**DEKRA Testing and Certification, S.A.U.**
Parque Tecnológico de Andalucía,
c/ Severo Ochoa nº 2 · 29590 Campanillas · Málaga · España
C.I.F. A29 507 456

DEKRA

ilac-MRA ENAC ENSAYOS Nº 51/LE147

Test report No:
NIE: 65644REM.003

# Test report

## FCC Rules and Regulations CFR 47, Part 15, Subpart B (10-1-19 Edition) & ICES-003 Issue 6 (Updated 2019-04)

| | |
|---|---|
| (*) Identification of item tested | Temperature logger with external PT100 probe |
| (*) Trademark | ELPRO |
| (*) Model and /or type reference | LIBERO CE |
| Other identification of the product | HW Version: V04<br>SW Version: V9.11 RC31<br>FCC ID: Z45LIBEROCEHL<br>IC: 9954A-LIBEROCEHL |
| (*) Features | Bluetooth LE 4.2 |
| Manufacturer | ELPRO-BUCHS AG.<br>Langäulistrasse, 45.<br>9470 Buchs SG, St. Gallen, Switzerland. |
| Test method requested, standard | FCC CFR 47, Part 15, Subpart B (10-1-19 Edition)<br>& ICES-003 Issue 6 (Updated 2019-04) |
| Summary | IN COMPLIANCE |
| Approved by (name / position & signature) | Rafael López Martín<br>EMC Consumer & RF Lab. Manager<br>RAFAEL LÓPEZ MARTÍN 2020.11.14 14:17:04 +01'00' |
| Date of issue | 2020-09-28 |
| Report template No | FDT08_22<br>(*) "Data provided by the client" |

# Index

Competences and guarantees ..... 3
General conditions ..... 3
Uncertainty ..... 3
Data provided by the client ..... 4
Usage of samples ..... 4
Test sample description ..... 4
Identification of the client ..... 6
Testing period and place ..... 6
Document history ..... 6
List of equipment used during the test ..... 6
Environmental conditions ..... 7
Remarks and comments ..... 8
Testing verdicts ..... 8
Summary ..... 8
Appendix A: Test results ..... 9

# Competences and guarantees

DEKRA Testing and Certification is a testing laboratory accredited by the National Accreditation Body (ENAC - Entidad Nacional de Acreditación), to perform the tests indicated in the Certificate No. 51/LE 147.

DEKRA Testing and Certification is a FCC recognized accredited testing laboratory with appropriate scope of accreditation that include testing performed in this test report, FCC designation number ES0004.

In order to assure the traceability to other national and international laboratories, DEKRA Testing and Certification has a calibration and maintenance program for its measurement equipment.

DEKRA Testing and Certification guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated on the report and, it is based on the knowledge and technical facilities available at DEKRA Testing and Certification at the time of performance of the test.

DEKRA Testing and Certification is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

The results presented in this Test Report apply only to the particular item under test established in this document.

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# General conditions

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or competent Authorities.
3. This document is only valid if complete; no partial reproduction can be made without previous written permission of DEKRA Testing and Certification.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of DEKRA Testing and Certification and the Accreditation Bodies.

# Uncertainty

Uncertainty (factor k=2) was calculated according to the DEKRA Testing and Certification internal document PODT000.

The total uncertainty of the measurement system for the measured radio disturbance characteristics of EUT from 30 MHz to 1000 MHz is I = ± 4,9 dB for quasi-peak measurements, I = ± 4,6 dB for peak measurements (k= 2).

The total uncertainty of the measurement system for the measured radio disturbance characteristics of EUT from 1000 MHz to 12.75 GHz is I = ± 2,6 dB for peaks and average measurements (k = 2).

# Data provided by the client

The following data has been provided by the client:

1. Information relating to the description of the sample ("Identification of the item tested", "Trademark", "Model and/or type reference tested).
2. The sample consists of a temperature logger with external PT100 probe. The LIBERO CE data logger is a device for temperature monitoring using an external PT100 probe. LIBERO CE saves temperature measurement values and is able to generate a PDF report when connected to a USB port on your computer. The LIBERO CE data logger features Bluetooth Low Energy (BLE) and usage of liberoAPP.

DEKRA declines any responsibility with respect to the information provided by the client and that may affect the validity of results.

# Usage of samples

Samples under test have been selected by: The client.

