

Test report No:
 NIE: 66340RRF.001

Test Report

USA FCC Part 15.247, 15.209

CANADA RSS-247, RSS-Gen

Radio Frequency Devices. Operation within the bands 902 - 928 MHz, 2400 -2483.5 MHz, and 5725 - 5850 MHz.

Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices.

General Requirements and Information for the Certification of Radio Apparatus.

(*) Identification of item tested	Long-range wireless gateway: master concentrador
(*) Trademark	Carlo Gavazzi
(*) Model and /or type reference	UWPMM1UL2X
Other identification of the product	HW version: 1 SW version: 1 FCC ID: SNJWLM IC ID: 7118D-WLM
(*) Features	USB, RS485, LoRaWan (both EU868 and US915 frequencies)
Applicant	CARLO GAVAZZI CONTROLS SPA Via Safforze, 8 , 32100 Belluno (BL) ITALY
Test method requested, standard	USA FCC Part 15.247 (10-1-19 Edition): Operation within the bands 902 - 928 MHz, 2400 -2483.5 MHz, and 5725 - 5850 MHz. USA FCC Part 15.209 (10-1-19 Edition): Radiated emission limits; general requirements. CANADA RSS-247 Issue 2 (February 2017). CANADA RSS-Gen Issue 5 (March 2019). 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)	Rafael López EMC Consumer & RF Lab. Manager
Date of issue	2021-02-16
Report template No	FDT08_23 (* "Data provided by the client")

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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 is a FCC-recognized accredited testing laboratory with appropriate scope of accreditation that include testing performed in this test report.

DEKRA Testing and Certification is an ISED-recognized accredited testing laboratory with appropriate scope of accreditation that include testing performed in this test 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.
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 of the model UWPMM1UL2X consists of an electric-cabinet equipment that receives data from Carlo Gavazzi UWPAM1US1L2X via LoRa frequencies and send them to the UWP Master controller.

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.

- Sample S/01 is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Date of reception
66340B/003	Long-range wireless gateway	UWPMM1UL2X	BU286001211X	2020/11/04
66340B /004	Antenna	--	--	2020/11/04

Sample S/01 has undergone the test(s): All RADIATED tests indicated in Appendix A.

- Sample S/02 is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Date of reception
66340B/003	Long-range wireless gateway	UWPMM1UL2X	BU286001211X	2020/11/04

Sample S/02 has undergone the following test(s): All CONDUCTED tests indicated in Appendix A.

Test sample description

Ports..... :	Port name and description	Cable					
		Specified max length [m]	Attached during test	Shielded	Coupled to patient ⁽³⁾		
	USB Micro B (shielded to internal mass)		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
	RS485		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
	Antenna connector (shielded to internal mass)		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
	Lateral Bus		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Supplementary information to the ports..... :	--						
Rated power supply	Voltage and Frequency		Reference poles				
			L1	L2	L3	N	PE
	<input checked="" type="checkbox"/>	AC: 115-240 V ac 50/60 Hz +/-10%	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	DC: 24V +/- 20%						
Rated Power	DC: 1.3 W max. AC: 5.5 VA max.						

Clock frequencies	Integrated micro :32MHz clock. Transceiver 32.768KHz clock		
Other parameters.....	--		
Software version	1		
Hardware version.....	1		
Dimensions in cm (W x H x D)....	--		
Mounting position.....	<input checked="" type="checkbox"/>	Other: Electrical Cabinet	
Modules/parts	Module/parts of test item	Type	Manufacturer
	Main module		Carlo Gavazzi
	Dipole Antenna		
	Power cable		
	Auxiliary Module for Testing		Carlo Gavazzi
Accessories (not part of the test item)	Description	Type	Manufacturer
	--		
Documents as provided by the applicant.....	Description	File name	Issue date
	UWPA-UWPM Datasheet	uwpa-uwpm_ds.pdf	4/12/2019

⁽³⁾ Only for Medical Equipment

Identification of the client

CARLO GAVAZZI CONTROLS SPA
 Via Safforze, 8, 32100 Belluno (BL) ITALY

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2021-02-09
Date (finish)	2021-02-10

Document history

Report number	Date	Description
66340RRF.001	2021-02-16	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 %

In the chamber for conducted measurements, 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: Cristina Calle, José Manuel Jiménez and Pablo Redondo.

Used instrumentation:

Conducted Measurements:

	Last Calibration	Due Calibration
1. Shielded Room ETS LINDGREN S101	N.A.	N.A.
2. Signal and Spectrum Analyzer 40 GHz Rohde and Schwarz FSV40	2019/09	2021/09
3. DC Power supply GW INSTEK GPS-3030D	N.A.	N.A.
4. Digital Multimeter FLUKE 175	2019/10	2020/10

Radiated Measurements:

	Last Calibration	Due Calibration
1. Semianechoic Absorber Lined Chamber ETS LINDGREN FACT 3 200 STP	N.A.	N.A.
2. Shielded Room ETS LINDGREN S101	N.A.	N.A.
3. Biconical/Log Antenna 30 MHz - 6 GHz ETS LINDGREN 3142E	2020/04	2023/04
4. RF Pre-amplifier, 40 dB ,10MHz-6 GHz BONN ELEKTRONIK BLMA 0160-01N	2020/02	2021/02
5. EMI Test Receiver 9kHz-7GHz ROHDE AND SCHWARZ ESR7	2020/12	2022/12
6. Broadband Horn antenna 1-18 GHz SCHWARZBECK MESS-ELEKTRONIK BBHA 9120 D	2019/11	2022/11
7. RF Pre-amplifier, 40 dB ,1-18 GHz BONN ELEKTRONIK BLMA 0118-1M	2020/05	2021/05
8. Spectrum Analyzer ROHDE AND SCHWARZ FSW50	2020/07	2022/07
9. AC Power Supply ELGAR CS-AC35(351SL)	2019/09	2022/09
10. DC Power supply 30V/5A 150W Agilent Technologies U8002A	N.A.	N.A.
11. Digital Multimeter FLUKE 175	2020/11	2021/11

Testing verdicts

Not applicable:	N/A
Pass:	P
Fail:	F
Not measured:	N/M

Summary

LoRa 500 kHz

FCC PART 15 PARAGRAPH / RSS-247			
Requirement – Test case		Verdict	Remark
FCC 15.247 (a)(2) / RSS-247 5.2. (a)	6 dB Bandwidth	P	
FCC 15.247 (b) / RSS-247 5.4. (d)	Maximum peak output power and antenna gain	P	
FCC 15.247 (d) / RSS-247 5.5.	Band-edge emissions compliance (Transmitter)	P	
FCC 15.247 (e) / RSS-247 5.2. (b)	Power spectral density	P	
FCC 15.247 (d) / RSS-247 5.5.	Emission limitations radiated (Transmitter)	P	
<u>Supplementary information and remarks:</u> None.			

Appendix A: Test results. LoRa 500 kHz

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TEST CONDITIONS

POWER SUPPLY (V):

Vnominal:	24 Vdc.
Type of Power Supply:	DC external power supply.

The power supply of 24 Vdc was selected based on preliminary testing that identified this power supply corresponding to the worst case for emission limitations radiated in the frequency range 1 GHz – 3 GHz.

ANTENNA:

Type of Antenna:	Dipole Antenna.
Maximum Declared Antenna Gain:	+2.15 dBi

TEST FREQUENCIES:

Low Channel:	903.0 MHz
High Channel:	912.6 MHz

CONDUCTED MEASUREMENTS

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



The DC supply voltage is applied using an external power supply.

