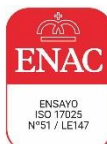


Test report No:
NIE: 65881REM.002A1

Test report

FCC Rules and Regulations CFR 47, Part 15, Subpart B
(10-1-20 Edition) & ICES-003 Issue 7 (October 2020)

(*) Identification of item tested	Prototyping Platform
(*) Trademark	Nordic Thingy:53
(*) Model and /or type reference	Thingy:53
Other identification of the product	FCC ID: 2ANPOTHINGY53 IC: Not provided HW version: v0.8.0 SW version: v1.0.0
(*) Features	Bluetooth LE, 802.15.4
Manufacturer	Nordic Semiconductor ASA Otto Nielsens Veg 12, 7052 Trondheim, Norway
Test method requested, standard	FCC Rules and Regulations CFR 47, Part 15, Subpart B (10-1-20 Edition) & ICES-003 Issue 7 (October 2020)
Summary	IN COMPLIANCE
Approved by (name / position & signature)	Rafael López Martín EMC Consumer & RF Lab. Manager
Date of issue	2022-06-20
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
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, 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

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

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 Battery operated prototyping platform based around the nRF5340 nRF5340 is an ultra-low power wireless System on Chip (SoC) with a multiprotocol 2.4 GHz transceiver.

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	65881B_1.1	THINGY:53 device	--	--	2021-06-17	Element Under Test

Notes referenced to samples during the project: None

Test sample description

Ports..... :	Port name and description	Cable					
		Specified max length [m]	Attached during test	Shielded	Coupled to patient ⁽³⁾		
	Current Measurement and Debug port		☐	☐	☐		
	USB port	< 3m	☒	☐	☐		
	External board connector		☐	☐	☐		
	Programming connector		☐	☐	☐		
Supplementary information to the ports..... :	Current Measurement and Debug port, External board connector and Programming connector are disabled for final user.						
Rated power supply	Voltage and Frequency		Reference poles				
			L1	L2	L3	N	PE
		AC:					
	x	DC: 1350mAh Li-po Battery, Nominal voltage 3.7V OR through USB					
Rated Power	TBD						
Clock frequencies.....	TBD						
Other parameters	--						
Software version	v1.0.0						
Hardware version	v.0.8.0						
Dimensions in cm (W x H x D)	6cm x 2,4cm x 6,4cm						
Mounting position	X	Table top equipment					
		Wall/Ceiling mounted equipment					
		Floor standing equipment					
	X	Hand-held equipment					
		Other:					

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

Identification of the client

Nordic Semiconductor ASA
Otto Nielsens Veg 12, 7052 Trondheim, Norway

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2021-06-24
Date (finish)	2021-08-09

Document history

Report number	Date	Description
65881REM.002	2022-05-16	First release
65881REM.002A1	2022-06-14	Second release. Typographic error. This modification test report cancels and replaces the test report 65881REM.002s.
65881REM.002A2	2022-06-20	Third release. Added information on DUT ports. This modification test report cancels and replaces the test report 65881REM.002A1s.

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 %
Air pressure	Min. = 860mbar Max. = 1060mbar

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 %
Air pressure	Min. = 860mbar Max. = 1060mbar

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 %
Air pressure	Min. = 860mbar Max. = 1060mbar

Remarks and comments

The tests have been performed by the technical personnel: José Antonio Santiago Galván and Salvador Cuellar Guerrero.

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
3547	TEMPERATURE AND HUMIDITY PROBE	HUMIDIPROBE	PICO TECHNOLOGY	2022-04-14
4659	PRE-AMPLIFIER G>28dB 1-18GHz	BBV 9718	SCHWARZBECK	2022-07-09
5151	TRANSIENT LIMITER 10DB N CONNECTOR	VTSD 9561-F	SCHWARZBECK	2022-10-18
6135	TEMPERATURE AND HUMIDITY PROBE	HWg-STE	HW GROUP	2022-04-07
6142	PRE-AMPLIFIER G>38dB 30MHz-6GHz	BLNA 0360-01N	BONN ELEKTRONIK	2022-03-08
6204	THREE-PHASE ARTIFICIAL NETWORK 32A	PMM L3-32	NARDA	2022-09-27
7553	TEMPERATURE AND HUMIDITY PROBE	HWg-STE	HW GROUP	2022-04-12
7743	HORN ANTENNA 0,75-18GHz	3115	ETS LINDGREN	2023-08-24
7746	HYBRID BILOG ANTENNA 30MHz-6GHz	3142E	ETS LINDGREN	2023-07-23
7816	EMI TEST RECEIVER 1Hz-26.5GHz	ESW26	ROHDE AND SCHWARZ	2023-11-04
8150	SEMIANECHOIC ABSORBER LINED CHAMBER I	FACT 10	ETS LINDGREN	---
8825	EMI TEST RECEIVER 9kHz-7GHz	ESR7	ROHDE AND SCHWARZ	2023-07-15