Sample **S/01**, radiated emission sample, is composed of the following elements:

| Control Nº | Description | Model | Serial Nº | Date of reception |
|---|---|---|---|---|
| 65644/002 | Temperature logger | LIBERO CE | --- | 2020-08-31 |
| 65644/014 | PT100 sensor cable | --- | --- | 2020-08-31 |

Sample **S/02**, conducted emission sample, is composed of the following elements:

| Control Nº | Description | Model | Serial Nº | Date of reception |
|---|---|---|---|---|
| 65644/002 | Temperature logger | LIBERO CE | --- | 2020-08-31 |
| 65644/014 | PT100 sensor cable | --- | --- | 2020-08-31 |

Auxiliary elements used with the sample S/02:

| Control Nº | Description | Model | Serial Nº | Date of reception |
|---|---|---|---|---|
| *7520 | Laptop | DELL LATITUDE | 301JLQ2 | --- |

* This element is property of DEKRA TC

- Sample S/02 is used to perform the testing according to ANSI 63.4

# Test sample description

| | | | | | | |
|---|---|---|---|---|---|---|
| Ports…… : | Port name and description | Cable | | | | |
| | | Specified length [m] | Attached during test | Shielded | | |
| | LIBERO CE Sensor Cable | <3.0m | ☒ | ☐ | | |
| | | | ☐ | ☐ | | |
| | | | ☐ | ☐ | | |
| | | | ☐ | ☐ | | |
| Supplymentary information to the ports…… : | Not provided data | | | | | |
| Rated power supply .....: | Voltage and Frequency | Reference poles | | | | |
| | | L1 | L2 | L3 | N | PE |
| | ☐ AC: | ☐ | ☐ | ☐ | ☐ | ☐ |
| | ☐ AC: | ☐ | ☐ | ☐ | ☐ | ☐ |
| | ☒ DC: 3Vdc. (CR2450 battery) | | | | | |
| Rated Power .....: | 30mWp | | | | | |
| Clock frequencies.....: | Not provided data | | | | | |
| Other parameters .....: | Not provided data | | | | | |
| Software version .....: | V9.11 RC31 | | | | | |
| Hardware version .....: | V04 | | | | | |
| Dimensions in mm (W x H x D)...: | 9.5 x 4.5 x 1.1 | | | | | |
| Mounting position .....: | ☐ Table top equipment | | | | | |
| | ☒ Wall/Ceiling mounted equipment | | | | | |
| | ☐ Floor standing equipment | | | | | |
| | ☐ Hand-held equipment | | | | | |
| | ☐ Other: | | | | | |
| Modules/parts.....: | Module/parts of test item | Type | Manufacturer | | | |
| | Not provided data | | | | | |
| | | | | | | |
| Accessories (not part of the test item) .....: | Description | Type | Manufacturer | | | |
| | LIBERO CE Sensor Cable | PT100 4 wire | Various | | | |
| | | | | | | |
| Documents as provided by the applicant.....: | Description | File name | Issue date | | | |
| | Not provided data | | | | | |
| | | | | | | |

# Identification of the client

ELPRO-BUCHS AG.
Langäulistrasse, 45.
9470 Buchs SG, St. Gallen, Switzerland.

# Testing period and place

| | |
|---|---|
| **Test Location** | DEKRA Testing and Certification S.A.U. |
| **Date (start)** | 2020-08-31 |
| **Date (finish)** | 2020-09-01 |

# Document history

| Report number | Date | Description |
|---|---|---|
| 65644REM.003 | 2020-09-28 | First release |

# List of equipment used during the test

| Control Number | Description | Model | Manufacturer | Next Calibration |
|---|---|---|---|---|
| 0246 | HORN ANTENNA 1-18GHz | 11966E | HEWLETT PACKARD | 2021-10-13 |
| 0482 | SEMIANECHOIC ABSORBER LINED CHAMBER 1 | 11.BS | IRSA | --- |
| 0549 | CAMARA CONDUCIDA | - | IRSA | --- |
| 3545 | USB TEMPERATURE AND HUMIDITY SENSOR | HUMIDIPROBE | PICO TECHNOLOGY | 2021-04-22 |
| 5705 | PRE-AMPLIFIER G>40dB 1-18 GHz | BLMA 0118-1M | BONN ELEKTRONIK | 2021-05-19 |
| 7746 | HYBRID BILOG ANTENNA 30MHz-6GHz | 3142E | ETS LINDGREN | 2023-07-23 |
| 7816 | EMI TEST RECEIVER 1Hz-26.5GHz | ESW26 | ROHDE AND SCHWARZ | 2021-09-05 |

# Environmental conditions

In the control chamber, the following limits were not exceeded during the test:

| | |
|---|---|
| **Temperature** | Min. = 15 ºC<br>Max. = 35 ºC |
| **Relative humidity** | Min. = 30 %<br>Max. = 75 % |
| **Air pressure** | Min. = 860 mbar<br>Max. = 1060 mbar |

In the semianechoic chamber, the following limits were not exceeded during the test.

| | |
|---|---|
| **Temperature** | Min. = 15 ºC<br>Max. = 35 ºC |
| **Relative humidity** | Min. = 30 %<br>Max. = 75 % |
| **Air pressure** | Min. = 860 mbar<br>Max. = 1060 mbar |

In the chamber for conducted measurements, the following limits were not exceeded during the test:

| | |
|---|---|
| **Temperature** | Min. = 15 ºC<br>Max. = 35 ºC |
| **Relative humidity** | Min. = 30 %<br>Max. = 60 % |
| **Air pressure** | Min. = 860 mbar<br>Max. = 1060 mbar |

# Remarks and comments

The test have been performed by the technical personnel: Alejandro Marín, Raúl Alfaya & Humberto Pérez.

