

FCC TEST REPORT FCC 47 CFR Part 15C Industry Canada RSS-210 Digital transmission systems operating within the 902 – 928 MHz band	
Report Reference No.	G0M-1406-3892-TFC247DT-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	Kamstrup A/S
Address	Industrivej 28 8660 Skanderborg DENMARK
Test specification:	
Standard	47 CFR Part 15C KDB Publication No. 558074 D01 v03r02 RSS-210, Issue 8, 2010-12 RSS-Gen, Issue 3, 2010-12 ANSI C63.4:2009
Test scope	partial Radio compliance test (C2PC)
Equipment under test (EUT):	
Product description	USB meter reader
Model No.	USB meter reader
Additional Model(s)	None
Brand Name(s)	None
Hardware version	55351369_B1
Firmware / Software version	5098711_B1 (production sw) / 5098775 F1 (customer sw) / 5514758 D1 (eeprom)
	FCC-ID: OUY-USBEXT IC: N/A
Test result	Passed

Possible test case verdicts:

- neither assessed nor tested: N/N
- required by standard but not appl. to test object.....: N/A
- required by standard but not tested.....: N/T
- not required by standard for the test object: N/R
- test object does meet the requirement.....: P (Pass)
- test object does not meet the requirement.....: F (Fail)

Testing:

Test Lab Temperature.....: 20 – 23 °C

Test Lab Humidity: 32 – 38 %

Date of receipt of test item: 2014-10-24

Date (s) of performance of tests: 2014-10-24

Compiled by: Christian Weber

Tested by (+ signature).....: Wilfried Treffke
(Responsible for Test)

Approved by (+ signature): Christian Weber

Date of issue: 2014-12-18

Total number of pages: 38

W. Treffke

C. Weber

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
01	2014-12-18	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	10
1.4	Supporting Equipment Used During Testing	11
1.5	Test Modes	12
1.6	Test Equipment Used During Testing	13
2	RESULT SUMMARY	15
3	TEST CONDITIONS AND RESULTS	16
3.1	Test Conditions and Results – Transmitter radiated emissions	16
ANNEX A	Transmitter radiated spurious emissions	18

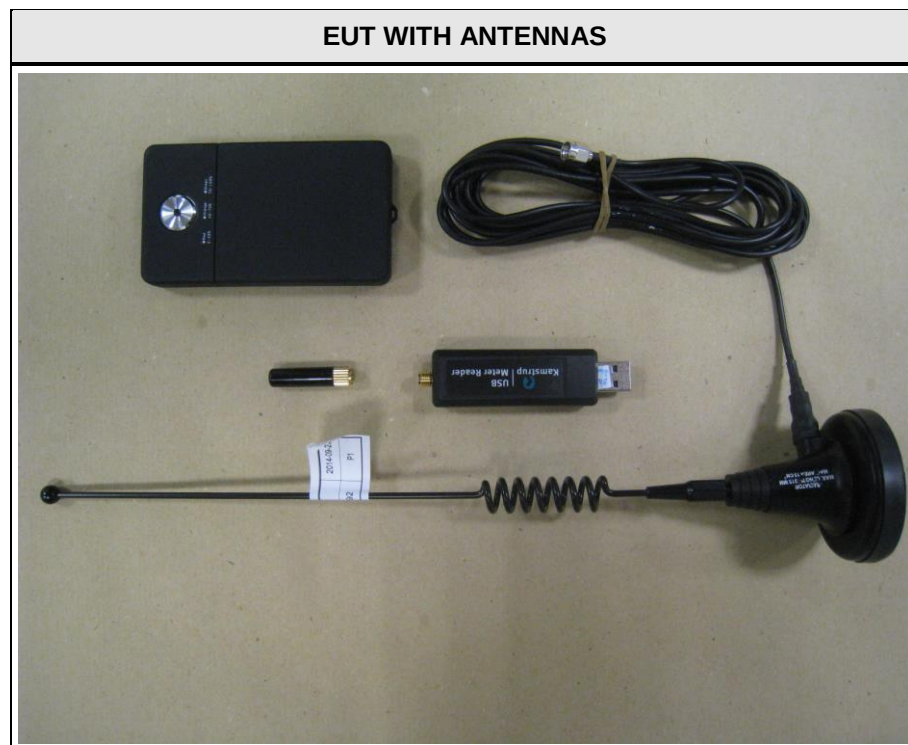
1 Equipment (Test item) Description

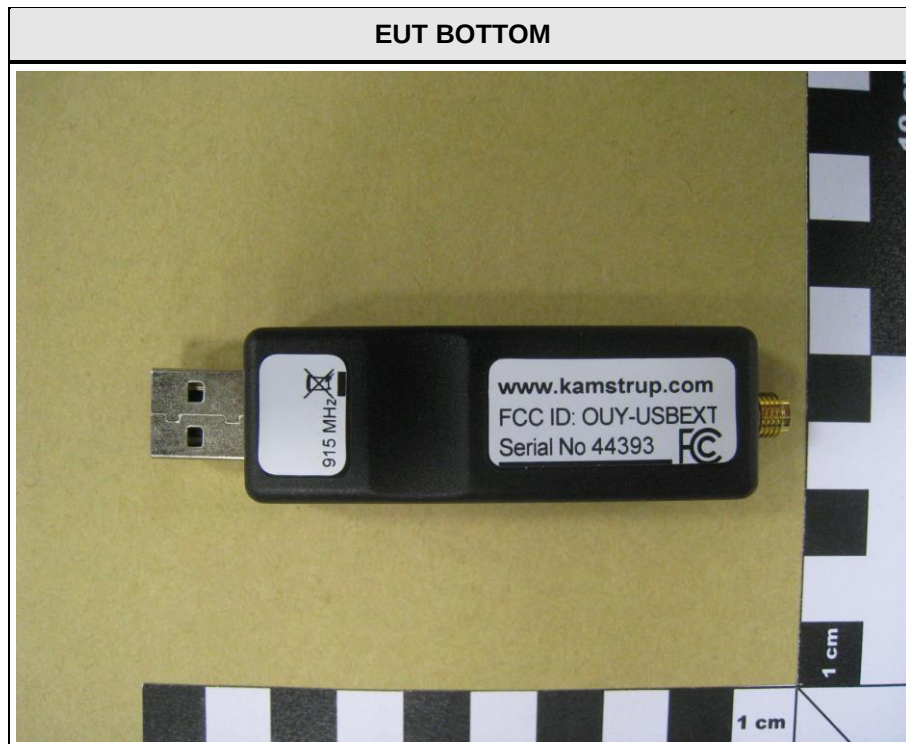
Description	USB meter reader	
Model	USB meter reader	
Additional Model(s)	None	
Brand Name(s)	None	
Serial number	None	
Hardware version	55351369_B1	
Software / Firmware version	5098711_B1 (production sw) / 5098775 F1 (customer sw) / 5514758 D1 (eeprom)	
FCC-ID	OUY-USBEXT	
IC	N/A	
Equipment type	End product	
Radio type	Transceiver	
Radio technology	custom	
Operating frequency range	Tx : 916 MHz, Rx: 915 MHz	
Assigned frequency band	902 - 928 MHz	
Frequency range	F _{MID}	916 MHz
Spreading	None	
Modulations	FSK	
Number of channels	1	
Channel spacing	None	
Number of antennas	1	
Antenna 1	Type	external dedicated
	Model	SBC-01
	Manufacturer	procell
	Gain	0.0 dBi
Antenna 2	Type	external dedicated
	Model	RA3156.03.00.00 + midmag base
	Manufacturer	smarteq
	Gain	5.15 dBi
Manufacturer	Kamstrup A/S Industrivej 28 8660 Skanderborg DENMARK	
Power supply	V _{NOM}	5.0 VDC
	V _{MIN}	N/A
	V _{MIN}	N/A
AC/DC-Adaptor	Model	N/A
	Vendor	N/A
	Input	N/A
	Output	N/A

Test Report No.: G0M-1406-3892-TFC247DT-V01

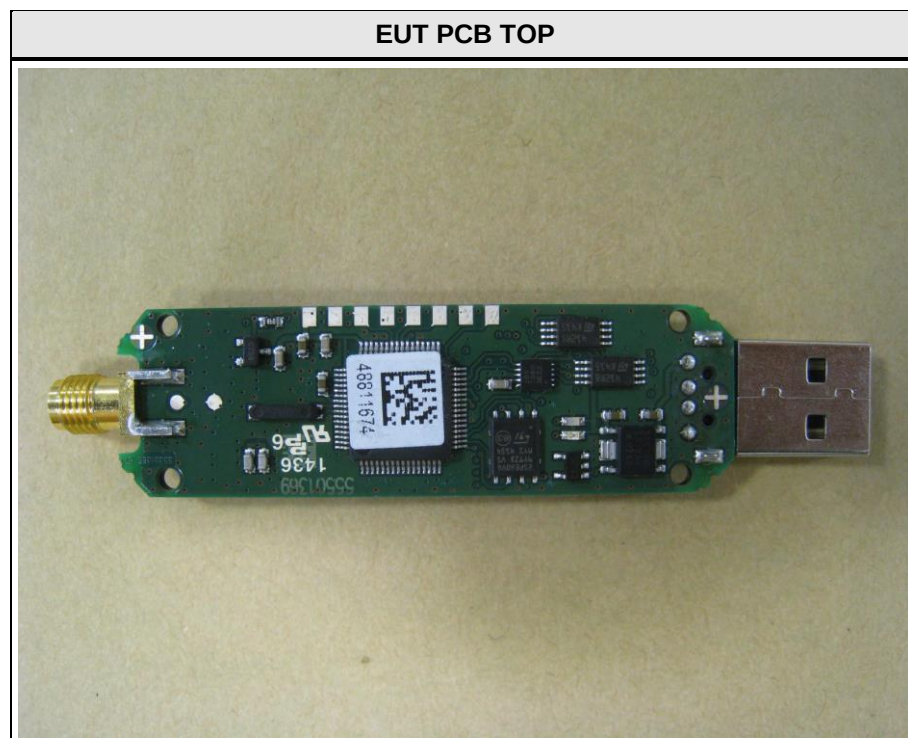
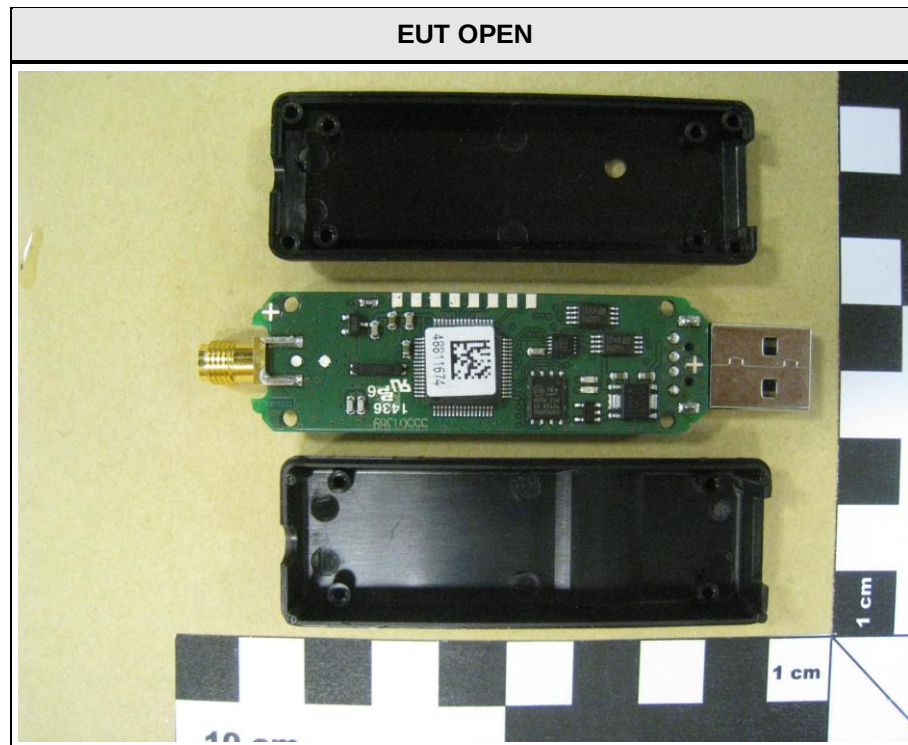
Eurofins Product Service GmbH
Storkower Str. 38c, D-15526 Reichenwalde, Germany

