

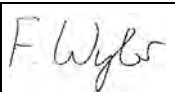
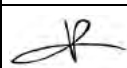


Test Report issued under the responsibility of:



E&E

TEST REPORT	
CISPR 14-1, CISPR 14-2, IEC 61000-3-2, IEC 61000-3-3	
Household appliances, electrical tools & similar apparatus	
Report Number.:	23CH-0900.E01
Date of issue	2024-10-03
Total number of pages	79
Name of Testing Laboratory preparing the Report	Eurofins Electric & Electronic Product Testing AG Route de Montena 75, 1728 Rossens SWITZERLAND
Applicant's name	Rez AG
Address	Litternaweg 8, 3930 Visp, SWITZERLAND
Test specification:	
TRF template used:	IECEE OD-2020-F7:2020; ed. 2
Standards	CISPR 14-1:2020, CISPR 14-2:2020, IEC 61000-3-2:2018, IEC 61000-3-2:2018/AMD1:2020, IEC 61000-3-3:2013, IEC 61000-3-3:2013/AMD1:2017, IEC 61000-3-3:2013/AMD2:2021 See page 4 for EN and SN EN standard
Test procedure.....:	Type testing for CoC SEV
Test Report Form No.....:	IECCISPR14_1&2_IEC61000_3_2&3J
Test Report Form(s) Originator.....:	VDE Prüf- und Zertifizierungsinstitut GmbH
Master TRF	Dated 2022-05-09
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Test item description	Warm air shower / Hair dryer	
Trademark or brand name	Rez	
Manufacturer.....	Rez AG, Litternaweg 8, 3930 Visp, SWITZERLAND	
Model/Type reference(s)	Beluga Fix, Beluga V, Beluga V/S, Beluga UPV/S	
Ratings	U = 230 VAC / I = 8.7 A / f = 50 Hz / P = 2000 W	
Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):		
☒ CB Testing Laboratory:	Eurofins Electric & Electronic Product Testing AG	
Testing location / address	Route de Montena 75, 1728 Rossens SWITZERLAND	
Tested by (name, function, signature)	F. Wyler EMC test Engineer	
	G. Chauvelier EMC test Engineer	
Approved by (name, function, signature) ..	M. Rodrigues EMC test Engineer	
Testing procedure: CTF Stage 1:		
Testing location / address		
Tested by (name, function, signature)		
Approved by (name, function, signature) ..		
Testing procedure: CTF Stage 2:		
Testing location / address		
Tested by (name + signature)		
Witnessed by (name, function, signature) .		
Approved by (name, function, signature) ..		
Testing procedure: CTF Stage 3:		
Testing procedure: CTF Stage 4:		
Testing location / address		
Tested by (name, function, signature)		
Witnessed by (name, function, signature) .		
Approved by (name, function, signature) ..		
Supervised by (name, function, signature) :		

List of Attachments (including a total number of pages in each attachment):

None

Summary of testing:

The EUT tested and identified below, complies with the standard requirements.

Tests performed (name of test and test clause):**CISPR 14-1:**

Disturbance voltage from 150 kHz to 30 MHz (4.3.3)
 Radiated disturbance Electric field from 30 MHz to 1GHz (4.3.4)
 Radiated disturbance Electric field from 1 GHz to 6GHz (4.3.5)

IEC 61000-3-2:

Harmonic current measurement (6.3)

IEC 61000-3-3:

Voltage fluctuation and flicker (4)

CISPR 14-2:

Electrostatic Discharges (5.1)
 Electrical Fast Transients (5.2)
 Injected currents from 0.15 MHz to 80 MHz (5.4)
 Radio frequency electromagnetic field from 80 MHz to 6 GHz (5.5)
 Surge (5.6)
 Voltage Dips (5.7)

Tests not performed (name of test and test clause):**CISPR 14-1:**

Disturbance voltage from 9 kHz to 30 MHz (4.3.2)
 Magnetic field from 9 kHz to 30 MHz (4.3.2)
 Disturbance power from 30 to 300 MHz (4.3.4.4)

CISPR 14-2:

Injected currents from 0.15 MHz to 230 MHz (5.2)

Testing location:

Eurofins Electric & Electronic Product Testing AG
 Route de Montena 75, 1728 Rossens
 SWITZERLAND
 (SAS accreditation no. STS 0001)

Summary of compliance with National Differences	
Country code	National differences standard
☒ Switzerland ☒ Europe (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MT, NL, NO, PL, PT, RO, SE, SI, SK) ☒ UK (*) ☐ AU ☐ KE ☐ NZ ☐ MY ☐ IL ☐ IN ☐ RS ☐ SG ☐ AR ☐ CL ☐ CN ☐ ID ☐ RU ☐ TH ☐ TR ☐ UA ☐ UY ☐ ZA ☐ HK ☐ KR ☐ SA ☐ PE ☐ US ☐ CA ☐ TW ☐ CO ☐ JP ☐ BR ☐ MX	☒ The product fulfils the requirements for Switzerland SN EN IEC 55014-1:2021 SN EN IEC 55014-2:2021 SN EN IEC 61000-3-2:2019 SN EN IEC 61000-3-2:2019/A1:2021, SN EN 61000-3-3:2013 SN EN 61000-3-3:2013/A1:2019 SN EN 61000-3-3:2013/A2:2021 SN EN 61000-3-3:2013/AC:2022 ☒ The product fulfils the requirements of group differences CENELEC: EN 55014-1:2017* EN 55014-1:2017/A11:2020* EN IEC 55014-1:2021 (Not harmonized) EN 55014-2:1997* EN 55014-2:1997/AC:1997* EN 55014-2:1997/A1:2001* EN 55014-2:1997/A2:2008* EN 55014-2:2015 (Not harmonized) EN IEC 55014-2:2021 (Not harmonized) EN 61000-3-2:2014* EN IEC 61000-3-2:2019 (Not harmonized) EN IEC 61000-3-2:2019/A1:2021 (Not harmonized) EN 61000-3-3:2013* EN 61000-3-3:2013/A1:2019 (Not harmonized) EN 61000-3-3:2013/A2:2021 (Not harmonized) EN 61000-3-3:2013/AC:2022-01 (Not harmonized) EN 61000-3-11:2000* EN IEC 61000-3-11:2019 (Not harmonized) EN 61000-3-12:2011* (*) Standards recognized for UKCA compliance requirements, see Electromagnetic Compatibility Regulations 2016 (S.I. 2016/1091) / NOTICE OF PUBLICATION 0071/22 (2022-10-26) ☒ The product fulfils partly the requirements of the corresponding ETSI EN Standards. Countries addressed: CENELEC ETSI EN 301 489-1:2019 (V2.2.3)** ETSI EN 301 489-3:2019 (V2.1.1)** (**) According to Rez AG, the "Radio Module" which is included in the EUT, has been tested by its manufacturer in accordance with the RED Directive and the relevant standards. Therefore, these tests have not been carried out. According to Rez AG, the radio module is installed in accordance with the instructions of its manufacturer. The tests of the EUT performed according to EN/ETSI 301 489-1 and -3, documented in this report only refer to the functional application of the EUT.
Use of uncertainty of measurement for decisions on conformity (decision rule): See section 6.2 in this report.	

Copy of marking plate.....:

The artwork below may be only a draft. The use of certification marks on a product must be authorized by the respective NCBs that own these marks.



Possible test case verdicts:	
- test case does not apply to the test item. :	N/A (Not Applicable)
- test item does meet the requirement :	P (Pass)
- test item does not meet the requirement. :	F (Fail)
Date of receipt of test item :	2024-02-19
Date (s) of performance of tests :	2024-02-19 to 2024-02-23
General remarks:	
"(See Enclosure #)" refers to additional information appended to the report. "(See appended table)" refers to a table appended to the report. Throughout this report a ☐ comma / ☒ point is used as the decimal separator. Note: Throughout this TRF, numerical data taken from IEC standards are using a comma as the decimal separator. Compliance assessment The statements of conformity are made on the basis of the testing standards and by applying the measurement uncertainties according to the rules in the applied standards as follows: - If U_{lab} is less than or equal to U_{CISPR} then: • Compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit, • Non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit. - If U_{lab} is greater than U_{CISPR} then: • Compliance is deemed to occur if no measured disturbance level, increased by $(U_{lab}-U_{CISPR})$, exceeds the disturbance limit, • Non-compliance is deemed to occur if any measured disturbance level, increased by $(U_{lab}-U_{CISPR})$, exceeds the disturbance limit. No additional margin to the limit is considered under the condition that the measurement instruments fulfil the requirements of the IEC 61000-4-5014 and the measurement uncertainty does not exceed the limits given in the relevant standards (e.g. U_{CISPR} as per CISPR 16-4-2, IEC 61000-4 series or product standards).	
Manufacturer's Declaration per sub-clause 4.2.5 of IEC 61000-4-5014:	
The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided	☐ Yes ☒ Not applicable When differences exist; they shall be identified in the General product information section.
Name and address of factory (ies)..... :	Justizvollzugsanstalt Pöschwies, Roosstrasse 49, 8105 Regensdorf, SWITZERLAND
General product information (GPI) and other remarks:	
Hair and body dryer for public use in sports, swimming pools and other public facilities.	

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1 General description of test item

Note: The information contained in this section was provided by Rez AG, which is responsible for its accuracy and validity.

1.1 Photo(s) of the test item

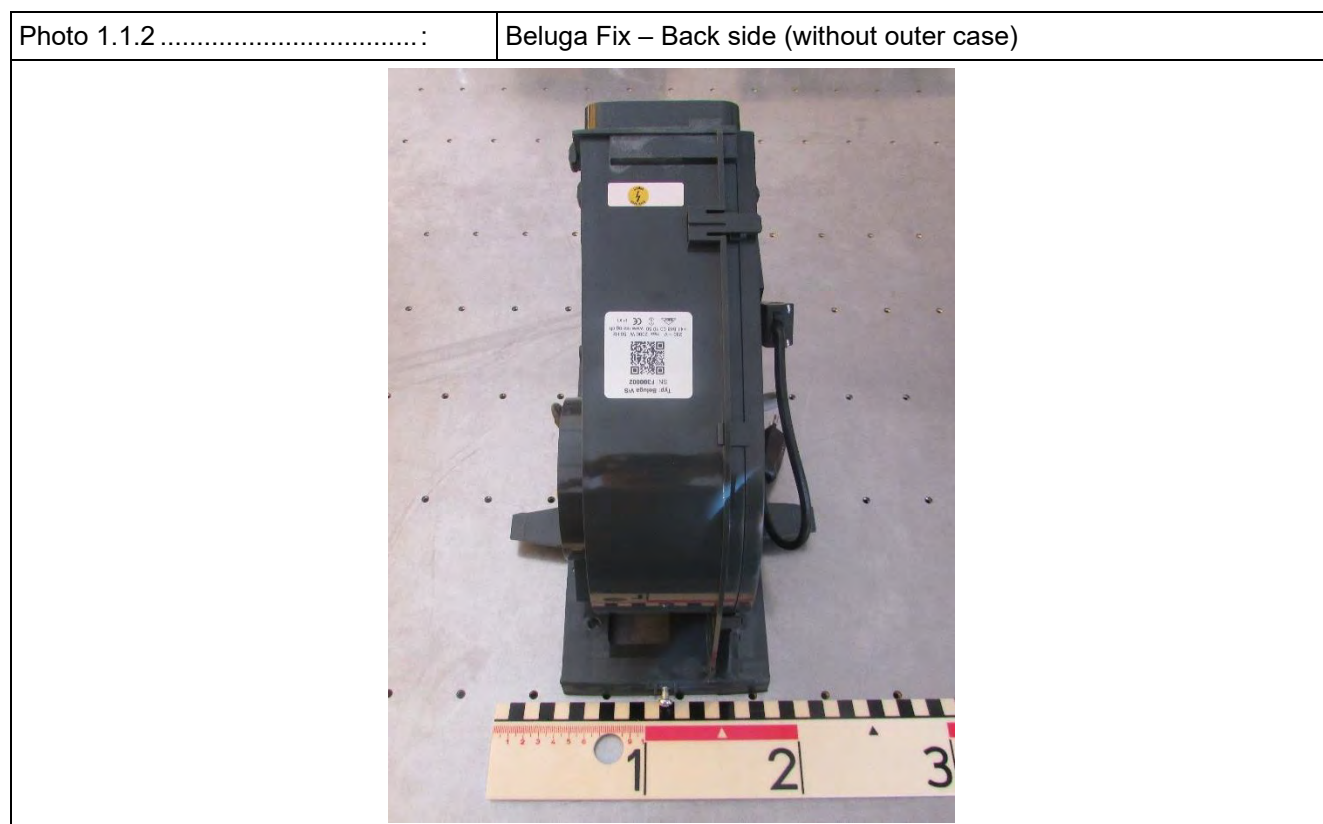


Photo 1.1.3

Beluga Fix – Left side (without outer case)



Photo 1.1.4

Beluga Fix – Right side (without outer case)



Photo 1.1.5

Beluga V/S – Front side (on test stand)



Photo 1.1.6

Beluga V/S – Back side (on test stand)

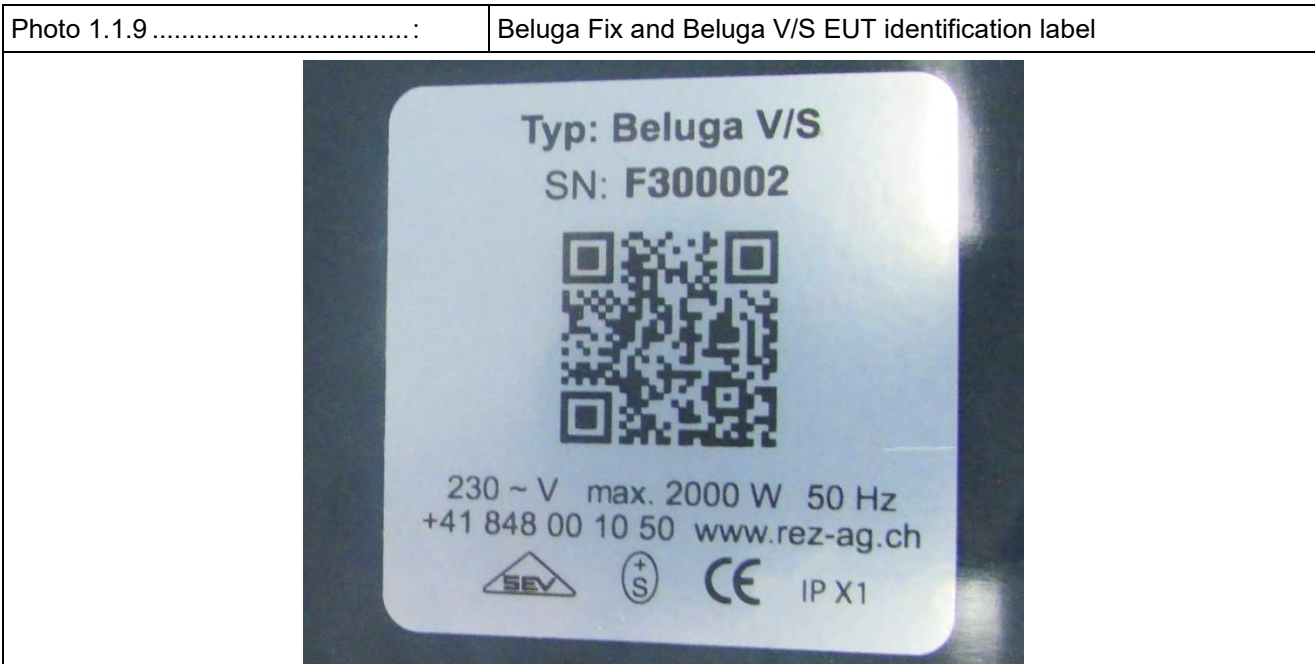


Photo 1.1.7: Beluga V/S – Left side (on test stand)



Photo 1.1.8: Beluga V/S – Right side (on test stand)





1.2 Test item(s)

No.	Test item name	Unique identification / type / description	Extent of test
1	Beluga Fix	Mounted on a fix height (Stand alone version)	Tested during conducted test
2	Beluga V	Mounted with height adjustable mechanic and longest cable connection	Not tested
3	Beluga V/S	Mounted with height adjustable mechanic and mirror and longest cable connection	Tested during radiated test
4	Beluga UPC/S	Flush mounted with height adjustable mechanic and mirror and longest cable connection	Not tested
5	--	--	--

Engineering statement for untested variants / product family:

Add the different product types (according to the explanation in the section §8 of the OD 2037)

Assessed by the applicant: Test items 1 is installed in all another version of family product.

The variant (1) is tested in full, because installed in variant (3) the system has a spring cord cable duct add for have possibility to move vertically, therefore the Radiated test are done with this version.

The variant (2) is covered by the variant (3), variant (2) is the same like variant (3) just without mirror.

The variant (4) is covered by the variant (3), variant (4) is the same like variant (3) just mounted differently.

We always tested the same electronic Beluga V/S SN: F300002, once mounted on the test stand as Test item No. 3 (Beluga V/S), once without outer case as Test item Nr. 1 (Beluga Fix).

Supplementary information: The Electronic is the same for all versions

1.3 Port(s)

No.	Port Name	Type	Cable		
			Specified length in m	Attached during test	Shielded
1	Enclosure	Enclosure	--	--	--
2	Mains IN	AC Mains input port	(*)	☒	☐
3	--	--	--	☐	☐

Supplementary information: (*) According the applicant this is a terminal inside each system, during EMC test we adjust the length from this terminal till each CDN base on each standard.

1.4 Power rating(s)

Power supply type	☒	AC, 1 phase
	☐	AC, 2 phases
	☐	AC, 3 phases
	☒	Neutral
	☒	Protective Earth
	☐	DC
	☐	Battery, not rechargeable in the device
	☐	Battery, rechargeable in the device
Rated voltage	230 VAC	
Rated frequency	50 Hz	
Rated power	2000 W	

1.5 Additional parameters

Protection class	Class I	
Clock frequencies	48 MHz	
Radio Module Frequency	Radar 5.8 GHz (HF sensor SIR13D) short range device	
Other parameters	--	
Software version	STEINEL Solutions AG	
Hardware version	STEINEL Solutions AG	
Dimensions (W x H x D)	Beluga Fix: 24.2 x 30 x 29.2 cm Beluga V : 25 x 121.2 x 37 cm Beluga V/S : 25 x 121.2 x 37 cm Beluga UPV/S : 29 x 125.9 x 37.5 cm	
Mounting position	☐	Table-top equipment
	☒	Wall/Ceiling mounted equipment
	☐	Floor standing equipment
	☐	Hand-held equipment
	☐	Other: --

Supplementary information: --

1.6 Operating mode(s)

No.	Abbreviation	Detailed description of the operating mode	Used for testing	
			Emission	Immunity
1	Ready to Operate	Equipment powered, Air and Heating off	☒	☒
2	Active	Air and Heating running (time is set depending each test)	☒	☒
3	--	--	☐	☐

Supplementary information: --

1.7 Auxiliary equipment

No.	Aux Item Name	Type and description	Manufacturer (if not the same)
1	None	--	--

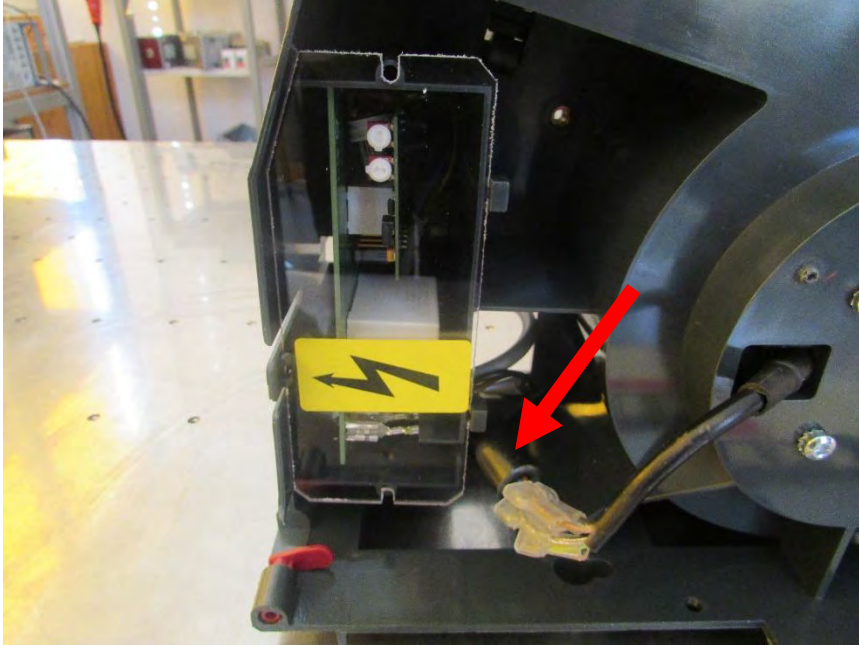
Supplementary information: --

1.8 Documents as provided by the applicant

No.	Document ref.	Type and description	Doc date
1	Beluga VS Bedienung u Montage A5 V20231023	User manual	2023-10-23
2	--	--	--

Supplementary information: --

1.9 Modifications to the test item during testing

☐	No modifications done during testing	
☒	Modifications done during testing (see details below)	
No.	Description of modification (if any)	Date of modification
1	Add ferrite WE 742 700 43 on air motor cables 	2024-02-19
2	--	--
Supplementary information: Manufacturer will provide a declaration statement that the modifications will all be incorporated into production units.		

