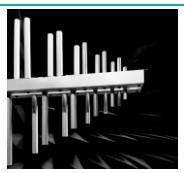
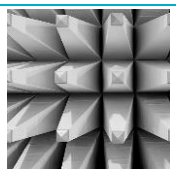

Bundesnetzagentur

BNetzA-CAB-02/21-102

TEST REPORT

Test Report No.: 1-7495/24_01_02_B

Testing Laboratory

cetecom advanced GmbH
Untertürkheimer Straße 6 – 10
66117 Saarbrücken/GERMANY
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Accredited Testing Laboratory:
The testing laboratory (area of testing) is accredited according to DIN EN ISO/IEC 17025 (2018-03) by the Deutsche Akkreditierungsstelle GmbH (DAkkS)
The accreditation is valid for the scope of testing procedures as stated in the accreditation certificate starting with the registration number: D-PL-12076-01.

Applicant

X2E GmbH
Große Ahlmühle 19
76865 Rohrbach/GERMANY
Contact: Gerhard Spengler
e-mail: gerhard.spengler@x2e.de

Manufacturer

X2E GmbH
Große Ahlmühle 19
76865 Rohrbach/GERMANY
Contact: Gerhard Spengler

Test Standard/s

FCC - Title 47 CFR Part 15: 2023-07	FCC - Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices
ANSI C63.4a: 2017	American National Standard for Methods of Measurement of RadioNoise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz Amendment 1: Test Site Validation

Test Item

Kind of test item: **external SSD**
Model name: **ESU-4TB Rev. 0300 4TB**
detailed information see chapter 6.1 and 6.2 of this test report

This test report is electronically signed and valid without handwritten signature. The public keys can be requested at the test laboratory to verify the electronic signatures.

Test report authorised:

cn=Uli Kraus, o=cetecom advanced GmbH, ou=EMC-8459, email=uli.kraus@cetecomadvanced.com, c=DE
2024.04.15 15:18:50 +02'00'

Uli Kraus
Supervisor EMC Services
EMC Labs

Test performed:

cn=Jan Schöner, o=cetecom advanced, ou=EMC Labs, email=jan.schoener@cetecomadvanced.com, c=DE
2024.04.15 12:42:25 +02'00'

Jan Schöner
Testing Manager
EMC Labs

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2 General information

2.1 Notes and disclaimer

The test results of this test report relate exclusively to the test item specified in this test report. Cetecom advanced GmbH does not assume responsibility for any conclusions and generalisations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of cetecom advanced GmbH.
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In no case this test report can be considered as a Letter of Approval.

The present test report can only be used for the sDOC procedure in the USA if the „Responsible Party" (located in USA) or an official of the responsible party confirms the report in writing, as designated in FCC§2.938.

This test report is electronically signed and valid without handwritten signature. For verification of the electronical signatures, the public keys can be requested at the testing laboratory.

This test report is a new release and replaces all former versions of this report. Please refer to Annex C "Document history" for further information

2.2 Application details

Date of receipt of order:	2023-07-17
Date of receipt of test item:	2023-07-03
Start of test[1)]:	2023-07-03
End of test[1)]:	2023-07-04

[1)] Date of each measurement, if not shown in the plot, can be requested. Dates are stored in the measurement software.

3 Test standard/s:

Test Standard	Test Standard Description
FCC - Title 47 CFR Part 15: 2023-07	FCC - Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices
ANSI C63.4a: 2017	American National Standard for Methods of Measurement of RadioNoise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz Amendment 1: Test Site Validation

4 Test Environment

Temperature:	15°C – 35°C
Relative humidity content:	30 % - 60 %
Air pressure:	860 – 1060 hPa
Power supply of measurement equipment:	230 V / 50 Hz

5 Test Laboratories sub-contracted

---

6 Information about Test Conditions

6.1 Test item

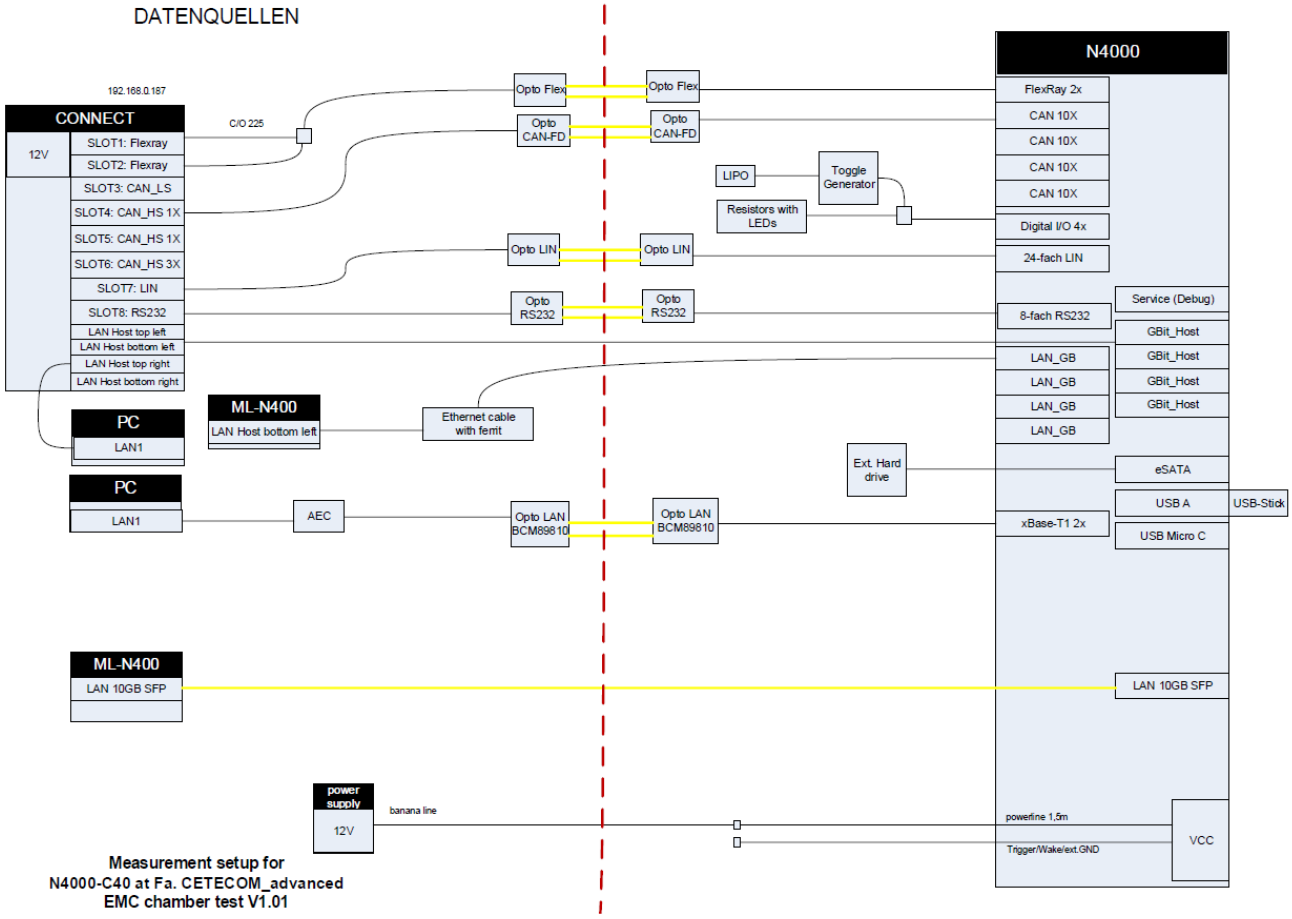
Kind of test item :	**external SSD**		
Type identification :	**ESU-4TB Rev. 0300 4TB**		
Equipment classification:	Equipment for fixed use		
Environment classification:	Industrial environment		
Supply voltage :	DC: 12V		
Ports :	**Description**	**Direction**	**Length**
	Logger port	in / output	< 3 m
Is mounting position / usual operating position defined?	no		
Additional information:			
Test set-up / cabling / operating modes of EUT during tests according to customer. - this is a class A digital device: the instructions furnished the user shall include a statement according to §15.105 of the used FCC rules FCC ID : 2AU4HESU			

6.2 EUT: Type, S/N etc. and Short Descriptions Used in this Test Report

short descrip-tion*)	EUT	Type	S/N serial number	HW hardware status	SW software status
EUT A	External SSD	ESU-4TB Rev. 0300 4TB	0002A8	0300	---
EUT B	Power supply	Deutronic ETC70H-12	H2833900111	---	---

*) EUT short description is used to simplify the identification of the EUT in this test report.

