

ISED CABid: ES1909

Lab. Company Number: 4621A

Test Report No:

76170RRF.002A1

Test Report

USA FCC Part 15.247, 15.209

CANADA RSS-247, RSS-Gen

(*) Identification of item tested	Noahlink Wireless 2, a hearing instrument programming interface.
(*) Trademark	Noahlink Wireless 2
(*) Model and /or type reference	CPD-2
Other identification of the product	FCC ID: 2AH4DCPD-2 IC: 21381-CPD2
(*) Features	Bluetooth LE HW version: NLW2-PS SW version: Test FW w HCI
Applicant	HIMSA II K/S Lyngbyvej 28, 1 DK-2100 Copenhagen Ø, DENMARK
Test method requested, standard	USA FCC Part 15.247 (10-1-21 Edition): Operation within the bands 902 - 928 MHz, 2400 -2483.5 MHz, and 5725 - 5850 MHz. USA FCC Part 15.209 (10-1-21 Edition): Radiated emission limits; general requirements. CANADA RSS-247 Issue 2 (February 2017). CANADA RSS-Gen Issue 5 amendment 2 (February 2021). Guidance for Performing Compliance Measurements on Digital Transmission System, Frequency Hopping Spread Spectrum System, and Hybrid Systems Devices Operating Under Section 15.247 of the FCC Rules. 558074 D01 Meas Guidance v05r02 dated April 2, 2019. ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices.
Summary	IN COMPLIANCE
Approved by (name / position & signature)	José Manuel Gómez Galván EMC Consumer & RF Lab. Manager
Date of issue	2023-11-08
Report template No	FDT08_24 (*) "Data provided by the client"

Index

INDEX	2
ACRONYMS	3
COMPETENCES AND GUARANTEES	3
GENERAL CONDITIONS	4
UNCERTAINTY	4
DATA PROVIDED BY THE CLIENT	4
USAGE OF SAMPLES	5
TEST SAMPLE DESCRIPTION	6
IDENTIFICATION OF THE CLIENT	7
TESTING PERIOD AND PLACE	7
DOCUMENT HISTORY	7
ENVIRONMENTAL CONDITIONS	7
REMARKS AND COMMENTS	8
LIST OF EQUIPMENT USED DURING THE TEST	8
TESTING VERDICTS	9
SUMMARY	9
APPENDIX A: TEST RESULTS. BLUETOOTH LOW ENERGY 5.0 (1M, 2M)	10

Acronyms

Acronym ID	Acronym Description
BW	Bandwidth
Detector	Detector used
Ebw	Emission Bandwidth
Equipment	Equipment Type
Freq	Frequency
Freq Rng	Frequency Range
Inband Peak Lvl	Inband Peak Level
Lvl	Level
MP	Measurement Point
Mod	Modulation
Mode	MIMO Mode
Occ Ch BW	Occupied Channel Bandwidth
PSD	Power Spectrum Density
PeakPower	Maximum Peak Conducted Output Power
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.

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.

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 S.A.U.

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.

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 radiated emissions of EUT from 17 GHz to 26 GHz is:
Measurement uncertainty $\leq \pm 5,51$ 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

Power Spectral Density: Measurement uncertainty $\leq \pm 0,99$ dB

6dB Bandwidth: Measurement uncertainty $\leq \pm 2,84$ %

Occupied Channel Bandwidth: Measurement uncertainty $\leq \pm 1,17$ %

Conducted Band-edge spurious emissions: Measurement uncertainty $\leq \pm 1,76$ 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 a Noahlink Wireless 2, a hearing instrument programming interface. Noahlink Wireless 2 is a hearing instrument programming interface based on the Bluetooth Low Energy (BLE) standard.

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	76170B_3.1	Noahlink Wireless 2	--	2383000179	2023-07-03	Element Under Test
	76170B_2.1	USB Cable	--	--	2023-07-03	Element Under Test
S/02	76170B_3.1	Noahlink Wireless 2	--	2383000179	2023-07-03	Element Under Test
	76170B_2.1	USB Cable	--	--	2023-07-03	Element Under Test
	76170B_9.1	Cable SMA (Antena)			2023-08-11	Auxiliary Element

Notes referenced to samples during the project:

Id	Type
S/01	Sample used for radiated test
S/02	Sample used for conducted test

Test sample description

Ports..... :	Port name and description		Cable				
			Specified max length [m]	Attached during test	Shielded	Coupled to patient ⁽³⁾	
	USB port		[]	[]	[]		
.....		[]	[]	[]			
Supplementary information to the ports..... :							
Rated power supply	Voltage and Frequency			Reference poles			
				L1	L2	L3	N
	[]	AC:	[]	[]	[]	[]	[]
[X]	DC: 5 V						
Rated Power	USB powered max 100 mA						
Clock frequencies..... :							
Other parameters							
Software version	Test FW w HCI						
Hardware version	NLW2-PS						
Dimensions in cm (W x H x D)							
Mounting position	[X]	Table top equipment					
	[]	Wall/Ceiling mounted equipment					
	[]	Floor standing equipment					
	[]	Hand-held equipment					
	[]	Other:					
Modules/parts..... :	Module/parts of test item			Type		Manufacturer	
	Noahlink Wireless			Test unit		HIMSA	
							
Accessories (not part of the test item)	Description			Type		Manufacturer	
	USB-C Cable			cable		(HIMSA)	
							
Documents as provided by the applicant..... :	Description			File name		Issue date	
							

⁽³⁾ Only for Medical Equipment

Identification of the client

HIMSA II K/S
Lyngbyvej 28, 1.
DK-2100 Copenhagen Ø, DENMARK

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2023-07-11
Date (finish)	2023-08-29

Document history

Report number	Date	Description
76170RRF.002	2023-09-19	First release.
76170RRF.002A1	2023-11-08	Modification 1. The “FCC ID: 2AH4D-CPD2” is replaced by “FCC ID: 2AH4DCPD-2”. This report cancels and replaces report 76170RRF.002.

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: Victoria Olmedo Villalba.

List of equipment used during the test

Control No.	Equipment	Model	Manufacturer	Next Calibration
8130	SEMIANECHOIC ABSORBER LINED CHAMBER	P29419	ALBATROSS PROJECTS GMBH	N/A
8134	SHIELDED ROOM	P29419	ALBATROSS PROJECTS GMBH	N/A
2932	HYBRID BILOG ANTENNA 30MHz-6GHz	JB6	SUNOL SCIENCES CORPORATION	2023-10-29
5862	EMI TEST RECEIVER 9kHz-7GHz	ESR7	ROHDE AND SCHWARZ	2025-02-15
7763	HORN ANTENNA 1-18GHz	BBHA 9120D	SCHWARZBECK MESS-ELEKTRONIK	2026-01-16
6495	HORN ANTENNA 18-40GHz	BBHA 9170	SCHWARZBECK	2024-03-19
7862	PRE-AMPLIFIER G>30dB 18-40GHz	BLMA 1840-3G	BONN ELEKTRONIK	2024-03-14
7769	PREAMPLIFIER 30dB 500MHz-18GHz	BBV 9718 C	SCHWARZBECK	2024-02-15
4848	SOFTWARE FOR EMC/RF TESTING	EMC32	ROHDE AND SCHWARZ	N/A
8661	SHIELDED ROOM	-	SIEPEL	N/A
7039	OPEN SWITCH UNIT UP TO 6 GHz	OSP-B157W8	ROHDE & SCHWARZ	2025-05-25
6158	SIGNAL AND SPECTRUM ANALYZER 10Hz-40GHz	FSV40	ROHDE AND SCHWARZ	2023-10-22
7040	EXTENSION FOR OPEN SWITCH UNIT UP TO 40GHz	OSP-B157Wx	ROHDE AND SCHWARZ	2025-04-19
7798	WMS32	WMS32	ROHDE AND SCHWARZ	N/A
7549	TEMPERATURE AND HUMIDITY PROBE	HWg-STE	HW GROUP	2024-05-02
7550	TEMPERATURE AND HUMIDITY PROBE	HWg-STE	HW GROUP	2024-05-02

Testing verdicts

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

Summary

Bluetooth Low Energy 5.0 (1M, 2M).

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	-
<u>Supplementary information and remarks:</u>			
None			

Appendix A: Test results. Bluetooth Low Energy 5.0 (1M, 2M)

TEST CONDITIONS	12
TEST CASES DETAILS	15
<i>Occupied Channel Bandwidth 99%</i>	15
<i>RSS-247 5.2 (a) / FCC 15.247 (a) (2) 6 dB Bandwidth</i>	22
<i>RSS-247 5.2 (b) / FCC 15.247 (e) Power spectral density</i>	29
<i>RSS-247 5.4 (d) / FCC 15.247 (b) (3) Maximum Peak Conducted output power</i>	36
<i>RSS-247 5.5 / FCC 15.247 (d) Band-edge emissions compliance (Transmitter)</i>	43
<i>RSS-247 5.5 / FCC 15.247 (d) Emission limitations radiated (Transmitter)</i>	54

TEST CONDITIONS

(*): Data provided by the client.

POWER SUPPLY (*):

Vnominal: 5Vdc
Type of Power Supply: External power supply (USB power)

ANTENNA (*):

Type of Antenna: Integral antenna
Maximum Declared Antenna Gain: +3 dBi

TEST FREQUENCIES (*):

Modulation	Data rates	Low Channel:	Middle Channel	High Channel
BTLE GFSK	1M 1 Mbit/s	2402 MHz	2440 MHz	2480 MHz
BTLE GFSK	2M 2 Mbit/s	2402 MHz	2440 MHz	2480 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.

CONDUCTED MEASUREMENTS:

The equipment under test was set up in a shielded room and it is connected to the TS8997 using a low loss RF cable. The reading of the spectrum analyser is corrected taking into account the cable loss.



RADIATED MEASUREMENTS:

All radiated tests were performed in a semi-anechoic chamber. The measurement antenna (Bilog antenna for the range between 30 MHz to 1000 MHz and 1 GHz-17 GHz Double ridge horn antenna) is situated at a distance of 3 m and at a distance of 1.5 m for the frequency range 17 GHz-26 GHz (17 GHz-40 GHz horn antenna).

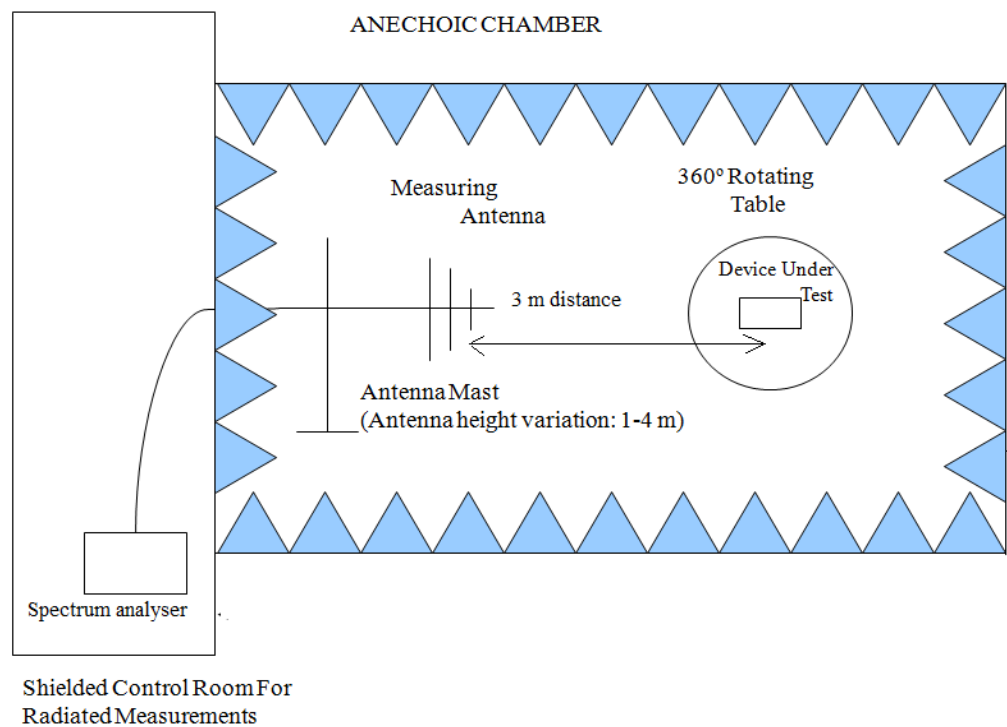
For radiated emissions in the range 17 GHz-26 GHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

The equipment under test was set up on a non-conductive platform above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360° and the antenna height (Bilog antenna and Double ridge horn antenna) was varied from 1 to 4 meters to find the maximum radiated emission.

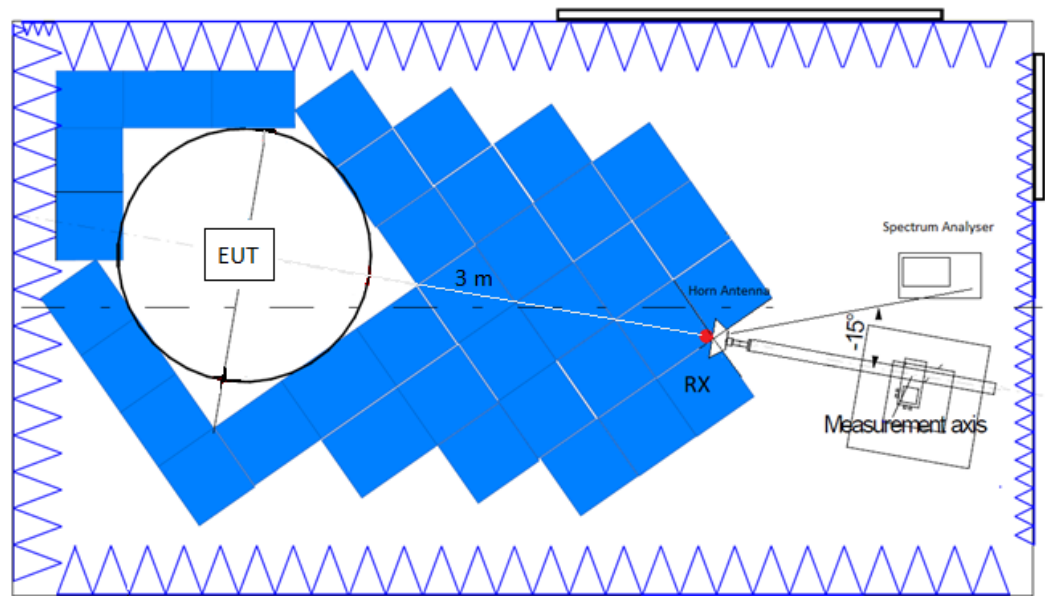
Measurements were made in both horizontal and vertical planes of polarization.

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

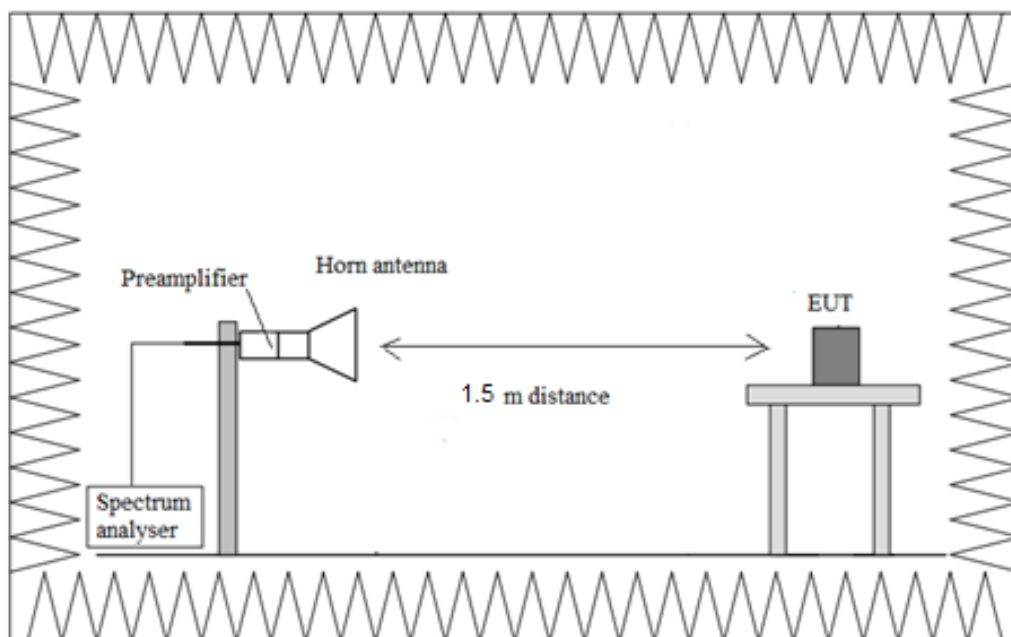
Radiated measurements setup from 30 MHz to 1 GHz:



Radiated measurements setup from 1 GHz to 17 GHz:



Radiated measurements setup $f > 17$ GHz:



TEST CASES DETAILS

Occupied Channel Bandwidth 99%

Results

Modulation: BTLE 5.0 (GFSK 1 Mbit/s)

Freq (MHz)	Occ Ch BW (MHz)
2402.00000	1.030
2440.00000	1.020
2480.00000	1.030

Modulation: BTLE 5.0 (GFSK 2 Mbit/s)

Freq (MHz)	Occ Ch BW (MHz)
2402.00000	2.050
2440.00000	2.030
2480.00000	2.050

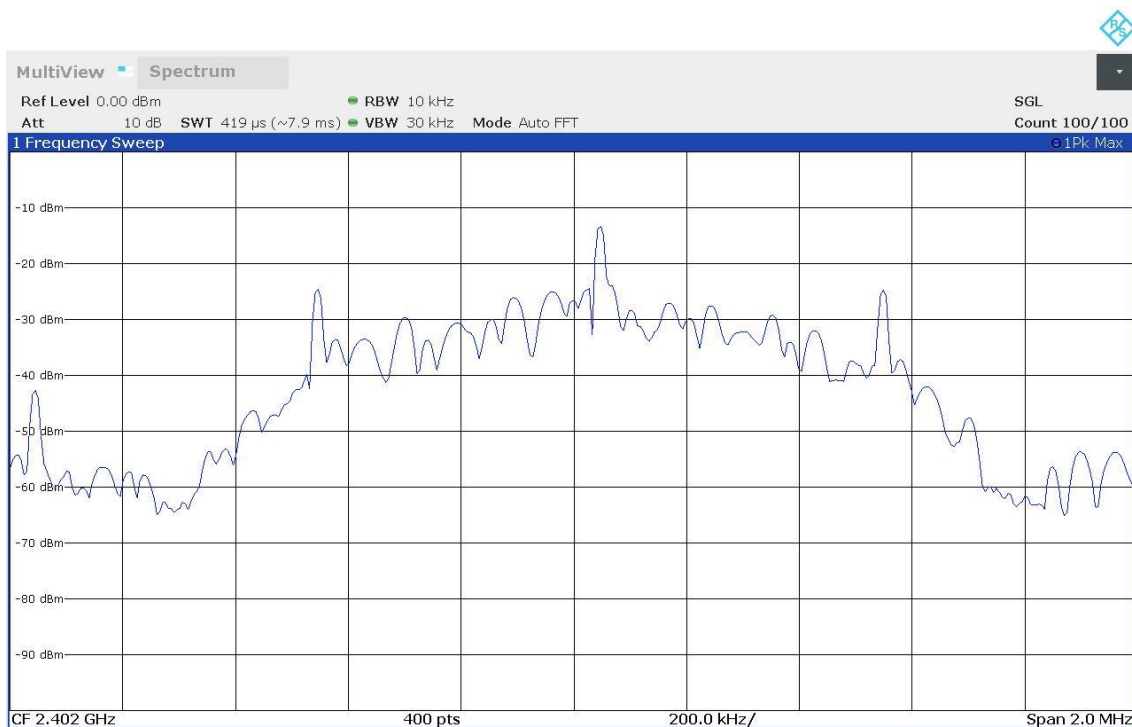
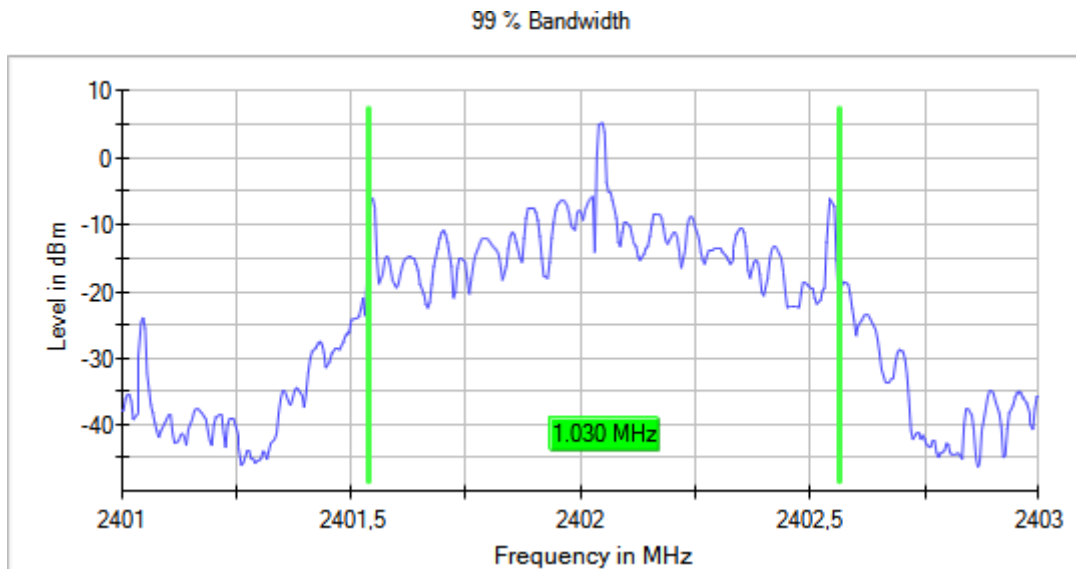
Verdict

Pass

Attachments

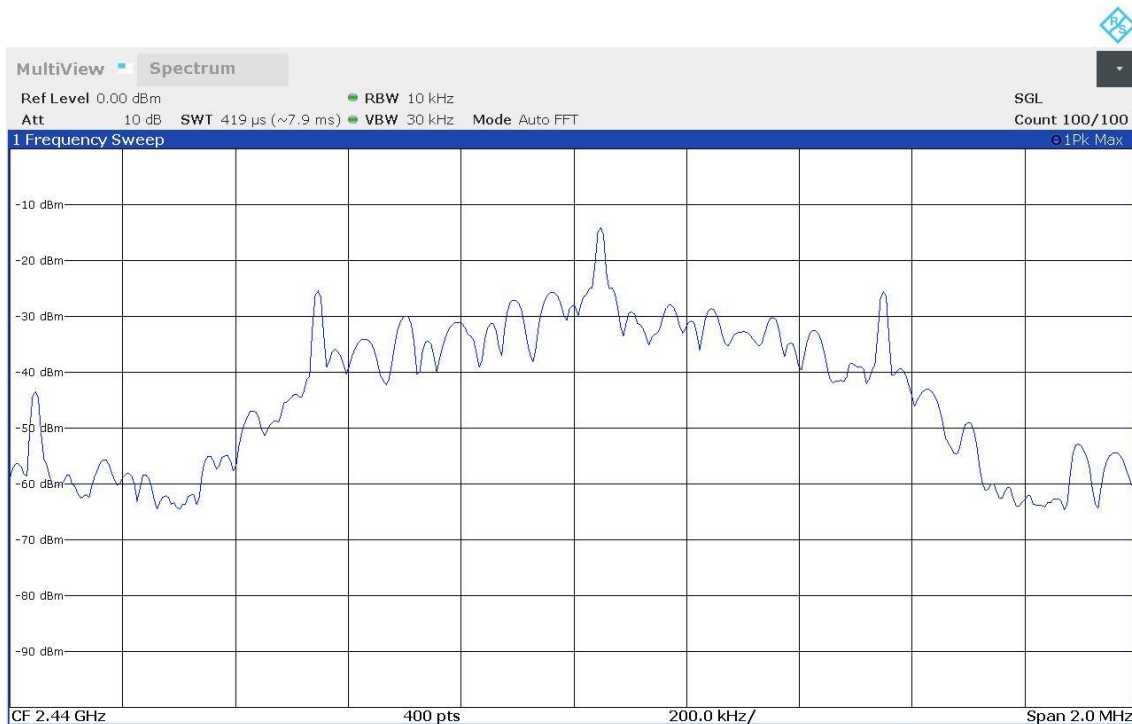
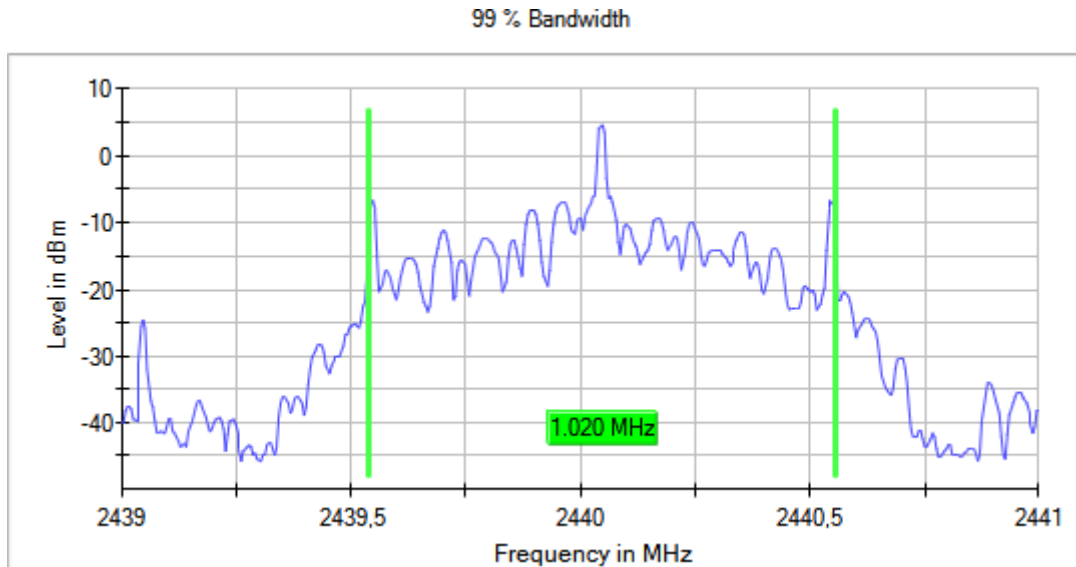
Equipment Type = Digital Transmission System (DTS) Bandwidth MHz = 1
Modulation = BTLE 5.0 (GFSK 1 Mbit/s) Frequency MHz = 2402.00000
MIMO Mode = SISO Active Port = 1

