

EMC TEST REPORT FCC 47 CFR Part 15B Industry Canada RSS-Gen Electromagnetic compatibility - Unintentional radiators	
Report Reference No.	G0M-1502-4502-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	SMT & Hybrid GmbH
Address	An der Priessnitzau 22 01328 Dresden GERMANY
Test specification:	
Standard	47 CFR Part 15 Subpart B RSS-Gen, Issue 4, 2014-11 ANSI C63.4:2009
Equipment under test (EUT):	
Product description	Datenlogger
Model No.	sensor module
Additional Models	None
Hardware version	R2
Firmware / Software version	0.90
FCC-ID	FCC-ID: 2AELT-09MONILOG
IC-ID	contains IC: 5123A-BGTBLE112
Test result	Passed

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: 2015-03-25

Date (s) of performance of tests: 2015-03-24 - 2015-04-30

Compiled by: Steffen Zunke

Tested by (+ signature).....: Yu Yu / Marcus Klein

Approved by (+ signature): Jens Marquardt

Date of issue: 2015-05-29

Total number of pages: 35

Yu Yu / Marcus Klein

Jens Marquardt

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:

The tests were performed with internal and external antenna.

Version History

Version	Issue Date	Remarks	Revised by
V01	2015-05-29	Initial Release	

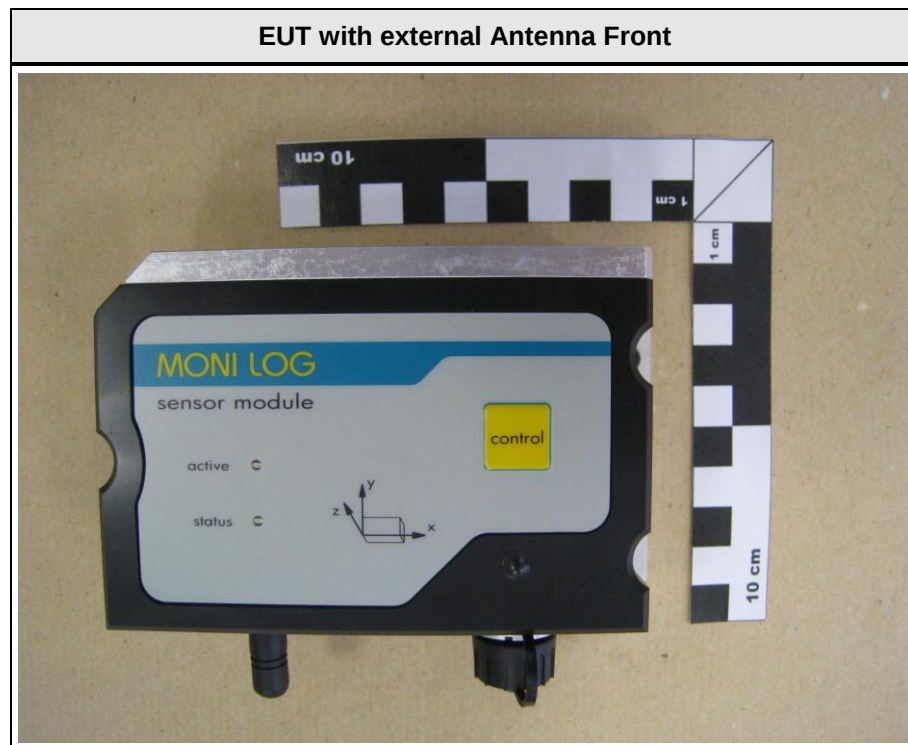
REPORT INDEX

1	EQUIPMENT (TEST ITEM) DESCRIPTION	5
1.1	Photos – Equipment external	6
1.2	Photos – Equipment internal	8
1.3	Photos – Test setup	12
1.4	Supporting Equipment Used During Testing	13
1.5	Input / Output Ports	13
1.6	Operating Modes and Configurations	14
1.7	Test Equipment Used During Testing	15
1.8	Sample emission level calculation	16
2	RESULT SUMMARY	17
3	TEST CONDITIONS AND RESULTS	18
3.1	Test Conditions and Results – Radiated emissions	18

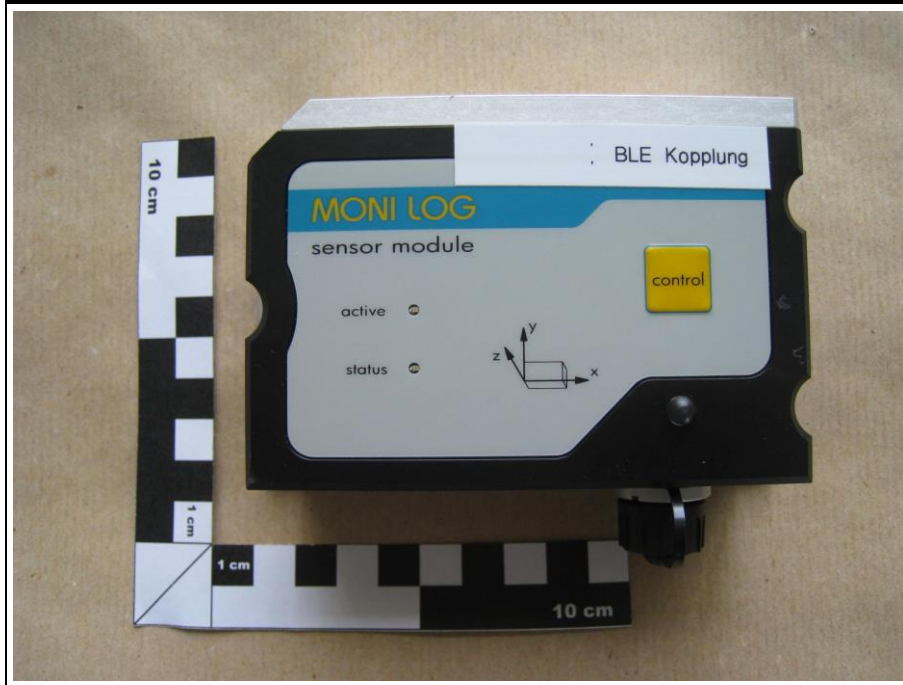
1 Equipment (Test item) Description

Description	Datenlogger	
Model	sensor module	
Additional Models	None	
Serial number	20159xxxx	
Hardware version	R2	
Software / Firmware version	0.90	
FCC-ID	2AELT-09MONILOG	
Contains IC-ID	5123A-BGTBLE112	
Power supply	3.6 VDC via Battery	
AC/DC-Adaptor	None	
Radio module	Type	Bluetooth Module
	Model	BLE112-A
	Manufacturer	Bluegiga
	HW Version	1
	SW Version	1.3
	FCC-ID	QOQBLE112
	IC	5123A-BGTBLE112
Manufacturer	SMT & Hybrid GmbH An der Priessnitzau 22 01328 Dresden GERMANY	
Highest emission frequency	Fmax [MHz] = 2400	
Device classification	Class B	
Equipment type	Tabletop	
Number of tested samples	1	

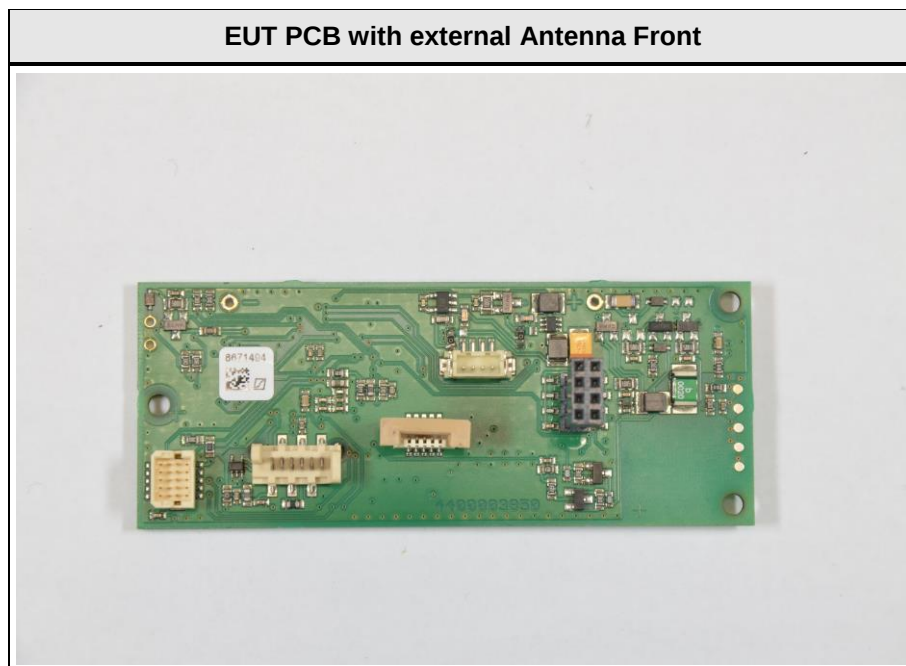
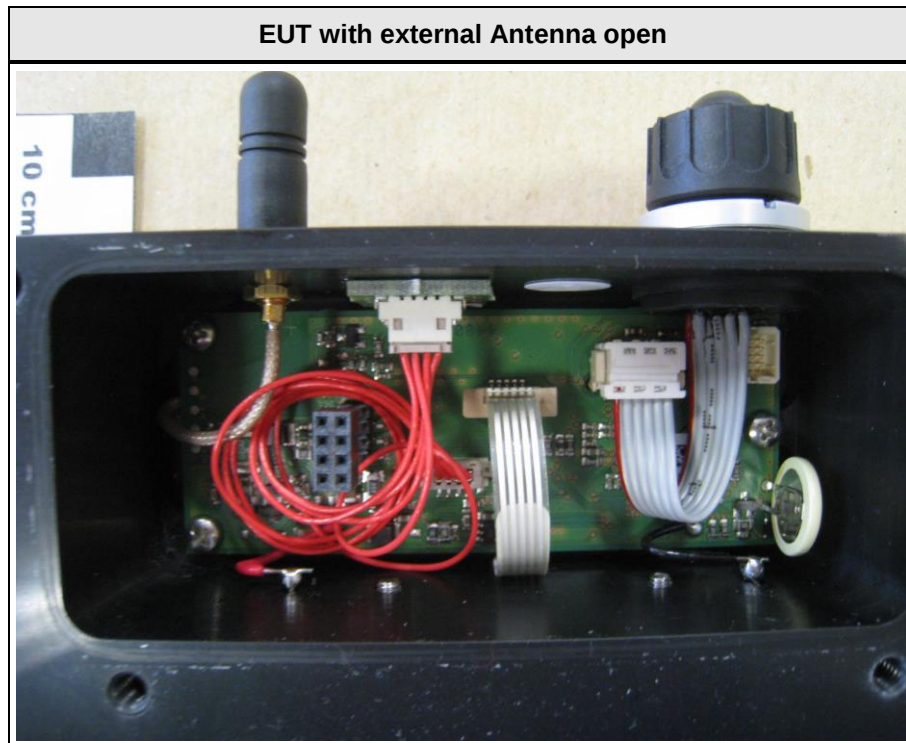
1.1 Photos – Equipment external



