37.53	46.00	8.47	16.99	H	-11	1.00
243.490	37.49	46.00	8.51	17.00	H	-11	1.00
579.610	43.87	46.00	2.13	25.47	H	156	1.03
600.010	41.13	46.00	4.87	25.76	H	208	1.01
705.610	37.02	46.00	8.98	27.20	V	160	1.01

Test result: Passed

Test equipment (please refer to chapter 7 for details)
3 - 9, 12 - 13

5.8.3.3 Test results (radiated 1 GHz to 26.5 GHz)

Ambient temperature:	22 °C
Relative humidity:	35 %

Date:	27 – 28.03.2025
Tested by:	P. NEUFELD

Position of EUT: For tests for f between 1 GHz and the 10th harmonic, the EUT was set-up on a positioner device with a height of 150 cm. The distance between EUT and antenna was 3 m.

Cable guide: For detail information of test set-up and the cable guide refer to the pictures in the annex A in the test report.

Test record: Plots for each frequency range are submitted below.

Remark: Only the worst-case data rate as pre-tests have shown was tested.
All emissions were tested using restricted band limits, because these limits are the worst-case and would also below the unrestricted band limits.

Calculation:

Max Peak [dBμV/m] = Reading [dBμV] + Correction [dB/m]

Average [dBμV/m] = Reading [dBμV] + Correction [dB/m]

Correction [dB/m] = AF [dB/m] + Cable attenuation [dB] + optional preamp gain [dB] + DCCF* [dB]
* (if applicable – only for Average values, that are fundamental related)

Margin [dB] = Limit [dBμV/m] – Max Peak | Average [dBμV/m]

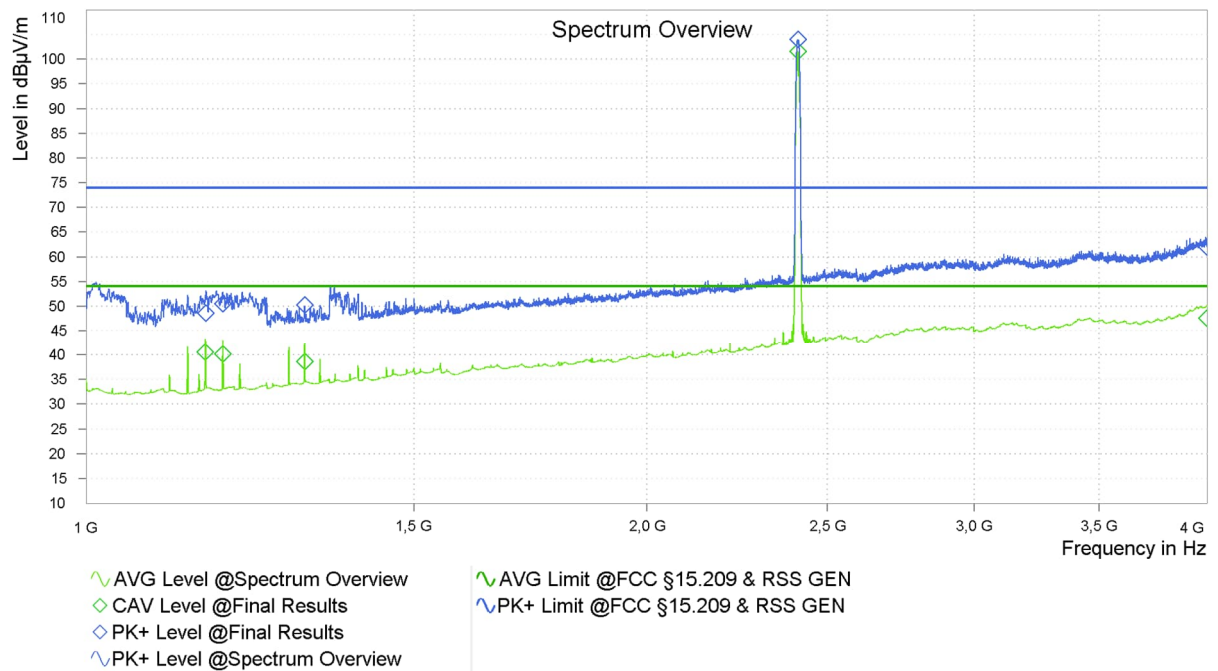
The curves in the diagram only represent the maximum measured value for each frequency point of all preliminary measurements, which were carried out with various EUT and antenna positions.

