



Test report No:
NIE: 57508REM.001

Test report

FCC Rules and Regulations CFR 47, Part 15, Subpart B (May 17, 2019 Edition) & ICES-003 Issue 6 (Updated 04-2019)

Identification of item tested	Energy Control Unit (ECU)
Trademark	ENKOA
Model and /or type reference	iSWITCH Multibox Offline
Other identification of the product	HW version: Source PCB V1.4 Control PCB V1.5 SW version: V0.194 FCC ID: 2ASEQDEMTXABA0S IC: 24733-DEMTXABA0S
Features	Not provided data
Manufacturer	ENKOA SYSTEM, S.L. Pol. Erramone 45 20850, Mendaro, Gipuzkoa, SPAIN
Test method requested, standard	FCC CFR 47, Part 15, Subpart B (May 17, 2019 Edition) & ICES-003 Issue 6 (Updated 04-2019)
Summary	IN COMPLIANCE
Approved by (name / position & signature)	Rafael López EMC LAB Manager
Date of issue	2018-12-17
Report template No	FDT08_21

Index

Competences and guarantees	3
General conditions.....	3
Uncertainty.....	3
Data provided by the client	4
Usage of samples	4
Test sample description.....	5
Identification of the client	6
Testing period and place	6
Document history.....	6
Environmental conditions	7
Remarks and comments.....	8
Testing verdicts.....	8
Summary	8
Appendix A: Test results.....	9

Competences and guarantees

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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.

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

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1. This report is only referred to the item that has undergone the test.
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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 conducted disturbance characteristics of EUT from 150kHz to 30 MHz is $I = \pm 3,9$ dB for quasi-peak measurements, $I = \pm 3,2$ dB for average 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 26 GHz is $I = \pm 2,6$ dB for peaks and average measurements ($k = 2$)

Data provided by the client

The sample consists of an energy saver: Energy Control Unit (ECU); with RFID MULTIBOX 13.56MHz function.
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 is composed of the following elements:

Control N°	Description	Model	Serial N°	Date of reception
57508/006	Energy Control Unit (ECU)	iSWITCH Multibox Offline	---	2018-10-18

Sample S/02 is composed of the following elements:

Control N°	Description	Model	Serial N°	Date of reception
57508/005	Energy Control Unit (ECU)	iSWITCH Multibox Offline	---	2018-10-18

Sample with RFID in transmission mode.

Test sample description

Ports..... :	Port name and description		Cable				
			Specified length [m]	Attached during test	Shielded		
				☐	☐		
				☐	☐		
				☐	☐		
Supplementary information to the ports..... :							
Rated power supply	Voltage and Frequency		Reference poles				
			L1	L2	L3	N	PE
	☒	AC: 110 – 230, 50-60Hz	☒	☐	☐	☒	☐
	☐	AC:	☐	☐	☐	☐	☐
	☐	DC:					
☐	DC:						
Rated Power	2 W nominal (input power consumption)						
Clock frequencies	Internal RC microcontroller 4MHz / glass transceiver 27.12MHz						
Other parameters..... :							
Software version	V0.194						
Hardware version..... :	Source PCB V1.4; Control PCB V1.5						
Dimensions in cm (W x H x D)..... :	8x8x3.2 (without accessory); 8x8x3.47 (with surface accessory)						
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	
	Surface accessory					ENKOA	
Accessories (not part of the test item)	Description		Type			Manufacturer	

	Description	File name	Issue date
Documents as provided by the applicant.....:			

Identification of the client

ENKOA SYSTEM, S.L.
 Pol. Erramone 45
 20850, Mendaro, Gipuzkoa, SPAIN

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2018-10-19
Date (finish)	2018-12-17

Document history

Report number	Date	Description
57508REM.001	2018-12-17	First release

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. = 860 mbar Max. = 1060 mbar

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. = 860 mbar Max. = 1060 mbar

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. = 860 mbar Max. = 1060 mbar

Remarks and comments

The test have been performed by the technical personnel: Carlos Haro, Jesus Garcia & David Rubio.

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 KHz – 1000 MHz)	P	-
Radiated emission. Electromagnetic field measure (1 GHz – 18 GHz)	P	-
Radiated emission. Electromagnetic field measure (18 GHz – 26 GHz)	P	-
Continuous conducted emission (150 KHz – 30 MHz)	P	-
<u>Supplementary information and remarks:</u> N/A		

Appendix A: Test results

Appendix A content

DESCRIPTION OF THE OPERATION MODES11

RADIATED EMISSION. ELECTROMAGNETIC FIELD MEASURE12

CONTINUOUS CONDUCTED EMISSION ON POWER LEADS.....19

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. RFID OFF. Power supply: 115Vac, 60Hz.
OM#02	EUT ON. RFID ON reading NFC card. Power supply: 115Vac, 60Hz.

