

ISED CABid: ES1909

Lab. Company Number: 4621A

Test Report No:
79807RRF.001

Partial Test Report

USA FCC Part 15.247, 15.209

CANADA RSS-247, RSS-Gen

(*) Identification of item tested	Ultrasonic Water Meter
(*) Trademark	flowIQ® 2200 Cellular
(*) Model and /or type reference	KWM2220
Other identification of the product	FCC ID: OUY-2023NB82 IC: 22376-2023NB82
(*) Features	LTE Cat NB2 and SRD in ISM band. HW version: 55502095-A4 (Top PCB); 55502080-D5 (Bottom PCB) SW version: 50981795 (Top PCB)
Applicant	Kamstrup A/S Industrivej 28 8660, Skanderborg, DENMARK
Test method requested, standard	USA FCC Part 15.247 (10-1-23 Edition): Operation within the bands 902 - 928 MHz, 2400 -2483.5 MHz, and 5725 - 5850 MHz. USA FCC Part 15.209 (10-1-23 Edition): Radiated emission limits; general requirements. CANADA RSS-247 Issue 3 (August 2023). CANADA RSS-Gen Issue 5 amendment 2 (February 2021). Guidance for Performing Compliance Measurements on Digital Transmission System, Frequency Hopping Spread Spectrum System, and Hybrid Systems Devices Operating Under Section 15.247 of the FCC Rules. 558074 D01 Meas Guidance v05r02 dated April 2, 2019. ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices.
Summary	IN COMPLIANCE
Approved by (name / position & signature)	José Manuel Gómez Galván EMC Consumer & RF Lab. Manager
Date of issue	2024-10-25
Report template No	FDT08_24 (*) "Data provided by the client"

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Acronyms

Acronym ID	Acronym Description
Detector	Detector used
Equipment	Equipment Type
Freq	Frequency
Freq Rng	Frequency Range
MP	Measurement Point
Mod	Modulation
Mode	MIMO Mode
Pol	Polarization
Port	Active Port
Unwanted Freq	Unwanted Emissions Frequency
Unwanted Lvl	Unwanted Emissions Level

Competences and guarantees

DEKRA Testing and Certification S.A.U. is a testing laboratory accredited by the National Accreditation Body (ENAC -Entidad Nacional de Acreditación), to perform the tests indicated in the Certificate No. 51/LE 147.

DEKRA Testing and Certification S.A.U. is an FCC-recognized accredited testing laboratory with appropriate scope of accreditation that covers the performed tests in this report.

DEKRA Testing and Certification S.A.U. is an ISED-recognized accredited testing laboratory, CABid: ES1909, Company Number: 4621A, with the appropriate scope of accreditation that covers the performed tests in this report.

In order to assure the traceability to other national and international laboratories, DEKRA Testing and Certification S.A.U. has a calibration and maintenance program for its measurement equipment.

DEKRA Testing and Certification S.A.U. guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated on the report and, it is based on the knowledge and technical facilities available at DEKRA Testing and Certification S.A.U. at the time of performance of the test.

DEKRA Testing and Certification S.A.U. is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

The results presented in this Test Report apply only to the particular item under test established in this document.

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General conditions

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or competent Authorities.
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4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of DEKRA Testing and Certification S.A.U. and the Accreditation Bodies.

Uncertainty

Uncertainty (factor $k=2$) was calculated according to the DEKRA Testing and Certification S.A.U. internal document PODT000.

The total uncertainty of the measurement system for the radiated emissions of EUT from 30 MHz to 1 GHz is:
Measurement uncertainty $\leq \pm 5,35$ dB with factor ($k = 2$).

The total uncertainty of the measurement system for the radiated emissions of EUT from 1 GHz to 17 GHz is:
Measurement uncertainty $\leq \pm 4,32$ dB with factor ($k = 2$).

