



EMC TEST REPORT FCC 47 CFR Part 15B Industry Canada ICES-003 Electromagnetic compatibility - Unintentional radiators	
Report Reference No.	G0M-1510-5111-EF0115B-V01
Testing Laboratory	Eurofins Product Service GmbH
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Accreditation	<div style="text-align: center;">   </div> <p>A2LA Accredited Testing Laboratory, Certificate No.: 1983.01 FCC Filed Test Laboratory, Reg.-No.: 96970 IC OATS Filing assigned code: 3470A</p>
Applicant's name	SMT & Hybrid GmbH
Address	An der Priessnitzau 22 01328 Dresden 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	Datenlogger
Model No.	EnDaL smart
Additional Models	None
Hardware version	R0
Firmware / Software version	0.1
IDs	FCC-ID: 2AELT-01MONILOG IC: N/A
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: 2015-12-07

Date (s) of performance of tests: 2015-12-07 - 2016-01-27

Compiled by: Yu Yu

Tested by (+ signature).....: Yu Yu 

Approved by (+ signature): Marcus Klein 

Head of Lab

Date of issue.....: 2016-01-29

Total number of pages.....: 21

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.

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Additional requirements:

Ferrite WE 74271111 shall be placed on USB Cable connected to device.

Ferrite L4 on pcb shall be bridged.

Version History

Version	Issue Date	Remarks	Revised by
V01	2016-01-29	Initial Release	

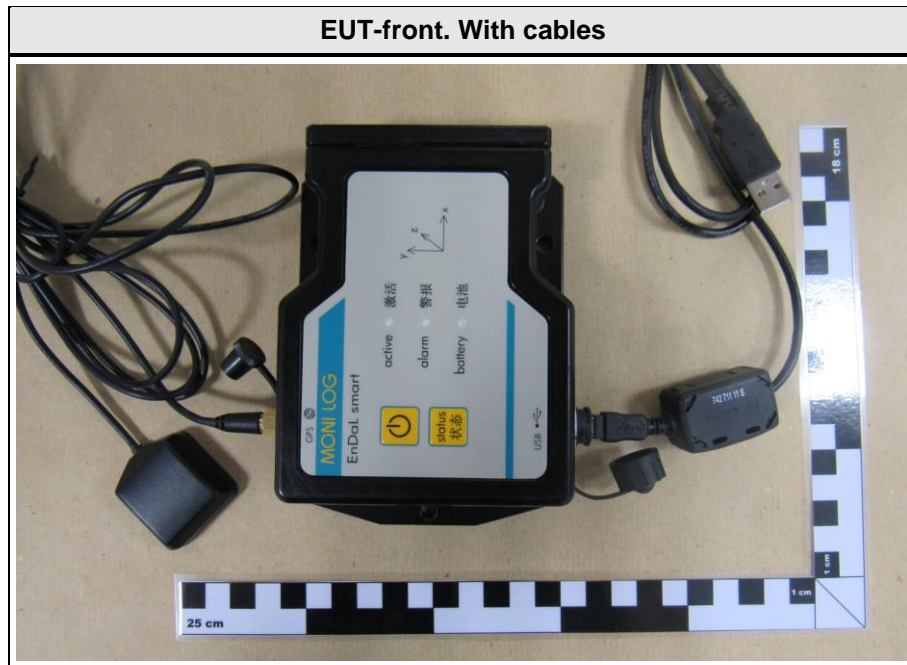
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1 Equipment (Test item) Description

Description	Datenlogger
Model	EnDaL smart
Additional Models	None
Serial number	201510002
Hardware version	R0
Software / Firmware version	0.1
FCC-ID	2AELT-01MONILOG
IC	N/A
Power supply	7.2V DC via non-rechargeable battery
Manufacturer	SMT & Hybrid GmbH An der Priessnitzau 22 01328 Dresden GERMANY
Highest emission frequency	Fmax=48MHz
Device classification	Class B
Equipment type	Tabletop
Number of tested samples	1

