

ISED CABid: ES1909

Lab. Company Number: 4621A

Test Report No:  
79807RRF.002

## Partial Test Report

### USA FCC Part 15.247, 15.209

### CANADA RSS-247, RSS-Gen

(*) Identification of item tested	Ultrasonic Water Meter
(*) Trademark	flowIQ® 3200 Cellular
(*) Model and /or type reference	KWM3220
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); 55502094-A7 (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.

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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.

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## Uncertainty

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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

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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 KWM3220 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 KWM3220 contains a NB-IoT module with the FCC ID: XMR2021BC660KGL. The NB-IoT module is controlled by the RF micro controller. The KWM3220 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 KWM3220 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_7.1	Water Meter	flowIQ® 3200	02L82D18F8UB	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 <sup>(3)</sup>	
	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); 55502094-A7 (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			
	KWM3220		02L82D18F 8UB	Kamsrup A/S			
	KWM3220		02L82D18F 8CA	Kamstrup A/S			
	.....		.....	.....			
Accessories (not part of the test item) .....	Description		Type	Manufacturer			
	USB Optical eye		6699099	Kamstrup A/S			
	.....		.....	.....			
Documents as provided by the applicant..... :	Description		File name	Issue date			
	Instruction to how set the test item into diff. testmodes		KWM_NB-C2 In	10-07-2023			
	.....		.....	.....			

<sup>(3)</sup> 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)	2024-10-09

## Document history

Report number	Date	Description
79807RRF.002	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, Valentin Andarias Diaz.

## 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
06496	HORN ANTENNA 1-18GHz	BBHA 9120 D	SCHWARZBECK	2026-12-01
03783	PRE-AMPLIFIER G>30dB 1GHz-18GHz	BLMA 0118-3A	BONN ELEKTRONIK	2025-03-15
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)	P	--
<u>Supplementary information and remarks:</u>			
(1) Test not requested by the client.			

# 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	Middle Channel	Middle Channel	Middle 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.

For Emission limitations radiated (Transmitter) test, the middle channel was not measured because the difference between the low and high channel is less than 10MHz.

### 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 and 1 GHz-17 GHz Double ridge horn antenna) is situated at a distance of 3 m and at a distance of 1.5 m for the frequency range 17 GHz-26 GHz (17 GHz-40 GHz horn antenna).

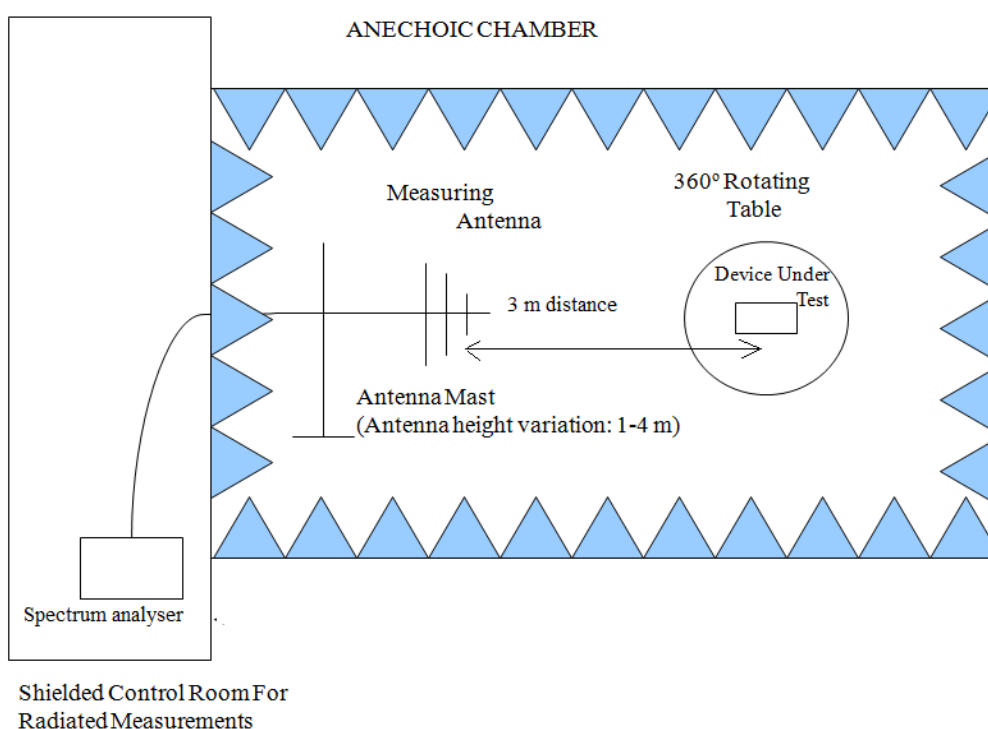
For radiated emissions in the range 17 GHz-26 GHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

