



Informe de ensayo nº:
Test report No:

NIE: 46165REM.003

Test Report

**FCC Rules and Regulations 47 CFR Chapter I Part 15
Subpart B (10-01-14 Edition)**

&

**ANSI C63.4-2009: American National standard for methods of
measurements of radio-noise emissions from low-voltage electrical and
electronic equipment in the range of 9kHz to 40GHz.**

Identification of item tested.....:	POLAR M450 CYCLING COMPUTER
Trade	Polar
Model and /or type reference	1F
Versión final del HW	00755840.01
Final HW version	
Versión final del SW	0.12.8
Final SW version	
FCC ID	INW1F
IC	6248A-1F
Features	Bluetooth Low Energy, GPS
Manufacturer	POLAR ELECTRO OY Professorintie 5, 90440 Kempele. Finland.
Test method requested, standard.....:	FCC Rules and Regulations 47 CFR Chapter I Part 15 Subpart B (10-01-14 Edition) & ANSI C63.4-2009
Summary	IN COMPLIANCE
Approved by (name / position & signature).....:	Rafael López Martín LAB EMC Manager
Date of issue.....:	2015-05-25
Report template No.....:	FDT08_16

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Competences and guarantees

AT4 wireless 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, AT4 wireless has a calibration and maintenance program for its measurement equipment.

AT4 wireless 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 AT4 wireless at the time of performance of the test.

AT4 wireless 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 AT4 wireless.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of AT4 wireless and the Accreditation Bodies.

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 next elements:

Control N°	Description	Model	Serial number	Reception date
46165/001	POLAR M450 Cycling Computer	M450, model 1F	F5151F0500286	2015-05-06

Test sample description

The samples consist of a POLAR M450 cycling computer.

Identification of the client

POLAR ELECTRO OY
Professorintie 5, 90440. Kempele. Finland.

Testing period

The performed test started on 2015-05-04 and finished on 2015-05-07.
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 °C Max. = 35 °C
Relative humidity	Min. = 20 % Max. = 80 %
Shielding effectiveness	> 100 dB
Electric insulation	> 10 kΩ
Reference resistance to earth	< 1 Ω

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

Temperature	Min. = 15 °C Max. = 30 °C
Relative humidity	Min. = 45 % Max. = 60 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar
Shielding effectiveness	> 100 dB
Electric insulation	> 10 kΩ
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 °C Max. = 30 °C
Relative humidity	Min. = 45 % Max. = 60 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar
Shielding effectiveness	> 100 dB
Electric insulation	> 10 kΩ
Reference resistance to earth	< 1 Ω

Remarks and comments

The test has been performed by the technical personnel: Mario Alberto Ureña.

The total uncertainty of the measurement system for the measured radio disturbance characteristics of EUT from 150 kHz to 30 MHz is $I = \pm 3,60$ dB for quasi-peak measurements, $I = \pm 3,48$ 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 1 GHz is $I = \pm 4,57$ dB for quasi-peak measurements, $I = \pm 4,48$ dB for peak measurements ($k = 2$) and from 1 to 12,75 GHz is $I = \pm 3,43$ dB for average and peak measurements.

The total uncertainty of the measurement system for the measured radio disturbance characteristics of EUT from 12,75 GHz to 26 GHz is $I = \pm 4,09$ dB for average and peak measurements.

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
4523	EMI Receptor	ROHDE & SCHWARZ	ESU 26	2013-08-27	2015-08-27
1935	EMI Receptor	ROHDE & SCHWARZ	ESPI 3	2013-12-11	2015-12-11
2932	Bilog Hybrid Antenna	SUNOL	JB6	2014-05-11	2017-05-11
4656	Horn Antenna	SCHWARZBECK	BBHA 9170	2014-03-28	2017-03-28
1658	RF Amplifier	SCHAFFNER	CPA9231A	2013-06-11	2015-06-11
1975	RF Amplifier	MITEQ	JS4	2014-05-22	2016-05-22
3783	RF Amplifier	BONN ELEKTRONIK	BLMA 0118-3A	2013-04-23	2015-05-19
0258	Transient Limiter	HP	119471A	2014-10-02	2016-10-02
1650	Artificial Network	SCHWARZBECK	NNLK - 8121	2013-06-25	2015-06-25

Appendix A – Test result

CONTENT

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DESCRIPTION OF THE OPERATION MODES

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. Charging batteries. Powered by USB. Bluetooth Idle (No paired with devices). Receiving GPS signal.
OM#02	EUT ON. Charging batteries. Powered by USB. Bluetooth in transmission mode (Paired with H6 device). Receiving GPS signal.