The top measured curve represents the peak measurement. The measured points marked with "◇" are frequency points for the final peak detector measurement. These values are indicated in the following table. The bottom measured curve represents the average measurement. The measured points marked with "◊" are frequency points for the final average detector measurement.

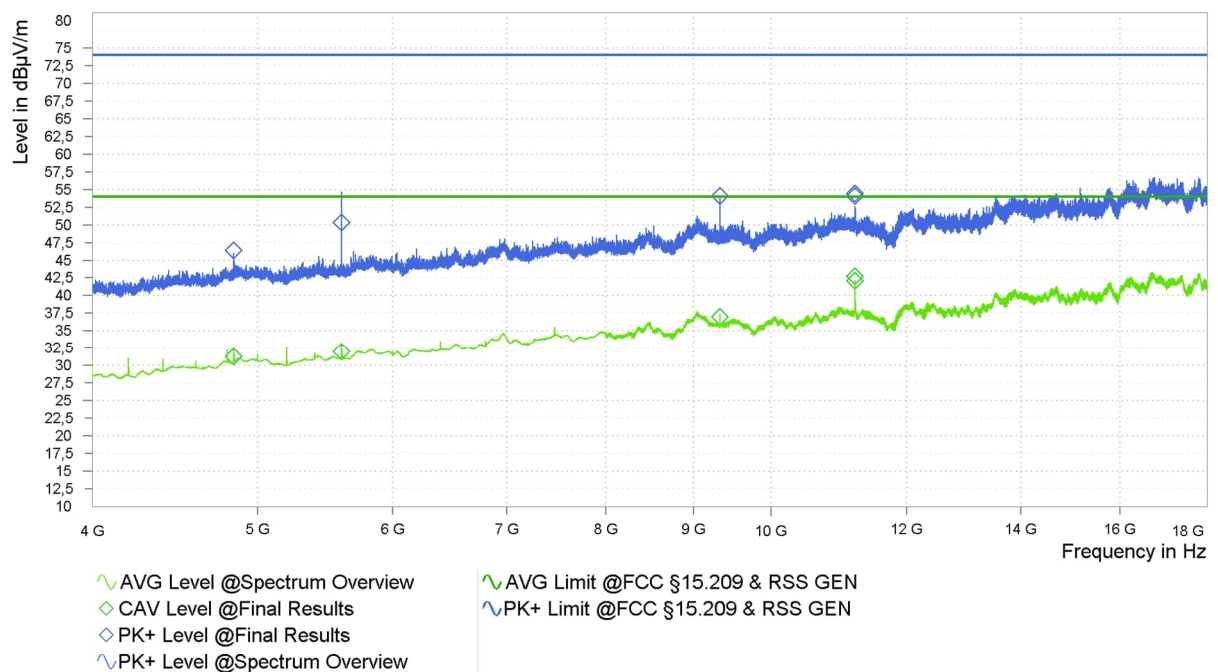
The measurement results are presented on the following pages.

Worst case plots:

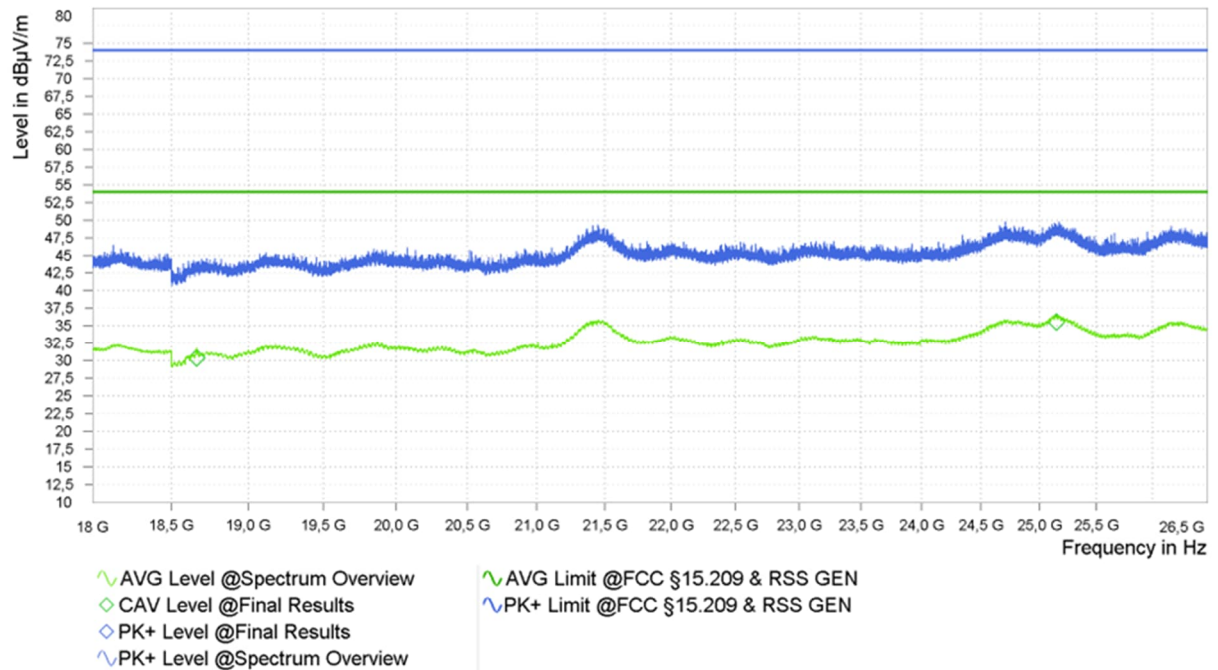
Spurious emissions from 1 GHz to 4 GHz (operation mode 1):



Spurious emissions from 4 GHz to 18 GHz (operation mode 41):



Spurious emissions from 18 GHz to 26.5 GHz (operation mode 1):



The result tables are presented on the following page.

Result tables:

Operation mode 1:

Frequency [MHz]	PK Level [dBμV/m]	PK Limit [dBμV/m]	PK Margin [dB]	AV Level [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Correction [dB/m]	Pol.	Elevation [deg]	Azimuth [deg]	Antenna Height [m]
1159.250	-	-	-	40.59	54.00	13.41	26.67	H	75	198.2842	1.50
1159.750	48.62	74.00	25.38	-	-	-	26.69	H	84	198	1.50
1184.250	50.48	74.00	23.52	-	-	-	26.64	H	84	187	1.50
1184.500	-	-	-	40.16	54.00	13.84	26.64	H	102	192	1.50
1310.500	-	-	-	38.57	54.00	15.43	27.64	V	-5	190	1.50
1310.500	50.22	74.00	23.78	-	-	-	27.64	V	-15	187	1.50
2412.750				101.56	Fundamental		34.49	V	36	283	1.50
2412.750	103.94	Fundamental		-	-	-	34.49	V	35	283	1.50
3998.500	-	-	-	47.50	54.00	6.50	40.06	H	156	32	1.50
3998.500	61.99	74.00	12.01	-	-	-	40.06	H	155	35	1.50
4824.000	45.02	74.00	28.98	35.10	54.00	18.90	8.65	H	120	250	1.50
5598.250	50.44	74.00	23.56	31.58	54.00	22.42	9.98	H	30	236	1.50
5600.000	53.94	74.00	20.06	32.97	54.00	21.03	9.97	H	60	160	1.50
11193.750	54.30	74.00	19.70	40.93	54.00	13.07	19.61	H	30	232	1.50
11196.000	53.97	74.00	20.03	42.25	54.00	11.75	19.59	H	30	233	1.50
19296.000	-	-	-	31.65	54.00	22.35	12.41	H	0	255	1.50
25149.250	-	-	-	35.25	54.00	18.75	13.81	H	90	-6	1.50

Operation mode 2:

Frequency [MHz]	PK Level [dBμV/m]	PK Limit [dBμV/m]	PK Margin [dB]	AV Level [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Correction [dB/m]	Pol.	Elevation [deg]	Azimuth [deg]	Antenna Height [m]
1184.500	-	-	-	31.91	54.00	22.09	26.64	V	165	254	1.50
2436.000	104.42	Fundamental		-	-	-	34.59	V	7	296	1.50
2437.750	-	-	-	101.85	Fundamental		34.60	V	7	297	1.50
3953.500	61.92	74.00	12.08	-	-	-	39.94	V	153	367	1.50
4000.000	-	-	-	46.85	54.00	7.15	40.07	H	51	7	1.50
4874.000	46.26	74.00	27.74	37.18	54.00	16.82	8.76	H	150	158	1.50
4874.000	45.37	74.00	28.63	35.94	54.00	18.06	8.76	H	150	164	1.50
5596.750	47.43	74.00	26.57	30.92	54.00	23.08	9.99	H	30	242	1.50
9330.500	52.66	74.00	21.34	37.66	54.00	16.34	16.49	V	60	159	1.50
11195.500	54.51	74.00	19.49	42.69	54.00	11.31	19.60	H	30	231	1.50
11196.000	54.34	74.00	19.66	42.74	54.00	11.26	19.59	H	30	232	1.50
18660.250	-	-	-	30.11	54.00	23.89	12.37	V	120	332	1.50
25152.750	-	-	-	35.24	54.00	18.76	13.81	V	120	71	1.50

