



EMC – TEST REPORT

Type / Model Name : GTC600C

Product Description : Thermal Camera

Applicant : Robert Bosch Power Tools GmbH

Address : Max-Lang-Straße 40-46

70771 Leinfelden-Echterdingen, GERMANY

Manufacturer : Robert Bosch Tool Corp.

Address : 1800 W. Central Rd.

Mount Prospect, Illinois, 60056, USA

Test Result according to the standards
listed in clause 1 test standards:

POSITIVE

Test Report No. : **80166755-01 Rev_1**

27. November 2023

Date of issue



Deutsche
Akkreditierungsstelle
D-PL-12030-01-04



Bundesnetzagentur

BNetzA-CAB-13/21-07

Contents

1	<u>TEST STANDARDS</u>	<u>3</u>
2	<u>SUMMARY</u>	<u>4</u>
2.1	GENERAL REMARKS	4
2.2	SUMMARY FOR ALL EMC TESTS	4
2.3	FINAL ASSESSMENT	4
3	<u>EQUIPMENT UNDER TEST</u>	<u>5</u>
3.1	PHOTO DOCUMENTATION OF THE EuT	5
3.2	INFORMATION PROVIDED BY THE CLIENT	7
3.3	SAMPLING	7
3.4	POWER SUPPLY SYSTEM UTILISED	7
3.5	HIGHEST INTERNAL FREQUENCY	7
3.6	SHORT DESCRIPTION OF THE EQUIPMENT UNDER TEST (EuT)	7
3.7	EuT OPERATION MODE	7
3.8	EuT CONFIGURATION	8
4	<u>TEST ENVIRONMENT</u>	<u>9</u>
4.1	ADDRESS OF THE TEST LABORATORY	9
4.2	ACCREDITATION AND RECOGNITION OF THE TEST LABORATORY	9
4.3	STATEMENT REGARDING THE USAGE OF LOGOS IN TEST REPORTS	9
4.4	ENVIRONMENTAL CONDITIONS	9
4.5	STATEMENT OF THE MEASUREMENT UNCERTAINTY	10
4.6	CONFORMITY DECISION RULE	10
4.7	MEASUREMENT PROTOCOL FOR FCC	11
5	<u>TEST CONDITIONS AND RESULTS</u>	<u>14</u>
5.1	RADIATED EMISSION < 1 GHz (ELECTRIC FIELD)	14
5.2	RADIATED EMISSION > 1 GHz (ELECTRIC FIELD)	25
6	<u>USED TEST EQUIPMENT AND ACCESSORIES</u>	<u>33</u>
7	<u>DETAILED MEASUREMENT UNCERTAINTY</u>	<u>34</u>

1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules and Regulations Part 15 Subpart B - Unintentional Radiators (October, 2022)

Part 15, Subpart B, Section 15.109

Radiated emission, general requirements

☐ Class A device

☒ Class B device

ANSI C63.4: 2014

Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

CISPR 16-4-2: 2011 + A1: 2014
EN 55016-4-2: 2011

Uncertainty in EMC measurement

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

2 SUMMARY

2.1 General remarks

Note: Insert informative statements in User Manual.

The WLAN function was disabled during the tests.

According to the information of the manufacturer 10.8V battery packs are same as 12V battery packs.

2.2 Summary for all EMC tests

Type of test	Test result
Emission:	
A4 Conducted emission (AC mains power / DC power)	Not Applicable*
A5 Radiated emission (< 1 GHz)	Fulfilled
SER 3 Radiated emission (> 1 GHz)	Fulfilled

*Battery powered device

2.3 Final assessment

The equipment under test **fulfills** the EMC requirements cited in clause 1 test standards.

Date of receipt of test sample : acc. to storage records

Testing commenced on : 08. May 2023

Testing concluded on : 23. November 2023

Checked by:

Tested by:

3 EQUIPMENT UNDER TEST

3.1 Photo documentation of the EuT



EUT (Front)



EUT (Back)



EUT (Left)



EUT (Right)



Battery (2.0 Ah)



Battery (3.0 Ah)



Battery (6.0 Ah)



USB A to USB C



Mobile Phone



Type label

3.2 Information provided by the Client

Please note, we do not take any responsibility for information provided by the client or his representative which may have an influence on the validity of the test results.

Documents provided by the client: Test plan: GTC600C-Ratio_EMC_TestPlan_29032023

3.3 Sampling

The customer is responsible for the choice of sample. Sample configuration, start-up and operation is carried out by the customer or according to his/her instructions.

3.4 Power supply system utilised

Supply voltage : 12 V battery powered

3.5 Highest internal frequency

Highest internal frequency : 2.4 GHz

3.6 Short description of the Equipment under Test (EuT)

The EUT is a thermal camera for contactless temperature measurement of a surface, not designed for human or medical applications.

3.7 EuT operation mode

The equipment under test was operated during the measurement under the following conditions:

- Operation mode 1: see note 1

- Operation mode 2: see note 2

Note 1:

- The Device is measuring continuously
- Picture in Picture mode is selected (visual camera image is also visible)
- Temperature value of center spot is shown on the Display
- The USB-cable is not plugged in
- Audio playback via speaker

Note 2:

- The Device is switched on
- The USB-cable is plugged in
- The PC is continuously writing test data to the GTC600C internal memory and reading the same back with H2testw SW.

3.8 EuT configuration

(The CDF filled by the applicant can be viewed at the test laboratory.)

The following peripheral devices and interface cables were connected during the measurements:

- Battery pack	Model: BAT414 2.0 Ah
- Battery pack	Model: GBA12V30 3.0Ah
- Battery pack	Model: GBA12V60 10.8V/12V 6.0 Ah
- USB cable	Model: 1 600 A01 L6H

Port	Cable	Screening	Transmission	Status	Length
1	USB line	shielded	adigital	active	0.6 m

Modifications during the EMC test:

None

4 TEST ENVIRONMENT

4.1 Address of the test laboratory

**CSA Group Bayern GmbH
Ohmstrasse 1-4
94342 STRASSKIRCHEN
GERMANY**

4.2 Accreditation and Recognition of the test laboratory

Within the framework of the Mutual Recognition Agreement (MRA) between the European Community and the USA the EMC test laboratory listed above has been approved as a Conformity Assessment Body (CAB) designated by the EU member states through the conclusion of the MRA on the basis of Article 133 of the treaty

The site is accredited/registered by

- the German accreditation body DAkkS-Registration No.: D-PL-12030-01-04
- the Federal Communications Commission (FCC)
 - o Identifier: DE0011
 - o Test Firm Number: 963892
- the Bundesnetzagentur (German Federal Network Agency) as Conformity assessment body (CAB) Registration No: BnetzA-CAB-13/21-07

4.3 Statement regarding the usage of logos in test reports

The accreditation and notification body logos displayed in this test report are only valid for standards listed in the accreditation or notification scope of CSA Group Bayern GmbH.

4.4 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature: 15-35 °C

Humidity: 30-60 %

Atmospheric pressure: 86-106 kPa

The environmental conditions are recorded by data logger in the test locations.
All data loggers used are regularly calibrated and verified.

4.5 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. It is noted that the expanded measurement uncertainty corresponds to the measurement results from the standard measurement uncertainty multiplied by the coverage factor $k = 2$. The true value is located in the corresponding interval with a probability of 95 %. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16-4-2 / 2011 + A1 / 2014 „Uncertainties, statistics and limit modelling – Uncertainty in EMC measurements“ and is documented in the quality system acc. to DIN EN ISO/IEC 17025. For all measurements shown in this report, the measurement uncertainty of the test laboratory, CSA Group Bayern GmbH, is below the measurement uncertainty as defined by CISPR. Therefore, no special measures must be taken into consideration with regard to the limits according to CISPR. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

4.6 Conformity Decision Rule

Field of EMC:

The field of EMC includes testing of EMF / EMCU, EMC in general, telecommunications, motor vehicles, maritime and aviation EMC. With respect to measurement uncertainty and decision rules, EMC is divided into the sub-sections emission and immunity. For standards where the measurement uncertainty is not taken into account, decisions on the measurements documented in this report are based on "simple acceptance" (acceptance limit = specification limit) in accordance with ILAC G8 and IEC Guide 115 in their respective editions valid at the time of issuing this report. In the case of standards where measurement uncertainty has been taken into account, these standards are used in decisions made regarding measurements documented in this report.

All equipment needed to determine results were calibrated at the time of their use and were therefore within the specified measurement uncertainty.

Sub-section Emission:

In accordance with the basic standard CISPR 16-4-2 in the version valid at the time of issuing this report, the measurement uncertainty was not taken into account in the conformity assessment as the measurement uncertainty of the laboratory Ulab is less than UCISPR.

Sub-section Immunity:

The decision rule of "simple acceptance" (acceptance limit = specification limit) is adopted.

4.7 Measurement protocol for FCC

4.7.1 General information

4.7.1.1 Test methodology

In compliance with 47 CFR Part 15 Subpart A Section 15.38 testing for FCC compliance may be done following the ANSI C63.4 procedures and using the CISPR 22 Limits.

4.7.1.2 Justification

The Equipment under Test (EuT) is configured in a typical user arrangement in accordance with the manufacturer's instructions. A cable is connected to each available port and either terminated with a peripheral using the appropriate impedance characteristic or left unterminated. Where appropriate, cables are manually manipulated with respect to each other thus obtaining maximum disturbances from the unit.

4.7.2 Details of test procedures

4.7.2.1 General standard information

The test methods used comply with ANSI C63.4 "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz."

4.7.3 Conducted emission

4.7.3.1 Description of measurement

The final level, expressed in dBmV, is arrived at by taking the reading directly from the EMI receiver. This level is compared directly to the FCC Limit or to the CISPR limit.

To convert between dBmV and mV, the following conversions apply:

$$\text{dBmV} = 20(\log \text{mV})$$

$$\text{mV} = \text{Inverse log}(\text{dBmV}/20)$$

Conducted emissions on the 50 Hz and/or 60 Hz power interface of the EuT are measured in the frequency range of 150 kHz to 30 MHz. The measurements are performed using a receiver, which has CISPR characteristic bandwidth and quasi-peak detection and a Line Impedance Stabilization Network (LISN) with 50 W / 50 mH (CISPR 16) characteristics. The receiver is protected by means of an impedance matched pulse limiter connected directly to the RF input. Table top equipment is placed on a non-conducting table 80 centimetres above the floor and is positioned 40 centimetres from the vertical ground plane (wall) of the screen room. If the minimum limit margin appears to be less than 20 dB with a peak mode measurement, the emission are remeasured using a tuned receiver with quasi-peak and average detection and recorded on the data sheets.

4.7.4 Radiated emission (electrical field 30 MHz - 1 GHz)

4.7.4.1 Description of measurement

Spurious emission from the EuT is measured in the frequency range of 30 MHz to 1000 MHz using a tuned receiver and appropriate broadband linearly polarized antennas. Measurements between 30 MHz and 1000 MHz are made with 120 kHz/6 dB bandwidth and quasi-peak detection. Table top equipment is placed on a 1.0 X 1.5 metre non-conducting table 80 centimetres above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. The setup of the equipment under test is established in accordance with ANSI C63.4. The interface cables that are closer than 40 centimetres to the ground plane are bundled in the center in a serpentine fashion so that they are at least 40 centimetres from the ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screened room located outside the test area.

The antenna is positioned 3, 10 or 30 metres horizontally from the EuT. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 metres, measurement scans are made with both horizontal and vertical antenna polarization planes and the EuT is rotated 360 degrees.

The final level, expressed in dBµV/m, is arrived at by taking the reading from the EMI receiver (Level dBµV) and adding the correction factors and cable loss factor (Factor dB) to it. This is done automatically in the EMI receiver where the correction factors are stored. The FCC or CISPR limit is subtracted from this result in order to provide the limit margins listed in the measurement protocols.

