

EMC TEST REPORT

FCC 47 CFR Part 15B
Industry Canada ICES-003

Electromagnetic compatibility - Unintentional radiators

Report Reference No. : G0M-1506-4852-EF0115B-V01

Testing Laboratory : Eurofins Product Service GmbH

Address : Storkower Str. 38c
15526 Reichenwalde
Germany

Accreditation :



A2LA Accredited Testing Laboratory, Certificate No.: 1983.01
FCC Filed Test Laboratory, Reg.-No.: 96970
IC OATS Filing assigned code: 3470A

Applicant's name : BEACONinside GmbH

Address : Czerninski Str. 7
10829 Berlin
GERMANY

Test specification:

Standard : 47 CFR Part 15 Subpart B
ICES-003, Issue 5:2012
ANSI C63.4:2014

Equipment under test (EUT):

Product description	Bluetooth low energy transceiver	
Model No.	B0002-A	
Additional Models	None	
Hardware version	2.0	
Firmware / Software version	1.0	
FCC-ID / IC	FCC-ID: 2ACCT-B0002-A	IC: 11976A-B0002A
Test result	Passed	

Test Report No.: G0M-1506-4852-EF0115B-V01

Eurofins Product Service GmbH
Storkower Str. 38c, D-15526 Reichenwalde, Germany

Possible test case verdicts:

- not applicable to test object: N/A
- test object does meet the requirement.....: P (Pass)
- test object does not meet the requirement.....: F (Fail)

Testing:

Date of receipt of test item: 2015-10-26

Date (s) of performance of tests: 2015-11-05 - 2015-11-11

Compiled by: Steffen Zunke

Tested by (+ signature).....: Steffen Zunke

Approved by (+ signature): Marcus Klein

Head of Lab

Date of issue.....: 2015-11-12

Total number of pages.....: 36



General remarks:

The test results presented in this report relate only to the object tested.

The results contained in this report reflect the results for this particular model and serial number. It is the responsibility of the manufacturer to ensure that all production models meet the intent of the requirements detailed within this report.

This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.

Additional comments:

Version History

Version	Issue Date	Remarks	Revised by
V01	2015-11-12	Initial Release	

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1 Equipment (Test item) Description

Description	Bluetooth low energy transceiver
Model	B0002-A
Additional Models	None
Serial number	None
Hardware version	2.0
Software / Firmware version	1.0
Contains FCC-ID	N/A
Contains IC	N/A
Power supply	5VDC via AC/DC Adapter or 3VDC via Battery
Used AC/DC-Adaptor	Model : HDW-44303-002 Manufacturer : Black Berry Input : 100-240VAC / 50-60Hz Output : 5VDC / 0.55A
Manufacturer	BEACONinside GmbH Czeminskistr. 7 10829 Berlin GERMANY
Highest emission frequency	Fmax [MHz] = 2496
Device classification	Class B
Equipment type	Tabletop
Number of tested samples	1

1.4 Supporting Equipment Used During Testing

Product Type*	Device	Manufacturer	Model No.	Comments
AE	Smartphone	Samsung	S5	-
AE	AC/DC Adapter	Black Berry	HDW-44303-002	-
*Note: Use the following abbreviations: AE : Auxiliary/Associated Equipment, or SIM : Simulator (Not Subjected to Test) CABL : Connecting cables				

1.5 Input / Output Ports

Port #	Name	Type*	Max. Cable Length	Cable Shielded	Comments
1	Power	AC	>3m	No	AC/DC Adapter connected via USB to EUT
*Note: Use the following abbreviations: AC : AC power port DC : DC power port N/E : Non electrical I/O : Signal input or output port TP : Telecommunication port					

1.6 Operating Modes and Configurations

Mode #	Description
1	Powered via AC/DC Adapter, Bluetooth LE link to Smartphone
2	Powered via battery, Bluetooth LE link to Smartphone

Configuration #	EUT Configuration
1	EUT fully assembled

1.7 Test Equipment Used During Testing

Measurement Software			
Description	Manufacturer	Name	Version
EMC Test Software	Dare Instruments	Radimation	2014.1.15

Radiated emissions – 3m Chamber					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Biconical Antenna	R&S	HK 116	EF00012	2013-02	2016-02
LPD-Antenne	R&S	HL 223	EF00187	2014-03	2017-03
Horn antenna	Schwarzbeck	BBHA 9120D	EF00018	2013-09	2016-09
EMI Test Receiver	R&S	ESU26	EF00887	2015-01	2016-01

Conducted emissions					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
AMN	R&S	ESH2-Z5	EF00182	2014-11	2016-11
EMI Test Receiver	R&S	ESR7	EF00943	2015-09	2016-09
Cable	-	RG58/U	-	System Cal.	System Cal.

1.8 Sample emission level calculation

The following is a description of terms and a sample calculation, as appears in the radiated emissions data table. The numbers used in the calculation are for example only. There is no direct correlation to the specific data taken for the product described in this document:

Reading:

This is the reading obtained on the spectrum analyzer in dBμV. Any external preamplifiers used are taken into account through internal analyzer settings.

A.F.:

This is the antenna factor for the receiving antenna. It is a conversion factor, which converts electric fields strengths to voltages, which can be measured directly on the spectrum analyzer. It is treated as a loss in dB. Cable losses have been included with the A.F. to simplify the calculations. The antenna factor is used in calculations as follows:

$$\text{Reading on Analyzer (dB}\mu\text{V)} + \text{A.F. (dB)} = \text{Net field strength (dB}\mu\text{V/m)}$$

Net:

This is the net field strength measurement (as shown above).

Limit:

This is the FCC Class B radiated emission limit (in units of dBμV/m). The FCC limits are given in units of μV/m. The following formula is used to convert the units of μV/m to dBμV/m:

$$\text{Limit (dB}\mu\text{V/m)} = 20 * \log (\mu\text{V/m})$$

Margin:

This is the margin of compliance below the FCC limit. The units are given in dB. A negative margin indicates the emission was below the limit. A positive margin indicates that the emission exceeds the limit.

Example only:

Reading	+	AF	=	Net Reading	:	Net reading - FCC limit	=	Margin
21.5 dBμV	+	26 dB	=	47.5 dBμV/m	:	47.5 dBμV/m - 57.0 dBμV/m	=	-9.5 dB

2 Result Summary

FCC 47 CFR Part 15B, Industry Canada ICES-003				
Product Specific Standard	Requirement – Test	Reference Method	Result	Remarks
47 CFR 15.109 ICES-003 Item 6.2	Radiated emissions	ANSI C 63.4	PASS	-
47 CFR 15.107 ICES-003 Item 6.1	AC power line conducted emissions	ANSI C63.4	PASS	-
Remarks:				

3 Test Conditions and Results

3.1 Test Conditions and Results – Radiated emissions

Radiated emissions acc. FCC 47 CFR 15.109 / ICES-003				Verdict: PASS		
Laboratory Parameters:		Required prior to the test		During the test		
Ambient Temperature		15 to 35 °C		23°C		
Relative Humidity		30 to 60 %		38%		
Test according referenced standards		Reference Method				
		ANSI C63.4				
Sample is tested with respect to the requirements of the equipment class		Equipment class				
		Class B				
Test frequency range determined from highest emission frequency		Highest emission frequency				
		Fmax [MHz] = 2496				
Fully configured sample scanned over the following frequency range		Frequency range				
		30 MHz to 12.5 GHz				
Operating mode		1 / 2				
Configuration		1				
Limits and results Class B						
Frequency [MHz]	Quasi-Peak [dBµV/m]	Result	Average [dBµV/m]	Result	Peak [dBµV/m]	Result
30 – 88	40	PASS	-		-	-
88 – 216	43.5	PASS	-		-	-
216 – 960	46	PASS	-		-	-
960 – 1000	54	PASS	-		-	-
> 1000	-	-	54	PASS	74	PASS
Comments:						

Test Procedure:

The test site is in accordance with ANSI C63-4:2009 requirements and is listed by FCC.