Operation mode 3:

Frequency [MHz]	PK Level [dBμV/m]	PK Limit [dBμV/m]	PK Margin [dB]	AV Level [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Correction [dB/m]	Pol.	Elevation [deg]	Azimuth [deg]	Antenna Height [m]
1184.500	-	-	-	39.49	54.00	14.51	26.64	H	81	200	1.50
2462.750	-	-	-	101.52	Fundamental		34.59	V	2	295	1.50
2463.000	104.26	Fundamental		-	-	-	34.59	V	5	296	1.50
3991.500	61.55	74.00	12.45	-	-		40.04	V	118	353	1.50
3996.750	-	-	-	47.50	54.00	6.50	40.06	V	105	109	1.50
4924.000	45.89	74.00	28.11	37.05	54.00	16.95	9.01	H	120	160	1.50
4924.000	45.78	74.00	28.22	37.57	54.00	16.43	9.01	H	120	158	1.50
5434.500	43.93	74.00	30.07	30.49	54.00	23.51	10.00	V	120	46	1.50
5598.000	44.53	74.00	29.47	32.28	54.00	21.72	9.98	H	150	143	1.50
9328.250	49.06	74.00	24.94	36.25	54.00	17.75	16.47	V	60	219	1.50
11194.000	54.01	74.00	19.99	41.21	54.00	12.79	19.61	H	30	232	1.50
11196.250	54.76	74.00	19.24	43.06	54.00	10.94	19.59	H	30	231	1.50
18661.000	-	-	-	30.37	54.00	23.63	12.37	V	120	153	1.50
25148.000	-	-	-	35.53	54.00	18.47	13.82	V	90	143	1.50

Operation mode 4:

Frequency [MHz]	PK Level [dBμV/m]	PK Limit [dBμV/m]	PK Margin [dB]	AV Level [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Correction [dB/m]	Pol.	Elevation [deg]	Azimuth [deg]	Antenna Height [m]
4841.250	46.35	74.00	27.65	31.24	54.00	22.76	8.69	V	60	158	1.50
5598.750	50.33	74.00	23.67	31.99	54.00	22.01	9.98	H	120	158	1.50
9331.250	54.06	74.00	19.94	36.99	54.00	17.01	16.49	H	0	224	1.50
11195.000	54.05	74.00	19.95	42.06	54.00	11.94	19.60	H	30	236	1.50
11196.250	54.42	74.00	19.58	42.73	54.00	11.27	19.59	H	30	232	1.50

Test result: Passed

Test equipment (please refer to chapter 7 for details)
2 - 10, 14 – 17

5.9 AC power-line conducted emissions

5.9.1 Test setup (Conducted emissions on power supply lines)

Test setup (Conducted emissions on power supply lines)			
Used	Setup	See sub-clause	Comment
☒	Conducted: AC power line	5.1.5	-

5.9.2 Test method (Conducted emissions on power supply lines)

Test setup (Conducted emissions on power supply lines)				
Used	Clause [3]	Name of method	Sub-clause	Comment
☒	6.2.3.2	Tabletop equipment testing	-	AC power adaptor *
☐	6.2.3.3	Floor-standing equipment testing	-	-

* The AC power adaptor as declared in clause 1.5.1 of this test report was used for the tests.
The power adaptor was supplied by 120V_{AC} 60Hz.

