

Test Report

Report Number:

F251065E4

Equipment under Test (EUT):

ISC-BDL2-WP12G

Applicant:

Radionix LLC

Manufacturer:

Keenfinity S.A.



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 for Compliance Testing of Transmitters Used in Licensed Radio Services
(The errata is not in accreditation scope of the laboratory yet)
- [2] **FCC CFR 47 Part 15**, Radio Frequency Devices
- [3] **RSS-210 Issue 11 – June 2024**, Licence-Exempt Radio Apparatus: Category I Equipment
- [4] **RSS-Gen Issue 5 – April 2018 + Amendment 1 – March 2019 + Amendment 2 – February 2021**, 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 clause 1.4 of ANSI C63.10 (2020). However, the measurement uncertainty is calculated and shown in this test report.

Tested and
written by:

Signature

Reviewed and
approved by:

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.

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1 Identification

1.1 Applicant

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eMail Address:	peter.namismak@keenfinity-group.com
Applicant represented during the test by the following person:	---

1.2 Manufacturer

Name:	Keenfinity S.A.
Address:	EN109/IC1, Zona Industrial de Ovar Lugar da Pardala - S. João de Ovar 3880-728 Ovar
Country:	Portugal
Name for contact purposes:	Mr. Antonio PEREIRA
Phone:	+351 256 596 - 110
eMail Address:	AntonioMaria.Pereira@keenfinity-group.com
Manufacturer represented during the test by the following person:	---

1.3 Test laboratory

The tests were carried out at: **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 ISSED# 3469A.

1.4 EUT (Equipment Under Test)

Test object: *	Blue Line Gen 2 Combined PIR/Microwave Motion Detector
PMN: *	BLG2
HVIN: *	ISC-BDL2-WP12G
FCC ID: *	T3X-BLG2B
IC: *	1249A-BLG2B
Serial number: *	042163657328100138
PCB identifier: *	F01U424565_01
Software version / FVIN: *	V3.02
Lowest internal frequency: *	8 MHz

*: Declared by the applicant.

Only one sample was used for testing.

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

Duty cycle: *	<0.5 %		
Receiver category: *	1		
Rated RF output power: *	<20 mW (e.i.r.p.)		
Antenna type:	Integral patch antenna		
Operation frequency range: *	10.500 GHz to 10.550 GHz		
Kind of transmission: *	Unmodulated pulse		
Bit rate of transmitter: *	N/A		
Supply Voltage (EUT): *	U _{Nom} = 12.0 V _{DC}	U _{Min} = 9.0 V _{DC}	U _{Max} = 15.0 V _{DC}
Power Supply: *	External		
Temperature range: *	-20 °C to +55 °C		

*: Declared by the applicant.

Ports/Connectors

Identification	Connector type		Length *
	EUT	Ancillary	
Connection cable (DC _{in} , tamper and NC)	Six pole terminal block	Banana plug	3 m
-	-	-	-

*: Length during test

Equipment used for testing	
AC adapter Enercell CAT. NO. 273-316*1	Used for conducted emissions on power supply lines only
-	-

*1 Provided by the laboratory

1.6 Dates

Date of receipt of test sample:	27.08.2025
Start of test:	01.09.2025
End of test:	02.04.2026

2 Operational states

All tests were carried out with an unmodified sample with integral antenna, which was supplied by an external power supply and operates in normal operation mode. If not otherwise stated, the supply voltage was 12.0 V_{DC}.

The EUT contains a radar transceiver operating with a fixed duty cycle and a passive infrared sensor for movement detection. It is intended to be used in indoor alarm applications.

If not otherwise stated, the tests were carried out in normal position of the EUT as it is stated in the installation instruction.

3 Additional information

None

4 Overview

Application	Frequency range	FCC 47 CFR Part 15 section [2]	RSS-Gen [4] and RSS 210 [3]	Status	Refer page
Bandwidth	10.500 GHz to 10.550 GHz	15.215 (c)	6.7 [4]	Passed	7 et seq.
Band edge compliance	10.500 GHz to 10.550 GHz	15.215 (c)	-	Passed	11 et seq.
Field strength of fundamental	10.500 GHz to 10.550 GHz	15.245 (b)	F.1 (a) [3]	Passed	14 et seq.
Field strength of harmonics	Up to 60 GHz	15.245 (b) (1) (ii)	F.1 (b) [3] F.1 (c) (ii) [3]	Passed	14 et seq.
Emissions outside the specified bands	10 MHz to 60 GHz	15.205 (a), 15.209 (a), 15.245 (3)	8.9 [4] 8.10 [4] F.1 (e) [3]	Passed	14 et seq.
Conducted emissions	150 kHz to 30 MHz	15.207	8.8 [4]	Passed	30 et seq.
Antenna requirement	-	15.203	-	Passed *	-

*: Integrated antenna only, requirement fulfilled.

5 Test results

5.1 Bandwidth

5.1.1 Method of measurement (bandwidth)

The calibration of the spectrum analyser has to be checked with the help of a known signal from a signal generator. The EUT has to be connected to the spectrum analyser via a low loss cable. If the EUT is not equipped with an antenna connector, a temporary antenna connector has to be installed or a test fixture shall be used. Alternatively the measurement could also be carried out with the setup used for the radiated emission measurement. The EUT has to be switched on, the transmitter shall work with its maximum data rate.

The following spectrum analyser settings shall be used:

- Span: App. 2 to 3 times the 20 dB bandwidth, centred on the actual channel.
- Resolution bandwidth: App. 1 % of the emission bandwidth.

The minimum resolution bandwidth shall be set according to the frequency range as follows:

Frequency range	(Min) Resolution Bandwidth
9 kHz – 30 MHz	0.1 kHz
30 MHz – 1000 MHz	1 kHz
Above 1000 MHz	10 kHz

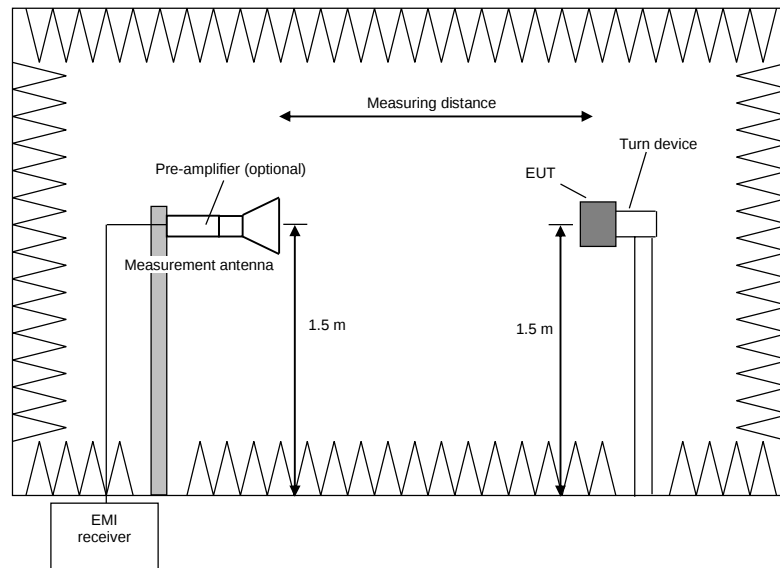
- Video bandwidth: at least three times the RBW.
- Sweep: Auto.
- Detector function: peak.
- Trace mode: Max hold.

20 dB bandwidth:

After trace stabilisation the marker shall be set on the signal peak. The first display line has to be set on this value. The second display line has to be set 20 dB below the first line (or the peak marker). The frequency lines shall be set on the intersection points between the second display line and the measured curve.

99 % bandwidth:

After trace stabilisation the marker shall be set on the signal peak. Use the 99 % bandwidth functionality of the spectrum analyser to integrate the requested bandwidth.



