

Test report No:
NIE: 63999REM.002A1

Test report

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

(*) Identification of item tested	e-bike user interface controller
(*) Trademark	Bosch
(*) Model and /or type reference	BRC3600
Other identification of the product	FCC ID: 2AWRC-BRC3600 IC: 26294-BRC3600 HW version: 5.0.2 SW version: 0.27.0-pi21-03-4-31-g8fb671f6
(*) Features	Bluetooth Low Energy
Manufacturer	Robert Bosch GmbH – eBike Systems Gerhard-Kindler-Strasse 3 72770 Reutlingen, Germany
Test method requested, standard	FCC Rules and Regulations CFR 47, Part 15, Subpart B (10-1-19 Edition) & ICES-003 Issue 6 (April 2019)
Summary	IN COMPLIANCE
Approved by (name / position & signature)	José Manuel Gómez Industrial & Automotive EMC Lab. Manager 
Date of issue	2021-07-02
Report template No	FDT08_23 (*) "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
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.

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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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.
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Uncertainty

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 1000 MHz is $I = \pm 4,9$ dB for quasi-peak measurements, $I = \pm 4,6$ 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 $I = \pm 2,6$ 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 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

Samples undergoing test have been selected by: The client.

Id	Control Number	Description	Model	Serial N°	Date of Reception	Application
S/01	63999B_13.1	E-bike device (RF RADIATED)	--	07817-0096	2021-03-05	Element Under Test
S/02	63999B_25.1	E-bike device	BRC3600	08004-0074-01- A10	2021-04-15	Element Under Test
S/02	63999B_9.1	USB cable	--	--	2021-03-05	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 ⁽³⁾		
	USB service port (USB-C interface for service)	< 3m	[X]*	[]	[]		
	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. 5VDC					
[X]	DC: System cable, nom. 13,5VDC						
Rated Power	System cable: max. 4,8W (16V/0,3A) / USB port: max. 3W (5V/0,6A)						
Clock frequencies.....	110MHz, 55MHz, 48MHz, 2MHz, 1.1MHz						
Other parameters							
Software version	0.27.0-pi21-03-4-31-g8fb671f6						
Hardware version	HW 5.0.2						
Dimensions in cm (W x H x D)	72,8 x 53,2 x 34,3 mm						
Mounting position	[]	Table top equipment					

	☐	Wall/Ceiling mounted equipment		
	☐	Floor standing equipment		
	☐	Hand-held equipment		
	☒	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
				
				
				
				

⁽³⁾ Only for Medical Equipment

*Harness attached depends of Operational Mode.

Identification of the client

Bittium Wireless OY
Ritaharjuntie 1,
90590 Oulu, Finland

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2021-03-09
Date (finish)	2021-04-22

Document history

Report number	Date	Description
63999REM.002	2021-05-11	First release
63999REM.002A1	2021-07-02	Second release: it was corrected a typo in page 15. This report modification, cancels and replaces the test report with NIE: 63999REM.002

Environmental conditions

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

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 30 % Max. = 75 %

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

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 30 % Max. = 75 %

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

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 30 % Max. = 60 %

Remarks and comments

The tests have been performed by the technical personnel: Alejandro Marin Chorro, Juan Manuel Pino Blanco and Víctor Manuel Tamayo Olea.

Testing verdicts

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

List of equipment used during the test

Control Number	Description	Model	Manufacturer	Next Calibration
3545	USB TEMPERATURE AND HUMIDITY SENSOR	HUMIDIPROBE	PICO TECHNOLOGY	2021-04-22
4575	ETHERNET TEMPERATURE AND HUMIDITY LOGGER	TR-702W	T&D	2021-04-22
7769	PREAMPLIFIER 30dB 500MHz-18GHz	BBV 9718 C	SCHWARZBECK	2021-01-09
1935	EMI TEST RECEIVER	ESPI3	ROHDE & SCHWARZ	2022-02-05
7007	HORN ANTENNA 18-40GHz	BBHA 9170	SCHWARZBECK	2021-05-24
7614	SEMIANECHOIC ABSORBER LINED CHAMBER V	FACT 3 200 STP	ETS LINDGREN	---
7743	HORN ANTENNA 0,75-18GHz	3115	ETS LINDGREN	2023-08-24
6666	EMI TEST RECEIVER 2Hz-44GHz	ESW44	ROHDE AND SCHWARZ	2022-02-05
6815	HYBRID BILOG ANTENNA 30MHz-6GHz	3142E	ETS LINDGREN	2022-02-01
7816	EMI TEST RECEIVER 2Hz-44GHz	ESW26	ROHDE AND SCHWARZ	2021-09-05
7746	HYBRID BILOG ANTENNA 30MHz-6GHz	3142E	ETS LINDGREN	2022-07-11
2873	THREE-PHASE ARTIFICIAL V-NETWORK 500A	NNLK8130	SCHWARZBECK MESS-ELEKTRONIK	2021-06-17