Images:



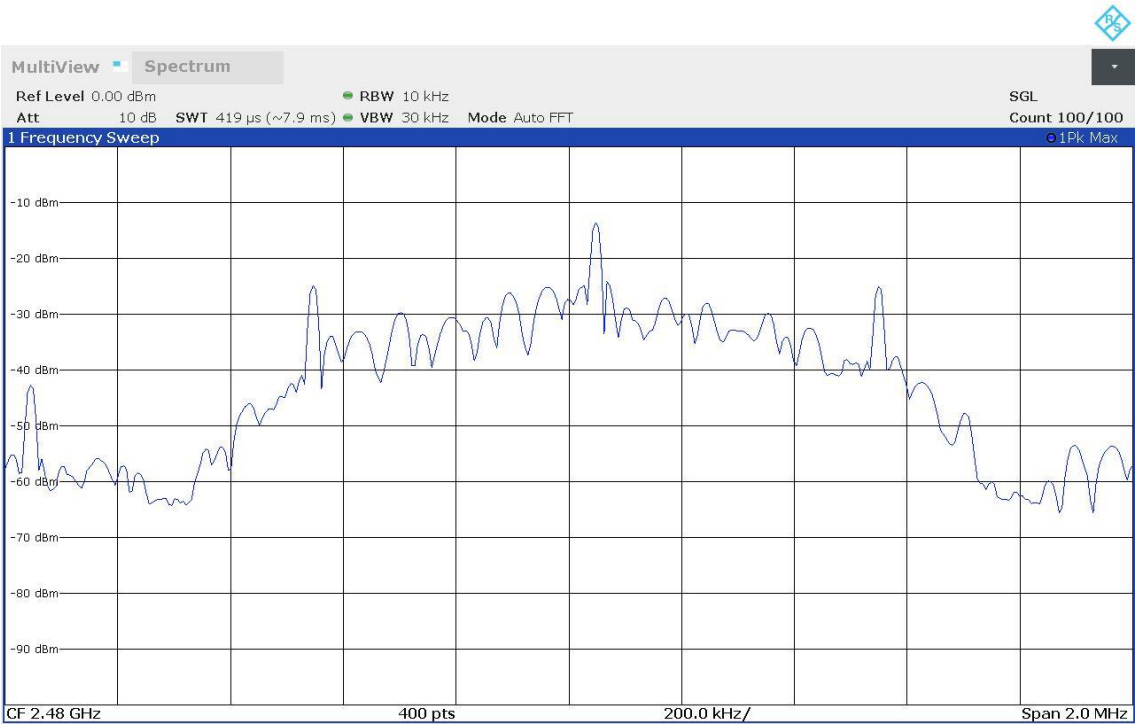
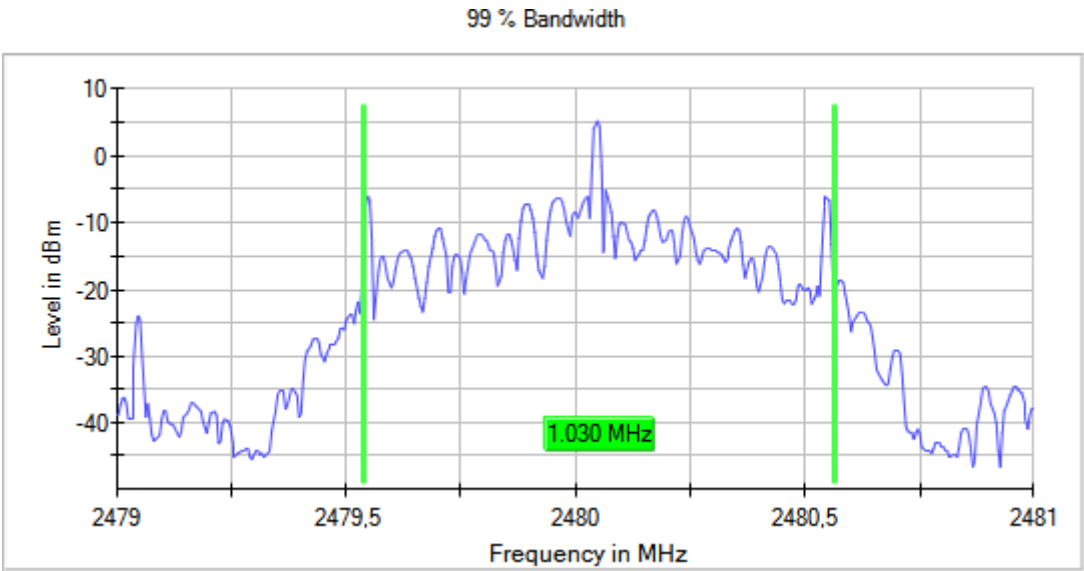
Equipment Type = Digital Transmission System (DTS) Bandwidth MHz = 1
 Modulation = BTLE 5.0 (GFSK 1 Mbit/s) Frequency MHz = 2440.00000
 MIMO Mode = SISO Active Port = 1

Images:



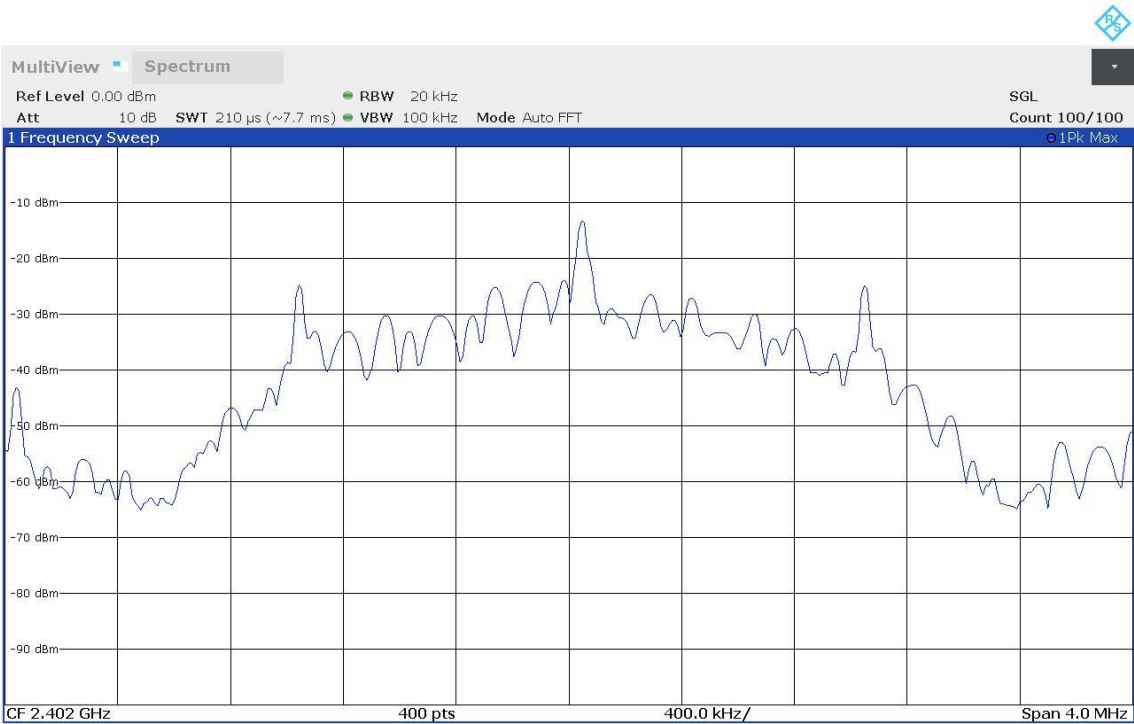
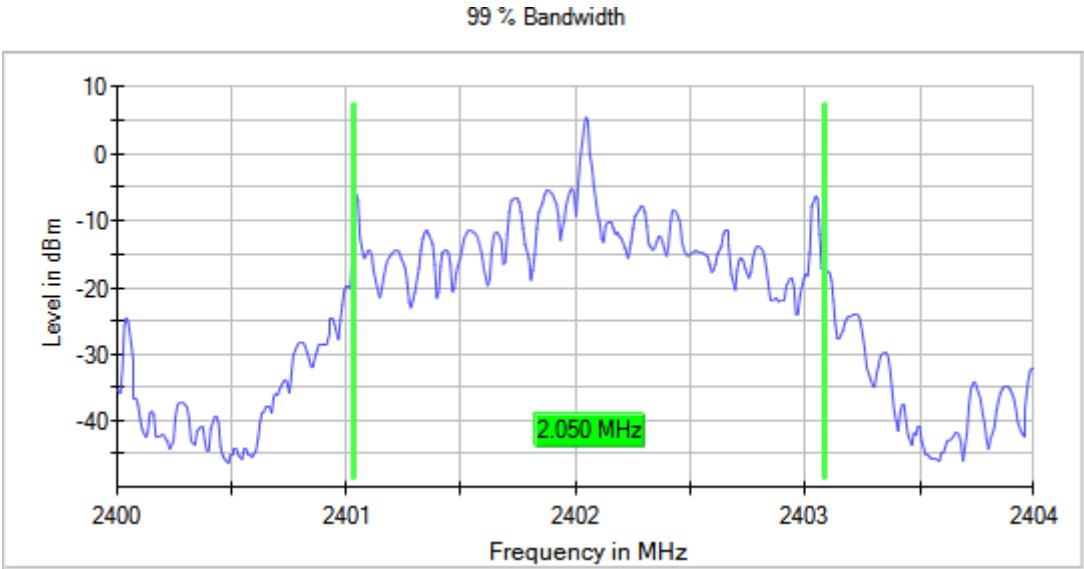
Equipment Type = Digital Transmission System (DTS) Bandwidth MHz = 1
Modulation = BTLE 5.0 (GFSK 1 Mbit/s) Frequency MHz = 2480.00000
MIMO Mode = SISO Active Port = 1

Images:



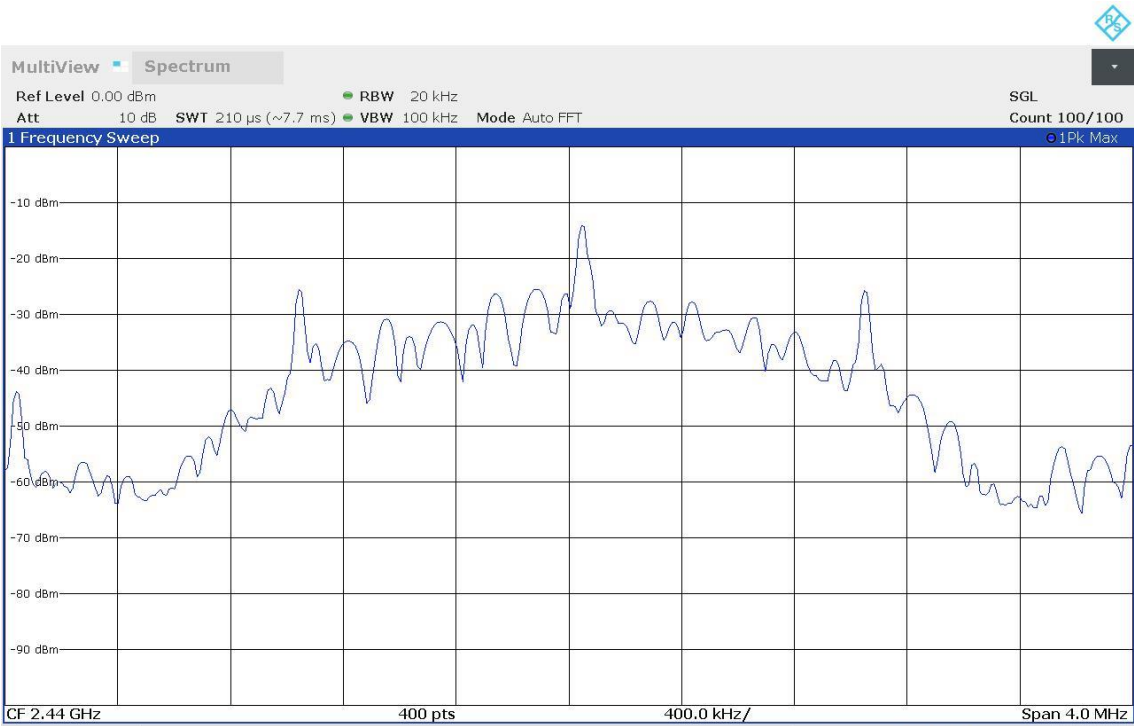
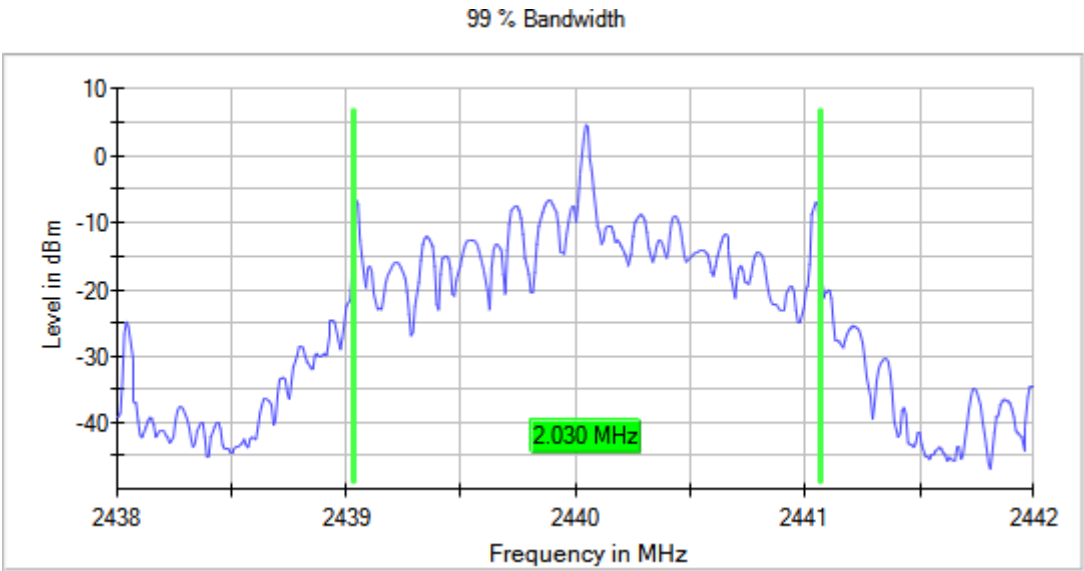
Equipment Type = Digital Transmission System (DTS) Bandwidth MHz = 2
Modulation = BTLE 5.0 (GFSK 2 Mbit/s) Frequency MHz = 2402.00000
MIMO Mode = SISO Active Port = 1

Images:



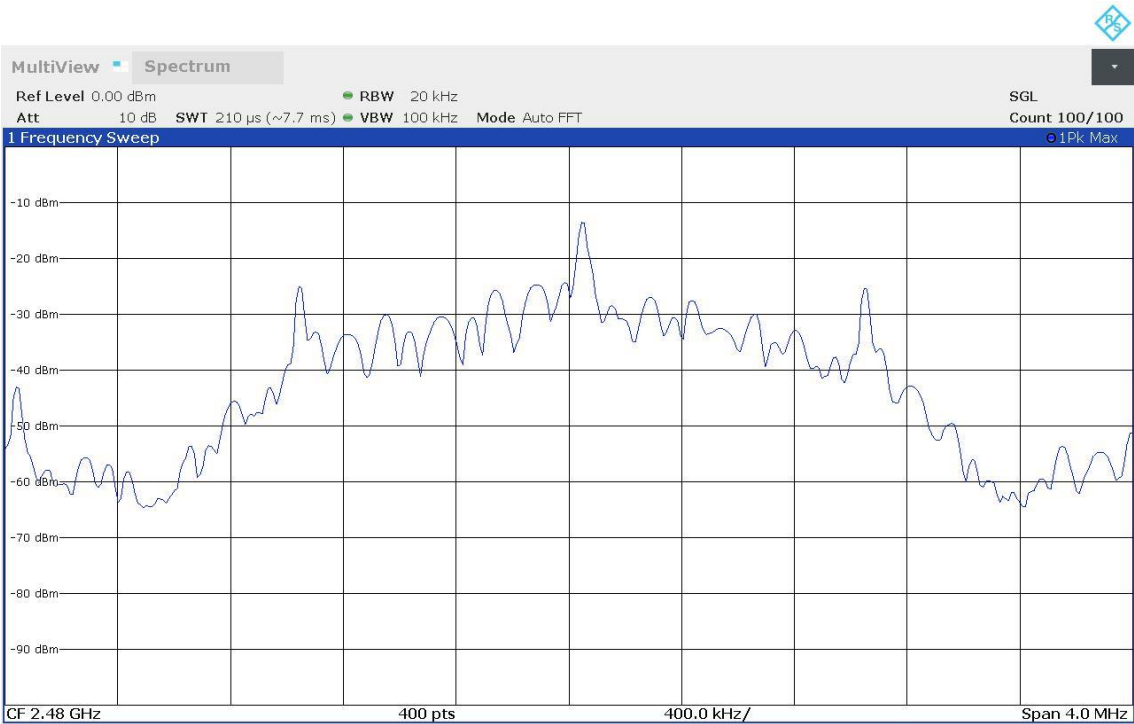
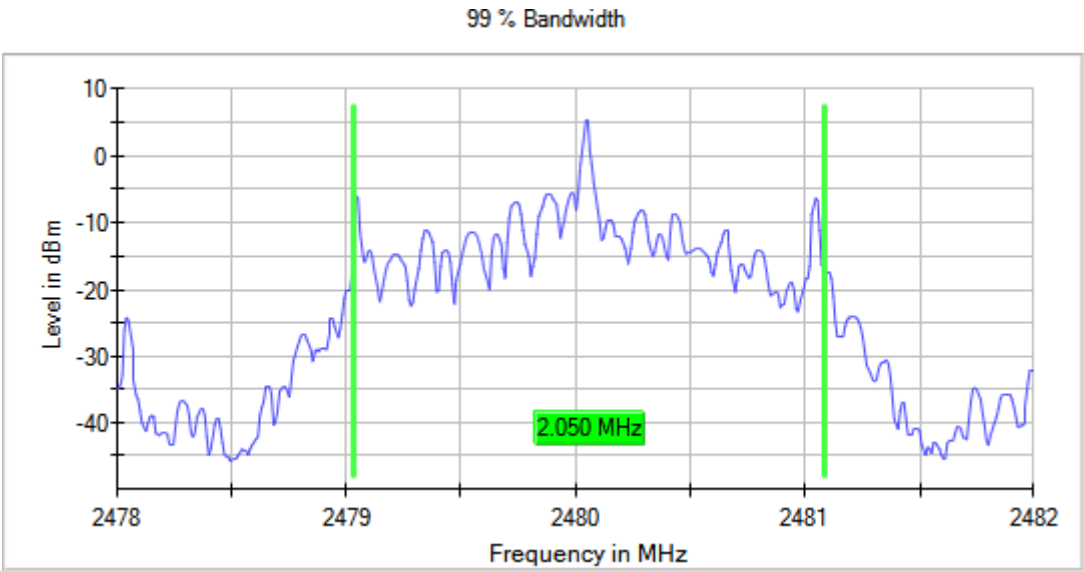
Equipment Type = Digital Transmission System (DTS) Bandwidth MHz = 2
Modulation = BTLE 5.0 (GFSK 2 Mbit/s) Frequency MHz = 2440.00000
MIMO Mode = SISO Active Port = 1

Images:



Equipment Type = Digital Transmission System (DTS) Bandwidth MHz = 2
Modulation = BTLE 5.0 (GFSK 2 Mbit/s) Frequency MHz = 2480.00000
MIMO Mode = SISO Active Port = 1

Images:



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

Limits

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

Results

Modulation: BTLE 5.0 (GFSK 1 Mbit/s)

Freq (MHz)	6 dB Bandwidth (MHz)
2402.00000	0.693
2440.00000	0.673
2480.00000	0.713

Modulation: BTLE 5.0 (GFSK 2 Mbit/s)

Freq (MHz)	6 dB Bandwidth (MHz)
2402.00000	0.911
2440.00000	0.950
2480.00000	0.911

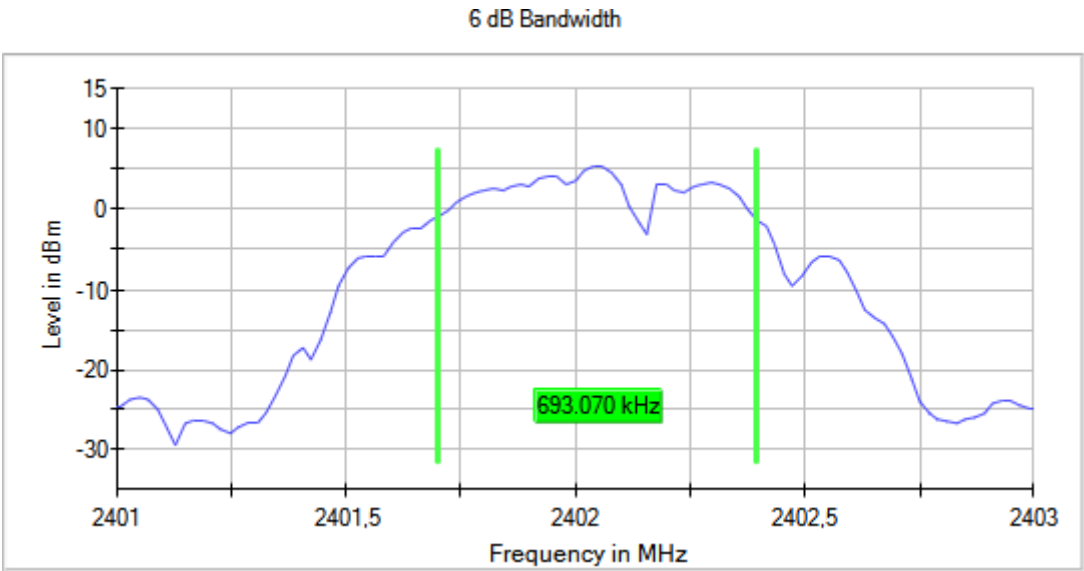
Verdict

Pass

Attachments

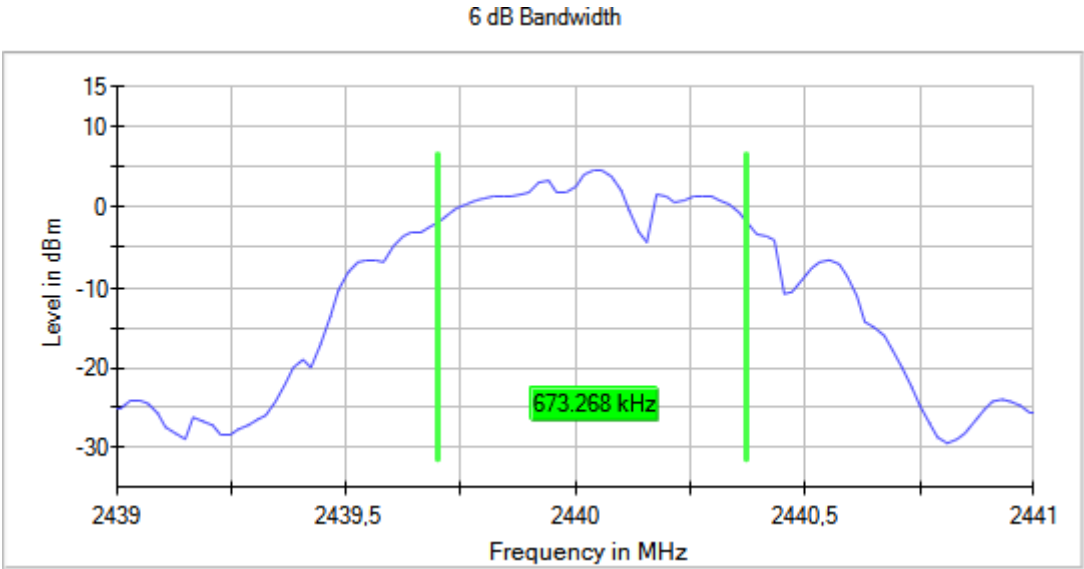
Bandwidth MHz = 1 Modulation = BTLE 5.0 (GFSK 1 Mbit/s)
Frequency MHz = 2402.00000 MIMO Mode = SISO
Active Port = 1

Images:



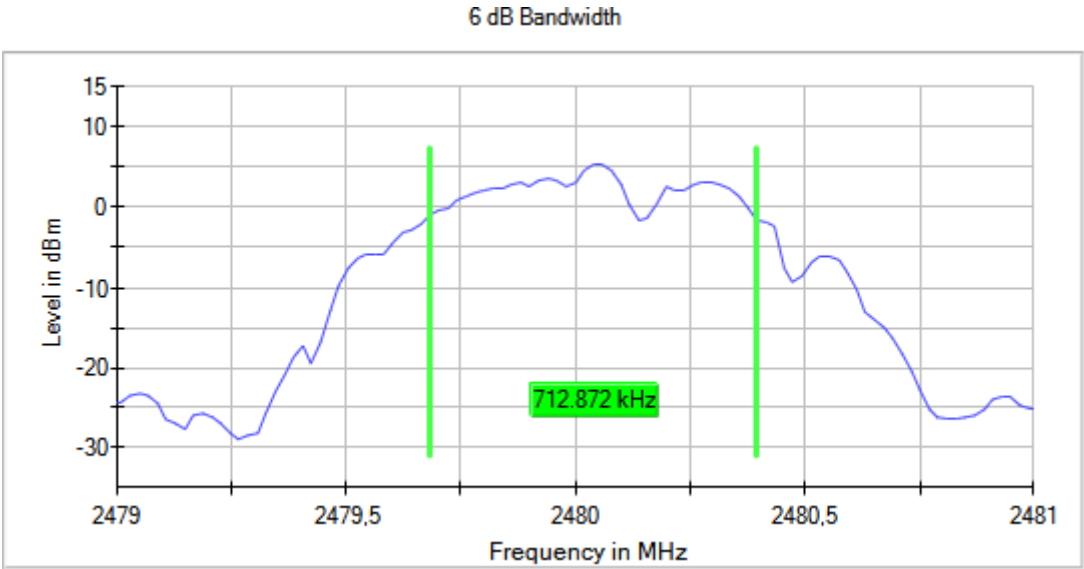
Bandwidth MHz = 1 Modulation = BTLE 5.0 (GFSK 1 Mbit/s)
Frequency MHz = 2440.00000 MIMO Mode = SISO
Active Port = 1

Images:



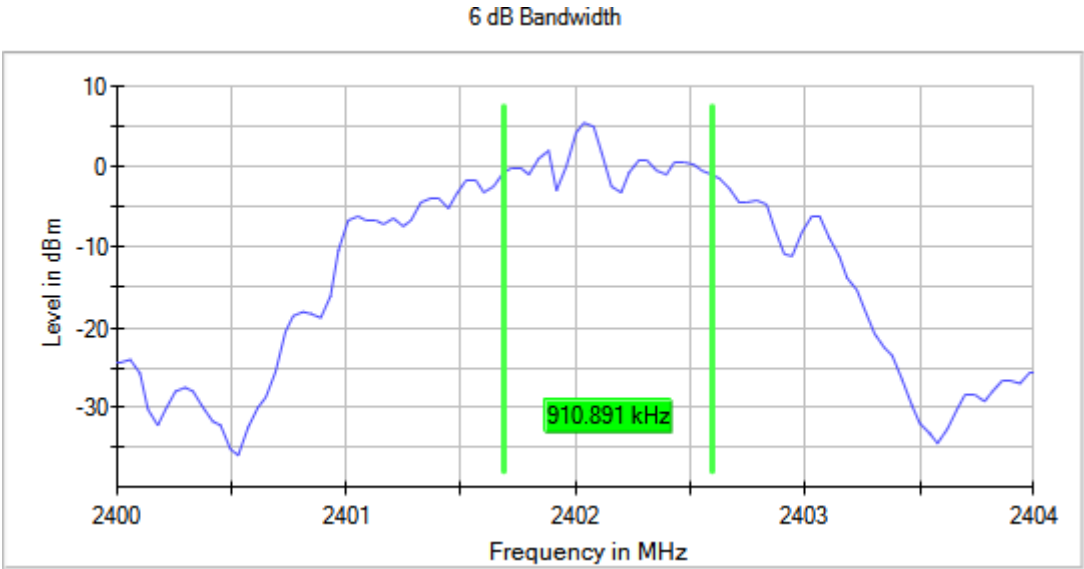
Bandwidth MHz = 1 Modulation = BTLE 5.0 (GFSK 1 Mbit/s)
Frequency MHz = 2480.00000 MIMO Mode = SISO
Active Port = 1

Images:



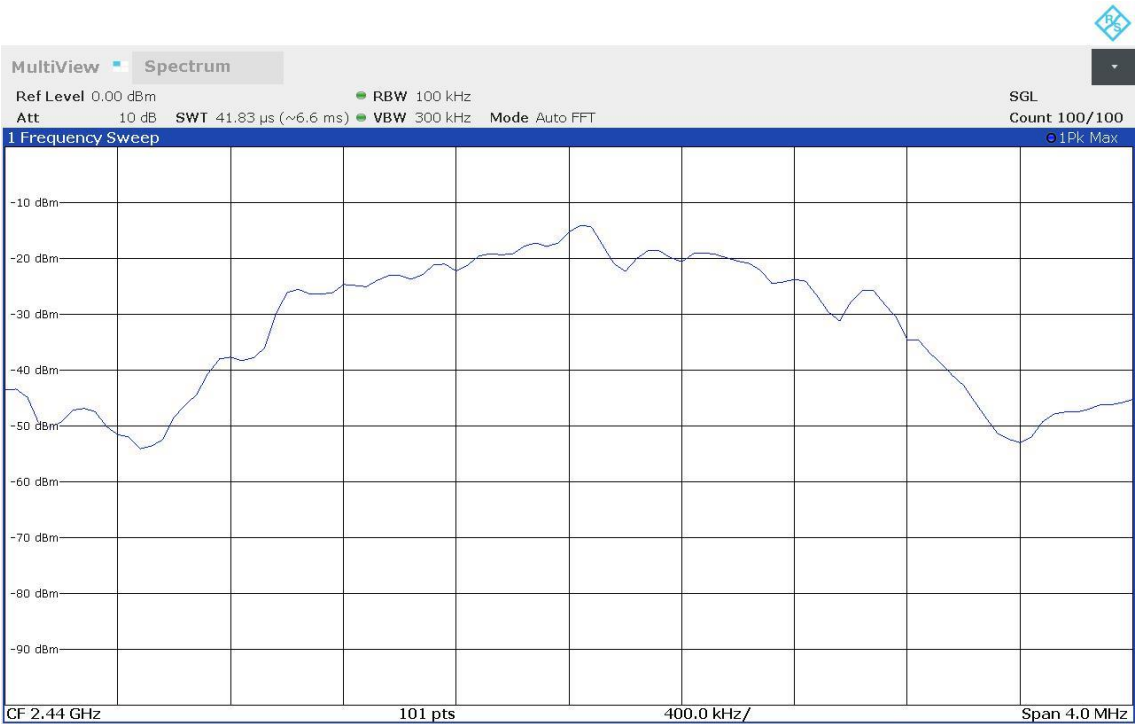
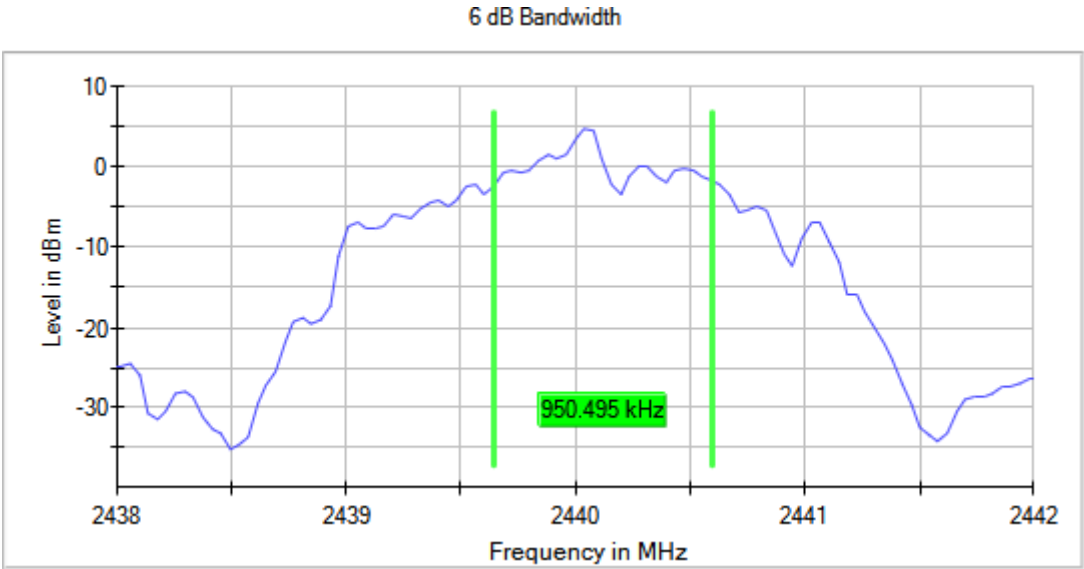
Bandwidth MHz = 2 Modulation = BTLE 5.0 (GFSK 2 Mbit/s)
Frequency MHz = 2402.00000 MIMO Mode = SISO
Active Port = 1

Images:



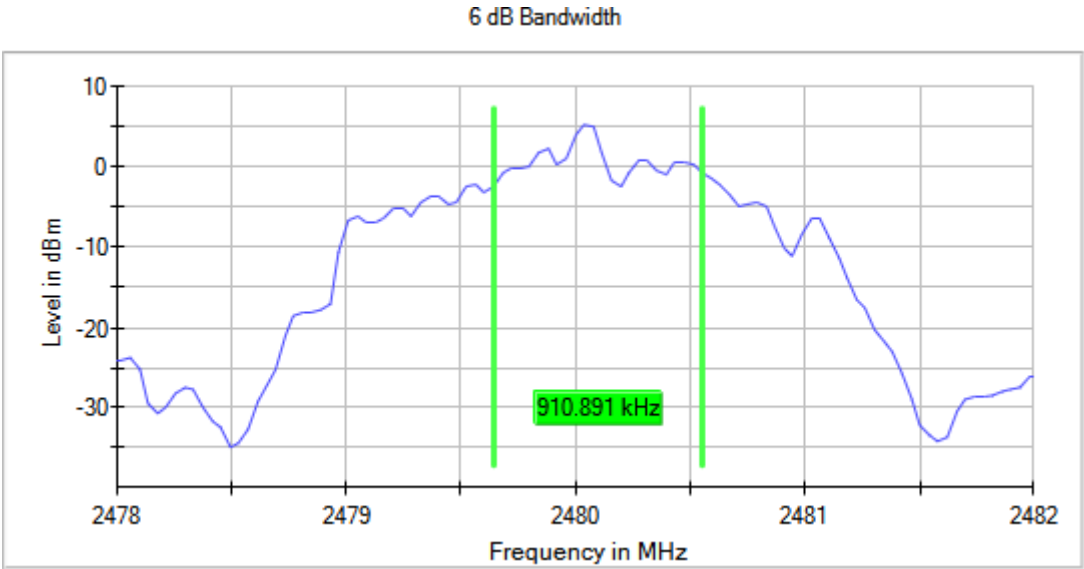
Bandwidth MHz = 2 Modulation = BTLE 5.0 (GFSK 2 Mbit/s)
Frequency MHz = 2440.00000 MIMO Mode = SISO
Active Port = 1

Images:



Bandwidth MHz = 2 Modulation = BTLE 5.0 (GFSK 2 Mbit/s)
Frequency MHz = 2480.00000 MIMO Mode = SISO
Active Port = 1

Images:



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

Limits

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

Modulation: BTLE 5.0 (GFSK 1 Mbit/s)

Freq (MHz)	Measured Freq (MHz)	PSD (dBm)
2402.00000	2402.0475	5.35
2440.00000	2440.0475	4.55
2480.00000	2480.0475	5.18

Modulation: BTLE 5.0 (GFSK 2 Mbit/s)

Freq (MHz)	Measured Freq (MHz)	PSD (dBm)
2402.00000	2402.0475	5.34
2440.00000	2440.0475	4.63
2480.00000	2480.0475	5.26

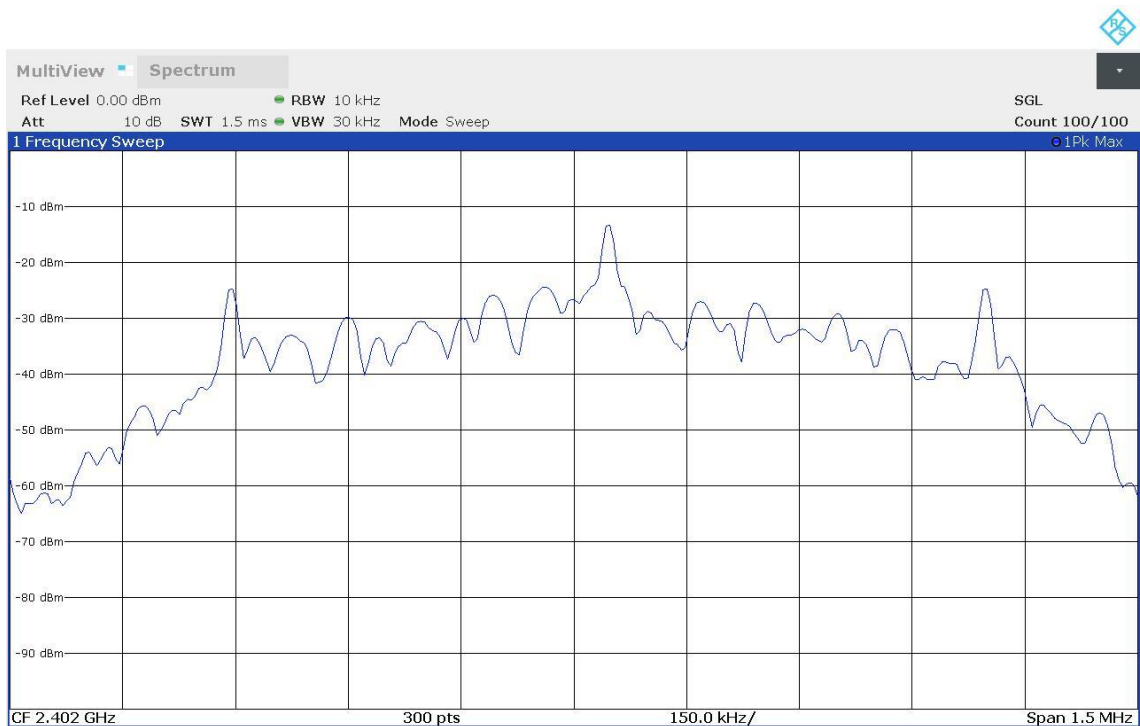
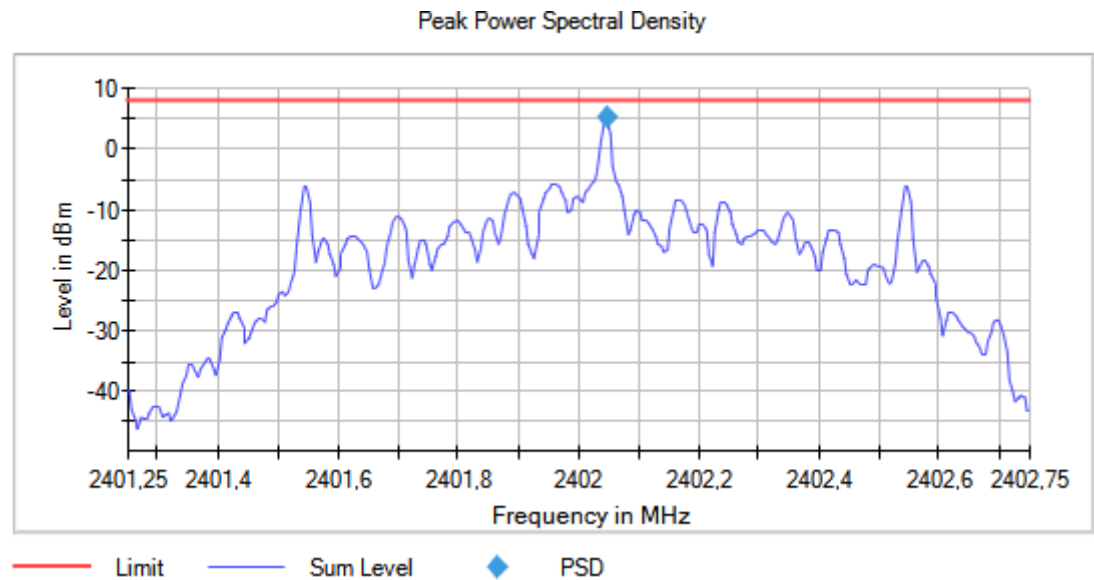
Verdict

Pass

Attachments

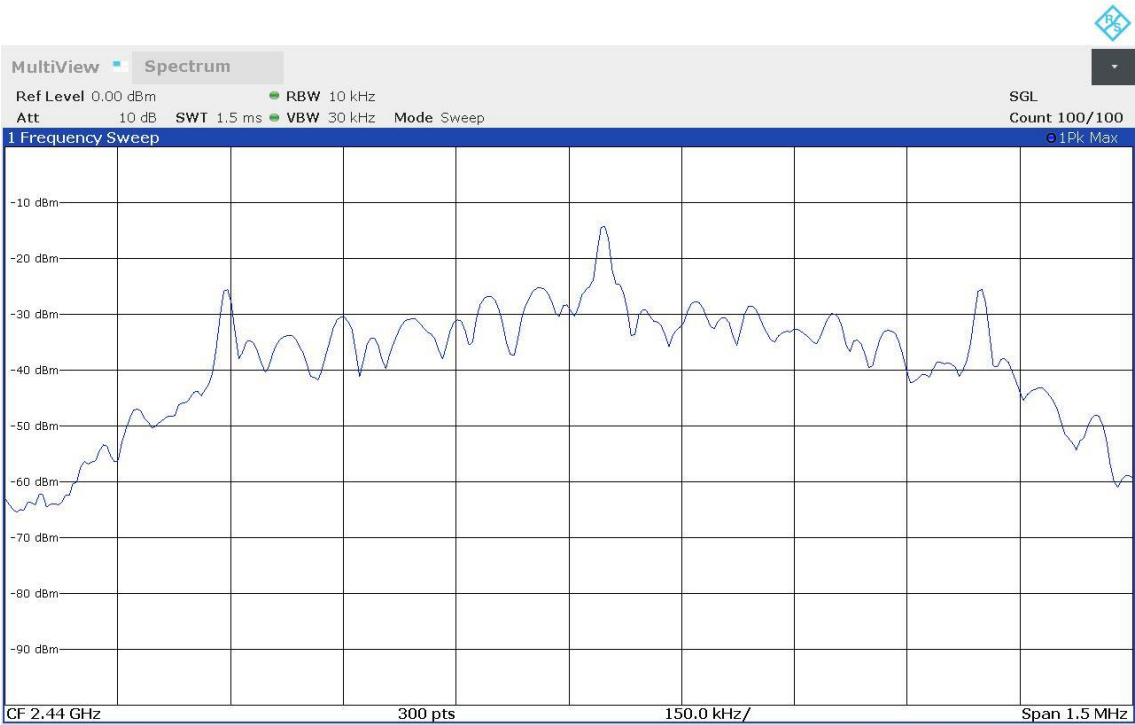
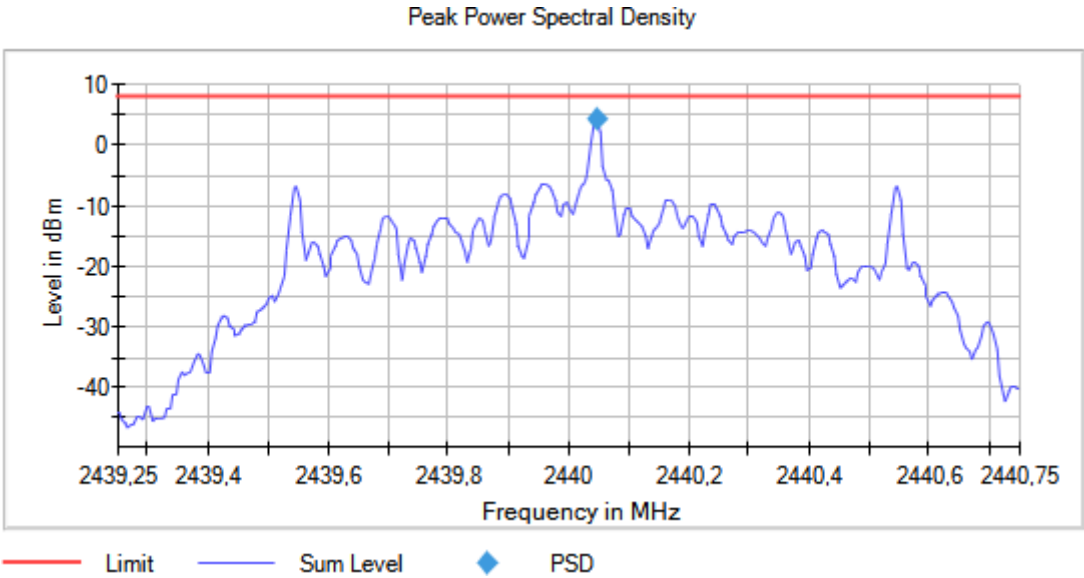
Equipment Type = Digital Transmission System (DTS) Bandwidth MHz = 1
Modulation = BTLE 5.0 (GFSK 1 Mbit/s) Frequency MHz = 2402.00000
MIMO Mode = SISO Active Port = 1

Images:



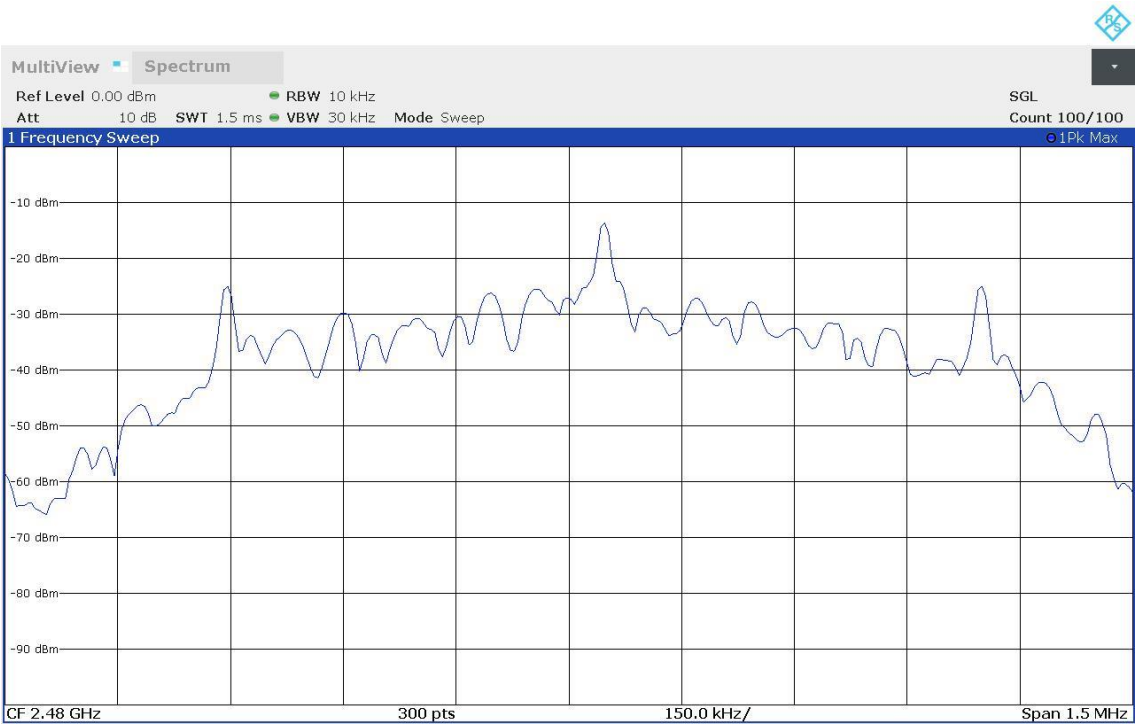
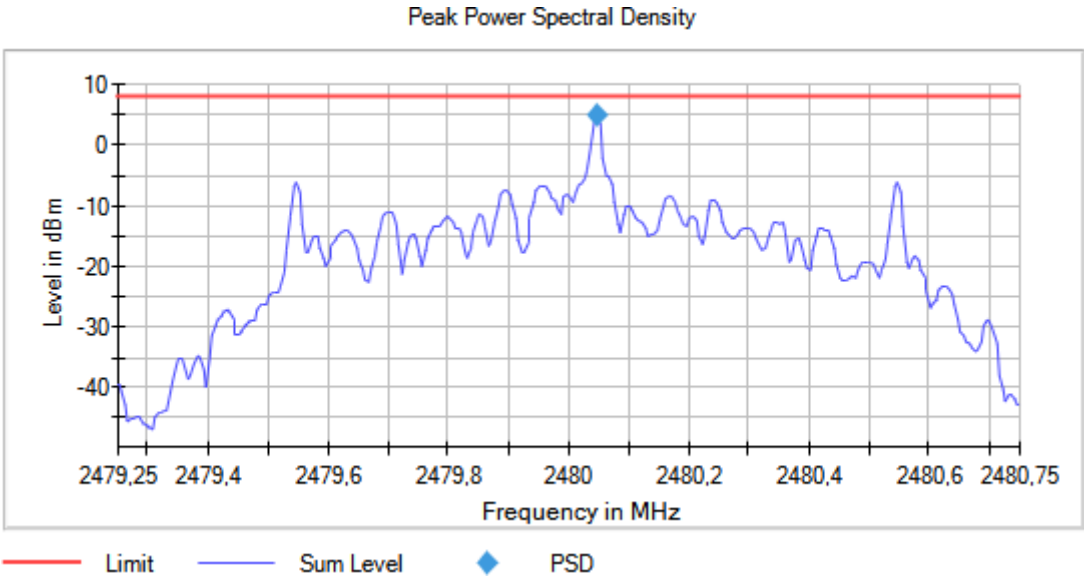
Equipment Type = Digital Transmission System (DTS) Bandwidth MHz = 1
Modulation = BTLE 5.0 (GFSK 1 Mbit/s) Frequency MHz = 2440.00000
MIMO Mode = SISO Active Port = 1

Images:



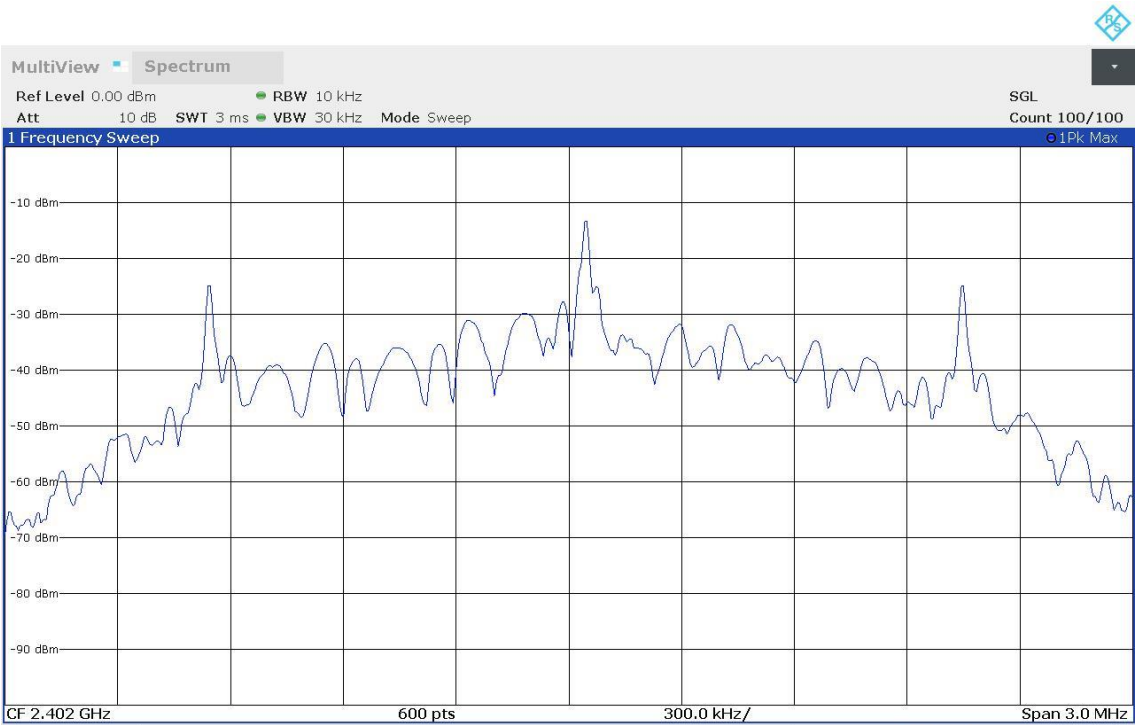
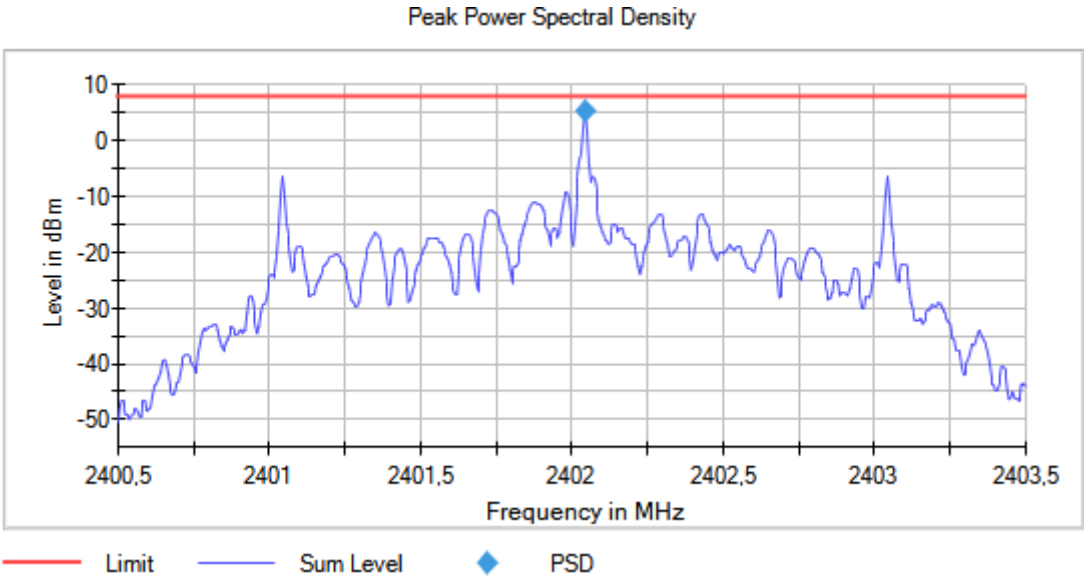
Equipment Type = Digital Transmission System (DTS) Bandwidth MHz = 1
Modulation = BTLE 5.0 (GFSK 1 Mbit/s) Frequency MHz = 2480.00000
MIMO Mode = SISO Active Port = 1

Images:



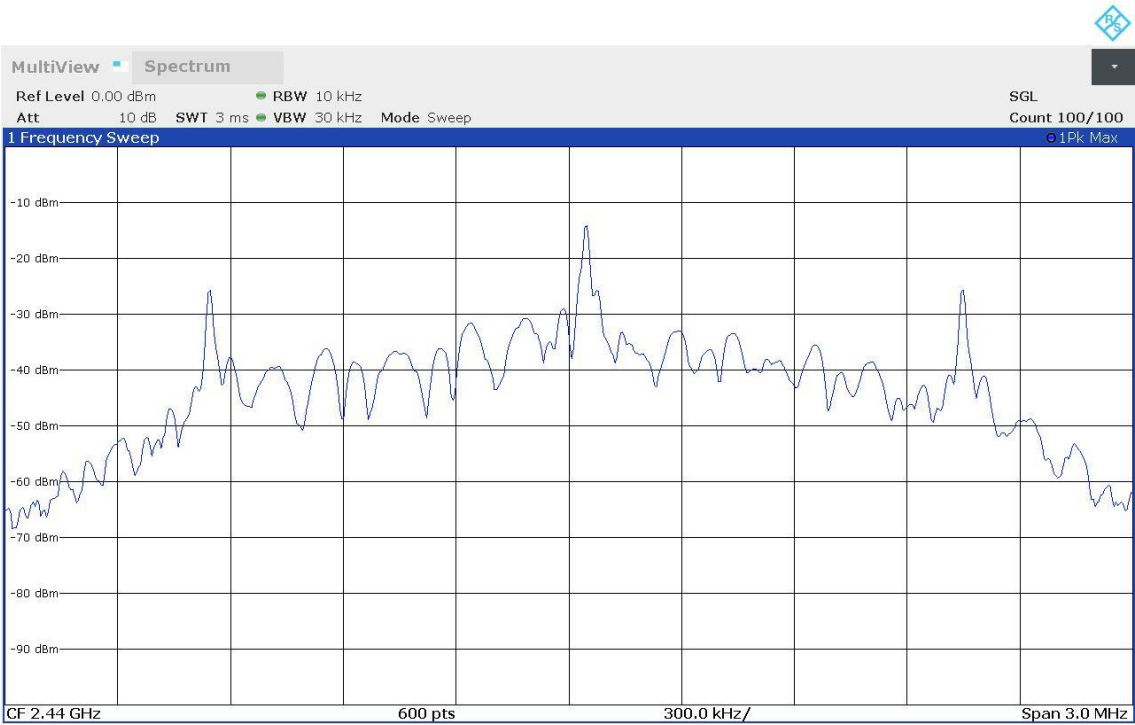
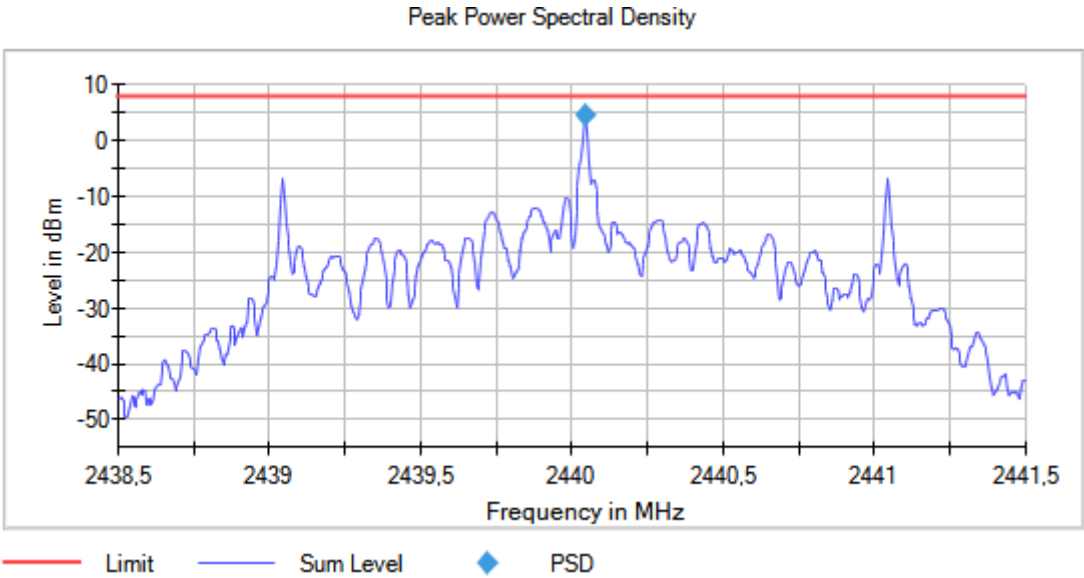
Equipment Type = Digital Transmission System (DTS) Bandwidth MHz = 2
Modulation = BTLE 5.0 (GFSK 2 Mbit/s) Frequency MHz = 2402.00000
MIMO Mode = SISO Active Port = 1

Images:



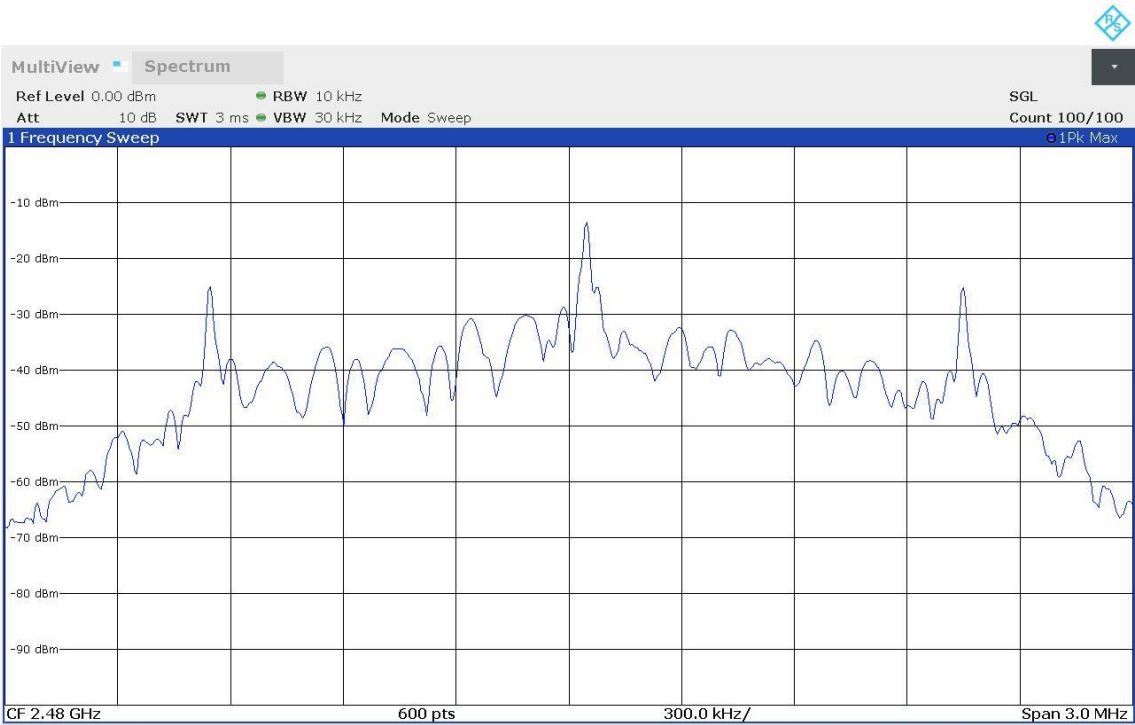
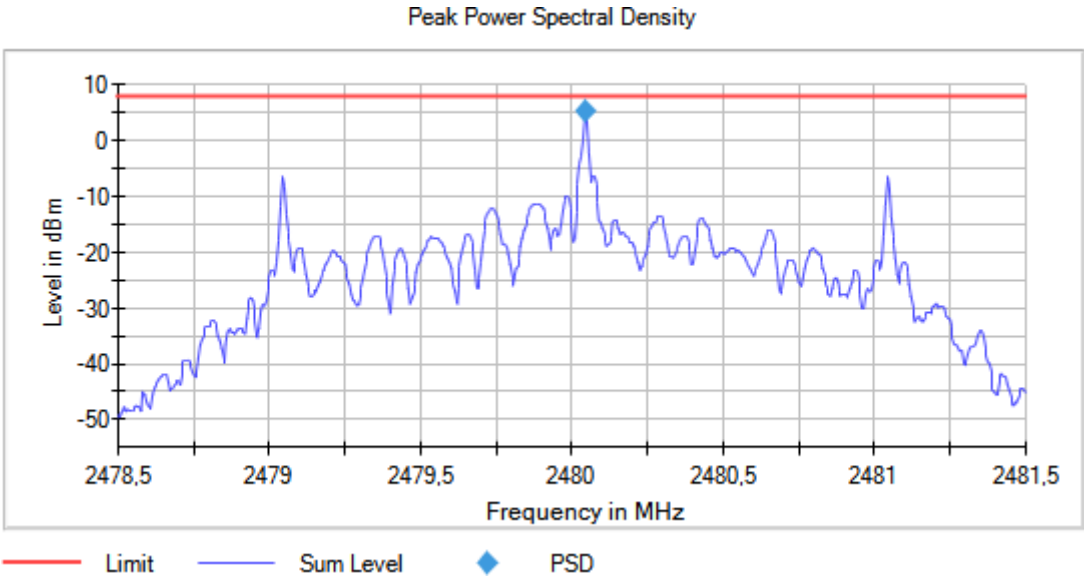
Equipment Type = Digital Transmission System (DTS) Bandwidth MHz = 2
Modulation = BTLE 5.0 (GFSK 2 Mbit/s) Frequency MHz = 2440.00000
MIMO Mode = SISO Active Port = 1

Images:



Equipment Type = Digital Transmission System (DTS) Bandwidth MHz = 2
Modulation = BTLE 5.0 (GFSK 2 Mbit/s) Frequency MHz = 2480.00000
MIMO Mode = SISO Active Port = 1

Images:



RSS-247 5.4 (d) / FCC 15.247 (b) (3) Maximum Peak Conducted output power

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 $\geq$ 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: +3 dBi

Results

Modulation: BTLE 5.0 (GFSK 1 Mbit/s)

Freq (MHz)	Maximum Conducted Power (dBm)	Maximum EIRP Power (dBm)
2402.00000	5.936	8.936
2440.00000	5.221	8.221
2480.00000	5.826	8.826

Modulation: BTLE 5.0 (GFSK 2 Mbit/s)

Freq (MHz)	Maximum Conducted Power (dBm)	Maximum EIRP Power (dBm)
2402.00000	5.929	8.929
2440.00000	5.268	8.268
2480.00000	5.909	8.909

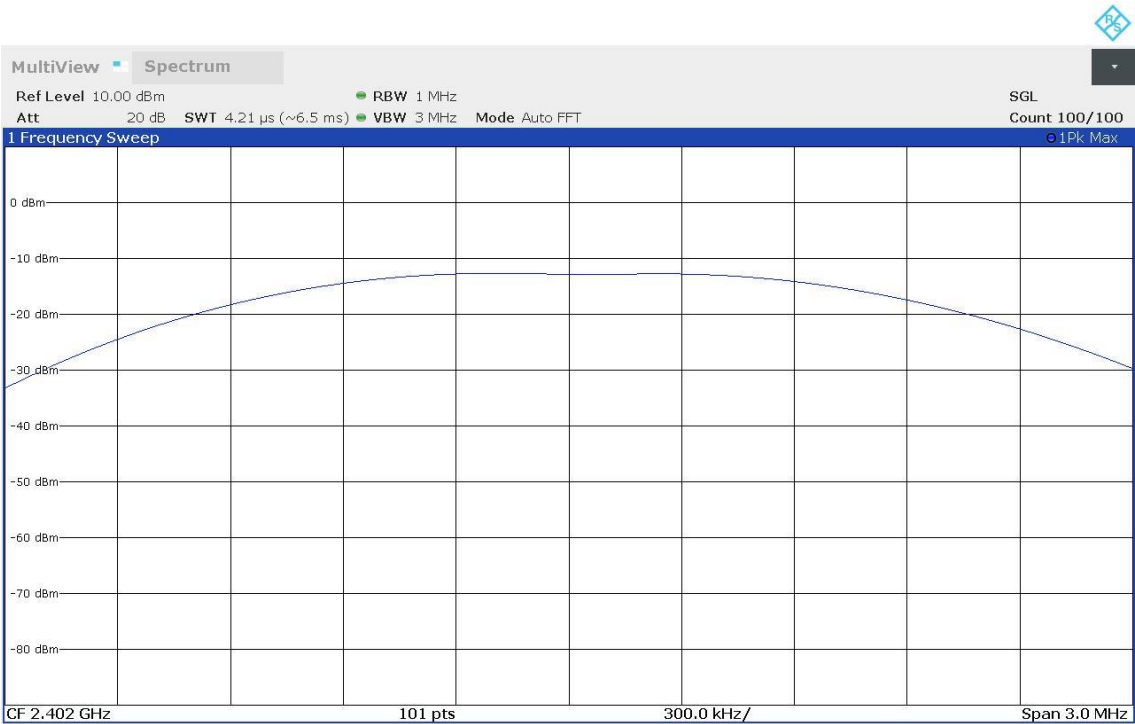
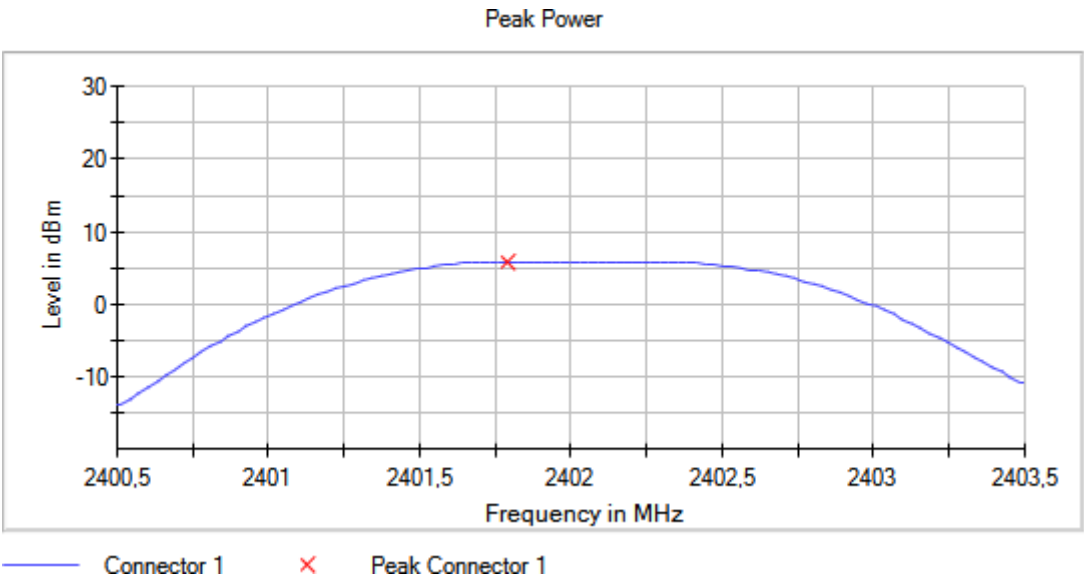
Verdict

Pass

Attachments

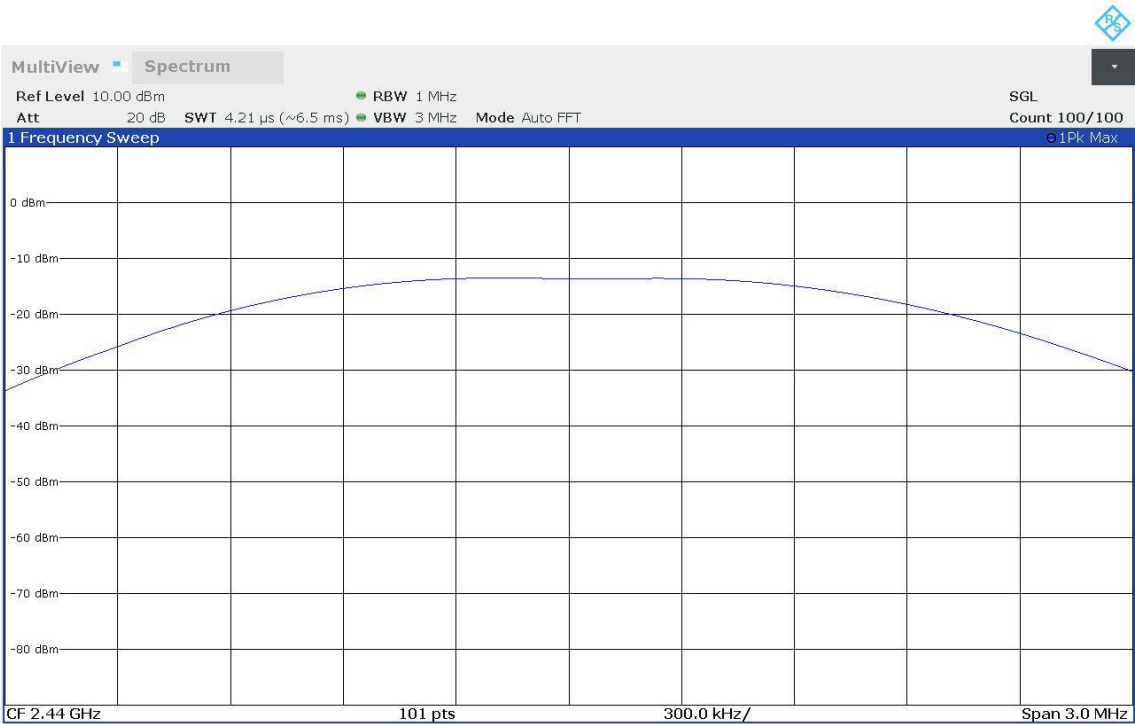
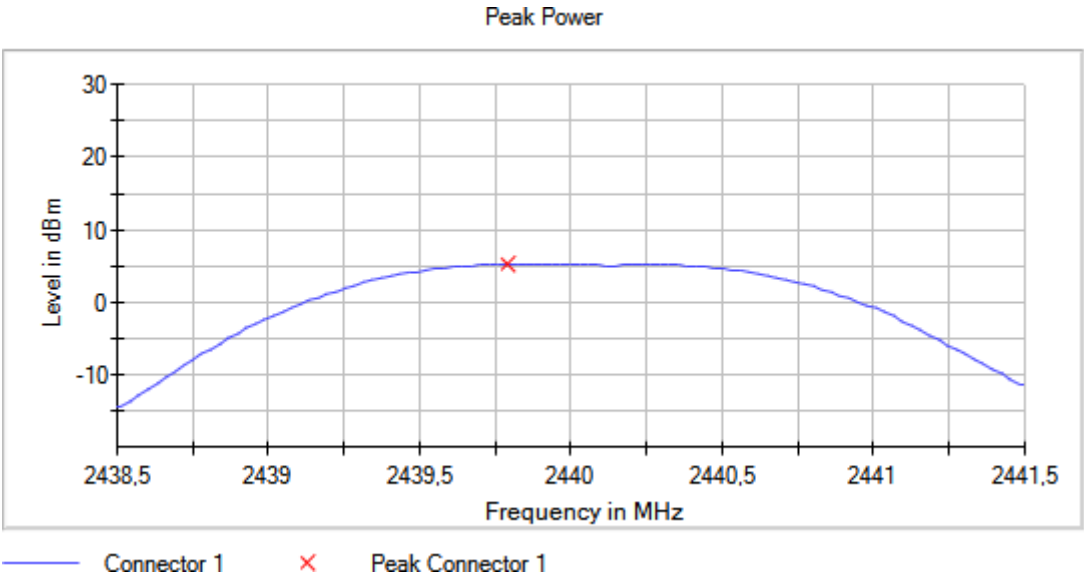
Equipment Type = Digital Transmission System (DTS) Bandwidth MHz = 1
Modulation = BTLE 5.0 (GFSK 1 Mbit/s) Frequency MHz = 2402.00000
MIMO Mode = SISO Active Port = 1

Images:



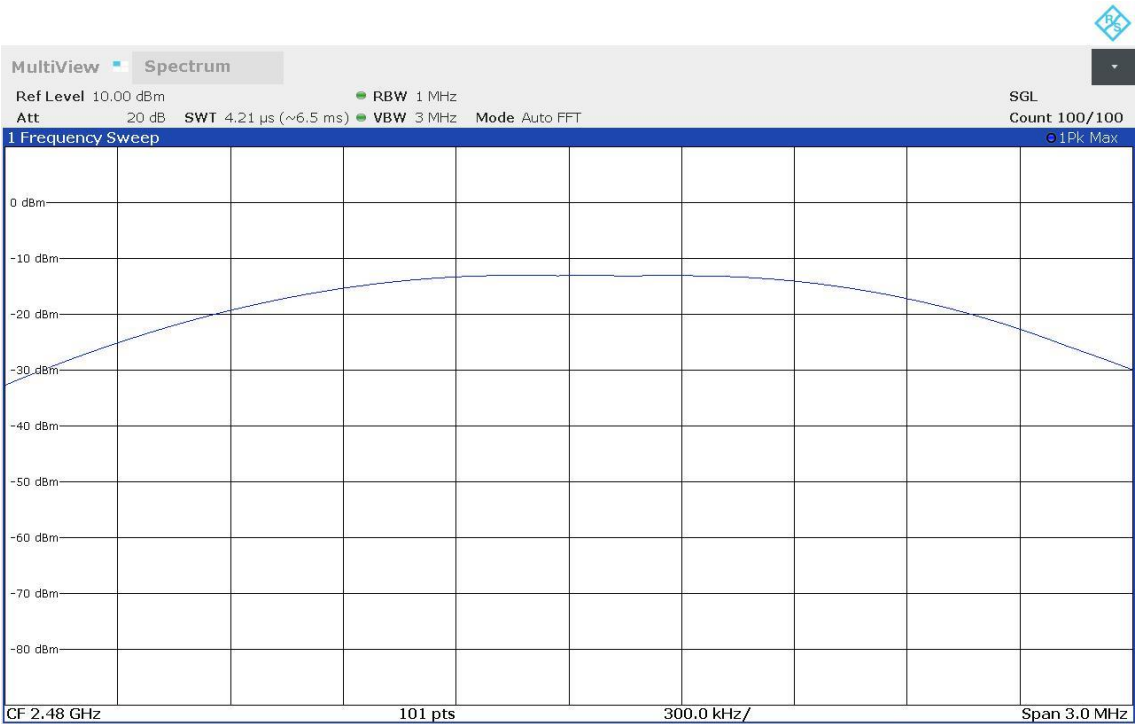
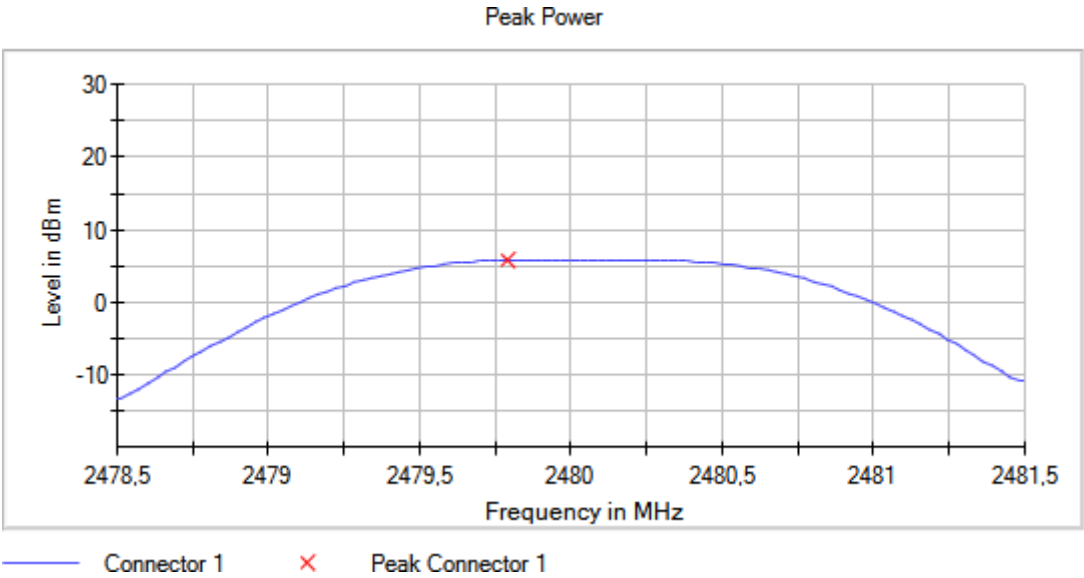
Equipment Type = Digital Transmission System (DTS) Bandwidth MHz = 1
Modulation = BTLE 5.0 (GFSK 1 Mbit/s) Frequency MHz = 2440.00000
MIMO Mode = SISO Active Port = 1

Images:



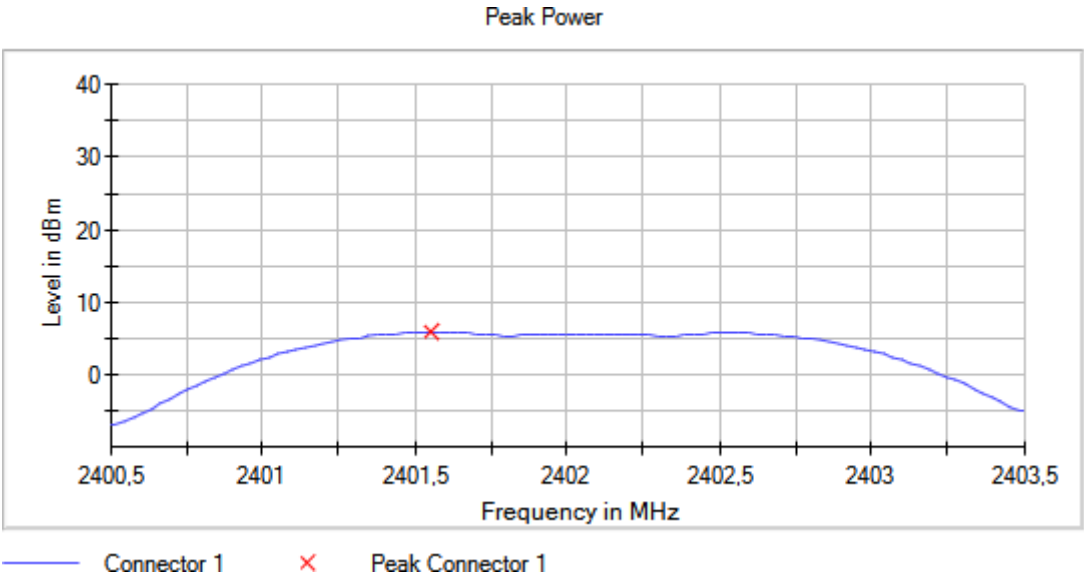
Equipment Type = Digital Transmission System (DTS) Bandwidth MHz = 1
Modulation = BTLE 5.0 (GFSK 1 Mbit/s) Frequency MHz = 2480.00000
MIMO Mode = SISO Active Port = 1

Images:



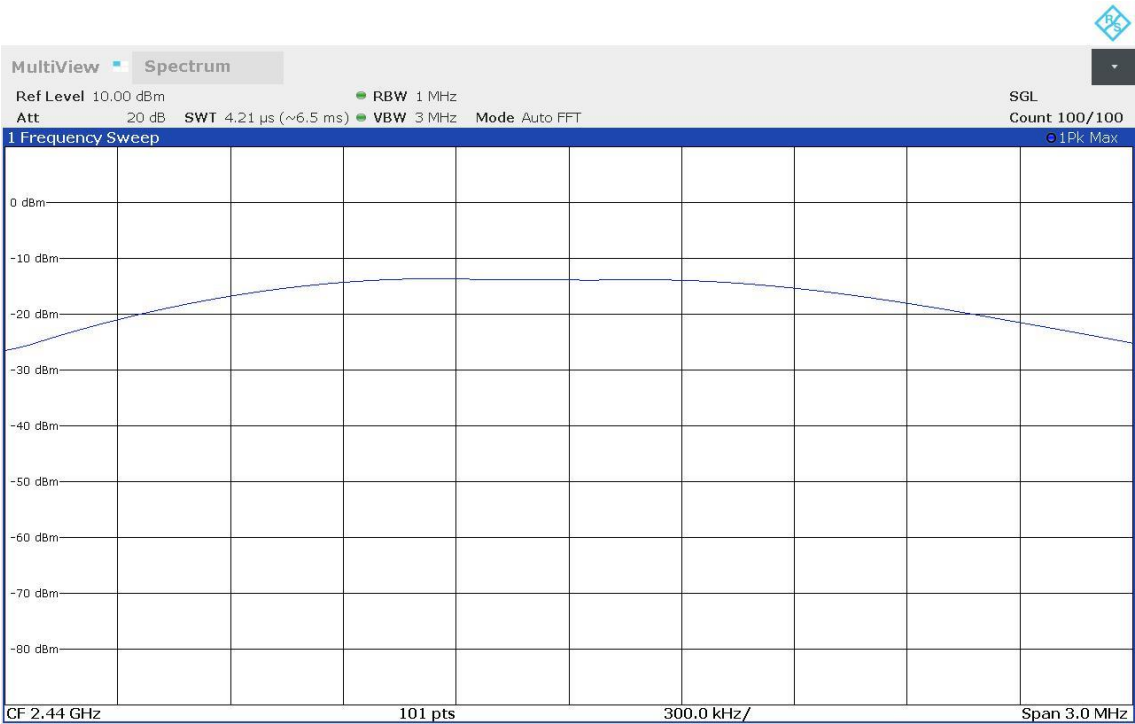
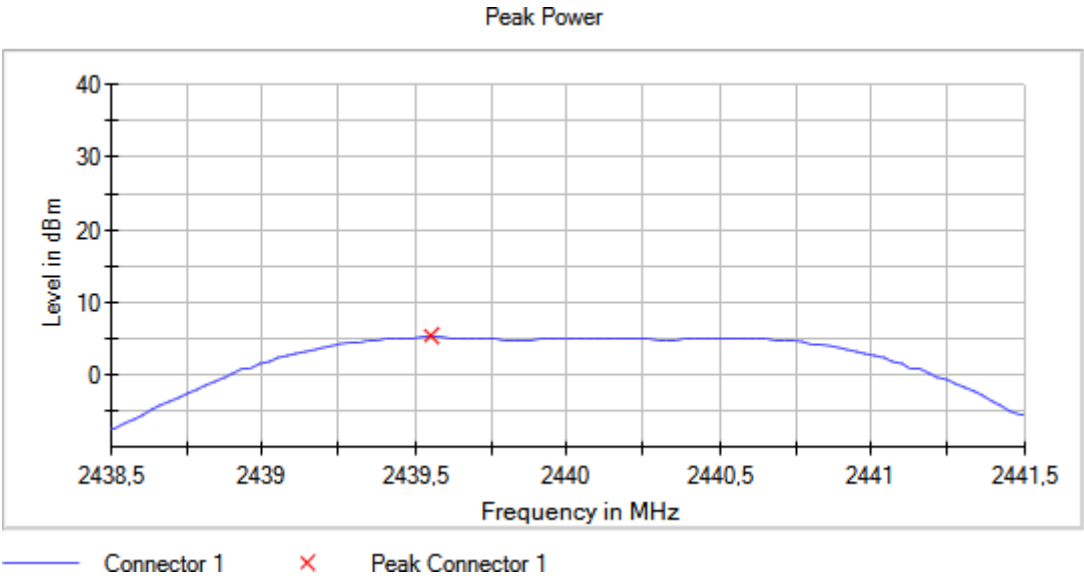
Equipment Type = Digital Transmission System (DTS) Bandwidth MHz = 2
Modulation = BTLE 5.0 (GFSK 2 Mbit/s) Frequency MHz = 2402.00000
MIMO Mode = SISO Active Port = 1

Images:



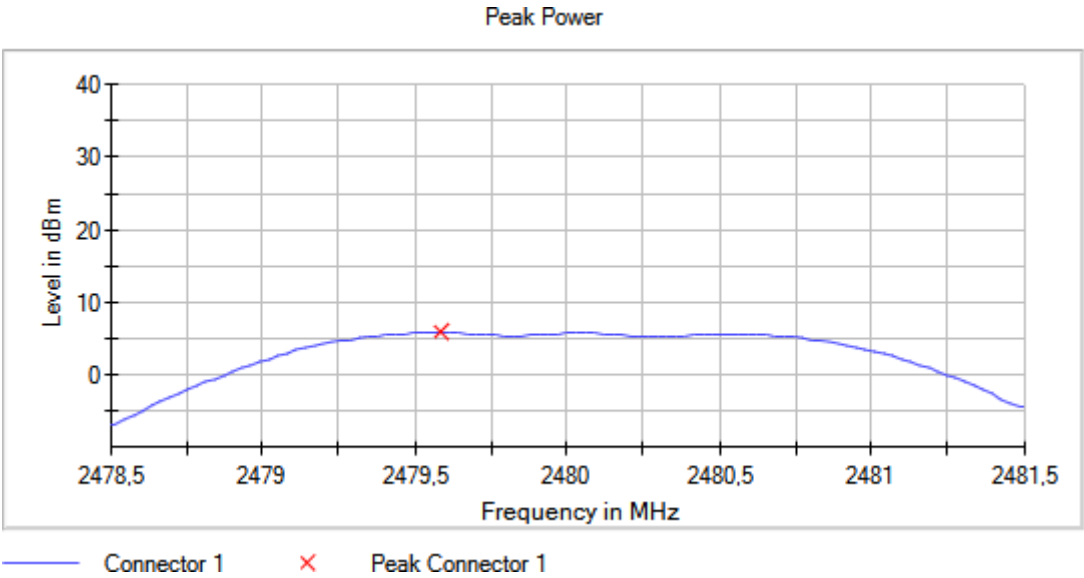
Equipment Type = Digital Transmission System (DTS) Bandwidth MHz = 2
Modulation = BTLE 5.0 (GFSK 2 Mbit/s) Frequency MHz = 2440.00000
MIMO Mode = SISO Active Port = 1

Images:



Equipment Type = Digital Transmission System (DTS) Bandwidth MHz = 2
Modulation = BTLE 5.0 (GFSK 2 Mbit/s) Frequency MHz = 2480.00000
MIMO Mode = SISO Active Port = 1

Images:



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

Limits

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

Radiated measurements were used to show compliance with the limits in the restricted bands 2.31-2.39 GHz and 2.4835-2.5 GHz.

Modulation: BTLE 5.0 (GFSK 1 Mbit/s)

Freq (MHz)	Measured Freq (MHz)	Level (dBm)	Limit (dBm)
2402.00000	2399.975000	-44.384	-10.218
	2399.925000	-44.767	
	2399.825000	-46.621	
	2399.875000	-46.904	
	2399.775000	-47.154	
	2399.725000	-47.165	
	2399.675000	-47.515	
	2399.625000	-48.488	
	2399.325000	-48.994	
	2399.575000	-49.074	
	2399.525000	-49.373	
	2399.425000	-49.461	
	2399.475000	-49.599	
	2399.375000	-49.753	
	2399.275000	-49.799	

Freq (MHz)	Measured Freq (MHz)	Level (dBm)	Limit (dBm)
2480.00000	2483.575000	-51.493	-9.966
	2483.525000	-51.524	
	2483.625000	-52.308	
	2483.925000	-53.075	
	2483.675000	-53.360	
	2484.275000	-53.577	
	2483.775000	-53.638	
	2484.225000	-53.640	
	2483.875000	-53.667	
	2483.725000	-53.843	
	2483.975000	-54.042	
	2484.025000	-54.065	
	2483.825000	-54.161	
	2484.075000	-54.366	
	2484.175000	-54.634	

Modulation: BTLE 5.0 (GFSK 2 Mbit/s)

Freq (MHz)	Measured Freq (MHz)	Level (dBm)	Limit (dBm)
2402.00000	2399.975000	-21.234	-10.181
	2399.925000	-25.116	
	2399.875000	-29.507	
	2399.775000	-33.681	
	2399.825000	-34.138	
	2399.725000	-34.382	
	2399.675000	-36.501	
	2399.625000	-39.145	
	2399.575000	-39.928	
	2399.225000	-41.574	
	2399.175000	-41.648	
	2399.425000	-41.756	
	2399.525000	-41.858	
	2399.375000	-42.073	
	2399.325000	-42.325	

Freq (MHz)	Measured Freq (MHz)	Level (dBm)	Limit (dBm)
2480.00000	2484.125000	-42.875	-9.922
	2484.175000	-42.889	
	2483.825000	-42.947	
	2483.525000	-43.112	
	2483.675000	-43.240	
	2484.075000	-43.296	
	2483.625000	-43.375	
	2484.025000	-43.393	
	2483.575000	-43.410	
	2483.725000	-43.412	
	2483.875000	-43.465	
	2483.925000	-43.587	
	2483.975000	-43.731	
	2483.775000	-43.899	
	2484.225000	-44.528	

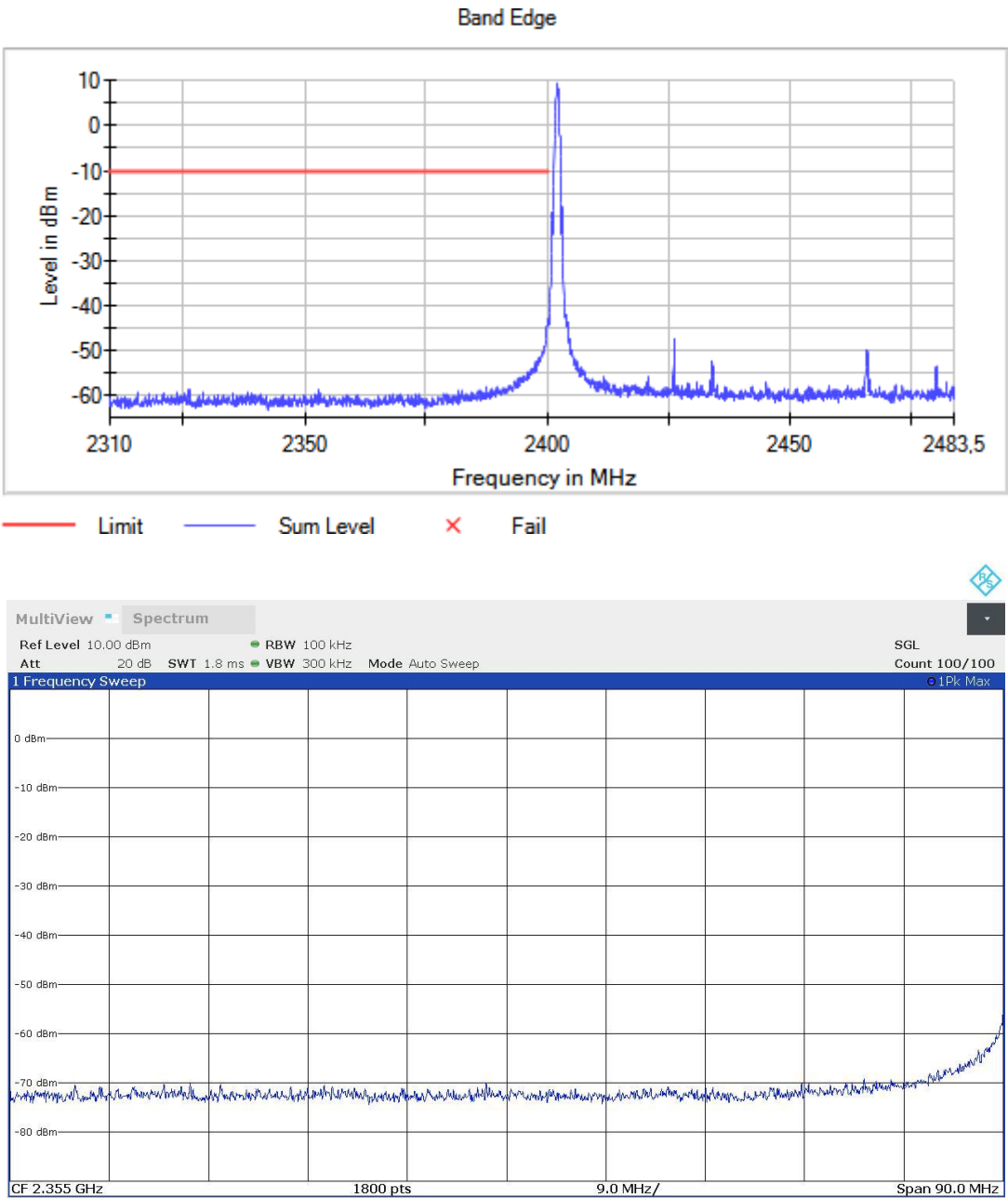
Verdict

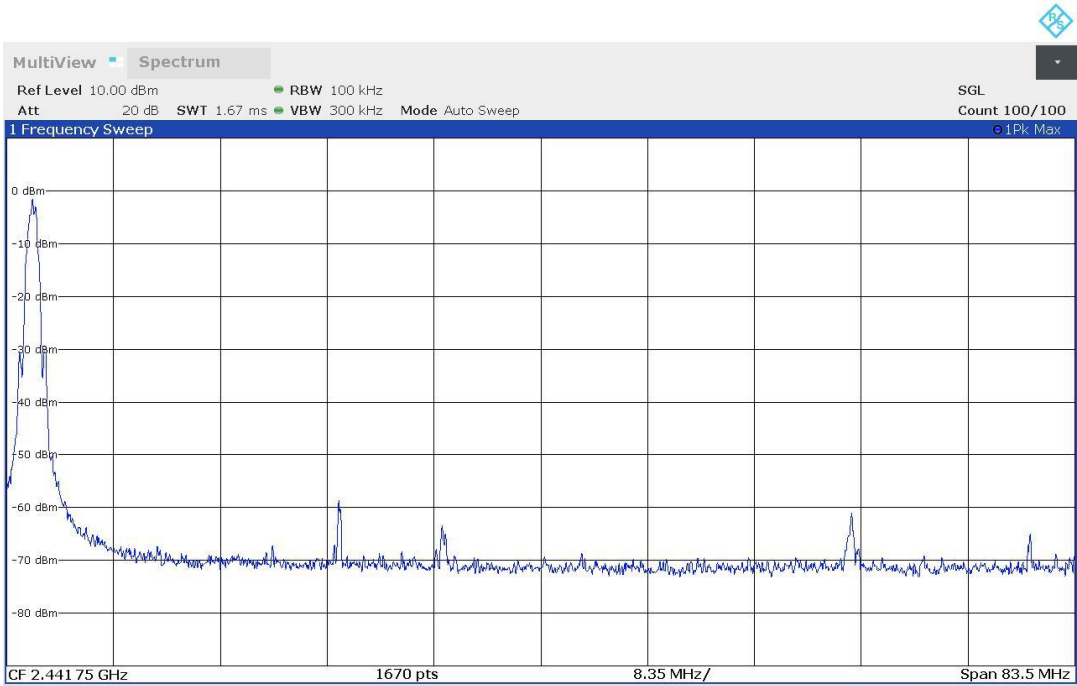
Pass

Attachments

Equipment Type = Digital Transmission System (DTS) Bandwidth MHz = 1
Modulation = BTLE 5.0 (GFSK 1 Mbit/s) Frequency MHz = 2402.00000
MIMO Mode = SISO Measurement Point = 1
Active Port = 1

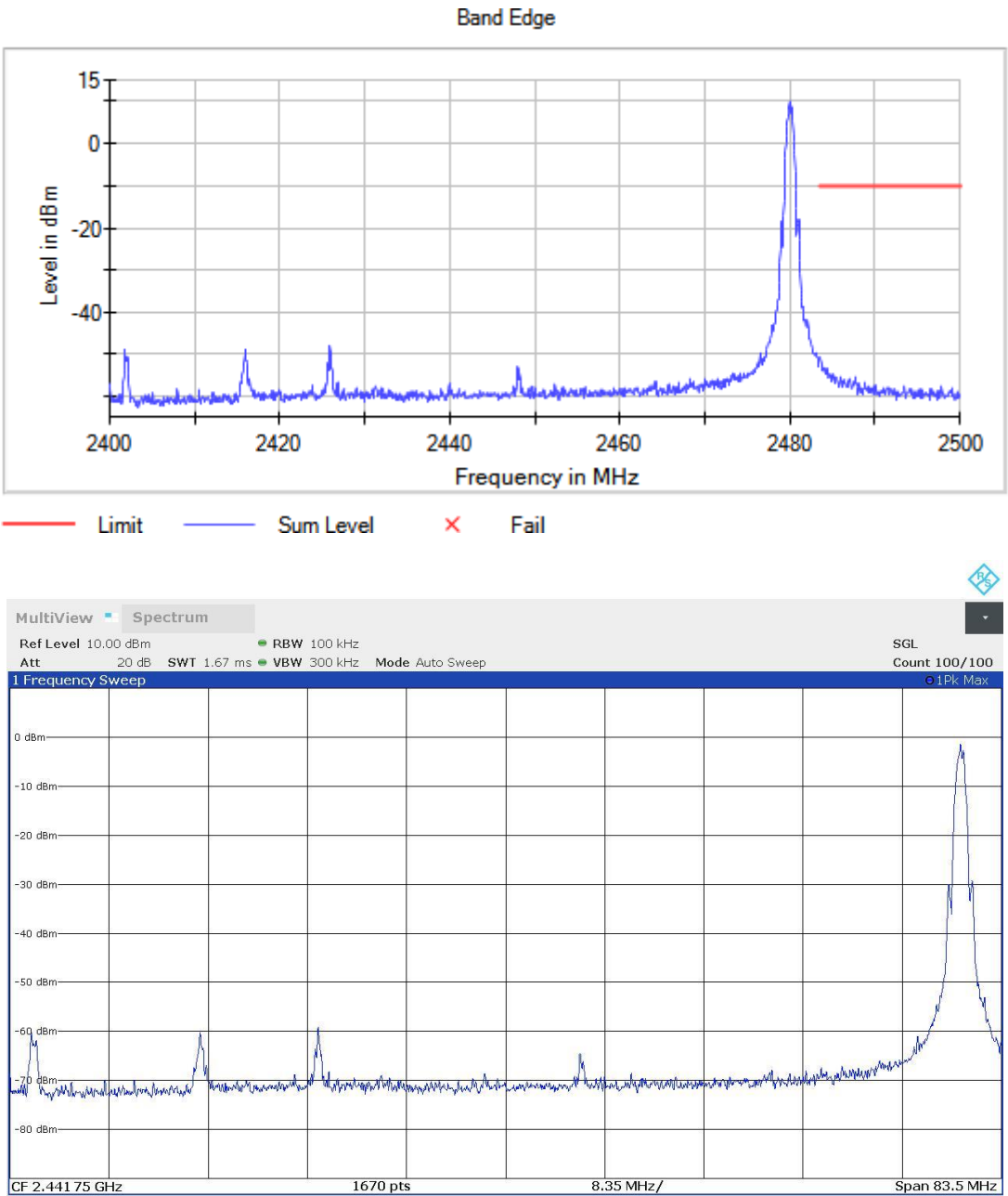
Images:

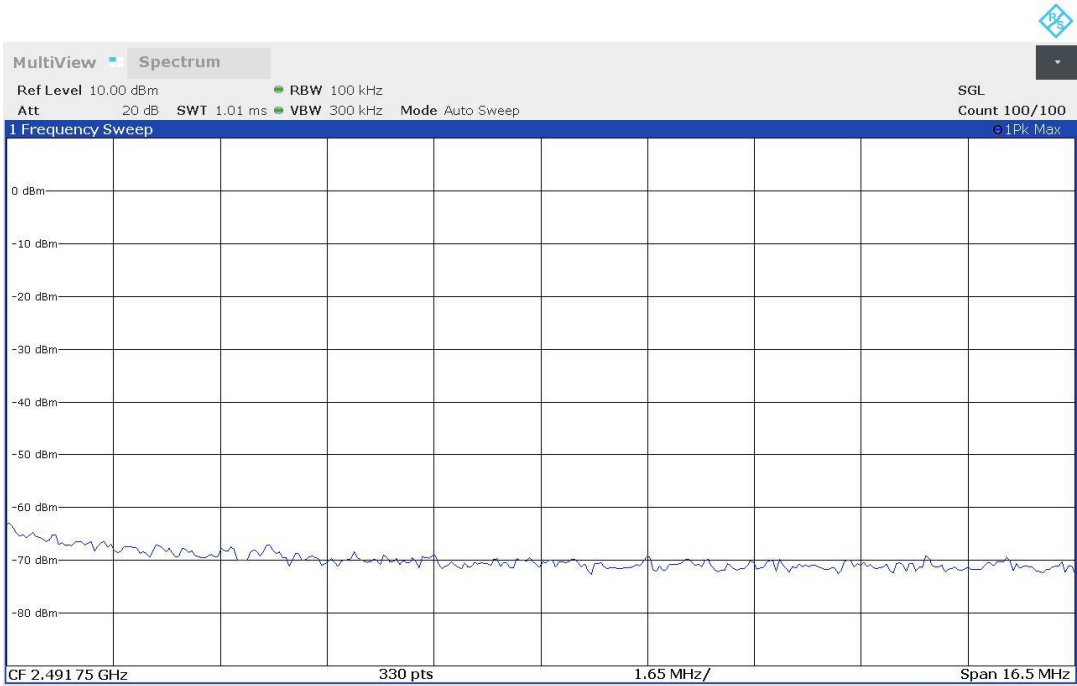




Equipment Type = Digital Transmission System (DTS) Bandwidth MHz = 1
Modulation = BTLE 5.0 (GFSK 1 Mbit/s) Frequency MHz = 2480.00000
MIMO Mode = SISO Measurement Point = 1
Active Port = 1

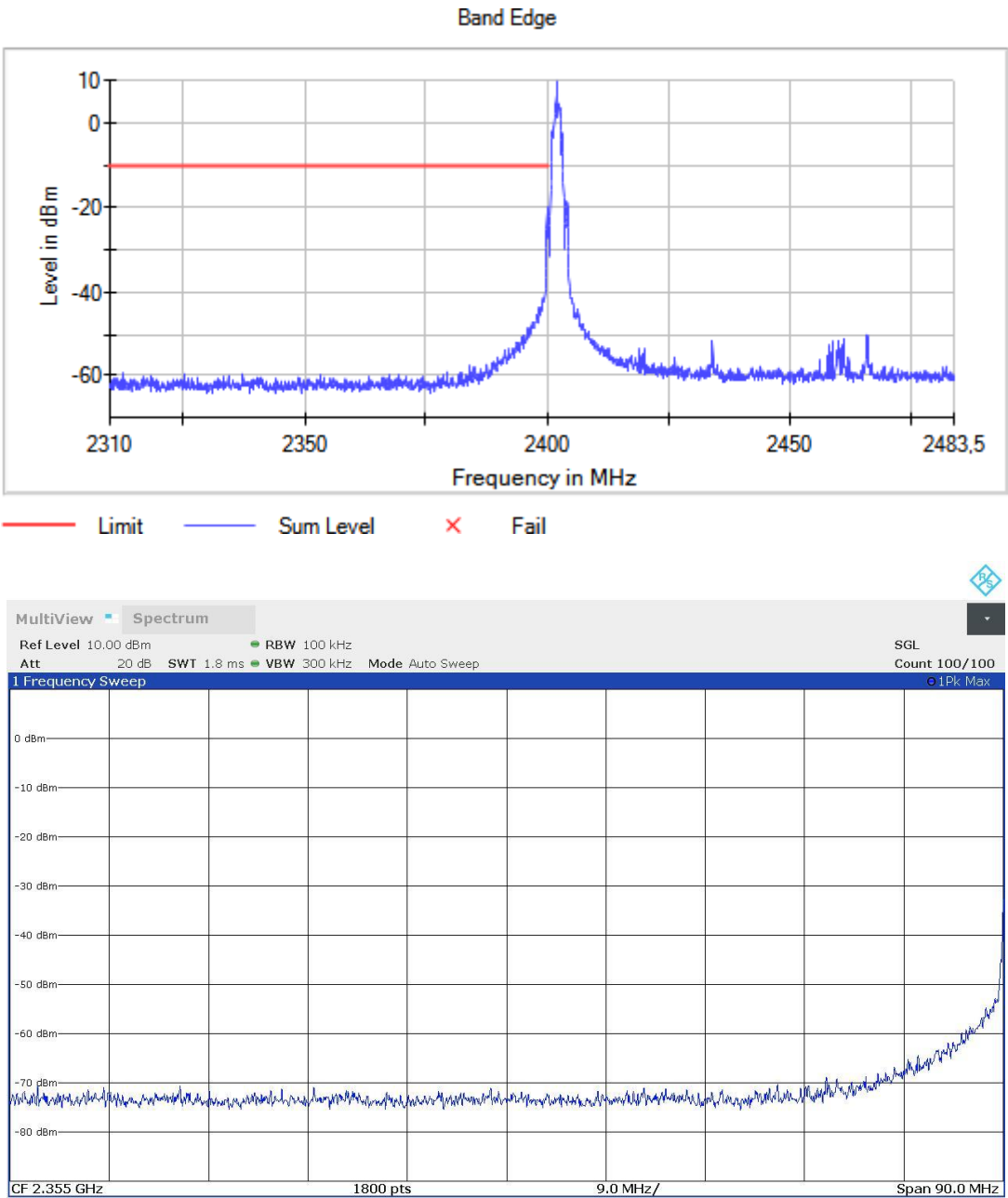
Images:

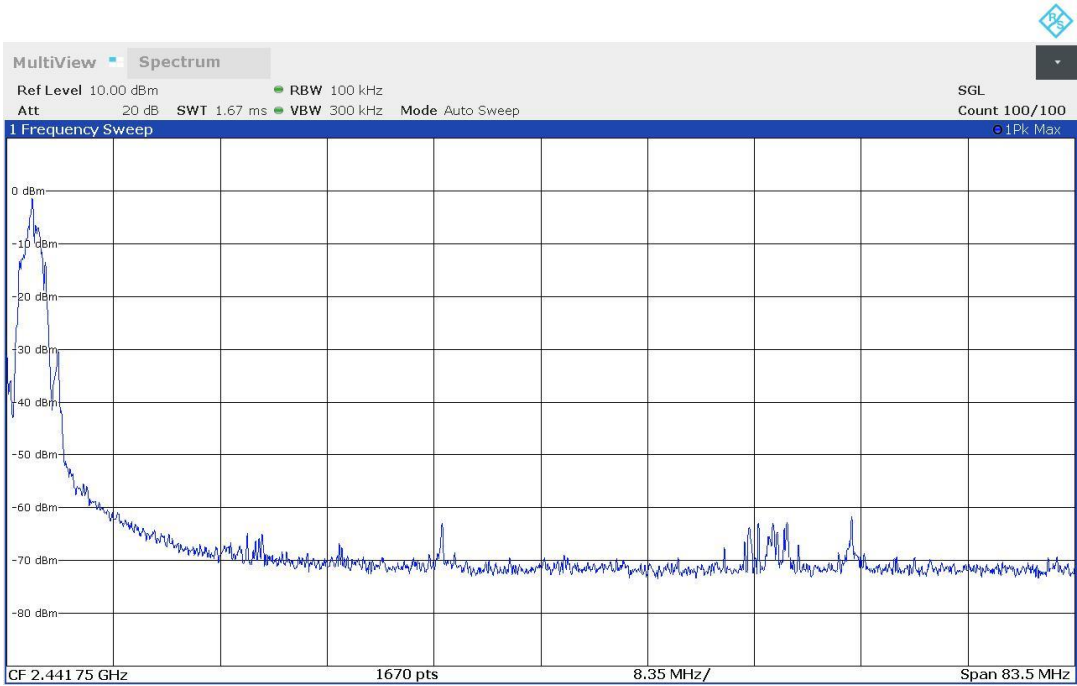




Equipment Type = Digital Transmission System (DTS) Bandwidth MHz = 2
Modulation = BTLE 5.0 (GFSK 2 Mbit/s) Frequency MHz = 2402.00000
MIMO Mode = SISO Measurement Point = 1
Active Port = 1

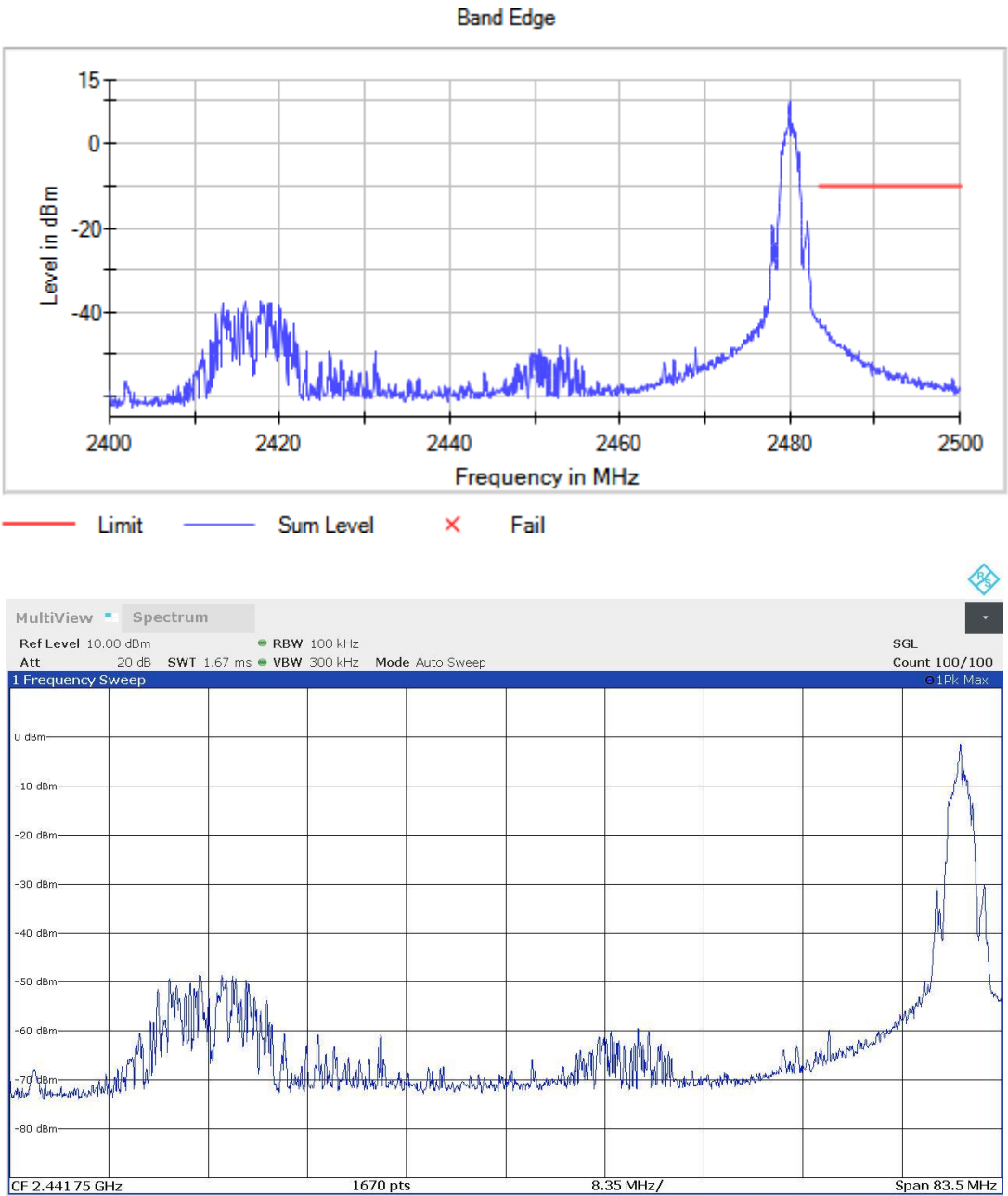
Images:

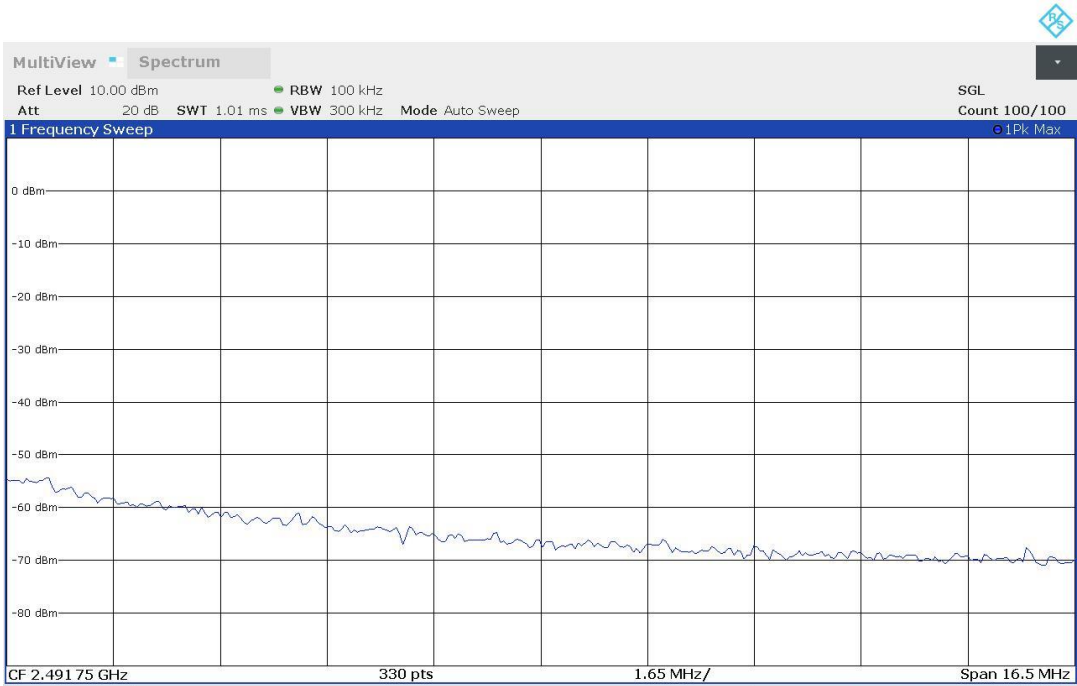




Equipment Type = Digital Transmission System (DTS) Bandwidth MHz = 2
Modulation = BTLE 5.0 (GFSK 2 Mbit/s) Frequency MHz = 2480.00000
MIMO Mode = SISO Measurement Point = 1
Active Port = 1

Images:





RSS-247 5.5 / FCC 15.247 (d) 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.

Results

Modulation: BTLE 5.0 (GFSK 1 Mbit/s)

Frequency range 30 MHz – 1 GHz:

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

Spurious frequencies detected at less than 20 dB below the limit:

Unwanted Freq (MHz)	Unwanted Lvl (dBμV/m)	Pol	Detector
204.018	20.64	V	QP
34.801	20.05	V	QP
38.876	24.48	V	QP
42.998	36.82	V	QP
44.986	27.71	V	QP
462.474	23.30	V	QP
47.072	33.04	V	QP
51.194	28.64	V	QP
55.269	22.49	V	QP
68.994	21.27	V	QP
80.974	20.40	V	QP

Frequency range 1 GHz – 26 GHz:

The results below 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 dB μ V/m at 3 m) are measured with average detector for compliance checking with the average limit.

- Low Channel:

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

- Middle Channel:

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

- High Channel:

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

Modulation: BTLE 5.0 (GFSK 2 Mbit/s)

Frequency range 30 MHz – 1 GHz:

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

Spurious frequencies detected at less than 20 dB below the limit:

Unwanted Freq (MHz)	Unwanted Lvl (dB μ V/m)	Pol	Detector
38.924	30.06	V	QP
42.998	35.67	V	QP
44.986	25.78	V	QP
462.281	24.59	H	QP
47.072	29.00	V	QP
51.146	21.11	V	QP
55.269	20.15	V	QP
62.980	21.14	V	QP
68.994	23.49	V	QP
74.960	21.60	V	QP
81.022	24.88	V	QP
86.987	23.96	V	QP

Frequency range 1 GHz – 26 GHz:

The results below 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 compliance checking with the average limit.

* Duty Cycle correction factor: 2.4 dB

- Low Channel:
No spurious frequencies found at less than 20 dB below the limit.
- Middle Channel:
No spurious frequencies found at less than 20 dB below the limit.
- High Channel:
Spurious frequencies found at less than 20 dB below the limit:

Unwanted Freq (MHz)	Unwanted Lvl (dBµV/m)	Corrected Unwanted Lvl (dBµV/m)	Pol	Detector
2483.5333	60.67	--	V	PK
	51.07	53.47		AVG

Verdict

Pass

Attachments

Spectrum Analyzer Parameters:

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
Receiver: [ESR 7] 30 MHz - 1 GHz	48,5 kHz	PK+	100 kHz	1 s	20 dB
Receiver: [FSV 40] 1 GHz - 3 GHz	66,667 kHz	PK+ ; AVG	1 MHz	1 s	0 dB
Receiver: [FSV 40] 3 GHz - 17 GHz	500 kHz	PK+ ; AVG	1 MHz	1 s	0 dB
Receiver: [FSV 40] 17 GHz - 26 GHz	500 kHz	PK+ ; AVG	1 MHz	1 s	0 dB

Frequency Range GHz = [0.03, 1]

Equipment Type = Digital Transmission System (DTS)

Modulation = BTLE 5.0 (GFSK 1 Mbit/s)

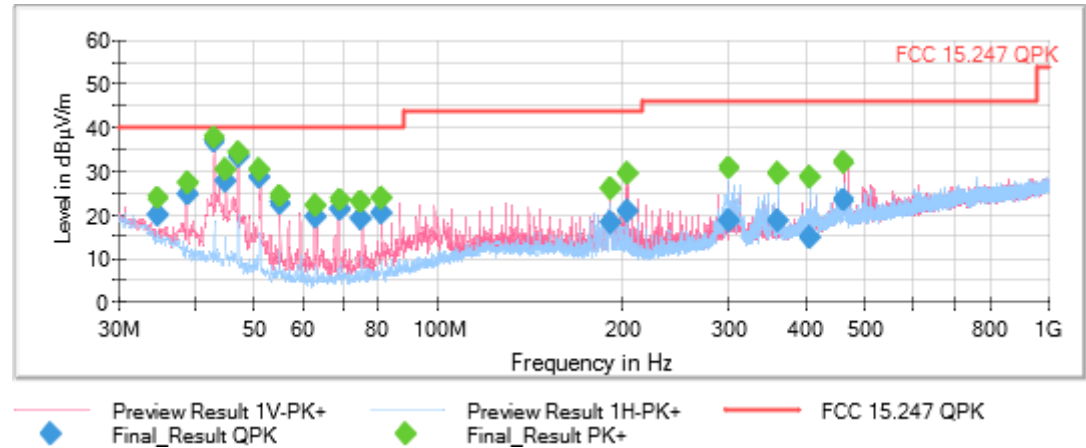
Frequency MHz = The spurious signals detected do not depend on the operating channel.

MIMO Mode = SISO

Measurement Point = 1

Active Port = 1

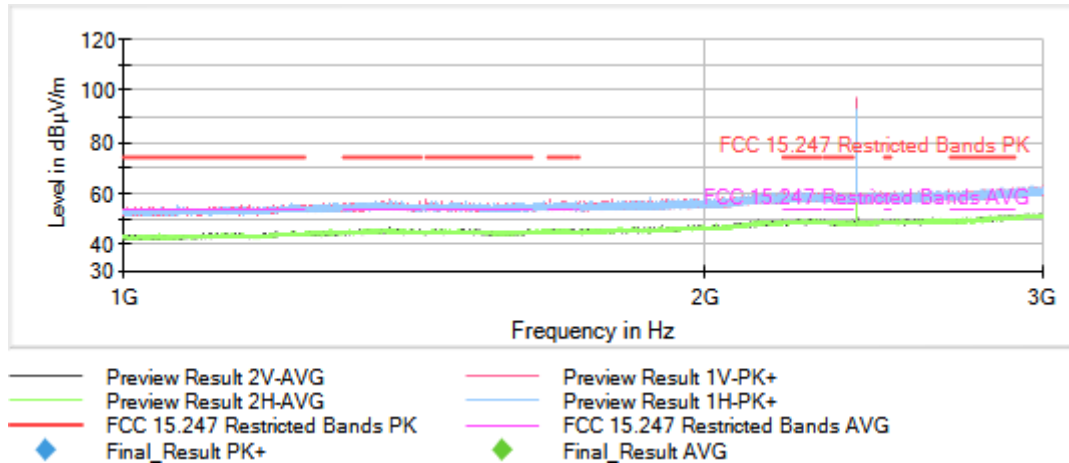
Images:



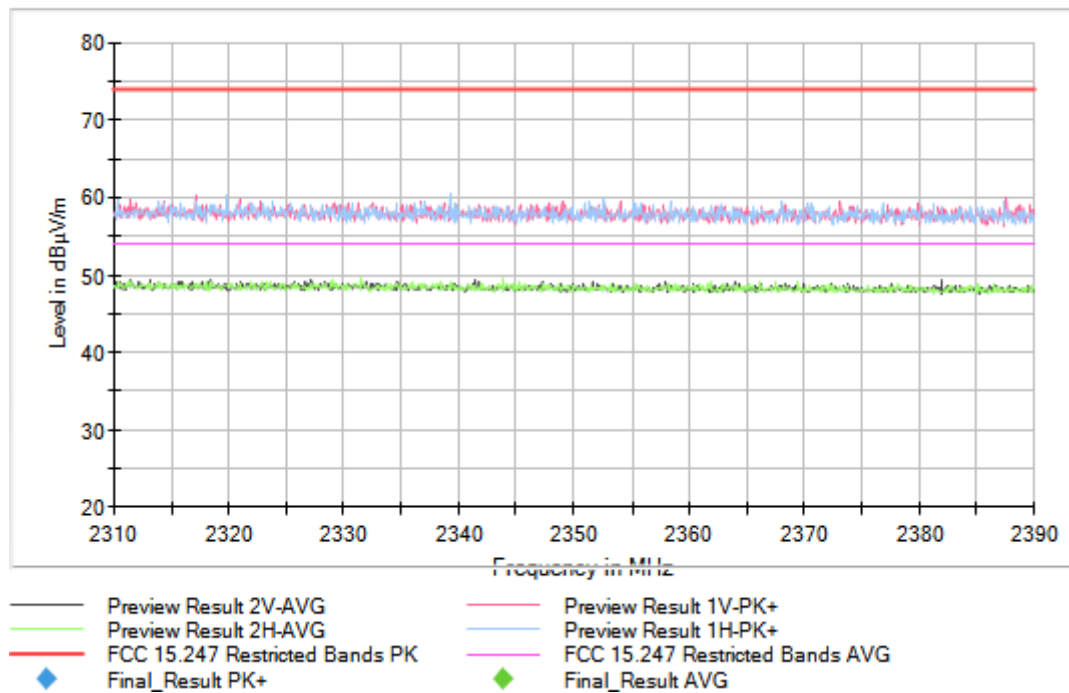
This plot is valid for all channels

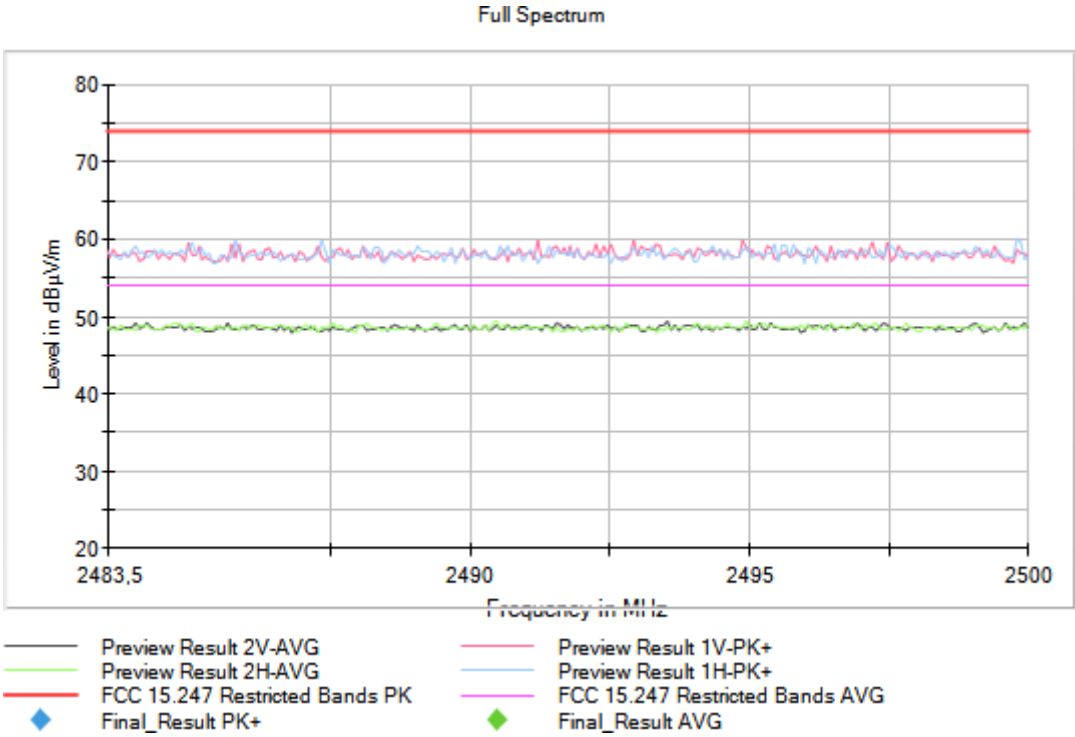
Frequency Range GHz = [1, 3] Equipment Type = Digital Transmission System (DTS)
Modulation = BTLE 5.0 (GFSK 1 Mbit/s) Frequency MHz = 2402.00000
MIMO Mode = SISO Measurement Point = 1
Active Port = 1

