

RADIO REPORT FCC 47 CFR Part 15C ISED Canada RSS-247 Digital transmission systems operating within the 902 - 928 MHz band	
Report Reference No	G0M-1904-8182-TFC247DT-V01
Testing Laboratory	Eurofins Product Service GmbH
Address	Storkower Str. 38c 15526 Reichenwalde Germany
Accreditation	    DAkkS - Registration number : D-PL-12092-01-03 (ISED) ISED Testing Laboratory site: 3470A-2 DAkkS - Registration number : D-PL-12092-01-04 (FCC) FCC Filed Test Laboratory, Reg.-No.: 96970
Applicant	Kamstrup A/S
Address	Industrivej 28 8660 Skanderborg DENMARK
Test Specification	According to FCC/ISED rules
Standard	47 CFR Part 15C RSS-247, Issue 2, 2017-02 RSS-Gen, Issue 5, Amendment 1, 2019-03
Non-Standard Test Method	None
Equipment under Test (EUT):	
Product Description	KWM2210 02K14xxxxxxx / Ultrasonic water meter * see Additional Comments
Model(s)	flowIQ® 2200
Additional Model(s)	None
Brand Name(s)	flowIQ® 2200
Hardware Version(s)	5550 1810D1 (top pcb) + 55501811 D1 (bottom pcb) + 5550 1350 A7 (Antenna)
Software Version(s)	50981547 E1 (fw top pcb) / 55141875 (flash top pcb)/55141876 eeprom file (top pcb) / 50981537 D1 (bottom pcb)
FCC-ID	OUY-KWM2210
IC	N/A
Test Result	PASSED

Test Report No.: G0M-1904-8182-TFC247DT-V01

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

Possible test case verdicts:		
required by standard but not tested	N/T	
not required by standard	N/R	
not applicable to EUT	N/A	
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	2019-05-13	
Report:		
Compiled by	Wilfried Treffke	
Tested by (+ signature) (Responsible for Test)	Wilfried Treffke	
Approved by (+ signature) (Deputy Head of Lab)	Toralf Jahn	
Date of Issue	2019-05-24	
Total number of pages	65	
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:		
type nummer for flowIQ®2200 , prefix : KWM2210 typenr 02K14XXXXXXX where * 02 : generic for flowIQ® 2200 • K : 1-part body, PPS housing • 14 : Wireless m-bus - 915MHz (1 way wireless communication) • X : battery type • X : dynamic range • XX : meter size • X : Meter type (hot/cold water) • XX : country code So the radio board electronic and setting is defined by the code "14" while the x corresponds to ordering details		

Test Report No.: G0M-1904-8182-TFC247DT-V01

VERSION HISTORY

Version History			
Version	Issue Date	Remarks	Revised By
01	2019-05-24	Initial Release	

ABBREVIATIONS AND ACRONYMS

Acronyms	
Acronym	Description
EUT	Equipment Under Test
FCC	Federal Communications Commission
ISED	Innovation, Science and Economic Development Canada
RBW	Resolution bandwidth
RMS	Root mean square
VBW	Video bandwidth
V _{NOM}	Nominal supply voltage

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1 Equipment (Test Item) Under Test

Description	KWM2210 02K14xxxxxxx / Ultrasonic water meter	
Model	flowIQ® 2200	
Additional Model(s)	None	
Brand Name(s)	flowIQ® 2200	
Serial Number(s)	KAW10000091/00	
Hardware Version(s)	5550 1810D1 (top pcb) + 55501811 D1 (bottom pcb) + 5550 1350 A7 (Antenna)	
Software Version(s)	50981547 E1 (fw top pcb) / 55141875 (flash top pcb)/55141876 eeprom file (top pcb) / 50981537 D1 (bottom pcb)	
PMN	N/A	
HVIN	N/A	
FVIN	N/A	
HMN	N/A	
FCC-ID	OUY-KWM2210	
IC	N/A	
Equipment type	End Product	
Radio type	Transceiver	
Assigned frequency bands	902.0 - 928.0 MHz	
Radio technology	Digital Modulation	
Modulation	2-FSK	
Number of antenna ports	1	
Antenna	Type	Integrated
	Model	5550 1350 A7
	Manufacturer	Kamstrup
	Gain	-1.3 dBi (customer declaration)
Supply Voltage	V _{NOM}	3.6 VDC
Operating Temperature	T _{NOM}	25 °C
AC/DC-Adaptor	Model	None
	Vendor	None
	Input	None
	Output	None
Manufacturer	Kamstrup A/S Industrivej 28 8660 Skanderborg DENMARK	

1.4 Support Equipment

Product Type	Device	Manufacturer	Model	Comment
AE	Kamstrup optical eye reader	Kamstrup	Kamstrup optical eye reader	Test controlled over optical eye reader
Description:				
AE	Auxiliary Equipment			
SIM	Simulator			
CBL	Connecting Cable			
SFT	Software			
Comment:				

1.5 Test mode duty cycle

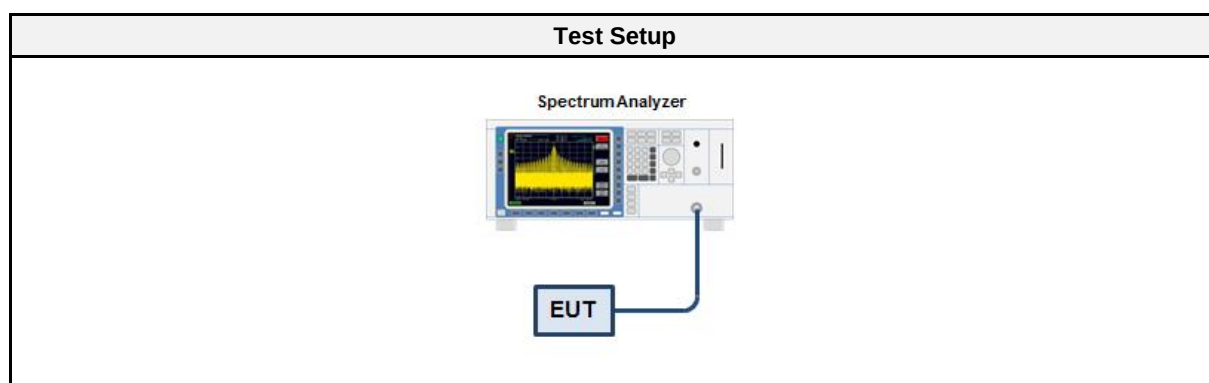
1.5.1 Information

Test Information	
Measurement Method	ANSI C63.10 11.6

1.5.2 Requirements

Requirements	
Duty cycle	Duty cycle correction
$\geq 98 \%$	No correction required
$< 98 \%$	Correction required ($10 \times \log_{10}(1/DC)$)

1.5.3 Setup



1.5.4 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyzer	R&S	FSU 26	EF01407	2018-12	2019-12

1.5.5 Procedure

Test Procedure
1. EUT set to test mode 2. Span is set to zero span 3. Detector set to peak 4. Sweep time is set long enough to capture at least 5 bursts 5. Envelope peak value of emission spectrum is selected 6. The maximum burst duration T_{ON} is measured using two markers set to the start and the end of the longest burst 7. The minimum idle duration T_{OFF} is measured using two markers set to the start and the end of the shortest idle period 8. The duty cycle is calculated by $DC = T_{ON} / (T_{ON} + T_{OFF})$ 9. The duty cycle correction is calculated by $DC = 10 \times \log_{10}(T_{ON} / (T_{ON} + T_{OFF}))$

1.5.6 Results

Duty Cycle Results		
Mode	Duty Cycle	Correction Factor [dB]
Transmit	100	0

1.6 Test Modes

Mode	Description
Transmit	Mode = Transmit Modulation = 2-FSK Max power (power key 63) Duty cycle = 100 %
Tx idle mode	Mode = idle mode
Comment:	

1.7 Test Frequencies

Designator	Mode	Channel	Frequency [MHz]
F1	Tx	1	912.5
F2	Tx	2	915.0
F3	Tx	3	918.5

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:

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

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:

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

2 Result Summary

FCC 47 CFR Part 15C, ISED RSS-247				
Product Standard Reference	Requirement	Reference Method	Result	Remarks
ISED RSS-Gen, Issue 5 (section 6.6)	Occupied Bandwidth	ANSI C63.10-2013	N/R	Informational only
FCC § 15.247(a)(2) ISED RSS-247, Issue 2 (section 5.2)	6 dB Bandwidth	ANSI C63.10-2013	PASS	
FCC § 15.247(b)(1) ISED RSS-247, Issue 2 (section 5.4)	Maximum peak conducted power	ANSI C63.10-2013	PASS	
FCC § 15.247(e) ISED RSS-247, Issue 2 (section 5.2)	Power spectral density	ANSI C63.10-2013	PASS	
FCC § 15.207 ISED RSS-247, Issue 2 (section 3.1)	AC power line conducted emissions	ANSI C63.10-2013	PASS	
FCC § 15.247(d) ISED RSS-247, Issue 2 (section 5.5)	Band edge compliance	ANSI C63.10-2013	PASS	
FCC § 15.247(d) ISED RSS-247, Issue 2 (section 5.5)	Conducted spurious emissions	ANSI C63.10-2013	PASS	
FCC § 15.247(d) FCC § 15.209 ISED RSS-Gen, Issue 5 (section 6.13)	Transmitter radiated spurious emissions	ANSI C63.10-2013	PASS	
ISED RSS-247, Issue 2 (section 3.1)	Receiver radiated spurious emissions	ANSI C63.10-2013	N/R	No receiver part inside the EUT
Comment:				

Possible Test Case Verdicts	
PASS	Test object does meet the requirements
FAIL	Test object does not meet the requirements
N/T	Required by standard but not tested
N/R	Not required by standard for the test object

3 Test Conditions and Results

3.1 Test Conditions and Results - Occupied bandwidth

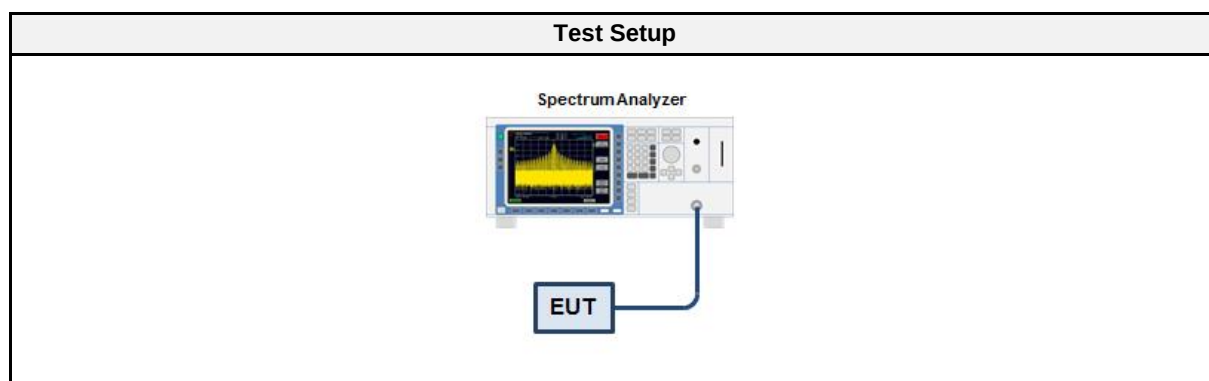
3.1.1 Information

Test Information	
Reference	ISED RSS-Gen, Issue 5 (section 6.6)
Measurement Method	ANSI C63.10 6.9.3
Operator	Wilfried Treffke
Date	2019-05-13

3.1.2 Limits

Limits
None (Informational only)

3.1.3 Setup



3.1.4 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyzer	R&S	FSU 26	EF01407	2018-12	2019-12

3.1.5 Procedure

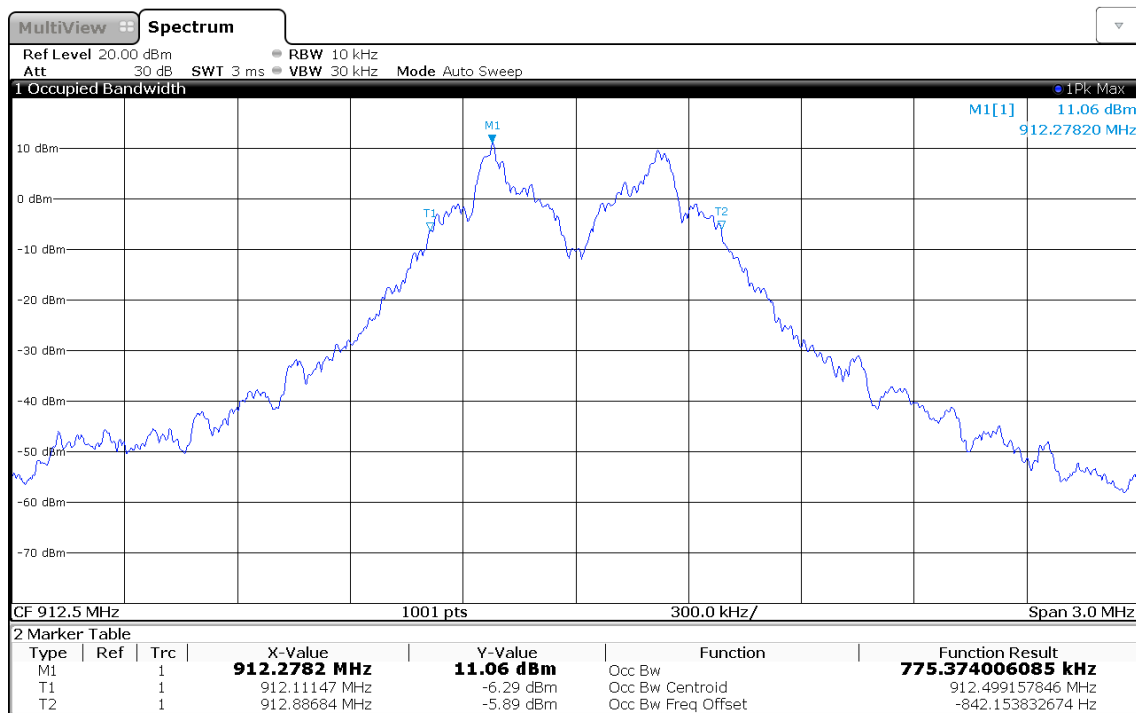
Test Procedure
1. EUT transmitter is activated in test mode under normal conditions 2. The spectrum analyzer is set to peak detection and maximum hold with a span twice the emission spectrum 3. The resolution bandwidth is set to the range of 1 % to 5 % of the occupied bandwidth 4. The occupied bandwidth is measured with the build-in analyzer function

3.1.6 Results

Test Results		
Mode	Frequency [MHz]	Bandwidth [MHz]
Transmit	912.5	0.775
Transmit	918.5	0.775

