DEKRA Testing and Certification, S.A.U.
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C.I.F. A29507456

ISED CABid: ES1909

Test Report No:
NIE: 69157RRF.006

Test Report
USA FCC Part 15.247, 15.209
CANADA RSS-247, RSS-Gen

(*) Identification of item tested	Rechargeable wireless hearing instrument
(*) Trademark	ReSound, Beltone
(*) Model and /or type reference	CABR70
Other identification of the product	HW version: PCBA,CAM BTE70 RHI,V1.A,C6.0 SW version: Dooku2 FCC ID: XC26CABR70 IC: 6941C-CABR70
(*) Features	BT 1/2Mbit, proximity & MI radio, rechargeable battery, IP68 enclosure
Applicant	GN HEARING A/S Lautrupbjerg 7, 2750 Ballerup, Denmark
Test method requested, standard	USA FCC Part 15.247 (10-1-20 Edition): Operation within the bands 902 - 928 MHz, 2400 -2483.5 MHz, and 5725 - 5850 MHz. USA FCC Part 15.209 (10-1-20 Edition): Radiated emission limits; general requirements. CANADA RSS-247 Issue 2 (February 2017). CANADA RSS-Gen Issue 5 amendment 1 (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 Martín EMC Consumer & RF Lab. Manager 2022.02.03 17:43:46 +01'00'
Date of issue	2022-02-03
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 S.A.U is a FCC-recognized accredited testing laboratory with appropriate scope of accreditation that include testing performed in this test report.

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

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

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

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

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

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General conditions

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or competent Authorities.
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 CABR70 is a rechargeable wireless hearing aid.

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 result.

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	Reception
69157B/036	Rechargeable wireless hearing instrument	CABR70	--	2021/11/24

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

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

Control Nº	Description	Model	Serial Nº	Reception
69157B/029	Rechargeable wireless hearing instrument	CABR70	2100815094	2021/11/24

Sample S/02 has undergone the test(s): The Radiated tests indicated in the Appendix A.

Test sample description

Ports……:	Port name and description	Cable					
		Specified max length [m]	Attached during test	Shielded	Coupled to patient(3)		
	-		☐	☐	☐		
	-		☐	☐	☐		
	-		☐	☐	☐		
Supplementary information to the ports……:	-						
Rated power supply ..... :	Voltage and Frequency		Reference poles				
			L1	L2	L3	N	PE
	☐	AC:	☐	☐	☐	☐	☐
	☒	DC: 3.8 Vdc					
Rated Power..... :	-						
Clock frequencies..... :	-						
Other parameters ..... :	-						
Software version..... :	Dooku2						
Hardware version ..... :	PCBA,CAM BTE70 RHI,V1.A,C6.0						
Dimensions in cm (W x H x D) ... :	-						
Mounting position ..... :	☐	Table top equipment					
	☐	Wall/Ceiling mounted equipment					
	☐	Floor standing equipment					
	☐	Hand-held equipment					
	☒	Other:					
Modules/parts..... :	Module/parts of test item		Type	Manufacturer			
	-						
	-						

Accessories (not part of the test item) ..... :	Description	Type	Manufacturer
	-		
Documents as provided by the applicant ..... :	Description	File name	Issue date
	-		

(3) Only applicable to medical equipments.

Identification of the client

GN HEARING A/S

Lautrupbjerg 7, 2750 Ballerup, Denmark

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2021-12-10
Date (finish)	2021-12-15

Document history

Report number	Date	Description
69157RRF.006	2022-02-03	First release.

Environmental conditions

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

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

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

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

In the chamber for conducted measurements, the following limits were not exceeded during the test:

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

Remarks and comments

The tests have been performed by the technical personnel: Antonio Manuel Sánchez, Jaime Barranquero.

Used instrumentation:

Conducted Measurements:

		Last Calibration	Due Calibration
1.	Signal and Spectrum Analyzer 2 Hz - 50 GHz ROHDE AND SCHWARZ FSW50	2021/07	2023/07
2.	Extension for Open Switch Unit up to 40 GHz ROHDE AND SCHWARZ OSP-B157Wx	2021/03	2023/03
3.	Vector Signal Generator 100 KHz-6GHz ROHDE AND SCHWARZ SMU200A	2021/04	2023/04
4.	Chamber HERAEUS VMT 04/35	2020/07	2022/07
5.	DC POWER SUPPLY 30V/3A 90W, GPS3030D, GW INSTEK	N/A	N/A
6.	Digital Multimeter, FLUKE 175	2021/11	2022/11

Radiated Measurements:

		Last Calibration	Due Calibration
1.	Semianechoic Absorber Lined Chamber VI ALBATROSS P29419	2020/01	2023/01
2.	Shielded Room ALBATROSS PROJECTS GMBH P29419	N/A	N/A
3.	Ultralog Antenna 30MHz-6GHz, ROHDE AND SCHWARZ HL562E_UPG	2019/10	2022/10
4.	EMI Test Receiver 2 Hz - 44 GHz ROHDE AND SCHWARZ ESW44	2020/02	2022/02
5.	Horn Antenna 1-18 GHz SCHWARZBECK MESS-ELEKTRONIK BBHA 9120 D	2019/11	2022/11
6.	Preamplifier 30 dB 500MHz-18GHz, SCHWARZBECK BBV 9718 C	2021/02	2022/02
7.	Preamplifier G>30 dB 18-40GHz BONN ELEKTRONIK BLMA 1840-3G	N/A	N/A
8.	Horn Antenna 18-40 GHz SCHWARZBECK BBHA 9170	2021/03	2024/03

Testing verdicts

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

Summary

Proximity 2.4 GHz.

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 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	
Supplementary information and remarks: None.			

Appendix A: Test results. Proximity 2.4 GHz

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TEST CONDITIONS

(*) Declared by the Applicant

POWER SUPPLY (*):

Vnominal:	3.8 Vdc
Type of Power Supply:	Rechargeable battery.

ANTENNA (*):

Type of Antenna:	Integral.
Maximum Declared Antenna Gain:	-7.4 dBi

TEST FREQUENCIES (*):

Low Channel:	2402 MHz
Middle Channel:	2440 MHz
High Channel:	2480 MHz

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 m for the frequency range 17 GHz-26 GHz (antenna and 18 GHz-40 GHz horn antenna).

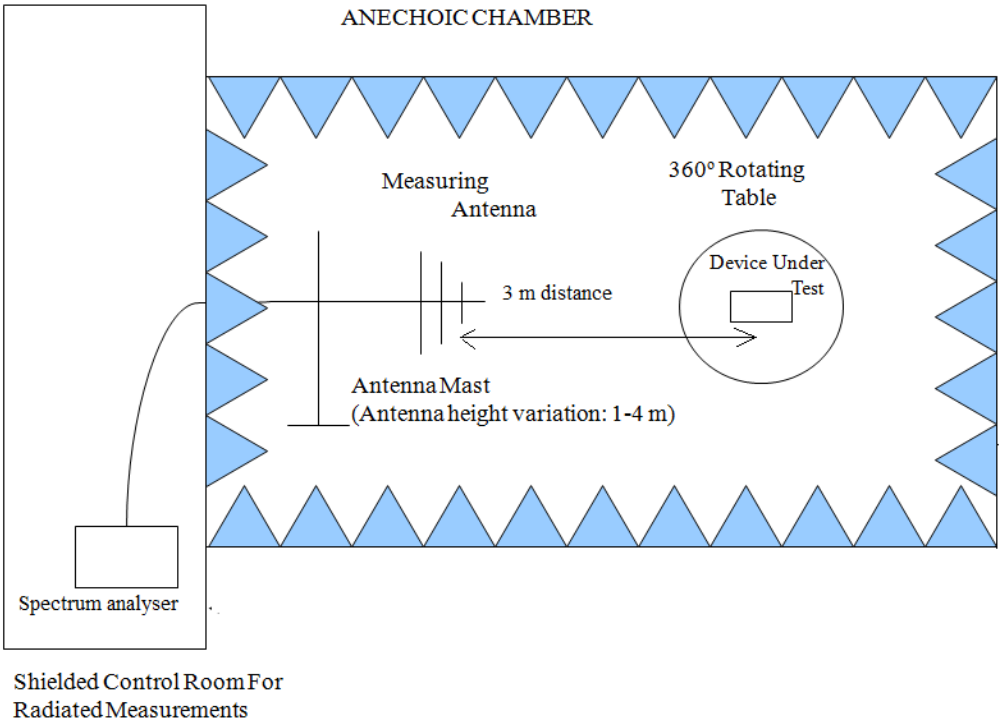
For radiated emissions in the range 17 GHz-26 GHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

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 360º and the antenna height (Bilog antenna and Double ridge horn antenna) was varied from 1 to 4 meters to find the maximum radiated emission.

