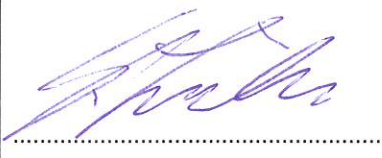
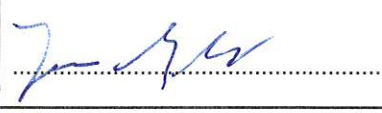


EMC TEST REPORT FCC CFR Title 47 / Chapter I / Subchapter A / Part 15 / Subpart B ISED ICES-003 Issue 7	
Report Reference No	G0M-2211-1783-EF0115B-V01
Testing Laboratory	Eurofins Product Service GmbH
Address	Storkower Str. 38c 15526 Reichenwalde Germany
Accreditation	    A2LA - Registration number: 1983.01 (ISED) ISED wireless device testing laboratory: CN 3470A 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 Standard(s)	FCC CFR Title 47 / Chapter I / Subchapter A / Part 15 / Subpart B ISED ICES-Gen Issue 1 ; Amendment 1 (February 2021) ISED ICES-003 Issue 7 ANSI C63.4:2014+A1:2017
Non-Standard Test Method	None
Equipment under Test (EUT):	
Product Description	Ultrasonic water meter
Model(s)	KW2220
Additional Model(s)	None
Brand Name(s)	Kamstrup
Hardware Version(s)	Unit: 620-210-04; RF PCB BOM: 5550-2066; Flow PCB BOM: 5550-2080
Software Version(s)	RF: 50981789; meter: 50981812; Flow: 50981813
FCC-ID	OUI-KWMX220
IC	22376-KWMX220
Test Result	PASSED

Possible test case verdicts:		
required by standard but not tested	N/T	
not required by standard	N/R	
required by standard but not appl. to test object	N/A	
test object does meet the requirement	P(PASS)	
test object does not meet the requirement	F(FAIL)	
Testing:		
Date of receipt of test item	2023-02-15	
Report:		
Compiled by	Stephan Liebich	
Tested by (+ signature) (Responsible for Test)	Stephan Liebich	
Approved by (+ signature) (Deputy Head of Lab)	Jens Marquardt	
Date of Issue	2023-06-02	
Total number of pages	50	
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.		
Statement concerning the uncertainty of the measurement systems used for decisions on conformity (decision rule): The Decision Rule is applied on the basis of CISPR 16-4-2 and/or IEC 61000-4-x (TR 61000-1-6) and their national publications. These standards provide guidance on how to calculate and apply measurement uncertainty whilst providing maximum uncertainties allowance. In all cases due consideration will be given to ILAC-G8:09/2019. Compliance or non-compliance with a disturbance limit is determined in the following manner. - If U_{lab} is less than or equal to U_{cisp}, then: compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit; non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit. - If U_{lab} is greater than U_{cisp}, then: compliance is deemed to occur if no measured disturbance level, increased by $(U_{lab} - U_{cisp})$, exceeds the disturbance limit; non-compliance is deemed to occur if any measured disturbance level, increased by $(U_{lab} - U_{cisp})$, exceeds the disturbance limit. Where appropriate for the test, for example for EMC pulsed immunity tests, the laboratory has demonstrated, by calibrating its equipment and facilities, that it complies with the above requirements and therefore no allowance of uncertainties has been given to the tolerances.		

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 RF PCB BOM: 5550-2066 Flow PCB BOM: 5550-2080
	Software Version	RF: 50981789 Meter: 50981812 Flow: 50981813
Additional Model 2	Product Type Description	Ultrasonic water meter
	Model Name	KWM2220
	Brand Name (optional)	Kamstrup
	Hardware Version	Unit: 6201-210-02 RF PCB BOM: 5550-2066 Flow PCB BOM: 5550-2080
	Software Version	RF: 50981789 Meter: 50981812 Flow: 50981813
Additional Model 3	Product Type Description	Ultrasonic water meter
	Model Name	KWM2220
	Brand Name (optional)	Kamstrup
	Hardware Version	Unit: 6201-210-03 RF PCB BOM: 5550-2066 Flow PCB BOM: 5550-2080
	Software Version	RF: 50981789 Meter: 50981812 Flow: 50981813
Additional Model 4	Product Type Description	Ultrasonic water meter
	Model Name	KWM3220
	Brand Name (optional)	Kamstrup
	Hardware Version	Unit: 6202-204-01 RF PCB BOM: 5550-2066 Flow PCB BOM: 5550-2094
	Software Version	RF: 50981789 Meter: 50981812 Flow: 50981813
Additional Model 5	Product Type Description	Ultrasonic water meter
	Model Name	KWM3220
	Brand Name (optional)	Kamstrup
	Hardware Version	Unit: 6202-205-01 RF PCB BOM: 5550-2066 Flow PCB BOM: 5550-2094
	Software Version	RF: 50981789 Meter: 50981812 Flow: 50981813

Test Report No.: G0M-2211-1783-EF0115B-V01

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

Additional Model 6	Product Type Description	Ultrasonic water meter
	Model Name	KWM3220
	Brand Name (optional)	Kamstrup
	Hardware Version	Unit: 6202-204-02 RF PCB BOM: 5550-2066 Flow PCB BOM: 5550-2094
	Software Version	RF: 50981789 Meter: 50981812 Flow: 50981813
Additional Model 7	Product Type Description	Ultrasonic water meter
	Model Name	KWM3220
	Brand Name (optional)	Kamstrup
	Hardware Version	Unit: 6202-204-03 RF PCB BOM: 5550-2066 Flow PCB BOM: 5550-2094
	Software Version	RF: 50981789 Meter: 50981812 Flow: 50981813
Additional Model 8	Product Type Description	Ultrasonic water meter
	Model Name	KWM3220
	Brand Name (optional)	Kamstrup
	Hardware Version	Unit: 6202-204-04 RF PCB BOM: 5550-2066 Flow PCB BOM: 5550-2094
	Software Version	RF: 50981789 Meter: 50981812 Flow: 50981813
Additional Model 9	Product Type Description	Ultrasonic water meter
	Model Name	KWM3220
	Brand Name (optional)	Kamstrup
	Hardware Version	Unit: 6202-204-05 RF PCB BOM: 5550-2066 Flow PCB BOM: 5550-2094
	Software Version	RF: 50981789 Meter: 50981812 Flow: 50981813
Additional Model 10	Product Type Description	Ultrasonic water meter
	Model Name	KWM3220
	Brand Name (optional)	Kamstrup
	Hardware Version	Unit: 6202-204-06 RF PCB BOM: 5550-2066 Flow PCB BOM: 5550-2094
	Software Version	RF: 50981789 Meter: 50981812 Flow: 50981813

Test Report No.: G0M-2211-1783-EF0115B-V01

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

Additional Model 11	Product Type Description	Ultrasonic water meter
	Model Name	KWM3220
	Brand Name (optional)	Kamstrup
	Hardware Version	Unit: 6202-204-07 RF PCB BOM: 5550-2066 Flow PCB BOM: 5550-2094
	Software Version	RF: 50981789 Meter: 50981812 Flow: 50981813
Additional Model 12	Product Type Description	Ultrasonic water meter
	Model Name	KWM3220
	Brand Name (optional)	Kamstrup
	Hardware Version	Unit: 6202-204-08 RF PCB BOM: 5550-2066 Flow PCB BOM: 5550-2094
	Software Version	RF: 50981789 Meter: 50981812 Flow: 50981813

ABBREVIATIONS AND ACRONYMS

Acronyms	
Acronym	Description
EUT	Equipment Under Test
FCC	Federal Communications Commission
ISED	Innovation, Science and Economic Development Canada
T _{NOM}	Nominal operating temperature
V _{NOM}	Nominal supply voltage

VERSION HISTORY

Version History			
Version	Issue Date	Remarks	Revised By
01	2023-06-02	Initial Release	-

REPORT INDEX

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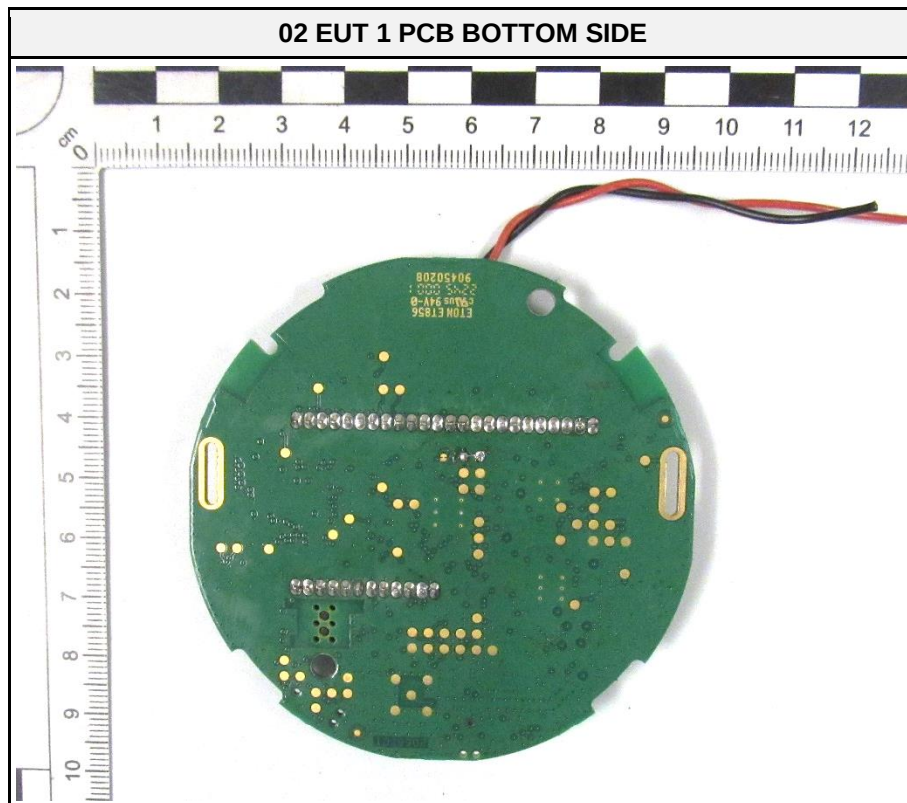
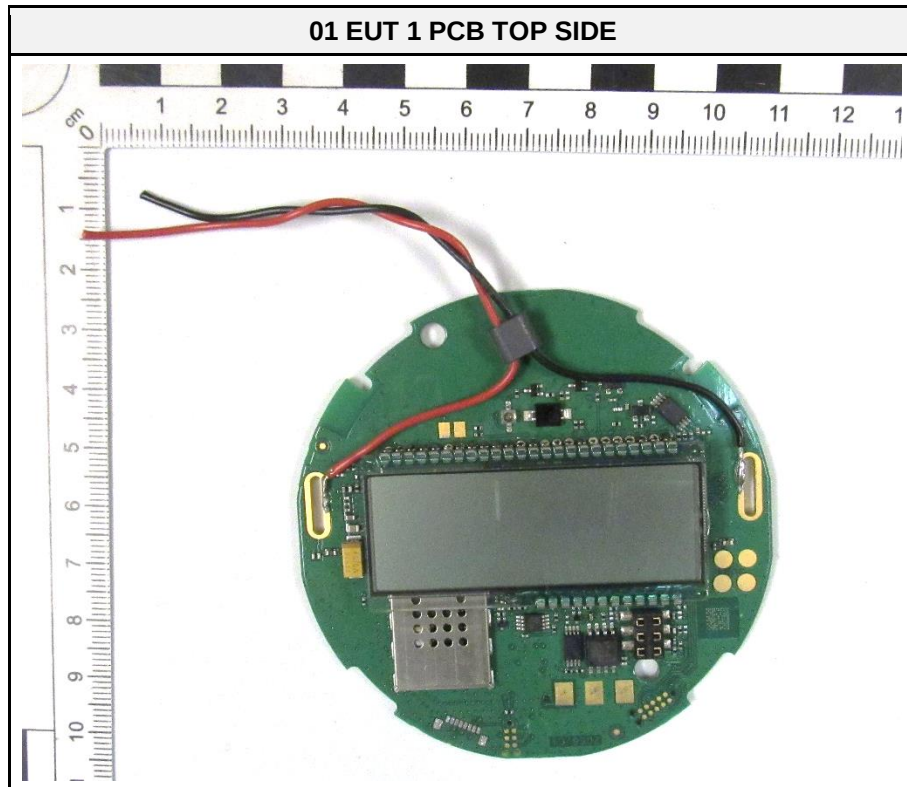
1 Equipment (Test Item) Under Test

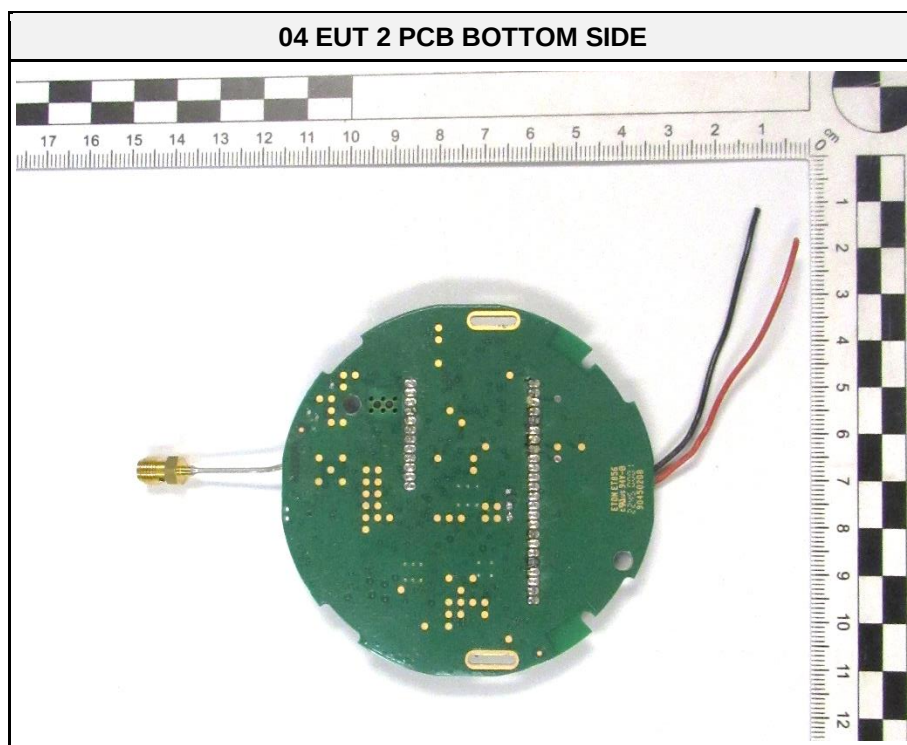
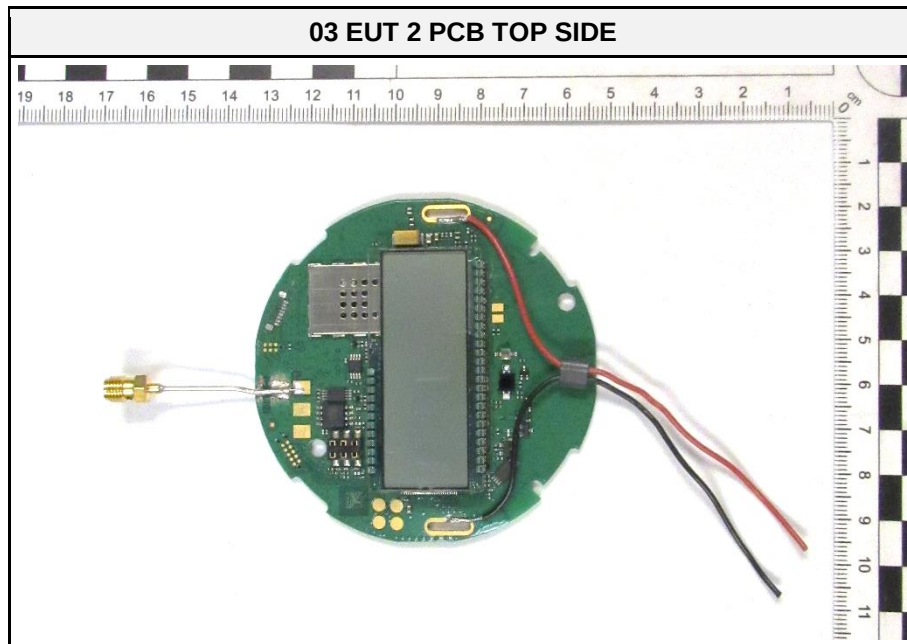
Description	Ultrasonic water meter		
Intended Use	The ultrasonic water meter from Kamstrup offers a more precise measuring range to earn revenue from every drop of water delivered to customers. The meter collects daily and monthly data and helps utilities stay ahead of system irregularities with alarm notifications for leak, burst, tamper, dry, and reverse flow. It also saves time with remote, drive-by reading capability and is compatible with existing communication interfaces.		
Model	KW2220		
Additional Model(s)	None		
Brand Name(s)	Kamstrup		
Hardware Version(s)	Unit: 620-210-04; RF PCB BOM: 5550-2066; Flow PCB BOM: 5550-2080		
Software Version(s)	RF: 50981789; meter: 50981812; Flow: 50981813		
Number of tested samples	2		
Sample Identification	EUT #	Sample-ID	Serial Number
	EUT 1	43142	10000235/23
	EUT 2	43140	10000231/23
EUT Dimensions [cm]	Ø 9 x 13		
FCC-ID	OUY-KWMX220		
IC	22376-KWMX220		
Contains FCC-ID	N/A		
Contains IC	N/A		
Class	Class B		
Equipment type	Table top		
Highest internal frequency [MHz]	3759.9		
Protective Earth	No		
Functional Earth	No		
Radio 1	Type	LMR/PMR	
	Model	unspecified	
	Manufacturer	Kamstrup A/S	
Radio 2	Type	SRD	
	Model	unspecified	
	Manufacturer	Kamstrup A/S	
Supply Voltage	V _{NOM}	3.66 V DC by internal lithium battery	
AC/DC-Adaptor	None		
Manufacturer	Kamstrup A/S Industrivej 28 8660 Skanderborg DENMARK		
Factory	Kamstrup A/S Industrivej 28 8660 Skanderborg DK		

