RADIO REPORT

FCC 47 CFR Part 90I

ISED Canada RSS-119 Issue 12

Report Reference No	G0M-2009-9331-TFC090PMR-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-3 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	47 CFR Part 90I ISED RSS-119, Issue 12: 2015-05
Non-Standard Test Method	None
Equipment under Test (EUT):	
Product Description	Ultrasonic water meter
Model(s)	KWM2220
Additional Model(s)	None
Brand Name(s)	Kamstrup
Hardware Version(s)	Unit: 6201-210-04, rev 4.00; RF PCB BOM: 55501900, rev. B1; Flow PCB BOM: 55501813, rev. B3
Software Version(s)	RF: 50981336, rev. N1; Meter: 50981595, rev. D1
FCC ID	OUY-KWMX220
IC	-/-
Test Result	**PASSED**

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 °C – 23 °C	
Test Lab Humidity	32 % – 38 %	
Date of receipt of test item	2020-12-01	
Report:		
Compiled by	Toralf Jahn	
Tested by (+ signature) (Responsible for Test)	Toralf Jahn	
Approved by (+ signature) (Test Lab Engineer)	Wilfried Treffke	
Date of Issue	2021-01-15	
Total number of pages	61	
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:		

ADDITIONAL VARIANTS

Additional Comments:		
Additional variants have been declared by the manufacturer. The listed models were not tested, evaluated or assessed in no way.		
Additional Model 1	Product Type Description	Ultrasonic water meter
	Model Name	KWM2220
	Brand Name (optional)	Kamstrup
	Hardware Version	Unit: 6201-210-01, rev. 00 RF PCB BOM: 55501900, rev. B1 Flow PCB BOM: 55501813, rev. B3
	Software Version	RF: 50981336, rev. N1 Meter: 50981595, rev. D1
Additional Model 2	Product Type Description	Ultrasonic water meter
	Model Name	KWM2220
	Brand Name (optional)	Kamstrup
	Hardware Version	Unit: 6201-210-02, rev. 00 RF PCB BOM: 55501900, rev. B1 Flow PCB BOM: 55501813, rev. B3
	Software Version	RF: 50981336, rev. N1 Meter: 50981595, rev. D1
Additional Model 3	Product Type Description	Ultrasonic water meter
	Model Name	KWM2220
	Brand Name (optional)	Kamstrup
	Hardware Version	Unit: 6201-210-03, rev. 00 RF PCB BOM: 55501900, rev. B1 Flow PCB BOM: 55501813, rev. B3
	Software Version	RF: 50981336, rev. N1 Meter: 50981595, rev. D1
Additional Model 4	Product Type Description	Ultrasonic water meter
	Model Name	KWM3220
	Brand Name (optional)	Kamstrup
	Hardware Version	Unit: 6201-204-01, rev. A1 RF PCB BOM: 55501900, rev. B1 Flow PCB BOM: 55501817, rev. B1
	Software Version	RF: 50981336, rev. N1 Meter: 50981595, rev. D1

Additional Model 5	Product Type Description	Ultrasonic water meter
	Model Name	KWM3220
	Brand Name (optional)	Kamstrup
	Hardware Version	Unit: 6202-205-01, rev. 00 RF PCB BOM: 55501900, rev. B1 Flow PCB BOM: 55501817, rev. B1
	Software Version	RF: 50981336, rev. N1 Meter: 50981595, rev. D1
Additional Model 6	Product Type Description	Ultrasonic water meter
	Model Name	KWM3220
	Brand Name (optional)	Kamstrup
	Hardware Version	Unit: 6202-103-02, rev. 00 RF PCB BOM: 55501900, rev. B1 Flow PCB BOM: 55501817, rev. B1
	Software Version	RF: 50981336, rev. N1 Meter: 50981595, rev. D1
Additional Model 7	Product Type Description	Ultrasonic water meter
	Model Name	KWM3220
	Brand Name (optional)	Kamstrup
	Hardware Version	Unit: 6202-103-03, rev. 00 RF PCB BOM: 55501900, rev. B1 Flow PCB BOM: 55501817, rev. B1
	Software Version	RF: 50981336, rev. N1 Meter: 50981595, rev. D1
Additional Model 8	Product Type Description	Ultrasonic water meter
	Model Name	KWM3220
	Brand Name (optional)	Kamstrup
	Hardware Version	Unit: 6202-103-04, rev. 00 RF PCB BOM: 55501900, rev. B1 Flow PCB BOM: 55501817, rev. B1
	Software Version	RF: 50981336, rev. N1 Meter: 50981595, rev. D1
Additional Model 9	Product Type Description	Ultrasonic water meter
	Model Name	KWM3220
	Brand Name (optional)	Kamstrup
	Hardware Version	Unit: 6202-103-05, rev. 00 RF PCB BOM: 55501900, rev. B1 Flow PCB BOM: 55501817, rev. B1
	Software Version	RF: 50981336, rev. N1 Meter: 50981595, rev. D1

Additional Model 10	Product Type Description	Ultrasonic water meter
	Model Name	KWM3220
	Brand Name (optional)	Kamstrup
	Hardware Version	Unit: 6202-103-06, rev. 00 RF PCB BOM: 55501900, rev. B1 Flow PCB BOM: 55501817, rev. B1
	Software Version	RF: 50981336, rev. N1 Meter: 50981595, rev. D1
Additional Model 11	Product Type Description	Ultrasonic water meter
	Model Name	KWM3220
	Brand Name (optional)	Kamstrup
	Hardware Version	Unit: 6202-103-07, rev. 00 RF PCB BOM: 55501900, rev. B1 Flow PCB BOM: 55501817, rev. B1
	Software Version	RF: 50981336, rev. N1 Meter: 50981595, rev. D1
Additional Model 12	Product Type Description	Ultrasonic water meter
	Model Name	KWM3220
	Brand Name (optional)	Kamstrup
	Hardware Version	Unit: 6202-103-08, rev. 00 RF PCB BOM: 55501900, rev. B1 Flow PCB BOM: 55501817, rev. B1
	Software Version	RF: 50981336, rev. N1 Meter: 50981595, rev. D1

VERSION HISTORY

Version History			
Version	Issue Date	Remarks	Revised By
01	2020-01-15	Initial Release	

ABBREVIATIONS AND ACRONYMS

Acronyms	
Acronym	Description
EIRP	Equivalent Isotropic Radiated Power
ERP	Effective Radiated Power
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

REPORT INDEX

1 Equipment (Test Item) Under Test

Description	Ultrasonic water meter	
Model	KWM2220	
Additional Model(s)	None	
Brand Name(s)	Kamstrup	
Serial Number(s)	KAM21142842/20 Test Sample ID 32344	
Hardware Version(s)	Unit: 6201-210-04, rev 4.00; RF PCB BOM: 55501900, rev. B1; Flow PCB BOM: 55501813, rev. B3	
Software Version(s)	RF: 50981336, rev. N1; Meter: 50981595, rev. D1	
FCC-ID	OUY-KWMX220	
Equipment type	End Product	
Radio type	Transceiver	
Radio technologies	PMR	
Assigned frequency band	421 - 512 MHz	
Operating frequency range	450.25 – 469.9875 MHz	
Channels	Low: : Frequency 912.5 MHz Mid: : Frequency 915.0 MHz High: : Frequency 918.5 MHz	
Modulation(s)	4GFSK, 4.8 ksps, 3.6 kHz deviation	
Emission designator	F1D	
Channel bandwidth	12.5 kHz	
Authorized bandwidth	11.25 kHz	
Channel spacing	11.25 kHz	
Radio Module	None	
Number of antennas	5	
Antenna 1	Type	External antenna
	Model	30261216 A1
	Manufacturer	Kamstrup
	Gain	-0.6 dBi
Antenna 2	Type	External antenna
	Model	6699490
	Manufacturer	Kamstrup
	Gain	0.5 dBi
Antenna 3	Type	External antenna
	Model	6697902
	Manufacturer	Kamstrup
	Gain	0.0 dBi
Antenna 4	Type	External antenna
	Model	6697916
	Manufacturer	Kamstrup
	Gain	-5.3 dBi
Antenna 5	Type	External antenna
	Model	30261216 B1
	Manufacturer	Kamstrup
	Gain	-2.9 dBi
Comment	Only antenna 3 was at the lab premisses during testing.	
Supply Voltage	V_{NOM}	3.66 VDC
Operating Temperature	T_{NOM}	25 °C
AC/DC-Adaptor	None	
Battery supply	Yes	

Manufacturer	Kamstrup A/S Industrivej 28 8660 Skanderborg DENMARK

1.4 Support Equipment

Product Type	Device	Manufacturer	Model	Comment
AE	Optical readout head	Kamstrup	140711	Programming interface
AE	Laboratory power supply	KORAD	KD6005P	The EUT battery does not last to perform the tests. Therefore an external power supply was necessary.
CBL	Auxillary cable			To connect EUT and power supply.
SFT	Device Control Tool	Kamstrup	ver. 0.05	Tool for controlling RF modules and meters
Description:				
AE	Auxiliary Equipment			
SIM	Simulator			
CBL	Connecting Cable			
SFT	Software			
Comment:				

1.5 Test Modes

Mode	Description
Unmodulated	Tuned conducted power = 30 dBm Mode = Transmit Modulation = None
Transmit	Tuned conducted power = 30 dBm Mode = Transmit Modulation = 4GFSK, 4.8 ksps, 3.6 kHz deviation Duty cycle = 100 %

1.6 Test Frequencies

Designator	Mode	Frequency [MHz]
F1	Tx / Rx	450.25
F2	Tx / Rx	460.11875
F3	Tx / Rx	469.9875

1.7 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:

Reading on Analyzer (dBµV) + A.F. (dB) = Net field strength (dBµV/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:

Limit (dBµV/m) = 20*log (µV/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

Test Summary)				
Product Standard Reference	**Requirement**	**Reference Method**	**Result**	**Remarks**
FCC 90.205	Power	ANSI C63.26:2015 5.2	PASS	
FCC 90.209 FCC 90.210 FCC 2.1049	Authorized bandwidth Emission masks Occupied bandwidth	FCC 90.210 ANSI C63.26:2015 5.4	N/T	
FCC 90.210 FCC 2.1051	Spurious emissions at antenna terminal	FCC 90.210 ANSI C63.26:2015 5.7	PASS	
FCC 90.210 FCC 2.1051	Spurious emissions radiated	FCC 90.210 ANSI C63.26:2015 5.7	PASS	
FCC 90.213 FCC 2.1055	Frequency Stability	ANSI C63.26:2015 5.6	N/T	
FCC 90.214	Transient Frequency behavior	ANSI C63.26:2015 6.5	N/T	
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 - Power

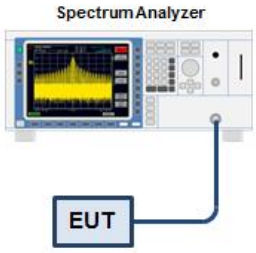
3.1.1 Information

Test Information	
Reference	FCC 90.205, FCC 90.2.1046 ISED RSS-119, Issue 12 (Section 5.4)
Measurement Method	ANSI C63.26:2015 5.2
Test Method	Conducted
Test Mode	Modulated
Maximum antenna gain	0.5 dBi
Operator	Toralf Jahn
Date	2021-01-12

3.1.2 Limits

Limits	
Device	Power
Base / Fixed / Mobile	± 1 dB of the rated power
Base / Fixed	110 W ERP (50.41 dBm ERP)
Mobile	60 W ERP (47.78 dBm ERP)

3.1.3 Setup

Test Setup


3.1.4 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyser	R&S	FSU 3	EF00241	2019-07	2021-07
Attenuator	Radiall GmbH	R416010000	EF01013	2017-08	2021-08
Cable	Gigalane	SMS111B	EF00779	2020-12	2021-12

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 3 MHz 4. Peak power is determined from peak of spectrum envelope 5. EIRP power is calculated by adding the antenna gain in dBi 6. ERP power is calculated by subtracting 2.15 from EIRP power

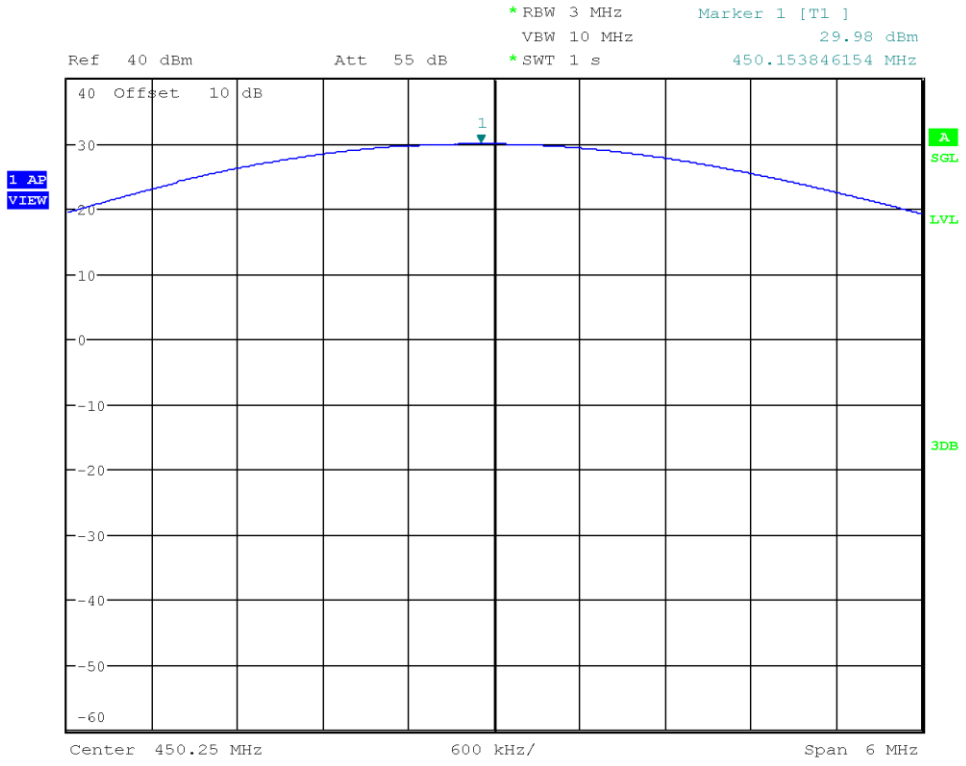
3.1.6 Results

Test Results – Rated Power					
Channel [MHz]	Conducted Power [dBm]	Rated Power [dBm]	Lower Limit [dBm]	Upper Limit [dBm]	Verdict
450.25	29.98	30	29	31	PASS
460.11875	29.98	30	29	31	PASS
469.9875	29.93	30	29	31	PASS

Test Results – Maximum ERP					
Channel [MHz]	Conducted Power [dBm]	ERP Peak Power [dBm]	ERP Peak Power [W]	ERP Power Limit [dBm]	margin [dB]
450.25	29.98	28.33	0.68	50.41	-22.08
460.11875	29.98	28.33	0.68	50.41	-22.08
469.9875	29.93	28.28	0.67	50.41	-22.13

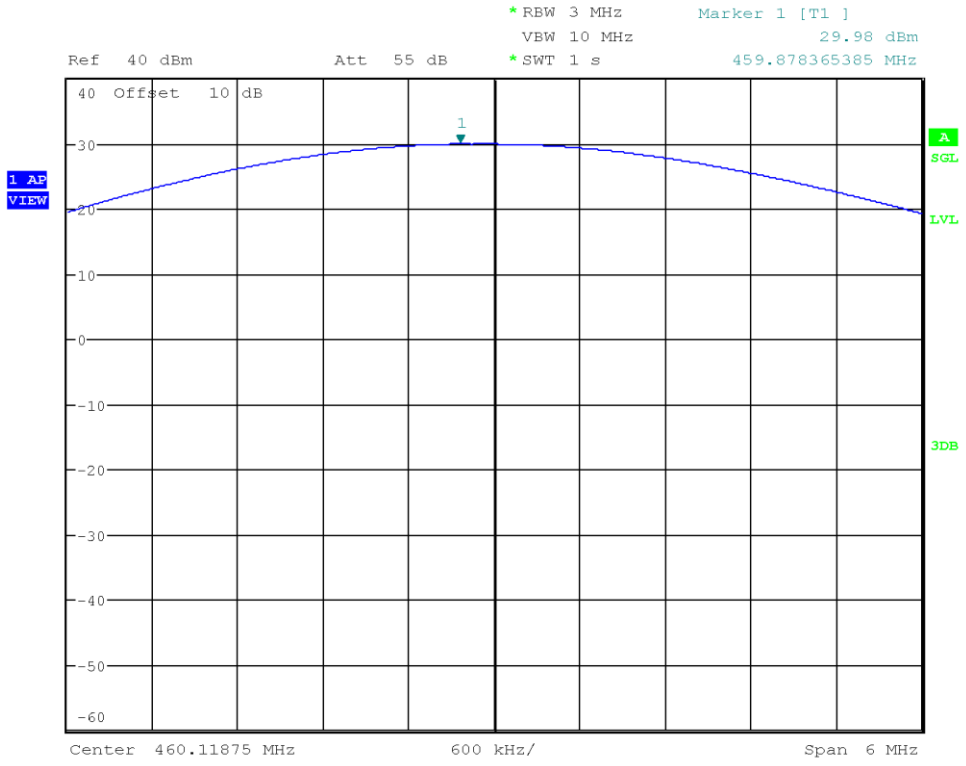
Conducted Power

Project Number:	G0M-2009-9331
Applicant:	Kamstrup A/S
Model Description:	Ultrasonic water meter
Model:	KWM2220
Test Sample ID:	32344
Operator:	Toralf Jahn
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-01-12
Operating Conditions:	Tnom/Vnom
Mode:	450.25 MHz