1.1 Photos – Equipment External

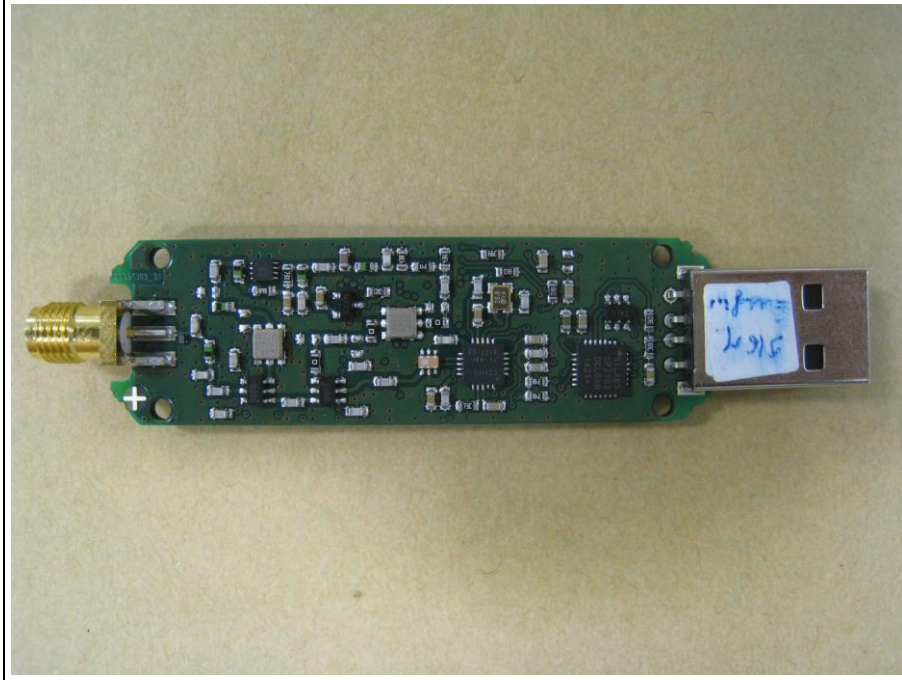




1.2 Photos – Equipment internal



EUT PCB BOTTOM

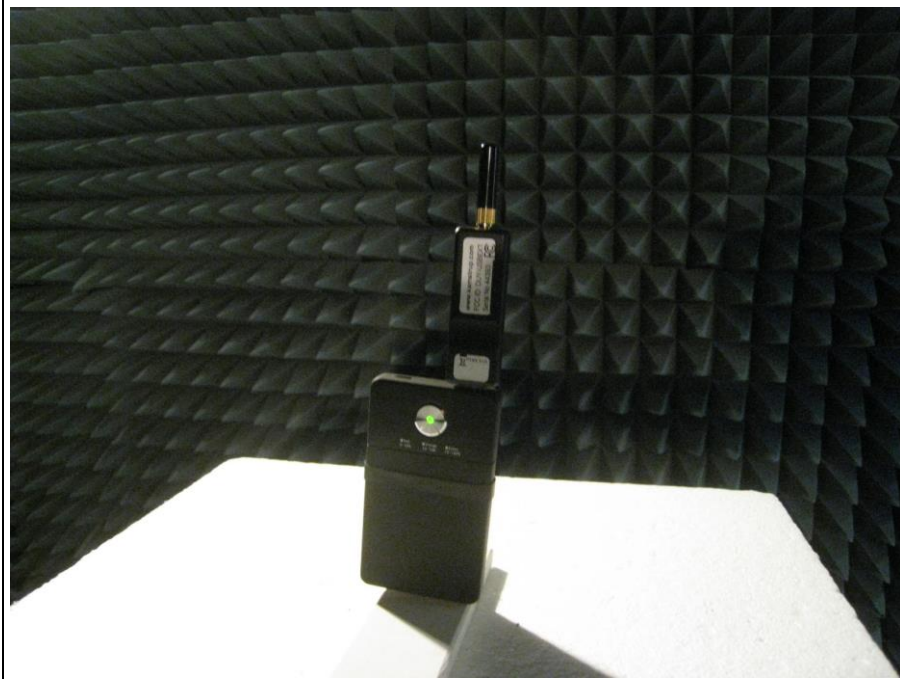


1.3 Photos – Test setup

RADIATED EMISSIONS: EUT WITH RA3156.03.00.00 ANTENNA



RADIATED EMISSIONS: EUT WITH SBC-01 ANTENNA



1.4 Supporting Equipment Used During Testing

Product Type*	Device	Manufacturer	Model No.	Comments
None				
*Note: Use the following abbreviations: AE : Auxiliary/Associated Equipment, or SIM : Simulator (Not Subjected to Test) CABL : Connecting cables				

1.5 Test Modes

Mode #	Description	
Single	General conditions:	EUT powered by laboratory power supply
	Radio conditions:	Mode = standalone transmit Spreading = None Modulation = FSK Duty cycle = 100 % Power level = Maximum

1.6 Test Equipment Used During Testing

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

Radiated spurious emissions					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Semi-anechoic chamber	Frankonia	AC 1	EF00062	-	-
Spectrum Analyzer	R&S	FSIQ26	EF00242	2014-03	2015-03
Biconical Antenna	R&S	HK 116	EF00012	2013-02	2016-02
LPD Antenna	R&S	HL 223	EF00187	2014-03	2017-03
LPD Antenna	R&S	HL 025	EF00327	2013-02	2016-02

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:

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

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:

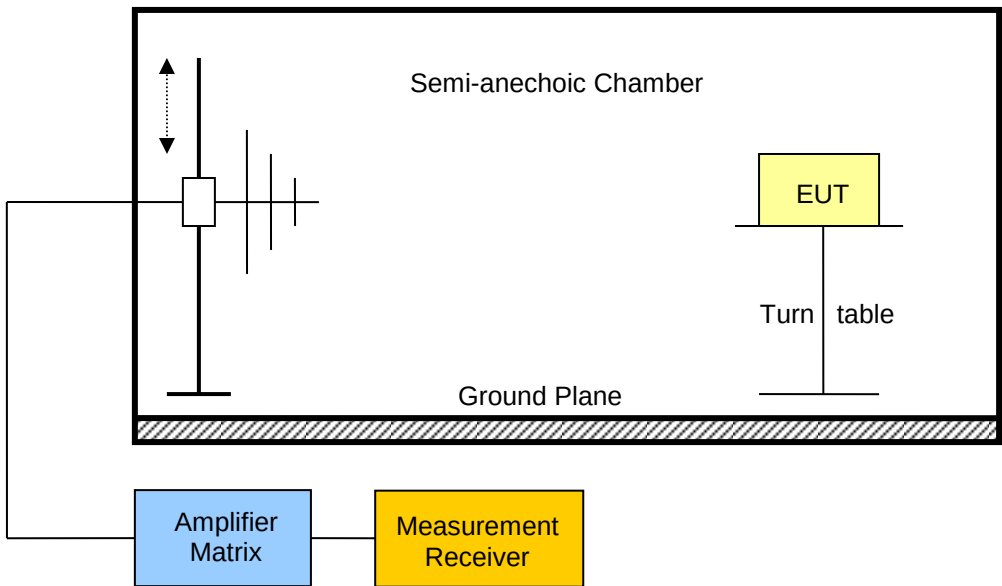
$$\begin{array}{rclcl} \text{Reading} & + & \text{AF} & = & \text{Net Reading} & : & \text{Net reading - FCC limit} & = & \text{Margin} \\ 21.5 \text{ dB}\mu\text{V} & + & 26 \text{ dB} & = & 47.5 \text{ dB}\mu\text{V/m} & : & 47.5 \text{ dB}\mu\text{V/m} - 57.0 \text{ dB}\mu\text{V/m} & = & -9.5 \text{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

2 Result Summary

FCC 47 CFR Part 15C, IC RSS-210				
Product Specific Standard Section	Requirement – Test	Reference Method	Result	Remarks
RSS-Gen 4.6.1	Occupied Bandwidth	RSS-Gen 4.6.1	N/N	
FCC § 15.247(a)(2) IC RSS-210 § A8.2	6 dB Bandwidth	KDB Publication No. 558074	N/N	See original grant
FCC § 15.247(b)(3) IC RSS-210 § A8.4	Maximum peak conducted power	KDB Publication No. 558074	N/N	See original grant
FCC § 15.247(e) IC RSS-210 § A8.2	Power spectral density	KDB Publication No. 558074	N/N	See original grant
47 CFR 15.207 RSS-Gen 7.2.4	AC power line conducted emissions	KDB Publication No. 558074 / ANSI C63.4	N/N	See original grant
FCC § 15.247(d) IC RSS-210 § A8.5	Band edge compliance	KDB Publication No. 558074	N/N	See original grant
FCC § 15.247(d) IC RSS-210 § A8.5	Conducted spurious emissions	KDB Publication No. 558074	N/N	See original grant
FCC § 15.247(d) FCC § 15.209 IC RSS-210 A8.5 IC RSS-Gen 4.9 IC RSS-Gen 7.2.5	Transmitter radiated spurious emissions	KDB Publication No. 558074 / ANSI C 63.4	PASS	
IC RSS-Gen 4.10 IC RSS-Gen 6.1	Receiver radiated spurious emissions	ANSI C 63.4	N/N	
Remarks:				

3 Test Conditions and Results

3.1 Test Conditions and Results – Transmitter radiated emissions

Transmitter radiated emissions acc. to FCC 47 CFR 15.247 / IC RSS-210				Verdict: PASS
Test according referenced standards	Reference Method			
	FCC 15.247(d) / FCC 15.209 / IC RSS-210 A8.5			
Test according to measurement reference	Reference Method			
	FCC KDB Publication No. 558074 / ANSI C63.4			
Test frequency range	Tested frequencies			
	30 MHz – 10 th Harmonic			
EUT test mode	Single			
Limits				
Frequency range [MHz]	Detector	Limit [μV/m]	Limit [dBμV/m]	Limit Distance [m]
30 – 88	Quasi-Peak	100	40	3
88 – 216	Quasi-Peak	150	43.5	3
216 – 960	Quasi-Peak	200	46	3
960 – 1000	Quasi-Peak	500	54	3
> 1000	Average	500	54	3
Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)). When average radiated emission measurements are specified, including average emission measurements below 1000 MHz, there also is a limit on the peak level of the radio frequency emissions. The limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test.				
Test setup				
				

Test Report No.: G0M-1406-3892-TFC247DT-V01

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

Test procedure								
1. EUT set to test mode (Communication tester is used if needed) 2. Span it set according to measurement range 3. Resolution bandwidth below 1 GHz is set according to CISPR 16 with peak/quasi-peak detector and RBW of 1 MHz with peak/average detector is used above 1 GHz 4. Markers are set to peak emission levels within restricted bands								
Test results – SBC-01 Antenna								
Channel	Frequency [MHz]	Emission [MHz]	Level [dBμV/m]	Detector	Pol.	Limit [dBμV/m]	Limit distance [m]*	Margin [dB]
F _{MID}	916	3664	43.16	pk	ver	74.00	3	-30.84
Test results – RA3156.03.00.00 + midmag base								
Channel	Frequency [MHz]	Emission [MHz]	Level [dBμV/m]	Detector	Pol.	Limit [dBμV/m]	Limit distance [m]*	Margin [dB]
F _{MID}	916	1336	44.01	pk	hor	74.00	3	-29.99
F _{MID}	916	5088	47.18	pk	hor	74.00	3	-26.82
Comments: * Physical distance between EUT and measurement antenna.								