5.1.2 Test results (20 dB bandwidth)

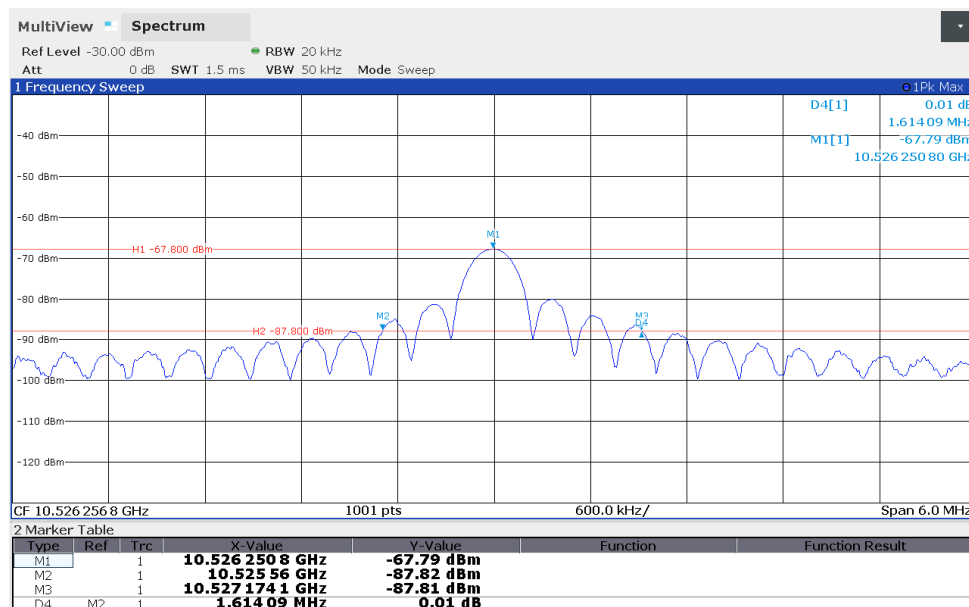
Ambient temperature:	21 °C
Relative humidity:	28 %

Date:	01.04.2026
Tested by:	S. KREHS

Position of EUT: The EUT was set-up 3 m in front of the measuring antenna.

Supply voltage: 12 V_{DC} by an external power supply.

251065_20dB.png: 20 dB bandwidth:



F _L	Limit F _L	F _U	Limit F _U	20 dB Bandwidth	Test result
10.525560	10.500	10.527174	10.550	1.614 MHz	Passed

Test equipment (please refer to chapter 6 for details)
27, 28, 35

5.1.3 Test results (99 % bandwidth)

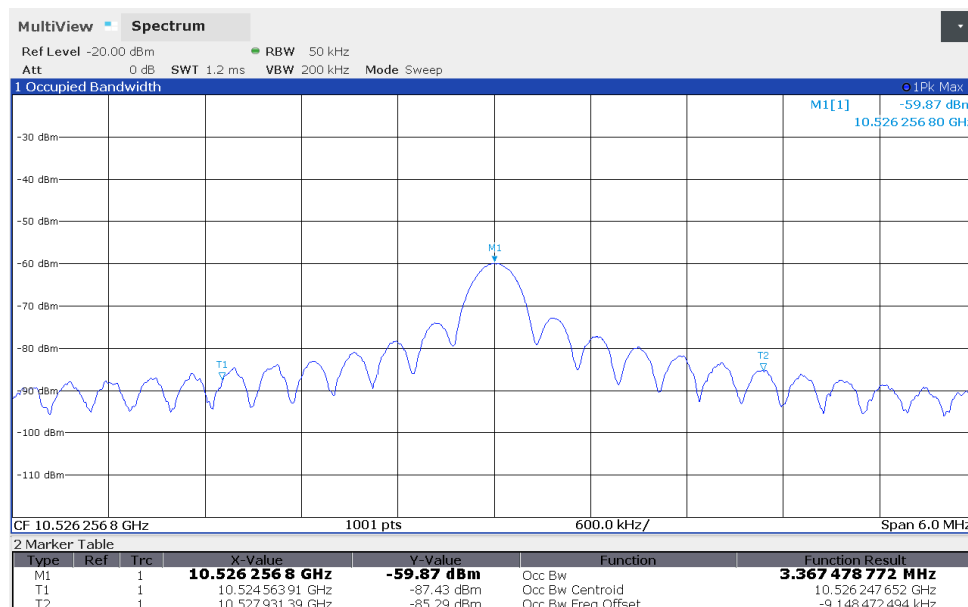
Ambient temperature:	21 °C
Relative humidity:	28 %

Date:	01.04.2026
Tested by:	S. KREHS

Position of EUT: The EUT was set-up 3 m in front of the measuring antenna.

Supply voltage: 12 V_{DC} by an external power supply.

251065_99%.png: 99 % bandwidth:



F _L	Limit F _L	F _U	Limit F _U	99 % Bandwidth	Test result
10.524564	10.500	10.527931	10.550	3.367 MHz	Passed

Test equipment (please refer to chapter 6 for details)
27, 28, 35

5.2 Band-edge compliance

5.2.1 Method of measurement (band-edge compliance)

The same test set-up as used for the final radiated emission measurement shall be used.
The measurements shall be carried out with using a resolution bandwidth of 100 kHz.

The following spectrum analyser settings shall be used:

- Span: Wide enough to capture the peak level of the emission on the channel closest to the band-edge, as well as any modulation products, which fall outside the assigned frequency band.
- Resolution bandwidth: 100 kHz.
- Video bandwidth: $\geq$ the resolution bandwidth.
- Sweep: Auto.
- Detector function: Peak.
- Trace mode: Max hold.

After trace stabilisation the marker shall be set on the signal peak. The display line has to be set 50 dB below the peak marker. The frequency line shall be set on the edge of the assigned frequency band. Set the second marker on the emission at the band-edge, or on the highest modulation product outside of the band, if this level is higher than that at the band-edge. This frequency shall be measured with the EMI receiver as described in subclause 5.3.1 of this test report, but 100 kHz resolution bandwidth shall be used.

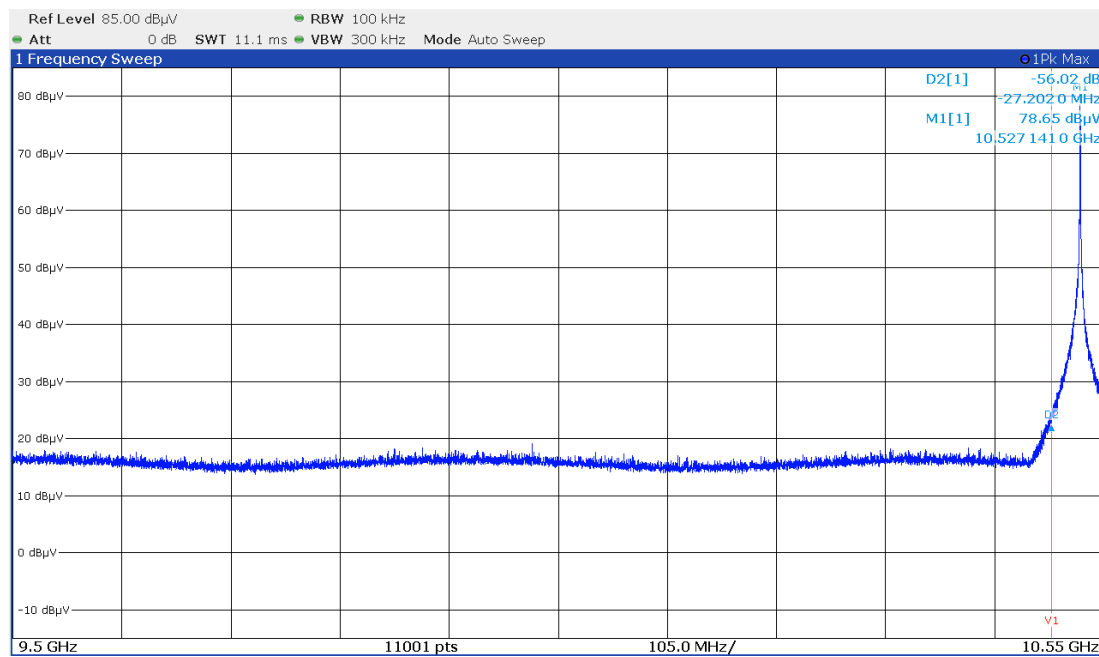
The measurement will be performed at the lower and upper end of the assigned frequency band.

