



Test report No:

NIE: 52153REM.002A1

Test report (Modification 1)

FCC Rules and Regulations CFR 47, Part 15, Subpart B (10-1-15 Edition)
&
ICES-003 ISSUE 6 (2016)

Identification of item tested	Heart Rate Sensor
Trademark	Polar
Model and/or type reference	2L
Other identification of the product	S/N: Prototype FCC ID: INW2L IC ID: 6248A-2L
Final HW version	00764348.01
Final SW version	0.1.136
Features	BLE, OHR (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) & ICES-003 Issue 6 (2016)
Summary	IN COMPLIANCE
Approved by (name / position & signature)	Rafael López EMC Lab Manager
Date of issue	2017-07-06
Report template No.	FDT11_20

Index

Competences and guarantees.....	3
General conditions.....	3
Usage of samples.....	4
Test sample description.....	4
Identification of the client	4
Testing period.....	4
Environmental conditions.....	5
Modifications to the reference test report.....	6
Remarks and comments.....	6
Testing verdicts (Legend).....	6
List of equipment used during the test.....	6
Appendix A – Test result.....	7

Competences and guarantees

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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.

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2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or competent Authorities.
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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 N°	Description	Model	Serial number	Reception date
52153/028	Polar OH1 B	2L	Prototype	2017-04-21
52153/038	Adaptor	--	--	2017-04-21

Sample S/02 is the sample S/01 connected to a laptop by USB (for test arrangement for tabletop equipment according to ANSI C63.4)

Test sample description

Optical heart rate sensor with Bluetooth low-energy and USB connectivity.

Identification of the client

POLAR ELECTRO OY
Professorintie, 5
90440 Kempele
FINLAND.

Testing period

The performed test started on 2017-04-24 and finished on 2017-04-26.

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 °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

Modifications to the reference test report

It was introduced the following modifications in respect to the test report number 52153REM.002 related with the same samples, in the next clauses and sub-clauses:

It was added the operation mode OM#03 and the test results and graphics to complete the conducted emission test.

This modification test report cancels and replaces the test report 52153REM.002.

Remarks and comments

The tests have been performed by the technical personnel: Alberto Parada, Victor Acedo & Ismael Gamarro.

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 (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	2016-09-19	2017-09-19
4612	Horn Antenna	SCHWARZBECK	BBHA 9120 D	2016-12-19	2019-12-19
3783	Preamplifier	BONN ELEKTRONIK	BLMA 0118-3A	2016-05-03	2017-05-03
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

Appendix A – Test result

APPENDIX A CONTENT

DESCRIPTION OF THE OPERATION MODES.....9

RADIATED EMISSION. ELECTROMAGNETIC FIELD MEASURE10

CONTINUOUS CONDUCTED EMISSION.....22

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. Charging battery. Power supply 5Vdc.
OM#02	EUT ON. Bluetooth IDLE. Charging battery throughout a laptop via USB port. Device is transferring data with the PC by USB. Power supply laptop 115Vac.
OM#03	EUT ON. TX Bluetooth with an auxiliary device. Charging battery throughout a laptop via USB port. Device is transferring data with the PC and USB. Power supply laptop 115Vac.

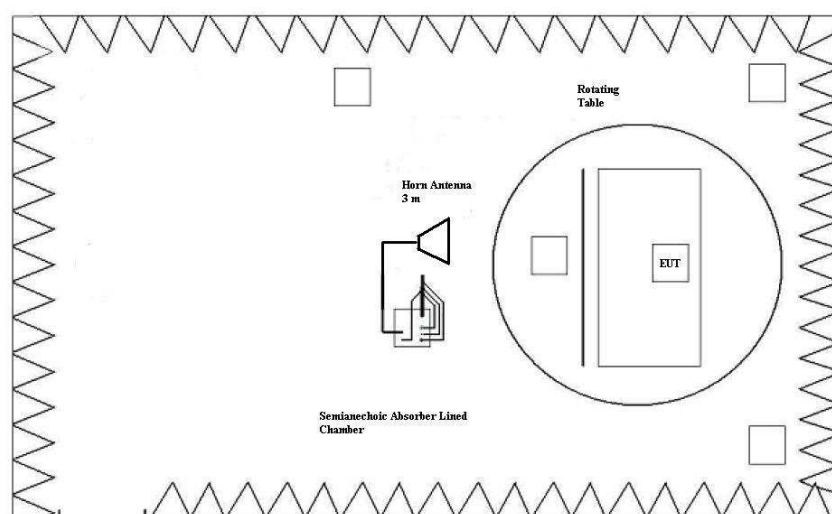
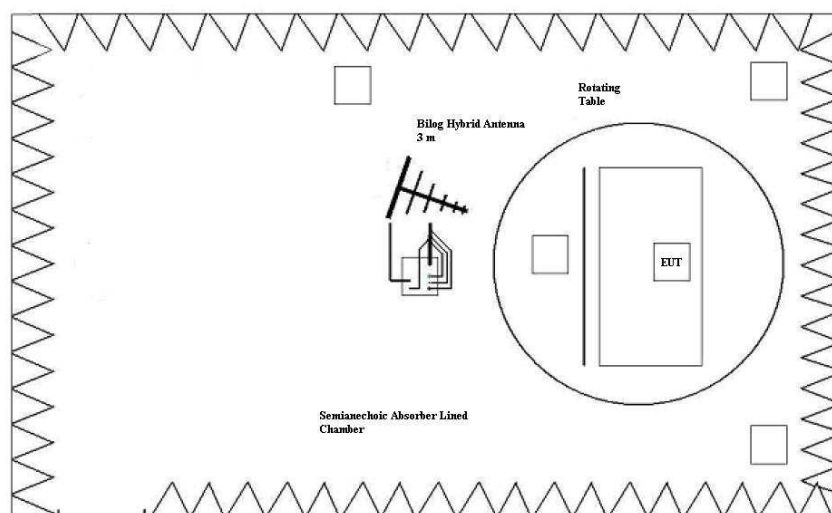
RADIATED EMISSION. ELECTROMAGNETIC FIELD MEASURE

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

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 (10-01-15 Edition), Secs. 15.109 & ICES-003 Issue 6 (2016) in the frequency range 30 MHz to 26 GHz for class B equipments.