The resolution bandwidth during the measurement is as follows:

30 MHz – 1000 MHz: ResBW: 120 kHz

Example:

Frequency (MHz)	Reading level (dBµV)	+	Correction Factor* (dB/m)	=	Level (dBµV/m)	-	CISPR Limit (dBµV/m)	=	Delta (dB)
719.0	75.0	+	32.6	=	107.6	-	110.0	=	-2.4

*Correction Factor = Antenna Factor + Cable Attenuation = 30 dB/m + 2.6 dB = 32.6 dB/m

4.7.4.2 Measurement Procedure

The test setup is prepared with the EUT at the desired EUT-Antenna separation.

The turntable is rotated 360° until the test receiver displays the maximum level at the observed frequency.

The antenna height is then adjusted from 1 m to 4 m maximizing the measured value.

The turntable is re-adjusted to re-affirm the maximum emission value which is then recorded.

This procedure is repeated for all frequencies of interest.

4.7.5 Radiated emission (electrical field 1 GHz - 30 GHz)

4.7.5.1 Description of measurement

Radiated emission from the EuT are measured in the frequency range of 1 GHz to the maximum frequency as specified in 47 CFR Part 15 Subpart A section 15.33, using a tuned receiver (Spectrum Analyser) and appropriate linearly polarized antennas. Table top equipment is placed on a 0.65 X 1.5 metre non-conducting table 80 centimetres above the ground plane. The turntable must be fully covered with the appropriate absorber (Type VHP-12).

Floor standing equipment is placed directly on the turntable/ground plane. The setup of the equipment under test is established in accordance with ANSI C63.4.

The interface cables that are closer than 40 centimetres to the ground plane are bundled in the centre in a serpentine fashion so they are at least 40 centimetres from the ground plane. Cables to simulators/testers (if used in this test) are routed through the centre of the table and to a screened room located outside the test area. The antenna is positioned 3 metres horizontally from the EuT.

Measurements are made in both the horizontal and vertical polarization planes in a fully anechoic room using a spectrum analyser set to a peak detector function and a resolution and video bandwidth of 1 MHz. All tests are performed at a test distance of 3 metres. Hand-held or body-worn devices are rotated around three orthogonal axes in order to determine the position, angle and configuration having the maximum emission. The cables and equipment are placed and moved within the range of their likely positioning to find the maximum emission. These conditions will then be used for the final measurements. The antenna height is then adjusted from 1 m to 4 m maximizing the measured value. The antenna is mounted to a boresight axis so the antenna centre always points to the EuT.

Other devices are placed according to their general purpose. The turntable is rotated 360° until the spectrum analyser displays the maximum level at the observed frequency. The antenna height is then adjusted from 1 m to 4 m maximizing the measured value. The turntable is re-adjusted to re-affirm the maximum emission value which is then recorded. This procedure is repeated for all frequencies of interest.

When the EuT is larger than the beamwidth of the measuring antenna it will be moved over the surface for the four sides of the equipment. Where appropriate, the test distance may be reduced in order to demonstrate that emissions are under the limits at the specified test distance.

5 TEST CONDITIONS AND RESULTS

5.1 Radiated emission < 1 GHz (electric field)

For test instruments and accessories used see section 6 Part A 5.

5.1.1 Description of the test location

Test location: Open Area Test Site OATS1

Test distance: 10 metres

5.1.2 Photo documentation of the test setup

Operation mode 1



Operation mode 2



5.1.3 Test result

Frequency range: 30 MHz - 1000 MHz

Min. limit margin >5 dB

The requirements are **FULFILLED**.

Remarks: For detailed results, please see the following page(s).

For description of the measurement see 4.7.4.

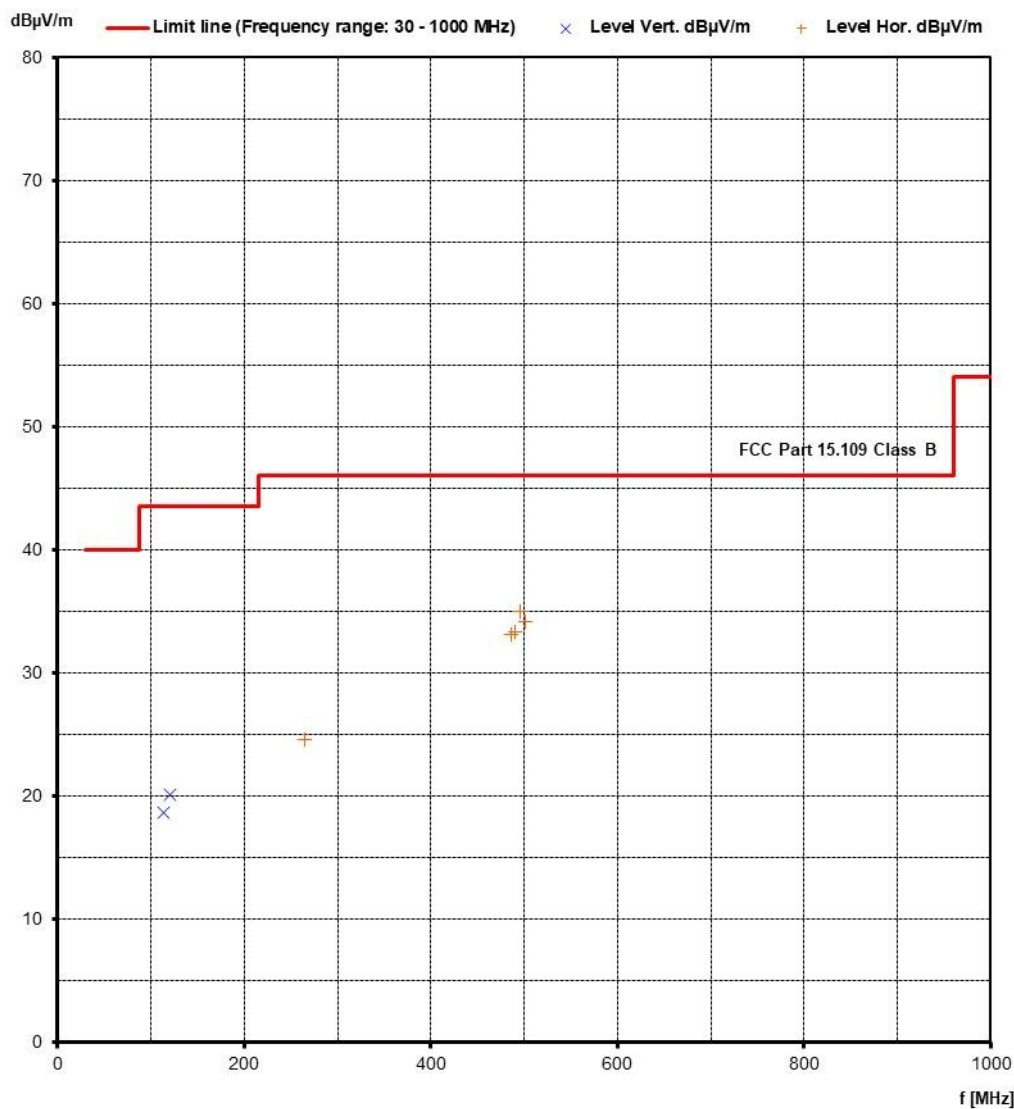
The test was performed with battery pack BAT414 2.0 Ah, GBA12V30 3.0 Ah

and GBA12V60 10.8V/12V 6.0 Ah.

5.1.4 Test protocol

Operation mode: Operation mode 1
Remarks: BAT414 2.0 Ah
Date: 14.05.2023
Tested by: Michael Hackl

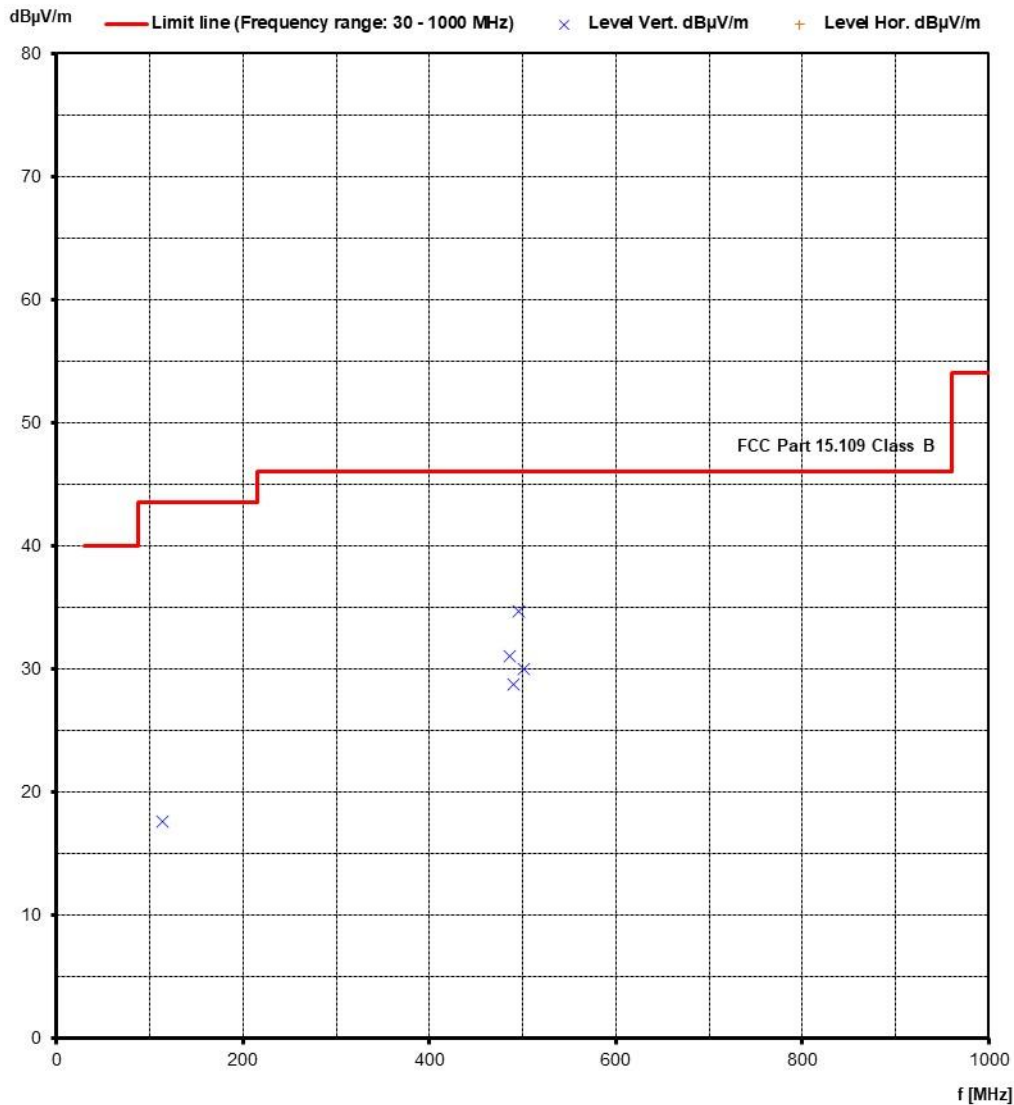
Result: passed



Frequency (MHz)	Reading Vert. (dBµV)	Reading Hor. (dBµV)	Correct. Vert. (dB)	Correct. Hor. (dB)	Level Vert. (dBµV/m)	Level Hor. (dBµV/m)	Limit (dBµV/m)	Dlimit (dB)
113.40	2.0		16.6		18.6		43.5	-24.9
120.60	2.8		17.4		20.2		43.5	-23.3
265.10		5.2		19.3		24.5	46.0	-21.5
486.10		7.4		25.8		33.2	46.0	-12.8
491.00		7.5		25.9		33.4	46.0	-12.6
496.30		9.0		26.0		35.0	46.0	-11.0
501.90		8.0		26.1		34.1	46.0	-11.9