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.

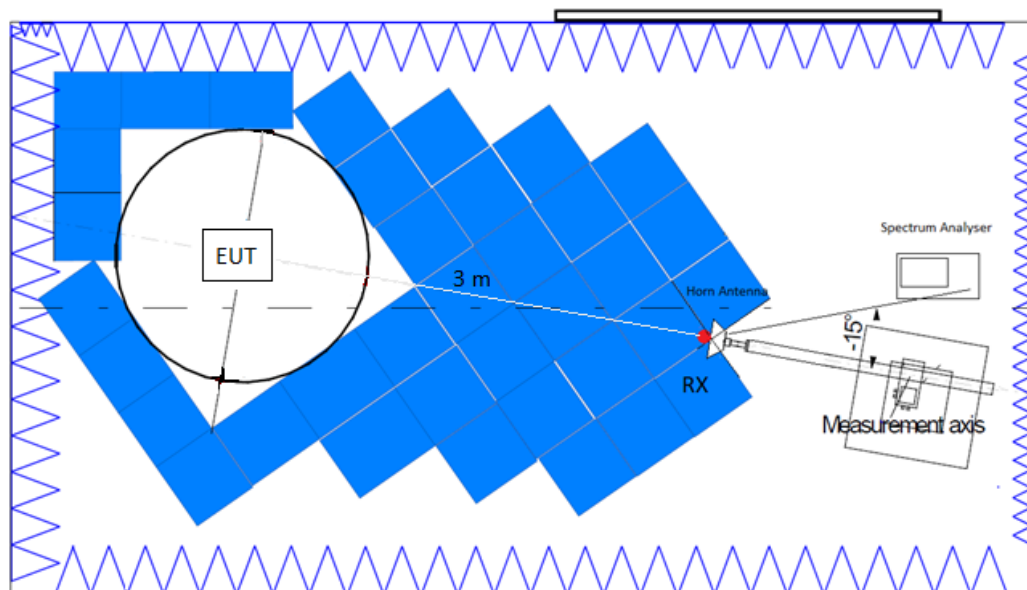
Measurements were made in both horizontal and vertical planes of polarization.

A resolution bandwidth/video bandwidth of 100 kHz / 300 kHz was used for frequencies below 1 GHz and 1 MHz / 3 MHz for frequencies above 1 GHz.

Radiated measurements setup from 30 MHz to 1 GHz:



Radiated measurements setup from 1 GHz to 17 GHz:

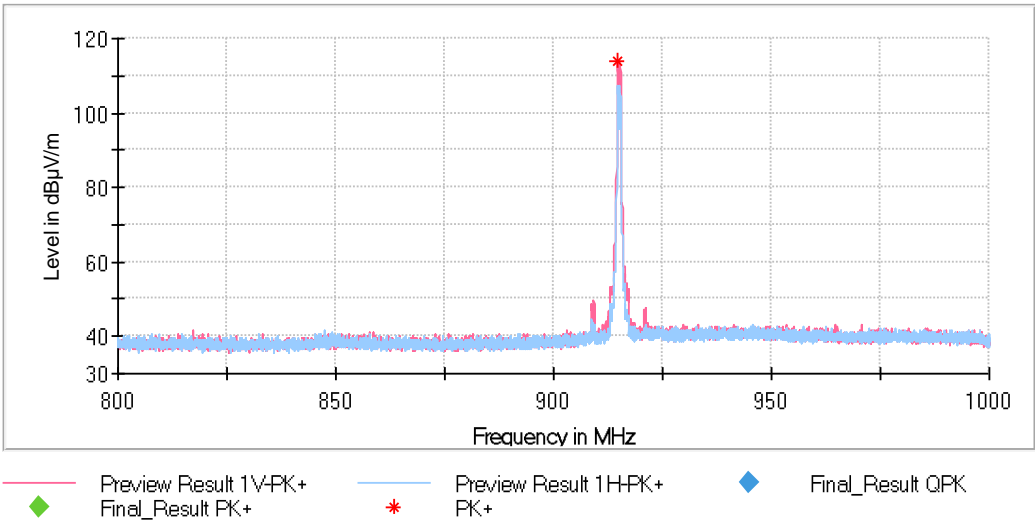


TEST CASES DETAILS

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 (worst case) was higher than the power obtained with the wall antenna (see report 74986RRF.002A2).

Radiated power Pit antenna:



Frequency (MHz)	MaxPeak (dBµV/m)
914.791563	113.73

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



## RSS-247 5.5 / FCC 15.247 (d) [RSE] Emission limitations radiated (Transmitter)

### Limits

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)/RSS-Gen):

Frequency Range (MHz)	Field strength (µV/m)	Field strength (dBµV/m)	Measurement distance (m)
0.009-0.490	2400/F(kHz)	-	300
0.490-1.705	24000/F(kHz)	-	30
1.705 - 30.0	30	-	30
30 - 88	100	40	3
88 - 216	150	43.5	3
216 - 960	200	46	3
Above 960	500	54	3

The emission limits shown in the above table are based on measurements employing CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

For average radiated emission measurements above 1000 MHz, there is also a limit corresponding to 20 dB above the indicated values in the table is specified when measuring with peak detector function.

RSS-247: Attenuation below the general field strength limits specified in RSS-Gen is not required.

Modulation: 2-FSK

Spectrum analyzer parameters

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
Receiver: [ESW 44]					
30 MHz - 1 GHz	48,5 kHz	PK+	100 kHz	1 s	0 dB
1 GHz - 3 GHz	100 kHz	PK+ ; AVG	1 MHz	1 s	0 dB
3 GHz - 17 GHz	466,667 kHz	PK+ ; AVG	1 MHz	1 s	0 dB

Results

Spurious frequencies detected at less than 20 dB below the limit

Freq Rng (GHz)	Freq (MHz)	Unwanted Freq (MHz)	Unwanted Lvl (dBµV/m)	Pol	Detector
[0.03, 1]	912.50000	39.166	28.88	H	PK
		39.166	27.71	H	QP
		213.475	26.87	H	PK
		213.475	21.46	H	QP
		312.464	27.51	H	PK
		312.464	22.19	H	QP
		900.242	28.17	V	PK
		900.242	22.10	V	QP
	918.50000	39.166	29.78	V	PK
		39.166	28.74	V	QP
		257.368	28.94	H	PK
		257.368	23.14	H	QP
		474.114	25.73	V	PK
		474.114	20.28	V	QP
[1, 10]	912.50000	No spurious frequencies are detected within 20 dB of the limit.			
	918.50000	No spurious frequencies are detected within 20 dB of the limit.			