Summary

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

Appendix A: Test results

Appendix A content

DESCRIPTION OF THE OPERATION MODES14

TEST STANDARDS VERSION APPLIED15

TEST CASES DETAILS16

RE Radiated emission. Electromagnetic field measure16

CE Continuous conducted emission20

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:

Id	Description
OM/01	EUT ON. EUT in RX mode transferring data with a laptop through USB port. Power supply: 5 Vdc (through an auxiliary laptop connected to 115 Vac).
OM/02	EUT ON. The communication bluetooth is established and paired with auxiliary device (worst case). Power supply: (through an auxiliary laptop connected to 115 Vac)
OM/03	EUT ON. NFC type 2 active (worst case). Power supply: (through an auxiliary laptop connected to 115 Vac)
OM/04	EUT ON. NFC type 4 active (worst case). Power supply: (through an auxiliary laptop connected to 115 Vac)
OM/05	EUT ON. Zigbee communication established (worst case). Power supply: (through an auxiliary laptop connected to 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 (10-1-20 Edition) & ICES-003 Issue 7 (October 2020)	ANSI C63.4 (2014)	RE Radiated emission.
	ANSI C63.4 (2014)	CE Continuous conducted emission

Test Cases Details

FCC CFR 47, Part 15, Subpart B
(10-1-20 Edition) & ICES-003 Issue 7 (October 2020)
RE Radiated emission. Electromagnetic field measure

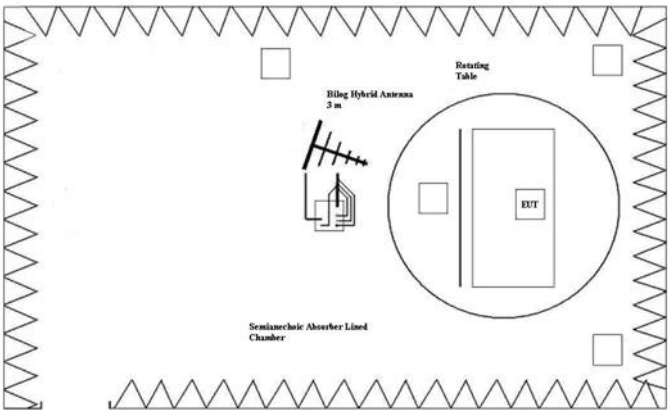
Limits of interference Class B

The applied limit for radiated emissions, 3 m distance, according to the requirements of FCC Rules and Regulations 47 CFR Part 15, Subpart B (10-1-20 Edition), Secs. 15.109 & ICES-003 Issue 7 (October 2020)

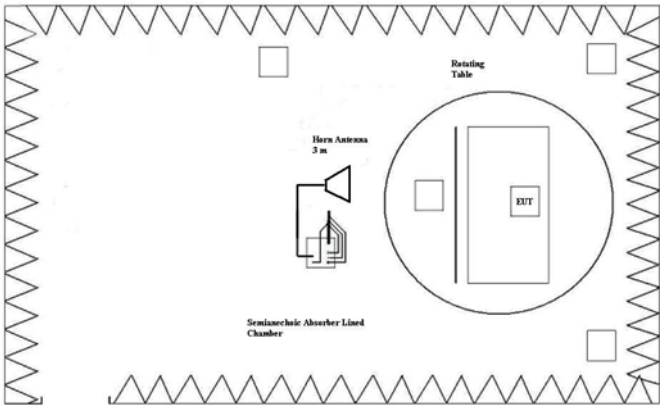
Frequency range (MHz)	FCC Part 15B		ICES-003 Issue 7		FCC Part 15B & ICES-003 Issue 7	
	QP Limit for 3 m		QP Limit for 3 m		PK Limit for 3 m	AVG Limit for 3 m
	(µV/m)	(dBµV/m)	(µV/m)	(dBµV/m)	(dBµV/m)	(dBµV/m)
30 to 88	100	40	100	40	---	---
88 to 216	150	43.5	150	43.5	---	---
216 to 230	200	46	200	46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

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/01	RE0101HR	[1000, 12750]	P