Operation mode: Operation mode 1
Remarks: GBA12V30 3.0 Ah
Date: 14.05.2023
Tested by: Michael Hackl

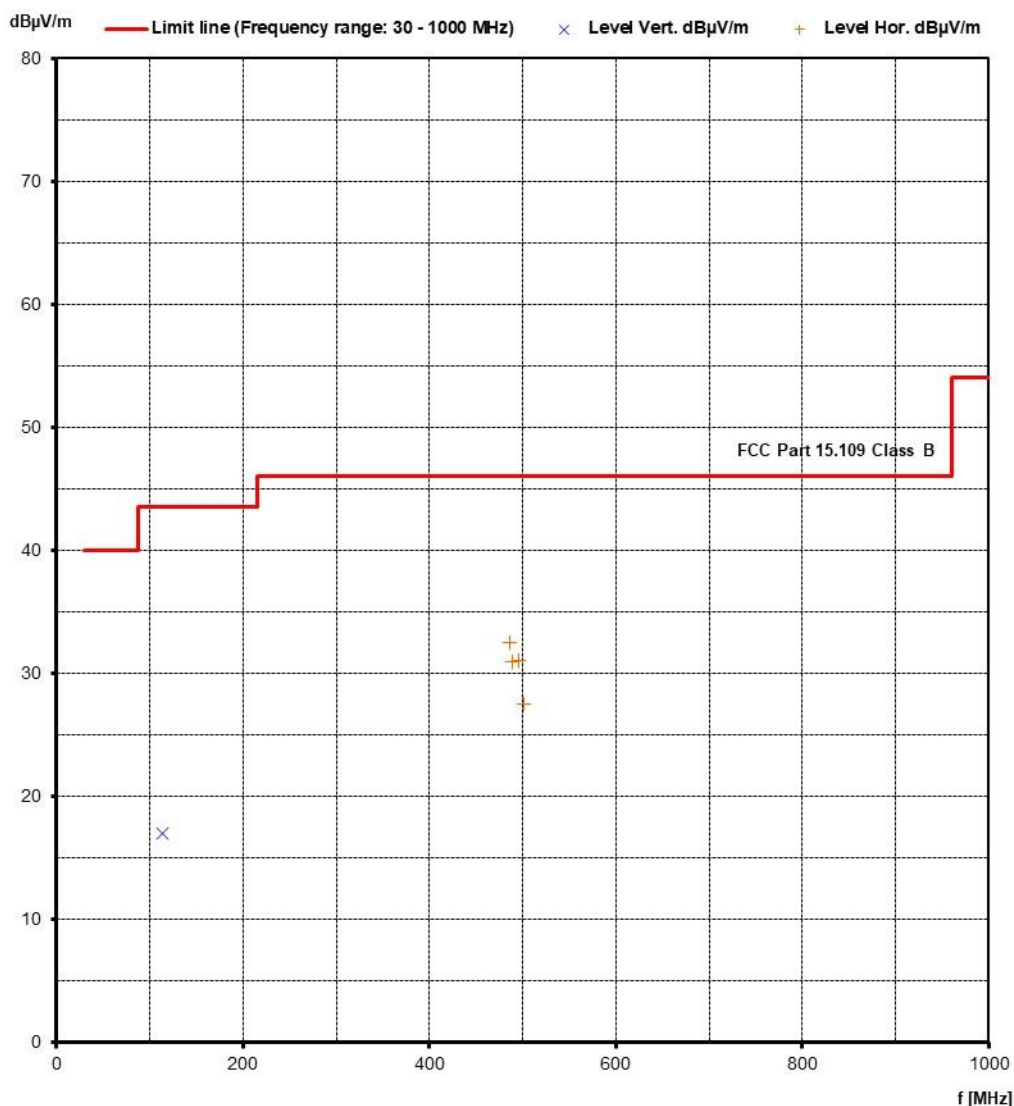
Result: passed



Frequency (MHz)	Reading Vert. (dBµV)	Reading Hor. (dBµV)	Correct. Vert. (dB)	Correct. Hor. (dB)	Level Vert. (dBµV/m)	Level Hor. (dBµV/m)	Limit (dBµV/m)	Dlimit (dB)
113.40	1.0		16.6		17.6		43.5	-25.9
486.10	5.6		25.5		31.1		46.0	-14.9
491.00	3.2		25.6		28.8		46.0	-17.2
496.30	9.0		25.7		34.7		46.0	-11.3
501.90	4.2		25.8		30.0		46.0	-16.0

Operation mode: Operation mode 1
Remarks: GBA12V60 10.8V/12V 6.0Ah
Date: 14.05.2023
Tested by: Michael Hackl

Result: passed

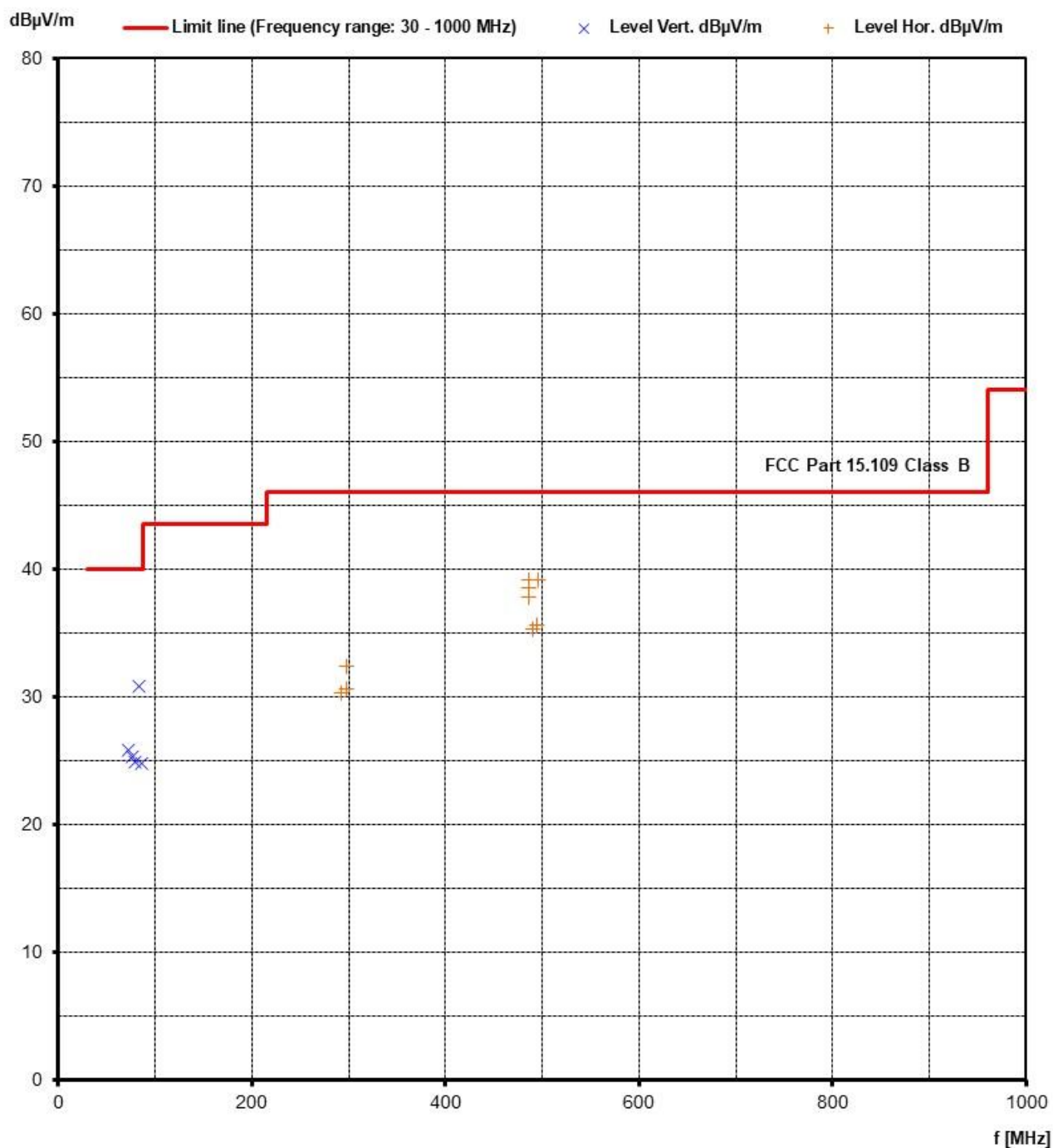


Frequency (MHz)	Reading Vert. (dBµV)	Reading Hor. (dBµV)	Correct. Vert. (dB)	Correct. Hor. (dB)	Level Vert. (dBµV/m)	Level Hor. (dBµV/m)	Limit (dBµV/m)	Dlimit (dB)
113.40	0.4		16.6		17.0		43.5	-26.5
486.10		6.7		25.8		32.5	46.0	-13.5
489.60		5.1		25.8		30.9	46.0	-15.1
496.30		5.0		26.0		31.0	46.0	-15.0
501.60		1.4		26.1		27.5	46.0	-18.5

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

Operation mode: Operation mode 2
Remarks: BAT414 2.0 Ah
Date: 14.05.2023
Tested by: Michael Hackl

Result: passed



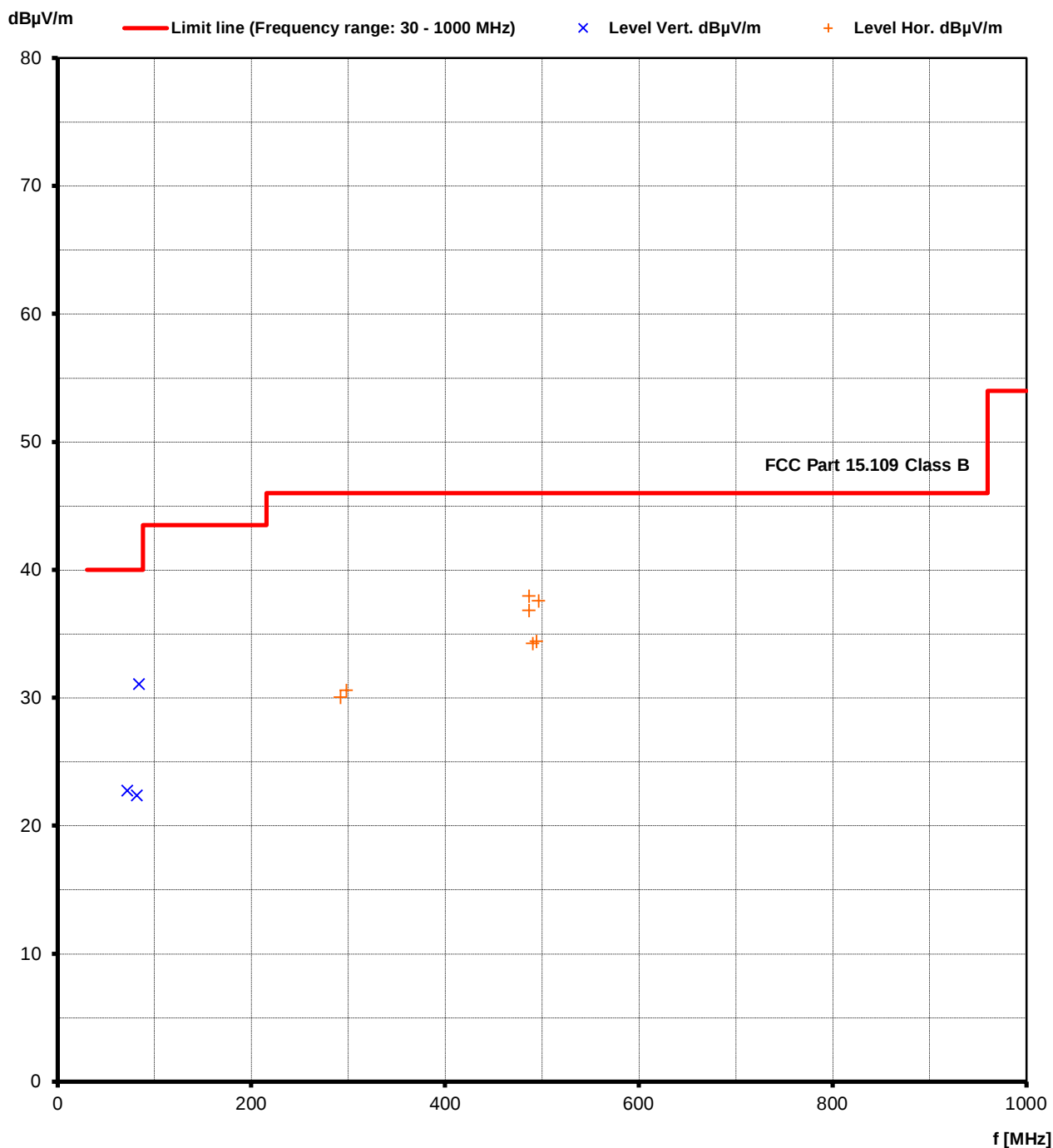
The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