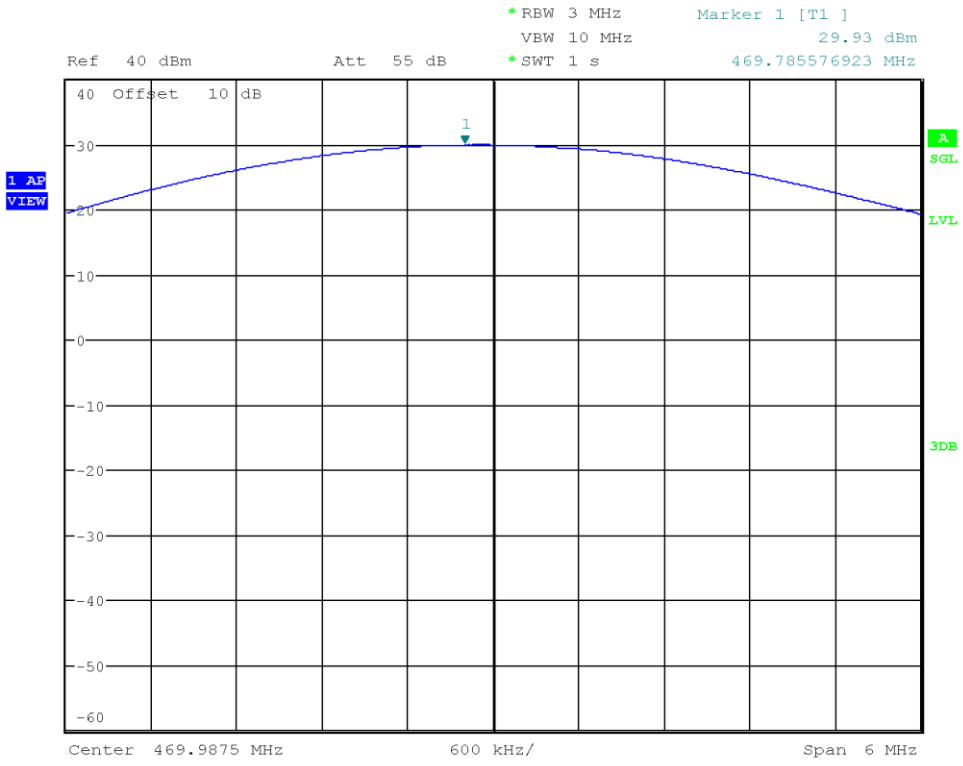
Conducted Power

Project Number:	G0M-2009-9331
Applicant:	Kamstrup A/S
Model Description:	Ultrasonic water meter
Model:	KWM2220
Test Sample ID:	32344
Operator:	Toralf Jahn
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-01-12
Operating Conditions:	Tnom/Vnom
Mode:	460.11875 MHz



Conducted Power

Project Number:	G0M-2009-9331
Applicant:	Kamstrup A/S
Model Description:	Ultrasonic water meter
Model:	KWM2220
Test Sample ID:	32344
Operator:	Toralf Jahn
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-01-12
Operating Conditions:	Tnom/Vnom
Mode:	469.9875 MHz



3.2 Test Conditions and Results - Spurious emissions at antenna terminal

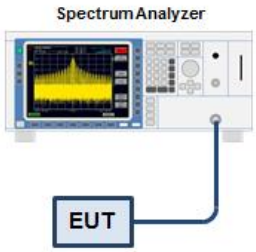
3.2.1 Information

Test Information	
Reference	FCC 90.210, FCC 2.1051 ISED RSS-119, Issue 12 (Sections 4.2,6.13)
Measurement Method	FCC 90.210 ANSI C63.26:2015 5.7
Test Method	Conducted
Test Mode	Unmodulated
Test Range	10 MHz to 10th Harmonic
Operator	Toralf Jahn
Date	2021-01-12

3.2.2 Limits

Limits
-20 dBm

3.2.3 Setup

Test Setup


3.2.4 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyser	R&S	FSP 30	EF00312	2020-07	2021-07
Attenuator	Radiall GmbH	R416010000	EF01013	2017-08	2021-08
Cable	Gigalane	SMS111B	EF00779	2020-12	2021-12

3.2.5 Procedure

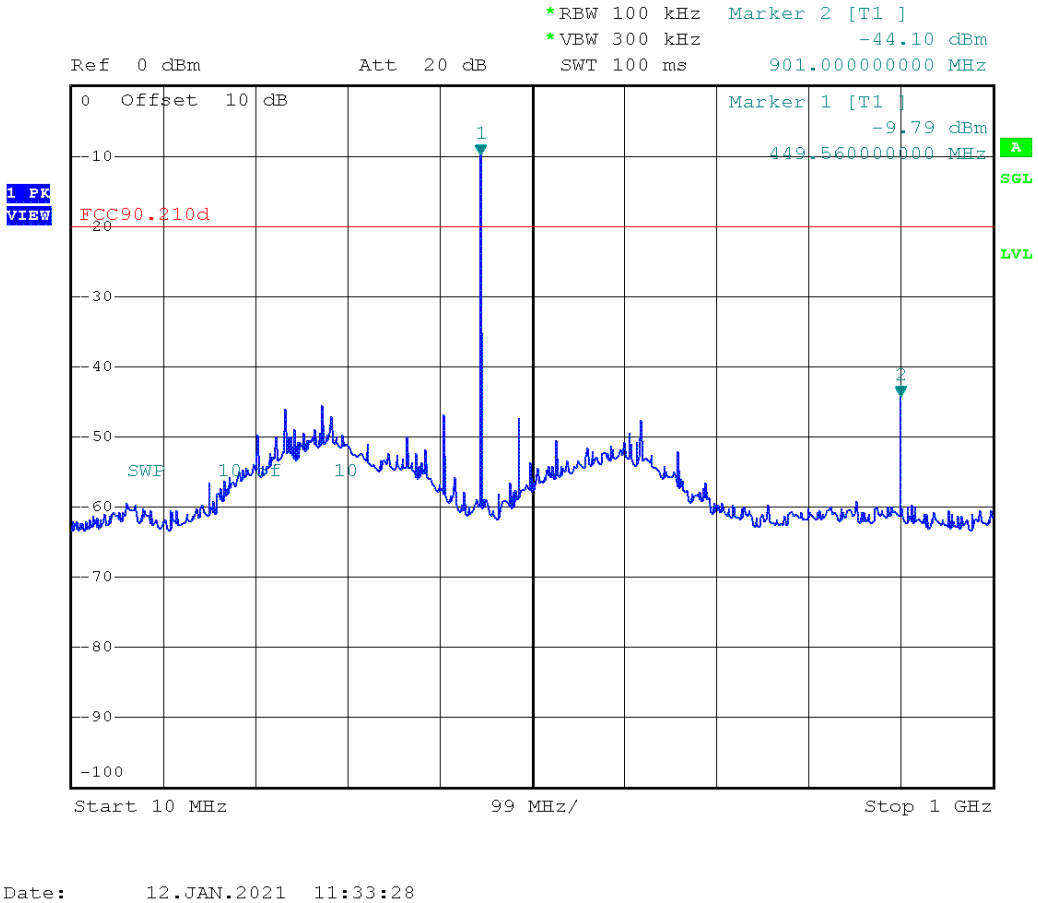
Test Procedure
1. EUT set to test mode 2. Span is set according to measurement range 3. Resolution bandwidth is set to 100 kHz below 1 GHz and 1 MHz above 1 GHz 4. Detector is set to peak and trace mode to max hold

3.2.6 Results

Test Results	
Channel [MHz]	Verdict
450.25	PASS
460.11875	PASS
469.9875	PASS

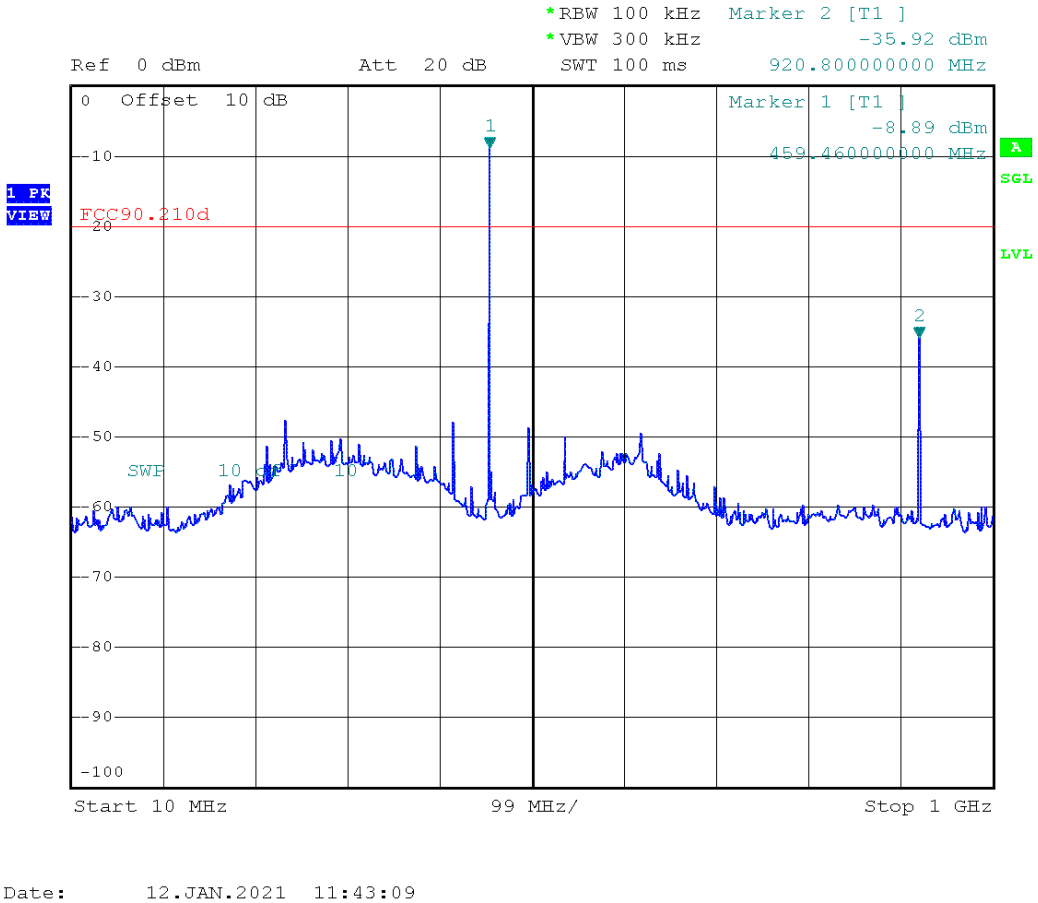
Spurious emissions at antenna terminal

Project Number:	G0M-2009-9331
Applicant:	Kamstrup A/S
Model Description:	Ultrasonic water meter
Model:	KWM2220
Test Sample ID:	32344
Operator:	Toralf Jahn
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-01-12
Operating Conditions:	Tnom/Vnom
Mode:	450.25 MHz



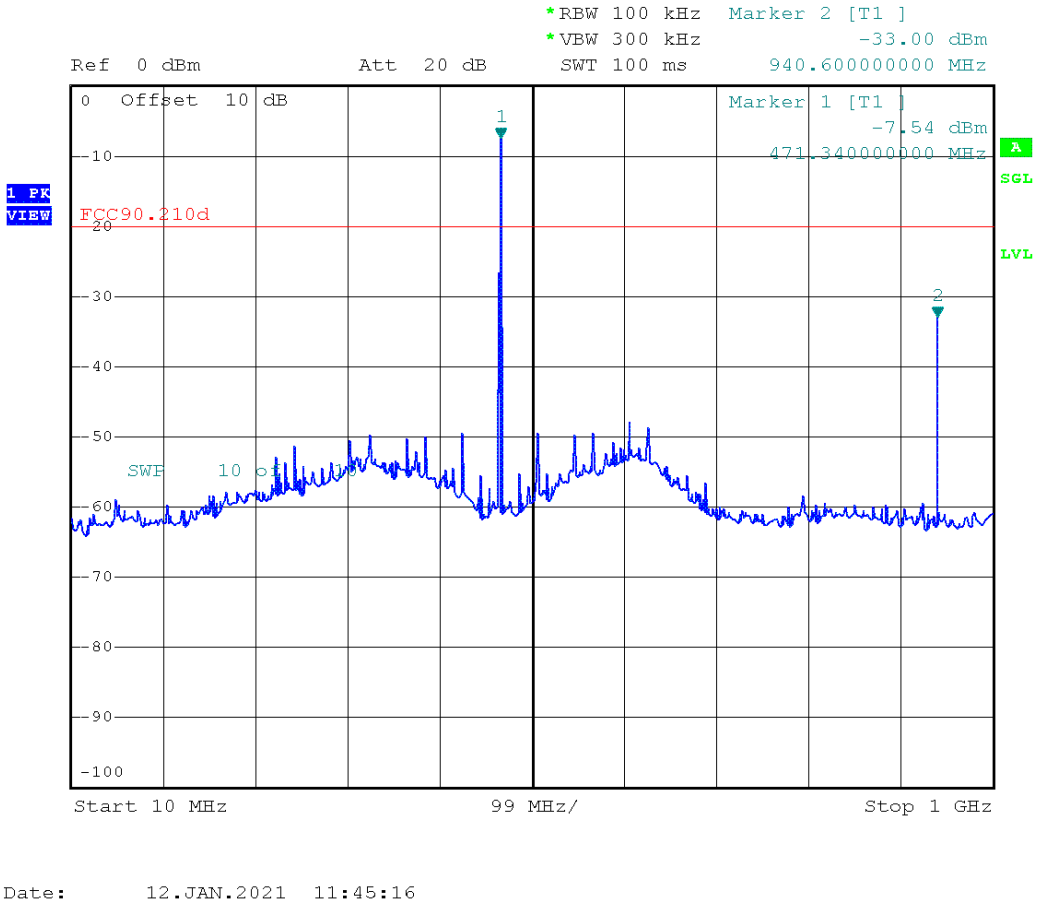
Spurious emissions at antenna terminal

Project Number:	G0M-2009-9331
Applicant:	Kamstrup A/S
Model Description:	Ultrasonic water meter
Model:	KWM2220
Test Sample ID:	32344
Operator:	Toralf Jahn
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-01-12
Operating Conditions:	Tnom/Vnom
Mode:	460.11875 MHz



