

ISED CABid: ES1909  
 Lab Company Number: 4621A

Test report No:  
 NIE: 73655REM.003

## Test report

**FCC Rules and Regulations CFR 47, Part 15, Subpart B & Subpart C (10-1-21 Edition)**  
**ICES-003 Issue 7 (October 2020)**  
**RSS-Gen Issue 5 (April 2018)**

(*) Identification of item tested	e-bike user interface controller
(*) Trademark	Bosch
(*) Model and /or type reference	BRC3800
Other identification of the product	Not Provided
(*) Features	FCC ID: 2AWRC-BRC3800 IC: 26294-BRC3800 HW version: 4.0.1 SW version: EmcAppSW 7.15.0 Features: Bluetooth Low Energy
Manufacturer	Robert Bosch GmbH – eBike Systems Markwiesenstraße 58 72770 Reutlingen, Germany
Test method requested, standard	FCC Rules and Regulations CFR 47, Part 15, Subpart B & Subpart C (10-1-21 Edition) ICES-003 Issue 7 (October 2020) & RSS-Gen Issue 5 (April 2018)
Summary	IN COMPLIANCE
Approved by (name / position & signature)	José Manuel Gómez Industrial & Automotive EMC Lab. Manager
Date of issue	2023-03-27
Report template No	FDT08_24 (*) "Data provided by the client"



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## Acronyms

Acronym ID	Acronym Description
Code	EMC Test Code
Freq Rng	Frequency Range
Line	Conducted Emissions - Tested Line
MP	Measurement Point
OM	Operation Mode
S/	Sample
V	Verdict

## Competences and guarantees

DEKRA Testing and Certification S.A.U. 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 S.A.U. is an FCC-recognized accredited testing laboratory with the appropriate scope of accreditation that covers the performed tests in this report, FCC designation number ES0004.

DEKRA Testing and Certification S.A.U. is an ISED recognized accredited testing laboratory, CABid: ES1909, Company Number: 4621A, with the appropriate scope of accreditation that covers the performed tests in this report.

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

DEKRA Testing and Certification S.A.U. 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 S.A.U. at the time of performance of the test.

DEKRA Testing and Certification S.A.U. 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

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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 S.A.U.
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 S.A.U. and the Accreditation Bodies.

## Uncertainty

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

The total uncertainty of the measurement system for the measured conducted disturbance characteristics of EUT from 150 kHz to 30 MHz is  $I = \pm 3,9$  dB for quasi-peak measurements,  $I = \pm 3,2$  dB for peak measurements ( $k = 2$ ).

The total uncertainty of the measurement system for the measured radio disturbance characteristics of EUT from 30 MHz to 12750 MHz is  $I = \pm 4,7$  dB for quasi-peak measurements,  $I = \pm 4,3$  dB for peak and average measurements ( $k = 2$ ).

## Data provided by the client

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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 an e-bike user interface controller

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

## Usage of samples

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Samples undergoing test have been selected by: The client.

Id	Control Number	Description	Model	Serial N°	Date of Reception	Application
S/01	73655B_12.1	Cable black	--	--	2023-01-30	Auxiliary Element
S/01	73655B_20.1	Bycicle control display	--	28013-0108-01-057-00	2023-01-30	Element Under Test
S/01	73655B_24.1	Bycicle handlebar	--	--	2023-01-30	Auxiliary Element
S/01	73655B_4.1	Load box	--	4065797	2023-01-30	Auxiliary Element

Notes referenced to samples during the project.

## Test sample description

### Test Sample description (compulsory information for EMC and RF testing services)

Ports..... :	Port name and description	Cable					
		Specified max length [m]	Attached during test	Shielded	Coupled to patient <sup>(3)</sup>		
	USB service port (USB-C interface for service)	< 3m	[ ]	[ ]	[ ]		
	System cable connector (Supply+CAN FD) connected to ebike	< 3m	[X]	[ ]	[ ]		
	.....	.....	[ ]	[ ]	[ ]		
	.....	.....	[ ]	[ ]	[ ]		
	.....	.....	[ ]	[ ]	[ ]		
	.....	.....	[ ]	[ ]	[ ]		
Supplementary information to the ports..... :	.....						
Rated power supply .....	Voltage and Frequency		Reference poles				
			L1	L2	L3	N	PE
	[ ]	AC: .....	[ ]	[ ]	[ ]	[ ]	[ ]
	[ ]	AC: .....	[ ]	[ ]	[ ]	[ ]	[ ]
	[X]	DC: USB port, nom. 5 VDC					
[X]	DC: System cable, nom. 13,5 VDC						
Rated Power .....	System cable: max. 2,7 W (13,5 V/ 0,2 A) / USB port: max. 2,5 W (5 V/ 0,5 A)						
Clock frequencies.....	160 MHz, 80 MHz, 53,3 MHz, 48 MHz, 40 MHz, 2 MHz, 1,1 MHz						
Other parameters .....	.....						
Software version .....	EmcAppSW 7.15.0						
Hardware version .....	4.0.1						
Dimensions in cm (W x H x D) .....	85 mm x 54 mm x 60 mm						

Mounting position .....	<input type="checkbox"/>	Table top equipment		
	<input type="checkbox"/>	Wall/Ceiling mounted equipment		
	<input type="checkbox"/>	Floor standing equipment		
	<input type="checkbox"/>	Hand-held equipment		
	<input checked="" type="checkbox"/>	Other: Bicycle handlebar		
Modules/parts.....	Module/parts of test item		Type	Manufacturer
	.....		.....	.....
	.....		.....	.....
	.....		.....	.....
	.....		.....	.....
Accessories (not part of the test item) .....	Description		Type	Manufacturer
	.....		.....	.....
	.....		.....	.....
	.....		.....	.....
	.....		.....	.....
	.....		.....	.....
	.....		.....	.....
Documents as provided by the applicant .....	Description		File name	Issue date
	.....		.....	.....
	.....		.....	.....
	.....		.....	.....
	.....		.....	.....