1.10 Information specific for CISPR 14-2

Classification of apparatus according to clause 4	☐	Category I (Equipment containing no electronic control circuitry)
	☐	Category II (Mains operated equipment containing electronic control circuitry with no clock frequency higher than 15 MHz)
	☐	Category III (Battery operated equipment not included in Category I.)
	☒	Category IV (Mains operated equipment containing electronic control circuitry with a highest clock frequency greater than 15 MHz but lower than or equal to 200 MHz)
	☐	Category V (Mains operated equipment containing electronic control circuitry with a highest clock frequency greater than 200 MHz)
Immunity testing necessary	☒	Yes
	☐	No (The pages with immunity test data will be left empty, no data will be added, no physical test has been performed.) Rationale for not testing: --
Supply voltage used during the tests U_N (if not otherwise specified in the test report)	EU: 230 VAC / 50 Hz	

2 Verdict summary section

Rationale for verdicts, including N/A (Not Applicable), are listed on each test sheet.
If applicable tests were not performed, then the CB Test Certificate cannot be issued.

CISPR 14-1			
Clause	Requirement – Test case	Basic standard	Verdict
4.3.2 Table 2	Continuous disturbances conducted (Induction cooking and IPT) (9 kHz to 30 MHz)	CISPR 16-1-1:2019 CISPR 16-1-2:2014 + AMD1:2017 CISPR 16-2-1:2014 + AMD1:2017	N/A ¹
4.3.3 Table 5 Table 6	Continuous disturbances conducted (150 kHz to 30 MHz)	CISPR 16-1-1:2019 CISPR 16-1-2:2014 + AMD1:2017 CISPR 16-2-1:2014 + AMD1:2017 CISPR 32:2015	Pass
4.3.2 Table 3 Table 4	Magnetic field (Induction cooking and IPT) (9 kHz to 30 MHz)	CISPR 16-1-4:2019 CISPR 16-2-3:2016 + AMD1:2019	N/A ¹
4.3.4.4 Table 7 Table 8	Disturbance power (30 MHz to 300 MHz)	CISPR 16-1-1:2019 CISPR 16-1-3:2004 + AMD1:2016 + AMD2:2020 CISPR 16-2-2:2010	N/A ²
4.3.4.5 Table 9 Table 11	Radiated emission (30 MHz to 6000 MHz)	CISPR 16-1-1:2019 CISPR 16-1-4:2019 CISPR 16-2-3:2016 + AMD1:2019 IEC 61000-4-20:2010 IEC 61000-4-22:2010	Pass
4.4	Discontinuous disturbance – Clicks	CISPR 16-1-1:2019 CISPR 14-1:202009	Pass
Supplementary information (e.g. detailed information to verdicts):			
¹ Test item don't contain IPT functions			
² Radiated emission test performed			

IEC 61000-3-2 (or IEC 61000-3-12)			
Clause	Requirement – Test case	Basic standard	Verdict
6.1	Control methods	IEC 61000-3-2:2018 + AMD1:2020	Pass
6.2	Harmonic current emissions	IEC 61000-4-7:2002+AMD1:2008	--
Supplementary information (e.g. detailed information to verdicts): --			

IEC 61000-3-3 (or IEC 61000-3-11)			
Clause	Requirement – Test case	Basic standard	Verdict
4	Voltage changes, voltage fluctuations and flicker	IEC 61000-4-15:2010	Pass
Supplementary information (e.g. detailed information to verdicts): --			

CISPR 14-2			
Clause	Requirement – Test case	Basic standard	Verdict
5.1	Electrostatic discharge	IEC 61000-4-2:2008	Pass
5.2	Fast transients	IEC 61000-4-4:2012	Pass
5.3	Injected currents (0.15 MHz to 230 MHz)	IEC 61000-4-6:2013	N/A ¹
5.4	Injected currents (0.15 MHz to 80 MHz)	IEC 61000-4-6:2013	Pass
5.5	Radio frequency electromagnetic fields, (80 MHz to 6 GHz)	IEC 61000-4-3:2006 + AMD1:2007 + AMD2:2010 IEC 61000-4-22:2010 IEC 61000-4-20:2010	Pass
5.6	Surges	IEC 61000-4-5:2014 + AMD1/2017	Pass
5.7	Voltage dips and interruptions	IEC 61000-4-11:2020	Pass
Supplementary information (e.g. detailed information to verdicts):			
¹ Test performed between 0.15 MHz to 80 MHz			

3 Test conditions

3.1 General

Environmental reference conditions:	The climatic conditions during the tests are within the limits specified by the manufacturer for the operation of the EUT and the test equipment. The climatic conditions during the tests were within the following limits:		
	Temperature	Humidity	Atmospheric pressure
	15 °C – 35 °C	30 % - 60 %	860 hPa – 1060 hPa
	If explicitly required in the basic standard or applied product standard the climatic values are recorded and documented separately in this test report.		

3.2 Performance criteria for immunity tests

Performance criteria details		
Criterion	Description	Monitoring
A	The apparatus shall continue to operate as intended during the test. No degradation of performance or loss of function is allowed below a performance level (or permissible loss of performance) specified by the manufacturer, when the apparatus is used as intended. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and from what the user may reasonably expect from the apparatus if used as intended.	Apparatus shall not turn on itself in ready mode. Apparatuses shall work as intended. Air and Heater turn on by hand and turns off after a fix setup time. ETSI criterion for Radio The turn on function by hand detected via the radar shall work as intended.
B	The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level (or permissible loss of performance) specified by the manufacturer, when the apparatus is used as intended. During the test, degradation of performance is allowed, however no change of actual operating state or stored data is allowed to persist after the test. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and from what the user may reasonably expect from the apparatus if used as intended.	Apparatus shall not turn on itself in ready mode. Apparatuses shall work as intended. Air and Heater turn on by hand and turns off after a fix setup time. ETSI criterion for Radio The radar function shall not turn on the apparatus itself.
C	Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of the controls, or by any operation specified in the instructions for use.	Apparatus is allowed to stop air and heating, and is allowed to restart.
Supplementary information: --		

3.3 Specific test conditions for CISPR 14-1

Application of Voltage variation for disturbance voltage and disturbance power ($\pm 10\%$)	☒	No (Only CISPR 14-1:2016 and CISPR 14-1:2020 are covered)
	☐	Yes (Versions of CISPR 14-1 older than CISPR 14-1:2016) are also covered by this report.)
Supply voltage used during the tests U_N (if not otherwise specified in the test report)	EU: 230 VAC / 50 Hz	

3.4 Test setups

Pictures of each test setups are included in each test sections.

4 Emission

4.1 Continuous disturbances (9 kHz or 150 kHz – 30 MHz)

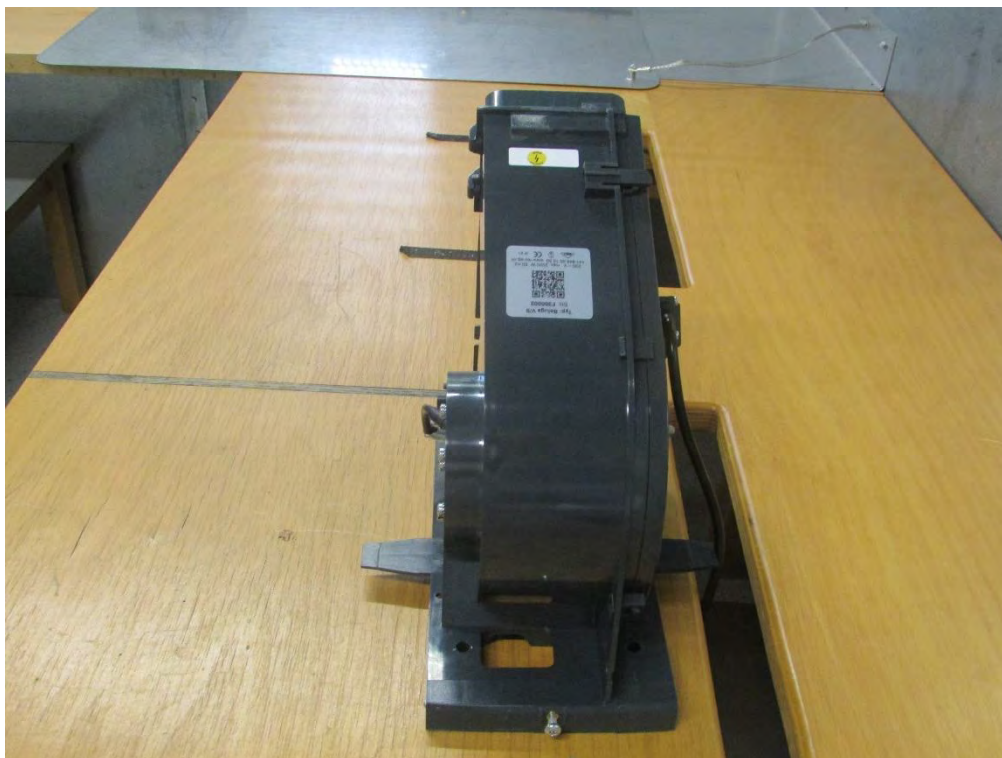
Name	G. Chauvelier		
Date	2024-02-22		
Test location (stand)	☐ SAC3 ☐ SAC5 ☐ SAC10 ☐ Laboratory ☒ Shielded room		
Applied limit class or environment	☐	Table 2 (Induction cooking 100 V rated); Mains terminals	
	☐	Table 2 (Induction cooking; Other appliances); Mains terminals	
	☒	Table 5 (Columns 2 and 3); Mains ports	
	☐	Table 5 (Columns 4 and 5); Associated ports; disturbance voltage	
	☐	Table 5 (Columns 6 and 7); Associated ports; disturbance current	
	☐	Table 6 (Columns 2 and 3); Mains port of tools $P \leq 700 \text{ W}$	
	☐	Table 6 (Columns 4 and 5); Mains port of tools $700 \text{ W} < P \leq 1000 \text{ W}$	
	☐	Table 6 (Columns 6 and 7); Mains port of tools $P > 1000 \text{ W}$	
	☐	Wired Network port according CISPR 32 class B	
	☐	Other: --	
	Test setup description	☒	Setup Type A (40 cm distance to vertical ground plane, 80 cm over ground plane)
		☐	Setup Type B (40 cm distance to horizontal ground plane)
☐		Floor standing equipment setup (10 cm over ground plane)	
☐		Other: --	
☐		Artificial hand applied	
Supplementary test setup description	The conducted disturbance is measured using a spectrum analyser and a line impedance substitution network (LISN). The measurement of the voltage against the earth is carried out successively. The peak values are recorded continuously on the graph. The values that exceed the limit shall be re-measured with a measuring receiver.		
Test method applied	☒	Artificial mains network	
	☐	Voltage probe	
	☐	Current probe according to CISPR 14-1	
	☐	Wired network port: CDN according to IEC 61000-4-6	
	☐	Wired network port: Current probe and capacitive voltage probe (CVP)	

	☐	Wired network port: ISN
	☐	Wired network port (Shielded): 150 Ohm and current probe
	☐	Artificial mains network used as voltage probe
	☐	Other: --
Supplementary information	--	

Photo 4.1.1 : Disturbance voltage / current measurements : Global view



Photo 4.1.2	Disturbance voltage / current measurements : Left side
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Test results for disturbance voltage / current	
--	--

Test item no(s) ref. cl. 1.2..... :	Beluga Fix SN: F300002
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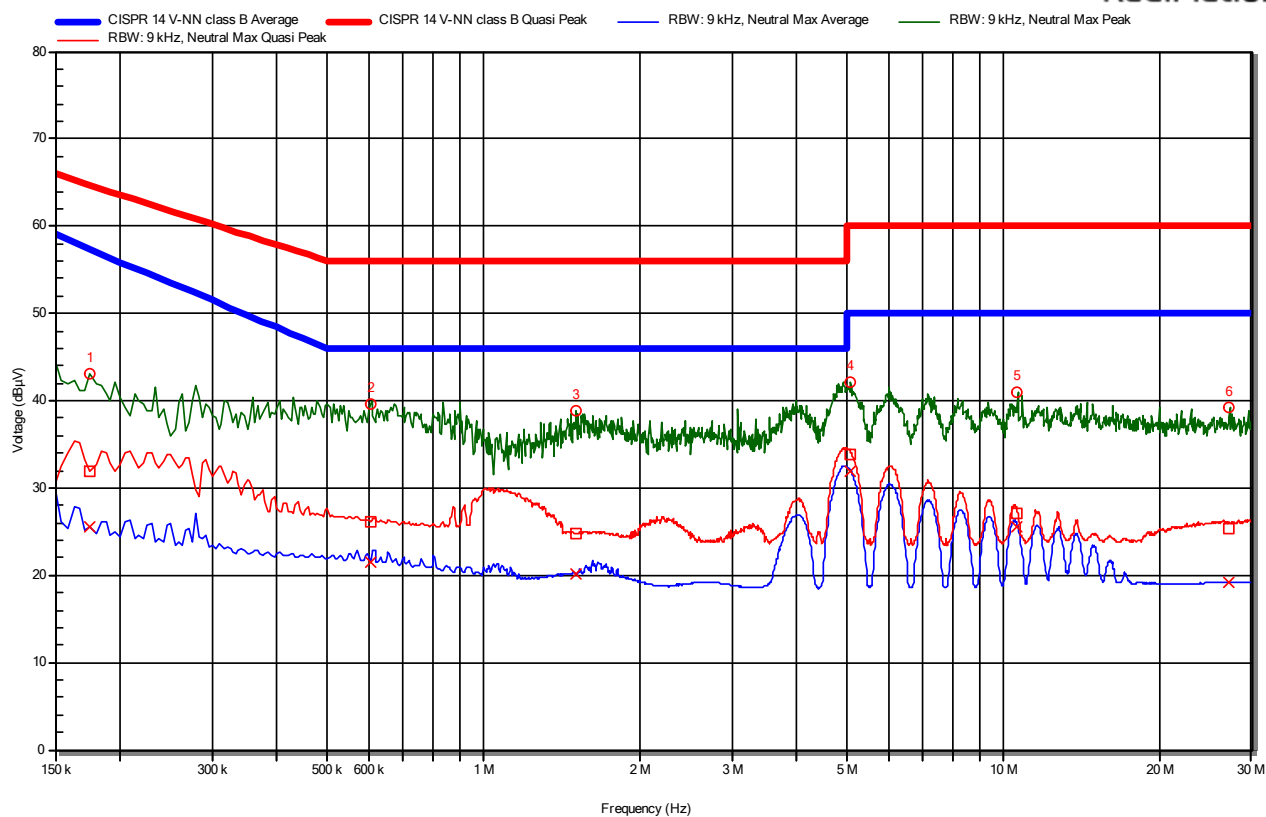
Operating mode no(s) ref. cl. 1.6 :	Ready to Operate
-------------------------------------	------------------

Results:

Measurement	CE 150 kHz to 30 MHz	Test ID	#5	Date and time	22.02.2024 09:24:00	Operator	GCh
EUT	Beluga			Order	23CH-00900	Verdict	Pass
Notes	EUT: Beluga Tested port: N Operating mode: Ready to Operate Power supply: 230 VAC 50 Hz Connected cables: Mains Modifications: None Remarks: None						
Test Place	ROS-FAR	Software	Radimation 2023.2.5 (FAR CE 150k-30M Std Class B V-AMN TDEMIX)				
Equipment		Settings	Band(s): 150 kHz - 30 MHz, Reference Level: 90 dBμV RBW: 9 kHz, VBW: Auto [120 kHz], Sweeptime: Auto [120 ms], Number of Sweeps: 1 Step freq: Linear: 4,5 kHz steps, Attenuator: 10 dB, Internal preamp: 0 dB, Measure time: 10 s Final Measurement/Observation Time: PK 1 s / 10 s, QP 1 s / 10 s, AVG 1 s / 10 s				

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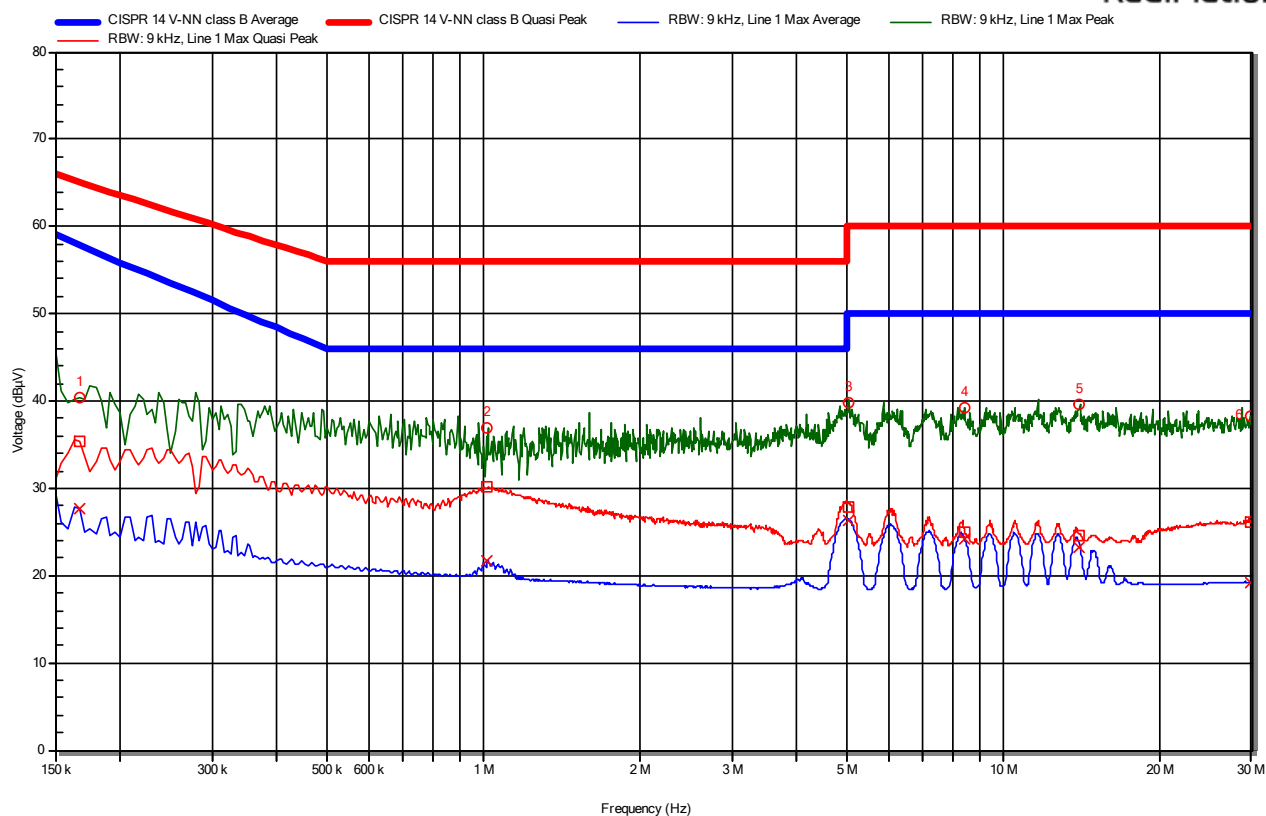
Detected peaks