Frequency (MHz)	Reading Vert. (dBµV)	Reading Hor. (dBµV)	Correct. Vert. (dB)	Correct. Hor. (dB)	Level Vert. (dBµV/m)	Level Hor. (dBµV/m)	Limit (dBµV/m)	Dlimit (dB)
72.00	10.4		15.5		25.9		40.0	-14.1
77.20	10.7		14.6		25.3		40.0	-14.7
79.60	10.6		14.3		24.9		40.0	-15.1
84.00	17.0		13.8		30.8		40.0	-9.2
86.80	11.3		13.5		24.8		40.0	-15.2
486.10		13.4		25.8		39.2	46.0	-6.8
486.60		12.8		25.8		38.6	46.0	-7.4
486.90		12.0		25.8		37.8	46.0	-8.2
490.20		9.5		25.9		35.4	46.0	-10.6
494.10		9.7		26.0		35.7	46.0	-10.3
496.30		13.1		26.0		39.1	46.0	-6.9
291.80		9.9		20.5		30.4	46.0	-15.6
297.40		9.9		20.7		30.6	46.0	-15.4
297.80		11.7		20.7		32.4	46.0	-13.6

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

Operation mode: Operation mode 2
 Remarks: GBA12V30 3.0 Ah
 Date: 14.05.2023
 Tested by: Michael Hackl

Result: passed



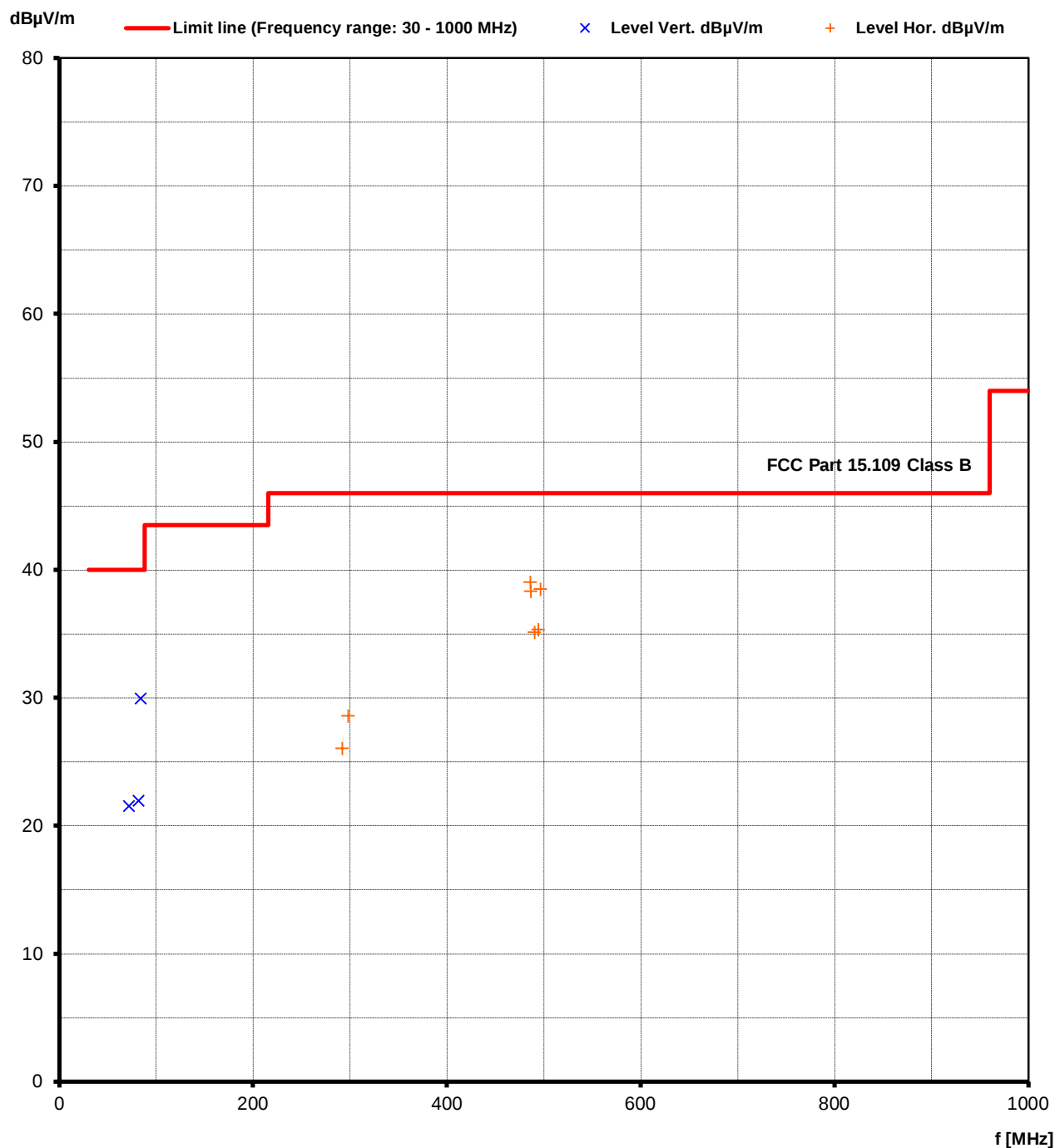
The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

Frequency (MHz)	Reading Vert. (dBµV)	Reading Hor. (dBµV)	Correct. Vert. (dB)	Correct. Hor. (dB)	Level Vert. (dBµV/m)	Level Hor. (dBµV/m)	Limit (dBµV/m)	Dlimit (dB)
72.00	7.3		15.5		22.8		40.0	-17.2
82.00	8.4		14.0		22.4		40.0	-17.6
84.00	17.3		13.8		31.1		40.0	-8.9
291.80		9.6		20.5		30.1	46.0	-15.9
297.70		9.9		20.7		30.6	46.0	-15.4
486.60		12.2		25.8		38.0	46.0	-8.0
486.60		11.1		25.8		36.9	46.0	-9.1
490.20		8.4		25.9		34.3	46.0	-11.7
494.10		8.5		26.0		34.5	46.0	-11.5
496.30		11.6		26.0		37.6	46.0	-8.4

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

Operation mode: Operation mode 2
Remarks: GBA12V60 10.8V/12V 6.0Ah
Date: 14.05.2023
Tested by: Michael Hackl

Result: passed



The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

Frequency (MHz)	Reading Vert. (dBµV)	Reading Hor. (dBµV)	Correct. Vert. (dB)	Correct. Hor. (dB)	Level Vert. (dBµV/m)	Level Hor. (dBµV/m)	Limit (dBµV/m)	Dlimit (dB)
72.00	6.1		15.5		21.6		40.0	-18.4
82.00	8.0		14.0		22.0		40.0	-18.0
84.00	16.2		13.8		30.0		40.0	-10.0
291.70		5.6		20.5		26.1	46.0	-19.9
297.80		7.9		20.7		28.6	46.0	-17.4
486.10		13.3		25.8		39.1	46.0	-6.9
486.60		12.6		25.8		38.4	46.0	-7.6
490.20		9.3		25.9		35.2	46.0	-10.8
494.10		9.4		26.0		35.4	46.0	-10.6
496.40		12.5		26.0		38.5	46.0	-7.5

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

5.2 Radiated emission > 1 GHz (electric field)

For test instruments and accessories used see section 6 Part SER 3.

5.2.1 Description of the test location

Test location: Anechoic Chamber A1

Test distance: 3 metres

ETS Lindgren 3117:

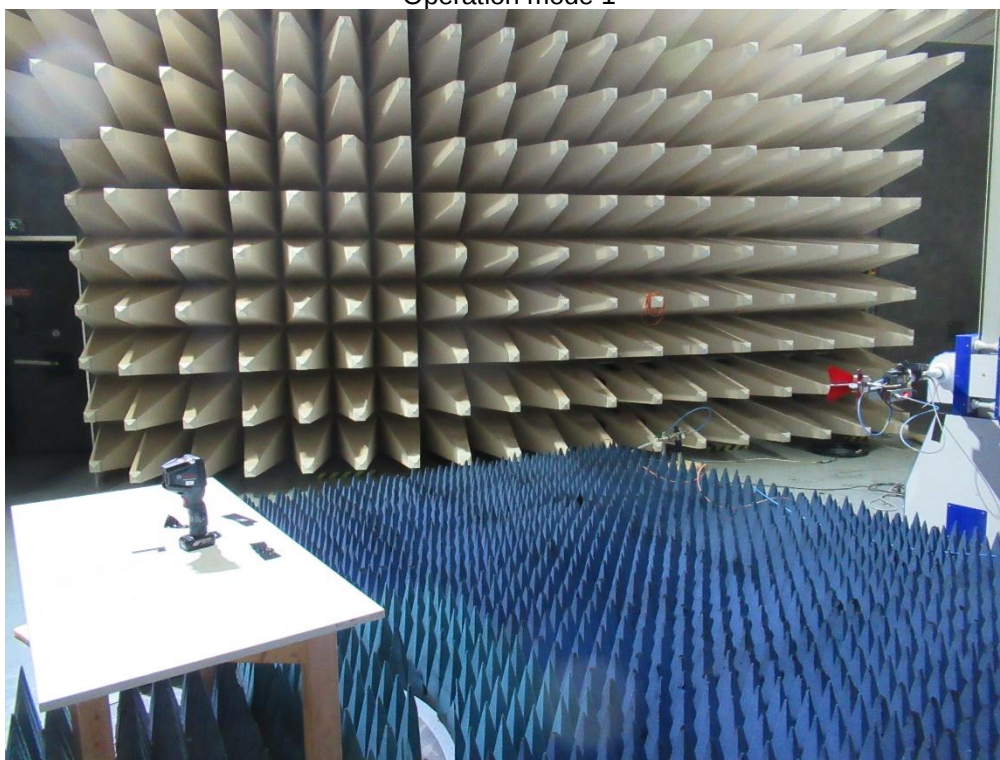
Dimension of the line tangent to the EUT according to CISPR 16-2-3:2010