Summary

Test Specification.	Requirement – Test case	Verdict	Remark
FCC 47 CFR Part 15B	CE Continuous conducted emission	Pass	
FCC 47 CFR Part 15B	RE Radiated emission. Electromagnetic field measure	Pass	

Supplementary information and remarks:

None

Appendix A: Test results

Appendix A context

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Description of the operation modes

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. Communication CAN active. BLE off. Power supply: 12 Vdc.
OM/02	EUT ON. Charging Battery and transferring data through USB port. BLE off. Power supply: 5Vdc via USB through a Laptop (Powered at 115 VAC).
OM/03	EUT ON. Charging Battery and transferring data through USB port. BLE Connected. Power supply: 5Vdc via USB through a Laptop (Powered at 115 VAC).

Test standards version applied

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(10-1-19 Edition) Secs. 15.109 & ICES-003 Issue 6 (April 2019). ANSI C63.4 (2014)	ANSI C63.4 (2014)	RE Radiated emission.
FCC CFR 47, Part 15, Subpart B (10-1-19 Edition) Secs. 15.107 & ICES-003 Issue 6 (April 2019) ANSI C63.4 (2014)	ANSI C63.4 (2014)	CE Continuous conducted emission

Test Cases Details

FCC 47 CFR Part 15B

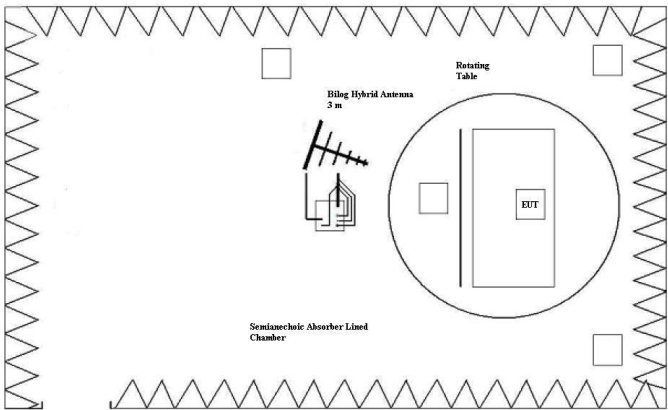
RE Radiated emission. Electromagnetic field measure

Limits

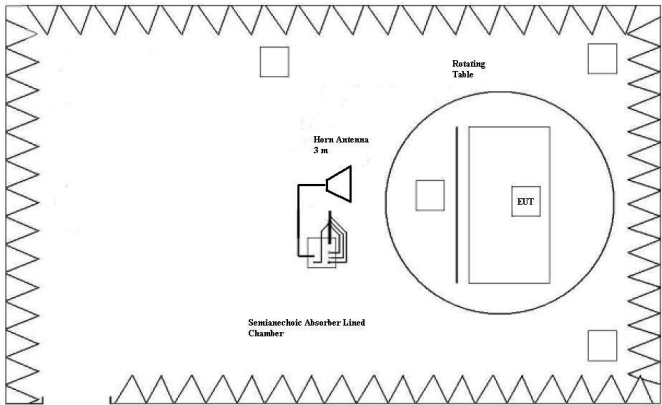
Limits of interference Class B

The applied limit for radiated emissions, 3 m distance, according 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
*Above 1GHz, the limit is defined for an AVG detector.	



Setup for measurements < 1GHz.



Setup for measurements > 1GHz.