The measurement procedure is as follows:

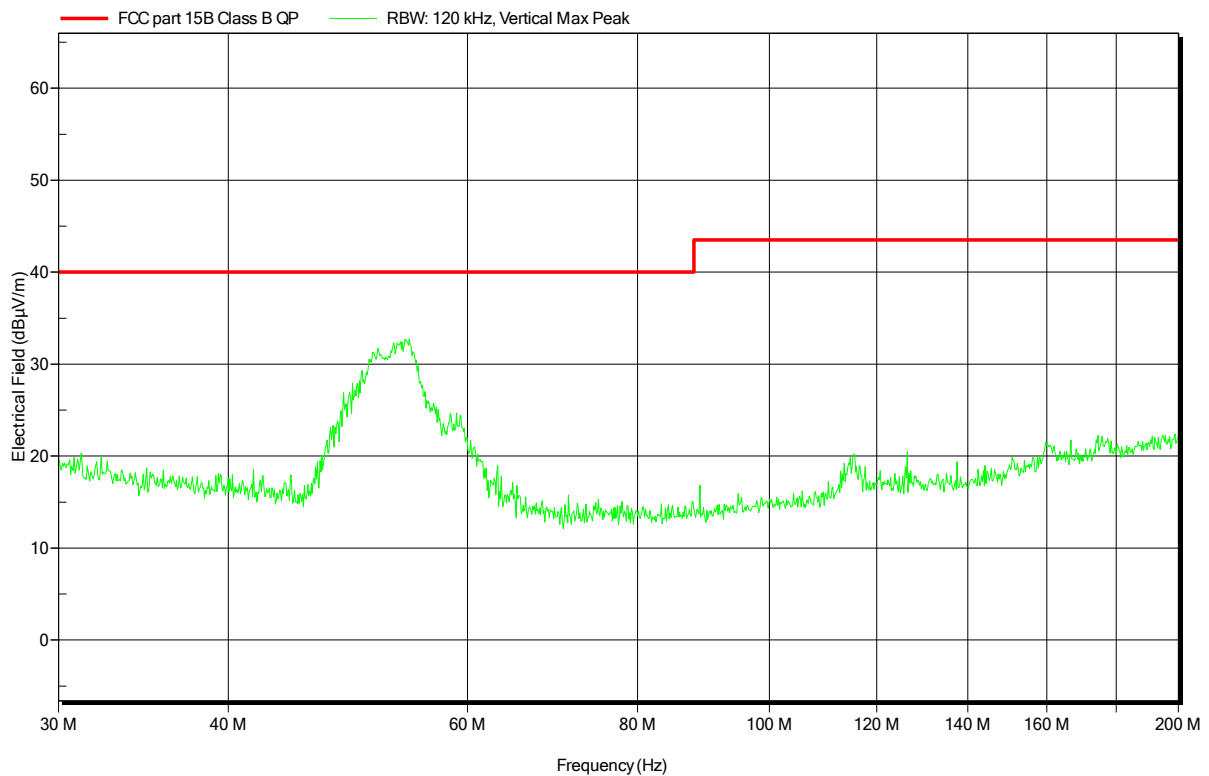
- 1) The EUT was placed on a 0.8 m non conductive table at a 3 m distance from the receive antenna (ANSI C63.4: 2009 item 6.2)
- 2) The antenna output was connected to the measurement receiver
- 3) A biconical antenna was used for the frequency range 30 – 200 MHz, a logarithmic periodical antenna was used for the frequency range from 200 – 1000 MHz. Above one 1 GHz a Double Ridged Broadband Horn antenna was used. The antenna was placed on an adjustable height antenna mast
- 4) Emissions were maximized at each frequency by rotating the EUT and adjusting the receive antenna height and polarization. The maximum values were recorded.

Spurious emissions under normal conditions according to FCC Part 15b

Project number: G0M-1506-4852

Applicant: BEACONinside GmbH
 EUT Name: Bluetooth low energy transceiver
 Model: B0002-A
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Zunke
 Test Conditions: Tnom: 23°C, Unom: 5VDC via AC/DC Adapter
 Antenna: Rohde & Schwarz HK 116, Vertical
 Measurement distance: 3m
 Mode: BT-link to companion device
 Test Date: 2015-11-05
 Note:

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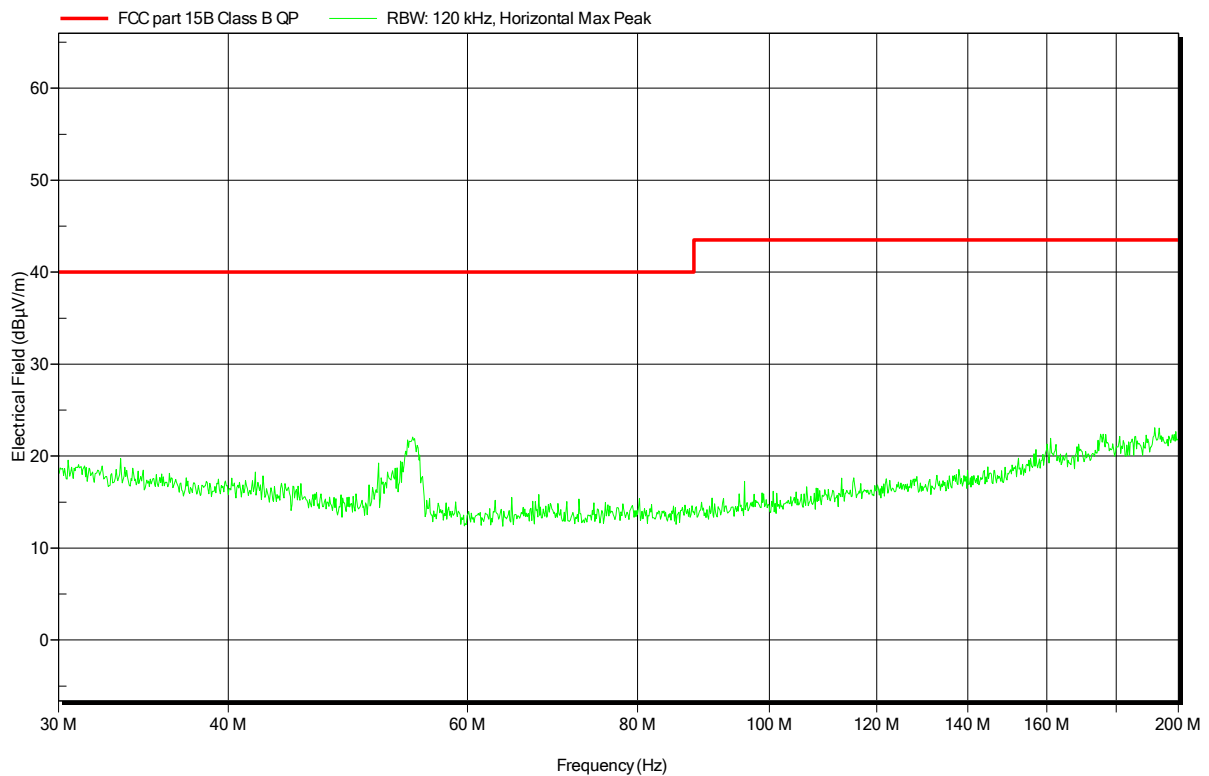
Eurofins Product Service GmbH
 Storkower Str. 38c, D-15526 Reichenwalde, Germany

Spurious emissions under normal conditions according to FCC Part 15b

Project number: G0M-1506-4852

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 Measurement distance: 3m
 Mode: BT-link to companion device
 Test Date: 2015-11-05
 Note:

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Test Report No.: G0M-1506-4852-EF0115B-V01

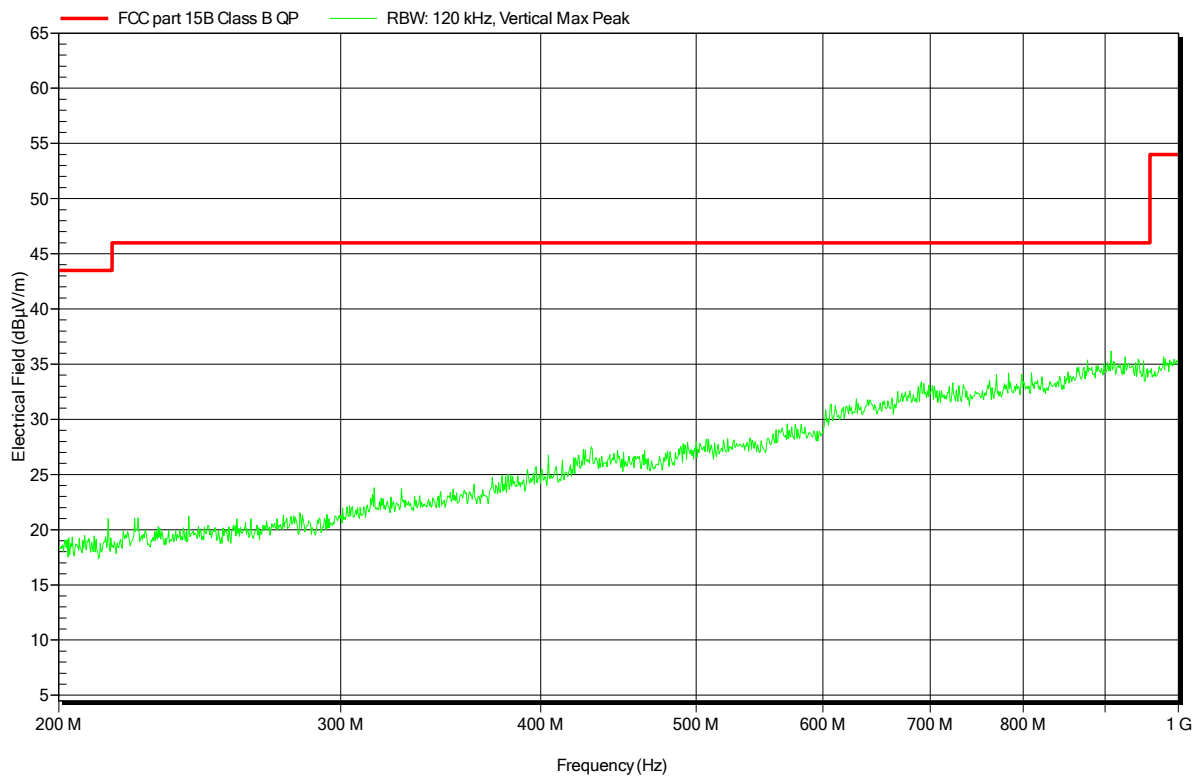
Eurofins Product Service GmbH
 Storkower Str. 38c, D-15526 Reichenwalde, Germany