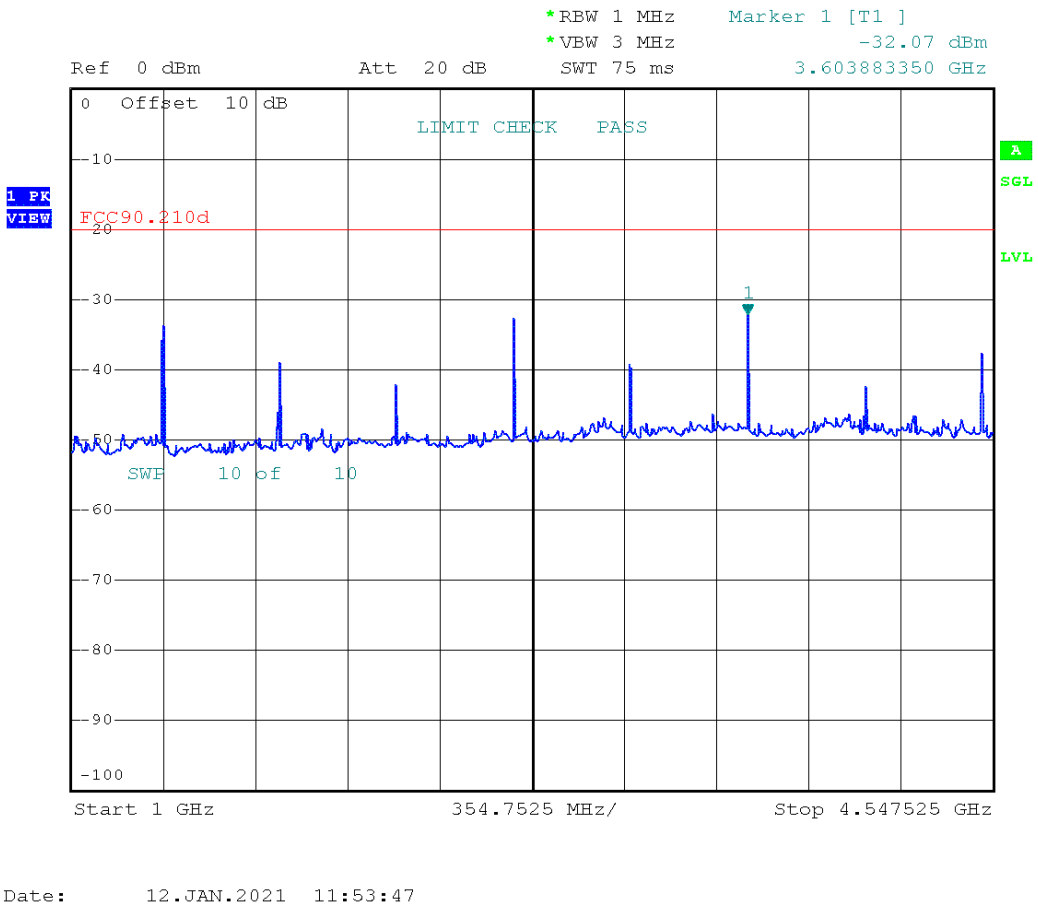
Spurious emissions at antenna terminal

Project Number:	G0M-2009-9331
Applicant:	Kamstrup A/S
Model Description:	Ultrasonic water meter
Model:	KWM2220
Test Sample ID:	32344
Operator:	Toralf Jahn
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-01-12
Operating Conditions:	Tnom/Vnom
Mode:	469.9875 MHz



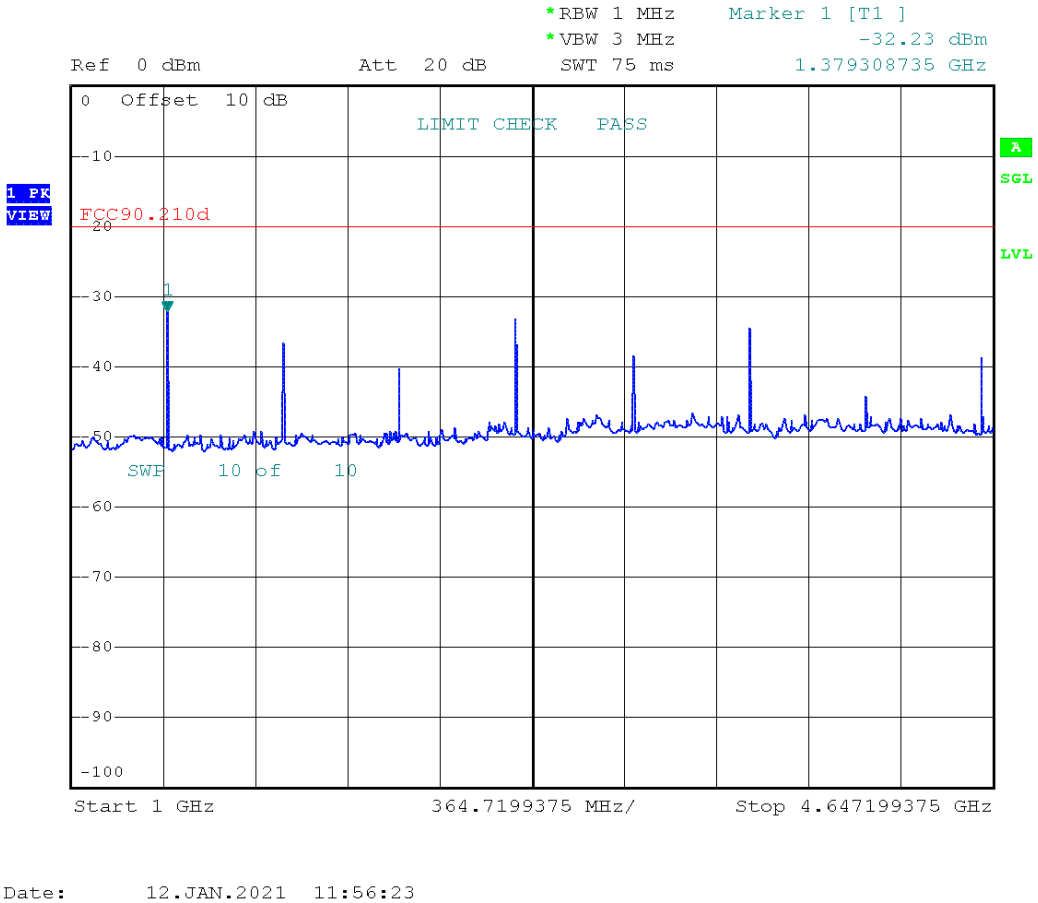
Spurious emissions at antenna terminal

Project Number:	G0M-2009-9331
Applicant:	Kamstrup A/S
Model Description:	Ultrasonic water meter
Model:	KWM2220
Test Sample ID:	32344
Operator:	Toralf Jahn
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-01-12
Operating Conditions:	Tnom/Vnom
Mode:	450.25 MHz



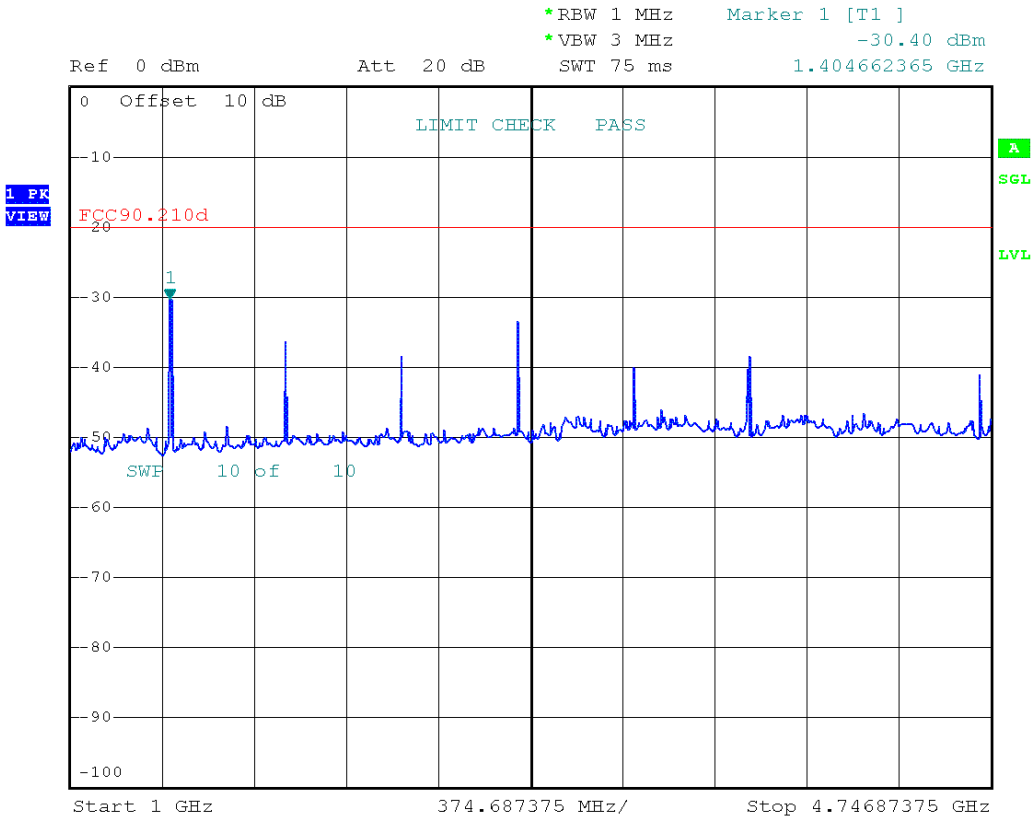
Spurious emissions at antenna terminal

Project Number:	G0M-2009-9331
Applicant:	Kamstrup A/S
Model Description:	Ultrasonic water meter
Model:	KWM2220
Test Sample ID:	32344
Operator:	Toralf Jahn
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-01-12
Operating Conditions:	Tnom/Vnom
Mode:	460.11875 MHz



Spurious emissions at antenna terminal

Project Number:	G0M-2009-9331
Applicant:	Kamstrup A/S
Model Description:	Ultrasonic water meter
Model:	KWM2220
Test Sample ID:	32344
Operator:	Toralf Jahn
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-01-12
Operating Conditions:	Tnom/Vnom
Mode:	469.9875 MHz



3.3 Test Conditions and Results - Transmitter radiated emissions

3.3.1 Information

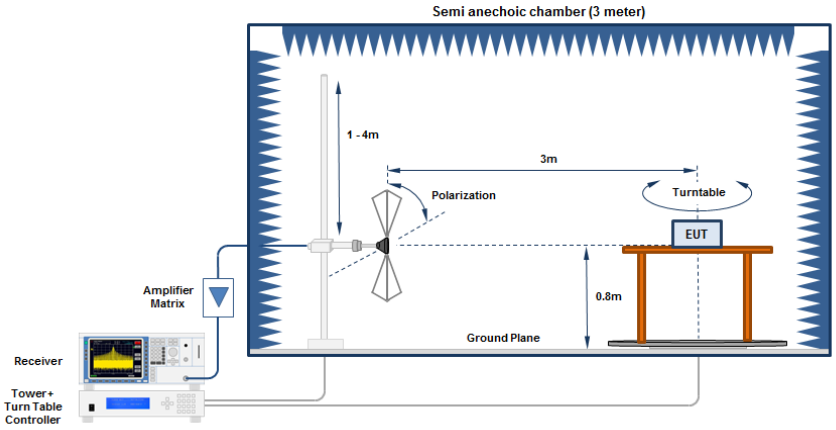
Test Information	
Reference	FCC 90.210 FCC 2.1053 ISED RSS-119, Issue 12 (Sections 4.2,6.13)
Measurement Method	FCC 90.210 ANSI C63.26:2015 5.7
Test Method	Radiated
Test Mode	Unmodulated
Test Range	30 MHz to 10th Harmonic
Operator	Toralf Jahn
Date	2021-01-11

3.3.2 Limits

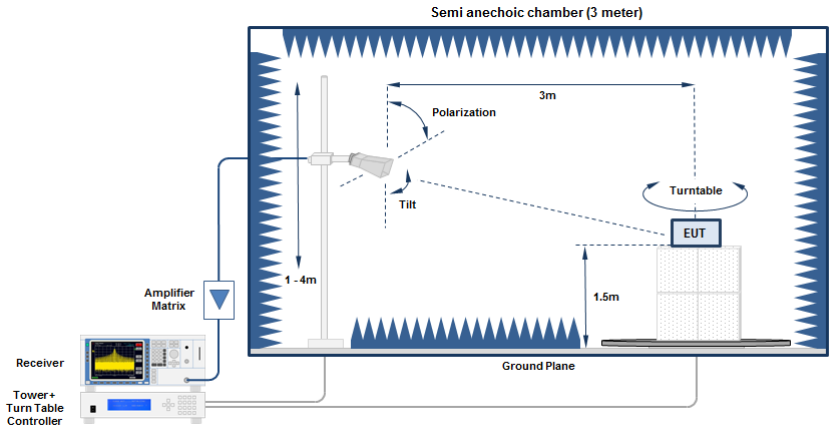
Limits
-20 dBm

3.3.3 Setup

Test Setup 30 - 1000 MHz



Test Setup > 1 GHz



3.3.4 Equipment

Test Software			
Description	Manufacturer	Name	Version
EMC Software	DARE Instruments	RadiMation	2020.1.8

Test Equipment 30 MHz - 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	2020-06	2021-06
Antenna	R&S	HK 116	EF00030	2019-04	2022-04
Antenna	R&S	HL 223	EF00187	2019-05	2022-05

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	2020-06	2021-06
Antenna	Schwarzbeck	BBHA 9120D	EF00018	2019-10	2022-10

3.3.5 Procedure

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

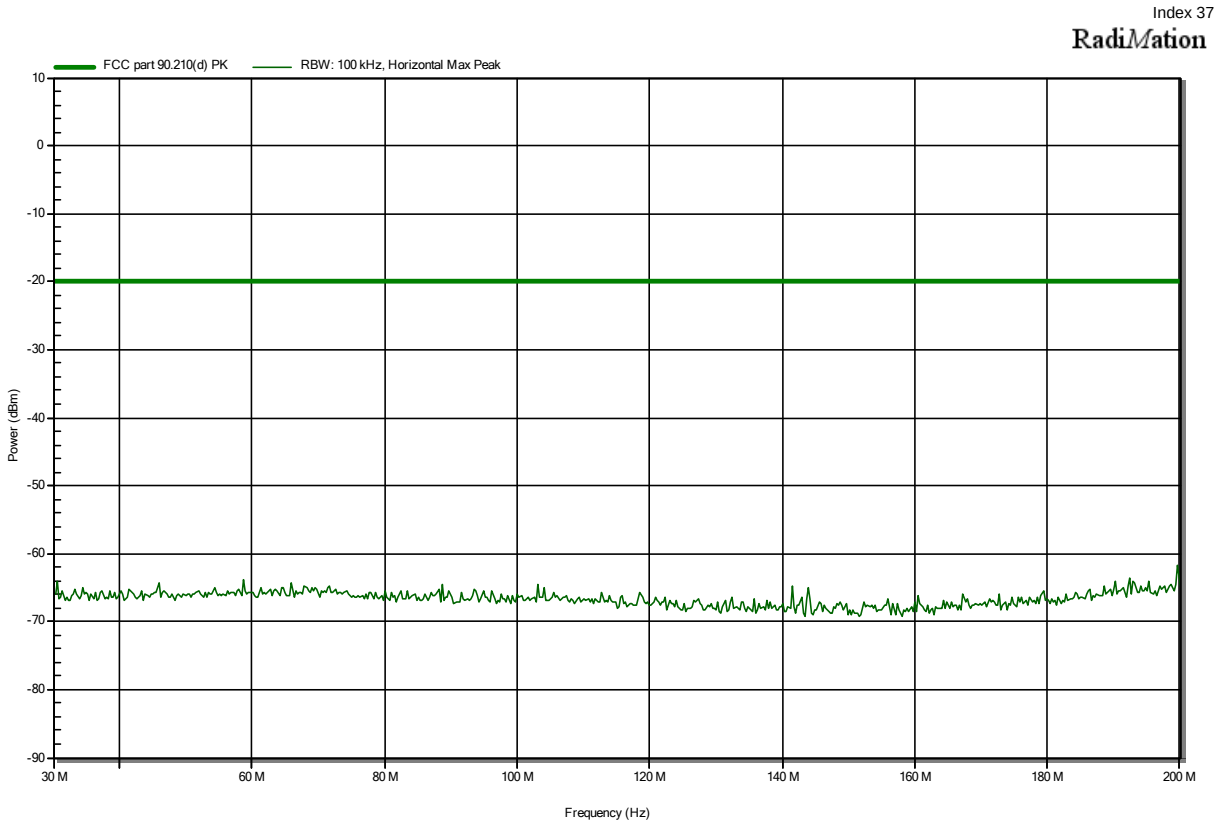
3.3.6 Results

Test Results						
Channel [MHz]	Emission [MHz]	Level [dBm]	Det.	Pol.	Limit [dBm]	Margin [dB]
450.25	2250	-48.40	pk	hor	-20.00	-28.44
450.25	2250	-45.70	pk	ver	-20.00	-25.71

