

ISED CABid: ES1909

Test Report No:

Lab. Company Number: 4621A

74986RRF.003

Partial Test Report

USA FCC Part 22

CANADA RSS-132

(*) Identification of item tested	Ultrasonic Water Meter
(*) Trademark	flowIQ®2200
(*) 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 22 (10-1-21 Edition). CANADA RSS-132 Issue 4, Jan. 2023. ANSI C63.26-2015. KDB 971168 D01 Power Meas License Digital Systems v03r01, April. 2018.
Approved by (name / position & signature)	José Manuel Gómez Galván EMC Consumer & RF Lab. Manager
Date of issue	2024-03-25
Report template No	FDT08_24 (*) "Data provided by the client"

Index

Competences and guarantees	3
General conditions	3
Uncertainty.....	3
Data provided by the client	4
Usage of samples	5
Test sample description.....	5
Identification of the client	7
Testing period and place	7
Document history.....	7
Environmental conditions	7
Remarks and comments.....	8
Testing verdicts.....	8
Summary	9
Appendix A: Test results for FCC 22 / RSS-132	10

Competences and guarantees

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

DEKRA Testing and Certification 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 has a calibration and maintenance program for its measurement equipment.

DEKRA Testing and Certification 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 at the time of performance of the test.

DEKRA Testing and Certification 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.

IMPORTANT: No parts of this report may be reproduced or quoted out of context, in any form or by any means, except in full, without the previous written permission of DEKRA Testing and Certification.

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.
3. This document is only valid if complete; no partial reproduction can be made without previous written permission of DEKRA Testing and Certification S.A.U.
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.

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 Antenna is a click-on antenna or a wall 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.

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_1.1	Water Meter	flowIQ@2200	02K82D18B8UB	2023-08-31	Element Under Test
	74986C_5.1	Click On Antenna Kit	6699663	--	2023-08-31	Element Under Test
	70058_6.1	Optical Readout USB	6699-099	--	2023-08-31	Auxiliary Element
S/02	74986C_1.1	Water Meter	flowIQ@2200	02K82D18B8UB	2023-08-31	Element Under Test
	74986C_8.1	Wall antenna	6699666	--	2023-08-31	Element Under Test
	70058_6.1	Optical Readout USB	6699-099	--	2023-08-31	Auxiliary Element

Notes referenced to samples during the project:

Id	Type
S/01	Sample used for radiated test with Click On antenna
S/02	Sample used for radiated test with Wall antenna

Test sample description

Ports..... :	Port name and description		Cable				
			Specified max length [m]	Attached during test	Shielded	Coupled to patient ⁽³⁾	
	<i>Antenna port</i>	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: 3.6 Volt D celle Battery					
Rated Power						
Clock frequencies.....:						
Other parameters						
Software version						
Hardware version						
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		02K82D18B 8UB	Kamstrup			
	KWM2220		02K82D18B 8CA	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)	2024-03-19
Date (finish)	2024-03-21

Document history

Report number	Date	Description
74986RRF.003	2024-03-21	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: Álvaro Gutiérrez Naranjo.

Used instrumentation:

Control No.	Equipment	Model	Manufacturer	Next Calibration
6791	SEMIANECHOIC ABSORBER LINED CHAMBER	FACT 3 200 STP	ETS LINDGREN	N/A
6792	SHIELDED ROOM	S101	ETS LINDGREN	N/A
06609	TEMPERATURE AND HUMIDITY PROBE	HWg-STE	HW GROUP	2024-04-25
06615	TEMPERATURE AND HUMIDITY PROBE	HWg-STE	HW GROUP	2024-04-25
6143	HYBRID BILOG ANTENNA 30MHz-6GHz	3142E	ETS LINDGREN	2027-01-22
6496	HORN ANTENNA 1-18GHz	BBHA 9120 D	SCHWARZBECK	2026-12-01
3783	PRE-AMPLIFIER G>30dB 1GHz-18GHz	BLMA 0118-3A	BONN ELEKTRONIK	2025-03-15
4716	SIGNAL AND SPECTRUM ANALYZER 2Hz-50GHz	FSW50	ROHDE AND SCHWARZ	2024-08-12
9227	WIDEBAND RADIO COMMUNICATION TESTER	CMW500	ROHDE AND SCHWARZ	2024-07-17
5880	DC POWER SUPPLY 30V/5A	U8002A	KEYSIGHT TECHNOLOGIES	N/A
7758	DIGITAL MULTIMETER	175	FLUKE	2024-11-08
4848	SOFTWARE FOR EMC/RF TESTING	EMC32	ROHDE AND SCHWARZ	N/A