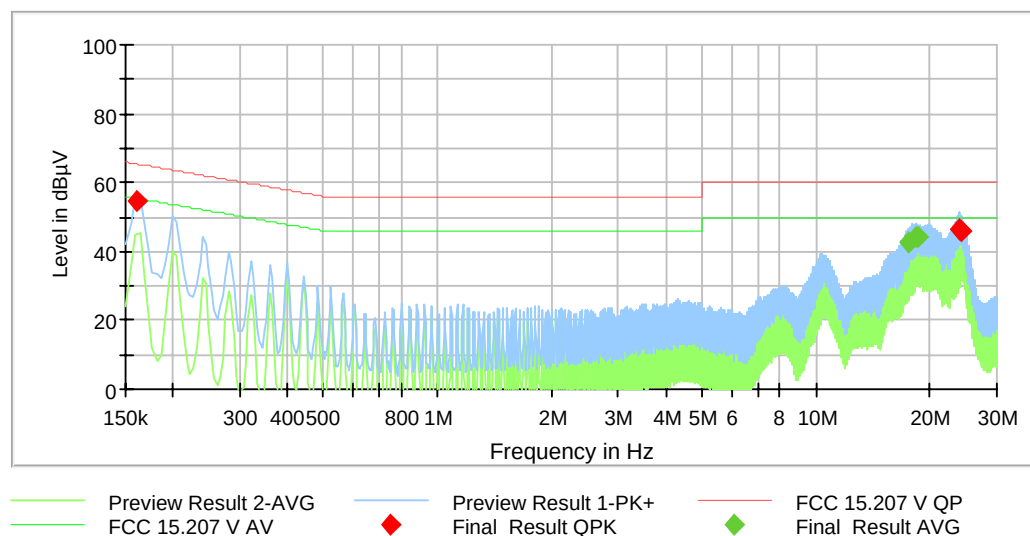
5.9.3 Test results (Conducted emissions on power supply lines)

Ambient temperature:	21.6 °C
Relative humidity:	28 %

Date:	06.05.2025
Tested by:	B. ROHDE

The curves in the diagrams below only represent for each frequency point the maximum measured value of all preliminary measurements which were made for each power supply line. The top measured curve represents the peak measurement and the bottom measured curve the average measurement. The quasi-peak measured points are marked by ◆ and the average measured points by ◆.

Operation mode 1 was tested.



Frequency [MHz]	QuasiPeak [dB(μV)]	Average [dB(μV)]	Limit [dB(μV)]	Margin [dB]	Line	PE	Corr. [dB]
0.160800	54.78	---	65.42	10.65	L1	GND	9.8
17.633400	---	42.59	50.00	7.41	L1	GND	10.9
18.437100	---	44.25	50.00	5.75	L1	GND	10.9
18.556800	---	44.34	50.00	5.66	L1	GND	10.9
23.902800	46.45	---	60.00	13.55	N	GND	11.0
24.099900	45.84	---	60.00	14.16	N	GND	11.1

Test result: Passed

Test equipment (please refer to chapter 7 for details)
18 - 23

6 Measurement Uncertainties

Conducted measurements		
Measurement method	Standard used for calculating measurement uncertainty	Expanded measurement uncertainty (95 %) U_{lab}
Frequency error	ETSI TR 100 028	4.5×10^{-8}
Bandwidth measurements	-	9.0×10^{-8}
Conducted emissions using a spectrum analyzer		
< 3.6 GHz	ETSI TR 100 028	2.3 dB
3.6 – 8 GHz	ETSI TR 100 028	2.8 dB
8 – 22 GHz	ETSI TR 100 028	3.2 dB
22 – 40 GHz	ETSI TR 100 028	3.6 dB
Power measurements		
Power meter	ETSI TR 100 028	0.9 dB
Conducted emissions from 150 kHz to 30 MHz with LISN		
	CISPR 16-4-2	2.8 dB

Radiated measurements		
Frequency error		
(Semi-) Anechoic chamber	ETSI TR 100 028	4.5×10^{-8}
OATS	ETSI TR 100 028	4.5×10^{-8}
Test fixture	ETSI TR 100 028	4.5×10^{-8}
Bandwidth measurements		
(Semi-) Anechoic chamber	-	9.0×10^{-8}
OATS	-	9.0×10^{-8}
Test fixture	-	9.1×10^{-8}
Radiated field strength M20		
CBL6112B @ 3 m 30 MHz – 1 GHz	CISPR 16-4-2	5.3 dB
R&S HL050 @ 3 m		
1 – 6 GHz	CISPR 16-4-2	5.1 dB
6 – 18 GHz	CISPR 16-4-2	5.4 dB
Flann Standard Gain Horns 12 – 40 GHz	-	5.9 dB
Radiated field strength M276		
R&S HL562E @ 3 m 30 MHz – 1 GHz	CISPR 16-4-2	4.8 dB
R&S HL050 @ 3 m	-	
1 – 6 GHz	CISPR 16-4-2	5.1 dB
6 – 18 GHz	CISPR 16-4-2	5.4 dB
Flann Standard Gain Horns 12 – 40 GHz	-	5.9 dB
OATS		
Field strength measurements below 30 MHz on OATS without ground plane	-	4.4 dB

