

Test Report

Report Number:

F230142E2 3rd Version

Equipment under Test (EUT):

NICP-EM30-IOL-H1141 + NICS-EM30-IOL-HK1141

Applicant:

Turck Beierfeld GmbH

Manufacturer:

Turck Beierfeld GmbH



Deutsche
Akkreditierungsstelle
D-PL-17186-01-00

References

- [1] **ANSI C63.4:2014 + A1 2017** 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

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 and written
by:



Paul Neufeld
02.10.2025

Signature

Reviewed and
approved by:



Bernd STEINER
02.10.2025

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.

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1 Identification

1.1 Applicant

Name:	Turck Beierfeld GmbH
Address:	Am Bockwald 2, 08344 Grünhain-Beierfeld
Country:	Germany
Name for contact purposes:	Michael Siegel
Phone:	+49 3774-135-153
eMail address:	Michael.siegel@turck.com
Applicant represented during the test by the following person:	-

1.2 Manufacturer

Name:	Turck Beierfeld GmbH
Address:	Am Bockwald 2, 08344 Grünhain-Beierfeld
Country:	Germany
Name for contact purposes:	Michael Siegel
Phone:	+49 3774-135-153
eMail address:	Michael.siegel@turck.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-17186-01-05 and D-PL-17186-01-06, FCC Test Firm Designation Number DE0004, FCC Test Firm Registration Number 469623, CAB Identifier DE0003 and ISED# 3469A.

1.4 EUT

Test object: *	Inductive coupler (base coupler)
Model name: *	NICP-EM30-IOL-H1141
Model number: *	-
Order number: *	100018258
FCC ID: *	YQ7-NICP-EM30
IC certification number: *	8821A-NICPEM30
PMN: *	NICP-EM30-IOL-H1141
HVIN: *	7630/08
FVIN: *	V1
HMN: *	NA

Test object: *	Inductive coupler (remote coupler)
Model name: *	NICS-EM30-IOL-HK1141
Model number: *	-
Order number: *	100018259
FCC ID: *	YQ7-NICS-EM30
IC certification number: *	8821A-NICSEM30
PMN: *	NICS-EM30-IOL-HK1141
HVIN: *	7631/07
FVIN: *	V1
HMN: *	NA

	EUT number		
	1 (NICP-EM30-IOL-H1141)	2 (NICS-EM30-IOL-HK1141)	3
Serial number: *	230714_16	230413_1	-
PCB identifier: *	07763008	07763107	-
Hardware version: *	2.1.0	2.0.0	-
Software version: *	1.0.14.2	1.0.1.0	-

* Declared by the applicant

2 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			
Power supply EUT: *	DC		
Supply voltage EUT: *	$U_{nom} = 24.0$	$U_{min} = 8.0$	$U_{max} = 32.0$
Temperature range: *	-25 °C to +55 °C		
Lowest / highest internal frequency: *	16 MHz / 2472 MHz		

* Declared by the applicant

Ports / Connectors				
Identification	Connector		Length during test	Shielding (Yes / No)
	EUT	Ancillary		
NICP-EM30-IOL-H1141 24V SDCI	M12 - Code A	M12 - Code A	~ 2 m	yes
NICS-EM30-IOL-HK1141 24V SDCI	M12 - Code A	M12 - Code A	~ 2 m	yes
-	-	-	-	-

Equipment used for testing	
Laptop* ²	Fujitsu E751
bel Power Solutions & Protection* ²	HC24-2.4-AG
-	-

*¹ Provided by the applicant

*² Provided by the laboratory

Ancillary equipment	
Fieldbus master* ¹	TBEN-L5-8IOL
Sensor* ¹	CMTH-M12-IOL6X2-H1141
-	-

*¹ Provided by the applicant

1.6 Dates

Date of receipt of test sample:	31.07.2023
Start of test:	22.08.2023
End of test:	25.09.2023

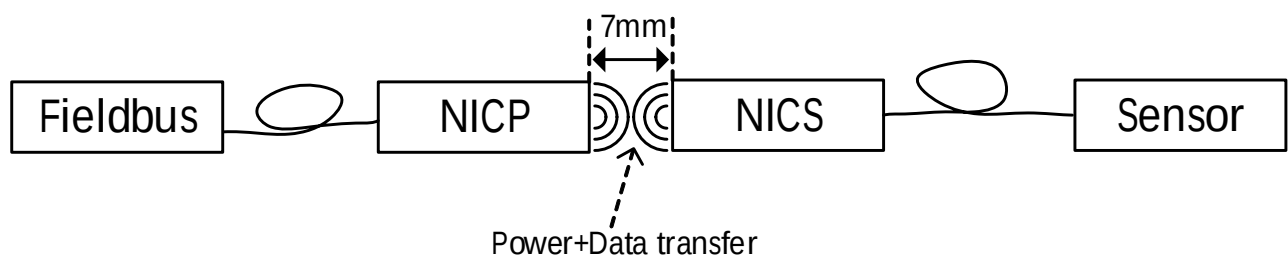
2 Operational States

Description of function of the EUT:

The NICP-EM30 coupler transmits power and data contact-free over an air gap of a few millimeters (0-7 mm). For contactless transmission at least two devices are needed: a primary part (NICP-EM30-IOL-H1141 - base coupler) and a secondary part (NICS-EM30-IOL-HK1141 - remote coupler). The primary part (base coupler) transfers the energy inductively to the secondary part (remote coupler) which could feed a sensor.

The system was setup as follows:

During the tests the EUT was connected to a field bus of the type TBEN-L5-8IOL. The field bus was connected to a laptop computer via Ethernet. The correct function of the EUT assembly was monitored via a browser on the laptop computer, having access to the fieldbus. A loss of connection is indicated by the fieldbus on the browser.



3 Additional Information

The EUT was not labeled as required by FCC / IC. All tests were performed using an unmodified sample.

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 0.5 to 5 MHz 5 to 30 MHz	66 to 56 dB(μV) QP* 56 to 46 dB(μV) AV* 56 dB(μV) QP 46 dB(μV) AV 60 dB(μV) QP 50 dB(μV) AV	ANSI C63.4	1 + 2	Passed
*: Decreases with the logarithm of the frequency					

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 A	30 to 88 MHz 88 to 216 MHz 216 to 960 MHz 960 to 1000 MHz above 1000 MHz	39.0 dB(μV/m) QP at 10 m 43.5 dB(μV/m) QP at 10 m 46.5 dB(μV/m) QP at 10 m 49.5 dB(μV/m) QP at 10 m 49.5 dB(μV/m) AV at 10 m and 69.5 dB(μV/m) PK at 10 m	ANSI C63.4	1 + 2	Passed
Radiated Emission Class B	30 to 88 MHz 88 to 216 MHz 216 to 960 MHz 960 to 1000 MHz above 1000 MHz	49.5 dB(μV/m) QP at 3 m 54.0 dB(μV/m) QP at 3 m 56.9 dB(μV/m) QP at 3 m 60.0 dB(μV/m) QP at 3 m 60.0 dB(μV/m) AV at 3 m and 80.0 dB(μV/m) PK at 3 m	ANSI C63.4	-	-

Radiated emissions ICES-003 Issue 7 section 3.2.2 [4]					
Application	Frequency range	Limits	Reference standard	Tested EUT	Status
Radiated Emission Class A	30 to 88 MHz 88 to 216 MHz 216 to 230 MHz 230 to 960 MHz 960 to 1000 MHz	40.0 dB(μV/m) QP at 10 m 43.5 dB(μV/m) QP at 10 m 46.4 dB(μV/m) QP at 10 m 47.0 dB(μV/m) QP at 10 m 49.5 dB(μV/m) QP at 10 m	ANSI C63.4	-	-
	above 1000 MHz	No limit available for 10 m			
Radiated Emission Class A	30 to 88 MHz 88 to 216 MHz 216 to 230 MHz 230 to 960 MHz 960 to 1000 MHz	50.0 dB(μV/m) QP at 3 m 54.0 dB(μV/m) QP at 3 m 56.9 dB(μV/m) QP at 3 m 57.0 dB(μV/m) QP at 3 m 60.0 dB(μV/m) QP at 3 m	ANSI C63.4	1 + 2	Passed
	above 1000 MHz	60 dB(μV/m) AV at 3 m and 80 dB(μV/m) PK at 3 m			

Remark: As declared by the applicant the highest internal clock frequency is 2.472 GHz.
Therefore the radiated emission measurement must be carried out up to 5th of the highest internal clock frequency up to 12.36 GHz, in this case the measurement was carried out up to 13 GHz.