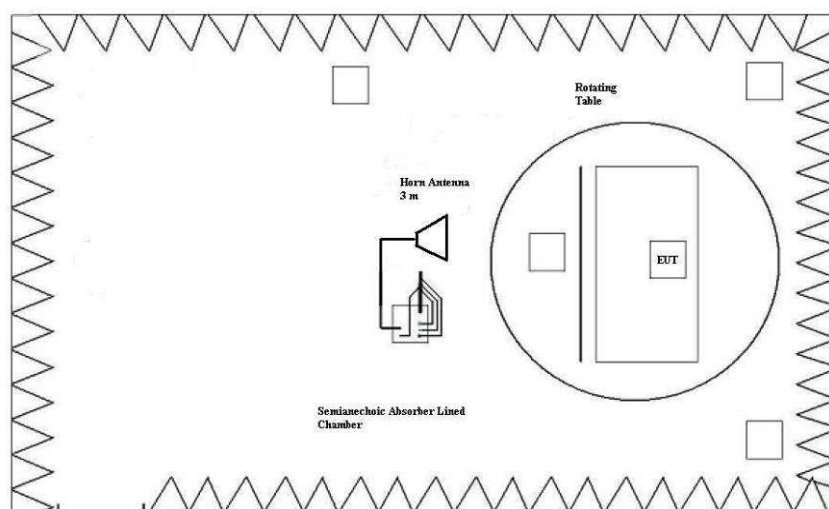
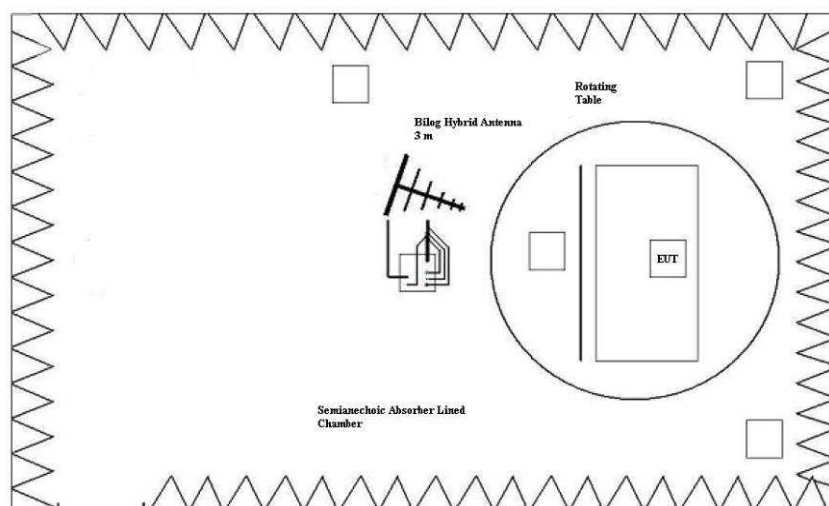
RADIATED EMISSION. ELECTROMAGNETIC FIELD MEASURE.

LIMITS:	Product standard:	FCC RULES AND REGULATIONS 47 CFR PART 15, SUBPART B (10-01-14 Edition) & ANSI C63.4-2009
	Test standard:	FCC RULES AND REGULATIONS 47 CFR PART 15, SUBPART B (10-01-14 Edition) & ANSI C63.4-2009

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 (10-01-14 Edition) & ANSI C63.4-2009 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 ($\mu\text{V/m}$)	QP Limit for 3 m ($\text{dB}\mu\text{V/m}$)
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 $\text{dB}\mu\text{V/m}$	73.98 $\text{dB}\mu\text{V/m}$