<sup>(3)</sup> Only for Medical Equipment

## Identification of the client

Bittium Wireless OY  
Ritaharjuntie 1, 90590 Oulu, Finland

## Testing period and place

<b>Test Location</b>	DEKRA Testing and Certification S.A.U.
<b>Date (start)</b>	2023-02-01
<b>Date (finish)</b>	2023-02-15

## Document history

Report number	Date	Description
73655REM.003	2023-03-27	First release



## Environmental conditions

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

<b>Temperature</b>	Min. = 15 °C Max. = 35 °C
<b>Relative humidity</b>	Min. = 30 % Max. = 75 %
<b>Air pressure</b>	Min. = 860mbar Max. = 1060mbar

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

<b>Temperature</b>	Min. = 15 °C Max. = 35 °C
<b>Relative humidity</b>	Min. = 30 % Max. = 75 %
<b>Air pressure</b>	Min. = 860mbar Max. = 1060mbar

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

<b>Temperature</b>	Min. = 15 °C Max. = 35 °C
<b>Relative humidity</b>	Min. = 30 % Max. = 60 %
<b>Air pressure</b>	Min. = 860mbar Max. = 1060mbar

## Remarks and comments

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The tests have been performed by the technical personnel: Armando Moles Tejedor and Raul Alfaya Ruiz.

## Testing verdicts

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Fail	F
Inconclusive	I
Not applicable	N/A
Not measured	N/M
Pass	P
Partial Passed	P*

## List of equipment used during the test

Control No.	Equipment	Model	Manufacturer	Next Calibration
6815	HYBRID BILOG ANTENNA 30MHz-6GHz	3142E	ETS LINDGREN	2025-03-04
7816	EMI TEST RECEIVER 1Hz-26.5GHz	ESW26	ROHDE AND SCHWARZ	2023-11-04
4848	SOFTWARE FOR EMC/RF TESTING	EMC32	ROHDE AND SCHWARZ	---
9360	PRE-AMPLIFIER G>40dB 1-18 GHz	BLMA 0118-1M	BONN ELEKTRONIK	2023-05-11
7743	HORN ANTENNA 0,75-18GHz	3115	ETS LINDGREN	2023-08-24
7614	SEMIANECHOIC ABSORBER LINED CHAMBER V	FACT 3 200 STP	ETS LINDGREN	--
7553	SONDA DE TEMPERATURA Y HUMEDAD RELATIVA / TEMPERATURE AND HUMIDITY PROBE	HWg-STE	HW GROUP	2023-04-19
6204	THREE-PHASE ARTIFICIAL NETWORK 32A	PMM L3-32	NARDA	2023-11-17

## Summary

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Test Specification.	Requirement – Test case	Verdict	Remark
FCC 47 CFR Part 15B	RE Radiated emission. Electromagnetic field measure	Pass	--
FCC 47 CFR Part 15B FCC 47 CFR Part 15C ICES-003 RSS-Gen	CE Continuous conducted emission	Pass	--
<u>Supplementary information and remarks:</u> None			

## Appendix A: Test results

## Appendix A content

DESCRIPTION OF THE OPERATION MODES .....	15
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## Description of the operation modes

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The operation modes described in this paragraph constitute a functionality of the sample under test for itself. Every operation mode takes a failure criteria for the immunity test that they were applying to it and a monitoring to guarantee performance of the same ones.

The operation modes used by the samples to which the present report refers, are shown in the following table:

Id	Description
OM/01	EUT ON. BLE OFF. Communication CAN activated. Power supply EUT: 13.5 Vdc + Auxiliary Power Supply: 115 VAC (Laptop). Equipment in communication with Laptop through USB.
OM/02	EUT ON. BLE OFF. Communication CAN activated. Power supply: 13.5 Vdc.
OM/03	EUT ON. BLE ON in communication with auxiliary Mobile Phone. Communication CAN activated. Power supply EUT: 13.5 Vdc + Auxiliary Power Supply: 115 VAC (Laptop). Equipment in communication with Laptop through USB.