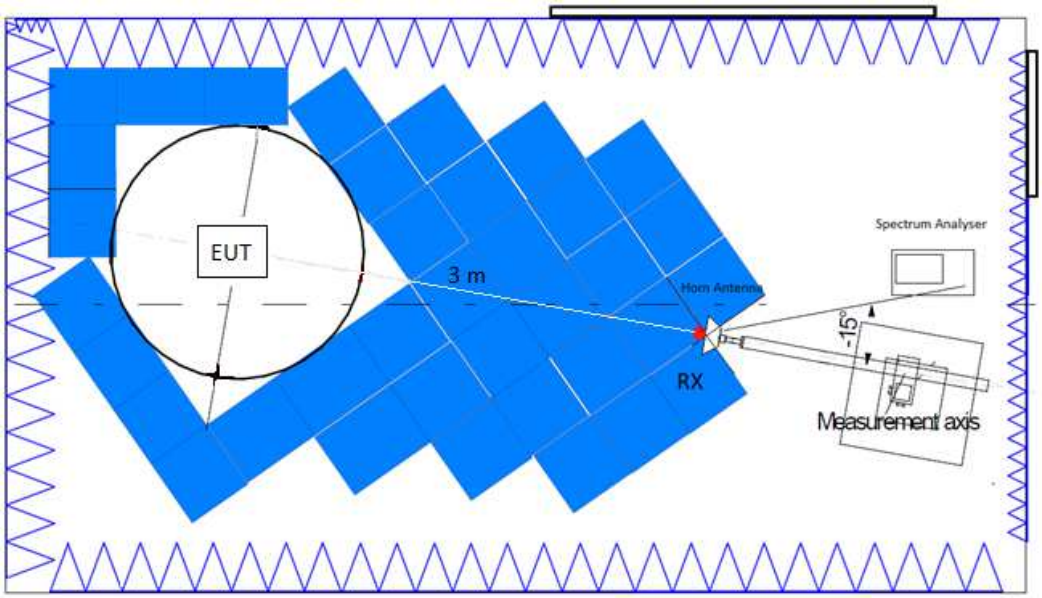
Measurements were made in both horizontal and vertical planes of polarization.

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.

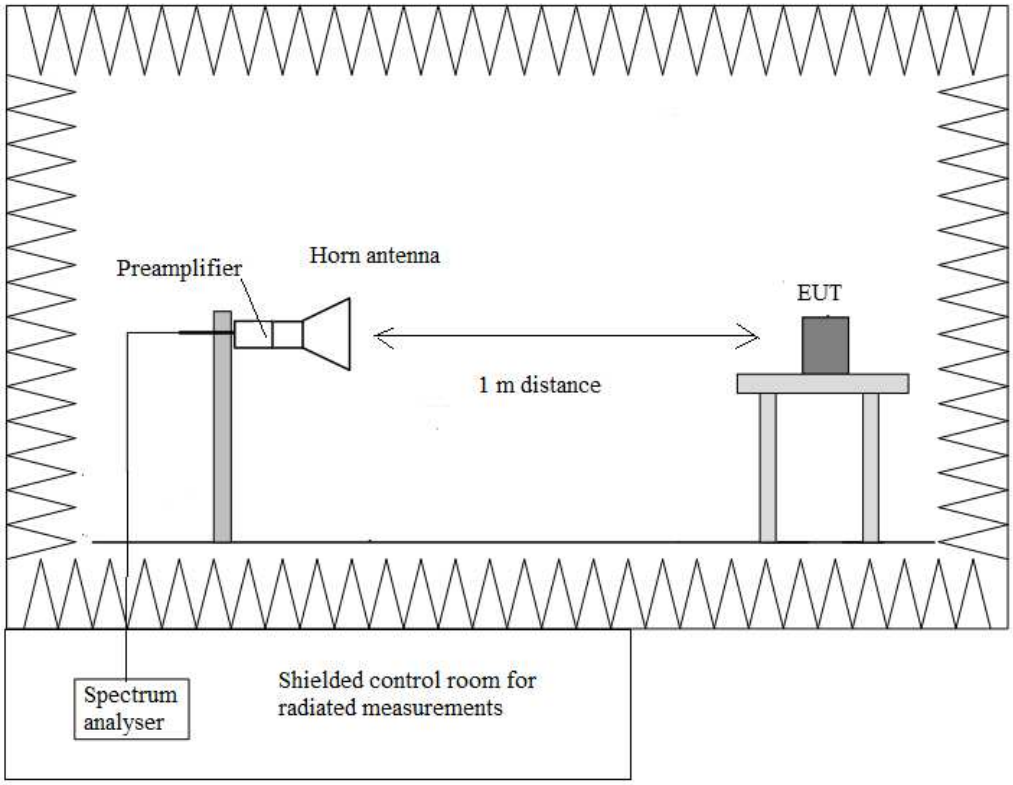
Radiated measurements setup from 30 MHz to 1 GHz:



Radiated measurements setup from 1 GHz to 17 GHz:



Radiated measurements setup f > 17 GHz:



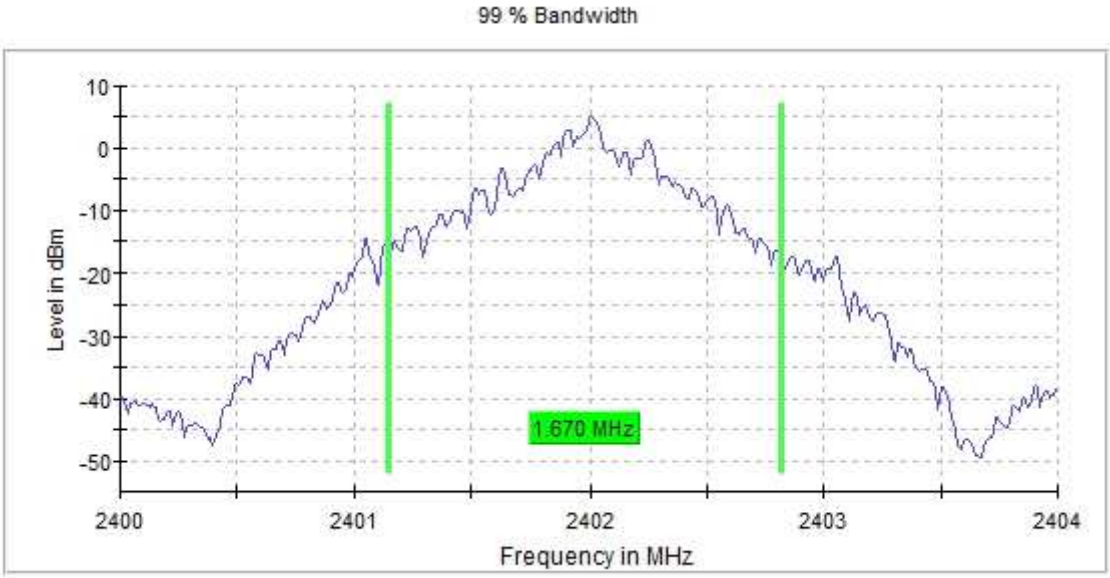
Occupied Bandwidth

RESULTS:

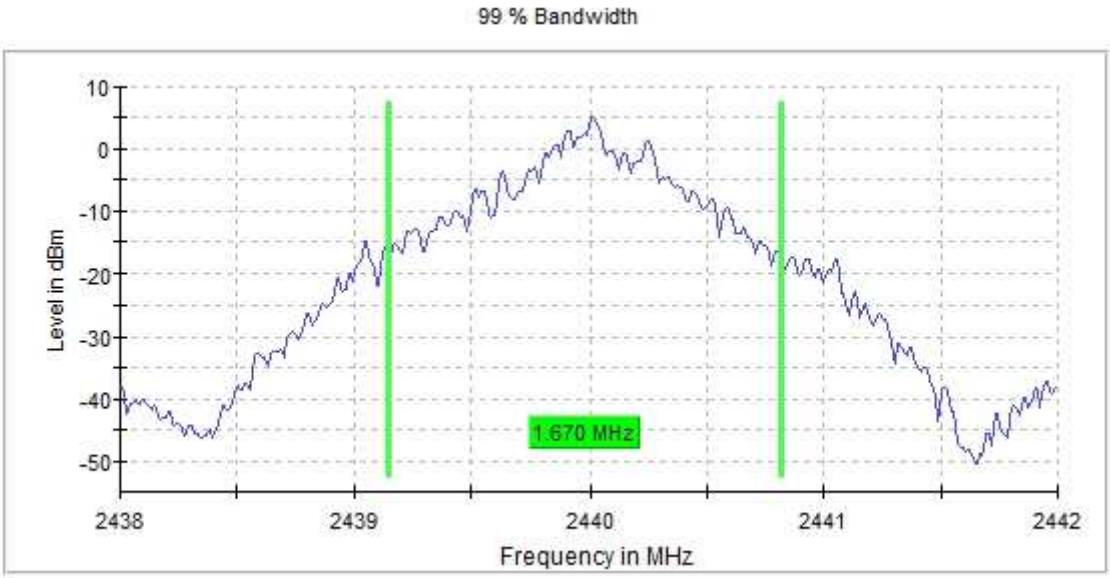
- **Proximity:**

	Low Channel 2402 MHz	Middle Channel 2440 MHz	High Channel 2480 MHz
99% bandwidth (MHz)	1.670000	1.670000	1.670000
Measurement uncertainty (%)	<± 1.17		

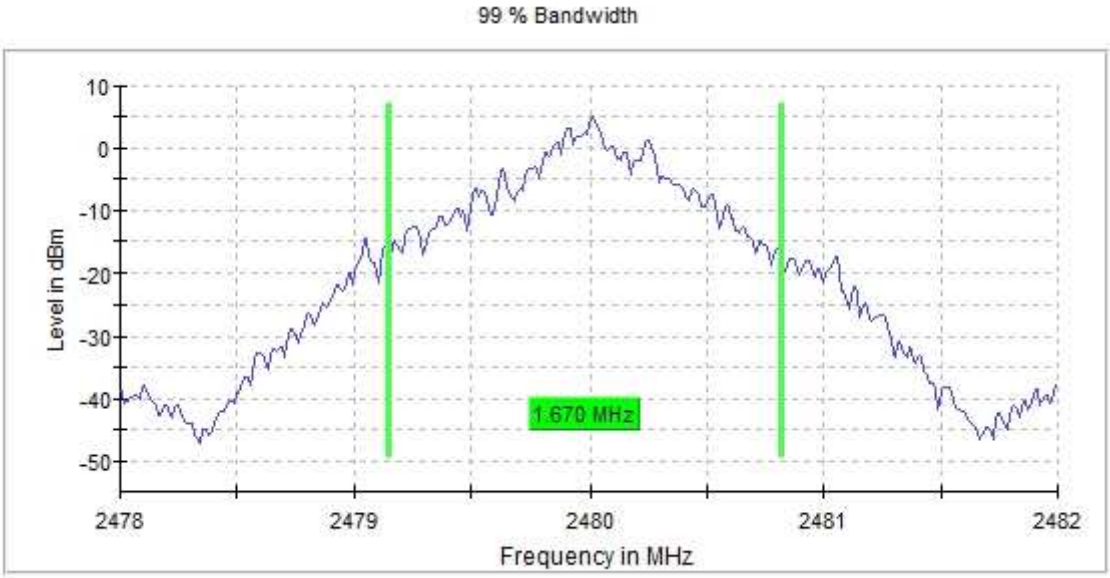
- Low Channel:



- Middle 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.