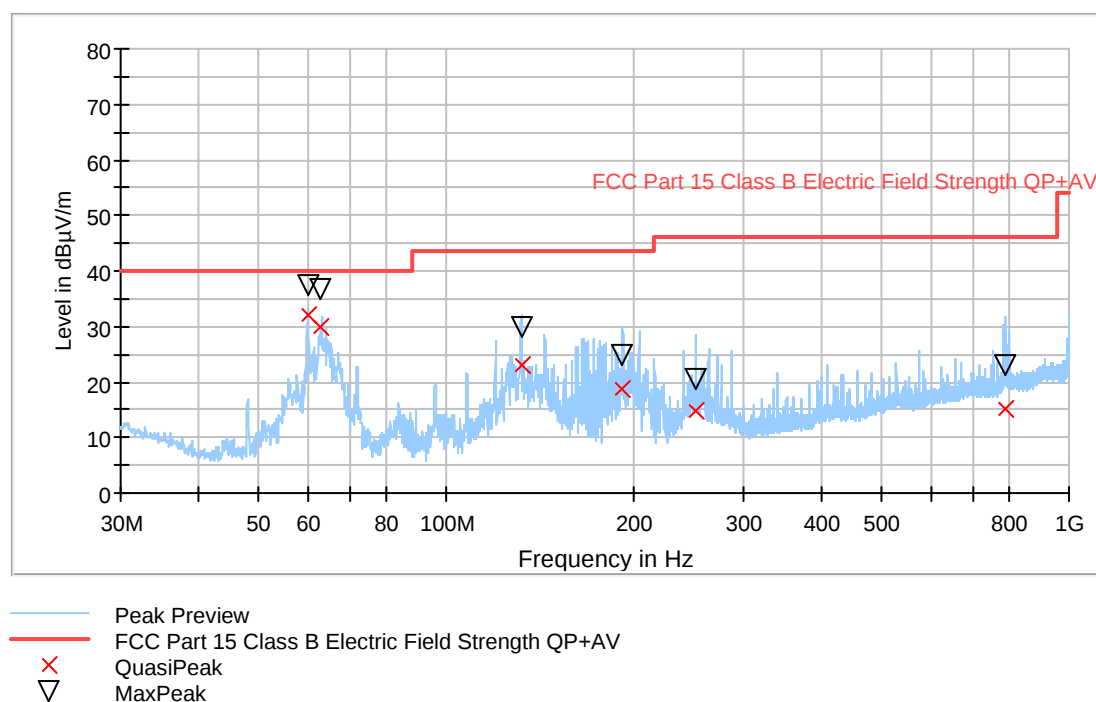
TESTED SAMPLES:	S/01
TESTED OPERATION MODES:	OM#01
TEST RESULTS :	CRmmnn: CR, Condición de Radiación; mm: Sample number; nn: Operation mode; rr: Measured range; PP: Antenna polarization.

CRmmnnrrpp	Description	Result
CR0101	Range: 30MHz o 1GHz.	P
CR0101_RA1_PH	Range: 1GHz o 18GHz. Horizontal polarization.	P
CR0101_RA1_PV	Range: 1GHz o 18GHz. Vertical polarization.	P
CR0101_RA2_PH	Range: 18GHz o 26GHz. Horizontal polarization.	P
CR0101_RA2_PV	Range: 18GHz o 26GHz. Vertical polarization.	P

Radiated Emission: CR0101

Project: 46165REM.002
Company: POLAR ELECTRO OY
Sample: S/01
Operation mode: OM#01
Description: EUT ON. Charging batteries. Powered by USB. Bluetooth Idle (No paired with devices). Receiving GPS signal.

Full Spectrum



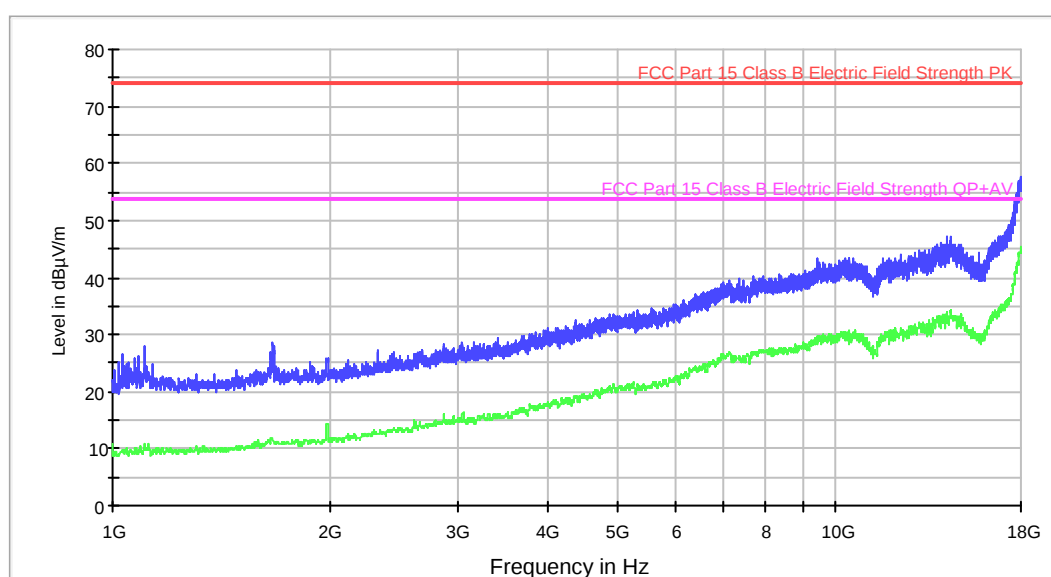
Final Result

Frequency (MHz)	QuasiPeak (dBµV/m)	MaxPeak (dBµV/m)	Height (cm)	Pol	Azimuth (deg)
59.889610	---	37.54	364.0	H	219.0
59.889610	32.09	---	364.0	H	219.0
62.957143	---	36.93	337.0	H	222.0
62.957143	29.88	---	337.0	H	222.0
132.315584	22.97	---	238.0	H	259.0
132.315584	---	29.89	238.0	H	259.0
191.935065	---	24.71	124.0	H	243.0
191.935065	18.60	---	124.0	H	243.0
251.720779	---	20.60	131.0	H	184.0
251.720779	14.81	---	131.0	H	184.0
789.214286	15.16	---	112.0	V	55.0
789.214286	---	23.06	112.0	V	55.0