5.2.2 Test results (band-edge compliance)

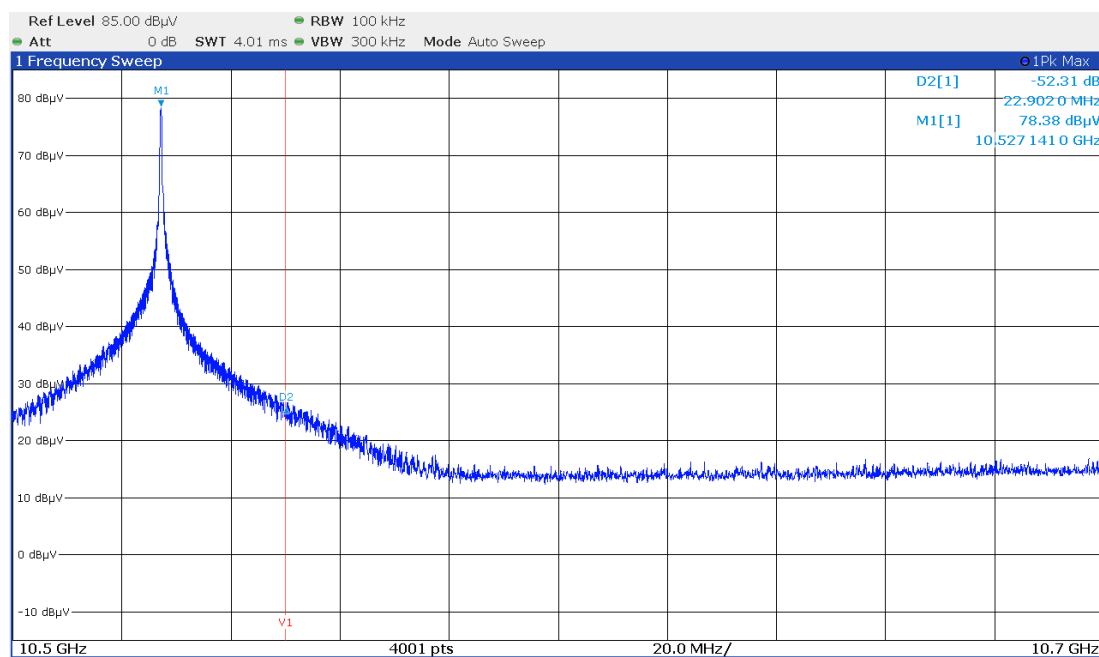
Ambient temperature:	20 °C
Relative humidity:	24 %

Date:	02.04.2026
Tested by:	S. KREHS

bandedge_low.png: Band-edge compliance, lower band edge:



bandedge_high.png: Band-edge compliance, upper band edge:



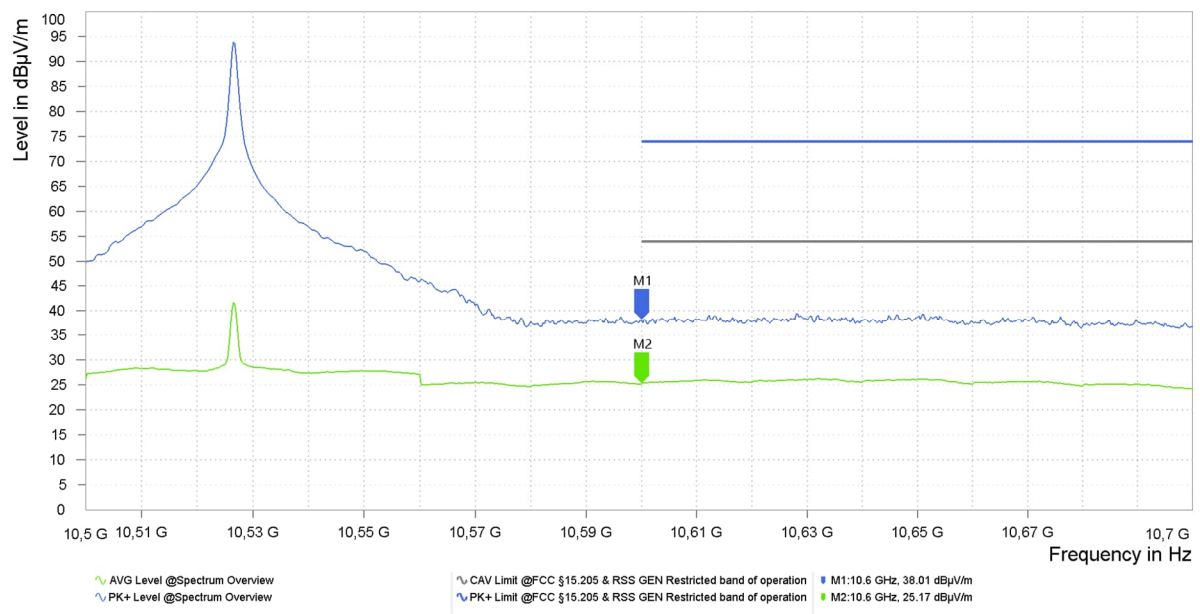
The plots on the previous page are showing the band-edge compliance for the lower and upper band-edge.

The Marker 1 represents the highest level within the assigned frequency band. The delta marker shows the difference to this peak.

The frequency line 1 (V1) shows the edge of the assigned frequency band.

In the plots on the previous page is shown, that the highest emissions at the band edges are more than 50 dB below the level of the fundamental. This requirement is fulfilled.

Additionally, at the upper band edge, the FCC § 15.209 & RSS GEN limits apply. This requirement is also fulfilled, because the level 50 dB below the fundamental is less than the level of the FCC § 15.209 & RSS GEN limits. The level of the fundamental is reported in clause 5.3.2.4 of this test report. Furthermore, the upper band edge compliance is shown in the following plot:



Test equipment (please refer to chapter 6 for details)

19 – 27

5.3 Radiated emissions

5.3.1 Method of measurement (radiated emissions)

The radiated emission measurement is subdivided into 6 stages.

- A preliminary measurement carried out in a semi-anechoic chamber with a fixed antenna height in the frequency range 9 kHz to 30 MHz.
- A preliminary measurement carried out in a semi-anechoic chamber with a variable antenna height in the frequency range 30 MHz to 1 GHz.
- A final measurement carried out on an outdoor test site without reflecting ground plane and a fixed antenna height in the frequency range 9 kHz to 30 MHz.
- A final measurement carried out in a semi-anechoic chamber with various antenna heights in the frequency range 30 MHz to 1 GHz.
- A preliminary measurement carried out in a fully anechoic chamber with a variable antenna distance and height in the frequency range 1 GHz to 60 GHz.
- A final measurement carried out in a fully anechoic chamber with a fixed antenna height in the frequency range 1 GHz to 60 GHz.

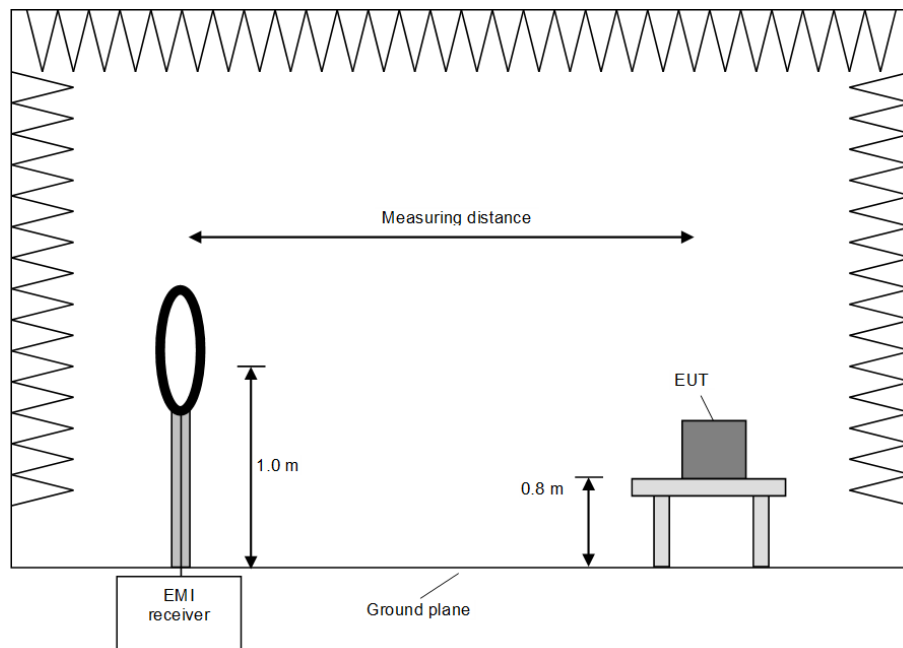
Preliminary measurement (9 kHz to 30 MHz):

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.