Nr	Frequency (MHz)	Peak (dB μ V)	Quasi-Peak (dB μ V)	Quasi-Peak Difference (dB)	Average (dB μ V)	Average Difference (dB)	Status
1	0,175	43,1	32	-32,72	25,4	-31,89	Pass
2	0,605	39,6	26,1	-29,87	21,6	-24,43	Pass
3	1,506	38,8	24,8	-31,22	20,2	-25,82	Pass
4	5,073	42,2	33,9	-26,13	32	-18	Pass
5	10,626	40,9	27	-32,96	25,5	-24,45	Pass
6	27,209	39,1	25,3	-34,68	19,1	-30,87	Pass

Measurement	CE 150 kHz to 30 MHz	Test ID	#6	Date and time	22.02.2024 09:25:46	Operator	GCh
EUT	Beluga			Order	23CH-00900	Verdict	Pass
Notes	EUT: Beluga Tested port: L Operating mode: Ready to Operate Power supply: 230 VAC 50 Hz Connected cables: Mains Modifications: None Remarks: None						
Test Place	ROS-FAR	Software	Radimation 2023.2.5 (FAR CE 150k-30M Std Class B V-AMN TDEMIX)				
Equipment		Settings	Band(s): 150 kHz - 30 MHz, Reference Level: 90 dBμV RBW: 9 kHz, VBW: Auto [120 kHz], Sweeptime: Auto [120 ms], Number of Sweeps: 1 Step freq: Linear: 4,5 kHz steps, Attenuator: 10 dB, Internal preamp: 0 dB, Measure time: 10 s Final Measurement/Observation Time: PK 1 s / 10 s, QP 1 s / 10 s, AVG 1 s / 10 s				

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Detected peaks

Nr	Frequency (MHz)	Peak (dBμV)	Quasi-Peak (dBμV)	Quasi-Peak Difference (dB)	Average (dBμV)	Average Difference (dB)	Status
1	0,167	40,4	35,3	-29,8	27,8	-30,1	Pass
2	1,018	36,9	30,1	-25,92	21,7	-24,35	Pass
3	5,039	39,7	27,9	-32,13	26,3	-23,69	Pass
4	8,414	39,1	24,9	-35,11	24,2	-25,85	Pass
5	14,013	39,6	24,6	-35,4	23,3	-26,74	Pass
6	29,812	38,2	26	-33,96	19,2	-30,75	Pass

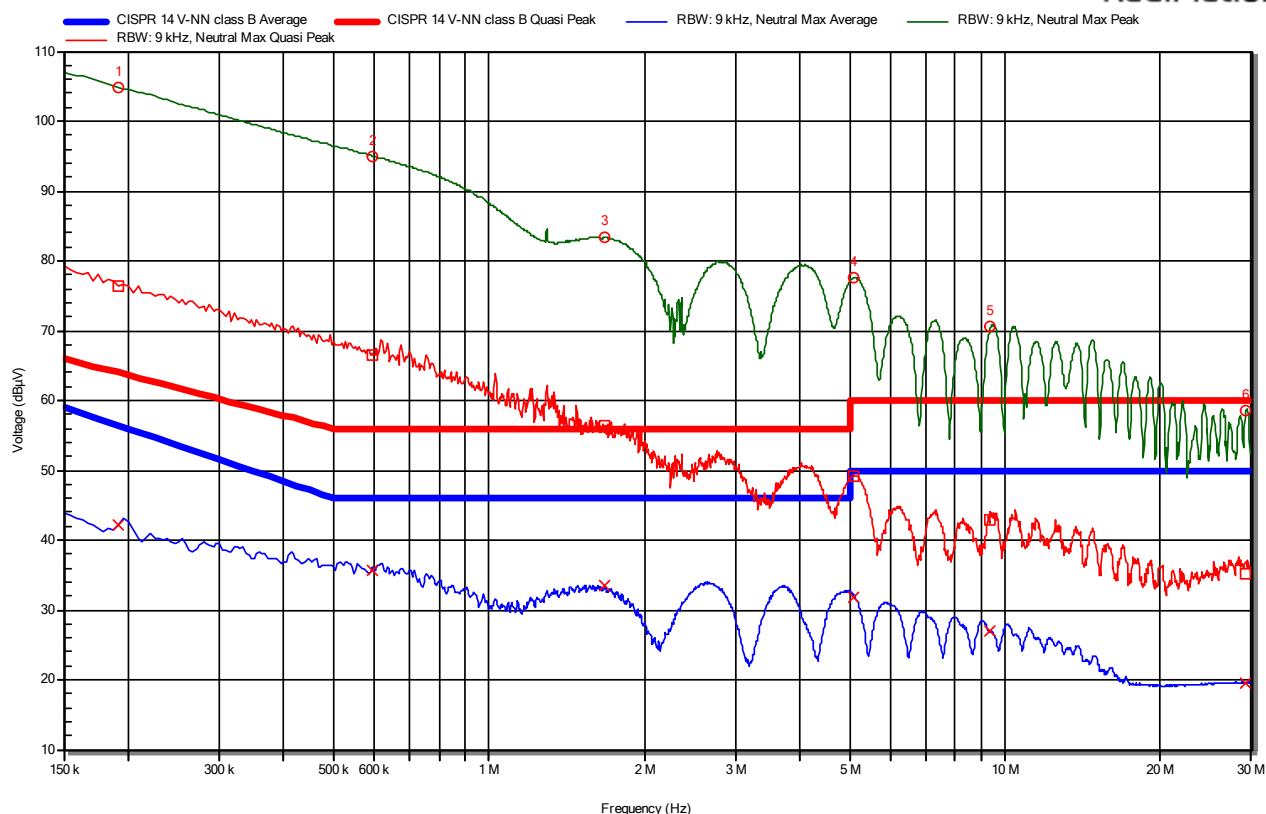
Test results for disturbance voltage / current

Test item no(s) ref. cl. 1.2..... : Beluga Fix SN: F300002

Operating mode no(s) ref. cl. 1.6 : Active

Results:

Measurement	CE 150 kHz to 30 MHz	Test ID	#4	Date and time	22.02.2024 09:22:14	Operator	GCh
EUT	Beluga	Order			23CH-00900	Verdict	Pass for AV limit, see Clicks for QP*
Notes	EUT: Beluga Tested port: N Operating mode: Active Power supply: 230 VAC 50 Hz Connected cables: Mains Modifications: None Remarks: None						
Test Place	ROS-FAR	Software	Radimation 2023.2.5 (FAR CE 150k-30M Std Class B V-AMN TDEMIX)				
Equipment		Settings	Band(s): 150 kHz - 30 MHz, Reference Level: 90 dB μ V RBW: 9 kHz, VBW: Auto [120 kHz], Swepttime: Auto [120 ms], Number of Sweeps: 1 Step freq: Linear: 4.5 kHz steps, Attenuator: 10 dB, Internal preamp: 0 dB, Measure time: 10 s Final Measurement/Observation Time: PK 1 s / 10 s, QP 1 s / 10 s, AVG 1 s / 10 s				

CISPR 14-1 / EN 55014-1**RadiMation****Detected peaks**

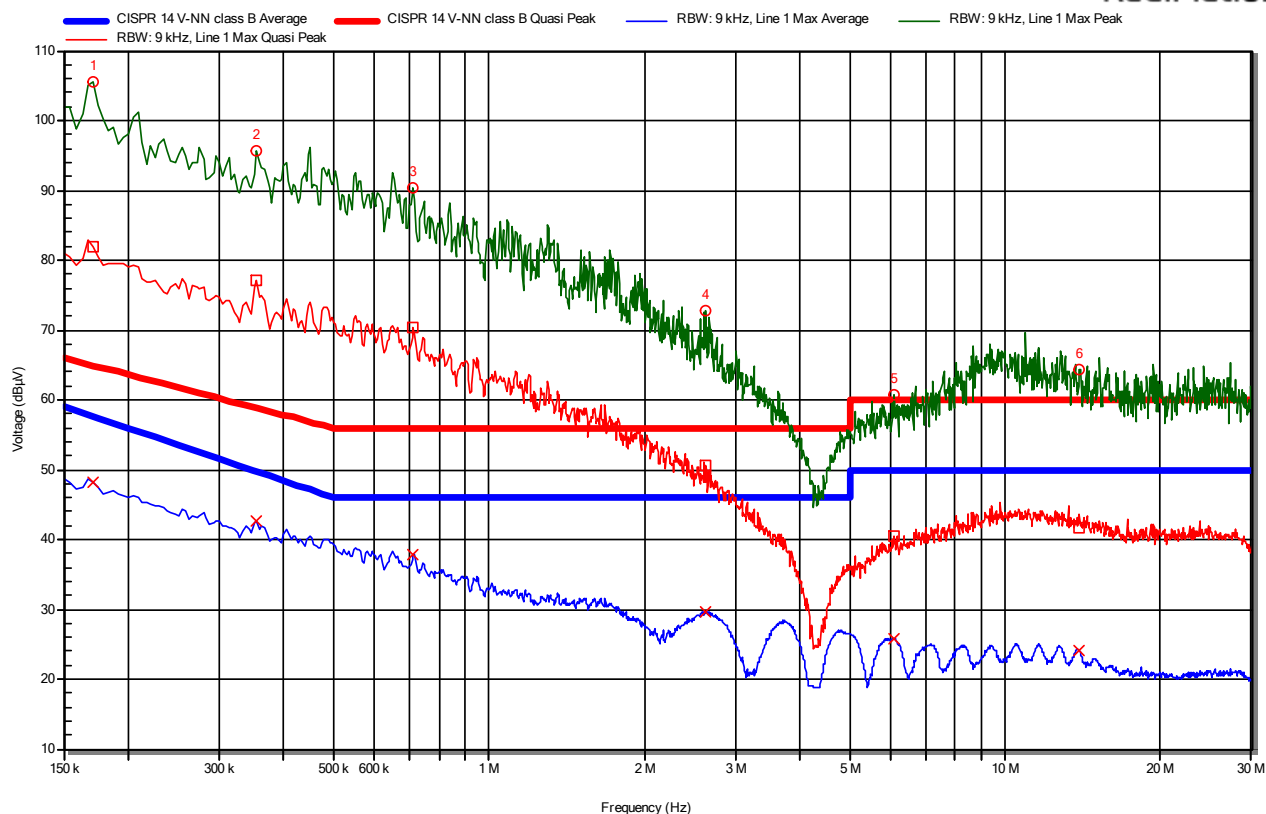
Nr	Frequency (MHz)	Peak (dB μ V)	Quasi-Peak (dB μ V)	Quasi-Peak Difference (dB)	Average (dB μ V)	Average Difference (dB)	Status
1	0,192	104,9	76,5	12,53	42	-14,3	Fail*
2	0,596	94,9	66,5	10,53	35,8	-10,22	Fail*
3	1,673	83,4	56,3	0,29	33,5	-12,54	Fail*
4	5,098	77,6	49,2	-10,79	31,9	-18,08	Pass
5	9,37	70,5	43	-17,01	27	-22,96	Pass
6	29,261	58,6	35,1	-24,88	19,4	-30,57	Pass

*Fail for QP limit, PASS for AV limit, therefore the Clicks has to be done for check the QP limit.

Measurement	CE 150 kHz to 30 MHz	Test ID	#7	Date and time	22.02.2024 09:27:19	Operator	GCh
EUT	Beluga			Order	23CH-00900	Verdict	Pass for AV limit, see Clicks for QP*
Notes	EUT: Beluga Tested port: L Operating mode: Active Power supply: 230 VAC 50 Hz Connected cables: Mains Modifications: None Remarks: None						
Test Place	ROS-FAR	Software	Radimation 2023.2.5 (FAR CE 150k-30M Std Class B V-AMN TDEMIX)				
Equipment		Settings	Band(s): 150 kHz - 30 MHz, Reference Level: 90 dBμV RBW: 9 kHz, VBW: Auto [120 kHz], Sweeptime: Auto [120 ms], Number of Sweeps: 1 Step freq: Linear: 4,5 kHz steps, Attenuator: 10 dB, Internal preamp: 0 dB, Measure time: 10 s Final Measurement/Observation Time: PK 1 s / 10 s, QP 1 s / 10 s, AVG 1 s / 10 s				

CISPR 14-1 / EN 55014-1

RadiMation



Detected peaks

Nr	Frequency (MHz)	Peak (dBμV)	Quasi-Peak (dBμV)	Quasi-Peak Difference (dB)	Average (dBμV)	Average Difference (dB)	Status
1	0,171	105,6	82	17,12	48,2	-9,42	Fail*
2	0,354	95,7	77,2	18,31	42,7	-6,98	Fail*
3	0,713	90,5	70,3	14,31	37,9	-8,05	Fail*
4	2,628	72,8	50,6	-5,35	29,7	-16,27	Pass
5	6,091	60,7	40,5	-19,48	25,8	-24,23	Pass
6	13,896	64,3	41,6	-18,36	24	-25,96	Pass

*Fail for QP limit, PASS for AV limit, therefore the Clicks has to be done for check the QP limit.

4.2 Discontinuous disturbances – Clicks (9 kHz – 30 MHz)

Name	G. Chauvelier
Date	2024-02-22
Test location (stand).....	☐ SAC3 ☐ SAC5 ☐ SAC10 ☐ Laboratory ☒ Shielded room
Test setup description	☒ Setup Type A (40 cm distance to vertical ground plane, 80 cm over ground plane) ☐ Setup Type B (40 cm distance to horizontal ground plane) ☐ Floor standing equipment setup (10 cm over ground plane) ☐ Other: -- ☐ Artificial hand applied
Supplementary test setup description	The discontinuous conducted disturbance is measured with a line impedance substitution network (LISN) using a spectrum analyser for pre-scan. A measurement receiver with quasi-peak detector and the software R&S are used to evaluate the results.
CDN applied	☒ Artificial mains network (LISN) ☐ Artificial mains network used as voltage probe ☐ Voltage probe ☐ CDN according to IEC 61000-4-6 ☐ Current probe and capacitive voltage probe (CVP) ☐ ISN according CISPR 32 ☐ In situ CDN (150 Ohm and current probe) ☐ Other: --
Applied method for discontinuous disturbances	☐ Click rate determined on base of switching operations ☒ Click rate determined on base of clicks measurements ☐ Other: --
Applied interpretation for upper quartile method (ISH 1 to CISPR 14-1)	☐ Interpretation 1: The click rate at 1,4 MHz and 30 MHz is determined at ¼ of the clicks counted at each frequency (1,4 MHz and 30 MHz) ☒ Interpretation 2: The click rate at 1,4 MHz and 30 MHz determined at ¼ of the clicks counted at 500 kHz.
Exceptions from the click definition applied	☐ Individual switching operations (5.4.3.2) ☐ Combination of disturbances in a time frame less than 600 ms (5.4.3.3) ☐ Instantaneous switching (5.4.3.4) ☐ Separation less than 200 ms (5.4.3.5) ☐ Thermostatically controlled three-phase switches (5.4.3.6) ☐ Superposition of clicks with continuous disturbance (5.4.3.7) ☐ Other: --
Supplementary information	--

Photo 4.2.1	Discontinuous disturbances (clicks)
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Test results for discontinuous disturbances (clicks)	
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Test item no(s) ref. cl. 1.2..... :	Beluga Fix SN: F300002
Operating mode no(s) ref. cl. 1.6 :	Active

Results:

Rez AG

Beluga

Operator : GCh

Op.Cond. : Active mode

Comment : 230 VAC 50 Hz

Test Duration	0:08:37	LISN Phase	N	Attenuation [dB]	15
Overload	Yes				
Frequency	150 kHz	500 kHz	1.4 MHz	30 MHz	
Clicks (≤10 ms)	40	40	20	0	
Clicks (>10 ms, ≤ 20 ms)	0	0	0	0	
Clicks (> 20 ms)	0	0	0	0	
Click Rate [1/min]	4.64	4.64	4.64	4.64	
Continuous Disturbances	0	0	0	0	
L [dBuV]	66	56	56	60	
Lq [dBuV]	82	72	72	76	
Clicks > Lq	0	0	0	0	
Clicks > Lq [%]	0	0	-	-	
Max. Allowed Nr. of Clicks > Lq	-	-	0	0	
Fridge Rules	0	0	0	0	
600 ms Rule used	NO	NO	NO	NO	
Overall Correction	20	20	20	20	
Margin for PK Detector	0	0	0	0	
Result	PASSED	PASSED	PASSED	PASSED	

Rez AG

Beluga

Operator : GCh

Op.Cond. : Active mode

Comment : 230 VAC 50 Hz

Test Duration	0:09:49	LISN Phase L1	Attenuation [dB]	15
Overload	Yes			
Frequency	150 kHz	500 kHz	1.4 MHz	30 MHz
Clicks (≤10 ms)	40	40	14	0
Clicks (>10 ms, ≤ 20 ms)	0	0	0	0
Clicks (> 20 ms)	0	0	0	0
Click Rate [1/min]	4.07	4.07	4.07	4.07
Continuous Disturbances	0	0	0	0
L [dBuV]	66	56	56	60
Lq [dBuV]	83	73	73	77
Clicks > Lq	0	0	0	0
Clicks > Lq [%]	0	0	-	-
Max. Allowed Nr. of Clicks > Lq	-	-	0	0
Fridge Rules	0	0	0	0
600 ms Rule used	NO	NO	NO	NO
Overall Correction	20	20	20	20
Margin for PK Detector	0	0	0	0
Result	PASSED	PASSED	PASSED	PASSED

4.3 Disturbance power (30 MHz – 300 MHz)

Name	F. Wyler
Date	2024-02-21
Rationale for verdict N/A	Measured radiated emission

4.4 Magnetic field strength (9 kHz – 30 MHz)

Name	F. Wyler
Date	2024-02-21
Rationale for verdict N/A	Test item don't contain IPT functions

4.5 Radiated disturbances electric field (30 MHz – 6000 MHz)

Name	F. Wyler	
Date	2024-02-21	
Test location (stand).....	☒ SAC3 ☐ SAC5 ☐ SAC10 ☐ Laboratory ☐ Shielded room	
Radiated test application	☐	Radiated test NOT applied because conditions of 4.3.4.2 are met. Only disturbance power measurement applied
	☐	Radiated test applied from 300 MHz to 1000 MHz Disturbance power measurement from 30 MHz to 300 MHz
	☒	Radiated test applied from 30 MHz to 1000 MHz No disturbance power measurement applied
Applied limit class	☒	Table 9 Radiated disturbance limits
	☐	Other: --
Test set up description	☐	Equipment on a table 80 cm height
	☐	Equipment on the floor (isolated from ground plane)
	☒	Other (e.g. height of pallet): 40 cm above floor.
Supplementary test set up description	The electromagnetic disturbance radiated by the equipment is measured using a spectrum analyser and a wide band antenna. The antenna is moved from 1 to 4 m in height successively with horizontal and vertical polarisations. The turning table is operated through 360° during the measurements or 16 positions (each 22.5°) is measured. The recordings are carried out taking into account the maximum value of all the disturbances appearing while the apparatus is under test. The peak values are recorded continuously on the graph. The values exceeding a limit shall be re-measured manually using a receiver.	
Test method applied (< 1000 MHz).....	☒	OATS or SAC with measurement distance [m]: 3
	☐	FAR/FAC CISPR 16-2-3 with measurement distance [m]:
	☐	FAR/FAC IEC 61000-4-22 with measurement distance [m]:
	☐	TEM Waveguide according to IEC 61000-4-20
Test method applied (1 – 6 GHz)	☐	FSOATS with measurement distance [m]:
	☒	FAR CISPR 16-2-3 with measurement distance [m]: 3 m
Measurement above 1 GHz: Dimension of the line tangent to the EUT volume (beam width)	☐	Not applicable
	☒	Value of w: 2.7 m
Supplementary information	--	