ANNEX A Transmitter radiated emissions

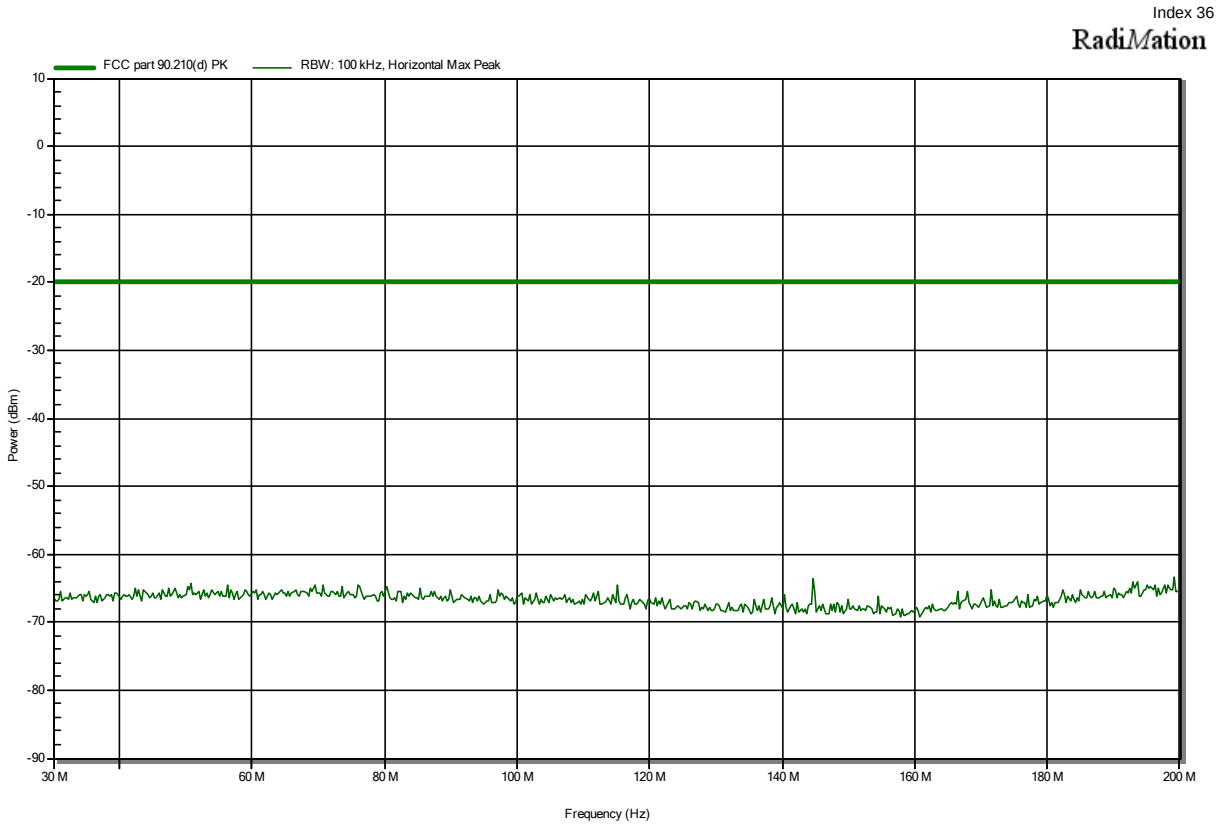
Radiated Spurious Emissions according to FCC 47 CFR 90 I

Project Number:	G0M-2009-9331
Applicant:	Kamstrup A/S
Model Description:	Ultrasonic water meter
Model:	KWM2220
Test Sample ID:	32344
Test Site:	Eurofins Product Service GmbH
Operator:	Toralf Jahn
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 24 °Celsius, Vnom: 3.66 VDC
Antenna:	Rohde & Schwarz HK 116, Horizontal
Measurement distance:	3 m
Mode:	Tx; 50 Ohm load, 450.25 MHz
Test Date:	2021-01-11
Note:	



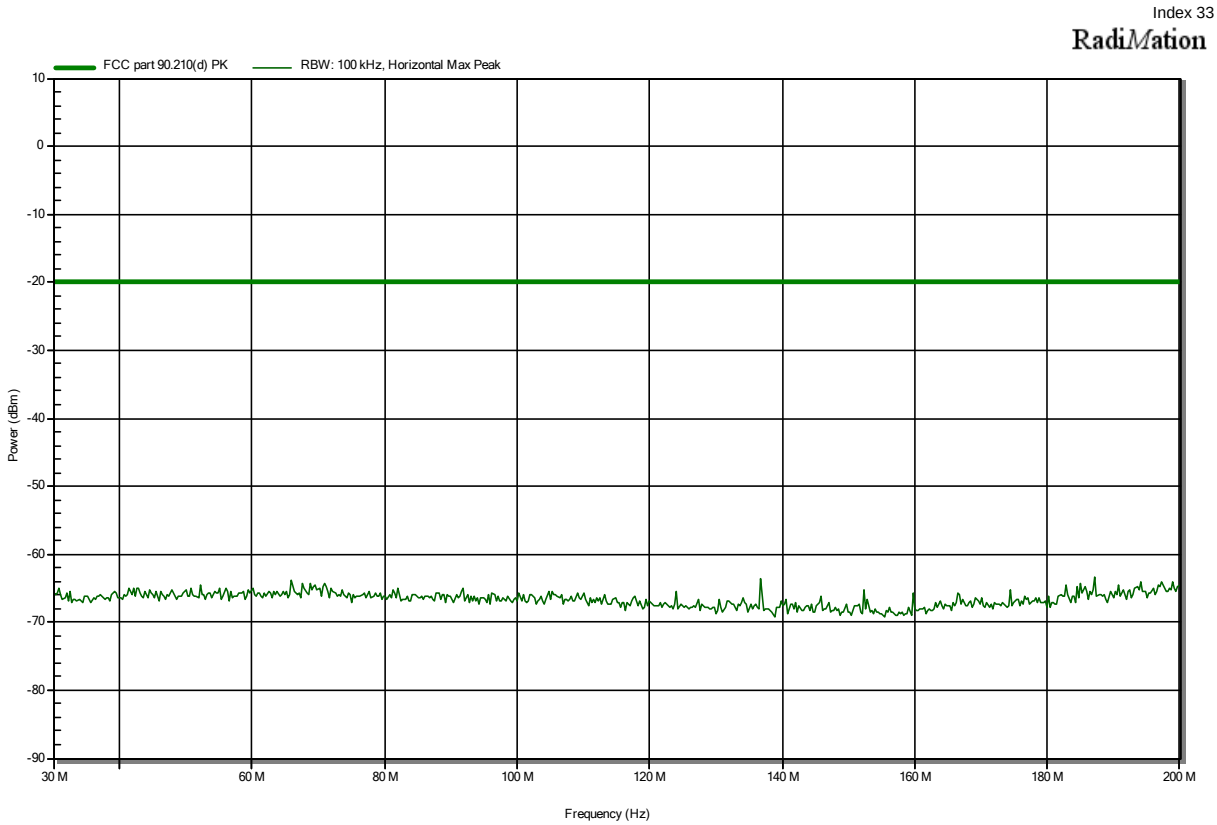
Radiated Spurious Emissions according to FCC 47 CFR 90 I

Project Number:	G0M-2009-9331
Applicant:	Kamstrup A/S
Model Description:	Ultrasonic water meter
Model:	KWM2220
Test Sample ID:	32344
Test Site:	Eurofins Product Service GmbH
Operator:	Toralf Jahn
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 24 °Celsius, Vnom: 3.66 VDC
Antenna:	Rohde & Schwarz HK 116, Horizontal
Measurement distance:	3 m
Mode:	Tx; 50 Ohm load, 460.11875 MHz
Test Date:	2021-01-11
Note:	



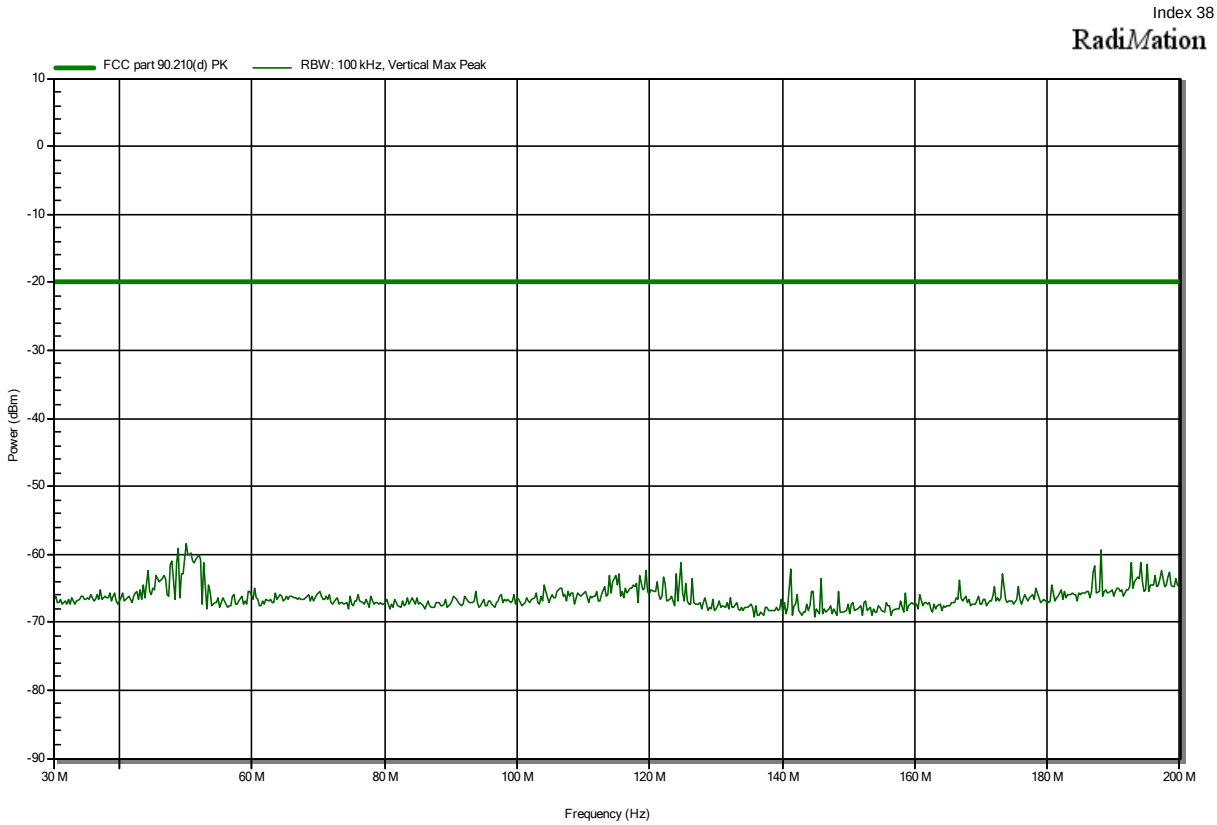
Radiated Spurious Emissions according to FCC 47 CFR 90 I

Project Number:	G0M-2009-9331
Applicant:	Kamstrup A/S
Model Description:	Ultrasonic water meter
Model:	KWM2220
Test Sample ID:	32344
Test Site:	Eurofins Product Service GmbH
Operator:	Toralf Jahn
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 24 °Celsius, Vnom: 3.66 VDC
Antenna:	Rohde & Schwarz HK 116, Horizontal
Measurement distance:	3 m
Mode:	Tx; 50 Ohm load, 469.9875 MHz
Test Date:	2021-01-11
Note:	



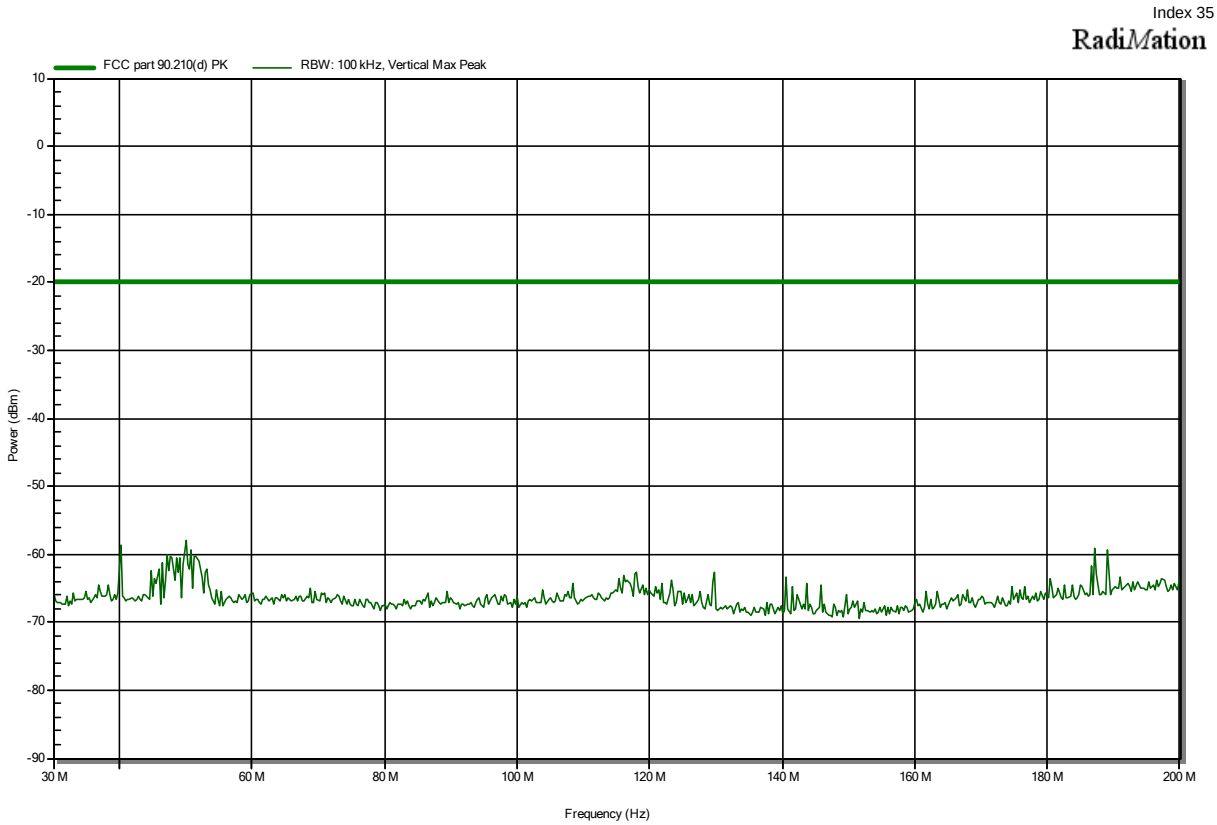
Radiated Spurious Emissions according to FCC 47 CFR 90 I

Project Number:	G0M-2009-9331
Applicant:	Kamstrup A/S
Model Description:	Ultrasonic water meter
Model:	KWM2220
Test Sample ID:	32344
Test Site:	Eurofins Product Service GmbH
Operator:	Toralf Jahn
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 24 °Celsius, Vnom: 3.66 VDC
Antenna:	Rohde & Schwarz HK 116, Vertical
Measurement distance:	3 m
Mode:	Tx; 50 Ohm load, 450.25 MHz
Test Date:	2021-01-11
Note:	



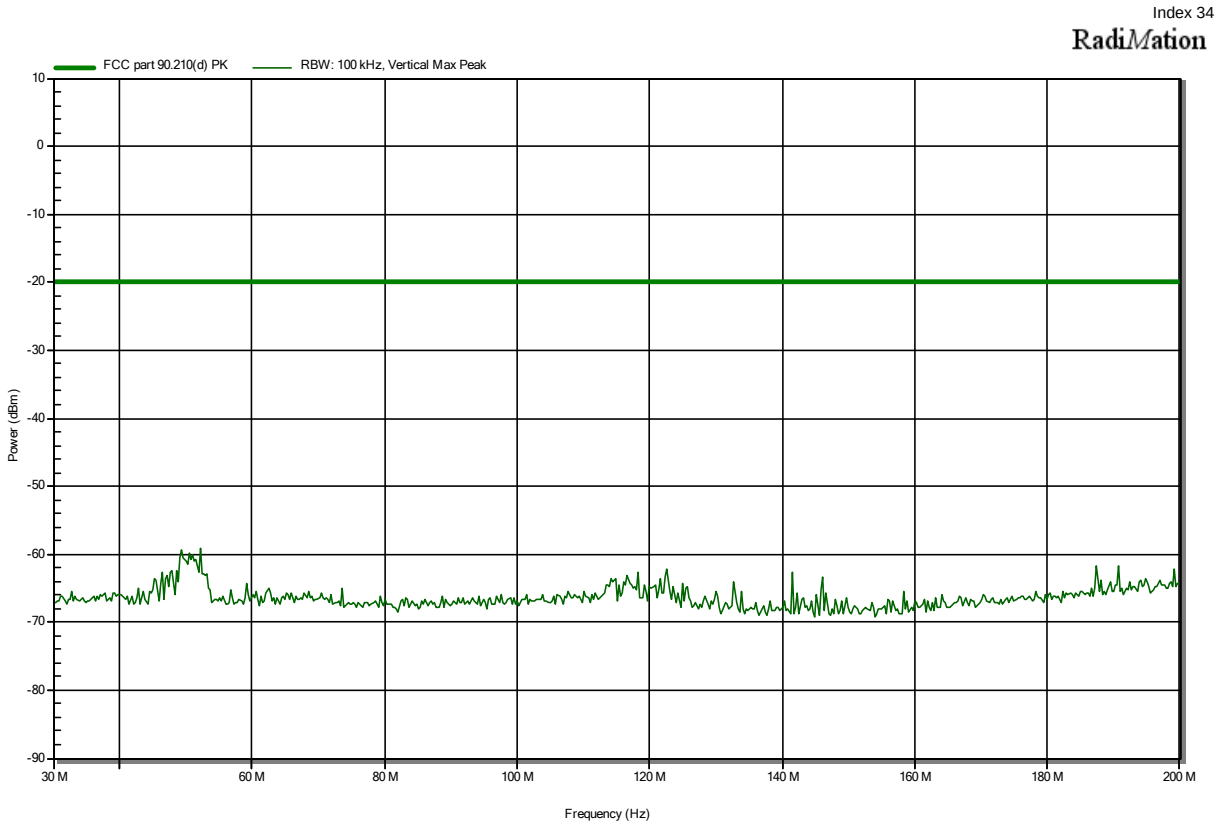
Radiated Spurious Emissions according to FCC 47 CFR 90 I