Radiated Emission: CR0101RA1_PH

Project: 46165REM.002
Company: POLAR
Sample: S/01
Operation mode: OM#01
Description: EUT ON. Charging batteries. Powered by USB. Bluetooth Idle (No paired with devices). Receiving GPS signal.

ER EMI FCC 15 Class B AMP_4659 (1-18GHz)



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

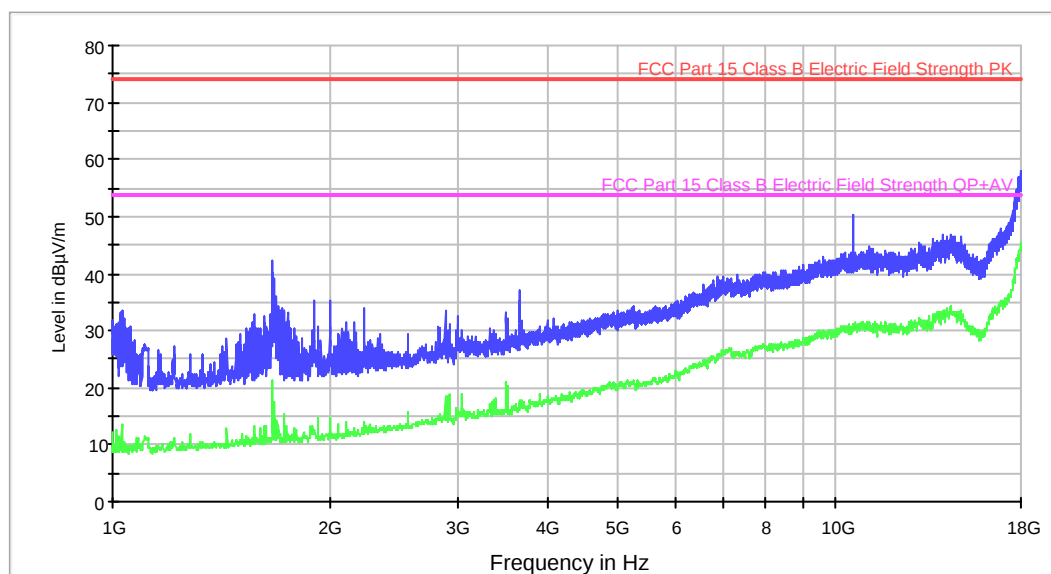
Subrange Maxima

Frequency (MHz)	MaxPeak-ClearWrite (dBµV/m)	Average-ClearWrite (dBµV/m)	Polarization
1107.000000	27.8	10.7	H
1667.000000	28.5	11.5	H
2326.000000	27.1	12.6	H
3049.000000	28.7	16.1	H
4227.000000	31.4	18.6	H
5557.000000	34.4	21.0	H
7362.000000	39.7	25.8	H
9403.000000	43.2	28.8	H
13271.000000	44.7	30.7	H
17978.000000	57.8	45.2	H

Radiated Emission: CR0101RA1_PV

Project: 46165REM.002
Company: POLAR
Sample: S/01
Operation mode: OM#01
Description: EUT ON. Charging batteries. Powered by USB. Bluetooth Idle (No paired with devices). Receiving GPS signal.

ER EMI FCC 15 Class B AMP_4659 (1-18GHz)