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

5 Results

5.1 Test setups

5.1.1 Radiated: 30 MHz to 1 GHz

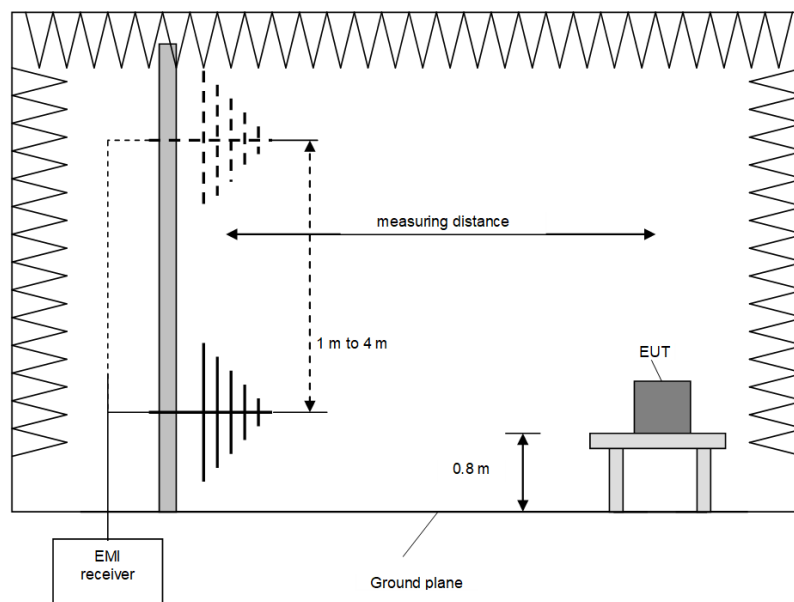
5.1.1.1 Preliminary and final measurement 30 MHz to 1 GHz

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	± 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

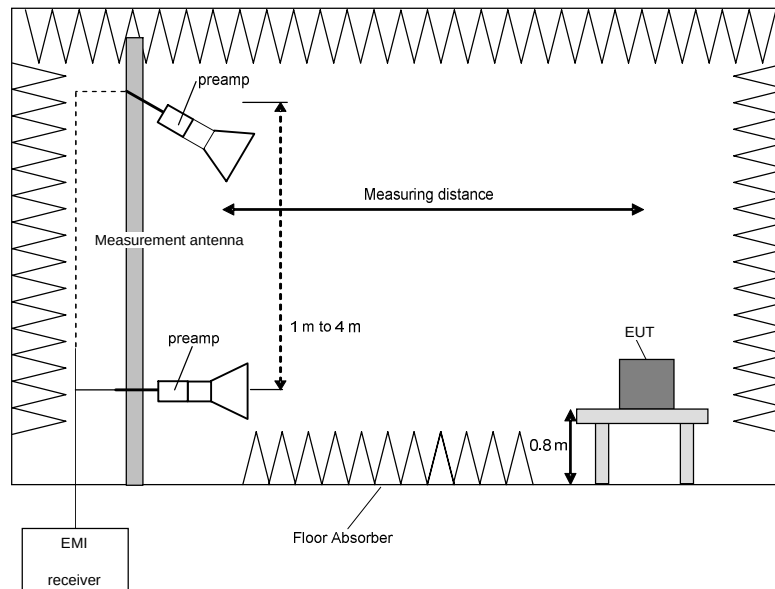
5.1.2.1 Preliminary and final measurement 1 GHz to 40 GHz

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:

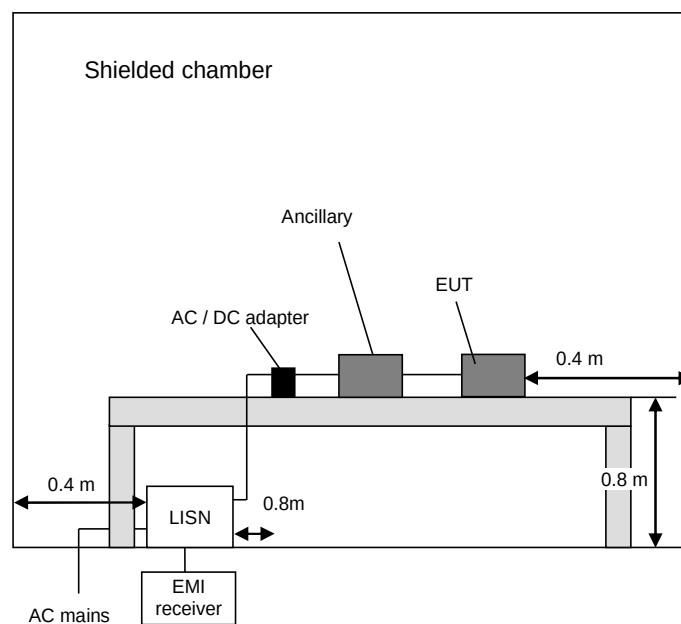
- 1) Select the highest frequency peaks (lowest margin to the limit) for the final measurement.
- 2) The software determines the exact peak frequencies by doing a partial scan with reduced step size of the pre-scan of the selected peaks.
- 3) If the EUT is portable or ceiling mounted, find the worst-case 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: 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
☒	Radiated: 30 MHz to 1 GHz / 1 GHz to 40 GHz	5.1.1 / 5.1.2	-

5.2.2 Test method (Maximum unwanted emissions)

☒ Test method (radiated) see sub-clause 5.1.1 / 5.1.2 as described herein

5.2.3 Test results (Maximum unwanted emissions)

5.2.3.1 Test results (30 MHz – 1 GHz)

Ambient temperature:	21°C
Relative humidity:	65%

Date:	22.08.2023
Tested by:	Paul 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: As pretests has shown the worst case of the 3 orthogonal planes of the EUTs position as shown in the test setup was used for the test.
The FCC testing was done at 3 m and the measurement results were corrected with 10.46 dB to account for the nominal 10 m measurement distance.