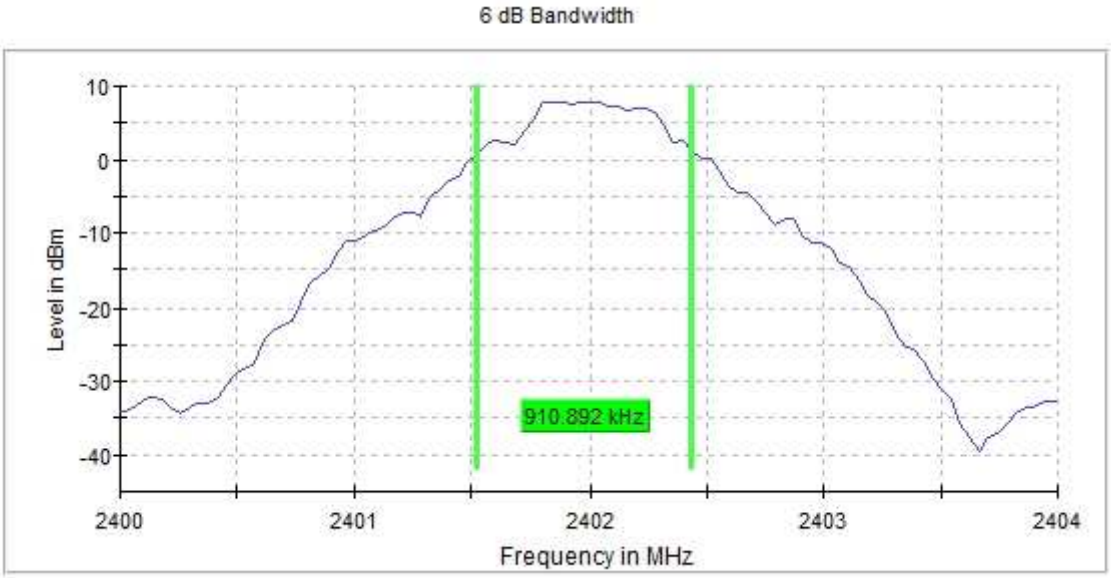
RESULTS:

- **Proximity:**

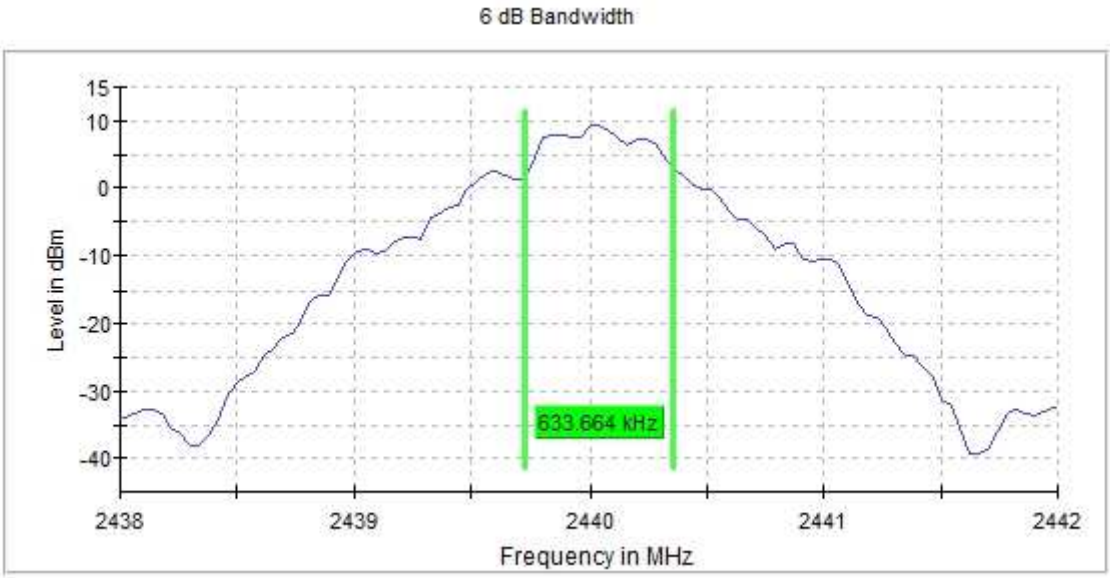
	Low Channel 2402 MHz	Middle Channel 2440 MHz	High Channel 2480 MHz
6 dB Spectrum bandwidth (MHz)	0.910892	0.633664	0.712872
Measurement uncertainty (%)	<±2.84		

Verdict: PASS

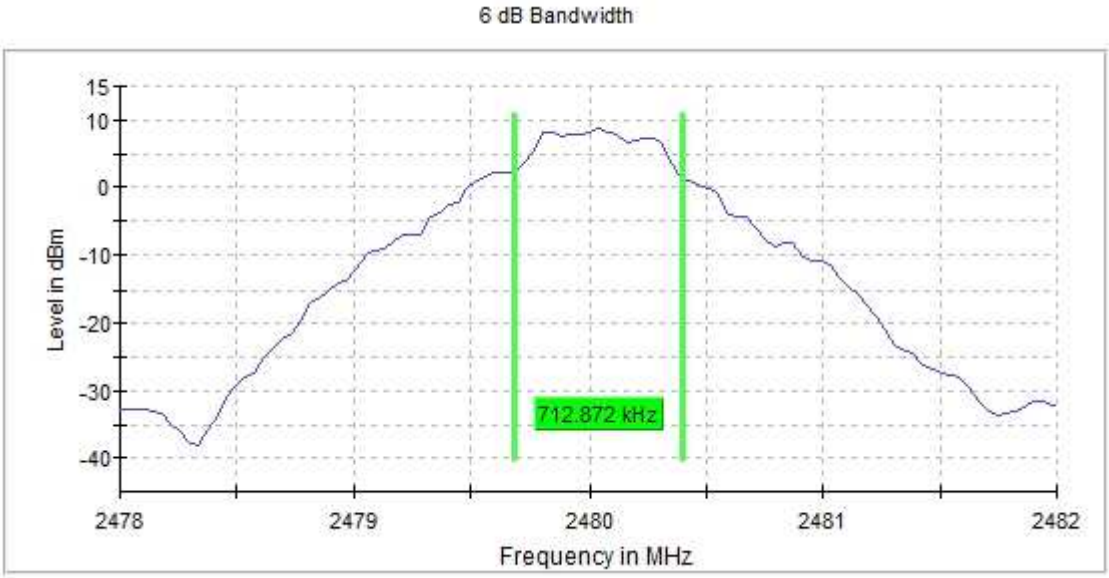
- Low Channel:



- Middle 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 2400-2483.5 MHz band: 1 watt (30 dBm).
The e.i.r.p. shall not exceed 4 W (36 dBm) (Canada).

RESULTS:

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: -7.4 dBi

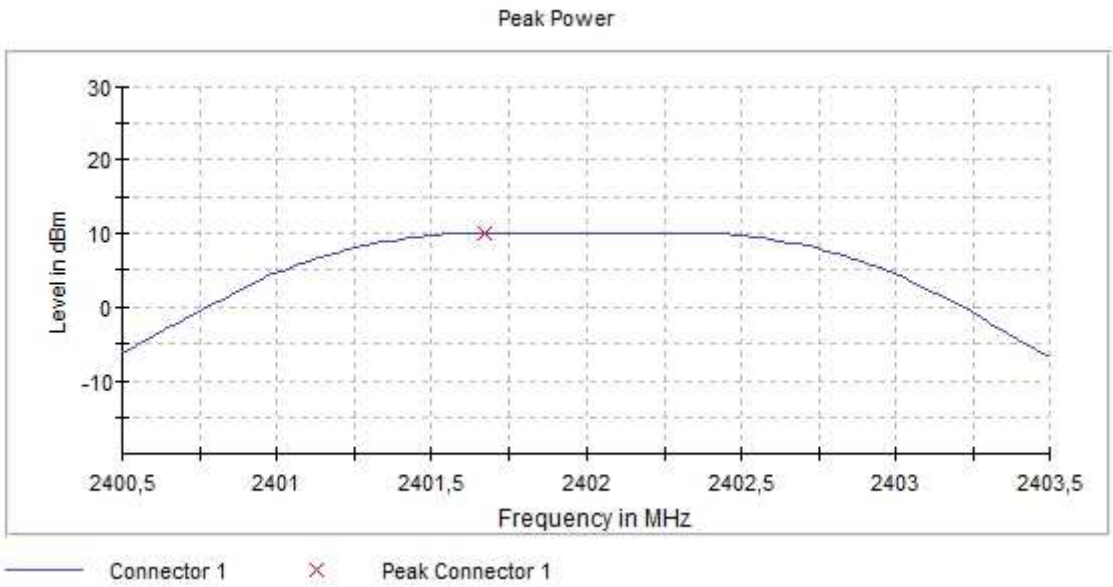
- **Proximity:**

	Low Channel 2402 MHz	Middle Channel 2440 MHz	High Channel 2480 MHz
Maximum Conducted Power (dBm)	10.0	9.9	10.1
Maximum EIRP Power (dBm)	2.6	2.5	2.7
Measurement uncertainty (dB)	<±0.80		