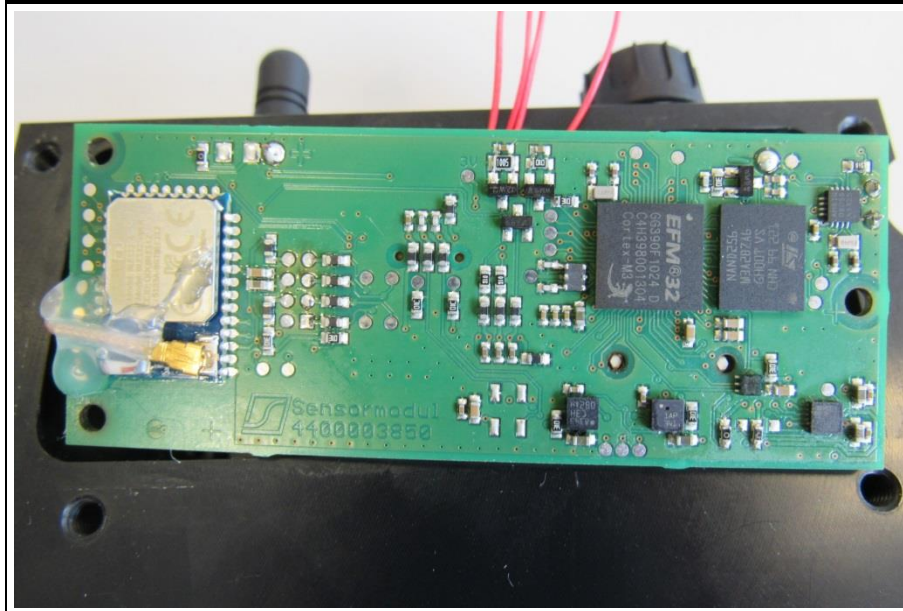
EUT with internal Antenna Front



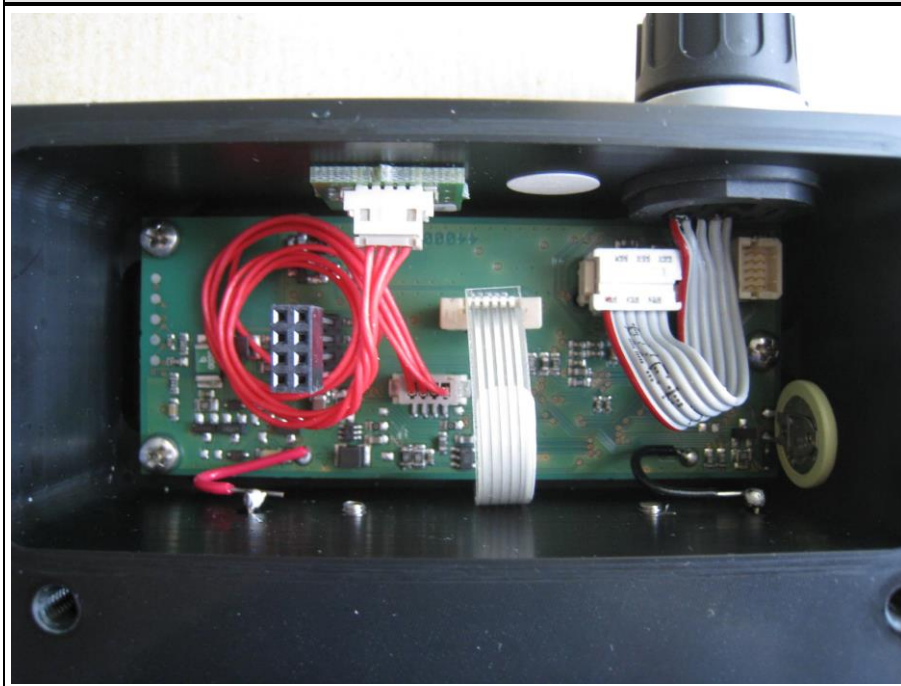
1.2 Photos – Equipment internal



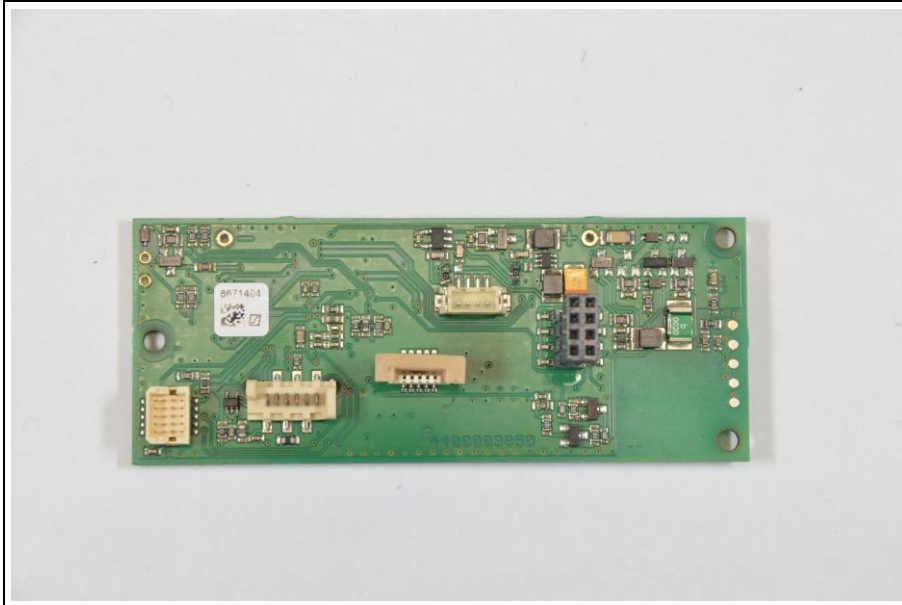
EUT PCB with external Antenna Back



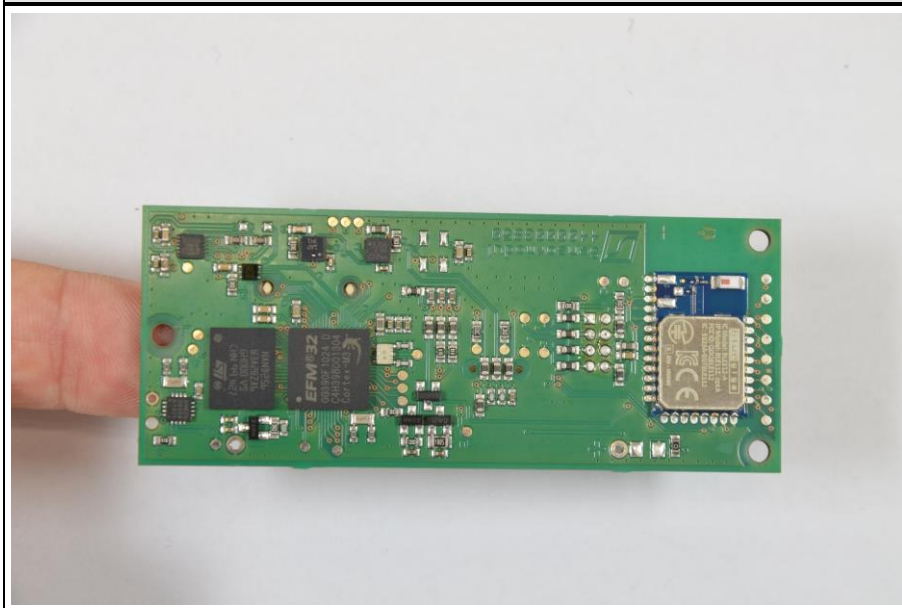
EUT with internal Antenna open



EUT PCB with internal Antenna Front



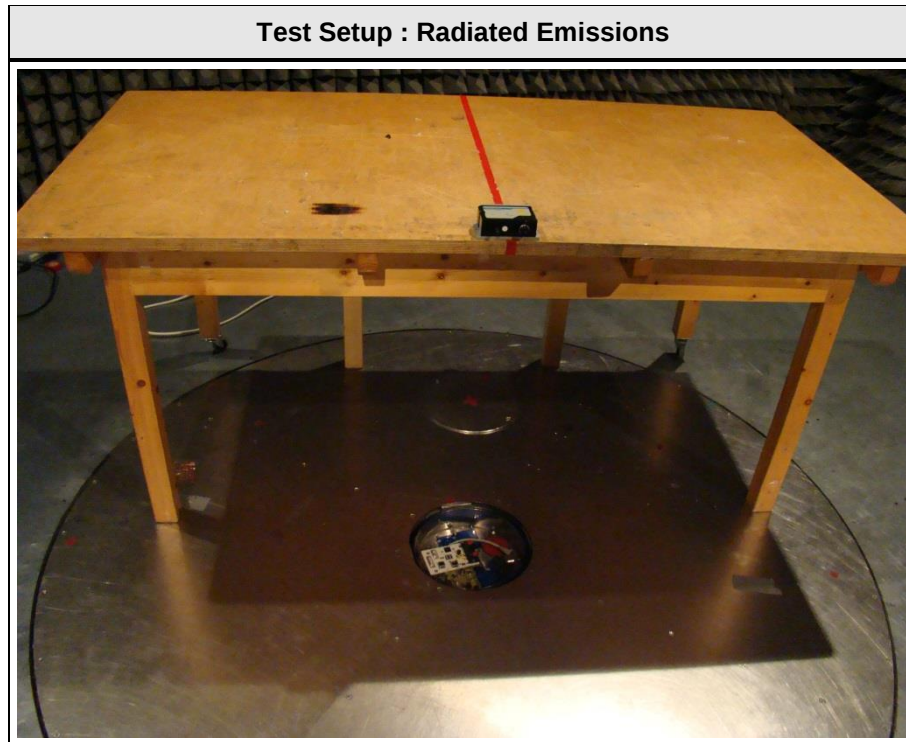
EUT PCB with internal Antenna Back



Bluetooth Module



1.3 Photos – Test setup



1.4 Supporting Equipment Used During Testing

Product Type*	Device	Manufacturer	Model No.	Comments
AE	Laptop	Lenovo	Thing Pad R61	-
CABL	USB 1.1 mini AB cable	Haiying Electronics	-	-
AE	Datalogger	SMT	Data link sensor	-
None				
*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	USB	I/O	2m	Yes	Service only
2	Antenna	I/O	Direct connected	-	-
*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	Communication between sensor module and data link every 1 second

Configuration #	EUT Configuration
1	EUT fully assembled with external antenna
2	EUT fully assembled with internal antenna

1.7 Test Equipment Used During Testing

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

Radiated emissions					
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

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 RSS-Gen				
Product Specific Standard	Requirement – Test	Reference Method	Result	Remarks
47 CFR 15.109 RSS-Gen 6.13	Radiated emissions	ANSI C 63.4	PASS	-
47 CFR 15.107 RSS-Gen 8.8	AC power line conducted emissions	ANSI C63.4	N/A	No relevant port available