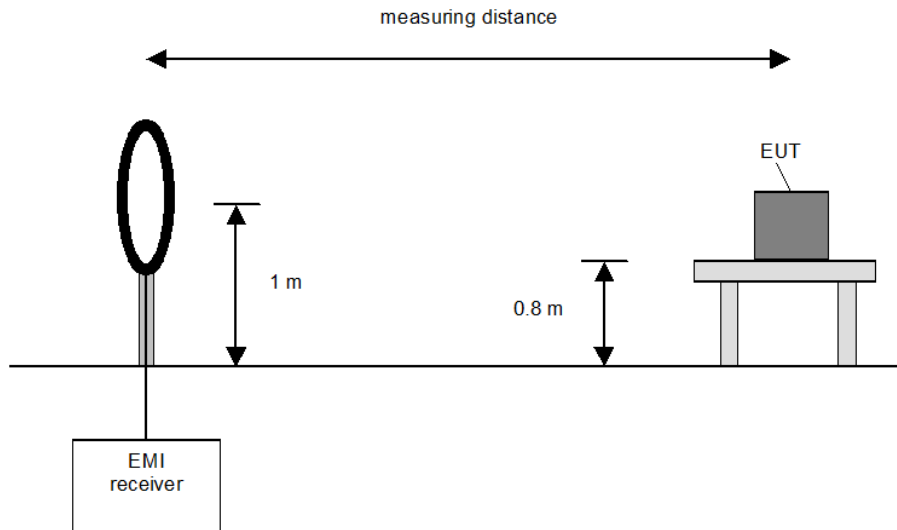
Final measurement (9 kHz to 30 MHz):

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) Repeat steps 1) to 4) with the other orthogonal axes of the EUT (only if the EUT is a module or is used in a handheld application).

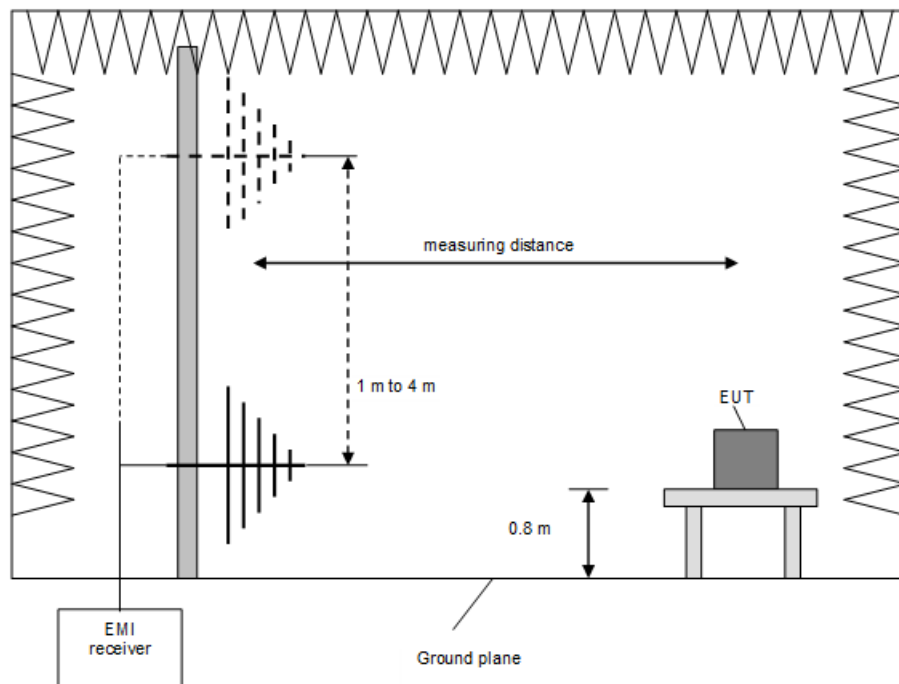
Preliminary measurement (30 MHz to 1 GHz)

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.

Final measurement (30 MHz to 1 GHz)

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.

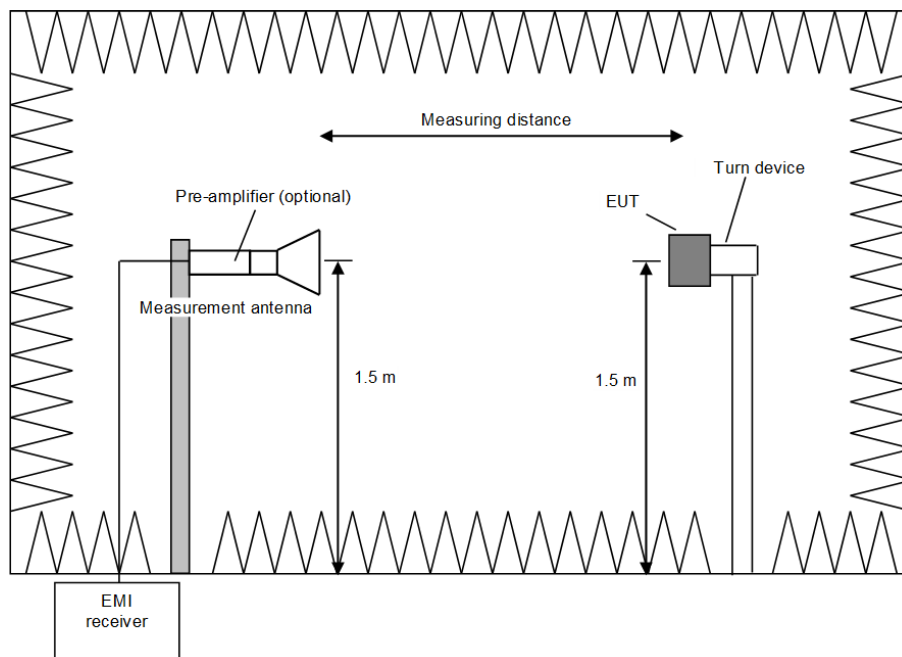
Preliminary and final measurement 1 GHz to 40 GHz

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.

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 - 40 GHz	250 kHz	1 MHz	-	Peak Average
Final measurement	1 - 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.

Preliminary and final measurement (40 GHz to 200 GHz)

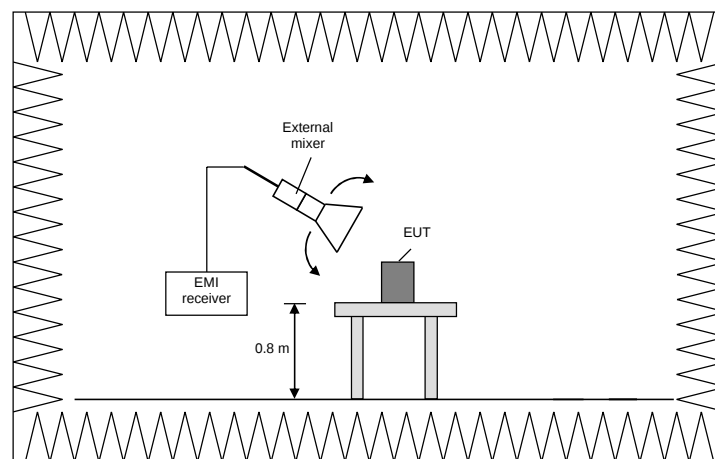
The frequency range will be divided into different sub ranges depending on the frequency range of the used horn antennas and frequency mixers. The spectrum analyser set to MAX Hold mode and a resolution bandwidth of 1 MHz. The measurement will be performed in horizontal and vertical polarisation of the measuring antenna, the antenna close to the EUT and while moving the antenna over all sides of the EUT. With the spectrum analyser in CLEAR / WRITE mode the cone of the emission should be found. After that the measuring distance will be set to the final measurement distance with the receiving antenna moving in this cone of emission. At this position the final measurement will be carried out with using the Auto ID functionality of the analyser. The used measuring distance for the used measurement antenna has to be above the far-field boundary calculated according to clause 9.1.4 [1] and listed below.

Antenna	Frequency range	Largest antenna dimension (D)	Minimum measurement distance ($2D^2/\lambda$)
Flann 24240-20	40 GHz to 60 GHz	23 mm	0.21 m
Flann 25240-20	50 GHz to 75 GHz	19 mm	0.18 m
Flann 26240-20	60 GHz to 90 GHz	15 mm	0.14 m
Flann 27240-20	75 GHz to 110 GHz	12.4 mm	0.11 m
Flann 28240-20	90 GHz to 140 GHz	10 mm	0.09 m
Flann 29240-20	110 GHz to 170 GHz	8.5 mm	0.08 m
Flann 30240-20	140 GHz to 220 GHz	7 mm	0.02 m

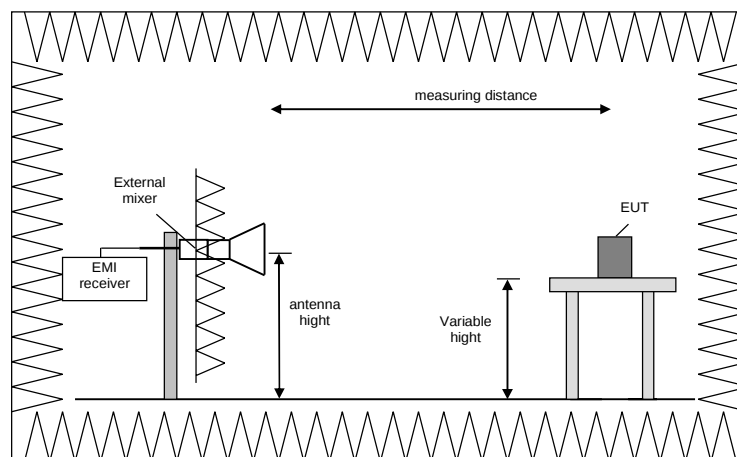
The resolution bandwidth of the EMI Receiver will be set to the following values:

Test	Frequency range	Resolution bandwidth	Measuring time	Detector
Preliminary measurement	40 GHz - 200 GHz	1 MHz	-	Peak
Final measurement	40 GHz - 200 GHz	Where not otherwise stated 1 MHz	>1 duty cycle per sweep point	Peak and average

Set up preliminary measurement:



Set up final measurement:



Procedure of measurement:

The measurements were performed in the frequency range 40 GHz to 60 GHz.