Verdict

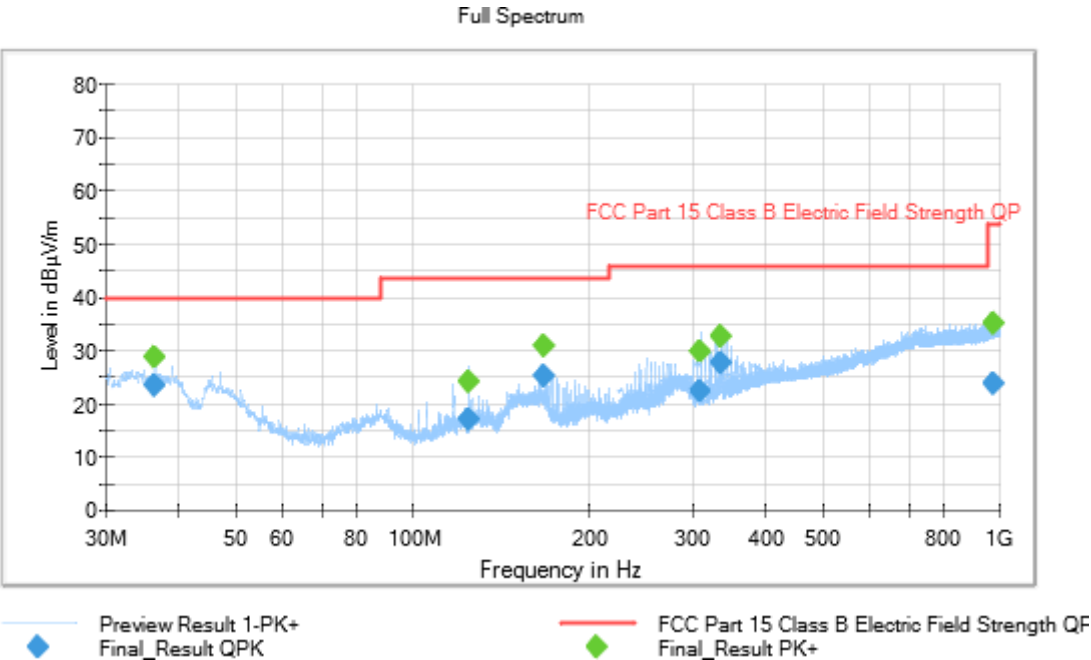
Pass

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

Sample ID: S/01

Operation Mode: OM/01. EUT ON. EUT in RX mode transferring data with a laptop through USB port. Power supply: 5 Vdc (through an auxiliary laptop connected to 115 Vac).

Images:



Documents:

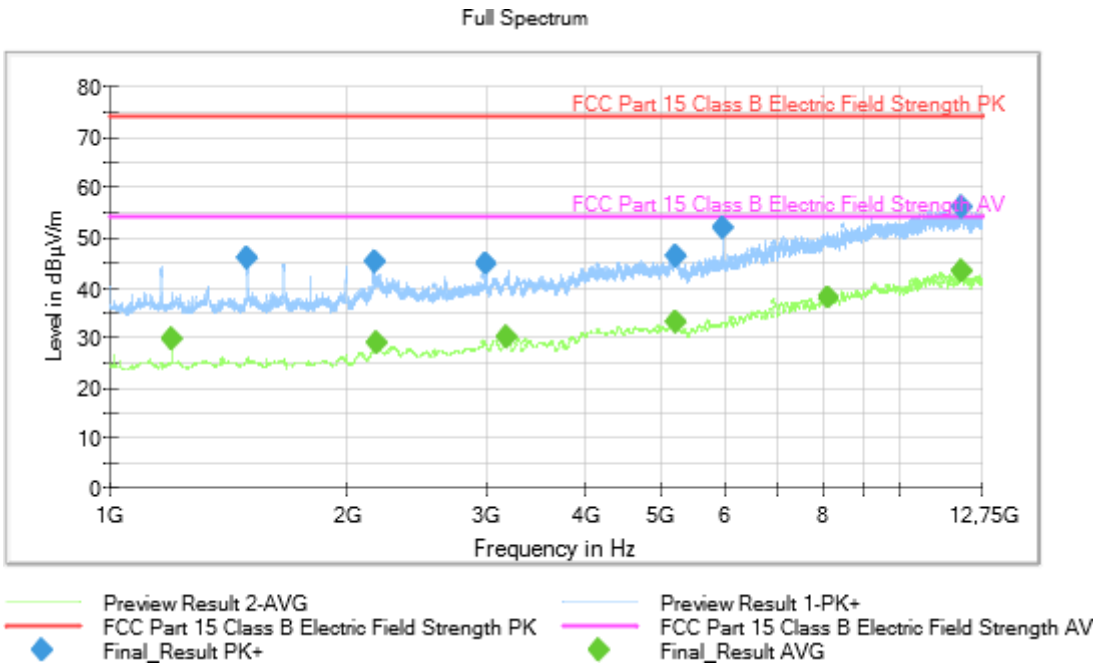
Frequency(MHz)	QuasiPeak(dBµV/m)	MaxPeak(dBµV/m)	Limit(dBµV/m)	Margin(dB)	Height(cm)	PoI	Azimuth(deg)
36.445000	---	28.71	---	---	168.0	V	194.0
36.445000	23.20	---	40.00	16.80	168.0	V	194.0
124.927000	16.94	---	43.52	26.58	157.0	V	14.0
124.927000	---	24.24	---	---	157.0	V	14.0
167.929000	25.23	---	43.52	18.29	212.0	H	231.0
167.929000	---	30.72	---	---	212.0	H	231.0
308.261000	22.17	---	46.00	23.83	158.0	H	58.0
308.261000	---	29.85	---	---	158.0	H	58.0
334.905000	---	32.63	---	---	100.0	H	64.0
334.905000	27.46	---	46.00	18.54	100.0	H	64.0
979.575000	23.82	---	53.97	30.15	111.0	H	153.0
979.575000	---	34.97	---	---	111.0	H	153.0