Remarks:				

3 Test Conditions and Results

3.1 Test Conditions and Results – Radiated emissions

Radiated emissions acc. FCC 47 CFR 15.109 / IC RSS-Gen					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 %		35%		
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] = 2400				
Fully configured sample scanned over the following frequency range		Frequency range				
		30 MHz to 13 GHz				
Operating mode		1				
Configuration		1 / 2				
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:

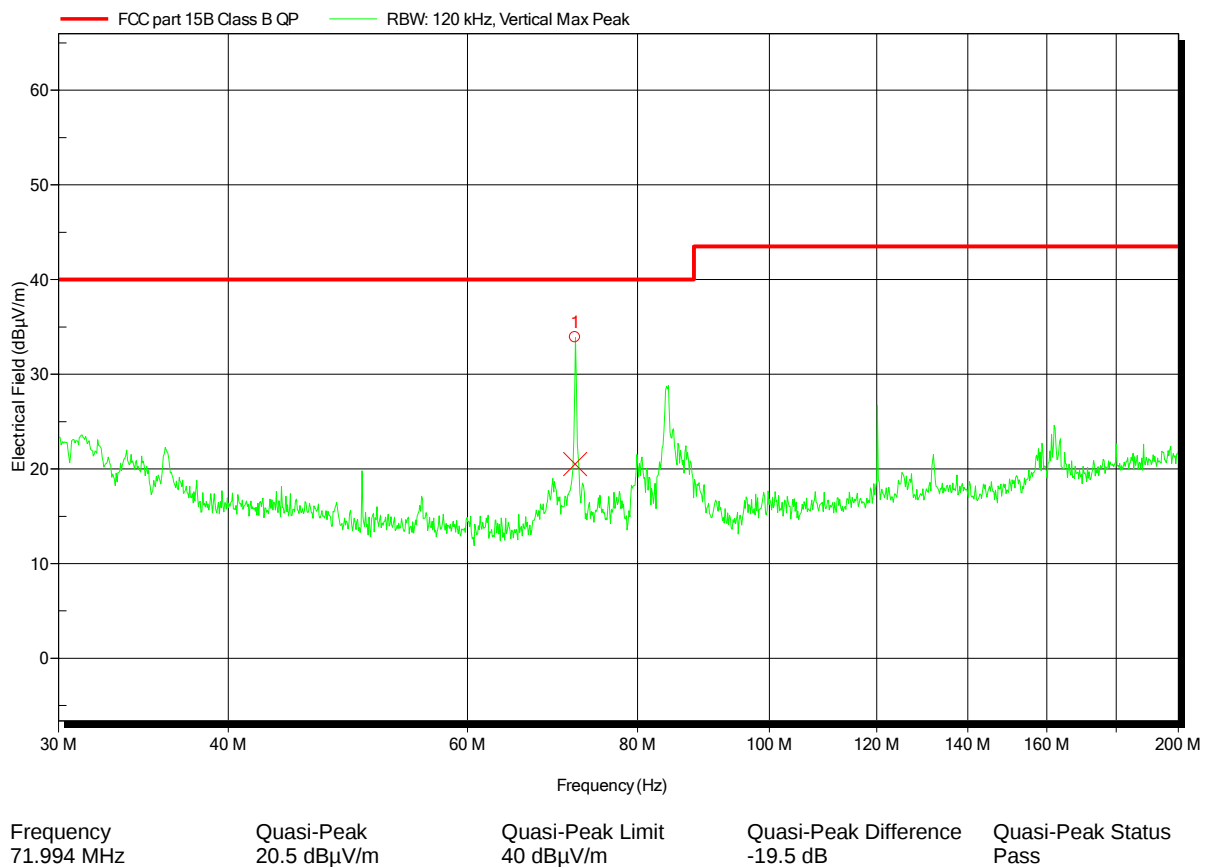
- 1) The EUT was placed on a 0.8 m non conductive table at a 3 m distance from the receive antenna (ANSI C63.4: 2009 item 6.2)
- 2) The antenna output was connected to the measurement receiver
- 3) A biconical antenna was used for the frequency range 30 – 200 MHz, a logarithmic periodical antenna was 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-1502-4502

Applicant: SMT&Hybrid GmbH
 EUT Name: Datenlogger
 Model: MONI LOG sensor module
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Yu
 Test Conditions: Tnom: 23°C, Unom: 3.6V Battery
 Antenna: Rohde & Schwarz HK 116, Vertical
 Measurement distance: 3m
 Mode: Communication between sensor module and data link every 1 second
 Test Date: 2015-04-30
 Note: with external Antenna

Index 17



Test Report No.: G0M-1502-4502-EF0115B-V01

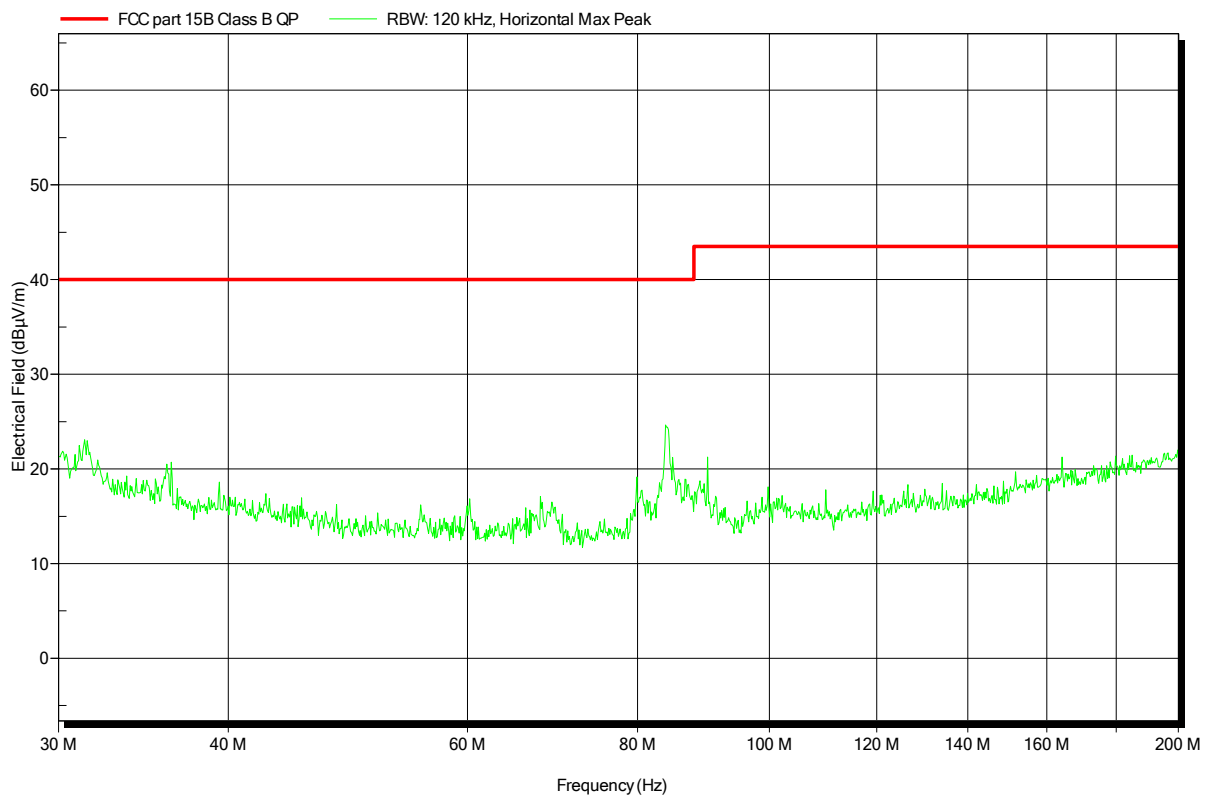
Eurofins Product Service GmbH
 Storkower Str. 38c, D-15526 Reichenwalde, Germany

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Project number: G0M-1502-4502