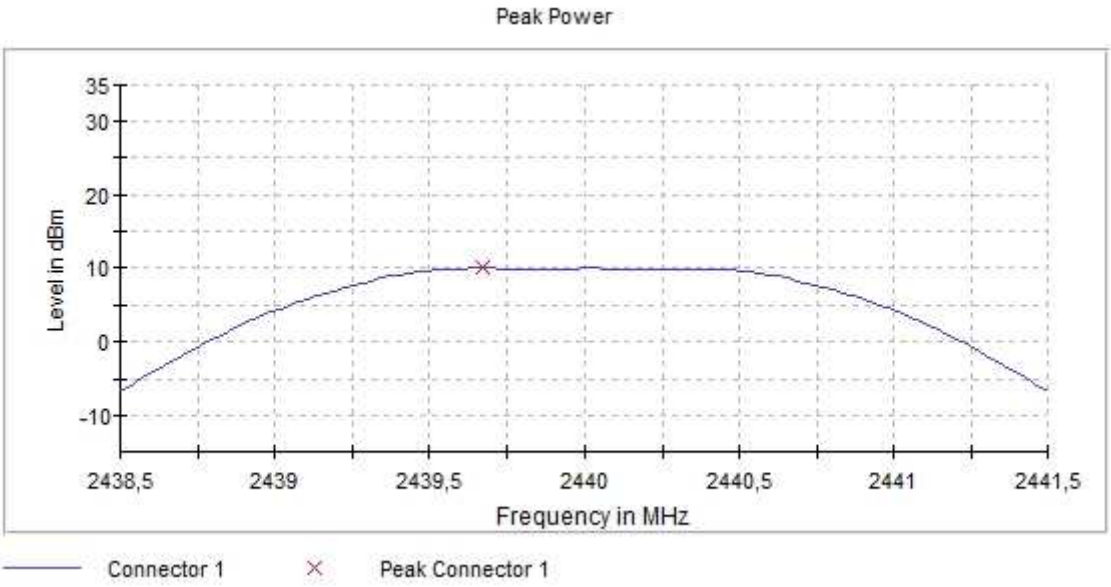
The maximum directional gain of the antenna is less than 6 dBi and therefore the maximum output power is not required to be reduced from the stated values.

Verdict: PASS

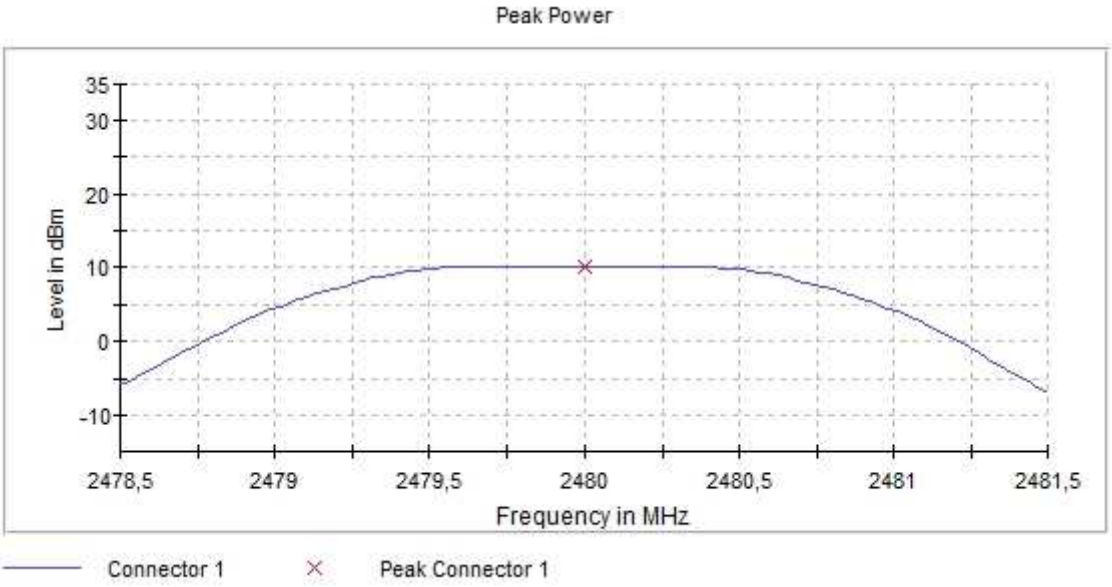
- Low Channel:



- Middle Channel:



- High Channel:



FCC 15.247 (d) / RSS-247 5.5. Band-Edge Emissions Compliance (Transmitter)

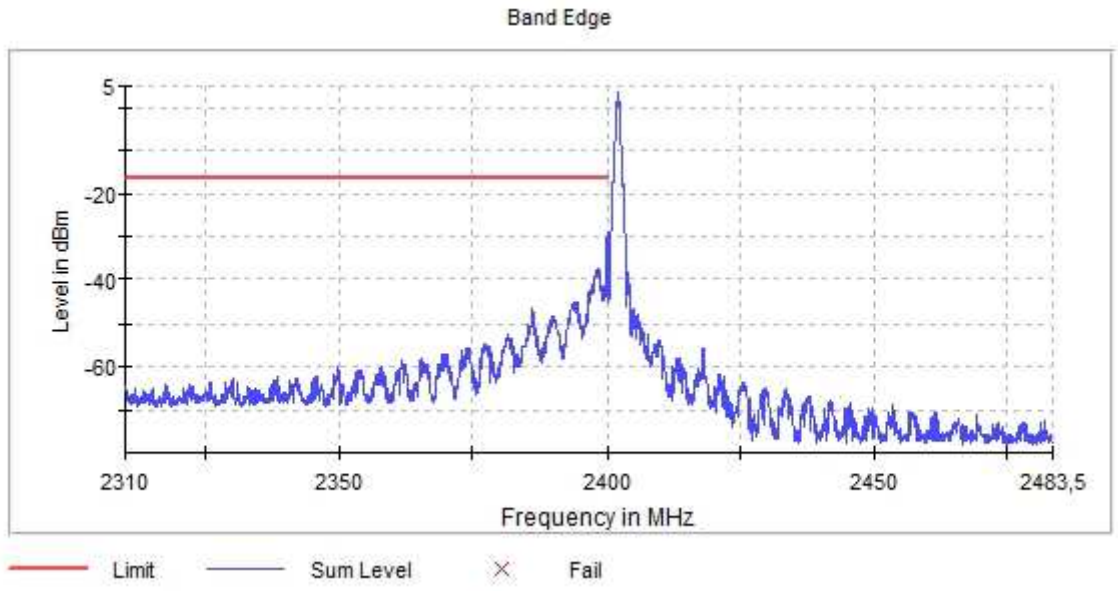
SPECIFICATION:

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:

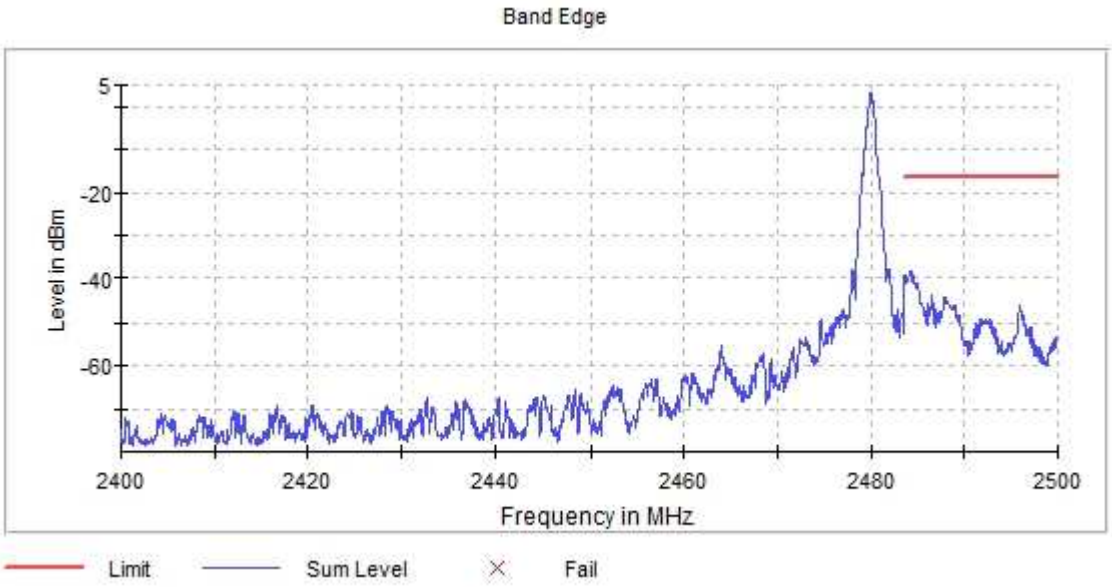
- **Proximity:**

- Low Channel:



Measurement uncertainty (dB)	<±1.53

- High Channel:



Measurement uncertainty (dB)	<±1.53

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:

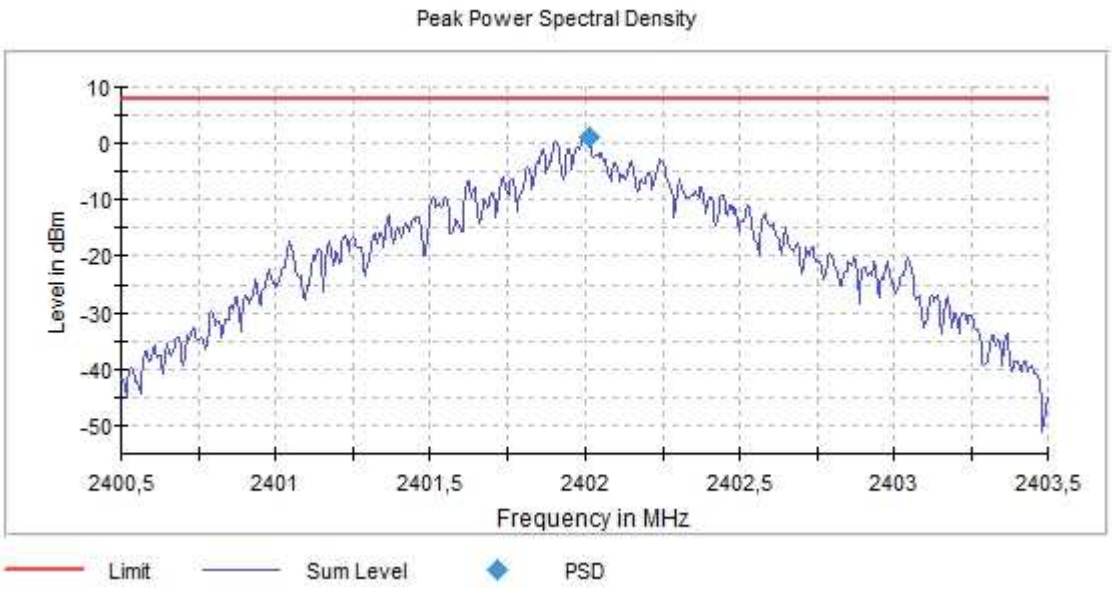
The maximum power spectral density level in the fundamental emission was measured using the method according to point 11.10.2." Method PKPSD (peak PSD)" of ANSI C.63.10-2013.

- **Proximity:**

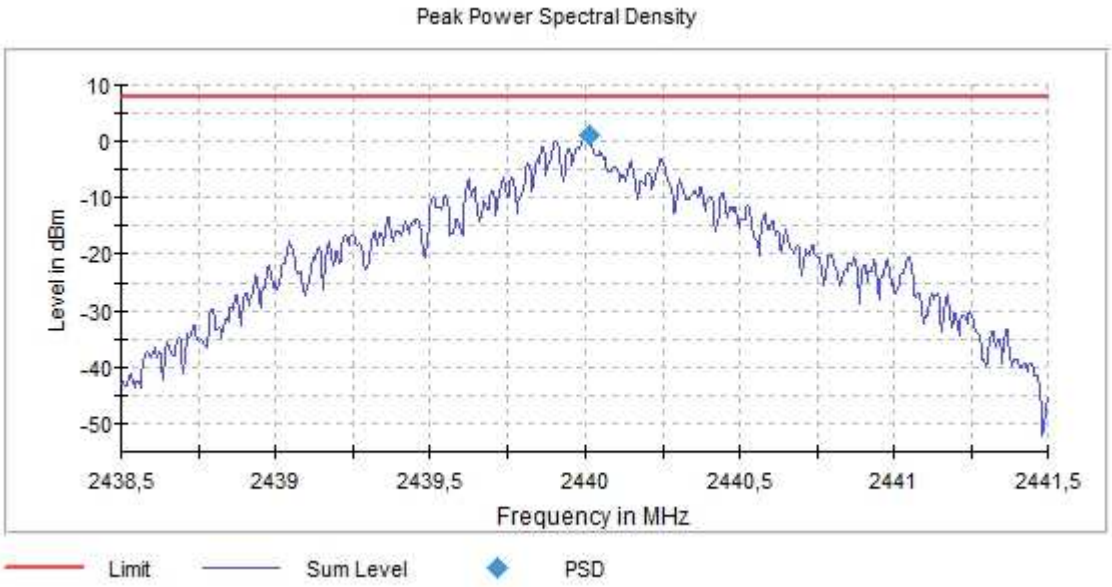
	Low Channel 2402 MHz	Middle Channel 2440 MHz	High Channel 2480 MHz
Power Spectral Density (dBm)	1.057	1.034	1.176
Measurement uncertainty (dB)	<±0.99		

Verdict: PASS

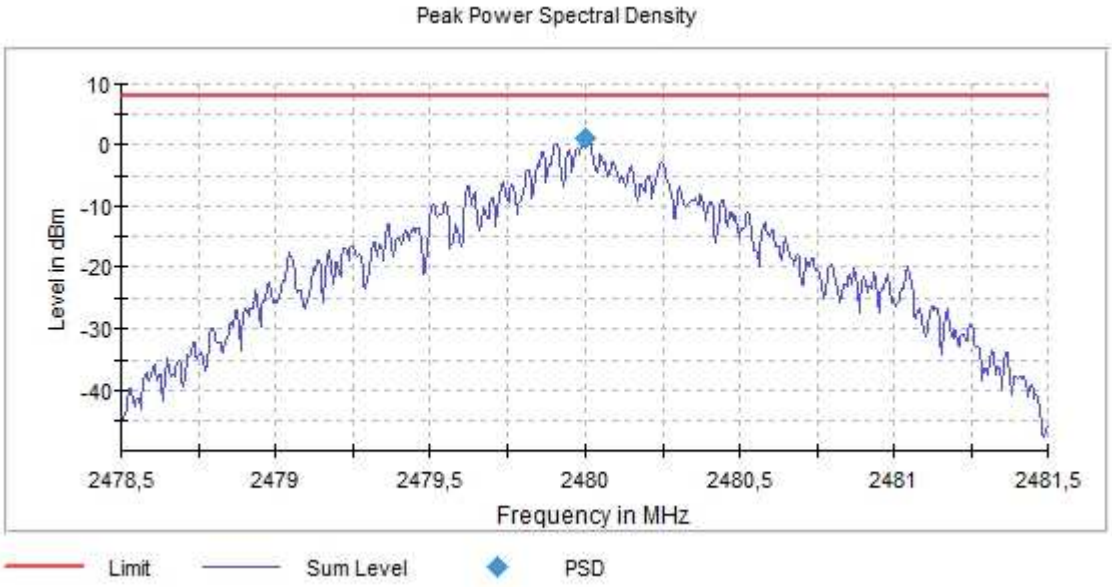
- Low Channel:



- Middle 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 (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
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 360º 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-17 GHz and at distance of 1 m for the frequency range 17 GHz-26 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 (worst-case):

The spurious frequencies detected do not depend neither on the operating channel nor the modulation mode.

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

Measurement Uncertainty (dB) <± 5.08

Frequency range 1 - 26 GHz:

The results in the next tables show the maximum measured levels in the 1-26 GHz range including the restricted bands 2.31-2.39 GHz and 2.4835-2.5 GHz.

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

- **Proximity:**

- LOW CHANNEL. Spurious frequencies detected at less than 20 dB below the limit:

Spurious Frequency (MHz)	Emission Level (dBµV/m)	Polarization	Detector
2354.333333	55.28	V	Peak
	44.76		Average
2489.333333	55.32	V	Peak
	44.64		Average
4804.000000	48.10	V	Peak
7206.500000	60.40	V	Peak
	47.21		Average
9609.500000	53.99	V	Peak
10688.000000	53.33	V	Peak

- MIDDLE CHANNEL. Spurious frequencies detected at less than 20 dB below the limit:

Spurious Frequency (MHz)	Emission Level (dBµV/m)	Polarization	Detector
2376.133333	55.00	H	Peak
	44.80		Average
2493.333333	55.41	V	Peak
	44.71		Average
4880.000000	58.95	V	Peak
	47.21		Average
7319.500000	60.43	V	Peak
	46.36		Average
12201.500000	55.56	V	Peak
	43.05		Average

- HIGH CHANNEL. Spurious frequencies detected at less than 20 dB below the limit:

Spurious Frequency (MHz)	Emission Level (dBµV/m)	Polarization	Detector
2384.066667	55.54	H	Peak
	44.60		Average
2484.400000	65.82	V	Peak
	48.72		Average
4959.000000	48.98	V	Peak
7439.000000	56.18	V	Peak
	43.16		Average
12234.500000	53.30	V	Peak

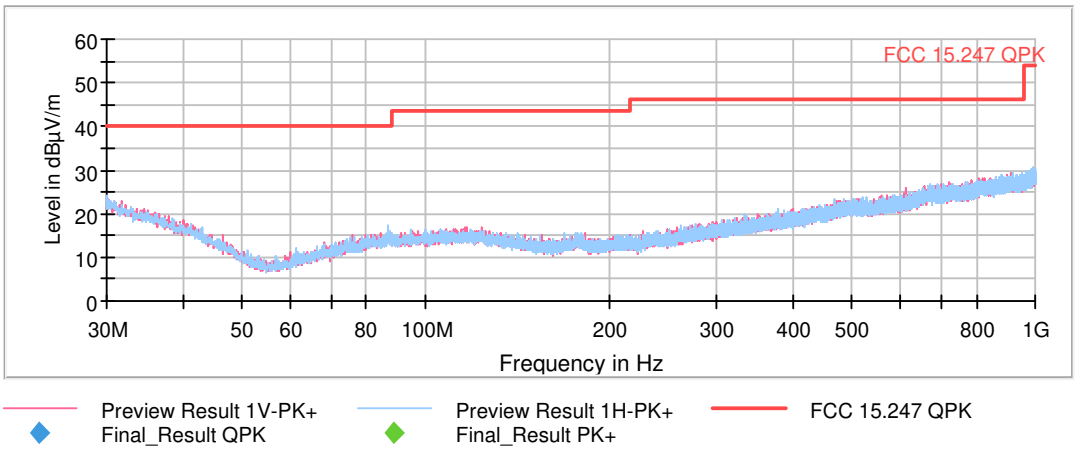
Measurement Uncertainty (dB): $<\pm$ 5.13 for $1< f < \leq 17$ GHz
$<\pm$ 4.82 for $17< f \leq 26$ GHz