6.3 Auxiliary Equipment (AE): Type, S/N etc. and Short Descriptions



6.4 EUT Set-up(s)

EUT set-up no.*)	Combination of EUT and AE	Remarks
set. 1	EUT A + EUT B	For radiated emission: EUT B outside the measurement area
set. 2	EUT A + EUT B	For conducted emission: EUT B within the measurement area

*) EUT set-up no. is used to simplify the identification of the EUT set-up in this test report.

6.5 EUT Operating Modes

EUT operating mode no.*)	Description of operating modes	Additional information
op. 1	Data logging	See also data transfer table below

*) EUT operating mode no. is used to simplify the test report.

7 Summary of Test Results

☒ No deviations from the technical specifications were ascertained
☐ There were deviations from the technical specifications ascertained

7.1 Emission

7.1.1 Enclosure

EMI Phenomenon	Frequency range	Basic standard	Result
Radiated Interference Field Strength	30 - 1000 MHz	FCC Part 15 Class A	passed
Radiated Interference Field Strength	> 1 GHz	FCC Part 15 Class A	passed

7.1.2 AC Mains Power Input/Output Ports

EMI Phenomenon	Frequency range	Basic standard	Result
Conducted interference voltage	0,15– 30 MHz	FCC Part 15 Class A	passed

Remarks:

NA1	Not tested because not required by used standard
NA2	Test not applicable because port does not exists
NA3	Test not applicable because port only for services
NA4	Test not applicable because port lengths not longer than 3m
NA5	Not tested because not required by customer
NA6	Not tested because used frequency < 108 MHz
NA7	Not tested because the device is for vehicular use

7.2 Measurement and Test Set-up

Note: Test set-up / cabling / operating modes of EUT during tests according to customer.

7.3 Measurement uncertainty

The uncertainty of the measurement equipment fulfils CISPR 16 and the related European and national standards.

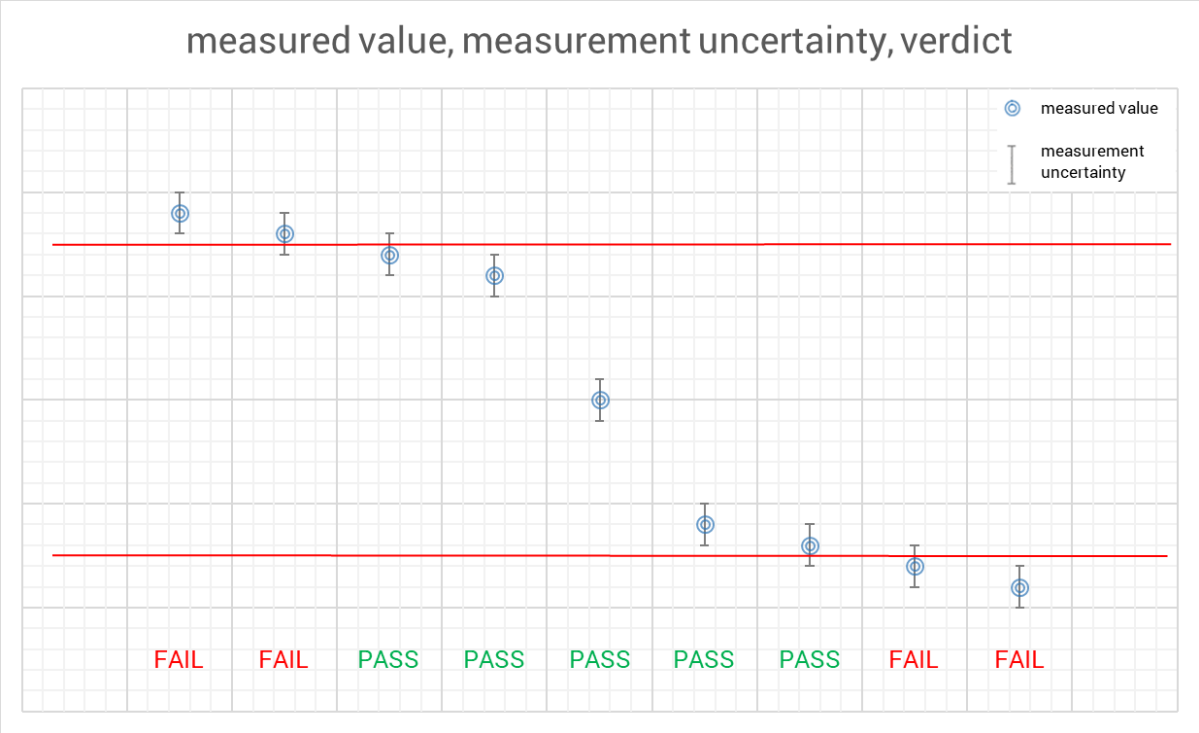
The semi anechoic chamber fulfils the requirements of CISPR 16-1 (ANSI C63.4) for a test volume of 4m ∅.

The table below shows the measurement uncertainties for each measurement method. The expended uncertainty (k=2 or 95%) was calculated with worst case values.

Measurement Method	Frequency area Impulse duration time	Description	Expanded uncertainty (k=2 or 95%)
Radiated Emission FCC part 15 B, ANSI C63.4	< 1 GHz > 1 GHz	Field strength [dBµV/m]	± 4.64 dB ± 4.92 dB
Conducted Emission FCC part 15 B, ANSI C63.4	9 kHz – 30 MHz	Voltage [dBµV]	± 3.49 dB

7.4 Reporting statements of conformity – decision rule

Only the measured values related to their corresponding limits will be used to decide whether the equipment under test meets the requirements of the test standards listed in chapter 3.
The measurement uncertainty is mentioned in this test report, see chapter above, but is not taken into account - neither to the limits nor to the measurement results. Measurement results with a smaller margin to the corresponding limits than the measurement uncertainty have a potential risk of more than 5% that the decision might be wrong."



8 Detailed test results - Emission

8.1 Conducted Emission

8.1.1 Instrumentation for Test (see equipment list)

G 1	G 2	F 21									

8.1.2 Test Plan

EUT set-up	Set 2		
Operating mode	**Port / Line**	**Limit**	**Result**
Op 1	AC power line	FCC part 15 B Class B	passed

Remark :	Powered by external power supply (120 V / 60 Hz) The device meets also Class A limits.

8.1.3 Conducted Limits (Power-Line)

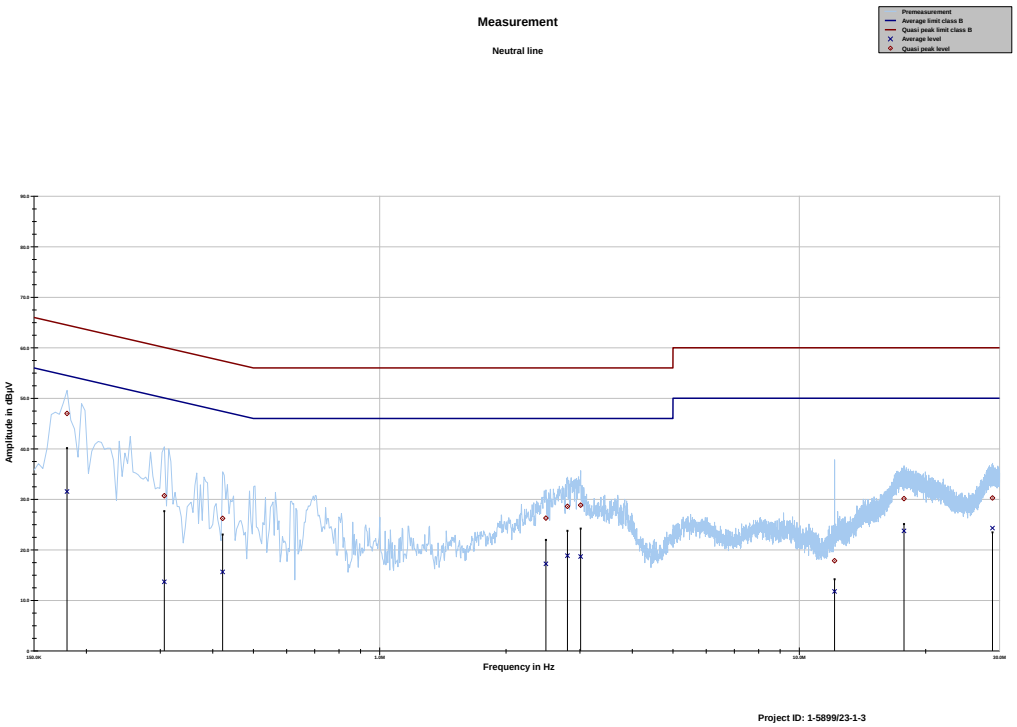
	FCC part 15 B Class B		FCC part 15 B Class A	
Frequency- range	**Quasi-Peak (dBµV)**	**Average (dBµV)**	**Quasi-Peak (dBµV)**	**Average (dBµV)**
0,15 MHz – 0,5 MHz	66-56	56-46	79	66
0,5 MHz -5 MHz	56	46	73	60
5 MHz -30 MHz	60	50	73	60