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

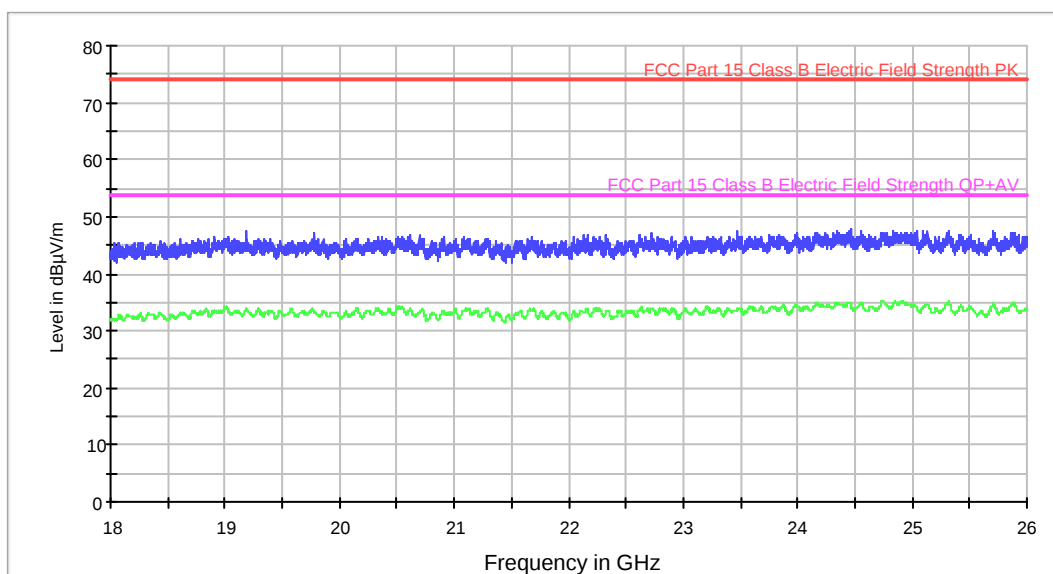
Subrange Maxima

Frequency (MHz)	MaxPeak-ClearWrite (dBµV/m)	Average-ClearWrite (dBµV/m)	Polarization
1031.000000	33.5	9.9	V
1659.000000	42.4	15.5	V
1903.000000	35.2	12.6	V
2880.000000	33.4	18.4	V
3664.000000	37.0	17.7	V
5247.000000	34.2	21.3	V
7313.000000	39.8	25.9	V
9572.000000	43.1	30.1	V
10531.000000	50.3	31.0	V
17992.000000	57.9	45.2	V

Radiated Emission: CR0101RA2_PH

Project: 46165REM.002
 Company: POLAR
 Sample: S/01
 Operation mode: OM#01
 Description: EUT ON. Charging batteries. Powered by USB. Bluetooth Idle (No paired with devices). Receiving GPS signal.

ER EMI FCC 15 Class B AMP_4729 (18-26GHz)



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

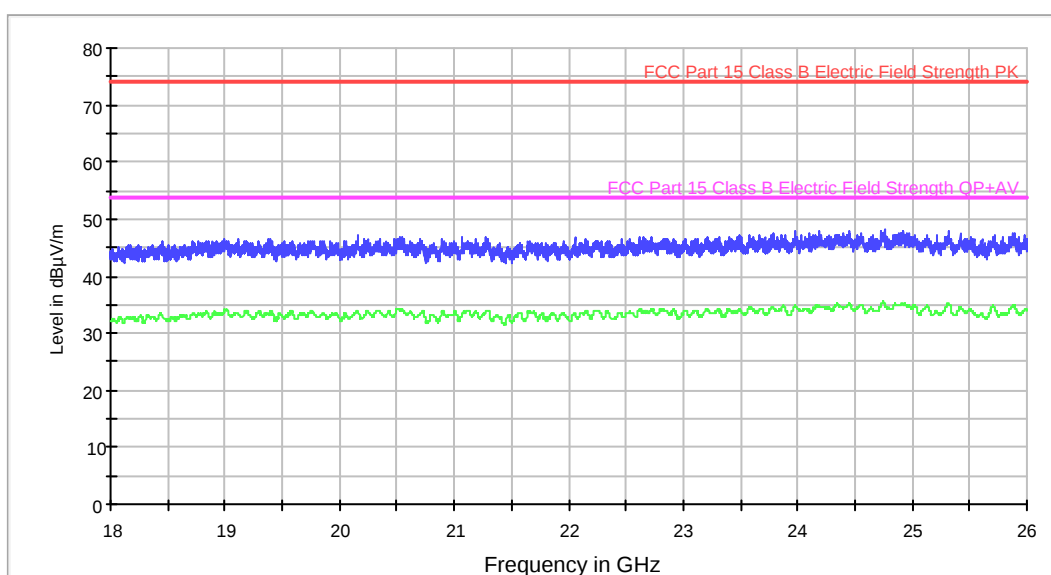
Subrange Maxima

Frequency (MHz)	MaxPeak-ClearWrite (dBµV/m)	Average-ClearWrite (dBµV/m)	Polarization
18617.000000	46.0	32.9	H
19182.000000	47.6	33.6	H
19782.000000	47.1	33.4	H
20622.000000	46.8	33.7	H
21089.000000	46.6	33.5	H
22158.000000	46.9	33.7	H
22726.000000	47.2	34.0	H
23476.000000	47.6	33.8	H
24459.000000	47.9	34.8	H
25322.000000	47.6	35.0	H

Radiated Emission: CR0101RA2_PV

Project: 46165REM.002
 Company: POLAR
 Sample: S/01
 Operation mode: OM#01
 Description: EUT ON. Charging batteries. Powered by USB. Bluetooth Idle (No paired with devices). Receiving GPS signal.