Applicant:	SMT&Hybrid GmbH
EUT Name:	Datenlogger
Model:	MONI LOG sensor module
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Yu
Test Conditions:	Tnom: 23°C, Unom: 3.6V Battery
Antenna:	Rohde & Schwarz HK 116, Horizontal
Measurement distance:	3m
Mode:	Communication between sensor module and data link every 1 second
Test Date:	2015-04-30
Note:	with external Antenna

Index 18



Test Report No.: G0M-1502-4502-EF0115B-V01

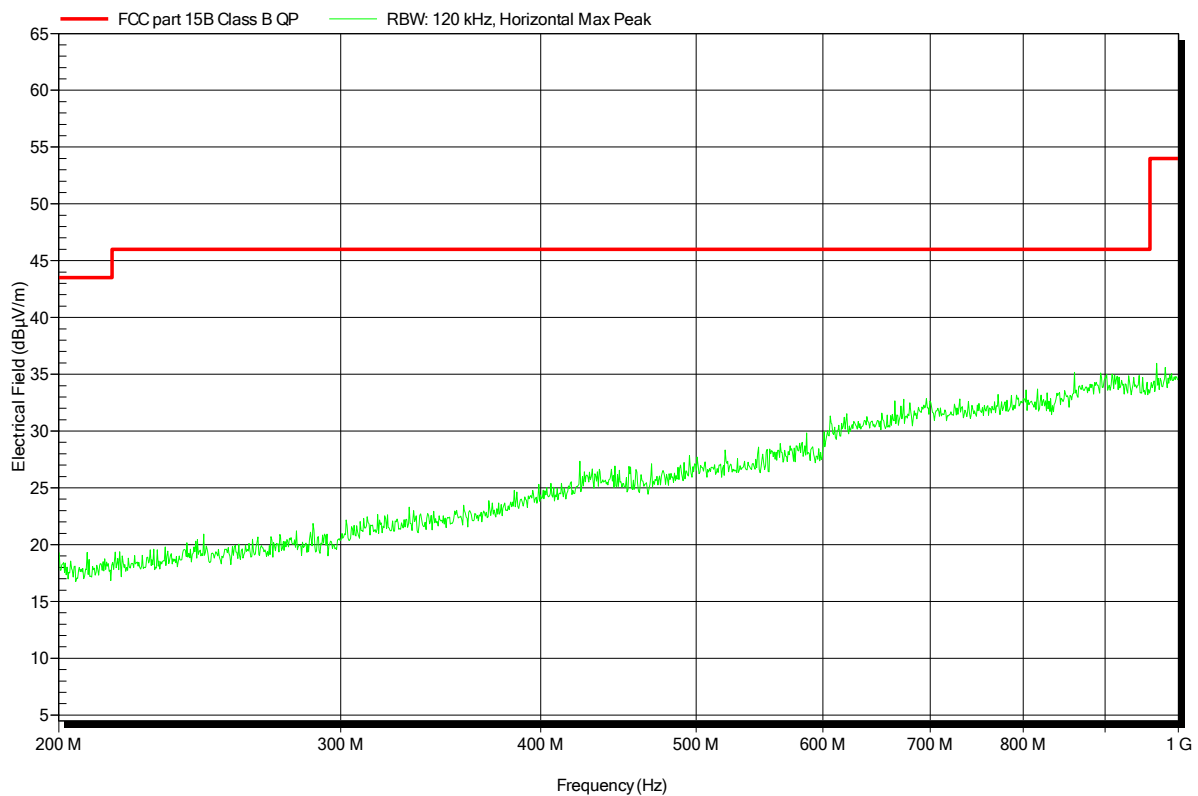
Eurofins Product Service GmbH
Storkower Str. 38c, D-15526 Reichenwalde, Germany

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Project number: G0M-1502-4502

Applicant:	SMT&Hybrid GmbH
EUT Name:	Datenlogger
Model:	MONI LOG sensor module
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Yu
Test Conditions:	Tnom: 23°C, Unom: 3.6V Battery
Antenna:	Rohde & Schwarz HL 223, Horizontal
Measurement distance:	3m
Mode:	Communication between sensor module and data link every 1 second
Test Date:	2015-04-30
Note:	with external Antenna

Index 19

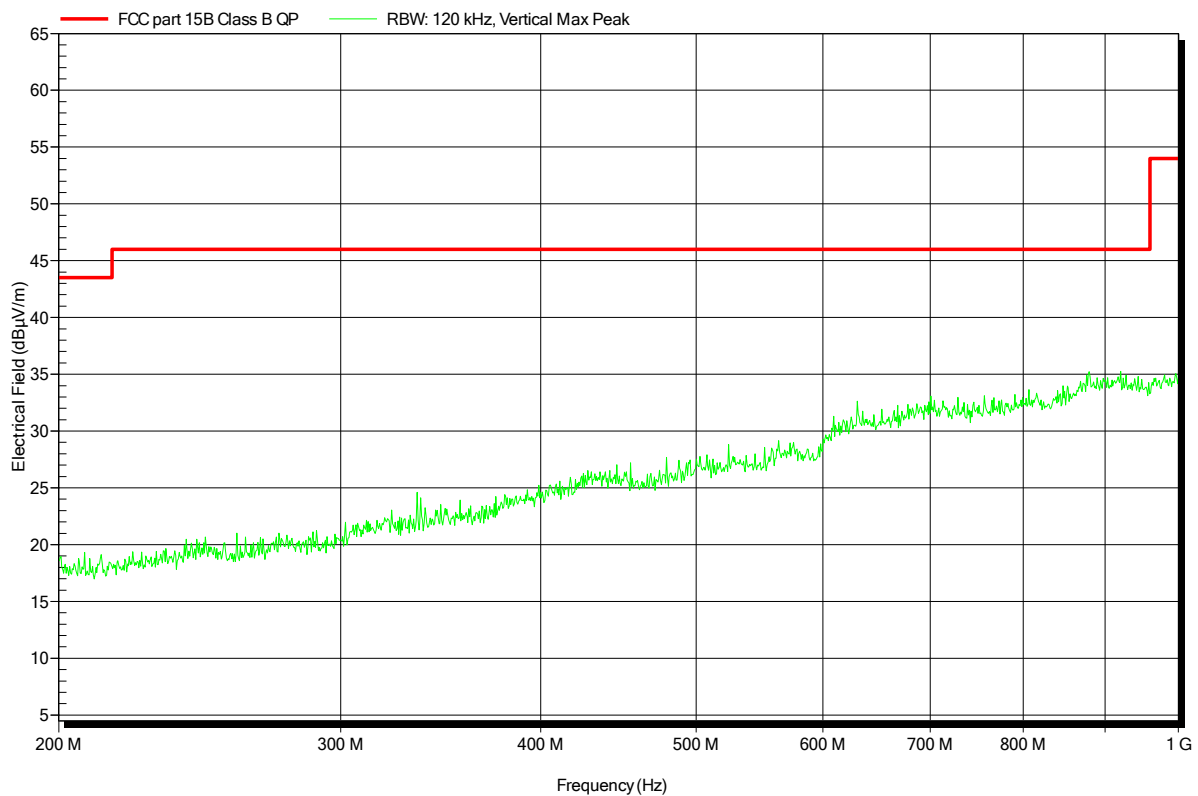


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Antenna:	Rohde & Schwarz HL 223, Vertical
Measurement distance:	3m
Mode:	Communication between sensor module and data link every 1 second
Test Date:	2015-04-30
Note:	with external Antenna

Index 20

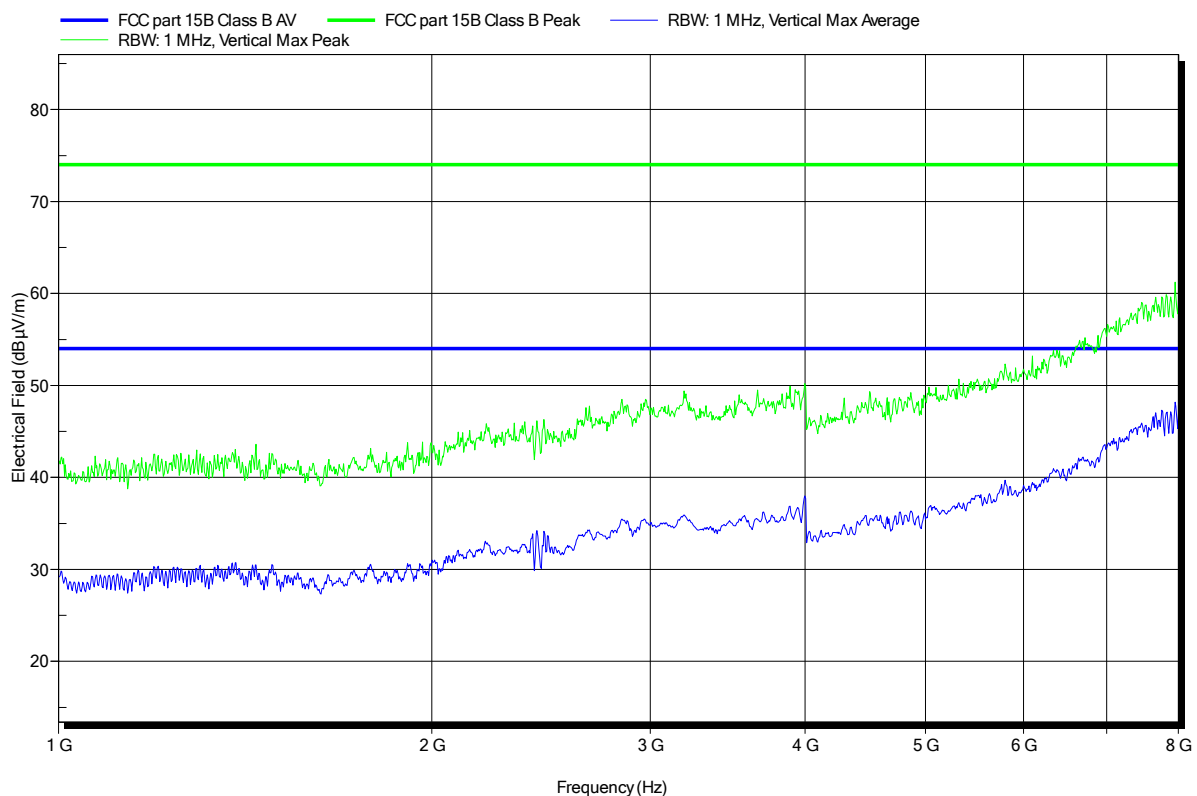


Spurious emissions under normal conditions according to FCC Part 15b

Project number: G0M-1502-4502

Applicant:	SMT&Hybrid GmbH
EUT Name:	Datenlogger
Model:	MONI LOG sensor module
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Yu
Test Conditions:	Tnom: 23°C, Unom: 3.6V Battery
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	3m
Mode:	Communication between sensor module and data link every 1 second
Test Date:	2015-04-30
Note:	with external Antenna