Occupied Bandwidth

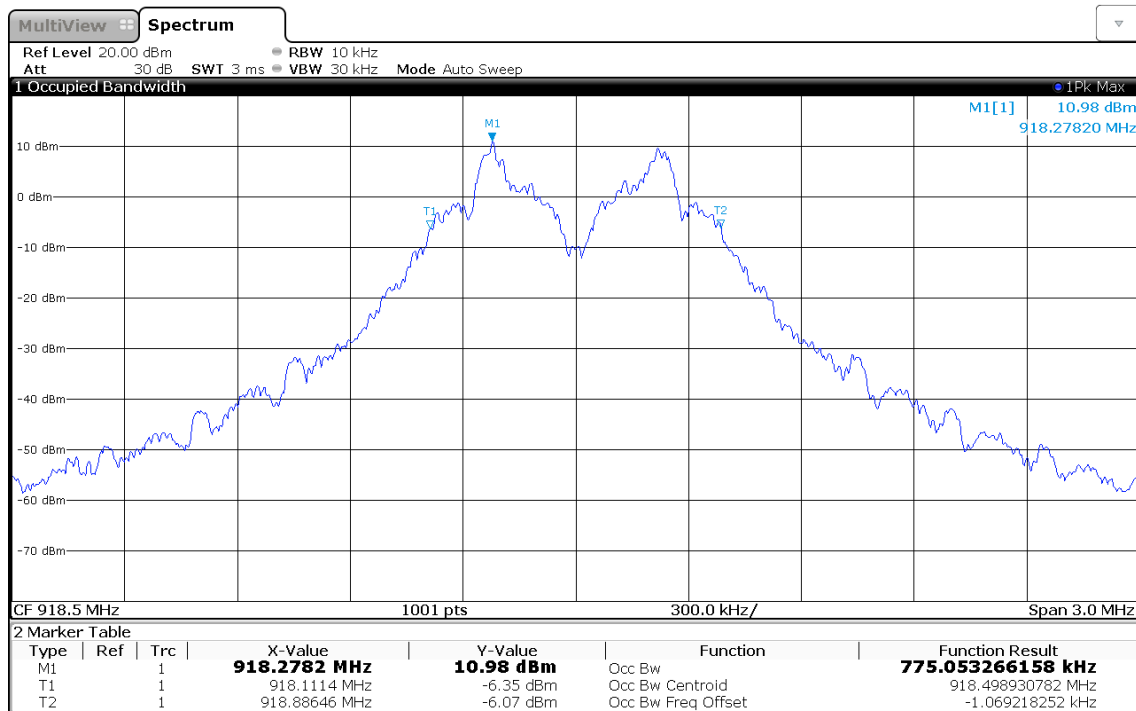
Project Number: G0M-1904-8182
 Applicant: Kamstrup A/S
 Model Description: KWM2210 02K14xxxxxxx / Ultrasonic water meter
 Model: flowIQ® 2200
 Test Sample ID: 24019
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 6.9.3
 Operational Mode: 2-FSK, Channel: 912.5 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2019-05-13
 Occupied Bandwidth [MHz]: 0.775



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Occupied Bandwidth

Project Number: G0M-1904-8182
 Applicant: Kamstrup A/S
 Model Description: KWM2210 02K14xxxxxxx / Ultrasonic water meter
 Model: flowIQ® 2200
 Test Sample ID: 24019
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 6.9.3
 Operational Mode: 2-FSK, Channel: 918.5 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2019-05-13
 Occupied Bandwidth [MHz]: 0.775



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3.2 Test Conditions and Results - 6 dB bandwidth

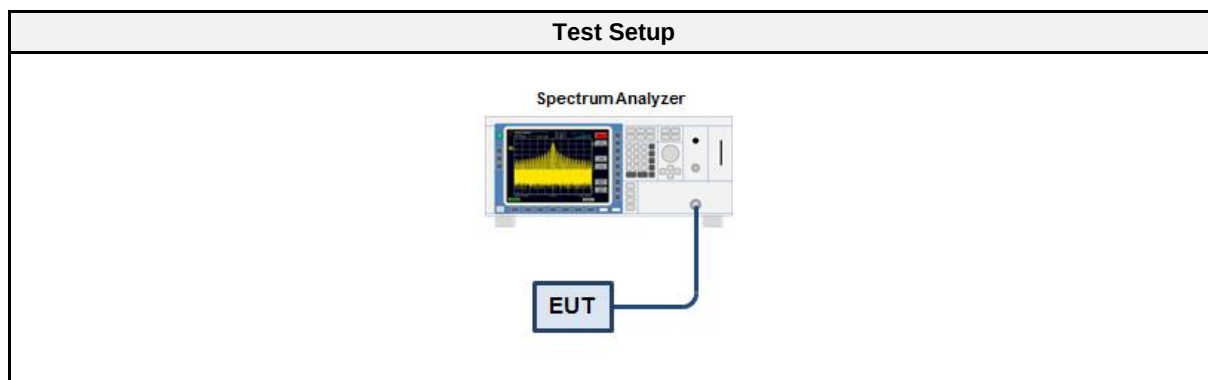
3.2.1 Information

Test Information	
Reference	FCC § 15.247(a)(2); ISED RSS-247, Issue 2 (section 5.2)
Measurement Method	ANSI C63.10 11.8
Operator	Wilfried Treffke
Date	2019-05-13

3.2.2 Limits

Limits
≥ 500kHz

3.2.3 Setup



3.2.4 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyzer	R&S	FSU 26	EF01407	2018-12	2019-12

3.2.5 Procedure

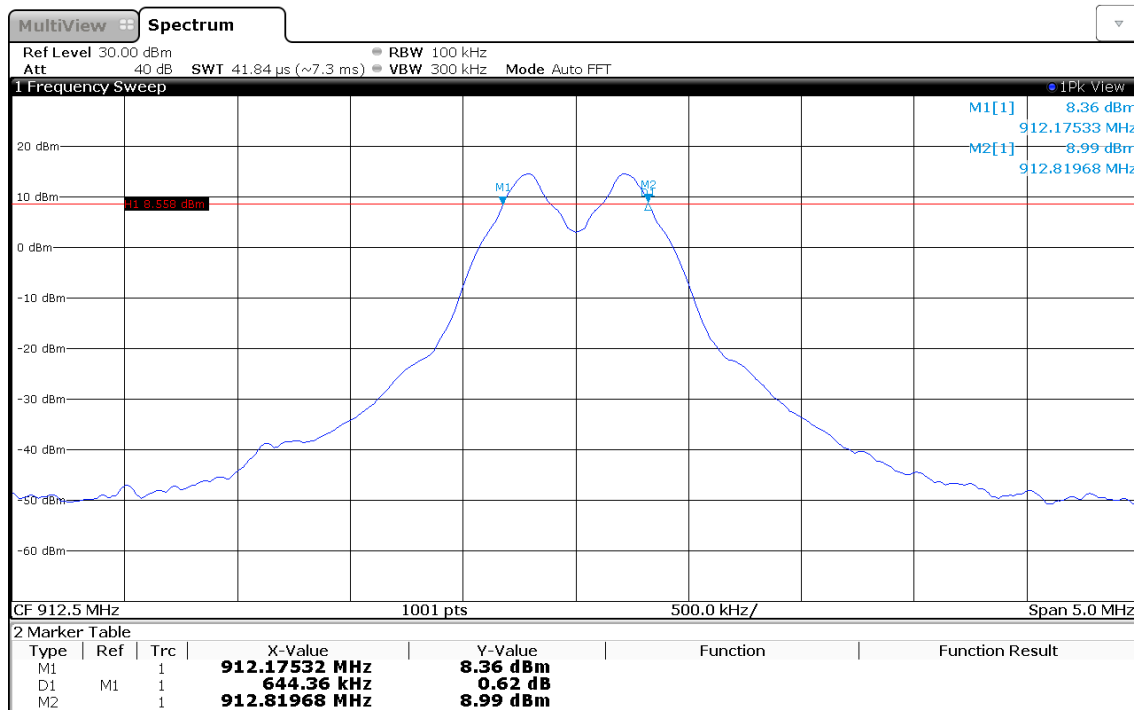
Test Procedure
1. EUT set to test mode 2. Span set to at least twice the emission spectrum 3. Detector set to peak and max hold and RBW is set to 100 kHz 4. Envelope peak value of emission spectrum is selected 5. Marker on envelope of spectrum is set to level of -6 dB to the left of the peak 6. Marker on envelope of spectrum is set to level of -6 dB to the right of the peak 7. 6 dB Bandwidth is determined by marker frequency separation

3.2.6 Results

Test Results				
Mode	Frequency [MHz]	Bandwidth [kHz]	Limit [kHz]	Verdict
Transmit	912.5	644	500	Pass
Transmit	918.5	644	500	Pass

DTS (6 dB) Bandwidth

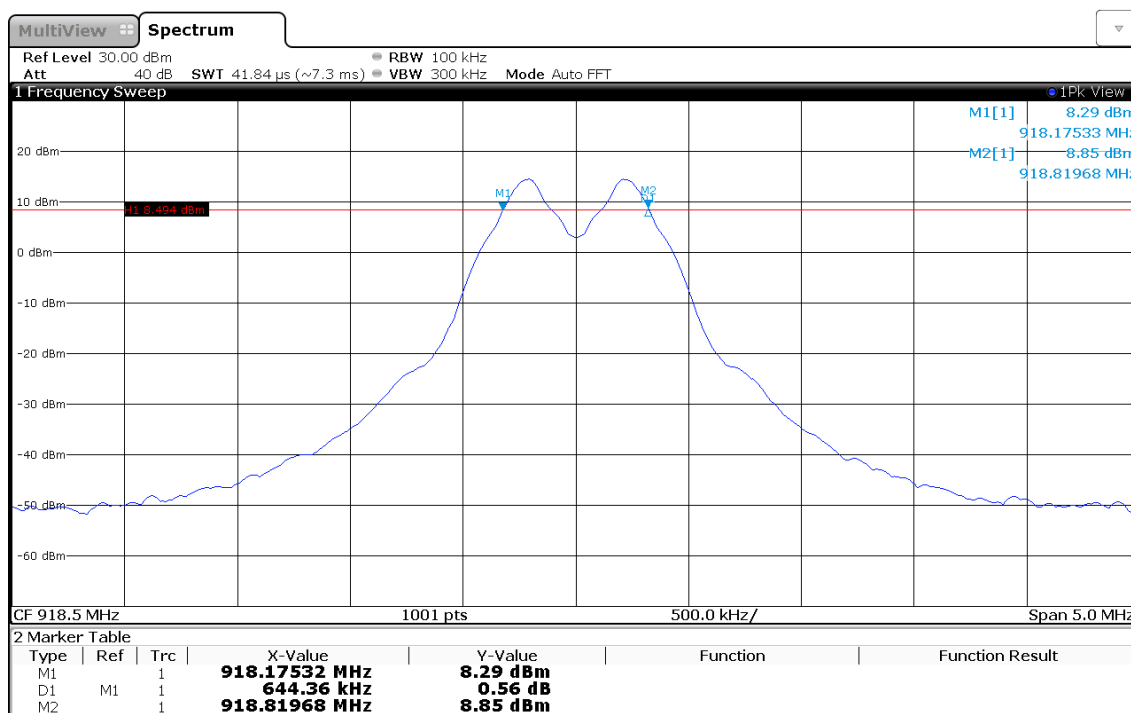
Project Number: G0M-1904-8182
 Applicant: Kamstrup A/S
 Model Description: KWM2210 02K14xxxxxxx / Ultrasonic water meter
 Model: flowIQ® 2200
 Test Sample ID: 24019
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.8.1 Option 1
 Operational Mode: 2-FSK, Channel: 912.5 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2019-05-13
 Lower Frequency [MHz]: 912.175
 Upper Frequency [MHz]: 912.820
 6 dB Bandwidth [kHz]: 644



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DTS (6 dB) Bandwidth

Project Number: G0M-1904-8182
 Applicant: Kamstrup A/S
 Model Description: KWM2210 02K14xxxxxxx / Ultrasonic water meter
 Model: flowIQ® 2200
 Test Sample ID: 24019
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.8.1 Option 1
 Operational Mode: 2-FSK, Channel: 918.5 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2019-05-13
 Lower Frequency [MHz]: 918.175
 Upper Frequency [MHz]: 918.820
 6 dB Bandwidth [kHz]: 644



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3.3 Test Conditions and Results - Maximum peak conducted output power

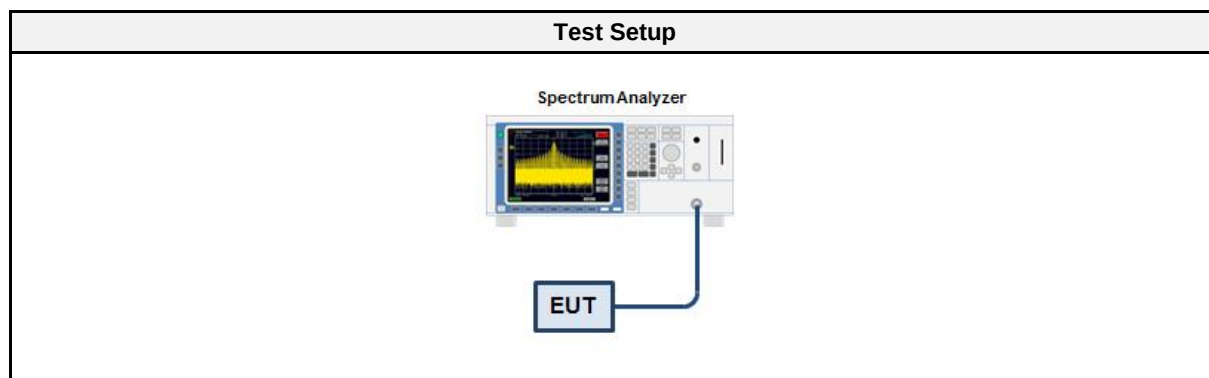
3.3.1 Information

Test Information	
Reference	FCC § 15.247(b)(1); ISED RSS-247, Issue 2 (section 5.4)
Measurement Method	ANSI C63.10 11.9.1
Operator	Wilfried Treffke
Date	2019-05-13

3.3.2 Limits

Limits
1 W (30 dBm)
The conducted output power limit specified above is based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in the table, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

3.3.3 Setup



3.3.4 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyzer	R&S	FSU 26	EF01407	2018-12	2019-12

3.3.5 Procedure

Test Procedure
1. EUT set to test mode (Communication tester is used if needed) 2. Analyzer resolution bandwidth is set $\geq$ DTS bandwidth 3. Detector set to peak and max hold 4. Sweep time is set to auto 5. After the trace has stabilized a marker is set to peak of envelope

3.3.6 Results

Test Results				
Channel [MHz]	Power [dBm]	Power [W]	Limit [W]	Verdict
912.5	15.483	0.0353	1.0	PASS
918.5	15.456	0.0351	1.0	PASS

3.4 Test Conditions and Results - Power spectral density

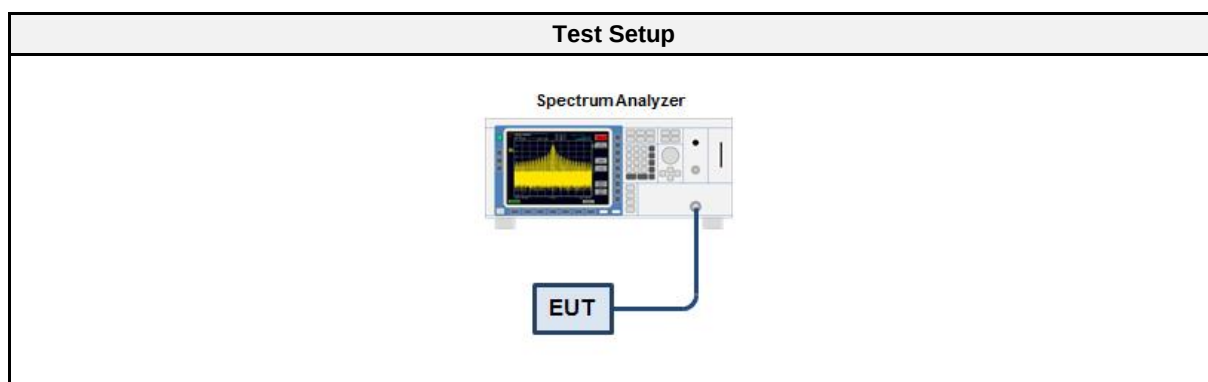
3.4.1 Information

Test Information	
Reference	FCC § 15.247(e); ISSED RSS-247, Issue 2 (section 5.2)
Measurement Method	ANSI C63.10 11.10.2, 14.3.2
Operator	Wilfried Treffke
Date	2019-05-13

3.4.2 Limits

Limits
8 dBm / 3 kHz

3.4.3 Setup



3.4.4 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyzer	R&S	FSU 26	EF01407	2018-12	2019-12