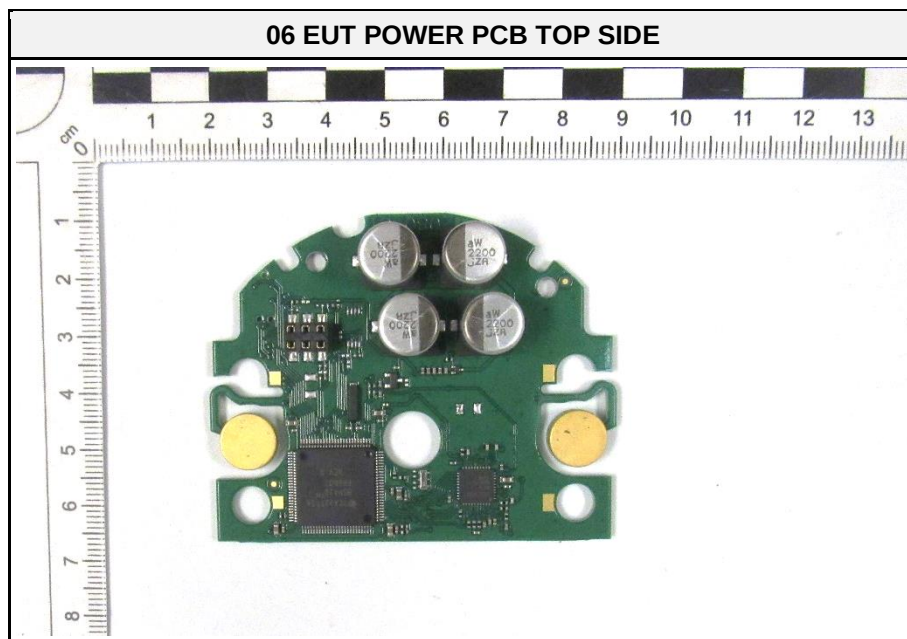
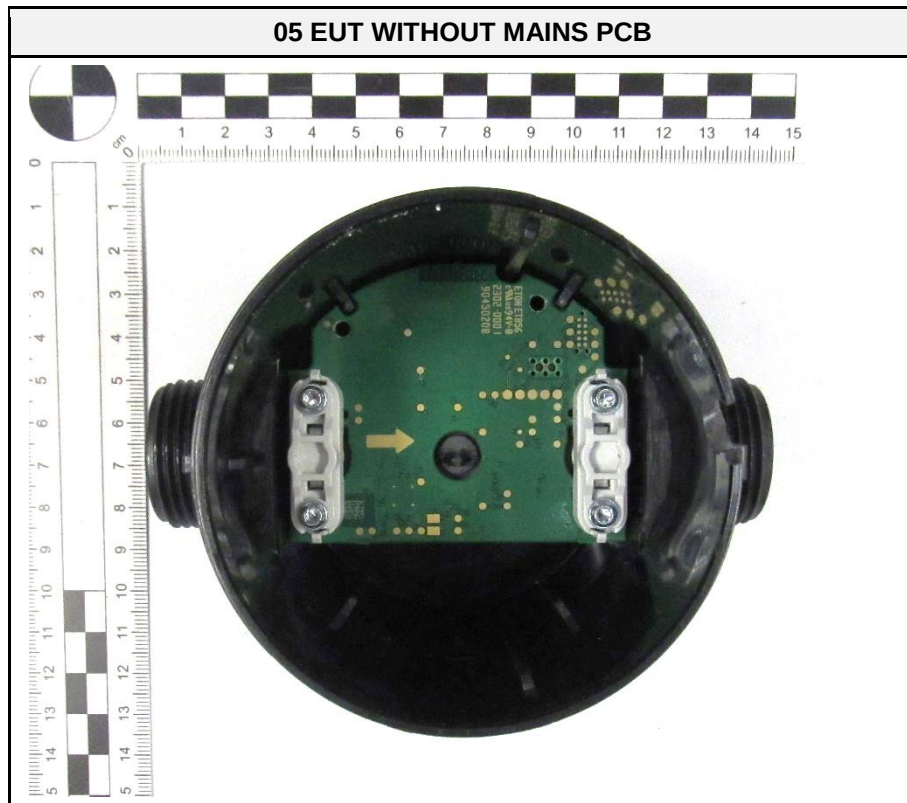
1.1 Equipment Ports

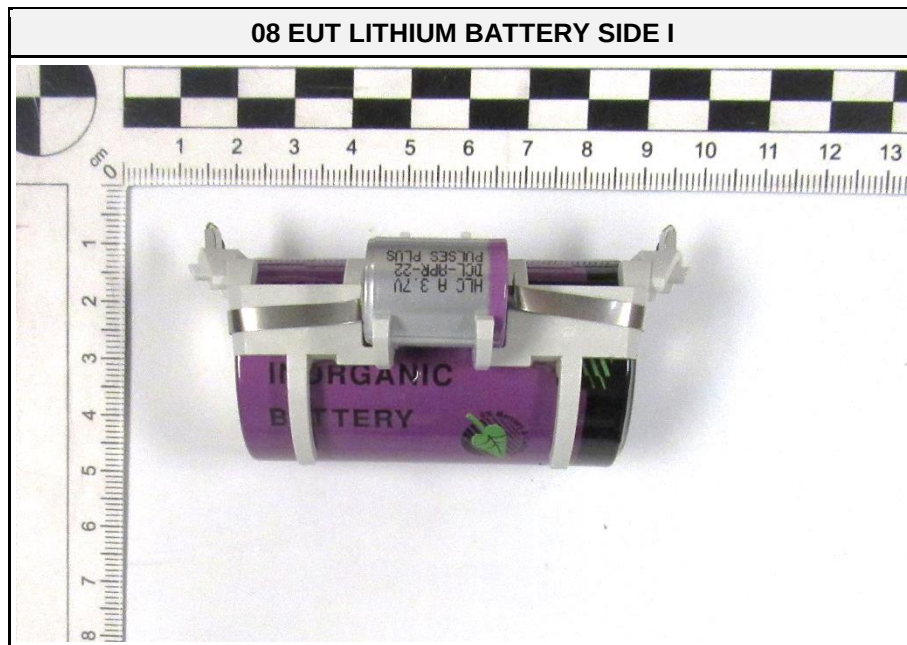
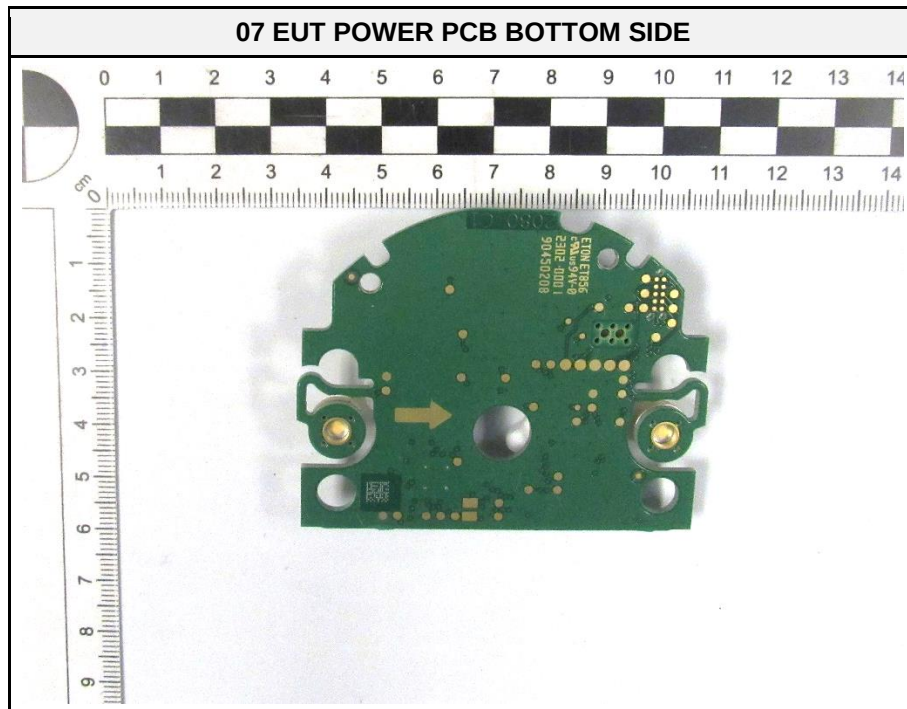
Name	Type	Attributes	Comment
None			
Description:			
AC	AC mains power input/output port		
DC	DC power input/output port		
BAT	DC power input port connected to external battery		
IO	Input/Output port		
TP	Telecommunication port		
NE	Non-electrical port		

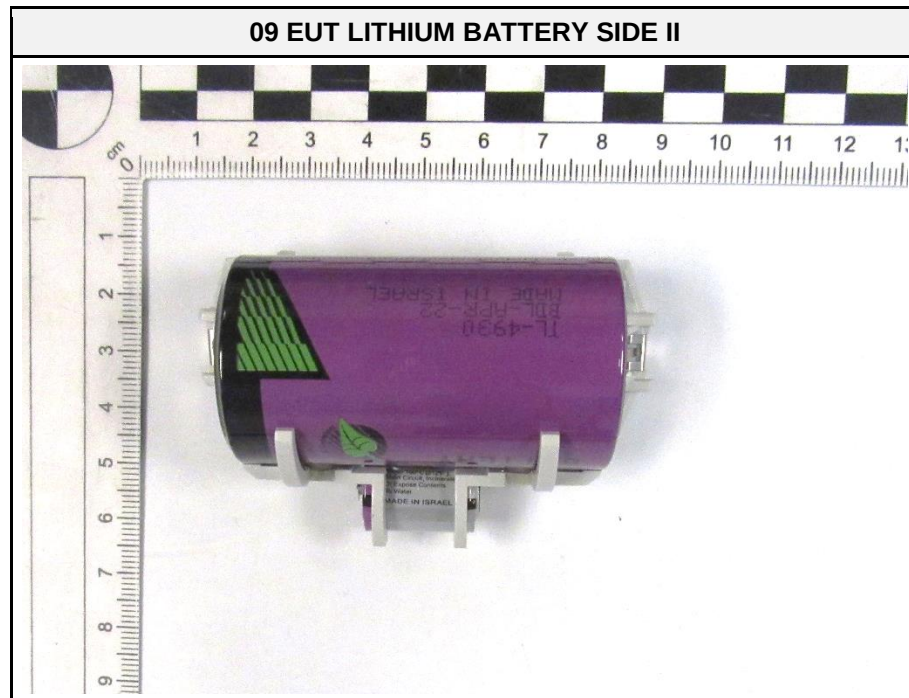
1.2 Equipment Photos - Internal



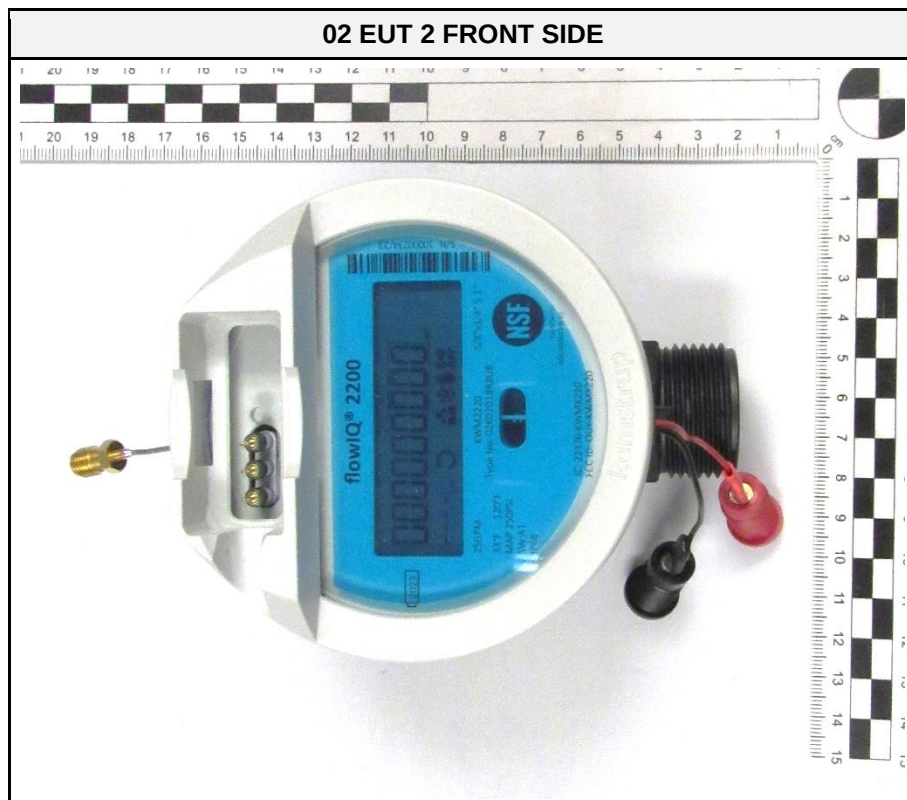
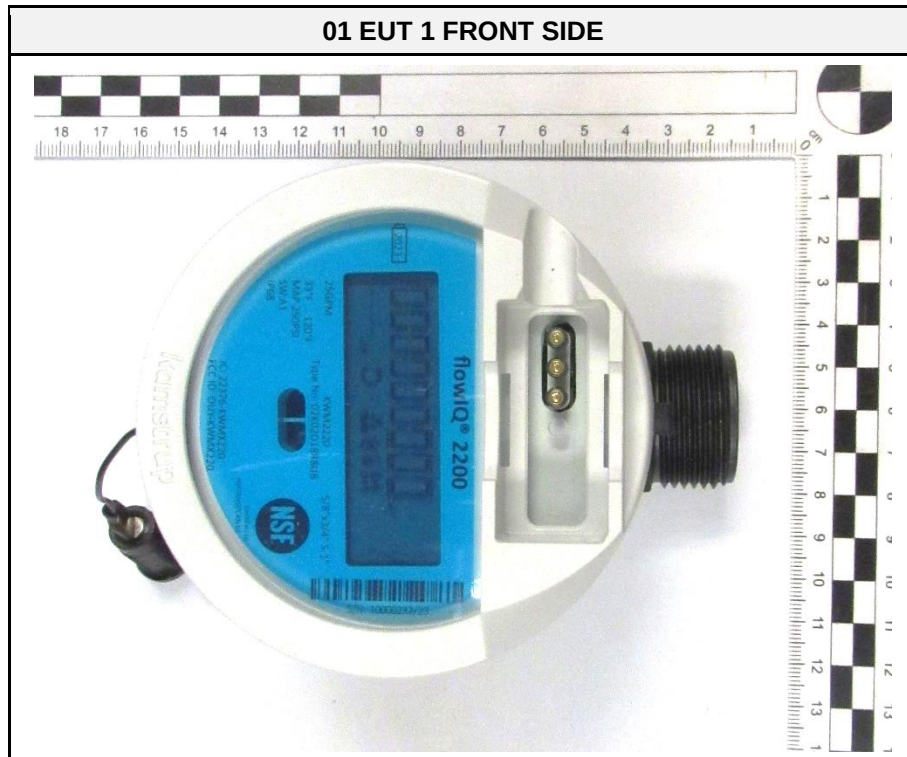