Index 21

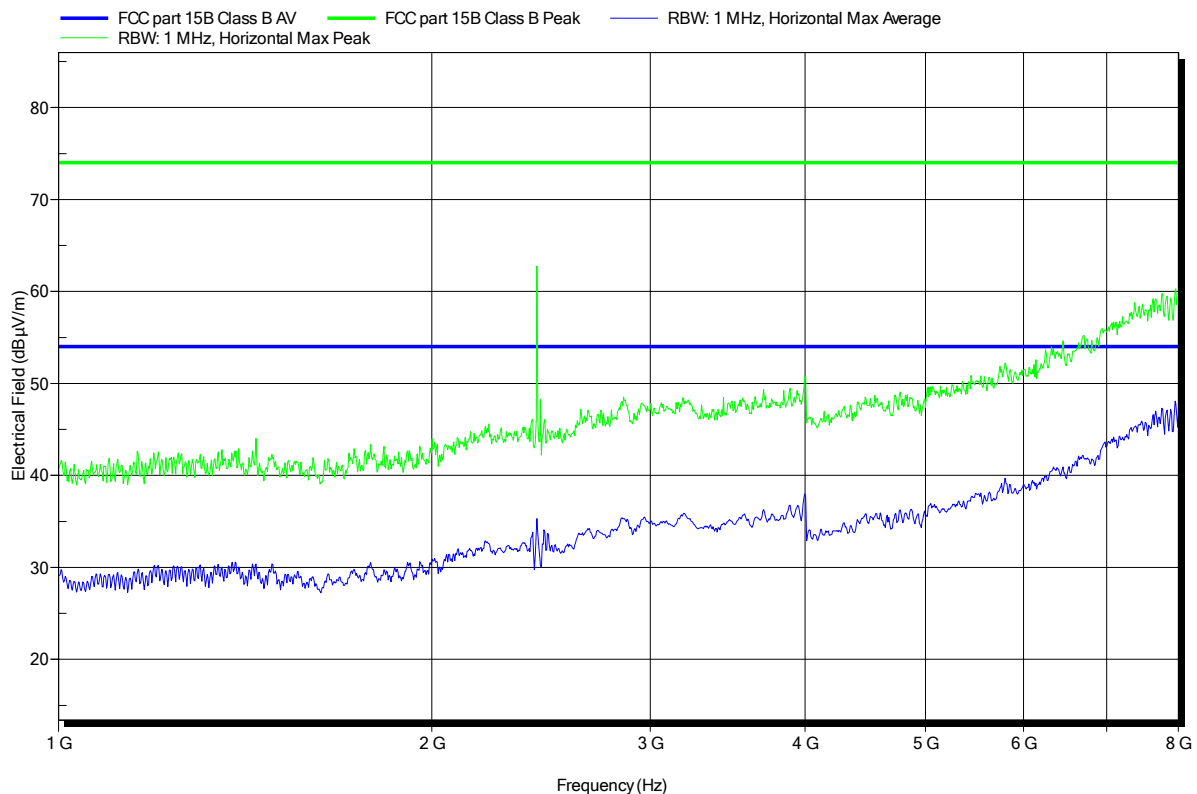


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EUT Name:	Datenlogger
Model:	MONI LOG sensor module
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Yu
Test Conditions:	Tnom: 23°C, Unom: 3.6V Battery
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	3m
Mode:	Communication between sensor module and data link every 1 second
Test Date:	2015-04-30
Note:	with external Antenna

Index 22

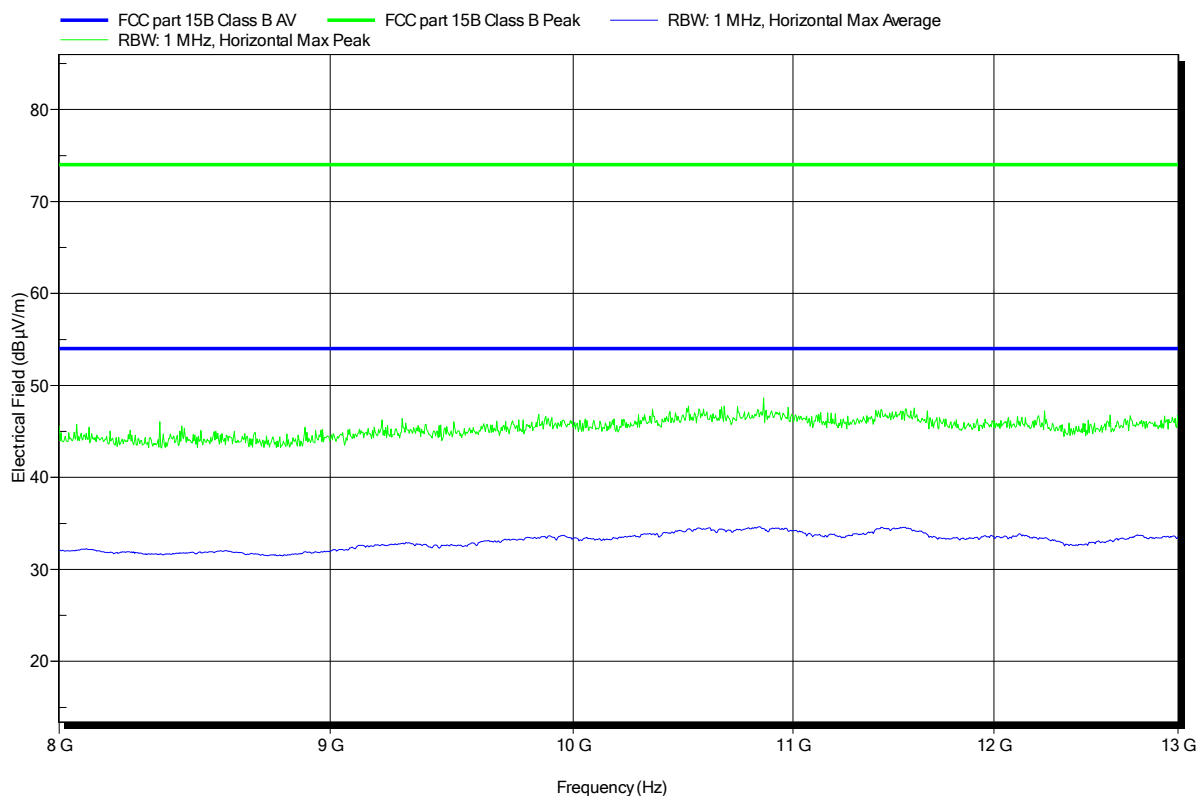


Spurious emissions under normal conditions according to FCC Part 15b

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Applicant: SMT&Hybrid GmbH
 EUT Name: Datenlogger
 Model: MONI LOG sensor module
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Yu
 Test Conditions: Tnom: 23°C, Unom: 3.6V Battery
 Antenna: Schwarzbeck BBHA 9120D, Horizontal
 Measurement distance: 3m
 Mode: Communication between sensor module and data link every 1 second
 Test Date: 2015-04-30
 Note: with external Antenna

Index 23

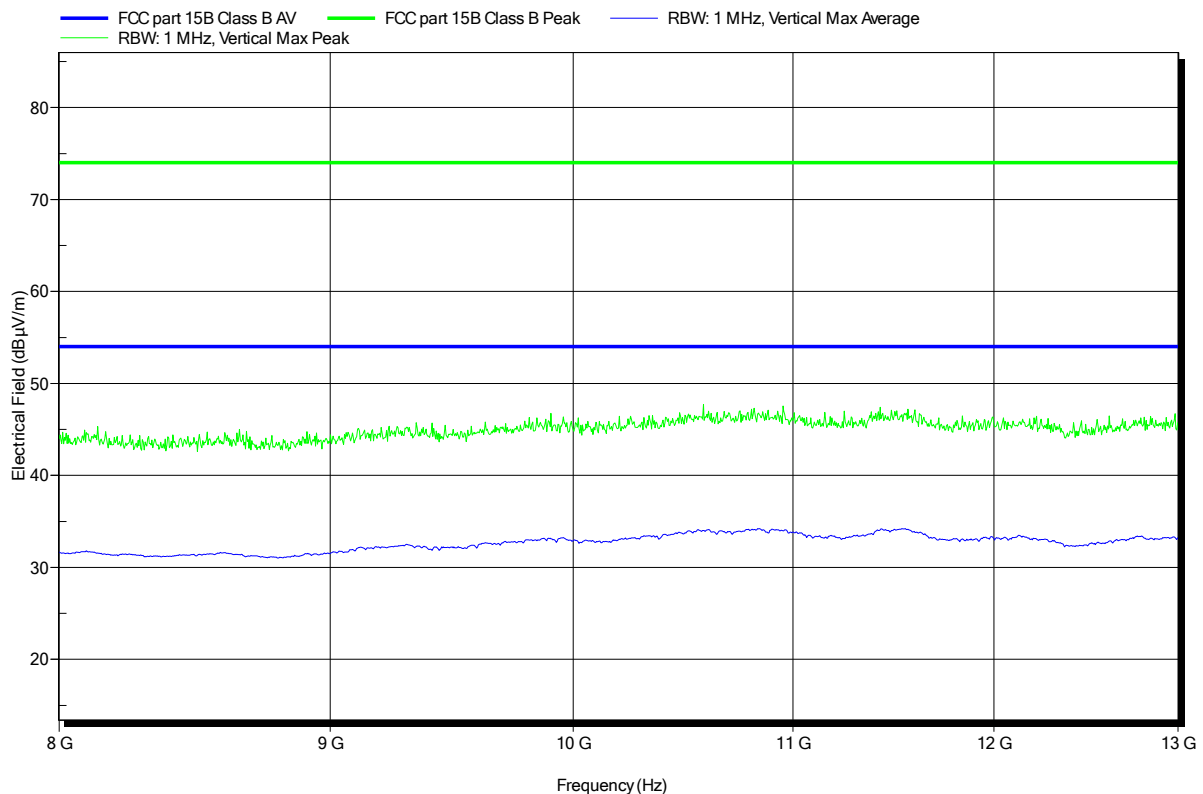


Spurious emissions under normal conditions according to FCC Part 15b

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Applicant:	SMT&Hybrid GmbH
EUT Name:	Datenlogger
Model:	MONI LOG sensor module
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Yu
Test Conditions:	Tnom: 23°C, Unom: 3.6V Battery
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	3m
Mode:	Communication between sensor module and data link every 1 second
Test Date:	2015-04-30
Note:	with external Antenna