3.4.5 Procedure

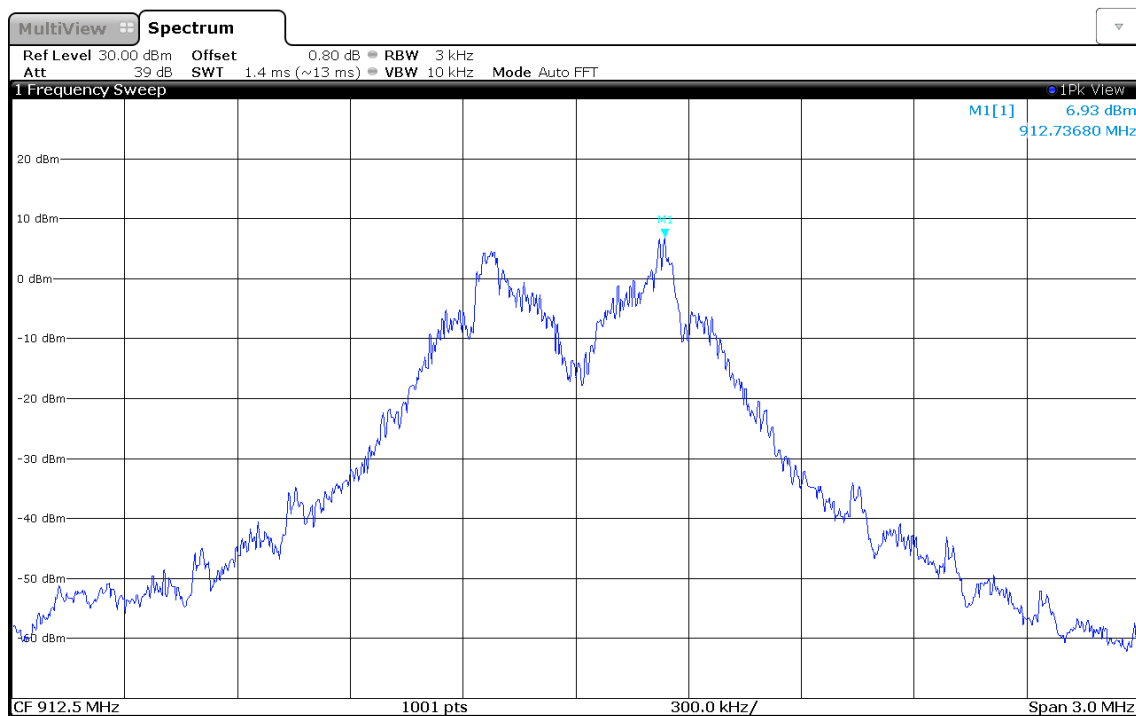
Test Procedure
1. EUT set to test mode 2. The analyzer is set to DTS channel center frequency with a span of 1.5 times the DTS bandwidth 3. The RBW is set to 100 kHz with VBW $\geq$ RBW and the detector is set to peak with max hold 4. After the trace has stabilized a marker is set to the envelope maximum 5. If the power spectral density is above the limit the RBW is reduced (not lower than 3 kHz) and the measurement is repeated 6. If the EUT has more than one transmit chain the procedure is repeated for each transmit chain

3.4.6 Results

Test Results			
Channel [MHz]	PSD [dBm/RBW]	Limit [dBm/3kHz]	Verdict
912.5	6.932	8.0	PASS
918.5	6.982	8.0	PASS
RBW = 3 kHz			

Peak Power Spectral Density

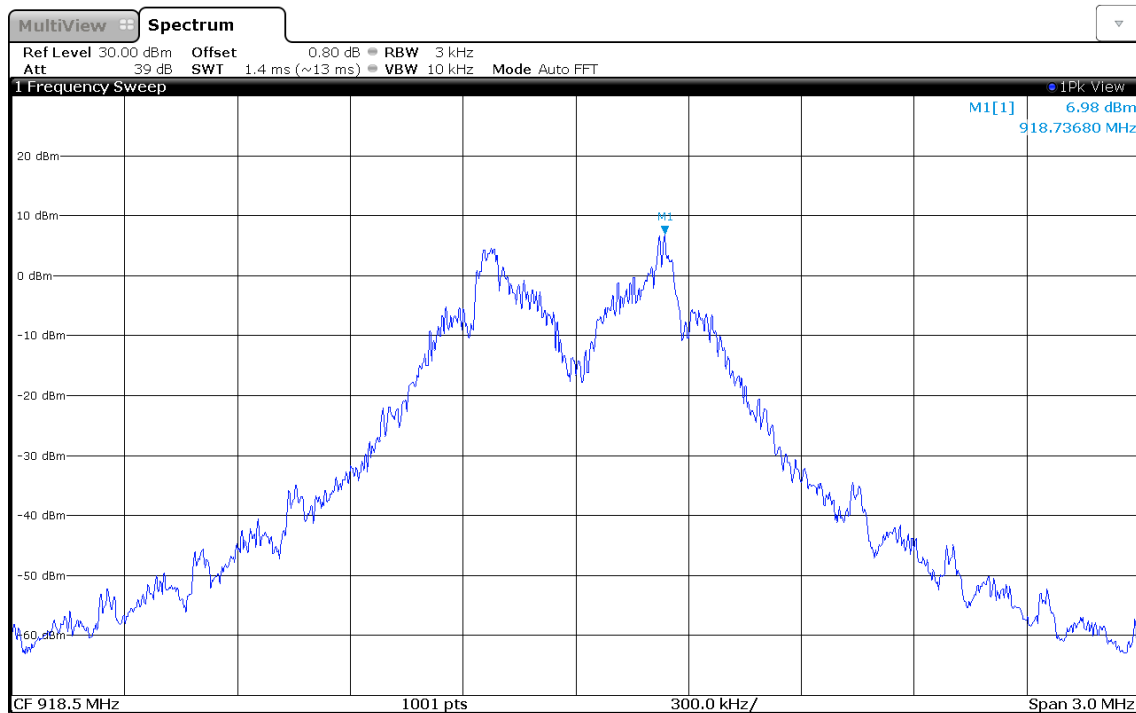
Project Number: G0M-1904-8182
 Applicant: Kamstrup A/S
 Model Description: KWM2210 02K14xxxxxxx / Ultrasonic water meter
 Model: flowIQ® 2200
 Test Sample ID: 24019
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.10.2
 Operational Mode: 2-FSK, Channel: 912.5 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2019-05-13
 Peak Frequency [MHz]: 912.737
 Spectral Density [dBm/RBW]: 6.932
 Resolution Bandwidth [kHz]: 3 kHz



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Peak Power Spectral Density

Project Number: G0M-1904-8182
 Applicant: Kamstrup A/S
 Model Description: KWM2210 02K14xxxxxxx / Ultrasonic water meter
 Model: flowIQ® 2200
 Test Sample ID: 24019
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.10.2
 Operational Mode: 2-FSK, Channel: 918.5 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2019-05-13
 Peak Frequency [MHz]: 918.737
 Spectral Density [dBm/RBW]: 6.982
 Resolution Bandwidth [kHz]: 3 kHz



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3.5 Test Conditions and Results - Band-edge compliance

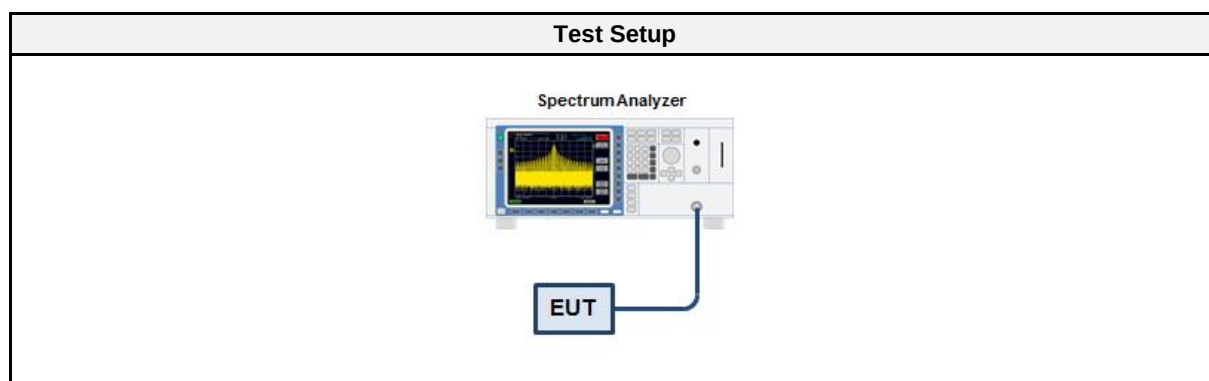
3.5.1 Information

Test Information	
Reference	FCC § 15.247(d); ISSED RSS-247, Issue 2 (section 5.5)
Measurement Method	ANSI C63.10 11.13
Operator	Wilfried Treffke
Date	2019-05-13

3.5.2 Limits

Limits	
Power Measurement	Out-of-band attenuation [dB]
Peak	20
RMS	30

3.5.3 Setup



3.5.4 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyzer	R&S	FSU 26	EF01407	2018-12	2019-12

3.5.5 Procedure

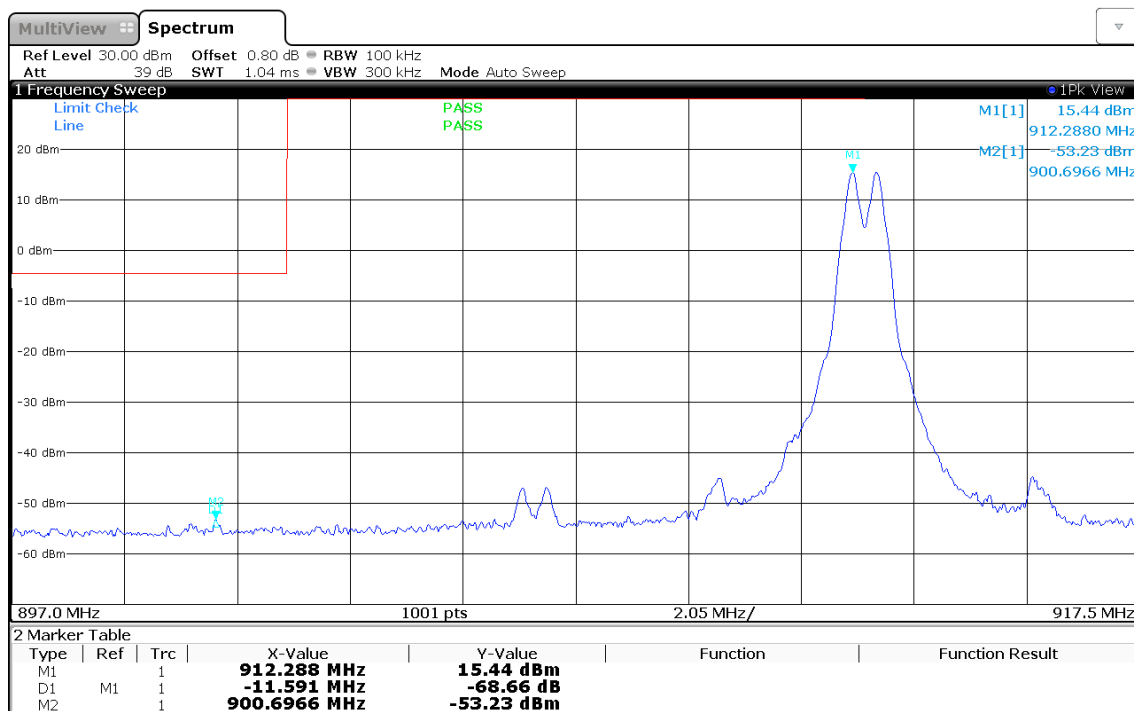
Test Procedure
1. EUT set to test mode (Communication tester is used if needed) 2. Span set around lower band edge and detector is set to peak and max hold 3. Resolution bandwidth is set to 100 kHz 4. Markers are set to peak emission levels within frequency band and outside frequency band 5. Band edge attenuation is determined from level difference

3.5.6 Results

Test Results				
Mode	Channel [MHz]	Out-of-band Attenuation [dB]	Limit [dB]	Verdict
Transmit	912.5	-68.66	-20	PASS
Transmit	918.5	-75.58	-20	PASS

Band-edge Compliance

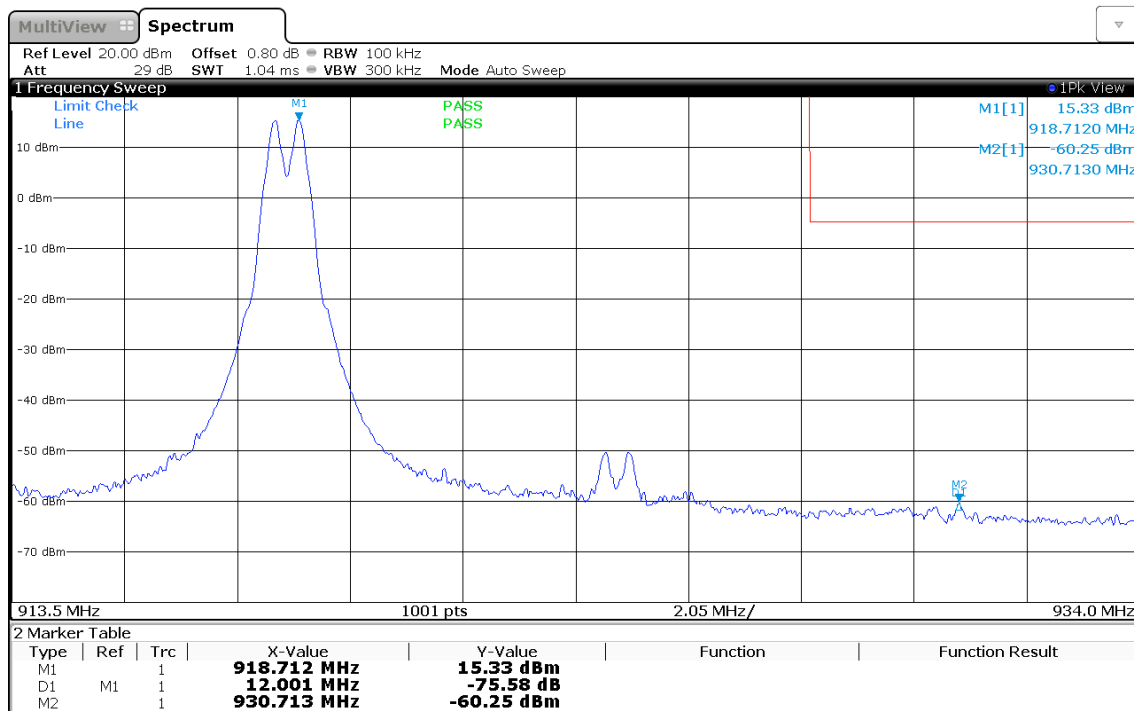
Project Number: G0M-1904-8182
 Applicant: Kamstrup A/S
 Model Description: KWM2210 02K14xxxxxx / Ultrasonic water meter
 Model: flowIQ® 2200
 Test Sample ID: 24019
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 6.10
 Operational Mode: single frequency, Channel: 912.5 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2019-05-13
 Band-edge: Lower
 In-band Frequency [MHz]: 912.288
 Max. in-band Level [dBm/100 kHz]: 15.437
 Out-of-band Frequency [MHz]: 900.697
 Max. out-of-band Level [dBm/100 kHz]: -53.225
 Attenuation [dB]: -68.66



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Band-edge Compliance

Project Number: G0M-1904-8182
 Applicant: Kamstrup A/S
 Model Description: KWM2210 02K14xxxxxxx / Ultrasonic water meter
 Model: flowIQ® 2200
 Test Sample ID: 24019
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 6.10
 Operational Mode: single frequency, Channel: 918.5 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2019-05-13
 Band-edge: Upper
 In-band Frequency [MHz]: 918.712
 Max. in-band Level [dBm/100 kHz]: 15.332
 Out-of-band Frequency [MHz]: 930.713
 Max. out-of-band Level [dBm/100 kHz]: -60.252
 Attenuation [dB]: -75.58



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3.6 Test Conditions and Results - Conducted spurious emissions

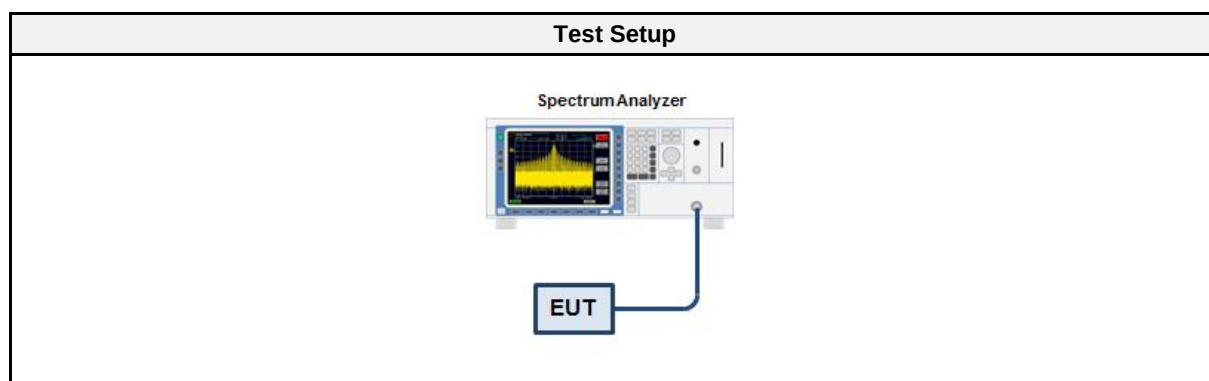
3.6.1 Information

Test Information	
Reference	FCC § 15.247(d); ISSED RSS-247, Issue 2 (section 5.5)
Measurement Method	ANSI C63.10 11.11
Operator	Wilfried Treffke
Date	2019-05-13