RADIATED MEASUREMENTS

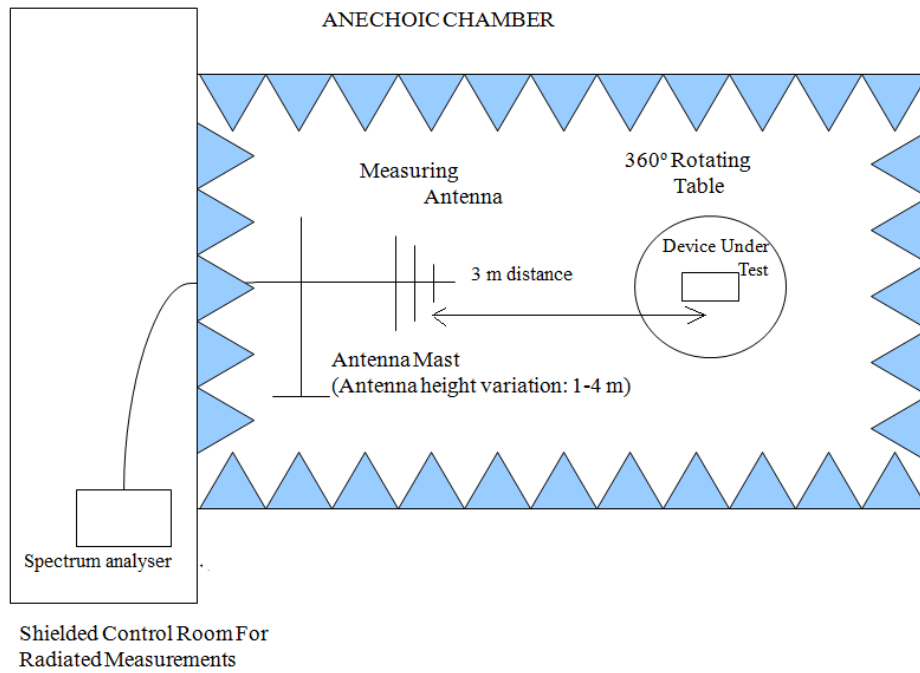
All radiated tests were performed in a semi-anechoic chamber. The measurement antenna (Bilog antenna for the range between 30 MHz to 1000 MHz and 1 GHz-10 GHz Double ridge horn antenna) is situated at a distance of 3 m.

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.

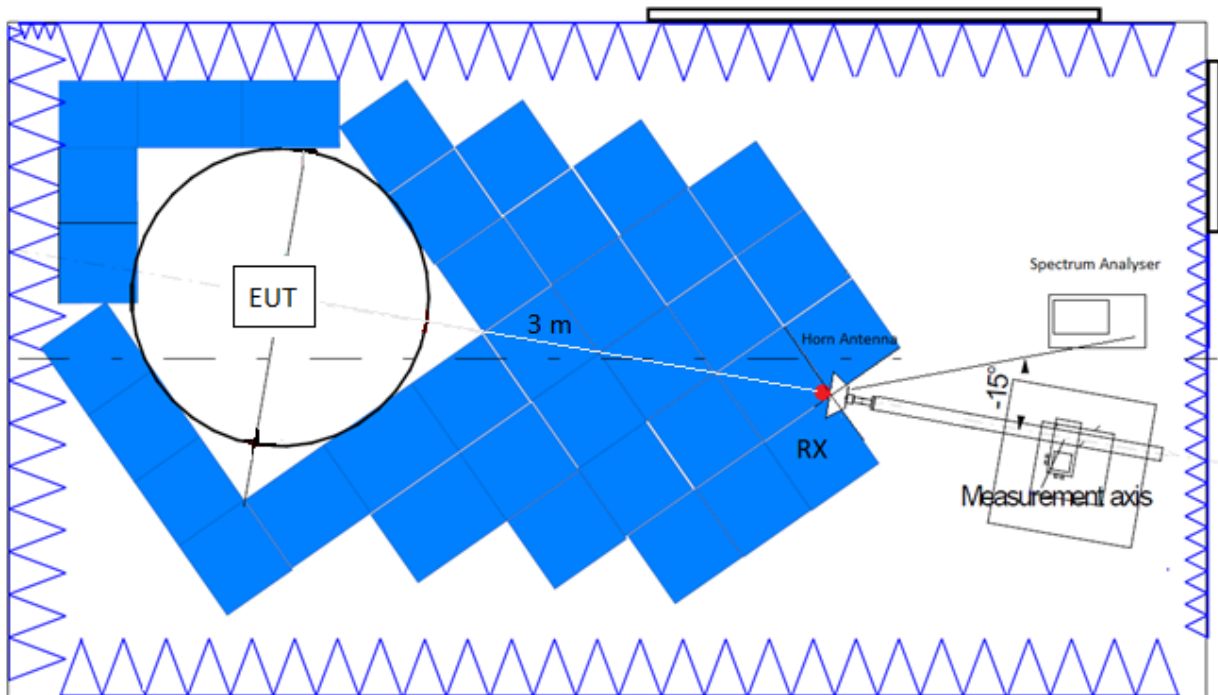
Measurements were made in both horizontal and vertical planes of polarization.

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

Radiated measurements setup from 30 MHz to 1 GHz:



Radiated measurements setup from 1 GHz to 10 GHz:

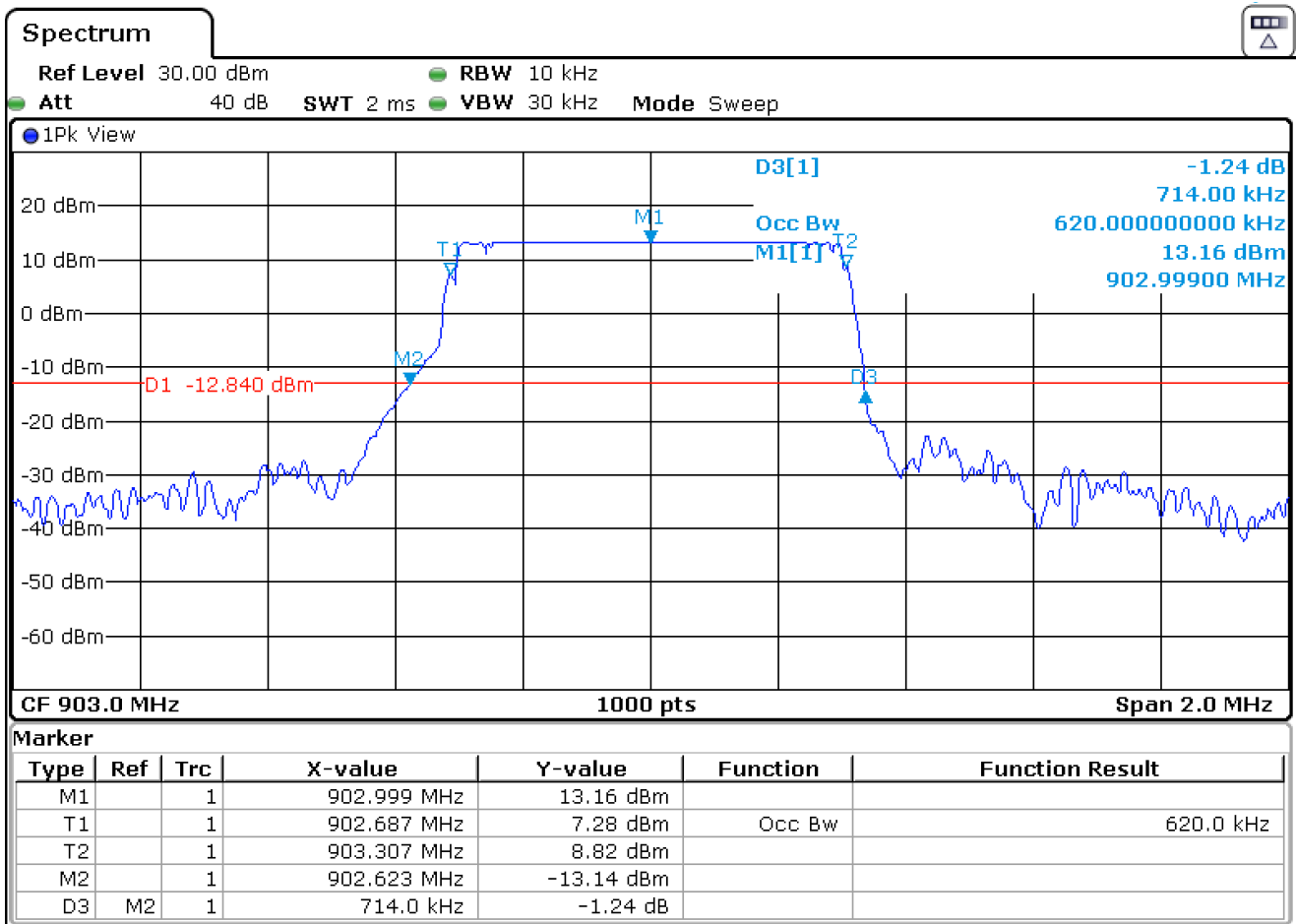


Occupied Bandwidth

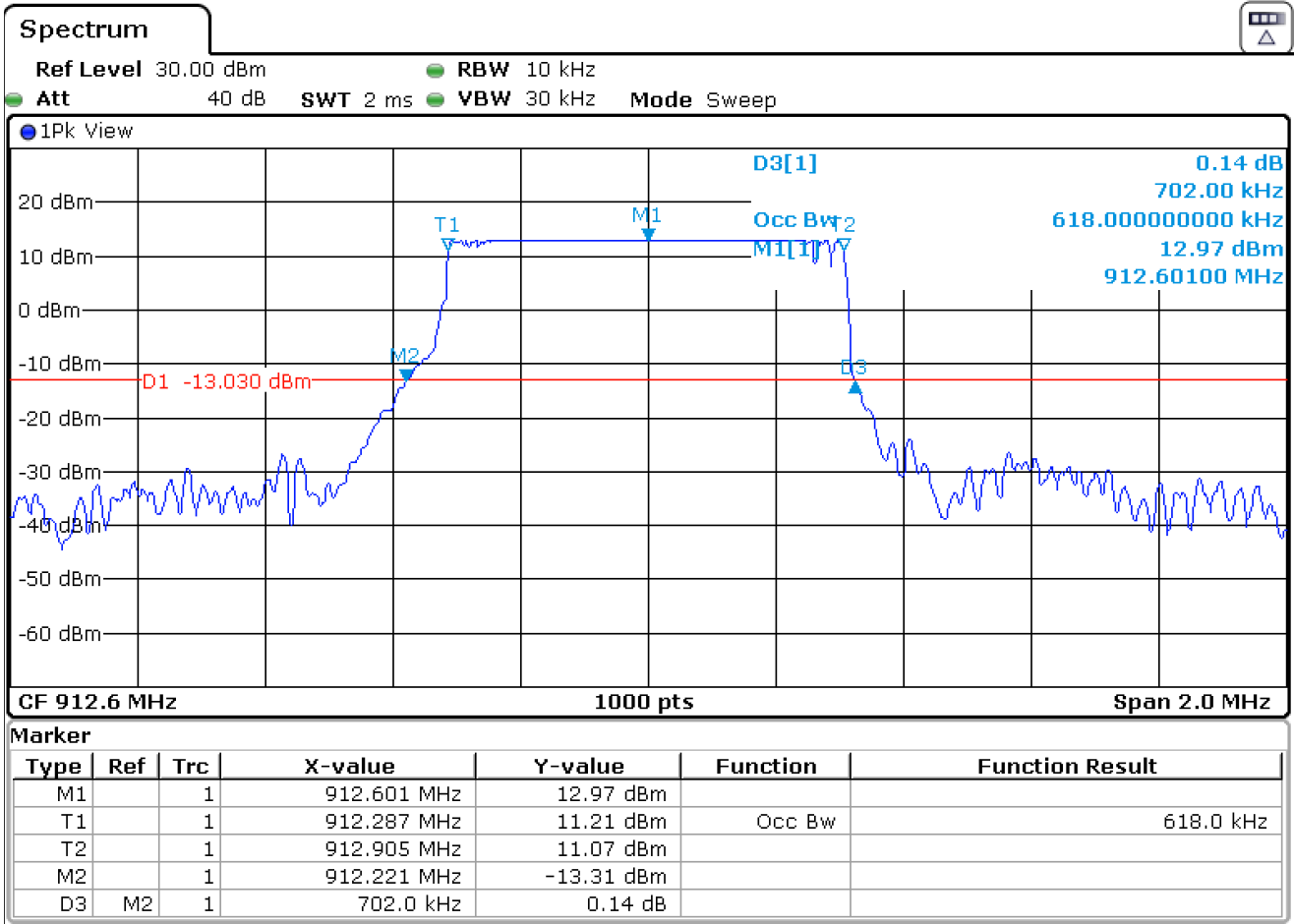
RESULTS:

	Low Channel 903.0 MHz	High Channel 912.6 MHz
99% bandwidth (MHz)	0.620	0.618
Measurement uncertainty (kHz)	$<\pm 2.34$	

- Low Channel:



- High Channel:



FCC 15.247 (a)(2) / RSS-247 5.2. (a) 6 dB Bandwidth

SPECIFICATION:

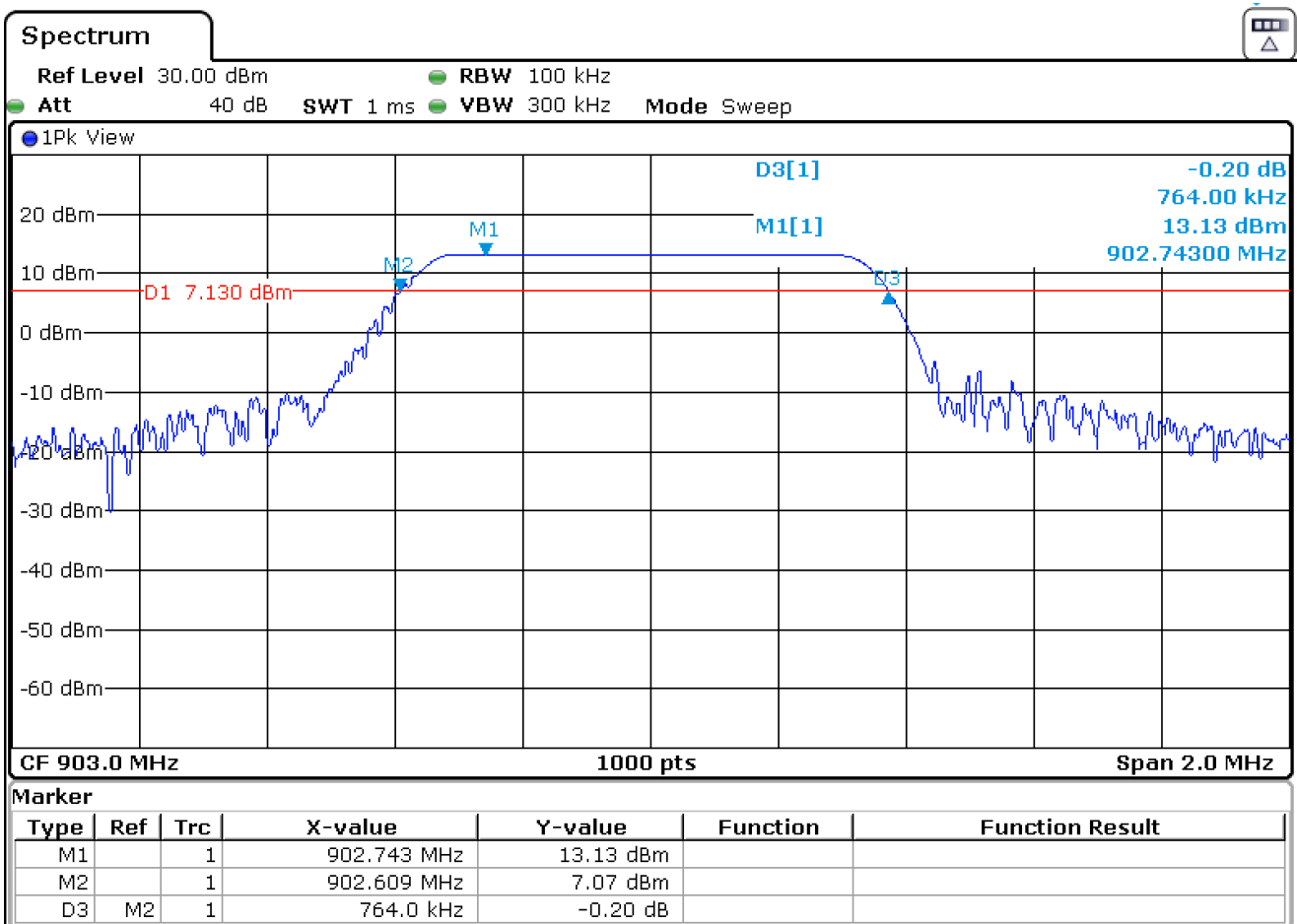
The minimum 6 dB bandwidth shall be at least 500 kHz.