1.3 Equipment Photos - External

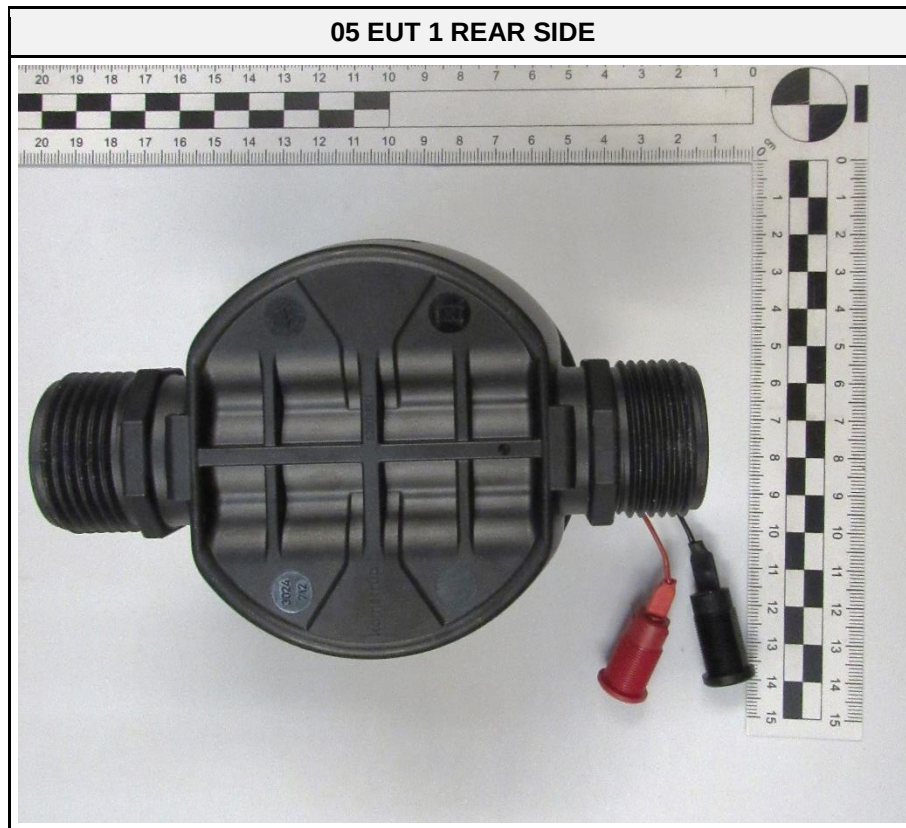


03 EUT 1 RIGHT SIDE



04 EUT 1 LEFT SIDE

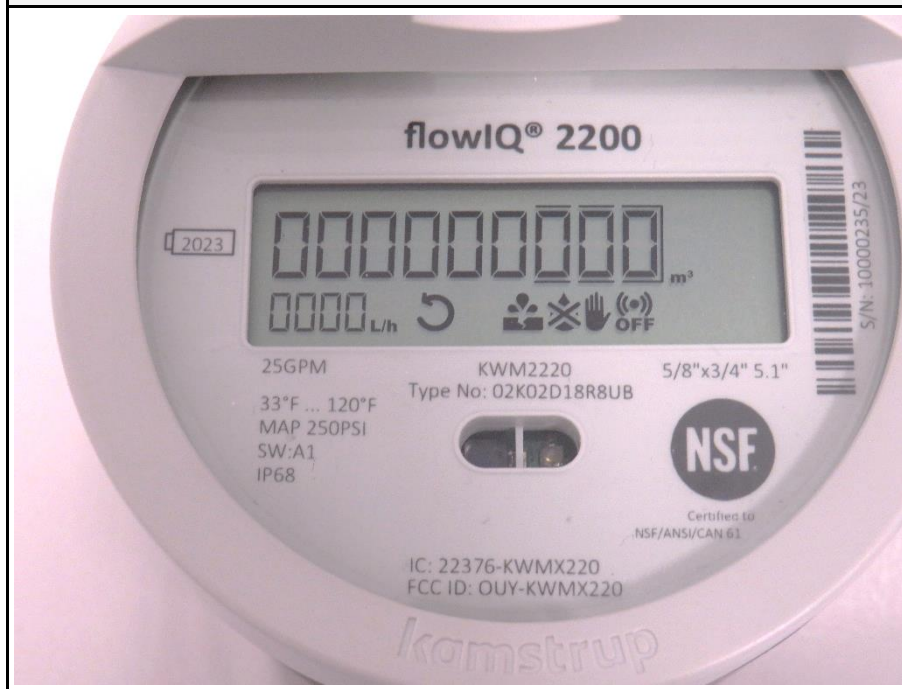




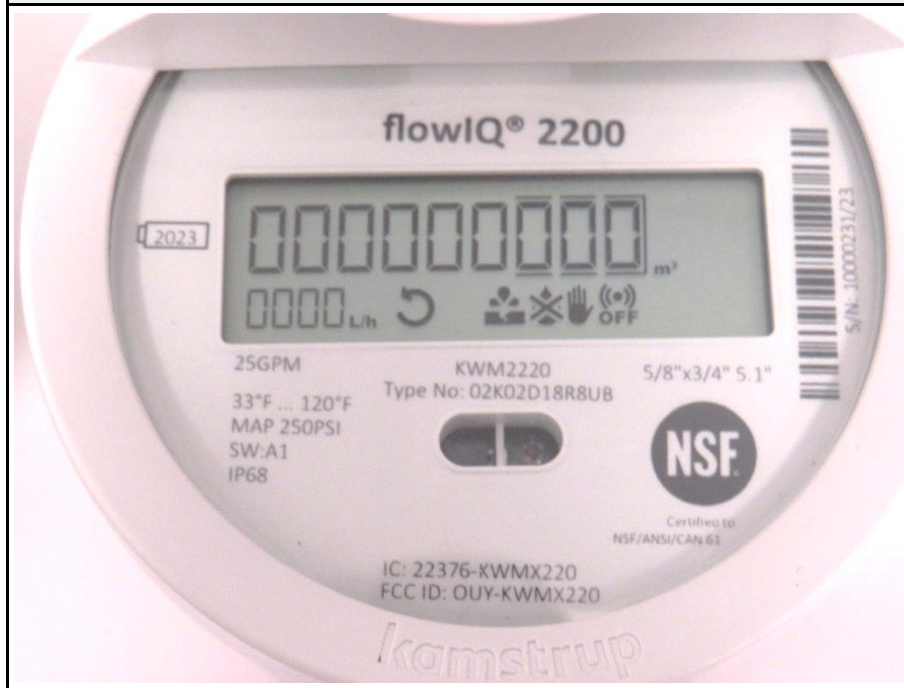
07 EUT 2 TOP SIDE



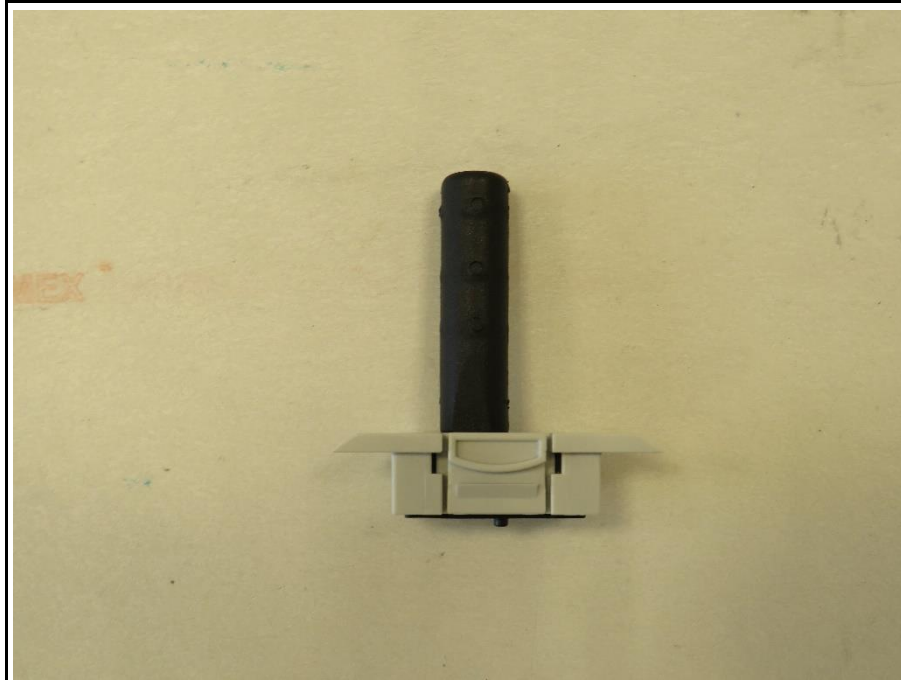
08 EUT 1 LABEL



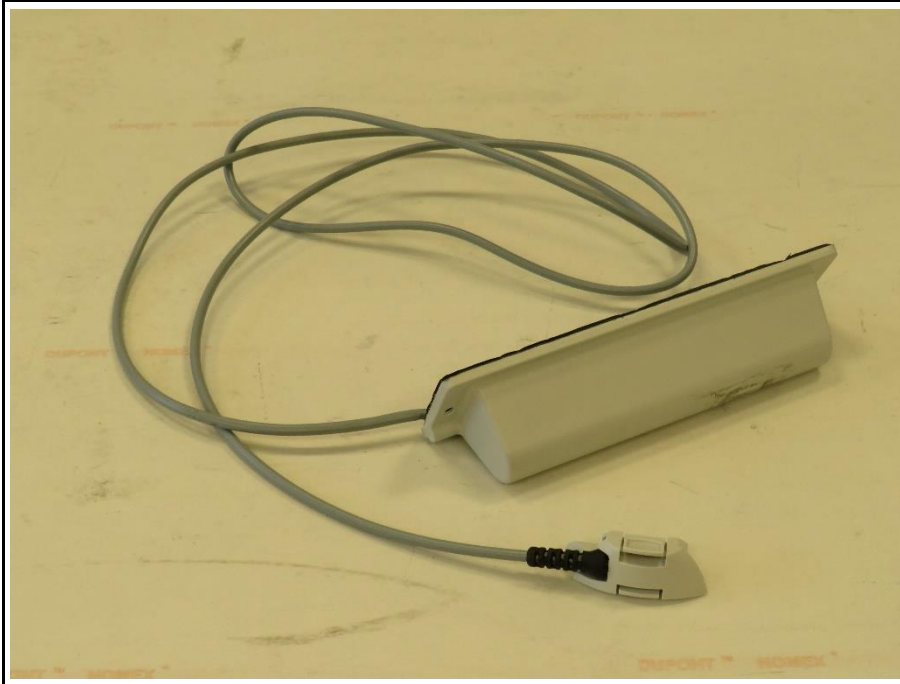
09 EUT 2 LABEL



10 HELIX ANTENNA



11 WALL ANTENNA



12 PIT ANTENNA



1.4 Support Equipment

Product Type	Device	Manufacturer	Model	Comment
AE	Helix antenna	Kamstrup	30261216 B1	Customer Support Equipment; 2 m
AE	Wall antenna	Kamstrup	6699490	Customer Support Equipment; 2 m
AE	Pit antenna	Kamstrup	6697902	Customer Support Equipment
Description:				
AE	Auxiliary Equipment			
SIM	Simulator			
MON	Monitoring Equipment			
CBL	Connecting Cable			
Comment: --				

1.5 Operational Modes

Mode #	Description
1	EUT sends permanently status data via SRD connection (915 MHz).
2	EUT sends permanently status data via PMR connection (450.25 MHz).
Comment: Mode 1 is used for EUT 1 and Mode 2 is used for EUT 2.	

1.6 EUT Configuration

Configuration #	Description
1	EUT is powered by 3.6 V DC via external laboratory power supply unit. EUT is connected with Helix antenna.
2	EUT is powered by 3.6 V DC via external laboratory power supply unit. EUT is connected with Wall antenna.
3	EUT is powered by 3.6 V DC via external laboratory power supply unit. EUT is connected with Pit antenna.
4	EUT is powered by 3.6 V DC via external laboratory power supply unit. EUT antenna port terminated with 50 Ohm resistor.
Comment: For EMC test the EUT 1 and 2 was modified by customer with external DC port and powered by external laboratory power supply. That modification enabled continuous operation in transmit mode Additional the EUT 2 was modified by customer with external PMR antenna port who was terminated with 50 Ohm resistor. EUT 1 is prepared for SRD connection and EUT 2 is prepared for PMR connection.	

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 analyser in dBµV. Any external preamplifiers used are taken into account through internal analyser 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 analyser. 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:

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

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

Title 47 CFR Part 15B, ISED ICES-003 Issue 7				
Reference	Requirement	Reference Method	Result	Remarks
Emission				
FCC 15.109 ICES-003, 3.2.2	Radiated emissions	ANSI C63.4:2014 +A1:2017	PASS	--
FCC 15.107 ICES-003, 3.2.1	AC power line conducted emissions	ANSI C63.4:2014 +A1:2017	N/R	No relevant port
Comment: --				

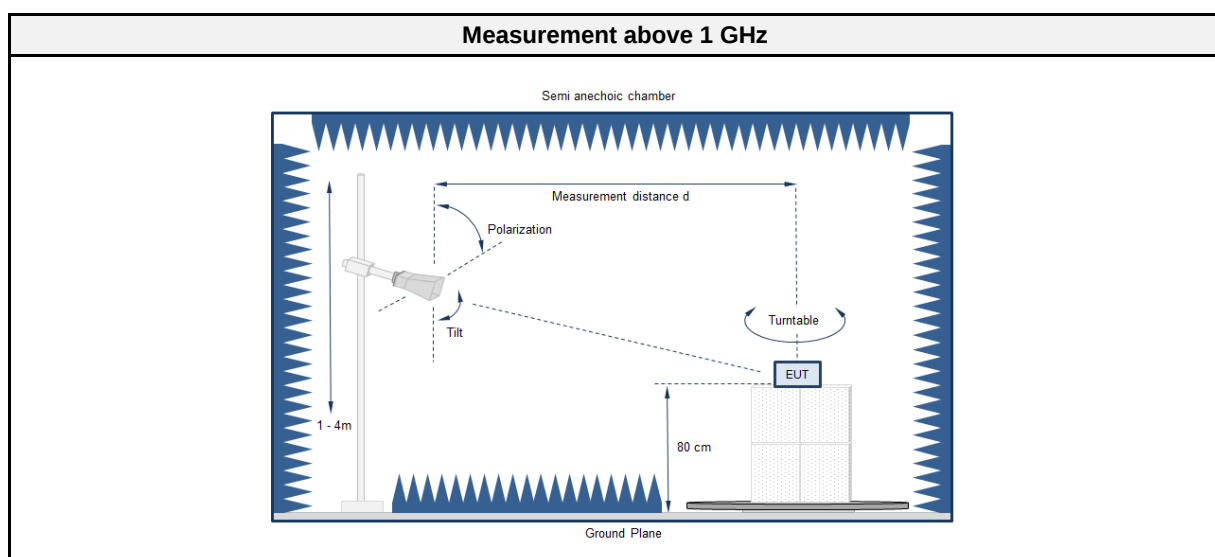
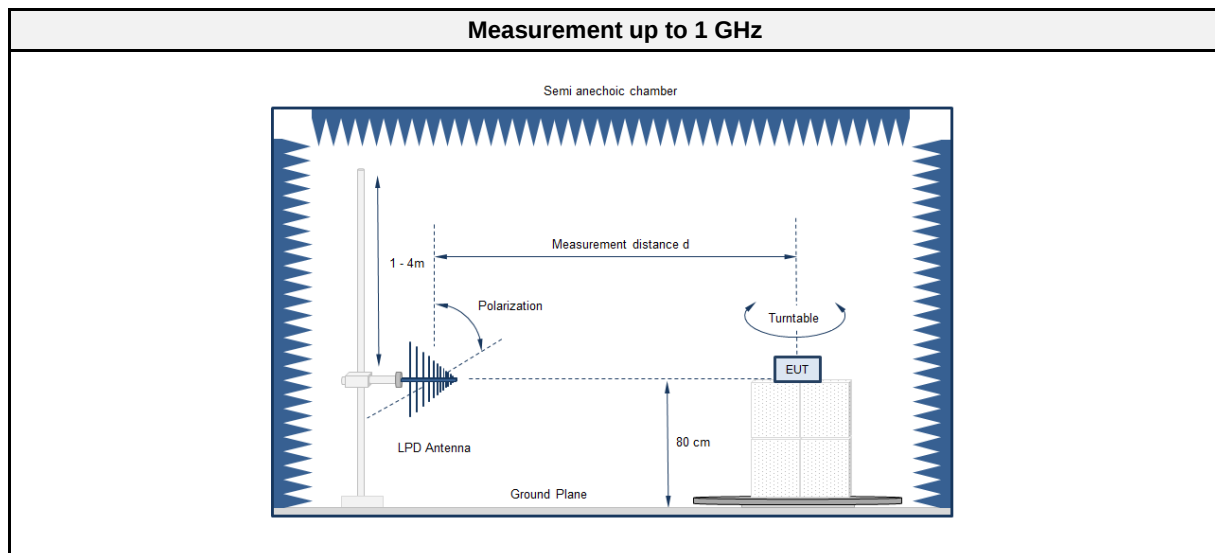
Possible Test Case Verdicts	
PASS	Test object does meet the requirements
FAIL	Test object does not meet the requirements
N/T	Required by standard but not tested
N/R	Not required by standard for the test object

2.1 Test Conditions and Results - Radiated emissions acc. to ANSI C63.4

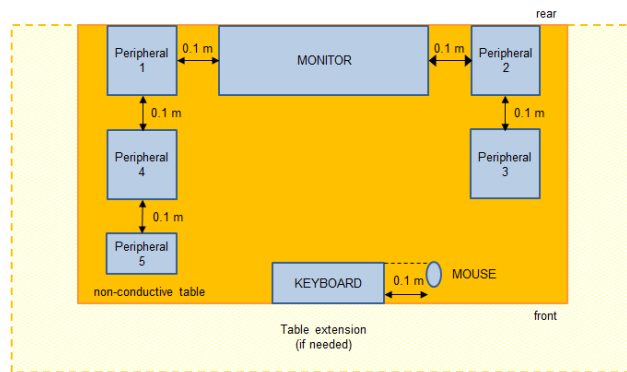
2.1.1 Information

Test Information	
Reference	FCC 15.109, ICES-003, 3.2.2
Reference method	ANSI C63.4:2014+A1:2017 Section 8
Equipment class	Class B
Equipment type	Table top
Highest internal frequency [MHz]	3759.9
Measurement range	30 MHz to 20000 MHz
Temperature [°C]	20 – 24
Humidity [%]	26 – 42
Operator	Stephan Liebich
Date	2023-02-23 and 2023-03-02

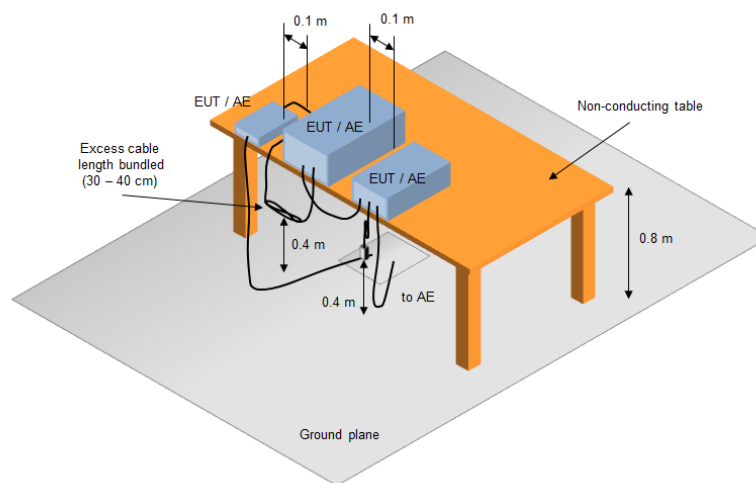
2.1.2 Setup *Table top*:



Equipment placement - Table top



Test Setup



2.1.3 Equipment

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

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Anechoic chamber (NSA)	Frankonia	AC1	EF00062	2022-11	2025-11
Anechoic chamber (SVSWR)	Frankonia	AC 1	EF01011	2022-11	2023-11
Programmable AC Source	Chroma ATE Inc.	61604	EF01068	2021-07	2023-07
EMI Test Receiver	Rohde & Schwarz Vertriebs GmbH	ESU8	EF00379	2022-10	2023-10
Spectrum analyzer	Rohde & Schwarz GmbH & Co. KG	FSU43	EF01631	2022-08	2023-08
Trilog Broadband Antenna	Schwarzbeck	VULB 9168	EF01824	2022-10	2023-10
Horn antenna	Schwarzbeck	BBHA 9120D	EF01561	2021-11	2024-11
Double Ridged Waveguide Horn Antenna	Schwarzbeck	HWRD 650 (6,5-18GHz)	EF01679	2021-03	2024-03
40GHz High Gain Antenna	Amplifier Research	AT4560	EF00302	2021-06	2023-06
Climatic Sensor	Embedded Data Systems, LLC.	2800100000254 17E	EF01054	2022-04	2023-04

2.1.4 Procedure

Exploratory measurement Table top	
1.	The EUT was placed on a non-conductive table at a height of 0.8m.
2.	The EUT and support equipment, if needed, were set up to simulate typical usage.
3.	Cables, of type and length specified by the manufacturer, were connected to at least one port of each type and were terminated by a device or simulating load of actual usage.
4.	The antenna was placed at a distance of 3 or 10 m.
5.	The received signal was monitored at the measurement receiver.
6.	This procedure has to be performed in both antenna polarizations, horizontal and Vertical / Horizontal.
7.	The arrangement of the equipment with the maximum emission level is shown on the setup picture at item 2.1.2

Final measurement 3m Table top	
1.	The EUT was placed on a 0.8 m non-conductive table at a 3 or 10 m distance from the receive antenna. The antenna output was connected to the measurement receiver.
2.	A biconical antenna was used for the frequency range 30 – 200 MHz, a logarithmic periodical antenna was used for the frequency range from 200 – 1000 MHz. Above one 1 GHz a Double Ridged Broadband Horn antenna was used. The antenna was placed on an adjustable height antenna mast. A broadband hybrid antenna was used for the frequency range 30 – 1000 MHz. Above 1 GHz the antenna was placed on an adjustable height antenna mast. If required, in the range 1- 18 GHz a double ridged broadband horn antenna was used, from 18 – 26.5 GHz the AT4560 and above 26.5 GHz the antenna CBL26402075.
3.	The EUT and cable arrangement were based on the exploratory measurement results.
4.	Emissions were maximized at each frequency by rotating the EUT and adjusting the receive antenna height and polarization. The maximum values were recorded.
5.	The test data of the worst-case conditions were recorded and shown on the next pages.

2.1.5 Limits

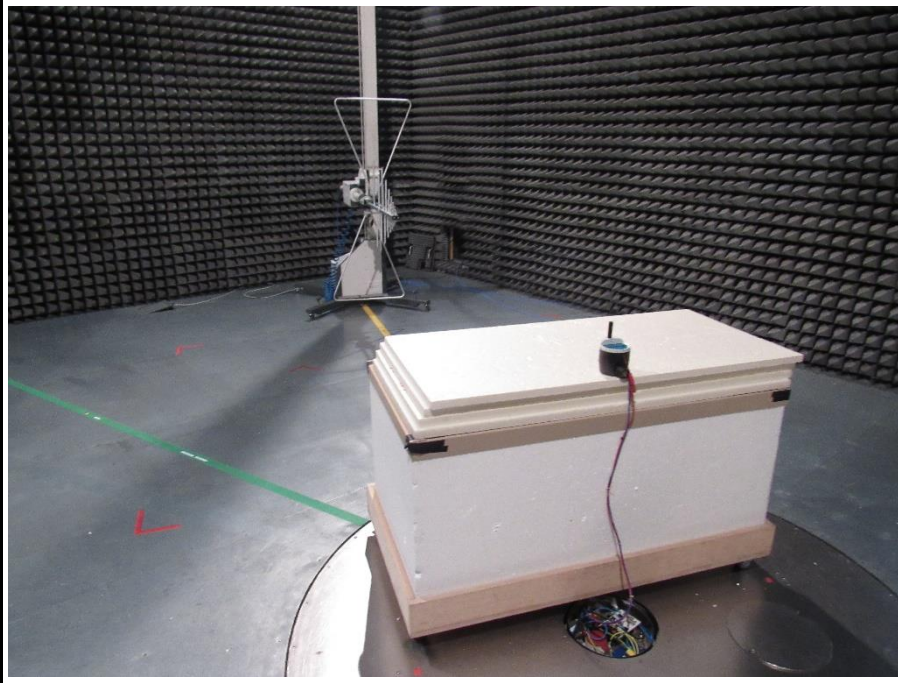
Class B @ 3 m		
Frequency [MHz]	Detector	Limit [dB μ V/m]
30 - 88	Quasi-peak	40
88 - 216	Quasi-peak	43.5
216 - 960	Quasi-peak	46
960 - 1000	Quasi-peak	54
> 1000	Peak	74
	Average	54

2.1.6 Results

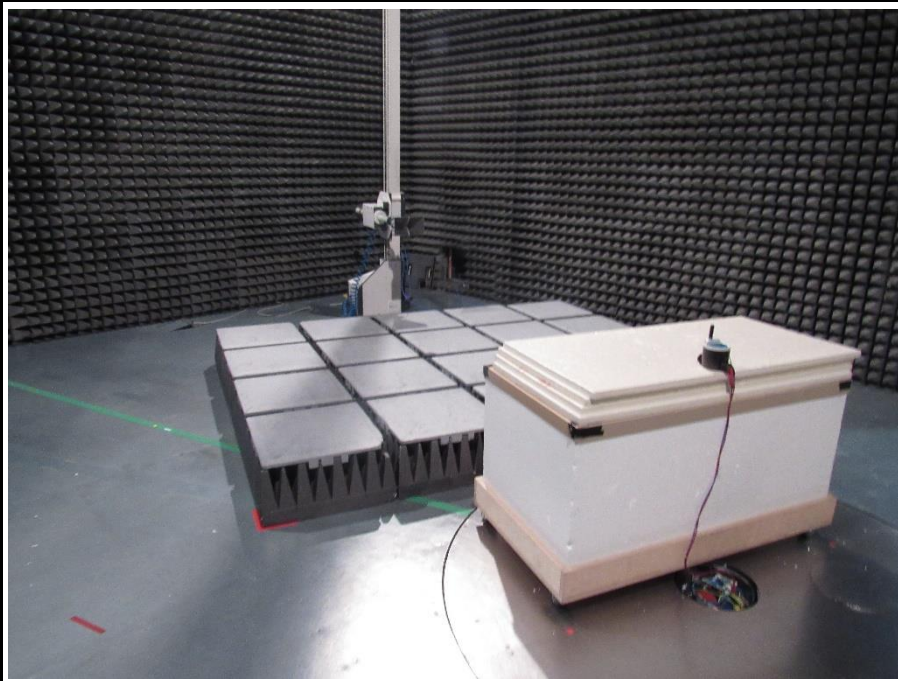
Test Results			
Operational mode	EUT Configuration	Verdict	Remark
1	1	PASS	3.6 V DC
1	2	PASS	3.6 V DC
1	3	PASS	3.6 V DC
2	4	PASS	3.6 V DC

2.1.7 Setup Photos

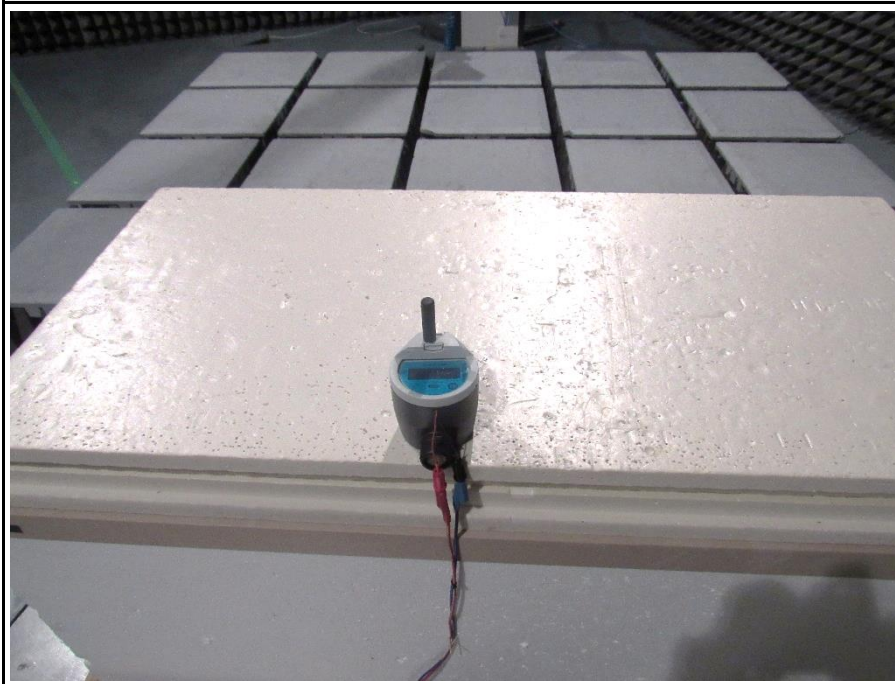
01 TEST SETUP - 30 MHz to 1000 MHz - CONFIGURATION 1



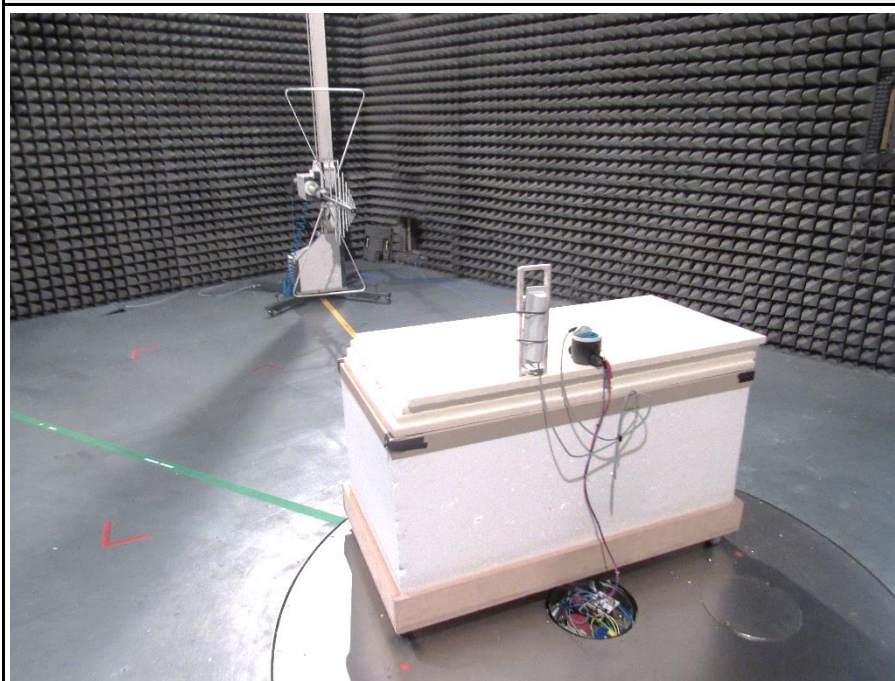
02 TEST SETUP - 1000 MHz to 20000 MHz - CONFIGURATION 2



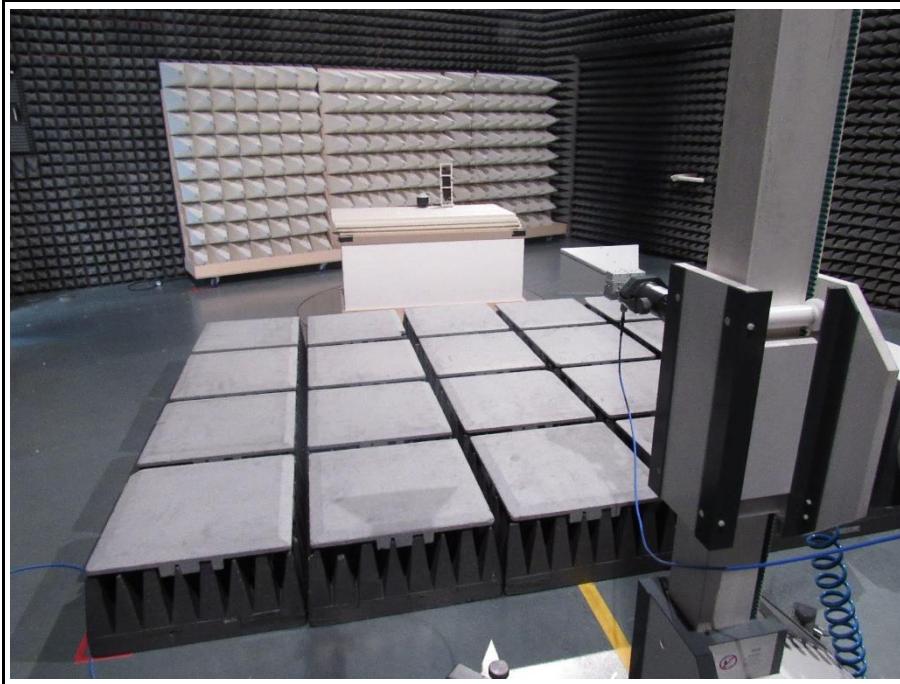
03 TEST SETUP - FOCUS - CONFIGURATION 1



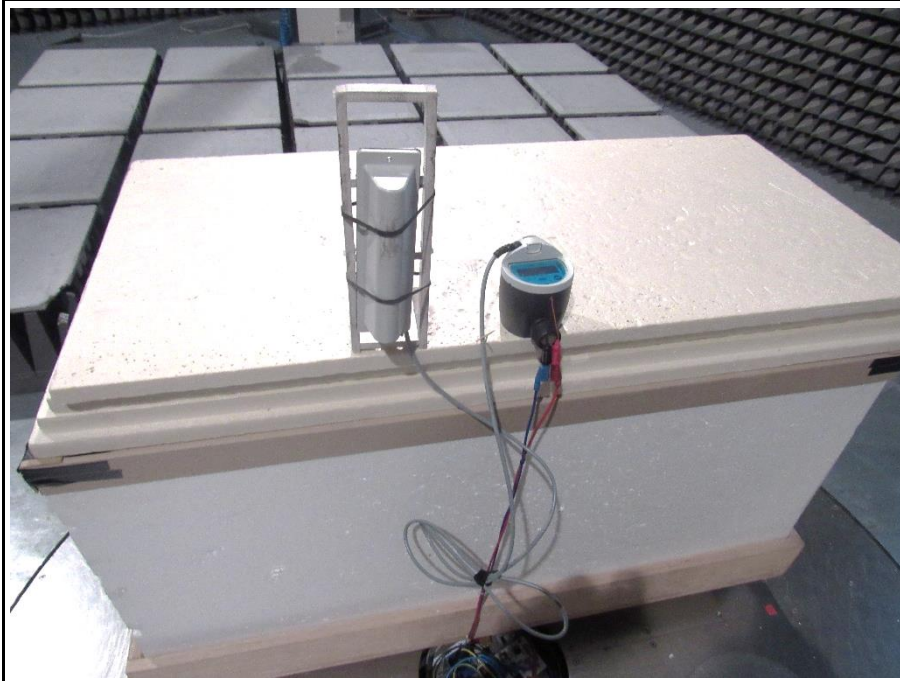
04 TEST SETUP - 30 MHz to 1000 MHz - CONFIGURATION 2



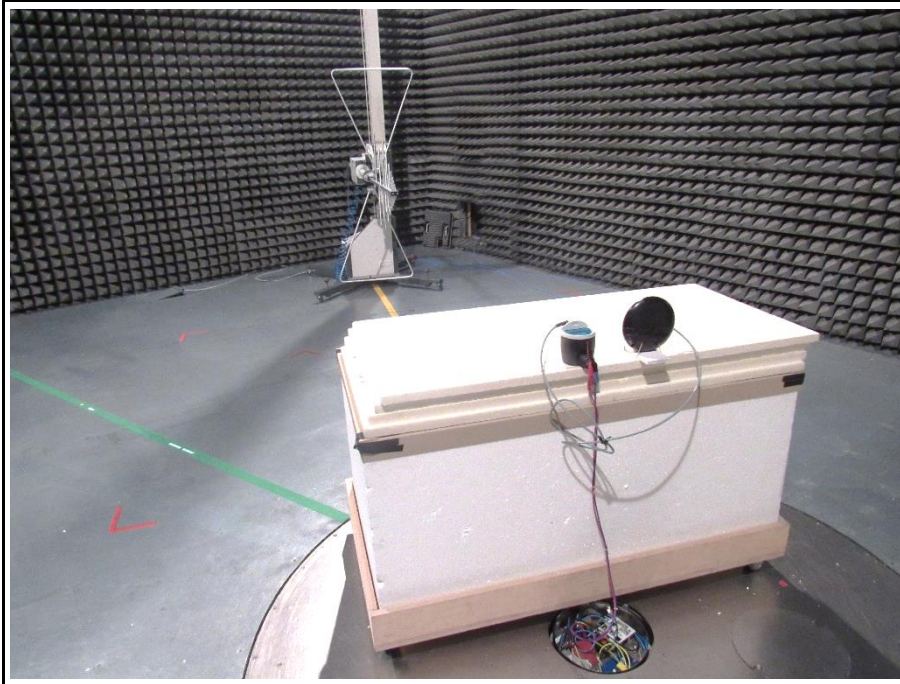
05 TEST SETUP - 1000 MHz to 20000 MHz - CONFIGURATION 2