Results

SI	OM	Code	Freq Rng (MHz)	V
01	OM/01	RE0101HR	[1000, 12750]	P
01	OM/01	RE0101LR	[30, 1000]	P
02	OM/02	RE0202HR	[1000, 12750]	P
02	OM/02	RE0202LR	[30, 1000]	P

Verdict

Pass

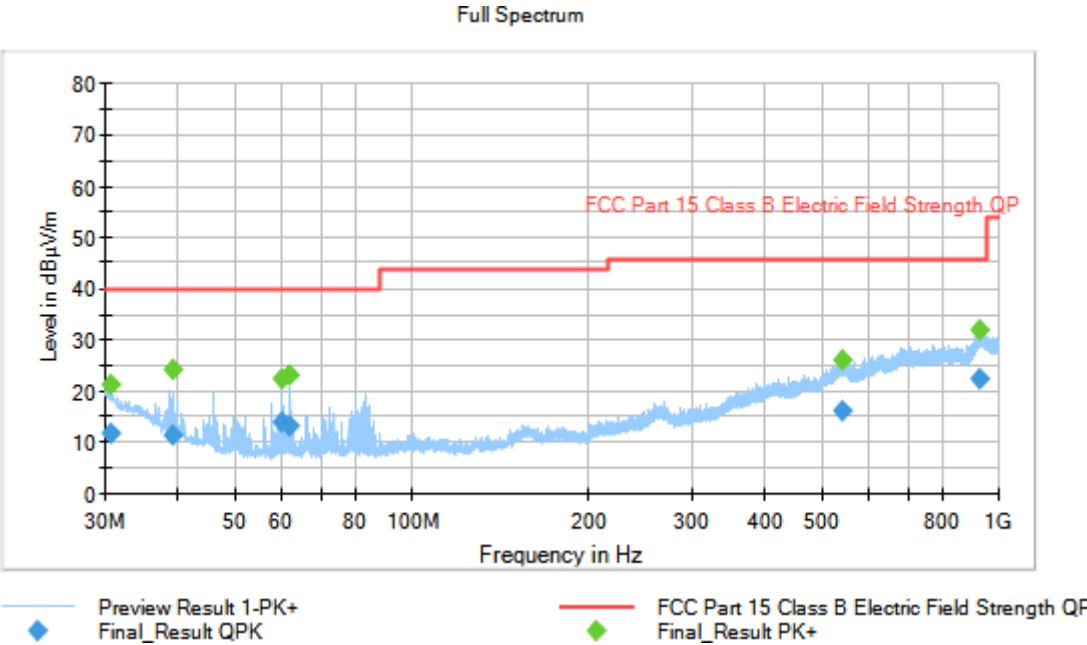
Attachments

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

Sample ID: S/01

Operation Mode: OM/01. EUT ON. Communication CAN active. BLE off. Power supply: 12 Vdc..

Images:



Documents:

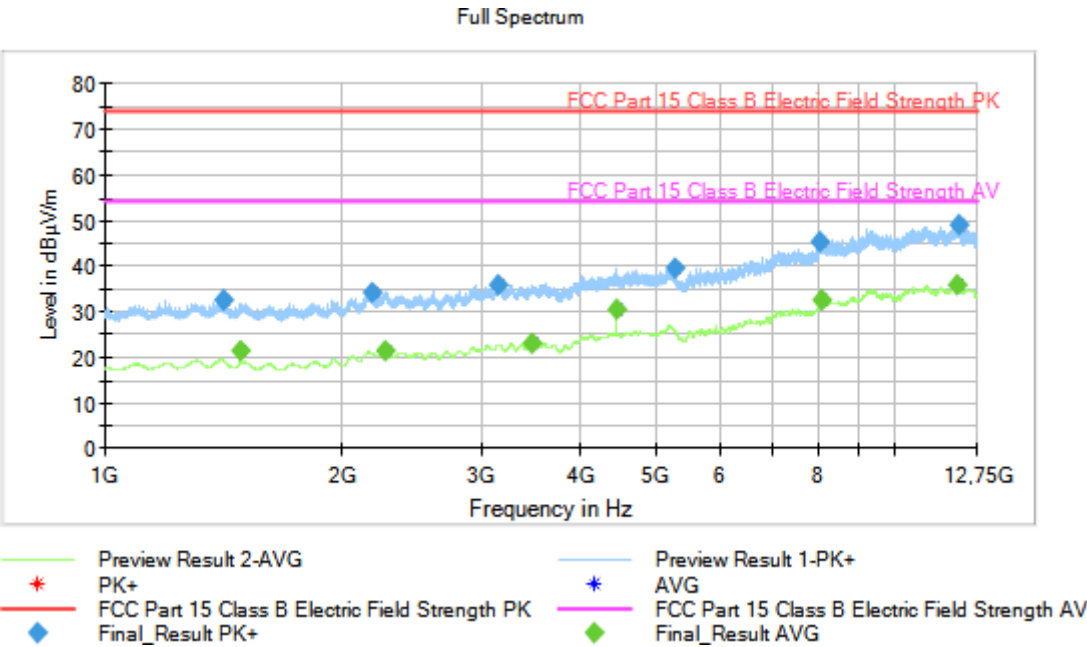
Frequency (MHz)	QuasiPeak (dBµV/m)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)
30.585420	---	21.16	---	---	218.0	H	294.0
30.585420	11.68	---	40.00	28.32	218.0	H	294.0
39.004000	---	24.32	---	---	100.0	V	286.0
39.004000	11.45	---	40.00	28.55	100.0	V	286.0
59.988000	---	22.38	---	---	100.0	V	62.0
59.988000	13.82	---	40.00	26.18	100.0	V	62.0
61.943000	---	23.26	---	---	120.0	V	0.0
61.943000	13.16	---	40.00	26.84	120.0	V	0.0
542.929000	---	26.19	---	---	173.0	V	110.0
542.929000	16.28	---	46.00	29.72	173.0	V	110.0
931.859000	---	31.93	---	---	189.0	V	223.0
931.859000	22.43	---	46.00	23.57	189.0	V	223.0

