

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<br>IC: 22376-2023NB82                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| (*) Features                              | LTE Cat NB2 and SRD in ISM band.<br>HW version: 55502095-A4 (Top PCB); 55502094-A7 (Bottom PCB)<br>SW version: 50981795 (Top PCB)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Applicant                                 | Kamstrup A/S<br>Industrivej 28<br>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.<br>USA FCC Part 15.209 (10-1-23 Edition): Radiated emission limits; general requirements.<br>CANADA RSS-247 Issue 3 (August 2023).<br>CANADA RSS-Gen Issue 5 amendment 2 (February 2021).<br>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.<br>ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices |
| Summary                                   | IN COMPLIANCE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Approved by (name / position & signature) | José Manuel Gómez Galván<br>EMC Consumer & RF<br>Lab. Manager                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Date of issue                             | 2024-10-25                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Report template No                        | FDT08_24<br>(*) "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.

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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.
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## 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 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®<br>3200 | 02L82D18F8UB | 2023-08-31        | Element<br>Under Test |
|      | 79807_1.1      | Pit Antenna | 6699664         | 2406210072   | 2024-07-30        | Element<br>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<br>Max. = 35 °C |
| Relative humidity | Min. = 20 %<br>Max. = 75 %   |

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

|                   |                              |
|-------------------|------------------------------|
| Temperature       | Min. = 15 °C<br>Max. = 35 °C |
| Relative humidity | Min. = 20 %<br>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.



### 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).

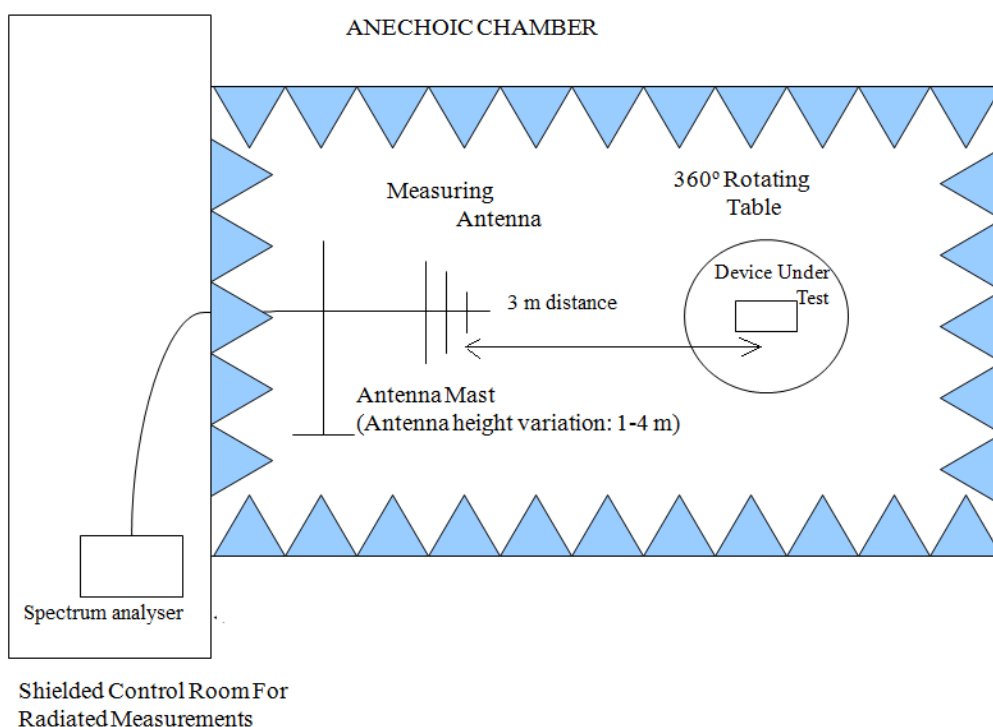
For radiated emissions in the range 17 GHz-26 GHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

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.