8.1.4 Calibration Information

Device	Serial number	Internal Number	Calibration valid until	Calibration interval
ESR3	102981	300006318	12 / 2023	12 month
VISN ESH 3-Z5	893045/004	300000584	12 / 2023	24 month

Remarks: All emission components and the shielded room were checked weekly
Cable loss: 0.6 to 2.4 dB (150kHz to 30 MHz)

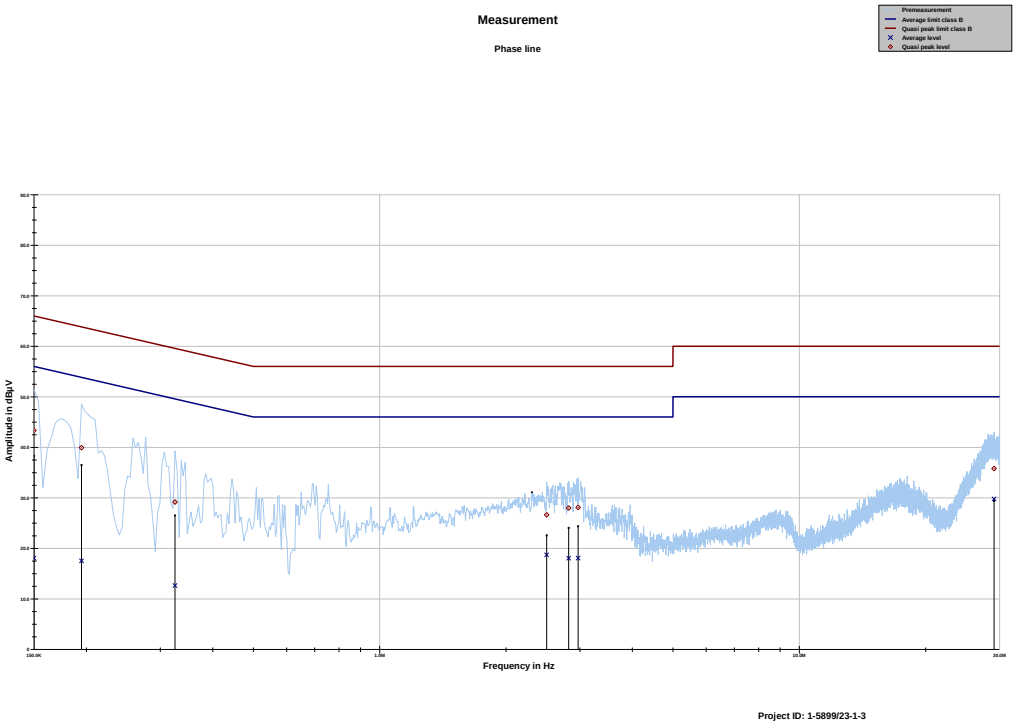
8.1.5 Test Results of Main



Neutral line tbl
Project ID: 1-5899/23-1-3

Frequency	Quasi peak level	Margin quasi peak	Limit QP	Average level	Margin Average	Limit AV
MHz	dBµV	dB	dBµV	dBµV	dB	dBµV
0.179850	46.99	17.51	64.493	31.55	23.60	55.147
0.306712	30.70	29.35	60.059	13.68	37.85	51.523
0.422381	26.23	31.17	57.401	15.63	32.59	48.218
2.489494	26.28	29.72	56.000	17.23	28.77	46.000
2.802919	28.61	27.39	56.000	18.85	27.15	46.000
3.011869	28.85	27.15	56.000	18.67	27.33	46.000
12.134775	17.85	42.15	60.000	11.78	38.22	50.000
17.761500	30.14	29.86	60.000	23.75	26.25	50.000
28.873162	30.27	29.73	60.000	24.30	25.70	50.000

Project ID - 1-5899/23-1-3
EUT – set2
Operating mode - data loggin



Phase line tbl
Project ID: 1-5899/23-1-3

Frequency	Quasi peak level	Margin quasi peak	Limit QP	Average level	Margin average	Limit AV
MHz	dBµV	dB	dBµV	dBµV	dB	dBµV
0.150000	43.34	22.66	66.000	18.05	37.95	56.000
0.194775	39.92	23.91	63.830	17.51	37.21	54.721
0.325369	29.16	30.41	59.569	12.63	38.36	50.989
2.500688	26.64	29.36	56.000	18.71	27.29	46.000
2.821575	27.99	28.01	56.000	18.04	27.96	46.000
2.970825	28.10	27.90	56.000	18.07	27.93	46.000
29.123156	35.80	24.20	60.000	29.79	20.21	50.000

Project ID - 1-5899/23-1-3
EUT - Set 2
Operating mode - data loggin

8.1.6 Signal strength calculation

Calculation formula:
SS = UR + CF + VC

List of abbreviations:

SS	▶	signal strength
UR	▶	voltage at the receiver
CF	▶	loss of the cable and filter (passband filter 130 kHz – 30 MHz)
VC	▶	correction factor of the ISN (ESH3-Z5)

List with correction factors:

Frequency [MHz]	CF [dB]	VC [dB]
0,150	9,80	1,42
1,000	9,80	0,41
5,000	9,90	0,32
10,000	9,90	0,23
15,000	10,00	0,39
20,000	10,00	1,19
25,000	10,20	1,55
30,000	10,30	1,31

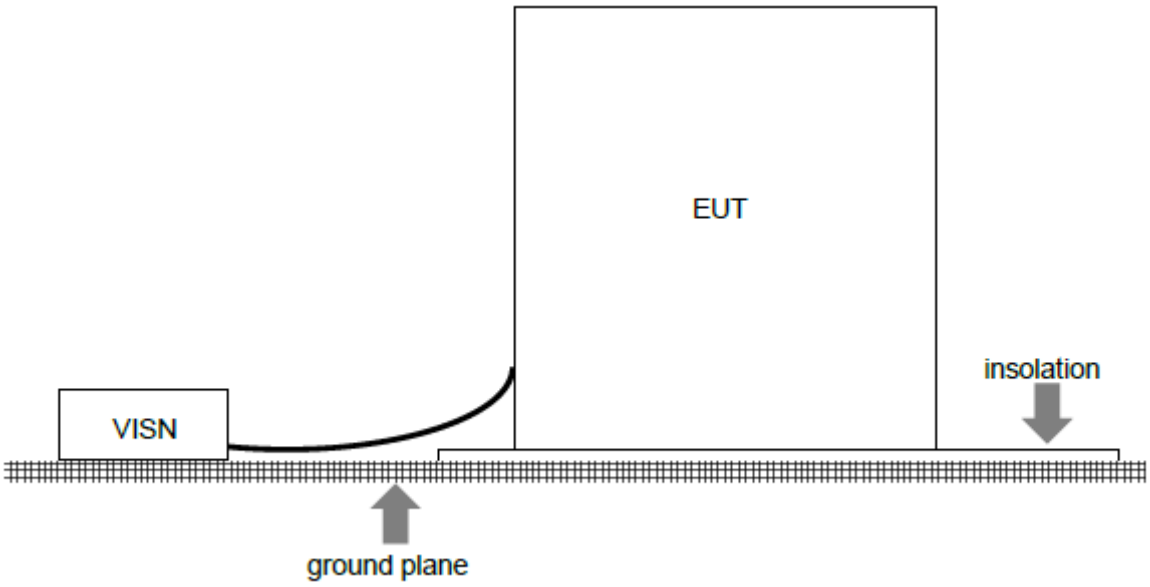
Example calculation:
For example at 10,000 000 MHz the measured Voltage (UR) is 37,62 dBµV, the loss of the cable and filter (CF) is 9,90 dB and the correction factor of the ISN (VC) is 0,23 dB the final result will be calculated:
SS [dBµV] = 37,62 [dBµV] + 9,90 [dB] + 0,23 [dB] = 47,75 [dBµV] (244, 06 µV)

