



Informe de ensayo nº:
Test report No:

NIE: 49380REM002

Test Report

FCC Rules and Regulations CFR 47, Part 15, Subpart B (10-1-15 Edition),
Secs. 15.107, 15.109 and Subpart C (10-1-15 Edition) Secs. 15.207.

&

ICES-003 Issue 6 (2016)

Identification of item tested.....:	M200 GPS sports watch with wrist-based heart rate
Trademark	Polar
Model and /or type reference.....:	2F
Other identification of the product	s/n: F6221W1100631 FCC ID: INW2F IC ID: 6248A-2F
Final HW version	59804.04
Final SW version	0.1.230
Features	GPS, BLE, accelerometer, vibration motor, optical heart rate
Manufacturer	POLAR ELECTRO OY Professorintie 5 90440 Kempele Finland
Test method requested, standard.....:	FCC CFR 47, Part 15, Subpart B (10-1-15 Edition), Secs. 15.107, 15.109 and Subpart C (10-1-15 Edition) Secs. 15.207 & ICES-003 Issue 6 (2016)
Summary	IN COMPLIANCE
Approved by (name / position & signature).....:	Rafael López Martín LAB EMC Manager
Date of issue.....:	2016-07-19
Report template No.....:	FDT08_18

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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 following elements:

Control N°	Description	Model	Serial number	Reception date
49380/10	Smartwatch	2F	F6221W1100638	2016-06-27

Sample S/02 is composed of the following elements:

Control N°	Description	Model	Serial number	Reception date
49380/10	Smartwatch	2F	F6221W1100638	2016-06-27

Sample S/02 is composed of the following auxiliary elements:

Control N°	Description	Model	Serial number	Reception date
49380/19	USB cable	-	-	2016-06-27

And an auxiliary PC for ANSI setup.

Test sample description

The sample consist of an GPS sports watch with Bluetooth low-energy connectivity and wrist-based heart rate measurement

Identification of the client

POLAR ELECTRO OY
Professorintie 5
90440. Kempele. Finland

Testing period

The performed test started on 2016-06-28 and finished on 2016-07-05.
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. = 30 % Max. = 60 %
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. = 60 %
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 tests have been performed by the technical personnel: Pedro Manuel Valenzuela & Alberto Parada.

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 26GHz is $I = \pm 2,6$ dB for peaks and average measurements ($k = 2$).

Testing verdicts

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	2015-11-17	2017-11-17
4578	Biconilog Antenna	ETS LINDGREN	3142E	2014-03-17	2017-03-17
4658	RF Amplifier	SCHWARZBECK	BBV9743	2016-04-28	2017-04-28
4659	RF Amplifier	SCHWARZBECK	BBV	2015-09-29	2016-09-29
4570	Temperature and relative humidity data logger	HW GROUP	HWg-STE	2016-04-28	2017-04-28
4612	Horn Antenna	SCHWARZBECK	BBHA 9120 D	2013-12-29	2016-12-29

Appendix A – Test result

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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. Bluetooth IDLE Mode. GPS IDLE Mode. Power supply: Internal battery.
OM#02	EUT ON. IDLE Bluetooth. GPS IDLE mode. Power supply: 5Vdc via USB (laptop)
OM#03	EUT ON. Equipment with the Bluetooth linked to a OM device and realizing a Fitness test. Rx GPS Mode. Power supply: 5Vdc via USB (laptop)

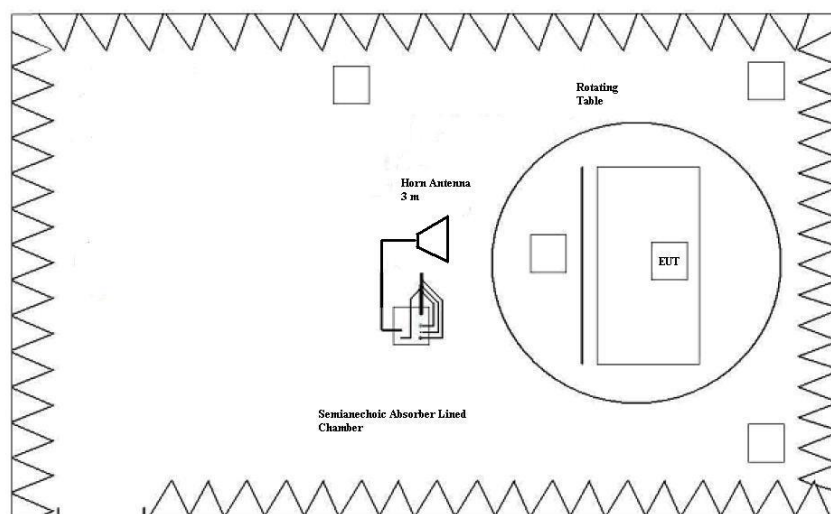
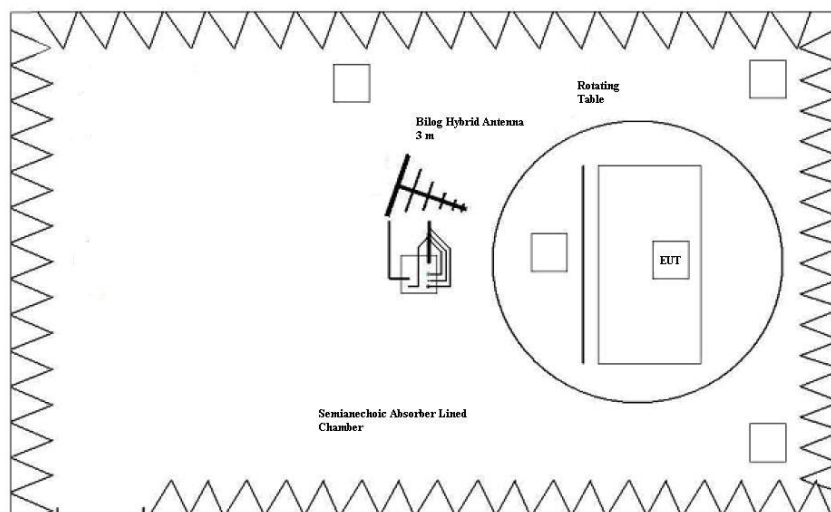
RADIATED EMISSION. ELECTROMAGNETIC FIELD MEASURE

LIMITS:	Product standard:	FCC CFR 47, Part 15, Subpart B (10-1-15 Edition), Secs. 15.107, 15.109 and Subpart C (10-1-15 Edition) Secs. 15.207 & ICES-003 Issue 6 (2016) & ANSI C63.4-2014
	Test standard:	FCC CFR 47, Part 15, Subpart B (10-1-15 Edition), Secs. 15.107, 15.109 and Subpart C (10-1-15 Edition) Secs. 15.207 & ICES-003 Issue 6 (2016) & ANSI C63.4-2014