Project Number:	G0M-2009-9331
Applicant:	Kamstrup A/S
Model Description:	Ultrasonic water meter
Model:	KWM2220
Test Sample ID:	32344
Test Site:	Eurofins Product Service GmbH
Operator:	Toralf Jahn
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 24 °Celsius, Vnom: 3.66 VDC
Antenna:	Rohde & Schwarz HK 116, Vertical
Measurement distance:	3 m
Mode:	Tx; 50 Ohm load, 460.11875 MHz
Test Date:	2021-01-11
Note:	



Radiated Spurious Emissions according to FCC 47 CFR 90 I

Project Number:	G0M-2009-9331
Applicant:	Kamstrup A/S
Model Description:	Ultrasonic water meter
Model:	KWM2220
Test Sample ID:	32344
Test Site:	Eurofins Product Service GmbH
Operator:	Toralf Jahn
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 24 °Celsius, Vnom: 3.66 VDC
Antenna:	Rohde & Schwarz HK 116, Vertical
Measurement distance:	3 m
Mode:	Tx; 50 Ohm load, 469.9875 MHz
Test Date:	2021-01-11
Note:	

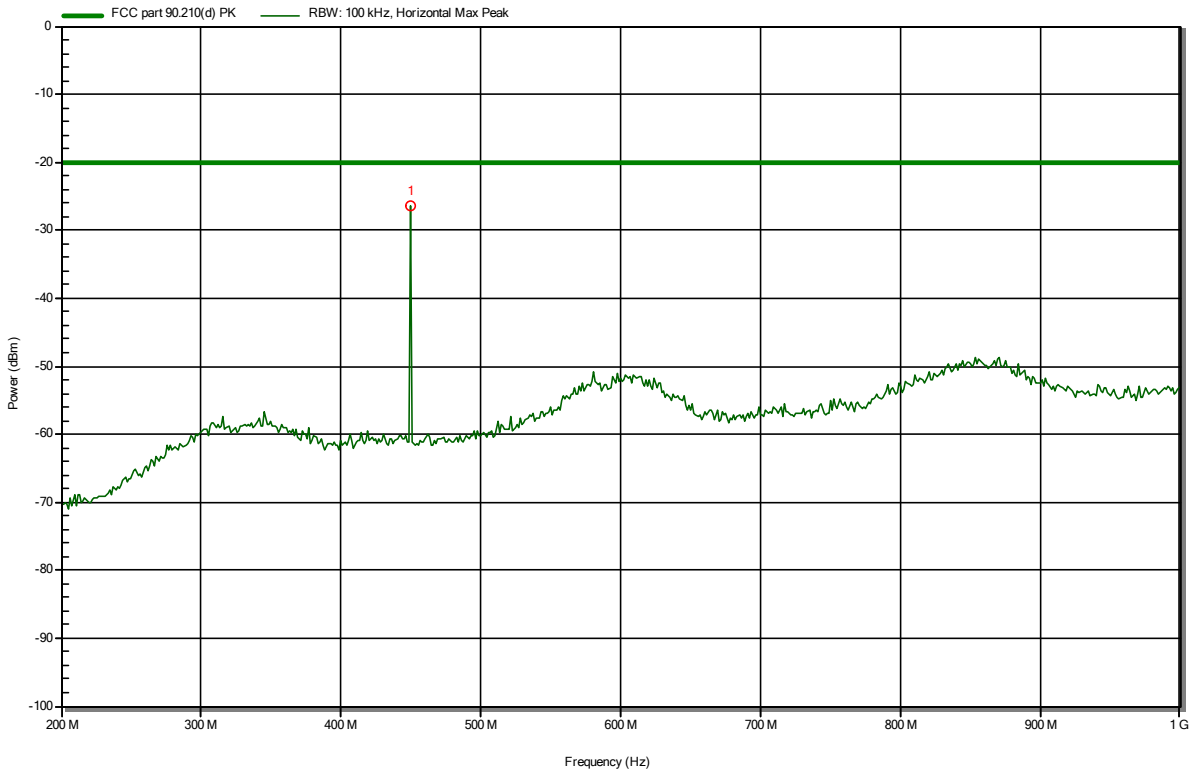


Radiated Spurious Emissions according to FCC 47 CFR 90 I

Project Number:	G0M-2009-9331
Applicant:	Kamstrup A/S
Model Description:	Ultrasonic water meter
Model:	KWM2220
Test Sample ID:	32344
Test Site:	Eurofins Product Service GmbH
Operator:	Toralf Jahn
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 24 °Celsius, Vnom: 3.66 VDC
Antenna:	Rohde & Schwarz HL 223, Horizontal
Measurement distance:	3 m
Mode:	Tx; 50 Ohm load, 450.25 MHz
Test Date:	2021-01-13
Note:	

Index 56

RadiMation



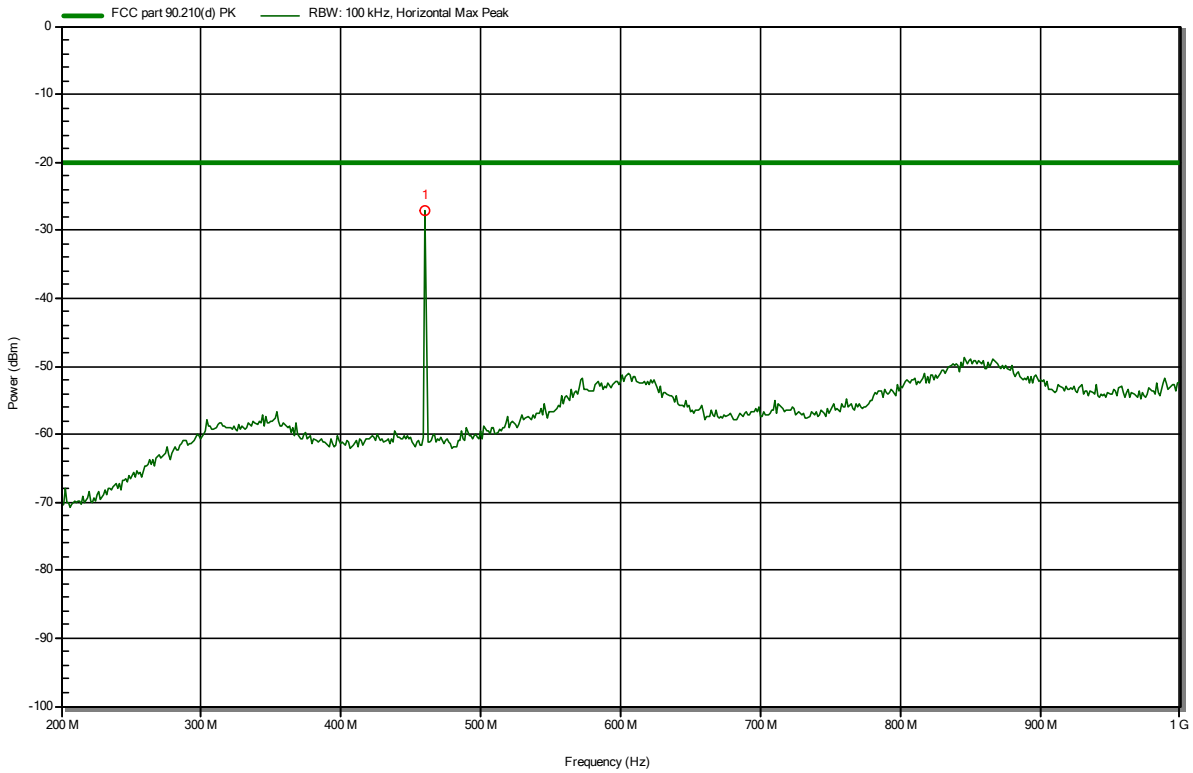
Frequency	Peak	Peak Limit	Peak Difference	Peak Status
450 MHz				Carrier

Radiated Spurious Emissions according to FCC 47 CFR 90 I

Project Number:	G0M-2009-9331
Applicant:	Kamstrup A/S
Model Description:	Ultrasonic water meter
Model:	KWM2220
Test Sample ID:	32344
Test Site:	Eurofins Product Service GmbH
Operator:	Toralf Jahn
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 24 °Celsius, Vnom: 3.66 VDC
Antenna:	Rohde & Schwarz HL 223, Horizontal
Measurement distance:	3 m
Mode:	Tx; 50 Ohm load, 460.11875 MHz
Test Date:	2021-01-13
Note:	

Index 59

RadiMation



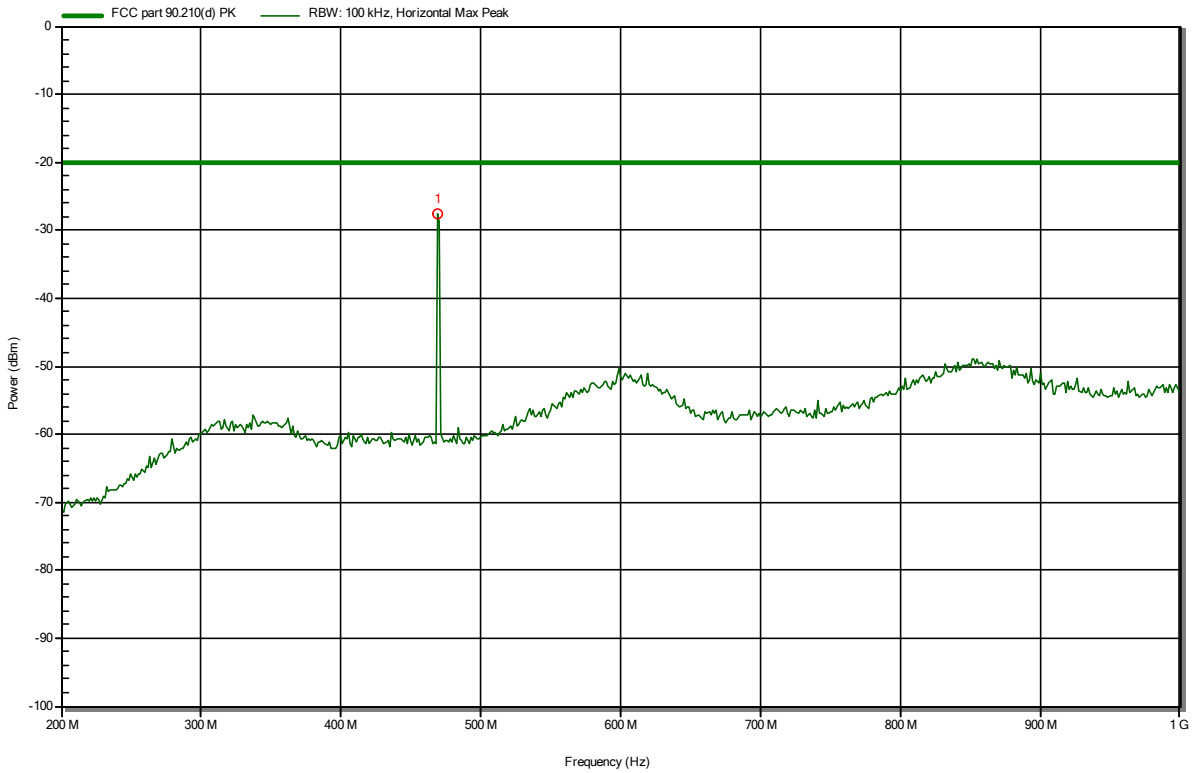
Frequency	Peak	Peak Limit	Peak Difference	Peak Status
460.256 MHz				Carrier

Radiated Spurious Emissions according to FCC 47 CFR 90 I

Project Number:	G0M-2009-9331
Applicant:	Kamstrup A/S
Model Description:	Ultrasonic water meter
Model:	KWM2220
Test Sample ID:	32344
Test Site:	Eurofins Product Service GmbH
Operator:	Toralf Jahn
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 24 °Celsius, Vnom: 3.66 VDC
Antenna:	Rohde & Schwarz HL 223, Horizontal
Measurement distance:	3 m
Mode:	Tx; 50 Ohm load, 469.9875 MHz
Test Date:	2021-01-13
Note:	

Index 53

RadiMation



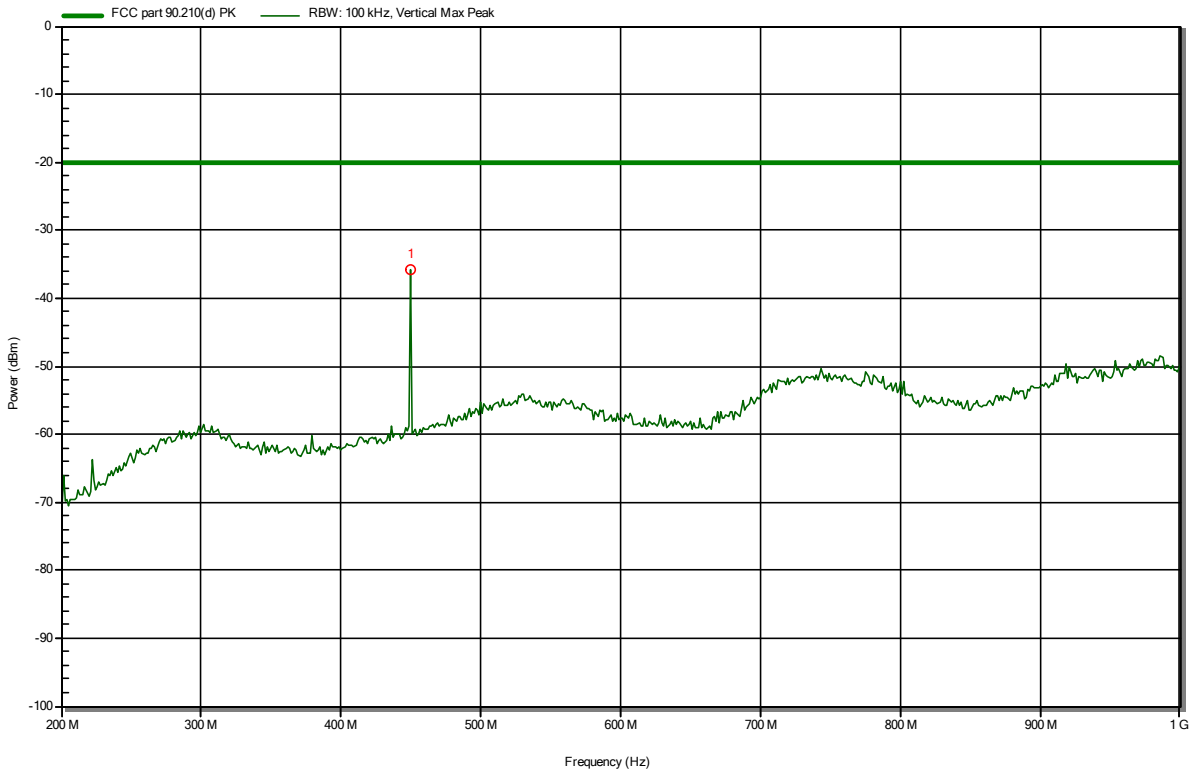
Frequency	Peak	Peak Limit	Peak Difference	Peak Status
469.231 MHz				Carrier

Radiated Spurious Emissions according to FCC 47 CFR 90 I

Project Number:	G0M-2009-9331
Applicant:	Kamstrup A/S
Model Description:	Ultrasonic water meter
Model:	KWM2220
Test Sample ID:	32344
Test Site:	Eurofins Product Service GmbH
Operator:	Toralf Jahn
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 24 °Celsius, Vnom: 3.66 VDC
Antenna:	Rohde & Schwarz HL 223, Vertical
Measurement distance:	3 m
Mode:	Tx; 50 Ohm load, 450.25 MHz
Test Date:	2021-01-13
Note:	