## Test standards version applied

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The product standards and test standards applied for each test cases are shown in the following table:

Product Test Standard	Test standard	Requirement – Test case
FCC CFR 47, Part 15, Subpart B and Subpart C (10-1-21 Edition) & ICES-003 Issue 7 (October 2020) RSS-Gen Issue 5 (April 2018)	ANSI C63.4 (2014)	CE Continuous conducted emission



## Test Cases Details

### FCC 47 CFR Part 15B

#### RE Radiated emission. Electromagnetic field measure

#### Limits

##### Limits of interference Class B

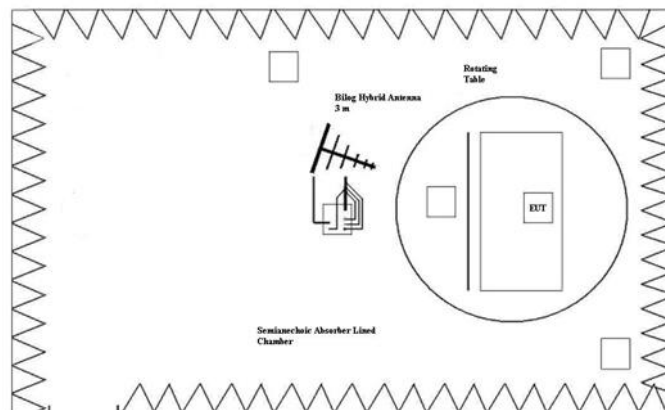
The applied limit for radiated emissions, 3 m distance, according to the requirements of FCC Rules and Regulations 47 CFR Part 15, Subpart B (10-1-21 Edition), Secs. 15.109 & ICES-003 Issue 7 (October 2020)

Frequency range (MHz)	FCC Part 15B		ICES-003 Issue 7		FCC Part 15B & ICES-003 Issue 7	
	QP Limit for 3 m		QP Limit for 3 m		PK Limit for 3 m	AVG Limit for 3 m
	( $\mu\text{V/m}$ )	( $\text{dB}\mu\text{V/m}$ )	( $\mu\text{V/m}$ )	( $\text{dB}\mu\text{V/m}$ )	( $\text{dB}\mu\text{V/m}$ )	( $\text{dB}\mu\text{V/m}$ )
30 to 88	100	40	100	40	---	---
88 to 216	150	43.5	150	43.5	---	---
216 to 230	200	46	200	46	---	---
230 to 960	200	46	224	47		
960 to 1000	500	54	500	54	---	---
Above 1000	---	---	---	---	74	54

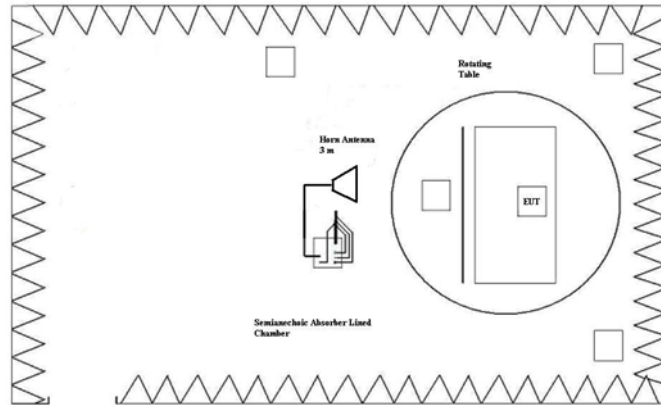
NOTE: FCC QP and AVG limits are in concordance with RSS-Gen Issue 5 (March 2019), Secs. 7.1 and 7.3.

Limits according to FCC Part 15B, are equal or more stringent than those of ICES-003 Issue 7.

#### Setup for measurements



Setup for measurements < 1GHz.



Setup for measurements > 1GHz.

**Results**

S/	OM	Code	Freq Rng (MHz)	V
01	OM/01	RE0101LR	[30, 1000]	P
01	OM/02	RE0101LR	[30, 1000]	P

**Verdict**

Pass

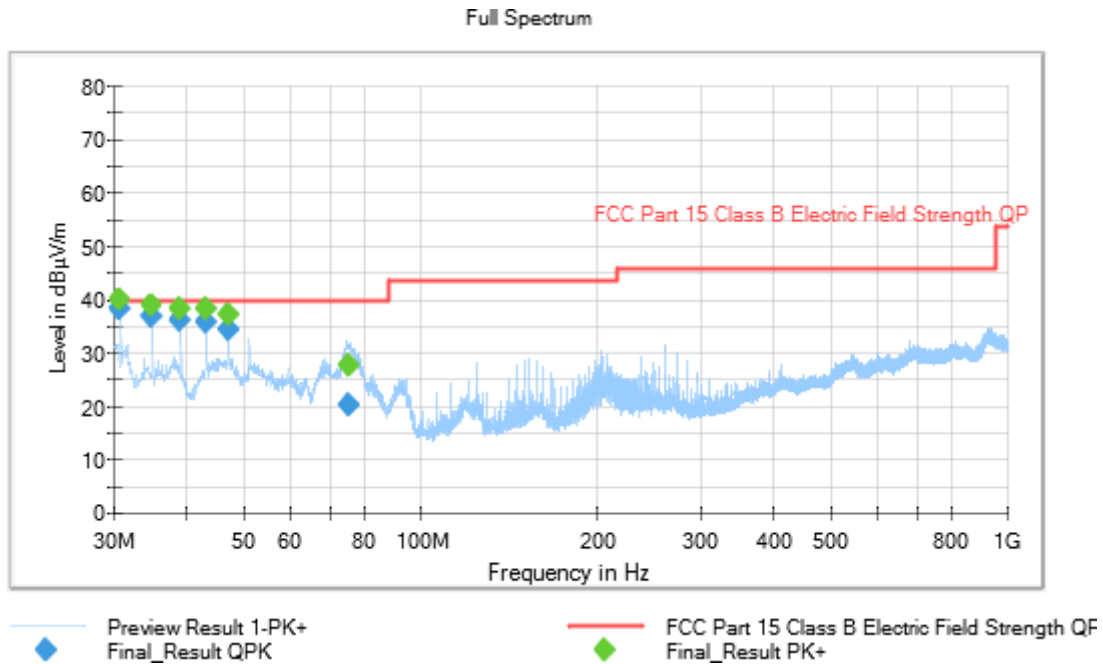
**Attachments**

EMC Test Code = RE0101LR Frequency Range MHz = [30, 1000]