Images:



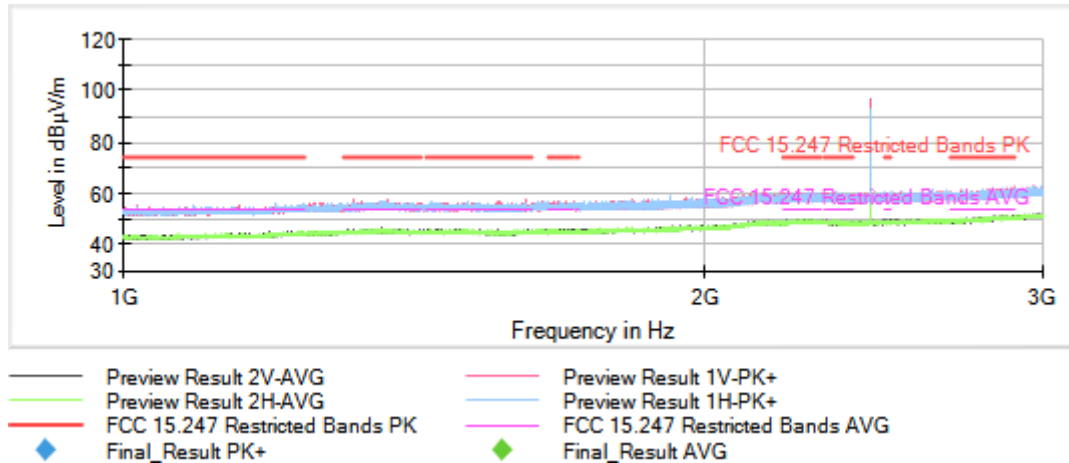
Full Spectrum



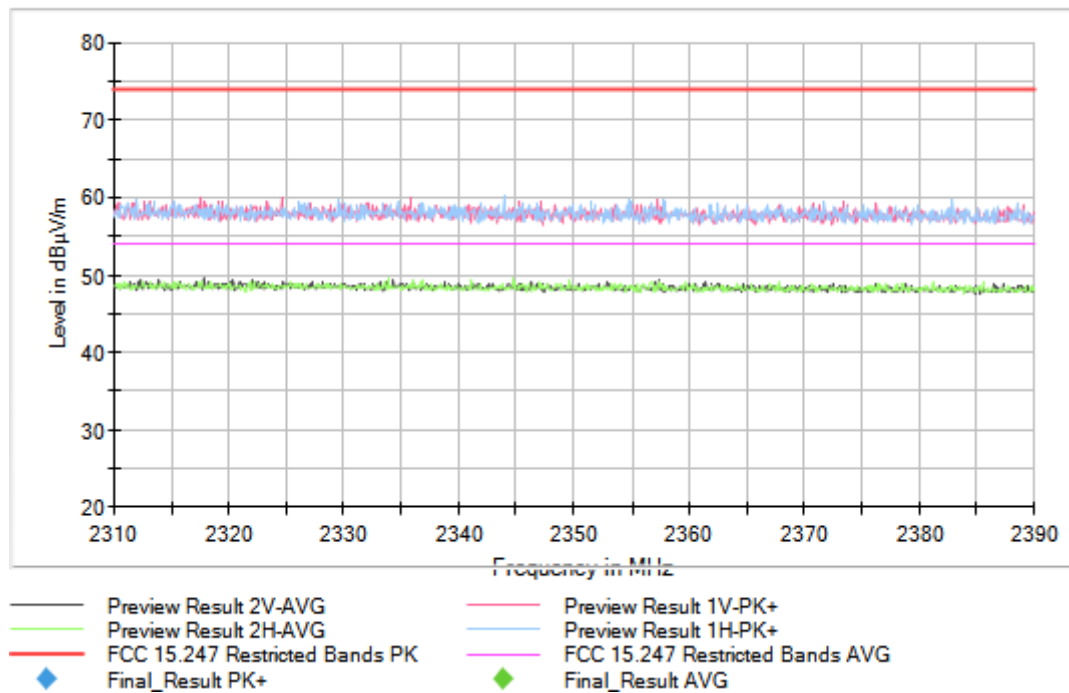


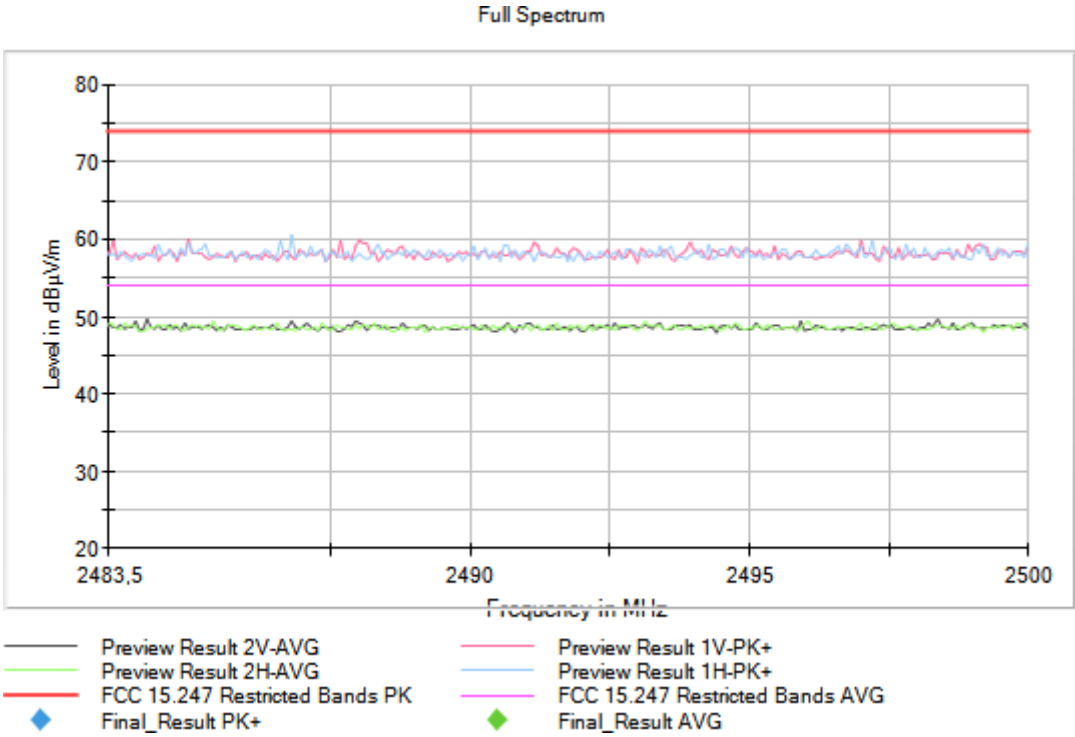
Frequency Range GHz = [1, 3] Equipment Type = Digital Transmission System (DTS)
Modulation = BTLE 5.0 (GFSK 1 Mbit/s) Frequency MHz = 2440.00000
MIMO Mode = SISO Measurement Point = 1
Active Port = 1

Images:



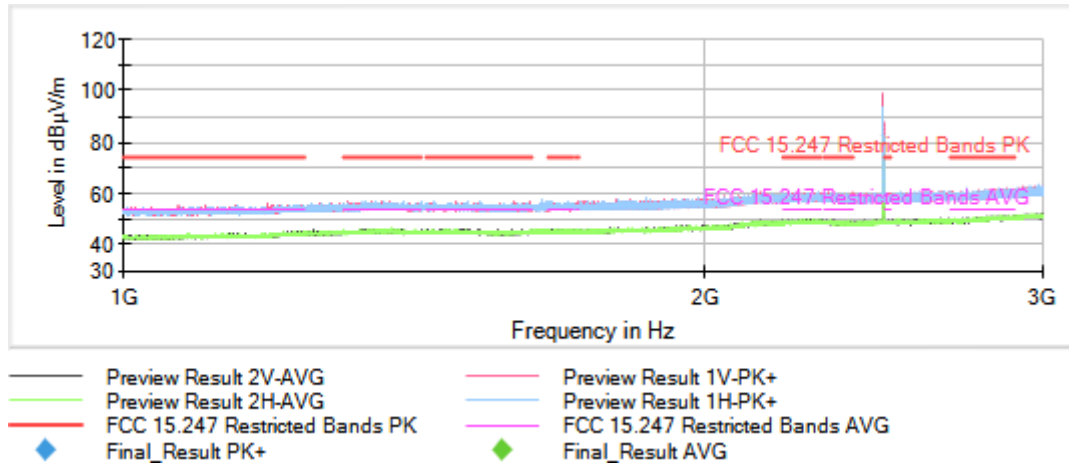
Full Spectrum



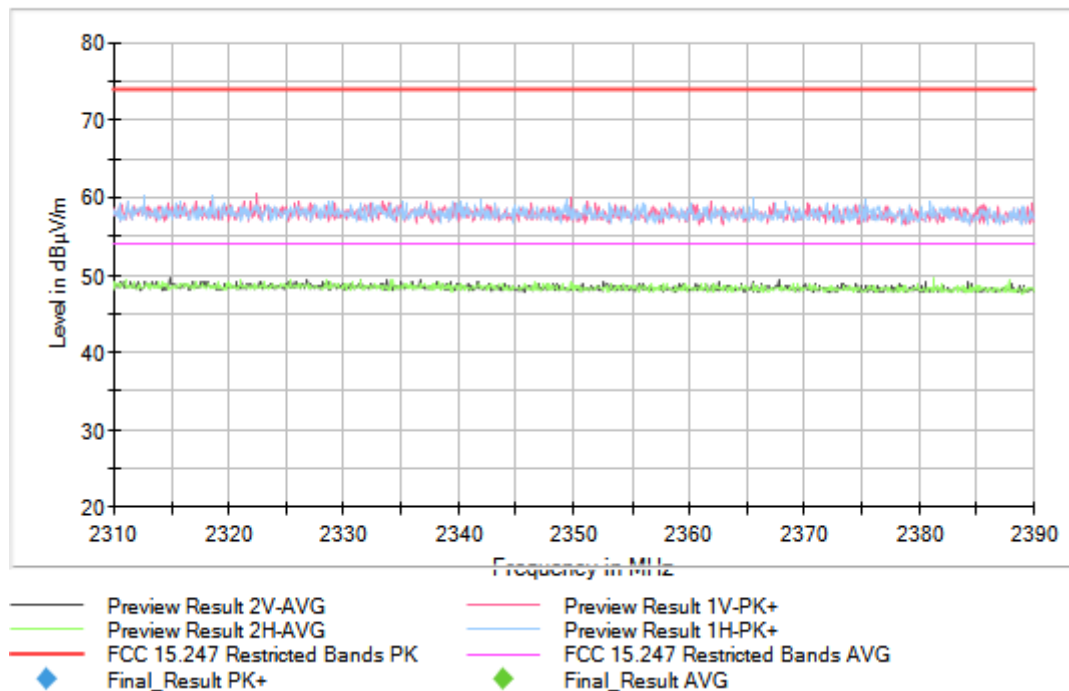


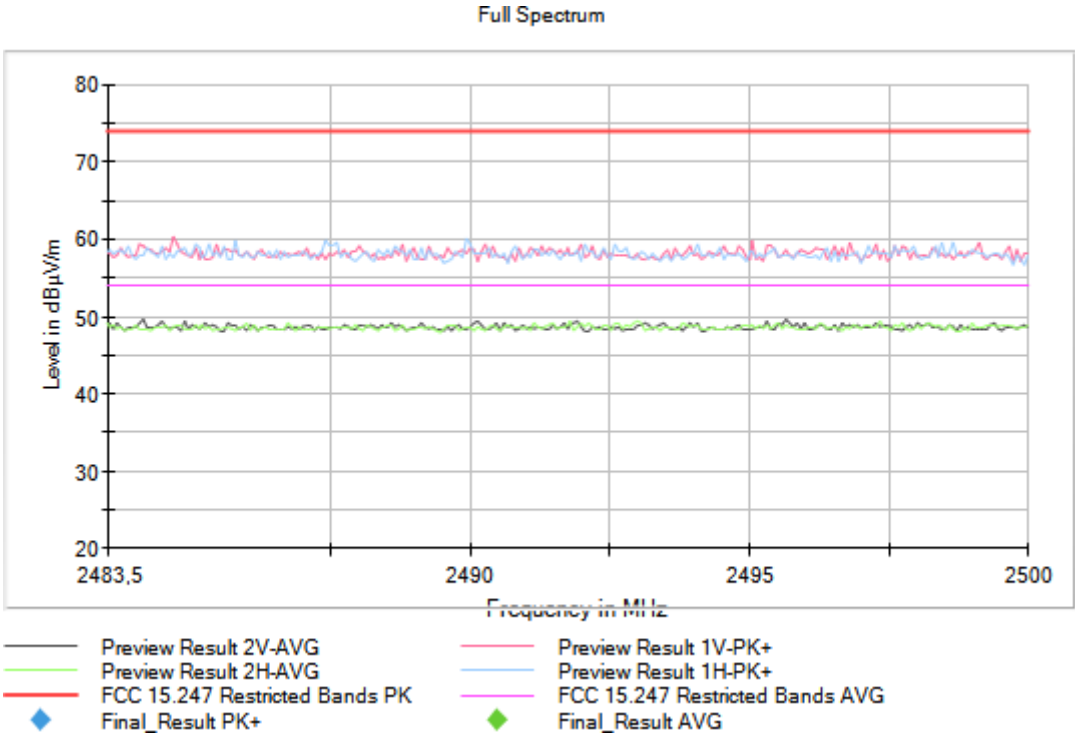
Frequency Range GHz = [1, 3] Equipment Type = Digital Transmission System (DTS)
Modulation = BTLE 5.0 (GFSK 1 Mbit/s) Frequency MHz = 2480.00000
MIMO Mode = SISO Measurement Point = 1
Active Port = 1

Images:



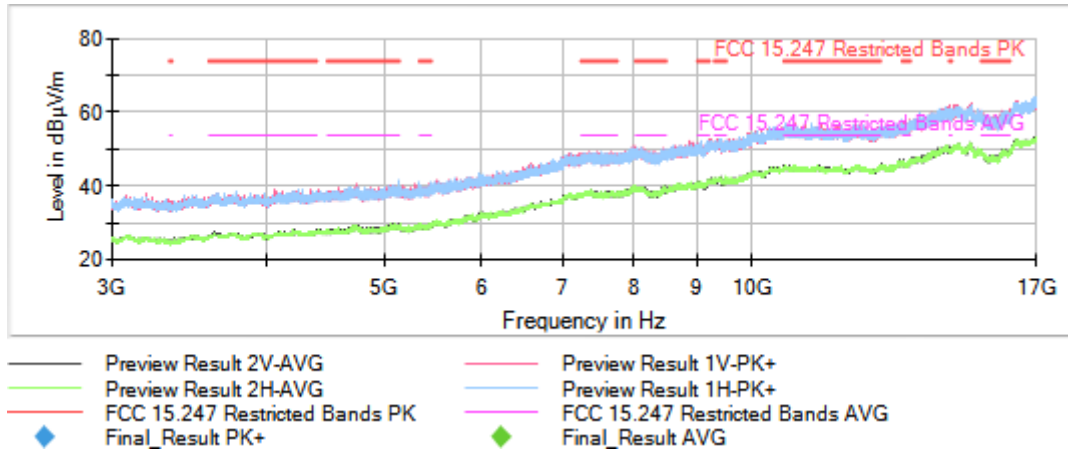
Full Spectrum





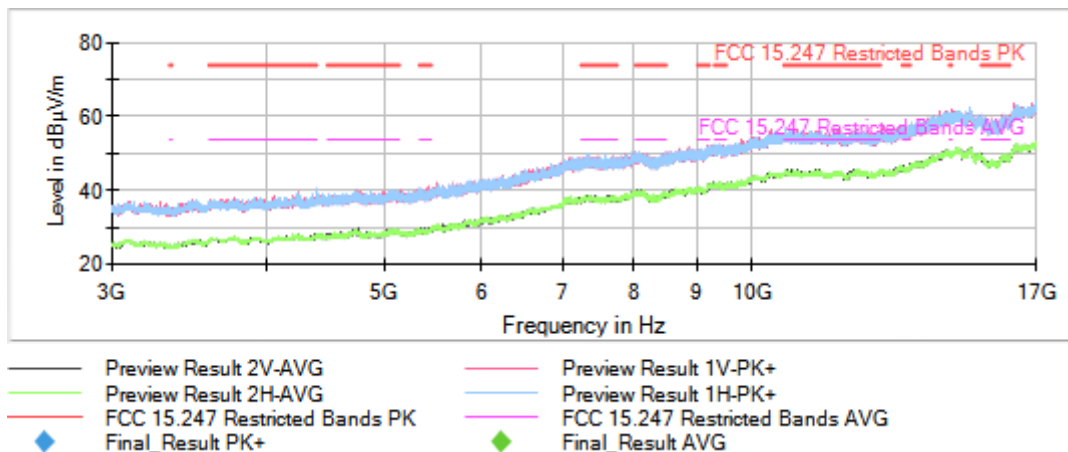
Frequency Range GHz = [3, 17] Equipment Type = Digital Transmission System (DTS)
 Modulation = BTLE 5.0 (GFSK 1 Mbit/s) Frequency MHz = 2402.00000
 MIMO Mode = SISO Measurement Point = 1
 Active Port = 1

Images:



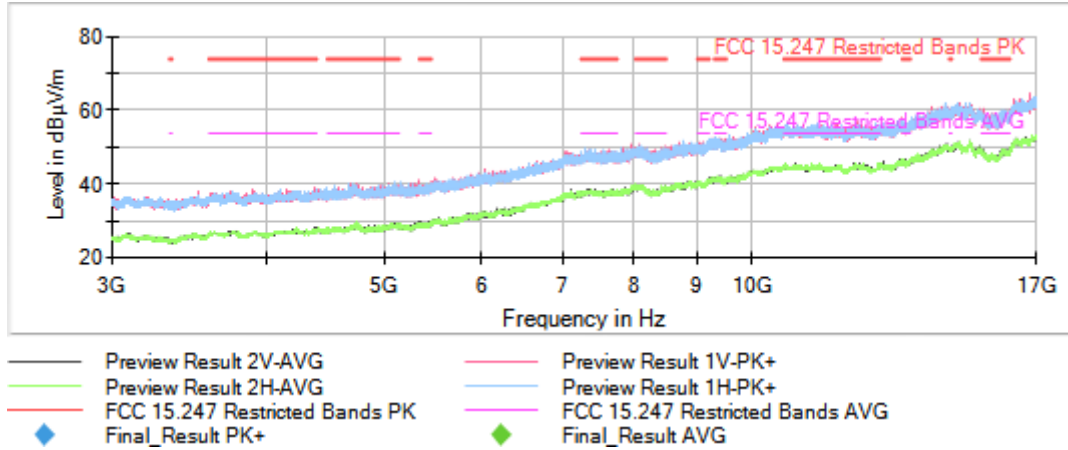
Frequency Range GHz = [3, 17] Equipment Type = Digital Transmission System (DTS)
 Modulation = BTLE 5.0 (GFSK 1 Mbit/s) Frequency MHz = 2440.00000
 MIMO Mode = SISO Measurement Point = 1
 Active Port = 1

Images:



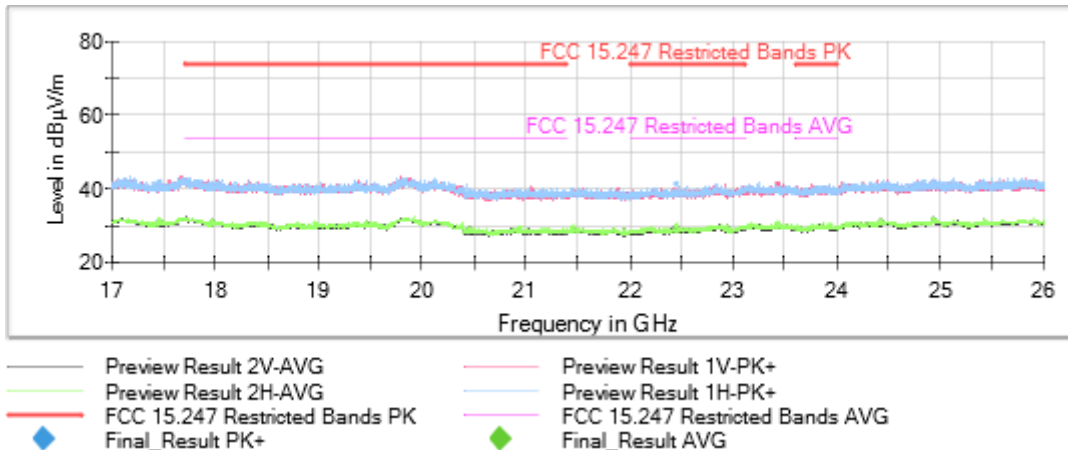
Frequency Range GHz = [3, 17] Equipment Type = Digital Transmission System (DTS)
Modulation = BTLE 5.0 (GFSK 1 Mbit/s) Frequency MHz = 2480.00000
MIMO Mode = SISO Measurement Point = 1
Active Port = 1

Images:



Frequency Range GHz = [17, 26] Equipment Type = Digital Transmission System (DTS)
Modulation = BTLE 5.0 (GFSK 1 Mbit/s) Frequency MHz = The spurious signals detected do not depend on the operating channel.
MIMO Mode = SISO Measurement Point = 1
Active Port = 1

Images:



This plot is valid for all channels

Frequency Range GHz = [0.03, 1]

Equipment Type = Digital Transmission System (DTS)

Modulation = BTLE 5.0 (GFSK 2 Mbit/s)

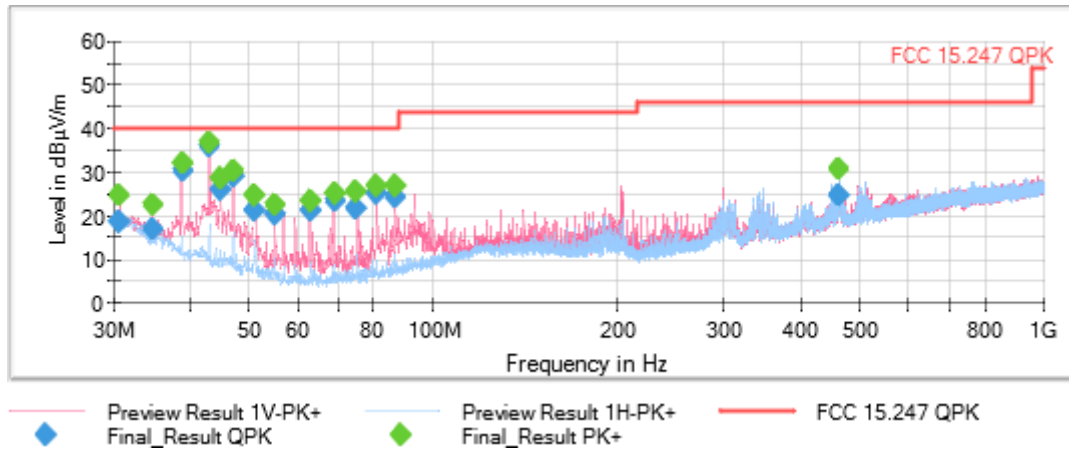
Frequency MHz = The spurious signals detected do not depend on the operating channel.

MIMO Mode = SISO

Measurement Point = 1

Active Port = 1

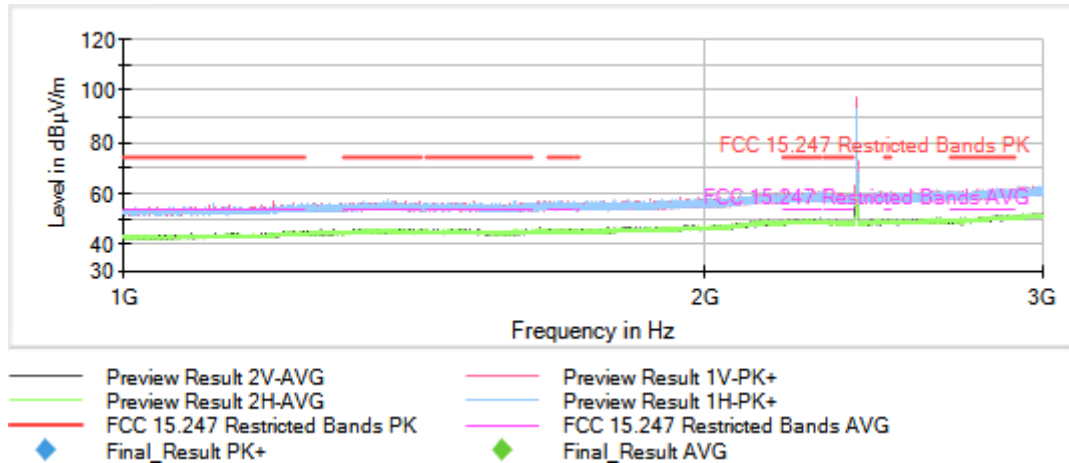
Images:



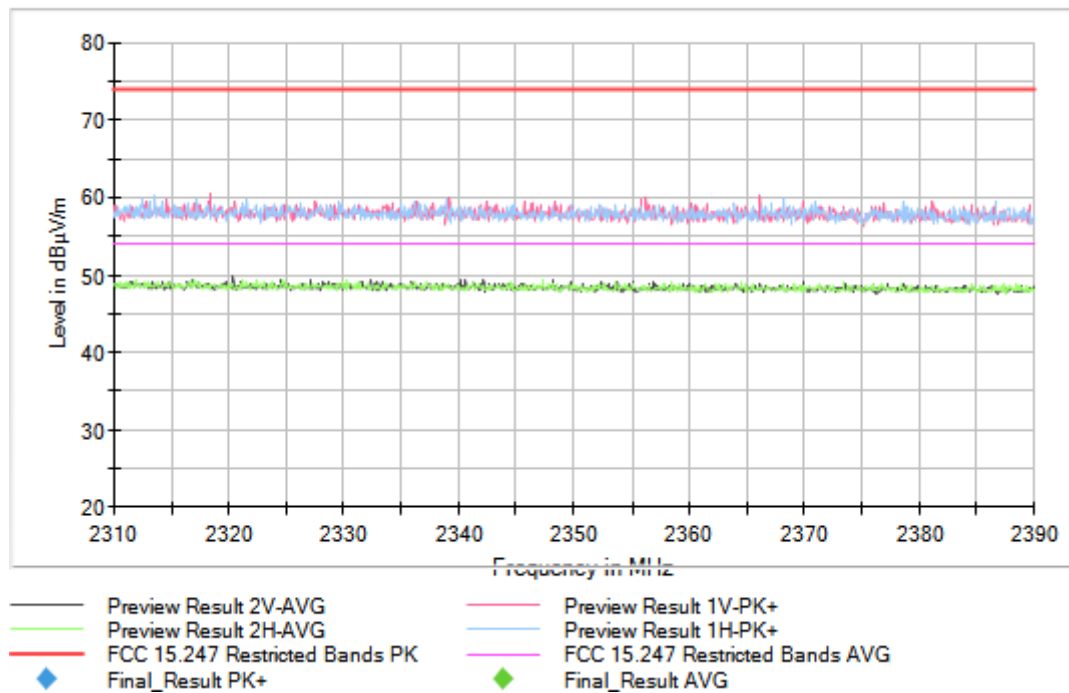
This plot is valid for all channels

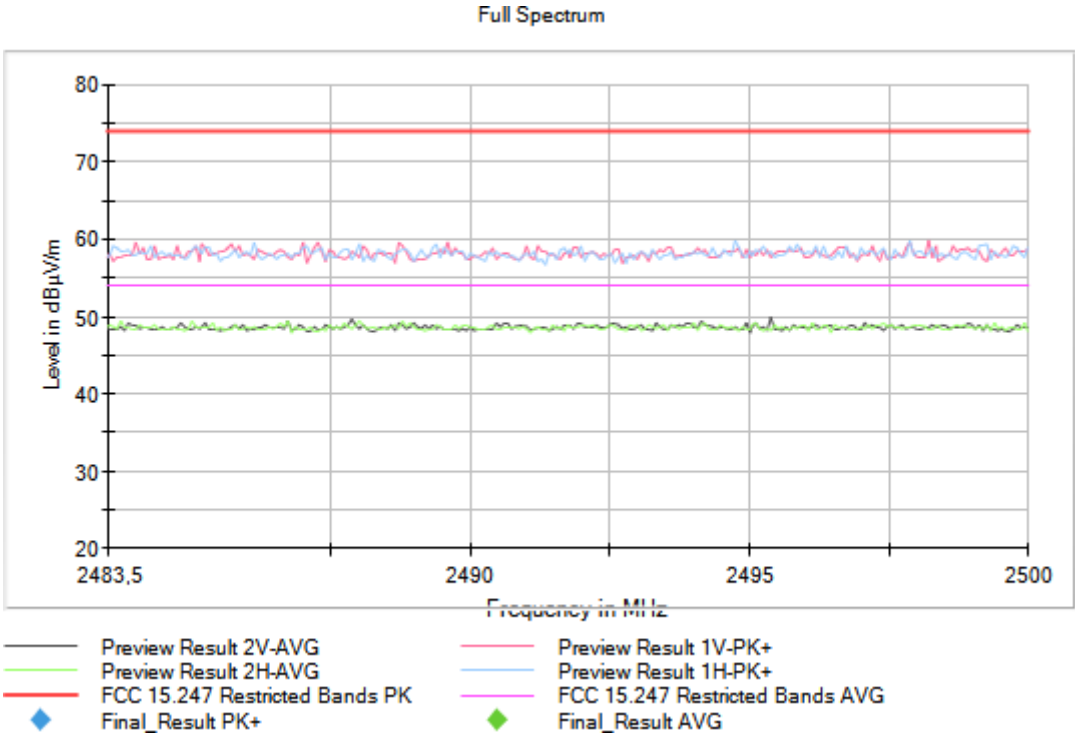
Frequency Range GHz = [1, 3] Equipment Type = Digital Transmission System (DTS)
Modulation = BTLE 5.0 (GFSK 2 Mbit/s) Frequency MHz = 2402.00000
MIMO Mode = SISO Measurement Point = 1
Active Port = 1

Images:



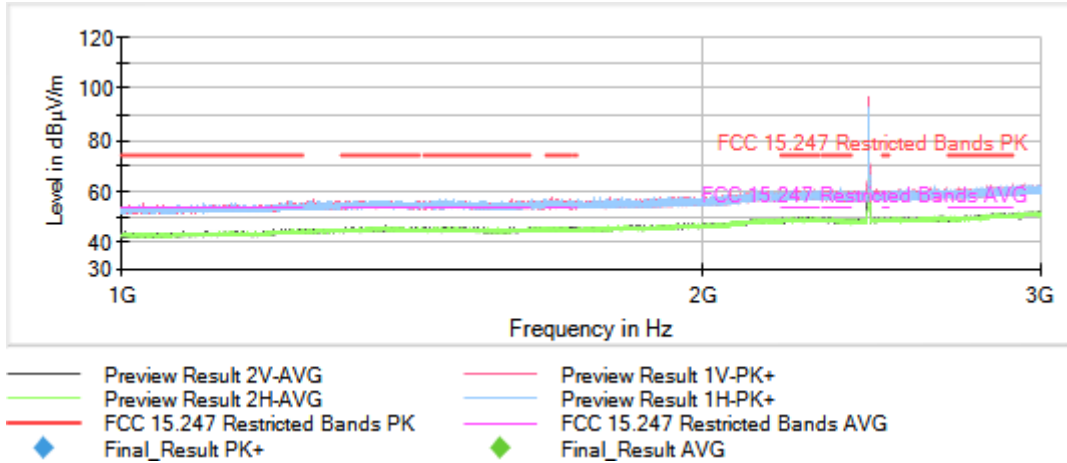
Full Spectrum



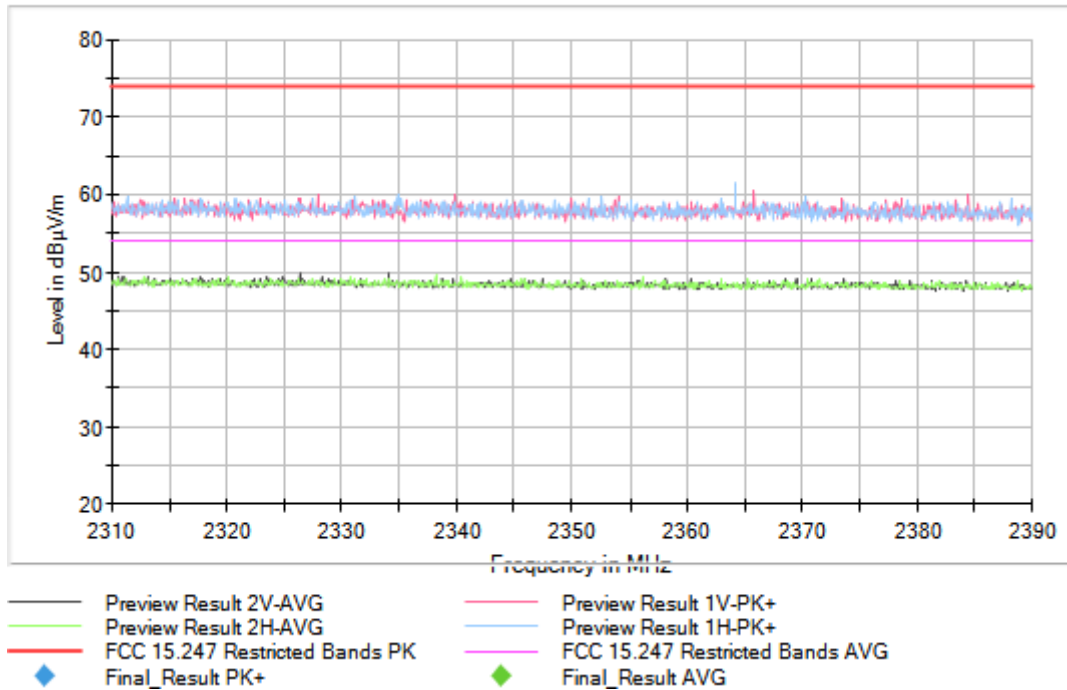


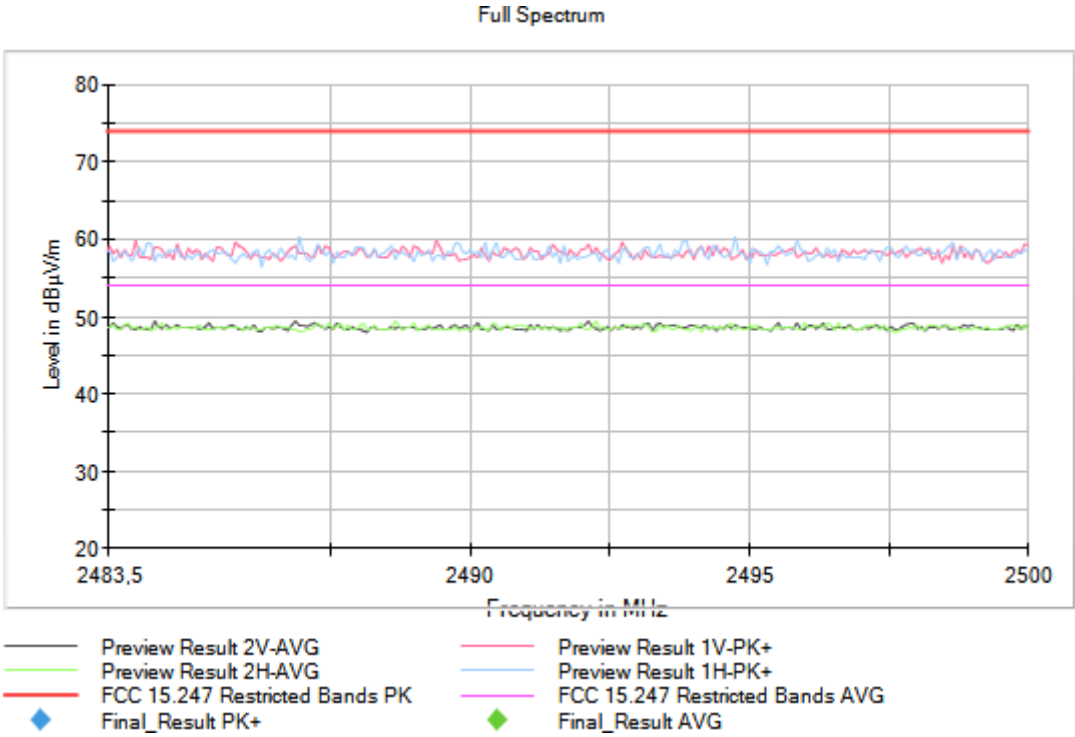
Frequency Range GHz = [1, 3] Equipment Type = Digital Transmission System (DTS)
Modulation = BTLE 5.0 (GFSK 2 Mbit/s) Frequency MHz = 2440.00000
MIMO Mode = SISO Measurement Point = 1
Active Port = 1

Images:



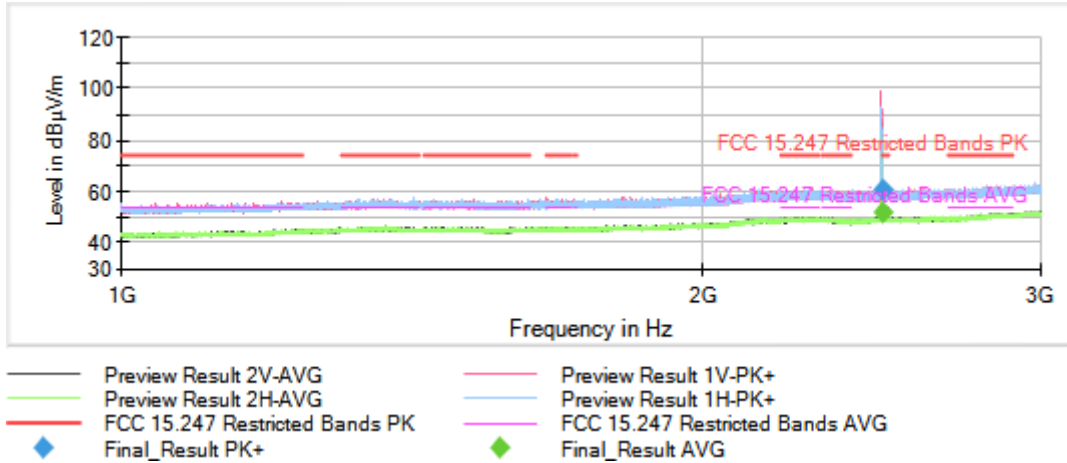
Full Spectrum



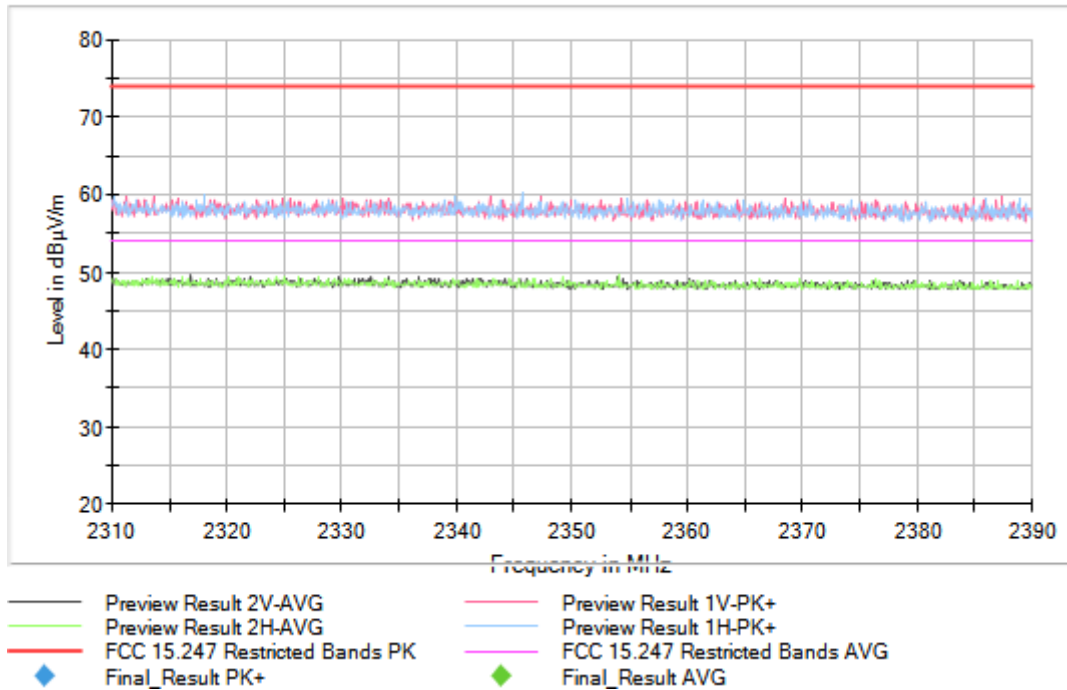


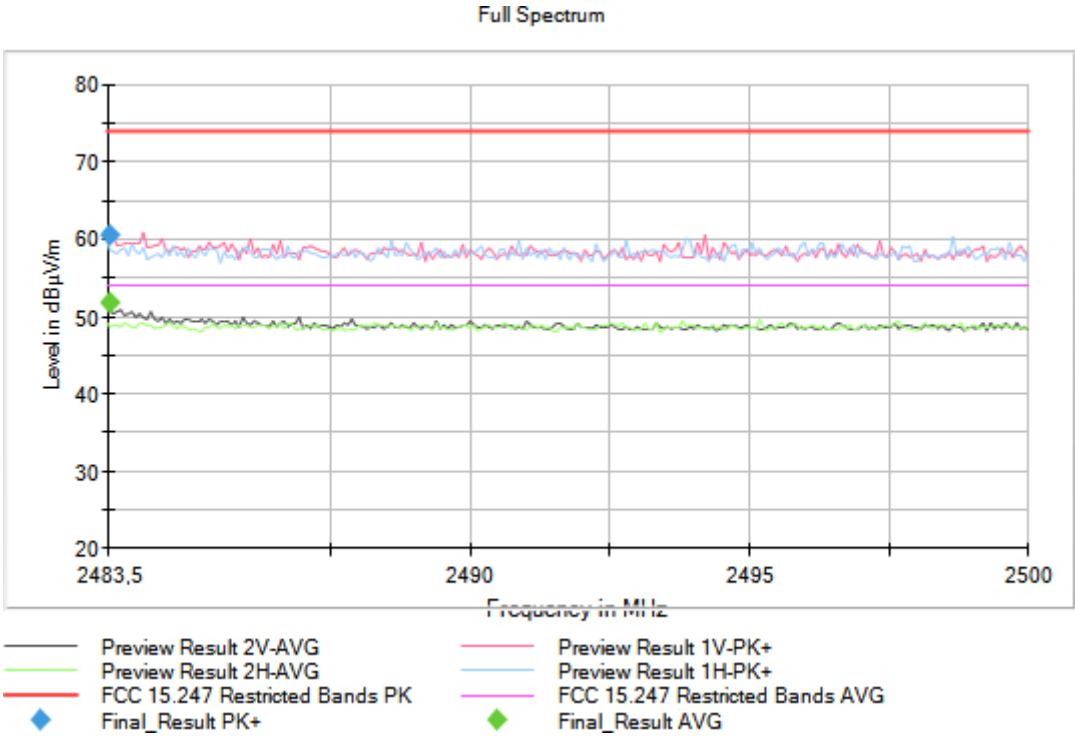
Frequency Range GHz = [1, 3] Equipment Type = Digital Transmission System (DTS)
Modulation = BTLE 5.0 (GFSK 2 Mbit/s) Frequency MHz = 2480.00000
MIMO Mode = SISO Measurement Point = 1
Active Port = 1

Images:



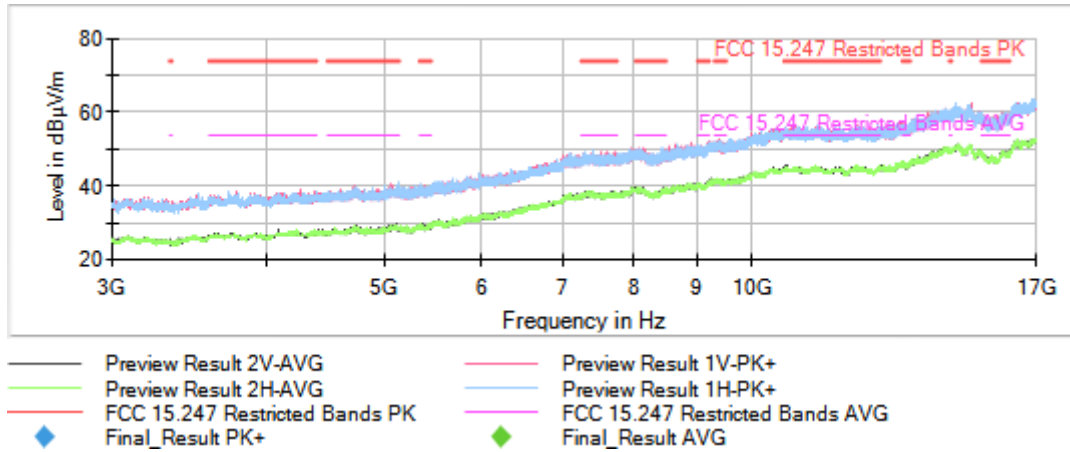
Full Spectrum





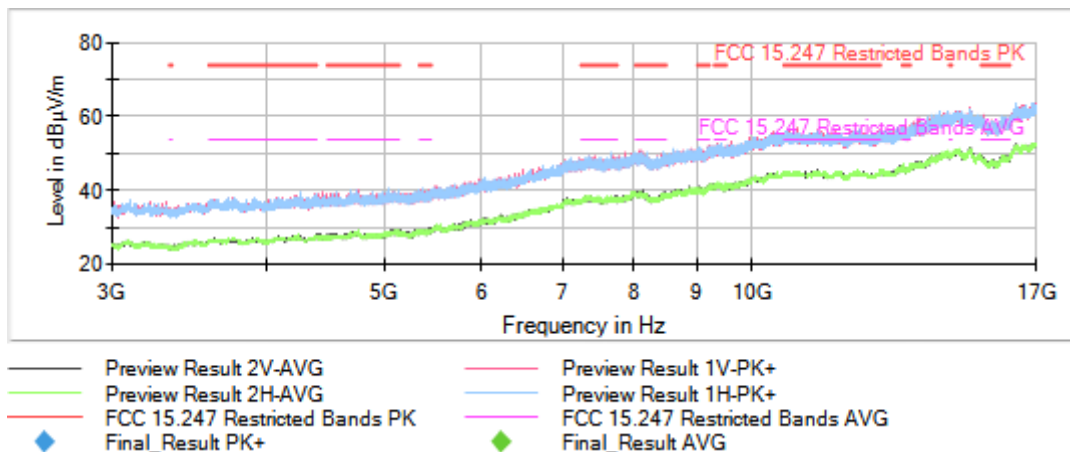
Frequency Range GHz = [3, 17] Equipment Type = Digital Transmission System (DTS)
Modulation = BTLE 5.0 (GFSK 2 Mbit/s) Frequency MHz = 2402.00000
MIMO Mode = SISO Measurement Point = 1
Active Port = 1

Images:



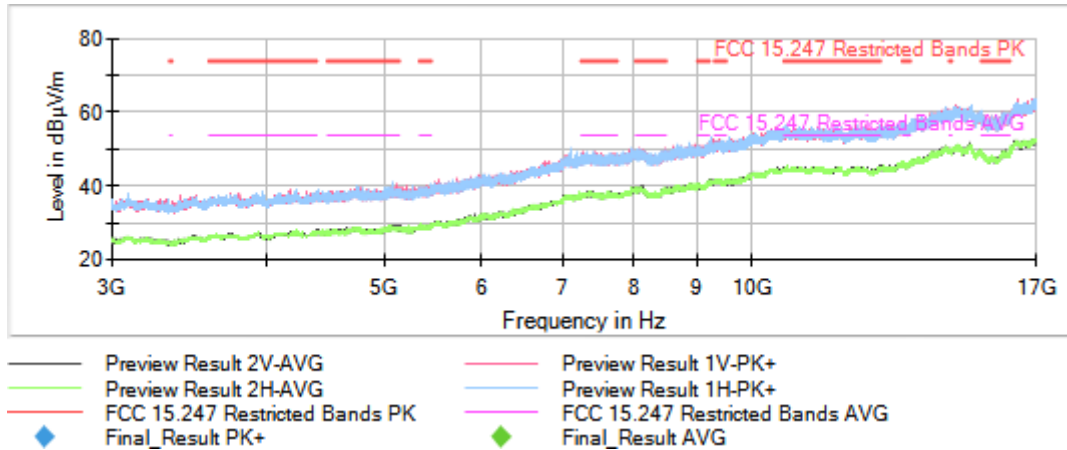
Frequency Range GHz = [3, 17] Equipment Type = Digital Transmission System (DTS)
Modulation = BTLE 5.0 (GFSK 2 Mbit/s) Frequency MHz = 2440.00000
MIMO Mode = SISO Measurement Point = 1
Active Port = 1

Images:



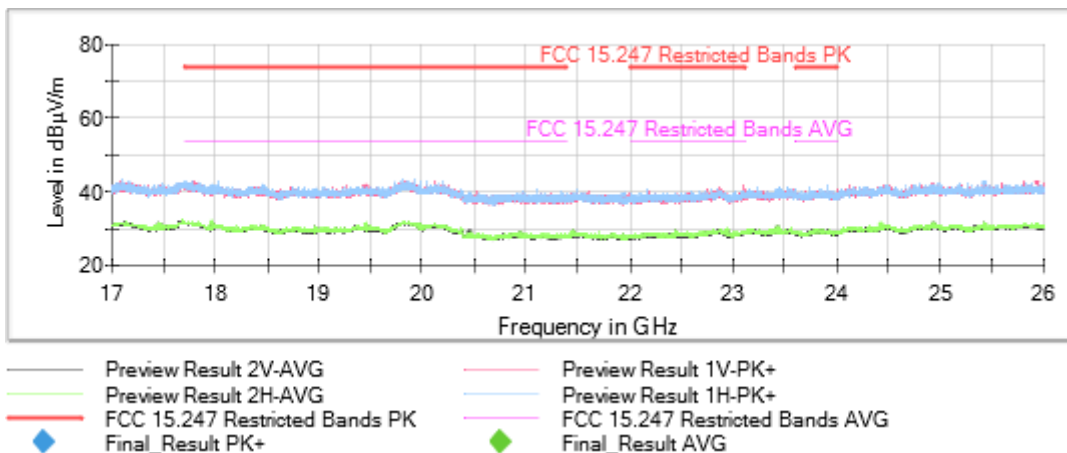
Frequency Range GHz = [3, 17] Equipment Type = Digital Transmission System (DTS)
Modulation = BTLE 5.0 (GFSK 2 Mbit/s) Frequency MHz = 2480.00000
MIMO Mode = SISO Measurement Point = 1
Active Port = 1

Images:



Frequency Range GHz = [17, 26] Equipment Type = Digital Transmission System (DTS)
Modulation = BTLE 5.0 (GFSK 2 Mbit/s) Frequency MHz = The spurious signals detected do not depend on the operating channel.
MIMO Mode = SISO Measurement Point = 1
Active Port = 1

Images:



This plot is valid for all channels