Calculations:

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

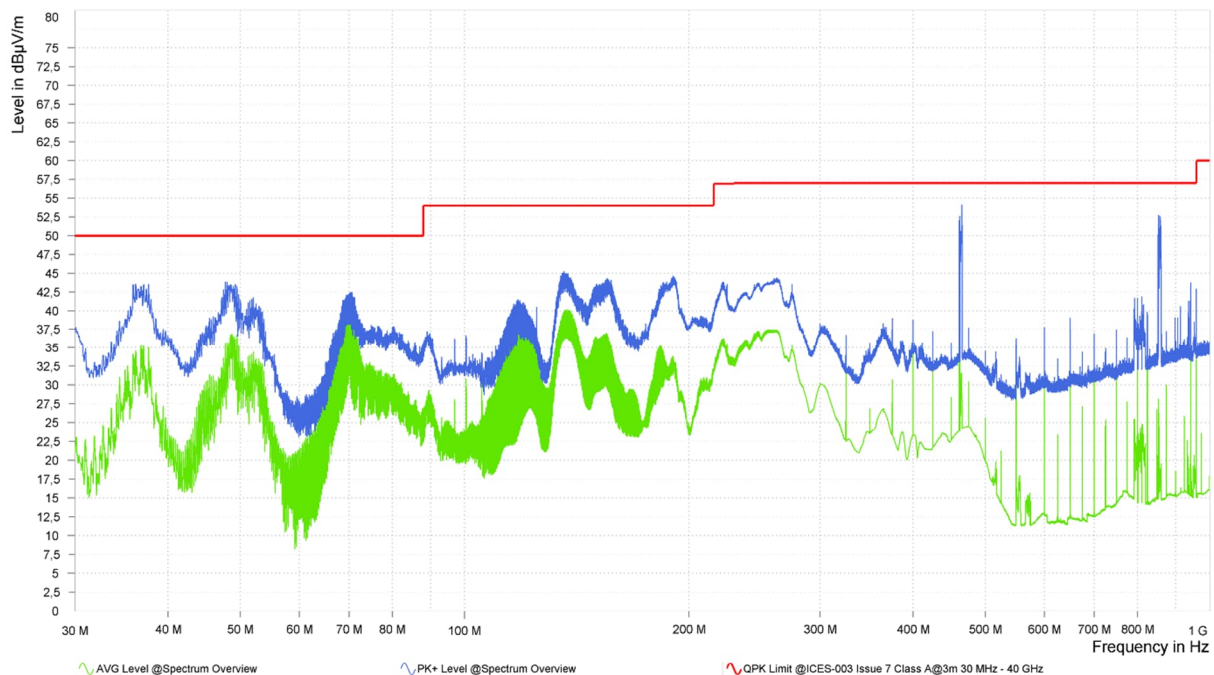
Correction [dB/m] = AF [dB/m] + Cable attenuation [dB] + optional preamp gain [dB]

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 (ICES Limits):

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



Result tables:

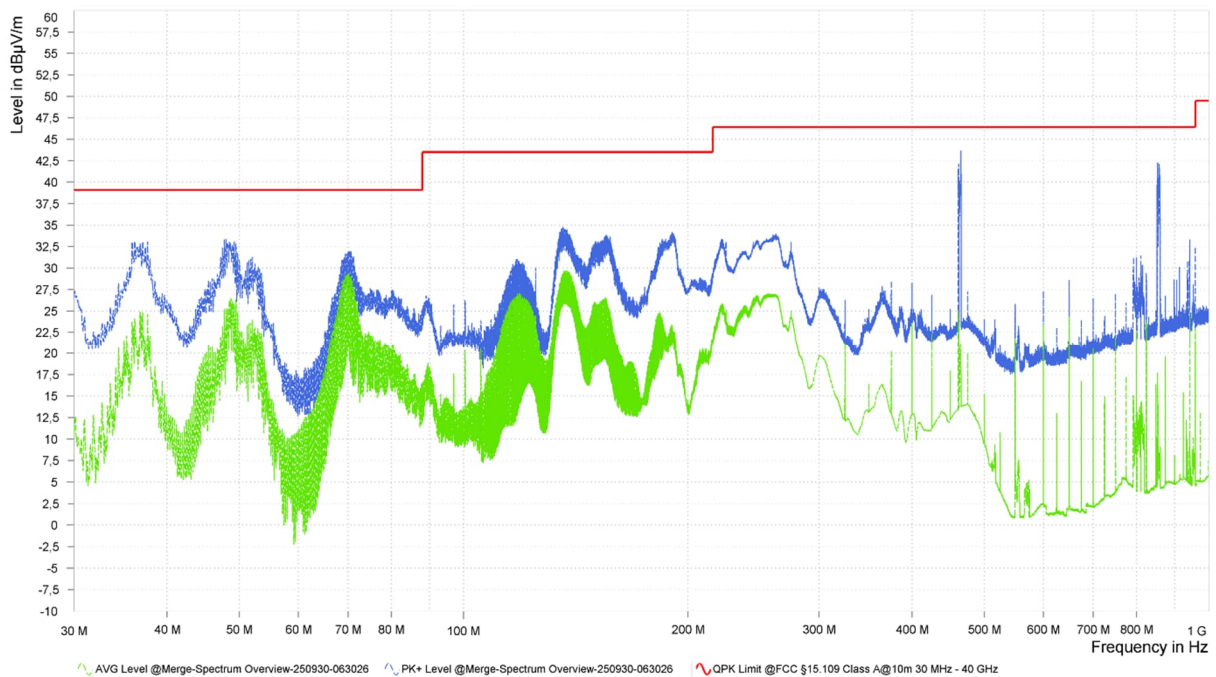
Results according to ICES-003 Issue 7 section 3.2.2 [4]

Frequency [MHz]	Result (QP) [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Readings [dBμV]	Correction [dB/m]	Antenna Height [m]	Azimuth [deg]	Pol. (H/V)	Position #
37.110	38.64	50.00	11.36	16.83	21.81	1.02	336	V	1
37.980	39.21	50.00	10.79	17.92	21.29	1.01	338	V	1
47.910	33.21	50.00	16.79	18.15	15.06	1.14	114	V	1
70.170	39.92	50.00	10.08	25.1	14.82	1.11	354	V	1
70.170	39.98	50.00	10.02	25.16	14.82	1.22	338	V	1
70.680	40.48	50.00	9.52	25.58	14.90	1.33	349	V	1
136.200	40.06	54.00	13.94	23.64	16.42	1.11	235	V	1
155.340	29.17	54.00	24.83	13.84	15.33	1.01	140	V	1
190.230	40.05	54.00	13.95	24.84	15.21	1.52	5	H	1
461.520	43.99	57.00	13.01	20.43	23.56	1.07	0	H	1
464.880	45.91	57.00	11.09	22.17	23.74	1.95	14	H	1
854.040	23.17	57.00	33.83	-6.2	29.37	1.69	268	H	1

Test result: Passed

Worst case plot (FCC Limits):

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



Result tables:

Results according to FCC 47 CFR Part 15 section 15.109 (a), (b) [3]

Frequency [MHz]	Result (QP) [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Readings [dBµV]	Correction [dB/m]	Antenna Height [m]	Azimuth [deg]	Pol. (H/V)	Position #
37.11	28.18	39.1	10.92	16.83	11.35	1.02	336	V	1
37.98	28.75	39.1	10.35	17.92	10.83	1.01	338	V	1
47.91	22.75	39.1	16.35	18.15	4.6	1.14	114	V	1
70.17	29.46	39.1	9.64	25.1	4.36	1.11	354	V	1
70.17	29.52	39.1	9.58	25.16	4.36	1.22	338	V	1
70.68	30.02	39.1	9.08	25.58	4.44	1.33	349	V	1
136.2	29.6	43.5	13.9	23.64	5.96	1.11	235	V	1
155.34	18.71	43.5	24.79	13.84	4.87	1.01	140	V	1
190.23	29.59	43.5	13.91	24.84	4.75	1.52	5	H	1
461.52	33.53	46.5	12.97	20.43	13.1	1.07	0	H	1
464.88	35.45	46.5	11.05	22.17	13.28	1.95	14	H	1
854.04	12.71	46.5	33.79	-6.2	18.91	1.69	268	H	1

Test result: Passed

Test equipment (please refer to chapter 7 for details)

1 - 9

5.2.3.2 Test results (radiated 1 GHz to 40 GHz)

Ambient temperature:	22°C
Relative humidity:	66%

Date:	24.08.2023
Tested by:	Paul NEUFELD

Position of EUT: For tests for f between 1 GHz and the 5th 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: As pretests has shown the worst case of the 3 orthogonal planes of the EUTs position as shown in the test setup was used for the test.
The FCC testing was done at 3 m and the measurement results were corrected with 10.46 dB to account for the nominal 10 m measurement distance.