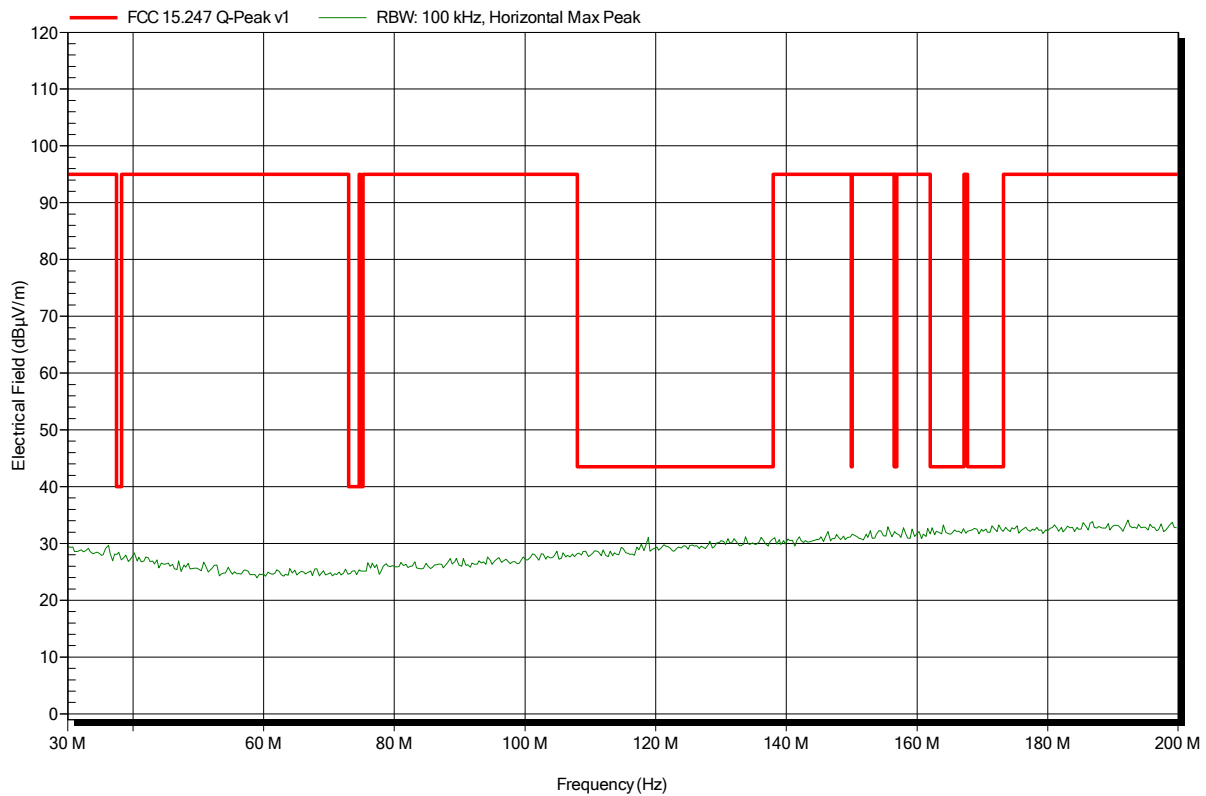
ANNEX A Transmitter radiated spurious emissions

Spurious emissions according to FCC 15.247

Project number: G0M-1408-3892

Applicant:	Kamstup A/S
EUT Name:	USB meter reader
Model:	USB meter reader
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Conditions:	Tnom: 24°C, Vnom: 5.0 V DC USB Battery pack
Antenna:	Rohde & Schwarz HK 116, Horizontal
Measurement distance:	3 m
Mode:	TX; 916 MHz, 2FSK; Ant. Procell SBC-01
Test Date:	2014-10-24
Note:	worst case

Index 32

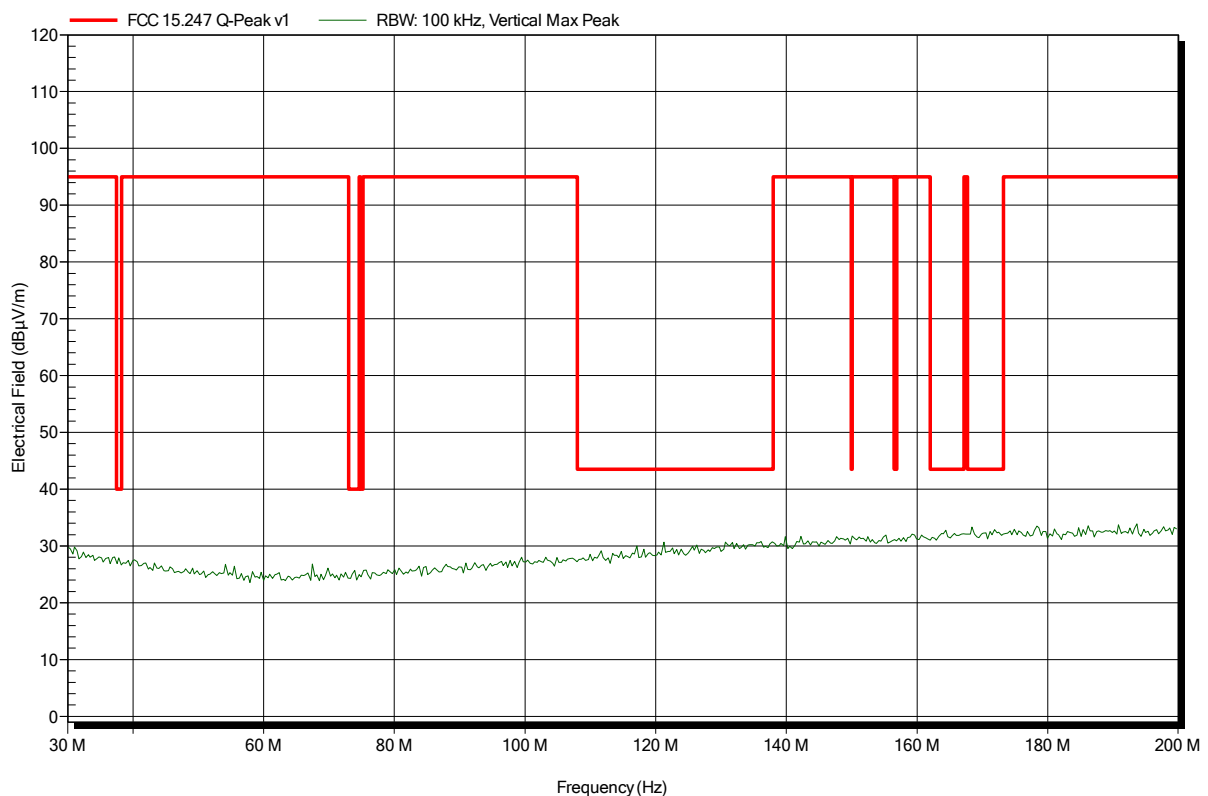


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Model:	USB meter reader
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Conditions:	Tnom: 24°C, Vnom: 5.0 V DC USB Battery pack
Antenna:	Rohde & Schwarz HK 116, Vertical
Measurement distance:	3 m
Mode:	TX; 916 MHz, 2FSK; Ant. Procell SBC-01
Test Date:	2014-10-24
Note:	worst case

Index 33

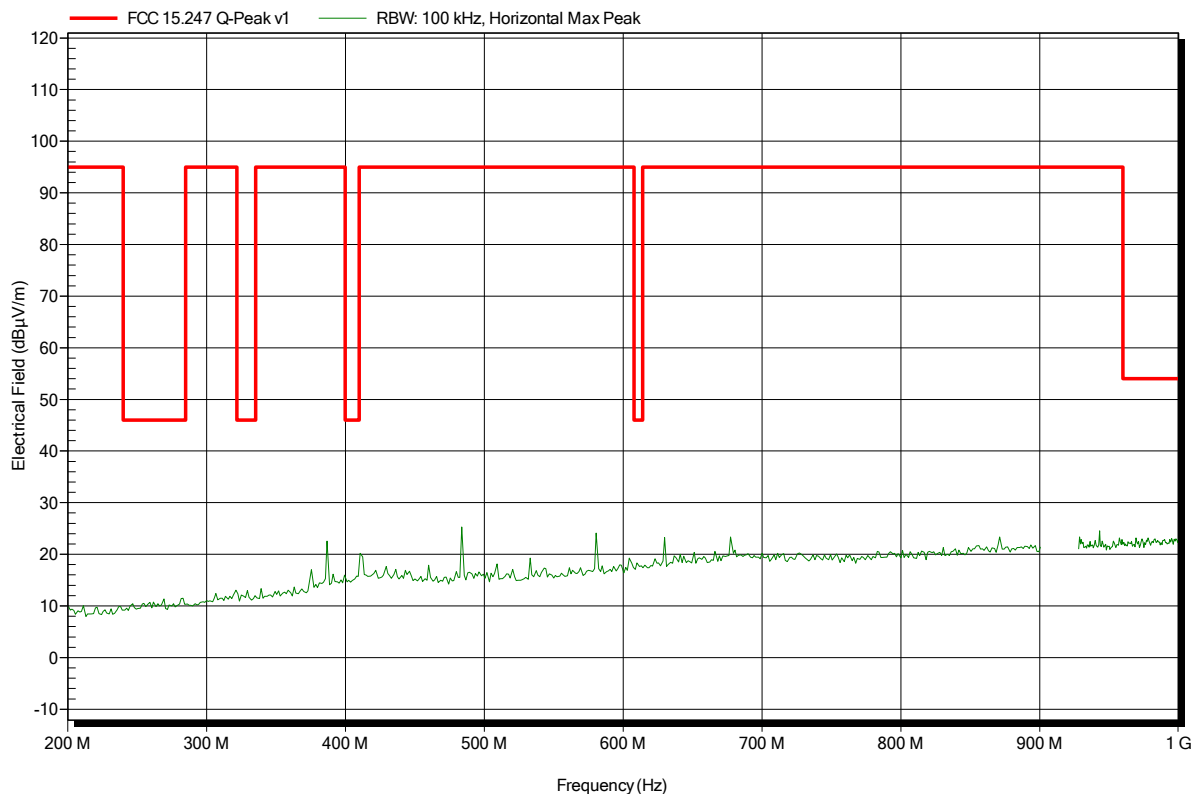


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EUT Name:	USB meter reader
Model:	USB meter reader
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Conditions:	Tnom: 24°C, Vnom: 5.0 V DC USB Battery pack
Antenna:	Rohde & Schwarz HL 223, Horizontal
Measurement distance:	3 m
Mode:	TX; 916 MHz, 2FSK; Ant. Procell SBC-01
Test Date:	2014-10-24
Note:	