7 Test Equipment used for Tests

No.	Test equipment	Type	Manufacturer	Serial No.	PM. No.	Cal. Date	Cal Due
1	Signal & spectrum analyser	FSW43	Rohde & Schwarz	100586 & 100926	481720	07.05.2024	05.2026
2	Log.-per. antenna	HL050	Rohde & Schwarz	100908	482977	22.09.2022	09.2025
3	EMC test software	Elektra V5.05.00	Rohde & Schwarz	-	483755	Calibration not necessary	
4	RF switch matrix	OSP220	Rohde & Schwarz	101391	482976	Calibration not necessary	
5	Turntable	TT3.0-3t	Maturo	825/2612/.01	483224	Calibration not necessary	
6	Antenna support	BAM 4.5-P-10kg	Maturo	222/2612.01	483225	Calibration not necessary	
7	Controller	NCD	Maturo	474/2612.01	483226	Calibration not necessary	
8	Semi anechoic chamber M276	SAC5-2	Albatross Projects	C62128-A540-A138-10-0006	483227	Calibration not necessary	
9	EMI test receiver	ESW44	Rohde & Schwarz	101828	482979	21.02.2024	02.2026
10	Positioner	TG1.5-10kg	Maturo	110/2648.01	483042	Calibration not necessary	
11	Loop antenna	HFH2-Z2	Rohde & Schwarz	832609/014	480059	21.02.2024	02.2026
12	Attenuator 6 dB	WA2-6	Weinschel	8254	410119	Calibration not necessary	
13	Ultralog antenna	HL562E	Rohde & Schwarz	101079	482978	24.04.2024	04.2027
14	Low noise amplifier 100 MHz - 18 GHz	LNA-30-00101800-25-10P	Narda-Miteq	2110917	482967	20.02.2024	02.2026
15	Low noise amplifier 18 GHz - 26.5 GHz	LNA-30-18002650-20-10P	Narda-Miteq	2110911	482969	19.02.2024	02.2026
16	Standard gain horn 18 GHz - 26 GHz	20240-20	Flann	266399	483026	Calibration not necessary	
17	High-pass filter	WHKX4.0/18G-8SS	Wainwright	1	480587	Calibration not necessary	
18	LISN	NSLK8128	Schwarzbeck	8128161	480138	28.02.2024	02.2026
19	AC power supply	AC6803A AC Quelle 2000VA	Keysight	JPVJ002509	482350	Calibration not necessary	
20	Software	EMC32	Rohde & Schwarz	100061	481022	Calibration not necessary	
21	Shielded chamber M4	B83117-S1-X158	Siemens	190075	480088	Calibration not necessary	
22	EMI receiver / Spectrum analyser	ESIB 26	Rohde & Schwarz	100292	481182	22.02.2024	02.2026
23	Transient filter limiter	CFL 9206A	Teseq	38268	481982	28.03.2024	03.2026

8 Test site Verification

Test equipment	PM. No.	Frequency range	Type of validation	According to	Val. Date	Val Due
Shielded chamber M4	480088	9 kHz – 30 MHz	GND-Plane	ANSI C63.4-2014	08.11.2022	07.11.2025
Semi anechoic chamber M276	483227	30 – 1000 MHz	NSA	ANSI C63.4-2014 ANSI C63.4a-2017	01.03.2023	28.02.2026
Semi anechoic chamber M276	483227	1 -18 GHz	SVSWR	CISPR 16-1-4 + Cor1:2010 + A1:2012 +A2:2017	28.02.2023	27.02.2026

9 Report History

Report Number	Date	Comment
F241004E17	01.10.2025	Initial Test Report
-	-	-
-	-	-

10 List of Annexes

Annex A

Test Setup Photos

8 pages

----- end of test report -----