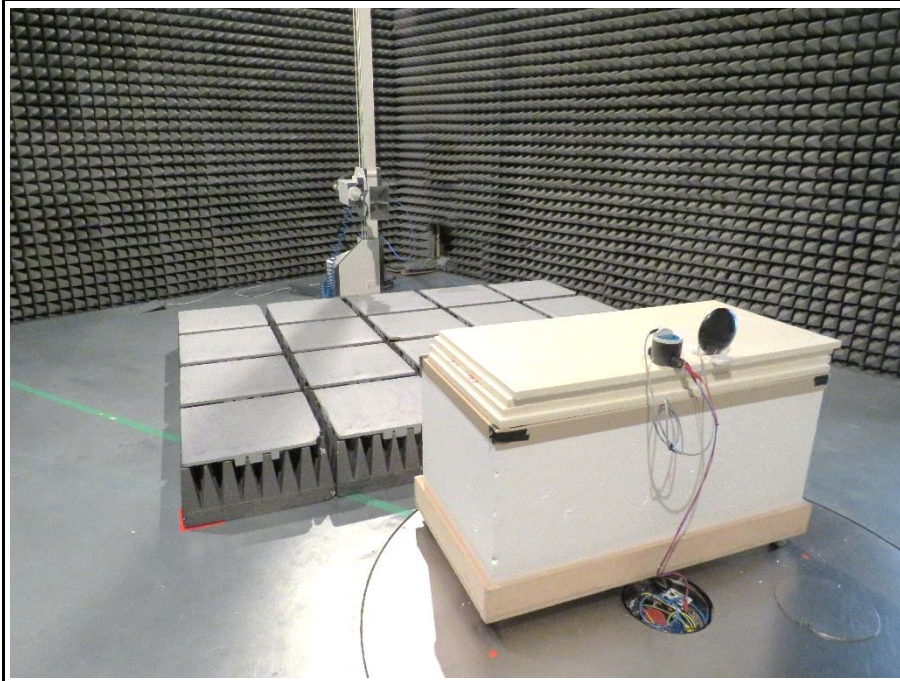
06 TEST SETUP - FOCUS - CONFIGURATION 2



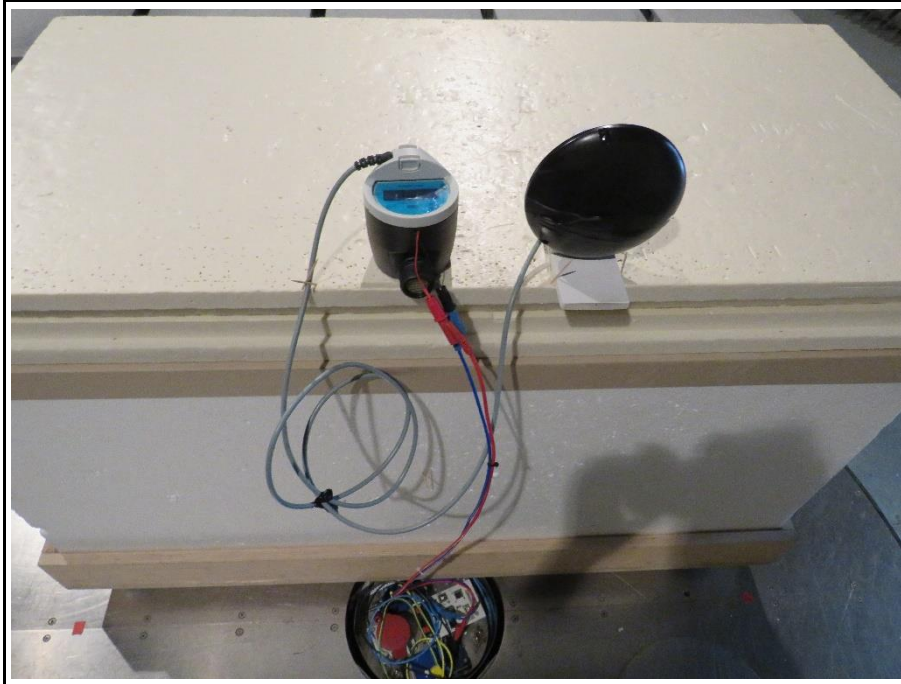
07 TEST SETUP - 30 MHz to 1000 MHz - CONFIGURATION 3



08 TEST SETUP - 1000 MHz to 20000 MHz - CONFIGURATION 3



09 TEST SETUP - FOCUS - CONFIGURATION 3



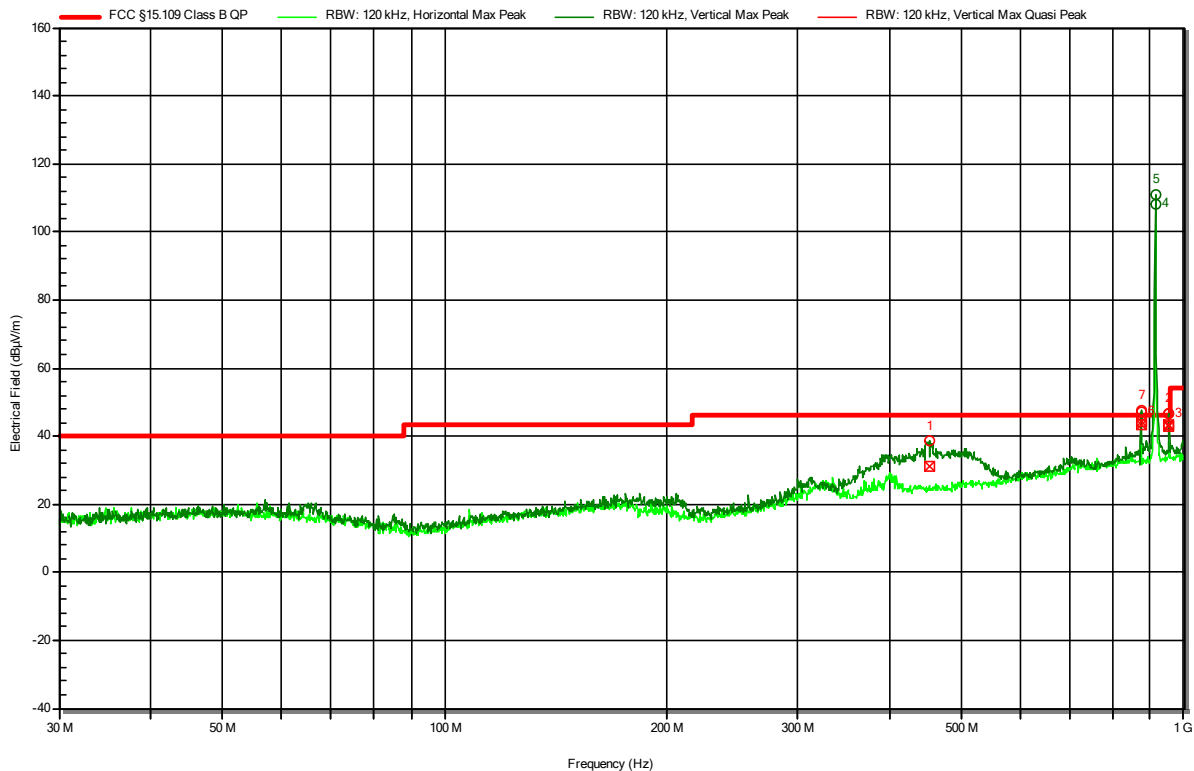
2.1.8 Records

**Radiated emissions
according to FCC part 15B**

Project Number: G0M-2211-1783
 Applicant: Kamstrup A/S
 Model Description: Ultrasonic water meter
 Model: KW2220
 Test Sample ID: 43140
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Liebich
 Test Date: 2023-03-02
 Operating Conditions: ambient temperature: 21 °Celsius
 power input: 3.6 V DC
 Antenna: Schwarzbeck VULB 9168, Vertical / Horizontal
 Measurement Distance: 3 m
 Operational Mode: 1
 EUT Configuration: 1
 Note 1: All results represents vertical antenna position

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RadiMation



Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Angle	Height
1	451.95 MHz	31.1 dBµV/m	46 dBµV/m	-14.94 dB	Pass	-180 degrees	1.2 m
2	955.2103 MHz	43 dBµV/m	46 dBµV/m	-3.05 dB	Pass	180 degrees	1.3 m
3	954.798 MHz	43.3 dBµV/m	46 dBµV/m	-2.71 dB	Pass	148 degrees	1.3 m
4	914.7855 MHz	SRD-Carrier					
5	915.1978 MHz						
6	874.7973 MHz	43.4 dBµV/m	46 dBµV/m	-2.58 dB	Pass	148 degrees	1.3 m
7	875.2095 MHz	44.4 dBµV/m	46 dBµV/m	-1.65 dB	Pass	148 degrees	1 m

Test Report No.: G0M-2211-1783-EF0115B-V01

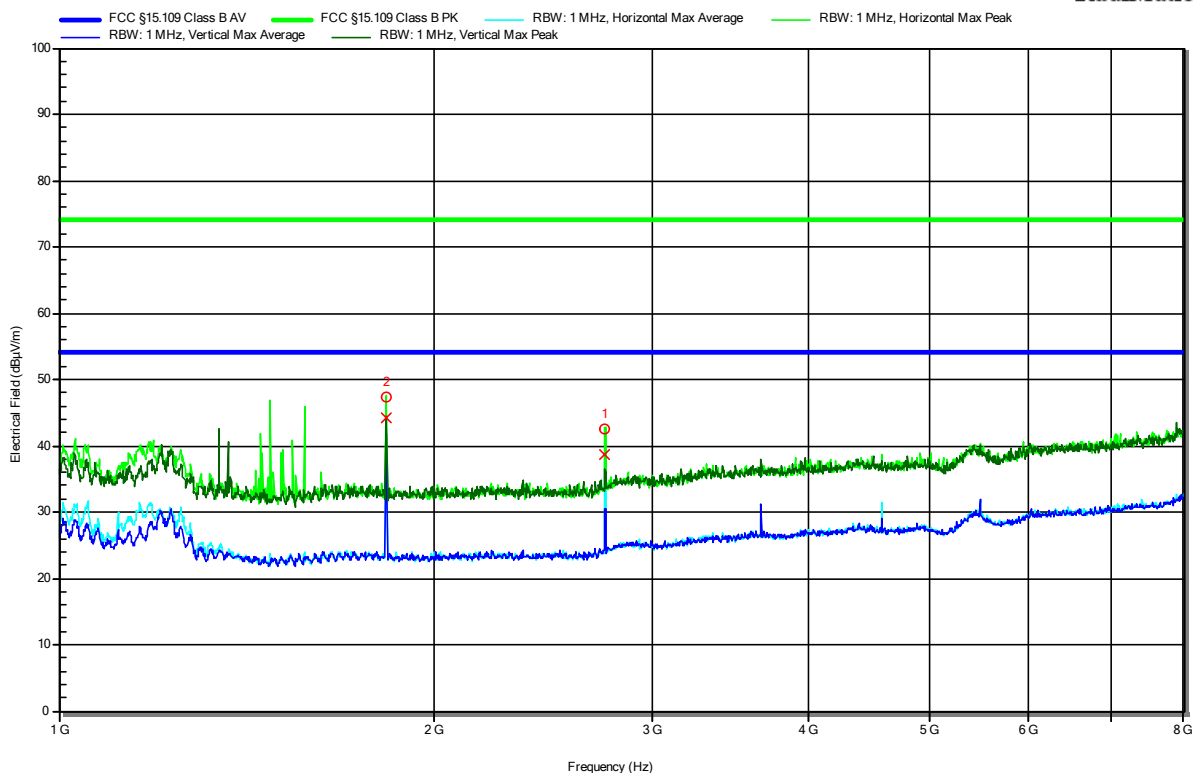
Eurofins Product Service GmbH
Storkower Str. 38c, D-15526 Reichenwalde, Germany

Radiated emissions according to FCC part 15B

Project Number: G0M-2211-1783
 Applicant: Kamstrup A/S
 Model Description: Ultrasonic water meter
 Model: KW2220
 Test Sample ID: 43142
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Qawasmeh
 Test Date: 2023-02-20
 Operating Conditions: ambient temperature: 24 °Celsius
 power input: 3.6 V DC
 Antenna: Schwarzbeck BBHA 9120B, Vertical / Horizontal
 Measurement Distance: 3 m
 Operational Mode: 1
 EUT Configuration: 1
 Note 1: All results represents vertical antenna position

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RadiMation



Peak Number	Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Angle	Height
1	2.7443 GHz	42.49 dBµV/m	73.98 dBµV/m	-31.49 dB	Pass	-139 degrees	1.5 m
2	1.8303 GHz	47.24 dBµV/m	73.98 dBµV/m	-26.74 dB	Pass	-154 degrees	1.5 m

Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	Angle	Height
1	2.7443 GHz	38.74 dBµV/m	53.98 dBµV/m	-15.24 dB	Pass	-139 degrees	1.5 m
2	1.8303 GHz	44.18 dBµV/m	53.98 dBµV/m	-9.8 dB	Pass	-154 degrees	1.5 m

Test Report No.: G0M-2211-1783-EF0115B-V01

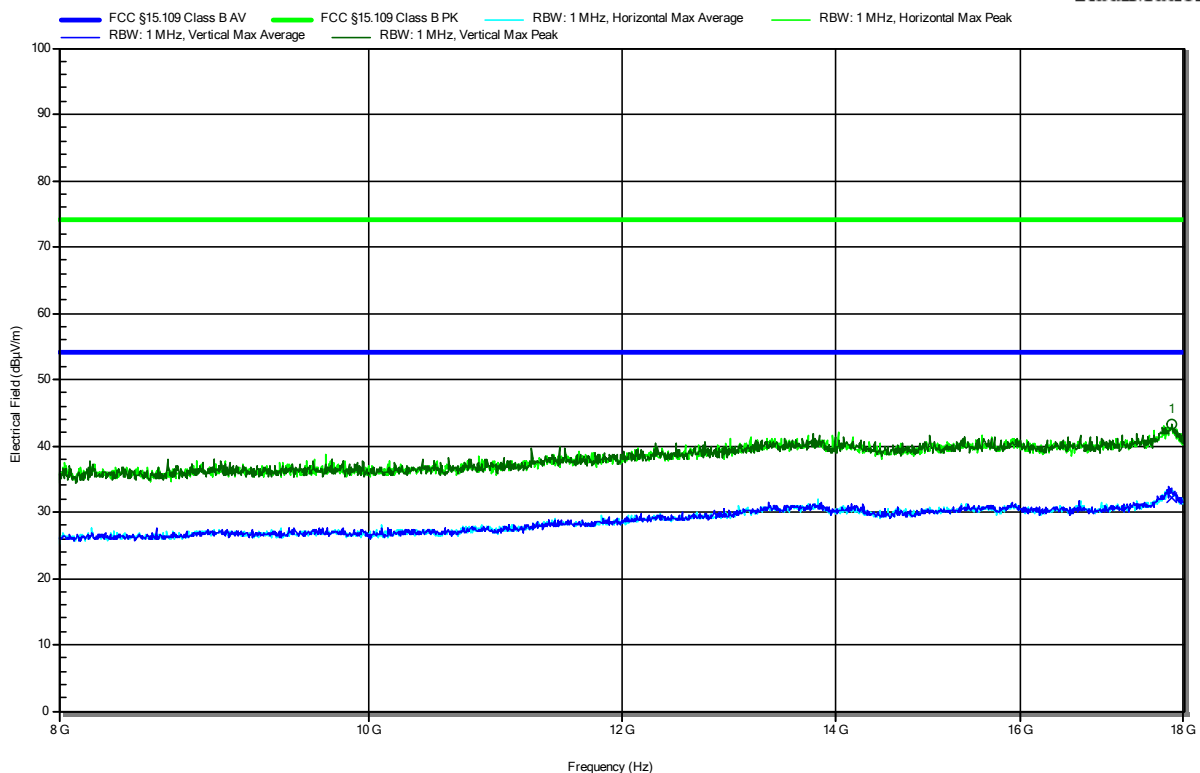
Eurofins Product Service GmbH
 Storkower Str. 38c, D-15526 Reichenwalde, Germany

**Radiated emissions
according to FCC part 15B**

Project Number: G0M-2211-1783
 Applicant: Kamstrup A/S
 Model Description: Ultrasonic water meter
 Model: KW2220
 Test Sample ID: 43142
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Qawasmeh
 Test Date: 2023-02-20
 Operating Conditions: ambient temperature: 24 °Celsius
 power input: 3.6 V DC
 Antenna: Schwarzbeck HWRD 650, Vertical / Horizontal
 Measurement Distance: 3 m
 Operational Mode: 1
 EUT Configuration: 1
 Note 1: All results represents vertical antenna position

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RadiMation



Peak Number	Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Angle	Height
1	17.841 GHz	43.16 dBµV/m	73.98 dBµV/m	-30.82 dB	Pass	-89 degrees	1.5 m
Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	Angle	Height
1	17.841 GHz	32.1 dBµV/m	53.98 dBµV/m	-21.88 dB	Pass	-89 degrees	1.5 m

