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

Test report No:
NIE: 73220REM.004

Test report

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

(*) Identification of item tested	SALTO KS IQ 2.0
(*) Trademark	SALTO
(*) Model and /or type reference	IQ224 (Type reference: IQ2.0)
Other identification of the product	Contains FCC ID: QOQ-BGM220S2 Contains IC: 5123A-BGM220S2
(*) Features	Features: Ethernet, ZigBee, Bluetooth LE and cellular technology HW version: 2.0 SW version: CCCPROD (Control FW), 0091 (RF2 Module FW)
Manufacturer	SALTO SYSTEMS, S.L. Arkotz 9, Polígono Lanbarren 20180, Oiartzun, Gipuzkoa, SPAIN
Test method requested, standard	FCC Rules and Regulations CFR 47, Part 15, Subpart B and C (10-1-21 Edition) & ICES-003 Issue 7 (October 2020)
Summary	IN COMPLIANCE
Approved by (name / position & signature)	Rafael López Martín EMC Consumer & RF Lab. Manager  2023.01.12 18:09:51 +01'00'
Date of issue	2023-01-12
Report template No	FDT08_24 (*) "Data provided by the client"

Index

Acronyms

Acronym ID	Acronym Description
Code	EMC Test Code
Freq Rng	Frequency Range
MP	Measurement Point
OM	Operation Mode
S/	Sample
V	Verdict
RE	Radiated Emission
LR	Low Range
HR	High Range

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.

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 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 SALTO KS IQ2.0 communication hub with Ethernet and cellular technology to connect the wireless locks to the SALTO KS cloud and IEEE 802.15.4 and Bluetooth LE technology to communicate with the access points.

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 Nº	Date of Reception	Application
S/01	73220C_8.1	SALTO KS IQ 2.0	IQ224	--	2022-08-17	Element Under Test
S/01	73220C_9.1	AC/DC adapter	--	--	2022-08-17	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)	
	Ethernet		100 m	[ ]	[ ]	[ ]	
	.....		.....	[ ]	[ ]	[ ]	
Supplementary information to the ports…… :	.....						
Rated power supply .....:	Voltage and Frequency		Reference poles				
			L1	L2	L3	N	PE
	[X]	AC: 230Vac, 50Hz	[X]	[ ]	[ ]	[X]	[ ]
	[ ]	DC:					
Rated Power .....:	9.6 W						
Clock frequencies.....:	32.768 KHz, 12 MHz, 25 MHz and 32 MHz						
Other parameters .....:	--						
Software version .....:	CCCPROD (Control FW) + 0091 (RF2 Module FW)						
Hardware version .....:	2.0						
Dimensions in cm (W x H x D) ....:	14.6 x 14.6 x 3 cm						
Mounting position .....:	[ ]	Table top equipment					
	[X]	Wall/Ceiling mounted equipment					
	[ ]	Floor standing equipment					
	[ ]	Hand-held equipment					
	[ ]	Other:					
Modules/parts.....:	Module/parts of test item			Type		Manufacturer	
	Bluetooth LE module			BLE		Silicon Labs	
	IEEE 802.15.4			IEEE 802.15.4		Texas Instruments	
	.....			.....		.....	
Accessories (not part of the test item) .....:	Description			Type		Manufacturer	
	.....			.....		.....	
Documents as provided by the applicant.....:	Description			File name		Issue date	
	Firmware explanation document			.....		.....	
	User manual			.....		.....	
	.....			.....		.....	

(3) Only for Medical Equipment

Identification of the client

SALTO SYSTEMS, S.L.
Arkotz 9, Polígono Lanbarren
20180 Oiartzun, Gipuzkoa, SPAIN

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2022-09-21
Date (finish)	2022-09-29

Document history

Report number	Date	Description
73220REM.004	2023-01-12	First release

Environmental conditions

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

Temperature	Min. = 15 ºC Max. = 35 ºC
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 ºC Max. = 35 ºC
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 ºC Max. = 35 ºC
Relative humidity	Min. = 30 % Max. = 60 %
Air pressure	Min. = 860mbar Max. = 1060mbar

Remarks and comments

The tests have been performed by the technical personnel: Salvador Cuellar and Carlos Haro.

Testing verdicts

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
6064	SEMIANECHOIC ABSORBER LINED CHAMBER	SAC-3	FRANKONIA	N/A
6329	SHIELDED ROOM	---	FRANKONIA	N/A
6132	ETHERNET TEMPERATURE AND HUMIDITY LOGGER	HWg-STE	HW GROUP	2023-04-05
6126	ETHERNET TEMPERATURE AND HUMIDITY LOGGER	HWg-STE	HW GROUP	2023-04-05
8866	EMI TEST RECEIVER 2Hz-44GHz	ESW44	ROHDE AND SCHWARZ	2023-09-21
5641	HYBRID BILOG ANTENNA 30MHz-6GHz	3142E	EST LINDGREN	2024-09-15
4612	HORN ANTENNA 1-18GHz	BBHA 9120 D	SCHWARZBECK MESS-ELEKTRONIK	2024-07-13
9360	PRE-AMPLIFIER G>40dB 1-18 GHz	BLMA 0118-1M	BONN ELEKTRONIK	2023-05-11
4848	MEASUREMENT SOFTWARE EMC/RF	EMC32	ROHDE AND SCHWARZ	N/A
6129	ETHERNET TEMPERATURE AND HUMIDITY LOGGER	--	--	2023-04-28
4679	THREE-PHASE ARTIFICIAL NETWORK 32A	--	--	2023-01-11

Control No.	Equipment	Model	Manufacturer	Next Calibration
5152	TRANSIENT LIMITER 10DB N CONNECTOR	VTSD 9561-F	SCHWARZBECK	2023-11-09
4523	EMI TEST RECEIVER 20Hz-26.5GHz	ESU26	ROHDE AND SCHWARZ	2023-11-05

Summary

Test Specification.	Requirement – Test case	Verdict	Remark
FCC CFR 47, Part 15, Subpart B (10-1-21 Edition) & ICES-003 Issue 7 (October 2020)	RE Radiated emission. Electromagnetic field measure	Pass	---
FCC CFR 47, Part 15, Subpart B and Subpart C (10-1-21 Edition) & ICES-003 Issue 7 (October 2020)	CE Continuous conducted emission	Pass	---
Supplementary information and remarks: None			

Appendix A: Test results

Appendix A content

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. Bluetooth LE and ZigBee (IEEE 802.15.4) in IDLE state. Ethernet communication established. Power supply: 115Vac, 60Hz
OM/02	EUT ON. Bluetooth LE, ZigBee (IEEE 802.15.4) and Ethernet communication established. Power supply: 115Vac, 60Hz

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 (10-1-21 Edition) & ICES-003 Issue 7 (October 2020)	ANSI C63.4 (2014)	RE Radiated emission.
FCC CFR 47, Part 15, Subpart B and C (10-1-21 Edition) & ICES-003 Issue 7 (October 2020)	ANSI C63.4 (2014)	CE Continuous conducted emission

Test Cases Details

RE Radiated emission. Electromagnetic field measure

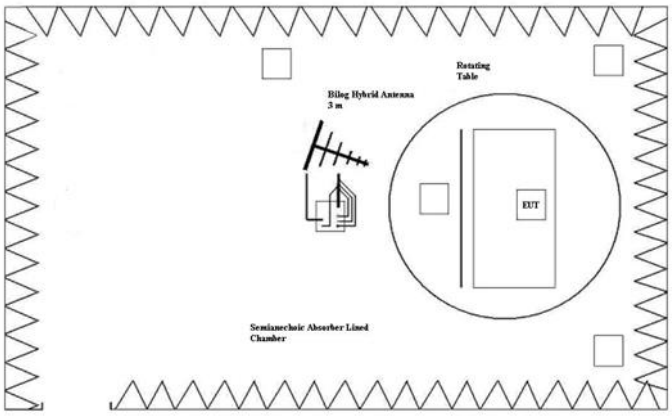
Limits of interference Class B

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

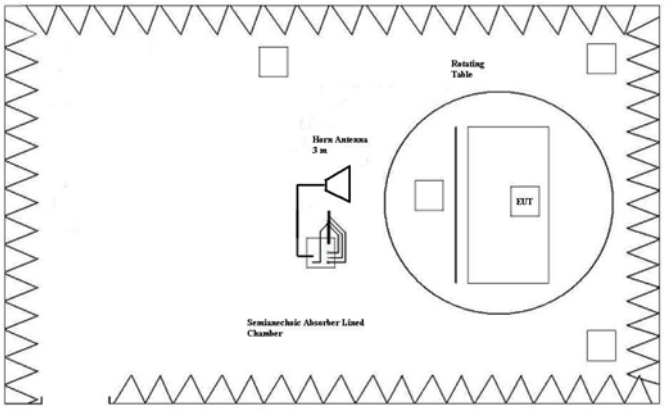
Frequency range (MHz)	FCC Part 15B		ICES-003 Issue 7		FCC Part 15B & ICES-003 Issue 7	
	QP Limit for 3 m		QP Limit for 3 m		PK Limit for 3 m	AVG Limit for 3 m
	(μV/m)	(dBμV/m)	(μV/m)	(dBμV/m)	(dBμV/m)	(dBμV/m)
30 to 88	100	40	100	40	---	---
88 to 216	150	43.5	150	43.5	---	---
216 to 230	200	46	200	46	---	---
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	RE0101HR1	[1000, 12750]	P

Note: Range: f>12.75 GHz. Test required only to the 5th harmonics of the maximum internal work frequency in the EUT.

Verdict

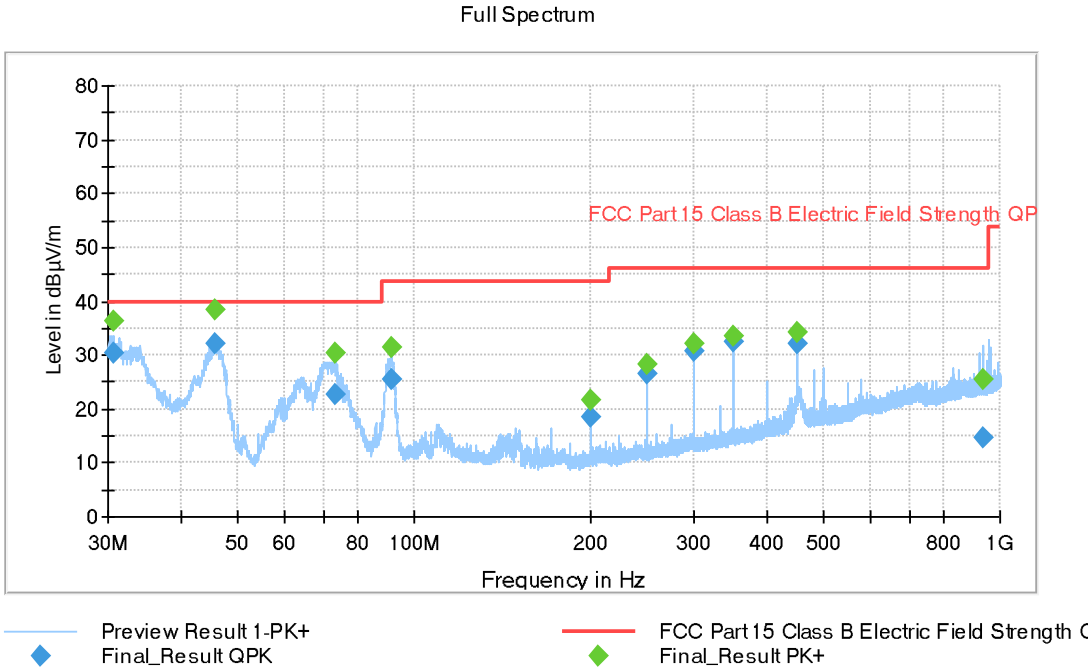
Pass

Attachments

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

Sample ID: S/01

Operation Mode: OM/01. EUT ON. Bluetooth LE and ZigBee (IEEE 802.15.4) in IDLE state. Ethernet communication established. Power supply: 115Vac, 60Hz



Tables:

Frequency(MHz)	MaxPeak(dBµV/m)	Average(dBµV/m)	Limit(dBµV/m)	Margin(dB)	Height (cm)	Pol	Azimuth (deg)
30.598500	---	36.30	---	---	118.0	H	299.0
30.598500	30.52	---	40.00	9.48	118.0	H	299.0
45.743000	32.24	---	40.00	7.76	100.0	H	108.0
45.743000	---	38.28	---	---	100.0	H	108.0
73.160000	22.80	---	40.00	17.20	107.0	V	91.0
73.160000	---	30.54	---	---	107.0	V	91.0
91.520000	25.47	---	43.52	18.05	116.0	H	241.0
91.520000	---	31.40	---	---	116.0	H	241.0
199.997000	18.65	---	43.52	24.87	150.0	V	124.0
199.997000	---	21.77	---	---	150.0	V	124.0
250.014000	---	28.24	---	---	126.0	H	37.0
250.014000	26.41	---	46.00	19.59	126.0	H	37.0
300.019000	30.67	---	46.00	15.33	117.0	H	141.0
300.019000	---	32.21	---	---	117.0	H	141.0

Tables (cont.):

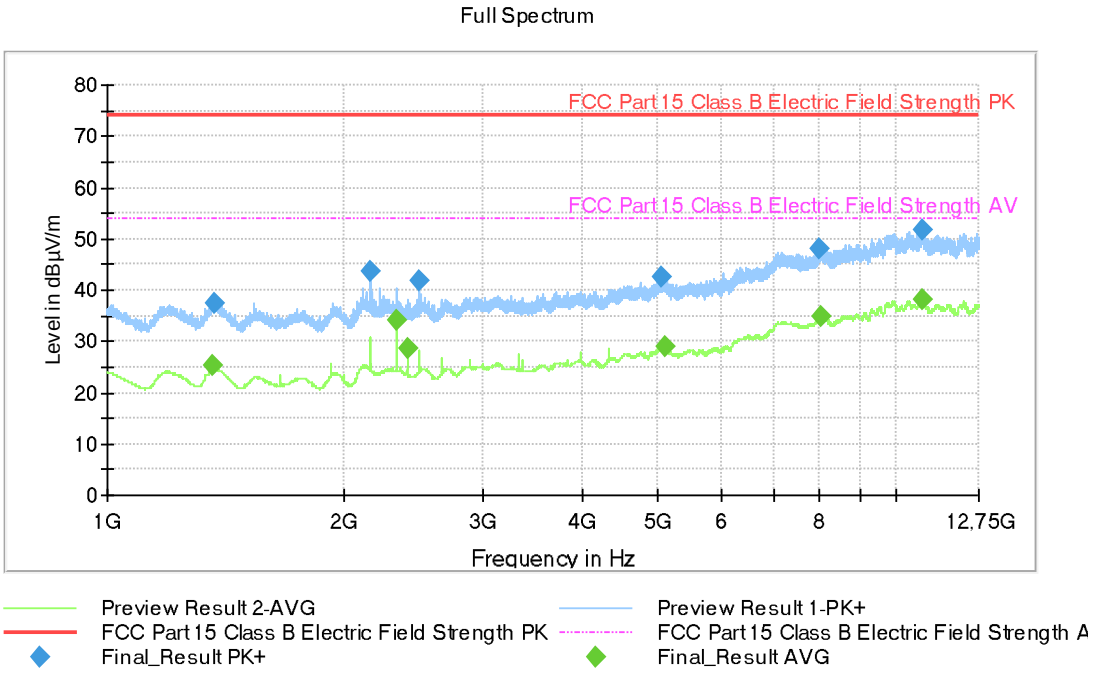
Frequency(MHz)	MaxPeak(dBµV/m)	Average(dBµV/m)	Limit(dBµV/m)	Margin(dB)	Height (cm)	Pol	Azimuth (deg)
350.026000	32.49	---	46.00	13.51	108.0	V	187.0
350.026000	---	33.68	---	---	108.0	V	187.0
450.017000	---	34.24	---	---	105.0	H	17.0
450.017000	32.14	---	46.00	13.86	105.0	H	17.0
933.885000	---	25.34	---	---	372.0	H	37.0
933.885000	14.64	---	46.00	31.36	372.0	H	37.0

EMC Test Code = RE0101HR1, Frequency Range MHz = [1000, 12750]

Sample ID: S/01

Operation Mode: OM/01. EUT ON. Bluetooth LE and ZigBee (IEEE 802.15.4) in IDLE state. Ethernet communication established. Power supply: 115Vac, 60Hz

Images:



Tables:

Frequency(MHz)	MaxPeak(dBµV/m)	Average(dBµV/m)	Limit(dBµV/m)	Margin(dB)
1360.000000	---	25.35	53.97	28.62
1368.400000	37.61	---	73.97	36.36
2153.600000	43.53	---	73.97	30.44
2324.000000	---	34.01	53.97	19.96
2400.000000	---	28.56	53.97	25.41
2487.200000	41.86	---	73.97	32.11
5035.200000	42.69	---	73.97	31.28
5100.000000	---	28.84	53.97	25.13
8020.000000	48.21	---	73.97	25.76
8030.000000	---	34.75	53.97	19.22
10819.600000	---	38.11	53.97	15.86
10832.800000	51.62	---	73.97	22.35

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 (10-1-21 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	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.

Results

S/	OM	Code	Freq Rng (MHz)	Line	V
01	OM/01	CE0101N	[0.15, 30]	N	P
01	OM/01	CE0101L1	[0.15, 30]	L1	P
01	OM/02	CE0102N	[0.15, 30]	N	P
01	OM/02	CE0102L1	[0.15, 30]	L1	P

Verdict

Pass

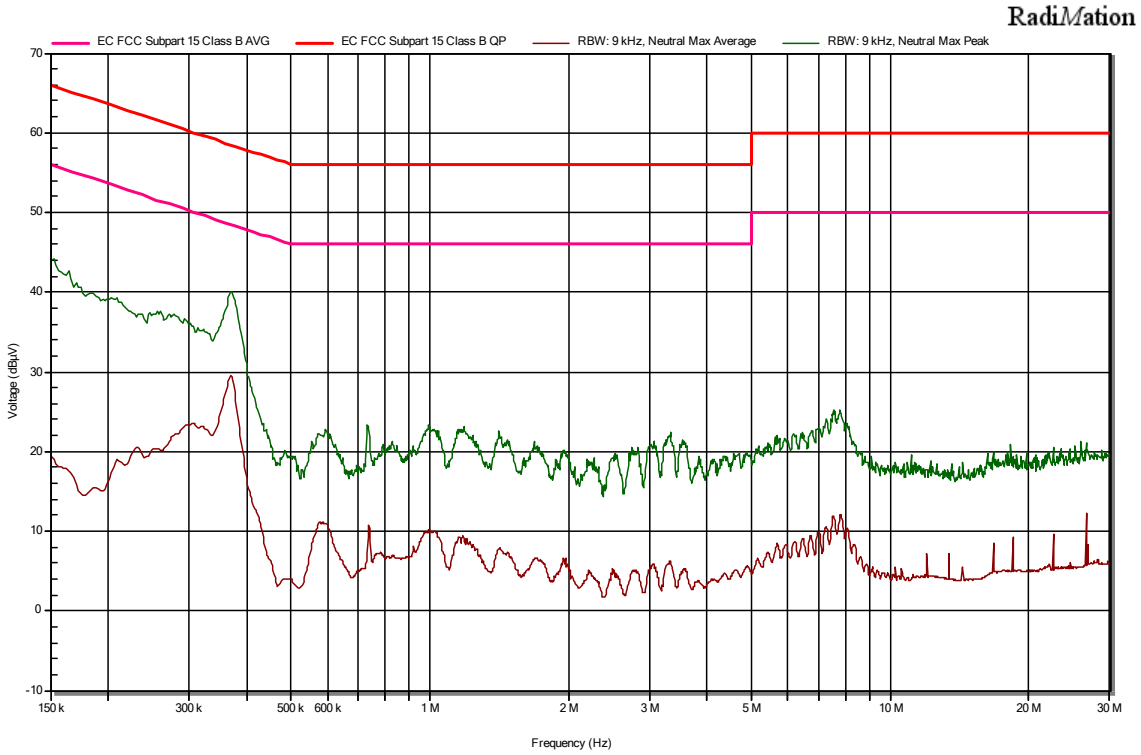
Attachments

EMC Test Code = CE0101N, Frequency Range MHz = [0.15, 30], Conducted Emissions - Tested Line = N

Sample ID: S/01

Operation Mode: OM/01. EUT ON. Bluetooth LE and ZigBee (IEEE 802.15.4) in IDLE state. Ethernet communication established. Power supply: 115Vac, 60Hz

Images:



Tables:

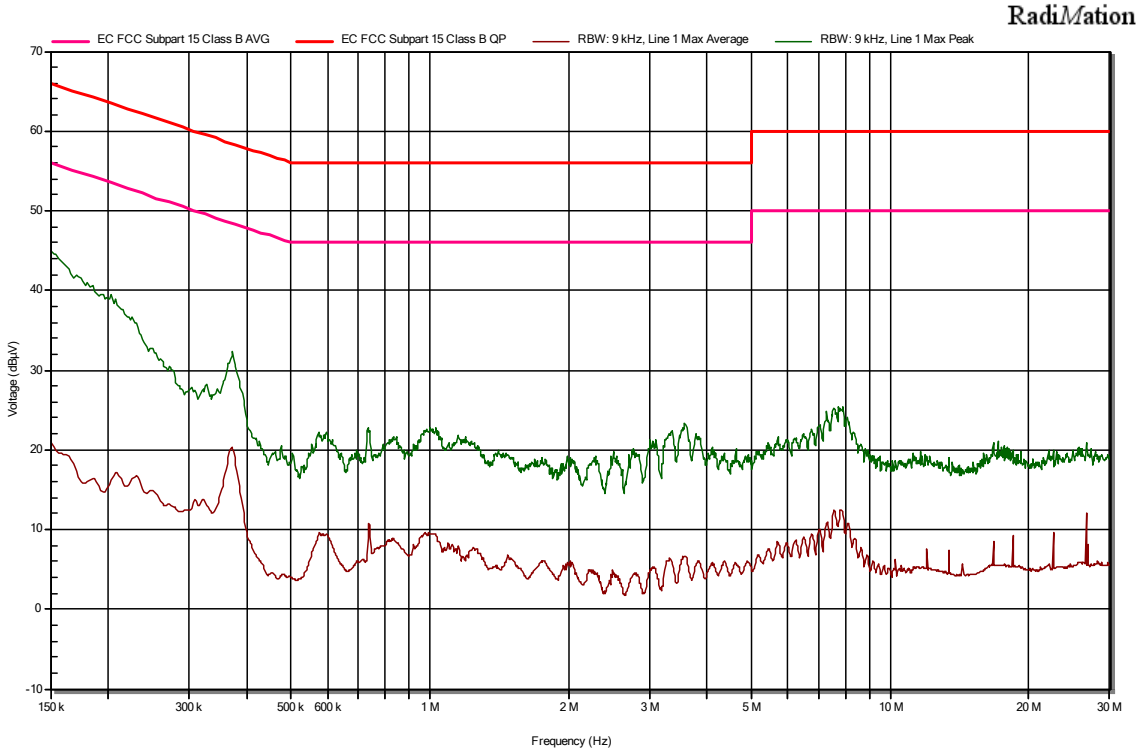
Frequency (MHz)	PK+_CLRWR (dBµV)	AVG_CLRWR (dBµV)	Line
0,15 MHz	19,4 dBµV	44 dBµV	N
0,371 MHz	29,4 dBµV	40,1 dBµV	N
0,594 MHz	10,9 dBµV	22,7 dBµV	N
0,735 MHz	10,7 dBµV	22,9 dBµV	N
0,992 MHz	10,1 dBµV	23,3 dBµV	N
1,183 MHz	9,1 dBµV	23 dBµV	N
1,414 MHz	7,8 dBµV	22,5 dBµV	N
1,677 MHz	6,4 dBµV	21,2 dBµV	N
3,327 MHz	5,8 dBµV	22,3 dBµV	N
7,515 MHz	11,8 dBµV	25,3 dBµV	N

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. Bluetooth LE and ZigBee (IEEE 802.15.4) in IDLE state. Ethernet communication established. Power supply: 115Vac, 60Hz

Images:



Tables:

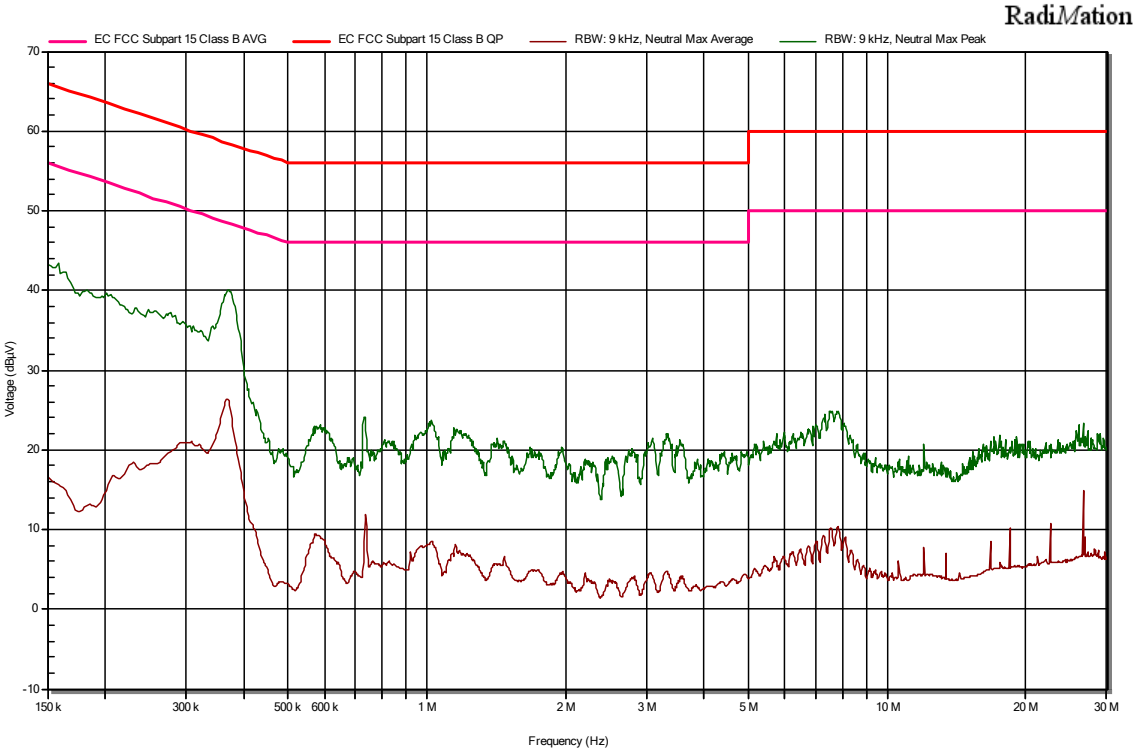
Frequency (MHz)	PK+_CLRWR (dBµV)	AVG_CLRWR (dBµV)	Line
0,15 MHz	20,8 dBµV	44,9 dBµV	L1
0,373 MHz	20,2 dBµV	32,3 dBµV	L1
0,573 MHz	9,5 dBµV	22,2 dBµV	L1
0,735 MHz	10,4 dBµV	22,7 dBµV	L1
0,833 MHz	8,9 dBµV	21,6 dBµV	L1
0,996 MHz	9,4 dBµV	22,8 dBµV	L1
3,051 MHz	5 dBµV	21,1 dBµV	L1
3,585 MHz	6,7 dBµV	23,1 dBµV	L1
3,818 MHz	6 dBµV	21,7 dBµV	L1
7,777 MHz	12,1 dBµV	25,2 dBµV	L1

EMC Test Code = CE0102N, Frequency Range MHz = [0.15, 30], Conducted Emissions - Tested Line = N

Sample ID: S/01

Operation Mode: OM/02. EUT ON. Bluetooth LE, ZigBee (IEEE 802.15.4) and Ethernet communication established. Power supply: 115Vac, 60Hz

Images:



Tables:

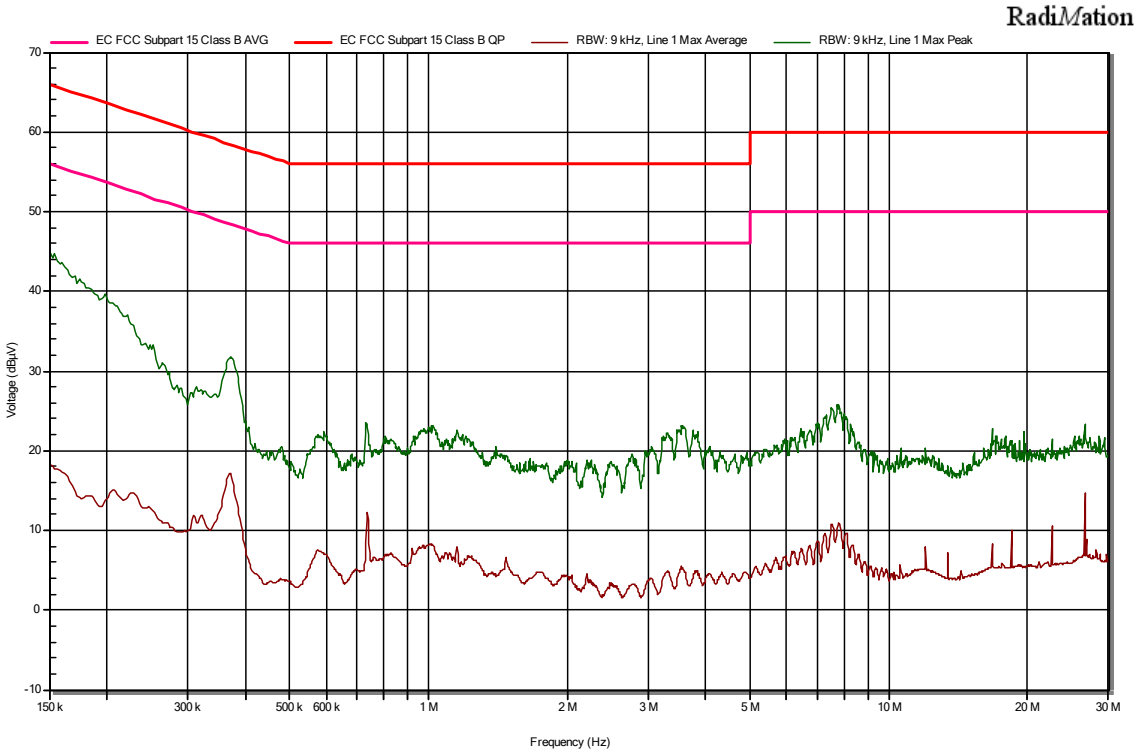
Frequency(MHz)	PK+_CLRWR(dBµV)	AVG_CLRWR(dBµV)	Line
0,15 MHz	16,6 dBµV	43,3 dBµV	N
0,371 MHz	26,1 dBµV	40 dBµV	N
0,577 MHz	9,3 dBµV	22,8 dBµV	N
0,733 MHz	11,2 dBµV	24,1 dBµV	N
1,015 MHz	8,3 dBµV	23,3 dBµV	N
1,158 MHz	7,3 dBµV	22,7 dBµV	N
1,42 MHz	5,5 dBµV	21,2 dBµV	N
3,092 MHz	4 dBµV	21,4 dBµV	N
3,311 MHz	4,6 dBµV	21,9 dBµV	N
7,533 MHz	10,2 dBµV	24,5 dBµV	N

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. Bluetooth LE, ZigBee (IEEE 802.15.4) and Ethernet communication established. Power supply: 115Vac, 60Hz

Images:



Tables:

Frequency(MHz)	PK+_CLRWR(dBµV)	AVG_CLRWR(dBµV)	Line
0,15 MHz	18,3 dBµV	44,9 dBµV	L1
0,371 MHz	17,1 dBµV	31,8 dBµV	L1
0,594 MHz	7 dBµV	22,5 dBµV	L1
0,735 MHz	12,2 dBµV	23,3 dBµV	L1
1,019 MHz	8,2 dBµV	23,1 dBµV	L1
3,563 MHz	5,3 dBµV	23,1 dBµV	L1
3,745 MHz	3,8 dBµV	22,7 dBµV	L1
4,061 MHz	4,5 dBµV	20,5 dBµV	L1
7,484 MHz	10,4 dBµV	25,5 dBµV	L1
7,789 MHz	10,9 dBµV	25,8 dBµV	L1