Testing verdicts

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

Summary

FCC PART 22 / RSS-132 PARAGRAPH		
Requirement – Test case	Verdict	Remark
Clause 22.913/RSS-132 Clause 5.4: RF Output Power	N/M	(1)
Clause 2.1047/RSS-132 Clause 5.2: Modulation Characteristics	N/M	(1)
Clause 22.355/RSS-132 Clause 5.3: Frequency Stability	N/M	(1)
Clause 2.1049: Occupied Bandwidth	N/M	(1)
Clause 22.917/RSS-132 Clause 5.5: Spurious Emissions at Antenna Terminals	N/M	(1)
Clause 22.917/RSS-132 Clause 5.5: Radiated Emissions	P	--
<u>Supplementary information and remarks:</u> (1) Test not requested.		

Appendix A: Test results for FCC 22 / RSS-132

INDEX

TEST CONDITIONS	12
Radiated Emissions	13

TEST CONDITIONS

(*): Declared by the Applicant.

POWER SUPPLY (*):

Vnominal: 3.6 Vdc
 Type of Power Supply: Battery

ANTENNA GAIN (*):

Bands	Gain (dBi)	Type
NB-IoT Band 5	+0.0	Click On Antenna
	+2.2	Wall Antenna

TEST FREQUENCIES:

NB-IoT Band 5. $\pi/2$ -BPSK modulation:

Channel Number (Frequency, MHz)	
Tone Channel BW = 3.75 kHz	
Middle	20525 (836.50)

The worst case has been determined as channel 20525 (836.50MHz), $\pi/2$ -BPSK modulation, Tone Number=1, Tone Channel Bandwidth=3.75 kHz, MSC/TBS=0 and Tone Offset=0. The following tables and plots show the results for this worst-case configuration.

Radiated Emissions

SPECIFICATION:

FCC §2.1051 and §22.917: The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.

RSS-132. 5.5: Mobile and base station equipment shall comply with the limits in (i) and (ii) below.

- i. In the first 1.0 MHz band immediately outside and adjacent to each of the sub-bands specified in Section 5.1, the power of emissions per any 1% of the occupied bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least $43 + 10 \log_{10} P$ (watts).
- ii. After the first 1.0 MHz immediately outside and adjacent to each of the sub-bands, the power of emissions in any 100 kHz bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least $43 + 10 \log_{10} P$ (watts). If the measurement is performed using 1% of the occupied bandwidth, power integration over 100 kHz is required.

METHOD:

The measurement was performed with the EUT inside an anechoic chamber. The spectrum was scanned from 30 MHz to at least the 10th harmonic of the highest frequency generated within the equipment.

The EUT was placed on a 1 meter high non-conductive stand at a 3 meter distance from the measuring antenna. Detected emissions were maximized at each frequency by rotating the EUT and adjusting the height and polarization of the measuring antenna. The maximum meter reading was recorded.

Measurement Limit:

According to specification, the power of emissions shall be attenuated below the transmitter power (P) by a factor of at least $43 + 10 \log(P)$ dB, P in watts.

At P_o transmitting power, the specified minimum attenuation becomes $43+10\log(P_o)$, and the level in dBm relative P_o becomes:

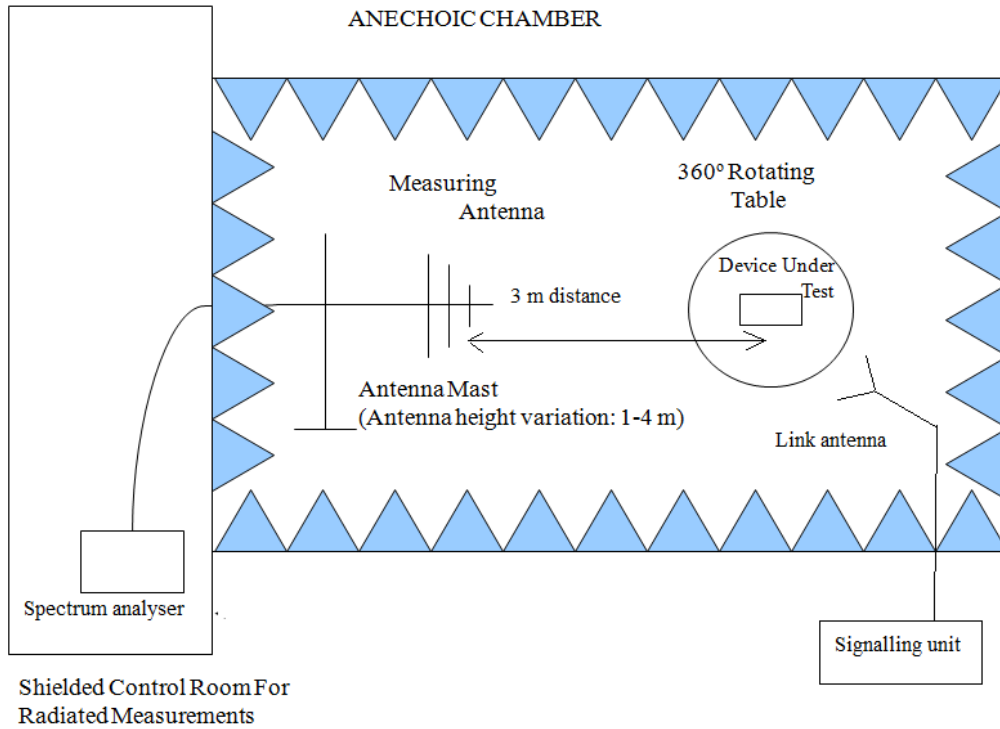
$$P_o \text{ (dBm)} - [43 + 10 \log(P_o \text{ in mwatts}) - 30] = - 13 \text{ dBm}$$

The maximum field strength (dB μ V/m) of each detected emission at less than 20 dB respect to the limit is converted to an equivalent EIRP level (dBm) according to ANSI C63.26 with the formula:

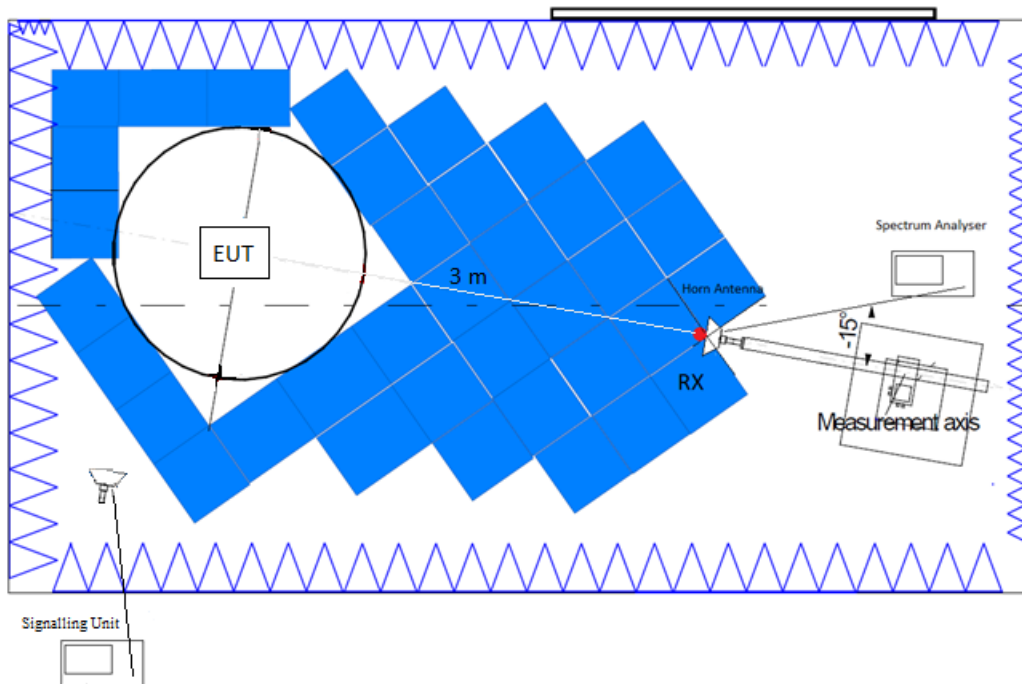
$EIRP \text{ (dBm)} = E \text{ (dB}\mu\text{V/m)} + 20 \log(D) - 104.8$; where D is the measurement distance (in the far field region) in m. D = 3 m

TEST SETUP:

Radiated measurements below 1 GHz:



Radiated measurements above 1 GHz:



RESULTS:

NB-IoT Band 5. Click On Antenna (S/01)

- Middle Channel:

Frequency range 30 MHz - 1 GHz:

No spurious frequencies at less than 20 dB below the limit.