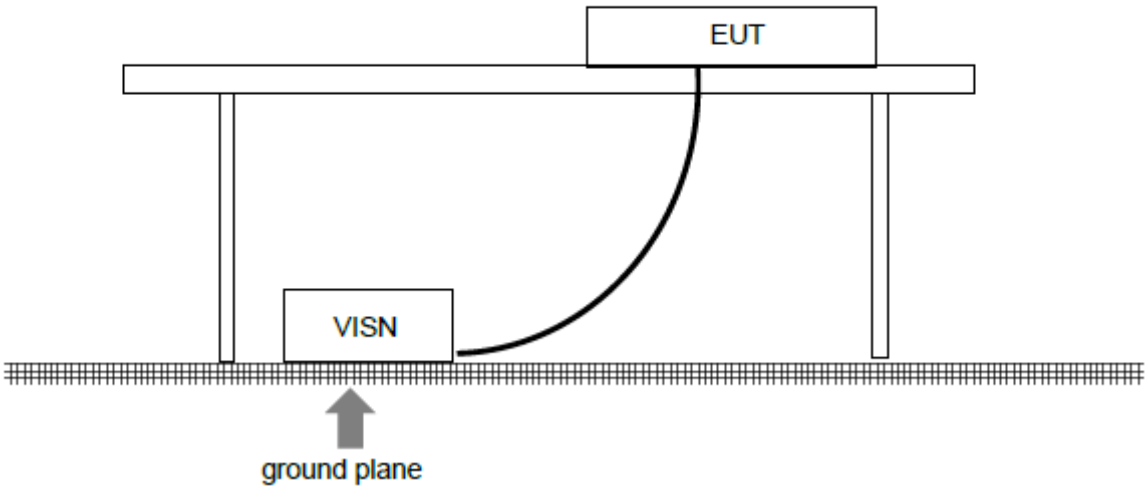
8.1.7 Version of test software

Software Version: TILE 7.3.0.15

8.1.8 Test Set-up

According to EMC basic standard **ANSI C 63.4**





A

8.2 Electromagnetic Radiated Emissions (Distance 10 m)

8.2.1 Instrumentation for Test (see equipment list)

F 1	F 2	F 4b	F 5	F 6	F 7	F 8					

8.2.2 Test Plan

EUT set-up	set 1		
Operating mode	**Application**	**Limit**	**Result**
op 1	Enclosure	FCC part 15 B Class A	passed

Remarks:	Powered by external power supply (12 DC EUT B)

8.2.3 Radiated Limits

Frequency- range	FCC part 15 B Class B @ 10 m	FCC part 15 B Class A @ 10 m
30 MHz – 88 MHz	30 dBµV/m	39,1 dBµV/m
88 MHz – 216 MHz	33,5 dBµV/m	43,5 dBµV/m
216 MHz – 960 MHz	36 dBµV/m	46,4 dBµV/m
above 960 MHz	44 dBµV/m	49,5 dBµV/m
	* This values are recalculated from the class B limits at 3 m antenna distance in §15.109 (g 2) of the FCC rules	.

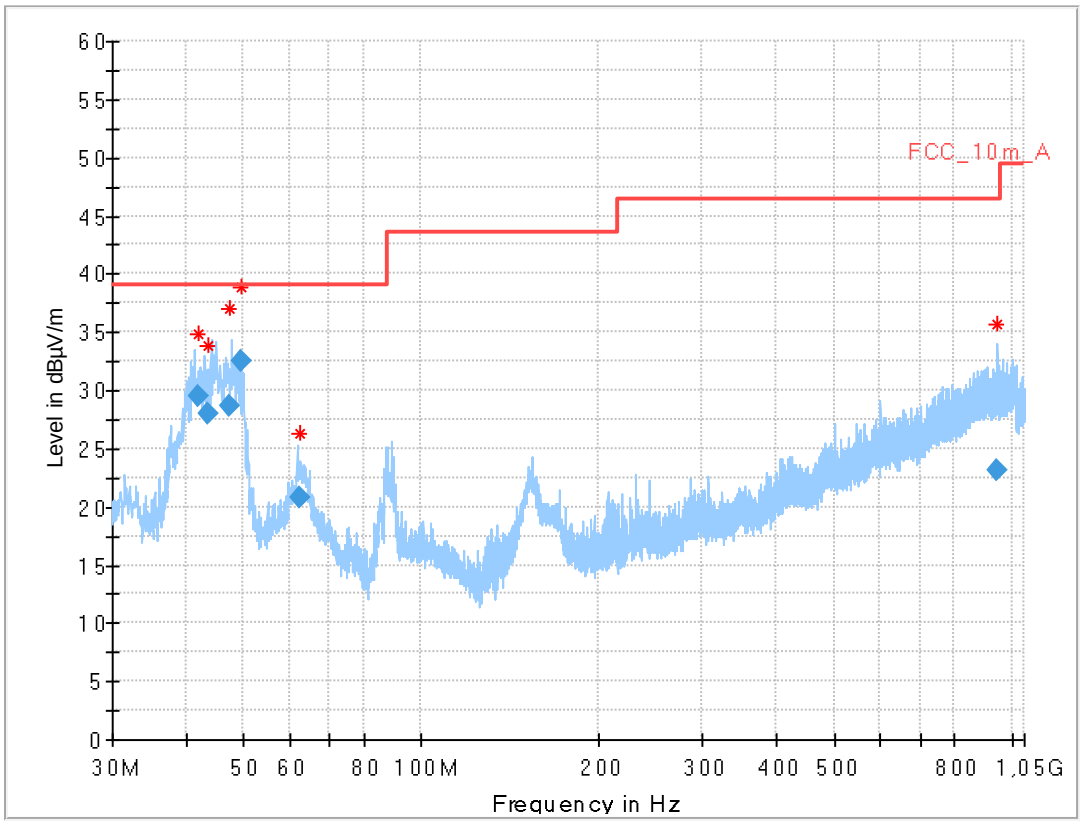
8.2.4 Calibration Information

Device	Serial number	Internal Number	Calibration valid until	Calibration interval
ESR 3	1316.3003K03-102587-ct	300005771	12 / 2023	12 month
Trilog Antenna	9163-1029	300005379	08 / 2023	24 month
Remarks: System check of all relevant devices and the chamber (weekly)				

8.2.5 Test Results

Common Information

EUT:	Set 1
Test description:	FCC part 15 B class A
Operating condition:	Op 1
Operator name:	SCR
Comment:	DC 12V



Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
41.788	29.43	39.1	9.7	1000	120.0	110.0	V	110	16
43.605	27.95	39.1	11.2	1000	120.0	103.0	V	124	16
47.262	28.65	39.1	10.5	1000	120.0	114.0	V	287	16
49.513	32.49	39.1	6.6	1000	120.0	133.0	V	0	16
62.122	20.76	39.1	18.3	1000	120.0	200.0	V	106	13
941.688	23.12	46.4	23.3	1000	120.0	106.0	H	221	26

8.2.6 Hardware Set-up

Hardware Setup: EMI radiated\VULP_10_m - [EMI radiated]

Subrange 1

Frequency Range:	30 MHz - 2 GHz
Receiver:	ESR 3 [ESR 3] @ GPIB0 (ADR 20), SN 1316.3003K03/102587, FW 3.66
Signal Path:	without Notch FW 1.0
Antenna:	VULB 9163 FW ---
Antenna Tower:	Tower [EMCO 2090 Antenna Tower] @ GPIB0 (ADR 8), FW REV 3.12
Turntable:	Turntable [EMCO Turntable] @ GPIB0 (ADR 9), FW REV 3.12
	Software version: EMC32 V10.59.0

8.2.7 Sequence of testing

Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- If the EUT is a tabletop system, a nonconducting table with 0.8 m height is used, which is placed on the ground plane.
- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- Measurement distance is 10 m or 3 m (see ANSI C 63.4) – see test details.
- EUT is set into operation.

Premeasurement

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna is polarized vertical and horizontal.
- The antenna height changes from 1 m to 3 m.
- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

Final measurement

- The final measurement is performed for at least six highest peaks according to the requirements of the ANSI C63.4.
- Based on antenna and turntable positions at which the peak values are measured the software maximize the peaks by changing turntable position ± 45° and antenna height between 1 and 4 m.
- The final measurement is done with quasi-peak detector (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit are recorded. A plot with the graph of the premeasurement with marked maximum final results and the limit is stored.

8.2.8 Signal strength calculation

Calculation formula:
SS = U_R + CL + AF

List of abbreviations:

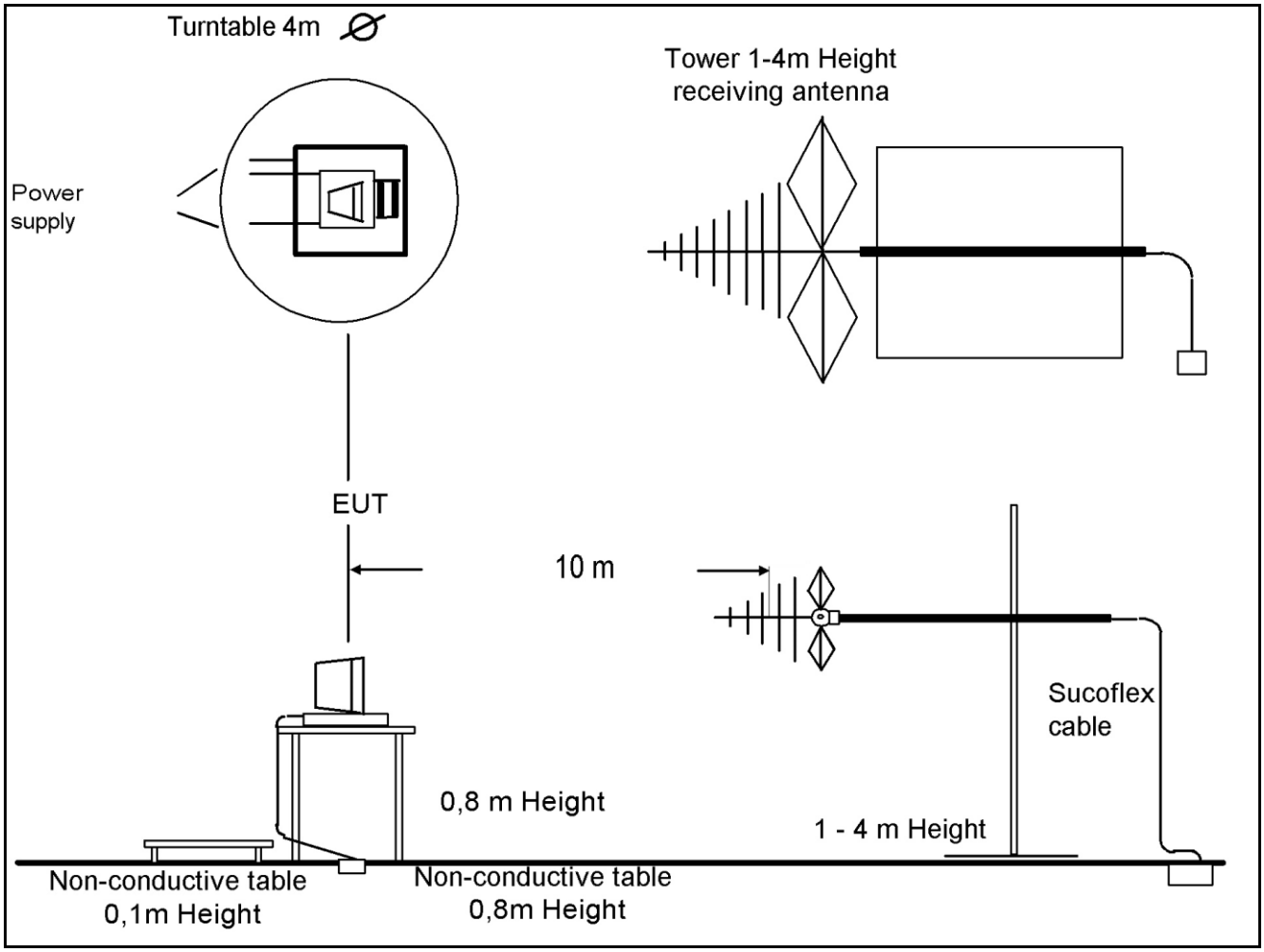
SS	►	signal strength
U_R	►	voltage at the receiver
CL	►	loss of the cable
AF	►	antenna factor

List with correction factors:

Frequency [MHz]	CL [dB]	AF [1/m]
30,000	0,20	12,30
100,000	0,60	11,30
200,000	1,10	10,60
300,000	1,30	13,20
400,000	1,60	15,30
500,000	1,90	16,80
600,000	2,00	18,80
700,000	2,20	20,30
800,000	2,30	21,50
900,000	2,40	22,80
1000,000	2,50	23,30

Example calculation:
For example at 500,000 000 MHz the measured Voltage (U_R) is 12,35 dBµV, the loss of the cable (CL) is 1,90 dB and the antenna factor (AF) is 16,80 dB (m^{-1}) the final result will be calculated:
SS [dBµV/m] = 12,35 [dBµV] + 1,90 [dB] + 16,80 [dB (m^{-1})] = 31,05 [dBµV/m] (35,69 µV/m)

8.2.9 Test Set-up



8.3 Electromagnetic Radiated Emissions (Distance 5 m)

8.3.1 Instrumentation for Test (see equipment list)

F 1	F 6	F 30	F 32	F 33							

8.3.2 Test Plan

EUT set-up	set 1		
Operating mode	**Application**	**Limit**	**Result**
op 1	Enclosure	FCC part 15 B Class A	passed

Remarks:	The measured values are recalculated from 5m to 3m distance Powered by external power supply (DC 12 V EUT B)

8.3.3 Radiated Limits

Frequency- range	47CFR15: (FCC part 15 B) Class B @ 3 m	47CFR15: (FCC part 15 B) Class A @ 3 m*
above 1GHz	54 dBµV/m	59,5 dBµV/m
		* This values are recalculated from the class A limits at 10 m antenna distance in §15.109 (g 2) of the FCC rules.

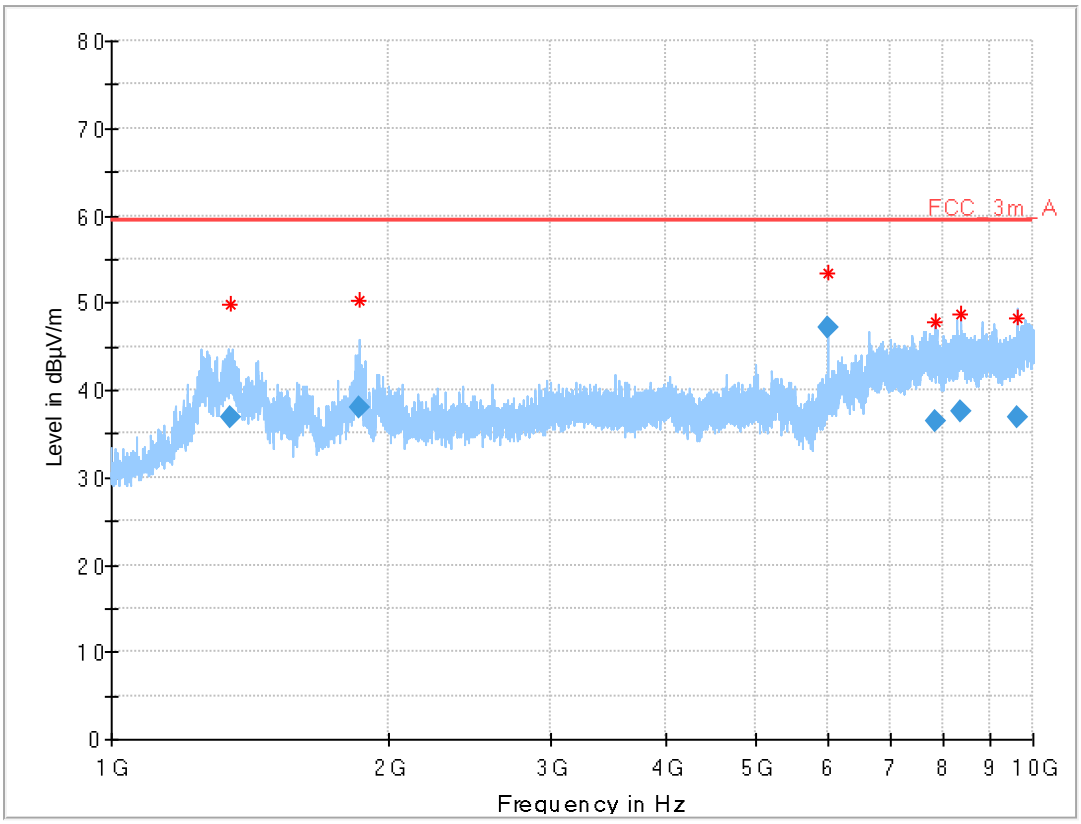
8.3.4 Calibration Information

Device	Serial number	Internal Number	Calibration valid until	Calibration interval
FSU 26	200809	300003874	12/2023	12 month
Horn Antenna	9709-5289	300000213	07/2024	24 month
Remarks: System check of all relevant devices and the chamber (weekly)				

8.3.5 Test Results

Common Information

EUT:	Set 1
Test description:	FCC part 15 B class A
Operating condition:	Op 1
Operator name:	SCR
Comment:	DC 12V



Final_Result

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Pol	Azimuth (deg	Corr. (dB/m)	Comment
1344.256	36.86	59.5	22.6	1000	1000.0	H	224	-8	
1859.231	37.93	59.5	21.6	1000	1000.0	V	81	-6	
5999.861	47.04	59.5	12.5	1000	1000.0	H	248	1	
7851.545	36.42	59.5	23.1	1000	1000.0	H	2	5	
8341.323	37.50	59.5	22.0	1000	1000.0	V	233	6	
9632.887	36.92	59.5	22.6	1000	1000.0	V	135	8	

8.3.6 Hardware Set-up

Hardware Setup: EMI radiated\BBHA_5m - [EMI radiated]

Subrange 1

Frequency Range:	1 GHz - 18 GHz
Receiver:	FSU 26 [FSU 26] @ GPIB0 (ADR 17), SN 200809/026, FW 4.71
Signal Path:	1_6_EN FW 1.0
Antenna:	Horn Antenna EMCO 3115
Turntable:	Turntable [EMCO Turntable] @ GPIB0 (ADR 9), FW REV 3.12
	Software version: EMC32 V10.59.0

8.3.7 Sequence of testing

Setup

- The Equipment was setup to simulate a typical usage like described in the user manual / or described by manufacturer.
- If the EUT is a tabletop system, a nonconducting table with 0,8 m height is used, which is placed on the ground plane.
- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- Auxiliary equipment and cables were positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- The measurement distance is: (see ANSI C 63.4)
  < 18 GHz = 5 m
  The EUT was set into operation.