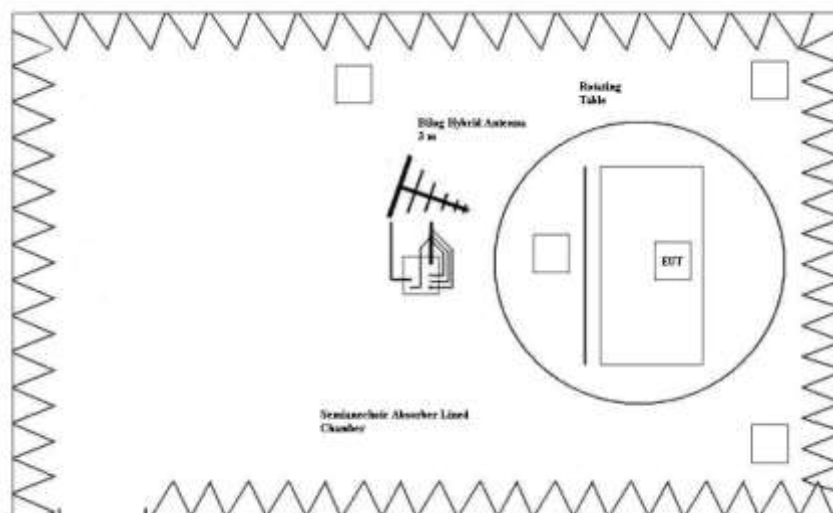
RADIATED EMISSION. ELECTROMAGNETIC FIELD MEASURE

LIMITS:	Product standard:	FCC Rules and Regulations CFR 47, Part 15, Subpart B (May 17, 2019 Edition) & ICES-003 Issue 6 (Updated 04-2019)
	Test standard:	FCC Rules and Regulations CFR 47, Part 15, Subpart B (May 17, 2019 Edition) & ICES-003 Issue 6 (Updated 04-2019)

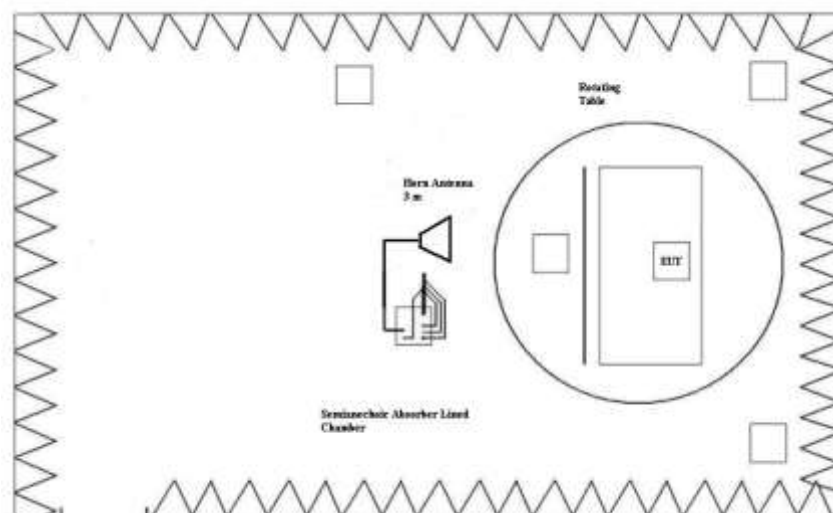
Limits of interference Class B

The applied limit for radiated emissions, 3 m distance, according with the requirements of FCC Rules and Regulations 47 CFR Part 15, Subpart B (10-1-16 Edition), Secs. 15.109 & ICES-003 (January 2016, updated April 2017) in the frequency range 30 MHz to 18 GHz for class B equipments.

Frequency range (MHz)	QP Limit for 3 m		PK Limit for 3 m
	($\mu\text{V/m}$)	($\text{dB}\mu\text{V/m}$)	($\text{dB}\mu\text{V/m}$)
30 to 88	100	40	---
88 to 216	150	43.5	---
216 to 960	200	46	---
Above 960	500	54	74



Setup for measurements < 1GHz.



Setup for measurements > 1GHz.

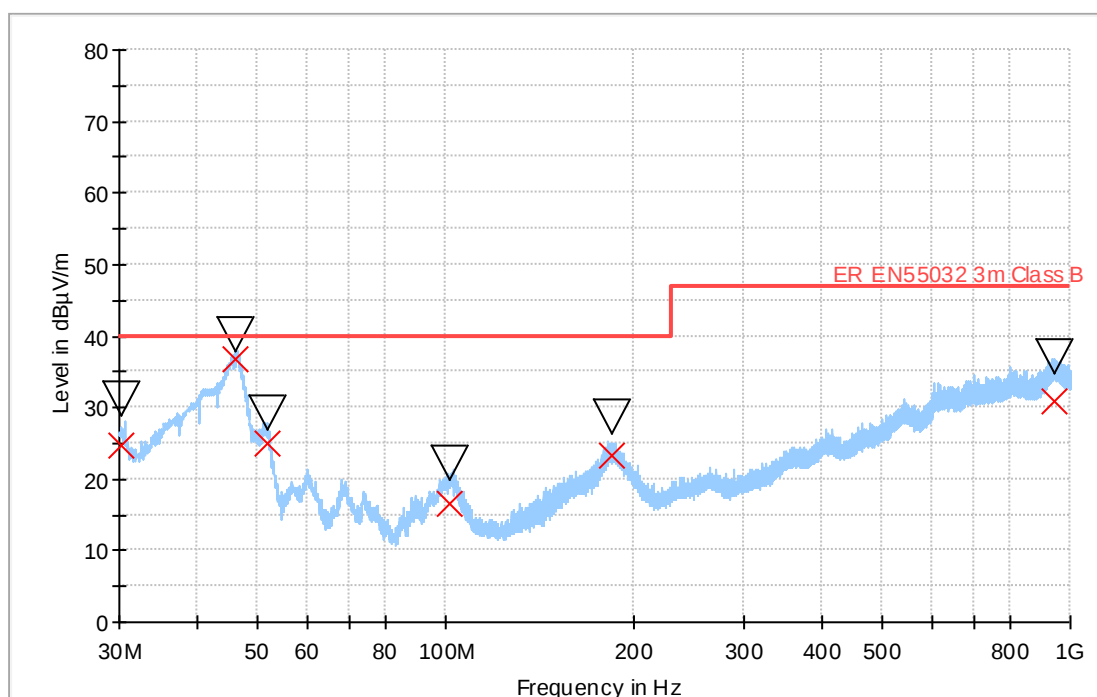
TESTED SAMPLE:	S/01
TESTED OPERATION MODES:	OM#01
TEST RESULTS:	CRmmnnRRPP: CR, Radiated Condition; mm: Sample number; nn: Operation mode; RR: Range; PP: Polarization.

CRmmnnRRPP	Description	Result
CR0101LR	Range: 30 MHz - 1000 MHz.	P
CR0101HR1 PH	Range: 1 GHz - 18 GHz. Horizontal Polarization.	P
CR0101HR1 PV	Range: 1 GHz - 18 GHz. Vertical Polarization.	P
CR0101HR2 PH	Range: 18 GHz - 26 GHz. Horizontal Polarization.	P
CR0101HR2 PV	Range: 18 GHz - 26 GHz. Vertical Polarization.	P

Radiated Emission. CR0101LR

Project: 57508REM.001
Company: ENKOA SYSTEM, S.L.
Sample: S/01
Operation mode: OM#01
Description: EUT ON. RFID OFF. Power supply: 115Vac

FCC Class B



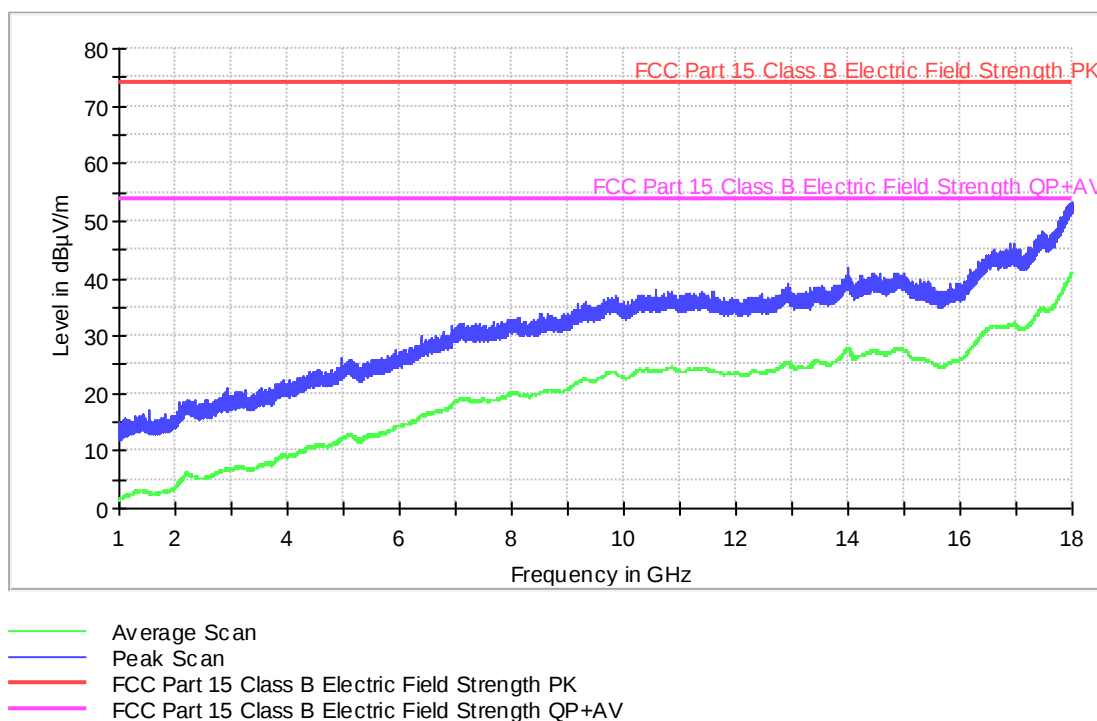
Maximizations

Frequency (MHz)	MaxPeak (dBμV/m)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)
30.169900	31.04	24.82	40.00	15.18	108.0	V	-141.0
46.195700	40.10	36.74	40.00	3.26	102.0	V	-83.0
51.781667	29.18	25.02	40.00	14.98	102.0	V	15.0
101.445700	22.14	16.43	40.00	23.57	102.0	V	-48.0
184.743867	28.73	23.18	40.00	16.82	100.0	V	153.0
941.030267	37.15	30.76	47.00	16.24	400.0	V	157.0

Radiated Emission. CR0101HR1_PH

Project: 57508REM.001
Company: ENKOA SYSTEM, S.L.
Sample: S/01
Operation mode: OM#01
Description: EUT ON. RFID OFF. Power supply: 115Vac. Horizontal polarization

FCC 15 Class B (1-18GHz)



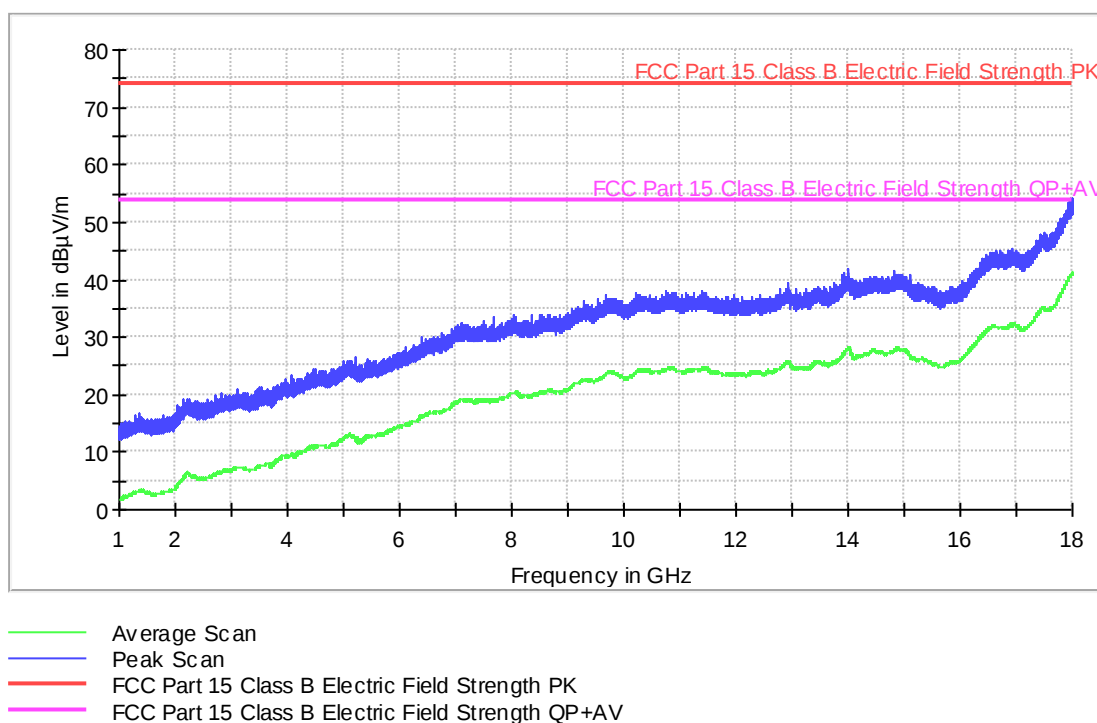
Subrange Maxima

Frequency (MHz)	PK+ CLRWR (dBµV/m)	AVG CLRWR (dBµV/m)
2360.000000	19.0	5.6
4394.800000	23.6	10.8
5912.400000	27.6	14.0
7684.800000	32.5	18.8
9330.800000	35.8	22.5
10586.800000	38.1	23.9
12881.600000	38.3	25.5
14011.600000	41.7	27.9
16190.800000	41.7	27.9
18000.000000	53.4	41.2

Radiated Emission. CR0101HR1_PV

Project: 57508REM.001
 Company: ENKOA SYSTEM, S.L.
 Sample: S/01
 Operation mode: OM#01
 Description: EUT ON. RFID OFF. Power supply: 115Vac. Vertical polarization

FCC 15 Class B (1-18GHz)



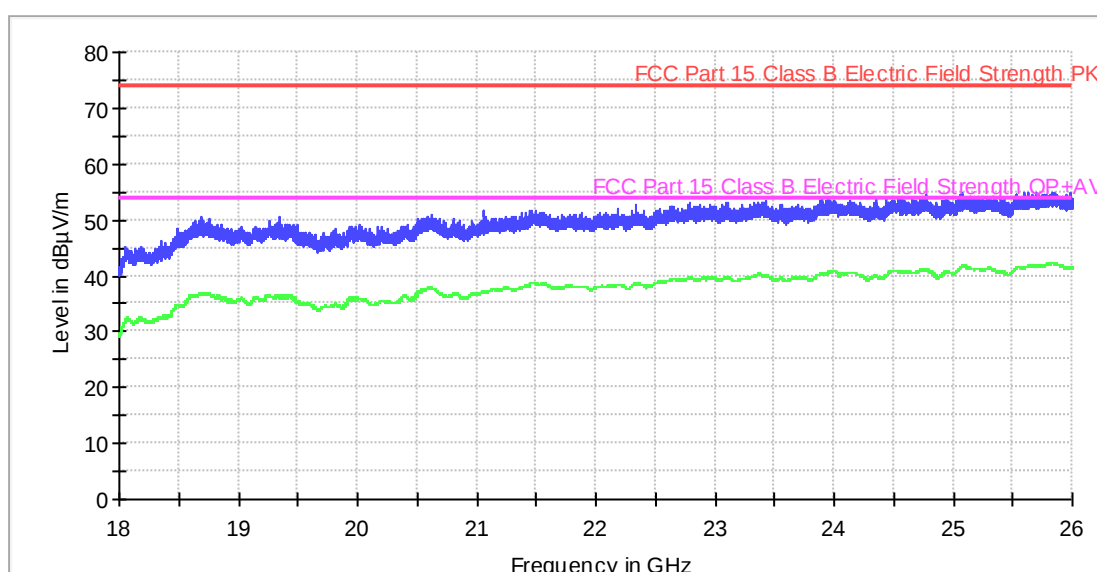
Subrange Maxima

Frequency (MHz)	PK+ CLRWR (dBµV/m)	AVG CLRWR (dBµV/m)
2700.000000	18.2	6.1
4400.000000	22.2	10.8
6100.000000	26.0	14.7
7800.000000	30.6	19.3
9500.000000	33.7	22.3
11200.000000	35.6	24.3
12900.000000	36.7	25.5
14600.000000	38.9	27.1
16300.000000	41.3	29.3
18000.000000	52.8	41.4

Radiated Emission. CR0101HR2_PH

Project: 57508REM.001
Company: ENKOA SYSTEM, S.L.
Sample: S/01
Operation mode: OM#01
Description: EUT ON. RFID OFF. Power supply: 115Vac. Horizontal polarization

FCC 15 Class B (18-26GHz)



— Average Scan
— Peak Scan
— FCC Part 15 Class B Electric Field Strength PK
— FCC Part 15 Class B Electric Field Strength QP+AV

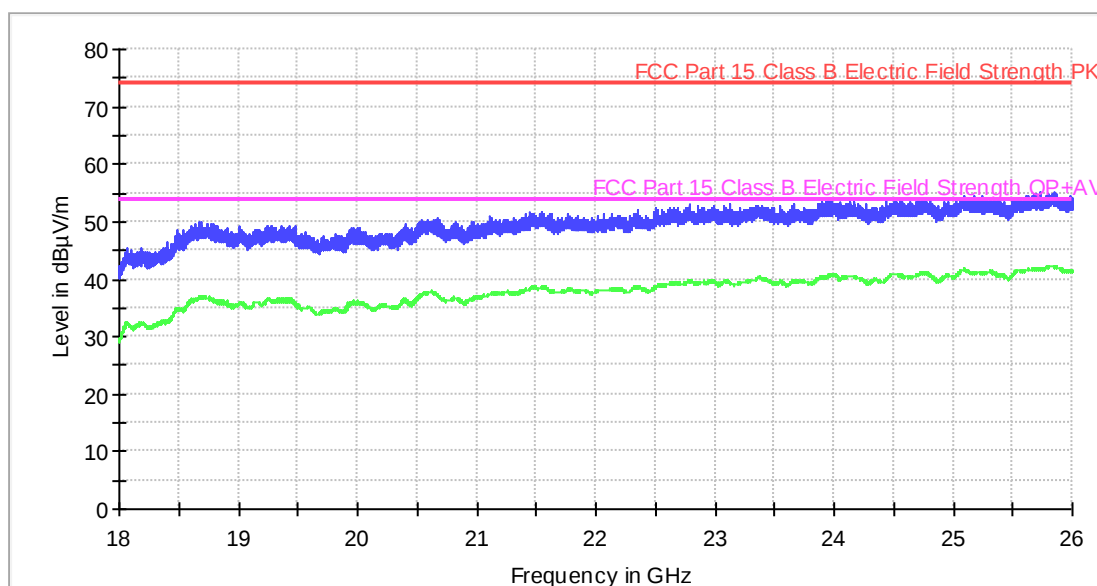
Subrange Maxima

Frequency (MHz)	PK+ CLRWR (dBµV/m)	AVG CLRWR (dBµV/m)
18690.000000	50.6	36.8
19347.200000	50.7	36.5
20015.200000	49.0	35.9
21061.200000	51.7	37.2
21449.200000	51.6	38.4
22796.400000	53.1	39.7
23428.000000	53.3	39.9
24351.600000	53.9	40.1
25082.000000	55.1	41.7
25984.800000	54.9	41.6

Radiated Emission. CR0101HR2_PV

Project: 57508REM.001
Company: ENKOA SYSTEM, S.L.
Sample: S/01
Operation mode: OM#01
Description: EUT ON. RFID OFF. Power supply: 115Vac. Vertical polarization

FCC 15 Class B (18-26GHz)



— Average Scan
— Peak Scan
— FCC Part 15 Class B Electric Field Strength PK
— FCC Part 15 Class B Electric Field Strength QP+AV

Subrange Maxima

Frequency (MHz)	PK+ CLRWR (dBµV/m)	AVG CLRWR (dBµV/m)
18693.600000	49.9	36.7
19251.600000	49.3	36.4
20399.600000	49.7	36.2
21117.600000	50.9	37.4
21453.600000	51.7	38.6
22781.600000	53.2	39.8
23120.800000	53.1	39.5
23956.800000	53.9	40.6
25094.800000	54.6	41.7
25728.000000	55.3	41.8

CONTINUOUS CONDUCTED EMISSION ON POWER LEADS

LIMITS:	Product standard:	FCC Rules and Regulations CFR 47, Part 15, Subpart B (May 17, 2019 Edition) & ICES-003 Issue 6 (Updated 04-2019)
	Test standard:	FCC Rules and Regulations CFR 47, Part 15, Subpart B (May 17, 2019 Edition) & ICES-003 Issue 6 (Updated 04-2019)

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 (May 17, 2019 Edition), Secs. 15.107/15.207 & ICES-003 (Updated 04-2019), 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

*Decreases with the logarithm of the frequency.

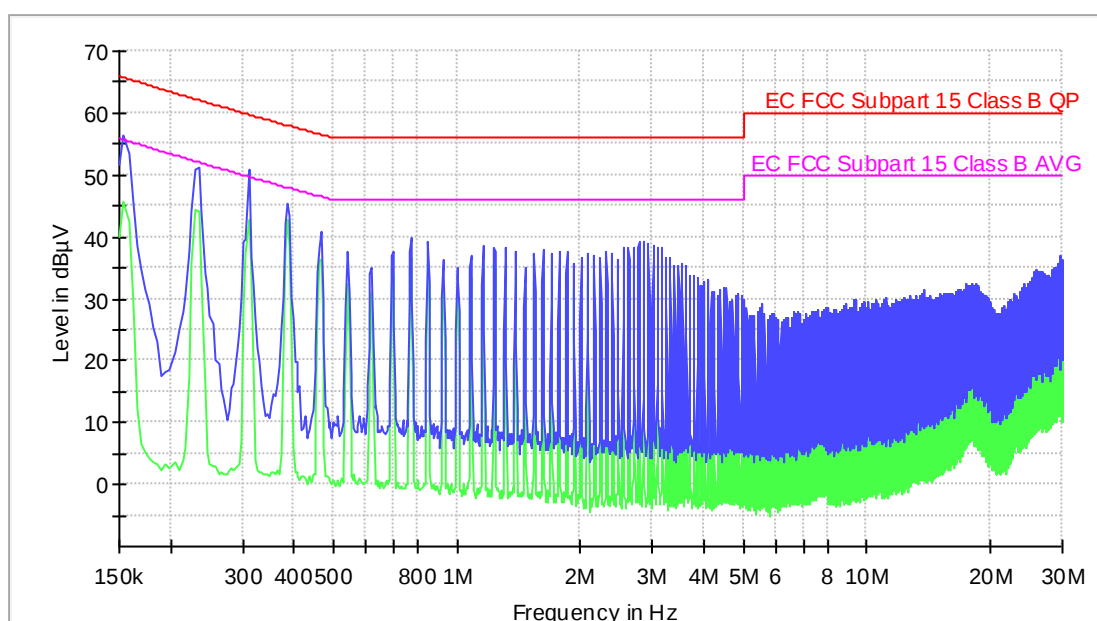
TESTED SAMPLES:	S/01 & S/02
TESTED OPERATION MODES:	OM#01 & OM#02
TEST RESULTS:	CCmmnnhh: CC, Conducted Condition; mm: Sample number; nn: Operation mode; hh: wire

CCmmnnhh	DESCRIPTION	RESULT
CC0101N	Range: 150kHz – 30MHz. Neutral wire noise.	P
CC0101L1	Range: 150kHz – 30MHz. Phase wire noise.	P
CC0202N	Range: 150kHz – 30MHz. Neutral wire noise.	P
CC0202L1	Range: 150kHz – 30MHz. Phase wire noise.	P

Conducted Emission. CC0101N

Project: 57508REM.001
Company: ENKOA SYSTEM, S.L.
Sample: S/01
Operation mode: OM#01
Description: EUT ON. RFID OFF. Power supply: 115Vac. Neutral wire noise

FCC Class B



— Average Scan — Peak Scan
— EC FCC Subpart 15 Class B AVG — EC FCC Subpart 15 Class B QP

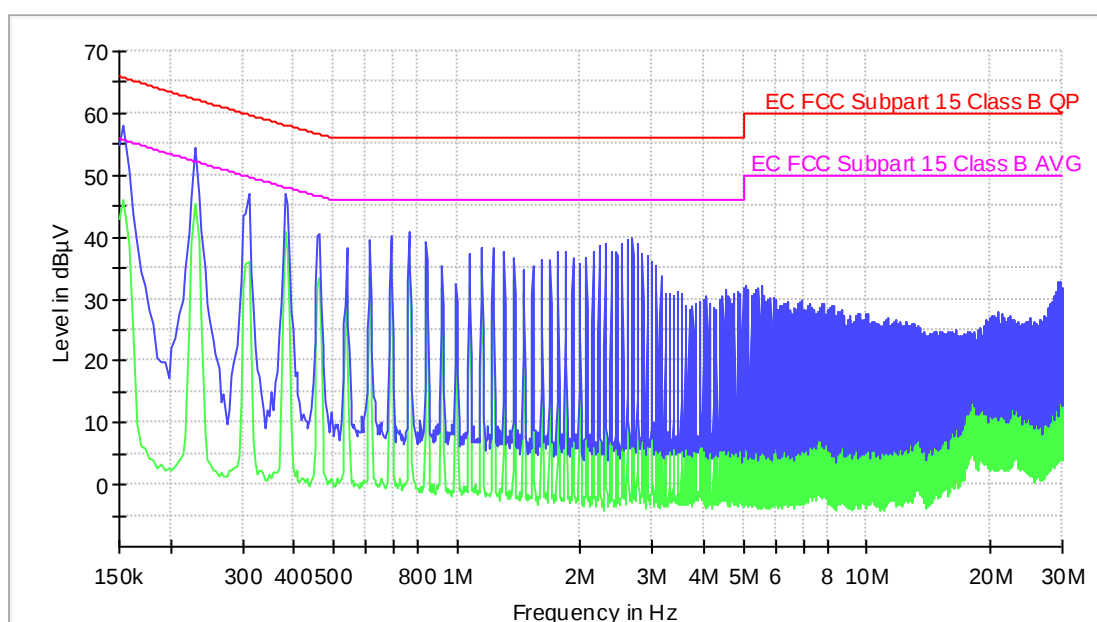
Subrange Maxima

Frequency (MHz)	PK+ CLRWR (dBμV)	AVG CLRWR (dBμV)
0.154000	56.3	45.7
3.166000	38.2	35.2
8.882000	29.1	24.2
11.122000	30.0	24.6
13.750000	31.4	26.2
17.998000	32.6	27.2
18.458000	32.4	23.1
23.870000	31.8	25.4
26.030000	34.7	24.3
29.590000	36.8	29.6

Conducted Emission. CC0101L1

Project: 57508REM.001
Company: ENKOA SYSTEM, S.L.
Sample: S/01
Operation mode: OM#01
Description: EUT ON. RFID OFF. Power supply: 115Vac. Phase wire noise

FCC Class B



— Average Scan — Peak Scan
— EC FCC Subpart 15 Class B QP — EC FCC Subpart 15 Class B AVG

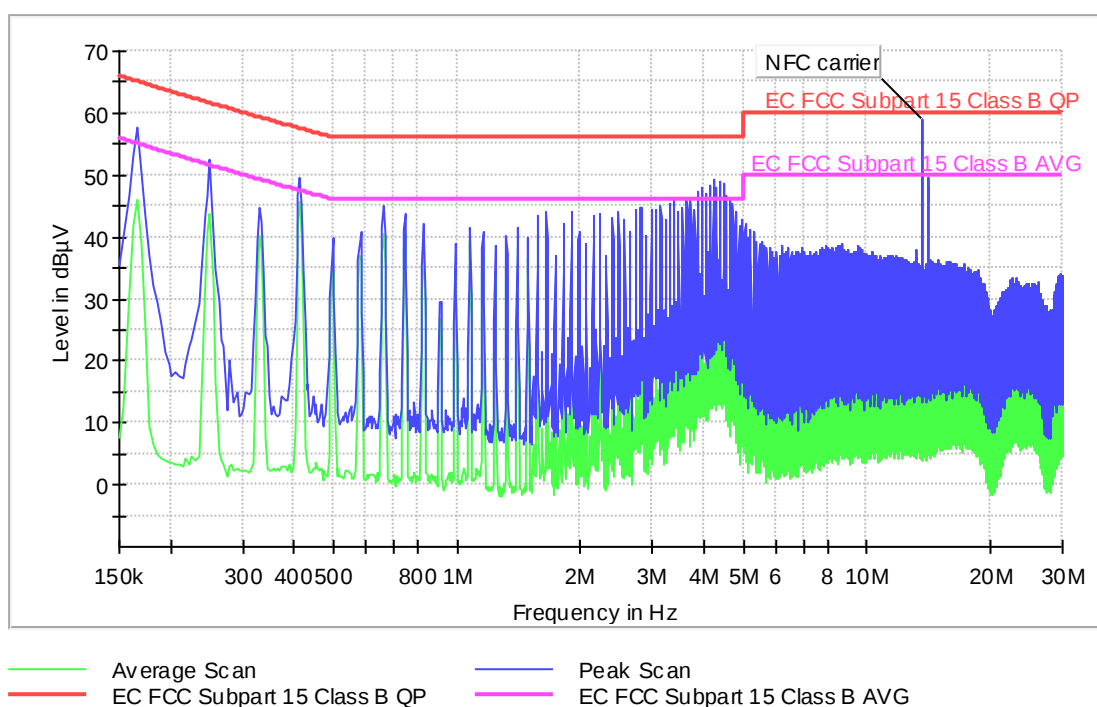
Subrange Maxima

Frequency (MHz)	PK+ CLRWR (dBµV)	AVG CLRWR (dBµV)
0.154000	58.0	46.0
3.146000	33.9	26.4
6.914000	29.8	24.3
9.994000	27.7	22.6
12.534000	26.4	20.0
16.466000	25.0	17.9
20.934000	27.8	21.9
21.322000	27.6	20.7
25.170000	27.0	17.4
29.642000	32.9	19.9

Conducted Emission. CC0202N

Project: 57508REM.001
Company: ENKOA SYSTEM, S.L.
Sample: S/02
Operation mode: OM#02
Description: EUT ON. RFID ON reading NFC card. Power supply: 115Vac.
Neutral wire noise

FCC Class B



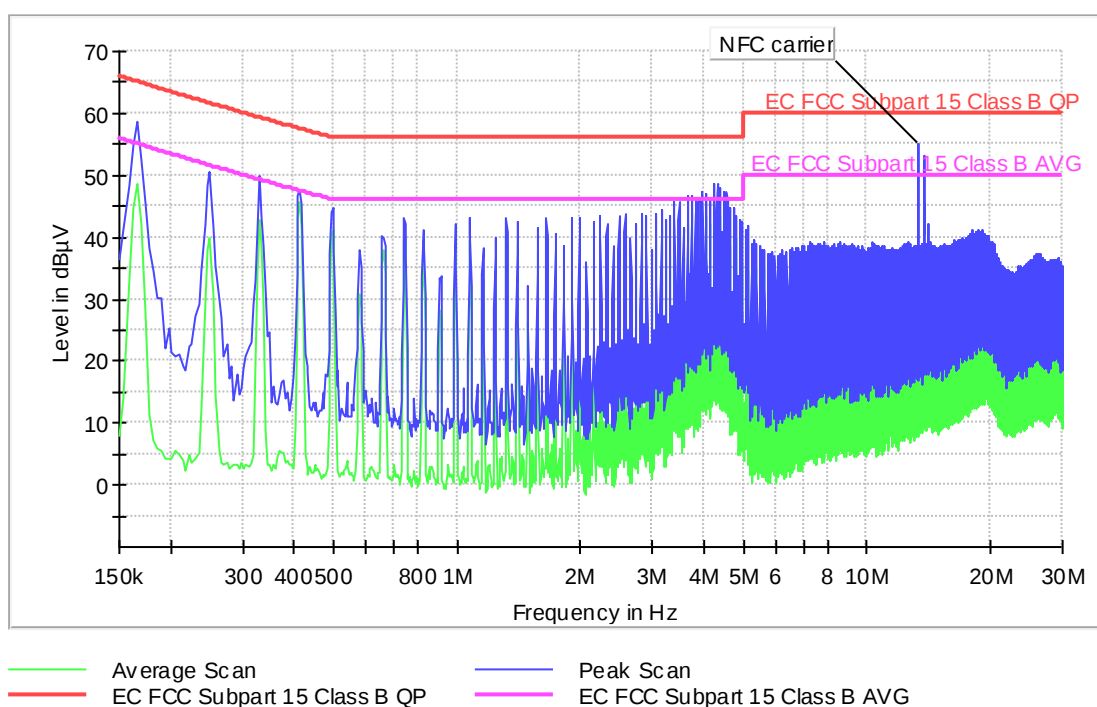
Subrange Maxima

Frequency (MHz)	PK+ CLRWR (dBµV)	AVG CLRWR (dBµV)
0.166000	57.7	46.2
4.218000	49.3	45.0
8.682000	39.0	35.0
9.510000	38.6	34.7
13.638000	58.9	32.1
15.794000	36.0	32.4
18.686000	34.7	30.5
23.230000	33.5	29.5
26.118000	32.6	26.5
29.594000	33.9	25.4

Conducted Emission. CC0202L1

Project: 57508REM.001
Company: ENKOA SYSTEM, S.L.
Sample: S/02
Operation mode: OM#02
Description: EUT ON. RFID ON reading NFC card. Power supply: 115Vac.
Phase wire noise

FCC Class B



Subrange Maxima

Frequency (MHz)	PK+ CLRWR (dBµV)	AVG CLRWR (dBµV)
0.166000	58.6	48.5
4.226000	48.6	45.9
7.874000	39.3	35.4
10.362000	39.1	36.1
13.350000	55.1	31.9
17.902000	40.5	37.1
18.650000	41.2	35.5
21.050000	36.0	31.6
26.246000	37.3	31.8
29.222000	36.6	31.0