Photo 4.5.1: Disturbance field strength / Electric field : Front 30 M – 1000 MHz

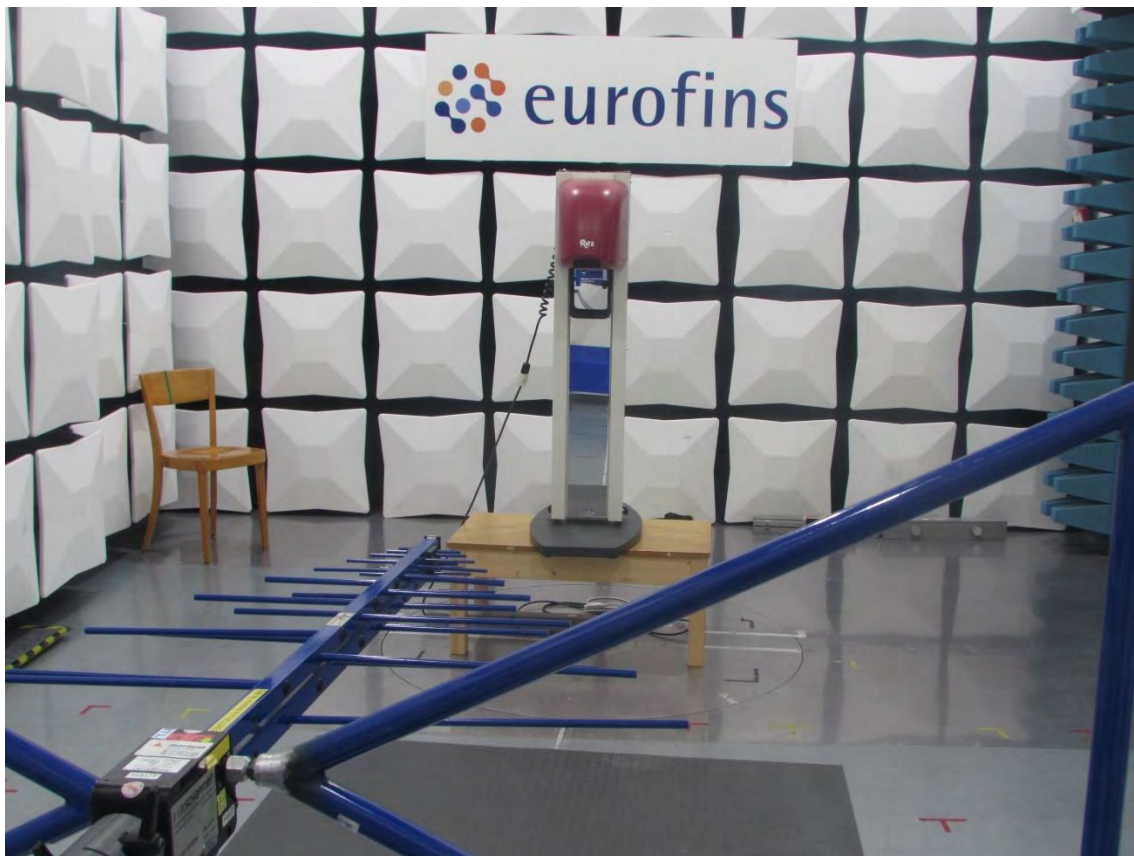


Photo 4.5.2: Disturbance field strength / Electric field : Back 30 M – 1000 MHz

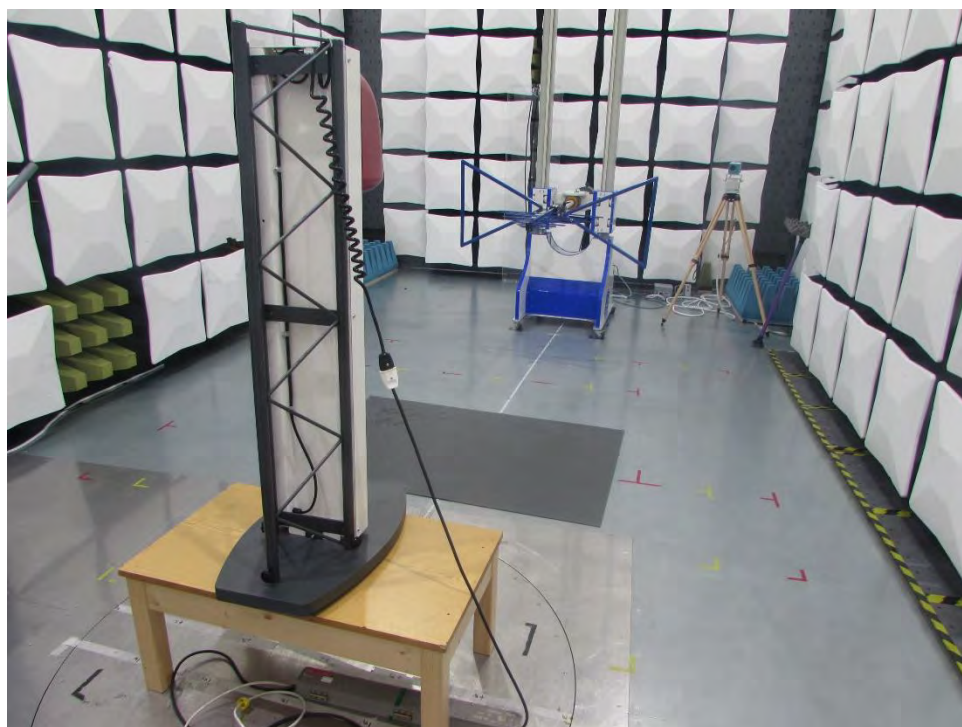


Photo 4.5.3 : Disturbance field strength / Electric field: Front 1000 M – 6000 MHz

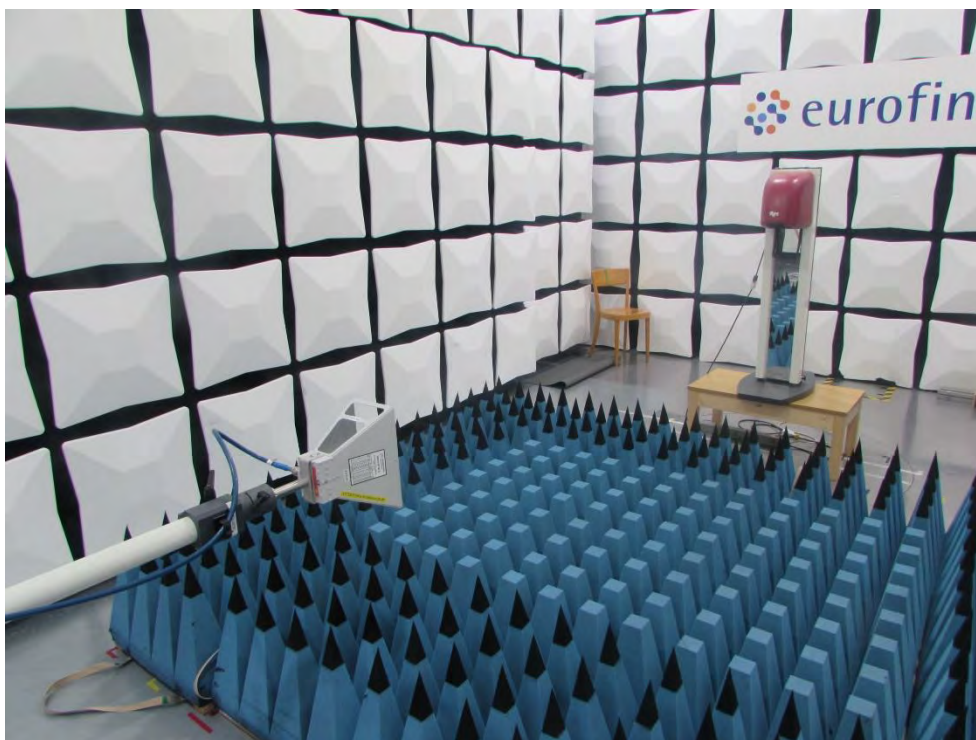


Photo 4.5.4 : Disturbance field strength / Electric field : Back 1000 M – 6000 MHz



Test results for disturbance field strength / electric field

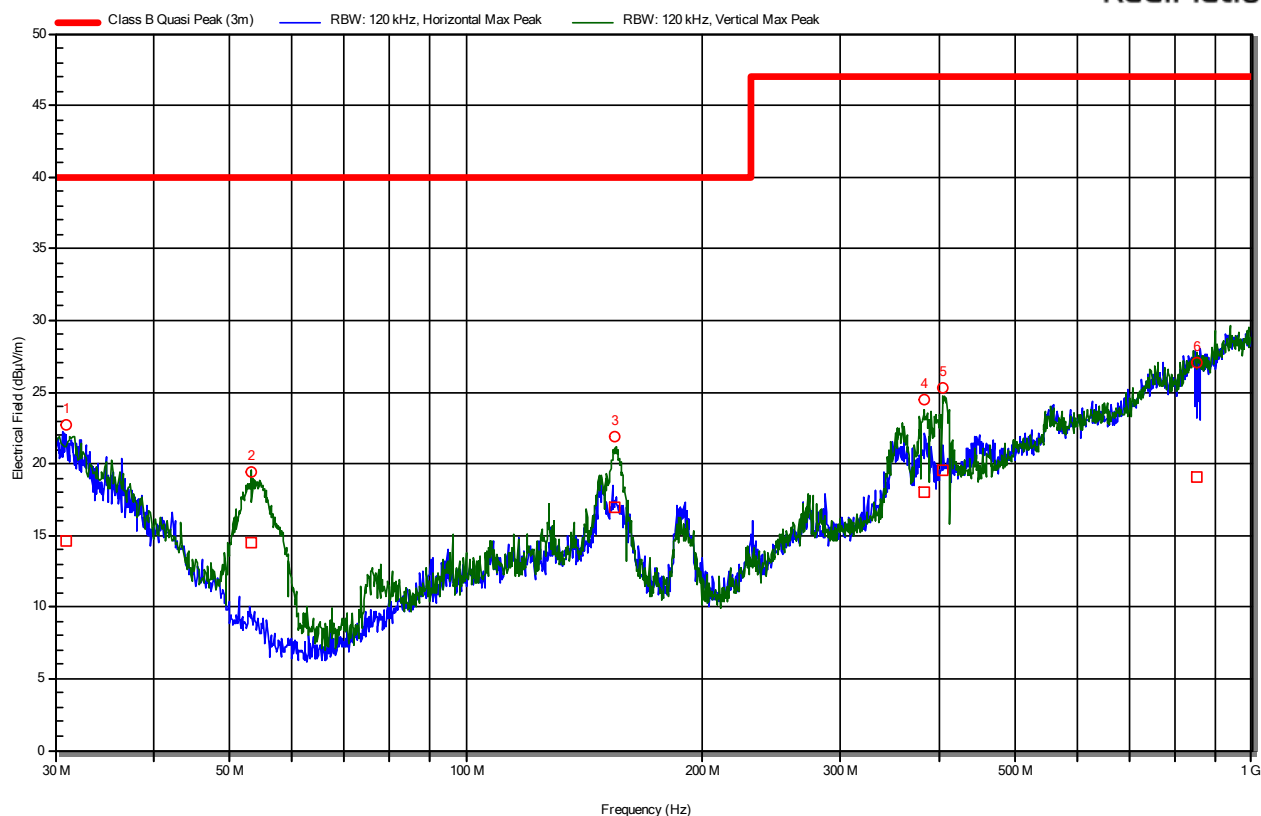
Test item no(s) ref. cl. 1.2..... : Beluga V/S SN: F300002

Operating mode no(s) ref. cl. 1.6 : Ready to Operate

Measurement	RE 30 MHz to 1 GHz	Test ID	#48	Date and time	2024-02-20 15:47:58	Operator	F. Wyler
EUT	Beluga	Order				Verdict	Pass
Notes	ME48 (final); EUT: Beluga V/S; Cables connected: Power 230 VAC 50 Hz Operating mode: Ready to Operate; Modifications: Level 1 Remarks: None;						
Antenna Height	1 m to 4 m, 4 step(s)	Polarization	Both	Table Angle	0 ° to 360 °, 16 step(s)	Distance	3 m
Test Place	ROS-SAC3	Software	Radimation 2023.2.5 (RE 30M-1G ESW26 CBL SAC3)				
Equipment		Settings	Band(s): 30 MHz - 1 GHz, Reference Level: 80 dBμV RBW: 120 kHz, VBW: 500 kHz, Swepttime: 200 ms, Number of Sweeps: 10 Step freq: Fixed step count: 8001 steps per Band, Attenuator: 0.0 dB, Internal preamp: 20 dB Final Measurement/Observation Time: PK 1 s / 10 s, QP 1 s / 10 s, AVG 1 s / 10 s				

CISPR 14-1 / EN 55014-1 @ 3 m

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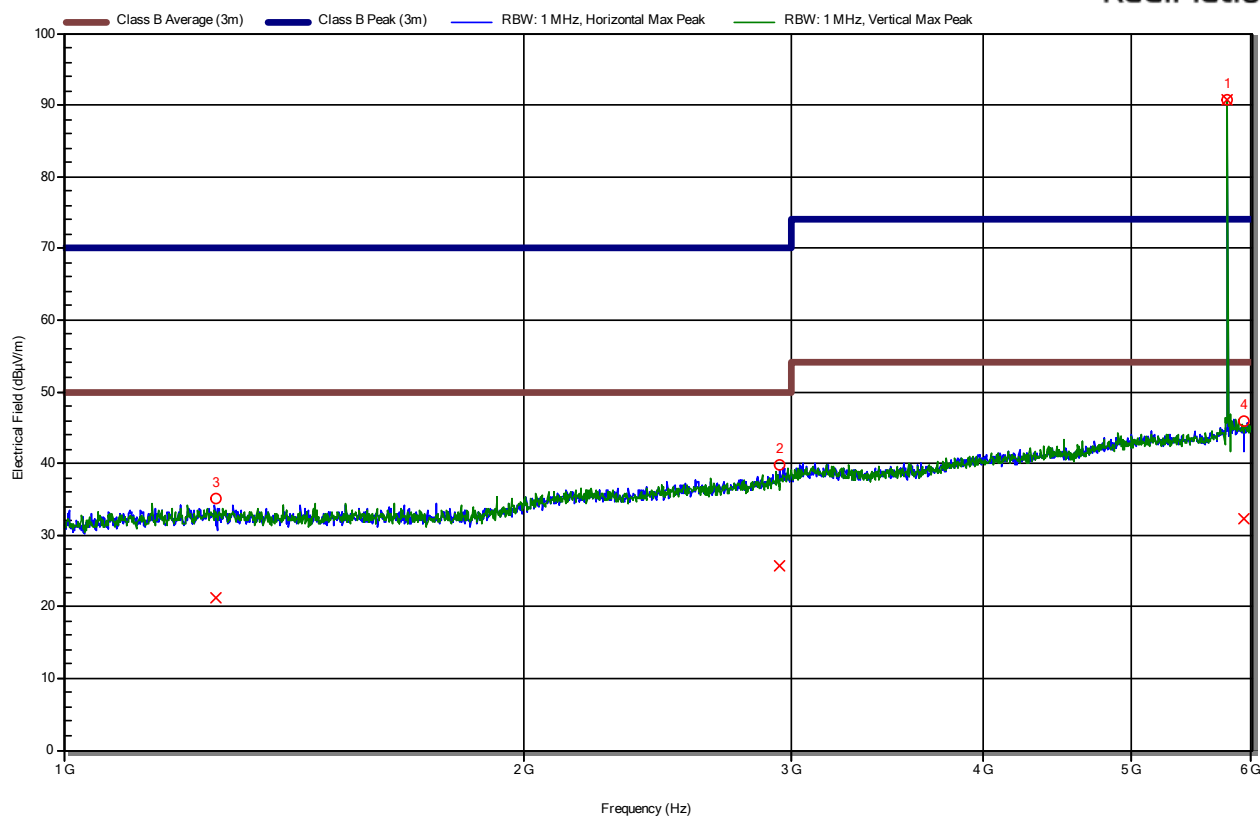
**Detected peaks**

Peak Number	Frequency (MHz)	Peak (dBμV/m)	Quasi-Peak (dBμV/m)	Quasi-Peak Difference (dB)	Angle (°)	Height (m)	Polarization	Status
1	30.955	22.7	14.6	-25.4	90	2	Horizontal	Pass
2	53.342	19.4	14.5	-25.5	360	1	Vertical	Pass
3	154.679	21.9	17	-23.0	45	3	Vertical	Pass
4	382.861	24.5	18	-29.0	0	2	Vertical	Pass
5	404.1	25.3	19.5	-27.5	338	1	Vertical	Pass
6	852.642	27.1	19.1	-27.9	90	4	Horizontal	Pass

Measurement	RE 1 GHz to 6 GHz	Test ID	#5	Date and time	2024-02-21 10:07:32	Operator	F. Wyler
EUT		Order		Verdict	Pass		
Notes	ME5 (final); EUT: Beluga V/S; Cables connected: Power 230 VAC 50 Hz Operating mode: Ready to Operate; Modifications: Level 1 Remarks: None;						
Antenna Height	1 m to 1 m, 1 step(s)	Polarization	Both	Table Angle	0 ° to 360 °, 16 step(s)	Distance	3 m
Test Place	ROS-SAC3	Software	Radimation 2023.2.5 (RE 1-6G ESW26 Schwarzbeck 9120D SAC3)				
Equipment		Settings	Band(s): 1 GHz - 6 GHz, Reference Level: 100 dBμV RBW: 1 MHz, VBW: 3 MHz, Sweep time: 200 ms, Number of Sweeps: 20 Step freq: Fixed step count: 5001 steps per Band, Attenuator: 10.0 dB, Internal preamp: 0 dB Final Measurement/Observation Time: PK 1 s / 10 s, QP 1 s / 5 s, AVG 1 s / 10 s				

CISPR 14-1 / EN 55014-1 @ 3m

RadiMation



Detected peaks

Peak Number	Frequency (MHz)	Peak (dBμV/m)	Peak Difference (dB)	Average (dBμV/m)	Average Difference (dB)	Angle (°)	Height (m)	Polarization	Status
3	1259	35.1	-34.9	21.3	-28.7	158	1	Horizontal	Pass
2	2943	39.7	-30.3	25.6	-24.4	23	1	Horizontal	Pass
1	5782.169	90.8	16.8	90.8	36.8	0	1	Vertical	Pass *
4	5934	45.9	-28.1	32.4	-21.6	180	1	Horizontal	Pass

* This is the carrier of the radar

Test results for disturbance field strength / electric field

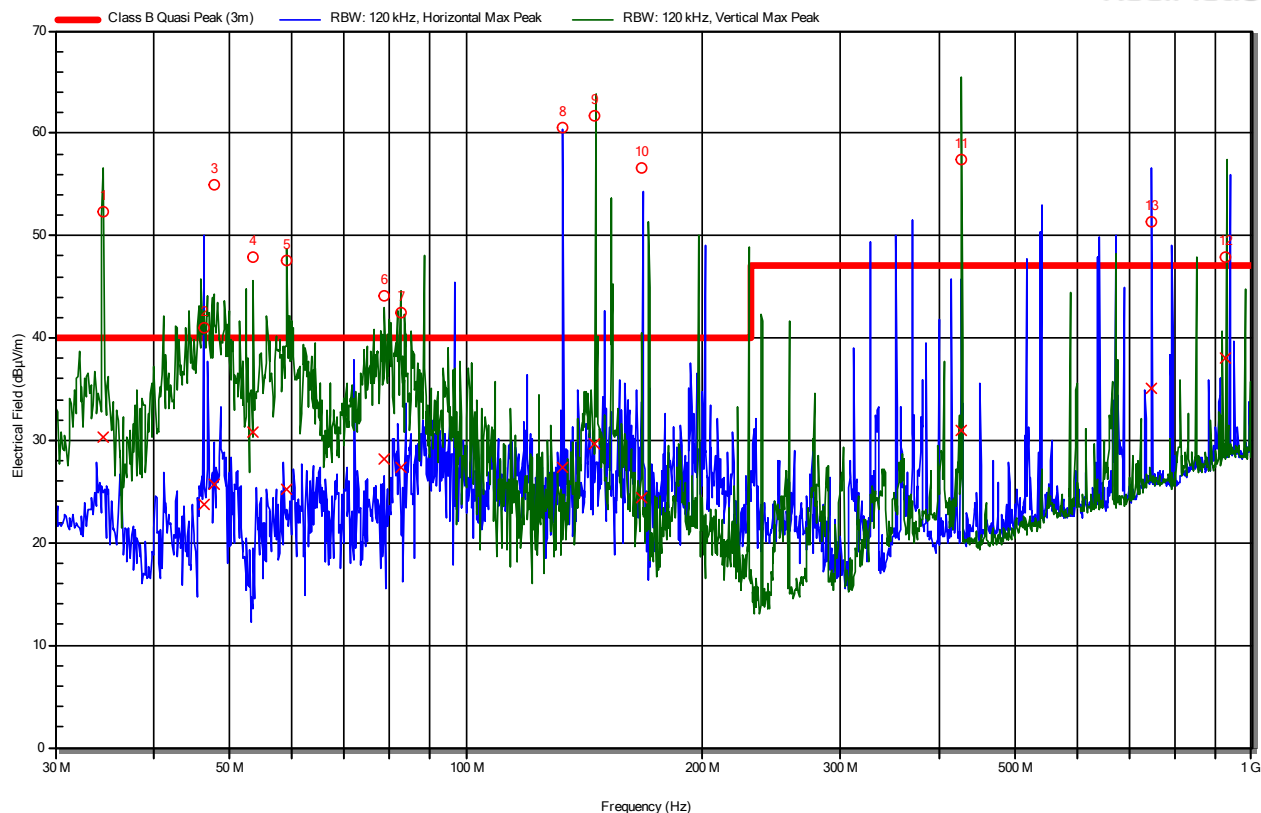
Test item no(s) ref. cl. 1.2..... : Beluga V/S SN: F300002