Note: The Q 3dB min values were given by the antenna manufacturer

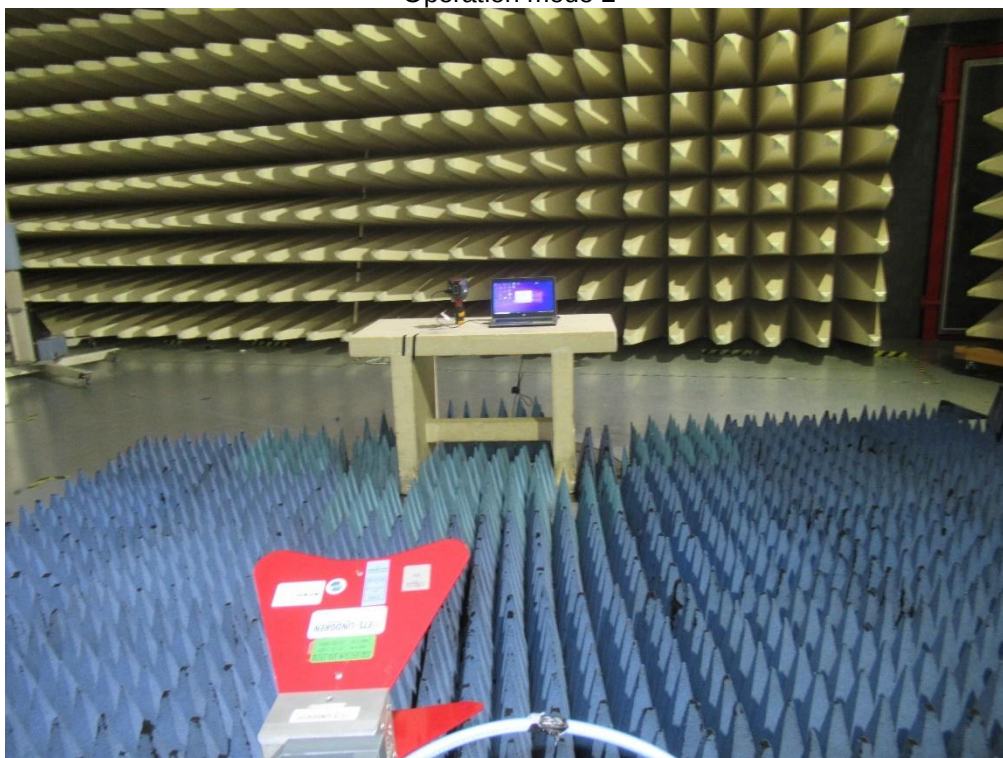
Frequency GHz	Q 3 dB min	Measurement distance	w min
1	88	3 m	5.79 m
2	67	3 m	3.97 m
4	69	3 m	4.12 m
6	53	3 m	2.99 m
10	40	3 m	2.18 m
18	36	3 m	1.95 m

5.2.2 Photo documentation of the test setup

Operation mode 1



Operation mode 2



5.2.3 Test result

Frequency range: 1000 MHz - 18000 MHz

Min. limit margin >5 dB

The requirements are **FULFILLED**.

Remarks: For detailed results, please see the following page(s).

For description of the measurement see 4.7.5.

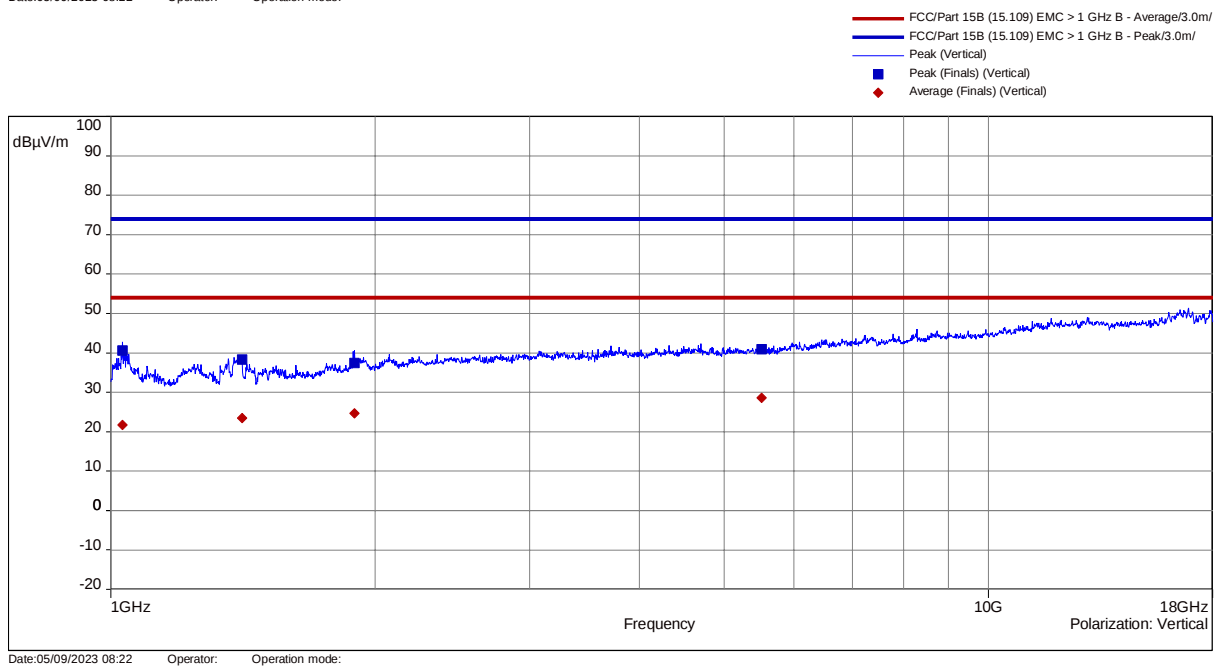
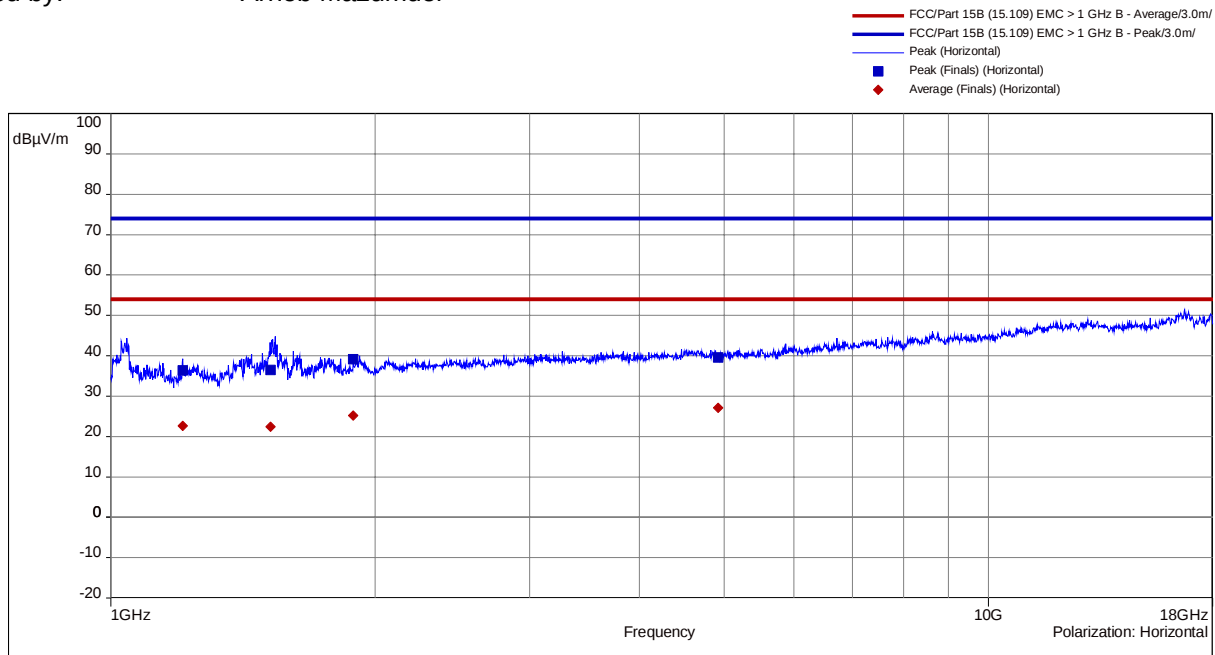
The test was performed with battery pack BAT414 2.0 Ah, GBA12V30 3.0 Ah

and GBA12V60 10.8V/12V 6.0 Ah. A 2.4 GHz notch filter was used.

5.2.4 Test protocol

Operation mode: Operation mode 1
Remarks: BAT414 2.0 Ah
Date: 09.05.2023
Tested by: Arnob Mazumder

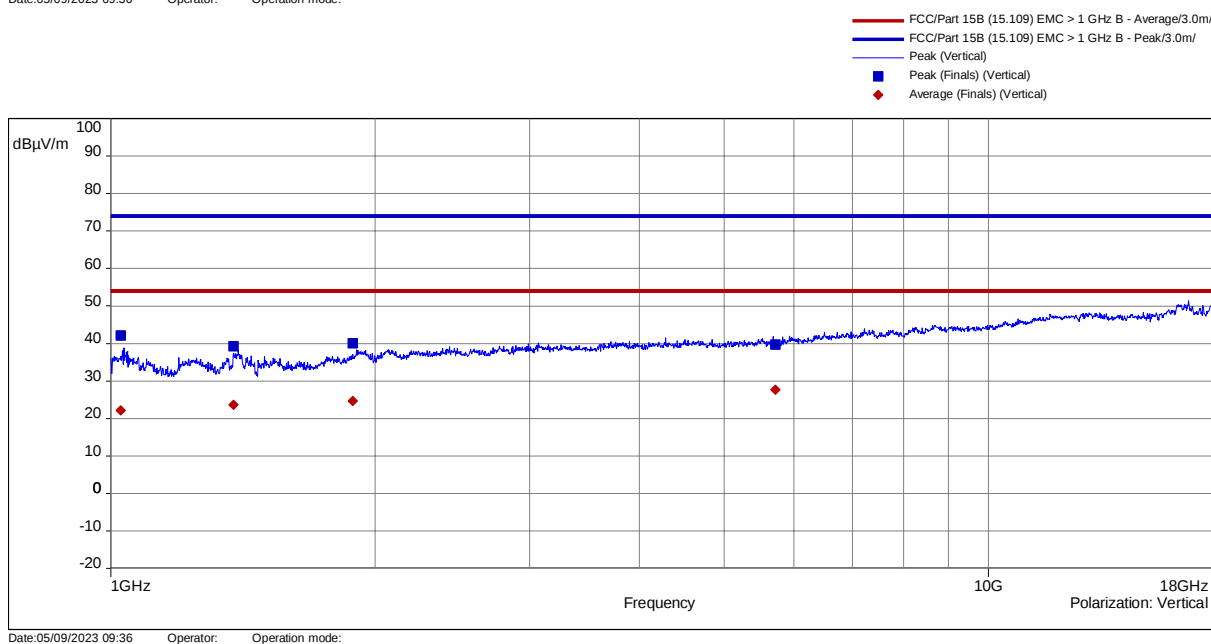
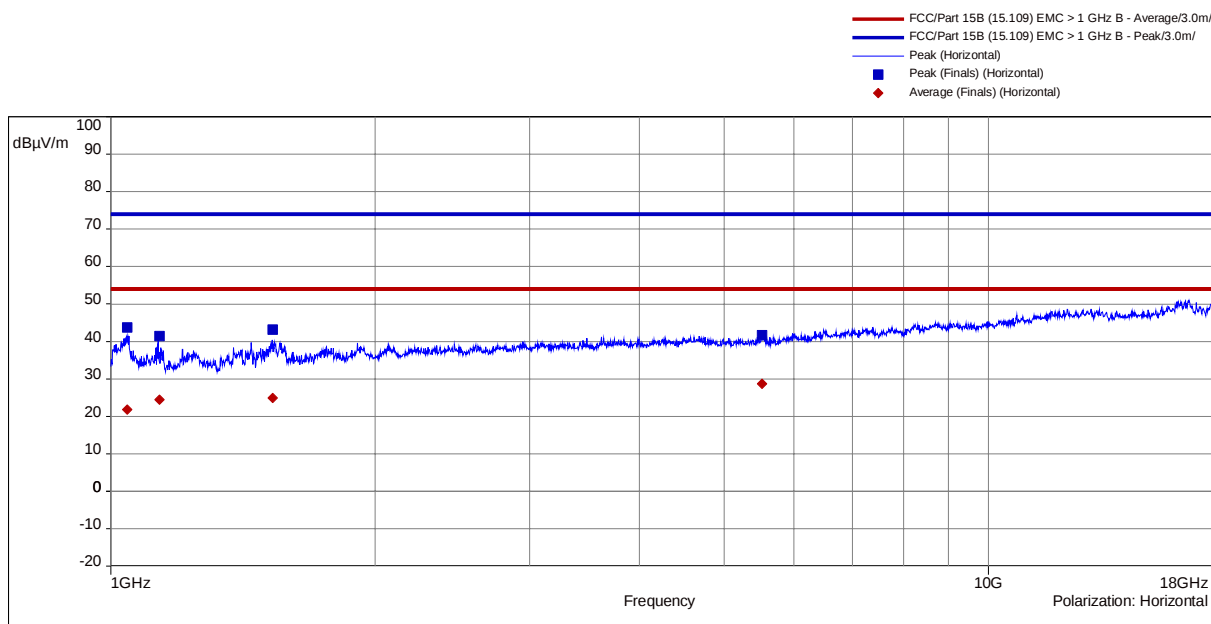
Result: passed