1.1 Photos – Equipment external



EUT-left side



EUT-right side

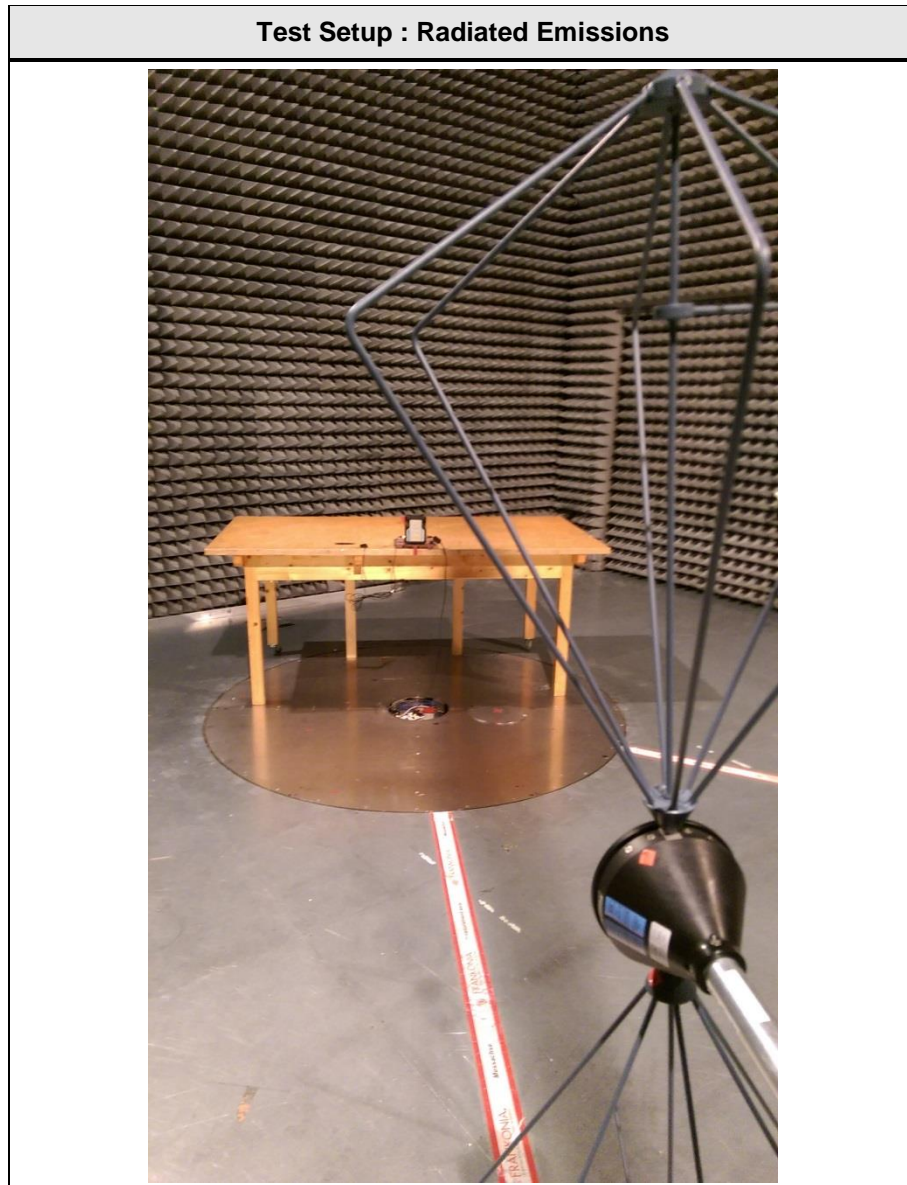




1.2 Photos – Equipment internal



1.3 Photos – Test setup



1.4 Supporting Equipment Used During Testing

Product Type*	Device	Manufacturer	Model No.	Comments (e.g. serial no.)
AE	Laptop	DELL	Latitude	
EUT	USB Cable	-	E188722 „D“ (UL) TYPE CM 75°C 28AWG/2C USB CABLE CSA LL112842AWM I/II A FT 80°C 150V	Cable included in package

***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 (e.g. Cat. of Cable)
1	Antenna	I/O	10m	Yes	
2	USB2.0	I/O	2m	Yes	

***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	Test mode: synchronous measurement every second; The EUT saves and loads the collected data from the sensors into/from the memory; Permanent USB data transfer. USB shield connected to reference ground.

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	2015.1.12

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
RF Cable			-	System Cal.	System Cal
RF Cable			-	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 dB μ V. 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 dB μ V/m). The FCC limits are given in units of μ V/m. The following formula is used to convert the units of μ V/m to dB μ V/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:

$$\begin{array}{rclcl} \text{Reading} & + & \text{AF} & = & \text{Net Reading} & : & \text{Net reading - FCC limit} & = & \text{Margin} \\ 21.5 \text{ dB}\mu\text{V} & + & 26 \text{ dB} & = & 47.5 \text{ dB}\mu\text{V/m} & : & 47.5 \text{ dB}\mu\text{V/m} - 57.0 \text{ dB}\mu\text{V/m} & = & -9.5 \text{ dB} \end{array}$$