Sample ID: S/01

Operation Mode: OM/01. EUT ON. BLE OFF. Communication CAN activated. Power supply EUT: 13.5 Vdc + Auxiliary Power Supply: 115 VAC (Laptop). Equipment in communication with Laptop through USB.

**Images:**



**Tables:**

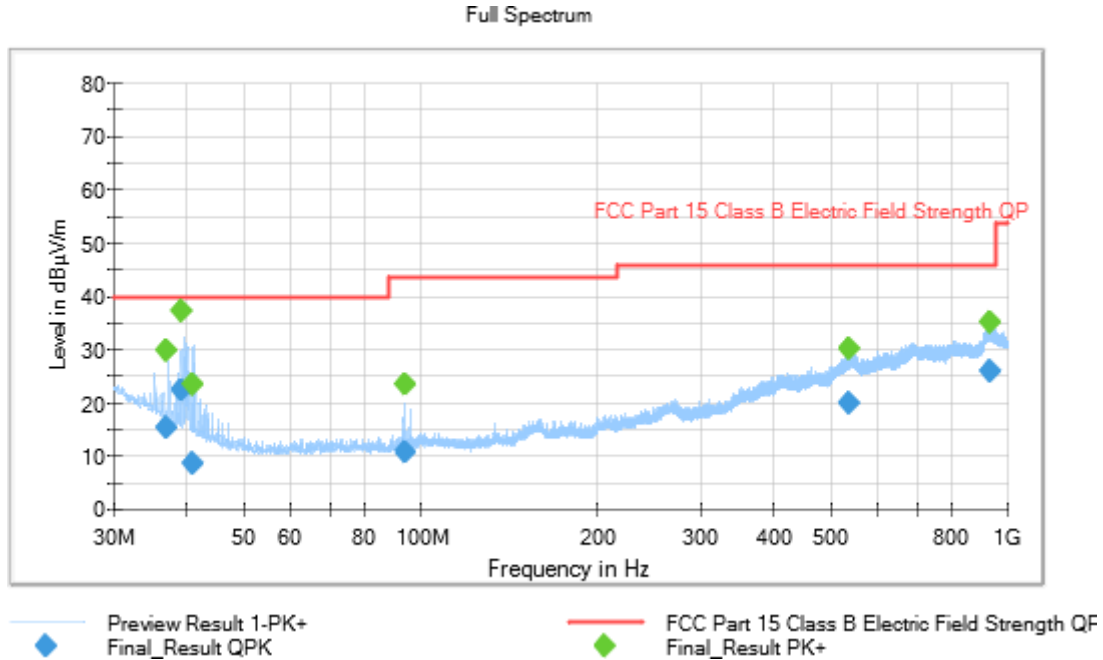
Frequency(MHz)	QuasiPeak(dBµV/m)	MaxPeak(dBµV/m)	Limit(dBµV/m)	Margin(dB)	Height(cm)	Po l	Azimuth(deg)
30.736000	38.19	---	40.00	1.81	100.0	V	99.0
30.736000	---	40.12	---	---	100.0	V	99.0
34.818000	36.92	---	40.00	3.08	104.0	V	98.0
34.818000	---	38.80	---	---	104.0	V	98.0
38.916000	35.99	---	40.00	4.01	100.0	V	108.0
38.916000	---	38.16	---	---	100.0	V	108.0
43.014000	35.84	---	40.00	4.16	100.0	V	126.0
43.014000	---	38.07	---	---	100.0	V	126.0
47.121000	---	37.13	---	---	104.0	V	345.0
47.121000	34.32	---	40.00	5.68	104.0	V	345.0
75.295000	---	27.65	---	---	126.0	V	102.0
75.295000	20.28	---	40.00	19.72	126.0	V	102.0

EMC Test Code = RE0101LR Frequency Range MHz = [30, 1000]

Sample ID: S/01

Operation Mode: OM/02. EUT ON. BLE OFF. Communication CAN activated. Power supply: 13.5 Vdc.