Index 55

RadiMation



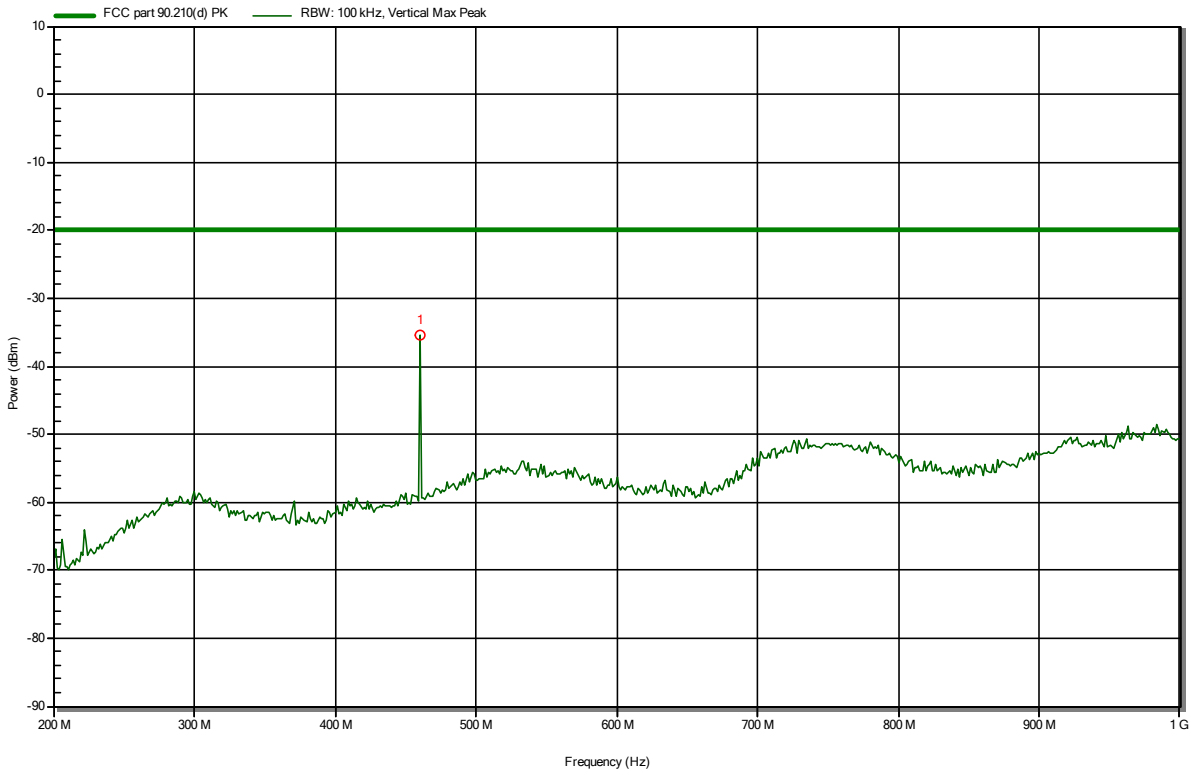
Frequency	Peak	Peak Limit	Peak Difference	Peak Status
450 MHz				Carrier

Radiated Spurious Emissions according to FCC 47 CFR 90 I

Project Number:	G0M-2009-9331
Applicant:	Kamstrup A/S
Model Description:	Ultrasonic water meter
Model:	KWM2220
Test Sample ID:	32344
Test Site:	Eurofins Product Service GmbH
Operator:	Toralf Jahn
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 24 °Celsius, Vnom: 3.66 VDC
Antenna:	Rohde & Schwarz HL 223, Vertical
Measurement distance:	3 m
Mode:	Tx; 50 Ohm load, 460.11875 MHz
Test Date:	2021-01-13
Note:	

Index 58

RadiMation



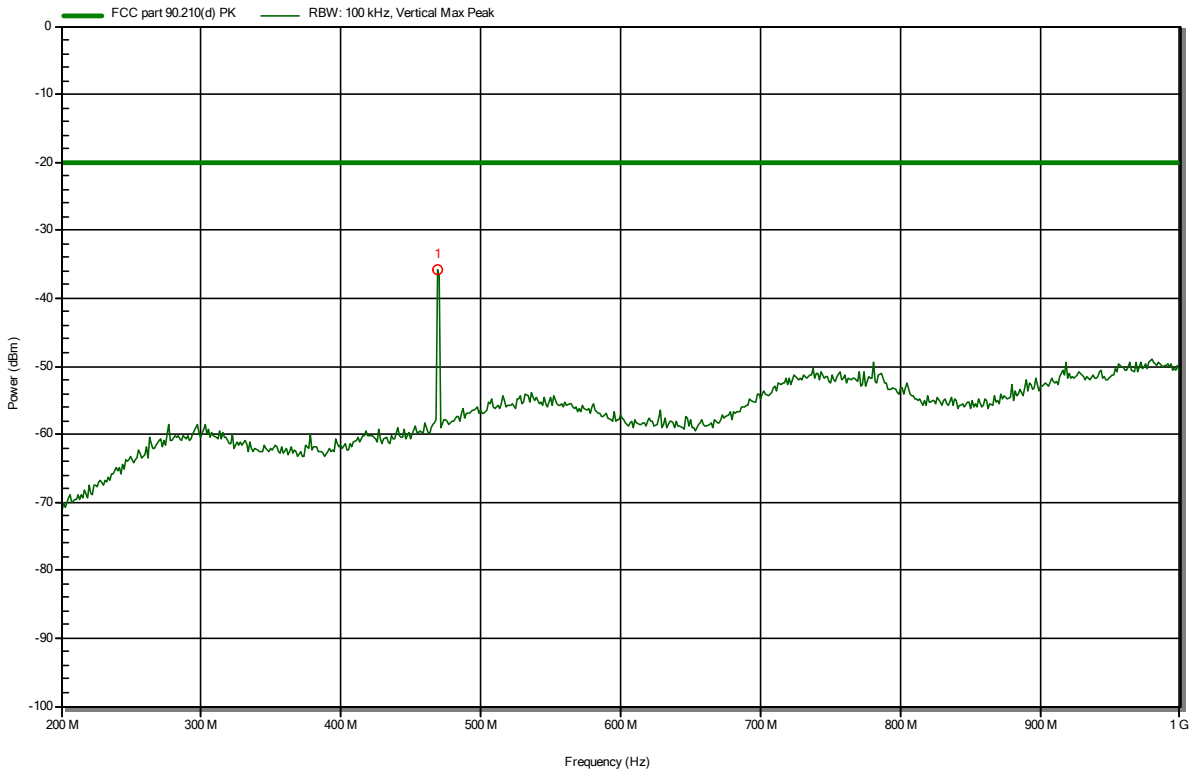
Frequency	Peak	Peak Limit	Peak Difference	Peak Status
460.256 MHz				Carrier

Radiated Spurious Emissions according to FCC 47 CFR 90 I

Project Number:	G0M-2009-9331
Applicant:	Kamstrup A/S
Model Description:	Ultrasonic water meter
Model:	KWM2220
Test Sample ID:	32344
Test Site:	Eurofins Product Service GmbH
Operator:	Toralf Jahn
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 24 °Celsius, Vnom: 3.66 VDC
Antenna:	Rohde & Schwarz HL 223, Vertical
Measurement distance:	3 m
Mode:	Tx; 50 Ohm load, 469.9875 MHz
Test Date:	2021-01-13
Note:	

Index 54

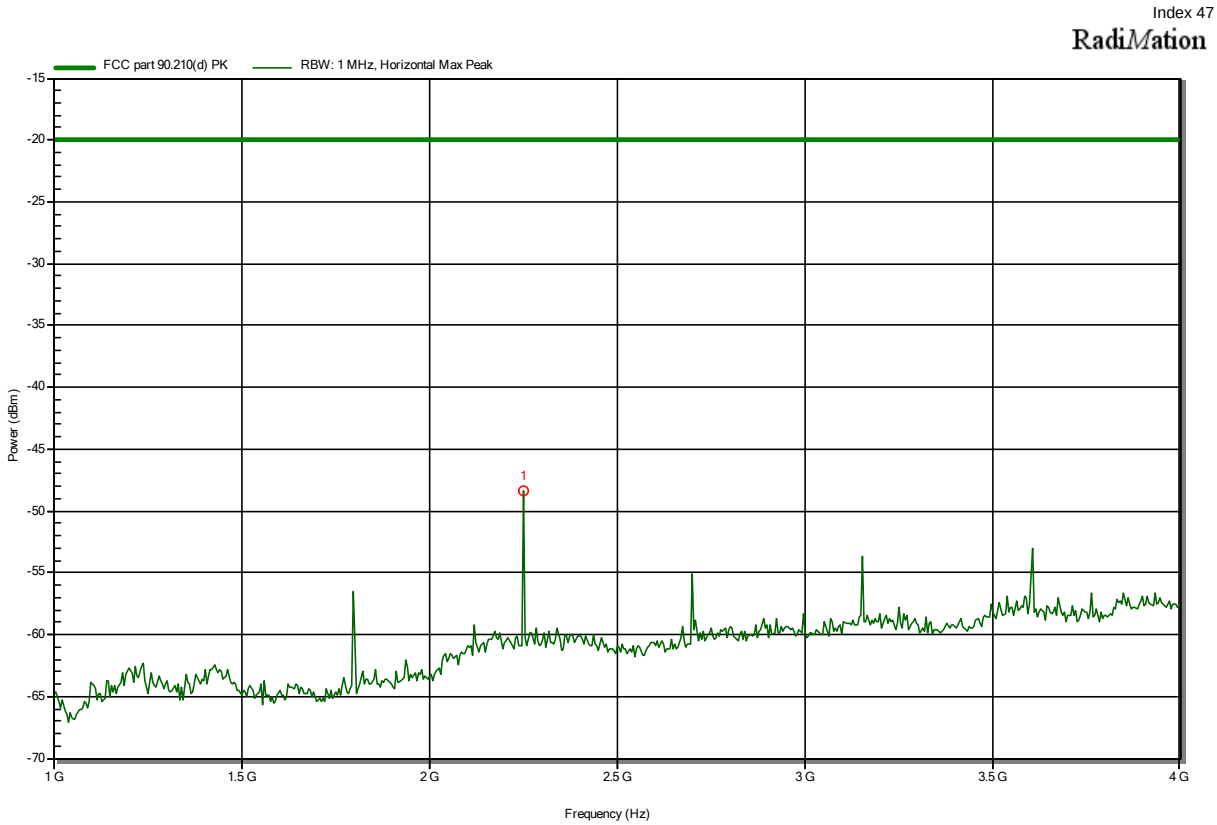
RadiMation



Frequency	Peak	Peak Limit	Peak Difference	Peak Status
469.231 MHz				Carrier

Radiated Spurious Emissions according to FCC 47 CFR 90 I

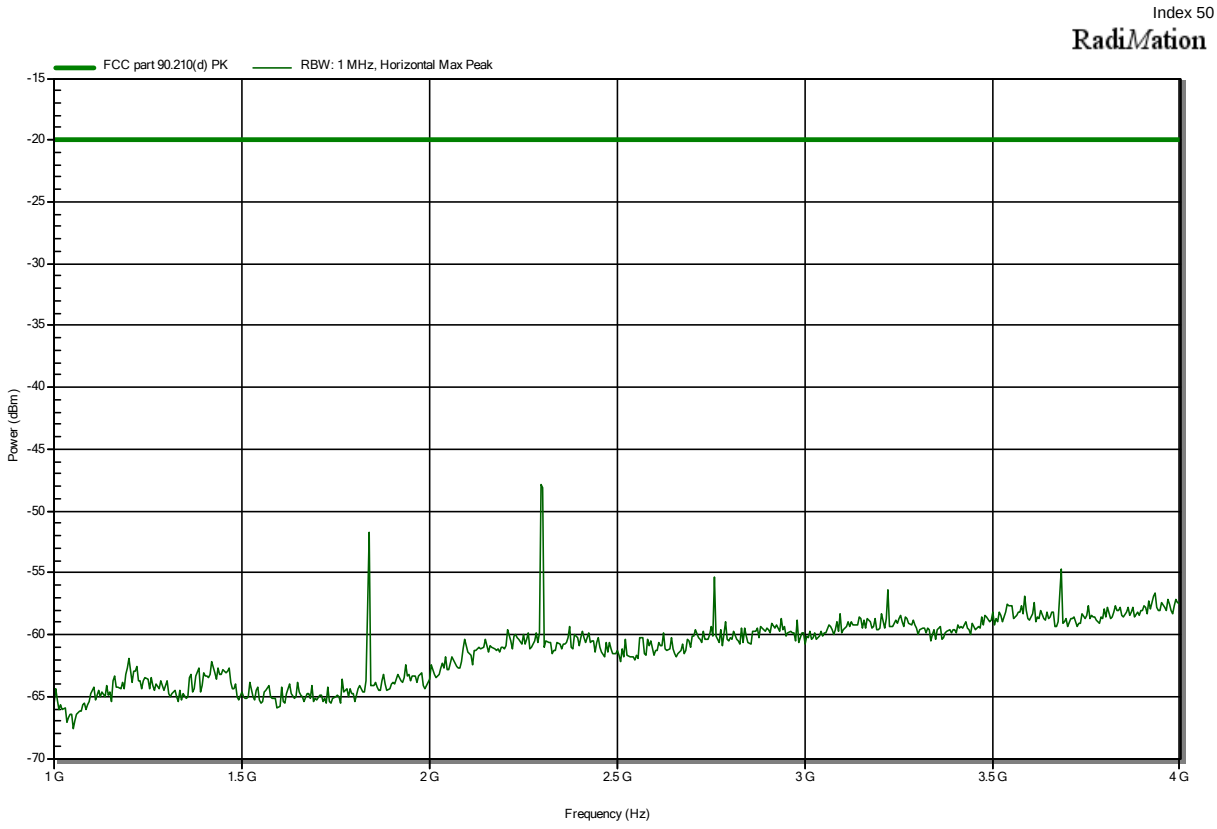
Project Number:	G0M-2009-9331
Applicant:	Kamstrup A/S
Model Description:	Ultrasonic water meter
Model:	KWM2220
Test Sample ID:	32344
Test Site:	Eurofins Product Service GmbH
Operator:	Toralf Jahn
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 24 °Celsius, Vnom: 3.66 VDC
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	3 m
Mode:	Tx; 50 Ohm load, 450.25 MHz
Test Date:	2021-01-13
Note:	



Frequency	Peak	Peak Limit	Peak Difference	Peak Status
2.25 GHz	-48.4 dBm	-20 dBm	-28.44 dB	Pass

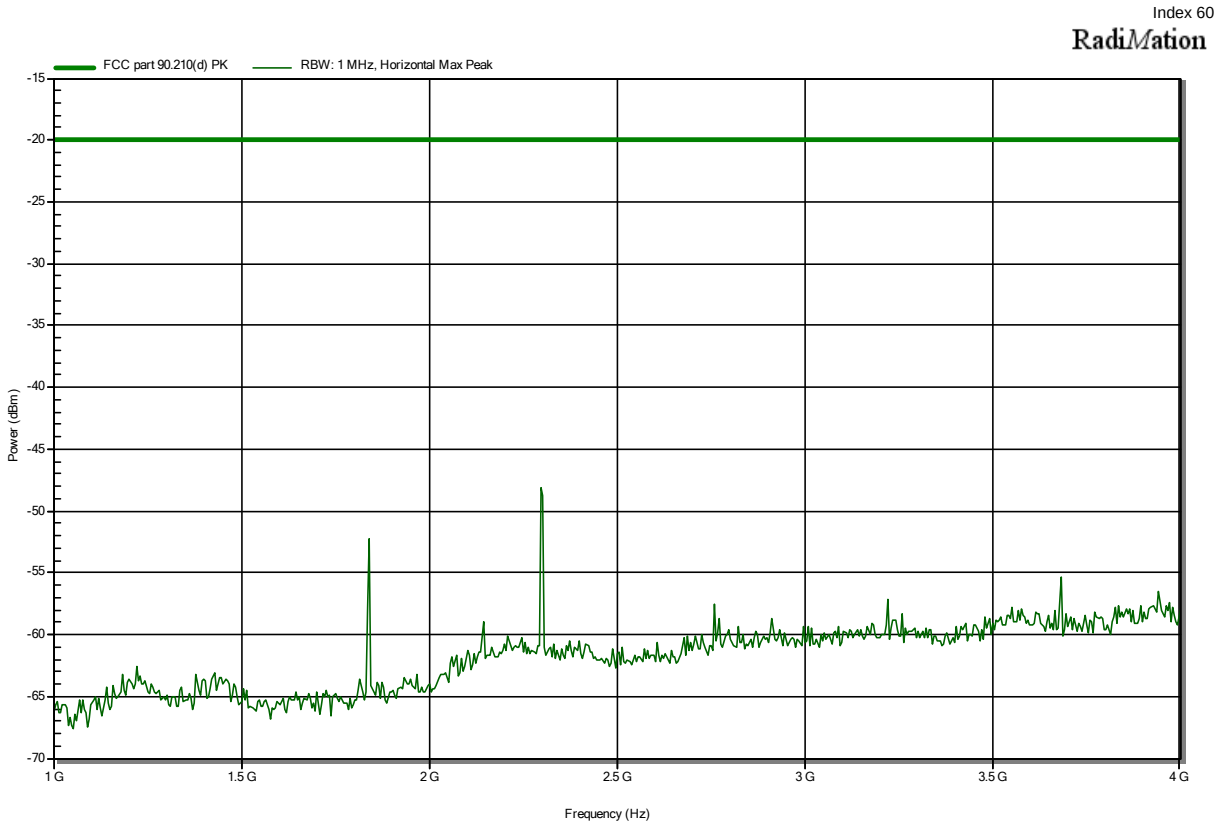
Radiated Spurious Emissions according to FCC 47 CFR 90 I