Spurious emissions under normal conditions according to FCC Part 15b

Project number: G0M-1506-4852

Applicant:	BEACONinside GmbH
EUT Name:	Bluetooth low energy transceiver
Model:	B0002-A
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Zunke
Test Conditions:	Tnom: 23°C, Unom: 5VDC via AC/DC Adapter
Antenna:	Rohde & Schwarz HL 223, Vertical
Measurement distance:	3m
Mode:	BT-link to companion device
Test Date:	2015-11-05
Note:	

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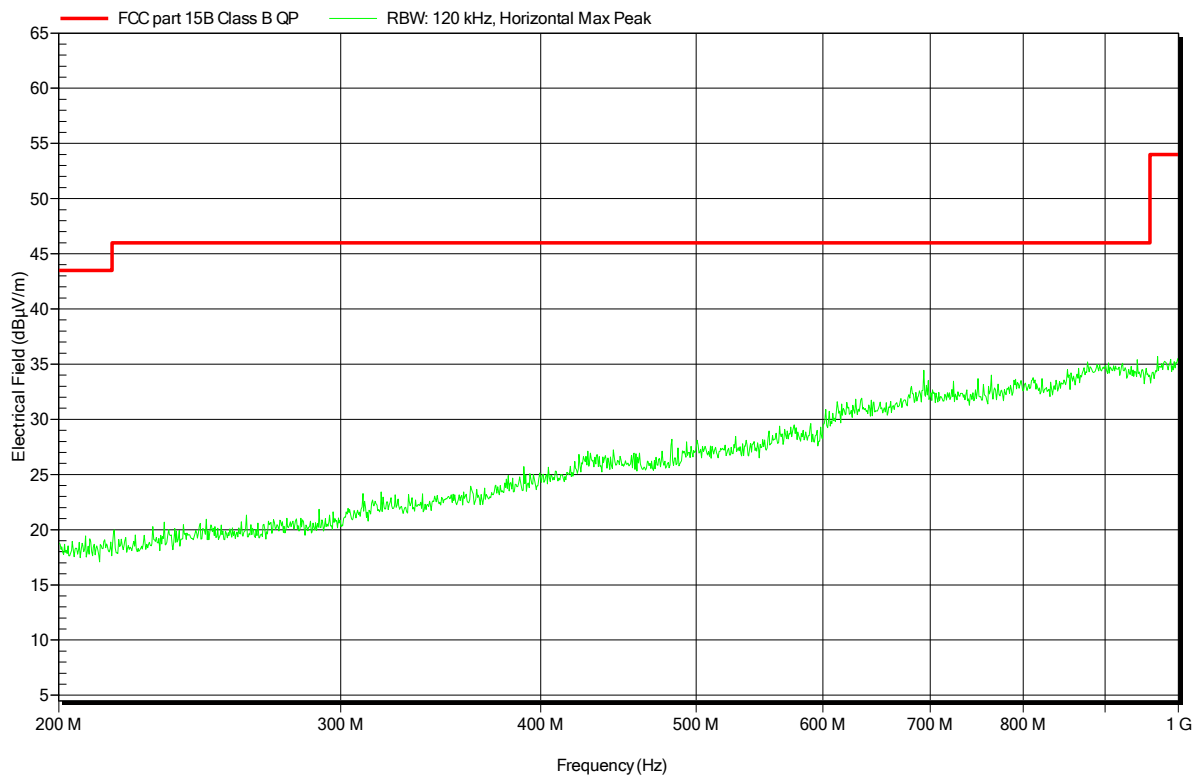


Spurious emissions under normal conditions according to FCC Part 15b

Project number: G0M-1506-4852

Applicant: BEACONinside GmbH
 EUT Name: Bluetooth low energy transceiver
 Model: B0002-A
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Zunke
 Test Conditions: Tnom: 23°C, Unom: 5VDC via AC/DC Adapter
 Antenna: Rohde & Schwarz HL 223, Horizontal
 Measurement distance: 3m
 Mode: BT-link to companion device
 Test Date: 2015-11-11
 Note:

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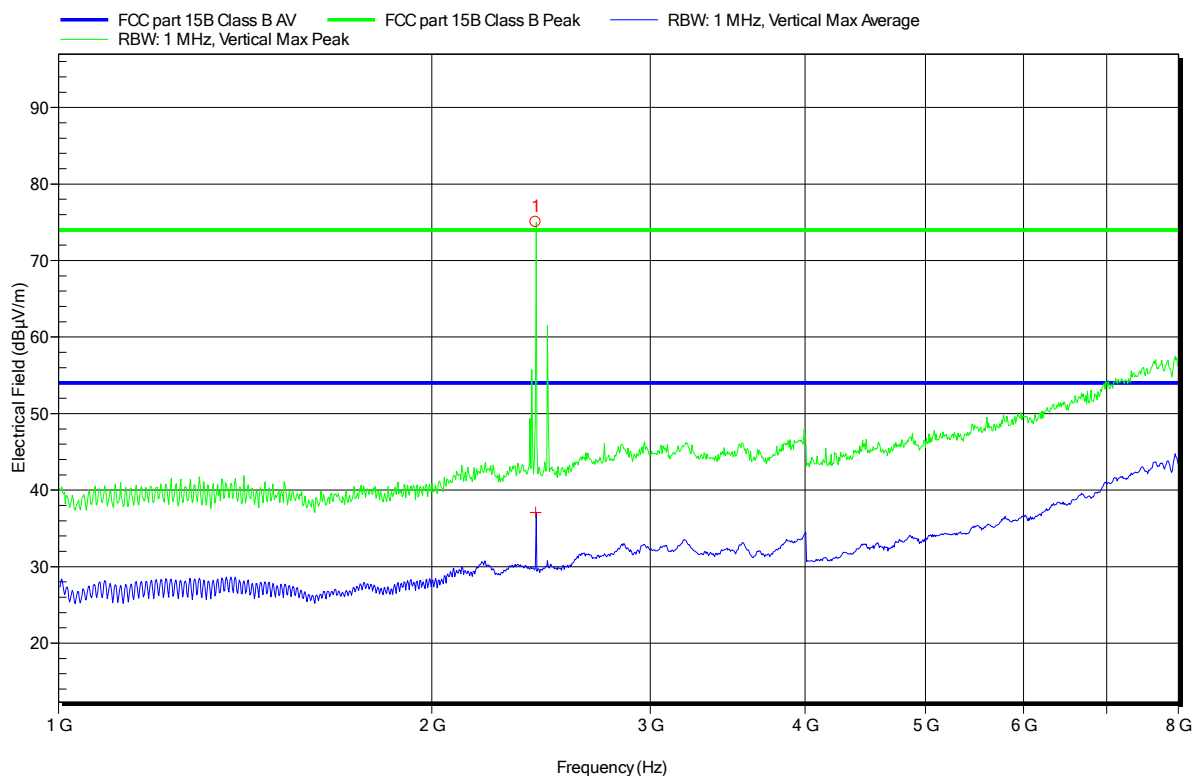


Spurious emissions under normal conditions according to FCC Part 15b

Project number: G0M-1506-4852

Applicant: BEACONinside GmbH
 EUT Name: Bluetooth low energy transceiver
 Model: B0002-A
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Zunke
 Test Conditions: Tnom: 23°C, Unom: 5VDC via AC/DC Adapter
 Antenna: Schwarzbeck BBHA 9120D, Vertical
 Measurement distance: 3m
 Mode: BT-link to companion device
 Test Date: 2015-11-11
 Note:

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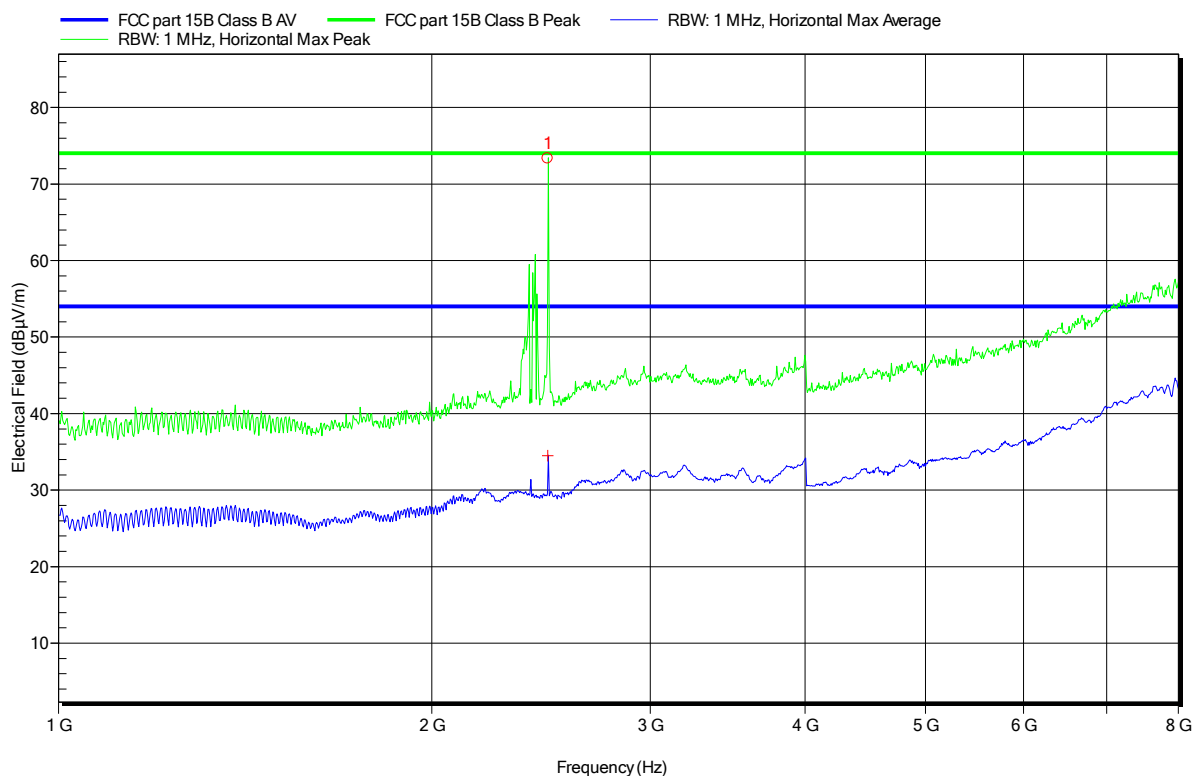
Frequency
 2.426 GHz Bluetooth carrier

Spurious emissions under normal conditions according to FCC Part 15b

Project number: G0M-1506-4852

Applicant: BEACONinside GmbH
 EUT Name: Bluetooth low energy transceiver
 Model: B0002-A
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Zunke
 Test Conditions: Tnom: 23°C, Unom: 5VDC via AC/DC Adapter
 Antenna: Schwarzbeck BBHA 9120D, Horizontal
 Measurement distance: 3m
 Mode: BT-link to companion device
 Test Date: 2015-11-11
 Note:

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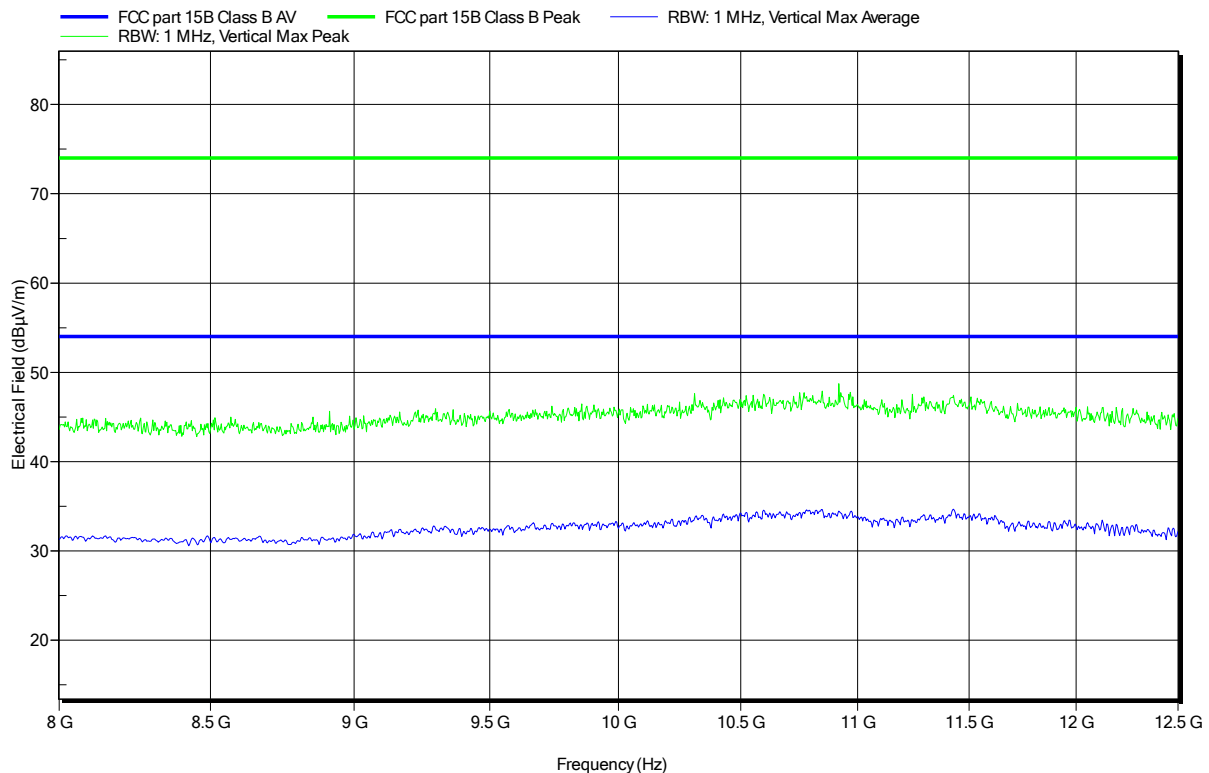
Frequency
 2.481 GHz Bluetooth carrier

Spurious emissions under normal conditions according to FCC Part 15b

Project number: G0M-1506-4852

Applicant: BEACONinside GmbH
 EUT Name: Bluetooth low energy transceiver
 Model: B0002-A
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Zunke
 Test Conditions: Tnom: 23°C, Unom: 5VDC via AC/DC Adapter
 Antenna: Schwarzbeck BBHA 9120D, Vertical
 Measurement distance: 3m
 Mode: BT-link to companion device
 Test Date: 2015-11-11
 Note:

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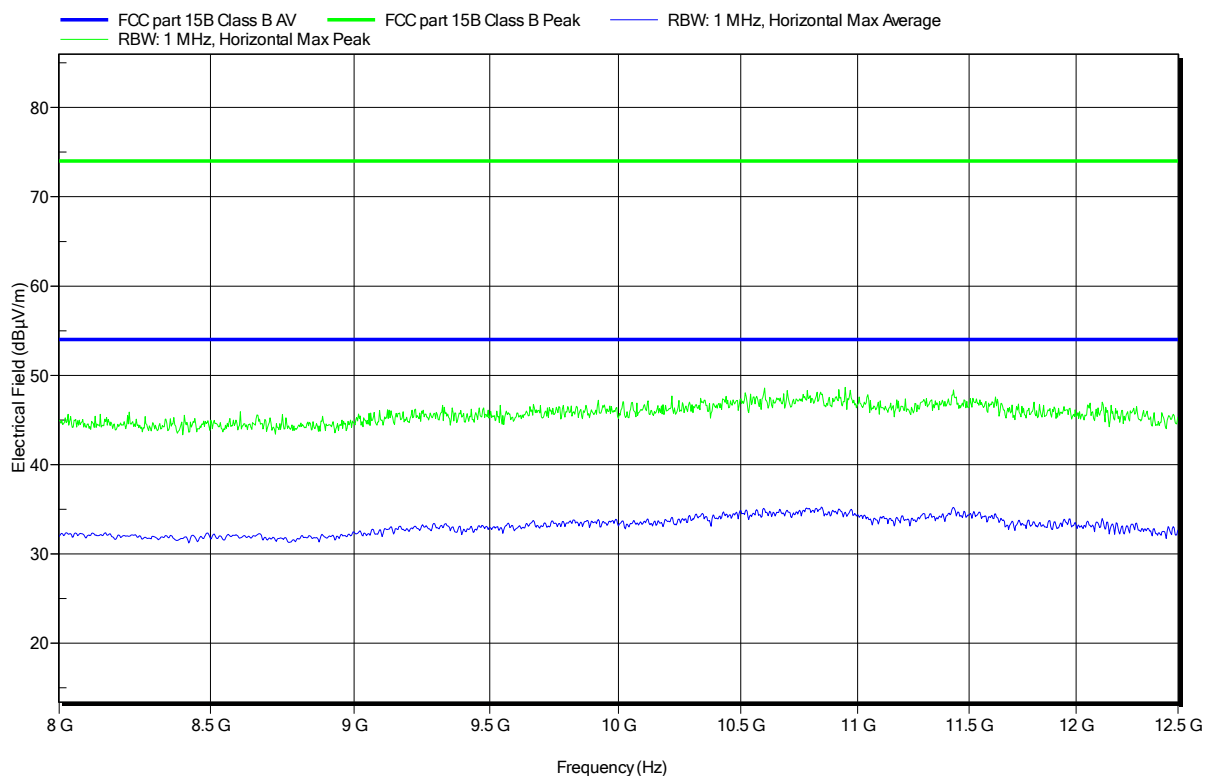