Frequency MHz	SR	Peak dBμV/m	Margin dB	Limit Peak dBμV/m	Average dBμV/m	Margin dB	limit AV dBμV/m	Angle °	Hight m	Polarization	RBW Hz	corr dB
1030.5	1	40.65	-33.35	74.00	21.70	-32.30	54.00	5.40	1.09	Vertical	1M	-13.37
1410.5	1	38.29	-35.71	74.00	23.45	-30.55	54.00	0.00	1.15	Vertical	1M	-11.80
1895	1	37.44	-36.56	74.00	24.72	-29.28	54.00	176.20	3.22	Vertical	1M	-8.78
1895.5	1	40.95	-33.05	74.00	28.59	-25.41	54.00	350.40	3.70	Vertical	1M	-4.61
5514	2	36.38	-37.62	74.00	22.65	-31.35	54.00	328.70	1.75	Horizontal	1M	-11.56
1207	2	36.45	-37.55	74.00	22.42	-31.58	54.00	316.10	1.59	Horizontal	1M	-11.92
1519	2	39.19	-34.81	74.00	25.17	-28.83	54.00	271.50	1.73	Horizontal	1M	-8.84
1888.5	2	39.64	-34.36	74.00	27.07	-26.93	54.00	224.30	2.13	Horizontal	1M	-5.30
4919	1	40.65	-33.35	74.00	21.70	-32.30	54.00	5.40	1.09	Vertical	1M	-13.37

Operation mode: Operation mode 1
Remarks: GBA12V30 3.0 Ah
Date: 09.05.2023
Tested by: Arnob Mazumder

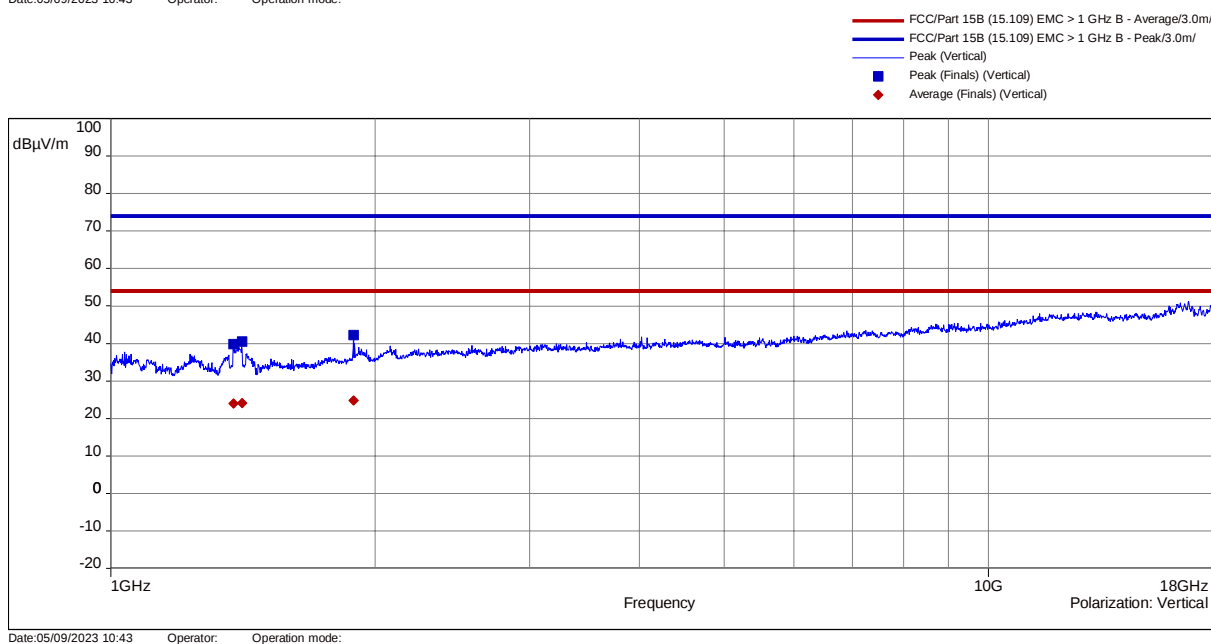
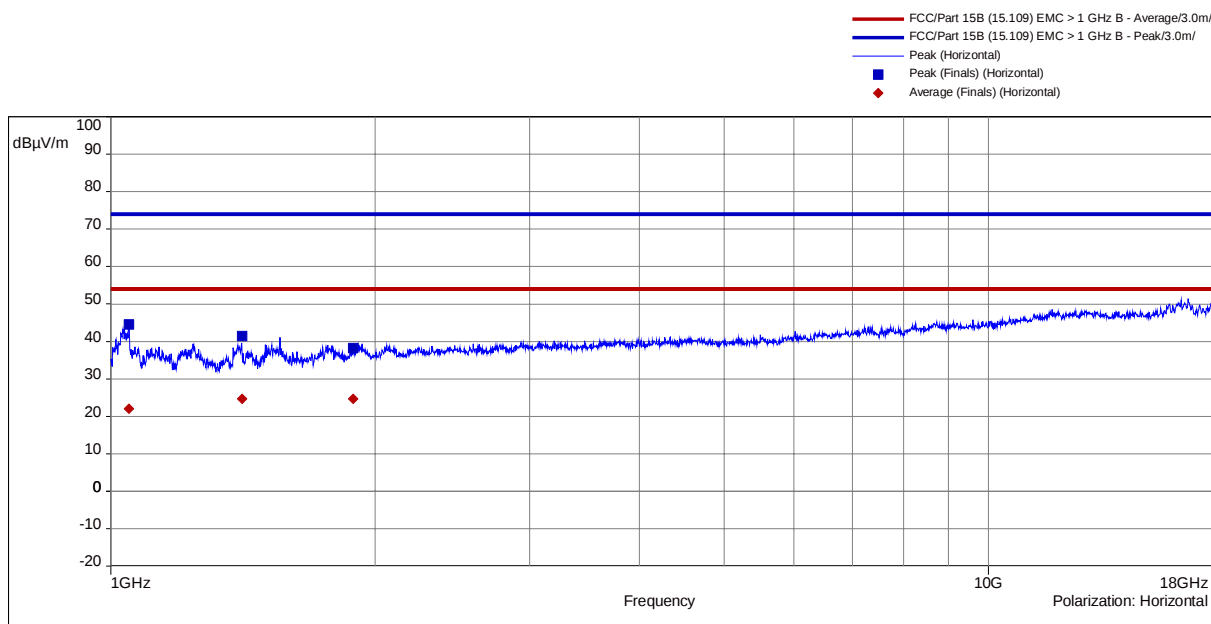
Result: passed



Frequency	SR	Peak	Margin	Limit Peak	Average	Margin	limit AV	Angle	Hight	Polarization	RBW	corr
MHz		dBμV/m	dB	dBμV/m	dBμV/m	dB	dBμV/m	°	m		Hz	dB
1027	1	42.09	-31.91	74.00	22.20	-31.80	54.00	352.90	1.06	Vertical	1M	-13.30
1379.5	1	39.30	-34.70	74.00	23.69	-30.31	54.00	2.80	1.09	Vertical	1M	-11.49
1886.5	1	40.10	-33.90	74.00	24.73	-29.27	54.00	355.10	2.16	Vertical	1M	-8.84
5714	1	39.74	-34.26	74.00	27.61	-26.39	54.00	154.30	2.47	Vertical	1M	-4.74
1043.5	2	43.74	-30.26	74.00	21.83	-32.17	54.00	63.80	2.25	Horizontal	1M	-13.30
1136	2	41.44	-32.56	74.00	24.42	-29.58	54.00	96.60	2.65	Horizontal	1M	-12.30
1529	2	43.19	-30.81	74.00	24.86	-29.14	54.00	147.10	2.33	Horizontal	1M	-11.90
5518	2	41.67	-32.33	74.00	28.71	-25.29	54.00	264.10	1.46	Horizontal	1M	-4.60

Operation mode: Operation mode 1
 Remarks: GBA12V60 10.8V/12V 6.0Ah
 Date: 09.05.2023
 Tested by: Arnob Mazumder

Result: passed

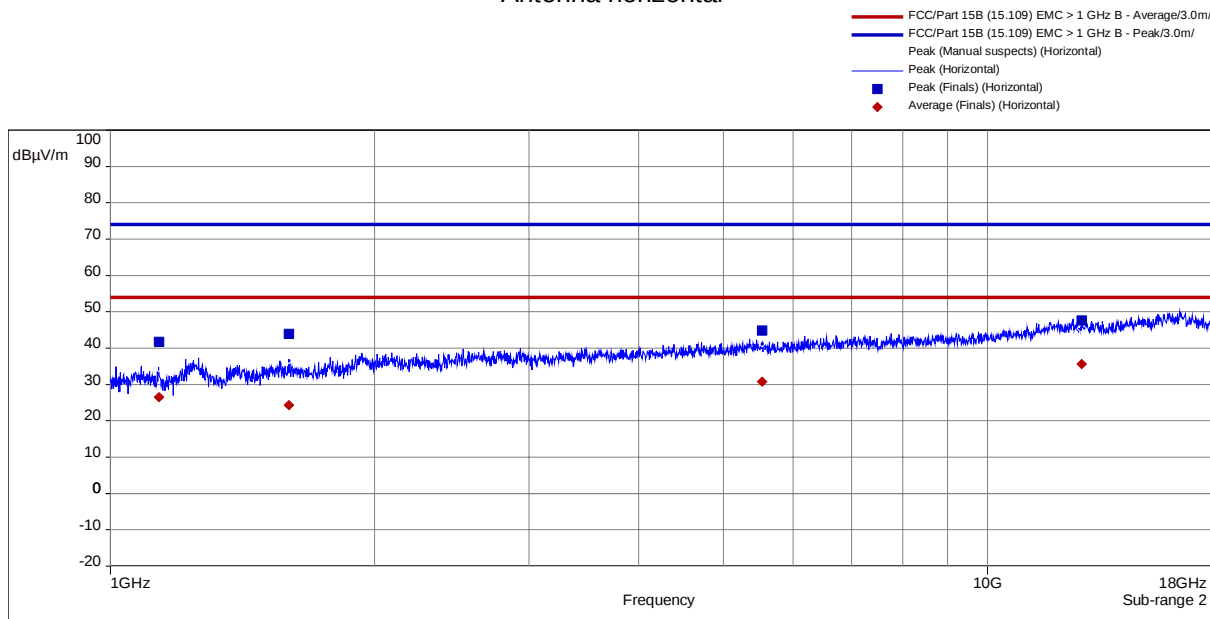


Frequency	SR	Peak	Margin	Limit Peak	Average	Margin	limit AV	Angle	Hight	Polarization	RBW	corr
MHz		dBμV/m	dB	dBμV/m	dBμV/m	dB	dBμV/m	°	m		Hz	dB
1379	1	39.79	-34.21	74.00	24.00	-30.00	54.00	332.80	1.47	Vertical	1M	-11.49
1410	1	40.48	-33.52	74.00	24.16	-29.84	54.00	344.50	1.40	Vertical	1M	-11.80
1890	1	42.26	-31.74	74.00	24.85	-29.15	54.00	116.40	3.48	Vertical	1M	-8.83
1048.5	2	44.55	-29.45	74.00	22.00	-32.00	54.00	72.80	2.57	Horizontal	1M	-13.22
1410	2	41.49	-32.51	74.00	24.67	-29.33	54.00	243.00	1.80	Horizontal	1M	-11.80
1889.5	2	38.26	-35.74	74.00	24.72	-29.28	54.00	236.10	1.00	Horizontal	1M	-8.84