Index 36

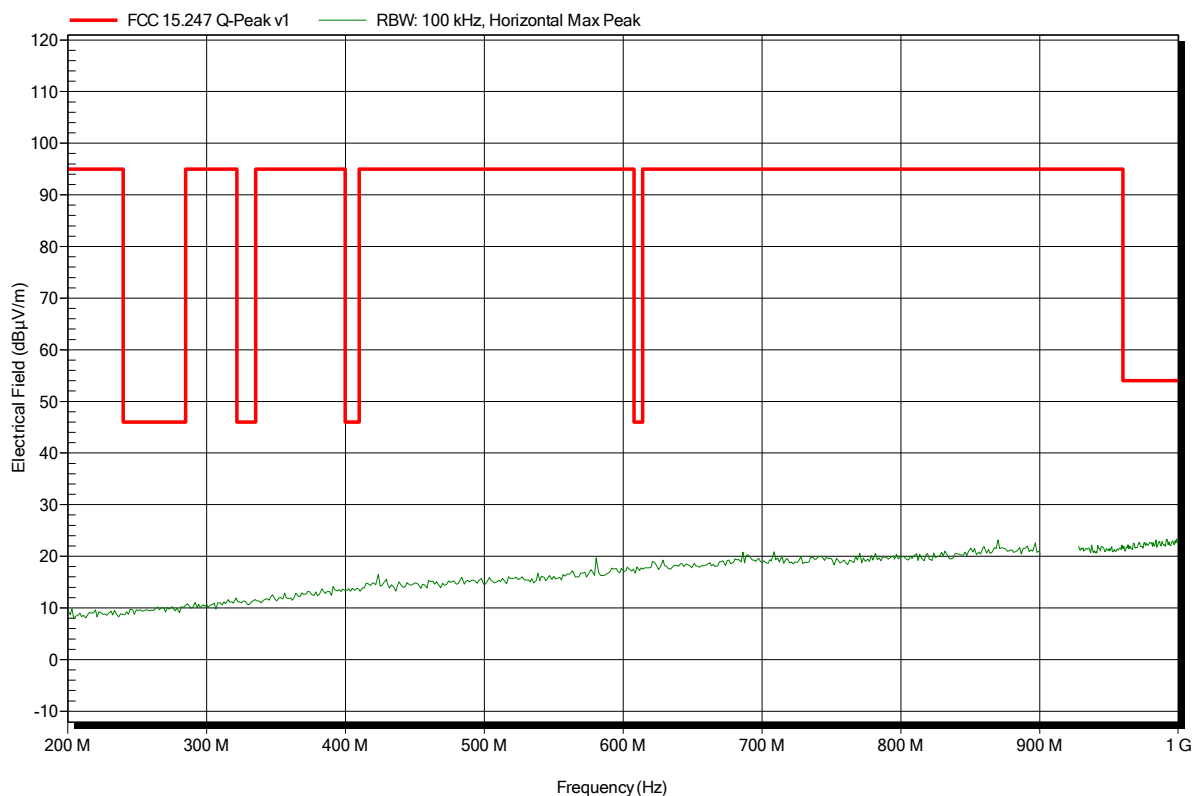


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Model:	USB meter reader
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Operator:	Mr. Treffke
Test Conditions:	Tnom: 24°C, Vnom: 5.0 V DC USB Battery pack
Antenna:	Rohde & Schwarz HL 223, Vertical
Measurement distance:	3 m
Mode:	TX; 916 MHz, 2FSK; Ant. Procell SBC-01
Test Date:	2014-10-24
Note:	

Index 31

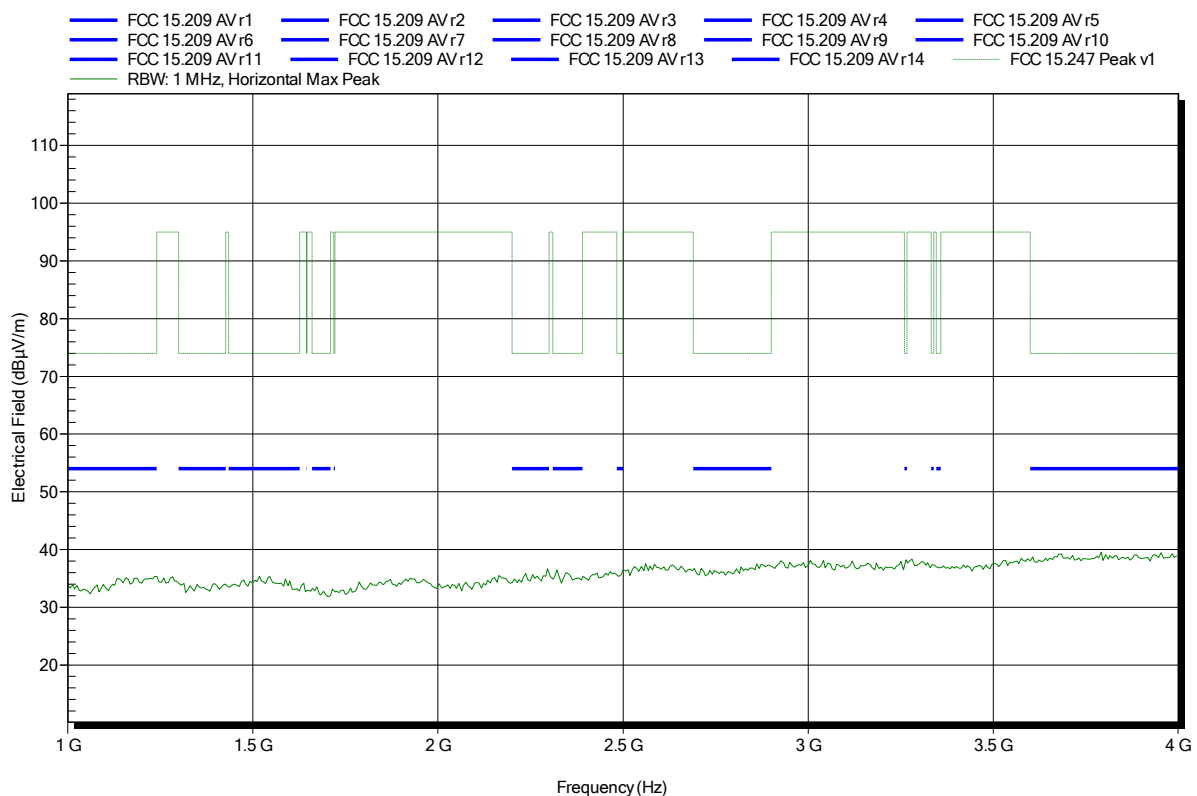


Spurious emissions according to FCC 15.247

Project number: GOM-1408-3892

Applicant: Kamstup A/S
 EUT Name: USB meter reader
 Model: USB meter reader
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Treffke
 Test Conditions: Tnom: 24°C, Vnom: 5.0 V DC USB Battery pack
 Antenna: Schwarzbeck BBHA 9120D, Horizontal
 Measurement distance: 3 m
 Mode: TX; 916 MHz, 2FSK; Ant. Procell SBC-01
 Test Date: 2014-10-24
 Note:

Index 24

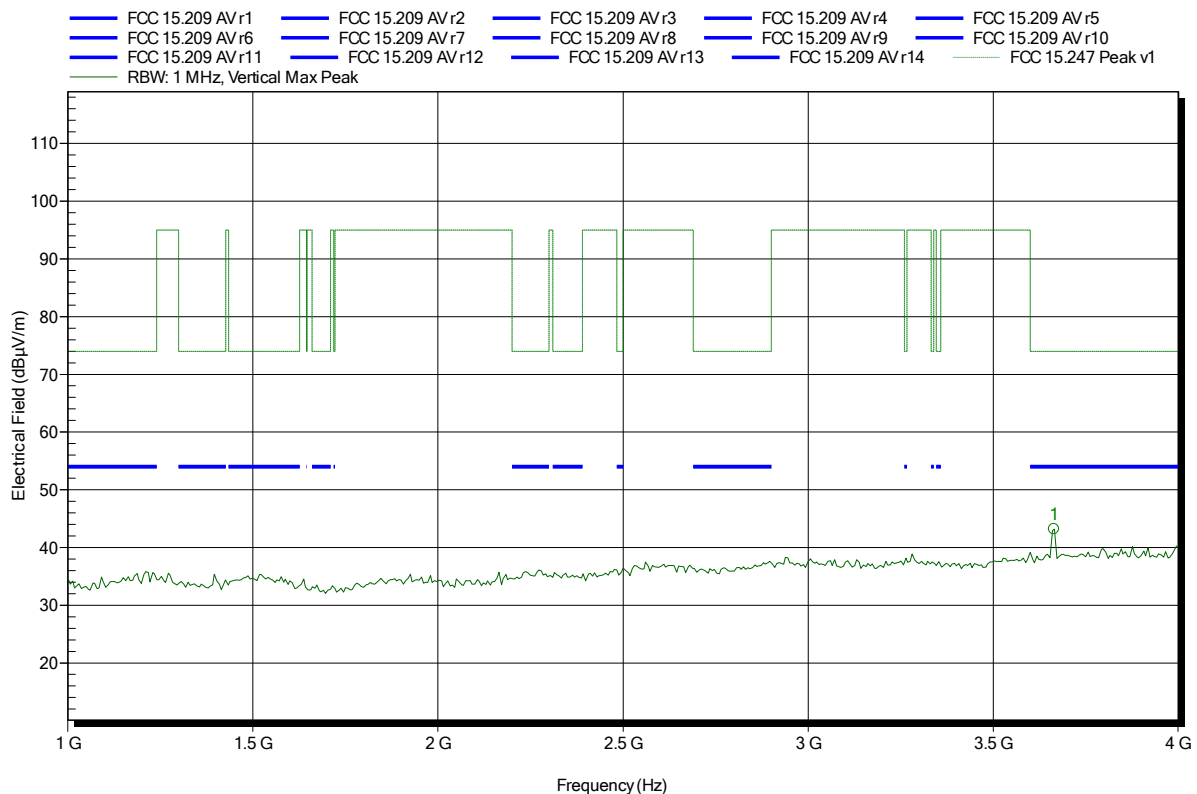


Spurious emissions according to FCC 15.247

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 EUT Name: USB meter reader
 Model: USB meter reader
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Treffke
 Test Conditions: Tnom: 24°C, Vnom: 5.0 V DC USB Battery pack
 Antenna: Schwarzbeck BBHA 9120D, Vertical
 Measurement distance: 3 m
 Mode: TX; 916 MHz, 2FSK; Ant. Procell SBC-01
 Test Date: 2014-10-24
 Note:

Index 27



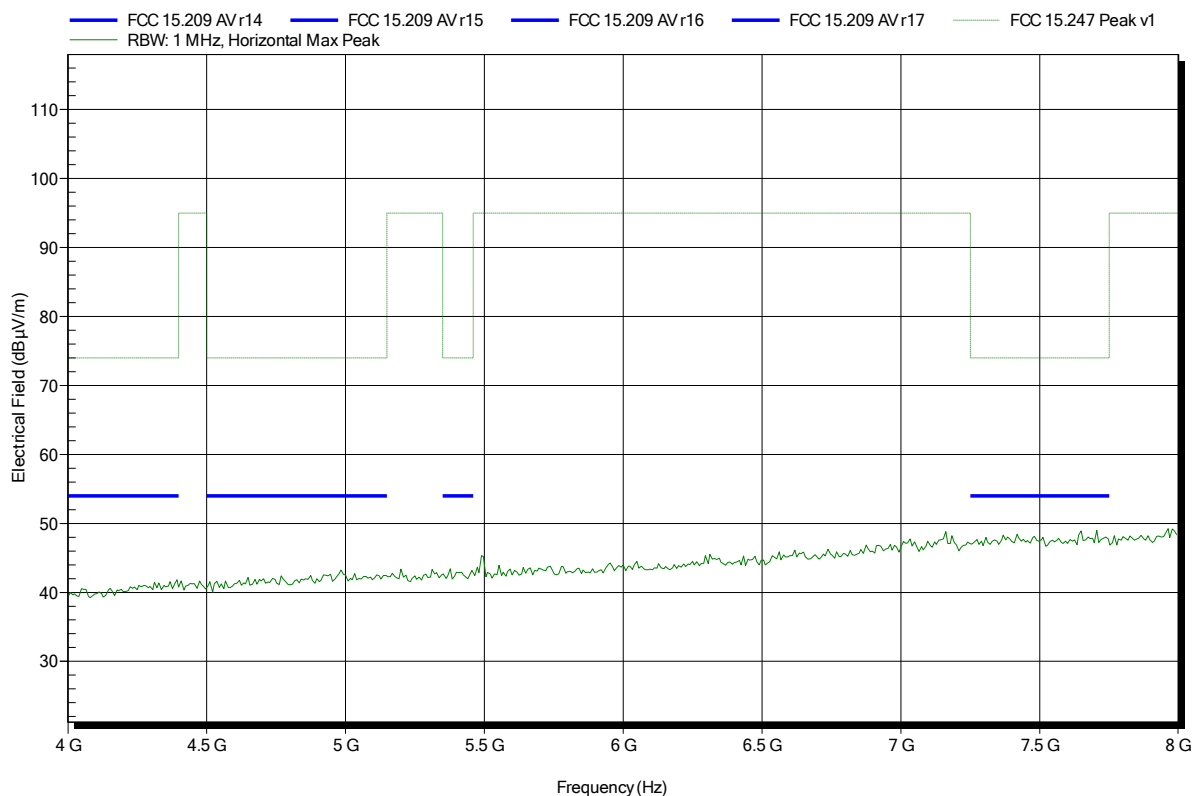
Frequency	Peak	Peak Limit	Peak Difference	Peak Status
3.664 GHz	43.16 dBµV/m	74 dBµV/m	-30.84 dB	Pass