The following procedure will be used:

- 1) Monitor the frequency range at horizontal polarisation and move the antenna over all sides of the EUT (if necessary) move the EUT to another orthogonal axis).
 - 2) Change the antenna polarisation and repeat 1) with vertical polarisation.
 - 3) Make a hardcopy of the spectrum.
 - 4) Measure the frequency of the detected emissions with a lower span and resolution bandwidth to increase the accuracy and note the frequency value.
 - 5) Change the analyser mode to Clear / Write and found the cone of emission.
 - 6) Rotate and move the EUT, so that the measuring distance can be enlarged to 3 m and the antenna will be still inside the cone of emission.
 - 7) Measure the level of the detected frequency with the correct resolution bandwidth, with the antenna polarisation and azimuth and the peak and average detector, which causes the maximum emission.
 - 8) Repeat steps 1) to 7) for the next antenna spot if the EUT is larger than the antenna beamwidth.
- Step 1) to 6) are defined as preliminary measurement.

5.3.2 Test results (radiated emissions)

5.3.2.1 Preliminary radiated emission measurement (1 MHz to 60 GHz)

Ambient temperature:	22 °C
Relative humidity:	47 to 52 %

Date:	15. to 17.09.2025
Tested by:	D. BRUSCHINSKI

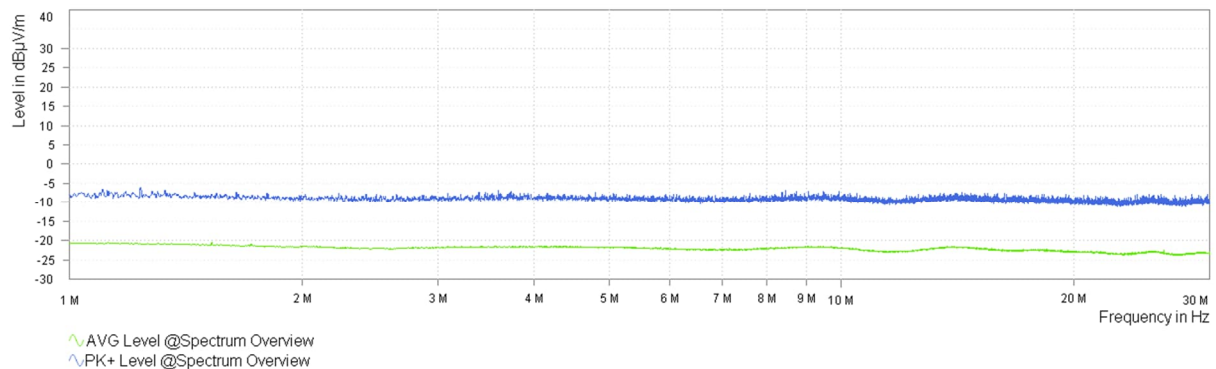
Position of EUT: The EUT was set-up on a non-conducting turn device of a height of 1.5 m (1 GHz to 40 GHz) and on a non-conducting table of a height of 80 cm (below 1 GHz and 40 GHz to 60 GHz). The distance between EUT and the antenna was 3 m (below 1 GHz and 1 GHz to 40 GHz) and 30 cm (40 GHz to 60 GHz).

Cable guide: For further information refer to the pictures in annex A of this test report.

Test record: The test was carried out in normal operation mode of the EUT.

Supply voltage: During all measurements the EUT was supplied with 12 V_{DC} by an external power supply.

Radiated emissions from 1 MHz to 30 MHz:

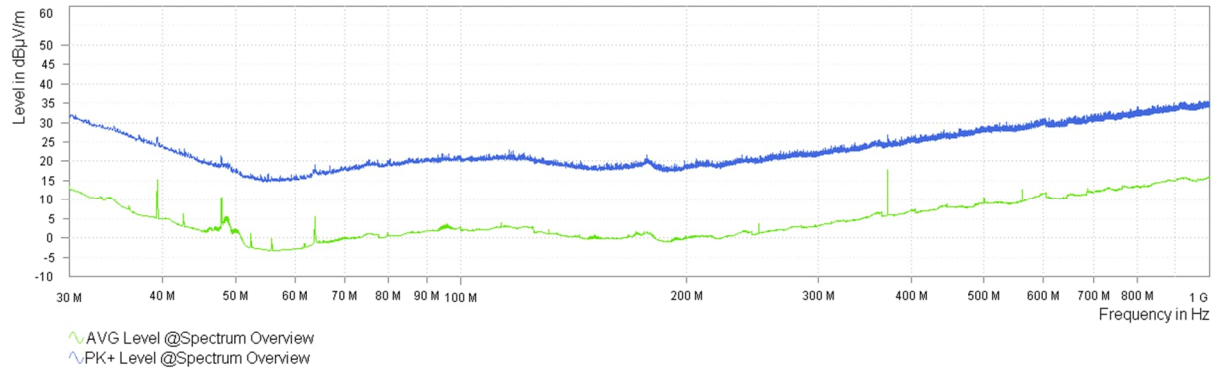


No emissions above the noise floor of the measurement system (max. 34.0 dBµV/m (measured with peak detector at 3 m distance)) found during the preliminary measurement. So, no final measurements on the outdoor test site were carried out.

Test equipment (please refer to chapter 6 for details)

6 – 32, 35

Radiated emissions from 30 MHz to 1000 MHz:

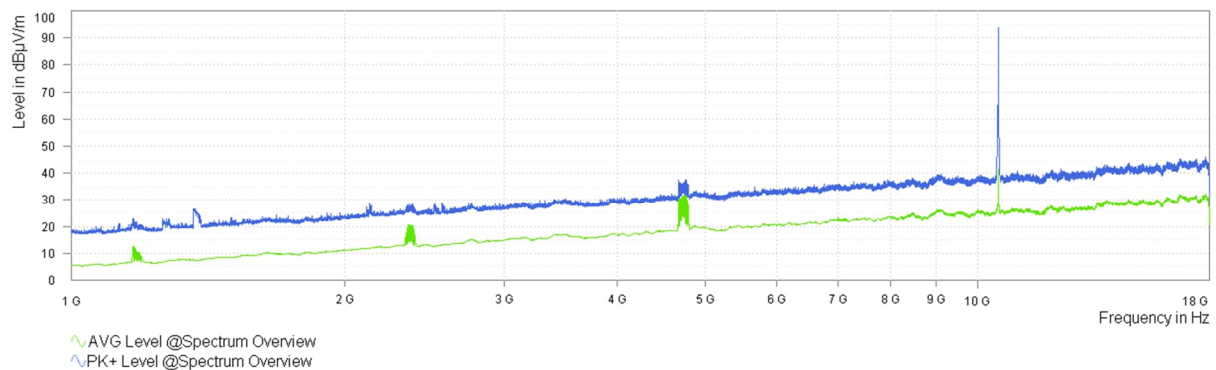


The following frequencies were found during the preliminary radiated emission measurement:

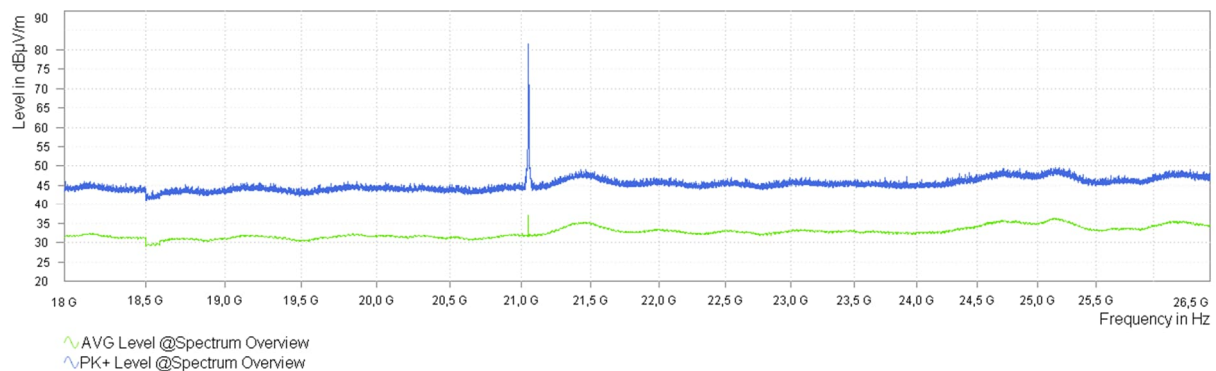
- 39.300 MHz, 47.880 MHz, 63.870 MHz, 177.150, 371.280 MHz and 928.950 MHz.

On these frequencies a final measurement has to be carried out. The result of this final measurement is presented in the following.

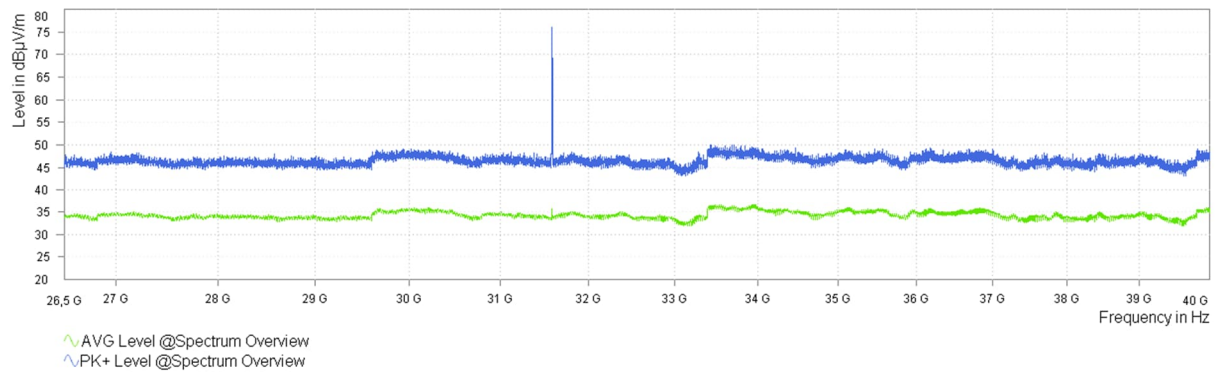
Radiated emissions from 1 GHz to 18 GHz:



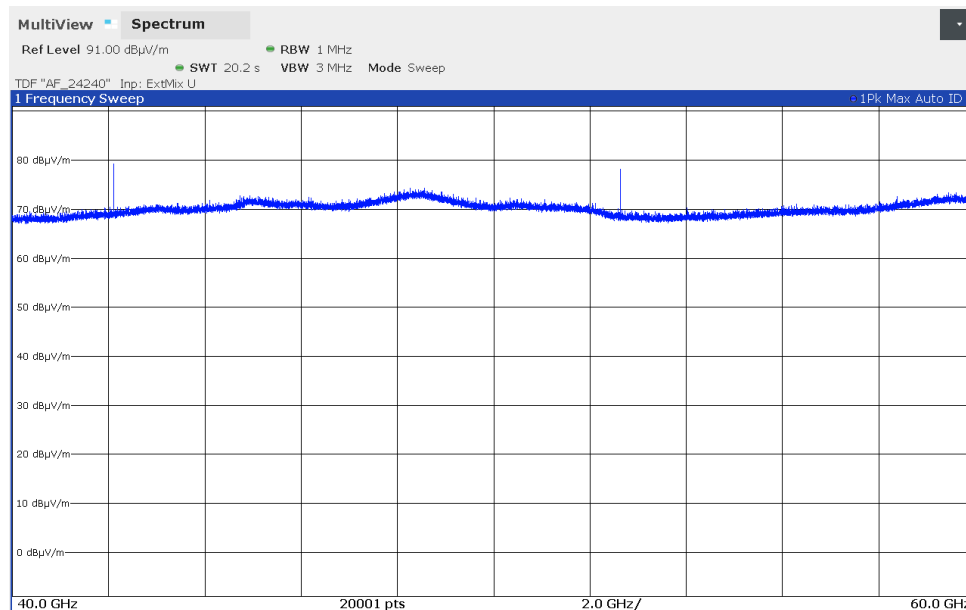
Radiated emissions from 18 GHz to 26.5 GHz:



Radiated emissions from 26.5 GHz to 40 GHz:



251065_40G_60G.png: Radiated emissions from 40 GHz to 60 GHz:



The following fundamental frequency was found during the preliminary radiated emission measurement:

- 10.526 GHz.

The following harmonic emission frequencies were found during the preliminary radiated emission measurement:

- 21.053 GHz, 31.580 GHz, 42.108 GHz, and 52.633 GHz.

The following other emission was found during the preliminary radiated emission measurement:

- 1.170 GHz, 1.364 GHz, 2.368 GHz and 4.730 GHz.

These frequencies have to be measured in a final measurement. The results were presented in the following.

5.3.2.2 Final radiated emission measurement (1 MHz to 30 MHz)

No emissions above the noise floor of the measurement system (max. 33.8 dB μ V/m (measured with peak detector at 3 m distance)) found during the preliminary measurement. So, no final measurements on the outdoor test site were carried out.

5.3.2.3 Final radiated emission measurement (30 MHz to 1 GHz)

Ambient temperature:	22 °C
Relative humidity:	59 %

Date:	15.09.2025
Tested by:	D. BRUSCHINSKI

Position of EUT: The EUT was set-up on a non-conducting table of a height of 0.8 m. The distance between EUT and antenna was 3 m.

Test record: All results are shown in the following.

Supply voltage: 12.0 V_{DC} by an external power supply.

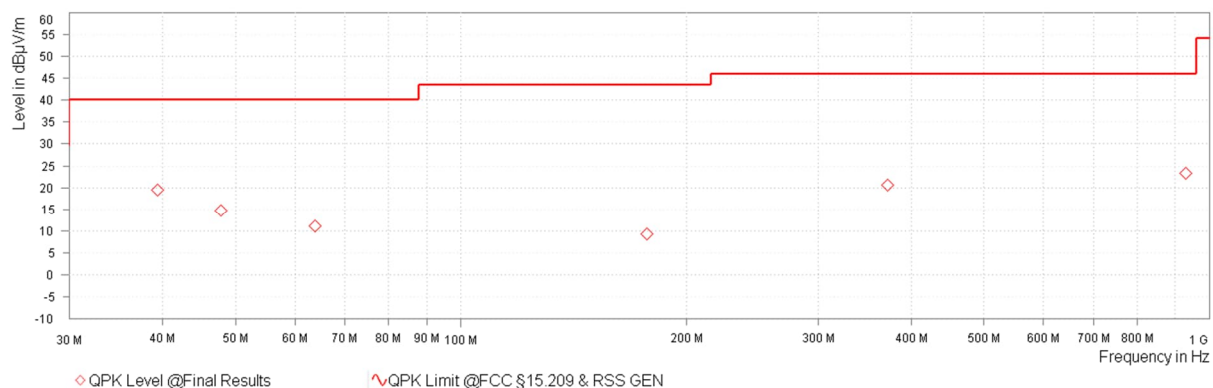
Test results: The test results were calculated with the following formula:

$$\text{Result [dB}\mu\text{V/m]} = \text{reading [dB}\mu\text{V]} + \text{level correction [dB]}$$

$$\text{Level correction [dB]} = + \text{cable loss [dB]} + \text{antenna factor [dB/m]} - \text{Preamp [dB]}$$

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 on the semi anechoic chamber.

Final radiated emissions from 30 MHz to 1000 MHz:



The results of the standard subsequent measurement inside the semi anechoic chamber are indicated in the table below. The limits as well as the measured results (levels) refer to the above-mentioned standard while taking account of the specified requirements for a 3 m measuring distance.

The measurement time with the quasi-peak measuring detector is 1 second.