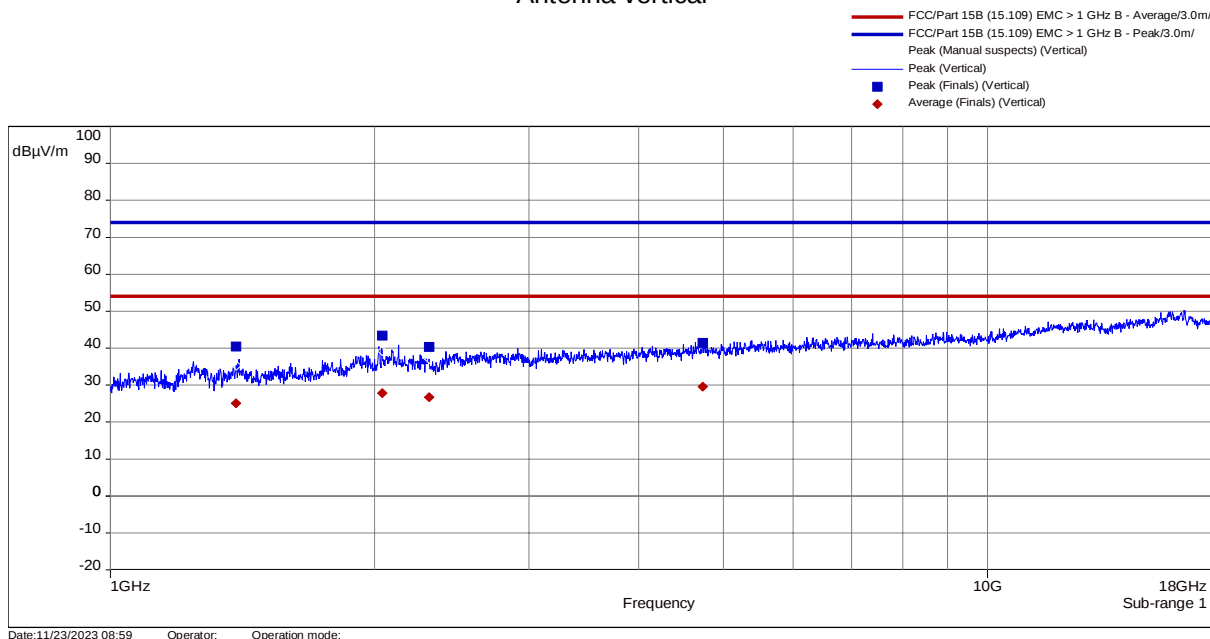
Operation mode: Operation mode 2
Remarks: BAT414 2.0 Ah
Date: 23.11.2023
Tested by: Michael Hackl

Result: passed

Antenna horizontal



Antenna vertical

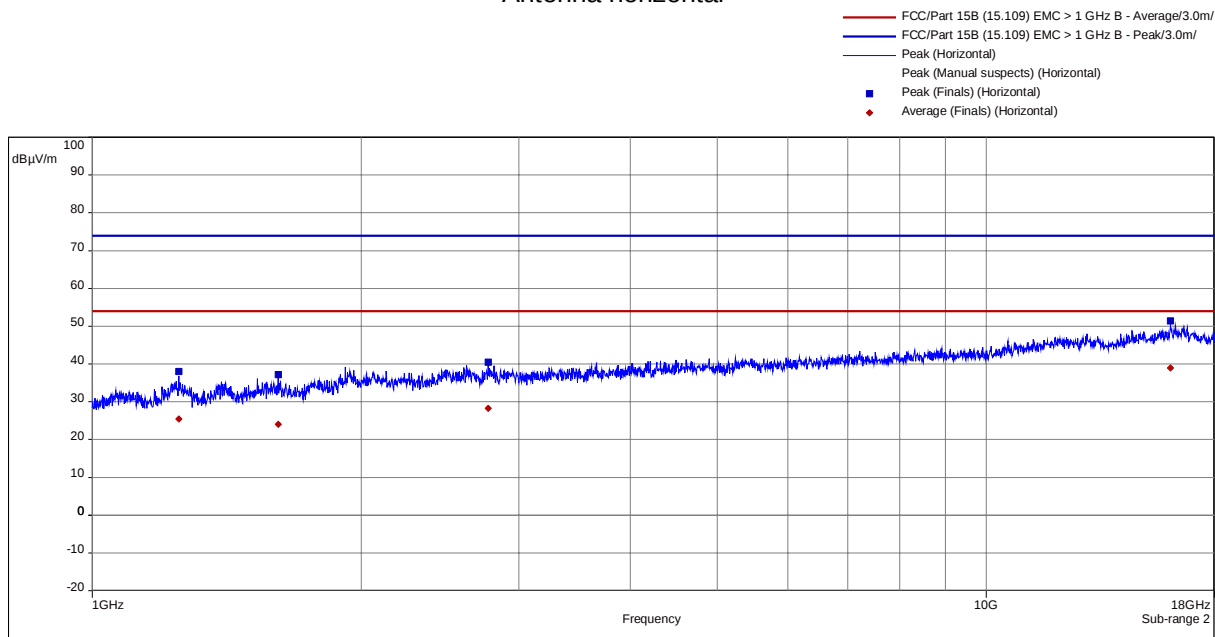


Frequency	SR	Peak	Margin	Limit Peak	Average	Margin	limit AV	Angle	Hight	Polarization	RBW	corr
MHz		dBμV/m	dB	dBμV/m	dBμV/m	dB	dBμV/m	°	m		Hz	dB
1391	1	40.45	-33.55	74	25.11	-28.89	54	302.20	2.44	Vertical	1M	-9.72
2040.68	1	43.38	-30.62	74	27.86	-26.14	54	309.10	3.38	Vertical	1M	-6.22
2307.79	1	40.34	-33.66	74	26.72	-27.28	54	145.00	1.46	Vertical	1M	-6.76
4734.34	1	41.46	-32.54	74	29.58	-24.42	54	103.60	2.26	Vertical	1M	-3.51
1135.95	2	41.71	-32.29	74	26.54	-27.46	54	143.00	3.76	Horizontal	1M	-10.99
1597.66	2	43.97	-30.03	74	24.37	-29.63	54	184.70	2.51	Horizontal	1M	-10.57
5532.33	2	44.84	-29.16	74	30.78	-23.22	54	322.60	3.41	Horizontal	1M	-2.62
12798.4	2	47.62	-26.38	74	35.6	-18.4	54	347.10	4	Horizontal	1M	5.26

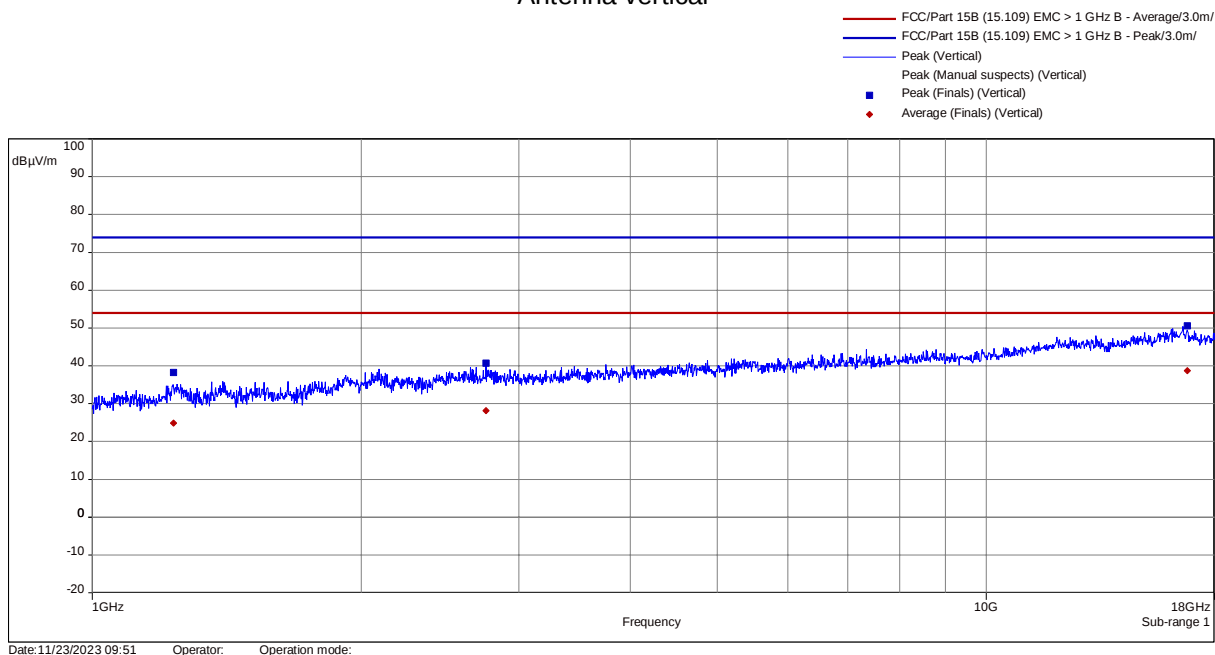
Operation mode: Operation mode 2
Remarks: GBA12V30 3.0 Ah
Date: 23.11.2023
Tested by: Michael Hackl