ER EMI FCC 15 Class B AMP_4729 (18-26GHz)



— 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)	Polarization
18455.000000	46.0	33.0	V
19119.000000	46.5	33.3	V
19384.000000	46.6	33.2	V
20155.000000	47.2	33.9	V
21284.000000	46.9	33.9	V
22053.000000	46.7	33.4	V
22614.000000	46.9	33.9	V
23982.000000	47.7	34.8	V
24754.000000	48.3	35.3	V
25322.000000	47.7	35.1	V

CONTINUOUS CONDUCTED EMISSION ON POWER LEADS

LIMITS:	Product standard :	FCC RULES AND REGULATIONS 47 CFR PART 15, SUBPART B (10-01-14 Edition) & ANSI C63.4-2009
	Test standard :	FCC RULES AND REGULATIONS 47 CFR PART 15, SUBPART B (10-01-14 Edition) & ANSI C63.4-2009

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) & ANSI C63.4-2009, 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/01
TESTED OPERATION MODES:	OM#01 & 02
TEST RESULTS :	CCmmnnhh: CC, Conducted Condition; mm: Sample number; nn: Operation mode; hh: wire

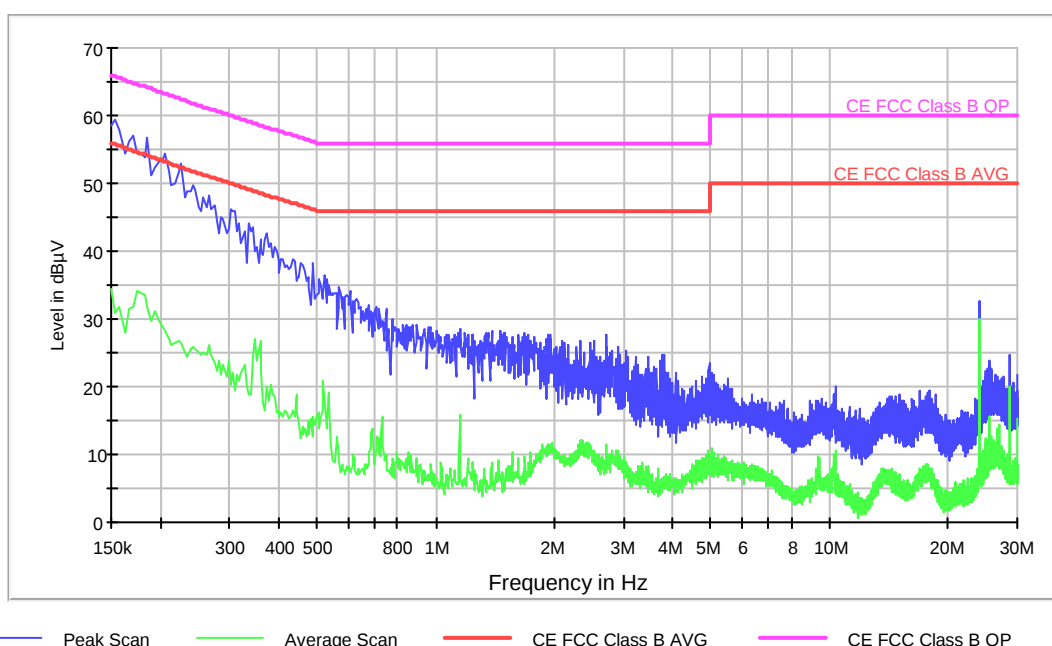
CCmmnnhh	Description	Result
CC01010N	Neutral wire noise	P
CC0101L1	Phase wire noise	P
CC01020N	Neutral wire noise	P
CC0102L1	Phase wire noise	P

Continuous Conducted Emission : CC01010N

Detector : Peak / Average / Cuasi-peak

Project: 46165REM.002
Company: POLAR
Sample: S/01
Operation mode: OM#01
Description: EUT ON. Charging batteries. Powered by USB. Bluetooth Idle (No paired with devices). Receiving GPS signal. Neutral wire noise.