Spurious emissions under normal conditions according to FCC Part 15b

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Applicant: BEACONinside GmbH
 EUT Name: Bluetooth low energy transceiver
 Model: B0002-A
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Zunke
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 Antenna: Schwarzbeck BBHA 9120D, Horizontal
 Measurement distance: 3m
 Mode: BT-link to companion device
 Test Date: 2015-11-11
 Note:

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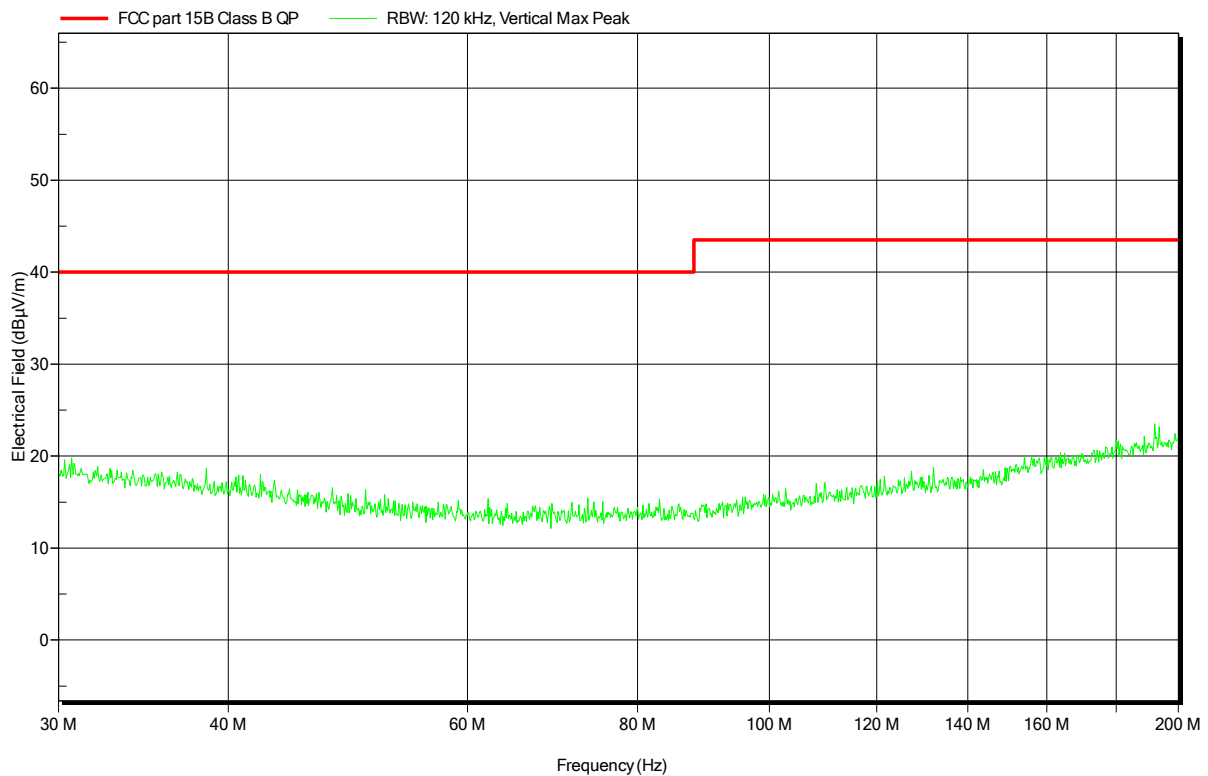


Spurious emissions under normal conditions according to FCC Part 15b

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Applicant: BEACONinside GmbH
 EUT Name: Bluetooth low energy transceiver
 Model: B0002-A
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Zunke
 Test Conditions: Tnom: 23°C, Unom: 3VDC via Battery
 Antenna: Rohde & Schwarz HK 116, Vertical
 Measurement distance: 3m
 Mode: BT-link to companion device
 Test Date: 2015-11-11
 Note:

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Test Report No.: G0M-1506-4852-EF0115B-V01

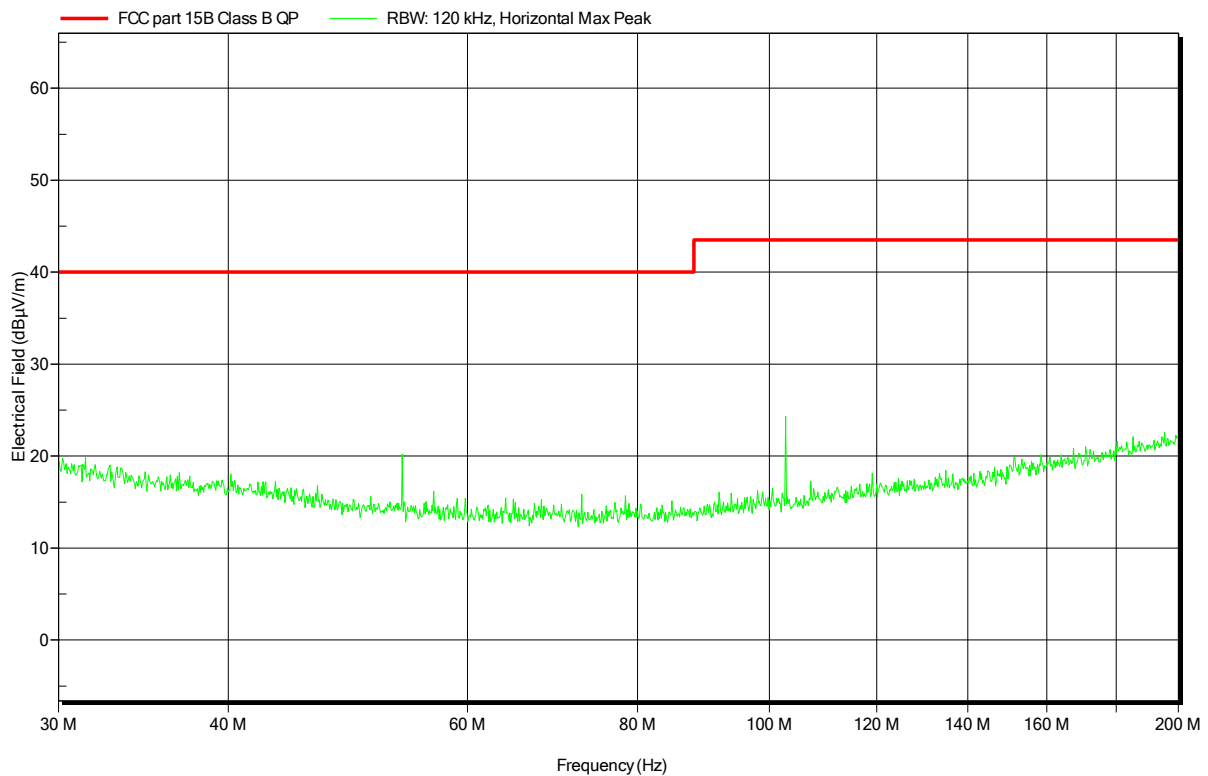
Eurofins Product Service GmbH
 Storkower Str. 38c, D-15526 Reichenwalde, Germany

Spurious emissions under normal conditions according to FCC Part 15b

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 Model: B0002-A
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 Operator: Mr. Zunke
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 Antenna: Rohde & Schwarz HK 116, Horizontal
 Measurement distance: 3m
 Mode: BT-link to companion device
 Test Date: 2015-11-11
 Note:

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Test Report No.: G0M-1506-4852-EF0115B-V01