Images:



Tables:

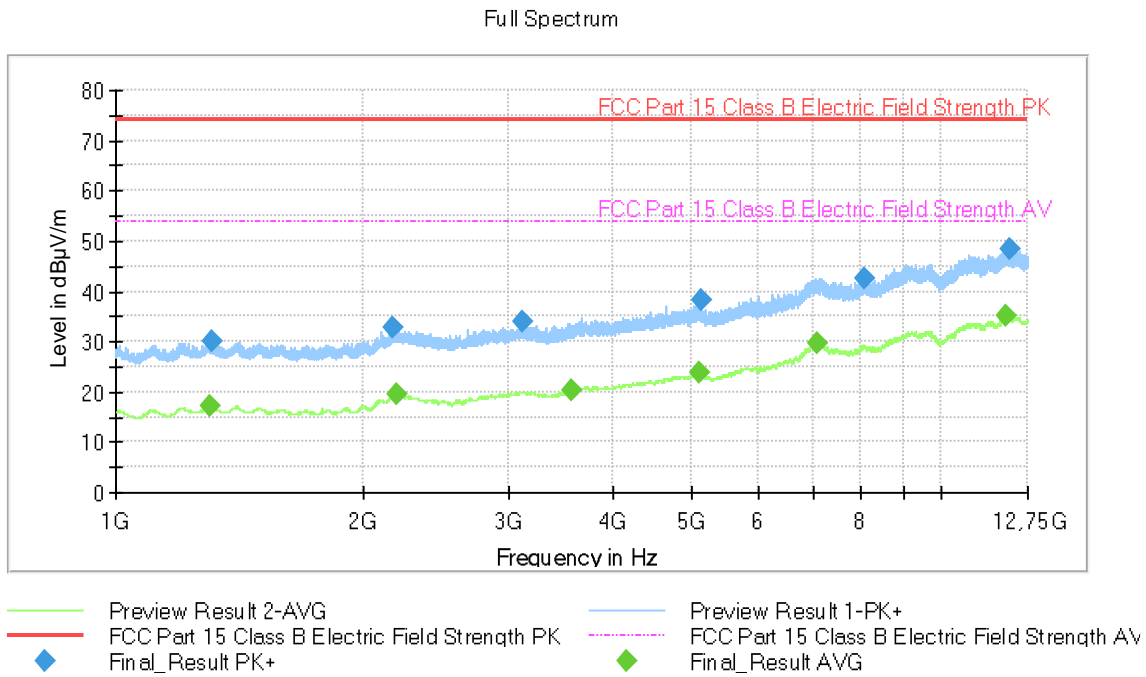
Frequency(MHz)	QuasiPeak(dBµV/m)	MaxPeak(dBµV/m)	Limit(dBµV/m)	Margin(dB)	Height(cm)	Po l	Azimuth(deg)
36.819000	15.14	---	40.00	24.86	100.0	V	153.0
36.819000	---	29.73	---	---	100.0	V	153.0
39.201000	---	37.22	---	---	100.0	V	73.0
39.201000	22.35	---	40.00	17.65	100.0	V	73.0
41.030000	---	23.48	---	---	374.0	V	235.0
41.030000	8.63	---	40.00	31.37	374.0	V	235.0
94.440000	10.45	---	43.52	33.07	108.0	V	157.0
94.440000	---	23.26	---	---	108.0	V	157.0
538.658000	---	30.05	---	---	299.0	V	98.0
538.658000	19.99	---	46.00	26.01	299.0	V	98.0
932.485000	---	35.14	---	---	386.0	V	216.0
932.485000	25.68	---	46.00	20.32	386.0	V	216.0

EMC Test Code = RE0101LR Frequency Range MHz = [1000, 12750]

Sample ID: S/01

Operation Mode: OM/01. EUT ON. BLE OFF. Communication CAN activated. Power supply EUT: 13.5 Vdc + Auxiliary Power Supply: 115 VAC (Laptop). Equipment in communication with Laptop through USB.

Images:



Tables:

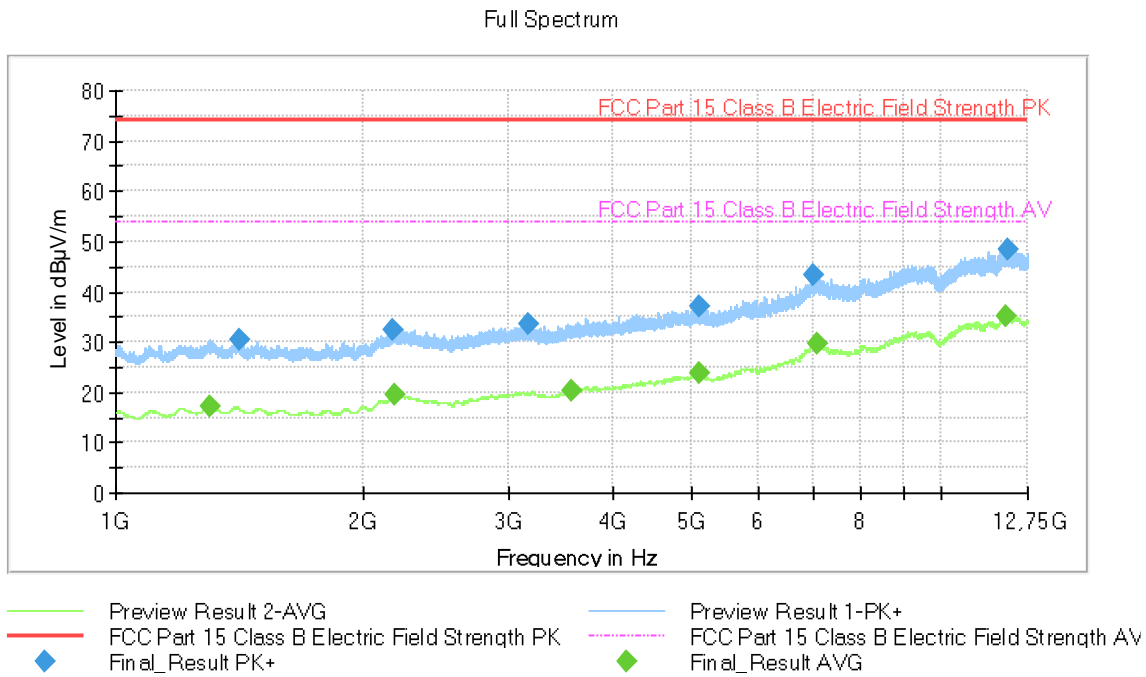
Frequency(MHz)	MaxPeak(dBµV/m)	Average(dBµV/m)	Limit(dBµV/m)	Margin(dB)
1300.000000	---	17.19	53.97	36.78
1311.500000	30.12	---	73.97	43.85
2166.250000	32.69	---	73.97	41.28
2195.250000	---	19.42	53.97	34.55
3107.250000	34.06	---	73.97	39.91
3565.000000	---	20.38	53.97	33.59
5096.750000	---	23.76	53.97	30.21
5142.250000	38.10	---	73.97	35.87
7073.000000	---	29.51	53.97	24.46
8079.250000	42.51	---	73.97	31.46
12021.250000	---	35.15	53.97	18.82
12157.750000	48.35	---	73.97	25.62