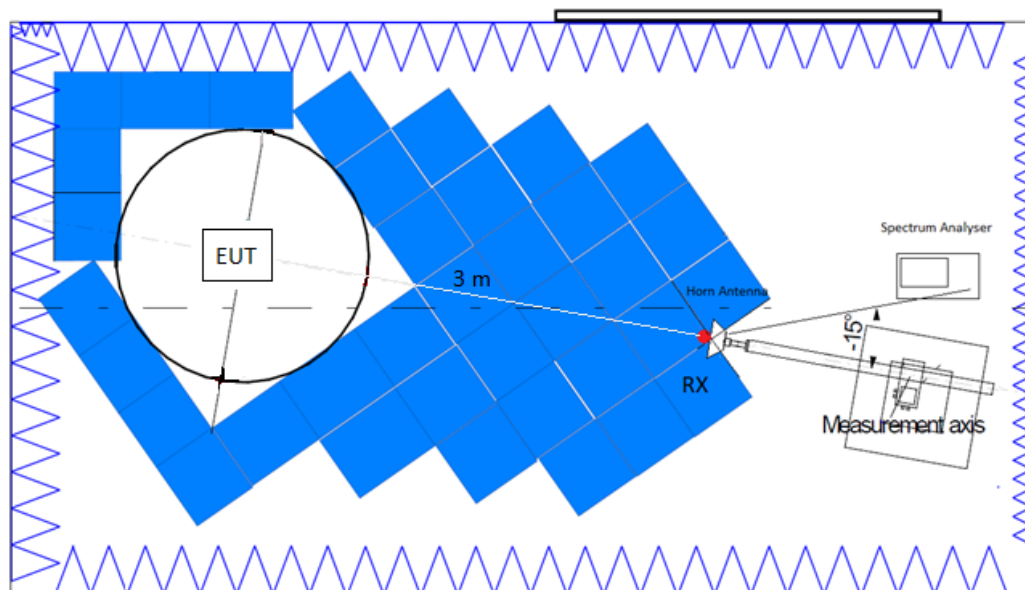
Measurements were made in both horizontal and vertical planes of polarization.

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:

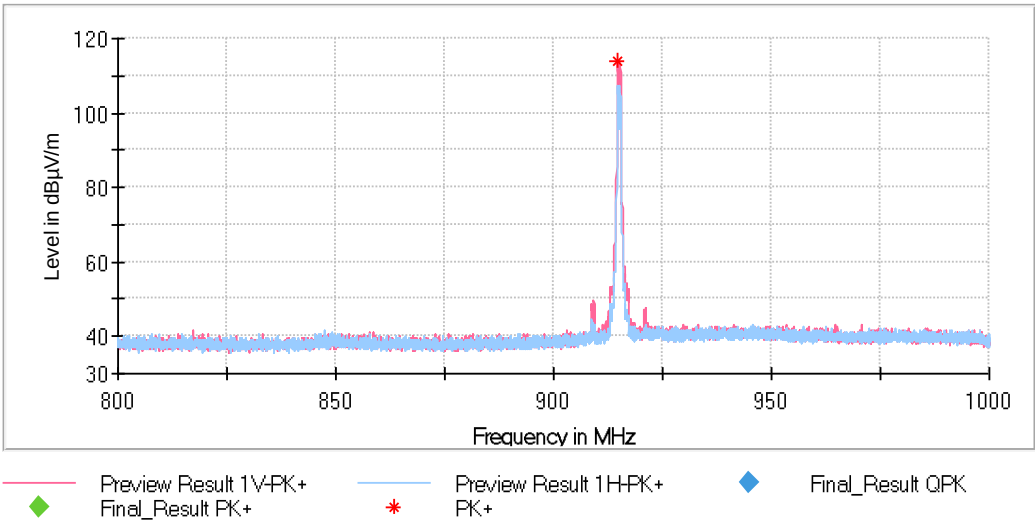


TEST CASES DETAILS

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. |                       |     |          |