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)

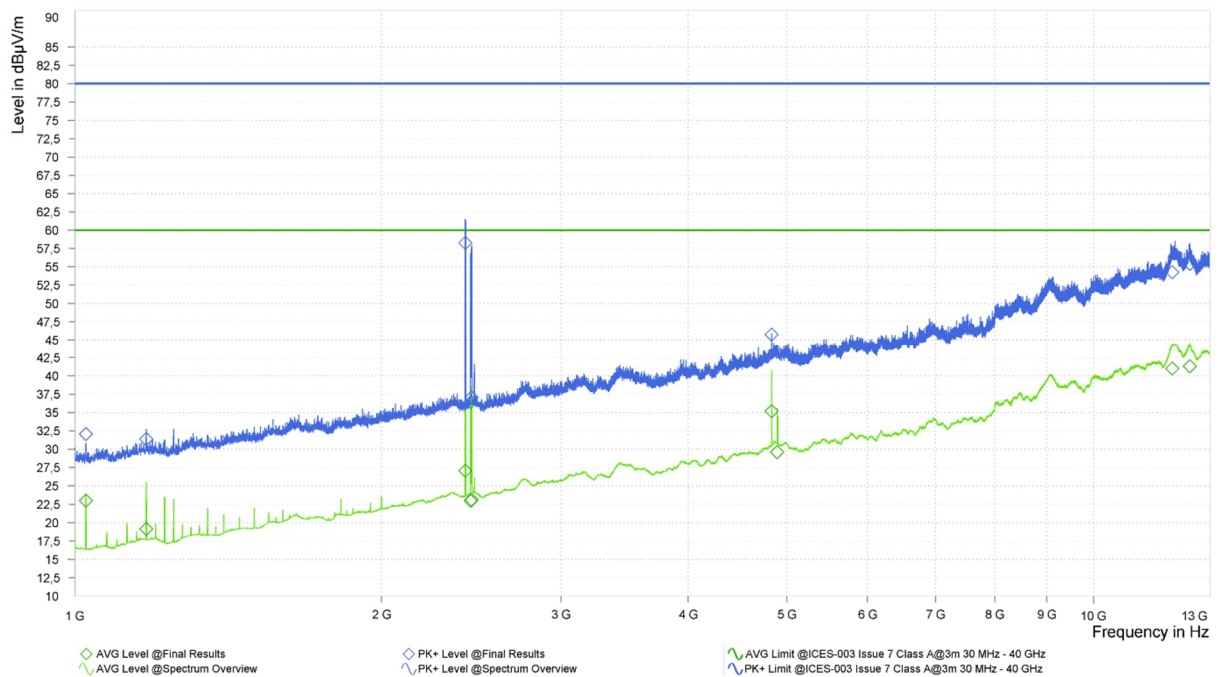
Margin [dB] = Limit [dBμV/m] – Max Peak | Average [dBμV/m]

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.

Worst case plot (ICES Limits):

Spurious emissions from 1 GHz to 13 GHz (operation mode 1):