3.6.2 Limits

Limits	
Power Measurement	Out-of-band attenuation [dB]
Peak	20
RMS	30

3.6.3 Setup



3.6.4 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyzer	R&S	FSU 26	EF01407	2018-12	2019-12

3.6.5 Procedure

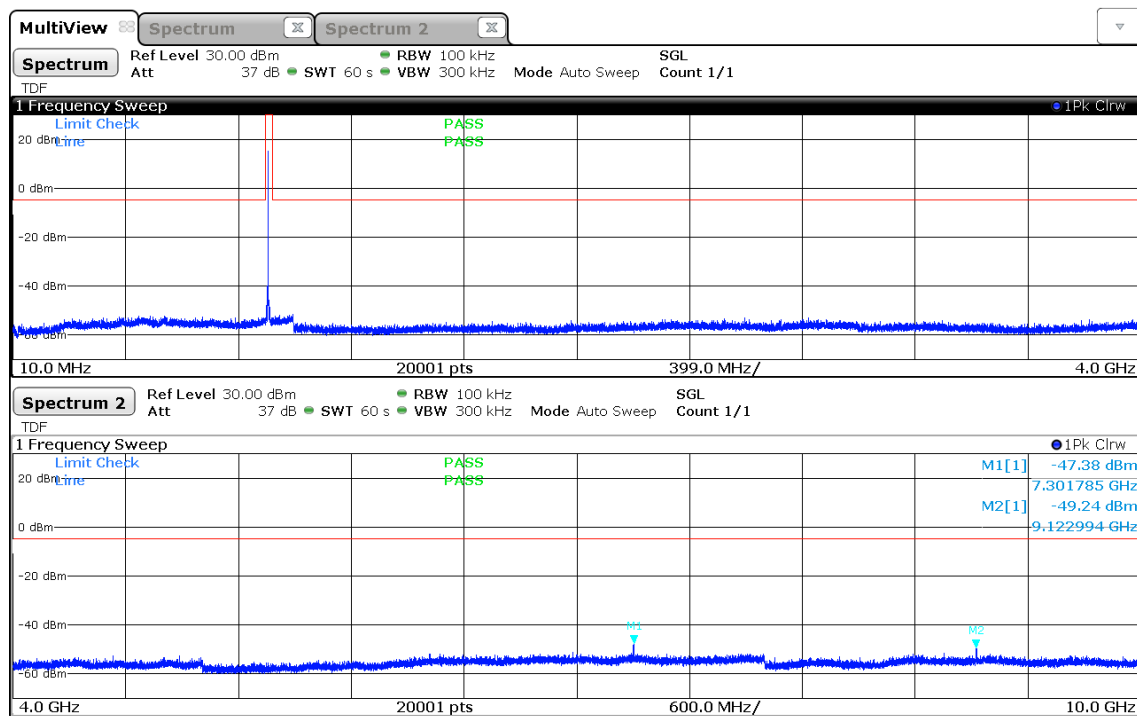
Test Procedure
1. EUT set to test mode (Communication tester is used if needed) 2. Span set around lower band edge and detector is set to peak and max hold 3. Resolution bandwidth is set to 100 kHz 4. Markers are set to peak emission levels within frequency band and outside frequency band 5. Band edge attenuation is determined from level difference

3.6.6 Results

Test Results		
Mode	Channel [MHz]	Verdict
Transmit	912.5	PASS
Transmit	918.5	PASS

Conducted Spurious Emissions

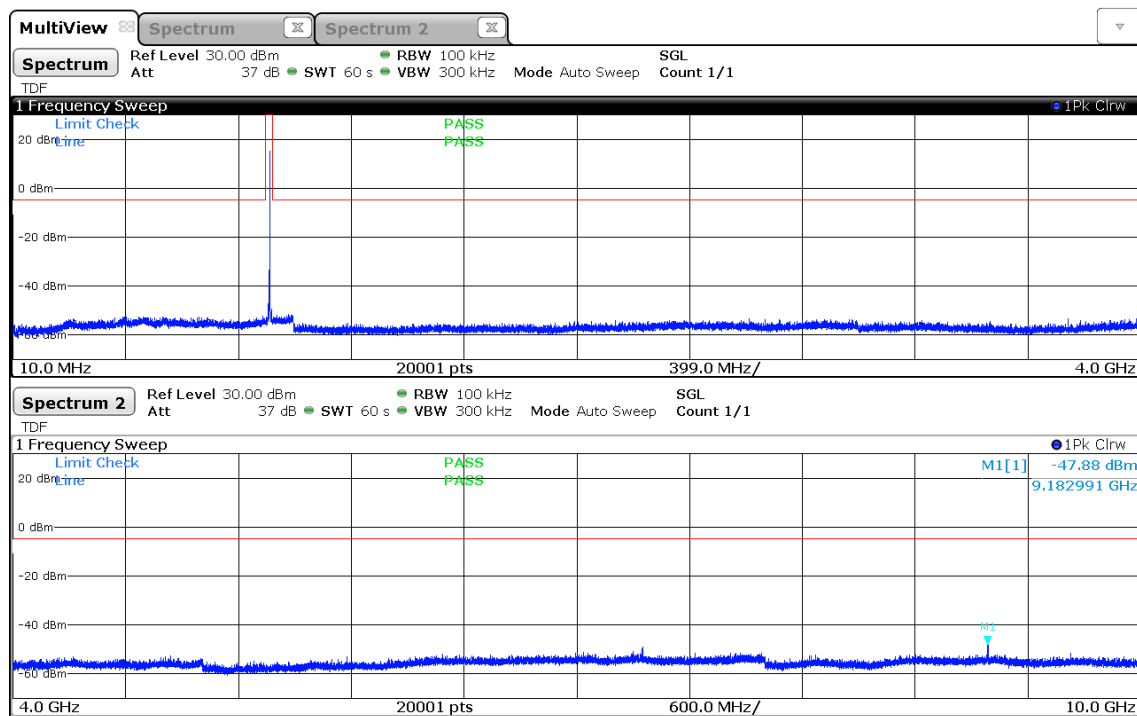
Project Number: G0M-1904-8182
 Applicant: Kamstrup A/S
 Model Description: KWM2210 02K14xxxxxxx / Ultrasonic water meter
 Model: flowIQ® 2200
 Test Sample ID: 24019
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.11
 Operational Mode: 2-FSK, Channel: 912.5 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2019-05-13
 Max. in-band Frequency [MHz]: 912.7
 Max. in-band Level [dBm/100 kHz]: 15.1
 Out-of-band Limit [dBm/100 kHz]: -4.9



14:07:53 13.05.2019

Conducted Spurious Emissions

Project Number: G0M-1904-8182
 Applicant: Kamstrup A/S
 Model Description: KWM2210 02K14xxxxxxx / Ultrasonic water meter
 Model: flowIQ® 2200
 Test Sample ID: 24019
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.11
 Operational Mode: 2-FSK, Channel: 918.5 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2019-05-13
 Max. in-band Frequency [MHz]: 918.7
 Max. in-band Level [dBm/100 kHz]: 15.1
 Out-of-band Limit [dBm/100 kHz]: -4.9



14:12:11 13.05.2019

3.7 Test Conditions and Results - Transmitter radiated emissions

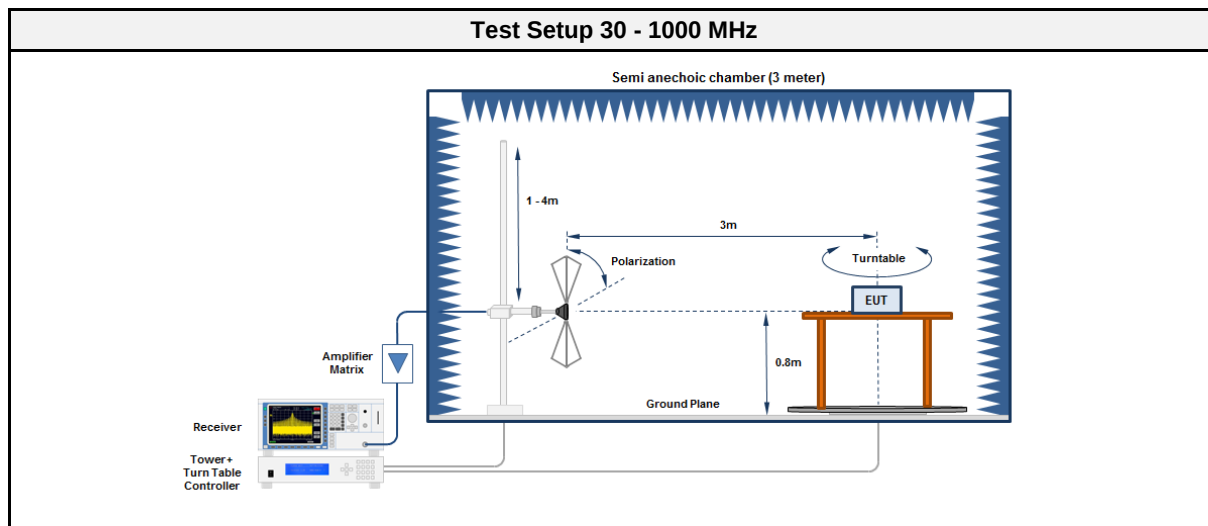
3.7.1 Information

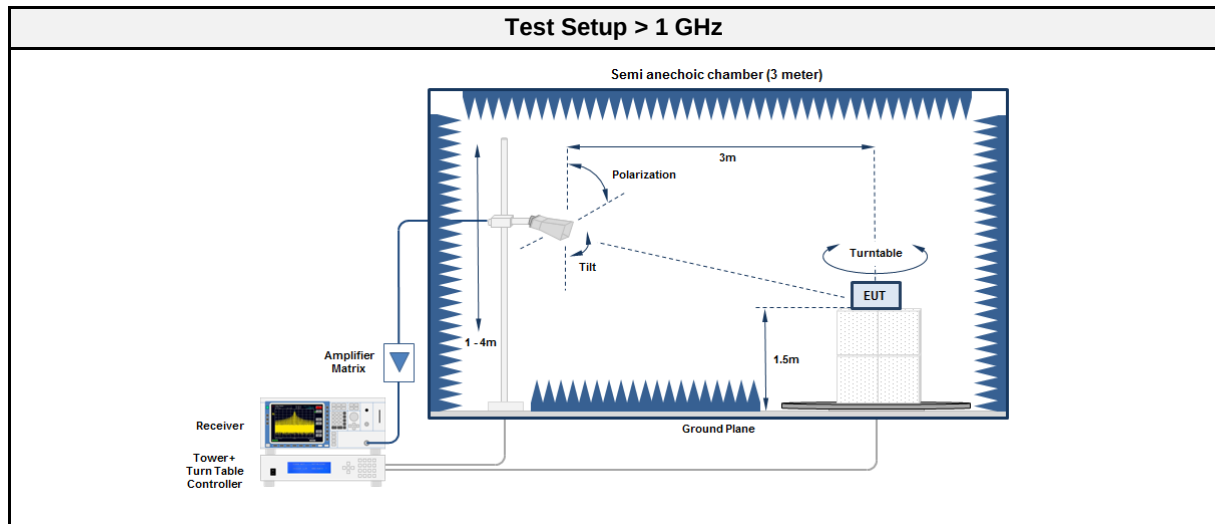
Test Information	
Reference	FCC § 15.247(d); FCC § 15.209; ISSED RSS-Gen, Issue 5 (section 6.13)
Measurement Method	ANSI C63.10 6.4, 6.5, 6.6, 11.12
Operator	Wilfried Treffke
Date	2019-05-13

3.7.2 Limits

Limits			
Frequency [MHz]	Detector	Field strength [$\mu\text{V/m}$]	Measurement distance [m]
0.009 - 0.09	Average	2400/F[kHz]	300
0.09 - 0.110	Quasi-Peak	2400/F[kHz]	300
0.110 - 0.490	Average	2400/F[kHz]	300
0.490 - 1.705	Quasi-Peak	24000/F[kHz]	30
1.705 - 30.0	Quasi-Peak	30	30
30 - 88	Quasi-Peak	100	3
88 - 216	Quasi-Peak	150	3
216 - 960	Quasi-Peak	200	3
960 - 1000	Quasi-Peak	500	3
>1000	Average	500	3

3.7.3 Setup





3.7.4 Equipment

Test Software			
Description	Manufacturer	Name	Version
EMC Software	DARE Instruments	RadiMation	2015.2.4

Test Equipment 30 - 1000 MHz					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Anechoic Chamber	Frankonia	AC1	EF00062	2018-07	2021-07
Measurement Receiver	Agilent	N9038A-526/WXP	EF01070	2018-08	2019-08
Antenna	R&S	HK 116	EF00030	2019-04	2022-04
Antenna	R&S	HL 223	EF00187	2016-05	2019-05

Test Equipment > 1 GHz					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Anechoic Chamber	Frankonia	AC1	EF00062	2018-07	2021-07
Measurement Receiver	Agilent	N9038A-526/WXP	EF01070	2018-08	2019-08
Antenna	Schwarzbeck	BBHA 9120D	EF01153	2018-09	2019-09

3.7.5 Procedure

Test Procedure < 30 MHz	
1.	EUT is placed on a non conducting support at the center of a turn table 0.8 m above the ground
2.	EUT set to test mode
3.	The EUT is rotated through 360°
4.	The emissions are measured with peak detector and max hold
5.	All significant emissions are measured again using the corresponding final detector

Test Procedure 30 - 1000 MHz	
1.	EUT is placed on a non conducting support at the center of a turn table 0.8 m above the ground
2.	EUT set to test mode
3.	The receiver is set to peak detection with max hold
4.	The EUT is rotated through 360° and the height of the antenna is varied from 1 m to 4 m
5.	All significant emissions are measured again using the corresponding final detector

Test Procedure > 1 GHz	
1.	EUT is placed on a non conducting support at the center of a turn table 1.5 m above the ground
2.	EUT set to test mode
3.	The receiver is set to peak detection with max hold
4.	The EUT is rotated through 360° and the height of the antenna is varied from 1 m to 4 m
5.	All significant emissions are measured again using the corresponding final detector

3.7.6 Results

Test Results						
Channel [MHz]	Emission [MHz]	Level [dBμV/m]	Det.	Pol.	Limit [dBμV/m]	Margin [dB]
912.5	No significant spurious emissions					
918.5	No significant spurious emissions					