Index 24

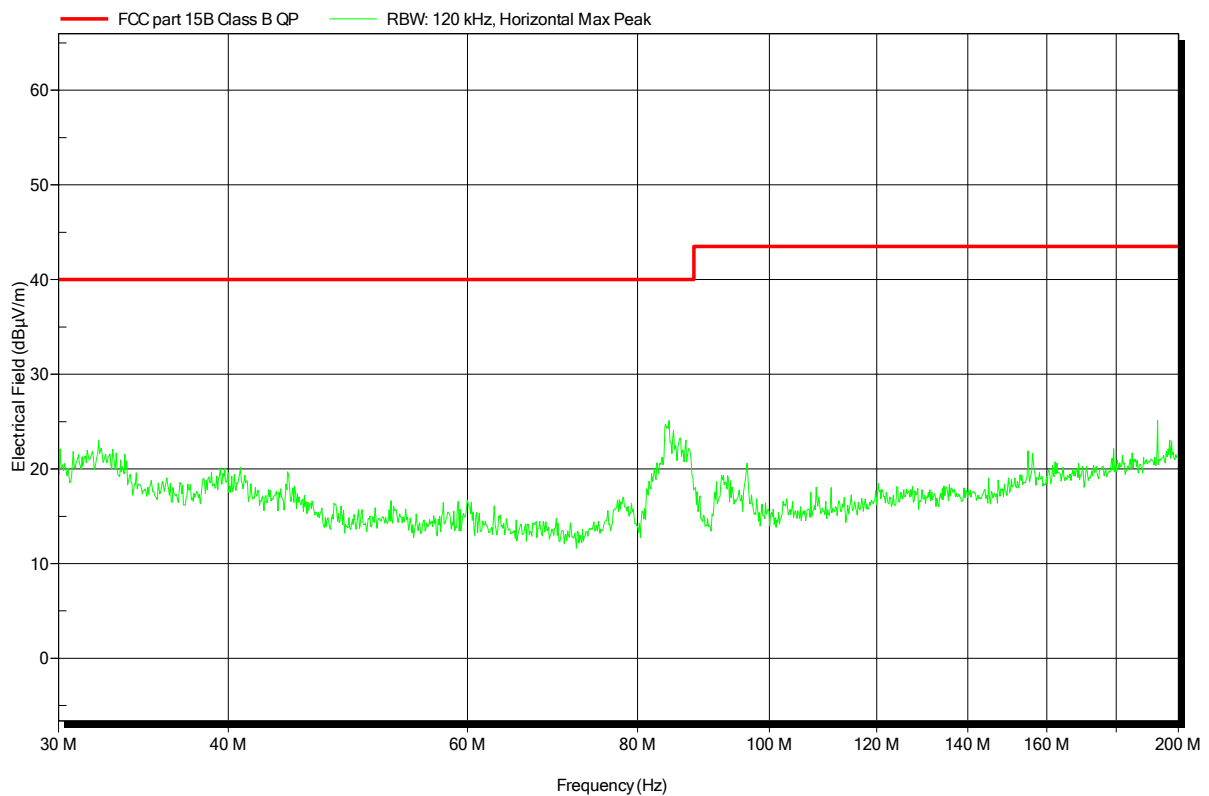


Spurious emissions under normal conditions according to FCC Part 15b

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EUT Name:	Datenlogger
Model:	MONI LOG sensor module
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Yu
Test Conditions:	Tnom: 23°C, Unom: 3.6V Battery
Antenna:	Rohde & Schwarz HK 116, Horizontal
Measurement distance:	3m
Mode:	Communication between sensor module and data link every 1 second
Test Date:	2015-03-30
Note:	with internal Antenna

Index 9

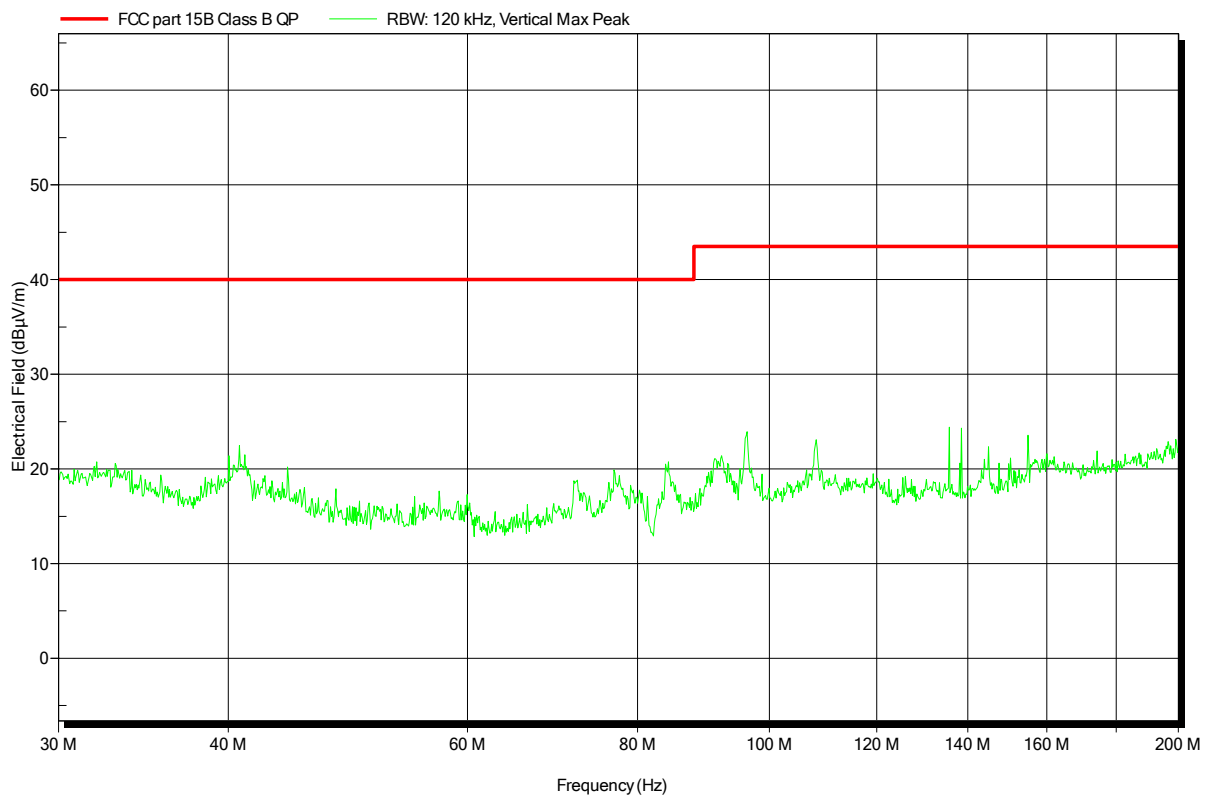


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Test Conditions:	Tnom: 23°C, Unom: 3.6V Battery
Antenna:	Rohde & Schwarz HK 116, Vertical
Measurement distance:	3m
Mode:	Communication between sensor module and data link every 1 second
Test Date:	2015-03-30
Note:	with internal Antenna