Premeasurement

- The turntable rotates continuous from 0° to 360°
- The antenna is polarized vertical and horizontal.
- In accordance to the antenna beam and the size of the EUT the antenna height changes in 30 cm steps, start at 1 meter. If it is not possible to tilt the emissions will be checked with a manually tilted antenna from top side.
- The analyzer scans quickly to find the maximum emissions of the EUT

Final measurement

- The final measurement will be performed with minimum the six highest peaks (depends on emissions and number of measured points below 1 GHz)
- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (± 45°).
- The final measurement will be done with AV (Average / see ANSI C 63.4) detector
- The final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit, and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

8.3.8 Signal strength calculation

Calculation formula:
SS = U_R + CL + AF + PA + DC

List of abbreviations:

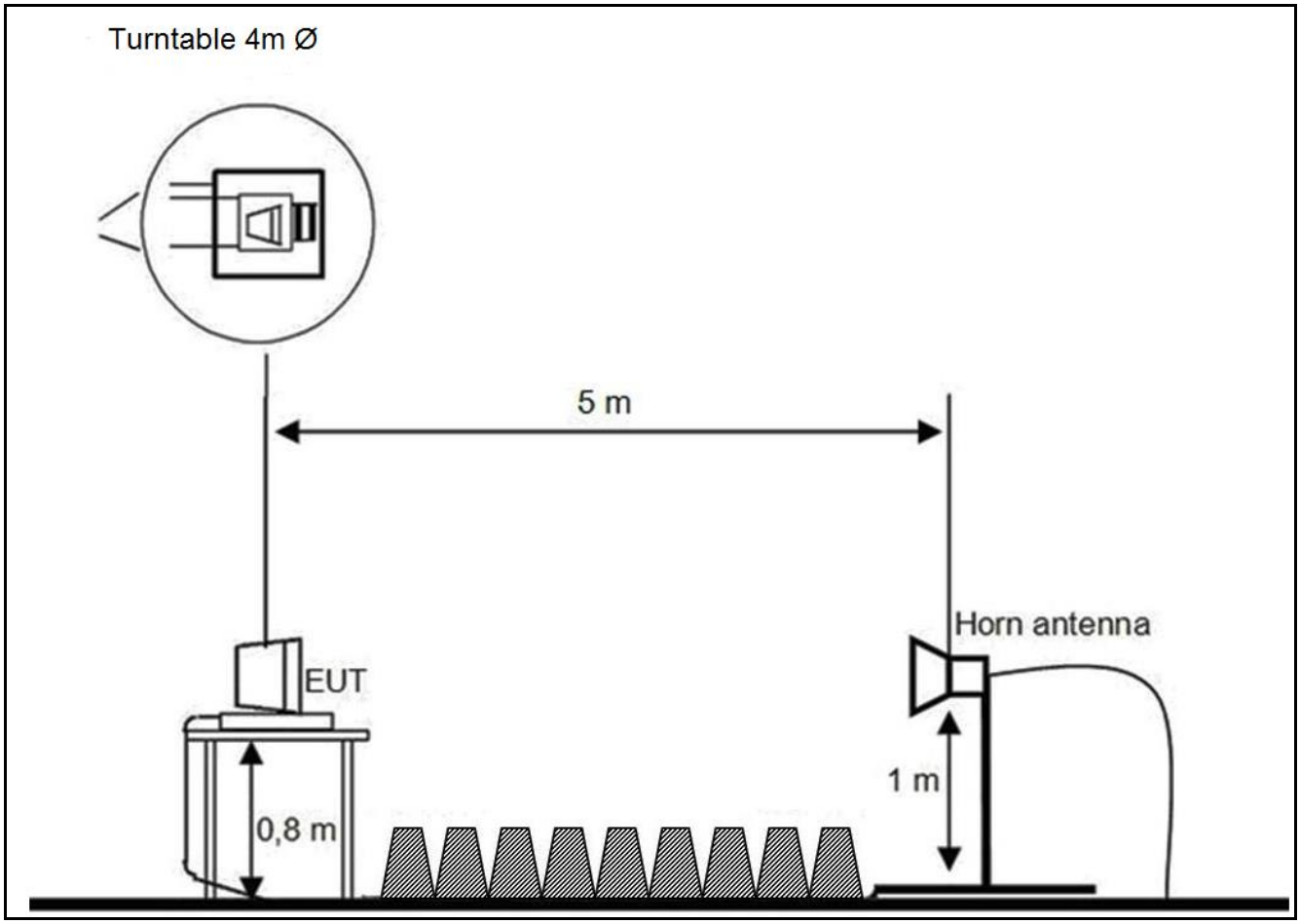
SS	►	signal strength
U_R	►	voltage at the receiver
CL	►	loss of the cable and gain of the preamp
AF	►	antenna factor
DC	►	distance correction (results measured on 5 m calculated to 3 m)

List with correction factors: column CL in table contains cable factor and preamplifier correction

Frequency [GHz]	CL [dB]	AF [dB1/m]	DC [dB]
1,000	-35,50	24,40	4,40
1,500	-35,20	25,10	4,40
2,000	-35,10	27,40	4,40
2,500	-35,00	28,50	4,40
3,000	-34,70	30,20	4,40
3,500	-34,80	31,20	4,40
4,000	-35,00	32,60	4,40
4,500	-34,90	32,50	4,40
5,000	-34,80	33,40	4,40
5,500	-34,35	34,10	4,40
6,000	-34,00	34,40	4,40
6,500	-33,50	34,50	4,40
7,000	-33,10	35,50	4,40
7,500	-33,40	36,50	4,40
8,000	-33,80	36,90	4,40
8,500	-33,75	37,20	4,40
9,000	-33,70	37,40	4,40
9,500	-33,50	37,50	4,40
10,000	-33,40	37,90	4,40
11,000	-35,90	38,30	4,40
12,000	-34,40	39,10	4,40
13,000	-37,30	39,30	4,40
14,000	-36,20	41,30	4,40
15,000	-36,90	40,10	4,40
16,000	-34,90	37,60	4,40
17,000	-35,60	40,80	4,40
18,000	-35,70	45,70	4,40

Example calculation:
For example at 4,000 000 000 GHz the measured Voltage (UR) is 46,13 dBµV, the loss of the cable (CL) is -35,00 dB, the antenna factor (AF) is 32,60 dB(m-1) and the distance correction (DC) is 4,40 dB the final result will be calculated:
SS [dBµV/m] = 46,13 [dBµV] + (-35,00) [dB] + 32,60 [dB(m-1)] + 4,4 [dB] = 48,13 [dBµV/m] (202,53 µV/m)

8.3.9 Test Set-up



9 Test equipment and ancillaries used for tests

To simplify the identification of the test equipment and/or ancillaries which were used, the reporting of the relevant test cases only refer to the test item number as specified in the table below.