Project Number:	G0M-2009-9331
Applicant:	Kamstrup A/S
Model Description:	Ultrasonic water meter
Model:	KWM2220
Test Sample ID:	32344
Test Site:	Eurofins Product Service GmbH
Operator:	Toralf Jahn
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 24 °Celsius, Vnom: 3.66 VDC
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	3 m
Mode:	Tx; 50 Ohm load, 460.11875 MHz
Test Date:	2021-01-13
Note:	



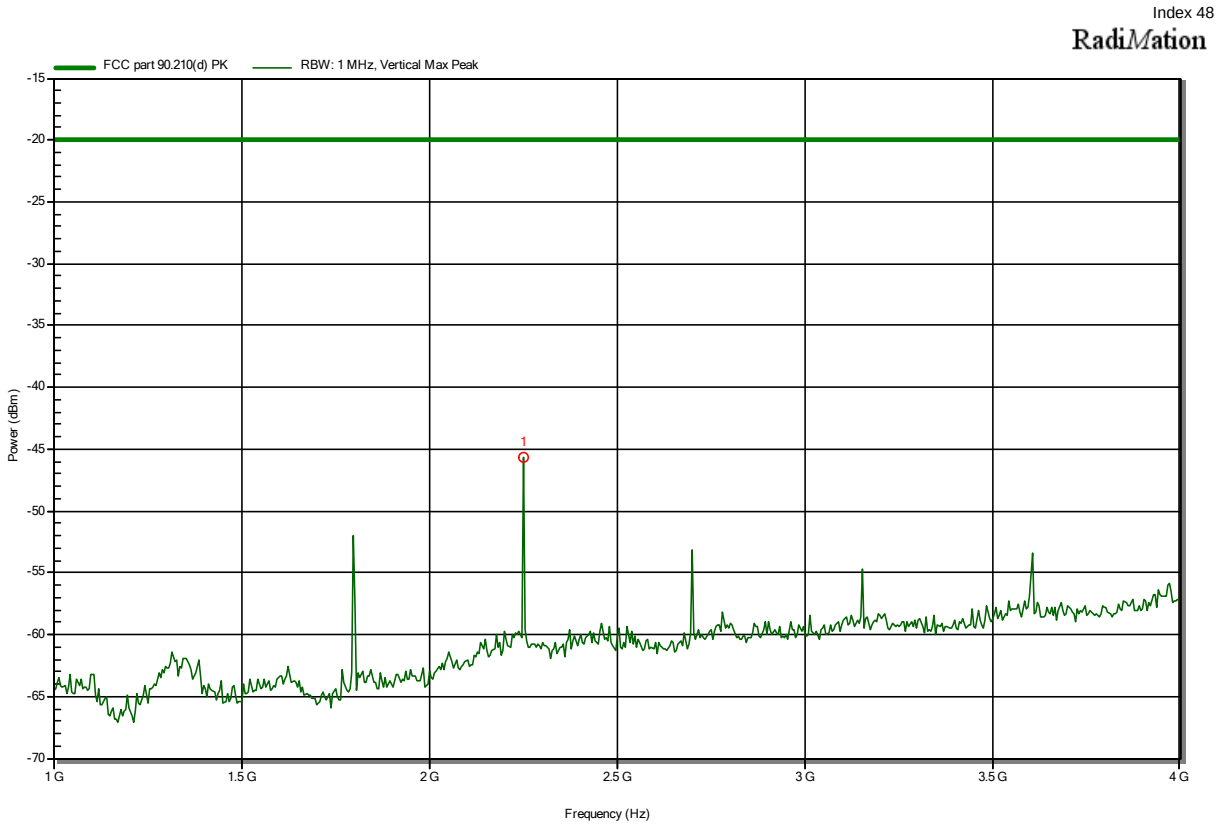
Radiated Spurious Emissions according to FCC 47 CFR 90 I

Project Number:	G0M-2009-9331
Applicant:	Kamstrup A/S
Model Description:	Ultrasonic water meter
Model:	KWM2220
Test Sample ID:	32344
Test Site:	Eurofins Product Service GmbH
Operator:	Toralf Jahn
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 24 °Celsius, Vnom: 3.66 VDC
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	3 m
Mode:	Tx; 50 Ohm load, 469.9875 MHz
Test Date:	2021-01-13
Note:	



Radiated Spurious Emissions according to FCC 47 CFR 90 I

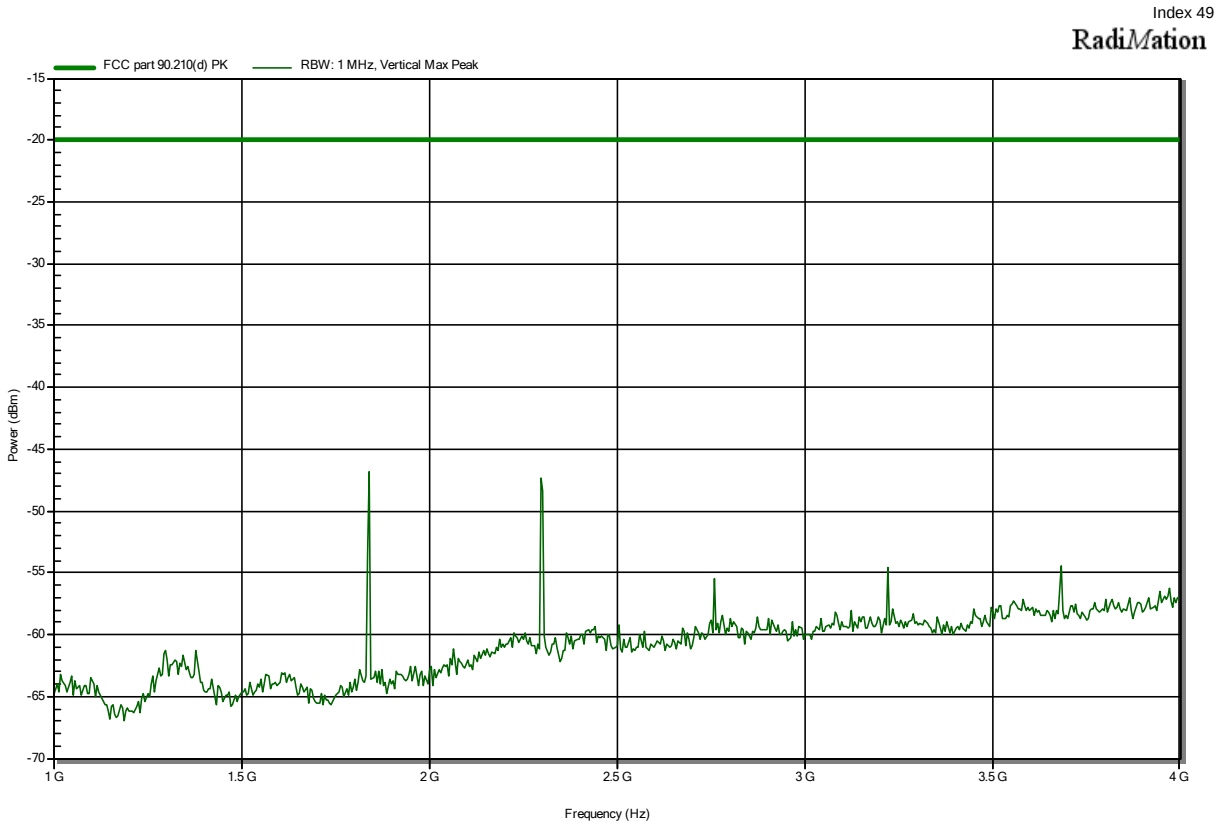
Project Number:	G0M-2009-9331
Applicant:	Kamstrup A/S
Model Description:	Ultrasonic water meter
Model:	KWM2220
Test Sample ID:	32344
Test Site:	Eurofins Product Service GmbH
Operator:	Toralf Jahn
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 24 °Celsius, Vnom: 3.66 VDC
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	3 m
Mode:	Tx; 50 Ohm load, 450.25 MHz
Test Date:	2021-01-13
Note:	



Frequency	Peak	Peak Limit	Peak Difference	Peak Status
2.25 GHz	-45.7 dBm	-20 dBm	-25.71 dB	Pass

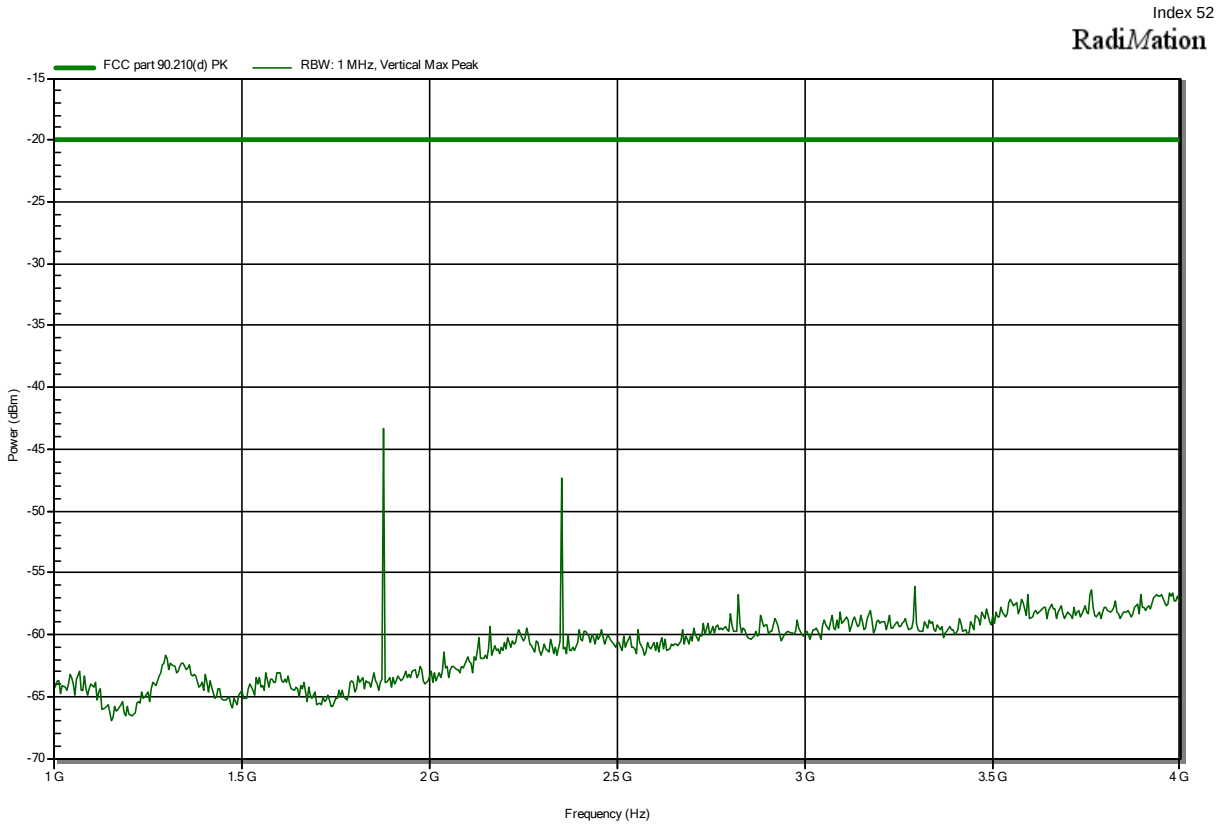
Radiated Spurious Emissions according to FCC 47 CFR 90 I

Project Number:	G0M-2009-9331
Applicant:	Kamstrup A/S
Model Description:	Ultrasonic water meter
Model:	KWM2220
Test Sample ID:	32344
Test Site:	Eurofins Product Service GmbH
Operator:	Toralf Jahn
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 24 °Celsius, Vnom: 3.66 VDC
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	3 m
Mode:	Tx; 50 Ohm load, 460.11875 MHz
Test Date:	2021-01-13
Note:	



Radiated Spurious Emissions according to FCC 47 CFR 90 I

Project Number:	G0M-2009-9331
Applicant:	Kamstrup A/S
Model Description:	Ultrasonic water meter
Model:	KWM2220
Test Sample ID:	32344
Test Site:	Eurofins Product Service GmbH
Operator:	Toralf Jahn
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 24 °Celsius, Vnom: 3.66 VDC
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	3 m
Mode:	Tx; 50 Ohm load, 469.9875 MHz
Test Date:	2021-01-13
Note:	

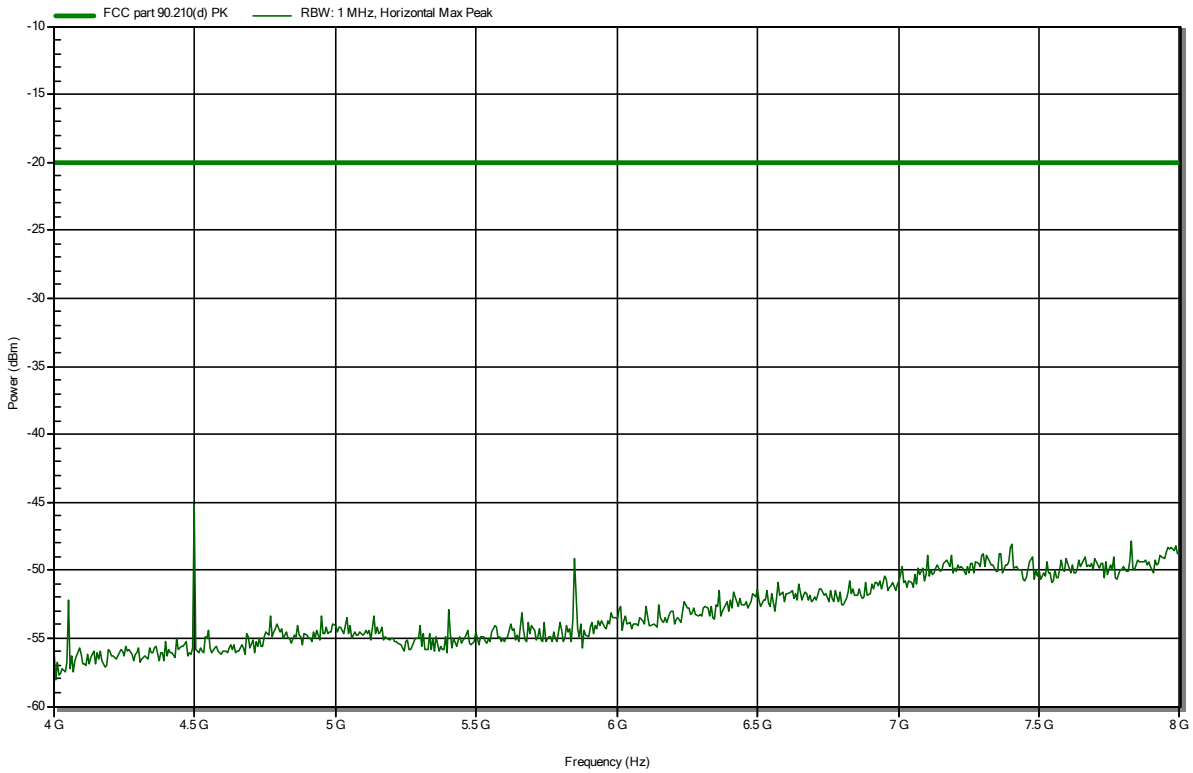


Radiated Spurious Emissions according to FCC 47 CFR 90 I

Project Number:	G0M-2009-9331
Applicant:	Kamstrup A/S
Model Description:	Ultrasonic water meter
Model:	KWM2220
Test Sample ID:	32344
Test Site:	Eurofins Product Service GmbH
Operator:	Toralf Jahn
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 24 °Celsius, Vnom: 3.66 VDC
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	3 m
Mode:	Tx; 50 Ohm load, 450.25 MHz
Test Date:	2021-01-11
Note:	