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



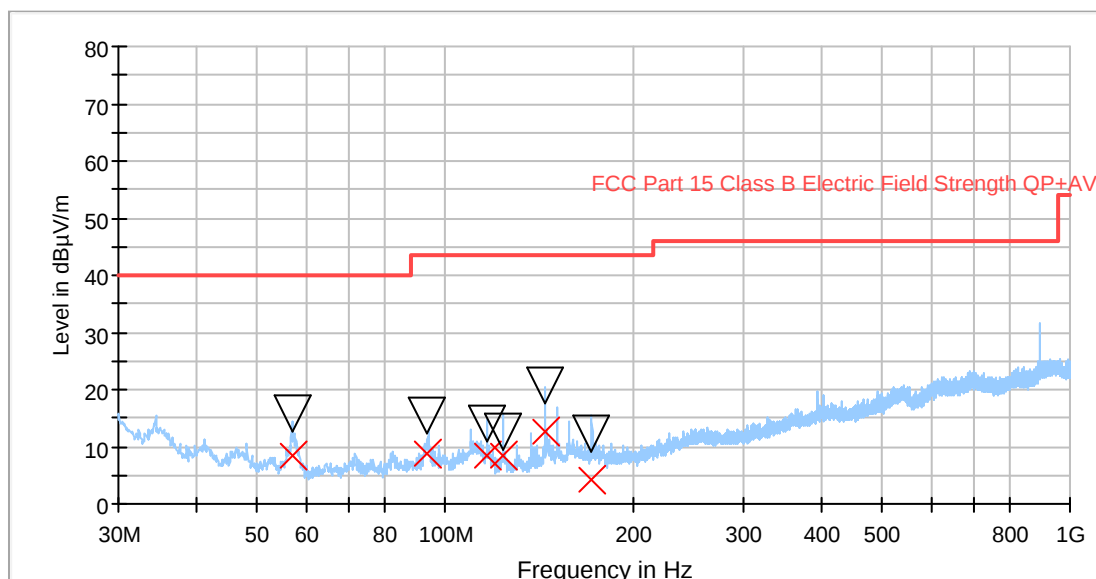
TESTED SAMPLE:	S/01 & S/02
TESTED OPERATION MODES:	OM#01 & OM#02
TEST RESULTS:	CRmmnnRRPP: CR, Radiated Condition; mm: Sample number; nn: Operation mode; RR: Range; PP: Polarization.

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
CR0202LR	Range: 30 MHz - 1000 MHz.	P
CR0202HR1_PH	Range: 1 GHz - 18 GHz. Horizontal Polarization.	P
CR0202HR1_PV	Range: 1 GHz - 18 GHz. Vertical Polarization.	P
CR0202HR2_PH	Range: 18 GHz - 26 GHz. Horizontal Polarization.	P
CR0202HR2_PV	Range: 18 GHz - 26 GHz. Vertical Polarization.	P

Radiated Emission. CR0101LR

Project: 52153rem002
Company: POLAR
Sample: S/01
Operation mode: OM#01
Description: EUT ON. IDLE Bluetooth. Charging battery. Power supply: 5Vdc.

Full Spectrum



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

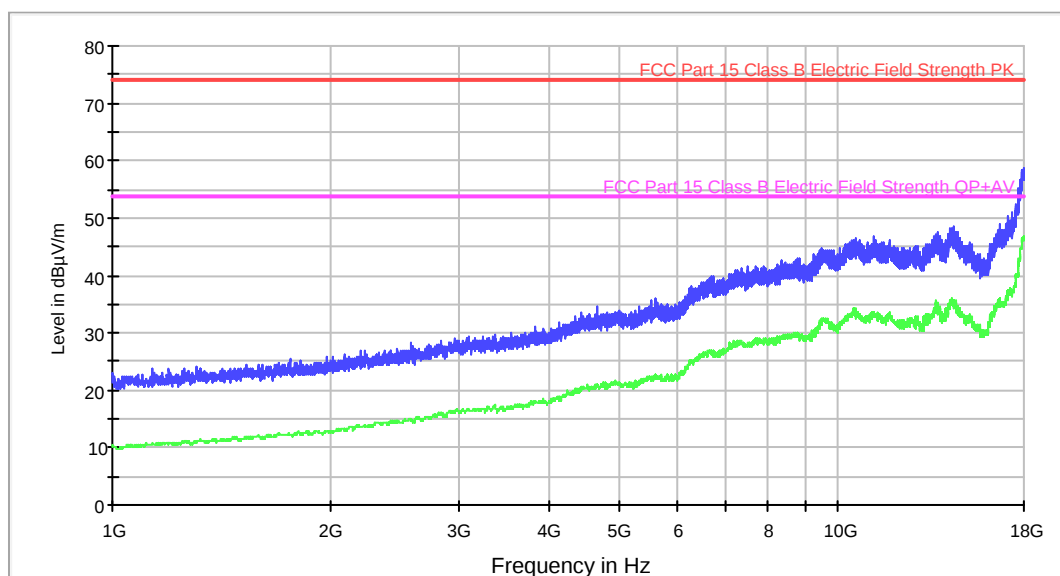
Maximizations

Frequency (MHz)	QuasiPeak (dBµV/m)	MaxPeak (dBµV/m)	Height (cm)	Pol	Azimuth (deg)
56.892208	8.36	15.78	123.0	V	72.0
93.788312	8.83	15.49	150.0	V	296.0
116.919481	8.26	14.08	107.0	V	179.0
123.702597	8.58	12.62	138.0	V	0.0
144.270130	12.59	20.77	105.0	V	64.0
171.812987	4.27	12.30	400.0	V	357.0