Spurious emissions according to FCC 15.247

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 Antenna: Schwarzbeck BBHA 9120D, Horizontal
 Measurement distance: 3 m
 Mode: TX; 916 MHz, 2FSK; Ant. Procell SBC-01
 Test Date: 2014-10-24
 Note:

Index 25

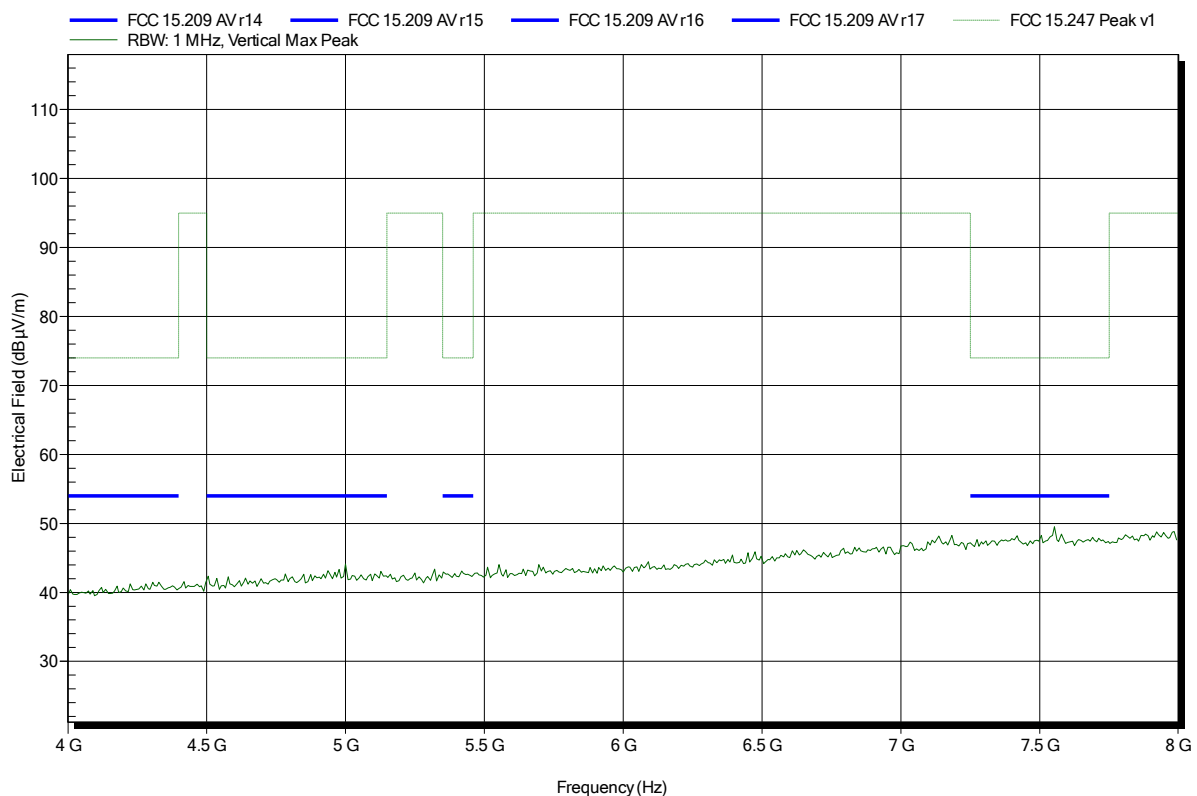


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 Antenna: Schwarzbeck BBHA 9120D, Vertical
 Measurement distance: 3 m
 Mode: TX; 916 MHz, 2FSK; Ant. Procell SBC-01
 Test Date: 2014-10-24
 Note:

Index 28

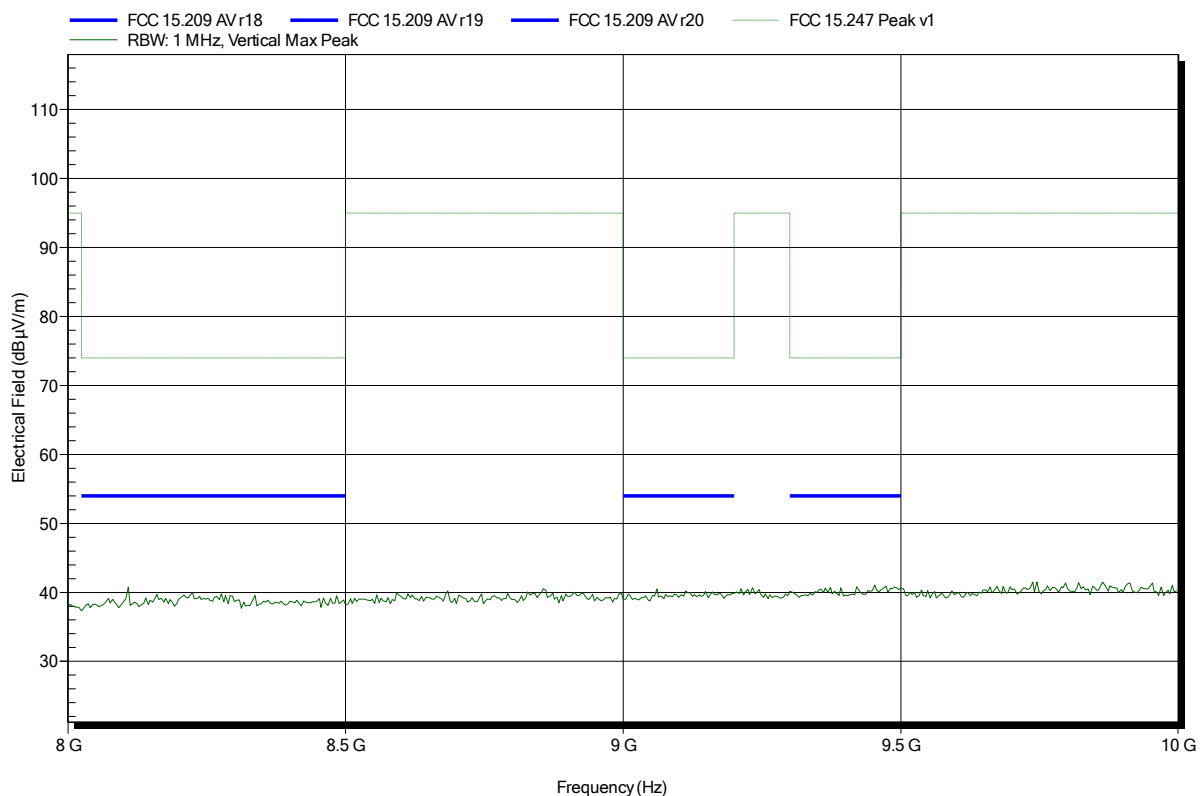


Spurious emissions according to FCC 15.247

Project number: G0M-1408-3892

Applicant: Kamstup A/S
 EUT Name: USB meter reader
 Model: USB meter reader
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Treffke
 Test Conditions: Tnom: 24°C, Vnom: 5.0 V DC USB Battery pack
 Antenna: Schwarzbeck BBHA 9120D, Vertical
 Measurement distance: 1 m converted to 3m
 Mode: TX; 916 MHz, 2FSK; Ant. Procell SBC-01
 Test Date: 2014-10-24
 Note:

Index 26

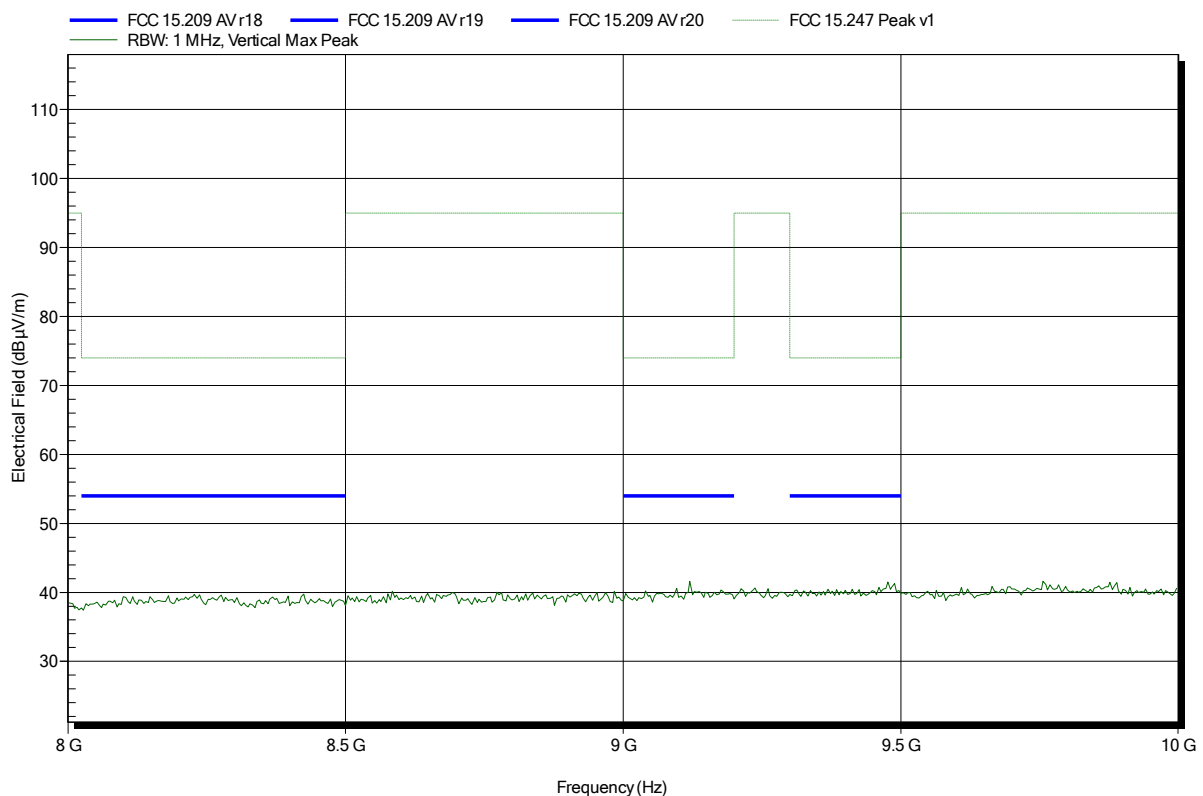


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 Antenna: Schwarzbeck BBHA 9120D, Vertical
 Measurement distance: 1 m converted to 3m
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 Note:

Index 29



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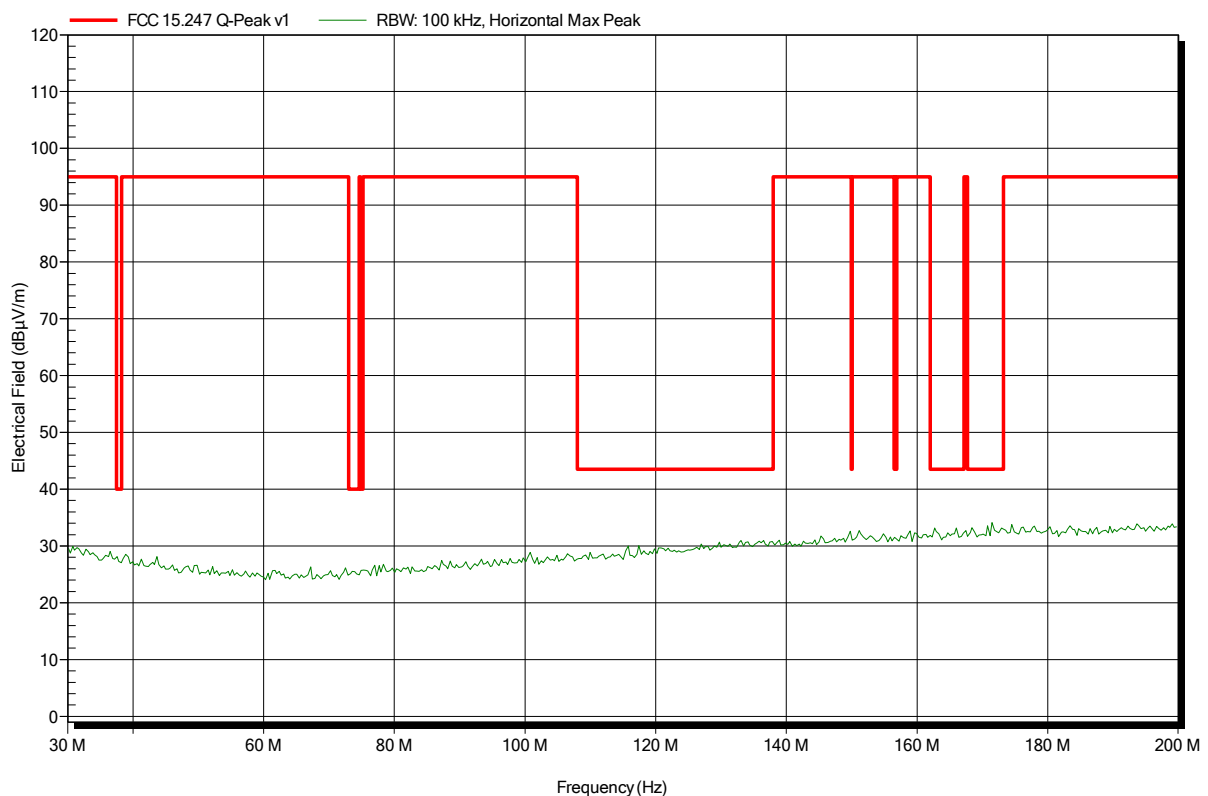
Eurofins Product Service GmbH
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Test Conditions:	Tnom: 24°C, Vnom: 5.0 V DC USB Battery pack
Antenna:	Rohde & Schwarz HK 116, Horizontal
Measurement distance:	3 m
Mode:	TX; 916 MHz, 2FSK; Smarteq RA3156.03.00.00 ant.
Test Date:	2014-10-24
Note:	worst case

Index 11

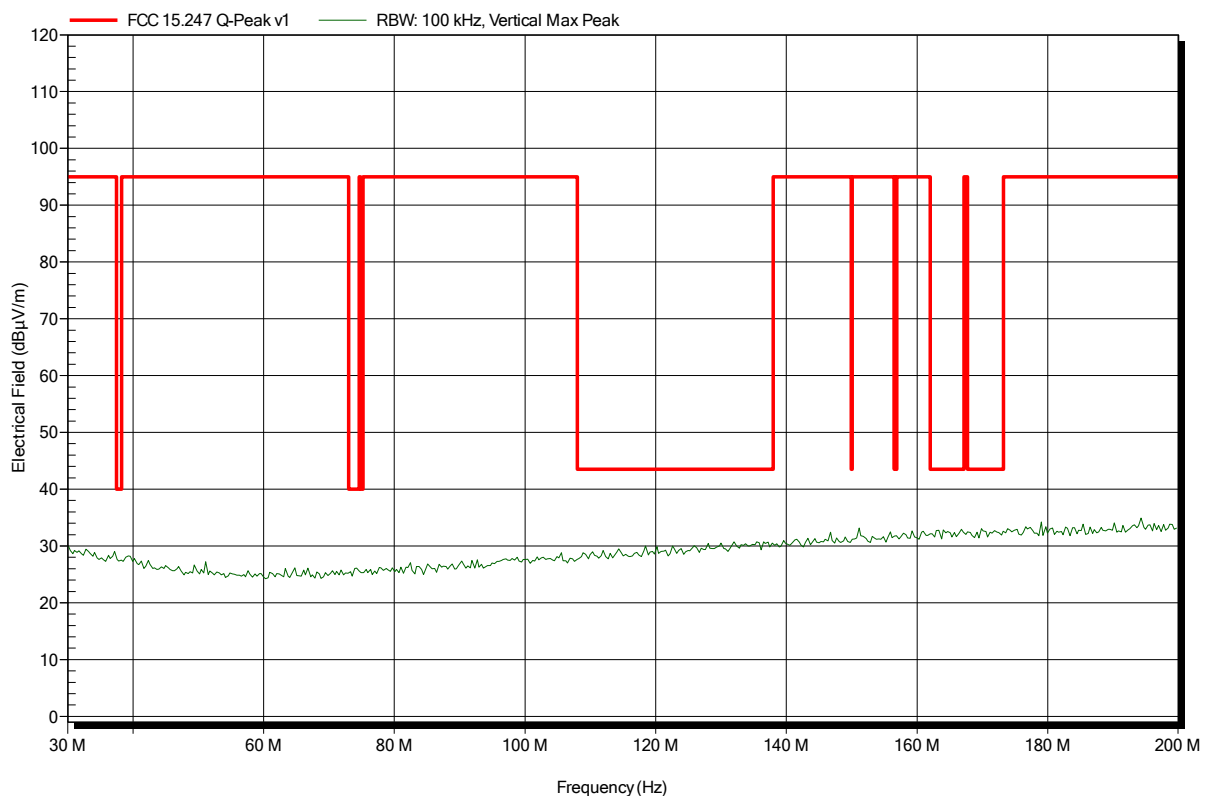


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Measurement distance:	3 m
Mode:	TX; 916 MHz, 2FSK; Smarteq RA3156.03.00.00 ant.
Test Date:	2014-10-24
Note:	worst case

Index 12

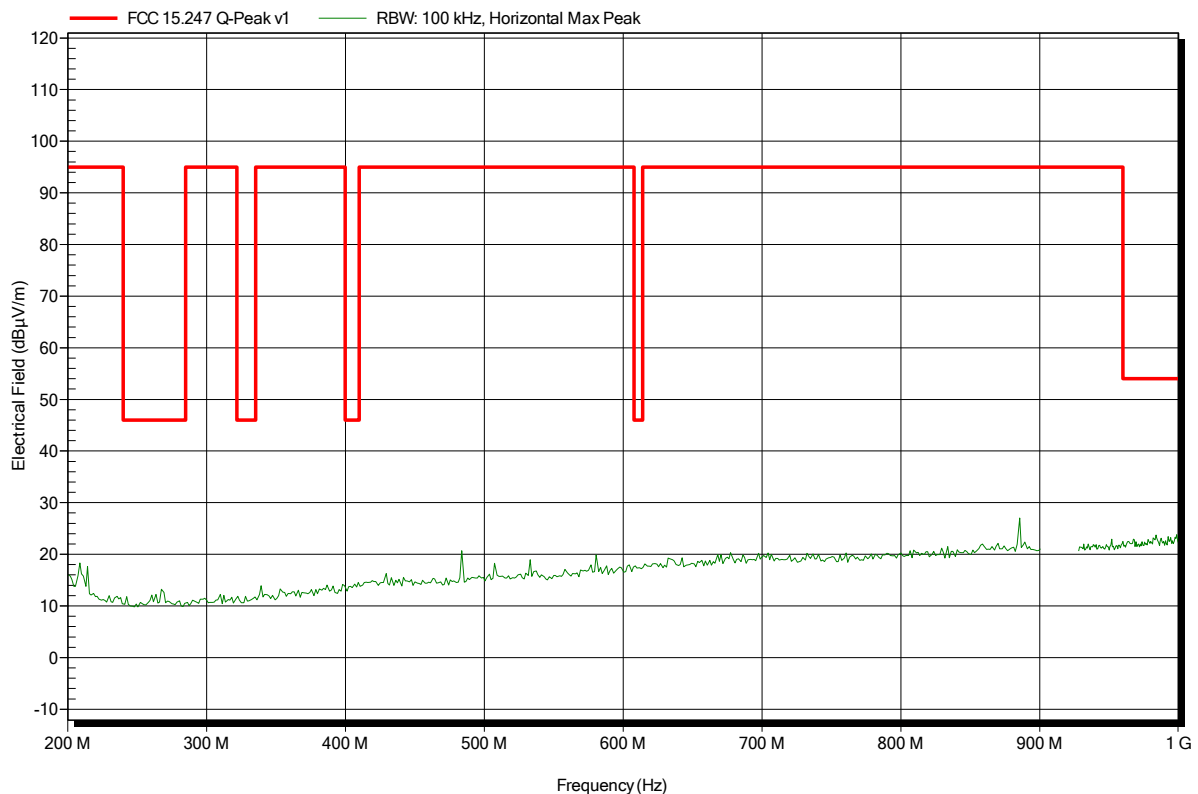


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Measurement distance:	3 m
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Test Date:	2014-10-24
Note:	

Index 7

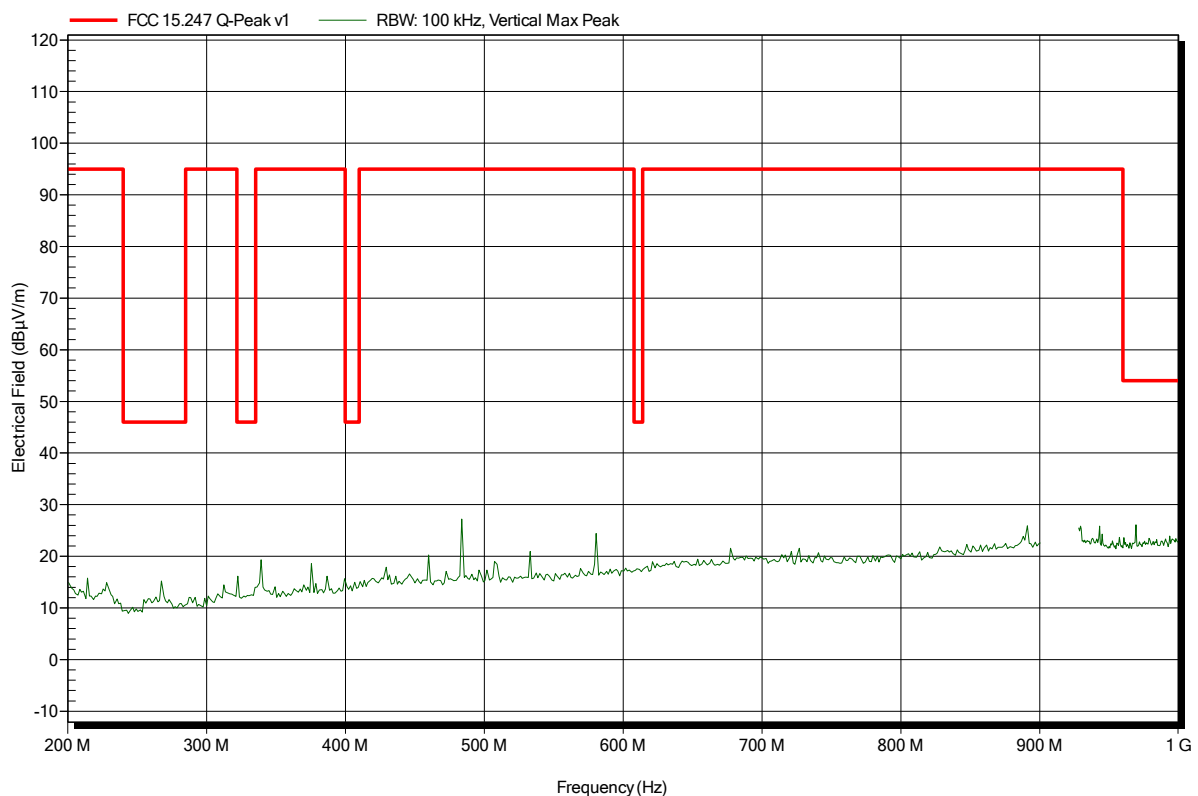


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Measurement distance:	3 m
Mode:	TX; 916 MHz, 2FSK; Smarteq RA3156.03.00.00 ant.
Test Date:	2014-10-24
Note:	