Frequency range 1 GHz - 8.5 GHz:

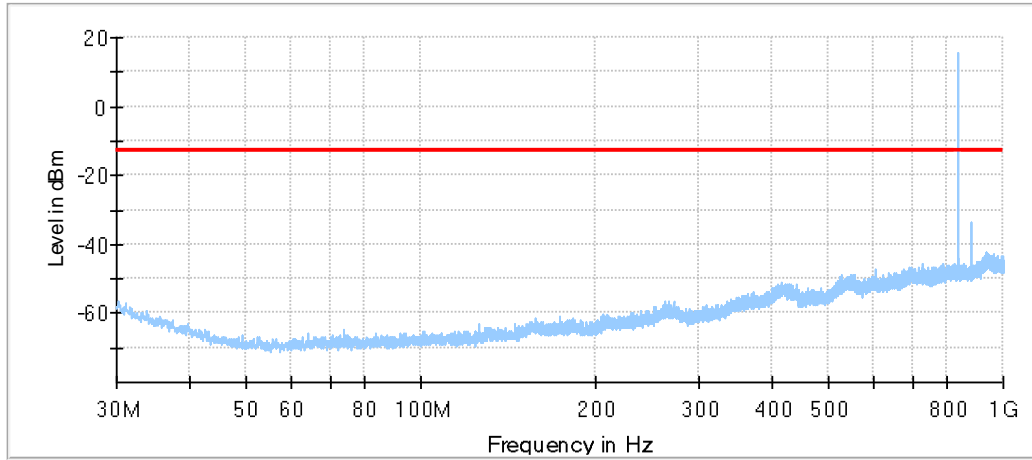
No spurious frequencies at less than 20 dB below the limit.

Measurement Uncertainty (dB): <± 4.90 for f ≥ 30 MHz up to 1 GHz
 <± 4.32 for f ≥ 1 GHz up to 8.5 GHz

Verdict: PASS

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
Receiver: [FSW 50]					
30 MHz - 1 GHz	30,312 kHz	PK+	100 kHz	Coupled	0 dB
1 GHz - 8,5 GHz	234,375 kHz	PK+	100 kHz	1 s	0 dB

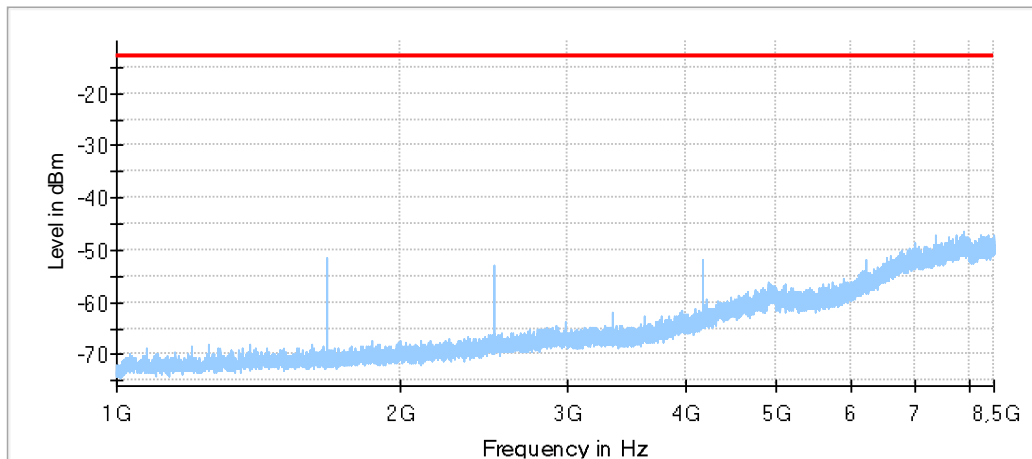
FREQUENCY RANGE 30 MHz - 1 GHz:



— Preview Result 1-PK+ — FCC RSE Part 22 (B5, B26)
— -13 dBm ◆ Final_Result PK+

The peak above the limit is the carrier frequency.

FREQUENCY RANGE 1 GHz - 8.5 GHz:



— Preview Result 1-PK+ — FCC RSE Part 22 (B5, B26)
— -13 dBm ◆ Final_Result PK+

NB-IoT Band 5. Wall Antenna (S/02)

- Middle Channel:

Frequency range 30 MHz - 1 GHz:

No spurious frequencies at less than 20 dB below the limit.

Frequency range 1 GHz - 8.5 GHz:

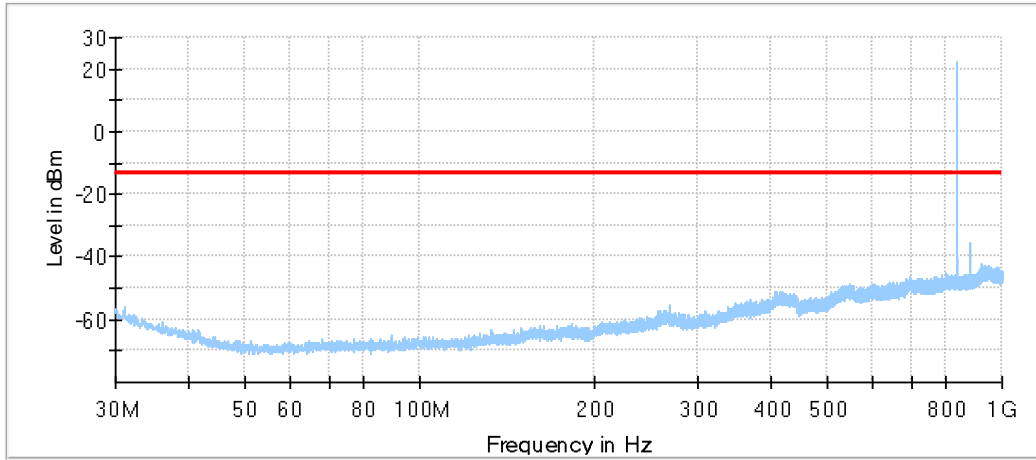
No spurious frequencies at less than 20 dB below the limit.

Measurement Uncertainty (dB): $\leq \pm 4.90$ for $f \geq 30$ MHz up to 1 GHz
 $\leq \pm 4.32$ for $f \geq 1$ GHz up to 8.5 GHz

Verdict: PASS

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
Receiver: [FSW 50]					
30 MHz - 1 GHz	30,312 kHz	PK+	100 kHz	Coupled	0 dB
1 GHz - 8,5 GHz	234,375 kHz	PK+	100 kHz	1 s	0 dB

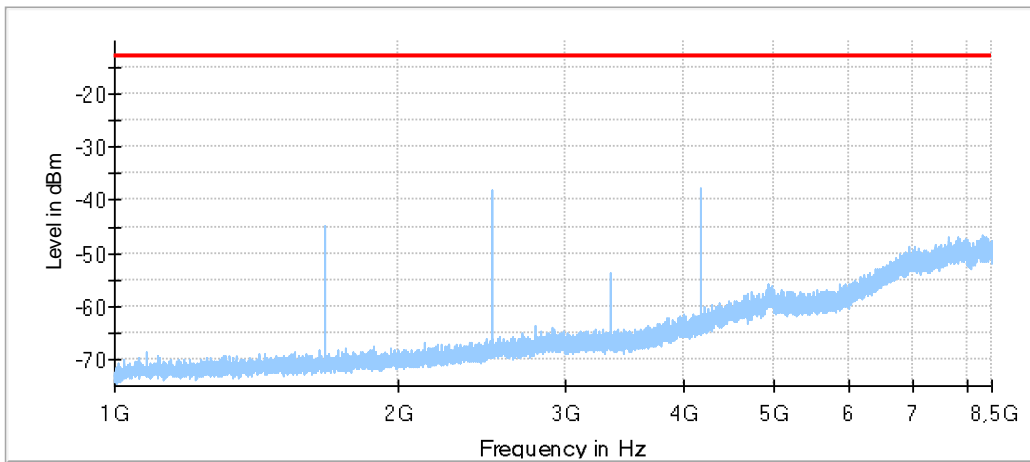
FREQUENCY RANGE 30 MHz - 1 GHz:



— Preview Result 1-PK+ — FCC RSE Part 22 (B5, B26)
— -13 dBm ◆ Final_Result PK+

The peak above the limit is the carrier frequency.

FREQUENCY RANGE 1 GHz - 8.5 GHz:



— Preview Result 1-PK+ — FCC RSE Part 22 (B5, B26)
— -13 dBm ◆ Final_Result PK+