# Testing verdicts

| | |
|---|---|
| Not applicable : | N/A |
| Pass : | P |
| Fail : | F |
| Not measured : | N/M |

# Summary

| Emission Test | | |
|---|---|---|
| **Requirement – Test case** | **Verdict** | **Remark** |
| Radiated emission. Electromagnetic field measure (30 MHz – 1000 MHz) | P | --- |
| Radiated emission. Electromagnetic field measure (1 GHz – 12,75 GHz) | P | --- |
| Radiated emission. Electromagnetic field measure (12,75 GHz – 26 GHz) | N/A | (1) |
| Continuous conducted emission (150 KHz – 30 MHz) | P | --- |
| Supplementary information and remarks: | | |
| (1) Range: f>12.75 GHz. Test required only if the 5th harmonics of the maximum internal work frequency EUT is higher than 12.75GHz. | | |

# **Appendix A:** Test results

# Appendix A Content

DESCRIPTION OF THE OPERATION MODES.....11
RADIATED EMISSION. ELECTROMAGNETIC FIELD MEASURE.....12
CONTINUOUS CONDUCTED EMISSION ON POWER LEADS.....12

# DESCRIPTION OF THE OPERATION MODES

The operation modes described in this paragraph constitute a functionality of the sample under test for itself. The operation modes used by the samples to which the present report refers, are shown in the following table:

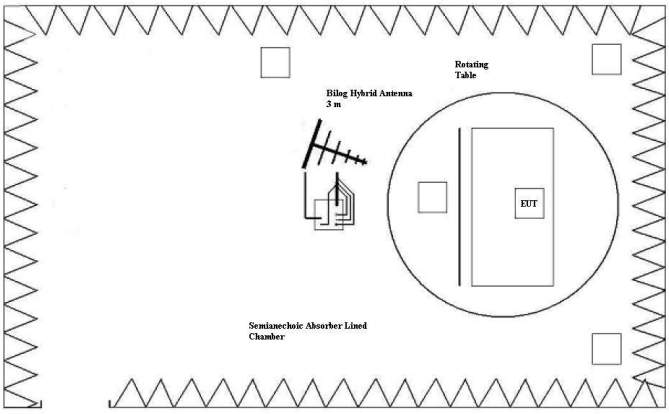
| OPERATION MODE | DESCRIPTION |
|---|---|
| OM#01 | EUT ON. Measuring the ambient temperature. Power supply: Internal Battery.(1x CR2450) |
| OM#02 | EUT ON. Dumping the measurements on PC. Transfering data to PC according to ANSI 63.4. Power supply: 5 Vdc (via USB through a laptop supplied by 115 Vac, 60 Hz) |

# RADIATED EMISSION. ELECTROMAGNETIC FIELD MEASURE

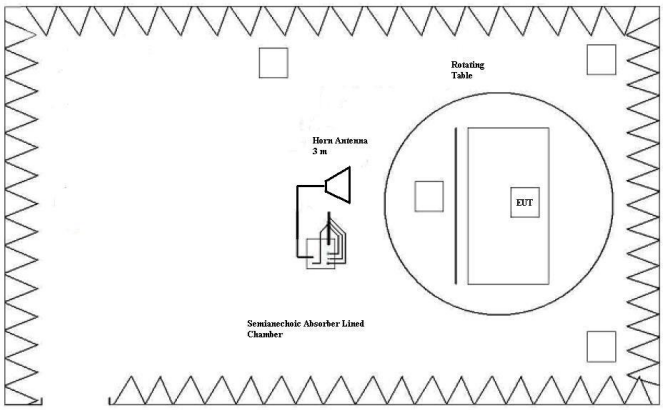
| | | |
|---|---|---|
| **LIMITS:** | Product standard: | FCC CFR 47, Part 15, Subpart B (10-1-19 Edition) & ICES-003 Issue 6 (Updated 2019-04) |
| | Test standard: | FCC CFR 47, Part 15, Subpart B (10-1-19 Edition) & ICES-003 Issue 6 (Updated 2019-04) |

**Limits of interference Class B**
The applied limit for radiated emissions, 3 m distance, according with the requirements of FCC Rules and Regulations 47 CFR Part 15, Subpart B (10-1-19 Edition), Secs. 15.109 & ICES-003 Issue 6 (Updated 04-2019)

| Frequency of emission (MHz) | Field strength (microvolt/meter) |
|---|---|
| 30-88 | 100 |
| 88-216 | 150 |
| 21-960 | 200 |
| Above 960 | 500 |




Setup for measurements < 1GHz.




Setup for measurements > 1GHz.