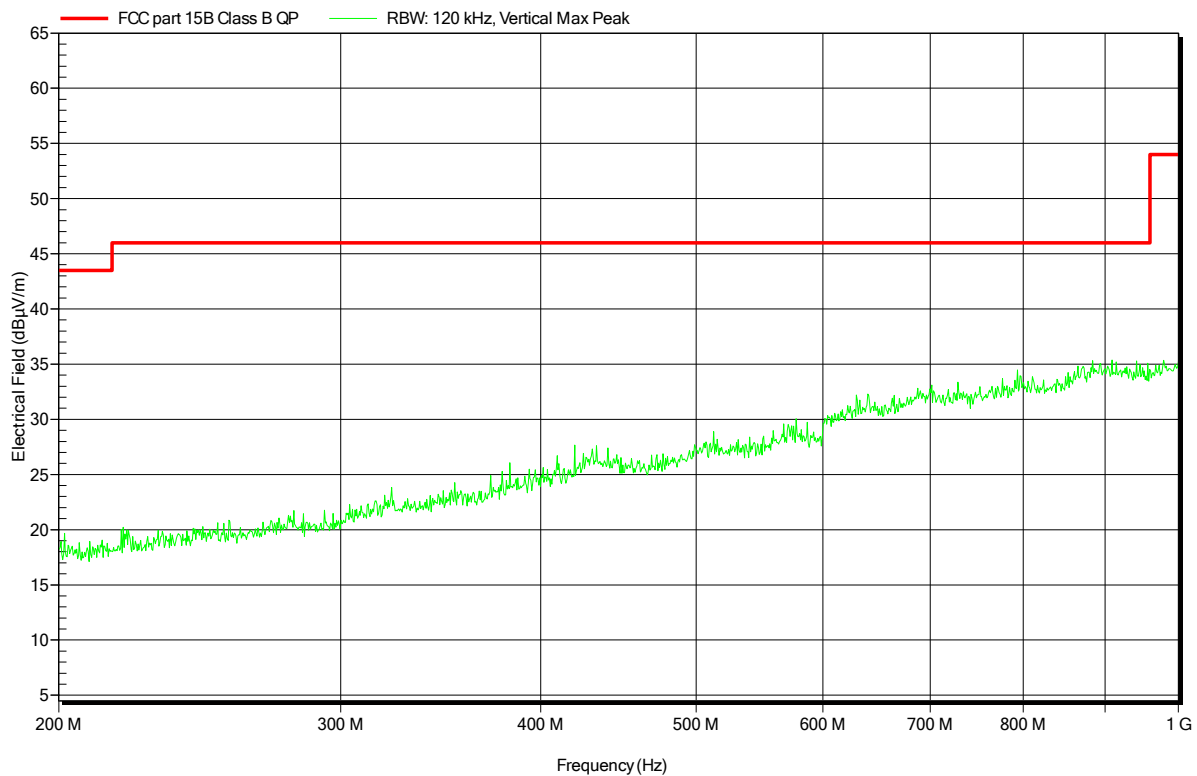
Eurofins Product Service GmbH
 Storkower Str. 38c, D-15526 Reichenwalde, Germany

Spurious emissions under normal conditions according to FCC Part 15b

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 Measurement distance: 3m
 Mode: BT-link to companion device
 Test Date: 2015-11-11
 Note:

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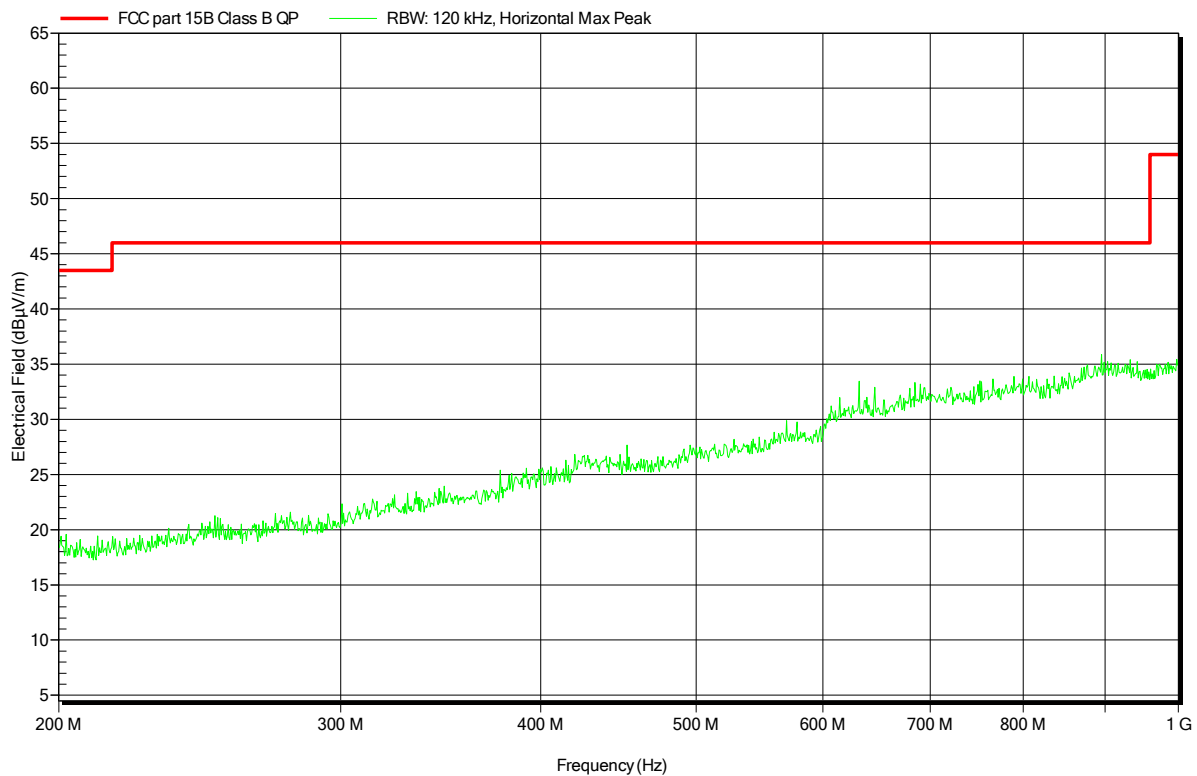


Spurious emissions under normal conditions according to FCC Part 15b

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Test Conditions:	Tnom: 23°C, Unom: 3VDC via Battery
Antenna:	Rohde & Schwarz HL 223, Horizontal
Measurement distance:	3m
Mode:	BT-link to companion device
Test Date:	2015-11-11
Note:	

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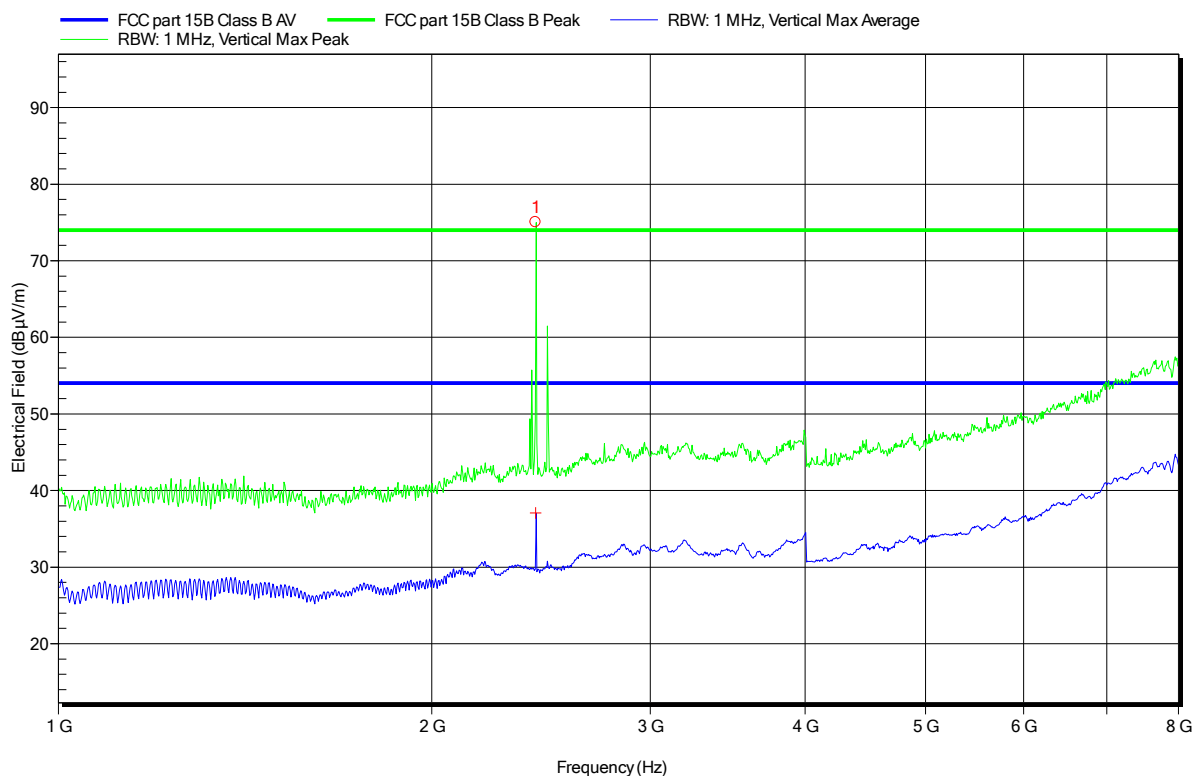


Spurious emissions under normal conditions according to FCC Part 15b

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 Antenna: Schwarzbeck BBHA 9120D, Vertical
 Measurement distance: 3m
 Mode: BT-link to companion device
 Test Date: 2015-11-11
 Note:

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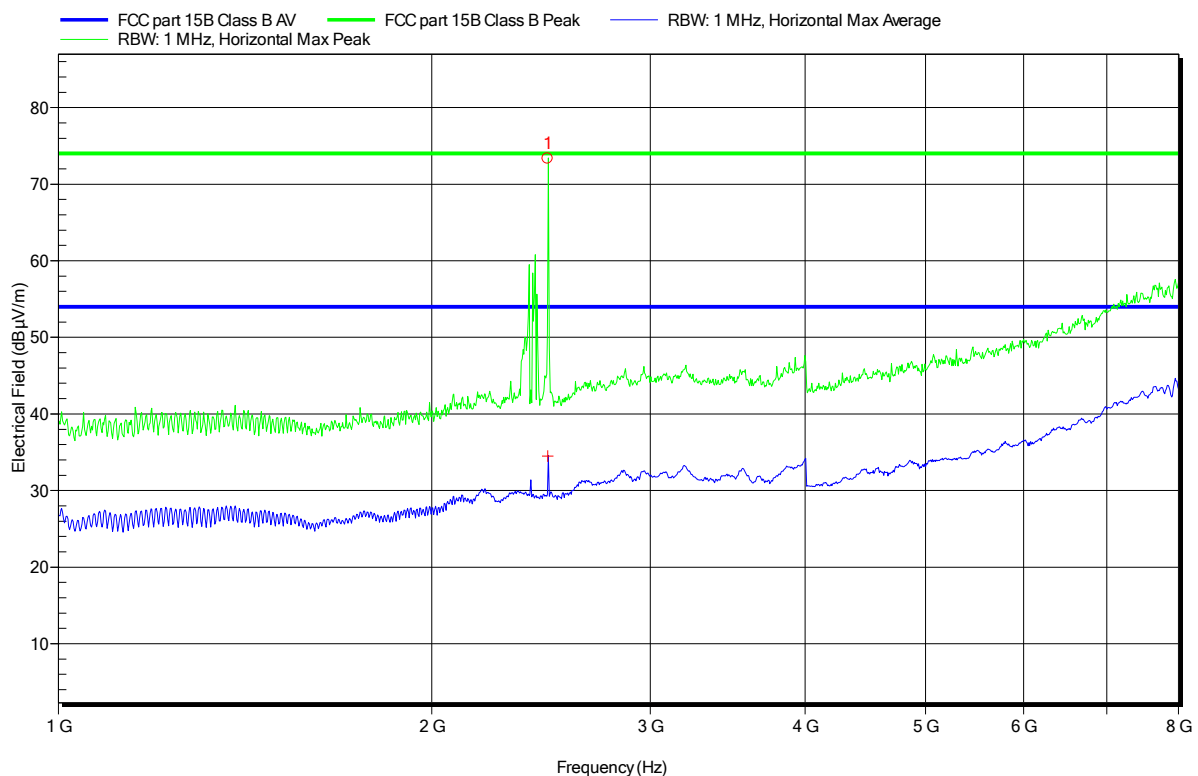
Frequency
 2.426 GHz Bluetooth carrier

Spurious emissions under normal conditions according to FCC Part 15b

Project number: G0M-1506-4852

Applicant: BEACONinside GmbH
 EUT Name: Bluetooth low energy transceiver
 Model: B0002-A
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 Test Conditions: Tnom: 23°C, Unom: 3VDC via Battery
 Antenna: Schwarzbeck BBHA 9120D, Horizontal
 Measurement distance: 3m
 Mode: BT-link to companion device
 Test Date: 2015-11-11
 Note:

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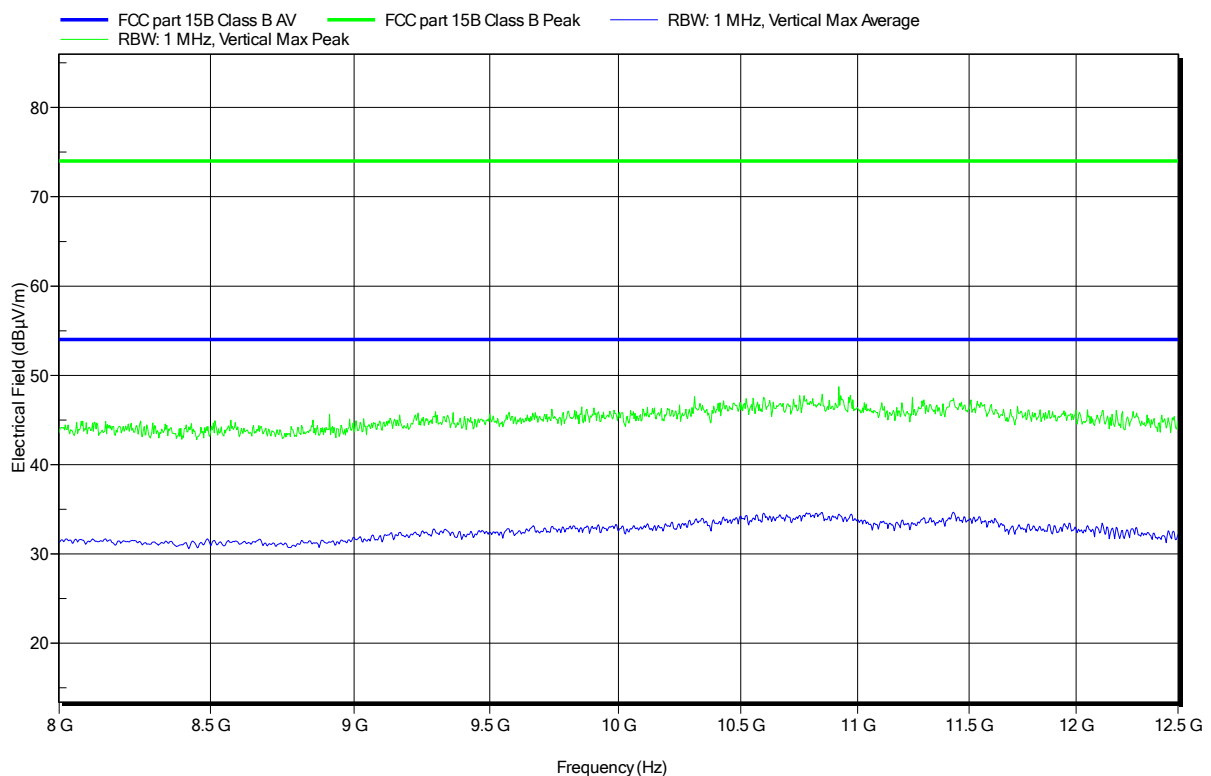
Frequency
 2.481 GHz Bluetooth carrier

Spurious emissions under normal conditions according to FCC Part 15b

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 Antenna: Schwarzbeck BBHA 9120D, Vertical
 Measurement distance: 3m
 Mode: BT-link to companion device
 Test Date: 2015-11-11
 Note:

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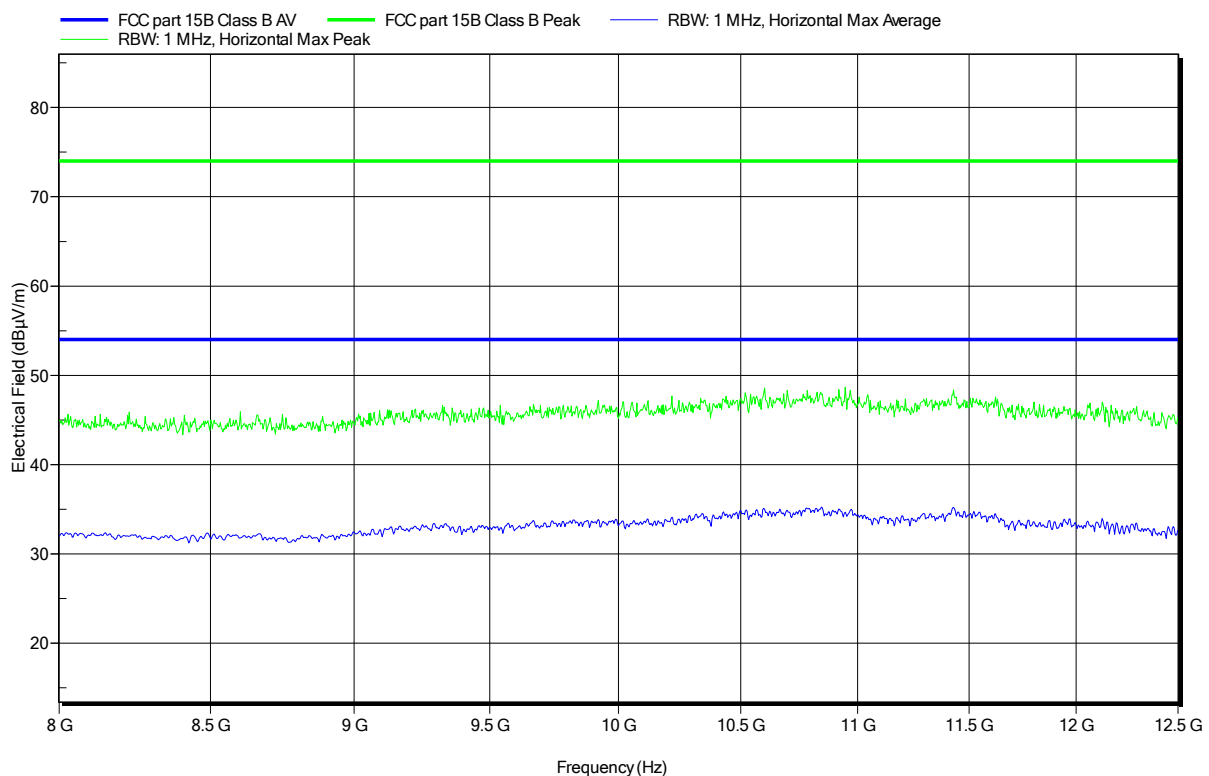