The total uncertainty of the measurement system for the conducted testing of EUT is:

RF Peak Output Power: Measurement uncertainty $\leq \pm 0,80$ dB

RF Average Output Power: Measurement uncertainty $\leq \pm 0,99$ dB

Data provided by the client

The following data has been provided by the client:

1. Information relating to the description of the sample ("Identification of the item tested", "Trademark", "Model and/or type reference tested").
2. The sample consists of an Ultrasonic Water Meter. The KWM2220 is based on 2 PCB boards and an Antenna.
 - Top PCB, where the MCU of the Meter calculator, the MCU of the communication and the NB-IoT modem and a short range device (SRD) radio are presented.
 - Bottom PCB, used for water flow measurement via Piezo electric device controlled with an ASIC.
 - The Antennas can be used is either a click-on antenna or a wall antenna or a Pit antenna.

The KWM2220 contains a NB-IoT module with the FCC ID: XMR2021BC660KGL. The NB-IoT module is controlled by the RF micro controller. The KWM2220 forwards data directly to Meter Data Management system (MDM) READY Manager over the NB-IoT network with a subscription handled by Kamstrup. The main configuration of the KWM2220 is 1 daily data transmission.

DEKRA Testing and Certification S.A.U. declines any responsibility with respect to the information provided by the client and that may affect the validity of results. The laboratory is not responsible for such information and it is not covered by accreditation.

Usage of samples

Samples undergoing test have been selected by: The client.

Id	Control Number	Description	Model	Serial N°	Date of Reception	Application
S/01	74986C_2.1	Water Meter	flowIQ® 2200	02K82D18B8CA	2023-08-31	Element Under Test
	79807_1.1	Pit Antenna	6699664	2406210072	2024-07-30	Element Under Test

Test sample description

Ports..... :	Port name and description		Cable				
			Specified max length [m]	Attached during test	Shielded	Coupled to patient ⁽³⁾	
	Antenna port	7.5	[X]	[X]	[]	[]	
.....		[]	[]	[]	[]		
Supplementary information to the ports..... :							
Rated power supply	Voltage and Frequency		Reference poles				
			L1	L2	L3	N	PE
	[]	AC:	[]	[]	[]	[]	[]
[X]	DC: 3.6V from D-cell Battery						
Rated Power							
Clock frequencies..... :							
Other parameters							
Software version	50981795						
Hardware version	55502095-A4 (Top PCB); 55502080-D5 (Bottom PCB)						
Dimensions in cm (W x H x D)							
Mounting position	[]	Table top equipment					
	[]	Wall/Ceiling mounted equipment					
	[]	Floor standing equipment					
	[]	Hand-held equipment					
	[X]	Other: in the water pipe-Line in house or in the a pit.					
Modules/parts..... :	Module/parts of test item		Type		Manufacturer		
	KWM2220		02K82D18B8UB		Kamstrup		
	KWM2220		02K82D18B8CA		Kamstrup		
							
Accessories (not part of the test item)	Description		Type		Manufacturer		
	USB optical eye		6699099		Kamstrup		
							
Documents as provided by the applicant	Description		File name		Issue date		
	Instruction to how set the test item into diff. testmodes		KWM_NB-C2 Instruction Manual		10-07-2023		
							

⁽³⁾ Only for Medical Equipment

Identification of the client

Kamstrup A/S
Industrivej 28
8660, Skanderborg, DENMARK

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2024-09-05
Date (finish)	2024-09-05

Document history

Report number	Date	Description
79807RRF.001	2024-10-25	First release.

Environmental conditions

In the control chamber, the following limits were not exceeded during the test:

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 20 % Max. = 75 %

In the semianechoic chamber, the following limits were not exceeded during the test.

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 20 % Max. = 75 %

Remarks and comments

The tests have been performed by the technical personnel: Alvaro Gutierrez Naranjo.

List of equipment used during the test

Control No.	Equipment	Model	Manufacturer	Next Calibration
06143	HYBRID BILOG ANTENNA 30MHz-6GHz	3142E	ETS LINDGREN	2027-01-22
04825	SEMIANECHOIC ABSORBER LINED CHAMBER II	FACT 3 200 STP	ETS LINDGREN	---
04826	SHIELDED ROOM	S101	ETS LINDGREN	---
04848	EMC/RF MEASUREMENT SOFTWARE	EMC32	ROHDE AND SCHWARZ	---
07817	EMI TEST RECEIVER 2Hz-44GHz	ESW44	ESW44	2026-07-01
07548	TEMPERATURE AND HUMIDITY PROBE	HWg-STE	HW GROUP	2025-04-09