Index 22

RadiMation

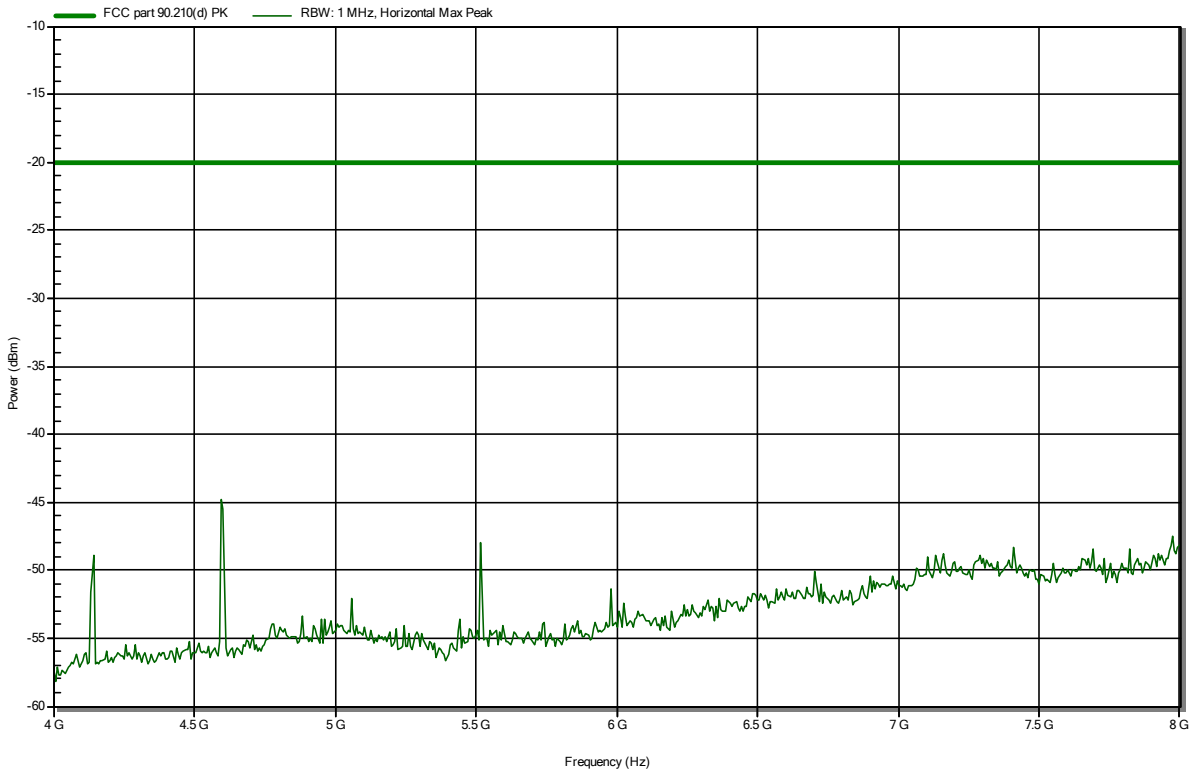


Radiated Spurious Emissions according to FCC 47 CFR 90 I

Project Number:	G0M-2009-9331
Applicant:	Kamstrup A/S
Model Description:	Ultrasonic water meter
Model:	KWM2220
Test Sample ID:	32344
Test Site:	Eurofins Product Service GmbH
Operator:	Toralf Jahn
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 24 °Celsius, Vnom: 3.66 VDC
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	3 m
Mode:	Tx; 50 Ohm load, 460.11875 MHz
Test Date:	2021-01-11
Note:	

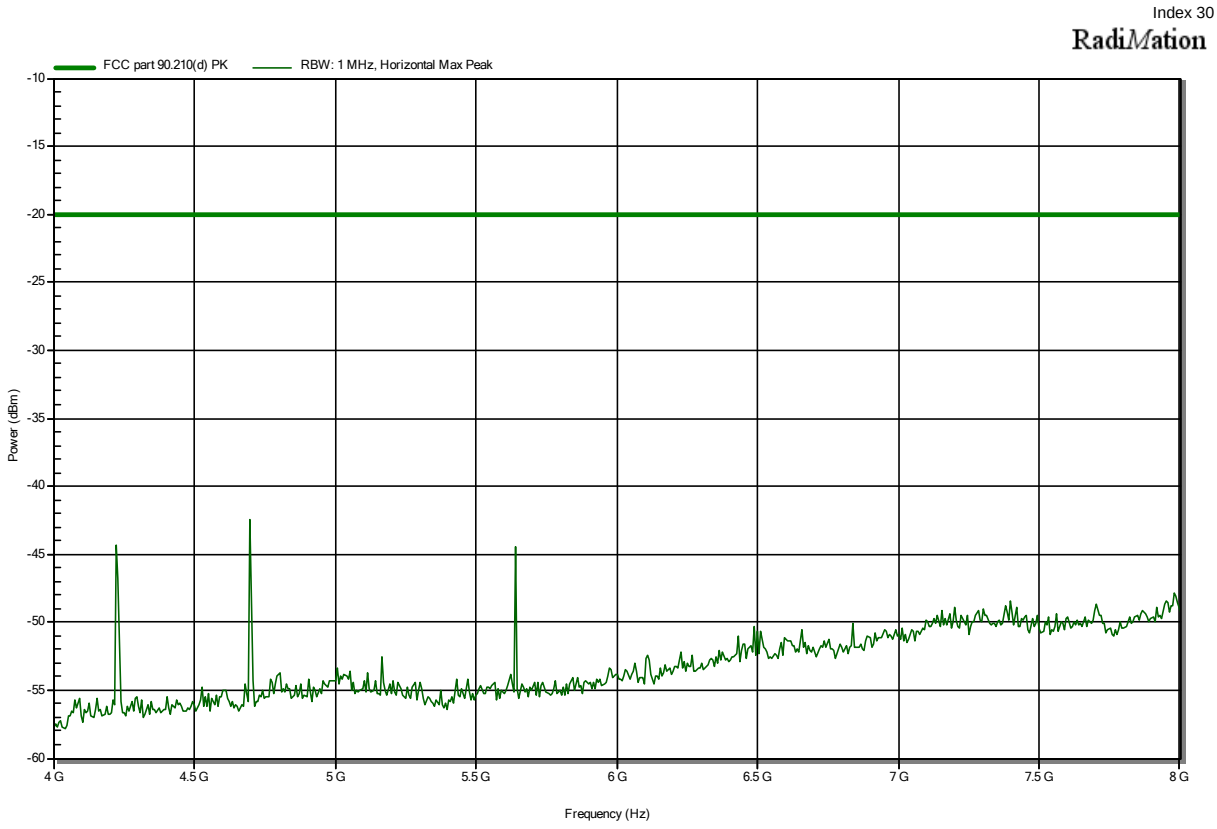
Index 26

RadiMation



Radiated Spurious Emissions according to FCC 47 CFR 90 I

Project Number:	G0M-2009-9331
Applicant:	Kamstrup A/S
Model Description:	Ultrasonic water meter
Model:	KWM2220
Test Sample ID:	32344
Test Site:	Eurofins Product Service GmbH
Operator:	Toralf Jahn
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 24 °Celsius, Vnom: 3.66 VDC
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	3 m
Mode:	Tx; 50 Ohm load, 469.9875 MHz
Test Date:	2021-01-11
Note:	

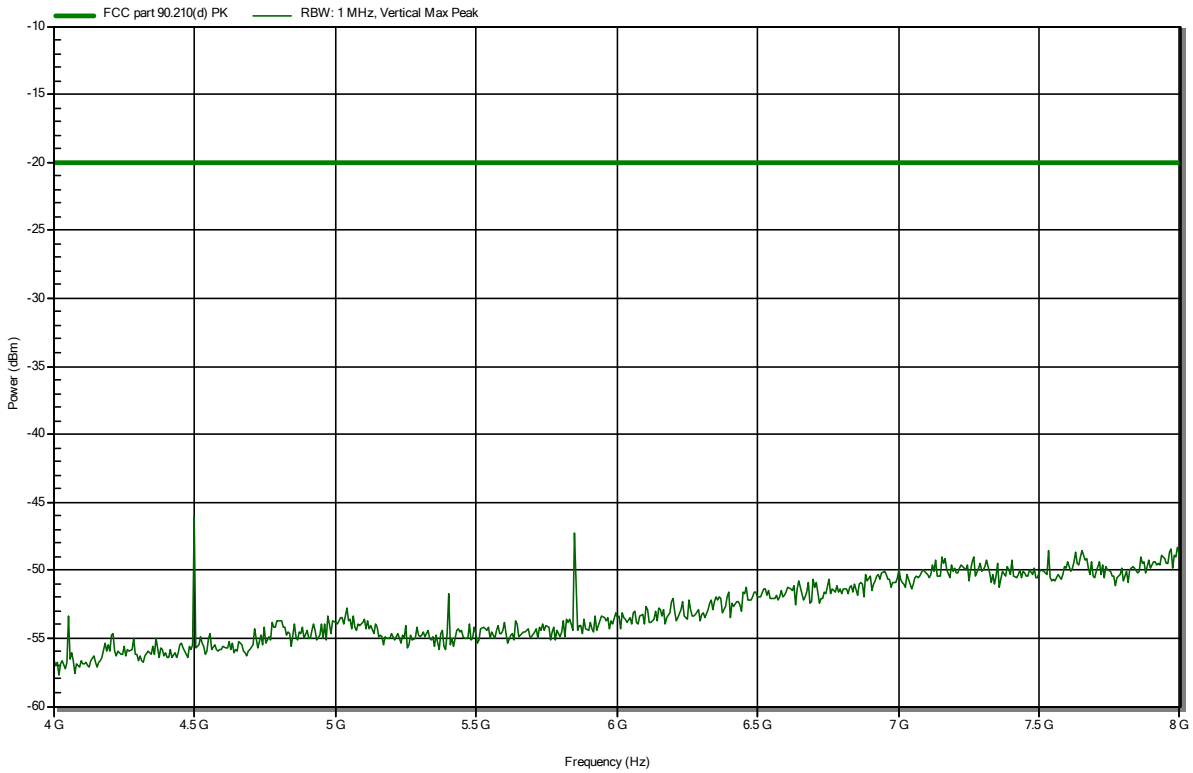


Radiated Spurious Emissions according to FCC 47 CFR 90 I

Project Number:	G0M-2009-9331
Applicant:	Kamstrup A/S
Model Description:	Ultrasonic water meter
Model:	KWM2220
Test Sample ID:	32344
Test Site:	Eurofins Product Service GmbH
Operator:	Toralf Jahn
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 24 °Celsius, Vnom: 3.66 VDC
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	3 m
Mode:	Tx; 50 Ohm load, 450.25 MHz
Test Date:	2021-01-11
Note:	

Index 24

RadiMation

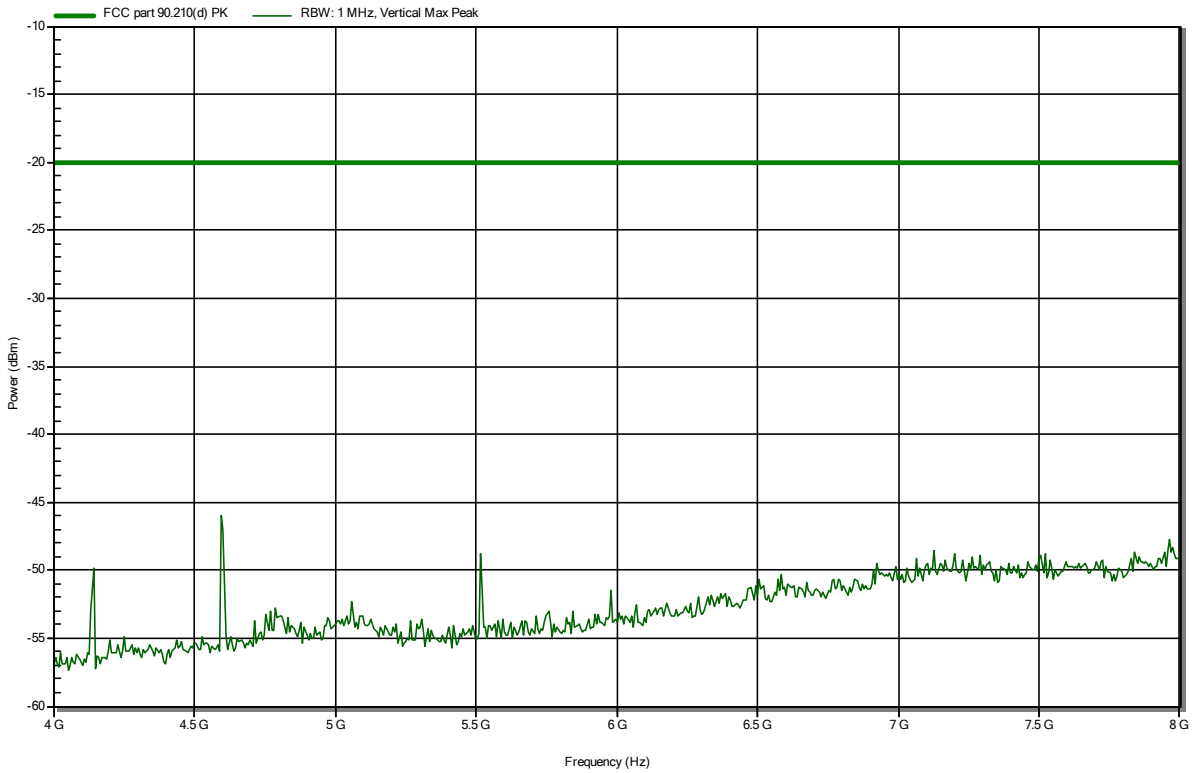


Radiated Spurious Emissions according to FCC 47 CFR 90 I

Project Number:	G0M-2009-9331
Applicant:	Kamstrup A/S
Model Description:	Ultrasonic water meter
Model:	KWM2220
Test Sample ID:	32344
Test Site:	Eurofins Product Service GmbH
Operator:	Toralf Jahn
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 24 °Celsius, Vnom: 3.66 VDC
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	3 m
Mode:	Tx; 50 Ohm load, 460.11875 MHz
Test Date:	2021-01-11
Note:	

Index 28

RadiMation

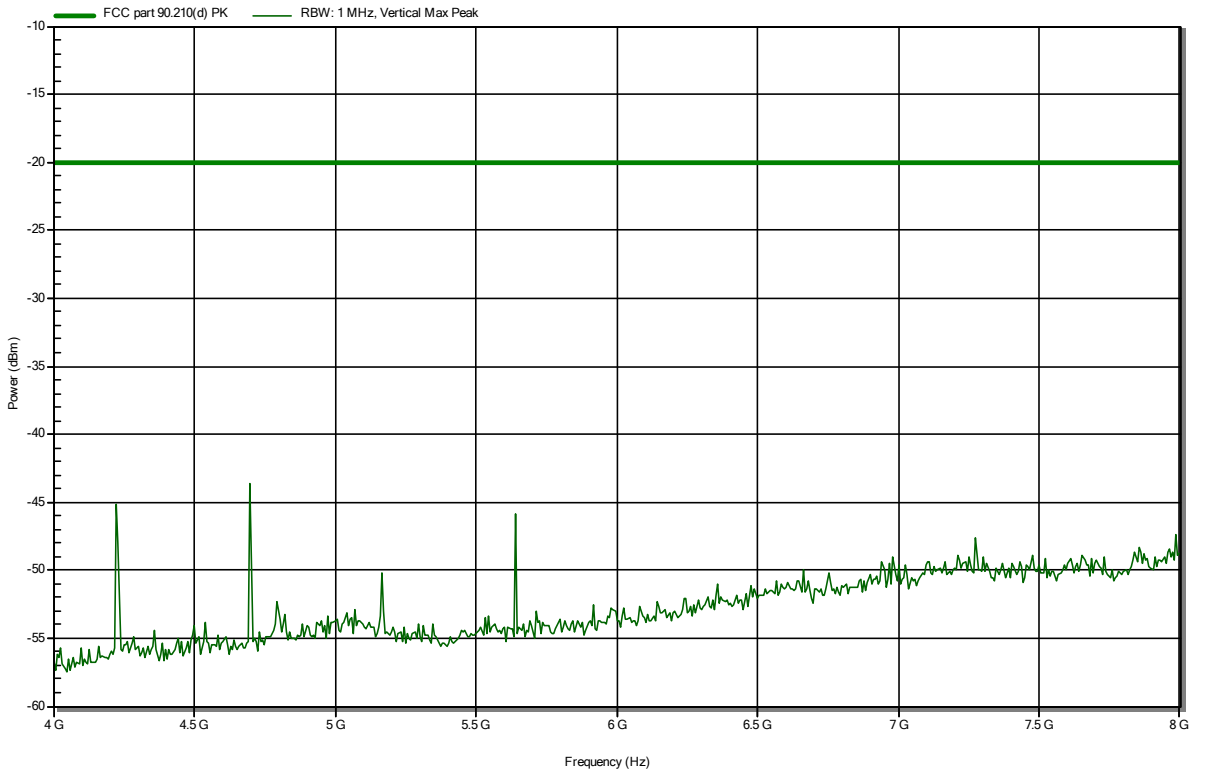


Radiated Spurious Emissions according to FCC 47 CFR 90 I

Project Number:	G0M-2009-9331
Applicant:	Kamstrup A/S
Model Description:	Ultrasonic water meter
Model:	KWM2220
Test Sample ID:	32344
Test Site:	Eurofins Product Service GmbH
Operator:	Toralf Jahn
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 24 °Celsius, Vnom: 3.66 VDC
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	3 m
Mode:	Tx; 50 Ohm load, 469.9875 MHz
Test Date:	2021-01-11
Note:	

Index 32

RadiMation



= = = END OF TEST REPORT = = =