Radiated Emission. CR0101HR1_PH

Project: 52153rem002
Company: POLAR ELECTRO OY
Sample: S/01
Operation mode: OM#01
Description: EUT ON. Bluetooth IDLE. Charging battery. Power supply 5Vdc.
Horizontal Polarization

ER EMI FCC 15 Class B (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

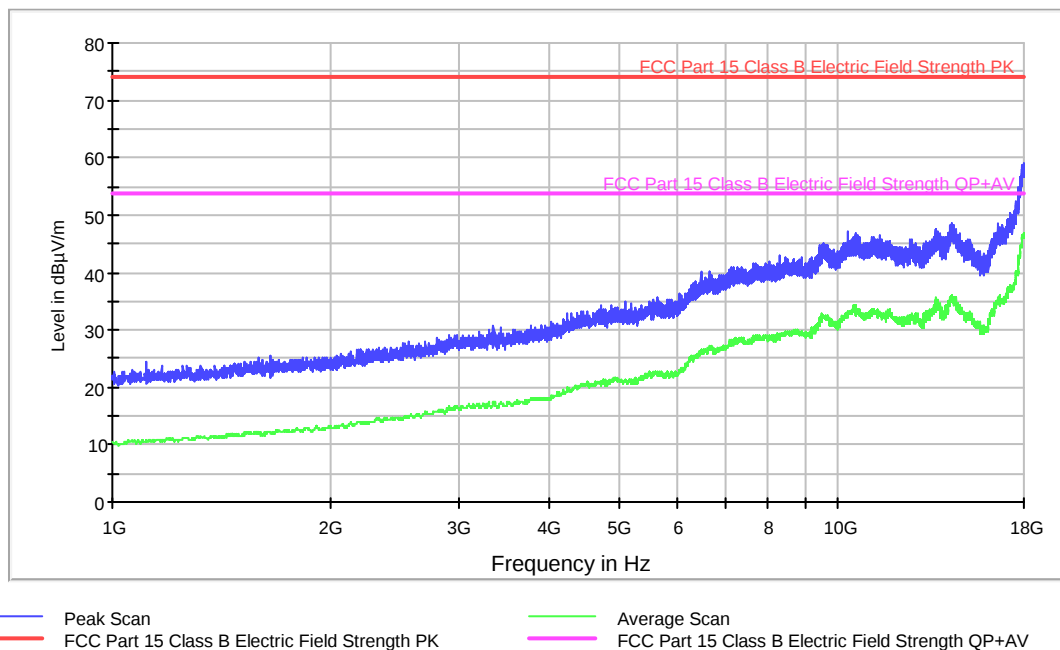
Subrange Maxima

Frequency (MHz)	MaxPeak-ClearWrite (dBµV/m)	Average-ClearWrite (dBµV/m)
1531.000000	24.4	11.8
2574.000000	28.2	15.0
4125.000000	31.9	18.6
6741.000000	40.0	26.8
10577.000000	46.4	33.5
17973.000000	58.6	46.3

Radiated Emission. CR0101HR1_PV

Project: 52153rem002
Company: POLAR ELECTRO OY
Sample: S/01
Operation mode: OM#01
Description: EUT ON. Bluetooth IDLE. Charging battery. Power supply 5Vdc.
Vertical Polarization

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



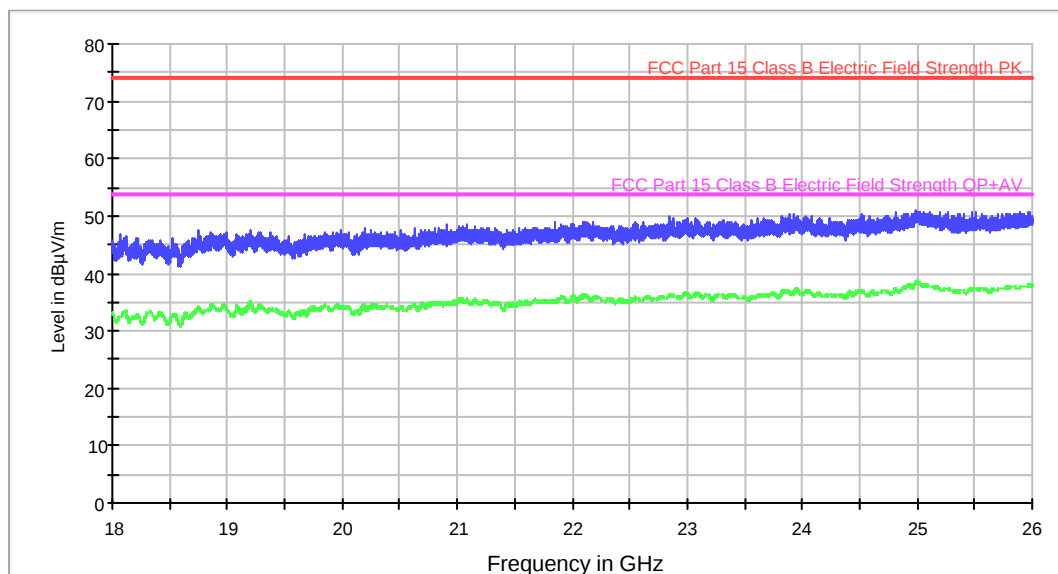
Subrange Maxima

Frequency (MHz)	MaxPeak-ClearWrite (dBµV/m)	Average-ClearWrite (dBµV/m)
1590.000000	25.0	12.1
2563.000000	27.8	15.1
4222.000000	32.7	19.5
6453.000000	40.2	26.1
10297.000000	47.1	32.8
17945.000000	59.1	46.7

Radiated Emission. CR0101HR2_PH

Project: 52153rem002
Company: POLAR ELECTRO OY
Sample: S/01
Operation mode: OM#01
Description: EUT ON. Bluetooth IDLE. Charging battery. Power supply 5Vdc.
Horizontal Polarization