EMC Test Code = RE0101HR, Frequency Range MHz = [1000, 12750]

Sample ID: S/01

Operation Mode: OM/01. EUT ON. Communication CAN active. BLE off. Power supply: 12 Vdc..

Images:



Documents:

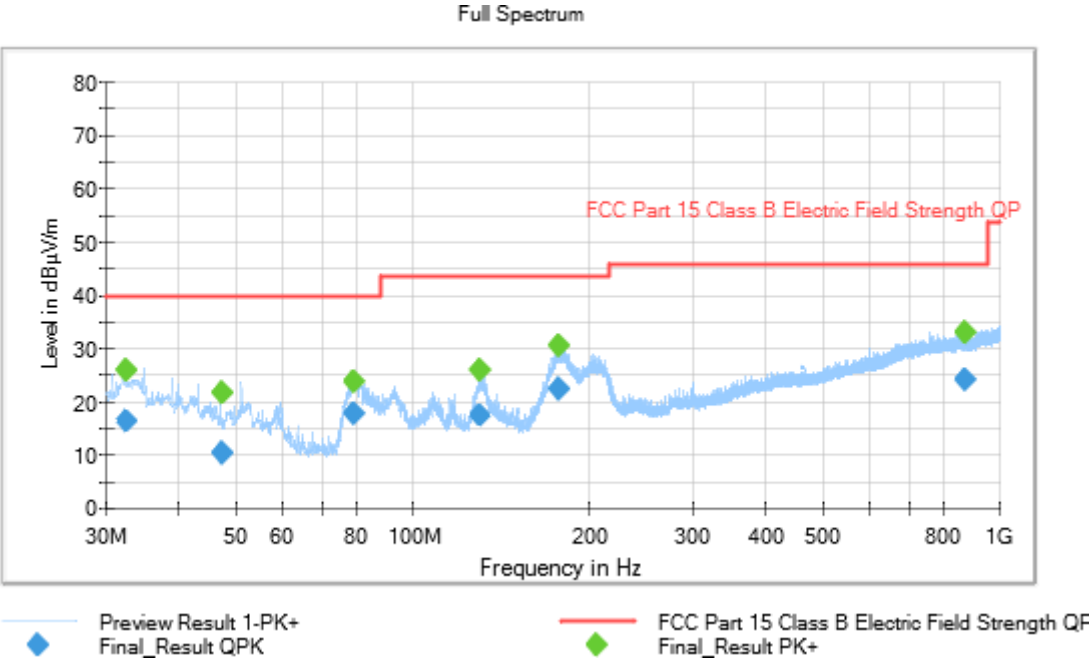
Frequency(MHz)	MaxPeak(dBµV/m)	Average(dBµV/m)	Limit(dBµV/m)	Margin(dB)
1412.800000	32.60	---	73.97	41.37
1484.800000	---	21.28	53.97	32.69
2174.400000	34.29	---	73.97	39.68
2261.600000	---	21.41	53.97	32.56
3154.800000	35.90	---	73.97	38.07
3478.400000	---	23.16	53.97	30.81
4454.800000	---	30.67	53.97	23.30
5260.800000	39.70	---	73.97	34.27
8047.200000	45.40	---	73.97	28.57
8098.800000	---	32.52	53.97	21.45
11979.600000	---	36.04	53.97	17.93
12064.400000	48.93	---	73.97	25.04

EMC Test Code = RE0202LR, Frequency Range MHz = [30, 1000]

Sample ID: S/02

Operation Mode: OM/02. EUT ON. Charging Battery and transferring data through USB port. BLE off. Power supply: 5Vdc via USB through a Laptop (Powered at 115 VAC).