Operating mode no(s) ref. cl. 1.6 : Active

Measurement	RE 30 MHz to 1 GHz	Test ID	#49	Date and time	2024-02-20 17:05:00	Operator	F. Wyler
EUT	Beluga	Order		Verdict	Pass		
Notes	ME49b (final); EUT: Beluga V/S; Cables connected: Power 230 VAC 50 Hz Operating mode: Active; Modifications: Level 1 Remarks: None;						
Antenna Height	1 m to 4 m, 4 step(s)	Polarization	Both	Table Angle	0 ° to 360 °, 16 step(s)	Distance	3 m
Test Place	ROS-SAC3	Software	Radiation 2023.2.5 (RE 30M-1G ESW26 CBL SAC3)				
Equipment		Settings	Band(s): 30 MHz - 1 GHz, Reference Level: 80 dBμV RBW: 120 kHz, VBW: 500 kHz, Sweep time: 200 ms, Number of Sweeps: 50 Step freq: Fixed step count: 8001 steps per Band, Attenuator: 10.0 dB, Internal preamp: 0 dB Final Measurement/Observation Time: PK 1 s / 30 s, QP 1 s / 30 s, AVG 1 s / 10 s				

CISPR 14-1 / EN 55014-1 @ 3 m

RadiMation

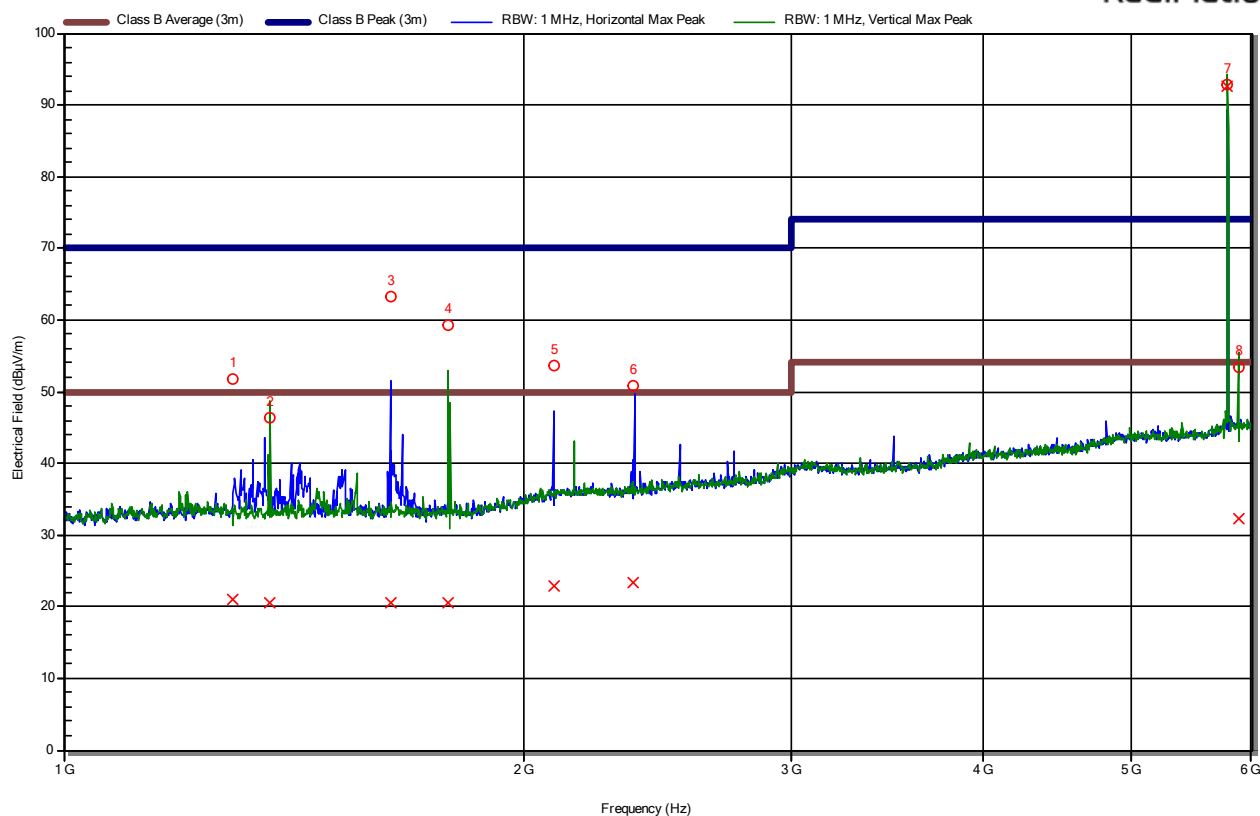
**Detected peaks**

Peak Number	Frequency (MHz)	Peak (dBμV/m)	Quasi-Peak (dBμV/m)	Quasi-Peak Difference (dB)	Angle (°)	Height (m)	Polarization	Status
1	34.486	52.3	30.4	-9.6	315	2	Vertical	Pass
2	46.369	41.1	23.7	-16.3	247	1	Horizontal	Pass
3	47.703	54.9	25.8	-14.2	0	2	Vertical	Pass
4	53.523	47.9	30.8	-9.2	112	1	Vertical	Pass
5	59.1	47.6	25.1	-14.9	0	4	Vertical	Pass
6	78.864	44.1	28.2	-11.8	67	1	Vertical	Pass
7	82.501	42.5	27.4	-12.6	45	1	Vertical	Pass
8	132.82	60.6	27.3	-12.7	247	2	Horizontal	Pass
9	146.036	61.7	29.6	-10.4	68	4	Vertical	Pass
10	167.619	56.6	24.5	-15.5	270	2	Horizontal	Pass
11	427.336	57.5	30.9	-16.1	338	1	Vertical	Pass
13	746.103	51.4	35.1	-11.9	338	1	Horizontal	Pass
12	928.584	47.8	38	-9.0	45	2	Vertical	Pass

Measurement	RE 1 GHz to 6 GHz	Test ID	#7	Date and time	2024-02-21 11:32:35	Operator	F. Wyler
EUT		Order				Verdict	Pass
Notes	ME7 (final); EUT: Beluga V/S; Cables connected: Power 230 VAC 50 Hz Operating mode: Active; Modifications: Level 1 Remarks: None;						
Antenna Height	1 m to 4 m, 4 step(s)	Polarization	Both	Table Angle	0 ° to 360 °, 16 step(s)	Distance	3 m
Test Place	ROS-SAC3	Software	Radimation 2023.2.5 (RE 1-6G ESW26 Schwarzbeck 9120D SAC3)				
Equipment		Settings	Band(s): 1 GHz - 6 GHz, Reference Level: 100 dBμV RBW: 1 MHz, VBW: 3 MHz, Sweep time: 200 ms, Number of Sweeps: 50 Step freq: Fixed step count: 5001 steps per Band, Attenuator: 10.0 dB, Internal preamp: 0 dB Final Measurement/Observation Time: PK 1 s / 30 s, QP 1 s / 5 s, AVG 1 s / 30 s				

CISPR 14-1 / EN 55014-1 @ 3m

RadiMation



Detected peaks

Peak Number	Frequency (MHz)	Peak (dBμV/m)	Peak Difference (dB)	Average (dBμV/m)	Average Difference (dB)	Angle (°)	Height (m)	Polarization	Status
1	1291	51.9	-18.1	20.9	-29.1	90	2	Vertical	Pass
2	1365	46.4	-23.6	20.4	-29.6	338	3	Vertical	Pass
3	1638	63.2	-6.8	20.6	-29.4	23	2	Horizontal	Pass
4	1788	59.2	-10.8	20.6	-29.4	90	4	Vertical	Pass
5	2095	53.6	-16.4	22.8	-27.2	270	1	Horizontal	Pass
6	2363	50.9	-19.1	23.2	-26.8	67	4	Horizontal	Pass
7	5783.073	92.9	18.9	92.6	38.6	0	4	Vertical	Pass *
8	5883	53.3	-20.7	32.3	-21.7	315	1	Vertical	Pass

* This is the carrier of the radar

4.6 AC Mains harmonic current emissions – IEC 61000-3-2

Name	G. Chauvelier		
Date	2024-02-23		
Test location (stand).....	☐ SAC3 ☐ SAC5 ☐ SAC10 ☒ Laboratory ☐ Shielded room		
Test method	☒	Direct measurement	
	☐	Calculation by validated simulation	
Version of measurement instrument standard used IEC 61000-4-7 (Clause 7).....	☒	IEC 61000-4-7:2002 + A1:2008 (grouping of harmonics on)	
	☐	IEC 61000-4-7:1991 (grouping of harmonics off)	
Supplementary test set up description	The measurement of harmonic currents is carried out e.g. with a harmonics analyser and a power source. For large currents it is possible to use harmonic current clamps. The values of the voltage and the frequency in the supply network are observed during the measurements. The measurements are carried out at the nominal load for the apparatus		
Limit classification in accordance with the standard	☒	Class A	
	☐	Class B	
	☐	Class C with power > 25 W	
	☐	Class C with power < 25 W Option a)	
	☐	Class C with power < 25 W Option b)	
	☐	Class D	
Observation period	Description	Period selected T _{obs}	
	☐ Quasi stationary	2.5 min	
	☒ Short cyclic	T _{obs} ≥ 10 cycles = 10 min	
	☐ Random	T _{obs} = 10 min	
	☐ Long cyclic	Full program cycle or 2.5 min. with highest THC T _{obs} =	
Control principle used in the sample	Manual switch		
Supplementary information	--		

Photo 4.6.1: Limits for harmonic current emissions



Test results for limits for harmonic current emissions	
Test item no(s) ref. cl. 1.2..... :	Beluga Fix SN: F300002
Operating mode no(s) ref. cl. 1.6 :	Active

Results:

Test Report			
Test Object :	Beluga		
Customer :	Rez AG		
Test Standard :	IEC 61000-3-2 (Edition 5.1) Limits for harmonic current emissions (equipment input current < 16 A per phase)		
Tester :	GCh		
Company :	Eurofins EEEPT / Rossens Laboratory		
Test Date :	2/23/2024 12:27:24 PM		
Result			
E.U.T. :	PASS	Source :	PASS
Customer			
Name :	Rez AG	Contact Person :	
Phone :		eMail :	
Address :			
Test Object / Product			
Name :	Beluga	Operation Mode :	Active mode
Serial Number :		Connection :	
Description :			
Measures & Analysis			
Measure Window :	10 periods	Voltage Range :	500 V
Refresh Interval :	2 s	Current Range :	70 A
Sampling Rate :	6.4 kS/s		
Scaled Window :	Rectangular	Current Probe :	Universal M1.U - 200A/2V (Ratio: 10 mV/A, Number of turns: 1, PhaseCompensation: 1.7)
According :	IEC 61000-3-2 (Edition 5.1) Limits for harmonic current emissions (equipment input current < 16 A per phase)		

Standard Specific Results for IEC 61000-3-2 (Edition 5.1)

Standard Group:	Industry
Standard Name:	IEC 61000-3-2 (Edition 5.1)
	Limits for harmonic current emissions (equipment input current < 16 A per phase)
Device Under Test:	PASS
Power Source:	PASS
Connection Type:	L - N
Main Line:	230 V, 50 Hz
Classification:	Class A
Appli. of Limits:	less than or equal to 150 % (Without POHC Enhancement)
Test Duration:	10 min

Check Harmonics 2..40

First detected harmonic order > 150 %

Line 1: None

Harmonics orders > 150 %

Line 1: None

Harmonics orders with average > 100 %

Line 1: None

Measured values

Fundamental Current

Line 1: 8.426 A

Active input Power

Line 1: 1934.581 W *

Circuit power factor

Line 1: 1 *

* Absolute value.

Prerequisite for simplified method fulfilled

First time window with THD(I) > 15 %

Line 1: None

Time window with max THD(I) > 15 %

Line 1: None

Current emission below 60 % of the applicable limits

Line 1: No

Active Input Power

Line 1: 1935 W *

* Absolute value.

Current Test Result

Average and Maximum harmonic current results									
Hn	Average				Maximum				Harmonic Result
	I _{eff} [A]	of Limit [%]	Limit [A]	Result	I _{eff} [A]	of Limit [%]	Limit [A]	Result	
1	8.190				8.427				
2	0.006	0.531	1.080	n/a	0.097	5.998	1.620	PASS	PASS
3	0.027	1.194	2.300	n/a	0.090	2.605	3.450	PASS	PASS
4	0.005	1.182	0.430	n/a	0.061	9.422	0.645	PASS	PASS
5	0.010	0.866	1.140	n/a	0.047	2.737	1.710	n/a	PASS
6	0.005	1.525	0.300	n/a	0.038	8.541	0.450	n/a	PASS
7	0.010	1.356	0.770	n/a	0.034	2.960	1.155	n/a	PASS
8	0.004	1.705	0.230	n/a	0.029	8.505	0.345	n/a	PASS
9	0.004	0.912	0.400	n/a	0.026	4.285	0.600	n/a	PASS
10	0.003	1.778	0.184	n/a	0.023	8.371	0.276	n/a	PASS
11	0.003	0.970	0.330	n/a	0.021	4.289	0.495	n/a	PASS
12	0.003	2.196	0.153	n/a	0.020	8.603	0.230	n/a	PASS
13	0.003	1.640	0.210	n/a	0.018	5.695	0.315	n/a	PASS
14	0.003	2.361	0.131	n/a	0.017	8.596	0.197	n/a	PASS
15	0.004	2.476	0.150	n/a	0.016	7.188	0.225	n/a	PASS
16	0.003	2.258	0.115	n/a	0.015	8.693	0.173	n/a	PASS
17	0.003	2.234	0.132	n/a	0.015	7.338	0.199	n/a	PASS
18	0.003	2.519	0.102	n/a	0.014	9.059	0.153	n/a	PASS
19	0.003	2.116	0.118	n/a	0.013	7.202	0.178	n/a	PASS
20	0.002	2.335	0.092	n/a	0.012	8.971	0.138	n/a	PASS
21	0.002	2.310	0.107	n/a	0.012	7.321	0.161	n/a	PASS
22	0.002	2.490	0.084	n/a	0.011	9.069	0.125	n/a	PASS
23	0.002	2.204	0.098	n/a	0.011	7.534	0.147	n/a	PASS
24	0.002	2.599	0.077	n/a	0.010	9.042	0.115	n/a	PASS
25	0.002	2.393	0.090	n/a	0.010	7.527	0.135	n/a	PASS
26	0.002	2.844	0.071	n/a	0.010	9.468	0.106	n/a	PASS
27	0.002	2.917	0.083	n/a	0.010	7.660	0.125	n/a	PASS
28	0.002	3.060	0.066	n/a	0.009	9.529	0.099	n/a	PASS
29	0.002	2.596	0.078	n/a	0.009	7.842	0.116	n/a	PASS
30	0.002	3.149	0.061	n/a	0.009	9.646	0.092	n/a	PASS
31	0.002	2.943	0.073	n/a	0.009	8.116	0.109	n/a	PASS
32	0.002	3.760	0.058	n/a	0.009	9.896	0.086	n/a	PASS
33	0.002	2.863	0.068	n/a	0.008	8.160	0.102	n/a	PASS
34	0.002	3.667	0.054	n/a	0.008	10.120	0.081	n/a	PASS
35	0.002	3.784	0.064	n/a	0.008	8.261	0.096	n/a	PASS
36	0.002	4.031	0.051	n/a	0.008	10.262	0.077	n/a	PASS
37	0.002	3.948	0.061	n/a	0.008	8.631	0.091	n/a	PASS
38	0.002	4.838	0.048	n/a	0.008	10.535	0.073	n/a	PASS
39	0.003	4.521	0.058	n/a	0.008	8.963	0.087	n/a	PASS
40	0.002	4.281	0.046	n/a	0.007	10.522	0.069	n/a	PASS

Note: Harmonic currents less than 0.6 % of the input current measured under the test conditions, or less than 5 mA, whichever is greater, are disregarded.

Voltage Source Verification

Harmonic voltage results				
Hn	Ueff [V]	Ueff [%]	Limit [%]	Result
1	230.463	100.201		
2	0.090	0.039	0.200	PASS
3	0.041	0.018	0.900	PASS
4	0.015	0.007	0.200	PASS
5	0.063	0.027	0.400	PASS
6	0.018	0.008	0.200	PASS
7	0.075	0.033	0.300	PASS
8	0.012	0.005	0.200	PASS
9	0.019	0.008	0.200	PASS
10	0.017	0.007	0.200	PASS
11	0.036	0.016	0.100	PASS
12	0.012	0.005	0.100	PASS
13	0.020	0.009	0.100	PASS
14	0.021	0.009	0.100	PASS
15	0.023	0.010	0.100	PASS
16	0.010	0.004	0.100	PASS
17	0.020	0.009	0.100	PASS
18	0.021	0.009	0.100	PASS
19	0.017	0.007	0.100	PASS
20	0.010	0.004	0.100	PASS
21	0.015	0.007	0.100	PASS
22	0.018	0.008	0.100	PASS
23	0.019	0.008	0.100	PASS
24	0.017	0.007	0.100	PASS
25	0.013	0.006	0.100	PASS
26	0.017	0.007	0.100	PASS
27	0.011	0.005	0.100	PASS
28	0.008	0.004	0.100	PASS
29	0.016	0.007	0.100	PASS
30	0.009	0.004	0.100	PASS
31	0.011	0.005	0.100	PASS
32	0.014	0.006	0.100	PASS
33	0.009	0.004	0.100	PASS
34	0.015	0.006	0.100	PASS
35	0.008	0.004	0.100	PASS
36	0.009	0.004	0.100	PASS
37	0.013	0.006	0.100	PASS
38	0.009	0.004	0.100	PASS
39	0.015	0.006	0.100	PASS
40	0.015	0.006	0.100	PASS

4.7 AC Mains voltage fluctuation and flicker – IEC 61000-3-3 / IEC 61000-3-11

Name	G. Chauvelier		
Date	2024-02-23		
Test location (stand).....	☐ SAC3 ☐ SAC5 ☐ SAC10 ☒ Laboratory ☐ Shielded room		
Applied standard	☒	IEC 61000-3-3	
	☐	IEC 61000-3-11	
		The test item deems to be compliant with the applied standard, on condition the manufacturer meets his obligations regarding EN 61000-3-11:2000, Section 4 a) and 4 b). The result is regarded as PASS if all information requested by EN 61000-3-11 is published in the user manual.	
		Test impedance / maximum permissible system impedance	☐ Maximum permissible system impedance (Cl. 6.3): ... Ω ☐ Minimum permissible service current (6.4) ≥ 100 A / phase
Supplementary test set up description	The measurement of variations in voltage is carried out using a flickermeter. The measurements are carried out under the normal load for the apparatus. The settings accessible to the user and the automatic programs are chosen so that a maximum flicker is produced.		
Test method	☒	4.2.2 Flickermeter according IEC 61000-4-15	
	☐	4.2.3 Simulation	
	☐	4.2.4 Analytical method	
	☐	4.2.5 Use of $P_{st} = 1$ curve	
Observation time selected	☒	10 Minutes	
	☐	120 Minutes	
	☐	24 times switching according to annex B of the standard	
Limit for d_{max} applied.....	☐	4 %	
	☐	6 %	
	☒	7 %	
Supplementary information	--		

Photo 4.7.1 : AC Mains Voltage fluctuation and flicker



Test results for limits for AC Mains voltage fluctuation and flicker	
Test item no(s) ref. cl. 1.2..... :	Beluga Fix SN: F300002
Operating mode no(s) ref. cl. 1.6 :	Active