Result: passed

Antenna horizontal



Antenna vertical

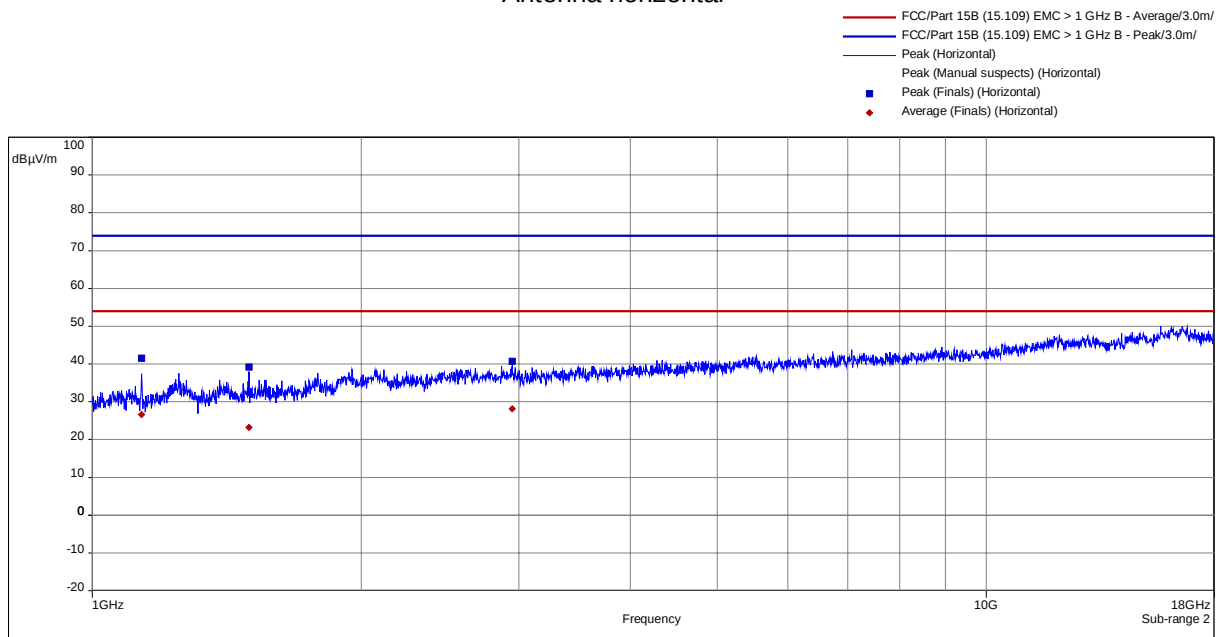


Frequency	SR	Peak	Margin	Limit Peak	Average	Margin	limit AV	Angle	Hight	Polarization	RBW	corr
MHz		dBμV/m	dB	dBμV/m	dBμV/m	dB	dBμV/m	°	m		Hz	dB
1232,45	1	38,2	-35,8	74	24,9	-29,1	54	302.20	1,52	Vertical	1M	-9,23
2756,33	1	40,76	-33,24	74	28,15	-25,85	54	309.10	1,77	Vertical	1M	-5,62
16795,5	1	50,59	-23,41	74	38,76	-15,24	54	145.00	3,74	Vertical	1M	6,93
1250	2	38,01	-35,99	74	25,43	-28,57	54	103.60	2,89	Horizontal	1M	-8,91
1615,16	2	37,24	-36,76	74	24	-30	54	143.00	2,46	Horizontal	1M	-10,42
2773,94	2	40,53	-33,47	74	28,28	-25,72	54	184.70	1	Horizontal	1M	-10,57
16080,9	2	51,38	-22,62	74	38,93	-15,07	54	322.60	3,32	Horizontal	1M	-2,62

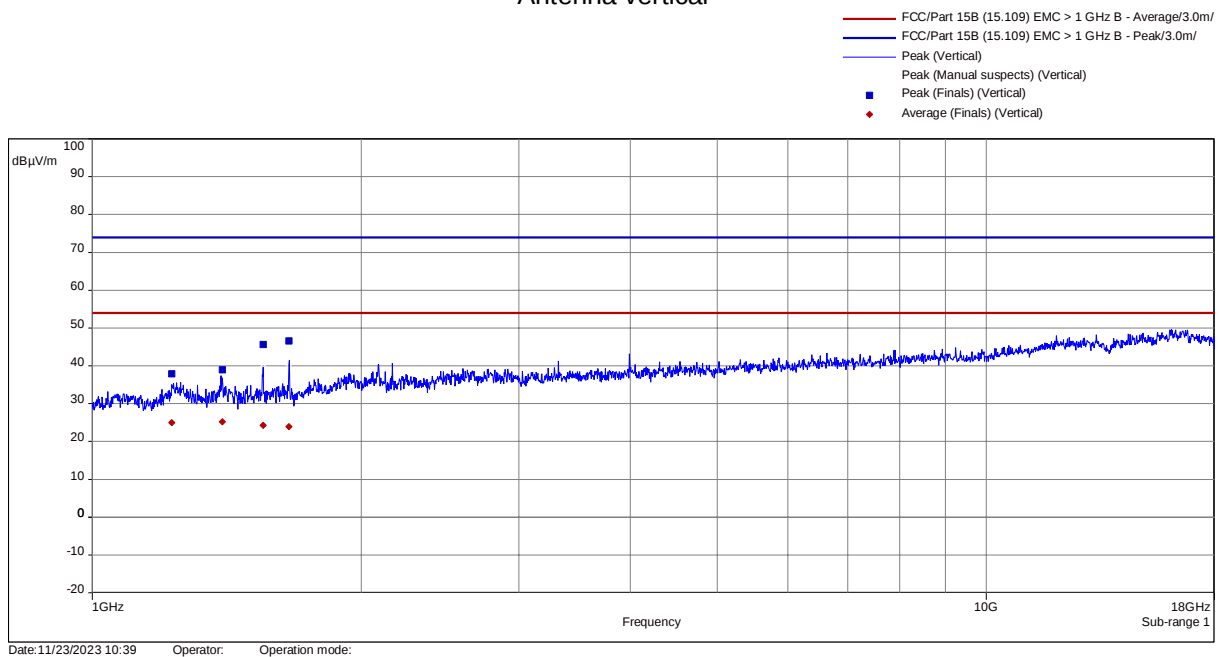
Operation mode: Operation mode 2
Remarks: GBA12V60 10.8V/12V 6.0Ah
Date: 23.11.2023
Tested by: Michael Hackl

Result: passed

Antenna horizontal



Antenna vertical



Frequency	SR	Peak	Margin	Limit Peak	Average	Margin	limit AV	Angle	Hight	Polarization	RBW	corr
MHz		dBμV/m	dB	dBμV/m	dBμV/m	dB	dBμV/m	°	m		Hz	dB
1227.39	1	37.9	-36.1	74	24.93	-29.07	54	124.00	1.22	Vertical	1M	-9.33
1398.26	1	39	-35	74	25.17	-28.83	54	218.10	2.37	Vertical	1M	-9.78
1552.3	1	45.59	-28.41	74	24.28	-29.72	54	234.80	2.7	Vertical	1M	-10.26
1660.02	1	46.63	-27.37	74	23.97	-30.03	54	223.60	2.86	Vertical	1M	-10.05
1135.98	2	41.54	-32.46	74	26.56	-27.44	54	163.10	3.76	Horizontal	1M	-10.99
1497.16	2	39.13	-34.87	74	23.18	-30.82	54	124.70	2.34	Horizontal	1M	-10.14
2950.36	2	40.68	-33.32	74	28.16	-25.84	54	346.80	2.96	Horizontal	1M	-5.78

6 USED TEST EQUIPMENT AND ACCESSORIES

All test instruments used, in addition to the test accessories, are calibrated and verified regularly.

Following software was used: Nexio BAT EMC (Version 2022.0.23.0)

Test ID	Model Type	Kind of Equipment	Manufacturer	Equipment No.	Next Calib.	Last Calib.
A 5	840 G3	HP Elitebook 840 G3	MCL Computer & Zubehör Straubing GmbH	01-01/01-16-010		
	ESVS 30	EMI Test Receiver	Rohde & Schwarz München	02-02/03-05-006	27/07/2023	27/07/2022
	VULB 9168	Trilog Broadband	Schwarzbeck Mess-Elektronik	02-02/24-05-005	20/04/2024	20/04/2023
	NW-2000-NB	RF Cable	Huber + Suhner	02-02/50-05-113		
	KK-EF393/U-16N-21N20 m	RF Cable 20m	Huber + Suhner	02-02/50-12-018		
	KK-SD_7/8-2X21N-33,0M	RF Cable 33 m	Huber + Suhner AG	02-02/50-15-028		
	50F-003 N 3 dB	Dämpfungsglied 3dB_50Ohm	Tactron Elektronik	02-02/50-21-010		

SER 3	840 G3	HP Elitebook 840 G3	MCL Computer & Zubehör Straubing GmbH	01-01/01-16-010		
	ESW26	EMI Test Receiver	Rohde & Schwarz München	02-02/03-17-002	08/03/2024	08/03/2023
	AMF-6D-01002000-22-10P	RF Amplifier	MITEQ, Inc.	02-02/17-15-004		
	3117	Horn Antenna 1 - 18 GHz	EMCO Elektronik GmbH	02-02/24-05-009	23/06/2023	23/06/2022
	BAM 4.5-P	Antenna Mast	maturo GmbH	02-02/50-17-024		
	NCD	Controller for Antenna Mast	maturo GmbH	02-02/50-17-025		
	KK-SF106-2X11N-6,5M	RF Cable	Huber + Suhner	02-02/50-18-016		

7 Detailed measurement uncertainty

Note: The following table provides an overview of all uncertainties for CSA Group Bayern GmbH

Measurement	Ucisp [dB]	Ulab comb. + [dB]	Ulab comb. - [dB]	Ulab exp. + [dB]	Ulab exp. - [dB]
EMISSION					
Conducted disturbance at AC mains and other port power using a V-AMN (150 kHz to 30 MHz)	3.4	1.48	1.58	2.96	3.16
Conducted disturbance at AC mains port using a voltage probe - 1500 Ohm (9 kHz - 30 MHz)	2.9	1.15	1.15	2.31	2.31
Conducted disturbance at telecommunication port using CP (9 kHz - 30 MHz)	2.9	1.08	1.09	2.17	2.18
Conducted disturbance at telecommunication port using CVP (150 kHz - 30 MHz)	3.9	1.57	1.57	3.13	3.13
Disturbance power (30 MHz to 300 MHz)	4.5	1.74	1.74	3.48	3.48
Radiated disturbance (disturbance current in a LLAS)	3.3	1.35	1.35	2.69	2.69
Radiated disturbance (disturbance current in a Loop antenna 10 kHz to 30 MHz)	na	0.00	0.00	0.00	0.00
Radiated disturbance (electrical field strength at an OATS / SAC; 30 MHz - 200 MHz; biconical antenna; 3 m or 10 m)	6.3	1.74	1.76	3.47	3.53
Radiated disturbance (electrical field strength at an OATS / SAC; 200 MHz - 1000 MHz; LPDA antenna; 3 m or 10 m)	6.3	2.14	2.14	4.29	4.28
Radiated disturbance (electrical field strength at an OATS / SAC; 30 MHz - 1000 MHz; Hybrid antenna; 3 m or 10 m)	6.3	2.08	2.07	4.17	4.13
Radiated disturbance (electrical field strength in a FAR; 1 GHz - 6 GHz)	5.2	2.54	1.87	5.07	3.73
Radiated disturbance (electrical field strength in a FAR; 6 GHz - 18 GHz)	5.5	2.70	2.15	5.40	4.30
Radiated disturbance (in a GTEM; 30 MHz - 1000 MHz)	6.3	1.44	1.47	2.87	2.94

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

Measurement	Influence factor	U(xi) (+- %)
Harmonic current emissions	Class I	
	Voltage $U_m \geq 1\% U_{nom}$	5 % U_m
	Voltage $U_m < 1\% U_{nom}$	0.05 % U_{nom}
	Current $I_m \geq 3\% I_{nom}$	5 % I_m
	Current $I_m < 3\% I_{nom}$	0.15 % I_{nom}
	Power $P_m \geq 150 W$	1 % P_m
	Power $P_m < 150 W$	1.5 W
	Phase shift (h=number of harmonic)	$< h \cdot 1^\circ$
	Class II	
	Voltage $U_m \geq 3\% U_{nom}$	5 % U_m
	Voltage $U_m < 3\% U_{nom}$	0.15 % U_{nom}
	Current $I_m \geq 10\% I_{nom}$	5 % I_m
	Current $I_m < 10\% I_{nom}$	0.5 % I_{nom}
Flicker	Current	
	Magnitude (active or reactive current)	$< (1\% I_m + 10 mA)$
	Magnitude (if phase angle used)	2°
	Direct measured parameters (clause 3 and 4) of limit or measured value whichever is higher	$< 8\%$

Measurement	Ucisp[μV]	Ulab comb. +[dB]	Ulab comb. - [dB]	Ulab exp. +[dB]	Ulab exp. - [dB]
IMMUNITY					
Radiated immunity (20 MHz to 6 GHz)	na	0.79	0.51	1.59	1.03
Conducted immunity (0,15 MHz - 230 GHz)	na	0.74	0.65	1.47	1.30
Power frequency magnetic field (50 Hz / 60 Hz)	na	2.69	2.69	5.39	5.39
Conducted, common mode disturbances	na	1.80	1.51	3.60	3.02
Transverse electromagnetic waveguides (IEC 61000-4-20)	na	0.51	0.51	1.03	1.03