EMC Test Code = RE0101LR Frequency Range MHz = [1000, 12750]

Sample ID: S/01

Operation Mode: OM/02. EUT ON. BLE OFF. Communication CAN activated. Power supply: 13.5 Vdc.

Images:



Tables:

Frequency(MHz)	MaxPeak(dBµV/m)	Average(dBµV/m)	Limit(dBµV/m)	Margin(dB)
1299.500000	---	17.20	53.97	36.77
1413.250000	30.54	---	73.97	43.43
2170.000000	32.39	---	73.97	41.58
2180.000000	---	19.44	53.97	34.53
3168.500000	33.59	---	73.97	40.38
3565.000000	---	20.38	53.97	33.59
5090.750000	37.10	---	73.97	36.87
5098.000000	---	23.67	53.97	30.30
7000.000000	43.31	---	73.97	30.66
7070.250000	---	29.50	53.97	24.47
12022.000000	---	35.13	53.97	18.84
12045.250000	48.55	---	73.97	25.42

## CE Continuous conducted emission

### Limits

#### Limits of interference 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 & C (10-1-21 Edition), Secs. 15.107 & 15.207 & ICES-003 Issue 6 (April 2019), in the frequency range 0,15 to 30 MHz, for Class B equipment was:

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

### Results

S/	OM	Code	Freq Rng (MHz)	Line	V
01	OM/01	CE0101L1	[0.15, 30]	L1	P
01	OM/01	CE0101L1	[0.15, 30]	N	P
01	OM/03	CE0103L1	[0.15, 30]	L1	P
01	OM/03	CE0103L1	[0.15, 30]	N	P

### Verdict

Pass

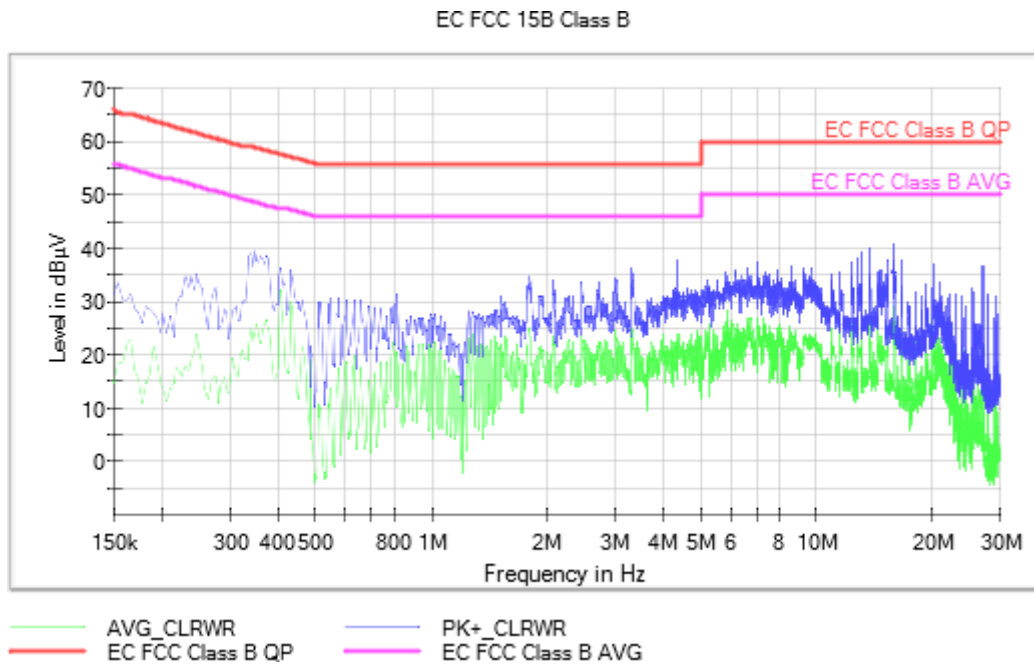
**Attachments**

EMC Test Code = CE0101L1                      Frequency Range MHz = [0.15, 30]  
 Conducted Emissions - Tested Line = L1

Sample ID: S/01

Operation Mode: OM/01. EUT ON. BLE OFF. Communication CAN activated. Power supply EUT: 13.5 Vdc + Auxiliary Power Supply: 115 VAC (Laptop). Equipment in communication with Laptop through USB.