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	
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	25°C				
Relative Humidity	30 to 60 %	43%				
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					
	Fehler! Verweisquelle konnte nicht gefunden werden.8					
Fully configured sample scanned over the following frequency range	Frequency range					
	30 MHz to 1 GHz					
Operating mode	1					
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	-		-	-
Comments:						

Test Procedure:

The test site is in accordance with ANSI C63-4:2014 requirements and is listed by FCC.
The measurement procedure is as follows:

Exploratory measurement:

- The EUT was placed on a non-conductive table at a height of 0.8m.
- The EUT and support equipment, if needed, were set up to simulate typical usage.
- Cables, of type and length specified by the manufacturer, were connected to at least one port of each type and were terminated by a device or simulating load of actual usage.
- The antenna was placed at a distance of 3 or 10 m.
- The received signal was monitored at the measurement receiver.
 - Cables not bundled were manipulated within the range of likely arrangements to produce the highest emission amplitude
 - To maximize the suspected emissions the EUT is rotated 360 degrees. If the signal exceeds the previous amplitude, go back to the corresponding azimuth and manipulate the cables again for maximizing the emissions if possible.
 - Move the antenna from 1 to 4m to maximize the suspected highest amplitude signal.
- This procedure has to be performed in both antenna polarizations, horizontal and vertical.
- The arrangement of the equipment with the maximum emission level is shown on the setup picture at item 1.3.

Final measurement:

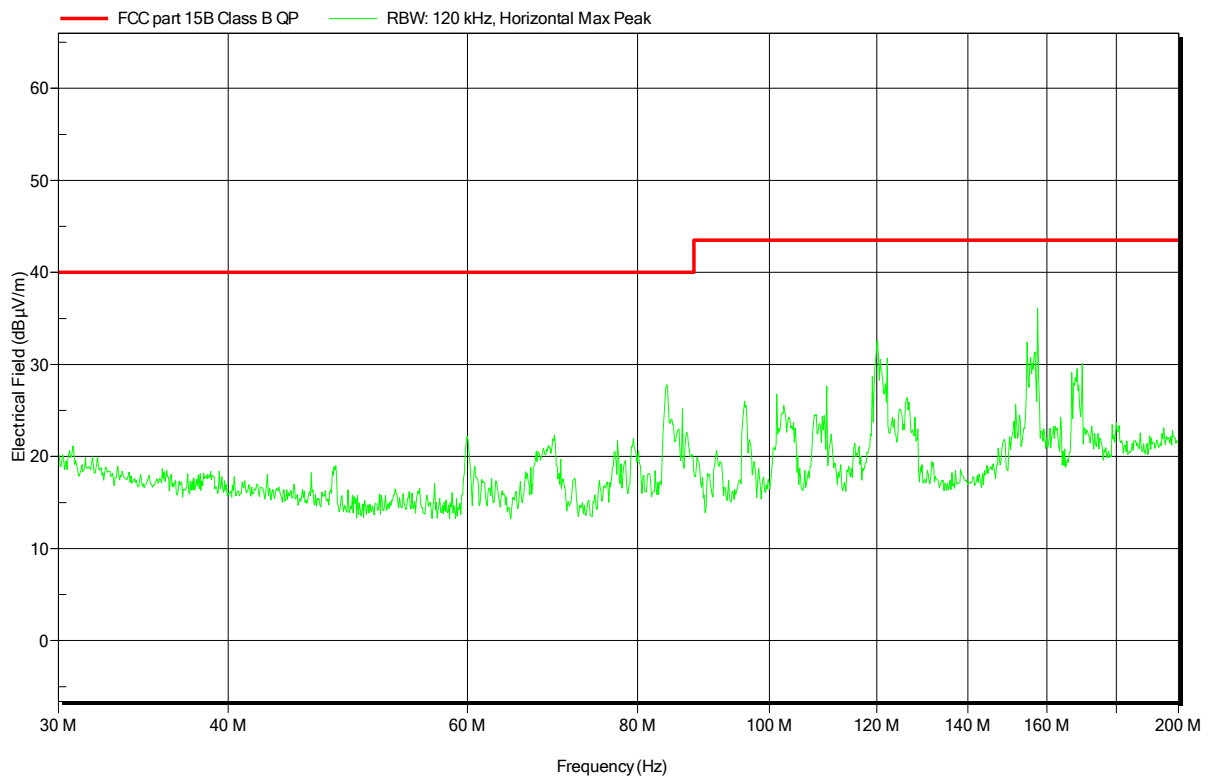
- The EUT was placed on a 0.8 m non-conductive table at a 3 m distance from the receive antenna. The antenna output was connected to the measurement receiver
- A biconical antenna was used for the frequency range 30 – 200 MHz, a logarithmic periodical antenna was used for the frequency range from 200 – 1000 MHz. Above one 1 GHz a Double Ridged Broadband Horn antenna was used. The antenna was placed on an adjustable height antenna mast
- The EUT and cable arrangement were based on the exploratory measurement results
- Emissions were maximized at each frequency by rotating the EUT and adjusting the receive antenna height and polarization. The maximum values were recorded.
- The test data of the worst-case conditions were recorded and shown on the next pages.