RESULTS:

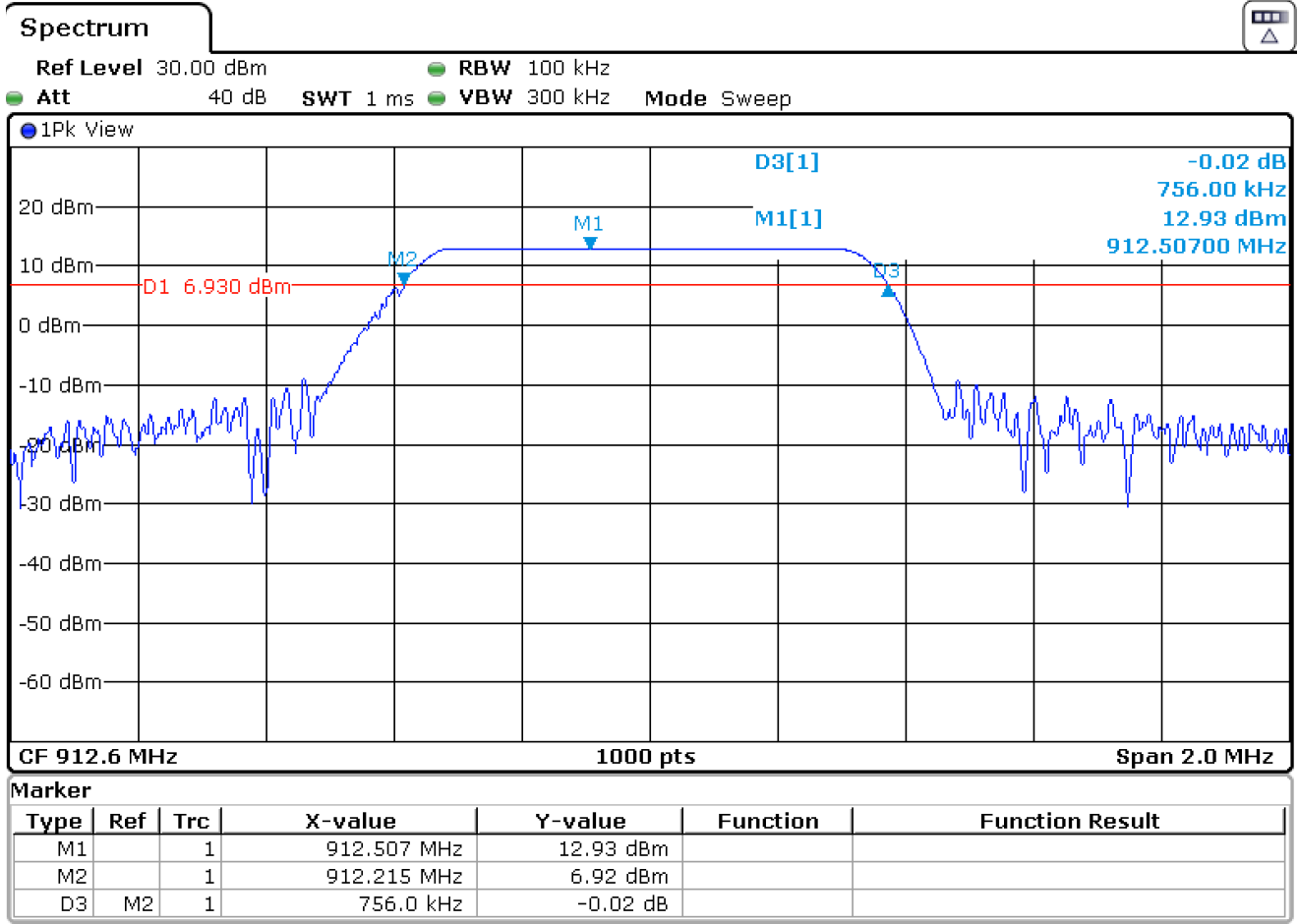
	Low Channel 903.0 MHz	High Channel 912.6 MHz
6 dB Spectrum bandwidth (kHz)	764.00	756.00
Measurement uncertainty (kHz)	$\leq \pm 12.71$	

Verdict: PASS

- Low Channel:



- High Channel:



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

SPECIFICATION:

For systems using digital modulation in the 902-928 MHz band: 1 watt (30 dBm).
The e.i.r.p. shall not exceed 4 W (36 dBm) (Canada).

RESULTS:

The maximum conducted output power level in the fundamental emission was measured using the method according to point 11.9.2.2.2 "AVGSA-1" of ANSI C.63.10-2013.

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

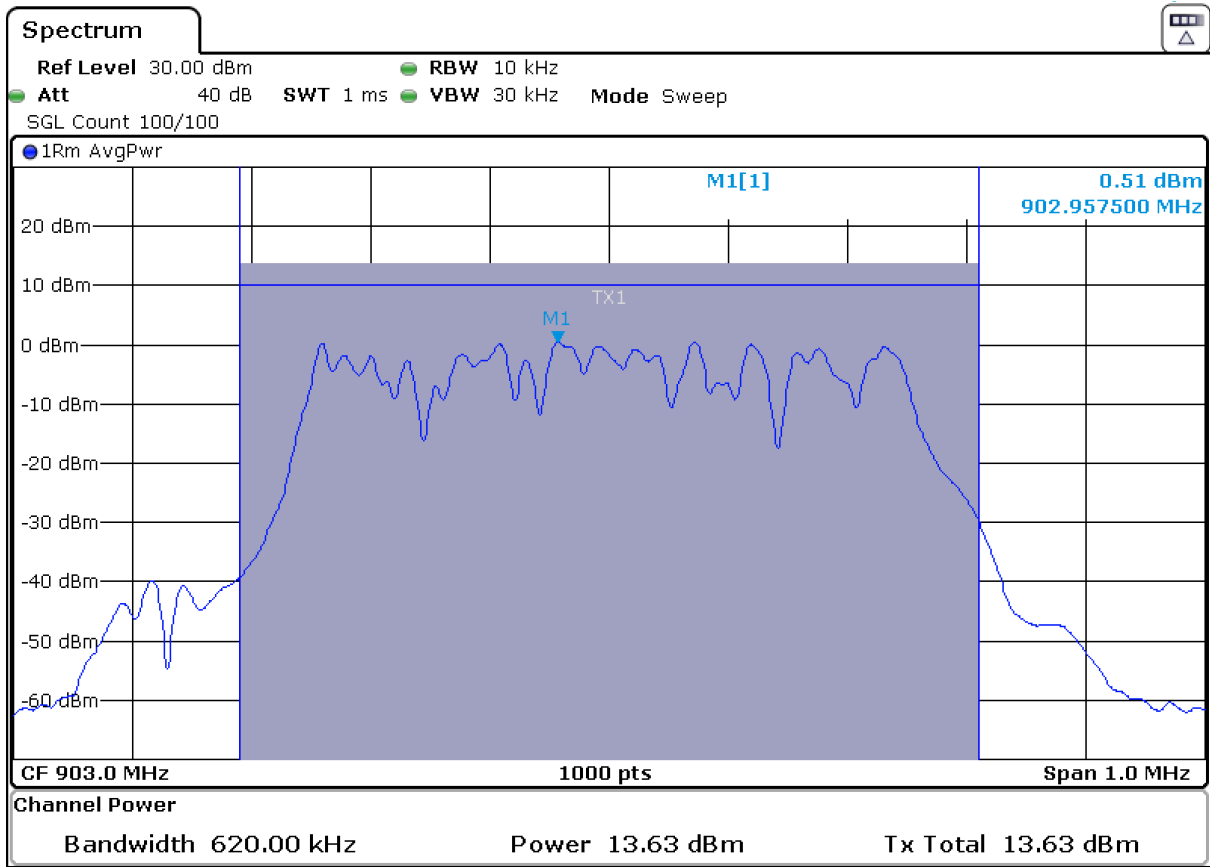
Maximum Declared Antenna Gain: +2.15 dBi

	Low Channel 903.0 MHz	High Channel 912.6 MHz
Maximum Conducted Power (dBm)	13.63	13.01
Maximum EIRP Power (dBm)	15.78	15.16
Measurement uncertainty (dB)	<±0.60	