Index 10



Test Report No.: G0M-1502-4502-EF0115B-V01

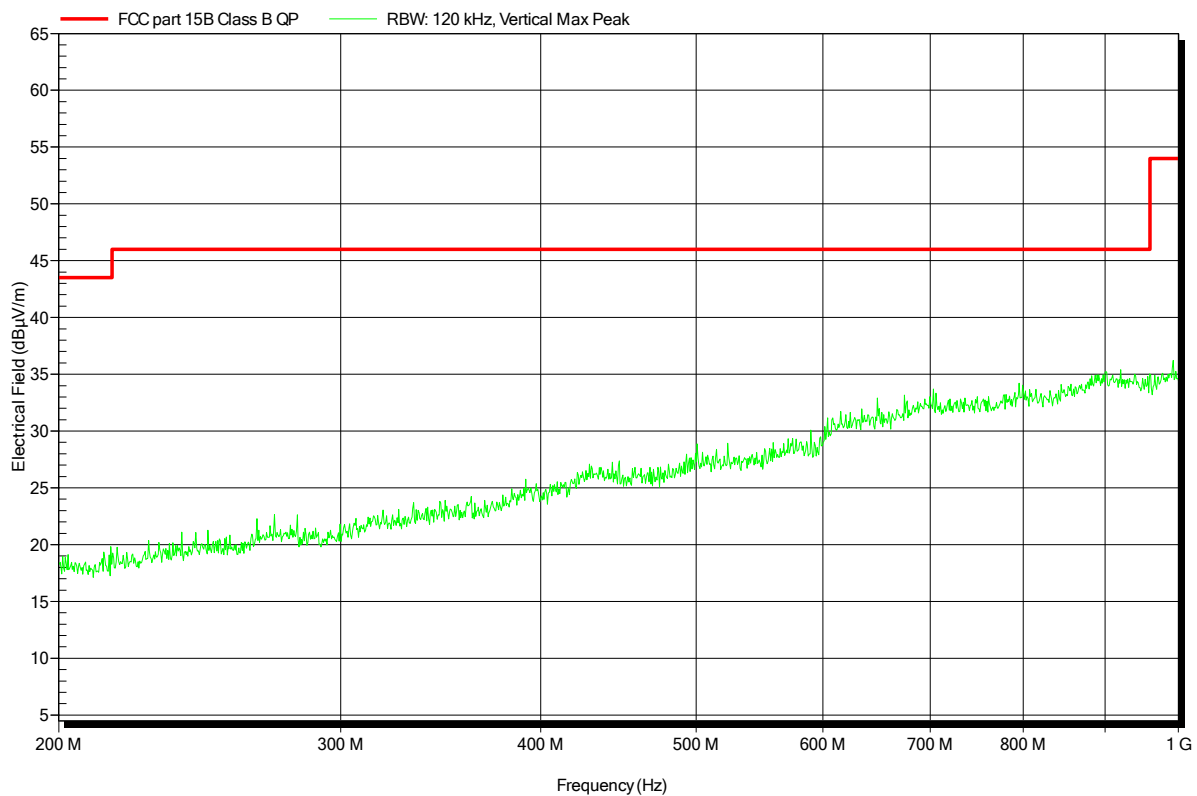
Eurofins Product Service GmbH
Storkower Str. 38c, D-15526 Reichenwalde, Germany

Spurious emissions under normal conditions according to FCC Part 15b

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Test Conditions:	Tnom: 23°C, Unom: 3.6V Battery
Antenna:	Rohde & Schwarz HL 223, Vertical
Measurement distance:	3m
Mode:	Communication between sensor module and data link every 1 second
Test Date:	2015-04-02
Note:	with internal Antenna

Index 11

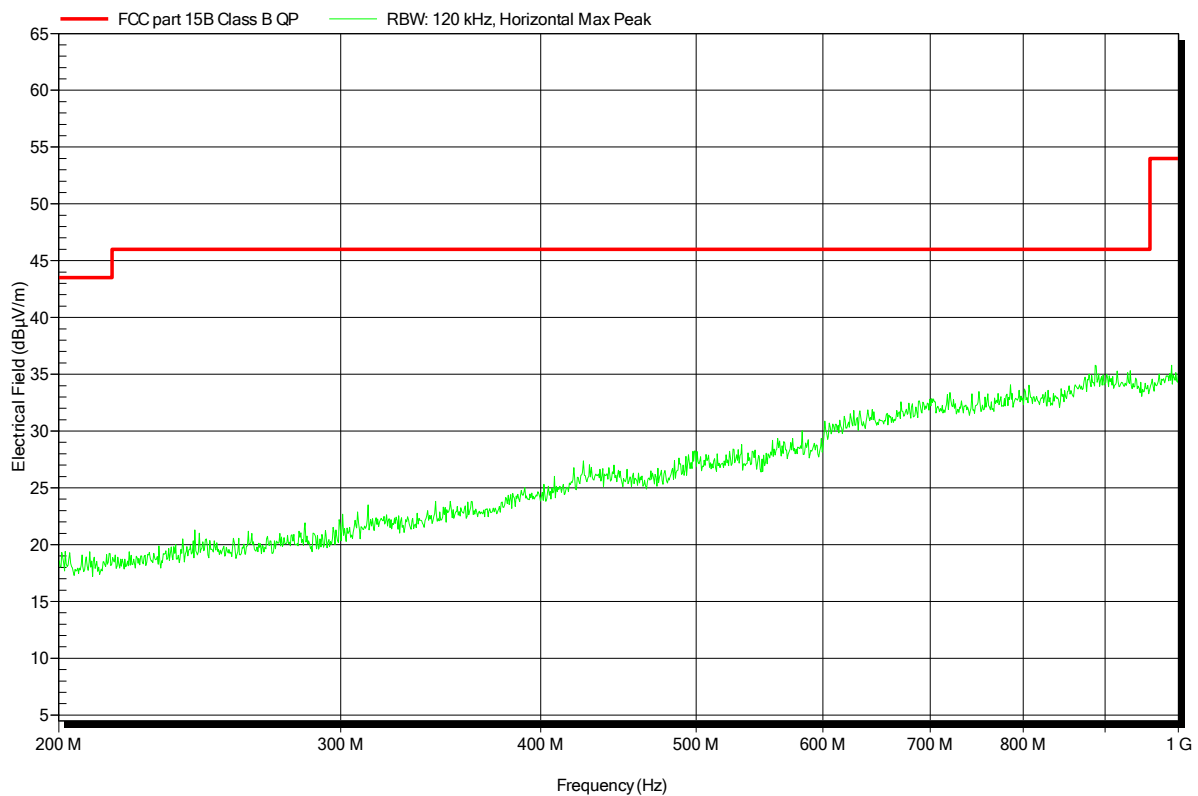


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Model:	MONI LOG sensor module
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Operator:	Mr. Yu
Test Conditions:	Tnom: 23°C, Unom: 3.6V Battery
Antenna:	Rohde & Schwarz HL 223, Horizontal
Measurement distance:	3m
Mode:	Communication between sensor module and data link every 1 second
Test Date:	2015-04-02
Note:	with internal Antenna

Index 12

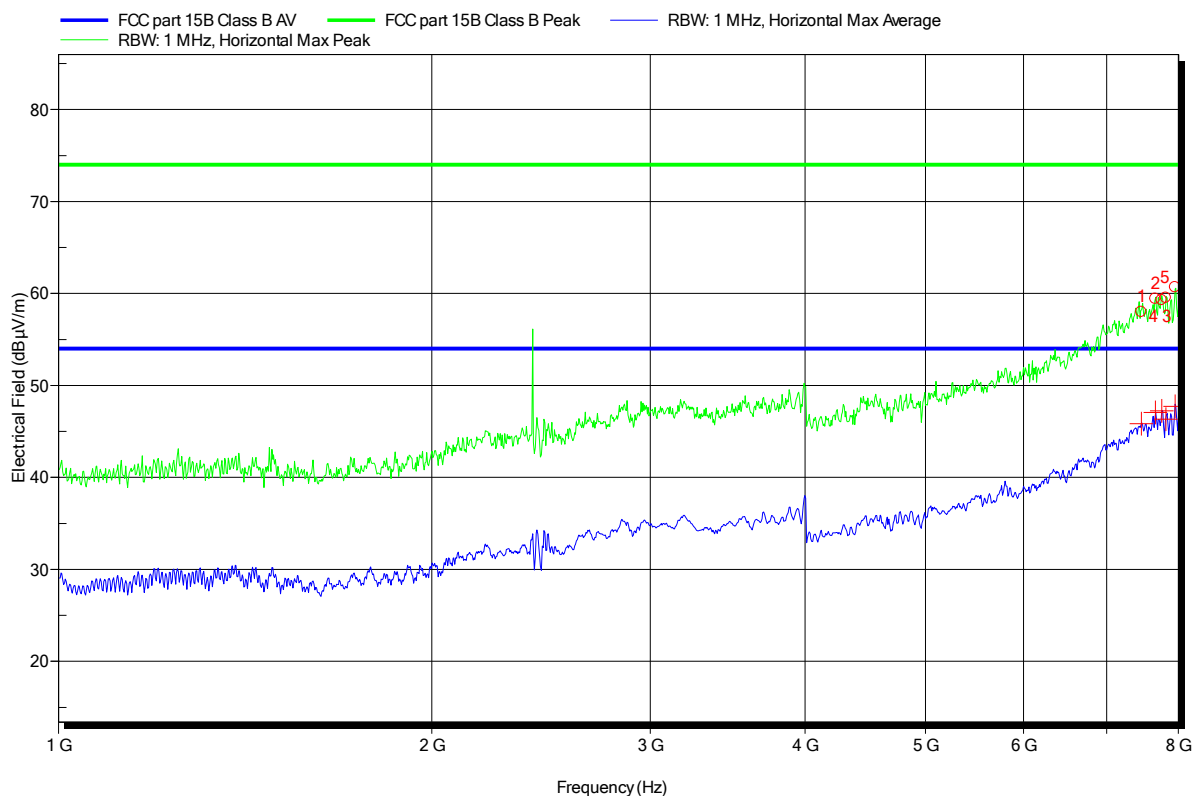


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 Test Conditions: Tnom: 23°C, Unom: 3.6V Battery
 Antenna: Schwarzbeck BBHA 9120D, Horizontal
 Measurement distance: 3m
 Mode: Communication between sensor module and data link every 1 second
 Test Date: 2015-04-07
 Note: with internal Antenna