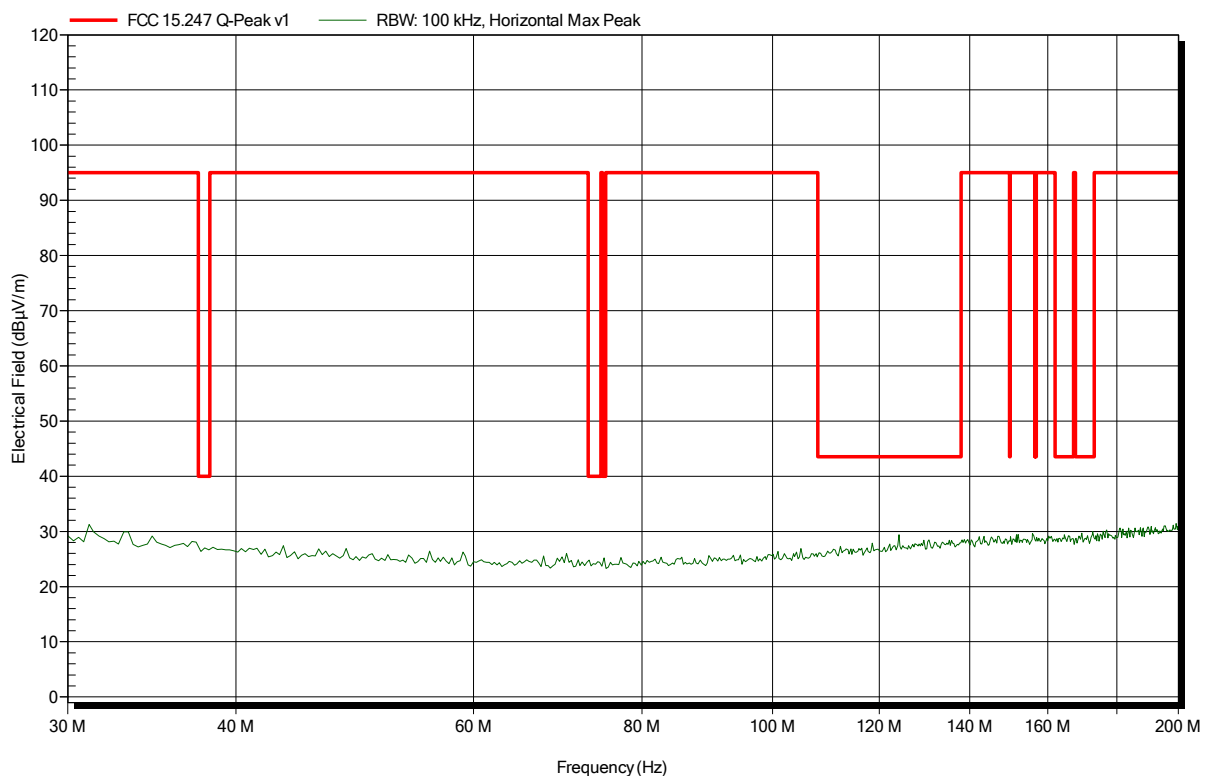
ANNEX A Transmitter spurious emissions

Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1904-8182

Applicant: Kampstrup A/S
 EUT Name: Ultrasonic water meter KWM2210 02K14
 Model: flowIQ 2200
 Test Site: Eurofins Product Service GmbH
 Operator: Wilfried Treffke
 Test Conditions: Tnom: 23°C, Vnom:
 Antenna: Rohde & Schwarz HK 116, Horizontal
 Measurement distance: 3 m
 Mode: TX; 2-FSK; 912.5 MHz
 Test Date: 2019-05-13
 Note:

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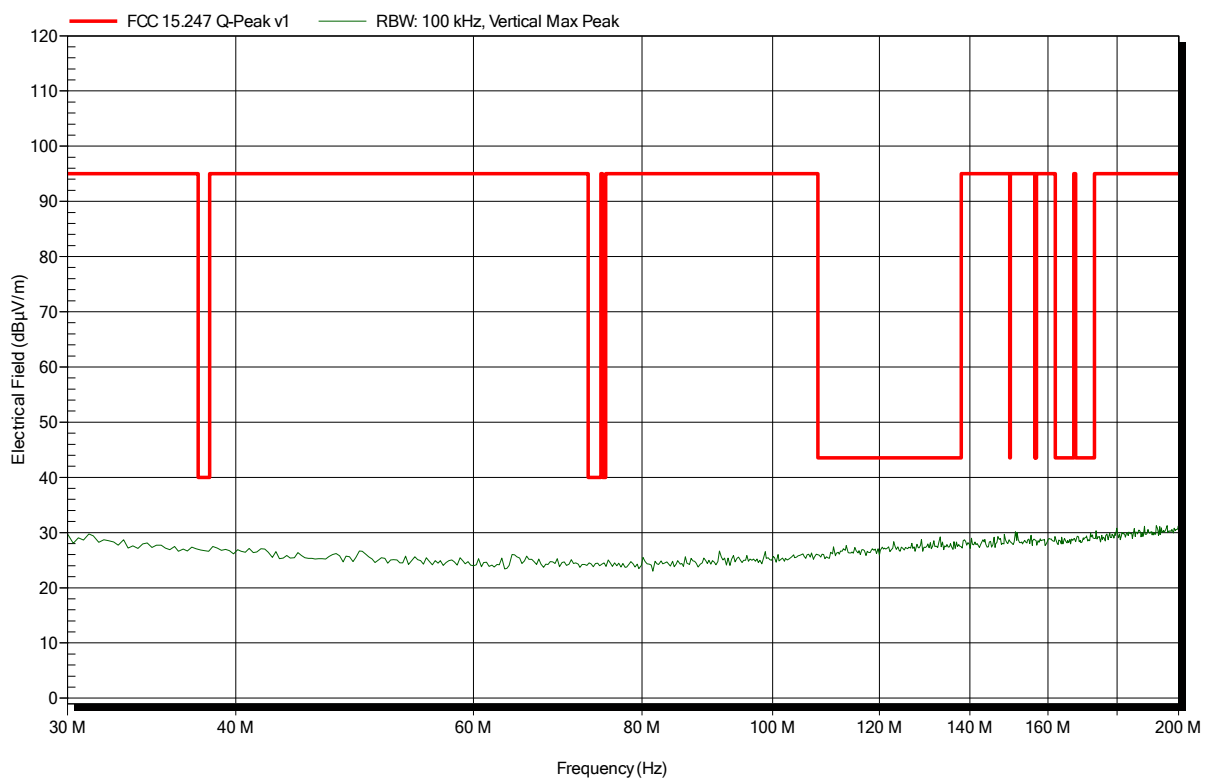


Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1904-8182

Applicant: Kampstrup A/S
EUT Name: Ultrasonic water meter KWM2210 02K14
Model: flowIQ 2200
Test Site: Eurofins Product Service GmbH
Operator: Wilfried Treffke
Test Conditions: Tnom: 23°C, Vnom:
Antenna: Rohde & Schwarz HK 116, Vertical
Measurement distance: 3 m
Mode: TX; 2-FSK; 912.5 MHz
Test Date: 2019-05-13
Note:

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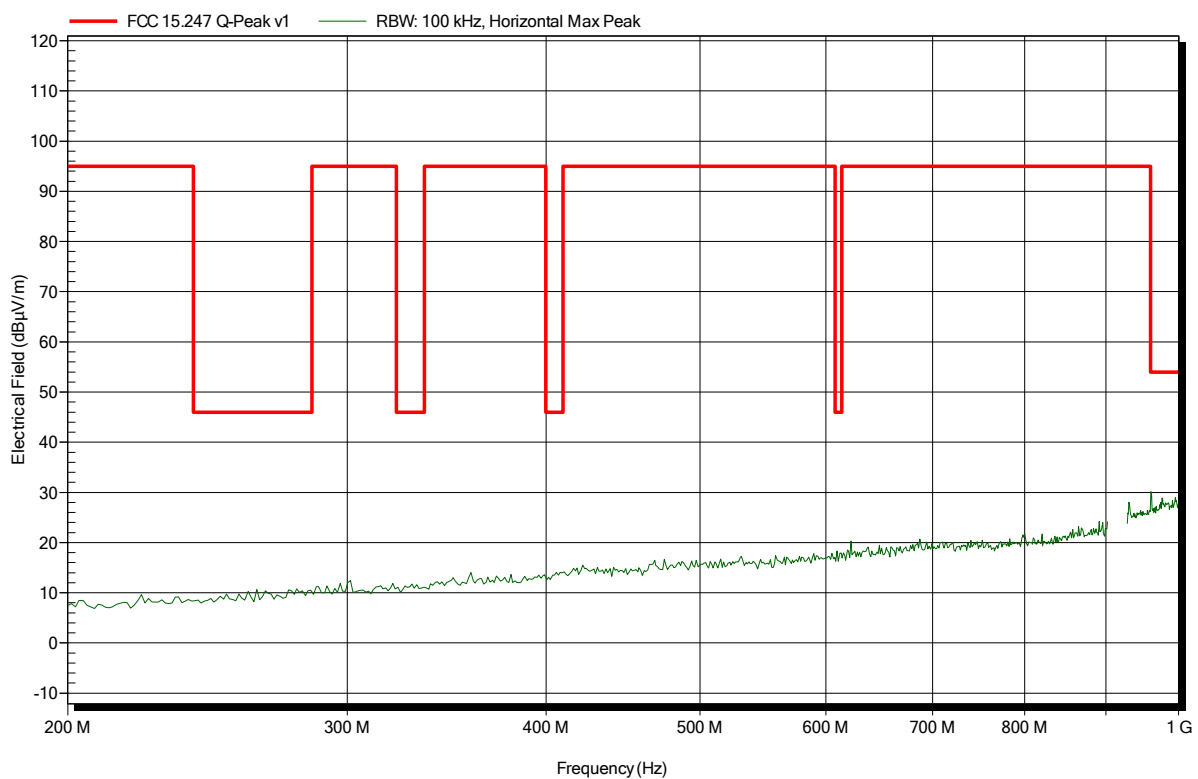


Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1904-8182

Applicant: Kampstrup A/S
 EUT Name: Ultrasonic water meter KWM2210 02K14
 Model: flowIQ 2200
 Test Site: Eurofins Product Service GmbH
 Operator: Wilfried Treffke
 Test Conditions: Tnom: 23°C, Vnom:
 Antenna: Rohde & Schwarz HL 223, Horizontal
 Measurement distance: 3 m
 Mode: TX; 2-FSK; 912.5 MHz
 Test Date: 2019-05-13
 Note:

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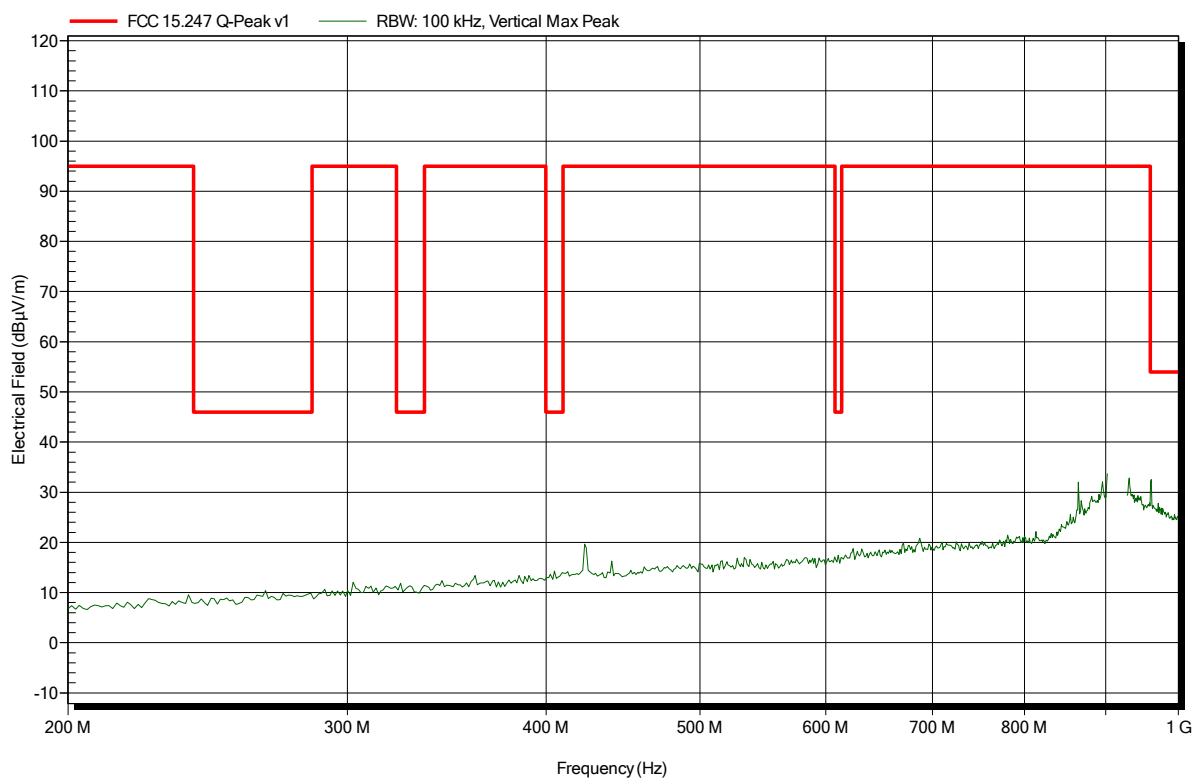


Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1904-8182

Applicant: Kampstrup A/S
EUT Name: Ultrasonic water meter KWM2210 02K14
Model: flowIQ 2200
Test Site: Eurofins Product Service GmbH
Operator: Wilfried Treffke
Test Conditions: Tnom: 23°C, Vnom:
Antenna: Rohde & Schwarz HL 223, Vertical
Measurement distance: 3 m
Mode: TX; 2-FSK; 912.5 MHz
Test Date: 2019-05-13
Note:

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Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1904-8182

Applicant: Kampstrup A/S

EUT Name: Ultrasonic water meter KWM2210 02K14

Model: flowIQ 2200

Test Site: Eurofins Product Service GmbH

Operator: Wilfried Treffke

Test Conditions: Tnom: 23°C, Vnom:

Antenna: Schwarzbeck BBHA 9120D, Horizontal

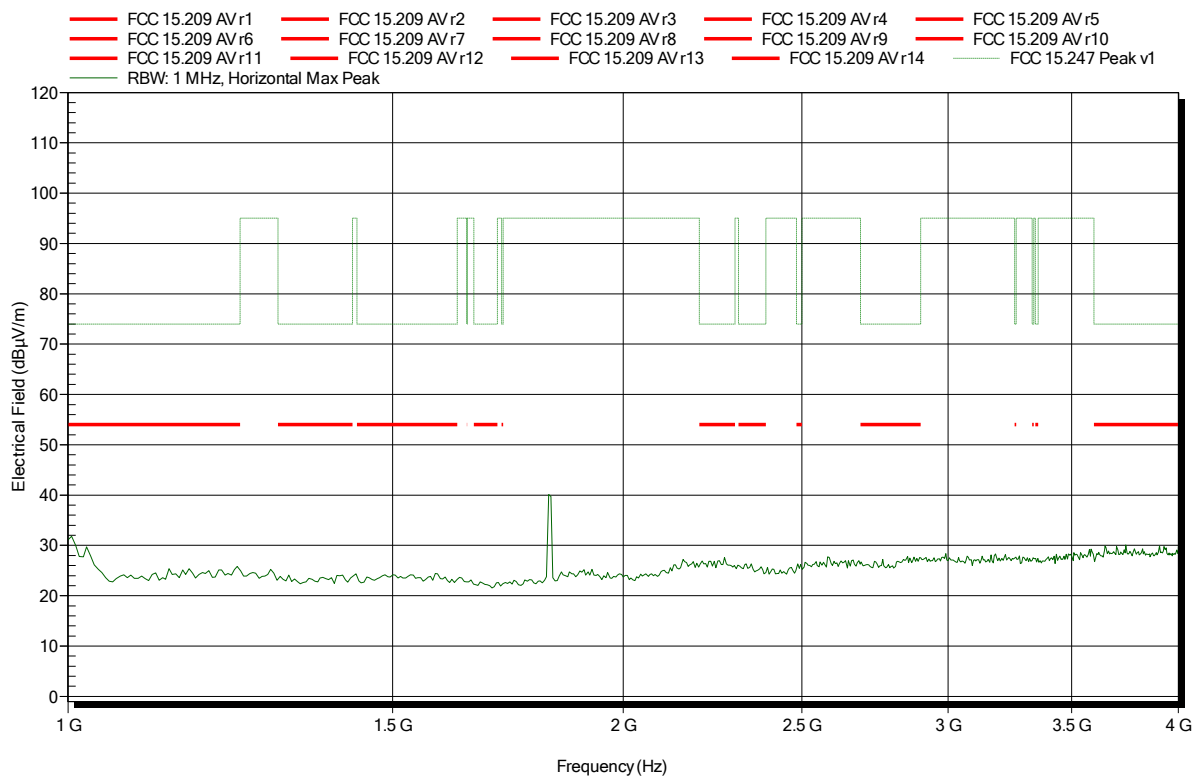
Measurement distance: 1 m converted to 3m

Mode: TX; 2-FSK; 912.5 MHz

Test Date: 2019-05-13

Note:

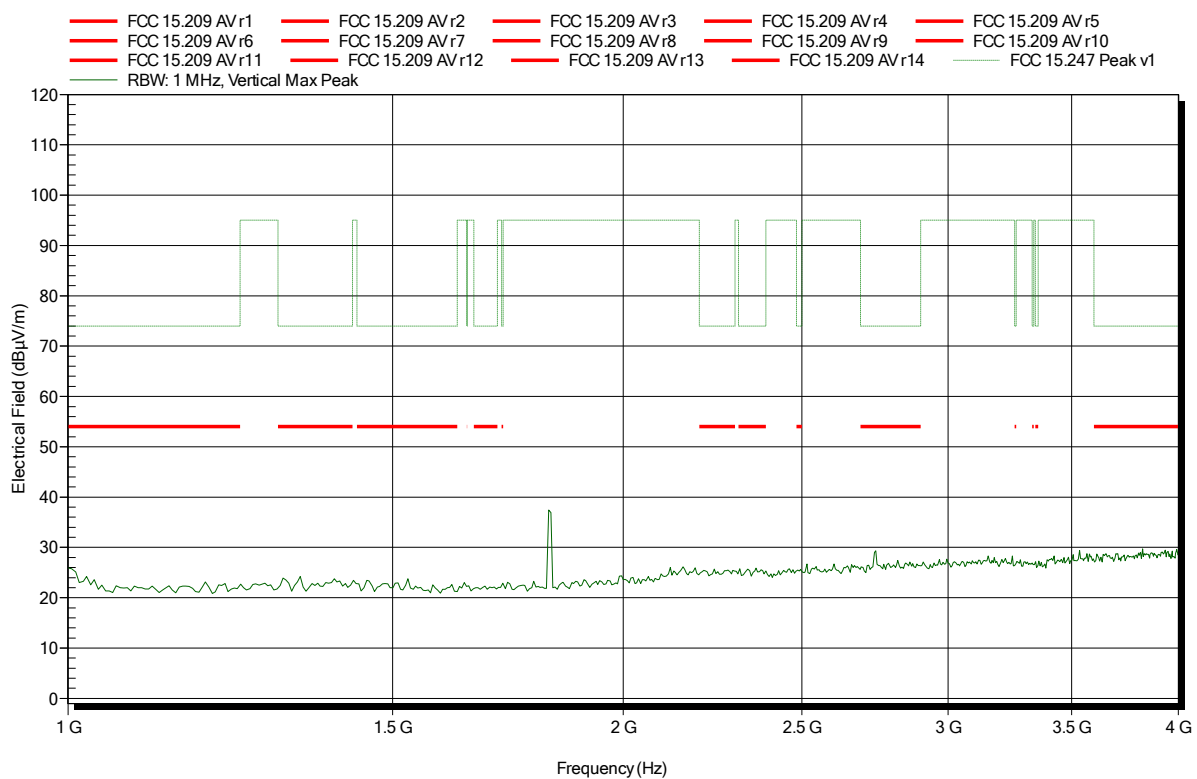
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Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1904-8182
 Applicant: Kampstrup A/S
 EUT Name: Ultrasonic water meter KWM2210 02K14
 Model: flowIQ 2200
 Test Site: Eurofins Product Service GmbH
 Operator: Wilfried Treffke
 Test Conditions: Tnom: 23°C, Vnom:
 Antenna: Schwarzbeck BBHA 9120D, Vertical
 Measurement distance: 1 m converted to 3m
 Mode: TX; 2-FSK; 912.5 MHz
 Test Date: 2019-05-13
 Note:

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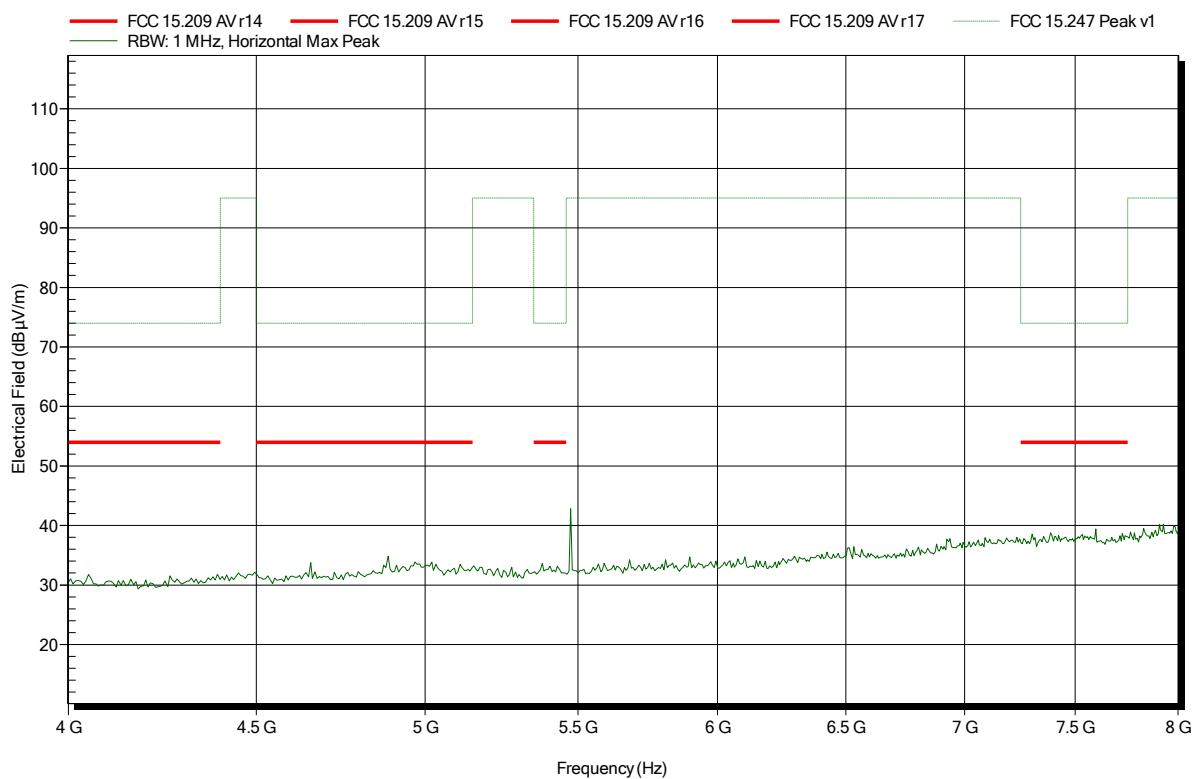


Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1904-8182

Applicant: Kampstrup A/S
EUT Name: Ultrasonic water meter KWM2210 02K14
Model: flowIQ 2200
Test Site: Eurofins Product Service GmbH
Operator: Wilfried Treffke
Test Conditions: Tnom: 23°C, Vnom:
Antenna: Schwarzbeck BBHA 9120D, Horizontal
Measurement distance: 1 m converted to 3m
Mode: TX; 2-FSK; 912.5 MHz
Test Date: 2019-05-13
Note:

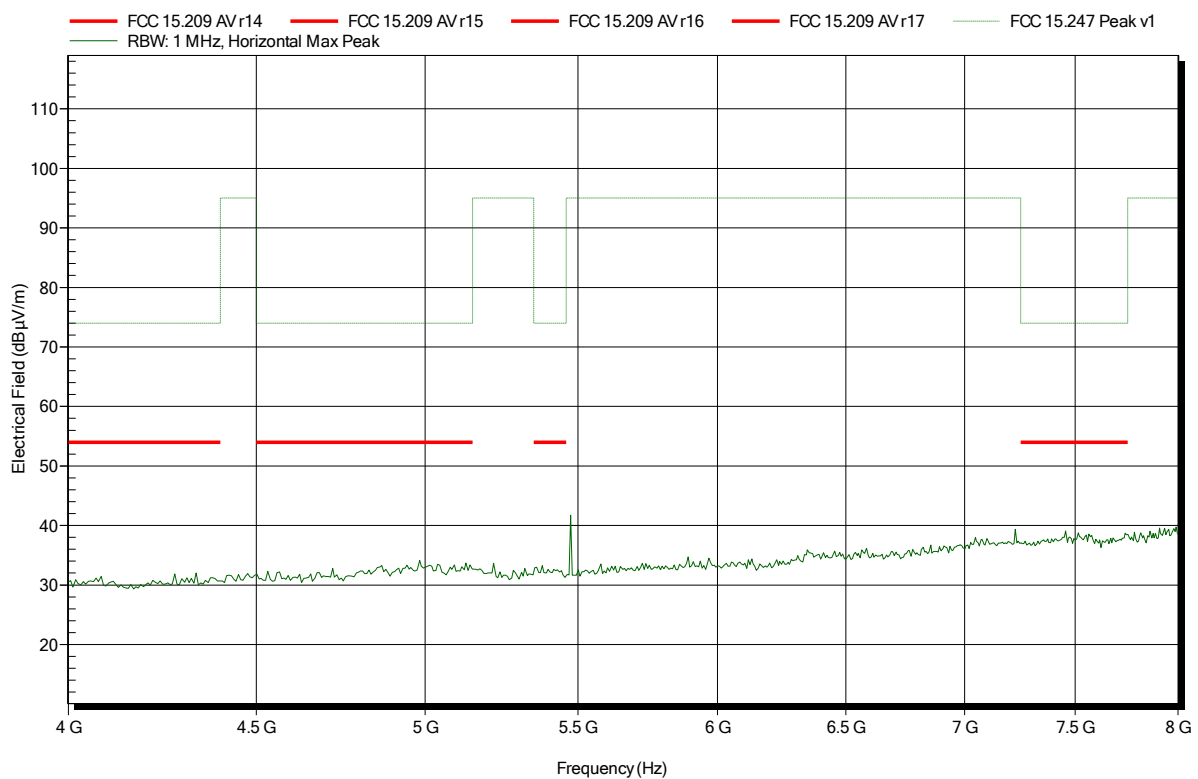
Index 9



Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1904-8182
 Applicant: Kampstrup A/S
 EUT Name: Ultrasonic water meter KWM2210 02K14
 Model: flowIQ 2200
 Test Site: Eurofins Product Service GmbH
 Operator: Wilfried Treffke
 Test Conditions: Tnom: 23°C, Vnom:
 Antenna: Schwarzbeck BBHA 9120D, Vertical
 Measurement distance: 1 m converted to 3m
 Mode: TX; 2-FSK; 912.5 MHz
 Test Date: 2019-05-13
 Note:

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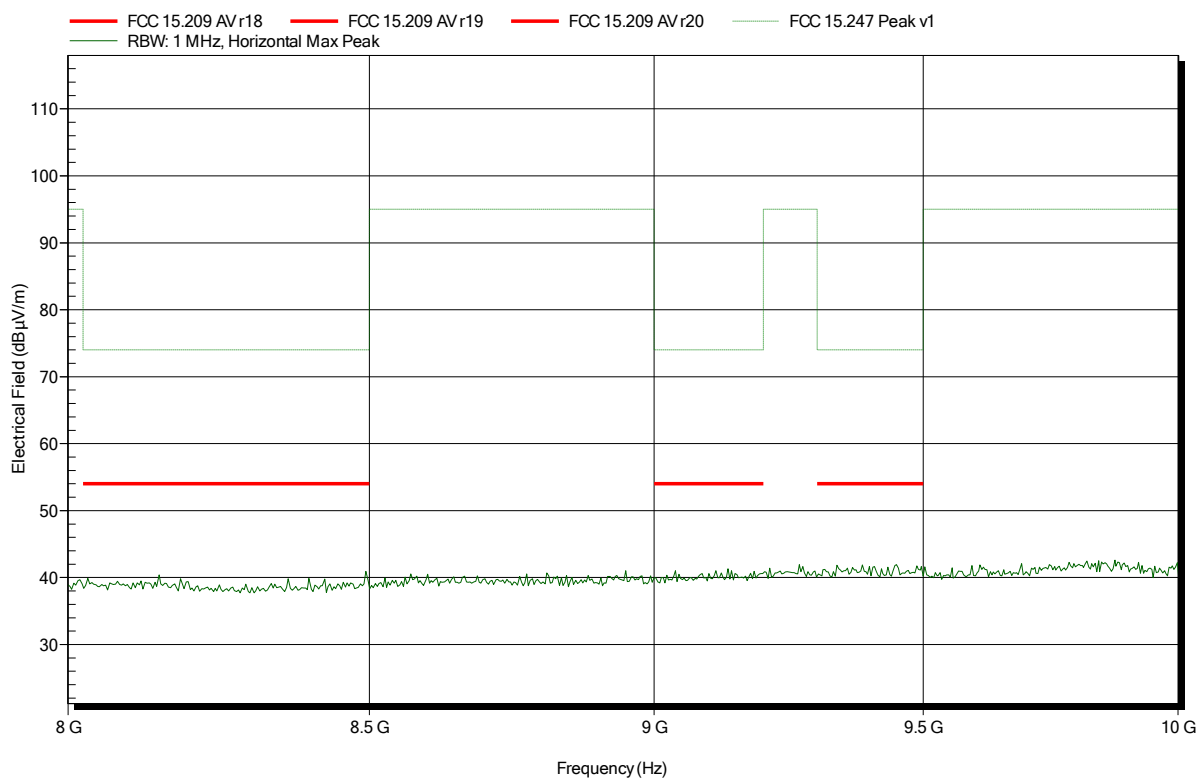


Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1904-8182

Applicant: Kampstrup A/S
EUT Name: Ultrasonic water meter KWM2210 02K14
Model: flowIQ 2200
Test Site: Eurofins Product Service GmbH
Operator: Wilfried Treffke
Test Conditions: Tnom: 23°C, Vnom:
Antenna: Schwarzbeck BBHA 9120D, Horizontal
Measurement distance: 1 m converted to 3m
Mode: TX; 2-FSK; 912.5 MHz
Test Date: 2019-05-13
Note:

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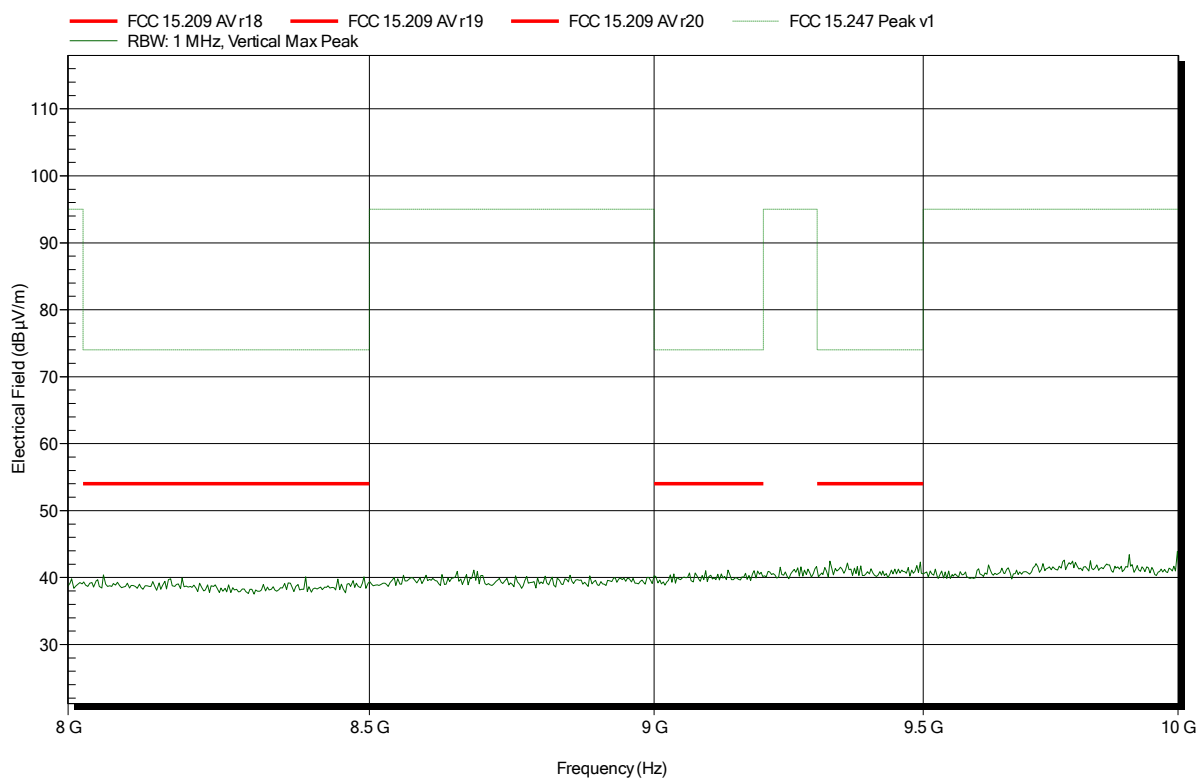


Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1904-8182

Applicant: Kampstrup A/S
EUT Name: Ultrasonic water meter KWM2210 02K14
Model: flowIQ 2200
Test Site: Eurofins Product Service GmbH
Operator: Wilfried Treffke
Test Conditions: Tnom: 23°C, Vnom:
Antenna: Schwarzbeck BBHA 9120D, Vertical
Measurement distance: 1 m converted to 3m
Mode: TX; 2-FSK; 912.5 MHz
Test Date: 2019-05-13
Note:

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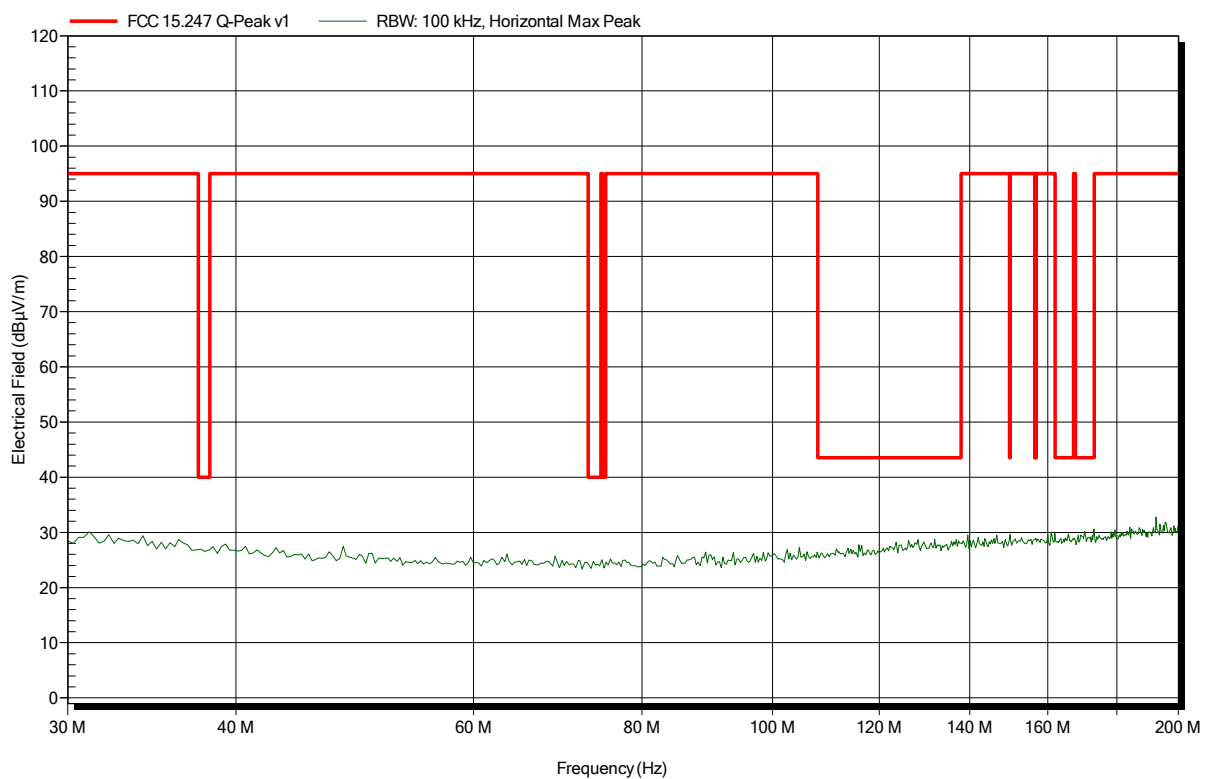


Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1904-8182

Applicant: Kampstrup A/S
EUT Name: Ultrasonic water meter KWM2210 02K14
Model: flowIQ 2200
Test Site: Eurofins Product Service GmbH
Operator: Wilfried Treffke
Test Conditions: Tnom: 23°C, Vnom:
Antenna: Rohde & Schwarz HK 116, Horizontal
Measurement distance: 3 m
Mode: TX; 2-FSK; 918.5 MHz
Test Date: 2019-05-13
Note:

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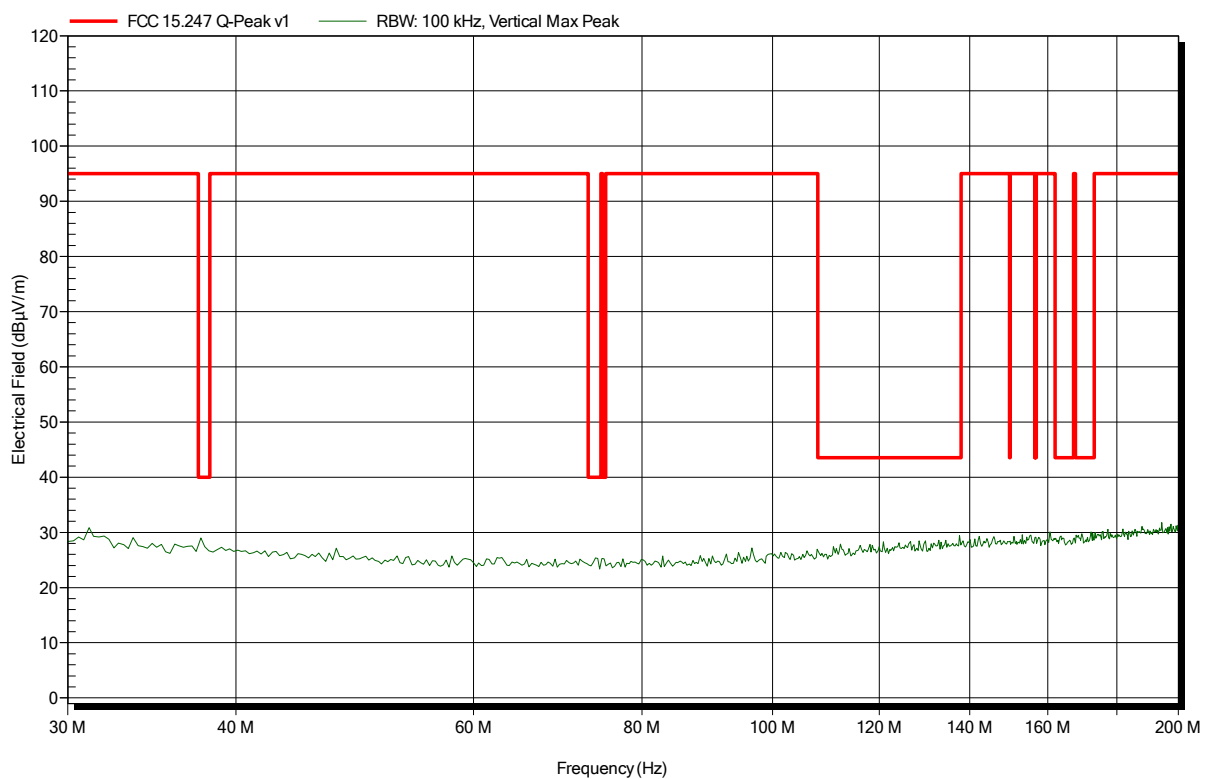


Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1904-8182

Applicant: Kampstrup A/S
EUT Name: Ultrasonic water meter KWM2210 02K14
Model: flowIQ 2200
Test Site: Eurofins Product Service GmbH
Operator: Wilfried Treffke
Test Conditions: Tnom: 23°C, Vnom:
Antenna: Rohde & Schwarz HK 116, Vertical
Measurement distance: 3 m
Mode: TX; 2-FSK; 918.5 MHz
Test Date: 2019-05-13
Note:

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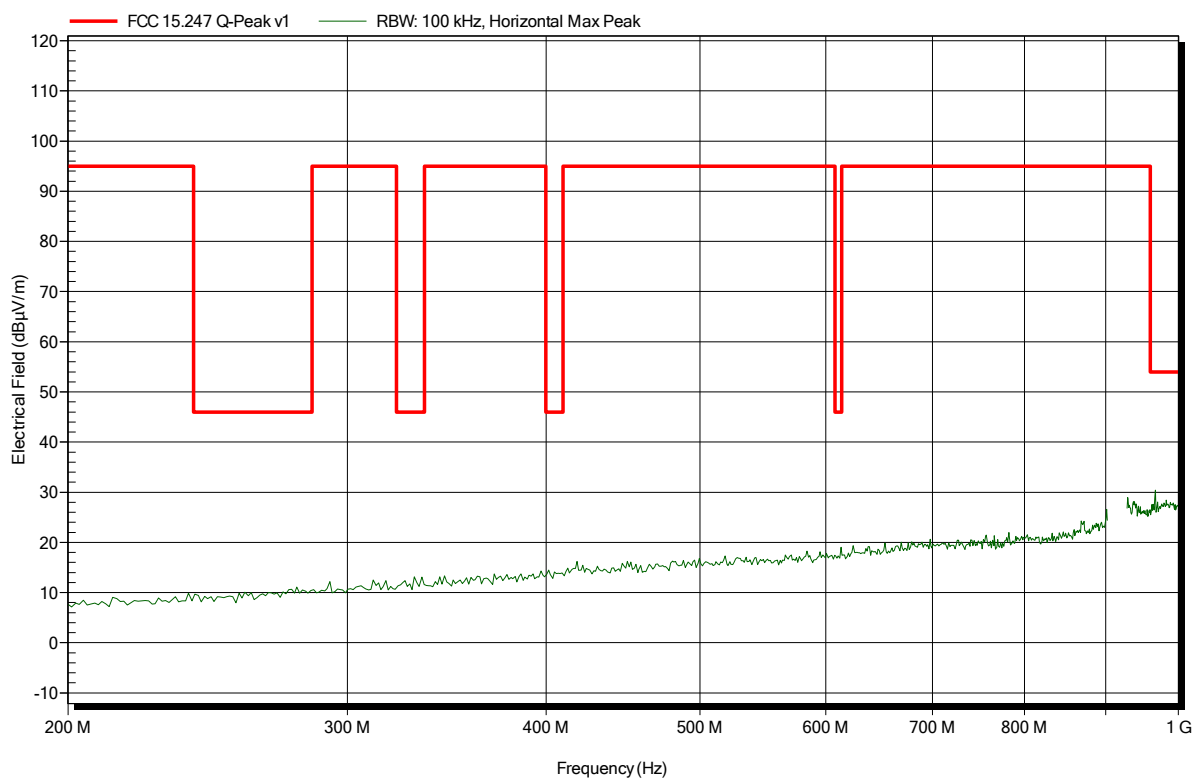


Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1904-8182

Applicant: Kampstrup A/S
EUT Name: Ultrasonic water meter KWM2210 02K14
Model: flowIQ 2200
Test Site: Eurofins Product Service GmbH
Operator: Wilfried Treffke
Test Conditions: Tnom: 23°C, Vnom:
Antenna: Rohde & Schwarz HL 223, Horizontal
Measurement distance: 3 m
Mode: TX; 2-FSK; 918.5 MHz
Test Date: 2019-05-13
Note:

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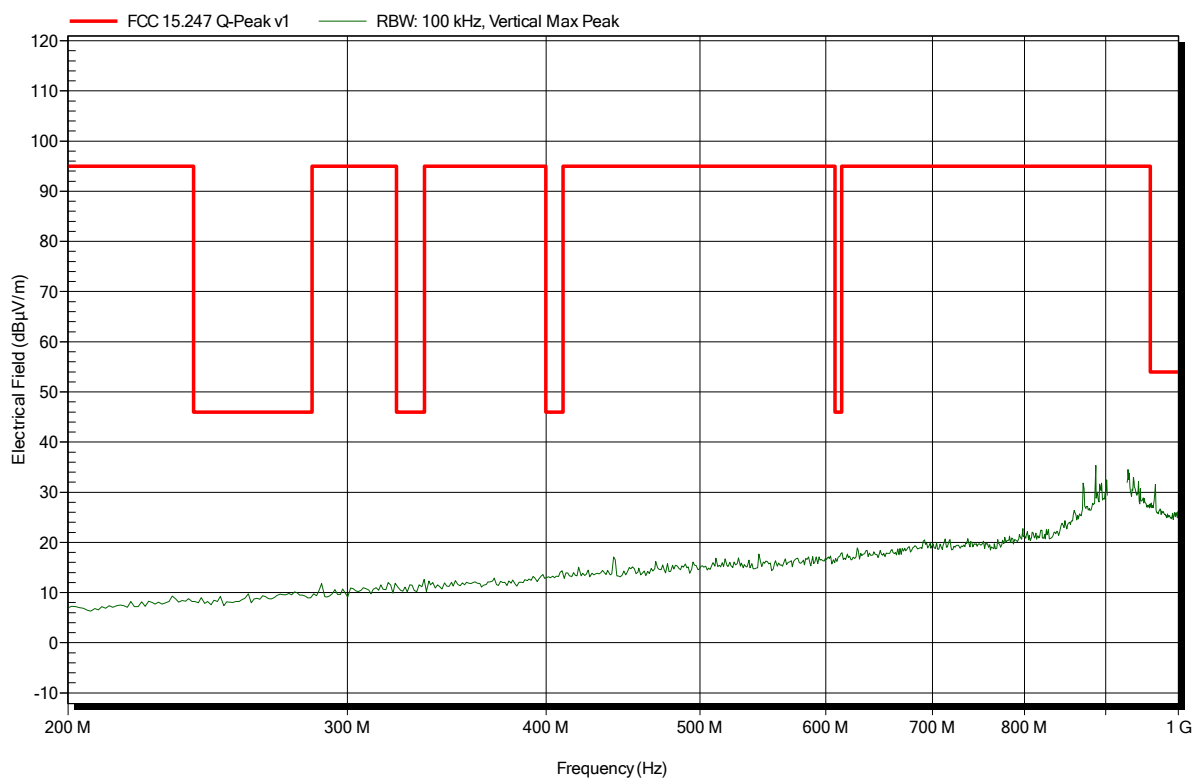


Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1904-8182

Applicant: Kampstrup A/S
EUT Name: Ultrasonic water meter KWM2210 02K14
Model: flowIQ 2200
Test Site: Eurofins Product Service GmbH
Operator: Wilfried Treffke
Test Conditions: Tnom: 23°C, Vnom:
Antenna: Rohde & Schwarz HL 223, Vertical
Measurement distance: 3 m
Mode: TX; 2-FSK; 918.5 MHz
Test Date: 2019-05-13
Note:

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Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1904-8182

Applicant: Kampstrup A/S

EUT Name: Ultrasonic water meter KWM2210 02K14

Model: flowIQ 2200

Test Site: Eurofins Product Service GmbH

Operator: Wilfried Treffke

Test Conditions: Tnom: 23°C, Vnom:

Antenna: Schwarzbeck BBHA 9120D, Horizontal

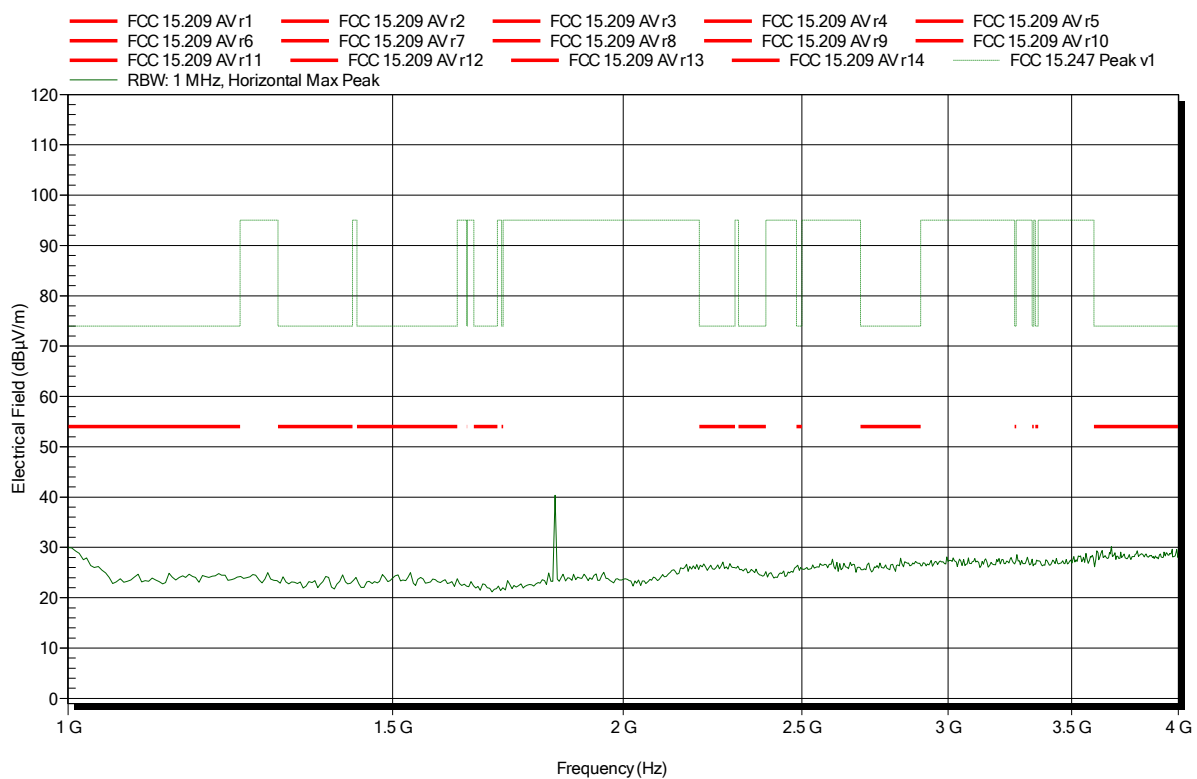
Measurement distance: 1 m converted to 3m

Mode: TX; 2-FSK; 918.5 MHz

Test Date: 2019-05-13

Note:

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Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1904-8182

Applicant: Kampstrup A/S

EUT Name: Ultrasonic water meter KWM2210 02K14

Model: flowIQ 2200

Test Site: Eurofins Product Service GmbH

Operator: Wilfried Treffke

Test Conditions: Tnom: 23°C, Vnom:

Antenna: Schwarzbeck BBHA 9120D, Vertical

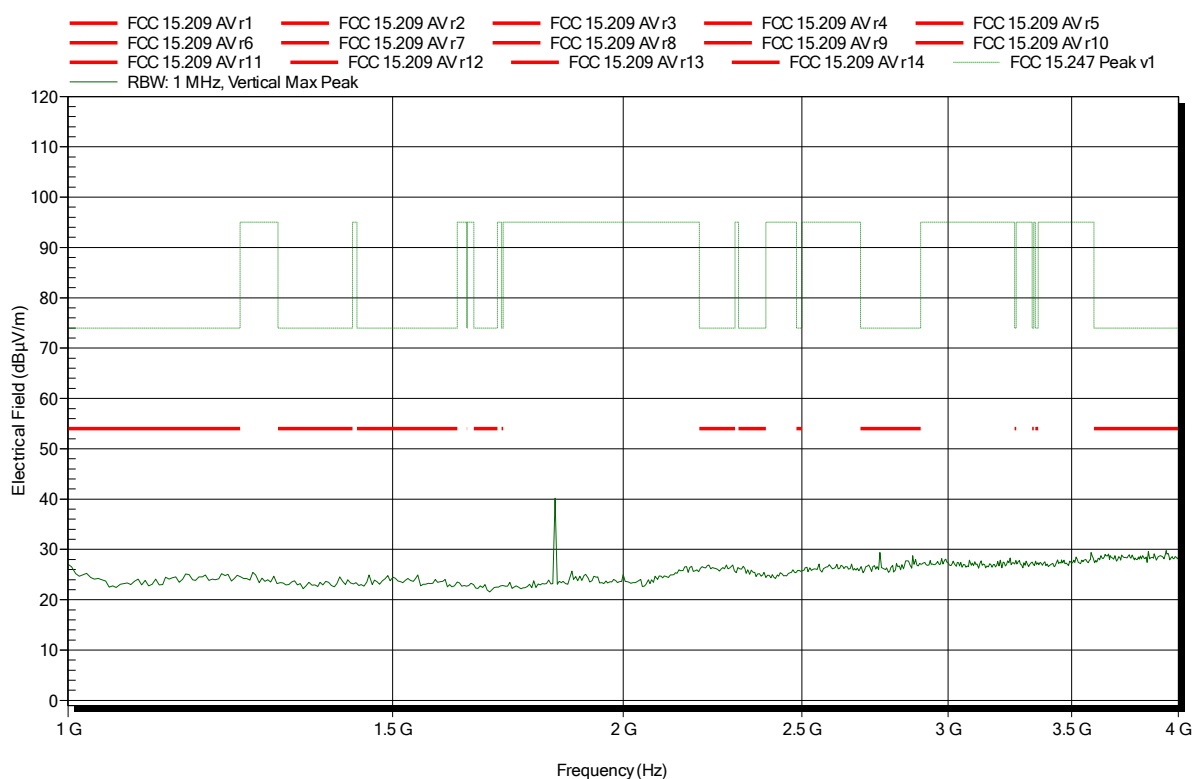
Measurement distance: 1 m converted to 3m

Mode: TX; 2-FSK; 918.5 MHz

Test Date: 2019-05-13

Note:

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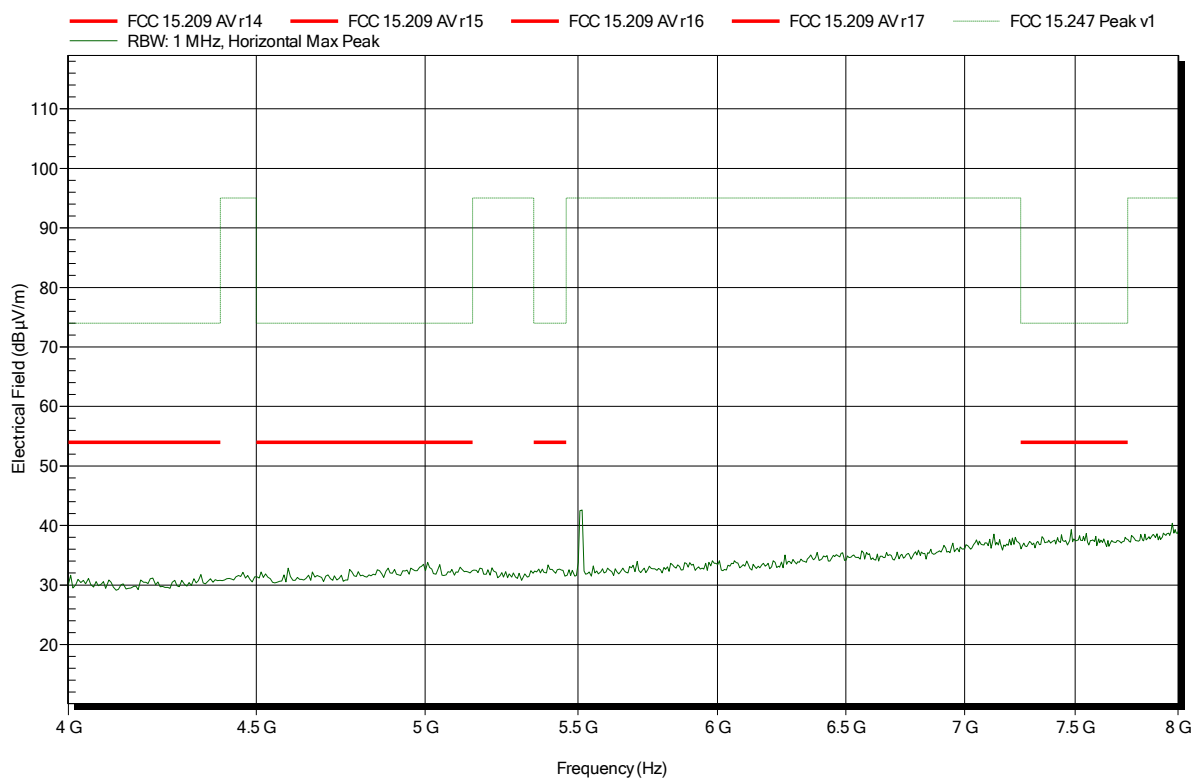


Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1904-8182

Applicant: Kampstrup A/S
EUT Name: Ultrasonic water meter KWM2210 02K14
Model: flowIQ 2200
Test Site: Eurofins Product Service GmbH
Operator: Wilfried Treffke
Test Conditions: Tnom: 23°C, Vnom:
Antenna: Schwarzbeck BBHA 9120D, Horizontal
Measurement distance: 1 m converted to 3m
Mode: TX; 2-FSK; 918.5 MHz
Test Date: 2019-05-13
Note:

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Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1904-8182

Applicant: Kampstrup A/S

EUT Name: Ultrasonic water meter KWM2210 02K14

Model: flowIQ 2200

Test Site: Eurofins Product Service GmbH

Operator: Wilfried Treffke

Test Conditions: Tnom: 23°C, Vnom:

Antenna: Schwarzbeck BBHA 9120D, Vertical

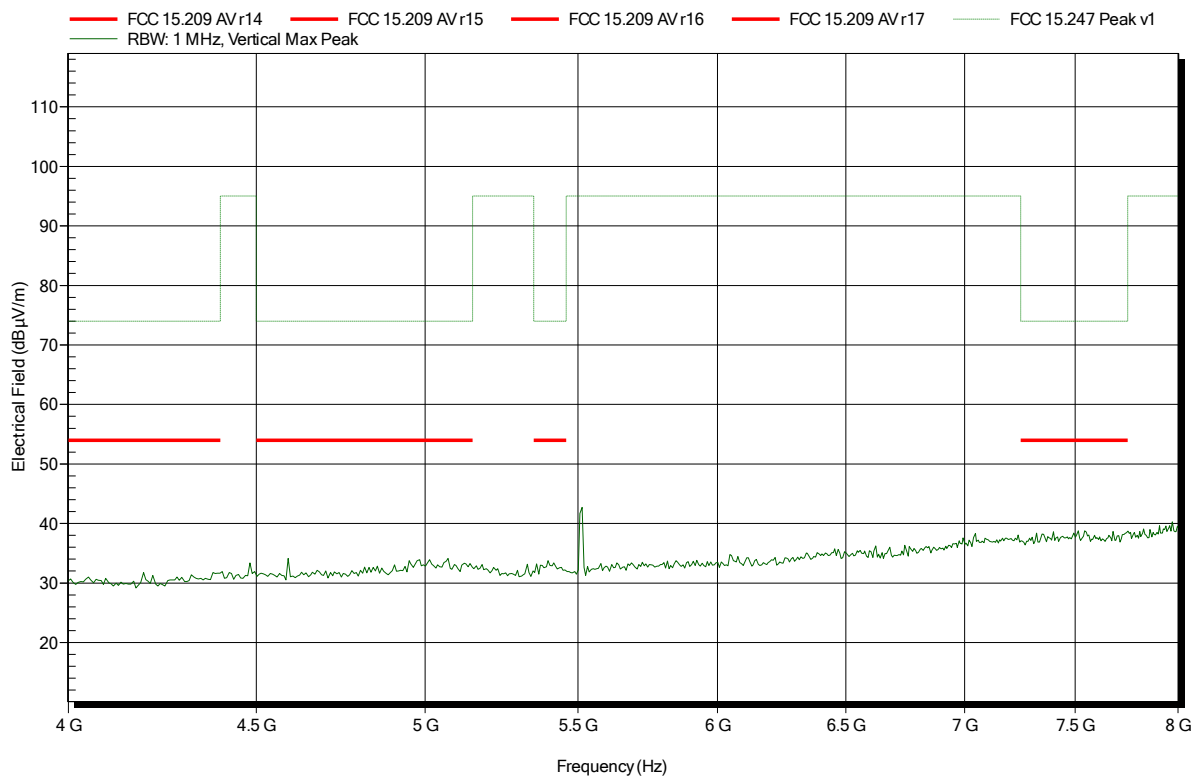
Measurement distance: 1 m, converted to 3 m

Mode: TX; 2-FSK; 918.5 MHz

Test Date: 2019-05-13

Note:

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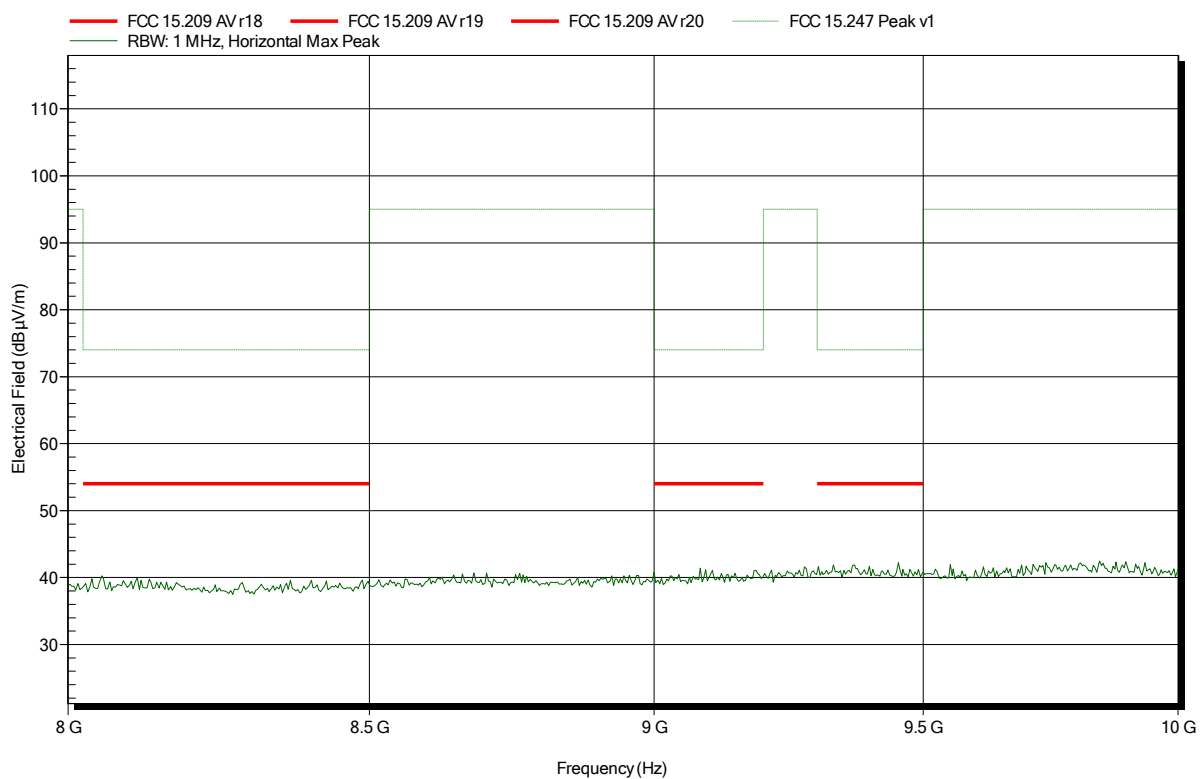


Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1904-8182

Applicant: Kampstrup A/S
 EUT Name: Ultrasonic water meter KWM2210 02K14
 Model: flowIQ 2200
 Test Site: Eurofins Product Service GmbH
 Operator: Wilfried Treffke
 Test Conditions: Tnom: 23°C, Vnom:
 Antenna: Schwarzbeck BBHA 9120D, Horizontal
 Measurement distance: 1 m converted to 3m
 Mode: TX; 2-FSK; 918.5 MHz
 Test Date: 2019-05-13
 Note:

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Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1904-8182

Applicant: Kampstrup A/S
 EUT Name: Ultrasonic water meter KWM2210 02K14
 Model: flowIQ 2200
 Test Site: Eurofins Product Service GmbH
 Operator: Wilfried Treffke
 Test Conditions: Tnom: 23°C, Vnom:
 Antenna: Schwarzbeck BBHA 9120D, Vertical
 Measurement distance: 1 m converted to 3m
 Mode: TX; 2-FSK; 918.5 MHz
 Test Date: 2019-05-13
 Note:

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