ER EMI FCC 15 Class B(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

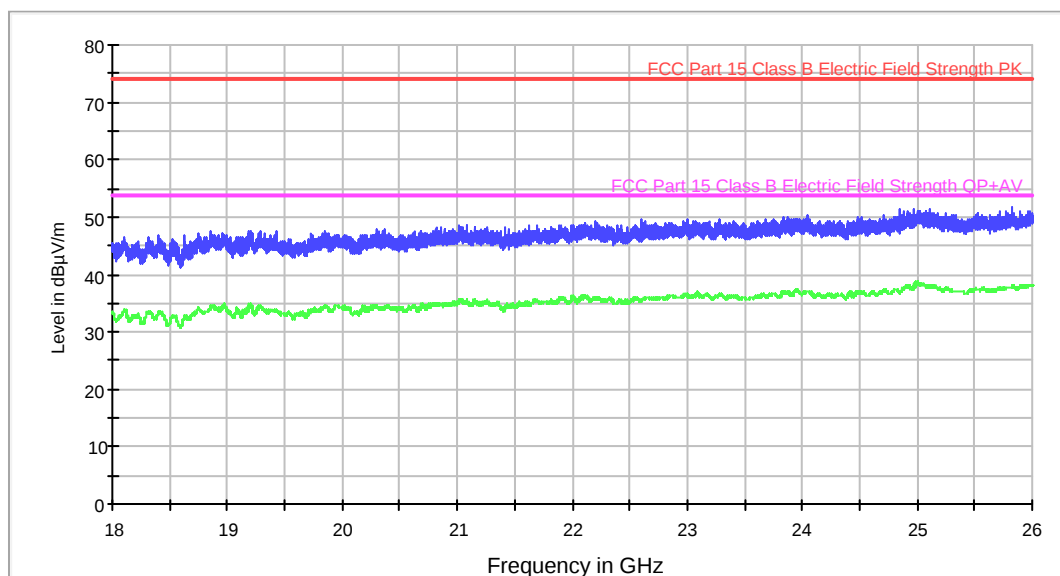
Subrange Maxima

Frequency (MHz)	MaxPeak-ClearWrite (dBµV/m)	Average-ClearWrite (dBµV/m)
18752.800000	47.5	34.0
20188.000000	47.7	34.5
21087.600000	48.4	35.3
22854.000000	49.9	36.3
23885.200000	50.3	36.8
24994.400000	50.8	38.3

Radiated Emission. CR0101HR2_PV

Project: 52153rem002
Company: POLAR ELECTRO OY
Sample: S/01
Operation mode: OM#01
Description: EUT ON. Bluetooth IDLE. Charging battery. Power supply 5Vdc.
Vertical Polarization

ER EMI FCC 15 Class B(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

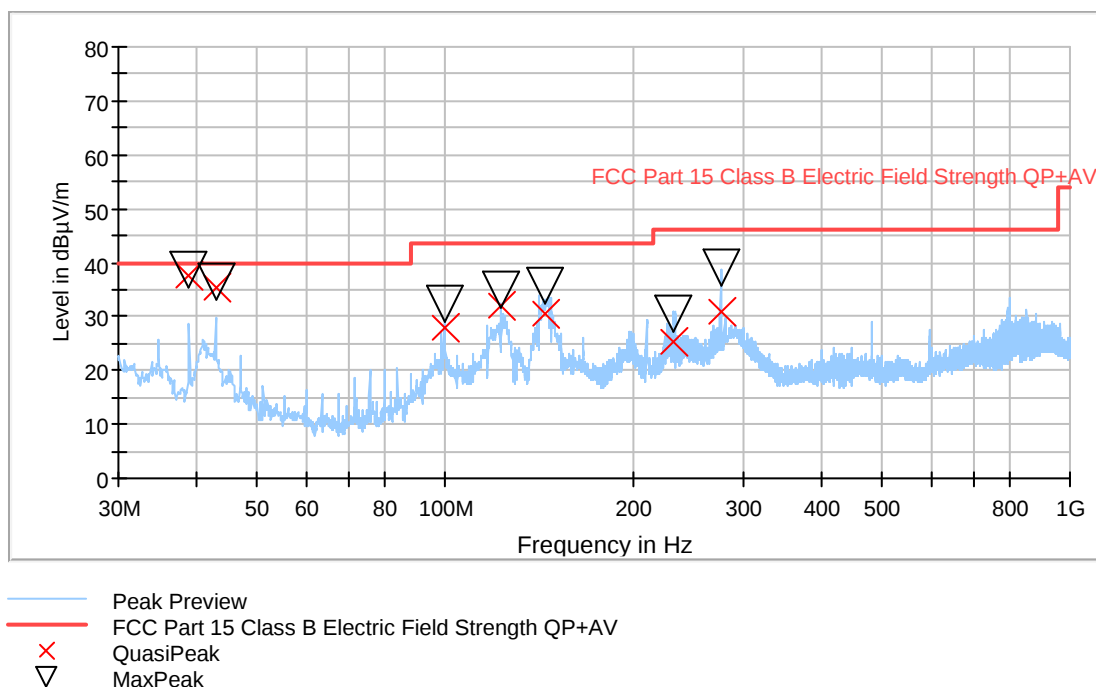
Subrange Maxima

Frequency (MHz)	MaxPeak-ClearWrite (dBµV/m)	Average-ClearWrite (dBµV/m)
18861.200000	47.6	34.5
20294.000000	47.8	34.5
21090.400000	48.7	35.2
22603.200000	49.6	35.4
24053.600000	50.1	37.0
25832.000000	51.6	37.9

Radiated Emission. CR0202LR

Project: 52153rem002
Company: POLAR
Sample: S/02
Operation mode: OM#02
Description: EUT ON. Bluetooth IDLE. Charging battery throughout a laptop via USB port. Device is transferring data with the PC by USB. Power supply laptop 115Vac.