Limits of interference Class B

The applied limit for radiated emissions, 3 m distance, according with the requirements of FCC Rules and Regulations CFR 47, Part 15, Subpart B (10-1-15 Edition), Secs. 15.107, 15.109 and Subpart C (10-1-15 Edition) Secs. 15.207 & ICES-003 Issue 6 (2016) & ANSI C63.4-2014 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 $\text{dB}\mu\text{V/m}$



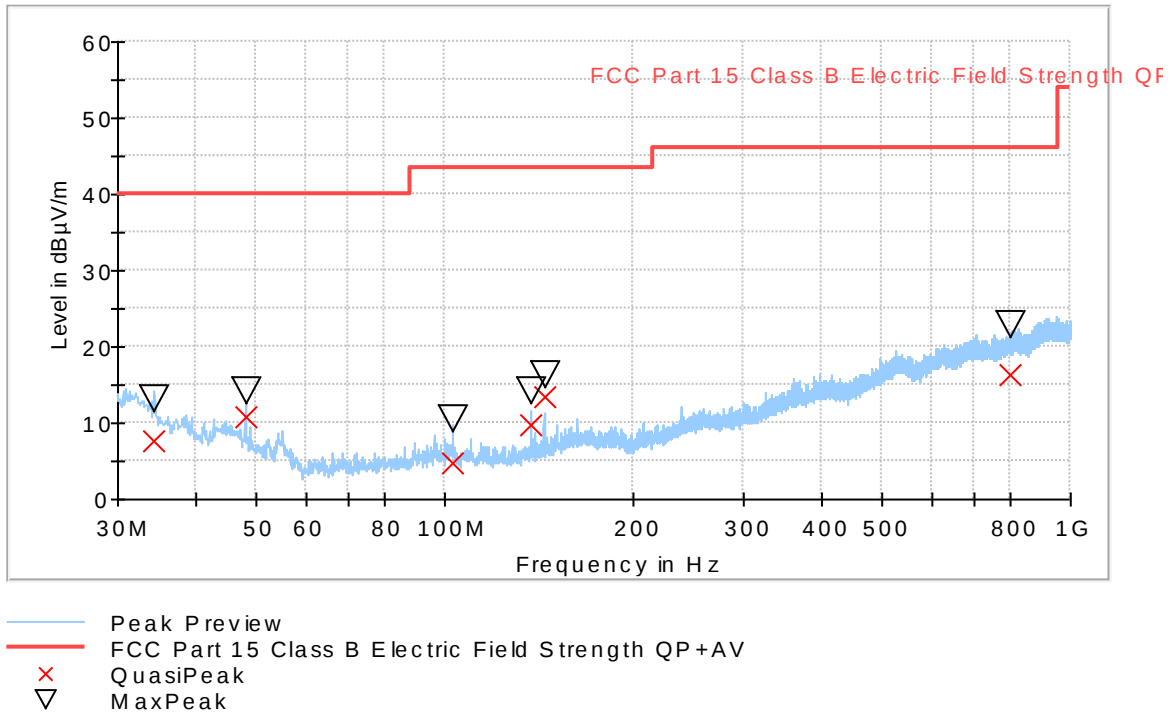
TESTED SAMPLES:	S/01 ; S/02
TESTED OPERATION MODES:	OM#01; OM#02
TEST RESULTS:	CRmmnn: CR, Radiation Condition; mm: Sample number; nn: Operation mode;

CRmmnn	Description	Result
CR0101	EUT ON. Bluetooth IDLE Mode. GPS IDLE Mode. Power supply: Internal battery. Range: 30 MHz - 1000 MHz.	P
CR0101	EUT ON. Bluetooth IDLE Mode. GPS IDLE Mode. Power supply: Internal battery. Range: 1 - 18 GHz. Horizontal Polarization.	P
CR0101	EUT ON. Bluetooth IDLE Mode. GPS IDLE Mode. Power supply: Internal battery. Range: 1 - 18 GHz. Vertical Polarization.	P
CR0101	EUT ON. Bluetooth IDLE Mode. GPS IDLE Mode. Power supply: Internal battery. Range: 18 - 26 GHz Horizontal Polarization. Cumple PV y PH	P
CR0101	EUT ON. Bluetooth IDLE Mode. GPS IDLE Mode. Power supply: Internal battery. Range: 18 - 26 GHz Vertical Polarization. Cumple PV y PH	P
CR0202	EUT ON. IDLE Bluetooth. GPS IDLE mode. Power supply: 5Vdc via USB (laptop) Range: 30 MHz - 1000 MHz.	P
CR0202	EUT ON. IDLE Bluetooth. GPS IDLE mode. Power supply: 5Vdc via USB (laptop) Range: 1 - 18 GHz Horizontal Polarization. Cumple PV y PH	P
CR0202	EUT ON. IDLE Bluetooth. GPS IDLE mode. Power supply: 5Vdc via USB (laptop) Range: 1 - 18 GHz Vertical Polarization. Cumple PV y PH	P
CR0202	EUT ON. IDLE Bluetooth. GPS IDLE mode. Power supply: 5Vdc via USB (laptop) Range: 18 - 26 GHz Horizontal Polarization. Cumple PV y PH	P
CR0202	EUT ON. IDLE Bluetooth. GPS IDLE mode. Power supply: 5Vdc via USB (laptop) Range: 18 - 26 GHz Vertical Polarization. Cumple PV y PH	P

CR0101. Range: 30-1000MHz

Project: 49380rem002
Company: POLAR ELECTRO OY
Sample: S/01
Operation mode: OM#01
Description: EUT ON. IDLE Bluetooth. Power supply: Internal battery.