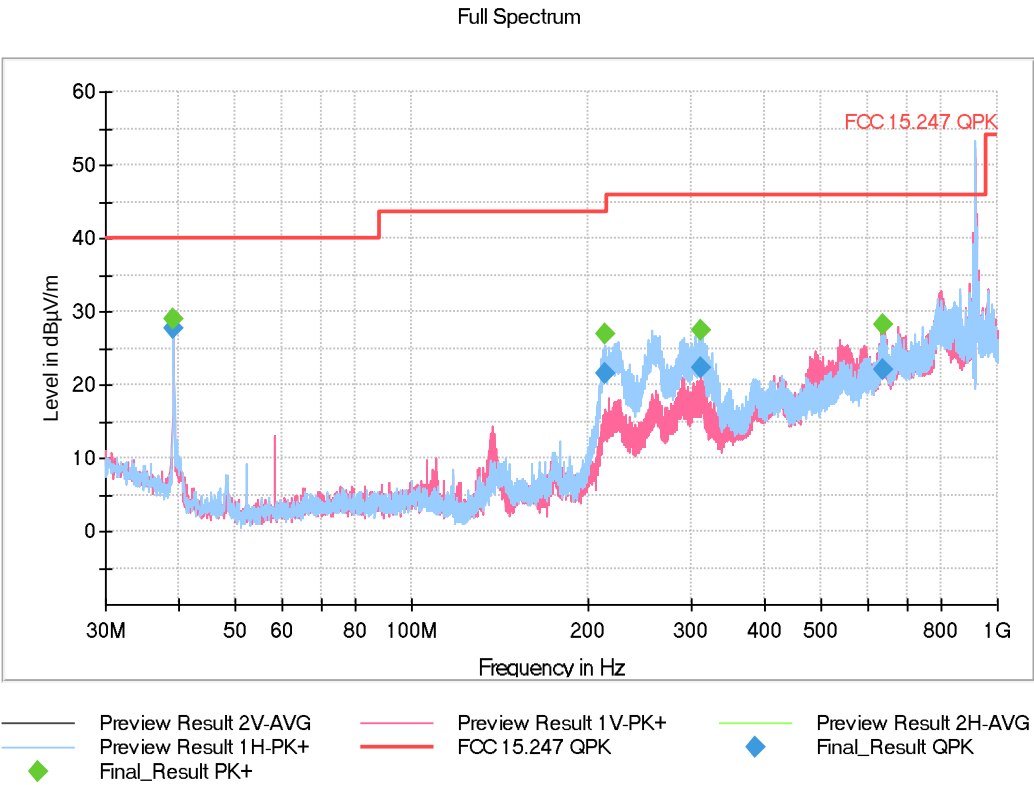
Verdict

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

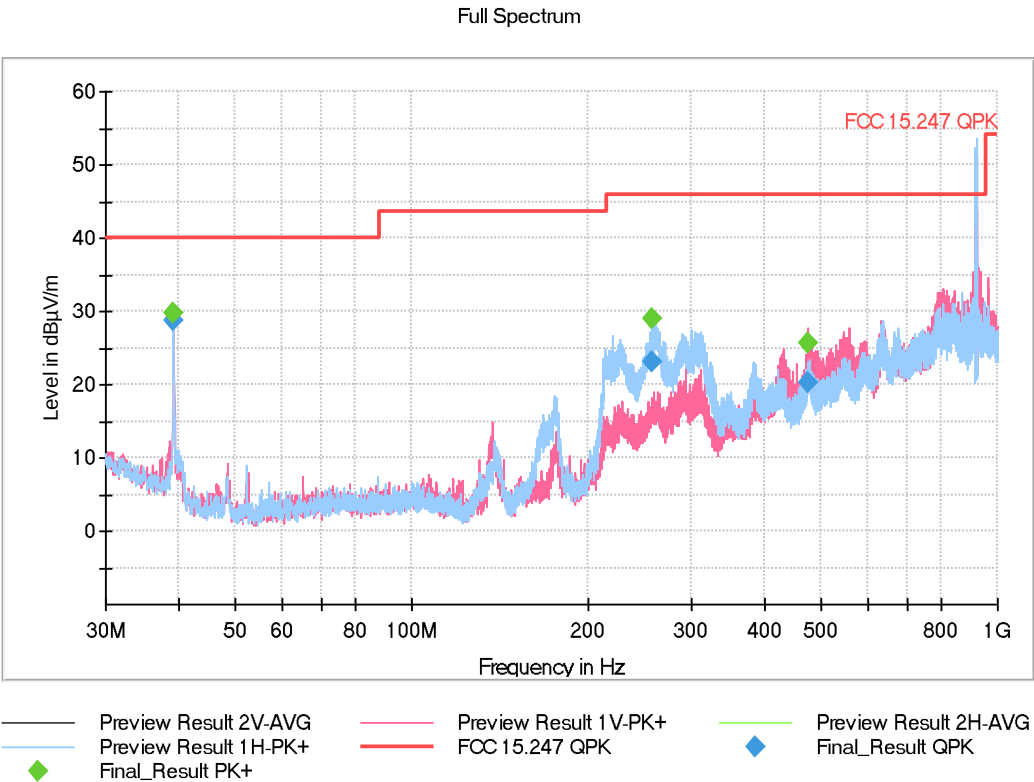
Images:



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

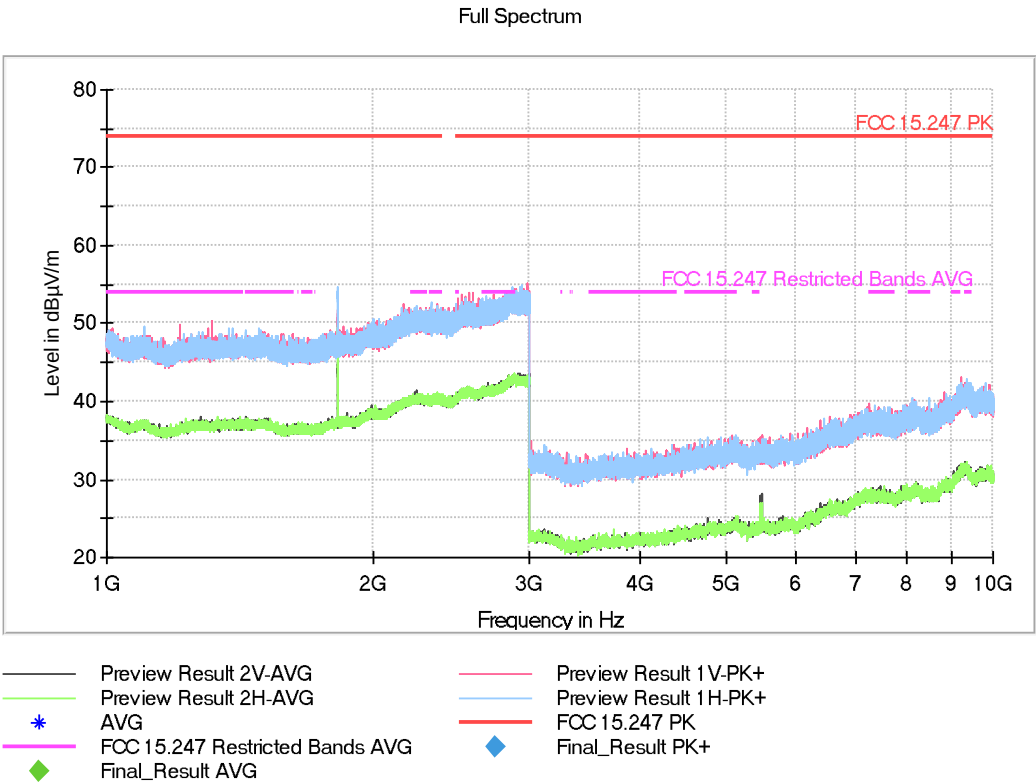
Images:



Emissions above the limit correspond to the carrier

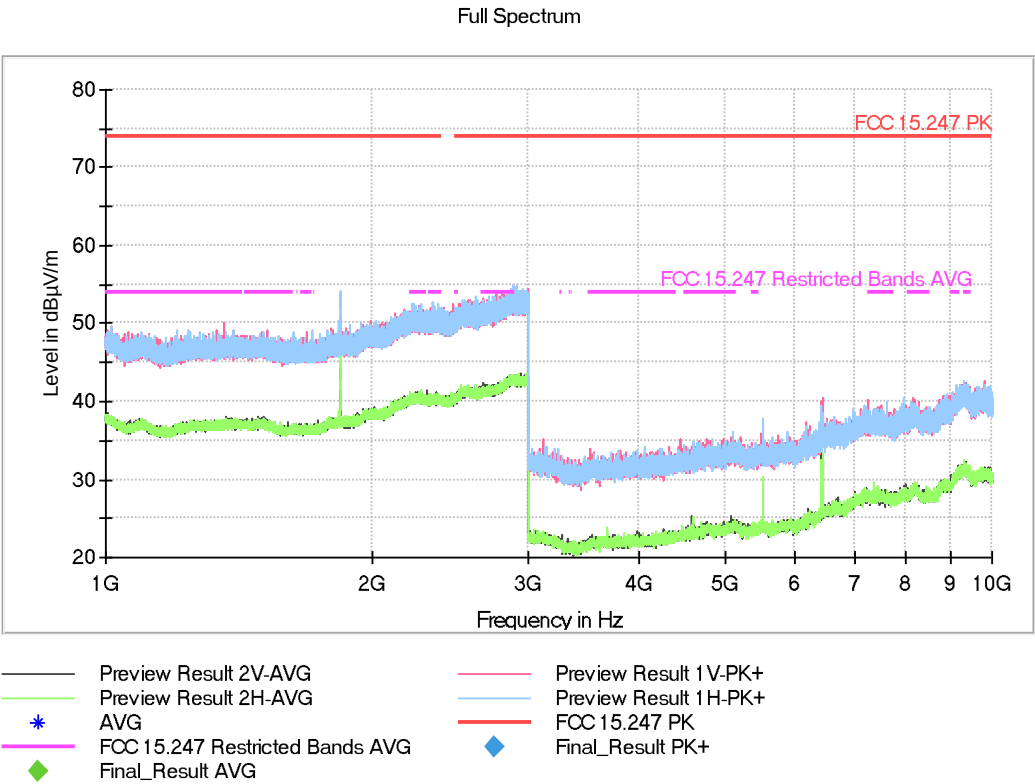
Frequency Range GHz = [1, 10]    Equipment Type = Digital Transmission System (DTS)  
Modulation = 2-FSK    Frequency MHz = 912.50000  
MIMO Mode = SISO    Measurement Point = 1  
Active Port = 1

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