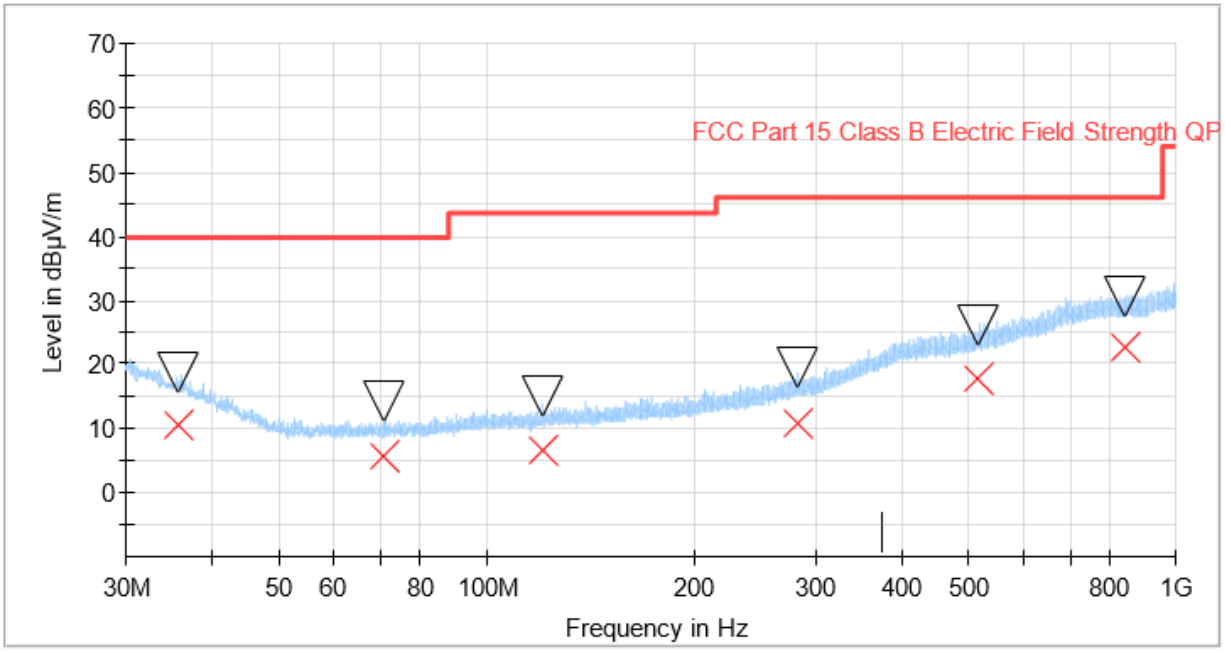
| | |
|---|---|
| **TESTED SAMPLE:** | S/01 |
| **TESTED OPERATION MODES:** | OM#01 & OM#02 |
| **TEST RESULTS:** | CRmmnnRRPP: CR, Radiated Condition; mm: Sample number; nn: Operation mode; RR: Range; PP: Polarization. |

| CRmmnnRRPP | Description | Result |
|---|---|---|
| CR0101LR | Range: 30 MHz - 1000 MHz. | P |
| CR0101HR | Range: 1 GHz – 12,75 GHz. | P |
| CR0102LR | Range: 30 MHz - 1000 MHz. | P |
| CR0102HR | Range: 1 GHz – 12,75 GHz. | P |

**Radiated Emission. CR0101LR**

| | |
|---|---|
| Project: | 65644REM.003 |
| Company: | ELPRO-BUCHS AG |
| Sample: | S/01 |
| Operation mode: | OM#01 |
| Description: | EUT ON. Measuring the ambient temperature. Power supply: Internal Battery.(1x CR2450) |

Full Spectrum




Peak Preview
QuasiPeak
FCC Part 15 Class B Electric Field Strength QP
MaxPeak

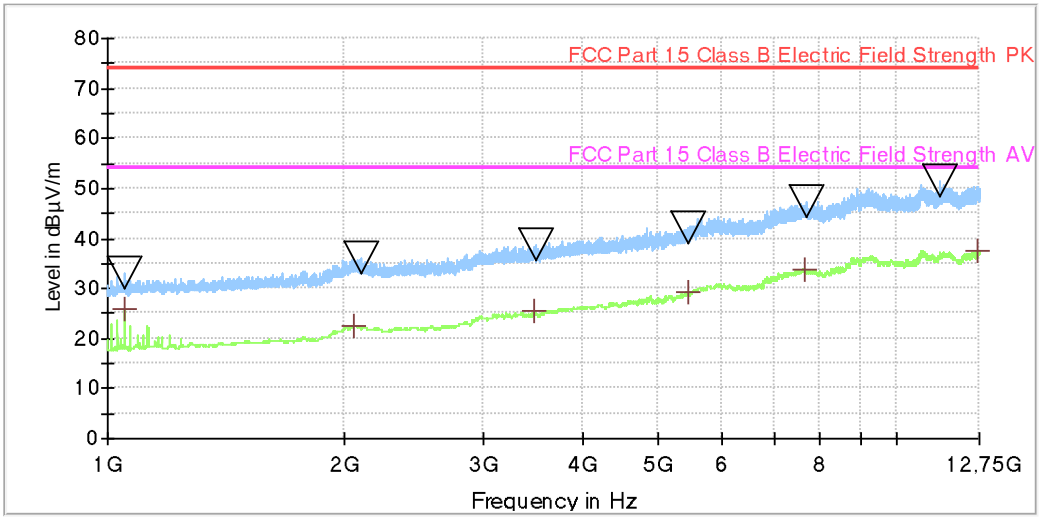
## Maximizations

| Frequency (MHz) | QuasiPeak (dBµV/m) | MaxPeak (dBµV/m) | Height (cm) | Pol | Azimuth (deg) |
|---|---|---|---|---|---|
| 35.871000 | 6.42 | 14.49 | 380.0 | V | 153.0 |
| 71.064000 | 1.31 | 10.09 | 328.0 | H | 34.0 |
| 120.851000 | 2.38 | 10.61 | 172.0 | H | 55.0 |
| 283.608000 | 6.78 | 15.15 | 324.0 | H | 114.0 |
| 518.468000 | 13.49 | 21.90 | 124.0 | V | 161.0 |
| 841.277000 | 18.37 | 26.34 | 259.0 | V | 296.0 |

**Radiated Emission. CR0101HR**

| | |
|---|---|
| Project: | 65644REM.003 |
| Company: | ELPRO-BUCHS AG |
| Sample: | S/01 |
| Operation mode: | OM#01 |
| Description: | EUT ON. Measuring the ambient temperature. Power supply: Internal Battery.(1x CR2450) |

Full Spectrum



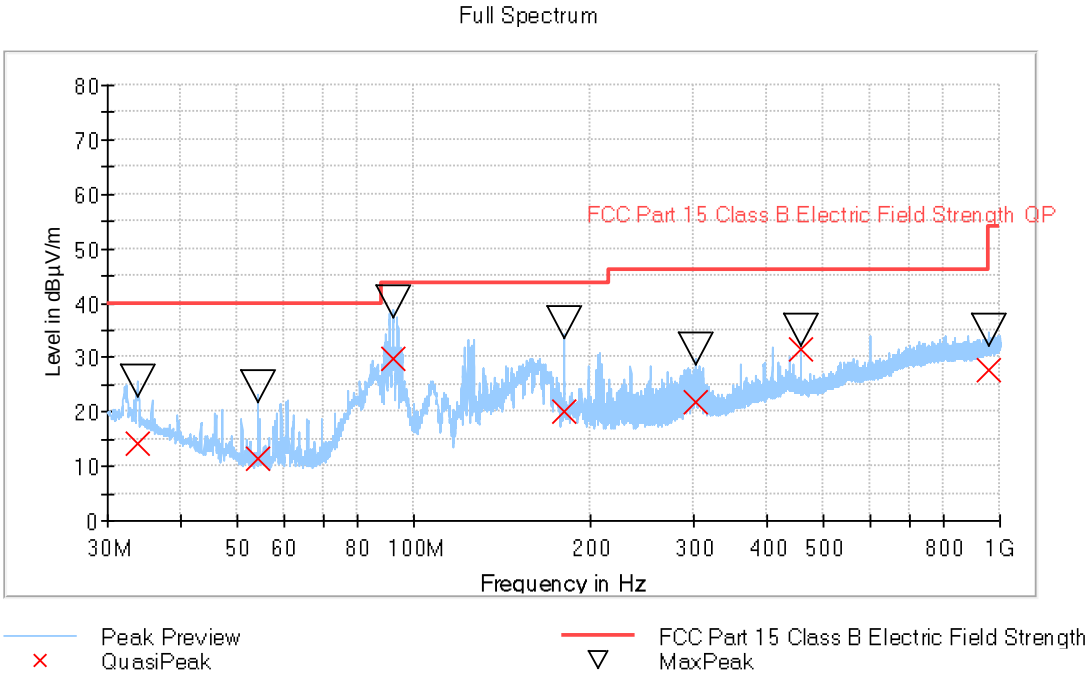

Average Preview
Peak Preview
FCC Part 15 Class B Electric Field Strength PK
FCC Part 15 Class B Electric Field Strength
MaxPeak
Average

# Final_Result

| Frequency (MHz) | MaxPeak (dBµV/m) | Average (dBµV/m) | Limit (dBµV/m) | Margin (dB) |
|---|---|---|---|---|
| 1050.000000 | --- | 25.96 | 53.97 | 28.01 |
| 1050.000000 | 32.87 | --- | 73.97 | 41.10 |
| 2049.600000 | --- | 22.72 | 53.97 | 31.25 |
| 2097.600000 | 35.96 | --- | 73.97 | 38.01 |
| 3475.600000 | --- | 25.35 | 53.97 | 28.62 |
| 3489.200000 | 38.82 | --- | 73.97 | 35.15 |
| 5451.600000 | 42.18 | --- | 73.97 | 31.79 |
| 5457.600000 | --- | 29.33 | 53.97 | 24.64 |
| 7648.400000 | --- | 33.79 | 53.97 | 20.18 |
| 7711.200000 | 47.21 | --- | 73.97 | 26.76 |
| 11358.000000 | 51.35 | --- | 73.97 | 22.62 |
| 12689.600000 | --- | 37.54 | 53.97 | 16.43 |

**Radiated Emission. CR0102LR**

| | |
|---|---|
| Project: | 65644REM.003 |
| Company: | ELPRO-BUCHS AG |
| Sample: | S/01 |
| Operation mode: | OM#02 |
| Description: | EUT ON. Dumping the measurements on PC. Transfering data to PC according to ANSI 63.4. Power supply: 5 Vdc (via USB through a laptop supplied by 115 Vac, 60 Hz) |

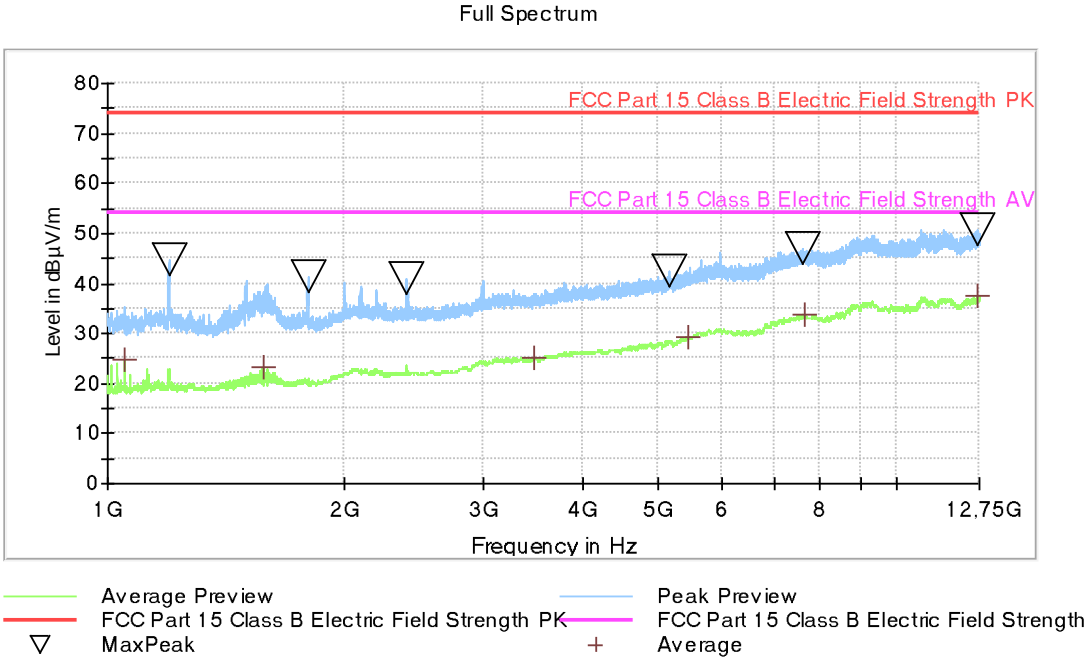



# Maximizations

| Frequency (MHz) | QuasiPeak (dBµV/m) | MaxPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|---|---|---|---|---|---|---|---|---|
| 33.702000 | 14.22 | 25.50 | 40.00 | 25.78 | 142.0 | V | 50.0 | 16.7 |
| 54.042000 | 11.51 | 24.59 | 40.00 | 28.49 | 400.0 | H | 46.0 | 10.2 |
| 92.265000 | 29.62 | 40.30 | 43.52 | 13.90 | 100.0 | V | 349.0 | 11.5 |
| 179.962000 | 20.09 | 36.30 | 43.52 | 23.43 | 121.0 | V | 111.0 | 14.1 |
| 303.149000 | 21.88 | 31.56 | 46.00 | 24.12 | 100.0 | H | 282.0 | 18.1 |
| 455.970000 | 31.52 | 35.11 | 46.00 | 14.48 | 175.0 | V | 97.0 | 23.6 |
| 960.004000 | 27.83 | 34.97 | 53.97 | 26.14 | 152.0 | V | 153.0 | 30.2 |

**Radiated Emission. CR0102HR**

| | |
|---|---|
| Project: | 65644REM.003 |
| Company: | ELPRO-BUCHS AG |
| Sample: | S/01 |
| Operation mode: | OM#02 |
| Description: | EUT ON. Dumping the measurements on PC. Transfering data to PC according to ANSI 63.4. Power supply: 5 Vdc (via USB through a laptop supplied by 115 Vac, 60 Hz) |




# Final_Result

| Frequency (MHz) | MaxPeak (dBµV/m) | Average (dBµV/m) | Limit (dBµV/m) | Margin (dB) |
|---|---|---|---|---|
| 1050.000000 | --- | 24.85 | 53.97 | 29.12 |
| 1198.800000 | 44.82 | --- | 73.97 | 29.15 |
| 1578.400000 | --- | 23.12 | 53.97 | 30.85 |
| 1794.800000 | 41.49 | --- | 73.97 | 32.48 |
| 2393.200000 | 41.03 | --- | 73.97 | 32.94 |
| 3472.800000 | --- | 25.20 | 53.97 | 28.77 |
| 5148.800000 | 42.36 | --- | 73.97 | 31.61 |
| 5456.400000 | --- | 29.33 | 53.97 | 24.64 |
| 7624.800000 | 46.79 | --- | 73.97 | 27.18 |
| 7648.000000 | --- | 33.68 | 53.97 | 20.29 |
| 12654.000000 | 50.69 | --- | 73.97 | 23.28 |
| 12688.400000 | --- | 37.45 | 53.97 | 16.52 |

# CONTINUOUS CONDUCTED EMISSION ON POWER LEADS

| | | |
|---|---|---|
| **LIMITS:** | Product standard: | FCC CFR 47, Part 15, Subpart B (10-1-19 Edition) & ICES-003 Issue 6 (Updated 2019-04) |
| | Test standard: | FCC CFR 47, Part 15, Subpart B (10-1-19 Edition) & ICES-003 Issue 6 (Updated 2019-04) |

## CLASS B

The applied limit for continuous conducted emissions in power leads, according with the requirements of FCC Rules and Regulations 47 CFR Part 15, Subpart B (10-1-19 Edition), Secs. 15.107 & ICES-003 Issue 6 (04-2019) & Subpart C (10-1-19 Edition). Sec. 15.207, in the frequency range 0,15 to 30 MHz, for Class B equipment was:

| **Frequency range** | **Limit (dBµV)** | |
|---|---|---|
| **(MHz)** | **Quasi-peak** | **Average** |
| 0,15 to 0,5 | 66-56* | 56-46* |
| 0,5 to 5 | 56 | 46 |
| 5 to 30 | 60 | 50 |

*Decreases with the logarithm of the frequency.

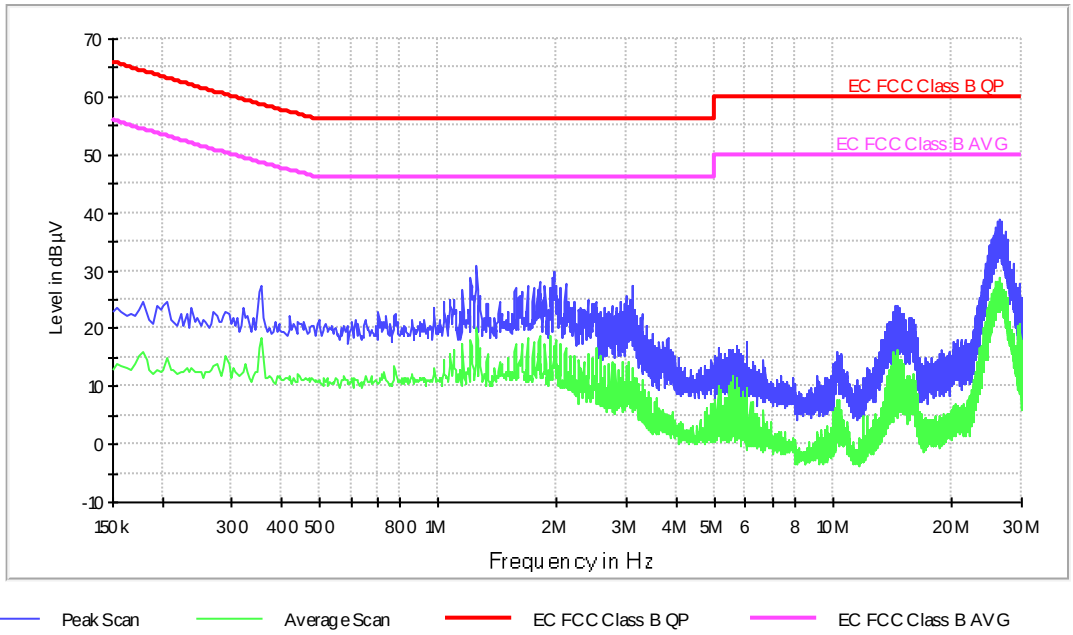
| | |
|---|---|
| **TESTED SAMPLES:** | S/02 |
| **TESTED OPERATION MODES:** | OM#02 |
| **TEST RESULTS:** | CCmmnnhh: CC, Conducted Condition; mm: Sample number; nn: Operation mode; hh: wire |

| **CCmmnnhh** | **DESCRIPTION** | **RESULT** |
|---|---|---|
| CC01020N | Neutral wire noise. | P |
| CC0102L1 | Phase wire noise. | P |

## Conducted Emission. CC01020N

| | |
|---|---|
| Project: | 65644REM.003 |
| Company: | ELPRO-BUCHS AG |
| Sample: | S/02 |
| Operation mode: | OM#02 |
| Description: | EUT ON. Dumping the measurements on PC. Transfering data to PC according to ANSI 63.4. Power supply: 5 Vdc (via USB through a laptop supplied by 115 Vac, 60 Hz). Neutral wire noise. |

# Full Spectrum



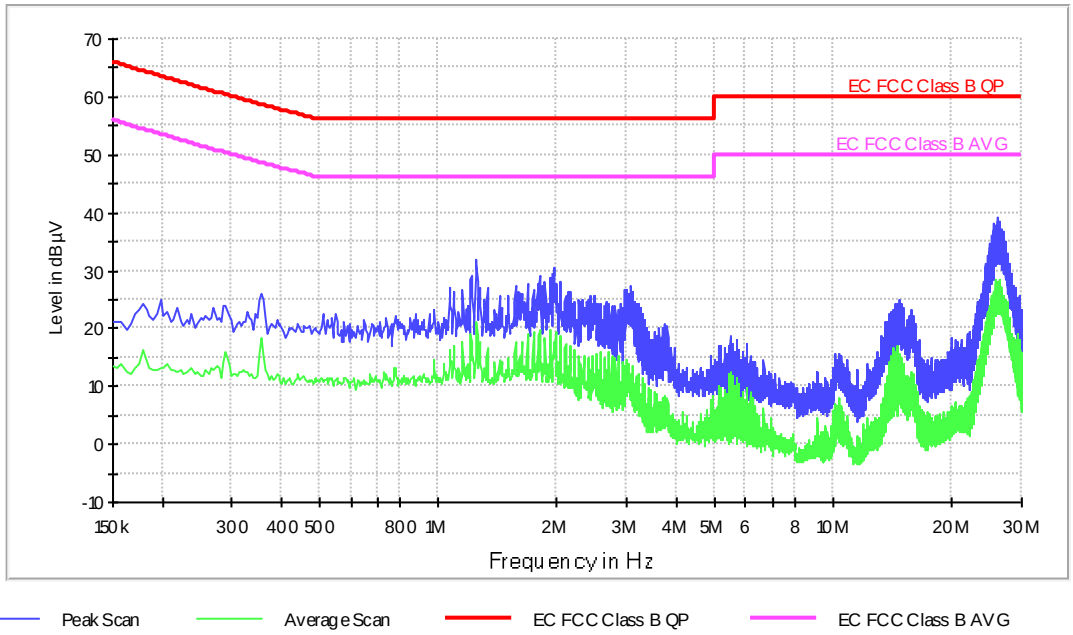

# Subrange Maxima

| Frequency (MHz) | MaxPeak-ClearWrite (dBµV) | Average-ClearWrite (dBµV) |
|---|---|---|
| 0.178000 | 24.8 | 16.0 |
| 0.358000 | 27.3 | 18.4 |
| 0.706000 | 22.8 | 10.4 |
| 1.246000 | 30.9 | 18.2 |
| 1.250000 | 30.9 | 20.1 |
| 3.094000 | 27.2 | 11.0 |
| 3.810000 | 18.3 | 4.9 |
| 10.198000 | 15.9 | 6.4 |
| 14.398000 | 23.9 | 15.4 |
| 26.286000 | 39.0 | 27.6 |

## Conducted Emission. CC0102L1

| | |
|---|---|
| Project: | 65644REM.003 |
| Company: | ELPRO-BUCHS AG |
| Sample: | S/02 |
| Operation mode: | OM#02 |
| Description: | EUT ON. Dumping the measurements on PC. Transfering data to PC according to ANSI 63.4. Power supply: 5 Vdc (via USB through a laptop supplied by 115 Vac, 60 Hz). Phase wire noise. |

# Full Spectrum




# Subrange Maxima

| Frequency (MHz) | MaxPeak-ClearWrite (dBµV) | Average-ClearWrite (dBµV) |
|---|---|---|
| 0.198000 | 24.9 | 13.3 |
| 0.358000 | 26.0 | 18.3 |
| 0.510000 | 22.6 | 10.9 |
| 1.246000 | 31.9 | 19.5 |
| 1.250000 | 31.3 | 21.1 |
| 3.082000 | 27.3 | 12.2 |
| 3.722000 | 20.7 | 6.5 |
| 10.350000 | 15.6 | 7.9 |
| 14.622000 | 24.8 | 15.7 |
| 26.114000 | 39.1 | 28.0 |