Full Spectrum



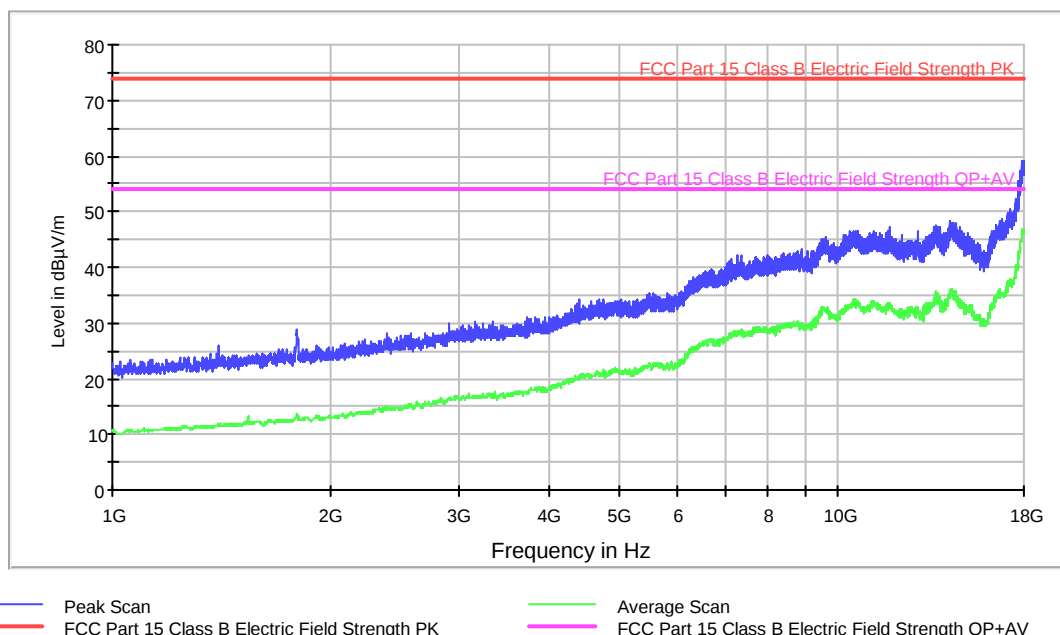
Maximizations

Frequency (MHz)	QuasiPeak (dBµV/m)	MaxPeak (dBµV/m)	Height (cm)	Pol	Azimuth (deg)
38.925974	37.40	38.70	98.0	V	208.0
43.006494	35.32	36.33	104.0	V	245.0
99.612987	27.88	32.54	202.0	H	234.0
122.861039	32.02	34.85	288.0	H	350.0
144.412987	30.63	35.81	152.0	H	324.0
232.583117	25.29	30.57	150.0	H	118.0
275.814286	31.01	38.89	119.0	H	356.0

Radiated Emission. CR0202HR1_PH

Project: 52153rem002
Company: POLAR ELECTRO OY
Sample: S/02
Operation mode: OM#02
Description: EUT ON. Bluetooth IDLE. Charging battery throughout a laptop via USB port. Device is transferring data with the PC by USB. Power supply laptop 115Vac. Horizontal Polarization

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



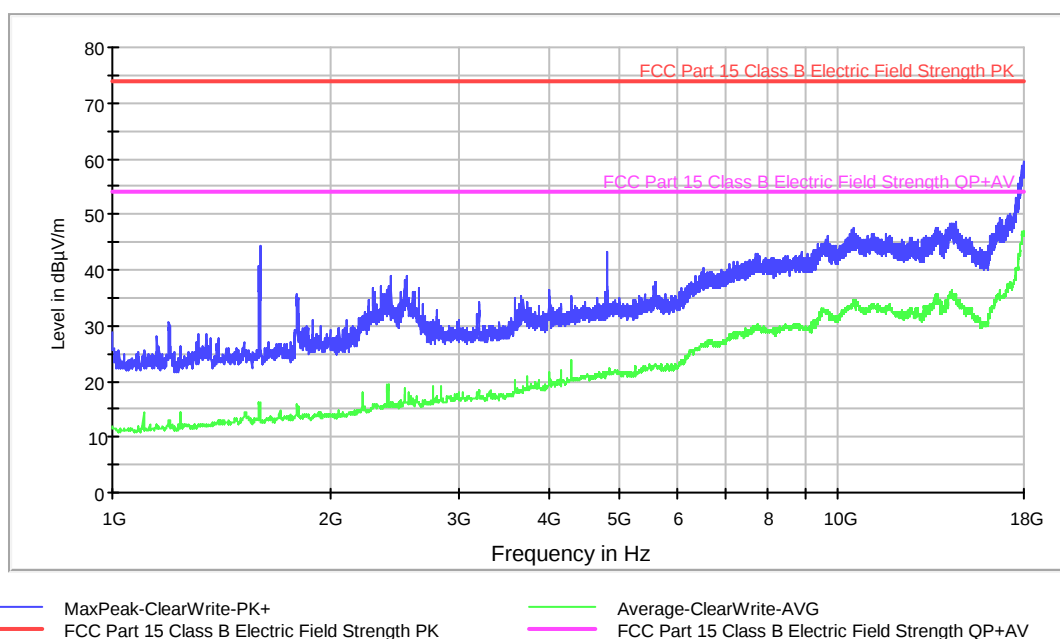
Subrange Maxima

Frequency (MHz)	MaxPeak-ClearWrite (dBµV/m)	Average-ClearWrite (dBµV/m)
1402.000000	25.9	11.7
1797.000000	28.9	13.4
4206.000000	31.7	19.2
6677.000000	39.6	27.0
10645.000000	46.6	33.7
17939.000000	59.0	46.6

Radiated Emission. CR0202HR1_PV

Project: 52153rem002
Company: POLAR ELECTRO OY
Sample: S/02
Operation mode: OM#02
Description: EUT ON. Bluetooth IDLE. Charging battery throughout a laptop via USB port. Device is transferring data with the PC by USB. Power supply laptop 115Vac. Vertical Polarization