Results:

Test Report	
Test Object :	Beluga
Customer :	Rez AG
Test Standard :	IEC 61000-3-3 (Edition 3.2) Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤ 16 A per phase and not subject to conditional connection
Tester :	GCh
Company :	Eurofins EEEPT / Rossens Laboratory
Test Date :	2/23/2024 12:45:41 PM

Result	
E.U.T. :	Test passed

Customer	
Name :	Rez AG
Phone :	
Address :	
Contact Person :	
eMail :	

Test Object / Product	
Name :	Beluga
Serial Number :	
Description :	
Operation Mode :	Active mode
Connection :	

Flicker Results

Standard Specific Results for IEC 61000-3-3 (Edition 3.2)

Standard Group: Industry

Standard Name: IEC 61000-3-3 (Edition 3.2)
 Limitation of voltage changes, voltage fluctuations and flicker
 in public low-voltage supply systems, for equipment with rated current ≤ 16 A per phase
 and not subject to conditional connection

Test Condition: Hairdryers

Analysis Status: **PASS**

Flicker Measurements Settings

Main Line: 230V, 50Hz
 Flicker Meter: 230V / 50Hz
 Flicker Impedance: Zref
 Observation Time: 1 × 10 min
 Measurements: 1

Flicker Measurements

	Last V_{rms} [V]	P_{It}	Max P_{st}	Max d_c [%]	Max d_{max} [%]	Max T_{max} [s]
Line 1:	227.212	0.233	0.533	1.477	1.64	0
Limits:		No Limit	1	3.3	7	0.5
Results:			PASS	PASS	PASS	PASS

Flicker Individual Measurements

Measurement	P_{st} []			d_c [%]			d_{max} [%]			T_{max} [s]		
	Value	Limit	Result	Value	Limit	Result	Value	Limit	Result	Value	Limit	Result
#1	0.53	1.00	PASS	1.48	3.30	PASS	1.64	7.00	PASS	0.00	0.50	PASS

5 Immunity

5.1 Electrostatic discharge

Name	G. Chauvelier		
Date	2024-02-22		
Test location (stand)	☐ SAC3 ☐ SAC5 ☐ SAC10 ☒ Laboratory ☐ Shielded room		
Environmental conditions during the test	Temperature value	Humidity value	Atmospheric pressure value or interval
	23.8 °C	36 %RH	920 hPa
Test set up	☐	Table-top equipment	
	☐	Floor standing equipment	
	☒	Wall or ceiling mounted equipment (Treated as table top)	
Supplementary test set up description	All the points accessible to the operator are tested successively. Contact discharges are carried out on conducting surfaces as well as indirect discharges on a vertical or horizontal coupling plate. Air discharges are carried out on insulated surfaces. A minimum of 10 discharges for each voltage level and polarity are applied to each test point		
Size of horizontal coupling plate ..	1,6 x 0,8 m		
Size of vertical coupling plate	0,5 x 0,5 m		
Number of discharges for each test point	10		
Discharges interval	1 sec		
ESD generator to surface	☒	ESD-Generator is held perpendicular to the surface of the test item	
	☐	ESD-Generator cannot be held perpendicular to the surface of the test item.	
		Description of the test condition: --	
Performance criterion	B		
Supplementary information	--		

Symbols identifying discharge applied		Contact discharge
		Air discharge
		Air discharge, discharge did not occur

Photo 5.1.1 : Electrostatic discharge immunity test (ESD) : Beluga Fix set-up

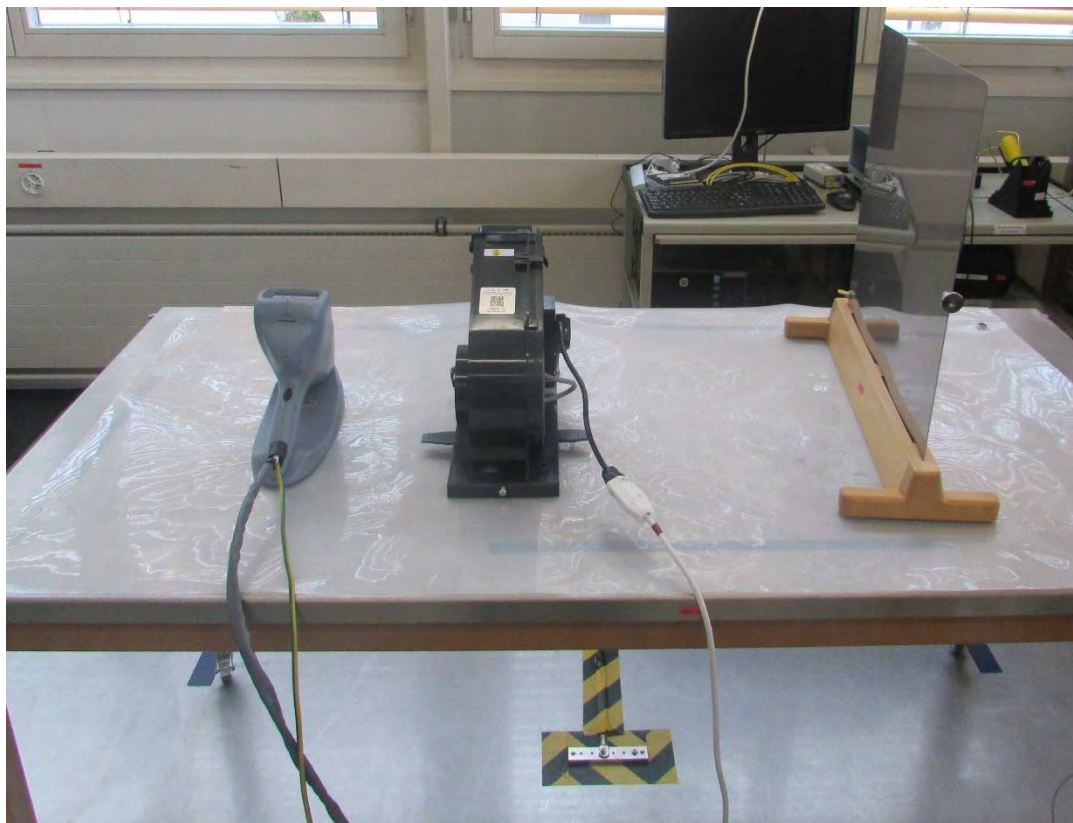


Photo 5.1.2 : Electrostatic discharge immunity test (ESD) : Beluga Fix - front, tests points examples

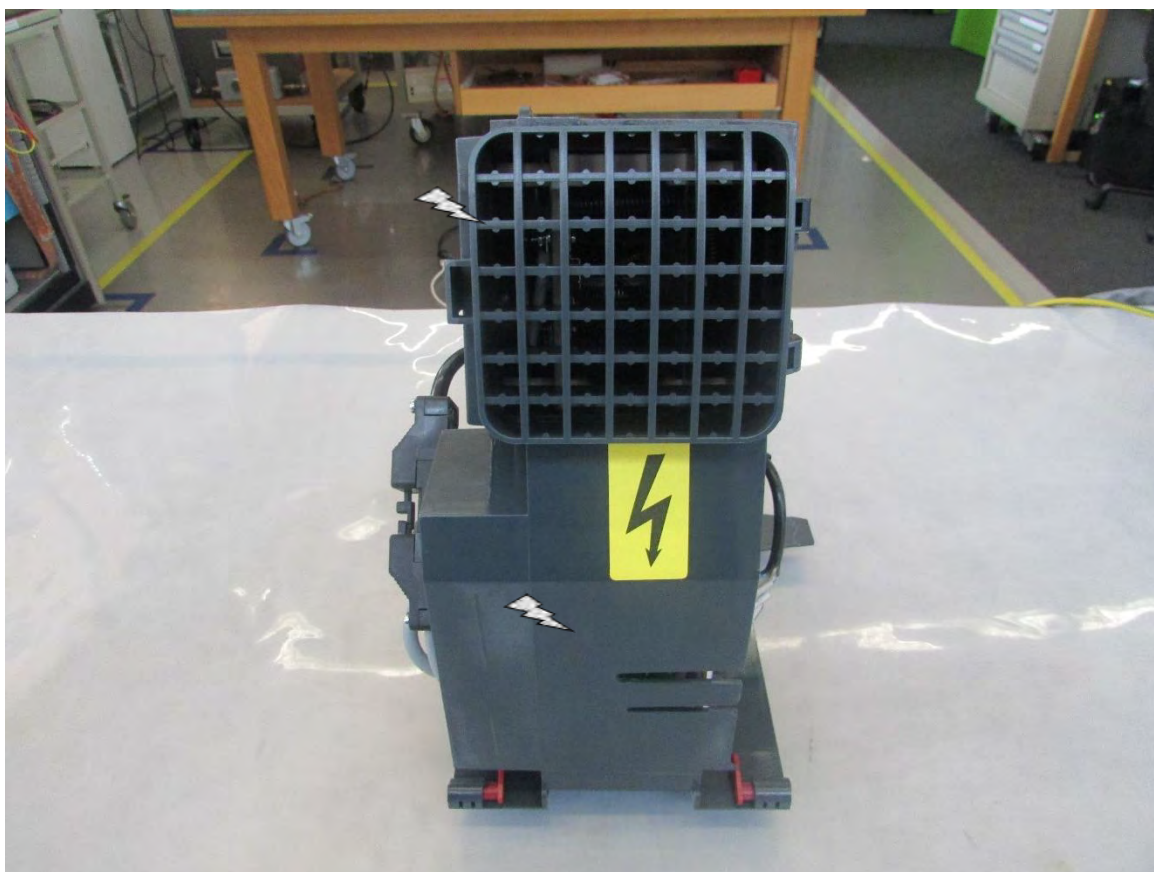


Photo 5.1.3 : Electrostatic discharge immunity test (ESD) : Beluga Fix - right, tests points examples

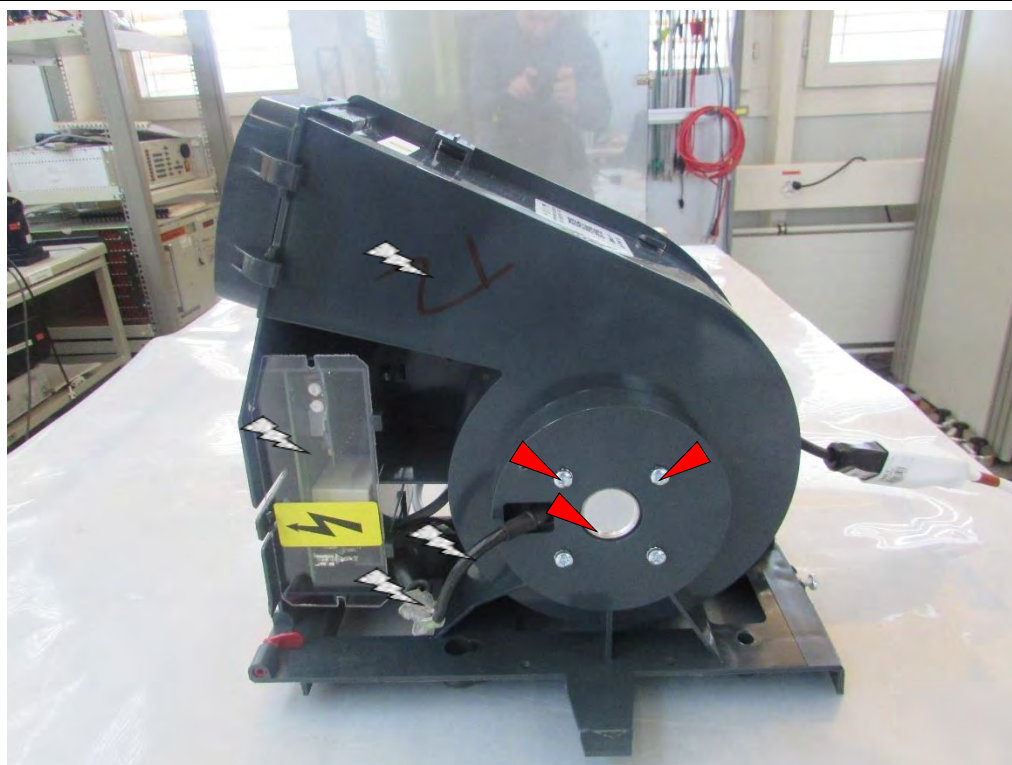


Photo 5.1.4

Electrostatic discharge immunity test (ESD) : Beluga Fix - left, tests points examples



Photo 5.1.5

Electrostatic discharge immunity test (ESD) : Beluga Fix - back, tests points examples



Photo 5.1.6

Electrostatic discharge indirect immunity test (ESD) : Beluga Fix, one side example, Horizontal and Vertical plane

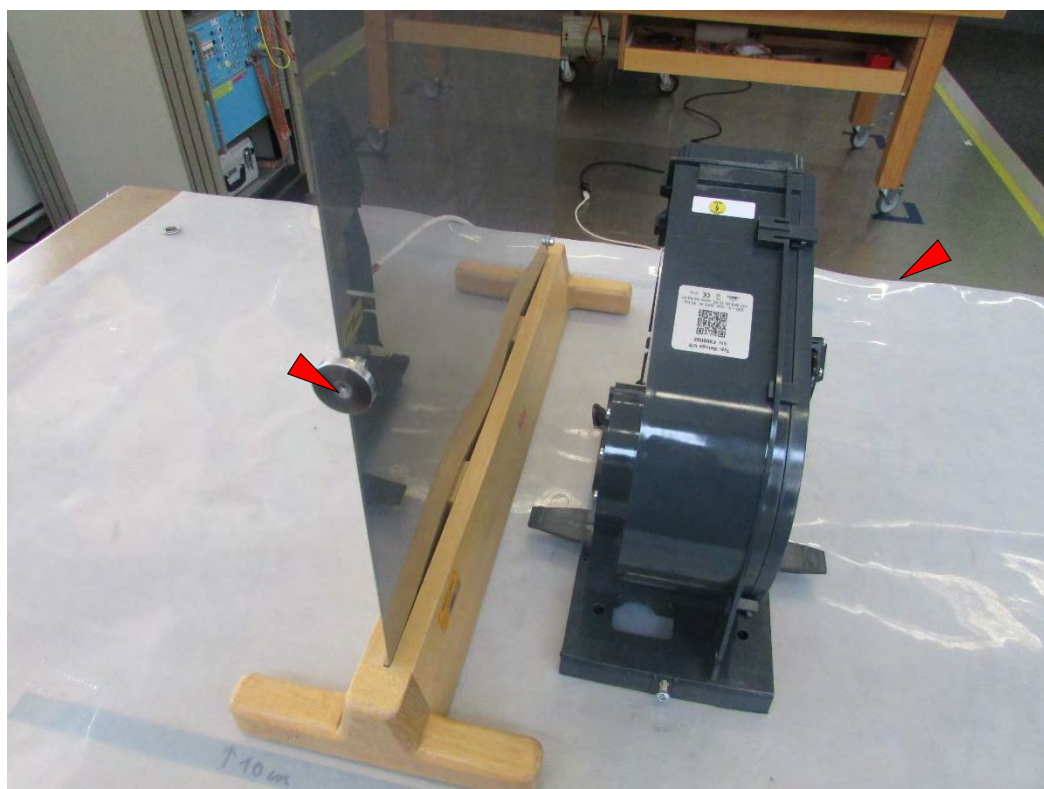


Photo 5.1.7 : Electrostatic discharge immunity test (ESD) : Beluga V/S set-up



Photo 5.1.8 : Electrostatic discharge immunity test (ESD) : Beluga V/S side, tests points examples



Photo 5.1.9

Electrostatic discharge immunity test (ESD) : Beluga V/S side back, tests points examples



Photo 5.1.10

Electrostatic discharge immunity test (ESD) : Beluga V/S down, tests points examples



Test results for electrostatic discharges (ESD) immunity test	
Test item no(s) ref. cl. 1.2..... :	Beluga Fix and Beluga V/S
Operating mode no(s) ref. cl. 1.6 :	Ready to Operate and Active
Test mains voltage / frequency ... :	230 VAC / 50 Hz

Results:

Beluga Fix SN: F300002:

Location of discharge	Test level [kV]	Polarity	Type	Observations
VCP	4	P	Con	No influence observed
VCP	4	N	Con	No influence observed
HCP	4	P	Con	No influence observed
HCP	4	N	Con	No influence observed
Points on conductive surface as indicated in the picture above	4	P	Con	No influence observed
Points on conductive surface as indicated in the picture above	4	N	Con	No influence observed
Points on non-conductive surface as indicated in the picture above	2, 4, 8	P	Air	No influence observed
Points on non-conductive surface as indicated in the picture above	2, 4, 8	N	Air	No influence observed
HCP = Horizontal coupling plate; VCP = Vertical coupling plate P= Positive; N= Negative				
Observations	--			
Bleeder equipment used?	No			
Supplementary information ..	--			

Beluga V/S SN: F300002:

Location of discharge	Test level [kV]	Polarity	Type	Observations
VCP	4	P	Con	No influence observed
VCP	4	N	Con	No influence observed
HCP	4	P	Con	No influence observed
HCP	4	N	Con	No influence observed
Points on conductive surface as indicated in the picture above	4	P	Con	No influence observed
Points on conductive surface as indicated in the picture above	4	N	Con	No influence observed
Points on non-conductive surface as indicated in the picture above	2, 4, 8	P	Air	No influence observed
Points on non-conductive surface as indicated in the picture above	2, 4, 8	N	Air	No influence observed
HCP = Horizontal coupling plate; VCP = Vertical coupling plate P= Positive; N= Negative				
Observations	--			
Bleeder equipment used?	No			
Supplementary information ..	--			

5.2 Fast transients

Name	G. Chauvelier		
Date	2024-02-22		
Test location (stand)	☐ SAC3 ☐ SAC5 ☐ SAC10 ☒ Laboratory ☐ Shielded room		
Test setup	☒	Equipment on the table ($0,1 \pm 0,05$) m above ground plane	
	☐	Equipment standing on floor at ($0,1 \pm 0,05$) m above ground plane	
	☐	Artificial hand applied. Location see photo.	
Supplementary test set up description	The transient coupling is carried out using a coupling network for the supply cables and a capacitive coupling clamp for the other cables. The two voltage polarities are tested.		
Repetition frequency	☒	5 kHz	
	☒	100 kHz	
Test time	2 min		
Performance criterion	B		
Supplementary information	--		

Photo 5.2.1 Electrical fast transients / burst immunity test



Test on Mains

Test results for electrical fast transients / burst immunity test	
Test item no(s) ref. cl. 1.2..... :	Beluga Fix SN: F300002
Operating mode no(s) ref. cl. 1.6 :	Ready to Operate and Active
Test mains voltage / frequency ... :	230 VAC / 50 Hz

Results:

Port name	Test level [kV]	Polarity	Coupling	Observations
Mains	1 / 2	P / N	CDN	No influence observed
P= Positive; N= Negative CDN= Coupling / Decoupling Network CCC= Capacitive Coupling Clamp				
Observations	--			
Supplementary information ..	--			

Port	Observation
--	All ports tested

5.3 Injected currents (0.15 MHz to 230 MHz or 0.15 MHz to 80 MHz)

Name	G. Chauvelier	
Date	2024-02-22	
Test location (stand).....	☐ SAC3 ☐ SAC5 ☐ SAC10 ☒ Laboratory ☐ Shielded room	
Test setup.....	☒	Equipment located (0,1 ± 0,05) m above ground plane
	☐	Elevated ground plane according to Annex F
	☐	Artificial hand applied. Location see photo.
Supplementary test set up description	The HF voltage is injected on the cables using different coupling/decoupling networks. All connected cables shall be provided with the appropriate coupling and decoupling devices. The voltage is calibrated without the equipment under test. The Dwell time is depending on the reaction time of the tested equipment.	
Clamp injection	☒	Common mode impedance requirements met
	☐	Common mode impedance not met. Modified test level: V
Modulation	☒	80 % AM with 1 kHz
	☐	Other: ---
Dwell time	3 s	
Step size.....	1 %	
Performance criterion	A	
Supplementary information	--	