Index 13



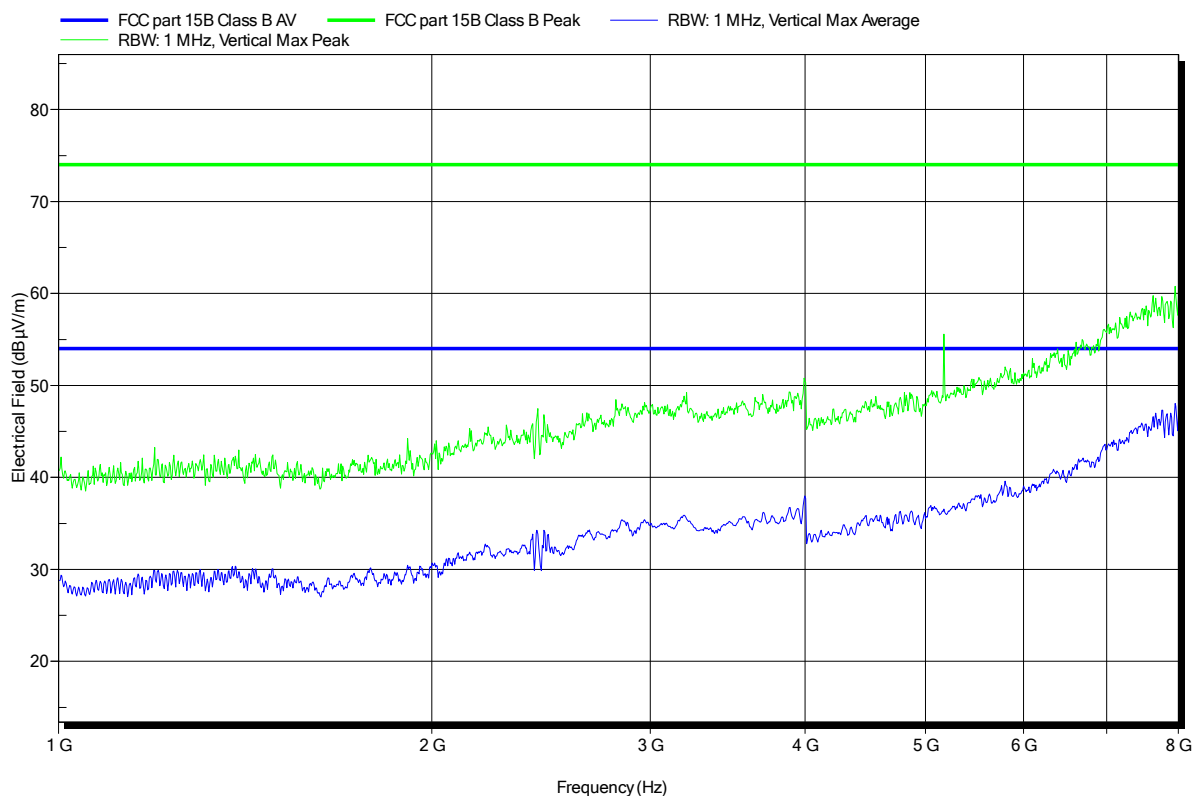
Frequency	Average	Average Limit	Average Difference	Average Status
7.467 GHz	45.85 dBµV/m	54 dBµV/m	-8.15 dB	Pass
7.664 GHz	47.07 dBµV/m	54 dBµV/m	-6.93 dB	Pass
7.755 GHz	47.23 dBµV/m	54 dBµV/m	-6.77 dB	Pass
7.816 GHz	46.33 dBµV/m	54 dBµV/m	-7.67 dB	Pass
7.949 GHz	47.72 dBµV/m	54 dBµV/m	-6.28 dB	Pass

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Measurement distance:	3m
Mode:	Communication between sensor module and data link every 1 second
Test Date:	2015-04-07
Note:	with internal Antenna

Index 14

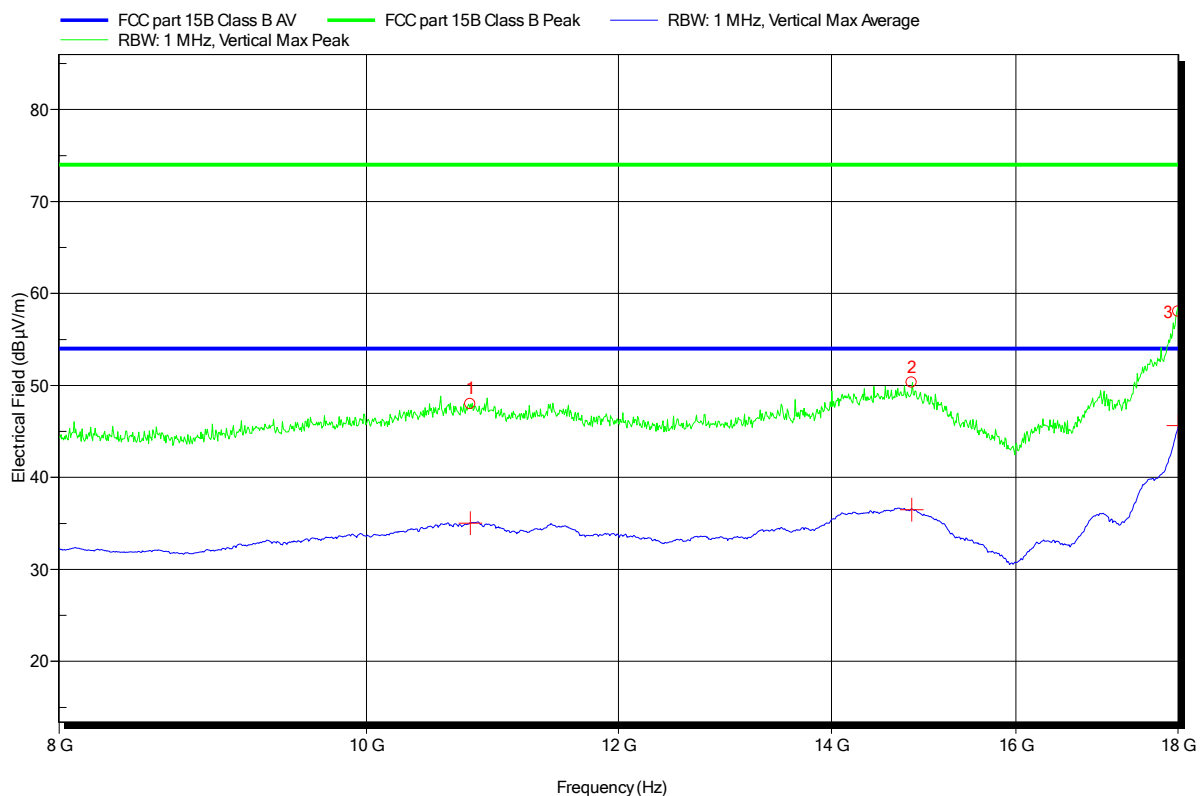


Spurious emissions under normal conditions according to FCC Part 15b

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Index 15



Frequency	Average	Average Limit	Average Difference	Average Status
10.78 GHz	35.03 dBµV/m	54 dBµV/m	-18.97 dB	Pass
14.838 GHz	36.5 dBµV/m	54 dBµV/m	-17.5 dB	Pass
17.999 GHz	45.63 dBµV/m	54 dBµV/m	-8.37 dB	Pass

Test Report No.: G0M-1502-4502-EF0115B-V01

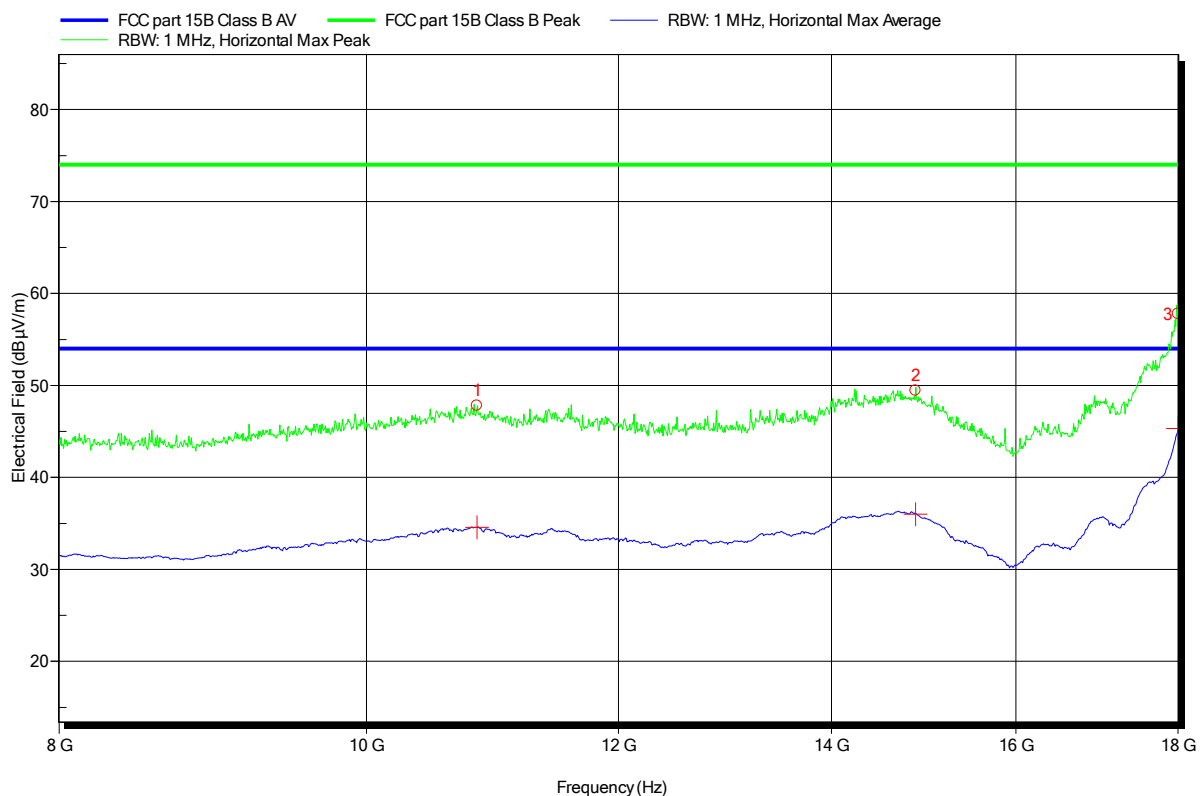
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 Antenna: Schwarzbeck BBHA 9120D, Horizontal
 Measurement distance: 3m
 Mode: Communication between sensor module and data link every 1 second
 Test Date: 2015-04-07
 Note: with internal Antenna

Index 16



Frequency	Average	Average Limit	Average Difference	Average Status
10.832 GHz	34.55 dBµV/m	54 dBµV/m	-19.45 dB	Pass
14.88 GHz	36 dBµV/m	54 dBµV/m	-18 dB	Pass
18 GHz	45.33 dBµV/m	54 dBµV/m	-8.67 dB	Pass

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