EC FCC Class B ESPI CC



Subrange Maxima

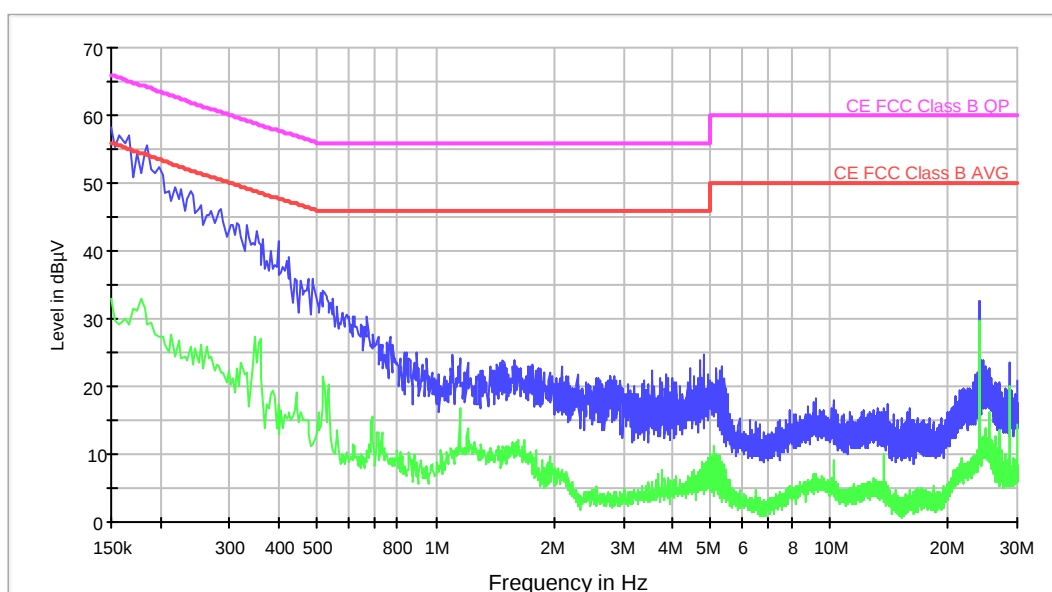
Frequency (MHz)	MaxPeak-ClearWrite (dBµV)	Average-ClearWrite (dBµV)
0.154000	59.4	30.8
0.266000	48.1	26.1
0.434000	39.0	16.6
0.750000	31.4	9.9
1.462000	28.2	6.4
2.722000	27.6	11.4
3.810000	24.7	6.3
10.338000	20.1	9.6
16.958000	19.3	6.7
24.002000	32.7	29.9

Continuous Conducted Emission : CC0101L1

Detector : Peak / Average / Cuasi-peak

Project: 46165REM.002
Company: POLAR
Sample: S/01
Operation mode: OM#01
Description: EUT ON. Charging batteries. Powered by USB. Bluetooth Idle (No paired with devices). Receiving GPS signal. Phase wire noise.

EC FCC Class B ESPI CC



— Peak Scan — Average Scan — CE FCC Class B AVG — CE FCC Class B QP

Subrange Maxima

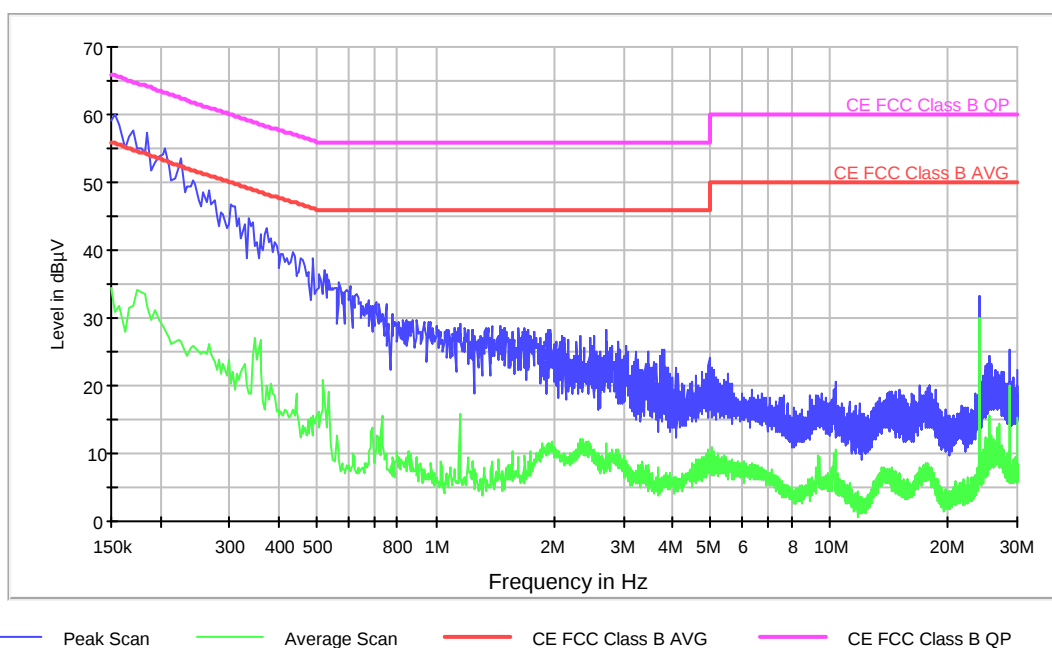
Frequency (MHz)	MaxPeak-ClearWrite (dBµV)	Average-ClearWrite (dBµV)
0.150000	58.1	33.1
0.286000	46.3	22.2
0.486000	35.9	11.6
0.766000	27.3	9.4
1.486000	23.9	11.1
3.542000	22.3	4.4
4.782000	24.7	5.4
9.226000	18.3	6.4
14.082000	17.3	5.0
24.002000	32.7	29.6