Photo 5.3.1: Immunity to conducted disturbances induced by RF fields : set-up

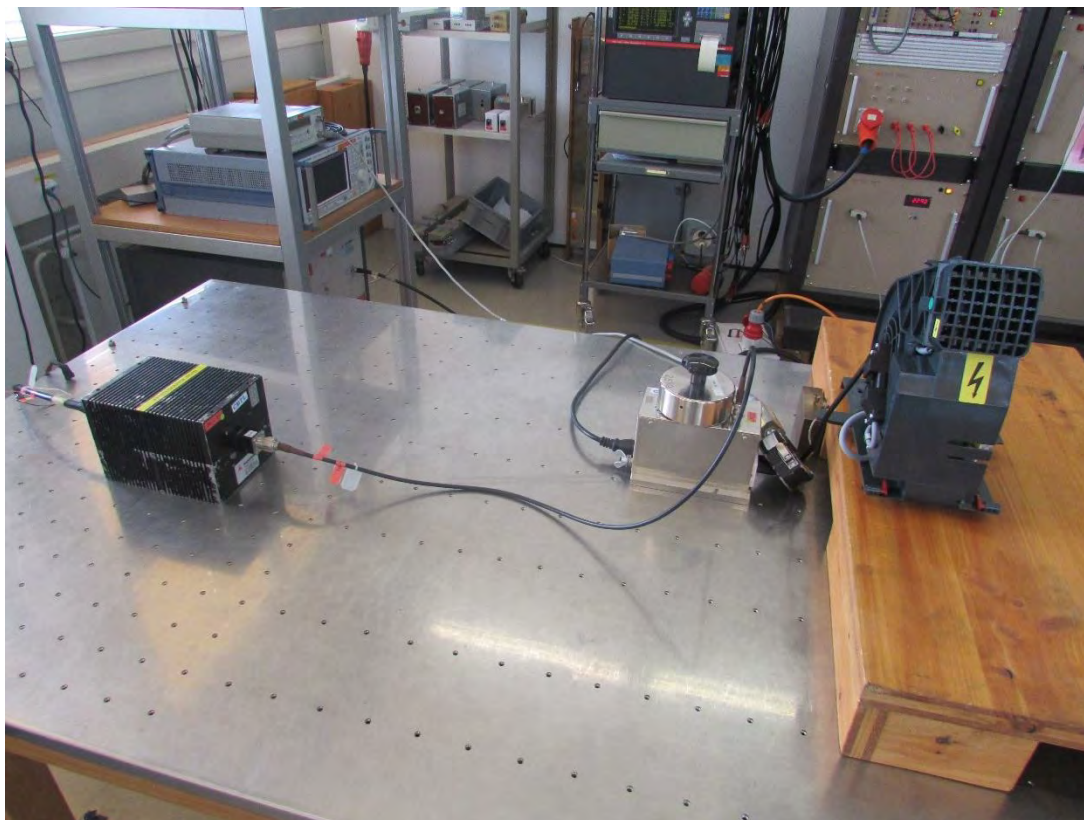


Photo 5.3.2: Immunity to conducted disturbances induced by RF fields : set-up zoomed

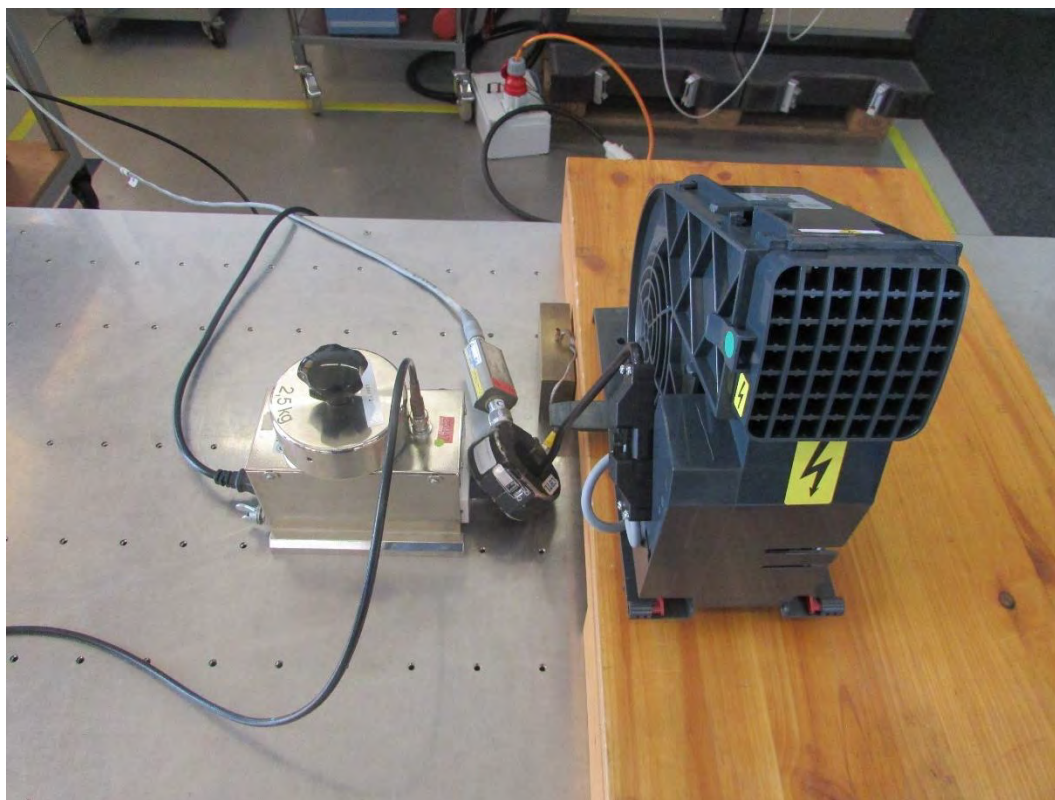
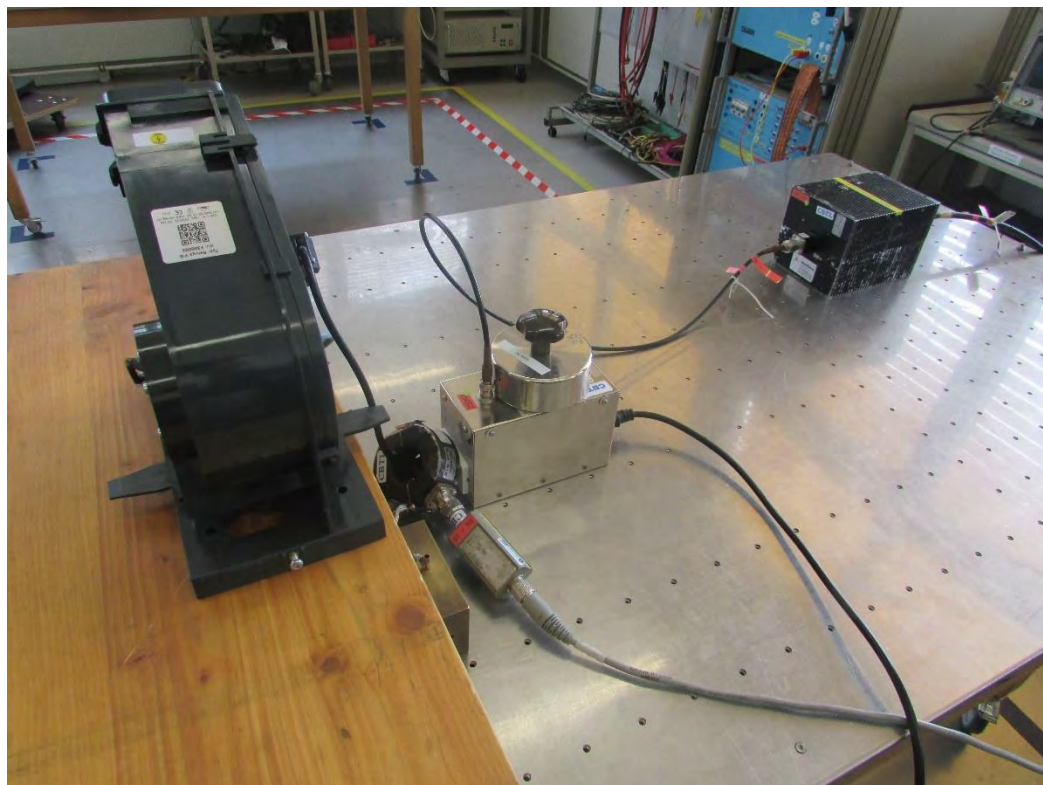


Photo 5.3.3 : Immunity to conducted disturbances induced by RF fields : set-up back

**Test results for immunity to conducted disturbances, induced by radio-frequency fields**

Test item no(s) ref. cl. 1.2..... :	Beluga Fix SN: F300002	
Operating mode no(s) ref. cl. 1.6 :	Ready to Operate and Active	
Test mains voltage / frequency ... :	230 VAC / 50 Hz	
Frequency range :	☐	0.15 MHz – 230 MHz
	☒	0.15 MHz – 80 MHz

Results:

Test level [V]	Port under test		Terminated port		Observations
	Port name	CDN type	Port name	CDN type	
10	Mains	M3	--	--	No influence observed
Observations : --					
Supplementary information ... : --					

Port	Observation
--	All ports tested

5.4 Radio frequency electromagnetic fields (80 MHz to 6 GHz)

Name	G. Chauvelier			
Date	2024-02-23			
Test location (stand).....	☒ SAC3 ☐ SAC5 ☐ SAC10 ☐ Laboratory ☐ Shielded room			
Test setup.....	☐	Equipment on the table (0,8 m height)		
	☐	Equipment standing on floor (0,05 m to 0,15 m height)		
	☒	Other height: 0.4 m		
Deviations from arrangement of wiring given in the standard	☒	No deviations		
	☐	Yes (e.g. less than 1 m of cable exposed to the field or low-inductive bundling not possible)		
		Cable	Rationale for deviation	
		--	--	
		--	--	
	☒	Take the same setup than radiated Emission and turn the table. If the field at cable exposed is too high we test with new cable arrangement.		
CMAD application.....	☐	No CMAD has been applied		
	☒	CMAD's have been applied		
		Cable with CMAD	Remark	
		Mains	--	
		--	--	
		--	--	
Supplementary test set up description	The field is emitted from one or different antennas placed successively in vertical and then in horizontal polarisation. The field is calibrated without the EUT using an isotropic probe.			
Exposed side of EUT.....	☒	Front	☒	Left (viewed from front)
	☒	Rear	☒	Right (view from front)
	☐	Top	☐	Bottom
Rationale for not exposing a side :	The EUT is a wall mounted device, where exposing top and bottom is technically not feasible			
Size shape and height of the uniform area	No.	Size	Shape	Height
	1	1,5 m x 1,5 m	Rectangular	0,8 m
Partial illumination applied.....	☒	No partial illumination has been applied		
	☐	Partial illumination has been applied		
		Description of the partial illumination: --		
Test item fully placed inside UFA :	☒	Yes		
	☐	No		

Tolerance range of the UFA up to 1 GHz	☒	0 dB to + 6 dB
	☐	0 dB to + 10 dB
		Actual tolerance: --
Test method	☒	IEC 61000-4-3 Radiated Field with Antenna
	☐	IEC 61000-4-22 Radiated emission and immunity measurements in fully anechoic rooms (FARs)
	☐	IEC 61000-4-20 Emission and immunity testing in transverse electromagnetic (TEM) waveguides
Distance Antenna to EUT	3 m	
Dwell time	Ready to Operate : 1 sec, Active : 3 sec	
Step size in %	1 %	
Performance criterion	A	
Supplementary information	--	

Photo 5.4.1 : Radiated RF electromagnetic field immunity test : 80 M – 1000 MHz

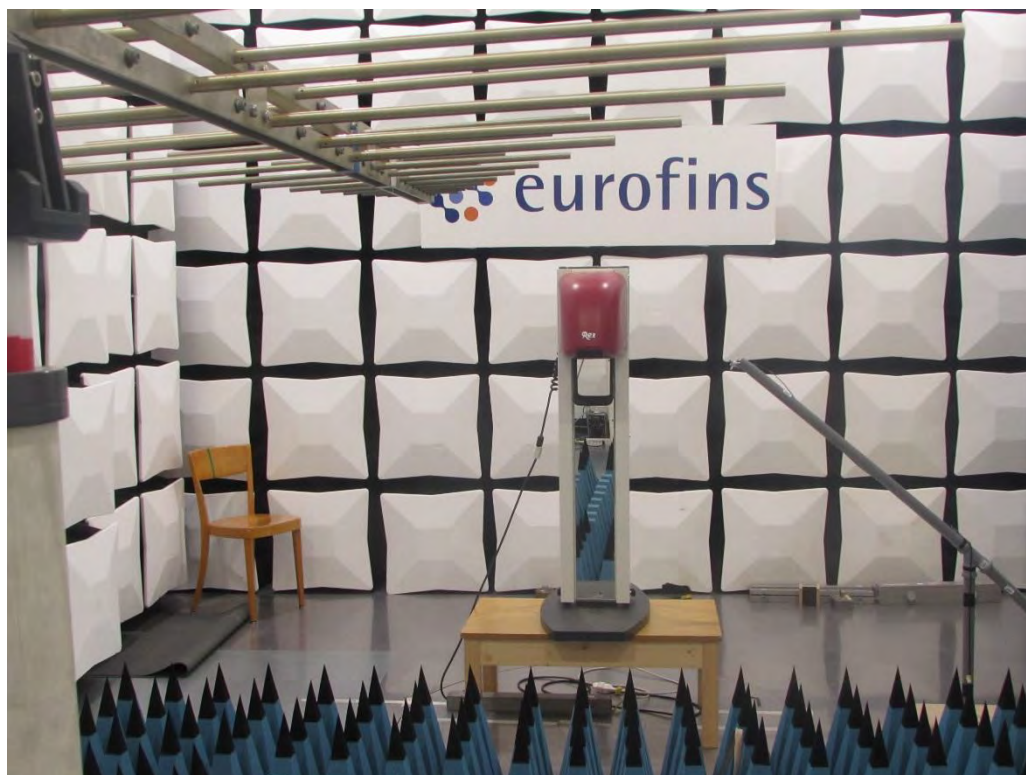


Photo 5.4.2 : Radiated RF electromagnetic field immunity test : 1000 M – 6000 MHz



Test results for radiated, radio-frequency, electromagnetic field immunity test	
Test item no(s) ref. cl. 1.2..... :	Beluga V/S SN: F300002
Operating mode no(s) ref. cl. 1.6 :	Ready to Operate and Active
Test mains voltage / frequency ... :	230 VAC / 50 Hz

Results mode Ready to Operate:

Frequency range	Test level [V/m]	Position	Polarization	Modulation	Observations
80 – 1000 MHz	10	0°	H / V	AM 1 kHz 80 %	No influence observed
80 – 1000 MHz	10	90°	H / V	AM 1 kHz 80 %	No influence observed
80 – 1000 MHz	10	180°	H / V	AM 1 kHz 80 %	No influence observed
80 – 1000 MHz	10	270°	H / V	AM 1 kHz 80 %	No influence observed
1 – 6 GHz	10	0°	H / V	AM 1 kHz 80 %	No influence observed
1 – 6 GHz	10	90°	H / V	AM 1 kHz 80 %	No influence observed
1 – 6 GHz	10	180°	H / V	AM 1 kHz 80 %	No influence observed
1 – 6 GHz	10	270°	H / V	AM 1 kHz 80 %	No influence observed
Observations	--				
Supplementary information.....	--				

Results mode Active:

Frequency range	Test level [V/m]	Position	Polarization	Modulation	Observations
80 – 1000 MHz	10	0°	H / V	AM 1 kHz 80 %	No influence observed
80 – 1000 MHz	10	90°	H / V	AM 1 kHz 80 %	No influence observed
80 – 1000 MHz	10	180°	H / V	AM 1 kHz 80 %	No influence observed
80 – 1000 MHz	10	270°	H / V	AM 1 kHz 80 %	No influence observed
1 – 6 GHz	10	0°	H / V	AM 1 kHz 80 %	No influence observed
1 – 6 GHz	10	90°	H / V	AM 1 kHz 80 %	No influence observed
1 – 6 GHz	10	180°	H / V	AM 1 kHz 80 %	No influence observed
1 – 6 GHz	10	270°	H / V	AM 1 kHz 80 %	No influence observed
Observations	--				
Supplementary information.....	--				

5.5 Surges

Name	G. Chauvelier		
Date	2024-02-23		
Test location (stand).....	☐ SAC3 ☒ Laboratory	☐ SAC5 ☐ Shielded room	☐ SAC10
Test set up description	The impulses are coupled using the coupling network where the supply lines and unshielded cables are concerned. The shielded cables are coupled directly. The two polarities and different phase angles are tested for all the test levels up until the specified level.		
Repetition rate	1/min		
Number of pulses for each coupling	5		
Performance criterion	☒	B	
	☐	C (Exception 7.2.7 of CISPR 14-2:2020 applied)	
		Technical justification: --	
Supplementary information	--		

Photo 5.5.1	Surge immunity test
	

Test results for surge immunity test	
Test item no(s) ref. cl. 1.2.....	Beluga Fix SN: F300002
Operating mode no(s) ref. cl. 1.6 :	Ready to Operate and Active
Test mains voltage / frequency ... :	230 VAC / 50 Hz

Results:

Port name	Test level [kV]	Polarity	Phase [°]	Coupling	Observations
Input AC power ports	1	P / N	90 / 270	L1 – N	No influence observed
Input AC power ports	2	P / N	90 / 270	L1 - PE	No influence observed
Input AC power ports	2	P / N	90 / 270	N – PE	No influence observed
Lower test levels.....:	☒		The lower test levels are tested also.		
	☐		The lower test levels are not tested.		
P= Positive; N= Negative CDN from IEC 61000-4-5: CDN = CDN for AC or DC ports CDN UUI = network for unshielded unsymmetrical interconnection lines: line-to-line and line-to-ground coupling CDN USI = network for unshielded symmetrical interconnection lines: lines-to-ground coupling CDN USIC = network for unshielded symmetrical interconnection lines: lines-to-ground coupling via capacitors CDN SL = surges applied to shielded lines					
Observations	--				
Supplementary information ..	--				

Port	Observation
--	All ports tested

5.6 Voltage dips

Name	G. Chauvelier		
Date	2024-02-22		
Test location (stand).....	☐ SAC3	☐ SAC5	☐ SAC10
	☒ Laboratory	☐ Shielded room	
Test method for 3 phase-to-phase system	☒	Method A (preferred)	
	☐	Method B	
	☐	N/A (single phase equipment)	
Test set up description	The disturbances are carried out with a power fail simulator. The EUT shall be tested for each selected combination of test level and duration with a sequence of three dips/interruptions with intervals of 10 s minimum (between each test event).		
Repetition rate	10 s		
Number of dips or interruptions....	3		
Performance criterion	B (Voltage dips) C (Short interruptions $U_T = 0\%$)		
Supplementary information	--		

Photo 5.6.1: Voltage dips, short int's and variations immunity test



Test results for voltage dips, interruptions and variations immunity test	
Test item no(s) ref. cl. 1.2..... :	Beluga Fix SN: F300002
Operating mode no(s) ref. cl. 1.6 :	Ready to Operate and Active

Results: Ready to Operate

Applied mains voltage / frequency (U _N)	Duration [cycles]	Test level [% of U _N]	Phase angle [°]	Type	Observations
230 V / 50 Hz	1	0	0, 180	Dip	No influence observed
230 V / 50 Hz	10	40	0, 180	Dip	No influence observed
230 V / 50 Hz	25	70	0, 180	Dip	No influence observed
230 V / 50 Hz	250	0	0, 180	Interruption	No influence observed
Observations		--			
Supplementary information		--			

Results: Active

Applied mains voltage / frequency (U _N)	Duration [cycles]	Test level [% of U _N]	Phase angle [°]	Type	Observations
230 V / 50 Hz	1	0	0, 180	Dip	No influence observed
230 V / 50 Hz	10	40	0, 180	Dip	No influence observed
230 V / 50 Hz	25	70	0, 180	Dip	No influence observed
230 V / 50 Hz	250	0	0, 180	Interruption	Stop and restart if activation of sensor
Observations		--			
Supplementary information		--			

6 Measurement instrumentation uncertainties and decision rule

6.1 Measurement uncertainty

Where relevant, the following measurement instrumentation uncertainty levels have been estimated for tests performed on the apparatus:

	Measurements According to CISPR 16-4- 2:2011+AMD1:2014+AMD2:2018	Normal distribution	Estimated uncertainty of the measurement results: U_{lab}	Maximum uncertainty defined by the standard: U_{CISPR}
Conducted disturbance	AC Mains and other port power, V-AMN 9 kHz - 150 kHz acc. table B.1	k=2	± 3.5 dB	± 3.8 dB
	AC Mains, V-AMN 150 kHz - 30 MHz acc. table B.2	k=2	± 3.23 dB	± 3.4 dB
	Telecommunication port, AAN 150 kHz - 30 MHz acc. table B.4	k=2	± 4.9 dB	± 5.0 dB
	Telecommunication port, CVP 150 kHz - 30 MHz acc. table B.5	k=2	N/A	± 3.9 dB
	Telecommunication port, CP 150 kHz - 30 MHz acc. table B.6	k=2	± 2.7 dB	± 2.9 dB
	Telecommunication port, CP and CVP 150 kHz - 30 MHz acc. table B.5	k=2	N/A	± 4.0 dB
	Disturbance power 30 MHz - 300 MHz acc. table C.1	k=2	± 4.45 dB	± 4.5 dB
	Mains port, CDNE 30 MHz - 300 MHz acc. table B.7	k=2	± 3.6 dB	± 3.8 dB
Radiated disturbance	Magnetic field for ERA/ERTMS/033281 (X, Y & Z axis) 27 kHz -1250 kHz	k=2	± 3 dB	Not given
	Disturbance current in a LLAS 9 kHz – 30 MHz: acc. table F.1	k=2	N/A	± 3.3 dB
	Electric field strength in a SAC @ 3, 5 and 10 m 30 – 1000 MHz, acc. table D.1 to D.4	k=2	± 4.24 dB (30- 300 MHz) ± 3.59 dB (200- 1000 MHz)	± 6.3 dB
	Electric field strength in a FAR @ 3 m 1 – 6 GHz, acc. table E.1	k=2	± 4.94 dB	± 5.2 dB
	Electric field strength in a FAR @ 3 m6 – 18 GHz, acc. table E.2	k=2	± 3.79 dB	± 5.5dB

	Emission Measurements According Standard	Normal distribution	Estimated uncertainty of the measurement results: U_{lab}	Maximum uncertainty defined by the standard: U_{CISPR}
Harmonics	IEC 61000-3-2:2018+AMD1:2020, acc. §6.3.3.1	k=2	± 5 %	± 5 %
Harmonics	IEC 61000-3-12:2011, acc. §4.2.3	k=2	± 5 %	± 5 %
Flicker	IEC 61000-3-3:2013+AMD1:2017, acc. §6.2	k=2	± 5 %	± 8 %
Flicker	IEC 61000-3-11:2017	k=2	± 5 %	Not existing

	Emission Measurements According Standard		Normal distribution		Estimated uncertainty of the measurement results: U_{lab}	Maximum uncertainty defined by the standard: U_{CISPR}
Radiated immunity	IEC 61000-4-3:2020, acc. §Annex J 80 – 1000 MHz		k=2		± 2.1 dB	± 2.19 dB
Radiated immunity	IEC 61000-4-3:2020, acc. §Annex J 1 – 6 GHz		k=2		± 2.5 dB	± 2.19 dB*
Conducted radio frequency	IEC 61000-4-6 150 kHz – 230 MHz		k=2	CDN	± 1.4 dB	± 1.36 dB
				EM clamp and direct injection	± 3.2 dB	± 3.19 dB
				Current clamp	± 3.3 dB	± 3.27 dB
				direct injection	± 3.1 dB	± 3.07 dB
Power frequency magnetic field	IEC 61000-4-8 0, 16 2/3, 50, 60 Hz		k=2		± 10.8 %	± 16 %
Voltage dips and interruptions	IEC 61000-4-11	Output voltage U_o :	k=2	± 1.0 %	± 9.0 %	
		Duration t_e :	k=1.73	± 20 μ s	± 5.0 %	
		Phase ϕ_o	k=1.73	± 1 °	± 2.8 %	
Electrostatic discharge	IEC 61000-4-2	Peak Current	k=2	± 5%	± 7 %	
		I_{30} , I_{60}	k=2	± 5%	± 7 %	
		Rise Time	k=2	± 10 %	± 15 %	
Fast transients	IEC 61000-4-4	Rise Time	k=2	± 5%	± 6.2 %	
		Peak voltage	k=2	± 5%	± 8.6 %	
		Voltage Pulse width	k=2	± 5%	± 5.9 %	
Slow transients surge	IEC 61000-4-5		k=2		± 5%	± 8.6 %

* The MU of the probe used for calibration of the homogenous field is already near 2.0 dB

6.2 Decision rule

Refer to the section “General remarks:” of this report.

7 List of test equipment

Equipment	Type	Inventory no.	Manufacturer	Last calibration date	Calibration due date
Test stand: Disturbance voltage – 9 kHz (150 kHz) to 30 MHz / Discontinuous disturbances (clicks)					
Faraday					
Shield Room (Faraday (FAR))	Home Made Faraday	2019-17	Universal Shielding	No Cal.	
Time-domain EMI Analyzer	TDEMI X6	2019-09	Gauss	2023-04-14	2024-04-14
EMI Test Receiver	ESR7	2016-03	Rohde & Schwarz	2023-02-16	2024-02-16
LISN	ESH3-Z5	182186	Rohde & Schwarz	2023-08-31	2025-01-31
Coaxial cable	RG223U	2019-120	Huber+Suhner	2023-08-29	2025-02-28
Coaxial cable	RG223U	2019-121	Huber+Suhner	2023-08-29	2025-02-28
Coaxial cable	RG223U	2019-122	Huber+Suhner	2023-08-29	2025-02-28
Attenuator	6920.01.A	2020-05c	Huber+Suhner	2023-02-06	2024-08-06
Comb Generator	25 kHz – 30 MHz	26080	PTT	Chain control	
Thermo-, hygro- & barometer	T7510	2020-03	Comet System	2023-09-28	2024-09-28

Equipment	Type	Inventory no.	Manufacturer	Last calibration date	Calibration due date
Test stand: Radiated disturbances – 30 MHz to 1000 MHz					
SAC3					
Semi Anechoic Chamber	SAC 3 m	2019-00	Albatross Projects	2023-07-13	2026-07-13
EMI Test Receiver	ESW26	2021-07	Rohde & Schwarz	2022-09-23	2024-03-22
Bilog 30 MHz – 1 GHz / 300 W	CBL6111C	2005-38	Chase	2022-09-16	2024-03-16
Coax Cable	Sucoflex 104A	2015-16	Huber+Suhner	2023-08-17	2025-02-17
Cable Sucoflex 18 GHz	SF106PA	2011-61	Huber & Suhner	2023-08-17	2025-02-17
Coax Cable	Sucoflex 104A	2015-15	Huber+Suhner	2023-08-17	2026-08-17
Coaxial Cable	Sucoflex 106	2021-03A	Huber+Suhner	2023-08-16	2025-02-16
Comb Generator 10 MHz to 6 GHz	YRS03	2023-05	York	2023-02-01	2024-08-01
Dimmable notch filter 430 MHz	CR430R	2019-11	Montena EMC	2023-02-06	2024-08-06
Adjustable resonant cavity notch filter	900 MHz	2004-19	Montena EMC	2023-02-06	2024-08-06
Adjustable resonant cavity notch filter	900 MHz	2004-21	Montena EMC	2023-02-07	2024-08-07
Common Mode Absorption Device	FGZ 40X15E	1994-49F	Luethi	2021-05-20	2024-05-20
Common Mode Absorption Device	FGZ 40X15E	1994-49H	Luethi	2021-05-20	2024-05-20
Common Mode Absorption Device	FGZ 40X15E	1994-49I	Luethi	2021-05-20	2024-05-20
Common Mode Absorption Device	FGZ 40X15E	17908	Luethi	2021-05-20	2024-05-20
Common Mode Absorption Device	FGZ 40X15E	15652	Luethi	2021-05-20	2024-05-20
NCD Hdcon6102	Controller NCD	2017-02	Maturo	No Cal.	No Cal.
EMC hardened Camera	HDCam6E130	2019-12	Pontis	No Cal.	No Cal.
Antenna Mast	TAM4.5-E-Bus	2017-10	Maturo	No Cal.	No Cal.
Turn table	TT1.5SI-1t	2019-18	Maturo	No Cal.	No Cal.
Thermo – Hygro & Barometer	T7511	2014-35	Comet System	2023-09-28	2024-09-28

Equipment	Type	Inventory no.	Manufacturer	Last calibration date	Calibration due date
Test stand: Radiated disturbances – 1000 MHz to 6000 MHz					
SAC3					
Semi Anechoic Chamber	SAC 3 m	2019-00	Albatross Projects	2023-07-13	2026-07-13
EMI Test Receiver	ESW26	2021-07	Rohde & Schwarz	2022-09-23	2024-03-22
Horn Antenna 1 - 18 GHz / 200W	BBHA 9120 D	2022-07	Schwarzbeck	2023-09-08	2025-03-08
Half-wave Dipole	UHA 9125 D	2000-52	Schwarzbeck	2022-08-12	2025-08-12
Preamplifier	AFS42-00101800-25-S-42	2014-27	MITEQ	2023-02-09	2024-08-09
Coax Cable	Sucoflex 104A	2015-16	Huber+Suhner	2023-08-17	2025-02-17
Cable Sucoflex 18 GHz	SF106PA	2011-61	Huber & Suhner	2023-08-17	2025-02-17
Coax Cable	Sucoflex 104A	2015-15	Huber+Suhner	2023-08-17	2026-08-17
Coaxial Cable	Sucoflex 106	2021-03A	Huber+Suhner	2023-08-16	2025-02-16
Comb Generator 10 MHz to 6 GHz	YRS03	2023-05	York	2023-02-01	2024-08-01
Filter; DC - 900 MHz	NLP-1000+	2011-25D	Mini-Circuits	2023-02-07	2024-08-07
Common Mode Absorption Device	FGZ 40X15E	1994-49F	Luethi	2021-05-20	2024-05-20
Common Mode Absorption Device	FGZ 40X15E	1994-49H	Luethi	2021-05-20	2024-05-20
Common Mode Absorption Device	FGZ 40X15E	1994-49I	Luethi	2021-05-20	2024-05-20
Common Mode Absorption Device	FGZ 40X15E	17908	Luethi	2021-05-20	2024-05-20
Common Mode Absorption Device	FGZ 40X15E	15652	Luethi	2021-05-20	2024-05-20
NCD HDcon6102	Controller NCD	2017-02	Maturo	No Cal.	No Cal.
EMC hardened Camera	HDCam6E130	2019-12	Pontis	No Cal.	No Cal.
Antenna Mast	TAM4.5-E-Bus	2017-10	Maturo	No Cal.	No Cal.
Turntable 150 cm	TT1.5SI-1t	2019-18	Maturo	No Cal.	No Cal.
Half-wave Dipole	UHA 9125 D	2000-52	Schwarzbeck	2022-08-12	2025-08-12
Thermo - Hygro & Barometer	T7511	2014-35	Comet System	2023-09-28	2024-09-28

Equipment	Type	Inventory no.	Manufacturer	Last calibration date	Calibration due date
Test stand: Harmonic current emissions					
Harmonic and Flicker Analyzer (3-phase)	DPA 503N	2013-33	EM Test	2022-08-17	2024-02-17
3LNPE coupling 32 A	multi-socket outlet	2015-10	EEEPT AG	No Cal	No Cal
AC Source	61511	2011-50	Chroma	2022-02-08	2024-03-19

Equipment	Type	Inventory no.	Manufacturer	Last calibration date	Calibration due date
Test stand: Voltage changes, voltage fluctuations and flicker					
Harmonic & Flicker Cart 1					
Harmonic and Flicker Analyzer (3-phase)	DPA 503N	2013-33	EM Test	2022-08-17	2024-02-17
3LNPE coupling 32 A	multi-socket outlet	2015-10	EEEPT AG	No Cal	No Cal
AC Source	61511	2011-50	Chroma	2022-02-08	2024-03-19

Test stand: Electrostatic discharge (IEC 61000-4-2)					
Lab F1 Table					
ESD Generator	NSG 438A	2018-03	Teseq	2024-02-06	2025-08-06
Lab D1 Table					
Table 1.6 x 0.8 m	Horizontal Coupling Plate	HCP2	EEEPT AG	No Cal	No Cal
0.5 x 0.5 m plate	Vertical Coupling Plate	VCP2	EEEPT AG	No Cal	No Cal
Wire with resistor	Wire with resistor	2019-10D	EEEPT AG	2022-03-31	2024-03-15
Thermo-, hygro- & barometer	T7510	2020-03	Comet System	2023-09-28	2024-09-28

Equipment	Type	Inventory no.	Manufacturer	Last calibration date	Calibration due date
Test stand: Fast transients (Burst) (IEC 61000-4-4)					
Burst 2 Cart					
Ultra Compact Simulator	UCS 500N5	2015-14A	EM Test	2023-11-15	2025-05-15
Digital Storage Scope / 4 channel, 600 MHz	waveRunner WR64Xi	2006-64	LeCroy	For observation Only No Cal.	
Coaxial Cable	RG223	2019-139	Huber+Suhner	2023-08-29	2025-02-28
Coaxial Cable	RG223	2019-140	Huber+Suhner	2023-08-29	2025-02-28
Coaxial Cable	RG223	2019-141	Huber+Suhner	2023-08-29	2025-02-28

Equipment	Type	Inventory no.	Manufacturer	Last calibration date	Calibration due date
Test stand: Injected currents, 0.15 MHz to 80 MHz (IEC61000-4-6)					
Lab D2					
Measurement Chain	RF Immunity IEC 61000-4-6	2019-25	Eurofins	2023-01-13	2024-07-13
Signal Generator 5kHz...3GHz	SME03	25200	Rohde & Schwarz	2022-05-24	2024-05-31
Amplifier	250L	2003-66	Amplifier Research	2023-11-14	2025-05-14
RF Attenuator	50FH-006-300	2004-07	JFW	2021-10-13	2024-03-20
Adjustable attenuator 140 dB / 50 Ohm	DPU	8245	Rohde & Schwarz	2022-05-16	2024-03-20
Power Meter	437B	2001-17	Hewlett Packard	2020-01-07	2024-03-20
Power Sensor	8482A	174232	Hewlett Packard	2020-01-07	2024-03-20
Current Clamp	6741-1	7525	Poetschke	2021-05-27	2024-03-20
Power Sensor	8482A	2007-03	Hewlett Packard	2023-11-14	2025-05-14
Coaxial cable	RG223U	2019-123	Huber+Suhner	2023-08-29	2025-02-28
Cable	RG214U	2019-124	Huber+Suhner	2023-08-29	2025-02-28
Coaxial cable	RG223U	2019-125	Huber+Suhner	2023-08-30	2025-02-28
Coaxial cable	RG223U	2019-126	Huber+Suhner	2023-08-30	2025-02-28
Coaxial cable	RG223U	2019-151	Huber+Suhner	2023-08-30	2025-02-28
Coaxial cable	RG223U	2006-152	Huber+Suhner	2023-08-30	2025-02-28

Equipment	Type	Inventory no.	Manufacturer	Last calibration date	Calibration due date
Test stand: Injected currents, 0.15 MHz to 80 MHz (IEC61000-4-6)					
CDN Labo D2					
Coupling/Decoupling	801-M3	25947	Luethi	2023-11-08	2025-05-08
EM Clamp RF 150kHz-1GHz	EM 100	2019-20	Lüthi	2023-11-16	2025-05-16
EM Clamp RF 150kHz-1GHz	EM 100	2019-21	Lüthi	2022-05-19	2025-05-19
EM Clamp RF 150kHz-1GHz	EM 101	14833	Luethi	2022-05-19	2025-05-19
EM Clamp RF 150kHz-1GHz	EM 101	17919A	Luethi	2023-11-16	2025-05-16
Common Mode Absorption Device (CMAD)	FTC 101	17919B	Luethi	2021-05-20	2024-05-20
EM Clamp RF 150kHz-1GHz	EM 101	25645	Luethi	2023-11-16	2025-05-16

Test stand: Immunity to radiated fields (IEC 61000-4-3) /Radiated RF EM fields and Proximity fields From RF wireless com. equipment immunity					
SAC3					

Semi Anechoic Chamber	SAC 3 m	2019-00	Albatross Projects	2023-10-27	2026-10-27
Measurement Chain	Field Immunity IEC 61000-4-3	2019-22	Eurofins	2023-01-13	2024-07-13
Differential Amplifier	100W1000M1	2003-40	Amplifier Research	2023-11-14	2025-05-14
Amplifier	AP32SW150	2009-26	Prana	No Cal.	No Cal.
Broadband Amplifier	50S1G6	15.6622.01	Amplifier Research	2023-11-14	2025-05-14
RF Broadband Amplifier	50S1G6	166639	Amplifier Research	2023-11-14	2025-05-14
Richtkoppler	DC6080M2	2009-30	Amplifier Research	2023-11-09	2025-05-09
Dual Directional Coupler	100-CC-FFN-30	2005-93	Bird	2023-11-10	2025-05-10
Dual Directional Coupler; 4 GHz - 8 GHz / 20 dB / 500 W	3044-20	1990-20	Narda	2023-11-10	2025-05-10
Dual Directional Coupler	DC7205A	19.6632.07	Amplifier Research	2023-11-09	2025-05-09
EPM Series Power Meter	E4418B	2005-73	Agilent	2022-05-19	2024-05-31
Power probe; -50 to 30 dBm / 9kHz - 18 GHz	E9304A H19	2009-04	Agilent	2022-05-23	2024-05-31
E-Field Probe	EP 600	2023-13	Narda S.T.S	2023-05-15	2024-11-15
Fieldmeter; E-Field 100 KHz - 3 GHz	CA 43	2003-23	Chauvin Arnoux	No Cal., use for check	
Log periodic Antenna 80 MHz - 1.3 GHz / 1.5 kW	LPD-8130/A1	1996-08	ARA	Calibrated by the software, signal gen, FWD Power	
Horn Antenna 1 - 18 GHz / 200W	BBHA 9120 D	2022-07	Schwarzbeck	Calibrated by the software, signal gen, FWD Power	
Horn Antenna 1 - 18 GHz / 200W	BBHA 9120 D	2007-31	Schwarzbeck	Calibrated by the software, signal gen, FWD Power	
Horn Antenna	3115	1990-24	EMCO	Calibrated by the software, signal gen, FWD Power	
Cables	RG214U	2010-40	Huber+Suhner	2023-08-17	2025-02-17
Coax cable	RG214U	2010-41	Huber+Suhner	2023-08-17	2025-02-17
Coax cable	RG214U	2006-107	Huber+Suhner	2023-08-17	2025-02-17
Coaxial Cable	Sucoflex 106B	2019-104	Huber+Suhner	2023-08-17	2025-02-17
Coax cable	RG214U	2006-105	Huber+Suhner	2023-08-17	2025-02-17
Thermo - Hygro & Barometer	T7511	2014-35	Comet System	2023-09-28	2024-09-28
Software	RadiMation 2023.2.5	---	Raditeq	No Cal.	No Cal.

Equipment	Type	Inventory no.	Manufacturer	Last calibration date	Calibration due date
Test stand: Surges (IEC 61000-4-5)					
Surge 2 Cart					
Ultra Compact Simulator	UCS 500N5	2015-14A	EM Test	2023-11-15	2025-05-15
Digital Storage Scope / 4 channel, 600 MHz	waveRunner WR64Xi	2006-64	LeCroy	For observation Only No Cal.	

Equipment	Type	Inventory no.	Manufacturer	Last calibration date	Calibration due date
Test stand: Voltage dips and interruptions (IEC61000-4-11)					
Dips 1 Cart					
Power Fail Generator	PFS 500	1996-12	EM Test	2022-02-08	2025-05-31
Variac transformer	Variac	1989-02	montena	Calibrate with Multimeter	
Digital Storage Oscilloscope	TDS 2012	2005-28	Tektronix	2023-10-19	2025-10-19
Coaxial cable	RG223U	2006-140	Huber+Suhner	2023-08-29	2025-02-28
True RMS Multimeter	87 V	2009-06	Fluke	2023-10-19	2025-04-19
Differential Probe	SI-9110	2001-31	Testec	2022-12-20	2025-12-20

* Calibration interval extended, based on sufficient calibration data and experience of use (see IEC61000-4-11:2021 clause 8.2.5)