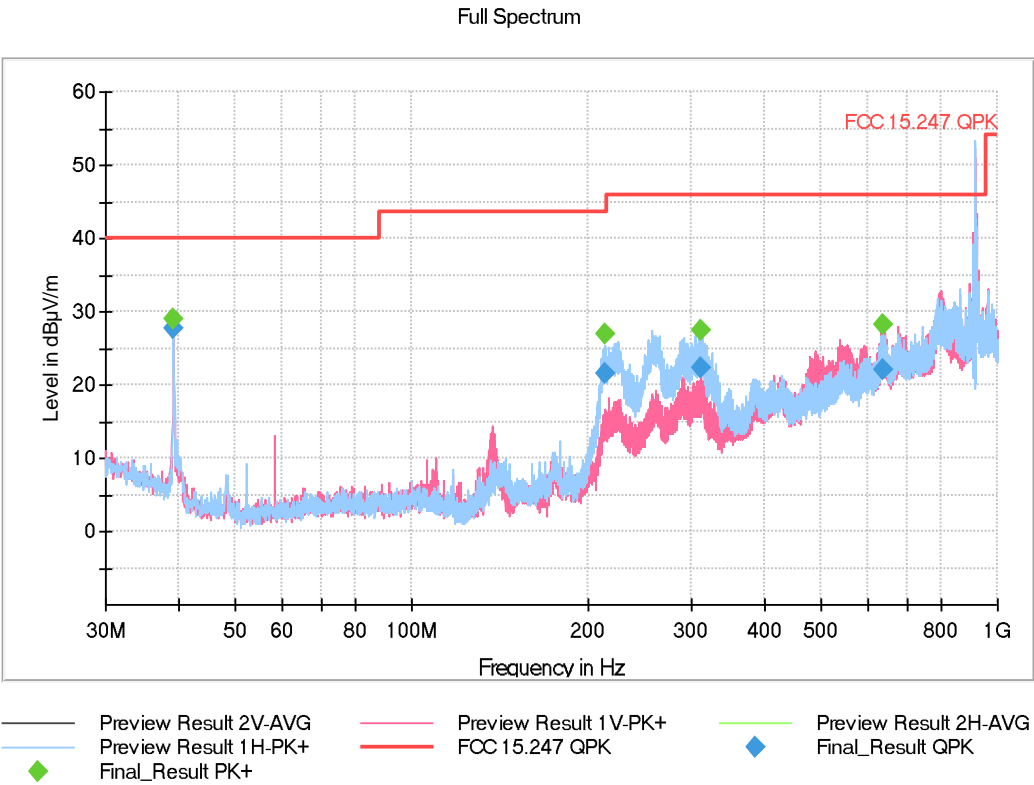
Verdict

Pass

Attachments

Frequency Range GHz = [0.03, 1]    Equipment Type = Digital Transmission System (DTS)  
Modulation = 2-FSK    Frequency MHz = 912.50000  
MIMO Mode = SISO    Measurement Point = 1  
Active Port = 1