Full Spectrum



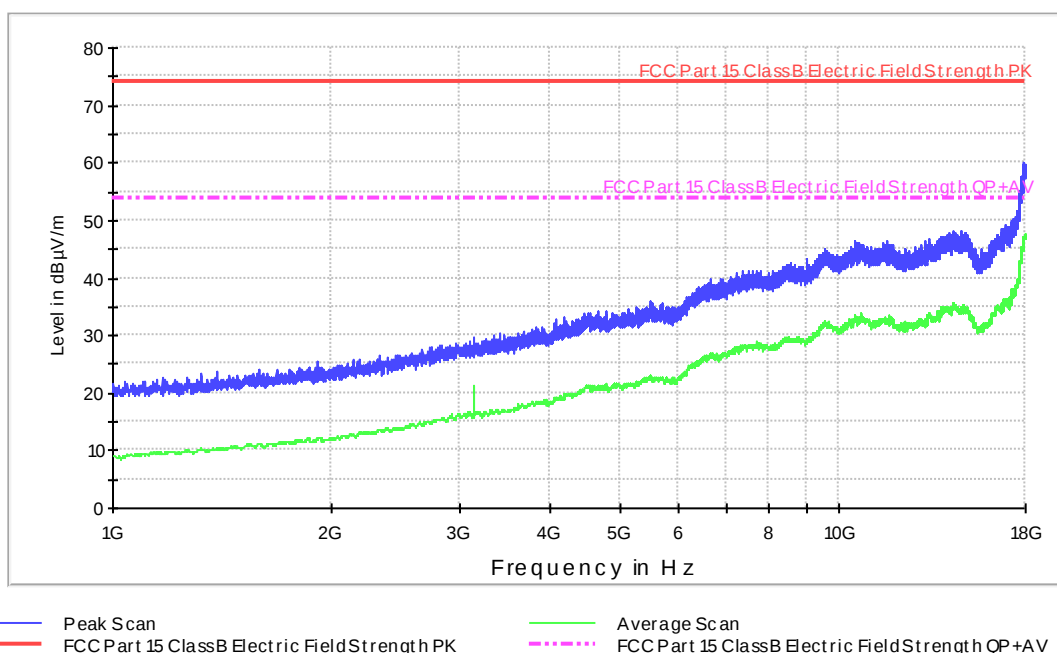
Final Result

Frequency (MHz)	QuasiPeak (dBµV/m)	MaxPeak (dBµV/m)	Height (cm)	Pol	Azimuth (deg)
34.293506	7.52	13.12	383.0	V	63.0
48.012987	10.86	14.11	115.0	V	0.0
102.923377	4.76	10.43	379.0	V	5.0
137.258442	9.80	14.24	103.0	V	6.0
144.015584	13.55	16.43	98.0	V	1.0
802.019481	16.40	23.02	394.0	H	149.0

CR0101. Range: 1-18GHz. Horizontal polarization.

Project: 49380rem002
Company: POLAR ELECTRO OY
Sample: S/01
Operation mode: OM#01
Description: EUT ON. IDLE Bluetooth. GPS IDLE mode. Power supply: Internal battery. Horizontal polarization.

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



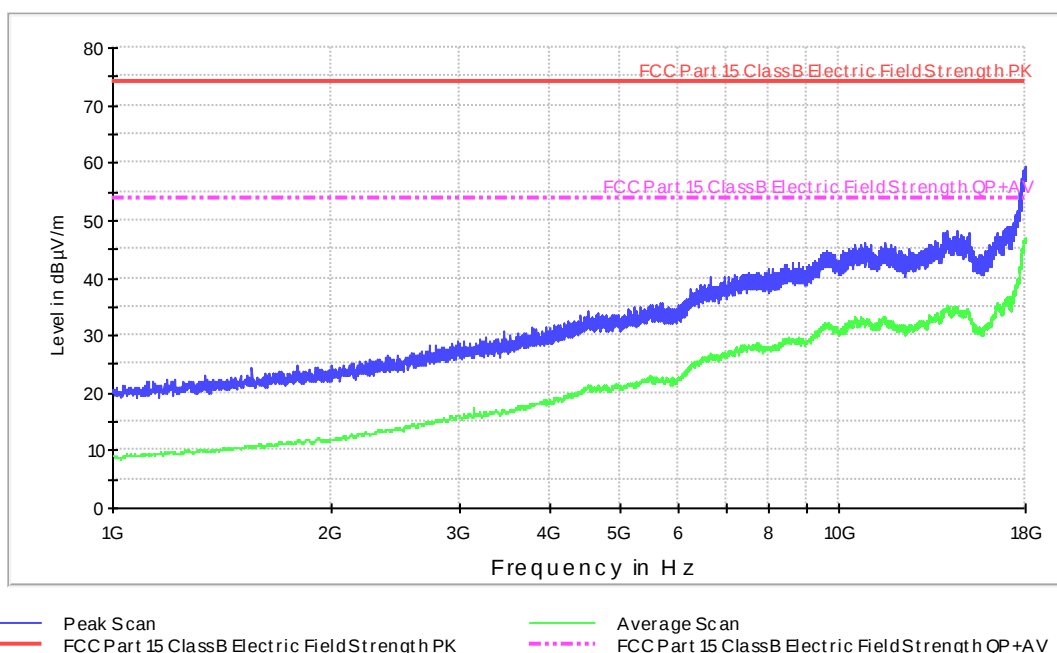
Subrange Maxima

Frequency (MHz)	MaxPeak-ClearWrite (dBµV/m)	Average-ClearWrite (dBµV/m)
1324.000000	23.4	10.4
1587.000000	24.2	11.1
2325.000000	26.6	13.6
3143.000000	29.6	21.3
4184.000000	33.0	19.6
5492.000000	35.8	22.9
7483.000000	41.2	28.2
9522.000000	45.0	32.2
13300.000000	46.7	33.6
17922.000000	60.0	46.6

CR0101. Range: 1-18GHz. Vertical polarization.

Project: 49380rem002
Company: POLAR ELECTRO OY
Sample: S/01
Operation mode: OM#01
Description: EUT ON. IDLE Bluetooth. Power supply: Internal battery. Vertical polarization.

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



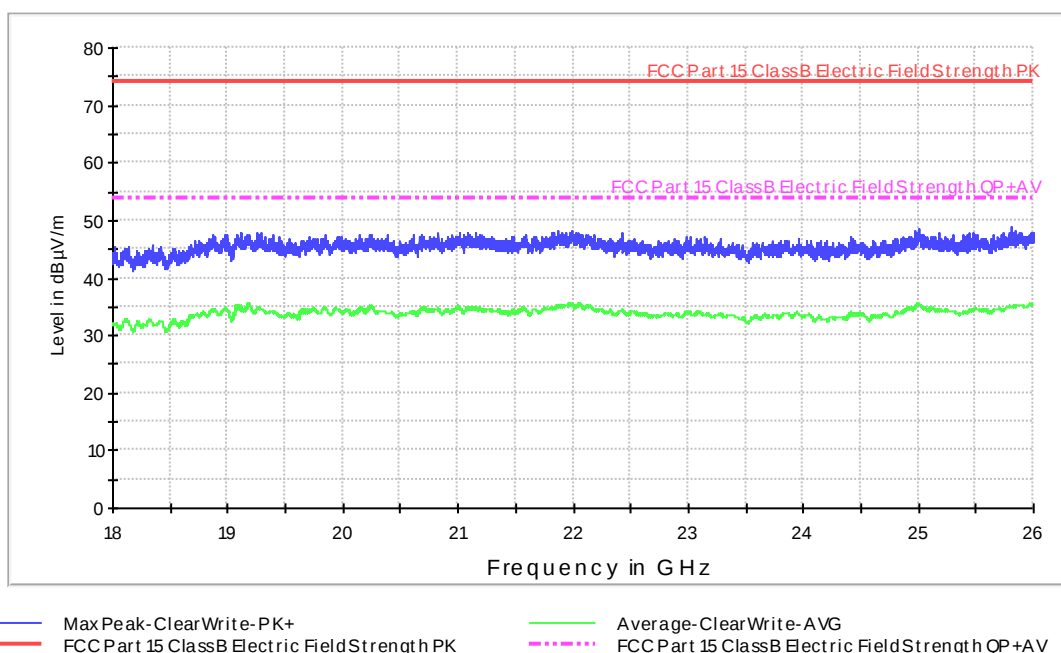
Subrange Maxima

Frequency (MHz)	MaxPeak-ClearWrite (dBµV/m)	Average-ClearWrite (dBµV/m)
1215.000000	22.3	9.6
1555.000000	24.6	10.6
2380.000000	26.1	13.5
3031.000000	29.0	16.0
4233.000000	32.4	19.4
5599.000000	35.4	22.5
7503.000000	40.8	27.9
10082.000000	44.8	31.0
10852.000000	46.3	32.4
17964.000000	59.3	46.8

CR0101. Range: 18-26GHz. Horizontal polarization.

Project: 49380rem002
Company: POLAR ELECTRO OY
Sample: S/01
Operation mode: OM#01
Description: EUT ON. IDLE Bluetooth. Power supply: Internal battery. Horizontal polarization.

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



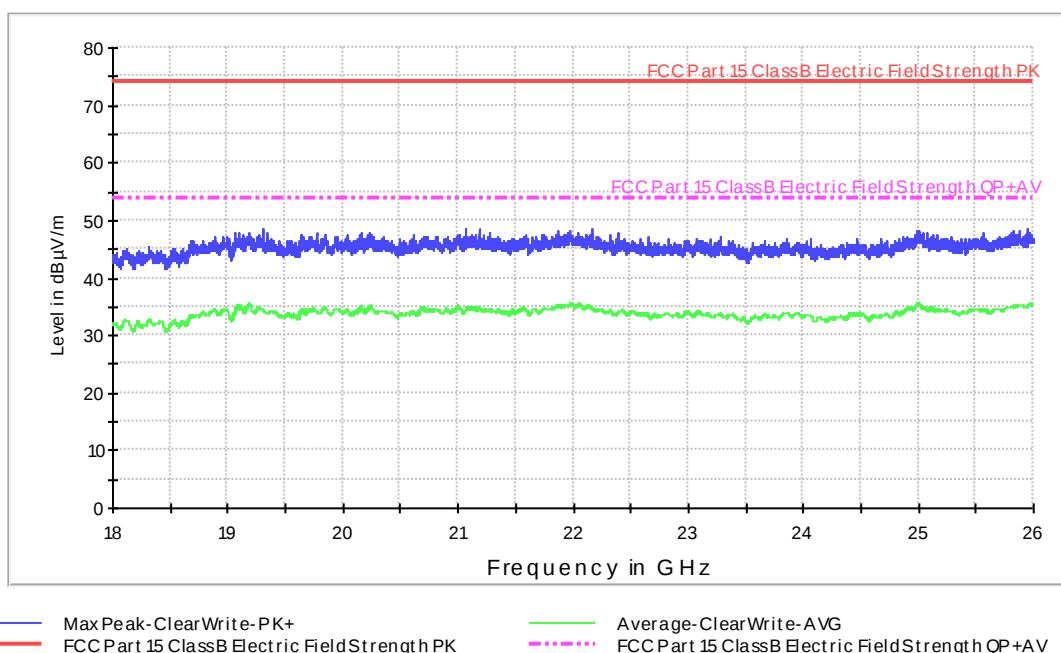
Subrange Maxima

Frequency (MHz)	MaxPeak-ClearWrite (dBµV/m)	Average-ClearWrite (dBµV/m)
18340.000000	45.6	32.3
19107.000000	48.0	35.0
19853.000000	47.4	34.7
20832.000000	47.9	34.4
21022.000000	48.0	34.7
21987.000000	48.1	35.4
22986.000000	47.1	34.2
23957.000000	46.7	33.8
25006.000000	48.7	35.5
25813.000000	48.9	35.1

CR0101. Range: 18-26GHz. Vertical polarization.

Project: 49380rem002
Company: POLAR ELECTRO OY
Sample: S/01
Operation mode: OM#01
Description: EUT ON. IDLE Bluetooth. Power supply: Internal battery. Vertical polarization.

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



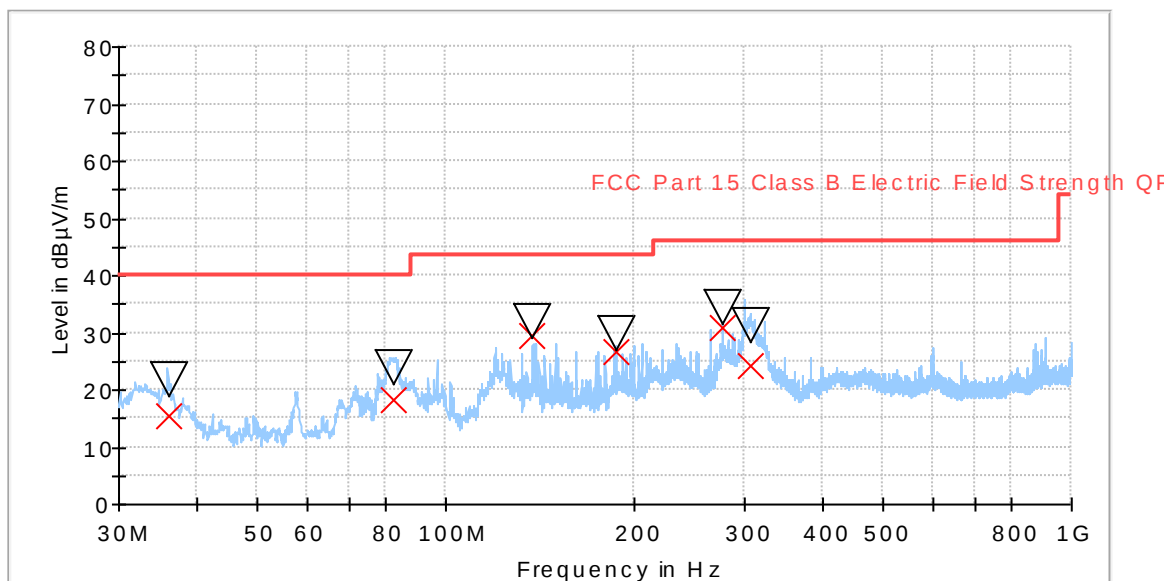
Subrange Maxima

Frequency (MHz)	MaxPeak-ClearWrite (dBµV/m)	Average-ClearWrite (dBµV/m)
18667.000000	45.7	33.1
19303.000000	48.4	34.5
19770.000000	47.8	34.3
20238.000000	47.9	35.0
21181.000000	48.5	34.5
22160.000000	48.6	34.8
23275.000000	47.1	33.7
24062.000000	46.8	33.4
24995.000000	48.3	35.4
25941.000000	48.7	34.9

CR0202. Range: 30-1000MHz

Project: 49380rem002
Company: POLAR ELECTRO OY
Sample: S/02
Operation mode: OM#02
Description: EUT ON. IDLE Bluetooth. Power supply: 5Vdc via USB (laptop)

Full Spectrum



— Preview Result 1-PK+
— FCC Part 15 Class B Electric Field Strength QP+AV
× QuasiPeak-QPK
▽ MaxPeak-PK+

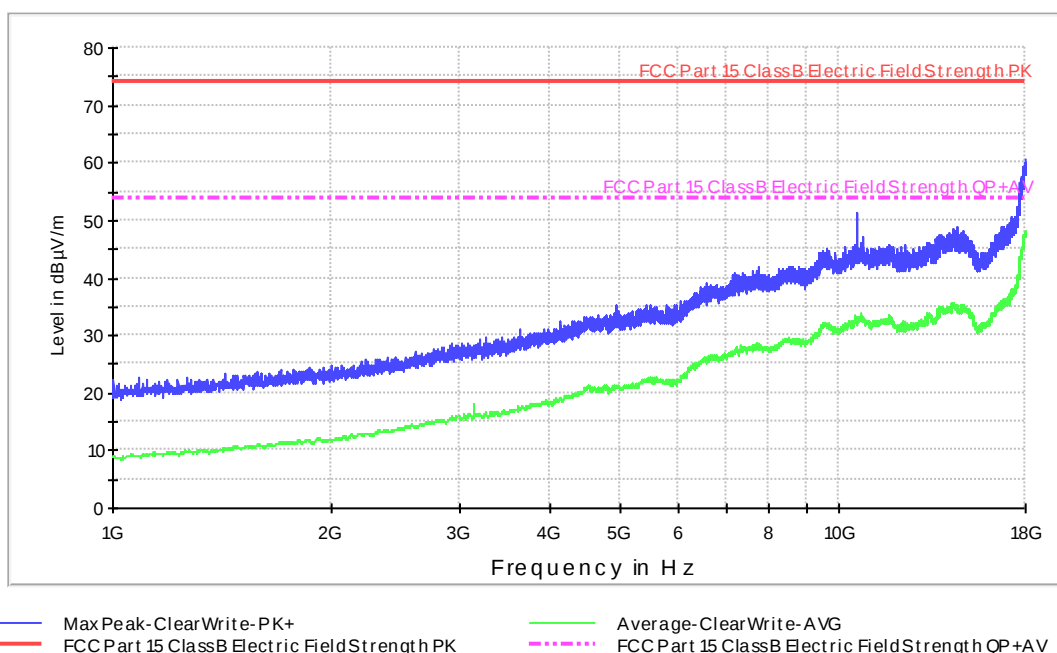
Final Result

Frequency (MHz)	QuasiPeak (dBµV/m)	MaxPeak (dBµV/m)	Height (cm)	Pol	Azimuth (deg)
36.107792	15.39	---	106.0	V	120.0
36.107792	---	21.83	106.0	V	120.0
82.355844	---	23.91	300.0	V	357.0
82.355844	18.17	---	300.0	V	357.0
137.735065	---	31.93	223.0	H	19.0
137.735065	29.42	---	223.0	H	19.0
187.472727	26.66	---	151.0	H	200.0
187.472727	---	29.72	151.0	H	200.0
276.019481	30.93	---	114.0	H	213.0
276.019481	---	34.25	114.0	H	213.0
306.953247	24.13	---	119.0	H	134.0
306.953247	---	31.27	119.0	H	134.0

CR0202. Range: 1-18GHz. Horizontal polarization.

Project: 49380rem002
Company: POLAR ELECTRO OY
Sample: S/02
Operation mode: OM#02
Description: EUT ON. IDLE Bluetooth. GPS IDLE mode. Power supply: 5Vdc via USB (laptop). Horizontal polarization.

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



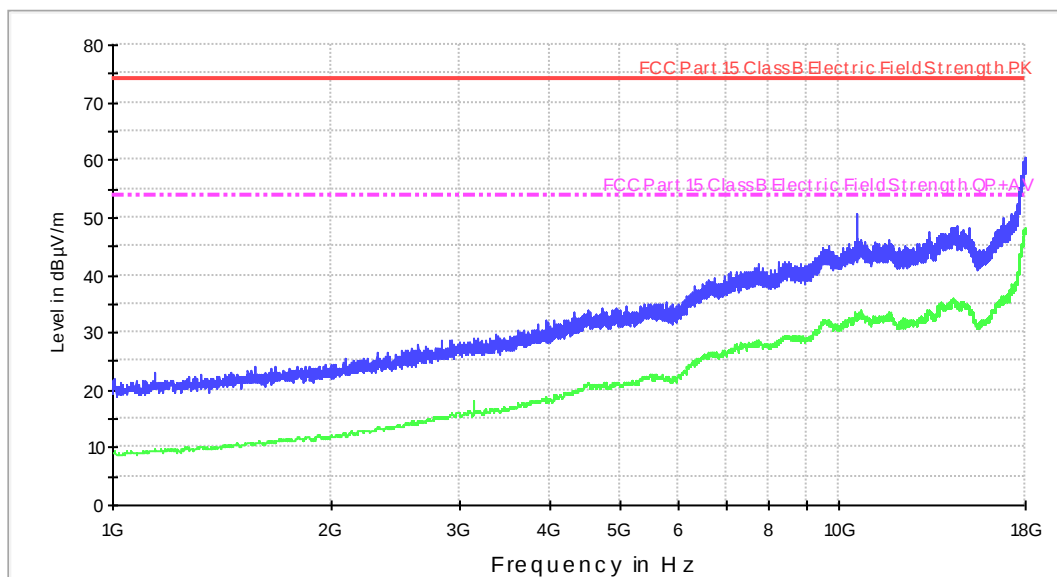
Subrange Maxima

Frequency (MHz)	MaxPeak-ClearWrite (dBµV/m)	Average-ClearWrite (dBµV/m)
1267.000000	22.7	9.9
1769.000000	24.2	11.3
2331.000000	26.0	13.4
3024.000000	28.8	15.4
4121.000000	32.6	19.1
5497.000000	35.4	22.7
7177.000000	40.9	27.6
9580.000000	44.9	31.5
10531.000000	51.4	32.3
18000.000000	60.6	48.2

CR0202. Range: 1-18GHz. Vertical polarization.

Project: 49380rem002
Company: POLAR ELECTRO OY
Sample: S/02
Operation mode: OM#02
Description: EUT ON. IDLE Bluetooth. GPS IDLE mode. Power supply: 5Vdc via USB (laptop). Vertical Polarization

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



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

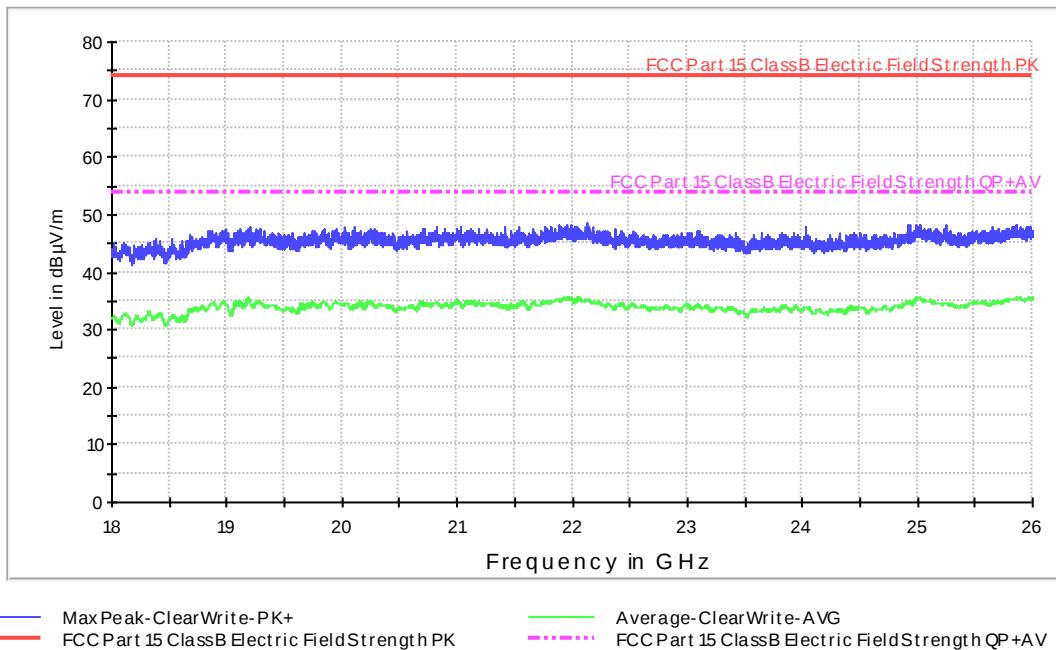
Subrange Maxima

Frequency (MHz)	MaxPeak-ClearWrite (dBµV/m)	Average-ClearWrite (dBµV/m)
1142.000000	22.9	9.5
1571.000000	24.1	10.8
2316.000000	26.6	13.4
3143.000000	29.0	18.2
4053.000000	32.3	19.0
5631.000000	35.1	22.0
7297.000000	40.7	28.1
9678.000000	44.9	31.5
10531.000000	50.5	32.3
17968.000000	60.5	47.6

CR0202. Range: 18-26GHz. Horizontal polarization.

Project: 49380rem002
Company: POLAR ELECTRO OY
Sample: S/02
Operation mode: OM#02
Description: EUT ON. IDLE Bluetooth. GPS IDLE mode. Power supply: 5Vdc via USB (laptop). Horizontal polarization.

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



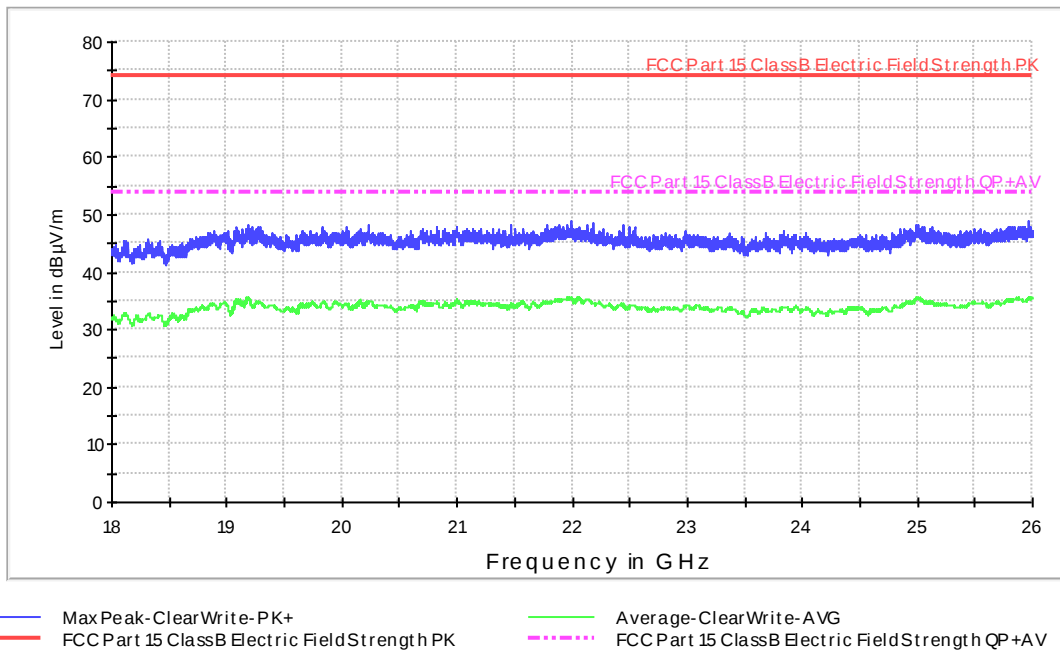
Subrange Maxima

Frequency (MHz)	MaxPeak-ClearWrite (dBµV/m)	Average-ClearWrite (dBµV/m)
18529.000000	45.7	32.4
19196.000000	47.7	35.0
20030.000000	47.8	34.6
20824.000000	47.9	34.7
21532.000000	47.9	34.6
22134.000000	48.5	35.3
23094.000000	47.2	34.2
24030.000000	47.8	33.9
25029.000000	48.4	35.4
25863.000000	48.2	35.5

CR0202. Range: 18-26GHz. Vertical polarization.

Project: 49380rem002
Company: POLAR ELECTRO OY
Sample: S/02
Operation mode: OM#02
Description: EUT ON. IDLE Bluetooth. GPS IDLE mode. Power supply: 5Vdc via USB (laptop). Vertical Polarization

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



Subrange Maxima

Frequency (MHz)	MaxPeak-ClearWrite (dBµV/m)	Average-ClearWrite (dBµV/m)
18322.000000	45.7	33.0
19187.000000	48.4	35.4
20039.000000	48.0	34.6
20228.000000	48.2	34.7
21468.000000	48.3	34.3
21989.000000	48.8	35.5
22541.000000	47.7	34.1
23837.000000	47.1	33.9
25001.000000	48.2	35.7
25959.000000	48.9	35.3

CONTINUOUS CONDUCTED EMISSION ON POWER LEADS

LIMITS:	Product standard:	FCC CFR 47, Part 15, Subpart B (10-1-15 Edition), Secs. 15.107, 15.109 and Subpart C (10-1-15 Edition) Secs. 15.207 & ICES-003 Issue 6 (2016)
	Test standard:	FCC CFR 47, Part 15, Subpart B (10-1-15 Edition), Secs. 15.107, 15.109 and Subpart C (10-1-15 Edition) Secs. 15.207 & ICES-003 Issue 6 (2016)

Class B

The applied limit for continuous conducted emissions in power leads, according with the requirements of of FCC Rules and Regulations CFR 47, Part 15, Subpart B (10-1-15 Edition), Secs. 15.107, 15.109 and Subpart C (10-1-15 Edition) Secs. 15.207 & ICES-003 Issue 6 (2016), 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 to 56*	56 to 46*
0.5 to 5	56	46
5 to 30	60	50

*Decreases with the logarithm of the frequency

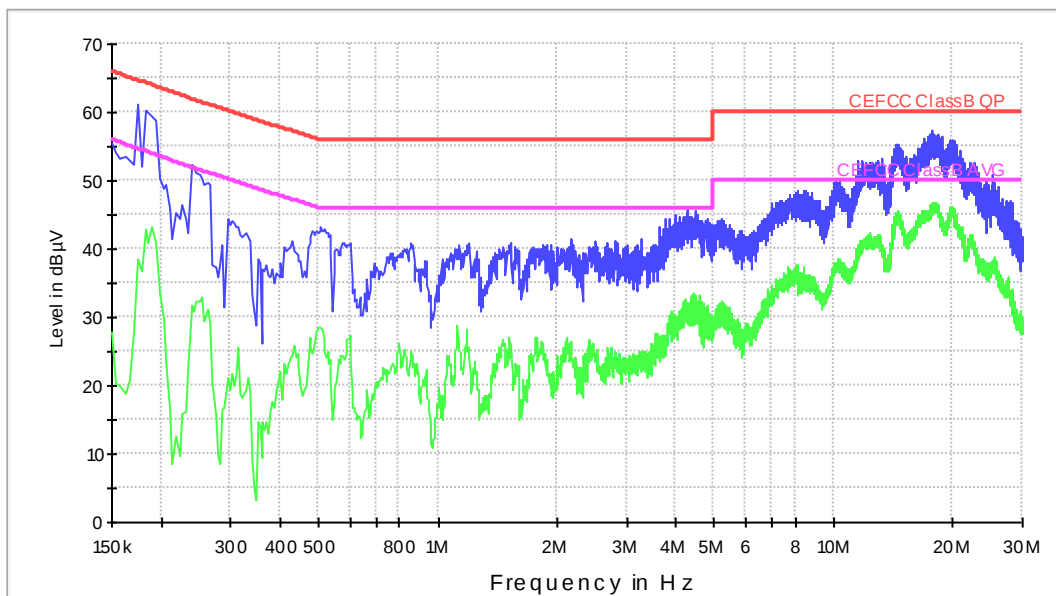
TESTED SAMPLES:	S/02
TESTED OPERATION MODES:	OM#02; OM#03;
TEST RESULTS:	CCmmnn: CC, Conducted Condition; mm: Sample number; nn: Operation mode;

CCmmnn	Description	Result
CC02020N	Neutral wire noise.	P
CC0202L1	Phase wire noise.	P
CC02030N	Neutral wire noise.	P
CC0203L1	Phase wire noise.	P

CC02020N. Neutral wire noise

Project: 49380REM.002
Company: POLAR ELECTRO OY
Sample: S/02
Operation mode: OM#02
Description: EUT ON. IDLE Bluetooth. GPS IDLE mode. Power supply: 5Vdc via USB (laptop). Neutral wire noise.

EC FCC Class B ESPI CC



Peak Scan Average Scan CEFCC ClassB QP CEFCC ClassB AVG

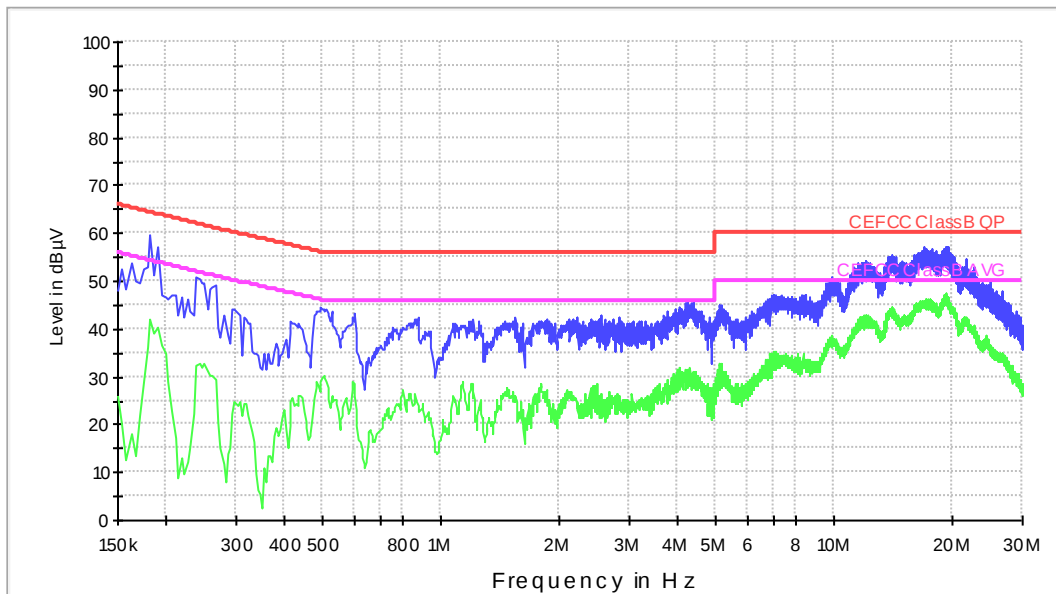
Subrange Maxima

Frequency (MHz)	MaxPeak-ClearWrite (dBµV)	Average-ClearWrite (dBµV)
0.174000	61.2	38.4
0.262000	49.8	31.3
0.506000	43.3	28.4
1.202000	40.9	24.2
1.530000	40.9	25.4
3.282000	41.4	24.6
4.266000	46.1	31.9
10.138000	50.4	37.1
17.638000	56.8	45.7
17.714000	57.2	45.7

CC0202L1. Phase wire noise

Project: 49380REM.002
Company: POLAR ELECTRO OY
Sample: S/02
Operation mode: OM#02
Description: EUT ON. IDLE Bluetooth. GPS IDLE mode. Power supply: 5Vdc via USB (laptop). Phase wire noise.