Images:



Documents:

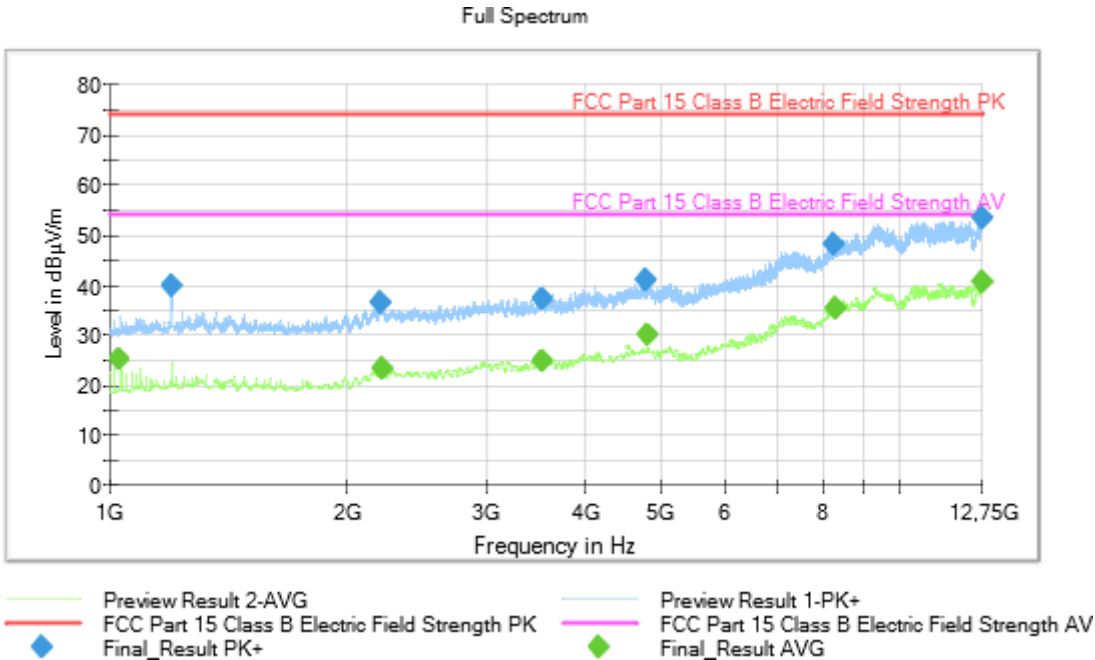
Frequency (MHz)	QuasiPeak (dBµV/m)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)
32.636000	16.22	---	40.00	23.78	292.0	V	248.0
32.636000	---	25.81	---	---	292.0	V	248.0
47.480000	10.22	---	40.00	29.78	285.0	V	269.0
47.480000	---	21.64	---	---	285.0	V	269.0
79.225000	---	23.76	---	---	100.0	V	39.0
79.225000	17.81	---	40.00	22.19	100.0	V	39.0
129.907000	---	25.99	---	---	200.0	H	165.0
129.907000	17.33	---	43.52	26.19	200.0	H	165.0
178.263000	---	30.31	---	---	168.0	H	9.0
178.263000	22.30	---	43.52	21.22	168.0	H	9.0
873.609000	---	32.78	---	---	297.0	V	98.0
873.609000	24.11	---	46.00	21.89	297.0	V	98.0

EMC Test Code = RE0202HR, Frequency Range MHz = [1000, 12750]

Sample ID: S/02

Operation Mode: OM/02. EUT ON. Charging Battery and transferring data through USB port. BLE off. Power supply: 5Vdc via USB through a Laptop (Powered at 115 VAC).