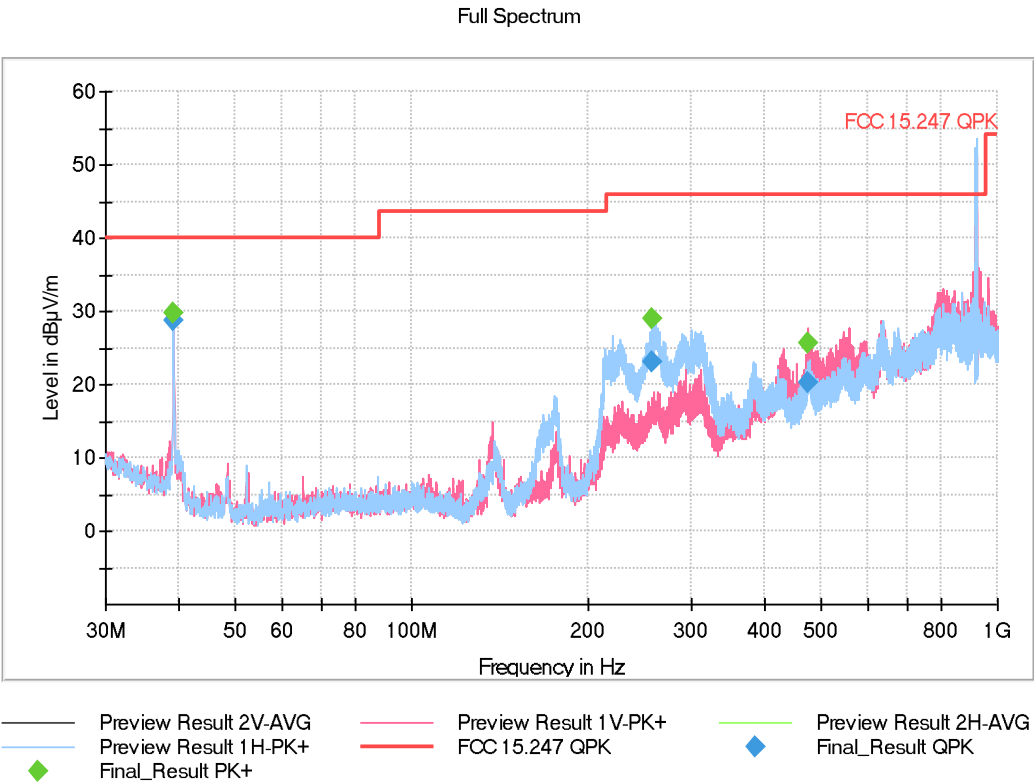
Images:



Emissions above the limit correspond to the carrier

Frequency Range GHz = [0.03, 1]    Equipment Type = Digital Transmission System (DTS)  
Modulation = 2-FSK    Frequency MHz = 918.50000  
MIMO Mode = SISO    Measurement Point = 1  
Active Port = 1

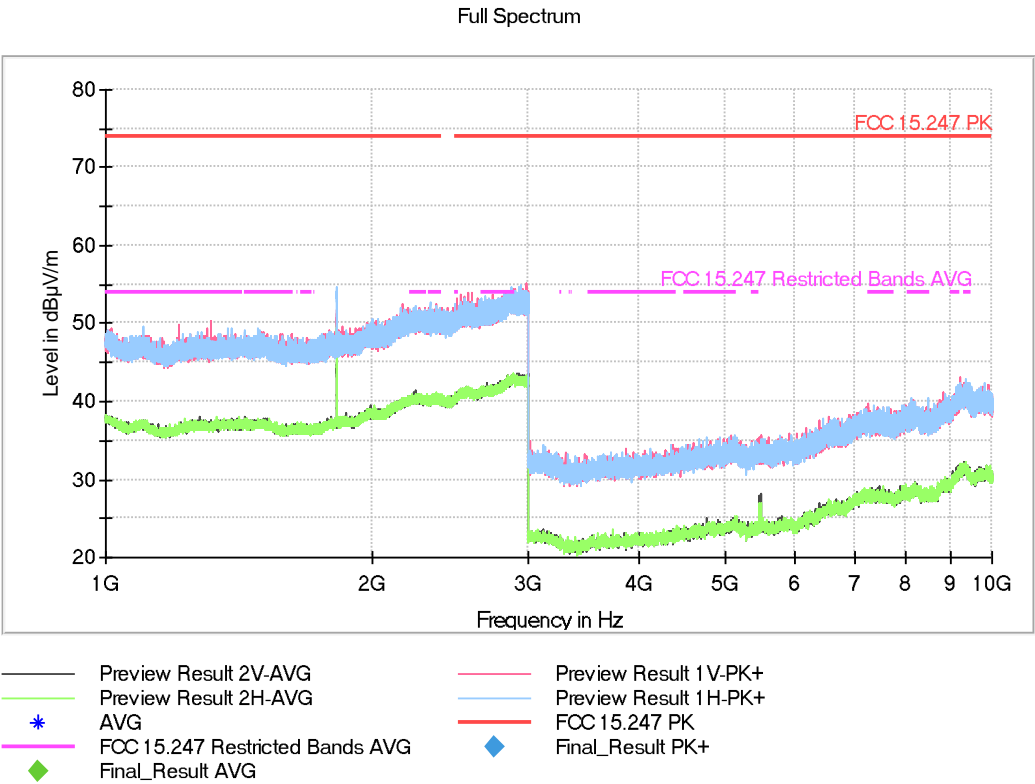
Images:



Emissions above the limit correspond to the carrier

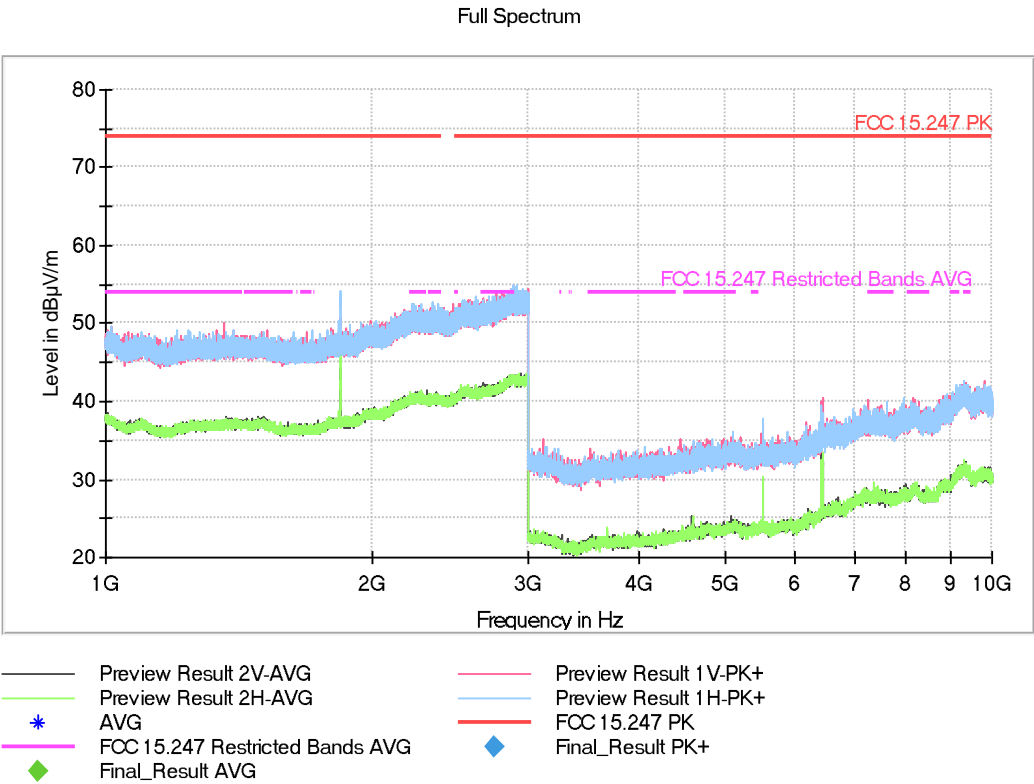
Frequency Range GHz = [1, 10]    Equipment Type = Digital Transmission System (DTS)  
Modulation = 2-FSK    Frequency MHz = 912.50000  
MIMO Mode = SISO    Measurement Point = 1  
Active Port = 1

Images:



Frequency Range GHz = [1, 10]    Equipment Type = Digital Transmission System (DTS)  
Modulation = 2-FSK    Frequency MHz = 918.50000  
MIMO Mode = SISO    Measurement Point = 1  
Active Port = 1

Images:



# 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

Previous measurements. Updated result with Pit antenna gain (see report 74986RRF.002A2).

Modulation: 2-FSK

Freq (MHz)	Maximum Conducted Power (dBm)	Maximum EIRP Power (dBm)
912.5	12.7	14.2
918.5	12.82	14.32

## Verdict

Pass