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



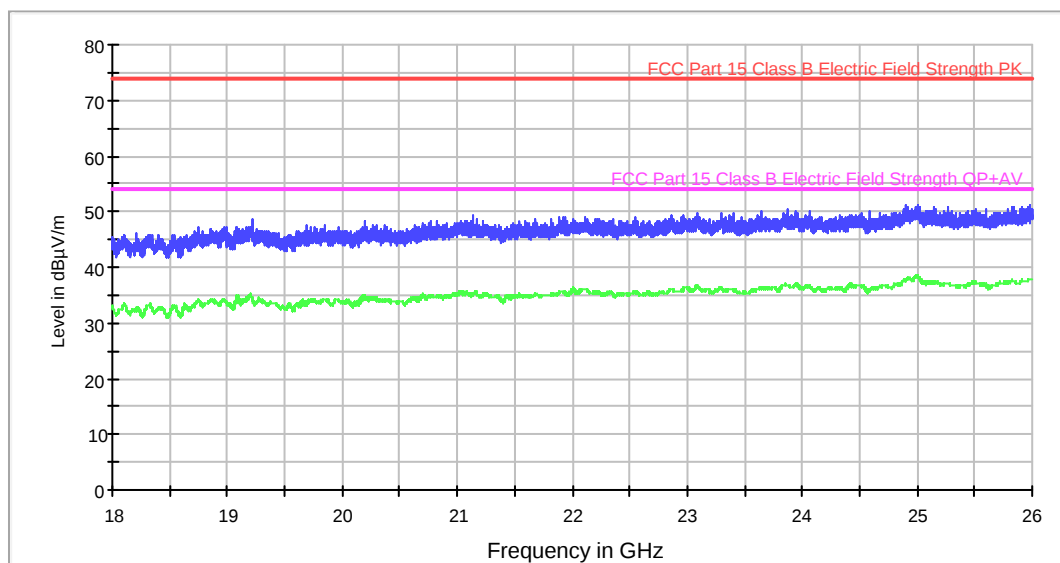
Subrange Maxima

Frequency (MHz)	MaxPeak-ClearWrite (dBµV/m)	Average-ClearWrite (dBµV/m)
1598.000000	44.3	15.5
2551.000000	38.9	16.1
2647.000000	36.7	16.2
4799.000000	43.4	21.5
10483.000000	47.4	33.9
17947.000000	59.3	46.7

Radiated Emission. CR0202HR2_PH

Project: 52153rem002
Company: POLAR ELECTRO OY
Sample: S/02
Operation mode: OM#02
Description: EUT ON. Bluetooth IDLE. Charging battery throughout a laptop via USB port. Device is transferring data with the PC by USB. Power supply laptop 115Vac. Horizontal Polarization

ER EMI FCC 15 Class B(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

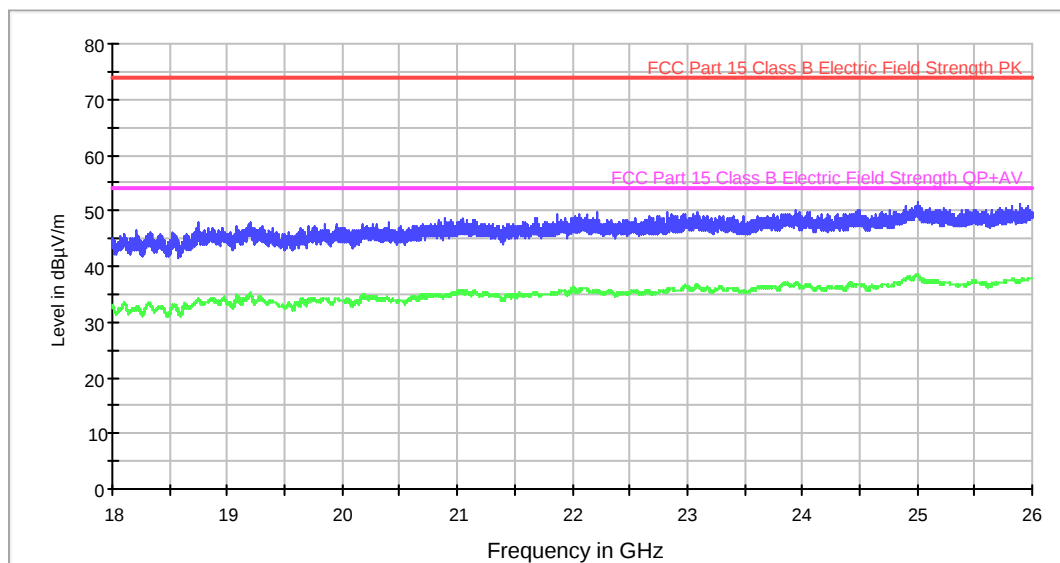
Subrange Maxima

Frequency (MHz)	MaxPeak-ClearWrite (dBµV/m)	Average-ClearWrite (dBµV/m)
18983.600000	47.3	33.9
19215.600000	48.7	34.4
21143.600000	49.4	35.5
22860.800000	49.5	36.0
23875.600000	50.4	36.8
25988.000000	51.2	37.8

Radiated Emission. CR0202HR2_PV

Project: 52153rem002
Company: POLAR ELECTRO OY
Sample: S/02
Operation mode: OM#02
Description: EUT ON. Bluetooth IDLE. Charging battery throughout a laptop via USB port. Device is transferring data with the PC by USB. Power supply laptop 115Vac. Vertical Polarization

ER EMI FCC 15 Class B(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)
18748.800000	47.7	34.2
19196.400000	47.8	35.0
21058.800000	48.7	35.4
22214.000000	49.9	35.6
23939.200000	50.1	37.0
25003.200000	51.5	38.5

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 & ICES-003 Issue 6 (2016)
	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 & ICES-003 Issue 6 (2016)

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 & 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	66-56	56-46
0,5 to 5	56	46
5 to 30	60	50