Continuous Conducted Emission : CC01020N

Detector : Peak / Average / Cuasi-peak

Project: 46165REM.002
Company: POLAR
Sample: S/01
Operation mode: OM#02
Description: EUT ON. Charging batteries. Powered by USB. Bluetooth in transmission mode (Paired with H6 device). Receiving GPS signal. Neutral wire noise.

EC FCC Class B ESPI CC



Subrange Maxima

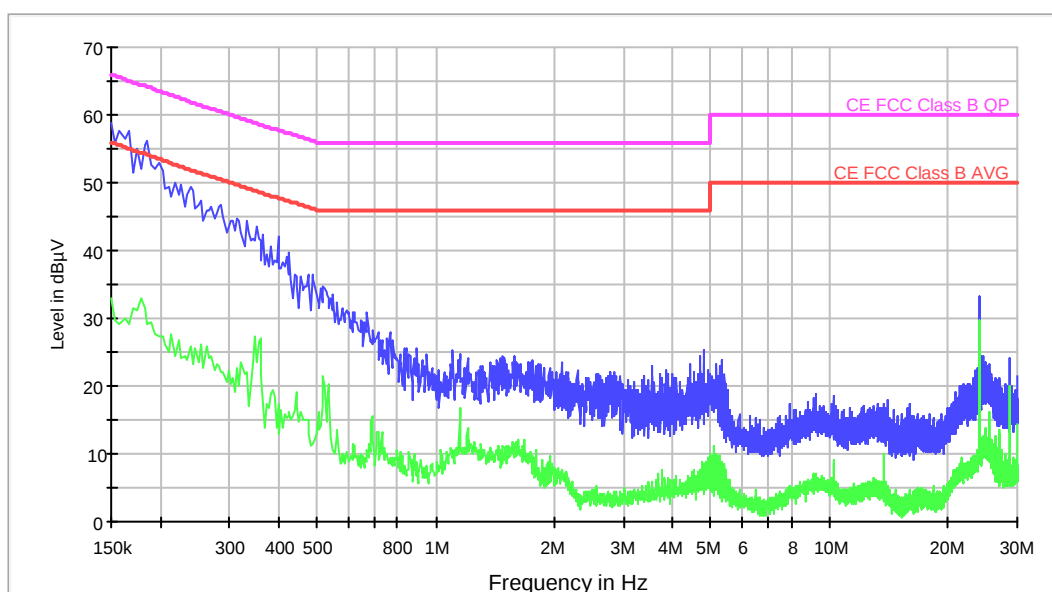
Frequency (MHz)	MaxPeak-ClearWrite (dBµV)	Average-ClearWrite (dBµV)
0.154000	60.0	30.8
0.266000	48.7	26.1
0.434000	39.6	16.6
0.750000	32.0	9.9
1.462000	28.8	6.4
2.722000	28.2	11.4
3.810000	25.3	6.3
10.338000	20.7	9.6
16.958000	19.9	6.7
24.002000	33.3	29.9

Continuous Conducted Emission : CC0102L1

Detector : Peak / Average / Cuasi-peak

Project: 46165REM.002
 Company: POLAR
 Sample: S/01
 Operation mode: OM#02
 Description: EUT ON. Charging batteries. Powered by USB. Bluetooth in transmission mode (Paired with H6 device). Receiving GPS signal. Phase wire noise.

EC FCC Class B ESPI CC



— Peak Scan — Average Scan — CE FCC Class B AVG — CE FCC Class B QP

Subrange Maxima

Frequency (MHz)	MaxPeak-ClearWrite (dBµV)	Average-ClearWrite (dBµV)
0.150000	58.7	33.1
0.286000	46.9	22.2
0.486000	36.5	11.6
0.766000	27.9	9.4
1.486000	24.5	11.1
3.542000	22.9	4.4
4.782000	25.3	5.4
9.226000	18.9	6.4
14.082000	17.9	5.0
24.002000	33.3	29.6