Spurious emissions under normal conditions according to FCC PART 15B

Project number: G0M-1510-5111

Applicant:	SMT & Hybrid GmbH
EUT Name:	Datenlogger
Model:	EnDaL smart
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Yu
Test Conditions:	Tnom: 25°C, Unom: 7.2V DC via Battery
Antenna:	Rohde & Schwarz HK 116, Horizontal
Measurement distance:	3m
Mode:	1
Test Date:	2015-12-16
Note:	

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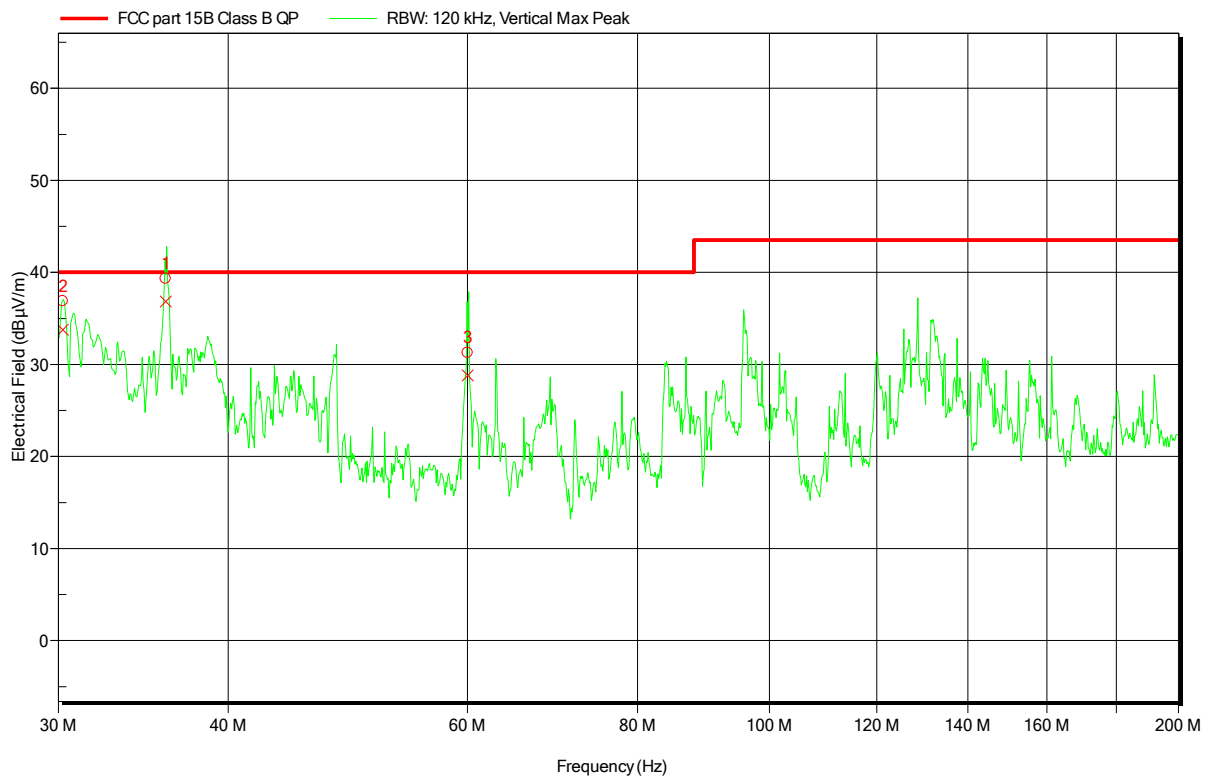


Spurious emissions under normal conditions according to FCC PART 15B

Project number: G0M-1510-5111

Applicant: SMT & Hybrid GmbH
 EUT Name: Datenlogger
 Model: EnDaL smart
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Yu
 Test Conditions: Tnom: 25°C, Unom: 7.2V DC via Battery
 Antenna: Rohde & Schwarz HK 116, Vertical
 Measurement distance: 3m
 Mode: 1
 Test Date: 2015-12-16
 Note:

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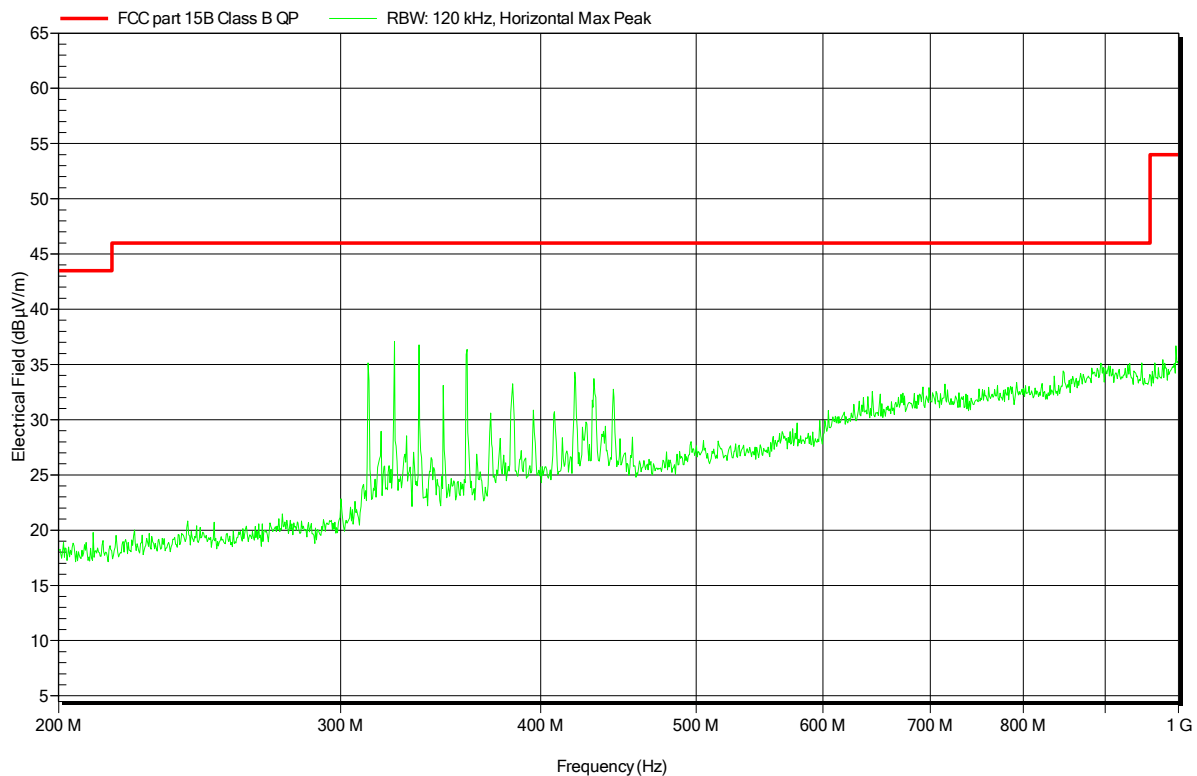
Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Angle	Height
1	36 MHz	36.84 dBµV/m	40 dBµV/m	-3.16 dB	Pass	283 Degree	1 m
2	30.228 MHz	33.77 dBµV/m	40 dBµV/m	-6.23 dB	Pass	283 Degree	1 m
3	60.002 MHz	28.81 dBµV/m	40 dBµV/m	-11.19 dB	Pass	283 Degree	1 m

Spurious emissions under normal conditions according to FCC PART 15B

Project number: G0M-1510-5111

Applicant:	SMT & Hybrid GmbH
EUT Name:	Datenlogger
Model:	EnDaL smart
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Yu
Test Conditions:	Tnom: 25°C, Unom: 7.2V DC via Battery
Antenna:	Rohde & Schwarz HL 223, Horizontal
Measurement distance:	3m
Mode:	1
Test Date:	2015-12-16
Note:	

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Spurious emissions under normal conditions according to FCC PART 15B

Project number: G0M-1510-5111

Applicant:	SMT & Hybrid GmbH
EUT Name:	Datenlogger
Model:	EnDaL smart
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Yu
Test Conditions:	Tnom: 25°C, Unom: 7.2V DC via Battery
Antenna:	Rohde & Schwarz HL 223, Vertical
Measurement distance:	3m
Mode:	1
Test Date:	2015-12-16
Note:	

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