Verdict: PASS

- **Proximity:**

FREQUENCY RANGE 30 MHz - 1 GHz (worst-case):

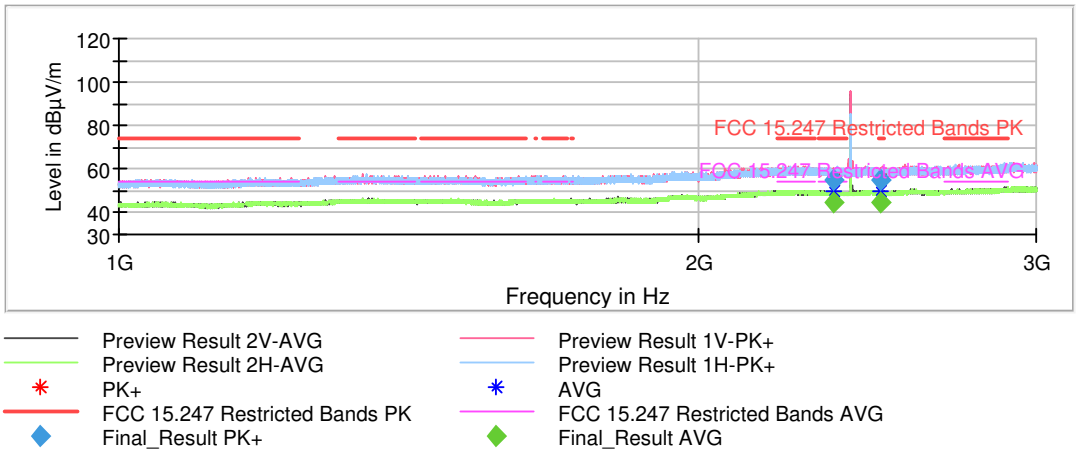
The spurious frequencies detected do not depend neither on the operating channel nor the modulation mode.



This plot is valid for the Low, Middle and High Channels.

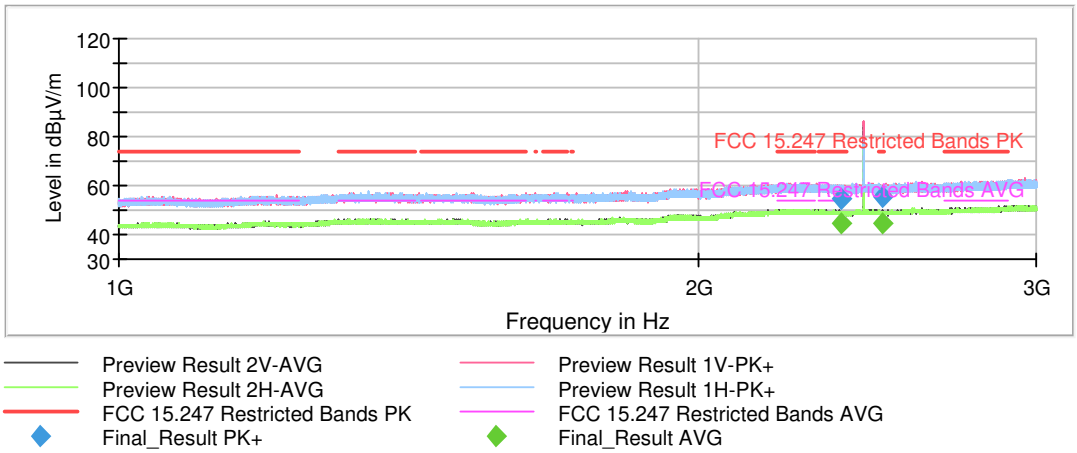
FREQUENCY RANGE 1 - 3 GHz:

- Low Channel:



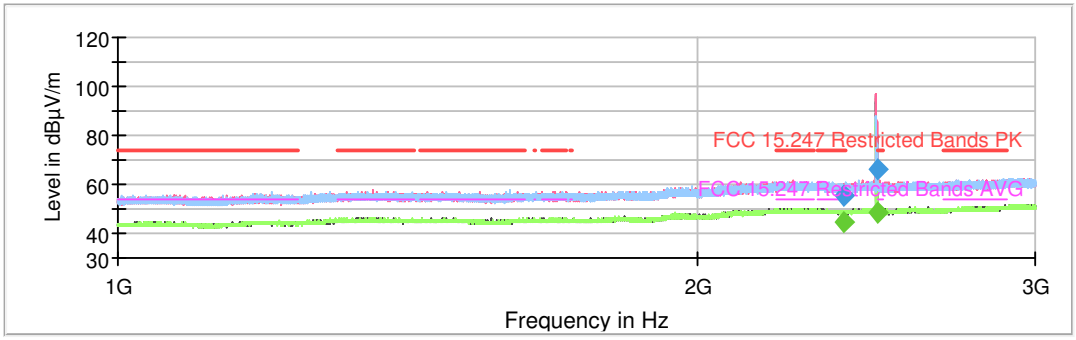
The peak above the limit is the carrier frequency.

- Middle Channel:



The peak above the limit is the carrier frequency.

- High Channel:

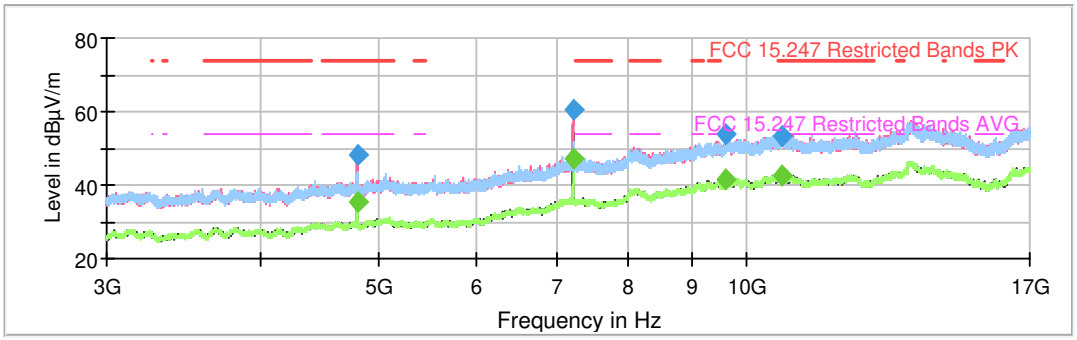


Preview Result 2V-AVG
Preview Result 2H-AVG
FCC 15.247 Restricted Bands PK
Final_Result PK+
Preview Result 1V-PK+
Preview Result 1H-PK+
FCC 15.247 Restricted Bands AVG
Final_Result AVG

The peak above the limit is the carrier frequency.

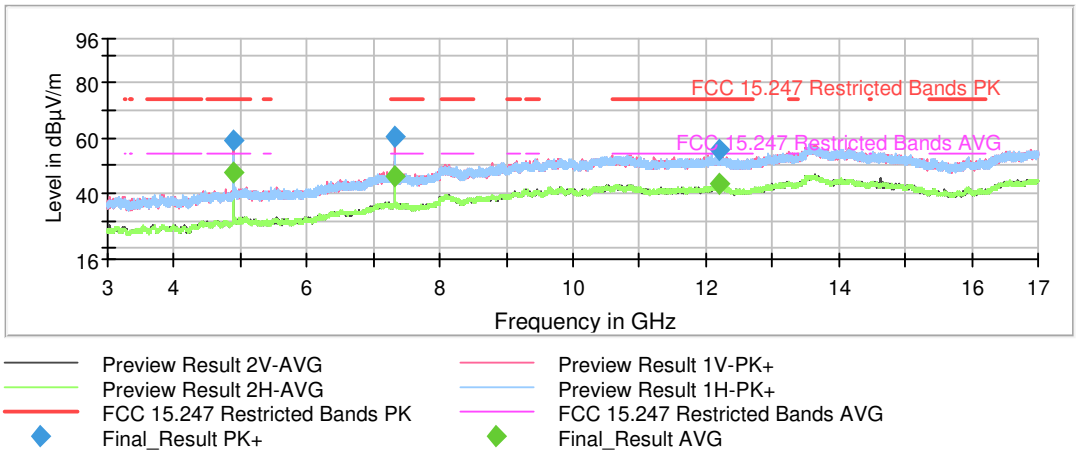
FREQUENCY RANGE 3 - 17 GHz:

- Low Channel:

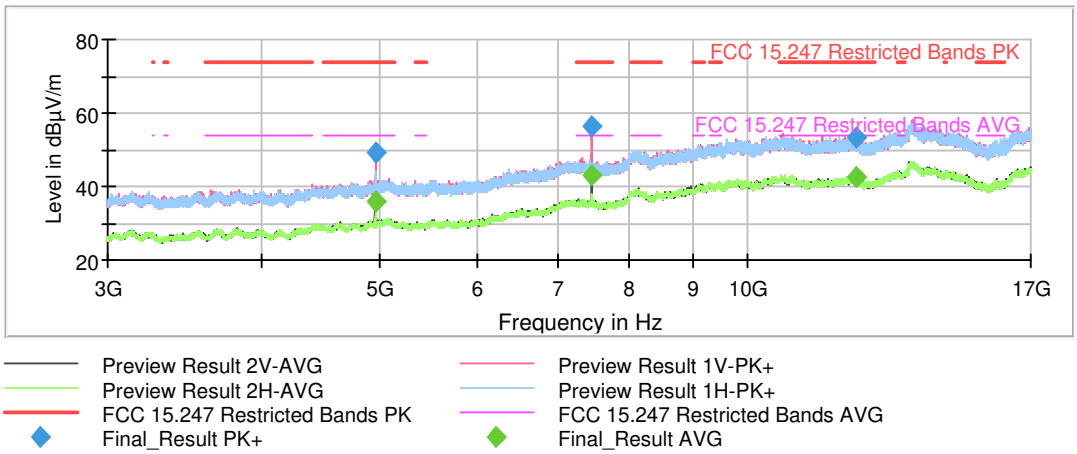


Preview Result 2V-AVG
Preview Result 2H-AVG
FCC 15.247 Restricted Bands PK
Final_Result PK+
Preview Result 1V-PK+
Preview Result 1H-PK+
FCC 15.247 Restricted Bands AVG
Final_Result AVG

- Middle Channel:

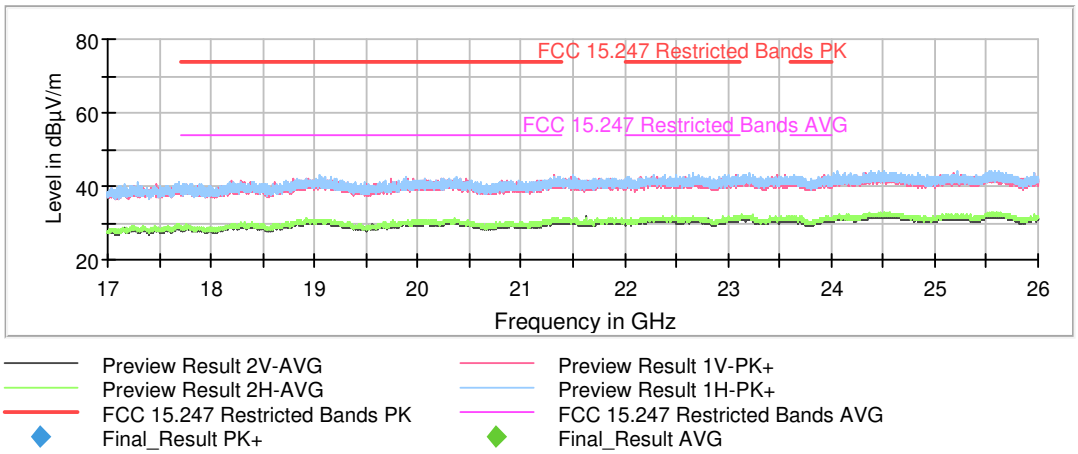


- High Channel:



FREQUENCY RANGE 17 - 26 GHz:

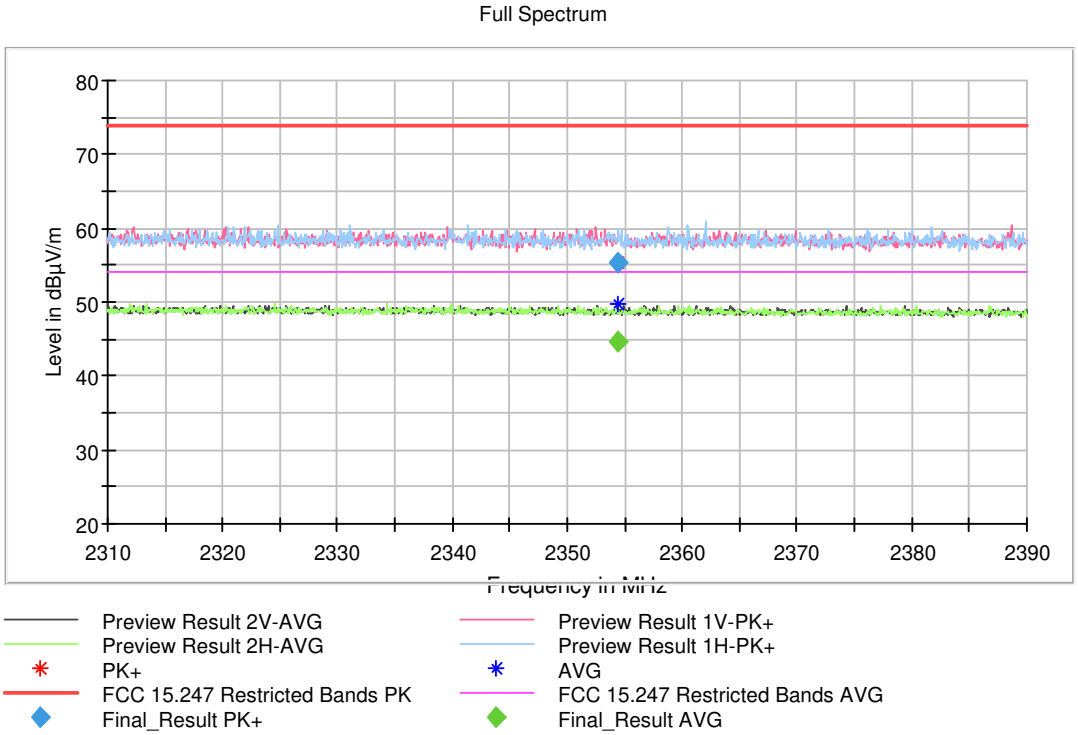
The spurious frequencies detected do not depend on the operating channel.



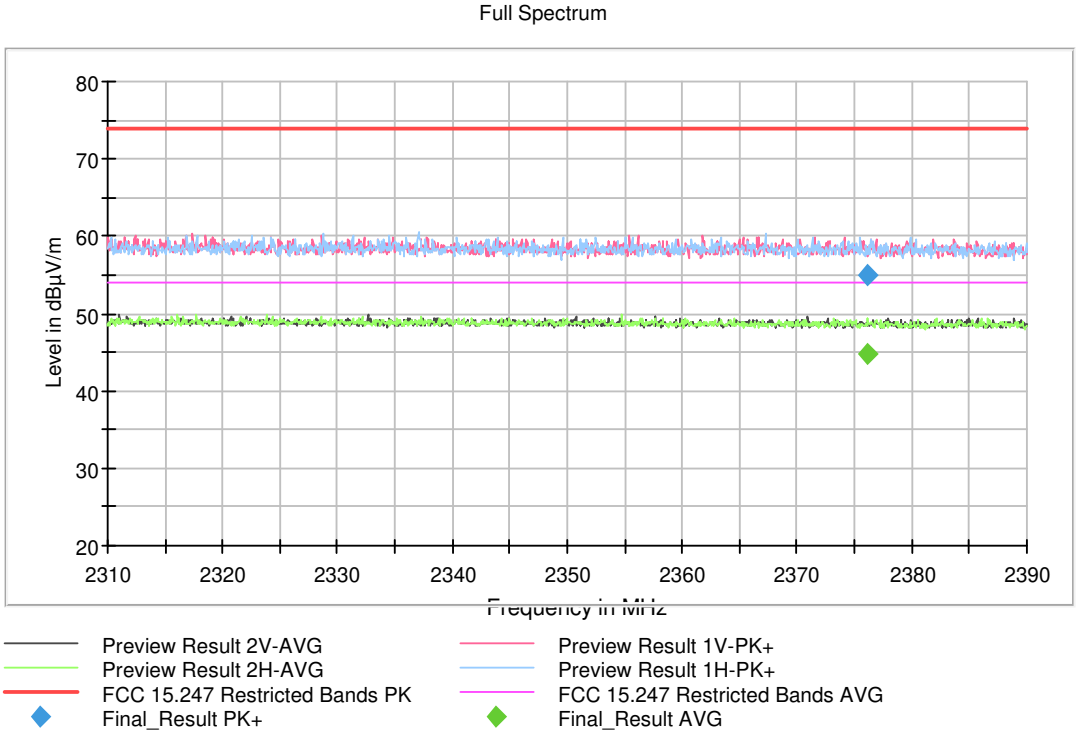
This plot is valid for the Low, Middle and High Channels.

