

# Test Report

Report Number:

**F221513E4**

Equipment under Test (EUT):

**TrackView Pro Transmitter**

**Applicant:**

**Ellab A/S**

**Manufacturer:**

**Ellab A/S**



Deutsche  
Akkreditierungsstelle  
D-PL-17186-01-00

## References

- [1] **ANSI C63.4:2014** American National Standard for Methods of Measuring of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
- [2] **FCC 47 CFR Part 2:** General Rules and Regulations
- [3] **FCC 47 CFR Part 15:** Radio Frequency Devices (Subpart B)
- [4] **ICES-003 Issue 7: (October 2020)** Spectrum Management and Telecommunications. Interference-Causing Equipment Standard. Information Technology Equipment (Including Digital Apparatus) —Limits and Methods of Measurement
- [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 clause 10.2.8.2 of ANSI C63.4 (2014). However, the measurement uncertainty is calculated and shown in this test report.

Tested by:

Signature

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:	mIs@ellab.com
Applicant represented during the test by the following person:	-

## 1.2 Manufacturer

Name:	Ellab A/S
Address:	Trollemindsalle 25 3400 Hilleroed
Country:	Denmark
Name for contact purposes:	Mr. James JACOBSSON
Phone:	+45 4452 0500
eMail address:	info@ellab.com
Manufacturer represented during the test by the following person:	-

## 1.3 Test Laboratory

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

Accredited by Deutsche Akkreditierungsstelle GmbH (DAkkS) in compliance with DIN EN ISO/IEC 17025 under Reg. No. D-PL-17186-01-05e and D-PL-17186-01-06e, 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: *	Ellab TrackView Pro Smart RF Transmitter – 915 MHz
Model name: *	TrackView Pro Transmitter
Model number: *	33047341
Order number: *	n/a
FCC ID: *	XUS-TVPTX1
IC certification number: *	8758A-TVPTX1
PMN: *	TrackView Pro Transmitter
HVIN: *	66310000
FVIN: *	-

	EUT number		
	1	2	3
Serial number: *	10001479	-	-
PCB identifier: *	610000126-07	-	-
Hardware version: *	n/a	-	-
Software version: *	n/a	-	-

\* Declared by the applicant

One EUT was used for all tests.

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			
Power supply EUT: *	DC (two AA batteries)		
Supply voltage EUT: *	$U_{nom} = 3.0 V_{DC}$	$U_{min} = 2.5 V_{DC}$	$U_{max} = 3.5 V_{DC}$
Temperature range: *	-20°C to +60°C		
Lowest / highest internal frequency: *	32.768 kHz / 927.5 MHz		

\* Declared by the applicant

Ports / Connectors				
Identification	Connector		Length during test	Shielding (Yes / No)
	EUT	Ancillary		
USB sensor 1	USB A jack	USB A	0 m*	Yes
USB sensor 2	USB A jack	USB A	0 m*	Yes

\*

Equipment used for testing	
Laptop: *1	Lenovo X1

\*1 Provided by the applicant

Ancillary equipment	
Sensor: *1	Temperature and humidity sensor, marked "10002033" and "00000384"

\*1 Provided by the applicant

## 1.6 Dates

Date of receipt of test sample:	19.12.2022
Start of test:	28.01.2023
End of test:	03.03.2023

## 2 Operational States

### Description of function of the EUT:

The EUT is a wireless logger for different kind of sensors. The sensor data is frequently transferred to an access point via wireless connection.

### The following states were defined as the operating conditions:

#### Operation mode 1:

The EUT is running in normal operation mode, two sensors were plugged in the dedicated USB sensor ports. The display shows the current temperature and humidity.

#### Operation mode 2:

EUT is connected to a laptop computer using the mini-USB interface inside the battery case. This interface is used for software updates on the EUT. For the test the EUT was connected to a laptop computer and a continuous data transmission is started using software provided by the applicant.

The EUT was supplied by internal batteries during all tests.

### The system was setup as follows:



## 3 Additional Information

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

## 4 Overview

Conducted emissions FCC 47 CFR Part 15 section 15.107 (a), (b) [3] ICES-003 Issue 7 section 3.2.1[4]					
Application	Frequency range	Limits	Reference standard	Tested EUT	Status
AC supply line Class B	0.15 to 0.5 MHz	66 to 56 dB( $\mu$ V) QP*	ANSI C63.4	1	Passed
	0.5 to 5 MHz	56 to 46 dB( $\mu$ V) AV*			
	5 to 30 MHz	56 dB( $\mu$ V) QP 46 dB( $\mu$ V) AV 60 dB( $\mu$ V) QP 50 dB( $\mu$ V) AV			
*: Decreases with the logarithm of the frequency					

Conducted emissions FCC 47 CFR Part 15 section 15.111 [3]					
Application	Frequency range	Limits	Reference standard	Tested EUT	Status
Antenna power conduction limits for receivers.	30 to 1000 MHz 1 to 5 GHz	2 nW / -57 dBm 2 nW / -57 dBm	ANSI C63.4	1	Passed

Conducted emissions RSS-Gen Issue 5 section 7.4 [5]					
Application	Frequency range	Limits	Reference standard	Tested EUT	Status
Antenna power conduction limits for receivers.	30 to 1000 MHz 1 to 5 GHz	2 nW / -57 dBm 5 nW / -53 dBm	ANSI C63.4	1	Passed