Result measured with the quasi-peak detector:
(These values were marked in the diagram by an)

Spurious emissions inside restricted bands									
Frequency MHz	Result dBμV/m	Limit dBμV/m	Margin dB	Readings dBμV	Level correction [dB]	Height cm	Azimuth deg	Pol.	Test result
39.300	19.5	40.0	20.5	-1.3	20.8	105	353	Vert.	Passed
47.880	14.7	40.0	25.3	-0.3	15.0	110	41	Vert.	Passed
63.870	11.2	40.0	28.8	-2.6	13.8	167	161	Vert.	Passed
177.150	9.3	43.5	34.2	-7.5	16.8	113	171	Vert.	Passed
371.280	20.5	46.0	25.5	-0.4	20.9	173	153	Vert.	Passed
928.950	23.3	46.0	22.7	-6.5	29.8	149	69	Vert.	Passed

Test equipment (please refer to chapter 6 for details)
6, 14 – 16, 18 – 24, 26, 27

5.3.2.4 Final radiated emission measurement (1 GHz to 60 GHz)

Ambient temperature:	21 °C
Relative humidity:	40 % 45 %

Date:	16. to 18.09.2025
Tested by:	D. BRUSCHINSKI / Th. KÜHN

Position of EUT: The EUT was set-up on a non-conducting turn device of a height of 1.5 m (1 GHz to 40 GHz) and on a non-conducting table of a height of 80 cm (40 GHz to 60 GHz). The distance between EUT and the antenna was 3 m (<1 GHz and 1 GHz to 40 GHz) and 30 cm (40 GHz to 60 GHz).

Test record: All results are shown in the following.

Supply voltage: During all measurements the EUT was supplied with 12.0 V_{DC}.

Resolution bandwidth: For all measurements a resolution bandwidth of 1 MHz was used.

Test results: The test results were calculated with the following formulas:

Result [dBμV/m] = reading [dBμV] + level correction [dB] + measuring distance correction factor [dB]

Level correction [dB] = + cable loss [dB] + antenna factor [dB/m] – Preamp [dB]

Result measured with the peak detector:

Frequency [GHz]	Result [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Reading [dBμV]	Pol.	Azimuth [deg]	Elevation [deg]	Level correction [dB]	Dist. [m]	Dist. corr. [dB] *	Test result
1.170	22.9	74.0	51.1	42.8	V	208	30	-19.9	3	---	Passed
1.364	19.9	74.0	54.1	38.6	V	254	30	-18.7	3	---	Passed
2.368	26.5	74.0	47.5	38.2	V	319	60	-11.7	3	---	Passed
4.730	36.1	74.0	37.9	38.7	V	308	150	-2.6	3	---	Passed
10.526 ***	95.5	148.0	52.5	87.3	H	21	0	8.2	3	---	Passed
21.053 ****	79.2	97.5	18.3	66.0	H	311	120	13.2	3	---	Passed
31.580 ****	72.0	97.5	25.5	51.7	V	8	30	20.3	3	---	Passed
42.108 ****	61.5	97.5	36.0	81.5 **	V	-4.5	1	---	0.3	-20.0	Passed
52.633 ****	58.8	97.5	38.7	78.8 **	V	-2.3	-4	---	0.3	-20.0	Passed

*: Measuring distance correction factor calculated with 20 dB / decade

**: Reading in dBμV/m at the measurement distance

***: Wanted signal, no spurious

****: Harmonic emission.

Result measured with the average detector:

Frequency	Result	Limit	Margin	Reading	Pol.	Azimuth	Elevation	Level correction	Dist.	Dist corr.	Test result
[GHz]	[dBμV/m]	[dBμV/m]	[dB]	[dBμV]		[deg]	[deg]	[dB]	[m]	[dB] *	
1.170	13.3	54.0	40.7	33.2	V	208	30	-19.9	3	---	Passed
1.364	6.8	54.0	47.2	25.5	V	254	30	-18.7	3	---	Passed
2.368	14.7	54.0	39.3	26.4	V	319	60	-11.7	3	---	Passed
4.730	29.2	54.0	24.8	31.8	V	308	150	-2.6	3	---	Passed
10.526 ***	46.6	128.0	81.4	38.4	H	21	0	8.2	3	---	Passed
21.053 ****	34.6	77.5	42.9	21.4	H	311	120	13.2	3	---	Passed
31.580 ****	34.7	77.5	42.8	14.4	V	8	30	20.3	3	---	Passed
42.108 ****	41.0	77.5	36.5	61.0 **	V	-4.5	1	---	0.3	-20.0	Passed
52.633 ****	39.8	77.5	37.7	59.8 **	V	-2.3	-4	---	0.3	-20.0	Passed

*: Measuring distance correction factor calculated with 20 dB / decade

** : Reading in dBμV/m at the measurement distance

***: Wanted signal, no spurious

****: Harmonic emission.

Test equipment (please refer to chapter 6 for details)

9 – 13, 18 – 32, 35

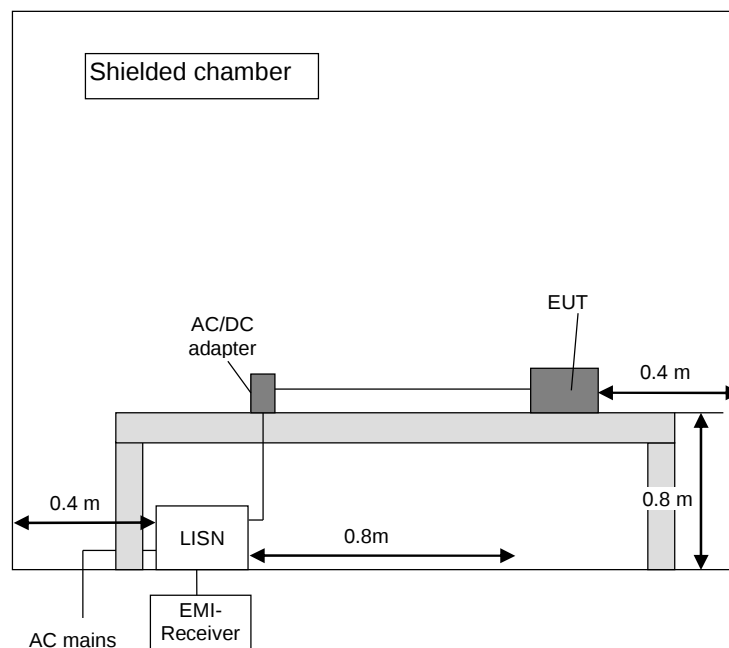
5.4 Conducted emissions on power supply lines (150 kHz to 30 MHz)

5.4.1 Method of measurement

The test is carried out in a shielded chamber. 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 above the ground plane. Floor-standing devices are placed directly on the ground plane. In case of DC powered equipment, which is not exclusively powered by a battery, it is connected to the LISN via a suitable AC/DC adaptor. The setup of the equipment under test is in accordance with [1].

The frequency range 150 kHz to 30 MHz will be measured with an EMI Receiver set to MAX Hold mode with peak and average detector and a resolution bandwidth of 9 kHz. A scan will be carried out on the phase (or plus pole in case of DC powered devices) of the AC mains network. If levels detected 10 dB below the appropriate limit, this emission will be measured with the average and quasi-peak detector on all lines.

Frequency range	Resolution bandwidth
150 kHz to 30 MHz	9 kHz



5.4.2 Test results (conducted emissions on power supply lines)

Ambient temperature:	22 °C
Relative humidity:	36 %

Date:	11.09.2025
Tested by:	S. KREHS

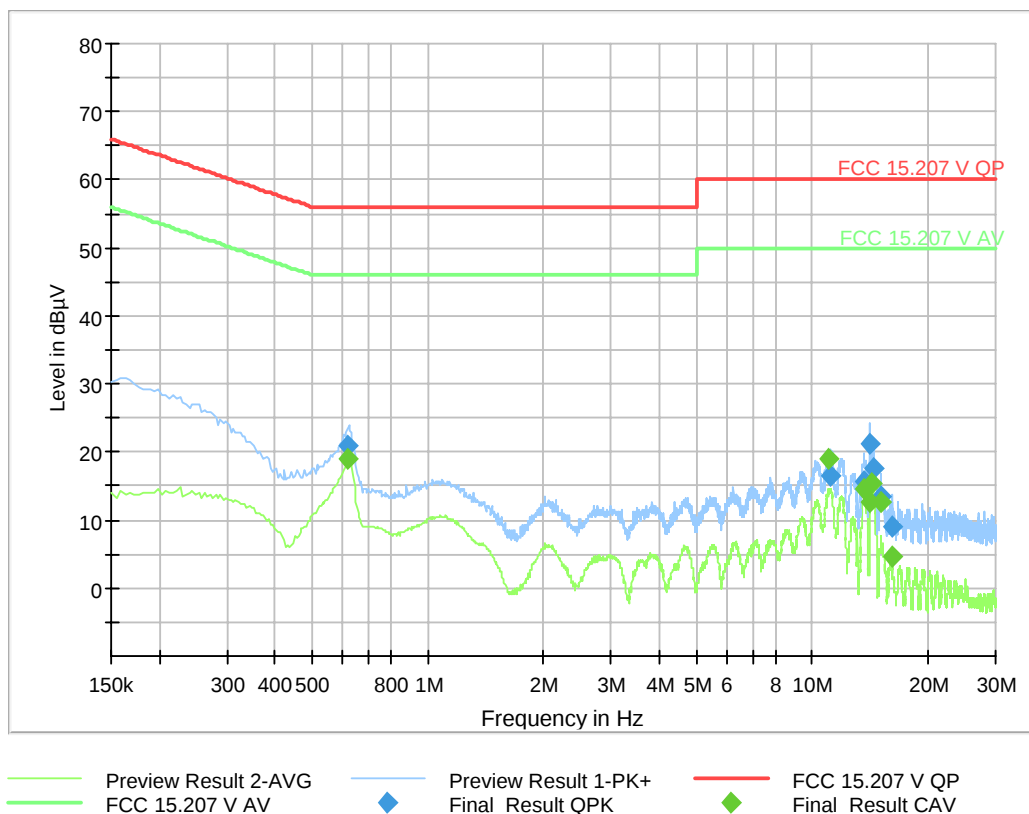
Position of EUT: The EUT was set-up on a non-conducting table of a height of 0.8 m.