Testing verdicts

Fail	F
Inconclusive	I
Not applicable	N/A
Not measured	N/M
Pass	P

Summary

SRD 902-928 MHz

FCC PART 15 PARAGRAPH/ RSS-247			
Requirement – Test case		Verdict	Remark
FCC 15.247 (a)(2) / RSS-247 5.2. (a)	6 dB Bandwidth	N/M	(1)
FCC 15.247 (b) / RSS-247 5.4. (d)	Maximum output power and antenna gain	P	--
FCC 15.247 (d) / RSS-247 5.5.	Band-edge emissions compliance (Transmitter)	N/M	(1)
FCC 15.247 (e) / RSS-247 5.2. (b)	Power spectral density	N/M	(1)
FCC 15.247 (d) / RSS-247 5.5.	Emission limitations radiated (Transmitter)	N/M	(2)
<u>Supplementary information and remarks:</u> (1) Test not requested by the client. (2) Measurements are not necessary, as this report shows that the emissions of the KWM2220 with the pit antenna are not a worst case, emission are lower than those of the KWM2220 with the click-on antenna (see report 74986RRF.001A2).			

Appendix A: Test results. SRD 902-928 MHz

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TEST CONDITIONS

(*): Data provided by the client.

POWER SUPPLY (*):

Vnominal: 3.6 Volt D cell Battery V
Type of Power Supply: Battery

ANTENNA (*):

Type of Antenna: Pit antenna
Maximum Declared Antenna Gain: 1.5 dBi

TEST FREQUENCIES (*):

Modulation	Low Channel	Middle Channel	High Channel
2-FSK	912.5 MHz	915 MHz	918.5 MHz

During transmitter test the EUT was controlled by a SW tool provided by the client to operate in a continuous transmit mode on the modulation schemes and test channels as required.

For Radiated power test, only the middle channel was measured in order to compare the carrier power with other antenna configurations.

CONDUCTED MEASUREMENTS:

The equipment under test was set up in a shielded room and it is connected to the TS8997 using a low loss RF cable. The reading of the spectrum analyser is corrected taking into account the cable loss.



RADIATED MEASUREMENTS:

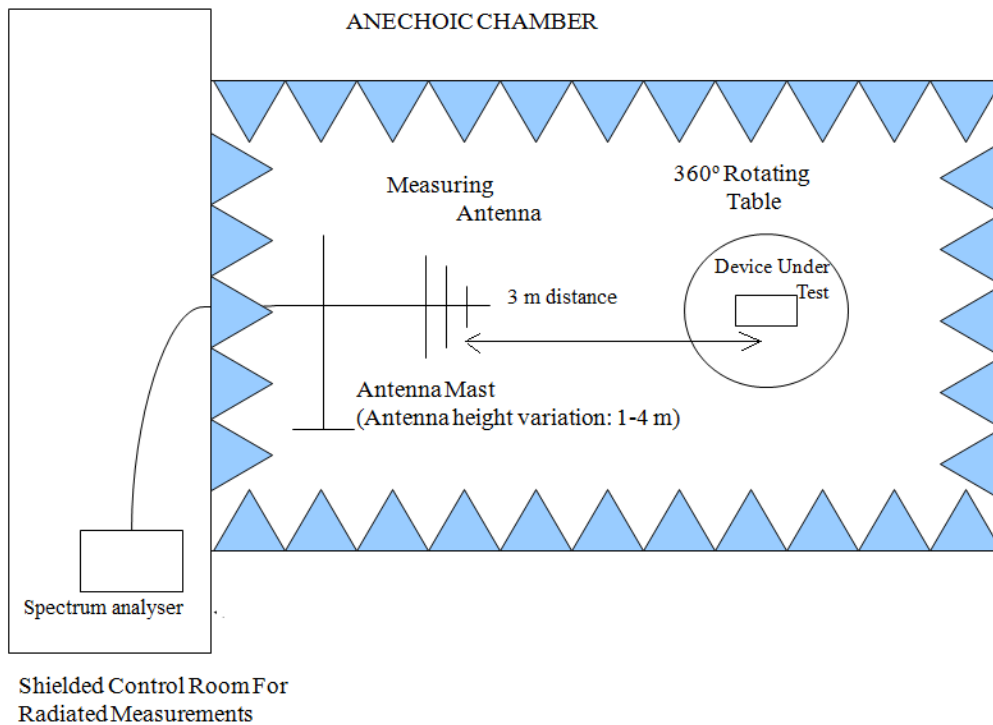
All radiated tests were performed in a semi-anechoic chamber. The measurement antenna (Bilog antenna for the range between 30 MHz to 1000 MHz) is situated at a distance of 3 m.