**Images:**



**Tables:**

Frequency(MHz)	PK+_CLRWR(dBµV)	AVG_CLRWR(dBµV)	Line
0.246000	35.2	23.8	L1
0.350000	39.6	24.4	L1
0.434000	36.2	29.8	L1
0.814000	31.3	20.5	L1
1.810000	34.7	24.6	L1
3.310000	36.5	25.2	L1
4.382000	37.9	22.1	L1
7.006000	37.4	27.2	L1
15.918000	41.0	29.2	L1
20.246000	37.1	25.5	L1



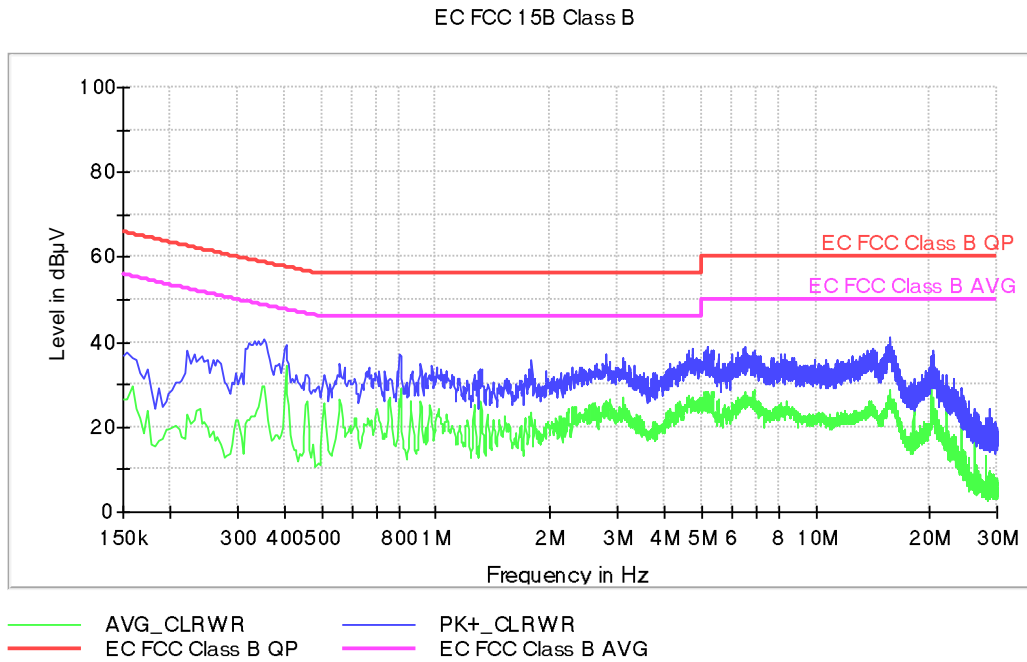
EMC Test Code = CE0101N                      Frequency Range MHz = [0.15, 30]

Conducted Emissions - Tested Line = L1

Sample ID: S/01

Operation Mode: OM/01. EUT ON. BLE OFF. Communication CAN activated. Power supply EUT: 13.5 Vdc + Auxiliary Power Supply: 115 VAC (Laptop). Equipment in communication with Laptop through USB.

**Images:**



**Tables:**

Frequency(MHz)	PK+_CLRWR(dBµV)	AVG_CLRWR(dBµV)	Line
0.222000	38.1	23.2	N
0.354000	40.5	29.5	N
0.558000	35.1	26.7	N
0.798000	37.2	26.5	N
1.786000	36.0	22.5	N
2.798000	37.3	26.1	N
5.170000	38.9	26.8	N
6.546000	38.8	27.5	N
15.630000	41.0	28.7	N
20.434000	38.0	25.8	N

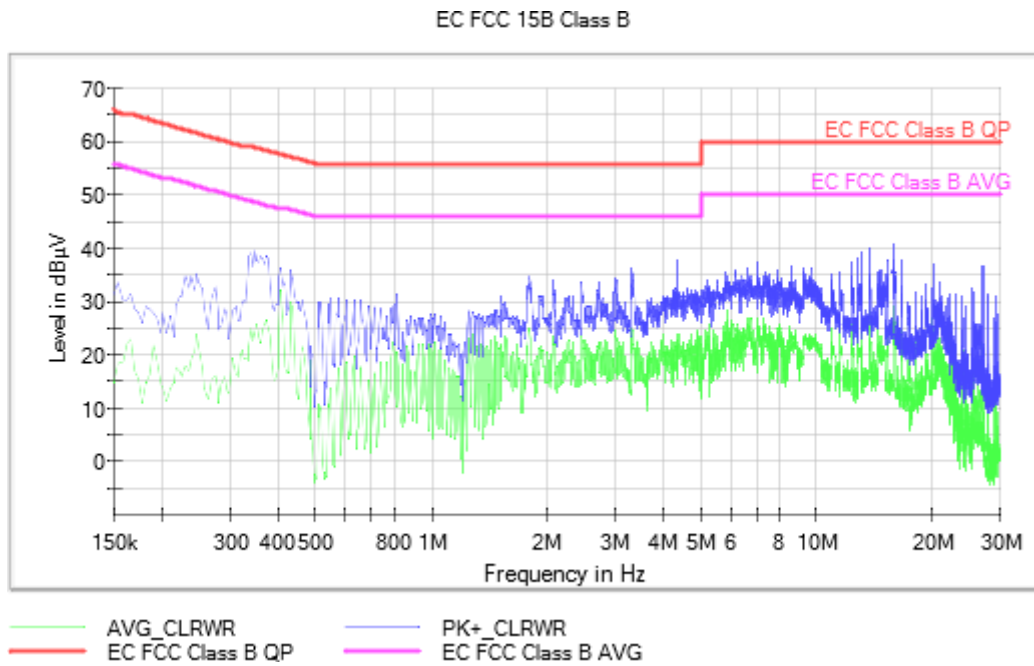
EMC Test Code = CE0103L1                      Frequency Range MHz = [0.15, 30]

Conducted Emissions - Tested Line = L1

Sample ID: S/01

Operation Mode: OM/03. EUT ON. BLE ON in communication with auxiliary Mobile Phone. Communication CAN activated. Power supply EUT: 13.5 Vdc + Auxiliary Power Supply: 115 VAC (Laptop). Equipment in communication with Laptop through USB.

**Images:**



**Tables:**

Frequency(MHz)	PK+_CLRWR(dBµV)	AVG_CLRWR(dBµV)	Line
0.246000	35.5	23.6	L1
0.350000	39.2	24.0	L1
0.434000	35.9	30.1	L1
0.814000	31.5	20.3	L1
1.810000	33.9	24.9	L1
3.310000	36.7	25.0	L1
4.382000	38.1	21.9	L1
7.006000	37.1	27.4	L1
15.918000	39.8	28.8	L1
20.246000	36.9	25.4	L1

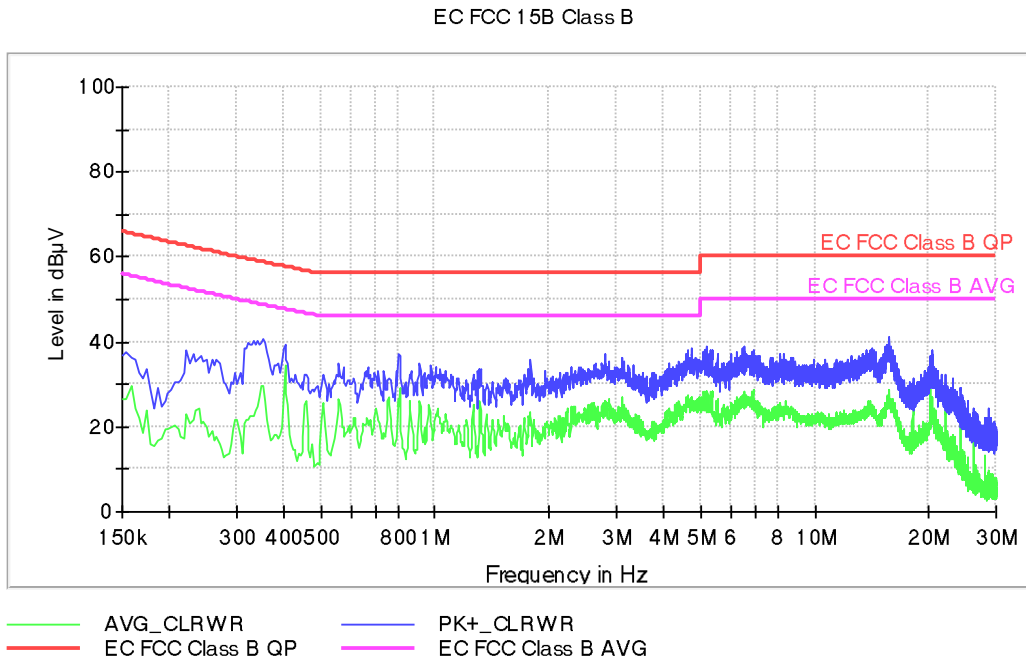
EMC Test Code = CE0103N                      Frequency Range MHz = [0.15, 30]

Conducted Emissions - Tested Line = L1

Sample ID: S/01

Operation Mode: OM/03. EUT ON. BLE ON in communication with auxiliary Mobile Phone. Communication CAN activated. Power supply EUT: 13.5 Vdc + Auxiliary Power Supply: 115 VAC (Laptop). Equipment in communication with Laptop through USB.

**Images:**



**Tables:**

Frequency(MHz)	PK+_CLRWR(dBµV)	AVG_CLRWR(dBµV)	Line
0.222000	37.9	23.1	N
0.354000	40.3	29.2	N
0.558000	35.4	26.9	N
0.798000	36.9	25.9	N
1.786000	35.8	22.1	N
2.798000	37.1	25.9	N
5.170000	39.1	26.4	N
6.546000	38.6	27.3	N
15.630000	40.8	28.6	N
20.434000	37.8	25.4	N