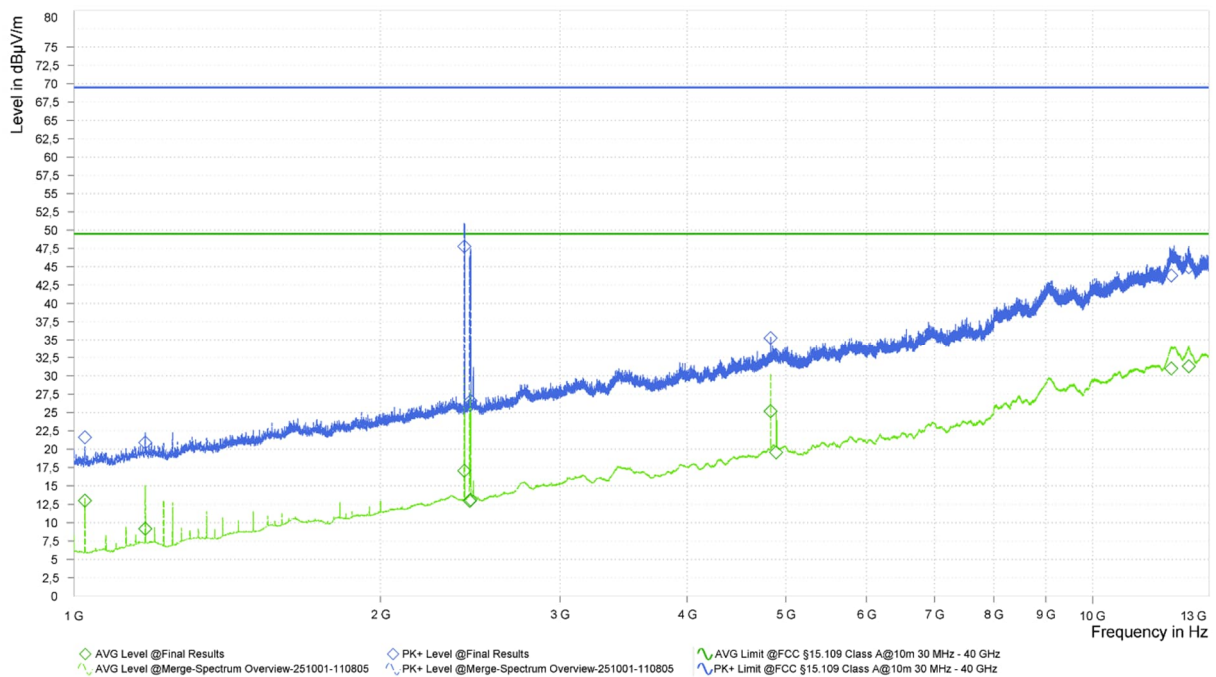


Result tables:

Frequency [MHz]	PK+ [dBμV/m]	Pk+ Limit [dBμV/m]	PK+ Margin [dB]	AV [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Corr. [dB/m]	Pol	Azimuth [deg]	Antenna Height [m]
1025.000	32.07	80.00	47.93	23.00	60.00	37.00	-10.61	V	73	2.67
1175.000	31.37	80.00	48.63	19.15	60.00	40.85	-9.09	H	379	2.07
2416.750	58.25	80.00	21.75	27.06	60.00	32.94	-0.39	H	-1	1.50
2447.000	36.44	80.00	43.56	22.97	60.00	37.03	-0.25	V	49	1.25
2452.000	37.05	80.00	42.95	23.13	60.00	36.87	-0.25	V	247	1.08
4830.750	45.73	80.00	34.27	35.17	60.00	24.83	9.77	V	68	3.57
4890.750	43.25	80.00	36.75	29.58	60.00	30.42	10.01	V	78	1.25
11950.000	54.26	80.00	25.74	41.00	60.00	19.00	23.23	V	339	2.40
12430.000	55.40	80.00	24.60	41.28	60.00	18.72	23.73	H	69	2.80

Test result: Passed

Worst case plot (FCC Limits):



Result tables:

Frequency [MHz]	PK+ [dBµV/m]	Pk+ Limit [dBµV/m]	PK+ Margin [dB]	AV [dBµV/m]	AV Limit [dBµV/m]	AV Margin [dB]	Corr. [dB/m]	Pol	Azimuth [deg]	Antenna Height [m]
1025.000	21.61	69.50	47.89	13.00	49.50	36.50	-10.61	V	73	2.67
1175.000	20.91	69.50	48.59	9.15	49.50	40.35	-9.09	H	379	2.07
2416.750	47.79	69.50	21.71	17.06	49.50	32.44	-0.39	H	-1	1.50
2447.000	25.98	69.50	43.52	12.97	49.50	36.53	-0.25	V	49	1.25
2452.000	26.59	69.50	42.91	13.13	49.50	36.37	-0.25	V	247	1.08
4830.750	35.27	69.50	34.23	25.17	49.50	24.33	9.77	V	68	3.57
4890.750	32.79	69.50	36.71	19.58	49.50	29.92	10.01	V	78	1.25
11950.000	43.80	69.50	25.70	31.00	49.50	18.50	23.23	V	339	2.40
12430.000	44.94	69.50	24.56	31.28	49.50	18.22	23.73	H	69	2.80

Test result: Passed

Test equipment (please refer to chapter 7 for details)

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5.3 AC power-line conducted emissions

5.3.1 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	5.1.3	-
☐	Not applicable, because ...	-	-

5.3.2 Test method (Conducted emissions on power supply lines)

Test setup (Conducted emissions on power supply lines)				
Used	Clause [1]	Name of method	Sub-clause	Comment
☒	7.3; 11.5; 11.8	Tabletop equipment testing	5.1.3	Provided AC switching power adaptor
☐	7.3; 11.6; 11.8	Floor-standing equipment testing	-	-

The AC power adaptor provided by the test laboratory was used for the tests:
bel Power Solutions & Protection.

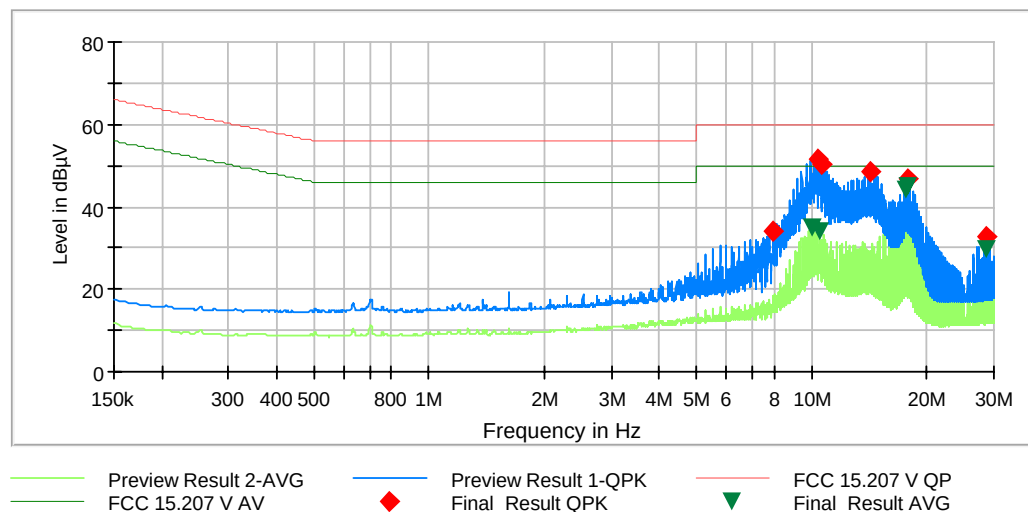
The power adaptor itself was supplied by 120V_{AC} 60Hz.

5.3.3 Test results (Conducted emissions on power supply lines)

Ambient temperature:	22 °C
Relative humidity:	44 %

Date:	25.09.2023
Tested by:	Michael Dinter

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]
7.953000	34.31	---	60.00	25.69	L1	GND	20.4
10.079250	---	34.96	50.00	15.04	L1	GND	20.5
10.376250	51.51	---	60.00	8.49	L1	GND	20.5
10.457250	---	34.01	50.00	15.99	L1	FLO	20.5
10.603500	50.37	---	60.00	9.63	L1	GND	20.5
14.291250	48.46	---	60.00	11.54	N	FLO	20.5
17.637000	---	44.26	50.00	5.74	L1	GND	20.6
17.889000	46.62	---	60.00	13.38	N	GND	20.6
17.889000	---	45.10	50.00	4.90	N	GND	20.6
28.686750	32.86	---	60.00	27.14	N	GND	20.7
28.686750	---	29.82	50.00	20.18	N	GND	20.7

Test result: Passed

Test equipment (please refer to chapter 7 for details)
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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	Attenuator 6 dB	WA2-6	Weinschel	8254	410119	Calibration not necessary	
2	Ultralog Antenna	HL562E	Rohde & Schwarz	101079	482978	18.03.2021	03.2024
3	Testsoftware M276	EMC32 V11.30	Rohde & Schwarz	100970	482972	Calibration not necessary	
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	Log.-Per. antenna	HL050	Rohde & Schwarz	100908	482977	22.09.2022	10.2025
11	V-LISN	NSLK8128RC	Schwarzbeck	0412	483186	15.02.2022	02.2024
12	Shielded chamber M155	SK3	Albatross Projects		482786	Calibration not necessary	
13	Software	EMC32	Rohde & Schwarz	100619	483182	Calibration not necessary	
14	EMI testreceiver	ESR7	Rohde & Schwarz	101939	482558	15.02.2022	02.2024

8 Test site Verification

Test equipment	PM. No.	Frequency range	Type of validation	According to	Val. Date	Val Due
Shielded chamber M155	482784	9 kHz – 30 MHz	GND-Plane	ANSI C63.4-2014	14.11.2022	13.11.2025
Semi anechoic chamber M276	483227	30 – 1000 MHz	NSA/RSM	CISPR 16-1-4 + Cor1:2010 + A1:2012 + A2:2017	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
F230142E2	29.02.2024	Initial Test Report
F230142E2 2 nd Version	06.03.2024	Correction of a copy+paste error in the first table in chapter 1.4
F230142E2 3 rd Version	01.10.2025	Page 9+10 Typo in the limit tables Page 16-20 Separate Plots+Result table for FCC&IC + Editing the correction (Measurement result correction instead of reduced limit lines for FCC)
-	-	-

10 List of Annexes

Annex A Test Setup Photos

8 pages