Index 9

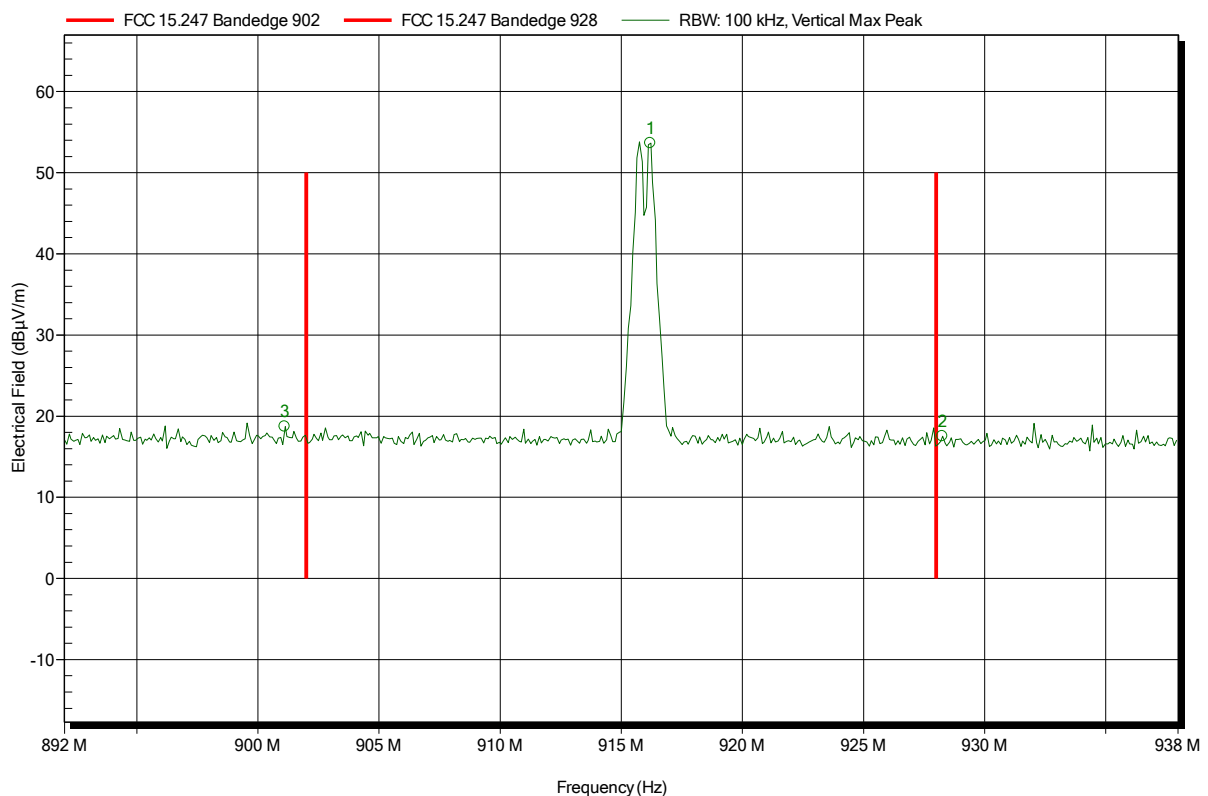


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 Antenna: Rohde & Schwarz HL 223, Vertical
 Measurement distance: 3 m
 Mode: TX; 916 MHz, 2FSK; Smarteq RA3156.03.00.00 ant.
 Test Date: 2014-10-24
 Note: Band-edge Marker-delta

Index 13



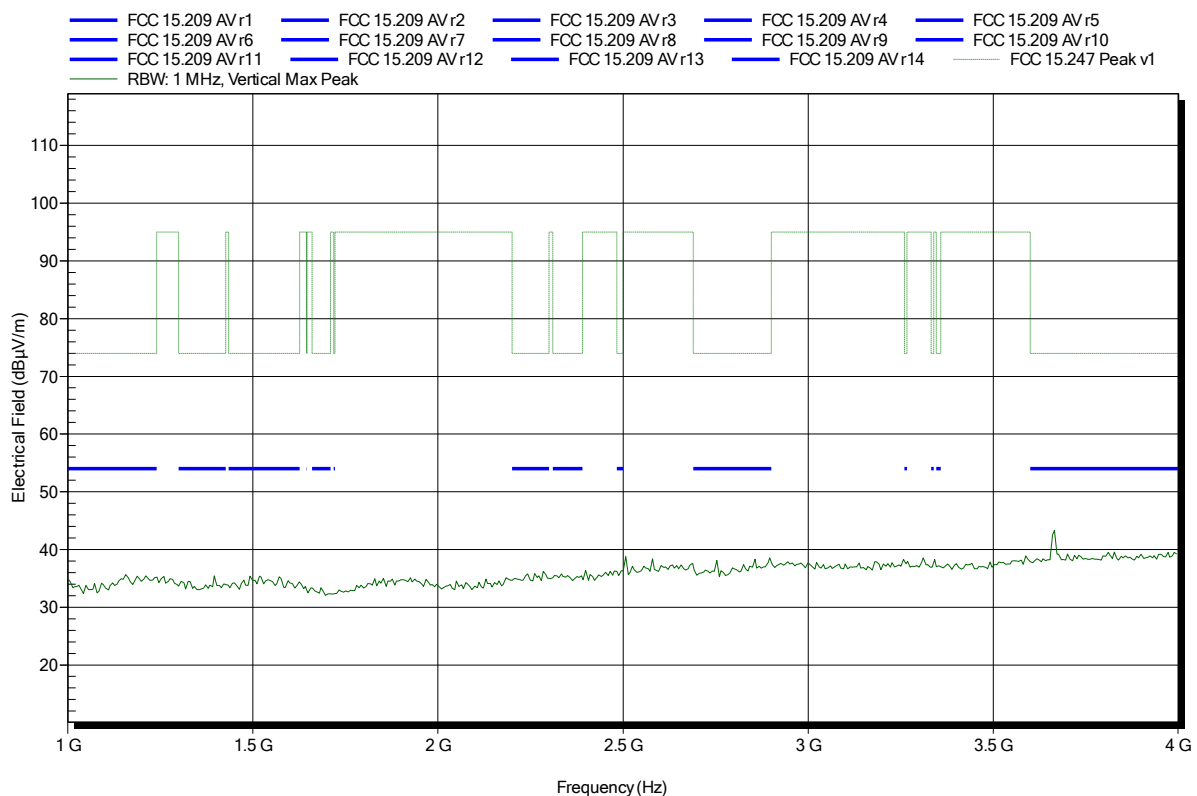
Frequency	Peak
901.108 MHz	18.71 dBµV/m
916.196 MHz	53.64 dBµV/m
928.248 MHz	17.54 dBµV/m

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 Antenna: Schwarzbeck BBHA 9120D, Vertical
 Measurement distance: 3 m
 Mode: TX; 916 MHz, 2FSK; Smarteq RA3156.03.00.00 ant.
 Test Date: 2014-10-24
 Note:

Index 17

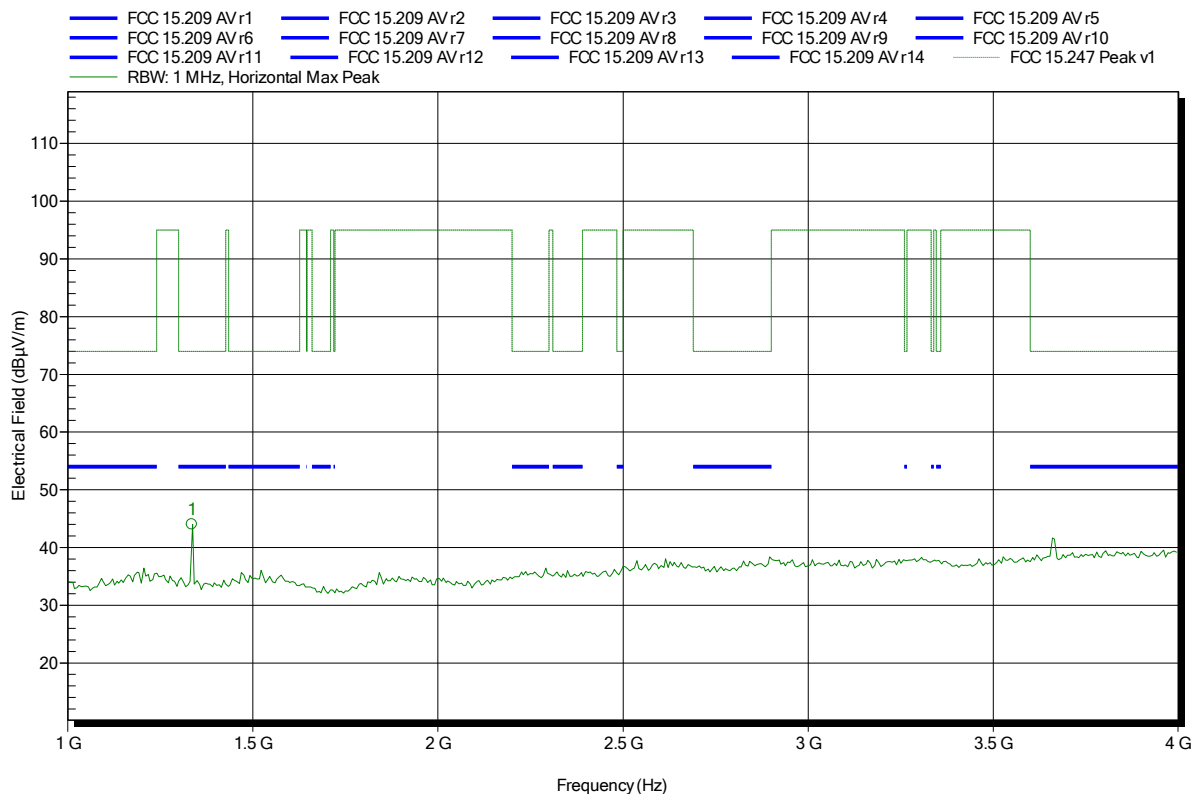


Spurious emissions according to FCC 15.247

Project number: GOM-1408-3892

Applicant: Kamstup A/S
 EUT Name: USB meter reader
 Model: USB meter reader
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Treffke
 Test Conditions: Tnom: 24°C, Vnom: 5.0 V DC USB Battery pack
 Antenna: Schwarzbeck BBHA 9120D, Horizontal
 Measurement distance: 3 m
 Mode: TX; 916 MHz, 2FSK; Smarteq RA3156.03.00.00 ant.
 Test Date: 2014-10-24
 Note:

Index 15



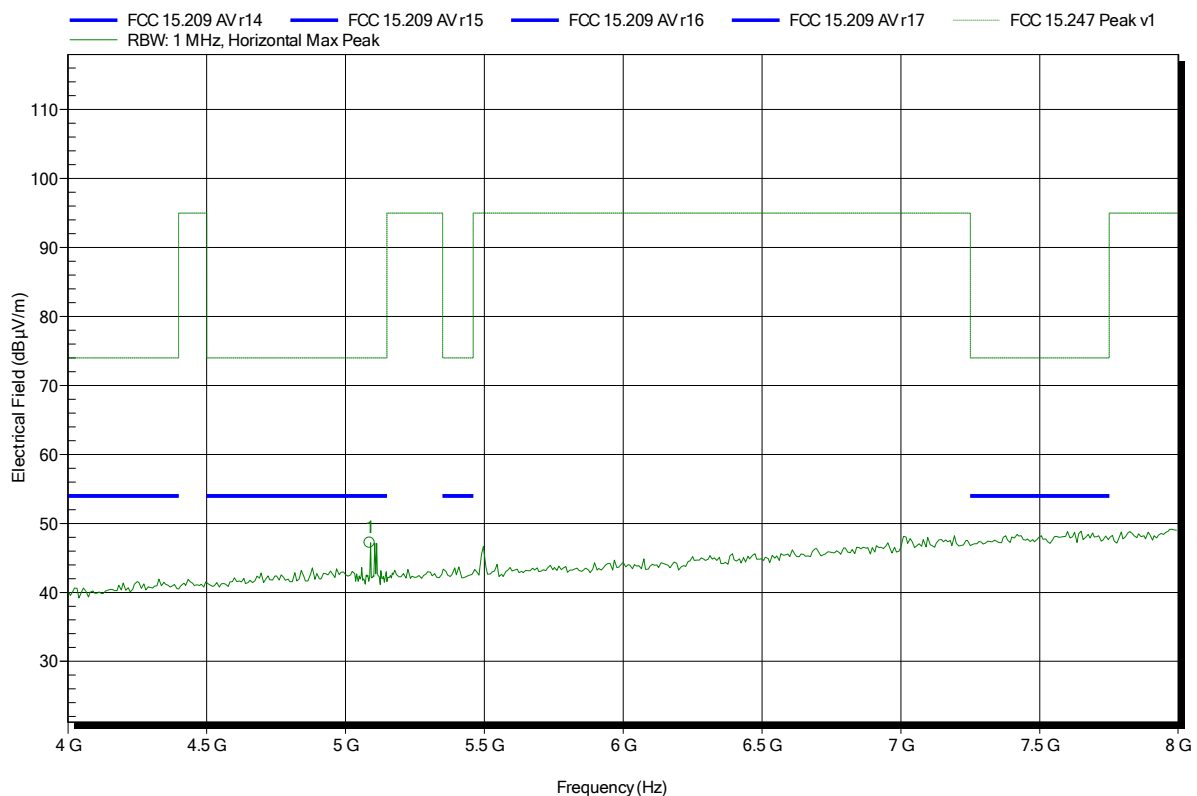
Frequency	Peak	Peak Limit	Peak Difference	Peak Status
1.336 GHz	44.01 dBµV/m	74 dBµV/m	-29.99 dB	Pass

Spurious emissions according to FCC 15.247

Project number: G0M-1408-3892

Applicant: Kamstup A/S
 EUT Name: USB meter reader
 Model: USB meter reader
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Treffke
 Test Conditions: Tnom: 24°C, Vnom: 5.0 V DC USB Battery pack
 Antenna: Schwarzbeck BBHA 9120D, Horizontal
 Measurement distance: 3 m
 Mode: TX; 916 MHz, 2FSK; Smarteq RA3156.03.00.00 ant.
 Test Date: 2014-10-24
 Note:

Index 14



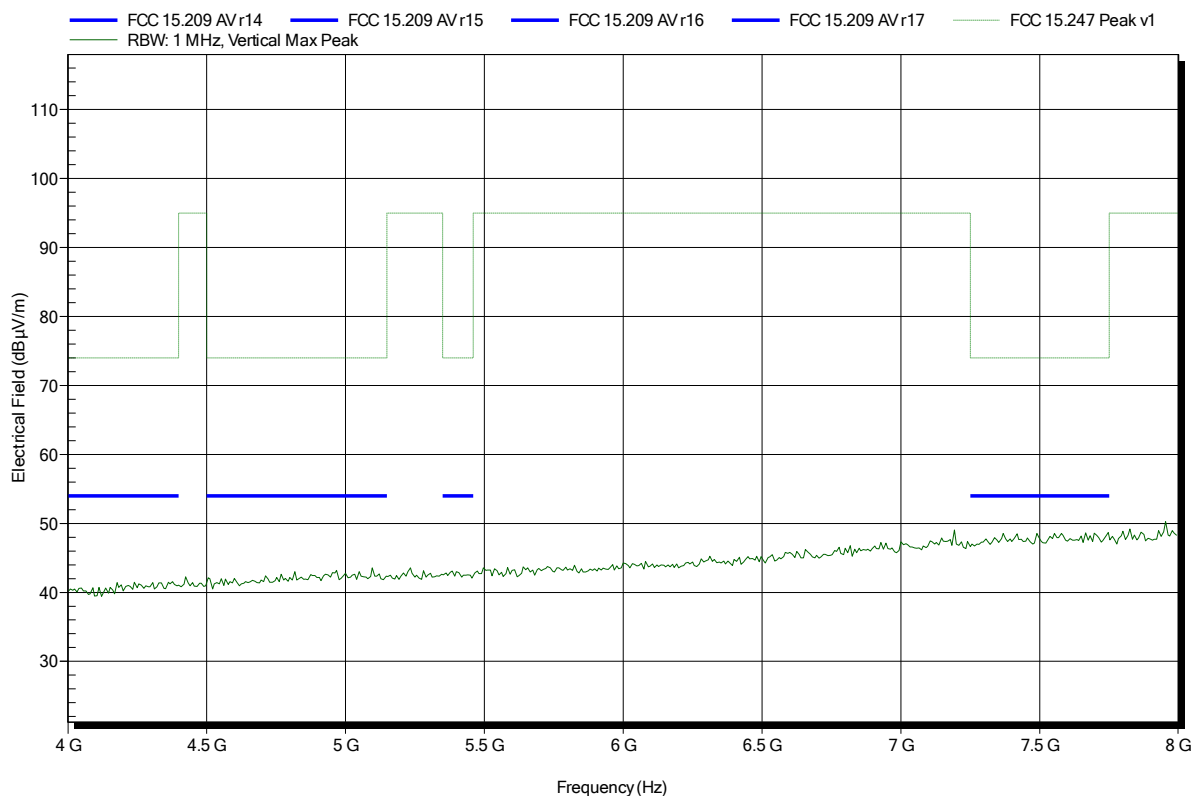
Frequency	Peak	Peak Limit	Peak Difference	Peak Status
5.088 GHz	47.18 dBµV/m	74 dBµV/m	-26.82 dB	Pass

Spurious emissions according to FCC 15.247

Project number: G0M-1408-3892

Applicant: Kamstup A/S
 EUT Name: USB meter reader
 Model: USB meter reader
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Treffke
 Test Conditions: Tnom: 24°C, Vnom: 5.0 V DC USB Battery pack
 Antenna: Schwarzbeck BBHA 9120D, Vertical
 Measurement distance: 3 m
 Mode: TX; 916 MHz, 2FSK; Smarteq RA3156.03.00.00 ant.
 Test Date: 2014-10-24
 Note:

Index 18

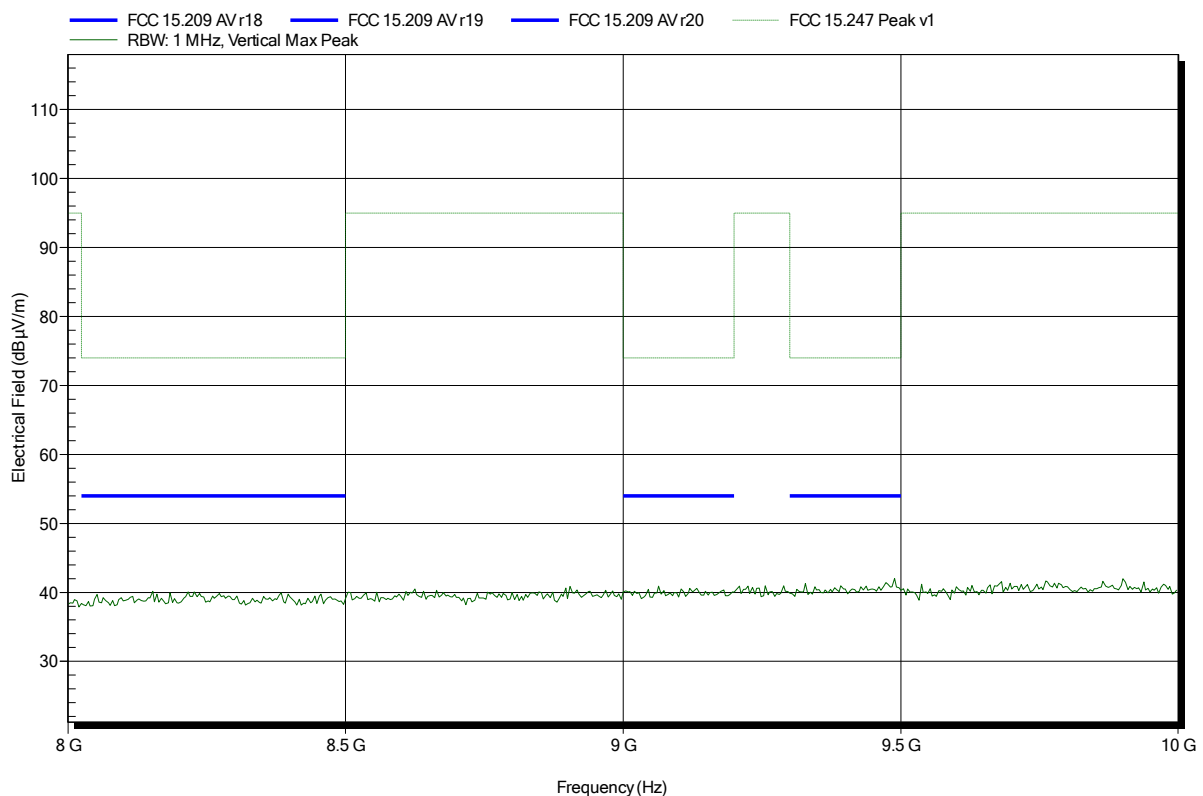


Spurious emissions according to FCC 15.247

Project number: G0M-1408-3892

Applicant: Kamstup A/S
 EUT Name: USB meter reader
 Model: USB meter reader
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Treffke
 Test Conditions: Tnom: 24°C, Vnom: 5.0 V DC USB Battery pack
 Antenna: Schwarzbeck BBHA 9120D, Vertical
 Measurement distance: 1 m converted to 3m
 Mode: TX; 916 MHz, 2FSK; Smarteq RA3156.03.00.00 ant.
 Test Date: 2014-10-24
 Note:

Index 16



Test Report No.: G0M-1406-3892-TFC247DT-V01

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

Spurious emissions according to FCC 15.247

Project number: G0M-1408-3892

Applicant: Kamstup A/S
 EUT Name: USB meter reader
 Model: USB meter reader
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Treffke
 Test Conditions: Tnom: 24°C, Vnom: 5.0 V DC USB Battery pack
 Antenna: Schwarzbeck BBHA 9120D, Vertical
 Measurement distance: 1 m converted to 3m
 Mode: TX; 916 MHz, 2FSK; Smarteq RA3156.03.00.00 ant.
 Test Date: 2014-10-24
 Note:

Index 19