Spurious emissions under normal conditions according to FCC Part 15b

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 Test Conditions: Tnom: 23°C, Unom: 3VDC via Battery
 Antenna: Schwarzbeck BBHA 9120D, Horizontal
 Measurement distance: 3m
 Mode: BT-link to companion device
 Test Date: 2015-11-11
 Note:

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3.2 Test Conditions and Results – AC power line conducted emissions

Conducted emissions acc. FCC 47 CFR 15.107 / ICES-003			Verdict: PASS	
Laboratory Parameters:		Required prior to the test		During the test
Ambient Temperature		15 to 35 °C		23°C
Relative Humidity		30 to 60 %		38%
Test according referenced standards		Reference Method		
		ANSI C63.4		
Fully configured sample scanned over the following frequency range		Frequency range		
		0.15 MHz to 30 MHz		
Sample is tested with respect to the requirements of the equipment class		Equipment class		
		Class B		
Points of Application		Application Interface		
AC Mains		LISN		
Operating mode		1		
Configuration		1		
Limits and results Class B				
Frequency [MHz]	Quasi-Peak [dBµV]	Result	Average [dBµV]	Result
0.15 to 5	66 to 56*	PASS	56 to 46*	PASS
0.5 to 5	56	PASS	46	PASS
5 to 30	60	PASS	50	PASS
Comments:				
* Limit decreases linearly with the logarithm of the frequency.				

Test Procedure:

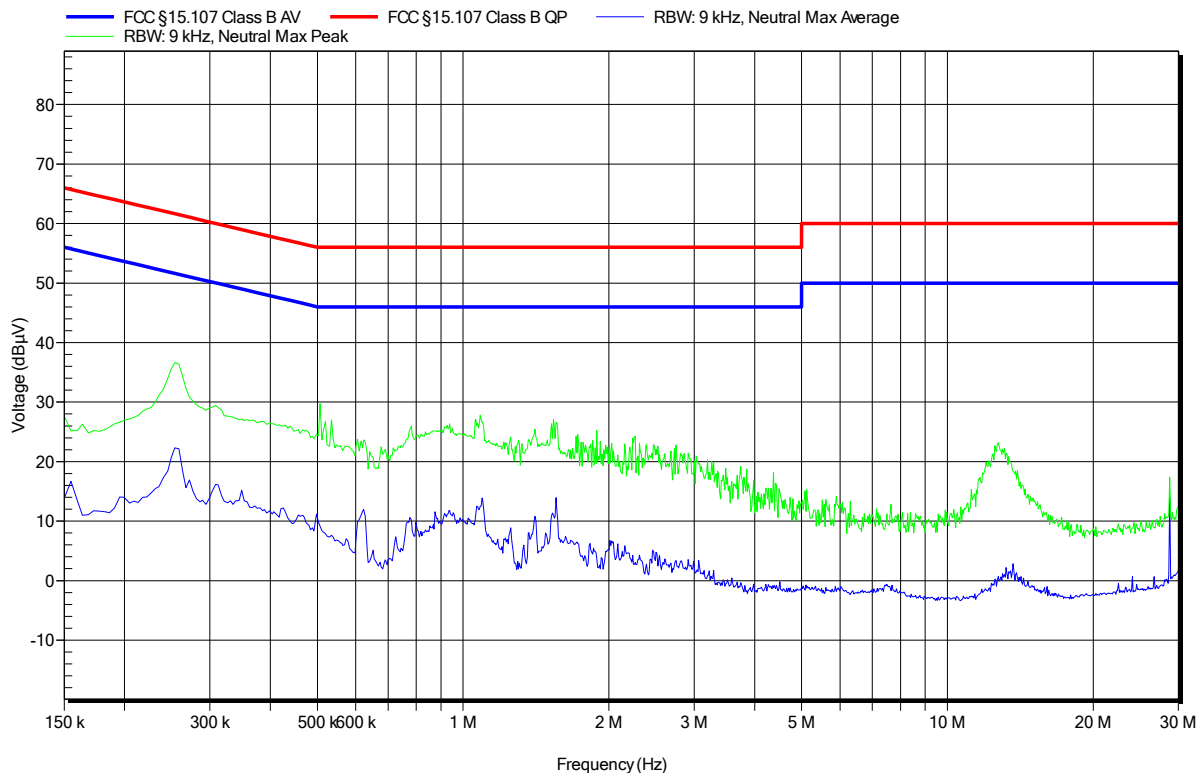
- 1) The EUT was placed on a non conductive table 0.8 m above the reference ground plane and 0.4 m away from the vertical conducting plane (ANSI C63.4: 2009 item 7.3.1)
- 2) The power cord that is normally supplied or recommended by the manufacturer was connected to the LISN.
- 3) The distance between the outer edge of the EUT and the LISN shall be set to 0.8 m. A longer power cord shall be bundled to this length (bundling shall not exceed 40 cm in length).
- 4) The LISN measurement port was connected to a measurement receiver
- 5) I/O cables were bundled not longer than 0.4 m
- 6) Measurement was performed in the frequency range 0.15 – 30MHz on each current-carrying conductor

EMI voltage test in the ac-mains according to FCC Part 15b

Project number: G0M-1506-4852

Applicant:	BEACONinside GmbH
EUT Name:	Bluetooth low energy transceiver
Model:	B0002-A
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Zunke
Test Conditions:	Tnom: 23°C, Unom: 5VDC via AC/DC Adapter
LISN:	ESH2-Z5 N
Mode:	BT-link to companion device
Test Date:	2015-11-06
Note:	

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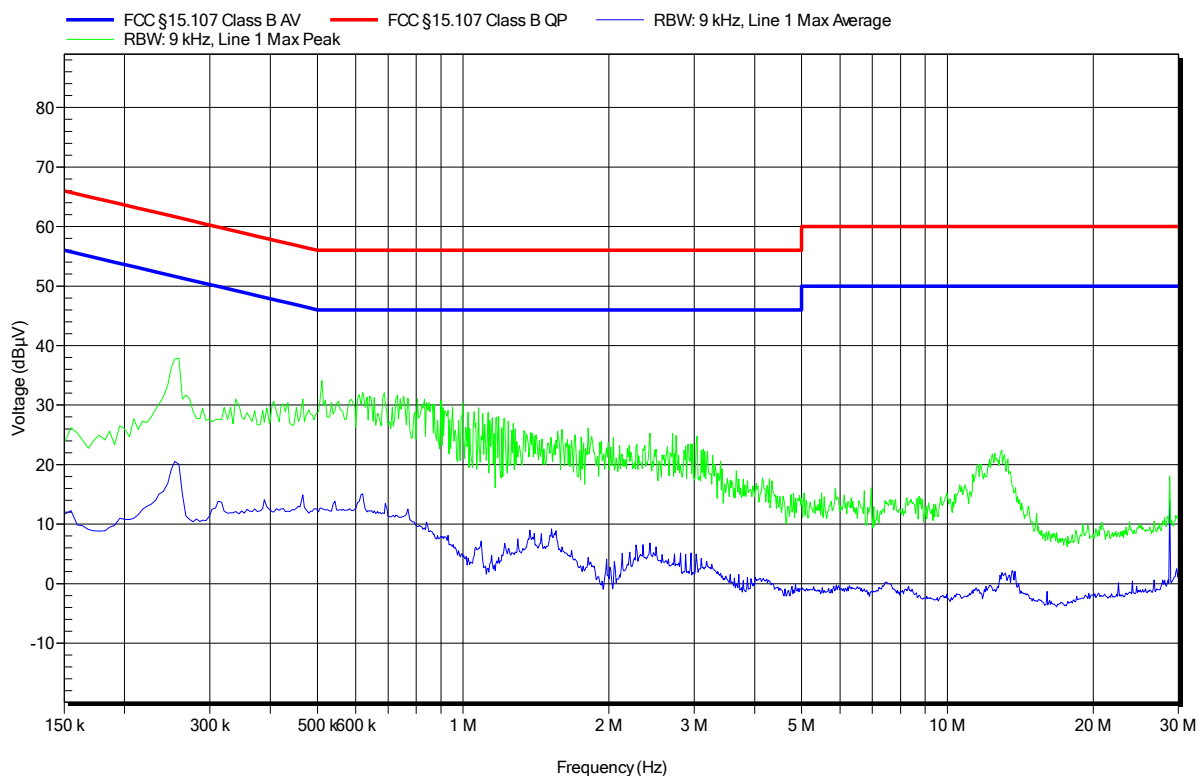


EMI voltage test in the ac-mains according to FCC Part 15b

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 EUT Name: Bluetooth low energy transceiver
 Model: B0002-A
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 Test Conditions: Tnom: 23°C, Unom: 5VDC via AC/DC Adapter
 LISN: ESH2-Z5 L
 Mode: BT-link to companion device
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 Note:

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Test Report No.: G0M-1506-4852-EF0115B-V01

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