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

Sample ID: S/01

Operation Mode: OM/01. Operation Mode: OM/01. EUT ON. EUT in RX mode transferring data with a laptop through USB port. Power supply: 5 Vdc (through an auxiliary laptop connected to 115 Vac).

Images:



Documents:

Frequency(MHz)	MaxPeak(dBµV/m)	Average(dBµV/m)	Limit(dBµV/m)	Margin(dB)
1200.000000	---	29.50	53.97	24.47
1493.200000	45.79	---	73.97	28.18
2166.400000	45.25	---	73.97	28.72
2182.400000	---	28.87	53.97	25.10
2990.800000	44.71	---	73.97	29.26
3175.600000	---	29.98	53.97	23.99
5216.000000	46.36	---	73.97	27.61
5221.200000	---	33.18	53.97	20.79
5986.800000	51.85	---	73.97	22.12
8114.000000	---	37.97	53.97	16.00
11996.400000	56.08	---	73.97	17.89
12003.600000	---	43.05	53.97	10.92

FCC CFR 47, Part 15, Subpart B and C
(10-1-20 Edition) & ICES-003 Issue 7 (October 2020)
CE Continuous conducted emission

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 and C (10-1-20 Edition), Secs. 15.107 and 15.207 & ICES-003 Issue 7 (October 2020), 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

S/	OM	Code	Freq Rng (MHz)	Line	V
01	OM/02	CE01020N	[0.15, 30]	N	P
01	OM/02	CE0102L1	[0.15, 30]	L1	P
01	OM/03	CE01030N	[0.15, 30]	N	P
01	OM/03	CE0103L1	[0.15, 30]	L1	P
01	OM/04	CE01040N	[0.15, 30]	N	P
01	OM/04	CE0104L1	[0.15, 30]	L1	P
01	OM/05	CE01050N	[0.15, 30]	N	P
01	OM/05	CE0105L1	[0.15, 30]	L1	P

Verdict

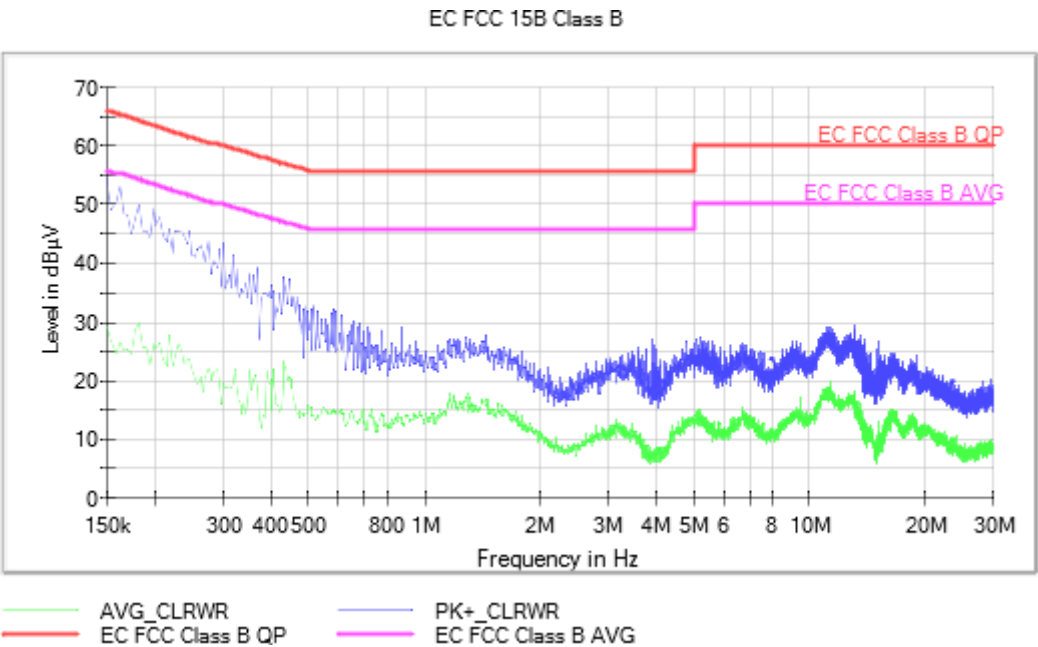
Pass

EMC Test Code = CE01020N, Frequency Range MHz = [0.15, 30], Conducted Emissions - Tested Line = N