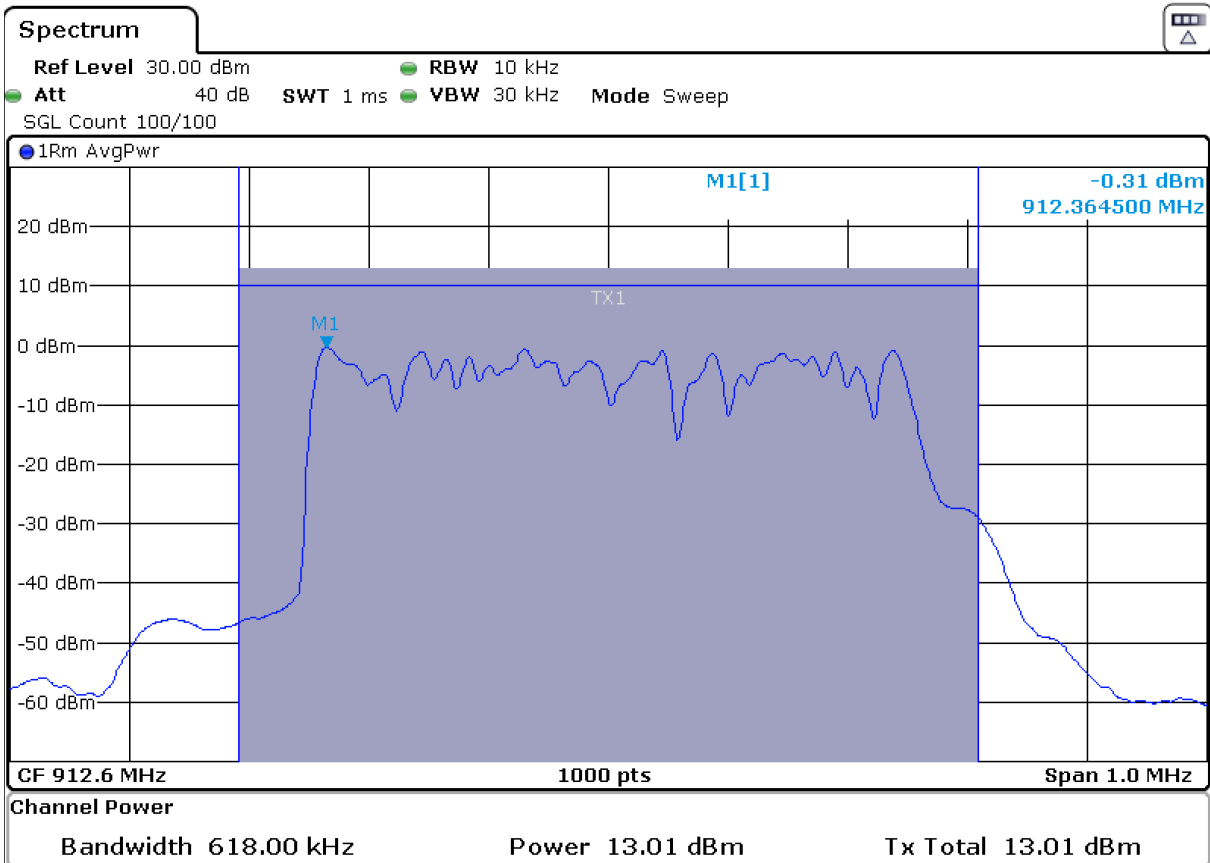
The maximum directional gain of the antenna is less than 6 dBi and therefore the maximum output power is not required to be reduced from the stated values.

Verdict: PASS

- Low Channel:



- High Channel:



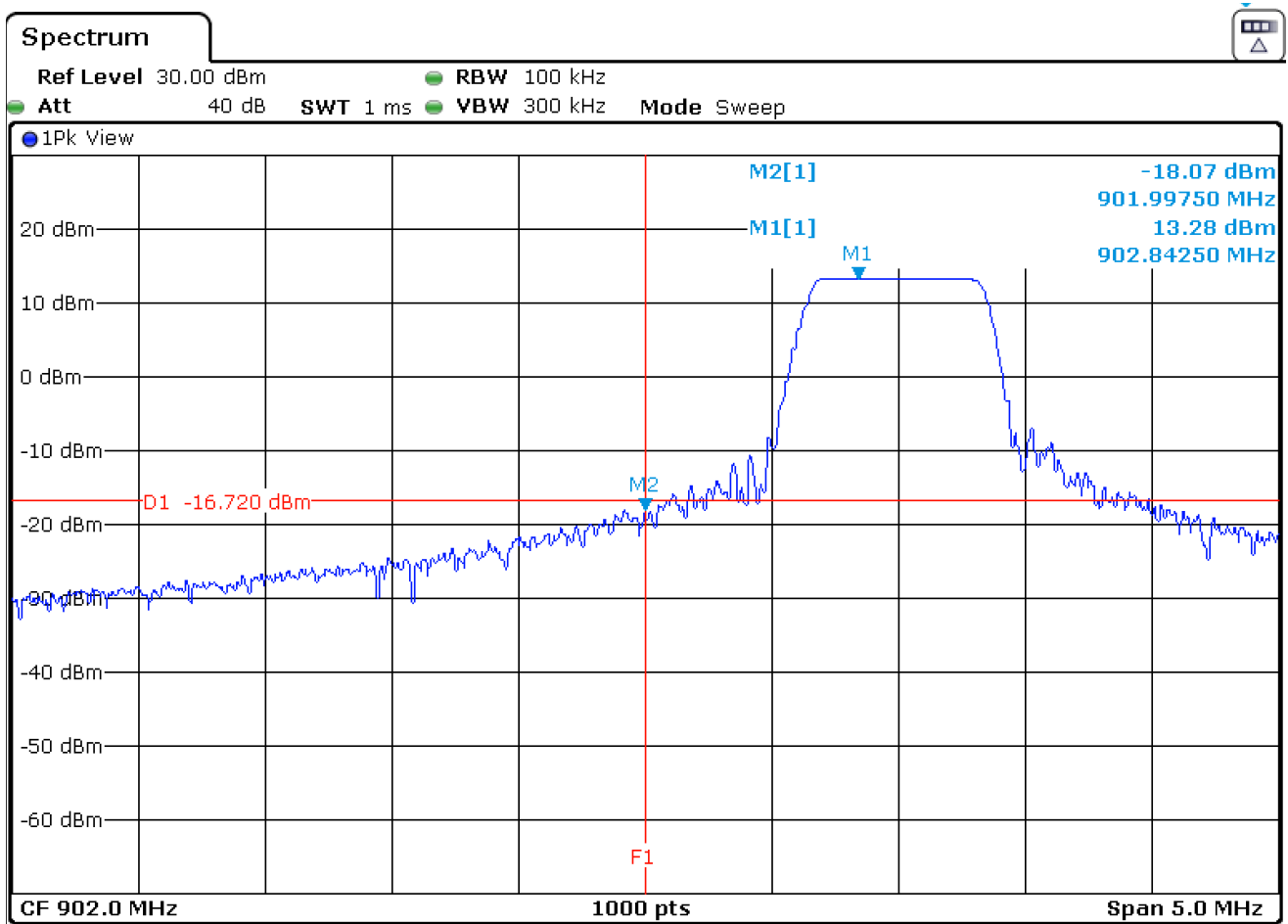
FCC 15.247 (d) / RSS-247 5.5. Band-edge emissions compliance (Transmitter)

SPECIFICATION:

In any 100 kHz bandwidths outside the frequency band in which the intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

RESULTS:

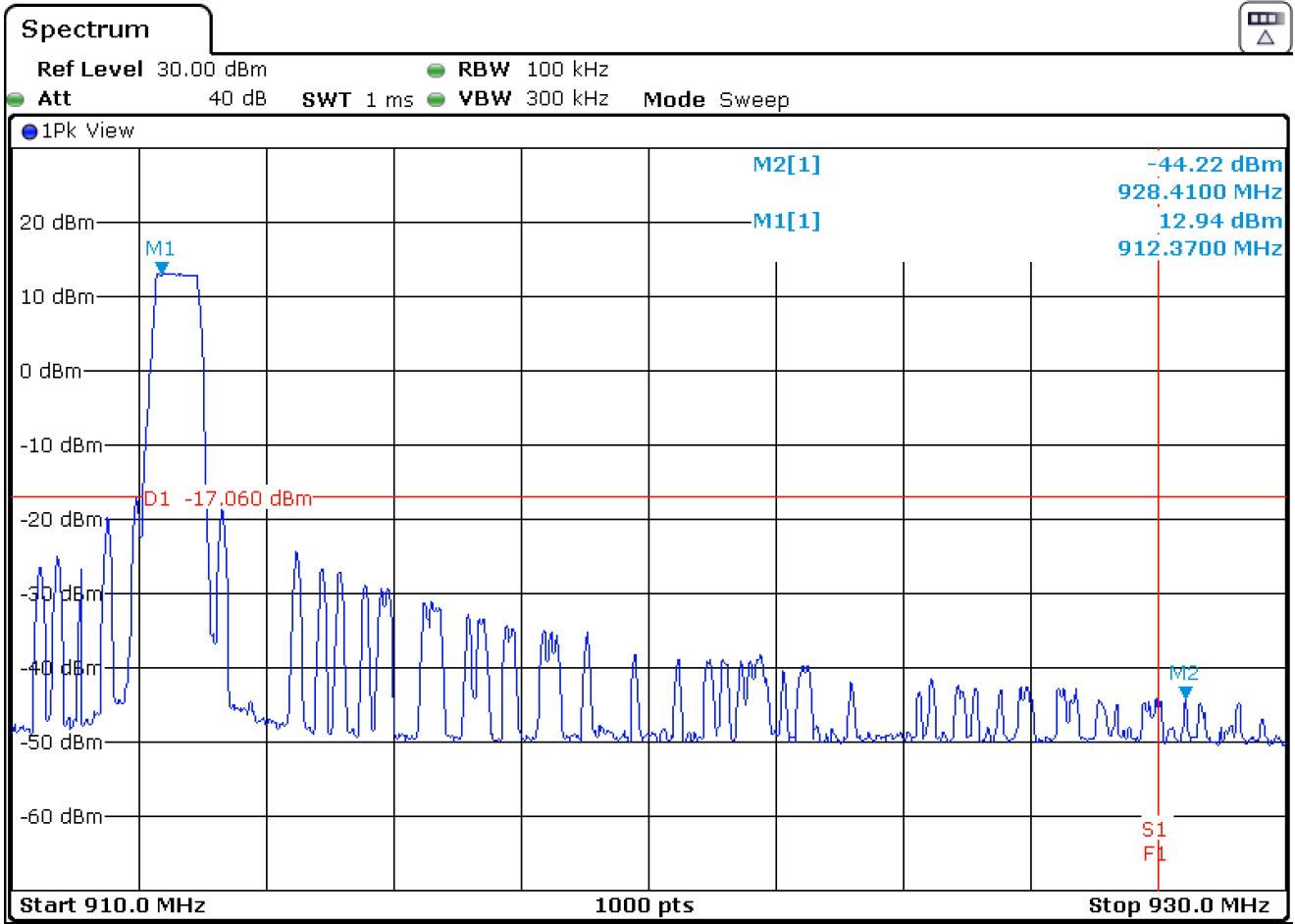
- Low Channel:



Measurement uncertainty (dB) $<\pm 0.77$

Verdict: PASS

- High Channel:



Measurement uncertainty (dB) $\leq \pm 0.77$

Verdict: PASS

FCC 15.247 (e) / RSS-247 5.2. (b) Power spectral density

SPECIFICATION:

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

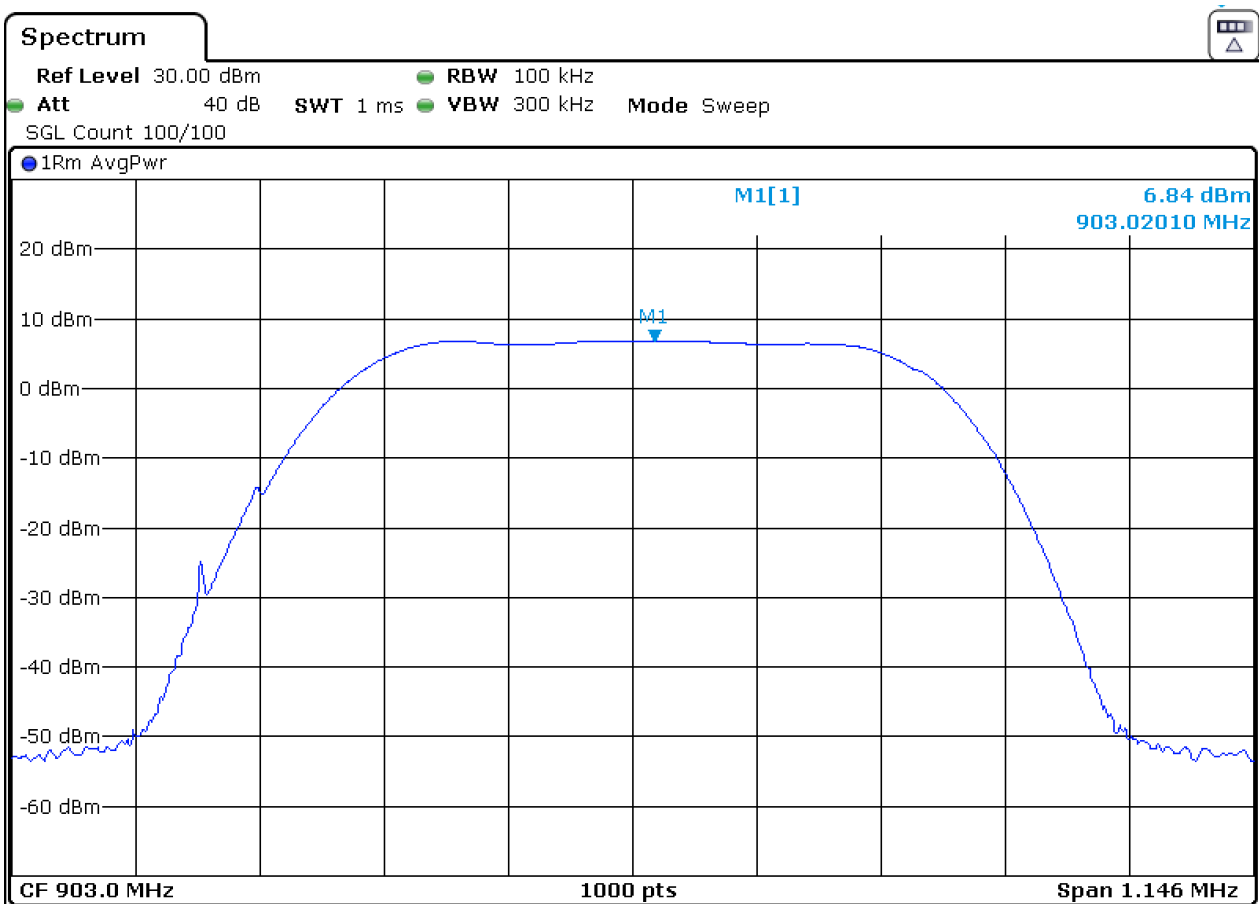
RESULTS:

The maximum power spectral density level in the fundamental emission was measured using the method according to point 11.10.3." Method AVGPSSD-1" of ANSI C.63.10-2013.

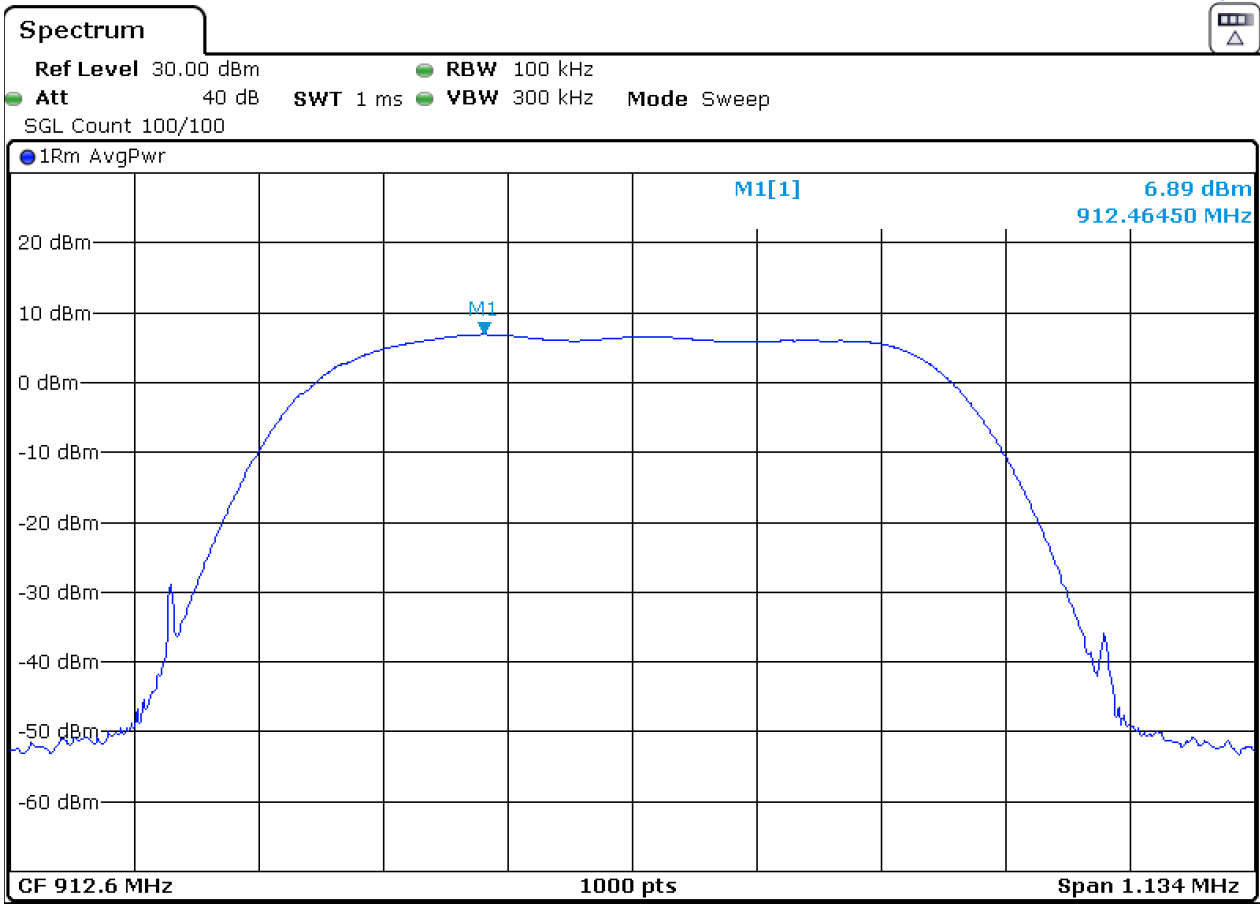
	Low Channel 903.0 MHz	High Channel 912.6 MHz
Power Spectral Density (dBm)	6.84	6.89
Measurement uncertainty (dB)	<±0.77	

Verdict: PASS

- Low Channel:



- High Channel:



FCC 15.247 (d) / RSS-247 5.5. Emission limitations radiated (Transmitter)

SPECIFICATION:

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 ($\mu\text{V/m}$)	Field strength ($\text{dB}\mu\text{V/m}$)	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
960 - 10000	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.

RESULTS:

The situation and orientation was varied to find the maximum radiated emission. It was also rotated 360° and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

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

All tests were performed in a semi-anechoic chamber at a distance of 3 m for the frequency range 30 MHz-10 GHz.

The field strength is calculated by adding correction factor to the measured level from the spectrum analyzer. This correction factor includes antenna factor, cable loss and pre-amplifiers gain.

Frequency range 30 MHz - 1 GHz:

- LOW CHANNEL. Spurious frequencies closest to the limit:

Spurious Frequency (MHz)	Emission Level (dB μ V/m)	Polarization	Detector	Measurement Uncertainty (dB)
128.843	21.68	V	Quasi peak	< \pm 5.17
202.320	25.66	V	Quasi peak	< \pm 5.17
241.120	31.97	V	Quasi peak	< \pm 5.17
305.051	32.50	H	Quasi peak	< \pm 5.17
930.063	36.25	V	Quasi peak	< \pm 5.17

- HIGH CHANNEL. Spurious frequencies closest to the limit:

Spurious Frequency (MHz)	Emission Level (dB μ V/m)	Polarization	Detector	Measurement Uncertainty (dB)
191.844	23.54	V	Quasi peak	< \pm 5.17
257.756	24.60	V	Quasi peak	< \pm 5.17
348.693	32.50	H	Quasi peak	< \pm 5.17
912.360	38.05	V	Quasi peak	< \pm 5.17

Frequency range 1 - 10 GHz:

The results in the next tables show the maximum measured levels in the 1-10 GHz range.

Spurious frequencies with peak levels above the average limit (54 dB μ V/m at 3 m) are measured with average detector for checking compliance with the average limit.

- LOW CHANNEL. Spurious frequencies closest to the limit:

Spurious frequency (GHz)	Emission Level (dB μ V/m)	Polarization	Detector	Measurement Uncertainty (dB)
1.18773	56.79	H	Peak	< \pm 5.13
	28.57		AVG	< \pm 5.13
1.20580	57.33	H	Peak	< \pm 5.13
	28.92		AVG	< \pm 5.13
1.23053	62.07	H	Peak	< \pm 5.13
	29.44		AVG	< \pm 5.13
1.24407	59.31	H	Peak	< \pm 5.13
	32.58		AVG	< \pm 5.13
1.27860	57.43	H	Peak	< \pm 5.13
	35.34		AVG	< \pm 5.13
1.32173	55.15	H	Peak	< \pm 5.13
	32.73		AVG	< \pm 5.13
1.80560	63.90	V	Peak	< \pm 5.13
	49.92		AVG	< \pm 5.13
2.70826	53.08	V	Peak	< \pm 5.13
3.61250	44.82	H	Peak	< \pm 5.13
4.51475	46.57	H	Peak	< \pm 5.13
8.12750	47.57	H	Peak	< \pm 5.13

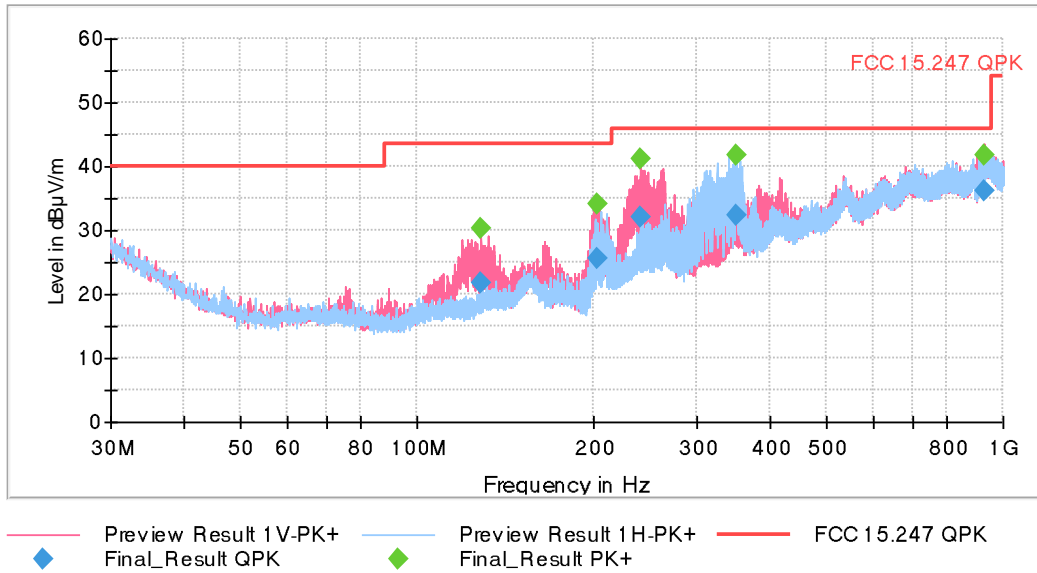
- HIGH CHANNEL. Spurious frequencies closest to the limit:

Spurious frequency (GHz)	Emission Level (dB μ V/m)	Polarization	Detector	Measurement Uncertainty (dB)
1.16353	55.40	H	Peak	< \pm 5.13
	28.22		AVG	< \pm 5.13
1.21613	58.28	H	Peak	< \pm 5.13
	29.66		AVG	< \pm 5.13
1.25793	58.07	H	Peak	< \pm 5.13
	33.06		AVG	< \pm 5.13
1.28006	43.01	H	Peak	< \pm 5.13
1.82506	69.00	V	Peak	< \pm 5.13
	53.94		AVG	< \pm 5.13
2.73780	57.00	V	Peak	< \pm 5.13
	44.61		AVG	< \pm 5.13
3.65125	42.70	V	Peak	< \pm 5.13
4.56275	43.73	V	Peak	< \pm 5.13
8.21550	45.58	H	Peak	< \pm 5.13

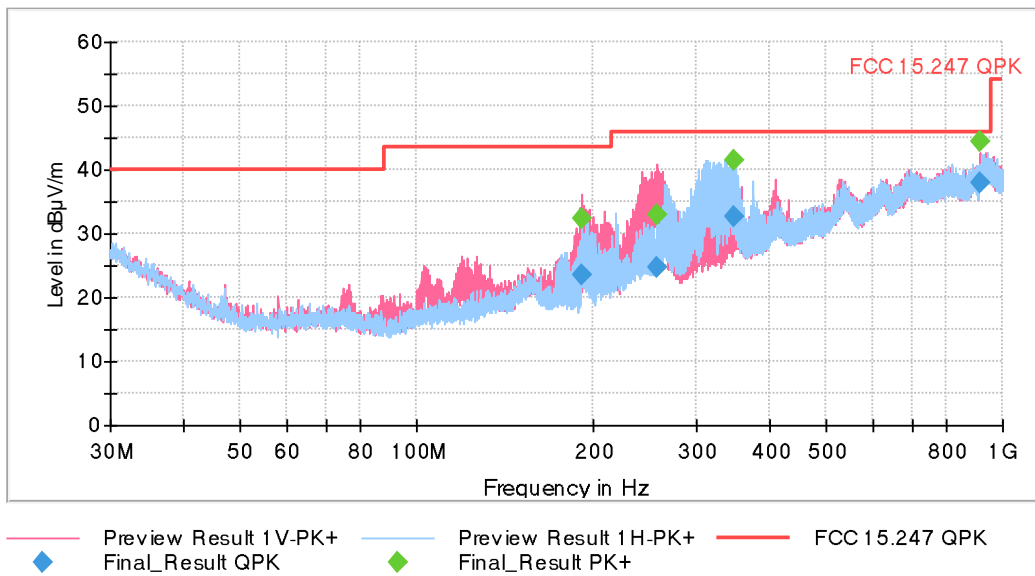
Verdict: PASS

FREQUENCY RANGE 30 MHz - 1 GHz:

- Low Channel:

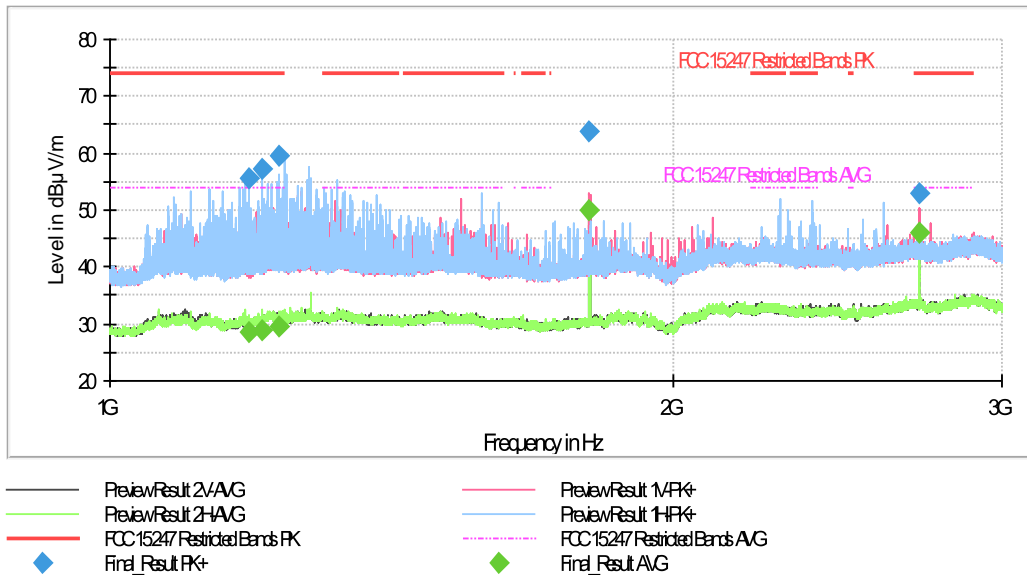


- High Channel:

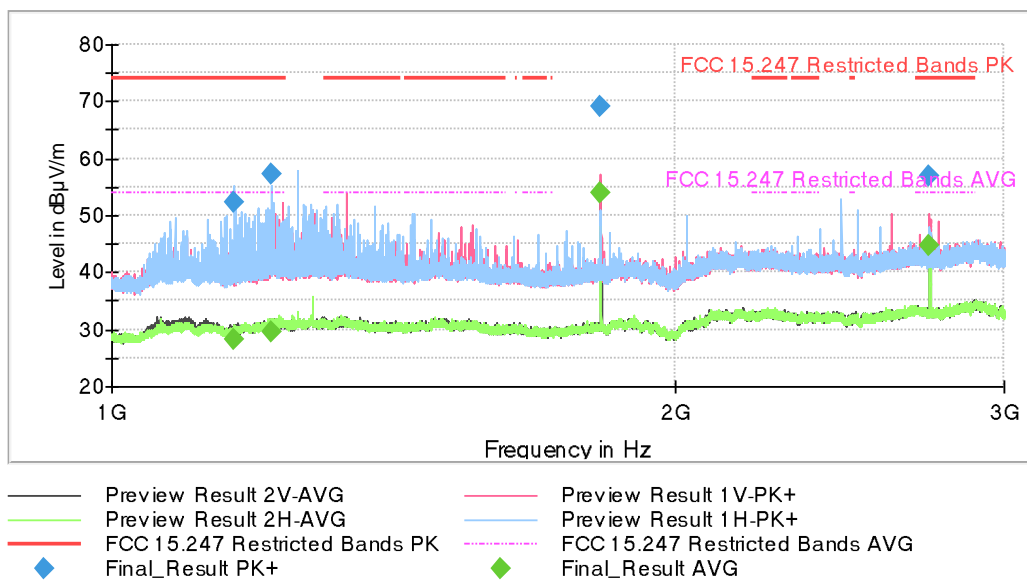


FREQUENCY RANGE 1 - 3 GHz:

- Low Channel:

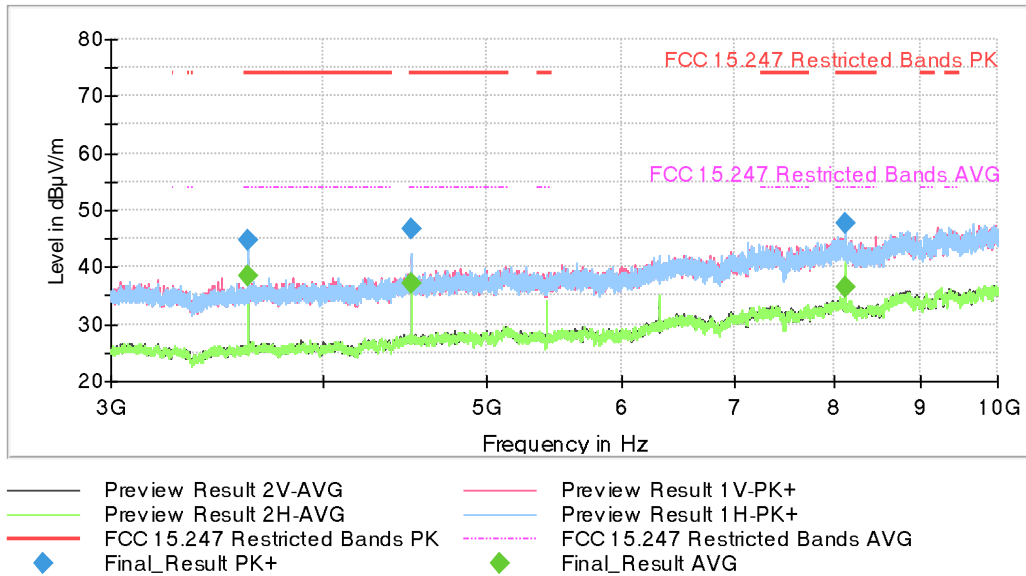


- High Channel:



FREQUENCY RANGE 3 - 10 GHz:

- Low Channel:



- High Channel:

