DEKRA Testing and Certification, S.A.U.
Parque Tecnológico de Andalucía,
c/ Severo Ochoa nº 2 · 29590 Campanillas · Málaga · España

Nº 51/LE147

Informe de ensayo nº:
Test report No:

NIE: 52386REM.002

Test report

FCC Rules and Regulations CFR 47, Part 15, Subpart C (10-1-15 Edition)

Identificación del objeto ensayado .....: Identification of item tested	Heart Rate Sensor
Marca .....: Trademark	Polar
Modelo y/o referencia tipo .....: Model and /or type reference	2R
Otra identificación del producto .....: Other identification of the product	S/N: 9406150204 1217
Versión final del HW .....: Final HW version	94061502
Versión final del SW .....: Final SW version	0.0.02.08
FCC ID .....:	INW2R
IC .....:	6248A-2R
Características .....: Features	BLE, CHR (contact heart rate), WHR (5 kHz heart rate)
Fabricante .....: Manufacturer	POLAR ELECTRO OY Professorintie 5 90440, Kempele, FINLAND
Método de ensayo solicitado, norma .....: Test method requested, standard	FCC CFR 47, Part 15, Subpart C (10-1-15 Edition)
Resultado .....: Summary	IN COMPLIANCE
Aprobado por (nombre / cargo y firma) .....: Approved by (name / position & signature)	Rafael López EMC Lab Manager Firmado digitalmente por RAFAEL LÓPEZ MARTÍN Fecha: 2017.11.02 08:32:43 +01'00'
Fecha de realización .....: Date of issue	2017-10-09
Formato de informe No. .....: Report template No	FDT08_20

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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 AT4 wireless.
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.

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
52386/012	Module	2R	9406150204 1217	2017-09-26

Test sample description

Three different functions. Contact heart rate thru metal plates user grabs or thru 5kHz magnetic transmission from heart rate chest strap or thru Bluetooth LE.

Identification of the client

POLAR ELECTRO OY
Professorintie 5
90440, Kempele, FINLAND

Testing period

The performed test started on 2017-10-05 and finished on 2017-10-06.
The tests have been performed at DEKRA Testing and Certification, S.A.U.

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. = 860 mbar Max. = 1060 mbar

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. = 860 mbar Max. = 1060 mbar

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. = 860 mbar Max. = 1060 mbar

Remarks and comments

The tests have been performed by the technical personnel: Antonio Ruiz & Ismael Gamarro.

The total uncertainty of the measurement system for the measured conducted disturbance characteristics of EUT from 150 kHz to 30 MHz is I=± 3,9 dB for quasi-peak measurements, I=±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 = ± 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 26GHz is I = ± 2,6 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
2942	EMI TEST Receiver	ROHDE & SCHWARZ	ESU40	2016-06-14	2017-10-09
4578	Bilog Antenna	ETS LINDGREN	3142E	2017-04-03	2020-04-03
2933	Preamplifier	A.H Systems	PAM-0207	2017-09-29	2018-09-29
4612	Horn Antenna	SCHWARZBECK	BBHA 9120 D	2016-12-19	2019-12-19
3783	Preamplifier	BONN ELEKTRONIK	BLMA 0118-3A	2017-05-03	2018-05-03
4656	Horn Antenna	SCHWARZBECK	BBHA 9170	2017-03-24	2020-03-24
1975	Preamplifier	MITEQ	JS4-12002600-30-5A	2015-10-06	2017-10-06
4570	Thermohigrometer	HW GROUP	HWg-STE	2017-04-25	2018-04-25
4567	Thermohigrometer	HW GROUP	HWg-STE	2017-04-25	2018-04-25
4522	EMC measurement software	ROHDE & SCHWARZ	EMC32 V9.01	---	---

Appendix A – Test result

APPENDIX A CONTENT

DESCRIPTION OF THE OPERATION MODES 9
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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. Signal 5kHz OFF. Bluetooth RX. Power supply: USB port (by laptop)
OM#02	EUT ON. Signal 5kHz and Bluetooth Communication with auxiliary device. Power supply: USB port (by laptop)

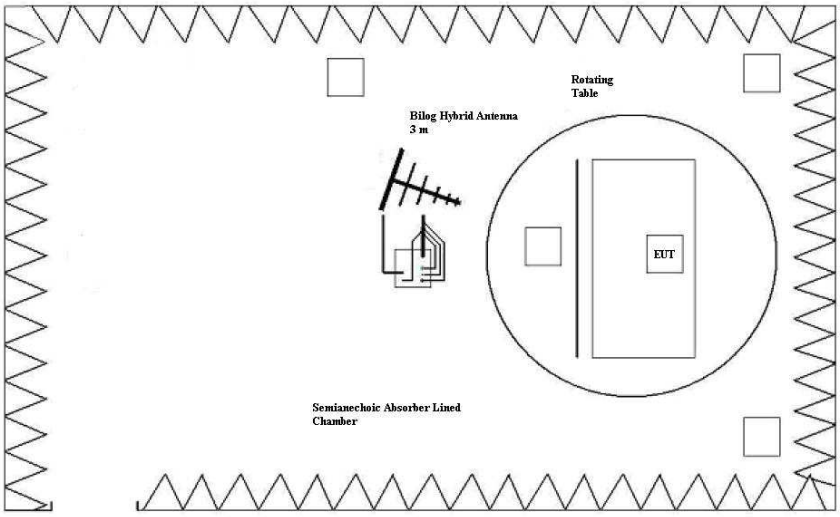
RADIATED EMISSION. ELECTROMAGNETIC FIELD MEASURE

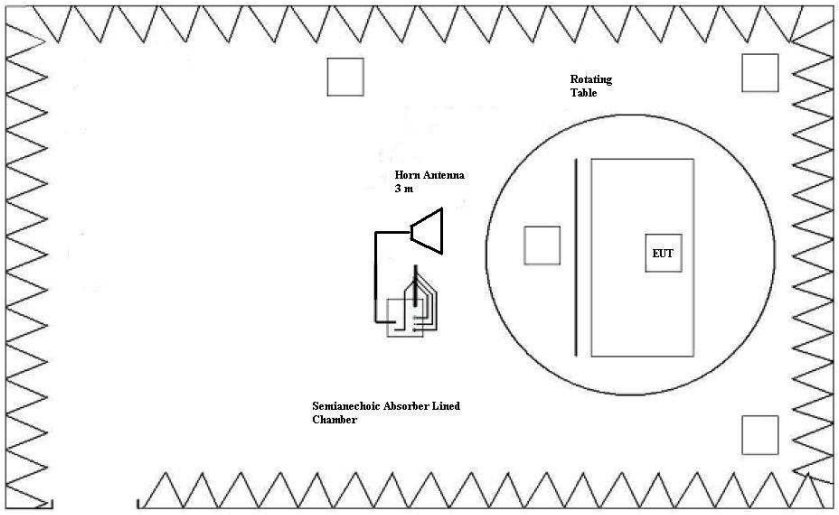
LIMITS:	Product standard:	FCC CFR 47, Part 15, Subpart C (10-1-15 Edition), Secs. 15.209
	Test standard:	FCC CFR 47, Part 15, Subpart C (10-1-15 Edition), Secs. 15.209

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 C (10-01-15 Edition), Secs. 15.209 in the frequency range 30 MHz to 26 GHz for class B equipments.

Frequency range (MHz)	QP Limit at 3 m		PK Limit at 3 m
	(µV/m)	(dBµV/m)	(dBµV/m)
30 to 88	100	40	---
88 to 216	150	43.5	---
216 to 960	200	46	---
Above 960	500	54	74





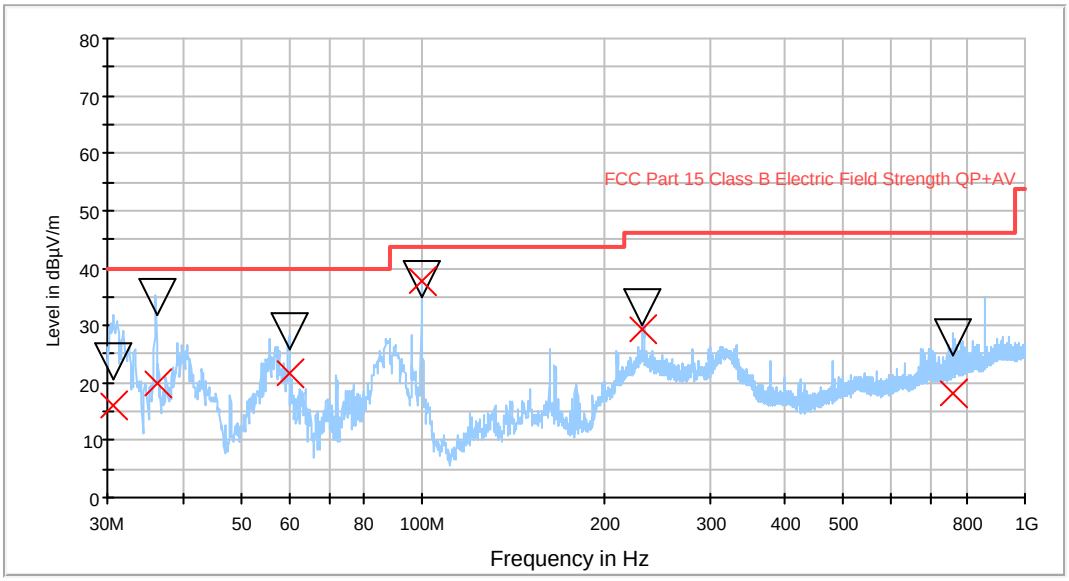
TESTED SAMPLE:	S#01
TESTED OPERATION MODES:	OM#01
TEST RESULTS:	CRmmnnRRPP: CR, Radiation Condition; mm: Sample number; nn: Operation mode; RR: Range; PP: Polarization.

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:	52386REM.002
Company:	POLAR ELECTRO OY
Sample:	S/01
Operation mode:	OM#01
Description:	EUT ON. Signal 5kHz OFF. Bluetooth RX. Power supply: USB port (by laptop)

FCC class B



FCC Part 15 Class B Electric Field Strength QP+AV
MaxPeak
Peak Preview
QuasiPeak

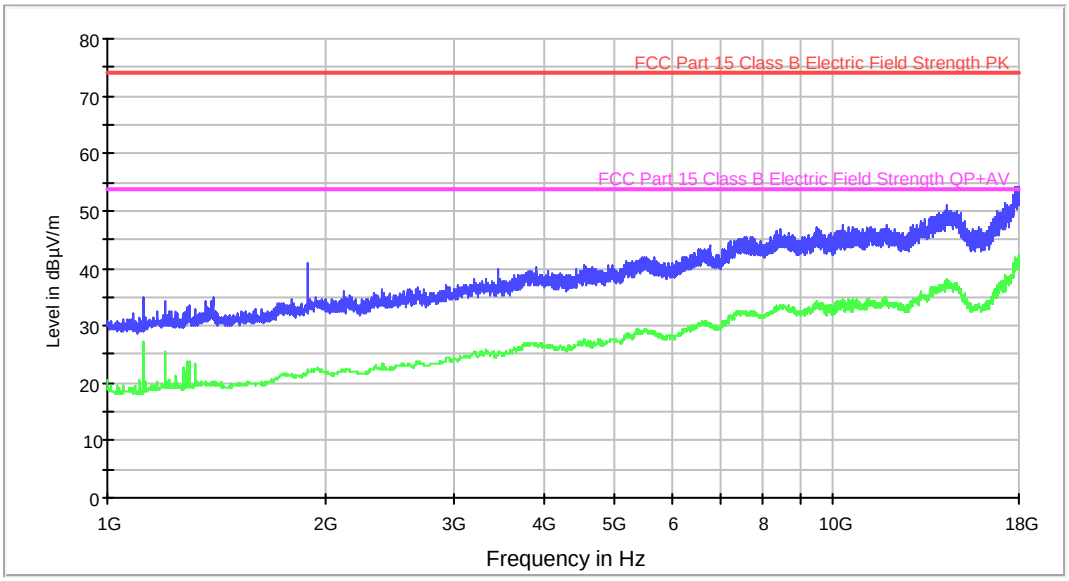
Maximizations

Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)	Height (cm)	Polarization	Azimuth (deg)
30.583117	23.9	16.0	105.0	H	291.0
36.222142	35.1	20.0	120.0	H	115.0
60.000000	29.2	21.6	283.0	H	198.0
99.606494	38.0	37.7	101.0	V	81.0
232.367532	33.0	29.2	132.0	H	52.0
760.597403	27.9	18.3	168.0	V	-1.0

Radiated Emission. CR0101HR1_PH

Project:	52386REM.002
Company:	POLAR ELECTRO OY
Sample:	S/01
Operation mode:	OM#01
Description:	EUT ON. Signal 5kHz OFF. Bluetooth RX. Power supply: USB port (by laptop). Horizontal polarization.

FCC 1-18GHz class B



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

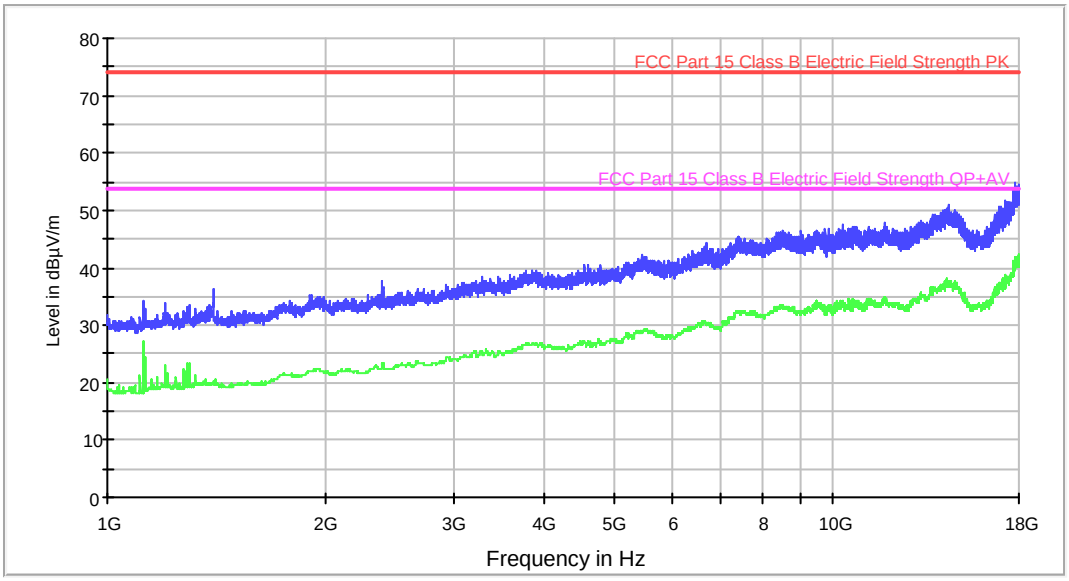
Subrange Maxima

Frequency (MHz)	MaxPeak-ClearWrite (dBµV/m)	Average-ClearWrite (dBµV/m)
1120.000000	35.0	27.4
1400.000000	35.0	20.2
1885.000000	41.0	22.3
3116.000000	37.2	24.8
3895.000000	40.1	26.8
5648.000000	42.0	28.9
7540.000000	45.4	32.5
9498.000000	47.1	33.4
13335.000000	48.5	35.0
17960.000000	54.3	42.0

Radiated Emission. CR0101HR1_PV

Project:	52386REM.002
Company:	POLAR ELECTRO OY
Sample:	S/01
Operation mode:	OM#01
Description:	EUT ON. Signal 5kHz OFF. Bluetooth RX. Power supply: USB port (by laptop). Vertical polarization.

FCC 1-18GHz class B



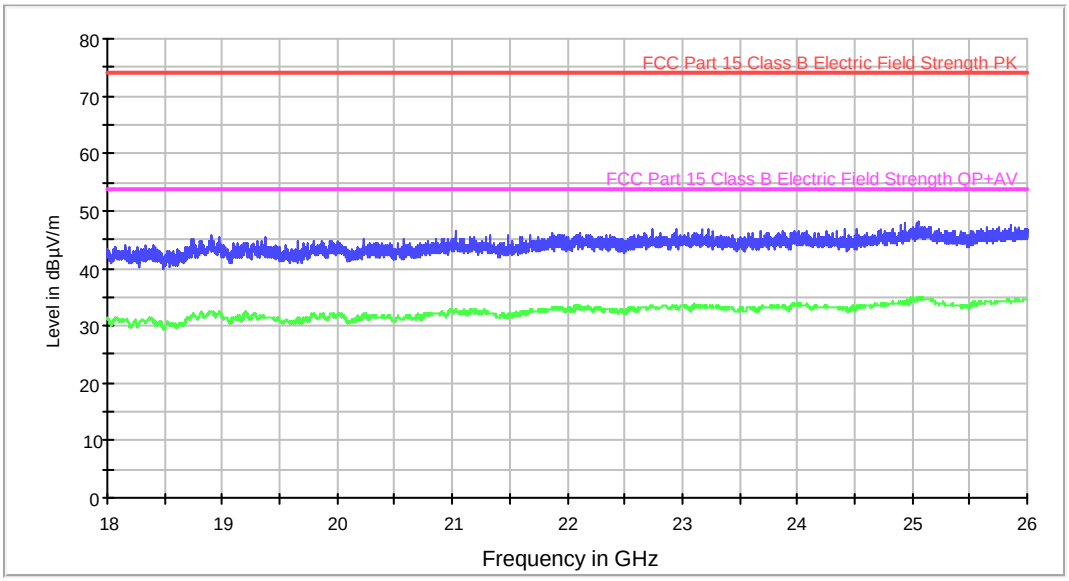
Subrange Maxima

Frequency (MHz)	MaxPeak-ClearWrite (dBµV/m)	Average-ClearWrite (dBµV/m)
1120.000000	34.2	27.2
1399.000000	36.4	19.8
1916.000000	35.5	22.0
2391.000000	37.8	23.3
3900.000000	39.5	26.7
5436.000000	42.4	28.8
7402.000000	45.5	32.3
9750.000000	46.9	33.3
13204.000000	48.0	35.5
17821.000000	54.8	41.8

Radiated Emission. CR0101HR2_PH

Project:	52386REM.002
Company:	POLAR ELECTRO OY
Sample:	S/01
Operation mode:	OM#01
Description:	EUT ON. Signal 5kHz OFF. Bluetooth RX. Power supply: USB port (by laptop). Horizontal polarization.

FCC 18-26GHz class B



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

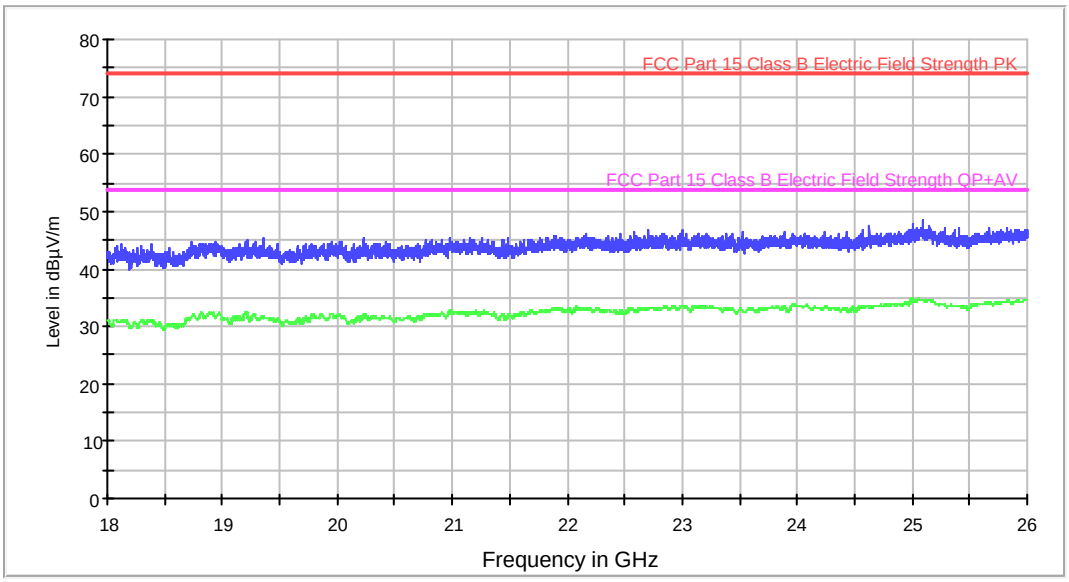
Subrange Maxima

Frequency (MHz)	MaxPeak-ClearWrite (dBµV/m)	Average-ClearWrite (dBµV/m)
18394.000000	44.2	31.1
18900.000000	45.6	32.5
19383.000000	45.4	31.5
20577.000000	45.1	31.3
21031.000000	46.4	32.7
22112.000000	46.2	33.3
22738.000000	46.9	33.3
23872.000000	46.4	33.4
25051.000000	48.3	34.8
25854.000000	47.4	34.3

Radiated Emission. CR0101HR2_PV

Project:	52386REM.002
Company:	POLAR ELECTRO OY
Sample:	S/01
Operation mode:	OM#01
Description:	EUT ON. Signal 5kHz OFF. Bluetooth RX. Power supply: USB port (by laptop). Vertical polarization.

FCC 18-26GHz class B



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

Subrange Maxima

Frequency (MHz)	MaxPeak-ClearWrite (dBµV/m)	Average-ClearWrite (dBµV/m)
18128.000000	44.4	30.9
19366.000000	45.2	31.5
20024.000000	44.9	32.0
20235.000000	45.3	32.1
21153.000000	45.4	32.2
22163.000000	46.2	33.2
22712.000000	46.9	33.2
23518.000000	46.4	32.9
25003.000000	48.0	34.5
25087.000000	48.7	34.7

CONTINUOUS CONDUCTED EMISSION

LIMITS:	Product standard :	FCC CFR 47, Part 15, Subpart B (10-1-15 Edition), Secs. 15.107 and Subpart C (10-1-15 Edition) Secs. 15.207
	Test standard :	FCC CFR 47, Part 15, Subpart B (10-1-15 Edition), Secs. 15.107, 15 and Subpart C (10-1-15 Edition) Secs. 15.207

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 (10-01-15 Edition), Secs. 15.107 and Subpart C (10-1-15 Edition) Secs. 15.207, 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

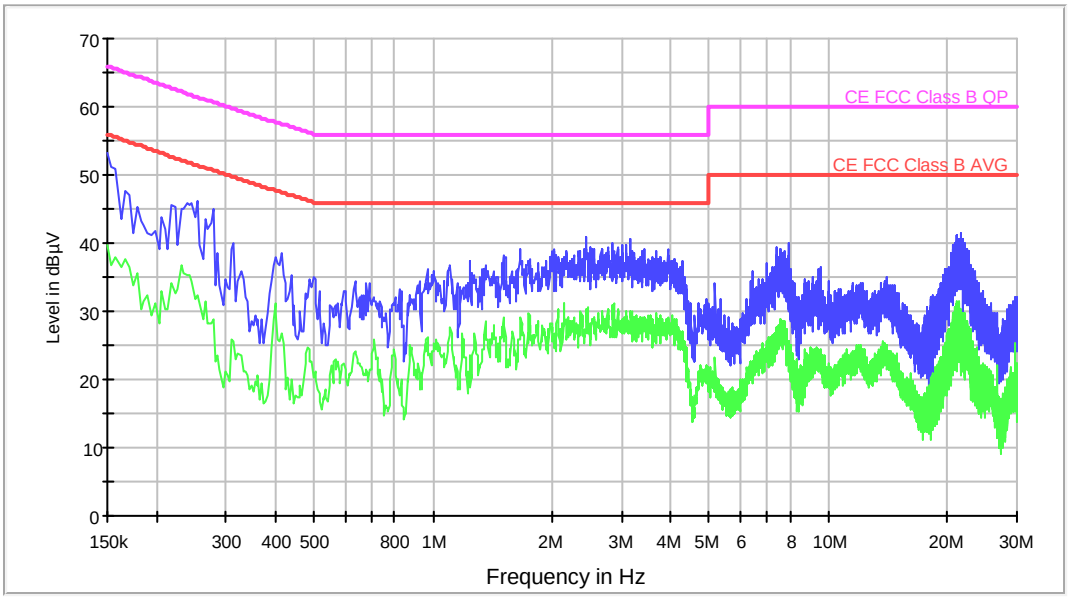
TESTED SAMPLES:	S#01
TESTED OPERATION MODES:	OM#01 & OM#02
TEST RESULTS:	CCmmnnhh: CC, Conducted Condition; mm: Sample number; nn: Operation mode; hh: wire

CCmmnnhh	**DESCRIPTION**	**RESULT**
CC0101N	Range: 150kHz – 30MHz. Neutral wire noise.	P
CC0101L1	Range: 150kHz – 30MHz. Phase wire noise.	P
CC0102N	Range: 150kHz – 30MHz. Neutral wire noise.	P
CC0102L1	Range: 150kHz – 30MHz. Phase wire noise.	P

Conducted Emission. CC0101L1

Project:	52386REM.002
Company:	POLAR ELECTRO OY
Sample:	S/01
Operation mode:	OM#01
Description:	EUT ON. Signal 5kHz OFF. Bluetooth RX. Power supply: USB port (by laptop). Phase wire noise.

FCC Class B



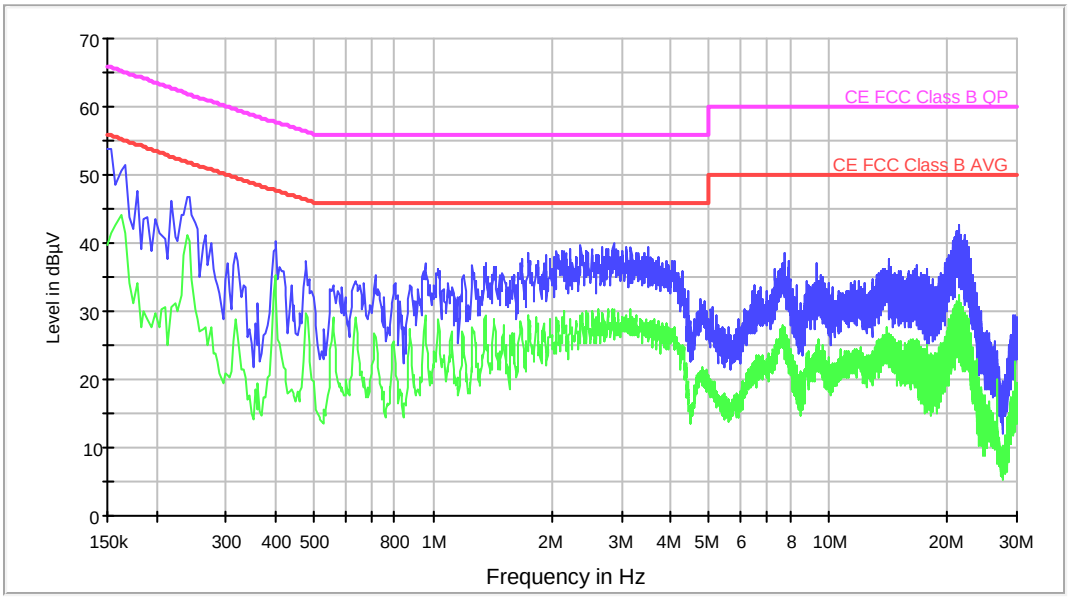
Subrange Maxima

Frequency (MHz)	MaxPeak-ClearWrite (dBµV)	Average-ClearWrite (dBµV)
0.150000	53.2	39.6
0.278000	45.0	28.9
0.438000	35.3	20.1
1.238000	37.3	23.4
2.014000	39.2	26.8
2.434000	40.7	27.2
3.918000	39.1	29.2
7.938000	40.0	25.1
14.094000	35.0	24.1
21.710000	41.4	29.7

Conducted Emission. CC0101N

Project:	52386REM.002
Company:	POLAR ELECTRO OY
Sample:	S/01
Operation mode:	OM#01
Description:	EUT ON. Signal 5kHz OFF. Bluetooth RX. Power supply: USB port (by laptop). Neutral wire noise.

FCC Class B



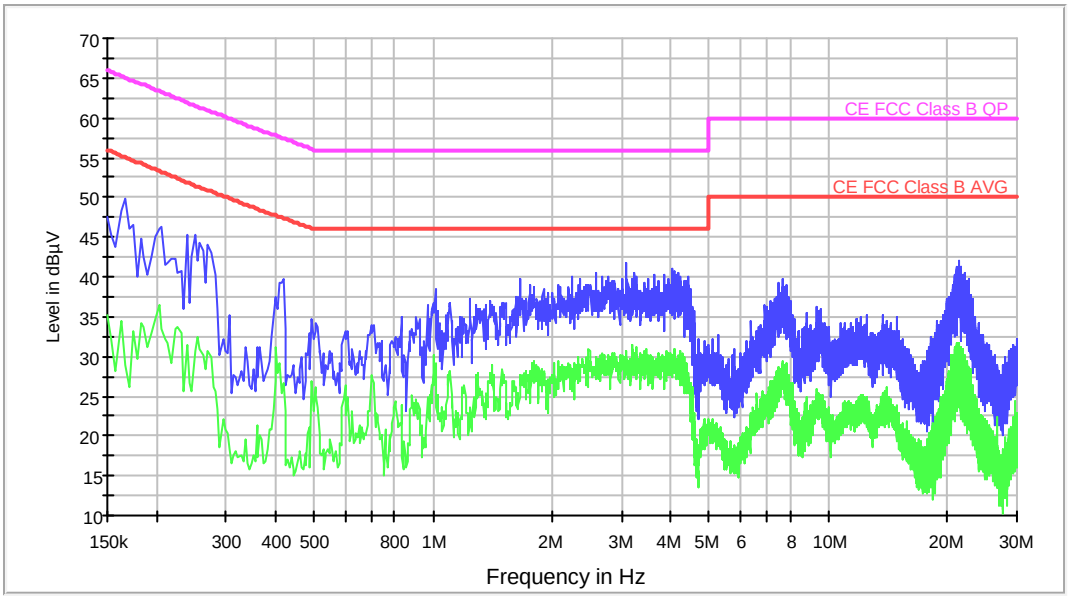
Subrange Maxima

Frequency (MHz)	MaxPeak-ClearWrite (dBµV)	Average-ClearWrite (dBµV)
0.150000	54.0	39.7
0.266000	41.2	27.7
0.478000	37.3	29.7
0.954000	37.2	29.3
2.058000	38.9	29.2
2.858000	40.1	30.3
3.710000	37.9	26.9
7.710000	38.6	26.6
14.178000	37.7	24.6
21.342000	42.7	31.2

Conducted Emission. CC0102L1

Project:	52386REM.002
Company:	POLAR ELECTRO OY
Sample:	S/01
Operation mode:	OM#02
Description:	EUT ON. Signal 5kHz and Bluetooth Communication with auxiliary device. Power supply: USB port (by laptop). Phase wire noise.

FCC Class B



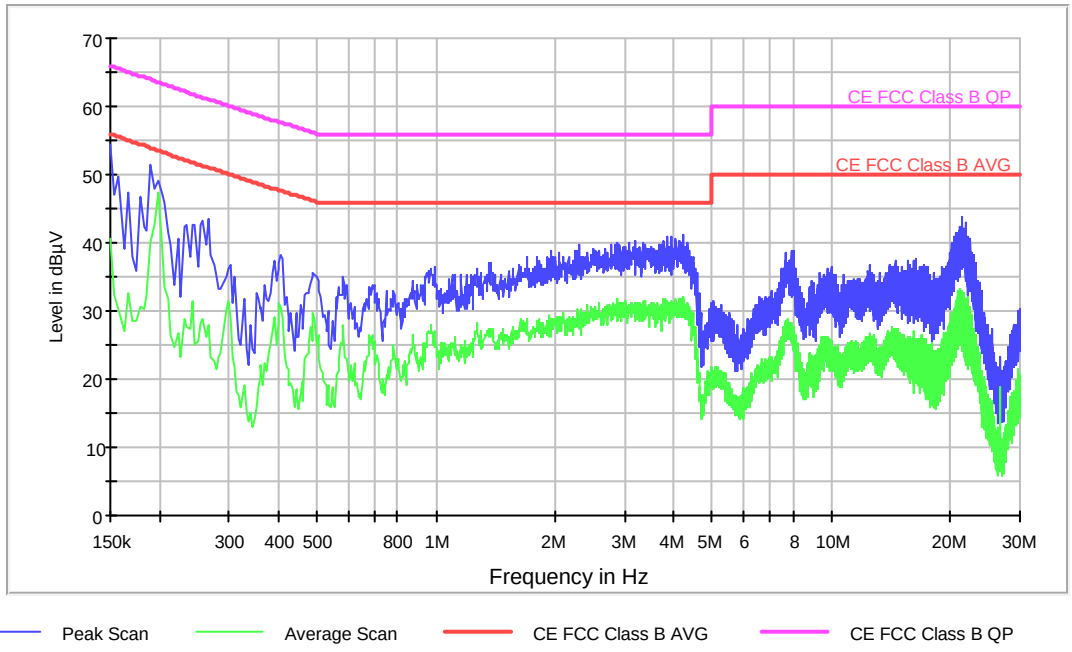
Subrange Maxima

Frequency (MHz)	MaxPeak-ClearWrite (dBµV)	Average-ClearWrite (dBµV)
0.166000	49.8	28.8
0.258000	44.3	30.9
0.494000	34.6	26.9
1.014000	38.4	29.1
1.658000	39.6	24.9
3.086000	41.9	30.0
4.018000	41.1	29.8
7.626000	39.7	29.2
12.478000	35.2	24.1
21.358000	42.0	30.7

Conducted Emission. CC0102N

Project:	52386REM.002
Company:	POLAR ELECTRO OY
Sample:	S/01
Operation mode:	OM#02
Description:	EUT ON. Signal 5kHz and Bluetooth Communication with auxiliary device. Power supply: USB port (by laptop). Neutral wire noise.

FCC Class B



Subrange Maxima

Frequency (MHz)	MaxPeak-ClearWrite (dBµV)	Average-ClearWrite (dBµV)
0.150000	54.3	40.7
0.266000	43.5	28.1
0.490000	35.7	29.7
0.994000	36.4	24.6
1.954000	38.9	28.8
3.186000	40.2	30.3
4.230000	41.3	31.6
7.886000	38.8	27.2
16.362000	37.7	24.1
21.370000	43.8	30.9