No.	Instrument/Ancillary	Manufacturer	Type	Serial-No.	Internal identification
	Radiated emission in chamber F				
F-1	Control Computer	F+W		2934939v001	300005258
F-2	Trilog-Antenna	Schwarzbeck	VULB 9163	9163-1029	300005379
F-4b	Switch	Netgear	GS108P	26V12A3H50336	300000368
F-5	EMI Test receiver	R&S	ESR	1316.3003K03-102587-ct	300005771
F-6	Turntable Interface-Box	EMCO / ETS-LINDGREN	Model 105637	44583	300003747
F-7	Tower/Turntable Controller	EMCO / ETS-LINDGREN	Model 2090	64672	300003746
F-8	Tower	EMCO / ETS-LINDGREN	Model 2175	64762	300003745
F-9	Ultra Notch-Filter Rejected band Ch. 62	WRCD		9	
	Radiated immunity in chamber F				
F-10	Control Computer	F+W		2934939v001	300005258
F-11	Signal Generator	R&S	SMB 100A	1406.6000k02-113856	300005266
F-13	RF-Amplifier	Bonn	BLWA 0860-250/100D	035491	300003210
F-14	Stacked Logper Antenna	Schwarzbeck	STLP 9129	200	300006249
F-14a	Bicon-Antenna	EMCO	3109	8906-2309	300000575
F-14b	Bicon-Antenna	Schwarzbeck	Balun VHBD 9134 elements BBFA 9146	3011 0057	300005385
F-15	RF-Amplifier	ar	1000LM20	20562	-/-
F-16	Directional Coupler	ar	DC7144A	312786	300003411
F-16a	Directional coupler	emv	DC 2000	9401-1677	300000592
F-18	Power Meter	R&S	NRP2	104973	300005114
F-19	Power sensor	R&S	NRP-Z91	103332	300005114-1
F-20	Power sensor	R&S	NRP-Z91	103333	300005114-2
F-35	RF- Amplifier	Bonn	BLMA 2060-5	097392A	300003908
F-36	Stacked Microwave Log.-Per. Antenna	Schwarzbeck	STLP9149	9149-044	300003919
	Harmonics and flicker in front of chamber F				
F-21	Flicker and Harmonics Test System	Spitzenberger & Spies	PHE4500/B I PHE4500/B II	B5983 B5984	300003314
F-21a	Power Supply	HBS Electronic	ACS-1600-PS	2002-001247-0	300006074
F-28	Power Supply	Hewlett Packard	6032 A	2920 A 04466	300000580
	Radiated emission in chamber F > 1GHz				
F-29	Horn antenna	Schwarzbeck	BBHA 9120 B	188	300003896
F-30	Amplifier	ProNova	0518C-138	005	F 024
F-31	Amplifier	Miteq	42-00502650-28-5A	1103782	300003379
F-32	Horn antenna	EMCO	3115	9709-5289	300000213
F-33	Spectrum Analyzer	R&S	FSU26	200809	300003874
F-34	Loop antenna	EMCO	6502	8905-2342	300000256

No.	Instrument/Ancillary	Manufacturer	Type	Serial-No.	Internal identification
	Conducted emission in chamber G				
G-1	EMI Receiver	R&S	ESR3	102981	300006318
G-2	V-ISN	Rohde & Schwarz	ESH 3-Z5	892475/017	300002209
G-2a	V-ISN	Rohde & Schwarz	ESH 2-Z5	892602/024	300000587
G-3	2-Wire ISN	Schaffner	ISN T200	19075	300003422
G-4	4-Wire ISN	Schaffner	ISN T400	22325	300003423
G-5	Shielded wire ISN	Schaffner	ISN ST08	22583	300003433
G-6	Unshielded 8 wire ISN	Teseq	ISN T800	26113	300003833
G-7	Unshielded 8 wire ISN	Teseq	ISN T8-Cat. 6	26374	300003851
G-8	RF Current probe	Solar	9134-1	100254	300004163
G-9	V-ISN	Schaffner	ISN PLC-150	21579	300003318
G-10	V-ISN	Schaffner	ISN PLC-25-30	21584	300003319
G 10a	PLC Filter	TESEQ	Filter PLC	23436	300003598
G 10b	Coupling unit 75 Ohm	Fiedler	AC	----	300003272.04
	Conducted immunity in chamber G				
G-11	Signal generator	R&S	SMG	8610647025	300000204.01
G-12	RF-Amplifier	BONN	BSA 0125-75	066502-01	300003545
G-13	Power Meter	R&S	URV 5	837723/025	300002844.01
G-14	Power Sensor	R&S	URV 5-Z2	832874/021	300002239
G-15	Directional coupler	emv	DC 2000	9401-1677	300000592
G-16	Attenuator 6dB	Alan	50HP6-100 N	121048 0348	300003148
G-17	EM-Injection Clamp	FCC	203i	232	300000626
G-18	CDN	FCC	FCC-801-M3-16	237	300000627
G-19	CDN	FCC	FCC-801-T2	78	300000629
G-20	CDN	FCC	FCC-801-AF 2	62	300000630
G-21	CDN	FCC	FCC-801-AF 4	61	300000631
G-22	CDN	FCC	FCC-801-M1	2027	300002761
G-23	CDN	TESEQ	CDN M016S	38741	300004847
G-23a	Clamp	FCC	F-130A-1	14	300003220
G-24	transformer for 50Hz Loop Antenna	EM-Test	MC2630	0200-10	300002659.01
G-25	50Hz Loop Antenna	EM-Test	MS 100	none	300002659
	Surge, Burst, Dips and Interruptions in chamber G				
G-26	Hybrid-Generator	EM-Test	UCS 500N7	P1506148835	300005070
G-27	Motor Variac	EM-Test	MV 2616	0600-01	300002658
G-28	Capacitive Coupling Clamp	MWB	KKS 100	---	300000589
G-29a	Coupling Decoupling Network	EMC-Partner	CDN-2000-06-32	158	300004108
G-29	Coupling Decoupling Network	EMC-Partner	CDN-UTP8 ED3	1503	300004752
	ESD in chamber G				
G-30	ESD generator	Schlöder	SESD 30000	511333	300005097
	Emission on bench in chamber G				
G-31	Absorbing Clamp	R&S	MDS-21	832 231/006	300000527
	generic in chamber G				
G-32	power supply	Hewlett Packard	6038A	2848A06673	300001512
G 45	Waveform Generator	Keysight	33500B	MY52500745	300005409
	Conducted interference in chamber G				
G 33	Arbitrary Function Generator	33521B	Keysight	MY52702534	300005023
G 34	Audio amplifier	Crown 5002VZ	MACRO-TECH 5002VZ	8001641218	300004094

10 Observations

No observations, exceeding those reported with the single test cases, have been made.