Sample ID: S/01

Operation Mode: OM/02. EUT ON. The communication bluetooth is established and paired with auxiliary device (worst case). Power supply: (through an auxiliary laptop connected to 115 Vac)

Images:



Documents:

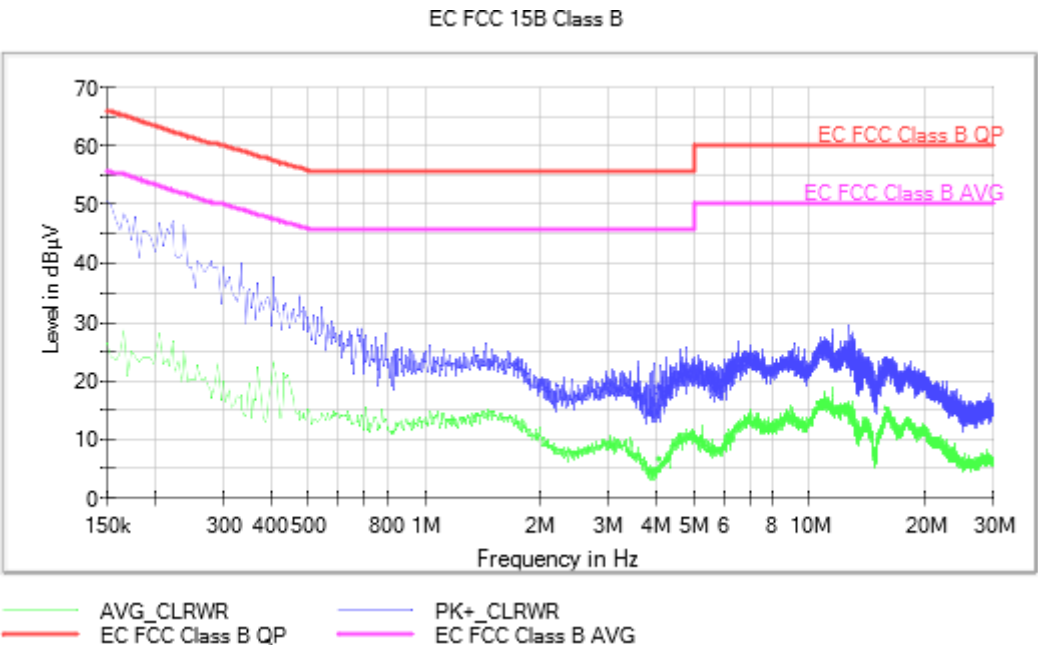
Frequency(MHz)	PK+_CLRWR(dBµV)	AVG_CLRWR(dBµV)
0.150000	54.3	29.3

EMC Test Code = CE0102L1, Frequency Range MHz = [0.15, 30], Conducted Emissions - Tested Line = L1

Sample ID: S/01

Operation Mode: OM/02. EUT ON. The communication bluetooth is established and paired with auxiliary device (worst case). Power supply: (through an auxiliary laptop connected to 115 Vac)

Images:



Documents:

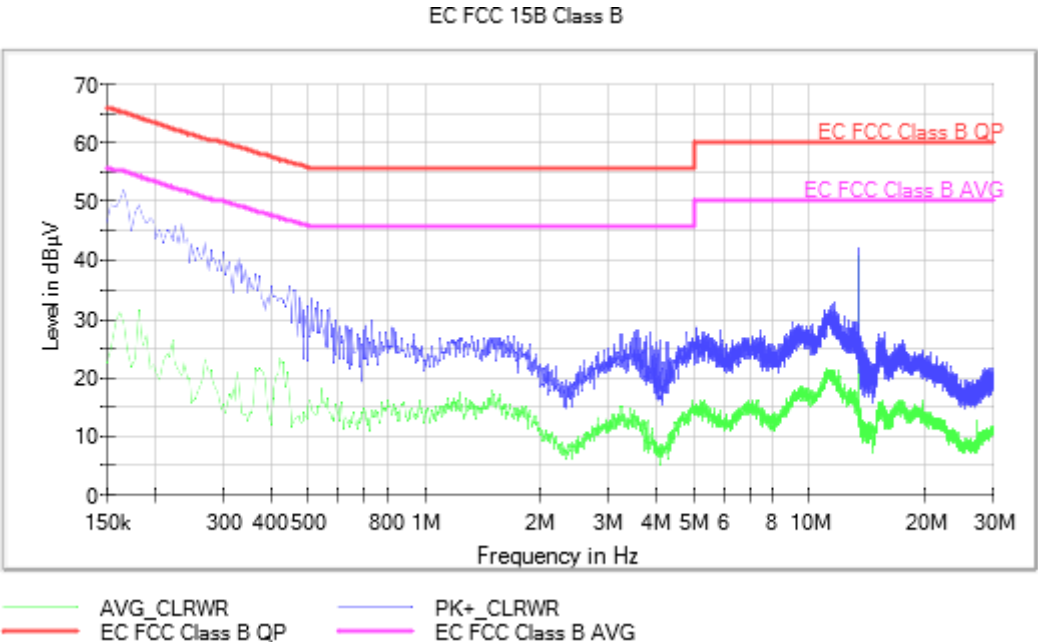
Frequency(MHz)	PK+_CLRWR(dBµV)	AVG_CLRWR(dBµV)
0.150000	50.6	26.3

EMC Test Code = CE01030N, Frequency Range MHz = [0.15, 30], Conducted Emissions - Tested Line = N

Sample ID: S/01

Operation Mode: OM/03. EUT ON. NFC type 2 active (worst case). Power supply: (through an auxiliary laptop connected to 115 Vac)

Images:



Documents:

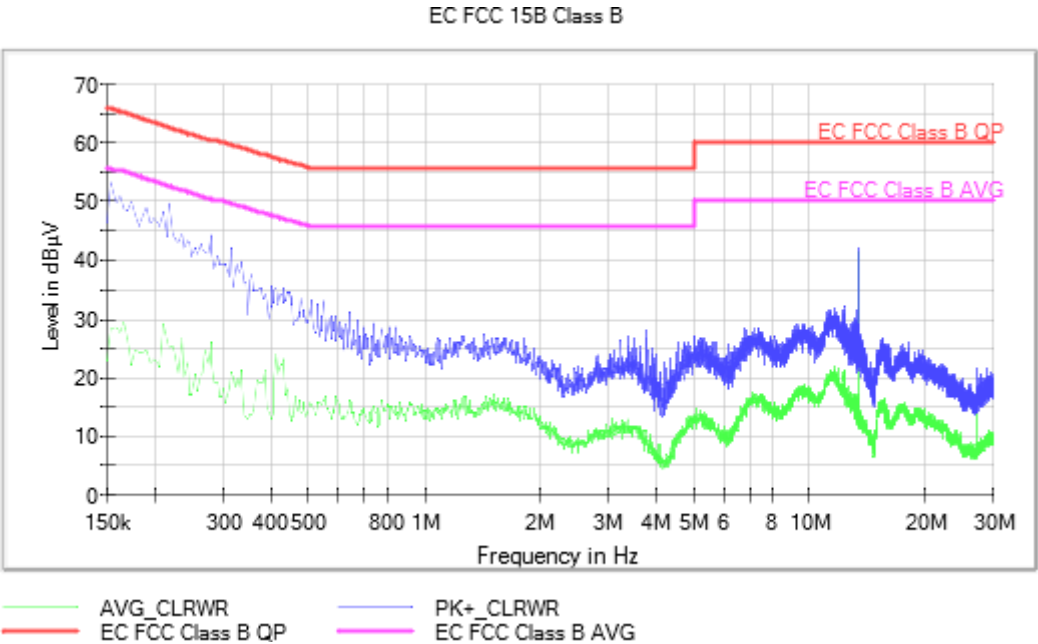
Frequency(MHz)	PK+_CLRWR(dBµV)	AVG_CLRWR(dBµV)
0.166000	52.1	29.1

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. NFC type 2 active (worst case). Power supply: (through an auxiliary laptop connected to 115 Vac)

Images:



Documents:

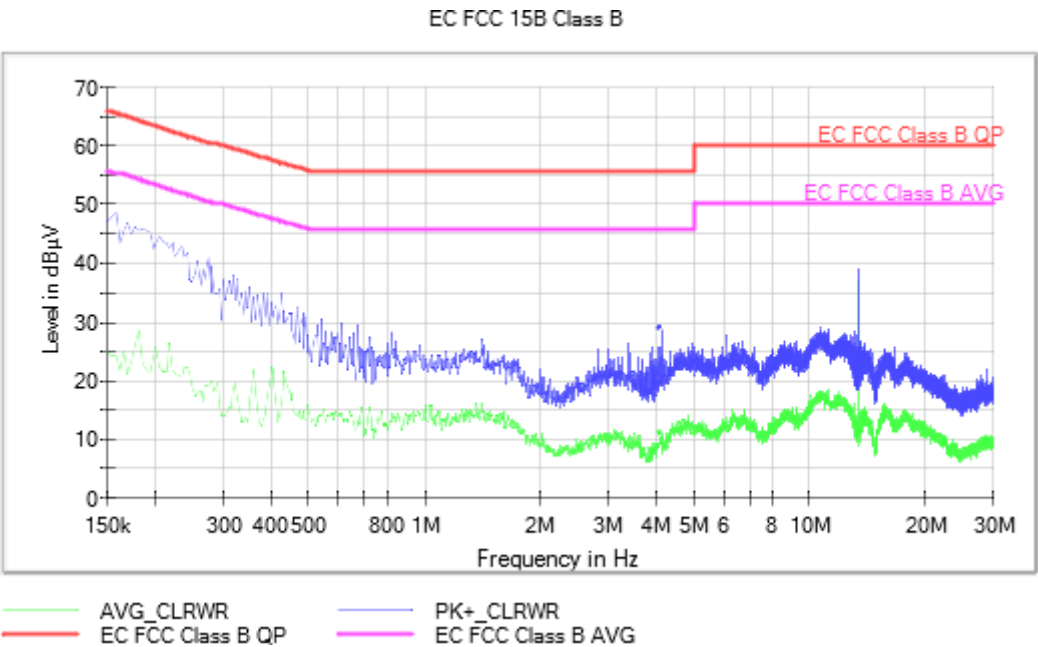
Frequency(MHz)	PK+_CLRWR(dBµV)	AVG_CLRWR(dBµV)
0.154000	53.2	28.3

EMC Test Code = CE01040N, Frequency Range MHz = [0.15, 30], Conducted Emissions - Tested Line = N

Sample ID: S/01

Operation Mode: OM/04. EUT ON. NFC type 4 active (worst case). Power supply: (through an auxiliary laptop connected to 115 Vac)

Images:



Documents:

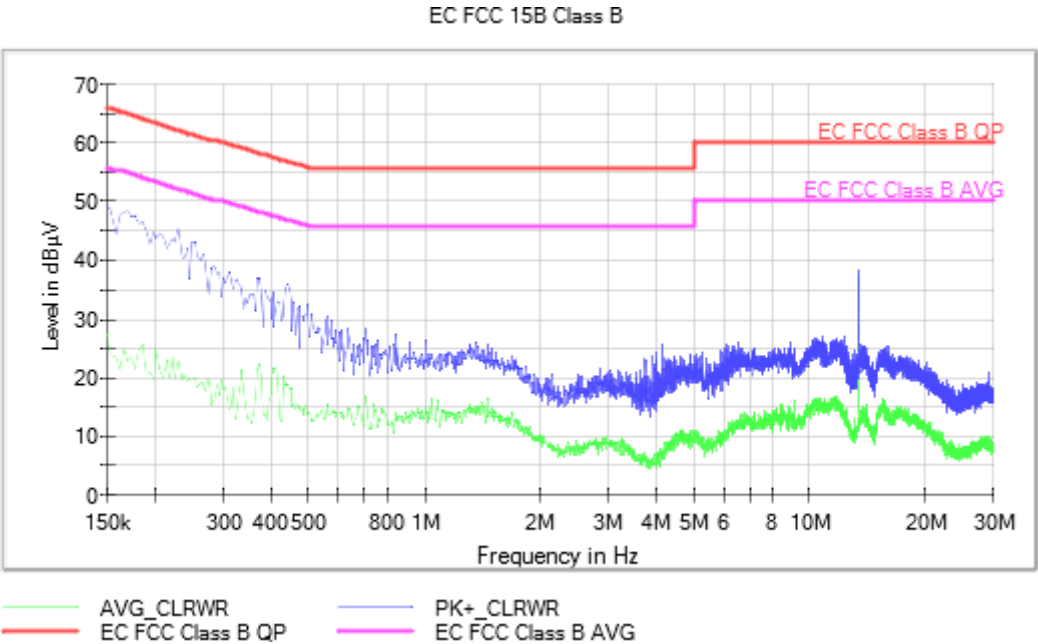
Frequency(MHz)	PK+_CLRWR(dBµV)	AVG_CLRWR(dBµV)
0.158000	48.7	24.4

EMC Test Code = CE0104L1, Frequency Range MHz = [0.15, 30], Conducted Emissions - Tested Line = L1

Sample ID: S/01

Operation Mode: OM/04. EUT ON. NFC type 4 active (worst case). Power supply: (through an auxiliary laptop connected to 115 Vac)

Images:



Documents:

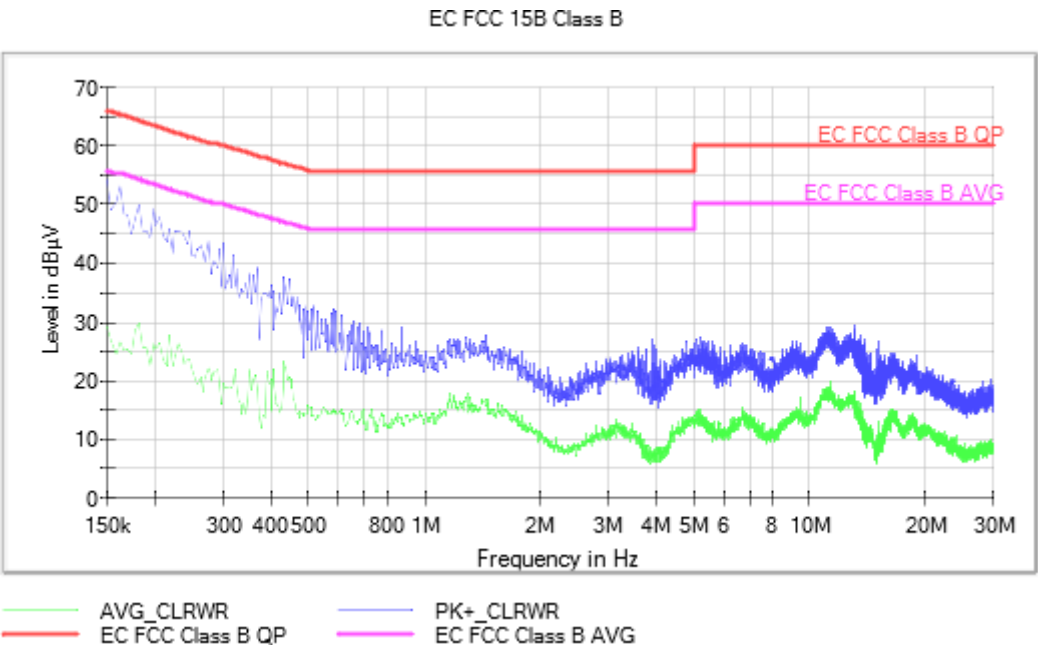
Frequency(MHz)	PK+_CLRWR(dBµV)	AVG_CLRWR(dBµV)
0.150000	49.4	27.3

EMC Test Code = CE01050N, Frequency Range MHz = [0.15, 30], Conducted Emissions - Tested Line = N

Sample ID: S/01

Operation Mode: OM/05. EUT ON. Zigbee communication established (worst case). Power supply: (through an auxiliary laptop connected to 115 Vac)

Images:



Documents:

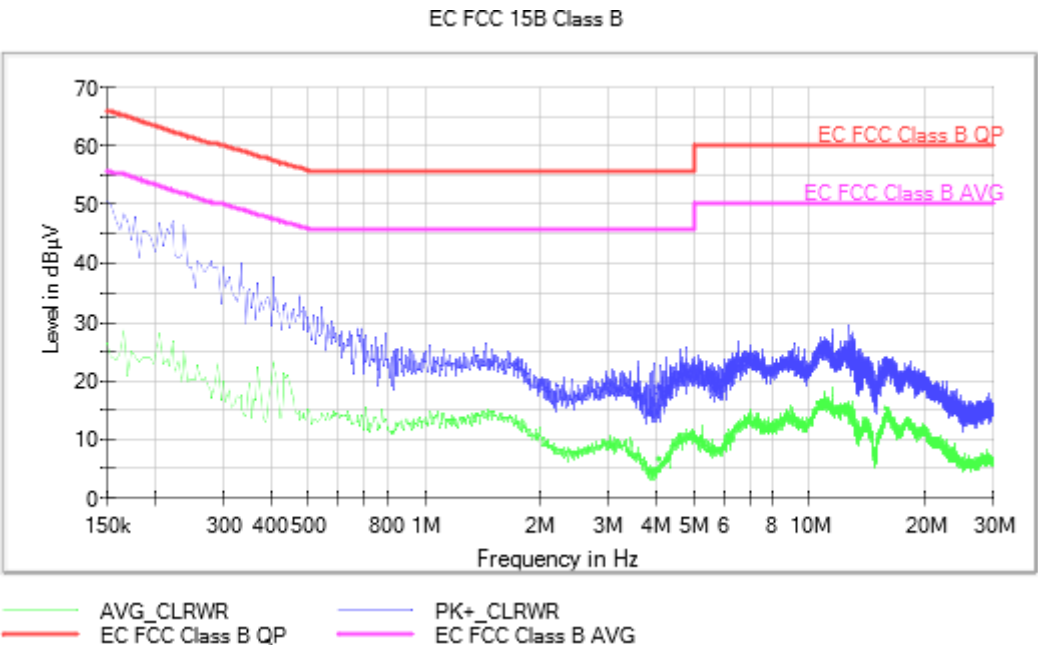
Frequency(MHz)	PK+_CLRWR(dBµV)	AVG_CLRWR(dBµV)
0.151000	54.5	28.9

EMC Test Code = CE0105L1, Frequency Range MHz = [0.15, 30], Conducted Emissions - Tested Line = L1

Sample ID: S/01

Operation Mode: OM/05. EUT ON. Zigbee communication established (worst case). Power supply: (through an auxiliary laptop connected to 115 Vac)

Images:



Documents:

Frequency(MHz)	PK+_CLRWR(dBµV)	AVG_CLRWR(dBµV)
0.151000	50.5	26.1