EC FCC Class B ESPI CC



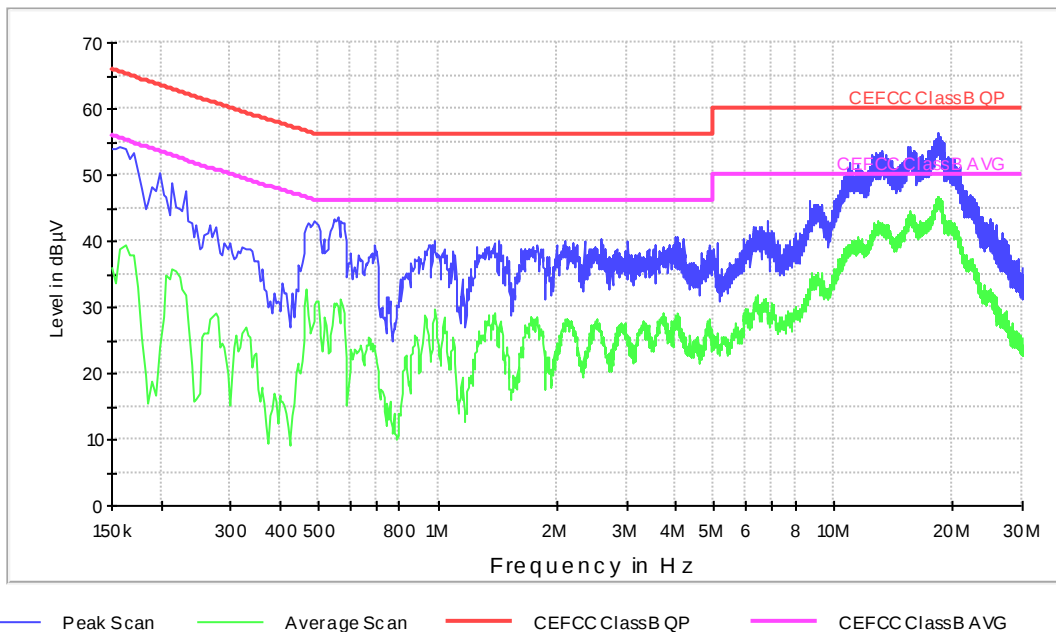
Subrange Maxima

Frequency (MHz)	MaxPeak-ClearWrite (dBµV)	Average-ClearWrite (dBµV)
0.182000	59.5	42.2
0.266000	49.1	29.3
0.494000	44.3	28.9
0.870000	42.4	23.9
1.542000	42.6	26.0
2.546000	42.7	26.3
4.218000	45.8	30.3
9.850000	50.9	37.9
16.934000	57.3	45.8
19.346000	57.3	46.5

CC02030N. Neutral wire noise

Project: 49380REM.002
Company: POLAR ELECTRO OY
Sample: S/02
Operation mode: OM#03
Description: EUT ON. Equipment with the Bluetooth linked to a OM device and realizing a Fitness test. Rx GPS Mode. Power supply: 5Vdc via USB (laptop). Neutral wire noise.

EC FCC Class B ESPI CC



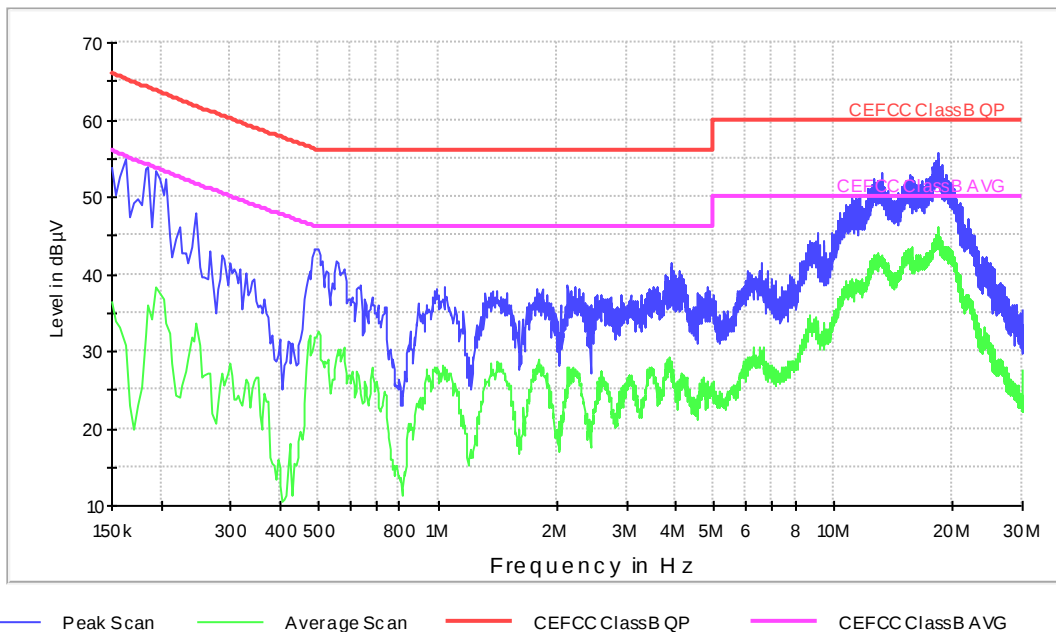
Subrange Maxima

Frequency (MHz)	MaxPeak-ClearWrite (dBµV)	Average-ClearWrite (dBµV)
0.158000	54.4	38.8
0.266000	42.4	28.1
0.558000	43.8	30.0
0.982000	40.0	29.4
2.098000	40.1	27.1
2.578000	40.3	26.3
4.034000	40.8	28.6
10.378000	47.7	37.4
15.662000	54.4	44.4
18.302000	56.5	46.1

CC0203L1. Phase wire noise

Project: 49380REM.002
Company: POLAR ELECTRO OY
Sample: S/02
Operation mode: OM#03
Description: EUT ON. Equipment with the Bluetooth linked to a OM device and realizing a Fitness test. Rx GPS Mode. Power supply: 5Vdc via USB (laptop). Phase wire noise.

EC FCC Class B ESPI CC



Subrange Maxima

Frequency (MHz)	MaxPeak-ClearWrite (dBµV)	Average-ClearWrite (dBµV)
0.162000	54.8	30.7
0.266000	43.1	27.1
0.490000	43.4	31.9
1.042000	38.2	27.9
1.786000	38.1	28.2
2.130000	38.6	28.0
3.886000	41.4	28.6
10.334000	47.5	36.2
13.314000	53.0	41.8
18.402000	55.6	45.5