Images:



Documents:

Frequency(MHz)	MaxPeak(dBµV/m)	Average(dBµV/m)	Limit(dBµV/m)	Margin(dB)
1030.000000	---	25.22	53.97	28.75
1197.600000	39.65	---	73.97	34.32
2206.400000	36.25	---	73.97	37.72
2214.800000	---	23.19	53.97	30.78
3535.600000	37.28	---	73.97	28.17
3535.600000	---	24.82	53.97	29.15
4787.200000	41.03	---	73.97	32.94
4806.000000	---	29.96	53.97	24.01
8277.200000	48.14	---	73.97	25.83
8332.800000	---	35.16	53.97	18.81
12741.600000	53.51	---	73.97	20.46
12749.600000	---	40.44	53.97	13.53

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 (10-1-19 Edition), Secs. 15.107 & ICES-003 Issue 6 (April 2019), in the frequency range 0,15 to 30 MHz, for Class B equipment was:

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

Results

SI	OM	Code	Freq Rng (MHz)	Line	V
02	OM/02	CE0202L	[0.15, 30]	L1	P
02	OM/02	CE0202N	[0.15, 30]	N	P
02	OM/03	CE0203L	[0.15, 30]	L1	P
02	OM/03	CE0203N	[0.15, 30]	N	P

Verdict

Pass

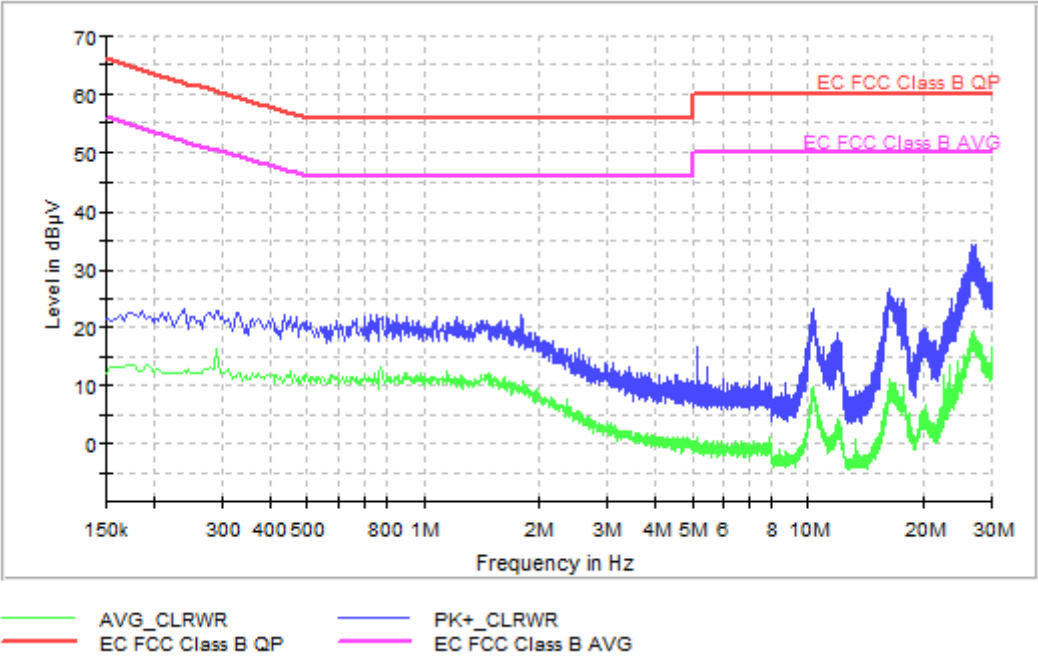
Attachments

EMC Test Code = CE0202L, Frequency Range MHz = [0.15, 30], Conducted Emissions - Tested Line = L1

Sample ID: S/02

Operation Mode: OM/02. EUT ON. Charging Battery and transferring data through USB port. BLE off. Power supply: 5Vdc via USB through a Laptop (Powered at 115 VAC).

Images:



Documents:

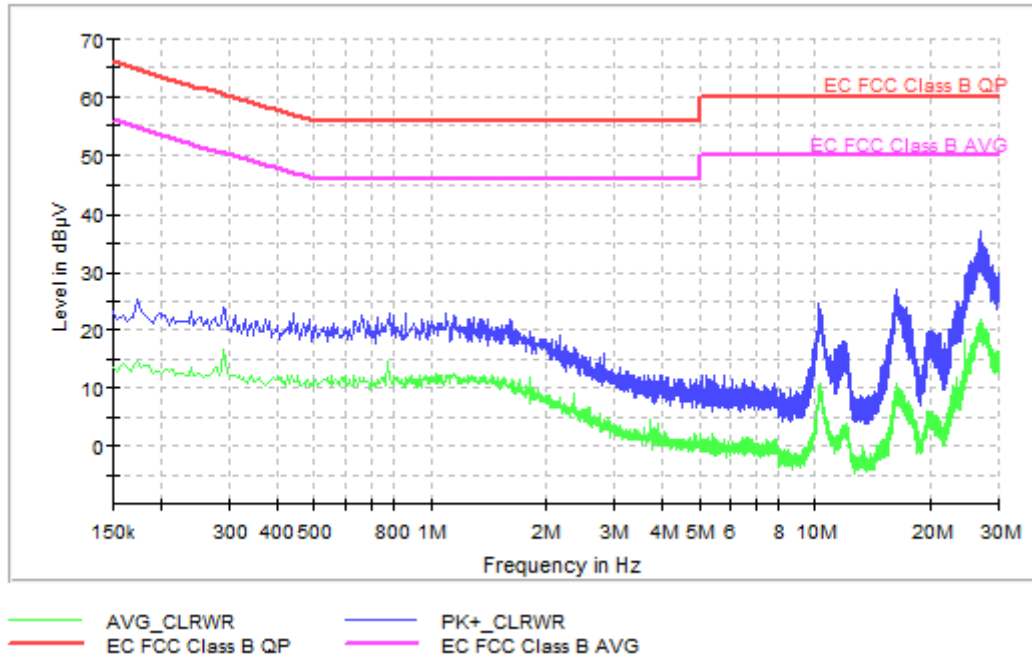
Frequency(MHz)	Peak (dBµV)	Average (dBµV)	Line
0.238000	22.9	12.8	L1
0.294000	22.8	14.3	L1
0.730000	22.2	10.9	L1
0.754000	22.2	11.1	L1
1.774000	22.2	9.7	L1
2.170000	17.5	7.3	L1
5.142000	16.4	1.0	L1
10.314000	23.1	9.8	L1
16.222000	26.8	10.5	L1
26.562000	34.1	17.3	L1

EMC Test Code = CE0202N, Frequency Range MHz = [0.15, 30], Conducted Emissions - Tested Line = N

Sample ID: S/02

Operation Mode: OM/02. EUT ON. Charging Battery and transferring data through USB port. BLE off. Power supply: 5Vdc via USB through a Laptop (Powered at 115 VAC).

Images:



Documents:

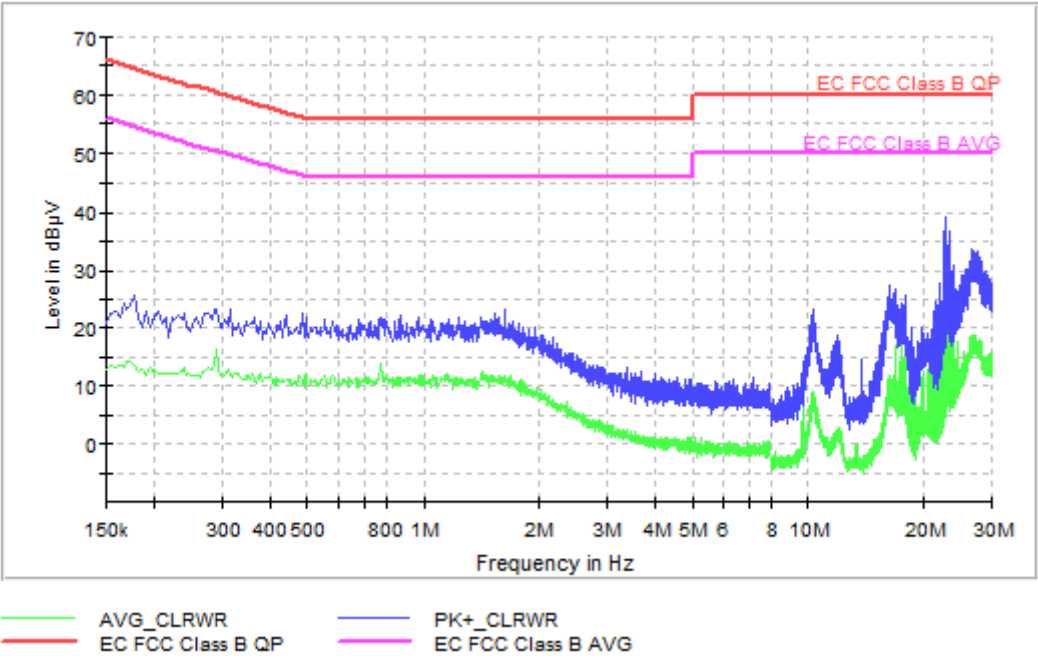
Frequency(MHz)	Peak (dBµV)	Average (dBµV)	Line
0.174000	25.4	14.7	N
0.290000	23.9	16.6	N
0.442000	22.6	11.0	N
0.782000	22.8	11.5	N
1.294000	22.0	11.7	N
2.186000	19.1	8.4	N
5.806000	12.5	0.9	N
10.234000	24.5	8.5	N
16.410000	26.9	10.6	N
26.710000	36.9	20.7	N