Test Report No.: G0M-2211-1783-EF0115B-V01

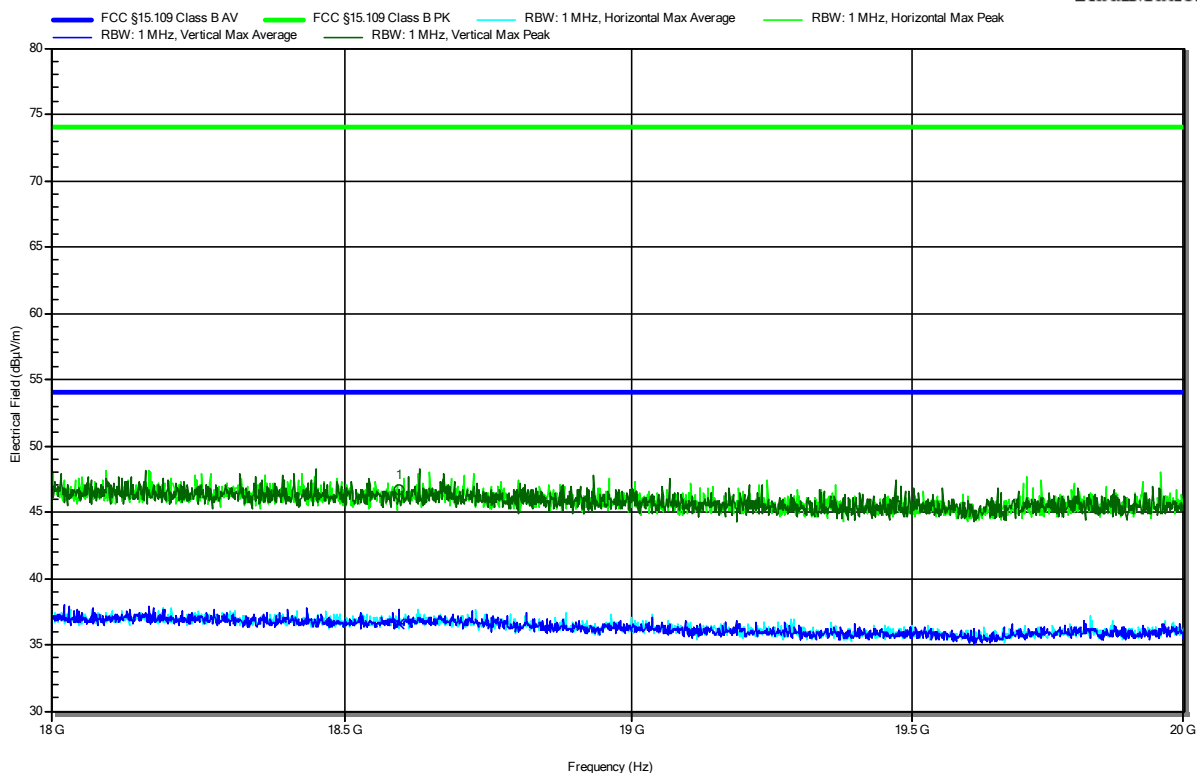
Eurofins Product Service GmbH
 Storkower Str. 38c, D-15526 Reichenwalde, Germany

Radiated emissions according to FCC part 15B

Project Number: G0M-2211-1783
 Applicant: Kamstrup A/S
 Model Description: Ultrasonic water meter
 Model: KW2220
 Test Sample ID: 43142
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Qawasmeh
 Test Date: 2023-02-20
 Operating Conditions: ambient temperature: 24 °Celsius
 power input: 3.6 V DC
 Antenna: Amplifier Research AT4560, Vertical / Horizontal
 Measurement Distance: 3 m
 Operational Mode: 1
 EUT Configuration: 1
 Note 1: All results represents vertical antenna position

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RadiMation



Peak Number	Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Angle	Height
1	18.592 GHz	46.72 dBµV/m	73.98 dBµV/m	-27.26 dB	Pass	-166 degrees	1.5 m

Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	Angle	Height
1	18.592 GHz	36.6 dBµV/m	53.98 dBµV/m	-17.38 dB	Pass	-166 degrees	1.5 m

Test Report No.: G0M-2211-1783-EF0115B-V01

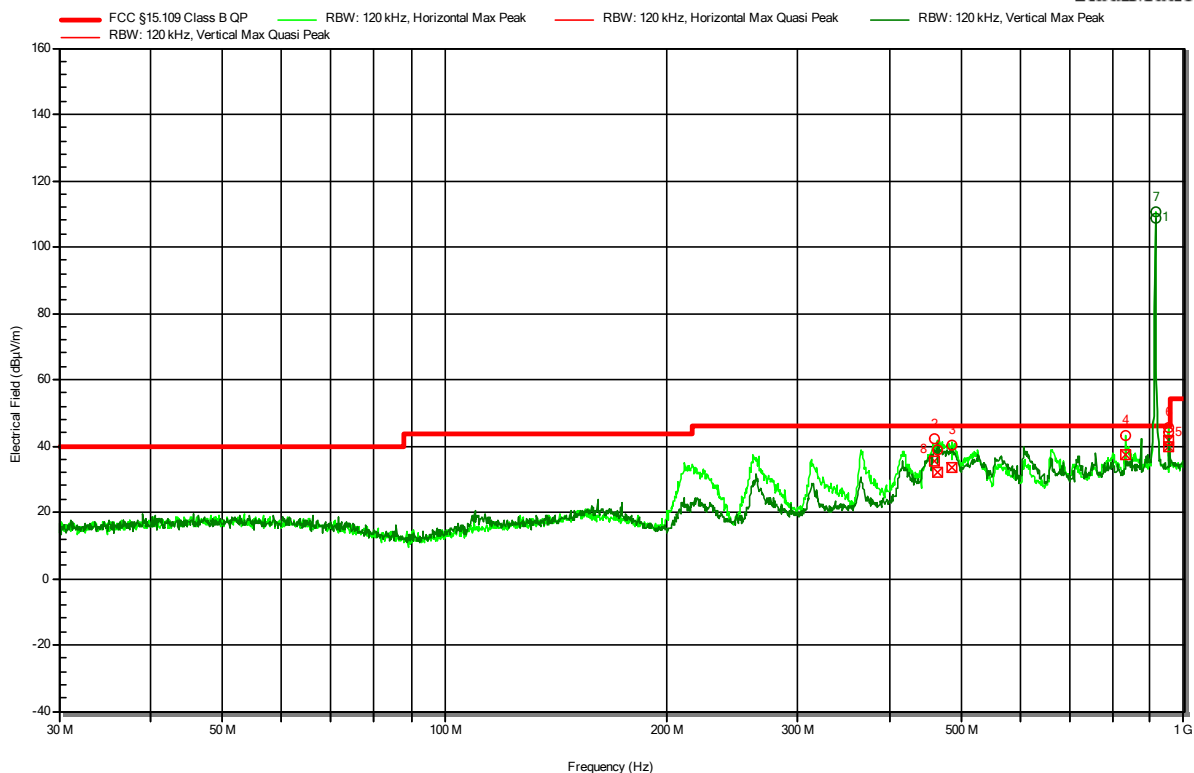
Eurofins Product Service GmbH
 Storkower Str. 38c, D-15526 Reichenwalde, Germany

Radiated emissions according to FCC part 15B

Project Number: G0M-2211-1783
 Applicant: Kamstrup A/S
 Model Description: Ultrasonic water meter
 Model: KW2220
 Test Sample ID: 43142
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Liebich
 Test Date: 2023-03-02
 Operating Conditions: ambient temperature: 21 °Celsius
 power input: 3.6 V DC
 Antenna: Schwarzbeck VULB 9168, Vertical / Horizontal
 Measurement Distance: 3 m
 Operational Mode: 1
 EUT Configuration: 2
 Note 1: All results represents vertical antenna position

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RadiMation



Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Angle	Height
1	915.1978 MHz	SRD-Carrier					
2	459.1522 MHz	35.6 dBµV/m	46 dBµV/m	-10.39 dB	Pass	-59 degrees	1.1 m
3	485.8515 MHz	33.4 dBµV/m	46 dBµV/m	-12.64 dB	Pass	-59 degrees	1.2 m
4	835.2213 MHz	37.3 dBµV/m	46 dBµV/m	-8.74 dB	Pass	13 degrees	1.1 m
5	954.798 MHz	39.9 dBµV/m	46 dBµV/m	-6.11 dB	Pass	13 degrees	1.3 m
6	955.2103 MHz	41.9 dBµV/m	46 dBµV/m	-4.14 dB	Pass	39 degrees	1 m
7	914.8098 MHz	SRD-Carrier					
8	464.6764 MHz	32 dBµV/m	46 dBµV/m	-14.02 dB	Pass	-44 degrees	1 m

Test Report No.: G0M-2211-1783-EF0115B-V01

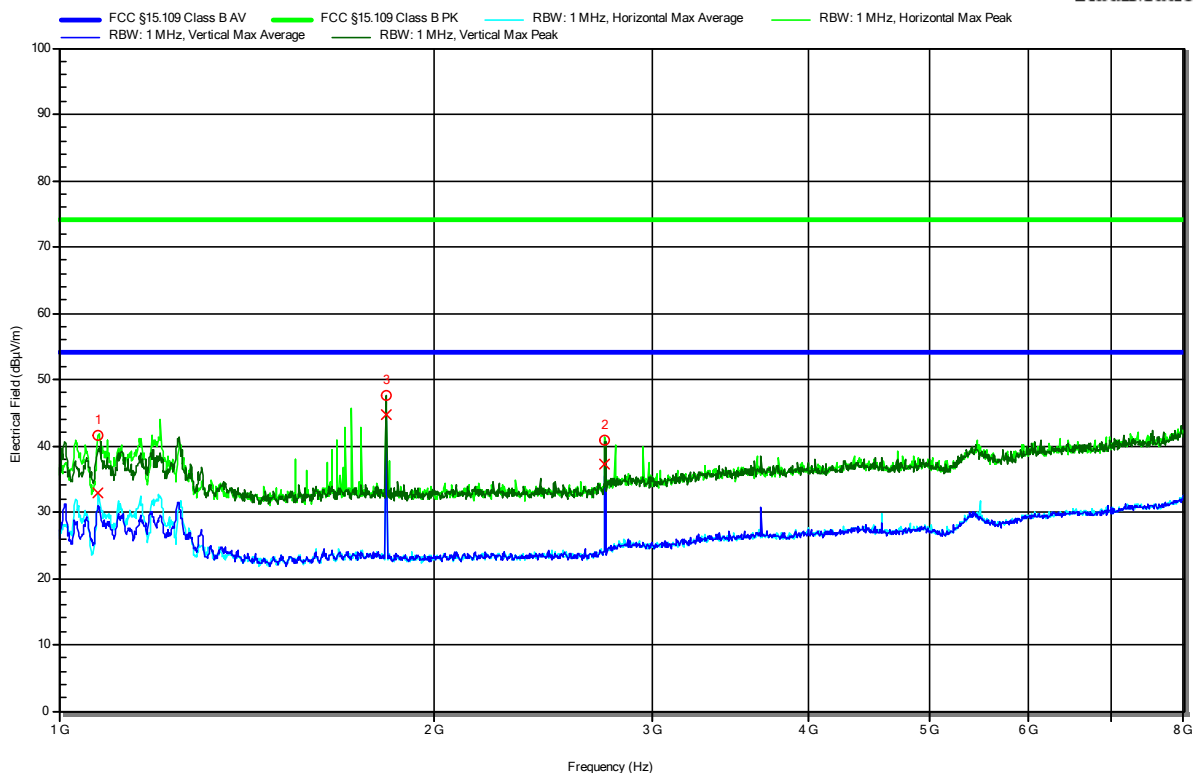
Eurofins Product Service GmbH
 Storkower Str. 38c, D-15526 Reichenwalde, Germany

Radiated emissions according to FCC part 15B

Project Number: G0M-2211-1783
 Applicant: Kamstrup A/S
 Model Description: Ultrasonic water meter
 Model: KW2220
 Test Sample ID: 43142
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Qawasmeh
 Test Date: 2023-02-20
 Operating Conditions: ambient temperature: 24 °Celsius
 power input: 3.6 V DC
 Antenna: Schwarzbeck BBHA 9120B, Vertical / Horizontal
 Measurement Distance: 3 m
 Operational Mode: 1
 EUT Configuration: 2
 Note 1: All results represents vertical antenna position

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RadiMation



Peak Number	Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Angle	Height
1	1.0748 GHz	41.46 dBµV/m	73.98 dBµV/m	-32.51 dB	Pass	77 degrees	1.5 m
2	2.7444 GHz	40.89 dBµV/m	73.98 dBµV/m	-33.09 dB	Pass	-121 degrees	1.5 m
3	1.8304 GHz	47.5 dBµV/m	73.98 dBµV/m	-26.48 dB	Pass	169 degrees	1.5 m

Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	Angle	Height
1	1.0748 GHz	32.88 dBµV/m	53.98 dBµV/m	-21.09 dB	Pass	77 degrees	1.5 m
2	2.7444 GHz	37.32 dBµV/m	53.98 dBµV/m	-16.66 dB	Pass	-121 degrees	1.5 m
3	1.8304 GHz	44.66 dBµV/m	53.98 dBµV/m	-9.32 dB	Pass	169 degrees	1.5 m

Test Report No.: G0M-2211-1783-EF0115B-V01

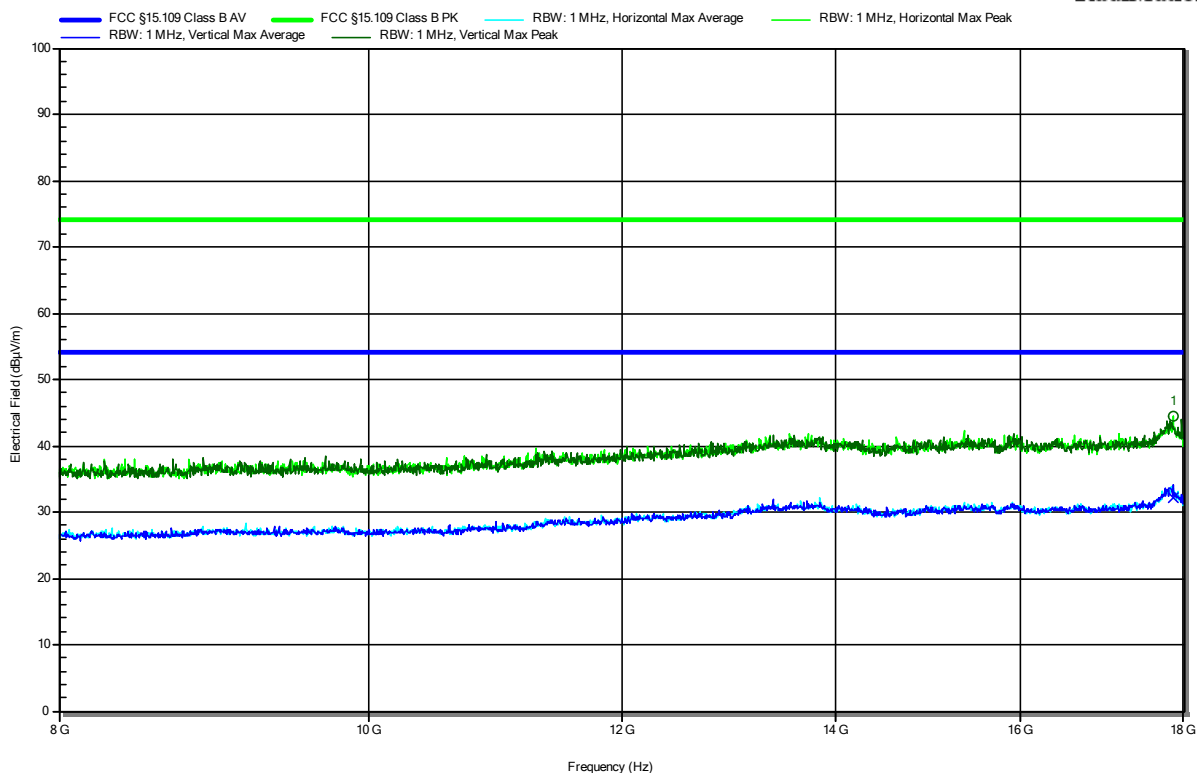
Eurofins Product Service GmbH
 Storkower Str. 38c, D-15526 Reichenwalde, Germany

Radiated emissions according to FCC part 15B

Project Number: G0M-2211-1783
Applicant: Kamstrup A/S
Model Description: Ultrasonic water meter
Model: KW2220
Test Sample ID: 43142
Test Site: Eurofins Product Service GmbH
Operator: Mr. Qawasmeh
Test Date: 2023-02-20
Operating Conditions: ambient temperature: 24 °Celsius
power input: 3.6 V DC
Antenna: Schwarzbeck HWRD 650, Vertical / Horizontal
Measurement Distance: 3 m
Operational Mode: 1
EUT Configuration: 2
Note 1: All results represents vertical antenna position

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RadiMation



Peak Number	Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Angle	Height
1	17.859 GHz	44.35 dBµV/m	73.98 dBµV/m	-29.63 dB	Pass	-147 degrees	1.5 m
Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	Angle	Height
1	17.859 GHz	32.17 dBµV/m	53.98 dBµV/m	-21.81 dB	Pass	-147 degrees	1.5 m