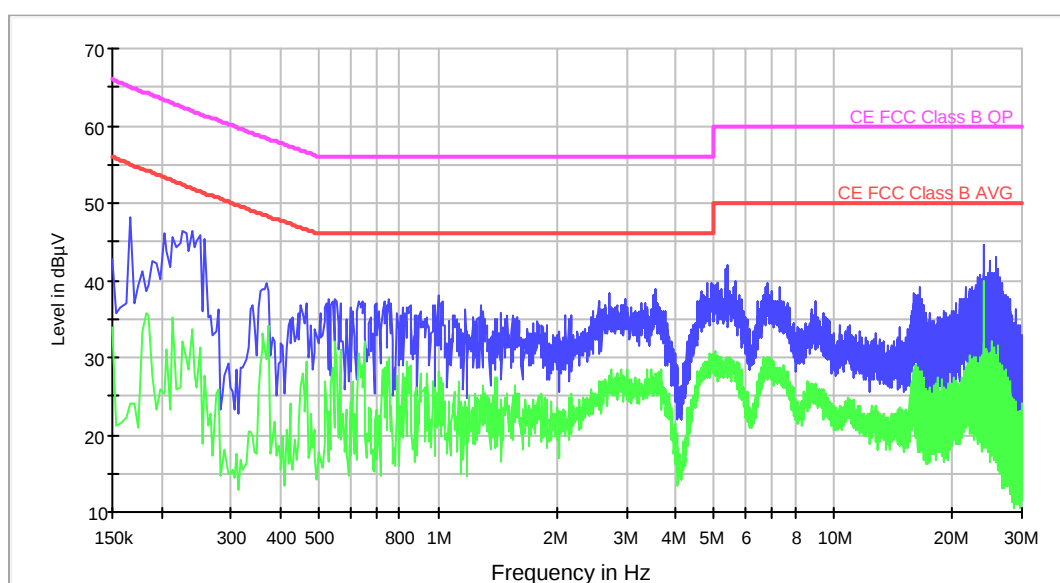
TESTED SAMPLES:	S/02
TESTED OPERATION MODES:	OM#02 & 03
TEST RESULTS:	CCmmnnhh: CC, Conducted Condition; mm: Sample number; nn: Operation mode; hh: wire

CCmmnnhh	Description	Result
CC02020N	Neutral wire noise. (PC laptop)	P
CC0202L1	Phase wire noise. (PC laptop)	P
CC02030N	Neutral wire noise. (PC laptop)	P
CC0203L1	Phase wire noise. (PC laptop)	P

Conducted Emission. CC02020N

Project: 52153REM.002
Company: POLAR ELECTRO OY
Sample: S/02
Operation mode: OM#02
Description: EUT ON. Bluetooth IDLE. Charging battery throughout a laptop via USB port. Device is transferring data with the PC by USB. Power supply laptop 115Vac. Neutral wire noise

EC FCC Class B



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

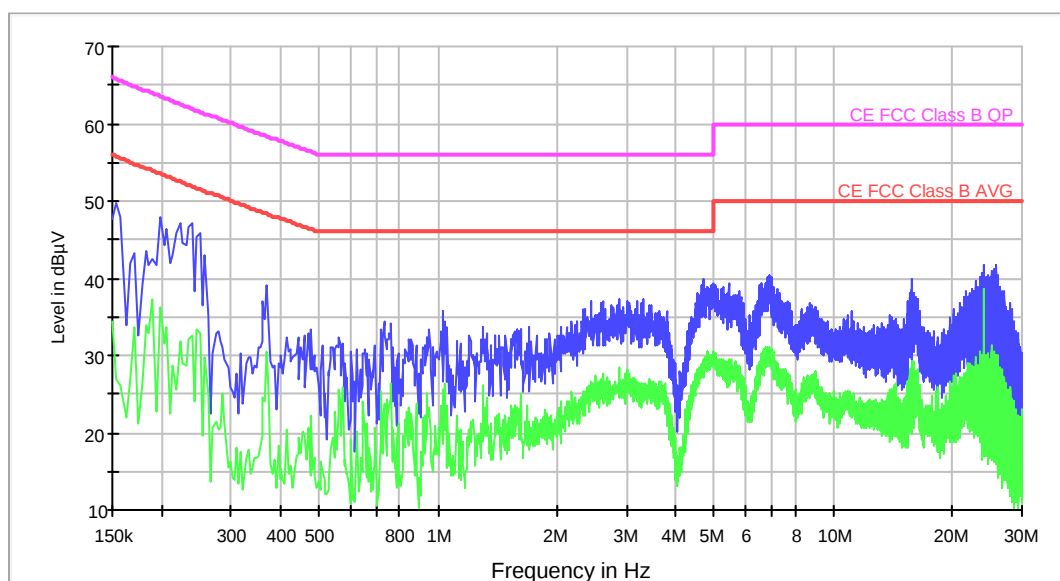
Subrange Maxima

Frequency (MHz)	MaxPeak-ClearWrite (dBµV)	Average-ClearWrite (dBµV)
0.166000	48.2	24.1
0.258000	45.3	27.7
0.550000	37.5	32.1
1.002000	38.1	25.6
1.278000	36.6	24.1
3.542000	38.9	27.0
5.370000	41.9	30.1
6.794000	39.5	29.0
16.454000	39.1	26.2
24.042000	44.5	38.0

Conducted Emission. CC0202L1

Project: 52153REM.002
Company: POLAR ELECTRO OY
Sample: S/02
Operation mode: OM#02
Description: EUT ON. Bluetooth IDLE. Charging battery throughout a laptop via USB port. Device is transferring data with the PC by USB. Power supply laptop 115Vac. Phase wire noise