Cable guide: The cable of the EUT was fixed on the non-conducting table. For further information of the cable guide refer to the pictures in annex A of this test report.

Test record: All results are shown in the following.

Supply voltage: The EUT was supplied with 12 V_{DC} by an AC/DC adaptor type enerCELL CAT.NO. 273-316, which was connected to an AC mains network with 120 V_{AC} / 60 Hz.

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 ▼.



Frequency [MHz]	QuasiPeak [dB(μV)]	Average [dB(μV)]	Limit [dB(μV)]	Margin [dB]	Line	PE	Corr. [dB]
0.622000	20.9	---	56.0	35.1	N	GND	9.9
0.622000	---	19.0	46.0	27.0	N	FLO	9.9
11.066500	---	19.0	50.0	31.1	N	FLO	10.7
11.188500	16.5	---	60.0	43.5	N	FLO	10.7
13.622500	15.6	---	60.0	44.4	N	FLO	10.8
13.680500	---	14.5	50.0	35.5	N	FLO	10.8
14.127500	---	12.8	50.0	37.3	N	GND	10.8
14.128000	21.2	---	60.0	38.8	N	GND	10.8
14.341500	---	15.4	50.0	34.6	N	GND	10.8
14.370000	17.6	---	60.0	42.4	N	GND	10.8
15.136500	13.4	---	60.0	46.6	N	FLO	10.9
15.138000	---	12.7	50.0	37.3	N	FLO	10.9
16.144500	---	4.6	50.0	45.4	N	GND	10.9
16.146000	9.0	---	60.0	51.0	N	GND	10.9

Test result: Passed

Test equipment (please refer to chapter 6 for details)

1 – 5, 27, 33

6 Test equipment and ancillaries used for tests

No.	Test equipment	Type	Manufacturer	Serial No.	PM. No.	Cal. Date	Cal. due
1	Shielded chamber M4	-	Siemens AG	B83117-S1-X158	480088	Calibration not necessary	
2	EMI receiver	ESIB 26	Rohde & Schwarz	1088.7490	481182	22.02.2024	02.2026
3	LISN	NSLK8128	Schwarzbeck	8128161	480138	28.02.2024	02.2026
4	Transient limiter	CFL 9206A	Teseq GmbH	38268	481982	Calibration not necessary	
5	System software EMC32 M4	EMC32 V 10.60.20	Rohde & Schwarz	100061	481022	Calibration not necessary	
6	Low noise amplifier 10 MHz - 18 GHz	LNA-30-00101800-25-10P	Narda-Miteq	2110917	482967	20.02.2024	02.2026
7	Low noise amplifier 12 GHz - 18 GHz	LNA-30-12001800-13-10P	Narda Miteq	2173737	483430	19.02.2024	02.2026
8	Standard gain horn 12 GHz-18 GHz	18240-20	Flann	267220	483025	Calibration not necessary	
9	Low noise amplifier 18 GHz - 26.5 GHz	LNA-30-18002650-20-10P	Narda-Miteq	2110911	482969	19.02.2024	02.2026
10	Standard gain horn 18 GHz - 26 GHz	20240-20	Flann	266399	483026	Calibration not necessary	
11	Low noise amplifier 26 GHz - 40 GHz	LNA-30-26004000-27-10P	Narda-Miteq	2110293	482970	19.02.2024	02.2026
12	Standard gain horn 26 GHz - 40 GHz	22240-20	Flann	266405	483027	Calibration not necessary	
13	Cable C419	Sucoflex 102	Huber+Suhner	510842/2	-	Calibration not necessary	
14	Attenuator 6 dB	WA2-6	Weinschel		482793	Calibration not necessary	
15	Ultralog antenna	HL562E	Rohde & Schwarz	101079	482978	24.04.2024	04.2027
16	Cable C417	Sucoflex 118	Huber+Suhner	500654/118	-	Calibration not necessary	
17	Loop antenna	HFH2-Z2	Rohde & Schwarz	832609/014	480059	21.02.2024	02.2026
18	EMC test software	Elektra V5.21.00	Rohde & Schwarz	---	483755	Calibration not necessary	
19	RF switch matrix	OSP220	Rohde & Schwarz	101391	482976	Calibration not necessary	
20	Turntable	TT3.0-3t	Maturo	825/2612/.01	483224	Calibration not necessary	
21	Antenna support tilt mast	BAM 4.5-P-10kg	Maturo	222/2612.01	483225	Calibration not necessary	
22	Controller	NCD	Maturo	474/2612.01	483226	Calibration not necessary	
23	Semi anechoic chamber M276	SAC5-2	Albatross Projects	C62128-A540-A138-10-0006	483227	Calibration not necessary	
24	EMI receiver / Spectrum analyser	ESW44	Rohde & Schwarz	101828	482979	21.02.2024 + 06.02.2026	02.2026 + 02.2028
25	Log.-Per. antenna 850 MHz - 26.5 GHz	HL050	Rohde & Schwarz	100977	483511	25.04.2024	04.2027

No.	Test equipment	Type	Manufacturer	Serial No.	PM. No.	Cal. Date	Cal. due
26	Power supply	TOE 8752	Toellner	31566	480010	Calibration not necessary	
27	Multimeter	971A	Hewlett Packard	JP39009365	480722	17.07.2025	07.2026
28	Spectrum analyser	FSW43	Rohde & Schwarz	100586 & 100926	481720	04.03.2025	03.2027
29	Harmonic mixer 40 GHz - 60 GHz	FS-Z60	Radiometer Physics	100980	482708	11.03.2025	03.2027
30	Standard gain horn 40 GHz - 60 GHz	24240-20	Flann	263442	482858	Calibration not necessary	
31	RF-cable 0.5 m	Sucoflex 102	Huber+Suhner	510210/2	483030	Calibration not necessary	
32	RF-cable 0.5 m	Sucoflex 102	Huber+Suhner	510213/2	483031	Calibration not necessary	
33	AC power supply	AC6803A	Keysight	JPVJ002509	482350	Calibration not necessary	
34	Standard gain horn 8.2 GHz - 12.5 GHz	16240-20	Flann	13567	480513	Calibration not necessary	
35	Power supply	HM8142	Hameg	142001P 04969	480720	Calibration not necessary	

7 Test site Validation

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 + ANSI C63.4a-2017 +	21.05.2025	20.05.2028
Semi anechoic chamber M276	483227	30 – 1000 MHz	NSA/RSM	CISPR 16-1-4 + Cor1:2010 + A1:2012 +A2:2017	05.06.2025	04.06.2028
Semi anechoic chamber M276	483227	1 -18 GHz	SVSWR	CISPR 16-1-4 Amd. 1	21.02.2024	20.02.2027

8 Measurement uncertainties

Measurement method	Standard used for calculating measurement uncertainty	Expanded measurement uncertainty (95 %) U_{lab}
Conducted measurements		
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		
R&S HL050 @ 3 m		
1 GHz – 6 GHz	CISPR 16-4-2	5.1 dB
6 GHz – 18 GHz	CISPR 16-4-2	5.4 dB
Flann Standard Gain Horns 12 GHz – 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
Radiated field strength outdoor test site		
R&S HFH2-Z2 9 kHz to 30 MHz	CISPR 25	4.4 dB
Radiated emissions above 40 GHz		
40 GHz – 60 GHz	-	7.0 dB

9 Report history

Report Number	Date	Comment
F251065E4	16.04.2026	Initial test report

10 List of annexes

Annex A Test setup photos

8 pages

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