Annex A Photographs of the test set-up

Photo 1: radiated emission

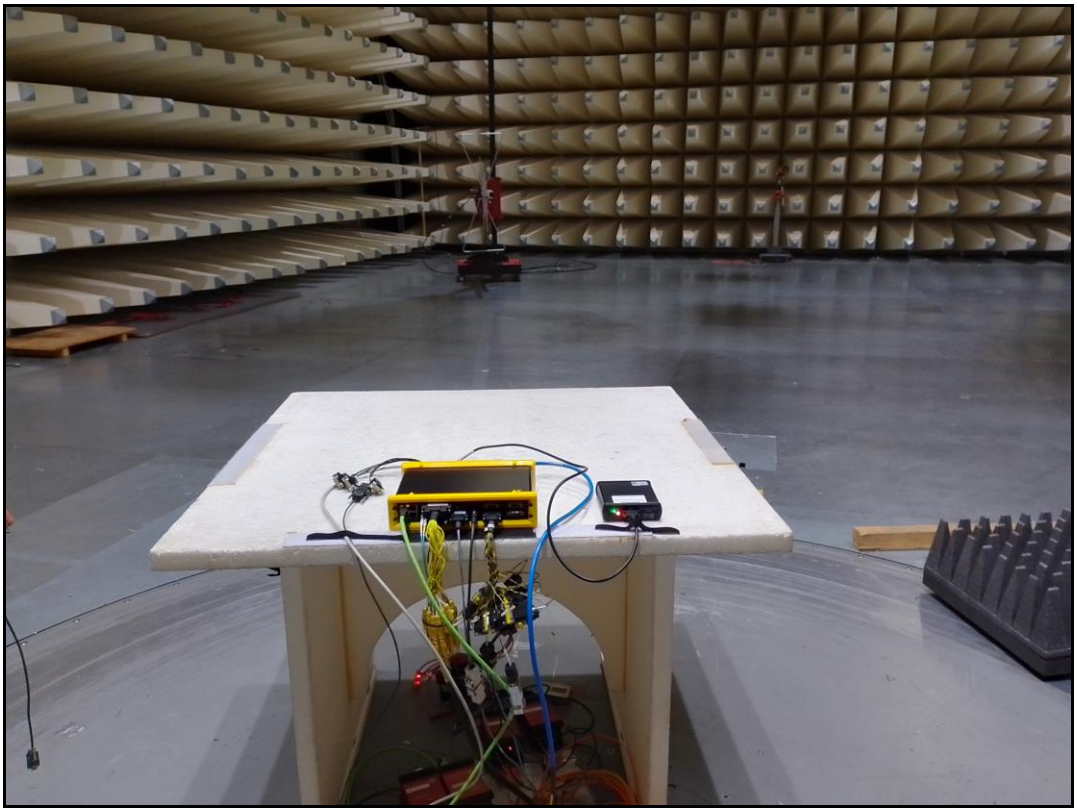


Photo 2: radiated emission

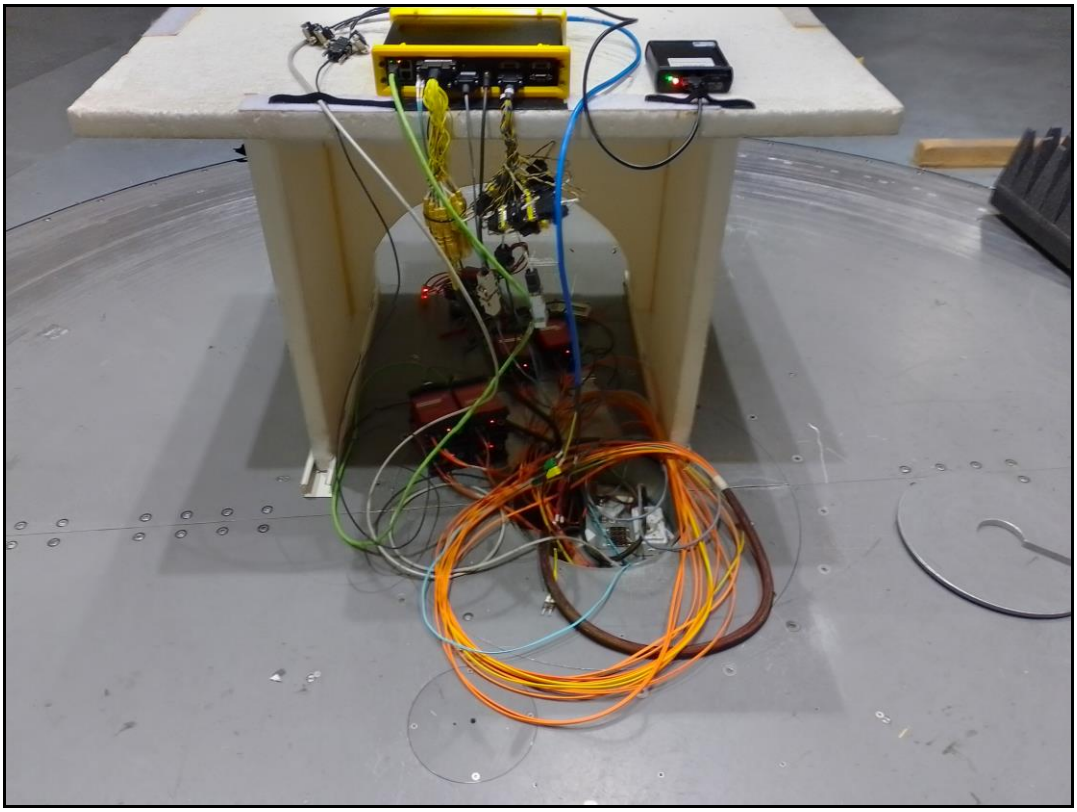


Photo 3: radiated emission

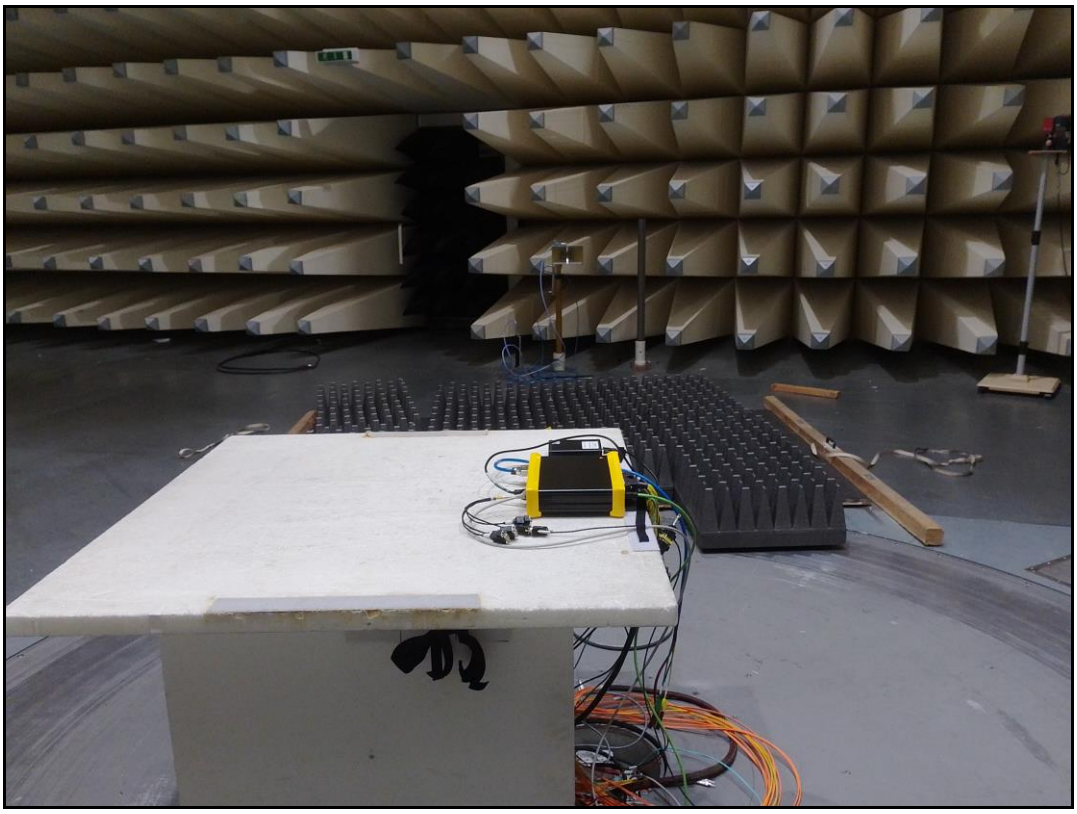
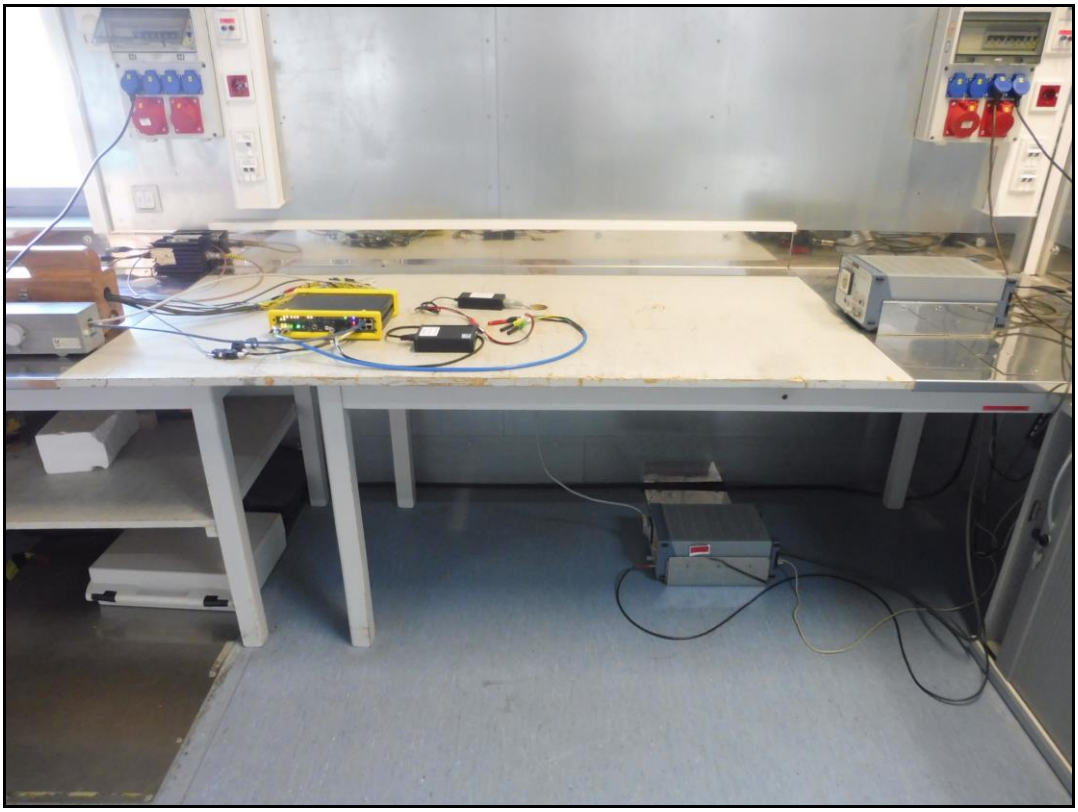


Photo 4: conducted emission



Annex B Photographs of the EUT

Photo 5: EUT

Photo 6: EUT

Photo 7: EUT

GESPERRT
nicht öffnen - nicht verändern
für Gerätequalifizierung
durch Gerhard Spengler
X2E

Annex C Document history

Version	Applied changes	Date of release
_B	Corrected the FCC ID to 2 AU4HESU	2024-04-15
_A	Inserted FCC ID AU4HESU	2024-04-05
- / -	Initial release	2024-03-25

This test report replaces the test report 1-7495/24_01_02_A and dated 2024-04-05

Annex D Further information

Glossary

DUT - Device under Test
EMC - Electromagnetic Compatibility
EUT - Equipment under Test
FCC - Federal Communication Commission
FCC ID - Company Identifier at FCC
HW - Hardware
IC - Industry Canada
Inv. No. - Inventory number
N/A - not applicable
S/N - Serial Number
SW - Software