Test Report No.: G0M-2211-1783-EF0115B-V01

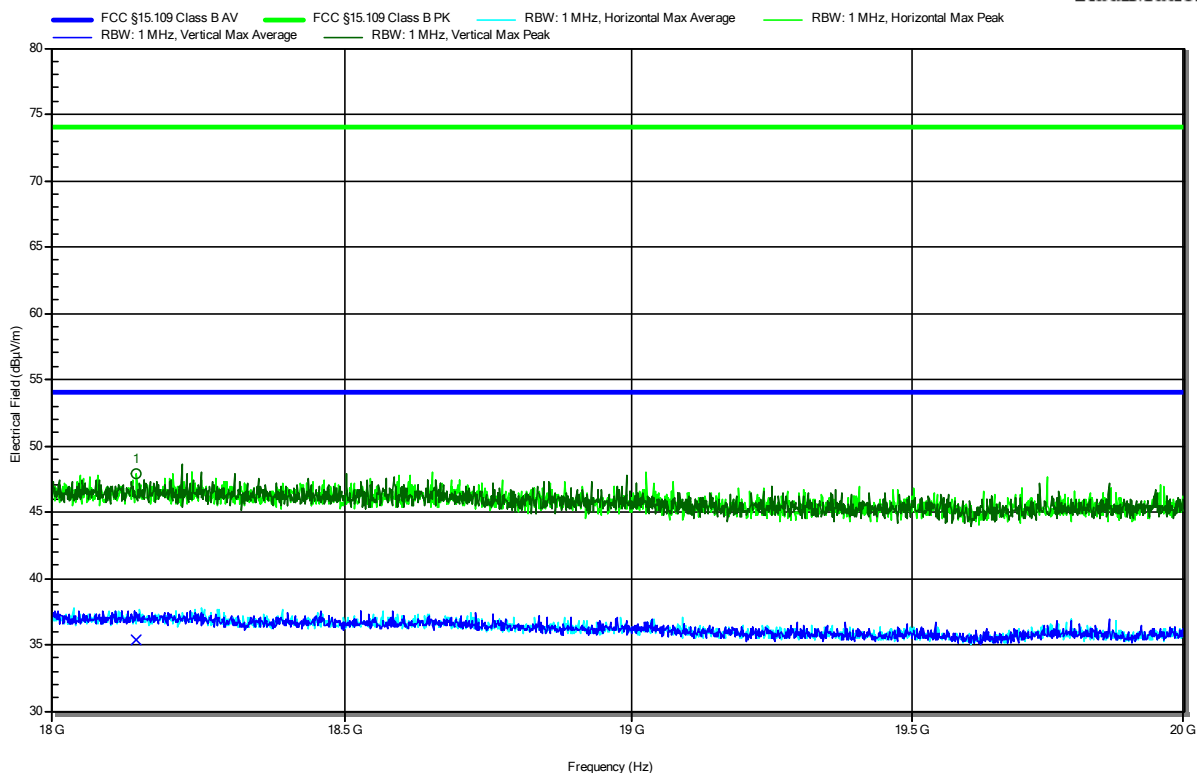
Eurofins Product Service GmbH
Storkower Str. 38c, D-15526 Reichenwalde, Germany

**Radiated emissions
according to FCC part 15B**

Project Number: G0M-2211-1783
 Applicant: Kamstrup A/S
 Model Description: Ultrasonic water meter
 Model: KW2220
 Test Sample ID: 43142
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Qawasmeh
 Test Date: 2023-02-20
 Operating Conditions: ambient temperature: 24 °Celsius
 power input: 3.6 V DC
 Antenna: Amplifier Research AT4560, Vertical / Horizontal
 Measurement Distance: 3 m
 Operational Mode: 1
 EUT Configuration: 2
 Note 1: All results represents vertical antenna position

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RadiMation



Peak Number	Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Angle	Height
1	18.144 GHz	47.91 dBµV/m	73.98 dBµV/m	-26.07 dB	Pass	-99 degrees	1.5 m
Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	Angle	Height
1	18.144 GHz	35.41 dBµV/m	53.98 dBµV/m	-18.57 dB	Pass	-99 degrees	1.5 m

Test Report No.: G0M-2211-1783-EF0115B-V01

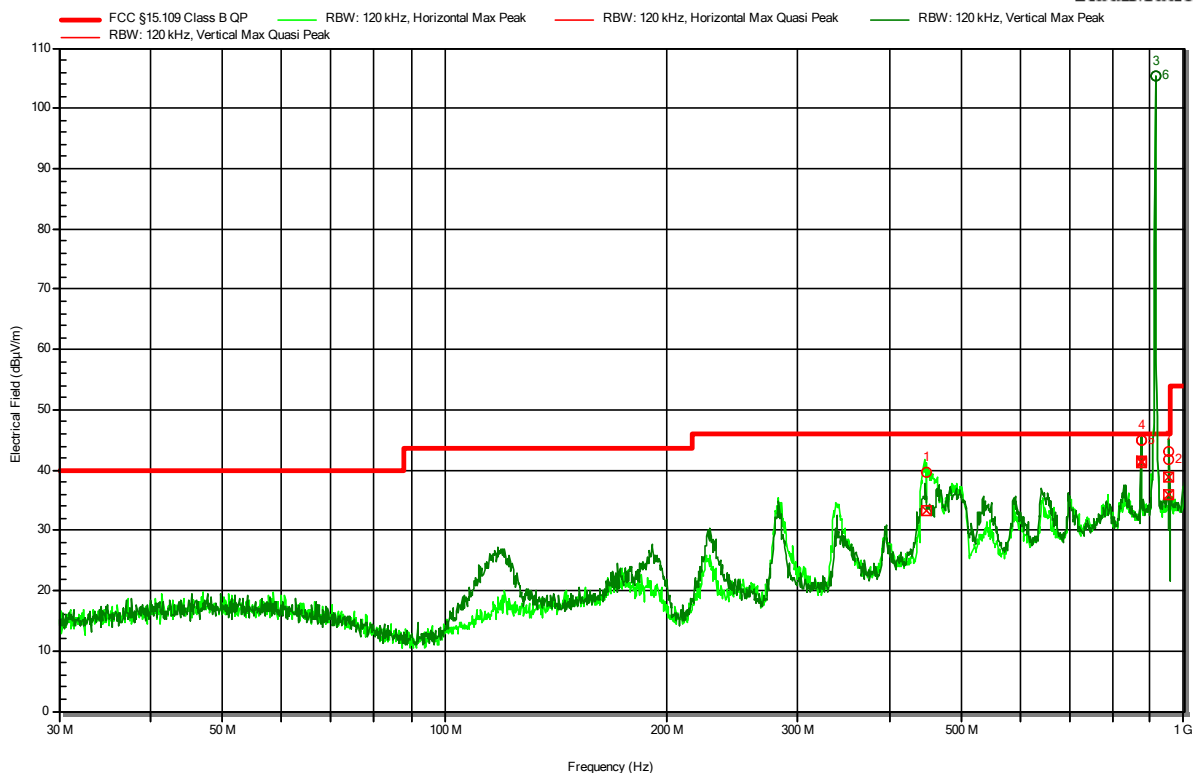
Eurofins Product Service GmbH
 Storkower Str. 38c, D-15526 Reichenwalde, Germany

Radiated emissions according to FCC part 15B

Project Number: G0M-2211-1783
 Applicant: Kamstrup A/S
 Model Description: Ultrasonic water meter
 Model: KW2220
 Test Sample ID: 43142
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Liebich
 Test Date: 2023-03-02
 Operating Conditions: ambient temperature: 21 °Celsius
 power input: 3.6 V DC
 Antenna: Schwarzbeck VULB 9168, Vertical / Horizontal
 Measurement Distance: 3 m
 Operational Mode: 1
 EUT Configuration: 3
 Note 1: All results represents vertical antenna position

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RadiMation



Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Angle	Height
1	447.8032 MHz	33.3 dBµV/m	46 dBµV/m	-12.77 dB	Pass	99 degrees	1.25 m
2	954.798 MHz	36 dBµV/m	46 dBµV/m	-10.06 dB	Pass	180 degrees	1.2 m
3	914.7855 MHz	SRD-Carrier					
4	874.7973 MHz	41.5 dBµV/m	46 dBµV/m	-4.54 dB	Pass	166 degrees	1.3 m
5	875.1853 MHz	41.1 dBµV/m	46 dBµV/m	-4.87 dB	Pass	180 degrees	1 m
6	915.222 MHz	SRD-Carrier					
7	955.2103 MHz	38.7 dBµV/m	46 dBµV/m	-7.28 dB	Pass	180 degrees	1.2 m

Test Report No.: G0M-2211-1783-EF0115B-V01

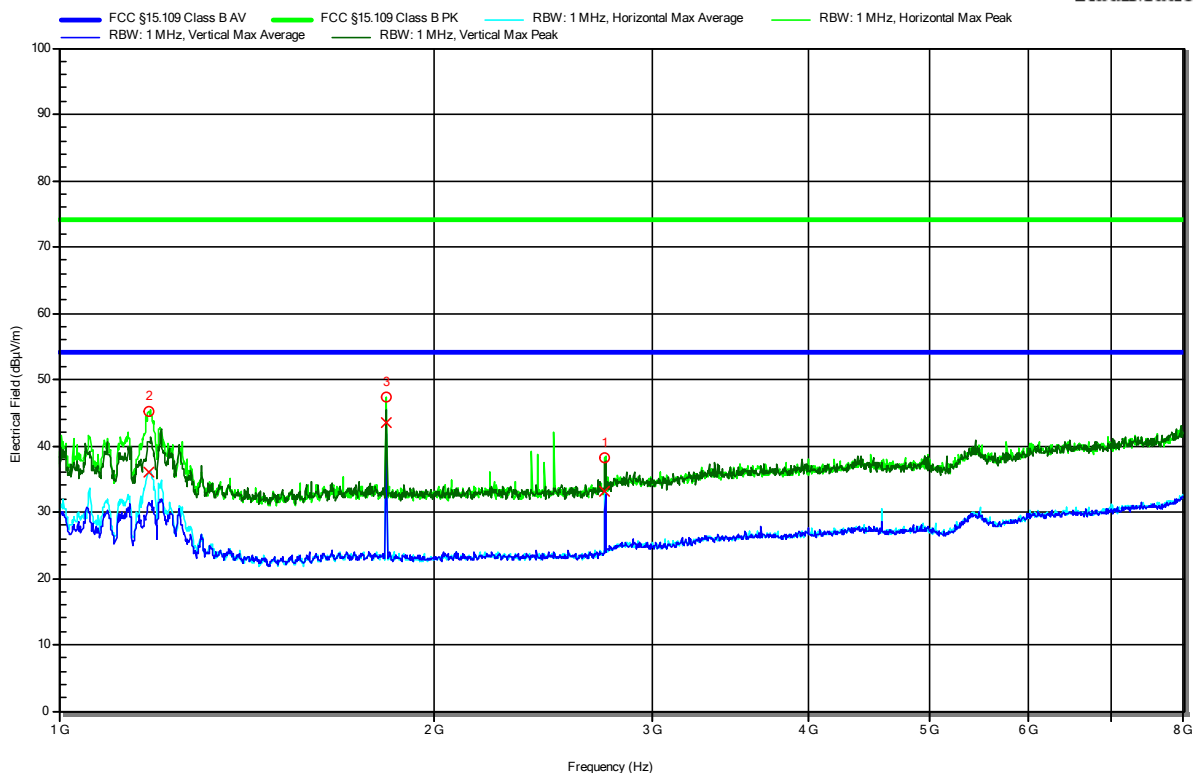
Eurofins Product Service GmbH
 Storkower Str. 38c, D-15526 Reichenwalde, Germany

Radiated emissions according to FCC part 15B

Project Number: G0M-2211-1783
 Applicant: Kamstrup A/S
 Model Description: Ultrasonic water meter
 Model: KW2220
 Test Sample ID: 43142
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Qawasmeh
 Test Date: 2023-02-20
 Operating Conditions: ambient temperature: 24 °Celsius
 power input: 3.6 V DC
 Antenna: Schwarzbeck BBHA 9120B, Vertical / Horizontal
 Measurement Distance: 3 m
 Operational Mode: 1
 EUT Configuration: 3
 Note 1: All results represents vertical antenna position

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RadiMation



Peak Number	Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Angle	Height
1	2.7445 GHz	38.16 dBµV/m	73.98 dBµV/m	-35.82 dB	Pass	130 degrees	1.5 m
2	1.1816 GHz	45.1 dBµV/m	73.98 dBµV/m	-28.87 dB	Pass	130 degrees	1.5 m
3	1.8304 GHz	47.38 dBµV/m	73.98 dBµV/m	-26.6 dB	Pass	130 degrees	1.5 m

Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	Angle	Height
1	2.7445 GHz	33.12 dBµV/m	53.98 dBµV/m	-20.86 dB	Pass	130 degrees	1.5 m
2	1.1816 GHz	36.01 dBµV/m	53.98 dBµV/m	-17.96 dB	Pass	130 degrees	1.5 m
3	1.8304 GHz	43.52 dBµV/m	53.98 dBµV/m	-10.46 dB	Pass	130 degrees	1.5 m

Test Report No.: G0M-2211-1783-EF0115B-V01

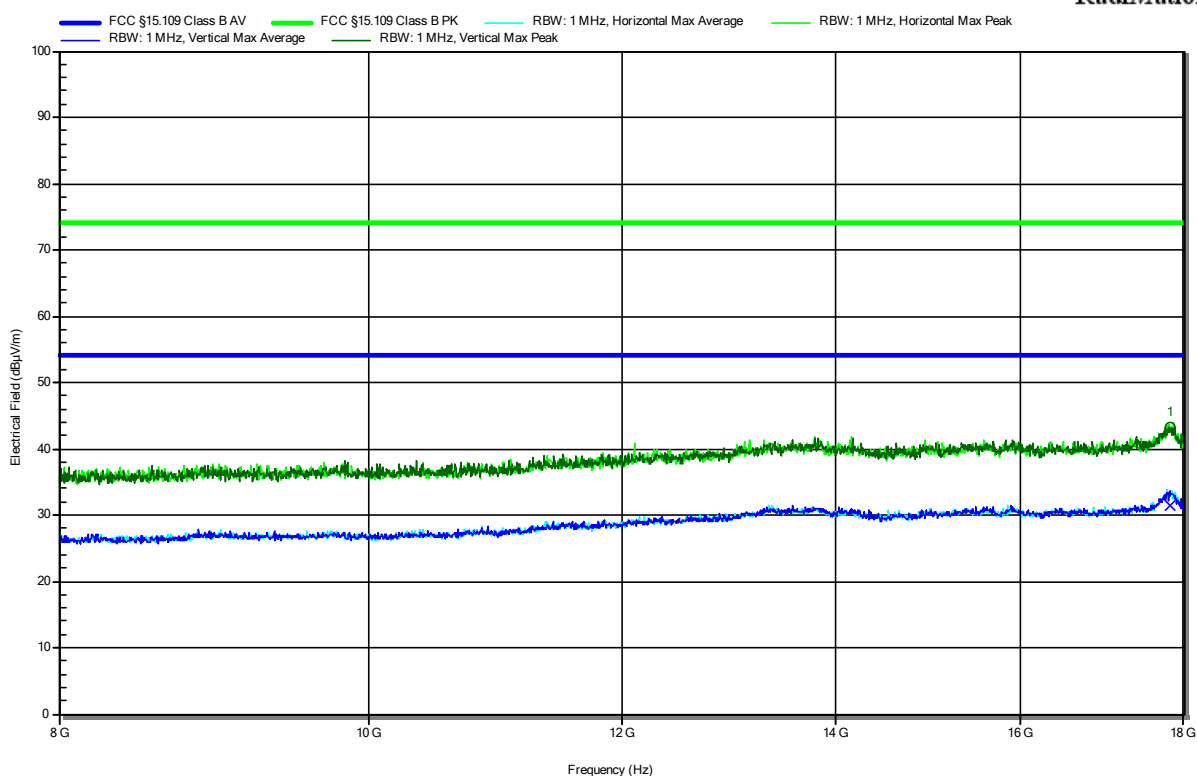
Eurofins Product Service GmbH
 Storkower Str. 38c, D-15526 Reichenwalde, Germany

Radiated emissions according to FCC part 15B

Project Number: G0M-2211-1783
Applicant: Kamstrup A/S
Model Description: Ultrasonic water meter
Model: KW2220
Test Sample ID: 43142
Test Site: Eurofins Product Service GmbH
Operator: Mr. Qawasmeh
Test Date: 2023-02-20
Operating Conditions: ambient temperature: 24 °Celsius
power input: 3.6 V DC
Antenna: Schwarzbeck HWRD 650, Vertical / Horizontal
Measurement Distance: 3 m
Operational Mode: 1
EUT Configuration: 3
Note 1: All results represents vertical antenna position

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RadiMation



Peak Number	Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Angle	Height
1	17.835 GHz	43.33 dBµV/m	73.98 dBµV/m	-30.64 dB	Pass	-42 degrees	1.5 m
Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	Angle	Height
1	17.835 GHz	31.45 dBµV/m	53.98 dBµV/m	-22.52 dB	Pass	-42 degrees	1.5 m

Test Report No.: G0M-2211-1783-EF0115B-V01

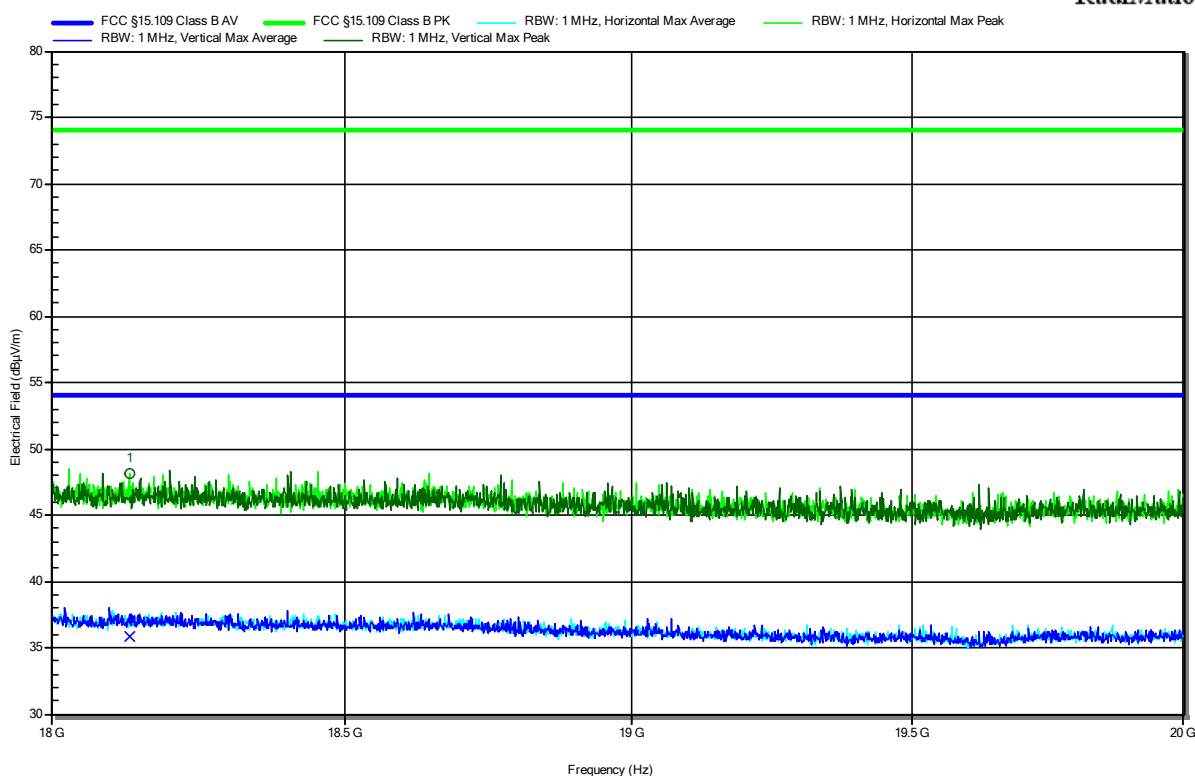
Eurofins Product Service GmbH
Storkower Str. 38c, D-15526 Reichenwalde, Germany