EMC Test Code = CE0203L, Frequency Range MHz = [0.15, 30], Conducted Emissions - Tested Line = L1

Sample ID: S/02

Operation Mode: OM/03. EUT ON. Charging Battery and transferring data through USB port. BLE Connected.
Power supply: 5Vdc via USB through a Laptop (Powered at 115 VAC).

Images:



Documents:

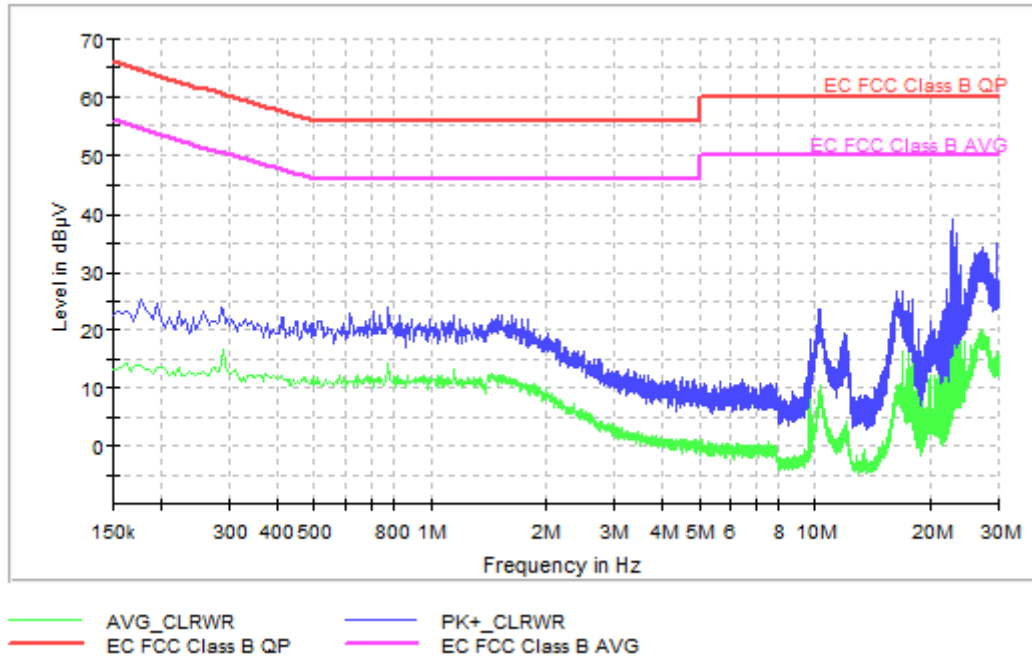
Frequency(MHz)	Peak (dBµV)	Average (dBµV)	Line
0.178000	25.5	13.7	L1
0.314000	23.5	12.4	L1
0.482000	22.4	11.1	L1
0.874000	22.1	11.4	L1
1.626000	23.0	10.7	L1
2.182000	18.6	7.2	L1
3.658000	12.7	1.5	L1
10.322000	22.9	8.2	L1
16.262000	27.3	11.0	L1
22.710000	38.9	37.7	L1

EMC Test Code = CE0203N, Frequency Range MHz = [0.15, 30], Conducted Emissions - Tested Line = N

Sample ID: S/02

Operation Mode: OM/03. EUT ON. Charging Battery and transferring data through USB port. BLE Connected.
Power supply: 5Vdc via USB through a Laptop (Powered at 115 VAC).

Images:



Documents:

Frequency(MHz)	Peak (dBµV)	Average (dBµV)	Line
0.178000	25.4	13.9	N
0.286000	24.1	14.5	N
0.710000	23.3	11.3	N
0.778000	23.9	14.2	N
1.534000	22.5	11.4	N
2.122000	18.6	7.6	N
3.674000	12.0	1.3	N
10.262000	23.8	8.1	N
16.358000	26.5	10.3	N
22.710000	39.0	37.6	N