EC FCC Class B



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

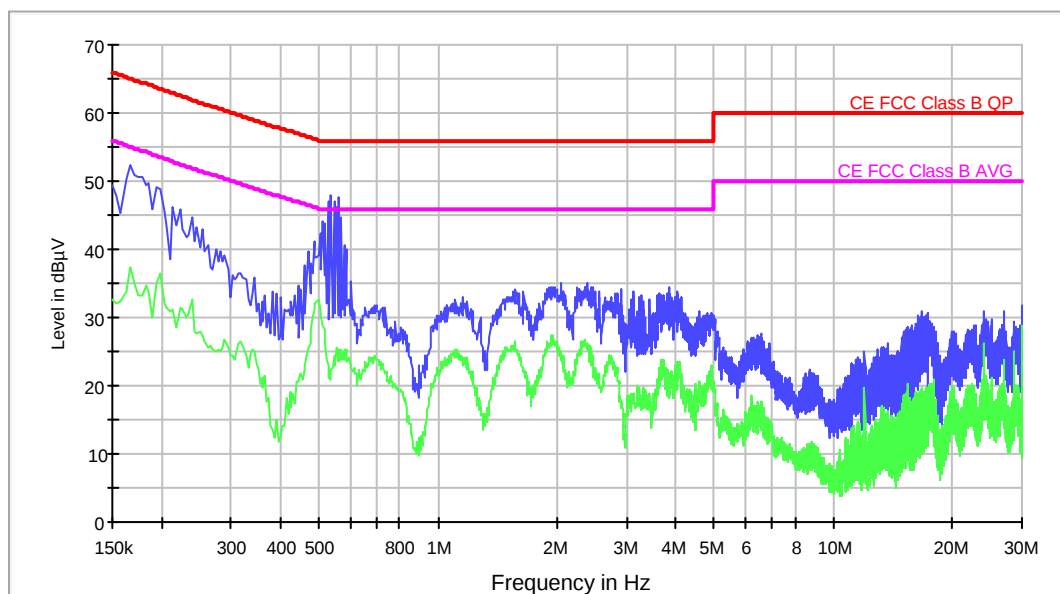
Subrange Maxima

Frequency (MHz)	MaxPeak-ClearWrite (dBµV)	Average-ClearWrite (dBµV)
0.154000	49.6	26.8
0.258000	43.1	29.8
0.730000	34.5	23.7
1.030000	35.7	25.6
1.302000	33.6	26.2
2.882000	37.3	28.5
4.686000	39.9	28.5
6.902000	40.4	30.1
15.830000	39.9	29.3
24.038000	41.8	38.6

Conducted Emission. CC02030N

Project: 52153REM.002
Company: POLAR ELECTRO OY
Sample: S/02
Operation mode: OM#03
Description: EUT ON. TX Bluetooth with an auxiliary device. Battery charging by USB port from an laptop (115 VAC). Neutral wire noise.

EC FCC Class B ESU40 CC



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

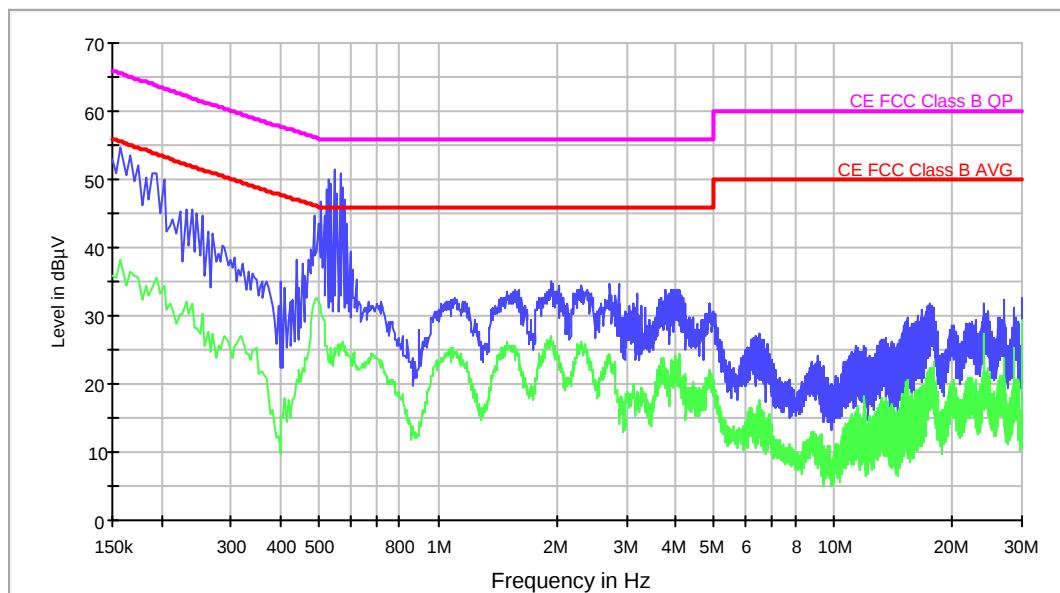
Subrange Maxima

Frequency (MHz)	MaxPeak-ClearWrite (dBµV)	Average-ClearWrite (dBµV)
0.166000	52.4	37.4
0.262000	40.5	25.6
0.538000	48.0	22.2
1.154000	32.9	24.1
2.042000	35.0	25.0
2.382000	35.1	25.9
3.834000	34.4	21.2
6.542000	27.8	17.7
16.790000	30.8	17.5
30.000000	31.9	28.8

Conducted Emission. CC0203L1

Project: 52153REM.002
Company: POLAR ELECTRO OY
Sample: S/02
Operation mode: OM#03
Description: EUT ON. TX Bluetooth with an auxiliary device. Battery charging by USB port from an laptop (115 VAC). Phase wire noise.

EC FCC Class B ESU40 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)
0.158000	54.7	38.1
0.262000	42.4	27.7
0.546000	51.5	25.3
1.098000	32.6	24.7
1.934000	34.9	26.3
2.858000	34.6	17.7
3.906000	33.9	22.6
6.490000	27.4	17.5
17.474000	31.7	20.9
30.000000	32.7	29.5