FREQUENCY RANGE 2.31-2.39 GHz:

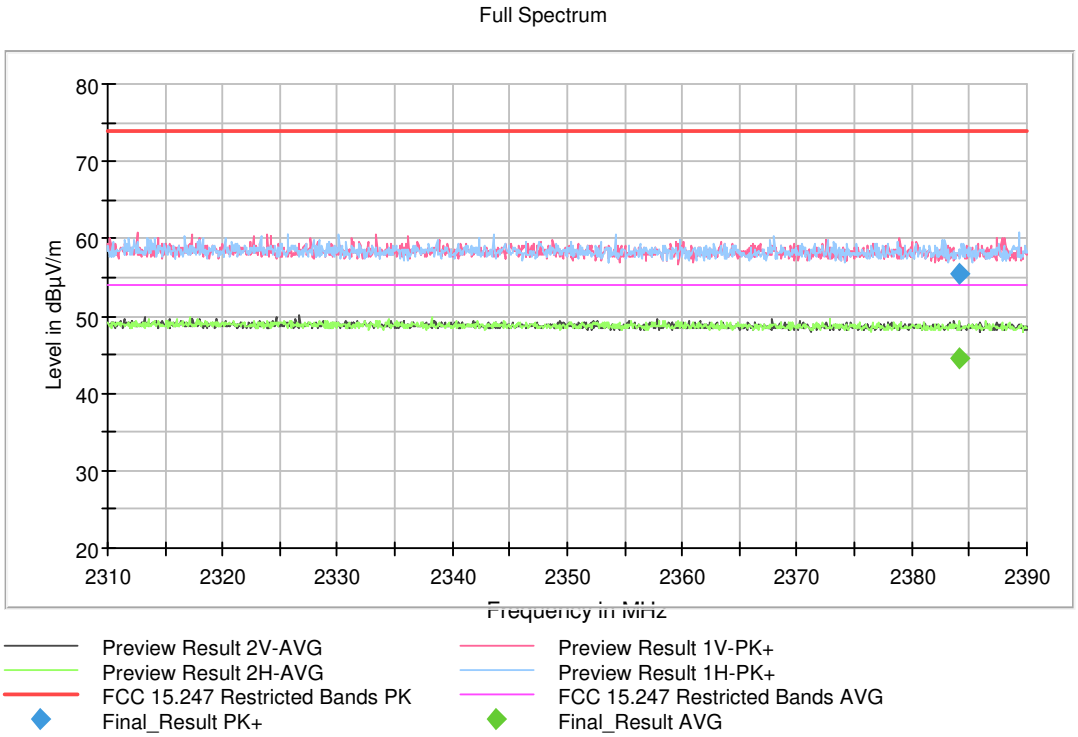
- Low Channel:



- Middle Channel:

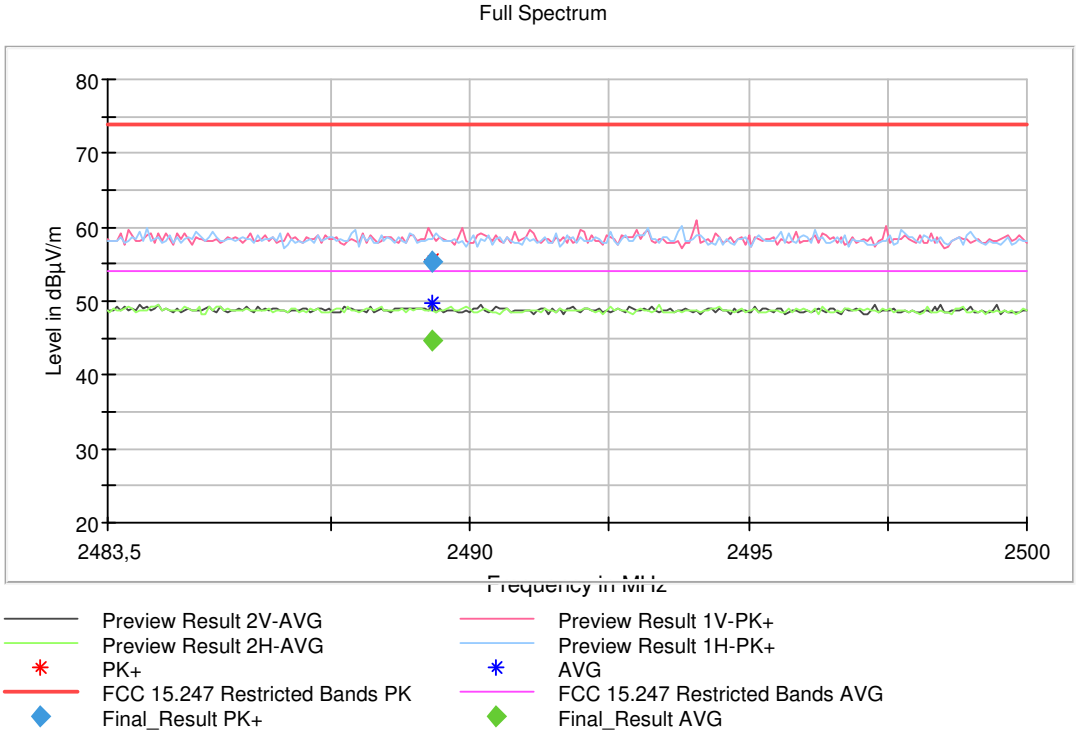


- High Channel:

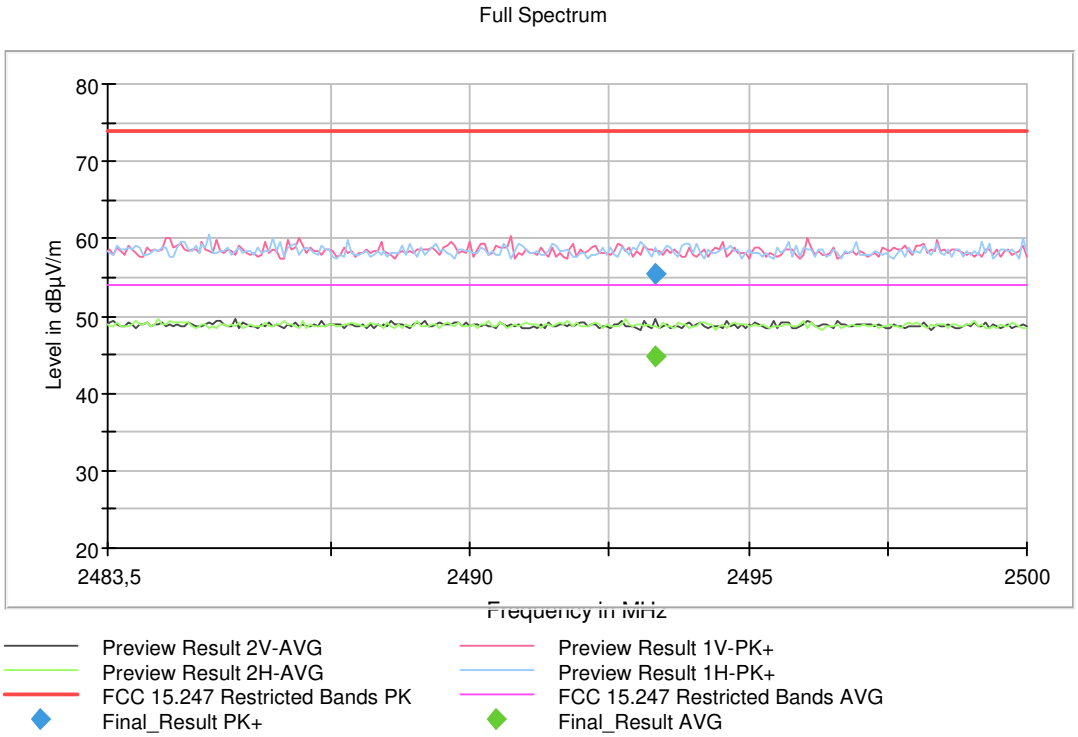
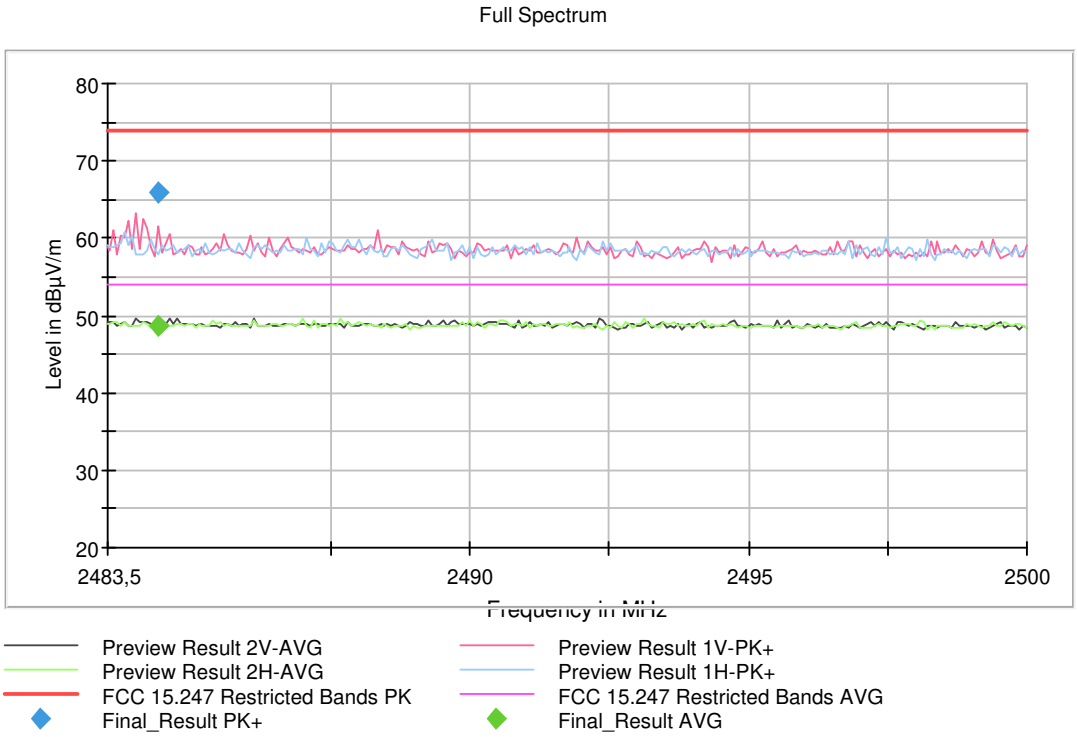


FREQUENCY RANGE 2.4835-2.5 GHz:

- Low Channel:



- Middle Channel:



- High Channel: