AT4 wireless, S.A.U.
Parque Tecnológico de Andalucía,
c/ Severo Ochoa nº 2 · 29590 Campanillas · Málaga · España
www.at4wireless.com · C.I.F. A29 507 456

Nº 51/LE147

Informe de ensayo nº:
Test report No:

NIE: 46495REM.002A4

Test Report (Modification 4)

FCC Rules and Regulations 47 CFR Chapter I Part 15 Subpart B (10-01-13 Edition); ICES-003 ISSUE 5 (2012)

Identification of item tested.....:	MySignals This device receives data from sensors and sends information with its wireless radio. It is 7V DC powered using a 220/7 AC/DC converter and can be easily programmed.
Trademark .....:	Libelium
Model and /or type reference.....:	MySignals Sensor Platform V3
Other identification of the product .....:	S/N: EMC
Final HW version .....:	1.0
Final SW version .....:	1.0
FCC ID .....:	FCC ID (MySignals): XKM-MYSIGNAL-V1 FCC ID (WiFi Chipset): 2AC7Z-ESPWROOM02 FCC ID (BLE Chipset): 5123A-BGTBLE112
IC .....:	IC (MySignals): 8472A-MYSIGNALV1
Features.....:	This device sends data via WiFi and Bluetooth Low Energy.
Manufacturer.....:	LIBELIUM COMUNICACIONES DISTRIBUIDAS, S.L. C/ Escatrón, 16. (Edificio Libelium), C.P.: 50014 Zaragoza. Spain.
Test method requested, standard.....:	FCC Rules and Regulations 47 CFR Chapter I Part 15 Subpart B (10-01-13 Edition); ICES-003 ISSUE 5 (2012)
Summary.....:	IN COMPLIANCE
Approved by (name / position & signature).....:	Francisco Cañas Regulatory Lab Director FRANCISCO CAÑAS ESCRIBANO 2016.11.15 09:03:58 +01'00'
Date of issue.....:	2016-10-11
Report template No.....:	FDT11_18

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Uncertainty

Uncertainty (factor k=2) was calculated according to the AT4 wireless internal document PODT000.

Usage of samples

Samples under test have been selected by: the Client.

Sample S/01 is composed of the following elements:

Control Nº	Description	Model	Serial number	Reception date
46495/001	Central node	MySignals	EMC	2015-11-16
46495/002	AC/DC Adapter	3A-186DB07	T5001ST	2015-11-16
46495/003	AC cable	---	---	2015-11-16
46495/004	Peak flow meter	MSA100	PFM150808	2015-11-16
46495/005	USB-Jack cable	---	---	2015-11-16
46495/006	SP02 meter	CMS50D+	DU1407100650	2015-11-16
46495/007	USB-Jack cable	---	---	2015-11-16
46495/008	Blood pressure	KD-2C2G	2G1507000009	2015-11-16
46495/009	USB-Jack cable	---	---	2015-11-16
46495/010	ECG Sensor	---	---	2015-11-16
46495/011	EMG Sensor	---	---	2015-11-16
46495/012	GSR Sensor	---	---	2015-11-16
46495/013	SNORE sensor	---	---	2015-11-16
46495/014	Glucose meter	---	---	2015-11-16
46495/015	Jack-miniJack cable	---	---	2015-11-16
46495/016	Air flow sensor	---	---	2015-11-16
46495/017	Temperature sensor	---	---	2015-11-16
46495/018	Position sensor	---	---	2015-11-16
46495/019	USB-micro USB cable	---	---	2015-11-16

Sample S/03 incorporates the next modifications:
The snore sensor cable with the button is moved to a real position near the snore sensor cable of the neck; It was added a ferrite with the code WÜRTH 742 711 11 to the DC power cable, near to the equipment.

Sample S/04 is the sample S/03 replacing the AC/DC adapter (46495/002) by the next one:

Control Nº	Description	Model	Serial number	Reception date
46495/021	AC/DC Adapter	3A-186DB07	---	2015-11-16

Auxiliary PC for Operation Mode 03: Dell Latitude E6440 (CTC-1230-D)

Test sample description

MySignals Sensor Platform. This device receives data from sensors and sends information with its wireless radio. It is 7Vdc powered using a 220/7 AC/DC converter and can be easily programmed.

Identification of the client

LIBELIUM COMUNICACIONES DISTRIBUIDAS, S.L.
C/ Escatrón, 16. (Edificio Libelium), C.P.: 50014
Zaragoza. Spain.

Testing period

The performed test started on 2015-11-16 and finished on 2015-11-27. The tests have been performed at AT4 wireless.

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. = 20 % Max. = 80 %
Shielding effectiveness	> 100 dB
Reference resistance to earth	< 1 Ω

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

Temperature	Min. = 15 ºC Max. = 30 ºC
Relative humidity	Min. = 45 % Max. = 60 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar
Shielding effectiveness	> 100 dB
Reference resistance to earth	< 1 Ω
Normal site attenuation (NSA)	< ±4 dB at 10 m distance between item under test and receiver antenna, (30 MHz to 1000 MHz)
Site VSWR	< ±6 dB at 3m distance between item under test and receiver antenna, (1 GHz to 18 GHz)
Field homogeneity	More than 75% of illuminated surface is between 0 and 6 dB (26 MHz to 18 GHz).

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

Temperature	Min. = 15 ºC Max. = 30 ºC
Relative humidity	Min. = 45 % Max. = 60 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar
Shielding effectiveness	> 100 dB
Reference resistance to earth	< 1 Ω

Modifications to the reference test report

It was introduced the following modifications in respect to the test report number 46495REM.002 related with the same samples, in the next clauses and sub-clauses:

- By client requirement it was modified the commercial name, FCC ID and IC fields.

- Also was replaced “MyHospital” and “eHealth” by “MySignals”.

- The Operation Mode 03 defined as “programming mode connected by USB cable to an auxiliary PC” is included in the report. The measurement results for this mode are added.

This modification test report cancels and replaces the test report 46495REM.002, 46495REM.002A1, 46495REM.002A2 and 46495REM.002A3 .

Remarks and comments

The tests have been performed by the technical personnel: Pedro Manuel Valenzuela & José Manuel Márquez.

The total uncertainty of the measurement system for the measured radio disturbance characteristics of EUT from 30 MHz to 1000 MHz is I = ± 4,37 dB for quasi-peak measurements, I = ± 4,28 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 26GHz is I = ± 2,62 dB for peaks and average measurements (k = 2).

Testing verdicts (Legend)

Not applicable ..... :	N/A
Pass ..... :	P
Fail ..... :	F
Not measured ..... :	N/M

List of equipment used during the test					
CONTROL NUMBER	**DESCRIPTION**	**MANUFACTURER**	**MODEL**	**LAST CALIBRATION**	**NEXT CALIBRATION**
1999	EMI Receptor	ROHDE & SCHWARZ	ESIB 26	2015-06-16	2017-06-16
2932	Bilog Hybrid Antenna	SUNOL	JB6	2014-05-11	2017-05-11
4612	Horn Antenna	SCHWARZBECK MESS- ELEKTRONIK	BBHA 9120D	2013-12-29	2016-12-29
4658	RF Amplifier	SCHWARZBECK	BBV9743	2015-03-19	2016-03-19
4662	Transient limiter	SCHWARZBECK	VTSD 9561-D	2014-02-12	2016-02-12
4659	RF Amplifier	SCHWARZBECK	BBV 9718	2015-09-29	2016-09-29
4729	RF Amplifier	BONN ELEKTRONIK	BLMA 1840-1M	2015-12-02	2017-12-02
3545	Temperature and humidity probe	PICO TECHNOLOGY	HUMIDIPROBE	2015-03-04	2016-03-04
3556	Digital termohigrometer	T&D	TR-72W	2015-04-16	2016-04-16
4657	Horn Antenna	SCHWARZBECK	BBHA 9170	2014-03-28	2017-03-28
0224	Artificial network	ROHDE & SCHWARZ	ESH2-Z5	2015-02-06	2017-02-06

Appendix A – Test result

CONTENT

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:

OPERATION MODE	DESCRIPTION
OM#01	EUT ON. IDLE WiFi. Bluetooth in IDLE mode. All sensors connected and working. Power supply: 115Vac.
OM#02	EUT ON. WiFi in transmission mode. Bluetooth in transmission mode. All sensors connected and working. Power supply: 115Vac.
OM#03	EUT ON. Equipment in programming mode connected by USB cable to an auxiliary PC. Power supply: 115Vac.

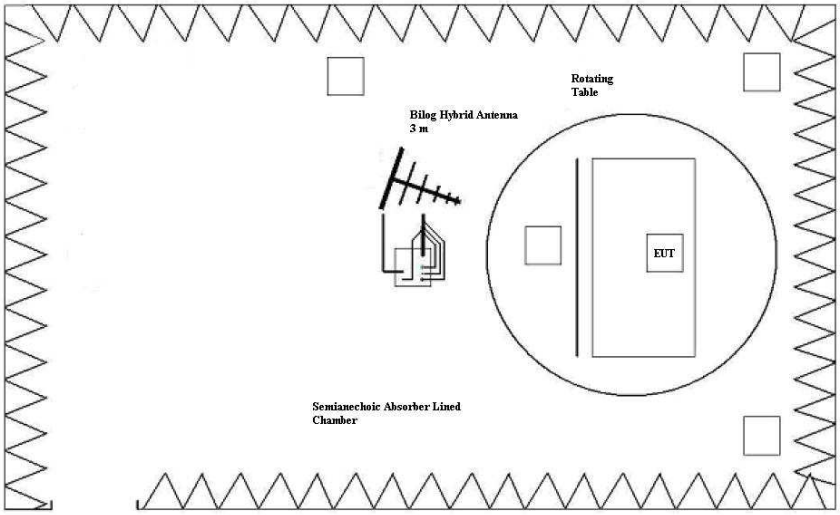
RADIATED EMISSION. ELECTROMAGNETIC FIELD MEASURE

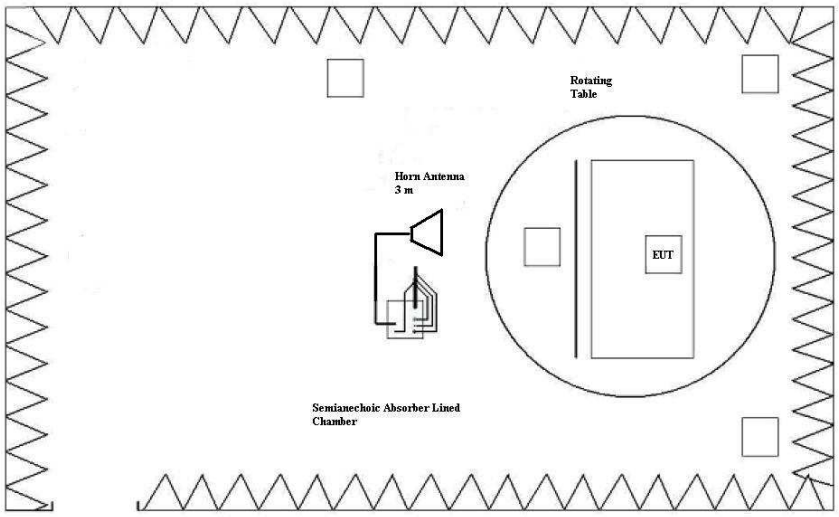
LIMITS:	**Product standard:**	FCC RULES AND REGULATIONS 47 CFR PART 15, SUBPART B (10-01-13 Edition); ICES-003 ISSUE 5 (2012)
	Test standard:	FCC RULES AND REGULATIONS 47 CFR PART 15, SUBPART B (10-01-13 Edition); ICES-003 ISSUE 5 (2012)

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 15.109, Subpart B (10-01-13 Edition) & ICES-003 ISSUE 5 (2012) in the frequency range 30 MHz to 26 GHz, for Class B equipment, which is a transmitter in a band over 500 MHz, was:

Frequency range (MHz)	QP Limit for 3 m (µV/m)	QP Limit for 3 m (dBµV/m)
30 to 88	100	40
88 to 216	150	43.52
216 to 960	200	46.02
Above 960	500	53.98
Above 1000	Limit for 3m AVG	Limit for 3m PK
	53.98 dBµV/m	73.98 dBµV/m





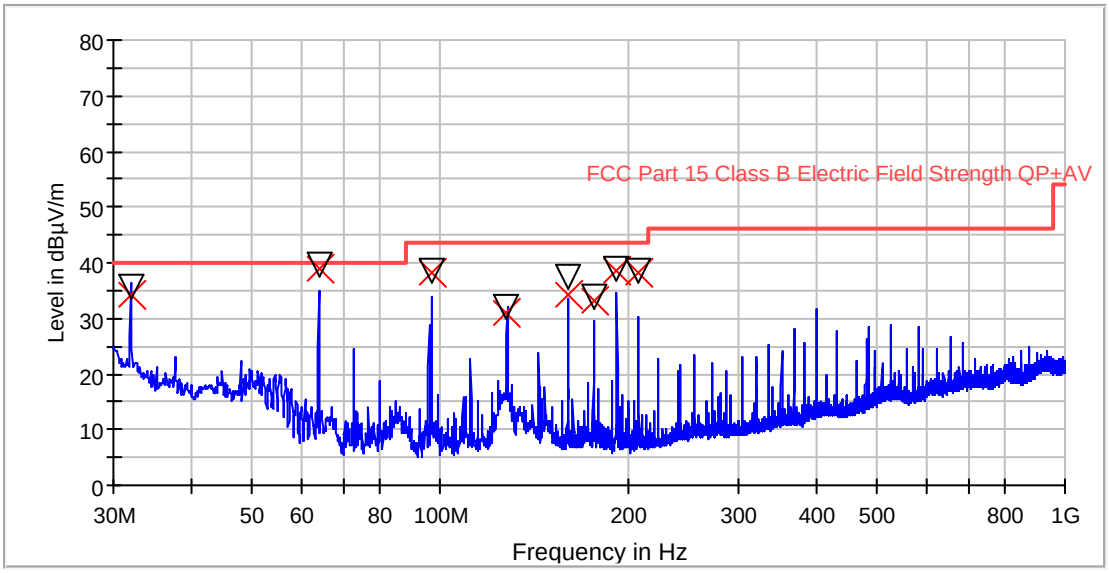
TESTED SAMPLES:	S/03
TESTED OPERATION MODES:	OM#01 & OM#03
TEST RESULTS:	CRmmnn: CR, Radiation Condition; mm: Sample number; nn: Operation mode;

CRmmnn	Description	Result
CR0301RB	Range: 30 MHz - 1000 MHz.	P
CR0301RA_1_PH	Range: 1 GHz - 18 GHz. Horizontal polarization.	P
CR0301RA_1_PV	Range: 1 GHz - 18 GHz. Vertical polarization.	P
CR0301RA_2_PH	Range: 18 GHz - 26 GHz. Horizontal polarization.	P
CR0301RA_2_PV	Range: 18 GHz - 26 GHz. Vertical polarization.	P
CR0303	The programming USB mode (03) is previewed and compared with normal mode (01). It is checked that the normal operation mode is the worst case, so the final measurements are performed on operation mode 03.	P

Radiated Emission. CR0301RB

Project:	46495REM.002
Company:	LIBELIUM COMUNICACIONES DISTRIBUIDAS S.L.
Sample:	S/03
Operation mode:	OM#01
Description:	EUT ON. WIFI idle. Bluetooth Idle. All sensor are connected and working. Power supply: 115Vac.

Full Spectrum



FCC Part 15 Class B Electric Field Strength QP+AV
Auto test - MaxPeak
QuasiPeak
MaxPeak

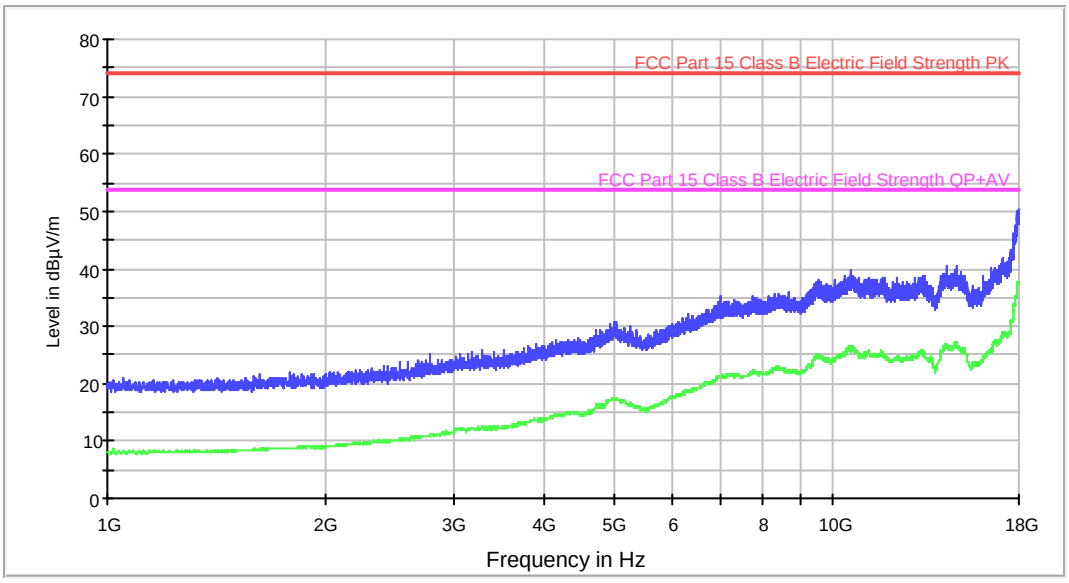
Maximizations

Frequency (MHz)	QuasiPeak (dBµV/m)	MaxPeak (dBµV/m)	Height (cm)	Pol	Azimuth (deg)
31.990260	34.24	---	107.0	V	287.0
31.990260	---	35.53	107.0	V	287.0
63.987013	39.09	---	270.0	V	279.0
63.987013	---	39.46	270.0	V	279.0
96.961039	38.21	---	202.0	H	216.0
96.961039	---	38.63	202.0	H	216.0
127.967532	31.03	---	106.0	V	278.0
127.967532	---	32.06	106.0	V	278.0
159.970779	---	37.30	182.0	H	9.0
159.970779	34.09	---	182.0	H	9.0
175.961039	33.21	---	201.0	H	346.0
175.961039	---	33.89	201.0	H	346.0
191.951948	---	39.03	109.0	H	0.0
191.951948	38.72	---	109.0	H	0.0
207.938961	38.06	---	137.0	H	49.0
207.938961	---	38.58	137.0	H	49.0

Radiated Emission. CR0301RA_1_PH

Project:	46495REM.002
Company:	LIBELIUM COMUNICACIONES DISTRIBUIDAS S.L.
Sample:	S/03
Operation mode:	OM#01
Description:	EUT ON. WIFI idle. Bluetooth Idle. All sensor are connected and working. Power supply: 115Vac. Horizontal polarization.

ER EMI FCC 15 Class B



MaxPeak-ClearWrite-PK+
FCC Part 15 Class B Electric Field Strength PK
Average-ClearWrite-AVG
FCC Part 15 Class B Electric Field Strength QP+AV

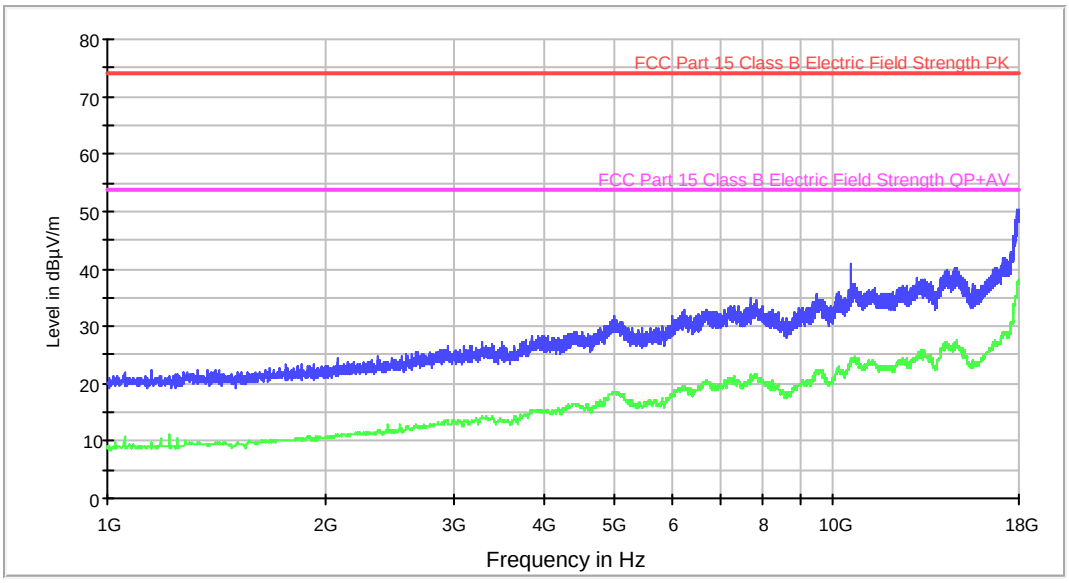
Subrange Maxima

Frequency (MHz)	MaxPeak-ClearWrite (dBµV/m)	Average-ClearWrite (dBµV/m)
1050.000000	20.8	8.0
1778.000000	21.9	8.8
2320.000000	22.8	10.0
3172.000000	25.4	12.1
4155.000000	27.5	14.8
5014.000000	30.7	17.4
6968.000000	35.1	21.3
9513.000000	38.0	24.9
10554.000000	39.7	26.7
17958.000000	50.2	37.7

Radiated Emission. CR0301RA_1_PV

Project:	46495REM.002
Company:	LIBELIUM COMUNICACIONES DISTRIBUIDAS S.L.
Sample:	S/03
Operation mode:	OM#01
Description:	EUT ON. WIFI idle. Bluetooth Idle. All sensor are connected and working. Power supply: 115Vac.

ER EMI FCC 15 Class B



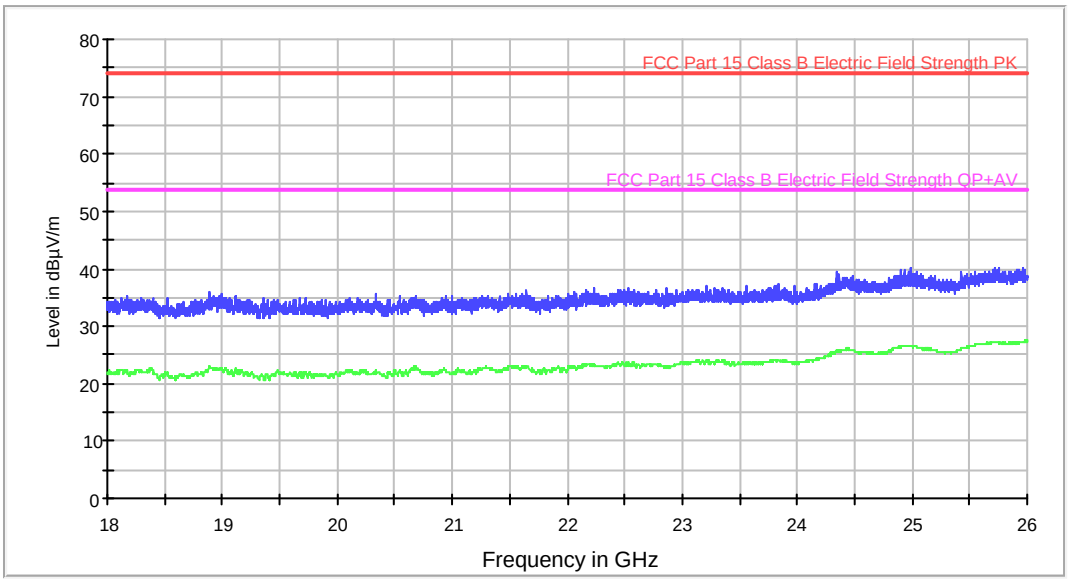
Subrange Maxima

Frequency (MHz)	MaxPeak-ClearWrite (dBµV/m)	Average-ClearWrite (dBµV/m)
1152.000000	22.4	9.7
1765.000000	23.3	10.2
2362.000000	24.8	11.7
3164.000000	26.6	13.3
4038.000000	28.5	15.3
4988.000000	31.7	18.6
7386.000000	33.6	20.5
9485.000000	35.5	22.1
10531.000000	41.0	23.8
17957.000000	50.4	37.8

Radiated Emission. CR0301RA_2_PH

Project:	46495REM.002
Company:	LIBELIUM COMUNICACIONES DISTRIBUIDAS S.L.
Sample:	S/03
Operation mode:	OM#01
Description:	EUT ON. WIFI idle. Bluetooth Idle. All sensor are connected and working. Power supply: 115Vac. Horizontal polarization.

ER EMI FCC 15 Class B



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

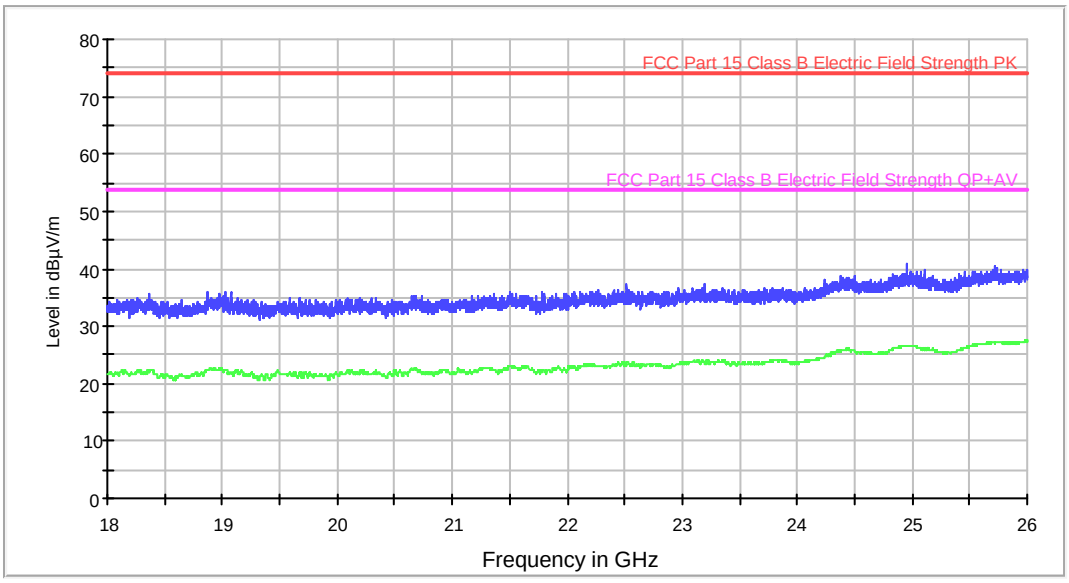
Subrange Maxima

Frequency (MHz)	MaxPeak-ClearWrite (dBµV/m)	Average-ClearWrite (dBµV/m)
18175.000000	35.3	22.2
18883.000000	35.9	22.7
19668.000000	35.0	21.7
20337.000000	35.5	21.9
21480.000000	35.8	22.4
22234.000000	36.6	23.1
23211.000000	36.9	23.8
23845.000000	37.5	24.0
24994.000000	40.2	26.5
25758.000000	40.3	27.2

Radiated Emission. CR0301RA_2_PV

Project:	46495REM.002
Company:	LIBELIUM COMUNICACIONES DISTRIBUIDAS S.L.
Sample:	S/03
Operation mode:	OM#01
Description:	EUT ON. WIFI idle. Bluetooth Idle. All sensor are connected and working. Power supply: 115Vac. Vertical polarization.

ER EMI FCC 15 Class B



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

Subrange Maxima

Frequency (MHz)	MaxPeak-ClearWrite (dBµV/m)	Average-ClearWrite (dBµV/m)
18372.000000	35.5	22.4
19029.000000	36.1	22.4
20083.000000	35.1	22.2
20687.000000	35.4	22.6
21508.000000	35.8	23.1
22401.000000	36.4	23.4
22522.000000	37.4	23.7
23791.000000	36.8	24.0
24959.000000	41.0	26.6
25717.000000	40.4	27.2

CONTINUOUS CONDUCTED EMISSION ON POWER LEADS

LIMITS:	Product standard :	FCC RULES AND REGULATIONS 47 CFR PART 15, SUBPART B (10-01-14 Edition) & ICES-003 ISSUE 5 (2012)
	Test standard :	FCC RULES AND REGULATIONS 47 CFR PART 15, SUBPART B (10-01-14 Edition) & ICES-003 ISSUE 5 (2012)

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 (10-01-14 Edition) & ICES-003 ISSUE 5 (2012), 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

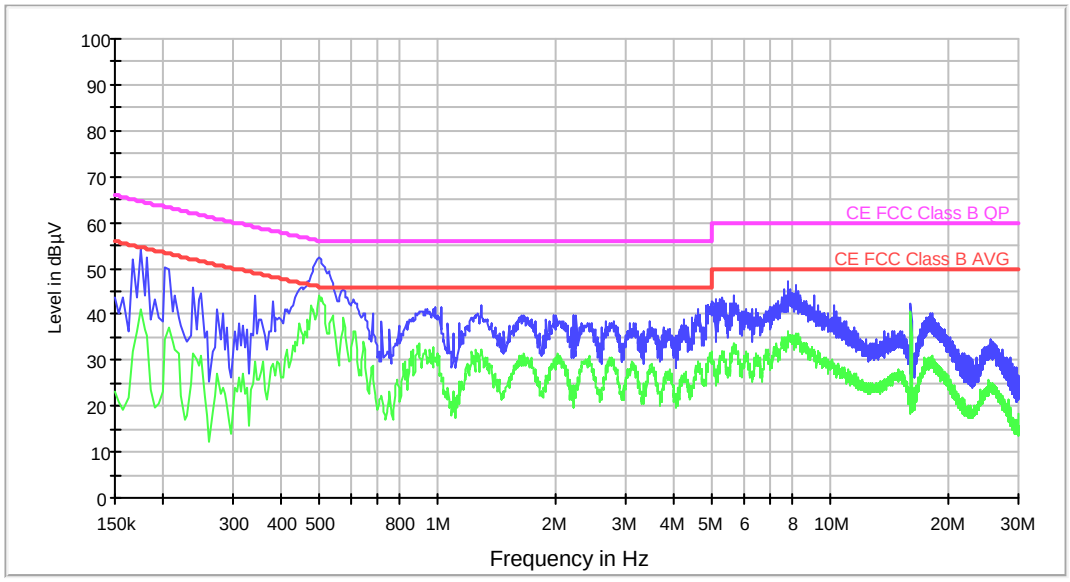
TESTED SAMPLES:	S/04
TESTED OPERATION MODES:	OM#01 & OM#02
TEST RESULTS :	CCmmnnhh: CC, Conducted Condition; mm: Sample number; nn: Operation mode; hh: wire

CCmmnnhh	**Description**	**Result**
CC04010N	Neutral wire noise.	P
CC0401L1	Phase wire noise.	P
CC04020N	Neutral wire noise.	P
CC0402L1	Phase wire noise.	P
CC0403	The programming mode (03) is previewed and compared with normal modes (01 and 02). It is checked that the working operation mode is the worst case, so the final measurements are performed on operation modes 01 and 02.	P

Continuous Conducted Emission : CC04010N	**Detector : Peak / Average / Cuasi-peak**

Project: 46495REM.002
Company: Libelium
Sample: S/04
Operation mode: OM#01
Description: EUT ON. WIFI idle. Bluetooth Idle. All sensor are conected and working. Power supply: 115Vac. Neutral wire noise

EC FCC Class B ESPI CC



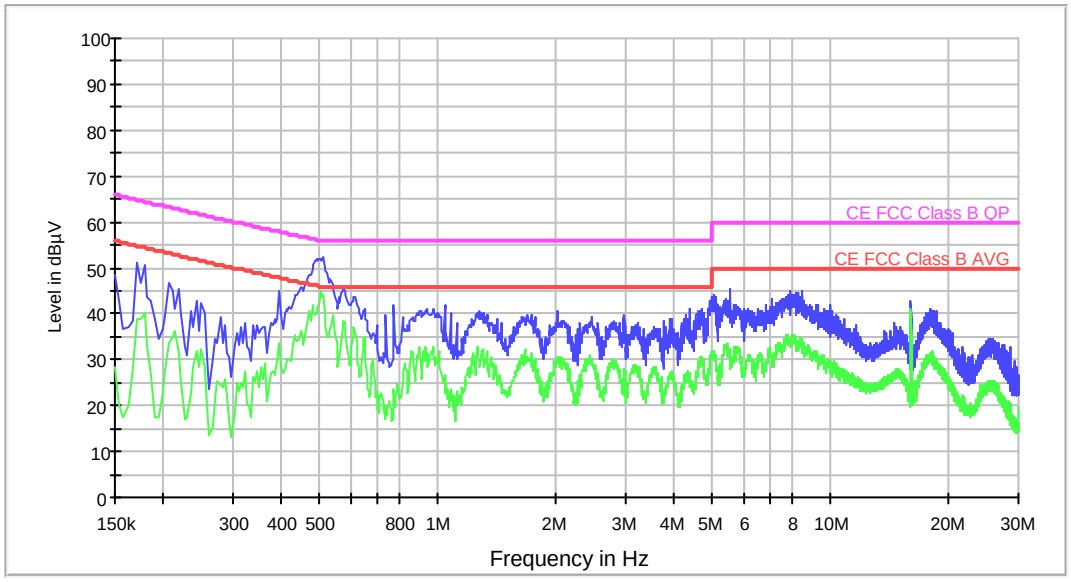
Subrange Maxima

Frequency (MHz)	MaxPeak-ClearWrite (dBµV)	Average-ClearWrite (dBµV)
0.174000	54.2	41.0
0.426000	41.9	33.0
0.498000	52.2	44.2
0.894000	40.7	33.4
1.250000	39.8	32.3
2.414000	38.1	30.8
5.690000	41.6	33.8
7.738000	47.0	36.3
15.998000	42.4	40.7
18.002000	39.4	30.9

Continuous Conducted Emission : CC0401L1	**Detector : Peak / Average / Cuasi-peak**

Project: 46495REM.002
Company: Libelium
Sample: S/04
Operation mode: OM#01
Description: EUT ON. WIFI idle. Bluetooth Idle. All sensor are conected and working. Power supply: 115Vac. L1 wire noise

EC FCC Class B ESPI CC



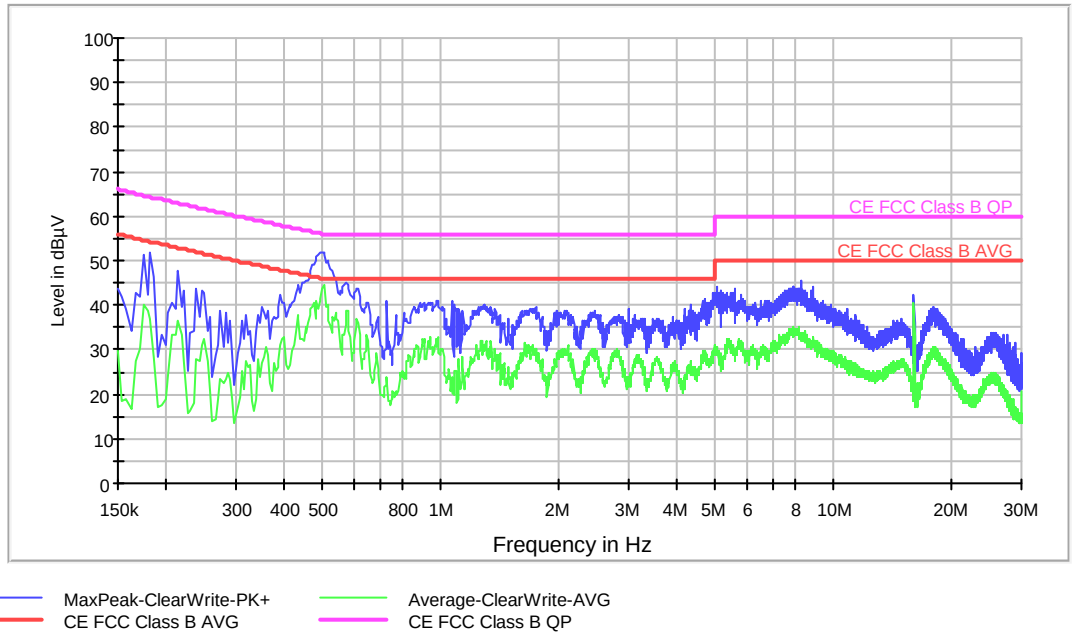
Subrange Maxima

Frequency (MHz)	MaxPeak-ClearWrite (dBµV)	Average-ClearWrite (dBµV)
0.178000	50.6	40.4
0.430000	43.6	35.3
0.502000	52.1	44.9
0.898000	40.5	32.7
1.258000	40.0	32.7
2.442000	38.0	30.9
5.430000	42.1	33.7
7.958000	44.2	35.4
15.998000	42.8	41.0
18.002000	38.4	31.9

Continuous Conducted Emission : CC04020N	**Detector : Peak / Average / Cuasi-peak**

Project: 46495REM.002
Company: Libelium
Sample: S/04
Operation mode: OM#02
Description: EUT ON. WIFI in Transmission Mode. Bluetooth in Transmission Mode. All sensor are conected and working. Power supply: 115Vac. Neutral wire noise

EC FCC Class B ESPI CC



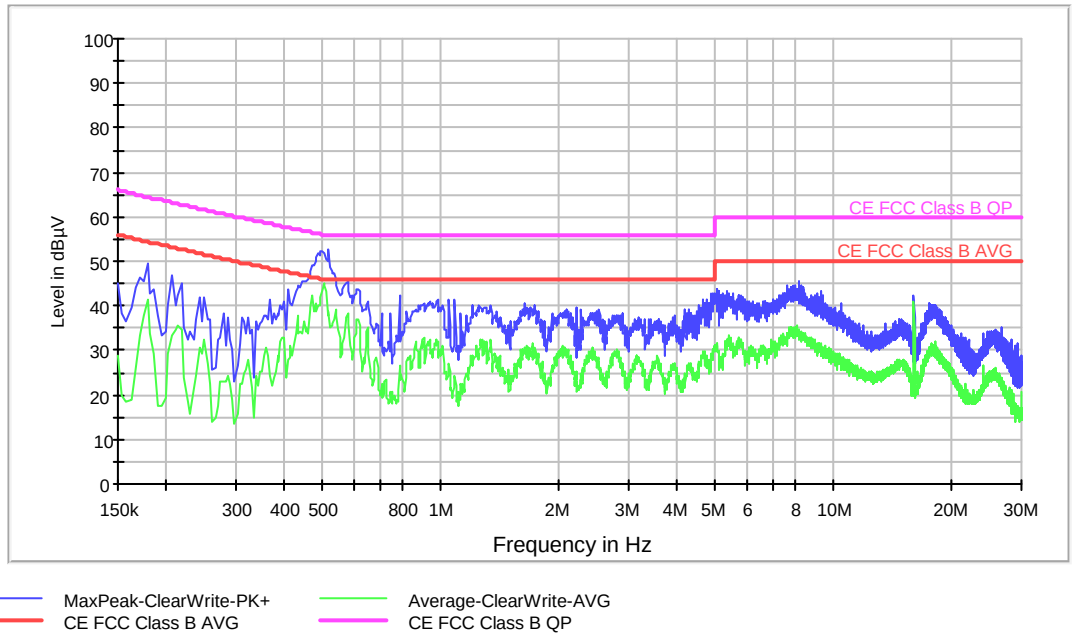
Subrange Maxima

Frequency (MHz)	MaxPeak-ClearWrite (dBµV)	Average-ClearWrite (dBµV)
0.174000	51.4	39.9
0.430000	44.2	37.7
0.502000	51.9	44.7
0.978000	41.2	32.9
1.262000	39.5	32.1
2.430000	37.7	30.4
5.334000	40.4	32.5
8.110000	42.6	35.0
15.998000	42.2	40.7
18.002000	39.3	30.7

Continuous Conducted Emission : CC0402L1	**Detector : Peak / Average / Cuasi-peak**

Project: 46495REM.002
Company: Libelium
Sample: S/04
Operation mode: OM#02
Description: EUT ON. WIFI in Transmission Mode. Bluetooth in Transmission Mode. All sensor are conected and working. Power supply: 115Vac. L1 wire noise.

EC FCC Class B ESPI CC



Subrange Maxima

Frequency (MHz)	MaxPeak-ClearWrite (dBµV)	Average-ClearWrite (dBµV)
0.178000	49.5	41.4
0.430000	44.0	37.7
0.502000	51.9	45.1
0.902000	40.6	33.0
1.258000	39.7	32.5
2.434000	38.3	30.4
5.390000	41.6	33.1
8.066000	43.9	35.6
15.998000	42.6	40.8
18.002000	40.1	32.1