Radiated emissions according to FCC part 15B

Project Number: G0M-2211-1783
Applicant: Kamstrup A/S
Model Description: Ultrasonic water meter
Model: KW2220
Test Sample ID: 43142
Test Site: Eurofins Product Service GmbH
Operator: Mr. Qawasmeh
Test Date: 2023-02-20
Operating Conditions: ambient temperature: 24 °Celsius
power input: 3.6 V DC
Antenna: Amplifier Research AT4560, Vertical / Horizontal
Measurement Distance: 3 m
Operational Mode: 1
EUT Configuration: 3
Note 1: All results represents vertical antenna position

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RadiMation



Peak Number	Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Angle	Height
1	18.131 GHz	48.17 dBµV/m	73.98 dBµV/m	-25.81 dB	Pass	0 degrees	1.5 m
Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	Angle	Height
1	18.131 GHz	35.85 dBµV/m	53.98 dBµV/m	-18.13 dB	Pass	0 degrees	1.5 m

Test Report No.: G0M-2211-1783-EF0115B-V01

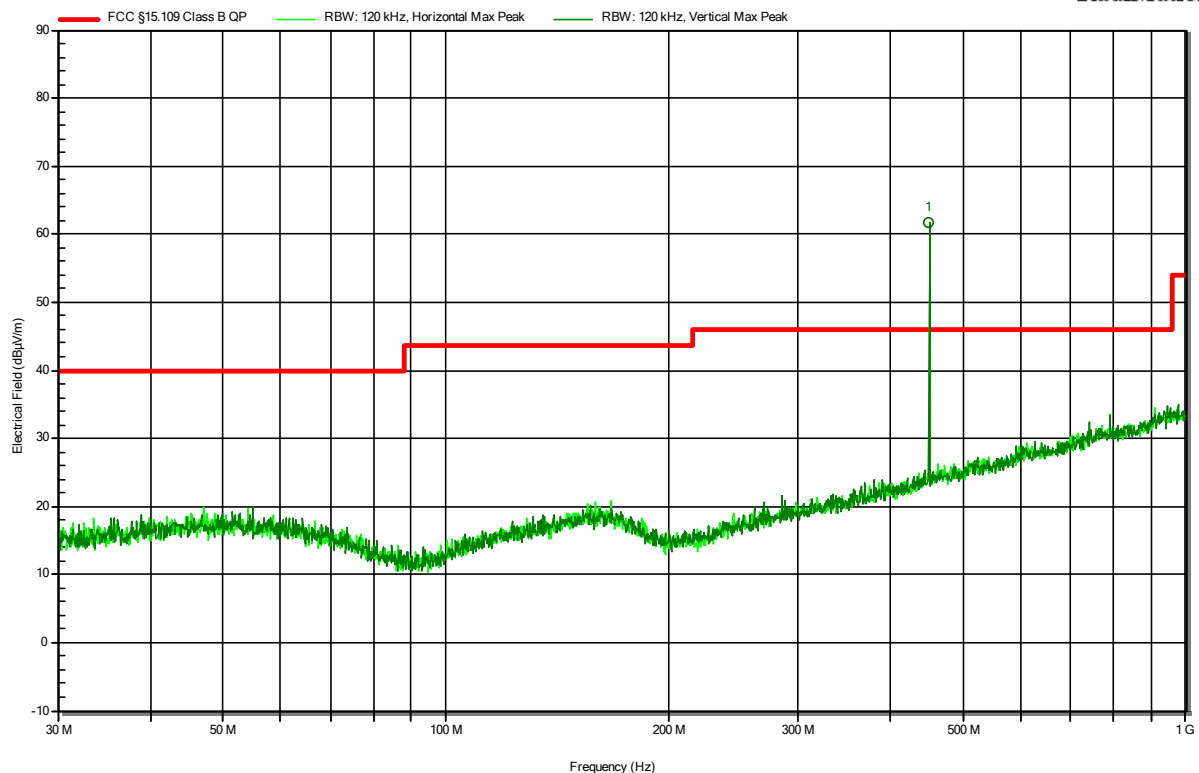
Eurofins Product Service GmbH
Storkower Str. 38c, D-15526 Reichenwalde, Germany

Radiated emissions according to FCC part 15B

Project Number: G0M-2211-1783
Applicant: Kamstrup A/S
Model Description: Ultrasonic water meter
Model: KW2220
Test Sample ID: 43140
Test Site: Eurofins Product Service GmbH
Operator: Mr. Liebich
Test Date: 2023-03-02
Operating Conditions: ambient temperature: 21 °Celsius
power input: 3.6 V DC
Antenna: Schwarzbeck VULB 9168, Vertical / Horizontal
Measurement Distance: 3 m
Operational Mode: 2
EUT Configuration: 4
Note 1: Angle: 0°
Height: 1 m
All results represents vertical antenna position

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RadiMation



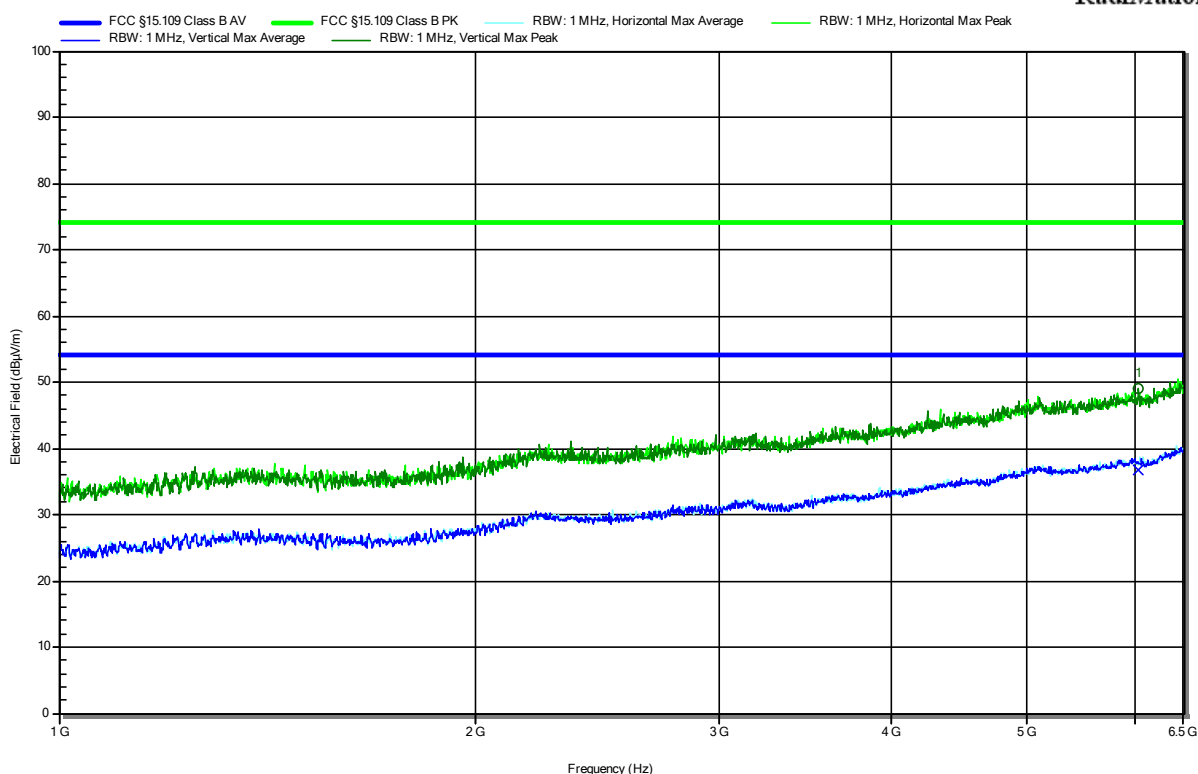
Peak Number	Frequency	Angle	Height
1	PMR-Carrier		

Radiated emissions according to FCC part 15B

Project Number: G0M-2211-1783
 Applicant: Kamstrup A/S
 Model Description: Ultrasonic water meter
 Model: KW2220
 Test Sample ID: 43140
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Qawasmeh
 Test Date: 2023-02-21
 Operating Conditions: ambient temperature: 21 °Celsius
 power input: 3.6 V DC
 Antenna: Schwarzbeck BBHA 9120D, Vertical / Horizontal
 Measurement Distance: 3 m
 Operational Mode: 2
 EUT Configuration: 4
 Note 1: All results represents vertical antenna position

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RadiMation



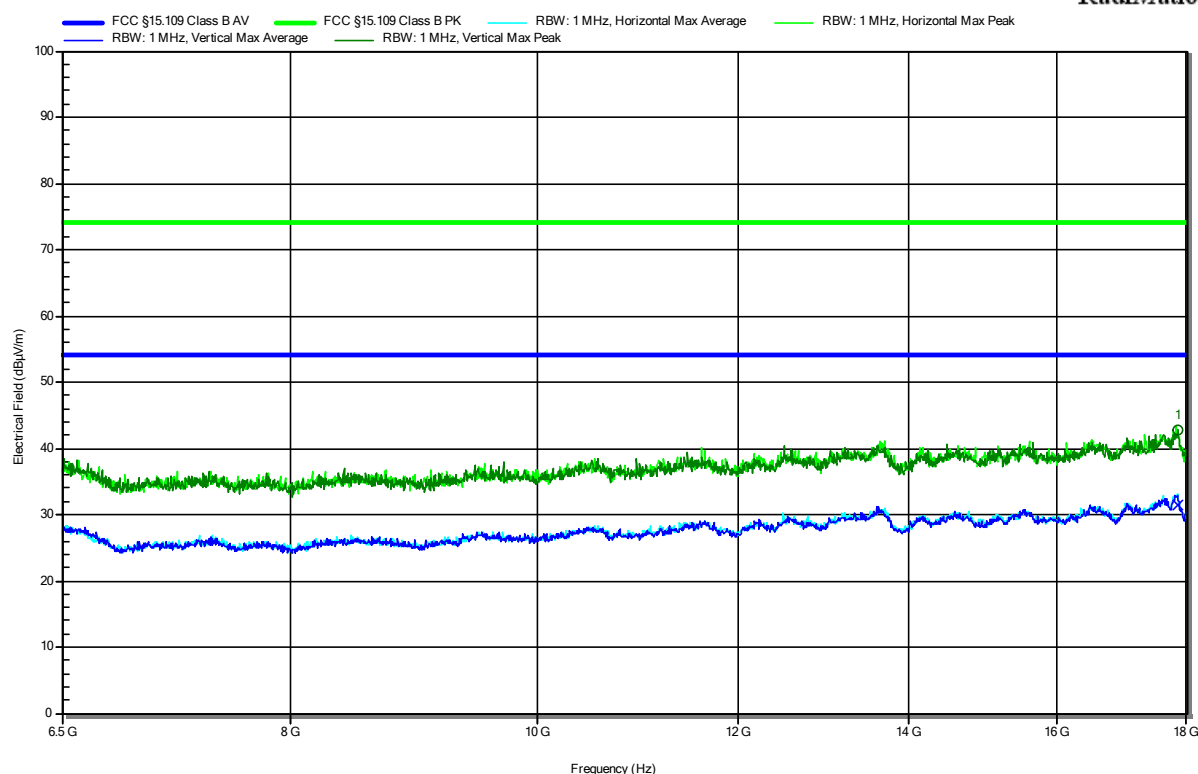
Peak Number	Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Angle	Height
1	6.028 GHz	49.02 dBµV/m	73.98 dBµV/m	-24.96 dB	Pass	-180 degrees	1 m
Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	Angle	Height
1	6.028 GHz	36.8 dBµV/m	53.98 dBµV/m	-17.18 dB	Pass	-180 degrees	1 m

Radiated emissions according to FCC part 15B

Project Number: G0M-2211-1783
 Applicant: Kamstrup A/S
 Model Description: Ultrasonic water meter
 Model: KW2220
 Test Sample ID: 43140
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Qawasmeh
 Test Date: 2023-02-21
 Operating Conditions: ambient temperature: 21 °Celsius
 power input: 3.6 V DC
 Antenna: Schwarzbeck HWRD 650, Vertical / Horizontal
 Measurement Distance: 3 m
 Operational Mode: 2
 EUT Configuration: 4
 Note 1: All results represents vertical antenna position

Index 10

RadiMation



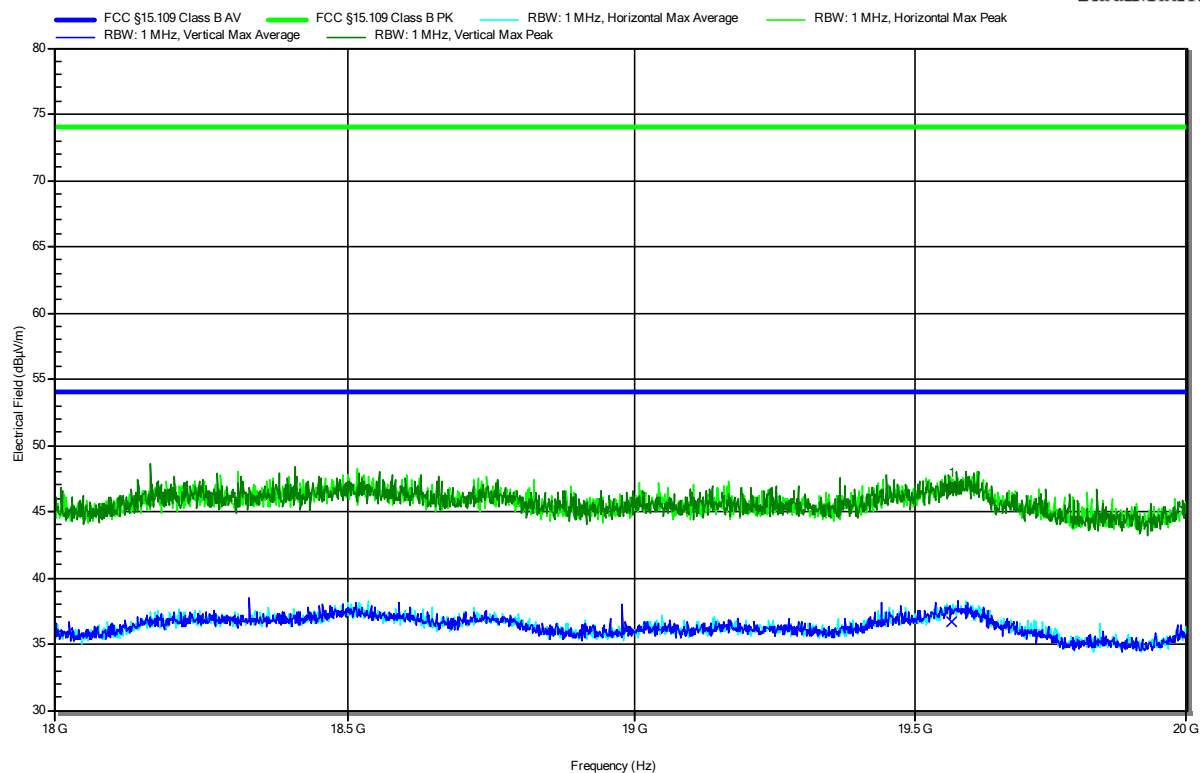
Peak Number	Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Angle	Height
1	17.849 GHz	42.74 dBμV/m	73.98 dBμV/m	-31.24 dB	Pass	-72 degrees	1 m
Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	Angle	Height
1	17.849 GHz	31.47 dBμV/m	53.98 dBμV/m	-22.51 dB	Pass	-72 degrees	1 m

Radiated emissions according to FCC part 15B

Project Number: G0M-2211-1783
 Applicant: Kamstrup A/S
 Model Description: Ultrasonic water meter
 Model: KW2220
 Test Sample ID: 43140
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Qawasmeh
 Test Date: 2023-02-21
 Operating Conditions: ambient temperature: 21 °Celsius
 power input: 3.6 V DC
 Antenna: Amplifier Research AT4560, Vertical / Horizontal
 Measurement Distance: 3 m
 Operational Mode: 2
 EUT Configuration: 4
 Note 1: All results represents vertical antenna position

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RadiMation



Peak Number	Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Angle	Height
1	19.567 GHz	46.8 dBµV/m	73.98 dBµV/m	-27.18 dB	Pass	153 degrees	1 m

Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	Angle	Height
1	19.567 GHz	36.64 dBµV/m	53.98 dBµV/m	-17.34 dB	Pass	153 degrees	1 m

3 Measurement Uncertainty

All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95%, with a coverage factor of 2.

Test Name	Measurement Uncertainty
Radiated Emission	30MHz to 200MHz @ 3m, 5.1dB 200MHz to 1GHz @ 3m, 5.3dB >1GHz to 20GHz @3m, 5.95dB