Radiated emissions FCC 47 CFR Part 15 section 15.109 (a), (b) [3]					
Application	Frequency range	Limits	Reference standard	Tested EUT	Status
Radiated Emission Class B	30 to 88 MHz	40.0 dB( $\mu$ V/m) QP at 3 m	ANSI C63.4	1	Passed
	88 to 216 MHz	43.5 dB( $\mu$ V/m) QP at 3 m			
	216 to 960 MHz	46.0 dB( $\mu$ V/m) QP at 3 m			
	960 to 1000 MHz	54.0 dB( $\mu$ V/m) QP at 3 m			
	above 1000 MHz	54.0 dB( $\mu$ V/m) AV at 3 m and 74.0 dB( $\mu$ V/m) PK at 3 m			



Radiated emissions ICES-003 Issue 7 section 3.2.2 [4]					
Application	Frequency range	Limits	Reference standard	Tested EUT	Status
Radiated Emission Class B	30 to 88 MHz 88 to 216 MHz 216 to 230 MHz 230 to 960 MHz 960 to 1000 MHz  above 1000 MHz	40.0 dB( $\mu$ V/m) QP at 3 m 43.5 dB( $\mu$ V/m) QP at 3 m 46.0 dB( $\mu$ V/m) QP at 3 m 47.0 dB( $\mu$ V/m) QP at 3 m 54.0 dB( $\mu$ V/m) QP at 3 m  54 dB( $\mu$ V/m) AV at 3 m and 74 dB( $\mu$ V/m) PK at 3 m	ANSI C63.4	1	Passed

Remark: As declared by the applicant the highest internal clock frequency is 0.928 GHz.  
Therefore the radiated emission measurement must be carried out up to 5<sup>th</sup> of the highest internal clock frequency in this case 10 GHz.

The EUT was classified by the applicant as CLASS B equipment.

## 5 Results

### 5.1 Test setups

#### 5.1.1 Radiated: 30 MHz to 1 GHz

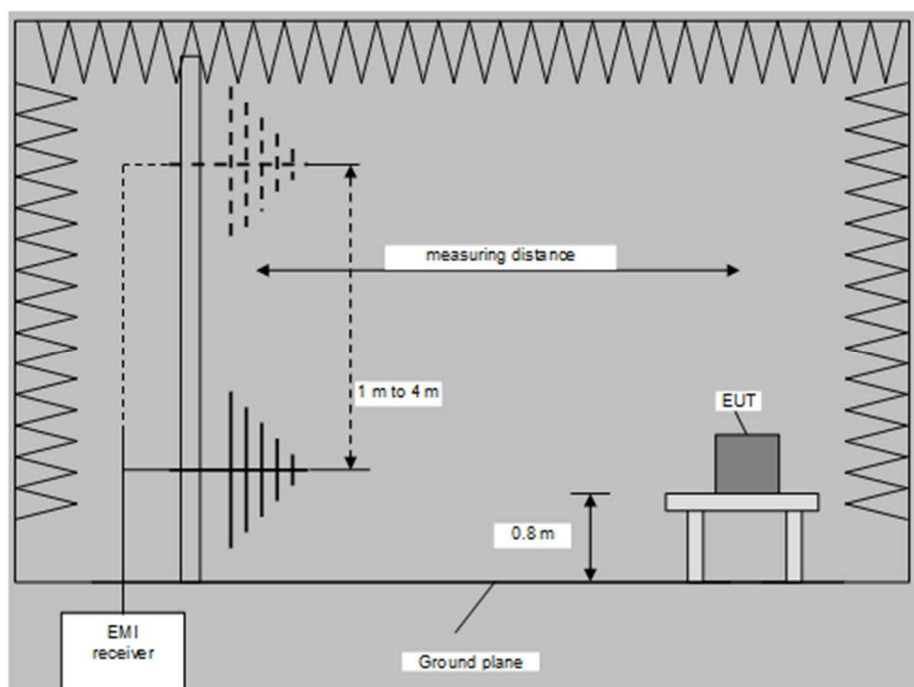
##### 5.1.1.1 Preliminary and final measurement 30 MHz to 1 GHz

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	$\pm 120$ 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.

## 5.1.2 Radiated: 1 GHz to 40 GHz

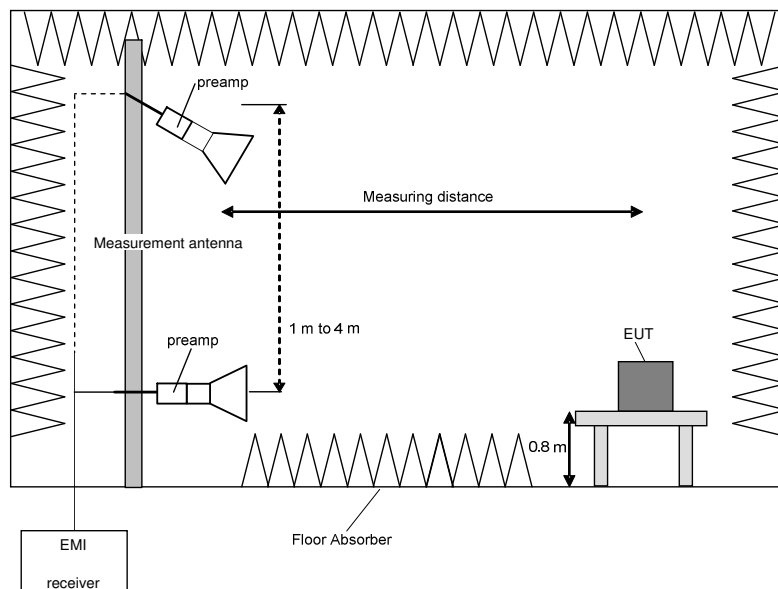
### 5.1.2.1 Preliminary and final measurement 1 to 40 GHz

The preliminary and final measurements are performed in a semi-anechoic chamber at a measuring distance of 3 meters, with floor absorbers between EUT and measuring antenna. 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. While changing the height, the measuring antenna gets tilted so that it is always aiming at the EUT.

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
Frequency peak search	+ / - 1 MHz	50 kHz	1 MHz	100 ms	Peak
Final measurement	1 - 40 GHz	-	1 MHz	100 ms	Peak Average



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.

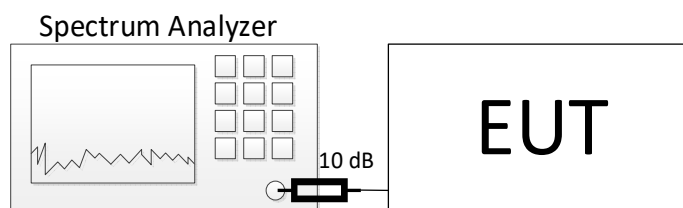
Procedure final measurement:

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 Conducted: Antenna port

Test setup (conducted)		
Used	Antenna connector	Comment
<input checked="" type="checkbox"/>	Temporary antenna connector	As provided by the applicant
<input type="checkbox"/>	Normal antenna connector	-



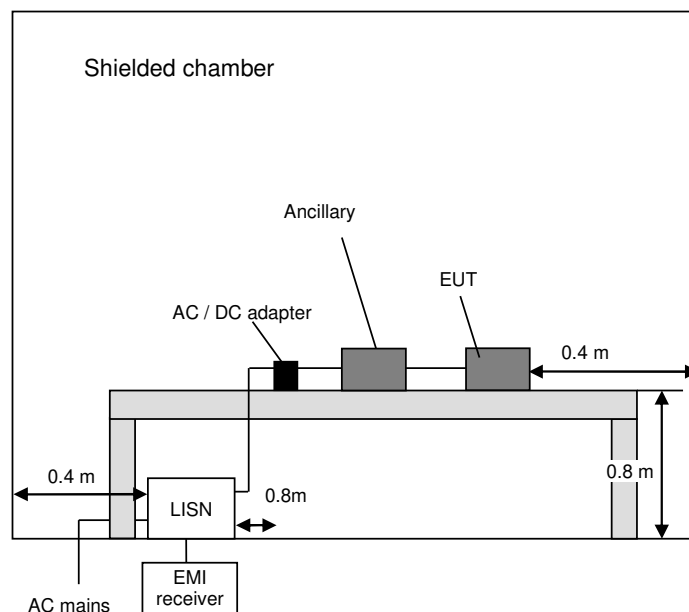
The 10 dB external attenuation are considered in all relevant plots

#### 5.1.4 Conducted: AC power line

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 is measured with an EMI receiver set to MAX hold mode with Peak and Average detectors and a resolution bandwidth of 9 kHz. A scan is carried out on the phase and neutral line of the AC mains network. If emissions less than 10 dB below the appropriate limit are detected, these emissions are measured with an Average and Quasi-Peak detector on all lines.

Frequency range	Resolution bandwidth	Measuring time
150 kHz to 30 MHz	9 kHz	5 s



## 5.2 Radiated emissions

### 5.2.1 Test setup (Maximum unwanted emissions)

Test setup (Maximum unwanted emissions)			
Used	Setup	See sub-clause	Comment
<input checked="" type="checkbox"/>	Radiated: 30 MHz to 1 GHz / 1 GHz to 40 GHz	5.1.1 / 5.1.2	Tested in dedicated position (wall mounted EUT)

### 5.2.2 Test method (Maximum unwanted emissions)

Test method (radiated) see sub-clause 5.1.1 / 5.1.2 as described here in

### 5.2.3 Test results (Maximum unwanted emissions)

#### 5.2.3.1 Test results (30 MHz – 1 GHz)

Ambient temperature:	22 °C
Relative humidity:	18 %

Date:	28.01.2023
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: Position 1: EUT mounted in normal wall mounted position (see test setup photographs)  
Position 2: EUT lying on the table with open battery case and connected to a laptop computer (see test setup photographs)

Calculations:

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

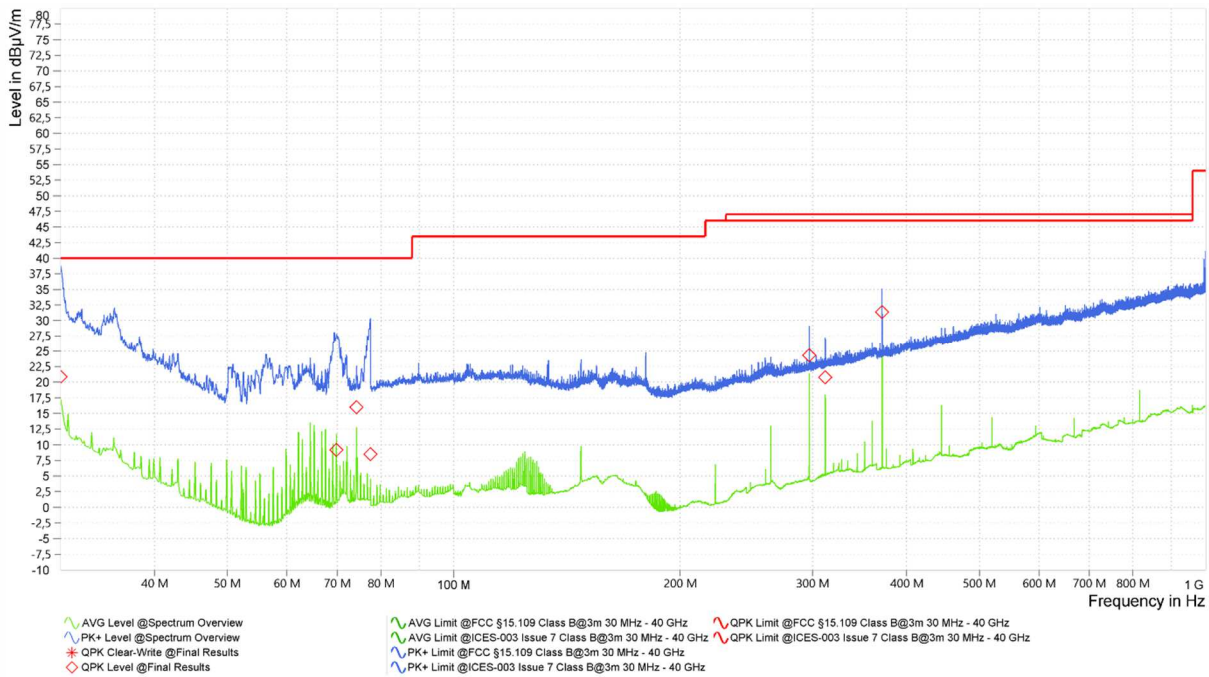
Correction [dB/m] = AF [dB/m] + Cable attenuation [dB] + optional preamp gain [dB]

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]	Readings [dBµV]	Correction [dB/m]	Height [cm]	Azimuth [deg]	Pol. (H/V)	Position #
30.084000	20.36	40.00	19.64	-5.24	25.6	150.0	256.0	V	1
909.030000	22.06	46.00	23.94	-7.54	29.6	106.0	272.0	V	1
909.594000	22.07	46.00	23.93	-7.53	29.6	122.0	258.0	V	1
959.994000	22.49	46.00	23.51	-7.31	29.8	130.0	283.0	V	1
992.082000	23.50	54.00	30.50	-6.80	30.3	109.0	267.0	V	1
736.170000	19.62	46.00	26.38	-7.88	27.5	139.0	210.0	V	1



(Operation mode 2):

Frequency [MHz]	Result (QP) [dB $\mu$ V/m]	Limit [dB $\mu$ V/m]	Margin [dB]	Readings [dB $\mu$ V]	Correction [dB/m]	Height [cm]	Azimuth [deg]	Pol. (H/V)	Position #
30.000	20.9	40.00	19.1	1.8	26.0	102	201	V	2
69.810	9.20	40.00	30.8	-21.6	14.8	330	341	H	2
74.250	16.0	40.00	24.0	-8.0	15.5	160	134	V	2
77.490	8.5	40.00	31.5	-23.0	16.1	340	350	H	2
297.030	24.3	46.00	21.7	2.6	19.0	250	239	V	2
312.030	20.8	46.00	25.2	-4.4	19.4	210	254	V	2
371.280	31.4	46.00	14.6	16.8	21.2	100	200	V	2

Test result: Passed

Test equipment (please refer to chapter 7 for details)
4 - 12

### 5.2.3.2 Test results (radiated 1 GHz to 40 GHz)

Ambient temperature:	22 °C
Relative humidity:	25 %

Date:	01.02.2023
Tested by:	P. NEUFELD

Position of EUT: For tests for f between 1 GHz and the 5<sup>th</sup> harmonic, 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 nominal position was tested

Calculation:

Max Peak [dB $\mu$ V/m] = Reading [dB $\mu$ V] + Correction [dB/m]

Average [dB $\mu$ V/m] = Reading [dB $\mu$ V] + 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)

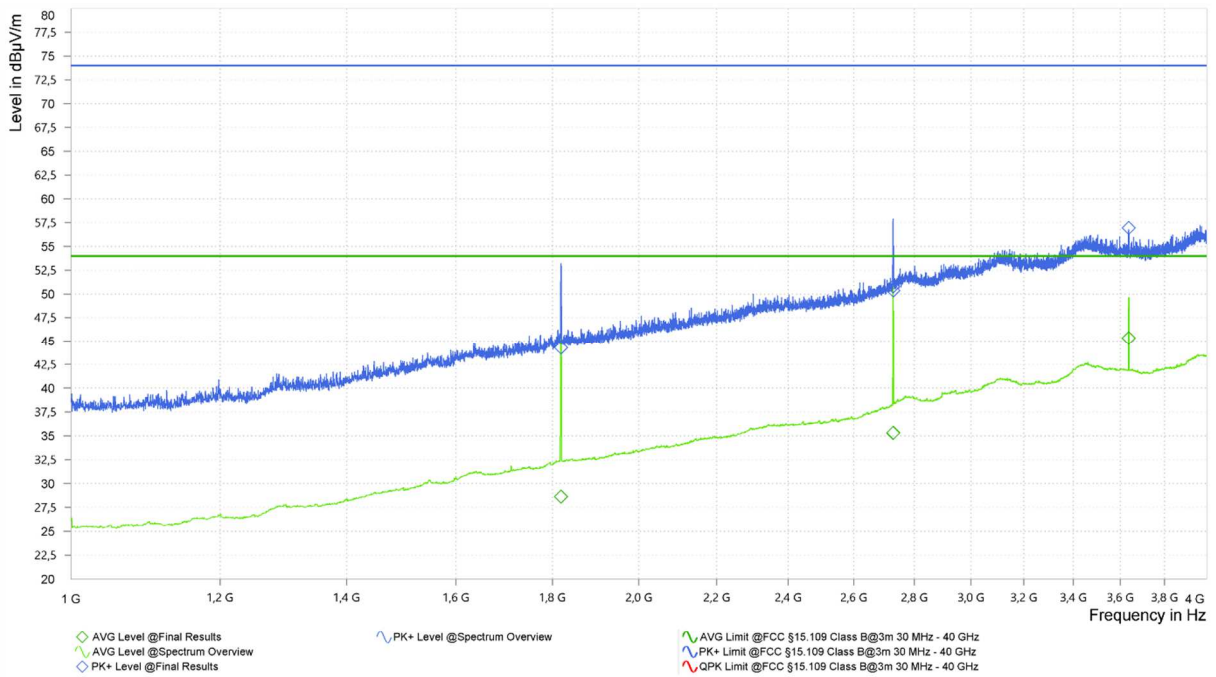
Margin [dB] = Limit [dB $\mu$ V/m] – Max Peak | Average [dB $\mu$ V/m]

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.

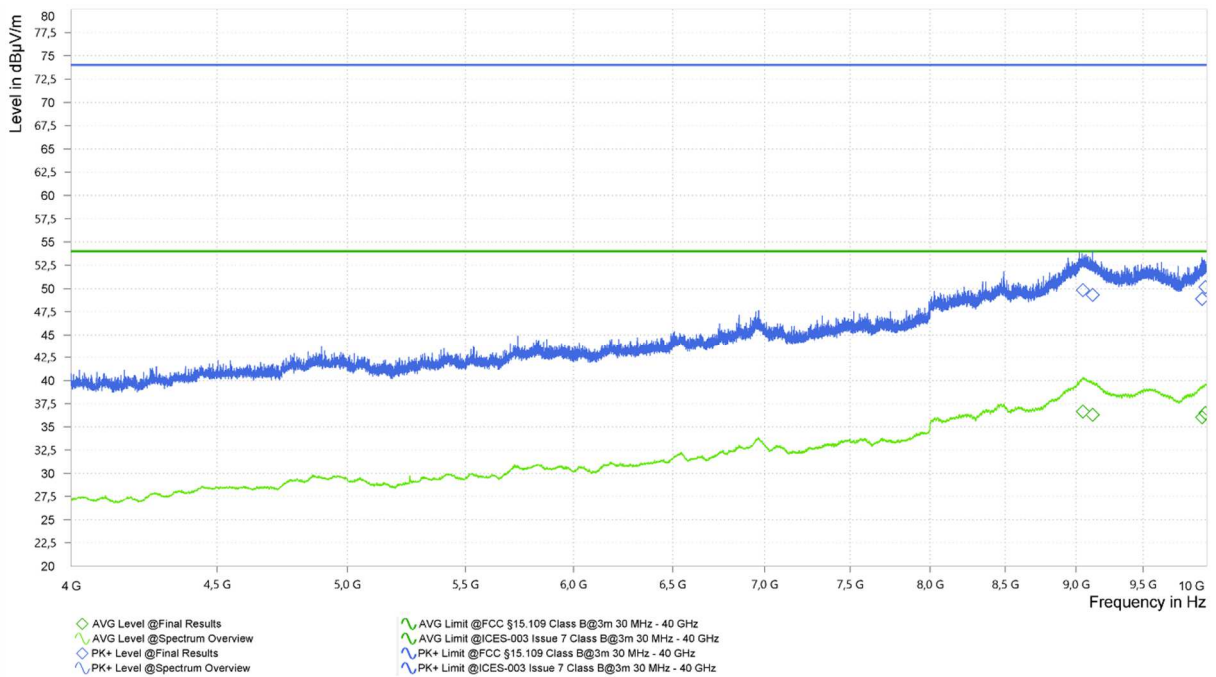
The top measured curve represents the peak measurement. The measured points marked with "◊" are frequency points for the final peak detector measurement. These values are indicated in the following table. The bottom measured curve represents the average measurement. The measured points marked with "◇"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

**Worst case plots:**

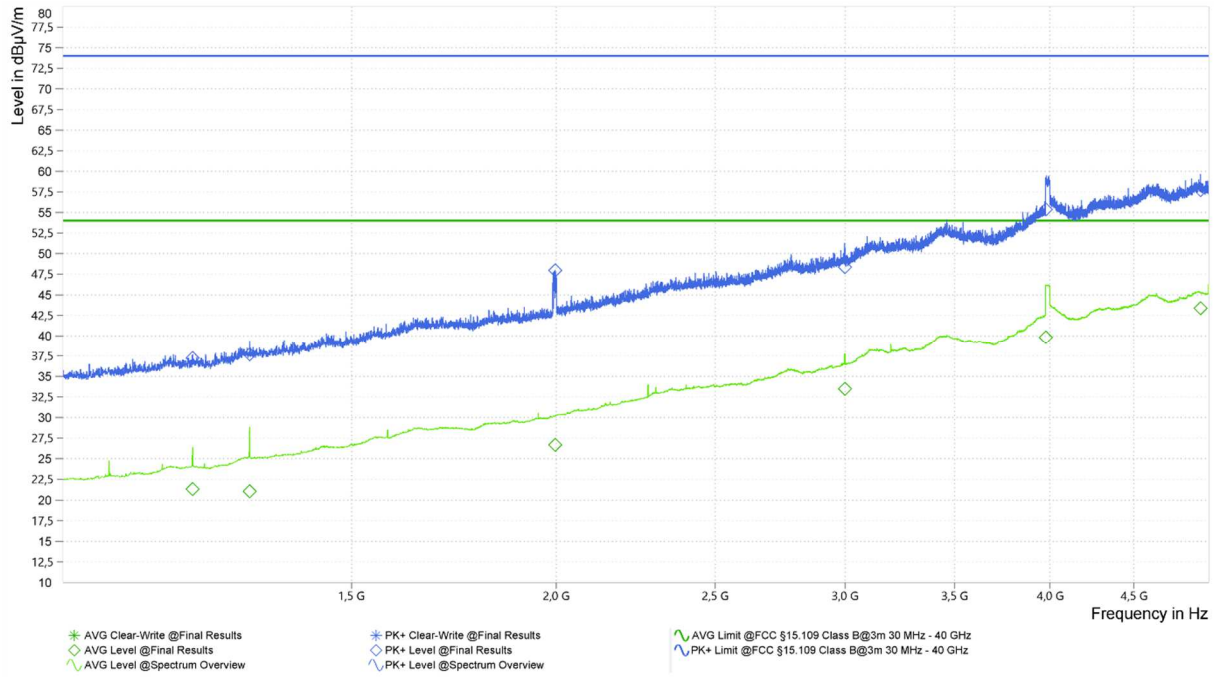
Spurious emissions from 1 GHz to 4 GHz (normal operation mode 1):



Spurious emissions from 4 GHz to 12 GHz (normal operation mode 1):



Spurious emissions from 1 GHz to 5 GHz (normal operation mode 2):



**Result tables:**

Operation mode 1:

Frequency [MHz]	PK+ Level [dBμV/m]	PK+ Limit [dBμV/m]	PK+ Margin [dB]	AVG Level [dBμV/m]	AVG Limit [dBμV/m]	AVG Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]	Antenna Height [m]	Meas. BW [kHz]
1818.750	44.27	74.00	29.73	28.63	54.00	25.37	31.87	H	266	1.68	1000
2727.750	50.77	74.00	23.23	35.29	54.00	18.71	36.99	H	47	3.42	1000
2728.500	50.36	74.00	23.64	35.32	54.00	18.68	37.00	H	66	3.42	1000
3637.750	56.94	74.00	17.06	45.32	54.00	8.68	39.68	V	107	3.22	1000
9050.750	49.83	74.00	24.17	36.65	54.00	17.35	19.30	H	232	1.25	1000
9121.250	49.32	74.00	24.68	36.30	54.00	17.70	18.90	H	28	3.97	1000
9964.500	48.88	74.00	25.12	36.04	54.00	17.96	20.17	H	100	3.07	1000
9990.500	50.15	74.00	23.85	36.50	54.00	17.50	20.33	V	219	3.93	1000

Operation mode 2:

Frequency [MHz]	PK+ Level [dBμV/m]	PK+ Limit [dBμV/m]	PK+ Margin [dB]	AVG Level [dBμV/m]	AVG Limit [dBμV/m]	AVG Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]	Antenna Height [m]	Meas. BW [kHz]
1200.000	37.22	74.00	36.78	21.34	54.00	32.66	27.27	V	151	2.72	1000
1300.000	37.68	74.00	36.32	21.04	54.00	32.96	28.28	H	167	3.29	1000
1997.250	47.95	74.00	26.05	26.68	54.00	27.32	32.75	V	192	1.88	1000
2999.750	48.37	74.00	25.63	33.48	54.00	20.52	37.55	V	262	2.52	1000
3978.000	55.36	74.00	18.64	39.80	54.00	14.20	41.00	V	297	3.86	1000
4943.500	57.71	74.00	16.29	43.38	54.00	10.62	43.81	V	264	3.78	1000

Test result: Passed

Test equipment (please refer to chapter 7 for details) 4 - 10, 13 - 14
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### 5.3 Antenna power for receivers

#### 5.3.1 Test setup (Antenna power for receivers)

Test setup (Maximum unwanted emissions)			
Used	Setup	See sub-clause	Comment
<input type="checkbox"/>	Radiated: 30 MHz to 1 GHz / 1 GHz to 5 GHz	5.1.1 / 5.1.2	-
<input checked="" type="checkbox"/>	Conducted: Antenna port	5.1.3	-

#### 5.3.2 Test method (Antenna power for receivers)

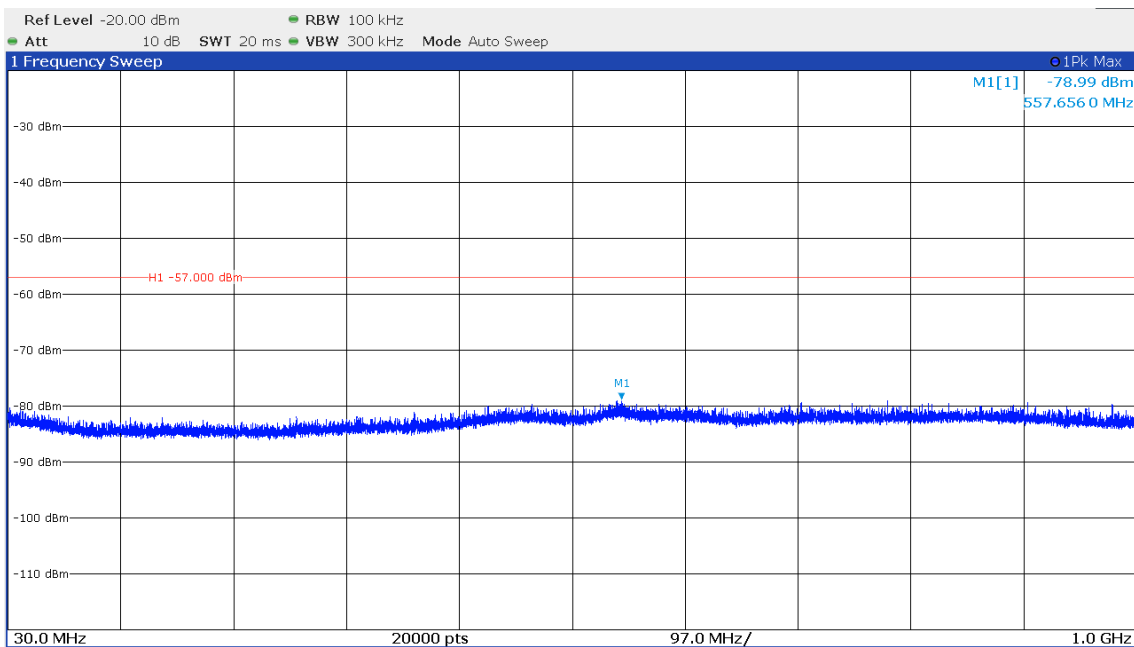
As described in [1] §15.111, [5] 7.5

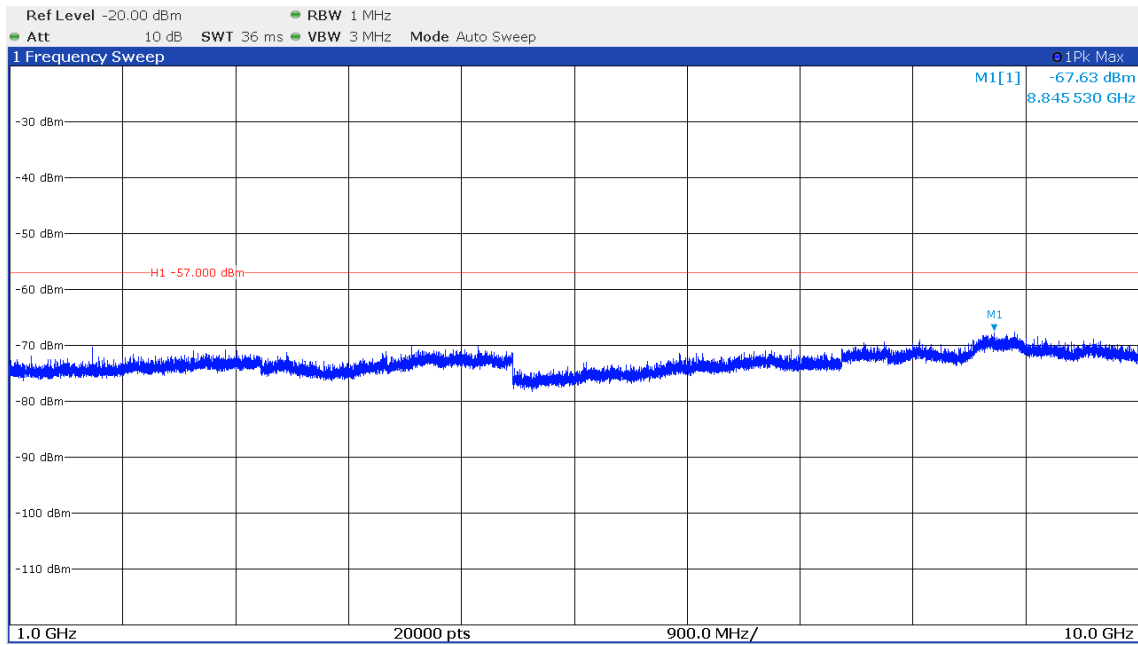
#### 5.3.3 Test results (Antenna power for receivers)

Ambient temperature:	22 °C
Relative humidity:	30 %

Date:	24.02.2023
Tested by:	P. NEUFELD

Worst case plot (receive test mode):





Frequency [MHz]	PK+ Level [dBm]	Limit acc. to [2]t [dBm]	Limit acc. to [5]t [dBm]	Minimum Margin [dB]
557.656	-79.0	-57	-57	22.0
8845.530	-67.6	-57	-53	10.6

Test result: Passed

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

## 5.4 AC power-line conducted emissions

### 5.4.1 Test setup (Conducted emissions on power supply lines)

Test setup (Conducted emissions on power supply lines)			
Used	Setup	See sub-clause	Comment
<input checked="" type="checkbox"/>	Conducted: AC power line	5.1.4	-
<input type="checkbox"/>	Not applicable, because ...	-	-

### 5.4.2 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
<input checked="" type="checkbox"/>	6.2.3.2	Tabletop equipment testing	5.1.4	Tested using a representative AC switching power adaptor
<input type="checkbox"/>	6.2.3.3	Floor-standing equipment testing	-	-

The representative AC power adaptor was provided by the test laboratory and was used for the tests:  
 Lenovo AC Adapter Model ADLX65YCC3A;  
 The power adaptor itself was supplied by 120V<sub>AC</sub> 60Hz.

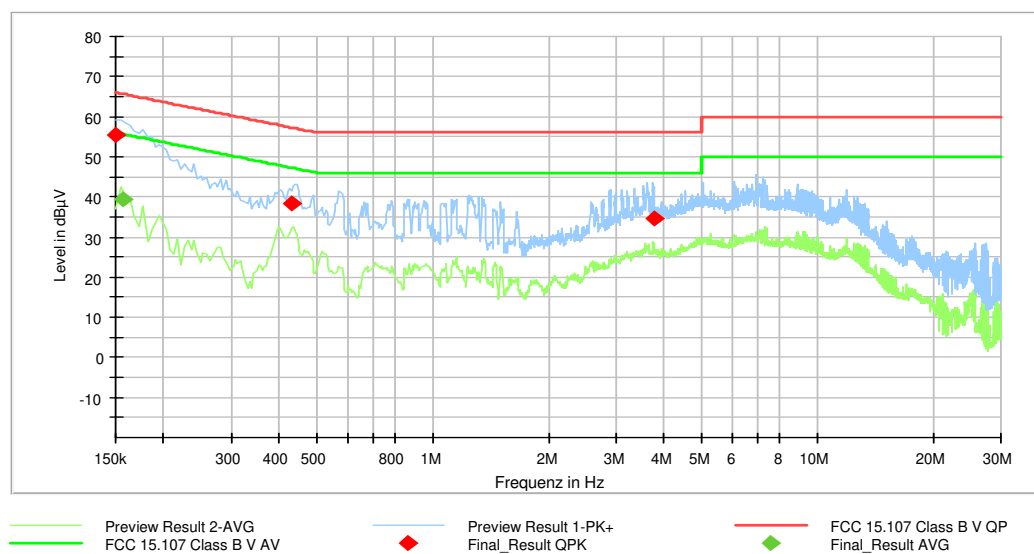


### 5.4.3 Test results (Conducted emissions on power supply lines)

Ambient temperature:	°C
Relative humidity:	%

Date:	03.03.2023
Tested by:	P. Neufeld

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]
0.150000	55.45	---	66.00	10.55	N	FLO	9.8
0.157200	---	39.28	55.61	16.33	N	GND	9.8
0.428100	38.30	---	57.29	18.99	L1	FLO	9.9
3.758100	34.52	---	56.00	21.48	L1	GND	10.3

Test result: Passed

Test equipment (please refer to chapter 7 for details)
15 – 20

## 6 Measurement Uncertainties

Conducted measurements		
Measurement method	Standard used for calculating measurement uncertainty	Expanded measurement uncertainty (95 %) $U_{lab}$
Conducted emissions from 150 kHz to 30 MHz with LISN	CISPR 16-4-2	2.8 dB

Radiated measurements		
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 18 – 40 GHz	-	5.9 dB

## 7 Test Equipment used for Tests

No.	Test equipment	Type	Manufacturer	Serial No.	PM. No.	Cal. Date	Cal Due
1	Signal & Spectrum Analyzer	FSW43	Rohde & Schwarz	100586 & 100926	481720	19.11.2021	11.2023
2	Loop antenna	HFH2-Z2	Rohde & Schwarz	832609/014	480059	22.02.2022	02.2024
3	loop antenna	HFH2-Z2	Rohde & Schwarz	100417	481912	22.02.2022	02.2024
4	RF Switch Matrix	OSP220	Rohde & Schwarz		482976	Calibration not necessary	
5	Turntable	TT3.0-3t	Maturo	825/2612/.01	483224	Calibration not necessary	
6	Antennasupport	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 Testreceiver	ESW44	Rohde & Schwarz	101828	482979	08.12.2021	12.2023
10	Test software M276	Elektra	Rohde&Schwarz	101381	483755	Calibration not necessary	
11	Attenuator 6 dB	WA2-6	Weinschel		482793	Calibration not necessary	
12	Ultralog Antenna	HL562E	Rohde & Schwarz	101079	482978	18.03.2021	03.2024
13	Low Noise Amplifier 100 MHz - 18 GHz	LNA-30-00101800-25-10P	Narda-Miteq	2110917	482967	18.02.2022	02.2024
14	Log.-Per. antenna	HL050	Rohde & Schwarz	100908	482977	22.09.2022	09.2025
15	LISN	NSLK8128	Schwarzbeck	8128155	480058	14.02.2022	02.2024
16	Software	EMC32	Rohde & Schwarz	100061	481022	Calibration not necessary	
17	Shielded chamber M4	B83117-S1-X158	Siemens	190075	480088	Calibration not necessary	
18	EMI Receiver / Spectrum Analyser	ESIB 26	Rohde & Schwarz	100292	481182	16.02.2022	02.2024
19	Transient Filter Limiter	CFL 9206A	Teseq GmbH	38268	481982	15.02.2022	02.2024
20	Power supply AC	AC6803A AC Quelle 2000VA	Keysight	JPVJ002509	482350	Calibration not necessary	

## 8 Test site Verification

Test equipment	PM. No.	Frequency range	Type of validation	According to	Val. Date	Val Due
Semi anechoic chamber M276	483227	30 – 1000 MHz	NSA/RSM	CISPR 16-1-4 + Cor1:2010 + A1:2012 +A2:2017	03.03.2021 29.02.2023	02.03.2023 29.02.2025
Semi anechoic chamber* M276	483227	1 -18 GHz	SVSWR	CISPR 16-1-4 + Cor1:2010 + A1:2012 +A2:2017	25.02.2021 28.02.2023	24.02.2023 28.02.2025
Shielded chamber M4	480088	9 kHz – 30 MHz	GND-Plane	ANSI C63.4-2014	12.05.2020	11.05.2023

\*All tests were performed in the time frame during which the test site verification was valid.

## 9 Report History

Report Number	Date	Comment
F221513E4	06.03.2023	Initial Test Report
-	-	-
-	-	-

## 10 List of Annexes

Annex A          Test Setup Photos

7 pages