The equipment under test was set up on a non-conductive platform above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360° and the antenna height (Bilog antenna and Double ridge horn antenna) was varied from 1 to 4 meters to find the maximum radiated emission.

Measurements were made in both horizontal and vertical planes of polarization.

A resolution bandwidth/video bandwidth of 100 kHz / 300 kHz was used for frequencies below 1 GHz.

Radiated measurements setup from 30 MHz to 1 GHz:

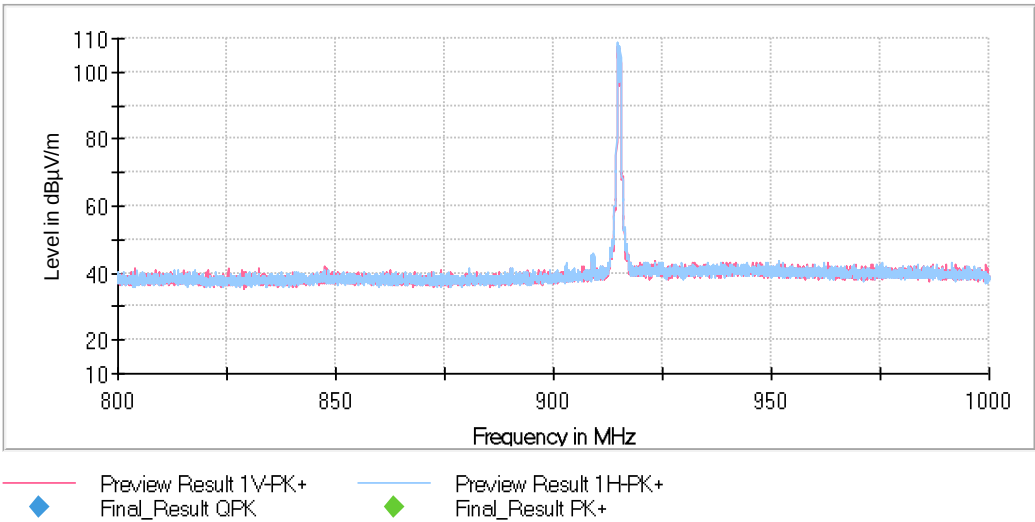


TEST CASES DETAILS

Radiated power

A radiated power measurement was performed to determine the maximum emission of the carrier in order to compare with the emissions obtained in the same power configuration with the click-on and wall antennas, with the result that the power obtained with the Pit antenna was lower than the power obtained with the click-on antenna, which turned out to be the worst case (see report 74986RRF.001A2).

Radiated power Pit antenna:



Frequency (MHz)	MaxPeak (dBµV/m)
914.821875	108.70

Spectrum analyser parameters:

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
Receiver: [ESW 44]					
30 MHz - 1 GHz	30,312 kHz	PK+	100 kHz	1 s	0 dB

FCC 15.247 (b) / RSS-247 5.4. (d) Maximum output power and antenna gain

Limits

For systems using digital modulation in the 2400-2483.5 MHz band: 1 watt (30 dBm).
The e.i.r.p. shall not exceed 4 W (36 dBm) (RSS-247).

The maximum peak conducted output power level in the fundamental emission was measured using the method according to point 11.9.1.1 "RBW ≥ DTS bandwidth" of ANSI C.63.10-2013.

The EIRP power (dBm) is calculated by adding the declared maximum antenna gain to the measured conducted power.

Maximum Declared Antenna Gain: +1.5 dBi

Results

Modulation: 2-FSK

Previous measurements. Updated result with Pit antenna gain (see report 74986RRF.001A2).

Freq (MHz)	Maximum Conducted Power (dBm)	Maximum EIRP Power (dBm)
912.5	12.75	14.25
918.5	12.64	14.14

Verdict

Pass